

IS 270



INNOVATIVE CONGESTION
MANAGEMENT CONTRACT

01.19.17



Mobility



Safety



Operability/
Maintainability/
Adaptability



Well-Managed
Project



TECHNICAL PROPOSAL | CONTRACT NO. MO0695172

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PARSONS

Table of Contents

1. COVER LETTER	ii
Professional Liability Insurance.....	iv
2. MOBILITY	1
3. SAFETY	21
4. OPERABILITY/MAINTAINABILITY/ADAPTABILITY	31
5. WELL-MANAGED PROJECT	41
6. LEGAL & FINANCIAL INFORMATION	51
i. Design-Builder Organization.....	51
ii. Liability.....	51
7. APPENDIX	52
i. Addenda Letters and Responses to RFIs.....	52
ii. PTCs and the Administration’s PTC Letters	53
iii. VISSIM Traffic Model for 2015 and 2040 Build Design Years	54
iv. Supporting Information.....	55

2

MOBILITY



② Mobility

The Federal Highway Administration (FHWA) cites nearly two dozen mobility performance measures to quantify circumstances that hinder the free and easy movement of vehicles and individuals through the transportation system. Given the combination of peak volumes, space and funding limitations, environmental considerations, the prevalence of interruptions resulting from incidents, and current driver operating practices, achieving significantly better traffic flow on IS 270 requires a creative approach that combines multiple strategies.

Parsons proposes a holistic solution that will improve mobility by enhancing roadway capacity, removing obstructions, and improving operational efficiency. The fully-integrated components of our solution will provide immediate vehicle throughput and trip predictability improvement, and provide the foundation for sustained improvements.

i. Improvements – Maximizing Vehicle Throughput and Minimizing Vehicle Travel Times

Parsons will utilize a variety of strategies to achieve SHA's goals of reducing recurring and non-recurring congestion:

- **Adding part-time capacity.** Parsons will add hard shoulder running (HSR) on lengths of mainline and C/D roadway where it will be effective and safe. The HSR lanes will be available during peak travel periods, and as auxiliary lanes during incidents.
- **Improving vehicle merging.** Parsons' mobility solution will improve vehicle merging by metering the flow of vehicles into the mainline using corridor-wide adaptive ramp metering control (ARMC). Using methods and control algorithms Parsons has developed, we will provide

a turnkey solution that will control the entry of vehicles based on the ability of the roadway to accommodate them in real-time, and reduce collisions at merge points.

- **Smoothing vehicle flow.** To complement our ARMC solution, Parsons will implement a variable speed limit (VSL) solution that will reduce speed fluctuations, and a connected vehicles (CV) solution and a queue warning system (QWS) to alert drivers of downstream traffic conditions.
- **Maximizing efficient use of existing capacity.** At present, the high-occupancy vehicle (HOV) lanes on the IS 270 corridor are underutilized. Parsons will deploy an innovative incentive-based solution called Mobility Options Discovery & Engagement (MODE[®]) to increase carpool participation and gather crowd-sourced data to assess Park & Ride space availability.
- **Safely reducing vehicle headway.** By implementing an innovative combination of technology solutions, Parsons will help the SHA to lay the groundwork for connected vehicle (CV) technology as a strategy for dramatically, but safely, reducing vehicle headways on the IS 270 corridor.
- **Influencing driver behavior.** The combination of an advisory VSL system, an incentive program to encourage ridesharing (MODE[®]), and CV technology will encourage corridor users to modify travel patterns and driving habits.

Parsons' proposed throughput improvement initiative is summarized in Exhibit 2-1. The sections that follow provide additional detail regarding the characteristics and locations of each component of the solution, and the quantification of benefits that will result.

Hard Shoulder Running

Hard Shoulder Running (HSR) is a proven active traffic management (ATM) strategy that Parsons will implement as a part of its comprehensive Performance-Based Practical Design (PBPD) approach. Combining the use of shoulders as temporary travel lanes with intelligent transportation system (ITS) technology will provide safe additional capacity to increase throughput on IS 270 at a level not practical with any other approach. On IS 270, where the peak demand already exceeds capacity and roadway expansion is impractical or impossible in many places, HSR will provide supplemental capacity in critical areas without requiring acquisition of additional right-of-way.

What Parsons Will Deploy

Parsons' HSR solution will use the shoulder as an additional lane of travel during peak period hours, and as warranted during non-peak periods based on congestion levels and in response to incidents.

PARSONS HSR DEPLOYMENTS

Parsons developed the ATM software solution, installing our Intelligent NETWORKS® Advanced Transportation Management System (ATMS) Software, to enable the implementation of HSR, VSL and ARMC on I-66 in Fairfax and Loudoun Counties in Northern Virginia.

Parsons' solution will monitor conditions continuously and use real-time and anticipated

EXHIBIT 2-1: Summary of Proposed Throughput Improvements

Solution Element	Description	Adding Part-Time Capacity	Improving Vehicle Merging	Smoothing Traffic Flow	Maximizing Efficient Use of Existing Capacity	Safely Reducing Vehicle Headway	Influencing Driver Behavior	PTC
Hard Shoulder Running (HSR)	Improves shoulder lanes for use during peak demand periods and incidents.	✓						PAR01
Variable Speed Limits (VSL)	Advises drivers to adjust speeds to minimize bottlenecks		✓	✓	✓	✓	✓	PAR02
Adaptive Ramp Metering Control (ARMC)	Controls the rate of entry of vehicles onto IS 270 based on prevailing traffic conditions.		✓	✓	✓			PAR03
Corridor Decision Support System (CDSS)	Coordinates operations between the ARMC system and adjacent signals to mitigate the effects of congestion		✓	✓	✓			N/A*
Connected Vehicles (CV)	Promotes speed harmonization and alerts drivers of downstream conditions.			✓	✓	✓	✓	PAR05
Queue Warning System (QWS)	Provides warnings to motorists of downstream traffic queues that require reductions in speed.			✓			✓	N/A*
Mobility Options Discovery and Engagement (MODE®)	Incentivizes dynamic ridesharing and casual carpooling for increasing HOV lane use.				✓		✓	PAR07

*Not submitted as a PTC

congestion levels to determine the need for shoulder lane use. This demand-responsive management approach will extract maximum throughput benefit from the HSR solution.

Parsons will build and deploy HSR on 19.02 total lane miles of roadway on IS 270, as shown in Exhibit 2-2.

EXHIBIT 2-2: Hard Shoulder Lane Mileage

Direction	Roadway Locations	Lane Miles
Southbound	Mainline	10.03
	Collector/Distributor	2.47
Northbound	Mainline	4.10
	Collector/Distributor	2.42

Parsons will design and build a Shoulder Lane Monitoring System (SLMS) that uses video detection to ensure that shoulders are free from obstructions and overhead HSR lane availability indicators to advise motorists when the lanes can be used. The field and back-office support systems for our HSR solution are summarized in Exhibit 2-3.

EXHIBIT 2-3: Summary of HSR Field and Back Office System Elements

System Element	Description	Deployment Plan*
Overhead Message Signs	Small “single character” message signs over the shoulder lanes indicate when the lane may be used.	At the start point of the hard shoulder and approximately every half mile along the entire length of the hard shoulder.
Video Image Detection System (VIDS) Cameras	Cameras will view all physical areas of the shoulder to confirm they are clear before the lane is opened.	At the start point of the hard shoulder and approximately every half mile along the entire length of the hard shoulder.
Dynamic Message Signs (DMS)	Multi-line dynamic message signs will alert motorists as to the status of downstream shoulders.	One mile upstream of start of HSR lane and every 5 miles thereafter.
Video Analytics Software	Software connected to the VIDS cameras will detect vehicles or debris in the hard shoulder lane.	Single instance with redundant backup housed in the Advanced Transportation Management System (ATMS).
Vehicle Detection Stations	Mainline vehicle detection stations will calculate mainline vehicle volumes, occupancy and speeds.	At the start point of the hard shoulder and approximately every half mile along the entire length of the hard shoulder.
Advanced Transportation Management System (ATMS) Software	Central system controls system monitoring, HSR algorithm and system reporting capabilities. Parsons will use its Intelligent NETworks® ATMS solution.	Single instance with redundant backup housed in the Advanced Transportation Management System (ATMS) at the SHA preferred traffic management center (TMC) location.

***Final Quantities and locations will be determined during design phase**

Page 1 of Appendix, Section iv (Supporting Information) depicts the location for each proposed HSR lane, as well as all supporting technology and associated infrastructure elements Parsons will install. These locations and the specific design may be adjusted during the detailed design process.

Variable Speed Limits

Through the reduction of the posted speed limit via dynamic message signs, a Variable Speed Limit (VSL) System helps drivers to adjust their speed and better react to downstream driving conditions, including reduced travel speeds and vehicle queuing. The three main mobility-related purposes for the deployment of a VSL System are:

1. Reducing speed variations to reduce the number of bottlenecks and capacity reductions caused by collisions and traffic flow shockwaves.

2. Achieving harmonized traffic flow to reduce the probability of a breakdown in the traffic flow and the subsequent reduction in highway capacity.
3. Limiting traffic flow into highway sections with a capacity problem to reduce the number of traffic flow shockwaves and the shockwave recovery time.

What Parsons Will Deploy

Parsons will implement a VSL System solution that will monitor conditions along IS 270 and advise motorists of recommended speeds for specific zones of travel. These zones are locations where our VISSIM analysis and data from the Regional Integrated Transportation Information System (RITIS) indicate frequent fluctuation in prevailing vehicle speeds during periods of high congestion.

Our solution will include roadside speed advisory signs, complemented by dynamic message signs (DMS). The DMS will advise motorists of downstream conditions that call for reduced speeds, which will improve driver compliance with advisory speeds. To maximize the visibility of the advisory speed limits,

Parsons will install the VSL signs on both sides of the highway in both directions. The field and back-office support systems for our VSL solution are summarized in Exhibit 2-4.

VSL signs will be installed on the roadside on a single pole, on the top or side of existing gantries and overpasses, or on new gantries. The installation of new overhead gantries is expensive, so our solution will control deployment costs by minimizing the use of new gantries. Parsons will install VSL signs on HSR support structures, other existing structures or new road side single poles.

The VSL system will use real-time speed data to detect bottlenecks and activate graduated slower advisory speeds on signs located upstream. The Parsons solution will draw data from a combination of sources including existing CHART detectors and new vehicle detector stations (both dedicated to the VSL application and shared with other applications, such as ARMC). Parsons will implement the VSL module of its Intelligent NETWORKS® ATMS solution to fuse the data and formulate the recommended speeds.

EXHIBIT 2-4: Summary of VSL Field and Back Office System Elements

System Element	Description	Deployment Plan*
Advisory Speed Limit Signs	Small speed advisory signs (similar to typical speed limit signs) notify motorists of advised speeds.	Approximately every half mile on both sides of the highway along sections of the highway.
Dynamic Message Signs (DMS)	Multi-line dynamic message signs alert motorists as to the reason for the advised speed.	Installed on gantries or poles at the beginning of each VSL System zone, and then, where applicable, every 5 miles downstream from that first sign.
Static Signage	Fixed signage indicates the existence of the VSL system zone.	Single sign at point where vehicles enter the VSL system zone.
Vehicle Detection Stations	Radar mainline vehicle detection stations monitor mainline vehicle volumes, occupancy and speeds.	Detector installed at every speed advisory sign location.
Advanced Transportation Management System (ATMS) Software	Central system controls system monitoring, VSL algorithm and system reporting capabilities. Parsons will use its Intelligent NETWORKS® ATMS solution.	Single instance with redundant backup housed in the Advanced Transportation Management System (ATMS) at the SHA preferred traffic management center (TMC) location.

***Final Quantities and locations will be determined during design phase**

Whenever a reduced advisory speed is activated, appropriate messages such as “Reduced Speed Ahead”, “Stopped Traffic Ahead” and “Incident Ahead” will also be activated on the DMS signs. To enhance the reliability and availability of the VSL System, communications to the signs will be provided via a dedicated fiber optic.

PARSONS VSL DEPLOYMENTS

Parsons has deployed seven active VSL systems in the U.S., including on IS 66 in Virginia, IS 80 in the San Francisco Bay area, IS 285 in Georgia and four systems in Oregon.

Adaptive Ramp Metering Control

Ramp metering is a proven tool to improve safety and performance for freeway operations. It reduces congestion by controlling the rate of entry of vehicles into the traffic stream. Early deployments were mostly fixed time systems that were sub-optimal because they did not respond to actual traffic conditions appropriately. Today,

advanced systems that adjust based on traffic conditions are far more effective.

What Parsons Will Deploy

Parsons will implement Adaptive Ramp Metering Control (ARMC) over the entire length of the IS 270. Parsons’ ARMC solution will adapt to traffic condition data gathered from multiple sets of freeway mainline detectors. Parsons has examined current and forecast bottleneck data and will design the system such that meters will work together to regulate traffic flow to reduce bottlenecks. Parsons’ centralized, system-wide ARMC deployment will operate during peak periods and when the system detects that conditions warrant.

PARSONS ARMC DEPLOYMENTS

Parsons has or is implementing 14 projects using ramp metering totaling over 2000 ramp meters, far more than any other firm. This includes seven adaptive ramp metering projects in the US.

EXHIBIT 2-5: Summary of ARMC Field and Back Office System Elements

System Element	Description	Deployment Plan*
Ramp Meter Signals	Two-head traffic signals will signal motorists when they are authorized to proceed onto IS 270	One signal on each side of the stop bar on each ARMC ramp.
Static Signage	Static signs directing motorists to “Stop Here on Red,” “One Car Per Green,” and “Prepare to Stop When Flashing.”	Installed adjacent or upstream of the stop bar at each ARMC-equipped ramp.
Striping	A wide stripe denotes where to stop and lane striping separates lanes where two or more are metered.	Stop lines between signal heads and lane lines between lanes at all metered ramps.
Vehicle Detection Systems	Determine vehicle presence at and upstream of meters, when a vehicle has passed and queuing at the meters; Mainline detectors monitor conditions on IS 270.	A full suite placed at each ARMC-equipped location.
Controller	Controls the meter device and accepts direction from the ATMS.	Single instance located at each ARMC-controlled ramp.
Advanced Transportation Management System (ATMS) Software	Central system controls system monitoring, ARMC algorithm and system reporting capabilities. Parsons will use its Intelligent NETWORKS® ATMS solution.	Single instance with redundant backup housed in the Advanced Transportation Management System (ATMS) at the SHA preferred traffic management center (TMC) location.

***Final Quantities and locations will be determined during design phase**

Effective ARMC requires a central control system with an adaptive algorithm, mainline detectors, and controllers that can adjust metering rates in real time—all of which Parsons has implemented before and will include in our solution. The pros of ARMC are:

- When properly tuned, ARMC can reduce delay and congestion on mainline more efficiently than other operational modes.
- ARMC responds to conditions throughout a corridor, including incidents, provides more efficient metering when needed and minimizes metering when it is not improving traffic flow.
- ARMC requires little ongoing parameter maintenance

A summary of the field and back-office support systems for our ARMC solution is provided in Exhibit 2-5.

Corridor Decision Support System

A Corridor Decision Support System (CDSS) uses artificial intelligence to automate the decision making regarding which ARMC ramp meters need operational changes, which adjacent signal timings need to be modified to reduce bottlenecks and conflicts with ARMC ramps, and whether information needs to be broadcast.

What Parsons Will Deploy

Parsons' CDSS solution will include a monitoring and control application within our Intelligent NETWORKS® ATMS. The CDSS system is fully automated. Once the CDSS has determined the best strategy, it activates the devices in its plan. Key staff are notified of the diversion, but all activations are automated, so plans are implemented quickly. If information must be broadcast, it can be done using one or more of the component elements in Parsons' solution, such as the DMS we will deploy for HSR and VSL, or the cell phone application deployed as part of our CV implementation. If additional signal control options are desired—such as those that

would support a future Integrated Corridor Management (ICM) solution—new devices can be entered into the application, and the CDSS can be updated easily to include the new route.

Connected Vehicles

The Connected Vehicle (CV) suite of applications has the potential to transform the transportation system. By connecting vehicles to each other and to ITS infrastructure using high-capacity wireless communications, CV can enhance mobility applications like VSL by making information delivery more efficient so motorists are not waiting for the “next” roadside sign to adjust their driving. CV also provides a foundation for the deployment of capabilities that will revolutionize transportation system management, and allow for significant reductions in cost for roadside devices and signage.

What Parsons Will Deploy

Parsons will design and implement a cell phone application with five (5) CV capabilities as part of our mobility solution. The application will collect data from the devices and provide users with advisories based on downstream congestion, incidents or weather. The application will complement the other solution elements—most notably the VSL system—to ensure that mobility improvement is maximized. The application components are described in the table in Exhibit 2-6, along with the back-office Intelligent NETWORKS® ATMS solution.

Since the algorithms for these applications already have been developed and are available for download from the USDOT's Open Source Application Development Portal (OSADP), a significant portion of the development has been done. Parsons will use these algorithms and tailor solutions specific to IS 270. Further, all of the logic

¹ <https://www.itsforge.net/>

EXHIBIT 2-6: Summary of CV Field and Back Office System Elements

System Element	Description	Deployment Plan*
Speed Harmonization (SPD-HARM)	Detects prevailing roadway or congestion conditions and generates the appropriate response plans and speed recommendation strategies for upstream traffic, and notifies drivers.	Parsons will develop the cell phone application and make it free to users. Users will be notified of its capabilities and availability via a comprehensive outreach campaign.
Queue Warning (Q-WARN)	Notifies drivers of queue events (e.g., rapid deceleration, disabled status, lane location) from nearby vehicles.	Parsons will develop the cell phone application and make it free to users. Users will be notified of its capabilities and availability via a comprehensive outreach campaign.
Probe Enabled Traffic Monitoring	Reports location, direction and speed, and other vehicle data and sends to the ATMS system via cellular communications.	Parsons will develop the cell phone application and make it free to users. Users will be notified of its capabilities and availability via a comprehensive outreach campaign.
Motorist Advisory Warning (MAW)	Provides advisories containing information on major delays, hazmat spills, major accidents, or other significant system disturbances.	Parsons will develop the cell phone application and make it free to users. Users will be notified of its capabilities and availability via a comprehensive outreach campaign.
Weather Responsive Traffic Information (WxINFO)	Monitors data from vehicles obtained via the traffic monitoring application (e.g., whether cars have their wipers on and at what rate, and the local temperatures outside every vehicle) and advises other motorists of weather conditions.	Parsons will develop the cell phone application and make it free to users. Users will be notified of its capabilities and availability via a comprehensive outreach campaign.
Advanced Transportation Management System (ATMS) Software	Central system controls system monitoring, CV algorithms and system reporting capabilities. Parsons will use its Intelligent NETWORKS® ATMS solution.	Single instance with redundant backup housed in the Advanced Transportation Management System (ATMS) at the SHA preferred traffic management center (TMC) location.

*Final Quantities and locations will be determined during design phase

Parsons will develop to gather data, formulate advisories and deliver them to the users can be adapted to future roadside and in-vehicle device implementations, making our solution a durable one. Our solution requires no additional roadside infrastructure or dedicated vehicle-mounted systems.

Queue Warning System

Queue Warning Systems (QWS) provide information to travelers about the presence of downstream stop-and-go traffic (based

on real-time traffic detection) using visual notifications. Drivers can be alerted to slow down to reduce queuing-related collisions. The most common method of relaying information is via dynamic message signs (DMS), which can be configured to show a symbol or phrase when stop-and-go traffic is near. Queue Warning is frequently used by itself or in combination with a VSL strategy. It is used upstream of locations prone to stop and go conditions, including work zones.

PARSONS QWS DEPLOYMENTS

Parsons' QWS deployments include systems at four separate international border crossings between the U.S. and Canada. In each location, Parsons designed and built a turnkey system.

What Parsons Will Deploy

Parsons will deploy a QWS as a complementary component to our VSL and CV applications along the entire length of the corridor. Our VSL system already includes the provision of DMS messages, and our CV application already requires computation and delivery of queue warnings directly to wireless devices. Hence, all of the necessary components exist to deliver the QWS capabilities. Our QWS system will deliver queue warnings to the DMS. Since our QWS application already includes this functionality, no additional development will be needed. A summary of the QWS deployment elements is provided in Exhibit 2-7.

Mobility Options Discovery & Engagement

Casual or Social Carpooling relies on existing social networks to form ad hoc ridesharing opportunities. Also referred to as Dynamic Ridesharing or Slugging in the Washington,

DC region, it has been operating in the United States since the mid-1970's as a response to the cost of commuting, increasing congestion, and the introduction of HOV lanes. With the confluence of advancements in technology, real-time transportation applications, and the surge in smart phones use in the United States, mobile-based tools to facilitate casual carpooling are emerging.

Agencies around the U.S. are beginning to turn to an innovative approach that aims to motivate (rather than penalize) travelers to change behavior to reduce congestion. These programs offer various monetary or other rewards to motorists that rideshare.

MODE®

Metropia's MODE® is operational in Austin and El Paso, TX, Tucson, AZ and the NY-NJ-CT metropolitan region. It will be deployed in Houston Q1 2017, as part of FHWA's Advanced Transportation and Congestion Management Technology Deployment (ATCMTD) grant.

What Parsons Will Deploy

MODE® is powered by Metropia's Synergy proprietary algorithms and data analytics capabilities and incorporates "DUO" (Driving Up Occupancy), a social carpooling feature. DUO matches drivers and riders as carpoolers

EXHIBIT 2-7: Summary of QWS Field and Back Office System Elements

System Element	Description	Deployment Plan*
Dynamic Message Signs (DMS)	Multi-line dynamic message signs alert motorists about downstream queues.	Installed on gantries or poles at the beginning of each QWS System zone, and approximately every 5 miles downstream from that first sign.
Vehicle Detection Stations	Radar mainline vehicle detection stations calculate mainline vehicle volumes, lane occupancy, and speeds.	Single detector installed at every speed advisory sign location.
Advanced Transportation Management System (ATMS) Software	Central system controls system monitoring, QWS algorithm, and system reporting capabilities. Parsons will use its Intelligent NETWORKS® software system.	Single instance with redundant backup housed in the Advanced Transportation Management System (ATMS) at the SHA preferred traffic management center (TMC) location.

*Parsons will utilize the devices installed for our VSL solution. No additional devices are required for QWS.

once they are inside a vehicle and does not require pre-matching or cash payments, but rather offers incentives to spur drivers and riders to carpool on a daily basis or on an ad hoc basis. DUO riders and drivers receive points which they can redeem for rewards.

Parsons will deploy MODE[®] in two phases as part of the project. First, Parsons (and Metropia) will configure the application to accommodate the features of the IS 270 corridor and its associated travelshed. Because the basic application already exists, capital costs needed for development will be minimal. Second, we will deploy a back-office support application that we will integrate with Parsons' Intelligent NETWORKS[®] ATMS suite.

Metropia's back-office system collates data retrieved from users' cell phones, verifies compliance with program requirements, and documents accrual of user points. The system keeps an accounting of the points, distributes offers to redeem them with local and regional retailers, and manages the redemption process.

Summary of Throughput and Travel Time Benefits

In order to accurately describe the combined benefits of our proposed solution, Parsons' modelers combined all elements within a

single model. We populated the 2015 and 2040 VISSIM model with the characteristics of all of the solution elements simultaneously, and re-ran the model to exclude certain components to assess their contribution. Parsons executed AM and PM peak model runs for 2015 for the HSR, VSL, ARMC and MODE[®] solutions, and 2040 for the HSR, VSL, and ARMC solutions.² The results of these modeling analyses are provided in Exhibits 2-8 through 2-14.

As directed in the RFP, Parsons used VISSIM version 7.00-13 to execute the SHA-provided model. Our modelers used SHA's Modeling Techniques to develop build models for our solution. Calibration parameters, such as vehicle inputs, vehicle routes, driving behavior, link behavior type, lane change distance, speed distributions and decisions were not modified except where necessary to reflect geometric changes that are inherent in our solutions (e.g., adding HSR lanes, modifying ramps as part of ARMC, etc.). All modifications are described and justification is provided in the report detailing our VISSIM analysis approach and results provided as an attachment (See Appendix, Section iii).

VISSIM Results for 2015

The effects of Parsons' solution for the 2015 AM Peak and PM Peak are illustrated in

EXHIBIT 2-8: Comprehensive VISSIM Mobility Results – 2015 AM Peak

Measure	No Build	Parsons Alternative	% Change
Total Delay	21,906,753	12,905,430	-41%
Average Delay per Vehicle	227	138	-39%
Total Travel Time	51,252,838	44,202,804	-14%
Vehicles (Arrived)	81,275	81,186	0%
Latent Demand	4,969	6,670	34%
Latent Delay	13,122,672	17,409,171	33%
Total Distance	467,210	458,662	-2%
Average Speed	33	37	14%

² MODE was not included in the 2040 VISSIM analysis because the SHA-provided VISSIM model indicated that the HOV lanes would already be at capacity without it.

EXHIBIT 2-9: Comprehensive VISSIM Mobility Results – 2015 PM Peak

Measure	No Build	Parsons Alternative	% Change
Total Delay	21,792,153	18,866,992	-13%
Average Delay per Vehicle	206	180	-13%
Total Travel Time	53,628,278	52,046,682	-3%
Vehicles (Arrived)	88,401	88,417	0%
Latent Demand	1,544	1,526	-1%
Latent Delay	2,650,217	2,714,907	2%
Total Distance	484,473	481,179	-1%
Average Speed	33	34	2%

Exhibits 2-8 and 2-9, respectively. As the figures indicate, our solution will result in dramatic improvements, particularly during the AM Peak period, with Total Delay reduced by 41%, and Average Delay reduced by 39%. Total Travel Time drops by 14%, while Average Speed increases by 14%.

Results for the 2015 PM Peak period also are significant, with Total Delay and Average Delay per Vehicle both dropping by 13%.

Parsons recognizes that the primary measurable mobility benefit of MODE[®] DUO will be the increase in HOV usage, and commensurate reduction in vehicles using general purpose lanes. Parsons conservatively estimates that implementation of DUO on the IS 270 corridor will result in an increase in HOV use by 15%. This increase was factored into the VISSIM results above. In order to address SHA comments to the MODE[®] PTC, Parsons ran VISSIM without it to illustrate its contribution to our overall improvement calculations. The comparison with and without MODE[®] are illustrated in Exhibit 2-10.

These results suggest that the implementation of MODE[®] would have a pronounced positive effect on overall throughput on IS 270 during both AM and PM Peak periods, even with a modest increase in ridesharing of 15%. Given its relatively small deployment and operating costs, the return would be impressive.

VISSIM Results for 2040

The effects of Parsons' solution for the 2040 AM Peak and PM Peak are illustrated in Exhibits 2-11 and 2-12, respectively. As the figures indicate, our solution will result in dramatic improvements, particularly during the AM Peak period, with Total Delay reduced by 45%, and Average Delay reduced by 45%. Total Travel Time drops by 18%, while Average Speed increases by 29%.

For the PM Peak, the effects of the improvements are less pronounced, but still significant. The result is that Total Delay is reduced by 19%, Average Delay per Vehicle by 21% and Total Travel Time by 5%, while Average Speed increases by 13%.

Modifications to Watkins Mill Interchange

Parsons reviewed several configuration options for the Watkins Mill Interchange. Based on this analysis, we determined that a Diverging Diamond Interchange (DDI) offered the most positive output from the VISSIM analysis. Additional detail regarding the outcome of the analysis is provided in the section below, and the recommended configuration is discussed in greater detail in Section 5 of this proposal, as directed in the RFP.

Modeled improvements for the 2040 AM Peak and PM Peak with the DDI configuration for Watkins Mill are shown in Exhibits 2-13 and 2-14, respectively. Total Delay and Average

EXHIBIT 2-10: Comprehensive VISSIM Mobility Results with and without MODE® – 2015

Measure	% Change AM Peak 2015		% Change PM Peak 2015	
	With MODE	Without MODE	With MODE	Without MODE
Total Delay	-41%	-37%	-13%	-9%
Average Delay per Vehicle	-39%	-35%	-13%	-9%
Total Travel Time	-14%	-12%	-3%	-1%
Vehicles (Arrived)	0%	0%	0%	0%
Latent Demand	34%	59%	-1%	11%
Latent Delay	33%	64%	2%	7%
Total Distance	-2%	-2%	-1%	-1%
Average Speed	14%	12%	2%	1%

EXHIBIT 2-11: Comprehensive VISSIM Mobility Results – 2040 AM Peak

Measure	No Build	Parsons Alternative	% Change
Total Delay	35,032,576	19,376,211	-45%
Average Delay per Vehicle	326	180	-45%
Total Travel Time	64,317,886	52,679,474	-18%
Vehicles (Arrived)	87,894	92,848	6%
Latent Demand	44,530	44,511	0%
Latent Delay	120,600,723	125,623,611	4%
Total Distance	463,125	490,310	6%
Average Speed	26	34	29%

EXHIBIT 2-12: Comprehensive VISSIM Mobility Results – 2040 PM Peak

Measure	No Build	Parsons Alternative	% Change
Total Delay	36,237,078	29,258,237	-19%
Average Delay per Vehicle	307	243	-21%
Total Travel Time	67,865,560	64,421,662	-5%
Vehicles (Arrived)	95,124	100,230	5%
Latent Demand	8,861	6,231	-30%
Latent Delay	13,484,325	10,791,035	-20%
Total Distance	477,455	511,732	7%
Average Speed	25	29	13%

Delay per Vehicle in the AM Peak both are reduced by 38% over the no-build condition, with Total Travel Time reduced by 16% and Average Speed increased by 22%.

For the PM Peak, the effects of the reconfiguration of the Watkins Mill Interchange to a DDI design on the 2040 numbers are decidedly more positive. The result is that Total Delay is reduced by 20%, Average Delay per

EXHIBIT 2-13: Comprehensive VISSIM Mobility Results with DDI – 2040 AM Peak

Measure	No Build	Parsons Alternative	% Change
Total Delay	35,032,576	21,624,724	-38%
Average Delay per Vehicle	326	201	-38%
Total Travel Time	64,317,886	54,280,006	-16%
Vehicles (Arrived)	87,894	91,128	4%
Latent Demand	44,530	44,443	0%
Latent Delay	120,600,723	124,821,632	3%
Total Distance	463,125	479,180	3%
Average Speed	26	32	22%

EXHIBIT 2-14: Comprehensive VISSIM Mobility Results with DDI – 2040 PM Peak

Measure	No Build	Parsons Alternative	% Change
Total Delay	36,237,078	29,010,420	-20%
Average Delay per Vehicle	307	239	-22%
Total Travel Time	67,865,560	64,476,166	-5%
Vehicles (Arrived)	95,124	101,095	6%
Latent Demand	8,861	5,010	-43%
Latent Delay	13,484,325	8,320,170	-38%
Total Distance	477,455	515,823	8%
Average Speed	25	29	14%

Vehicle by 22% and Total Travel Time by 5%, while Average Speed increases by 14%.

Reviewing the model results it can be confirmed that the corridor will perform at a better LOS in build condition with the proposed Watkins Mill Road DDI configuration. Density, travel time and speed all improve along the corridor in the build condition when the Watkins Mill Road is configured as a DDI. However, latent demand and latent delay show a slight increase in this scenario. The impact of this is more pronounced in AM peak hour than in the PM peak hour. This increase in latent demand can easily be eliminated by adjusting signal timing along the Watkins Mill Road corridor. Parsons will work with the Montgomery County DOT to determine the appropriate timing.

Estimated Throughput Benefits for CV

Since the CV applications we propose have only been deployed within small pilot

corridors, limited empirical evidence regarding mobility improvement has been documented. Hence, incorporation of appropriate figures for these CV applications into our VISSIM analysis is not possible. However, there are published USDOT Research Reports that provide estimated benefits. See Exhibit 2-15 and 2-16 for estimated benefits for the Speed Harmonization and Queue Warning applications, respectively.

Within these tables, the references to “near, mid and long” make reference to the penetration of connected vehicles on our roadways, and roughly equate to 5-, 15- and 25-year horizons.

Estimated Throughput Benefits for QWS

Queue warning systems (QWS) predominantly have been implemented for improved safety, and have an established track record in that regard. Systems have been deployed in the U.S., Canada and Europe with dramatic

EXHIBIT 2-15: CV Performance Improvement Estimates Summary – SPD-HARM

Measure	Performance Measure	CV Population Term		
		Near-Term	Mid-Term	Long-Term
Reduce Shockwave Occurrence	Number of shockwaves	-25%	-50%	-75%
Reduce Shockwave Severity	Length of shockwaves	-25%	-50%	-75%
Improve Throughput	Vehicles per hour	-10%	-25%	-50%
Reduce Travel Time	Average travel time	-10%	-25%	-50%

EXHIBIT 2-16: CV Performance Improvement Estimates Summary – Q-WARN

Measure	Performance Measure	CV Population Term		
		Near-Term	Mid-Term	Long-Term
Reduce Shockwave Occurrence	Number of shockwaves	-25%	-50%	-75%
Reduce Shockwave Severity	Length of shockwaves	-25%	-50%	-75%
Improve Throughput	Vehicles per hour	-10%	-25%	-50%
Reduce Travel Time	Average travel time	-10%	-25%	-50%

crash reduction results. However, research conducted by the Texas Transportation Institute (TTI) indicates that QWS also can significantly improve throughput by delaying the onset of congestion. On IH 610 in Houston, QWS was credited with, “increasing average travel speeds and reducing crash-causing speed variations among lanes.”³ In Germany, “Queue warning deployment on the A8 Autobahn improved the quality of traffic flow, reduced speeds with closer headways, encouraged more uniform driving speeds, and slightly increased capacity.”⁴

ii. Improvements – Providing a more Predictable Commuter Trip

Studies performed in recent years have concluded that commuters often are as concerned about the predictability of their trips as their travel time. Having made decisions about where to live and work, they generally have accepted the conditions under which they are willing to travel on a daily basis. However, when disturbances generate unplanned delay, motorists may drive aggressively and unsafely.

Several metrics are used to characterize predictability. The most common is Travel Time Reliability, which is defined using reliability measures:

- **Buffer Index.** The extra time cushion that travelers add to their average travel time to ensure on-time arrival and account for unexpected delay.
- **Planning Time Index.** The total travel time that should be planned when an adequate buffer time is included.

The greater the unpredictability of a trip, the greater the buffer time that a motorist must build into their trip to ensure an on-time arrival. Events that can contribute to unpredictability include: Crashes & Vehicle breakdowns; Unplanned construction or road-way repair; and Weather & Special events

Events that result in loss of roadway capacity, reduced visibility or degraded surface traction can increase crashes, reduce vehicle speeds, and alter travel patterns and demand on the roadway. Strategies are available to better manage the effects of these sorts of events, including:

³ <https://mobility.tamu.edu/mip/strategies-pdfs/active-traffic/technical-summary/Queue-Warning-4-Pg.pdf>

⁴ Ibid.

- **Reducing the likelihood of crashes.** VSL, ARMC, CV and QWS can reduce crash frequency and severity by smoothing traffic flow, mitigating unsafe operating behaviors and warning vehicles of downstream queues.
- **Managing reductions in capacity due to incidents.** In addition to managing peak demand, HSR can help maintain traffic flow in the event of incidents. Additionally, ARMC, VSL, CV and QWS can help to manage demand resulting from capacity-reducing events (e.g., construction, special events).
- **Clearing incidents quickly.** Towing & Recovery Incentive Programs (TRIP) provide incentives to clear travel lanes quickly, reducing incident duration.

The complementary nature of these applications underscores the importance of having fully integrated solutions. Again, this is a particular strength for Parsons due to the flexibility of its Intelligent NETworks® ATMS solution. A summary of the elements of Parsons’ proposed trip predictability improvement initiative will be implemented are described in Exhibit 2-17. The sections that follow provide additional detail regarding the specific

Hard Shoulder Running

HSR will improve vehicle throughput significantly, and also is a powerful tool for improving travel time reliability. HSR provides additional capacity during incidents. By providing full-depth pavement, appropriate lane control signals and a traffic

EXHIBIT 2-17: Summary of Trip Predictability Improvements

Solution Element	Description	Reducing Likelihood of Crashes	Managing Reductions in Capacity Due to Incidents	Clearing Incidents Quickly	PTC
Hard Shoulder Running (HSR)	Makes shoulder lanes available for use during peak demand periods and incidents		<input checked="" type="checkbox"/>		PAR01
Variable Speed Limits (VSL)	Advises motorists to adjust speed and minimizes fluctuations	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		PAR02
Adaptive Ramp Metering Control (ARMC)	Controls the rate of entry of vehicles onto the mainline based on traffic conditions	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		PAR03
Corridor Decision Support System (CDSS)	Coordinates operations between the ARMC system and adjacent signals on connecting routes		<input checked="" type="checkbox"/>		N/A*
Connected Vehicles (CV)	Harmonizes vehicle speeds and alerts drivers of downstream conditions	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		PAR05
Queue Warning System (QWS)	Provides warnings to motorists of downstream traffic queues that require reductions in speed	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		N/A*
Towing & Recovery Incentive Program (TRIP)	Rewards towing companies for clearing incidents and reopening travel lanes quickly	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	PAR06

*Not submitted as a PTC

monitoring solution, HSR can safely manage non-recurring demand. Parsons will program lane management devices to open and close HSR lanes to respond to traffic conditions. Additionally, the VIDS cameras will provide the ability to quickly assess and monitor incidents, facilitating appropriate response actions. This also will facilitate the effective implementation of Parsons' TRIP solution described later in this section.

Variable Speed Limits

Incidents are commonplace on IS 270 and crashes often occur because motorists do not have sufficient advance warning of downstream reductions in speed caused by congestion or incidents. Parsons' VSL will notify drivers to adjust speeds to decrease their risk of being involved in incidents, which can exacerbate unpredictability. It will monitor traffic conditions along the corridor, quickly detect incidents and congestion and adjust the advisory speeds automatically.

Adaptive Ramp Metering Control

Parsons' ARMC will improve trip predictability by controlling the rate at which vehicles enter IS 270. Our ARMC solution manages ramp signal operating parameters based on mainline conditions, improving travel time reliability by increasing the spacing between entering vehicles, facilitating better throughput. It will improve trip predictability without requiring modification of the design. Parsons' ARMC solution uses the same mainline detection network and is directly linked to the HSR and VSL solutions via our Intelligent NETWORKS® ATMS platform.

Corridor Decision Support System

As described earlier, Parsons' CDSS solution will perform a valuable role for improving trip predictability by enhancing the efficiency and effectiveness of our ARMC solution. It monitors prevailing conditions and predicts how they will change, offering adjustments to

ramp meter signal timing and options for the timing of signals at adjacent locations.

Connected Vehicles

Connected vehicle applications offer important capabilities for the improvement of trip predictability because they directly provide motorists with information about downstream traffic and roadway conditions in near real-time. Any reductions in speed or hazards caused by congestion, incidents or localized weather conditions are provided as far upstream as possible. Drivers are able to adjust their driving well in advance, reducing the likelihood of crashes that adversely affect trip predictability.

Queue Warning System

As described earlier, Queue Warning Systems provide information to travelers of the presence of downstream stop-and-go traffic (based on real-time traffic detection) using visual notifications. Drivers can anticipate an upcoming situation of emergency braking and slow down, avoid erratic behavior, and reduce queuing-related collisions, thereby improving overall trip predictability.

Towing and Recovery Incentive Program

Rapid clearance of incidents is essential for improving trip predictability. Parsons' Towing and Recovery Incentive Program (TRIP) speeds the clearance of incidents involving large vehicles by providing towing and recovery companies monetary rewards for reopening travel lanes quickly.

PARSONS TRIP DEPLOYMENTS

Parsons designed, implemented and manages the highly successful TRIP program for Georgia DOT in the greater Atlanta area.

TRIP is activated when the conditions of an incident meet specific criteria (i.e, when incident clearance is complicated, such as when large vehicles are involved, large loads of materials are spilled, or resulting

conditions create a hazard to other traffic). Once an incident is declared a TRIP event, the responsible entity (SHA or police) notifies the towing company assigned to respond to the area. The company must reach the scene with the appropriate equipment and personnel within a prescribed period of time. Once authorized to proceed, they are required to complete clean-up and have the roadway ready for full reopening within a set period of time in order to receive the incentives.

What Parsons Will Deploy

Parsons will design and implement the full TRIP solution for the entire length of the IS 270 corridor, will include the solution elements shown in Exhibit 2-18.

Summary of Trip Predictability Benefits

Hard Shoulder Running (HSR)

The contribution of HSR to trip predictability comes from the flexibility to use this added part-time capacity for peak period volumes and when an incident blocks an existing travel lane. Lane capacity can be increased by 25-50%, depending upon the location of the incident, without degrading safety.

HSR adds controlled additional capacity that requires little to no additional operational support on the part of law enforcement or service patrol staff, and can actually provide a safety benefit to those personnel as they work to clear an incident scene.

Variable Speed Limits (VSL)

The greatest trip predictability benefit of VSL comes from its ability to control upstream traffic, which reduces the probability of incidents that increase congestion. Several trip predictability benefits can potentially be obtained from a VSL System. These include:

- **Reduced Shockwaves.** Controls upstream traffic flow and the speed of arriving vehicles at bottleneck locations reduces shockwaves and lowers recovery times.
- **Reduction in Collisions.** Reduces the number of collisions and their severity by reducing traffic shockwaves and harmonizing flow among adjacent lanes.
- **Equal Lane Utilization and fewer Lane Changes.** Reduces lane changes by reducing speed variation among adjacent lanes.

A study conducted of the effects of VSL on travel times on IS 270 in St. Louis, MO revealed that VSL systems allow highway segments to accommodate higher traffic volumes and improve average vehicle speeds.⁵ Based on the results of the study, VSL improved travel time reliability from 0.4% to 50%, depending on the highway segment analyzed. Average improvement for each segment ranged from 6% to 42%.⁶

Adaptive Ramp Metering Control (ARMC)

Similar to our VSL solution, our ARMC solution will benefit trip predictability by contributing to the improved control of upstream traffic, further reducing the probability of secondary incidents that increase congestion. The FHWA reports that, "Many regions have experienced increased travel time reliability (reduced variations in day-to-day travel times) due to ramp metering."⁷ The Minnesota DOT examined travel time reliability effects with their ramp metering system shut down, and reports that, "Turning off the ramp metering system caused travel time reliability to worsen by 91 percent. In comparison, the average travel times worsened by only 22 percent."⁸

⁵ Bham, PhD. et. al., "Evaluation of Variable Speed Limits on I-270/I-255 in St. Louis: Final Report," University of Missouri, October 2010. p.11.

⁶ Ibid. p.12.

⁷ <http://ops.fhwa.dot.gov/publications/fhwahop14020/sec1.htm>

⁸ http://ops.fhwa.dot.gov/publications/tt_reliability/brochure/trr_brochure.pdf. p.6

EXHIBIT 2-18: Summary of TRIP Solution Elements

System Element	Description	Deployment Plan*
TRIP Program Specifications	Provides methods, performance measures, roles and responsibilities for all parties involved in TRIP operations, stipulates incentive amounts, and prescribes evaluation and accounting processes.	Parsons will develop a complete program specification, which will include all necessary components for CHART/SHA or another entity (including a contractor) to manage the program once it's implemented.
Registry of Qualified Towing Providers	Lists providers that have undergone a rigorous qualification process to qualify as TRIP providers, which includes a review of available equipment and trained personnel.	Parsons will recruit and qualify at least one towing provider for each segment of the IS 270 corridor, to provide comprehensive coverage for the entire length of the corridor.
Coordination with Incident Response Stakeholders	Engages all entities involved in incident management on the corridor in program development and execution. Includes CHART/SHA, Maryland State Police (MSP) and members of the towing and recovery community	Parsons will conduct planned and ad hoc meetings with CHART/SHA, MSP and the leaders and members of the Towing & Recovery Professionals of Maryland (TRPM), during which the TRIP program specifications will be discussed and reviewed.
Delivery of Training Program	Trains towing provider staff and state agency incident management staff in TRIP-compliant incident management and recovery, as well as incentive award evaluation and accounting processes.	Parsons will prepare and deliver training courses for all towing staff from qualified providers and up to 20 representatives from CHART/SHA and MSP, up to the completion of implementation of the program.

***Final Quantities and locations will be determined during design phase**

Connected Vehicles (CV)

The CV applications we propose have only been deployed within small pilot corridors, so limited empirical evidence regarding trip predictability improvement has been documented. However, there are published USDOT Research Reports that predict benefits. These reports estimate that two of the applications—SPD-HARM and Q-WARN—will increase travel time reliability by 25% in the near term (~5 yrs) and by as much as 75% over the long term (~25 yrs) as the capabilities become ubiquitous.

Queue Warning System (QWS)

Queue warning systems (QWS) predominantly have been implemented for improved safety, and have an established track record in

that regard. Systems have been deployed in the U.S., Canada and Europe with dramatic crash reduction results. Research conducted by TTI indicates that QWS also can significantly improve trip predictability by reducing primary and secondary crashes. Furthermore, the incident severity is reduced because drivers are prepared for impending congestion. A study cited by TTI indicated that, “In Washington, queue warning could reduce congestion related collisions by 15 to 20 percent.”⁹

Towing & Recovery Incentive Program (TRIP)

In 2011, Georgia DOT completed an evaluation and published a report detailing the results the first few years of its TRIP

⁹ Active Traffic Management Feasibility Study. Report to Washington State Department of Transportation, Urban Corridors Office. Seattle, WA: PB Americas, Carter + Burgess, EarthTech, Inc., and Telvent Farradyne, 2007.

program. The study examined the incidents for which TRIP was activated against similar incidents that occurred prior to implementation. Incident timelines were examined and the cost of each incident in terms of delay, wasted fuel and excess emissions from vehicles queued upstream were calculated by modeling each incident based on incident location, typical traffic volumes during the incident, the roadway geometrics at each incident location and other factors specific to each incident. According to the study, “Using TRIP reduces incident clearance times as much as 69 percent when compared to the pre-TRIP experience of 2007.”

iii. Improvements – Performance life

In order to estimate the performance life of the final build condition, Parsons compared each MOE for the existing year (2015) to the build condition MOE (2040 Build model). This comparison offers a means to assess when the improvements to the conditions on the corridor will no longer be evident, and throughput-related performance will be approximately equivalent to current conditions. The results for our proposed solution are provided below, for the AM Peak and PM Peak periods, respectively.

AM Peak

Parsons’ analysis indicates that the proposed build condition will maintain at least the same level of performance as existing conditions in the year 2040 for the AM Peak period, in spite of projected growth in the number of vehicles using the corridor. Consequently, the proposed build condition of Parsons’ mobility enhancement solution will have a performance life that extends to at least 2040, and with some signal timing modifications and corridor timing plan updates should last beyond 2040. Results related to each MOE for the AM Peak period are illustrated in Exhibit 2-19

EXHIBIT 2-19: Summary of Parsons Solution Performance Life – AM Peak

Measure	2015 No Build	2040 Parsons Alternative
Total Delay	21,906,753	19,376,211
Average Delay per Vehicle	227	180
Total Travel Time	51,252,838	52,679,474
Vehicles (Arrived)	81,275	92,848
Total Distance	467,210	490,310
Average Speed	33	34

In summary, these results indicate that:

- Total delay along the corridor in the 2040 AM Peak with the build model is expected to be slightly less than total delay in 2015.
- Average delay per vehicle in the 2040 AM Peak build condition will be less than existing delay.
- Total travel time in 2040 AM Peak build condition will be slightly higher than existing travel time.
- Vehicles arrived along the corridor in the 2040 AM Peak build condition will be much higher than vehicles arrived in the existing condition.
- Total distance traveled in the 2040 AM Peak build condition will be higher than total distance covered in the existing condition.
- Average speed in the 2040 AM Peak build condition will be almost the same as the speed in the existing conditions.

PM Peak

Parsons’ analysis indicates that improvements from the proposed build condition in the PM peak period will have a slightly shorter performance life than the AM Peak improvements, ending slightly earlier than 2040. This is because even though some

MOEs increase in the 2040 build condition versus the existing condition, the PM peak will be serving about 15% more vehicles than are served under the existing condition. Using interpolation of MOE results, we conclude that the 2040 PM Peak build condition performance life will extend to at least 2032 and with some signal timing modifications and corridor timing plan updates may last until year 2040. Results for the PM Peak period are illustrated in Exhibit 2-20

EXHIBIT 2-20: Summary of Parsons Solution Performance Life – PM Peak

Measure	2015 No Build	2040 Parsons Alternative
Total Delay	21,792,152	29,258,237
Average Delay per Vehicle	239	243
Total Travel Time	53,628,278	64,421,662
Vehicles (Arrived)	88,401	101,095
Total Distance	484,473	511,732
Average Speed	33	29

In summary, these results indicate that:

- Total delay along the corridor in the 2040 PM Peak with the build model is expected to be slightly greater than total delay in 2015.
- Average delay per vehicle in the 2040 PM Peak build condition will be slightly greater than existing delay.
- Total travel time in 2040 PM Peak build condition will be slightly higher than existing travel time.
- Vehicles arrived along the corridor in the 2040 PM Peak build condition will be much higher than vehicles arrived in the existing condition.
- Total distance traveled in the 2040 PM Peak build condition will be higher than total distance covered in the existing condition.

- Average speed in the 2040 PM Peak build condition will be slightly lower than the speed in the existing conditions.

Why Parsons’ Solution is the Right Solution

Parsons’ solution will deliver significant and lasting mobility enhancements. In addition to improving vehicle throughput and reducing delay, our solution will improve the commuting experience without expensive additional full-time travel lanes. By making the most effective use of existing right-of-way, it also minimizes impacts to the environment. It also offers the most cost-effective approach to improving mobility on the corridor. It offers proven elements like HSR, VSL and ARMC, and incorporates innovative components (i.e., CV and MODE®) that prepare the corridor for future challenges. It lays the foundation for advanced technology (i.e., V2V and V2I), and seeds the region with applications that can change the way drivers use the corridor.

With its combination of proven and innovative elements and our extensive design-build experience, Parsons’ solution lowers risks to SHA, and to Maryland taxpayers. Most of the components of our solution have proven their value elsewhere, while our CV solution will be deployed using a small fraction of the project budget, and will draw on the work already done under the sponsorship of FHWA to develop the applications.

Key to Parsons’ solution its combination of multiple, highly-integrated components. The full spectrum of solutions will be tied together by Parsons’ Intelligent NETworks® advanced transportation management system (ATMS).

INTELLIGENT NETWORKS®

Intelligent NETWORKS® ATMS is a state-of-the-art, off the shelf application designed to assist in the collection, dissemination, and management of transportation information. A scalable architecture, which can be customized to meet unique operational environments, makes Intelligent NETWORKS® ATMS an adaptable solution for small and large scale deployments.

Why Parsons is the Right D-B Partner

Parsons' team is unique in its ability to implement a seamlessly integrated suite of solutions using off-the-shelf tools we have developed. Our full-spectrum design-build capabilities for civil and ITS implementation allow us to function more efficiently. This significantly reduces risk for SHA by ensuring that all elements of the design and build processes will be cooperatively executed, assuring goal alignment among the designee, builder and ITS systems integrator. Our delivery will be streamlined and cost-effective.

AWARD-WINNING PERFORMANCE

Over the past 20 years, Parsons has received more than 40 awards for the deployment of innovation and technology that increase mobility and improve safety, five of which are recent corridor projects very similar to the IS270 project.

Parsons brings to this project unique qualifications and experience that provide unmatched value to SHA in the form of a low risk and cost effective solution. These include:

- Extensive ITS planning, design and integration experience. As a result, we fully understand the issues and risks and best practices for ITS deployments, and can apply a broad array of first-hand lessons learned.
- Over 25 years of experience in design-build and turnkey ITS implementation acting as prime contractor,

sub-contractor and Joint Venture member in large deployments in the U.S. and world-wide.

- Experience designing and installing more than 50 ATMS currently in operation, including award winning projects in the U.S., Canada, Hong Kong, Europe, South Africa and South East Asia.
- More than 250 engineers and experts that fully understand freeway and arterial traffic operations, systems integration, construction, operations and maintenance, transportation planning, traffic modeling, freeway traffic operations and incident management to provide a problem/needs-driven approach to our solutions.
- Unparalleled specific expertise in the integration of field equipment and systems (new and legacy) from multiple suppliers onto one platform utilizing open system standards and industry standard protocols.

3

SAFETY



3 Safety

i. Improvements – Incident Reductions in Numbers, Duration and Severity

Parsons has identified the following suite of strategies to effectively achieve SHA’s goal of reducing the number, duration, and severity of incidents on the IS 270 corridor:

- **Reducing risk conditions.** Roadway conditions and driver behavior are two predominant factors affecting incident frequency. One effective method to reduce frequency is to inform drivers about roadway conditions proactively so they can adjust their speeds. Another is to apply traffic control measures that reduce the risk that conditions will deteriorate and result in crashes. A third method is to encourage smoother, more predictable traffic flow, which can reduce frequent lane changing.
- **Reducing factors that worsen outcomes.** Many factors contribute to incident severity, but speed often is the most significant. Effectively managing Interstate vehicle speeds will reduce fatalities, severe injuries and the potential for small incidents to become much larger. Although police remain responsible for speed enforcement, SHA can reduce crash severity using tools that manage and harmonize vehicle speeds.
- **Removing inefficiencies in detection and clearance.** Fully coordinated incident management is essential to minimizing incident duration. Quickly detecting incidents and providing for prompt, appropriate response are cornerstones of an effective traffic incident management (TIM) program.

To execute these strategies, Parsons will help SHA plan and implement the safety

improvements summarized in Exhibit 3-1 on the following page.

AWARD WINNING TEAM

Over the past 20 years, Parsons earned more than 40 awards for innovative and technological transportation mobility and safety solutions – including awards for 5 ICM projects very similar to this Project.

Variable Speed Limits

Providing advisory speeds via dynamic signage in a Variable Speed Limit System proactively helps drivers adjust their speed and react better to conditions on sections of highway with reduced visibility, slippery surfaces, work zones, and/or vehicle queuing.

The main safety-related purpose of deploying a VSL System is to reduce speed variations and resultant traffic flow shockwaves, both along the immediately affected and adjacent highway lanes. By doing so, VSL Systems lower the probability and severity of rear-end collisions, also decreasing bottlenecks and the capacity reductions they cause.

What Parsons Will Deploy

Parsons’ VSL System will deliver safety enhancement capabilities in three areas:

- **Congestion/Incident Response.** Slowing traffic approaching a queue or incident.
- **Road / Weather Response Management.** Slowing traffic during adverse weather, in low visibility, and under poor road conditions.
- **Work Zone Warning.** Slowing traffic approaching highway work zones.

Parsons will implement a VSL System advising motorists of real-time recommended speeds for specific travel zones in the corridor. These zones, described in detail in PTC 02, are where our analysis and review of Regional

EXHIBIT 3-1: Summary of Proposed Safety Improvements

Solution Element	Description	Reducing Risk Conditions/ Exposure	Removing Inefficiencies in Detection & Clearance	Reducing Factors that Worsen Outcomes	PTC
Variable Speed Limits (VSL)	An advisory system for reducing speed variation among vehicles and fluctuation on the mainline	✓	✓	✓	PTC 02
Adaptive Ramp Metering Control (ARMC)	Adaptive ramp meters that control the rate of entry of vehicles onto IS 270 based on prevailing traffic conditions.	✓		✓	PTC 03
Connected Vehicles (CV)	A system that will provide speed harmonization and queue warning capabilities to alert drivers of downstream conditions	✓		✓	PTC 05
Queue Warning System (QWS)	Warns motorists of downstream traffic queues and speed reductions.	✓		✓	N/A*
Towing & Recovery Incentive Program (TRIP)	An incentive program that rewards towing companies for meeting performance targets in clearing incidents and reopening travel lanes mode quickly.		✓		PTC 06

***Not submitted previously as a PTC.**

Integrated Transportation Information System (RITIS) data identified frequent prevailing vehicle speed fluctuation and crashes.

Our system will consist of roadside speed advisory signs operating in conjunction with dynamic message signs (DMS). The dynamic messaging plays a critical role by informing drivers about downstream conditions requiring reduced speeds, and improving their advisory speed compliance. To optimize advisory speed limit visibility, Parsons proposes installing VSL signs on both sides of the highway in each direction. The field and back-office support systems for our VSL solution are summarized in Exhibit 3-2.

VSL signs will be installed on single poles, overpasses, and existing or new gantries. Because installing new overhead gantries is expensive, our proposal minimizes their use

but would further place VSL signs on support structures proposed for the HSR PTC.

Parsons’ system will use real-time speed data to detect traffic slowdowns and activate graduated advisory speeds on VSL signs located upstream of the congested area. The system will draw information from a combination of sources in the corridor -- including existing CHART detectors and new vehicle detector stations -- then use the VSL module of Parsons’ Intelligent NETworks® ATMS solution to formulate the recommended speeds for each travel zone.

Whenever a reduced speed is posted, the DMS signs will simultaneously activate with appropriate messages, such as “Reduced Speed Ahead”, “Stopped Traffic Ahead” and “Incident Ahead,” that give drivers the reason for the advised speed.

EXHIBIT 3-2: Summary of VSL Field and Back Office System Elements

System Element	Description	Deployment Plan*
Advisory Speed Limit Signs	Speed advisory signs (similar to typical speed limit signs) mounted on gantries or cantilever poles proposed under the HSR PTC or mounted on standalone poles.	About every half mile on both sides of the highway in both directions.
Dynamic Message Signs	Multi-line dynamic signs to inform motorists of the reason for the advised speed.	On gantries or poles at the start of each VSL System zone and, as applicable, every 5 miles thereafter.
Static Signage	Fixed signs denote where VSL system zones exist.	At each VSL system zone entry point.
Vehicle Detection Stations	Radar detection stations calculate mainline vehicle volumes, lane occupancy, and speeds.	At each speed advisory sign location.
Advanced Transportation Management System (ATMS) Software	Central system management software with system monitoring, VSL algorithm, and reporting capabilities. Will use Parsons' Intelligent NETWORKS® system.	Single instance with redundant backup housed in the Advanced Transportation Management System (ATMS) at the SHA traffic management center (TMC).

***Final Quantities and locations will be determined during design.**

Adaptive Ramp Metering

Ramp metering is a proven method of improving safety and freeway operational performance. It enhances safety on limited access highways by controlling the vehicle rate of entry. In the past, metering mostly used fixed-time systems requiring constant updates and significant effort to maintain. Today, advanced systems are far more effective, adjusting based on real-time traffic conditions.

What Parsons Will Deploy

Parsons will implement a corridor-wide adaptive ramp metering control (ARMC) solution on the IS 270 corridor using meters that adapt to traffic data gathered from freeway mainline detectors. We will segment the highway based on historic and forecast bottlenecks and design the system so meters upstream from each bottleneck work together to regulate traffic flow through them. Parsons' adaptive system also will operate as freeway conditions require. Parsons' ARMC will respond to conditions throughout a corridor,

including incidents. As a result, metering will be efficient when needed and minimized when not improving traffic flow.

EXPERIENCED TEAM

Parsons has or is implementing 14 ramp meter projects, 7 of them adaptive, that incorporate a combined total of more than 2,000 ramp meters, superior to any other firm.

Effective ARMC requires a central control system, an adaptive algorithm, mainline detectors, and controllers that accept metering rates in real time — all of which Parsons has implemented before and will include in our IS 270 design. Field and back-office support systems for our ARMC solution are summarized in Exhibit 3-3

Connected Vehicles

The Connected Vehicle (CV) suite of applications has the potential to transform transportation systems operation. By connecting vehicles to each other and the infrastructure through high-capacity wireless communications, CV provides a foundation

for deploying devices and applications that could ultimately revolutionize the way our transportation system is used and managed.

What Parsons Will Deploy

Parsons will deploy a cell phone-based application with five (5) CV capabilities as part of our IS 270 solution. The application will collect a variety of data and provide users recommended speed adjustments based upon downstream congestion, incidents or weather events. This will complement the other safety elements — most notably the VSL system — while also maximizing mobility and efficient traffic flow throughout the corridor. Parsons’ CV mobility and safety enhancement application elements are shown in Exhibit 3-4, along with the back office support system.

It is important to note that algorithms for these applications already were developed and are available for download from the USDOT’s Open Source Application Development Portal (OSADP), so a significant portion of the

development has been done. Parsons will use these algorithms as the starting point to tailor solutions specific to the IS 270 corridor.

Since these capabilities will be delivered via a cell phone application, additional roadside infrastructure and dedicated vehicle-mounted systems are not required. Furthermore, all the logic Parsons will develop to gather data, formulate recommendations and deliver information can be adapted to accommodate future roadside and in-vehicle device implementations, making our solution durable and adaptable.

Queue Warning System

Queue Warning is a strategy that alerts travelers to downstream stop-and-go traffic (based on real-time traffic detection) using visual notifications. Drivers can avoid potential emergency braking situations by slowing down, and reduce queuing-related collisions. Information is most commonly relayed via

EXHIBIT 3-3: Summary of ARMC Field and Back Office System Elements

System Element	Description	Deployment Plan*
Ramp Meter Signals	Two-head traffic signals advise motorists when they can proceed onto IS 270	One signal placed on each side of the stop bar on every ramp where ARMC is deployed.
Static Signage	Static signs direct motorists to “Stop Here on Red,” “One Car Per Green,” and “Prepare to Stop When Flashing.”	Installed adjacent or upstream of the stop bar at each ARMC-equipped ramp.
Striping	A wide stripe denotes where to stop and lanes are striped where two or more lanes are metered.	Installation of stop lines between signal heads and lane lines between lanes at all metered ramps.
Vehicle Detection Systems	Separate detectors identify vehicle presence at and upstream of meters; when a vehicle has passed a meter; queuing at the meters; and conditions on IS 270.	A full suite placed at each ARMC-equipped location.
Controller	A device that controls the meter device and accepts direction from the ATMS.	One located at each ARMC-controlled ramp.
Advanced Transportation Management System Software	Central system management software with system monitoring, ARMC algorithm and system reporting capabilities. Parsons will use its Intelligent NETWORKS® ATMS.	Single instance with redundant backup housed in the ATMS at the SHA traffic management center (TMC).

***Final Quantities and locations will be determined during design**

EXHIBIT 3-4: Summary of CV Field and Back Office System Elements

System Element	Description	Deployment Plan*
Speed Harmonization (SPD-HARM)	Detects prevailing roadway or congestion, generates appropriate response plans and speed recommendation strategies for upstream traffic, and broadcasts to the affected vehicles. Done in synchronization with the Variable Speed Limit (VSL) system.	Parsons will develop the cell phone application and make it free to users. User will be notified of its availability via a comprehensive outreach campaign.
Queue Warning (Q-WARN)	Minimizes the occurrence and impact of traffic queues by sharing queued status data from devices in vehicles (e.g., rapid deceleration, disabled status, etc.) to nearby upstream vehicles and to the ATMS.	Parsons will develop the cell phone application and make it free to users. User will be notified of its availability via a comprehensive outreach campaign.
Probe Enabled Traffic Monitoring	All devices deployed with the CV application will report location, direction and speed, and other operating data at pre-defined intervals to the ATMS via cellular.	Parsons will develop the cell phone application and make it free to users. User will be notified of its availability via a comprehensive outreach campaign.
Motorist Advisory Warning (MAW)	Provides advisories about major delays, hazmat spills, major accidents, or other significant events to users' cell phones, allowing drivers to act sooner. Can include information about improving conditions on IS 270.	Parsons will develop the cell phone application and make it free to users. User will be notified of its availability via a comprehensive outreach campaign.
Weather Responsive Traffic Information (WxINFO)	Will monitor data from vehicles, such as at what rate cars are using wipers and temperatures outside every vehicle. Will then advise motorists on weather and issue advisories that will prevent accidents.	Parsons will develop the cell phone application and make it free to users. User will be notified of its availability via a comprehensive outreach campaign.
Advanced Transportation Management System Software**	Central system that contains system monitoring, CV algorithms and system reporting capabilities. Parsons will use its Intelligent NETWORKS® ATMS.	Single instance with redundant backup housed in the Advanced Transportation Management System (ATMS) at the SHA traffic management center (TMC).

*Final Quantities and locations will be determined during design

**Not an “app,” but the central management system

dynamic message signs (DMS), which can be configured to show a symbol or phrase when stop-and-go traffic is near. Queue Warning is used by itself or in combination with a VSL strategy upstream of locations prone to stop-and-go conditions, including work zones.

What Parsons Will Deploy

Parsons will deploy a QWS as a complementary component to our VSL and CV applications. Our VSL system already includes the provision of DMS messages,

and our CV application already requires computation and delivery of queue warnings directly to wireless devices. Hence, all of the necessary components exist to deliver the QWS capabilities. Our QWS system deployment will require only the ability to deliver queue warnings to the DMS. Since our QWS application already includes this functionality, no additional development will be needed. A summary of the QWS deployment elements are provided in Exhibit 3-5.

Towing and Recovery Incentive Program

Rapidly clearing incidents is essential to enhancing safety. Through a Towing and Recovery Incentive Program (TRIP), large vehicle incidents are cleared more quickly because towing and recovery companies earn monetary rewards for meeting performance criteria. Qualified companies earn bonuses for reaching incident scenes and completing recovery operations within specified timeframes so all affected travel lanes reopen within defined time periods.

TRIP activates when incidents meet specific criteria—specifically, when clearing them is complicated with large vehicles involved, loads of materials are spilled, and/or conditions result in hazards to other traffic on the roadway. Once an incident is declared a TRIP event, the responsible entity (DOT or police) notifies the towing company assigned to respond to the area. To receive incentive payment the towing company must meet timetables to have a supervisor on-scene, to have all needed equipment on-scene, and after receiving authorization to proceed, to complete clean-up and have the roadway ready to fully reopen.

What Parsons Will Deploy

Parsons will design and implement the full TRIP solution for the entire length of the IS 270

corridor. Parsons will develop and deliver the elements shown in Exhibit 3-6.

Estimated Benefits

Variable Speed Limits

Section 2 of this proposal discusses how VSL systems improve vehicle throughput. They do so by informing drivers of appropriate speeds for conditions ahead, which when combined with contextual information on DMS signs reduces travel speed variation. As touched upon earlier, VSL systems also offer significant safety benefits, including:

- **Reduced Shockwaves.** Controlling upstream traffic flow and the speed of arriving vehicles at bottleneck locations reduces the number of shockwaves and results in faster recovery times when they occur.
- **Reduced Collisions.** Fewer traffic shockwaves and more harmonized flow among multiple adjacent lanes will reduce collisions and their severity.
- **Equal Lane Utilization and Less Lane Changes.** Less speed variation on adjacent lanes means drivers are less likely to change lanes abruptly.

Exhibit 3-7 summarizes the safety benefits of VSL demonstrated on similar deployments,

EXHIBIT 3-5: Summary of QWS Field and Back Office System Elements

System Element	Description	Deployment Plan*
Dynamic Message Signs	Multi-line dynamic message signs give motorists reasons for the advised speeds.	Installed on gantries or poles at the start of each QWS System zone, and, as needed, every 5 miles thereafter.
Vehicle Detection Stations	Radar mainline vehicle detector stations calculate mainline vehicle volumes, lane occupancy, and speeds.	One detector installed at every speed advisory sign location.
Advanced Transportation Management System Software	Central system management software controls system monitoring, QWS algorithm, and system reporting capabilities. Parsons will use its Intelligent NETworks® software system.	Single instance with redundant backup housed in the ATMS at the SHA traffic management center (TMC).

* Parsons will utilize the devices installed for our VSL solution. No additional devices are required for QWS.

EXHIBIT 3-6: Summary of TRIP Solution Elements

System Element	Description	Deployment Plan*
TRIP Program Specifications	Includes all methods, performance measures, roles and responsibilities for all parties involved in TRIP recovery operations on the corridor, incentive amounts, and evaluation and accounting processes.	Parsons will develop a complete program specification for the IS 270 TRIP program, which will include all necessary components for CHART/SHA or another entity (including a contractor) to manage the program.
Registry of Qualified Towing Providers	A listing of towing providers that have completed a rigorous qualification process, which includes a review of available equipment and trained personnel.	Parsons will recruit and qualify at least one towing provider for each travel zone of the IS 270 interstate, to provide comprehensive coverage for the entire length of the corridor.
Coordination with Incident Response Stakeholders	Full engagement of all entities involved in incident management on the corridor in the development and execution of the program. Includes CHART/SHA, Maryland State Police (MSP) and members of the towing and recovery community	Parsons will conduct a series of planned and ad hoc meetings with CHART/SHA, MSP and the leaders and members of the Towing & Recovery Professionals of Maryland (TRPM) during which the TRIP program specifications will be discussed and reviewed.
Delivery of Training Program	Training for all towing provider staff and state agency incident management staff in TRIP-compliant incident management and recovery techniques, as well as incentive award evaluation and accounting processes.	Parsons will prepare and deliver training courses for all towing staff from qualified providers and up to 20 representatives from CHART/SHA and MSP, up to the completion of implementation of the program.

***Final Quantities and locations will be determined during design phase**

as reported in the 2014 ITS Systems Benefits, Costs and Lessons Learned Report.

These results clearly illustrate the crash reduction benefits of VSL. Results on IS 270 will be similarly significant. While less has been documented about the potential reduction in incident severity that VSL solutions offer, significant research illustrates the correlation between speed differentials and injuries and fatalities. An Econolite Control Products study suggests that crash severity is approximately proportional to the speed differential to the fourth power.⁵ Hence, as speed differential decreases, so do the consequences of crashes. Therefore, it is reasonable to conclude that VSL will significantly reduce the severity of incidents on the IS 270 corridor.

EXHIBIT 3-7: Summary of Measured Safety Benefits of VSL

Source	Measured Benefit
Field data collected over the last two decades show that VSL systems reduce crashes	8-30% reduction in crashes
I-5 in Washington State (7.5-miles) – ATM Corridor	Collisions reduced 65-75%
Major Motorway in England	Personal injury accidents decreased 55.7%

Adaptive Ramp Metering Control

Ramp metering enhances safety by breaking up platoons of vehicles entering the freeway, which reduces merging turbulence and crashes. Effective queue management reduces queue spillback into intersections,

⁵ Source: As a Measure of Traffic Conflict Severity (3rd International Conference, Road Safety and Simulation – Steven G. Shelby)

also improving safety. Once drivers adjust to the ramp metering operation, mainline crash rates and severity have been shown to be reduced by as much as 64 percent. Exhibit 3-8 provides sample results for crash measures supporting ARMC safety improvements.

EXHIBIT 3-8: Summary of Estimated Safety Benefits of ARMC

Source	Measured Benefit
Phoenix, AZ	16% reduction in crash rate during metered hours
Milwaukee, WI	15% reduction in crash rate during peak period
Kansas City, MO	64% reduction in rear end and side swipe crashes
Portland, OR	43% decrease in crash frequency
Sacramento, CA	50% decrease in crash frequency
Los Angeles, CA	20% decrease in crash frequency

Connected Vehicles

Since connected vehicle applications, such as those above, have only been deployed within small pilot corridors, little empirical evidence regarding safety improvement has been documented. However, there are published USDOT Research Reports that provide estimated benefits. Exhibit 3-9 and 3-10 contain estimated safety benefits for the Speed Harmonization and Queue Warning applications, respectively.

Within these tables, the references to “near, mid, and long” refer to the penetration of connected vehicles on our roadways, and correspond to 5, 15 and 25-year horizons.

Queue Warning System

Queue warning systems (QWS) have an established track record of improving safety with deployment in the U.S., Canada and Europe yielding dramatic results.

The Illinois DOT evaluated the effectiveness of a work zone QWS installed to improve safety during reconstruction on the I-70/I-57

interchange in Effingham, Illinois. They found that with a QWS in place travelers experienced fewer crashes, including fewer end-of-queue crashes. Between 2010 (prior to system implementation) and 2011 (after system implementation) researchers saw nearly a 14% decrease in queuing crashes, and an 11% reduction in injury crashes, despite a 52% increase in the number of days when temporary lane closures were implemented during the evaluation.

In Germany, studies have shown that QWS reduced crash frequency and severity, and promoted more uniform travel behavior. In Amsterdam, queue warning in conjunction with speed harmonization are reported to have reduced primary crashes by 15 to 25% and secondary crashes from 40 to 50%. Another notable peer-reviewed study of QWS completed by the Texas Transportation Institute (TTI) for a system deployed in Texas reported that it reduced crashes an estimated 44% from what they would have been otherwise.⁶ The study went on to state that, “The crashes that did occur were less severe, most likely because fewer of them were of the high-speed rear-end collision variety.”

Towing & Recovery Incentive Program

In 2011, Georgia DOT published an evaluation and a report detailing the results the first few years of its TRIP program. The study examined the incidents for which TRIP was activated compared to similar incidents that occurred prior to implementation.

The study examined data from the 110 incidents for which TRIP was activated and compared them to similar accidents that occurred during 2007. The analysis indicated that TRIP allowed the roadway to be opened to traffic at least 165 minutes (2 hours and 45 minutes) faster on average than in 2007.

In addition to reducing motorist delay and delivering significant monetary benefit,

⁶ Source: Developed from procedures presented in the Roadway Safety Design Workbook (Bonneson and Pratt, 2009)

EXHIBIT 3-9: CV Safety Improvement Estimates Summary – SPD-HARM

Performance Goal	Performance Measure	CV Population Term		
		Near-Term	Mid-Term	Long-Term
Reduce Primary Crashes	Number of crashes	-50%	-75%	-100%
Improve Crash Outcomes	Injuries & fatalities	-25%	-50%	-75%
Reduce Secondary Crashes	Number of crashes	-50%	-75%	-100%

EXHIBIT 3-10: CV Safety Improvement Estimates Summary – Q-WARN

Performance Goal	Performance Measure	CV Population Term		
		Near-Term	Mid-Term	Long-Term
Reduce Secondary Crashes	Number of crashes	-50%	-75%	-100%
Improve Crash Outcomes	Injuries & fatalities	-25%	-50%	-75%

TRIP provides for improved safety by reducing the amount of time vehicles are queued, thereby reducing the potential for secondary incidents. Rear-end collisions are commonplace on IS 270, and often result from motorists being unable to react to events ahead in a timely manner.

CHART’s own data indicates that in 2014, CHART incident management activities to rapidly clear incidents from the State’s roadways reduced the likelihood of secondary incidents by 33%. This finding supports the position that a TRIP solution for IS 270 would generate similar outcomes.

ii. Innovative Technologies or Techniques

As discussed throughout, the strength of Parsons’ solution lies in our strategy of delivering a fully-integrated suite of complementary capabilities. Safety and mobility are linked closely, and our innovative technologies and techniques will improve both.

Pavement Elements

Though Parsons’ proposed HSR implementation is primarily a solution to increase capacity, we will employ innovative design elements to address related safety concerns. Parsons will use asphalt that is

red or a similar color for all HSR lanes to differentiate them from the regular lanes. Our experience has shown that red pavement is clearly visible in low light and bad weather.

Parsons also will implement rumble strips, raised pavement markings, and reflector/delineators at strategic locations to clearly distinguish HSR lanes from regular pavement; as well as to help travelers maintain a safe distance from barriers. We will use all-weather pavement markings to provide better visibility under wet conditions. When the HSR lanes are not in use, they offer a wider shoulder to facilitate incident response and provide additional runoff room.

Since the inside shoulders will be used as HSR on a large portion of the corridor, the short distance between opposing traffic flows can degrade visibility, causing unsafe conditions and significant discomfort for drivers. The lanes predominantly will be used during daylight hours, but short daylight hours in winter, coupled with the potential for HSR lanes to be used under incident conditions, makes nighttime use likely. Parsons will install light screens on top of the existing concrete barrier along the left shoulder HSR lanes to address this safety concern.

Parsons also proposes to widen the bridge over Baker Valley Road. The existing bridge will be widened to provide two full lanes with HSR on one side and a normal shoulder on the other, providing motorists an extra buffer from the edge of the travel lane.

Non-Pavement Elements

Each element of Parsons' proposed IS 270 solution is innovative in its own right. None have been implemented in Maryland, but Parsons team members have implemented each of them (with the exception of CV) in other locations around the country.

Additionally, Parsons' approach to an integrated implementation of complementary systems, using a proven, off-the shelf ATMS solution in the form of our Intelligent NETworks® product, minimizes systems integration cost and risk. This approach offers the unique combination of new, yet highly effective technology applications that offer robust capabilities, will integrate seamlessly, and have a long service life.

iii. Mitigation Techniques if Approach does not Meet Design Standards

Pavement Elements

As part of its mobility improvement strategy, Parsons will be implement a hard shoulder running (HSR) solution, details of which can be found in Section 2 of this proposal and in PTC 01, which is provided in the Appendix, Section ii. (PTCs and the Administration's PTC Letters).

From a safety perspective, the pertinent design characteristic of our HSR solution is a reduction in lane width from the standard 12 feet to 11 feet at one limited location on the IS 270 corridor. Research suggests that narrowing lane widths from 12 feet to 11 feet on an urban interstate with more than three lanes in one direction may present a 3% increase in risk for injury and fatality crashes.

To mitigate this, Parsons will provide a 12-foot lane width on the majority of the corridor for its HSR solution. One short stretch of southbound IS 270 south of MD 85 is the only location where the HSR lane is 11-foot wide. This is a straight section of IS 270 and the two existing lanes will maintain the full 12-foot width, so the risk exposure is negligible. In addition, the HSR lanes will only be used during rush hour and during incidents, so the 11-foot section of HSR lane will only be used as a travel lane during the three-hour AM rush hour or incidents when the travel speeds are lower due to a combination of congestion and speed advisories issued by our VSL solution.

The HSR solution will provide a significant safety benefit when not in use because current shoulders, typically only two feet in width, will be significantly widened.

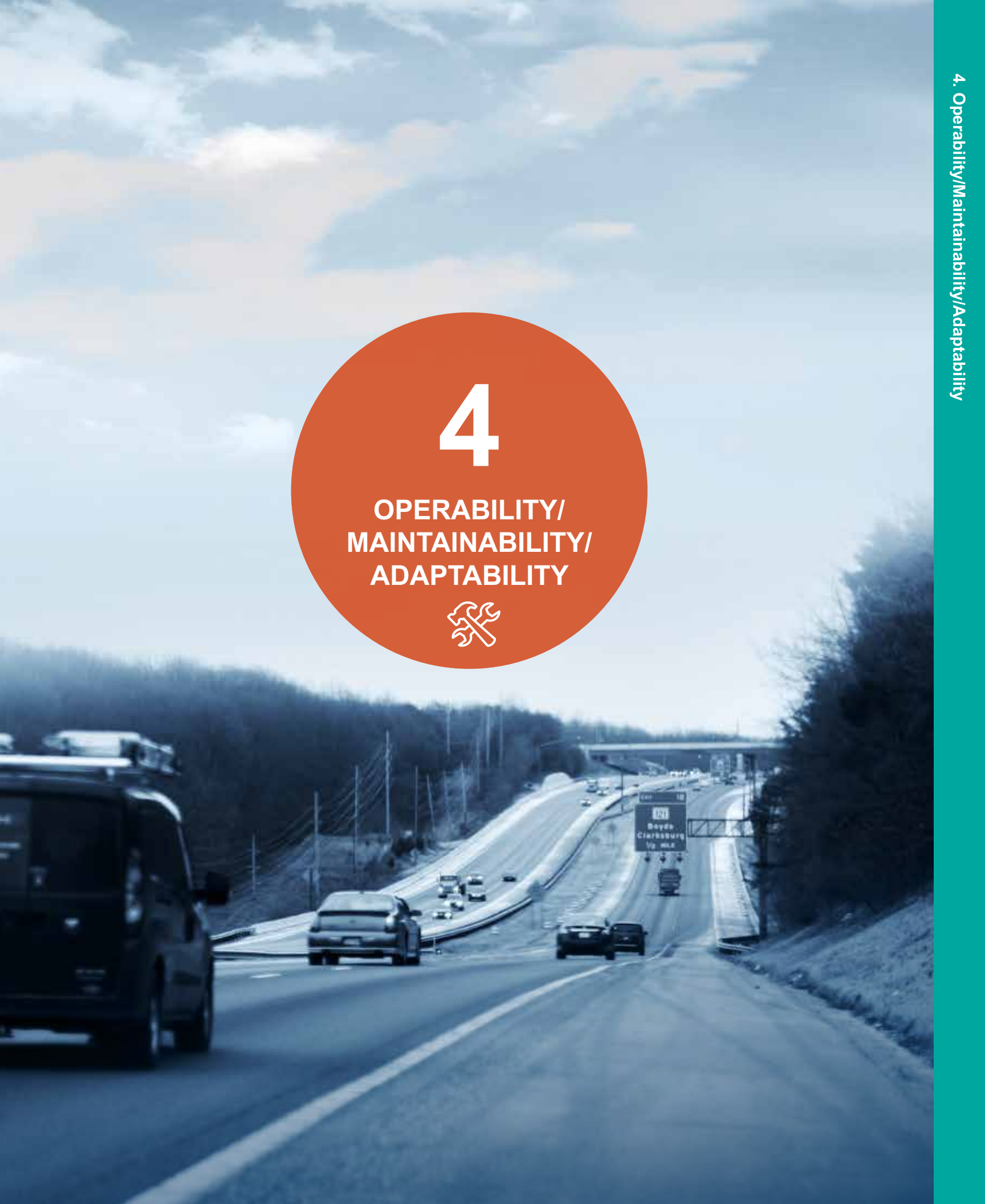
In most of the areas on IS 270, the right shoulder is more than 8-feet wide for emergency use in the event of an incident, consistent with current first-responder practices. However, less than three miles of roadway, spread over eight stretches, has shoulder width less than 8 feet. In these areas, we have identified emergency use areas that will be used as staging areas and to accommodate disabled vehicles.

Non-Pavement Elements

All elements of Parsons' ITS solutions will comply with all current technical standards and standards of practice. We will adhere to all appropriate National and regional ITS architecture and standards and protocols. This ensures that the solution we implement will function properly and in an integrated fashion with any system, subsystem or device also designed to these standards.

4

**OPERABILITY/
MAINTAINABILITY/
ADAPTABILITY**



④ Operability/Maintainability/Adaptability

Sections 2 and 3 of this proposal describe substantial mobility and safety improvements that Parsons will provide for IS 270 corridor motorists. Immediately, commuters, in particular, will experience significant decreases in delays along with less risk of injury and property loss.

To maximize their overall value to SHA, we recognize that these improvements must be designed and built economically with features that operate reliably and cost-effectively over the long term. To this end, we applied the following guiding principles in formulating our proposal:

- Prioritize scope improvements such that elements that do not substantially improve overall performance are excluded.
- Focus investment on elements delivering the greatest benefit.

- Minimize SHA labor costs by automating system monitoring and decision-making.
- Select devices and infrastructure components through balanced consideration of capabilities, durability and life-cycle cost.
- Develop technology applications that can adapt as new communications channels and control systems emerge.
- Use off-the-shelf components and systems to reduce integration costs and to minimize expensive support services
- Incorporate risk mitigation in the design.

The sections that follow describe the steps Parsons will take to ensure reliable operations and to minimize long-term costs for our proposed solution, which is summarized in Exhibit 4-1.

EXHIBIT 4-1: Summary of Proposed Improvements

Solution Element	Description	PTC
Hard Shoulder Running (HSR)	Improves shoulder lanes making them available for use as travel lanes during peak demand periods and incidents.	PTC 01
Variable Speed Limits (VSL)	Reduces speed variation among vehicles and overall speeds upstream of bottlenecks	PTC 02
Adaptive Ramp Metering Control (ARMC)	Controls the rate of vehicles entering onto IS 270 based on prevailing traffic conditions.	PTC 03
Corridor Decision Support System (CDSS)	Coordinates operations between the ARMC system and adjacent signals on connecting routes to mitigate effects of non-recurring congestion due to disturbances in normal operations.	N/A*
Queue Warning System (QWS)	Warns motorists of downstream traffic queues and speed reductions.	N/A*
Connected Vehicles (CV)	Provides speed harmonization, road weather advisories, queue warning and other advisories to alert drivers of downstream conditions.	PTC 05
Towing & Recovery Incentive Program (TRIP)	Rewards towing companies for quickly clearing incidents and reopening travel lanes.	PTC 06

Solution Element	Description	PTC
Mobility Options Discovery and Engagement (MODE)	Offers users dynamic ridesharing and casual carpooling with incentives to increase vehicle occupancy and HOV lane use.	PTC07

***CDSS and QWS were not submitted as a PTC.**

i. Improvements – Maintenance Requirements

Pavement Elements

Only our HSR component involves modifying existing pavement and related infrastructure on IS 270. In most locations, this involves milling and repaving existing right-of-way (ROW), and adding pavement dye to identify the shoulder lanes as part-time facilities. In some northern portions of the highway, additional pavement will be required but not ROW acquisition. All pavement depth will be uniform and not require unusual maintenance. HSR operations and maintenance requirements will be similar to SHA's existing pavement management plans. Maintenance issues may include:

- Highway appurtenances like signs, barriers, drains, and lights that are closer to traffic can be damaged more often and more severely than under unaltered conditions. Parsons will evaluate the need to relocate or install updated appurtenances during the design phase and include determinations in its final plans.
- Conducting regular maintenance often requires additional personnel and equipment to close lanes and provide adequate work area protection. Parsons will review and recommend adjustments to SHA's pavement modification protocols.
- Most incidents, minor or major, require action by personnel that uses shoulders. During peak hours, incident clearance times typically increase with shoulder

lane use. Parsons will review SHA's Traffic Incident Management (TIM) plans for the corridor and recommend changes to accommodate pavement alterations.

- Delays of emergency vehicles accessing accidents by using shoulders, which may increase clearance times. As denoted above, Parsons will review SHA's TIM plans for opportunities to accommodate pavement alterations.
- The HSR lane surface course will be colored to differentiate it from the general purpose lanes. This coloring will run the full depth of the surface course. HSR and general purpose lane surface maintenance will be similar.

Other pavement-related infrastructure items include placing glare screens on the top of existing safety barriers along the southern half of IS 270 and reflectors on the face of the safety barriers in accordance with AASHTO guidelines or pertinent best practices. Glare screens block light from nearby oncoming traffic, delineate median barriers and reduce rubbernecking. Reflectors clearly indicate to drivers the proximity of barriers to the edge of travel lane and are inexpensive and easily replaced.

Plowing and roadway chemicals do not degrade roadway coloring, and should result in minimal damage to glare screens and reflectors and nominal maintenance costs for their occasional replacement.

Non-Pavement Elements

Our proposal generally contains two types of non-pavement maintenance costs: those related to intelligent transportation systems

(ITS) or to incentive programs. Each is discussed in detail below.

Intelligent Transportation Systems (ITS)

Because the components of Parsons’ ITS solutions are both proven and fully integrated into our Intelligent NETWORKS® product, staff intervention to operate them and maintenance to keep them running optimally is minimal. Moreover, as new functionality is desired or necessary, our ATMS’ modular nature supports seamless integration without expensive customization.

Several ITS implementation considerations apply regardless of which applications are deployed and we factored them into our design and build estimates. These include the following operations and maintenance requirements:

Staffing and Training. Although our ITS will run automatically without direct intervention, all such systems require monitoring for possible device malfunction or unusual conditions. As a result, each will require some staffing for operations and maintenance. Operational personnel also would be responsible for tuning of the central software. We anticipate existing staff could manage daily operations but each application would require one half-time staff member.

System Maintenance. As customary with ITS, field element maintenance is required and typically ranges annually from 5 and 10 percent of deployment cost. This includes labor, parts inventory, and preventive maintenance. Our maintenance plan will include expected maintenance provisions and response times, as well as fall back strategies.

Strategic Partnerships. Forging relationships with a breadth of agencies and partners for information and planning purposes will be key to the overall success of our proposed far-reaching, comprehensive improvements. This will involve, but not be limited to,

operations integration and coordination, enforcement, and media support.

Public Outreach Planning. To help ensure our strategies and improvements are successful, we know from experience that proactive and effective two-way communication with the corridor’s stakeholders about use and benefits will be critical. To achieve this, we will work with SHA to customize an outreach plan that is targeted and strategic and yields measurable results. From the onset, Parsons will help SHA coordinate with all applicable agencies to gain their concurrence and support. Concurrently, we will identify, engage and forge relationships with various motorist and community groups, employers and other key stakeholders to learn how to best address their issues and concerns throughout planning, design and implementation of this project. Although measured and cost-effective, our communications and outreach efforts will constitute more than just a check the box exercise. In coordination with SHA communication and community relations staff we will educate and gather public feedback about proposed improvements through a variety of methods. This will include a mix of general public information meetings, community and business briefings, earned media coverage, website content, printed materials, social media use, traditional and electronic mailings and possibly paid advertising. Clear, concise information sharing and transparency builds good will, while alleviating fear, skepticism and misinformation that can lead to costly and time consuming opposition.

Planning for Enforcement. Parsons will help SHA seek input from all relevant agencies, including police, on proposed operational and enforcement strategies during design and prior to implementation. Doing so will foster more effective ramp meter enforcement. Typically, a highly publicized enforcement plan achieves motorist compliance. We anticipate working with police to design a

plan with greater enforcement in the first six to eight months that tapers down to lower levels thereafter. In addition, while we propose an advisory VSL, Parsons will engage SHA and law enforcement in discussions about the potential benefits and implications of adopting a regulatory posture.

Hard Shoulder Running (HSR)

Parsons' HSR plans will include the implementation of a series of video detection cameras, lane signals, dynamic message signs (DMS) and a monitoring and control application within our Intelligent NETworks® Advanced Transportation Management System (ATMS). Unfortunately, existing roadway pavement width is not sufficient in all cases to provide emergency pull-off refuge areas beyond the HSR lanes. To mitigate temporary loss of existing shoulders during HSR operation, we propose the following operating procedures revisions/inclusions:

- Use camera coverage and video image detection analytics before opening the lanes to traffic to ensure shoulders are clear of debris and disabled vehicles. Parsons will coordinate the development of management rules to address HSR general operational, opening and closing scenarios.
- Develop Interagency agreements before implementing HSR to determine which agencies have the authority to instruct the Traffic Management Center (TMC) to close the shoulder.
- Effectively use the traveler advisory information system and lane availability signs to quickly clear HSR lanes and move the traffic over to GP lanes.
- Coordinate CCTV, HSR lane signs, TMC, and incident managers so shoulder is closed so emergency vehicles can drive safely on the shoulder to quickly remove disabled vehicles.

- Provide static signs to provide information and location of emergency refuge areas that are available for safe use by responders and removal of disabled vehicles.
- Provide emergency responders real-time information about the HSR lane's operational status.
- Develop and execute a regularly updated public awareness and outreach plan for all stakeholders.

The support system elements, such as HSR lane management signs, related structures and poles, and other ITS devices and subsystems, will be designed in accordance with MUTCD and AASHTO design standards.

Field devices, such as HSR lane management signs and VSL signs, may be mounted on gantries above shoulder lanes. Gantry vertical members will be installed outside the clear zone or be protected behind the guard rail. These devices will be maintained via bucket truck during off peak periods. All signs and ITS equipment support will be designed per AASHTO's Standard Specifications for Structural Supports for Highway signs, Luminaires, and Traffic Signals (6th edition) and submitted to SHA for review and approval.

Communications fiber and power cables will be built and installed according to MDOT and SHA standards to support ease of access and routine maintenance.

Parsons' Intelligent NETworks® will be maintained on a separate network with monitoring and management independent of and not impacting CHART or its maintenance.

Variable Speed Limits (VSL)

Parsons' VSL system will include a series of mainline detectors, VSL signs, dynamic message signs (DMS) and a monitoring and control application within our Intelligent NETworks® ATMS. Parsons' VSL system will

function automatically, 24-hours-per-day, seven-days-a-week, providing smooth and safe inter-operability between adjacent VSL sign locations (e.g., trooping of signs). Parameters like the interval frequency for updating the VSL signs are configurable to adapt to SHA preferences.

The VSL System uses speed data to detect slowdowns in traffic and change speed limits. This functionality will combine existing SHA mainline detectors and a series of new devices installed as part of this project. Preliminarily, Parsons plans to use new side-fire radar detectors that also will satisfy traffic monitoring requirements for our HSR, ARMC, CV and CDSS solutions. This “piggybacking” will save SHA considerable equipment purchase, installation, operations and maintenance costs.

All software required to operate our VSL system already exists within our Intelligent NETworks® suite, which has a long reliability record and will be maintained by Parsons under the product’s licensing agreement.

Adaptive Ramp Metering Control (ARMC)

Parsons’ ARMC solution will include a series of mainline detectors (shared with our other applications), ramp detectors, ramp signals and a monitoring and control application within our Intelligent NETworks® Advanced Transportation Management System (ATMS). Important planning for ramp meter impacts and operation will begin well before their deployment.

During construction, off-peak temporary ramp closures will be necessary to install meter detectors. Appropriate Maintenance of Traffic Plans also will be developed for this work.

After construction and well into operation, a mix of advertising and other public outreach activities will continue to educate motorists about the meters and the importance of complying with them. Equally important during initial operations, we will monitor and

review traffic patterns to refine operational strategies with SHA and partner agencies.

Corridor Decision Support System (CDSS)

Our CDSS will implement a monitoring and control application within Parsons’ Intelligent NETworks® ATMS. The CDSS system improves operations through automation. It uses artificial intelligence to determine the necessary changes to ARMC ramp meters and adjacent signal timings that will reduce bottlenecks and conflicts with each ramp; as well as information to disseminate via DMS, VSL, or the CV cell phone application. Upon determining its best strategy, CDSS automatically activates those devices in its plan. Although key staff are notified of diversions, all activations are automated and executed quickly. The CDSS is easy to maintain and update since it requires only algorithm adjustments based on new control strategies. If additional signal control options are identified or desired — such as those that would support an Integrated Corridor Management (ICM) solution — new devices can be entered into the application, and the CDSS is easily updated to include the new route. This adaptability will be essential should local jurisdictions eventually agree to more coordination along parallel routes.

Connected Vehicle (CV)

Parsons’ CV solution will implement a monitoring and control application within our Intelligent NETworks® ATMS. Our connected vehicle applications will require no roadside infrastructure, making operability and maintainability expenditures extremely low. In addition, upon acceptance and deployment of connected vehicle technology, more than 90 CV Dynamic Mobility Applications can be considered for future deployment. Most of these are in the Connected Vehicle Reference Implementation Architecture (CVRIA). This allows for adaptability to any of the other applications referenced in Exhibit 4-2.

Most important, Parson’s solution can be adapted easily to receive input data from additional sources and also deliver output values to different devices without expensive modifications to the underlying logic. For instance, should SHA eventually deploy roadside V2I infrastructure to enhance network monitoring capabilities, the values produced by these devices can be fused with other data sources to enhance the accuracy and timeliness of the data fed into the algorithms.

Further, as vehicle manufacturers roll out cars and trucks with more advanced vehicle information and control systems, the values that Parsons’ system produces (e.g., advised speeds via SPD-HARM) can be ported directly into other systems, allowing vehicle-mounted systems to leverage the information for such features as Cooperative Adaptive

Cruise Control (CACC). This adaptability will provide SHA the foundation upon which future CV applications can be built and deployed.

Communications and Infrastructure Backbone

Parsons’ improvements will minimize the number of devices as well as the complexity of power and communications networks required to support them. Components will utilize a common set of mainline detectors, share cabinet space, and tie into fiber and power networks in a coordinated fashion. We have extensive experience with each of our ITS applications, which allows us to refine our cost estimates to eliminate unnecessary redundancies (some redundancy is necessary to ensure reliability).

In addition to controlling costs, this approach minimizes build risks and reduces the

Exhibit 4-2: Example Connected Vehicle Dynamic Mobility Applications (Source: USDOT)

V2I Safety	Environment	Mobility
<ul style="list-style-type: none"> Red Light Violation Warning Curve Speed Warning Stop Sign Gap Assist Spot Weather Impact Warning Reduced Speed/Work Zone Warning Pedestrian in Signalized Crosswalk Warning (Transit) 	<ul style="list-style-type: none"> Eco-Approach and Departure at Signalized Intersections Eco-Traffic Signal Timing Eco-Traffic Signal Priority Connected Eco-Driving Wireless Inductive/Resonance Charging Eco-Lanes Management Eco-Speed Harmonization Eco-Cooperative Adaptive Cruise Control Eco-Traveler Information Eco-Ramp Metering Low Emissions Zone Management AFV Charging/ Fueling Information Eco-Smart Parking Dynamic Eco-Routing (light 	<ul style="list-style-type: none"> Advanced Traveler Information System Intelligent Traffic Signal System (I-SIG) Signal Priority (transit, freight) Mobile Accessible Pedestrian Signal System (PED-SIG) Emergency Vehicle Preemption (PREEMPT) Dynamic Speed Harmonization (SPD-HARM) Queue Warning (Q-WARN) Cooperative Adaptive Cruise Control (CACC) Incident Scene Pre-Arrival Staging Guidance for Emergency Responders (RESP-STG) Incident Scene Work Zone Alerts for Drivers and Workers (INC-ZONE) Emergency Communications and Evacuation (EVAC) Connection Protection (T-CONNECT) Dynamic Transit Operations (T-DISP)
<p>V2V Safety</p> <ul style="list-style-type: none"> Emergency Electronic Brake Lights (EEBL) Forward Collision Warning (FCW) Intersection Movement Assist (IMA) Left Turn Assist (LTA) Blind Spot/Lane Change Warning (BSW/LCW) Do Not Pass Warning (DNPW) 	<p>Road Weather</p> <ul style="list-style-type: none"> Motorist Advisories and Warnings (MAW) Enhanced MDSS Vehicle Data Translator (VDT) Weather Response Traffic Information (WxTINFO) 	<p>Smart Roadside</p> <ul style="list-style-type: none"> Wireless Inspection Smart Truck Parking
<p>Agency Data</p> <ul style="list-style-type: none"> Probe-based Pavement Maintenance Probe-enabled Traffic Monitoring Vehicle Classification-based Traffic Studies CV-enabled Turning Movement & Intersection Analysis CV-enabled Origin-Destination Studies Work Zone Traveler Information 		

extent of stakeholder inconvenience during construction.

Incentive Programs

Parsons’ proposed Towing & Recovery Incentive Program will need funding for support activities, and to pay incentives to towing providers that comply with performance requirements. Additionally, the Mobility Options Discovery & Engagement program will require funding for support activities and motorist rideshare incentives.

TRIP

The primary operations and maintenance burden associated with a TRIP solution are incentives paid to TRIP service providers, quality monitoring activities to ensure accurate incentive payments, and recruiting and training new providers. Since incentives are linked directly to performance, payments are clearly justifiable based on resulting benefits. Georgia estimates a benefit-cost ratio of nearly 11 to 1 for the system Parsons deployed there.

SHA has options for operating and maintaining TRIP post-implementation. Parsons proposes to support the program for at least two years (2018-2019) while working with SHA to identify and secure funding for maintenance, operations and towing provider incentives. If SHA opts to manage the program internally (i.e., as a turnkey solution), it has no obligation to Parsons. Whichever approach SHA chooses, Parsons is committed to helping SHA identify the necessary funding as part of our program design and implementation efforts under this contract.

We expect quality monitoring activities to be modest, and, again, a function of the number of incidents to which incentives apply. Furthermore, if the coverage area remains constant, the costs associated with ongoing recruitment and training will be minimal.

Finally, if the program is successful, SHA may opt to expand its geographic scope as Georgia DOT did, perhaps incorporating the heavily traveled I-495 and I-95 corridors. In that case, the benefits of the program clearly will have justified expansion, which will be relatively easy and straightforward. Conversely, if the program fails to meet expectations, terminating it would be relatively simple with the only sunk costs having been for program implementation, which on prior Parsons projects has been modest. See PTC 6 (Potential Impacts) in the Appendix, Section ii. (PTCs and the Administration’s PTC Letters).

Ultimately, reductions in incident-related delay and risk of secondary incidents also can minimize SHA operations and maintenance costs by decreasing the time and expense requiring service patrol staff and vehicles to remain on scene. This reduces the likelihood of overtime expenses and frees them to assist in other areas on and off the corridor.

MODE®

Similar to the TRIP program, the MODE’s primary operations and maintenance costs will be to pay incentives encouraging ridesharing, monitor activities that confirm ridesharing, accurately award those incentives, and recruit and train new subscribers. Again, since incentives are awarded only when driver behavior warrants, payments clearly will be justifiable based on actual increases in HOV share.

Here again, SHA has options for operating and maintaining MODE post-implementation. However, Parsons and Metropia likely will need to support the program for at least three years (2017-2019) to seek and secure incentive funds. We will help SHA identify operations and maintenance funding as part of our program design and implementation efforts under this contract.

Parsons expects Quality Monitoring activities to be modest and a function of the frequency

of instances for which rideshare incentives apply. If the program results fall below expectations, terminating it would be relatively simple with modest sunk costs only having been for program implementation.

ii. Improvements – Compatibility and Integration with Current Transportation Infrastructure

Pavement Elements

As indicated earlier the HSR pavement will be colored to distinguish it from the general purpose lanes for added safety. The HSR new surface course and base material will have strength and material specifications comparable to general purpose lanes. The pavement markings, raised pavement markers, glare screens, rumble strips, and reflectors will all be according to SHA and AASHTO standards, ensuring roadway classification compatibility and effective integration with the other planned projects like Watkins Mill Road Interchange and MD 121.

Parsons will design the HSR lanes to be compatible with the corridor's existing infrastructure, with the following minor exceptions:

- The bridge over Baker Valley Drive two miles south of MD 85 on IS 270 SB will be widened to accommodate the HSR lane and new shoulder. The new HSR lane will be 12 feet wide and the new shoulder will be the same width as the existing shoulder, or the minimum required by AASHTO.
- Existing ramp interchange gore areas will be modified to allow HSR lanes at various locations using geometry that meets AASHTO design criteria. Auxiliary lanes at these interchanges will be designed to match existing minimum length.
- Existing sound barriers may not meet FHWA criteria in areas where HSR lanes are added. Parsons will perform and

provide SHA with sound analysis to determine locations where existing wall heights are insufficient or new walls are required.

- The existing pavement cross slope at HSR lane locations may be steeper than allowable in some locations. Where this is the case, Parsons will wedge and pave the existing shoulder to stay within allowable limits. When the rollover rate between general purpose lane and HSR grade is higher than allowable, we will grind the pavement for smooth transition.

Non-Pavement Elements

Parsons' ITS group (formerly known as Delcan) is one of the world's premier ITS integrators. Our experience has afforded us the opportunity to learn and apply lessons ranging from field device and communications mechanism selection to architecture and buildout of fully functional turn-key systems that are user-friendly, scalable, adaptable and robust.

Our integration philosophy is to minimize client risk and cost. We achieve this by using proven componentry with open standards and protocols while building in information and system security capabilities that safeguard against unauthorized intrusion.

Intelligent NETworks®

Parsons' proven, powerful and flexible Intelligent NETworks® ATMS solution lies at the core of how we will comprehensively integrate our proposed improvements. This modular platform will allow us to adapt all of our applications to changing conditions and evolving operational strategies. This well-managed central system will accommodate new input sources and provide new control algorithms.

Parsons' Intelligent NETworks® ATMS is a state-of-the-art, off-the-shelf application designed to assist in the collecting,

disseminating, and managing transportation information. A scalable architecture that can be customized to meet unique operational environments makes Intelligent NETWORKS® ATMS an adaptable solution for small and large scale deployments.

The Intelligent NETWORKS® ATMS is web-based ITS modular software in which an end user or agency selects desired system modules for their system. The system is sized and priced based on the modules selected, their specific feature set and the level of customization (if any) that may be required.

PARSONS' INTELLIGENT NETWORKS® ATMS

In the past three years, Parsons has received seven awards for our Intelligent NETWORKS® ATMS, including national awards from InfoWeek and ITS America. It has been deployed in 23 jurisdictions worldwide.

Designed to be fully compliant with National Transportation Communications for ITS Protocol (NTCIP) and the National ITS Architecture, Intelligent NETWORKS® is also fully compatible with and adaptable to all current and future applications that also comply with these standards. It can exchange information with any system that supports center to center communications.

Intelligent NETWORKS® offers SHA several key benefits for the IS 270 corridor. Due to our innovative design, it is:

- **Configurable and Customizable.** Users can mix and match individual modules; modify them to meet unique local requirements; and choose multilingual and local language support.
- **Cost Effective.** The system uses an enterprise license model; functions on a dedicated server or in a virtualized environment with redundancy; and operates on a single inexpensive PC-based server.
- **Platform Independent.** It can run on any hardware platform and operating

system that supports Java Runtime; no commercial off-the-shelf software is required other than a database management system.

- **Open Architecture.** Maximizes interoperability with other technologies, including center-to-center interfaces; supports common ITS field devices using standard NTCIP/UTMC or legacy protocols; and minimizes risk of obsolescence.
- **Highly Accessible.** A true thin client, web-based application built for performance over the Internet; available using a standard web browser from any location with secure Internet or local network access.
- **Fault Tolerant/High Availability.** Designed for full redundant failover and operations (99.9 percent uptime); can be deployed in a virtualized clustered server environment (as recommended).

iii. Innovative Technologies or Techniques

Pavement Elements

In all aspects of this proposal, Parsons has strived to deliver improvements that best meet the goals for IS 270 with the least possible impact on existing physical and environmental characteristics. As a result, none of our improvements require right of way acquisition, new bridge structures, or environmental remediation measures. Consequently, our proposal maximizes use of the project budget for actual mobility and safety improvements.

Of further note, our hard shoulder running solution minimizes changes required to provide appropriate pavement depth, eliminates costly safety barrier reconstruction and controls costs of pavement marking removal and reapplication.

We will use a different colored pavement for the HSR lanes to help motorists easily

distinguish them from general purpose lanes. Glare screens will delineate median barrier, reduce rubbernecking and provide an effective headlight shield from approaching vehicles. Finally, our median barrier reflectors will give motorists an extra margin of safety in inclement weather.

Non-Pavement Elements

Parsons's technical proposal offers innovation in multiple forms. By combining improvement elements into a holistic approach, we will deliver immediate benefits while simultaneously laying groundwork for a dramatically different future. Our proposal manages risk by focusing the bulk of SHA's investment on near- and mid-term improvements while applying a smaller — yet effective — portion of the project budget on foundational building blocks that will support a future "connected corridor".

While Parsons' team has delivered hard shoulder running, variable speed limits, adaptive ramp metering, integrated corridor management, towing and recovery incentive programs and ridesharing incentive programs successfully across the country, we recognize that they represent new solutions for SHA and Maryland motorists. There will be a familiarization and normalization period for all project stakeholders; and Parsons will be an active partner with SHA throughout the process. Once the systems are installed, integrated and tested, IS 270 users will experience significant and lasting benefits in mobility and safety on the corridor.

Beyond our experience delivering these solutions, Parsons is unique among the design-build contractors bidding on this contract in that we already have an integration platform that allows all of these components to work together seamlessly. Our Intelligent NETworks® ATMS product is a versatile platform that enables the delivery of multiple capabilities while dramatically reducing the time and expense associated with systems

integration — savings we pass along to our clients. Simply put, our ITS integration will take less time and money to complete, which means SHA will be able to deliver a solution quicker and have more funding focused on throughput improvements.

Parsons also has defined ITS infrastructure elements in a manner that will control costs, allowing solutions to be deployed along the entire corridor. For instance, our plan to use both cantilever mounting and existing overhead fixtures (i.e., road signs and overpasses) for hard shoulder lane management devices, variable speed limit signs and dynamic message signs will reduce the number of full-span gantries that must be installed on the highway.

Of further note, we plan to deploy multi-use detection devices that will support our systems while accommodating other SHA uses. For instance, the cameras we install to ensure hard shoulders are clear before they open also will be used to help determine whether to activate TRIP. A single set of radar detection devices also will support both our variable speed limit and adaptive ramp metering solutions. In addition, our CDSS will support efficient operation of the ramp metering system by ensuring that queues at ramps are not excessive.

5

WELL-MANAGED PROJECT



5 Well-Managed Project

i. Project Management Plan: Communications, Coordination and Risk Management

Progressive Design-Build (PDB) fosters discourse to generate creative solutions to project goals and efficient pricing that minimizes risk to both parties. A collaborative process between SHA and Parsons to optimize solutions is one that perfectly suits the One Parsons structure.

Maximizing PDB's benefit requires including key construction leaders -- the Construction Manager, Systems Integration Manager, Cost Estimator, Quality Manager, and Safety Manager – in the design process and design leaders – the Design Manager and ITS Design Manager -- in the construction process. This, too, is fundamental to the Parsons' approach to this project.

PROJECT MANAGEMENT PLAN (PMP)

The cornerstone of Parsons' Project Management Plan is that we are truly an integrated Design-Builder. Our project leads do not have to cross organizational lines to collaborate. This structure ensures goal alignment within the design-build team, facilitates communication throughout design and construction, and eliminates contractual friction.

Key elements of Parsons' Project Management Plan are described in the sections that follow. By leveraging our existing working relationships and inherent integration, the job-specific techniques, processes, and practices in our PMP will reduce turnaround times and maximize functional efficiency. Our PMP will adhere to best practices and be tailored to the needs of this project. It will provide distinct internal communication protocols and explicit lines of communication with SHA.

Communications

Authorized Parsons Representatives will be DBPM Brian Quinlan PE on all contract matters, DM Olu Adeyinka PE on all design matters, and CM Paul Price on all construction matters. On day-to day-matters, however, Parsons will encourage expedient communication between design and construction staff.

Parsons will facilitate and codify expectations at a Partnering Kickoff Meeting shortly after Notice to Proceed. Here all parties establish priorities, offer ideas for achieving goals, and agree to communication and coordination protocols. They also establish organizational level protocols for direct, effective lowest-level possible communication, which is critical to teamwork development and timely issue resolution. To account for higher level intervention as warranted, guidelines also include a defined escalation ladder – an essential tool to facilitate prompt and complete resolution.

Parsons will base design-phase operations in its Tysons, VA office. Within 8 miles of IS 270, this is the permanent office for key design team staff and reduces project costs. As work transitions to construction, Parsons will establish a jobsite office near the corridor median point.

Parsons' team includes Susan Sharp of Rockville, MD-based Sharp & Company to develop and implement the project's Public Outreach Plan. Their proposed tools include a website, emails, flyers, meetings, electronic signs, and press releases to inform travelers and other stakeholders about project status and activities.

A Parsons best practice will be to use a Design-Build Coordinator to interface between the Design and Construction Team. Richard Chylinski will fill this role before

transitioning to his Key Personnel role as Systems Integration Manager. His mission during design is coordinating between the design and construction teams and the SHA. Richard is construction oriented with extensive ITS design and procurement experience. He will chair all task force meetings to assure coordinated development of all solution elements and appropriate packaging for construction pricing and execution. His knowledgeable leadership also ensures productive interaction between the design and construction teams. This is key to streamlining reviews, preventing design-related delays or rework, and avoiding constructability issues.

Parsons also will provide experienced ITS Design Manager Ian St. Yves, PE. Ian filled an identical role on Inter County Connector (ICC) Contract B and related roles on ICC Contract A and other major corridors.

PMP tools to facilitate Design Development include:

- Design package narratives explaining to reviewers at all stages package content and review expectations.
- Interdisciplinary design reviews with SHA participation.
- Comment resolution processes with package walkthroughs; comment and proposed resolution discussion and agreement; and comment resolution review with page turns as part of final resolution.
- Design constructability reviews, especially plans related to traffic management, environmental controls, and utility interfaces.
- Construction packaging maximizing MBE participation.
- Construction packaging streamlining permitting and procurement.

The PMP roster of meetings includes:

- Partnering Kickoff Meeting upon NTP and quarterly meetings thereafter.

- Monthly Risk Analysis and Mitigation Workshops.
- Monthly CPM Schedule Update meetings to review progress, discuss pending work, and share long-range planning.
- Weekly progress meetings with SHA to discuss submittals and progress.
- Weekly disciplinary task force meetings chaired by design leads to integrate design and construction team views.
- Weekly schedule meetings to review the previous week and develop three week look-a-heads.
- Weekly subcontractor schedule meetings.
- Weekly foreman meetings to discuss safety, schedule, and coordination.
- Morning huddles with the crews to review Work Plans (covering production, safety, and quality).
- Preparatory Meetings prior to each discrete item of work.
- Bi-weekly construction coordination meetings with adjacent contractors, EMS, State Police, etc.
- Bi-weekly utility coordination meetings.
- Bi-weekly stakeholder coordination meetings with Montgomery County, Frederick County, etc.
- Ad hoc meetings with public groups and towing providers.

Coordination

Our Design-Build Coordinator will manage interactions with third parties, including utilities and permitting agencies. He will plan and conduct Task Force meetings with the Owner and third parties to define requirements and expedite approval. Parsons anticipates needing to coordinate, at a minimum, with following entities:

- Public and private utilities in the ROW
- Noise permitting agencies
- Air quality agencies

- Design exception agencies
- Jurisdictions affected by the project

Sharp & Company will develop and facilitate the public coordination process. We anticipate multiple outreach meetings during design and construction. Supplementing this effort, we plan to use traditional and social media to inform the public.

Risk Management

Risk Analysis and Mitigation Workshops

Parsons will host a Risk Analysis and Mitigation (RAM) workshop and follow-up meetings throughout the project to help the team, including SHA, use proven RAM tools to manage risk. The systematic and comprehensive RAM approach codified in the Parsons ESHARP safety program will guide this effort. This methodology is as follows:

- **Identification.** Team listing of project risks.
- **Quantification.** Risk evaluation on the magnitude of potential impacts to schedule and budget.
- **Probability.** Assessing the likelihood of identified risks becoming reality.
- **Mitigation.** Implementing strategies that fall into four categories:
 - **Avoid.** Eliminate the risk altogether by adopting a new approach.
 - **Transfer.** Assign risks to the party that can best manage the risk.
 - **Reduce.** Reduce the severity or likelihood of risks that cannot be avoided or transferred.
 - **Accept.** Internalize the risk so it includes appropriate cost allowances and contingency plans.

Risk Register

The risk register is a tool to manage exposure and quantify residual risk. It is a dynamic, living document quantifying risks via subjective evaluations of possible impact

and likelihood. Exhibit 5-1 is a summary preliminary matrix of major risk areas we have identified. Our DBPM will manage continuous risk register maintenance and ensure the design and construction teams take appropriate steps to mitigate identified risks.

This structured approach drives down perceived and realized risk cost by reducing potential cost impact or likelihood. Successful implementation removes risk from pricing by tracking risk separate from the work's direct cost. During the Construction Agreed Price (CAP) process, this yields a clearer understanding of the direct cost of proposed work features and allows for easier comparisons to historical norms. This results in a more efficient cost evaluation and change order process.

Cost Model Approach: Cost Certainty

Our cost model approach produces reasonable implementation costs for proposed solutions. These are necessary to successfully execute the CAP process, enhancing the likelihood of reaching mutually agreeable pricing for proposed work packages.

Parsons will leverage time-tested procedures and relevant lessons-learned from hundreds of highway projects and SHA's standard items and past plans to identify project bid item scope and locations. We will develop estimates based on actual material and subcontractor costs, our firm's historical bid data, and production study estimates from current projects. Using Heavy Bid software, we will present a typical bid item list in meetings with SHA and the ICE (Independent Cost Estimating). Parsons will share a detailed cost breakdown of our production rates, quantities, crew sizes, work shifts, labor rates, equipment rates, material prices and subcontractor prices to facilitate equitable pricing and timely CAPs.

Utilizing Existing SHA Bid Items from the Item Code List. The SHA item code list will serve as a useful tool for the CAP process. To reach a mutually agreeable CAP, we will develop a bid item list from the preliminary plans that identifies key work elements, construction activities, and sequencing requirements. From that point, the bid list will provide an organized structure for detailed pricing, streamlining the negotiating process via historical pricing comparisons.

Communicating Assumptions of Cost, Risk, Subcontracting, Market. As part of the Progressive Design-Build process, our team will openly discuss how we develop costs models. This is a necessity since there will be instances where our cost estimates and approach to the work will differ from ICE expectations. To resolve differences, we will openly discuss subcontractors and vendors, materials availability, work schedules, production rates, means and methods, and risk. Face-to-face meeting communication is the heart of the process.

Submit Comprehensive Pricing that Includes Innovative Cost Savings, Added Value, and Low Risk. Parsons has extensive experience on alternative delivery projects as a DB contractor and an Owner representative. To develop our estimate, we will use our experience to suggest cost reductions through innovative ideas, design changes, cost-effective specifications, alternative traffic patterns, schedule modifications, or other ways to add value without dramatically changing the scope of work.

Comprehensive Scheduling

Parsons will use the Critical Path Method (CPM) to establish a Project Baseline Schedule, track performance, and forecast work as the project progresses. A comprehensive, resource-loaded schedule is invaluable in understanding the impacts of project risks. The CPM schedule allows accurate scope of work modeling by

capturing necessary construction sequencing and work item dependencies. Our team uses the CPM to manage and analyze changes that occur in a dynamic field environment and examine alternate strategies to complete the project in a timely manner. We will consider every activity and apply a risk/contingency duration multiplier where appropriate so that submitted schedules contain requisite buffers and allow successfully CAP delivery.

ii. Design-Builder's Work Plan

The first 120 days will be used to validate existing conditions, confirm project scope, and initiate design. Parsons will facilitate an interactive discussion to ensure both SHA and Design-Build Team collectively understand the scope of work. With this accomplished, we will prepare a definitive work activity schedule and form task forces. Task forces will monitor schedules and deliverables. Our preliminary work plan, to be developed with SHA, is outlined below:

1. Confirm scope of work
2. Start design and break out CAP Packages
3. Start task force meetings with SHA and 3rd parties to assure the packages contain the necessary items to negotiate a CAP
4. Provide 65 percent design so that a CAP can be executed
5. Provide a CAP estimate for each package to SHA, including necessary risk assessment, DBE requirements, and schedule information
6. After executing a CAP Change Order, schedule a construction kick-off meeting with all entities involved.
7. Prepare construction packages.
8. Test, integrate, and activate all ITS function to enable a seamless system.
9. Substantially complete system and turn it over to SHA.

EXHIBIT 5-1: Preliminary Risk Matrix

KEY: VH - Very High | H - High | M - Medium | L - Low | VL - Very Low

Risk Identification				Analysis		Risk Response
Risk #	Status	Discipline	Description of Risk Categories and Potential Consequences	Probability	Impact	Risk Mitigation Strategy
1	Active	Environmental	Additional noise walls may be required which are outside the scope of work for this project.	H	H	We have provided a preliminary analysis of the modified locations in Attachment 5 of PTC 01.
2	Active	Roadway	Narrowing and/or shifting of the HOV lane(s) will require an equivalency study. This would need to be approved by FHWA prior to establishing a CAP.	H	M	An equivalency study is programmed into our workplan.
3	Active	Power	Access to commercial power could require additional undefined costs to provide. Alternately, VSL signs may have to be equipped with solar panels and backup batteries where power is not readily accessible.	L	M	A power survey will be conducted in the early design phase to ensure the necessary power source selection is accurate.
4	Active	Right-of-Way	Unknown utility conflicts may require additional right-of-way acquisition.	M	H	Perform early identification of utility locations and establish a new communication trunk.
5	Active	Drainage	Review of the drainage spread for temporary and ultimate impacts to roadway.	M	H	Perform early identification completion of drainage analysis and mitigation.
6	Active	ITS	Fabrication and delivery of long-lead schedule ITS devices and structures.	L	M	Develop design packages of ITS CAP early in the design phase. Then expedite review of shop drawings.
7	Active	ITS	Cost and logistics of using four existing dark fiber optic cables for redundant trunk line may prove unacceptable, making it necessary to install additional fiber optic cable through the full length of the Project.	L	H	Initiate early discussions with Level 3 to evaluate viability of using existing dark fiber optic cables.
8	Active	ITS	Software development cost and schedule demands are driven by modeling effort that is essential to deriving maximum benefit from INet, which can be unpredictable.	L	M	Utilize experienced Parsons modeling experts to optimize process.
9	Active	Construction	Resource shortages due to regional mega-projects (Purple Line, I-66, South Capital Street Bridge).	H	L	Robust outreach program to subcontractors and suppliers, especially MBEs. Explore weather PLA to address labor shortages is warranted for self-perform work.
10	Active	ITS	Adaptive Ramp Metering Controls works best when coordinated with nearby traffic signals, which are county owned and operated.	H	L	Our initial outreach to counties has been positive. We will ensure MOUs are in place prior to conclusion of the CAP process.
11	Active	Schedule	ITS solutions may require fine tuning prior to final hand over to SHA.	L	L	Plan to achieve Substantial Completion in three years from NTP – first year being for design and following two years being for construction. Include a six month period between Substantial Completion and Final Completion to account for unforeseen commissioning and training requirements.
12	Active	Schedule	Construction will impact traffic flow, even when conducted off-peak.	H	L	Commence work on northern half of NB IS 270, as work in this section is most straightforward and it is the most favorable area in terms of traffic dissipation. Progress to southern half of NB IS 270 where traffic counts are much higher, but operational procedures have been tested and validated. From there, move to the southern half of SB IS 270, which is the most challenging MOT area on the Project. Finally, finish with northern half of SB IS 270, which places the Project on path to successful completion.

10. Complete project close out for Final Completion.

Our Design Manager will lead a fully integrated design team, accountable by technical discipline. Key design management approach goals are as follows:

- Prepare designs that meet specified criteria and are consistent, cost-effective, constructible, and maintainable.
- Drive innovation, continuous performance improvement, enhanced safety and minimized traffic disruptions.
- Deliver quality construction through quality designs.
- Support early construction packages and completion so that the public can benefit as soon as practical.

Parsons has successfully used this approach on projects such as the I-25 T-REX (Colorado), I-64 Design-Build (Missouri), and I-15 Pioneer Crossing (Utah) design-build projects. Key to this approach's success is fully integrated multidisciplinary design teams that provide critical jurisdictional design knowledge and experience. Parsons will continue this proven process on the IS 270 Project. It includes elements that work together to deliver prompt quality design packages, including the following:

- Preliminary plans with adequate detail for CAP negotiation.
- Formal submittals at milestone and release-for construction (RFC) stages.
- Quality processes in accordance with our DQMP, QA audits, and certification for each package at each stage.

Task Forces are integral to successful delivery of progressive design-build projects. Parsons pioneered the use of Task Forces on highway design-build projects, beginning on the I-15 Reconstruction Project in Salt Lake City, Utah. Task Forces provide a forum for communication between design disciplines and between design and construction personnel.

Our weekly Management Team meeting will facilitate communication between discipline leads. Each Task Force will comprise Parsons Team members, SHA personnel, subcontractors (if required), and applicable stakeholders. Parsons' Design-Build Coordinator will insure coordinated solutions between design/construction phases while defining overall approach and scheduling. The Technical Discipline Leads will head each Task Force, ensuring that work is communicated and coordinated with the other Task Forces. Staff from various Task Forces will intermingle depending upon the particular needs of a given Task Force. During Task Force meetings, Discipline Leads will discuss their efforts, identify and resolve issues, monitor the schedule for deliverables, and share information between groups to prevent conflicts/impacts.

Parsons anticipates the need for the following task forces during the design period:

- Management Task Force
- Master ITS Structure and Integration
- Additional PTC Development
 - Hard Shoulder Running (HSR)
 - Variable Speed Limits (VSL)
 - Adaptive Ramp Metering Control (ARMC)
 - Coordinated Decision Support System (CDSS)
 - Connected Vehicles (CV)
 - Towing and Recovery Incentive Program (TRIP)
 - Mobility Options Discovery & Engagement (MODE)
- Utility Interface
- Environmental Requirements
- Traffic Management
- Public Outreach

Design-Builder Services

As Design-Builder, Parsons will provide complete design and construction packages for each CAP. We will manage design to expedite early work packages and CAP negotiations plus provide packages enhancing MBE participation on the project. During Design and Pre-Construction, we will meet the 25 percent DBE goal and the sub goals. We also expect to meet the DBE goals for individual CAPs. After CAP negotiation, Parsons will provide the final design and construction teams, including necessary direct hire forces and subcontractors to complete the work. Parsons will self-perform at least 50 percent of project design and construction, including all construction management activities.

We will write a Quality Construction Plan within the first 180 days of the Project based on PAR-PRO™. This is our internationally recognized, award-winning Quality Management approach comprised of interrelated modules that help teams fully realize project requirements, define scope and capture objective evidence verifying requirement fulfillment.

As work is completed (design or construction), conformance of contract requirements is generated within PAR-PRO™ and ultimately becomes part of the material test results, inspections of workmanship, or other QMP process outputs. Collection and organization of this documentation will provide SHA with a high level of confidence that the finished work products fully conform to contract requirements. Any non-conformance also is documented with the status of each issue tracked and reported until closure.

Design Quality Management

Parsons will complete the Design Quality Management Plan (DQMP) during the first 30 days to address the specific project requirements, including design quality

control activities. The DQMP will address design management responsibilities for the implementing the quality plan and staff training on quality procedures and requirements. It will define the quality assurance and quality control organization by position and assign individual responsibility for each quality control function.

Our DQMP will draw from three documents that form the core of Parsons Quality Management program.

- The ISO 9001:2008 Quality Manual
- Parsons Quality Assurance Procedures
- Parsons Administrative Procedures

In developing our DQMP, we will employ best practices demonstrated on the IS 25 T-REX project, which won the International Road Federation Quality Management and Maintenance Award in 2006. This will include implementing a senior management level quality committee engaging members from Parsons and SHA to review quality progress, issues, and concerns. Our DQMP will focus on the major quality components of the design process. We also will engage in interdisciplinary reviews and external peer reviews to provide an additional level of design quality support to the project.

iii. Minimizing Extra-Contractual Impacts

Parsons understands the design-build team's responsibility to execute improvements in a responsible manner. This includes taking appropriate steps to apply best practices to control overall costs and minimize adverse environmental impacts. Identified below are some specific areas where we will act to achieve these objectives.

Environmental

The project will require National Environmental Policy Act (NEPA) approvals due to potential action by the Federal Highway Administration associated with the Interstate Access Point

Approval (IAPA). As stated in the RFP, the NEPA documents will be prepared by SHA. Parsons will provide documentation of the independent utility and logical termini of the project. We will closely coordinate with the SHA Environmental Manager throughout the project, especially for updated agency coordination as defined project limits and limits of disturbance are developed. The project team will support SHA by providing other information as needed to ensure compliance with the NEPA process.

The Parsons team has configured its solution to avoid or minimize environmental impacts. The solution limits the construction work on proposed improvements to the existing Right of Way (ROW). The Parsons team will continue to develop measures to minimize environmental impacts as the projects moves further in design.

Based on available information, the project meets Categorical Exclusion requirements pursuant to FHWA NEPA regulations 23CFR771.117 c(22), c(23), c(26) and d(7). Parsons' team developed all PTCs in way such that the entire project can be approved in one NEPA action as a categorical exclusion, or based on SHA's decision it can be divided into multiple environmental actions/ documents. The latter is possible because discrete parts of our design can be packaged as stand-alone construction projects that connect logical termini and be of sufficient length, have independent utility, and do not restrict consideration of alternatives for other reasonably foreseeable transportation improvements. However, as stated in the RFP, Parsons will have no decision making responsibility for NEPA/MEPA and the final NEPA approval is FHWA and SHA's decision. Again, we will provide information to SHA for NEPA approvals, permits, and mitigation measures as needed.

Parsons will develop storm water management plans and work with SHA to

obtain any necessary permits, including any needed for any potential impacts to wetlands, streams, and water bodies. We will work with the SHA environmental staff to coordinate the project with resource regulatory agencies including the MD Department of Natural Resources, MD Department of Environment, US Fish and Wildlife Service, MD Historical Trust, and the US Army Corps of Engineers as needed.

The project corridor is within the Metropolitan Washington Council of Governments boundaries. The Washington metropolitan region is currently designated as in attainment of the 2008 ozone standard; however, the Metro Region is designated as marginal non-attainment for the 2015 ozone standard. In addition, the region has recently been re-designated as non-attainment from maintenance area for fine particulate (PM_{2.5}) pollutants. This will require air quality analysis for some potential improvements, pursuant to the 40 CFR 93 of the Clean Air Act. Our solution improves traffic movement and reduces idle time of commercial and common motor vehicles, thereby providing an improvement to air quality along the corridor and the region.

Inclusion of Hard Shoulder Running (HSR) categorizes the project as a "Type I Project" for purposes of FHWA Noise Analyses. As such, a noise analyses for affected project areas will be needed pursuant to 23 CFR 772 FHWA Noise Regulations and SHA Highway Noise Policy. Parsons will provide the analysis and mitigation measures. We will work closely with the SHA, including its environmental program and cultural resources staff, to develop an environmental management plan to ensure that all the mitigation measures and commitments made in the NEPA and related environmental approval process are implemented in a timely and efficient manner.

Parsons will proactively engage the public and agency in a meaningful, effective, and

timely manner. Public engagement will involve emails, flyers, online information, social media (if approved by SHA), and public and community meetings, as needed. We also will engage businesses, and civic/ community organization in the area while working with SHA to ensure appropriate project coordination with other local, state and federal government agencies. Our Environmental Task Force will participate actively in this process to ensure appropriate coordination with all environmental regulatory and permitting agencies and that the project receives all necessary permits and approvals.

ROW

The Parsons solution limits proposed improvements to within the existing Right of Way (ROW), eliminating the need for ROW acquisitions and minimizing potential impacts on human, physical and natural resources.

Utilities

During the first 120 days, Parsons will determine if utility easements may be needed due to potential utility relocation. Parsons will review and update existing utilities during the detail design of the project. We recognize that there are four fiber-optic cables available to us on IS 270. We will use it if available and supplement it with new fiber as needed. We will work with local power companies to provide drops where necessary. We also will examine using solar power to minimize commercial power requirements. We will collaborate with third party utility owners to identify innovative steps to minimize schedule risk due to utility impacts.

Timely Implementation of Improvements

We will provide our first CAP package 6 months after NTP, and the remainder within first 12 months after NTP. We anticipate that the full progressive design-build project will be completed three years after NTP. Paving

seasons will be the major decision point of packages and we expect to utilize two full paving seasons to substantially complete the Project.

Design and Construction Packages

Parsons will formulate construction packages to promote early construction and simplify CAP negotiations. The first packages will be the installing ITS’ backbone and other long-lead time items. All other packages can be connected. The HSR work will need to be segmented for MOT purposes, particularly with respect to the outside shoulder work. The ARMC system will be installed sequentially, governed by MOT requirements and crew availability. The VSL and CDSS will be implemented with the HSR and Ramp Metering packages. The CV, TRIP and the MODE will be separate packages since no infrastructure is required. Exhibit 5-2 contains a preliminary list of proposed CAP packages, which will be defined and reordered as necessary during negotiations. Parsons chose this sequence to minimize traffic disruptions by conducting work on downstream segments first.

Exhibit 5-2 Preliminary CAP Packages

NO.	Description
1	Performance & Payment Bond & Similar Expenses
2	Overall ITS Backbone & Facilities
3	NB HSR, VSL, ARMC, CDSS from IS 370 to IS 70
4	NB HSR, VSL, ARMC, CDSS from IS 495 to IS 370
5	SB HSR, VSL, ARMC, CDSS from IS 370 to IS 495
6	SB HSR, VSL, ARMC, CDSS from IS 70 to IS 370
7	CV Application (Corridor-wide)
8	TRIP (Corridor-wide)
9	MODE (Corridor-wide)

v. Watkins Mill Interchange Project

Based on the review of the model results and simulation, Parsons concluded that the currently proposed Watkins Mill Road interchange will fail in both 2040 morning and evening peak hour conditions. In addition to heavy volume on Watkins Mill Road causing capacity issues, its proximity to existing interchanges and short ramp lengths on NB IS 270 will cause a failing LOS for this interchange. The current design shows turning radii at ramps on Watkins Mill Road varying from 25 to 85 feet. Given the ramp widths, they will be unable to handle a WB-67 truck effectively.

Recommended Design Modifications

To address the above concerns, Parsons developed a Diverging Diamond Interchange (DDI) concept for the interchange (see Appendix iv. Supporting Information.) The DDI is an innovative practical-design concept that will alleviate traffic congestion by providing a smoother transition between the on/off ramps of IS 270 and Watkins Mill Road. Traffic moving between Watkins Mill Road and IS 270 will be free flowing with sufficient auxiliary length provided for easy merging into through traffic. All thru-lanes and turn lanes are able to accommodate WB-67 truck movements due to adequate roadway and ramp width. Only two signal controls will be needed (Grey box on plans) to control traffic flow, leading to less congestion/queuing.

The conceptual DDI design is contained within the existing interchange footprint on either side of existing Watkins Mill Road. The entrance to the neighborhood on the west side of the interchange will use a right-in right-out movement. The conceptual DDI accommodates pedestrian and bicycle movements with ADA compliance. The ramp in the current design from northbound Watkins Mill Road to MD 124 is eliminated in the DDI concept. Additionally, the detailed

design of DDI shortens the bridge over Watkins Mill as the ramp to MD 124 is eliminated. As a result, stream and wetland impacts may need to be reevaluated with the shortened bridge.

PARSONS DDI DESIGN EXPERIENCE

Parsons has designed numerous DDI interchanges including an award winning design-build project in Virginia for the I-64 interchange at Route 15, Zion Crossroads. This is Virginia's first DDI, saving the department a capital outlay of nearly 30 million dollars.

To evaluate our DDI concept plan, Parsons modeled the Watkins Mill Interchange both in its current configuration and as a DDI in the 2040 Build Year AM and PM model. This model included all of Parsons' proposed solution elements. Model results confirmed that the corridor will perform at a better LOS in the build condition with the proposed Watkins Mill Road DDI configuration since density, travel time, and speed all improve. Latent demand and latent delay show a slight increase in this scenario, which is more pronounced in AM peak. This increase in latent demand can easily be eliminated by adjusting signal timing along Watkins Mill Road corridor. A full discussion of the results is provided in the modeling report contain in the Appendix to this technical proposal.



7
APPENDIX



Addenda Letters
and Responses
to RFIs



MARYLAND DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF HIGHWAY DEVELOPMENT
707 NORTH CALVERT STREET
BALTIMORE, MARYLAND 21202

September 1, 2016

Contract No.: MO0695172
F.A.P. No.: Not Applicable
Description: IS 270 Innovative
Congestion Management Contract –
Progressive Design-Build: Request
for Proposals (RFP)

ADDENDUM NO. 1

To All Prospective Proposers:

Please be advised that the Technical and Price Proposal Submittal Date for this contract is still scheduled for **January 5, 2017**.

The attention of prospective proposers is directed to the following revisions, additions and/or deletions to the Request for Proposals (RFP).

REQUEST FOR PROPOSALS

<u>Page No.</u>	<u>Description</u>
18	ADDED "ITS Information" to the Additional Material.
Appendix	Stipend Agreement, page 2 of 6: REVISED "Alternative Technical Concept" and "ATC" to "Proposed Technical Concept" and "PTC." Also, REVISED stipend amount in section 2.2 (a) to \$750,000.

NOTICE TO PROSPECTIVE PROPOSERS

The attention of prospective proposers is directed to the following revisions, additions, and/or deletions to the Additional Information on ProjectWise:

ADDED "I-270 ITS Devices.xlsx" and "ITS_I270.kmz" and "I270_FiberLine.kmz" and "I270_MH_FM.kmz" at the following location on ProjectWise:
pw:\\SHAVMPWX.shacadd.ad.mdot.mdstate:SHAEDMS01\Documents\Design-Build\MO0695172\H Additional Material\06 - ITS Information\

Contract No.: MO0695172

Addendum No. 1

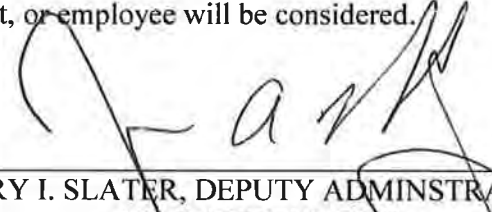
September 1, 2016

Page 2

Questions relating to this Addendum No. 1 may be directed in writing to:

Jason A. Ridgway, P.E.
Director, Office of Highway Development
Maryland Department of Transportation
State Highway Administration
e-mail address: MO069_IS_270@sha.state.md.us

During the Technical Proposal Phase, only e-mailed inquires will be accepted. No requests for additional information or clarification to any other Department or Administration office, consultant, or employee will be considered.


GREGORY I. SLATER, DEPUTY ADMINSTRATOR FOR PLANNING, ENGINEERING,
REAL ESTATE, AND ENVIRONMENT.

THIS ADDENDUM IS ISSUED TO CLARIFY, ADD TO, DELETE FROM, CORRECT AND/OR CHANGE THE CONTRACT DOCUMENTS TO THE EXTENT INDICATED AND IS HEREBY MADE PART OF THE SAID CONTRACT DOCUMENTS. COMAR 21.05.02.08 REQUIRES THAT ALL ADDENDA ISSUED BE ACKNOWLEDGED; THEREFORE, PRIOR TO SUBMITTING YOUR PRICE PROPOSAL, ATTACH THE ADDENDUM RECEIPT VERIFICATION FORM TO THE FRONT OF THE PRICE PROPOSAL FORM PACKET. FAILURE TO DO SO MAY RESULT IN THE PRICE PROPOSAL BEING DECLARED NON-RESPONSIVE.

- Watkins Mill IAPA and Permits

F. Watkins Mill Interchange Plans

G. Watkins Mill Interchange Design Files

The following materials are being provided in electronic format on Projectwise. The Administration makes no representation regarding its accuracy.

H. Additional Material

- 100-Scale Mapping
- Existing Right-of-Way mosaic file
- Inventory of Existing Structures
- Utility plans and/or as-builts
- As-builts
- ITS Information



The following materials are being provided in electronic format on Projectwise, unless otherwise noted. This material is considered necessary for the Design-Build Team to submit a technical proposal and prepare a bid.

I. I-270 Concept Evaluation Templates

J. Manuals and Guidance

- VISSIM Modeling Techniques
- Manual for the Inspection of Highway Right of Way in Karst Areas

In general, the Microstation files included on the ProjectWise are in conformance with the MDSHA Microstation V8 CAD Standards Manual.

It is likely that most Proposers will use plot drivers that differ from the drivers used to produce the provided plans. Some of the drawings screen existing features through level symbology color 250. The manipulation of the drawing files to produce any requirements (as found elsewhere in the RFP) for as-built plans will be the responsibility of the selected Design-Builder.

Proposers are also provided with a file index provided on ProjectWise. The file is a Word Document describing all the files and files names as outlined above.

III. RULES OF CONTACT

The Procurement Officer is the Administration's single contact and source of information for this procurement.

The following rules of contact will apply during the Contract procurement process, which begins upon the submittal of the SOQ, and will be completed with the execution of the Contract. These rules are designed to promote a fair, unbiased, and legally defensible

- 1.5 shall not be entitled to use information submitted by Proposer to the SHA in which the SHA determines is exempt from disclosure under the Maryland Public Information Act (“PIA”), Title 10, Subtitle 6, Part III of the State Government Article of the Annotated Code of Maryland, unless the RFP otherwise provides.
- 1.6 The SHA acknowledges that the use of any of the Work Product by the SHA or the Design-Builder is at the sole risk and discretion of the SHA and the Design-Builder, and shall in no way be deemed to confer liability on the unsuccessful Proposer.

2. **Compensation And Payment.**

2.1 Compensation payable to Proposer for the Work Product described herein shall be \$750,000.00 if any of the following conditions are met:

- (a) The Proposer was in the competitive range and was not the most advantageous to the State or was not selected for award;
- (b) The Proposer was selected for award, but the Contract was not executed or it was terminated by SHA for its convenience prior to issuance of a notice to proceed for events outside the control of the Design-Builder and the Design-Builder is not seeking reimbursement for design activities undertaken after notice of selection;
- (c) The Proposer was not in the competitive range, but it submitted an Proposed Technical Concept (PTC) approved by the Administration and that the Administration wishes to utilize the PTC in the final design.

2.2 In its sole discretion, the SHA may pay compensation to Proposer, in an amount to be determined by the SHA, for the Work Product described herein under the following conditions:

- (a) For any Proposer meeting the criteria identified in Section 2.1, above.

Any amount paid under this subparagraph (a) will not exceed \$750,000.00 and will be subject to audit of the costs incurred by the Proposer in preparing its Technical Proposal and Price Proposal. Auditors shall have access to all books, records, documents and other evidence and accounting principles and practices sufficient to reflect properly all direct and indirect costs of whatever nature claimed to have been incurred. Failure of the Proposer or its team members to maintain and retain sufficient records to allow the auditors to verify all or a portion of the claim or to permit the auditors access to the books and records of Proposer and its team members shall constitute a waiver of the right to be paid a stipend and shall bar any recovery hereunder.

Any Proposer wishing to apply for a stipend under this subparagraph (a) shall submit the completed Agreement to the SHA concurrently with the price proposals being submitted. Eligibility of receipt of a stipend is dependent upon

MARYLAND DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF HIGHWAY DEVELOPMENT
707 NORTH CALVERT STREET
BALTIMORE, MARYLAND 21202

October 7, 2016

Contract No.: MO0695172
F.A.P. No.: Not Applicable
Description: IS 270 Innovative
Congestion Management Contract –
Progressive Design-Build: Request
for Proposals (RFP)

ADDENDUM NO. 2

To All Prospective Proposers:

Please be advised that the Technical and Price Proposal Submittal Date for this contract has been POSTPONED from January 5, 2017 to **January 19, 2017**.

The attention of prospective proposers is directed to the following revisions, additions and/or deletions to the Request for Proposals (RFP).

REQUEST FOR PROPOSALS

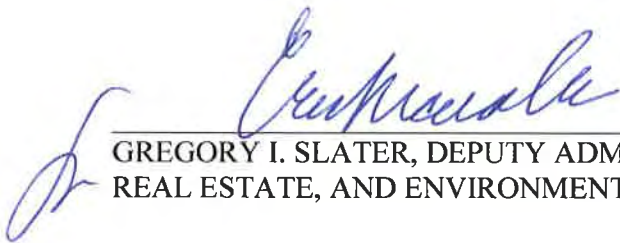
<u>Page No.</u>	<u>Description</u>
38	REVISED the submittal deadline for Proposed Technical Concepts to November 17, 2016.
41	REVISED the submittal deadline for the Technical and Price Proposals to January 19, 2017.
57	REVISED the submittal deadline for Proposed Technical Concepts to November 17, 2016.
57	REVISED the submittal deadline for the Technical and Price Proposals to January 19, 2017.
Appendix	Price Proposal, Page 1 of 43: REVISED the submittal deadline for the Technical and Price Proposals to January 19, 2017.

Contract No.: MO0695172
Addendum No. 2
October 7, 2016
Page 2

Questions relating to this Addendum No. 2 may be directed in writing to:

Jason A. Ridgway, P.E.
Director, Office of Highway Development
Maryland Department of Transportation
State Highway Administration
e-mail address: MO069_IS_270@sha.state.md.us

During the Technical Proposal Phase, only e-mailed inquires will be accepted. No requests for additional information or clarification to any other Department or Administration office, consultant, or employee will be considered.



GREGORY I. SLATER, DEPUTY ADMINSTRATOR FOR PLANNING, ENGINEERING,
REAL ESTATE, AND ENVIRONMENT.

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A Letter of Interest (LOI), on official letterhead of the Design-Builder, notifying the Administration whether or not the Design-Builder intends to submit a Technical and Price Proposal must be delivered no later than **December 15, 2016 prior to 12 noon** (EST). The LOI must be delivered to the following email address:

MO069_IS_270@sha.state.md.us

The LOI must be signed by individual(s) authorized to represent the Major Participant firm(s) and the lead Constructor firm(s). A Major Participant is defined as the legal entity, firm or company, individually or as a party in a joint venture or limited liability company or some other legal entity, that will be signatory to the Design-Build Contract with the Administration. Major Participant(s) will be expected to accept joint and several liability for performance of the Design-Build Contract. Major Participants are not design subconsultants, construction subcontractors or any other subcontractors to the legal entity that signs the Design-Build Contract.

If the Design-Build contracting entity will be a joint venture, or some other entity involving multiple firms, all Major Participant firms involved must have an authorized representative sign the LOI.

iii. Proposed Technical Concepts Submittal and Review

Section iii through section vii sets the process for the submittal and review of Proposed Technical Concepts (PTC). The process is intended to:

- Allow Proposers to incorporate innovation and creativity into the Proposals.
- Allow the Administration to consider Proposer PTCs in making the selection decision.
- Avoid delays and potential conflicts in the design associated with deferring of reviews of PTCs to the post-award period.
- Obtain the best-value for the public.

The Proposer is also encouraged to submit standards or specifications that are approved for usage by other state Departments of Transportation as PTCs.



The Proposer may submit PTCs for review by the Administration on or before **November 17, 2016 prior to 12 noon**, (prevailing local time). Inquiries received after that date and time will not be accepted.

All PTCs shall be submitted in writing via email only to the project email address, with a cover letter clearly identifying the submittal as a request for review of a PTC. If the Proposer does not clearly designate its submittal as a PTC, the submission will not be treated as a PTC by the Administration

The Administration will review each PTC submitted to assess the implementation potential of the technical aspects of the concept and its compatibility with the project goals. The Administration will not approve PTCs but will return comments on the PTC on its implementation potential and its compatibility with the project goals. If the Administration needs more information, the Administration will submit written questions to the Proposer and/or request a one-on-one meeting in order to better understand the details of the PTC.

Proposer's Name

Price Proposal

Contract No. MO0695172

Container ____ of ____

d. Location and deadline for submittal of Technical and Price Proposals

△
2

Technical Proposals and Price Proposals must be delivered no later than **January 19, 2017 prior to 12 noon** (prevailing local time). The proposal must be delivered to the following location:

Office of Procurement and Contract Management
Fourth Floor, C-405
707 N. Calvert Street
Baltimore, Maryland 21202

e. Number of Copies

One original and eleven (11) copies of the complete Technical Proposal shall be submitted along with one (1) electronic copy PDF file on a CD or flash drive. A single original of the Price Proposal shall also be submitted.

f. Proposal Guaranty

The Proposal Guaranty shall be delivered with the Price Proposal in a sealed business-sized envelope clearly marked as follows:

Prospective Proposer's Name

Proposal Guaranty

IS 270 – Innovative Congestion Management Project



Contract No. MO0695172

4. Effect of Submitting Proposal

Signing of the Design-Build Proposal Submission Form and Price Proposal Form, and delivery of the Proposal represents (a) an offer by the proposer to perform the Work for the Price submitted within the time(s) specified in accordance with all provisions of this RFP and (b) the Prospective proposer's agreement to all the provisions of the RFP and Contract governing requirements and procedures applicable through execution of the Design – Build Contract. **The Technical Proposal will become part of the Design – Build Contract.**

By so signing the above referenced terms and by delivering the Proposals, the Prospective Proposer makes the following affirmative representations.

XVII. PROPOSED PROCUREMENT SCHEDULE

	Issue RFQ/RFP	June 7, 2016
	Final Date for RFQ Questions	July 11, 2016
	SOQ submittal to MSHA	July 25, 2016
	Reduced Candidate List (RCL) Notified	August 11, 2016
	One-on-One Meetings	August 24-25, 2016
	One-on-One Meetings	September 28-29, 2016
	One-on-One Meetings	October 26-27, 2016
	Last Day to submit PTCs	November 17, 2016
	Final Date for RFP Questions	December 8, 2016
	Letter of Interest	December 15, 2016
	Technical and Price Proposal Submittal	January 19, 2017
	Selection of Successful Proposer	February 2017
	Notice to Proceed (Anticipated)	March 2017

This is the proposed procurement schedule for this project as of the date of the issuance of this RFQ/RFP.



**STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
PROPOSAL FORM**

Proposal by _____
Name

Address (Street and/or P.O. Box)

	City	State	Zip
()	()		
A.C.	Phone No.	A.C.	Fax No.

to furnish and deliver all materials and to do and perform all work, in conformance with the Standard Specifications, revisions thereto, General Provisions and the Special Provisions in this contract to IS 270 Innovative Congestion Management located in, Frederick and Montgomery Counties, Maryland, for which Technical and Price Proposals will be received until 12:00 o'clock noon on January 19, 2017. Technical and Price Proposals shall be submitted to:



State Highway Administration
Office of Procurement and Contract Management
Fourth Floor, C-405
707 N. Calvert Street
Baltimore, MD 21202

In response to the advertisement by the Administration, requesting proposals for the work in conformance with the Contract Documents, now on file in the office of the Administration. I/We hereby certify that I/we am/are the only person, or persons, interested in this proposal as principals, and that an examination has been made of the work site, the Specifications, and Request for Proposals, including the Special Provisions contained herein. I/We propose to furnish all necessary machinery, equipment, tools, labor and other means of construction, and to furnish all materials required to complete the project at the following unit price or lump sum price.

MARYLAND DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF HIGHWAY DEVELOPMENT
707 NORTH CALVERT STREET
BALTIMORE, MARYLAND 21202

November 9, 2016

Contract No.: MO0695172
F.A.P. No.: Not Applicable
Description: IS 270 Innovative
Congestion Management Contract –
Progressive Design-Build: Request
for Proposals (RFP)

ADDENDUM NO. 3

To All Prospective Proposers:

Please be advised that the Technical and Price Proposal Submittal Date for this contract is still scheduled for **January 19, 2017**.

The attention of prospective proposers is directed to the following revisions, additions and/or deletions to the Request for Proposals (RFP).

REQUEST FOR PROPOSALS

<u>Page No.</u>	<u>Description</u>
9	REVISED the 3 rd bullet to shift the responsibility of constructing noise barriers required for the project from the Design-Builder to the Administration.
14	ADDED noise studies to the Design-Builder's services.
16	ADDED construction of any required noise abatement to the Administration's services.
45	REVISED the page limit for the Mobility goal from 16 pages to 20 pages.
Appendix	Contract Provisions: REPLACED TC-5.01.

Contract No.: MO0695172
Addendum No. 3
November 9, 2016
Page 2

Questions relating to this Addendum No. 3 may be directed in writing to:

Jason A. Ridgway, P.E.
Director, Office of Highway Development
Maryland Department of Transportation
State Highway Administration
e-mail address: MO069_IS_270@sha.state.md.us

During the Technical Proposal Phase, only e-mailed inquiries will be accepted. No requests for additional information or clarification to any other Department or Administration office, consultant, or employee will be considered.



GREGORY I. SLATER, DEPUTY ADMINISTRATOR FOR PLANNING, ENGINEERING,
REAL ESTATE, AND ENVIRONMENT.

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Act (MEPA)

- Project(s) will require NEPA approval from the Federal Highway Administration (FHWA) when federal actions will be required (e.g. design exceptions, Interstate Access Point Approval [IAPA]). If no federal action is required, then MEPA approval will be needed. Multiple environmental documents may be developed for the contract. Each separate project for an environmental document must be a standalone construction project that connects logical termini and be of sufficient length, have independent utility, and not restrict consideration of alternatives for other reasonably foreseeable transportation improvements. Any NEPA/MEPA document will be prepared by SHA. The Design-Builder will have no decision making responsibility with respect to the NEPA/MEPA process but will provide information needed about the project and possible mitigation actions.
- Public Involvement will be needed as part of NEPA/MEPA and should ensure travel shed is covered, not just the immediate project area.
- The requirements of the SHA Noise Policy must be met for the Design-Builder's improvements. However, noise barriers, if required, will be excluded from any work package or CAP, and will not be paid for from the contract budget. The Administration will be responsible for the costs associated with noise barriers and the additional impacts or requirements they incur, including additional right-of-way, utility relocations, grading, drainage, stormwater management, retaining walls, etc.
- DNR managed land (Seneca Creek State Park) is within the contract limits.



5. Minimize Environmental Impacts

- No permits have been obtained. Agency coordination will be required to secure necessary permits for any environmental impacts.
- The Design-Builder will prepare permit applications for submittal by the Administration.
- Environmental impacts due to Design-Builder's project should be minimized to the extent practical.
- Mitigation may be required by permitting agencies depending on impacts to environmental features as a result of Design-Builder's project.

6. Minimize utility and property impacts and relocations

- Utility and property impacts due to Design-Builder's project should be minimized to the extent practical.
- All costs for third party utility relocations and property impacts will be subtracted from the fixed value contract.

E. **Project Status**

The current status of aspects of the project is as follows:

Mapping and Survey

- Develop any Right-of-way needs for the project(s)
- Preparation of any Design Exceptions as required for the project(s)
- Design of any surface drainage conveyances, stormwater management, and erosion and sediment control and obtain any related environmental agency approvals required for the project(s) (including NPDES and MDE Approvals).
- Hydrologic and Hydraulic analyses, Drainage and Storm Water Management (SWM) Analyses, Design, and Approvals.
- Closed-Circuit Television (CCTV) inspections of existing drainage pipes as needed.
- The pavement engineering for the Project shall include, but is not limited to, the pavement investigation, pavement type selection, new pavement design, pavement rehabilitation design, and material selection.
- Perform pavement and subsurface geotechnical investigations needed to determine subsurface features and characteristics, and properties to support pavement and geotechnical engineering functions.
- Analyze pavement performance data and existing material conditions to determine the structural and functional conditions for the development of pavement engineering recommendations;
- Analyze subsurface geotechnical field and laboratory test data to determine existing soil, rock, and groundwater conditions etc. for the development of geotechnical engineering recommendations;
- Structural design for all bridges, culverts, walls and any and all other incidental structures required for the project(s).
- Traffic engineering design of any temporary and permanent signing, lighting, traffic signals, pavement markings, and Intelligent transportation systems (ITS) required for the project(s)
- Traffic Operations Analyses including the preparation of a Traffic Operations Analysis Report
- Temporary Traffic Control Design and Implementation including the preparation of a Traffic Management Plan (TMP), red flag summary, Maintenance of Traffic Alternatives Analysis (MOTAA). Additionally, attending and running TMP meetings.
- HOV equivalency analysis and submit to FHWA for approval, if required
- Safety analysis using the Highway Safety Manual (HSM) and submit to FHWA for approval, if required
- Landscape Architecture design of any roadside landscaping and stormwater management landscaping required for the project(s)
- Forest Impact Analysis, Significant tree identification, development of forest impact plans, tree preservation plan and design of any reforestation mitigation required for the project(s)
- Preparation of any necessary documents to obtain final reforestation site review approval from the Maryland Department of Natural Resources
- Prepare and coordinate the Joint Permit Application(s) (JPA) including but not limited to preparation and submittal of the JPA application(s) to SHA with attachments including location map, impact plates, trilogy request and
- Complete all work related to providing a noise study(ies) that makes a final determination on reasonableness and feasibility related to noise abatement.

- Acquisition of Environmental Permits
- Acquisition of Right-of-Way
- Review Construction CAP proposals and compare to ICE
- Reconcile Final CAP for each phase
- Construction Management and Inspection Services
- Design and construct required noise abatement, including additional impacts or requirements they incur, such as additional utility relocations, grading, drainage, stormwater management, retaining walls, etc.

3

Scope Validation and Identification of Scope Issues

A Scope Validation Period of 120 days from the date of the Notice to Proceed for Design and Preconstruction Services will be provided on this contract. During the Scope Validation Period, the Design-Builder shall thoroughly verify and validate that the Design-Builder’s understanding of the scope of work and its ability to complete it within the Design and Preconstruction Services Fee. Any Scope Issues determined during this period shall not be deemed to include items that the Design-Builder should have reasonably discovered prior to submission of its Technical Proposal.

If the Design-Builder intends to seek an adjustment to the Design and Preconstruction Fee due to a Scope Issue, it shall promptly, but in no event later than the expiration of the Scope Validation Period, provide the Administration in writing with a notice of the existence of such Scope Issue and basis for such Scope Issue. Within 30 days of the notice, the Design-Builder shall provide documentation that specifically explains its support for the Scope Issue, which shall include among other things: (a) the assumptions the Design-Builder made during the preparation of its Proposal that form the basis of its allegation, along with documentation verifying it made such assumptions in developing its Proposal; (b) explanation of the Scope Issue that the Design-Builder could not have reasonably identified prior to submission of the Technical Proposal; (c) specific impact on the Design and Preconstruction Services. For the avoidance of doubt: (1) The Design-Builder shall not be entitled to raise any Scope Issues that were not previously addressed with a notice; and (2) Design-Builder shall have no right to seek any relief for any Scope Issues not identified in a notice provided to the Administration during the Scope Validation Period.

Within a reasonable time after the Administration’s receipt of the documentation, the parties shall meet and confer to discuss the resolution of such Scope Issues. If the Administration agrees that the Design-Builder has identified a valid Scope Issue, a change order will be executed to increase the value of the Design and Preconstruction Fee; however, the Construction Services will be adjusted to retain the overall fixed value of the contract. Notwithstanding anything to the contrary in the Contract Documents or a matter of law, the Design-Builder shall have the burden of proving that the alleged Scope Issue could not have reasonably been identified prior to the submission of the Technical Proposal and such Scope Issue materially impacts its Design and Preconstruction Services Fee.

The parties acknowledge that the purpose of the Scope Validation Period is to enable the Design-Builder to identify those Scope Issues that could not have reasonably been identified prior to the submission of the Technical Proposal. By submission of the Technical Proposal, the Design-Builder acknowledges that the Scope Validation Period is a reasonable time to enable the Design-Builder to identify Scope Issues that materially impacts its Design and Preconstruction Fee. The Design-Builder will assume and accept all risks to complete the Design and

Proposer is alerted to their responsibility to confirm that all team members have received addenda. The Proposer is solely responsible to ensure that their team has the correct information.

- i. Statement including the proposed legal structure of the Design–Builder.
- j. Include a general authorization for the Administration to confirm all information contained in the Technical Proposal submittal with third parties, and indicate limitations, if any, to such authorization.

As an attachment to the cover letter and excluded from the page limitation for this section, provide documentation that the Design Team has Professional Liability Insurance.



2. **Mobility (20 Pages Maximum) – CRITICAL**

Goal: Provide improvements that maximize vehicle throughput, minimize vehicle travel times and create a more predictable commuter trip along I-270.

Value Statement: Effective and reliable traffic flow along I-270 is necessary for its function as a primary commuter route and for the vitality of economic development. Describe the improvements you will provide to address and manage congestion along I-270 while reducing delay and increasing reliability.

- i. Provide the Design-Builder’s improvements for maximizing vehicle throughput and minimizing vehicle travel times. Specifically, discuss how the Design-Builder’s improvements will reduce recurring congestion in terms of travel time, vehicle throughput, density, intersection operations, queues and vehicle network performance, both along I-270 and on the connecting ramps and arterial roadways. – **CRITICAL**
- ii. Discuss how the Design-Builder’s improvements will provide a more predictable commuter trip, including innovative technologies or techniques that will be provided. – **SIGNIFICANT**
- iii. Discuss the performance life of the improvements; that is, the time it will take for congestion levels to return to pre-construction levels and the basis for the Design-Builder’s assessment of performance. – **IMPORTANT**

3. **Safety (10 Pages Maximum) – IMPORTANT**

Goal: Provide for a safer I-270 corridor.

Value Statement: Safer flow of traffic will increase mobility along I-270 by reducing incidents that increase delay and reduce travel time reliability. Discuss how your improvements will increase safety along I-270.

TERMS AND CONDITIONS

TC SECTION 5
LEGAL RELATIONS AND PROGRESS

TC-5.01 INSURANCE

100 **DELETE:** In its entirety.

INSERT: The following.

TC-5.01 INSURANCE FOR DESIGN-BUILD

In addition to the provisions of GP-7.14 (Liability Insurance), the following shall apply on Administration Contracts.

The Contractor shall maintain in full force and effect third party legal liability insurance necessary to cover claims arising from the Contractor's operations under this agreement that cause damage to the person or property of third parties. The insurance shall be under a standard commercial general liability (CGL) form endorsed as necessary to comply with the above requirements and the other requirements of this Section. The State of Maryland shall be listed as an additional insured on the policy. The limit of liability shall be no less than \$1 000 000 per occurrence/\$2 000 000 general aggregate. The insurance shall be kept in full force and effect until all work has been satisfactorily completed and accepted.

When specified in the Contract Documents or otherwise required by law, the Contractor shall carry the type and amounts of insurance in addition to any other forms of insurance or bonds required under the terms of the Contract and these Specifications.

All insurance policies required by this Section, elsewhere in the Contract Documents, or otherwise required by law, shall be kept in full force and effect until all work has been satisfactorily completed and accepted. The Contractor shall be responsible for the payment of all deductibles or self-insured retentions.

All insurance policies required by this Section, elsewhere in the Contract Documents, or otherwise required by law, (other than Workers' Compensation Policies) shall include endorsements:

- (a) Stating that the State of Maryland is additional insured with respect to liability arising from the Contractor's operations under this agreement that cause damage to the person or property of third parties.
- (b) Stating that such coverage as is provided by the policies for the benefit of the additional insureds is primary and any other coverage maintained by such additional insureds (including self-insurance pursuant to the Maryland Tort Claims Act) shall be non-contributing with the coverage provided under the policies.

- (c) Containing waivers of subrogation with respect to all named insureds and additional insureds.
- (d) Stating that the insurer has the duty to adjust claims and provide a defense with regard to such claims made against the additional insured.

All insurance policies required by this Section, elsewhere in the Contract Documents, or otherwise required by law, (including Workers' Compensation Policies) shall be endorsed to state that the insurer shall provide at least 7 days notice of cancellation or nonrenewal to:

Maryland State Highway Administration
Director, Office of Construction
7450 Traffic Drive
Hanover MD 21076

Evidence of insurance shall be provided to the Administration at the address listed above prior to the award of the Contract by means of a Certificate of Insurance with copies of all endorsements attached.

Any policy exclusions shall be shown on the face of the Certificate of Insurance or provided with the Certificate of Insurance.

Certificates of Insurance shall comply with all requirements of the Maryland Annotated Code, Insurance Article, § 19-116. Certificates of Insurance shall be on a form approved by the Maryland Insurance Commissioner (Commissioner). Standard Certificate of Insurance forms currently adopted for use by the Association for Cooperative Operations Research (ACORD) or the Insurance Services Office (ISO) are deemed approved by the Commissioner and are acceptable. Outdated ACORD or ISO forms (those with a revision date prior to the date of the form currently adopted for current use by ACORD or ISO) are not acceptable. The Contractor shall ensure that all required Certificates of Insurance satisfy all requirements of §19-116 of the Insurance Article, including the prohibition against the issuance of any certificate of insurance that contains false or misleading information or that purports to amend, alter, or extend the coverage provided by the policies referenced in the certificate.

The Certificate of Insurance shall be accompanied by a document (a copy of State License or letter from insurer) that indicates that the agent signing the certificate is an authorized agent of the insurer.

No acceptance and/or approval of any Certificate of Insurance or insurance by the Administration shall be construed as relieving or excusing the Contractor, or the Contractor's Surety from any liability or obligation imposed upon either or both of them by the provisions of this Contract or elsewhere in the Contract Documents.

The cost of the insurance will not be measured but the cost will be incidental to the Contract lump sum price.

Contractor and Railroad Public Liability and Property Damage Insurance shall be provided as specified in TC-6.05.

.01 Indemnification

The Design-Build Team shall indemnify, defend and hold the Administration and its officers, directors, employees, agents and consultants from and against all claims, actions, torts, costs, losses, and damages for bodily injury (including sickness, disease or death) and/or tangible property damage (other than to the Work itself) arising out of or resulting from the performance of the Work by the Design-Build Team, any subcontractor, subconsultant, engineer, supplier, any individual or entity directly or indirectly employed by any of them or anyone for whose acts any of them may be liable. Damages covered by the preceding sentence include, but are not limited to, all fees and charges of engineers, attorneys and all other professionals and all mediation, arbitration, court or other dispute resolution costs.

The indemnity obligation set forth in the preceding paragraph shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for the Design-Build Team or any subcontractor, subconsultant, engineer, supplier, or other individual or entity under Workers' Compensation acts, disability benefit acts, or other employee benefit acts.

.02 Additional Insurance Requirements

.02.1 Professional Liability Insurance

Professional Liability Insurance Policy, which covers the Indemnification Clause of this contract (paragraph .02 above), as it relates to errors, omissions, negligent acts or negligent performance in the work performance under this contract by the Designer, its subcontractors, employees and agents. The limitation of the Courts and Judicial Proceedings Article states Annotated Code of Maryland Section 5-108(b) shall apply.

.02.2 Workers' Compensation Insurance

Workers' compensation, as required by the laws of the State of Maryland, including Employer's Liability Coverage and coverage for the benefits set forth under the U.S. Longshoremen and Harbor Workers' Compensation Act, the Jones Act, and other federal laws where applicable.

.02.3 Comprehensive Automobile Liability Insurance

Comprehensive Business Automobile Liability covering use of any motor vehicle to be used in conjunction with this contract, including hired automobiles and non-owned automobiles. Loading and unloading of any motor vehicle must be covered by endorsement to the automobile liability policy or policies.

.02.4 Administrative & General Provisions

- a. Each policy, with the exception of Workers' Compensation and Professional Liability Insurance, shall name the State Highway Administration.
- b. Defense of Claims

Each insurance policy shall include a provision requiring the carrier to investigate and defend all named insured against any and all claims for death, bodily injury or property damage, even if groundless.

- c. Compliance

The Design-Build Team shall be in compliance with this Section provided it procures either one policy or insurance covering all work under the contract or separate insurance policies for all segments constituting the entire project. In either case, a certificate of insurance must be filed for each policy with the Administration indicating that all required insurance has been obtained.

The Design-Build Team is responsible for assuring that insurance policies required by this Contract comply with all the requirements. The Design-Build Team is also responsible to determine that all subconsultants, subcontractors, suppliers, and all other individuals or entities performing Work for the Project carry all applicable insurance coverages set forth in this section, including, in all cases, Workers' Compensation, Automobile, and Commercial General Liability Insurance. The Design-Build Team shall indemnify and hold harmless the Administration from any claims arising from the failure to fulfill said responsibilities.

- d. Reporting Provisions

Any failure to comply with reporting provisions of the policies shall not affect coverage provided to the Administration, its officers, agents and employees.

- e. Separate Application

The insurance provided by the Design-Build Team shall apply separately to each insured against whom claim is made or suit is brought, except with respect to the limits of the insurer's liability.

.02.5 Notice of Cancellation or Modification

All policies of insurance provided in this Section shall be endorsed to provide that the insurance company shall notify the Administration, the Design-Build Team, and each named insured at least thirty (30) days prior to the effective date of any cancellation or modification of such policies.

TC-5.03 SUBCONTRACTING AND SUBCONTRACTORS

102 **INSERT:** The following before the paragraph titled 'Subcontractors Prompt Payment.'

Percentage of Own Workforce Required. The Design-Build Team must perform at least fifty percent of the value of the on-site construction work with its own workforce, not including the percent goal required in the contract proposal to be performed by DBE's. The Designer must perform at least fifty percent (50%) of the value of the design work with its own workforce, not including the work required by DBE's.

106 **ADD:** The following sections at the end of section 'TC-5.05 DETERMINATION AND EXTENSION OF CONTRACT TIME.'

TC-5.06 OWNERSHIP OF DOCUMENTS

All plans, specifications, inspection records, or other documents ("Documents") generated by the Design-Build Team and all consultants, subcontractors, suppliers, manufacturers performing Work on the Project are the property of the Administration. Upon request by the Administration, the Design-Build Team or any other person or entity performing Work will produce and deliver such Documents as requested, both in hard copy and electronic format.

TC-5.07 ACCESS TO AND RETENTION OF RECORDS

The Design-Build Team and its employees and Subcontractors shall make all project records available for inspection by the Project Manager and all other persons authorized by the Administration, and shall permit such representatives to interview employees during working hours. Project records include daily time reports, records of force account work, quality control or assurance documentation, inspectors reports, employment records, payrolls, equal opportunity records, construction conference records, partnering records, and any other documents in any way related to the Project substantiating payment. These records shall be retained at least three years after final acceptance of the project.

MARYLAND DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF HIGHWAY DEVELOPMENT
707 NORTH CALVERT STREET
BALTIMORE, MARYLAND 21202

December 19, 2016

Contract No.: MO0695172
F.A.P. No.: Not Applicable
Description: IS 270 Innovative
Congestion Management Contract –
Progressive Design-Build: Request
for Proposals (RFP)

ADDENDUM NO. 4

To All Prospective Proposers:

Please be advised that the Technical and Price Proposal Submittal Date for this contract is still scheduled for **January 19, 2017**.

The attention of prospective proposers is directed to the following revisions, additions and/or deletions to the Request for Proposals (RFP).

REQUEST FOR PROPOSALS

Page No.

Description

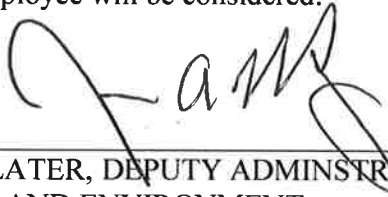
- | | |
|----|--|
| 14 | REVISED the order of the last two bullets at the bottom of the page so the language for the JPA services, which flows onto the next page, is continuous. |
| 16 | REVISED the last bullet of the Administration's Services to exclude construction, as the construction will not occur during the preconstruction phase. |

Contract No.: MO0695172
Addendum No. 4
December 19, 2016
Page 2

Questions relating to this Addendum No. 4 may be directed in writing to:

Jason A. Ridgway, P.E.
Director, Office of Highway Development
Maryland Department of Transportation
State Highway Administration
e-mail address: MO069_IS_270@sha.state.md.us

During the Technical Proposal Phase, only e-mailed inquiries will be accepted. No requests for additional information or clarification to any other Department or Administration office, consultant, or employee will be considered.



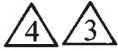
FORM

GREGORY I. SLATER, DEPUTY ADMINISTRATOR FOR PLANNING, ENGINEERING,
REAL ESTATE, AND ENVIRONMENT.

THIS ADDENDUM IS ISSUED TO CLARIFY, ADD TO, DELETE FROM, CORRECT AND/OR CHANGE THE CONTRACT DOCUMENTS TO THE EXTENT INDICATED AND IS HEREBY MADE PART OF THE SAID CONTRACT DOCUMENTS. COMAR 21.05.02.08 REQUIRES THAT ALL ADDENDA ISSUED BE ACKNOWLEDGED; THEREFORE, PRIOR TO SUBMITTING YOUR PRICE PROPOSAL, ATTACH THE ADDENDUM RECEIPT VERIFICATION FORM TO THE FRONT OF THE PRICE PROPOSAL FORM PACKET. FAILURE TO DO SO MAY RESULT IN THE PRICE PROPOSAL BEING DECLARED NON-RESPONSIVE.

- Develop any Right-of-way needs for the project(s)
- Preparation of any Design Exceptions as required for the project(s)
- Design of any surface drainage conveyances, stormwater management, and erosion and sediment control and obtain any related environmental agency approvals required for the project(s) (including NPDES and MDE Approvals).
- Hydrologic and Hydraulic analyses, Drainage and Storm Water Management (SWM) Analyses, Design, and Approvals.
- Closed-Circuit Television (CCTV) inspections of existing drainage pipes as needed.
- The pavement engineering for the Project shall include, but is not limited to, the pavement investigation, pavement type selection, new pavement design, pavement rehabilitation design, and material selection.
- Perform pavement and subsurface geotechnical investigations needed to determine subsurface features and characteristics, and properties to support pavement and geotechnical engineering functions.
- Analyze pavement performance data and existing material conditions to determine the structural and functional conditions for the development of pavement engineering recommendations;
- Analyze subsurface geotechnical field and laboratory test data to determine existing soil, rock, and groundwater conditions etc. for the development of geotechnical engineering recommendations;
- Structural design for all bridges, culverts, walls and any and all other incidental structures required for the project(s).
- Traffic engineering design of any temporary and permanent signing, lighting, traffic signals, pavement markings, and Intelligent transportation systems (ITS) required for the project(s)
- Traffic Operations Analyses including the preparation of a Traffic Operations Analysis Report
- Temporary Traffic Control Design and Implementation including the preparation of a Traffic Management Plan (TMP), red flag summary, Maintenance of Traffic Alternatives Analysis (MOTAA). Additionally, attending and running TMP meetings.
- HOV equivalency analysis and submit to FHWA for approval, if required
- Safety analysis using the Highway Safety Manual (HSM) and submit to FHWA for approval, if required
- Landscape Architecture design of any roadside landscaping and stormwater management landscaping required for the project(s)
- Forest Impact Analysis, Significant tree identification, development of forest impact plans, tree preservation plan and design of any reforestation mitigation required for the project(s)
- Preparation of any necessary documents to obtain final reforestation site review approval from the Maryland Department of Natural Resources
- Complete all work related to providing a noise study(ies) that makes a final determination on reasonableness and feasibility related to noise abatement.
- Prepare and coordinate the Joint Permit Application(s) (JPA) including but not limited to preparation and submittal of the JPA application(s) to SHA with attachments including location map, impact plates, trilogy request and

△ 4 △ 3



- Acquisition of Environmental Permits
- Acquisition of Right-of-Way
- Review Construction CAP proposals and compare to ICE
- Reconcile Final CAP for each phase
- Construction Management and Inspection Services
- Design required noise abatement

Scope Validation and Identification of Scope Issues

A Scope Validation Period of 120 days from the date of the Notice to Proceed for Design and Preconstruction Services will be provided on this contract. During the Scope Validation Period, the Design-Builder shall thoroughly verify and validate that the Design-Builder's understanding of the scope of work and its ability to complete it within the Design and Preconstruction Services Fee. Any Scope Issues determined during this period shall not be deemed to include items that the Design-Builder should have reasonably discovered prior to submission of its Technical Proposal.

If the Design-Builder intends to seek an adjustment to the Design and Preconstruction Fee due to a Scope Issue, it shall promptly, but in no event later than the expiration of the Scope Validation Period, provide the Administration in writing with a notice of the existence of such Scope Issue and basis for such Scope Issue. Within 30 days of the notice, the Design-Builder shall provide documentation that specifically explains its support for the Scope Issue, which shall include among other things: (a) the assumptions the Design-Builder made during the preparation of its Proposal that form the basis of its allegation, along with documentation verifying it made such assumptions in developing its Proposal; (b) explanation of the Scope Issue that the Design-Builder could not have reasonably identified prior to submission of the Technical Proposal; (c) specific impact on the Design and Preconstruction Services. For the avoidance of doubt: (1) The Design-Builder shall not be entitled to raise any Scope Issues that were not previously addressed with a notice; and (2) Design-Builder shall have no right to seek any relief for any Scope Issues not identified in a notice provided to the Administration during the Scope Validation Period.

Within a reasonable time after the Administration's receipt of the documentation, the parties shall meet and confer to discuss the resolution of such Scope Issues. If the Administration agrees that the Design-Builder has identified a valid Scope Issue, a change order will be executed to increase the value of the Design and Preconstruction Fee; however, the Construction Services will be adjusted to retain the overall fixed value of the contract. Notwithstanding anything to the contrary in the Contract Documents or a matter of law, the Design-Builder shall have the burden of proving that the alleged Scope Issue could not have reasonably been identified prior to the submission of the Technical Proposal and such Scope Issue materially impacts its Design and Preconstruction Services Fee.

The parties acknowledge that the purpose of the Scope Validation Period is to enable the Design-Builder to identify those Scope Issues that could not have reasonably been identified prior to the submission of the Technical Proposal. By submission of the Technical Proposal, the Design-Builder acknowledges that the Scope Validation Period is a reasonable time to enable the Design-Builder to identify Scope Issues that materially impacts its Design and Preconstruction Fee. The Design-Builder will assume and accept all risks to complete the Design and

Contract No. MO0695172
IS 270 Innovative Congestion Management Contract

Request for Proposals – Questions and Responses

The following questions were received on September 2, 2016.

Question 1:

Please provide the SHA I-270 accident data in Excel Spreadsheet format from SHA OOTS TDSD's ACRES system to aid with the expedited review and analysis of data during the Technical Proposal phase of the I-270 project.

Response 1:

Crash data in Excel format has been posted on ProjectWise at the following location:

pw:\\SHAVMPWX.shacadd.ad.mdot.mdstate:SHAEDMS01\Documents\Design-Build\MO0695172\E_Appendices\04 - Existing Crash Data\Accident Data\

Question 2:

Please provide Synchro files which were used to develop signal timing for signalized intersections in the VISSIM network to aid with the review and analysis of solutions during the Technical Proposal phase of the I-270 project.

Response 2:

Synchro files are not available. The existing signal timing sheets were used for 2015 design year and minor signal timing adjustments were made to traffic signals with excessive delays and queues for 2040 no-build design year.

Question 3:

Will SHA provide consistent parameters such as number of runs, seeds, seeding time for the VISSIM runs so that all teams provide comparable results for SHA to evaluate?

Response 3:

As stated on Page 48 of the Request for Proposals (RFP), "The Proposer shall use VISSIM version 7.00-13, shall follow SHA's VISSIM Modeling Techniques, shall not modify calibration parameters, such as vehicle inputs, vehicle routes, driving behavior, link behavior type, lane change distance, speed distributions and decisions without providing justification to the SHA and must use the simulation parameters and random seeds as provided in the VISSIM files when reporting results."

The following questions were received on September 7, 2016.

Question 4:

Please provide the following: schedule and plans for MD 85 at I-270 project, MD 121 at I-270 project, and schedule for I-270 at Watkins Mill project.

Contract No. MO0695172
IS 270 Innovative Congestion Management Contract

Response 4:

The Watkins Mill Interchange is planned to be re-advertised in 2017; however, a precise schedule is undetermined and will depend on the magnitude of the design changes (if any) that will be required to accommodate the I-270 Innovative Congestion Management (ICM) Contract.

The I-270/MD 121 Interchange Improvements Project is in the planning phase. Information can be found at the following project website:

<http://apps.roads.maryland.gov/WebProjectLifeCycle/ProjectInformation.aspx?projectno=MO4261115>

Final review plans for the I-270/MD 85 (Phase 1) Interchange Reconstruction Project (Contract No. FR3885171) have been posted to ProjectWise at the location below. Additionally, Plans, Specifications, & Estimate (PS&E) plans for a stream stabilization project (Contract No. MO1605174) have been posted to ProjectWise at the location below:

pw:\\SHAVMPWX.shacadd.ad.mdstate:SHAEDMS01\Documents\Design-Build\MO0695172\E_Appendices\11 - Other Projects\

The latest advertisement, bid, and notice to proceed (NTP) dates for these projects can be found in the Contractor's Ad Schedule on SHA's website:

<http://www.roads.maryland.gov/pages/contractadschedule.aspx>

Question 5:

Please provide the following: 100 scale mapping north of the Watkins Mill project.

Response 5:

The SHA will not provide additional 100 scale mapping. A planimetrics file for the area north of the 100 scale mapping has been posted to ProjectWise at the following location:

pw:\\SHAVMPWX.shacadd.ad.mdstate:SHAEDMS01\Documents\Design-Build\MO0695172\H_Additional Material\07 - Planimetrics\mTO_planimetrics_I270.dgn

Question 6:

Please provide the following: crash data in MS Excel format.

Response 6:

See question 1.

Question 7:

Please provide the following: traffic counts in 15 minute increments and in MS Excel format.

Response 7:

Two MS Access databases have been posted to the ProjectWise location below, one for I-270 and one for Montgomery and Frederick Counties. A data dictionary has been included to explain

Contract No. MO0695172

IS 270 Innovative Congestion Management Contract

the columns in the tables. Also, the locations of the counts have been included in shape and KMZ formats.

pw:\\SHAVMPWX.shacadd.ad.mdstate:SHAEDMS01\Documents\Design-Build\MO0695172\E_Appendices\02 - Existing Traffic Counts\15 minute counts\

Question 8:

Please provide the following: speed data in 15 minute increments (collected at the same time as the traffic counts).

Response 8:

Speed, Travel Time Index (TTI), and Planning Time Index (PTI) data for the I-270 mainline (from the spurs to I-70), the I-270 collector distributor (CD) lanes, and I-495 (from American Legion Bridge to the spurs) has been posted to ProjectWise at the following location:

pw:\\SHAVMPWX.shacadd.ad.mdstate:SHAEDMS01\Documents\Design-Build\MO0695172\E_Appendices\10 - 2015 Avg Weekday INRIX Data\

Question 9:

Please provide the following: Excel sheet for I-270 Concept Evaluation 042516 Final.pdf.

Response 9:

The Excel files used to generate said document had been posted to ProjectWise at the following location:

pw:\\SHAVMPWX.shacadd.ad.mdstate:SHAEDMS01\Documents\Design-Build\MO0695172\I_I-270 Concept Evaluation Templates\files\

Question 10:

Please provide the following: origin-destination data and 5 year interval traffic projections through 2040.

Response 10:

Origin-destination data and land use information in 5 year increments have been posted to ProjectWise at the following location:

pw:\\SHAVMPWX.shacadd.ad.mdstate:SHAEDMS01\Documents\Design-Build\MO0695172\E_Appendices\09 - MWCOG Travel Demand Model Outputs\

Question 11:

Please provide the following: small structure inventory for Frederick County.

Response 11:

The following file on ProjectWise has been updated to include the maps for Frederick County:

Contract No. MO0695172

IS 270 Innovative Congestion Management Contract

pw:\\SHAVMPWX.shacadd.ad.mdod.mdstate:SHAEDMS01\Documents\Design-Build\MO0695172\H_Additional Material\03 - Inventory of Existing Structures\Inventory Maps\Small Structures.pdf

Three additional small structures (10182X0, 10358X0, and 10359X0) have been added to the following ProjectWise folder:

pw:\\SHAVMPWX.shacadd.ad.mdod.mdstate:SHAEDMS01\Documents\Design-Build\MO0695172\H_Additional Material\03 - Inventory of Existing Structures\Other Structures\

Question 12:

Please provide the following: utility designation north of the Watkins Mill Project, right-of-way (ROW) mosaic north of the Watkins Mill Project, pavement borings/geotech info north of the Watkins Mill Project, and wetland delineation and environmental features north of Game Preserve Road.

Response 12:

The extent of additional base information required to complete design will be highly dependent on the concept; therefore, the additional data collection needed to complete the project is included in the pre-construction services to be provided by the Design-Builder.

Question 13:

Please provide the following: pavement structure numbers of all shoulders.

Response 13:

The SHA has not performed any design to date. Pavement design is included in the pre-construction services to be provided by the Design-Builder. Prospective proposers may, at their will and discretion, perform preliminary calculations during the procurement phase.

Question 14:

Please provide the following: noise model north of Watkins Mill.

Response 14:

The SHA will not provide additional noise models. Should the project require noise analyses, the Design-Builder shall develop the required noise models, analyses and reports as part of the pre-construction services.

The following questions were received on September 12, 2016.

Question 15:

Our Team is requesting access to view and use the “Explore and Visualize Crashes” tool within the RITIS (Regional Integrated Transportation Information System). This tool will be beneficial to the project by allowing our team to view more detailed crash data to better identify the deficiencies along I-270.

Contract No. MO0695172

IS 270 Innovative Congestion Management Contract

Response 15:

Proposers may request one team member to be provided RITIS access. If access is desired, please submit a request to the project email address along with the name and email address of the user to whom RITIS access will be given.

Question 16:

In reference to RFQ/RFQ Article XII.B.7, is it acceptable to use VISSIM Version 8.00-10 in lieu of Version 7.00-13?

Response 16:

VISSIM version 7.00-13 shall be used. However, additional supporting information related to the technical proposal may be included in the Appendix.

The following questions were received on September 27, 2016.

Question 17:

Please provide clarification on the schedule of prices as shown in the RFP. All three bid items are shown as lump sum, but the RFP describes a design development process involving SHA, the DB team and public/stakeholders as required by SHA design development policies. Throughout the design process, it is likely that the construction scope will evolve with stakeholder and SHA input. For clarity, will the lump sum prices also evolve as the scope becomes better defined in the design period?

Response 17:

The contract budget is \$100,000,000 and this budget is fixed. As noted in the question, the proposed concept and final construction scope shall continue to evolve during design, as is usual for all design processes and projects, prior to reconciliation of a Construction Agreed Price (CAP). However, the Design and Preconstruction Services Fee should be considered to be a "Guaranteed Maximum Price" or upset limit. It shall include all design and preconstruction services needed to deliver the scope of improvement proposed by the Design-Builder.

The Construction Management Fee shall include all profit, general and administrative costs, regional and home office overhead, and other indirect costs, as specified in Article XII.C.2 beginning on page 48 of the RFP.

The Construction Services Fee is determined by subtracting the Design and Preconstruction Services Fee and Construction Management Fee from the total contract budget. Regardless of what the final construction scope becomes, each construction package price will be reconciled and have its own agreed upon CAP. The sum of all the CAPs, any necessary right-of-way acquisition costs, and utility relocations costs will not exceed the Construction Services Fee, which is a "Guaranteed Maximum Price" or upset limit.

If there is a scope change during the design and preconstruction services, then it will be handled by the appropriate contract specifications. However, the Administration does not intend to

Contract No. MO0695172
IS 270 Innovative Congestion Management Contract

increase the value of the contract and the Design-Builder will need to propose modifications to stay within budget.

Question 18:

What level of design and plans related to PTCs are required for the Technical Proposal submittal?

Response 18:

Per General paragraph of Article XII.B (Technical Proposal) in the RFP (page 42), “The Technical Proposal submittal shall contain concise narrative descriptions and graphic illustrations, drawings, charts, plans and specifications that will enable the Administration to clearly understand and evaluate the capabilities of the Design - Builder and the characteristics and benefits of the proposed solutions.” Proposers are responsible for determining the necessary level of detail that will enable the Administration to clearly understand and evaluate the capabilities of the Design - Builder and the characteristics and benefits of the proposed solutions.

Question 19:

Since each PTC is being evaluated on its own merits, and with its own VISSIM analysis, please clarify what should be submitted with the final Technical Proposal? Is a VISSIM model for each PTC required, or one model that combines each of the PTCs selected by the DB for inclusion in their Technical Proposal?

Response 19:

One VISSIM model that combines each of the PTCs selected by the Design-Builder for inclusion in the Technical Proposal shall be submitted. Please refer to Article XII.B.7 in the RFP (page 48).

Question 20:

We request that SHA consider revising the Technical Proposal due date to either December 21st or January 18th.

Response 20:

In Addendum No. 2 the Technical Proposal due date was revised to January 19, 2017.

Question 21:

Is there any VISSIM calibration report available? If so, please provide.

Response 21:

A VISSIM calibration memorandum has been posted on ProjectWise at the following location:

pw:\\SHAVMPWX.shacadd.ad.mdod.mdstate:SHAEDMS01\Documents\Design-Build\MO0695172\E_Appendices\ 03 - VISSIM Traffic Models\I-270 Modeling Calibration Methodologies Memorandum.pdf

Contract No. MO0695172

IS 270 Innovative Congestion Management Contract

Question 22:

Can SHA provide any origin-destination traffic data for the GP and HOV lanes within the corridor used to develop existing and 2040 traffic volumes for the corridor?

Response 22:

See response to question 10.

Question 23:

We have been unable to locate any CAD files on PW that support the TNM validation that has been done, including Microstation files with the NSA shapes, the measured receptors and the TNM validation model layouts. Will SHA provide these files to all proposers?

Response 23:

MicroStation files with the NSA shapes, the measured receptors and the TNM validation model layouts will not be provided.

Question 24:

Special Provision Insert, TC-5.01 Insurance, page 2, 6th paragraph requires “*Any policy exclusions shall be shown on the face of the Certificate of Insurance or provided with the Certificate of Insurance.*” All policies have numerous standard exclusions which are usual and customary in the industry. Listing all these exclusions in or attached to the certificate of insurance would be an unnecessary administrative burden. Please consider the following amendment, which we believe is the true intent of this requirement, “*Any ~~policy~~ Policy exclusions applicable to the requirements herein shall be shown on the face of the Certificate of Insurance or provided with the Certificate of Insurance.*”

Response 24:

This is a standard Special Provision for all Administration contracts and will not be modified.

The following questions were received on October 6, 2016.

Question 25:

If our proposed solution requires additional staff to operate, beyond the existing MDOT / CHART manpower capabilities, is the additional staffing to be included in the current \$100M budget? If yes, for what period of time (years) would the staff need to be provided? Will additional staffing (temporary or permanent) be SHA employees, contract employees, or staff provided by the Design Builder? Will staff be located in an existing MDOT / CHART facility. If yes, which existing facility?

Response 25:

No, the contract budget does not include long-term Operations and Maintenance (O&M) costs. The budget does include design, construction, integration, testing, system documentation, training and anything else needed to turn over to the State a fully functional & operational system.

Contract No. MO0695172
IS 270 Innovative Congestion Management Contract

Though long-term O&M costs are not included in the budget, as part of their Technical Proposal Submittal, Proposers are responsible for evaluating impacts to O&M, and justifying and documenting anticipated O&M requirements. Please refer to the Operability/Maintainability/Adaptability goal in the RFP. The SHA needs to clearly understand the impacts the project will have on its O&M programs.

Question 26:

If our proposed solution requires “back-office” computers and other equipment, shall they be housed in an existing MDOT / CHART facility. If yes which one? If no, would the Design Builder be required to provide such facilities and would the cost be included in the current \$100 Million budget?

Response 26:

Housing back-office computers and equipment in MDOT, SHA and/or CHART facilities is potentially feasible, but not required. Proposers would need to confirm that the proposed location would be implementable, assuring basic system support such as telecommunication connectivity, a reliable power supply, accessibility for maintenance and system redundancy.

Proposers will design the system and should propose where the best location would be. There are numerous alternatives – e.g. the Statewide Operations Center, the Hanover Traffic Signal Shop, the Glen Burnie Data Center, District 3, etc. Proposers shall determine the most practical solution that meets the goals of the project. As noted above, using a State facility is feasible.

Regardless of where the equipment is housed, the Design-Builder shall provide all required equipment and facilities to turn over to the State a fully functional & operational system, as noted in response 25, the cost for which must be paid for from the contract budget.

Question 27:

If existing MDOT / CHART facilities are being utilized for proposed operational activities, is the Design Builder responsible for any improvements to the facility (physical improvements or new equipment/connectivity) as part of the \$100 Million budget? Please provide any existing plans or requirements for where equipment or staffing might be housed at the proposed MDOT / CHART facility including IT and computer facilities so we can estimate the cost of any improvements. Please arrange for access to the proposed facility for the Design Builders designers and estimators.

Response 27:

The cost of improvements to MDOT facilities shall be paid for from the project budget if the improvements are required for the Design-Builder to provide a fully functional system at project completion. The Design-Builder is not responsible for facility improvements unrelated to the project.

Your request for existing plans/information is too broad. Also, SHA does not know the equipment/staffing requirements for your proposed solutions and would be unable to determine potential housing locations. However, to help Proposers conceptualize potential housing

Contract No. MO0695172

IS 270 Innovative Congestion Management Contract

locations, Proposers may visit SHA facilities. To make an appointment, Proposers may send an email request to the project email address, specifying which facility and potential dates.

Question 28:

Will maintenance of any new field ITS devices need to be covered in our \$100 Million budget? If so, for what time period and to what extent is expected?

Response 28:

No. See response to question 25.

The following questions were received on October 10, 2016.

Question 29:

The RFP allows for resubmittal of PTC's after receiving initial feedback from SHA, but it does not specify a due date. Can a PTC be resubmitted after the 11/17 Last Day to submit PTC's, if the initial submittal was made prior to 11/17?

Response 29:

Yes.

Question 30:

We request permission to engage in joint discussions with FHWA and the SHA noise barrier team on proper implementation of Federal Highway Noise Regulations and Guidance. If you concur with this request, please provide appropriate point of contact.

Response 30:

Proposers may meet with the SHA Noise Team by sending a request to the project email address. If additional guidance from FHWA is needed, SHA will follow up and report back to the Proposer(s).

Question 31:

A fiber optic exists along I-270. Can this fiber optic be utilized for the project?

Response 31:

The Administration has determined that up to 4 fibers may be dedicated to this project.

The following question was received on October 13, 2016.

Question 32:

The RFP requests us to “*Discuss what modifications would be needed to the proposed Watkins Mill Interchange project to be compatible in a safe and efficient manner with your Innovative Congestion Management improvements.*” In order to properly reply to that question may we please have the latest Watkins Mill Interchange plans to review so the proper analysis can be made.

Contract No. MO0695172
IS 270 Innovative Congestion Management Contract

Response 32:

The Watkins Mill Interchange plans were previously posted on ProjectWise on June 7, 2016. The Proposer shall discuss what modifications would be needed to the proposed Watkins Mill Interchange as shown in that information.

The following questions were received on October 15, 2016.

Question 33:

Please furnish the 2015 Calibration Report for the I-270 Vissim models.

Response 33:

See response to question 21.

Question 34:

Please furnish contact information for Network Maryland.

Response 34:

Contact information for Network Maryland can be found on the Maryland Department of Information Technology's (DoITs) website.

Question 35:

Page 2 of the RFQ/RFP indicates that all costs for ROW acquisition will be subtracted from the established cost for Construction Services, and that ROW acquisition will be completed by the Administration. Please specify and generally describe applicable SHA costs related to ROW acquisition, e.g. purchase cost, legal fees, assessment fees, GEC fees, SHA staff, etc.

Response 35:

Only the final negotiated purchase cost of the ROW will be subtracted from the Construction Services Fee. All SHA labor and overhead—including that of our ROW specialists who will make first offers, negotiate, prepare documentation, etc.—will not be subtracted from the contract budget. Please note, development of ROW needs and plats are included in the Design & Preconstruction Services, and, therefore, will be subtracted from the contract budget.

The following questions were received on October 17, 2016.

Question 36:

As indicated in the RFQ/RFP, the Mobility Section in our Technical Proposal is of Critical Importance is 16 pages and will represent 50% of our Technical score. The other sections representing the remaining 50% are 30 pages and are rated only Important. We request that the page count for the Mobility Section be increased to accurately represent the relative level of importance and scoring of our proposal. A suggested page count for the Mobility Section is 25-30 pages.

Response 36:

The Administration will increase the page count to 20 pages for the Mobility section with a future addendum.

Contract No. MO0695172
IS 270 Innovative Congestion Management Contract

Question 37:

We request that full page explanatory graphics not count against the total page count of a specific section when included in the Technical Proposal (and not the appendix).

Response 37:

The specified page limits shall include full page explanatory graphics.

The following questions were received on October 18, 2016.

Question 38:

Can SHA provide GIS information for existing stormwater management BMPs, drainage areas and storm drains along the I-270 corridor in Montgomery County and Frederick County?

Response 38:

Available GIS information has been posted to ProjectWise at the following location:

pw:\\SHAVMPWX.shacadd.ad.mdot.mdstate:SHAEDMS01\Documents\Design-Build\MO0695172\H_Additional Material\08 - SWM GIS maps\

Question 39:

Please confirm the IS 270 Congestion Management contract shall be all-inclusive and not rely on any follow-up SHA or County contracts, such as future overlays to repair any stripping eradication efforts, to meet SHA or RFP requirements.

Response 39:

No resurfacing projects on I-270 are funded or programmed in the near future. Proposed improvements for the I-270 Innovative Congestion Management contract shall be all-inclusive and not rely on improvements provided in other projects.

The following questions were received on October 31, 2016.

Question 40:

Please confirm that since this is not a capacity addition project, but a congestion management and reduction project of existing roadway traffic that noise analysis and potentially new noise walls, or modifications to existing noise walls or other mitigation efforts, will NOT be required.

Response 40:

Per the RFP Contract Provisions, General Provisions, Terms and Conditions and Technical Requirements, the Design-Builder shall comply with all Federal, State and local laws, ordinances and regulations applicable to the activities and obligations associated with this project. The Design-Builder is responsible for determining whether noise mitigation will be required to implement the Design-Builder's proposed improvements. Please note that noise analysis and mitigation may be required if, based on the scope of improvements, the NEPA defined project is considered Type I. Refer to the MDOT SHA Highway Noise Policy and 23 CFR 772 for additional information related to the definition of Type I projects.

Contract No. MO0695172
IS 270 Innovative Congestion Management Contract

Question 41:

Please confirm that if no new full time mainline or CD lanes are added to the existing I-270 typical section, noise analysis and potentially new noise walls or modifications to existing noise walls or other mitigation efforts will NOT be required.

Response 41:

See response to question 40. Full-time use is not a consideration for the determination of a Type I project. Part-time shoulder use would fall under the definition of a Type I project. Refer to FHWA's Use of Freeway Shoulder for Travel for additional information.

Question 42:

Please confirm that if revisions to current entrances and exit ramp configurations along the I-270 corridor are proposed, noise analysis and potentially new noise walls, or modifications to existing noise walls or other mitigation efforts will NOT be required.

Response 42:

See response to question 40.

Question 43:

If a noise analysis is performed utilizing current criteria on the existing I-270 configuration and traffic, (without any or with only minor improvement such as the installation of gantry's, detection or ramp metering made by the Design Builder) and the results indicate additional noise mitigation is required, will the design builder be required to provide such mitigation as part of the \$100 Million dollar budget? If so what would be the limit of the mitigation – the entire corridor from the I-495 juncture to the I-70 interchange - or other limits.

Response 43:

All costs for noise mitigation required by the Design-Builder's project(s) to comply with all applicable Federal, State and local laws, ordinances and regulations, shall be a part of the contract budget. This includes any required Right-of-way and or Utility Relocations needed as a result.

Multiple environmental documents may be developed for the contract. Each separate project for an environmental document must be a standalone construction project that connects logical termini and be of sufficient length, have independent utility, and not restrict consideration of alternatives for other reasonably foreseeable transportation improvements. If the project is determined to be a Type I project, the level of mitigation required and the limits of that mitigation would be determined based on any noise analysis done for the environmental document(s) to meet applicable Federal, State and local laws, ordinances and regulations.

The following questions were received on November 2, 2016.

Question 44:

It was noted that the wetlands and waterways shapes and delineation report were a draft. Have they been finalized?

Contract No. MO0695172
IS 270 Innovative Congestion Management Contract

Response 44:

The wetland delineation report has been finalized and posted to ProjectWise at the location below:

pw:\\SHAVMPWX.shacadd.ad.mdot.mdstate:SHAEDMS01\Documents\Design-Build\MO0695172\E_Appendices\06 - Wetland Delineations\

Also, the shape files have been updated and replaced at the location below. Included is a CAD file of the wetlands and waterways (mEF_I270_16.1019.dgn).

pw:\\SHAVMPWX.shacadd.ad.mdot.mdstate:SHAEDMS01\Documents\Design-Build\MO0695172\B_Survey and Topographic Files\02 - Environmental Features Files\

Question 45:

Since noise mitigation does not contribute directly to meeting the project goals, would MDOT consider utilizing a separate funding mechanism for noise barriers?

Response 45:

Yes. The Administration has decided to use another funding source(s) for the construction of noise barriers. This will be reflected in Addendum No. 3.

The Design-Builder shall identify in its proposal where noise barriers may be required, including approximate locations and areas. As part of its design and preconstruction services, the Design-Builder will be responsible to complete all work related to providing a noise study to make a final determination on reasonableness and feasibility related to noise abatement for the Design-Builder's project(s) to comply with all applicable Federal, State and local laws, ordinances and regulations.

The SHA will be responsible for final design and construction of any required noise abatement and the additional impacts or requirements they incur, including additional utility relocations, grading, drainage, SWM, retaining walls, etc.

Please note, responses to questions 40, 41, and 42 still apply. Also note, this response (45) supersedes the first paragraph of response 43.

The following questions were received on November 14, 2016.

Question 46:

Please provide a copy of the SHA application for Federal funding under the Integrated Corridor Management (ICM) program.

Response 46:

The requested document has been posted to ProjectWise at the location below:

pw:\\SHAVMPWX.shacadd.ad.mdot.mdstate:SHAEDMS01\Documents\Design-Build\MO0695172\H_Additional Material\09 - Integrated Corridor Management\

Contract No. MO0695172

IS 270 Innovative Congestion Management Contract

Question 47:

With regard to communications for ITS field devices such as CCTV cameras, message signs, and ramp meters, we understand there are four (4) existing dark fibers on the corridor that are available for use by the design-builder. If so:

- a) How do we obtain the exact locations of existing fiber conduits, pull boxes, and splice vaults?
- b) Are we able to break into the fiber duct at any point to add additional pull boxes and splice vaults?
- c) Can we splice into existing fibers at any new/existing pull box or splice vault?
- d) Can we add additional fiber within the existing conduits?
- e) Are there spare conduits in the existing ITS duct bank?
- f) Does SHA have any mandatory standards on communication architecture or equipment? For instance, is there a requirement for Cisco-supplied switches or for GB Ethernet?

Response 47:

There are four (4) existing dark fiber strands on the corridor that are available for use by the Design-Builder. The locations of these strands were previously posted to ProjectWise and can be found at the following location:

pw:\\SHAVMPWX.shacadd.ad.mdot.mdstate:SHAEDMS01\Documents\Design-Build\MO0695172\H_Additional Material\06 - ITS Information\

These four (4) fibers are a part of the MDOT's Resource Share Agreement (RSA) with Level 3. Only these four dark fiber strands are available for the Design-Builder to use. There are no other existing strands or conduits available for the Design-Builder's use. Level 3 owns the strands and requires that any splicing of the strands be performed by Level 3's certified splicers. Any associated cost for that splicing shall be part of the project budget. The RSA does allow for the ability to add new pull boxes and/or splice vaults but does not allow adding fiber to the existing conduits. Any new pull boxes and/or splice vaults must be coordinated with Level 3, and locations must be approved by Level 3. If the Design-Builder's solutions require additional conduit/fiber, the Design-Builder will be required to construct these new resources as part of their project.

SHA does not have any mandatory standards on communication architecture or equipment. However, the Administration values a project which will provide for ease of operations and maintenance. It is the Design-Builder's responsibility, per the RFP, to describe how its approach, including communication architecture or equipment, will ensure the SHA will have a fully functional system that is easily maintainable.

Question 48:

We request the SHA re-evaluate the DBE participation goal of 25% for the Design and Preconstruction phase of the project.

The Construction portion of this phase involves only Estimating and Project Management (no construction). It is unrealistic to ask the Construction firm selected to subcontract out ¼ of its estimating and or management functions. Those two key functions are never subcontracted out by any Construction firms as no firm would allow these two key functions to be performed

Contract No. MO0695172

IS 270 Innovative Congestion Management Contract

outside of their organizations from both a propriety and leadership standpoint. This fact is recognized in the DBE requirements included in SHA's CMAR program where DBE participation is not required for this phase of the project. The following is taken from one of the recent CMAR RFQ's. *"The overall DBE participation goal will be 0% of the total Contract price for the Preconstruction Services. Due to the nature of the Contractor's role in the Preconstruction Design phase, the Administration has determined that there are insufficient subcontracting opportunities to justify a DBE goal on the Preconstruction Design phase."*

The above will therefore require that the full 25% of Design and Preconstruction services be shifted to the Engineering portion of the fee putting a DBE component of approx. 35% to 40% on the designer. As an innovative project requiring "World Class" expertise to identify and implement new innovative solutions specialize senior staff will be required from the firms other national or international offices. That staff is generally only found in large multinational engineering and planning firms - not local small DBE organizations. There are specific areas where DBE firms can be utilized (e.g. Outreach, Survey, Subsurface investigations, etc.) but these tasks do not come close to equaling 25% of the total Design and Preconstruction fee.

We respectfully request the Design and Preconstruction DBE requirement be lowered to no more than 5% to 10% of the total Design and Preconstruction fee. If desired by SHA, the resulting decrease in DBE dollars can be shifted to the Construction portion of the project so as to provide the same total DBE participation for the full \$100 million dollar project budget as previously desired.

Response 48:

On Design-Build projects, typically 30% of the portion of the contract price allocable to professional services requires good faith effort to achieving DBE/MBE participation. Understanding that, in addition to the professional services, that the Contractor's preconstruction services are included in the Design and Preconstruction Services Fee, the Administration determined that overall 25% was a realistic MBE goal contract to be in line with 30% of professional services allocable to MBE participation. This would allow all preconstruction services to be completed the Contractor with a similar level of MBE for professional services to other Design-Build contracts. We believe there are other areas for DBE participation above those identified such as highway, traffic, drainage, stormwater management, erosion and sediment control, permitting, noise analysis, etc.

Question 49:

On normal DB and CMAR projects the different sections of the technical proposal are divided between several different groups to review and score totally independently. Will that be same on this project. Will the Technical Proposal be reviewed by three independent groups, do the individual groups see the other sections, and are the given the appendix?

On this project, that is so non typical and innovative, we request SHA review the above assumed procedures and have one team review and score the entire document. As a minimum we believe, if independently scored, the teams should have access to the entire document, including the appendix.

Contract No. MO0695172

IS 270 Innovative Congestion Management Contract

Response 49:

Yes, the technical proposal will be broken down into individual Evaluation Factors and evaluated independently by different evaluation teams as described in the RFP beginning on page 50. This is SHA's standard evaluation process that serves the organization well, regardless of the nature of the project.

The following question was received on November 27, 2016.

Question 50:

On page 41 Item 4 of the RFP "Effect of Submitting a Proposal" it states we are to "*perform the work for the price submitted within the time(s) specified*". We have found no time to be specified in the RFP for completion and Section B on pages 42 thru 47, which details what is to be included in our technical proposal, does not request a schedule or completion date. We therefore assume individual completion dates will be assigned to each construction package at the time the CAP's are determined. Please confirm our assumption or inform us where the completion date is specified or requested.

Response 50:

The schedule for design and completion of construction for each CAP will be determined by the Design-Builder as part of the submittal of its Technical and Price Proposal. See Response 2 (R2) in the Notice to Prospective Proposers dated June 17, 2016. The completion date shall be provided on Page 41 of 43 of the Price Proposal Form Packet.

The following question was received on December 1, 2016.

Question 51:

As a follow up to question number 49: Will the reviewers of the individual sections have access to the full technical proposal, including the appendix?

Response 51:

As stated in the RFP on page 51, "Each Evaluation Team will only be given the section or sections for each specific Evaluation Factor or Factors they are rating and not the Technical Proposals in its entirety. Evaluations will be limited to the information provided in the specific Evaluation Factor section and will not consider information provided in other sections." Each Evaluation Team will have access to the appendix, which is not rated. It should be noted the Evaluation Teams determine the initial technical ratings. The Evaluation Committee, which determines the overall technical ratings, will have access to the entire Technical Proposal and appendix.

The following questions were received on December 5, 2016.

Question 52:

RFQ Article XII.B.5.ii (Page 47) requires the proposer to "Discuss the services to be provided by the Design-Builder." Please clarify what services are to be addressed in this section of the Technical Proposal.

Contract No. MO0695172

IS 270 Innovative Congestion Management Contract

Response 52:

Discuss the Design and Preconstruction Services, and any other services the Design-Builder will provide that will best meet or exceed the goals of the project.

Question 53:

In the definition of Construction Agreed Price on pages 3 and 4 of the RFP, it states that a CAP “shall include all final design...” Please define “final design”.

- Is this the design effort required to progress the design to 100% from the 65% state used for negotiation of the CAP?
- If the cost to progress the design from 65% to 100% is included in the CAP, what further design effort, if any, is required if SHA elects to bid a package competitively?

Response 53:

Final design for a work package, the cost of which is included in the CAP, is the design effort required to complete design for that work package. For example, if the CAP is initiated at 65% design, final design is the effort required to progress design from 65% to 100% release for construction drawings, including revisions/redlines. If the CAP is initiated at 90% design, final design is the effort required to progress design from 90% to 100% release for construction drawings, including revisions/redlines. Proposers shall identify in their proposals at what percent design completion (e.g. 65%, 90%, 100%, etc.) CAPs will be initiated. If SHA rejects the Design-Builder’s price and bids the package competitively, no further design effort will be required by the Design-Builder. The Administration will terminate the process and complete design by some other means for that work package.

Question 54:

In the second paragraph addressing Construction Agree Price on page 4, it is noted that, “A proportionate amount of the Construction Management Fee will be included in the CAP.” Is it the intent of the PDB process for the total amount of all executed CAPs to equal the sum of the Construction Management Fee bid item and the Construction Services Fee bid item, less any amount paid to third parties for ROW acquisition and utility relocation? If so, this seems inconsistent with the paragraph’s first sentence that says, “A zero-dollar change order will be executed to subtract the amount of the CAP, and any associated right-of-way and utility relocation costs, from the Construction services costs...” (Emphasis added.)

Response 54:

Assuming the entire budget were to be spent and there were multiple independent projects, then the sum of the CAPs and amount paid to third parties for ROW acquisition and utility relocation for each project would add up to the Construction Services Fee submitted as part of the Price Proposal. Likewise the Construction Management Fee for each project would add up to the Construction Management Fee submitted as part of the Price Proposal.

Page 4 of the RFP goes on to state, “For example, if the Construction Management Fee was five percent when compared to the Construction services costs, this amount will be added to the CAP and subtracted from the original Construction Management Fee as part of the change order. Payment for the Construction of the project will be paid through an agreed upon work

Contract No. MO0695172
IS 270 Innovative Congestion Management Contract

breakdown structure.” Thus the change order pulls the CAP, ROW costs, and utility relocation costs from the Proposal Construction Services Fee, and pulls a proportionate amount from the Proposal Construction Management Fee. The purpose of the net zero dollar change order is to approve the CAP and create a pay item for it.

Question 55:

In the event that SHA executes its right to competitively bid a PS&E package, will there be any further obligation under this contract to provide design, preconstruction, or construction management services?

Response 55:

All Design and Preconstruction Services in the contract shall be provided until the Administration terminates the contract.

There is no obligation to perform Construction Management (CM) services until a CAP is accepted. If a CAP is not accepted, then the Design-Builder is not obligated to provide CM services for that work package. If a CAP is not accepted, this does not release the Design-Builder from its obligation to perform CM services for other CAPs that have been accepted.

Question 56:

On the bottom of Page 4 of the RFP in Section I.A, there is the subtitle **Design and Preconstruction Services**. The ensuing paragraph seems to be addressing the contract as a whole, including the Construction Management Fee and Construction Services Fee. Is there an inconsistency here?

Response 56:

The SHA is entering into a contract with the Design-Builder to complete the Design and Pre-Construction Services as required in the Technical Proposal. If SHA is agreeable to the CAP(s), then a net zero dollar change order will be executed for a CAP to include the PS&E package of that CAP. The Design-Builder cannot proceed with any Construction Services until SHA has approved a CAP and issued Notice to Proceed for the CAP.

Question 57:

At the bottom of RFQ page 48 in Section XII.C.2, it is noted that regional and home office overhead costs are to be included in the Construction Management Fee. No further guidance on overhead cost is provided in the ensuing table. Please clarify where to allocate the cost for establishing and maintaining a project office on the jobsite.

Response 57:

An engineer’s office would be included in a CAP.

Question 58:

At the bottom of RFQ page 48 in Section XII.C.2, it is noted that general and administrative costs are to be included in the Construction Management Fee. Does this include all costs for indirect items such as Bond, insurance premiums, permits, licenses, and success fees? Might not

Contract No. MO0695172

IS 270 Innovative Congestion Management Contract

a separate mobilization bid item for a fixed amount of say \$1,500,000.00 be appropriate for such one-time expenses?

Response 58:

If a separate mobilization item were included in the Schedule of Prices (SOP), it would apply to all work packages; however, each work package must be independent and severable. Like all other work items necessary for construction (e.g. construction stakeout, maintenance of traffic, class 1 excavation, etc.), mobilization for each work package will be included the CAP for that specific package. Permits and licenses are also included in the CAP(s). Any cost associated with providing requirements to submit a proposal, such as Proposal Guaranty for the overall \$100 M contract, may be included in the Design and Preconstruction item.

Regarding Success Fees, refer to Response 4 (R4) in the Notice to Prospective Proposers dated June 17, 2016.

Question 59:

Please confirm that the “Traffic Control Plan Certification” is not relevant to this contract.

Response 59:

The Traffic Control Plan Certification Contract Provision should be completed with Option 3 checked as it is the Design-Builder’s responsibility to provide any traffic control plan.

Question 60:

TC-4-02 Failure to Maintain Traffic indicates a \$1,000 per day deduction for failure to maintain the project. Please clarify if this is only applicable to active work zones or if it is applicable to the entire length of I-270.

Response 60:

TC-4.02, Failure to Maintain Project, is applicable to the work as defined in GP-5.11, Maintenance of Work During Construction.

Question 61:

TC-7.05 addresses retainage on Progress Payments. Is it the intention of the Authority to hold retainage on the Design and Preconstruction Services Fee? Is this necessary when the Authority is only paying for “services actually provided and invoiced” as stated on in XII.C on page 48?

Response 61:

Retainage applies to all work under the contract.

Question 62:

Should execution of the Buy American Steel Form (Page 3 of 43 of the Contract) be deferred until CAP negotiation?

Response 62:

The Price Proposal form needs to be completed in its entirety and no portion of it can be deferred to a CAP.

Contract No. MO0695172
IS 270 Innovative Congestion Management Contract

Question 63:

The standard MDOT MBE Form A on Page 15 of 43 includes a certification referencing the “total dollar amount of the Contract” although the goal at the time of submission is only applicable to design work. Please clarify how this form is to be completed.

Response 63:

The form should be completed for the Design and Preconstruction Services. See response 56.

The following question was received on December 6, 2016.

Question 64:

We have had difficulty reproducing some of the results in the evaluation templates provided by SHA. We would like to be able to replicate the results to ensure the validity and comparability of all team’s results.

Response 64:

The model must be run in **32-bit mode** to replicate the VISSIM model results that SHA has provided for every MOE.

The following question was received on December 7, 2016.

Question 65:

Does the Watkins Mill Interchange Project impact Level 3?

Response 65:

Yes. Design plans for the proposed relocation of Level 3 have been posted to ProjectWise at the following location:

pw:\\SHAVMPWX.shacadd.ad.mdot.mdstate:SHAEDMS01\Documents\Design-Build\MO0695172\F_Watkins Mill Interchange Plans\Level 3 Relocation\

The following questions were received on December 8, 2016.

Question 66:

In the *General Requirements* on page 2 of Section I.A, it states that the Design-Builder shall complete all design and construction work in two phases, Phase IV - Final Design and Phase V – Partnering during design and construction, Review Shop Drawings, Revisions, Redesign Under Construction, As-Built Plans and provisions for expert court testimony. Please clarify the intent or significance of Phase IV and Phase V in the context of either this two-phase procurement or the two-phase contract.

Response 66:

The intent is to ensure that the consulting services provided and tasks performed by the Design-Builder during both phases of the contract comply with the Administration’s policies and

Contract No. MO0695172
IS 270 Innovative Congestion Management Contract

procedures and the requirements set forth in “Volume II -Specifications for Consulting Engineers’ Services,” dated 1986.

Question 67:

A definition of *Opinion on Probable Construction Cost* (OPCC) is provided on page 3 in Section I.A. Please confirm that the OPCC is simply the aggregate construction cost of anticipated improvements and that these costs are expected to be incorporated into CAPs as the “Construction, labor, equipment, and materials and all incidentals necessary to complete the Construction of the package.”

Response 67:

The OPCC is the actual Construction cost the Design-Builder estimates to build all aspects of a Construction package.

Question 68:

On page 4 as part of the definition of a CAP, it states that SHA will consider establishing a risk sharing pool with the Design-Builder during the Design and Preconstruction phase. Please clarify whether the funding for this risk sharing pool is from within or outside of the \$100 million fixed value of the contract.

Response 68:

Risk sharing pools must come from the contract’s fixed budget.

Question 69:

In the *General Requirements* in Section I.A and again in Section I.F *Scope of Services / Description of Work*, there are multiple references to “milestones”. Please define these milestones.

Response 69:

Proposers shall determine what milestones are needed to deliver a well-managed project.

Question 70:

Section XII.C.1 defines the *Design-Builder Design and Preconstruction Services Fee*, noting that payment will be based on services actually provided and invoiced.

- a. Subsequent language requires the Design-Builder to provide a fee breakdown. Is this Design-Builder requirement relevant to Proposal content or is this just guidance on how the successful proposer (the Design-Builder) is to bill for post-Award design services?
- b. The final sentence of this segment indicates the Design-Builder shall provide a breakdown for each firm showing the estimated direct labor breakdown, estimated direct expenses, approved audited overhead, and profit. Is this also guidance on how the successful proposer (the Design-Builder) is to bill for post-Award design services for work performed by the Lead Designer and any subconsultants?

Response 70:

The fee breakdowns are not merely guidance. They are required of all Proposers in their Price Proposals.

Contract No. MO0695172
IS 270 Innovative Congestion Management Contract

Question 71:

Section XII.C.2 indicates that the Proposer will provide a breakdown of all components used in establishing the fee. Is this Proposer requirement relevant to Proposal content? If so, where in the Proposal should this information be provided?

Response 71:

This requirement shall be provided with the Price Proposal.

Question 72:

In response to Question #48, it was noted that “the Contractor’s preconstruction services are included in the Design and Preconstruction Services Fee.” Assuming that the table provided at the top of page 49 is applicable to the entire contract and not just to the Construction Phase, please provide guidance or examples for other types of Contractor costs that can be included in the fee for design and preconstruction services. Alternately, please confirm that the table on page 49 is only applicable to the Construction Phase thereby allowing Contractor project costs to be classified as preconstruction services during the Design Phase.

Response 72:

The table on page 49 is applicable to the Design-Builder’s Construction Management services, which support the Construction Services and are not needed for nor applicable to the Design & Preconstruction Services.

Question 73:

Regarding ground mounted signs along the corridor: If a sign is proposed to be relocated without changing the content of the sign, does the sign material need to be upgraded to MUTCD standards?

Response 73:

Upgrading existing facilities to current standards when no safety or operational issues exist is not a contract goal. Existing signs that are not impacted and will remain in place do not necessarily need to be upgraded to MUTCD standards. However, once the Design-Builder changes the conditions in which that sign exists, including the sign’s location or message, the sign should be upgraded to current MUTCD standards.

Question 74:

For signs mounted on cantilever or sign bridges: If a sign must be relocated to a different location without changing the content of the sign, does the sign material need to be upgraded to MUTCD standards?

Response 74:

Yes. See response 73.

Question 75:

If a sign remains in place with a different message, does the sign material need to be upgraded to MUTCD standards?

Contract No. MO0695172
IS 270 Innovative Congestion Management Contract

Response 75:

Yes. See response 73.

Question 76:

If a sign with the same message must be temporarily removed and replaced on a new structure in the same location without changing the message, or a different location on the same structure without changing the message, does the sign material need to be upgraded to MUTCD standards?

Response 76:

Yes. See response 73.

Question 77:

Are there any restrictions for including discussion of costs in the technical proposal?

Response 77:

No.

Question 78:

For the final proposal, can the PTC's and other Appendix data be presented in only electronic format and provide the required copies for the technical and cost proposal only?

Response 78:

Proposals shall include hard copies of the Concept Evaluation Templates. All other appendix materials may be saved onto a flash drive.

Question 79:

We would like to request the following data for six scenario years including the years 2015, 2020, 2025, 2030, 2035, and 2040:

- A. Four OD trip tables for all scenarios, which are inputs to the 4th iteration highway assignment. These OD trip table names are i4_AM.VTT, i4_MD.VTT, i4_PM.VTT and i4_NT.VTT.
- B. Two highway assignment loaded networks for all scenarios, which are outputs from the 4th iteration highway assignment. These loaded network names are i4_HWY.NET and i4_HWYMOD.NET.
- C. The full MWCOG model transmittal folder with input files, scripts and all the supporting input data.

Response 79:

The MWCOG model input files and the documentation necessary to run the model successfully have been posted to ProjectWise at the following location:

pw:\\SHAVMPWX.shacadd.ad.mdstate:SHAEDMS01\Documents\Design-Build\MO0695172\H_Additional Material\10 - MWCOG model\

Contract No. MO0695172
IS 270 Innovative Congestion Management Contract

Proposers can use these files to run the interim year models and generate loaded networks and time of day trip tables. This model set represents version 2.3.57a, the 2015 CLRP and Round 8.4 land use assumptions.

The following question was received on December 11, 2016.

Question 80:

We understand this is past the due date for questions and apologize for this late clarification request; however, we believe it may be in the Administration's best interest to provide additional information to the proposers on formatting of the Technical Proposal and Appendix. The only guidance provided is that the Technical Proposal (including appendix) shall be in a 3-ring binder and any "*Charts, exhibits, and other illustrative and graphical information may be on 11"-by-17" paper, but must be folded to 8.5"-by-11", with the title block showing. An 11"-by-17" sheet will be considered only one page.*"

It may be inconvenient to unfold and then refold each sheet individually as your team reviews the material and we may not be able to fit, in a reasonably sized single 3-ring binder, if tri-folded. We respectfully request the appendix be allowed in its own 11"x17" binder with unfolded sheets.

Response 80:

The appendix can be in its own 11"x17" binder with unfolded sheets. Also, see Response 78.

The following question was received on December 16, 2016.

Question 81:

Question 70 addressed a cost breakdown that must be provided by the Design-Builder. Question 71 addressed a cost breakdown that must be provided by the Proposer. In both cases, the SHA response indicates that the required breakdown must be provided with the Price Proposal. It is mandated on RFP page 40 that the "Price Proposal shall be submitted on the Price Proposal Form supplied by the Administration..." Would the aforementioned Article XII.C breakdowns be a supplement to the 43-page Price Proposal Form since there does not seem to be an appropriate place for inclusion within those 43 pages.

Response 81:

Yes, the cost breakdown should be a supplement submitted with the Price Proposal Form.

The following question was received on December 19, 2016.

Question 82:

We have been unsuccessful in exporting the document "Ver2.3.57a_Conformity_2015CLRP_Rnd8_4_Xmittal.zip" located in the following folder on ProjectWise:

pw:\\SHAVMPWX.shacadd.ad.mdstate:SHAEDMS01\Documents\Design-Build\MO0695172\H_Additional Material\10 – MWCOG model\

Contract No. MO0695172

IS 270 Innovative Congestion Management Contract

We believe this is due to the zip folders size (25.48 GB). Would you please consider breaking this folder into smaller zip files, or extracting the files into the 10-MWCOG model folder so that we can download the information and put it to use on this project?

Response 82:

The files that were in the zip file “Ver2.3.57a_Conformity_2015CLRP_Rnd8_4_Xmittal.zip” have been extracted and placed at the following location on PW:
pw:\\SHAVMPWX.shacadd.ad.mdod.state:SHAEDMS01\Documents\Design-Build\MO0695172\H_Additional Material\10 - MWCOG model\Ver2.3.57a_Conformity_2015CLRP_Rnd8_4_Xmittal\

The following questions were received on December 23, 2016.

Question 83:

The fifth paragraph of TC-5.01 indicates that Workers’ Compensation policies are the only exceptions to an endorsement requirement. Please note that such endorsements are not commercially available on a Professional Liability insurance policy because of the nature of the coverage. Accordingly, we request listing of Professional Liability insurance as an exception.

Response 83:

Professional Liability insurance may be an exception.

Question 84:

TC Section 5 Article .02.1 is an additional requirement for the Professional Liability Insurance Policy to provide various indemnifications. Please note that such indemnifications are not commercially available because of the nature of the coverage. Accordingly, we request deletion of this requirement.

Response 84:

This is a standard Special Provision for all Administration contracts and will not be modified.

Question 85:

TC Section 5 Article 02.4a establishes a requirement to name the State Highway Administration in various insurance policies, presumably meaning that the Administration must be named as an Additional Insured. Consistent with the questions addressing endorsements and indemnifications and with the nature of errors and omissions coverage, we request that Professional Liability Insurance be listed with Workers’ Compensation as an exception to this requirement.

Response 85:

The said article states, “Each policy, with the exception of Workers’ Compensation and Professional Liability Insurance, shall name the State Highway Administration.”

Question 86:

TC Section 5 Article 02.4b uses “named insured” as an identifier, as was the case in 02.4a. Please consider revising the reference to Additional Insureds, assuming this is the intent of the requirement.

Contract No. MO0695172
IS 270 Innovative Congestion Management Contract

Response 86:

The said language, “named insured,” is consistent with other provisions in SHA’s Standard Specifications for Construction and Materials, 2008.

Question 87:

TC Section 5 Article 02.5 requires the insurance company to notify the Administration, the Design-Build Team, and each insured about policy cancellation or modification. The industry-standard Notice of Cancellation to Others will trigger appropriate notifications if a policy is cancelled, but it will not react to modifications. We suggest that the obligation for notification of policy modifications be eliminated or assigned to the design-builder. Alternately, could the Administration provide an example Notice of Cancellations to Others endorsement that they have accepted in the past?

Response 87:

This is a standard Special Provision for all Administration contracts and will not be modified.

The following question was received on December 24, 2016.

Question 88:

A safety and resurfacing project (Contract No. MO1865177) has appeared on the contractor’s advertisement schedule. It appears to be located on I-495 near the southern end of the I-270 contract. The advertisement date is 2/14/17 and the NTP date is 5/22/17. Are plans available?

Response 88:

Yes. Plans have been posted to ProjectWise at the following location:
pw:\\SHAVMPWX.shacadd.ad.mdod.state:SHAEDMS01\Documents\Design-Build\MO0695172\E_Appendices\11 - Other Projects\MO1865177 - IFB_PS&E- Design Plans.pdf

The following question was received on January 4, 2017.

Question 89:

Article VIII.B on page 23 of the RFP mandates meeting or exceeding the DBE Participation Goal for work performed under the Design and Preconstruction Fee bid item. Please clarify this requirement. Does the reference to a goal only pull in the goal for 25% DBE participation, or does this reference also pull in the subgoals for 9% female participation and 6% African-American participation?

Response 89:

The Design-Builder shall meet or exceed the DBE goals, including sub-goals, required by the Contract Provision AFFIRMATIVE ACTION REQUIREMENTS UTILIZATION OF MINORITY BUSINESS ENTERPRISES FOR STRAIGHT STATE CONTRACTS (page 3 of 10).

Contract No. MO0695172
IS 270 Innovative Congestion Management Contract

The following question was received on January 9, 2017.

Question 90:

The RFP states that the Contract MBE goal as shown in the Appendix is only applicable to the Design and Preconstruction item in the Price Proposal. The Design and Preconstruction item includes significant cost for items such as ‘costs associated with providing requirements to submit a proposal, such as the Proposal Guaranty’ (per Response 58) and the contractually required ACONEX project management software. There is no ability to provide MBE participation for these items or to help meet the MBE goal via the considerable construction to be performed under the CAPS, forcing the entire MBE participation for the Design and Preconstruction to be achieved via professional services participation. Is it SHA’s intent that the MBE goal be achieved on the entire value of the Design and Preconstruction item, or may the MBE goal be interpreted to apply only to those professional services being provided by the Lead Design Firm and its subconsultants?

Response 90:

25 percent of the Design & Preconstruction Services Fee provided with the Price Proposal must be MBE. As mentioned in Response 48, the MBE goal has been adjusted down from what a typical design-build project would require to account for Preconstruction Services and Aconex costs. Also note, the Design-Builder is not required to include the Proposal Guaranty in the Design & Preconstruction Services Fee. The Design-Builder may elect to include the Proposal Guaranty in the Construction Services Fee.

The following questions were received on January 10, 2017.

Question 91:

Has the Maryland State Highway Administration issued a wage determination for the project based upon the (Anticipated) Notice to Proceed Date of March 2017?

Response 91:

Prevailing wage rates will be established with the CAP.

Question 92:

Will the Maryland State Highway Administration consider establishing indexed base cost for petroleum based products (diesel fuel, hot mixed asphalt pavements and slurry seal) and structural steel?

Response 92:

Any adjustments will be included in the CAP. Depending on the scope of the CAP, typical SHA adjustments for asphalt binder, pavement density, asphalt mixture, pavement surface profile, and diesel fuel will be included. While SHA does not have a standard structural steel adjustment, this can be discussed with the CAP and potentially included in a risk sharing pool.

Contract No. MO0695172

IS 270 Innovative Congestion Management Contract

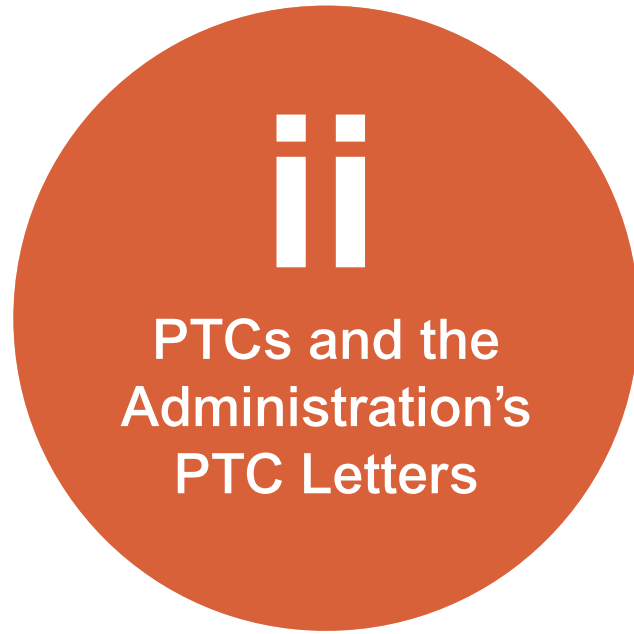
The following question was received on January 11, 2017.

Question 93:

Please confirm the design builder must provide Aconex project management software for this project. The cost of providing that software from March 2017 thru March 2020 is almost 1/4 of a million dollars. In addition after that date access to the data base to retrieve the project records would not be available unless additional payments are made by SHA on a yearly basis. Several members of our team have existing service agreement with other software firms for similar Project Management tools that could be made available for use on this project for no cost and would provide the SHA the availability to recover their Project Records at no cost after March 2020.

Response 93:

Confirmed. The Design-Builder is to provide Aconex project management software per the RFP.



Responses to SHA Comments on PTC No. 1 Hard Shoulder Running

1 COMMENT: Generally, the concept appears to be a reasonable solution to address the goals of this contract.

RESPONSE: no response required

PTC REFERENCE: none

2 COMMENT: Page 1, Section A, Description: We agree with the potential benefits of Lane Use signals to provide advanced warning, and a measure of lane-specific traffic management. To assure the feasibility of this strategy, we would recommend that the existing sign inventory on I-270 be considered. I-270 already experiences “sign congestion”, and the successful implementation of additional Dynamic Lane Use Control and Dynamic Speed Advisory gantries would depend on meeting, or successfully requesting waivers for MUTCD design standards. Also, these strategies will need to be reviewed to determine if Maryland would make the lane control and speed limits regulatory or advisory (noted that this PTC recommends advisory, but this would be a Maryland policy decision).

RESPONSE: Parsons has performed a sign inventory, and where possible will combine existing signs and new signs using the same sign structures to minimize sign congestion. Structural analysis evaluation will be performed for sign structures where new and existing signs will be combined. Parsons will work with SHA to obtain approvals and any required waivers for sign design that deviates from the MUTCD design standards. Parsons technical staff have worked with Virginia Department of Transportation and FHWA to obtain experimental approval of Variable Speed Limit Signs in Virginia. We work will with SHA and develop engineering justification memorandum to support design justifications with FHWA and other authorities.

PTC REFERENCE: See additional text in section titled “Geometry”.

3 COMMENT: Page 2, Section A, Description: It is a strength of this PTC to take into consideration the Federal System Engineering Requirements for Intelligent Transportation Systems and the intent to meet the guidelines of the National ITS Architecture, including incorporating the system into the Maryland Statewide ITS Architecture.

RESPONSE: During the design phase, Parsons will to take into consideration the Federal System Engineering requirements for ITS to meet guidelines of the National ITS architecture including incorporating the system into the Maryland Statewide ITS Architecture. We will develop an ITS project architecture and define all system flows and data interfaces in accordance with the CHART System Architecture, National ITS and Maryland ITS Architecture, Traffic Management Data Dictionary (TMDD) and NTCIP Center-to-Center interfaces. We will review input and output sources of data/information, verify consistency and identify necessary modifications to Maryland Statewide ITS architecture, and other interface processes.

PTC REFERENCE: See additional text in section titled “Traffic Management”

4 COMMENT: Page 3, Section A, Description, Hard Shoulder Running (HSR) Technology: It would be helpful to clarify the planned architecture for the Video Analytics. Would the processing be done in the field, with camera based software, or would the images be processed at a back-end server location where the video streams can _be captured? Are the cameras fixed, purpose built for VIDS, or would they be capable of Pan-Tilt-Zoom for incident management, with the ability to automatically recalibrate to support an automated monitoring mode? How would identified obstructions be flagged and how would operational staff be notified of safety concerns?

RESPONSE: IP digital camera will be installed to support the HSR lane monitoring. The camera video will be transmitted back to the server room and analyzed through image analyzers. The cameras will be fixed variable focus length allow for optimal setup within the field of view. Camera field of view coverage support overlapping coverage along the HSR lane with cameras spaced at 800 to 1,300 feet intervals. The video analytics will support stopped and congested detection, debris, and traffic detection. The image processing will be done at a back-end server location where the video stream will also be captured. Similar to existing CHART system, the video management software will have alert management, video monitoring management, and communication management capability.

PTC REFERENCE: See additional text in section titled “HSR Technology”

5 COMMENT: Page 4, Section B, Location: The diagram on page 4, along with the table on page 8, describe some segments as right shoulder HSR, and other segments as left shoulder HSR. Would implementing these lane configuration changes involve restriping to maintain lane continuity, or would there be lane drops, and lane additions, in various segments?

RESPONSE: Yes, addition of HSR lane will require shifting of existing travel lanes and restriping lanes to maintain continuity. The plans are updated to show proposed pavement markings in Magenta color to differentiate from existing pavement markings in white color. Proposed pavement markings have now been shown in Magenta colors for any modification to Auxiliary lanes. A table showing changes to auxiliary lane has been added on plan along with proposed typical section with lane configurations at locations where lane shifts are proposed to change from existing conditions.

PTC REFERENCE: Addressed in Attachment 1, Design Plans

6 COMMENT: Page 10, Section C, Analysis, Safety: The proposal should address alterations to operational procedures that might be necessary. Changes to shoulder areas will influence traffic incident management in the following ways:

6.1. PROVIDING A SAFE BUFFER ZONE FOR EMERGENCY RESPONDERS.

Managed lanes can facilitate lane use and advanced warning, but full shoulders provide a work area for emergency responders which, by vehicular regulation and driver behavior, motorists don't use. Managed lanes can help, but positive guidance and physical barriers (e.g. cones) will be the only protection in a normally traveled lane (i.e. hard shoulder).

RESPONSE: The following steps will be included as revision in operations processes:

- Inspect Shoulders through the camera coverage and video image detection analytics before opening the lanes to traffic to ensure that the shoulders are clear of debris and any disabled vehicles. Traffic management rules will also be developed to support various HSR operational scenarios to support opening and closure.
- Develop interagency agreements prior to the implementation of HSR to determine which agencies have the authority to instruct the TMC to close the shoulder.
- Effective use of the traveler advisory information system, and DLM signs to clear HSR and move the traffic to GP lanes
- Coordination of CCTV, DLM, and emergency response team – A shoulder will be closed for safety so emergency vehicle can drive on the shoulder and disabled vehicle stopped on the shoulder can be removed
- Provide static signage within corridor to provide information and location of emergency refuge areas to safely move disabled vehicle

- Provide real time information to emergency responders on the operational status of the HSR
- Develop and implement an outreach and public awareness plan for all stakeholders.

PTC REFERENCE: See additional text in section titled “Operability/Maintainability/Adaptability”

6.2 COMMENT: USE AS A STAGING AREA FOR VEHICLE RECOVERY. Maryland, by policy and regulation in support of the towing and recovery industry, public agencies only relocate damaged and disabled vehicles to the shoulder, to stage them for final removal by industry towers. Limited shoulder availability would likely require new policies and procedures to minimize the blockage time impact while preparing for private towers to arrive.

RESPONSE: Parsons will develop a Concept of Operations Plan and work with SHA and affected stakeholders to develop new policies for vehicle recovery. Parsons Incident Management Team experts have been involved in such practice implementations in the US, such as Florida, Georgia, and Washington.

PTC REFERENCE: None

6.3. COMMENT: ACCESS TO THE INCIDENT SCENE. The CHART patrols, in Maryland, function as an extension of staff for the Maryland State Police, in the area of Traffic Incident Management. However, CHART patrols are not enforcement vehicles and do not have the authority of a “blue light” (police) or a “red light” (fire and rescue) emergency responders in traveling through traffic (even though they are equipped with lights and sirens). Consequently motorists may, or may not, yield right of way to CHART vehicles.

RESPONSE: Parsons will develop a Concept of Operations and update the Traffic Incident Management Plan to incorporate policy and operational changes. Parsons will work with the State Highway Patrol and CHART Emergency

Patrol develop operational strategies to support incident response and management with the HSR Lanes. Parsons will also develop public awareness campaigns to educate the motoring public of new operations and management with HSR Lanes.

PTC REFERENCE: None.

6.4. COMMENT: IMPACTS OF MORE COMPLEX INCIDENTS. Procedures and impacts need to be analyzed and addressed for more complex incidents that require more complex recovery procedures and other public safety impacts. Some of these complicating factors include: heavy/large vehicles, injuries, hazardous materials, fires, criminal activities, significant debris (e.g. a load of mulch) etc. Each of these scenarios requires different personnel and equipment on scene: fire trucks, ambulances, police vehicles, heavy equipment, etc. Shoulders provide the additional geometry to stage and maneuver these resources.

RESPONSE: For this and all of the above concern it is essential to develop Decision Support system that include:

- Relay of advisory messages to TMC operator
- Develop communication system between CHART, 911, Fire and Rescue, and Police to
- Identify the complexity of the incident to deploy necessary resources to clear incident.
- Switching sign displays
- Switching text messages
- Sending notifications to emergency responders
- Automatically setting signs to normal once an incident is cleared

PTC REFERENCE: See additional text in section titled “Operability/Maintainability/Adaptability”

7 COMMENT: Page 13, C. Analysis, Operability, Maintainability, Adaptability: The PTC states “ ... dynamic lane management signs, related

structures and poles, and other ITS devices and subsystems will be designed in accordance with MDDOT design standards.” There are no MDOT design standards for Lane Control Gantries, Variable Speed Limit signing or Video Imaging Analytic field infrastructure. They will have to be developed for this project.

RESPONSE: Parsons, will design all sign and ITS equipment support in accordance with Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals (6th Edition), and submit to MD SHA for review and approvals.

PTC REFERENCE: See additional text in section titled “Operability/Maintainability/Adaptability”

8 COMMENT: Page 17, D. Potential Impacts, Technology: The PTC states that the firm” ... will examine in detail the utility requirements (e.g., available fiber versus communications needs, etc.) during the design process ... “ We recommend that the proposed telecommunications solution be analyzed early, to confirm the feasibility of installing and operating the field device infrastructure. The CHART system communicates with field infrastructure in two ways; through wireless modems for Dynamic Message Signs, Highway Advisory Radios, Roadway Weather Information Systems and Traffic Speed Sensors and through a combination of T-1 and fiber optics for cameras streams. CHART accesses fiber optic communication as a customer of Network Maryland and T-1 services from local telecommunications providers. The telecommunications architecture of the CHART system does not currently utilize dedicated circuits for point-to-point connectivity between central servers and field devices. It is also important to note that the CHART system central servers currently reside in an MDOT data center in Glen Burnie, not at the Statewide Operations Center in Hanover, MD. However, the CHART system is an information management and advisory ATMS. Lane control signals and

variable speed limit signing provide real-time dynamic guidance to vehicles, and due to safety considerations, they must be highly reliable, available and maintainable.

RESPONSE: The conceptual design for the HSR Lane equipment relies on a separate dedicated communications network with interface to the Maryland CHART Systems and with RITIS for exchange of data via NTCIP center-to-center protocol. Parsons has developed preliminary conceptual physical and logical architecture to support the design. Field surveys, investigation, and engineering collaboration will be performed prior to detail design advancing.

PTC REFERENCE: See additional text in section titled “Technology”

9 COMMENT: For locations where HSR utilizes the outside shoulder, please describe the Design-Builder’s proposed treatments of auxiliary lanes at interchanges.

RESPONSE: The auxiliary lanes will be extended wherever it is possible to meet AASHTO requirements. A table of the auxiliary lane has been added on plan to clarify this concern.

PTC REFERENCE: See table of auxiliary lanes provided in Attachment 1, Design Plans.

10 COMMENT: Please state whether the intent is to have the HSR operational during rain events or not.

RESPONSE: If detailed drainage analysis indicates that existing or modified cross slopes and the current drainage system create ponding on the shoulder, attempt will be made to add additional inlet to allow for the HSR to be operable during rain event. However, if this is not feasible and implementation cost outweighs the benefits, the HSR will not be operational during rain to allow shoulder to facilitate drainage.

PTC REFERENCE: None

11 COMMENT: This PTC will require design exceptions. More detailed information related to impacts and costs of fully meeting AASHTO requirements, potential impacts to safety and operations for implementing the design exception, and mitigation, if any, which would be implemented as a result of the design exception(s) will be required for formal approval. The design exception(s) must be approved prior to establishing a CAP.

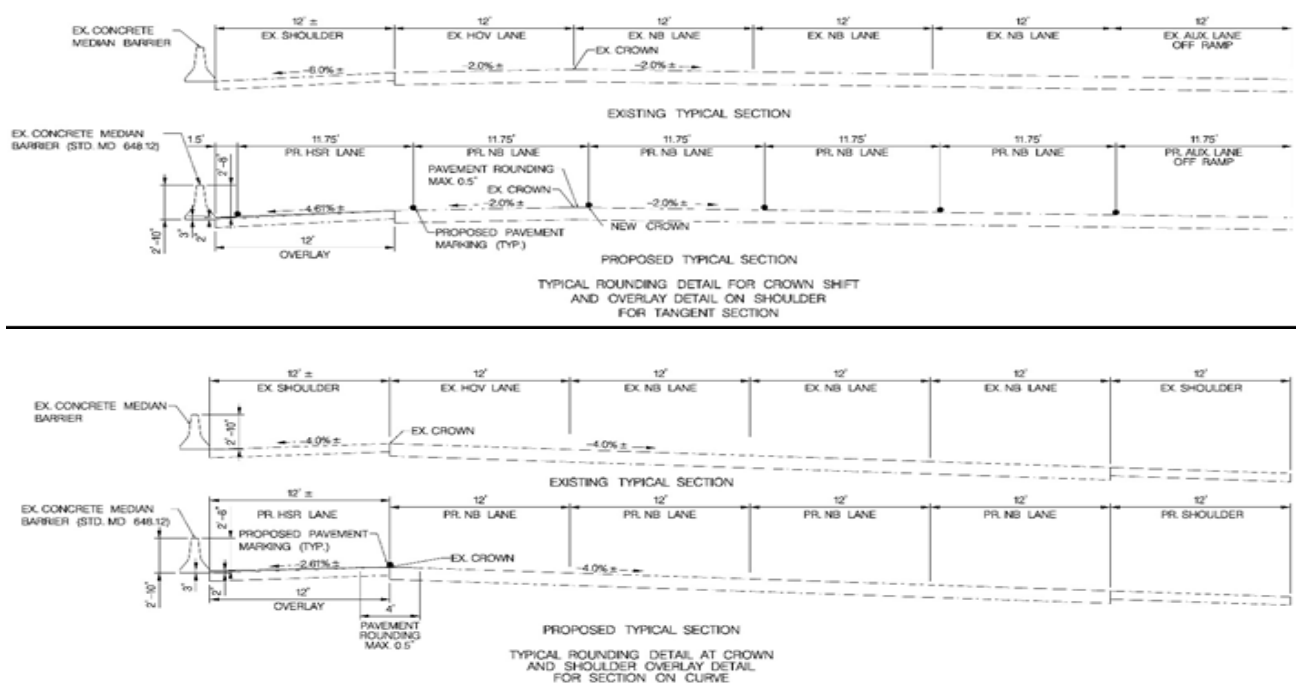
RESPONSE: Yes, we understand this and we have identified potential design exceptions on the plan. However, during the detail design we will have more clear understanding on exact locations where design exceptions will be required.

PTC REFERENCE: See Attachment 6. Design Exceptions

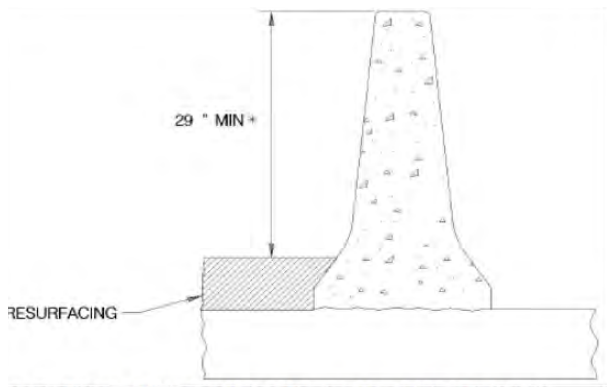
12 COMMENT: This PTC states that adjustments to shoulder cross slopes may be necessary on the HSR. Concrete traffic barriers have some flexibility to add overlays, but if previous overlays have used that flexibility, flattening the cross slopes for HSR may reduce the barriers

heights to less than acceptable. Please elaborate on this topic. Should concrete traffic barrier heights be insufficient, what does the Design-Builder propose? Does the Design-Builder know if the flatter cross slopes will create an issue? If not, will this be a Design-builder risk and how will the Design-Builder mitigate that risk?

RESPONSE: The MDSHA Standard No. 648.12 for “Concrete Jersey Shape Median Traffic Barrier Type A” indicates total barrier height of 34” from finished grade to the top of barrier. This will allow for 2” of future overlay and still have required barrier height of 32”. Based on our initial field inspection, it appears that there is still an approximately 3” of reveal at vertical face of the bottom of the barrier and indicates that shoulder pavement has not been overlaid. This should give enough to allow for adjustment of about 1.4% slope to maintain minimum rollover required by the SHA without reconstructing barrier. Two typical details for overlay and rounding treatments for roadway on tangent and curve section have been provided below. Some places where the total barrier height is reduced, we will modify barrier to meet the minimum barrier height.



MDSHA’s Guidelines for Traffic Barrier Placement and End Treatment Design states (on page 5 second paragraph) that “Any depth overlay can be placed against it (Concrete Barrier) as long as there is a minimum of 29” of exposed face remaining”. This will allow another 3” of overlay on shoulders against barrier and can result in further cross-slope reduction of about 2% on HSR lanes. Hence total 5” of overlay can be made against existing concrete barrier, resulting in cross-slope reduction of about 3.4% while still having 29” of exposed vertical face on existing barrier. Below is a Figure 19 from MDSHA’s Guidelines from Traffic Barrier Placement and End Treatment Design that depicts barrier height of 29” after overlay



OR 42" F-SHAPED BARRIER, THE MINIMUM HEIGHT AFTER RESURFACING IS 39"

FIGURE 19: PAVEMENT RESURFACING CONSIDERATIONS FOR CONCRETE BARRIER

PTC REFERENCE: None

13 COMMENT: Page 2, Geometry, states existing pavement markings may need to be eradicated. Does the Design-BUILDER intend to leave the eradicated pavement markings after construction, or to eliminate the eradicated pavement markings with some treatment?

RESPONSE: As mentioned in the PTC, the pavement markings will be eradicated using “Hydroblast”. Although, we do not anticipate visible residue of existing pavement marking with this technique, heated liquid asphalt treatment will be used..

PTC REFERENCE: See additional text in section titled “Geometry and Roadway Geometric Analysis”

14 COMMENT: Page 9 states this PTC will not have an impact on the Watkins Mill Road Interchange; however, HSR is proposed within the limits of this interchange. The Administration believes some changes to the current design plans will be necessary. Please address.

RESPONSE: Yes, it will impact existing plans of improvement to Watkins Mill Road Interchange. We are developing concept plan to reconfigure this interchange and present it as a Diverging Diamond interchange if Traffic Analysis indicates improvement to I-270 capacity.

PTC REFERENCE: See additional text in section titled “Impact to Watkins Mill Road Interchange”

15 COMMENT: HSR Plans: The typical sections leave room for interpretation and ambiguity. For example, section A-A on sheets 3 and 5 show all of the pavement as existing, except for the HSR, which leaves the reader with the impression that the widths are also existing. Is this the case? Or are the lanes being shifted? If shifted, is there some pavement treatment on the outer most lane to provide an acceptable cross slope? In general, typical sections should be able to communicate on their own without the need to refer back to the text in the write up for clarification. Communication may be better served by providing an existing section and a proposed section at the selected locations.

RESPONSE: Typical sections are revised as per recommendations showing existing and proposed sections separately at the locations of changes to typical sections. The new pavement marking is shown as different color for better legibility. The cross slope of the HSR will adjusted to maintain 8% roll over rate with rounding at the crown for easy cross over between lanes and HSR.

PTC REFERENCE: See additional text in section titled Typical sections have been revised to

clarify existing and proposed roadways on “Attachment 1 - Plans”

16 COMMENT: HSR Plans: Some mainline typical sections (e.g. sheet 3) provide an 8-foot shoulder, which is difficult for emergency responders to utilize effectively. During periods of congestion, there are in essence no usable shoulders on the mainline for responders. Please address the safety aspects of the concept.

RESPONSE: Due to restricted barrier to barrier width of the existing roadway and in order to maintain 12’ lanes, we had to limit right shoulder width to 8’ at some locations. The alternative to this would be reduced lane width to 11.5’ with design exception. During the detail design we will analyze both options and potential pull over area for disabled vehicles.

PTC REFERENCE: See additional text in section titled Locations where the width to be reduced to 11.5’ are shown in “Attachment 1 - Plans”

17 COMMENT: HSR Plans: The HSR widths proposed in the typical sections will sometimes have inlets encroaching into the travel lane. Is there a cost-effective solution to this issue? Please address.

RESPONSE: The inlets will have heavy duty grate designed to withstand traffic load.

PTC REFERENCE: See additional text in section titled “Design-Build Risk”

18 COMMENT: HSR Plans: Narrowing and/or shifting the HOV lane(s) will require an equivalency study, to be approved by FHWA, prior to establishing a CAP.

RESPONSE: We understand that and apply for necessary design exceptions.

PTC REFERENCE: None.

01 Hard Shoulder Running

A. Description

Hard Shoulder Running with Active Traffic Management (HSR) is a proven strategy and Parsons proposes to implement it as a part of a comprehensive Performance-Based Practical Design (PBPD) approach that will increase vehicle throughput on IS 270. Combining the use of existing shoulders as temporary travel lanes paired with active traffic management (ATM) techniques will provide safe additional capacity to increase throughput in the IS 270 corridor at a level not practical with any other approach. On a roadway such as IS 270, where the peak demand already exceeds capacity and roadway expansion is impractical or impossible in many places, HSR with ATM can provide supplemental capacity in critical areas without requiring acquisition of additional right-of-way.

Parsons' HSR solution will use the shoulder as an additional lane of travel for vehicular traffic during peak period hours based on congestion levels and in response to incidents or other conditions as warranted during non-peak periods. In contrast to a static time-of-day schedule for using a shoulder lane, an ATM approach continuously monitors conditions and uses real-time and anticipated congestion levels to determine the need for using a shoulder lane as a regular or special purpose travel lane. In this case for IS 270, ATM will include both a Shoulder Lane Monitoring Systems (SLMS) and Dynamic Lane Management (DLM). Dynamic lane management of the shoulders will be accomplished using overhead lane use signs to communicate to all travelers the status of the shoulder lanes.

SLMS includes both surveillance and detection to actively provide camera coverage of the shoulder lanes, and vehicle detection for monitoring the flow of traffic in the lane. The SLMS will be used to monitor traffic flow, slowdowns, and any stoppage in the HSR Lane. A DLM solution often includes both lane control signs and variable speed limits (VSL).¹ Lane control signs indicate whether a lane is open to the traveling public (i.e. whether an incident has occurred downstream in a given lane). The signs would indicate that the lane is closed with an "X", and even further upstream, it could prompt drivers to merge away from that lane to avoid further backups.

TRAFFIC OPERATION

Traffic operations for the proposed improvements are presented in detail in the Mobility section of this PTC. Operational analysis was conducted based on the guidance provided in the RFP. The "build" condition results reflect the proposed PTC improvements and are compared to the "no-build" conditions to demonstrate effectiveness of the proposed improvement. Using the VISSIM model provided by SHA and with knowledge of the area, it was determined that the peak travel



Hard Shoulder Running will use the full width of shoulder as an additional lane of travel for vehicular traffic during peak period hours. Dynamic lane management of the shoulders will be accomplished using overhead lane use signs to communicate to all travelers the status of the shoulder lanes.

¹ Parsons recognizes that Variable Speed Limits (VSL) can help improve safety and it has been detailed in separate PTC.

congestion was southbound in the morning peak and northbound in the evening peak. The HSR configurations in this PTC are based on the flow of peak direction traffic.

GEOMETRY

The AASHTO Policy on Geometric Design of Highways and Streets, 2011 was used to determine lane width, transition length, cross slope, sight distance, vertical clearance under bridges, and horizontal clearance between HSR and concrete barriers and other unmovable objects. The shoulder cross slope will be required to be in the range of 2% to 6% to comply with the AASHTO requirement. Shoulder reconstruction or overlays may be required to provide an acceptable cross slope and to achieve suitable structural pavement thickness.

Due to limitations on available shoulder width, in some areas the roadway will be restriped to maintain minimum lane width requirements. Where restriping occurs, the existing pavement marking will be eradicated per MDSHA specifications 500 section 565 using either high pressure water blasting or an alternate method such as abrasive blasting or grinding.

In summary, the goal of the proposed geometric improvements is to provide a cost-effective solution to improve traffic operations and safety by providing additional capacity thru HSR while adhering to design guidelines to the maximum extent.

Parsons recognizes the sign congestion and requirements of the MUTCD to accommodate new sign concepts and additional infrastructure to support the HSR concept. Parsons has performed a sign inventory, and where possible will combine existing signs and new signs using the same sign structures to minimize sign congestion. Structural analysis evaluation will be performed for sign structures where new and existing signs will be combined. Parsons will prepare any required waivers for sign design that deviates from the MUTCD design standards, and work with SHA to obtain FHWA waiver and approvals

TRAFFIC MANAGEMENT

The National ITS National Architecture recognizes Active Traffic Management (ATM) as an acceptable practice for dynamically managing recurring and nonrecurring congestion based on prevailing traffic conditions. These ITS service packages are recognized to maximize the effectiveness and efficiency of the facility, and increase throughput and safety through the use of integrated systems with new technology.

The National ITS Architecture (Version 7) recognizes these new service packages that support ATM strategies as:

- ATMS22: Variable Speed Limits
- ATMS23: Dynamic Lane Management and Shoulder Use
- ATMS24: Dynamic Roadway Warning and are identified in figures below.

The devices and equipment deployed to operate and manage the HSR Lane will be integrated into Parsons' Intelligent NETWORKS® (iNET) Advanced Traffic Management (ATM) Module which supports the proposed ATM strategies. iNET will be implemented as a standalone module to the current Maryland CHART System and integrated via NTCIP Center-to-Center protocols to exchange data between the systems. Intelligent NETWORKS® Active Traffic Management Module will be used to continuously monitor HSR Lane system performance using the real time detection data obtained and to manage opening or closing of the HSR Lane based on defined operational and safety conditions that will be defined through concept of operations development.

In addition to the design and implementation of the ATM system to meet all RFP requirements, the system design will conform to all system design standards identified by SHA. During the detailed design, a concept of operations and mapping of the new ATM service packages will be prepared for incorporation into the Maryland ITS Architecture.

HSR TECHNOLOGY

The technology that needs to be implemented to deploy HSR on IS 270 includes the following:

- **Overhead Message Signs** – These are small “single character” message signs that will appear over the shoulder lane that will indicate whether the lane may be used.. Typically this would include a Red X, Green Arrow, or perhaps a yellow merge arrow. This will be hung on small cantilever signs over each lane in approximate ½ mile distances.
- **Video Image Detection System (VIDS) Cameras** – These cameras will be set to view all physical areas of the shoulder so that verification can take place to confirm that no vehicles are stalled or parked in the shoulder before the lane is opened. The system will require cameras spaced at 800 to 1,300 feet along the HSR lane to support monitoring and detection in the HSR lane.
- **Video Analytics Software** – This software is used to monitor the lanes and detect if a vehicle or other debris is stopped in the hard shoulder lane. The video image software will provide analytics that support several detection alarms, including stopped and congested detection, debris, and traffic detection. The VID's cameras will be integrated with the video analytic software and the iNET ATMS for management of the HSR lanes.
- **Vehicle Detection Stations** – In order to implement HSR on a dynamic basis, new mainline vehicle detection stations are needed to calculate mainline vehicle volumes, occupancy and speeds. There are some existing vehicle detection stations along the IS270 corridor, however these are not enough to address the algorithm operational needs. To supplement existing corridor detection, Parsons proposes additional side fire radar detection placed at ½ to 1 mile intervals.



Single Character Overhead Message Sign.

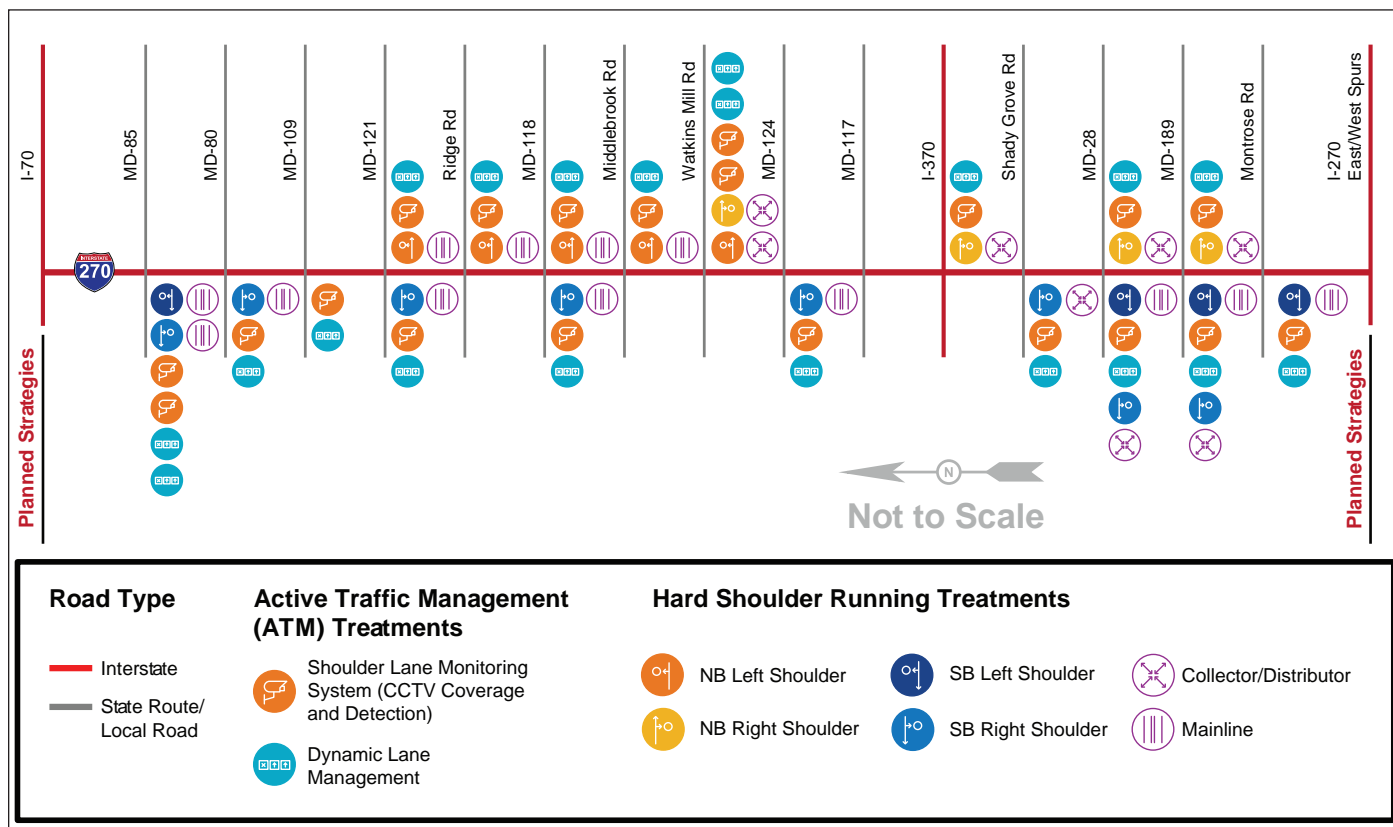
- **Advanced Transportation Management System (ATMS) Software** – The central management software with the Active Traffic Management (ATM) control features to detect when the shoulder should be opened, verify there are no conflicts, then activate the message signs that allow the shoulder to be used. It contains the system monitoring, HSR algorithm and system reporting capabilities. Parsons will use its Intelligent Networks software system to perform these functions.

B. LOCATION

Parsons identified and evaluated multiple potential HSR locations on the mainline and collector/distributor roadways on the IS 270 corridor, and has determined that HSR is likely to be most effective if deployed as depicted in Figure 1. The criteria for identification of candidate locations and providing ATM device placement are the following:

1. Prioritize strategic locations for a combination of HSR and DLM to achieve maximum vehicle throughput benefit at a minimal cost compared to HSR for the entire corridor.
2. Shoulders are to be used for travel only during those times of day when the adjoining lanes are likely to be heavily congested (e.g., during peak hours,

Figure 1: IS 270 PTC Hard Shoulder Running with ATM Treatment

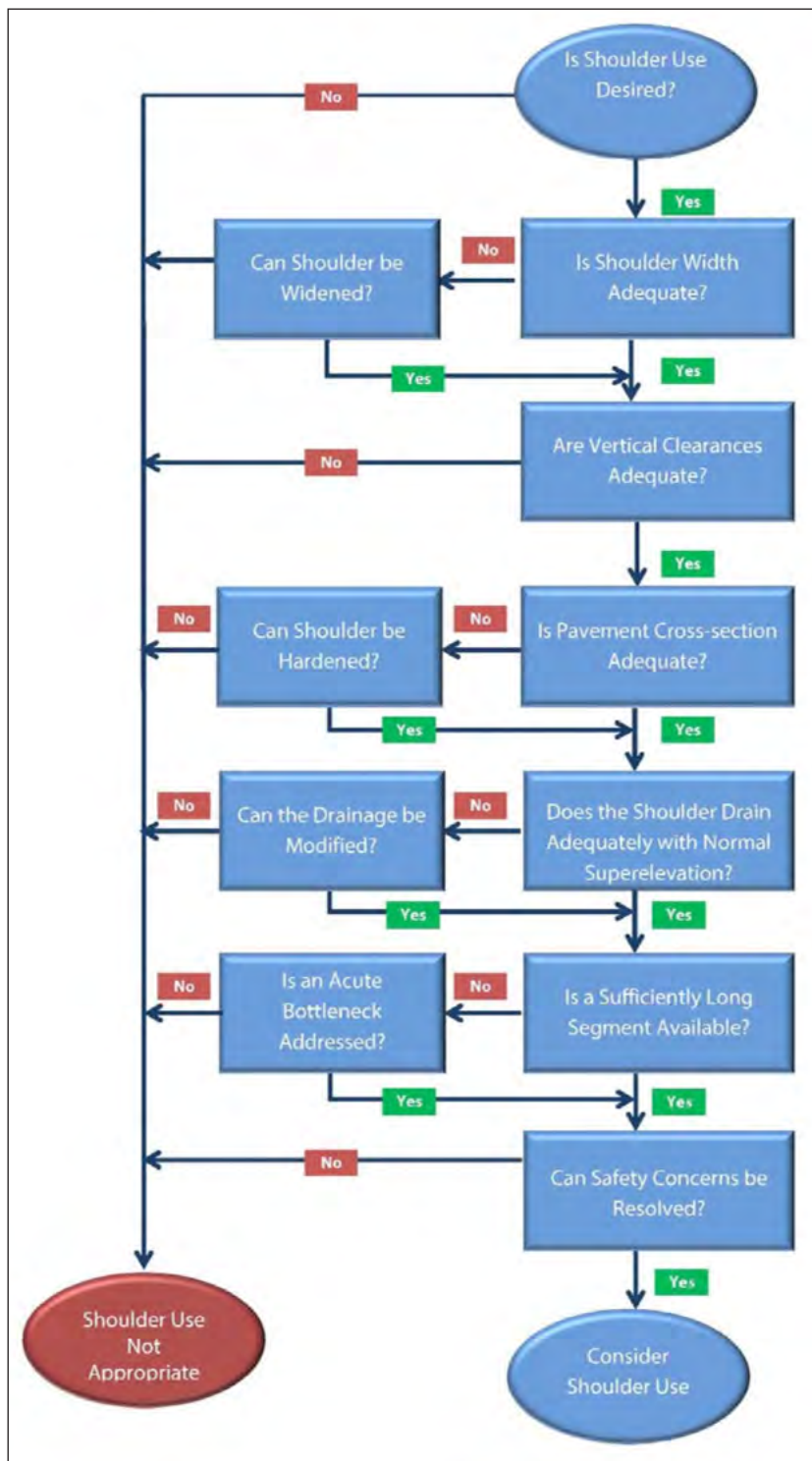


when congestion is detected, or when general purpose lanes are closed for construction or incidents).

3. When not used as an additional travel lane, a shoulder will serve its original purpose with its basic physical characteristics retained and recognizable.
4. When the available shoulder width is less than permissible for a travel lane, it will be necessary to restripe the pavement as needed to achieve/maintain minimum lane widths across the entire cross section of the roadway. Existing pavement markings will be eradicated using hydroblasting technique. Any visible residue of existing pavement marking after hydroblasting will be covered by heated liquid asphalt treatment.
5. When the available shoulder width is insufficient for a 12' travel lane, appropriate signage is required to prevent truck traffic on the shoulder.
6. DLM devices are spaced at an average of ¼ mile spacing support the open and closing the of HSR Lane operations
7. SLMS are spaced at ½ mile to provide video coverage and vehicular detection in the HSR Lane. The SLMS will provide overlapping coverage for the length of the HSR Lane

Parsons used the flowchart depicted in Figure 2 (at right), which is excerpted from the FHWA "Use of Freeway Shoulder for Travel: Guide for Planning, Evaluating and Designing Part-Time Shoulder Use as a Traffic Management Strategy," to evaluate options for hard shoulder running on IS 270.

Figure 2: Part-time Shoulder Use Screening Decision Tree



C. ANALYSIS

This PTC proposes the addition of hard shoulder running paired with ATM strategies to alleviate recurring congestion along IS 270 corridor. Parsons reviewed several measures of effectiveness assess the value of this PTC in accordance with the goal areas stipulated in the RFP. Our approach included the following steps:

- Traffic volumes along the corridor were analyzed to determine the locations which exhibit the worst recurring congestion during peak periods.
- No Build conditions for current year (2015) and future base year (2040) were reviewed using VISSIM to determine segments with recurring congestion during both AM and PM peak hour periods.
- An assessment was conducted to determine which of these locations have shoulders that have adequate pavement thickness and width, or could be economically modified to accommodate vehicular traffic.
- We analyzed data provided in the RFP to determine pavement thickness of the existing shoulders.
- We computed the need for additional asphalt overlay on top of existing shoulder or total reconstruction of the shoulder where required.
- Preliminary roadway modeling was performed where the DTM was available to ensure that the cross slope at HSR locations is within allowable limits.
- The corridor's emergency stoppage areas or the potential for such areas was also assessed.
- Factors such as feasibility of providing HSR, geometry, existing pavement thickness, existing traffic congestion areas, pavement marking, static and dynamic signs, existing noise walls, right-of-way, utilities, environmental factors, drainage, stormwater management, and maintenance of traffic were taken into account to determine the optimal areas for HSR to achieve performance objectives for Mobility and Safety.

TRAFFIC ANALYSIS

A VISSIM Analysis for No Build was provided by SHA. The build condition VISSIM for year 2040 was developed with strategic locations for HSR to improve vehicle throughput, to reduce vehicle travel times, and to create a predictable commuter trip along IS 270. After several iterations, we were able to optimize the vehicle throughput and minimize vehicle travel time by providing HSR at locations shown on the plan in Attachment 1.

In summary the 2040 VISSIM output shows that the implementation of HSR reduces AM and PM Peak delays by 17 and 27% and travel times by 6 and 12% respectively, while average speed is increased by approximately 5 mph. AM Peak performance improvement is depicted in Figure 3, while PM peak performance improvements are illustrated in Figure 4.

Figure 3: AM Peak – HSR 2040 - IS 270 Vehicle Network Performance

	No Build	HSR- Alternative	% Change
Total Delay	35,032,576	25,737,836	-27%
Average Delay per Vehicle	326	233	-28%
Total Travel Time	64,317,886	56,499,525	-12%
Vehicles (Arrived)	87,894	93,550	6%
Latent Demand	44,530	40,664	-9%
Latent Delay	120,600,723	115,384,506	-4%
Total Distance	463,125	486,877	5%
Average Speed	26	31	19%

Figure 4: PM Peak – HSR 2040 - IS 270 Vehicle Network Performance

	No Build	HSR- Alternative	% Change
Total Delay	36,237,078	30,149,654	-17%
Average Delay per Vehicle	307	250	-19%
Total Travel Time	67,865,560	64,132,685	-6%
Vehicles (Arrived)	95,124	100,280	5%
Latent Demand	8,861	5,939	-33%
Latent Delay	13,484,325	10,176,973	-25%
Total Distance	477,455	512,488	7%
Average Speed	25	29	14%

ROADWAY GEOMETRIC ANALYSIS

The HSR beginning and end locations were primarily determined based on the VISSIM analysis. Other factors taken into consideration included horizontal and vertical alignments, vertical clearance, locations of fixed objects, stopping sight distance, and necessary taper length per AASHTO and FHWA guidance for use of freeway shoulders for travel. Proper pavement marking, signing, and DLM sign locations were determined using MUTCD standards and criteria, as well as ITS requirements.

Design speed limits for HSR on the entire corridor are 55 MPH, which is also the posted speed limit. However, the use of the HSR will be limited to peak hours therefore the actual computed speed is expected to be approximately 30 MPH. The cross slope of the HSR will be adjusted to account the effect of curvature as well as drainage. Per FHWA guidelines for the temporary use of the shoulder, we anticipate rounding the grade break between the travel lane and the shoulder or reducing shoulder cross slope by adding pavement on top of shoulder pavement in order to modify the cross slope.

Existing shoulder width varies from 10' to 12'. For safety consideration, we have used a 12' shoulder with 1.5 lateral offset between fixed objects per AASHTO criteria. We anticipate restriping pavement in proposed HSR zones to achieve this goal. The existing pavement marking will be eradicated using a sand blaster or similar techniques per MDSHA specifications. There is one location where a 12' lane width cannot be achieved, where we propose to use an 11' shoulder lane as a "Design Exception".

Plans are provided to demonstrate HSR locations with proper pavement marking and signing, and are provided as Attachment 1. At strategic locations, we plan to use DLM signs similar to what is successfully being used on I-66 in Fairfax County, VA to guide users when to use HSR. The same DLM signs can also be used in response to disabled vehicles or other incidents affecting the HSR lane. This system can electronically sweep a facility, so that manual oversight is not required.



DLM sign example

Figure 5: Summary of Locations and Length of the HSR

Station Range		Location	Length	NB/SB	L/R	Lane Width	Add'l Shoulder Constr.
From	To						
195+00	327+00	Express	13200'	SB	L	12'	
241+00	265+00	Local	2400'	NB	R	12'	
248+00	280+00	Local	3200'	SB	R	12'	
278+00	304+00	Local	2550'	SB	R	12'	
306+00	317+00	Local	1100'	NB	R	12'	
309+00	317+00	Local	800'	SB	R	12'	
348+00	351+00	Local	300'	SB	R	12'	
401+00	431+00	Local	3000'	SB	R	12'	
448+00	480+00	Local	3200'	SB	L	12'	12'
451+00	480+00	Local	2900'	NB	R	12'	
500+00	519+00	Local	1900'	NB	R	12'	
600+00	605+00	Express	500'	SB	R	12'	
611+00	635+00	Local	2,400'	NB	L	12'	6'
616+00	634+00	Local	1,800'	NB	R	12'	9'
648+00	856+00	Express	20,800'	NB	L	12'	
744+50	766+00	Express	2,150'	SB	R	12'	
862+00	970+00	Express	10,800'	SB	R	12'	
1353+50	1364+00	Express	1,100'	SB	R	12'	

Station Range		Location	Length	NB/SB	L/R	Lane Width	Add'l Shoulder Constr.
From	To						
1380+00	1389+00	Express	900'	SB	R	12'	
1381+00	1570+00	Express	18,900	SB	L	12'	
1600+00	1645+00	Express	4,500'	SB	L	11'-12'	0'-2'
1618+00	1627+50	Express	950'	SB	R	12'	

IMPACT TO WATKINS MILL ROAD INTERCHANGE

This PTC will not have an impact on the Watkins Mill Road Interchange design.

ROADWAY PAVEMENT ANALYSIS

In addition to the above mentioned criteria, our analysis included a pavement analysis to address remediation costs where the existing shoulder pavement thickness does not meet the minimum requirements for future traffic. For the locations where the HSR is to be used for HOV, we have considered “No Truck Traffic” to develop pavement thickness. At all other locations we have estimated 10% truck traffic. The improvements for this roadway project will include overlaying, milling and resurfacing of existing pavement, and/or full depth shoulder reconstruction. Lane configurations in some areas of the existing roadway will be modified. The data provided in the RFP utilized to determine the 18-kip wheel load are summarized below:

Figure 6: Pavement Design Parameters

Description	Data	Source
Design period	25 Yr.	Data was Provided in RFP
Average Daily Traffic (ADT) (year 2040)	Variable	Data was Provided in RFP
Percent Trucks	10%	Assumed Based on Typical Freeway
Truck Factor – HMA (30,000 lbs, Tandem axle truck load)	0.71	Assumed Based on Typical Freeway
Directional Distribution	100%	Assumed Based on Typical Freeway (One Direction)
Lane Distribution – Left-Side Base- Widening and Shoulder Reconstruction	Variable	Data was Assumed, uniform distribution for all thru lanes
Reliability	90%	Based on SHA Design Manual
Overall deviation	0.49	Based on SHA Design Manual
Design subgrade resilient modulus (MR)	5,000 psi	Data was Assumed
Initial serviceability	4.2	Based on SHA Design Manual
Pavement Type	Flexible	Based on As-built
Terminal serviceability	2.9	Based on SHA Design Manual

Description	Data	Source
Overall Drainage Coefficient	1	Based on SHA Design Manual

Pavement design results are provided in Attachment 2.



Mobility

Provide improvements that maximize vehicle throughput, minimize vehicle travel times, and create a more predictable commuter trip along IS 270.

This PTC when implemented will improve network performance by increasing throughput and minimizing travel times. VISSIM output in the RFP were used to present “Build” conditions with this PTC. RFP-provided No-Build 2040 AM and PM models were modified to reflect additional pavement at the hard shoulder running locations. In particular, Southbound I-270 was modified to reflect the HSR locations in the AM model and Northbound I-270 was modified to reflect the PM HSR conditions. No other calibration parameters in the model, such as vehicle inputs, vehicle routes, driving behavior, link behavior type, lane change distance, speed distributions, and decisions were modified.

The results of network performance are shown in Figures 3 and 4 for 2040 AM and 2040 PM. Detailed traffic review and concept evaluation templates comparing the No-Build condition and proposed PTC results are attached in the appendix of this document. These results reflect only additional lane capacity added to the model with the hard shoulder running.

The results in the tables shown in Section C. Analysis, show substantial improvement in vehicle throughput and average speed along the corridor, as well as a decrease in delay and travel time. Thus it is evident that by providing additional travel lanes on the existing shoulders at strategic locations, a faster, safer, and more predictable commuter trip along IS-270 corridor will be produced.



Safety

Provide for a safer IS 270 corridor

The additional shoulder travel lane during peak hours will reduce traffic congestion as demonstrated by traffic analysis presented in previous sections of this PTC, while potentially reducing the number of crashes in the corridor based on crash prediction model under the FHWA’s guide “ Use of Freeway Shoulder Use”. Below are some of the safety related graphs (from FHWA Guide for Use of Freeway Shoulders for Travel) that are applicable to segments for the proposed improvements on this project. They show frequencies of Fatal and Injury (FI) and Property Damage Only (PDO) crashes with or without shoulder use depending on

AADT. These charts uses 11' lanes, however our design has 12' lanes except for small segment where travel lanes are 12' and only HSR is 11'. With one foot wider lanes could potentially provide much better results than that of the graphs shown below.

Figure 7 (Conversion of 4-lane section to 6-lane section with HSR) applies to the conversion of I-270 Local 2 lanes to 3 lanes (I-270 north of MD 121). The crash frequency of FI crashes will slightly increase with use of shoulder lanes while PDO frequency will decrease with use of shoulder lanes for IS-270 AADT.

Figure 7: Conversion of 4-lane section to 6-lane section with HSR

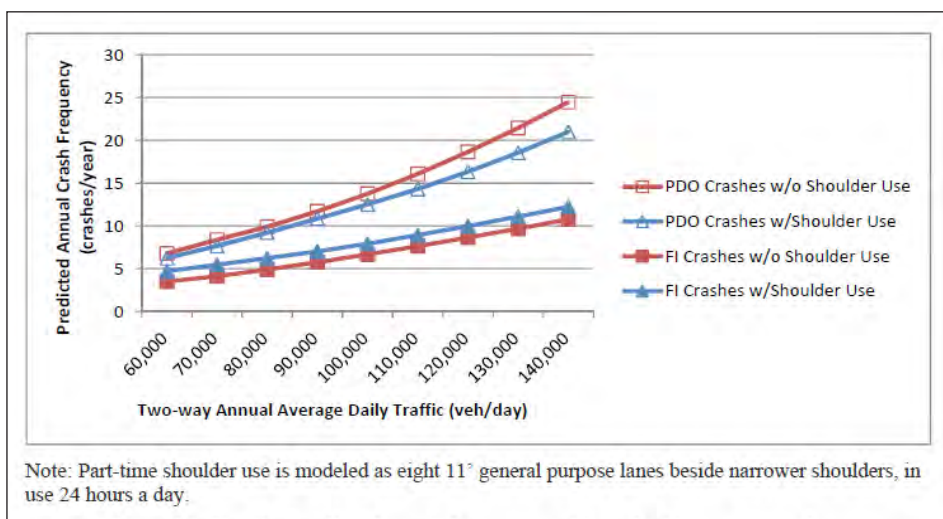


Figure 8 (Conversion of 6 lane section to 8 lane section with HSR) applies to the conversion of I-270 from 3 lanes to 4 lanes (Middlebrook Road to MD 121 and on the spurs) and have similar crash results with shoulder use.

Figure 8: Conversion of 6 lane section to 8 lane section with HSR

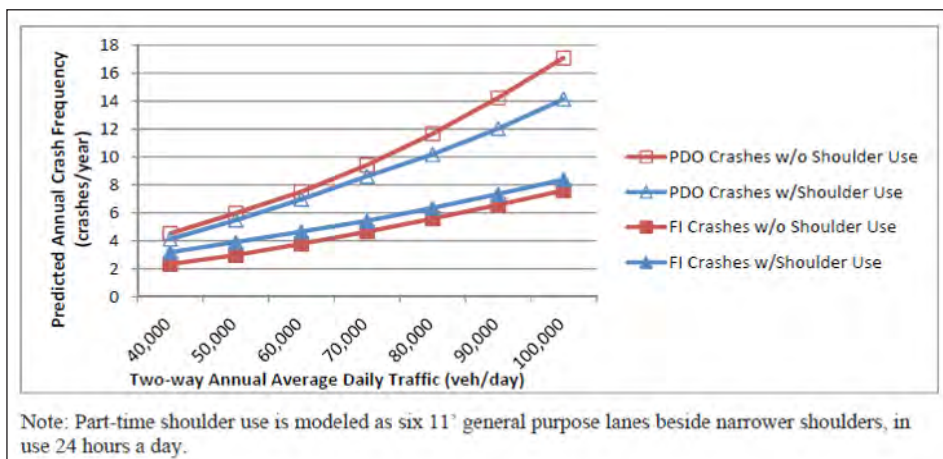


Figure 9 (Conversion of 8-lane section to 10-lane section with HSR) applies to the conversion of I-270 Express from 4 lanes to 5 lanes (Montrose Road to Middlebrook Road).

Figure 9: Conversion of 8-lane section to 10-lane section with HSR

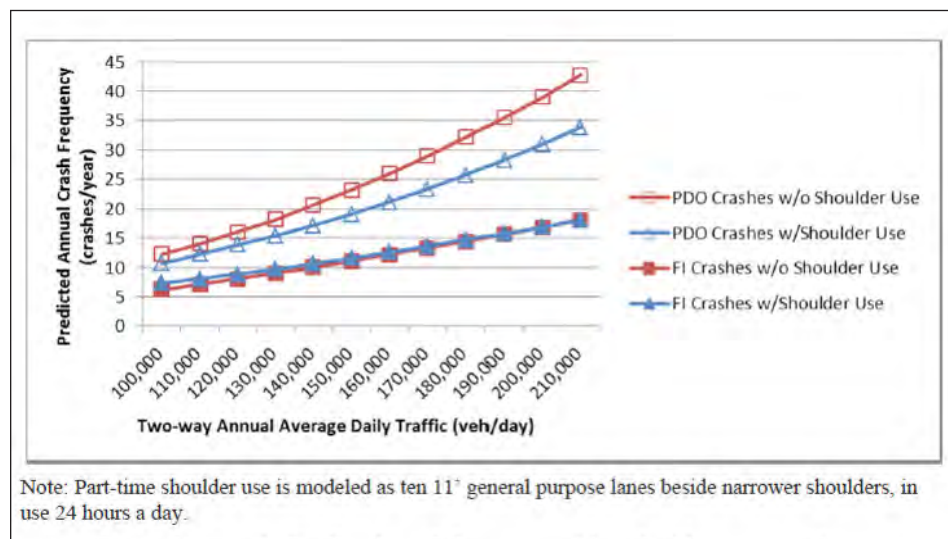
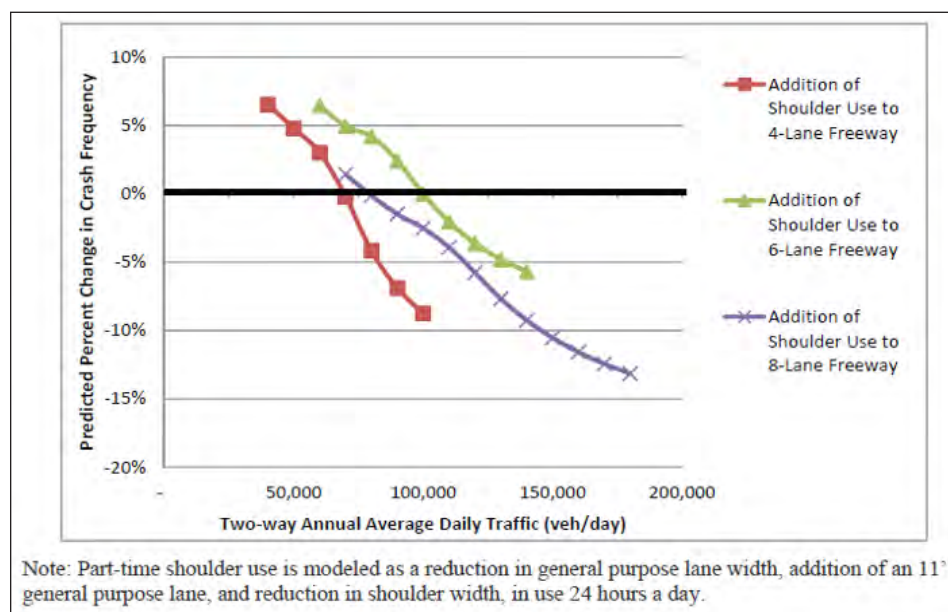


Figure 10 shows Overall percent change in crashes for each HSR conversion assuming narrowed mainline lanes. For part time usage, this percentage change would be applied to the crashes during the peak period.

Figure 10: Overall percent change in crashes for each HSR



Per FHWA's guide for "Use of Freeway Shoulder for Travel", Virginia conducted a

safety analysis of a portion of I-66 with a left-side high-occupancy vehicle (HOV) lane and a right-side part-time shoulder use. The study only included “after” data with the HOV lane and part-time shoulder use in place, and focused on crash frequency differences between the hours when the part-time shoulder use was open and closed to traffic. The study found no significant differences in crash frequency in the study area. A typical factor, high annual average daily traffic (AADT) volume, and a natural causal factor, light conditions, especially combined with motorists’ aggressive lane change behaviors in merging and diverging areas, are presumably major factors influencing crashes in the study area.



Operability/Maintainability/Adaptability

Provide improvements that minimize SHA operations and maintenance activities while being adaptable to future transportation technological advancements.

HSR operations and maintenance requirements will be similar to pavement management plans that SHA currently has in place. Maintenance issues may include:

- Under altered conditions, highway appurtenances such as signage, barriers, drains, and lights are closer to traffic and can be damaged more often and more severely than under unaltered conditions.
- In order to conduct regular maintenance, additional personnel and equipment are often needed to close lanes and provide adequate work area protection.
- Most incidents, from minor to major, require some action by personnel that involves shoulders, which in turn requires shoulders to remain closed until the incident is cleared, items are removed, or other action is completed. Typically clearance time for incidents increases with shoulder lane use for travel during peak hours.
- As emergency vehicles use shoulders to access scenes of accidents, delays in arriving on the scene can have consequent impacts on clearance time.

The system and technology such as dynamic lane management signs, related structures and poles, and other ITS devices and subsystems will be designed in accordance with MDDOT design standards.

- The field devices such SLMS and DLM signs may be mounted on gantries overhanging the shoulder lane and the vertical member of the gantry will be installed outside the clear zone or protected behind guard rail. These field devices will be maintained via bucket truck with the required maintenance of traffic during the off peak period.
- The installation of communications fiber and power will be constructed and installed in accordance with MDDOT and SHA standards to support the ease

Adverse effects of HSR on incident clearance times can be effectively mitigated through the implementation of a Towing and Recovery Incentive Program (TRIP), as Parsons has proposed in a separate PTC.

of access and routine maintenance.

- Parsons' Intelligent NETWORKS® will be maintained on its own network and monitored and managed independent of the CHART System and will not impact maintenance of CHART.



Well-Managed Project

Provide a Project Management and Work Plan that addresses communications, coordination and risk management, achieves a collaborative partnership with all members of the project team and stakeholders, and successfully advances the project goals.

One attractive characteristic of strategically located HSR is that the design-builder can expeditiously create smaller packages based on the section/sections that deliver the best improvements in throughput. In implementing this selection process Parsons will rank the packages in terms of mobility and safety, and the highest ranking packages will be designed and constructed first. Additionally, smaller packages will be easier to manage and construct with only localized impact on current traffic.

Parsons will prepare a complete project management, risk management, and work plan for each of the packages outlining means and method of communicating and coordinating with all stake holders and other packages. Since the corridor encompasses multiple localities, two counties and numerous cities; smaller packages aids in coordinating and developing partnerships with these localities, counties, and cities.

D. POTENTIAL IMPACTS

User Impacts: Hard shoulder running will be new to some users of this corridor so there will be a need for public information and education. The use of proper static and DLM signs, pavement markings, and other latest technology to identify proper use of HSR is part of Parsons' mitigation strategy to reduce user impact. Additionally, Parsons will develop maintenance of traffic plans to minimize the impact of construction as traffic congestion during construction mitigation measures. Since more than 50% of the construction will only require mill and overlay, the impact on existing traffic will not be as severe as it would be for full reconstruction. Parsons will develop a public outreach strategy to minimize user impact through advance notifications via website and other technology tools in addition to local public meeting.

Right-of-Way: All HSR work will be done within the footprint of the existing roadway therefore Parsons does not anticipate a need for additional right-of-way. We performed a cursory review of available noise studies to gain an understanding of likely noise wall requirements; however, we will perform a detailed noise analysis to determine actual noise barrier requirements and the

need for additional right-of-way.

Geotechnical: The overhead cantilever and gantry structures are still under consideration and locations are not finalized; therefore the detailed geotechnical investigation for each of the structures has not been performed. However, Parsons will prepare a geotechnical investigation program for the anticipated gantry and overhead sign foundation for the proposed for this project.

All geotechnical field investigation will be performed as per the SHA Geotechnical Performance Specification. Subsurface explorations and laboratory testing will be performed in conformance with appropriate Administration, AASHTO and ASTM policies and specifications. The pertinent subsurface information obtained from this subsurface exploration and laboratory testing will be used for the evaluation and design of the proposed structure. However, for estimating purposes all ITS gantry and overhead sign foundations designs will be based on actual geotechnical investigation. For the cost estimate purpose, as-built plans were used for typical foundation and SHA STD. 801.01, 803.07, 803.08

Utilities: Parsons will examine the existing storm drainage system for adequate capacity due to proposed changes in the cross slope of the shoulder. Additional median inlets may be required to keep spread within allowable limits, which might also entail new storm drain pipes to connect to the existing system.

There are existing underground utilities for electric and communication. Our understanding is that there will be at least four dark fiber optic cables and two spare conduits available for project use. If conflicts are discovered between existing utilities and proposed work, Parsons will develop a mitigation strategy which incorporates avoidance or minimization of the conflict, or worst case on relocation of the existing utility. Our expectation based on the available information and in the absence of a detailed SUE is that there will be minimum impact on existing utilities.

Environmental Permitting: From an air quality perspective, HSR generally provides benefits by increasing traffic speeds along the corridor. A unique difference from traditional widening is the concern of dust accumulation. Dust may accumulate when the shoulder is closed during the off peak hours and be stirred up each day when the shoulder opens. In general, air quality requirements are rarely an issue on Maryland State Highway Administration projects outside of the NEPA phase.

From a noise perspective, HSR meets two parts of the Type I project definition: The addition of a thru traffic lane (including for HOV) and the restriping of existing pavement to add a thru lane or auxiliary lane. For Type 1 projects, a noise analysis is required by Federal noise regulations and SHA noise Policy. Where future noise levels are determined to represent a significant increase over existing levels or exceed the Noise Abatement Criteria (even if already exceeded in the existing condition), noise abatement is required where feasible and reasonable. A summary review of potential Noise wall locations is provided in attachment #5.

From a stormwater management perspective, HSR has low impacts. There are no Maryland State Highway Administration requirements for resurfacing the existing pavement for Hard Shoulder Running. Modifications where MD SHA is concerned include excavating the full depth of the existing pavement on graded shoulder and changing the cross slope of a roadway leading to a change in drainage (outside vs median drainage). If the point of interest of the roadway drainage is also changed and the new impervious area is added, Parsons understand that a permit from Maryland Department of the Environment would be required, and we will include the appropriate process and scheduling in our estimates.

Local Community: Since most of the community has seen hard shoulder running in other local communities, the learning curve of using this PTC will not be significant. To assure that the impacts are minimal as possible Parsons will prepare and manage an outreach program to notify and educate the traveling public and all appropriate jurisdictional entities.

Safety: The safety impacts of Hard Shoulder Running can be summarized as a balance between the effects of reducing congestion related crashes and increasing geometry related crashes. Motorists utilizing Hard Shoulder Running see a reduction in congestion intensity and duration but must navigate suboptimal geometry such as reduced/no shoulder, reduced lane widths and reduced offsets from obstructions/barriers.

A report published by FHWA in February 2016 “Use of Freeway Shoulders for Travel” performed a safety analysis of the effects of Hard Shoulder Running on freeways according to the methodology provided in the Highway Safety Manual. This analysis was performed for 4, 6 and 8 lane freeways with Hard Shoulder Running added in both directions. For the analysis, shoulder widths were set to the minimum that the Highway Safety Manual has crash modification factors for, and the remaining lanes were reduced in width to represent common implementations of Hard Shoulder Running. The results of this analysis are discussed earlier in this PTC.

The conclusions of the analysis found that as ADT and by extension congestion increased, the use Hard Shoulder Running showed a net reduction in predicted crashes. This trend was more pronounced as the number of lanes on the freeway segment increased with the eight lane section showing the greatest reduction in crashes at over 10%. Overall, Hard Shoulder Running was shown to reduce Property Damage Crashes, slightly increase Fatal/Injury crashes on four and six lane freeways and have little to no effect on Fatal/Injury Crashes on eight lane freeways.

Life-Cycle: During the design phase of the project, the engagement and involvement of key stakeholders such as Montgomery and Frederick Counties are important to successful planning and implementation of the hard shoulder running treatments, and future operational roadway maintenance improvements. Public education and outreach is also a major component of the administrative risk requiring public input and acceptance through continuous program planning and outreach. A major consideration also during implementation is the inclusion of key regional and Statewide transportation agency stakeholders in the early design and

Report Link:
<http://www.ops.fhwa.dot.gov/publications/fhwahop15023/fhwahop15023.pdf>

implementation activities so there clear understanding of the contract administration, design, implementation and maintenance goals across the project team.

Technology: Technology impacts are expected to be limited to those associated with ensuring that appropriate power and communications capacity is available for connection of all ITS devices on the corridor, and that any construction associated with ITS devices and hard shoulder improvement is completed only after a full analysis of existing utilities is conducted and proper care is exercised during construction. Parsons will examine in detail the utility requirements (e.g., available fiber versus communications needs, etc.) during the design process to ensure that all requirements are satisfied.

Infrastructure Costs: Figure 11 is a high level estimate of the costs for installation of the field infrastructure for HSR System.

Figure 11: Estimate for Installation of HSR Field Infrastructure

Item	Unit	Qty	Unit Cost	Total Cost
Civil Costs – HSR				
Overlay and Wedge Asphalt Mix 12.5 mm For Surface	TON	1,7531	\$100.00	\$1,753,067
Milling	SY	8,0601	\$4.50	\$362,704
			Subtotal	\$2,115,77
Civil Costs – New Pavement				
Asphalt Mix 12.5 mm For Surface	TON	4,365	\$100.00	\$436,508
Superpave Asphalt Mix 25.0 mm for Surface	TON	17,460	\$200.00	\$3,492,064
Aggregate Base	SY	40,139	\$20.00	\$802,773
			Subtotal	\$2,115,77
Civil Costs – Stripping				
Eradication of Exist. Pavt. Marking	LF	70,5650	\$0.50	\$352,825
New Pavement Marking	LF	70,5650	\$2.00	\$1,411,300
			Subtotal	\$1,764,12
Civil Costs – Incidental				
Concrete Barrier	LF	2,819	\$100.00	\$281,900
Guardrail	LF	1,950	\$25.00	\$48,750
			Subtotal	\$330,650
Civil Costs – Signs				
Static	Each	76	\$5,000.00	\$380,000
			Subtotal	\$380,000
Civil Costs – MOT				
MOT	LS	50% of the total		\$6,000,000

Item	Unit	Qty	Unit Cost	Total Cost
Contingency	LS	25% of total		\$3,000,000
Total:				\$18,321,891

ITS

Item	Unit	Qty	Unit Cost	Total Cost
ITS Field Equipment Costs				
HSR sign structures/poles	EA	60	\$7,500	\$450,000
HSR Message Signs with Controllers (32x32)	EA	60	\$5,500	\$330,000
ATM Gantries (sign structures with foundations)	EA	0	\$200,000	\$-
Dynamic Message Signs (Queue Warning and incident Mmmt - freeway)	EA	0	\$90,000	\$-
Variable Speed Limit Signs (2-character)	EA	0	\$30,000	\$-
VSL Poles (15') with foundations	EA	0	\$4,000	\$-
Equipment Cabinets (NEMA) Pole-Mounted	EA	60	\$2,500	\$150,000
Lane Management Signs (Arrow Signs)	EA	0	\$18,000	\$-
Dynamic HOV Signs	EA	0	\$40,000	\$-
New Mainline VDS (Freeway) - Side-fire Radar	EA	45	\$18,000	\$810,000
Arterial Detection	EA	0	\$25,000	\$-
CCTV Cameras (for Hard Shoulder Running)	EA	120	\$4,500	\$540,000
CCTV Camera Poles	EA	120	\$8,000	\$960,000
CCTV Camera Installation	EA	120	\$2,000	\$240,000
Arterial DMS	EA	0	\$40,000	\$-
Traffic Signal System Upgrades	LS	0	\$2,000,000	\$-
Ramp Metering System Upgrades	EA	0	\$15,000	\$-
Power Service for ITS Cabinets/Equipment	EA	120	\$15,000	\$1,800,000
Restriping	EA	1	\$800,000	\$800,000
Shoulder Painting	EA	0	\$500,000	\$-
Traffic Control	LS	1	\$400,000	\$400,000
TOTAL - ITS Field Equipment Costs				\$6,480,000
Subtotal				\$6,480,000

Systems Integration

ATMS Software	LS	1	\$250,000	\$250,000
Systems Integration	LS	1	\$200,000	\$200,000

Item	Unit	Qty	Unit Cost	Total Cost
System Testing	LS	1	\$300,000	\$300,000
Central System Hardware	LS	1	\$100,000	\$100,000
			Subtotal	\$850,000
System Testing				
Master Test Plan	LS	1	\$40,000	\$40,000
Factory Acceptance Test Procedures	LS	1	\$40,000	\$40,000
Conduct FAT and Submit report	LS	1	\$40,000	\$40,000
Equipment Commission Test Procedures	LS	1	\$50,000	\$50,000
Conduct ECTs and Submit Report	LS	1	\$25,000	\$25,000
Develop System Acceptance Test Procedures	LS	1	\$100,000	\$100,000
Conduct ATP and submit Report	LS	1	\$40,000	\$40,000
			Subtotal	\$850,000
System Documentation and Training				
System O&M Plan	LS	1	\$40,000	\$40,000
System Maintenance Manuals	LS	1	\$40,000	\$40,000
System User Manuals	LS	1	\$25,000	\$25,000
System Admin Manuals	LS	1	\$25,000	\$25,000
As-Built Drawings	LS	1	\$30,000	\$30,000
Conduct Maintenance Training	LS	1	\$30,000	\$30,000
Conduct User Training	LS	1	\$20,000	\$20,000
Conduct System Admin Training	LS	1	\$20,000	\$20,000
			System Documentation and Training Subtotal	\$230,000
			Subtotal	\$7,895,000
			Contingency (25%)	\$1,973,750
			Total Capital Costs:	\$9,868,750

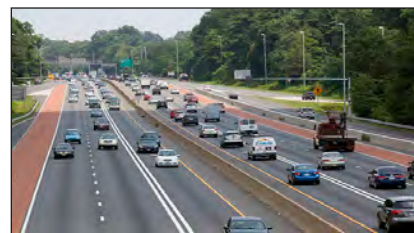
Fiber Optic Communications (GB Ethernet)

Item	Unit	Qty	Unit Cost	Total Cost
ITS Communication System Costs				
Layer 2 Communication Switches	EA	175	\$5,000	\$875,000
Layer 3 Communication Switches	EA	10	\$10,000	\$100,000
SFP GBICs (Short Haul)	EA	350	\$600	\$210,000
SFP GBICs (Long Haul)	EA	40	\$2,000	\$80,000
72 SMFO Trunk Backhaul Cable	LF	337920	\$3.20	\$1,081,344

Item	Unit	Qty	Unit Cost	Total Cost
6 SMFO Distribution Cable	LF	30000	\$2.50	\$75,000
3" PVC Conduit	LF	337920	\$14.00	\$4,730,880
Pull Boxes	EA	200	\$3,000.00	\$600,000
Splice Closures	EA	128	\$6,500.00	\$832,000
Fiber Termination Units	EA	128	\$1,200	\$153,600
Mid Span Splices	EA	36	\$2,000	\$72,000
			Subtotal	\$8,809,824
System Testing				
System Testing (includes test Plan, FATS, ECTS and ATPS)	LS	1	\$200,000	\$180,000
Master Test Plan	LS	1	\$20,000	\$20,000
Factory Acceptance Test Procedures	LS	1	\$20,000	\$20,000
Conduct FAT and Submit report	LS	1	\$20,000	\$20,000
Equipment Commission Test Procedures	LS	1	\$25,000	\$25,000
Conduct ECTs and Submit Report	LS	1	\$25,000	\$25,000
Develop System Acceptance Test Procedures	LS	1	\$50,000	\$50,000
Conduct ATP and submit Report	LS	1	\$20,000	\$20,000
			Subtotal	\$180,000
System Documentation and Training				
System Documentation and Training (includes O&M Plan, Maintenance Manuals, User Manuals , System Admin Manuals, Training Documentation and Training Execution)	LS	1	\$100,000	\$100,000
System O&M Plan	LS	1	\$20,000	\$20,000
System Maintenance Manuals	LS	1	\$20,000	\$20,000
System User and Admin Manuals	LS	1	\$25,000	\$25,000
System Admin Manuals	LS	1	\$25,000	\$25,000
As-Built Drawings	LS	1	\$15,000	\$15,000
Conduct Maintenance Training	LS	1	\$10,000	\$10,000
Conduct User Training	LS	1	\$10,000	\$10,000
Conduct System Admin Training	LS	1	\$10,000	\$10,000
			System Documentation and Training Subtotal	\$100,000
			Subtotal	\$9,089,824
			Contingency (25%)	\$2,272,456
			Total Capital Costs:	\$11,362,280
			POTENTIAL TOTAL COST	\$39,552,921

E. OTHER PROJECTS

A prime example of implementation of temporary added capacity paired with ATM techniques is the implementation of ATM on I-66 in Fairfax and Loudoun Counties in Northern Virginia. Variable speed limits, dynamic lane management, hard shoulder running, and adaptive ramp metering are the key ATM elements of this corridor. Parsons developed the ATM software solution, installing our Intelligent NETworks® Advanced Transportation Management System (ATMS) Software to enable the strategies listed above.



I-66 (Between Merrifield, VA and Washington DC)

- Outside shoulders used as a HSR Signs are placed strategically
- Shoulder lane is paved with red material to distinguish
- Double white lanes were placed to indicate area where merging and diverging is allowed

ROUTE 8 ACTIVE TRAFFIC MANAGEMENT PROJECT

Parsons has implemented the Route 8 Active Traffic Management Project and Traffic Control Surveillance System; this includes VSL, dynamic lane control, and variable message signs. Some places where elements of this PTC have been used are listed in Section C.

Mr. Kei Hung TAO

Chief Engineer / Major Works 1-2

Highways Department, Major Works Project Management Office, Major Works Office (1)

6th Floor, Ho Man Tin Government Offices, 88 Chung Hau Street, Ho Man Tin, Kowloon

Tel: +852-2762-3626

Email: cemw1-2.mw@hyd.gov.hk



I-35 (Minneapolis, MN)

- Inside shoulder was converted to HSR
- Utilizes variable speed limits
- MnDOT states that the facility is operating safely and more efficiently

ADDITIONAL PROJECTS

The projects listed to the right implemented HSR techniques as a PBPD to manage incidents and congestion. The project provided benefits such as add capacity, improved throughput, improve safety, cost saving up to 40% with environment benefits, and faster deployment due to no need for ROW acquisition.

Additional to these project, internationally there have been case studies that demonstrate significant improvement in traffic congestion. Following are the experience on pilot project of 18 km scheme west of Birmingham England which has similar attribute as we are proposing such as HSR, variable speed limits, and overhead lane/speed indicator:

- Peak hour journey time down 10-25% variability down 22%
- Personal injury accident down 58%
- Emissions down by 10%
- Fuels consumption down by 4%
- 94% compliance with variable speed limits
- Improved incident management



L-110/I-10 L.A. Metro Express lanes

- Congestion reduction pilot project
- Increase speed in general purpose lanes

We plan to use our lesson learned from our past projects as well as other various projects implemented throughout the world. Here are some examples to make

traditional HSR cheaper and simpler:

- Define operating model early ... and make it resilient to equipment faults
- Establish a formal hazard review process and collect input data
- Over-engineer the initial scheme, but revisit the design for future deployments
- Be prepared to change operational model as gain experience
- Consider key cost drivers up front - density of signage, gantries vs cantilevers, overhead lane indicators vs generic variable message signs, system for hard shoulder checking
- Involve maintenance organizations during scheme design
- Worry about consistency of signage and lane markings
- Establish strategy for compliance
- No emergency refuge area (space restrictions as well as assumption that they do not add safety)
- Detail of the presentation by David Kamnitze can be found at following link:

<https://www.dot.state.oh.us/engineering/OTEC/2014%20OTEC%20Presentations/Wednesday,%20Oct.%2029/54-C223-225-830-10/Kamnitze.pdf>

F. ADMINISTRATIVE RISK

The main administrative risk is the addition of noise walls which is outside the scope of this project. We have provided a preliminary analysis of the modified locations in Attachment 5. The other item that can of concern if this trips a corridor wide EIS. This could slow the schedule down considerably.

The potential of enforcement of the use of the shoulders will need to be addressed with the enforcements divisions of the state and local entities.

The Environmental Protection Agency (EPA) requires air quality analysis of federal transportation projects in these designated areas for the transportation-related pollutant. This could have 3 to 6 months of schedule impact at a minimum.

The system design requires all utilities and services be coordinated with external agencies to secure permits and schedules for third party-provided design or services such as power and communications. These service will be coordinated to minimize the project implementation schedule. Procurement of long lead system items will be brought forward in the project schedule to accelerate the procurement for on-time delivery. The overall system design and integration will be coordinated with SHA to prevent construction impacts to the communications backbone or system integration with the CHART System.

G. DESIGN-BUILD RISK

The PTC provided herein provides for moving the HOV lane onto the Hard Shoulder which requires a modification of the IMR by the approving authorities to

allow this movement to happen. This is a schedule risk that needs to be noted since it is not internal to the SHA approvals.

The design-builder will have substantial risk on design and cost if FHWA will not approve an HSR lane width of less than 12'. Our current PTC proposes about 2000' of 11 feet wide travel lane on the left shoulder between stations 1600+00 to 1620+00 on southbound lanes of IS-270. The design-builder will be required to build an additional 1' of pavement width in this zone to make 12' HSR lanes and maintain existing shoulder width. This will also require to remove and reinstall considerable length of guard rails. The addition of new pavement will require the design-builder to perform stormwater management and drainage design and will result in additional cost to the project. The addition of new stormwater management and drainage structures may in turn impact existing utilities.

The implementation of HSR will reduce the distance between the face of the pier and edge of the travel lane by moving vehicular travel closer to the existing bridge piers. The existing bridge pier will have to be evaluated to see if it can resist the collision force when the pier is less than 30' from the edge of travel lane. If the bridge pier can resist collision force, then bridge pier protection will not be required. A Bridge pier protection system will be required for all structures adjacent to HSR (less than 30' from edge of travel lane) that cannot resist vehicle collision force. The existing bridge piers will required to be protected with a 42" high barrier when located between 12' and 30' from the edge of travel lane. The existing bridge piers will be required to be protected with 54" high barrier when located within 12' from the edge of the travel lane. These items add considerable risk since information is not available about existing piers structural adequacy to withstand a vehicular collision force.

Geotechnical information in the RFP – The RFP provided a significant amount of information on southern half of the corridor from I-495 to MD 109. This data was used to determine full depth or additional pavement on existing shoulder for HSR but would need to be verified further in the field. While the area north of MD-109, the shoulder thickness data was gathered from the existing as-built plans which were developed in early 1960's. This would require significant data collection during design to ensure proper pavement section development. Therefore, we have assumed conservatively that we must plan to replace existing shoulder with new full depth pavement section. For those areas where more recent data is available, it appears that only a wedge and overlay of the existing shoulder is needed. However, there is a risk that this data is not representative of the existing shoulder condition.

The construction program on the roadway requires proper MOT plans to be developed during the design phase to protect the travelling public and the workers plus minimize the impact of the travelling public during construction times. Other Design-Build risks would be drainage configuration of adding hardscape and less grade of shoulders, movement of permanent barrier, and more roadway construction than expected.

H. COST/SCHEDULE BENEFIT

This PTC provides a large benefit to SHA by giving additional throughput without buying additional right-of-way. The inclusion of the ATM components provides a low-cost solution to support HSR without requiring modifications to the CHART system and minor impacts to the roadway infrastructure. The peak period user costs from the RITIS database indicate the 2015 AM (6-10am) cost is \$10,537,944 and 2015 PM (3-7pm) cost is \$42,291,917. The 2040 VISSIM analysis shows substantial improvement in the total vehicle hours of delay with a reduction of 27 percent in the AM peak hour and 17 percent in the PM peak hour. The HSR alternative is estimated to reduce the annual weekday user cost per hour by approximately \$11.3 million in the AM peak hour (from \$42.5 million to \$31.2 million), approximately \$7.4 million in the PM peak hour (from \$44.0 million to \$36.6 million). These user cost reductions would amount significant benefits compared to the estimated implementation cost of \$40,000,000.

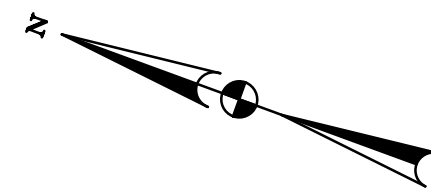
I. MISCELLANEOUS

Any additional information that would assist the Administration in the review of this PTC.

ATTACHMENTS:

1. IS-270 Design Plans
2. Pavement Design Summary
3. HSR DLM sign Location Table
4. VISSIM Run
5. Potential Noise Barrier Locations
6. Design Exception

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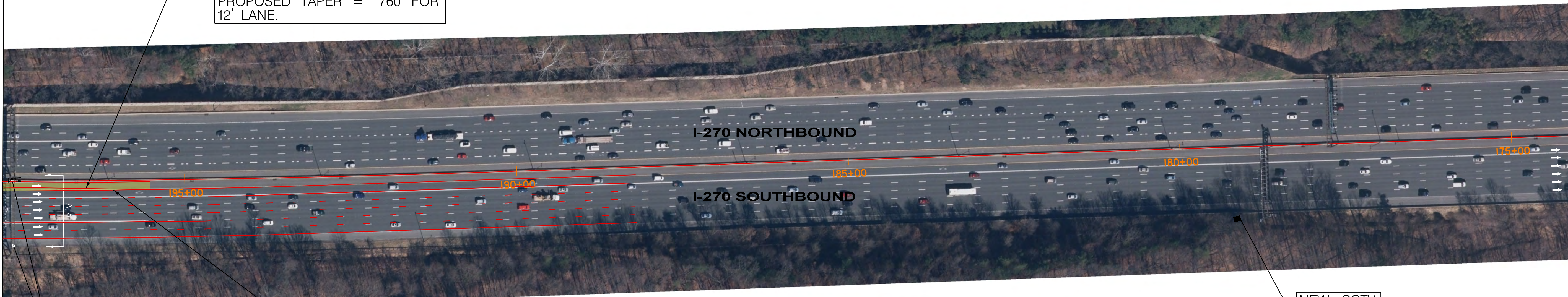
TO MONTROSE ROAD

PER AASHTO 2011 REQUIREMENT
SECTION 10, PG. 75:
50:1 MIN. TAPER LENGTH FOR
LANE REDUCTION

PROPOSED TAPER = 760' FOR
12' LANE.

AT 167+90
2 VSL ON EXISTING GANTRY
+ NEW RTMS
(NOT SHOWN ON PLANS)

MATCH LINE - SHEET NO. 2

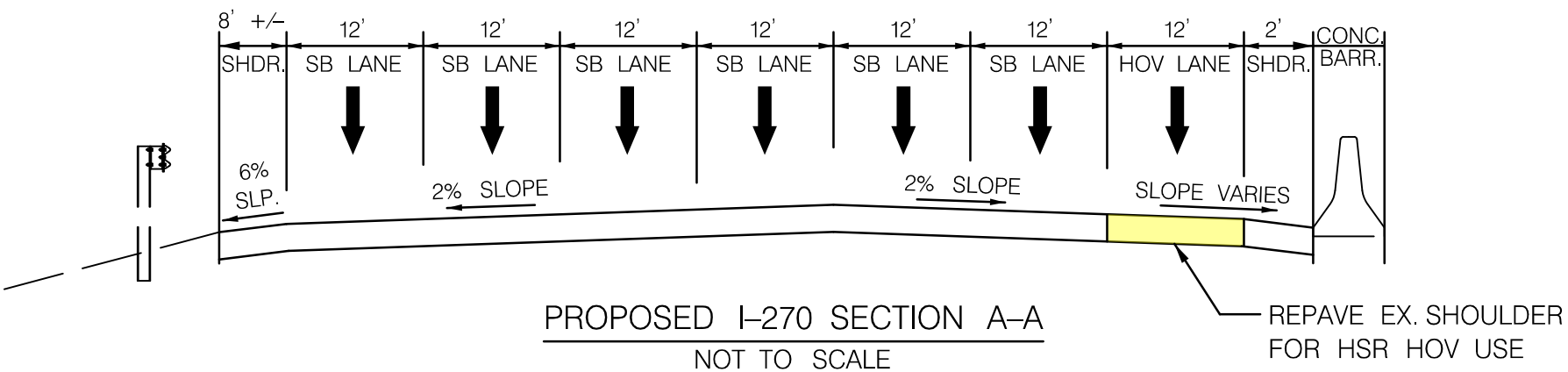
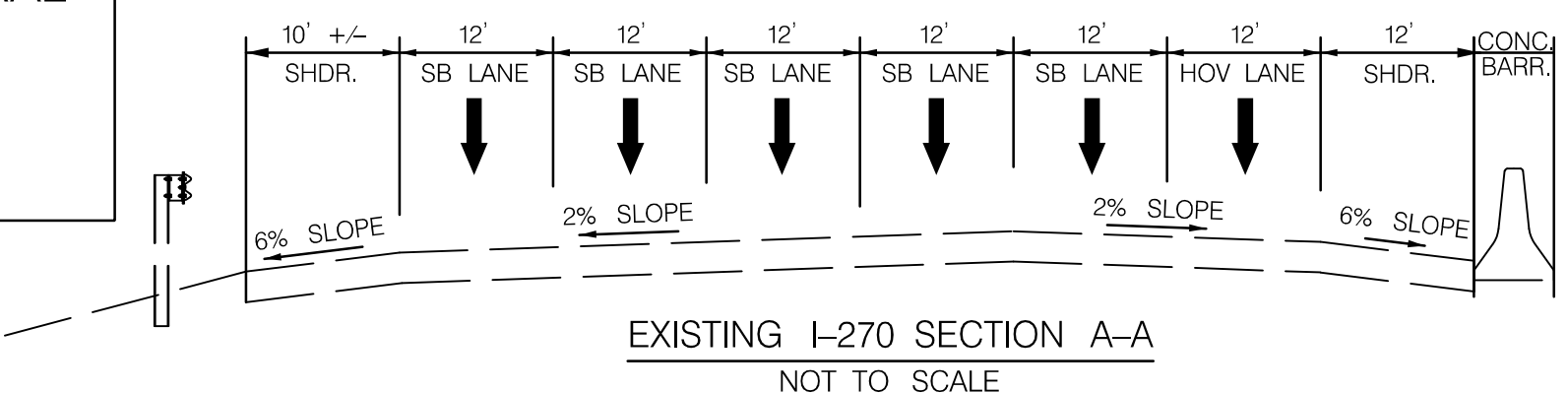


2 VSL ON EXISTING GANTRY
+ VDIS + NEW RTMS

MD 189 AM IMPROVEMENT.
HSR HOV FOR INSIDE SHOULDER OF I-270 SB
MAINLINE. EXISTING HOV LANE BECOMES GENERAL
PURPOSE LANE. HSR HOV FROM NORTH OF
MD 189 STARTING AT MAINLINE TO CD SLIP
RAMP TO MERGE POINT OF CD AND MAINLINE.
APPROXIMATELY 13200' (~ 2.5 MI)

NEW CCTV
CAMERA

TO I-495

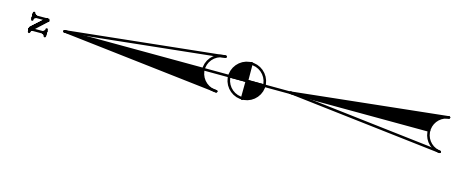


LEGEND			
NEW CONSTRUCTION		STOP BAR	
HARD SHOULDER RUNNING		ADVANCE WARNING DEVICE	
PROPOSED PAVEMENT MARKING		SIGN	
		RAMP METER DETECTOR	
		PROPOSED RTMS	
		EXISTING RTMS	

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

APPR CHECK DRAWN DESIGN	I-270 INTERCHANGE IMPROVEMENT PRELIMINARY ENGINEERING	CONTRACT NO. PROPOSAL
	I-270 SPUR TO MONTROSE ROAD	DRAWING NO.
	DATE: 11/15/16	SCALE: 1" = 80'

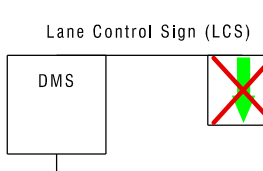
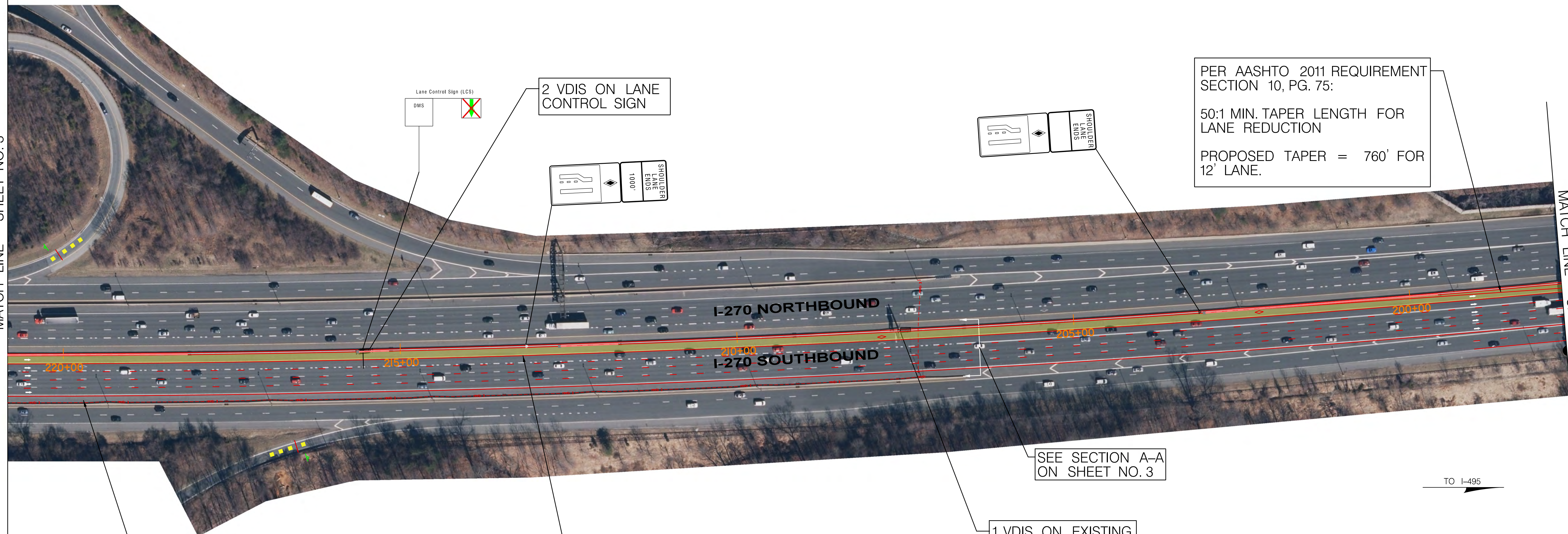
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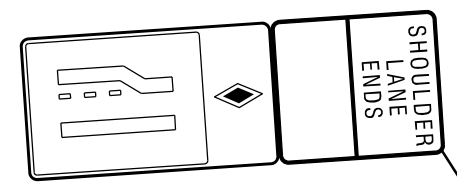
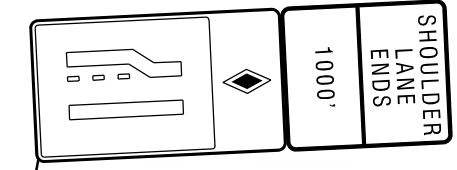
TO MONTROSE ROAD

MATCH LINE - SHEET NO.3

MATCH LINE - SHEET NO.1



2 VDIS ON LANE CONTROL SIGN



PER AASHTO 2011 REQUIREMENT SECTION 10, PG. 75:
 50:1 MIN. TAPER LENGTH FOR LANE REDUCTION
 PROPOSED TAPER = 760' FOR 12' LANE.

11' + WIDE SHOULDER FOR EMERGENCY REFUGE AREA

MD 189 AM IMPROVEMENT. HSR HOV FOR INSIDE SHOULDER OF I-270 SB MAINLINE. EXISTING HOV LANE BECOMES GENERAL PURPOSE LANE. HSR HOV FROM NORTH OF MD 189 STARTING AT MAINLINE TO CD SLIP RAMP TO MERGE POINT OF CD AND MAINLINE. APPROXIMATELY 13200' (~2.5 MI)

SEE SECTION A-A ON SHEET NO.3

1 VDIS ON EXISTING STRUCTURE

TO I-495



LEGEND

- | | | | | | |
|---------------------------|--|------------------------|--|---------------------|--|
| NEW CONSTRUCTION | | STOP BAR | | RAMP METER DETECTOR | |
| HARD SHOULDER RUNNING | | ADVANCE WARNING DEVICE | | PROPOSED RTMS | |
| PROPOSED PAVEMENT MARKING | | SIGN | | EXISTING RTMS | |

PRELIMINARY PLANS
 DO NOT USE FOR CONSTRUCTION

APPR | CHECK | DRAWN | DESIGN

**I-270 INTERCHANGE IMPROVEMENT
 PRELIMINARY ENGINEERING**

I-270 SPUR TO MONTROSE ROAD

DATE: 11/15/16

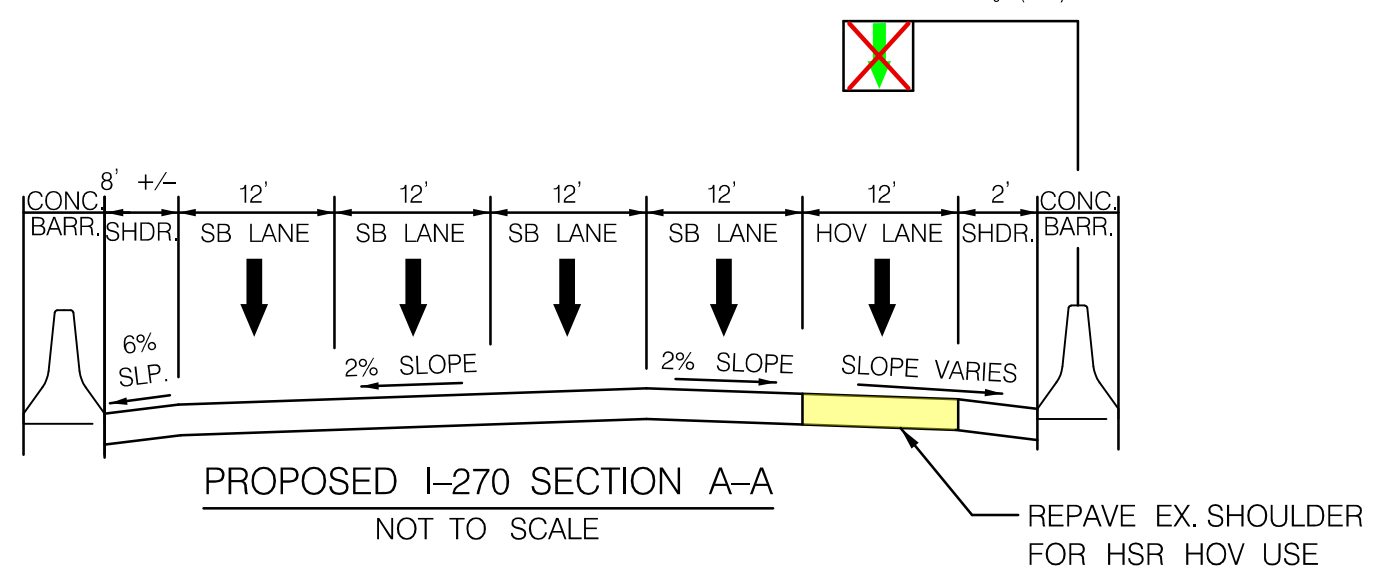
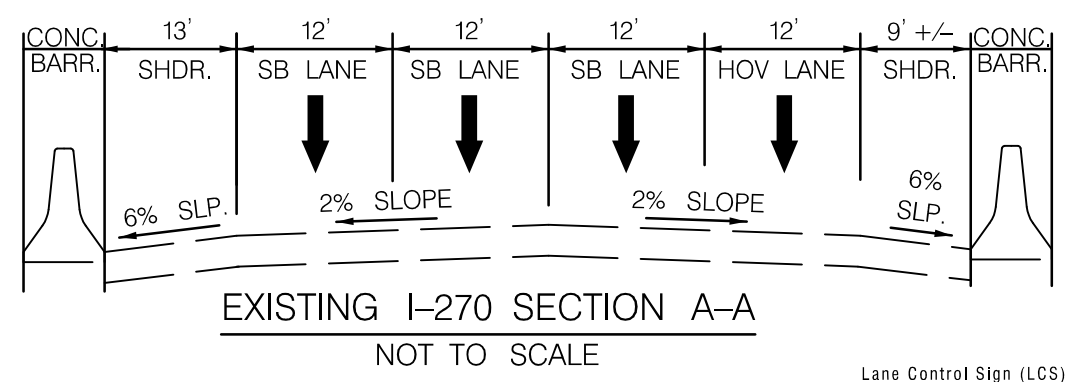
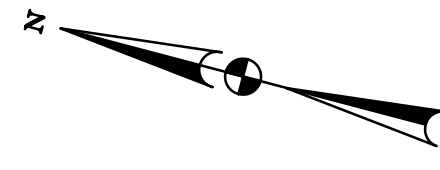
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PROPOSAL

DRAWING NO.

SHEET NO.
2 OF 66

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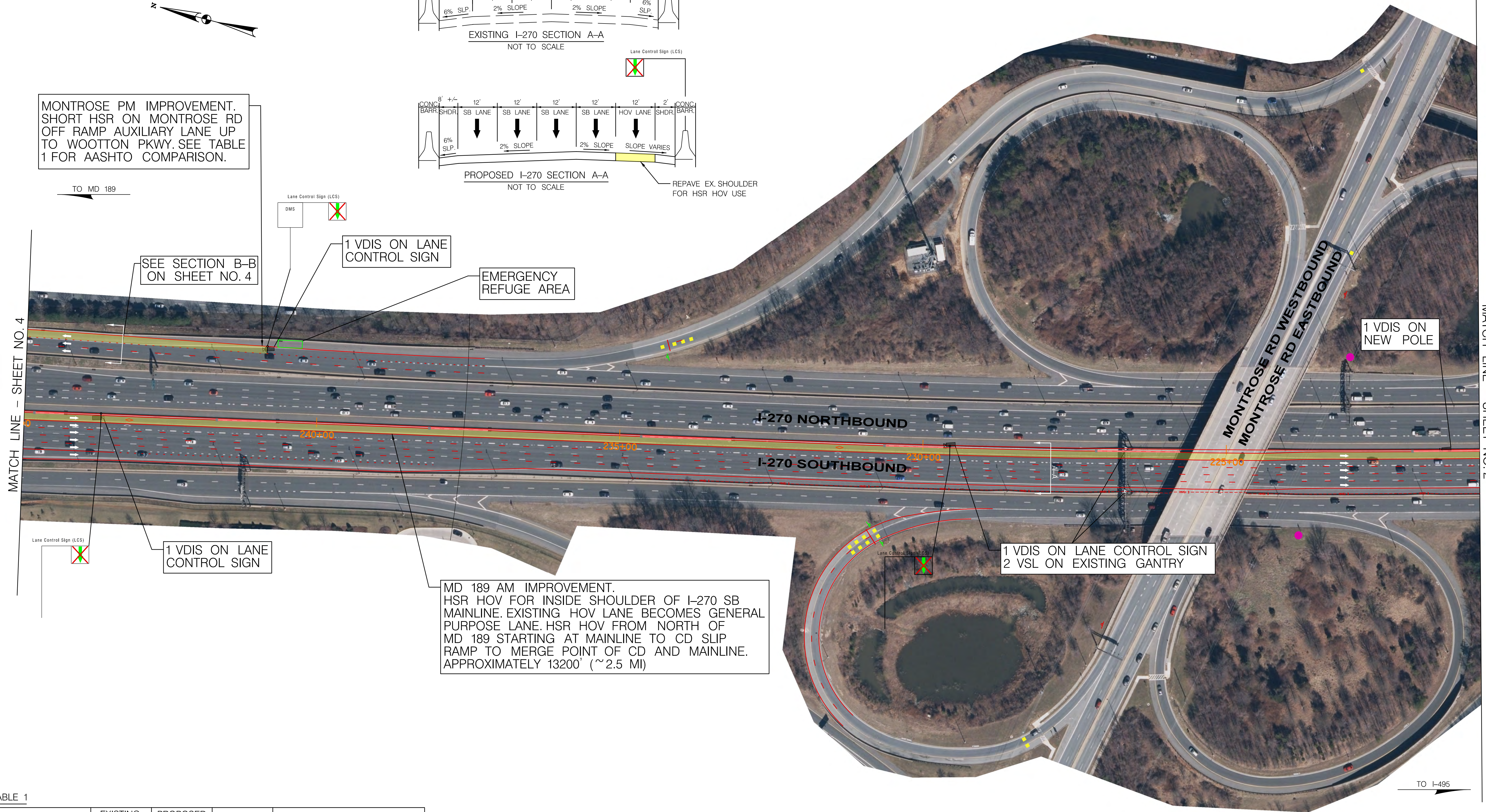


MONTROSE PM IMPROVEMENT. SHORT HSR ON MONTROSE RD OFF RAMP AUXILIARY LANE UP TO WOOTTON PKWY. SEE TABLE 1 FOR AASHTO COMPARISON.

TO MD 189

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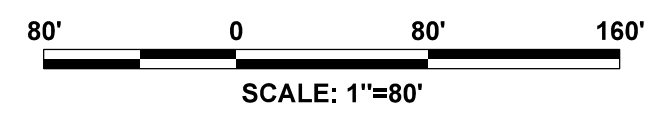
MATCH LINE - SHEET NO. 2



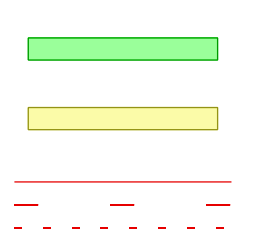
MD 189 AM IMPROVEMENT. HSR HOV FOR INSIDE SHOULDER OF I-270 SB MAINLINE. EXISTING HOV LANE BECOMES GENERAL PURPOSE LANE. HSR HOV FROM NORTH OF MD 189 STARTING AT MAINLINE TO CD SLIP RAMP TO MERGE POINT OF CD AND MAINLINE. APPROXIMATELY 13200' (~2.5 MI)

TABLE 1

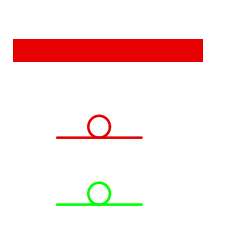
LOCATION	EXISTING LENGTH	PROPOSED LENGTH	AASHTO	NOTES
RAMP FROM MONTROSE RD TO I-270 NB	720'	2580'	1120'	NO ACCEPTION NEEDED



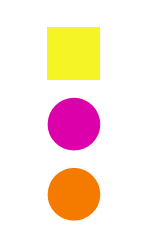
LEGEND
 NEW CONSTRUCTION
 HARD SHOULDER RUNNING
 PROPOSED PAVEMENT MARKING



STOP BAR
 ADVANCE WARNING DEVICE
 SIGN



RAMP METER DETECTOR
 PROPOSED RTMS
 EXISTING RTMS



PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

APPR CHECK DRAWN DESIGN

**I-270 INTERCHANGE IMPROVEMENT
PRELIMINARY ENGINEERING**

MONTROSE ROAD TO MD 189

DATE: 11/15/16

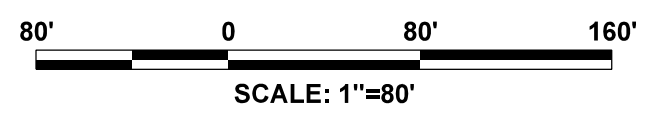
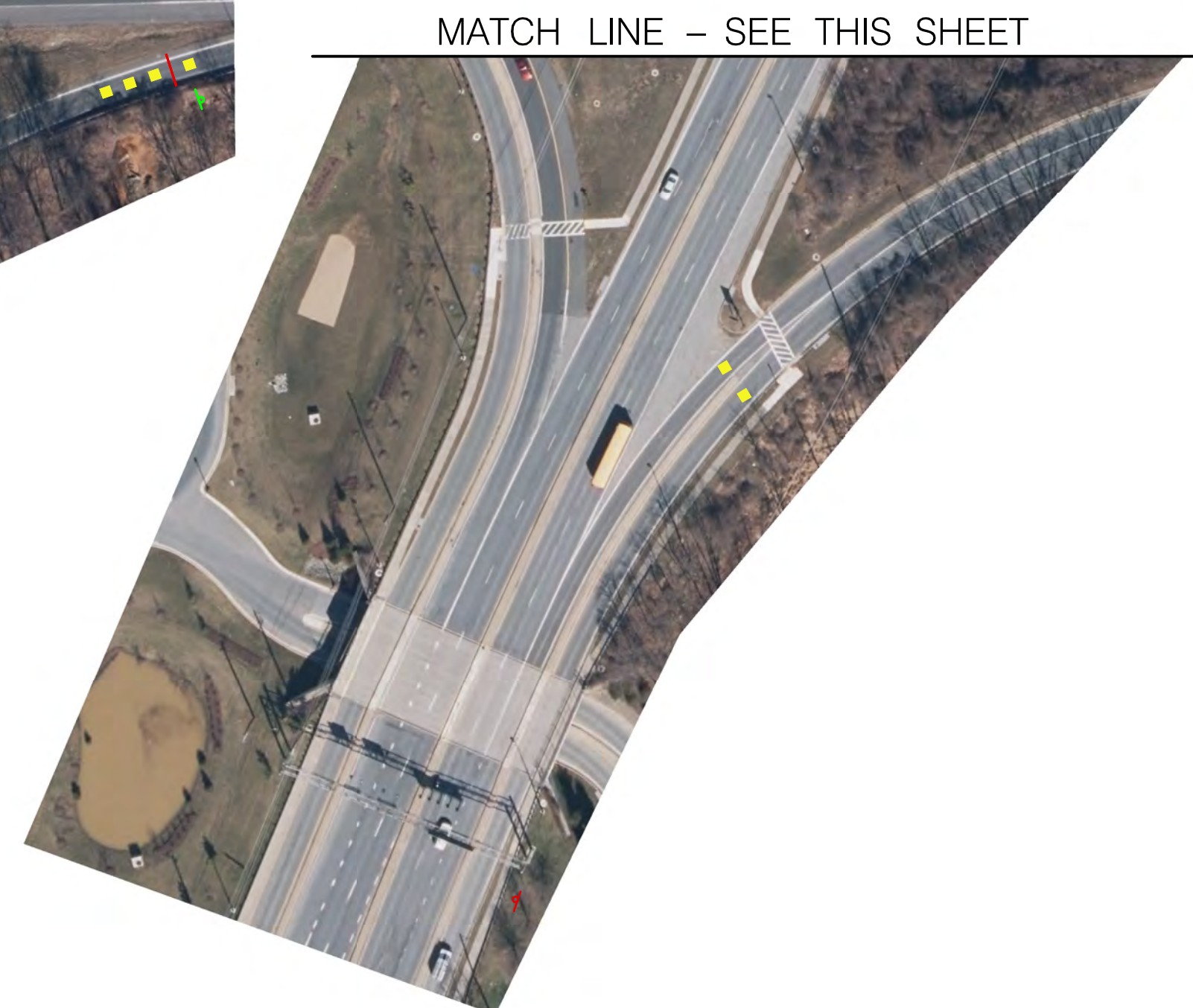
SCALE: 1" = 80'

CONTRACT NO.
PROPOSAL

DRAWING NO.

SHEET NO.
3 OF 66

pw:\projects\2016\10\101\parsons.com\Maryland_State\ICM\Design\Roadway_Improvements\Exit_6 - MD 28 W. Montgomery Ave\pHD-0001_Montrose_RM.dgn
 Tuesday, December 20, 2016 AT 06:10 AM



MATCH LINE - SEE THIS SHEET

MATCH LINE - SEE THIS SHEET

LEGEND

- | | | | | | |
|---------------------------|---|------------------------|---|---------------------|---|
| NEW CONSTRUCTION |  | STOP BAR |  | RAMP METER DETECTOR |  |
| HARD SHOULDER RUNNING |  | ADVANCE WARNING DEVICE |  | PROPOSED RTMS |  |
| PROPOSED PAVEMENT MARKING |  | SIGN |  | EXISTING RTMS |  |

PRELIMINARY PLANS
 DO NOT USE FOR CONSTRUCTION

APPR CHECK DRAWN DESIGN

I-270 INTERCHANGE IMPROVEMENT
PRELIMINARY ENGINEERING

MONTROSE ROAD INTERCHANGE
RAMP METER

DATE: 11/15/16

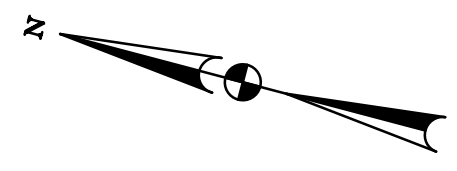
SCALE: 1" = 80'

CONTRACT NO.
PROPOSAL

DRAWING NO.

SHEET NO.
3A OF 66

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 Monday, December 19, 2016 AT 10:20 AM



MD 189 AM IMPROVEMENT.
 HSR HOV FOR INSIDE SHOULDER OF I-270 SB
 MAINLINE. EXISTING HOV LANE BECOMES GENERAL
 PURPOSE LANE. HSR HOV FROM NORTH OF
 MD 189 STARTING AT MAINLINE TO CD SLIP
 RAMP TO MERGE POINT OF CD AND MAINLINE.
 APPROXIMATELY 13200' (~2.5 MI)

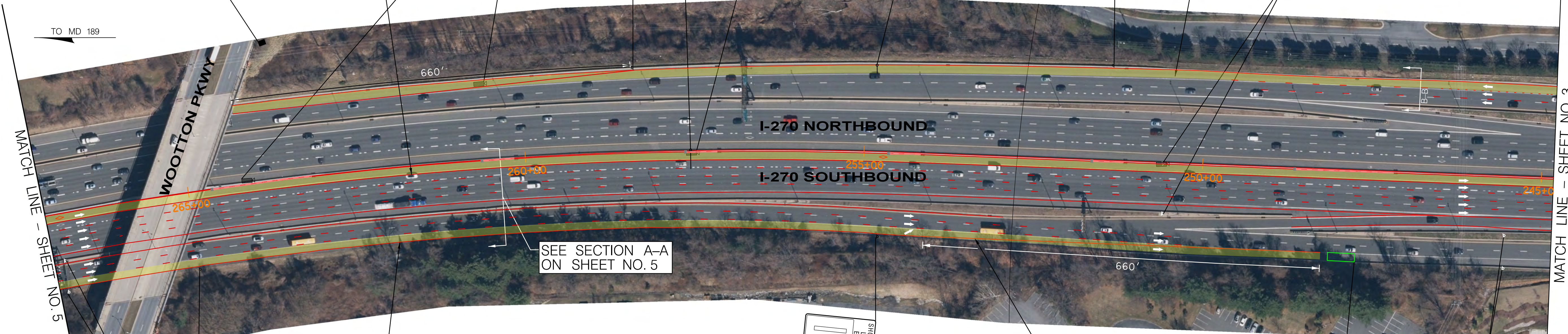
NEW CCTV
CAMERA

2 VDIS ON
NEW POLE

1 VDIS ON LANE
CONTROL SIGN

MONTROSE PM IMPROVEMENT.
 SHORT HSR ON MONTROSE RD
 OFF RAMP AUXILIARY LANE UP
 TO WOOTTON PKWY. SEE TABLE
 1 ON SHEET NO. 3 FOR
 AASHTO COMPARISON.

1 VDIS ON NEW POLE + VSL
1 POLE MOUNTED VSL

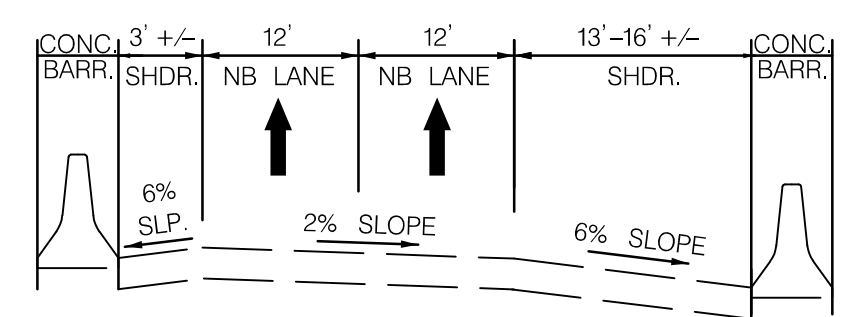


TO MD 189

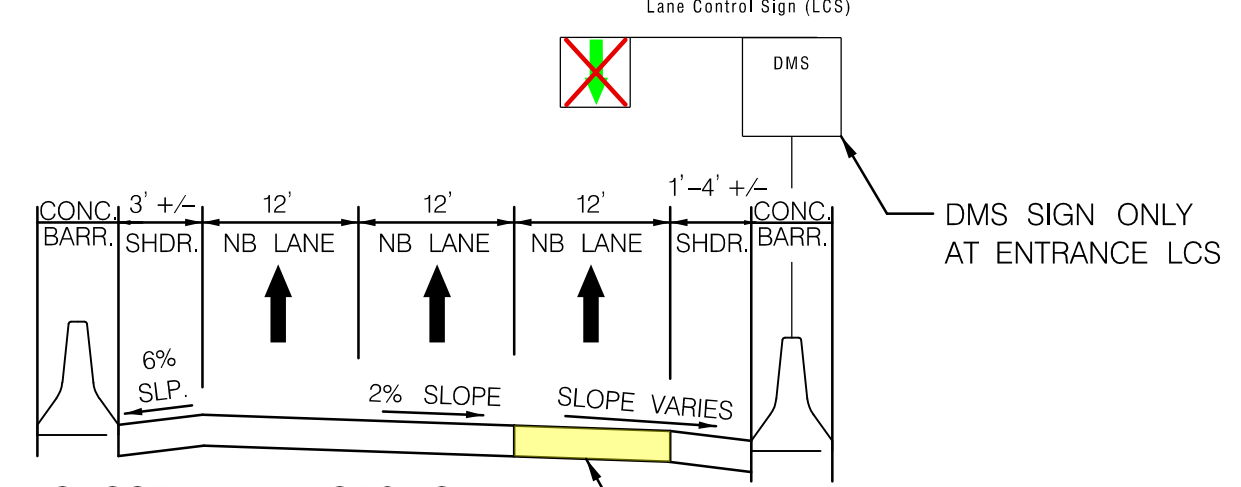
MATCH LINE - SHEET NO. 5

MATCH LINE - SHEET NO. 3

SEE SECTION A-A
ON SHEET NO. 5



EXISTING I-270 SECTION B-B
NOT TO SCALE



PROPOSED I-270 SECTION B-B
NOT TO SCALE

REPAVE EX. SHOULDER
FOR HSR LANE USE

PER AASHTO 2011 REQUIREMENT
 SECTION 10, PG. 75:
 LANE REDUCTION TAPER SHOULD
 BE 50:1 MINIMUM.

1 POLE MOUNTED VSL
1 POLE MOUNTED VSL
+ RTMS

EMERGENCY
REFUGE AREA

TO MONTROSE ROAD

2 VSL ON EXISTING
GANTRY + NEW RTMS

MD 189 AM IMPROVEMENT.
 ADD HSR STARTING FROM
 MD 189 ON RAMP. HSR
 DROPS OFF AT CD TO
 MAINLINE SLIP RAMP FOR
 APPROXIMATELY 2500' (~0.5 MI)



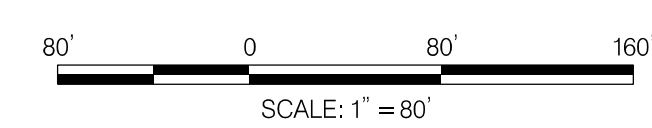
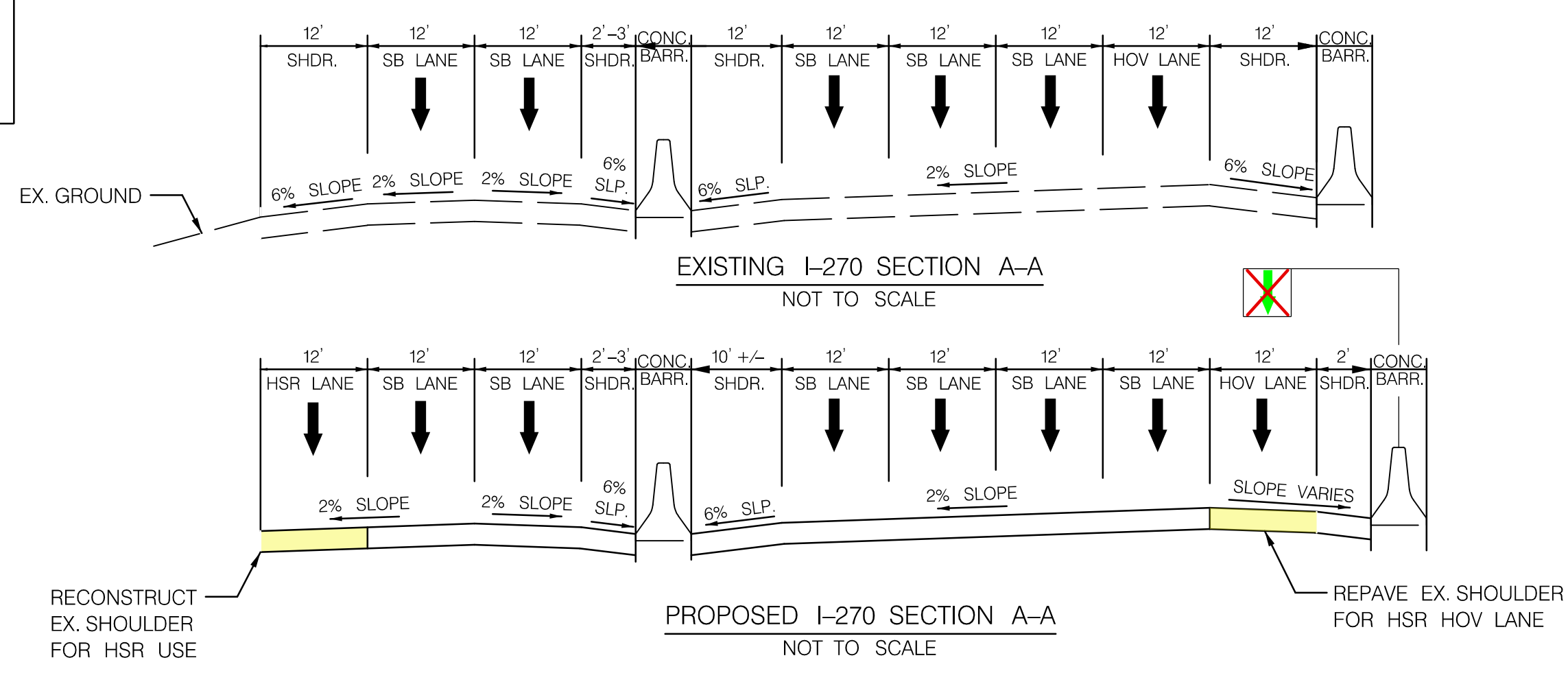
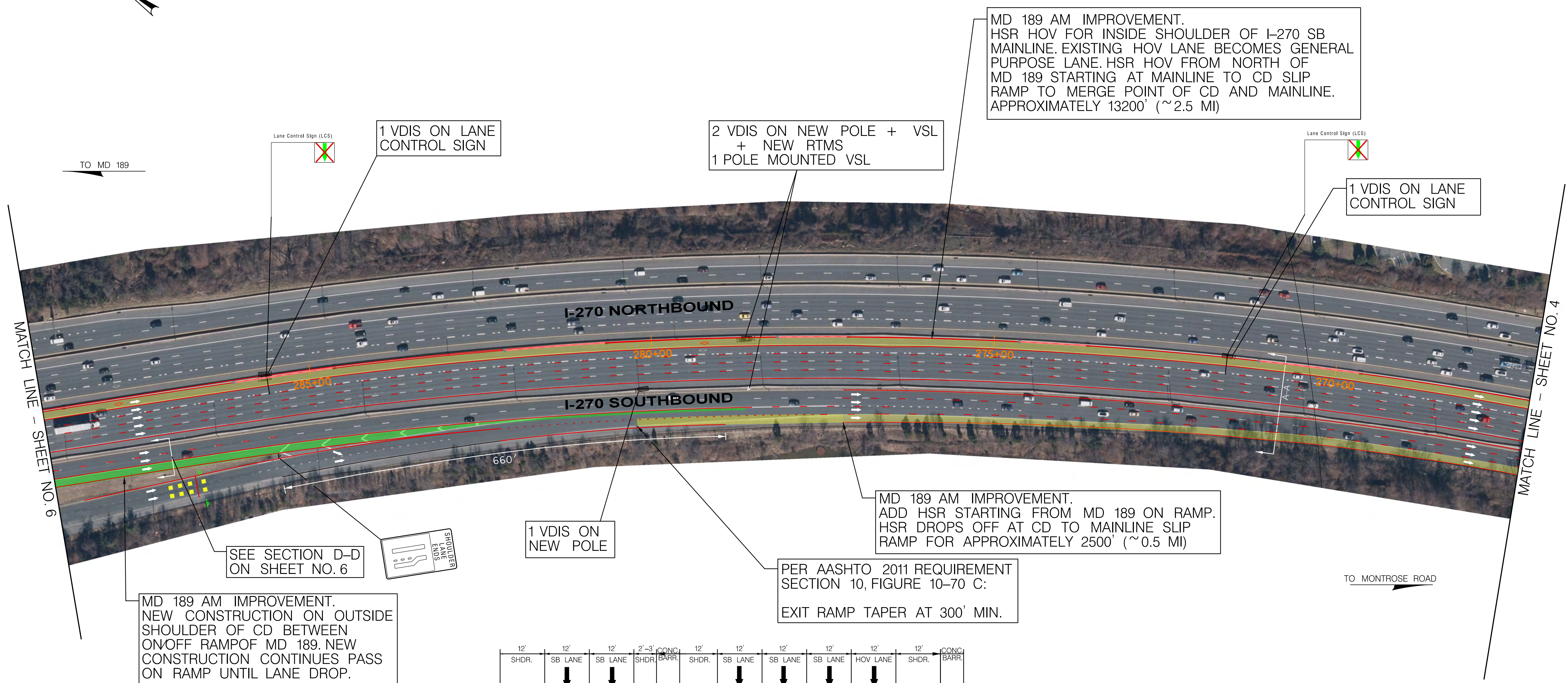
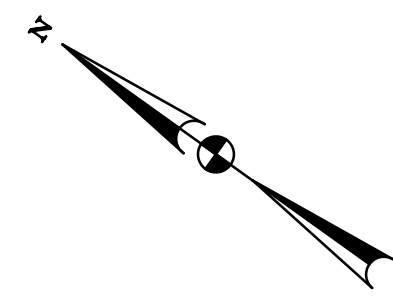
LEGEND

NEW CONSTRUCTION		STOP BAR		RAMP METER DETECTOR	
HARD SHOULDER RUNNING		ADVANCE WARNING DEVICE		PROPOSED RTMS	
PROPOSED PAVEMENT MARKING		SIGN		EXISTING RTMS	

PRELIMINARY PLANS
 DO NOT USE FOR CONSTRUCTION

APPR CHECK DRAWN DESIGN	I-270 INTERCHANGE IMPROVEMENT PRELIMINARY ENGINEERING	CONTRACT NO. PROPOSAL
	MONTROSE ROAD TO MD 189	DRAWING NO.
	DATE: 11/15/16	SCALE: 1" = 80'

pw:\txpl\02\win101\parsons.com\Maryland_State\Design\Roadway_Improvements\Exit_8 - Shady Grove Road\pHD-P005_MD-189.dgn
 Monday, December 19, 2016 AT 08:08 PM

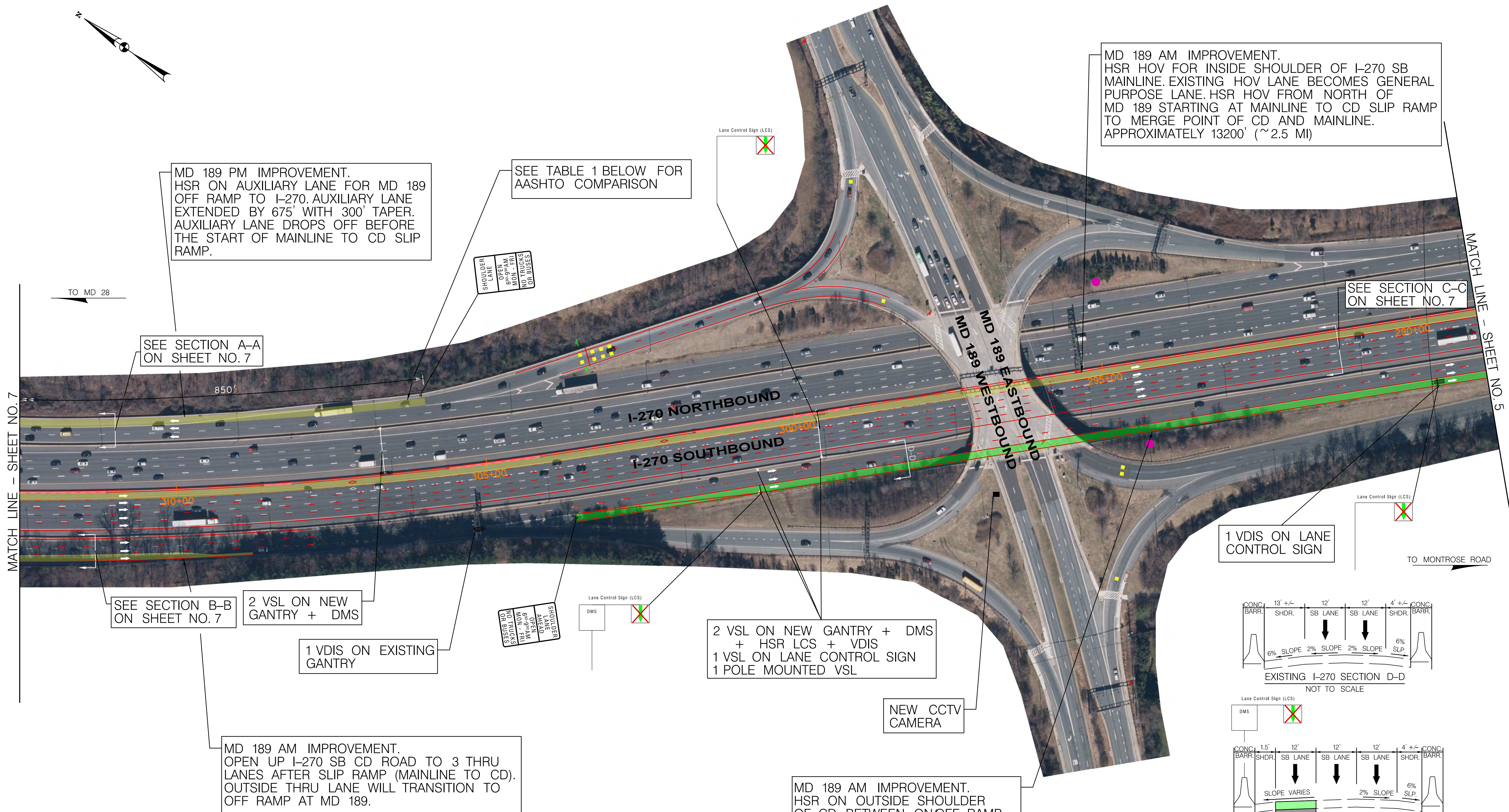
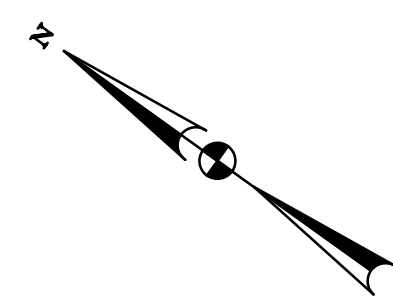


LEGEND			
NEW CONSTRUCTION		STOP BAR	
HARD SHOULDER RUNNING		ADVANCE WARNING DEVICE	
PROPOSED PAVEMENT MARKING		SIGN	
		RAMP METER DETECTOR	
		PROPOSED RTMS	
		EXISTING RTMS	

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

APPR. CHECK DRAWN DESIGN	I-270 INTERCHANGE IMPROVEMENT PRELIMINARY ENGINEERING		CONTRACT NO. PROPOSAL
	MONTROSE ROAD TO MD 189		DRAWING NO.
	DATE: 11/15/16	SCALE: 1" = 80'	SHEET NO. 5 OF 66

pw:\txpl\02\pwin\01\parsons.com\Maryland_State\Documents\IS 270 ICM\Design\Roadway Improvements\Exit 8 - Shady Grove Road\pHD-P006_MD-189.dgn
 Monday, December 19, 2016 AT 08:06 PM



MD 189 PM IMPROVEMENT.
 HSR ON AUXILIARY LANE FOR MD 189
 OFF RAMP TO I-270. AUXILIARY LANE
 EXTENDED BY 675' WITH 300' TAPER.
 AUXILIARY LANE DROPS OFF BEFORE
 THE START OF MAINLINE TO CD SLIP
 RAMP.

SEE TABLE 1 BELOW FOR
 AASHTO COMPARISON

MD 189 AM IMPROVEMENT.
 HSR HOV FOR INSIDE SHOULDER OF I-270 SB
 MAINLINE. EXISTING HOV LANE BECOMES GENERAL
 PURPOSE LANE. HSR HOV FROM NORTH OF
 MD 189 STARTING AT MAINLINE TO CD SLIP RAMP
 TO MERGE POINT OF CD AND MAINLINE.
 APPROXIMATELY 13200' (~ 2.5 MI)

SEE SECTION A-A
 ON SHEET NO. 7

SEE SECTION C-C
 ON SHEET NO. 7

SEE SECTION B-B
 ON SHEET NO. 7

2 VSL ON NEW
 GANTRY + DMS

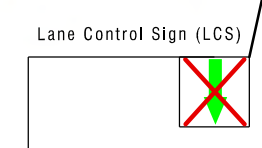
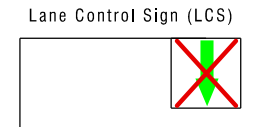
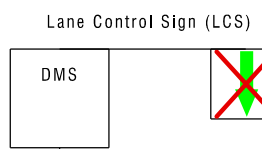
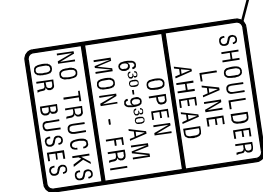
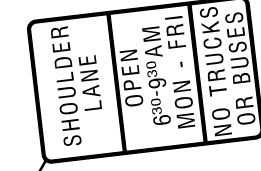
1 VDIS ON EXISTING
 GANTRY

2 VSL ON NEW GANTRY + DMS
 + HSR LCS + VDIS
 1 VSL ON LANE CONTROL SIGN
 1 POLE MOUNTED VSL

1 VDIS ON LANE
 CONTROL SIGN

MD 189 AM IMPROVEMENT.
 OPEN UP I-270 SB CD ROAD TO 3 THRU
 LANES AFTER SLIP RAMP (MAINLINE TO CD).
 OUTSIDE THRU LANE WILL TRANSITION TO
 OFF RAMP AT MD 189.

MD 189 AM IMPROVEMENT.
 HSR ON OUTSIDE SHOULDER
 OF CD BETWEEN ON/OFF RAMP
 OF MD 189. HSR CONTINUES PASS
 ON RAMP UNTIL LANE DROP.



NEW CCTV
 CAMERA

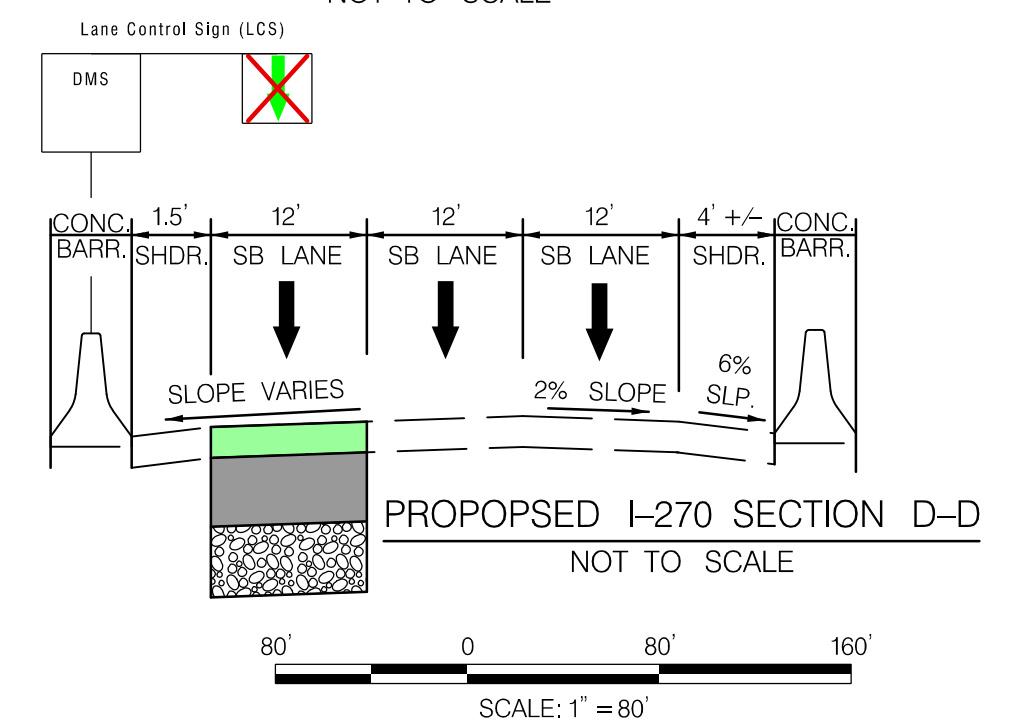
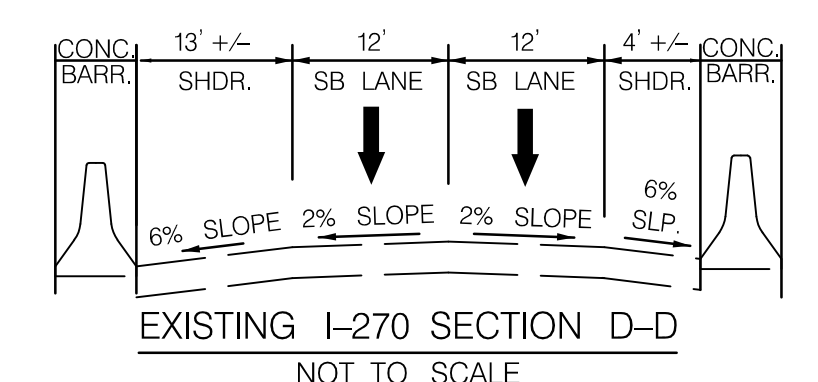


TABLE 1

LOCATION	EXISTING LENGTH	PROPOSED LENGTH	AASHTO	NOTES
RAMP FROM MD 189 WB TO I-270 NB	175'	850'	1120'	ACCEPTION NEEDED

LEGEND

NEW CONSTRUCTION		STOP BAR		RAMP METER DETECTOR	
HARD SHOULDER RUNNING		ADVANCE WARNING DEVICE		PROPOSED RTMS	
PROPOSED PAVEMENT MARKING		SIGN		EXISTING RTMS	

PRELIMINARY PLANS
 DO NOT USE FOR CONSTRUCTION

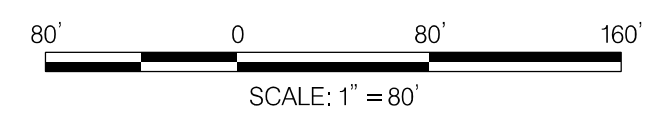
**I-270 INTERCHANGE IMPROVEMENT
 PRELIMINARY ENGINEERING**

MD 189 TO MD 28

DATE: 11/15/16 SCALE: 1" = 80'

CONTRACT NO. PROPOSAL
 DRAWING NO.
 SHEET NO. 6 OF 66

pw:\txpl\02\win101\parsons.com\Maryland_State\ICM\Design\Roadway_Improvements\Exit_6 - MD 28 W. Montgomery Ave\pHD-0002_MD-189_RM.dgn
 Tuesday, December 20, 2016 AT 06:14 AM



LEGEND

NEW CONSTRUCTION		STOP BAR		RAMP METER DETECTOR	
HARD SHOULDER RUNNING		ADVANCE WARNING DEVICE		PROPOSED RTMS	
PROPOSED PAVEMENT MARKING		SIGN		EXISTING RTMS	

PRELIMINARY PLANS
 DO NOT USE FOR CONSTRUCTION

APPR CHECK DRAWN DESIGN

**I-270 INTERCHANGE IMPROVEMENT
 PRELIMINARY ENGINEERING**

**MD 189 INTERCHANGE
 RAMP METER**

DATE: 11/15/16

SCALE: 1" = 80'

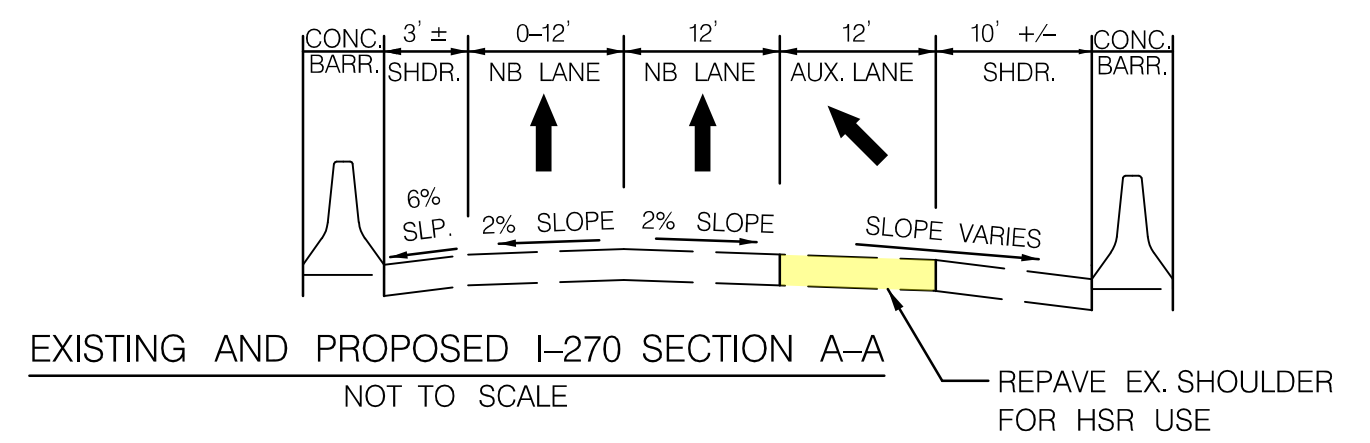
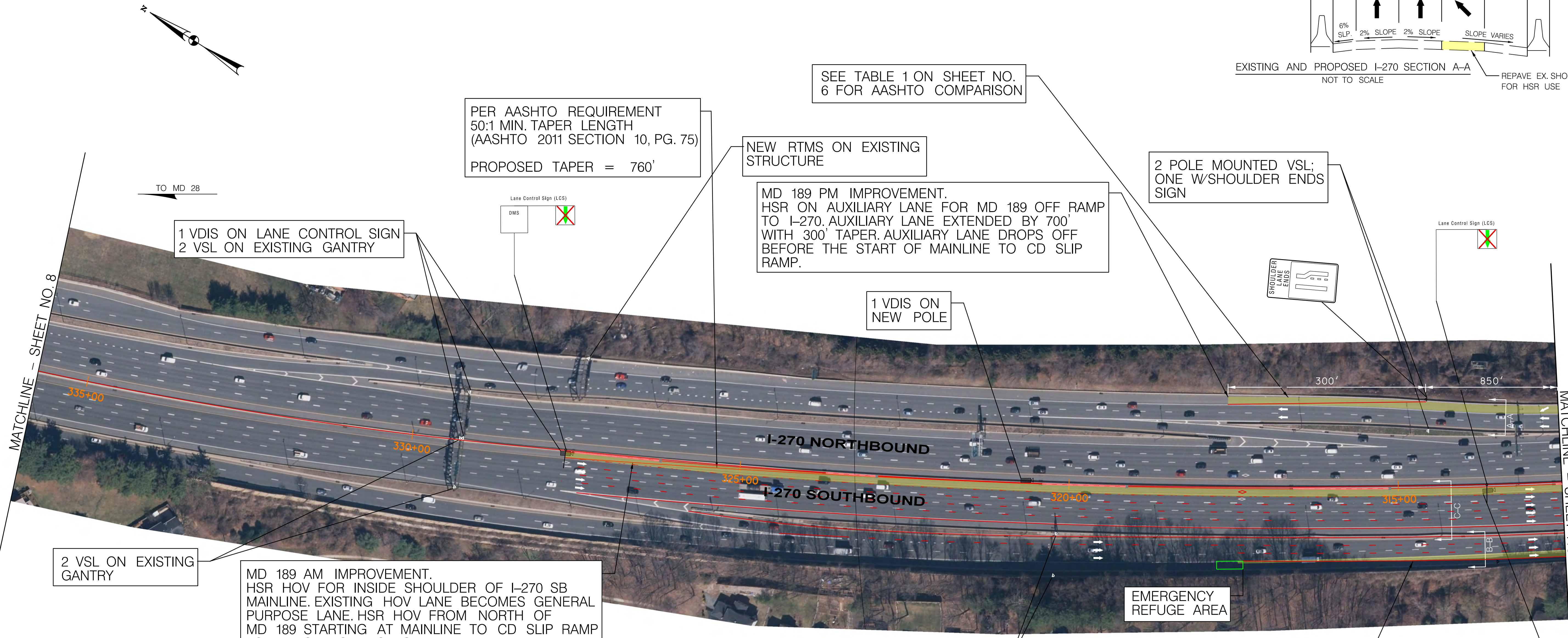
CONTRACT NO.
PROPOSAL

DRAWING NO.

SHEET NO.

6A OF 66

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 Monday, December 19, 2016 AT 10:40 AM



SEE TABLE 1 ON SHEET NO. 6 FOR AASHTO COMPARISON

PER AASHTO REQUIREMENT
50:1 MIN. TAPER LENGTH
(AASHTO 2011 SECTION 10, PG. 75)
PROPOSED TAPER = 760'

NEW RTMS ON EXISTING STRUCTURE

MD 189 PM IMPROVEMENT.
HSR ON AUXILIARY LANE FOR MD 189 OFF RAMP TO I-270. AUXILIARY LANE EXTENDED BY 700' WITH 300' TAPER. AUXILIARY LANE DROPS OFF BEFORE THE START OF MAINLINE TO CD SLIP RAMP.

2 POLE MOUNTED VSL;
ONE W/SHOULDER ENDS SIGN

1 VDIS ON LANE CONTROL SIGN
2 VSL ON EXISTING GANTRY

1 VDIS ON NEW POLE

2 VSL ON EXISTING GANTRY

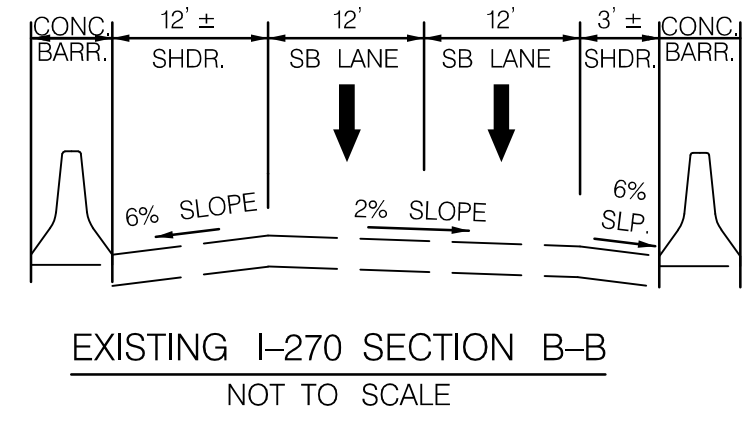
MD 189 AM IMPROVEMENT.
HSR HOV FOR INSIDE SHOULDER OF I-270 SB MAINLINE. EXISTING HOV LANE BECOMES GENERAL PURPOSE LANE. HSR HOV FROM NORTH OF MD 189 STARTING AT MAINLINE TO CD SLIP RAMP TO MERGE POINT OF CD AND MAINLINE. APPROXIMATELY 13200' (~2.5 MI.)

1 VSL ON EXISTING GANTRY
1 POLE MOUNTED VSL + NEW RTMS

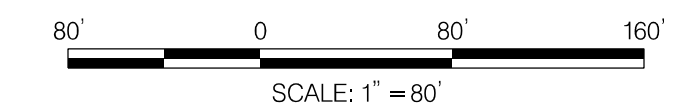
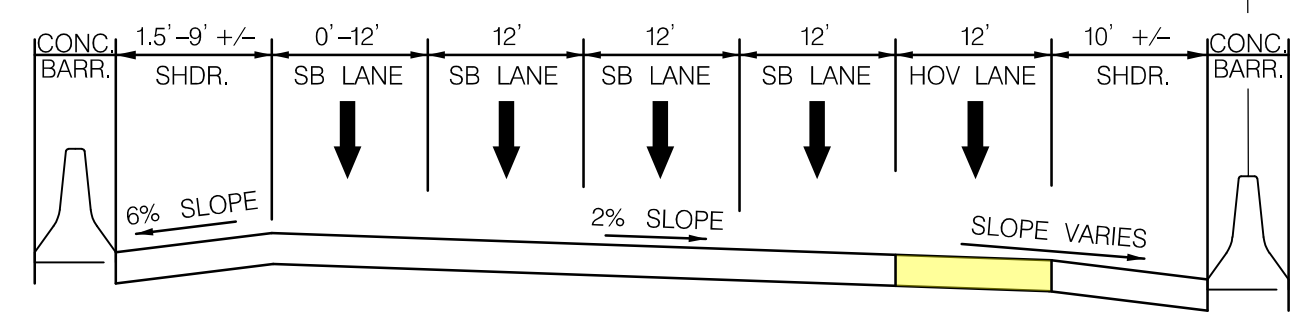
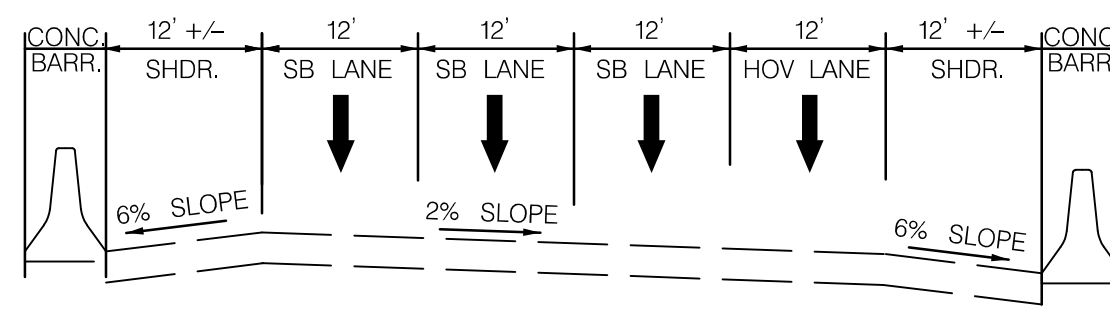
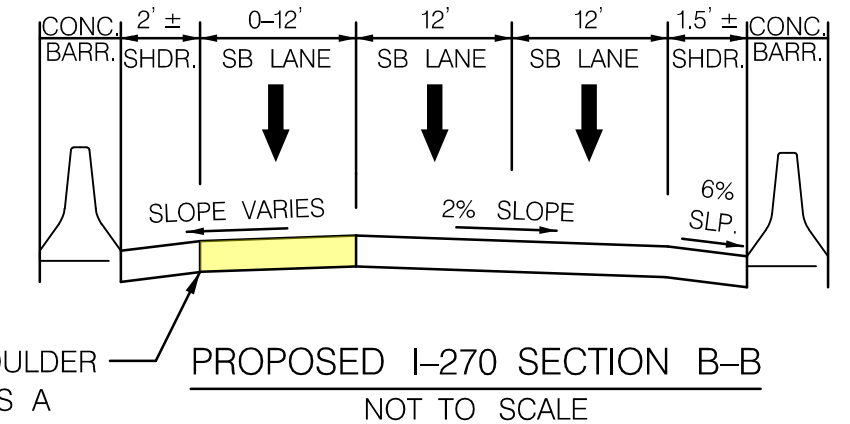
EMERGENCY REFUGE AREA

MD 189 AM IMPROVEMENT.
OPEN UP I-270 SB CD ROAD TO 3 THRU LANES AFTER SLIP RAMP (MAINLINE TO CD). OUTSIDE THRU LANE WILL TRANSITION TO OFF RAMP AT MD 189

1 VDIS ON LANE CONTROL SIGN



REPAVE EX. SHOULDER TO BE USED AS A THRU LANE



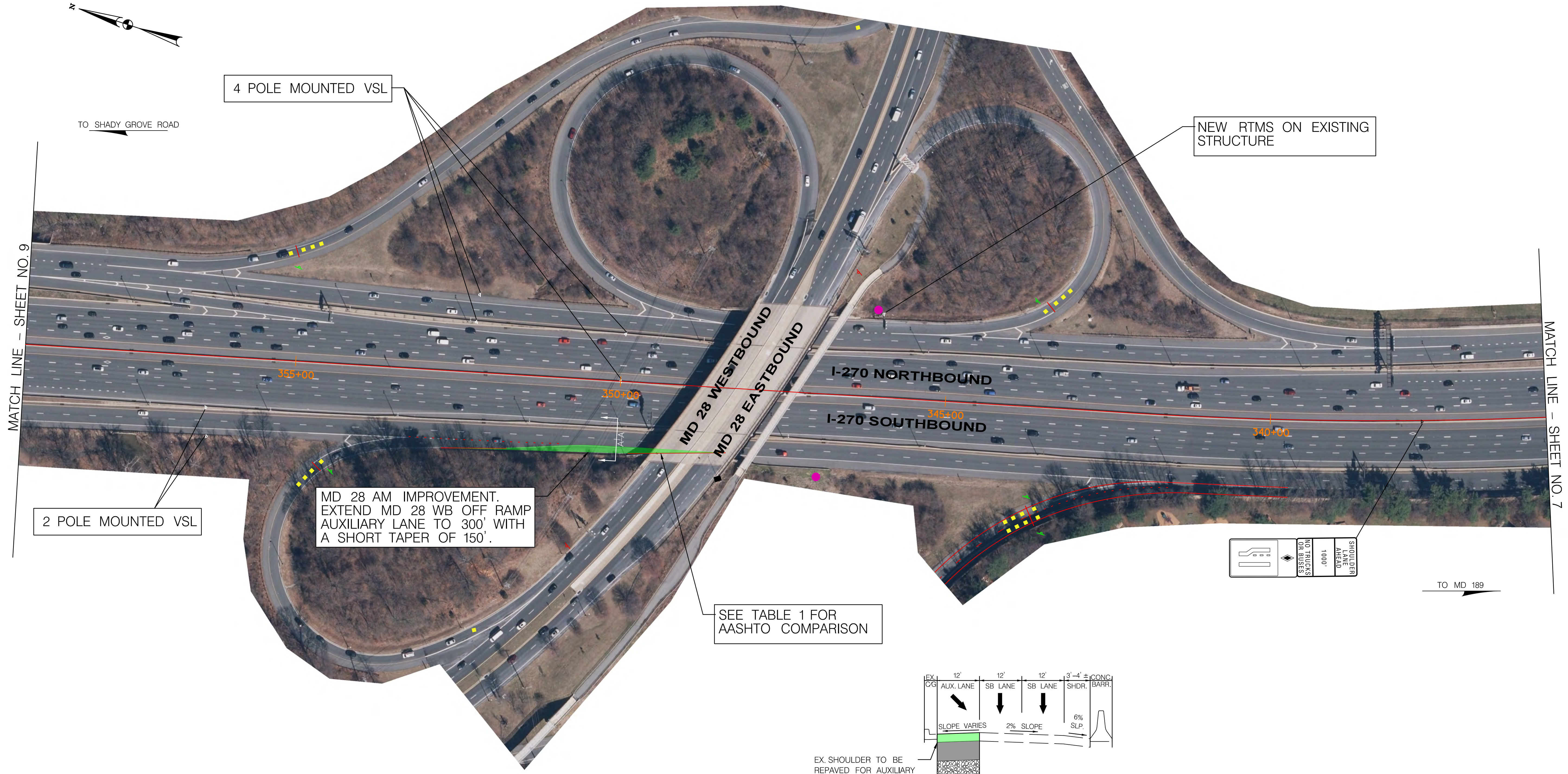
LEGEND

- | | | | | | |
|---------------------------|--|------------------------|--|---------------------|--|
| NEW CONSTRUCTION | | STOP BAR | | RAMP METER DETECTOR | |
| HARD SHOULDER RUNNING | | ADVANCE WARNING DEVICE | | PROPOSED RTMS | |
| PROPOSED PAVEMENT MARKING | | SIGN | | EXISTING RTMS | |

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

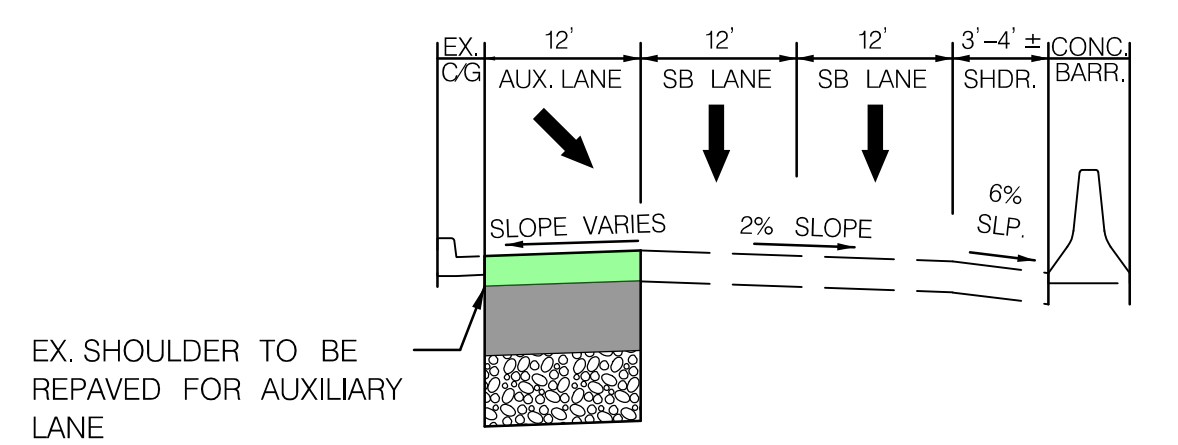
APPR CHECK DRAWN DESIGN	I-270 INTERCHANGE IMPROVEMENT PRELIMINARY ENGINEERING		CONTRACT NO. PROPOSAL
	MD 189 TO MD 28		DRAWING NO.
	DATE: 11/15/16	SCALE: 1" = 80'	SHEET NO. 7 OF 66

pw:\txpl\02\pwin\01\parsons.com\Maryland_State\Design\Roadway_Improvements\Exit_8 - Shady Grove Road\pHD-P008_MD-28.dgn
 Monday, December 19, 2016 AT 08:12 PM



MD 28 AM IMPROVEMENT.
 EXTEND MD 28 WB OFF RAMP
 AUXILIARY LANE TO 300' WITH
 A SHORT TAPER OF 150'.

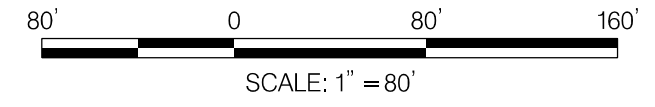
SEE TABLE 1 FOR
 AASHTO COMPARISON



EXISTING AND PROPOSED I-270 SECTION A-A
 NOT TO SCALE

TABLE 1

LOCATION	EXISTING LENGTH	PROPOSED LENGTH	AASHTO	NOTES
RAMP FROM MD 28 WB TO I-270 SB	115'	300'	1120'	BRIDGE ABUTMENT LIMITS DESIGN; ACCEPTANCE NEEDED



LEGEND			
NEW CONSTRUCTION		STOP BAR	
HARD SHOULDER RUNNING		ADVANCE WARNING DEVICE	
PROPOSED PAVEMENT MARKING		SIGN	
		RAMP METER DETECTOR	
		PROPOSED RTMS	
		EXISTING RTMS	

PRELIMINARY PLANS
 DO NOT USE FOR CONSTRUCTION

APPR CHECK DRAWN DESIGN	I-270 INTERCHANGE IMPROVEMENT PRELIMINARY ENGINEERING	CONTRACT NO. PROPOSAL
	MD 189 TO MD 28	DRAWING NO.
	DATE: 11/15/16	SCALE: 1" = 80'

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 Tuesday, December 20, 2016 AT 06:18 AM



LEGEND

- | | | | | | |
|---------------------------|--|------------------------|--|---------------------|--|
| NEW CONSTRUCTION | | STOP BAR | | RAMP METER DETECTOR | |
| HARD SHOULDER RUNNING | | ADVANCE WARNING DEVICE | | PROPOSED RTMS | |
| PROPOSED PAVEMENT MARKING | | SIGN | | EXISTING RTMS | |

PRELIMINARY PLANS
 DO NOT USE FOR CONSTRUCTION

APPR CHECK DRAWN DESIGN

**I-270 INTERCHANGE IMPROVEMENT
PRELIMINARY ENGINEERING**

**MD 28 INTERCHANGE
RAMP METER**

DATE: 11/15/16

SCALE: 1" = 80'

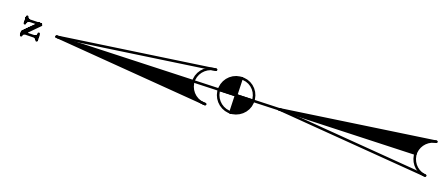
CONTRACT NO.
PROPOSAL

DRAWING NO.

SHEET NO.

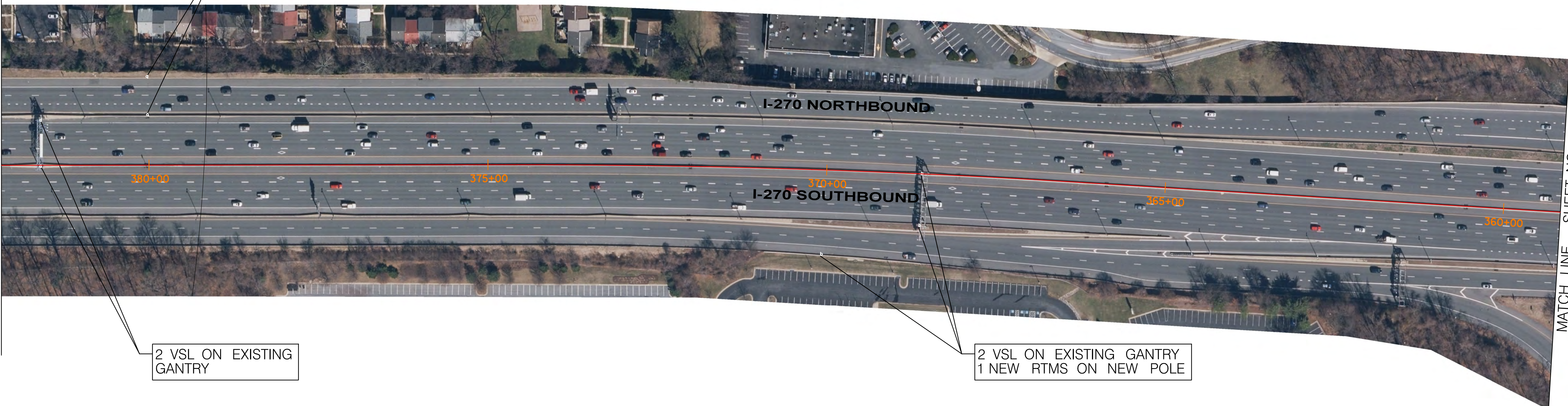
8A OF 66

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 Monday, December 19, 2016 AT 10:49 AM



TO SHADY GROVE ROAD

MATCH LINE - SHEET NO. 10



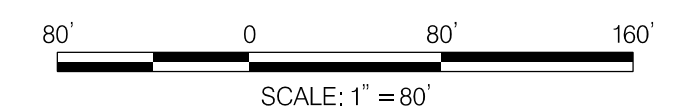
1 POLE MOUNTED VSL + RTMS
1 POLE MOUNTED VSL

2 VSL ON EXISTING
GANTRY

2 VSL ON EXISTING GANTRY
1 NEW RTMS ON NEW POLE

TO MD 28

MATCH LINE - SHEET NO. 8



LEGEND

NEW CONSTRUCTION		STOP BAR		RAMP METER DETECTOR	
HARD SHOULDER RUNNING		ADVANCE WARNING DEVICE		PROPOSED RTMS	
PROPOSED PAVEMENT MARKING		SIGN		EXISTING RTMS	

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

APPR CHECK DRAWN DESIGN

**I-270 INTERCHANGE IMPROVEMENT
PRELIMINARY ENGINEERING**

MD 28 to SHADY GROVE ROAD

DATE: 11/15/16

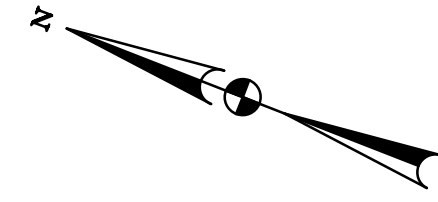
SCALE: 1" = 80'

CONTRACT NO.
PROPOSAL

DRAWING NO.

SHEET NO.
9 OF 66

pw:\txpl\02\pwin\01\parsons.com\Maryland_State\Design\Roadway_Improvements\Exit_8 - Shady Grove Road\pHD-P010_ShadyGrove.dgn
 Monday, December 19, 2016 AT 10:54 AM



TO SHADY GROVE ROAD



MATCH LINE - SHEET NO. 11

MATCH LINE - SHEET NO. 9

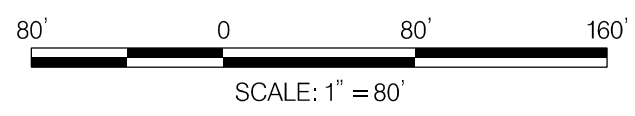
SEE SECTION A-A
ON SHEET NO. 12

EMERGENCY
REFUGE AREA

NEW RTMS + VDIS ON
EXISTING GANTRY

1 VSL ON EXISTING GANTRY
1 POLE MOUNTED VSL

TO MD 28



LEGEND

NEW CONSTRUCTION		STOP BAR		RAMP METER DETECTOR	
HARD SHOULDER RUNNING		ADVANCE WARNING DEVICE		PROPOSED RTMS	
PROPOSED PAVEMENT MARKING		SIGN		EXISTING RTMS	

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

APPR CHECK DRAWN DESIGN

**I-270 INTERCHANGE IMPROVEMENT
PRELIMINARY ENGINEERING**

MD 28 TO SHADY GROVE ROAD

DATE: 11/15/16

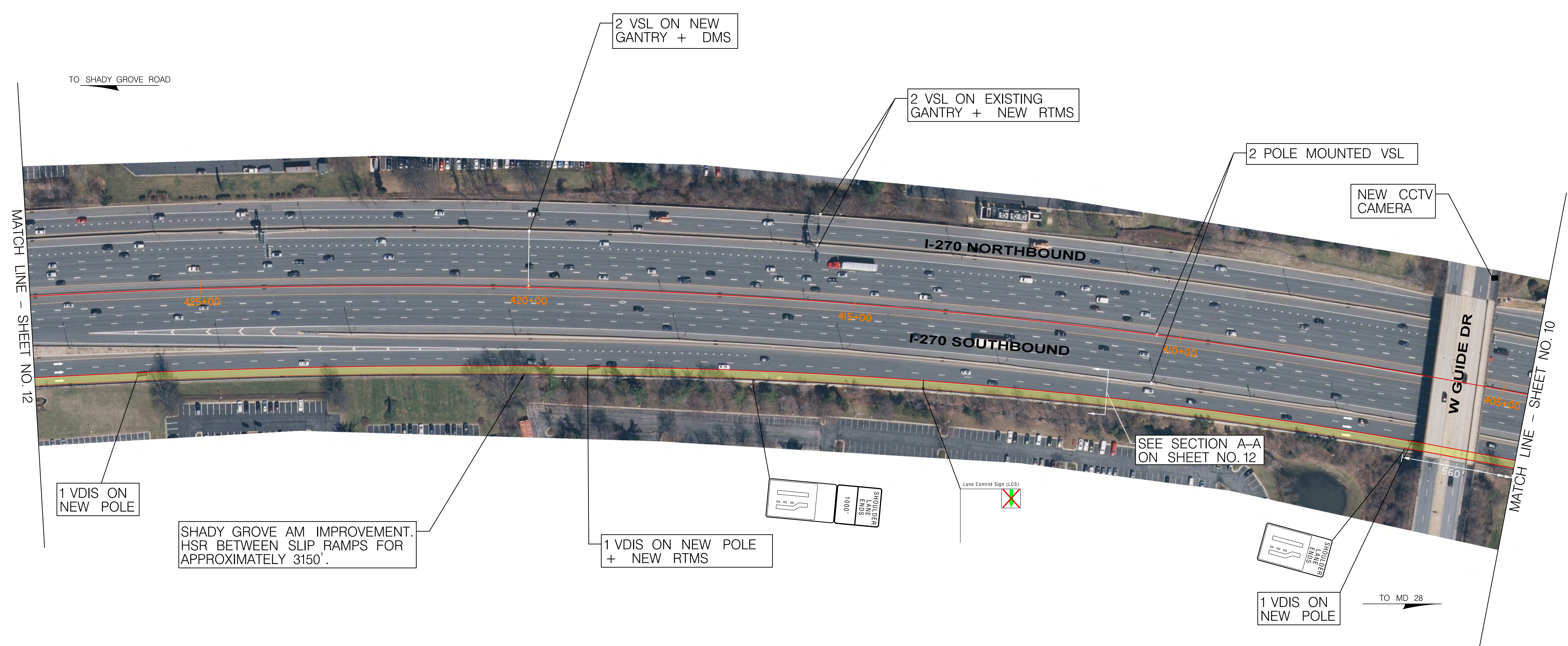
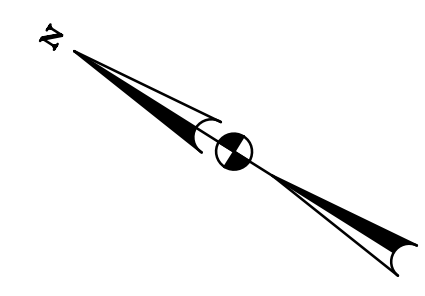
SCALE: 1" = 80'

CONTRACT NO.
PROPOSAL

DRAWING NO.

SHEET NO.
10 OF 66

pw:\txpl\02\pwin\01\parsons.com\Maryland_State\Design\Roadway_Improvements\Exit_8 - Shady Grove Road\pHD-P011_ShadyGrove.dgn
 Monday, December 19, 2016 AT 10:57 AM



TO SHADY GROVE ROAD

MATCH LINE - SHEET NO. 12

MATCH LINE - SHEET NO. 10

2 VSL ON NEW GANTRY + DMS

2 VSL ON EXISTING GANTRY + NEW RTMS

2 POLE MOUNTED VSL

NEW CCTV CAMERA

1 VDIS ON NEW POLE

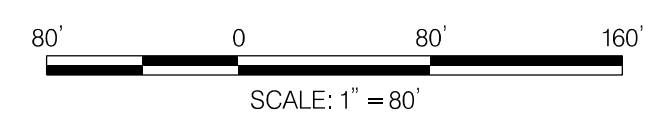
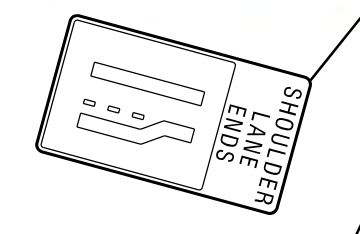
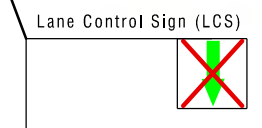
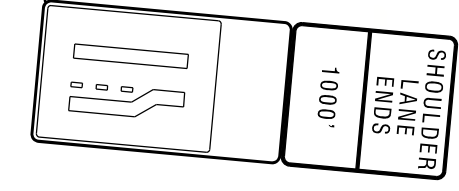
SHADY GROVE AM IMPROVEMENT. HSR BETWEEN SLIP RAMPS FOR APPROXIMATELY 3150'.

1 VDIS ON NEW POLE + NEW RTMS

SEE SECTION A-A ON SHEET NO. 12

1 VDIS ON NEW POLE

TO MD 28

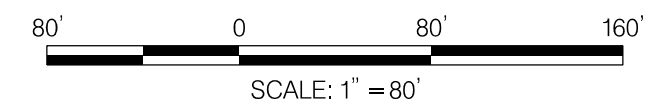
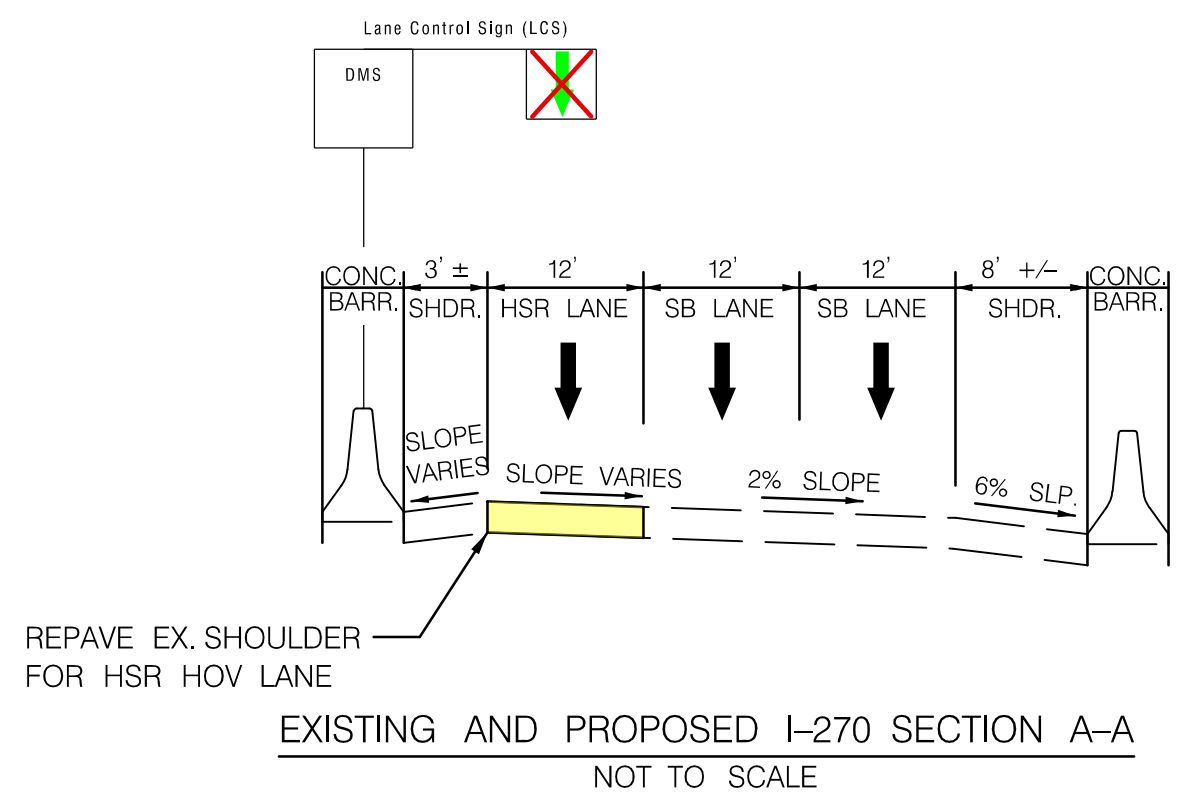
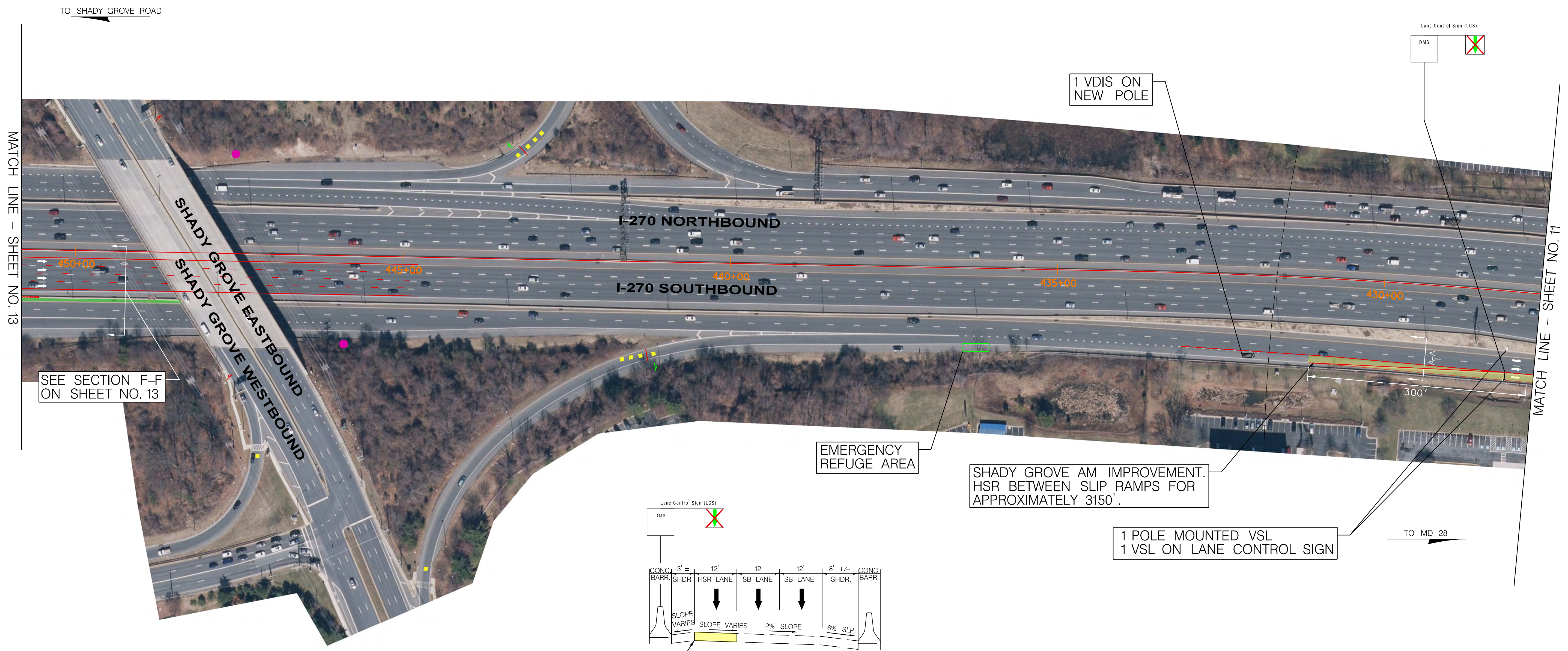
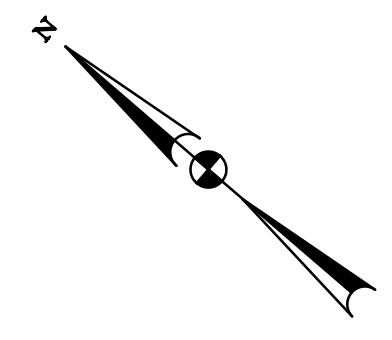


LEGEND			
NEW CONSTRUCTION		STOP BAR	
HARD SHOULDER RUNNING		ADVANCE WARNING DEVICE	
PROPOSED PAVEMENT MARKING		SIGN	
		RAMP METER DETECTOR	
		PROPOSED RTMS	
		EXISTING RTMS	

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

APPR CHECK DRAWN DESIGN	I-270 INTERCHANGE IMPROVEMENT PRELIMINARY ENGINEERING		CONTRACT NO. PROPOSAL
	MD 28 TO SHADY GROVE ROAD		DRAWING NO.
	DATE: 11/15/16	SCALE: 1" = 80'	SHEET NO. 11 OF 66

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 Monday, December 19, 2016 AT 08:15 PM



LEGEND			
NEW CONSTRUCTION		STOP BAR	
HARD SHOULDER RUNNING		ADVANCE WARNING DEVICE	
PROPOSED PAVEMENT MARKING		SIGN	
		RAMP METER DETECTOR	
		PROPOSED RTMS	
		EXISTING RTMS	

PRELIMINARY PLANS
 DO NOT USE FOR CONSTRUCTION

APPR. CHECK DRAWN DESIGN	I-270 INTERCHANGE IMPROVEMENT PRELIMINARY ENGINEERING	CONTRACT NO. PROPOSAL
	MD 28 TO SHADY GROVE ROAD	DRAWING NO.
	DATE: 11/15/16	SCALE: 1" = 80'

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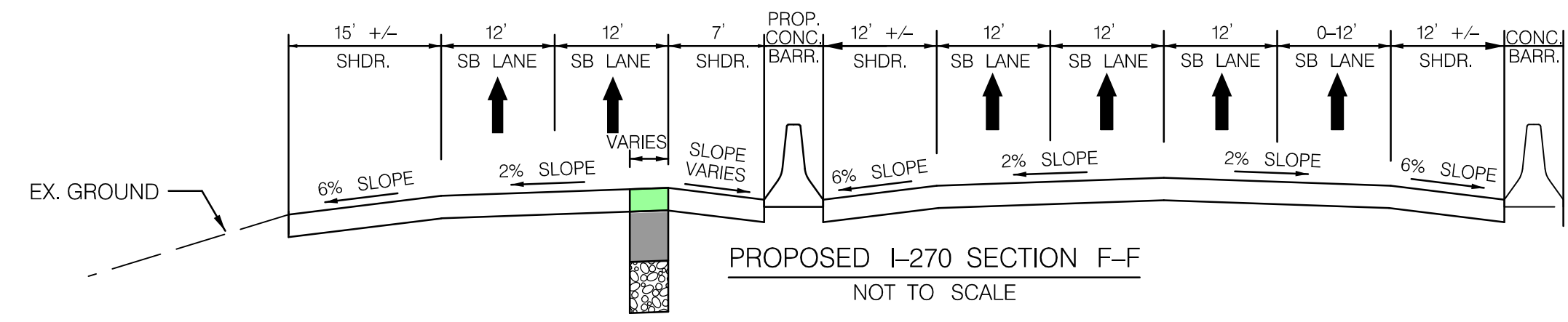
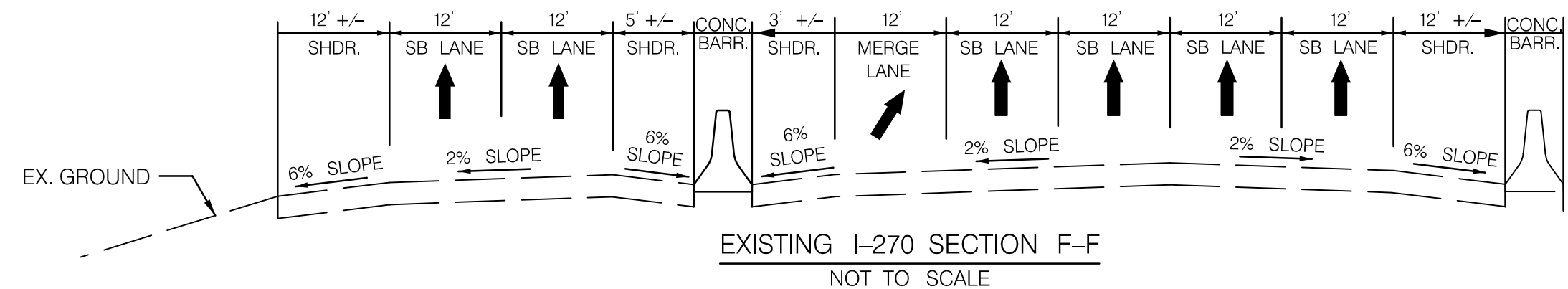
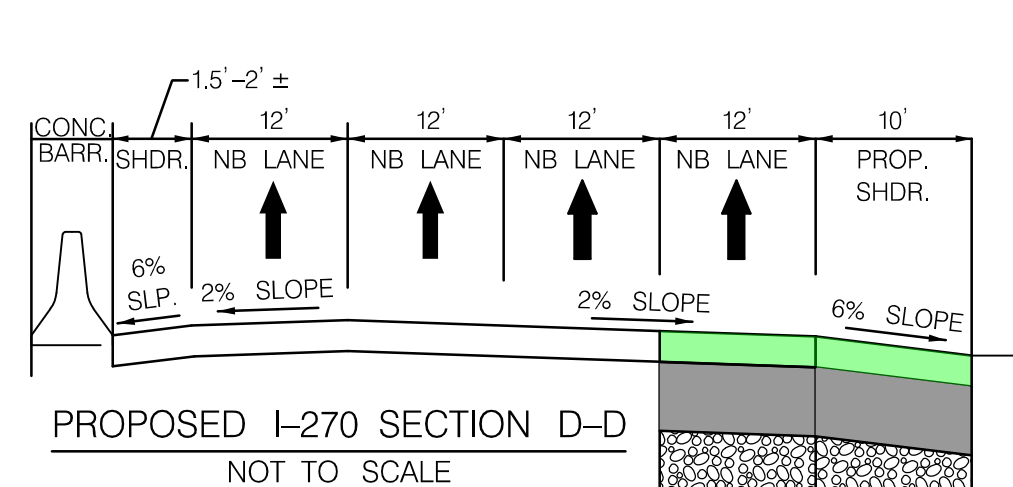
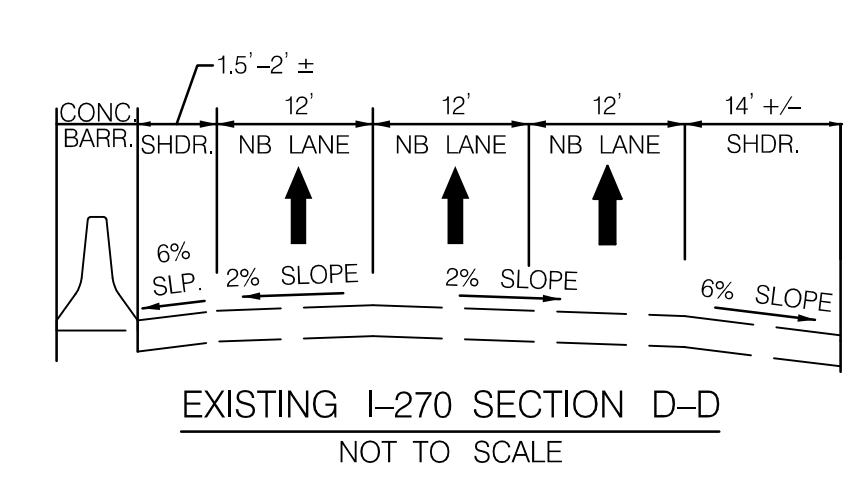
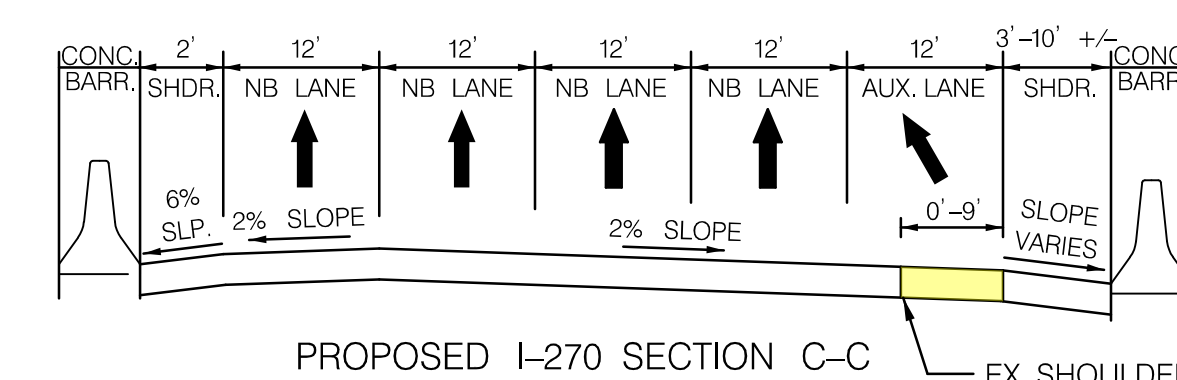
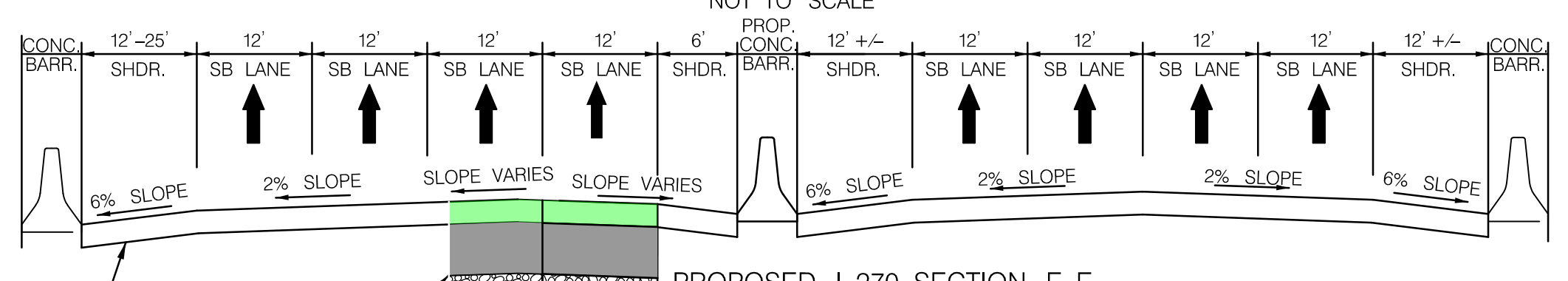
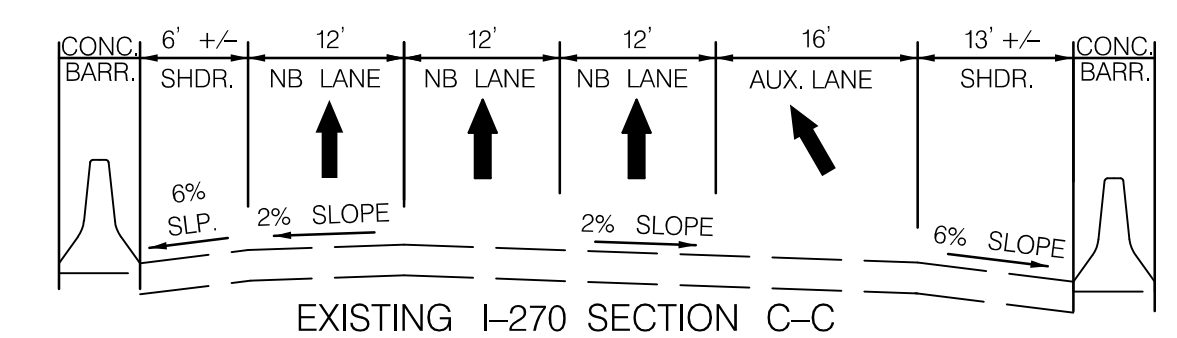
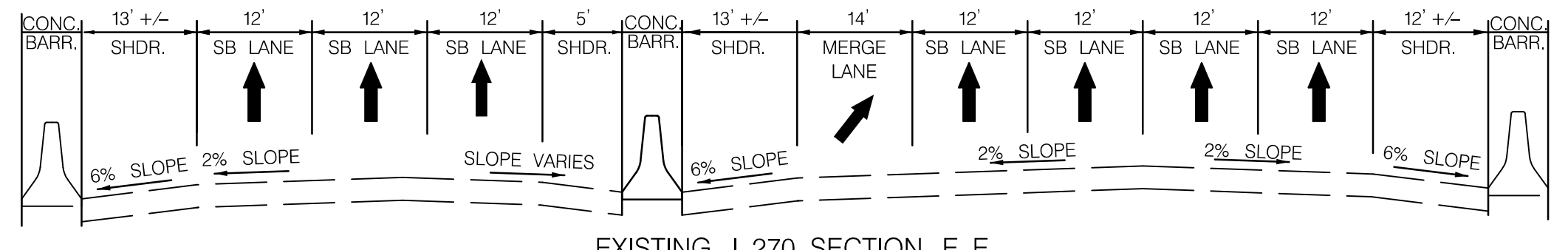
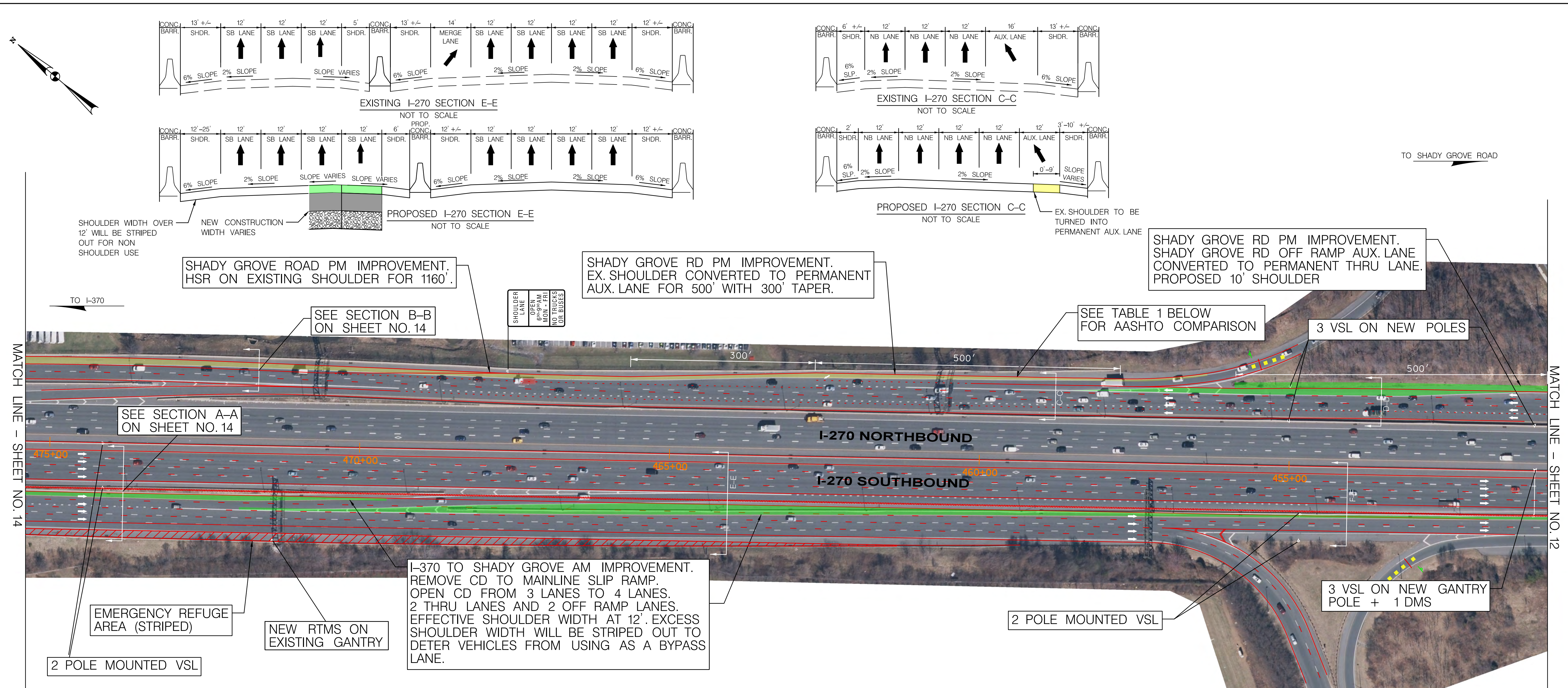


TABLE 1

LOCATION	EXISTING LENGTH	PROPOSED LENGTH	AASHTO	NOTES
RAMP FROM SHADY GROVE RD WB TO I-270 NB	500'	500'	1120'	ACCEPTION NEEDED

LEGEND

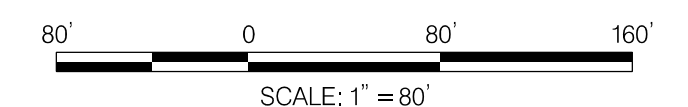
NEW CONSTRUCTION		STOP BAR		RAMP METER DETECTOR	
HARD SHOULDER RUNNING		ADVANCE WARNING DEVICE		PROPOSED RTMS	
PROPOSED PAVEMENT MARKING		SIGN		EXISTING RTMS	

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

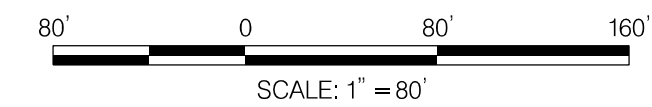
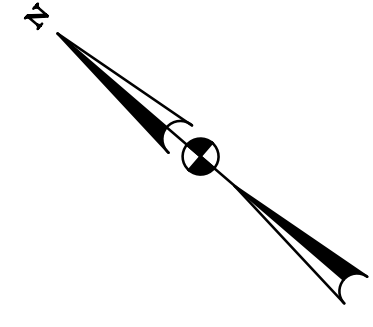
I-270 INTERCHANGE IMPROVEMENT
 PRELIMINARY ENGINEERING
 SHADY GROVE ROAD TO I-370

CONTRACT NO. PROPOSAL
 DRAWING NO.
 SHEET NO. 13 OF 66

DATE: 11/15/16
 SCALE: 1" = 80'



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Tuesday, December 20, 2016 AT 06:22 AM



LEGEND

NEW CONSTRUCTION		STOP BAR		RAMP METER DETECTOR	
HARD SHOULDER RUNNING		ADVANCE WARNING DEVICE		PROPOSED RTMS	
PROPOSED PAVEMENT MARKING		SIGN		EXISTING RTMS	

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

APPR CHECK DRAWN DESIGN

**I-270 INTERCHANGE IMPROVEMENT
PRELIMINARY ENGINEERING**

**SHADY GROVE ROAD
RAMP METER**

DATE: 11/15/16

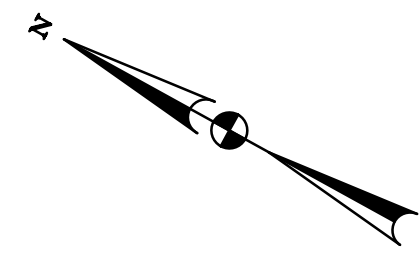
SCALE: 1" = 80'

CONTRACT NO.
PROPOSAL

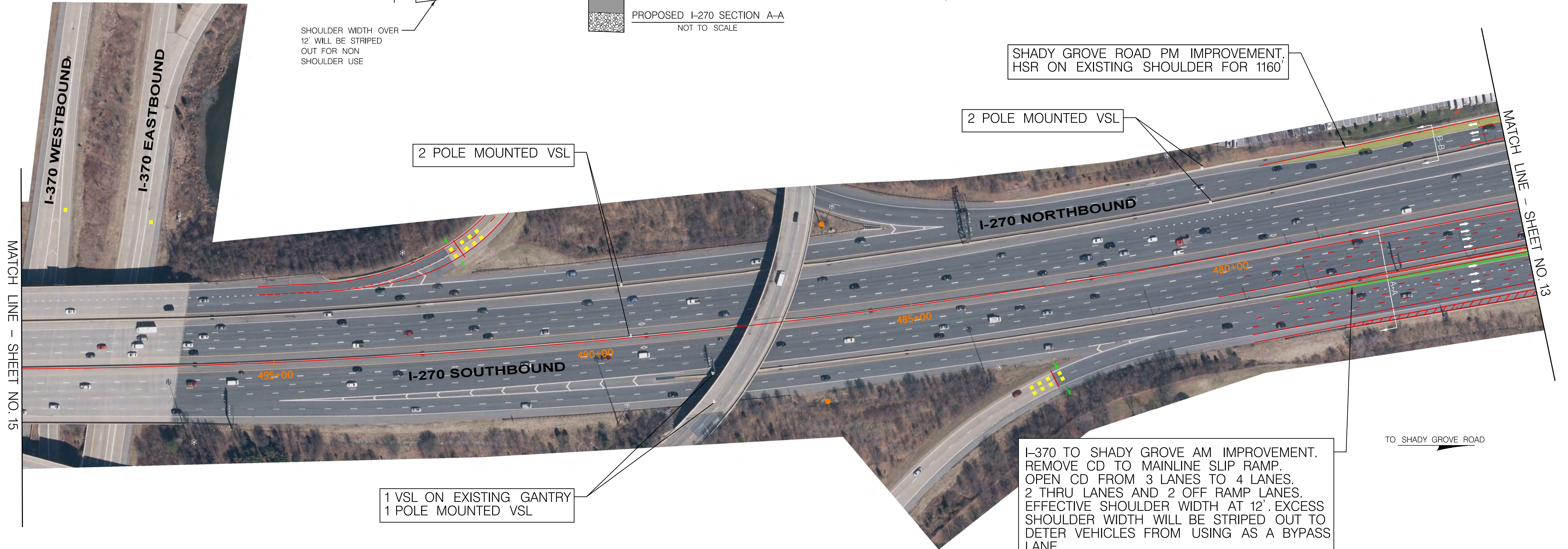
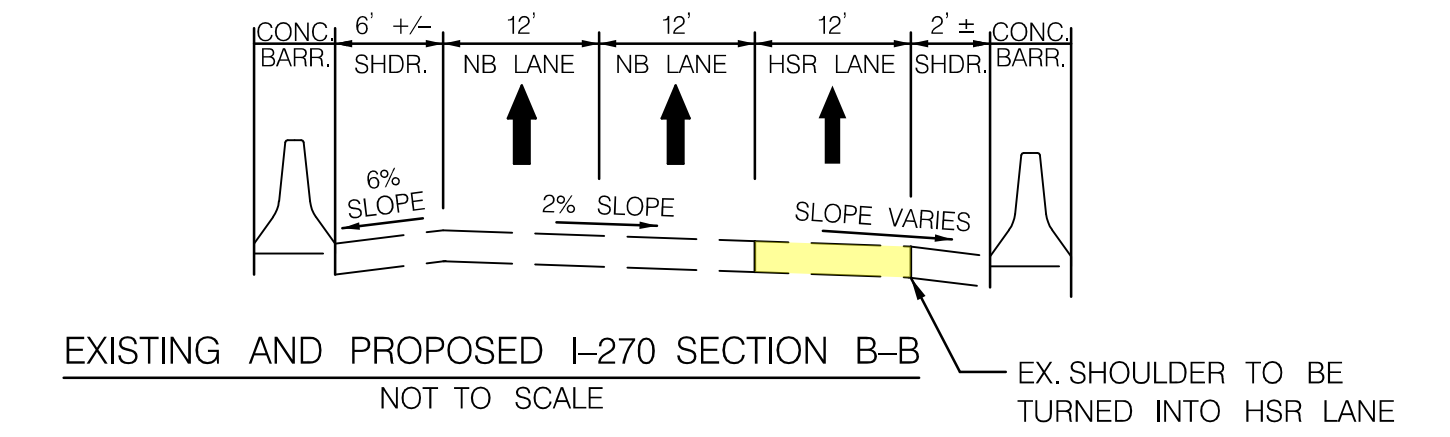
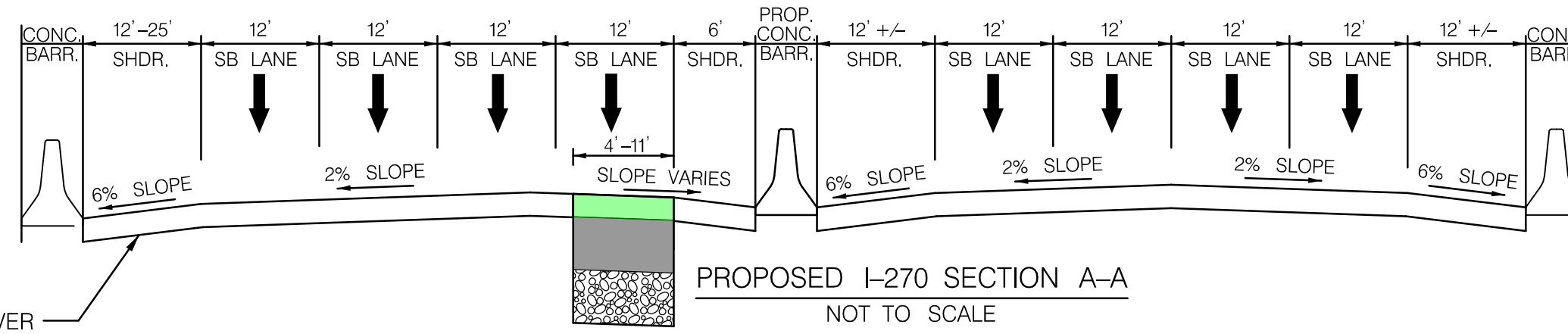
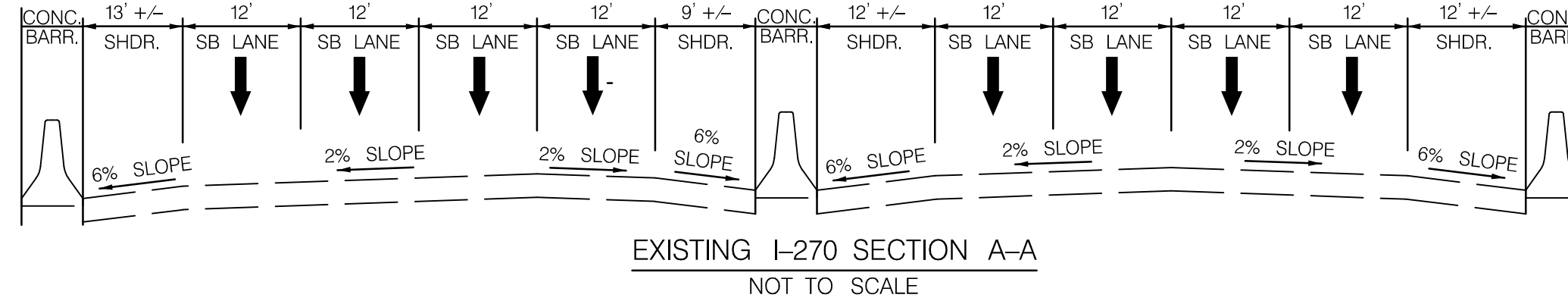
DRAWING NO.

SHEET NO.
13A OF 66

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 Monday, December 19, 2016 AT 08:22 PM



TO I-370



SHADY GROVE ROAD PM IMPROVEMENT, HSR ON EXISTING SHOULDER FOR 1160'

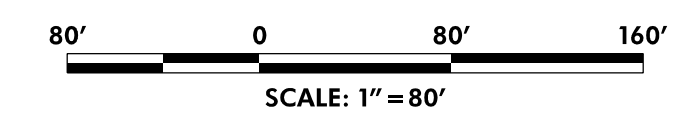
2 POLE MOUNTED VSL

2 POLE MOUNTED VSL

1 VSL ON EXISTING GANTRY
1 POLE MOUNTED VSL

I-370 TO SHADY GROVE AM IMPROVEMENT. REMOVE CD TO MAINLINE SLIP RAMP. OPEN CD FROM 3 LANES TO 4 LANES. 2 THRU LANES AND 2 OFF RAMP LANES. EFFECTIVE SHOULDER WIDTH AT 12'. EXCESS SHOULDER WIDTH WILL BE STRIPED OUT TO DETER VEHICLES FROM USING AS A BYPASS LANE.

TO SHADY GROVE ROAD



LEGEND

NEW CONSTRUCTION		STOP BAR		RAMP METER DETECTOR	
HARD SHOULDER RUNNING		ADVANCE WARNING DEVICE		PROPOSED RTMS	
PROPOSED PAVEMENT MARKING		SIGN		EXISTING RTMS	

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

APPR CHECK DRAWN DESIGN	I-270 INTERCHANGE IMPROVEMENT PRELIMINARY ENGINEERING		CONTRACT NO. PROPOSAL
	SHADY GROVE ROAD TO I-370		DRAWING NO.
	DATE: 11/15/16	SCALE: 1" = 80'	SHEET NO. 14 OF 66

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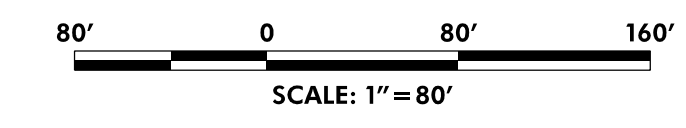
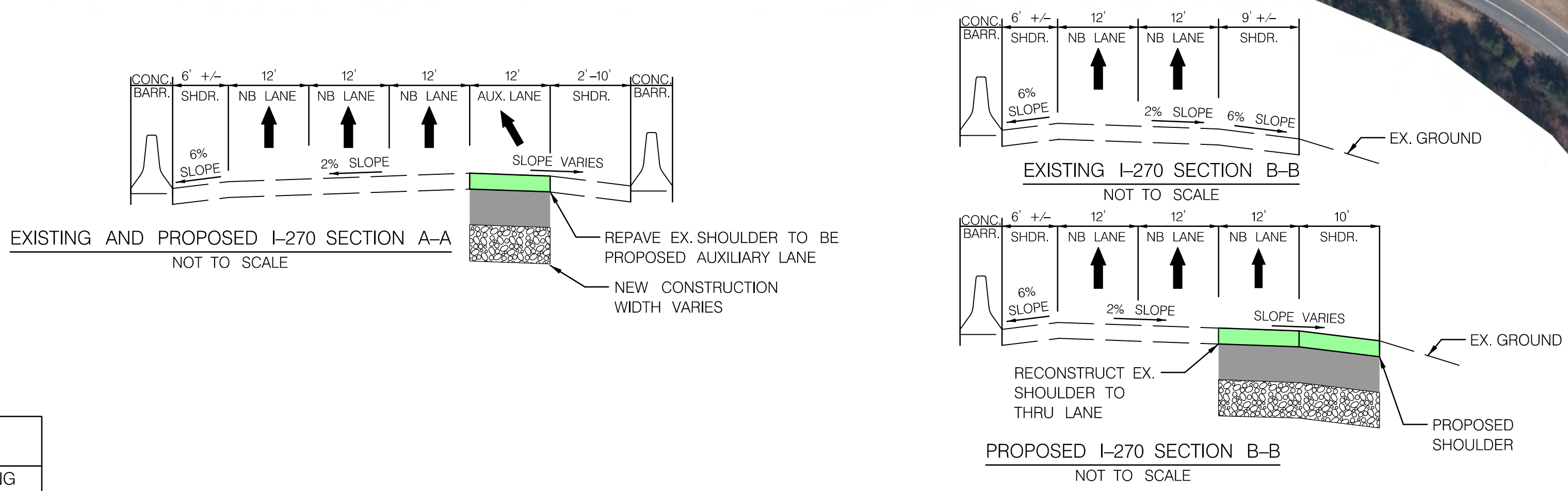
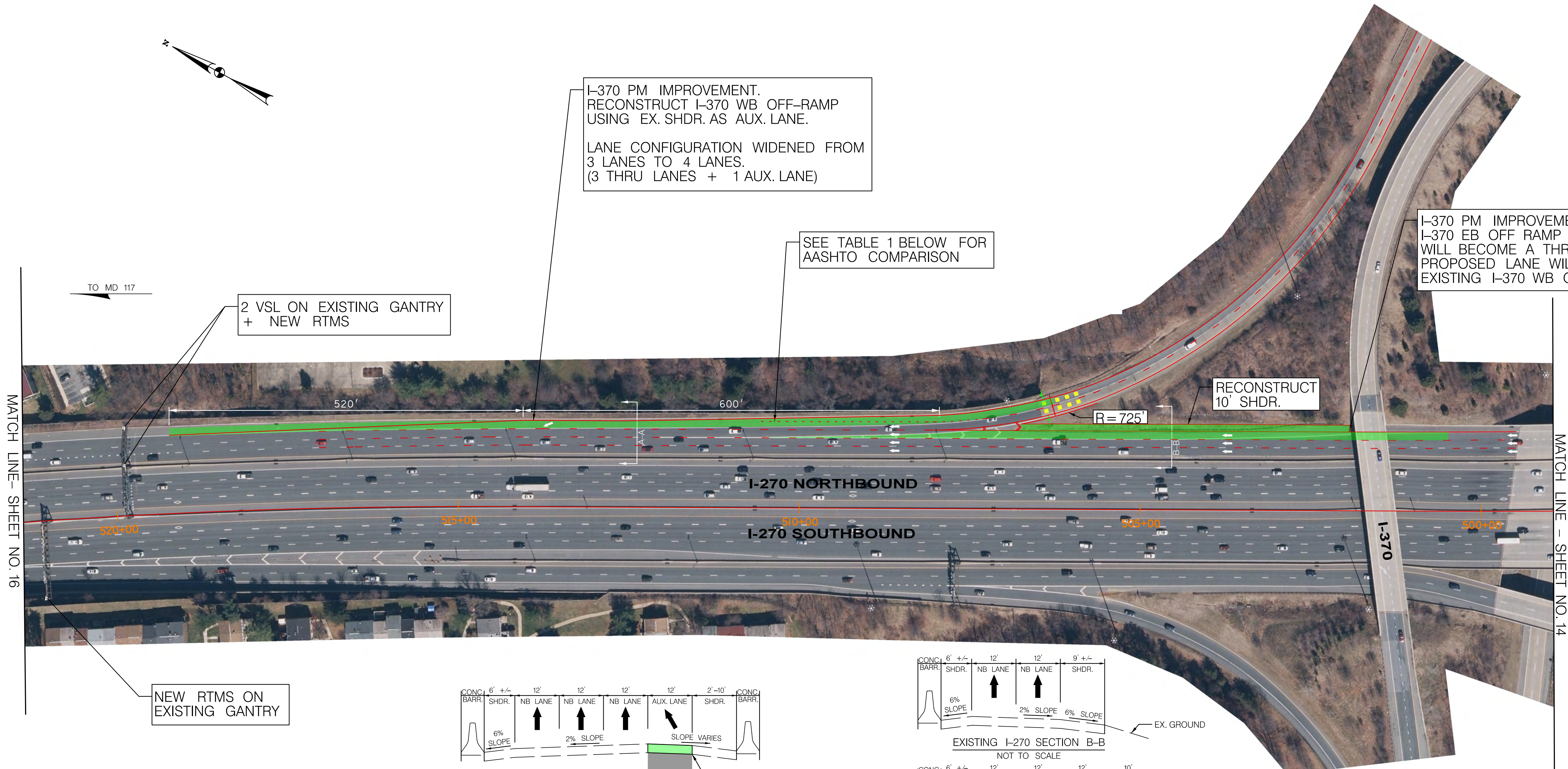


TABLE 1

LOCATION	EXISTING LENGTH	PROPOSED LENGTH	AASHTO	NOTES
RAMP FROM I-370 WB TO I-270 NB	—	600'	600'	NO ACCEPTANCE NEEDED; EXISTING ON RAMP CONTINUES AS THRU LANE

LEGEND			
NEW CONSTRUCTION		STOP BAR	
HARD SHOULDER RUNNING		ADVANCE WARNING DEVICE	
PROPOSED PAVEMENT MARKING		SIGN	
		RAMP METER DETECTOR	
		PROPOSED RTMS	
		EXISTING RTMS	

PRELIMINARY PLANS
 DO NOT USE FOR CONSTRUCTION

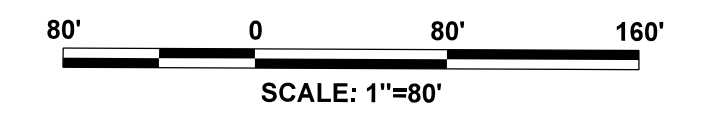
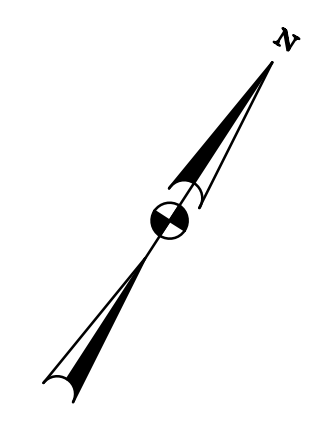
APPR CHECK DRAWN DESIGN	I-270 INTERCHANGE IMPROVEMENT PRELIMINARY ENGINEERING I-370 TO MD-117	CONTRACT NO. PROPOSAL DRAWING NO. SHEET NO. 15 OF 66
	DATE: 11/15/16 SCALE: 1" = 80'	

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 Tuesday, December 20, 2016 AT 06:49 AM

MATCH LINE - SEE SHEET 15B NORTH



MATCH LINE - SEE SHEET 15B EAST



MATCH LINE - SEE SHEET 15B SOUTH

LEGEND

- | | | | | | |
|---------------------------|--|------------------------|--|---------------------|--|
| NEW CONSTRUCTION | | STOP BAR | | RAMP METER DETECTOR | |
| HARD SHOULDER RUNNING | | ADVANCE WARNING DEVICE | | PROPOSED RTMS | |
| PROPOSED PAVEMENT MARKING | | SIGN | | EXISTING RTMS | |

PRELIMINARY PLANS
 DO NOT USE FOR CONSTRUCTION

APPR. CHECK DRAWN DESIGN

**I-270 INTERCHANGE IMPROVEMENT
PRELIMINARY ENGINEERING**

**I-370 INTERCHANGE
RAMP METER**

DATE: 11/15/16

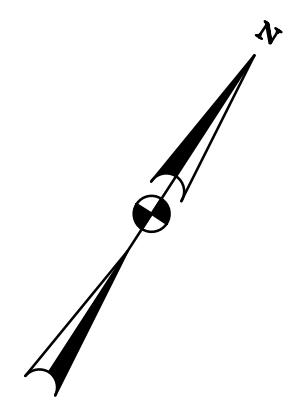
SCALE: 1" = 80'

CONTRACT NO.
PROPOSAL

DRAWING NO.

SHEET NO.
15A OF 66

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 Tuesday, December 20, 2016 AT 07:00 AM



MATCH LINE – SEE SHEET 15A SOUTH

MATCH LINE – SEE SHEET 15A EAST



MATCH LINE – SEE SHEET 15A NORTH



LEGEND

- | | | | | | |
|---------------------------|--|------------------------|--|---------------------|--|
| NEW CONSTRUCTION | | STOP BAR | | RAMP METER DETECTOR | |
| HARD SHOULDER RUNNING | | ADVANCE WARNING DEVICE | | PROPOSED RTMS | |
| PROPOSED PAVEMENT MARKING | | SIGN | | EXISTING RTMS | |

PRELIMINARY PLANS
 DO NOT USE FOR CONSTRUCTION

APPR | CHECK | DRAWN | DESIGN

**I-270 INTERCHANGE IMPROVEMENT
PRELIMINARY ENGINEERING**

**I-370 INTERCHANGE
RAMP METER**

DATE: 11/15/16

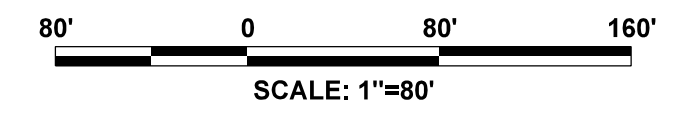
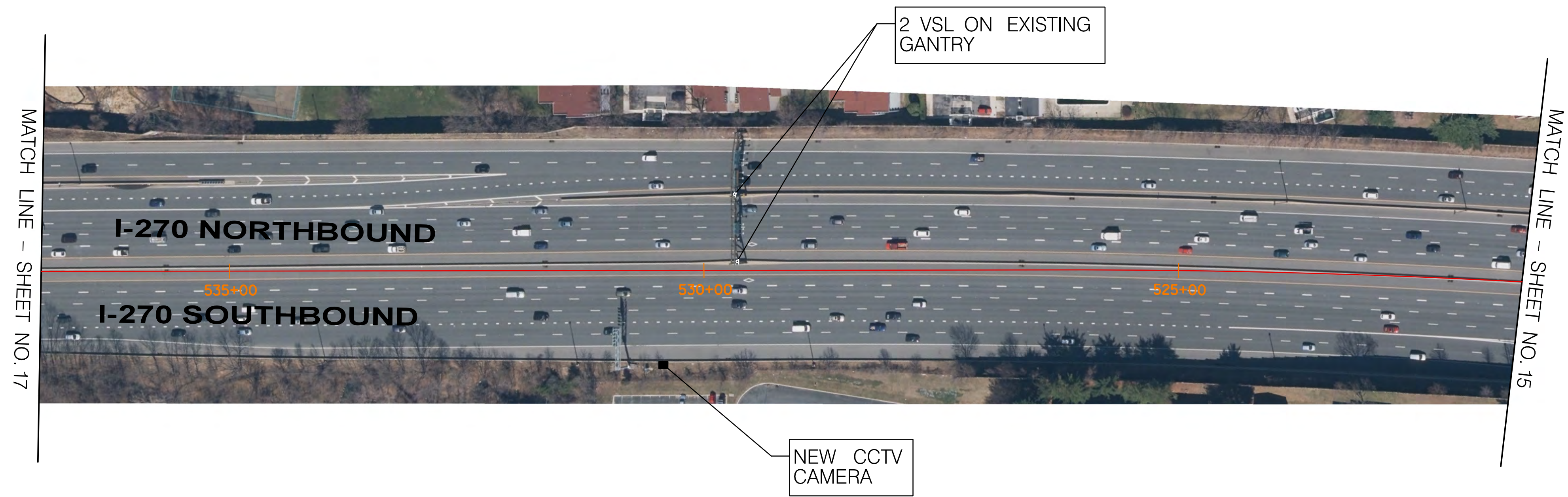
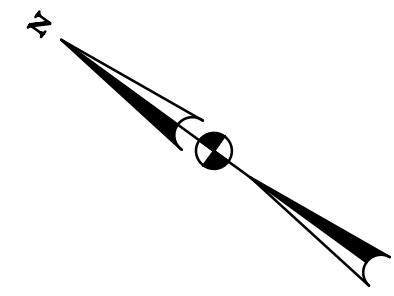
SCALE: 1" = 80'

CONTRACT NO.
PROPOSAL

DRAWING NO.

SHEET NO.
15B OF 66

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 Monday, December 19, 2016 AT 12:49 PM



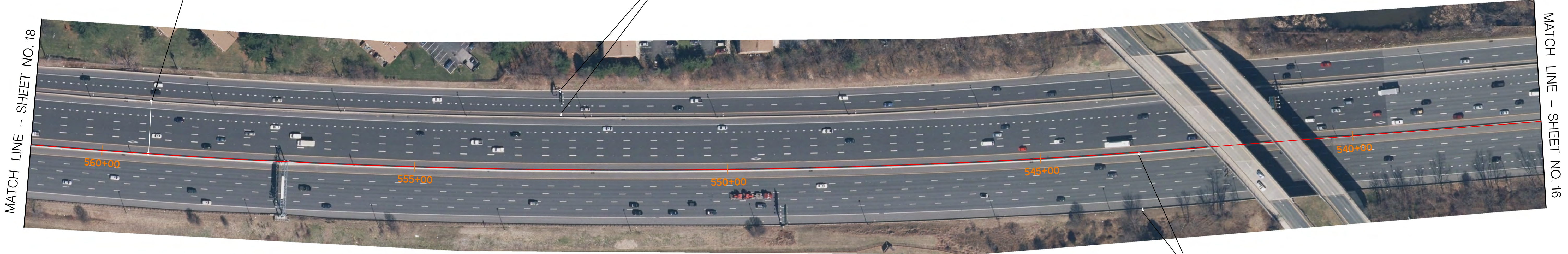
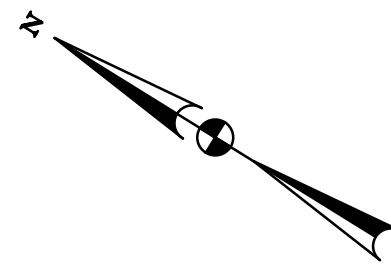
LEGEND

NEW CONSTRUCTION		STOP BAR		RAMP METER DETECTOR	
HARD SHOULDER RUNNING		ADVANCE WARNING DEVICE		PROPOSED RTMS	
PROPOSED PAVEMENT MARKING		SIGN		EXISTING RTMS	

PRELIMINARY PLANS
 DO NOT USE FOR CONSTRUCTION

APPR CHECK DRAWN DESIGN	I-270 INTERCHANGE IMPROVEMENT PRELIMINARY ENGINEERING	CONTRACT NO. PROPOSAL
	I-370 TO MD 117	DRAWING NO.
	DATE: 11/15/16 SCALE: 1" = 80'	SHEET NO. 16 OF 66

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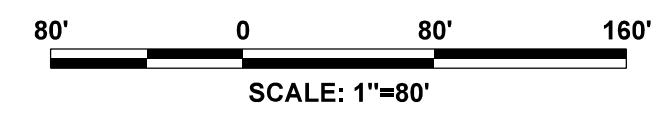
2 VSL ON NEW GANTRY + DMS

1 VSL ON EXISTING POLE + NEW RTMS
1 POLE MOUNTED VSL

1 POLE MOUNTED VSL
1 POLE MOUNTED VSL
+ NEW RTMS

MATCH LINE - SHEET NO. 18

MATCH LINE - SHEET NO. 16



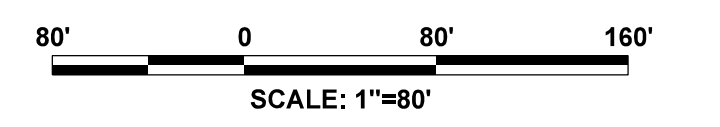
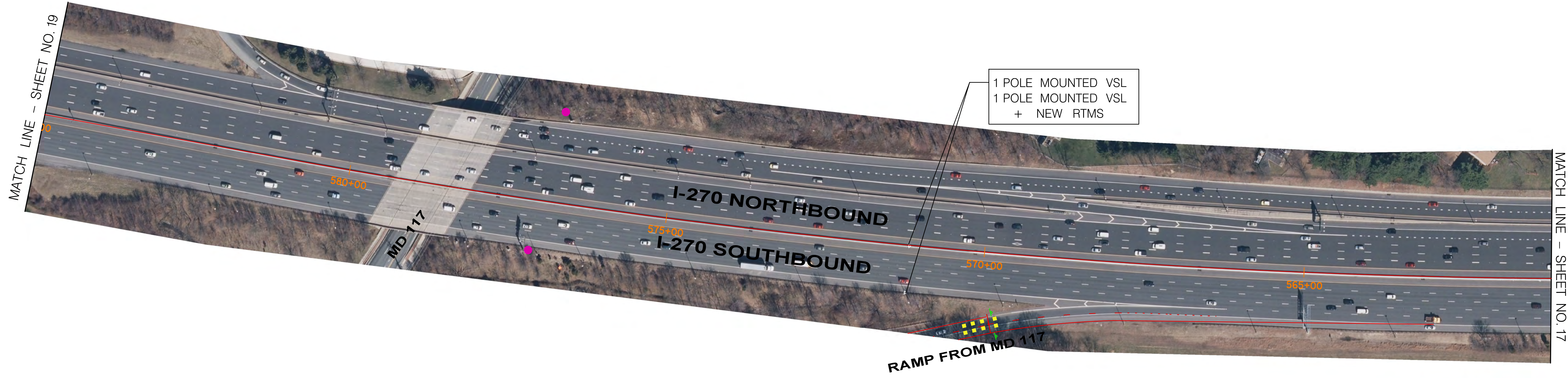
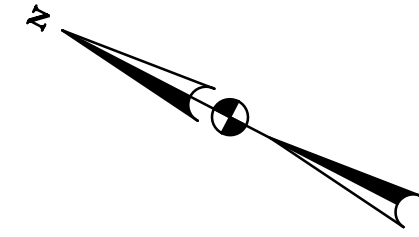
LEGEND

NEW CONSTRUCTION		STOP BAR		RAMP METER DETECTOR	
HARD SHOULDER RUNNING		ADVANCE WARNING DEVICE		PROPOSED RTMS	
PROPOSED PAVEMENT MARKING		SIGN		EXISTING RTMS	

PRELIMINARY PLANS
 DO NOT USE FOR CONSTRUCTION

APPR CHECK DRAWN DESIGN	I-270 INTERCHANGE IMPROVEMENT PRELIMINARY ENGINEERING	CONTRACT NO. PROPOSAL
	I-370 TO MD 117	DRAWING NO.
	DATE: 11/15/16 SCALE: 1" = 80'	SHEET NO. 17 OF 66

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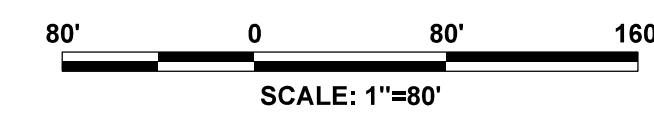
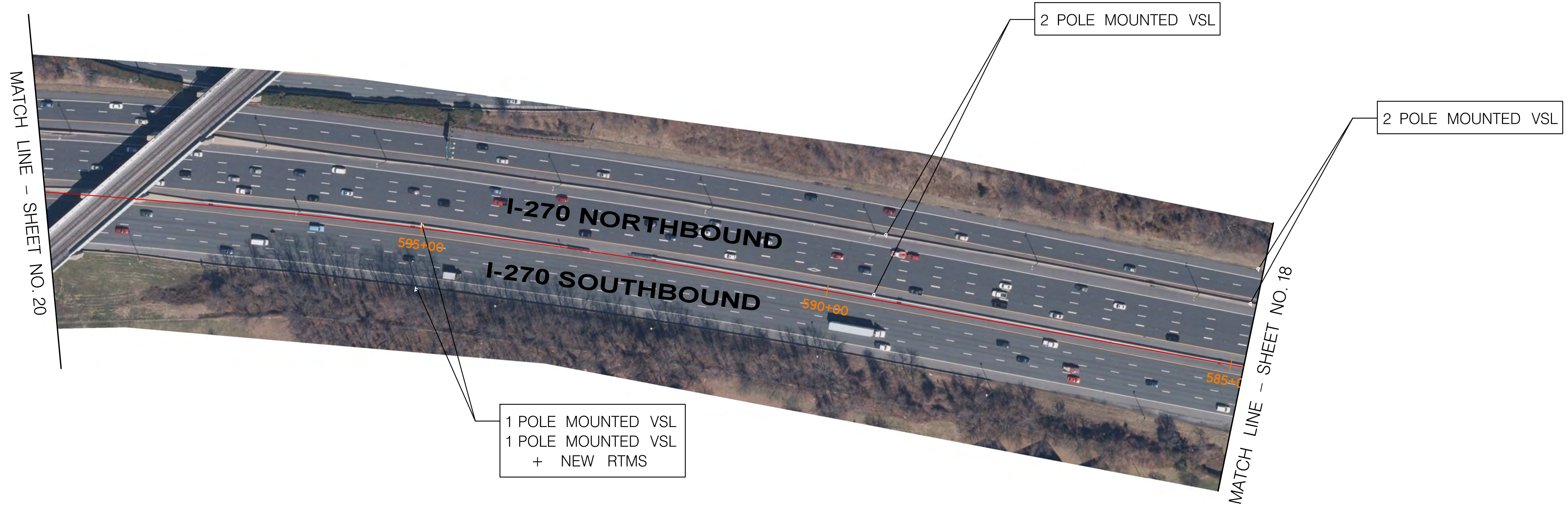
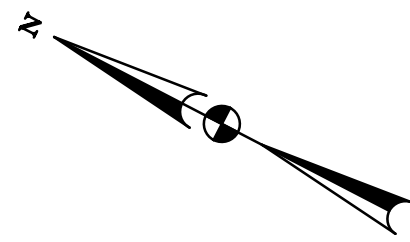
LEGEND

NEW CONSTRUCTION		STOP BAR		RAMP METER DETECTOR	
HARD SHOULDER RUNNING		ADVANCE WARNING DEVICE		PROPOSED RTMS	
PROPOSED PAVEMENT MARKING		SIGN		EXISTING RTMS	

PRELIMINARY PLANS
 DO NOT USE FOR CONSTRUCTION

APPR CHECK DRAWN DESIGN	I-270 INTERCHANGE IMPROVEMENT PRELIMINARY ENGINEERING	CONTRACT NO. PROPOSAL
	I-370 TO MD 117	DRAWING NO.
	DATE: 11/15/16 SCALE: 1" = 80'	SHEET NO. 18 OF 66

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 Monday, December 19, 2016 AT 05:27 PM



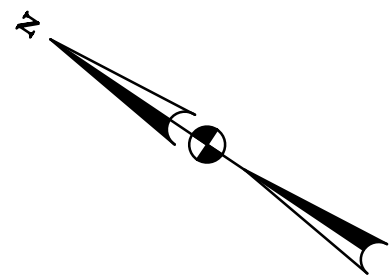
LEGEND

NEW CONSTRUCTION		STOP BAR		RAMP METER DETECTOR	
HARD SHOULDER RUNNING		ADVANCE WARNING DEVICE		PROPOSED RTMS	
PROPOSED PAVEMENT MARKING		SIGN		EXISTING RTMS	

PRELIMINARY PLANS
 DO NOT USE FOR CONSTRUCTION

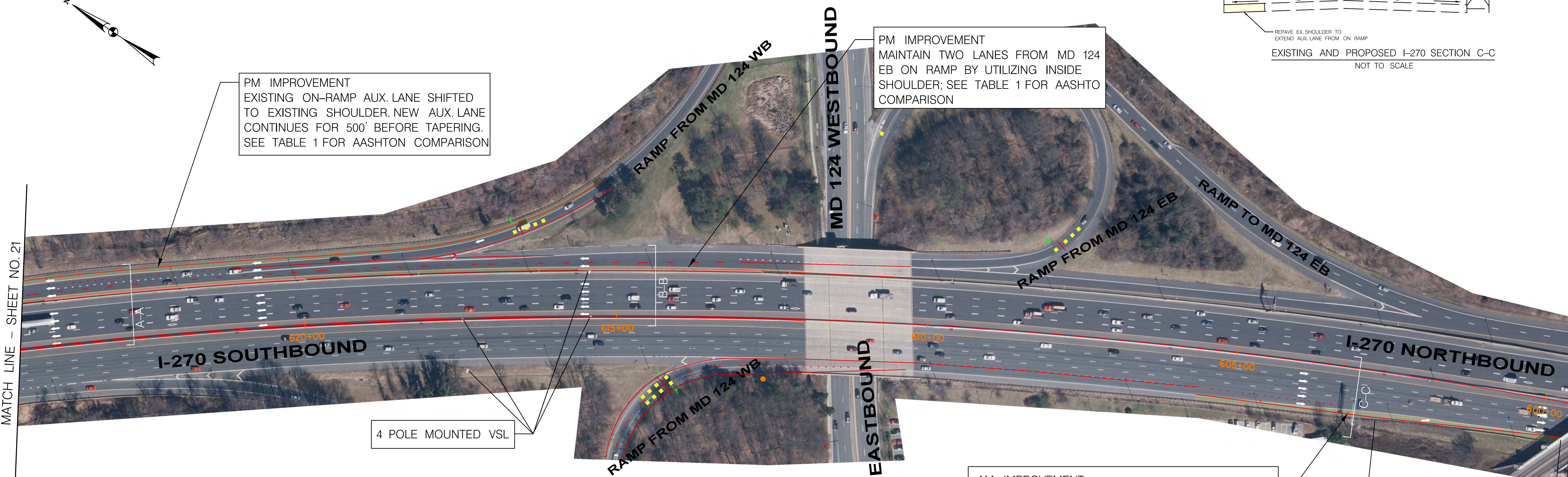
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MATCH LINE - SHEET NO. 21

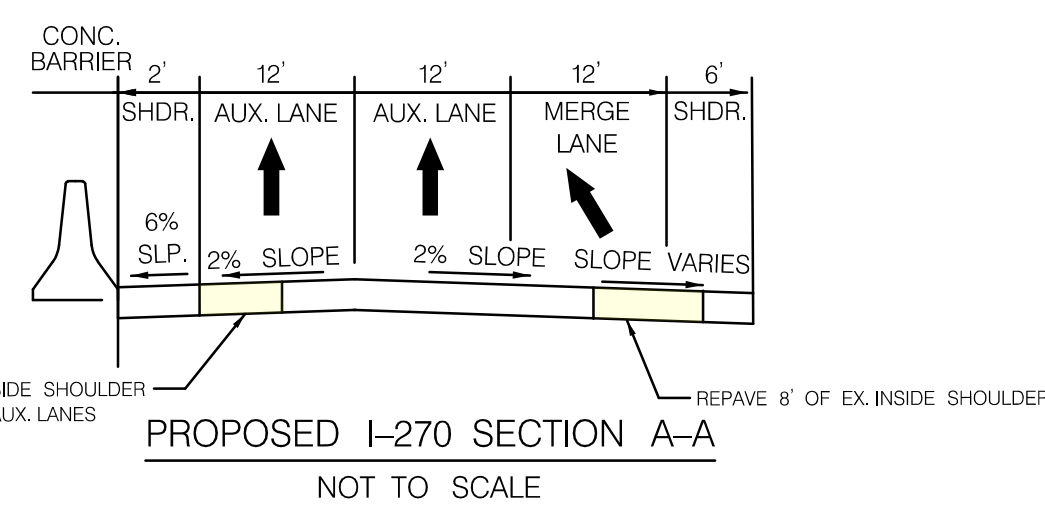
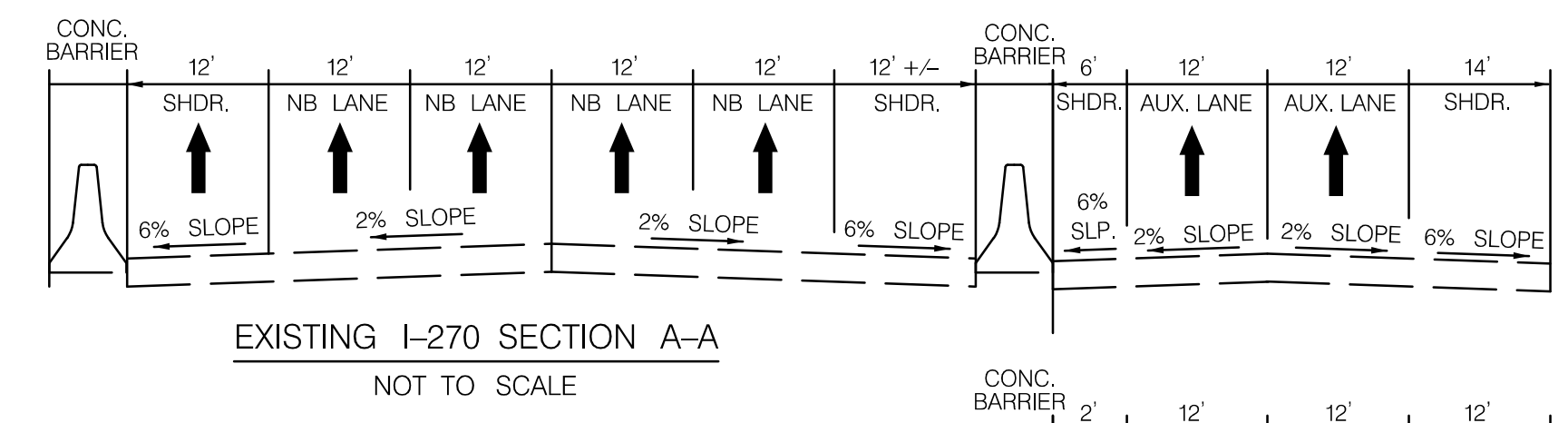
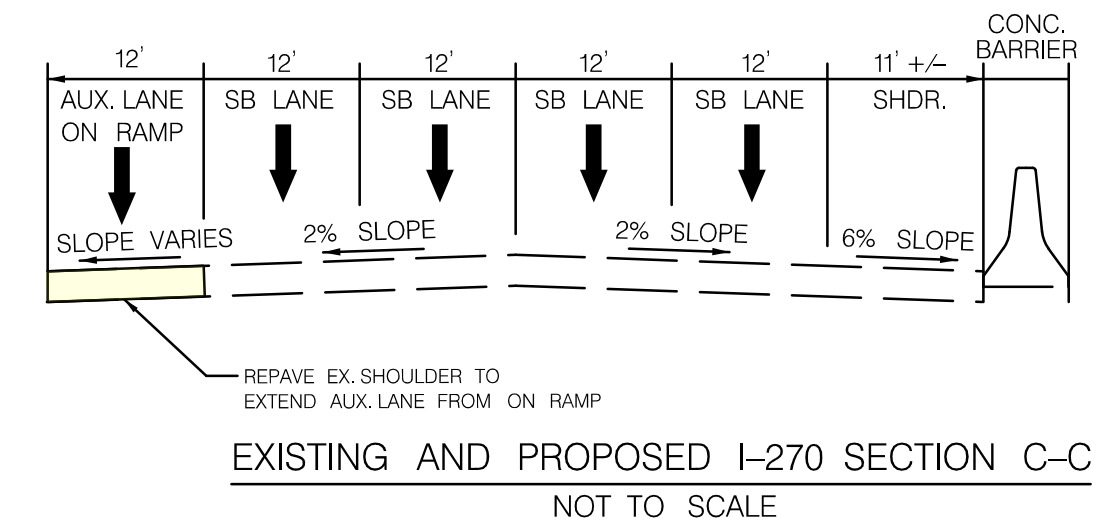
MATCH LINE - SHEET NO. 19



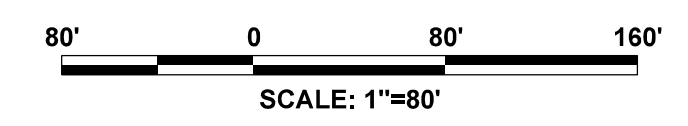
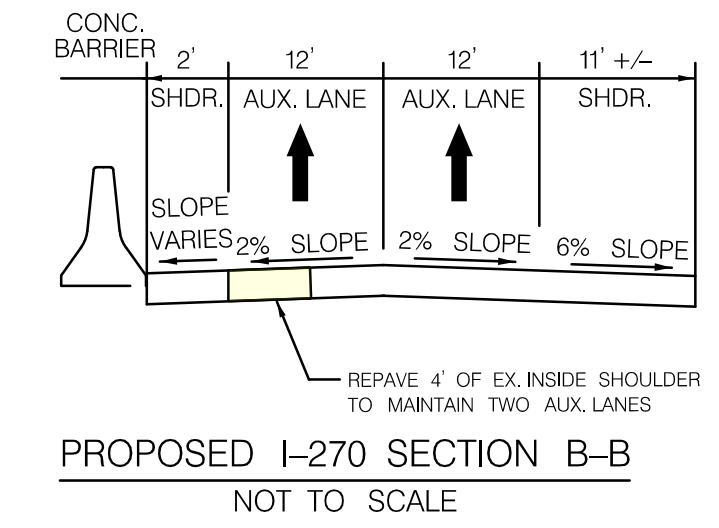
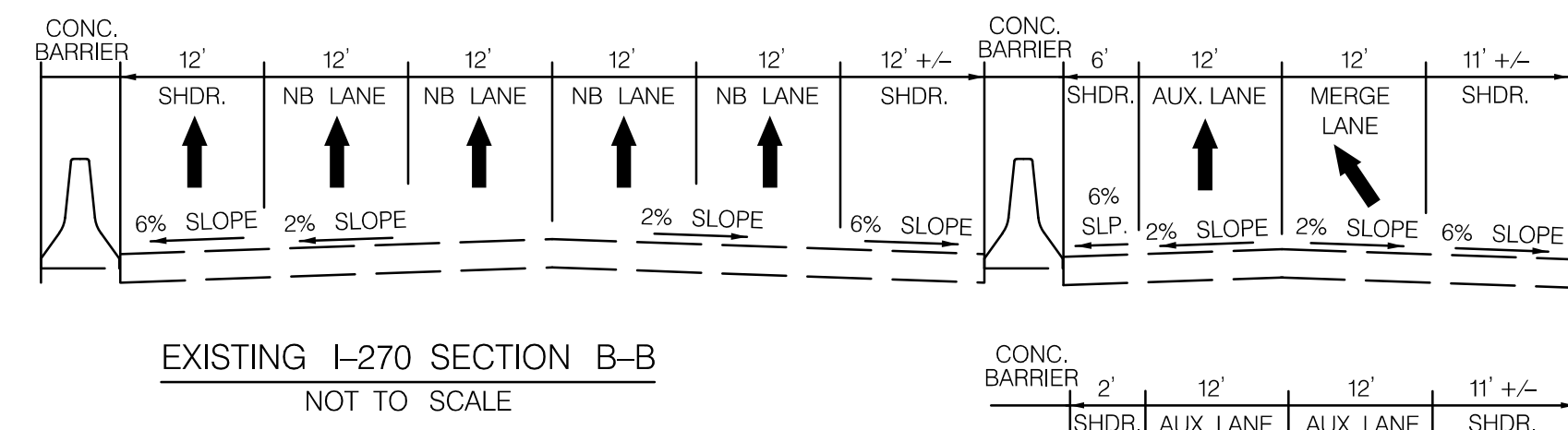
PM IMPROVEMENT
 EXISTING ON-RAMP AUX. LANE SHIFTED TO EXISTING SHOULDER. NEW AUX. LANE CONTINUES FOR 500' BEFORE TAPERING. SEE TABLE 1 FOR AASHTON COMPARISON

PM IMPROVEMENT
 MAINTAIN TWO LANES FROM MD 124 EB ON RAMP BY UTILIZING INSIDE SHOULDER; SEE TABLE 1 FOR AASHTO COMPARISON

4 POLE MOUNTED VSL



AM IMPROVEMENT
 EXTEND EXISTING AUX. LANE FROM I-270 SB ON-RAMP; SEE TABLE 1 FOR AASHTO COMPARISON



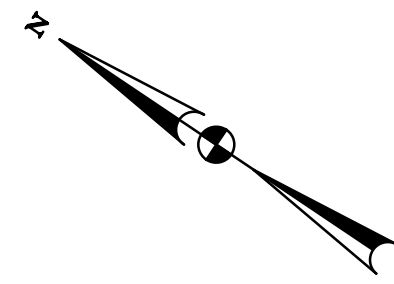
LOCATION	EXISTING LENGTH	PROPOSED LENGTH	AASHTO	NOTES
RAMP FROM MD 124 WB TO I-270 SB	940'	1220'	1120'	NO ACCEPTION NEEDED
RAMP FROM MD 124 WB TO I-270 NB	865'	865'	1120'	LENGTH REMAINS SAME, LANE MOVED TO SHOULDER, ACCEPTION NEEDED
RAMP FROM MD 124 EB TO I-270 NB	665'	2700'	1120'	AUX LANE DOES NOT MERGE UNTIL AFTER MD 124 WB ON-RAMP, NO ACCEPTION NEEDED

LEGEND			
NEW CONSTRUCTION		STOP BAR	
HARD SHOULDER RUNNING		ADVANCE WARNING DEVICE	
PROPOSED PAVEMENT MARKING		SIGN	
		RAMP METER DETECTOR	
		PROPOSED RTMS	
		EXISTING RTMS	

PRELIMINARY PLANS
 DO NOT USE FOR CONSTRUCTION

APPR CHECK DRAWN DESIGN	I-270 INTERCHANGE IMPROVEMENT PRELIMINARY ENGINEERING		CONTRACT NO. PROPOSAL
	MD 124 INTERCHANGE		DRAWING NO.
	DATE: 11/15/16	SCALE: 1" = 80'	SHEET NO. 20 OF 66

pw:\txpl\02\win101\parsons.com\Maryland_State\ICM\Design\Roadway_Improvements\Exit_6 - MD 28 W. Montgomery Ave\pHD-0006_MD124_RM.dgn
 Tuesday, December 20, 2016 AT 06:30 AM



LEGEND			
NEW CONSTRUCTION		STOP BAR	
HARD SHOULDER RUNNING		ADVANCE WARNING DEVICE	
PROPOSED PAVEMENT MARKING		SIGN	
		RAMP METER DETECTOR	
		PROPOSED RTMS	
		EXISTING RTMS	

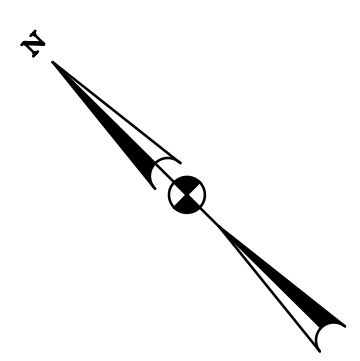
PRELIMINARY PLANS
 DO NOT USE FOR CONSTRUCTION

APPR	CHECK	DRAWN	DESIGN
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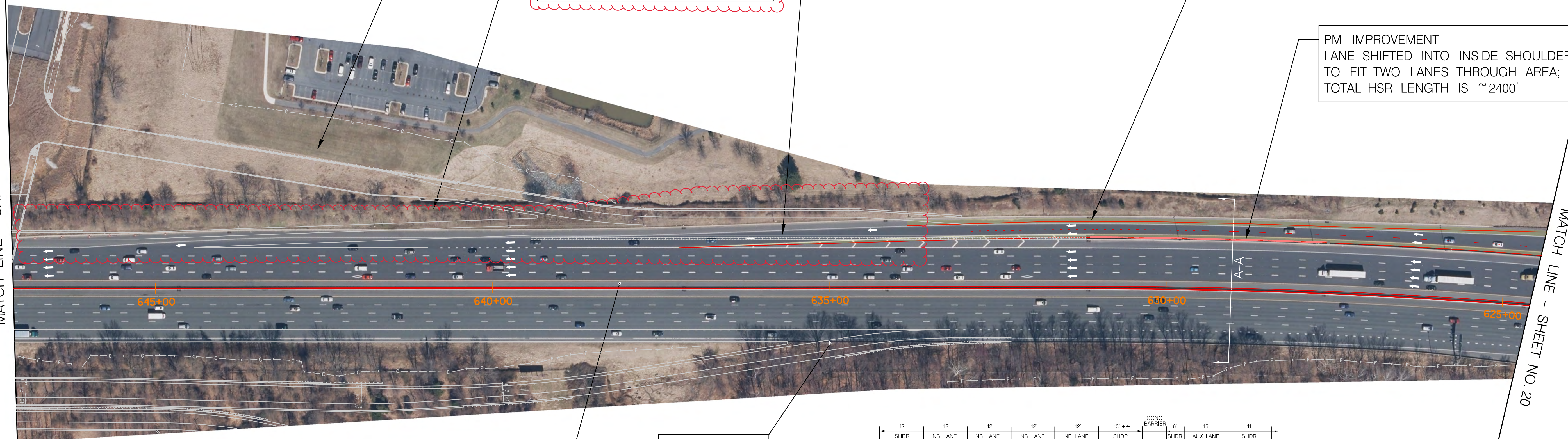
I-270 INTERCHANGE IMPROVEMENT PRELIMINARY ENGINEERING	
MD 124 INTERCHANGE RAMP METER	
DATE: 11/15/16	SCALE: 1" = 80'

CONTRACT NO. PROPOSAL
DRAWING NO.
SHEET NO. 20A OF 66

pw:\t\p\02\2\wint01\parsons.com\Maryland_State\Design\Roadway_Improvements\Exit_15 - MD 118\pHD-P006_MD118.dgn
 Monday, December 19, 2016 AT 05:55 PM



MATCH LINE - SHEET NO. 22



WATKINS MILL INTERCHANGE TO BE COMPLETED BY OTHERS

RECOMMEND TO HAVE CD LANE CONTINUE THROUGH INTERCHANGE AND MERGE WITH MAINLINE AFTER WATKINS MILL INTERCHANGE

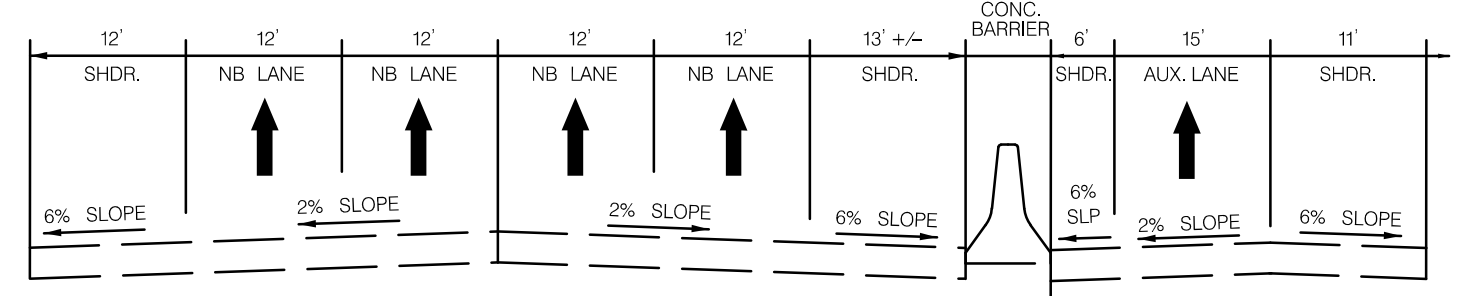
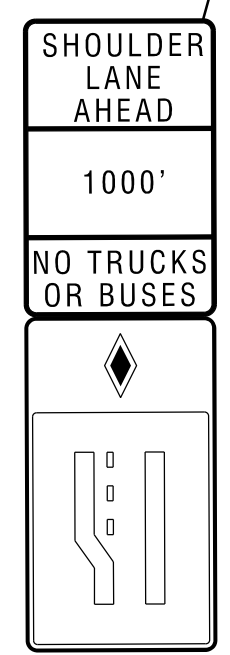
WATKINS MILL INTERCHANGE DESIGN PROPOSES TO MAINTAIN A CD LANE FOR THE FIRST OFF RAMP; HSR DESIGN HAS THE AUX LANE MERGE WITH THE MAINLINE.

DESIGN CHANGES TO WATKINS MILL INTERCHANGE MAY BE NECESSARY

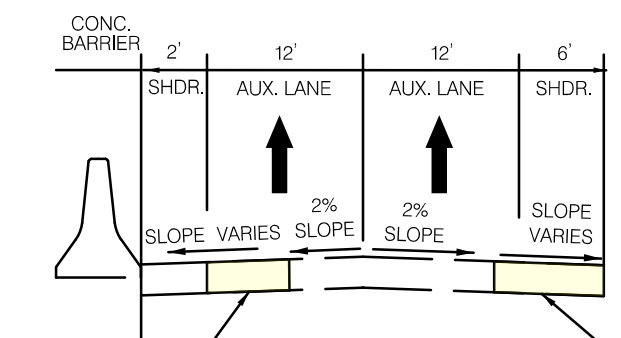
PM IMPROVEMENT LANE SHIFTED INTO OUTSIDE SHOULDER TO FIT TWO LANES THROUGH AREA; TOTAL HSR LENGTH IS ~1800'

PM IMPROVEMENT LANE SHIFTED INTO INSIDE SHOULDER TO FIT TWO LANES THROUGH AREA; TOTAL HSR LENGTH IS ~2400'

NEW RTMS ON NEW POLE

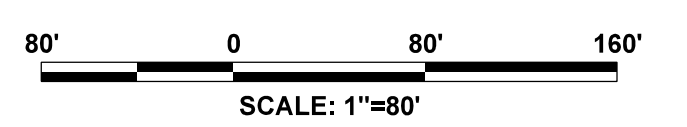


EXISTING I-270 SECTION A-A
NOT TO SCALE



PROPOSED I-270 SECTION A-A
NOT TO SCALE

REPAVE 4' OF EX. INSIDE SHOULDER TO MAINTAIN TWO AUX. LANES
REPAVE 8' OF EX. OUTSIDE SHOULDER TO MAINTAIN TWO AUX. LANES



LEGEND

NEW CONSTRUCTION		STOP BAR		RAMP METER DETECTOR	
HARD SHOULDER RUNNING		ADVANCE WARNING DEVICE		PROPOSED RTMS	
PROPOSED PAVEMENT MARKING		SIGN		EXISTING RTMS	

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

APPR. CHECK DRAWING DESIGN

**I-270 INTERCHANGE IMPROVEMENT
PRELIMINARY ENGINEERING**

WATKINS MILL INTERCHANGE

DATE: 11/15/16

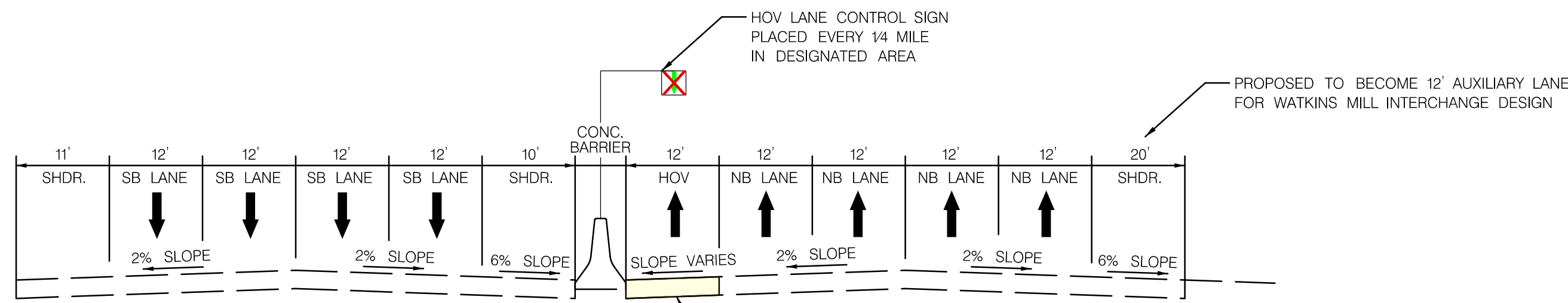
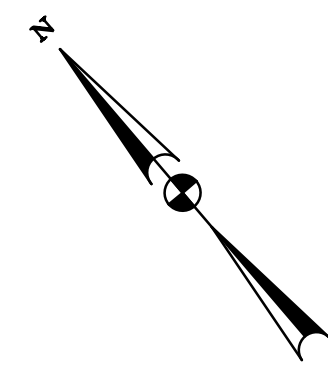
SCALE: 1" = 80'

CONTRACT NO.
PROPOSAL

DRAWING NO.

SHEET NO.
21 OF 66

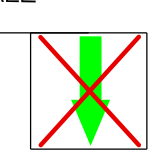
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 Monday, December 19, 2016 AT 06:09 PM



EXISTING AND PROPOSED I-270 SECTION A-A

NOT TO SCALE

NOT TO SCALE



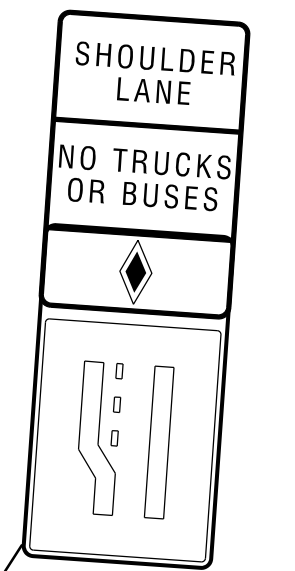
2 VSL ON NEW GANTRY +
DMS + LCS + NEW RTMS

RECOMMEND TO HAVE CD LANE
CONTINUE THROUGH INTERCHANGE
AND MERGE WITH MAINLINE AFTER
WATKINS MILL INTERCHANGE

PM IMPROVEMENT
12' INSIDE HSR FROM MD 24 TO MD 121
TOTAL HSR LENGTH IS ~20,800'

1 VDIS ON NEW POLE + VSL

1 VDIS ON LANE
CONTROL SIGN



MATCH LINE - SHEET NO. 23

MATCH LINE - SHEET NO. 21

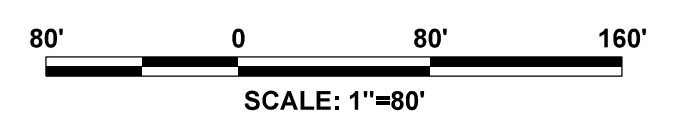
I-270 NORTHBOUND
I-270 SOUTHBOUND

1 VDIS ON NEW POLE

1 POLE BOUNDED
VSL + NEW RTMS

NEW CCTV
CAMERA

WATKINS MILL INTERCHANGE
TO BE DONE BY OTHERS



LEGEND

NEW CONSTRUCTION		STOP BAR		RAMP METER DETECTOR	
HARD SHOULDER RUNNING		ADVANCE WARNING DEVICE		PROPOSED RTMS	
PROPOSED PAVEMENT MARKING		SIGN		EXISTING RTMS	

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

APPR CHECK DRAWN DESIGN

**I-270 INTERCHANGE IMPROVEMENT
PRELIMINARY ENGINEERING**

WATKINS MILL INTERCHANGE

DATE: 11/15/16

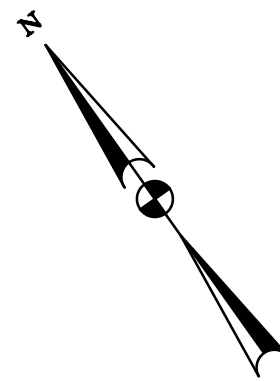
SCALE: 1" = 80'

CONTRACT NO.
PROPOSAL

DRAWING NO.

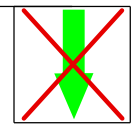
SHEET NO.
22 OF 66

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 Monday, December 19, 2016 AT 06:07 PM



PM IMPROVEMENT
 12' INSIDE HSR FROM MD 124 TO MD 121
 TOTAL HSR LENGTH IS ~20,800'

NOT TO SCALE



SEE SECTION A-A
ON SHEET NO. 22

MATCH LINE - SHEET NO. 24

MATCH LINE - SHEET NO. 22

I-270 NORTHBOUND
I-270 SOUTHBOUND

620+00

685+00

690+00

675+00

670+00

2 VSL ON EXISTING GANTRY +
HSR LCS + VDIS + NEW RTMS

1 VDIS + 2 VSL + NEW
RTMS ON EXISTING GANTRY

1 VDIS ON LANE
CONTROL SIGN



LEGEND

- | | | | | | |
|----------------------------------|--|-------------------------------|--|----------------------------|--|
| NEW CONSTRUCTION | | STOP BAR | | RAMP METER DETECTOR | |
| HARD SHOULDER RUNNING | | ADVANCE WARNING DEVICE | | PROPOSED RTMS | |
| PROPOSED PAVEMENT MARKING | | SIGN | | EXISTING RTMS | |

PRELIMINARY PLANS
 DO NOT USE FOR CONSTRUCTION

APPR CHECK DRAWN DESIGN

**I-270 INTERCHANGE IMPROVEMENT
 PRELIMINARY ENGINEERING**

WATKINS MILL INT. TO MIDDLEBROOK RD

DATE: 11/15/16

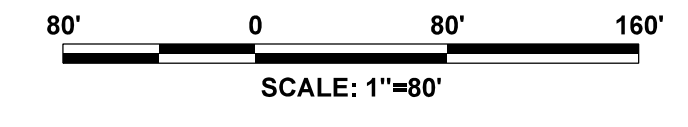
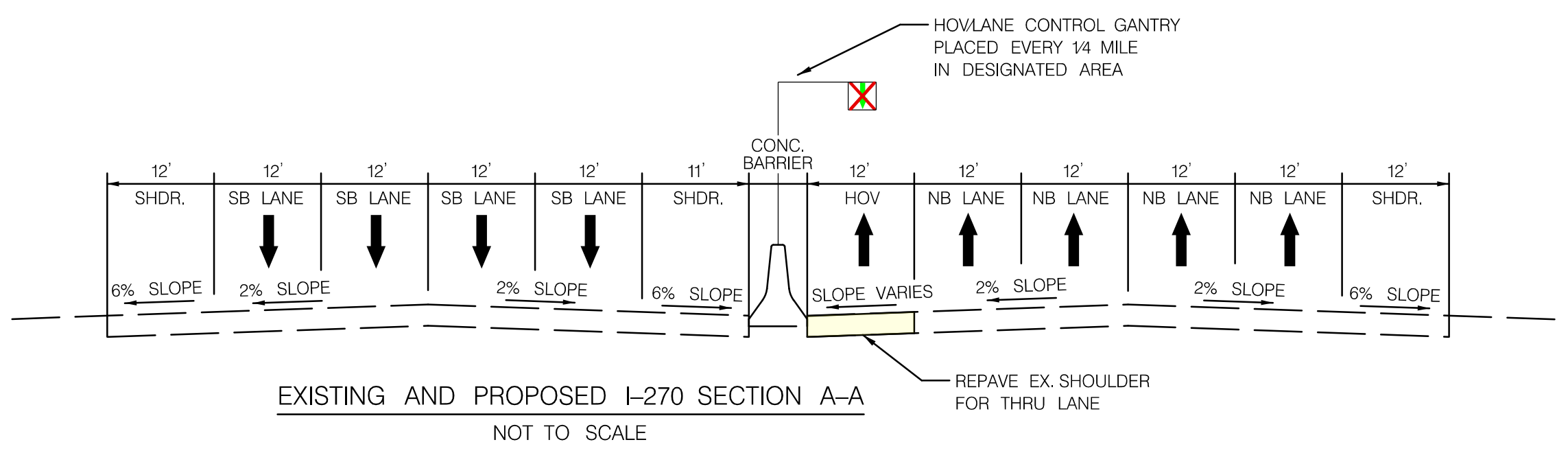
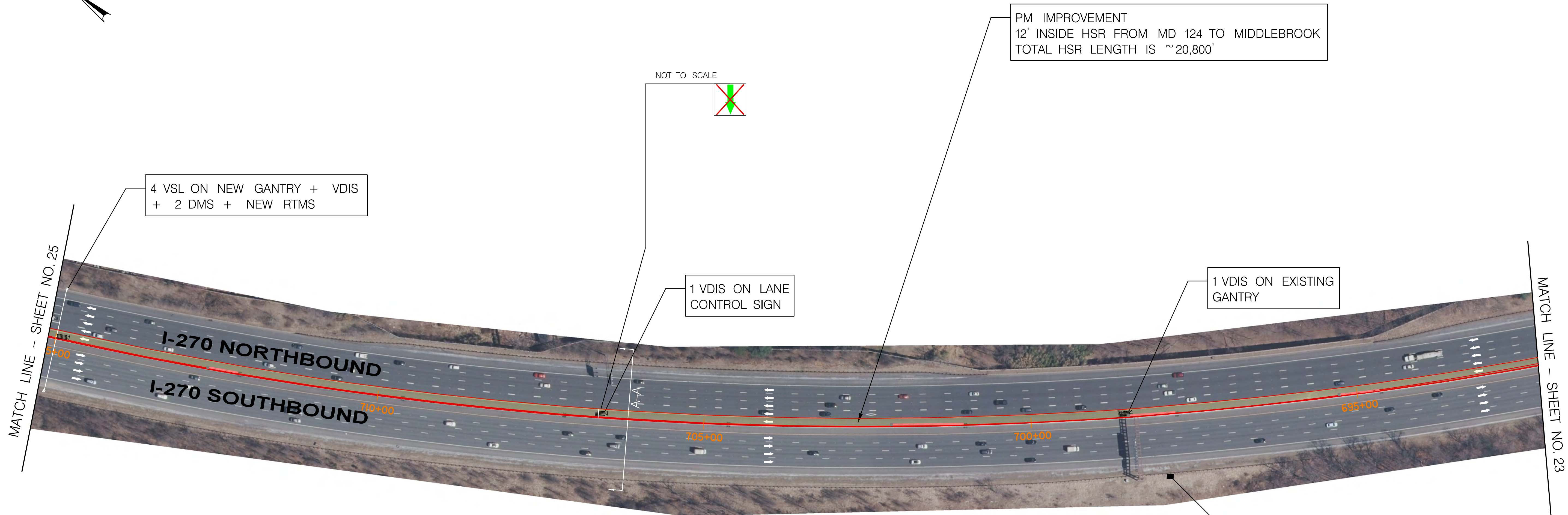
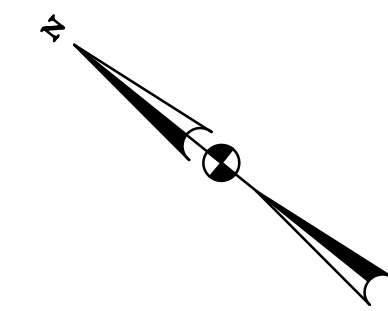
SCALE: 1" = 80'

CONTRACT NO.
PROPOSAL

DRAWING NO.

SHEET NO.
 23 OF 66

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 Monday, December 19, 2016 AT 06:14 PM

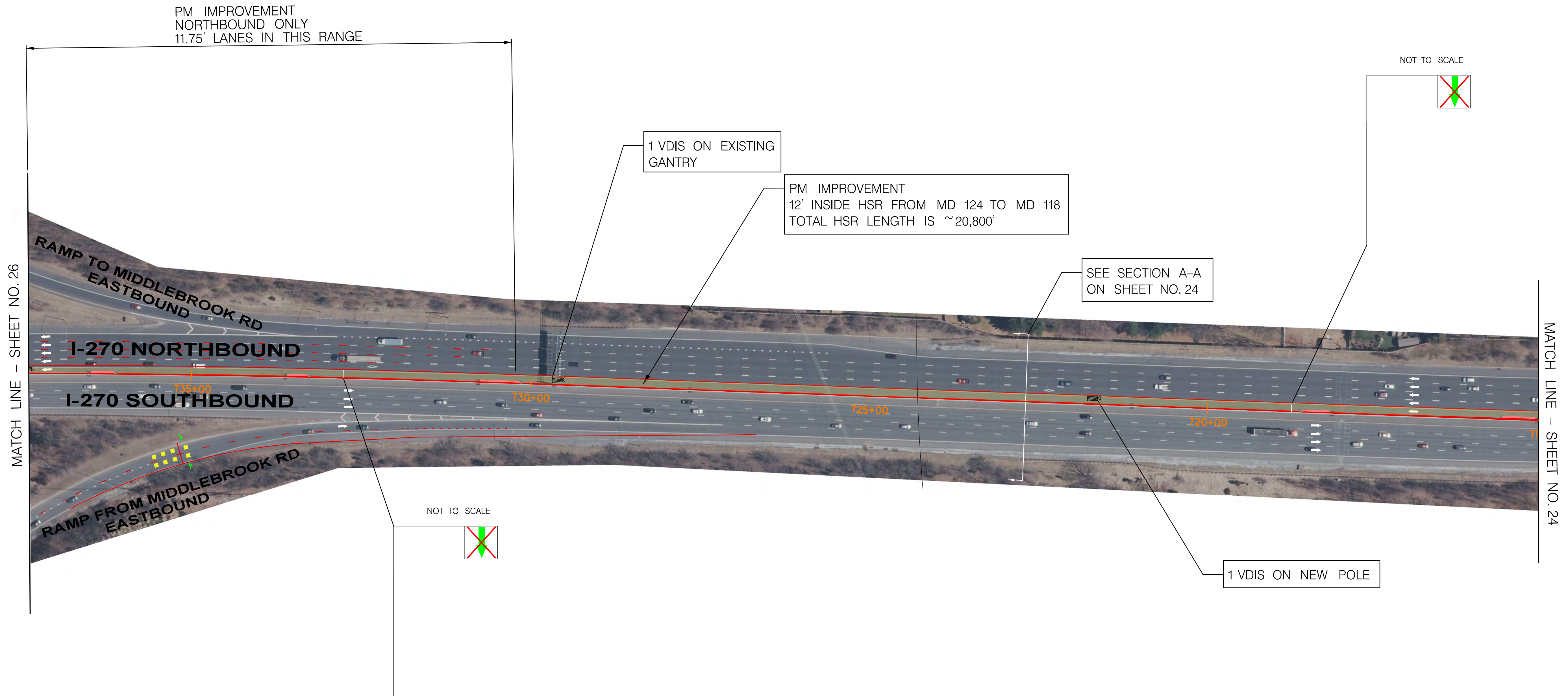
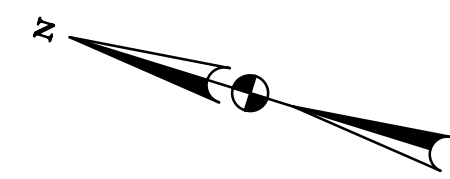


LEGEND			
NEW CONSTRUCTION		STOP BAR	
HARD SHOULDER RUNNING		ADVANCE WARNING DEVICE	
PROPOSED PAVEMENT MARKING		SIGN	
		RAMP METER DETECTOR	
		PROPOSED RTMS	
		EXISTING RTMS	

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

APPR. CHECK DRAWN DESIGN	I-270 INTERCHANGE IMPROVEMENT PRELIMINARY ENGINEERING		CONTRACT NO. PROPOSAL
	MIDDLEBROOK RD TO MD 124		DRAWING NO.
	DATE: 11/15/16	SCALE: 1" = 80'	SHEET NO. 24 OF 66

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 Tuesday, December 20, 2016 AT 05:54 AM



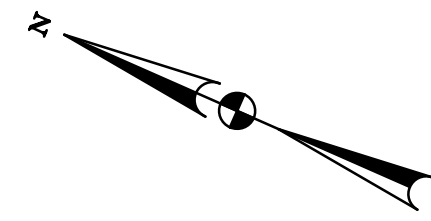
LEGEND

NEW CONSTRUCTION		STOP BAR		RAMP METER DETECTOR	
HARD SHOULDER RUNNING		ADVANCE WARNING DEVICE		PROPOSED RTMS	
PROPOSED PAVEMENT MARKING		SIGN		EXISTING RTMS	

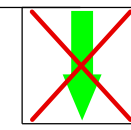
PRELIMINARY PLANS
 DO NOT USE FOR CONSTRUCTION

APPR CHECK DRAWN DESIGN	I-270 INTERCHANGE IMPROVEMENT PRELIMINARY ENGINEERING	CONTRACT NO. PROPOSAL
	WATKINS MILL INT. TO MIDDLEBROOK RD	DRAWING NO.
	DATE: 11/15/16	SHEET NO. 25 OF 66
	SCALE: 1" = 80'	

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 Monday, December 19, 2016 AT 06:23 PM



NOT TO SCALE



PM IMPROVEMENT
 12' INSIDE HSR FROM MD 124 TO MD 121
 TOTAL HSR LENGTH IS ~20,800'

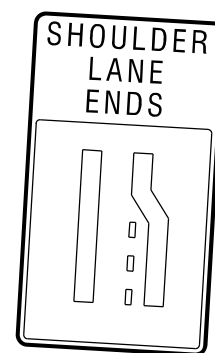
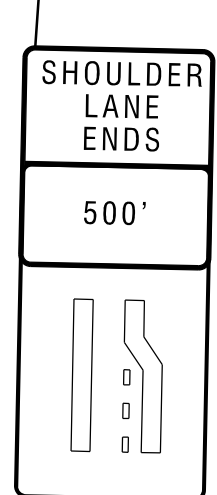
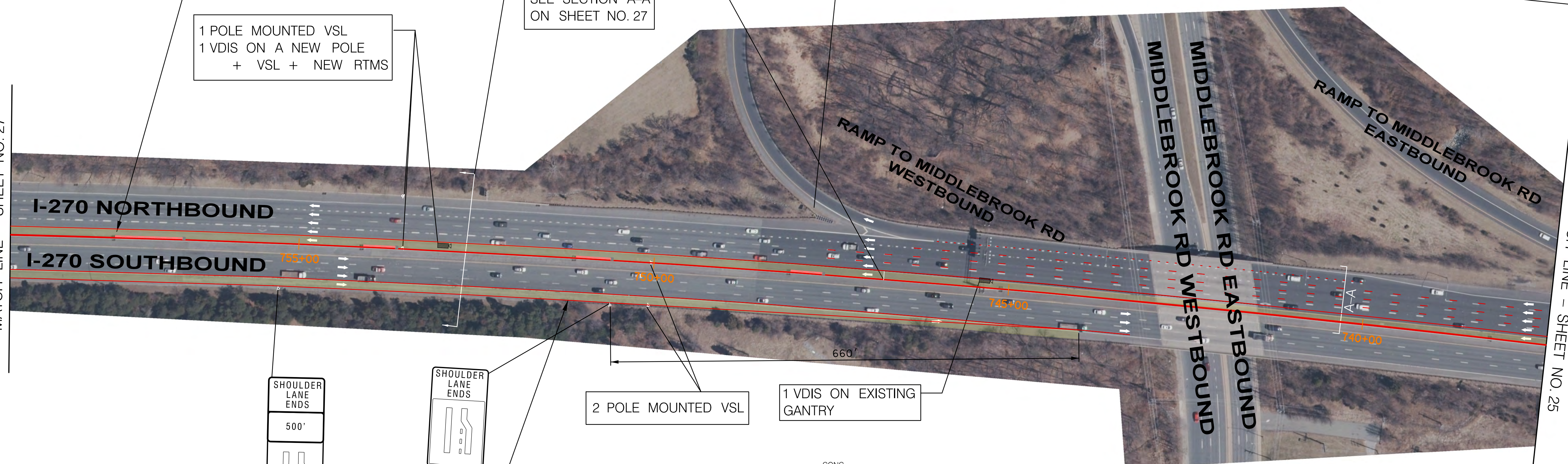
1 POLE MOUNTED VSL
 1 VDIS ON A NEW POLE
 + VSL + NEW RTMS

SEE SECTION A-A
 ON SHEET NO. 27

PM IMPROVEMENT
 NORTHBOUND ONLY
 11.75' LANES IN THIS RANGE

MATCH LINE - SHEET NO. 27

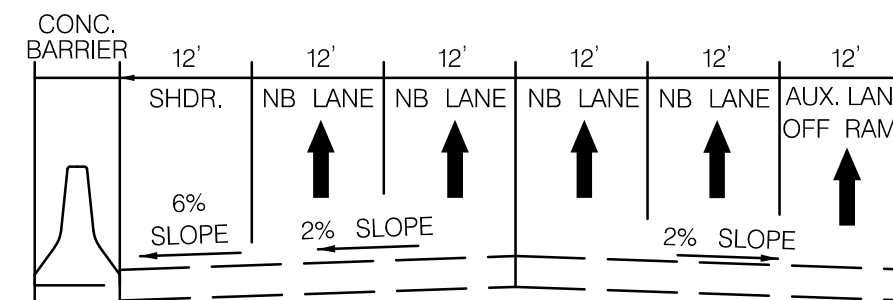
MATCH LINE - SHEET NO. 25



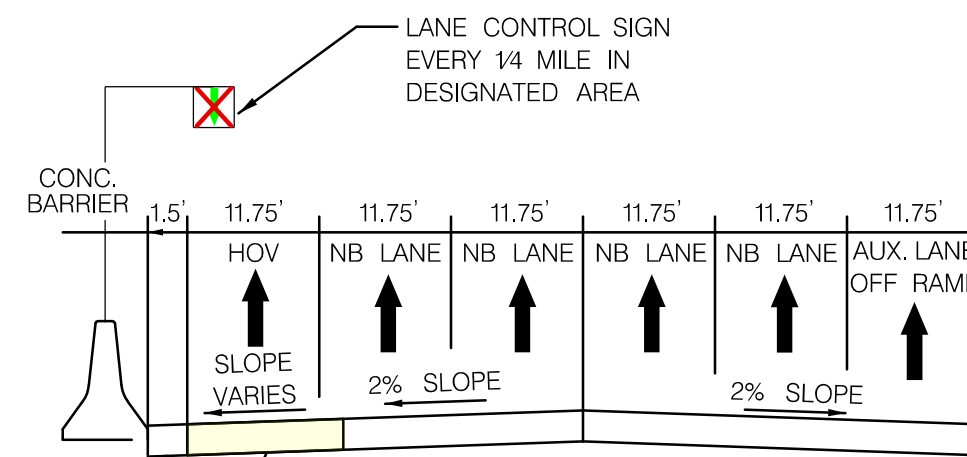
2 POLE MOUNTED VSL

1 VDIS ON EXISTING GANTRY

AM IMPROVEMENT
 12' OUTSIDE HSR FROM AFTER ON RAMP MERGE
 LANE UNTIL BRIDGE; LENGTH OF HSR
 IS ~2150'



EXISTING I-270 SECTION A-A
 NOT TO SCALE



PROPOSED I-270 SECTION A-A
 NOT TO SCALE



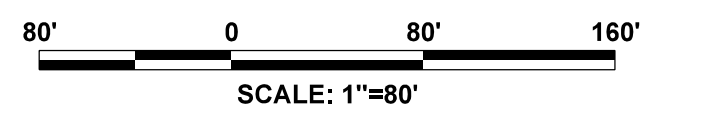
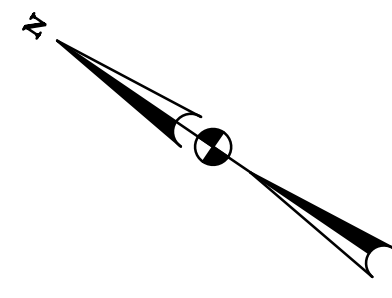
SCALE: 1" = 80'

LEGEND			
NEW CONSTRUCTION		STOP BAR	
HARD SHOULDER RUNNING		ADVANCE WARNING DEVICE	
PROPOSED PAVEMENT MARKING		SIGN	
		RAMP METER DETECTOR	
		PROPOSED RTMS	
		EXISTING RTMS	

PRELIMINARY PLANS
 DO NOT USE FOR CONSTRUCTION

APPR CHECK DRAWN DESIGN	I-270 INTERCHANGE IMPROVEMENT PRELIMINARY ENGINEERING		CONTRACT NO. PROPOSAL
	MIDDLEBROOK RD INTERCHANGE		DRAWING NO.
	DATE: 11/15/16	SCALE: 1" = 80'	SHEET NO. 26 OF 66

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 Tuesday, December 20, 2016 AT 06:32 AM



LEGEND

NEW CONSTRUCTION		STOP BAR		RAMP METER DETECTOR	
HARD SHOULDER RUNNING		ADVANCE WARNING DEVICE		PROPOSED RTMS	
PROPOSED PAVEMENT MARKING		SIGN		EXISTING RTMS	

PRELIMINARY PLANS
 DO NOT USE FOR CONSTRUCTION

APPR	CHECK	DRAWN	DESIGN
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**I-270 INTERCHANGE IMPROVEMENT
 PRELIMINARY ENGINEERING**

**MIDDLEBROOK RD INTERCHANGE
 RAMP METER**

DATE: 11/15/16

SCALE: 1" = 80'

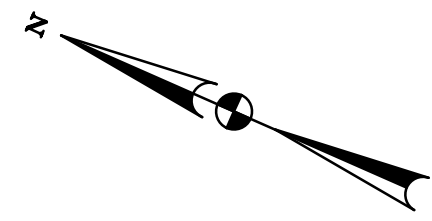
CONTRACT NO.
PROPOSAL

DRAWING NO.

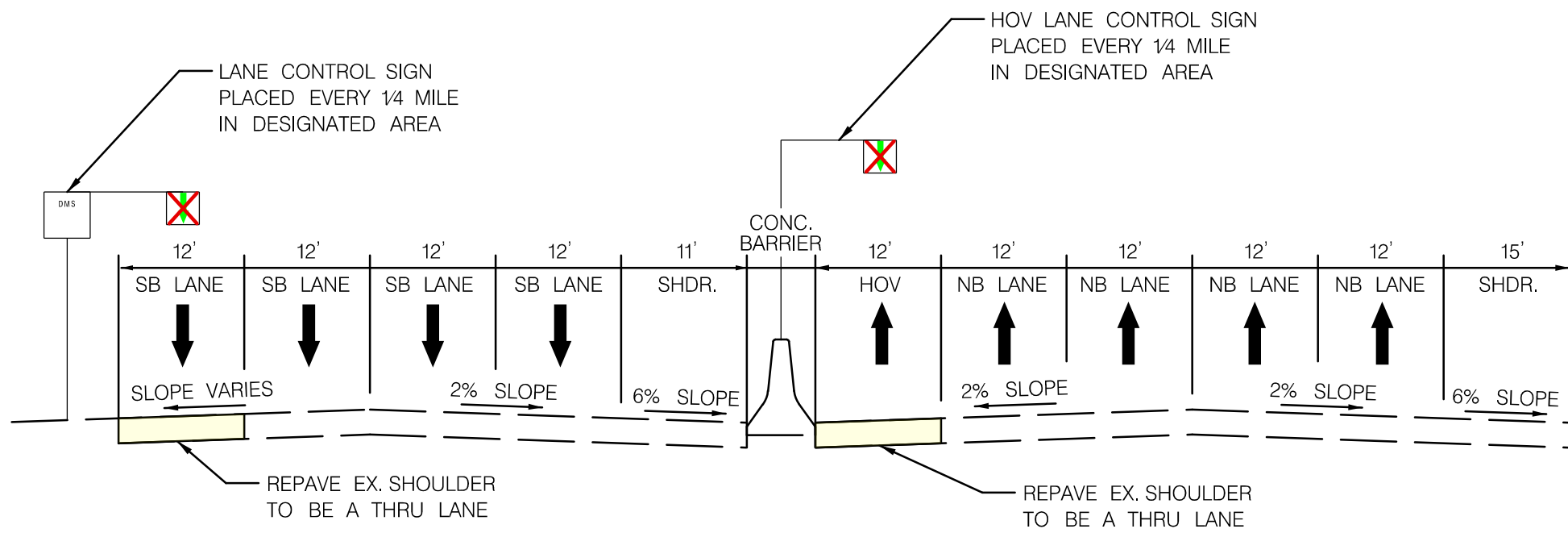
SHEET NO.

26A OF 66

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 Monday, December 19, 2016 AT 06:29 PM

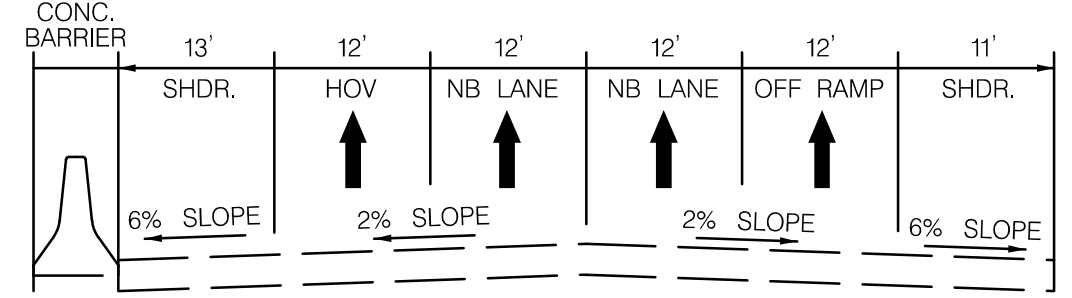
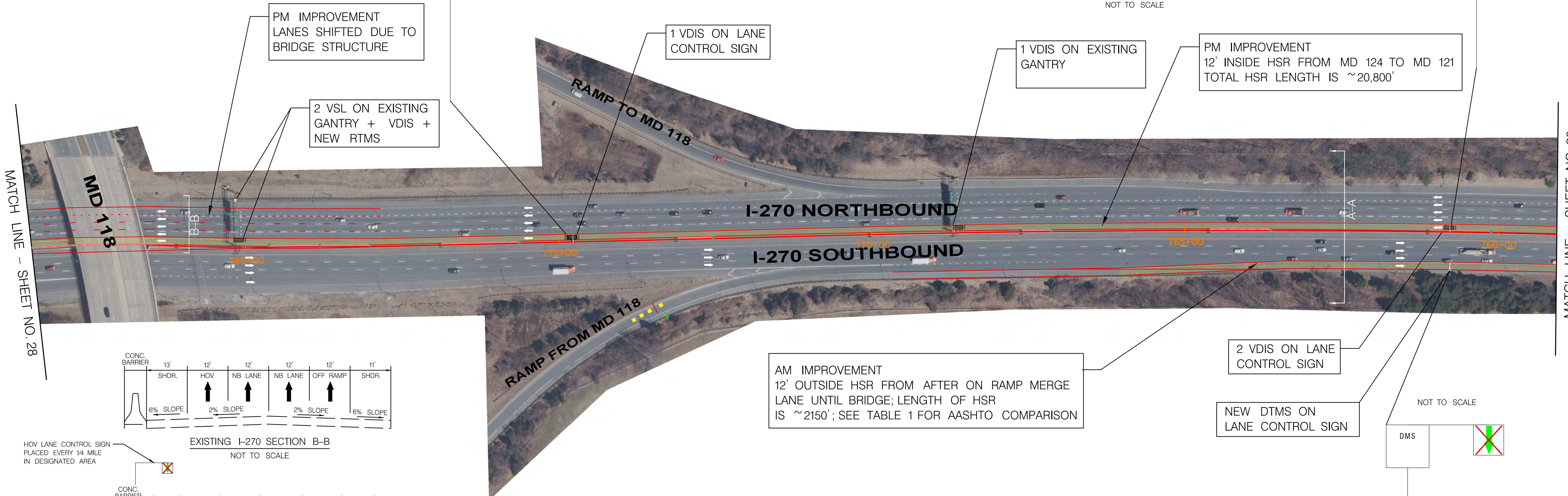


NOT TO SCALE

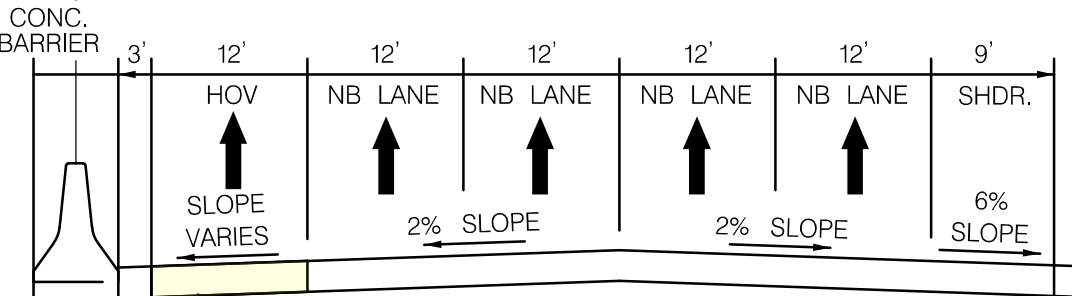


NOT TO SCALE

EXISTING AND PROPOSED I-270 SECTION A-A
NOT TO SCALE



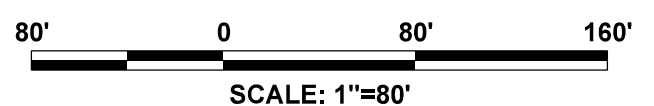
EXISTING I-270 SECTION B-B
NOT TO SCALE



PROPOSED I-270 SECTION B-B
NOT TO SCALE

TABLE 1

LOCATION	EXISTING LENGTH	PROPOSED LENGTH	AASHTO	NOTES
RAMP FROM MD 118 TO I-270 SB	730'	2715'	1120'	NO ACCEPTION NEEDED



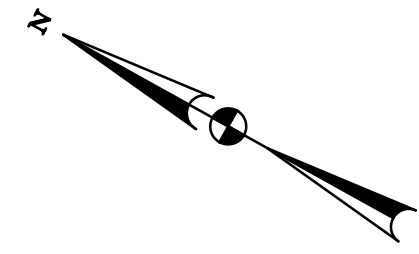
LEGEND

NEW CONSTRUCTION		STOP BAR		RAMP METER DETECTOR	
HARD SHOULDER RUNNING		ADVANCE WARNING DEVICE		PROPOSED RTMS	
PROPOSED PAVEMENT MARKING		SIGN		EXISTING RTMS	

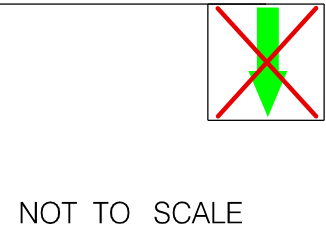
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

APPR CHECK DRAWN DESIGN	I-270 INTERCHANGE IMPROVEMENT PRELIMINARY ENGINEERING		CONTRACT NO. PROPOSAL
	MD 118 INTERCHANGE		DRAWING NO.
	DATE: 11/15/16	SCALE: 1" = 80'	SHEET NO. 27 OF 66

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 Monday, December 19, 2016 AT 06:32 PM



SEE SECTION A-A
ON SHEET NO. 29



2 VDIS ON LANE
CONTROL SIGN

SEE SECTION B-B
ON SHEET NO. 27

MATCH LINE - SHEET NO. 29

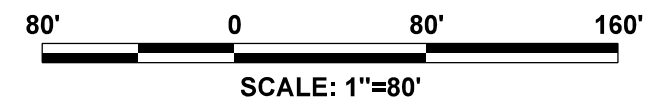
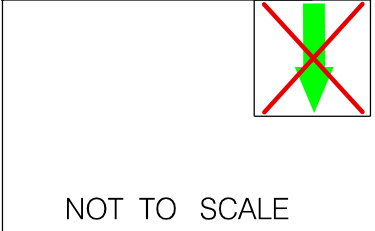
2 VDIS ON EXISTING
GANTRY

MATCH LINE - SHEET NO. 27

1 POLE MOUNTED VSL
1 VSL ON LANE CONTROL SIGN
+ VDIS + NEW RTMS

PM IMPROVEMENT
INSIDE HSR (12' WIDE) BETWEEN MD 121
AND MD 124; LENGTH OF HSR IS ~20,800'

2 POLE MOUNTED VSL



LEGEND			
NEW CONSTRUCTION		STOP BAR	
HARD SHOULDER RUNNING		ADVANCE WARNING DEVICE	
PROPOSED PAVEMENT MARKING		SIGN	
		RAMP METER DETECTOR	
		PROPOSED RTMS	
		EXISTING RTMS	

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

APPR CHECK DRAWN DESIGN

**I-270 INTERCHANGE IMPROVEMENT
PRELIMINARY ENGINEERING**

MD 118 INTERCHANGE

DATE: 11/15/16

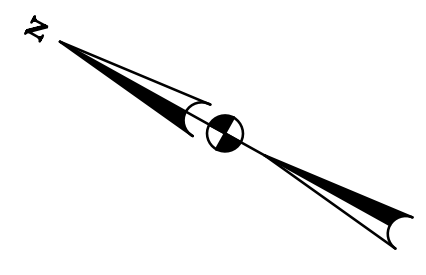
SCALE: 1" = 80'

CONTRACT NO.
PROPOSAL

DRAWING NO.

SHEET NO.
28 OF 66

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 Tuesday, December 20, 2016 AT 06:35 AM



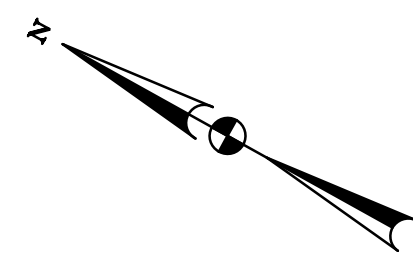
MATCH LINE - SEE SHEET 28B WEST

LEGEND			
NEW CONSTRUCTION		STOP BAR	
HARD SHOULDER RUNNING		ADVANCE WARNING DEVICE	
PROPOSED PAVEMENT MARKING		SIGN	
		RAMP METER DETECTOR	
		PROPOSED RTMS	
		EXISTING RTMS	

PRELIMINARY PLANS
 DO NOT USE FOR CONSTRUCTION

APPR CHECK DRAWN DESIGN	I-270 INTERCHANGE IMPROVEMENT PRELIMINARY ENGINEERING	CONTRACT NO. PROPOSAL
	MD 118 INTERCHANGE RAMP METER	DRAWING NO.
	DATE: 11/15/16	SCALE: 1" = 80'

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 Tuesday, December 20, 2016 AT 06:38 AM



MATCH LINE- SEE SHEET 28A WEST



LEGEND

- | | | | | | |
|----------------------------------|--|-------------------------------|--|----------------------------|--|
| NEW CONSTRUCTION | | STOP BAR | | RAMP METER DETECTOR | |
| HARD SHOULDER RUNNING | | ADVANCE WARNING DEVICE | | PROPOSED RTMS | |
| PROPOSED PAVEMENT MARKING | | SIGN | | EXISTING RTMS | |

PRELIMINARY PLANS
 DO NOT USE FOR CONSTRUCTION

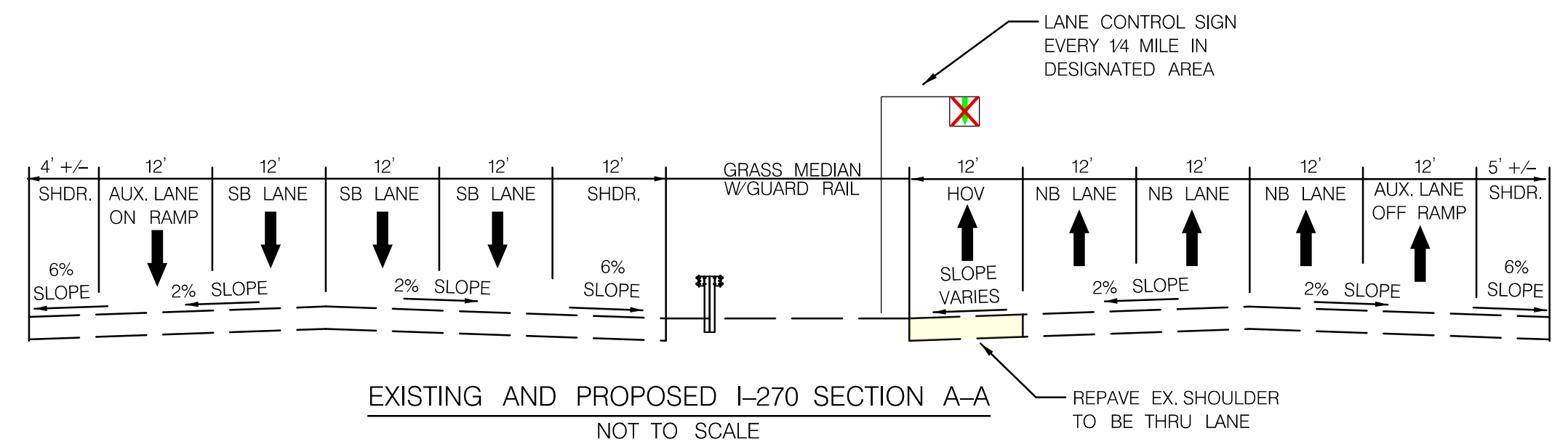
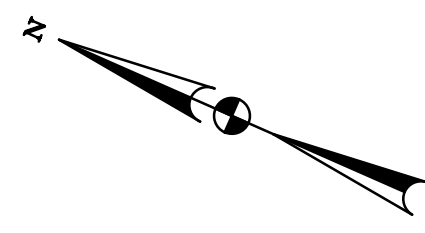
APPR | CHECK | DRAWN | DESIGN

**I-270 INTERCHANGE IMPROVEMENT
PRELIMINARY ENGINEERING**

**MD 118 INTERCHANGE
RAMP METER**
 DATE: 11/15/16 SCALE: 1" = 80'

CONTRACT NO. PROPOSAL
DRAWING NO.
SHEET NO. 28B OF 66

pw:\t\p\02\win101\parsons.com\Maryland_State\ICM\Design\Roadway_Improvements\Exit_16 - MD 27 Father Hurley Blvd\pHD-P006_MD27-FatherHurleyBlvd.dgn
 Monday, December 19, 2016 AT 06:44 PM

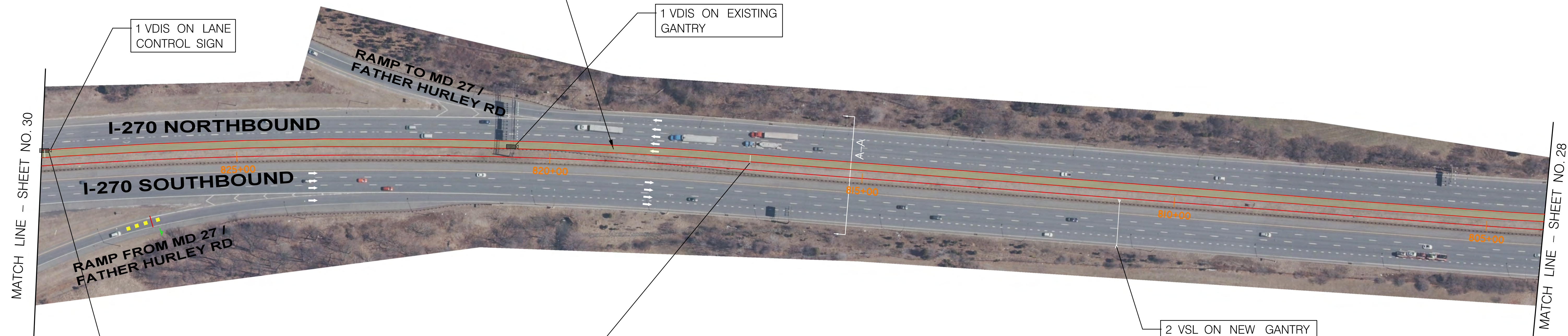


PM IMPROVEMENT
INSIDE HSR (12' WIDE) BETWEEN MD 121 AND
MD 124; LENGTH OF HSR IS ~20,800'

1 VDIS ON LANE
CONTROL SIGN

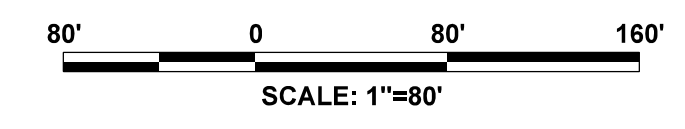
1 VDIS ON EXISTING
GANTRY

2 VSL ON NEW GANTRY
+ DMS + NEW RTMS



NOT TO SCALE

NOT TO SCALE

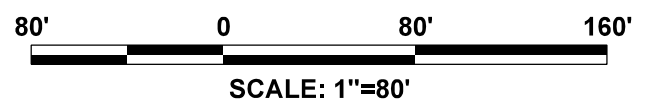
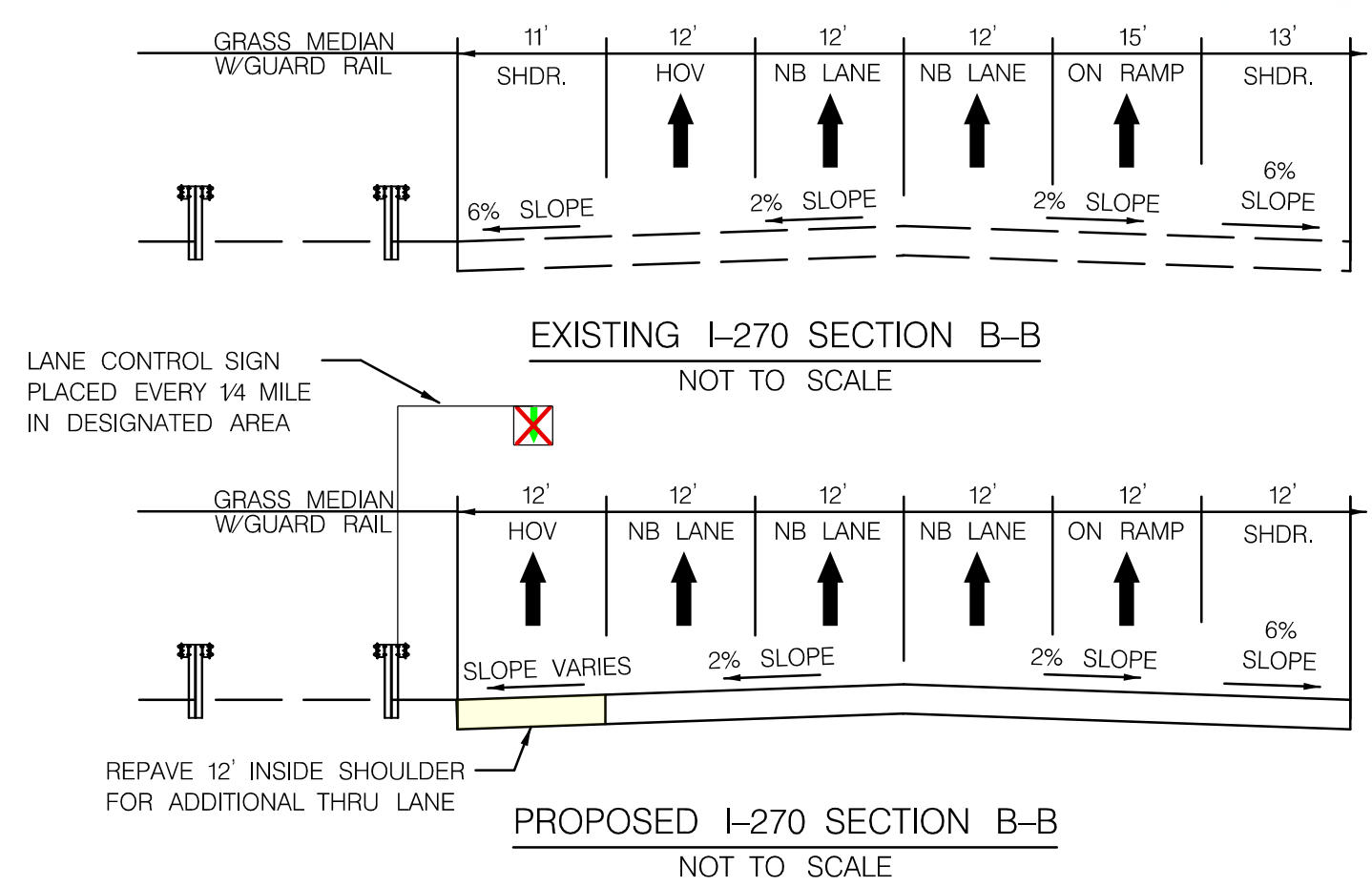
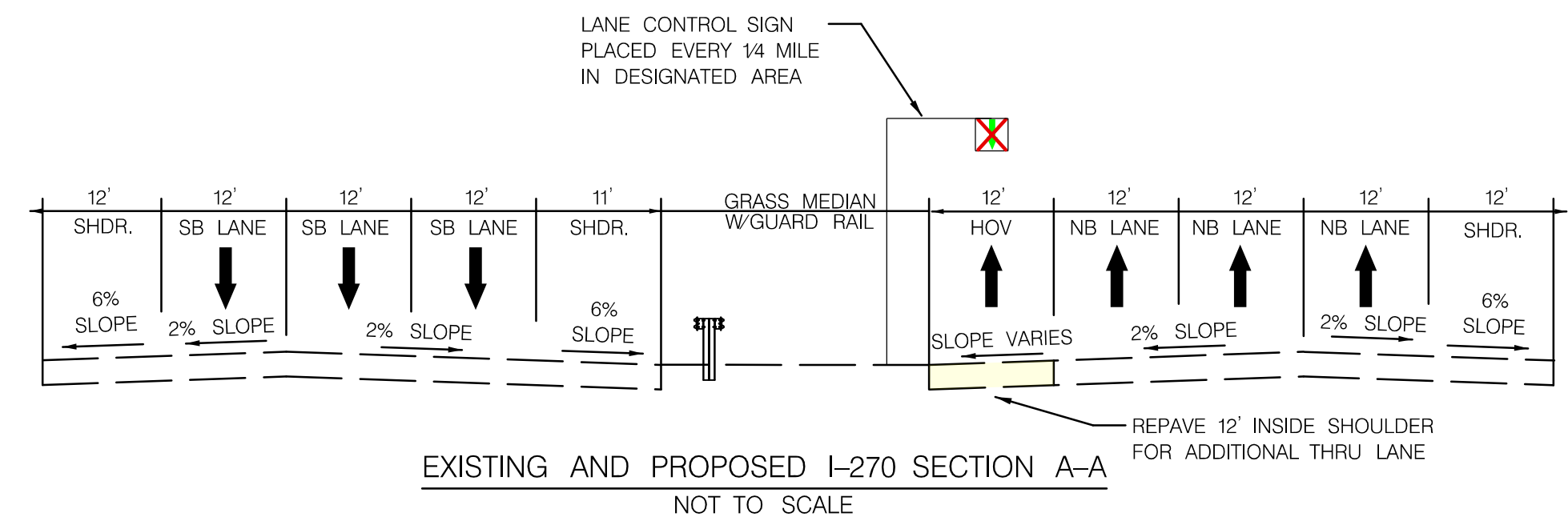
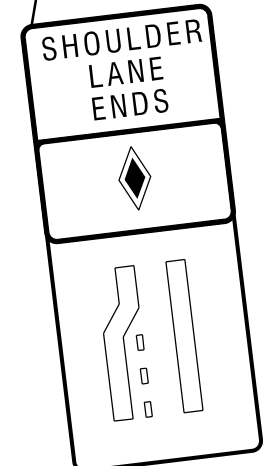
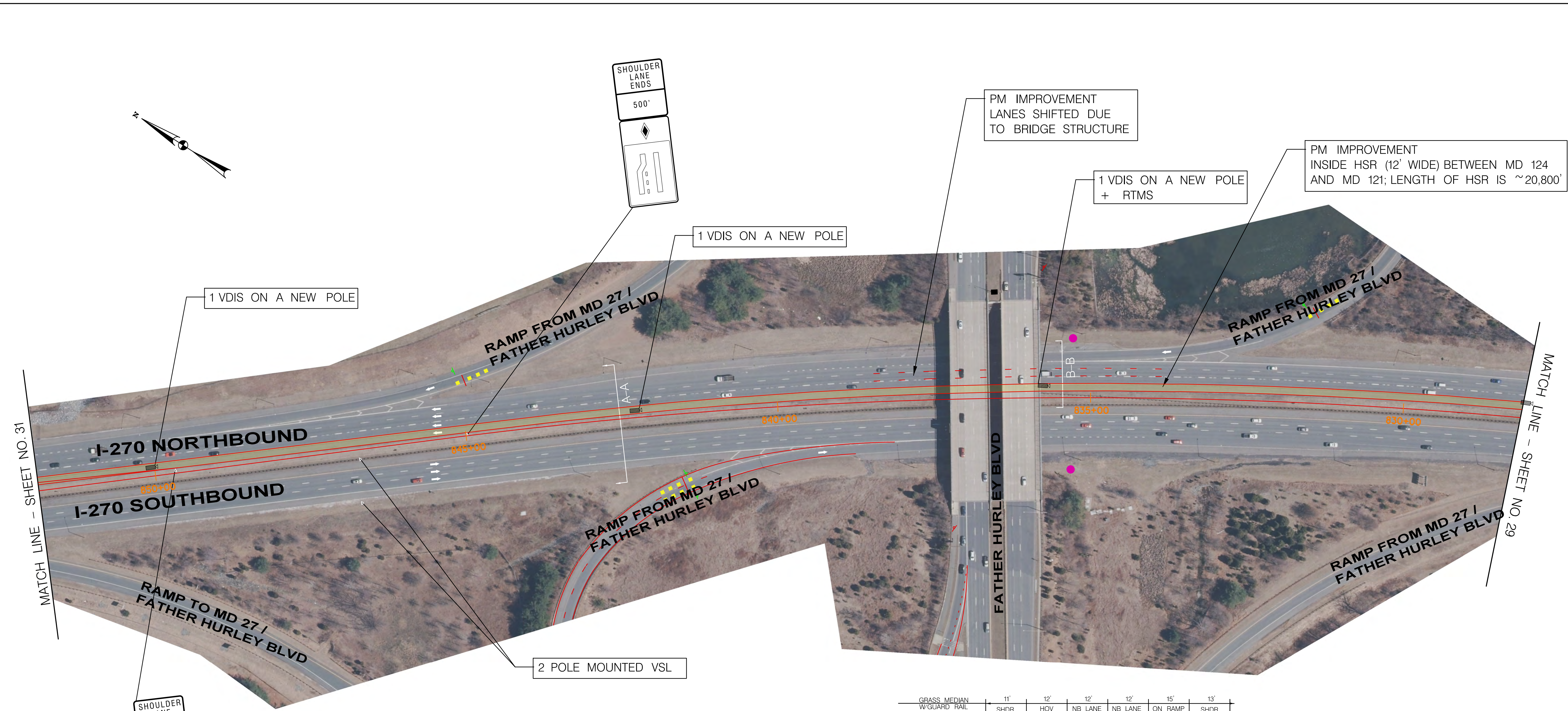


LEGEND			
NEW CONSTRUCTION		STOP BAR	
HARD SHOULDER RUNNING		ADVANCE WARNING DEVICE	
PROPOSED PAVEMENT MARKING		SIGN	
		RAMP METER DETECTOR	
		PROPOSED RTMS	
		EXISTING RTMS	

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

APPR CHECK DRAWN DESIGN	I-270 INTERCHANGE IMPROVEMENT PRELIMINARY ENGINEERING	CONTRACT NO. PROPOSAL
	MD 118 TO FATHER HURLEY BLVD	DRAWING NO.
	DATE: 11/15/16	SCALE: 1" = 80'

pw:\txpl\02\win101\parsons.com\Maryland_State\ICM\Design\Roadway_Improvements\Exit_16 - MD 27 Father Hurley Blvd\pHD-P005_MD27-FatherHurleyBlvd.dgn
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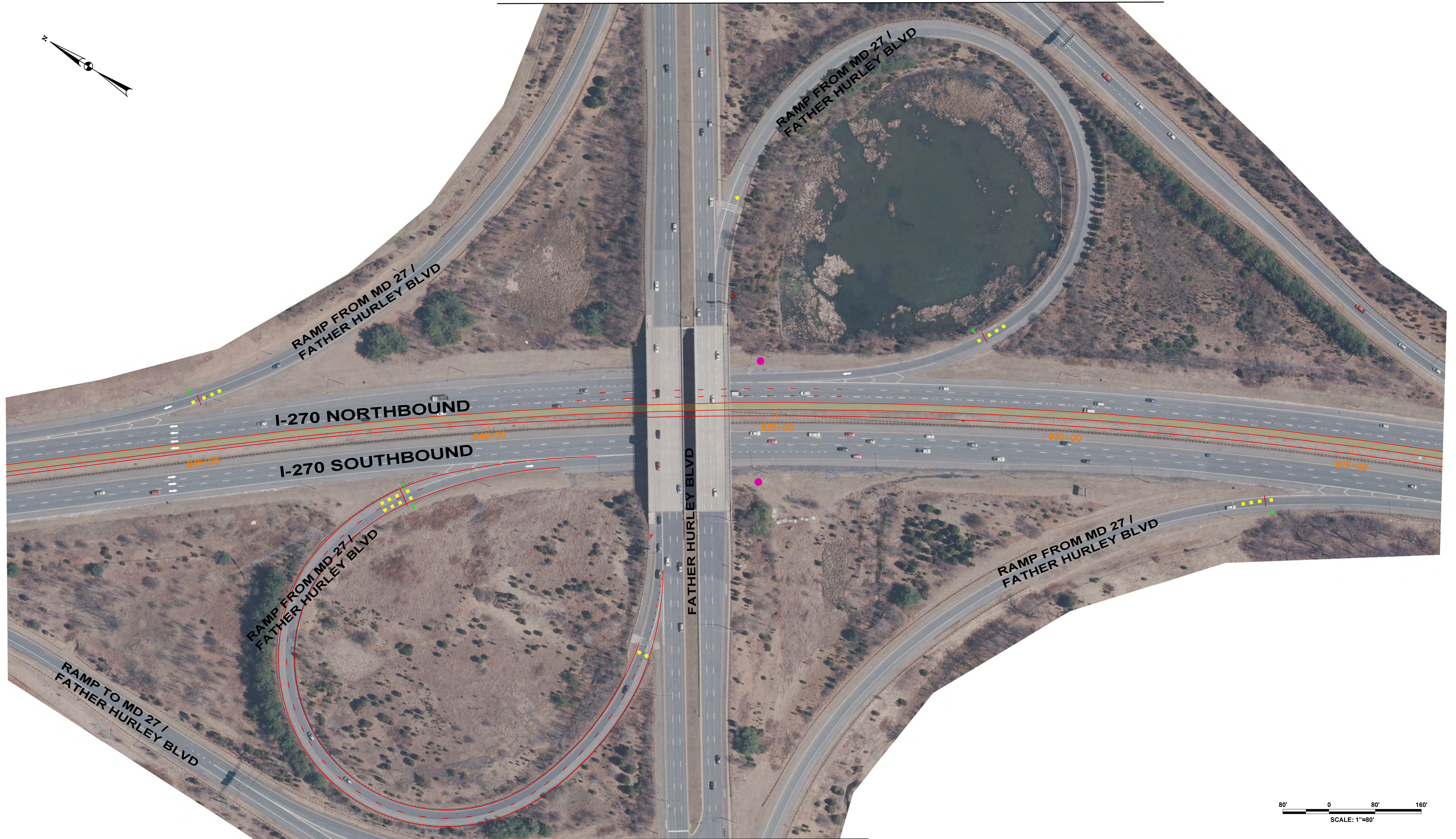
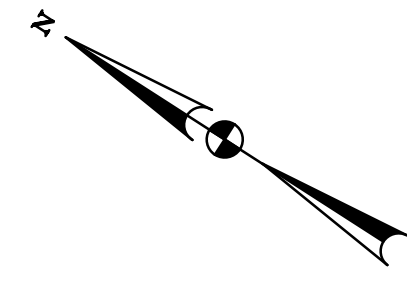


LEGEND			
NEW CONSTRUCTION		STOP BAR	
HARD SHOULDER RUNNING		ADVANCE WARNING DEVICE	
PROPOSED PAVEMENT MARKING		SIGN	
		RAMP METER DETECTOR	
		PROPOSED RTMS	
		EXISTING RTMS	

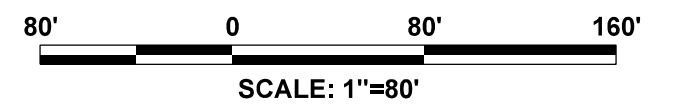
PRELIMINARY PLANS
 DO NOT USE FOR CONSTRUCTION

APPR CHECK DRAWN DESIGN	I-270 INTERCHANGE IMPROVEMENT PRELIMINARY ENGINEERING	CONTRACT NO. PROPOSAL
	FATHER HURLEY BLVD INTERCHANGE	DRAWING NO.
	DATE: 11/15/16	SCALE: 1" = 80'

MATCH LINE - SEE SHEET 30B EAST



MATCH LINE - SEE SHEET 30B WEST



LEGEND

NEW CONSTRUCTION		STOP BAR		RAMP METER DETECTOR	
HARD SHOULDER RUNNING		ADVANCE WARNING DEVICE		PROPOSED RTMS	
PROPOSED PAVEMENT MARKING		SIGN		EXISTING RTMS	

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

APPR CHECK DRAWN DESIGN

**I-270 INTERCHANGE IMPROVEMENT
PRELIMINARY ENGINEERING**

**FATHER HURLEY BLVD INTERCHANGE
RAMP METER**

DATE: 11/15/16

SCALE: 1" = 80'

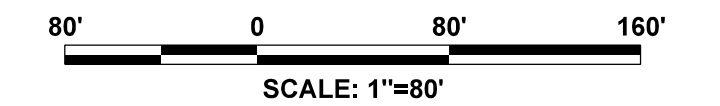
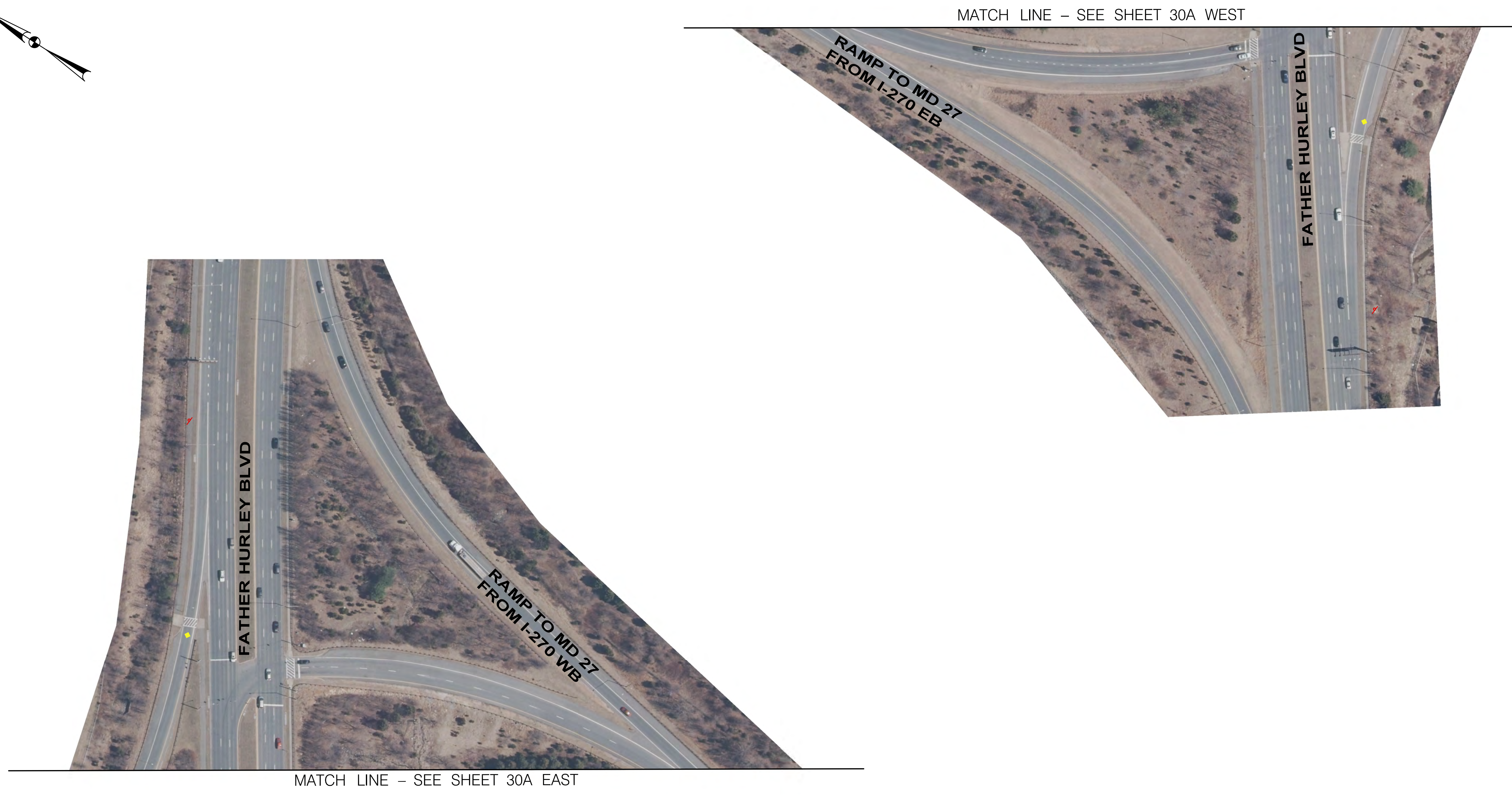
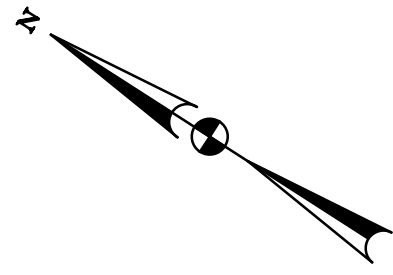
CONTRACT NO.
PROPOSAL

DRAWING NO.

SHEET NO.
30A OF 66

pw:\txpl\02\win101\parsons.com\Maryland_State\ICM\Design\Roadway_Improvements\Exit_6 - MD 28 W. Montgomery Ave\pHD-0010_FatherHurley_RM.dgn Tuesday, December 20, 2016 AT 06:41 AM

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 Tuesday, December 20, 2016 AT 06:44 AM



LEGEND

- | | | | | | |
|----------------------------------|--|-------------------------------|--|----------------------------|--|
| NEW CONSTRUCTION | | STOP BAR | | RAMP METER DETECTOR | |
| HARD SHOULDER RUNNING | | ADVANCE WARNING DEVICE | | PROPOSED RTMS | |
| PROPOSED PAVEMENT MARKING | | SIGN | | EXISTING RTMS | |

PRELIMINARY PLANS
 DO NOT USE FOR CONSTRUCTION

APPR | CHECK | DRAWN | DESIGN

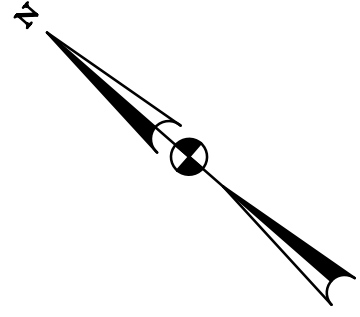
**I-270 INTERCHANGE IMPROVEMENT
 PRELIMINARY ENGINEERING**

**FATHER HURLEY BLVD INTERCHANGE
 RAMP METER**

 DATE: 11/15/16 SCALE: 1" = 80'

CONTRACT NO. PROPOSAL
 DRAWING NO.
 SHEET NO. 30B OF 66

pw:\txpl\02\win101\parsons.com\Maryland_State\ICM\Design\Roadway_Improvements\Exit_16 - MD 27 Father Hurley Blvd\pHD-P004_MD27-FatherHurleyBlvd.dgn
 Monday, December 19, 2016 AT 06:51 PM



AM IMPROVEMENT
 OUTSIDE HSR (12' WIDE) BETWEEN MD 121
 AND FATHER HURLEY BLVD; LENGTH OF
 HSR IS ~10,550'

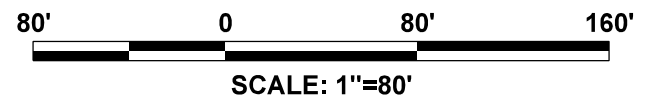
SEE SECTION A-A
 ON SHEET NO. 35

1 VDIS ON A NEW POLE
 + VSL + NEW RTMS
 1 POLE BOUNDED VSL

PM IMPROVEMENT
 INSIDE HSR (12' WIDE) BETWEEN MD 118 AND MD
 124; LENGTH OF HSR IS ~20,800'

1 VDIS ON A NEW POLE
 + VSL
 1 POLE BOUNDED VSL

1 VDIS ON
 NEW POLE



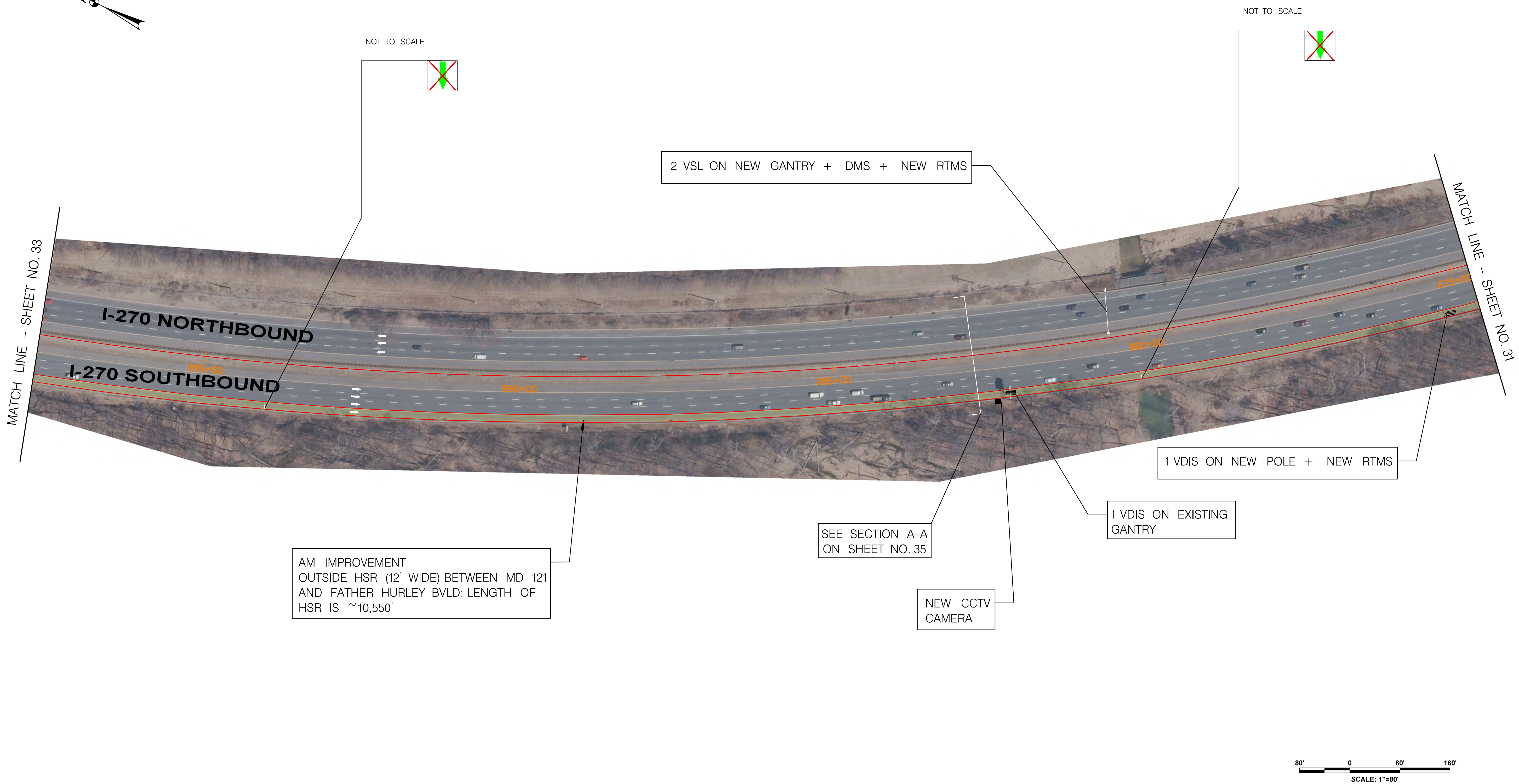
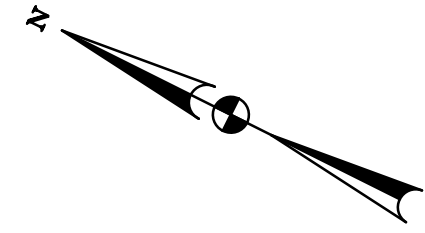
LEGEND

- | | | | | | |
|---------------------------|--|------------------------|--|---------------------|--|
| NEW CONSTRUCTION | | STOP BAR | | RAMP METER DETECTOR | |
| HARD SHOULDER RUNNING | | ADVANCE WARNING DEVICE | | PROPOSED RTMS | |
| PROPOSED PAVEMENT MARKING | | SIGN | | EXISTING RTMS | |

PRELIMINARY PLANS
 DO NOT USE FOR CONSTRUCTION

APPR CHECK DRAWN DESIGN	I-270 INTERCHANGE IMPROVEMENT PRELIMINARY ENGINEERING		CONTRACT NO. PROPOSAL
	FATHER HURLEY BLVD TO MD 121		DRAWING NO.
	DATE: 11/15/16	SCALE: 1" = 80'	SHEET NO. 31 OF 66

pw:\txpl\02\win101\parsons.com\Maryland_State\Design\Roadway_Improvements\Exit_16 - MD 27 Father Hurley Blvd\pHD-P003_MD27-FatherHurleyBlvd.dgn
 Monday, December 19, 2016 AT 07:22 AM

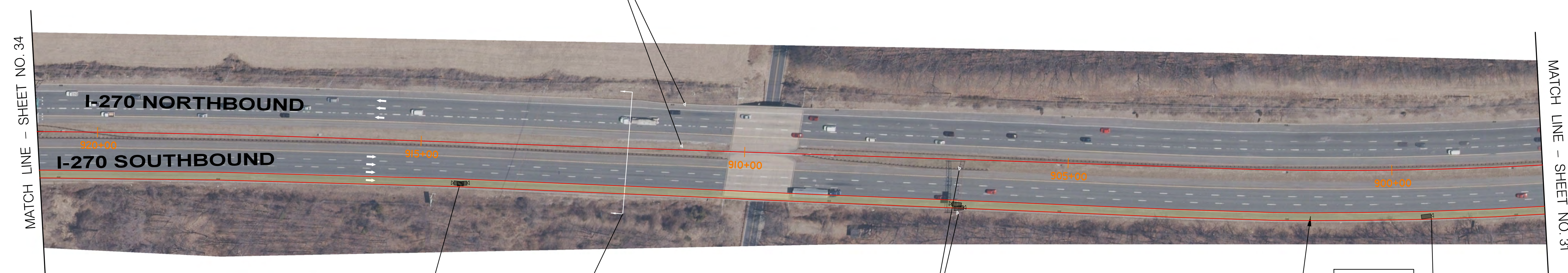
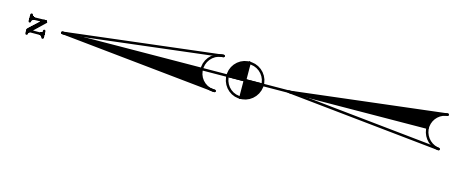


NEW CONSTRUCTION		STOP BAR		RAMP METER DETECTOR	
HARD SHOULDER RUNNING		ADVANCE WARNING DEVICE		PROPOSED RTMS	
PROPOSED PAVEMENT MARKING		SIGN		EXISTING RTMS	

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

APPR CHECK DRAWN DESIGN	I-270 INTERCHANGE IMPROVEMENT PRELIMINARY ENGINEERING	CONTRACT NO. PROPOSAL
	MD 121 TO FATHER HURLEY BLVD	DRAWING NO.
	DATE: 11/15/16	SCALE: 1" = 80'

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 Monday, December 19, 2016 AT 06:55 PM



NEW RTMS ON A NEW POLE + VSL
1 POLE MOUNTED VSL

2 VDIS ON
NEW POLE

SEE SECTION A-A
ON SHEET NO. 35

2 VSL ON EXISTING GANTRY
+ 2 VDIS + NEW RTMS
+ LCS

1 VDIS ON
NEW POLE

AM IMPROVEMENT
OUTSIDE HSR (12' WIDE) BETWEEN MD 121
AND FATHER HURLEY BLVD; LENGTH OF
HSR IS ~10,550



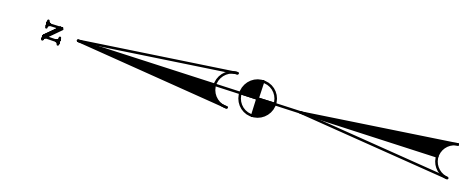
LEGEND

- | | | | | | |
|---------------------------|--|------------------------|--|---------------------|--|
| NEW CONSTRUCTION | | STOP BAR | | RAMP METER DETECTOR | |
| HARD SHOULDER RUNNING | | ADVANCE WARNING DEVICE | | PROPOSED RTMS | |
| PROPOSED PAVEMENT MARKING | | SIGN | | EXISTING RTMS | |

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

APPR CHECK DRAWN DESIGN	I-270 INTERCHANGE IMPROVEMENT PRELIMINARY ENGINEERING		CONTRACT NO. PROPOSAL
	FATHER HURLEY BLVD TO MD 121		DRAWING NO.
	DATE: 11/15/16	SCALE: 1" = 80'	SHEET NO. 33 OF 66

pw:\txpl\02\win101\parsons.com\Maryland_State\Design\Roadway_Improvements\Exit_16 - MD 27 Father Hurley Blvd\pHD-P001_MD27-FatherHurleyBlvd.dgn
 Monday, December 19, 2016 AT 07:25 AM

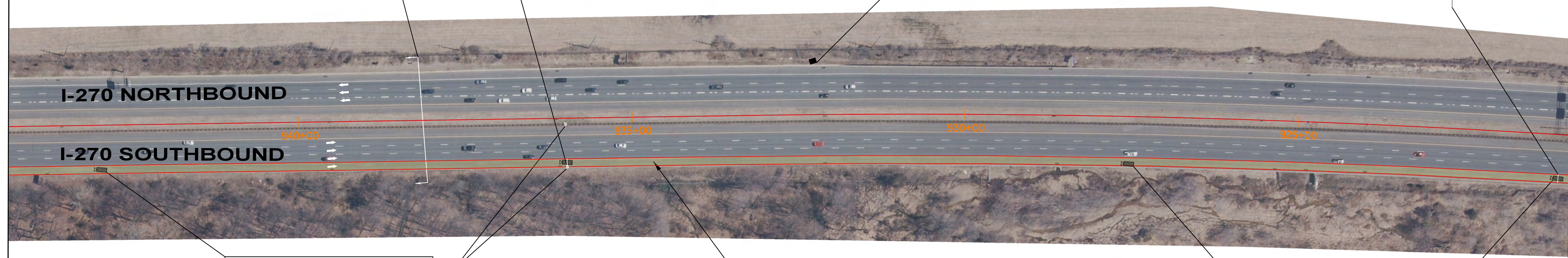


NOT TO SCALE

NOT TO SCALE

MATCH LINE - SHEET NO. 35

MATCH LINE - SHEET NO. 33



SEE SECTION A-A
ON SHEET NO. 35

NEW CCTV
CAMERA

1 POLE MOUNTED VSL
1 VSL ON LANE CONTROL SIGN
+ VDIS + NEW RTMS
1 VDIS ON NEW POLE

AM IMPROVEMENT
OUTSIDE HSR (12' WIDE) BETWEEN MD 121
AND FATHER HURLEY BLVD; LENGTH OF
HSR IS ~10,550'

1 VDIS ON LANE CONTROL SIGN
1 VDIS ON NEW POLE



LEGEND

NEW CONSTRUCTION		STOP BAR		RAMP METER DETECTOR	
HARD SHOULDER RUNNING		ADVANCE WARNING DEVICE		PROPOSED RTMS	
PROPOSED PAVEMENT MARKING		SIGN		EXISTING RTMS	

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

APPR CHECK DRAWN DESIGN

**I-270 INTERCHANGE IMPROVEMENT
PRELIMINARY ENGINEERING**

FATHER HURLEY BLVD TO MD 121

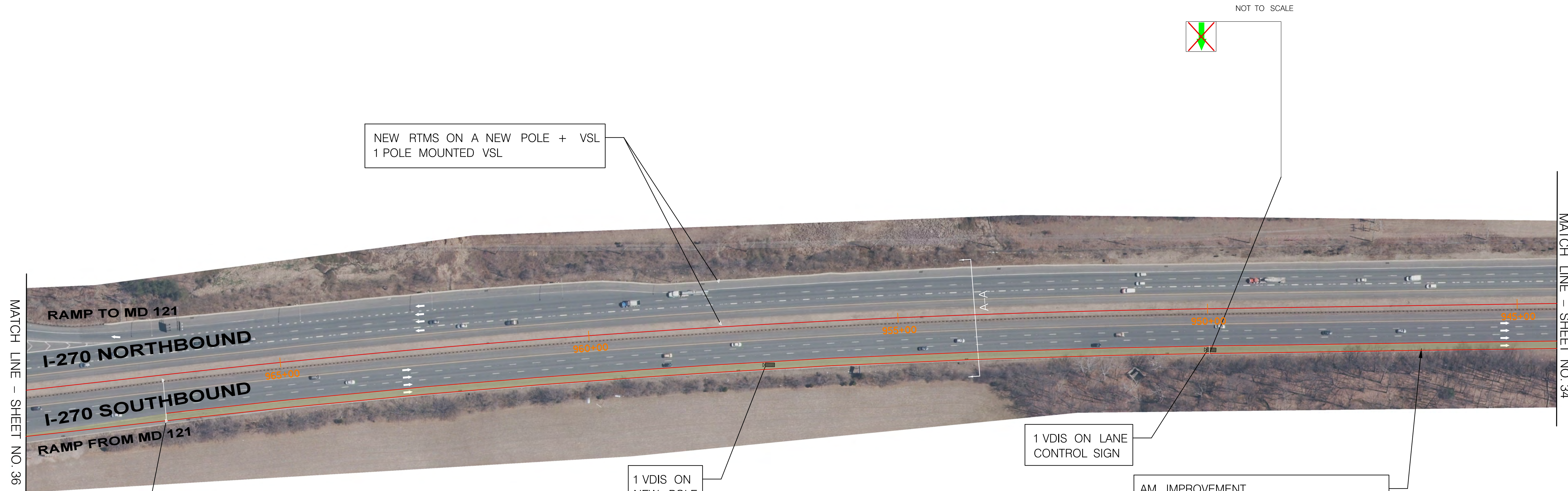
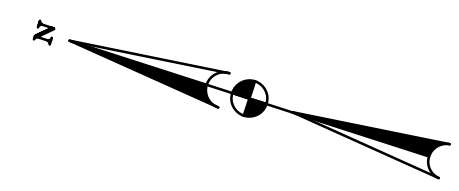
DATE: 11/15/16 SCALE: 1" = 80'

CONTRACT NO.
PROPOSAL

DRAWING NO.

SHEET NO.
34 OF 66

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 Monday, December 19, 2016 AT 06:58 PM



MATCH LINE - SHEET NO. 36

MATCH LINE - SHEET NO. 34

NEW RTMS ON A NEW POLE + VSL
1 POLE MOUNTED VSL

NOT TO SCALE

2 VSL ON NEW GANTRY
+ DMS + HSR LCS

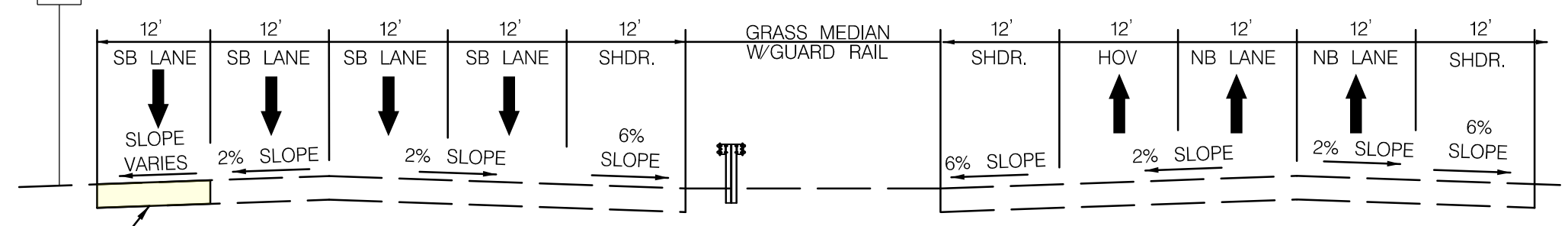
1 VDIS ON
NEW POLE

1 VDIS ON LANE
CONTROL SIGN

AM IMPROVEMENT
OUTSIDE HSR (12' WIDE) BETWEEN MD 121
AND FATHER HURLEY BVLD; LENGTH OF
HSR IS ~10,550'

LANE CONTROL SIGN
EVERY 14 MILE IN
DESIGNATED AREA

REPAVE SHOULDER TO BE
ADDITIONAL THRU LANE



EXISTING AND PROPOSED I-270 SECTION A-A
NOT TO SCALE



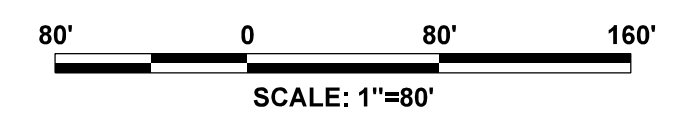
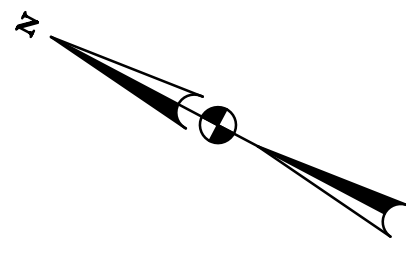
LEGEND

NEW CONSTRUCTION		STOP BAR		RAMP METER DETECTOR	
HARD SHOULDER RUNNING		ADVANCE WARNING DEVICE		PROPOSED RTMS	
PROPOSED PAVEMENT MARKING		SIGN		EXISTING RTMS	

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

APPR CHECK DRAWN DESIGN	I-270 INTERCHANGE IMPROVEMENT PRELIMINARY ENGINEERING	CONTRACT NO. PROPOSAL
	FATHER HURLEY BLVD TO MD 121	DRAWING NO.
	DATE: 11/15/16	SCALE: 1" = 80'

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LEGEND

NEW CONSTRUCTION		STOP BAR		RAMP METER DETECTOR	
HARD SHOULDER RUNNING		ADVANCE WARNING DEVICE		PROPOSED RTMS	
PROPOSED PAVEMENT MARKING		SIGN		EXISTING RTMS	

PRELIMINARY PLANS
 DO NOT USE FOR CONSTRUCTION

APPR CHECK DRAWN DESIGN

**I-270 INTERCHANGE IMPROVEMENT
PRELIMINARY ENGINEERING**

MD 121 INTERCHANGE

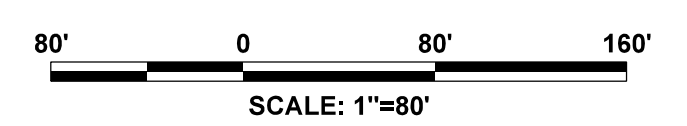
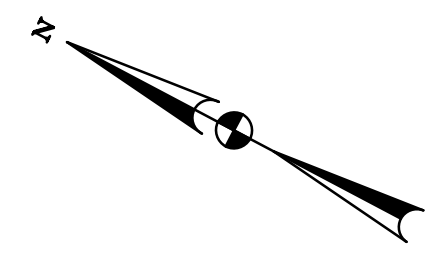
DATE: 11/15/16 SCALE: 1" = 80'

CONTRACT NO.
PROPOSAL

DRAWING NO.

SHEET NO.
36 OF 66

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 Tuesday, December 20, 2016 AT 07:04 AM



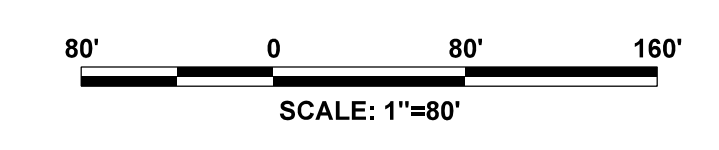
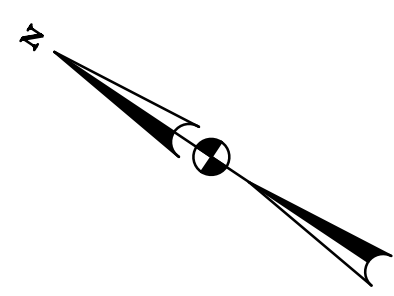
LEGEND			
NEW CONSTRUCTION		STOP BAR	
HARD SHOULDER RUNNING		ADVANCE WARNING DEVICE	
PROPOSED PAVEMENT MARKING		SIGN	
		RAMP METER DETECTOR	
		PROPOSED RTMS	
		EXISTING RTMS	

PRELIMINARY PLANS
 DO NOT USE FOR CONSTRUCTION

APPR CHECK DRAWN DESIGN

I-270 INTERCHANGE IMPROVEMENT PRELIMINARY ENGINEERING		CONTRACT NO. PROPOSAL
MD 121 INTERCHANGE		DRAWING NO.
DATE: 11/15/16	SCALE: 1" = 80'	SHEET NO. 36A OF 66

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 Monday, December 19, 2016 AT 07:04 PM



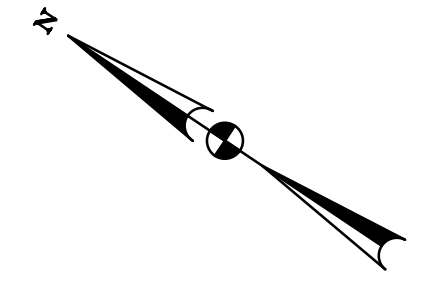
LEGEND

NEW CONSTRUCTION		STOP BAR		RAMP METER DETECTOR	
HARD SHOULDER RUNNING		ADVANCE WARNING DEVICE		PROPOSED RTMS	
PROPOSED PAVEMENT MARKING		SIGN		EXISTING RTMS	

PRELIMINARY PLANS
 DO NOT USE FOR CONSTRUCTION

APPR CHECK DRAWN DESIGN	I-270 INTERCHANGE IMPROVEMENT PRELIMINARY ENGINEERING MD 121 TO MD 109 DATE: 11/15/16 SCALE: 1" = 80'	CONTRACT NO. PROPOSAL DRAWING NO. SHEET NO. 37 OF 66
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 Monday, December 19, 2016 AT 07:07 PM



MATCH LINE - SHEET NO. 39

MATCH LINE - SHEET NO. 37



LEGEND

NEW CONSTRUCTION		STOP BAR		RAMP METER DETECTOR	
HARD SHOULDER RUNNING		ADVANCE WARNING DEVICE		PROPOSED RTMS	
PROPOSED PAVEMENT MARKING		SIGN		EXISTING RTMS	

PRELIMINARY PLANS
 DO NOT USE FOR CONSTRUCTION

APPR | CHECK | DRAWN | DESIGN

**I-270 INTERCHANGE IMPROVEMENT
PRELIMINARY ENGINEERING**

MD 121 TO MD 109

DATE: 11/15/16

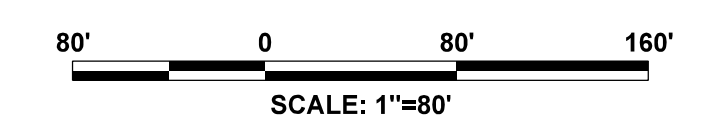
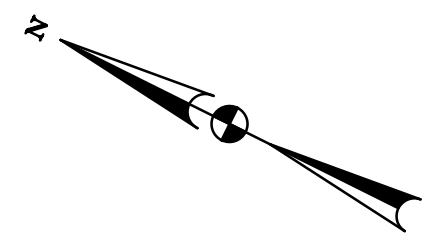
SCALE: 1" = 80'

CONTRACT NO.
PROPOSAL

DRAWING NO.

SHEET NO.
38 OF 66

pw:\txpl\02\win101\parsons.com\Maryland_State\ICM\Design\Roadway_Improvements\Exit_18 - MD 121\pHD-P003_MD 121.dgn
 Monday, December 19, 2016 AT 07:09 PM



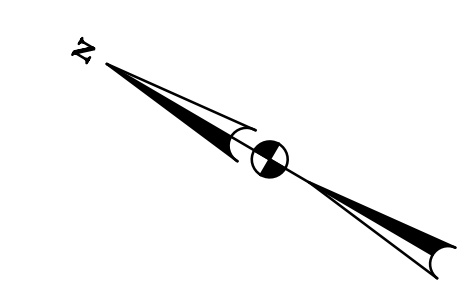
LEGEND

NEW CONSTRUCTION		STOP BAR		RAMP METER DETECTOR	
HARD SHOULDER RUNNING		ADVANCE WARNING DEVICE		PROPOSED RTMS	
PROPOSED PAVEMENT MARKING		SIGN		EXISTING RTMS	

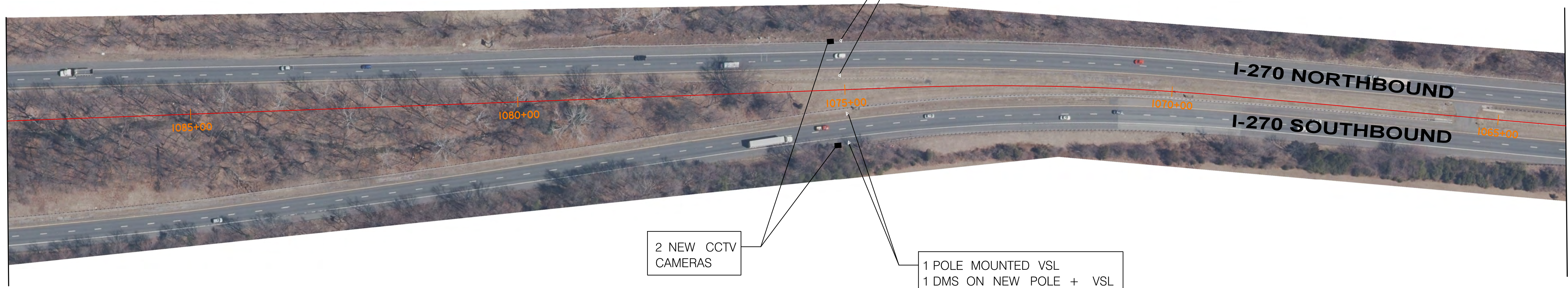
PRELIMINARY PLANS
 DO NOT USE FOR CONSTRUCTION

APPR CHECK DRAWN DESIGN	I-270 INTERCHANGE IMPROVEMENT PRELIMINARY ENGINEERING	CONTRACT NO. PROPOSAL
	MD 121 TO MD 109	DRAWING NO.
	DATE: 11/15/16 SCALE: 1" = 80'	SHEET NO. 39 OF 66

pw:\txpl\02\win101\parsons.com\Maryland_State\Documents\IS_270_ICM\Design\Roadway_Improvements\Exit_18 - MD 121\pHD-P004_MD_121.dgn
 Monday, December 19, 2016 AT 07:33 AM



MATCH LINE - SHEET NO. 41

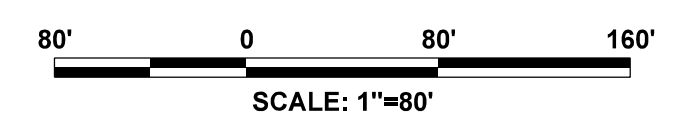


MATCH LINE - SHEET NO. 39

NEW RTMS ON A NEW POLE + VSL
1 POLE MOUNTED VSL

2 NEW CCTV
CAMERAS

1 POLE MOUNTED VSL
1 DMS ON NEW POLE + VSL
+ NEW DTMS



LEGEND

NEW CONSTRUCTION		STOP BAR		RAMP METER DETECTOR	
HARD SHOULDER RUNNING		ADVANCE WARNING DEVICE		PROPOSED RTMS	
PROPOSED PAVEMENT MARKING		SIGN		EXISTING RTMS	

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

APPR CHECK DRAWN DESIGN

**I-270 INTERCHANGE IMPROVEMENT
PRELIMINARY ENGINEERING**

MD 121 TO MD 109

DATE: 11/15/16

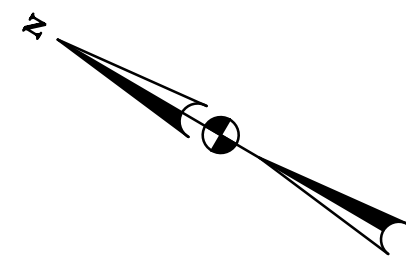
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PROPOSAL

DRAWING NO.

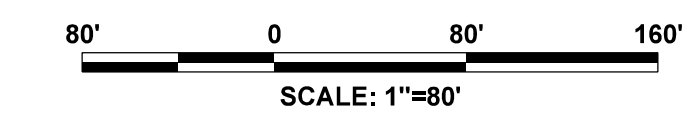
SHEET NO.
40 OF 66

pw:\txpl\02\win101\parsons.com\Maryland_State\Design\Roadway_Improvements\Exit_18 - MD 121\pHD-P005_MD_121.dgn
 Monday, December 19, 2016 AT 07:37 AM



MATCH LINE - SHEET NO. 42

MATCH LINE - SHEET NO. 40



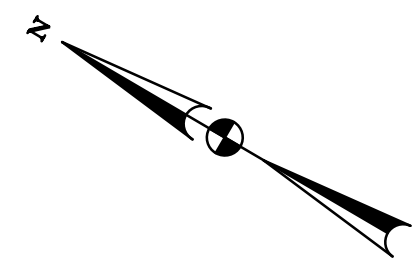
LEGEND

NEW CONSTRUCTION		STOP BAR		RAMP METER DETECTOR	
HARD SHOULDER RUNNING		ADVANCE WARNING DEVICE		PROPOSED RTMS	
PROPOSED PAVEMENT MARKING		SIGN		EXISTING RTMS	

PRELIMINARY PLANS
 DO NOT USE FOR CONSTRUCTION

APPR CHECK DRAWN DESIGN	I-270 INTERCHANGE IMPROVEMENT PRELIMINARY ENGINEERING	CONTRACT NO. PROPOSAL
	MD 121 TO MD 109	DRAWING NO.
	DATE: 11/15/16 SCALE: 1" = 80'	SHEET NO. 41 OF 66

pw:\txpl\02\win101\parsons.com\Maryland_State\ICM\Design\Roadway_Improvements\Exit_18 - MD 121\pHD-P006_MD_121.dgn
 Monday, December 19, 2016 AT 07:15 PM



MATCH LINE - SHEET NO. 43



MATCH LINE - SHEET NO. 41



LEGEND

- | | | | | | |
|---------------------------|--|------------------------|--|---------------------|--|
| NEW CONSTRUCTION | | STOP BAR | | RAMP METER DETECTOR | |
| HARD SHOULDER RUNNING | | ADVANCE WARNING DEVICE | | PROPOSED RTMS | |
| PROPOSED PAVEMENT MARKING | | SIGN | | EXISTING RTMS | |

PRELIMINARY PLANS
 DO NOT USE FOR CONSTRUCTION

APPR CHECK DRAWN DESIGN

**I-270 INTERCHANGE IMPROVEMENT
PRELIMINARY ENGINEERING**

MD 121 TO MD 109

DATE: 11/15/16

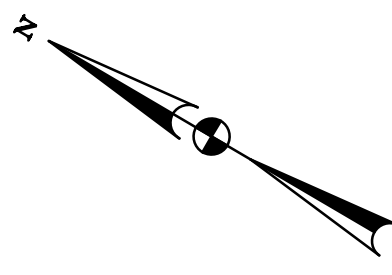
SCALE: 1" = 80'

CONTRACT NO.
PROPOSAL

DRAWING NO.

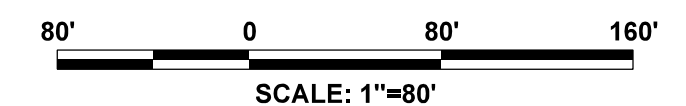
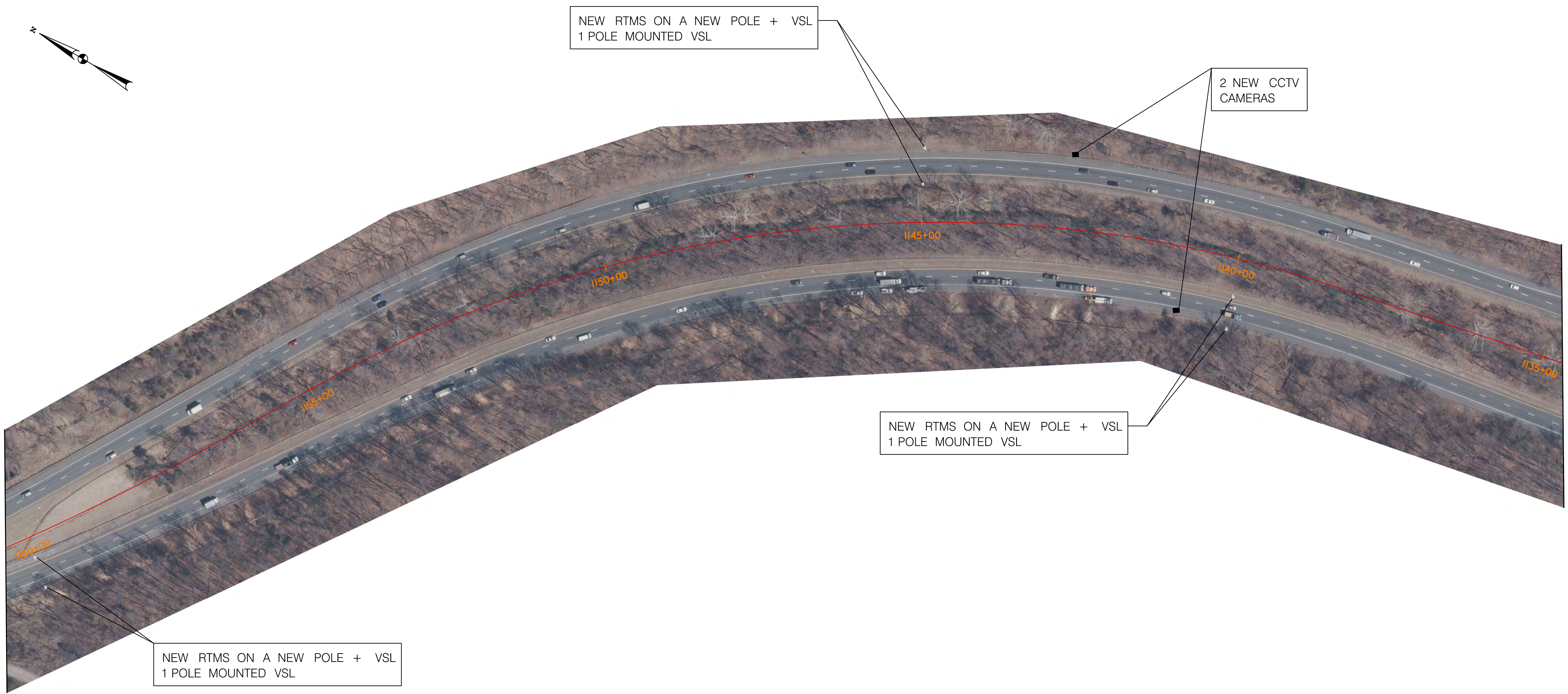
SHEET NO.
42 OF 66

pw:\txpl\02\win101\parsons.com\Maryland_State\Documents\IS_270_ICM\Design\Roadway_Improvements\Exit_18 - MD 121\pHD-P007_MD_121.dgn
 Monday, December 19, 2016 AT 07:55 AM



MATCH LINE - SHEET NO. 44

MATCH LINE - SHEET NO. 42

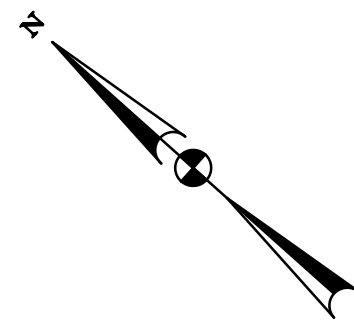


LEGEND			
NEW CONSTRUCTION		STOP BAR	
HARD SHOULDER RUNNING		ADVANCE WARNING DEVICE	
PROPOSED PAVEMENT MARKING		SIGN	
		RAMP METER DETECTOR	
		PROPOSED RTMS	
		EXISTING RTMS	

PRELIMINARY PLANS
 DO NOT USE FOR CONSTRUCTION

APPR CHECK DRAWN DESIGN	I-270 INTERCHANGE IMPROVEMENT PRELIMINARY ENGINEERING	CONTRACT NO. PROPOSAL
	MD 121 TO MD 109	DRAWING NO.
	DATE: 11/15/16	SCALE: 1" = 80'

pw:\txpl\02\win101\parsons.com\Maryland_State\ICM\Design\Roadway_Improvements\Exit_18 - MD 121\pHD-P008_MD 121.dgn
 Monday, December 19, 2016 AT 07:20 PM



LEGEND

NEW CONSTRUCTION		STOP BAR		RAMP METER DETECTOR	
HARD SHOULDER RUNNING		ADVANCE WARNING DEVICE		PROPOSED RTMS	
PROPOSED PAVEMENT MARKING		SIGN		EXISTING RTMS	

PRELIMINARY PLANS
 DO NOT USE FOR CONSTRUCTION

APPR CHECK DRAWN DESIGN

I-270 INTERCHANGE IMPROVEMENT
PRELIMINARY ENGINEERING

MD 109 INTERCHANGE

DATE: 11/15/16

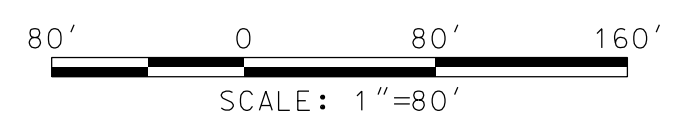
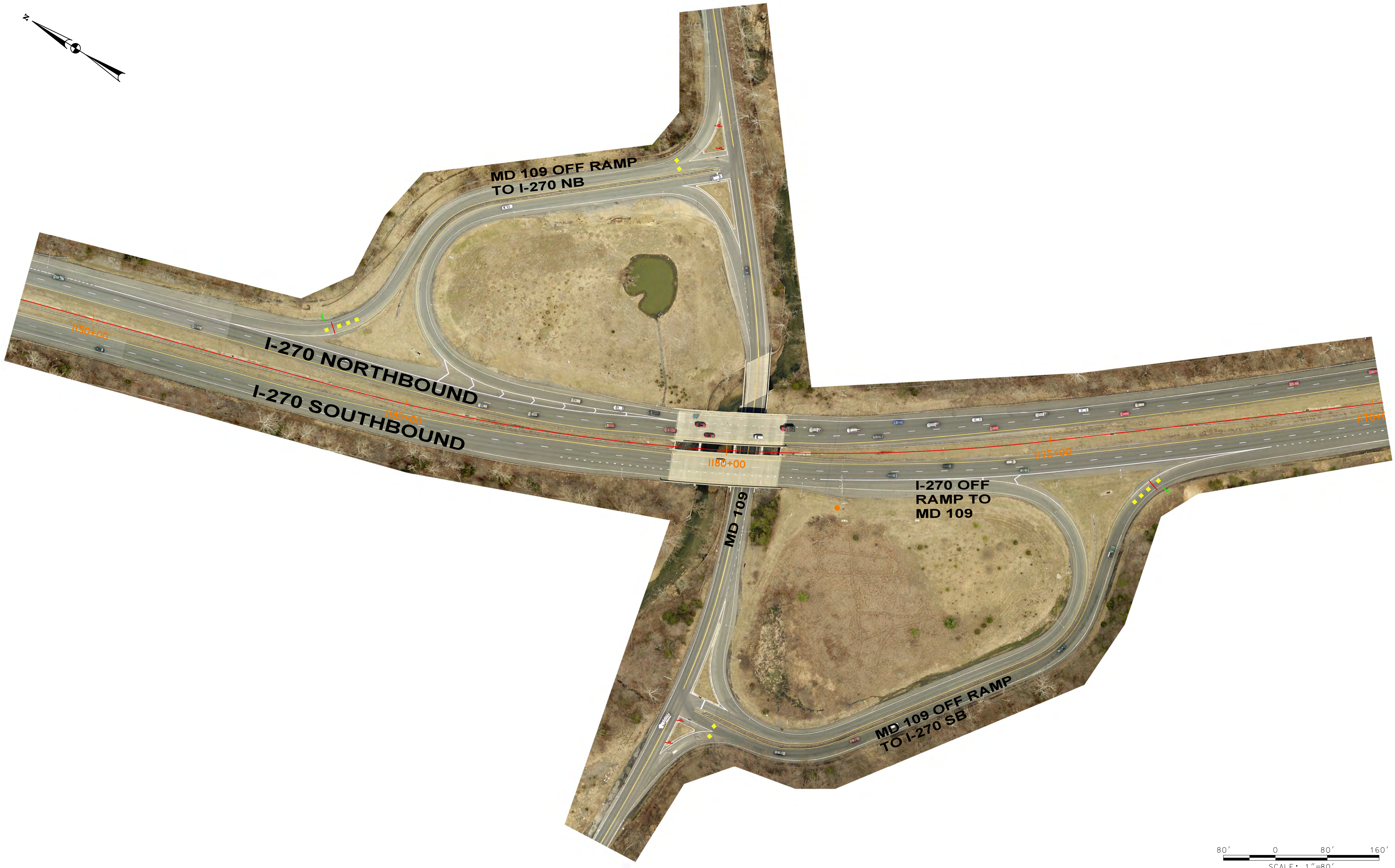
SCALE: 1" = 80'

CONTRACT NO.
PROPOSAL

DRAWING NO.

SHEET NO.
44 OF 66

pw:\txplo02\win101\parsons.com\Maryland_State\Documents\IS_270_ICM\Design\Roadway_Improvements\Exit_6 - MD 28 W. Montgomery Ave\pHD-0015_MD109_RM.dgn
 Tuesday, December 20, 2016 AT 07:07 AM

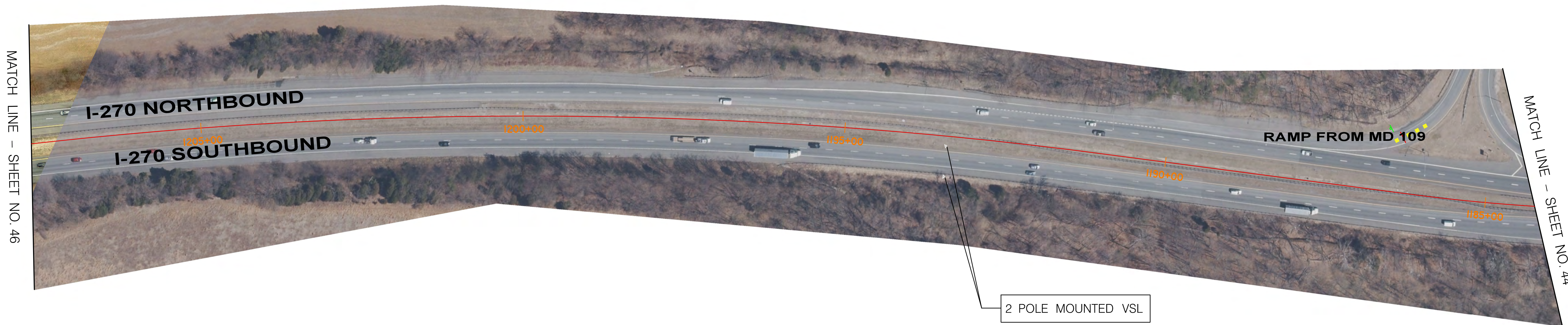
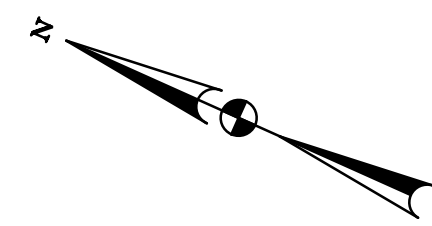


LEGEND			
NEW CONSTRUCTION		STOP BAR	
HARD SHOULDER RUNNING		ADVANCE WARNING DEVICE	
PROPOSED PAVEMENT MARKING		SIGN	
		RAMP METER DETECTOR	
		PROPOSED RTMS	
		EXISTING RTMS	

PRELIMINARY PLANS
 DO NOT USE FOR CONSTRUCTION

APPR CHECK DRAWN DESIGN	I-270 INTERCHANGE IMPROVEMENT PRELIMINARY ENGINEERING	CONTRACT NO. PROPOSAL
	MD 109 INTERCHANGE RAMP METER	DRAWING NO.
	DATE: 11/15/16	SCALE: 1" = 80'

pw:\txpl\02\win101\parsons.com\Maryland_State\Documents\IS_270_ICM\Design\Roadway_Improvements\Exit_18 - MD 121\pHD-P009_MD_121.dgn
Tuesday, December 20, 2016 AT 09:37 AM



LEGEND

NEW CONSTRUCTION		STOP BAR		RAMP METER DETECTOR	
HARD SHOULDER RUNNING		ADVANCE WARNING DEVICE		PROPOSED RTMS	
PROPOSED PAVEMENT MARKING		SIGN		EXISTING RTMS	

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

APPR CHECK DRAWN DESIGN

**I-270 INTERCHANGE IMPROVEMENT
PRELIMINARY ENGINEERING**

MD 109 INTERCHANGE

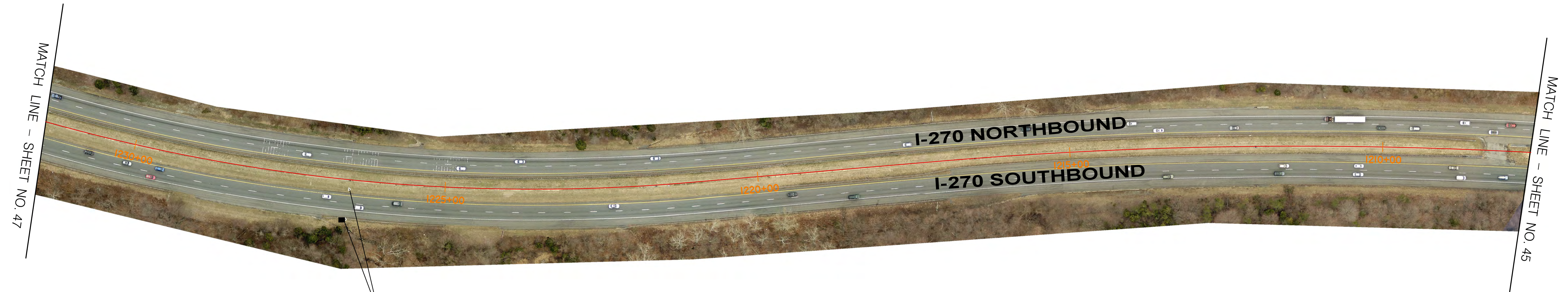
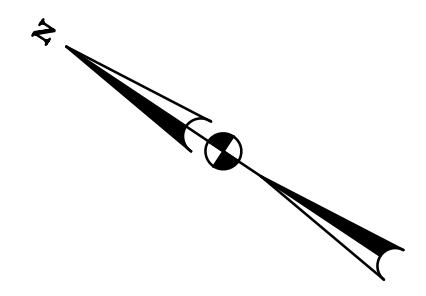
DATE: 11/15/16 SCALE: 1" = 80'

CONTRACT NO.
PROPOSAL

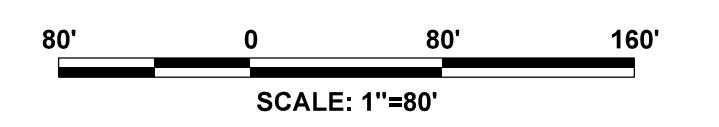
DRAWING NO.

SHEET NO.
45 OF 66

pw:\txpl\02\win101\parsons.com\Maryland_State\Documents\IS_270_ICM\Design\Roadway_Improvements\Exit_18 - MD 121\PHD-P010_MD_121.dgn
 Monday, December 19, 2016 AT 08:02 AM



NEW RTMS ON NEW POLE + VSL
 + NEW CCTV CAMERA
 1 POLE MOUNTED VSL



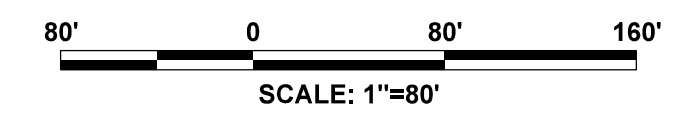
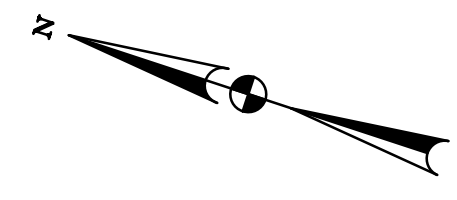
LEGEND

NEW CONSTRUCTION		STOP BAR		RAMP METER DETECTOR	
HARD SHOULDER RUNNING		ADVANCE WARNING DEVICE		PROPOSED RTMS	
PROPOSED PAVEMENT MARKING		SIGN		EXISTING RTMS	

PRELIMINARY PLANS
 DO NOT USE FOR CONSTRUCTION

APPR CHECK DRAWN DESIGN	I-270 INTERCHANGE IMPROVEMENT PRELIMINARY ENGINEERING	CONTRACT NO. PROPOSAL
	MD 109 TO MD 80	DRAWING NO.
	DATE: 11/15/16	SCALE: 1" = 80'

pw:\txpl\02\win101\parsons.com\Maryland_State\ICM\Design\Roadway_Improvements\Exit_18 - MD 121\pHD-P011_MD 121.dgn
 Monday, December 19, 2016 AT 07:30 PM



LEGEND

- | | | | | | |
|----------------------------------|--|-------------------------------|--|----------------------------|--|
| NEW CONSTRUCTION | | STOP BAR | | RAMP METER DETECTOR | |
| HARD SHOULDER RUNNING | | ADVANCE WARNING DEVICE | | PROPOSED RTMS | |
| PROPOSED PAVEMENT MARKING | | SIGN | | EXISTING RTMS | |

PRELIMINARY PLANS
 DO NOT USE FOR CONSTRUCTION

APPR | CHECK | DRAWN | DESIGN

**I-270 INTERCHANGE IMPROVEMENT
 PRELIMINARY ENGINEERING**

MD 109 TO MD 80

DATE: 11/15/16

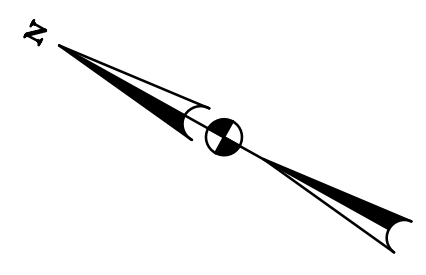
SCALE: 1" = 80'

CONTRACT NO.
PROPOSAL

DRAWING NO.

SHEET NO.
47 OF 66

pw:\txpl\02\win101\parsons.com\Maryland_State\ICM\Design\Roadway_Improvements\Exit_18 - MD 121\pHD-P012_MD_121.dgn
 Monday, December 19, 2016 AT 08:07 AM



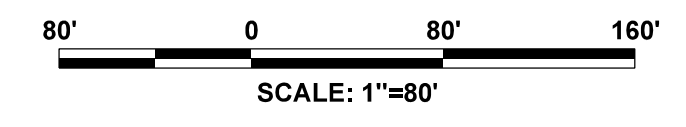
MATCH LINE - SHEET NO. 49

MATCH LINE - SHEET NO. 47



NEW CCTV
CAMERA

2 POLE MOUNTED VSL



LEGEND

NEW CONSTRUCTION		STOP BAR		RAMP METER DETECTOR	
HARD SHOULDER RUNNING		ADVANCE WARNING DEVICE		PROPOSED RTMS	
PROPOSED PAVEMENT MARKING		SIGN		EXISTING RTMS	

PRELIMINARY PLANS
 DO NOT USE FOR CONSTRUCTION

APPR CHECK DRAWN DESIGN

**I-270 INTERCHANGE IMPROVEMENT
 PRELIMINARY ENGINEERING**

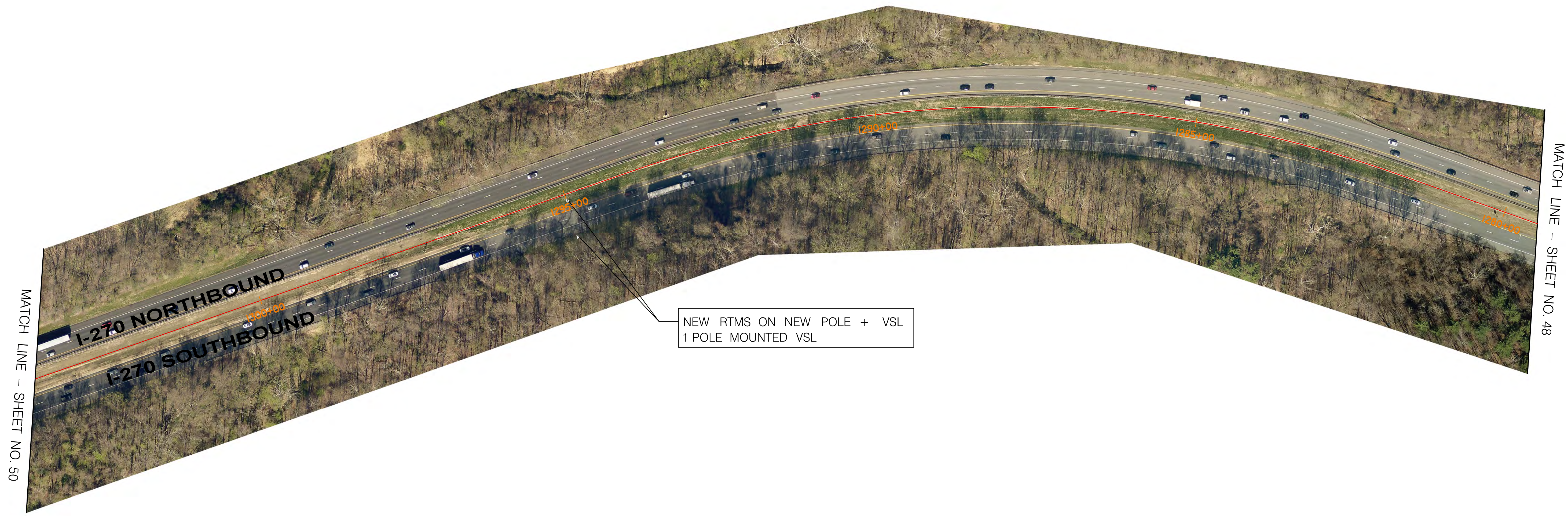
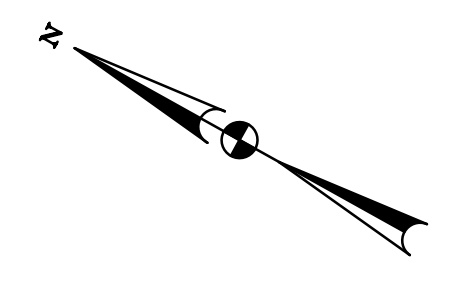
MD 109 TO MD 80
 DATE: 11/15/16 SCALE: 1" = 80'

CONTRACT NO.
PROPOSAL

DRAWING NO.

SHEET NO.
48 OF 66

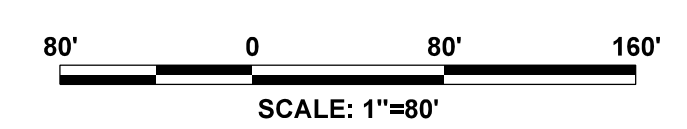
pw:\txpl\02\win101\parsons.com\Maryland_State\ICM\Design\Roadway_Improvements\Exit_18 - MD 121\pHD-P013_MD_121.dgn
 Monday, December 19, 2016 AT 07:33 PM



MATCH LINE - SHEET NO. 50

MATCH LINE - SHEET NO. 48

NEW RTMS ON NEW POLE + VSL
1 POLE MOUNTED VSL



LEGEND

NEW CONSTRUCTION		STOP BAR		RAMP METER DETECTOR	
HARD SHOULDER RUNNING		ADVANCE WARNING DEVICE		PROPOSED RTMS	
PROPOSED PAVEMENT MARKING		SIGN		EXISTING RTMS	

PRELIMINARY PLANS
 DO NOT USE FOR CONSTRUCTION

APPR CHECK DRAWN DESIGN

**I-270 INTERCHANGE IMPROVEMENT
PRELIMINARY ENGINEERING**

MD 109 TO MD 80

DATE: 11/15/16

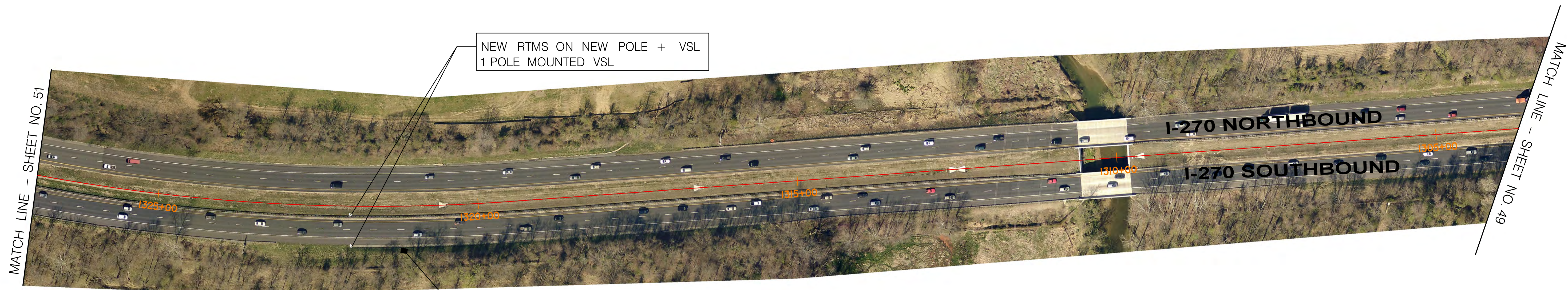
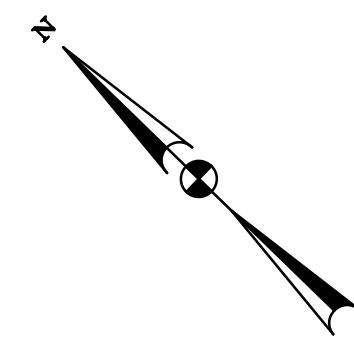
SCALE: 1" = 80'

CONTRACT NO.
PROPOSAL

DRAWING NO.

SHEET NO.
49 OF 66

pw:\txpl\02\pwin\01\parsons.com\Maryland_State\ICM\Design\Roadway_Improvements\Exit_18 - MD 121\pHD-P014_MD 121.dgn
 Monday, December 19, 2016 AT 08:11 AM



LEGEND

NEW CONSTRUCTION		STOP BAR		RAMP METER DETECTOR	
HARD SHOULDER RUNNING		ADVANCE WARNING DEVICE		PROPOSED RTMS	
PROPOSED PAVEMENT MARKING		SIGN		EXISTING RTMS	

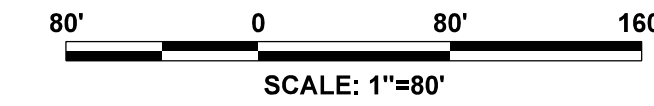
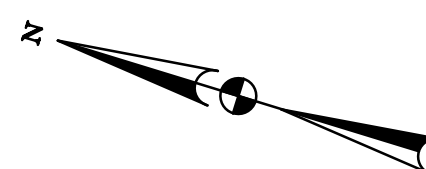
PRELIMINARY PLANS
 DO NOT USE FOR CONSTRUCTION

APPR CHECK DRAWN DESIGN	I-270 INTERCHANGE IMPROVEMENT PRELIMINARY ENGINEERING	CONTRACT NO. PROPOSAL
	MD 109 TO MD 80	DRAWING NO.
	DATE: 11/15/16 SCALE: 1" = 80'	SHEET NO. 50 OF 66

pw:\txpl\02\win101\parsons.com\Maryland_State\ICM\Design\Roadway_Improvements\Exit_18 - MD 121\pHD-P015_MD 121.dgn
 Monday, December 19, 2016 AT 07:37 PM

MATCH LINE - SHEET NO. 52

MATCH LINE - SHEET NO. 50



LEGEND

NEW CONSTRUCTION		STOP BAR		RAMP METER DETECTOR	
HARD SHOULDER RUNNING		ADVANCE WARNING DEVICE		PROPOSED RTMS	
PROPOSED PAVEMENT MARKING		SIGN		EXISTING RTMS	

PRELIMINARY PLANS
 DO NOT USE FOR CONSTRUCTION

APPR CHECK DRAWN DESIGN

**I-270 INTERCHANGE IMPROVEMENT
PRELIMINARY ENGINEERING**

MD 109 TO MD 80

DATE: 11/15/16

SCALE: 1" = 80'

CONTRACT NO.
PROPOSAL

DRAWING NO.

SHEET NO.
51 OF 66

pw:\txpl\02\win101\parsons.com\Maryland_State\ICM\Design\Roadway_Improvements\Exit_26 - MD 80\pHD-P001_MDB80.dgn
 Monday, December 19, 2016 AT 07:40 PM

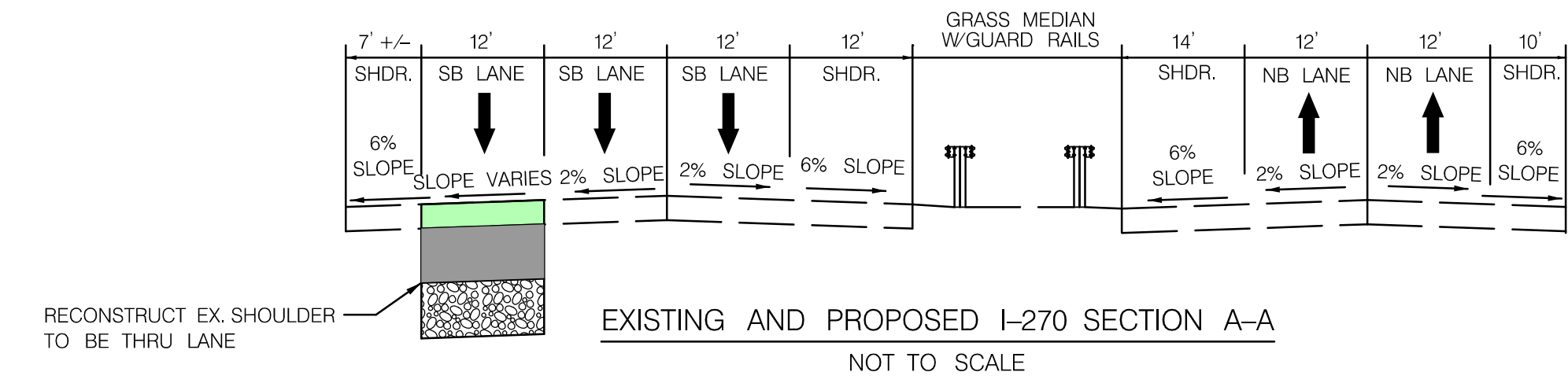
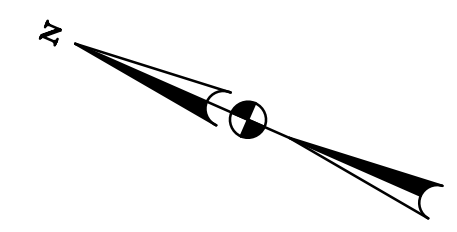
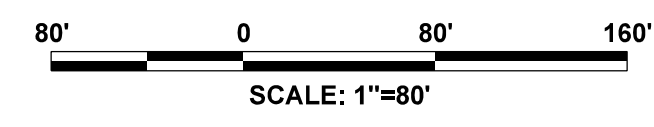


TABLE 1

LOCATION	EXISTING LENGTH	PROPOSED LENGTH	AASHTO	NOTES
RAMP FROM MD 80 TO I-270 SB	705'	1705'	1120'	NO ACCEPTION NEEDED

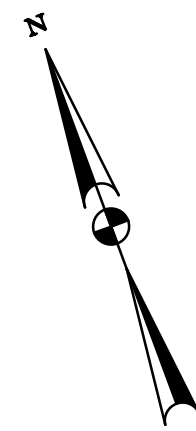


LEGEND			
NEW CONSTRUCTION		STOP BAR	
HARD SHOULDER RUNNING		ADVANCE WARNING DEVICE	
PROPOSED PAVEMENT MARKING		SIGN	
		RAMP METER DETECTOR	
		PROPOSED RTMS	
		EXISTING RTMS	

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

APPR. CHECK DRAWN DESIGN	I-270 INTERCHANGE IMPROVEMENT PRELIMINARY ENGINEERING	CONTRACT NO. PROPOSAL
	MD 80 INTERCHANGE	DRAWING NO.
	DATE: 11/15/16	SCALE: 1" = 80'

pw:\txpl\02\win101\parsons.com\Maryland_State\ICM\Design\Roadway_Improvements\Exit_26 - MD 80\pHD-P000_MD80.dgn
 Monday, December 19, 2016 AT 07:48 PM



MATCH LINE - SHEET NO. 54

MATCH LINE - SHEET NO. 52

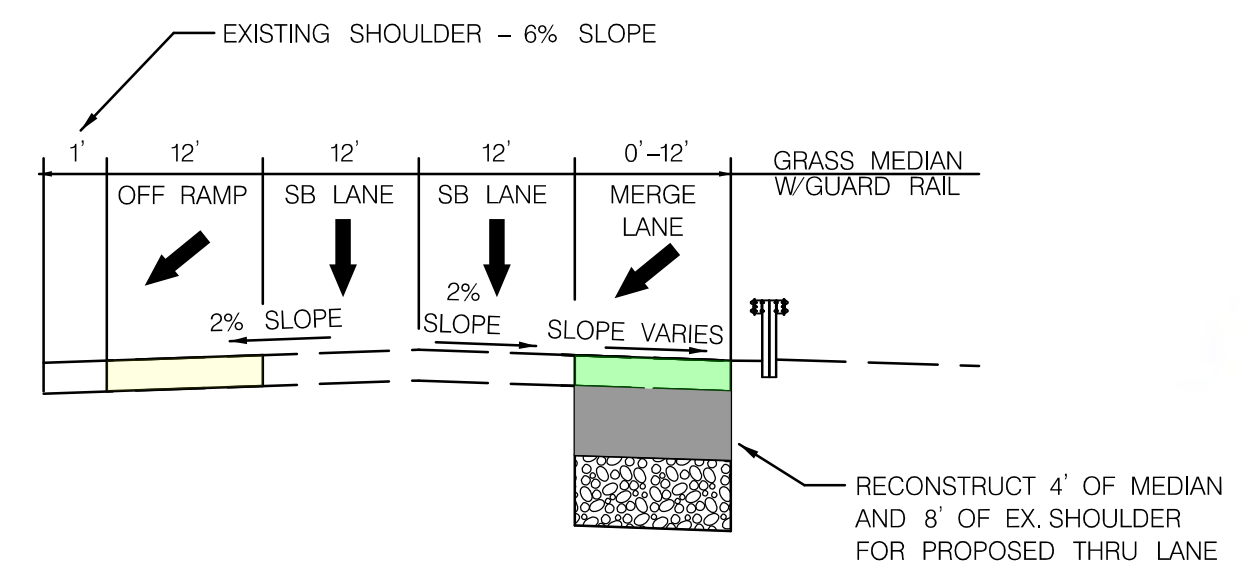
AM IMPROVEMENT
 UTILIZE INSIDE 12' SHOULDER AS A THIRD
 THRU LANE; LENGTH OF HSR IS ~19,200';
 660' TAPER BACK TO TWO LANES

1 VDIS ON
 NEW POLE

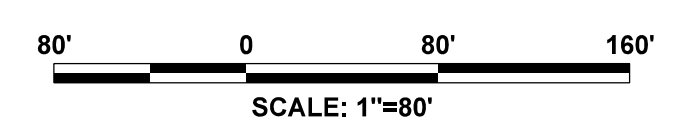
AM IMPROVEMENT
 RECONSTRUCT 1440' OF GUARDRAIL
 (CONTINUED ON SHEET NO. 54)

1 VDIS ON NEW POLE
 + VSL + NEW RTMS
 1 POLE MOUNDED VSL

AM IMPROVEMENT
 EXTEND MD 80 OFF RAMP
 BY ~1000'



EXISTING AND PROPOSED I-270 SECTION A-A
 NOT TO SCALE



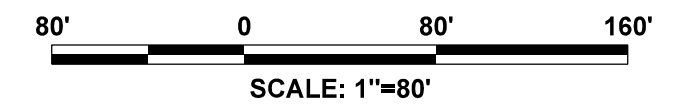
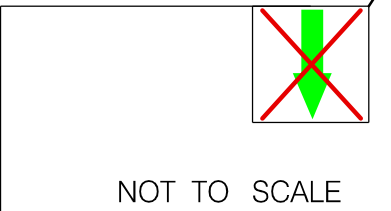
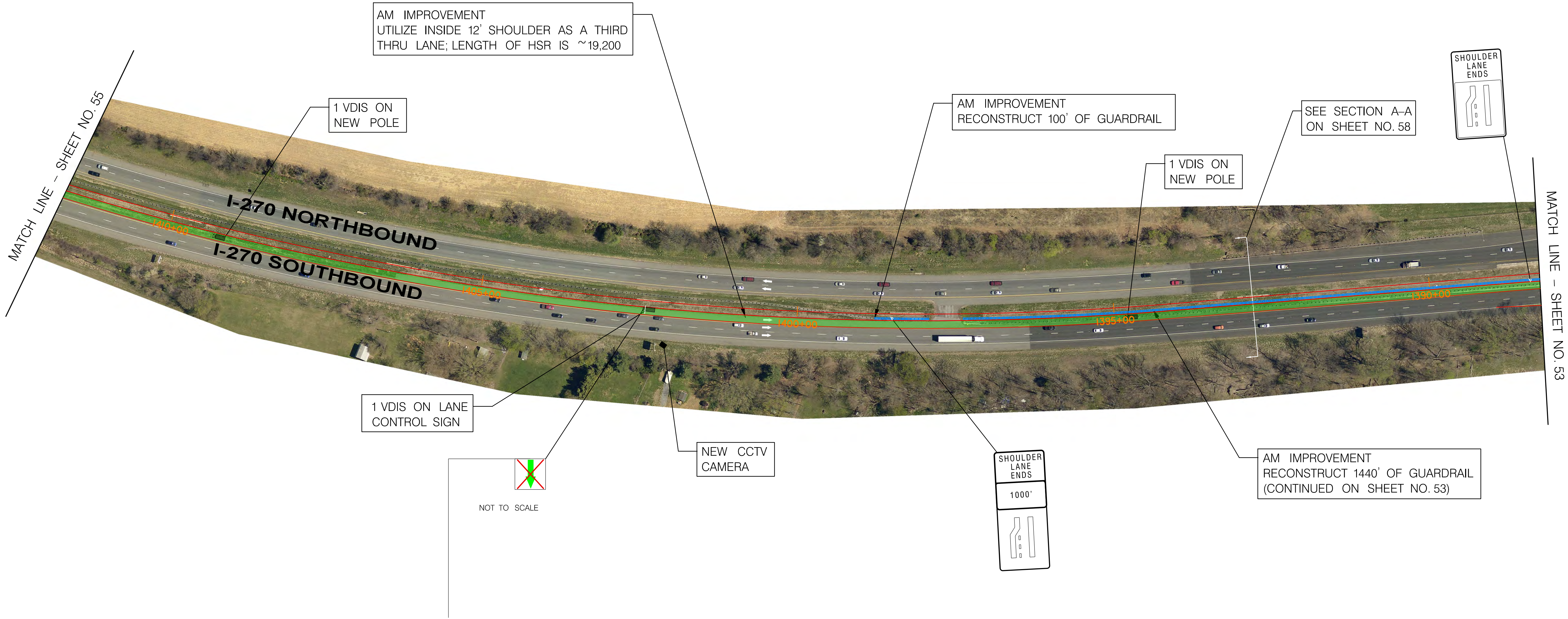
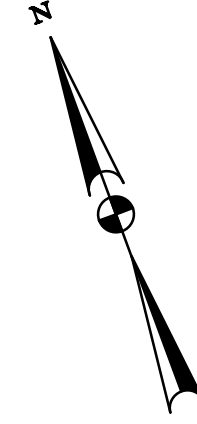
LEGEND

- | | | | | | |
|----------------------------------|--|-------------------------------|--|----------------------------|--|
| NEW CONSTRUCTION | | STOP BAR | | RAMP METER DETECTOR | |
| HARD SHOULDER RUNNING | | ADVANCE WARNING DEVICE | | PROPOSED RTMS | |
| PROPOSED PAVEMENT MARKING | | SIGN | | EXISTING RTMS | |

PRELIMINARY PLANS
 DO NOT USE FOR CONSTRUCTION

APPR CHECK DRAWN DESIGN	I-270 INTERCHANGE IMPROVEMENT PRELIMINARY ENGINEERING		CONTRACT NO. PROPOSAL
	MD 80 INTERCHANGE		DRAWING NO.
	DATE: 11/15/16	SCALE: 1" = 80'	SHEET NO. 53 OF 66

pw:\txpl\02\pwin\01\parsons.com\Maryland_State\Design\Roadway_Improvements\Exit_31 - MD 85\pHD-P010_MDB85 to MD80.dgn
 Monday, December 19, 2016 AT 08:19 AM

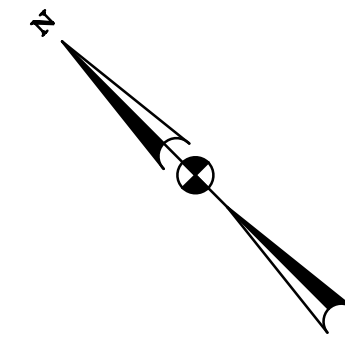


LEGEND			
NEW CONSTRUCTION		STOP BAR	
HARD SHOULDER RUNNING		ADVANCE WARNING DEVICE	
PROPOSED PAVEMENT MARKING		SIGN	
		RAMP METER DETECTOR	
		PROPOSED RTMS	
		EXISTING RTMS	

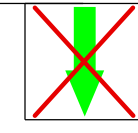
PRELIMINARY PLANS
 DO NOT USE FOR CONSTRUCTION

APPR CHECK DRAWN DESIGN	I-270 INTERCHANGE IMPROVEMENT PRELIMINARY ENGINEERING	CONTRACT NO. PROPOSAL
	MD 80 TO MD 85	DRAWING NO.
	DATE: 11/10/16	SCALE: 1" = 80'

pw:\txpl\02\win101\parsons.com\Maryland_State\Design\Roadway_Improvements\Exit_31 - MD 85\pHD-P009_MD85 to MD80.dgn
 Monday, December 19, 2016 AT 07:53 PM

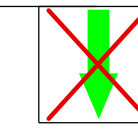


NOT TO SCALE



AM IMPROVEMENT
 UTILIZE INSIDE 12' SHOULDER AS A THIRD
 THRU LANE; LENGTH OF HSR IS ~19,200

NOT TO SCALE



SEE SECTION A-A
 ON SHEET NO. 58

MATCH LINE - SHEET NO. 56

MATCH LINE - SHEET NO. 54

1 VDIS ON LANE
 CONTROL SIGN

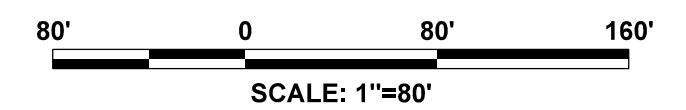
PROPOSED MEDIAN CROSSOVER
 APPROX. EVERY HALF MILE

1 VDIS ON
 NEW POLE

1 VSL ON LANE CONTROL SIGN + VDIS
 1 POLE MOUNTED VSL

I-270 NORTHBOUND

I-270 SOUTHBOUND



LEGEND

NEW CONSTRUCTION		STOP BAR		RAMP METER DETECTOR	
HARD SHOULDER RUNNING		ADVANCE WARNING DEVICE		PROPOSED RTMS	
PROPOSED PAVEMENT MARKING		SIGN		EXISTING RTMS	

PRELIMINARY PLANS
 DO NOT USE FOR CONSTRUCTION

APPR CHECK DRAWN DESIGN

**I-270 INTERCHANGE IMPROVEMENT
 PRELIMINARY ENGINEERING**

MD 80 TO MD 85

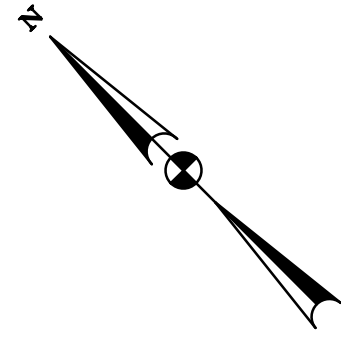
DATE: 11/15/16 SCALE: 1" = 80'

CONTRACT NO.
 PROPOSAL

DRAWING NO.

SHEET NO.
 55 OF 66

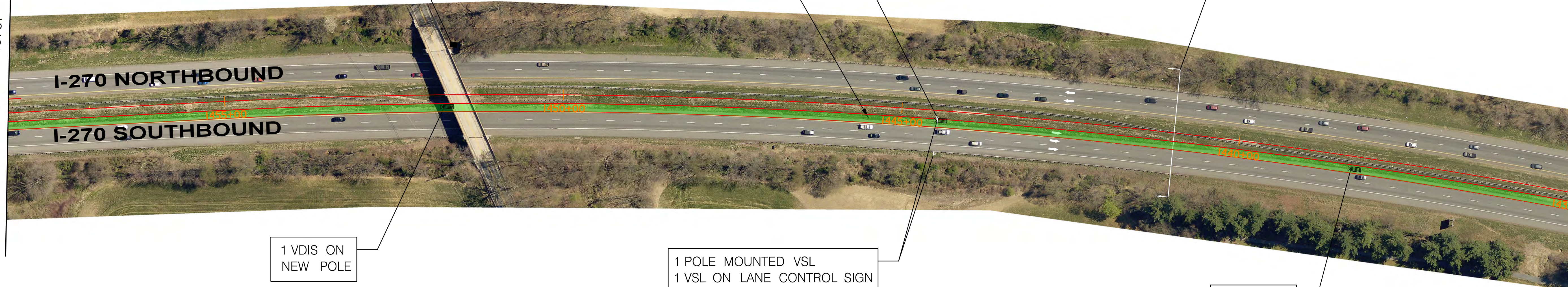
pw:\txpl\02\win101.parsons.com\Maryland_State\ICM\Design\Roadway_Improvements\Exit_31 - MD 85\pHD-P008_MDB85 to MD80.dgn
 Monday, December 19, 2016 AT 08:36 AM



NOT TO SCALE

MATCH LINE - SHEET NO. 57

MATCH LINE - SHEET NO. 55



NEW CCTV CAMERA

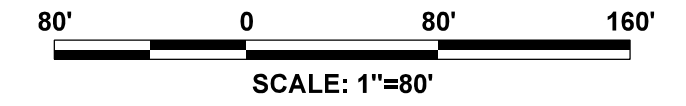
AM IMPROVEMENT
UTILIZE INSIDE 12' SHOULDER AS A THIRD
THRU LANE; LENGTH OF HSR IS ~19,200

1 VDIS ON
NEW POLE

1 POLE MOUNTED VSL
1 VSL ON LANE CONTROL SIGN
+ VDIS + NEW RTMS

1 VDIS ON
NEW POLE

SEE SECTION A-A
ON SHEET NO. 58



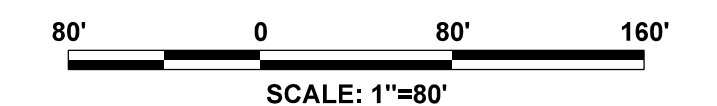
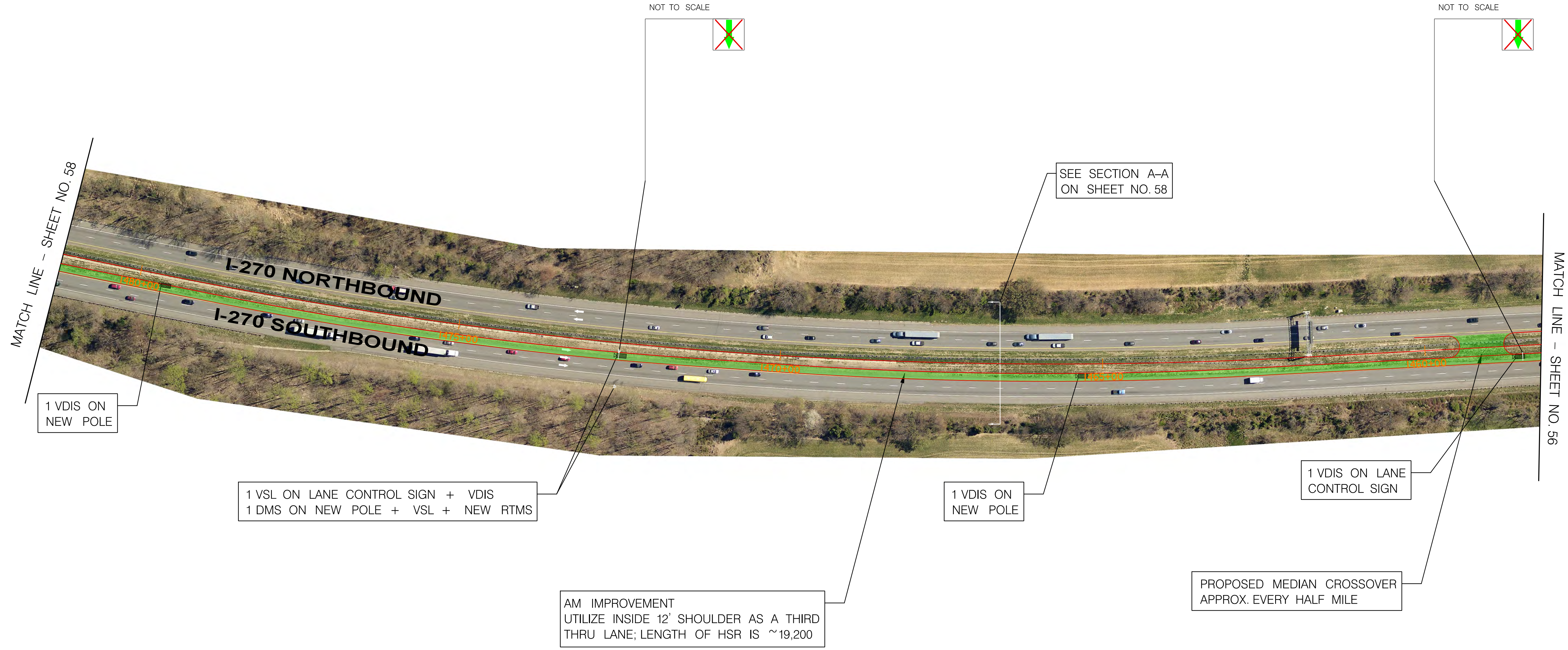
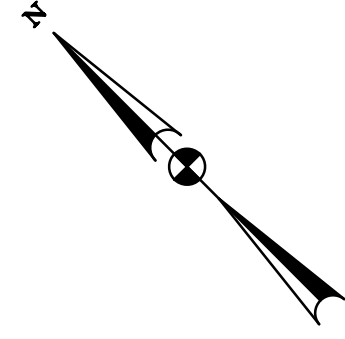
LEGEND

- | | | | | | |
|---------------------------|--|------------------------|--|---------------------|--|
| NEW CONSTRUCTION | | STOP BAR | | RAMP METER DETECTOR | |
| HARD SHOULDER RUNNING | | ADVANCE WARNING DEVICE | | PROPOSED RTMS | |
| PROPOSED PAVEMENT MARKING | | SIGN | | EXISTING RTMS | |

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

APPR CHECK DRAWN DESIGN	I-270 INTERCHANGE IMPROVEMENT PRELIMINARY ENGINEERING		CONTRACT NO. PROPOSAL
	MD 80 TO MD 85		DRAWING NO.
	DATE: 11/15/16	SCALE: 1" = 80'	SHEET NO. 56 OF 66

pw:\txpl\02\win101\parsons.com\Maryland_State\Design\Roadway_Improvements\Exit_31 - MD 85\pHD-P007_MDB85 to MD80.dgn
 Tuesday, December 20, 2016 AT 09:59 AM



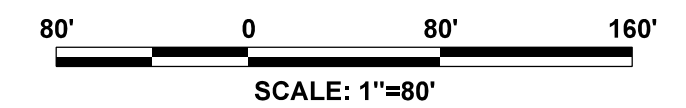
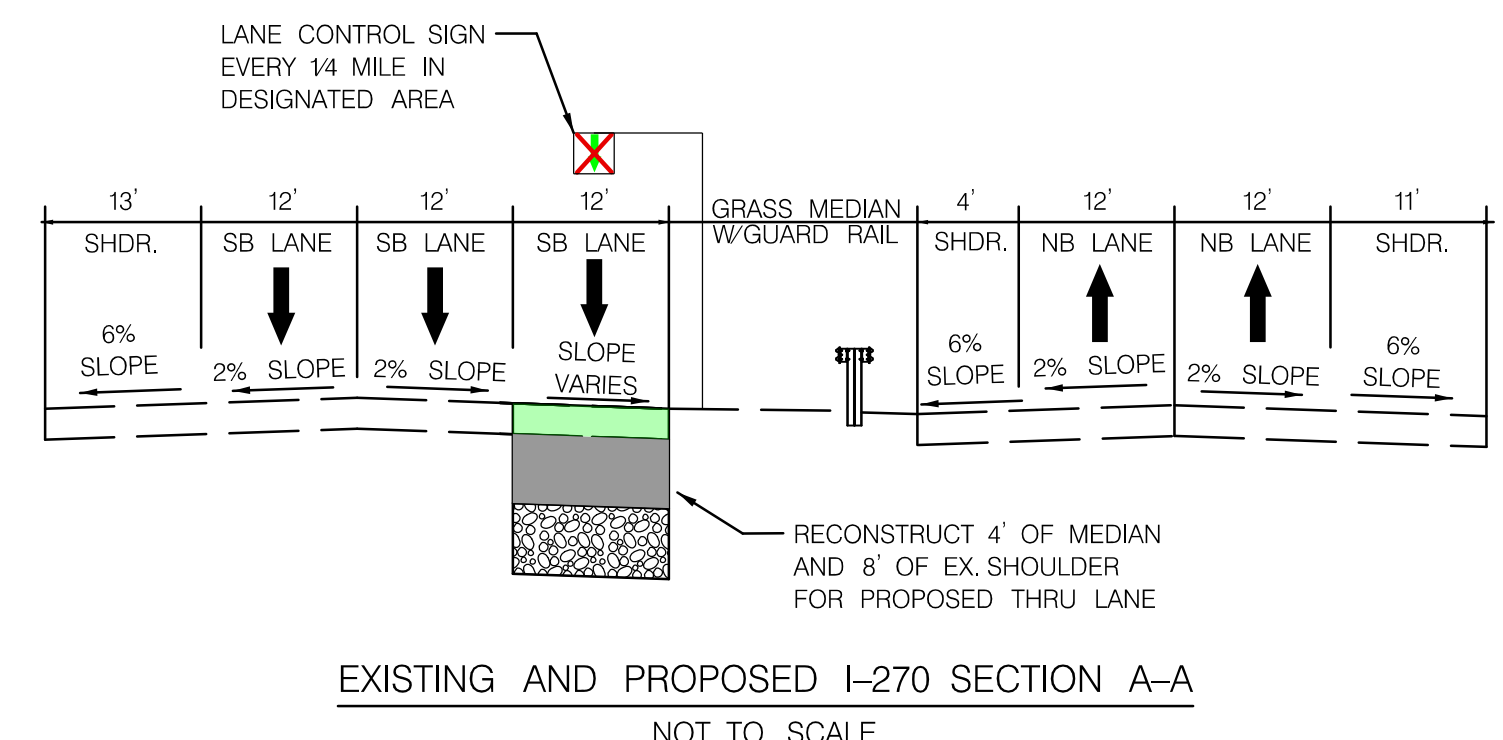
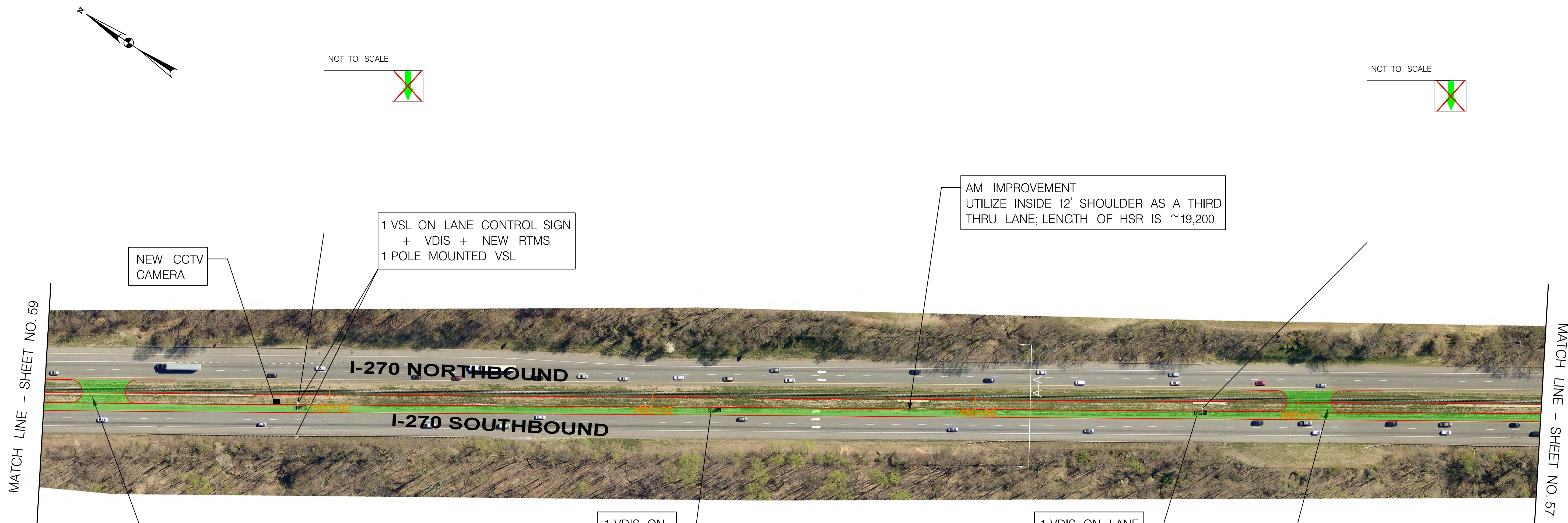
LEGEND

NEW CONSTRUCTION		STOP BAR		RAMP METER DETECTOR	
HARD SHOULDER RUNNING		ADVANCE WARNING DEVICE		PROPOSED RTMS	
PROPOSED PAVEMENT MARKING		SIGN		EXISTING RTMS	

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

APPR CHECK DRAWN DESIGN	I-270 INTERCHANGE IMPROVEMENT PRELIMINARY ENGINEERING		CONTRACT NO. PROPOSAL
	MD 80 TO MD 85		DRAWING NO.
	DATE: 11/15/16	SCALE: 1" = 80'	SHEET NO. 57 OF 66

pw:\t\p\02\win101\parsons.com\Maryland_State\Design\Roadway_Improvements\Exit_31 - MD 85\pHD-P006_MDB85 to MD80.dgn
 Tuesday, December 20, 2016 AT 09:03 AM

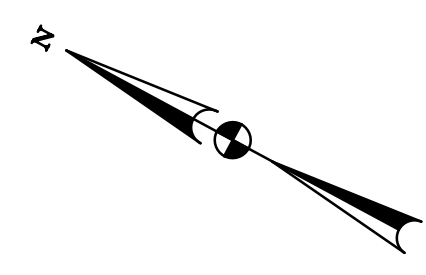


LEGEND			
NEW CONSTRUCTION		STOP BAR	
HARD SHOULDER RUNNING		ADVANCE WARNING DEVICE	
PROPOSED PAVEMENT MARKING		SIGN	
		RAMP METER DETECTOR	
		PROPOSED RTMS	
		EXISTING RTMS	

PRELIMINARY PLANS
 DO NOT USE FOR CONSTRUCTION

APPR. CHECK DRAWN DESIGN	I-270 INTERCHANGE IMPROVEMENT PRELIMINARY ENGINEERING	CONTRACT NO. PROPOSAL
	MD 80 TO MD 85	DRAWING NO.
	DATE: 11/15/16	SCALE: 1" = 80'

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 Tuesday, December 20, 2016 AT 09:07 AM



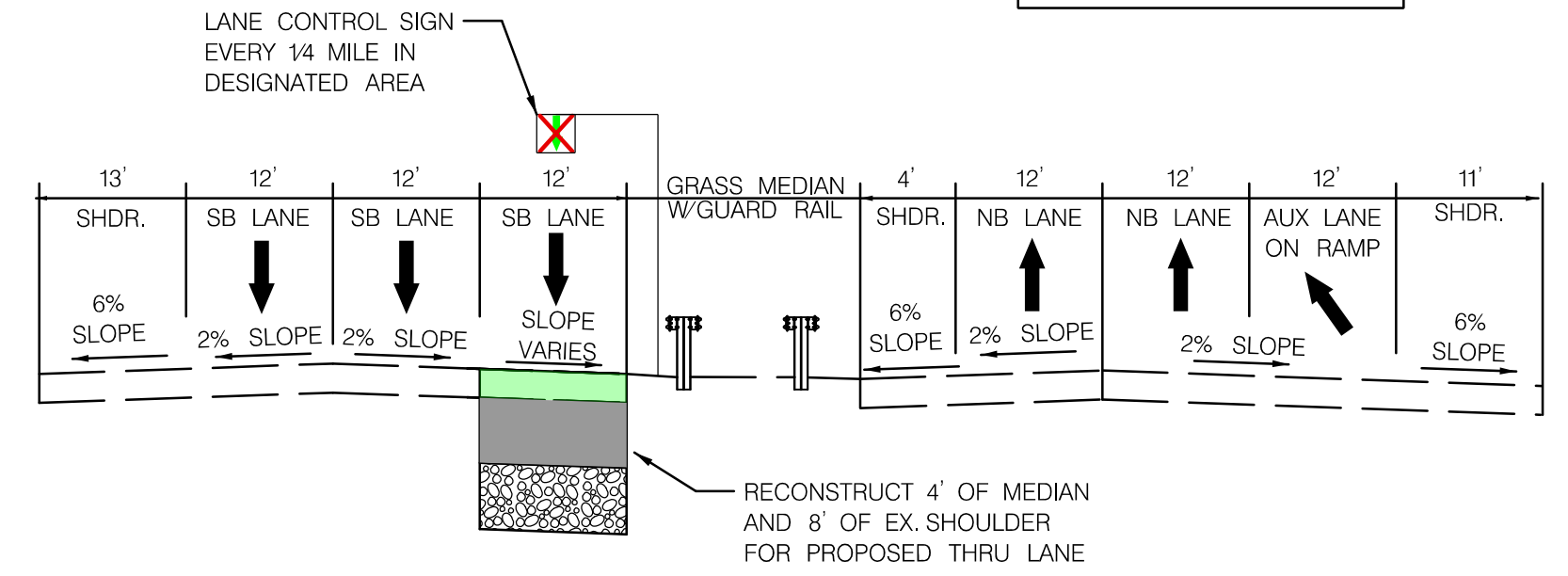
AM IMPROVEMENT
 UTILIZE INSIDE 12' SHOULDER AS A THIRD
 THRU LANE; LENGTH OF HSR IS ~19,200

NOT TO SCALE

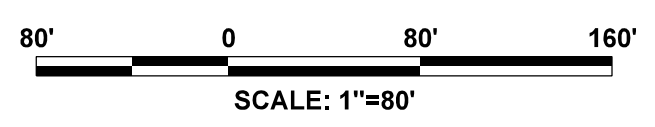
1 VDIS ON
 NEW POLE

1 VDIS ON LANE
 CONTROL SIGN

1 VDIS ON
 NEW POLE



EXISTING AND PROPOSED I-270 SECTION A-A
 NOT TO SCALE



LEGEND			
NEW CONSTRUCTION		STOP BAR	
HARD SHOULDER RUNNING		ADVANCE WARNING DEVICE	
PROPOSED PAVEMENT MARKING		SIGN	
		RAMP METER DETECTOR	
		PROPOSED RTMS	
		EXISTING RTMS	

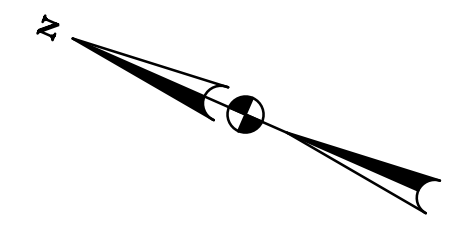
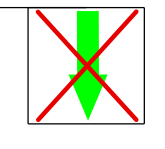
PRELIMINARY PLANS
 DO NOT USE FOR CONSTRUCTION

APPR CHECK DRAWN DESIGN	I-270 INTERCHANGE IMPROVEMENT PRELIMINARY ENGINEERING	CONTRACT NO. PROPOSAL
	MD 80 TO MD 85	DRAWING NO.
	DATE: 11/15/16	SCALE: 1" = 80'

pw:\txpl\02\win101\parsons.com\Maryland_State\Documents\IS_270_ICM\Design\Roadway_Improvements\Exit_31 - MD_85\pHD-P004_MDB85 to MD80.dgn
 Monday, December 19, 2016 AT 08:44 AM

NOT TO SCALE

DMS



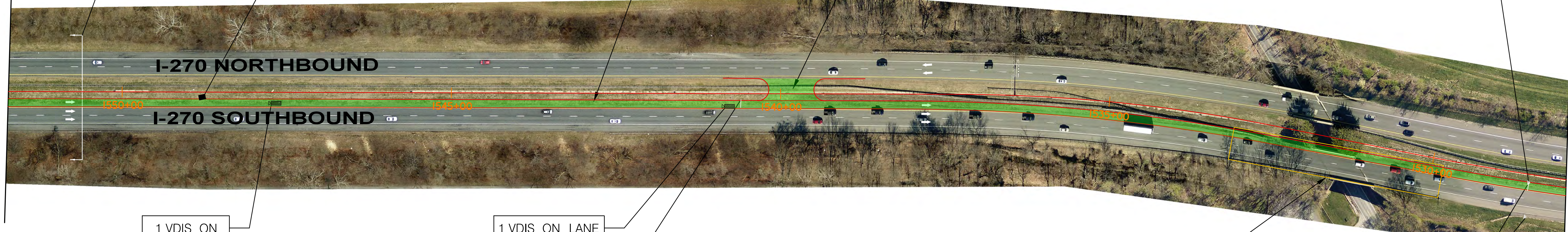
AM IMPROVEMENT
 UTILIZE INSIDE 12' SHOULDER AS A THIRD
 THRU LANE; TOTAL LENGTH OF HSR IS ~19,200'

PROPOSED MEDIAN CROSSOVER
 APPROX. EVERY HALF MILE

SEE SECTION A-A
 ON SHEET NO. 61

NEW CCTV
 CAMERA

MATCH LINE - SHEET NO. 61

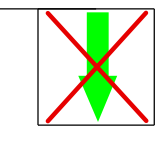


1 VDIS ON
 NEW POLE

1 VDIS ON LANE
 CONTROL SIGN

NOT TO SCALE

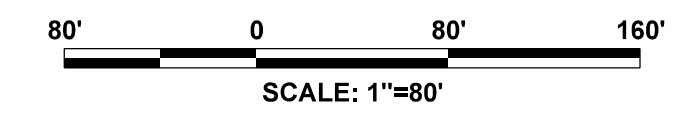
DMS



PROPOSED BRIDGE
 WIDENING

1 POLE MOUNTED VSL
 1 VSL ON LANE CONTROL SIGN
 + NEW RTMS

MATCH LINE - SHEET NO. 59



LEGEND

- | | | | | | |
|---------------------------|--|------------------------|--|---------------------|--|
| NEW CONSTRUCTION | | STOP BAR | | RAMP METER DETECTOR | |
| HARD SHOULDER RUNNING | | ADVANCE WARNING DEVICE | | PROPOSED RTMS | |
| PROPOSED PAVEMENT MARKING | | SIGN | | EXISTING RTMS | |

PRELIMINARY PLANS
 DO NOT USE FOR CONSTRUCTION

APPR CHECK DRAWN DESIGN

**I-270 INTERCHANGE IMPROVEMENT
 PRELIMINARY ENGINEERING**

MD 80 TO MD 85

DATE: 11/15/16

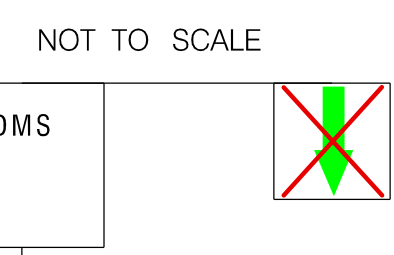
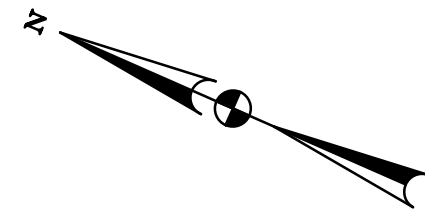
SCALE: 1" = 80'

CONTRACT NO.
 PROPOSAL

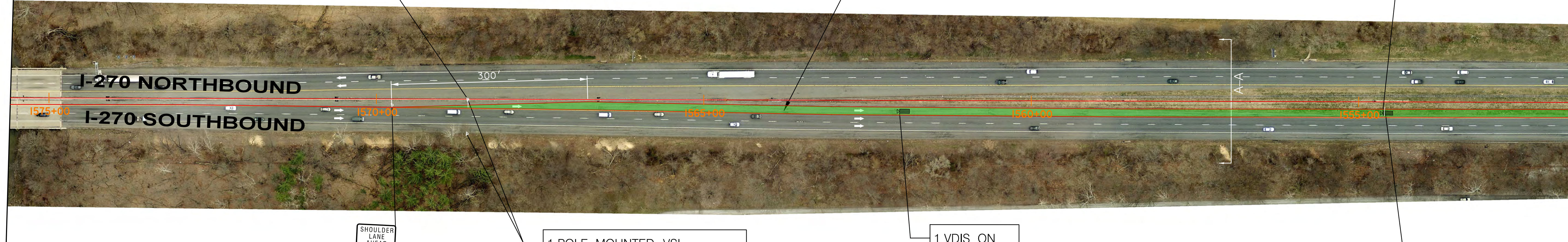
DRAWING NO.

SHEET NO.
 60 OF 66

pw:\txpl\02\win101\parsons.com\Maryland_State\ICM\Design\Roadway_Improvements\Exit_31 - MD 85\pHD-P003_MDB85 to MD80.dgn
 Tuesday, December 20, 2016 AT 09:11 AM



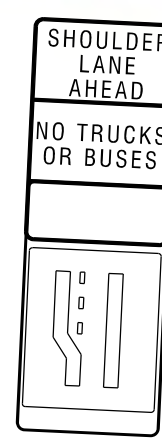
MATCH LINE - SHEET NO. 62



MATCH LINE - SHEET NO. 60

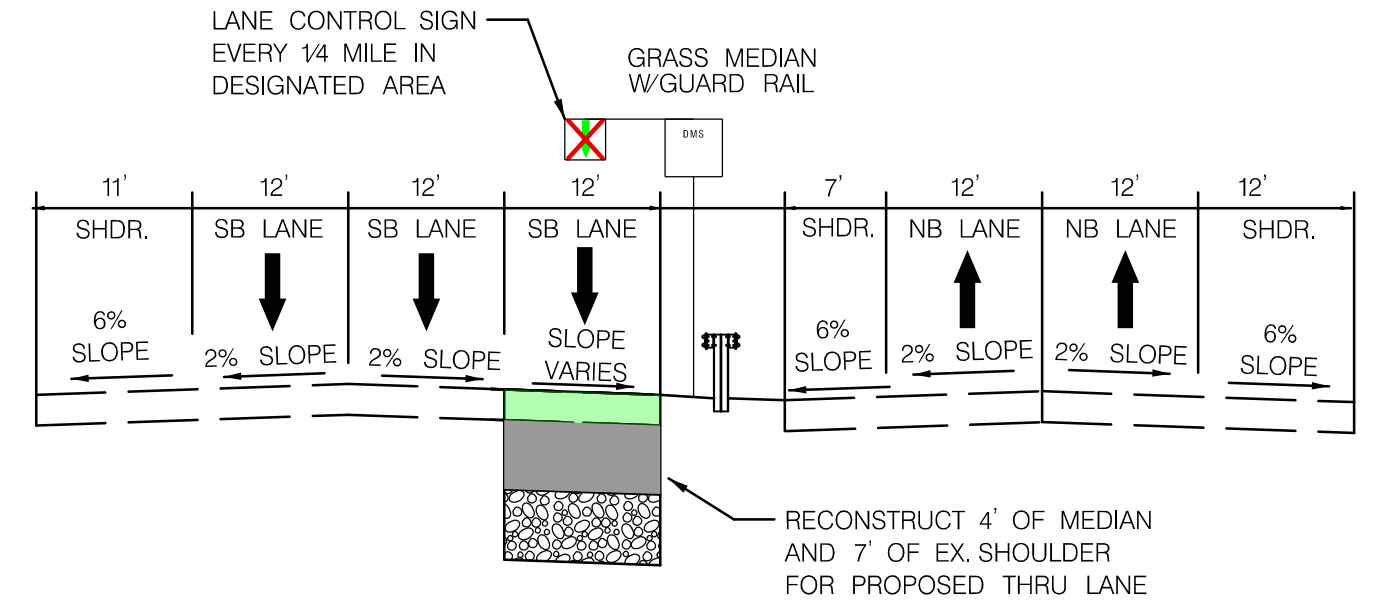
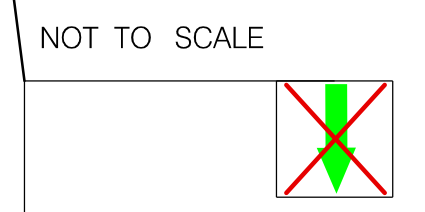
AM IMPROVEMENT
 UTILIZE INSIDE 12' SHOULDER AS A THIRD
 THRU LANE; LENGTH OF HSR IS ~19,200'

1 VDIS ON LANE
 CONTROL SIGN

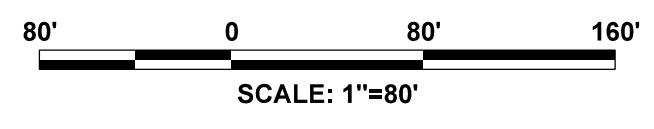


1 POLE MOUNTED VSL
 1 VSL ON LANE CONTROL SIGN
 + NEW RTMS

1 VDIS ON
 NEW POLE



EXISTING AND PROPOSED I-270 SECTION A-A
 NOT TO SCALE



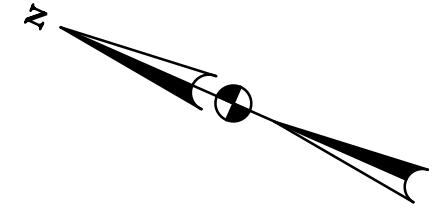
LEGEND

NEW CONSTRUCTION		STOP BAR		RAMP METER DETECTOR	
HARD SHOULDER RUNNING		ADVANCE WARNING DEVICE		PROPOSED RTMS	
PROPOSED PAVEMENT MARKING		SIGN		EXISTING RTMS	

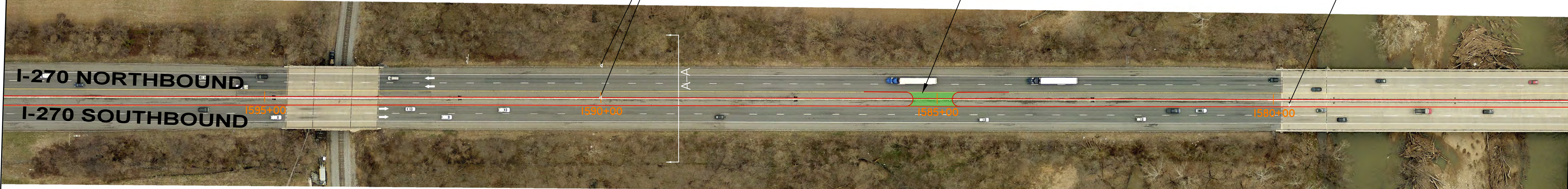
PRELIMINARY PLANS
 DO NOT USE FOR CONSTRUCTION

APPR CHECK DRAWN DESIGN	I-270 INTERCHANGE IMPROVEMENT PRELIMINARY ENGINEERING		CONTRACT NO. PROPOSAL
	MD 80 TO MD 85		DRAWING NO.
	DATE: 11/15/16	SCALE: 1" = 80'	SHEET NO. 61 OF 66

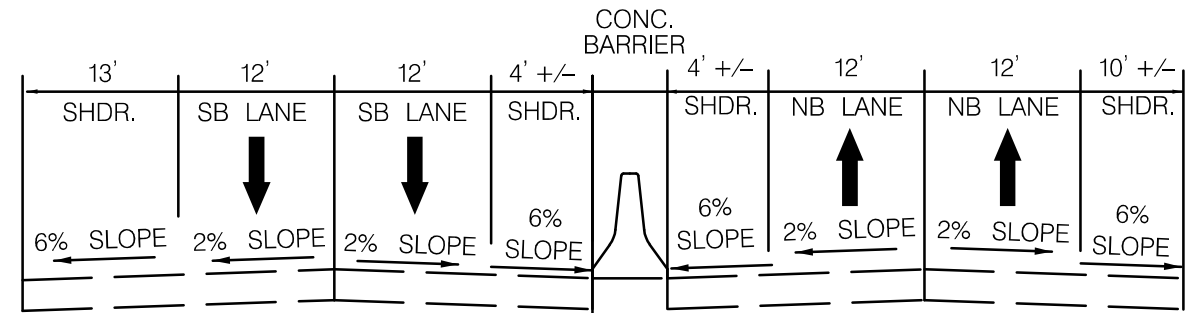
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 Tuesday, December 20, 2016 AT 09:15 AM



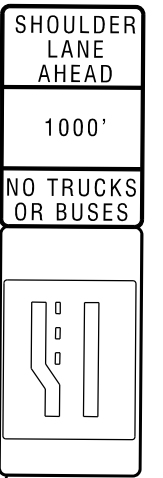
MATCH LINE - SHEET NO. 63



MATCH LINE - SHEET NO. 61



EXISTING I-270 SECTION A-A
NOT TO SCALE



PROPOSED MEDIAN CROSSOVER
APPROX. EVERY HALF MILE

1 DMS ON A NEW POLE + VSL
1 POLE MOUNTED VSL

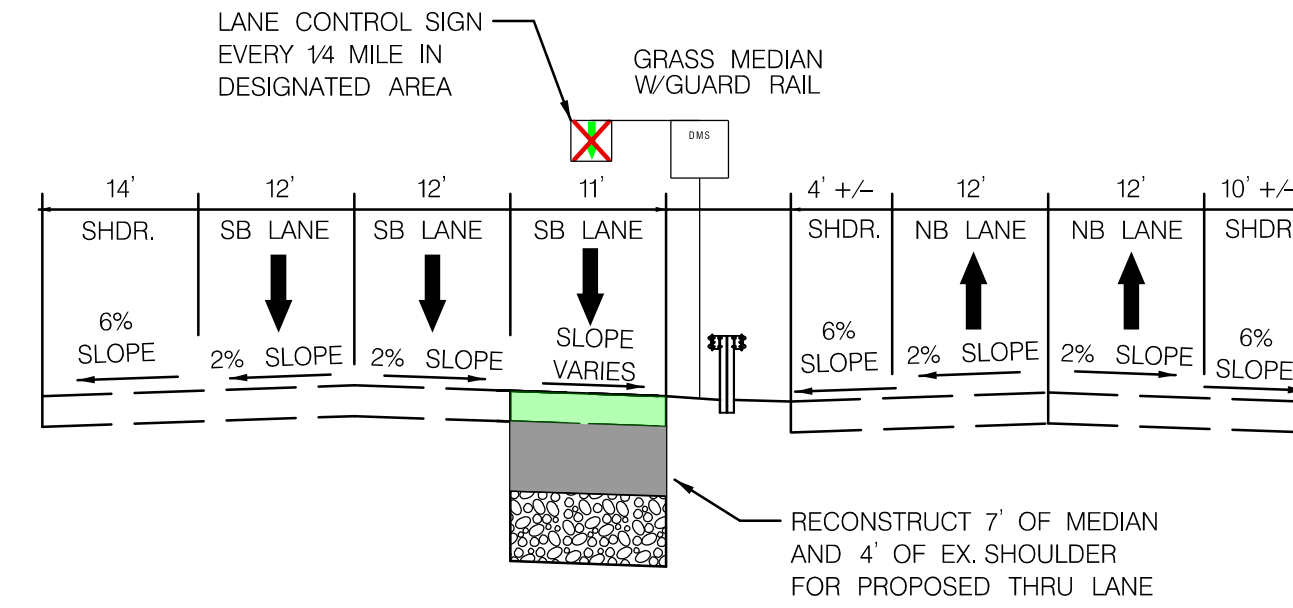
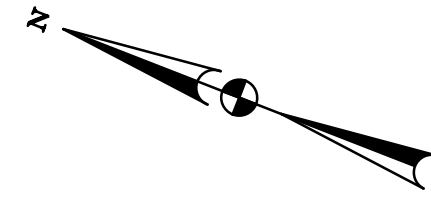


LEGEND			
NEW CONSTRUCTION		STOP BAR	
HARD SHOULDER RUNNING		ADVANCE WARNING DEVICE	
PROPOSED PAVEMENT MARKING		SIGN	
		RAMP METER DETECTOR	
		PROPOSED RTMS	
		EXISTING RTMS	

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

APPR. CHECK DRAWN DESIGN	I-270 INTERCHANGE IMPROVEMENT PRELIMINARY ENGINEERING		CONTRACT NO. PROPOSAL
	MD 80 TO MD 85		DRAWING NO.
	DATE: 11/15/16	SCALE: 1" = 80'	SHEET NO. 62 OF 66

pw:\txpl\02\win101\parsons.com\Maryland_State\Documents\IS_270_ICM\Design\Roadway_Improvements\Exit_31 - MD_85\pHD-P001_MDB85.dgn
 Tuesday, December 20, 2016 AT 09:19 AM



EXISTING AND PROPOSED I-270 SECTION A-A
NOT TO SCALE

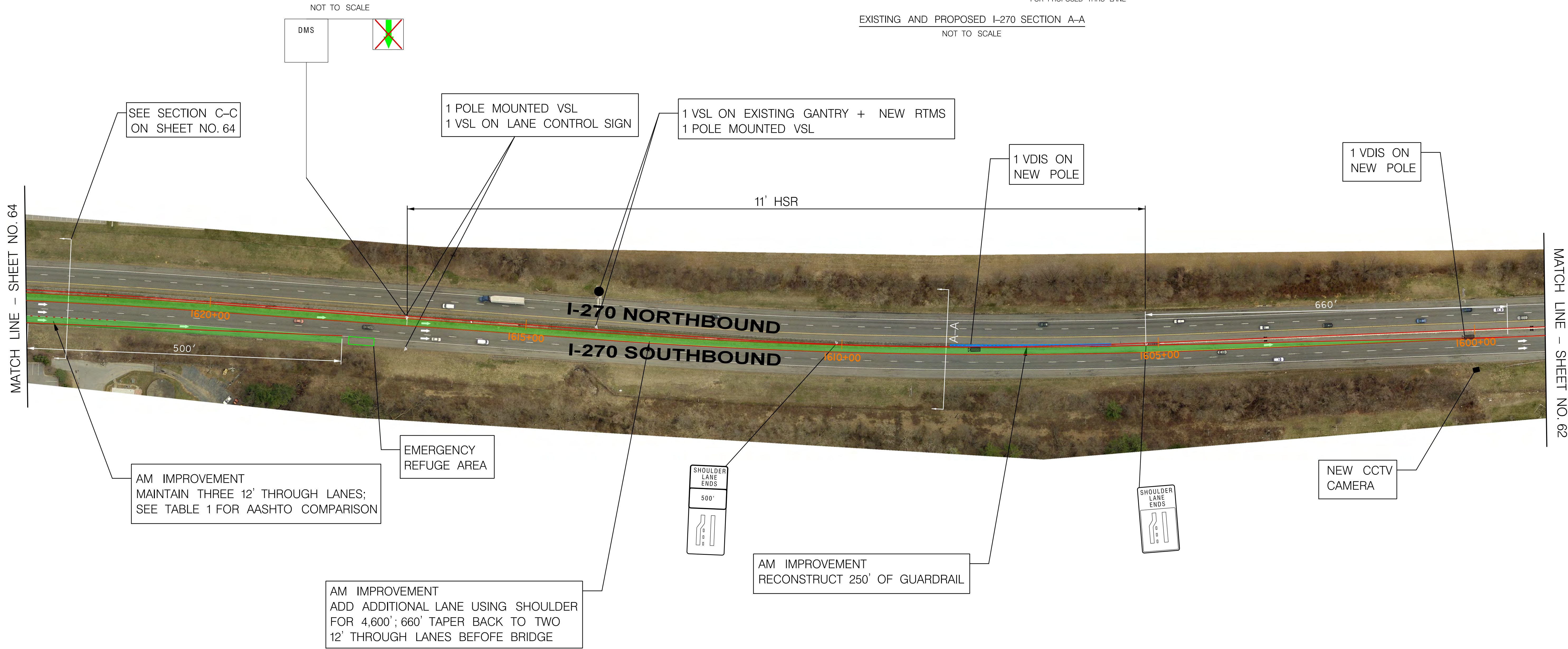
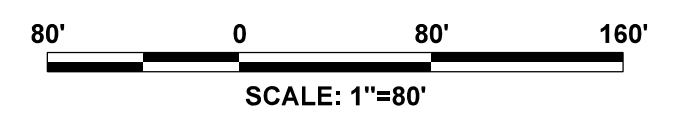


TABLE 1

LOCATION	EXISTING LENGTH	PROPOSED LENGTH	AASHTO	NOTES
RAMP FROM MD 85 TO I-270 SB	825'	1585'	1120'	NO ACCEPTION NEEDED

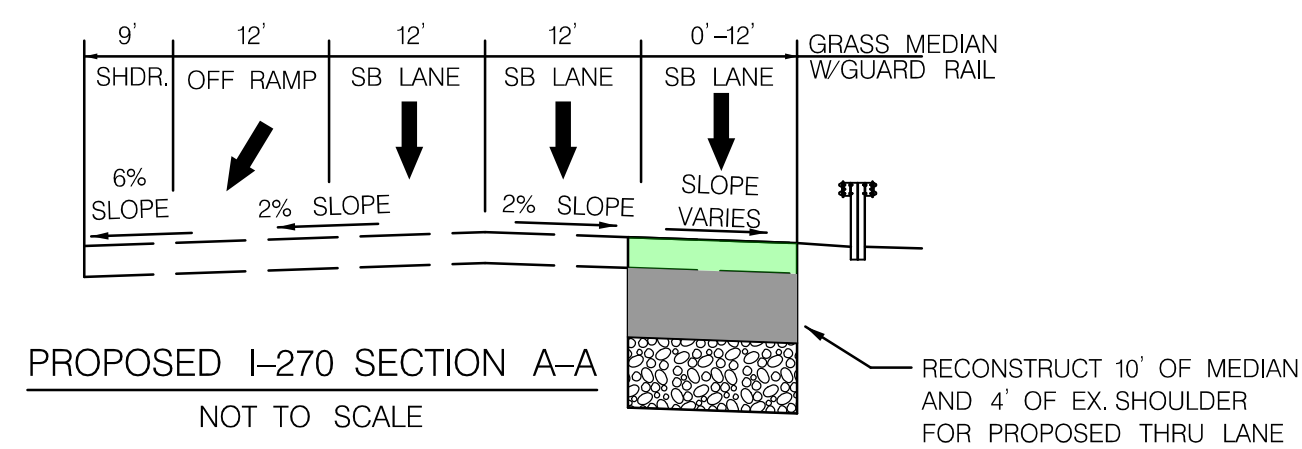
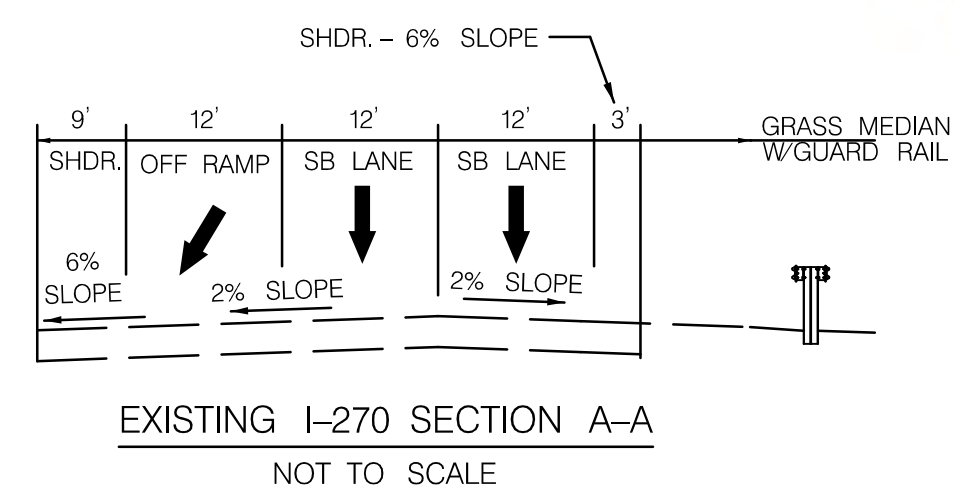
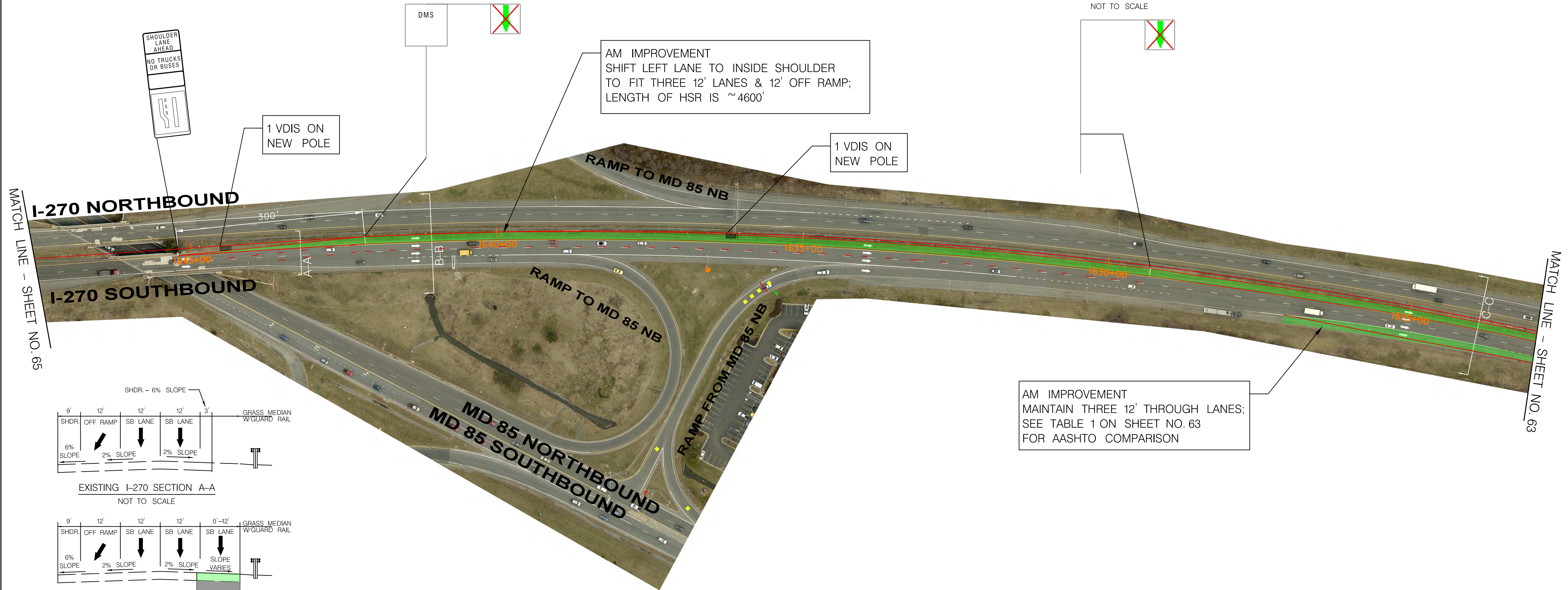
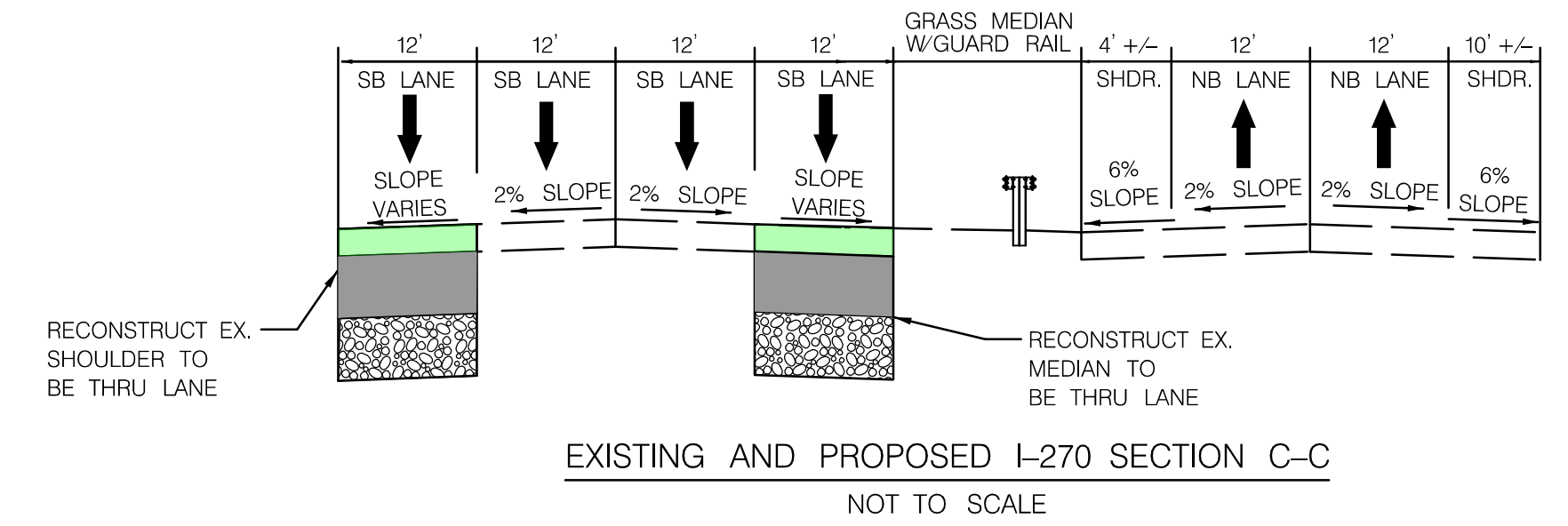
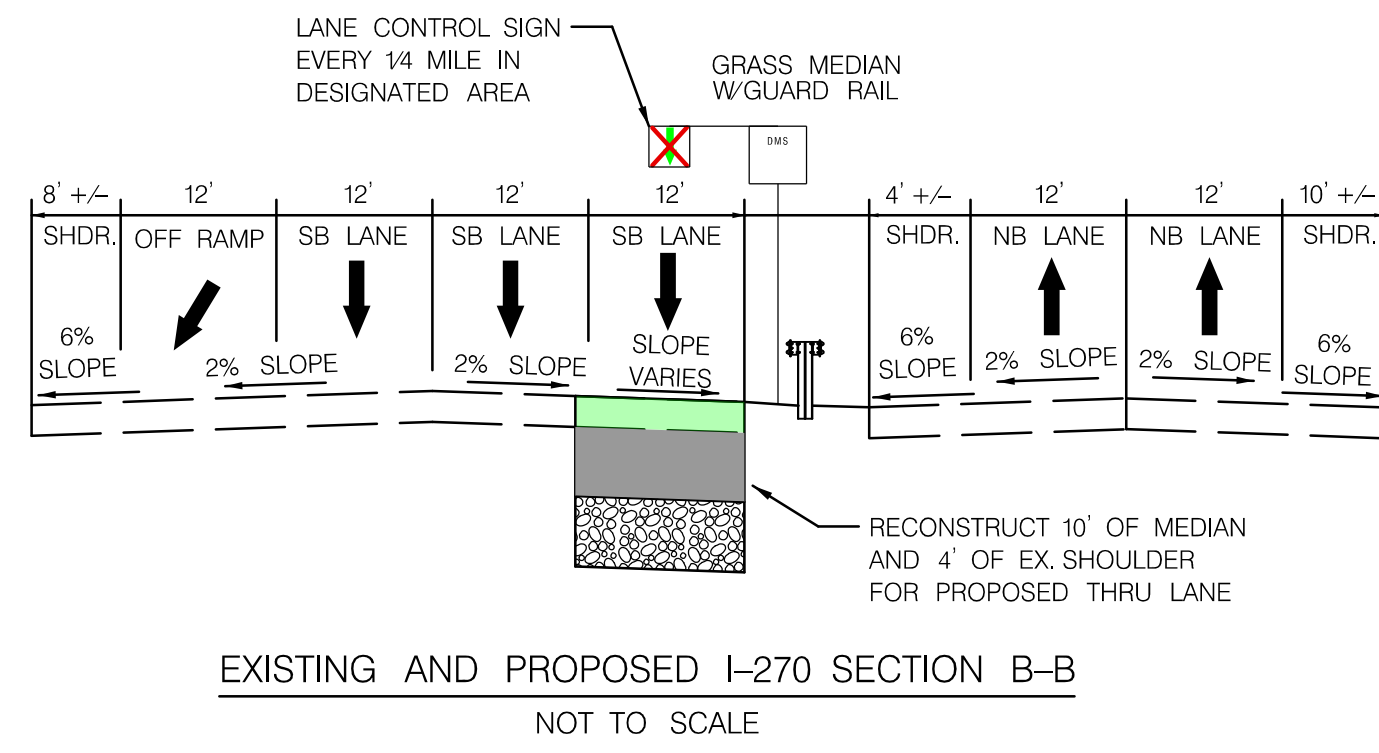
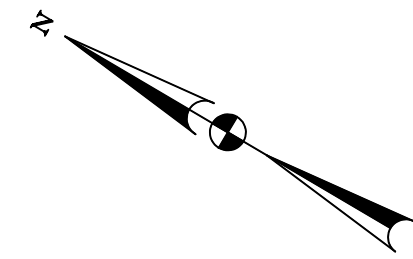


LEGEND			
NEW CONSTRUCTION		STOP BAR	
HARD SHOULDER RUNNING		ADVANCE WARNING DEVICE	
PROPOSED PAVEMENT MARKING		SIGN	
		RAMP METER DETECTOR	
		PROPOSED RTMS	
		EXISTING RTMS	

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

APPR. CHECK DRAWN DESIGN	I-270 INTERCHANGE IMPROVEMENT PRELIMINARY ENGINEERING	CONTRACT NO. PROPOSAL
	MD 85 INTERCHANGE	DRAWING NO.
	DATE: 11/15/16	SCALE: 1" = 80'

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 Tuesday, December 20, 2016 AT 09:28 AM



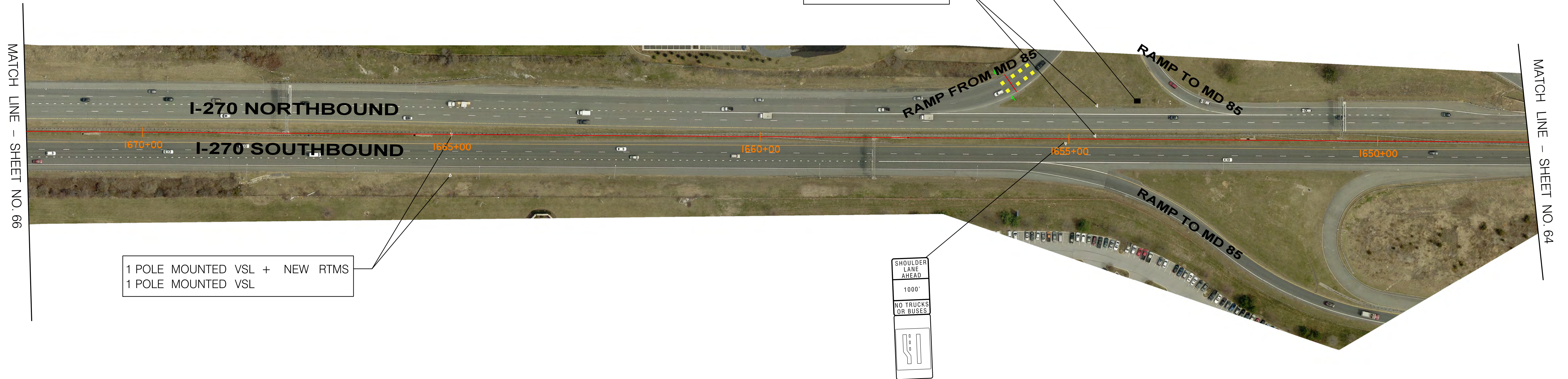
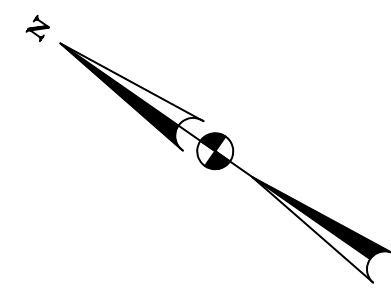
LEGEND

- | | | | | | |
|---------------------------|--|------------------------|--|---------------------|--|
| NEW CONSTRUCTION | | STOP BAR | | RAMP METER DETECTOR | |
| HARD SHOULDER RUNNING | | ADVANCE WARNING DEVICE | | PROPOSED RTMS | |
| PROPOSED PAVEMENT MARKING | | SIGN | | EXISTING RTMS | |

PRELIMINARY PLANS
 DO NOT USE FOR CONSTRUCTION

APPR CHECK DRAWN DESIGN	I-270 INTERCHANGE IMPROVEMENT PRELIMINARY ENGINEERING MD 85 INTERCHANGE	CONTRACT NO. PROPOSAL DRAWING NO. SHEET NO. 64 OF 66
DATE: 11/15/16 SCALE: 1" = 80'		

pw:\txpl\02\win101\parsons.com\Maryland_State\Design\Roadway_Improvements\Exit_31 - MD 85\pHD-P00_1-70 to MD85.dgn
 Tuesday, December 20, 2016 AT 09:32 AM

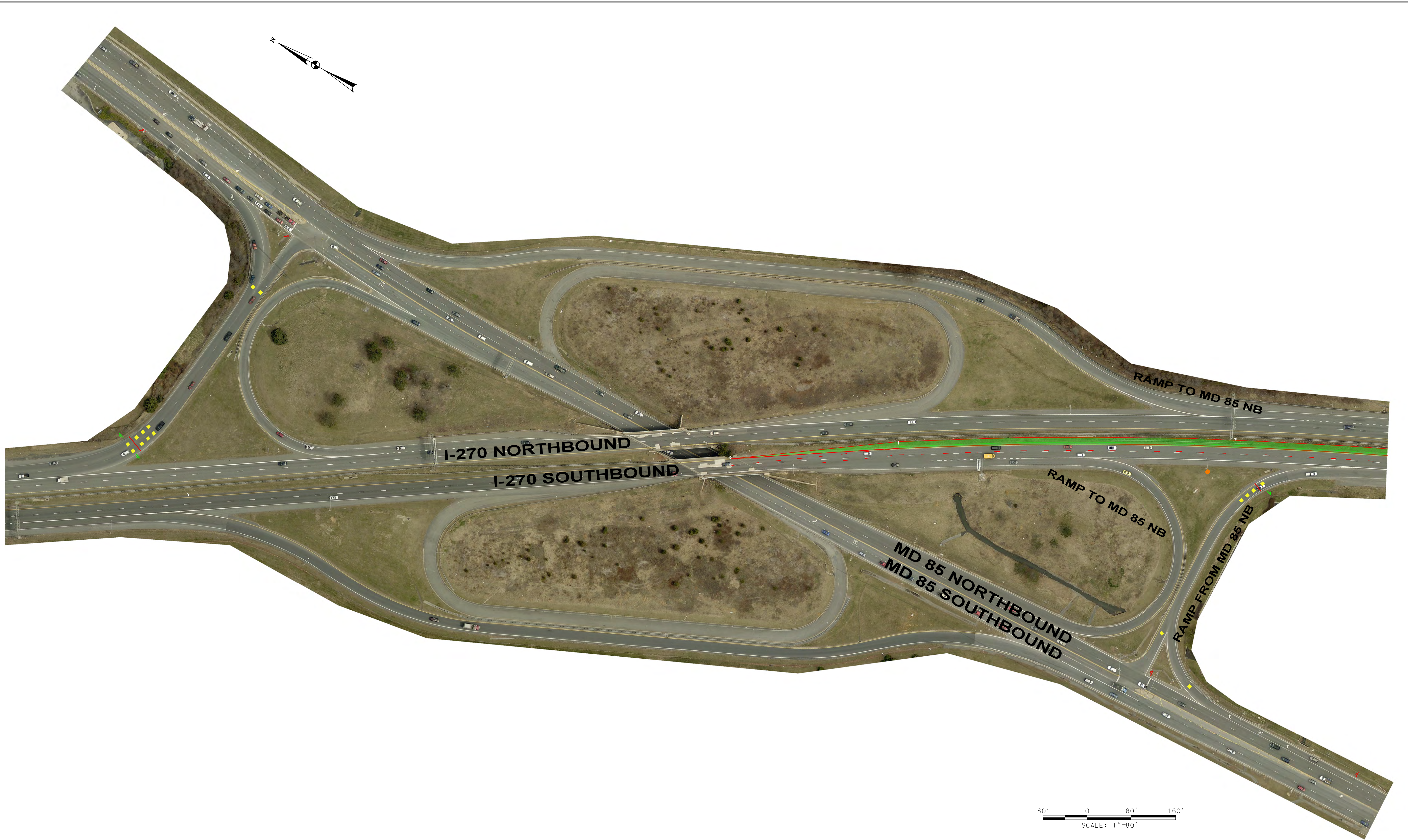


LEGEND			
NEW CONSTRUCTION		STOP BAR	
HARD SHOULDER RUNNING		ADVANCE WARNING DEVICE	
PROPOSED PAVEMENT MARKING		SIGN	
		RAMP METER DETECTOR	
		PROPOSED RTMS	
		EXISTING RTMS	

PRELIMINARY PLANS
 DO NOT USE FOR CONSTRUCTION

APPR CHECK DRAWN DESIGN	I-270 INTERCHANGE IMPROVEMENT PRELIMINARY ENGINEERING	CONTRACT NO. PROPOSAL
	MD 85 INTERCHANGE	DRAWING NO.
	DATE: 11/15/16 SCALE: 1" = 80'	SHEET NO. 65 OF 66

pw:\txpl\02\win101\parsons.com\Maryland_State\Documents\IS_270_ICM\Design\Roadway_Improvements\Exit_6 - MD 28 W. Montgomery Ave\pHD-0017_MD85_RM.dgn
 Tuesday, December 20, 2016 AT 07:10 AM



LEGEND	
NEW CONSTRUCTION	
HARD SHOULDER RUNNING	
PROPOSED PAVEMENT MARKING	
STOP BAR	
ADVANCE WARNING DEVICE	
SIGN	
RAMP METER DETECTOR	
PROPOSED RTMS	
EXISTING RTMS	

PRELIMINARY PLANS
 DO NOT USE FOR CONSTRUCTION

APPR CHECK DRAWN DESIGN

I-270 INTERCHANGE IMPROVEMENT
PRELIMINARY ENGINEERING

MD 85 INTERCHANGE
RAMP METER

DATE: 11/15/16 SCALE: 1" = 80'

CONTRACT NO. PROPOSAL
 DRAWING NO.
 SHEET NO. 65A OF 66

pw:\txpl\02\pwin\01\parsons.com\Maryland_State\ICM\Design\Roadway_Improvements\Exit_31 - MD 85\pHD-P0_I-70 to MD85.dgn
 Monday, December 19, 2016 AT 08:58 AM

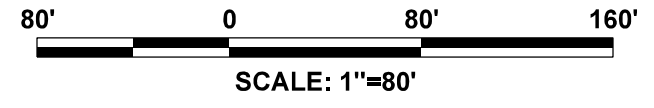


MATCH LINE - SHEET NO. 65

AT 1700+50
NEW CCTV CAMERA
(NOT SHOWN ON PLANS)

1 POLE MOUNTED VSL
1 DMS ON NEW POLE + VSL

1 POLE MOUNTED VSL
NEW RTMS ON NEW POLE + VSL



LEGEND			
NEW CONSTRUCTION		STOP BAR	
HARD SHOULDER RUNNING		ADVANCE WARNING DEVICE	
PROPOSED PAVEMENT MARKING		SIGN	
		RAMP METER DETECTOR	
		PROPOSED RTMS	
		EXISTING RTMS	

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

APPR CHECK DRAWN DESIGN	I-270 INTERCHANGE IMPROVEMENT PRELIMINARY ENGINEERING	CONTRACT NO. PROPOSAL
	MD 85 TO I-70	DRAWING NO.
	DATE: 11/15/16	SCALE: 1" = 80'

I-270 Hard Shoulder Running

Sr. No	Location	Station (As Proposed)	Pavement Design Parameters					Design Structural No. (SN)	Existing Pavement Structural Capacity	Proposed Improvement
			Estimated Total 18-Kip Equivalent Single Axle Load Applications (W ₁₈)	Reliability ®	Standard Deviation (So)	Sub grade Resilient Modulus (Mr)	Design Serviceability loss (PSI)			
1	I-270 (SB)- Express Lane (L)	195+00 to 327+00	853,346	90%	0.49	5000	1.3	4.32	5.72	Resurface, Wedge and Level
2	I-270 (SB) - Local Lane (L)	241+00 to 265+00	5,569,535	90%	0.49	5000	1.3	5.75	5.34	Overlay with 2" HMA
3	I-270 (SB)- Local Lane (R)	248+00 to 280+00	12,739,861	90%	0.49	5000	1.3	6.43	5.34	Overlay with 2.5" HMA
4	I-270 (SB)- Local Lane (R)	280+00 to 304+00	10,234,710	90%	0.49	5000	1.3	6.26	5.34	Overlay with minimum 2.5" HMA or Reconstruct
5	I-270 (NB)- Local Lane (R)	306+00 to 317+00	4,980,598	90%	0.49	5000	1.3	5.66	4.50	Overlay with minimum 3" HMA or Reconstruct
6	I-270 (SB)- Local Lane (R)	309+00 to 317+00	5,992,305	90%	0.49	5000	1.3	5.81	5.34	Resurface
7	I-270 (SB)- Local Lane (R)	348+00 to 351+00	2,837,338	90%	0.49	5000	1.3	5.22	4.08	Overlay with minimum 3" HMA or Reconstruct
8	I-270 (SB)- Local Lane (R)	401+00 to 432+00	7,749,558	90%	0.49	5000	1.3	6.02	5.34	Overlay with 2" HMA
9	I-270 (SB)-Local Lane (L)	448+00 to 480+00	11,455,229	90%	0.49	5000	1.3	6.35	6.26	Resurface, Wedge and Level
10	I-270(SB)- Express Lane (L/R)	445+00 to 480+00	12,140,484	90%	0.49	5000	1.3	6.40	5.50	Resurface, Wedge and Level
11	I-270(NB)- Local Lane (R)	451+00 to 480+00	9,549,455	90%	0.49	5000	1.3	6.20	5.50	Resurface, Wedge and Level
12	I-270(NB)- Local Lane (R)	500+00 to 517+00	6,588,227	90%	0.49	5000	1.3	5.89		Reconstruct
13	I-270 (SB) Express Lane (R)	600+00 to 605+00	10,712,624	90%	0.49	5000	1.3	6.29	5.26	Resurface, Wedge and Level
14	I-270 (NB) Local Lane (L)	611+00 to 635+00	5,558,874	90%	0.49	5000	1.3	5.75	5.26	Resurface, Wedge and Level
15	I-270 (NB) Local Lane (R)	616+00 to 634+00	1,679,316	90%	0.49	5000	1.3	4.82	5.26	Resurface, Wedge and Level
16	I-270 (NB)-Express (L)	648+00 to 856+00	779,367	90%	0.49	5000	1.3	4.25	3.50	Resurface, Wedge and Level
17	I-270 (SB) Express Lane (R)	744+50 to 766+00	5,472,482	90%	0.49	5000	1.3	5.74	6.02	Resurface, Wedge and Level
18	I-270 (SB) Express Lane (R)	862+00 to 950+00	13,926,000	90%	0.49	5000	1.3	6.52	6.02	Resurface, Wedge and Level
19	I-270 (SB) Express Lane (R)	1353+50 to 1364+00	4,168,800	90%	0.49	5000	1.3	5.52		Reconstruct
20	I-270 (SB) Express Lane (L)	1381+00 to 1530+00	10,782,032	90%	0.49	5000	1.3	6.30		Reconstruct
21	I-270 (SB) Express Lane (L)	1540+00 to 1570+00	10,782,032	90%	0.49	5000	1.3	6.30		Reconstruct
22	I-270 (SB) Express Lane (L)	1600+00 to 1620+00	10,782,032	90%	0.49	5000	1.3	6.30		Reconstruct
23	I-270 (SB) Express Lane (R)	1618+00 to 1627+50	11,175,833	90%	0.49	5000	1.3	6.33		Reconstruct
24	I-270 (SB) Express Lane (L)	1627+50 to 1645+00	10,782,032	90%	0.49	5000	1.3	6.30		Reconstruct

I-270 Hard Shoulder Running

Sr. No	Location	Station (As Proposed)	Estimated Total 18-Kip Equivalent Single Axle Load Applications (W_{18})	Existing Pavement Section	Propose Pavement Improvement Type	Propose Pavement Improvement		
						Wedge and Level	Overlay	Replace
1	I-270 (SB)- Express Lane (L)	195+00 to 327+00	853,346	10" HMA with 16" Base	Resurface, Wedge and Level	13200		
2	I-270 (SB) - Local Lane (L)	241+00 to 265+00	5,569,535	9" HMA with 16" Base	Overlay with 2" HMA		2400	
3	I-270 (SB)- Local Lane (R)	248+00 to 280+00	12,739,861	9" HMA with 16" Base	Overlay with 2.5" HMA		3200	
4	I-270 (SB)- Local Lane (R)	280+00 to 304+00	10,234,710	9" HMA with 16" Base	Overlay with minimum 2.5" HMA or Reconstruct		2400	
5	I-270 (NB)- Local Lane (R)	306+00 to 317+00	4,980,598	9" HMA with 9" Base	Overlay with minimum 3" HMA or Reconstruct		1100	
6	I-270 (SB)- Local Lane (R)	309+00 to 317+00	5,992,305	9" HMA with 16" Base	Resurface	800		
7	I-270 (SB)- Local Lane (R)	348+00 to 351+00	2,837,338	6" HMA with 15" Base	Overlay with minimum 3" HMA or Reconstruct		300	
8	I-270 (SB)- Local Lane (R)	401+00 to 432+00	7,749,558	9" HMA with 16" Base	Overlay with 2" HMA		3100	
9	I-270 (SB)-Local Lane (L)	448+00 to 480+00	11,455,229	13" HMA with 9" Base	Resurface, Wedge and Level	3200		
10	I-270(SB)- Express Lane (L/R)	445+00 to 480+00	12,140,484	6" to 11 HMA with " to 16" Base	Resurface, Wedge and Level	3500		
11	I-270(NB)- Local Lane (R)	451+00 to 480+00	9,549,455	11" HMA with 11" Base	Resurface, Wedge and Level	2900		
12	I-270(NB)- Local Lane (R)	500+00 to 517+00	6,588,227	Insufficient Information	Reconstruct			1700
13	I-270 (SB) Express Lane (R)	600+00 to 605+00	10,712,624	11" HMA with 9" Base	Resurface, Wedge and Level	500		
14	I-270 (NB) Local Lane (L)	611+00 to 635+00	5,558,874	11" HMA with 9" Base	Resurface, Wedge and Level	2400		
15	I-270 (NB) Local Lane (R)	616+00 to 634+00	1,679,316	11" HMA with 9" Base	Resurface, Wedge and Level	1800		
16	I-270 (NB)-Express (L)	648+00 to 856+00	779,367	7" HMA with 7" Base	Resurface, Wedge and Level	20800		
17	I-270 (SB) Express Lane (R)	744+50 to 766+00	5,472,482	13" HMA with 9" Base	Resurface, Wedge and Level	2150		
18	I-270 (SB) Express Lane (R)	862+00 to 950+00	13,926,000	13" HMA with 9.5" Base	Resurface, Wedge and Level	8800		
19	I-270 (SB) Express Lane (R)	1353+50 to 1364+00	4,168,800	2" HMA with 9" Base	Reconstruct			1100
20	I-270 (SB) Express Lane (L)	1381+00 to 1530+00	10,782,032	2" HMA with 9" Base	Reconstruct			14900
21	I-270 (SB) Express Lane (L)	1540+00 to 1570+00	10,782,032	2" HMA with 9" Base	Reconstruct			3000
22	I-270 (SB) Express Lane (L)	1600+00 to 1620+00	10,782,032	2" HMA with 9" Base	Reconstruct			2,000
23	I-270 (SB) Express Lane (R)	1618+00 to 1627+50	11,175,833	2" HMA with 9" Base	Reconstruct			950
24	I-270 (SB) Express Lane (L)	1627+50 to 1645+00	10,782,032	2" HMA with 9" Base	Reconstruct			1,750
Total						97950		
						60050	12500	25400
						61%	13%	26%

HSR DLM Sign Table For Northbound Traffic

Northbound - Express			Northbound - CD	
Station	ITS		Station	ITS
			237+50	Static Sign
			241+00	Lane Control Sign
			248+00	Static Sign
			252+00	Static Sign
			255+00	Lane Control Sign
			258+00	Static Sign
			306+00	Static Sign
			314+50	Static Sign
			468+00	Static Sign
638+00	Static Sign			
648+00	Static Sign			
651+00	HOV Lane Control Sign			
657+50	Static Sign			
663+00	HOV Lane Control Sign			
670+50	Static Sign			
676+50	HOV Lane Control Sign			
684+50	Static Sign			
690+50	HOV Lane Control Sign			
699+00	Static Sign			
704+50	HOV Lane Control Sign			
713+00	Static Sign			
719+00	HOV Lane Control Sign			
726+00	Static Sign			
733+00	HOV Lane Control Sign			
740+50	Static Sign			
746+50	HOV Lane Control Sign			
753+50	Static Sign			
760+50	HOV Lane Control Sign			
769+00	Static Sign			
774+75	HOV Lane Control Sign			
781+50	Static Sign			
789+00	HOV Lane Control Sign			
797+50	Static Sign			
803+00	HOV Lane Control Sign			
810+00	Static Sign			
816+50	HOV Lane Control Sign			
824+00	Static Sign			
830+50	HOV Lane Control Sign			
845+00	Static Sign			
849+50	Static Sign			

HSR DLM Sign Table For Southbound Traffic

Southbound - Express			Southbound - CD	
Station	ITS		Station	ITS
204+00	Static Sign		255+00	Static Sign
214+00	Static Sign		265+00	Static Sign
215+50	HOV Lane Control Sign		286+00	Static Sign
223+50	Static Sign		290+00	Lane Control Sign
229+00	HOV Lane Control Sign		294+00	Static Sign
237+00	Static Sign		301+00	Lane Control Sign
244+00	HOV Lane Control Sign		304+00	Static Sign
250+50	Static Sign		313+50	Static Sign
258+00	HOV Lane Control Sign		406+00	Static Sign
264+50	Static Sign		414+00	Lane Control Sign
272+00	HOV Lane Control Sign		416+50	Static Sign
278+00	Static Sign		421+00	Static Sign
286+00	HOV Lane Control Sign		428+00	Lane Control Sign
292+50	Static Sign		431+00	Static Sign
299+00	HOV Lane Control Sign		439+00	Static Sign
306+00	Static Sign			
314+00	HOV Lane Control Sign			
320+50	Static Sign			
328+00	HOV Lane Control Sign			
338+00	Static Sign			
750+50	Static Sign			
755+50	Static Sign			
760+50	Lane Control Sign			
766+00	Static Sign			
873+50	Static Sign			
880+00	Lane Control Sign			
887+50	Static Sign			
894+00	Lane Control Sign			
901+00	Static Sign			
908+00	Lane Control Sign			
915+00	Static Sign			
921+50	Lane Control Sign			
929+50	Static Sign			
935+50	Lane Control Sign			
942+50	Static Sign			
950+00	Lane Control Sign			
957+50	Static Sign			
966+00	Lane Control Sign			
1388+00	Static Sign			
1398+50	Static Sign			
1403+50	Lane Control Sign			
1409+00	Static Sign			
1416+00	Lane Control Sign			
1421+50	Static Sign			
1430+50	Lane Control Sign			
1437+50	Static Sign			

1444+50	Lane Control Sign			
1450+00	Static Sign			
1458+50	Lane Control Sign			
1464+75	Static Sign			
1473+00	Lane Control Sign			
1479+50	Static Sign			
1486+00	Lane Control Sign			
1494+00	Static Sign			
1500+50	Lane Control Sign			
1506+50	Static Sign			
1514+75	Lane Control Sign			
1520+25	Static Sign			
1529+00	Lane Control Sign			
1529+50	Static Sign			
1535+00	Static Sign			
1547+00	Static Sign			
1552+00	Static Sign			
1554+75	Lane Control Sign			
1561+50	Static Sign			
1568+50	Lane Control Sign			
1569+50	Static Sign			
1579+75	Static Sign			
1605+00	Static Sign			
1610+00	Static Sign			
1614+75	Static Sign			
1616+50	Lane Control Sign			
1619+75	Static Sign			
1623+50	Static Sign			
1629+00	Static Sign			
1629+50	Lane Control Sign			
1634+50	Static Sign			
1636+00	Static Sign			
1642+00	Lane Control Sign			
1645+00	Static Sign			

Table C.1: AM Peak -2040 Hard Shoulder Running- I-270 Vehicle Travel Time

I-270 Northbound	Segment Length (miles)	No Build VISSIM Travel Time (seconds)	HSR VISSIM Travel Time (seconds)	% Change	I-270 Southbound	Segment Length (miles)	No Build VISSIM Travel Time (seconds)	HSR VISSIM Travel Time (seconds)	% Change
From I-495 interchange					From I-70				
to MD 187	1.8	115.1	110.3	-4%	to MD 85	1.7	260.9	100.1	-62%
to I-270 Split	0.6	47.5	39.7	-16%	to MD 80	5.4	1,374.0	1,367.4	0%
to Montrose Rd	1.8	139.0	101.1	-27%	to MD 109	3.7	583.2	605.5	4%
to MD 189	1.0	77.0	58.0	-25%	to MD 121	3.6	284.4	280.3	-1%
to MD 28	1.0	61.0	55.4	-9%	to MD 27	2.5	266.9	355.3	33%
to Shady Grove Rd	1.9	108.7	109.4	1%	to MD 118	1.1	254.6	314.5	23%
to I-370	0.9	53.0	53.2	0%	to Middlebrook Rd	1.1	206.2	258.7	25%
to MD 117	1.5	85.5	85.9	0%	to MD 124	2.2	528.0	584.5	11%
to MD 124	0.6	34.5	34.5	0%	to MD 117	0.9	180.6	201.6	12%
to Middlebrook Rd	2.5	140.8	141.2	0%	to I-370	1.0	94.3	85.5	-9%
to MD 118	1.1	64.7	65.0	0%	to Shady Grove Rd	1.5	124.1	107.9	-13%
to MD 27	0.9	52.0	52.0	0%	to MD 28	1.9	141.9	135.0	-5%
to MD 121	2.4	135.6	136.0	0%	to MD 189	1.0	157.8	68.9	-56%
to MD 109	4.1	235.2	235.6	0%	to Montrose Rd	1.0	251.0	71.4	-72%
to MD 80	3.7	214.0	214.7	0%	to I-270 Split	1.9	243.1	141.3	-42%
to MD 85	5.3	310.9	310.5	0%	to MD 187	0.4	30.7	30.7	0%
to I-70	1.4	80.1	80.4	0%	to I-495 interchange	1.9	134.0	133.9	0%
I-270 Total (miles/minutes)	32.4	32.6	31.4	-4%	I-270 Total (miles/minutes)	32.7	85.3	80.7	-5%
I-270 Spur Northbound					I-270 Spur Southbound				
From Cabin John Pkwy					From I-70				
to MD 190	0.5	32.4	32.3	0%	to I-270 Split	30.3	4,951.1	4,677.9	-6%
to I-495	1.1	68.6	66.9	-2%	to Democracy Blvd	0.7	91.3	130.6	43%
to Democracy Blvd	1.4	102.7	92.9	-9%	to I-495	1.3	191.0	216.7	13%
to I-270 Split	0.9	77.7	51.2	-34%	to MD 190	1.3	101.6	101.8	0%
to I-70	30.0	1,792.1	1,732.8	-3%	to Cabin John Pkwy	0.6	35.1	35.1	0%
I-270 Spur Total (miles/minutes)	34.0	34.6	32.9	-5%	I-270 Spur Total (miles/minutes)	34.2	89.5	86.0	-4%

I-270 Spur Northbound	Segment Length (miles)	No Build VISSIM Travel Time (seconds)	HSR VISSIM Travel Time (seconds)	% Change	I-270 Spur Southbound	Segment Length (miles)	No Build VISSIM Travel Time (seconds)	HSR VISSIM Travel Time (seconds)	% Change
From Cabin John Pkwy					From I-70				
to MD 190	0.5	32.4	32.3	0%	to MD 85	1.7	260.9	100.1	-62%
to I-495	1.1	68.6	66.9	-2%	to MD 80	5.4	1,374.0	1,367.4	0%
to Democracy Blvd	1.4	102.7	92.9	-9%	to MD 109	3.7	583.2	605.5	4%
to I-270 Split	0.9	77.7	51.2	-34%	to MD 121	3.6	284.4	280.3	-1%
to Montrose Rd	1.8	139.0	101.1	-27%	to MD 27	2.5	266.9	355.3	33%
to MD 189	1.0	77.0	58.0	-25%	to MD 118	1.1	254.6	314.5	23%
to MD 28	1.0	61.0	55.4	-9%	to Middlebrook Rd	1.1	206.2	258.7	25%
to Shady Grove Rd	1.9	108.7	109.4	1%	to MD 124	2.2	528.0	584.5	11%
to I-370	0.9	53.0	53.2	0%	to MD 117	0.9	180.6	201.6	12%
to MD 117	1.5	85.5	85.9	0%	to I-370	1.0	94.3	85.5	-9%
to MD 124	0.6	34.5	34.5	0%	to Shady Grove Rd	1.5	124.1	107.9	-13%
to Middlebrook Rd	2.5	140.8	141.2	0%	to MD 28	1.9	141.9	135.0	-5%
to MD 118	1.1	64.7	65.0	0%	to MD 189	1.0	157.8	68.9	-56%
to MD 27	0.9	52.0	52.0	0%	to Montrose Rd	1.0	251.0	71.4	-72%
to MD 121	2.4	135.6	136.0	0%	to I-270 Split	1.9	243.1	141.3	-42%
to MD 109	4.1	235.2	235.6	0%	to Democracy Blvd	0.7	91.3	130.6	43%
to MD 80	3.7	214.0	214.7	0%	to I-495	1.3	191.0	216.7	13%
to MD 85	5.3	310.9	310.5	0%	to MD 190	1.3	101.6	101.8	0%
to I-70	1.4	80.1	80.4	0%	to Cabin John Pkwy	0.6	35.1	35.1	0%
I-270 Spur Total (miles/minutes)	34.0	34.6	32.9	-5%	I-270 Spur Total (miles/minutes)	34.2	89.5	86.0	-4%

Table C.2: AM Peak -2040 Hard Shoulder Running- I-270 Local Vehicle Travel Time

I-270 Northbound	Segment Length (miles)	No Build VISSIM Travel Time (seconds)	HSR VISSIM Travel Time (seconds)	% Change	I-270 Southbound	Segment Length (miles)	No Build VISSIM Travel Time (seconds)	HSR VISSIM Travel Time (seconds)	% Change
From C-D start					From C-D start				
to Montrose Rd	0.8	256.2	53.4	-79%	to Shady Grove	1.3	490.1	97.8	-80%
to MD 189	1.3	471.8	80.9	-83%	to MD 28	1.8	491.5	138.1	-72%
to MD 28	1.0	250.0	62.9	-75%	to MD 189	1.1	481.0	75.7	-84%
to Shady Grove	2.0	117.6	123.0	5%	to Montrose	1.2	344.5	192.1	-44%
to I-370	1.0	56.5	56.8	1%	to I-270 mainline	0.9	197.1	175.5	-11%
to MD 117	1.2	74.0	80.3	8%					
to MD 124	0.8	49.5	50.5	2%					
to I-270 mainline	0.8	49.7	49.4	-1%					
I-270 Local Total (miles/minutes)	8.9	22.1	9.3	-58%	I-270 Local Total (miles/minutes)	6.3	33.4	11.3	-66%

Table C.3: AM Peak -2040 Hard Shoulder Running- I-270 Vehicle Speed

I-270 Northbound	Segment Length (miles)	No Build VISSIM Speed (MPH)	HSR VISSIM Speed (MPH)	% Change	I-270 Southbound	Segment Length (miles)	No Build VISSIM Speed (MPH)	HSR VISSIM Speed (MPH)	% Change
From I-495 interchange					From I-70				
to MD 187	1.8	57.4	59.9	4%	to MD 85	1.7	22.9	59.8	161%
to I-270 Split	0.6	44.8	53.6	20%	to MD 80	5.4	14.0	14.1	0%
to Montrose Rd	1.8	45.4	62.4	38%	to MD 109	3.7	23.0	22.1	-4%
to MD 189	1.0	47.4	62.9	33%	to MD 121	3.6	45.8	46.5	1%
to MD 28	1.0	56.9	62.7	10%	to MD 27	2.5	33.5	25.2	-25%
to Shady Grove Rd	1.9	62.9	62.4	-1%	to MD 118	1.1	15.2	12.3	-19%
to I-370	0.9	64.1	63.9	0%	to Middlebrook Rd	1.1	19.4	15.5	-20%
to MD 117	1.5	63.8	63.5	0%	to MD 124	2.2	15.0	13.5	-10%
to MD 124	0.6	64.0	63.9	0%	to MD 117	0.9	17.7	15.8	-10%
to Middlebrook Rd	2.5	63.6	63.4	0%	to I-370	1.0	37.6	41.5	10%
to MD 118	1.1	62.3	62.1	0%	to Shady Grove Rd	1.5	43.1	49.6	15%
to MD 27	0.9	63.4	63.4	0%	to MD 28	1.9	47.6	50.0	5%
to MD 121	2.4	63.6	63.4	0%	to MD 189	1.0	22.3	51.1	129%
to MD 109	4.1	62.4	62.3	0%	to Montrose Rd	1.0	14.8	52.0	251%
to MD 80	3.7	61.9	61.7	0%	to I-270 Split	1.9	27.5	47.4	72%
to MD 85	5.3	60.8	60.9	0%	to MD 187	0.4	51.0	51.0	0%
to I-70	1.4	62.5	62.3	0%	to I-495 interchange	1.9	50.8	50.8	0%
I-270 Total (miles/minutes)	32.4	59.8	62.0	4%	I-270 Total (miles/minutes)	32.7	23.0	24.3	6%
I-270 Spur Northbound					I-270 Spur Southbound				
From Cabin John Pkwy					From I-70				
to MD 190	0.5	59.9	60.1	0%	to I-270 Split	30.3	22.1	23.3	6%
to I-495	1.1	59.5	61.0	3%	to Democracy Blvd	0.7	28.8	20.2	-30%
to Democracy Blvd	1.4	50.3	55.5	10%	to I-495	1.3	24.7	21.8	-12%
to I-270 Split	0.9	41.3	62.7	52%	to MD 190	1.3	44.4	44.3	0%
to I-70	30.0	60.3	62.4	3%	to Cabin John Pkwy	0.6	58.5	58.5	0%

Table C.4: AM Peak -2040 Hard Shoulder Running- I-270 Local Vehicle Speed

I-270 Northbound	Segment Length (miles)	No Build VISSIM Speed (MPH)	HSR VISSIM Speed (MPH)	% Change	I-270 Southbound	Segment Length (miles)	No Build VISSIM Speed (MPH)	HSR VISSIM Speed (MPH)	% Change
From C-D start					From C-D start				
to Montrose Rd	0.8	11.9	57.0	380%	to Shady Grove	1.3	9.6	48.2	401%
to MD 189	1.3	10.0	58.2	483%	to MD 28	1.8	13.0	46.2	256%
to MD 28	1.0	13.9	55.4	297%	to MD 189	1.1	8.1	51.5	536%
to Shady Grove	2.0	59.8	57.2	-4%	to Montrose	1.2	12.9	23.2	79%
to I-370	1.0	61.5	61.2	-1%	to I-270 mainline	0.9	16.1	18.1	12%
to MD 117	1.2	60.6	55.9	-8%					
to MD 124	0.8	59.8	58.6	-2%					
to I-270 mainline	0.8	59.3	59.7	1%					
I-270 Local Total (miles/minutes)	8.9	24.2	57.7	138%	I-270 Local Total (miles/minutes)	6.3	11.3	33.3	195%

Table C.5: AM Peak -2040 Hard Shoulder Running- I-270 Vehicle Density

I-270 Northbound	Type	No Build		HSR		% Change	I-270 Southbound	Type	No Build		HSR		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS	
I-270	Freeway	40	E	27	D	-31%	I-270	Freeway	45	F	22	C	-52%
I-270 Diverge to MD 187	Diverge	33	D	21	C	-36%	I-270 Merge from WB I-70	Merge	62	F	14	B	-77%
I-270	Freeway	45	F	24	C	-46%	I-270	Freeway	67	F	26	D	-61%
I-270 Diverge to Rockledge Rd	Diverge	35	D	21	C	-40%	I-270 Merge from EB I-70	Merge	57	F	22	C	-61%
I-270	Freeway	48	F	20	C	-58%	I-270	Freeway	67	F	32	D	-52%
I-270 Weave from MD 187 to I-270 HOV	Weave	30	D	12	B	-60%	I-270 Diverge to SB MD 85	Diverge	70	F	37	E	-48%
I-270 Lane Drop	Merge	47	F	17	B	-65%	I-270	Freeway	92	F	30	D	-68%
I-270	Freeway	64	F	29	D	-54%	I-270 Diverge to NB MD 85	Diverge	56	F	16	B	-72%
I-270 Merge from I-270 Spur	Merge	63	F	25	C	-60%	I-270	Freeway	119	F	15	B	-87%
I-270 Weave from I-270 HOV to I-270 C-D	Weave	68	F	29	D	-58%	I-270 Merge from MD 85	Merge	104	F	16	B	-84%
I-270	Freeway	38	E	25	C	-33%	I-270	Freeway	112	F	119	F	6%
I-270 Diverge to C-D (MD 189)	Diverge	31	D	23	C	-25%	I-270 Diverge to MD 80	Diverge	61	F	114	F	87%
I-270	Freeway	23	C	19	C	-16%	I-270	Freeway	108	F	108	F	0%
I-270 Diverge to C-D (MD 28)	Diverge	50	F	21	C	-59%	I-270 Merge from MD 80	Merge	111	F	62	F	-44%
I-270	Freeway	14	B	16	B	13%	I-270	Freeway	75	F	76	F	2%
I-270 Merge from C-D (MD 189)	Merge	14	B	19	B	37%	I-270 Diverge to MD 109	Diverge	41	F	40	E	-2%
I-270 Diverge to C-D (Shady Grove Rd)	Diverge	18	B	22	C	19%	I-270	Freeway	80	F	79	F	-2%
I-270	Freeway	12	B	16	B	30%	I-270 Merge from MD 109	Merge	87	F	75	F	-13%
I-270 Weave from C-D (MD 28) to C-D (Shady Grove Rd)	Weave	10	B	14	B	33%	I-270	Freeway	44	E	45	E	1%
I-270	Freeway	10	A	13	B	29%	I-270 Diverge to SB Weigh Station	Diverge	19	B	19	B	0%
I-270 Merge from C-D (Shady Grove Rd)	Merge	9	A	11	B	29%	I-270	Freeway	38	E	38	E	0%
I-270	Freeway	12	B	14	B	26%	I-270 Merge from SB Weigh Station	Merge	20	B	20	B	-1%
I-270 Merge from C-D (I-370)	Merge	10	B	12	B	15%	I-270	Freeway	41	E	40	E	-1%
I-270 Diverge to C-D (MD 117)	Diverge	16	B	19	B	17%	I-270 Diverge to MD 121	Diverge	20	B	22	C	12%
I-270	Freeway	12	B	14	B	16%	I-270	Freeway	28	D	34	D	20%
I-270 Merge from C-D (MD 124)	Merge	14	B	16	B	10%	I-270 Merge from WB MD 121	Merge	33	D	42	F	27%
I-270	Freeway	16	B	18	C	13%	I-270	Freeway	43	E	43	E	-1%
I-270 Diverge to EB Middlebrook Rd	Diverge	10	B	12	B	10%	I-270 Merge from EB MD 121	Merge	37	E	35	E	-5%
I-270	Freeway	15	B	17	B	12%	I-270	Freeway	55	F	56	F	3%
I-270 Diverge to WB Middlebrook Rd	Diverge	10	A	11	B	11%	I-270 Diverge to MD 27	Diverge	57	F	78	F	37%
I-270	Freeway	13	B	15	B	12%	I-270	Freeway	81	F	102	F	26%
I-270 Diverge to EB MD 118	Diverge	11	B	12	B	12%	I-270 Merge from WB MD 27	Merge	90	F	106	F	18%
I-270 Diverge to WB MD 118	Diverge	15	B	16	B	11%	I-270	Freeway	82	F	91	F	11%
I-270	Freeway	13	B	14	B	11%	I-270 Weave from EB MD 27 to MD 118	Weave	81	F	87	F	7%
I-270 Weave from MD 118 to MD 27	Weave	13	B	14	B	7%	I-270	Freeway	91	F	95	F	5%
I-270	Freeway	12	B	13	B	9%	I-270 Merge from WB MD 118	Merge	73	F	74	F	1%
I-270 Merge from EB MD 27	Merge	13	B	14	B	7%	I-270	Freeway	85	F	87	F	2%
I-270	Freeway	14	B	15	B	8%	I-270 Merge from EB MD 118	Merge	73	F	94	F	30%
I-270 Merge from WB MD 27	Merge	11	B	11	B	7%	I-270	Freeway	70	F	79	F	13%
I-270	Freeway	14	B	16	B	8%	I-270 Merge from Middlebrook Rd	Merge	113	F	116	F	3%
I-270 Diverge to MD 121	Diverge	11	B	12	B	7%	I-270	Freeway	86	F	89	F	3%

Table C.5: AM Peak -2040 Hard Shoulder Running- I-270 Vehicle Density

I-270 Northbound	Type	No Build		HSR		% Change	I-270 Southbound	Type	No Build		HSR		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS	
I-270	Freeway	11	A	11	B	7%	I-270 Diverge to Watkins Mill Rd	Diverge	81	F	81	F	0%
I-270 Merge from EB MD 121	Merge	10	A	10	B	4%	I-270	Freeway	124	F	125	F	1%
I-270 Lane Drop	Merge	13	B	14	B	4%	I-270 Diverge to MD 124	Diverge	89	F	80	F	-10%
I-270	Freeway	19	C	20	C	7%	I-270	Freeway	133	F	134	F	1%
I-270 Diverge to NB Weigh Station	Diverge	10	B	11	B	5%	I-270 Merge from Watkins Mill	Merge	158	F	159	F	1%
I-270	Freeway	21	C	22	C	5%	I-270	Freeway	99	F	115	F	16%
I-270 Merge from NB Weight Station	Merge	10	B	11	B	5%	I-270 Merge from WB MD 124	Merge	132	F	112	F	-15%
I-270	Freeway	21	C	22	C	5%	I-270	Freeway	53	F	49	F	-8%
I-270 Diverge to MD 109	Diverge	11	B	12	B	4%	I-270 Merge from MD 117	Merge	49	F	46	F	-6%
I-270	Freeway	19	C	20	C	4%	I-270	Freeway	48	F	42	E	-13%
I-270 Merge from MD 109	Merge	11	B	11	B	5%	I-270 Diverge to I-370	Diverge	41	F	33	D	-19%
I-270	Freeway	21	C	21	C	4%	I-270	Freeway	49	F	33	D	-32%
I-270 Diverge to MD 80	Diverge	12	B	13	B	5%	I-270 Diverge to I-270 C-D	Diverge	96	F	26	C	-73%
I-270	Freeway	19	C	19	C	4%	I-270	Freeway	20	C	21	C	4%
I-270 Merge from MD 80	Merge	14	B	14	B	3%	I-270 Merge from I-270 (I-370)	Merge	20	C	21	C	3%
I-270	Freeway	24	C	25	C	2%	I-270 Diverge to I-270 C-D (Shady Grove Rd)	Diverge	27	C	22	C	-19%
I-270 Diverge to Scenic View	Diverge	12	B	13	B	2%	I-270	Freeway	21	C	17	B	-15%
I-270	Freeway	24	C	25	C	2%	I-270 Merge from I-270 C-D (Shady Grove Rd Northern)	Merge	18	B	22	C	24%
I-270 Merge from Scenic View	Merge	12	B	13	B	3%	I-270	Freeway	26	C	21	C	-18%
I-270	Freeway	25	C	25	C	2%	I-270 Merge from I-270 C-D (Shady Grove Rd Southern)	Merge	32	D	21	C	-33%
I-270 Diverge to NB MD 85	Diverge	14	B	14	B	1%	I-270 Diverge to I-270 C-D (MD 189)	Diverge	46	F	28	D	-38%
I-270	Freeway	23	C	24	C	2%	I-270	Freeway	82	F	18	B	-79%
I-270 Diverge to SB MD 85	Diverge	17	B	18	B	3%	I-270 Merge from I-270 C-D (MD 189)	Merge	106	F	20	B	-82%
I-270	Freeway	19	C	20	C	3%	I-270	Freeway	77	F	25	C	-67%
I-270 Weave from MD 85 to I-70	Weave	13	B	13	B	2%	I-270 Merge from I-270 C-D	Merge	39	E	34	D	-12%
I-270	Freeway	17	B	17	B	1%	I-270 Diverge to I-270 HOV Lane	Diverge	19	B	20	C	7%
							I-270 Diverge to I-270 Spur	Diverge	40	E	40	F	1%
							I-270	Freeway	23	C	23	C	2%
							I-270 Diverge to Rockledge Dr / MD 187	Diverge	17	B	17	B	-1%
							I-270	Freeway	23	C	24	C	2%
							I-270 Merge from Rockledge Dr	Merge	19	B	19	B	-1%
							I-270	Freeway	24	C	25	C	2%
							I-270 Merge from Rockledge Dr / MD 187	Merge	22	C	22	C	0%
							I-270	Freeway	26	C	26	D	2%

Table C.6: AM Peak -2040 Hard Shoulder Running- I-270 Spur Vehicle Density

I-270 Spur Northbound	Type	No Build		HSR		% Change	I-270 Southbound	Type	No Build		HSR		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS			
I-270 Spur	Freeway	57	F	56	F	-2%	I-270 Spur	Freeway	49	F	70	F	44%
I-270 Spur Merge from Clara Barton Parkway	Merge	25	C	25	C	0%	I-270 Spur Weave from I-270 HOV to Democracy Blvd	Weave	60	F	76	F	26%
I-270 Spur	Freeway	39	E	39	E	0%	I-270 Spur	Freeway	54	F	64	F	17%
I-270 Diverge to MD 190	Diverge	28	D	28	D	0%	I-270 Merge from Democracy Blvd	Merge	30	D	34	D	11%
I-270 Spur	Freeway	34	D	34	D	0%	I-270 Spur Lane Drop	Merge	54	F	59	F	9%
I-270 Spur Merge from Cabin John Parkway	Merge	25	C	24	C	-4%	I-270 Spur	Freeway	75	F	81	F	8%
I-270 Spur Merge from MD 190	Merge	26	C	24	C	-6%	I-270 Spur Merge from I-495	Merge	37	E	40	E	7%
I-270 Spur	Freeway	35	D	32	D	-9%	I-270 Spur	Freeway	45	F	43	E	-5%
I-270 Spur Diverge to I-495	Merge	38	E	34	D	-9%	I-270 Spur Diverve to EB MD 190	Diverge	56	F	61	F	9%
I-270 Spur	Freeway	40	E	33	D	-18%	I-270 Spur Diverve to Cabin John Pkwy	Diverge	27	C	26	C	-5%
I-270 Spur Diverge to Democracy Blvd	Diverge	33	D	27	C	-18%	I-270 Spur	Freeway	29	D	28	D	-3%
I-270 Spur	Freeway	36	E	25	C	-31%	I-270 Merge from MD 190	Merge	26	C	25	C	-3%
I-270 Spur Merge from EB Democracy Blvd	Merge	30	D	16	B	-48%	I-270 Spur	Freeway	34	D	34	D	-2%
I-270 Spur	Freeway	39	E	24	C	-38%	I-270 Diverge to WB Clara Barton Pkwy	Diverge	23	C	22	C	-1%
I-270 Spur Merge from WB Democracy Blvd	Merge	30	D	16	B	-46%	I-270 Spur	Freeway	33	D	33	D	-2%
I-270 Spur	Freeway	43	E	25	C	-42%	I-270 Merge from Clara Barton Pkwy	Merge	30	D	30	D	-2%
I-270 Spur Merge from Westlake Terrace	Merge	45	F	25	C	-45%							
I-270 Spur	Freeway	50	F	25	C	-49%							

Table C.7: AM Peak -2040 Hard Shoulder Running- I-270 Local Vehicle Density

I-270 Northbound	Type	No Build		HSR		% Change	I-270 Southbound	Type	No Build		HSR		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS			
I-270 C-D	Freeway	84	F	36	E	-57%	I-270 C-D	Freeway	107	F	20	C	-81%
I-270 C-D Diverge to EB Montrose Rd	Diverge	48	F	23	C	-53%	I-270 C-D Weave from I-370 EB to I-270	Weave	128	F	24	B	-82%
I-270 C-D	Freeway	80	F	19	C	-76%	I-270 C-D Diverge to Shady Grove Rd	Diverge	115	F	20	B	-83%
I-270 C-D Weave between Montrose Rd Loop Ramps	Weave	69	F	13	B	-81%	I-270 C-D	Freeway	137	F	28	D	-80%
I-270 C-D	Freeway	84	F	18	C	-78%	I-270 C-D Merge from WB Shady Grove Rd	Merge	106	F	23	C	-78%
I-270 C-D Merge from WB Montrose Rd	Merge	89	F	25	C	-72%	I-270 C-D	Freeway	113	F	38	E	-67%
I-270 C-D	Freeway	98	F	31	D	-68%	I-270 C-D Merge from EB Shady Grove Rd	Merge	77	F	35	E	-54%
I-270 C-D Merge from I-270	Merge	96	F	31	D	-67%	I-270 C-D	Freeway	93	F	37	E	-61%
I-270 C-D	Freeway	104	F	31	D	-70%	I-270 C-D Merge from I-270	Merge	98	F	25	C	-74%
I-270 C-D Diverge to MD 189	Diverge	58	F	17	B	-70%	I-270 C-D Diverge to I-270	Diverge	56	F	38	E	-32%
I-270 C-D	Freeway	111	F	24	C	-78%	I-270 C-D Diverge to I-270	Diverge	64	F	29	D	-55%
I-270 C-D Merge from MD 189	Merge	101	F	18	B	-82%	I-270 C-D	Freeway	75	F	19	C	-75%
I-270 C-D	Freeway	114	F	32	D	-72%	I-270 C-D Diverge to MD 28	Diverge	62	F	12	B	-80%
I-270 C-D Weave between I-270 (to MD 28 from MD 189)	Weave	108	F	31	C	-71%	I-270 C-D	Freeway	128	F	13	B	-90%
I-270 C-D	Freeway	106	F	34	D	-68%	I-270 C-D Merge from WB MD 28	Merge	160	F	10	A	-94%
I-270 C-D Diverge to MD 28	Diverge	64	F	23	C	-64%	I-270 C-D	Freeway	132	F	17	B	-87%
I-270 C-D	Freeway	87	F	28	D	-67%	I-270 C-D Merge from EB MD 28	Merge	152	F	21	C	-86%
I-270 C-D Weave between MD 28 Ramps	Weave	109	F	39	E	-64%	I-270 C-D	Freeway	123	F	34	D	-73%
I-270 C-D	Freeway	7	A	11	A	67%	I-270 C-D Merge from I-270	Merge	124	F	24	C	-80%
I-270 C-D Merge from MD 28 WB	Merge	6	A	8	A	18%	I-270 C-D	Freeway	95	F	25	C	-74%
I-270 C-D Merge from I-270 and Drop Lane	Merge	7	A	10	A	39%	I-270 C-D Diverge to MD 189	Diverge	60	F	20	B	-67%
I-270 C-D Diverge to I-270	Diverge	12	B	16	B	35%	I-270 C-D	Freeway	117	F	23	C	-80%
I-270 C-D	Freeway	19	C	26	D	36%	I-270 C-D Merge from MD 189	Merge	120	F	74	F	-38%
I-270 C-D Diverge to Shady Grove Rd	Diverge	15	B	20	B	29%	I-270 C-D Diverge to I-270	Diverge	84	F	74	F	-12%
I-270 C-D	Freeway	5	A	7	A	27%	I-270 C-D	Freeway	92	F	83	F	-9%
I-270 C- D Merge from I-270 and EB Shady Grove Rd	Merge	8	A	10	A	19%	I-270 C-D Diverge to WB Montrose Rd	Diverge	55	F	45	F	-18%
I-270 C-D	Freeway	8	A	9	A	20%	I-270 C-D	Freeway	98	F	90	F	-8%
I-270 C-D Merge from WB Shady Grove Rd	Merge	10	A	12	B	19%	I-270 Weave between Montrose Rd Loops	Weave	94	F	89	F	-5%
I-270 C-D Diverge to I-270	Diverge	14	B	17	B	17%	I-270 C-D	Freeway	76	F	81	F	7%
I-270 C-D	Freeway	13	B	15	B	17%	I-270 C-D Merge from EB Montrose Rd	Merge	56	F	63	F	13%
I-270 C-D Diverge to I-370	Diverge	13	B	15	B	17%	I-270 C-D	Freeway	54	F	50	F	-8%
I-270 C-D	Freeway	2	A	3	A	18%							
I-270 Merge from I-370 EB	Merge	7	A	8	A	4%							
I-270 C-D	Freeway	8	A	8	A	6%							
I-270 C-D Weave from I-370 to I-270	Weave	19	B	19	B	1%							
I-270 C-D	Freeway	14	B	15	B	8%							
I-270 C-D Weave from I-270 to MD 117	Weave	19	B	32	C	68%							
I-270 C-D Diverge to MD 124	Diverge	13	B	14	B	12%							
I-270 C-D	Freeway	13	B	15	B	10%							
I-270 C-D Merge from EB MD 124	Merge	12	B	13	B	8%							
I-270 C-D Merge From WB MD 124	Merge	12	B	13	B	8%							
I-270 C-D	Freeway	10	A	10	A	3%							

Table C.7: AM Peak -2040 Hard Shoulder Running- I-270 Local Vehicle Density

		No Build		HSR		% Change			No Build		HSR		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS	
I-270 Northbound	Type						I-270 Souhbound	Type					
I-270 C-D Merge from Watkins Mill	Merge	10	A	10	B	3%							

Table C.8: AM Peak - 2040 Hard Shoulder Running- I-270 Vehicle Throughput

I-270 Northbound	No-Build VISSIM Throughput	HSR VISSIM Throughput	Change %	I-270 Southbound	No-Build VISSIM Throughput	HSR VISSIM Throughput	Change %
Between I-495 and MD 187	4485	4860	8%	North of I-70	2514	2636	5%
Between MD 187 on and off ramps	3881	4319	11%	Between I-70 on ramps	2842	3038	7%
Between Rockledge Blvd on and off ramps	3138	3623	15%	From I-70 interchange to MD-85	4882	5374	10%
Between Rockledge Dr and I-270 Spur	2720	3287	21%	Between MD-85 on and off ramps	2530	2910	15%
Between I-270 Spur and Montrose Rd	7422	8811	19%	Between MD-85 and MD-80	3043	3078	1%
Between Montrose Rd on and off ramps	4321	5065	17%	Between MD-80 on and off ramps	2724	2713	0%
Between Montrose Rd and MD 189	4064	4729	16%	Between MD-80 and Md-109	3532	3537	0%
Between MD 189 and MD 28	4018	4725	18%	Between MD-109 on and off ramps	3430	3488	2%
Between MD 28 on and off ramps	4122	5141	25%	Between MD-109 and MD-121	4100	4141	1%
Between MD 28 and Shady Grove Rd	2980	3819	28%	Between MD-121 on and off ramps	3551	3521	-1%
Between Shady Grove Rd and I-370	2552	3288	29%	Between MD-121 and MD-27	4802	4621	-4%
Between I-370 on and off ramps	2849	3588	26%	Between MD-27 on and off ramps	4223	4014	-5%
Between I-370 and MD 117	3979	4725	19%	Between MD-27 and MD-118	4688	4504	-4%
Between MD 117 and MD 124	3010	3512	17%	Between MD-118 on and off ramps	4542	4392	-3%
Between MD-124 on and off ramps	3023	3510	16%	Between MD-118 and Middlebrook Rd	5199	5047	-3%
Between Watkins Mill Rd and Middlebrook Rd	3974	4485	13%	Between Middlebrook Rd on and off ramps	5197	5064	-3%
Between Middlebrook Rd on and off ramps	3705	4139	12%	Between Middlebrook Rd and MD-124	6832	6654	-3%
Between Middlebrook Rd and MD 118	3293	3672	12%	Between MD-124 on and off ramps	5415	5494	1%
Between MD-118 on and off ramps	2981	3335	12%	Between MD-124 and MD-117	6469	6727	4%
Between MD 118 and MD 27	2827	3071	9%	Between MD-117 and I-370	8146	8460	4%
Between MD-27 on and off ramps	2280	2486	9%	Between I-370 on and off ramps	2997	3153	5%
Between MD 27 and MD 121	2687	2890	8%	Between I-370 on ramp to Shady Grove Rd	3871	3151	-19%
Between MD-121 on and off ramps	1970	2100	7%	Between Shady Grove Rd and MD 28	3552	3190	-10%
Between MD 121 and MD 109	2497	2628	5%	Between MD 28 on and off ramps	4372	4061	-7%
Between MD-109 on and off ramps	2327	2428	4%	Between MD 28 and MD 189	3946	3211	-19%
Between MD 109 and MD 80	2487	2579	4%	Between MD 189 and Montrose Rd	4070	2795	-31%
Between MD-80 on and off ramps	2222	2291	3%	Between Montrose Rd on and off ramps	5046	3711	-26%
Between MD 80 and MD 85	2916	2982	2%	Between Montrose Rd and I-270 Spur	8064	7979	-1%
Between MD-85 on and off ramps	2213	2260	2%	Between I-270 Spur and Rockledge Blvd	3823	3791	-1%
Between MD 85 and I-70	3227	3261	1%	Between Rockledge Blvd on and off ramps	2733	2707	-1%
North of I-70	2081	2097	1%	Between MD 187 on and off ramps	2887	2868	-1%
				Between MD 187 and I-495	2902	2917	1%
I-270 Spur Northbound				I-270 Spur Southbound			
Between I-495 and Democracy Blvd	5264	5476	4%	Between I-270 Split and HOV on ramp	4251	4179	-2%
Between Democracy Blvd on and off ramps	4077	4281	5%	Between HOV on ramp and Democracy Blvd	4186	4063	-3%
Between Democracy Blvd and I-270 Split	4219	4562	8%	Between Democracy Blvd on and off ramps	3670	3554	-3%
				Between Democracy Blvd and I-495	4194	4080	-3%

Table C.9: AM Peak -2040 Hard Shoulder Running- I-270 Local Vehicle Throughput

I-270 Local Northbound	No-Build VISSIM Throughput	HSR VISSIM Throughput	Change %	I-270 Local Southbound	No-Build VISSIM Throughput	HSR VISSIM Throughput	Change %
Between Montrose Rd EB off ramp and EB on ramp	1707	2370	39%	Between I-370 on ramp and I-270 off ramp	3627	4039	11%
Between Montrose Rd EB on ramp and WB off ramp	1884	2621	39%	Between I-270 off ramp and Shady Grove off ramp	2767	3199	16%
Between Montrose Rd WB off ramp and on ramp	1556	2196	41%	Between Shady Grove off ramp and Shady Grove WB on ramp	1593	2749	73%
Between Montrose Rd WB on ramp and I-270 on ramp	2215	3322	50%	Between Shady Grove WB and EB on ramps	2225	3380	52%
Between I-270 on ramp and MD 189 off ramp	2316	3655	58%	Between Shady Grove on ramp and I-270 on ramp	2594	3770	45%
Between MD 189 ramps	1739	2952	70%	Between I-270 on ramp and I-270 off ramp1	3272	4345	33%
Between MD 189 off ramp and I-270 on ramp	2036	3530	73%	Between I-270 off ramp1 and I-270 off ramp2	2767	2762	0%
Between I-270 on ramp and I-270 off ramp	2547	4315	69%	Between I-270 off ramp2 and MD 28 off ramp	1961	1886	-4%
Between I-270 off ramp and MD 28 EB off ramp	1823	3111	71%	Between MD 28 off ramp and MD 28 WB on ramp	1428	1377	-4%
Between MD 28 EB off ramp to MD 28 EB on ramp	1585	2742	73%	Between MD 28 WB on ramp and MD 28 EB on ramp	1700	1697	0%
Between MD 28 EB on ramp and MD 28 WB off ramp	1616	2839	76%	Between MD 28 EB on ramp and I-270 on ramp	2375	3206	35%
Between MD 28 WB off ramp and MD 28 WB on ramp	751	1285	71%	Between I-270 on ramp and MD 189 off ramp	2871	2997	4%
Between MD 28 WB on ramp and I-270 on ramp	1263	1808	43%	Between MD 189 on and off ramps	2353	1615	-31%
Between I-270 on ramp and I-270 off ramp	2439	3140	29%	Between MD 189 on ramp and I-270 off ramp	3387	2528	-25%
Between I-270 off ramp and Shady Grove off ramp	2131	2684	26%	Between I-270 off ramp and Montrose Rd off ramp	2357	2690	14%
Between Shady Grove off ramp and I-270 on ramp	322	406	26%	Between Montrose Rd off ramp and Montrose Rd WB on ramp	2251	2550	13%
Between I-270 on ramp and Shady Grove WB on ramp	1448	1730	19%	Between Montrose Rd WB on ramp and EB off ramp	2992	3559	19%
Between Shady Grove WB on ramp and I-270 off ramp	1788	2066	16%	Between Montrose Rd EB off and on ramps	2336	2798	20%
Between I-270 off ramp and I-370 off ramp	1515	1771	17%	Between Montrose Rd EB off ramp and I-270	3139	3578	14%
Between I-370 off ramp and I-370 EB on ramp	286	340	19%				
Between I-370 EB and WB on ramps	919	979	7%				
Between I-370 WB on ramp and I-270 off ramp	2785	2843	2%				
Between I-270 off ramp and I-270 on ramp	1670	1705	2%				
Between I-270 on ramp and MD 117 off ramp	2654	2921	10%				
Between MD 117 off ramp and MD 124 off ramp	1509	1649	9%				
Between MD 124 off ramp and MD 124 EB on ramp	789	866	10%				
Between MD 124 EB and WB on ramps	1183	1262	7%				
Between MD 124 on ramp I-270	573	595	4%				

Table C.10: AM Peak - No Build - I-270 On Ramp Queue Length - Northbound

I-270 Northbound	No Build VISSIM Average Queue (feet)	Alternative VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	Alternative VISSIM Maximum Queue (feet)	% Change
Rockledge Dr on ramp	67	0	-100%	421	0	-100%
MD 189 C-D on ramp	0	0	-	0	0	-
MD 28 C-D on ramp	0	0	-	0	0	-
Shady Grove Rd C-D on ramp	0	0	-	0	0	-
I-370 C-D on ramp	0	0	-	0	0	-
MD 124 C-D on ramp	0	0	-	0	0	-
MD 118 on ramp	0	0	-	0	0	-
MD 27 EB on ramp	0	0	-	0	0	-
MD 27 WB on ramp	0	0	-	0	0	-
MD 121 on ramp	0	0	-	0	0	-
MD 109 on ramp	0	0	-	0	0	-
MD 80 on ramp	0	0	-	0	0	-
MD 85 on ramp	0	0	-	0	0	-
I-270 Spur Northbound	No Build VISSIM Average Queue (feet)	Alternative VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	Alternative VISSIM Maximum Queue (feet)	% Change
Democracy Blvd EB on ramp	4	0	-100%	57	0	-100%
Democracy Blvd WB on ramp	0	0	-100%	5	0	-100%
I-495 Northbound	No Build VISSIM Average Queue (feet)	Alternative VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	Alternative VISSIM Maximum Queue (feet)	% Change
Cabin John Pkwy on ramp	0	0	-	0	0	-
MD 190 on ramp	0	0	-	0	0	-
I-270 C-D Northbound	No Build VISSIM Average Queue (feet)	Alternative VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	Alternative VISSIM Maximum Queue (feet)	% Change
Montrose Rd EB on ramp	436	1	-100%	1548	125	-92%
Montrose Rd WB on ramp	1047	0	-100%	2581	0	-100%
I-270 on ramp	409	0	-100%	1171	0	-100%
MD 189 on ramp	1304	0	-100%	2877	0	-100%
I-270 on ramp	1354	0	-100%	3378	0	-100%
MD 28 EB on ramp	3	0	-100%	55	0	-100%
MD 28 WB on ramp	0	0	-	0	0	-
Shady Grove Rd EB on ramp	0	0	-	0	0	-
I-270 on ramp	0	0	-	0	0	-
Shady Grove Rd WB on ramp	0	0	-	0	0	-
I-370 EB on ramp	0	0	-	0	0	-
I-370 WB on ramp	0	9	-	0	159	-
I-270 on ramp	0	0	-100%	29	0	-100%
MD 124 EB on ramp	0	0	-	0	0	-
MD 124 WB on ramp	0	68	-	0	1235	-
Watkins Mill Rd on ramp	0	3023	3043529%	24	3131	13033%

Table C.11: AM Peak - 2040 Hard Shoulder Running - I-270 Off Ramp Queue Length - Northbound

I-270 Northbound	No Build VISSIM Average Queue (feet)	HSR VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	HSR VISSIM Maximum Queue (feet)	% Change
MD 187 off ramp NB	28	0	-100%	242	0	-100%
MD 187 off ramp SB	0	8	-	0	355	-
Rockledge Dr off ramp	6	24	334%	359	185	-48%
Tower Oaks Blvd off ramp	19	0	-100%	179	0	-100%
Montrose Rd off ramp EB	0	0	-	0	0	-
Montrose Rd off ramp WB	0	14	-	0	116	-
MD 189 off ramp WB	8	4	-51%	99	272	174%
MD 189 off ramp EB	60	56	-8%	1148	292	-75%
MD 28 off ramp EB	28	0	-100%	227	0	-100%
MD 28 off ramp WB	2636	0	-100%	5046	0	-100%
Shady Grove Rd off ramp - Redland Blvd	0	209	-	0	679	-
Shady Grove Rd off ramp WB	151	0	-100%	605	0	-100%
Shady Grove Rd off ramp EB	0	0	-	0	0	-
I-370 off ramp WB	0	0	-	0	0	-
I-370 off ramp EB	0	515	-	0	1588	-
MD 117 off ramp	311	101	-67%	1011	448	-56%
MD 124 off ramp	95	0	-100%	453	0	-100%
Watkins Mill Rd off ramp	78	0	-100%	366	0	-100%
Middlebrook Rd EB off ramp	0	0	-	0	0	-
Middlebrook Rd WB off ramp	0	0	-	0	5	-
MD 118 WB off ramp - Seneca Meadows	0	0	-	0	0	-
MD 118 WB off ramp	0	0	-	0	0	-
MD 118 EB off ramp	0	8	-	0	85	-
MD 27 off ramp WB	7	0	-100%	81	0	-100%
MD 27 off ramp EB	0	66	-	0	252	-
MD 121 off ramp WB	62	0	-100%	250	0	-100%
MD 121 off ramp EB	0	11	-	0	144	-
MD 109 off ramp EB	29	0	-100%	228	0	-100%
MD 109 off ramp WB	8	8	1%	84	146	74%
MD 80 off ramp EB	7	0	-100%	102	9	-91%
MD 80 off ramp WB	0	0	-100%	26	0	-100%
MD 85 NB off ramp	0	1	-	0	124	-
MD 85 SB off ramp	1	1	152%	126	261	107%
I-270 Spur Northbound	No Build VISSIM Average Queue (feet)	Alternative VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	HSR VISSIM Maximum Queue (feet)	% Change
Clara Barton Pkwy off ramp EB	1	0	-100%	214	0	-100%
Clara Barton Pkwy off ramp WB	0	0	-	0	80	-
MD 190 off ramp EB	0	0	-100%	10	0	-100%
MD 190 off ramp WB	0	110	-	0	570	-
Democracy Blvd off ramp WB	104	16	-84%	563	146	-74%
Democracy Blvd off ramp EB	15	0	-100%	143	0	-100%

Table C.12: AM Peak - 2040 Hard Shoulder Running- I-270 On Ramp Queue Length - Southbound

I-270 Southbound	No Build VISSIM Average Queue (feet)	HSR VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	HSR VISSIM Maximum Queue (feet)	% Change
MD 85 on ramp	41	0	-100%	528	0	-100%
MD 80 on ramp	1039	0	-100%	2688	0	-100%
MD 109 on ramp	995	211	-79%	1914	1389	-27%
MD 121 WB on ramp	135	90	-33%	972	1579	62%
MD 121 EB on ramp	0	2446	-	0	5042	-
MD 27 WB on ramp	552	667	21%	2591	2905	12%
MD 27 EB on ramp	3	3	16%	173	304	76%
MD 118 WB on ramp	0	0	-	0	0	-
MD 118 EB on ramp	0	5	2257%	44	277	525%
Middlebrook Rd on ramp	2842	3834	35%	4433	4421	0%
Watkins Mill Rd on ramp	3066	3063	0%	3136	3143	0%
MD 124 WB on ramp	2789	316	-89%	4158	1544	-63%
MD 117 on ramp	293	23	-92%	1898	1008	-47%
I-370 C-D on ramp	0	0	-	0	0	-
Shady Grove Rd C-D on ramp North	0	0	-	0	0	-
Shady Grove Rd C-D on ramp South	2	0	-100%	127	0	-100%
MD 189 C-D on ramp	1787	0	-100%	3610	0	-100%
Montrose Rd C-D on ramp	2	0	-100%	227	0	-100%
Rockledge Dr on ramp	0	0	-	0	0	-
MD 187 on ramp	0	0	-	0	0	-
I-270 Spur Southbound	No Build VISSIM Average Queue (feet)	HSR VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	HSR VISSIM Maximum Queue (feet)	% Change
Democracy Blvd on ramp	0	340	-	0	1268	-
I-495 Southbound	No Build VISSIM Average Queue (feet)	HSR VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	HSR VISSIM Maximum Queue (feet)	% Change
I-270 Spur on ramp	147	0	-100%	1557	0	-100%
MD 190 on ramp	0	0	-	0	0	-
I-270 C-D Southbound	No Build VISSIM Average Queue (feet)	HSR VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	HSR VISSIM Maximum Queue (feet)	% Change
I-270 on ramp	2947	0	-100%	4900	0	-100%
I-370 on ramp	2511	0	-100%	2932	0	-100%
Shady Grove Rd WB on ramp	28	0	-100%	597	0	-100%
Shady Grove Rd EB on ramp	0	0	-100%	37	0	-100%
I-270 on ramp	0	0	-100%	42	0	-100%
MD 28 WB on ramp	1406	0	-100%	2299	0	-100%
MD 28 EB on ramp	3724	0	-100%	3882	0	-100%
I-270 on ramp	1	1514	231830%	74	2494	3256%
MD 189 on ramp	3725	27	-99%	4200	708	-83%
Montrose Rd WB on ramp	68	0	-100%	926	41	-96%
Montrose Rd EB on ramp	0	0	-100%	69	0	-100%

Table C.13: AM Peak -2040 Hard Shoulder Running- I-270 Off Ramp Queue Length - Southbound

I-270 Southbound	No Build VISSIM Average Queue (feet)	HSR VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	HSR VISSIM Maximum Queue (feet)	% Change
MD 85 SB off ramp	297	0	-100%	1410	17	-99%
MD 85 NB off ramp	0	0	22%	43	69	60%
MD 80 off ramp	1	0	-59%	99	23	-77%
MD 109 off ramp WB	0	0	-100%	25	0	-100%
MD 109 off ramp EB	0	284	-	0	1936	-
MD 121 off ramp EB	219	87	-60%	946	1315	39%
MD 121 off ramp WB	10	52	423%	519	272	-48%
MD 27 off ramp EB	50	258	417%	262	1871	615%
MD 27 off ramp WB	881	31	-97%	3309	168	-95%
MD 118 off ramp EB	31	0	-100%	160	0	-100%
MD 118 off ramp WB	0	69	-	0	296	-
Watkins Mill Rd off ramp	2034	91	-96%	5055	424	-92%
MD 124 off ramp EB	70	19	-74%	368	356	-3%
MD 124 off ramp WB	19	0	-100%	419	0	-100%
I-370 off ramp WB	0	0	-	0	0	-
I-370 off ramp EB	0	3	-	0	138	-
Shady Grove Rd off ramp - Omega Drive	4	0	-100%	172	0	-100%
Shady Grove Rd off ramp	0	1	-	0	99	-
MD 28 off ramp	4	43	938%	154	341	121%
MD 189 off ramp EB	35	0	-100%	238	0	-100%
MD 189 off ramp WB	0	0	-	0	0	-
Montrose Rd off ramp WB	0	1	-	0	119	-
Montrose Rd off ramp EB	382	17	-96%	1566	238	-85%
Rockledge Dr off ramp	27	49	82%	343	247	-28%
I-270 Spur Southbound	No Build VISSIM Average Queue (feet)	HSR VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	HSR VISSIM Maximum Queue (feet)	% Change
Democracy Blvd off ramp EB	50	0	-100%	219	0	-100%
Democracy Blvd off ramp WB	0	1483	-	0	3336	-
MD 190 off ramp WB	1389	0	-100%	3571	0	-100%
MD 190 off ramp EB	0	0	-	0	0	-
Clara Barton Pkwy WB off ramp	0	33	1119166%	5	258	4790%

Table C.14: AM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
1- MD 85 at Sam's Club Drive											
1	NB	23.0	C	NB Left	119	77	82	496	E	38.6	D
				NB Through	365	28	82	496	C		
				NB Right	664	11	22	438	B		
	SB	50.1	D	SB Left	137	63	174	771	E		
				SB Through	599	50	174	771	D		
				SB Right	68	26	174	771	C		
	EB	50.9	D	EB Left	105	78	56	182	E		
				EB Through	62	81	56	182	F		
				EB Right	113	9	56	182	A		
	WB	52.7	D	WB Left	230	77	90	355	E		
				WB Through	15	67	90	355	E		
				WB Right	126	7	90	355	A		
2- MD 85 at I-270 NB on and off ramp											
2	NB	52.1	D	NB Left	683	52	265	1136	D	36.3	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	18.8	B	SB Left	0	0	0	0	A		
				SB Through	611	19	56	562	B		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
3- MD 85 at I-270 SB on and off ramp											
3	NB	5.3	A	NB Left	0	0	0	0	A	10.2	B
				NB Through	1071	5	19	413	A		
				NB Right	0	0	0	0	A		
	SB	40.9	D	SB Left	172	41	43	440	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
4- MD 85 at Crestwood Blvd											
4	NB	19.4	C	NB Left	13	71	54	382	E	25.0	C
				NB Through	762	19	54	382	B		
				NB U-Turn	0	0	0	0	A		
	SB	18.8	B	SB Left	64	69	25	156	E		
				SB Through	1783	18	80	627	B		
				SB Right	808	16	68	617	B		
	EB	52.7	D	EB Left	621	54	91	276	D		
				EB Through	28	68	91	276	E		
				EB Right	42	17	91	276	B		
	WB	44.1	D	WB Left	52	53	21	137	D		
				WB Through	18	56	21	137	E		
				WB Right	19	9	21	137	A		
5- MD 80 at I-270 NB on and ramp											
5	NB	-1.0	A	NB Left	3	1	0	4	A	21.2	C
				NB Through	1	1	0	4	A		
				NB Right	5	-3	0	4	A		
	SB	13.0	B	SB Left	204	16	14	108	B		
				SB Through	6	20	14	108	B		
				SB Right	59	2	0	0	A		
			EB Left	54	12	11	183	B			

Table C.14: AM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
	EB	11.3	B	EB Through	0	0	8	0	A		
				EB Right	5	5	19	213	A		
	WB	23.1	C	WB Left	35	24	1	56	C		
				WB Through	879	31	182	786	C		
				WB Right	639	12	11	442	B		
6- MD 80 at I-270 SB on and off ramp											
6	NB	6.2	A	NB Left	24	37	2	134	E	31.6	D
				NB Through	0	0	0	0	A		
				NB Right	258	3	2	134	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	36.7	E	EB Left	0	0	0	0	A		
				EB Through	360	36	67	436	E		
				EB Right	161	38	68	446	E		
	WB	47.8	E	WB Left	0	0	0	0	A		
				WB Through	278	48	157	758	E		
WB Right				0	0	0	0	A			
7- MD 109 at I-270 NB on and off ramp											
7	NB			NB Left	0	0	0	0	A	29.9	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	33.1	D	SB Left	143	37	37	244	E		
				SB Through	0	0	0	0	A		
				SB Right	47	20	17	177	C		
	EB	15.7	C	EB Left	88	11	5	149	B		
				EB Through	0	0	0	0	A		
				EB Right	63	22	0	0	C		
	WB	32.2	D	WB Left	0	0	0	0	A		
				WB Through	671	32	399	555	D		
WB Right				0	0	0	0	A			
8- MD 80 at I-270 SB on and off ramp											
8	NB	9.3	A	NB Left	17	36	4	78	E	33.7	D
				NB Through	0	0	0	0	A		
				NB Right	48	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	50.0	E	EB Left	0	0	0	0	A		
				EB Through	92	34	58	270	D		
				EB Right	102	64	60	268	F		
	WB	31.6	D	WB Left	570	29	158	594	D		
				WB Through	156	39	152	571	E		
WB Right				0	0	0	0	A			
9- MD 121 at Gateway Center Dr											
9	NB	17.8	C	NB Left	154	27	43	285	C	51.2	D
				NB Through	434	22	43	285	C		
				NB Right	327	8	52	311	A		
	SB	32.3	D	SB Left	55	22	113	555	C		
				SB Through	792	33	123	555	C		
				SB Right	8	26	131	576	C		
	EB	120.4	F	EB Left	8	97	421	525	F		
				EB Through	99	125	422	525	F		
				EB Right	646	120	452	557	F		
	WB	21.8	C	WB Left	137	25	18	147	C		
				WB Through	17	22	18	147	C		
WB Right				28	6	16	171	A			
10- MD 121 at I-270 NB on and off ramp											
	NB	28.3	D	NB Left	324	59	67	255	F		
				NB Through	0	0	0	0	A		

Table C.14: AM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
10	SB			NB Right	402	3	0	0	A	19.0	B
				SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	11.5	B	EB Left	0	0	0	0	A		
				EB Through	513	18	32	325	C		
				EB Right	285	1	0	0	A		
				WB Left	233	63	145	805	F		
	WB	18.6	C	WB Through	1337	11	145	805	B		
				WB Right	0	0	0	0	A		

Table C.14: AM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
11- MD 121 at I-270 SB on and off ramp											
11	NB			NB Left	0	0	0	0	A	18.3	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	62.8	E	SB Left	218	94	225	953	F		
				SB Through	0	0	0	0	A		
				SB Right	304	40	8	439	E		
	EB	5.2	A	EB Left	0	0	0	0	A		
				EB Through	578	5	12	206	A		
				EB Right	0	0	0	0	A		
	WB	8.8	A	WB Left	0	0	0	0	A		
				WB Through	642	18	61	438	C		
				WB Right	1010	3	30	185	A		
12- MD 27 at Observation Dr											
12	NB	48.1	D	NB U-Turn	0	0	0	0	A	37.1	D
				NB Through	48	58	14	72	E		
				NB Right	12	7	14	72	A		
	SB	44.0	D	SB Left	91	52	29	192	D		
				SB Through	54	52	39	261	D		
				SB Right	178	38	64	298	D		
	EB	16.9	B	EB Left	151	40	40	324	D		
				EB Through	1217	14	42	325	B		
				EB Right	48	10	49	363	B		
	WB	48.1	D	WB Left	100	32	333	847	C		
				WB Through	2130	50	333	847	D		
				WB Right	109	30	333	847	C		
13- MD 27 at I-270 NB off ramp											
13	NB	35.6	D	NB Left	106	36	15	88	D	52.4	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.1	A	EB Left	0	0	0	0	A		
				EB Through	973	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	76.7	E	WB Left	0	0	0	0	A		
				WB Through	2166	77	1092	2164	E		
				WB Right	0	0	0	0	A		
14- MD 27 at I-270 SB off ramp											
14	NB			NB Left	0	0	0	0	A	70.6	E
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	49.4	D	SB Left	384	49	61	275	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	2.6	A	EB Left	0	0	0	0	A		
				EB Through	840	3	2	62	A		
				EB Right	0	0	0	0	A		
	WB	118.3	F	WB Left	0	0	0	0	A		
				WB Through	1365	118	1106	1497	F		
				WB Right	0	0	0	0	A		
15- MD 27 at Crystal Rock Dr											
15	NB	64.8	E	NB Left	30	38	296	736	D	92.0	F
				NB Through	1051	65	316	736	E		
				NB Right	92	70	327	748	E		
	SB	119.1	F	SB Left	514	118	1842	3792	F		
				SB Through	1620	121	1842	3792	F		
				SB Right	51	81	1836	3787	F		
				EB Left	224	50	59	199	D		

Table C.14: AM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
	EB	44.2	D	EB Through	97	43	55	194	D		
				EB Right	75	29	60	228	C		
	WB	46.8	D	WB Left	11	56	32	103	E		
				WB Through	32	224	32	103	F		
				WB Right	142	6	32	103	A		
16- MD 118 at Seneca Meadows Pkwy											
16	NB	3.6	A	NB Left	109	11	1	72	B	6.1	A
				NB Through	725	3	4	134	A		
				NB Right	60	1	9	187	A		
	SB	4.0	A	SB Left	31	4	7	238	A		
				SB Through	948	4	10	238	A		
				SB Right	41	2	12	271	A		
	EB	18.4	B	EB Left	20	65	10	77	E		
				EB Through	6	82	10	77	F		
				EB Right	115	7	10	77	A		
	WB	44.2	D	WB Left	35	71	16	102	E		
				WB Through	6	55	11	101	D		
				WB Right	27	7	14	111	A		
17- MD 118 at I-270 NB on ramp											
17	NB			NB Left	0	0	0	0	A	10.2	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	29.6	C	EB Left	274	30	31	194	C		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	5.4	A	WB Left	0	0	0	0	A		
				WB Through	188	1	0	0	A		
				WB Right	911	6	15	309	A		
18- MD 118 at I-270 SB off ramp											
18	NB			NB Left	0	0	0	0	A	7.5	A
				NB Through	0	0.0	0	0	A		
				NB Right	0	0.0	0	0	A		
	SB	38.1	D	SB Left	215	38.1	34	163	D		
				SB Through	0	0.0	0	0	A		
				SB Right	0	0.0	0	0	A		
	EB	3.7	A	EB Left	0	0.0	0	0	A		
				EB Through	631	3.7	5	194	A		
				EB Right	0	0.0	0	0	A		
	WB	4.1	A	WB Left	0	0.0	0	0	A		
				WB Through	1214	4.1	9	173	A		
				WB Right	0	0.0	0	0	A		
19- MD 118 at Aircraft Dr											
19	NB	46.2	D	NB Left	9	78	9	75	E	20.6	C
				NB Through	13	80	9	75	F		
				NB Right	17	3	0	24	A		
	SB	60.5	E	SB Left	267	55	112	418	E		
				SB Through	53	72	112	418	E		
				SB Right	96	68	112	418	E		
	EB	12.4	B	EB Left	132	16	37	329	B		
				EB Through	1019	12	37	329	B		
				EB Right	34	12	37	329	B		
	WB	15.1	B	WB Left	83	23	47	310	C		
				WB Through	1046	17	47	310	B		
				WB Right	324	6	47	310	A		
20- Middlebrook Rd at Observation Dr											
	NB			NB Left	0	0	0	0	A		
				NB Through	0	0	0	0	A		

Table C.14: AM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
20	SB	20.4	C	NB Right	0	0	0	0	A	16.4	B
				SB Left	26	36	5	63	D		
				SB Through	0	0	0	0	A		
				SB Right	27	5	5	63	A		
	EB	14.1	B	EB Left	231	21	29	249	C		
				EB Through	825	12	29	249	B		
				EB Right	0	0	0	0	A		
	WB	18.0	B	WB Left	0	0	0	0	A		
				WB Through	1141	19	72	392	B		
				WB Right	275	15	97	441	B		

Table C.14: AM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
21- Middlebrook Rd at I-270 SB on ramp											
21	NB			NB Left	0	0	0	0	A	19.5	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	13.7	B	EB Left	0	0	0	0	A		
				EB Through	763	14	31	203	B		
				EB Right	0	0	0	0	A		
	WB	25.4	C	WB Left	761	25	104	893	C		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
22- Middlebrook Rd at Waring Station Rd											
22	NB	179.6	F	NB Left	145	136	348	485	F	70.4	E
				NB Through	6	133	348	485	F		
				NB Right	268	204	348	485	F		
	SB	17.6	B	SB Left	3	39	1	29	D		
				SB Through	0	0	1	29	A		
				SB Right	5	5	2	67	A		
	EB	69.3	E	EB Left	31	21	645	1297	C		
				EB Through	1448	71	645	1297	E		
				EB Right	80	62	645	1297	E		
	WB	18.4	B	WB Left	80	23	33	237	C		
				WB Through	719	19	33	237	B		
				WB Right	41	4	33	237	A		
23- MD 124 at MD 355											
23	NB	52.9	D	NB Left	228	73	86	264	E	96.2	F
				NB Through	390	48	84	262	D		
				NB Right	54	3	0	0	A		
	SB	104.2	F	SB Left	64	166	490	804	F		
				SB Through	1188	124	490	804	F		
				SB Right	559	54	284	780	D		
	EB	54.5	D	EB Left	610	130	444	1095	F		
				EB Through	494	17	444	1095	B		
				EB Right	555	5	236	1008	A		
	WB	143.6	F	WB Left	0	0	0	0	A		
				WB Through	1717	146	760	1115	F		
				WB Right	52	73	0	0	E		
24- MD 124 at I-270 SB on and off											
24	NB	65.3	F	NB Left	16	62	18	95	E	29.3	C
				NB Through	37	67	18	95	E		
				NB U-Turn	0	0	0	0	A		
	SB	26.0	C	SB Left	285	65	77	373	E		
				SB Through	11	65	77	373	E		
				SB Right	588	6	14	350	A		
	EB	17.0	B	EB Left	0	0	0	0	A		
				EB Through	1037	17	50	409	B		
				EB Right	67	14	60	433	B		
	WB	41.6	D	WB Left	43	47	1679	2437	D		
				WB Through	1136	41	1679	2437	D		
				WB Right	0	0	0	0	A		
25- MD 117 at MD 124											
25	NB	49.7	D	NB Left	20	108	157	726	F	48.5	D
				NB Through	541	64	157	726	E		
				NB Right	433	30	76	717	C		
	SB	47.0	D	SB Left	181	69	221	826	E		
				SB Through	1072	48	221	826	D		
				SB Right	131	9	0	0	A		
				EB Left	102	119	217	782	F		

Table C.14: AM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
	EB	54.0	D	EB Through	1470	50	217	783	D		
				EB Right	82	47	229	811	D		
				WB Left	319	70	103	304	E		
	WB	39.4	D	WB Through	478	27	103	304	C		
				WB Right	99	0	0	0	A		
26- MD 117 at Bureau Dr											
26	NB	50.3	D	NB Left	25	64	19	125	E	41.1	D
				NB Through	24	65	19	125	E		
				NB Right	26	23	19	125	C		
	SB	174.5	F	SB Left	197	177	223	397	F		
				SB Through	55	190	223	397	F		
				SB Right	32	130	223	397	F		
	EB	36.8	D	EB Left	33	26	272	958	C		
				EB Through	2020	37	278	958	D		
				EB Right	29	43	271	948	D		
	WB	20.8	C	WB Left	299	67	134	543	E		
				WB Through	840	10	134	544	A		
WB Right				314	6	100	582	A			
27- MD 117 at I-270 SB off ramp											
27	NB			NB Left	0	0	0	0	A	9.3	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	2.0	A	EB Left	0	0	0	0	A		
				EB Through	835	2	1	180	A		
				EB Right	0	0	0	0	A		
	WB	28.1	D	WB Left	328	28	59	453	D		
				WB Through	0	0	0	0	A		
WB Right				0	0	0	0	A			
28- MD 117 at I-270 NB off ramp											
28	NB			NB Left	0	0	0	0	A	34.5	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	60.5	E	SB Left	287	63	325	1037	E		
				SB Through	0	0	0	0	A		
				SB Right	871	60	329	1039	E		
	EB	19.2	B	EB Left	14	123	74	848	F		
				EB Through	821	17	74	848	B		
				EB Right	0	0	0	0	A		
	WB	15.6	B	WB Left	0	0	0	0	A		
				WB Through	909	16	60	360	B		
WB Right				9	8	66	390	A			
29- MD 117 at Perry Pkwy											
29	NB	44.5	D	NB Left	36	76	17	120	E	15.9	B
				NB Through	7	58	17	119	E		
				NB Right	38	12	27	140	B		
	SB	48.7	D	SB Left	112	96	60	247	F		
				SB Through	14	102	60	247	F		
				SB Right	133	3	60	247	A		
	EB	10.6	B	EB Left	119	70	44	269	E		
				EB Through	975	3	44	269	A		
				EB Right	10	1	31	254	A		
	WB	10.4	B	WB Left	8	89	21	297	F		
				WB Through	747	10	21	297	B		
WB Right				136	6	21	297	A			
30- Shady Grove Rd at I-270 NB off ramp											
	NB	9.8	A	NB Left	0	0	0	0	A		
				NB Through	959	10	22	267	A		

Table C.14: AM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS			
30	SB	10.4	B	NB Right	0	0	0	0	A	22.3	C			
				SB Left	0	0	0	0	A					
				SB Through	1349	10	34	334	B					
	EB				SB Right	0	0	0	0			A		
					EB Left	0	0	0	0			A		
					EB Through	0	0	0	0			A		
	WB	55.7		E	EB Right	0	0	0	0			A		
					WB Left	846	56	160	616			E		
					WB Through	0	0	0	0			A		
					WB Right	0	0	0	0			A		

Table C.14: AM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
31- Shady Grove Rd at I-270 SB off ramp											
31	NB	12.7	B	NB Left	0	0	0	0	A	19.9	B
				NB Through	1004	13	37	399	B		
				NB Right	0	0	0	0	A		
	SB	9.3	A	SB Left	0	0	0	0	A		
				SB Through	1565	9	32	563	A		
				SB Right	0	0	0	0	A		
	EB	47.4	D	EB Left	286	41	42	360	D		
				EB Through	0	0	0	0	A		
				EB Right	576	51	98	441	D		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
32- MD 28 at I-270 SB off ramp											
32	NB			NB U-Turn	0	0	0	0	A	67.9	E
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	35.7	D	SB Left	426	44	68	327	D		
				SB Through	0	0	0	0	A		
				SB Right	103	3	0	36	A		
	EB	131.7	F	EB Left	0	0	0	0	A		
				EB Through	683	200	1979	2136	F		
				EB Right	409	18	1925	2144	B		
	WB	25.4	C	WB Left	0	0	0	0	A		
				WB Through	1235	25	23	384	C		
				WB Right	0	0	0	0	A		
33- MD 28 at I-270 on and off ramps											
33	NB	36.5	D	NB Left	0	0	32	238	A	36.3	D
				NB Through	128	53	38	247	D		
				NB Right	80	10	38	247	A		
	SB	84.5	F	SB Left	26	102	128	357	F		
				SB Through	0	0	0	0	A		
				SB Right	273	83	128	357	F		
	EB	21.4	C	EB Left	177	45	57	407	D		
				EB Through	599	15	57	407	B		
				EB Right	0	0	0	0	A		
	WB	33.3	C	WB Left	26	37	101	391	D		
				WB Through	944	33	83	354	C		
				WB Right	0	0	0	0	A		
34- MD 189 at Great Falls Rd											
34	NB	37.3	D	NB Left	63	42	17	117	D	23.3	C
				NB Through	8	40	14	117	D		
				NB Right	10	8	16	128	A		
	SB	17.3	B	SB Left	63	45	19	229	D		
				SB Through	6	45	19	229	D		
				SB Right	478	13	54	147	B		
	EB	24.6	C	EB Left	227	55	111	1165	E		
				EB Through	680	15	17	199	B		
				EB Right	10	10	26	236	A		
	WB	26.4	C	WB Left	4	26	64	389	C		
				WB Through	311	27	63	388	C		
				WB Right	11	13	77	422	B		
35- MD 189 at I-270 Ramps											
35	NB	60.5	E	NB Left	88	61	18	121	E	79.7	E
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	55.9	E	SB Left	150	56	48	258	E		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
				EB Left	284	138	627	1494	F		

Table C.14: AM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
	EB	106.2	F	EB Through	436	85	627	1494	F		
				EB Right	0	0	0	0	A		
	WB	60.0	E	WB Left	457	53	107	429	D		
				WB Through	244	73	107	429	E		
				WB Right	0	0	0	0	A		
36- MD 189 at Wooton Pkwy											
36	NB	71.9	E	NB Left	161	48	85	311	D	117.9	F
				NB Through	125	95	85	311	F		
				NB Right	155	78	85	311	E		
	SB	142.8	F	SB Left	325	210	509	805	F		
				SB Through	593	106	482	792	F		
				SB Right	0	0	0	0	A		
	EB	162.3	F	EB Left	137	157	650	1047	F		
				EB Through	803	170	650	1047	F		
				EB Right	101	106	650	1047	F		
	WB	49.3	D	WB Left	346	69	104	353	E		
				WB Through	318	34	104	353	C		
				WB Right	47	6	104	353	A		
37- Montrose Rd at Tower Oaks Blvd											
37	NB			NB Left	0	0	0	0	A	104.5	F
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	235.8	F	SB Left	123	49	1098	1406	D		
				SB Through	0	0	0	0	A		
				SB Right	435	289	1123	1402	F		
	EB	25.5	C	EB Left	28	65	136	923	E		
				EB Through	1513	25	136	923	C		
				EB Right	0	0	0	0	A		
	WB	141.4	F	WB Left	0	0	0	0	A		
				WB Through	1255	145	491	850	F		
				WB Right	58	60	491	850	E		
38- Tower Oaks Blvd at I-270 off ramp											
38	NB	24.1	C	NB Left	385	22	30	200	C	78.2	E
				NB Through	8	22.5	25	192	C		
				NB Right	22	64.1	30	200	E		
	SB	0.6	A	SB Left	0	800.1	0	20	F		
				SB Through	0	0.0	0	20	A		
				SB Right	4	0.6	0	0	A		
	EB	122.8	F	EB Left	6	113.7	347	465	F		
				EB Through	558	122.3	347	465	F		
				EB Right	82	126.7	338	456	F		
	WB	9.5	A	WB Left	0	0.0	3	80	A		
				WB Through	81	9.9	3	80	A		
				WB Right	6	5.0	0	25	A		
39- Montrose Rd at Tower Oaks Blvd											
39	NB	17.9	B	NB Left	37	71	49	285	E	50.9	D
				NB Through	240	42	49	285	D		
				NB Right	555	4	12	151	A		
	SB	41.1	D	SB Left	334	54	163	619	D		
				SB Through	778	37	163	618	D		
				SB Right	78	29	124	658	C		
	EB	90.2	F	EB Left	76	74	416	718	E		
				EB Through	971	92	418	718	F		
				EB Right	62	89	439	742	F		
	WB	43.4	D	WB Left	300	52	68	290	D		
				WB Through	188	50	68	290	D		
				WB Right	109	7	77	321	A		
40- Rockledge Blvd at I-270 NB on and off ramp											
	NB	34.1	C	NB Left	0	0	0	0	A		
				NB Through	92	32	33	165	C		

Table C.14: AM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
40	SB	2.0	A	NB Right	216	35	33	165	C	18.0	B
				SB Left	0	0	4	61	A		
				SB Through	923	2	4	61	A		
				SB Right	0	0	0	0	A		
	EB	26.9	C	EB Left	7	48	126	506	D		
				EB Through	529	54	126	506	D		
				EB Right	563	1	0	0	A		
				WB Left	0	0	0	0	A		
	WB			WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table C.14: AM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
41- Rockledge Blvd at I-270 SB on and off ramps											
41	NB	2.6	A	NB Left	97	3	5	72	A	20.4	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	21.7	C	WB Left	923	23	92	655	C		
				WB Through	403	20	92	655	B		
				WB Right	0	0	0	0	A		
42- MD 187 at Tuckerman Ln											
42	NB	58.8	E	NB Left	230	25	265	793	C	153.0	F
				NB Through	1468	55	265	793	D		
				NB Right	213	124	265	793	F		
	SB	224.9	F	SB Left	60	164	2605	2704	F		
				SB Through	1204	225	2605	2704	F		
				SB Right	162	247	2605	2704	F		
	EB	186.0	F	EB Left	223	128	1864	1988	F		
				EB Through	624	205	1865	1989	F		
				EB Right	129	194	1889	2013	F		
	WB	188.4	F	WB Left	721	229	1921	2147	F		
				WB Through	393	152	1921	2147	F		
				WB Right	159	92	1921	2147	F		
43- MD 187 at I-270 NB on and off ramps											
43	NB	11.2	B	NB Left	163	76	57	257	E	19.1	B
				NB Through	1541	4	57	257	A		
				NB Right	0	0	0	0	A		
	SB	25.4	C	SB Left	0	0	0	0	A		
				SB Through	1529	25	81	553	C		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	49.5	D	WB Left	114	50	35	250	D		
				WB Through	10	47	35	250	D		
				WB Right	0	0	0	0	A		
44- MD 187 at I-270 NB on and off ramps											
44	NB	23.9	C	NB Left	0	0	0	0	A	25.9	C
				NB Through	1478	24	68	404	C		
				NB Right	0	0	0	0	A		
	SB	7.7	A	SB Left	178	49	58	295	D		
				SB Through	1465	3	58	295	A		
				SB Right	0	0	0	0	A		
	EB	80.8	F	EB Left	228	58	187	740	E		
				EB Through	0	0	187	740	A		
				EB Right	371	95	232	784	F		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
45- MD 187 at Rock Spring Dr											
45	NB	14.9	B	NB Left	255	57	68	257	E	20.8	C
				NB Through	1383	7	69	258	A		
				NB Right	10	6	93	291	A		
	SB	21.9	C	SB Left	13	25	98	632	C		
				SB Through	1668	24	98	632	C		
				SB Right	144	1	63	619	A		
	EB Left	190	59	56	222	E					

Table C.14: AM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
	EB	37.9	D	EB Through	26	54	56	222	D		
				EB Right	251	20	56	222	C		
	WB	7.2	A	WB Left	1	7	1	29	A		
				WB Through	9	11	1	29	B		
				WB Right	5	0	0	7	A		
47-Democracy Blvd at I-270 NB off ramp											
47	NB	29.7	C	NB Left	217	30	24	159	C	13.4	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	12.7	B	EB Left	0	0	0	0	A		
				EB Through	1654	13	50	446	B		
				EB Right	0	0	0	0	A		
	WB	10.4	B	WB Left	0	0	0	0	A		
WB Through				778	10	23	187	B			
WB Right				0	0	0	0	A			
48- Democracy Blvd at I-270 SB on ramp											
48	NB			NB Left	0	0	0	0	A	6.6	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	5.4	A	EB Left	0	0	0	0	A		
				EB Through	1768	5	23	270	A		
				EB Right	0	0	0	0	A		
	WB	8.7	A	WB Left	223	37	31	173	D		
WB Through				771	1	21	152	A			
WB Right				0	0	0	0	A			
49- Democracy Blvd at I-270 SB off ramp											
49	NB			NB Left	0	0	0	0	A	12.1	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	32.9	C	SB Left	329	49	57	226	D		
				SB Through	0	0	0	0	A		
				SB Right	171	2	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	2.6	A	WB Left	0	0	0	0	A		
WB Through				770	3	4	133	A			
WB Right				334	2	1	163	A			
50- MD 190 at Burdette Rd											
50	NB	73.2	E	NB Left	20	80	15	118	E	13.2	B
				NB Through	4	59	15	118	E		
				NB Right	11	67	15	118	E		
	SB	34.4	C	SB Left	50	79	31	151	E		
				SB Through	17	64	31	151	E		
				SB Right	120	12	31	151	B		
	EB	10.5	B	EB Left	53	93	61	561	F		
				EB Through	1814	8	60	561	A		
				EB Right	15	6	51	584	A		
	WB	12.5	B	WB Left	1	106	61	828	F		
WB Through				1494	13	62	828	B			
WB Right				21	2	55	834	A			

Table C.14: AM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
51- MD 190 at I-270 NB on ramp											
51	NB			NB Left	0	0	0	0	A	53.3	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	123.2	F	EB Left	531	123	347	715	F		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	15.9	B	WB Left	0	0	0	0	A		
				WB Through	994	16	76	747	B		
				WB Right	0	0	0	0	A		
52- MD 190 at I-270 SB off ramp											
52	NB	79.3	E	NB Left	258	79	1392	3574	E	14.2	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	2.9	A	EB Left	0	0	0	0	A		
				EB Through	982	3	6	151	A		
				EB Right	0	0	0	0	A		
	WB	5.7	A	WB Left	0	0	0	0	A		
				WB Through	667	6	8	160	A		
				WB Right	0	0	0	0	A		
53- MD 190 at Seven Locks Rd											
53	NB	68.2	E	NB Left	21	67	23	149	E	45.0	D
				NB Through	59	69	25	148	E		
				NB Right	0	0	0	0	A		
	SB	56.9	E	SB Left	624	56	184	777	E		
				SB Through	183	59	185	778	E		
				SB Right	18	54	184	777	D		
	EB	37.5	D	EB Left	24	30	135	584	C		
				EB Through	846	38	135	584	D		
				EB Right	42	42	135	584	D		
	WB	39.7	D	WB Left	119	127	125	418	F		
				WB Through	639	33	128	421	C		
				WB Right	157	1	4	127	A		
54- MD 124 at I-270 NB off ramp											
54	NB	40.6	D	NB Left	0	0	0	0	A	26.5	C
				NB Through	0	0	0	0	A		
				NB Right	723	41	100	459	D		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	15.6	B	EB Left	0	0	0	0	A		
				EB Through	933	16	37	359	B		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
55- Democracy Blvd at I-270 NB off ramp											
55	NB	37.1	D	NB Left	0	0	0	0	A	16.2	B
				NB Through	0	0	0	0	A		
				NB Right	928	37	113	575	D		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
			EB Left	0	0	0	0	A			

Table C.14: AM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
	EB	4.5	A	EB Through	1657	5	18	95	A		
				EB Right	0	0	0	0	A		
	WB	WB Left	0	0	0	0	A				
		WB Through	0	0	0	0	A				
		WB Right	0	0	0	0	A				
56- Watkins Mill Rd at I-270 SB off ramp/Parkview Ave											
56	NB	747.0	F	NB Left	46	222	668	726	F	174.0	F
				NB Through	0	0	0	0	A		
				NB Right	86	1028	668	726	F		
	SB	SB Left	552	113	2037	5048	F				
		SB Through	131	109	2037	5048	F				
		SB Right	447	39	2037	5048	D				
	EB	EB Left	0	0	0	0	A				
		EB Through	494	463	1163	1232	F				
		EB Right	2	599	1163	1232	F				
	WB	WB Left	116	87	120	459	F				
		WB Through	769	35	117	457	D				
WB Right		0	0	0	0	A					
57- Watkins Mill Rd at I-270 NB on ramp											
57	NB	35.2	D	NB Left	386	51	92	383	D	70.0	E
				NB Through	0	0	0	0	A		
				NB Right	478	23	92	383	C		
	SB	SB Left	0	0	0	0	A				
		SB Through	0	0	0	0	A				
		SB Right	0	0	0	0	A				
	EB	EB Left	190	61	49	301	E				
		EB Through	749	8	49	301	A				
		EB Right	0	0	0	0	A				
	WB	WB Left	0	0	0	0	A				
		WB Through	954	150	640	849	F				
WB Right		174	78	640	849	E					
58- Watkins Mill Rd at I-270 SB on ramp											
58	NB			NB Left	0	0	0	0	A	60.7	E
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	SB Left	0	0	0	0	A				
		SB Through	0	0	0	0	A				
		SB Right	0	0	0	0	A				
	EB	EB Left	0	0	0	0	A				
		EB Through	938	30	483	620	C				
		EB Right	182	299	483	620	F				
	WB	WB Left	456	142	273	516	F				
		WB Through	883	2	273	516	A				
WB Right		0	0	0	0	A					

Table C.15: AM Peak -2040 Hard Shoulder Running- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
1	NB	23.2	C	NB Left	124	82	86	481	F	37.4	D
				NB Through	197	17	0	46	C		
				NB Right	705	11	25	477	B		
	SB	45.5	D	SB Left	137	62	163	691	D		
				SB Through	197	68	153	691	D		
				SB Right	68	26	153	691	C		
	EB	48.1	D	EB Left	106	74	53	202	E		
				EB Through	62	75	53	202	E		
				EB Right	112	9	53	202	A		
	WB	52.3	D	WB Left	209	15	68	294	E		
				WB Through	16	74	89	294	E		
				WB Right	125	89	89	294	A		
2- MD 85 at 1-270 NB on and off ramp											
2	NB	52.3	D	NB Left	686	52	293	1160	D	36.4	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	18.6	B	SB Left	0	0	0	0	A		
				SB Through	608	18	23	545	B		
				SB Right	0	0	0	0	A		
	EB	0	0	EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	0	0	WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
3- MD 85 at 1-270 SB on and off ramp											
3	NB	5.1	A	NB Left	0	0	0	0	A	10.1	B
				NB Through	1074	5	17	426	A		
				NB Right	0	0	0	0	A		
	SB	42.7	D	SB Left	167	43	113	1457	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0	0	EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	0	0	WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
4- MD 85 at Chestwood Blvd											
4	NB	19.5	C	NB Left	13	48	56	383	D	25.4	C
				NB Through	769	19	56	383	B		
				NB Right	0	0	0	0	A		
	SB	19.3	B	SB Left	67	71	26	145	E		
				SB Through	688	18	85	700	B		
				SB Right	68	18	72	700	B		
	EB	54.1	D	EB Left	624	56	83	279	E		
				EB Through	28	71	83	279	E		
				EB Right	41	21	93	279	C		
	WB	43.1	D	WB Left	51	52	21	113	D		
				WB Through	18	57	21	113	E		
				WB Right	20	8	21	113	A		
5- MD 80 at 1-270 NB on and off ramp											
5	NB	-1.3	A	NB Left	3	0	0	0	A	10.5	B
				NB Through	3	0	0	0	A		
				NB Right	5	3	0	0	A		
	SB	13.2	B	SB Left	215	16	15	152	B		
				SB Through	6	20	15	152	B		
				SB Right	63	2	0	0	A		
	EB	11.0	B	EB Left	56	12	10	164	B		
				EB Through	6	5	18	105	A		
				EB Right	6	5	18	105	A		
	WB	10.1	B	WB Left	36	10	8	40	B		
				WB Through	880	15	26	568	B		
				WB Right	628	3	0	0	A		
6- MD 80 at 1-270 SB on and off ramp											
6	NB	8.2	A	NB Left	22	10	1	100	A	10.1	B
				NB Through	0	0	0	0	A		
				NB Right	260	8	0	100	A		
	SB	0	0	SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	11.0	B	EB Left	0	0	0	0	A		
				EB Through	340	12	11	148	B		
				EB Right	166	10	13	156	A		
	WB	10.3	B	WB Left	0	0	0	0	A		
				WB Through	381	10	10	148	B		
				WB Right	0	0	0	0	A		
7- MD 109 at 1-270 NB on and off ramp											
7	NB	15.2	C	NB Left	0	0	0	0	A	5.7	A
				NB Through	0	0	0	0	A		
				NB Right	150	19	19	160	C		
	SB	0	0	SB Left	0	0	0	0	A		
				SB Through	46	2	0	96	A		
				SB Right	50	5	0	58	A		
	EB	5.1	A	EB Left	0	0	0	0	A		
				EB Through	62	6	0	0	A		
				EB Right	62	6	0	0	A		
	WB	2.9	A	WB Left	0	0	0	0	A		
				WB Through	601	0	12	315	A		
				WB Right	0	0	0	0	A		
8- MD 80 at 1-270 SB on and off ramp											
8	NB	8.1	A	NB Left	18	29	4	90	D	13.0	B
				NB Through	0	0	0	0	A		
				NB Right	48	0	0	20	A		
	SB	0	0	SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	28.3	D	EB Left	0	0	0	0	A		
				EB Through	94	21	32	145	C		
				EB Right	100	15	32	150	E		
	WB	9.3	A	WB Left	52	8	36	414	A		
				WB Through	154	15	33	391	B		
				WB Right	0	0	0	0	A		
9- MD 121 at Gateway Center Dr											
9	NB	18.7	C	NB Left	154	25	47	375	C	50.2	D
				NB Through	445	24	46	373	C		
				NB Right	340	8	57	399	A		
	SB	30.6	D	SB Left	57	20	101	485	B		
				SB Through	808	31	110	486	C		
				SB Right	8	20	141	501	C		
	EB	117.1	F	EB Left	9	88	431	521	F		
				EB Through	104	123	414	523	F		
				EB Right	663	117	493	525	F		
	WB	22.6	C	WB Left	118	26	19	124	C		
				WB Through	18	20	19	124	B		
				WB Right	28	5	15	149	A		
10- MD 121 at 1-270 NB on and off ramp											
10	NB	27.8	D	NB Left	352	58	72	258	F	18.3	B
				NB Through	0	0	0	0	A		
				NB Right	438	4	0	0	A		
	SB	0	0	SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	11.4	B	EB Left	0	0	0	0	A		
				EB Through	501	18	33	277	C		
				EB Right	0	0	0	0	A		
	WB	17.0	C	WB Left	288	13	14	31	F		
				WB Through	232	13	14	750	F		
				WB Right	1369	9	124	759	A		
WB Right	0	0	0	0	A						

Table C.15: AM Peak -2040 Hard Shoulder Running- Intersection Delay and Level of Service

11- MD 121 at I-270 SB on and off ramp											
11	NB	67.6	E	NB Left	0	0	0	0	A	18.4	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	SB Left	205	100	298	1942	F				
		SB Through	0	0	0	0	A				
		SB Right	302	46	81	1228	E				
	EB	4.9	A	EB Left	0	0	0	0	A		
				EB Through	584	5	11	189	A		
				EB Right	0	0	0	0	A		
	WB	8.5	A	WB Left	0	0	0	0	A		
WB Through				673	18	47	626	C			
WB Right				1040	2	16	515	A			
12- MD 27 at Observation Dr											
12	NB	46.9	D	NB U-Turn	0	0	0	0	A	38.0	D
				NB Through	48	57	13	74	E		
				NB Right	12	7	13	74	A		
	SB	SB Left	89	52	28	175	D				
		SB Through	52	52	38	271	D				
		SB Right	180	37	63	308	D				
	EB	17.6	B	EB Left	154	40	43	312	D		
				EB Through	1242	15	44	313	B		
				EB Right	48	13	52	351	B		
	WB	49.3	D	WB Left	102	35	352	839	C		
WB Through				2195	51	352	839	D			
WB Right				110	28	352	839	C			
13- MD 27 at I-270 NB off ramp											
13	NB	34.4	C	NB Left	110	34	15	93	C	53.2	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	SB Left	0	0	0	0	A				
		SB Through	0	0	0	0	A				
		SB Right	0	0	0	0	A				
	EB	0.1	A	EB Left	0	0	0	0	A		
				EB Through	965	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	76.9	E	WB Left	0	0	0	0	A		
WB Through				2251	77	1144	2270	E			
WB Right				0	0	0	0	A			
14- MD 27 at I-270 SB off ramp											
14	NB	47.9	D	NB Left	0	0	0	0	A	75.3	E
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	SB Left	382	48	63	286	D				
		SB Through	0	0	0	0	A				
		SB Right	0	0	0	0	A				
	EB	2.6	A	EB Left	0	0	0	0	A		
				EB Through	835	3	1	54	A		
				EB Right	0	0	0	0	A		
	WB	123.8	F	WB Left	0	0	0	0	A		
WB Through				1469	124	1291	1651	F			
WB Right				0	0	0	0	A			
15- MD 27 at Crystal Rock Dr											
15	NB	62.3	E	NB Left	30	35	283	746	C	90.1	F
				NB Through	1041	63	309	745	E		
				NB Right	94	68	319	758	E		
	SB	SB Left	536	115	1501	2660	F				
		SB Through	1695	117	1501	2660	F				
		SB Right	53	77	1495	2654	E				
	EB	44.0	D	EB Left	230	50	58	195	D		
				EB Through	95	44	55	190	D		

Table C.15: AM Peak -2040 Hard Shoulder Running- Intersection Delay and Level of Service

				EB Right	75	26	59	225	C		
	WB	53.0	D	WB Left	11	57	34	116	E		
				WB Through	31	267	34	116	F		
				WB Right	142	6	34	116	A		
16- MD 118 at Seneca Meadows Pkwy											
16	NB	3.5	A	NB Left	113	11	1	81	B	6.3	A
				NB Through	739	3	4	131	A		
				NB Right	60	1	9	184	A		
	SB	4.2	A	SB Left	31	4	7	236	A		
				SB Through	951	4	11	237	A		
				SB Right	42	2	13	269	A		
	EB	18.8	B	EB Left	20	66	11	69	E		
				EB Through	7	81	11	69	F		
				EB Right	119	7	11	69	A		
	WB	45.6	D	WB Left	36	74	18	105	E		
				WB Through	6	54	12	103	D		
				WB Right	28	8	16	111	A		
17- MD 118 at I-270 NB on ramp											
17	NB			NB Left	0	0	0	0	A	10.2	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	30.5	C	EB Left	267	30	31	195	C		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	5.3	A	WB Left	0	0	0	0	A		
				WB Through	183	1	0	0	A		
				WB Right	925	6	15	303	A		
18- MD 118 at I-270 SB off ramp											
18	NB			NB Left	0	0	0	0	A	7.4	A
				NB Through	0	0.0	0	0	A		
				NB Right	0	0.0	0	0	A		
	SB	40.8	D	SB Left	201	40.8	34	172	D		
				SB Through	0	0.0	0	0	A		
				SB Right	0	0.0	0	0	A		
	EB	3.6	A	EB Left	0	0.0	0	0	A		
				EB Through	629	3.6	5	170	A		
				EB Right	0	0.0	0	0	A		
	WB	4.1	A	WB Left	0	0.0	0	0	A		
				WB Through	1297	4.1	9	196	A		
				WB Right	0	0.0	0	0	A		
19- MD 118 at Aircraft Dr											
19	NB	43.8	D	NB Left	9	83	9	63	F	20.3	C
				NB Through	13	77	9	63	E		
				NB Right	19	2	0	23	A		
	SB	61.0	E	SB Left	264	55	113	416	E		
				SB Through	54	73	113	416	E		
				SB Right	97	70	113	416	E		
	EB	12.4	B	EB Left	129	16	37	316	B		
				EB Through	1023	12	37	316	B		
				EB Right	33	13	37	316	B		
	WB	14.8	B	WB Left	88	26	48	304	C		
				WB Through	1111	17	48	304	B		
				WB Right	331	6	48	304	A		
20- Middlebrook Rd at Observation Dr											
	NB			NB Left	0	0	0	0	A		
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	20.5	C	SB Left	27	35	5	65	C		
				SB Through	0	0	0	0	A		

Table C.15: AM Peak -2040 Hard Shoulder Running- Intersection Delay and Level of Service

20	EB	13.4	B	SB Right	26	6	5	65	A	15.6	B
				EB Left	214	20	25	237	C		
				EB Through	764	12	25	237	B		
				EB Right	0	0	0	0	A		
	WB	17.0	B	WB Left	0	0	0	0	A		
				WB Through	1138	18	70	369	B		
				WB Right	284	14	94	418	B		

Table C.15: AM Peak -2040 Hard Shoulder Running- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
21- Middlebrook Rd at I-270 SB on ramp											
21	NB			NB Left	0	0	0	0	A	21.1	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	14.2	B	EB Left	0	0	0	0	A		
				EB Through	649	14	28	190	B		
				EB Right	0	0	0	0	A		
	WB	27.0	C	WB Left	757	27	118	900	C		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
22- Middlebrook Rd at Waring Station Rd											
22	NB	276.5	F	NB Left	110	206	415	492	F	101.8	F
				NB Through	4	225	415	492	F		
				NB Right	211	314	415	492	F		
	SB	18.3	B	SB Left	3	38	1	30	D		
				SB Through	0	0	1	30	A		
				SB Right	5	7	2	67	A		
	EB	115.2	F	EB Left	26	34	961	1293	C		
				EB Through	1260	117	961	1293	F		
				EB Right	68	115	961	1293	F		
	WB	17.9	B	WB Left	87	22	34	228	C		
				WB Through	759	18	34	228	B		
				WB Right	41	5	34	228	A		
23- MD 124 at MD 355											
23	NB	51.7	D	NB Left	224	69	86	258	E	82.6	F
				NB Through	388	49	83	256	D		
				NB Right	56	3	0	0	A		
	SB	83.4	F	SB Left	67	155	402	786	F		
				SB Through	1233	109	402	786	F		
				SB Right	594	22	155	709	C		
	EB	55.0	E	EB Left	619	131	460	1149	F		
				EB Through	513	19	460	1149	B		
				EB Right	574	5	274	1127	A		
	WB	116.1	F	WB Left	0	0	0	0	A		
				WB Through	1924	118	711	1107	F		
				WB Right	59	67	0	0	E		
24- MD 124 at I-270 SB on and off											
24	NB	66.7	F	NB Left	16	62	20	93	E	22.4	C
				NB Through	39	69	20	93	E		
				NB U-Turn	0	0	0	0	A		
	SB	25.8	C	SB Left	276	65	74	302	E		
				SB Through	11	66	74	302	E		
				SB Right	581	6	12	286	A		
	EB	16.6	B	EB Left	0	0	0	0	A		
				EB Through	1044	17	51	425	B		
				EB Right	69	12	61	449	B		
	WB	23.1	C	WB Left	49	28	250	1255	C		
				WB Through	1262	23	250	1255	C		
				WB Right	0	0	0	0	A		
25- MD 117 at MD 124											
25	NB	49.5	D	NB Left	20	126	147	704	F	47.3	D
				NB Through	533	64	147	704	E		
				NB Right	443	29	73	691	C		
	SB	45.1	D	SB Left	180	65	208	824	E		
				SB Through	1070	46	208	824	D		
				SB Right	131	9	0	0	A		
	EB Left	101	115	210	808	F					

Table C.15: AM Peak -2040 Hard Shoulder Running- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
	EB	52.6	D	EB Through	1470	49	209	809	D		
				EB Right	82	43	223	836	D		
	WB	38.9	D	WB Left	331	69	108	371	E		
				WB Through	504	27	108	371	C		
				WB Right	103	0	0	0	A		
26- MD 117 at Bureau Dr											
26	NB	53.2	D	NB Left	24	69	20	122	E	40.5	D
				NB Through	23	72	20	122	E		
				NB Right	27	23	20	122	C		
	SB	183.1	F	SB Left	206	182	229	405	F		
				SB Through	54	200	229	405	F		
				SB Right	31	161	229	405	F		
	EB	34.4	C	EB Left	31	26	256	964	C		
				EB Through	2031	35	262	964	C		
				EB Right	31	39	255	954	D		
	WB	20.8	C	WB Left	311	65	134	569	E		
				WB Through	879	11	135	570	B		
WB Right				326	6	109	618	A			
27- MD 117 at I-270 SB off ramp											
27	NB			NB Left	0	0	0	0	A	8.8	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	1.8	A	EB Left	0	0	0	0	A		
				EB Through	844	2	1	155	A		
				EB Right	0	0	0	0	A		
	WB	26.8	D	WB Left	326	27	55	321	D		
				WB Through	0	0	0	0	A		
WB Right				0	0	0	0	A			
28- MD 117 at I-270 NB off ramp											
28	NB			NB Left	0	0	0	0	A	41.5	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	72.2	E	SB Left	308	66	534	1605	E		
				SB Through	0	0	0	0	A		
				SB Right	948	74	539	1607	E		
	EB	21.7	C	EB Left	15	123	86	789	F		
				EB Through	827	20	86	789	B		
				EB Right	0	0	0	0	A		
	WB	17.2	B	WB Left	0	0	0	0	A		
				WB Through	899	17	69	365	B		
WB Right				9	4	76	396	A			
29- MD 117 at Perry Pkwy											
29	NB	42.8	D	NB Left	36	72	17	126	E	16.1	B
				NB Through	8	58	16	125	E		
				NB Right	38	12	27	146	B		
	SB	48.6	D	SB Left	111	96	59	221	F		
				SB Through	14	99	59	221	F		
				SB Right	130	3	59	221	A		
	EB	10.3	B	EB Left	125	69	45	301	E		
				EB Through	996	3	45	301	A		
				EB Right	9	3	32	285	A		
	WB	11.6	B	WB Left	8	78	22	284	E		
				WB Through	739	12	22	284	B		
WB Right				133	6	22	284	A			
30- Shady Grove Rd at I-270 NB off ramp											
	NB	8.4	A	NB Left	0	0	0	0	A		
				NB Through	977	8	19	255	A		

Table C.15: AM Peak -2040 Hard Shoulder Running- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS	
30	SB	10.7	B	NB Right	0	0	0	0	A	25.0	C	
				SB Left	0	0	0	0	A			
				SB Through	1344	11	35	327	B			
				SB Right	0	0	0	0	A			
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
					WB Left	1039	59	219	690			E
	WB	59.3		E	WB Through	0	0	0	0			A
					WB Right	0	0	0	0			A

Table C.15: AM Peak -2040 Hard Shoulder Running- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
31- Shady Grove Rd at I-270 SB off ramp											
31	NB	14.5	B	NB Left	0	0	0	0	A	20.8	C
				NB Through	993	15	40	334	B		
				NB Right	0	0	0	0	A		
	SB	11.2	B	SB Left	0	0	0	0	A		
				SB Through	1752	11	46	674	B		
				SB Right	0	0	0	0	A		
	EB	45.7	D	EB Left	308	41	44	269	D		
				EB Through	0	0	0	0	A		
				EB Right	621	48	99	407	D		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
32- MD 28 at I-270 SB off ramp											
32	NB			NB U-Turn	0	0	0	0	A	8.6	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	34.6	C	SB Left	414	42	63	271	D		
				SB Through	0	0	0	0	A		
				SB Right	99	3	0	63	A		
	EB	3.4	A	EB Left	0	0	0	0	A		
				EB Through	1512	1	0	0	A		
				EB Right	966	7	18	246	A		
	WB	8.4	A	WB Left	0	0	0	0	A		
				WB Through	2007	8	40	407	A		
				WB Right	0	0	0	0	A		
33- MD 28 at I-270 on and off ramps											
33	NB	37.3	D	NB Left	0	0	61	303	A	25.7	C
				NB Through	219	53	70	312	D		
				NB Right	146	14	70	312	B		
	SB	25.6	C	SB Left	29	64	30	217	E		
				SB Through	0	0	0	0	A		
				SB Right	311	22	30	217	C		
	EB	31.7	C	EB Left	298	59	130	684	E		
				EB Through	991	23	130	684	C		
				EB Right	0	0	0	0	A		
	WB	13.7	B	WB Left	28	14	49	311	B		
				WB Through	973	14	35	275	B		
				WB Right	0	0	0	0	A		
34- MD 189 at Great Falls Rd											
34	NB	36.2	D	NB Left	67	40	15	109	D	11.1	B
				NB Through	9	38	12	109	D		
				NB Right	10	6	13	120	A		
	SB	5.9	A	SB Left	83	44	23	184	D		
				SB Through	7	47	23	184	D		
				SB Right	625	0	0	0	A		
	EB	11.5	B	EB Left	325	17	16	245	B		
				EB Through	944	9	20	248	A		
				EB Right	14	6	29	285	A		
	WB	14.2	B	WB Left	5	19	21	203	B		
				WB Through	329	14	21	202	B		
				WB Right	11	10	33	236	B		
35- MD 189 at I-270 Ramps											
35	NB	50.9	D	NB Left	144	51	28	138	D	46.2	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	50.0	D	SB Left	185	50	57	361	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
			EB Left	413	26	94	802	C			

Table C.15: AM Peak -2040 Hard Shoulder Running- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
	EB	32.7	C	EB Through	539	38	94	802	D		
				EB Right	0	0	0	A			
	WB	59.8	E	WB Left	560	49	144	445	D		
				WB Through	285	81	144	445	F		
				WB Right	0	0	0	A			
36- MD 189 at Wooton Pkwy											
36	NB	44.3	D	NB Left	154	51	59	239	D	73.6	E
				NB Through	126	57	59	239	E		
				NB Right	157	28	59	239	C		
	SB	88.9	F	SB Left	443	108	394	803	F		
				SB Through	794	79	359	790	E		
				SB Right	0	0	0	A			
	EB	84.9	F	EB Left	163	104	403	1016	F		
				EB Through	964	86	403	1016	F		
				EB Right	127	52	403	1016	D		
	WB	50.7	D	WB Left	432	70	128	312	E		
				WB Through	389	36	128	312	D		
				WB Right	61	6	128	312	A		
37- Montrose Rd at Tower Oaks Blvd											
37	NB			NB Left	0	0	0	0	A	82.4	F
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	195.6	F	SB Left	163	45	1071	1397	D		
				SB Through	0	0	0	0	A		
				SB Right	606	236	1066	1392	F		
	EB	29.1	C	EB Left	30	42	195	1179	D		
				EB Through	1648	29	195	1179	C		
				EB Right	0	0	0	0	A		
	WB	83.9	F	WB Left	0	0	0	0	A		
WB Through				1738	86	442	852	F			
WB Right				83	32	442	852	C			
38- Tower Oaks Blvd at I-270 off ramp											
38	NB	21.5	C	NB Left	543	22	37	206	C	54.1	D
				NB Through	11	17.5	30	198	B		
				NB Right	29	20.5	37	206	C		
	SB	3.0	A	SB Left	1	8.9	0	22	A		
				SB Through	0	0.0	0	22	A		
				SB Right	3	1.1	0	0	A		
	EB	82.1	F	EB Left	9	69.2	285	452	E		
				EB Through	745	82.7	285	452	F		
				EB Right	114	78.7	277	442	E		
	WB	10.4	B	WB Left	0	0.0	4	74	A		
				WB Through	106	10.8	4	74	B		
				WB Right	8	4.8	0	16	A		
39- Montrose Rd at Tower Oaks Blvd											
39	NB	16.6	B	NB Left	35	74	41	178	E	51.1	D
				NB Through	246	45	41	178	D		
				NB Right	559	0	0	0	A		
	SB	40.6	D	SB Left	331	52	167	622	D		
				SB Through	777	37	166	621	D		
				SB Right	75	29	139	664	C		
	EB	94.6	F	EB Left	80	82	444	730	F		
				EB Through	981	96	446	731	F		
				EB Right	61	94	467	754	F		
	WB	41.8	D	WB Left	405	51	89	283	D		
				WB Through	254	48	89	283	D		
				WB Right	148	8	104	314	A		
40- Rockledge Blvd at I-270 NB on and off ramp											
	NB	33.4	C	NB Left	0	0	0	0	A		
				NB Through	90	35	33	145	D		

Table C.15: AM Peak -2040 Hard Shoulder Running- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
40	SB	2.2	A	NB Right	217	33	33	145	C	16.3	B
				SB Left	0	0	5	63	A		
				SB Through	976	2	5	63	A		
				SB Right	0	0	0	0	A		
	EB	24.0	C	EB Left	7	46	109	401	D		
				EB Through	521	49	109	401	D		
				EB Right	562	1	0	0	A		
				WB Left	0	0	0	0	A		
	WB			WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table C.15: AM Peak -2040 Hard Shoulder Running- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
41- Rockledge Blvd at I-270 SB on and off ramps											
41	NB	3.0	A	NB Left	98	3	1	42	A	21.5	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	22.7	C	WB Left	976	24	102	658	C		
				WB Through	433	21	102	658	C		
				WB Right	0	0	0	0	A		
42- MD 187 at Tuckerman Ln											
42	NB	64.9	E	NB Left	229	29	299	923	C	154.8	F
				NB Through	1483	62	299	923	E		
				NB Right	211	125	299	923	F		
	SB	217.8	F	SB Left	59	158	2598	2708	F		
				SB Through	1243	217	2598	2708	F		
				SB Right	167	244	2598	2708	F		
	EB	185.7	F	EB Left	221	126	1858	1980	F		
				EB Through	619	205	1860	1981	F		
				EB Right	132	194	1883	2005	F		
	WB	195.3	F	WB Left	697	237	1929	2146	F		
				WB Through	386	158	1929	2146	F		
				WB Right	155	101	1929	2146	F		
43- MD 187 at I-270 NB on and off ramps											
43	NB	10.8	B	NB Left	163	78	56	256	E	18.5	B
				NB Through	1533	4	56	256	A		
				NB Right	0	0	0	0	A		
	SB	24.3	C	SB Left	0	0	0	0	A		
				SB Through	1541	24	80	523	C		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	48.8	D	WB Left	129	50	40	266	D		
				WB Through	11	40	40	266	D		
				WB Right	0	0	0	0	A		
44- MD 187 at I-270 NB on and off ramps											
44	NB	23.9	C	NB Left	0	0	0	0	A	24.7	C
				NB Through	1481	24	68	397	C		
				NB Right	0	0	0	0	A		
	SB	6.8	A	SB Left	178	43	52	230	D		
				SB Through	1492	3	52	230	A		
				SB Right	0	0	0	0	A		
	EB	77.3	E	EB Left	222	62	187	769	E		
				EB Through	0	0	187	769	A		
				EB Right	367	87	211	757	F		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
45- MD 187 at Rock Spring Dr											
45	NB	15.0	B	NB Left	252	56	68	303	E	20.7	C
				NB Through	1381	8	68	304	A		
				NB Right	10	6	91	337	A		
	SB	21.8	C	SB Left	12	31	97	579	C		
				SB Through	1685	24	97	579	C		
				SB Right	148	1	61	574	A		
				EB Left	194	58	54	222	E		

Table C.15: AM Peak -2040 Hard Shoulder Running- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
	EB	36.9	D	EB Through	26	52	54	222	D		
				EB Right	254	20	54	222	B		
	WB	7.4	A	WB Left	0	-1	1	25	A		
				WB Through	9	11	1	25	B		
				WB Right	5	0	0	0	A		
47-Democracy Blvd at I-270 NB off ramp											
47	NB	29.7	C	NB Left	225	30	25	162	C	13.9	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	13.3	B	EB Left	0	0	0	0	A		
				EB Through	1662	13	54	479	B		
				EB Right	0	0	0	0	A		
	WB	10.5	B	WB Left	0	0	0	0	A		
				WB Through	788	11	23	193	B		
WB Right				0	0	0	0	A			
48- Democracy Blvd at I-270 SB on ramp											
48	NB			NB Left	0	0	0	0	A	6.4	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	5.3	A	EB Left	0	0	0	0	A		
				EB Through	1778	5	22	270	A		
				EB Right	0	0	0	0	A		
	WB	8.3	A	WB Left	219	36	31	171	D		
				WB Through	790	1	20	150	A		
WB Right				0	0	0	0	A			
49- Democracy Blvd at I-270 SB off ramp											
49	NB			NB Left	0	0	0	0	A	11.9	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	33.3	C	SB Left	327	49	57	254	D		
				SB Through	0	0	0	0	A		
				SB Right	165	2	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	2.6	A	WB Left	0	0	0	0	A		
				WB Through	790	3	4	129	A		
WB Right				341	2	1	173	A			
50- MD 190 at Burdette Rd											
50	NB	74.3	E	NB Left	18	80	14	123	E	13.2	B
				NB Through	4	70	14	123	E		
				NB Right	11	67	14	123	E		
	SB	34.9	C	SB Left	50	80	32	157	E		
				SB Through	17	63	32	157	E		
				SB Right	121	12	32	157	B		
	EB	10.7	B	EB Left	52	98	60	516	F		
				EB Through	1783	8	58	515	A		
				EB Right	15	5	49	539	A		
	WB	12.2	B	WB Left	1	106	60	824	F		
				WB Through	1509	12	61	824	B		
WB Right				21	2	55	853	A			

Table C.15: AM Peak -2040 Hard Shoulder Running- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
51- MD 190 at I-270 NB on ramp											
51	NB			NB Left	0	0	0	0	A	59.0	E
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	137.1	F	EB Left	542	137	390	809	F		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	16.6	B	WB Left	0	0	0	0	A		
				WB Through	1000	17	78	733	B		
				WB Right	0	0	0	0	A		
52- MD 190 at I-270 SB off ramp											
52	NB	77.2	E	NB Left	240	77	1486	3338	E	13.6	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	3.9	A	EB Left	0	0	0	0	A		
				EB Through	990	4	10	208	A		
				EB Right	0	0	0	0	A		
	WB	5.1	A	WB Left	0	0	0	0	A		
				WB Through	671	5	7	150	A		
				WB Right	0	0	0	0	A		
53- MD 190 at Seven Locks Rd											
53	NB	67.2	E	NB Left	20	64	24	151	E	44.1	D
				NB Through	62	68	26	151	E		
				NB Right	0	0	0	0	A		
	SB	58.3	E	SB Left	633	58	194	857	E		
				SB Through	187	60	195	857	E		
				SB Right	18	55	194	857	E		
	EB	37.0	D	EB Left	25	27	134	592	C		
				EB Through	845	37	134	592	D		
				EB Right	44	40	134	592	D		
	WB	35.9	D	WB Left	118	103	106	350	F		
				WB Through	636	32	109	353	C		
				WB Right	156	1	1	97	A		
54- MD 124 at I-270 NB off ramp											
54	NB	39.6	D	NB Left	0	0	0	0	A	26.0	C
				NB Through	0	0	0	0	A		
				NB Right	781	40	106	454	D		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	14.5	B	EB Left	0	0	0	0	A		
				EB Through	929	15	32	326	B		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
55- Democracy Blvd at I-270 NB off ramp											
55	NB	37.5	D	NB Left	0	0	0	0	A	16.6	B
				NB Through	0	0	0	0	A		
				NB Right	960	38	119	582	D		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
			EB Left	0	0	0	0	A			

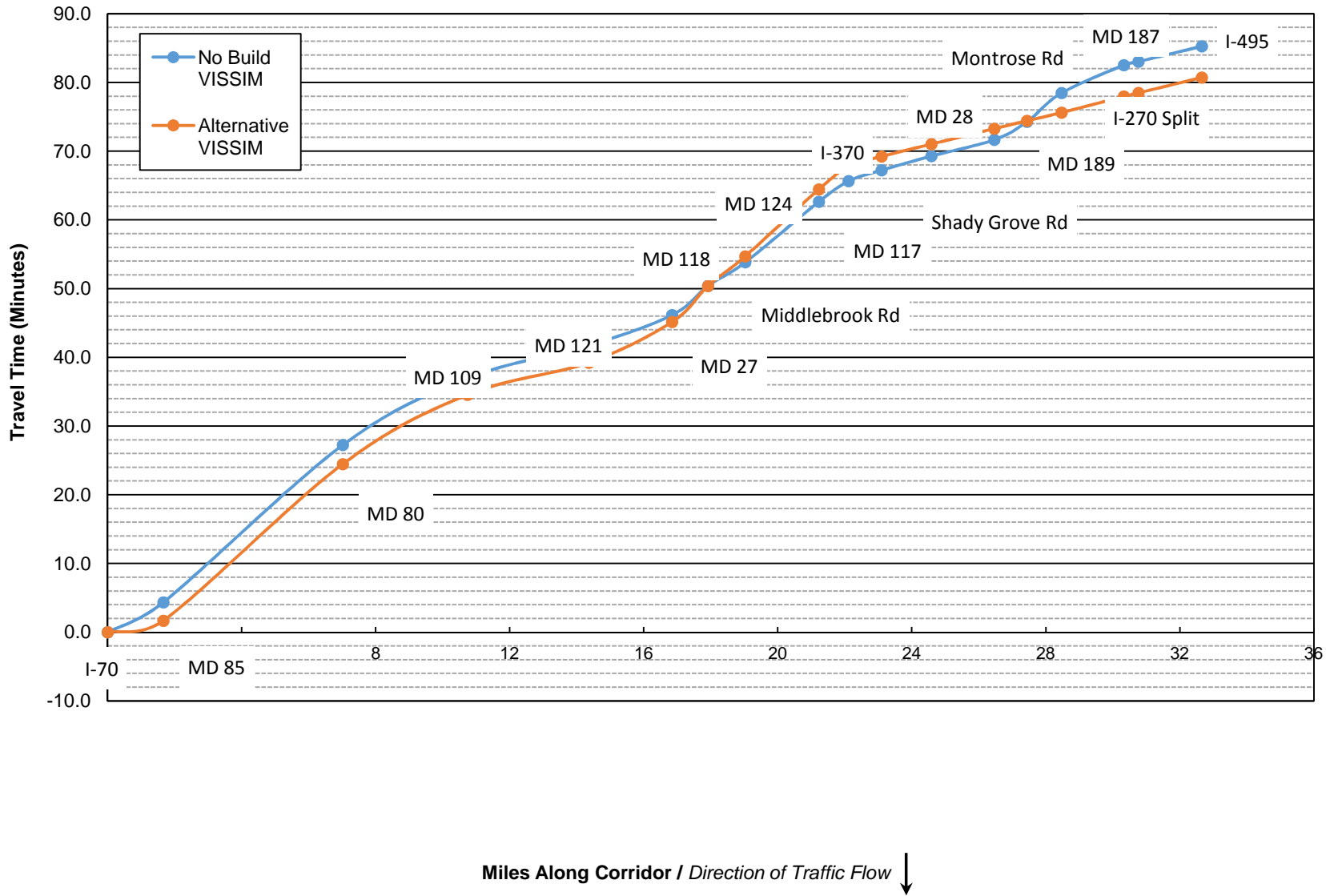
Table C.15: AM Peak -2040 Hard Shoulder Running- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
	EB	4.5	A	EB Through	1662	4	19	92	A		
				EB Right	0	0	0	0	A		
	WB	WB Left	0	0	0	0	A				
		WB Through	0	0	0	0	A				
		WB Right	0	0	0	0	A				
56- Watkins Mill Rd at I-270 SB off ramp/Parkview Ave											
56	NB	863.4	F	NB Left	44	234	676	721	F	183.7	F
				NB Through	0	0	0	0	A		
				NB Right	94	1158	676	721	F		
	SB	SB Left	558	95	2436	5045	F				
		SB Through	131	82	2436	5045	F				
		SB Right	445	35	2436	5045	C				
	EB	EB Left	0	0	0	0	A				
		EB Through	527	520	1148	1230	F				
		EB Right	3	505	1148	1230	F				
	WB	WB Left	133	87	142	492	F				
		WB Through	880	36	140	491	D				
		WB Right	0	0	0	0	A				
57- Watkins Mill Rd at I-270 NB on ramp											
57	NB	34.8	C	NB Left	422	45	103	442	D	64.3	E
				NB Through	0	0	0	0	A		
				NB Right	523	27	103	442	C		
	SB	SB Left	0	0	0	0	A				
		SB Through	0	0	0	0	A				
		SB Right	0	0	0	0	A				
	EB	EB Left	186	71	58	346	E				
		EB Through	757	9	58	346	A				
		EB Right	0	0	0	0	A				
	WB	WB Left	0	0	0	0	A				
		WB Through	1148	122	595	867	F				
		WB Right	203	75	595	867	E				
58- Watkins Mill Rd at I-270 SB on ramp											
58	NB			NB Left	0	0	0	0	A	47.8	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	SB Left	0	0	0	0	A				
		SB Through	0	0	0	0	A				
		SB Right	0	0	0	0	A				
	EB	EB Left	0	0	0	0	A				
		EB Through	958	27	455	619	C				
		EB Right	213	276	455	619	F				
	WB	WB Left	563	78	147	509	E				
		WB Through	1018	3	147	509	A				
		WB Right	0	0	0	0	A				

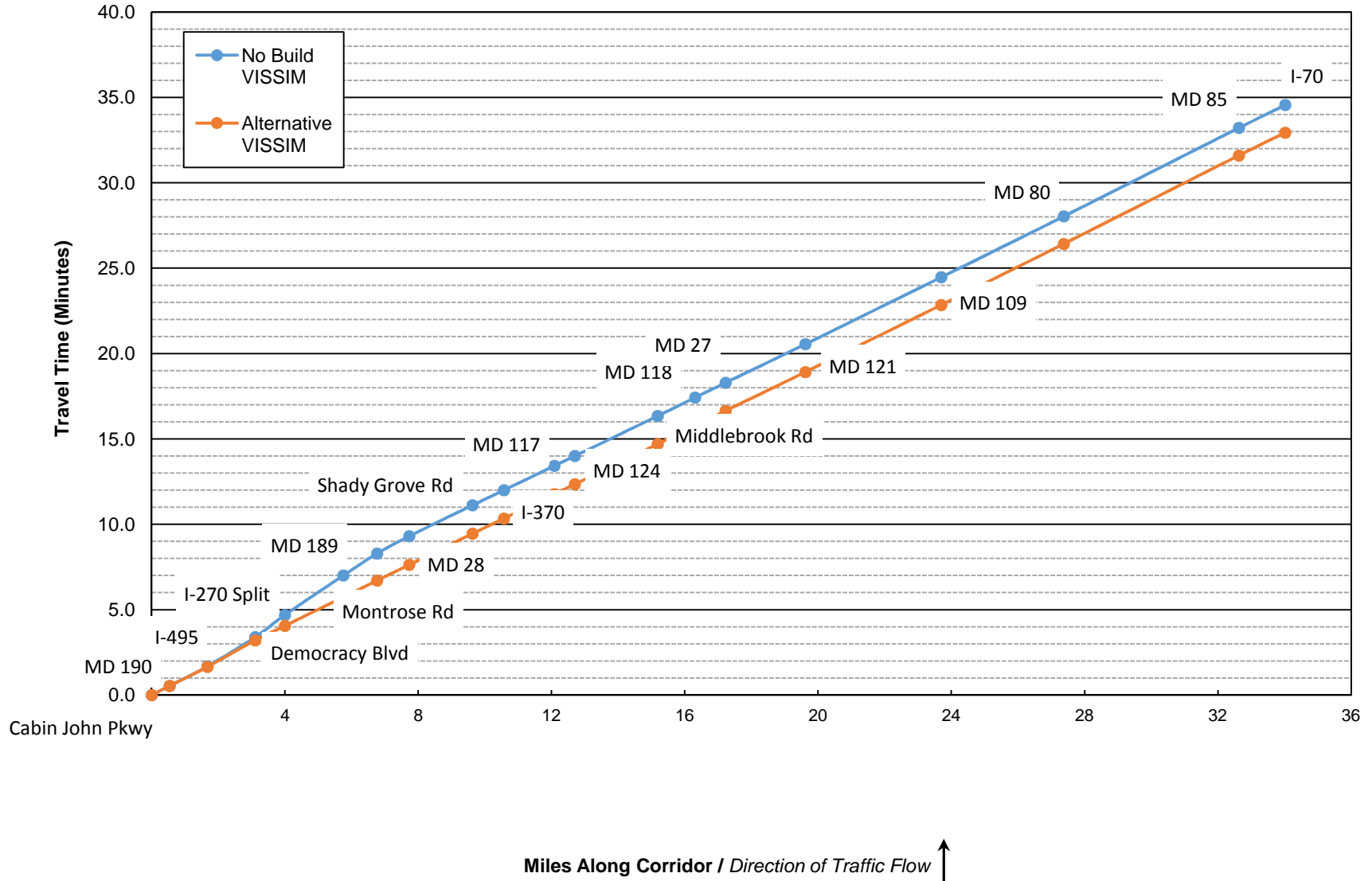
Table C.16: AM Peak -2040 Hard Shoulder Running- I-270 Vehicle Network P

	No Build	HSR- Alternative	% Change
Total Delay	35,032,576	25,737,836	-27%
Average Delay per Vehicle	326	233	-28%
Total Travel Time	64,317,886	56,499,525	-12%
Vehicles (Arrived)	87,894	93,550	6%
Latent Demand	44,530	40,664	-9%
Latent Delay	120,600,723	115,384,506	-4%
Total Distance	463,125	486,877	5%
Average Speed	26	31	19%

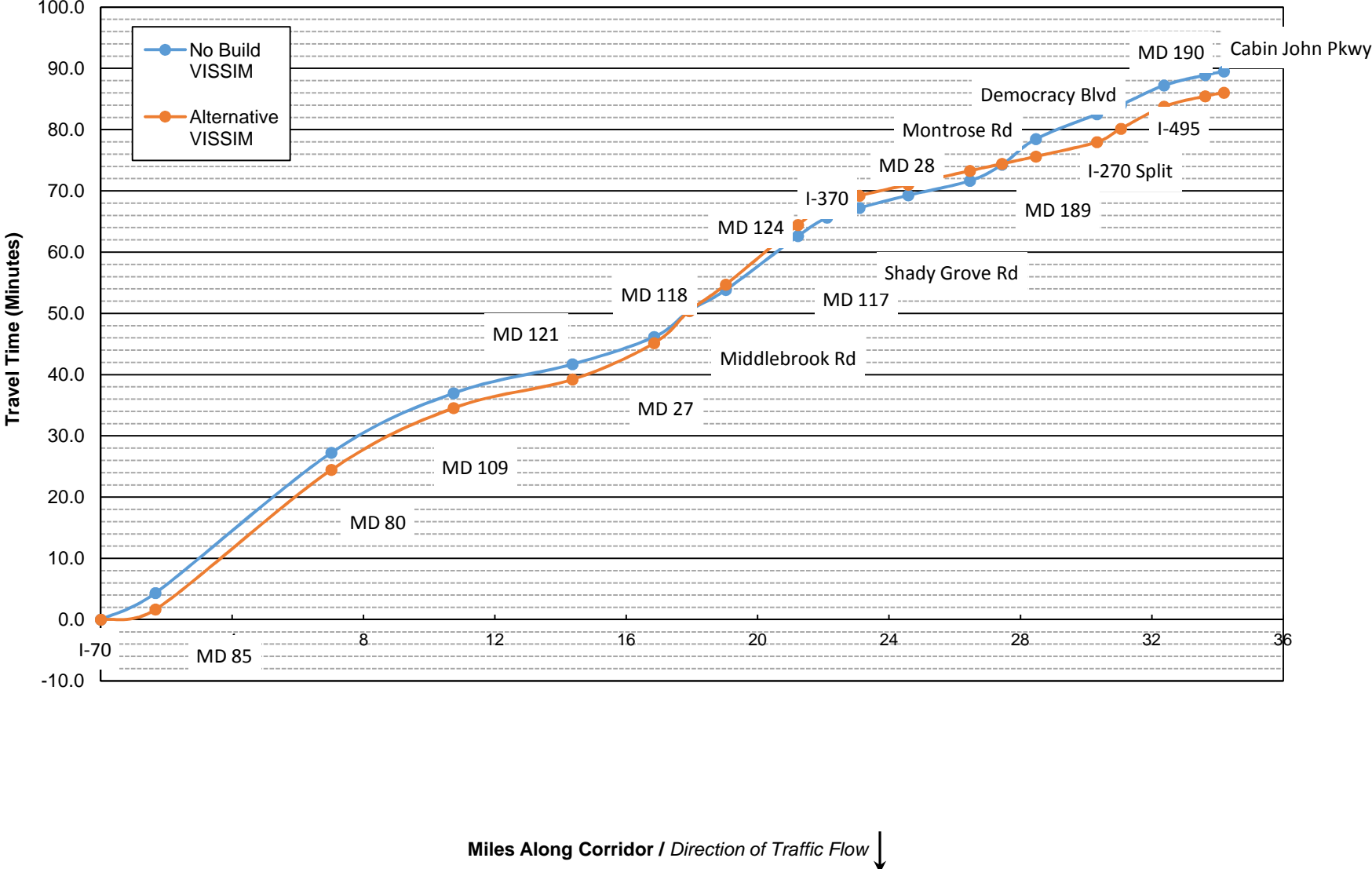
**Figure C.2: AM Peak - 2040 Hard Shoulder Running
I-270 Travel Time Graph - Southbound**



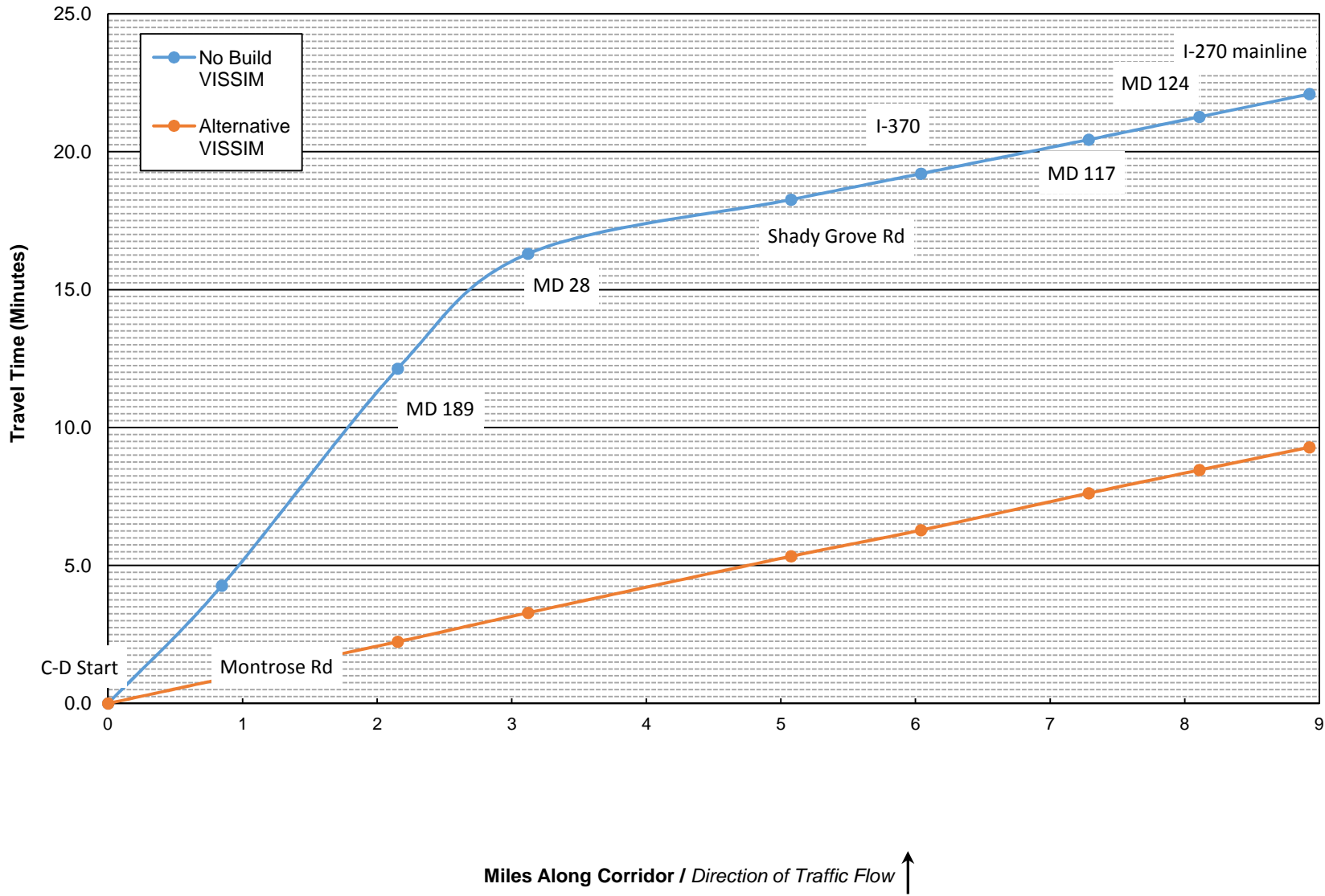
**Figure C.3: AM Peak - 2040 Hard Shoulder Running
I-270 Spur Travel Time Graph - Northbound**



**Figure C.4: AM Peak - 2040 Hard Shoulder Running
I-270 Spur Travel Time Graph - Southbound**



**Figure C.5: AM Peak - 2040 Hard Shoulder Running
I-270 Local Travel Time Graph - Northbound**



**Figure C.6: AM Peak - 2040 Hard Shoulder Running
I-270 Local Travel Time Graph - Southbound**

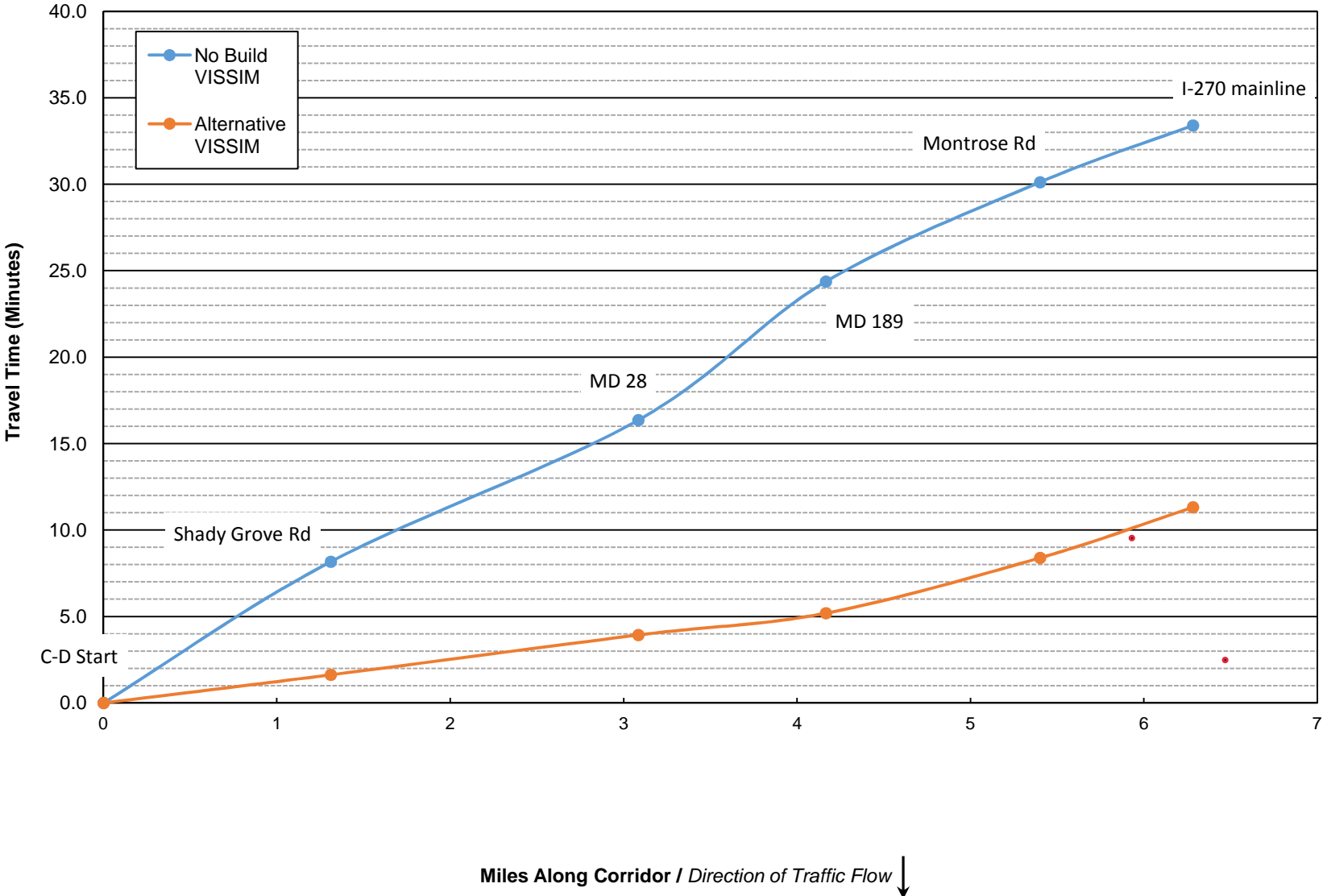


Table D.1: PM Peak 2040 Hard Shoulder Running-I-270 Vehicle Travel Time

I-270 Northbound	Segment Length (miles)	No Build VISSIM Travel Time (seconds)	HSR VISSIM Travel Time (seconds)	% Change	I-270 Southbound	Segment Length (miles)	No Build VISSIM Travel Time (seconds)	HSR VISSIM Travel Time (seconds)	% Change
From I-495 interchange					From I-70				
to MD 187	1.8	432.3	429.4	-0.7%	to MD 85	1.7	94.6	94.6	0.0%
to I-270 Split	0.6	90.3	89.9	-0.4%	to MD 80	5.4	307.1	306.5	0.2%
to Montrose Rd	1.8	115.8	114.3	-1.4%	to MD 109	3.7	210.7	211.6	-0.4%
to MD 189	1.0	76.0	66.2	-12.9%	to MD 121	3.6	204.4	204.6	-0.1%
to MD 28	1.0	92.5	67.1	-27.4%	to MD 27	2.5	146.4	146.2	0.1%
to Shady Grove Rd	1.9	211.0	132.1	-37.4%	to MD 118	1.1	65.1	65.2	-0.1%
to I-370	0.9	185.6	105.2	-43.3%	to Middlebrook Rd	1.1	71.2	71.2	-0.1%
to MD 117	1.5	158.7	123.7	-22.1%	to MD 124	2.2	137.5	137.5	0.0%
to MD 124	0.6	38.8	39.1	1.0%	to MD 117	0.9	117.3	120.9	-3.0%
to Middlebrook Rd	2.5	214.3	171.2	-20.1%	to I-370	1.0	72.5	80.8	-11.5%
to MD 118	1.1	80.3	86.9	8.1%	to Shady Grove Rd	1.5	83.4	83.1	0.4%
to MD 27	0.9	69.9	134.1	91.9%	to MD 28	1.9	114.1	113.7	0.3%
to MD 121	2.4	161.1	290.8	80.5%	to MD 189	1.0	62.7	62.8	-0.2%
to MD 109	4.1	337.8	392.4	16.2%	to Montrose Rd	1.0	64.8	64.9	-0.2%
to MD 80	3.7	247.0	246.0	-0.4%	to I-270 Split	1.9	114.7	117.7	-2.6%
to MD 85	5.3	348.1	349.0	0.2%	to MD 187	0.4	23.0	23.1	-0.4%
to I-70	1.4	182.3	182.2	0.0%	to I-495 interchange	1.9	155.6	156.1	-0.3%
I-270 Total (miles/minutes)	32.4	50.7	50.3	-0.7%	I-270 Total (miles/minutes)	32.6	34.1	34.3	-0.8%
I-270 Spur Northbound					I-270 Spur Southbound				
From Cabin John Pkwy					From I-70				
to MD 190	0.5	125.4	130.1	3.7%	to I-270 Split	30.3	1,866.3	1,881.2	0.8%
to I-495	1.1	271.9	274.9	1.1%	to Democracy Blvd	0.7	183.2	186.6	1.9%
to Democracy Blvd	1.4	226.8	229.4	1.2%	to I-495	1.3	509.9	513.9	0.8%
to I-270 Split	0.9	76.4	76.4	0.0%	to MD 190	1.3	199.4	199.0	-0.2%
to I-70	30.0	2,519.1	2,500.2	-0.8%	to Cabin John Pkwy	0.6	164.4	163.3	-0.7%
I-270 Spur Total (miles/minutes)	34.0	53.7	53.5	-0.3%	I-270 Spur Total (miles/minutes)	34.2	48.7	49.1	0.7%

Table D.2: PM Peak - 2040 Hard Shoulder Running- I-270 Local Vehicle Travel Time

I-270 Northbound	Segment Length (miles)	No Build VISSIM Travel Time (seconds)	HSR VISSIM Travel Time (seconds)	% Change	I-270 Southbound	Segment Length (miles)	No Build VISSIM Travel Time (seconds)	HSR VISSIM Travel Time (seconds)	% Change
From C-D start					From C-D start				
to Montrose Rd	0.8	68.8	57.2	-16.8%	to Shady Grove	1.3	87.5	89.0	1.7%
to MD 189	1.3	212.1	198.1	-6.6%	to MD 28	1.8	120.3	120.8	0.4%
to MD 28	1.0	96.2	105.4	9.6%	to MD 189	1.1	80.2	107.3	33.8%
to Shady Grove	2.0	420.6	124.8	-70.3%	to Montrose	1.2	88.8	102.6	15.6%
to I-370	1.0	346.7	86.1	-75.2%	to I-270 mainline	0.9	59.7	60.0	0.5%
to MD 117	1.2	819.0	248.1	-69.7%					
to MD 124	0.8	1,033.2	79.7	-92.3%					
to I-270 mainline	0.8	555.0	91.4	-83.5%					
I-270 Local Total (miles/minutes)	8.9	59.2	16.5	-72.1%	I-270 Local Total (miles/minutes)	6.3	7.3	8.0	9.9%

Table D.3: PM Peak - 2040 Hard Shoulder Running- I-270 Vehicle Speed

I-270 Northbound	Segment Length (miles)	No Build VISSIM Speed (MPH)	HSR VISSIM Speed (MPH)	% Change	I-270 Southbound	Segment Length (miles)	No Build VISSIM Speed (MPH)	HSR VISSIM Speed (MPH)	% Change
From I-495 interchange					From I-70				
to MD 187	1.8	15.3	15.4	0.7%	to MD 85	1.7	63.3	63.3	0.0%
to I-270 Split	0.6	23.6	23.7	0.4%	to MD 80	5.4	62.8	62.9	0.2%
to Montrose Rd	1.8	54.5	55.3	1.4%	to MD 109	3.7	63.6	63.3	-0.4%
to MD 189	1.0	48.0	55.2	14.9%	to MD 121	3.6	63.8	63.7	-0.1%
to MD 28	1.0	37.5	51.7	37.8%	to MD 27	2.5	61.1	61.1	0.1%
to Shady Grove Rd	1.9	32.4	51.8	59.8%	to MD 118	1.1	59.3	59.3	-0.1%
to I-370	0.9	18.3	32.3	76.4%	to Middlebrook Rd	1.1	56.2	56.2	-0.1%
to MD 117	1.5	34.4	44.1	28.3%	to MD 124	2.2	57.5	57.5	0.0%
to MD 124	0.6	56.9	56.4	-1.0%	to MD 117	0.9	27.2	26.4	-2.9%
to Middlebrook Rd	2.5	41.8	52.3	25.1%	to I-370	1.0	48.9	43.9	-10.3%
to MD 118	1.1	50.2	46.5	-7.5%	to Shady Grove Rd	1.5	64.2	64.4	0.4%
to MD 27	0.9	47.2	24.6	-47.9%	to MD 28	1.9	59.1	59.3	0.3%
to MD 121	2.4	53.5	29.6	-44.6%	to MD 189	1.0	56.2	56.1	-0.2%
to MD 109	4.1	43.5	37.4	-13.9%	to Montrose Rd	1.0	57.4	57.2	-0.2%
to MD 80	3.7	53.6	53.8	0.4%	to I-270 Split	1.9	58.7	57.3	-2.5%
to MD 85	5.3	54.3	54.2	-0.2%	to MD 187	0.4	65.7	65.4	-0.4%
to I-70	1.4	27.1	27.1	0.0%	to I-495 interchange	1.9	43.7	43.6	-0.3%
I-270 Total (miles/minutes)	32.4	38.4	38.7	0.7%	I-270 Total (miles/minutes)	32.6	57.5	57.0	-0.7%
I-270 Spur Northbound					I-270 Spur Southbound				
From Cabin John Pkwy					From I-70				
to MD 190	0.5	15.5	14.9	-3.6%	to I-270 Split	30.3	58.5	58.1	-0.8%
to I-495	1.1	15.0	14.8	-1.1%	to Democracy Blvd	0.7	14.4	14.1	-1.8%
to Democracy Blvd	1.4	22.8	22.5	-1.2%	to I-495	1.3	9.3	9.2	-0.8%
to I-270 Split	0.9	42.0	42.1	0.0%	to MD 190	1.3	22.6	22.7	0.2%
to I-70	30.0	42.9	43.2	0.8%	to Cabin John Pkwy	0.6	12.5	12.6	0.7%
I-270 Spur Total (miles/minutes)	34.0	38.0	38.1	0.3%	I-270 Spur Total (miles/minutes)	34.2	42.1	41.8	-0.7%

Table D.4: PM Peak -2040 Hard Shoulder Running- I-270 Local Vehicle Speed

I-270 Northbound	No Build VISSIM Speed (MPH)	HSR VISSIM Speed (MPH)	% Change	I-270 Southbound	No Build VISSIM Speed (MPH)	HSR VISSIM Speed (MPH)	% Change
From C-D start				From C-D start			
to Montrose Rd	44.2	53.2	20.1%	to Shady Grove	53.9	53.0	-1.7%
to MD 189	22.2	23.7	7.1%	to MD 28	53.1	52.9	-0.4%
to MD 28	36.2	33.1	-8.8%	to MD 189	48.6	36.3	-25.3%
to Shady Grove	16.7	56.4	237.0%	to Montrose	50.1	43.3	-13.5%
to I-370	10.0	40.4	302.8%	to I-270 mainline	53.2	52.9	-0.5%
to MD 117	5.5	18.1	230.1%				
to MD 124	2.9	37.1	1196.0%				
to I-270 mainline	5.3	32.5	507.3%				
I-270 Local Total (miles/minutes)	9.1	32.5	258.4%	I-270 Local Total (miles/minutes)	51.8	47.2	-9.0%

Table D.5: PM Peak -2040 Hard Shoulder Running- I-270 Vehicle Density

I-270 Northbound	Type	No Build		HSR		% Change	I-270 Southbound	Type	No Build		HSR		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS			
I-270	Freeway	91	F	91	F	0%	I-270	Freeway	19	C	19	C	0%
I-270 Diverge to MD 187	Diverge	77	F	77	F	0%	I-270 Merge from WB I-70	Merge	17	B	17	B	0%
I-270	Freeway	84	F	84	F	-1%	I-270	Freeway	24	C	24	C	0%
I-270 Diverge to Rockledge Rd	Diverge	77	F	78	F	1%	I-270 Merge from EB I-70	Merge	16	B	16	B	0%
I-270	Freeway	85	F	85	F	-1%	I-270	Freeway	22	C	22	C	0%
I-270 Weave from MD 187 to I-270 HOV	Weave	57	F	57	F	0%	I-270 Diverge to SB MD 85	Diverge	23	C	23	C	0%
I-270 Lane Drop	Merge	65	F	64	F	-1%	I-270	Freeway	24	C	24	C	0%
I-270	Freeway	51	F	51	F	0%	I-270 Diverge to NB MD 85	Diverge	15	B	15	B	0%
I-270 Merge from I-270 Spur	Merge	37	E	37	E	0%	I-270	Freeway	19	C	19	C	0%
I-270 Weave from I-270 HOV to I-270 C-D	Weave	34	D	33	D	-3%	I-270 Merge from MD 85	Merge	20	C	20	B	-3%
I-270	Freeway	34	D	32	D	-7%	I-270	Freeway	25	C	25	C	0%
I-270 Diverge to C-D (MD 189)	Diverge	46	F	39	E	-16%	I-270 Diverge to MD 80	Diverge	17	B	17	B	0%
I-270	Freeway	46	F	32	D	-30%	I-270	Freeway	20	C	20	C	0%
I-270 Diverge to C-D (MD 28)	Diverge	62	F	39	E	-37%	I-270 Merge from MD 80	Merge	14	B	14	B	0%
I-270	Freeway	55	F	29	D	-47%	I-270	Freeway	23	C	23	C	0%
I-270 Merge from C-D (MD 189)	Merge	72	F	40	E	-45%	I-270 Diverge to MD 109	Diverge	12	B	12	B	0%
I-270 Diverge to C-D (Shady Grove Rd)	Diverge	77	F	41	F	-46%	I-270	Freeway	22	C	22	C	1%
I-270	Freeway	65	F	30	D	-55%	I-270 Merge from MD 109	Merge	13	B	14	B	5%
I-270 Weave from C-D (MD 28) to C-D (Shady Grove Rd)	Weave	90	F	36	E	-60%	I-270	Freeway	24	C	24	C	1%
I-270	Freeway	90	F	43	E	-52%	I-270 Diverge to SB Weigh Station	Diverge	12	B	12	B	1%
I-270 Merge from C-D (Shady Grove Rd)	Merge	124	F	60	F	-51%	I-270	Freeway	24	C	24	C	0%
I-270	Freeway	88	F	54	F	-39%	I-270 Merge from SB Weigh Station	Merge	12	B	12	B	0%
I-270 Merge from C-D (I-370)	Merge	155	F	78	F	-50%	I-270	Freeway	23	C	22	C	0%
I-270 Diverge to C-D (MD 117)	Diverge	159	F	78	F	-51%	I-270 Diverge to MD 121	Diverge	9	A	9	A	0%
I-270	Freeway	21	C	26	C	20%	I-270	Freeway	12	B	12	B	0%
I-270 Merge from C-D (MD 124)	Merge	47	F	30	D	-37%	I-270 Merge from WB MD 121	Merge	10	B	10	B	0%
I-270	Freeway	27	D	33	D	23%	I-270	Freeway	15	B	15	B	0%
I-270 Diverge to EB Middlebrook Rd	Diverge	20	B	28	D	42%	I-270 Merge from EB MD 121	Merge	13	B	13	B	-1%
I-270	Freeway	25	C	32	D	29%	I-270	Freeway	20	C	20	C	0%
I-270 Diverge to WB Middlebrook Rd	Diverge	20	C	30	D	47%	I-270 Diverge to MD 27	Diverge	13	B	13	B	-1%
I-270	Freeway	22	C	26	D	23%	I-270	Freeway	16	B	16	B	0%
I-270 Diverge to EB MD 118	Diverge	17	B	25	C	45%	I-270 Merge from WB MD 27	Merge	14	B	14	B	1%
I-270 Diverge to WB MD 118	Diverge	31	D	31	D	0%	I-270	Freeway	20	C	20	C	0%
I-270	Freeway	27	D	31	D	14%	I-270 Weave from EB MD 27 to MD 118	Weave	15	B	15	B	0%
I-270 Weave from MD 118 to MD 27	Weave	36	E	41	F	14%	I-270	Freeway	19	C	19	C	0%
I-270	Freeway	25	C	42	E	70%	I-270 Merge from WB MD 118	Merge	15	B	15	B	-1%
I-270 Merge from EB MD 27	Merge	36	E	41	F	14%	I-270	Freeway	22	C	22	C	0%
I-270	Freeway	26	C	89	F	247%	I-270 Merge from EB MD 118	Merge	18	B	19	B	3%
I-270 Merge from WB MD 27	Merge	22	C	43	F	101%	I-270	Freeway	28	D	28	D	0%
I-270	Freeway	28	D	56	F	101%	I-270 Merge from Middlebrook Rd	Merge	30	D	30	D	0%
I-270 Diverge to MD 121	Diverge	22	C	57	F	160%	I-270 Diverge to Watkins Mill Rd	Diverge	24	C	24	C	0%

Table D.5: PM Peak -2040 Hard Shoulder Running- I-270 Vehicle Density

I-270 Northbound	Type	No Build		HSR		% Change	I-270 Southbound	Type	No Build		HSR		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS	
I-270	Freeway	22	C	67	F	198%	I-270	Freeway	19	C	20	C	1%
I-270 Merge from EB MD 121	Merge	35	E	96	F	171%	I-270 Diverge to MD 124	Diverge	17	B	17	B	0%
I-270 Lane Drop	Merge	78	F	112	F	43%	I-270	Freeway	14	B	14	B	0%
I-270	Freeway	37	E	43	E	14%	I-270 Merge from Watkins Mill	Merge	17	B	17	B	0%
I-270 Diverge to NB Weigh Station	Diverge	18	B	19	B	4%	I-270	Freeway	58	F	59	F	2%
I-270	Freeway	36	E	38	E	4%	I-270 Merge from WB MD 124	Merge	96	F	97	F	1%
I-270 Merge from NB Weight Station	Merge	18	B	19	B	5%	I-270	Freeway	0	A	0	A	#DIV/0!
I-270	Freeway	38	E	39	E	3%	I-270 Merge from MD 117	Merge	39	E	43	F	10%
I-270 Diverge to MD 109	Diverge	22	C	22	C	1%	I-270	Freeway	28	D	30	D	8%
I-270	Freeway	34	D	35	D	3%	I-270 Diverge to I-370	Diverge	22	C	32	D	48%
I-270 Merge from MD 109	Merge	19	B	19	B	3%	I-270	Freeway	18	B	18	B	0%
I-270	Freeway	36	E	37	E	2%	I-270 Diverge to I-270 C-D	Diverge	14	B	14	B	-3%
I-270 Diverge to MD 80	Diverge	27	C	26	C	-5%	I-270	Freeway	14	B	13	B	-1%
I-270	Freeway	30	D	30	D	0%	I-270 Merge from I-270 (I-370)	Merge	21	C	20	C	-3%
I-270 Merge from MD 80	Merge	18	B	18	B	1%	I-270 Diverge to I-270 C-D (Shady Grove Rd)	Diverge	23	C	23	C	-1%
I-270	Freeway	36	E	36	E	1%	I-270	Freeway	19	C	19	C	0%
I-270 Diverge to Scenic View	Diverge	19	B	19	B	2%	I-270 Merge from I-270 C-D (Shady Grove Rd Northern)	Merge	18	B	19	B	3%
I-270	Freeway	36	E	37	E	2%	I-270	Freeway	23	C	24	C	2%
I-270 Merge from Scenic View	Merge	18	B	19	B	1%	I-270 Merge from I-270 C-D (Shady Grove Rd Southern)	Merge	18	B	19	B	3%
I-270	Freeway	36	E	36	E	1%	I-270 Diverge to I-270 C-D (MD 189)	Diverge	25	C	26	C	3%
I-270 Diverge to NB MD 85	Diverge	20	C	21	C	2%	I-270	Freeway	21	C	22	C	2%
I-270	Freeway	34	D	34	D	0%	I-270 Merge from I-270 C-D (MD 189)	Merge	20	C	21	C	2%
I-270 Diverge to SB MD 85	Diverge	20	C	20	B	-2%	I-270	Freeway	26	C	26	D	2%
I-270	Freeway	30	D	30	D	-1%	I-270 Merge from I-270 C-D	Merge	25	C	29	D	15%
I-270 Weave from MD 85 to I-70	Weave	22	C	22	C	0%	I-270 Diverge to I-270 HOV Lane	Diverge	17	B	19	B	8%
I-270	Freeway	64	F	64	F	0%	I-270 Diverge to I-270 Spur	Diverge	38	E	41	F	8%
							I-270	Freeway	13	B	13	B	2%
							I-270 Diverge to Rockledge Dr / MD 187	Diverge	9	A	9	A	-1%
							I-270	Freeway	13	B	13	B	1%
							I-270 Merge from Rockledge Dr	Merge	11	B	12	B	2%
							I-270	Freeway	16	B	16	B	2%
							I-270 Merge from Rockledge Dr / MD 187	Merge	14	B	14	B	1%
							I-270	Freeway	35	E	36	E	1%

Table D.6: PM Peak -2040 Hard Shoulder Running- I-270 Spur Vehicle Density

I-270 Spur Northbound	Type	No Build		HSR		% Change	I-270 Southbound	Type	No Build		HSR		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS			
I-270 Spur	Freeway	62	F	63	F	2%	I-270 Spur	Freeway	72	F	73	F	2%
I-270 Spur Merge from Clara Barton Parkway	Merge	64	F	65	F	1%	I-270 Spur Weave from I-270 HOV to Democracy Blvd	Weave	94	F	96	F	2%
I-270 Spur	Freeway	78	F	79	F	2%	I-270 Spur	Freeway	108	F	109	F	1%
I-270 Diverge to MD 190	Diverge	49	F	49	F	0%	I-270 Merge from Democracy Blvd	Merge	152	F	154	F	1%
I-270 Spur	Freeway	89	F	91	F	2%	I-270 Spur Lane Drop	Merge	144	F	146	F	1%
I-270 Spur Merge from Cabin John Parkway	Merge	105	F	106	F	1%	I-270 Spur	Freeway	125	F	125	F	0%
I-270 Spur Merge from MD 190	Merge	97	F	97	F	0%	I-270 Spur Merge from I-495	Merge	124	F	125	F	0%
I-270 Spur	Freeway	84	F	84	F	0%	I-270 Spur	Freeway	49	F	48	F	-1%
I-270 Spur Diverge to I-495	Merge	66	F	65	F	-2%	I-270 Spur Diverve to EB MD 190	Diverge	50	F	49	F	-1%
I-270 Spur	Freeway	45	F	46	F	2%	I-270 Spur Diverve to Cabin John Pkwy	Diverge	67	F	68	F	1%
I-270 Spur Diverge to Democracy Blvd	Diverge	50	F	50	F	0%	I-270 Spur	Freeway	95	F	95	F	-1%
I-270 Spur	Freeway	58	F	59	F	2%	I-270 Merge from MD 190	Merge	120	F	122	F	2%
I-270 Spur Merge from EB Democracy Blvd	Merge	97	F	99	F	2%	I-270 Spur	Freeway	93	F	94	F	0%
I-270 Spur	Freeway	58	F	58	F	1%	I-270 Diverge to WB Clara Barton Pkwy	Diverge	60	F	61	F	0%
I-270 Spur Merge from WB Democracy Blvd	Merge	65	F	66	F	0%	I-270 Spur	Freeway	83	F	83	F	0%
I-270 Spur	Freeway	39	E	38	E	-1%	I-270 Merge from Clara Barton Pkwy	Merge	77	F	76	F	0%
I-270 Spur Merge from Westlake Terrace	Merge	31	D	31	D	-1%							
I-270 Spur	Freeway	34	D	34	D	-1%							

Table D.7: PM Peak -2040 Hard Shoulder Running- I-270 Local Vehicle Density

I-270 Northbound	Type	No Build		HSR		% Change	I-270 Southbound	Type	No Build		HSR		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS			
I-270 C-D	Freeway	29	D	29	D	0%	I-270 C-D	Freeway	8	A	8	A	0%
I-270 C-D Diverge to EB Montrose Rd	Diverge	21	C	21	C	0%	I-270 C-D Weave from I-370 EB to I-270	Weave	23	B	22	B	-5%
I-270 C-D	Freeway	16	B	16	B	-2%	I-270 C-D Diverge to Shady Grove Rd	Diverge	11	B	11	B	0%
I-270 C-D Weave between Montrose Rd Loop Ramps	Weave	13	B	12	A	-9%	I-270 C-D	Freeway	8	A	8	A	0%
I-270 C-D	Freeway	28	D	18	B	-38%	I-270 C-D Merge from WB Shady Grove Rd	Merge	8	A	10	B	22%
I-270 C-D Merge from WB Montrose Rd	Merge	83	F	41	F	-50%	I-270 C-D	Freeway	14	B	15	B	14%
I-270 C-D	Freeway	67	F	48	F	-27%	I-270 C-D Merge from EB Shady Grove Rd	Merge	10	A	12	B	20%
I-270 C-D Merge from I-270	Merge	42	F	53	F	26%	I-270 C-D	Freeway	19	C	22	C	17%
I-270 C-D	Freeway	65	F	61	F	-6%	I-270 C-D Merge from I-270	Merge	18	B	21	C	17%
I-270 C-D Diverge to MD 189	Diverge	43	F	31	D	-27%	I-270 C-D Diverge to I-270	Diverge	25	C	29	D	14%
I-270 C-D	Freeway	91	F	71	F	-22%	I-270 C-D Diverge to I-270	Diverge	17	B	19	B	11%
I-270 C-D Merge from MD 189	Merge	112	F	72	F	-35%	I-270 C-D	Freeway	16	B	17	B	10%
I-270 C-D	Freeway	62	F	58	F	-5%	I-270 C-D Diverge to MD 28	Diverge	11	B	12	B	11%
I-270 C-D Weave between I-270 (to MD 28 from MD 189)	Weave	63	F	49	F	-22%	I-270 C-D	Freeway	11	A	12	B	10%
I-270 C-D	Freeway	42	E	50	F	19%	I-270 C-D Merge from WB MD 28	Merge	12	B	14	B	17%
I-270 C-D Diverge to MD 28	Diverge	18	B	20	B	11%	I-270 C-D	Freeway	14	B	15	B	11%
I-270 C-D	Freeway	28	D	31	D	11%	I-270 C-D Merge from EB MD 28	Merge	26	C	42	F	64%
I-270 C-D Weave between MD 28 Ramps	Weave	28	C	30	C	6%	I-270 C-D	Freeway	32	D	58	F	84%
I-270 C-D	Freeway	26	D	19	C	-28%	I-270 C-D Merge from I-270	Merge	20	B	38	E	94%
I-270 C-D Merge from MD 28 WB	Merge	28	C	14	B	-49%	I-270 C-D	Freeway	44	E	51	F	15%
I-270 C-D Merge from I-270 and Drop Lane	Merge	34	D	18	B	-46%	I-270 C-D Diverge to MD 189	Diverge	25	C	26	C	4%
I-270 C-D Diverge to I-270	Diverge	61	F	23	C	-62%	I-270 C-D	Freeway	27	D	32	D	17%
I-270 C-D	Freeway	48	F	20	C	-59%	I-270 C-D Merge from MD 189	Merge	27	C	32	D	17%
I-270 C-D Diverge to Shady Grove Rd	Diverge	14	B	13	B	-9%	I-270 C-D Diverge to I-270	Diverge	34	D	39	E	13%
I-270 C-D	Freeway	130	F	14	B	-89%	I-270 C-D	Freeway	24	C	29	D	20%
I-270 C-D Merge from I-270 and EB Shady Grove Rd	Merge	140	F	16	B	-89%	I-270 C-D Diverge to WB Montrose Rd	Diverge	18	B	22	C	26%
I-270 C-D	Freeway	144	F	16	B	-89%	I-270 C-D	Freeway	23	C	28	D	20%
I-270 C-D Merge from WB Shady Grove Rd	Merge	146	F	16	B	-89%	I-270 Weave between Montrose Rd Loops	Weave	41	F	52	F	26%
I-270 C-D Diverge to I-270	Diverge	113	F	30	D	-74%	I-270 C-D	Freeway	15	B	16	B	5%
I-270 C-D	Freeway	94	F	28	D	-71%	I-270 C-D Merge from EB Montrose Rd	Merge	9	A	9	A	2%
I-270 C-D Diverge to I-370	Diverge	64	F	33	D	-49%	I-270 C-D	Freeway	18	B	18	C	4%
I-270 C-D	Freeway	120	F	9	A	-93%							
I-270 Merge from I-370 EB	Merge	129	F	16	B	-88%							
I-270 C-D	Freeway	139	F	26	D	-81%							
I-270 C-D Weave from I-370 to I-270	Weave	134	F	54	F	-60%							
I-270 C-D	Freeway	110	F	70	F	-36%							
I-270 C-D Weave from I-270 to MD 117	Weave	114	F	90	F	-22%							
I-270 C-D Diverge to MD 124	Diverge	142	F	28	D	-80%							
I-270 C-D	Freeway	178	F	30	D	-83%							
I-270 C-D Merge from EB MD 124	Merge	168	F	33	D	-80%							
I-270 C-D Merge From WB MD 124	Merge	154	F	38	E	-76%							
I-270 C-D	Freeway	144	F	35	D	-76%							

Table D.7: PM Peak -2040 Hard Shoulder Running- I-270 Local Vehicle Density

		No Build		HSR					No Build		HSR				
I-270 Northbound		Type	Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS	% Change	I-270 Souhbound		Type	Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS	% Change
I-270 C-D Merge from Watkins Mill		Merge	133	F	37	E	-72%								

Table D.8: PM Peak -2040 Hard Shoulder Running- I-270 Vehicle Throughput

I-270 Northbound	No Build VISSIM Throughput	HSR VISSIM Throughput	% Change	I-270 Southbound	No Build VISSIM Throughput	HSR VISSIM Throughput	% Change
Between I-495 and MD 187	4113	4119	0%	North of I-70	2366	2366	0%
Between MD 187 on and off ramps	3710	3709	0%	Between I-70 on ramps	2703	2703	0%
Between Rockledge Blvd on and off ramps	3540	3545	0%	From I-70 interchange to MD-85	4047	4047	0%
Between Rockledge Dr and I-270 Spur	3873	3870	0%	Between MD-85 on and off ramps	2379	2379	0%
Between I-270 Spur and Montrose Rd	8718	8705	0%	Between MD-85 and MD-80	3075	3079	0%
Between Montrose Rd on and off ramps	5582	5737	3%	Between MD-80 on and off ramps	2415	2412	0%
Between Montrose Rd and MD 189	5102	5467	7%	Between MD-80 and Md-109	2866	2868	0%
Between MD 189 and MD 28	5078	5838	15%	Between MD-109 on and off ramps	2767	2769	0%
Between MD 28 on and off ramps	5014	6179	23%	Between MD-109 and MD-121	2935	2930	0%
Between MD 28 and Shady Grove Rd	4214	5447	29%	Between MD-121 on and off ramps	2413	2409	0%
Between Shady Grove Rd and I-370	3243	4774	47%	Between MD-121 and MD-27	3354	3349	0%
Between I-370 on and off ramps	2749	4629	68%	Between MD-27 on and off ramps	3458	3456	0%
Between I-370 and MD 117	2851	5818	104%	Between MD-27 and MD-118	3773	3762	0%
Between MD 117 and MD 124	2432	4441	83%	Between MD-118 on and off ramps	3719	3705	0%
Between MD-124 on and off ramps	2547	4534	78%	Between MD-118 and Middlebrook Rd	4384	4369	0%
Between Watkins Mill Rd and Middlebrook Rd	4564	6671	46%	Between Middlebrook Rd on and off ramps	4382	4373	0%
Between Middlebrook Rd on and off ramps	4337	6266	44%	Between Middlebrook Rd and MD-124	5462	5467	0%
Between Middlebrook Rd and MD 118	3776	4224	12%	Between MD-124 on and off ramps	4179	4195	0%
Between MD-118 on and off ramps	3479	5011	44%	Between MD-124 and MD-117	5347	5322	0%
Between MD 118 and MD 27	3770	5010	33%	Between MD-117 and I-370	6905	6834	-1%
Between MD-27 on and off ramps	2754	3573	30%	Between I-370 on and off ramps	3456	3436	-1%
Between MD 27 and MD 121	3428	3901	14%	Between I-370 on ramp to Shady Grove Rd	4990	4994	0%
Between MD-121 on and off ramps	2299	2593	13%	Between Shady Grove Rd and MD 28	5157	5262	2%
Between MD 121 and MD 109	3931	4101	4%	Between MD 28 on and off ramps	5327	5460	2%
Between MD-109 on and off ramps	3643	3752	3%	Between MD 28 and MD 189	4678	4776	2%
Between MD 109 and MD 80	3831	3909	2%	Between MD 189 and Montrose Rd	4678	4773	2%
Between MD-80 on and off ramps	3186	3222	1%	Between Montrose Rd on and off ramps	5599	5692	2%
Between MD 80 and MD 85	3875	3901	1%	Between Montrose Rd and I-270 Spur	7355	7392	1%
Between MD-85 on and off ramps	3257	3250	0%	Between I-270 Spur and Rockledge Blvd	3320	3363	1%
Between MD 85 and I-70	5239	5236	0%	Between Rockledge Blvd on and off ramps	2542	2576	1%
North of I-70	2739	2728	0%	Between MD 187 on and off ramps	3011	3047	1%
				Between MD 187 and I-495	3393	3426	1%
I-270 Spur Northbound				I-270 Spur Southbound			
Between I-495 and Democracy Blvd	4568	4558	0%	Between I-270 Split and HOV on ramp	3187	3175	0%
Between Democracy Blvd on and off ramps	4101	4087	0%	Between HOV on ramp and Democracy Blvd	2329	2332	0%
Between Democracy Blvd and I-270 Split	4833	4822	0%	Between Democracy Blvd on and off ramps	1856	1857	0%
				Between Democracy Blvd and I-495	2227	2186	-2%

Table D.9: PM Peak -2040 Hard Shoulder Running- I-270 Local Vehicle Throughput

I-270 Local Northbound	No Build VISSIM Throughput	HSR VISSIM Throughput	% Change	I-270 Local Southbound	No Build VISSIM Throughput	HSR VISSIM Throughput	% Change
Between Montrose Rd EB off ramp and EB on ramp	1766	1768	0%	Between I-370 on ramp and I-270 off ramp	3064	3059	0%
Between Montrose Rd EB on ramp and WB off ramp	2079	2089	0%	Between I-270 off ramp and Shady Grove off ramp	1525	1522	0%
Between Montrose Rd WB off ramp and on ramp	1811	1833	1%	Between Shady Grove off ramp and Shady Grove WB on ramp	811	809	0%
Between Montrose Rd WB on ramp and I-270 on ramp	3211	3408	6%	Between Shady Grove WB and EB on ramps	1431	1632	14%
Between I-270 on ramp and MD 189 off ramp	3392	3641	7%	Between Shady Grove on ramp and I-270 on ramp	1957	2287	17%
Between MD 189 ramps	2697	2950	9%	Between I-270 on ramp and I-270 off ramp1	2571	2892	12%
Between MD 189 off ramp and I-270 on ramp	3503	3818	9%	Between I-270 off ramp1 and I-270 off ramp2	1808	1997	10%
Between I-270 on ramp and I-270 off ramp	4032	4511	12%	Between I-270 off ramp2 and MD 28 off ramp	1648	1808	10%
Between I-270 off ramp and MD 28 EB off ramp	3156	3507	11%	Between MD 28 off ramp and MD 28 WB on ramp	1153	1263	10%
Between MD 28 EB off ramp to MD 28 EB on ramp	2855	3161	11%	Between MD 28 WB on ramp and MD 28 EB on ramp	1423	1526	7%
Between MD 28 EB on ramp and MD 28 WB off ramp	2994	3298	10%	Between MD 28 EB on ramp and I-270 on ramp	2987	3057	2%
Between MD 28 WB off ramp and MD 28 WB on ramp	1879	2080	11%	Between I-270 on ramp and MD 189 off ramp	3660	3725	2%
Between MD 28 WB on ramp and I-270 on ramp	2552	2802	10%	Between MD 189 on and off ramps	2740	2788	2%
Between I-270 on ramp and I-270 off ramp	3027	3640	20%	Between MD 189 on ramp and I-270 off ramp	3316	3357	1%
Between I-270 off ramp and Shady Grove off ramp	1718	2170	26%	Between I-270 off ramp and Montrose Rd off ramp	2399	2422	1%
Between Shady Grove off ramp and I-270 on ramp	468	769	64%	Between Montrose Rd off ramp and Montrose Rd WB on ramp	2155	2173	1%
Between I-270 on ramp and Shady Grove WB on ramp	2182	3501	60%	Between Montrose Rd WB on ramp and EB off ramp	2705	2773	3%
Between Shady Grove WB on ramp and I-270 off ramp	2671	4351	63%	Between Montrose Rd EB off and on ramps	1525	1590	4%
Between I-270 off ramp and I-370 off ramp	2310	3809	65%	Between Montrose Rd EB off ramp and I-270	1845	1907	3%
Between I-370 off ramp and I-370 EB on ramp	529	1016	92%				
Between I-370 EB and WB on ramps	896	2164	142%				
Between I-370 WB on ramp and I-270 off ramp	1577	3762	139%				
Between I-270 off ramp and I-270 on ramp	1008	2315	130%				
Between I-270 on ramp and MD 117 off ramp	1386	3767	172%				
Between MD 117 off ramp and MD 124 off ramp	920	2661	189%				
Between MD 124 off ramp and MD 124 EB on ramp	346	1124	225%				
Between MD 124 EB and WB on ramps	651	1632	151%				
Between MD 124 on ramp I-270	812	1167	44%				

Table D.10: PM Peak -2040 Hard Shoulder Running- I-270 On Ramp Queue Length - Northbound

I-270 Northbound	No Build VISSIM Average Queue (feet)	HSR VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	HSR VISSIM Maximum Queue (feet)	% Change
Rockledge Dr on ramp	1	2	122%	192	226	18%
MD 189 C-D on ramp	610	0	-100%	4780	0	-100%
MD 28 C-D on ramp	994	2	-100%	4333	140	-97%
Shady Grove Rd C-D on ramp	1762	2	-100%	4090	126	-97%
I-370 C-D on ramp	3386	1257	-63%	5049	3284	-35%
MD 124 C-D on ramp	4875	2	-100%	5069	70	-99%
MD 118 on ramp	0	0	-100%	43	0	-100%
MD 27 EB on ramp	0	0	-	0	0	-
MD 27 WB on ramp	0	1	-	0	148	-
MD 121 on ramp	0	0	-	4	0	-100%
MD 109 on ramp	0	0	-	0	0	-
MD 80 on ramp	0	0	-	0	0	-
MD 85 on ramp	0	0	-	0	9	-
I-270 Spur Northbound	No Build VISSIM Average Queue (feet)	HSR VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	HSR VISSIM Maximum Queue (feet)	% Change
Democracy Blvd EB on ramp	0	0	-	9	0	-100%
Democracy Blvd WB on ramp	0	82	-	0	1271	-
I-495 Northbound	No Build VISSIM Average Queue (feet)	HSR VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	HSR VISSIM Maximum Queue (feet)	% Change
Cabin John Pkwy on ramp	46	0	-100%	903	24	-97%
MD 190 on ramp	0	0	-100%	48	0	-100%
I-270 C-D Northbound	No Build VISSIM Average Queue (feet)	HSR VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	HSR VISSIM Maximum Queue (feet)	% Change
Montrose Rd EB on ramp	0	217	-	0	1269	-
Montrose Rd WB on ramp	916	0	-100%	2556	0	-100%
I-270 on ramp	0	0	-	0	0	-
MD 189 on ramp	104	0	-100%	1084	32	-97%
I-270 on ramp	1	0	-99%	109	10	-90%
MD 28 EB on ramp	0	0	-	0	0	-
MD 28 WB on ramp	38	0	-100%	652	0	-100%
Shady Grove Rd EB on ramp	1396	0	-100%	4077	0	-100%
I-270 on ramp	1555	0	-100%	5058	0	-100%
Shady Grove Rd WB on ramp	739	1	-100%	1949	148	-92%
I-370 EB on ramp	1319	394	-70%	2422	1654	-32%
I-370 WB on ramp	1606	3436	114%	2548	5054	98%
I-270 on ramp	4357	12	-100%	5055	233	-95%
MD 124 EB on ramp	1831	1	-100%	2796	52	-98%
MD 124 WB on ramp	98	56	-43%	700	364	-48%
Watkins Mill Rd on ramp	2665	0	-100%	3270	0	-100%

Table D.11: PM Peak -2040 Hard Shoulder Running- I-270 Off Ramp Queue Length - Northbound

I-270 Northbound	No Build VISSIM Average Queue (feet)	HSR VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	HSR VISSIM Maximum Queue (feet)	% Change
MD 187 off ramp NB	39	0	-100%	309	0	-100%
MD 187 off ramp SB	0	1	-	0	85	-
Rockledge Dr off ramp	1	36	3957%	88	208	137%
Tower Oaks Blvd off ramp	37	0	-100%	219	0	-100%
Montrose Rd off ramp EB	0	0	-	0	0	-
Montrose Rd off ramp WB	0	28	-	0	153	-
MD 189 off ramp WB	26	1	-98%	174	108	-38%
MD 189 off ramp EB	0	38	9577%	78	250	219%
MD 28 off ramp EB	35	0	-100%	215	0	-100%
MD 28 off ramp WB	0	0	-	0	0	-
Shady Grove Rd off ramp - Redland Blvd	0	48	-	0	214	-
Shady Grove Rd off ramp WB	40	0	-100%	253	0	-100%
Shady Grove Rd off ramp EB	0	37	-	0	630	-
I-370 off ramp WB	8	0	-100%	162	0	-100%
I-370 off ramp EB	0	3473	-	0	5073	-
MD 117 off ramp	1835	199	-89%	2770	895	-68%
MD 124 off ramp	55	0	-100%	626	0	-100%
Watkins Mill Rd off ramp	45	0	-100%	627	0	-100%
Middlebrook Rd EB off ramp	0	0	-	0	0	-
Middlebrook Rd WB off ramp	0	0	-	0	0	-
MD 118 WB off ramp - Seneca Meadows	0	0	-100%	8	0	-100%
MD 118 WB off ramp	0	0	-	0	0	-
MD 118 EB off ramp	0	55	136250%	16	267	1521%
MD 27 off ramp WB	44	0	-100%	252	0	-100%
MD 27 off ramp EB	0	74	-	0	287	-
MD 121 off ramp WB	70	1	-99%	314	130	-59%
MD 121 off ramp EB	2	30	1300%	94	300	220%
MD 109 off ramp EB	26	0	-100%	251	0	-100%
MD 109 off ramp WB	0	20	-	0	171	-
MD 80 off ramp EB	21	0	-100%	233	17	-93%
MD 80 off ramp WB	0	0	260%	24	28	18%
MD 85 NB off ramp	1	0	-60%	53	79	50%
MD 85 SB off ramp	1	0	-100%	141	0	-100%
I-270 Spur Northbound	No Build VISSIM Average Queue (feet)	HSR VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	HSR VISSIM Maximum Queue (feet)	% Change
Clara Barton Pkwy off ramp EB	0	0	-	0	0	-
Clara Barton Pkwy off ramp WB	0	0	-	0	0	-
MD 190 off ramp EB	0	4	-	0	282	-
MD 190 off ramp WB	5	42	791%	354	204	-42%
Democracy Blvd off ramp WB	41	17	-60%	194	111	-43%
Democracy Blvd off ramp EB	17	0	-100%	120	0	-100%

Table D.12: PM Peak -2040 Hard Shoulder Running- I-270 On Ramp Queue Length - Southbound

I-270 Southbound	No Build VISSIM Average Queue (feet)	HSR VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	HSR VISSIM Maximum Queue (feet)	% Change
MD 85 on ramp	0	0	-100%	12	0	-100%
MD 80 on ramp	0	0	-	0	0	-
MD 109 on ramp	0	0	-	0	0	-
MD 121 WB on ramp	0	0	-	0	0	-
MD 121 EB on ramp	0	116	-	0	620	-
MD 27 WB on ramp	0	0	-	0	0	-
MD 27 EB on ramp	0	0	-	0	0	-
MD 118 WB on ramp	0	0	-	0	0	-
MD 118 EB on ramp	0	0	-	0	0	-
Middlebrook Rd on ramp	0	0	-	0	0	-
Watkins Mill Rd on ramp	0	0	-	0	0	-
MD 124 WB on ramp	1368	1028	-25%	3492	3749	7%
MD 117 on ramp	29	208	623%	837	1571	88%
I-370 C-D on ramp	0	0	-	0	0	-
Shady Grove Rd C-D on ramp North	0	0	-	0	0	-
Shady Grove Rd C-D on ramp South	0	0	-	0	0	-
MD 189 C-D on ramp	0	0	-	0	0	-
Montrose Rd C-D on ramp	0	0	-	0	0	-
Rockledge Dr on ramp	0	0	-	0	0	-
MD 187 on ramp	0	0	-	0	0	-
I-270 Spur Southbound	No Build VISSIM Average Queue (feet)	HSR VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	HSR VISSIM Maximum Queue (feet)	% Change
Democracy Blvd on ramp	698	698	0%	1919	2077	8%
I-495 Southbound	No Build VISSIM Average Queue (feet)	HSR VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	HSR VISSIM Maximum Queue (feet)	% Change
I-270 Spur on ramp	4555	4573	0%	5065	5065	0%
MD 190 on ramp	184	65	-64%	956	595	-38%
I-270 C-D Southbound	No Build VISSIM Average Queue (feet)	HSR VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	HSR VISSIM Maximum Queue (feet)	% Change
I-270 on ramp	0	0	-100%	10	0	-100%
I-370 on ramp	0	0	-100%	80	0	-100%
Shady Grove Rd WB on ramp	0	0	-	0	0	-
Shady Grove Rd EB on ramp	0	0	-	0	0	-
I-270 on ramp	0	0	-	0	0	-
MD 28 WB on ramp	0	0	-	0	14	-
MD 28 EB on ramp	0	302	71779%	63	2024	3095%
I-270 on ramp	0	0	-	0	0	-
MD 189 on ramp	0	3	-	0	115	-
Montrose Rd WB on ramp	1	25	1955%	115	284	146%
Montrose Rd EB on ramp	0	0	-	0	0	-

Table D.13: PM Peak -2040 Hard Shoulder Running- I-270 Off Ramp Queue Length - Southbound

I-270 Southbound	No Build VISSIM Average Queue (feet)	HSR VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	HSR VISSIM Maximum Queue (feet)	% Change
MD 85 SB off ramp	22	13	-38%	383	341	-11%
MD 85 NB off ramp	17	2	-88%	354	221	-37%
MD 80 off ramp	2	1	-66%	204	69	-66%
MD 109 off ramp WB	1	0	-100%	88	0	-100%
MD 109 off ramp EB	0	233	-	0	1056	-
MD 121 off ramp EB	217	0	-100%	970	111	-89%
MD 121 off ramp WB	0	23	5668%	137	143	4%
MD 27 off ramp EB	22	0	-100%	137	0	-100%
MD 27 off ramp WB	1	24	2493%	65	146	126%
MD 118 off ramp EB	24	0	-100%	142	22	-84%
MD 118 off ramp WB	0	125	416867%	23	646	2759%
Watkins Mill Rd off ramp	103	1517	1376%	384	3730	872%
MD 124 off ramp EB	185	7	-96%	731	309	-58%
MD 124 off ramp WB	17	1202	7051%	445	3834	762%
I-370 off ramp WB	147	0	-100%	725	0	-100%
I-370 off ramp EB	0	1	-	0	49	-
Shady Grove Rd off ramp - Omega Drive	1	0	-100%	52	0	-100%
Shady Grove Rd off ramp	0	4	-	0	140	-
MD 28 off ramp	3	110	3905%	149	461	209%
MD 189 off ramp EB	108	0	-100%	433	0	-100%
MD 189 off ramp WB	0	0	-	0	0	-
Montrose Rd off ramp WB	0	3	-	0	321	-
Montrose Rd off ramp EB	4	205	5140%	337	695	106%
Rockledge Dr off ramp	155	21	-87%	641	164	-74%
I-270 Spur Southbound	No Build VISSIM Average Queue (feet)	HSR VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	HSR VISSIM Maximum Queue (feet)	% Change
Democracy Blvd off ramp EB	20	0	-100%	136	0	-100%
Democracy Blvd off ramp WB	0	82	-	0	826	-
MD 190 off ramp WB	80	0	-100%	797	0	-100%
MD 190 off ramp EB	0	0	-	0	6	-
Clara Barton Pkwy WB off ramp	0	36	359000%	6	313	5119%

Table D.14: PM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
1- MD 85 at Sam's Club Drive											
1	NB	60.8	E	NB Left	134	78	463	889	E	115.6	F
				NB Through	570	38	463	889	D		
				NB Right	935	72	443	912	E		
	SB	179.8	F	SB Left	153	131	1021	1231	F		
				SB Through	874	186	1021	1231	F		
				SB Right	74	209	1021	1231	F		
	EB	35.0	C	EB Left	55	84	32	144	F		
				EB Through	24	81	32	144	F		
				EB Right	169	13	32	144	B		
	WB	163.6	F	WB Left	561	181	536	762	F		
				WB Through	30	166	536	762	F		
				WB Right	224	119	536	762	F		
2- MD 85 at I-270 NB on and off ramp											
2	NB	58.5	E	NB Left	1136	58	700	1857	E	48.2	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	32.6	C	SB Left	0	0	0	0	A		
				SB Through	743	33	132	737	C		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
3- MD 85 at I-270 SB on and off ramp											
3	NB	17.3	B	NB Left	0	0	0	0	A	19.5	B
				NB Through	1975	17	181	1210	B		
				NB Right	0	0	0	0	A		
	SB	44.0	D	SB Left	173	44	74	582	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
4- MD 85 at Crestwood Blvd											
4	NB	68.0	F	NB Left	74	103	368	830	F	51.3	D
				NB Through	1450	66	367	830	E		
				NB U-Turn	0	0	0	0	A		
	SB	31.9	C	SB Left	105	83	53	246	F		
				SB Through	940	30	105	1039	C		
				SB Right	923	28	92	1030	C		
	EB	63.3	E	EB Left	949	66	196	744	E		
				EB Through	43	51	196	744	D		
				EB Right	28	1	196	744	A		
	WB	53.0	D	WB Left	44	78	60	230	E		
				WB Through	79	81	60	230	F		
				WB Right	94	18	60	230	B		
5- MD 80 at I-270 NB on and ramp											
5	NB	-0.9	A	NB Left	1	9	0	4	A	11.5	B
				NB Through	2	0	0	4	A		
				NB Right	7	-3	0	4	A		
	SB	12.8	B	SB Left	479	16	27	238	B		
				SB Through	22	16	27	238	B		
				SB Right	149	3	0	0	A		
			EB Left	97	14	24	208	B			

Table D.14: PM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
	EB	13.6	B	EB Through	0	0	8	0	A		
				EB Right	5	10	37	239	B		
	WB	10.7	B	WB Left	15	14	0	38	B		
				WB Through	670	18	66	419	B		
				WB Right	612	2	0	0	A		
6- MD 80 at I-270 SB on and off ramp											
6	NB	3.4	A	NB Left	55	5	3	239	A	5.9	A
				NB Through	0	0	0	0	A		
				NB Right	605	3	3	239	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	7.1	A	EB Left	0	0	0	0	A		
				EB Through	382	8	4	111	A		
				EB Right	66	4	4	119	A		
	WB	8.4	A	WB Left	0	0	0	0	A		
				WB Through	446	8	3	163	A		
				WB Right	0	0	0	0	A		
7- MD 109 at I-270 NB on and off ramp											
7	NB			NB Left	0	0	0	0	A	7.9	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	15.2	C	SB Left	317	16	34	268	C		
				SB Through	0	0	0	0	A		
				SB Right	25	6	1	162	A		
	EB	2.5	A	EB Left	80	2	0	47	A		
				EB Through	0	0	0	0	A		
				EB Right	83	3	0	0	A		
	WB	0.4	A	WB Left	0	0	0	0	A		
				WB Through	222	0	0	0	A		
				WB Right	0	0	0	0	A		
8- MD 80 at I-270 SB on and off ramp											
8	NB	4.9	A	NB Left	63	8	3	120	A	1.8	A
				NB Through	0	0	0	0	A		
				NB Right	36	0	0	63	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.9	A	EB Left	0	0	0	0	A		
				EB Through	166	0	0	0	A		
				EB Right	34	4	0	0	A		
	WB	1.4	A	WB Left	137	1	0	58	A		
				WB Through	110	2	0	30	A		
				WB Right	0	0	0	0	A		
9- MD 121 at Gateway Center Dr											
9	NB	29.4	D	NB Left	590	33	112	604	C	47.0	D
				NB Through	795	28	112	604	C		
				NB Right	64	16	119	630	B		
	SB	22.6	C	SB Left	28	15	19	219	B		
				SB Through	300	24	31	223	C		
				SB Right	9	13	34	244	B		
	EB	14.9	B	EB Left	4	40	8	196	D		
				EB Through	24	41	15	229	D		
				EB Right	248	12	27	261	B		
	WB	117.1	F	WB Left	349	162	304	715	F		
				WB Through	75	73	304	714	E		
				WB Right	186	51	327	739	D		
10- MD 121 at I-270 NB on and off ramp											
	NB	22.1	C	NB Left	372	59	77	320	F		
				NB Through	0	0	0	0	A		

Table D.14: PM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
10	SB			NB Right	785	4	1	73	A	18.1	B
				SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	11.8	B	EB Left	0	0	0	0	A		
				EB Through	651	18	38	367	C		
				EB Right	336	1	0	0	A		
				WB Left	219	60	86	412	F		
	WB	20.0	C	WB Through	682	7	86	412	A		
				WB Right	0	0	0	0	A		

Table D.14: PM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
11- MD 121 at I-270 SB on and off ramp											
11	NB			NB Left	0	0	0	0	A	22.3	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	62.3	E	SB Left	271	85	226	977	F		
				SB Through	0	0	0	0	A		
				SB Right	254	39	0	49	E		
	EB	6.5	A	EB Left	0	0	0	0	A		
				EB Through	717	6	16	229	A		
				EB Right	0	0	0	0	A		
	WB	13.2	B	WB Left	0	0	0	0	A		
				WB Through	520	27	46	382	D		
				WB Right	538	0	0	0	A		
12- MD 27 at Observation Dr											
12	NB	37.7	D	NB U-Turn	0	0	0	0	A	24.8	C
				NB Through	94	55	22	98	E		
				NB Right	61	11	22	98	B		
	SB	41.3	D	SB Left	146	44	38	216	D		
				SB Through	57	62	43	250	E		
				SB Right	188	33	69	287	C		
	EB	18.6	B	EB Left	189	33	70	458	C		
				EB Through	2012	17	71	459	B		
				EB Right	97	16	84	497	B		
	WB	27.9	C	WB Left	41	24	149	731	C		
				WB Through	1695	29	149	731	C		
				WB Right	69	9	149	731	A		
13- MD 27 at I-270 NB off ramp											
13	NB	47.2	D	NB Left	303	47	52	260	D	6.5	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.1	A	EB Left	0	0	0	0	A		
				EB Through	1512	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	4.9	A	WB Left	0	0	0	0	A		
				WB Through	1791	5	37	726	A		
				WB Right	0	0	0	0	A		
14- MD 27 at I-270 SB off ramp											
14	NB			NB Left	0	0	0	0	A	5.2	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	50.1	D	SB Left	174	50	33	150	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	1.8	A	EB Left	0	0	0	0	A		
				EB Through	1677	2	4	89	A		
				EB Right	0	0	0	0	A		
	WB	3.7	A	WB Left	0	0	0	0	A		
				WB Through	1541	4	12	384	A		
				WB Right	0	0	0	0	A		
15- MD 27 at Crystal Rock Dr											
15	NB	31.1	C	NB Left	77	30	107	545	C	70.1	E
				NB Through	1196	31	116	545	C		
				NB Right	55	29	123	558	C		
	SB	56.5	E	SB Left	157	74	381	1298	E		
				SB Through	1468	58	381	1298	E		
				SB Right	225	33	368	1291	C		
				EB Left	125	53	34	129	D		

Table D.14: PM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
	EB	40.4	D	EB Through	49	36	30	124	D		
				EB Right	62	18	23	156	B		
				WB Left	104	99	1056	1511	F		
	WB	163.8	F	WB Through	127	110	1056	1511	F		
				WB Right	665	184	1056	1511	F		
16- MD 118 at Seneca Meadows Pkwy											
16	NB	4.9	A	NB Left	97	14	2	77	B	9.0	A
				NB Through	1309	4	11	182	A		
				NB Right	1	-1	19	235	A		
	SB	7.4	A	SB Left	15	8	19	307	A		
				SB Through	1226	7	22	307	A		
				SB Right	11	5	25	340	A		
	EB	14.0	B	EB Left	23	59	14	138	E		
				EB Through	0	65	14	138	E		
				EB Right	312	11	14	138	B		
	WB	53.8	D	WB Left	103	65	43	243	E		
				WB Through	7	69	39	242	E		
				WB Right	30	13	48	262	B		
17- MD 118 at I-270 NB on ramp											
17	NB			NB Left	0	0	0	0	A	13.8	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	26.5	C	EB Left	493	26	43	299	C		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	10.0	A	WB Left	0	0	0	0	A		
				WB Through	283	2	1	139	A		
				WB Right	1361	12	46	611	B		
18- MD 118 at I-270 SB off ramp											
18	NB			NB Left	0	0	0	0	A	7.1	A
				NB Through	0	0.0	0	0	A		
				NB Right	0	0.0	0	0	A		
	SB	37.7	D	SB Left	169	37.7	27	145	D		
				SB Through	0	0.0	0	0	A		
				SB Right	0	0.0	0	0	A		
	EB	5.5	A	EB Left	0	0.0	0	0	A		
				EB Through	1407	5.5	13	384	A		
				EB Right	0	0.0	0	0	A		
	WB	5.1	A	WB Left	0	0.0	0	0	A		
				WB Through	1499	5.1	10	218	A		
				WB Right	0	0.0	0	0	A		
19- MD 118 at Aircraft Dr											
19	NB	26.2	C	NB Left	53	72	43	241	E	43.0	D
				NB Through	53	70	43	241	E		
				NB Right	227	5	5	87	A		
	SB	165.9	F	SB Left	436	156	419	656	F		
				SB Through	14	205	419	656	F		
				SB Right	126	195	419	656	F		
	EB	22.6	C	EB Left	125	31	89	536	C		
				EB Through	1415	22	89	536	C		
				EB Right	21	20	89	536	B		
	WB	24.3	C	WB Left	15	30	107	749	C		
				WB Through	1399	28	107	749	C		
				WB Right	367	8	107	749	A		
20- Middlebrook Rd at Observation Dr											
	NB			NB Left	0	0	0	0	A		
				NB Through	0	0	0	0	A		

Table D.14: PM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
20	SB	20.5	C	NB Right	0	0	0	0	A	9.0	A
				SB Left	124	36	23	150	D		
				SB Through	0	0	0	0	A		
				SB Right	186	10	23	150	B		
	EB	6.0	A	EB Left	14	11	15	149	B		
				EB Through	1053	6	15	149	A		
				EB Right	0	0	0	0	A		
	WB	8.8	A	WB Left	0	0	0	0	A		
				WB Through	1313	9	27	253	A		
				WB Right	17	7	42	302	A		

Table D.14: PM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
21- Middlebrook Rd at I-270 SB on ramp											
21	NB			NB Left	0	0	0	0	A	4.6	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	2.7	A	EB Left	0	0	0	0	A		
				EB Through	742	3	4	110	A		
				EB Right	0	0	0	0	A		
	WB	7.8	A	WB Left	438	8	5	236	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
22- Middlebrook Rd at Waring Station Rd											
22	NB	48.4	D	NB Left	200	46	83	309	D	13.7	B
				NB Through	1	55	83	309	D		
				NB Right	236	50	83	309	D		
	SB	30.1	C	SB Left	32	47	8	72	D		
				SB Through	2	38	8	72	D		
				SB Right	24	7	19	110	A		
	EB	8.0	A	EB Left	4	11	28	285	B		
				EB Through	1125	8	28	285	A		
				EB Right	198	7	28	285	A		
	WB	8.6	A	WB Left	210	21	28	289	C		
				WB Through	1437	7	28	289	A		
				WB Right	3	3	28	289	A		
23- MD 124 at MD 355											
23	NB	130.8	F	NB Left	490	115	682	1082	F	78.6	E
				NB Through	1162	138	680	1079	F		
				NB Right	7	85	0	0	F		
	SB	44.6	D	SB Left	180	92	146	490	F		
				SB Through	698	66	146	490	E		
				SB Right	720	12	44	383	B		
	EB	27.2	C	EB Left	291	68	108	598	E		
				EB Through	1615	25	108	598	C		
				EB Right	338	3	28	551	A		
	WB	126.4	F	WB Left	0	0	0	0	A		
				WB Through	1645	129	683	946	F		
				WB Right	88	83	0	3	F		
24- MD 124 at I-270 SB on and off											
24	NB	95.9	F	NB Left	55	84	67	182	F	63.0	E
				NB Through	21	127	67	182	F		
				NB U-Turn	0	0	0	0	A		
	SB	55.4	E	SB Left	547	95	190	736	F		
				SB Through	8	98	190	736	F		
				SB Right	456	7	13	379	A		
	EB	101.1	F	EB Left	0	0	0	0	A		
				EB Through	1409	100	584	1113	F		
				EB Right	22	162	604	1137	F		
	WB	21.7	C	WB Left	5	78	653	2194	E		
				WB Through	1192	22	653	2194	C		
				WB Right	0	0	0	0	A		
25- MD 117 at MD 124											
25	NB	78.5	E	NB Left	54	158	328	743	F	50.1	D
				NB Through	686	93	328	743	F		
				NB Right	461	48	29	665	D		
	SB	37.8	D	SB Left	134	61	153	737	E		
				SB Through	969	41	153	737	D		
				SB Right	182	5	0	0	A		
	EB			EB Left	153	80	152	574	E		

Table D.14: PM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
	EB	44.9	D	EB Through	1156	41	152	576	D		
				EB Right	57	37	156	603	D		
	WB	42.6	D	WB Left	315	71	205	1006	E		
				WB Through	1069	38	205	1006	D		
				WB Right	99	1	0	0	A		
26- MD 117 at Bureau Dr											
26	NB	50.3	D	NB Left	98	76	81	296	E	37.8	D
				NB Through	35	77	81	296	E		
				NB Right	272	38	81	296	D		
	SB	80.7	F	SB Left	284	95	132	405	F		
				SB Through	23	83	132	405	F		
				SB Right	83	32	132	405	C		
	EB	30.3	C	EB Left	52	54	165	806	D		
				EB Through	1683	30	166	806	C		
				EB Right	6	18	160	795	B		
	WB	31.9	C	WB Left	14	35	185	997	D		
WB Through				1272	34	186	998	C			
WB Right				213	19	211	1046	B			
27- MD 117 at I-270 SB off ramp											
27	NB			NB Left	0	0	0	0	A	12.8	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	3.7	A	EB Left	0	0	0	0	A		
				EB Through	944	4	6	464	A		
				EB Right	0	0	0	0	A		
	WB	40.7	E	WB Left	306	41	98	848	E		
WB Through				0	0	0	0	A			
WB Right				0	0	0	0	A			
28- MD 117 at I-270 NB off ramp											
28	NB			NB Left	0	0	0	0	A	24.3	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	89.3	F	SB Left	97	91	1950	2779	F		
				SB Through	0	0	0	0	A		
				SB Right	374	89	1949	2779	F		
	EB	17.3	B	EB Left	3	120	90	983	F		
				EB Through	947	17	90	983	B		
				EB Right	0	0	0	0	A		
	WB	7.3	A	WB Left	0	0	0	0	A		
WB Through				1403	7	52	390	A			
WB Right				0	0	52	390	A			
29- MD 117 at Perry Pkwy											
29	NB	40.8	D	NB Left	19	59	17	125	E	49.4	D
				NB Through	26	59	17	124	E		
				NB Right	34	17	27	145	B		
	SB	162.4	F	SB Left	241	198	280	446	F		
				SB Through	21	220	280	446	F		
				SB Right	121	82	280	446	F		
	EB	21.1	C	EB Left	223	69	74	337	E		
				EB Through	778	8	74	337	A		
				EB Right	30	7	60	321	A		
	WB	41.4	D	WB Left	37	108	248	736	F		
WB Through				1260	42	248	736	D			
WB Right				382	33	248	736	C			
30- Shady Grove Rd at I-270 NB off ramp											
	NB	7.6	A	NB Left	0	0	0	0	A		
				NB Through	914	8	87	483	A		

Table D.14: PM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS					
30	SB	44.7	D	NB Right	0	0	0	0	A	30.1	C					
				SB Left	0	0	0	0	A							
				SB Through	1013	45	163	681	D							
	EB				SB Right	0	0	0	0			A				
					EB Left	0	0	0	0			A				
					EB Through	0	0	0	0			A				
					EB Right	0	0	0	0			A				
					WB	51.6	D		WB Left			267	52	48	264	D
									WB Through			0	0	0	0	A
	WB Right	0	0	0					0			A				

Table D.14: PM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
31- Shady Grove Rd at I-270 SB off ramp											
31	NB	31.3	C	NB Left	0	0	0	0	A	29.5	C
				NB Through	1229	31	435	1759	C		
				NB Right	0	0	0	0	A		
	SB	5.6	A	SB Left	0	0	0	0	A		
				SB Through	676	6	7	154	A		
				SB Right	0	0	0	0	A		
	EB	55.6	E	EB Left	232	54	43	211	D		
				EB Through	0	0	0	0	A		
				EB Right	304	57	62	297	E		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
32- MD 28 at I-270 SB off ramp											
32	NB			NB U-Turn	0	0	0	0	A	7.9	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	37.2	D	SB Left	406	46	71	322	D		
				SB Through	0	0	0	0	A		
				SB Right	97	3	0	28	A		
	EB	2.8	A	EB Left	0	0	0	0	A		
				EB Through	1560	1	0	0	A		
				EB Right	932	6	16	224	A		
	WB	6.7	A	WB Left	0	0	0	0	A		
				WB Through	1642	7	20	253	A		
				WB Right	0	0	0	0	A		
33- MD 28 at I-270 on and off ramps											
33	NB	36.9	D	NB Left	0	0	41	226	A	39.9	D
				NB Through	185	49	49	235	D		
				NB Right	123	18	49	235	B		
	SB	137.2	F	SB Left	14	160	361	412	F		
				SB Through	0	0	0	0	A		
				SB Right	219	136	361	412	F		
	EB	20.0	B	EB Left	283	61	94	334	E		
				EB Through	920	7	94	334	A		
				EB Right	0	0	0	0	A		
	WB	41.7	D	WB Left	40	37	168	432	D		
				WB Through	1279	42	144	396	D		
				WB Right	0	0	0	0	A		
34- MD 189 at Great Falls Rd											
34	NB	36.7	D	NB Left	43	45	12	90	D	13.2	B
				NB Through	14	48	9	90	D		
				NB Right	19	9	9	101	A		
	SB	3.4	A	SB Left	18	41	7	83	D		
				SB Through	13	48	7	83	D		
				SB Right	408	0	3	48	A		
	EB	11.6	B	EB Left	410	23	37	417	C		
				EB Through	644	5	6	200	A		
				EB Right	55	5	10	236	A		
	WB	18.0	B	WB Left	14	19	52	406	B		
				WB Through	842	18	51	406	B		
				WB Right	18	12	67	440	B		
35- MD 189 at I-270 Ramps											
35	NB	47.1	D	NB Left	225	47	41	196	D	42.5	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	54.4	D	SB Left	348	54	124	453	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
				EB Left	479	32	91	341	C		

Table D.14: PM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
	EB	28.0	C	EB Through	373	23	91	341	C		
				EB Right	0	0	0	A			
	WB	50.8	D	WB Left	443	54	111	336	D		
				WB Through	428	47	111	336	D		
				WB Right	0	0	0	A			
36- MD 189 at Wooton Pkwy											
36	NB	45.9	D	NB Left	238	57	142	506	E	52.4	D
				NB Through	694	51	142	506	D		
				NB Right	176	12	142	506	B		
	SB	82.8	F	SB Left	250	101	295	794	F		
				SB Through	926	78	312	780	E		
				SB Right	0	0	0	0	A		
	EB	38.7	D	EB Left	153	72	123	486	E		
				EB Through	552	38	123	486	D		
				EB Right	204	15	123	486	B		
	WB	39.5	D	WB Left	157	72	141	743	E		
				WB Through	775	41	141	743	D		
				WB Right	315	19	141	743	B		
37- Montrose Rd at Tower Oaks Blvd											
37	NB	0.4	A	NB Left	0	0	0	0	A	32.4	C
				NB Through	0	0	0	0	A		
				NB Right	537	0	0	0	A		
	SB	143.6	F	SB Left	87	49	213	902	D		
				SB Through	0	0	0	0	A		
				SB Right	305	171	269	899	F		
	EB	6.9	A	EB Left	0	0	0	0	A		
				EB Through	1868	7	39	520	A		
				EB Right	0	0	0	0	A		
	WB	40.0	D	WB Left	79	37	39	520	D		
				WB Through	2426	41	277	780	D		
				WB Right	261	30	277	780	C		
38- Tower Oaks Blvd at I-270 off ramp											
38	NB	23.3	C	NB Left	707	24	50	240	C	17.3	B
				NB Through	0	0.0	43	232	A		
				NB Right	26	7.0	50	240	A		
	SB	9.8	A	SB Left	8	18.4	1	39	B		
				SB Through	0	0.0	1	39	A		
				SB Right	9	2.2	0	23	A		
	EB	10.8	B	EB Left	1	11.5	16	177	B		
				EB Through	363	11.2	16	177	B		
				EB Right	37	7.0	11	167	A		
	WB	12.7	B	WB Left	139	16.3	16	145	B		
				WB Through	203	10.4	16	145	B		
				WB Right	3	3.4	3	100	A		
39- Montrose Rd at Tower Oaks Blvd											
39	NB	20.0	C	NB Left	97	42	83	387	D	45.0	D
				NB Through	773	32	83	387	C		
				NB Right	621	2	0	0	A		
	SB	32.1	C	SB Left	210	63	76	334	E		
				SB Through	506	23	74	333	C		
				SB Right	131	15	72	340	B		
	EB	133.4	F	EB Left	104	112	358	697	F		
				EB Through	518	136	360	698	F		
				EB Right	44	149	382	722	F		
	WB	36.9	D	WB Left	542	46	109	374	D		
				WB Through	456	42	110	374	D		
				WB Right	315	13	129	404	B		
40- Rockledge Blvd at I-270 NB on and off ramp											
	NB	132.4	F	NB Left	0	0	0	0	A		
				NB Through	335	121	557	836	F		

Table D.14: PM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
40	SB	85.9	F	NB Right	854	137	557	836	F	112.4	F
				SB Left	0	0	89	217	A		
				SB Through	352	86	89	217	F		
				SB Right	0	0	0	0	A		
	EB	93.5	F	EB Left	6	184	288	804	F		
				EB Through	459	148	288	804	F		
				EB Right	304	10	0	0	B		
				WB Left	0	0	0	0	A		
	WB			WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table D.14: PM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
41- Rockledge Blvd at I-270 SB on and off ramps											
41	NB	30.3	C	NB Left	343	30	76	273	C	48.1	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	53.0	D	WB Left	355	59	195	867	E		
				WB Through	890	51	195	867	D		
				WB Right	0	0	0	0	A		
42- MD 187 at Tuckerman Ln											
42	NB	66.6	E	NB Left	216	39	567	1282	D	128.7	F
				NB Through	2309	68	567	1282	E		
				NB Right	200	76	567	1282	E		
	SB	187.6	F	SB Left	205	172	2555	2693	F		
				SB Through	1151	185	2555	2693	F		
				SB Right	306	209	2555	2693	F		
	EB	112.4	F	EB Left	302	66	540	1403	E		
				EB Through	534	136	541	1404	F		
				EB Right	118	121	564	1428	F		
	WB	195.5	F	WB Left	465	191	1941	2142	F		
				WB Through	674	211	1941	2142	F		
				WB Right	166	145	1941	2142	F		
43- MD 187 at I-270 NB on and off ramps											
43	NB	16.8	B	NB Left	566	35	117	404	C	20.4	C
				NB Through	2515	13	117	404	B		
				NB Right	0	0	0	0	A		
	SB	25.1	C	SB Left	0	0	0	0	A		
				SB Through	1290	25	66	269	C		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	60.3	E	WB Left	59	60	47	317	E		
				WB Through	67	60	47	317	E		
				WB Right	0	0	0	0	A		
44- MD 187 at I-270 NB on and off ramps											
44	NB	40.0	E	NB Left	0	0	0	0	A	36.9	D
				NB Through	2426	40	155	739	D		
				NB Right	0	0	0	0	A		
	SB	18.1	B	SB Left	147	56	67	271	E		
				SB Through	1203	13	67	271	B		
				SB Right	0	0	0	0	A		
	EB	58.2	E	EB Left	652	60	143	560	E		
				EB Through	0	0	143	560	A		
				EB Right	179	53	82	486	D		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
45- MD 187 at Rock Spring Dr											
45	NB	20.6	C	NB Left	492	37	123	826	D	29.8	C
				NB Through	2174	17	124	827	B		
				NB Right	18	14	145	860	B		
	SB	34.2	C	SB Left	21	62	111	472	E		
				SB Through	1186	39	111	472	D		
				SB Right	173	1	69	465	A		
	EB Left	431	60	146	519	E					

Table D.14: PM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
	EB	50.0	D	EB Through	50	68	146	519	E		
				EB Right	484	39	146	519	D		
	WB	17.1	B	WB Left	7	29	6	108	C		
				WB Through	16	33	6	108	C		
				WB Right	36	8	3	97	A		
47-Democracy Blvd at I-270 NB off ramp											
47	NB	45.3	D	NB Left	154	45	28	136	D	3.0	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	1.2	A	EB Left	0	0	0	0	A		
				EB Through	1127	1	3	66	A		
				EB Right	0	0	0	0	A		
	WB	1.1	A	WB Left	0	0	0	0	A		
				WB Through	2241	1	3	84	A		
WB Right				0	0	0	0	A			
48- Democracy Blvd at I-270 SB on ramp											
48	NB			NB Left	0	0	0	0	A	8.4	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	5.5	A	EB Left	0	0	0	0	A		
				EB Through	1336	5	19	232	A		
				EB Right	0	0	0	0	A		
	WB	10.1	B	WB Left	543	35	59	404	D		
				WB Through	1827	3	49	383	A		
WB Right				0	0	0	0	A			
49- Democracy Blvd at I-270 SB off ramp											
49	NB			NB Left	0	0	0	0	A	8.8	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	37.4	D	SB Left	154	51	28	143	D		
				SB Through	0	0	0	0	A		
				SB Right	59	2	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	5.8	A	WB Left	0	0	0	0	A		
				WB Through	1827	4	19	305	A		
WB Right				156	29	116	746	C			
50- MD 190 at Burdette Rd											
50	NB	76.4	E	NB Left	27	79	18	118	E	36.6	D
				NB Through	7	69	18	118	E		
				NB Right	6	75	18	118	E		
	SB	37.5	D	SB Left	45	77	25	148	E		
				SB Through	9	72	25	148	E		
				SB Right	122	20	25	148	C		
	EB	21.6	C	EB Left	138	99	113	625	F		
				EB Through	1297	14	113	625	B		
				EB Right	31	4	99	653	A		
	WB	45.7	D	WB Left	13	114	390	1119	F		
				WB Through	2161	46	390	1119	D		
WB Right				65	35	390	1119	C			

Table D.14: PM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
51- MD 190 at I-270 NB on ramp											
51	NB			NB Left	0	0	0	0	A	17.6	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	65.7	E	EB Left	254	66	101	343	E		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	9.3	A	WB Left	0	0	0	0	A		
				WB Through	1471	9	49	692	A		
				WB Right	0	0	0	0	A		
52- MD 190 at I-270 SB off ramp											
52	NB	70.5	E	NB Left	225	70	84	800	E	12.3	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	3.6	A	EB Left	0	0	0	0	A		
				EB Through	1062	4	8	176	A		
				EB Right	0	0	0	0	A		
	WB	10.0	A	WB Left	0	0	0	0	A		
				WB Through	1641	10	30	635	A		
				WB Right	0	0	0	0	A		
53- MD 190 at Seven Locks Rd											
53	NB	0.5	A	NB Left	28	1	0	0	A	26.9	C
				NB Through	314	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	52.6	D	SB Left	364	52	120	414	D		
				SB Through	232	53	120	414	D		
				SB Right	20	50	120	414	D		
	EB	32.0	C	EB Left	27	30	95	436	C		
				EB Through	800	32	95	436	C		
				EB Right	45	32	95	436	C		
	WB	20.8	C	WB Left	255	75	124	491	E		
				WB Through	914	18	124	491	B		
				WB Right	693	5	124	491	A		
54- MD 124 at I-270 NB off ramp											
54	NB	31.3	C	NB Left	0	0	0	0	A	23.6	C
				NB Through	0	0	0	0	A		
				NB Right	556	31	56	630	C		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	21.1	C	EB Left	0	0	0	0	A		
				EB Through	1661	21	57	938	C		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
55- Democracy Blvd at I-270 NB off ramp											
55	NB	46.2	D	NB Left	0	0	0	0	A	11.2	B
				NB Through	0	0	0	0	A		
				NB Right	313	46	51	205	D		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
			EB Left	0	0	0	0	A			

Table D.14: PM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
	EB	1.5	A	EB Through	1128	2	4	59	A		
				EB Right	0	0	0	0	A		
	WB	WB Left	0	0	0	0	A				
		WB Through	0	0	0	0	A				
		WB Right	0	0	0	0	A				
56- Watkins Mill Rd at I-270 SB off ramp/Parkview Ave											
56	NB	71.3	E	NB Left	145	53	170	656	D	87.9	F
				NB Through	0	0	0	0	A		
				NB Right	342	79	170	656	E		
	SB	42.7	D	SB Left	410	63	107	388	E		
				SB Through	110	59	107	388	E		
				SB Right	441	20	107	388	C		
	EB	143.5	F	EB Left	0	0	0	0	A		
				EB Through	1216	144	961	1246	F		
				EB Right	4	136	961	1246	F		
				WB Left	62	85	49	220	F		
	WB	41.9	D	WB Through	295	33	47	219	C		
WB Right				0	0	0	0	A			
57- Watkins Mill Rd at I-270 NB on ramp											
57	NB	40.5	D	NB Left	77	65	56	638	E	72.4	E
				NB Through	0	0	0	0	A		
				NB Right	193	31	56	638	C		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	26.1	C	EB Left	644	66	146	438	E		
				EB Through	1051	2	146	438	A		
				EB Right	0	0	0	0	A		
				WB Left	0	0	0	0	A		
	WB	157.1	F	WB Through	684	122	651	866	F		
WB Right				343	227	651	866	F			
58- Watkins Mill Rd at I-270 SB on ramp											
58	NB			NB Left	0	0	0	0	A	16.5	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	17.2	B	EB Left	0	0	0	0	A		
				EB Through	1691	19	150	598	B		
				EB Right	286	8	150	598	A		
	WB	14.8	B	WB Left	409	27	46	464	C		
				WB Through	352	1	46	464	A		
WB Right				0	0	0	0	A			

Table D.15: PM Peak -2040 Hard Shoulder Running- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
1- MD 85 at Sam's Club Drive											
1	NB	60.2	E	NB Left	133	77	451	887	E	118.0	F
				NB Through	566	37	451	887	D		
				NB Right	934	72	422	910	E		
	SB	178.8	F	SB Left	153	128	1025	1234	F		
				SB Through	870	186	1025	1234	F		
				SB Right	72	202	1025	1234	F		
	EB	34.5	C	EB Left	55	84	31	138	F		
				EB Through	24	81	31	138	F		
				EB Right	169	12	31	138	B		
	WB	177.5	F	WB Left	563	196	565	760	F		
				WB Through	31	171	565	760	F		
				WB Right	223	131	565	760	F		
2- MD 85 at I-270 NB on and off ramp											
2	NB	57.0	E	NB Left	1130	57	660	1799	E	47.0	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	31.9	C	SB Left	0	0	0	0	A		
				SB Through	743	32	130	695	C		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
3- MD 85 at I-270 SB on and off ramp											
3	NB	18.5	B	NB Left	0	0	0	0	A	20.5	C
				NB Through	1956	18	190	1287	B		
				NB Right	0	0	0	0	A		
	SB	43.8	D	SB Left	174	44	110	692	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
4- MD 85 at Crestwood Blvd											
4	NB	77.6	F	NB Left	73	110	419	900	F	54.6	D
				NB Through	1437	76	419	901	E		
				NB U-Turn	0	0	0	0	A		
	SB	31.9	C	SB Left	105	76	47	199	E		
				SB Through	941	30	102	850	C		
				SB Right	919	29	89	841	C		
	EB	64.3	E	EB Left	950	67	203	757	E		
				EB Through	43	52	203	757	D		
				EB Right	28	2	203	757	A		
	WB	54.9	D	WB Left	44	78	62	236	E		
				WB Through	79	84	62	236	F		
				WB Right	94	19	62	236	B		
5- MD 80 at I-270 NB on and ramp											
5	NB	-1.8	A	NB Left	1	0	0	5	A	11.4	B
				NB Through	2	0	0	5	A		
				NB Right	7	-3	0	5	A		
	SB	12.6	B	SB Left	481	16	27	177	B		
				SB Through	22	17	27	177	B		
				SB Right	151	3	0	0	A		
EB Left	97	14	23	229	B						

Table D.15: PM Peak -2040 Hard Shoulder Running- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
	EB	13.4	B	EB Through	0	0	8	0	A		
				EB Right	5	5	36	259	A		
	WB	10.7	B	WB Left	15	15	1	35	B		
				WB Through	675	18	65	503	B		
				WB Right	612	2	0	14	A		
6- MD 80 at I-270 SB on and off ramp											
6	NB	3.5	A	NB Left	55	4	4	257	A	5.8	A
				NB Through	0	0	0	0	A		
				NB Right	604	3	4	257	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	7.0	A	EB Left	0	0	0	0	A		
				EB Through	381	7	4	105	A		
				EB Right	66	4	3	114	A		
	WB	7.9	A	WB Left	0	0	0	0	A		
				WB Through	447	8	2	118	A		
				WB Right	0	0	0	0	A		
7- MD 109 at I-270 NB on and off ramp											
7	NB			NB Left	0	0	0	0	A	8.5	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	16.6	C	SB Left	320	18	38	317	C		
				SB Through	0	0	0	0	A		
				SB Right	25	5	0	182	A		
	EB	2.5	A	EB Left	80	2	0	55	A		
				EB Through	0	0	0	0	A		
				EB Right	83	3	0	0	A		
	WB	0.4	A	WB Left	0	0	0	0	A		
				WB Through	222	0	0	0	A		
				WB Right	0	0	0	0	A		
8- MD 80 at I-270 SB on and off ramp											
8	NB	4.7	A	NB Left	63	8	3	105	A	1.8	A
				NB Through	0	0	0	0	A		
				NB Right	37	0	0	23	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.9	A	EB Left	0	0	0	0	A		
				EB Through	166	0	0	0	A		
				EB Right	34	4	0	0	A		
	WB	1.5	A	WB Left	137	1	0	55	A		
				WB Through	109	2	0	26	A		
				WB Right	0	0	0	0	A		
9- MD 121 at Gateway Center Dr											
9	NB	30.0	D	NB Left	632	35	128	658	C	46.3	D
				NB Through	857	28	128	658	C		
				NB Right	70	11	136	684	B		
	SB	21.7	C	SB Left	27	15	19	217	B		
				SB Through	301	23	30	217	C		
				SB Right	9	9	32	237	A		
	EB	14.2	B	EB Left	4	43	8	248	D		
				EB Through	24	37	14	248	D		
				EB Right	248	12	26	281	B		
	WB	116.2	F	WB Left	350	160	295	690	F		
				WB Through	75	77	295	689	E		
				WB Right	185	49	318	714	D		
10- MD 121 at I-270 NB on and off ramp											
	NB	21.3	C	NB Left	422	57	80	293	F		
				NB Through	0	0	0	0	A		

Table D.15: PM Peak -2040 Hard Shoulder Running- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
10	SB			NB Right	900	4	0	88	A	18.4	B
				SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	12.6	B	EB Left	0	0	0	0	A		
				EB Through	648	19	41	375	C		
				EB Right	336	1	0	0	A		
				WB Left	219	60	89	448	F		
	WB	20.5	C	WB Through	677	8	89	448	A		
				WB Right	0	0	0	0	A		

Table D.15: PM Peak -2040 Hard Shoulder Running- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
11- MD 121 at I-270 SB on and off ramp											
11	NB			NB Left	0	0	0	0	A	22.9	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	64.8	E	SB Left	269	87	239	1062	F		
				SB Through	0	0	0	0	A		
				SB Right	251	41	0	49	E		
	EB	6.4	A	EB Left	0	0	0	0	A		
				EB Through	717	6	16	218	A		
				EB Right	0	0	0	0	A		
				WB Left	0	0	0	0	A		
WB	13.8	B	WB Through	562	27	49	369	D			
			WB Right	535	0	0	0	A			
12- MD 27 at Observation Dr											
12	NB	38.4	D	NB U-Turn	0	0	0	0	A	26.1	C
				NB Through	94	55	22	98	E		
				NB Right	61	13	22	98	B		
	SB	41.3	D	SB Left	146	44	38	216	D		
				SB Through	57	62	44	250	E		
				SB Right	188	33	68	287	C		
	EB	20.2	C	EB Left	211	34	88	520	C		
				EB Through	2246	19	90	521	B		
				EB Right	107	17	103	560	B		
	WB	30.0	C	WB Left	41	27	161	720	C		
WB Through				1695	31	161	720	C			
WB Right				69	11	161	720	B			
13- MD 27 at I-270 NB off ramp											
13	NB	44.0	D	NB Left	388	44	62	275	D	7.6	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.1	A	EB Left	0	0	0	0	A		
				EB Through	1515	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	6.1	A	WB Left	0	0	0	0	A		
WB Through				1790	6	50	763	A			
WB Right				0	0	0	0	A			
14- MD 27 at I-270 SB off ramp											
14	NB			NB Left	0	0	0	0	A	6.0	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	51.7	D	SB Left	175	52	34	156	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	1.9	A	EB Left	0	0	0	0	A		
				EB Through	1678	2	4	97	A		
				EB Right	0	0	0	0	A		
	WB	5.2	A	WB Left	0	0	0	0	A		
WB Through				1624	5	22	412	A			
WB Right				0	0	0	0	A			
15- MD 27 at Crystal Rock Dr											
15	NB	31.5	C	NB Left	76	33	109	578	C	72.1	E
				NB Through	1196	31	118	577	C		
				NB Right	55	30	125	590	C		
	SB	62.3	E	SB Left	164	80	468	1217	F		
				SB Through	1526	64	468	1217	E		
				SB Right	233	36	453	1211	D		
	EB Left	125	54	35	129	D					

Table D.15: PM Peak -2040 Hard Shoulder Running- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
	EB	40.8	D	EB Through	49	36	30	124	D		
				EB Right	62	19	23	158	B		
	WB	161.3	F	WB Left	104	95	1023	1500	F		
				WB Through	128	107	1023	1500	F		
				WB Right	665	182	1023	1500	F		
16- MD 118 at Seneca Meadows Pkwy											
16	NB	5.7	A	NB Left	109	15	2	90	B	9.5	A
				NB Through	1417	5	14	229	A		
				NB Right	1	2	23	282	A		
	SB	7.9	A	SB Left	16	8	21	314	A		
				SB Through	1226	8	24	314	A		
				SB Right	11	4	28	347	A		
	EB	14.0	B	EB Left	23	59	14	140	E		
				EB Through	0	65	14	140	E		
				EB Right	312	11	14	140	B		
	WB	53.9	D	WB Left	103	65	43	243	E		
				WB Through	7	69	39	242	E		
WB Right				30	13	48	262	B			
17- MD 118 at I-270 NB on ramp											
17	NB			NB Left	0	0	0	0	A	13.6	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	25.7	C	EB Left	495	26	42	296	C		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	9.9	A	WB Left	0	0	0	0	A		
				WB Through	283	2	0	35	A		
WB Right				1362	12	45	535	B			
18- MD 118 at I-270 SB off ramp											
18	NB			NB Left	0	0	0	0	A	7.5	A
				NB Through	0	0.0	0	0	A		
				NB Right	0	0.0	0	0	A		
	SB	36.4	D	SB Left	168	36.4	27	150	D		
				SB Through	0	0.0	0	0	A		
				SB Right	0	0.0	0	0	A		
	EB	6.0	A	EB Left	0	0.0	0	0	A		
				EB Through	1412	6.0	14	412	A		
				EB Right	0	0.0	0	0	A		
	WB	6.0	A	WB Left	0	0.0	0	0	A		
				WB Through	1713	6.0	14	295	A		
WB Right				0	0.0	0	0	A			
19- MD 118 at Aircraft Dr											
19	NB	26.1	C	NB Left	52	71	42	242	E	41.9	D
				NB Through	53	69	42	242	E		
				NB Right	227	6	5	102	A		
	SB	153.1	F	SB Left	441	143	393	653	F		
				SB Through	14	204	393	653	F		
				SB Right	129	184	393	653	F		
	EB	22.8	C	EB Left	125	36	89	527	D		
				EB Through	1415	22	89	527	C		
				EB Right	21	20	89	527	C		
	WB	27.0	C	WB Left	16	31	140	971	C		
				WB Through	1566	31	140	971	C		
WB Right				411	11	140	971	B			
20- Middlebrook Rd at Observation Dr											
	NB			NB Left	0	0	0	0	A		
				NB Through	0	0	0	0	A		

Table D.15: PM Peak -2040 Hard Shoulder Running- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
20	SB	20.5	C	NB Right	0	0	0	0	A	9.0	A
				SB Left	125	36	23	150	D		
				SB Through	0	0	0	0	A		
				SB Right	186	10	23	150	B		
	EB	6.4	A	EB Left	15	11	17	168	B		
				EB Through	1184	6	17	168	A		
				EB Right	0	0	0	0	A		
	WB	8.7	A	WB Left	0	0	0	0	A		
				WB Through	1313	9	27	275	A		
				WB Right	17	7	42	324	A		

Table D.15: PM Peak -2040 Hard Shoulder Running- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
21- Middlebrook Rd at I-270 SB on ramp											
21	NB			NB Left	0	0	0	0	A	4.6	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	2.6	A	EB Left	0	0	0	0	A		
				EB Through	742	3	4	103	A		
				EB Right	0	0	0	0	A		
	WB	7.9	A	WB Left	438	8	5	227	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
22- Middlebrook Rd at Waring Station Rd											
22	NB	48.4	D	NB Left	200	46	83	309	D	13.8	B
				NB Through	1	55	83	309	D		
				NB Right	236	50	83	309	D		
	SB	30.2	C	SB Left	32	47	8	72	D		
				SB Through	2	38	8	72	D		
				SB Right	24	8	19	110	A		
	EB	8.1	A	EB Left	4	15	28	285	B		
				EB Through	1125	8	28	285	A		
				EB Right	198	8	28	285	A		
	WB	9.4	A	WB Left	243	24	39	298	C		
				WB Through	1651	7	39	298	A		
				WB Right	3	2	39	298	A		
23- MD 124 at MD 355											
23	NB	140.6	F	NB Left	487	121	730	1135	F	74.8	E
				NB Through	1141	149	727	1133	F		
				NB Right	7	109	0	0	F		
	SB	44.5	D	SB Left	182	93	143	467	F		
				SB Through	702	65	143	467	E		
				SB Right	719	12	42	429	B		
	EB	29.7	C	EB Left	448	72	187	869	E		
				EB Through	2578	28	187	869	C		
				EB Right	534	3	75	804	A		
	WB	136.2	F	WB Left	0	0	0	0	A		
				WB Through	1573	139	693	947	F		
				WB Right	85	90	0	0	F		
24- MD 124 at I-270 SB on and off											
24	NB	57.7	F	NB Left	53	57	21	97	E	29.0	C
				NB Through	21	59	21	97	E		
				NB U-Turn	0	0	0	0	A		
	SB	38.8	D	SB Left	561	65	130	651	E		
				SB Through	8	67	130	651	E		
				SB Right	455	5	4	232	A		
	EB	25.6	C	EB Left	0	0	0	0	A		
				EB Through	1888	26	184	1062	C		
				EB Right	36	27	197	1085	C		
	WB	24.1	C	WB Left	5	72	319	1768	E		
				WB Through	1155	24	319	1768	C		
				WB Right	0	0	0	0	A		
25- MD 117 at MD 124											
25	NB	77.9	E	NB Left	56	147	323	747	F	51.3	D
				NB Through	681	93	323	747	F		
				NB Right	461	47	27	719	D		
	SB	38.5	D	SB Left	135	65	155	679	E		
				SB Through	968	41	155	679	D		
				SB Right	182	5	0	0	A		
	EB			EB Left	150	81	166	573	F		

Table D.15: PM Peak -2040 Hard Shoulder Running- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
	EB	48.7	D	EB Through	1162	45	166	574	D		
				EB Right	57	41	174	601	D		
	WB	44.8	D	WB Left	395	73	277	1029	E		
				WB Through	1327	40	277	1029	D		
				WB Right	128	2	0	0	A		
26- MD 117 at Bureau Dr											
26	NB	52.8	D	NB Left	98	79	86	293	E	40.9	D
				NB Through	35	79	86	293	E		
				NB Right	266	40	86	293	D		
	SB	81.7	F	SB Left	285	95	134	423	F		
				SB Through	22	94	134	423	F		
				SB Right	83	31	134	423	C		
	EB	33.9	C	EB Left	52	81	184	873	F		
				EB Through	1681	32	185	873	C		
				EB Right	6	25	178	862	C		
	WB	36.5	D	WB Left	18	36	306	1058	D		
				WB Through	1655	38	307	1059	D		
				WB Right	282	25	337	1107	C		
27- MD 117 at I-270 SB off ramp											
27	NB			NB Left	0	0	0	0	A	12.9	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	3.8	A	EB Left	0	0	0	0	A		
				EB Through	944	4	13	532	A		
				EB Right	0	0	0	0	A		
	WB	41.6	E	WB Left	301	42	115	1067	E		
WB Through				0	0	0	0	A			
WB Right				0	0	0	0	A			
28- MD 117 at I-270 NB off ramp											
28	NB			NB Left	0	0	0	0	A	60.7	E
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	162.2	F	SB Left	239	154	3992	5069	F		
				SB Through	0	0	0	0	A		
				SB Right	871	165	3991	5068	F		
	EB	17.7	B	EB Left	3	122	86	973	F		
				EB Through	943	17	86	973	B		
				EB Right	0	0	0	0	A		
	WB	8.2	A	WB Left	0	0	0	0	A		
WB Through				1374	8	56	383	A			
WB Right				0	0	56	383	A			
29- MD 117 at Perry Pkwy											
29	NB	38.1	D	NB Left	18	54	16	126	D	47.8	D
				NB Through	26	55	15	125	E		
				NB Right	34	17	24	146	B		
	SB	159.9	F	SB Left	233	196	277	452	F		
				SB Through	20	216	277	452	F		
				SB Right	118	79	277	452	E		
	EB	21.7	C	EB Left	247	71	91	360	E		
				EB Through	884	9	91	360	A		
				EB Right	33	6	76	344	A		
	WB	41.4	D	WB Left	36	108	246	746	F		
				WB Through	1236	42	246	746	D		
				WB Right	376	32	246	746	C		
30- Shady Grove Rd at I-270 NB off ramp											
	NB	6.7	A	NB Left	0	0	0	0	A		
				NB Through	1058	7	16	199	A		

Table D.15: PM Peak -2040 Hard Shoulder Running- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS	
30	SB	10.0	B	NB Right	0	0	0	0	A	13.6	B	
				SB Left	0	0	0	0	A			
				SB Through	1363	10	49	553	B			
				SB Right	0	0	0	0	A			
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
					WB Left	323	51	58	225			D
	WB	51.2		D	WB Through	0	0	0	0			A
					WB Right	0	0	0	0			A

Table D.15: PM Peak -2040 Hard Shoulder Running- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
31- Shady Grove Rd at I-270 SB off ramp											
31	NB	7.1	A	NB Left	0	0	0	0	A	15.8	B
				NB Through	1529	7	33	433	A		
				NB Right	0	0	0	0	A		
	SB	5.5	A	SB Left	0	0	0	0	A		
				SB Through	864	5	8	159	A		
				SB Right	0	0	0	0	A		
	EB	58.1	E	EB Left	230	56	45	191	E		
				EB Through	0	0	0	0	A		
				EB Right	300	60	64	266	E		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
32- MD 28 at I-270 SB off ramp											
32	NB			NB U-Turn	0	0	0	0	A	9.4	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	37.1	D	SB Left	443	45	76	312	D		
				SB Through	0	0	0	0	A		
				SB Right	104	3	0	20	A		
	EB	4.9	A	EB Left	0	0	0	0	A		
				EB Through	1540	4	132	1179	A		
				EB Right	929	6	16	344	A		
	WB	7.1	A	WB Left	0	0	0	0	A		
				WB Through	1807	7	23	288	A		
				WB Right	0	0	0	0	A		
33- MD 28 at I-270 on and off ramps											
33	NB	37.0	D	NB Left	0	0	44	261	A	51.1	D
				NB Through	208	48	52	270	D		
				NB Right	137	20	52	270	B		
	SB	140.3	F	SB Left	21	171	349	415	F		
				SB Through	0	0	0	0	A		
				SB Right	291	138	349	415	F		
	EB	34.7	C	EB Left	273	122	185	414	F		
				EB Through	946	10	185	414	A		
				EB Right	0	0	0	0	A		
	WB	48.9	D	WB Left	41	43	193	419	D		
				WB Through	1284	49	168	382	D		
				WB Right	0	0	0	0	A		
34- MD 189 at Great Falls Rd											
34	NB	36.7	D	NB Left	43	45	12	95	D	13.8	B
				NB Through	14	48	9	94	D		
				NB Right	19	9	9	105	A		
	SB	3.3	A	SB Left	18	41	7	83	D		
				SB Through	13	46	7	83	D		
				SB Right	414	0	0	0	A		
	EB	12.2	B	EB Left	422	24	40	433	C		
				EB Through	663	5	5	180	A		
				EB Right	57	4	10	217	A		
	WB	19.0	B	WB Left	15	21	52	514	C		
				WB Through	852	19	52	514	B		
				WB Right	18	13	67	548	B		
35- MD 189 at I-270 Ramps											
35	NB	45.8	D	NB Left	243	46	44	175	D	41.5	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	54.6	D	SB Left	349	55	126	481	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
				EB Left	485	30	91	368	C		

Table D.15: PM Peak -2040 Hard Shoulder Running- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
	EB	27.2	C	EB Through	374	23	91	368	C		
				EB Right	0	0	0	0	A		
				WB Left	448	53	110	269	D		
	WB	49.0	D	WB Through	436	45	110	269	D		
				WB Right	0	0	0	0	A		
36- MD 189 at Wooton Pkwy											
36	NB	45.5	D	NB Left	237	57	141	487	E	53.0	D
				NB Through	694	50	141	487	D		
				NB Right	176	12	141	487	B		
	SB	83.9	F	SB Left	252	104	287	801	F		
				SB Through	929	78	317	791	E		
				SB Right	0	0	0	0	A		
	EB	39.4	D	EB Left	152	73	127	450	E		
				EB Through	553	39	127	450	D		
				EB Right	205	15	127	450	B		
	WB	40.4	D	WB Left	162	71	149	796	E		
				WB Through	784	42	149	796	D		
				WB Right	320	20	149	796	C		
37- Montrose Rd at Tower Oaks Blvd											
37	NB	0.4	A	NB Left	0	0	0	0	A	24.0	C
				NB Through	0	0	0	0	A		
				NB Right	540	0	0	0	A		
	SB	74.7	E	SB Left	88	49	38	355	D		
				SB Through	0	0	0	0	A		
				SB Right	312	82	112	433	F		
	EB	7.3	A	EB Left	0	0	0	0	A		
				EB Through	1859	7	43	518	A		
				EB Right	0	0	0	0	A		
	WB	31.7	C	WB Left	78	41	43	518	D		
				WB Through	2682	32	212	778	C		
				WB Right	288	24	212	778	C		
38- Tower Oaks Blvd at I-270 off rmap											
38	NB	22.9	C	NB Left	707	24	49	229	C	17.1	B
				NB Through	0	0.0	43	221	A		
				NB Right	26	6.3	49	229	A		
	SB	10.3	B	SB Left	9	17.9	1	40	B		
				SB Through	0	0.0	1	39	A		
				SB Right	9	2.8	0	23	A		
	EB	10.6	B	EB Left	1	10.3	16	185	B		
				EB Through	363	10.9	16	185	B		
				EB Right	37	7.0	11	176	A		
	WB	13.0	B	WB Left	149	16.2	17	161	B		
				WB Through	215	10.9	17	161	B		
				WB Right	3	3.0	3	117	A		
39- Montrose Rd at Tower Oaks Blvd											
39	NB	20.4	C	NB Left	97	43	85	392	D	44.9	D
				NB Through	773	32	85	392	C		
				NB Right	621	2	0	0	A		
	SB	32.7	C	SB Left	210	64	76	319	E		
				SB Through	506	24	75	318	C		
				SB Right	131	16	77	321	B		
	EB	130.6	F	EB Left	103	108	354	709	F		
				EB Through	518	134	356	710	F		
				EB Right	44	145	378	733	F		
	WB	37.6	D	WB Left	576	46	120	416	D		
				WB Through	482	43	120	416	D		
				WB Right	333	15	141	446	B		
40- Rockledge Blvd at I-270 NB on and off ramp											
	NB	134.8	F	NB Left	0	0	0	0	A		
				NB Through	335	123	568	845	F		

Table D.15: PM Peak -2040 Hard Shoulder Running- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
40	SB	85.6	F	NB Right	853	140	568	845	F	117.7	F
				SB Left	0	0	89	232	A		
				SB Through	357	86	89	232	F		
				SB Right	0	0	0	0	A		
	EB	106.2	F	EB Left	6	205	339	857	F		
				EB Through	455	164	339	857	F		
				EB Right	306	18	0	0	B		
				WB Left	0	0	0	0	A		
	WB			WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table D.15: PM Peak -2040 Hard Shoulder Running- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
41- Rockledge Blvd at I-270 SB on and off ramps											
41	NB	31.8	C	NB Left	338	32	79	267	C	50.9	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	56.1	E	WB Left	355	60	203	753	E		
				WB Through	890	55	203	753	D		
				WB Right	0	0	0	0	A		
42- MD 187 at Tuckerman Ln											
42	NB	76.3	E	NB Left	212	53	644	1328	D	136.4	F
				NB Through	2261	78	644	1328	E		
				NB Right	199	80	644	1328	F		
	SB	187.2	F	SB Left	208	168	2556	2694	F		
				SB Through	1159	184	2556	2694	F		
				SB Right	307	210	2556	2694	F		
	EB	134.8	F	EB Left	301	75	686	1504	E		
				EB Through	531	165	687	1505	F		
				EB Right	117	150	711	1529	F		
	WB	195.2	F	WB Left	464	186	1937	2140	F		
				WB Through	675	213	1937	2140	F		
				WB Right	167	147	1937	2140	F		
43- MD 187 at I-270 NB on and off ramps											
43	NB	19.2	B	NB Left	561	34	131	429	C	21.8	C
				NB Through	2483	16	131	429	B		
				NB Right	0	0	0	0	A		
	SB	24.3	C	SB Left	0	0	0	0	A		
				SB Through	1295	24	65	264	C		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	57.8	E	WB Left	60	57	43	321	E		
				WB Through	67	59	43	321	E		
				WB Right	0	0	0	0	A		
44- MD 187 at I-270 NB on and off ramps											
44	NB	45.3	E	NB Left	0	0	0	0	A	43.1	D
				NB Through	2401	45	192	837	D		
				NB Right	0	0	0	0	A		
	SB	19.1	B	SB Left	149	60	71	288	E		
				SB Through	1207	14	71	288	B		
				SB Right	0	0	0	0	A		
	EB	76.3	E	EB Left	642	78	198	701	E		
				EB Through	0	0	198	701	A		
				EB Right	178	69	112	656	E		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
45- MD 187 at Rock Spring Dr											
45	NB	20.7	C	NB Left	492	36	120	759	D	29.5	C
				NB Through	2184	17	121	760	B		
				NB Right	18	14	141	793	B		
	SB	33.2	C	SB Left	21	61	108	556	E		
				SB Through	1190	37	108	556	D		
				SB Right	174	1	73	551	A		
	EB Left	431	61	144	542	E					

Table D.15: PM Peak -2040 Hard Shoulder Running- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
	EB	49.6	D	EB Through	50	69	144	542	E		
				EB Right	482	38	144	542	D		
	WB	16.6	B	WB Left	7	28	5	108	C		
				WB Through	16	32	5	108	C		
				WB Right	36	8	3	97	A		
47-Democracy Blvd at I-270 NB off ramp											
47	NB	44.3	D	NB Left	153	44	28	127	D	2.9	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	1.1	A	EB Left	0	0	0	0	A		
				EB Through	1124	1	3	55	A		
				EB Right	0	0	0	0	A		
	WB	1.0	A	WB Left	0	0	0	0	A		
				WB Through	2239	1	3	57	A		
WB Right				0	0	0	0	A			
48- Democracy Blvd at I-270 SB on ramp											
48	NB			NB Left	0	0	0	0	A	8.5	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	5.4	A	EB Left	0	0	0	0	A		
				EB Through	1328	5	19	246	A		
				EB Right	0	0	0	0	A		
	WB	10.2	B	WB Left	533	36	63	418	D		
				WB Through	1826	3	53	397	A		
WB Right				0	0	0	0	A			
49- Democracy Blvd at I-270 SB off ramp											
49	NB			NB Left	0	0	0	0	A	8.4	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	35.5	D	SB Left	154	48	27	171	D		
				SB Through	0	0	0	0	A		
				SB Right	59	3	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	5.5	A	WB Left	0	0	0	0	A		
				WB Through	1826	4	20	288	A		
WB Right				153	28	120	901	C			
50- MD 190 at Burdette Rd											
50	NB	75.4	E	NB Left	27	79	18	118	E	36.8	D
				NB Through	7	69	18	118	E		
				NB Right	6	68	18	118	E		
	SB	36.3	D	SB Left	45	77	25	147	E		
				SB Through	9	71	25	147	E		
				SB Right	122	19	25	147	B		
	EB	22.9	C	EB Left	138	101	124	621	F		
				EB Through	1287	15	124	621	B		
				EB Right	30	4	117	648	A		
	WB	45.2	D	WB Left	13	124	390	1119	F		
				WB Through	2159	45	390	1119	D		
WB Right				65	35	390	1119	C			

Table D.15: PM Peak -2040 Hard Shoulder Running- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
51- MD 190 at I-270 NB on ramp											
51	NB			NB Left	0	0	0	0	A	18.2	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	66.2	E	EB Left	253	66	101	342	E		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	10.0	A	WB Left	0	0	0	0	A		
				WB Through	1473	10	54	766	A		
				WB Right	0	0	0	0	A		
52- MD 190 at I-270 SB off ramp											
52	NB	72.6	E	NB Left	223	73	86	829	E	12.8	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	3.5	A	EB Left	0	0	0	0	A		
				EB Through	1062	4	8	181	A		
				EB Right	0	0	0	0	A		
	WB	10.8	B	WB Left	0	0	0	0	A		
				WB Through	1636	11	28	629	B		
				WB Right	0	0	0	0	A		
53- MD 190 at Seven Locks Rd											
53	NB	0.5	A	NB Left	28	1	0	0	A	27.2	C
				NB Through	314	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	52.6	D	SB Left	364	52	120	414	D		
				SB Through	232	53	120	414	D		
				SB Right	20	51	120	414	D		
	EB	32.0	C	EB Left	27	30	95	442	C		
				EB Through	800	32	95	442	C		
				EB Right	45	32	95	442	C		
	WB	21.4	C	WB Left	256	77	126	535	E		
				WB Through	908	18	126	535	B		
				WB Right	691	5	126	535	A		
54- MD 124 at I-270 NB off ramp											
54	NB	36.8	D	NB Left	0	0	0	0	A	35.9	D
				NB Through	0	0	0	0	A		
				NB Right	1532	37	201	898	D		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	35.2	D	EB Left	0	0	0	0	A		
				EB Through	2009	35	257	1195	D		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
55- Democracy Blvd at I-270 NB off ramp											
55	NB	47.3	D	NB Left	0	0	0	0	A	11.4	B
				NB Through	0	0	0	0	A		
				NB Right	314	47	51	214	D		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
			EB Left	0	0	0	0	A			

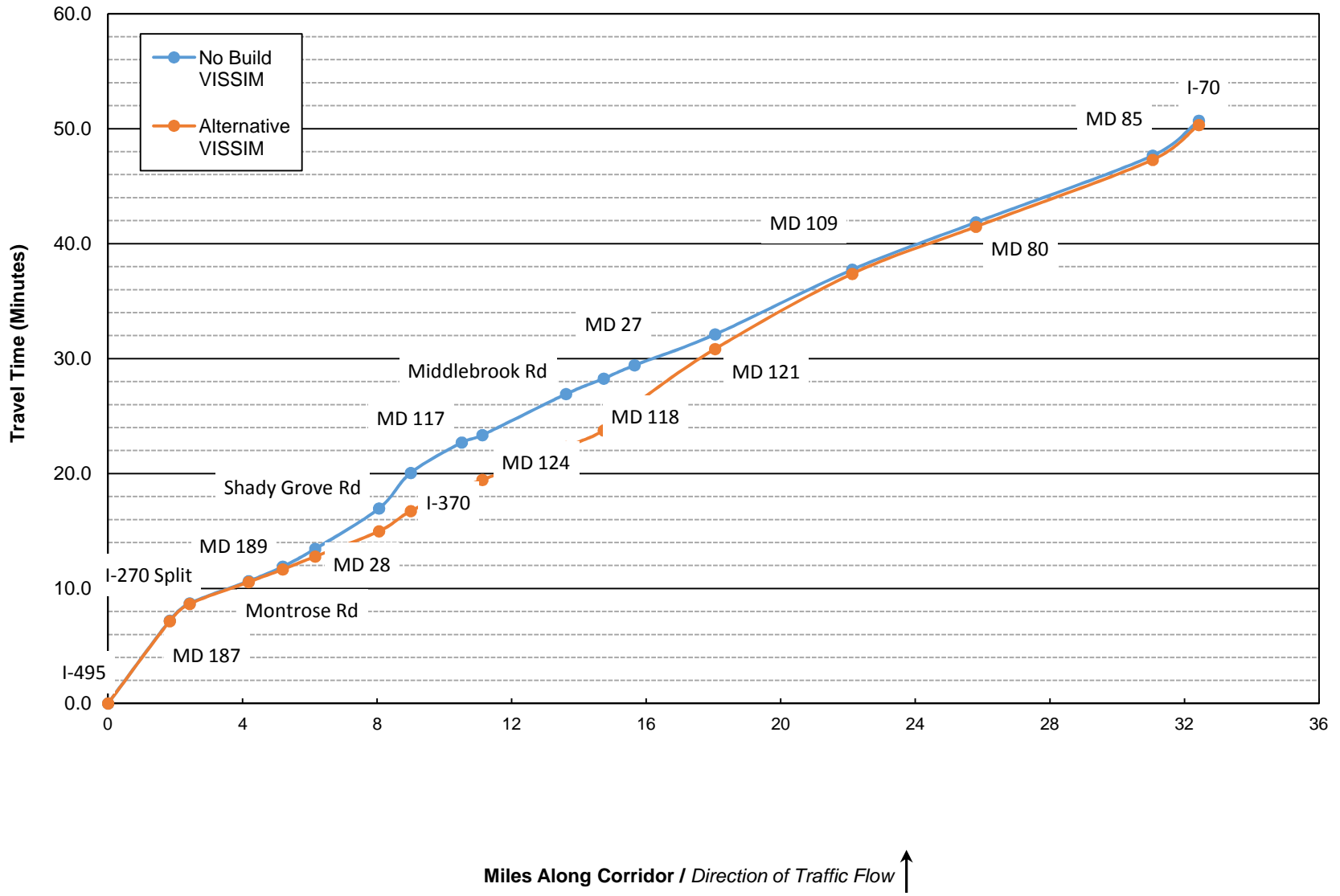
Table D.15: PM Peak -2040 Hard Shoulder Running- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
	EB	1.4	A	EB Through	1125	1	4	63	A		
				EB Right	0	0	0	0	A		
	WB	WB Left	0	0	0	0	A				
		WB Through	0	0	0	0	A				
		WB Right	0	0	0	0	A				
56- Watkins Mill Rd at I-270 SB off ramp/Parkview Ave											
56	NB	135.0	F	NB Left	139	66	391	721	E	110.3	F
				NB Through	0	0	0	0	A		
				NB Right	327	164	391	721	F		
	SB	46.7	D	SB Left	404	70	120	625	E		
				SB Through	111	60	120	625	E		
				SB Right	442	22	120	625	C		
	EB	194.1	F	EB Left	0	0	0	0	A		
				EB Through	989	194	1030	1251	F		
				EB Right	3	146	1030	1251	F		
	WB	50.2	D	WB Left	95	91	87	305	F		
				WB Through	467	42	85	304	D		
				WB Right	0	0	0	0	A		
57- Watkins Mill Rd at I-270 NB on ramp											
57	NB	113.6	F	NB Left	238	68	1529	3740	E	87.0	F
				NB Through	0	0	0	0	A		
				NB Right	611	132	1529	3740	F		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	45.5	D	EB Left	529	107	263	440	F		
				EB Through	950	11	263	440	B		
				EB Right	0	0	0	0	A		
	WB	119.0	F	WB Left	0	0	0	0	A		
				WB Through	789	137	617	875	F		
				WB Right	420	85	617	875	F		
58- Watkins Mill Rd at I-270 SB on ramp											
58	NB			NB Left	0	0	0	0	A	24.9	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	31.9	C	EB Left	0	0	0	0	A		
				EB Through	1479	35	271	601	D		
				EB Right	242	11	271	601	B		
	WB	13.2	B	WB Left	472	28	57	478	C		
				WB Through	555	1	57	478	A		
				WB Right	0	0	0	0	A		

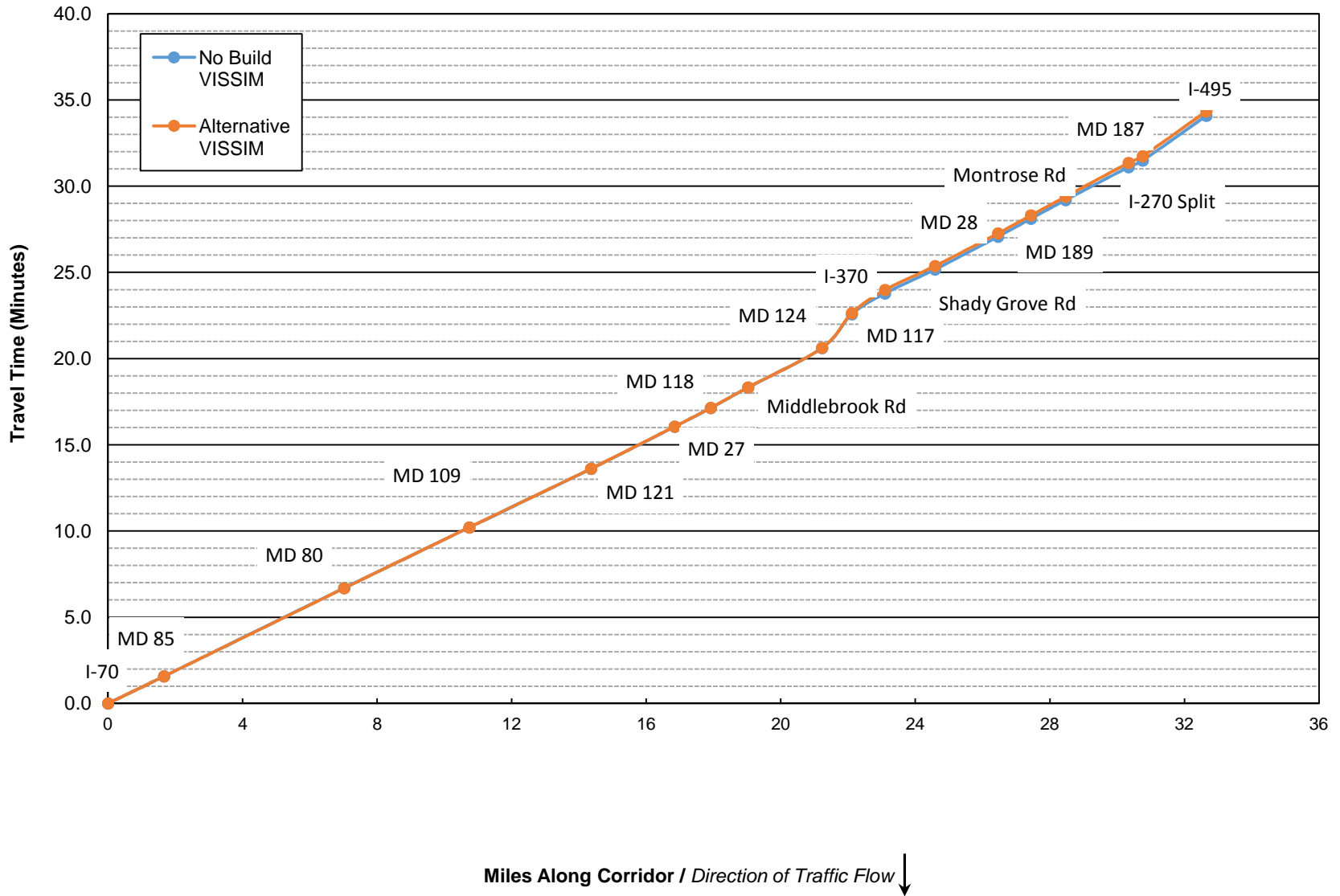
Table D.16: PM Peak- 2040 Hard Shoulder Running- I-270 Vehicle Network Performance

	No Build	HSR	% Change
Total Delay	36,237,078	30,149,654	-17%
Average Delay per Vehicle	307	250	-19%
Total Travel Time	67,865,560	64,132,685	-6%
Vehicles (Arrived)	95,124	100,280	5%
Latent Demand	8,861	5,939	-33%
Latent Delay	13,484,325	10,176,973	-25%
Total Distance	477,455	512,488	7%
Average Speed	25	29	14%

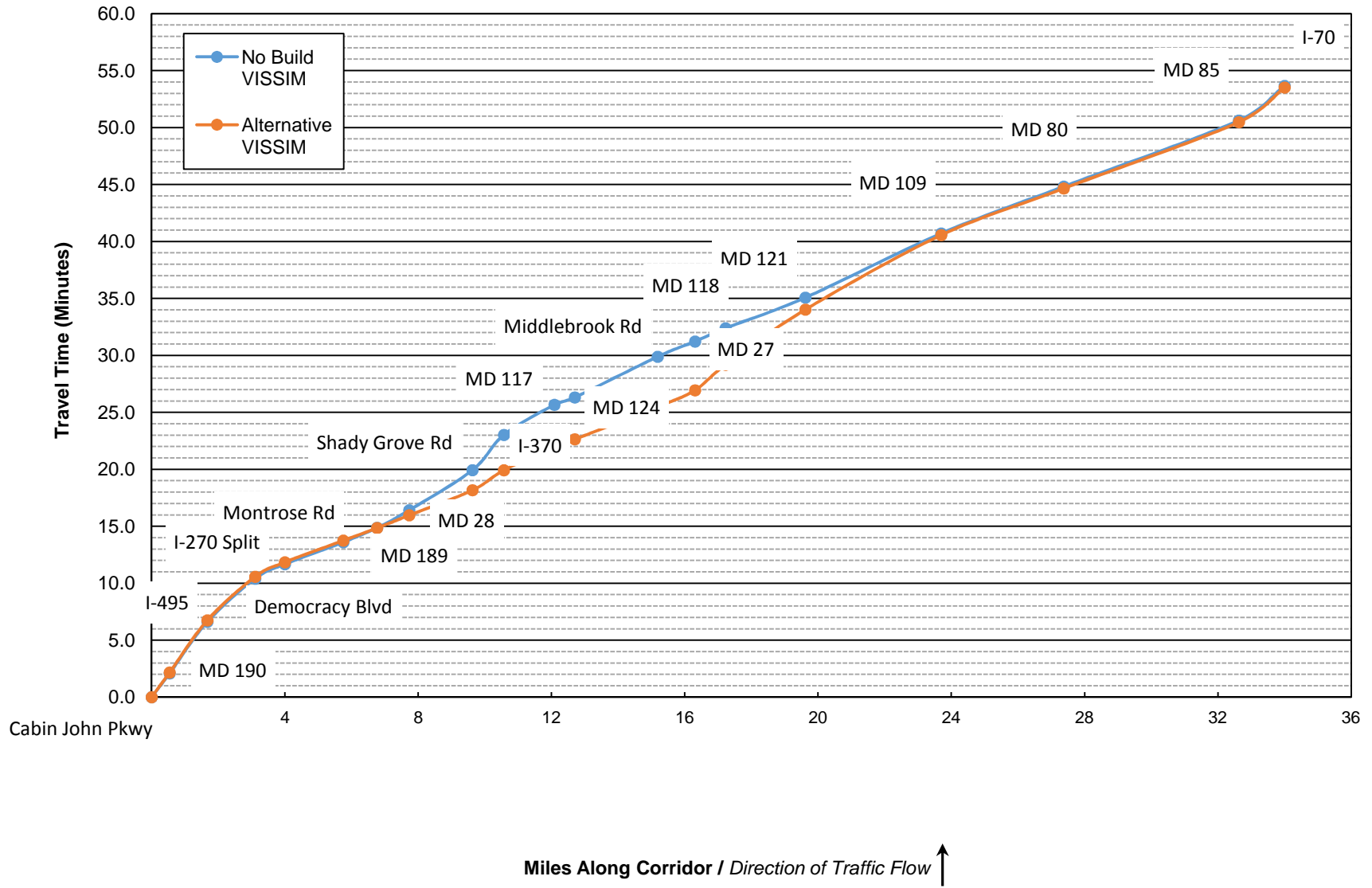
**Figure D.1: PM Peak - 2040 Hard Shoulder Running
I-270 Travel Time Graph - Northbound**



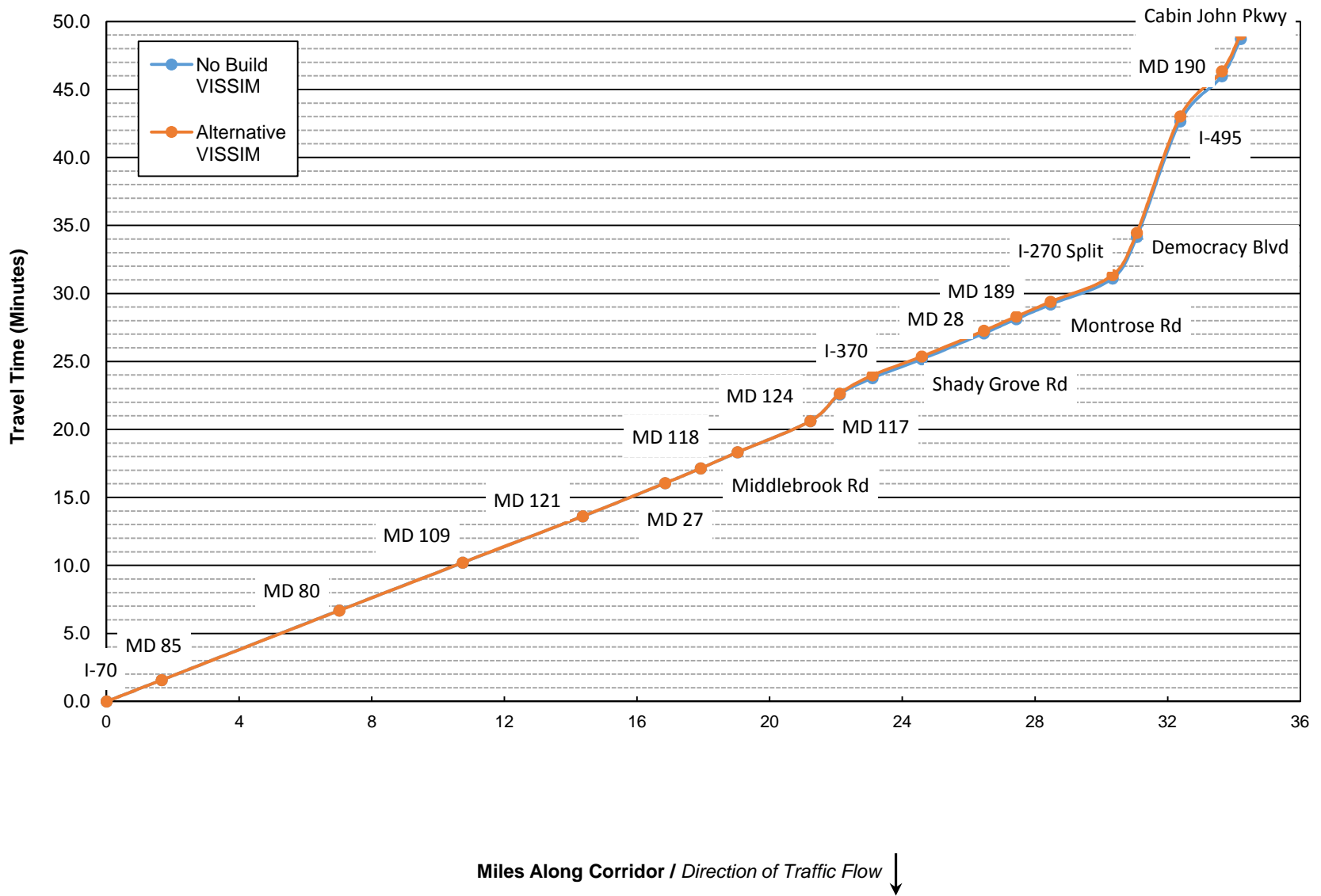
**Figure D.2: PM Peak - 2040 Hard Shoulder Running
I-270 Travel Time Graph - Southbound**



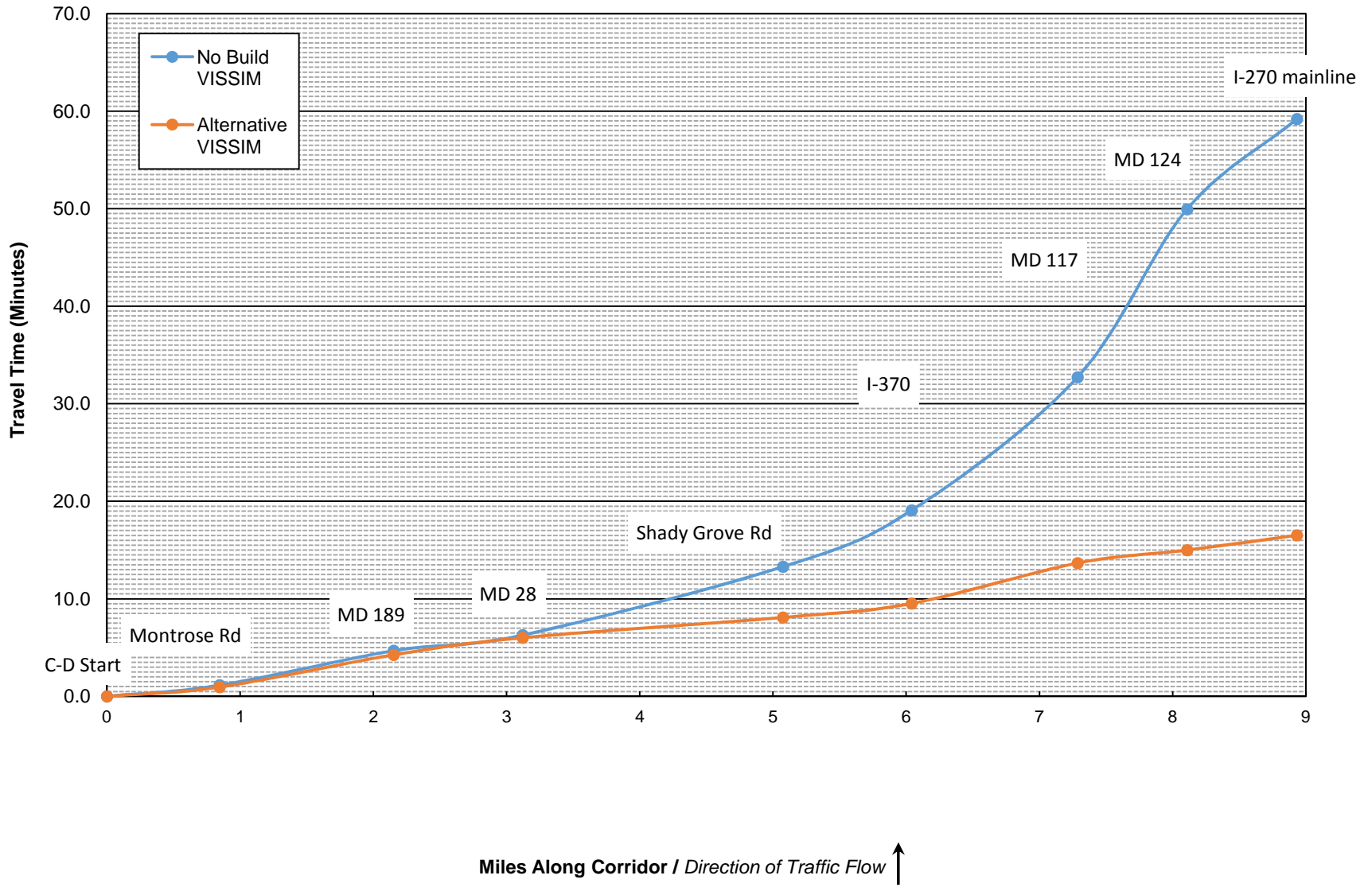
**Figure D.3: PM Peak - 2040 Hard Shoulder Running
I-270 Spur Travel Time Graph - Northbound**



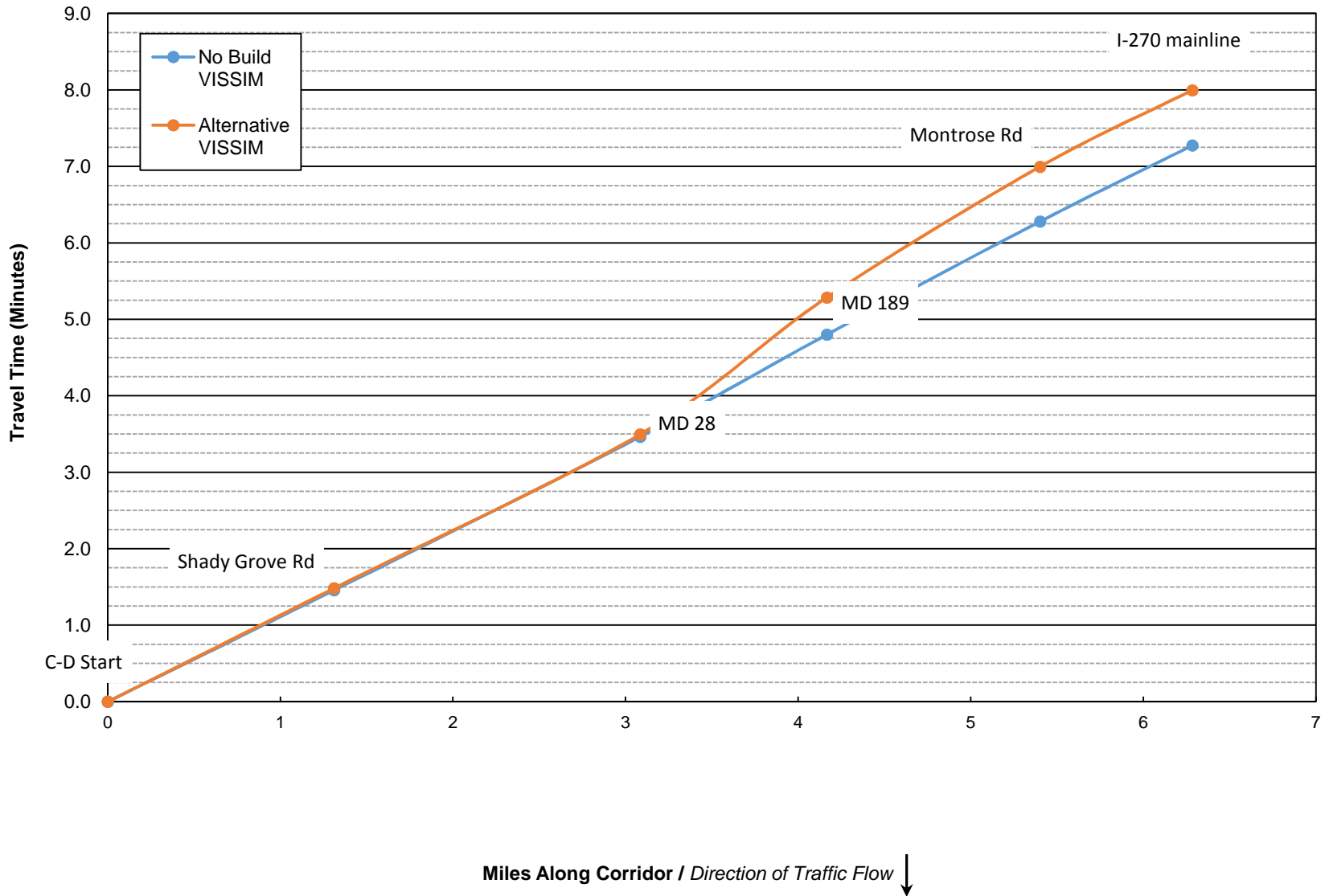
**Figure D.4: PM Peak - 2040 Hard Shoulder Running
I-270 Spur Travel Time Graph - Southbound**



**Figure D.5: PM Peak -2040 Hard Shoulder Running
I-270 Local Travel Time Graph - Northbound**



**Figure D.6: PM Peak - 2040 Hard Shoulder Running
I-270 Local Travel Time Graph - Southbound**



Potential Noise Barrier Locations
I-270 INNOVATIVE CONGESTION
MANAGEMENT (ICM) PROJECT

Maryland State Highway Administration (SHA) has completed noise measurements and traffic noise analysis for the existing I-270 for the southern half of the project from Beltway to Watkins Mill Road. There are numerous residential developments along the southern half of the project but most of them already have noise barriers. There are few residential developments and some scattered houses along the northern half of the project.

A review of the available noise studies conducted by SHA and aerial photos were used to determine if the project may be responsible for constructing any noise barriers or replacing existing ones. FHWA requirement is for any new project to consider noise abatement for areas where the future peak hour noise levels will approach or exceed noise abatement criteria even if traffic noise in an areas is already approaching or exceeding the noise abatement criteria without the proposed project.

Determination of areas that may need new noise barriers or existing barriers that may need to be replaced with higher ones have been done using available information without any new modeling. Therefore, findings of this evaluation should be considered preliminary and subject to change. There are also some scattered houses along northern half of the project alignment where traffic noise impact analysis will be needed but most probable those areas would not qualify for noise barriers.

SHA has identified and numbered different noise sensitive areas (NSAs). Their numbering system is used in this evaluation.

Southern half of the project - Beltway to Watkins Mill Road

NSA 104-B

This NSA represents the townhomes within the Bethesda Overlook community located along Bradley Boulevard. Existing traffic noise levels at the first row residences are between 67 and 75 dBA; therefore, these areas would be impacted and a noise barrier will be required.

NSAs 106-B, 107-B, and 108-B

These NSAs represent the single-family residences within the Wolfe's Subdivision community along Barnett Road, the Academy Woods community of single-family residences along Grubby Thicket Way, and Stratton Commons community along Greentree Road. Existing traffic noise levels at the first row residences are between 68 and 76 dBA; therefore, these areas would be impacted and a noise barrier will be required.

NSA 117-B

This NSA represents the single-family residences within the Grosvenor Woods community along Snow Point Drive, Thornbush Lane, and Thornbush Court. Existing traffic noise levels at the first row residences are between 63 and 67 dBA; therefore, these areas would be impacted and a noise barrier will be required.

NSA 118-B

This NSA represents the newly constructed Grosvenor Heights luxury townhouse development. Each unit has a rooftop terrace with an outdoor dining and lounge area as well as a deck or terrace off of the main level. Developer has implemented some noise mitigation measures. SHA has not evaluated this area as they assumed this area will be outside of the project limits. If this area is within the project limits, then there may be a need for a noise barrier along the shoulder of I-270 if developer implemented noise mitigation measures are not sufficient.

NSA 121-B

This NSA represents the Grosvenor Mews townhouse and condominium community along King Charles Way. A wooded berm, which varies in height from 8 to 24 feet, lies between the community and I-270. At the southern end of the community (before the berm begins) along the I-270 northbound on-ramp from the Capital Beltway outer loop, the residences sit around 6 to 8 feet above the highway. SHA has not

evaluated this area as they assumed this area will be outside of the project limits. If this area is within the project limits, then there may be a need for a noise barrier along the shoulder of I-270 to provide abatement to the southern part of this development.

NSA 125-B

This NSA represents the residences within the Grosvenor Park Townhouse Condominium community along Englishman Drive. Existing traffic noise levels at the first row residences are between 60 and 69 dBA; therefore, these areas would be impacted and a noise barrier will be required.

NSAs 128-B, 129-B, 103-B, 131-B, and 132-C

These NSAs represent the Timberlawn Crescent Apartments located along Luxemburg Street, townhouses within the Timberlawn South at North Bethesda community along Pine Haven Terrace and Mist Haven Terrace, townhouses within The Cloisters community (platted as Timberlawn) along Valerian Lane, the single-family residences within The Cloisters community (platted as Timberlawn) along Valerian Lane and Lady Slipper Terrace, and the Saint Mark Presbyterian Church, located at 10701 Old Georgetown Road. Existing traffic noise levels at the first row residences are between 65 and 72 dBA; therefore, these areas would be impacted and a noise barrier may be required. Most of these residences are located 5 to 35 feet above the highway and few are partially protected by a berm. A noise barrier may not be effective in providing the minimum noise reduction for this area.

NSA 136-B

This NSA represents the single-family residences within the Windermere community (platted as Heritage Walk) along Earls Gate Lane. An existing screen wall (#15373N0) constructed in 2002 currently provides abatement for this NSA; however, traffic noise levels at two locations are close to the impact levels and they may be impacted as a result of the proposed project. This area needs to be analyzed but most probably a replacement noise barrier would not be considered reasonable base on the cost.

NSA 201-B

This NSA represents the portion of the Windermere community (platted as Heritage Walk) along Daybreak Court. The NSA includes a row of six single-family detached homes east of I-270 and south of Tuckerman Lane. An existing Type I screen wall (#15373N0) constructed in 2002 currently provides abatement for this NSA; however, existing traffic noise levels at these residences are between 66 and 69 dBA; therefore, these areas would be impacted and a noise barrier may be required. This area needs to be analyzed but most probably a replacement noise barrier would not be considered reasonable base on the cost.

NSA 202-B

This NSA represents the Old Farm and Montrose Woods communities, which includes single family detached homes east of I-270 in-between Tuckerman Lane and Old Stage Road, south of Montrose Road. The buildings are located along several local roads and often are situated around cul-de-sacs. The buildings are shielded from I-270 by an existing Type I noise barrier (#15121N0); however, existing traffic noise levels at majority of the first row residences are between 64 and 65 dBA. It is possible that noise levels could exceed slightly as a result of the project and make this area impacted. Existing traffic noise levels at several houses located at the north end of this area are between 68 and 69 dBA, which means they are presently impacted and will be considered impacted in the future too. This area needs to be analyzed but most probably a replacement noise barrier would not be considered reasonable base on the cost. However, north end of the existing wall may need some modifications and extension at the area close to the impacted houses.

NSAs 213-B, 214-C, 215-C, and 217-C

These NSAs represent the portion of the Rose Hill Falls community along Winding Rose Drive and Blue Hosta Way, which includes single-family three-story townhomes; the Rockville Nursing Home at 303 Adclare Road; the Rockville Christian Church at 301 Adclare Road, which has a large outdoor playground; and the First Baptist Church at 55 Adclare Road that operates the Weekday Early Education Center (W.E.E. Center) preschool, which has outdoor play areas. Existing traffic noise levels at these areas are

between 64 and 74 dBA; therefore, these areas would be impacted and a noise barrier may be required if it is considered reasonable base on the cost.

NSA 222-B

This NSA represents the Saddlebrook community, which includes single-family detached homes located along Woodsend Place, Woodsend Court, and Lawngate Court along Watts Branch Parkway west of I-270. The houses are shielded from I-270 by an existing Type I noise barrier (#15123N0); however, this wall does not cover several houses located on Woodsend Court. Existing traffic noise levels at these houses are between 66 and 68 dBA, which means they are presently impacted and will be considered impacted in the future too. Noise barrier needs to be extended further to the south to provide abatement for these impacted houses. There may be some difficulties to extend the noise barrier due to the existing retaining wall.

NSAs 306-B and 307-B

These NSAs represent Regents Square Condominium townhouses and the Woodley Woods community along the east side of I-270. The existing Type I noise barrier (#15124N0) constructed in 1991 is providing noise abatement to the community; however, existing traffic noise levels are between 63 and 68 dBA. Therefore, certain parts would be impacted and the noise barrier may need to be replaced with a taller noise barrier. Replacing the existing noise barrier may not be considered reasonable base on the cost.

NSA 322-B

This NSA represents the Fireside Condominium community along the east side of I-270. The existing Type I noise barrier (#15126N0) constructed in 1991 is providing noise abatement to the community; however, existing traffic noise levels at areas on the north end of this barrier are between 65 and 68 dBA. Therefore, certain parts would be impacted and the noise barrier may need to be replaced with a taller noise barrier. Replacing the existing noise barrier may not be considered reasonable base on the cost.

NSAs 326-B and 328-B

These NSAs represent the Londonderry Apartments and The Willows apartment complex located along the east side of I-270. Existing traffic noise levels at these areas are between 66 and 79 dBA; therefore, these areas would be impacted and a noise barrier will be required.

Northern half of the project - Watkins Mill Road to I-70

West of I-270 south of Middlebrook Road

A noise barrier will be required along the shoulder of I-270 to provide abatement to the single family houses.

East of I-270 and south of Old Hundred Road

There are scattered single family houses located east of I-270 that would be impacted by the traffic noise but most probably a noise barrier will not meet cost reasonableness requirements.

East of I-270 and south of Old Hundred Road

There is a cluster of single family houses that would be impacted by the traffic noise. I noise barrier may be required for this area.

West of I-270 and north of Old Hundred Road

There are scattered single family houses located west of I-270 that would be impacted by the traffic noise but a noise barrier will not meet cost reasonableness requirements.

East of I-270 and south of Bennett Creek

There are scattered single family houses located east of I-270 that would be impacted by the traffic noise but a noise barrier will not meet cost reasonableness requirements.

West of I-270 and north of Fingerboard Road

There are several single family houses and a multifamily complex located along I-270 that would be impacted by the traffic noise and a noise barrier will meet cost reasonableness requirements.

West of I-270 and south of I-70

There is a multifamily complex and a school along I-270 that would be impacted by the traffic noise and a noise barrier will meet cost reasonableness requirements.

Potential New Noise barrier Locations

	Station Range		NB / SB	Location	Length of Wall	Construction	
	From	To				NB/SB	Location
NSA 104 B	40+00	45+00	SB	W	500'	-	-
NSAs 106B, 107B, 108B	60+00	80+00	NB	E	2000'	-	-
NSA 222-B	302+50	307+50	SB	Off-ramp	360'	NB & SB	Outside Shoulder (NB & SB)
NSAs 213B,214C,215C,217C	325+00	342+50	NB	Off-ramp	1700'	-	-
NSAs 326B,328B	547+50	570+00	NB	E	2600'	-	-
West of I-270, S of Middlebrook Road	722+50	740+00	SB	W	2100'	NB & SB	Outside Shoulder(NB) Inside Shoulder(SB)
West of I-270, S of Old Hundred Road	1155+00	1170+00	NB	E	1300'	SB	Outside Shoulder
West of I-270, N of Fingerboard Road	1387+50	1435+00	SB	W	4600'	-	-
West of I-270, S of I-70	1680+00	1705+00	SB	W	2600'	-	-

Design Exceptions - Lane Width (less than 12')				
Station Range		Location	Lane Width	Notes
730+00	748+00	NB Mainline	11.75'	Design is constrained by existing bridge structure; see Sheet No. 25-26
1605+00	1617+50	SB Mainline	11'	Only HSR lane is 11' to avoid existing guard rail; see Sheet No. 63

Design Exceptions - Shoulder Width (outside shoulder less than 8')					
Station Range	Location	Shoulder Width	Notes	L (FT)	Emergency Refuge
224+00	227+00	SB Mainline	4' to 8'	Bridge abutment reduces shoulder width	300 - use 12' outside shoulder before or after bridge
241+50	260+00	NB C/D	2' to 8'	Utilizing outside shoulder for HSR	1900 - use 12' outside shoulder before HSR location (approx. 240+50)
250+00	280+00	SB C/D	2' to 8'	Utilizing outside shoulder for HSR	3000 - use 12' outside shoulder after HSR location (approx. 248+00)
285+00	304+00	SB C/D	1.5' to 8'	Utilizing outside shoulder for HSR	1900 - use Falls Rd exit at 305+00
295+00	298+00	SB Mainline	7' to 8'	Bridge abutment reduces shoulder width	300 - use 12' outside shoulder before or after bridge
310+00	315+00	SB C/D	2' to 8'	Utilizing outside shoulder for HSR	500 - use 12' outside shoulder before HSR location (approx. 317+50)
402+50	431+00	SB C/D	2' to 8'	Utilizing outside shoulder for HSR	2900 - use 12' outside shoulder before HSR location (approx. 436+00) - use 12' outside shoulder after HSR location (approx. 400+50)
745+00	765+00	SB Mainline	1.5' to 8'	Utilizing outside shoulder for HSR	2000 - use 12' inside shoulder
864+00	969+00	SB Mainline	1.5' to 8'	Utilizing outside shoulder for HSR	10500 - use 12' inside shoulder
1619+00	1626+00	SB Mainline	1.5' to 8'	Utilizing outside shoulder for HSR	700 - use 12' outside shoulder after HSR location (approx. 1617+50)
Design Exceptions - Total length Shoulder Width (outside shoulder less than 8')				24000	

Design Exceptions - HSR Cross Slope (greater than 8%)			
Station Range		Location	Notes
253+00	292+00	SB Mainline HSR HOV	Design Exception superelevation
256+00	264+00	NB CD HSR	Design Exception superelevation
309+00	317+50	SB CD HSR	Design Exception superelevation
506+00	519+00	NB CD HSR	Design Exception superelevation
682+50	715+00	NB Mainline HSR HOV	Design Exception Superelevation on curve
861+00	909+00	SB Mainline SHDR HSR	Design Exception Superelevation on Curve

IMR / Design Exceptions - Ramp Freeway Junction (locations with improvements)			
Ramp	Station	Location	Notes
On ramp from MD 189 EB to I-270 SB	285+00	SB C/D	Adjustment due to additional lane prior to ramp
Off ramp from I-270 SB to Shady Grove Rd	455+00	SB C/D	Adjustment due to additional lane prior to ramp
On ramp from Shady Grove Rd to I-270 NB	455+00	NB C/D	Adjustment due to additional lane prior to ramp
On ramp from I-370 to I- 270 NB	507+00	NB C/D	Adjustment due to additional lane prior to ramp
On ramp from MD 124 WB to I-270 NB	615+00	NB C/D	Adjustment due to additional lane prior to ramp
Off ramp from I-270 NB to MD 118 WB	785+00	NB Mainline	Adjustment due to lane shift under bridge

Design Exceptions - Turnout / Emergency Refuge Locations (between each interchange; mainline only)			
Interchange Range		Location	Notes
I-270 Spur	Montrose Rd	NB	142+50 to 146+00 - Gore area for I-270 Spur on ramp 200+00 to 206+00 - Slip ramp gore area
Montrose Rd	MD 189	NB	245+00 to 247+00 - Slip ramp gore area
MD 189	MD 28	NB	315+00 to 317+50 - Slip ramp gore area 330+75 to 332+50 - Slip ramp gore area
MD 28	Shady Grove Rd	NB	355+00 to 356+50 - Slip ramp gore area 392+00 to 394+00 - Slip ramp gore area
Shady Grove Rd	I-370	NB	442+50 to 445+50 - Slip ramp gore area 473+00 to 475+00 - Slip ramp gore area
I-370	MD 117	NB	531+50 to 533+00 - Slip ramp gore area 566+00 to 568+75 - Slip ramp gore area
MD 117	MD 124	NB	
MD 124	Middlebrook Rd	NB	631+00 to 635+00 - Gore area for MD 124 on ramp 734+50 to 735+50 - Gore area for Middlebrook Rd off ramp
Middlebrook Rd	MD 118	NB	746+50 to 747+50 - Gore area for Middlebrook Rd off ramp 770+00 to 771+50 - Gore area for MD 118 off ramp
MD 118	MD 27 Father Hurley Blvd	NB	786+00 to 787+50 - Gore area for MD 118 off ramp 794+50 to 796+00 - Gore area for MD 118 on ramp 820+00 to 822+00 - Gore area for MD 27 off ramp
MD 27 Father Hurley Blvd	MD 121	NB	845+50 to 846+50 - Gore area for MD 27 on ramp 968+00 to 969+50 - Gore area for MD 121 off ramp
MD 121	MD 109	NB	1102+50 to 1120+00 - Rest area / Truck Stop
MD 109	MD 80	NB	1182+00 to 1185+00 - Gore area for MD 109 off ramp
MD 80	MD 85	NB	1378+00 to 1381+50 - Gore area for MD 80 off and on ramp 1505+00 to 1511+50 - Rest area
<hr/>			
I-270 Spur	Montrose Rd	SB	140+00 to 145+00 - Gore areas for I-270 Spur ramps 200+00 to 206+50 - Slip ramp gore area
Montrose Rd	MD 189	SB	247+00 to 248+50 - Slip ramp gore area
MD 189	MD 28	SB	325+50 to 327+00 - Slip ramp gore area
MD 28	Shady Grove Rd	SB	363+00 to 365+00 - Slip ramp gore area 394+50 to 395+50 - Slip ramp gore area 423+50 to 425+50 - Slip ramp gore area
Shady Grove Rd	I-370	SB	489+50 to 491+50 - Slip ramp gore area
I-370	MD 117	SB	515+00 to 520+00 - Gore area for I-370 off ramp
MD 117	MD 124	SB	
MD 124	Middlebrook Rd	SB	620+50 to 622+50 - Gore area for MD 124 off ramp 730+00 to 733+50 - Gore area for Middlebrook Rd on ramp
Middlebrook Rd	MD 118	SB	771+00 to 773+00 - Gore area for MD 118 on ramp
MD 118	MD 27 Father Hurley Blvd	SB	785+00 to 787+00 - Gore area for MD 118 on ramp 793+50 to 795+00 - Gore area for MD 118 off ramp 824+00 to 825+50 - Gore area for MD 27 on ramp
MD 27 Father Hurley Blvd	MD 121	SB	839+50 to 840+50 - Gore area for MD 27 on ramp 852+50 to 854+50 - Gore area for MD 27 off ramp
MD 121	MD 109	SB	980+00 to 985+00 - Gore area for MD 121 off and on ramp 1102+50 to 1120+00 - Rest area / Truck Stop
MD 109	MD 80	SB	1370+00 to 1375+00 - Gore area for MD 80 off and on ramp
MD 80	MD 85	SB	1635+00 to 1638+50 - Gore area for MD 85 off and on ramp

Larry Hogan, *Governor*
Boyd K. Rutherford, *Lt. Governor*



Pete K. Rahn, *Secretary*
Gregory C. Johnson, P.E., *Administrator*

November 30, 2016

Brian Quinlan, P.E.
Parsons Construction Group, Inc.
10 East Baltimore Street, Suite 801
Baltimore MD 21202

Dear Mr. Quinlan:

The Maryland Department of Transportation's State Highway Administration's (SHA) is in receipt of Proposed Technical Concept (PTC) No. 1 for the I-270 Innovative Congestion Management Progressive Design-Build contract (Contract No. MO0695172), submitted by your Design-Build Team on November 17, 2016. The SHA has completed our review of the PTC and offers the following comments for your consideration in the further development of your technical concepts and proposal:

1. Generally, the concept appears to be a reasonable solution to address the goals of this contract.
2. Page 1, Section A, Description: We agree with the potential benefits of Lane Use signals to provide advanced warning, and a measure of lane-specific traffic management. To assure the feasibility of this strategy, we would recommend that the existing sign inventory on I-270 be considered. I-270 already experiences "sign congestion", and the successful implementation of additional Dynamic Lane Use Control and Dynamic Speed Advisory gantries would depend on meeting, or successfully requesting waivers for MUTCD design standards. Also, these strategies will need to be reviewed to determine if Maryland would make the lane control and speed limits regulatory or advisory (noted that this PTC recommends advisory, but this would be a Maryland policy decision).
3. Page 2, Section A, Description: It is a strength of this PTC to take into consideration the Federal System Engineering Requirements for Intelligent Transportation Systems and the intent to meet the guidelines of the National ITS Architecture, including incorporating the system into the Maryland Statewide ITS Architecture.

My telephone number/toll-free number is 410-545-8800 or 1-888-228-6971
Maryland Relay Service for Impaired Hearing or Speech 1.800.735.2258 Statewide Toll Free

Street Address: 707 North Calvert Street • Baltimore, Maryland 21202 • Phone 410.545.0300 • www.roads.maryland.gov

4. Page 3, Section A, Description, Hard Shoulder Running (HSR) Technology: It would be helpful to clarify the planned architecture for the Video Analytics. Would the processing be done in the field, with camera based software, or would the images be processed at a back-end server location where the video streams can be captured? Are the cameras fixed, purpose built for VIDS, or would they be capable of Pan-Tilt-Zoom for incident management, with the ability to automatically recalibrate to support an automated monitoring mode? How would identified obstructions be flagged and how would operational staff be notified of safety concerns?
5. Page 4, Section B, Location: The diagram on page 4, along with the table on page 8, describe some segments as right shoulder HSR, and other segments as left shoulder HSR. Would implementing these lane configuration changes involve restriping to maintain lane continuity, or would there be lane drops, and lane additions, in various segments?
6. Page 10, Section C, Analysis, Safety: The proposal should address alterations to operational procedures that might be necessary. Changes to shoulder areas will influence traffic incident management in the following ways:
 - Providing a safe buffer zone for emergency responders. Managed lanes can facilitate lane use and advanced warning, but full shoulders provide a work area for emergency responders which, by vehicular regulation and driver behavior, motorists don't use. Managed lanes can help, but positive guidance and physical barriers (e.g. cones) will be the only protection in a normally traveled lane (i.e. hard shoulder).
 - Use as a staging area for vehicle recovery. In Maryland, by policy and regulation in support of the towing and recovery industry, public agencies only relocate damaged and disabled vehicles to the shoulder, to stage them for final removal by industry towers. Limited shoulder availability would likely require new policies and procedures to minimize the blockage time impact while preparing for private towers to arrive.
 - Access to the incident scene. The CHART patrols, in Maryland, function as an extension of staff for the Maryland State Police, in the area of Traffic Incident Management. However, CHART patrols are not enforcement vehicles and do not have the authority of a "blue light" (police) or a "red light" (fire and rescue) emergency responders in traveling through traffic (even though they are equipped with lights and sirens). Consequently motorists may, or may not, yield right of way to CHART vehicles.
 - Impacts of more complex incidents. Procedures and impacts need to be analyzed and addressed for more complex incidents that require more complex recovery procedures and other public safety impacts. Some of these complicating factors include: heavy/large vehicles, injuries, hazardous materials, fires, criminal activities, significant debris (e.g. a load of mulch) etc. Each of these scenarios requires different personnel and equipment on scene: fire trucks, ambulances, police vehicles, heavy equipment, etc. Shoulders provide the additional geometry to stage and maneuver these resources.

7. Page 13, C. Analysis, Operability, Maintainability, Adaptability: The PTC states "...dynamic lane management signs, related structures and poles, and other ITS devices and subsystems will be designed in accordance with MDDOT design standards." There are no MDOT design standards for Lane Control Gantries, Variable Speed Limit signing or Video Imaging Analytic field infrastructure. They will have to be developed for this project.
8. Page 17, D. Potential Impacts, Technology: The PTC states that the firm "...will examine in detail the utility requirements (e.g., available fiber versus communications needs, etc.) during the design process..." We recommend that the proposed telecommunications solution be analyzed early, to confirm the feasibility of installing and operating the field device infrastructure. The CHART system communicates with field infrastructure in two ways; through wireless modems for Dynamic Message Signs, Highway Advisory Radios, Roadway Weather Information Systems and Traffic Speed Sensors and through a combination of T-1 and fiber optics for cameras streams. CHART accesses fiber optic communication as a customer of Network Maryland and T-1 services from local telecommunications providers. The telecommunications architecture of the CHART system does not currently utilize dedicated circuits for point-to-point connectivity between central servers and field devices. It is also important to note that the CHART system central servers currently reside in an MDOT data center in Glen Burnie, not at the Statewide Operations Center in Hanover, MD. However, the CHART system is an information management and advisory ATMS. Lane control signals and variable speed limit signing provide real-time dynamic guidance to vehicles, and due to safety considerations, they must be highly reliable, available and maintainable.
9. For locations where HSR utilizes the outside shoulder, please describe the Design-Builder's proposed treatments of auxiliary lanes at interchanges.
10. Please state whether the intent is to have the HSR operational during rain events or not.
11. This PTC will require design exceptions. More detailed information related to impacts and costs of fully meeting AASHTO requirements, potential impacts to safety and operations for implementing the design exception, and mitigation, if any, which would be implemented as a result of the design exception(s) will be required for formal approval. The design exception(s) must be approved prior to establishing a CAP.
12. This PTC states that adjustments to shoulder cross slopes may be necessary on the HSR. Concrete traffic barriers have some flexibility to add overlays, but if previous overlays have used that flexibility, flattening the cross slopes for HSR may reduce the barriers heights to less than acceptable. Please elaborate on this topic. Should concrete traffic barrier heights be insufficient, what does the Design-Builder propose? Does the Design-Builder know if the flatter cross slopes will create an issue? If not, will this be a Design-builder risk and how will the Design-Builder mitigate that risk?

13. Page 2, Geometry, states existing pavement markings may need to be eradicated. Does the Design-Builder intend to leave the eradicated pavement markings after construction, or to eliminate the eradicated pavement markings with some treatment?
14. Page 9 states this PTC will not have an impact on the Watkins Mill Road Interchange; however, HSR is proposed within the limits of this interchange. The Administration believes some changes to the current design plans will be necessary. Please address.
15. HSR Plans: The typical sections leave room for interpretation and ambiguity. For example, section A-A on sheets 3 and 5 show all of the pavement as existing, except for the HSR, which leaves the reader with the impression that the widths are also existing. Is this the case? Or are the lanes being shifted? If shifted, is there some pavement treatment on the outer most lane to provide an acceptable cross slope? In general, typical sections should be able to communicate on their own without the need to refer back to the text in the write up for clarification. Communication may be better served by providing an existing section and a proposed section at the selected locations.
16. HSR Plans: Some mainline typical sections (e.g. sheet 3) provide an 8-foot shoulder, which is difficult for emergency responders to utilize effectively. During periods of congestion, there are in essence no usable shoulders on the mainline for responders. Please address the safety aspects of the concept.
17. HSR Plans: The HSR widths proposed in the typical sections will sometimes have inlets encroaching into the travel lane. Is there a cost-effective solution to this issue? Please address.
18. HSR Plans: Narrowing and/or shifting the HOV lane(s) will require an equivalency study, to be approved by FHWA, prior to establishing a CAP.

Any questions or communications regarding the response to this PTC should be directed to Mr. Jason A. Ridgway, Director, Office of Highway Development at the project specific email address, MO069_IS_270@sha.state.md.us.

Sincerely,



Jason A. Ridgway, P.E.

Director, Office of Highway Development

cc: Olu Adeyinka, P.E., DBIA, Parsons Transportation Group, Inc.

Responses to SHA Comments on PTC No. 2 Variable Speed Limit

1 COMMENT: Generally, the concept appears to be a reasonable solution to address the goals of this contract.

RESPONSE: No response required.

PTC REFERENCE: None.

2 COMMENT: Page 2, Section A, Description: Since lane control signals and variable speed limit signing provide real-time dynamic guidance to vehicles, and due to safety considerations, they must be highly reliable, available and maintainable. It would be helpful to have some description and additional information on the premise that cellular and/or wireless communications would be suitably reliable for control of these devices; In addition, PTC # 1 indicated that the company “ ... will examine in detail the utility requirements (e.g., available fiber versus communications needs, etc.) during the design process...” which seem inconsistent with the statement that cellular/wireless communications can be used for these signs.

RESPONSE: Noted and agreed. Parsons will design the communication considering the required reliability and requirements of other PTCs. Therefore, the communication will be provided via a dedicated fibre optic network.

PTC REFERENCE: See additional text in section titled “Proposed Technical Concept.”

3 COMMENT: Page 3, Section A, Description: In the description of “Intelligent NETworks (iNET)” inputs include data on current incidents, weather conditions and work zones. We would assume that these inputs would come from CHART; however, there are other alternatives. It would be good to have a more specific description of how this system would interface, driving inter-operable processes, with Maryland’s existing traffic management programs.

RESPONSE: Noted and agreed. As part of our final detailed technical solution, Parsons will include a system architecture to present details on how iNET will interface with different data sources.

PTC REFERENCE: See additional text in section titled “Parsons Intelligent NETworks Active Traffic Management Module.”

4 COMMENT: Page 4, Section B, Location: We agree with the potential benefits of Variable Speed Limit signs to provide advanced warning, and a measure of lane-specific traffic management. To assure the feasibility of this strategy, we would recommend that the existing sign inventory on 1-270 be considered. 1-270 already experiences “sign congestion”, and the successful implementation of additional Dynamic Lane Use Control and Dynamic Speed Advisory gantries would depend on meeting, or successfully requesting waivers for MUTCD design standards. Also, these strategies will need to be reviewed to determine if Maryland would make the lane control and speed limits regulatory or advisory (noted that this PTC recommends advisory, but this would be a Maryland policy decision).

RESPONSE: Noted and agreed. Parsons will design the final locations for new signs considering the minimum required distance from the existing signs and structures according to the design guidelines in MUTCD standard. Parsons will work with SHA to review and determine if Maryland should make the VSLs regulatory or advisory.

PTC REFERENCE: See additional text in sections titled “Proposed Technical Concept” and “B. Location.”

5 COMMENT: Page 22, Section F, Administration Risk: There will be Operations and Maintenance expenses associated with any active traffic management. It is understood that this project

will not include funding for ongoing Operations and Maintenance. However, per the goal of providing a sustainable solution, we would anticipate the final technical solution would include a plan and estimate of the operations and maintenance requirements and costs, in order to program ongoing support and provide documentation and justification for the required Operational Budget enhancements.

RESPONSE: Noted and agreed. As part of our final detailed technical solution, Parsons will prepare a plan and estimate for the recommended operations and maintenance requirements and budgets.

PTC REFERENCE: See additional text in section titled “F. Administrative Risk.”

02 Variable Speed Limit

A. Description

Through the reduction of the posted speed limit via dynamic message signs, a Variable Speed Limit (VSL) System helps drivers to adjust their speed and better react to the current driving conditions when they are approaching sections of a highway with reduced visibility, slippery road surface condition, highway work zones and/or vehicle queuing.

The implementation of a VSL System can be via posted speed limits that are either advisory or regulatory.

The three main purposes for the deployment of a VSL System are:

1. Achieving a harmonized traffic flow that in turns reduces the probability of a breakdown in the traffic flow and the subsequent reduction in highway capacity ⁽¹⁾.
2. Reducing speed variations and resultant traffic flow shockwaves along the highway, as well as across adjacent highway lanes, to lower the probability of rear-end collisions and their severity, which in turns reduces the number of bottlenecks and capacity reductions caused by these collisions ¹.
3. Limiting inflow traffic that is approaching a highway section with a capacity problem in order to reduce the number of traffic flow shockwaves and the shockwave recovery time ².

PROPOSED TECHNICAL CONCEPT

Parsons proposes to implement a VSL System solution that will advise motorists of recommended speeds for specific zones of travel on the corridor. These zones, which are described in the section that follows, represent locations where our analysis has identified frequent fluctuation in prevailing vehicle speeds during periods of high congestion.

Our solution will consist of a series of roadside variable speed limit signs (VSLs), and dynamic message signs (DMSs) that will offer motorists additional information regarding downstream conditions that dictate the need for reduced speeds, with the goal to improve driver compliance with the reduced speeds.

Parsons will work with SHA to review and determine if Maryland should make the VSLs regulatory or advisory. For the purposes of this PTC, Parsons proposes an advisory VSL System, since enforcement of VSL requires significant investment in additional infrastructure, and will likely require legislative action at the State level to implement. Neither of these are practical at this time. In addition, based on our design, it is expected that motorists will be able to see (or will soon be able to see) the traffic and/or road conditions ahead and will therefore better understand the need for lower speeds. As such, in conjunction with a proposed public outreach program, an advisory VSL System is expected to be an effective

A VSL System reduces the posted speed in a controlled manner – the target speed limit is achieved by a gradual decrease in the posted speed limit via a series of VSL signs – using different traffic metric thresholds (e.g., traffic volume, speed, occupancy, or a combination of each).



Figure 1: Advisory VSL Installation

traffic management tool. Key field device elements of the proposed Variable Speed Limit System include:

- Advisory variable speed limit signs installed every 0.5 miles, on both sides of the roadway, along selected sections of the highway;
 - Mounted on gantries or cantilever poles where these have been proposed under the Parsons' HSR PTC;
 - Otherwise mounted on standalone poles;
- Dynamic Message Signs (DMSs) installed on gantries at the beginning of each VSL System zone, and then, where applicable, every 5 miles downstream from that first sign;
- Vehicle Detector Stations installed with every VSL signing location;
- Static signage stating "Entering Variable Speed Limit Zone" and installed where motorists will enter the VSL System zone; and
- Public outreach program.

To maximize the visibility of the advisory speed limits, Parsons is proposing to install the VSL signs on both sides of the highway in both northbound and southbound directions.

VSL signs will be installed on the roadside on a single pole, or on the top or side of existing gantries and overpasses, or on new gantries. That said, the installation of new overhead gantries is expensive. Our proposal is therefore designed to minimize deployment costs by minimizing the use of new gantries. VSL signs are generally proposed to be installed on either support structures proposed for the HSR PTC or otherwise, on new road side single poles.

The VSL System will use real-time speed data to detect slowdowns in traffic and to activate graduated slower advisory speeds on VSL signs located upstream of the detected congested area. The Parsons solution will draw information necessary to determine the recommended speeds from a combination of sources, including existing CHART detectors, new vehicle detector stations, and third-party data available to SHA (i.e., INRIX). Parsons will implement the VSL module of its Intelligent NETWORKS® (iNET) ATMS solution to fuse the data and formulate the recommended speeds for each segment of the corridor.

Whenever a reduced advisory speed is activated, appropriate messages such as "Reduced Speed Ahead", "Stopped Traffic Ahead" and "Incident Ahead" will also be activated on the DMS signs to inform drivers of the reason for the advised speed.

To enhance the reliability and availability of the VSL System, communications to the signs will be provided via a dedicated fiber optic communications network.

A VSL System solution is most effective when coupled with a combination of other active traffic management strategies. As such, we propose to deploy it as a complementary function alongside our proposed hard-shoulder running (PTC PAR01) and ramp metering (PTC PAR03) solutions.

PARSONS INTELLIGENT NETWORKS ACTIVE TRAFFIC MANAGEMENT MODULE

The Intelligent NETworks (iNET) Active Traffic Management (ATM) module consists of an integrated suite of traffic management tools including Ramp Metering, Variable Speed Limit, Incident Detection, Event Management, Lane Control Signing, and Hard Shoulder Running designed to minimize recurrent congestion (due to daily variations in traffic demand) and mitigate non-recurrent congestion (due to incidents, weather and roadwork) within the applicable corridors. As part of our final technical solution, a system architecture will be included to present details on how iNET will interface with different data sources and Maryland's existing traffic management programs.

Parsons' VSL System can typically be deployed for the following four primary applications:

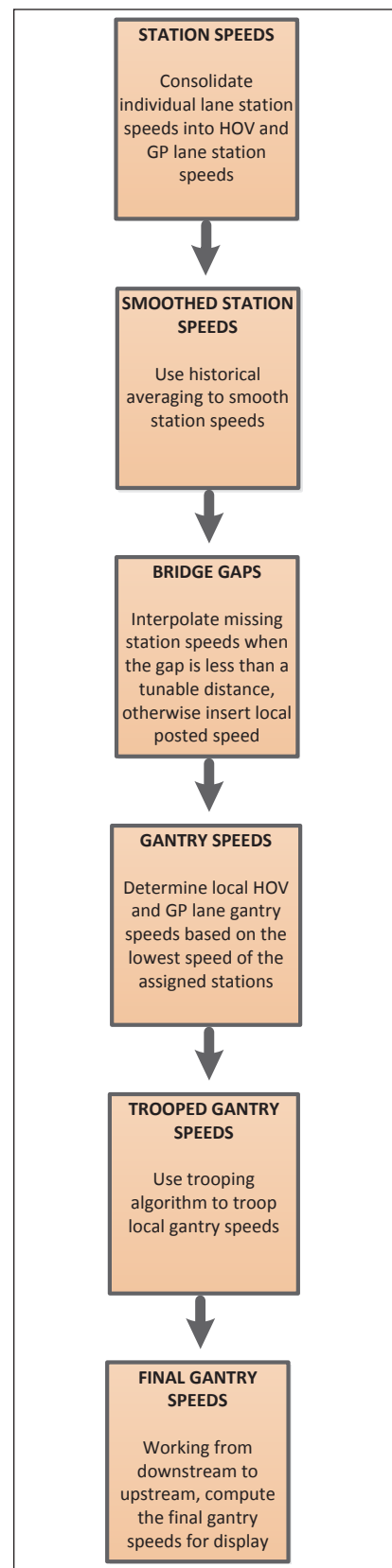
- **Speed Harmonization** – Achieving a harmonized traffic flow and hence higher vehicle throughput; however, as the benefits of this are often not immediately evident to motorists, this has typically only been effectively done in a regulatory mode
- **Incident Response** – Slowing traffic approaching a vehicle queue or incident, which can be done in either a regulatory or advisory mode
- **Road / Weather Response Management** – Slowing traffic during adverse weather, and/or before entering an area with low visibility area and/or poor road conditions, which be done in either a regulatory or advisory mode
- **Work Zone Warning** – Slowing traffic approaching a highway work zone, which can be done in either a regulatory or advisory mode

The Variable Speed Limit (VSL) function system calculates a new set of speed limits for each sign location along the corridor for each lane group (e.g., General Purpose, Local and/or High-Occupancy Vehicle), at a configurable interval (typically 1 minute), 24 hours per day, seven days per week. The VSL signs are updated at a separate configurable interval (typically 1 minute, but may be 5 or 15 minutes depending on agency preferences).

The VSL function receives speed, volume, and occupancy data from the Vehicle Detector Station (VDS) subsystem, and uses this information to determine a separate speed limit for each lane group at each sign location. Designed to harmonize speeds longitudinally along the corridor, the calculated speed limits are stable, responsive to changes in congestion patterns, considerate of road construction and weather conditions, and safe. Each stage of the variable speed limit calculation (shown in the right column) is highly configurable to fit the specific needs of the operating agency.

First, individual lane speeds are consolidated into station speeds. Then a smoothed speed is calculated as the average (or, alternatively, a user-specified percentile) of an agency-specified number of consecutive previous speed measurements. Next, bridging is used to interpolate smoothed station speeds for

Figure 2: Overview of iNET VSL Processes.



stations having invalid speed data. VSL sign location speeds are then computed from the smoothed and bridged station speeds. Trooping is then applied to minimize speed variations between successive VSL sign locations. Finally, temporal and spatial constraints are applied to ensure that applicable weather and work zone conditions are respected, and that changes in speed limit from one VSL sign location to the next, and from one minute to the next, are safe for motorists. At each step of this process, configuration parameters enable the operating agency to tune the operation of the system to its individual needs.

B. LOCATION

Parsons proposes to install a VSL System (and associated VSL and DMS signs) in segments along IS 270 over the entire distance between IS 495 and IS 70. The VSL System will be installed as described in this section.

Based on most recent applications in the U.S., and the guidelines in VicRoads “Handbook for Lane Use Management, Variable Speed Limits, Traveler Information” (3), Parsons proposes 0.5 mile spacing between VSL signs. The potential locations of the proposed VSL signs and DMSs are provided in Attachment 1. The final locations for the proposed signs will be designed to meet the MUTCD design standards with respect to the minimum required distances between consecutive signs and structures along the highway.

Northbound Direction

- South of MD-85 approaching Interstate 70 – a series of VSL signs and a DMS sign
- North of MD-121 approaching MD-109 – a series of VSL signs and a DMS sign
- North of Father Hurly Blvd approaching MD-121 – a series of VSL signs and a DMS sign
- South of Middle Brooks Rd. approaching Father Hurley Blvd. – a series of VSL signs and a DMS sign
- North of Muddy Branch Rd. approaching Montgomery Village Ave. – a series of VSL signs and a DMS sign
- North of MD-189 to south of Shady Grove Rd. – a series of VSL signs and two DMS signs

Southbound Direction

- Between MD-85 and MD-109 – a series of VSL signs and two DMS signs
- South of MD-109 to north of IS 270 Spur – a series of VSL signs and five DMS signs

Figure 3 summarizes the approximate number of required VSL and DMS signs for both northbound and southbound directions.



To maximum the visibility of the advisory speed limits, the VSL signs are proposed to be installed on both sides of the highway; similar to the regulatory static speed limit signs.



VSL signs can be equipped with solar panels and backup batteries where providing power is not easy, and communications to the signs can be provided using cellular or wireless modems.

Figure 3: Required ITS Equipment

	Direction	
	Northbound	Southbound
Installations on Existing Infrastructure	6	7
Installations on HSR Infrastructure	6	13
Installations on New Poles	43	71
Installations on New Gantries	6	7
Installations on New Cantilevers	2	4
Total Number of VSL Signs	80	116
Total Number of DMSs	8	9

C. ANALYSIS

A review of the literature and previous VSL implementations presented in Section E illustrates that the success of a VSL System can be linked to several factors including the intended goal (e.g., weather advisory, congestion management, etc.), drivers' behavior, speed enforcement, etc. In this respect, advisory VSL signs are proposed to be installed based on Parsons' analysis of the current traffic conditions and the following important considerations.

LITERATURE REVIEW

As demonstrated in previous applications, the following types of benefits can potentially be obtained from a VSL System:

- **Reduced Shockwaves:** VSL System controls the upstream traffic flow and speed of arriving vehicles to bottleneck locations, which helps in reducing the number of shockwaves and results in faster recovery times when shockwaves occur.
- **Increased Throughput:** Traffic throughput can be increased when individual vehicle speeds are more uniform – resulting in smoother traffic flows. At high saturation levels, variations in vehicle speeds can cause breakdowns in the smooth flow of traffic. By preventing traffic flow breakdowns, the highway can better operate close to its maximum capacity; thus resulting in an increase in the vehicle throughput (particularly compared to when traffic flow breakdowns occur).
- **Improved Travel Time:** Further to the above point regarding smoother traffic flows, improvements in journey travel time on congested sections of a highway may be realized.
- **Improved Travel Time Reliability:** Due to less congestion and fewer collisions, less variations in travel times are possible.
- **Improved Safety:** Due to fewer traffic shockwaves and a more harmonized flow among multiple adjacent lanes, reductions in the number of collisions and their severity have been reported.

- **Equal Lane Utilization and Less Lane Changes:** Since there is less speed variation on different adjacent lanes, drivers were more willing to stay in their lane and tended to use all lanes equally.
- **Decrease in Emissions:** Due to a more harmonized flow and fewer traffic shockwaves, reports have shown reductions in vehicle emissions.

Figure 4 summarizes some of recent benefit analyses of VSL System implementations.

Figure 4: Measured Benefits of using VSL from other Projects

Source	Measured Benefit
Field data collected over the last two decades show variable speed limit (VSL) systems can reduce crashes	8-30% reduction in crashes
I-495 Capital Beltway (7.5 mile section)	Saved motorists approximately 267 vehicle-hours of delay each day
I-5 in Washington State (7.5 mile corridor) – ATM Corridor	Collisions reduced 65-75 percent
Major Motorway in England	55.7% Decrease in personal injury accidents
IH-35, Austin, TX	17 percent reduction in NOx on “Ozone Action Days”

(Source: Intelligent Transportation Systems Benefits, Costs, and Lessons Learned 2014 Update Report).

Lessons Learned

A successful implementation of a VSL System depends on several factors that need to be considered during the design of such a system. These factors include:

- **Rate of Driver Speed Compliance:** The rate of success of variable message sign system is highly dependent on the compliance rate of drivers to the posted speeds. Successful applications such as M25 in the UK usually use speed enforcement systems ⁽⁴⁾. It is also recommended to agencies to inform and educate the public about the new system through media.
- **Posted Speed:** The posted speed on the variable message signs should reflect the existing conditions on the highway. Drivers may not obey very low speeds if it is not justifiable.
- **Driver Advisory:** There should be a system to inform drivers on reasons to reduce their speed. If the reason for speed reduction is not clear, it should be explained to drivers (to increase their compliance). Variable Message Signs (VMS) can be used to inform drivers ahead of time about traffic condition (e.g., using text or pictogram) ⁽⁵⁾.
- **Automated vs Operator Activated:** The VSL System should be capable of responding to changes in the traffic condition in a timely manner. It is important to post new speed limits on signs before the traffic flow breaks down. Therefore, automated systems have an advantage over operator activated systems as automated systems have less delay in posting the new speeds ⁽⁵⁾.

- **Spacing and the Rate of Speed Change:** Spacing between VSL signs should be designed carefully and should not be too short to allow drivers to react to the change in the speed. On the other hand, large spacing may cause drivers to accelerate to their desired speed if they are advised to reduce their speed far from the congested area. In Germany and Finland, VSL signs are placed with 1 mile spacing. In New Jersey, 120 signs are installed over 148 miles (average spacing of 1.2 miles) ⁽⁶⁾. VSL applications in the United States tend to use shorter spacing between VSL signs. Based on the design guidelines presented in the VicRoads “Handbook for Lane Use Management, Variable Speed Limits, Traveler Information” (3), 0.5 mile spacing is recommended for VSL System applications. The change in the speed limit should be in 5 mph increments.

TRAFFIC CONGESTION AND COLLISION ANALYSIS FOR IS 270

NORTHBOUND DIRECTION

Figure 6 shows typical traffic congestion along IS 270 for each day of a week during the year 2014. The figure shows that traffic slow down and queuing occurs during PM rush hours between MD-28 and MD-109 where there are several major interchanges, lane reductions, and uphill sections. Traffic slowdown is also observed South of Interstate 70. Collision data presented in Figure 5 also show that majority of collisions occur within or close to these congested sections. Therefore, Parsons proposes installing VSL Systems along the above sections and DMS signs at the following locations to inform drivers on reasons for the advised speeds and to reduce the probability of collisions by providing drivers with information on unforeseen traffic conditions:

- **South of MD-85 approaching Interstate 70**
 - Queueing and congestion are observed South of IS 70 during PM peak. Parsons will use a DMS sign close to this section to warn approaching drivers of queued vehicles ahead and a series of VSL signs will be used to gradually reduce the speed of approaching vehicles with the goal to prevent collisions.
- **North of MD-121 approaching MD-109**
 - Traffic data show that this section becomes congested during PM peak hours. Based on traffic data and collision frequencies, Parsons proposes VSL signs for this section and a DMS sign to inform drivers of the reason for reduced advised speed.
- **North of Father Hurley Blvd approaching MD-121**
 - The uphill section where there is a merging traffic from Clarksburg Rd and there is also a lane reduction on I270 from 3 to 2 lanes. A DMS will be used to inform drivers of slowdown in traffic near MD-121 and VSL signs will be used to advise proper speeds.

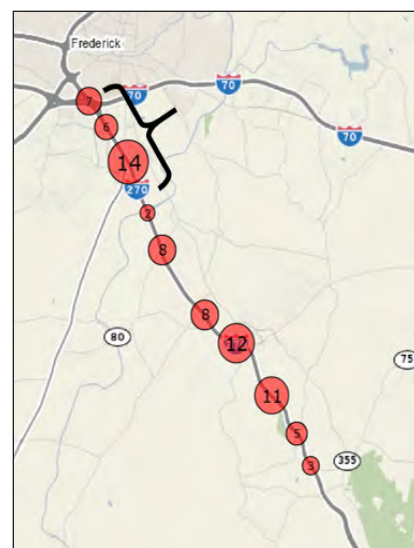
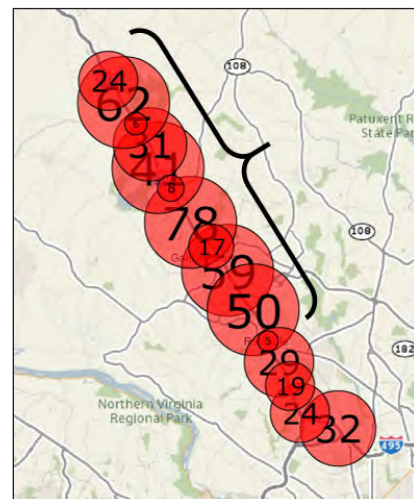


Figure 5: Collision frequency on northbound directions between the years 2013 and 2015

- South of Middlebrook Rd. approaching Father Hurley Blvd.
 - Congestion at MD-121 spreads to downstream overtime resulting in slowdown in this section. A DMS sign on south of Middlebrook Rd. and a series of VSL sign along this section will be used to inform drivers of traffic conditions ahead and to advise slower speeds during traffic slow down to reduce the probability of collisions.
- North of Muddy Branch Rd. approaching Montgomery Village Ave.
 - Traffic congestion and slow down on PM peak starts from north of Montgomery Village Ave where local lanes end. A DMS sign and a series of VSL signs in this section will be used to advise drivers when queueing occurs.
- North of MD-189 and south of Shady Grove Rd
 - Parsons will install two DMS signs at these locations to advise drivers on traffic conditions close to Interstate 370 and the reason for possible reductions in the advised speeds. A series of VSL signs to be installed along this section will be used to advise drivers with proper speeds.

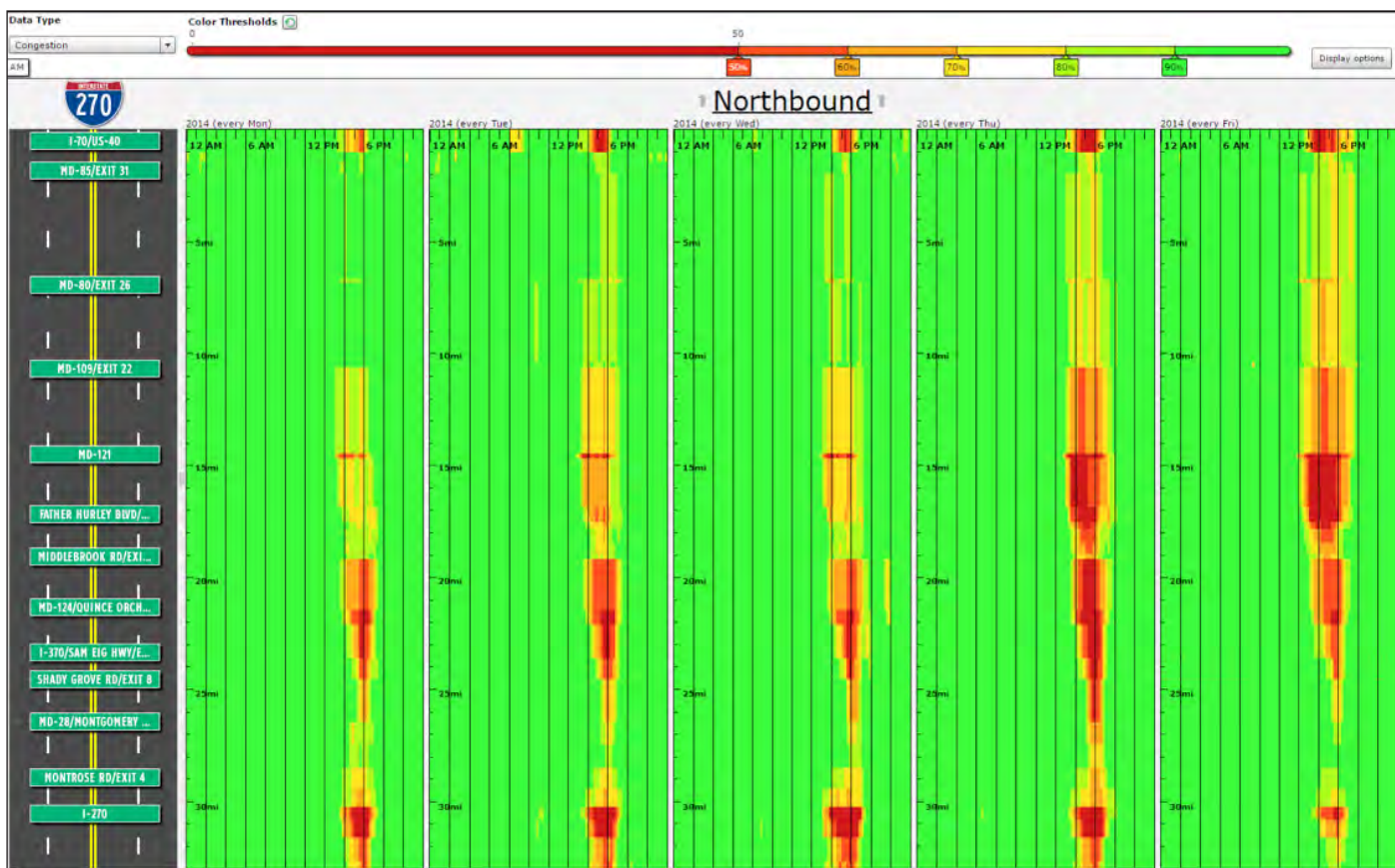


Figure 6: Typical Congestion (Northbound)

SOUTHBOUND DIRECTION

The typical traffic congestion on southbound direction shown in Figure 7 and collision data presented in Figure 8 show that there are two major sections where traffic experiences slow down during AM rush hour. Using this information, Parsons proposes installing a series of VSL and DMS signs along the following sections:

- North of MD-85 | North of MD-80 | North of MD-109
 - Traffic between MD-85 and MD-109 experience slowdown as a result of a hilly topography. Merging traffic from MD-80 and MD-109 also cause congestion at these locations. Congestion starts at MD-85 where Parsons is proposing a DMS sign north of this location to inform drivers when approaching congested area and a series of VSL signs to advise proper speeds. A DMS sign and a series of VSL signs are also proposed for north of MD-80 where there is a merging traffic from MD-80 to IS 270. The DMS sign at this location will be used to inform drivers of existing queues when approaching MD-80. The slowdown in traffic along this section continues up to MD-109 where a DMS and VSL signs will be used to warn drivers of traffic conditions ahead and to advise suitable speeds.
- North of MD-121 | North of Father Hurley Blvd | North of Middlebrook Rd. | North of Montgomery Village Ave. approaching I-370 | North of MD-28
 - Approaching MD-121, traffic experiences another slowdown. Congestion is spread south of MD-121 to IS 270 Spur where there are multiple major interchanges with high volume of weaving traffic entering and existing IS 270. Parsons is proposing VSL signs starting south of MD-109 where traffic is approaching MD-121 to north of IS 270 Spur. A series of DMS signs will be installed along this sections to inform drivers about traffic conditions close to these major interchanges.

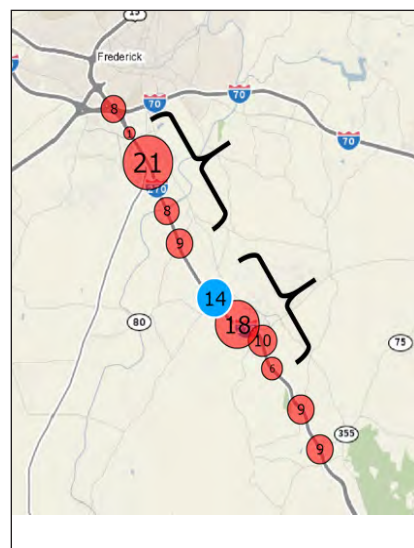
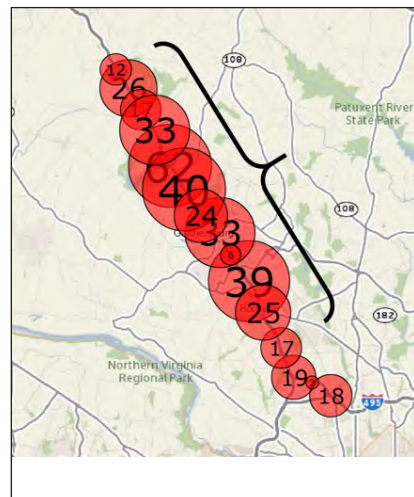
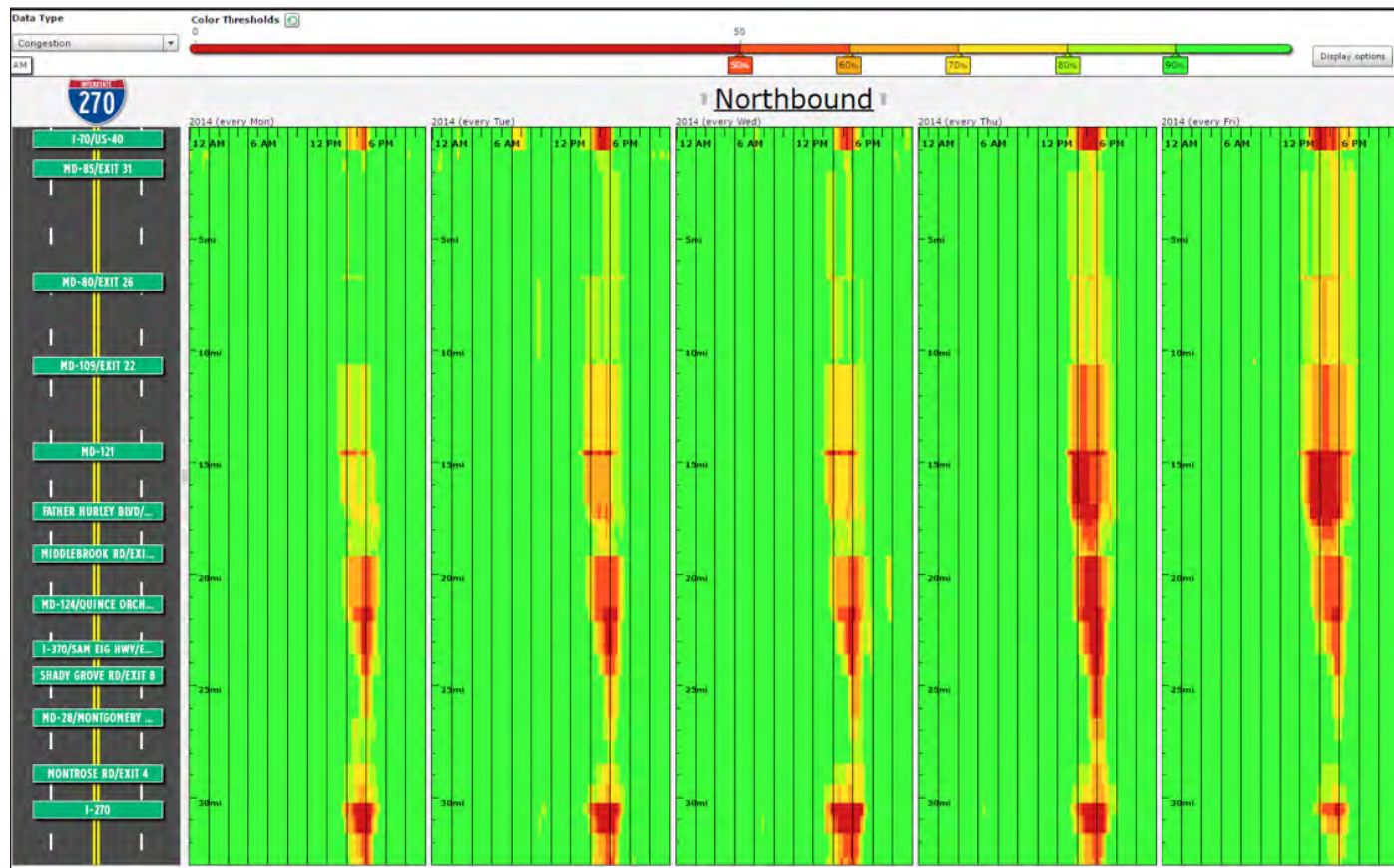


Figure 7: Collision frequency on southbound directions between the years 2013 and 2015

Figure 8: Typical Congestion (Southbound)



VSL SYSTEM MODELING ANALYSIS FOR IS 270

A VISSIM Analysis for No Build was provided by SHA. The build condition VISSIM for year 2040 was developed with strategic locations for VSL to reduce collisions, improve vehicle throughput, to reduce vehicle travel times, and to create a predictable commuter trip along IS 270. After several iterations, we were able to optimize the vehicle throughput and minimize vehicle travel time by providing VSL at locations shown on plan in Attachment 1. VSL at these identified locations was then added to the VISSIM models as a build condition and using VISSIM version 7.13, 5 runs were conducted for both AM and PM models and the results are summarized as provided in the RFP. Detailed results are provided in Figure 9 and 10 and speed graphs are provided in Attachment 2.

2040 AM – BUILD CONDITION

The analysis was conducted for the morning peak period as directed in the RFP. The results of VISSIM modeling show an overall improvement in the network performance after VSL implementation. Figure 9 shows that total delay, average delay, and total travel time have been reduced by 9%, 8%, and 1%, respectively. The travel speed along the corridor is increased by 1%. See Figure 9.

2040 PM – BUILD CONDITION

The analysis was conducted for the evening peak period as directed in the RFP. The results of VISSIM modeling show an overall improvement in the network performance after VSL implementation. Figure 10 shows that total delay and average delay have been reduced by 1%, 2% respectively. The number of vehicles entering the network at the end of a simulation period has not changed. See Figure 10.

Current VSL modeling is based on speed decision changes and is modeled as static speed change through the peak period. It is important to note that the major improvement in the traffic condition from using VSL will be achieved by maintaining the existing capacity by reducing the probability of collisions caused by speed variations. The current VISSIM analysis only includes the results from using the VSL System assuming no collisions occurred in the No Build models.

Figure 9: 2040 AM Peak VSL - IS 270 Vehicle Network Performance

	No Build	RM	% Change
Total Delay	35,032,576	31,952,568	-9%
Average Delay per Vehicle	326	298	-8%
Total Travel Time	64,317,886	63,543,133	-1%
Vehicles (Arrived)	87,894	87,962	0%
Latent Demand	44,530	44,817	1%
Latent Delay	120,600,723	121,430,995	1%
Total Distance	463,125	463,143	0%
Average Speed	26	26	1%

Figure 10: 2040 PM Peak VSL IS 270 Vehicle Network Performance

	No Build	RM	% Change
Total Delay	35,032,576	31,952,568	-9%
Average Delay per Vehicle	326	298	-8%
Total Travel Time	64,317,886	63,543,133	-1%
Vehicles (Arrived)	87,894	87,962	0%
Latent Demand	44,530	44,817	1%
Latent Delay	120,600,723	121,430,995	1%
Total Distance	463,125	463,143	0%
Average Speed	26	26	1%



Mobility

Provide improvements that maximize vehicle throughput, minimize vehicle travel times, and create a more predictable commuter trip along IS 270.

At high saturation levels, variations in individual vehicle speeds can cause breakdowns in the smooth flow of traffic. By delaying or even preventing the breakdown of smooth traffic flows, the highway can better operate close to its maximum capacity. Moreover, by reducing speed variations and the resultant traffic flow shockwaves that result, the probability of rear-end collisions, and their severity, will be reduced. With less congestion and fewer collisions, mobility, including an increase in the vehicle throughput, and improved travel times and travel time reliability, can be improved.



Safety

Provide for a safer IS 270 corridor

Parsons' proposed proposed VSL System also will provide for a safer IS 270 corridor. By reducing speed variations and the resultant traffic flow shockwaves along the highway, as well as across adjacent highway lanes, during periods of traffic congestion, the system will lower the probability of rear-end collisions and their severity.



Operability/Maintainability/Adaptability

Provide improvements that minimize SHA operations and maintenance activities while being adaptable to future transportation technological advancements.

The VSL System functions automatically, 24 hours per day, seven days per week, and provides for the smooth and safe inter-operability between adjacent VSL sign locations (e.g., trooping of signs). Parameters such as the interval frequency for the updating the VSL signs are configurable to adapt to the SHA's preferences.

The VSL System uses speed data to detect slowdowns in traffic (and subsequently activate the VSL signs), and as such, is adaptable with future technologies such as Connected Vehicles (see PTC PAR05).



Well-Managed Project

Provide a Project Management and Work Plan that addresses communications, coordination and risk management, achieves a collaborative partnership with all members of the project team and stakeholders, and successfully advances the project goals.

As part of our iNET ATM module, Parsons VSL System technology is an off-the-shelf, proven technology that can be quickly and efficiently deployed. As such, deployment costs as well as administrative and design-build risks will be minimized.

In addition, our VSL System solution is proposed to be deployed as a complementary function alongside our proposed hard-shoulder running (PTC PAR01), ramp metering (PTC PAR03), and connected vehicle (PTC PAR05) solutions.

D. POTENTIAL IMPACTS

In our analysis, we assumed that the VSL System PTC option would be installed in addition to the proposed HSR PTC. As such, the additional impact of adding a VSL System would be minimal. A preliminary analysis of potential impacts (both during and after construction) includes the following:

- **User Impacts** – During construction, the VSL signs (which will be typically roadside mounted) will be installed during the off peak hours and/or at night with minimal lane closures, and as such, will have minimal impacts on the highway users. The installation of new overhead gantries and DMS signs will require some temporary road closures, and as such, will be installed at night to minimize impacts on the users. During operations of the VSL System, the variable speed limits will be advisory, and as such, will not be enforced, and will therefore not adversely impact on the users. On the contrary, the system is expected to provide positive travel benefits to users during operations (as discussed elsewhere in this PTC). Maintenance activities will be also conducted during the off peak hours and/or at night with minimal lane closures.
- **Right-of-Way** – Additional ROW will not be needed to deploy VSL System; all hardware installation will be within the existing ROW.
- **Geotechnical** – VSL signs are relatively small and light. Moreover, the majority of the VSL signs are proposed to be installed on existing and other proposed signs support structures. So we would not anticipate a need for any geotechnical work related to the deployment of these signs. Geotechnical reports and detailed foundation designs will be required for the installation of gantries for the proposed DMSs.
- **Utilities** – We assumed that the field devices, including VSL signs, DMS signs and VDS Stations, will require a tie into the local power. The costs will

be refined in our detailed design.

- **Environmental Permitting** – No environmental permitting is expected for this PTC. It will have minimal adverse impacts in this area (and in fact is expected to provide positive impacts through the reduction in traffic collisions and traffic congestion).
- **Local Community** – The deployment of VSL Systems along IS 270 is not expected to have any impacts on the local communities adjacent to the highway.
- **Safety** – VSL System has been consistently demonstrated to improve safety by reducing speed variations and the resultant traffic flow shockwaves along the highway, as well as across adjacent highway lanes, during periods of traffic congestion; thereby reducing the probability of rear-end collisions and their severity.
- **Infrastructure Costs** – Figure 11 offers a high level estimate of the costs for installation of the field infrastructure for VSL System.

Figure 11: Estimate for Installation of VSL Field Infrastructure

Item	Unit	Qty	Unit Cost	Total Cost
ITS Field Equipment Costs				
Variable Speed Limit Signs (2-character) - small side mounted	EA	196	\$5,500	\$1,078,000
Dynamic Message Signs (Queue Warning & Incident Mmmt - freeway)	EA	17	\$90,000	\$1,530,000
ATM Gantries (sign structures with foundations)	EA	13	\$200,000	\$2,600,000
VSL Poles (15') with foundations	EA	114	\$4,000	\$456,000
Equipment Cabinets (NEMA) Pole-Mounted	EA	98	\$2,500	\$245,000
New Mainline VDS (Freeway) - Side-fire Radar	EA	200	\$18,000	\$3,600,000
Power Service for ITS Cabinets/Equipment	EA	98	\$15,000	\$1,470,000
Traffic Control	LS	1	\$1,000,000	\$1,000,000
Systems Integration				\$850,000
System Testing				\$335,000
System Documentation and Training			\$190,000	\$230,000
			Subtotal	\$13,394,000
			Contingency (25%)	\$3,348,500
			Total Capital Costs:	\$16,742,500

E. OTHER PROJECTS

UNITED STATES APPLICATIONS

Parsons has been involved in the detailed design and deployment of VSL Systems across the U.S. including our four most recent installations:

- I-80 in the San Francisco Bay Area
- I-285 in Georgia
- I-66 in Virginia
- Oregon Route 217

Figure 12 provides a list of these and other recent VSL implementations in the U.S. ⁷.

Figure 12: VSL Implementations in the United States

Location	Type of Activation	Total Length	Type	Number of VSL Signs	Type of Sensors	Current Status
I-10, Mobile, Alabama	Manual	7 mi	Regulatory	24	Visibility, CCTV	Active
I-66, Fairfax, Virginia	Automatic	34 mi	Advisory	42 gantries	Radar, VIDS/CCTV	Active
I-70, Colorado	Manual	19 mi	Regulatory	8	Loops, Radar, Temperature, Precipitation, Wind speed	Active
I-70, Colorado	Manual	1 mi	Regulatory	4		Active
Delaware	Manual	4 bridges	Regulatory	5-8	Speed, Volume, Occupancy, Environmental (weather)	Active
I-80 SF Bay Area	Manual/ Automatic via Incident Response	21 miles	Advisory	54	Loop detectors (volume, speed, occupancy)	Active
I-4, Florida	Hybrid	10.5 mi	Regulatory	20	Loop detectors, Side-fire radar (volume, speed, occupancy), Weather visible by CCTV	Active
I-95, Maine	Manual	~195 mi	Advisory	65 total (solar powered)	Some have cameras, Radar (to read speed of traffic)	Active
OR-217, Oregon	Automated (Speed, Weather)	7.5 mi	Advisory	28	Radar (9), Loops (20 Stations), RWIS (5)	Active
OR – I-5/I-405	Automated (Speed)	4.6 mi	Advisory	16	Radar ⁽⁷⁾ , Loops (5 Stations)	Active

Location	Type of Activation	Total Length	Type	Number of VSL Signs	Type of Sensors	Current Status
OR – Staley's Junction	Automated (Speed)	1 mi	Regulatory	2	Radar ⁽²⁾	Active
OR – I-84 EB at Baker Valley	Automated (Speed, Weather)	30 mi	Regulatory	24	Radar (5), RWIS ⁽³⁾	Inactive (To Be Activated 2016-11)
I-285, Georgia	Automated (manual support)	36 mi	Regulatory	176	Speed, Volume, Occupancy	Active
I-295, Maine	Manual	50 mi	Advisory		Some have cameras, Radar (to read speed of traffic)	Active
I-35W, Minneapolis	Automated	15 mi	Advisory	174	Single loops	Active
IS 270, St. Louis, Missouri	Hybrid	38 mi	Advisory	70 (all solar powered)	Speed, Occupancy	Active
Turnpike, New Jersey	Manual	~148 mi	Regulatory	164	Speed (Environmental sensors are inactive due to lost connection)	Active
Turnpike, Pennsylvania	Manual	10 mi	Regulatory	18	Speed, Environmental, CCTV	Active
Bridges/Tunnels, Virginia	Manual	4 bridge tunnels	Regulatory	50	CCTV	Active
I-75, Tennessee	Manual	19 mi	Regulatory	10	Speed, Environmental (fog)	Active
I-90, Washington	Manual	28 mi	Regulatory	14	Speed, Environmental	Active
US 2, Washington	Manual	23 mi	Regulatory	8	Speed, Environmental	Active
Seattle Metropolitan Area, Washington (I-5, I-90, SR 520)	Automated	Unknown	Regulatory	Unknown	Speed, Environmental	Active
I-80 Wyoming	Manual	140 mi	Regulatory	Approx. 42	Speed, Environmental	Active
I-84, Idaho	Manual	105 mi	Advisory	5	Vehicle, Environmental	Test Site
I-94, Minneapolis	Automated	8 mi	Advisory	110	Single loops	Under Construction
I-77, South of I-81, Virginia	Hybrid	20 mi	Regulatory	40	TBD	Planned
Turnpike/I-595, Florida	Automated	2-lane off-ramp	Advisory	1	Moisture	Removed
I-10/I-310, Louisiana	Manual	Unknown	Advisory	Approx. 12	Visibility, Speed	Removed

Location	Type of Activation	Total Length	Type	Number of VSL Signs	Type of Sensors	Current Status
I-695, Maryland	Automated	3 mi	Regulatory	4	Speed, Queue	Removed (Temporary Installation)
I-96, Michigan	Automated	8 mi	Regulatory	7	Speed	Removed (Temporary Installation)
I-494, Minnesota	Automated	2.5 mi	Advisory	3	Speed	Removed
I-80, Nevada	Manual	2-3 mi	Regulatory	4	Visibility	Removed (Technical Issues)
I-40, New Mexico	Automated	3 mi	Regulatory	3	Speed, Environmental	Removed
I-526, South Carolina	Manual	2 mi	No speed change	8	Fog	Removed
I-80, Utah	Manual	6 mi	Regulatory	2	Day/Night automatic	Removed (Temporary Installation)
I-215, Utah	Manual	2 mi	Regulatory	2	Speed, Environmental	Removed
I-95, Virginia (work zone at Woodrow Wilson Bridge)	Hybrid	1 bridge	Regulatory	Unknown	Speed, Queue length	Removed

The following describes a few of these previous VSL implementations and their reported benefits.

State of Oregon has started using a congestion and weather responsive advisory variable speed limit on OR-217, a 7.5 mile highway section, since summer 2014. Figure 15 shows sample VSL signs on a bridge and a gantry used on OR-217 and Figure 13 shows the two sections of the highway with location of detector and VSL signs. The spacing between VSL signs, as shown in Figure 14, can vary between 0.66 and 1.62 mile ⁽⁸⁾.

An eight month evaluation after the implementation of the system showed that there was a significant reduction in speed variability, and that crashes became less frequent in the immediate vicinity of the VSL signs. Traffic showed a more even distribution across multiple lanes, and the travel time reliability improved after the implementation of the system ⁽⁸⁾. The rate of compliance was also studied ⁽⁹⁾. The results of the study, as presented in Figure 16, showed that when VSL System is in use, 88 percent of drivers were driving more than the advised



Figure 13: OR-217 Corridor

Figure 14: VSL and Detectors Locations on OR-217

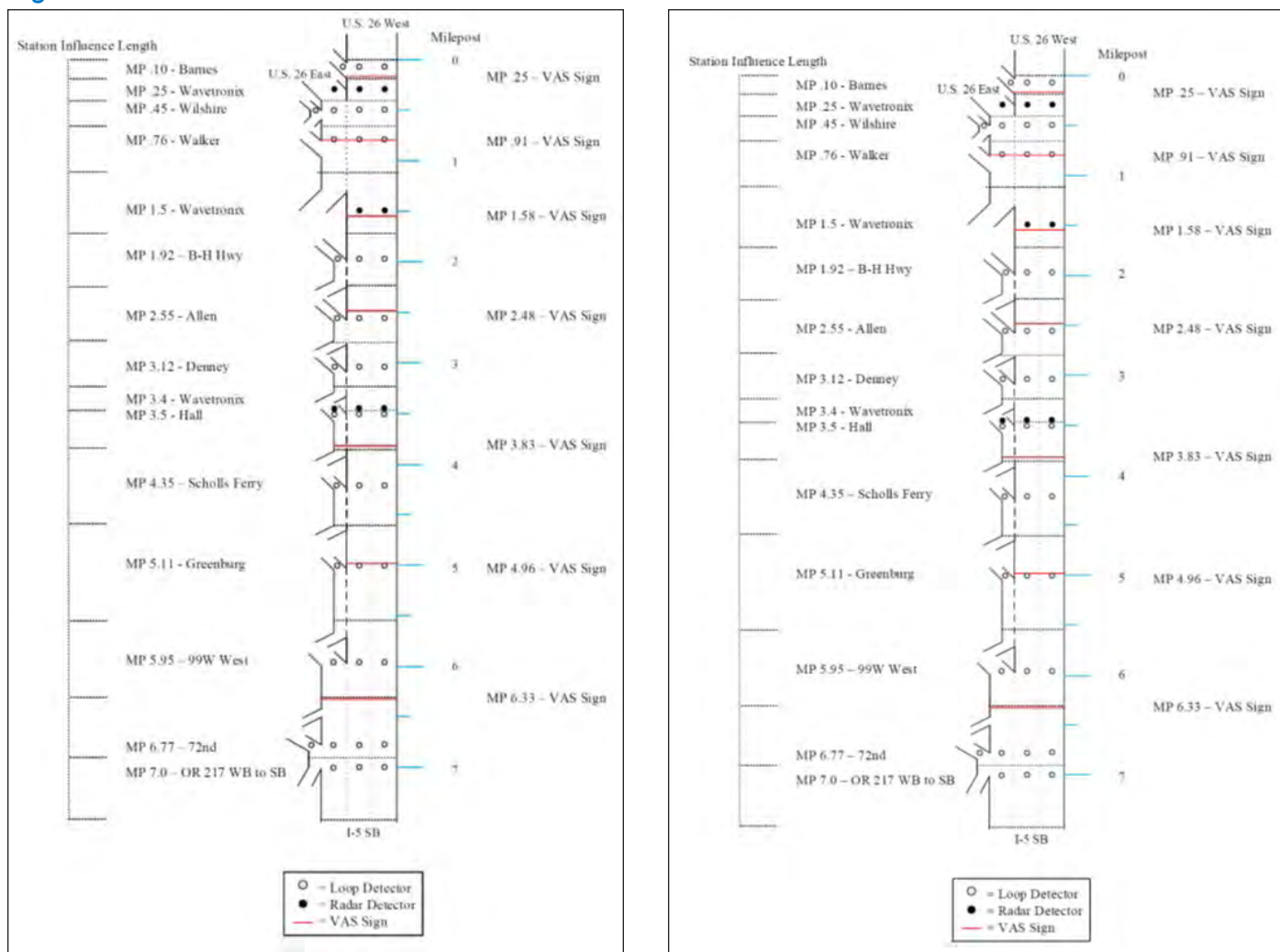


Figure 16: Distribution of Detected Speeds vs Posted Advisory Speed (10)

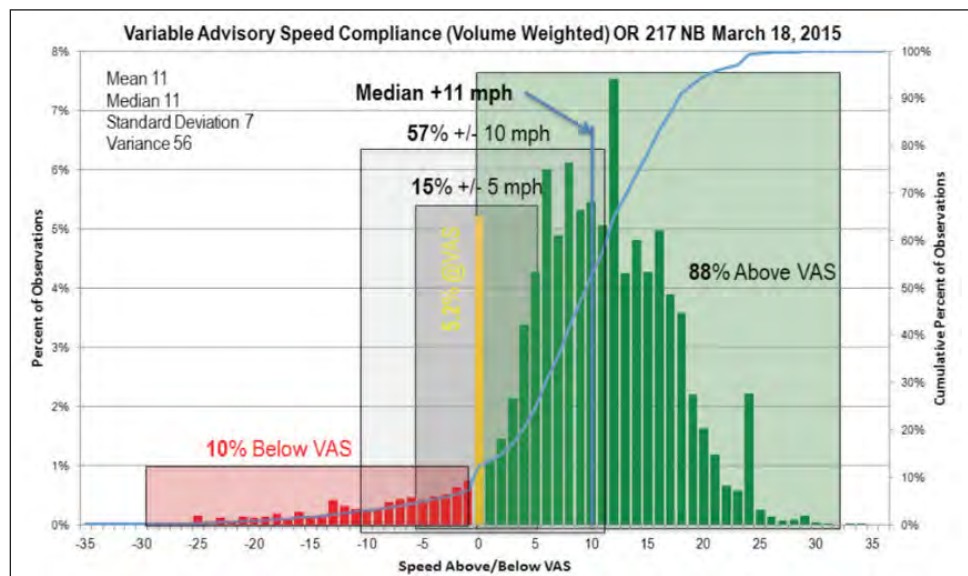
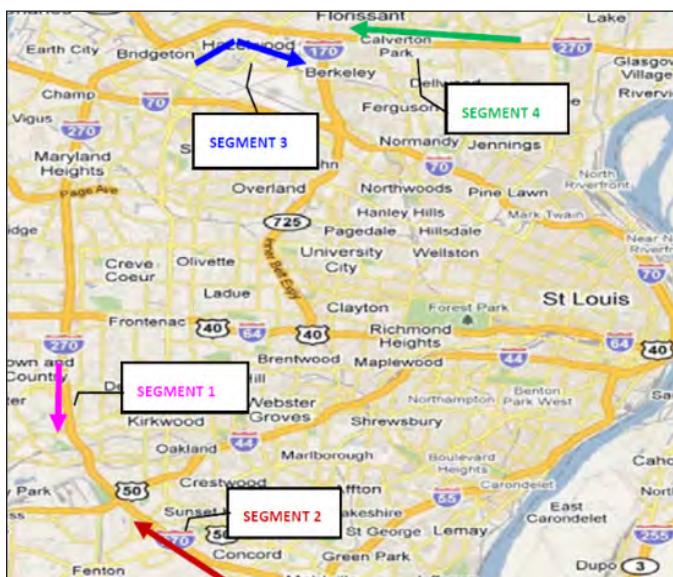


Figure 15: Two Examples of VSL Installations on OR-217

speed limit by a mean speed of 10 mph, while 10% were traveling slower. The study also concluded that the compliance rate increased as the posted speed become higher.

Washington State has several VSL applications along Northbound I-5 into downtown Seattle, I-90 between the City of Bellevue and Seattle, SR 520 between the City of Bellevue and Seattle, US 2 over the Stevens Mountain Pass, and I-90 over the Snoqualmie Mountain Pass. The posted speed limits on VSL signs are regulatory along these sections. The speed limit changes based on the detected speed and occupancy data collected from road sensors. On I-90, for instance, the speed limit can change between 35 mph and 65 mph in 10 mph increments. VSL system was implemented on I-5 in August 2010. VSL signs are installed every 0.5 mile on along 7 miles of this corridor. The before and after study results showed that, except for the morning peak hour (6-8 am), there was a significant improvement in the travel time reliability.

Figure 19: I270 Corridor in St. Louis, Missouri



Interstate 80 in San Francisco Bay Area is a recent VSL implementation in the United States. The system uses advisory speed limit signs to warn drivers to slow down during traffic incidents. VLS signs are blanked during normal traffic conditions. The system is active since September 2016, thus no performance evaluation results are available.

VSL system has been used on Interstate 66, Virginia, as one of the components of its Active Traffic Management (ATM) system. The length of the corridor under ATM system is approximately 34 miles. The field infrastructure consists of traffic detector stations spaced approximately every 1/3 mile, and gantries spaced approximately every 1/2 mile, each having lane control/variable speed signs over each lane/shoulder and a separate VMS. Additional isolated signs are



Figure 17: VSL Signs on I-5, Washington State



Figure 18: VSL Signs on SR 520, Seattle, Washington

Segment Nos.	Direction	On I-270 Between
1	SB	I-64 and Route 100
2	NB	Route 30 and I-44
3	EB	Route 370 and I-170
4	WB	Route 367 and I-170

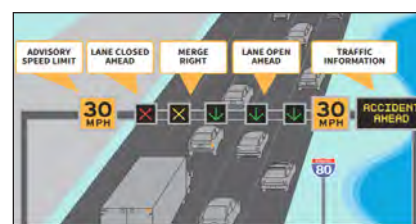
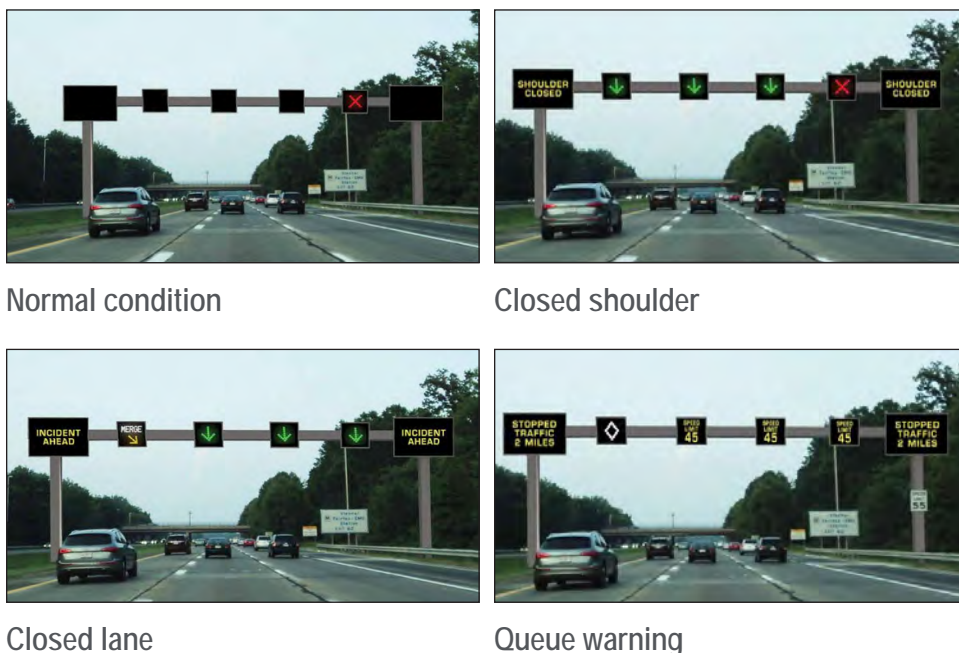


Figure 20: I-80, San Francisco Bay Area – Source: <http://80smartcorridor.org/>

also present (i.e., pre-existing VMS signs or stand-alone shoulder lane signs). VSL system is used on 13 miles of this highway for speed harmonization, traffic incidents, work zones, inclement weather, and shoulder blockages.

Advisory speeds are posted on lane control signs when a queueing or slowdown is detected downstream of a section. Schematic examples of different signage at different conditions are presented in Figure 22.

Figure 22: Examples of Different Signage



Normal condition

Closed shoulder

Closed lane

Queue warning

No evaluation results are provided yet due to recent implementation of system.

Interstate 285 in Georgia is another example of VSL implementation in the United States. Regulatory and enforceable VSL signs in this implementation are installed on two sides of the highway showing a single speed for all lanes. The instrumented section include the top northern side of the highway as shown in green in Figure 24. 176 VSL signs are installed in 88 locations with approximately 0.5 to 1.5 miles spacing. Parsons' Intelligent NETworks® is used to control the speed limits on these signs. The speed limit can change between 35 mph and 65 mph with 10 mph increments based on the traffic data obtained from traffic sensors. VMS signs are used to warn drivers about the traffic condition. VSL signs are showing the normal speed limit (65 mph) during normal traffic conditions.



Figure 21: VSL Signs on Gantry on I-66, Virginia



Figure 23: VSL Signs on Interstate 285, Georgia



Figure 24: VSL System Installed on North Side of I-285 (Area in Green Color)

INTERNATIONAL APPLICATIONS

Germany is using VSL on its Autobahn systems since 1965. Using VSL on A5 in Frankfurt has resulted in 10% increase in traffic throughput on southbound direction from 5,200 vph to 5,900 vph. This implementation has also shown improvement in traffic safety by reducing the number of collisions by 30% and fatalities by 60% ⁽¹¹⁾.

The results of using VSL system on M25 motorway in the United Kingdom showed a 1.5% increase in the traffic throughput during 5 hour peak periods. The results also showed reductions in the frequency of shockwaves, less stops and variations in the speeds and reduced journey travel times on congested sections of the motorway. The results also showed that the number of injury accidents are dropped by 10%, and traffic emissions are reduced between 2% and 8% as a result of less stops and accelerations ⁽¹²⁾.

Another successful VSL implementation in the UK is on M42 motorway. The results of system evaluation showed that there was an increase in the motorway capacity between 7% and 9%. Speed variations among lanes were decreased, and average number of personal injury accidents were reduced from 5.08 to 1.83 per month. The noise level reduced between 1.8 and 2.4 dB and emissions between 3% and 10% depending on the pollutant type. For the northbound motorway, the average journey time was reduced by 4 minutes (24% reductions), and 1 minute (9%) reduction was observed for the southbound. The free flow journey time on the motorway is reported to be 11 minutes ⁽¹³⁾.

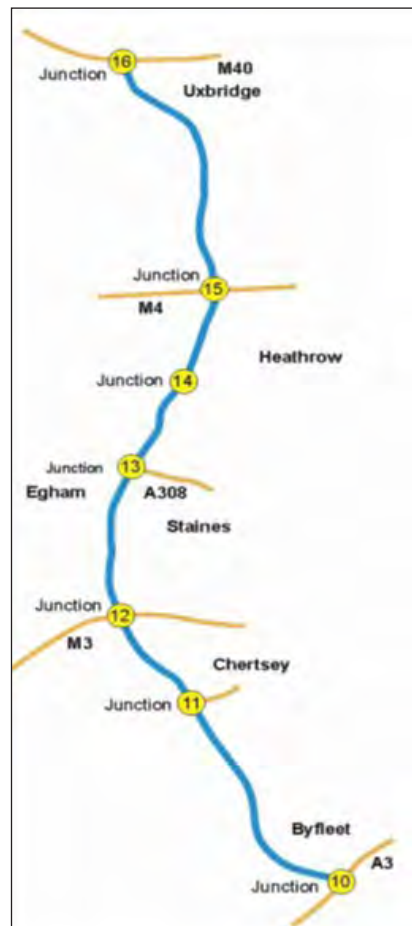
In France, VSL system was implemented on the A7 motorway and speed limits on the southbound corridor was reduced progressively from 130km/h to 70 km/h with 20km/h decrements depending on the traffic volume. The evaluation of the system showed increased traffic throughput during peak hours, reduced congestion by 40%, and reduction in number of crashes by 20%. For the northbound, the results show 16% reduction in traffic congestion, 50% decrease in the number of crashes and a 10% increase in the traffic throughput ⁽¹⁴⁾.

A study in the Netherland ⁽¹⁵⁾ compared before/after traffic lane distribution for a section of the A12 motorway after the implementation of a VSL system. The after analysis showed that traffic was more evenly distributed across all lanes and more traffic was detected on the outside lane.

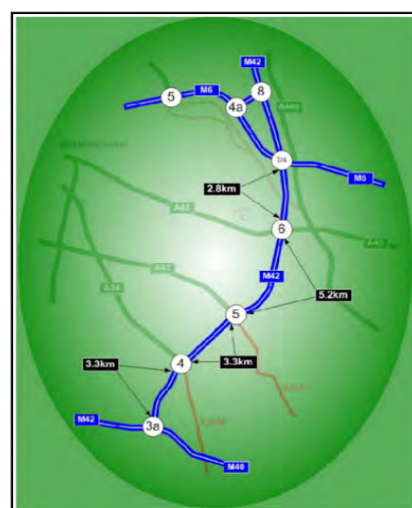
F. ADMINISTRATIVE RISK

Salient issues that must be considered with respect to administrative risks include:

- **Lack of Driver Compliance** – The primary administrative risk is that the majority of the drivers will ignore the posted advisory speeds (e.g., due to a perceived lack of benefits and/or repercussions to themselves personally) and simply proceed 'as normal', thereby negating the potential benefits of the VSL System. It needs to be recognized that full driver compliance will never be achieved, as the speed limits will be advisory.



M25 motorway in the United Kingdom



M42 Motorway in France

However, steps can be taken to maximize driver compliance. For example, a comprehensive VSL System concept of operations will be prepared, and a corresponding public outreach program will be conducted prior to and at the start of operations. The outreach program, which will need to be widely disseminated, will explain why motorists need to slow down and how they will benefit. In addition to the outreach program, static signage advising motorists that they are “Entering Variable Speed Limit Zone” will be placed prior to entering the respective VSL System zones to remind motorists and further encourage driver compliance.

- **System Calibration** – Advisory speeds that are accurate and appropriate for the driving conditions are critical to the success of the VSL System. The administration will get complaints from the public if the advisory speeds are not appropriate. On the other hand, when the advisory speeds are appropriate, motorists will learn to consistently comply with those advisory speeds through their good experience. To address this issue, Parsons will insure that the vehicle detector stations are thoroughly tested and calibrated, such that the detector data being measured is accurate, prior to the initial activation of the VSL System.
- **Operations Reliability and Availability** – To provide real-time dynamic guidance to motorists, and enhance roadway safety, the VSL System must be highly reliable, available and maintainable. In this respect, there will be ongoing operating and maintenance expenses associated with the VSL System (as per any active traffic management solution). As part of our final technical solution, Parsons will prepare a plan and estimate for the recommended operations and maintenance requirements and costs in order to assist SHA to program ongoing support, and provide documentation and justification for the required operation and maintenance budgets.

G. DESIGN-BUILD RISK

Design-build risks related to a VSL System are minimal. The following represent potential risk issues, which are generally based on design assumptions that are subsequently found to be in error after the VSL design has been completed:

- **Additional Infrastructure Requirements** – To minimize deployment costs, VSL signs are proposed to be installed, to the maximum extent feasible, on existing and proposed new sign support structures, including on existing overhead static sign gantries. A need for additional new field infrastructure (e.g., new overhead gantry, etc.) in lieu of using the existing sign support infrastructure would require additional undefined costs.
- **Power** – Access to power could require additional undefined costs to provide. For example, VSL signs may have to be equipped with solar panels and backup batteries where power is not readily accessible. However, in general, we would not expect this to be a significant issue in this corridor, and these details will be further worked out in the development of our final proposal.

- **Hard Shoulder Running (HSR) PTC** – HSR PTC is being developed in parallel with this PTC. To minimize deployment costs, VSL signs have been proposed to be installed on proposed HSR sign support structures (e.g., gantries and poles) along those sections of the highway where these two PTCs overlap. Consequently, the HSR final design will affect the VSL System final design where this infrastructure is assumed to be used and is subsequently modified. These details will be further worked out in the development of our final proposal.

H. COST/SCHEDULE BENEFIT

VSL signs can be installed on the roadside on a single pole or on the top or side of existing gantries and overpasses, or on new gantries, as shown in the two examples in Figure 25. That said, the installation of new overhead gantries is expensive.

Our proposal is therefore designed to minimize deployment costs by minimizing the use of overhead gantries, and in particular, the installation of new gantries. VSL signs are proposed to be primarily installed on either sign support structures proposed for the HSR PTC or on existing sign support structures, or otherwise, on new roadside single poles.

I. MISCELLANEOUS

REFERENCES

I-80 ICM:

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VDOT I-66 ICM:

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GDOT VSL:

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Figure 25: VSL Installation Examples: Overhead on a Gantry and Side Mounted

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ATTACHMENTS

1. VSL Sign Table
2. VISSIM Run

Response to Comments

- Comment 2: Noted and agreed. The communication will be designed considering needs for all the proposed solutions in other PTCs. The PTC submitted with the Final Proposal will be updated accordingly.
- Comment 3: Noted and agreed. As part of our final technical solution, a system architecture will be included to present details on how iNET will interface with different data sources. The PTC submitted with the Final Proposal will be updated accordingly.
- Comment 4: Noted and agreed. The final locations for new VSL signs will be designed and adjusted considering the minimum required distance from the existing signs and structures by considering the design guidelines in MUTCD standard. The speed control strategy that Parsons recommends for the variable speed limit solution is advisory; however, the final strategy will be determined based on inputs from Maryland Department of Transportation and their decision on the speed control policy. The PTC submitted with the Final Proposal will be updated accordingly.
- Comment 5: Noted and agreed. As part of our final technical solution, a plan and estimate for the recommended operations and maintenance requirements and budgets will be prepared.

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- (15) Knoop, V. L., Duret, A., Buisson, C., & Van Arem, B. (2010, September). Lane distribution of traffic near merging zones influence of variable speed limits. In *Intelligent Transportation Systems (ITSC), 2010 13th International IEEE Conference on* (pp. 485-490). IEEE.

Station	ITS Equipment	Dir	Express/Local	VSL	ATM Gantry
150+00	I-270 Spur				
167+90	2 VSL on existing gantry + new RTMS	SB	Express	2	
197+60	2 VSL on existing gantry + VDIS + new RTMS	SB	Express	2	
225+00	Montrose Rd				
226+60	2 VSL on existing gantry	SB	Express	2	
246+00	New RTMS on a new pole + VSL	SB	local	1	
246+00	1 Pole mounted VSL	SB	local	1	
250+60	1 VDIS on a new pole + VSL	SB	Express	1	
250+60	1 VSL on a pole	SB	Express	1	
267+00	2 VSL on existing gantry + new RTMS	SB	Local	2	
278+60	2 VDIS on a new pole + VSL+ new RTMS	SB	Express	1	
278+60	1 VSL on a pole	SB	Express	1	
297+00	Falls Rd				
299+00	2 VSL on new gantry + DMS + HSR LCS + VDIS	SB	Express	2	1
301+00	1 VSL on HSR structure	SB	Local	1	
301+00	1 VSL on a pole	SB	Local	1	
306+30	2 VSL on new gantry + DMS	NB	Local	2	1
314+50	2 Pole mounted VSL	NB	Local	2	
320+00	1 VSL on existing gantry	SB	Local	1	
320+00	new RTMS on a new pole + VSL	SB	local	1	
329+00	2 VSL on existing gantry pole	SB	Express	2	
329+32	2 VSL on existing gantry pole	NB	Express	2	
347+00	MD28/Montgomery Ave.				
350+00	2 Pole mounted VSL	NB	Express	2	
353+22	2 Pole mounted VSL	NB	Local	2	
356+30	2 Pole mounted VSL	SB	Local	2	
368+55	2 VSL on existing gantry	SB	Express	2	
380+00	New RTMS on a new pole + VSL	NB	local	1	
380+00	1 Pole mounted VSL	NB	Local	1	
381+71	2 VSL on existing gantry pole	NB	Express	2	
391+50	1 VSL on existing gantry pole	SB	Local	1	
391+50	1 Pole mounted VSL	SB	Local	1	
410+50	2 Pole mounted VSL	SB	Express	2	
416+00	2 VSL on existing gantry	NB	Local	2	
420+00	2 VSL on new gantry + DMS	NB	Express	2	1
428+00	1 Pole mounted VSL	SB	Local	1	
428+00	1 VSL on HSR structure	SB	Local	1	
448+00	Shady Grove Rd/ Exit 8				
451+50	2 VSL on new gantry + DMS	SB	Express	2	1
451+50	1 VSL on southbound new gantry pole	NB	Express	1	
452+00	1 Pole mounted VSL	NB	Express	1	
454+50	2 Pole mounted VSL	SB	Local	2	
455+00	2 Pole mounted VSL	NB	Local	2	
474+00	2 Pole mounted VSL	SB	Express	2	
481+35	2 Pole mounted VSL	NB	Local	2	

488+00	1 VSL on existing gantry	SB	Local	1	
488+00	1 Pole mounted VSL	SB	Local	1	
489+26	2 Pole mounted VSL	NB	Express	2	
500+00	I370				
519+71	2 VSL on existing gantry pole	NB	Local	2	
529+53	2 VSL on existing gantry pole	NB	Express	2	
543+47	1 Pole mounted VSL	SB	Express	1	
543+47	new RTMS on a new pole + VSL	SB	Express	1	
552+50	1 Pole mounted VSL	NB	Local	1	
558+56	2 VSL on new gantry + DMS	NB	Express	2	1
571+50	1 Pole mounted VSL	SB	Express	1	
571+50	new RTMS on a new pole + VSL	SB	Express	1	
578+00	MD 117				
585+00	2 Pole mounted VSL	NB	Local	2	
588+78	2 Pole mounted VSL	NB	express	2	
595+00	1 Pole mounted VSL	SB	Express	1	
595+00	new RTMS on a new pole + VSL	SB	Express	1	
610+00	MD 124				
616+00	2 Pole mounted VSL	NB	express	2	
618+00	2 Pole mounted VSL	SB	Express	2	
651+10	2 VSL on new gantry + DMS+new RTMS+HSR LCS	NB	Express	2	1
655+50	1 VSL on Northbound VDIS pole	SB	Express	1	
655+50	new RTMS on a new pole + VSL	SB	Express	1	
683+85	2 VSL on existing gantry + new RTMS	SB	Express	2	
690+50	2 VSL on existing gantry+ HSR LCS + VDIS+new RTMS	NB	Express	2	
715+00	2 VSL on new gantry + DMS +VDIS + new RTMS	SB	Express	2	1
715+00	2 VSL on new gantry + DMS+new RTMS + VDIS	NB	Express	2	1
743+00	MiddleBrook RD				
750+00	2 Pole mounted VSL	SB	Express	2	
753+77	1 VDIS on a new pole + VSL+ new RTMS	NB	Express	1	
753+77	1 VSL on a pole	NB	Express	1	
780+12	2 VSL on existing gantry+ VDIS+ Existing RTMS	NB	Express	2	
783+00	MD118				
790+00	2 Pole mounted VSL	SB	Express	2	
802+82	1 VSL on HSR structure + VDIS + new RTMS	NB	Express	1	
802+82	1 Pole mounted VSL	NB	Express	1	
810+90	2 VSL on new gantry + DMS + new RTMS	SB	Express	2	1
836+00	Father Hurley Blvd				
846+71	2 Pole mounted VSL	SB	Express	2	
868+40	1 VDIS on a new pole + VSL	SB	Express	1	
868+40	1 Pole mounted VSL	SB	Express	1	
880+56	2 VSL on new gantry + DMS + new RTMS	NB	Express	2	1
906+67	2 VSL on existing gantry +2 VDIS + new RTMS	SB	Express	2	
911+00	new RTMS on a new pole + VSL	NB	Express	1	
911+00	1 Pole mounted VSL	NB	Express	1	
936+00	1 Pole mounted VSL	SB	Express	1	

936+00	1 VSL on HSR structure + VDIS + new RTMS	SB	Express	1	
957+86	new RTMS on a new pole + VSL	NB	Express	1	
957+86	1 Pole mounted VSL	NB	Express	1	
966+00	2 VSL on new gantry + DMS + HSR LCS	SB	Express	2	1
978+00	MD 121				
998+82	new RTMS on a new pole + VSL	SB	Express	1	
998+82	1 Pole mounted VSL	SB	Express	1	
1012+86	1 DMS on a new pole +VSL+RTMS	NB	Express	1	
1012+86	1 Pole mounted VSL	NB	Express	1	
1022+30	new RTMS on a new pole + VSL	SB	Express	1	
1022+30	1 Pole mounted VSL	SB	Express	1	
1041+85	2 Pole mounted VSL	NB	Express	2	
1050+00	2 Pole mounted VSL	SB	Express	2	
1075+00	1 Pole mounted VSL	SB	Express	1	
1075+00	1 DMS on a new DMS Pole +VSL +new RTMS	SB	Express	1	
1075+00	new RTMS on a new pole + VSL	NB	Express	1	
1075+00	1 Pole mounted VSL	NB	Express	1	
1110+00	2 Pole mounted VSL	SB	Express	2	
1110+00	2 Pole mounted VSL	NB	Express	2	
1140+00	new RTMS on a new pole + VSL	SB	Express	1	
1140+00	1 Pole mounted VSL	SB	Express	1	
1145+00	new RTMS on a new pole + VSL	NB	Express	1	
1145+00	1 Pole mounted VSL	NB	Express	1	
1160+00	new RTMS on a new pole + VSL	SB	Express	1	
1160+00	1 Pole mounted VSL	SB	Express	1	
1180+00	MD109				
1193+40	2 Pole mounted VSL	SB	Express	2	
1226+50	new RTMS on a new pole + VSL	SB	Express	1	
1226+50	1 Pole mounted VSL	SB	Express	1	
1265+00	2 Pole mounted VSL	SB	Express	2	
1295+00	new RTMS on a new pole + VSL	SB	Express	1	
1295+00	1 Pole mounted VSL	SB	Express	1	
1322+00	new RTMS on a new pole + VSL	SB	Express	1	
1322+00	1 Pole mounted VSL	SB	Express	1	
1352+56	1 Pole mounted VSL	SB	Express	1	
1352+56	1 DMS on a new DMS Pole +VSL	SB	Express	1	
1376+00	MD80				
1387+00	1 VDIS on a new pole + VSL + new RTMS	SB	Express	1	
1387+00	1 Pole mounted VSL	SB	Express	1	
1416+00	1 Pole mounted VSL	SB	Express	1	
1416+00	1 VSL on HSR structure + VDIS	SB	Express	1	
1444+50	1 Pole mounted VSL	SB	Express	1	
1444+50	1 VSL on HSR structure + VDIS + new RTMS	SB	Express	1	
1473+00	1 VSL on HSR structure +VDIS	SB	Express	1	
1473+00	1 DMS on a new DMS pole +VSL + new RTMS	SB	Express	1	
1500+50	1 Pole mounted VSL	SB	Express	1	

1500+50	1 VSL on HSR structure +VDIS + New RTMS	SB	Express	1
1529+00	1 Pole mounted VSL	SB	Express	1
1529+00	1 VSL on HSR structure + new RTMS	SB	Express	1
1568+60	1 Pole mounted VSL	SB	Express	1
1568+60	1 VSL on HSR structure+ new RTMS	SB	Express	1
1590+00	1 DMS on a new pole +VSL	NB	Express	1
1590+00	1 Pole mounted VSL	NB	Express	1
1613+89	1 VSL on existing gantry + new RTMS	NB	Express	1
1613+89	1 Pole mounted VSL	NB	Express	1
1616+90	1 Pole mounted VSL	SB	Express	1
1616+90	1 VSL on HSR structure	SB	Express	1
1645+00	MD85			
1654+90	2 Pole mounted VSL	NB	Express	2
1665+00	New RTMS + VSL	SB	Express	1
1665+00	1 Pole mounted VSL	SB	Express	1
1690+50	1 Pole mounted VSL	SB	Express	1
1690+50	1 DMS on a new pole +VSL	SB	Express	1
1696+84	new RTMS on a new pole + VSL	NB	Express	1
1696+84	1 Pole mounted VSL	NB	Express	1
1720+00	I-70			
			Total=	191
				11

DMS Pole (18') DMS VSL Pole (15')



1

1

1



1

1

1

2



2

2

2

1

1

2

1

1



1

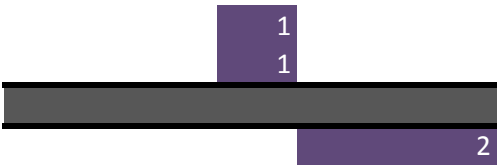
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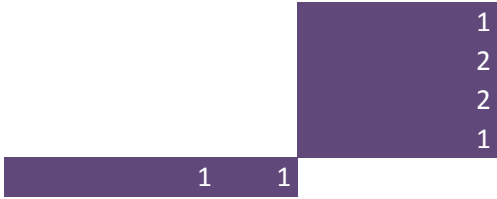
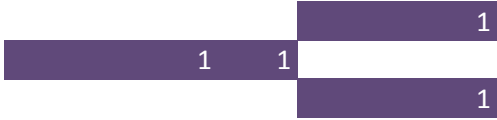
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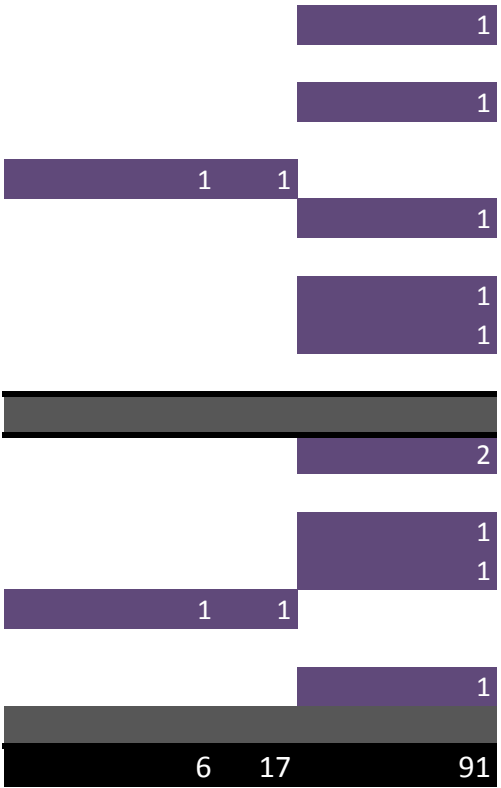


Table C.1: AM Peak -2040 Variable Speed Limit - I-270 Vehicle Travel Time

I-270 Southbound	Segment Length (miles)	No Build VISSIM Travel Time (seconds)	VSL VISSIM Travel Time (seconds)	% Change
From I-70				
to MD 85	1.7	260.9	257.0	-2%
to MD 80	5.4	1,374.0	1,337.9	-3%
to MD 109	3.7	583.2	591.1	1%
to MD 121	3.6	284.4	309.1	9%
to MD 27	2.5	266.9	284.1	6%
to MD 118	1.1	254.6	270.0	6%
to Middlebrook Rd	1.1	206.2	220.7	7%
to MD 124	2.2	528.0	554.9	5%
to MD 117	0.9	180.6	196.1	9%
to I-370	1.0	94.3	109.9	17%
to Shady Grove Rd	1.5	124.1	135.3	9%
to MD 28	1.9	141.9	157.4	11%
to MD 189	1.0	157.8	141.0	-11%
to Montrose Rd	1.0	251.0	213.5	-15%
to I-270 Split	1.9	243.1	247.8	2%
to MD 187	0.4	30.7	34.4	12%
to I-495 interchange	1.9	134.0	150.9	13%
I-270 Total (miles/minutes)	32.7	85.3	86.9	2%
I-270 Spur Southbound				
From I-70				
to I-270 Split	30.3	4,951.1	5,025.8	2%
to Democracy Blvd	0.7	91.3	98.9	8%
to I-495	1.3	191.0	175.5	-8%
to MD 190	1.3	101.6	82.1	-19%
to Cabin John Pkwy	0.6	35.1	35.0	0%
I-270 Spur Total (miles/minutes)	34.2	89.5	90.3	1%

Table C.2: AM Peak -2040 Variable Speed Limit- I-270 Local Vehicle Travel Time

I-270 Southbound	Segment Length (miles)	No Build VISSIM Travel Time (seconds)	VSL VISSIM Travel Time (seconds)	% Change
From C-D start				
to Shady Grove	1.3	490.1	492.2	0%
to MD 28	1.8	491.5	439.0	-11%
to MD 189	1.1	481.0	437.0	-9%
to Montrose	1.2	344.5	358.2	4%
to I-270 mainline	0.9	197.1	208.3	6%
I-270 Local Total (miles/minutes)	6.3	33.4	32.2	-3%

Table C.3: AM Peak -2040 Variable Speed Limit - I-270 Vehicle Speed

I-270 Southbound	Segment Length (miles)	No Build VISSIM Speed (MPH)	VSL VISSIM Speed (MPH)	% Change
From I-70				
to MD 85	1.7	22.9	23.3	2%
to MD 80	5.4	14.0	14.4	3%
to MD 109	3.7	23.0	22.7	-1%
to MD 121	3.6	45.8	42.2	-8%
to MD 27	2.5	33.5	31.5	-6%
to MD 118	1.1	15.2	14.3	-6%
to Middlebrook Rd	1.1	19.4	18.1	-7%
to MD 124	2.2	15.0	14.3	-5%
to MD 117	0.9	17.7	16.3	-8%
to I-370	1.0	37.6	32.3	-14%
to Shady Grove Rd	1.5	43.1	39.6	-8%
to MD 28	1.9	47.6	42.9	-10%
to MD 189	1.0	22.3	25.0	12%
to Montrose Rd	1.0	14.8	17.4	18%
to I-270 Split	1.9	27.5	27.0	-2%
to MD 187	0.4	51.0	45.5	-11%
to I-495 interchange	1.9	50.8	45.1	-11%
I-270 Total (miles/minutes)	32.7	23.0	22.6	-2%
I-270 Spur Southbound				
From I-70				
to I-270 Split	30.3	22.1	21.7	-1%
to Democracy Blvd	0.7	28.8	26.6	-8%
to I-495	1.3	24.7	26.9	9%
to MD 190	1.3	44.4	55.0	24%
to Cabin John Pkwy	0.6	58.5	58.5	0%
I-270 Spur Total (miles/minutes)	34.2	22.9	22.7	-1%

Table C.4: AM Peak -2040 Variable Speed Limit- I-270 Local Vehicle Speed

I-270 Southbound	Segment Length (miles)	No Build VISSIM Speed (MPH)	VSL VISSIM Speed (MPH)	% Change
From C-D start				
to Shady Grove	1.3	9.6	9.6	0%
to MD 28	1.8	13.0	14.5	12%
to MD 189	1.1	8.1	8.9	10%
to Montrose	1.2	12.9	12.4	-4%
to I-270 mainline	0.9	16.1	15.2	-5%
I-270 Local Total (miles/minutes)	6.3	11.3	11.7	4%

Table C.5: AM Peak -2040 Variable Speed Limit- I-270 Vehicle Density

I-270 Southbound	Type	No Build		VSL		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS	
I-270	Freeway	45	F	49	F	8%
I-270 Merge from WB I-70	Merge	62	F	61	F	-1%
I-270	Freeway	67	F	63	F	-6%
I-270 Merge from EB I-70	Merge	57	F	57	F	-1%
I-270	Freeway	67	F	68	F	2%
I-270 Diverge to SB MD 85	Diverge	70	F	73	F	5%
I-270	Freeway	92	F	94	F	2%
I-270 Diverge to NB MD 85	Diverge	56	F	55	F	-2%
I-270	Freeway	119	F	108	F	-9%
I-270 Merge from MD 85	Merge	104	F	88	F	-15%
I-270	Freeway	112	F	111	F	-1%
I-270 Diverge to MD 80	Diverge	61	F	61	F	1%
I-270	Freeway	108	F	108	F	0%
I-270 Merge from MD 80	Merge	111	F	116	F	5%
I-270	Freeway	75	F	76	F	1%
I-270 Diverge to MD 109	Diverge	41	F	41	F	1%
I-270	Freeway	80	F	80	F	-1%
I-270 Merge from MD 109	Merge	87	F	83	F	-5%
I-270	Freeway	44	E	50	F	13%
I-270 Diverge to SB Weigh Station	Diverge	19	B	23	C	22%
I-270	Freeway	38	E	47	F	23%
I-270 Merge from SB Weigh Station	Merge	20	B	23	C	16%
I-270	Freeway	41	E	43	E	6%
I-270 Diverge to MD 121	Diverge	20	B	24	C	20%
I-270	Freeway	28	D	35	E	24%

Table C.5: AM Peak -2040 Variable Speed Limit- I-270 Vehicle Density

I-270 Southbound	Type	No Build		VSL		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS	
I-270 Merge from WB MD 121	Merge	33	D	41	F	25%
I-270	Freeway	43	E	51	F	18%
I-270 Merge from EB MD 121	Merge	37	E	43	E	15%
I-270	Freeway	55	F	57	F	5%
I-270 Diverge to MD 27	Diverge	57	F	58	F	2%
I-270	Freeway	81	F	86	F	6%
I-270 Merge from WB MD 27	Merge	90	F	95	F	6%
I-270	Freeway	82	F	85	F	4%
I-270 Weave from EB MD 27 to MD 118	Weave	81	F	83	F	2%
I-270	Freeway	91	F	94	F	4%
I-270 Merge from WB MD 118	Merge	73	F	76	F	5%
I-270	Freeway	85	F	89	F	4%
I-270 Merge from EB MD 118	Merge	73	F	77	F	5%
I-270	Freeway	70	F	74	F	5%
I-270 Merge from Middlebrook Rd	Merge	113	F	116	F	3%
I-270	Freeway	86	F	91	F	6%

Table C.5: AM Peak -2040 Variable Speed Limit- I-270 Vehicle Density

I-270 Southbound	Type	No Build		VSL		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS	
I-270 Diverge to Watkins Mill Rd	Diverge	81	F	84	F	4%
I-270	Freeway	124	F	121	F	-2%
I-270 Diverge to MD 124	Diverge	89	F	86	F	-3%
I-270	Freeway	133	F	133	F	0%
I-270 Merge from Watkins Mill	Merge	158	F	160	F	1%
I-270	Freeway	99	F	101	F	2%
I-270 Merge from WB MD 124	Merge	132	F	136	F	3%
I-270	Freeway	53	F	59	F	11%
I-270 Merge from MD 117	Merge	49	F	53	F	9%
I-270	Freeway	48	F	50	F	4%
I-270 Diverge to I-370	Diverge	41	F	44	F	5%
I-270	Freeway	49	F	49	F	-1%
I-270 Diverge to I-270 C-D	Diverge	96	F	93	F	-3%
I-270	Freeway	20	C	21	C	9%
I-270 Merge from I-270 (I-370)	Merge	20	C	20	C	0%
I-270 Diverge to I-270 C-D (Shady Grove Rd)	Diverge	27	C	29	D	7%
I-270	Freeway	21	C	23	C	11%
I-270 Merge from I-270 C-D (Shady Grove Rd Northern)	Merge	18	B	20	B	11%
I-270	Freeway	26	C	28	D	9%
I-270 Merge from I-270 C-D (Shady Grove Rd Southern)	Merge	32	D	34	D	7%
I-270 Diverge to I-270 C-D (MD 189)	Diverge	46	F	49	F	6%
I-270	Freeway	82	F	69	F	-16%
I-270 Merge from I-270 C-D (MD 189)	Merge	106	F	93	F	-13%
I-270	Freeway	77	F	75	F	-3%

Table C.5: AM Peak -2040 Variable Speed Limit- I-270 Vehicle Density

I-270 Southbound	Type	No Build		VSL		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS	
I-270 Merge from I-270 C-D	Merge	39	E	42	F	9%
I-270 Diverge to I-270 HOV Lane	Diverge	19	B	22	C	16%
I-270 Diverge to I-270 Spur	Diverge	40	E	44	F	10%
I-270	Freeway	23	C	25	C	10%
I-270 Diverge to Rockledge Dr / MD 187	Diverge	17	B	18	B	6%
I-270	Freeway	23	C	26	C	11%
I-270 Merge from Rockledge Dr	Merge	19	B	21	C	8%
I-270	Freeway	24	C	27	D	10%
I-270 Merge from Rockledge Dr / MD 187	Merge	22	C	24	C	7%
I-270	Freeway	26	C	29	D	11%

Table C.6: AM Peak -2040 Variable Speed Limit- I-270 Spur Vehicle Density

I-270 Southbound	Type	No Build		VSL		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS	
I-270 Spur	Freeway	49	F	54	F	11%
I-270 Spur Weave from I-270 HOV to Democracy Blvd	Weave	60	F	57	F	-6%
I-270 Spur	Freeway	54	F	50	F	-7%
I-270 Merge from Democracy Blvd	Merge	30	D	27	C	-11%
I-270 Spur Lane Drop	Merge	54	F	50	F	-7%
I-270 Spur	Freeway	75	F	68	F	-10%
I-270 Spur Merge from I-495	Merge	37	E	32	D	-14%
I-270 Spur	Freeway	45	F	33	D	-28%
I-270 Spur Diverve to EB MD 190	Diverge	56	F	45	F	-20%
I-270 Spur Diverve to Cabin John Pkwy	Diverge	27	C	28	C	1%
I-270 Spur	Freeway	29	D	29	D	0%
I-270 Merge from MD 190	Merge	26	C	26	C	1%
I-270 Spur	Freeway	34	D	34	D	0%
I-270 Diverge to WB Clara Barton Pkwy	Diverge	23	C	23	C	1%
I-270 Spur	Freeway	33	D	33	D	1%
I-270 Merge from Clara Barton Pkwy	Merge	30	D	30	D	0%

Table C.7: AM Peak -2040 Variable Speed Limit- I-270 Local Vehicle Density

I-270 Souhbound	Type	No Build		VSL		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS	
I-270 C-D	Freeway	107	F	108	F	0%
I-270 C-D Weave from I-370 EB to I-270	Weave	128	F	126	F	-2%
I-270 C-D Diverge to Shady Grove Rd	Diverge	115	F	112	F	-2%
I-270 C-D	Freeway	137	F	133	F	-2%
I-270 C-D Merge from WB Shady Grove Rd	Merge	106	F	103	F	-3%
I-270 C-D	Freeway	113	F	110	F	-3%
I-270 C-D Merge from EB Shady Grove Rd	Merge	77	F	75	F	-3%
I-270 C-D	Freeway	93	F	91	F	-2%
I-270 C-D Merge from I-270	Merge	98	F	96	F	-2%
I-270 C-D Diverge to I-270	Diverge	56	F	55	F	-3%
I-270 C-D Diverge to I-270	Diverge	64	F	50	F	-22%
I-270 C-D	Freeway	75	F	51	F	-32%
I-270 C-D Diverge to MD 28	Diverge	62	F	42	F	-33%
I-270 C-D	Freeway	128	F	92	F	-28%
I-270 C-D Merge from WB MD 28	Merge	160	F	148	F	-7%
I-270 C-D	Freeway	132	F	128	F	-3%
I-270 C-D Merge from EB MD 28	Merge	152	F	153	F	0%
I-270 C-D	Freeway	123	F	122	F	-1%
I-270 C-D Merge from I-270	Merge	124	F	125	F	1%
I-270 C-D	Freeway	95	F	97	F	2%
I-270 C-D Diverge to MD 189	Diverge	60	F	61	F	1%
I-270 C-D	Freeway	117	F	120	F	3%
I-270 C-D Merge from MD 189	Merge	120	F	121	F	0%
I-270 C-D Diverge to I-270	Diverge	84	F	87	F	3%
I-270 C-D	Freeway	92	F	92	F	1%
I-270 C-D Diverge to WB Montrose Rd	Diverge	55	F	57	F	4%

Table C.7: AM Peak -2040 Variable Speed Limit- I-270 Local Vehicle Density

I-270 Souhbound	Type	No Build		VSL		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS	
I-270 C-D	Freeway	98	F	102	F	4%
I-270 Weave between Montrose Rd Loops	Weave	94	F	97	F	3%
I-270 C-D	Freeway	76	F	81	F	7%
I-270 C-D Merge from EB Montrose Rd	Merge	56	F	61	F	9%
I-270 C-D	Freeway	54	F	59	F	9%

Table C.8: AM Peak -2040 Variable Speed Limit- I-270 Vehicle Throughput

I-270 Southbound	No-Build VISSIM Throughput	VSL Alternative VISSIM Throughput	% Change
North of I-70	2514	2559	2%
Between I-70 on ramps	2842	2904	2%
From I-70 interchange to MD-85	4882	4949	1%
Between MD-85 on and off ramps	2530	2564	1%
Between MD-85 and MD-80	3043	2997	-2%
Between MD-80 on and off ramps	2724	2722	0%
Between MD-80 and Md-109	3532	3549	0%
Between MD-109 on and off ramps	3430	3448	1%
Between MD-109 and MD-121	4100	4097	0%
Between MD-121 on and off ramps	3551	3480	-2%
Between MD-121 and MD-27	4802	4711	-2%
Between MD-27 on and off ramps	4223	4097	-3%
Between MD-27 and MD-118	4688	4556	-3%
Between MD-118 on and off ramps	4542	4400	-3%
Between MD-118 and Middlebrook Rd	5199	5045	-3%
Between Middlebrook Rd on and off ramps	5197	5015	-4%
Between Middlebrook Rd and MD-124	6832	6566	-4%
Between MD-124 on and off ramps	5415	5310	-2%
Between MD-124 and MD-117	6469	6254	-3%
Between MD-117 and I-370	8146	7910	-3%
Between I-370 on and off ramps	2997	2946	-2%
Between I-370 on ramp to Shady Grove Rd	3871	3846	-1%
Between Shady Grove Rd and MD 28	3552	3493	-2%
Between MD 28 on and off ramps	4372	4341	-1%
Between MD 28 and MD 189	3946	3925	-1%
Between MD 189 and Montrose Rd	4070	3976	-2%
Between Montrose Rd on and off ramps	5046	4958	-2%
Between Montose Rd and I-270 Spur	8064	7942	-2%
Between I-270 Spur and Rockledge Blvd	3823	3740	-2%
Between Rockledge Blvd on and off ramps	2733	2658	-3%
Between MD 187 on and off ramps	2887	2808	-3%
Between MD 187 and I-495	2902	2930	1%
I-270 Spur Southbound			
Between I-270 Split and HOV on ramp	4251	4205	-1%
Between HOV on ramp and Democracy Blvd	4186	4170	0%
Between Democracy Blvd on and off ramps	3670	3659	0%
Between Democracy Blvd and I-495	4194	4201	0%

Table C.9: AM Peak -2040 Variable Speed Limit- I-270 Local Vehicle Throughput

I-270 Local Southbound	No-Build VISSIM Throughput	VSL Alternative VISSIM Throughput	% Change
Between I-370 on ramp and I-270 off ramp	3627	3729	3%
Between I-270 off ramp and Shady Grove off ramp	2767	2838	3%
Between Shady Grove off ramp and Shady Grove WB on ramp	1593	1637	3%
Between Shady Grove WB and EB on ramps	2225	2279	2%
Between Shady Grove on ramp and I-270 on ramp	2594	2670	3%
Between I-270 on ramp and I-270 off ramp1	3272	3332	2%
Between I-270 off ramp1 and I-270 off ramp2	2767	2792	1%
Between I-270 off ramp2 and MD 28 off ramp	1961	1958	0%
Between MD 28 off ramp and MD 28 WB on ramp	1428	1421	0%
Between MD 28 WB on ramp and MD 28 EB on ramp	1700	1718	1%
Between MD 28 EB on ramp and I-270 on ramp	2375	2388	1%
Between I-270 on ramp and MD 189 off ramp	2871	2855	-1%
Between MD 189 on and off ramps	2353	2316	-2%
Between MD 189 on ramp and I-270 off ramp	3387	3370	-1%
Between I-270 off ramp and Montrose Rd off ramp	2357	2334	-1%
Between Montrose Rd off ramp and Montrose Rd WB on ramp	2251	2224	-1%
Between Montrose Rd WB on ramp and EB off ramp	2992	2990	0%
Between Montrose Rd EB off and on ramps	2336	2345	0%
Between Montrose Rd EB off ramp and I-270	3139	3124	0%

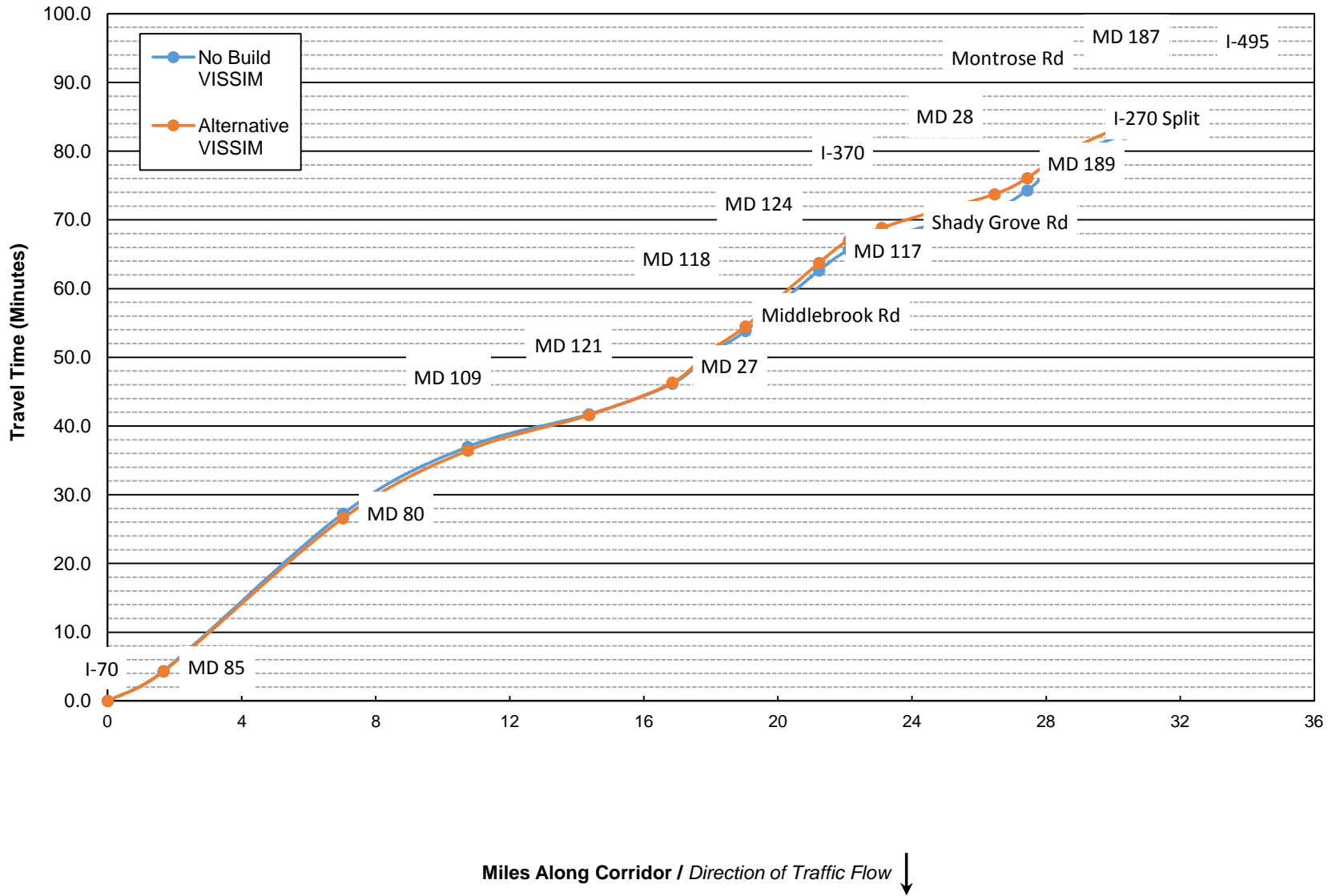
Table C.12: AM Peak -2040 Variable Speed Limit- I-270 On Ramp Queue Length - Southbound

I-270 Southbound	No Build VISSIM Average Queue (feet)	VSL VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	VSL VISSIM Maximum Queue (feet)	% Change
MD 85 on ramp	41	9	-78%	528	322	-39%
MD 80 on ramp	1039	1509	45%	2688	3057	14%
MD 109 on ramp	995	458	-54%	1914	2120	11%
MD 121 WB on ramp	135	127	-5%	972	2074	113%
MD 121 EB on ramp	0	2	-	0	137	-
MD 27 WB on ramp	552	605	10%	2591	2912	12%
MD 27 EB on ramp	3	9	244%	173	346	100%
MD 118 WB on ramp	0	0	-	0	0	-
MD 118 EB on ramp	0	2	658%	44	95	115%
Middlebrook Rd on ramp	2842	2751	-3%	4433	4399	-1%
Watkins Mill Rd on ramp	3066	3073	0%	3136	3134	0%
MD 124 WB on ramp	2789	2995	7%	4158	4167	0%
MD 117 on ramp	293	1338	357%	1898	2244	18%
I-370 C-D on ramp	0	0	-	0	0	-
Shady Grove Rd C-D on ramp North	0	0	-	0	0	-
Shady Grove Rd C-D on ramp South	2	0	-100%	127	0	-100%
MD 189 C-D on ramp	1787	2791	56%	3610	4087	13%
Montrose Rd C-D on ramp	2	0	-98%	227	53	-77%
Rockledge Dr on ramp	0	0	-	0	0	-
MD 187 on ramp	0	0	-	0	0	-
I-270 Spur Southbound	No Build VISSIM Average Queue (feet)	VSL VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	VSL VISSIM Maximum Queue (feet)	% Change
Democracy Blvd on ramp	0	0	-	0	0	-
I-495 Southbound	No Build VISSIM Average Queue (feet)	VSL VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	VSL VISSIM Maximum Queue (feet)	% Change
I-270 Spur on ramp	147	0	-100%	1557	0	-100%
MD 190 on ramp	0	0	-	0	0	-
I-270 C-D Southbound	No Build VISSIM Average Queue (feet)	VSL VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	VSL VISSIM Maximum Queue (feet)	% Change
I-270 on ramp	2947	2877	-2%	4900	4657	-5%
I-370 on ramp	2511	2565	2%	2932	2938	0%
Shady Grove Rd WB on ramp	28	45	62%	597	757	27%
Shady Grove Rd EB on ramp	0	0	-100%	37	5	-87%
I-270 on ramp	0	0	-100%	42	0	-100%
MD 28 WB on ramp	1406	1037	-26%	2299	2178	-5%
MD 28 EB on ramp	3724	3701	-1%	3882	3882	0%
I-270 on ramp	1	1	128%	74	115	54%
MD 189 on ramp	3725	3171	-15%	4200	4342	3%
Montrose Rd WB on ramp	68	41	-39%	926	684	-26%
Montrose Rd EB on ramp	0	9	2860%	69	391	464%

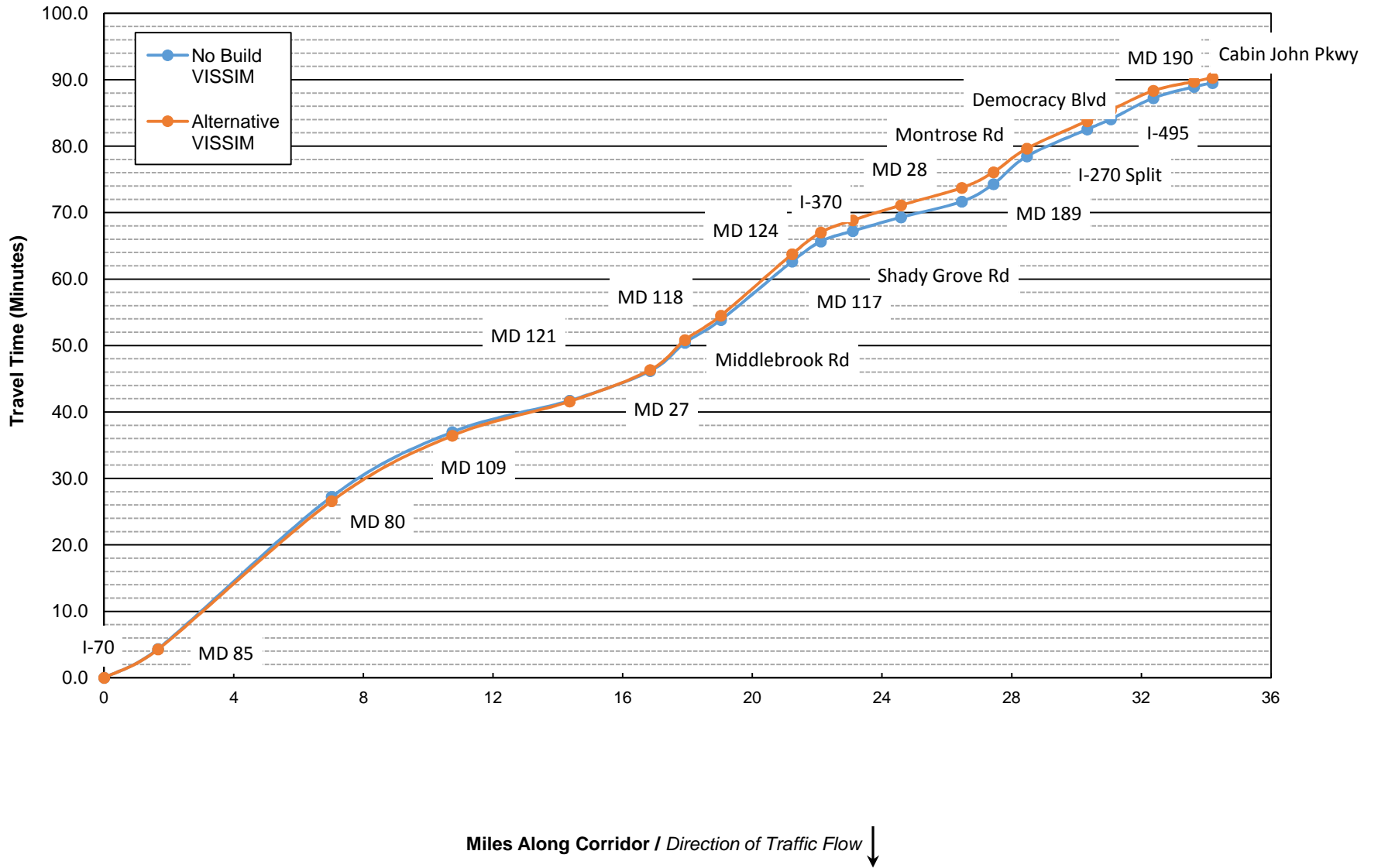
Table C.13: AM Peak -2040 Variable Speed Limit - I-270 Off Ramp Queue Length - Southbound

I-270 Southbound	No Build VISSIM Average Queue (feet)	VSL VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	VSL VISSIM Maximum Queue (feet)	% Change
MD 85 SB off ramp	297	5	-98%	1410	366	-74%
MD 85 NB off ramp	0	0	-19%	43	49	13%
MD 80 off ramp	1	11	1091%	99	214	116%
MD 109 off ramp WB	0	0	-96%	25	6	-75%
MD 109 off ramp EB	0	0	-	0	0	-
MD 121 off ramp EB	219	223	2%	946	1070	13%
MD 121 off ramp WB	10	21	110%	519	552	7%
MD 27 off ramp EB	50	53	6%	262	243	-7%
MD 27 off ramp WB	881	86	-90%	3309	956	-71%
MD 118 off ramp EB	31	32	4%	160	146	-9%
MD 118 off ramp WB	0	0	-	0	0	-
Watkins Mill Rd off ramp	2034	2771	36%	5055	5048	0%
MD 124 off ramp EB	70	60	-15%	368	313	-15%
MD 124 off ramp WB	19	10	-48%	419	347	-17%
I-370 off ramp WB	0	0	-	0	0	-
I-370 off ramp EB	0	0	-	0	0	-
Shady Grove Rd off ramp - Omega Drive	4	5	17%	172	212	24%
Shady Grove Rd off ramp	0	0	-	0	0	-
MD 28 off ramp	4	3	-17%	154	162	5%
MD 189 off ramp EB	35	36	3%	238	260	9%
MD 189 off ramp WB	0	0	-	0	0	-
Montrose Rd off ramp WB	0	0	-	0	0	-
Montrose Rd off ramp EB	382	434	14%	1566	2022	29%
Rockledge Dr off ramp	27	24	-13%	343	245	-29%
I-270 Spur Southbound	No Build VISSIM Average Queue (feet)	VSL VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	VSL VISSIM Maximum Queue (feet)	% Change
Democracy Blvd off ramp EB	50	52	4%	219	239	9%
Democracy Blvd off ramp WB	0	0	-	0	0	-
MD 190 off ramp WB	1389	719	-48%	3571	2839	-20%
MD 190 off ramp EB	0	0	-	0	0	-
Clara Barton Pkwy WB off ramp	0	0	-100%	5	0	-100%

**Figure C.2: AM Peak - 2040 Variable Speed Limit
I-270 Travel Time Graph - Southbound**



**Figure C.4: AM Peak - 2040 Variable Speed Limit
I-270 Spur Travel Time Graph - Southbound**



**Figure C.6: AM Peak - 2040 Variable Speed Limit
I-270 Local Travel Time Graph - Southbound**

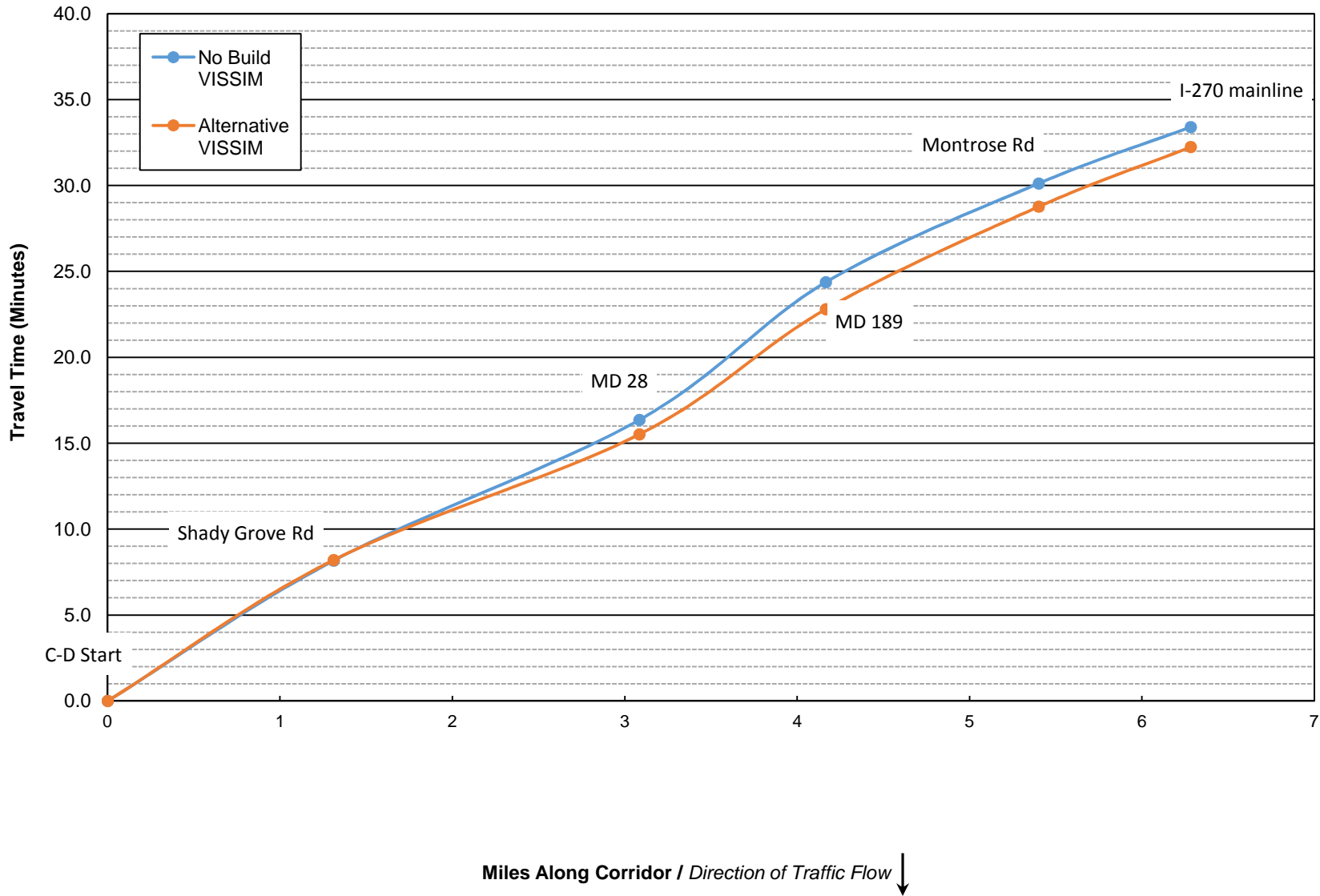


Table C.14: AM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
1- MD 85 at Sam's Club Drive											
1	NB	23.0	C	NB Left	119	77	82	496	E	38.6	D
				NB Through	365	28	82	496	C		
				NB Right	664	11	22	438	B		
	SB	50.1	D	SB Left	137	63	174	771	E		
				SB Through	599	50	174	771	D		
				SB Right	68	26	174	771	C		
	EB	50.9	D	EB Left	105	78	56	182	E		
				EB Through	62	81	56	182	F		
				EB Right	113	9	56	182	A		
	WB	52.7	D	WB Left	230	77	90	355	E		
				WB Through	15	67	90	355	E		
				WB Right	126	7	90	355	A		
2- MD 85 at I-270 NB on and off ramp											
2	NB	52.1	D	NB Left	683	52	265	1136	D	36.3	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	18.8	B	SB Left	0	0	0	0	A		
				SB Through	611	19	56	562	B		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
3- MD 85 at I-270 SB on and off ramp											
3	NB	5.3	A	NB Left	0	0	0	0	A	10.2	B
				NB Through	1071	5	19	413	A		
				NB Right	0	0	0	0	A		
	SB	40.9	D	SB Left	172	41	43	440	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
4- MD 85 at Crestwood Blvd											
4	NB	19.4	C	NB Left	13	71	54	382	E	25.0	C
				NB Through	762	19	54	382	B		
				NB U-Turn	0	0	0	0	A		
	SB	18.8	B	SB Left	64	69	25	156	E		
				SB Through	1783	18	80	627	B		
				SB Right	808	16	68	617	B		
	EB	52.7	D	EB Left	621	54	91	276	D		
				EB Through	28	68	91	276	E		
				EB Right	42	17	91	276	B		
	WB	44.1	D	WB Left	52	53	21	137	D		
				WB Through	18	56	21	137	E		
				WB Right	19	9	21	137	A		
5- MD 80 at I-270 NB on and ramp											
5	NB	-1.0	A	NB Left	3	1	0	4	A	21.2	C
				NB Through	1	1	0	4	A		
				NB Right	5	-3	0	4	A		
	SB	13.0	B	SB Left	204	16	14	108	B		
				SB Through	6	20	14	108	B		
				SB Right	59	2	0	0	A		
			EB Left	54	12	11	183	B			

Table C.14: AM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
	EB	11.3	B	EB Through	0	0	8	0	A		
				EB Right	5	5	19	213	A		
	WB	23.1	C	WB Left	35	24	1	56	C		
				WB Through	879	31	182	786	C		
				WB Right	639	12	11	442	B		
6- MD 80 at I-270 SB on and off ramp											
6	NB	6.2	A	NB Left	24	37	2	134	E	31.6	D
				NB Through	0	0	0	0	A		
				NB Right	258	3	2	134	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	36.7	E	EB Left	0	0	0	0	A		
				EB Through	360	36	67	436	E		
				EB Right	161	38	68	446	E		
	WB	47.8	E	WB Left	0	0	0	0	A		
				WB Through	278	48	157	758	E		
WB Right				0	0	0	0	A			
7- MD 109 at I-270 NB on and off ramp											
7	NB			NB Left	0	0	0	0	A	29.9	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	33.1	D	SB Left	143	37	37	244	E		
				SB Through	0	0	0	0	A		
				SB Right	47	20	17	177	C		
	EB	15.7	C	EB Left	88	11	5	149	B		
				EB Through	0	0	0	0	A		
				EB Right	63	22	0	0	C		
	WB	32.2	D	WB Left	0	0	0	0	A		
				WB Through	671	32	399	555	D		
WB Right				0	0	0	0	A			
8- MD 80 at I-270 SB on and off ramp											
8	NB	9.3	A	NB Left	17	36	4	78	E	33.7	D
				NB Through	0	0	0	0	A		
				NB Right	48	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	50.0	E	EB Left	0	0	0	0	A		
				EB Through	92	34	58	270	D		
				EB Right	102	64	60	268	F		
	WB	31.6	D	WB Left	570	29	158	594	D		
				WB Through	156	39	152	571	E		
WB Right				0	0	0	0	A			
9- MD 121 at Gateway Center Dr											
9	NB	17.8	C	NB Left	154	27	43	285	C	51.2	D
				NB Through	434	22	43	285	C		
				NB Right	327	8	52	311	A		
	SB	32.3	D	SB Left	55	22	113	555	C		
				SB Through	792	33	123	555	C		
				SB Right	8	26	131	576	C		
	EB	120.4	F	EB Left	8	97	421	525	F		
				EB Through	99	125	422	525	F		
				EB Right	646	120	452	557	F		
	WB	21.8	C	WB Left	137	25	18	147	C		
				WB Through	17	22	18	147	C		
WB Right				28	6	16	171	A			
10- MD 121 at I-270 NB on and off ramp											
	NB	28.3	D	NB Left	324	59	67	255	F		
				NB Through	0	0	0	0	A		

Table C.14: AM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
10	SB			NB Right	402	3	0	0	A	19.0	B
				SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	11.5	B	EB Left	0	0	0	0	A		
				EB Through	513	18	32	325	C		
				EB Right	285	1	0	0	A		
	WB	18.6	C	WB Left	233	63	145	805	F		
				WB Through	1337	11	145	805	B		
				WB Right	0	0	0	0	A		

Table C.14: AM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
11- MD 121 at I-270 SB on and off ramp											
11	NB			NB Left	0	0	0	0	A	18.3	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	62.8	E	SB Left	218	94	225	953	F		
				SB Through	0	0	0	0	A		
				SB Right	304	40	8	439	E		
	EB	5.2	A	EB Left	0	0	0	0	A		
				EB Through	578	5	12	206	A		
				EB Right	0	0	0	0	A		
	WB	8.8	A	WB Left	0	0	0	0	A		
				WB Through	642	18	61	438	C		
				WB Right	1010	3	30	185	A		
12- MD 27 at Observation Dr											
12	NB	48.1	D	NB U-Turn	0	0	0	0	A	37.1	D
				NB Through	48	58	14	72	E		
				NB Right	12	7	14	72	A		
	SB	44.0	D	SB Left	91	52	29	192	D		
				SB Through	54	52	39	261	D		
				SB Right	178	38	64	298	D		
	EB	16.9	B	EB Left	151	40	40	324	D		
				EB Through	1217	14	42	325	B		
				EB Right	48	10	49	363	B		
	WB	48.1	D	WB Left	100	32	333	847	C		
				WB Through	2130	50	333	847	D		
				WB Right	109	30	333	847	C		
13- MD 27 at I-270 NB off ramp											
13	NB	35.6	D	NB Left	106	36	15	88	D	52.4	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.1	A	EB Left	0	0	0	0	A		
				EB Through	973	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	76.7	E	WB Left	0	0	0	0	A		
				WB Through	2166	77	1092	2164	E		
				WB Right	0	0	0	0	A		
14- MD 27 at I-270 SB off ramp											
14	NB			NB Left	0	0	0	0	A	70.6	E
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	49.4	D	SB Left	384	49	61	275	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	2.6	A	EB Left	0	0	0	0	A		
				EB Through	840	3	2	62	A		
				EB Right	0	0	0	0	A		
	WB	118.3	F	WB Left	0	0	0	0	A		
				WB Through	1365	118	1106	1497	F		
				WB Right	0	0	0	0	A		
15- MD 27 at Crystal Rock Dr											
15	NB	64.8	E	NB Left	30	38	296	736	D	92.0	F
				NB Through	1051	65	316	736	E		
				NB Right	92	70	327	748	E		
	SB	119.1	F	SB Left	514	118	1842	3792	F		
				SB Through	1620	121	1842	3792	F		
				SB Right	51	81	1836	3787	F		
				EB Left	224	50	59	199	D		

Table C.14: AM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
	EB	44.2	D	EB Through	97	43	55	194	D		
				EB Right	75	29	60	228	C		
	WB	46.8	D	WB Left	11	56	32	103	E		
				WB Through	32	224	32	103	F		
				WB Right	142	6	32	103	A		
16- MD 118 at Seneca Meadows Pkwy											
16	NB	3.6	A	NB Left	109	11	1	72	B	6.1	A
				NB Through	725	3	4	134	A		
				NB Right	60	1	9	187	A		
	SB	4.0	A	SB Left	31	4	7	238	A		
				SB Through	948	4	10	238	A		
				SB Right	41	2	12	271	A		
	EB	18.4	B	EB Left	20	65	10	77	E		
				EB Through	6	82	10	77	F		
				EB Right	115	7	10	77	A		
	WB	44.2	D	WB Left	35	71	16	102	E		
				WB Through	6	55	11	101	D		
				WB Right	27	7	14	111	A		
17- MD 118 at I-270 NB on ramp											
17	NB			NB Left	0	0	0	0	A	10.2	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	29.6	C	EB Left	274	30	31	194	C		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	5.4	A	WB Left	0	0	0	0	A		
				WB Through	188	1	0	0	A		
				WB Right	911	6	15	309	A		
18- MD 118 at I-270 SB off ramp											
18	NB			NB Left	0	0	0	0	A	7.5	A
				NB Through	0	0.0	0	0	A		
				NB Right	0	0.0	0	0	A		
	SB	38.1	D	SB Left	215	38.1	34	163	D		
				SB Through	0	0.0	0	0	A		
				SB Right	0	0.0	0	0	A		
	EB	3.7	A	EB Left	0	0.0	0	0	A		
				EB Through	631	3.7	5	194	A		
				EB Right	0	0.0	0	0	A		
	WB	4.1	A	WB Left	0	0.0	0	0	A		
				WB Through	1214	4.1	9	173	A		
				WB Right	0	0.0	0	0	A		
19- MD 118 at Aircraft Dr											
19	NB	46.2	D	NB Left	9	78	9	75	E	20.6	C
				NB Through	13	80	9	75	F		
				NB Right	17	3	0	24	A		
	SB	60.5	E	SB Left	267	55	112	418	E		
				SB Through	53	72	112	418	E		
				SB Right	96	68	112	418	E		
	EB	12.4	B	EB Left	132	16	37	329	B		
				EB Through	1019	12	37	329	B		
				EB Right	34	12	37	329	B		
	WB	15.1	B	WB Left	83	23	47	310	C		
				WB Through	1046	17	47	310	B		
				WB Right	324	6	47	310	A		
20- Middlebrook Rd at Observation Dr											
	NB			NB Left	0	0	0	0	A		
				NB Through	0	0	0	0	A		

Table C.14: AM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
20	SB	20.4	C	NB Right	0	0	0	0	A	16.4	B
				SB Left	26	36	5	63	D		
				SB Through	0	0	0	0	A		
				SB Right	27	5	5	63	A		
	EB	14.1	B	EB Left	231	21	29	249	C		
				EB Through	825	12	29	249	B		
				EB Right	0	0	0	0	A		
	WB	18.0	B	WB Left	0	0	0	0	A		
				WB Through	1141	19	72	392	B		
				WB Right	275	15	97	441	B		

Table C.14: AM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
21- Middlebrook Rd at I-270 SB on ramp											
21	NB			NB Left	0	0	0	0	A	19.5	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	13.7	B	EB Left	0	0	0	0	A		
				EB Through	763	14	31	203	B		
				EB Right	0	0	0	0	A		
	WB	25.4	C	WB Left	761	25	104	893	C		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
22- Middlebrook Rd at Waring Station Rd											
22	NB	179.6	F	NB Left	145	136	348	485	F	70.4	E
				NB Through	6	133	348	485	F		
				NB Right	268	204	348	485	F		
	SB	17.6	B	SB Left	3	39	1	29	D		
				SB Through	0	0	1	29	A		
				SB Right	5	5	2	67	A		
	EB	69.3	E	EB Left	31	21	645	1297	C		
				EB Through	1448	71	645	1297	E		
				EB Right	80	62	645	1297	E		
	WB	18.4	B	WB Left	80	23	33	237	C		
				WB Through	719	19	33	237	B		
				WB Right	41	4	33	237	A		
23- MD 124 at MD 355											
23	NB	52.9	D	NB Left	228	73	86	264	E	96.2	F
				NB Through	390	48	84	262	D		
				NB Right	54	3	0	0	A		
	SB	104.2	F	SB Left	64	166	490	804	F		
				SB Through	1188	124	490	804	F		
				SB Right	559	54	284	780	D		
	EB	54.5	D	EB Left	610	130	444	1095	F		
				EB Through	494	17	444	1095	B		
				EB Right	555	5	236	1008	A		
	WB	143.6	F	WB Left	0	0	0	0	A		
				WB Through	1717	146	760	1115	F		
				WB Right	52	73	0	0	E		
24- MD 124 at I-270 SB on and off											
24	NB	65.3	F	NB Left	16	62	18	95	E	29.3	C
				NB Through	37	67	18	95	E		
				NB U-Turn	0	0	0	0	A		
	SB	26.0	C	SB Left	285	65	77	373	E		
				SB Through	11	65	77	373	E		
				SB Right	588	6	14	350	A		
	EB	17.0	B	EB Left	0	0	0	0	A		
				EB Through	1037	17	50	409	B		
				EB Right	67	14	60	433	B		
	WB	41.6	D	WB Left	43	47	1679	2437	D		
				WB Through	1136	41	1679	2437	D		
				WB Right	0	0	0	0	A		
25- MD 117 at MD 124											
25	NB	49.7	D	NB Left	20	108	157	726	F	48.5	D
				NB Through	541	64	157	726	E		
				NB Right	433	30	76	717	C		
	SB	47.0	D	SB Left	181	69	221	826	E		
				SB Through	1072	48	221	826	D		
				SB Right	131	9	0	0	A		
EB Left	102	119	217	782	F						

Table C.14: AM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
	EB	54.0	D	EB Through	1470	50	217	783	D		
				EB Right	82	47	229	811	D		
				WB Left	319	70	103	304	E		
	WB	39.4	D	WB Through	478	27	103	304	C		
				WB Right	99	0	0	0	A		
26- MD 117 at Bureau Dr											
26	NB	50.3	D	NB Left	25	64	19	125	E	41.1	D
				NB Through	24	65	19	125	E		
				NB Right	26	23	19	125	C		
	SB	174.5	F	SB Left	197	177	223	397	F		
				SB Through	55	190	223	397	F		
				SB Right	32	130	223	397	F		
	EB	36.8	D	EB Left	33	26	272	958	C		
				EB Through	2020	37	278	958	D		
				EB Right	29	43	271	948	D		
	WB	20.8	C	WB Left	299	67	134	543	E		
				WB Through	840	10	134	544	A		
WB Right				314	6	100	582	A			
27- MD 117 at I-270 SB off ramp											
27	NB			NB Left	0	0	0	0	A	9.3	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	2.0	A	EB Left	0	0	0	0	A		
				EB Through	835	2	1	180	A		
				EB Right	0	0	0	0	A		
	WB	28.1	D	WB Left	328	28	59	453	D		
				WB Through	0	0	0	0	A		
WB Right				0	0	0	0	A			
28- MD 117 at I-270 NB off ramp											
28	NB			NB Left	0	0	0	0	A	34.5	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	60.5	E	SB Left	287	63	325	1037	E		
				SB Through	0	0	0	0	A		
				SB Right	871	60	329	1039	E		
	EB	19.2	B	EB Left	14	123	74	848	F		
				EB Through	821	17	74	848	B		
				EB Right	0	0	0	0	A		
	WB	15.6	B	WB Left	0	0	0	0	A		
				WB Through	909	16	60	360	B		
WB Right				9	8	66	390	A			
29- MD 117 at Perry Pkwy											
29	NB	44.5	D	NB Left	36	76	17	120	E	15.9	B
				NB Through	7	58	17	119	E		
				NB Right	38	12	27	140	B		
	SB	48.7	D	SB Left	112	96	60	247	F		
				SB Through	14	102	60	247	F		
				SB Right	133	3	60	247	A		
	EB	10.6	B	EB Left	119	70	44	269	E		
				EB Through	975	3	44	269	A		
				EB Right	10	1	31	254	A		
	WB	10.4	B	WB Left	8	89	21	297	F		
				WB Through	747	10	21	297	B		
WB Right				136	6	21	297	A			
30- Shady Grove Rd at I-270 NB off ramp											
	NB	9.8	A	NB Left	0	0	0	0	A		
				NB Through	959	10	22	267	A		

Table C.14: AM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS			
30	SB	10.4	B	NB Right	0	0	0	0	A	22.3	C			
				SB Left	0	0	0	0	A					
				SB Through	1349	10	34	334	B					
	EB				SB Right	0	0	0	0			A		
					EB Left	0	0	0	0			A		
					EB Through	0	0	0	0			A		
	WB	55.7		E	EB Right	0	0	0	0			A		
					WB Left	846	56	160	616			E		
					WB Through	0	0	0	0			A		
					WB Right	0	0	0	0			A		

Table C.14: AM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
31- Shady Grove Rd at I-270 SB off ramp											
31	NB	12.7	B	NB Left	0	0	0	0	A	19.9	B
				NB Through	1004	13	37	399	B		
				NB Right	0	0	0	0	A		
	SB	9.3	A	SB Left	0	0	0	0	A		
				SB Through	1565	9	32	563	A		
				SB Right	0	0	0	0	A		
	EB	47.4	D	EB Left	286	41	42	360	D		
				EB Through	0	0	0	0	A		
				EB Right	576	51	98	441	D		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
32- MD 28 at I-270 SB off ramp											
32	NB			NB U-Turn	0	0	0	0	A	67.9	E
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	35.7	D	SB Left	426	44	68	327	D		
				SB Through	0	0	0	0	A		
				SB Right	103	3	0	36	A		
	EB	131.7	F	EB Left	0	0	0	0	A		
				EB Through	683	200	1979	2136	F		
				EB Right	409	18	1925	2144	B		
	WB	25.4	C	WB Left	0	0	0	0	A		
				WB Through	1235	25	23	384	C		
				WB Right	0	0	0	0	A		
33- MD 28 at I-270 on and off ramps											
33	NB	36.5	D	NB Left	0	0	32	238	A	36.3	D
				NB Through	128	53	38	247	D		
				NB Right	80	10	38	247	A		
	SB	84.5	F	SB Left	26	102	128	357	F		
				SB Through	0	0	0	0	A		
				SB Right	273	83	128	357	F		
	EB	21.4	C	EB Left	177	45	57	407	D		
				EB Through	599	15	57	407	B		
				EB Right	0	0	0	0	A		
	WB	33.3	C	WB Left	26	37	101	391	D		
				WB Through	944	33	83	354	C		
				WB Right	0	0	0	0	A		
34- MD 189 at Great Falls Rd											
34	NB	37.3	D	NB Left	63	42	17	117	D	23.3	C
				NB Through	8	40	14	117	D		
				NB Right	10	8	16	128	A		
	SB	17.3	B	SB Left	63	45	19	229	D		
				SB Through	6	45	19	229	D		
				SB Right	478	13	54	147	B		
	EB	24.6	C	EB Left	227	55	111	1165	E		
				EB Through	680	15	17	199	B		
				EB Right	10	10	26	236	A		
	WB	26.4	C	WB Left	4	26	64	389	C		
				WB Through	311	27	63	388	C		
				WB Right	11	13	77	422	B		
35- MD 189 at I-270 Ramps											
35	NB	60.5	E	NB Left	88	61	18	121	E	79.7	E
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	55.9	E	SB Left	150	56	48	258	E		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
				EB Left	284	138	627	1494	F		

Table C.14: AM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
	EB	106.2	F	EB Through	436	85	627	1494	F		
				EB Right	0	0	0	0	A		
	WB	60.0	E	WB Left	457	53	107	429	D		
				WB Through	244	73	107	429	E		
				WB Right	0	0	0	0	A		
36- MD 189 at Wooton Pkwy											
36	NB	71.9	E	NB Left	161	48	85	311	D	117.9	F
				NB Through	125	95	85	311	F		
				NB Right	155	78	85	311	E		
	SB	142.8	F	SB Left	325	210	509	805	F		
				SB Through	593	106	482	792	F		
				SB Right	0	0	0	0	A		
	EB	162.3	F	EB Left	137	157	650	1047	F		
				EB Through	803	170	650	1047	F		
				EB Right	101	106	650	1047	F		
	WB	49.3	D	WB Left	346	69	104	353	E		
				WB Through	318	34	104	353	C		
				WB Right	47	6	104	353	A		
37- Montrose Rd at Tower Oaks Blvd											
37	NB			NB Left	0	0	0	0	A	104.5	F
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	235.8	F	SB Left	123	49	1098	1406	D		
				SB Through	0	0	0	0	A		
				SB Right	435	289	1123	1402	F		
	EB	25.5	C	EB Left	28	65	136	923	E		
				EB Through	1513	25	136	923	C		
				EB Right	0	0	0	0	A		
	WB	141.4	F	WB Left	0	0	0	0	A		
				WB Through	1255	145	491	850	F		
				WB Right	58	60	491	850	E		
38- Tower Oaks Blvd at I-270 off ramp											
38	NB	24.1	C	NB Left	385	22	30	200	C	78.2	E
				NB Through	8	22.5	25	192	C		
				NB Right	22	64.1	30	200	E		
	SB	0.6	A	SB Left	0	800.1	0	20	F		
				SB Through	0	0.0	0	20	A		
				SB Right	4	0.6	0	0	A		
	EB	122.8	F	EB Left	6	113.7	347	465	F		
				EB Through	558	122.3	347	465	F		
				EB Right	82	126.7	338	456	F		
	WB	9.5	A	WB Left	0	0.0	3	80	A		
				WB Through	81	9.9	3	80	A		
				WB Right	6	5.0	0	25	A		
39- Montrose Rd at Tower Oaks Blvd											
39	NB	17.9	B	NB Left	37	71	49	285	E	50.9	D
				NB Through	240	42	49	285	D		
				NB Right	555	4	12	151	A		
	SB	41.1	D	SB Left	334	54	163	619	D		
				SB Through	778	37	163	618	D		
				SB Right	78	29	124	658	C		
	EB	90.2	F	EB Left	76	74	416	718	E		
				EB Through	971	92	418	718	F		
				EB Right	62	89	439	742	F		
	WB	43.4	D	WB Left	300	52	68	290	D		
				WB Through	188	50	68	290	D		
				WB Right	109	7	77	321	A		
40- Rockledge Blvd at I-270 NB on and off ramp											
	NB	34.1	C	NB Left	0	0	0	0	A		
				NB Through	92	32	33	165	C		

Table C.14: AM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
40	SB	2.0	A	NB Right	216	35	33	165	C	18.0	B
				SB Left	0	0	4	61	A		
				SB Through	923	2	4	61	A		
				SB Right	0	0	0	0	A		
	EB	26.9	C	EB Left	7	48	126	506	D		
				EB Through	529	54	126	506	D		
				EB Right	563	1	0	0	A		
				WB Left	0	0	0	0	A		
	WB			WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table C.14: AM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
41- Rockledge Blvd at I-270 SB on and off ramps											
41	NB	2.6	A	NB Left	97	3	5	72	A	20.4	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	21.7	C	WB Left	923	23	92	655	C		
				WB Through	403	20	92	655	B		
				WB Right	0	0	0	0	A		
42- MD 187 at Tuckerman Ln											
42	NB	58.8	E	NB Left	230	25	265	793	C	153.0	F
				NB Through	1468	55	265	793	D		
				NB Right	213	124	265	793	F		
	SB	224.9	F	SB Left	60	164	2605	2704	F		
				SB Through	1204	225	2605	2704	F		
				SB Right	162	247	2605	2704	F		
	EB	186.0	F	EB Left	223	128	1864	1988	F		
				EB Through	624	205	1865	1989	F		
				EB Right	129	194	1889	2013	F		
	WB	188.4	F	WB Left	721	229	1921	2147	F		
				WB Through	393	152	1921	2147	F		
				WB Right	159	92	1921	2147	F		
43- MD 187 at I-270 NB on and off ramps											
43	NB	11.2	B	NB Left	163	76	57	257	E	19.1	B
				NB Through	1541	4	57	257	A		
				NB Right	0	0	0	0	A		
	SB	25.4	C	SB Left	0	0	0	0	A		
				SB Through	1529	25	81	553	C		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	49.5	D	WB Left	114	50	35	250	D		
				WB Through	10	47	35	250	D		
				WB Right	0	0	0	0	A		
44- MD 187 at I-270 NB on and off ramps											
44	NB	23.9	C	NB Left	0	0	0	0	A	25.9	C
				NB Through	1478	24	68	404	C		
				NB Right	0	0	0	0	A		
	SB	7.7	A	SB Left	178	49	58	295	D		
				SB Through	1465	3	58	295	A		
				SB Right	0	0	0	0	A		
	EB	80.8	F	EB Left	228	58	187	740	E		
				EB Through	0	0	187	740	A		
				EB Right	371	95	232	784	F		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
45- MD 187 at Rock Spring Dr											
45	NB	14.9	B	NB Left	255	57	68	257	E	20.8	C
				NB Through	1383	7	69	258	A		
				NB Right	10	6	93	291	A		
	SB	21.9	C	SB Left	13	25	98	632	C		
				SB Through	1668	24	98	632	C		
				SB Right	144	1	63	619	A		
			EB Left	190	59	56	222	E			

Table C.14: AM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
	EB	37.9	D	EB Through	26	54	56	222	D		
				EB Right	251	20	56	222	C		
	WB	7.2	A	WB Left	1	7	1	29	A		
				WB Through	9	11	1	29	B		
				WB Right	5	0	0	7	A		
47-Democracy Blvd at I-270 NB off ramp											
47	NB	29.7	C	NB Left	217	30	24	159	C	13.4	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	12.7	B	EB Left	0	0	0	0	A		
				EB Through	1654	13	50	446	B		
				EB Right	0	0	0	0	A		
	WB	10.4	B	WB Left	0	0	0	0	A		
WB Through				778	10	23	187	B			
WB Right				0	0	0	0	A			
48- Democracy Blvd at I-270 SB on ramp											
48	NB			NB Left	0	0	0	0	A	6.6	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	5.4	A	EB Left	0	0	0	0	A		
				EB Through	1768	5	23	270	A		
				EB Right	0	0	0	0	A		
	WB	8.7	A	WB Left	223	37	31	173	D		
WB Through				771	1	21	152	A			
WB Right				0	0	0	0	A			
49- Democracy Blvd at I-270 SB off ramp											
49	NB			NB Left	0	0	0	0	A	12.1	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	32.9	C	SB Left	329	49	57	226	D		
				SB Through	0	0	0	0	A		
				SB Right	171	2	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	2.6	A	WB Left	0	0	0	0	A		
WB Through				770	3	4	133	A			
WB Right				334	2	1	163	A			
50- MD 190 at Burdette Rd											
50	NB	73.2	E	NB Left	20	80	15	118	E	13.2	B
				NB Through	4	59	15	118	E		
				NB Right	11	67	15	118	E		
	SB	34.4	C	SB Left	50	79	31	151	E		
				SB Through	17	64	31	151	E		
				SB Right	120	12	31	151	B		
	EB	10.5	B	EB Left	53	93	61	561	F		
				EB Through	1814	8	60	561	A		
				EB Right	15	6	51	584	A		
	WB	12.5	B	WB Left	1	106	61	828	F		
WB Through				1494	13	62	828	B			
WB Right				21	2	55	834	A			

Table C.14: AM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
51- MD 190 at I-270 NB on ramp											
51	NB			NB Left	0	0	0	0	A	53.3	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	123.2	F	EB Left	531	123	347	715	F		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	15.9	B	WB Left	0	0	0	0	A		
				WB Through	994	16	76	747	B		
				WB Right	0	0	0	0	A		
52- MD 190 at I-270 SB off ramp											
52	NB	79.3	E	NB Left	258	79	1392	3574	E	14.2	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	2.9	A	EB Left	0	0	0	0	A		
				EB Through	982	3	6	151	A		
				EB Right	0	0	0	0	A		
	WB	5.7	A	WB Left	0	0	0	0	A		
				WB Through	667	6	8	160	A		
				WB Right	0	0	0	0	A		
53- MD 190 at Seven Locks Rd											
53	NB	68.2	E	NB Left	21	67	23	149	E	45.0	D
				NB Through	59	69	25	148	E		
				NB Right	0	0	0	0	A		
	SB	56.9	E	SB Left	624	56	184	777	E		
				SB Through	183	59	185	778	E		
				SB Right	18	54	184	777	D		
	EB	37.5	D	EB Left	24	30	135	584	C		
				EB Through	846	38	135	584	D		
				EB Right	42	42	135	584	D		
	WB	39.7	D	WB Left	119	127	125	418	F		
				WB Through	639	33	128	421	C		
				WB Right	157	1	4	127	A		
54- MD 124 at I-270 NB off ramp											
54	NB	40.6	D	NB Left	0	0	0	0	A	26.5	C
				NB Through	0	0	0	0	A		
				NB Right	723	41	100	459	D		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	15.6	B	EB Left	0	0	0	0	A		
				EB Through	933	16	37	359	B		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
55- Democracy Blvd at I-270 NB off ramp											
55	NB	37.1	D	NB Left	0	0	0	0	A	16.2	B
				NB Through	0	0	0	0	A		
				NB Right	928	37	113	575	D		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
			EB Left	0	0	0	0	A			

Table C.14: AM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
	EB	4.5	A	EB Through	1657	5	18	95	A		
				EB Right	0	0	0	0	A		
	WB	WB Left	0	0	0	0	A				
		WB Through	0	0	0	0	A				
		WB Right	0	0	0	0	A				
56- Watkins Mill Rd at I-270 SB off ramp/Parkview Ave											
56	NB	747.0	F	NB Left	46	222	668	726	F	174.0	F
				NB Through	0	0	0	0	A		
				NB Right	86	1028	668	726	F		
	SB	SB Left	552	113	2037	5048	F				
		SB Through	131	109	2037	5048	F				
		SB Right	447	39	2037	5048	D				
	EB	EB Left	0	0	0	0	A				
		EB Through	494	463	1163	1232	F				
		EB Right	2	599	1163	1232	F				
	WB	WB Left	116	87	120	459	F				
		WB Through	769	35	117	457	D				
WB Right		0	0	0	0	A					
57- Watkins Mill Rd at I-270 NB on ramp											
57	NB	35.2	D	NB Left	386	51	92	383	D	70.0	E
				NB Through	0	0	0	0	A		
				NB Right	478	23	92	383	C		
	SB	SB Left	0	0	0	0	A				
		SB Through	0	0	0	0	A				
		SB Right	0	0	0	0	A				
	EB	EB Left	190	61	49	301	E				
		EB Through	749	8	49	301	A				
		EB Right	0	0	0	0	A				
	WB	WB Left	0	0	0	0	A				
		WB Through	954	150	640	849	F				
WB Right		174	78	640	849	E					
58- Watkins Mill Rd at I-270 SB on ramp											
58	NB			NB Left	0	0	0	0	A	60.7	E
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	SB Left	0	0	0	0	A				
		SB Through	0	0	0	0	A				
		SB Right	0	0	0	0	A				
	EB	EB Left	0	0	0	0	A				
		EB Through	938	30	483	620	C				
		EB Right	182	299	483	620	F				
	WB	WB Left	456	142	273	516	F				
		WB Through	883	2	273	516	A				
WB Right		0	0	0	0	A					

Table C.15: AM Peak -2040 Variable Speed Limit- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
1- MD 85 at Sam's Club Drive											
1	NB	21.7	C	NB Left	118	77	76	357	E	36.6	D
				NB Through	363	26	76	357	C		
				NB Right	667	10	21	360	A		
	SB	47.1	D	SB Left	137	60	157	713	E		
				SB Through	601	46	157	713	D		
				SB Right	69	27	157	713	C		
	EB	49.3	D	EB Left	105	77	55	186	E		
				EB Through	61	77	55	186	E		
				EB Right	113	9	55	186	A		
	WB	50.2	D	WB Left	231	73	86	349	E		
				WB Through	15	67	86	349	E		
				WB Right	126	6	86	349	A		
2- MD 85 at I-270 NB on and off ramp											
2	NB	50.4	D	NB Left	685	50	254	1156	D	35.7	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	19.2	B	SB Left	0	0	0	0	A		
				SB Through	610	19	56	643	B		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
3- MD 85 at I-270 SB on and off ramp											
3	NB	5.4	A	NB Left	0	0	0	0	A	10.6	B
				NB Through	1068	5	19	452	A		
				NB Right	0	0	0	0	A		
	SB	43.2	D	SB Left	172	43	47	431	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
4- MD 85 at Crestwood Blvd											
4	NB	19.1	C	NB Left	13	52	53	382	D	24.9	C
				NB Through	762	18	53	382	B		
				NB U-Turn	0	0	0	0	A		
	SB	18.5	B	SB Left	65	70	25	158	E		
				SB Through	1799	18	80	587	B		
				SB Right	818	15	67	577	B		
	EB	53.9	D	EB Left	620	55	95	283	E		
				EB Through	28	76	95	283	E		
				EB Right	42	20	95	283	C		
	WB	44.0	D	WB Left	52	53	21	136	D		
				WB Through	18	55	21	136	E		
				WB Right	19	8	21	136	A		
5- MD 80 at I-270 NB on and ramp											
5	NB	3.7	A	NB Left	4	13	0	4	B	44.6	D
				NB Through	2	0	0	4	A		
				NB Right	5	-3	0	4	A		
	SB	12.6	B	SB Left	206	15	13	115	B		
				SB Through	6	18	13	115	B		
				SB Right	59	2	0	0	A		
			EB Left	53	17	10	187	B			

Table C.15: AM Peak -2040 Variable Speed Limit- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS	
	EB	16.0	B	EB Through	0	0	8	0	A			
				EB Right	5	6	19	217	A			
				WB Left	38	42	1	53	D			
	WB	51.3	D	WB Through	918	65	435	930	E			
				WB Right	663	33	53	667	C			
6- MD 80 at I-270 SB on and off ramp												
6	NB	10.0	B	NB Left	22	50	13	250	F	39.6	E	
				NB Through	0	0	0	0	A			
				NB Right	254	7	13	250	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB	38.2	E	E	EB Left	0	0	0	0			A
					EB Through	357	35	68	414			E
					EB Right	158	45	69	423			E
	WB	71.4	F	F	WB Left	0	0	0	0			A
					WB Through	279	71	276	885			F
					WB Right	0	0	0	0			A
7- MD 109 at I-270 NB on and off ramp												
7	NB				NB Left	0	0	0	0	A	12.7	B
					NB Through	0	0	0	0	A		
					NB Right	0	0	0	0	A		
	SB	26.9	D	D	SB Left	143	31	37	265	D		
					SB Through	0	0	0	0	A		
					SB Right	47	14	14	209	B		
	EB	7.9	A	A	EB Left	87	7	1	103	A		
					EB Through	0	0	0	0	A		
					EB Right	63	9	0	0	A		
	WB	9.7	A	A	WB Left	0	0	0	0	A		
					WB Through	666	10	78	662	A		
					WB Right	0	0	0	0	A		
8- MD 80 at I-270 SB on and off ramp												
8	NB	5.7	A	A	NB Left	16	21	2	83	C	19.3	C
					NB Through	0	0	0	0	A		
					NB Right	49	1	0	25	A		
	SB				SB Left	0	0	0	0	A		
					SB Through	0	0	0	0	A		
					SB Right	0	0	0	0	A		
	EB	33.7	D	D	EB Left	0	0	0	0	A		
					EB Through	92	27	24	241	D		
					EB Right	101	40	39	251	E		
	WB	16.6	C	C	WB Left	566	16	71	615	C		
					WB Through	154	20	67	592	C		
					WB Right	0	0	0	0	A		
9- MD 121 at Gateway Center Dr												
9	NB	18.2	C	C	NB Left	151	27	41	292	C	50.5	D
					NB Through	438	23	41	292	C		
					NB Right	326	7	52	318	A		
	SB	31.4	D	D	SB Left	58	21	102	579	C		
					SB Through	814	32	113	579	C		
					SB Right	8	26	122	600	C		
	EB	118.0	F	F	EB Left	8	96	419	521	F		
					EB Through	99	123	421	521	F		
					EB Right	660	118	451	553	F		
	WB	21.1	C	C	WB Left	136	24	18	149	C		
					WB Through	17	23	18	148	C		
					WB Right	28	5	15	162	A		
10- MD 121 at I-270 NB on and off ramp												
	NB	27.5	D	D	NB Left	325	57	67	263	F		
					NB Through	0	0	0	0	A		

Table C.15: AM Peak -2040 Variable Speed Limit- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
10	SB			NB Right	402	3	0	0	A	18.8	B
				SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	11.9	B	EB Left	0	0	0	0	A		
				EB Through	508	18	34	321	C		
				EB Right	285	1	0	5	A		
	WB	18.2	C	WB Left	237	65	142	819	F		
				WB Through	1354	10	142	819	B		
				WB Right	0	0	0	0	A		

Table C.15: AM Peak -2040 Variable Speed Limit- Intersection Delay and Level of Service

11- MD 121 at I-270 SB on and off ramp											
11	NB	62.7	E	NB Left	0	0	0	0	A	17.9	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	5.1	A	SB Left	214	93	231	1076	F		
				SB Through	0	0	0	0	A		
				SB Right	303	41	19	522	E		
	EB	8.4	A	EB Left	0	0	0	0	A		
				EB Through	578	5	11	214	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
WB Through				647	18	41	549	C			
WB Right				1020	3	23	587	A			
12- MD 27 at Observation Dr											
12	NB	49.2	D	NB U-Turn	0	0	0	0	A	27.3	C
				NB Through	48	60	14	72	E		
				NB Right	12	8	14	72	A		
	SB	42.0	D	SB Left	91	53	30	192	D		
				SB Through	54	52	37	267	D		
				SB Right	177	33	61	304	C		
	EB	16.2	B	EB Left	151	37	38	319	D		
				EB Through	1203	14	39	320	B		
				EB Right	47	8	47	358	A		
	WB	31.2	C	WB Left	105	25	237	830	C		
WB Through				2232	32	237	830	C			
WB Right				115	17	237	830	B			
13- MD 27 at I-270 NB off ramp											
13	NB	32.5	C	NB Left	106	32	15	91	C	18.9	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	0.1	A	SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	26.1	C	EB Left	0	0	0	0	A		
				EB Through	954	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
WB Through				2263	26	445	2263	C			
WB Right				0	0	0	0	A			
14- MD 27 at I-270 SB off ramp											
14	NB	48.3	D	NB Left	0	0	0	0	A	40.2	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	2.5	A	SB Left	370	48	64	256	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	60.1	E	EB Left	0	0	0	0	A		
				EB Through	834	3	1	57	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
WB Through				1433	60	539	1398	E			
WB Right				0	0	0	0	A			
15- MD 27 at Crystal Rock Dr											
15	NB	61.2	E	NB Left	30	34	279	728	C	79.0	E
				NB Through	1040	61	302	727	E		
				NB Right	93	68	312	740	E		
	SB	97.3	F	SB Left	515	97	1114	1995	F		
				SB Through	1653	98	1114	1995	F		
				SB Right	52	67	1105	1989	E		
	EB	43.8	D	EB Left	224	50	58	201	D		
				EB Through	97	43	55	196	D		
				EB Right							

Table C.15: AM Peak -2040 Variable Speed Limit- Intersection Delay and Level of Service

				EB Right	76	28	60	229	C		
				WB Left	11	56	33	103	E		
	WB	48.0	D	WB Through	32	231	33	103	F		
				WB Right	142	6	33	103	A		
16- MD 118 at Seneca Meadows Pkwy											
16	NB	3.6	A	NB Left	108	10	1	67	B	6.0	A
				NB Through	721	3	4	127	A		
				NB Right	59	2	9	180	A		
	SB	3.9	A	SB Left	31	4	6	231	A		
				SB Through	948	4	9	232	A		
				SB Right	41	3	11	264	A		
	EB	18.5	B	EB Left	20	65	10	77	E		
				EB Through	6	82	10	77	F		
				EB Right	115	7	10	77	A		
	WB	44.7	D	WB Left	35	72	16	102	E		
				WB Through	6	55	11	101	D		
				WB Right	27	7	14	111	A		
17- MD 118 at I-270 NB on ramp											
17	NB			NB Left	0	0	0	0	A	10.2	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	29.5	C	EB Left	274	29	31	194	C		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	5.4	A	WB Left	0	0	0	0	A		
				WB Through	188	1	0	0	A		
				WB Right	911	6	16	308	A		
18- MD 118 at I-270 SB off ramp											
18	NB			NB Left	0	0	0	0	A	7.8	A
				NB Through	0	0.0	0	0	A		
				NB Right	0	0.0	0	0	A		
	SB	39.9	D	SB Left	211	39.9	35	149	D		
				SB Through	0	0.0	0	0	A		
				SB Right	0	0.0	0	0	A		
	EB	3.7	A	EB Left	0	0.0	0	0	A		
				EB Through	631	3.7	5	191	A		
				EB Right	0	0.0	0	0	A		
	WB	4.4	A	WB Left	0	0.0	0	0	A		
				WB Through	1214	4.4	9	221	A		
				WB Right	0	0.0	0	0	A		
19- MD 118 at Aircraft Dr											
19	NB	46.1	D	NB Left	9	78	9	75	E	20.4	C
				NB Through	13	80	9	75	F		
				NB Right	17	3	0	23	A		
	SB	60.4	E	SB Left	267	55	112	418	E		
				SB Through	53	72	112	418	E		
				SB Right	96	68	112	418	E		
	EB	12.2	B	EB Left	132	16	37	329	B		
				EB Through	1019	12	37	329	B		
				EB Right	34	12	37	329	B		
	WB	14.8	B	WB Left	84	24	45	292	C		
				WB Through	1041	17	45	292	B		
				WB Right	322	5	45	292	A		
20- Middlebrook Rd at Observation Dr											
	NB			NB Left	0	0	0	0	A		
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	20.5	C	SB Left	26	36	6	63	D		
				SB Through	0	0	0	0	A		

Table C.15: AM Peak -2040 Variable Speed Limit- Intersection Delay and Level of Service

20	EB	14.2	B	SB Right	27	5	6	63	A	16.4	B
				EB Left	223	22	30	244	C		
				EB Through	799	12	30	244	B		
				EB Right	0	0	0	0	A		
	WB	17.8	B	WB Left	0	0	0	0	A		
				WB Through	1147	19	72	396	B		
				WB Right	276	14	96	445	B		

Table C.15: AM Peak -2040 Variable Speed Limit- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
21- Middlebrook Rd at I-270 SB on ramp											
21	NB			NB Left	0	0	0	0	A	21.9	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	12.8	B	EB Left	0	0	0	0	A		
				EB Through	728	13	28	188	B		
				EB Right	0	0	0	0	A		
	WB	30.8	C	WB Left	750	31	154	1085	C		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
22- Middlebrook Rd at Waring Station Rd											
22	NB	190.1	F	NB Left	139	146	342	480	F	71.1	E
				NB Through	6	165	342	480	F		
				NB Right	252	215	342	480	F		
	SB	17.8	B	SB Left	3	38	1	29	D		
				SB Through	0	0	1	29	A		
				SB Right	5	6	2	67	A		
	EB	69.5	E	EB Left	29	20	611	1285	C		
				EB Through	1369	71	611	1285	E		
				EB Right	77	64	611	1285	E		
	WB	18.1	B	WB Left	80	23	33	238	C		
				WB Through	717	18	33	238	B		
				WB Right	41	5	33	238	A		
23- MD 124 at MD 355											
23	NB	59.0	E	NB Left	228	92	88	251	F	117.9	F
				NB Through	390	48	86	248	D		
				NB Right	54	3	0	0	A		
	SB	144.3	F	SB Left	56	173	566	797	F		
				SB Through	1019	142	566	797	F		
				SB Right	477	146	432	783	F		
	EB	47.8	D	EB Left	611	112	351	1023	F		
				EB Through	496	17	351	1023	B		
				EB Right	545	4	136	939	A		
	WB	191.8	F	WB Left	0	0	0	0	A		
				WB Through	1502	194	806	1123	F		
				WB Right	45	112	5	215	F		
24- MD 124 at I-270 SB on and off											
24	NB	66.3	F	NB Left	16	63	19	95	E	31.6	C
				NB Through	37	68	19	95	E		
				NB U-Turn	0	0	0	0	A		
	SB	22.7	C	SB Left	269	61	66	319	E		
				SB Through	10	64	66	319	E		
				SB Right	565	4	6	278	A		
	EB	16.2	B	EB Left	0	0	0	0	A		
				EB Through	1031	16	48	410	B		
				EB Right	67	13	57	433	B		
	WB	53.2	D	WB Left	39	54	1606	2419	D		
				WB Through	1014	53	1606	2419	D		
				WB Right	0	0	0	0	A		
25- MD 117 at MD 124											
25	NB	77.6	E	NB Left	19	129	244	699	F	64.4	E
				NB Through	521	88	244	699	F		
				NB Right	410	62	173	666	E		
	SB	47.5	D	SB Left	181	72	225	789	E		
				SB Through	1068	48	225	789	D		
				SB Right	131	9	0	0	A		
	EB Left	102	144	346	812	F					

Table C.15: AM Peak -2040 Variable Speed Limit- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
	EB	84.0	F	EB Through	1432	80	346	813	E		
				EB Right	80	80	362	841	F		
	WB	41.2	D	WB Left	323	72	108	342	E		
				WB Through	482	29	108	342	C		
				WB Right	99	0	0	0	A		
26- MD 117 at Bureau Dr											
26	NB	55.0	D	NB Left	25	68	21	125	E	50.5	D
				NB Through	24	70	21	125	E		
				NB Right	25	27	21	125	C		
	SB	225.9	F	SB Left	195	228	285	433	F		
				SB Through	54	237	285	433	F		
				SB Right	33	198	285	433	F		
	EB	48.9	D	EB Left	32	29	357	974	C		
				EB Through	1942	49	364	974	D		
				EB Right	28	62	357	964	E		
	WB	18.8	B	WB Left	304	60	115	426	E		
				WB Through	848	9	116	426	A		
				WB Right	316	6	91	475	A		
27- MD 117 at I-270 SB off ramp											
27	NB			NB Left	0	0	0	0	A	7.9	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	1.8	A	EB Left	0	0	0	0	A		
				EB Through	803	2	1	151	A		
				EB Right	0	0	0	0	A		
	WB	22.7	C	WB Left	331	23	44	424	C		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
28- MD 117 at I-270 NB off ramp											
28	NB			NB Left	0	0	0	0	A	35.7	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	61.2	E	SB Left	289	65	338	963	E		
				SB Through	0	0	0	0	A		
				SB Right	877	60	342	965	E		
	EB	20.9	C	EB Left	14	120	84	923	F		
				EB Through	786	19	84	923	B		
				EB Right	0	0	0	0	A		
	WB	16.0	B	WB Left	0	0	0	0	A		
				WB Through	909	16	62	362	B		
				WB Right	9	6	67	392	A		
29- MD 117 at Perry Pkwy											
29	NB	44.9	D	NB Left	36	77	17	125	E	16.3	B
				NB Through	7	59	17	124	E		
				NB Right	38	12	27	145	B		
	SB	49.5	D	SB Left	113	98	61	249	F		
				SB Through	14	102	61	249	F		
				SB Right	133	3	61	249	A		
	EB	10.6	B	EB Left	115	72	45	306	E		
				EB Through	950	3	45	306	A		
				EB Right	9	3	32	290	A		
	WB	10.8	B	WB Left	8	87	22	278	F		
				WB Through	747	11	22	278	B		
				WB Right	136	6	22	278	A		
30- Shady Grove Rd at I-270 NB off ramp											
	NB	9.2	A	NB Left	0	0	0	0	A		
				NB Through	962	9	21	243	A		

Table C.15: AM Peak -2040 Variable Speed Limit- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS			
30	SB	10.4	B	NB Right	0	0	0	0	A	22.0	C			
				SB Left	0	0	0	0	A					
				SB Through	1349	10	34	334	B					
	EB				SB Right	0	0	0	0			A		
					EB Left	0	0	0	0			A		
					EB Through	0	0	0	0			A		
	WB	53.6		D	EB Right	0	0	0	0			A		
					WB Left	883	54	159	605			D		
					WB Through	0	0	0	0			A		
					WB Right	0	0	0	0			A		

Table C.16: 2040 AM Peak - VSL - I-270 Vehicle Network Performance

	No Build	VSL Alternative	% Change
Total Delay	35,032,576	31,952,568	-9%
Average Delay per Vehicle	326	298	-8%
Total Travel Time	64,317,886	63,543,133	-1%
Vehicles (Arrived)	87,894	87,962	0%
Latent Demand	44,530	44,817	1%
Latent Delay	120,600,723	121,430,995	1%
Total Distance	463,125	463,143	0%
Average Speed	26	26	1%

Table C.15: AM Peak -2040 Variable Speed Limit- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
31- Shady Grove Rd at I-270 SB off ramp											
31	NB	13.5	B	NB Left	0	0	0	0	A	20.0	B
				NB Through	1004	13	39	346	B		
				NB Right	0	0	0	0	A		
	SB	10.0	B	SB Left	0	0	0	0	A		
				SB Through	1601	10	36	512	B		
				SB Right	0	0	0	0	A		
	EB	45.8	D	EB Left	289	40	45	393	D		
				EB Through	0	0	0	0	A		
				EB Right	579	49	98	481	D		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
32- MD 28 at I-270 SB off ramp											
32	NB			NB U-Turn	0	0	0	0	A	60.1	E
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	34.8	C	SB Left	424	43	70	334	D		
				SB Through	0	0	0	0	A		
				SB Right	104	1	0	61	A		
	EB	130.6	F	EB Left	0	0	0	0	A		
				EB Through	662	200	1959	2137	F		
				EB Right	403	16	1956	2144	B		
	WB	17.6	B	WB Left	0	0	0	0	A		
				WB Through	1450	18	26	411	B		
				WB Right	0	0	0	0	A		
33- MD 28 at I-270 on and off ramps											
33	NB	37.4	D	NB Left	0	0	43	348	A	22.8	C
				NB Through	151	55	50	357	E		
				NB Right	98	10	50	357	A		
	SB	42.0	D	SB Left	29	64	73	357	E		
				SB Through	0	0	0	0	A		
				SB Right	307	40	73	357	D		
	EB	18.1	B	EB Left	182	37	44	294	D		
				EB Through	598	12	44	294	B		
				EB Right	0	0	0	0	A		
	WB	16.3	B	WB Left	26	16	55	330	B		
				WB Through	960	16	41	293	B		
				WB Right	0	0	0	0	A		
34- MD 189 at Great Falls Rd											
34	NB	36.8	D	NB Left	65	41	15	105	D	18.7	B
				NB Through	8	40	11	104	D		
				NB Right	10	7	13	115	A		
	SB	13.5	B	SB Left	69	47	63	238	D		
				SB Through	7	79	63	238	E		
				SB Right	521	8	42	112	A		
	EB	19.1	B	EB Left	258	39	122	1142	D		
				EB Through	751	12	17	192	B		
				EB Right	11	11	26	229	B		
	WB	22.5	C	WB Left	5	21	36	352	C		
				WB Through	322	22	36	351	C		
				WB Right	11	32	48	385	C		
35- MD 189 at I-270 Ramps											
35	NB	62.5	E	NB Left	101	63	19	120	E	81.8	F
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	56.5	E	SB Left	149	57	50	279	E		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
				EB Left	340	152	579	1438	F		

Table C.15: AM Peak -2040 Variable Speed Limit- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
	EB	104.4	F	EB Through	496	72	579	1438	E		
				EB Right	0	0	0	A			
	WB	64.2	E	WB Left	491	58	136	479	E		
				WB Through	255	75	136	479	E		
				WB Right	0	0	0	A			
36- MD 189 at Wooton Pkwy											
36	NB	62.8	E	NB Left	159	52	91	356	D	97.4	F
				NB Through	120	79	91	356	E		
				NB Right	150	61	91	356	E		
	SB	125.6	F	SB Left	369	166	464	815	F		
				SB Through	644	102	434	801	F		
				SB Right	0	0	0	A			
	EB	116.6	F	EB Left	153	120	498	1015	F		
				EB Through	903	122	498	1015	F		
				EB Right	117	72	498	1015	E		
	WB	48.2	D	WB Left	356	66	103	266	E		
				WB Through	333	35	103	266	D		
				WB Right	49	6	103	266	A		
37- Montrose Rd at Tower Oaks Blvd											
37	NB			NB Left	0	0	0	0	A	100.6	F
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	246.4	F	SB Left	120	50	1175	1388	D		
				SB Through	0	0	0	0	A		
				SB Right	431	301	1170	1384	F		
	EB	26.5	C	EB Left	28	49	153	1013	D		
				EB Through	1504	26	153	1013	C		
				EB Right	0	0	0	0	A		
	WB	124.3	F	WB Left	0	0	0	0	A		
WB Through				1326	128	519	850	F			
WB Right				63	39	519	850	D			
38- Tower Oaks Blvd at I-270 off ramp											
38	NB	23.1	C	NB Left	408	23	31	194	C	78.3	E
				NB Through	9	20.1	25	186	C		
				NB Right	22	27.2	31	194	C		
	SB	0.6	A	SB Left	0	527.5	0	21	F		
				SB Through	0	0.0	0	21	A		
				SB Right	4	0.6	0	0	A		
	EB	127.7	F	EB Left	6	71.2	367	463	E		
				EB Through	539	128.3	367	463	F		
				EB Right	77	127.9	358	453	F		
	WB	9.8	A	WB Left	0	0.0	3	67	A		
				WB Through	85	10.3	3	67	B		
				WB Right	6	2.9	0	5	A		
39- Montrose Rd at Tower Oaks Blvd											
39	NB	15.7	B	NB Left	37	72	51	354	E	47.6	D
				NB Through	238	42	51	354	D		
				NB Right	546	0	14	218	A		
	SB	39.7	D	SB Left	324	54	168	634	D		
				SB Through	762	35	167	633	C		
				SB Right	75	28	133	665	C		
	EB	82.3	F	EB Left	76	70	387	715	E		
				EB Through	967	83	389	715	F		
				EB Right	61	80	409	739	E		
	WB	42.6	D	WB Left	310	52	71	298	D		
				WB Through	192	48	70	298	D		
				WB Right	114	7	79	328	A		
40- Rockledge Blvd at I-270 NB on and off ramp											
	NB	33.0	C	NB Left	0	0	0	0	A		
				NB Through	92	34	32	159	C		

Table C.15: AM Peak -2040 Variable Speed Limit- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS	
40	SB	2.5	A	NB Right	214	33	32	159	C	17.1	B	
				SB Left	0	0	6	77	A			
				SB Through	930	2	6	77	A			
	EB	25.2	C	SB Right	0	0	0	0	A			
				EB Left	7	48	118	407	D			
				EB Through	520	51	118	407	D			
	WB			EB Right	556	1	0	0	A			
				WB Left	0	0	0	0	A			
				WB Through	0	0	0	0	A			
					WB Right	0	0	0	0			A

Table C.15: AM Peak -2040 Variable Speed Limit- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
41- Rockledge Blvd at I-270 SB on and off ramps											
41	NB	2.7	A	NB Left	98	3	2	50	A	20.9	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	22.3	C	WB Left	931	23	96	680	C		
				WB Through	405	21	96	680	C		
				WB Right	0	0	0	0	A		
42- MD 187 at Tuckerman Ln											
42	NB	53.1	D	NB Left	230	21	236	697	C	149.8	F
				NB Through	1456	50	236	697	D		
				NB Right	216	105	236	697	F		
	SB	218.2	F	SB Left	61	158	2594	2708	F		
				SB Through	1243	218	2594	2708	F		
				SB Right	166	244	2594	2708	F		
	EB	183.5	F	EB Left	224	131	1863	1985	F		
				EB Through	631	200	1864	1986	F		
				EB Right	133	191	1888	2010	F		
	WB	188.9	F	WB Left	720	230	1913	2146	F		
				WB Through	396	153	1913	2146	F		
				WB Right	158	93	1913	2146	F		
43- MD 187 at I-270 NB on and off ramps											
43	NB	11.1	B	NB Left	164	82	61	243	F	18.7	B
				NB Through	1536	4	61	243	A		
				NB Right	0	0	0	0	A		
	SB	24.7	C	SB Left	0	0	0	0	A		
				SB Through	1556	25	82	551	C		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	49.2	D	WB Left	115	50	35	263	D		
				WB Through	10	42	35	263	D		
				WB Right	0	0	0	0	A		
44- MD 187 at I-270 NB on and off ramps											
44	NB	23.4	C	NB Left	0	0	0	0	A	25.0	C
				NB Through	1481	23	67	385	C		
				NB Right	0	0	0	0	A		
	SB	7.0	A	SB Left	182	46	54	247	D		
				SB Through	1490	2	54	247	A		
				SB Right	0	0	0	0	A		
	EB	80.2	F	EB Left	222	60	191	743	E		
				EB Through	0	0	191	743	A		
				EB Right	367	93	228	731	F		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
45- MD 187 at Rock Spring Dr											
45	NB	15.0	B	NB Left	255	57	68	249	E	20.9	C
				NB Through	1385	7	69	249	A		
				NB Right	10	6	93	283	A		
	SB	21.9	C	SB Left	12	35	97	592	C		
				SB Through	1694	24	97	592	C		
				SB Right	146	1	58	587	A		
				EB Left	190	59	55	225	E		

Table C.15: AM Peak -2040 Variable Speed Limit- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
	EB	37.8	D	EB Through	25	53	55	225	D		
				EB Right	252	20	55	225	C		
	WB	7.2	A	WB Left	1	7	1	29	A		
				WB Through	9	11	1	29	B		
				WB Right	5	0	0	7	A		
47-Democracy Blvd at I-270 NB off ramp											
47	NB	31.3	C	NB Left	219	31	26	161	C	13.7	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	13.0	B	EB Left	0	0	0	0	A		
				EB Through	1653	13	52	456	B		
				EB Right	0	0	0	0	A		
	WB	10.4	B	WB Left	0	0	0	0	A		
WB Through				778	10	23	186	B			
WB Right				0	0	0	0	A			
48- Democracy Blvd at I-270 SB on ramp											
48	NB			NB Left	0	0	0	0	A	6.5	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	5.3	A	EB Left	0	0	0	0	A		
				EB Through	1767	5	23	276	A		
				EB Right	0	0	0	0	A		
	WB	8.6	A	WB Left	223	37	31	171	D		
WB Through				773	1	21	150	A			
WB Right				0	0	0	0	A			
49- Democracy Blvd at I-270 SB off ramp											
49	NB			NB Left	0	0	0	0	A	12.3	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	33.8	C	SB Left	330	50	59	246	D		
				SB Through	0	0	0	0	A		
				SB Right	166	1	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	2.6	A	WB Left	0	0	0	0	A		
WB Through				771	3	4	131	A			
WB Right				335	2	1	159	A			
50- MD 190 at Burdette Rd											
50	NB	73.3	E	NB Left	20	80	15	118	E	13.8	B
				NB Through	4	59	15	118	E		
				NB Right	11	67	15	118	E		
	SB	34.5	C	SB Left	50	79	31	150	E		
				SB Through	17	65	31	150	E		
				SB Right	120	12	31	150	B		
	EB	11.5	B	EB Left	54	93	70	656	F		
				EB Through	1813	9	70	656	A		
				EB Right	15	5	62	680	A		
	WB	12.7	B	WB Left	1	106	65	815	F		
WB Through				1497	13	66	815	B			
WB Right				21	2	61	856	A			

Table C.15: AM Peak -2040 Variable Speed Limit- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
51- MD 190 at I-270 NB on ramp											
51	NB			NB Left	0	0	0	0	A	53.9	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	125.2	F	EB Left	530	125	351	653	F		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	15.9	B	WB Left	0	0	0	0	A		
				WB Through	995	16	76	722	B		
				WB Right	0	0	0	0	A		
52- MD 190 at I-270 SB off ramp											
52	NB	77.8	E	NB Left	259	78	720	2843	E	14.1	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	3.3	A	EB Left	0	0	0	0	A		
				EB Through	982	3	7	183	A		
				EB Right	0	0	0	0	A		
	WB	5.3	A	WB Left	0	0	0	0	A		
				WB Through	667	5	7	164	A		
				WB Right	0	0	0	0	A		
53- MD 190 at Seven Locks Rd											
53	NB	68.2	E	NB Left	21	67	23	149	E	44.0	D
				NB Through	59	69	25	148	E		
				NB Right	0	0	0	0	A		
	SB	56.9	E	SB Left	624	56	184	777	E		
				SB Through	183	59	185	778	E		
				SB Right	18	54	184	777	D		
	EB	37.5	D	EB Left	24	30	135	584	C		
				EB Through	846	38	135	584	D		
				EB Right	42	42	135	584	D		
	WB	36.8	D	WB Left	121	110	113	367	F		
				WB Through	639	32	116	370	C		
				WB Right	158	1	0	31	A		
54- MD 124 at I-270 NB off ramp											
54	NB	40.4	D	NB Left	0	0	0	0	A	24.4	C
				NB Through	0	0	0	0	A		
				NB Right	726	40	100	403	D		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	11.7	B	EB Left	0	0	0	0	A		
				EB Through	918	12	27	292	B		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
55- Democracy Blvd at I-270 NB off ramp											
55	NB	37.4	D	NB Left	0	0	0	0	A	16.3	B
				NB Through	0	0	0	0	A		
				NB Right	929	37	112	562	D		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
			EB Left	0	0	0	0	A			

Table C.15: AM Peak -2040 Variable Speed Limit- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
	EB	4.5	A	EB Through	1654	5	18	97	A		
				EB Right	0	0	0	0	A		
	WB	WB Left	0	0	0	0	A				
		WB Through	0	0	0	0	A				
		WB Right	0	0	0	0	A				
56- Watkins Mill Rd at I-270 SB off ramp/Parkview Ave											
56	NB	793.8	F	NB Left	42	279	677	721	F	186.5	F
				NB Through	0	0	0	0	A		
				NB Right	86	1045	677	721	F		
	SB	SB Left	519	120	2774	5052	F				
		SB Through	125	102	2774	5052	F				
		SB Right	420	37	2774	5052	D				
	EB	EB Left	0	0	0	0	A				
		EB Through	469	516	1168	1230	F				
		EB Right	2	555	1168	1230	F				
	WB	WB Left	111	81	109	469	F				
		WB Through	741	33	107	468	C				
WB Right		0	0	0	0	A					
57- Watkins Mill Rd at I-270 NB on ramp											
57	NB	36.3	D	NB Left	390	52	97	412	D	75.3	E
				NB Through	0	0	0	0	A		
				NB Right	484	23	97	412	C		
	SB	SB Left	0	0	0	0	A				
		SB Through	0	0	0	0	A				
		SB Right	0	0	0	0	A				
	EB	EB Left	181	63	46	275	E				
		EB Through	706	8	46	275	A				
		EB Right	0	0	0	0	A				
	WB	WB Left	0	0	0	0	A				
		WB Through	898	167	668	858	F				
WB Right		163	83	668	858	F					
58- Watkins Mill Rd at I-270 SB on ramp											
58	NB			NB Left	0	0	0	0	A	67.7	E
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	SB Left	0	0	0	0	A				
		SB Through	0	0	0	0	A				
		SB Right	0	0	0	0	A				
	EB	EB Left	0	0	0	0	A				
		EB Through	884	37	485	617	D				
		EB Right	178	317	485	617	F				
	WB	WB Left	434	157	291	512	F				
		WB Through	860	3	291	512	A				
WB Right		0	0	0	0	A					

Table D.1: PM Peak -2040 Variable Speed Limit- I-270 Vehicle Travel Time

I-270 Northbound	Segment Length (miles)	No Build VISSIM Travel Time (seconds)	VSL VISSIM Travel Time (seconds)	% Change	I-270 Southbound	Segment Length (miles)	No Build VISSIM Travel Time (seconds)	VSL VISSIM Travel Time (seconds)	% Change
From I-495 interchange					From I-70				
to MD 187	1.8	432.3	431.6	-0.2%	to MD 85	1.7	94.6	94.6	0.0%
to I-270 Split	0.6	90.3	90.3	0.0%	to MD 80	5.4	307.1	306.9	0.1%
to Montrose Rd	1.8	115.8	115.5	-0.3%	to MD 109	3.7	210.7	211.0	-0.2%
to MD 189	1.0	76.0	76.8	1.1%	to MD 121	3.6	204.4	204.7	-0.2%
to MD 28	1.0	92.5	99.8	7.9%	to MD 27	2.5	146.4	146.6	-0.2%
to Shady Grove Rd	1.9	211.0	231.6	9.8%	to MD 118	1.1	65.1	64.9	0.4%
to I-370	0.9	185.6	202.6	9.2%	to Middlebrook Rd	1.1	71.2	70.5	1.0%
to MD 117	1.5	158.7	166.9	5.1%	to MD 124	2.2	137.5	137.6	-0.1%
to MD 124	0.6	38.8	47.8	23.4%	to MD 117	0.9	117.3	114.5	2.4%
to Middlebrook Rd	2.5	214.3	226.5	5.7%	to I-370	1.0	72.5	71.7	1.1%
to MD 118	1.1	80.3	92.1	14.6%	to Shady Grove Rd	1.5	83.4	82.8	0.7%
to MD 27	0.9	69.9	77.2	10.5%	to MD 28	1.9	114.1	113.5	0.5%
to MD 121	2.4	161.1	192.1	19.2%	to MD 189	1.0	62.7	62.3	0.5%
to MD 109	4.1	337.8	315.2	-6.7%	to Montrose Rd	1.0	64.8	64.5	0.4%
to MD 80	3.7	247.0	245.5	-0.6%	to I-270 Split	1.9	114.7	115.1	-0.3%
to MD 85	5.3	348.1	360.1	3.5%	to MD 187	0.4	23.0	23.1	-0.3%
to I-70	1.4	182.3	128.0	-29.8%	to I-495 interchange	1.9	155.6	155.1	0.3%
I-270 Total (miles/minutes)	32.4	50.7	51.7	1.9%	I-270 Total (miles/minutes)	32.6	34.1	34.0	0.3%
I-270 Spur Northbound					I-270 Spur Southbound				
From Cabin John Pkwy					From I-70				
to MD 190	0.5	125.4	127.2	1.4%	to I-270 Split	30.3	1,866.3	1,861.2	-0.3%
to I-495	1.1	271.9	273.1	0.5%	to Democracy Blvd	0.7	183.2	170.8	-6.8%
to Democracy Blvd	1.4	226.8	228.3	0.7%	to I-495	1.3	509.9	503.6	-1.2%
to I-270 Split	0.9	76.4	76.4	0.1%	to MD 190	1.3	199.4	200.6	0.6%
to I-70	30.0	2,519.1	2,577.8	2.3%	to Cabin John Pkwy	0.6	164.4	163.6	-0.5%
I-270 Spur Total (miles/minutes)	34.0	53.7	54.7	2.0%	I-270 Spur Total	34.2	48.7	48.3	-0.8%

Table D.2: PM Peak -2040 Variable Speed Limit- I-270 Local Vehicle Travel Time

I-270 Northbound	Segment Length (miles)	No Build VISSIM Travel Time (seconds)	VSL VISSIM Travel Time (seconds)	% Change	I-270 Southbound	Segment Length (miles)	No Build VISSIM Travel Time (seconds)	VSL VISSIM Travel Time (seconds)	% Change
From C-D start					From C-D start				
to Montrose Rd	0.8	68.8	69.7	1.3%	to Shady Grove	1.3	87.5	88.0	0.6%
to MD 189	1.3	212.1	231.1	8.9%	to MD 28	1.8	120.3	120.4	0.0%
to MD 28	1.0	96.2	129.9	35.1%	to MD 189	1.1	80.2	99.7	24.3%
to Shady Grove	2.0	420.6	563.8	34.0%	to Montrose	1.2	88.8	96.8	9.1%
to I-370	1.0	346.7	473.5	36.6%	to I-270 mainline	0.9	59.7	59.7	-0.1%
to MD 117	1.2	819.0	831.6	1.5%					
to MD 124	0.8	1,033.2	1,027.5	-0.6%					
to I-270 mainline	0.8	555.0	540.4	-2.6%					
I-270 Local Total (miles/minutes)	8.9	59.2	64.5	8.9%	I-270 Local Total (miles/minutes)	6.3	7.3	7.7	6.4%

Table D.3: PM Peak -2040 Variable Speed Limit- I-270 Vehicle Speed

I-270 Northbound	Cumulative Length (miles)	No Build VISSIM Speed (MPH)	VSL VISSIM Speed (MPH)	% Change	I-270 Southbound	No Build VISSIM Speed (MPH)	VSL VISSIM Speed (MPH)	% Change	
From I-495 interchange	0.0				From I-70				
to MD 187	1.8	15.3	15.3	0.2%	to MD 85	63.3	63.3	0.0%	
to I-270 Split	2.4	23.6	23.6	0.0%	to MD 80	62.8	62.8	0.1%	
to Montrose Rd	4.2	54.5	54.7	0.3%	to MD 109	63.6	63.5	-0.2%	
to MD 189	5.2	48.0	47.5	-1.1%	to MD 121	63.8	63.7	-0.2%	
to MD 28	6.2	37.5	34.8	-7.3%	to MD 27	61.1	61.0	-0.2%	
to Shady Grove Rd	8.1	32.4	29.5	-8.9%	to MD 118	59.3	59.5	0.4%	
to I-370	9.0	18.3	16.8	-8.4%	to Middlebrook Rd	56.2	56.8	1.0%	
to MD 117	10.5	34.4	32.7	-4.9%	to MD 124	57.5	57.5	-0.1%	
to MD 124	11.1	56.9	46.1	-19.0%	to MD 117	27.2	27.9	2.5%	
to Middlebrook Rd	13.6	41.8	39.5	-5.4%	to I-370	48.9	49.5	1.1%	
to MD 118	14.7	50.2	43.8	-12.8%	to Shady Grove Rd	64.2	64.6	0.7%	
to MD 27	15.7	47.2	42.7	-9.5%	to MD 28	59.1	59.4	0.5%	
to MD 121	18.0	53.5	44.9	-16.1%	to MD 189	56.2	56.5	0.5%	
to MD 109	22.1	43.5	46.6	7.2%	to Montrose Rd	57.4	57.6	0.4%	
to MD 80	25.8	53.6	53.9	0.6%	to I-270 Split	58.7	58.6	-0.3%	
to MD 85	31.1	54.3	52.5	-3.3%	to MD 187	65.7	65.6	-0.3%	
to I-70	32.4	27.1	38.6	42.4%	to I-495 interchange	43.7	43.9	0.3%	
I-270 Total (miles/minutes)		38.4	37.7	-1.9%	I-270 Total (miles/minutes)	57.5	57.6	0.3%	
I-270 Spur Northbound					I-270 Spur Southbound				
From Cabin John Pkwy	0.0				From I-70				
to MD 190	0.5	15.5	15.3	-1.4%	to I-270 Split	58.5	58.7	0.3%	
to I-495	1.7	15.0	14.9	-0.5%	to Democracy Blvd	14.4	15.4	7.3%	
to Democracy Blvd	3.1	22.8	22.6	-0.7%	to I-495	9.3	9.4	1.2%	
to I-270 Split	4.0	42.0	42.0	-0.1%	to MD 190	22.6	22.5	-0.6%	
to I-70	34.0	42.9	41.9	-2.3%	to Cabin John Pkwy	12.5	12.5	0.5%	
I-270 Spur Total (miles/minutes)		38.0	37.3	-1.9%	I-270 Spur Total (miles/minutes)	42.1	42.5	0.8%	

Table D.4: PM Peak -2040 Variable Speed Limit- I-270 Local Vehicle Speed

I-270 Northbound	No Build VISSIM Speed (MPH)	VSL VISSIM Speed (MPH)	% Change	I-270 Southbound	No Build VISSIM Speed (MPH)	VSL VISSIM Speed (MPH)	% Change
From C-D start				From C-D start			
to Montrose Rd	44.2	43.7	-1.3%	to Shady Grove	53.9	53.6	-0.6%
to MD 189	22.2	20.4	-8.2%	to MD 28	53.1	53.0	0.0%
to MD 28	36.2	26.8	-26.0%	to MD 189	48.6	39.1	-19.6%
to Shady Grove	16.7	12.5	-25.4%	to Montrose	50.1	45.9	-8.3%
to I-370	10.0	7.3	-26.8%	to I-270 mainline	53.2	53.2	0.1%
to MD 117	5.5	5.4	-1.5%				
to MD 124	2.9	2.9	0.6%				
to I-270 mainline	5.3	5.5	2.7%				
I-270 Local Total (miles/minutes)	9.1	8.3	-8.2%	I-270 Local Total (miles/minutes)	51.8	48.7	-6.1%

Table D.5: PM Peak -2040 Variable Speed Limit- I-270 Vehicle Density

I-270 Northbound	Type	No Build		VSL		% Change	I-270 Southbound	Type	No Build		VSL		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS	
I-270	Freeway	91	F	91	F	0%	I-270	Freeway	19	C	19	C	0%
I-270 Diverge to MD 187	Diverge	77	F	77	F	0%	I-270 Merge from WB I-70	Merge	17	B	17	B	0%
I-270	Freeway	84	F	85	F	1%	I-270	Freeway	24	C	24	C	0%
I-270 Diverge to Rockledge Rd	Diverge	77	F	79	F	2%	I-270 Merge from EB I-70	Merge	16	B	16	B	0%
I-270	Freeway	85	F	86	F	1%	I-270	Freeway	22	C	22	C	0%
I-270 Weave from MD 187 to I-270 HOV	Weave	57	F	57	F	0%	I-270 Diverge to SB MD 85	Diverge	23	C	23	C	0%
I-270 Lane Drop	Merge	65	F	65	F	0%	I-270	Freeway	24	C	24	C	0%
I-270	Freeway	51	F	51	F	0%	I-270 Diverge to NB MD 85	Diverge	15	B	15	B	0%
I-270 Merge from I-270 Spur	Merge	37	E	37	E	0%	I-270	Freeway	19	C	19	C	0%
I-270 Weave from I-270 HOV to I-270 C-D	Weave	34	D	34	D	0%	I-270 Merge from MD 85	Merge	20	C	20	C	-1%
I-270	Freeway	34	D	35	D	1%	I-270	Freeway	25	C	25	C	0%
I-270 Diverge to C-D (MD 189)	Diverge	46	F	45	F	-1%	I-270 Diverge to MD 80	Diverge	17	B	17	B	0%
I-270	Freeway	46	F	46	F	0%	I-270	Freeway	20	C	20	C	1%
I-270 Diverge to C-D (MD 28)	Diverge	62	F	63	F	3%	I-270 Merge from MD 80	Merge	14	B	14	B	0%
I-270	Freeway	55	F	57	F	5%	I-270	Freeway	23	C	23	C	0%
I-270 Merge from C-D (MD 189)	Merge	72	F	82	F	14%	I-270 Diverge to MD 109	Diverge	12	B	12	B	1%
I-270 Diverge to C-D (Shady Grove Rd)	Diverge	77	F	83	F	7%	I-270	Freeway	22	C	22	C	1%
I-270	Freeway	65	F	69	F	7%	I-270 Merge from MD 109	Merge	13	B	14	B	6%
I-270 Weave from C-D (MD 28) to C-D (Shady Grove Rd)	Weave	90	F	93	F	4%	I-270	Freeway	24	C	24	C	0%
I-270	Freeway	90	F	89	F	0%	I-270 Diverge to SB Weigh Station	Diverge	12	B	12	B	1%
I-270 Merge from C-D (Shady Grove Rd)	Merge	124	F	121	F	-2%	I-270	Freeway	24	C	24	C	0%
I-270	Freeway	88	F	88	F	0%	I-270 Merge from SB Weigh Station	Merge	12	B	12	B	0%
I-270 Merge from C-D (I-370)	Merge	155	F	136	F	-12%	I-270	Freeway	23	C	23	C	0%
I-270 Diverge to C-D (MD 117)	Diverge	159	F	155	F	-3%	I-270 Diverge to MD 121	Diverge	9	A	9	A	0%
I-270	Freeway	21	C	22	C	3%	I-270	Freeway	12	B	12	B	0%
I-270 Merge from C-D (MD 124)	Merge	47	F	48	F	0%	I-270 Merge from WB MD 121	Merge	10	B	10	B	0%
I-270	Freeway	27	D	32	D	21%	I-270	Freeway	15	B	15	B	0%
I-270 Diverge to EB Middlebrook Rd	Diverge	20	B	25	C	25%	I-270 Merge from EB MD 121	Merge	13	B	13	B	0%
I-270	Freeway	25	C	31	D	24%	I-270	Freeway	20	C	20	C	0%
I-270 Diverge to WB Middlebrook Rd	Diverge	20	C	24	C	20%	I-270 Diverge to MD 27	Diverge	13	B	13	B	0%
I-270	Freeway	22	C	27	D	24%	I-270	Freeway	16	B	16	B	0%
I-270 Diverge to EB MD 118	Diverge	17	B	21	C	24%	I-270 Merge from WB MD 27	Merge	14	B	14	B	0%
I-270 Diverge to WB MD 118	Diverge	31	D	31	D	2%	I-270	Freeway	20	C	20	C	0%
I-270	Freeway	27	D	30	D	12%	I-270 Weave from EB MD 27 to MD 118	Weave	15	B	15	B	-2%
I-270 Weave from MD 118 to MD 27	Weave	36	E	34	D	-7%	I-270	Freeway	19	C	19	C	-1%
I-270	Freeway	25	C	29	D	17%	I-270 Merge from WB MD 118	Merge	15	B	15	B	-2%
I-270 Merge from EB MD 27	Merge	36	E	34	D	-7%	I-270	Freeway	22	C	22	C	0%
I-270	Freeway	26	C	31	D	22%	I-270 Merge from EB MD 118	Merge	18	B	18	B	0%
I-270 Merge from WB MD 27	Merge	22	C	26	C	20%	I-270	Freeway	28	D	28	D	-1%
I-270	Freeway	28	D	33	D	20%	I-270 Merge from Middlebrook Rd	Merge	30	D	30	D	1%
I-270 Diverge to MD 121	Diverge	22	C	26	C	18%	I-270 Diverge to Watkins Mill Rd	Diverge	24	C	24	C	1%

Table D.5: PM Peak -2040 Variable Speed Limit - I-270 Vehicle Density

I-270 Northbound	Type	No Build		VSL		% Change	I-270 Southbound	Type	No Build		VSL		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS			
I-270	Freeway	22	C	24	C	8%	I-270	Freeway	19	C	20	C	0%
I-270 Merge from EB MD 121	Merge	35	E	21	C	-40%	I-270 Diverge to MD 124	Diverge	17	B	17	B	0%
I-270 Lane Drop	Merge	78	F	56	F	-29%	I-270	Freeway	14	B	14	B	0%
I-270	Freeway	37	E	41	E	10%	I-270 Merge from Watkins Mill	Merge	17	B	17	B	0%
I-270 Diverge to NB Weigh Station	Diverge	18	B	18	B	-2%	I-270	Freeway	58	F	56	F	-3%
I-270	Freeway	36	E	36	E	-2%	I-270 Merge from WB MD 124	Merge	96	F	92	F	-3%
I-270 Merge from NB Weight Station	Merge	18	B	18	B	-1%	I-270	Freeway	0	A	0	A	-
I-270	Freeway	38	E	37	E	-3%	I-270 Merge from MD 117	Merge	39	E	40	E	1%
I-270 Diverge to MD 109	Diverge	22	C	21	C	-5%	I-270	Freeway	28	D	28	D	1%
I-270	Freeway	34	D	33	D	-3%	I-270 Diverge to I-370	Diverge	22	C	21	C	-1%
I-270 Merge from MD 109	Merge	19	B	18	B	-2%	I-270	Freeway	18	B	18	B	0%
I-270	Freeway	36	E	35	E	-2%	I-270 Diverge to I-270 C-D	Diverge	14	B	14	B	-1%
I-270 Diverge to MD 80	Diverge	27	C	26	C	-6%	I-270	Freeway	14	B	14	B	0%
I-270	Freeway	30	D	29	D	-2%	I-270 Merge from I-270 (I-370)	Merge	21	C	20	C	-1%
I-270 Merge from MD 80	Merge	18	B	18	B	-2%	I-270 Diverge to I-270 C-D (Shady Grove Rd)	Diverge	23	C	23	C	0%
I-270	Freeway	36	E	36	E	-1%	I-270	Freeway	19	C	19	C	0%
I-270 Diverge to Scenic View	Diverge	19	B	18	B	-2%	I-270 Merge from I-270 C-D (Shady Grove Rd Northern)	Merge	18	B	18	B	0%
I-270	Freeway	36	E	35	E	-2%	I-270	Freeway	23	C	23	C	0%
I-270 Merge from Scenic View	Merge	18	B	18	B	-3%	I-270 Merge from I-270 C-D (Shady Grove Rd Southern)	Merge	18	B	18	B	0%
I-270	Freeway	36	E	37	E	1%	I-270 Diverge to I-270 C-D (MD 189)	Diverge	25	C	25	C	0%
I-270 Diverge to NB MD 85	Diverge	20	C	25	C	25%	I-270	Freeway	21	C	21	C	0%
I-270	Freeway	34	D	39	E	15%	I-270 Merge from I-270 C-D (MD 189)	Merge	20	C	21	C	0%
I-270 Diverge to SB MD 85	Diverge	20	C	23	C	14%	I-270	Freeway	26	C	26	C	0%
I-270	Freeway	30	D	35	E	17%	I-270 Merge from I-270 C-D	Merge	25	C	25	C	0%
I-270 Weave from MD 85 to I-70	Weave	22	C	25	C	13%	I-270 Diverge to I-270 HOV Lane	Diverge	17	B	18	B	3%
I-270	Freeway	64	F	39	E	-40%	I-270 Diverge to I-270 Spur	Diverge	38	E	37	E	-4%
							I-270	Freeway	13	B	13	B	1%
							I-270 Diverge to Rockledge Dr / MD 187	Diverge	9	A	9	A	-1%
							I-270	Freeway	13	B	13	B	0%
							I-270 Merge from Rockledge Dr	Merge	11	B	11	B	1%
							I-270	Freeway	16	B	16	B	1%
							I-270 Merge from Rockledge Dr / MD 187	Merge	14	B	14	B	0%
							I-270	Freeway	35	E	35	E	0%

Table D.6: PM Peak - 2040 Fixed Ramp Metering- I-270 Spur Vehicle Density

I-270 Spur Northbound	Type	No Build		RM		% Change	I-270 Southbound	Type	No Build		RM		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS			
I-270 Spur	Freeway	62	F	63	F	0%	I-270 Spur	Freeway	72	F	64	F	-11%
I-270 Spur Merge from Clara Barton Parkway	Merge	64	F	64	F	0%	I-270 Spur Weave from I-270 HOV to Democracy Blvd	Weave	94	F	86	F	-8%
I-270 Spur	Freeway	78	F	78	F	1%	I-270 Spur	Freeway	108	F	105	F	-3%
I-270 Diverge to MD 190	Diverge	49	F	49	F	0%	I-270 Merge from Democracy Blvd	Merge	152	F	151	F	-1%
I-270 Spur	Freeway	89	F	89	F	1%	I-270 Spur Lane Drop	Merge	144	F	142	F	-1%
I-270 Spur Merge from Cabin John Parkway	Merge	105	F	106	F	0%	I-270 Spur	Freeway	125	F	125	F	0%
I-270 Spur Merge from MD 190	Merge	97	F	97	F	-1%	I-270 Spur Merge from I-495	Merge	124	F	124	F	0%
I-270 Spur	Freeway	84	F	83	F	0%	I-270 Spur	Freeway	49	F	48	F	-1%
I-270 Spur Diverge to I-495	Merge	66	F	65	F	-2%	I-270 Spur Diverve to EB MD 190	Diverge	50	F	49	F	-1%
I-270 Spur	Freeway	45	F	45	F	0%	I-270 Spur Diverve to Cabin John Pkwy	Diverge	67	F	68	F	1%
I-270 Spur Diverge to Democracy Blvd	Diverge	50	F	50	F	0%	I-270 Spur	Freeway	95	F	95	F	0%
I-270 Spur	Freeway	58	F	58	F	0%	I-270 Merge from MD 190	Merge	120	F	122	F	2%
I-270 Spur Merge from EB Democracy Blvd	Merge	97	F	99	F	1%	I-270 Spur	Freeway	93	F	94	F	0%
I-270 Spur	Freeway	58	F	58	F	1%	I-270 Diverge to WB Clara Barton Pkwy	Diverge	60	F	61	F	0%
I-270 Spur Merge from WB Democracy Blvd	Merge	65	F	65	F	0%	I-270 Spur	Freeway	83	F	83	F	0%
I-270 Spur	Freeway	39	E	38	E	0%	I-270 Merge from Clara Barton Pkwy	Merge	77	F	76	F	0%
I-270 Spur Merge from Westlake Terrace	Merge	31	D	31	D	1%							
I-270 Spur	Freeway	34	D	35	D	0%							

Table D.7: PM Peak -2040 Variable Speed Limit - I-270 Local Vehicle Density

I-270 Northbound	Type	No Build		VSL		% Change	I-270 Southbound	Type	No Build		VSL		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS			
I-270 C-D	Freeway	29	D	29	D	0%	I-270 C-D	Freeway	8	A	9	A	2%
I-270 C-D Diverge to EB Montrose Rd	Diverge	21	C	21	C	-1%	I-270 C-D Weave from I-370 EB to I-270	Weave	23	B	26	C	10%
I-270 C-D	Freeway	16	B	16	B	1%	I-270 C-D Diverge to Shady Grove Rd	Diverge	11	B	11	B	1%
I-270 C-D Weave between Montrose Rd Loop Ramps	Weave	13	B	13	B	2%	I-270 C-D	Freeway	8	A	8	A	0%
I-270 C-D	Freeway	28	D	28	D	0%	I-270 C-D Merge from WB Shady Grove Rd	Merge	8	A	8	A	2%
I-270 C-D Merge from WB Montrose Rd	Merge	83	F	96	F	15%	I-270 C-D	Freeway	14	B	14	B	2%
I-270 C-D	Freeway	67	F	74	F	11%	I-270 C-D Merge from EB Shady Grove Rd	Merge	10	A	10	B	3%
I-270 C-D Merge from I-270	Merge	42	F	47	F	12%	I-270 C-D	Freeway	19	C	20	C	3%
I-270 C-D	Freeway	65	F	71	F	9%	I-270 C-D Merge from I-270	Merge	18	B	21	C	14%
I-270 C-D Diverge to MD 189	Diverge	43	F	48	F	11%	I-270 C-D Diverge to I-270	Diverge	25	C	26	C	3%
I-270 C-D	Freeway	91	F	97	F	7%	I-270 C-D Diverge to I-270	Diverge	17	B	18	B	2%
I-270 C-D Merge from MD 189	Merge	112	F	114	F	2%	I-270 C-D	Freeway	16	B	16	B	2%
I-270 C-D	Freeway	62	F	74	F	20%	I-270 C-D Diverge to MD 28	Diverge	11	B	11	B	4%
I-270 C-D Weave between I-270 (to MD 28 from MD 189)	Weave	63	F	74	F	16%	I-270 C-D	Freeway	11	A	11	A	2%
I-270 C-D	Freeway	42	E	54	F	29%	I-270 C-D Merge from WB MD 28	Merge	12	B	13	B	5%
I-270 C-D Diverge to MD 28	Diverge	18	B	25	C	40%	I-270 C-D	Freeway	14	B	14	B	2%
I-270 C-D	Freeway	28	D	42	E	47%	I-270 C-D Merge from EB MD 28	Merge	26	C	34	D	32%
I-270 C-D Weave between MD 28 Ramps	Weave	28	C	30	C	7%	I-270 C-D	Freeway	32	D	51	F	62%
I-270 C-D	Freeway	26	D	31	D	17%	I-270 C-D Merge from I-270	Merge	20	B	34	D	73%
I-270 C-D Merge from MD 28 WB	Merge	28	C	37	E	33%	I-270 C-D	Freeway	44	E	49	F	10%
I-270 C-D Merge from I-270 and Drop Lane	Merge	34	D	48	F	43%	I-270 C-D Diverge to MD 189	Diverge	25	C	26	C	4%
I-270 C-D Diverge to I-270	Diverge	61	F	72	F	18%	I-270 C-D	Freeway	27	D	29	D	8%
I-270 C-D	Freeway	48	F	56	F	15%	I-270 C-D Merge from MD 189	Merge	27	C	29	D	8%
I-270 C-D Diverge to Shady Grove Rd	Diverge	14	B	18	B	30%	I-270 C-D Diverge to I-270	Diverge	34	D	37	E	9%
I-270 C-D	Freeway	130	F	122	F	-6%	I-270 C-D	Freeway	24	C	27	D	14%
I-270 C-D Merge from I-270 and EB Shady Grove Rd	Merge	140	F	132	F	-6%	I-270 C-D Diverge to WB Montrose Rd	Diverge	18	B	21	C	17%
I-270 C-D	Freeway	144	F	133	F	-8%	I-270 C-D	Freeway	23	C	26	D	15%
I-270 C-D Merge from WB Shady Grove Rd	Merge	146	F	141	F	-3%	I-270 Weave between Montrose Rd Loops	Weave	41	F	46	F	11%
I-270 C-D Diverge to I-270	Diverge	113	F	105	F	-7%	I-270 C-D	Freeway	15	B	15	B	-1%
I-270 C-D	Freeway	94	F	102	F	8%	I-270 C-D Merge from EB Montrose Rd	Merge	9	A	9	A	-2%
I-270 C-D Diverge to I-370	Diverge	64	F	73	F	14%	I-270 C-D	Freeway	18	B	17	B	-1%
I-270 C-D	Freeway	120	F	116	F	-3%							
I-270 Merge from I-370 EB	Merge	129	F	131	F	2%							
I-270 C-D	Freeway	139	F	140	F	1%							
I-270 C-D Weave from I-370 to I-270	Weave	134	F	141	F	6%							
I-270 C-D	Freeway	110	F	110	F	0%							
I-270 C-D Weave from I-270 to MD 117	Weave	114	F	111	F	-3%							
I-270 C-D Diverge to MD 124	Diverge	142	F	145	F	2%							
I-270 C-D	Freeway	178	F	176	F	-1%							
I-270 C-D Merge from EB MD 124	Merge	168	F	167	F	-1%							
I-270 C-D Merge From WB MD 124	Merge	154	F	153	F	-1%							
I-270 C-D	Freeway	144	F	142	F	-1%							

Table D.7: PM Peak -2040 Variable Speed Limit - I-270 Local Vehicle Density

	Type	No Build		VSL		% Change		Type	No Build		VSL		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS	
I-270 Northbound							I-270 Southbound						
I-270 C-D Merge from Watkins Mill	Merge	133	F	131	F	-1%							

Table D.8: PM Peak -2040 Variable Speed Limit- I-270 Vehicle Throughput

I-270 Northbound	No Build VISSIM Throughput	VSL VISSIM Throughput	% Change	I-270 Southbound	No Build VISSIM Throughput	VSL VISSIM Throughput	% Change
Between I-495 and MD 187	4113	4121	0%	North of I-70	2366	2366	0%
Between MD 187 on and off ramps	3710	3708	0%	Between I-70 on ramps	2703	2703	0%
Between Rockledge Blvd on and off ramps	3540	3547	0%	From I-70 interchange to MD-85	4047	4047	0%
Between Rockledge Dr and I-270 Spur	3873	3871	0%	Between MD-85 on and off ramps	2379	2379	0%
Between I-270 Spur and Montrose Rd	8718	8707	0%	Between MD-85 and MD-80	3075	3075	0%
Between Montrose Rd on and off ramps	5582	5548	-1%	Between MD-80 on and off ramps	2415	2414	0%
Between Montrose Rd and MD 189	5102	5092	0%	Between MD-80 and Md-109	2866	2864	0%
Between MD 189 and MD 28	5078	5043	-1%	Between MD-109 on and off ramps	2767	2767	0%
Between MD 28 on and off ramps	5014	4982	-1%	Between MD-109 and MD-121	2935	2933	0%
Between MD 28 and Shady Grove Rd	4214	4184	-1%	Between MD-121 on and off ramps	2413	2409	0%
Between Shady Grove Rd and I-370	3243	3217	-1%	Between MD-121 and MD-27	3354	3354	0%
Between I-370 on and off ramps	2749	2767	1%	Between MD-27 on and off ramps	3458	3451	0%
Between I-370 and MD 117	2851	2869	1%	Between MD-27 and MD-118	3773	3763	0%
Between MD 117 and MD 124	2432	2434	0%	Between MD-118 on and off ramps	3719	3708	0%
Between MD-124 on and off ramps	2547	2553	0%	Between MD-118 and Middlebrook Rd	4384	4374	0%
Between Watkins Mill Rd and Middlebrook Rd	4564	4578	0%	Between Middlebrook Rd on and off ramps	4382	4374	0%
Between Middlebrook Rd on and off ramps	4337	4345	0%	Between Middlebrook Rd and MD-124	5462	5479	0%
Between Middlebrook Rd and MD 118	3776	3785	0%	Between MD-124 on and off ramps	4179	4177	0%
Between MD-118 on and off ramps	3479	3476	0%	Between MD-124 and MD-117	5347	5382	1%
Between MD 118 and MD 27	3770	3754	0%	Between MD-117 and I-370	6905	6942	1%
Between MD-27 on and off ramps	2754	2746	0%	Between I-370 on and off ramps	3456	3462	0%
Between MD 27 and MD 121	3428	3405	-1%	Between I-370 on ramp to Shady Grove Rd	4990	5007	0%
Between MD-121 on and off ramps	2299	2273	-1%	Between Shady Grove Rd and MD 28	5157	5191	1%
Between MD 121 and MD 109	3931	3864	-2%	Between MD 28 on and off ramps	5327	5371	1%
Between MD-109 on and off ramps	3643	3578	-2%	Between MD 28 and MD 189	4678	4707	1%
Between MD 109 and MD 80	3831	3771	-2%	Between MD 189 and Montrose Rd	4678	4711	1%
Between MD-80 on and off ramps	3186	3136	-2%	Between Montrose Rd on and off ramps	5599	5635	1%
Between MD 80 and MD 85	3875	3811	-2%	Between Montrose Rd and I-270 Spur	7355	7369	0%
Between MD-85 on and off ramps	3257	3204	-2%	Between I-270 Spur and Rockledge Blvd	3320	3333	0%
Between MD 85 and I-70	5239	5169	-1%	Between Rockledge Blvd on and off ramps	2542	2551	0%
North of I-70	2739	2701	-1%	Between MD 187 on and off ramps	3011	3022	0%
				Between MD 187 and I-495	3393	3397	0%
I-270 Spur Northbound				I-270 Spur Southbound			
Between I-495 and Democracy Blvd	4568	4560	0%	Between I-270 Split and HOV on ramp	3187	3212	1%
Between Democracy Blvd on and off ramps	4101	4088	0%	Between HOV on ramp and Democracy Blvd	2329	2376	2%
Between Democracy Blvd and I-270 Split	4833	4819	0%	Between Democracy Blvd on and off ramps	1856	1892	2%
				Between Democracy Blvd and I-495	2227	2214	-1%

Table D.9: PM Peak - 2040 Variable Speed Limit- I-270 Local Vehicle Throughput

I-270 Local Northbound	No Build VISSIM Throughput	VSL VISSIM Throughput	% Change	I-270 Local Southbound	No Build VISSIM Throughput	VSL VISSIM Throughput	% Change
Between Montrose Rd EB off ramp and EB on ramp	1766	1762	0%	Between I-370 on ramp and I-270 off ramp	3064	3072	0%
Between Montrose Rd EB on ramp and WB off ramp	2079	2073	0%	Between I-270 off ramp and Shady Grove off ramp	1525	1530	0%
Between Montrose Rd WB off ramp and on ramp	1811	1807	0%	Between Shady Grove off ramp and Shady Grove WB on ramp	811	814	0%
Between Montrose Rd WB on ramp and I-270 on ramp	3211	3136	-2%	Between Shady Grove WB and EB on ramps	1431	1455	2%
Between I-270 on ramp and MD 189 off ramp	3392	3299	-3%	Between Shady Grove on ramp and I-270 on ramp	1957	2020	3%
Between MD 189 ramps	2697	2595	-4%	Between I-270 on ramp and I-270 off ramp1	2571	2637	3%
Between MD 189 off ramp and I-270 on ramp	3503	3403	-3%	Between I-270 off ramp1 and I-270 off ramp2	1808	1851	2%
Between I-270 on ramp and I-270 off ramp	4032	3935	-2%	Between I-270 off ramp2 and MD 28 off ramp	1648	1689	2%
Between I-270 off ramp and MD 28 EB off ramp	3156	3084	-2%	Between MD 28 off ramp and MD 28 WB on ramp	1153	1180	2%
Between MD 28 EB off ramp to MD 28 EB on ramp	2855	2788	-2%	Between MD 28 WB on ramp and MD 28 EB on ramp	1423	1449	2%
Between MD 28 EB on ramp and MD 28 WB off ramp	2994	2926	-2%	Between MD 28 EB on ramp and I-270 on ramp	2987	3013	1%
Between MD 28 WB off ramp and MD 28 WB on ramp	1879	1840	-2%	Between I-270 on ramp and MD 189 off ramp	3660	3686	1%
Between MD 28 WB on ramp and I-270 on ramp	2552	2515	-1%	Between MD 189 on and off ramps	2740	2759	1%
Between I-270 on ramp and I-270 off ramp	3027	2988	-1%	Between MD 189 on ramp and I-270 off ramp	3316	3340	1%
Between I-270 off ramp and Shady Grove off ramp	1718	1712	0%	Between I-270 off ramp and Montrose Rd off ramp	2399	2416	1%
Between Shady Grove off ramp and I-270 on ramp	468	511	9%	Between Montrose Rd off ramp and Montrose Rd WB on ramp	2155	2172	1%
Between I-270 on ramp and Shady Grove WB on ramp	2182	2303	6%	Between Montrose Rd WB on ramp and EB off ramp	2705	2697	0%
Between Shady Grove WB on ramp and I-270 off ramp	2671	2835	6%	Between Montrose Rd EB off and on ramps	1525	1508	-1%
Between I-270 off ramp and I-370 off ramp	2310	2454	6%	Between Montrose Rd EB off ramp and I-270	1845	1830	-1%
Between I-370 off ramp and I-370 EB on ramp	529	564	7%				
Between I-370 EB and WB on ramps	896	943	5%				
Between I-370 WB on ramp and I-270 off ramp	1577	1621	3%				
Between I-270 off ramp and I-270 on ramp	1008	1012	0%				
Between I-270 on ramp and MD 117 off ramp	1386	1396	1%				
Between MD 117 off ramp and MD 124 off ramp	920	936	2%				
Between MD 124 off ramp and MD 124 EB on ramp	346	348	1%				
Between MD 124 EB and WB on ramps	651	667	2%				
Between MD 124 on ramp I-270	812	837	3%				

Table D.10: PM Peak -2040 Variable Speed Limit- I-270 On Ramp Queue Length - Northbound

I-270 Northbound	No Build VISSIM Average Queue (feet)	VSL VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	VSL VISSIM Maximum Queue (feet)	% Change
Rockledge Dr on ramp	1	50	5518%	192	1	-99%
MD 189 C-D on ramp	610	51	-92%	4780	641	-87%
MD 28 C-D on ramp	994	52	-95%	4333	1039	-76%
Shady Grove Rd C-D on ramp	1762	53	-97%	4090	1936	-53%
I-370 C-D on ramp	3386	54	-98%	5049	3414	-32%
MD 124 C-D on ramp	4875	55	-99%	5069	4876	-4%
MD 118 on ramp	0	56	39900%	43	0	-100%
MD 27 EB on ramp	0	57	-	0	0	-
MD 27 WB on ramp	0	58	-	0	0	-
MD 121 on ramp	0	59	-	4	0	-100%
MD 109 on ramp	0	60	-	0	0	-
MD 80 on ramp	0	61	-	0	0	-
MD 85 on ramp	0	62	-	0	0	-
I-270 Spur Northbound	No Build VISSIM Average Queue (feet)	VSL VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	VSL VISSIM Maximum Queue (feet)	% Change
Democracy Blvd EB on ramp	0	63	-	9	0	-99%
Democracy Blvd WB on ramp	0	64	-	0	0	-
I-495 Northbound	No Build VISSIM Average Queue (feet)	VSL VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	VSL VISSIM Maximum Queue (feet)	% Change
Cabin John Pkwy on ramp	46	65	42%	903	30	-97%
MD 190 on ramp	0	66	14900%	48	0	-100%
I-270 C-D Northbound	No Build VISSIM Average Queue (feet)	VSL VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	VSL VISSIM Maximum Queue (feet)	% Change
Montrose Rd EB on ramp	0	67	-	0	0	-
Montrose Rd WB on ramp	916	68	-93%	2556	1246	-51%
I-270 on ramp	0	69	-	0	0	-
MD 189 on ramp	104	70	-33%	1084	141	-87%
I-270 on ramp	1	71	5917%	109	3	-98%
MD 28 EB on ramp	0	72	-	0	0	-
MD 28 WB on ramp	38	73	90%	652	80	-88%
Shady Grove Rd EB on ramp	1396	74	-95%	4077	1204	-70%
I-270 on ramp	1555	75	-95%	5058	562	-89%
Shady Grove Rd WB on ramp	739	76	-90%	1949	682	-65%
I-370 EB on ramp	1319	77	-94%	2422	1346	-44%
I-370 WB on ramp	1606	78	-95%	2548	1643	-36%
I-270 on ramp	4357	79	-98%	5055	4165	-18%
MD 124 EB on ramp	1831	80	-96%	2796	1871	-33%
MD 124 WB on ramp	98	81	-18%	700	65	-91%
Watkins Mill Rd on ramp	2665	191	-93%	3270	2473	-24%

Table D.11: PM Peak -2040 Variable Speed Limit- I-270 Off Ramp Queue Length - Northbound

I-270 Northbound	No Build VISSIM Average Queue (feet)	VSL VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	VSL VISSIM Maximum Queue (feet)	% Change
MD 187 off ramp NB	39	150	283%	309	38	-88%
MD 187 off ramp SB	0	151	-	0	0	-
Rockledge Dr off ramp	1	152	17173%	88	1	-99%
Tower Oaks Blvd off ramp	37	153	319%	219	35	-84%
Montrose Rd off ramp EB	0	154	-	0	0	-
Montrose Rd off ramp WB	0	155	-	0	0	-
MD 189 off ramp WB	26	156	496%	174	24	-86%
MD 189 off ramp EB	0	157	40156%	78	0	-100%
MD 28 off ramp EB	35	158	354%	215	35	-84%
MD 28 off ramp WB	0	159	-	0	0	-
Shady Grove Rd off ramp - Redland Blvd	0	160	-	0	0	-
Shady Grove Rd off ramp WB	40	161	306%	253	37	-85%
Shady Grove Rd off ramp EB	0	162	-	0	0	-
I-370 off ramp WB	8	163	1900%	162	0	-100%
I-370 off ramp EB	0	164	-	0	0	-
MD 117 off ramp	1835	165	-91%	2770	984	-64%
MD 124 off ramp	55	166	204%	626	53	-92%
Watkins Mill Rd off ramp	45	190	319%	627	40	-94%
Middlebrook Rd EB off ramp	0	167	-	0	0	-
Middlebrook Rd WB off ramp	0	168	-	0	0	-
MD 118 WB off ramp - Seneca Meadows	0	169	844900%	8	0	-100%
MD 118 WB off ramp	0	170	-	0	0	-
MD 118 EB off ramp	0	171	427400%	16	0	-100%
MD 27 off ramp WB	44	172	292%	252	47	-81%
MD 27 off ramp EB	0	173	-	0	0	-
MD 121 off ramp WB	70	174	148%	314	68	-78%
MD 121 off ramp EB	2	175	8155%	94	0	-100%
MD 109 off ramp EB	26	176	584%	251	20	-92%
MD 109 off ramp WB	0	177	-	0	0	-
MD 80 off ramp EB	21	178	759%	233	21	-91%
MD 80 off ramp WB	0	179	357900%	24	0	-100%
MD 85 NB off ramp	1	180	15971%	53	0	-100%
MD 85 SB off ramp	1	181	16659%	141	1	-100%
I-270 Spur Northbound	No Build VISSIM Average Queue (feet)	VSL VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	VSL VISSIM Maximum Queue (feet)	% Change
Clara Barton Pkwy off ramp EB	0	182	-	0	0	-
Clara Barton Pkwy off ramp WB	0	183	-	0	0	-
MD 190 off ramp EB	0	184	-	0	0	-
MD 190 off ramp WB	5	185	3795%	354	10	-97%
Democracy Blvd off ramp WB	41	186	349%	194	42	-79%
Democracy Blvd off ramp EB	17	187	997%	120	17	-86%

Table D.12: PM Peak-2040 Variable Speed Limit- I-270 On Ramp Queue Length - Southbound

I-270 Southbound	No Build VISSIM Average Queue (feet)	VSL VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	VSL VISSIM Maximum Queue (feet)	% Change
MD 85 on ramp	0	1	1567%	12	0	-99%
MD 80 on ramp	0	2	-	0	0	-
MD 109 on ramp	0	3	-	0	0	-
MD 121 WB on ramp	0	4	-	0	0	-
MD 121 EB on ramp	0	188	-	0	0	-
MD 27 WB on ramp	0	5	-	0	0	-
MD 27 EB on ramp	0	6	-	0	0	-
MD 118 WB on ramp	0	7	-	0	0	-
MD 118 EB on ramp	0	8	-	0	0	-
Middlebrook Rd on ramp	0	9	-	0	0	-
Watkins Mill Rd on ramp	0	0	-	0	0	-
MD 124 WB on ramp	1368	10	-99%	3492	1160	-67%
MD 117 on ramp	29	11	-62%	837	33	-96%
I-370 C-D on ramp	0	12	-	0	0	-
Shady Grove Rd C-D on ramp North	0	13	-	0	0	-
Shady Grove Rd C-D on ramp South	0	14	-	0	0	-
MD 189 C-D on ramp	0	15	-	0	0	-
Montrose Rd C-D on ramp	0	16	-	0	0	-
Rockledge Dr on ramp	0	17	-	0	0	-
MD 187 on ramp	0	18	-	0	0	-
I-270 Spur Southbound	No Build VISSIM Average Queue (feet)	VSL VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	VSL VISSIM Maximum Queue (feet)	% Change
Democracy Blvd on ramp	698	19	-97%	1919	675	-65%
I-495 Southbound	No Build VISSIM Average Queue (feet)	VSL VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	VSL VISSIM Maximum Queue (feet)	% Change
I-270 Spur on ramp	4555	20	-100%	5065	4528	-11%
MD 190 on ramp	184	21	-89%	956	15	-98%
I-270 C-D Southbound	No Build VISSIM Average Queue (feet)	VSL VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	VSL VISSIM Maximum Queue (feet)	% Change
I-270 on ramp	0	22	73233%	10	0	-100%
I-370 on ramp	0	23	4794%	80	0	-100%
Shady Grove Rd WB on ramp	0	24	-	0	0	-
Shady Grove Rd EB on ramp	0	25	-	0	0	-
I-270 on ramp	0	26	-	0	0	-
MD 28 WB on ramp	0	27	-	0	0	-
MD 28 EB on ramp	0	28	6567%	63	19	-70%
I-270 on ramp	0	29	-	0	0	-
MD 189 on ramp	0	30	-	0	1	-
Montrose Rd WB on ramp	1	31	2462%	115	33	-72%
Montrose Rd EB on ramp	0	32	-	0	0	-

Table D.13: PM Peak -2040 Variable Speed Limit- I-270 Off Ramp Queue Length - Southbound

I-270 Southbound	No Build VISSIM Average Queue (feet)	VSL VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	VSL VISSIM Maximum Queue (feet)	% Change
MD 85 SB off ramp	22	100	363%	383	2	-99%
MD 85 NB off ramp	17	101	512%	354	12	-97%
MD 80 off ramp	2	102	6356%	204	3	-98%
MD 109 off ramp WB	1	103	20096%	88	1	-99%
MD 109 off ramp EB	0	104	-	0	0	-
MD 121 off ramp EB	217	105	-52%	970	236	-76%
MD 121 off ramp WB	0	106	26400%	137	0	-100%
MD 27 off ramp EB	22	107	390%	137	23	-83%
MD 27 off ramp WB	1	108	11639%	65	0	-99%
MD 118 off ramp EB	24	109	360%	142	24	-83%
MD 118 off ramp WB	0	110	366567%	23	0	-100%
Watkins Mill Rd off ramp	103	189	84%	384	108	-72%
MD 124 off ramp EB	185	111	-40%	731	200	-73%
MD 124 off ramp WB	17	112	566%	445	15	-97%
I-370 off ramp WB	147	113	-23%	725	0	-100%
I-370 off ramp EB	0	114	-	0	0	-
Shady Grove Rd off ramp - Omega Drive	1	115	19392%	52	0	-99%
Shady Grove Rd off ramp	0	116	-	0	0	-
MD 28 off ramp	3	117	4170%	149	3	-98%
MD 189 off ramp EB	108	118	9%	433	106	-75%
MD 189 off ramp WB	0	119	-	0	0	-
Montrose Rd off ramp WB	0	120	-	0	0	-
Montrose Rd off ramp EB	4	121	2987%	337	17	-95%
Rockledge Dr off ramp	155	122	-21%	641	123	-81%
I-270 Spur Southbound	No Build VISSIM Average Queue (feet)	VSL VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	VSL VISSIM Maximum Queue (feet)	% Change
Democracy Blvd off ramp EB	20	123	500%	136	23	-83%
Democracy Blvd off ramp WB	0	124	-	0	0	-
MD 190 off ramp WB	80	125	57%	797	83	-90%
MD 190 off ramp EB	0	126	-	0	0	-
Clara Barton Pkwy WB off ramp	0	127	1269900%	6	0	-100%

Table D.14: PM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
1- MD 85 at Sam's Club Drive											
1	NB	60.8	E	NB Left	134	78	463	889	E	115.6	F
				NB Through	570	38	463	889	D		
				NB Right	935	72	443	912	E		
	SB	179.8	F	SB Left	153	131	1021	1231	F		
				SB Through	874	186	1021	1231	F		
				SB Right	74	209	1021	1231	F		
	EB	35.0	C	EB Left	55	84	32	144	F		
				EB Through	24	81	32	144	F		
				EB Right	169	13	32	144	B		
	WB	163.6	F	WB Left	561	181	536	762	F		
				WB Through	30	166	536	762	F		
				WB Right	224	119	536	762	F		
2- MD 85 at I-270 NB on and off ramp											
2	NB	58.5	E	NB Left	1136	58	700	1857	E	48.2	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	32.6	C	SB Left	0	0	0	0	A		
				SB Through	743	33	132	737	C		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
3- MD 85 at I-270 SB on and off ramp											
3	NB	17.3	B	NB Left	0	0	0	0	A	19.5	B
				NB Through	1975	17	181	1210	B		
				NB Right	0	0	0	0	A		
	SB	44.0	D	SB Left	173	44	74	582	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
4- MD 85 at Crestwood Blvd											
4	NB	68.0	F	NB Left	74	103	368	830	F	51.3	D
				NB Through	1450	66	367	830	E		
				NB U-Turn	0	0	0	0	A		
	SB	31.9	C	SB Left	105	83	53	246	F		
				SB Through	940	30	105	1039	C		
				SB Right	923	28	92	1030	C		
	EB	63.3	E	EB Left	949	66	196	744	E		
				EB Through	43	51	196	744	D		
				EB Right	28	1	196	744	A		
	WB	53.0	D	WB Left	44	78	60	230	E		
				WB Through	79	81	60	230	F		
				WB Right	94	18	60	230	B		
5- MD 80 at I-270 NB on and ramp											
5	NB	-0.9	A	NB Left	1	9	0	4	A	11.5	B
				NB Through	2	0	0	4	A		
				NB Right	7	-3	0	4	A		
	SB	12.8	B	SB Left	479	16	27	238	B		
				SB Through	22	16	27	238	B		
				SB Right	149	3	0	0	A		
			EB Left	97	14	24	208	B			

Table D.14: PM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
	EB	13.6	B	EB Through	0	0	8	0	A		
				EB Right	5	10	37	239	B		
	WB	10.7	B	WB Left	15	14	0	38	B		
				WB Through	670	18	66	419	B		
				WB Right	612	2	0	0	A		
6- MD 80 at I-270 SB on and off ramp											
6	NB	3.4	A	NB Left	55	5	3	239	A	5.9	A
				NB Through	0	0	0	0	A		
				NB Right	605	3	3	239	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	7.1	A	EB Left	0	0	0	0	A		
				EB Through	382	8	4	111	A		
				EB Right	66	4	4	119	A		
	WB	8.4	A	WB Left	0	0	0	0	A		
				WB Through	446	8	3	163	A		
				WB Right	0	0	0	0	A		
7- MD 109 at I-270 NB on and off ramp											
7	NB			NB Left	0	0	0	0	A	7.9	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	15.2	C	SB Left	317	16	34	268	C		
				SB Through	0	0	0	0	A		
				SB Right	25	6	1	162	A		
	EB	2.5	A	EB Left	80	2	0	47	A		
				EB Through	0	0	0	0	A		
				EB Right	83	3	0	0	A		
	WB	0.4	A	WB Left	0	0	0	0	A		
				WB Through	222	0	0	0	A		
				WB Right	0	0	0	0	A		
8- MD 80 at I-270 SB on and off ramp											
8	NB	4.9	A	NB Left	63	8	3	120	A	1.8	A
				NB Through	0	0	0	0	A		
				NB Right	36	0	0	63	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.9	A	EB Left	0	0	0	0	A		
				EB Through	166	0	0	0	A		
				EB Right	34	4	0	0	A		
	WB	1.4	A	WB Left	137	1	0	58	A		
				WB Through	110	2	0	30	A		
				WB Right	0	0	0	0	A		
9- MD 121 at Gateway Center Dr											
9	NB	29.4	D	NB Left	590	33	112	604	C	47.0	D
				NB Through	795	28	112	604	C		
				NB Right	64	16	119	630	B		
	SB	22.6	C	SB Left	28	15	19	219	B		
				SB Through	300	24	31	223	C		
				SB Right	9	13	34	244	B		
	EB	14.9	B	EB Left	4	40	8	196	D		
				EB Through	24	41	15	229	D		
				EB Right	248	12	27	261	B		
	WB	117.1	F	WB Left	349	162	304	715	F		
				WB Through	75	73	304	714	E		
				WB Right	186	51	327	739	D		
10- MD 121 at I-270 NB on and off ramp											
	NB	22.1	C	NB Left	372	59	77	320	F		
				NB Through	0	0	0	0	A		

Table D.14: PM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
10	SB			NB Right	785	4	1	73	A	18.1	B
				SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	11.8	B	EB Left	0	0	0	0	A		
				EB Through	651	18	38	367	C		
				EB Right	336	1	0	0	A		
				WB Left	219	60	86	412	F		
	WB	20.0	C	WB Through	682	7	86	412	A		
				WB Right	0	0	0	0	A		

Table D.14: PM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
11- MD 121 at I-270 SB on and off ramp											
11	NB			NB Left	0	0	0	0	A	22.3	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	62.3	E	SB Left	271	85	226	977	F		
				SB Through	0	0	0	0	A		
				SB Right	254	39	0	49	E		
	EB	6.5	A	EB Left	0	0	0	0	A		
				EB Through	717	6	16	229	A		
				EB Right	0	0	0	0	A		
	WB	13.2	B	WB Left	0	0	0	0	A		
				WB Through	520	27	46	382	D		
				WB Right	538	0	0	0	A		
12- MD 27 at Observation Dr											
12	NB	37.7	D	NB U-Turn	0	0	0	0	A	24.8	C
				NB Through	94	55	22	98	E		
				NB Right	61	11	22	98	B		
	SB	41.3	D	SB Left	146	44	38	216	D		
				SB Through	57	62	43	250	E		
				SB Right	188	33	69	287	C		
	EB	18.6	B	EB Left	189	33	70	458	C		
				EB Through	2012	17	71	459	B		
				EB Right	97	16	84	497	B		
	WB	27.9	C	WB Left	41	24	149	731	C		
				WB Through	1695	29	149	731	C		
				WB Right	69	9	149	731	A		
13- MD 27 at I-270 NB off ramp											
13	NB	47.2	D	NB Left	303	47	52	260	D	6.5	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.1	A	EB Left	0	0	0	0	A		
				EB Through	1512	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	4.9	A	WB Left	0	0	0	0	A		
				WB Through	1791	5	37	726	A		
				WB Right	0	0	0	0	A		
14- MD 27 at I-270 SB off ramp											
14	NB			NB Left	0	0	0	0	A	5.2	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	50.1	D	SB Left	174	50	33	150	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	1.8	A	EB Left	0	0	0	0	A		
				EB Through	1677	2	4	89	A		
				EB Right	0	0	0	0	A		
	WB	3.7	A	WB Left	0	0	0	0	A		
				WB Through	1541	4	12	384	A		
				WB Right	0	0	0	0	A		
15- MD 27 at Crystal Rock Dr											
15	NB	31.1	C	NB Left	77	30	107	545	C	70.1	E
				NB Through	1196	31	116	545	C		
				NB Right	55	29	123	558	C		
	SB	56.5	E	SB Left	157	74	381	1298	E		
				SB Through	1468	58	381	1298	E		
				SB Right	225	33	368	1291	C		
				EB Left	125	53	34	129	D		

Table D.14: PM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
	EB	40.4	D	EB Through	49	36	30	124	D		
				EB Right	62	18	23	156	B		
				WB Left	104	99	1056	1511	F		
	WB	163.8	F	WB Through	127	110	1056	1511	F		
				WB Right	665	184	1056	1511	F		
16- MD 118 at Seneca Meadows Pkwy											
16	NB	4.9	A	NB Left	97	14	2	77	B	9.0	A
				NB Through	1309	4	11	182	A		
				NB Right	1	-1	19	235	A		
	SB	7.4	A	SB Left	15	8	19	307	A		
				SB Through	1226	7	22	307	A		
				SB Right	11	5	25	340	A		
	EB	14.0	B	EB Left	23	59	14	138	E		
				EB Through	0	65	14	138	E		
				EB Right	312	11	14	138	B		
	WB	53.8	D	WB Left	103	65	43	243	E		
				WB Through	7	69	39	242	E		
				WB Right	30	13	48	262	B		
17- MD 118 at I-270 NB on ramp											
17	NB			NB Left	0	0	0	0	A	13.8	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	26.5	C	EB Left	493	26	43	299	C		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	10.0	A	WB Left	0	0	0	0	A		
				WB Through	283	2	1	139	A		
				WB Right	1361	12	46	611	B		
18- MD 118 at I-270 SB off ramp											
18	NB			NB Left	0	0	0	0	A	7.1	A
				NB Through	0	0.0	0	0	A		
				NB Right	0	0.0	0	0	A		
	SB	37.7	D	SB Left	169	37.7	27	145	D		
				SB Through	0	0.0	0	0	A		
				SB Right	0	0.0	0	0	A		
	EB	5.5	A	EB Left	0	0.0	0	0	A		
				EB Through	1407	5.5	13	384	A		
				EB Right	0	0.0	0	0	A		
	WB	5.1	A	WB Left	0	0.0	0	0	A		
				WB Through	1499	5.1	10	218	A		
				WB Right	0	0.0	0	0	A		
19- MD 118 at Aircraft Dr											
19	NB	26.2	C	NB Left	53	72	43	241	E	43.0	D
				NB Through	53	70	43	241	E		
				NB Right	227	5	5	87	A		
	SB	165.9	F	SB Left	436	156	419	656	F		
				SB Through	14	205	419	656	F		
				SB Right	126	195	419	656	F		
	EB	22.6	C	EB Left	125	31	89	536	C		
				EB Through	1415	22	89	536	C		
				EB Right	21	20	89	536	B		
	WB	24.3	C	WB Left	15	30	107	749	C		
				WB Through	1399	28	107	749	C		
				WB Right	367	8	107	749	A		
20- Middlebrook Rd at Observation Dr											
	NB			NB Left	0	0	0	0	A		
				NB Through	0	0	0	0	A		

Table D.14: PM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
20	SB	20.5	C	NB Right	0	0	0	0	A	9.0	A
				SB Left	124	36	23	150	D		
				SB Through	0	0	0	0	A		
				SB Right	186	10	23	150	B		
	EB	6.0	A	EB Left	14	11	15	149	B		
				EB Through	1053	6	15	149	A		
				EB Right	0	0	0	0	A		
	WB	8.8	A	WB Left	0	0	0	0	A		
				WB Through	1313	9	27	253	A		
				WB Right	17	7	42	302	A		

Table D.14: PM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
21- Middlebrook Rd at I-270 SB on ramp											
21	NB			NB Left	0	0	0	0	A	4.6	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	2.7	A	EB Left	0	0	0	0	A		
				EB Through	742	3	4	110	A		
				EB Right	0	0	0	0	A		
	WB	7.8	A	WB Left	438	8	5	236	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
22- Middlebrook Rd at Waring Station Rd											
22	NB	48.4	D	NB Left	200	46	83	309	D	13.7	B
				NB Through	1	55	83	309	D		
				NB Right	236	50	83	309	D		
	SB	30.1	C	SB Left	32	47	8	72	D		
				SB Through	2	38	8	72	D		
				SB Right	24	7	19	110	A		
	EB	8.0	A	EB Left	4	11	28	285	B		
				EB Through	1125	8	28	285	A		
				EB Right	198	7	28	285	A		
	WB	8.6	A	WB Left	210	21	28	289	C		
				WB Through	1437	7	28	289	A		
				WB Right	3	3	28	289	A		
23- MD 124 at MD 355											
23	NB	130.8	F	NB Left	490	115	682	1082	F	78.6	E
				NB Through	1162	138	680	1079	F		
				NB Right	7	85	0	0	F		
	SB	44.6	D	SB Left	180	92	146	490	F		
				SB Through	698	66	146	490	E		
				SB Right	720	12	44	383	B		
	EB	27.2	C	EB Left	291	68	108	598	E		
				EB Through	1615	25	108	598	C		
				EB Right	338	3	28	551	A		
	WB	126.4	F	WB Left	0	0	0	0	A		
				WB Through	1645	129	683	946	F		
				WB Right	88	83	0	3	F		
24- MD 124 at I-270 SB on and off											
24	NB	95.9	F	NB Left	55	84	67	182	F	63.0	E
				NB Through	21	127	67	182	F		
				NB U-Turn	0	0	0	0	A		
	SB	55.4	E	SB Left	547	95	190	736	F		
				SB Through	8	98	190	736	F		
				SB Right	456	7	13	379	A		
	EB	101.1	F	EB Left	0	0	0	0	A		
				EB Through	1409	100	584	1113	F		
				EB Right	22	162	604	1137	F		
	WB	21.7	C	WB Left	5	78	653	2194	E		
				WB Through	1192	22	653	2194	C		
				WB Right	0	0	0	0	A		
25- MD 117 at MD 124											
25	NB	78.5	E	NB Left	54	158	328	743	F	50.1	D
				NB Through	686	93	328	743	F		
				NB Right	461	48	29	665	D		
	SB	37.8	D	SB Left	134	61	153	737	E		
				SB Through	969	41	153	737	D		
				SB Right	182	5	0	0	A		
	EB			EB Left	153	80	152	574	E		

Table D.14: PM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
	EB	44.9	D	EB Through	1156	41	152	576	D		
				EB Right	57	37	156	603	D		
	WB	42.6	D	WB Left	315	71	205	1006	E		
				WB Through	1069	38	205	1006	D		
				WB Right	99	1	0	0	A		
26- MD 117 at Bureau Dr											
26	NB	50.3	D	NB Left	98	76	81	296	E	37.8	D
				NB Through	35	77	81	296	E		
				NB Right	272	38	81	296	D		
	SB	80.7	F	SB Left	284	95	132	405	F		
				SB Through	23	83	132	405	F		
				SB Right	83	32	132	405	C		
	EB	30.3	C	EB Left	52	54	165	806	D		
				EB Through	1683	30	166	806	C		
				EB Right	6	18	160	795	B		
				WB Left	14	35	185	997	D		
WB	31.9	C	WB Through	1272	34	186	998	C			
			WB Right	213	19	211	1046	B			
			27- MD 117 at I-270 SB off ramp								
27	NB			NB Left	0	0	0	0	A	12.8	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	3.7	A	EB Left	0	0	0	0	A		
				EB Through	944	4	6	464	A		
				EB Right	0	0	0	0	A		
				WB Left	306	41	98	848	E		
WB	40.7	E	WB Through	0	0	0	0	A			
			WB Right	0	0	0	0	A			
			28- MD 117 at I-270 NB off ramp								
28	NB			NB Left	0	0	0	0	A	24.3	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	89.3	F	SB Left	97	91	1950	2779	F		
				SB Through	0	0	0	0	A		
				SB Right	374	89	1949	2779	F		
	EB	17.3	B	EB Left	3	120	90	983	F		
				EB Through	947	17	90	983	B		
				EB Right	0	0	0	0	A		
				WB Left	0	0	0	0	A		
WB	7.3	A	WB Through	1403	7	52	390	A			
			WB Right	0	0	52	390	A			
			29- MD 117 at Perry Pkwy								
29	NB	40.8	D	NB Left	19	59	17	125	E	49.4	D
				NB Through	26	59	17	124	E		
				NB Right	34	17	27	145	B		
	SB	162.4	F	SB Left	241	198	280	446	F		
				SB Through	21	220	280	446	F		
				SB Right	121	82	280	446	F		
	EB	21.1	C	EB Left	223	69	74	337	E		
				EB Through	778	8	74	337	A		
				EB Right	30	7	60	321	A		
				WB Left	37	108	248	736	F		
WB	41.4	D	WB Through	1260	42	248	736	D			
			WB Right	382	33	248	736	C			
			30- Shady Grove Rd at I-270 NB off ramp								
	NB	7.6	A	NB Left	0	0	0	0	A		
				NB Through	914	8	87	483	A		

Table D.14: PM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS					
30	SB	44.7	D	NB Right	0	0	0	0	A	30.1	C					
				SB Left	0	0	0	0	A							
				SB Through	1013	45	163	681	D							
	EB				SB Right	0	0	0	0			A				
					EB Left	0	0	0	0			A				
					EB Through	0	0	0	0			A				
					EB Right	0	0	0	0			A				
					WB	51.6	D		WB Left			267	52	48	264	D
									WB Through			0	0	0	0	A
	WB Right	0	0	0					0			A				

Table D.14: PM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
31- Shady Grove Rd at I-270 SB off ramp											
31	NB	31.3	C	NB Left	0	0	0	0	A	29.5	C
				NB Through	1229	31	435	1759	C		
				NB Right	0	0	0	0	A		
	SB	5.6	A	SB Left	0	0	0	0	A		
				SB Through	676	6	7	154	A		
				SB Right	0	0	0	0	A		
	EB	55.6	E	EB Left	232	54	43	211	D		
				EB Through	0	0	0	0	A		
				EB Right	304	57	62	297	E		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
32- MD 28 at I-270 SB off ramp											
32	NB			NB U-Turn	0	0	0	0	A	7.9	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	37.2	D	SB Left	406	46	71	322	D		
				SB Through	0	0	0	0	A		
				SB Right	97	3	0	28	A		
	EB	2.8	A	EB Left	0	0	0	0	A		
				EB Through	1560	1	0	0	A		
				EB Right	932	6	16	224	A		
	WB	6.7	A	WB Left	0	0	0	0	A		
				WB Through	1642	7	20	253	A		
				WB Right	0	0	0	0	A		
33- MD 28 at I-270 on and off ramps											
33	NB	36.9	D	NB Left	0	0	41	226	A	39.9	D
				NB Through	185	49	49	235	D		
				NB Right	123	18	49	235	B		
	SB	137.2	F	SB Left	14	160	361	412	F		
				SB Through	0	0	0	0	A		
				SB Right	219	136	361	412	F		
	EB	20.0	B	EB Left	283	61	94	334	E		
				EB Through	920	7	94	334	A		
				EB Right	0	0	0	0	A		
	WB	41.7	D	WB Left	40	37	168	432	D		
				WB Through	1279	42	144	396	D		
				WB Right	0	0	0	0	A		
34- MD 189 at Great Falls Rd											
34	NB	36.7	D	NB Left	43	45	12	90	D	13.2	B
				NB Through	14	48	9	90	D		
				NB Right	19	9	9	101	A		
	SB	3.4	A	SB Left	18	41	7	83	D		
				SB Through	13	48	7	83	D		
				SB Right	408	0	3	48	A		
	EB	11.6	B	EB Left	410	23	37	417	C		
				EB Through	644	5	6	200	A		
				EB Right	55	5	10	236	A		
	WB	18.0	B	WB Left	14	19	52	406	B		
				WB Through	842	18	51	406	B		
				WB Right	18	12	67	440	B		
35- MD 189 at I-270 Ramps											
35	NB	47.1	D	NB Left	225	47	41	196	D	42.5	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	54.4	D	SB Left	348	54	124	453	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
				EB Left	479	32	91	341	C		

Table D.14: PM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
	EB	28.0	C	EB Through	373	23	91	341	C		
				EB Right	0	0	0	A			
	WB	50.8	D	WB Left	443	54	111	336	D		
				WB Through	428	47	111	336	D		
				WB Right	0	0	0	A			
36- MD 189 at Wooton Pkwy											
36	NB	45.9	D	NB Left	238	57	142	506	E	52.4	D
				NB Through	694	51	142	506	D		
				NB Right	176	12	142	506	B		
	SB	82.8	F	SB Left	250	101	295	794	F		
				SB Through	926	78	312	780	E		
				SB Right	0	0	0	A			
	EB	38.7	D	EB Left	153	72	123	486	E		
				EB Through	552	38	123	486	D		
				EB Right	204	15	123	486	B		
	WB	39.5	D	WB Left	157	72	141	743	E		
				WB Through	775	41	141	743	D		
				WB Right	315	19	141	743	B		
37- Montrose Rd at Tower Oaks Blvd											
37	NB	0.4	A	NB Left	0	0	0	0	A	32.4	C
				NB Through	0	0	0	0	A		
				NB Right	537	0	0	0	A		
	SB	143.6	F	SB Left	87	49	213	902	D		
				SB Through	0	0	0	0	A		
				SB Right	305	171	269	899	F		
	EB	6.9	A	EB Left	0	0	0	0	A		
				EB Through	1868	7	39	520	A		
				EB Right	0	0	0	0	A		
	WB	40.0	D	WB Left	79	37	39	520	D		
WB Through				2426	41	277	780	D			
WB Right				261	30	277	780	C			
38- Tower Oaks Blvd at I-270 off ramp											
38	NB	23.3	C	NB Left	707	24	50	240	C	17.3	B
				NB Through	0	0.0	43	232	A		
				NB Right	26	7.0	50	240	A		
	SB	9.8	A	SB Left	8	18.4	1	39	B		
				SB Through	0	0.0	1	39	A		
				SB Right	9	2.2	0	23	A		
	EB	10.8	B	EB Left	1	11.5	16	177	B		
				EB Through	363	11.2	16	177	B		
				EB Right	37	7.0	11	167	A		
	WB	12.7	B	WB Left	139	16.3	16	145	B		
WB Through				203	10.4	16	145	B			
WB Right				3	3.4	3	100	A			
39- Montrose Rd at Tower Oaks Blvd											
39	NB	20.0	C	NB Left	97	42	83	387	D	45.0	D
				NB Through	773	32	83	387	C		
				NB Right	621	2	0	0	A		
	SB	32.1	C	SB Left	210	63	76	334	E		
				SB Through	506	23	74	333	C		
				SB Right	131	15	72	340	B		
	EB	133.4	F	EB Left	104	112	358	697	F		
				EB Through	518	136	360	698	F		
				EB Right	44	149	382	722	F		
	WB	36.9	D	WB Left	542	46	109	374	D		
				WB Through	456	42	110	374	D		
				WB Right	315	13	129	404	B		
40- Rockledge Blvd at I-270 NB on and off ramp											
	NB	132.4	F	NB Left	0	0	0	0	A		
				NB Through	335	121	557	836	F		

Table D.14: PM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
40	SB	85.9	F	NB Right	854	137	557	836	F	112.4	F
				SB Left	0	0	89	217	A		
				SB Through	352	86	89	217	F		
				SB Right	0	0	0	0	A		
	EB	93.5	F	EB Left	6	184	288	804	F		
				EB Through	459	148	288	804	F		
				EB Right	304	10	0	0	B		
				WB Left	0	0	0	0	A		
	WB			WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table D.14: PM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
41- Rockledge Blvd at I-270 SB on and off ramps											
41	NB	30.3	C	NB Left	343	30	76	273	C	48.1	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	53.0	D	WB Left	355	59	195	867	E		
				WB Through	890	51	195	867	D		
				WB Right	0	0	0	0	A		
42- MD 187 at Tuckerman Ln											
42	NB	66.6	E	NB Left	216	39	567	1282	D	128.7	F
				NB Through	2309	68	567	1282	E		
				NB Right	200	76	567	1282	E		
	SB	187.6	F	SB Left	205	172	2555	2693	F		
				SB Through	1151	185	2555	2693	F		
				SB Right	306	209	2555	2693	F		
	EB	112.4	F	EB Left	302	66	540	1403	E		
				EB Through	534	136	541	1404	F		
				EB Right	118	121	564	1428	F		
	WB	195.5	F	WB Left	465	191	1941	2142	F		
				WB Through	674	211	1941	2142	F		
				WB Right	166	145	1941	2142	F		
43- MD 187 at I-270 NB on and off ramps											
43	NB	16.8	B	NB Left	566	35	117	404	C	20.4	C
				NB Through	2515	13	117	404	B		
				NB Right	0	0	0	0	A		
	SB	25.1	C	SB Left	0	0	0	0	A		
				SB Through	1290	25	66	269	C		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	60.3	E	WB Left	59	60	47	317	E		
				WB Through	67	60	47	317	E		
				WB Right	0	0	0	0	A		
44- MD 187 at I-270 NB on and off ramps											
44	NB	40.0	E	NB Left	0	0	0	0	A	36.9	D
				NB Through	2426	40	155	739	D		
				NB Right	0	0	0	0	A		
	SB	18.1	B	SB Left	147	56	67	271	E		
				SB Through	1203	13	67	271	B		
				SB Right	0	0	0	0	A		
	EB	58.2	E	EB Left	652	60	143	560	E		
				EB Through	0	0	143	560	A		
				EB Right	179	53	82	486	D		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
45- MD 187 at Rock Spring Dr											
45	NB	20.6	C	NB Left	492	37	123	826	D	29.8	C
				NB Through	2174	17	124	827	B		
				NB Right	18	14	145	860	B		
	SB	34.2	C	SB Left	21	62	111	472	E		
				SB Through	1186	39	111	472	D		
				SB Right	173	1	69	465	A		
	EB Left	431	60	146	519	E					

Table D.14: PM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
	EB	50.0	D	EB Through	50	68	146	519	E		
				EB Right	484	39	146	519	D		
	WB	17.1	B	WB Left	7	29	6	108	C		
				WB Through	16	33	6	108	C		
				WB Right	36	8	3	97	A		
47-Democracy Blvd at I-270 NB off ramp											
47	NB	45.3	D	NB Left	154	45	28	136	D	3.0	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	1.2	A	EB Left	0	0	0	0	A		
				EB Through	1127	1	3	66	A		
				EB Right	0	0	0	0	A		
	WB	1.1	A	WB Left	0	0	0	0	A		
				WB Through	2241	1	3	84	A		
WB Right				0	0	0	0	A			
48- Democracy Blvd at I-270 SB on ramp											
48	NB			NB Left	0	0	0	0	A	8.4	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	5.5	A	EB Left	0	0	0	0	A		
				EB Through	1336	5	19	232	A		
				EB Right	0	0	0	0	A		
	WB	10.1	B	WB Left	543	35	59	404	D		
				WB Through	1827	3	49	383	A		
WB Right				0	0	0	0	A			
49- Democracy Blvd at I-270 SB off ramp											
49	NB			NB Left	0	0	0	0	A	8.8	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	37.4	D	SB Left	154	51	28	143	D		
				SB Through	0	0	0	0	A		
				SB Right	59	2	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	5.8	A	WB Left	0	0	0	0	A		
				WB Through	1827	4	19	305	A		
WB Right				156	29	116	746	C			
50- MD 190 at Burdette Rd											
50	NB	76.4	E	NB Left	27	79	18	118	E	36.6	D
				NB Through	7	69	18	118	E		
				NB Right	6	75	18	118	E		
	SB	37.5	D	SB Left	45	77	25	148	E		
				SB Through	9	72	25	148	E		
				SB Right	122	20	25	148	C		
	EB	21.6	C	EB Left	138	99	113	625	F		
				EB Through	1297	14	113	625	B		
				EB Right	31	4	99	653	A		
	WB	45.7	D	WB Left	13	114	390	1119	F		
				WB Through	2161	46	390	1119	D		
WB Right				65	35	390	1119	C			

Table D.14: PM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
51- MD 190 at I-270 NB on ramp											
51	NB			NB Left	0	0	0	0	A	17.6	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	65.7	E	EB Left	254	66	101	343	E		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	9.3	A	WB Left	0	0	0	0	A		
				WB Through	1471	9	49	692	A		
				WB Right	0	0	0	0	A		
52- MD 190 at I-270 SB off ramp											
52	NB	70.5	E	NB Left	225	70	84	800	E	12.3	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	3.6	A	EB Left	0	0	0	0	A		
				EB Through	1062	4	8	176	A		
				EB Right	0	0	0	0	A		
	WB	10.0	A	WB Left	0	0	0	0	A		
				WB Through	1641	10	30	635	A		
				WB Right	0	0	0	0	A		
53- MD 190 at Seven Locks Rd											
53	NB	0.5	A	NB Left	28	1	0	0	A	26.9	C
				NB Through	314	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	52.6	D	SB Left	364	52	120	414	D		
				SB Through	232	53	120	414	D		
				SB Right	20	50	120	414	D		
	EB	32.0	C	EB Left	27	30	95	436	C		
				EB Through	800	32	95	436	C		
				EB Right	45	32	95	436	C		
	WB	20.8	C	WB Left	255	75	124	491	E		
				WB Through	914	18	124	491	B		
				WB Right	693	5	124	491	A		
54- MD 124 at I-270 NB off ramp											
54	NB	31.3	C	NB Left	0	0	0	0	A	23.6	C
				NB Through	0	0	0	0	A		
				NB Right	556	31	56	630	C		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	21.1	C	EB Left	0	0	0	0	A		
				EB Through	1661	21	57	938	C		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
55- Democracy Blvd at I-270 NB off ramp											
55	NB	46.2	D	NB Left	0	0	0	0	A	11.2	B
				NB Through	0	0	0	0	A		
				NB Right	313	46	51	205	D		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
			EB Left	0	0	0	0	A			

Table D.14: PM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
	EB	1.5	A	EB Through	1128	2	4	59	A		
				EB Right	0	0	0	0	A		
	WB	WB Left	0	0	0	0	A				
		WB Through	0	0	0	0	A				
		WB Right	0	0	0	0	A				
56- Watkins Mill Rd at I-270 SB off ramp/Parkview Ave											
56	NB	71.3	E	NB Left	145	53	170	656	D	87.9	F
				NB Through	0	0	0	0	A		
				NB Right	342	79	170	656	E		
	SB	42.7	D	SB Left	410	63	107	388	E		
				SB Through	110	59	107	388	E		
				SB Right	441	20	107	388	C		
	EB	143.5	F	EB Left	0	0	0	0	A		
				EB Through	1216	144	961	1246	F		
				EB Right	4	136	961	1246	F		
				WB Left	62	85	49	220	F		
	WB	41.9	D	WB Through	295	33	47	219	C		
WB Right				0	0	0	0	A			
57- Watkins Mill Rd at I-270 NB on ramp											
57	NB	40.5	D	NB Left	77	65	56	638	E	72.4	E
				NB Through	0	0	0	0	A		
				NB Right	193	31	56	638	C		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	26.1	C	EB Left	644	66	146	438	E		
				EB Through	1051	2	146	438	A		
				EB Right	0	0	0	0	A		
				WB Left	0	0	0	0	A		
	WB	157.1	F	WB Through	684	122	651	866	F		
WB Right				343	227	651	866	F			
58- Watkins Mill Rd at I-270 SB on ramp											
58	NB			NB Left	0	0	0	0	A	16.5	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	17.2	B	EB Left	0	0	0	0	A		
				EB Through	1691	19	150	598	B		
				EB Right	286	8	150	598	A		
	WB	14.8	B	WB Left	409	27	46	464	C		
				WB Through	352	1	46	464	A		
WB Right				0	0	0	0	A			

Table D.15: PM Peak -2040 Variable Speed Limit- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
1- MD 85 at Sam's Club Drive											
1	NB	65.7	E	NB Left	134	78	507	885	E	120.1	F
				NB Through	571	40	507	885	D		
				NB Right	932	80	488	909	E		
	SB	181.0	F	SB Left	150	128	1023	1231	F		
				SB Through	861	187	1023	1231	F		
				SB Right	73	215	1023	1231	F		
	EB	34.5	C	EB Left	55	85	31	141	F		
				EB Through	24	81	31	141	F		
				EB Right	169	12	31	141	B		
	WB	175.2	F	WB Left	553	193	561	754	F		
				WB Through	29	184	561	754	F		
				WB Right	222	130	561	754	F		
2- MD 85 at I-270 NB on and off ramp											
2	NB	59.0	E	NB Left	1120	59	728	1874	E	47.5	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	30.1	C	SB Left	0	0	0	0	A		
				SB Through	736	30	115	551	C		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
3- MD 85 at I-270 SB on and off ramp											
3	NB	21.7	C	NB Left	0	0	0	0	A	23.4	C
				NB Through	1950	22	250	1380	C		
				NB Right	0	0	0	0	A		
	SB	42.8	D	SB Left	172	43	50	450	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
4- MD 85 at Crestwood Blvd											
4	NB	69.6	F	NB Left	74	97	373	869	F	51.3	D
				NB Through	1441	68	372	870	E		
				NB U-Turn	0	0	0	0	A		
	SB	29.3	C	SB Left	105	81	54	380	F		
				SB Through	938	29	89	801	C		
				SB Right	923	24	75	793	C		
	EB	65.5	E	EB Left	950	68	205	752	E		
				EB Through	43	52	205	752	D		
				EB Right	28	2	205	752	A		
	WB	54.5	D	WB Left	44	79	62	239	E		
				WB Through	78	82	62	239	F		
				WB Right	94	20	62	239	B		
5- MD 80 at I-270 NB on and ramp											
5	NB	2.4	A	NB Left	2	15	0	8	B	11.4	B
				NB Through	1	0	0	8	A		
				NB Right	6	-1	0	8	A		
	SB	13.1	B	SB Left	470	16	27	158	B		
				SB Through	22	18	27	158	B		
				SB Right	147	3	0	0	A		
			EB Left	97	14	24	287	B			

Table D.15: PM Peak -2040 Variable Speed Limit- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
	EB	13.3	B	EB Through	0	0	8	0	A		
				EB Right	5	7	37	317	A		
	WB	10.5	B	WB Left	15	12	0	30	B		
				WB Through	673	18	65	472	B		
				WB Right	612	2	0	18	A		
6- MD 80 at I-270 SB on and off ramp											
6	NB	4.0	A	NB Left	55	4	5	269	A	6.2	A
				NB Through	0	0	0	0	A		
				NB Right	605	4	5	269	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	7.4	A	EB Left	0	0	0	0	A		
				EB Through	382	8	4	103	A		
				EB Right	66	5	4	111	A		
	WB	8.2	A	WB Left	0	0	0	0	A		
				WB Through	443	8	3	137	A		
				WB Right	0	0	0	0	A		
7- MD 109 at I-270 NB on and off ramp											
7	NB			NB Left	0	0	0	0	A	7.1	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	13.8	B	SB Left	310	14	28	217	B		
				SB Through	0	0	0	0	A		
				SB Right	24	5	1	147	A		
	EB	2.5	A	EB Left	80	2	0	60	A		
				EB Through	0	0	0	0	A		
				EB Right	83	3	0	0	A		
	WB	0.4	A	WB Left	0	0	0	0	A		
				WB Through	222	0	0	0	A		
				WB Right	0	0	0	0	A		
8- MD 80 at I-270 SB on and off ramp											
8	NB	4.9	A	NB Left	63	8	3	124	A	1.9	A
				NB Through	0	0	0	0	A		
				NB Right	37	0	0	36	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.9	A	EB Left	0	0	0	0	A		
				EB Through	166	0	0	0	A		
				EB Right	34	4	0	0	A		
	WB	1.4	A	WB Left	137	1	0	59	A		
				WB Through	109	2	0	36	A		
				WB Right	0	0	0	0	A		
9- MD 121 at Gateway Center Dr											
9	NB	23.8	C	NB Left	584	28	93	574	C	42.4	D
				NB Through	784	22	93	574	C		
				NB Right	64	10	96	600	B		
	SB	21.1	C	SB Left	28	15	17	221	B		
				SB Through	301	22	29	221	C		
				SB Right	9	11	32	242	B		
	EB	15.3	C	EB Left	4	39	8	201	D		
				EB Through	24	40	16	218	D		
				EB Right	249	13	29	250	B		
	WB	109.5	F	WB Left	352	153	278	643	F		
				WB Through	76	67	278	642	E		
				WB Right	186	44	301	667	D		
10- MD 121 at I-270 NB on and off ramp											
	NB	21.1	C	NB Left	367	59	74	286	F		
				NB Through	0	0	0	0	A		

Table D.15: PM Peak -2040 Variable Speed Limit- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
10	SB			NB Right	773	3	0	0	A	17.9	B
				SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	11.5	B	EB Left	0	0	0	0	A		
				EB Through	652	17	37	351	C		
				EB Right	335	1	0	5	A		
	WB	20.9	C	WB Left	219	63	93	476	F		
				WB Through	680	7	93	476	A		
				WB Right	0	0	0	0	A		

Table D.15: PM Peak -2040 Variable Speed Limit- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
11- MD 121 at I-270 SB on and off ramp											
11	NB			NB Left	0	0	0	0	A	23.7	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	68.3	E	SB Left	272	91	249	1008	F		
				SB Through	0	0	0	0	A		
				SB Right	253	44	0	43	E		
	EB	6.4	A	EB Left	0	0	0	0	A		
				EB Through	717	6	16	212	A		
				EB Right	0	0	0	0	A		
	WB	13.2	B	WB Left	0	0	0	0	A		
				WB Through	514	27	45	346	D		
				WB Right	538	0	0	0	A		
12- MD 27 at Observation Dr											
12	NB	37.5	D	NB U-Turn	0	0	0	0	A	25.1	C
				NB Through	94	55	22	98	E		
				NB Right	61	11	22	98	B		
	SB	41.3	D	SB Left	146	44	38	216	D		
				SB Through	57	62	44	250	E		
				SB Right	188	33	69	287	C		
	EB	19.0	B	EB Left	189	33	72	452	C		
				EB Through	2018	18	73	453	B		
				EB Right	97	15	86	491	B		
	WB	28.3	C	WB Left	41	24	153	744	C		
				WB Through	1695	29	153	744	C		
				WB Right	69	9	153	744	A		
13- MD 27 at I-270 NB off ramp											
13	NB	46.8	D	NB Left	305	47	55	251	D	6.3	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.1	A	EB Left	0	0	0	0	A		
				EB Through	1513	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	4.6	A	WB Left	0	0	0	0	A		
				WB Through	1791	5	34	579	A		
				WB Right	0	0	0	0	A		
14- MD 27 at I-270 SB off ramp											
14	NB			NB Left	0	0	0	0	A	5.3	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	51.9	D	SB Left	175	52	34	139	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	1.9	A	EB Left	0	0	0	0	A		
				EB Through	1677	2	5	84	A		
				EB Right	0	0	0	0	A		
	WB	3.7	A	WB Left	0	0	0	0	A		
				WB Through	1542	4	12	440	A		
				WB Right	0	0	0	0	A		
15- MD 27 at Crystal Rock Dr											
15	NB	31.1	C	NB Left	77	30	106	532	C	70.3	E
				NB Through	1196	31	115	532	C		
				NB Right	55	29	121	545	C		
	SB	57.4	E	SB Left	155	78	375	1193	E		
				SB Through	1454	60	375	1193	E		
				SB Right	223	29	358	1187	C		
				EB Left	125	54	35	130	D		

Table D.15: PM Peak -2040 Variable Speed Limit- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
	EB	40.6	D	EB Through	49	36	30	125	D		
				EB Right	62	18	23	155	B		
	WB	162.5	F	WB Left	104	93	1053	1490	F		
				WB Through	127	107	1053	1490	F		
				WB Right	664	184	1053	1490	F		
16- MD 118 at Seneca Meadows Pkwy											
16	NB	5.1	A	NB Left	96	14	2	79	B	9.2	A
				NB Through	1310	4	12	207	A		
				NB Right	1	-1	20	260	A		
	SB	7.5	A	SB Left	16	8	19	298	A		
				SB Through	1226	8	22	298	A		
				SB Right	11	4	26	330	A		
	EB	14.0	B	EB Left	23	58	14	136	E		
				EB Through	0	65	14	136	E		
				EB Right	312	11	14	136	B		
	WB	53.8	D	WB Left	103	65	43	243	E		
				WB Through	7	69	39	242	E		
				WB Right	30	13	48	262	B		
17- MD 118 at I-270 NB on ramp											
17	NB			NB Left	0	0	0	0	A	13.6	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	25.8	C	EB Left	494	26	43	338	C		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	10.0	A	WB Left	0	0	0	0	A		
				WB Through	283	2	0	25	A		
				WB Right	1362	12	46	566	B		
18- MD 118 at I-270 SB off ramp											
18	NB			NB Left	0	0	0	0	A	7.0	A
				NB Through	0	0.0	0	0	A		
				NB Right	0	0.0	0	0	A		
	SB	37.9	D	SB Left	167	37.9	27	125	D		
				SB Through	0	0.0	0	0	A		
				SB Right	0	0.0	0	0	A		
	EB	5.7	A	EB Left	0	0.0	0	0	A		
				EB Through	1408	5.7	13	346	A		
				EB Right	0	0.0	0	0	A		
	WB	4.8	A	WB Left	0	0.0	0	0	A		
				WB Through	1490	4.8	11	255	A		
				WB Right	0	0.0	0	0	A		
19- MD 118 at Aircraft Dr											
19	NB	25.9	C	NB Left	52	70	42	237	E	43.2	D
				NB Through	53	69	42	237	E		
				NB Right	227	6	5	112	A		
	SB	165.9	F	SB Left	438	153	423	658	F		
				SB Through	14	220	423	658	F		
				SB Right	127	205	423	658	F		
	EB	22.3	C	EB Left	125	32	88	506	C		
				EB Through	1415	22	88	506	C		
				EB Right	21	20	88	506	B		
	WB	24.8	C	WB Left	15	26	107	719	C		
				WB Through	1392	29	107	719	C		
				WB Right	364	8	107	719	A		
20- Middlebrook Rd at Observation Dr											
	NB			NB Left	0	0	0	0	A		
				NB Through	0	0	0	0	A		

Table D.15: PM Peak -2040 Variable Speed Limit- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
20	SB	20.4	C	NB Right	0	0	0	0	A	9.0	A
				SB Left	125	36	23	150	D		
				SB Through	0	0	0	0	A		
				SB Right	186	10	23	150	B		
	EB	5.7	A	EB Left	14	11	14	148	B		
				EB Through	1052	6	14	148	A		
				EB Right	0	0	0	0	A		
				WB Left	0	0	0	0	A		
	WB	8.9	A	WB Through	1313	9	28	278	A		
				WB Right	17	7	43	328	A		

Table D.15: PM Peak -2040 Variable Speed Limit- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
21- Middlebrook Rd at I-270 SB on ramp											
21	NB			NB Left	0	0	0	0	A	4.5	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	2.6	A	EB Left	0	0	0	0	A		
				EB Through	742	3	4	105	A		
				EB Right	0	0	0	0	A		
	WB	7.8	A	WB Left	438	8	5	247	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
22- Middlebrook Rd at Waring Station Rd											
22	NB	48.4	D	NB Left	200	46	83	309	D	13.6	B
				NB Through	1	55	83	309	D		
				NB Right	236	50	83	309	D		
	SB	30.6	C	SB Left	32	48	8	72	D		
				SB Through	2	38	8	72	D		
				SB Right	24	7	20	110	A		
	EB	8.0	A	EB Left	4	11	28	300	B		
				EB Through	1125	8	28	300	A		
				EB Right	198	7	28	300	A		
	WB	8.3	A	WB Left	209	21	27	287	C		
				WB Through	1437	7	27	287	A		
				WB Right	3	3	27	287	A		
23- MD 124 at MD 355											
23	NB	136.2	F	NB Left	498	119	714	1077	F	80.3	F
				NB Through	1171	144	711	1075	F		
				NB Right	7	101	0	0	F		
	SB	45.0	D	SB Left	180	94	146	474	F		
				SB Through	695	66	146	474	E		
				SB Right	718	12	42	446	B		
	EB	27.4	C	EB Left	294	70	110	648	E		
				EB Through	1634	25	110	648	C		
				EB Right	344	2	26	524	A		
	WB	127.9	F	WB Left	0	0	0	0	A		
				WB Through	1642	130	684	950	F		
				WB Right	89	83	0	4	F		
24- MD 124 at I-270 SB on and off											
24	NB	104.6	F	NB Left	54	103	62	172	F	62.2	E
				NB Through	21	109	62	172	F		
				NB U-Turn	0	0	0	0	A		
	SB	58.4	E	SB Left	551	100	205	877	F		
				SB Through	8	118	205	877	F		
				SB Right	456	8	12	367	A		
	EB	95.9	F	EB Left	0	0	0	0	A		
				EB Through	1444	95	577	1103	F		
				EB Right	24	148	597	1126	F		
	WB	21.1	C	WB Left	5	66	582	1870	E		
				WB Through	1184	21	582	1870	C		
				WB Right	0	0	0	0	A		
25- MD 117 at MD 124											
25	NB	74.4	E	NB Left	56	149	309	746	F	48.7	D
				NB Through	690	88	309	746	F		
				NB Right	462	45	38	690	D		
	SB	37.2	D	SB Left	134	61	148	636	E		
				SB Through	971	40	148	636	D		
				SB Right	182	4	0	0	A		
	EB Left	151	80	154	573	F					

Table D.15: PM Peak -2040 Variable Speed Limit- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
	EB	45.2	D	EB Through	1156	41	154	574	D		
				EB Right	57	37	157	601	D		
	WB	40.9	D	WB Left	310	70	192	990	E		
				WB Through	1062	36	192	990	D		
				WB Right	98	1	0	0	A		
26- MD 117 at Bureau Dr											
26	NB	49.4	D	NB Left	99	72	79	303	E	37.4	D
				NB Through	35	79	79	303	E		
				NB Right	271	37	79	303	D		
	SB	81.1	F	SB Left	286	95	132	408	F		
				SB Through	22	90	132	408	F		
				SB Right	83	31	132	408	C		
	EB	31.3	C	EB Left	52	60	166	836	E		
				EB Through	1687	30	167	836	C		
				EB Right	6	22	160	826	C		
	WB	29.9	C	WB Left	13	38	171	1024	D		
				WB Through	1264	32	172	1025	C		
WB Right				212	19	197	1073	B			
27- MD 117 at I-270 SB off ramp											
27	NB			NB Left	0	0	0	0	A	12.4	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	3.7	A	EB Left	0	0	0	0	A		
				EB Through	944	4	7	471	A		
				EB Right	0	0	0	0	A		
	WB	39.3	E	WB Left	306	39	91	840	E		
				WB Through	0	0	0	0	A		
WB Right				0	0	0	0	A			
28- MD 117 at I-270 NB off ramp											
28	NB			NB Left	0	0	0	0	A	21.8	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	72.8	E	SB Left	100	82	1036	2118	F		
				SB Through	0	0	0	0	A		
				SB Right	381	70	1037	2117	E		
	EB	17.3	B	EB Left	4	104	89	968	F		
				EB Through	946	17	89	968	B		
				EB Right	0	0	0	0	A		
	WB	7.3	A	WB Left	0	0	0	0	A		
				WB Through	1391	7	49	381	A		
WB Right				0	0	49	381	A			
29- MD 117 at Perry Pkwy											
29	NB	39.8	D	NB Left	19	61	16	125	E	46.9	D
				NB Through	26	53	16	124	D		
				NB Right	33	17	25	145	B		
	SB	157.8	F	SB Left	238	195	273	460	F		
				SB Through	20	212	273	460	F		
				SB Right	117	72	273	460	E		
	EB	20.1	C	EB Left	220	67	76	328	E		
				EB Through	777	7	76	328	A		
				EB Right	30	6	61	312	A		
	WB	38.9	D	WB Left	36	108	234	742	F		
				WB Through	1253	40	234	742	D		
WB Right				381	30	234	742	C			
30- Shady Grove Rd at I-270 NB off ramp											
	NB	7.0	A	NB Left	0	0	0	0	A		
				NB Through	963	7	14	187	A		

Table D.15: PM Peak -2040 Variable Speed Limit- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS			
30	SB	40.8	D	NB Right	0	0	0	0	A	27.5	C			
				SB Left	0	0	0	0	A					
				SB Through	1051	41	129	560	D					
	EB				SB Right	0	0	0	0			A		
					EB Left	0	0	0	0			A		
					EB Through	0	0	0	0			A		
	WB	48.9		D	EB Right	0	0	0	0			A		
					WB Left	264	49	46	232			D		
					WB Through	0	0	0	0			A		
					WB Right	0	0	0	0			A		

Table D.15: PM Peak -2040 Variable Speed Limit- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
31- Shady Grove Rd at I-270 SB off ramp											
31	NB	18.3	B	NB Left	0	0	0	0	A	23.1	C
				NB Through	1321	18	322	1766	B		
				NB Right	0	0	0	0	A		
	SB	5.4	A	SB Left	0	0	0	0	A		
				SB Through	688	5	7	173	A		
				SB Right	0	0	0	0	A		
	EB	57.9	E	EB Left	232	56	47	213	E		
				EB Through	0	0	0	0	A		
				EB Right	303	59	65	255	E		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
32- MD 28 at I-270 SB off ramp											
32	NB			NB U-Turn	0	0	0	0	A	8.0	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	36.8	D	SB Left	414	45	70	294	D		
				SB Through	0	0	0	0	A		
				SB Right	97	3	0	37	A		
	EB	3.0	A	EB Left	0	0	0	0	A		
				EB Through	1560	1	0	0	A		
				EB Right	931	6	15	216	A		
	WB	6.8	A	WB Left	0	0	0	0	A		
				WB Through	1623	7	20	271	A		
				WB Right	0	0	0	0	A		
33- MD 28 at I-270 on and off ramps											
33	NB	36.4	D	NB Left	0	0	40	227	A	38.0	D
				NB Through	184	50	48	236	D		
				NB Right	119	16	48	236	B		
	SB	137.6	F	SB Left	14	152	361	409	F		
				SB Through	0	0	0	0	A		
				SB Right	220	137	361	409	F		
	EB	19.3	B	EB Left	283	59	90	329	E		
				EB Through	925	7	90	329	A		
				EB Right	0	0	0	0	A		
	WB	37.9	D	WB Left	42	31	158	414	C		
				WB Through	1292	38	134	377	D		
				WB Right	0	0	0	0	A		
34- MD 189 at Great Falls Rd											
34	NB	36.9	D	NB Left	43	46	12	95	D	13.6	B
				NB Through	14	48	9	94	D		
				NB Right	19	9	9	105	A		
	SB	3.5	A	SB Left	18	42	7	83	D		
				SB Through	13	48	7	83	D		
				SB Right	408	0	3	89	A		
	EB	11.9	B	EB Left	406	24	41	445	C		
				EB Through	635	5	5	148	A		
				EB Right	55	3	10	184	A		
	WB	18.7	B	WB Left	14	19	53	489	B		
				WB Through	841	19	53	489	B		
				WB Right	18	14	68	523	B		
35- MD 189 at I-270 Ramps											
35	NB	46.9	D	NB Left	220	47	38	208	D	42.6	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	54.7	D	SB Left	349	55	122	469	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
				EB Left	466	33	104	501	C		

Table D.15: PM Peak -2040 Variable Speed Limit- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
	EB	28.6	C	EB Through	372	23	104	501	C		
				EB Right	0	0	0	0	A		
	WB	50.2	D	WB Left	442	55	110	277	E		
				WB Through	428	45	110	277	D		
				WB Right	0	0	0	0	A		
36- MD 189 at Wooton Pkwy											
36	NB	46.8	D	NB Left	238	59	144	501	E	53.1	D
				NB Through	694	51	144	501	D		
				NB Right	176	13	144	501	B		
	SB	84.2	F	SB Left	250	107	297	795	F		
				SB Through	925	78	315	782	E		
				SB Right	0	0	0	0	A		
	EB	39.7	D	EB Left	152	73	129	471	E		
				EB Through	555	40	129	471	D		
				EB Right	204	15	129	471	B		
	WB	39.2	D	WB Left	156	71	136	649	E		
				WB Through	768	41	136	649	D		
				WB Right	314	19	136	649	B		
37- Montrose Rd at Tower Oaks Blvd											
37	NB	0.4	A	NB Left	0	0	0	0	A	33.5	C
				NB Through	0	0	0	0	A		
				NB Right	537	0	0	0	A		
	SB	135.3	F	SB Left	87	50	174	578	D		
				SB Through	0	0	0	0	A		
				SB Right	303	160	267	617	F		
	EB	6.9	A	EB Left	0	0	0	0	A		
				EB Through	1868	7	41	498	A		
				EB Right	0	0	0	0	A		
	WB	43.8	D	WB Left	78	40	41	498	D		
WB Through				2342	45	287	788	D			
WB Right				253	33	287	788	C			
38- Tower Oaks Blvd at I-270 off ramp											
38	NB	23.0	C	NB Left	705	24	49	235	C	17.7	B
				NB Through	0	0.0	42	227	A		
				NB Right	26	8.5	49	235	A		
	SB	10.8	B	SB Left	9	19.3	1	39	B		
				SB Through	0	0.0	1	39	A		
				SB Right	9	2.3	0	23	A		
	EB	12.5	B	EB Left	1	5.2	18	205	A		
				EB Through	363	12.9	18	205	B		
				EB Right	37	8.6	13	195	A		
	WB	12.8	B	WB Left	134	16.5	15	141	B		
WB Through				197	10.4	16	141	B			
WB Right				3	3.0	3	97	A			
39- Montrose Rd at Tower Oaks Blvd											
39	NB	19.8	B	NB Left	97	41	82	386	D	43.7	D
				NB Through	773	31	82	386	C		
				NB Right	621	2	0	0	A		
	SB	32.7	C	SB Left	211	65	77	343	E		
				SB Through	505	24	75	342	C		
				SB Right	131	15	78	360	B		
	EB	121.8	F	EB Left	104	103	323	670	F		
				EB Through	527	125	324	670	F		
				EB Right	44	128	346	694	F		
	WB	37.6	D	WB Left	530	46	109	377	D		
				WB Through	444	44	110	377	D		
				WB Right	307	14	130	407	B		
40- Rockledge Blvd at I-270 NB on and off ramp											
	NB	134.6	F	NB Left	0	0	0	0	A		
				NB Through	335	119	568	846	F		

Table D.15: PM Peak -2040 Variable Speed Limit- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
40	SB	86.5	F	NB Right	851	141	568	846	F	110.2	F
				SB Left	0	0	90	219	A		
				SB Through	356	86	90	219	F		
				SB Right	0	0	0	0	A		
	EB	83.5	F	EB Left	6	152	255	764	F		
				EB Through	460	134	255	764	F		
				EB Right	307	7	0	0	A		
				WB Left	0	0	0	0	A		
	WB			WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table D.15: PM Peak -2040 Variable Speed Limit- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
41- Rockledge Blvd at I-270 SB on and off ramps											
41	NB	30.5	C	NB Left	340	30	75	261	C	53.2	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	59.4	E	WB Left	355	67	225	901	E		
				WB Through	891	57	225	901	E		
				WB Right	0	0	0	0	A		
42- MD 187 at Tuckerman Ln											
42	NB	72.2	E	NB Left	210	48	615	1306	D	132.0	F
				NB Through	2298	74	615	1306	E		
				NB Right	200	78	615	1306	E		
	SB	191.7	F	SB Left	203	171	2567	2701	F		
				SB Through	1137	190	2567	2701	F		
				SB Right	301	211	2567	2701	F		
	EB	111.4	F	EB Left	301	65	505	1390	E		
				EB Through	535	135	506	1391	F		
				EB Right	118	121	529	1415	F		
	WB	196.7	F	WB Left	461	189	1940	2148	F		
				WB Through	670	213	1940	2148	F		
				WB Right	166	151	1940	2148	F		
43- MD 187 at I-270 NB on and off ramps											
43	NB	17.6	B	NB Left	563	33	122	415	C	20.8	C
				NB Through	2507	14	122	415	B		
				NB Right	0	0	0	0	A		
	SB	24.4	C	SB Left	0	0	0	0	A		
				SB Through	1278	24	64	252	C		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	62.2	E	WB Left	60	62	47	310	E		
				WB Through	67	63	47	310	E		
				WB Right	0	0	0	0	A		
44- MD 187 at I-270 NB on and off ramps											
44	NB	42.4	E	NB Left	0	0	0	0	A	39.4	D
				NB Through	2421	42	174	824	D		
				NB Right	0	0	0	0	A		
	SB	18.6	B	SB Left	145	53	66	293	D		
				SB Through	1192	14	66	293	B		
				SB Right	0	0	0	0	A		
	EB	64.6	E	EB Left	648	66	164	652	E		
				EB Through	0	0	164	652	A		
				EB Right	181	61	84	622	E		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
45- MD 187 at Rock Spring Dr											
45	NB	20.1	C	NB Left	492	36	120	886	D	30.2	C
				NB Through	2184	17	120	887	B		
				NB Right	18	14	141	920	B		
	SB	37.4	D	SB Left	20	65	122	596	E		
				SB Through	1180	42	122	596	D		
				SB Right	172	1	85	590	A		
				EB Left	431	60	143	522	E		

Table D.15: PM Peak -2040 Variable Speed Limit- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
	EB	49.0	D	EB Through	50	66	143	522	E		
				EB Right	482	38	143	522	D		
	WB	16.8	B	WB Left	7	30	6	116	C		
				WB Through	16	31	6	116	C		
				WB Right	36	8	3	105	A		
47-Democracy Blvd at I-270 NB off ramp											
47	NB	44.3	D	NB Left	153	44	29	128	D	2.9	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	1.2	A	EB Left	0	0	0	0	A		
				EB Through	1137	1	3	54	A		
				EB Right	0	0	0	0	A		
	WB	1.0	A	WB Left	0	0	0	0	A		
WB Through				2240	1	3	53	A			
WB Right				0	0	0	0	A			
48- Democracy Blvd at I-270 SB on ramp											
48	NB			NB Left	0	0	0	0	A	8.2	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	5.3	A	EB Left	0	0	0	0	A		
				EB Through	1345	5	19	256	A		
				EB Right	0	0	0	0	A		
	WB	9.8	A	WB Left	542	34	58	349	C		
WB Through				1826	3	48	328	A			
WB Right				0	0	0	0	A			
49- Democracy Blvd at I-270 SB off ramp											
49	NB			NB Left	0	0	0	0	A	9.0	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	39.1	D	SB Left	154	53	30	161	D		
				SB Through	0	0	0	0	A		
				SB Right	59	3	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	5.8	A	WB Left	0	0	0	0	A		
WB Through				1826	4	20	290	A			
WB Right				157	29	105	755	C			
50- MD 190 at Burdette Rd											
50	NB	76.5	E	NB Left	27	79	18	118	E	37.5	D
				NB Through	7	69	18	118	E		
				NB Right	6	75	18	118	E		
	SB	35.0	C	SB Left	44	76	24	143	E		
				SB Through	9	72	24	143	E		
				SB Right	122	18	24	143	B		
	EB	25.2	C	EB Left	136	102	136	754	F		
				EB Through	1292	18	136	754	B		
				EB Right	31	7	132	781	A		
	WB	45.1	D	WB Left	13	126	393	1118	F		
WB Through				2143	45	393	1118	D			
WB Right				64	36	393	1118	D			

Table D.15: PM Peak -2040 Variable Speed Limit- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
51- MD 190 at I-270 NB on ramp											
51	NB			NB Left	0	0	0	0	A	18.4	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	67.0	E	EB Left	253	67	104	376	E		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
				WB Left	0	0	0	0	A		
WB	10.0	A	WB Through	1461	10	51	754	A			
			WB Right	0	0	0	0	A			
52- MD 190 at I-270 SB off ramp											
52	NB	70.7	E	NB Left	228	71	87	769	E	12.6	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	3.5	A	EB Left	0	0	0	0	A		
				EB Through	1062	4	8	185	A		
				EB Right	0	0	0	0	A		
				WB Left	0	0	0	0	A		
WB	10.3	B	WB Through	1629	10	27	704	B			
			WB Right	0	0	0	0	A			
53- MD 190 at Seven Locks Rd											
53	NB	0.5	A	NB Left	28	1	0	0	A	26.8	C
				NB Through	314	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	52.7	D	SB Left	364	53	120	414	D		
				SB Through	232	53	120	414	D		
				SB Right	20	50	120	414	D		
	EB	31.6	C	EB Left	27	30	94	436	C		
				EB Through	800	32	94	436	C		
				EB Right	45	32	94	436	C		
				WB Left	253	76	124	566	E		
WB	20.8	C	WB Through	908	17	124	566	B			
			WB Right	691	5	124	566	A			
54- MD 124 at I-270 NB off ramp											
54	NB	26.7	C	NB Left	0	0	0	0	A	22.8	C
				NB Through	0	0	0	0	A		
				NB Right	553	27	54	653	C		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	21.6	C	EB Left	0	0	0	0	A		
				EB Through	1696	22	100	1104	C		
				EB Right	0	0	0	0	A		
				WB Left	0	0	0	0	A		
WB			WB Through	0	0	0	0	A			
			WB Right	0	0	0	0	A			
55- Democracy Blvd at I-270 NB off ramp											
55	NB	47.0	D	NB Left	0	0	0	0	A	11.3	B
				NB Through	0	0	0	0	A		
				NB Right	313	47	50	189	D		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
			EB Left	0	0	0	0	A			

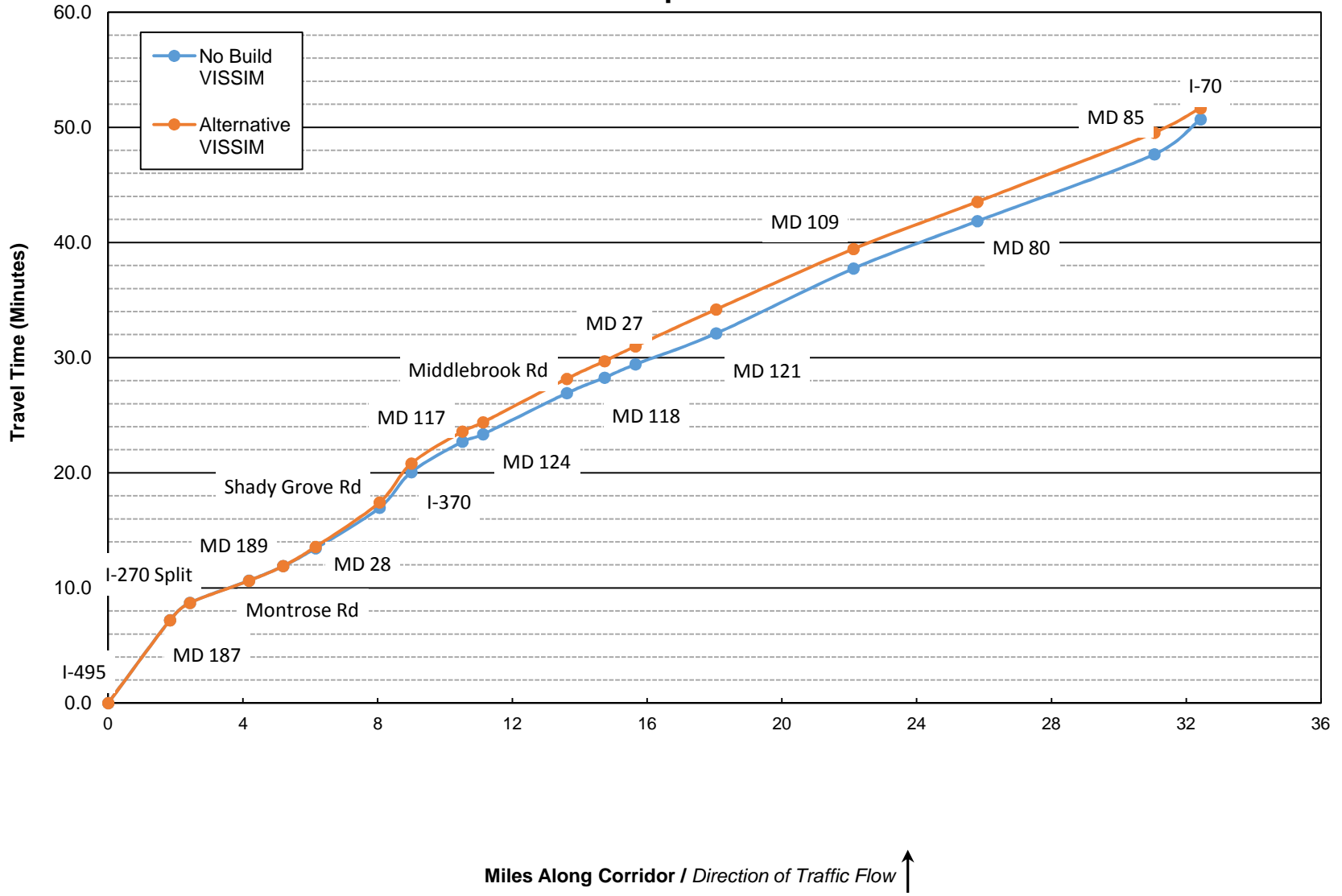
Table D.15: PM Peak -2040 Variable Speed Limit- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
	EB	1.5	A	EB Through	1138	2	4	67	A		
				EB Right	0	0	0	0	A		
				WB Left	0	0	0	0	A		
	WB	WB Through	0	0	0	0	A				
		WB Right	0	0	0	0	A				
56- Watkins Mill Rd at I-270 SB off ramp/Parkview Ave											
56	NB	67.9	E	NB Left	145	54	154	597	D	84.6	F
				NB Through	0	0	0	0	A		
				NB Right	339	74	154	597	E		
	SB	43.1	D	SB Left	405	63	113	403	E		
				SB Through	110	60	113	403	E		
				SB Right	442	21	113	403	C		
	EB	134.9	F	EB Left	0	0	0	0	A		
				EB Through	1259	135	940	1247	F		
				EB Right	4	134	940	1247	F		
	WB	39.3	D	WB Left	61	80	48	240	F		
				WB Through	288	31	46	238	C		
WB Right				0	0	0	0	A			
57- Watkins Mill Rd at I-270 NB on ramp											
57	NB	37.2	D	NB Left	80	72	50	579	E	71.4	E
				NB Through	0	0	0	0	A		
				NB Right	195	23	50	579	C		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	25.5	C	EB Left	654	64	141	439	E		
				EB Through	1064	2	141	439	A		
				EB Right	0	0	0	0	A		
	WB	158.8	F	WB Left	0	0	0	0	A		
				WB Through	671	123	649	863	F		
WB Right				337	230	649	863	F			
58- Watkins Mill Rd at I-270 SB on ramp											
58	NB			NB Left	0	0	0	0	A	15.5	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	15.8	B	EB Left	0	0	0	0	A		
				EB Through	1712	17	147	564	B		
				EB Right	291	7	147	564	A		
	WB	14.6	B	WB Left	403	27	46	424	C		
				WB Through	348	1	46	424	A		
WB Right				0	0	0	0	A			

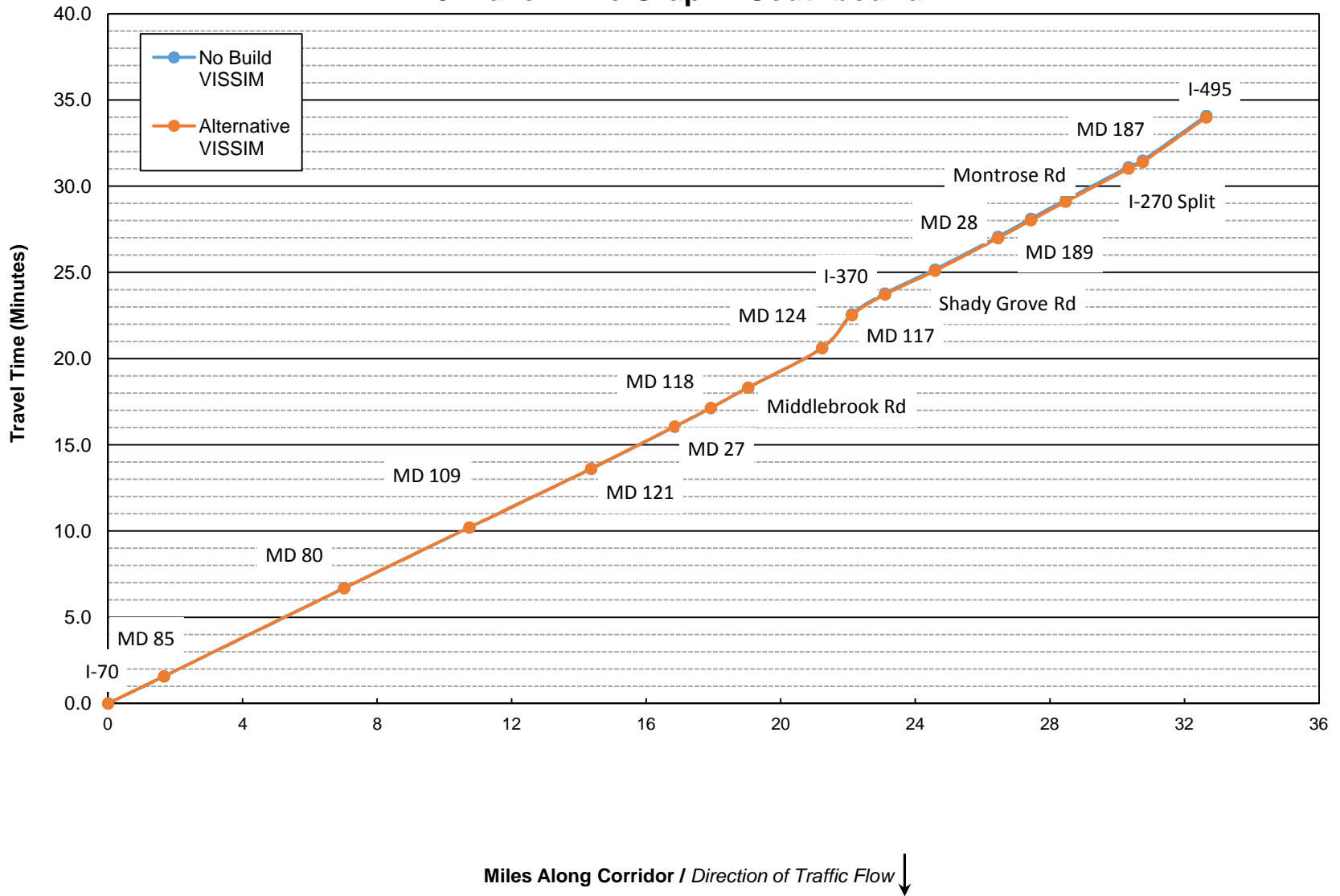
Table D.16: PM Peak - 2040 Variable Speed Limit- I-270 Vehicle Network Performance

	No-Build	VSL	% Change
Total Delay	36,237,078	35,698,182	-1%
Average Delay per Vehicle	307	303	-2%
Total Travel Time	67,865,560	68,362,656	1%
Vehicles (Arrived)	95,124	95,100	0%
Latent Demand	8,861	8,745	-1%
Latent Delay	13,484,325	13,554,643	1%
Total Distance	477,455	476,619	0%
Average Speed	25	25	-1%

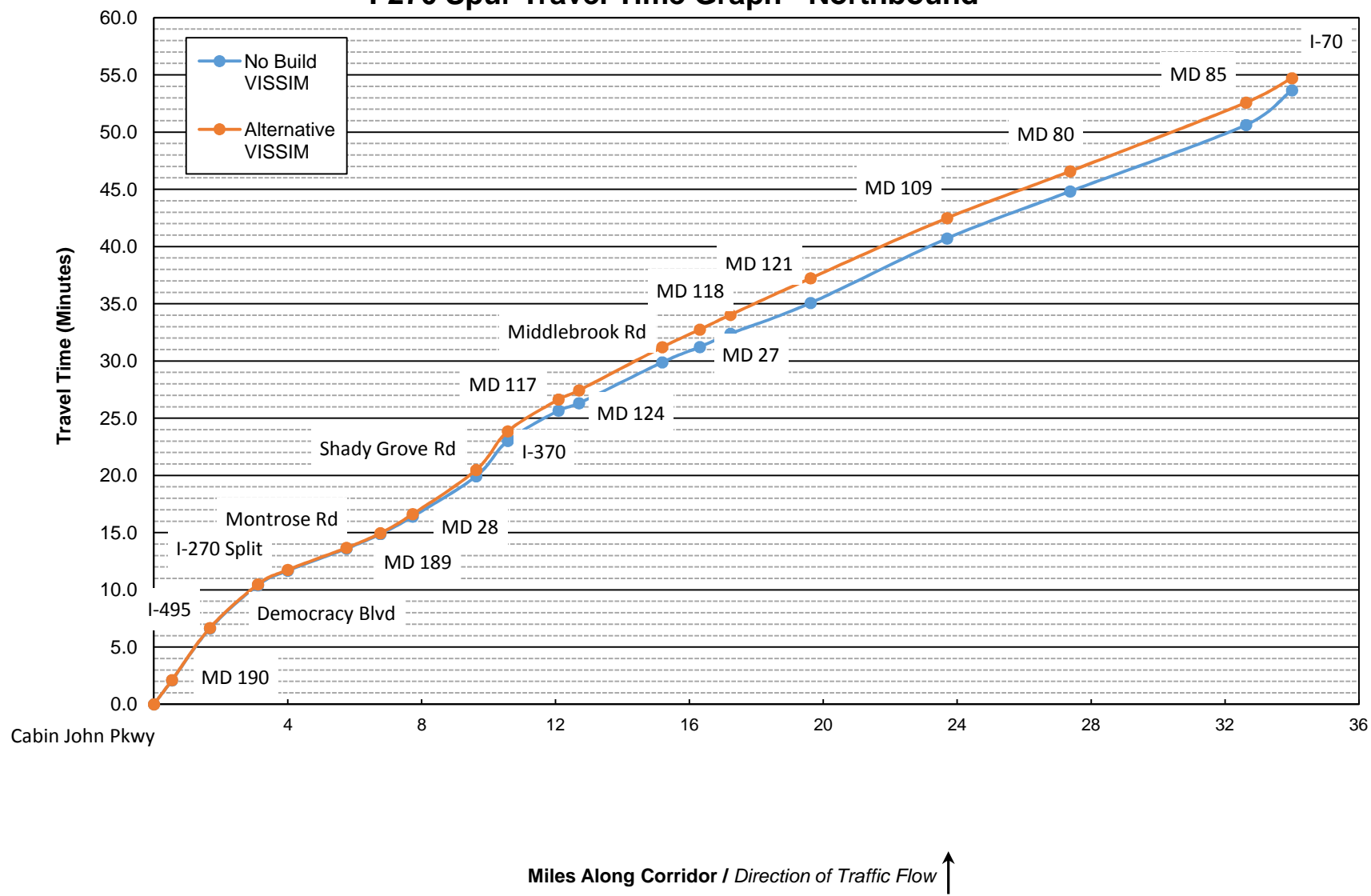
**Figure D.1: PM Peak -
2040 Variable Speed Limit
I-270 Travel Time Graph - Northbound**



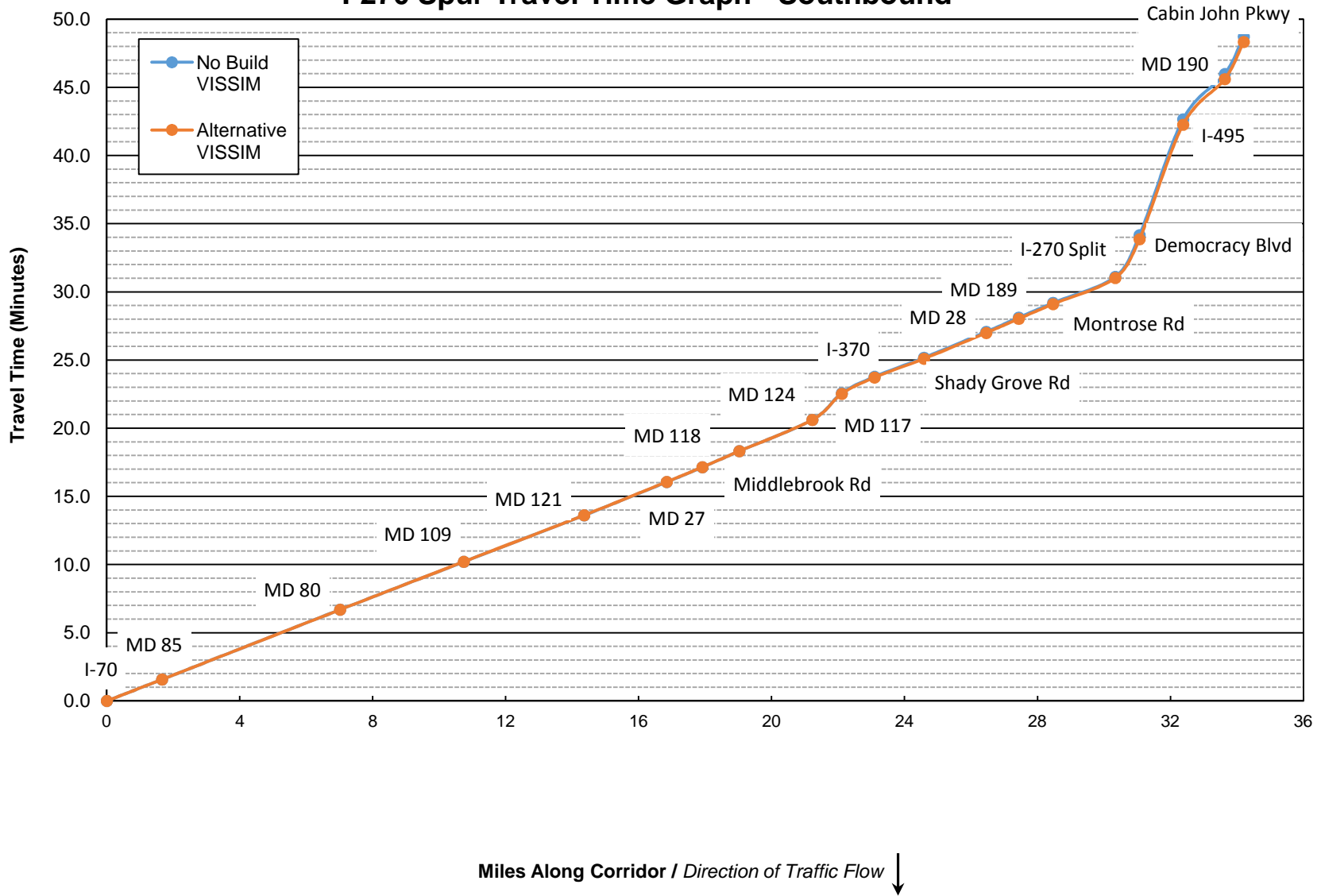
**Figure D.2: PM Peak -
2040 Variable Speed Limit
I-270 Travel Time Graph - Southbound**



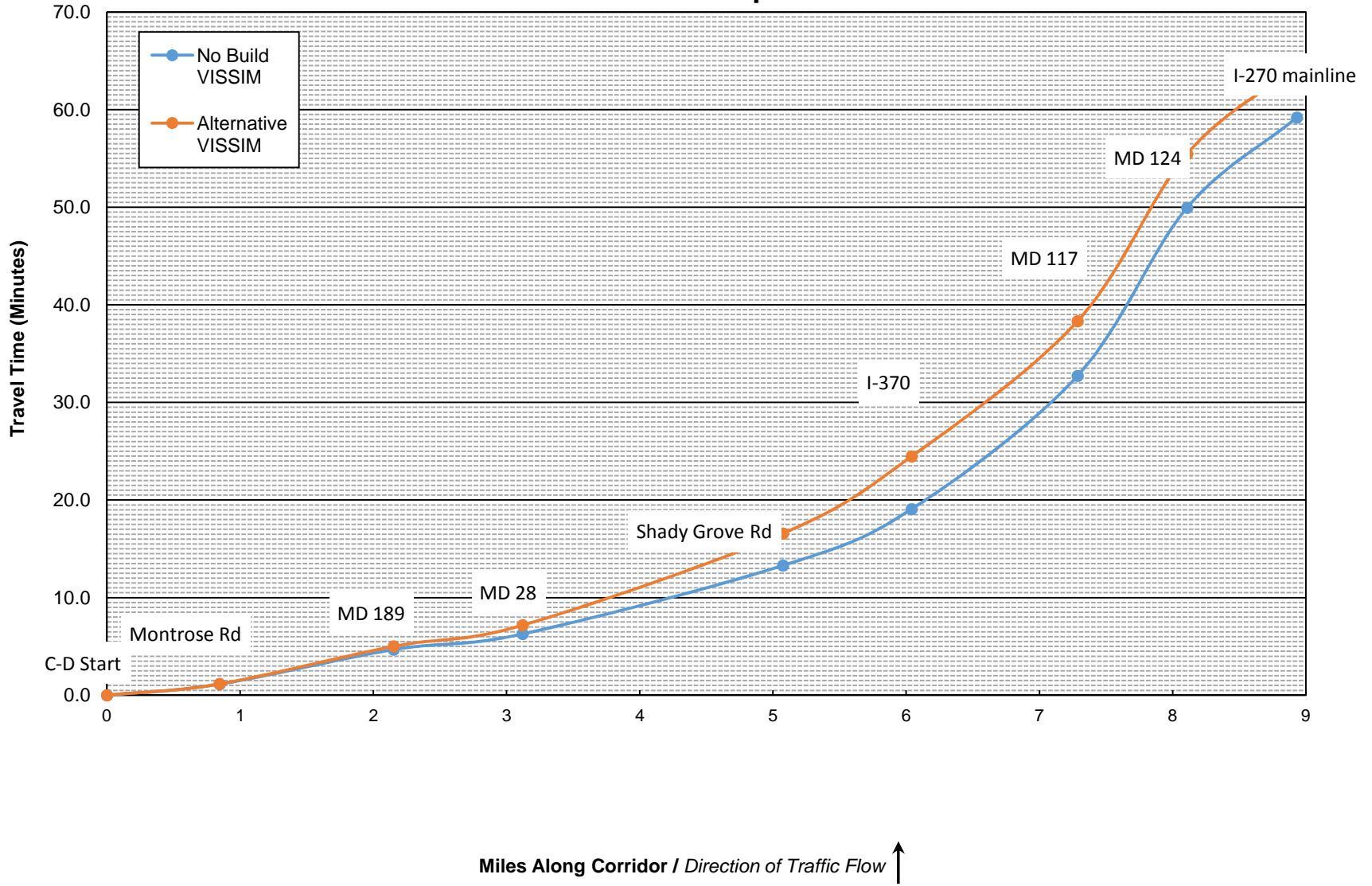
**Figure D.3: PM Peak -
2040 Variable Speed Limit
I-270 Spur Travel Time Graph - Northbound**



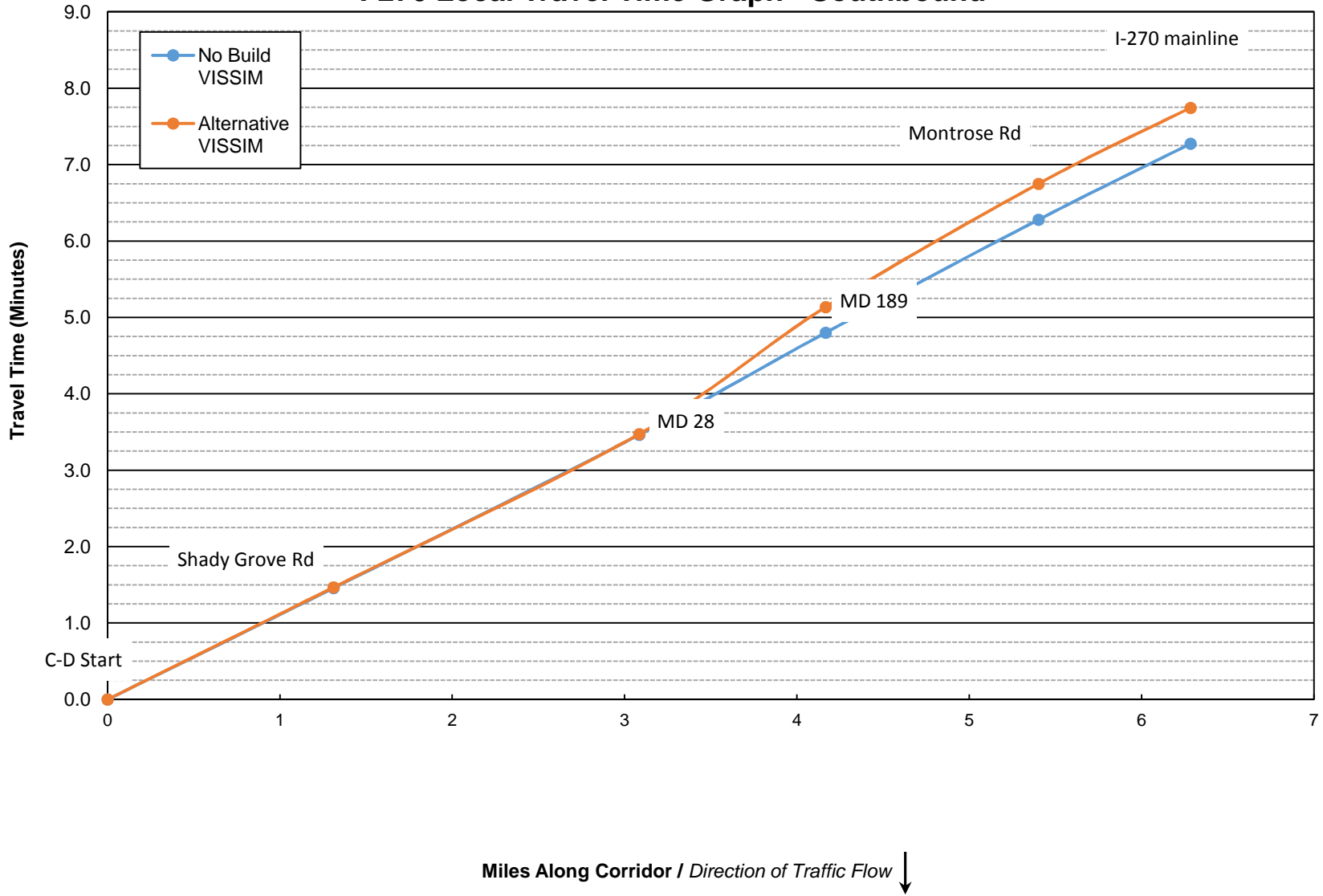
**Figure D.4: PM Peak -
2040 Variable Speed Limit
I-270 Spur Travel Time Graph - Southbound**



**Figure D.5: PM Peak -
2040 Variable Speed Limit
I-270 Local Travel Time Graph - Northbound**



**Figure D.6: PM Peak -
2040 Variable Speed Limit
I-270 Local Travel Time Graph - Southbound**



Larry Hogan, *Governor*
Boyd K. Rutherford, *Lt. Governor*



Pete K. Raht, *Secretary*
Gregory C. Johnson, P.E., *Administrator*

November 30, 2016

Brian Quinlan, P.E.
Parsons Construction Group, Inc.
10 East Baltimore Street, Suite 801
Baltimore MD 21202

Dear Mr. Quinlan:

The Maryland Department of Transportation's State Highway Administration's (SHA) is in receipt of Proposed Technical Concept (PTC) No. 2 for the I-270 Innovative Congestion Management Progressive Design-Build contract (Contract No. MO0695172), submitted by your Design-Build Team on November 17, 2016. The SHA has completed our review of the PTC and offers the following comments for your consideration in the further development of your technical concepts and proposal:

1. Generally, the concept appears to be a reasonable solution to address the goals of this contract.
2. Page 2, Section A, Description: Since lane control signals and variable speed limit signing provide real-time dynamic guidance to vehicles, and due to safety considerations, they must be highly reliable, available and maintainable. It would be helpful to have some description and additional information on the premise that cellular and/or wireless communications would be suitably reliable for control of these devices. In addition, PTC #1 indicated that the company "...will examine in detail the utility requirements (e.g., available fiber versus communications needs, etc.) during the design process..." which seem inconsistent with the statement that cellular/wireless communications can be used for these signs.
3. Page 3, Section A, Description: In the description of "Intelligent NETWORKS (iNET)" inputs include data on current incidents, weather conditions and work zones. We would assume that these inputs would come from CHART; however, there are other alternatives. It would be good to have a more specific description of how this system would interface, driving inter-operable processes, with Maryland's existing traffic management programs.

My telephone number/toll-free number is 410-545-8800 or 1-888-228-6971
Maryland Relay Service for Impaired Hearing or Speech 1.800.735.2258 Statewide Toll Free


Street Address: 707 North Calvert Street • Baltimore, Maryland 21202 • Phone 410.545.0300 • www.roads.maryland.gov

4. Page 4, Section B, Location: We agree with the potential benefits of Variable Speed Limit signs to provide advanced warning, and a measure of lane-specific traffic management. To assure the feasibility of this strategy, we would recommend that the existing sign inventory on I-270 be considered. I-270 already experiences "sign congestion", and the successful implementation of additional Dynamic Lane Use Control and Dynamic Speed Advisory gantries would depend on meeting, or successfully requesting waivers for MUTCD design standards. Also, these strategies will need to be reviewed to determine if Maryland would make the lane control and speed limits regulatory or advisory (noted that this PTC recommends advisory, but this would be a Maryland policy decision).
5. Page 22, Section F, Administration Risk: There will be Operations and Maintenance expenses associated with any active traffic management. It is understood that this project will not include funding for ongoing Operations and Maintenance. However, per the goal of providing a sustainable solution, we would anticipate the final technical solution would include a plan and estimate of the operations and maintenance requirements and costs, in order to program ongoing support and provide documentation and justification for the required Operational Budget enhancements.

Any questions or communications regarding the response to this PTC should be directed to Mr. Jason A. Ridgway, Director, Office of Highway Development at the project specific email address, MO069_IS_270@sha.state.md.us.

Sincerely,



 Jason A. Ridgway, P.E.
Director, Office of Highway Development

cc: Olu Adeyinka, P.E., DBIA, Parsons Transportation Group, Inc.

Responses to SHA Comments on PTC No. 3 Ramp Metering

1 COMMENT: Generally, the concept appears to be a reasonable solution to address the goals of this contract.

RESPONSE: no response required

PTC REFERENCE: none

2 COMMENT: The PTC does not commit to any particular algorithm. Could the selection of the algorithm affect costs, which would in turn affect the level of improvements the budget can accommodate? If so, and the Design-Builder defers the decision for which algorithm to utilize until after Notice to Proceed, please add a note that the Design-Builder has considered the costs of any algorithm for the proposed improvements. Also, consider making a recommendation or commitment concerning which algorithm to use based on your knowledge of the algorithms, I-270 corridor, and contract goals.

RESPONSE: Parsons proposes to use the Dynamic Corridor Ramp Metering System (DCRMS) which is based upon Fuzzy Logic and uses arterial data to improve coordination between the freeway/highway and arterials. This approach is recommended over SWARM, CARMA, direct fuzzy logic and the other options since it is the most pro-active approach to minimize impacts to the highway, ramps and arterials.

PTC REFERENCE: See additional text in section titled “Description”

3 COMMENT: Adaptive metering is most effective when all entrance ramps are metered; however, this PTC does not meter the freeway connector ramps from I-370. Other states have successfully implemented freeway connector metering. Are there conditions that prevent the metering of the I-370 ramps? If so, can the Design-Builder propose improvements that could change those conditions to make freeway connector metering feasible at I-370?

RESPONSE: We have reevaluated the connectors from I370 to I270 and have concluded that metering can be accomplished using the existing infrastructure and metering at two vehicle per green.

PTC REFERENCE: See additional text in section titled “Attachments: Ramp Review v14.xls (tabs 1 & 2) & PTC_PAR03_Ramp_Metering_Data_v0.9964.docx”

4 COMMENT: Page 1, Section A, Description: The PTC indicates that the Ramp metering will use “... two and/or three ...” head traffic signals. We would request that an assessment of the pros and cons of each configuration be presented and a specific recommendation made.

RESPONSE: Different states use different configurations and the decision is primarily one of policy.

Two Head configuration – one signal on each side of the stop bar. The pros are a simple unambiguous display and many nationwide installations. The main con is it requires a strategy in the controller to reduce the chance upon initial startup of turning from a steady green to red when a vehicle is approaching too close to the stop bar.

Two Head Low and a Three Head High – one configuration on each side of the stop bar. The pros are using the upper signal upon startup allows switching from a steady green to yellow then red eliminates the need to check for a sudden change from steady green to red, the ability to face in the lower signal to aim at the driver, and many such installations nationwide.. The cons are that the only use of the yellow indication is for one phase change.

We have priced our proposal for the Two Head configuration but if the SHA wishes the alternate configuration Parsons has no issues.

PTC REFERENCE: See additional text in section titled “Description”

5 COMMENT: Page 3, Section A, Description: The PTC presents three potential operational modes: Time of Day, Responsive Ramp Metering Control or Adaptive Ramp Metering Control (ARMC); however, the recommended mode, ARMC, is presented later in the document under Section B, Location. This presentation in the document was a bit confusing (i.e. at first it seemed as though the PTC wasn't going to propose a specific mode of operation for ramp metering).

RESPONSE: This will be clarified in the final PTC.

PTC REFERENCE: See additional text in section titled "Description"

6 COMMENT: Page 4, Traffic Analysis: The Administration recognizes the difficulties associated with modeling ramp metering and appreciate the attempts to demonstrate the mobility benefits of this PTC. Please ensure that all assumptions made during your modeling efforts are documented so the Administration can efficiently follow your methodologies and analysis techniques.

RESPONSE: Detailed description of modeling methodology for both fixed ramp metering (results shown in PTC document) and adaptive ramp metering (will be shown in the final proposal) will be included in the traffic memorandum that will be submitted as a part of the final proposal. All assumptions and any changes to the model will be clearly documented in the traffic memorandum in the proposal for ease of evaluation of benefits.

PTC REFERENCE: See additional text in section titled "Analysis & Attachments: 2040 AM ARM Results final 01-11-17.pdf & 2040 PM ARM Results final 01-11-17.pdf"

7 COMMENT: Page 4, Section C, Analysis: Although the rationale for not modeling ARMC (i.e. the complexity of modeling this mode of operational) is understood, we're not sure what

the mode that was modeled (Fixed Time of Day) reveals, since the performance dynamics are significantly different.

RESPONSE: We understand the limitations of fixed time ramp metering since the performance dynamics of this type of ramp metering are significantly different from adaptive ramp metering. However, this section was included to show the benefit of just ramp metering in general and to show that a significant improvement is possible even with simple fixed time algorithm. To further clarify this concern, the team will include adaptive ramp metering modeling in the final proposal submittal. Assumptions and methodology for adaptive ramp metering model development will be included in that submittal for evaluation.

PTC REFERENCE: See additional text in section titled "Analysis"

8 COMMENT: Page 6, Section C, Analysis, Safety: The safety improvements to I-270 mainline operations are intuitive (due to smoother merging and traffic flow), but there could also be an expectation that the occurrence of collisions on the ramps might increase due to queued traffic.

RESPONSE: While this is true the overall crash picture has been shown to be significantly reduced typically 16-64%. Furthermore we will be recommending additional ramp signage illuminated when the meter is on that flashes "METER ON", "PREPARE TO STOP" before the entrance and "PREPARE TO STOP WHEN FLASHING" at middle of each ramp.

PTC REFERENCE: See additional text in section titled "Analysis & Description"

9 COMMENT: Page 7, Analysis, Operability, Maintainability, Adaptability: There will be Operations and Maintenance expenses associated with any active traffic management. It is understood that this project will not include funding for ongoing Operations and Maintenance. However, per the goal of providing

a sustainable solution, we would anticipate the final technical solution would include a plan and estimate of the operations and maintenance requirements and costs, in order to program ongoing support and provide documentation and justification for the required Operational Budget enhancements.

RESPONSE: Parsons is aware that there are maintenance and operations costs and has made an estimate of these costs regarding ramp metering in the PTC. Operations and maintenance plans apply to the entire system and will be outlined in our final proposal. We have modified this PTC to highlight key steps in the plans for operations and maintenance issues that will be considered for ramp metering.

Maintenance

- Agency verses Contractor
- Preventive maintenance
- Reporting system
- Response times
- System resources (spares and tools)
- Staffing
- Training Operations
- Agency verses Contractor
- Staffing
- Hours of Operation

PTC REFERENCE: See additional text in section titled “Analysis & Potential Impacts”

03 Ramp Metering

A. Description

Ramp metering is a proven tool to improve safety and performance for freeway operations. The first ramp metering installation in the United States took place in the mid-1960s in the city of Chicago, Illinois. This was followed closely in 1967 with a research study employing eight metered ramps in Detroit, Michigan. Since that time ramp metering has spread across the United States and the world as an effective means of controlling congestion on limited access highways. Early deployments were mostly fixed time systems that required constant updates and significant effort to maintain, and they did not optimize the efficiency of ramp metering, because they do not respond to actual traffic conditions appropriately. Today, advanced systems that adjust based on traffic conditions are far more effective.

Key elements of a ramp metering installation include:

- **Traffic Signals:** installed on both sides of the entrance ramp roadway. Different states use different configurations and the decision is primarily one of policy. There are options regarding the type of signal, as outlined below. We have priced our proposal for the Two Head configuration; however, if SHA wishes the alternate configuration Parsons has no issues.
 - Two Head configuration – one signal on each side of the stop bar. The pros are a simple unambiguous display and many nationwide installations. The main con is it requires a strategy in the controller to reduce the chance upon initial startup of turning from a steady green to red when a vehicle is approaching too close to the stop bar.
 - Two Head Low and a Three Head High – one configuration on each side of the stop bar. The pros are using the upper signal upon startup allows switching from a steady green to yellow then red eliminates the need to check for a sudden change from steady green to red, the ability to face in the lower signal to aim at the driver, and many such installations nationwide.. The cons are that the only use of the yellow indication is for one phase change.
- **Signaging:**
 - “Stop Here on Red” sign typically installed adjacent to the Stop Bar.
 - “One Car Per Green” (or Two or more cars per green) sign typically installed upstream of the traffic signals
 - “Prepare to Stop When Flashing” sign installed at the entrance point to the ramp (alternatives are blank out signs or alternate text such as Ramp Metered when Flashing).
- **Striping:**
 - A Stop Bar, which is a wide strip denoting where to stop typically between the two signal heads.



In the over 50 years that ramp metering has been deployed a significant amount of research has been done in several areas including performance, benefits, human factors, operations, maintenance, and algorithms. Recently Active Traffic and Demand Management and the Integrated Corridor Management initiatives have helped drive more advanced ramp metering strategies. These highly proactive paradigm demand more out of our current efforts using adaptive and predictive algorithms to further improve ramp metering as one of its primary tools.

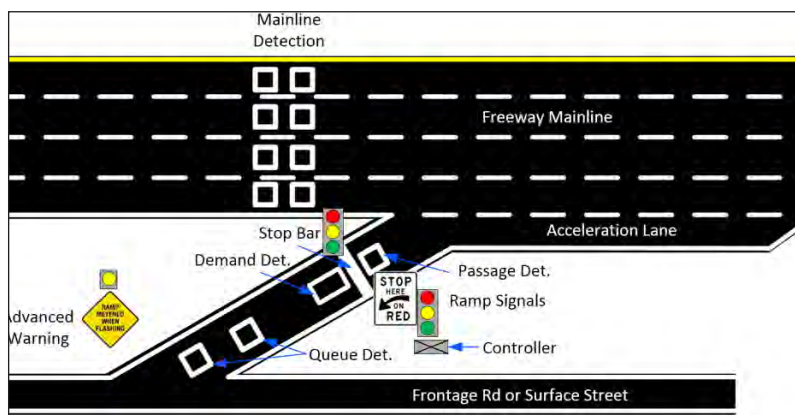


Ramp Metering is one of the 29 modules available in Parsons innovative and award winning Intelligent Networks® ATMS suite. The RMS module allows for full flexibility in operational strategies and supports all levels of operations from manual control, (set fixed ramp metering rates at on-ramp locations), time-of-day (TOD) based ramp metering operations, Local Mainline Responsive (LMR) ramp metering operations as well as options to support several of the nations most advanced adaptive control algorithms. See page 18 for descriptions of these algorithms.

- Lane line striping when two or more lanes are metered.
- **Detection Devices:**
 - Demand detector: typically a loop detector configured to cover approximately 20 feet upstream of the Stop Bar for each lane and used to determine if a vehicle is present and ready for a green indication.
 - Passage detector: typically a loop detector configured downstream of the Stop Bar for each lane and used to determine that a vehicle has passed the signal.
 - Queue detectors: typically two locations, the Intermediate typically placed half way from the Stop Bar and the top of the ramp and the Extensive typically placed near the top of the ramp. The detector type is typically a loop detector but other technologies can be used. The purpose of the queue detectors is to allow different strategies to override the metering rate when the queues arrive at these two points.
 - Mainline detectors: Usually installed near the entrance ramp gore and used by the controller to set metering rates based on local conditions. The metering for IS 270 will use the existing mainline detector stations whenever possible. However, in the absence of stations close enough the central algorithm will make it possible to operate efficiently on a corridor wide perspective (See operational modes and the potential algorithm descriptions later in this PTC).
- **Controller:** a device which controls operations at the meter including:
 - Switching red-green displays based on the metering rate and queue overrides.
 - Accepting metering rates from central.
 - Turning on and off the flashers on the Ramp Metered which denote metering is in operation.
 - Having a Time of Day table and a Local Adaptive algorithm

Figure 1 offers a typical conceptual layout for a metered ramp.

Figure 1: Conceptual Layout for a Metered Ramp



Technology Requirements

TOD requires a controller that can store tables of rates, dates, times, and holidays. All NTCIP (National Transportation Communications for ITS Protocols) Controllers can operate TOD mode.

Pros

- When properly setup, reduces delay and congestion on mainline.
- Simple form of control.
- Serves as an effective backup mode when more complex modes cannot operate.

Cons

- Not responsive to real time conditions including congestion and incidents.
- May meter when not necessary.
- May not meter when necessary.
- Requires continual metering rate evaluations including seasonal variations.

Geometric challenges that must be analyzed prior to installation of a ramp metering system include:

- **Queuing space:** how many vehicles can be stored on the ramp upstream of the Stop Bar
- **Merging areas:** affect the placement of the Stop Bar
- **Grade:** also affects the placement of the Stop Bar

OPERATIONAL MODES

Ramp metering can be operated using several different modes. The following defines each along with its pros and cons and technology requirements.

LOCAL TIME OF DAY (TOD)

TOD mode consists of using predetermined metering rates using a schedule of operation. It requires an off line determination based on mainline and ramp data history. This determination can be based on computed values, engineering judgment or a combination. TOD mode is typically used when real time traffic data is unavailable and used as a backup when higher level modes cannot operate due to equipment failures.

RESPONSIVE RAMP METERING CONTROL

Responsive Ramp Metering Control (RRMC) is a mode where a single meter uses traffic data from the set of vehicle detectors on freeway mainline adjacent to the on-ramp. RRMC can be performed within a local controller or at a central location. Typically RRMC is based on a simple algorithm that uses the local mainline volume, occupancy and/ or speed data to look up in a table the desired metering rate. This mode is included in all NTCIP compliant ramp metering firmware. When RRMC is operated from central it can be configured in many ways including using multiple mainline stations and using a more complex method to compute metering rates.

ADAPTIVE RAMP METERING CONTROL

Adaptive Ramp Metering Control (ARMC) is a mode that controls a set of meters assigned to a specified corridor adapting to traffic conditions derived from multiple sets of freeway mainline detectors. Typically the corridor is segmented based on its bottlenecks and the set of meters upstream from each bottleneck work together to regulate traffic flow into the bottleneck. Adaptive algorithms also feature dynamic on/off strategies. Parsons proposes to implement ARMC on IS 270.

The ramp metering system should support both standalone

Technology Requirements

Local RRMC requires a controller that can access the local mainline traffic data.

Pros

- When properly tuned, can improve reduce delay and congestion on the mainline more effectually than TOD mode.
- Can be set to turn on/off meters based on conditions if there is an algorithm present in the controller for Local RRMC.
- Respond to local mainline conditions.
- Require little ongoing parameter maintenance.

Cons

- Requires mainline detectors. Note that some of the ramps on IS 270 do not have corresponding local detection.
- Not responsive to downstream conditions including congestion and incidents

Technology Requirements

ARMC requires a central system, an adaptive algorithm, mainline detectors, and controllers that can accept metering rates in real time.

Pros

- When properly tuned, can reduce delay and congestion on mainline more efficiently than other operational modes.
- Responds to conditions throughout a corridor including incidents, and as a result provide more efficient metering when needed and more effectively minimizes metering when it is not improving traffic flow.
- Requires little ongoing parameter maintenance

Cons

- Requires mainline detectors, a central system, and a controller that can accept real time rates
- Complexity requires a bit more training of staff to understand how it works and how to fine tune the system.

operations and central adaptive ramp metering. Parsons' solution includes an NTCIP compatible controller that operates standalone in Time of Day and Responsive Ramp Metering Control modes and includes a central system operating in an Adaptive Ramp Metering Control using the Dynamic Corridor Ramp Metering System (DCRMS). Our initial preferred algorithm is based upon Fuzzy Logic and uses arterial data to improve coordination between the freeway/highway and arterials. This approach is recommended over SWARM, CARMA, direct fuzzy logic and the other options since it is the most pro-active approach to minimize impacts to the highway, ramps and arterials. However, CARMA or SWARM are good alternatives if appropriate arterial signal interface is not available through the local agencies.

B. Location

The proposed ramp metering system includes all of the entrance ramps on NB and SB IS 270 from MD-85, milepost 31 to Montrose Rd milepost 4. Peak hours generally are NB from 3 pm to 7 pm and SB from 5 am to 9 am.

We prefer to install meters on all entrance ramps because this configuration allows for the most effective system wide adaptive metering. However, exceptions exist. These include freeway to freeway connectors and locations that geometrically pose significant problems such as very little storage capability, inability to merge safely from the Stop Bar, roundabouts, and extremely low volumes (See our IS 270 corridor evaluation below).

Ramp metering typically runs during peak hours, however in a system wide adaptive deployment, meters will operate when freeway conditions dictate the necessity. We are recommending a corridor wide adaptive approach for this project.

C. ANALYSIS

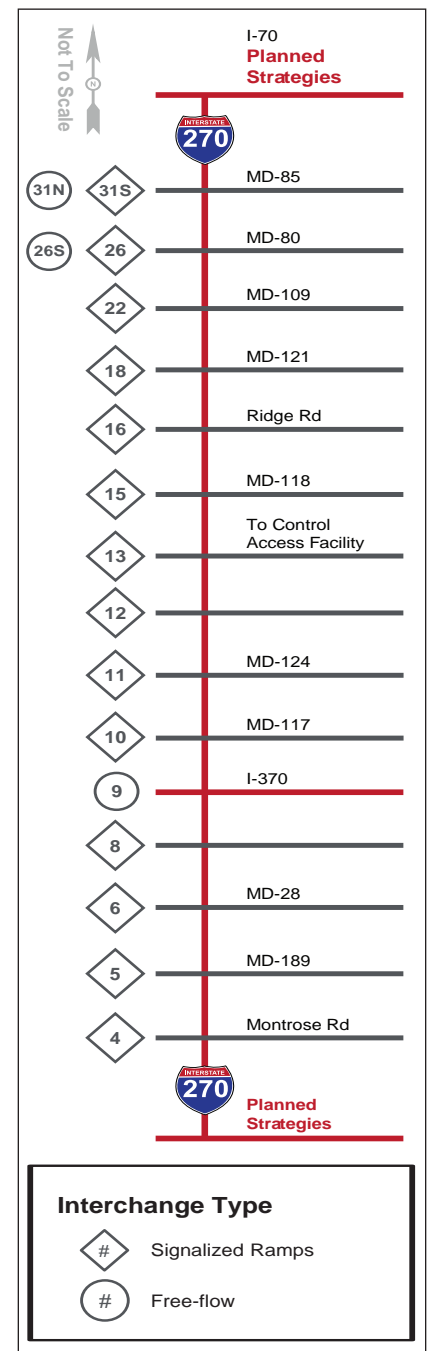
TRAFFIC ANALYSIS – FIXED RAMP METERING

In order to perform traffic analysis for ramp metering PTC, no-build 2040 AM and PM models provided by SHA were used. The build condition 2040 models were then developed utilizing the ramp meter locations and were coded in as fixed time ramp meters. No other model parameters were changed in this process. Traffic signal timing along the arterials was left as provided in the no-build model for this preliminary analysis.

Detailed description of modeling methodology for both fixed ramp metering and adaptive ramp metering, along with all assumptions and any changes to the model, are included in the VISSIM Methodology memorandum included as an appendix to our proposal.

We understand the limitations of fixed time ramp metering since the performance dynamics of this type of ramp metering are significantly different from adaptive ramp metering. Fixed time ramp metering was included in the initial PTC based on the time constraints, and the need to set up the dynamic model. However, this

The proposed ramp metering system includes most of the entrance ramps on NB and SB I-270 from MD-85, milepost 31 to Montrose Rd milepost 4. Peak hours generally are NB from 3 pm to 7 pm and SB from 5 am to 9 am.



section was included to show the benefit of ramp metering in general and to show that a significant improvement is possible even with simple fixed time algorithm. This revised PTC includes the results of the dynamic ramp metering model.

2040 AM – BUILD CONDITION

The analysis was conducted for the morning one-hour peak period as directed in the RFP. The results of VISSIM modeling show an overall improvement in the network performance after ramp meter implementation. **Table C.16 shows that total delay, average delay, and total travel time are reduced by 29%, 29%, and 13%, respectively.** The number of vehicles entering the network at the end of a simulation period has been **increased by 4%** and the average speed of the corridor **increased by 21%**.

Improvements in speed, travel time and throughput are also observed on the northbound direction in AM model. This happens because the proposed PTC could clear the queue on loop ramps at MD-28. The queue, formed on SB loop ramp in the AM peak model backs up to the NB loop ramp, creating a gridlock on NB direction of the C/D road in the no-build 2040 model. Due to improvements provided for the southbound direction vehicular flow using ramp metering the grid lock at NB loop ramp of MD 28 will be relieved improving operations along NB IS 270 direction as well.

Table C.16: AM Peak - 2040 Adaptive Ramp Metering - I-270 Vehicle Network Performance

	No Build	ARM	% Change
Total Delay	35,032,576	24,961,667	-29%
Average Delay per Vehicle	326	233	-29%
Total Travel Time	64,317,886	55,856,620	-13%
Vehicles (Arrived)	87,894	91,423	4%
Latent Demand	44,530	46,296	4%
Latent Delay	120,600,723	129,765,371	8%
Total Distance	463,125	487,947	5%
Average Speed	26	31	21%

Detailed traffic analysis VISSIM results shown in Figures 2 and 3, including travel time and speed graphs are provided as attachments.

2040 PM – BUILD CONDITION


The analysis was conducted for the evening one-hour peak period as directed in the RFP. The results of VISSIM modeling show an overall improvement in the network performance after HSR implementation. Table D.16 shows that there benefit to the network with ramp metering in the PM condition, as well. However, if individual measures of effectiveness are looked at closely from Tables D.1 to D.16 attached in the appendix it can be seen that there is substantial improvement in each area during PM peak with ramp metering. From table D.1 in the appendix, **vehicle travel time for IS 270 NB is reduced by 1.8% and NB C/D road travel time is reduced by 2.9%**. From Table D.3 in appendix, **vehicle**

speed increases by 2.9% along C/D road and 1.8% along IS 270. From Table D.8 there is an increase of up to 2% in throughput the IS 270 NB corridor and along the NB C/D road increase in throughput is up to 3%.

Table D.16: PM Peak - 2040 Adaptive Ramp Metering- I-270 Vehicle Network Performance

	No Build	RM	% Change
Total Delay	36,237,078	36,442,816	1%
Average Delay per Vehicle	307	309	1%
Total Travel Time	67,865,560	68,043,530	0%
Vehicles (Arrived)	95,124	94,948	0%
Latent Demand	8,861	9,170	3%
Latent Delay	13,484,325	14,252,737	6%
Total Distance	477,455	477,055	0%
Average Speed	25	25	0%

Detailed traffic analysis VISSIM results tables C.1-16 and D.1-16 (as well as travel time and speed graphs) are attached as appendix. Note that the modeling cannot address operational fine tuning that can be done through the system based on real operational traffic patterns, as a result, we would anticipate the true results would be better than the model after the metering strategies are fine tuned.



Mobility

Provide improvements that maximize vehicle throughput, minimize vehicle travel times, and create a more predictable commuter trip along IS 270.

Ramp metering reduces congestion and delay. Travel times are reduced and are more reliable even considering times in ramp queues. Figure 4 provides ample results for several performance measures that supports the effectiveness of ramp metering.

Figure 4: Ramp Metering Analysis

Performance Measure	Location & Result
Travel time:	Atlanta – 10% decrease in peak period
	Houston – 22% decrease in peak period
	Arlington – 10% decrease in peak period

Performance Measure	Location & Result
Travel speed:	Milwaukee – 35% increase in peak period
	Portland – 155% increase in peak period
	Detroit - 8% increase
	Los Angeles – 15 miles per hour faster
Driver hours saved:	Sacramento – 50% decrease
	Los Angeles – 8,470 hours per day
Vehicle volume:	Milwaukee – 22% increase in peak period
	Sacramento – 5% increase in peak period
	Detroit -14% increase in volume
	Los Angeles – increase of 900 vehicles per day
	Kansas City – 20% increase



Safety

Provide for a safer IS 270 corridor

Ramp metering provides safety by reducing crashes. By breaking up platoons of vehicles entering the freeway, merging turbulence is reduced thereby reducing crashes. In addition, effective queue management reduces queue spillover into intersections also improving safety. The overall crash rates and severity have been shown to be reduced from 15 to 64%. During operation the possibility of minor crashes due to queuing may increase during the early implementation phase while drivers get used to the ramp metering operation. Parsons recommends additional ramp signage illuminated when the meter is on that flashes “METER ON”, “PREPARE TO STOP” before the entrance and “PREPARE TO STOP WHEN FLASHING” at middle of each ramp to mitigate this risk.

Figure 5: Ramp Metering Analysis (Crash Measures)

Performance Measure	Location & Result
Crash rate:	Phoenix – 16% decrease during metered hours
	Milwaukee – 15% decrease in peak period
	Kansas City – 64% decrease of rear end and side swipe crashes
Crash frequency:	Portland – 43% decrease
	Sacramento – 50% decrease
	Los Angeles – 20% decrease



Operability/Maintainability/Adaptability

Provide improvements that minimize SHA operations and maintenance activities while being adaptable to future transportation technological advancements.

It is important to consider and plan for the impacts of ramp metering. Planning for deployment and operations of ramp metering must start well before deployment.

Planning must include:

- Selection of a metering strategy and central algorithm (see a review of algorithms in the Miscellaneous Section below)
- Staffing and training – staffing would require operational and maintenance personnel. Operational personnel would be responsible for monitoring and tuning of the central software. We would anticipate that the daily operations of the ramp meters could be managed through current operations staff. However we would expect the need for a ramp metering lead that we would expect to require about one person half-time.
- As with any ITS deployment, maintenance of the additional filed elements is required. Ongoing maintenance typically ranges between 5% and 10% of the deployment cost per year. This includes labor, parts inventory, and preventive maintenance. The maintenance plan must consider reduced operations fall back strategies and response time for maintenance.
- **Strategic Partnerships** – Forming partnerships with other agencies and partners for the purposes of information and planning is essential. This includes and is not limited to arterial signal timing, transits coordination, enforcement, and media support.
- **Public outreach planning** – From the FHWA document “Ramp Metering a Proven Effective Strategy” Agencies should devote effort to outreach and collaboration. First, the agency should partner with other relevant agencies to gain concurrence and support. For both agencies and the public, one of the best ways to encourage support is by proactively disseminating information and clearly communicating the benefits of ramp metering. This may include gathering public feedback, conducting open houses, and issuing statements to local media. In order to reach a broader local population, the agency should maintain important information on a web site and distribute it via brochure or flyer. Providing clear information and addressing questions adds transparency to the planning process, which the public will generally favor. The overall plan must consider handling of negative calls from the public and adverse press.
- **Planning for Enforcement** – We suggest reviewing the operational and enforcement strategies with local law enforcement in advance of the initial deployment of ramp metering. Typically a random spot enforcement plan is appropriate to ensure motorists compliance. We would also expect more

enforcement for the first six to eight months and a tapered down level of enforcement on an ongoing basis.

- **Adaptability** – In the long run, ramp metering can adapt to changing operational strategies through a well-managed central system capable of flexibility to provide for new metering concepts such as new algorithms. Adaptive ramp metering is also very well suited for integration into overall Integrated Corridor Management (ICM) and other Active Traffic Management (ATM) strategies.

During construction the installation of ramp metering will require temporary closures of the ramps to install detection. This is work that can be done off peak to minimize any potential impacts. Maintenance of Traffic Plans will be developed. After construction public outreach advertising explanation of ramp metering should continue through the turn on of the ramp meters. During the initial operations it is important to monitor and review traffic patterns to determine if there is a need to fine to any of the operational strategies. We would anticipate working with SHA and the local agencies during this phase.

IS 270 CORRIDOR FEASIBILITY ANALYSIS

Ramp Metering, while a proven effective strategy, should be analyzed with regard to the IS 270 corridor. Analysis consists of a feasibility study and a set of simulation scenarios.

The feasibility of a potential ramp metering site is largely based on a ramp's geometric layout and the ramp volumes. There are several criteria to consider when evaluating a ramp's geometry for ramp metering. These items include storage area, grade, lane and pavement widths, acceleration lanes, signalization, and shoulder area.

Parsons evaluated the feasibility of each ramp by applying a point valuation system that we have used for previous deployments (See Figure 6). After rating each ramp, we grouped them into the categories of High, Moderate, and Low feasibility. The development of the point valuation system and the high, moderate, and low feasibility categories are explained in the following sections.

Past experience has shown that the manageable upper limits of ramp demands that can be metered are: 900 vph for a single-entry ramp metering operation, and 1,700 vph for a two-lane ramp metering operation. While these were analyzed using peak hour demands it is known that a certain percentage of vehicles (typically short trippers) will ultimately divert (Given the limitations of the provided model and traffic data, we cannot assess this diversion). Points are awarded to each ramp based on how much deviation there is between this range and the peak hour demands. For each configuration, only a single vehicle is admitted for each green indication per lane.

It is then necessary to determine the amount of available storage space and the potential for providing additional lanes on the ramp. Ramp lengths were measured from the top of the ramp to the end of the painted gore. A distance

of either 250 feet for a downgrade ramp or 350 feet for an at-grade or upgrade ramp was subtracted (unless an auxiliary lane exists whereby 0 is subtracted) to provide for acceleration and to accommodate placement of the metering signal. The remaining distance was divided by 26 feet per vehicle to determine the number of vehicles that could be stored on the ramps. Ramps that have a large amount of storage capability are better suited for metering and allow for greater flexibility in metering rates.

To determine if additional lanes could be provided on a ramp, the existing pavement width was measured. It is assumed that ramp metering lanes are typically 12 feet wide and that shoulders are not necessary. A pavement width of about 24-26 feet could accommodate two lanes of traffic. Additional points were awarded to each ramp on the basis of the ability to provide sufficient storage space and to provide additional lanes.

Figure 6: Metrics used to Determine if Additional Lanes are Feasible

Parameter	Condition	Points
Peak Hour Demand (vph)	(1 or more existing lanes) 0 - 700	8
	(2 existing lanes) <1300	7
	(1 existing lane) < 900	6
	(2 existing lanes) 1301 - 1700	5
	(1 existing lane) > 900	0
	> 1700	0
Storage Capacity (vehicles)	< 10	0
	11 - 25	1
	> 25	2
Ramp Geometry	One lane exists and two are required and there is a potential for pavement re-striping	2
	One lane exists and two are required and there is a potential for ramp widening	1
	One lane exists and two are required and there is not a potential for ramp re-striping or widening	0

*** Note – Maximum Score = 10, as ramp geometry score only applicable if two lane metering is required.**

Based on the ramp metering feasibility scoring system, the expected score value ranges between zero and ten. A zero (0) score is the worst case for ramp metering where the ramps have demand greater than 1,700 vph, the ramp has little room for storage, and the ramp’s geometry has no potential for ramp widening or re-striping. A ten (10) score, on the other hand, is the optimal case for ramp metering where the on-ramp demand is less than 700 vph, the ramp has a large storage capacity, and the ramp’s geometry has the potential for either widening or re-striping.

The ramps are grouped by their feasibility scores. Scores of 0 to 3 are considered low feasibility and alternate strategies must be considered. Scores of 4 to 6 are considered moderate feasibility and may need alternate strategies, and scores of 7 to 10 are considered high feasibility. Note – Maximum Score = 10, as ramp geometry score only applicable if two lane metering is required.

The results of the feasibility analysis indicate that ramp metering is a very good candidate solution for IS 270. Based on our analysis, most of the ramps can readily support ramp metering without geometric modifications. A few single lane ramps will require either operating at two vehicles per green, striping to allow two lanes, structural modifications, or using an aggressive queue managing strategy such as flushing the ramp when it is beginning to queue. These ramps are listed below with potential mitigation strategies. Details analysis per ramp are include in the appendix.

Figure 7: Ramp Results of the Feasibility Analysis

Ramp and Direction	Score	Revised Score	Comments
EB MD28 Montgomery to SB	4	9	May require a short section of roadway geometric and structural section changes in advance of the ramp metering stop bar to allow for 2 lane metering. We are anticipating a 200 foot section with two lanes. Allowing two cars per green will also be looked at in more detail as an alternative.
EB &WB Montgomery Village Drive to SB	4	9	May require a short section of roadway geometric and structural section changes in advance of the ramp metering stop bar to allow for 2 lane metering. We are anticipating a 200 foot section with two lanes. Allowing two cars per green will also be looked at in more detail as an alternative.
WB Montrose to NB	4	9	We may be able to just restripe this ramp for about 250 ft to allow for two lane metering, but we will need to investigate the shoulder structural section for suitability for a second lane. Allowing two cars per green will also be looked at in more detail as an alternative.
WB Montrose to SB	4	9	This ramp is showing demand slightly past capacity, with a 15 minute spike. We may be able to just restripe this ramp for about 200 ft to allow for two lane metering, but we will need to investigate the shoulder structural section for suitability for a second lane. Allowing two cars per green will also be looked at in more detail as an alternative.
Ridge Road to SB	4	9	We may be able to just restripe this ramp for about 200 ft to allow for two lane metering, but we will need to investigate the shoulder structural section for suitability for a second lane. Allowing two cars per green will also be looked at in more detail as an alternative.
EB &WB Falls Road NB	4	9	Just at max capacity, we will first look at two cars per green as an option, but my need to be converted to two lanes for a short stretch. But limited space may require a design exception to change.

To achieve maximum results from our adaptive algorithms it is highly desirable to meter all entrances on the mainline, including connectors from other freeways.

Our evaluation of the connectors from IS 370 to IS 270 are shown below. The final solutions will be recommended in conjunction with field evaluations and SHA acceptance.

Ramp and Direction	Score	Revised Score
WB IS 370 to NB IS 270	Currently this connector operates as a single lane. Peak hour demands in the 1500 to 1600 range. Using one vehicle per green would queue over 600 vehicles per hour and backup onto WB IS 370	We may be able to just restripe this ramp to allow for two lane metering, but we will need to investigate the shoulder structural section for suitability for a second lane. Allowing two cars per green will also be looked at in more detail as an alternative.
EB IS 370 to NB IS 270	Currently this connector operates as a single lane. Peak hour demands in the 900 – 1000 range. Using one vehicle per green would queue over 100 vehicles per hour. The ramp has a storage capability of 90+ vehicles	We may be able to just restripe this ramp for about 250 ft. to allow for two lane metering, but we will need to investigate the shoulder structural section for suitability for a second lane. Allowing two cars per green will also be looked at in more detail as an alternative.
WB IS 370 and EB IS 370 Merge to SB IS 270	Currently the EB IS 370 connector is a two lane ramp with a peak hour demand in the 1000 range. However the WB connector is a single lane ramp with a peak hour demand in the 1700 range. Currently the WB connector routinely backs up on to IS 370. These two ramps merge into an ultimate two lane ramp before entering IS 270 representing a peak hour combined demand of 2700 vehicles. There are also issues of existing guard rails and steep drop-offs.	Use a two vehicle per green strategy on the existing two lanes

D. POTENTIAL IMPACTS

User Impacts: It is important to understand that ramp metering does not affect all users evenly. In general ramp metering does favor the commuters that use the entire corridor over the short distance commuter. Ramp meters tend to discourage motorists from using the freeway for short distances during metering hours. Obviously this has positive impacts to freeway flow, but does also have some negative impacts for the motorist that would otherwise use the freeway for a short commute. Overall commuters will experience the benefit of a system that will include improved safety, travel times, and better trip reliability.

Right-of-Way: We do not anticipate any need for additional ROW needed to deploy ramp metering throughout the corridor. All hardware installation will be within existing ROW.

Geotechnical: The ramp metering light poles are relatively small, and we would not anticipate there would be any need for geotechnical work related to the actual meter deployments. We are anticipating that two ramps will need to be widened to two lanes. We will need to confirm the structural section of the shoulders on these ramps.

Utilities: The ramp meters will require a tie in to local power. Our initial cost estimate assumed typically costs for a metering deployment in a similar urban area. These costs will be refined in the detailed design.

Environmental Permitting: No environmental permitting is expected for this PTC. It has minimal impact in this area.

Local Community: Our approach to planning for ramp metering would include coordination with the local agencies. As indicated above, there are inequities in the distribution of benefits for ramp metering that need to be assessed and addressed in coordination with the local agencies. Ideally ramp metering would be deployed in conjunction with an integrated corridor approach. This is addressed in a separate PTC. If full ICM coordination is not possible it is still likely that there will be operational advantages in reviewing and refining local traffic signal operations in coordination with the ramp metering deployment.

Safety: Ramp metering has consistently proven to improve safety on the mainline by reducing the platooning of vehicles as they enter the freeway. The construction involves installation of ITS components on entrance (signals, signs, detectors, etc.), however the ramps will be closed and there will be minimal safety issues during construction, As indicated previously, during operation the possibility of minor crashes due to queuing may increase particularly during the early implementation phase while drivers get used to the ramp metering operation.

Infrastructure Costs: The following table is a high level estimate of the costs for installation of the field infrastructure for ramp metering This is subject to change based upon the specifications of systems that SHA chooses to implement under this contract.

Figure 8: Estimate for Installation of Ramp Metering Field Infrastructure

Item	Quantity per Ramp	Cost each	Cost per Ramp	Cost for 37 ramps (7 existing 2 lanes, 2 modified to 2 lanes)
Signal Head and Pole	2	\$10,000	\$20,000	\$760,000
Cabinet and Pole	1	\$7,000	\$7,000	\$266,000
Signing	6	\$700	\$4,200	\$150,000
Controller	1	\$3,500	\$3,500	\$133,000
Loop Single Lane	5	\$1,000	\$5,000	\$155,000
Loops 2 Lane	10	\$1,000	\$10,000	\$310,000
Loop Wire 1 lane + Lead	5	\$500	\$2,500	\$135,000
Loop Wire 2 Lane Plus Lead	10	\$500	\$5,000	\$45,000
Stop Bar	1	\$750	\$750	\$27,000

Item	Quantity per Ramp	Cost each	Cost per Ramp	Cost for 37 ramps (7 existing 2 lanes, 2 modified to 2 lanes)
Stop Bar and Striping for widened ramp	1	\$3,000	\$3,000	\$6,000
Trenching, jack boring, and power Service	1	\$20,000	\$20,000	\$760,000
Comm Service	1	\$5,000	\$5,000	\$190,000
Maintaining Traffic	1	\$4,000	\$4,000	\$152,000
Average/ Ramp:			\$81,305	
Total for 37 ramps:				~3,089,000

Geometric and/or striping changes will likely be required for some of the ramps as described above. Our preliminary estimate for the cost of those changes is about \$320,000. This number will be refined with further review of these ramps.

Central System software cost for ramp corridor wide adaptive ramp metering is approximately \$250,000 including deployment, testing, initial setup and training.

Cost of Maintenance: Our initial estimate, using 5% of the field infrastructure cost, maintenance would be about \$150,000 per year for field and central system. This would include all labor and equipment.

Cost of Operation: As indicated previously, we would expect the day to day operations to be managed through your existing operations, However, we would expect the need to add about ½ Person Year (PY) to manage the ramp metering program. Expected additional operations cost would be approximately \$40,000 per year.

Cost of Outreach Program: We will assume a program in which Parsons supports the development of Brochures, website, videos, open house meetings, inter-agency meetings media releases, and social media. We expect our budget to support this effort to be between \$75,000 and \$125,000. We would anticipate working closely with SHA on this effort.

E. OTHER PROJECTS

Parsons currently has ramp metering deployments in 13 locations as shown the following chart. We included is contact information of several different types of deployments. We can provide contacts for the rest if desired.

The map on the right was prepared by the FHWA showing ramp metering deployments in the United States.

Figure 9: Ramp Metering in the Top U.S. Metro Areas



Figure 10: Parsons Ramp Metering Projects

Project	Number of Meters	Type of Metering	Contact
Caltrans District 4 Ramps	598	Manual, TOD	
Caltrans D4 Mainline Metering	16	Manual, TOD	

Project	Number of Meters	Type of Metering	Contact
I-80 ICMS	44	Adaptive - Fuzzy Logic	Connie Fremier Executive Vice President Vali Cooper & Associates, Inc. 2000 Powell Street, Suite 550 Emeryville, California 94608 Tel: 510.446.8301 x 514 Cell: 510.867.7529 Email: connie.fremier@valicooper.com
Oregon DOT - Portland	148	Adaptive - SWARM 2C	Dennis Mitchell 503-731-8218 Dennis.J.MITCHELL@odot.state.or.us
Caltrans District 7 SWARM	960	Adaptive - SWARM 1, 2a and 2B	Wahib Jreij 213-761-6545 Wahib_jreij@dot.ca.gov
Caltrans District 7 DCRMS	28 (I-110) Up to 960	Adaptive – DCRMS	Wahib Jreij 213-761-6545 Wahib_jreij@dot.ca.gov
Kansas City Scout	15	Adaptive – CARMA	K. Mark Sommerhauser KC Scout ITS Project Manager 816-607-2243
VDOT I-66 ATM	7	Adaptive - CARMA	provided upon request
San Diego ICMS	42	Adaptive via DSS	provided upon request
Chicago ATMS	113	Manual, TOD	Jeff Galas IDOT TSC 708-524-2145 galasjm@nt.dot.state.il.us
Taiwan Ramp Metering	109	Manual, TOD	
Toronto Compass	11	Manual, TOD	

F. ADMINISTRATIVE RISK

While ramp metering is a proven strategy for the mitigation of congestion, several issues must be considered regarding administrative risk including:

Public Opposition: Public support is critical for the success of a ramp metering program. Opposition can come from misconceptions about ramp metering effectiveness, concerns regarding equity, and ramp queues. It is therefore imperative to have an outreach program in place both prior to and during the early phases of operation. See Potential Impacts above.

Enforcement: One risk is that drivers will ignore the signals and simply proceed as before onto the mainline, thereby negating the potential benefits of the application. The risk might be higher in more rural areas, where peer pressure might be less prevalent, or the violations could come about due to the perceived lack of repercussions. Again the public outreach program that explains the benefits of compliance is imperative. In addition, a spot enforcement program at the start of operations that encourages people to comply, and (hopefully) serves to illustrate the benefits.

Local Agency Lack of Support: Sometimes key people in the agency and third parties do not understand ramp metering and its high benefit-cost ratio, long term maintenance and operations. If this is an issue, it is important to have internal presentations showing the benefits of ramp metering scheduled at appropriate times. As discussed previously, it is important to engage local agencies upfront and coordinate the deployment and operations of ramp metering with local agencies.

G. DESIGN-BUILD RISK

Design build risks related to ramp metering are minimal but the following represent issues based on design assumptions that are found to be in error:

- Access to power could require undefined cost to provide these services. However, we would not expect either of these items to be a significant issue in this corridor.
- As of the date of this PTC we have not confirmed the shoulder structural section on the ramps that we would like to widen to two lanes is sufficient to be converted to a general lane. Additional research is required and there is the potential for additional cost to upgrade the structural section of the shoulder to convert it to a traveled lane.
- A Hard Shoulder Running (HSR) PTC is being developed in parallel with this PTC. The HSR PTC will include converting some of the outside shoulder to an HSR lane. This final design will affect the ramp metering design where the outside shoulder is being used. The HSR will affect the location of the stop bar for the ramp meter. These details will be worked out in the development of our final proposal. However, reduced acceleration distances could push the location of the ramp meter stop bars back and therefore reduce ramp storage space.

H. COST/SCHEDULE BENEFIT

Previous ramp metering studies have shown benefit to cost ratios of around 15/1. The Twin Cities Ramp Meter Evaluation Report confirmed this number. This comprehensive evaluation included benefits and dis-benefits associated with travel time, travel time reliability, accidents, accidents avoided, hydrocarbons, carbon monoxide, nitrous oxide and fuel use. The evaluation costs included capital costs and annual operations and maintenance cost, including estimated percentage of cost associated to ramp metering from the overall congestion management program.

Deployment of ramp metering along the 270 corridor should be straight forward and involves very limited risk. Deploying ramp metering in coordination with HSR is a complimentary strategy that includes synergies in development and deployment as well as operations. Most ramp metering experts would agree that the most critical time in gaining acceptance for ramp metering is within the first year of deployment. While ramp metering has been repeatedly shown to improve flow and safety in a corridor, the inherent inequities in benefits between motorists does make initial ramp metering deployments more susceptible to public criticism, particularly in initial deployment. Deploying ramp metering in conjunction with HSR should help ease some of the public concerns. Therefore, If you are ever going to deploy ramp metering in the corridor, this is a good time.

I. MISCELLANEOUS

As discussed previously, adaptive ramp metering algorithms more efficiently utilize ramp meters and avoid metering when it is not improving traffic flow

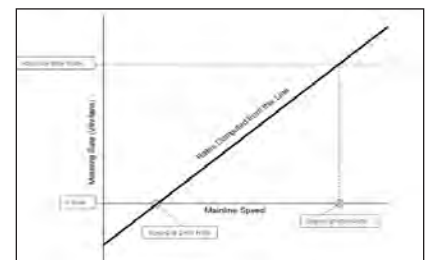
The following is a discussion five adaptive algorithms that contains Parsons Proprietary information. All pages marked as “Parsons Proprietary” contain sensitive information that shall not be disclosed outside SHA..

CORRIDOR ADAPTIVE RAMP METERING ALGORITHM (CARMA)

CARMA computes metering rates based on mainline speeds and prevailing local controller conditions then optimizes them over each freeway direction. It is currently in use in Kansas City MO/KS

CONCEPT

CARMA computes a metering rate at each mainline station regardless of whether there is an associated metered ramp or not. VDSs are ordered by geography and are processed starting with the furthest downstream location. The concept is based on the assumption that a ramp can allow maximum vehicles when the speed is high and should theoretically allow no vehicles when the speed is at a jam condition. Then a linear relationship is assumed to compute a slope and intercept to be used to interpolate and extrapolate metering rates for all speeds as follows:



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- Slope = Local Maximum Rate / (Speed at Max – Speed at Zero rate)
- Intercept = Local Maximum Rate – Slope x Speed at Max

The algorithm allows for computing raw metering rates that are above the local Absolute Max Rate and metering rates below Absolute Min Rate (and possibly negative). Conceptually the Raw Rate represents the desirable number of vehicle to allow entry solely based on local mainline traffic conditions.

Then a rate is computed as follows:

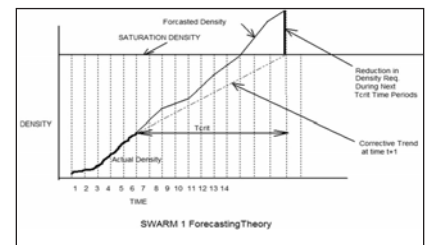
- Compute the smoothed Speed using a exponential smoothing factor
- Compute the Raw Rate = Smoothed Speed x Slope + Intercept
- Compute the Adjusted Rate = Raw Rate + Excess x Propagation Factor ^d where:
 - Excess = this value represents the excess number of vehicles that were propagated from downstream VDSs. Positive values indicate that after the downstream ramps allowed the maximum number of vehicles to enter that there is still room for more vehicles downstream. Conversely, negative values indicate that after allowing vehicles to enter downstream that exceed the desirable number and there is not room downstream for additional vehicles. Computationally, Excess after computing final rates at a ramp is
 - d = the distance between the current mainline VDS and the next downstream VDS
 - Propagation Factor = user selected value representing the ratio of Excess to propagate. The value must be between 0 and 1. Using the power formula allows Excess to decrease over distance.
- Compute the Final Rate which is bounded by the Local Absolute Maximum and Absolute Minimum Rates

SYSTEM WIDE ADAPTIVE RAMP METERING (SWARM)

The SWARM algorithm uses a forecasting methodology based on Density and apportions rates across an entire system. SWARM is currently in operation in Caltrans District 7 and Portland Oregon.

SWARM FORECASTING

Based upon recent conditions, SWARM attempts to estimate the density at a time in the future. How far into the future (Tcrit) the algorithm will estimate is a tunable parameter and is limited based upon practical limitations of the algorithm and the necessary lead time for metering rates to take effect the figure at the right depicts this forecasting methodology. The heavy line on the drawing represents density rising in a typical fashion. In the Figure the forecast indicates that density will rise above saturation before Tcrit minutes. The heavy line above the saturation density line represents the amount that the density must be reduced during the next Tcrit minutes to avoid saturation. Every polling interval (typically one minute) a new forecast is made and if saturation density will occur before the Tcrit minutes, a new density reduction is computed.



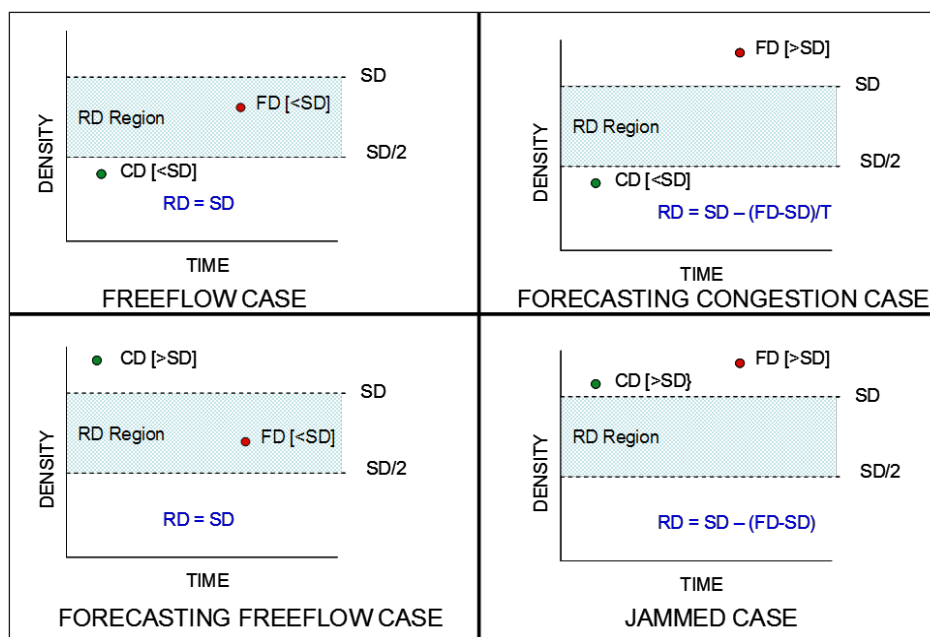
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FOUR VALUES OF DENSITY ARE USED BY SWARM:

- **Current Density (CD)** – This represents the Density at the Vehicle Detector Station (VDS).
- **Saturation Density (SD)** – Each VDS has a computed value of SD which represents the value of Density at saturation at the VDS and that should not be exceeded to achieve optimal system performance. SD is computed by capturing values of CD when the station Speed is between 30 and 50, Volume >10, and CD between 30 and 60. This region is defined as saturation. When these three conditions are true SD is recomputed by smoothing in the CD according to the formula $SD_{new} = CD * k + (1-k) * SD_{old}$. k is the tunable smoothing parameter.
- **Forecast Density (FD)** – Each VDS has a computed Forecast Density (FD). This forecast is computed with a linear regression based on a tunable number of samples of Density (Forecast Size) and a tunable number of samples into the future (Forecast Lead Time).
- **Required Density (RD)** – This value is key to SWARM apportionment and represents the maximum density that should be striven for at each VDS reporting to its bottleneck. RD’s value is always between SD and SD/2 and is computed for each bottleneck as follows:
 - Freeflow Case: If $CD \leq SD$ and $FD \leq SD$ then $RD = SD$
 - Forecasting Congestion Case: If $CD \leq SD$ and $FD > SD$ then $RD = SD - (FD - SD) / \text{Forecast Lead Time}$
 - Forecasting Freeflow Case: If $CD > SD$ and $FD \leq SD$ then $RD = SD$
 - Jammed Case: If $CD > SD$ and $FD > SD$ then $RD = SD - (FD - SD)$

These four cases are shown in Figure 11.

Figure 11: Four Values of Density are Used by SWARM



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SWARM DYNAMIC BOTTLENECKS

A process is run continuously that looks for VDS stations that are exhibiting bottleneck behavior. The process looks at individual freeway directions starting at the furthest downstream point. The furthest VDS on a freeway direction is always set as a bottleneck to insure that there is always a downstream bottleneck. Then searching from downstream to upstream each VDS is examined to see if it has a saturation density less than the current downstream bottleneck. If its saturation density is less, then it is classified as a new bottleneck. If not, its distance from the current upstream bottleneck is tested against a parameter (around 5 miles) and to the VDS with the lowest Saturation Density plus or minus 2 miles of this distance is also established as a new bottleneck. After completion this algorithm flags all VDS that are currently bottlenecks to be used by SWARM.

Using the resulting value of Required Density at each bottleneck defines the maximum value of density at all ramps upstream reporting to that bottleneck location. This used in conjunction with the current local densities and the apportionment algorithm define the metering rates at each ramp. Each new bottleneck's Required Density controls all of its upstream ramps.

SWARM DESIRED METERING RATES

SWARM desired metering rates are computed independent of all constraints. This rate can be negative or positive and is computed as follows:

$MR(\text{desired}) = \text{AbsMax} - (\text{CD} \times \text{N} - \text{RD} \times \text{Nbn}) \times \text{D} - \text{Excess}$. Where:

- AbsMax = The Absolute Maximum Metering Rate at the ramp
- CD = Current Density at the ramp. Note: If the VDS has no valid data CD is set to SD
- RD = Required Density (see Section Reference)
- N = The number of lanes at the ramp
- Nbn = The number of lanes at the bottleneck
- D = The distance to the next downstream ramp
- Excess = the number of vehicles that were not handled from downstream ramps. Excess can be positive; vehicles were not handled or negative; extra room is available.

The final SWARM metering rate is computed in two steps:

- Insure the SWARM rate is bounded between the Local Minimum and Local Maximum rates The rate is smoothed as follows:
 - IF the rate is increasing insure that it increases by no more that the Up Rate Smoothing parameter (which is given in vehicles per minute)
 - IF the rate is decreasing insure that it decreases by no more that the Down Rate Smoothing parameter (which is given in vehicles per minute)
 - After smoothing reinsure the final SWARM rate is bounded between the Local Minimum and Local Maximum rates.

Note: If SWARM is not a chosen mode, the bounding of Local Minimum and Local Maximum rates insures proper operation.

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SWARM EXCESS COMPUTATIONS

In SWARM metering rates are computed in a specific order. The order starts at the furthest downstream ramp on a freeway direction and proceeds upstream until the furthest upstream ramp is reached. This is repeated for each freeway direction.

Excess is the value that is used to allow SWARM to adapt to areas of congestion by propagating upstream those vehicles that cannot be handled at each ramp in those areas. Excess can be thought of as the number of vehicles that should be removed from the freeway to obtain stable flow. Negative Excess then can be thought of holes where vehicles can be added without affecting stability.

Excess starts at zero at the first ramp at the furthest downstream ramp. After the final SWARM metering rate is computed) a new value of Excess is computed to be used at the next upstream ramp as follows:

Excess(new) = (MR(final) - MR(desired)) x Ramp's Inter Section Propagation Factor ^ Distance between ramps.

The tunable values for Inter and Intra Section Propagation Factors control how fast the Excess dissipates. The smaller the values the faster the dampening effect.

STRATIFIED ZONE METERING-THE MINNESOTA ALGORITHM

The objective of stratified zone metering is to regulate zones through metering so that the total volume exiting a zone exceeds the volume entering. For this to happen, the relationship of inputs and outputs within a given zone is as follows:

$$M + A + U \leq B + X + S$$

Therefore:

$$M \leq B + X + S - A - U$$

Through this calculation, M is the maximum number of vehicles allowed to pass through all meters in any given zone between stations A and B. The key to stratified zone metering is to disperse the volume M throughout the zone suitably depending on demand (D) on the metered entrance ramps. D is the total number of vehicles that need to enter a freeway through all metered entrances within a given zone. In order to disperse M appropriately, calculations are made one zone at a time from upstream to downstream (beginning with Zone 1-1) as follows:

$$R_n = M * D_r / D$$

R_n is the proposed rate for meter n (n is a meter within the zone).

D_n is the demand for the meter n.

Therefore, based on demand, this calculation gives a proposed rate for every meter to run in according to a percentage of M. This calculation begins with Zone 1-1 in the first layer. After R_n has been calculated for the first layer, the proposed rates for all meters are compared to the demand and minimum rates for each corresponding meter.

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For all meters where the proposed rate is less than the minimum release rate (discussed earlier), the proposed rate is set to the minimum release rate. The meters that have a proposed rate greater than the demand and the meters that have proposed rate less than the minimum release rate need to have their proposed rates recalculated. These, therefore, have their proposed rates recalculated upstream to downstream using the second layer (beginning with Zone 2-1). The same process is involved for the second layer as the first. However, those meters that have been set to the minimum release rate are “locked in” at that minimum release rate, and this is also factored into the calculation of the zones in the second layer. This process will continue one layer at a time until all proposed rates are less than (or equal to) demand but greater than (or equal to) the minimum rates.

After all proposed rates for meters have been established, the zones that were involved with calculating the final proposed rates must be inspected. If the sum of release rates in one of these zones is less than M for that zone, this is a “broken zone” and needs to be corrected. If not corrected, meters in this zone would be more restrictive than necessary. If a broken zone is found, the meters that have proposed rates controlled by that zone are temporarily set to the maximum release rate. These meters alone are processed again beginning in the first layer as they were before. This will correct the problems of the broken zones and the proposed rates will all be finalized and implemented for the next thirty-second period. See page 5 for numeric examples of the algorithm process.

Various zones may be disqualified from being used in some cases. If any detector in the upstream mainline volume station malfunctions, the zone is disqualified. See appendix (Fake Detectors) for information on exit and unmetered entrance ramp detection that has failed. Also, if there is a drop in density greater than fifty vehicles per mile from one mainline detector to the next downstream detector in the same lane, the zone is disqualified. This scenario suggests that there is an incident on the roadway or heavy congestion and stratified zone metering is inappropriate. If this scenario occurs, each meter in that zone is set to its “simple plan” rate which is 130% of its expected maximum hourly volume.

ALINEA

The ALINEA algorithm, while not system wide, is a feedback method and is used in many installations. It attempts to maximize the mainline throughput by maintaining a desired occupancy on a downstream mainline freeway station. Two detector stations are required for the implementation of the ALINEA algorithm. The first station is located on the mainline freeway, immediately downstream of the entrance ramp. The second loop station is on the downstream end of the entrance ramp and is used for counting the on-ramp volume.

The metering rate for an on-ramp under ALINEA control during time interval (t, t+Δt) is calculated as:

$$r(t) = \sim r(t - \Delta t) + KR \cdot (O^* - O(t))$$

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Where Δt is the update cycle, O^* is the desired occupancy, $O(t)$ is the measured occupancy and K_R is a regulator parameter, used for adjusting the constant disturbances of the feedback control.

The ALINEA algorithm has four parameters to be calibrated: the location of the downstream detector station, the desired occupancy of the downstream detector station O^* , the update cycle of each metering rate Δt , and a constant regulator K_R . The following is a summary of parameter settings used in previous research and implementations.

1. The desired occupancy, O^* , is set equal to or slightly less than the critical occupancy
2. The algorithm has been determined to perform well for $K_R = 70$.
3. The downstream detector should be placed at a location where the congestion caused by the excessive traffic flow originated from the ramp entrance can be detected. In reported implementations, this site was located between 40 m and 500 m downstream of the on-ramp nose.

A wide range of values for the update cycle of metering control has been used: from 40 seconds to 5 minutes. In theory, if the value is small, the location of the downstream detector station should be close to the entrance ramp otherwise there is a risk of congestion build-up between ramp nose to the detector station.

FUZZY LOGIC AND DYNAMIC CORRIDOR RAMP METERING SYSTEM (DCRMS)

The DCRMS expands the Fuzzy Logic Algorithm installed in the I-80 ICM by adding arterial inputs to generate metering rates. The discussion of the Fuzzy Logic aspects is virtually the same as the freeway only version of the algorithm.

These algorithm uses an inference engine to compute metering rates. DCRMS has features similar to the Caltrans D4 Fuzzy logic algorithm but it also takes into account Incident proximity and severity for upstream mainline incidents as well as downstream arterial incidents included as inputs

- Upstream Incidents cause more demand on arterials as motorists divert to avoid the incident. A ramp downstream of an incident should therefore meter more freely
- Downstream Arterial Incidents have a reverse effect, as the freeway offers motorists a route past the incident. Thus, if an arterial incident is downstream, a ramp may meter more freely

In addition, local arterial demand is considered, and more vehicles may be allowed onto the freeway to alleviate traffic on the arterial

PHYSICAL AND EXTERNAL SYSTEM INPUTS

The physical inputs include the following mainline detector stations:

- **Upstream:** Station upstream of the on-ramp merge. This station is used

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only when data from the local station is unavailable.

- **Local:** Station adjacent to the on-ramp merge.
- **Downstream:** One or more stations downstream of the on-ramp merge. Usually, all stations up to 2 miles downstream of the on-ramp are used.

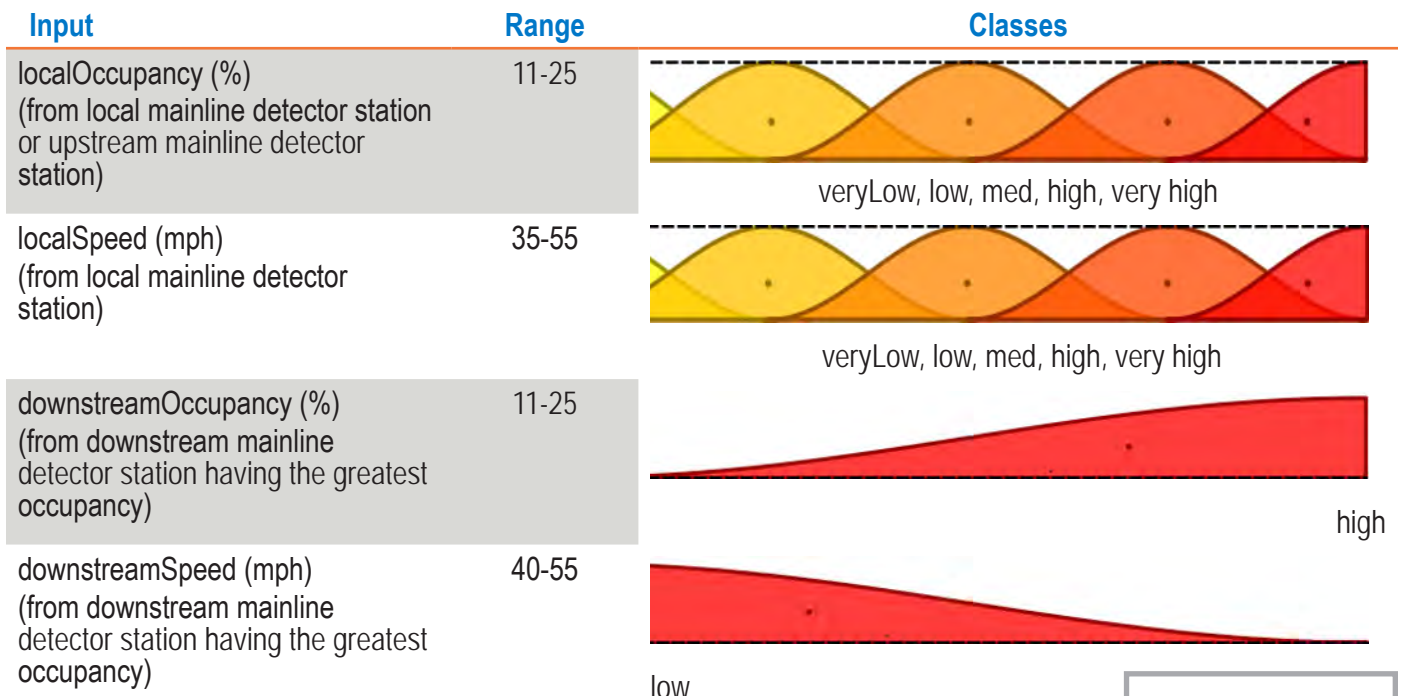
The physical inputs include the following detectors on the on-ramp:

- Queue detector: Detector placed midway between the ramp meter signal and the start of the ramp.
- Advance queue detector: Detector placed at the start of the ramp.
- The generic DCRM controller also requires the following external system inputs for coordination of operations with the arterial signal system:
- Arterial signal system: Provides a real-time measure of ramp demand based on local turning movement counts collected at the adjacent intersection.
- Event management system: Based on the real-time incident information entered by the ATMS operator, provides the severity and location of upstream incidents on the freeway and downstream incidents on parallel arterial roadways.

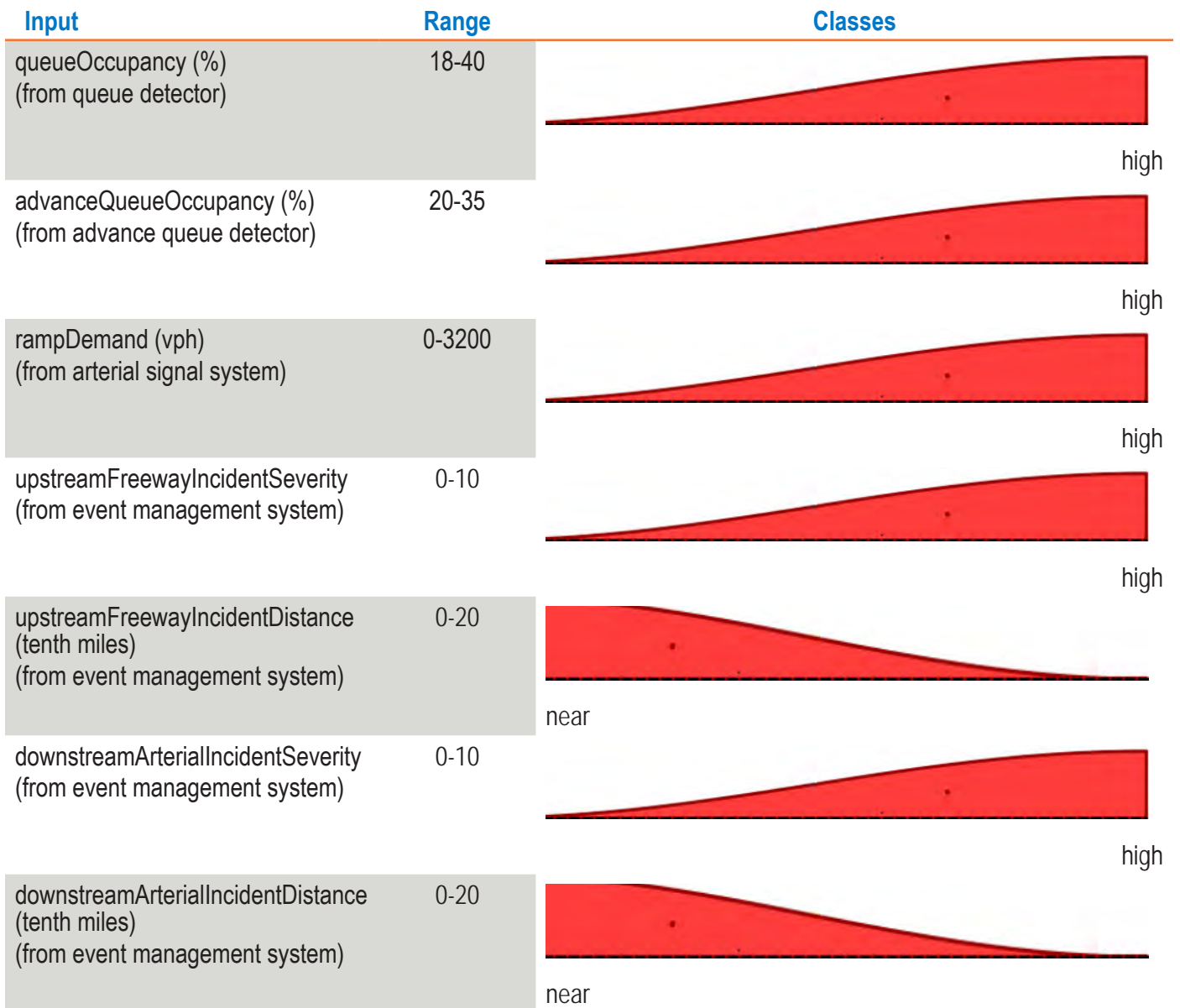
LOGICAL INPUTS

The Figure 12 depicts the logical inputs to the generic DCRM controller defined above. The input classes are defined as sinusoidal curves to provide a natural transition between adjacent classes. The physical or data input corresponding to each logical input is noted.

Figure 12: Inputs to the Generic DCRM Controller



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NATURAL LANGUAGE RULES

Figure 13 depicts lists the rule blocks of the generic DCRM controller defined above. The local rule block provides local ramp metering roughly equivalent in behavior to standard responsive operation. The downstream rule block adds the ability to coordinate with nearby ramp meters to address to downstream congestion. The ramp rule block prevents the queue from spilling back when metering rates are reduced to address congestion on the mainline or when a large demand is expected from the arterial network. The incident rule block is intended to allow diverted vehicles to be moved back onto the freeway downstream of a freeway incident, and to allow diverting of vehicles onto the freeway upstream of an arterial incident.

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The rules in the downstream, ramp, and incident rule blocks have higher weighting than the rules in the local rule block. This ensures that the system will respond strongly when one or more of these prepositions holds true. Within the local rule block, rules activating the highest class of metering rate (very high) have higher weighting than other rules within the local rule block. This ensures that the system will respond strongly as occupancy and speed conditions indicate that mainline congestion is about to occur.

A conventional “product” activation function is specified for all rule blocks. As a result, the corresponding output class for each rule is scaled in direct proportion to that rule’s level of activation.

Figure 13: Rule Blocks of the Generic DCRM Controller

Input	Range	
Local	Product	<ul style="list-style-type: none"> • RULE 1: if localOccupancy is veryHigh then meteringRate is veryLow with 0.5 • RULE 2: if localOccupancy is high then meteringRate is low with 0.2 • RULE 3: if localOccupancy is med then meteringRate is med with 0.2 • RULE 4: if localOccupancy is low then meteringRate is high with 0.2 • RULE 5: if localOccupancy is veryLow then meteringRate is veryHigh with 0.2 • RULE 6: if localSpeed is veryLow then meteringRate is veryLow with 0.6 • RULE 7: if localSpeed is low then meteringRate is low with 0.2 • RULE 8: if localSpeed is med then meteringRate is med with 0.2 • RULE 9: if localSpeed is high then meteringRate is high with 0.2 • RULE 10: if localSpeed is veryHigh then meteringRate is veryHigh with 0.2
Downstream	Product	<ul style="list-style-type: none"> • RULE 1: if downstreamSpeed is low and downstreamOccupancy is high then metering Rate is veryLow with 0.8
Ramp	Product	<ul style="list-style-type: none"> • RULE 1: if queueOccupancy is high then meteringRate is veryHigh with 0.4 • RULE 2: if advanceQueueOccupancy is high then meteringRate is veryHigh with 0.8 • RULE 3: if rampDemand is high then meteringRate is veryHigh with 1.0
Incident	Product	<ul style="list-style-type: none"> • RULE 1: if upstreamFreewayIncidentSeverity is high and upstreamFreewayIncidentDistance is near then meteringRate is veryHigh with 1.0 • RULE 2: if downstreamArterialIncidentSeverity is high and downstreamArterialIncidentDistance is near then meteringRate is veryHigh with 1.0

LOGICAL RAMP METERING RATE OUTPUT

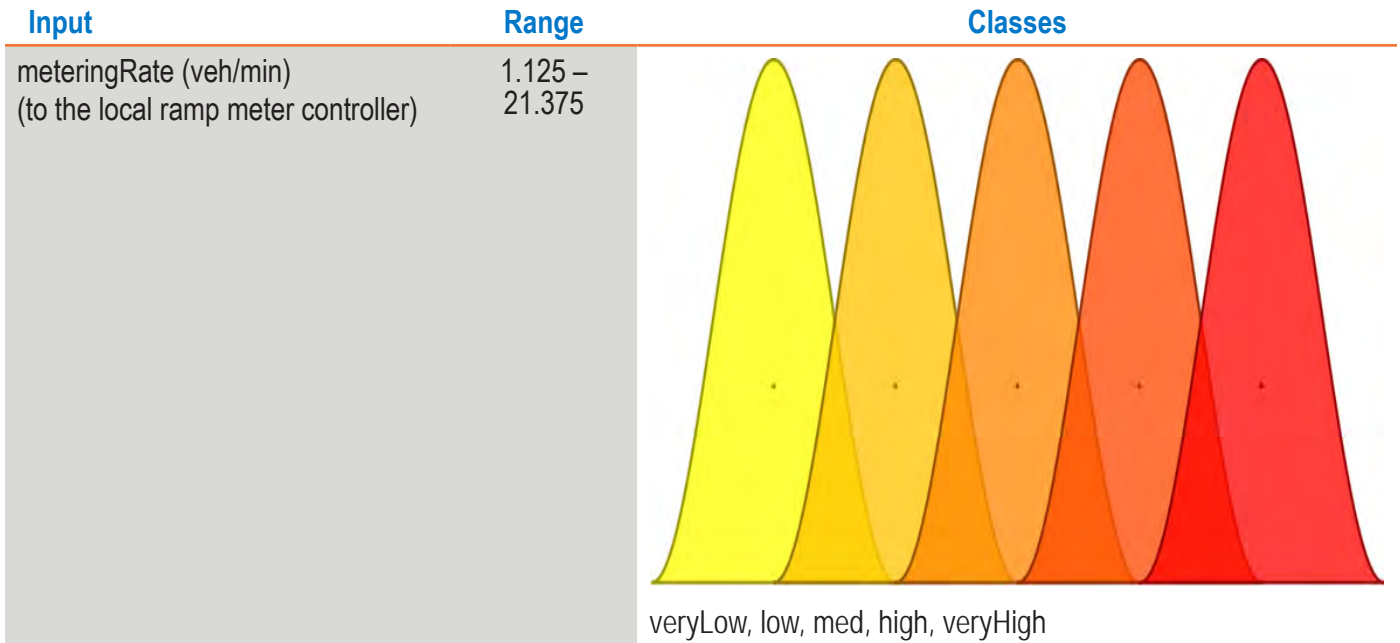
Figure 14 depicts the metering rate output from the generic DCRM controller defined above. The output classes are defined as sinusoidal curves to provide a natural transition between adjacent classes.

The “maximum” accumulation function is specified. As a result, the level of activation of each output class is taken as the maximum activation of the rules resulting in that class. This has the effect that, if more than one rule results in the same output class, only the rule having the greatest impact is considered. This is

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in contrast to the “sum” activation function that accumulates the impact of all rules affecting the same output class. The conventional “centroid” method was specified to convert the individual output classes to a simple variable output value.

Figure 14: Metering Rate Output from the Generic DCRM Controller



BEHAVIOR

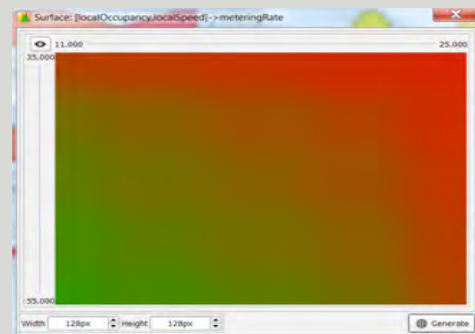
Figure 15 depicts the generic DCRM controller response under the noted conditions.

Figure 15: Generic DCRM Controller Response

Surface Plot of meteringRate for all Combinations of localOccupancy (horizontal) and localSpeed (vertical). Red indicates a low metering rate. Green indicates a high metering rate.

Conditions/Observations

Local ramp metering only.
 Note that realistic combinations of volume and occupancy can be found along the diagonal. Along the diagonal, the metering rate decreases with increasing local occupancy and decreasing local speed, with an accelerated drop at very high occupancies and very low speeds. Off the diagonal, more moderate rates are used.



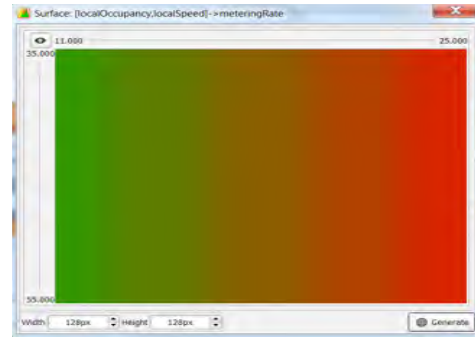
Min(meteringRate) = 4.5, Max(meteringRate) = 18.0

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Surface Plot of meteringRate for all Combinations of localOccupancy (horizontal) and localSpeed (vertical). Red indicates a low metering rate. Green indicates a high metering rate.

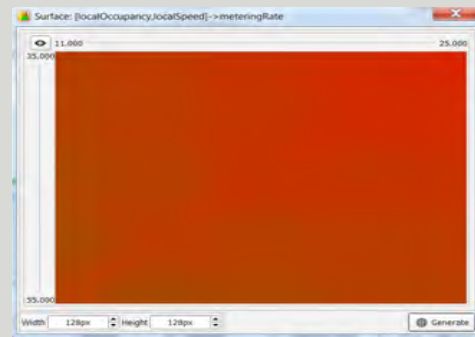
Conditions/Observations

Invalid localSpeed.
 Metering rate is still reasonable, but is no longer moderated if speed and occupancy are inconsistent.



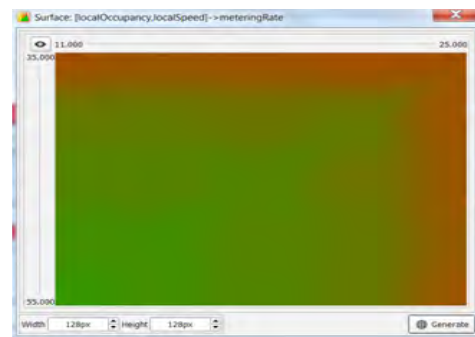
Min(meteringRate) = 4.5, Max(meteringRate) = 18.0

High downstreamOccupancy, low downstreamSpeed.
 Maximum local ramp metering rate decreased due to downstream congestion resulting in a much lower maximum metering rate.



Min(meteringRate) = 4.5, Max(meteringRate) = 8.3

High queueOccupancy.
 Minimum local ramp metering rate increased due to spillback on ramp resulting in a much higher minimum metering rate.



Min(meteringRate) = 9.8, Max(meteringRate) = 18.0

High advanceQueueOccupancy.
 Minimum local ramp metering rate increased due to severe spillback on ramp resulting in a much higher minimum metering rate.

Similar to above.
 Min(meteringRate) = 12.0, Max(meteringRate) = 18.0

High rampDemand
 Minimum local ramp metering rate increased due to high ramp demand reported from neighboring arterial signal system resulting in a much higher minimum metering rate.

Similar to above.
 Min(meteringRate) = 12.9, Max(meteringRate) = 18.0

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Surface Plot of meteringRate for all Combinations of localOccupancy (horizontal) and localSpeed (vertical). Red indicates a low metering rate. Green indicates a high metering rate.

Conditions/Observations

High upstreamFreewayIncidentSeverity, near upstreamFreewayIncidentDistance.
 Minimum local ramp metering rate increased due to upstream incident on freeway resulting in a much higher minimum metering rate.

Similar to above.
 Min(meteringRate) = 12.9, Max(meteringRate) = 18.0

High downstreamArterialIncidentSeverity, near downstreamArterialIncidentDistance
 Minimum local ramp metering rate increased due to downstream incident on arterial resulting in a much higher minimum metering rate.

Similar to above.
 Min(meteringRate) = 12.9, Max(meteringRate) = 18.0

DYNAMIC RANGES

Individualized configuration is achieved through a “dynamic range” applied to each input and output variable and a customized set of rule weights. The dynamic range is a user-configured upper and lower value that overrides the default upper and lower values of the input and output variables, scaling the input and output classes accordingly.

Dynamic ranges for local occupancy, local speed, downstream occupancy, and downstream speed are derived by identifying the critical occupancy and critical speed at the relevant mainline location through modelling or field observation. For occupancy, the upper bound is set to the critical occupancy. The lower bound is set to the occupancy below which a metering response is not required. For speed, the lower bound is set to the critical speed. The upper bound is set to the speed above which a metering response is not required.

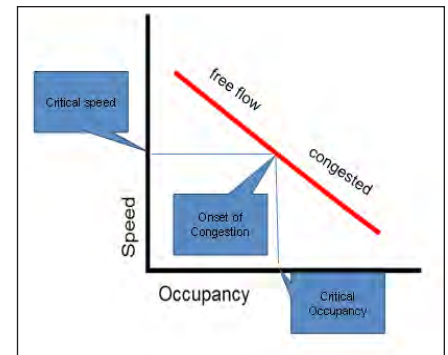
Dynamic ranges for queue occupancy and advanced queue occupancy are derived by identifying representative occupancies of the queue approaching the detector and the queue blocking the detector. The upper bound is set to the blocked occupancy. The lower bound is set to the approaching queue occupancy.

The dynamic range for the ramp demand is derived from the minimum and maximum metering rates. The upper bound is set to the maximum metering rate. The lower bound is set to the minimum metering rate.

The dynamic range for the upstream and downstream incident severity is derived from the incident severity scale used by the event management system. The upper bound is set to the maximum severity. The lower bound is set to the minimum severity requiring a metering response.

The dynamic range for the upstream and downstream incident distance is set as prescribed by the operating agency. The upper bound is set to the maximum distance requiring a metering response. The lower bound is set to zero.

The dynamic range for the metering rate is set as prescribed by the operating



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agency. The upper and lower bounds of the dynamic range are set so that the centroid of the “very low” class corresponds to the minimum rate (say 3 vehicles/min) and the centroid of the “very high” class corresponds to the maximum rate (say 15 vehicles/min).

The choice of a Metering Algorithm is an important consideration with ramp metering. Parsons recently conducted a study for Caltrans evaluating a set of agreed upon criteria. Figure 16 shows the results of that analysis.

Figure 16: Metering Algorithm used in Parsons’ Study for Caltrans

Desired Functionality	Weight	Candidate Algorithm Rankings				
		MN Zone	Fuzzy Logic	HERO	CARMA	SWARM
<i>Operator Interaction</i>						
Fully automated with minimal operator interaction. Including the ability to turn metering on and off automatically. Ability to respond to non-recurring congestion scenarios such as incidents without operator input.	5	5	5	5	5	5
Minimal and infrequent adjustment/calibration needed	5	5	5	5	5	5
The algorithm should be easy to understand and tune. Reasonable number of parameters that are easy to change or modify. A tool to help in calibration would be helpful.	4	4	4	4	4	4
The operator should be able to override metering rates and be able to turn meters on and off	5	5	5	5	5	5
<i>Ramp queue management</i>						
Impacts of congestion stay localized	1	3	3	3	3	3
Equitably spread wait times throughout the corridor	4	3	3	3	3	3
Quick action and quick propagation of ramp queues upstream	3	5	5	1	5	5
Minimize the likelihood of queue override conditions that “flush” the ramp. The algorithm needs a more sophisticated way to mitigate queues than simple queue override or queue adjustment. Functionality to treat ramp queues differently	4	5	5	1	3	5
Ability to function meaningfully if one or more ramps go offline	5	4	4	3	5	5

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Candidate Algorithm Rankings

Desired Functionality	Weight	MN Zone	Fuzzy Logic	HERO	CARMA	SWARM
Ability to work in concert with Caltrans local algorithm	5	4	4	2	5	5
System needs to respond quickly to congestion at multiple locations in the corridor, not just pre-determined bottlenecks. Each ramp needs to be able to respond to congestion at multiple locations in the corridor	5	5	5	2	5	5
Ability to respond before congestion occurs	3	4	4	4	3	5
Can incorporate preferential metering for HOVs	4	4	4	3	4	4
Algorithm should support existing field configuration for ramp meters, particularly mainline detector placement.	5	5	5	3	5	5
Weighted Score:		4.5	4.5	3.2	4.4	4.7

ATTACHMENTS

- 1a Ramp Review v14.xlsx (tab 1 columns A-K)
- 1b Ramp Review v14.xlsx (tab 2 columns A-K)
- 2 PTC_PAR03_Ramp_Metering_Data_v0.9964.docx
- 3a 2040 AM ARM Results final 01-11-17.pdf
- 3b 2040 PM ARM Results final 01-11-17.pdf

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I-270 South Bound

Ramps between Frederick, MD-85, Mile 31 to Bethesda, Montrose RD, Mile 4

Reference data from I-270 Volumes Existing Conditions (Traffic: SB Morning 5:45 am - 9 am; NB Evening 3:30 pm - 7 pm)

Mile Marker	I-270 Direction	Road	Peak Hour Volume		Approx Length to Merge	Approx Length # of Lanes	Approx Length to Gore	Storage (Gore - 300/26)	Score
			AM	PM					
31	SB	MD-85 - Buckeystown Pike	435	625	800	1	500	8	8
26	SB	MD-80 - Traffic Circle	670	360	1270	1	920	24	9
22	SB	MD-109 - Old Hundred Rd	465	125	1384	1	1033	28	10
18	SB	MD-121 - Clarksburg/Stringtown Rd	850	375	1693	1	1015	28	9
16	SB	EB Father Hurley Blvd	440	260	2100	1	1800	58	10
16	SB	WB Ridge Road	915	555	2250	1	1750	56	4
15	SB	EB MD-118 Germantown Rd	590	620	2141	1	1730	55	10
15	SB	WB MD-118 Germantown Rd	300	385	2040	1	1600	50	10
13	SB	WB EB Middlebrook Rd	1780	1045	1526	2	1300	77	6
11	SB	WB MD 124 Montgomery Village	1642	1315	1786	1	1050	29	4
10	SB	EB MD-117 Diamond Ave	1355	1235	1926	2	1350	81	
10	SB	WB MD-117 Diamond Ave	310	280	1490	2	1390	14	
		EB & WB MD-117 Diamond Ave	1665	1515	1490	2	1370	95	7
9	SB	WB I-370	1700	1100	3025	1	3025	116	4
9	SB	EB I-370	975	790	2453	2	2450	130	9
		EB & WB I-370 (both combined)	2675	1890		3		246	
8	SB	WB Shady Grove Rd	610	780	2550	1	1950	63	9
8	SB	EB Shady Grove Rd	380	630	1650	1	1000	27	10
6	SB	WB MD-28 Montgomery Ave. SB	300	255	956	1	870	22	9
6	SB	EB MD-28 Montgomery Ave. SB	1410	1495	2590	1	2020	66	4
5	SB	WB MD-189 Falls Rd SB	560	440	2145	2	1470	90	10
5	SB	EB MD-189 Falls Rd SB	575	120	2300	1	1600	30	10
4	SB	WB Montrose Rd SB	935	580	1480	1	1010	27	4
4	SB	EB Montrose Rd SB	760	350	2100	1	1820	76	
4	SB	EB Montrose Rd Secondary SB	60	95	850	1		32	
		Both EB Combined	820	445	2100	2	1820	108	8

I-270 North Bound

Ramps between Bethesda, Montrose RD, Mile 4 to Frederick, MD-85, Mile 31

Reference data from I-270 Volumes Existing Conditions (Traffic: SB Morning 5:45 am - 9 am; NB Evening 3:30 pm - 7 pm)

Mile Marker	I-270 Direction	Road	Peak Hour Volume		Approx Length to Merge	# of Lanes	Approx Length to Gore	Storage (Gore - 300/26)	Score
			AM	PM					
4	NB	WB Montrose Rd NB	930	1500	2145	1	1815	93	4
4	NB	EB Montrose Rd NB	215	290	1325	1	1020	39	10
5	NB	WB MD-189 Falls Road NB	165	410	400	1		15	
5	NB	EB MD-189 Falls Rd NB	390	490	860	1	790	30	
		WB & EB MD-189 Falls Road NB	555	900	860	1	790	45	4
6	NB	WB MD-28 Montgomery Ave. NB	465	700	1660	1	1212	47	10
6	NB	EB MD-28 Montgomery Ave. NB	85	125	1180	1	985	38	10
8	NB	WB Shady Grove Rd NB	320	850	1310	1	885	34	9
8	NB	EB Shady Grove Rd NB	320	675	2025	1	1450	56	10
9	NB	WB I-370 NB - Freeway	1565	1600	2770	1	2550	98	4
9	NB	EB I-370 NB - Freeway	490	950	2965	1	2425	93	8
11	NB	WB MD-124 Montgomery Village Dr. NB	420	555	1855	1	1275	49	10
11	NB	EB MD-124 Montgomery Village Dr. NB	385	540	1400	1	1100	42	10
15	NB	EB & WB MD-118 Germantown Rd NB	385	670	1750	2	1285	102	9
16	NB	EB Father Hurley Blvd NB	145	230	2300	1	1772	68	10
16	NB	WB Ridge Rd NB	135	250	2215	1	1895	73	10
18	NB	EB & WB MD-121 Clarksburg Rd NB	200	155	1865	1	1195	46	10
22	NB	EB & WB MD-109 Old Hundred Rd NB	100	115	1365	1	835	32	10
26	NB	EB & WB MD-80 Fingerboard Rd.	535	600	1475	1	1035	40	10
31	NB	SB & NB MD-85 - Buckeystown Pike	860	1820		2	695	38	2

Notes:

The intent of the ramp by ramp analysis is to identify potential operational issues and potential mitigation strategies. It is based on using the maximum metering rates that can be used while metering. We typically use 900 vehicles per hour for a single lane and 1700 vehicle per hour for 2 lanes.

Given that we do not have full ramp layouts, all lengths were taken from google maps, google maps satellite and or google earth. Lengths are not exact but should be close enough for this ramp analysis.

Length is from the start of the ramp to the gore.

Lengths for merge lanes ending under a bridge were estimated at the middle of the road segment under the bridge.

Storage is calculated as the length of the ramp to the gore minus 300' (technically it should be 250' for downhill and 350' for uphill but without elevation data we averaged them) then divide by 26' average vehicle. 300' was not subtracted for lanes that don't merge (become an additional lane on the highway) or lanes with merge lanes over 1000'. Storage on detail pages may be higher as secondary entrances to the ramps were calculated into the total storage value.

Length to merge is from the start of the ramp to end of dashed merge line.

Some ramps have two entrances have additional storage from the start of the second entrance to the merge of the first entrance divided by 26.

We do not have 15 minute data for all ramps and do not have full peak period data for some ramps. As a result, we used what data was available to make the best possible assessment. at Mile 26, 22, 18, 6 and 5 we used peak hour factor to calculate the highest 15 min volume. If the volume was less than 225 we just listed the peak hour rate and for ramps over 225 we estimated the table using the peak hour rate, subtracted by peak hour volume, divided by 3 and randomized slightly so the total volume for the hour uses the peak hour rate but the total volume equals the peak hour rate.

Ramps at Mile 10 we used hourly data, then used 900 and 1700 for the limits.

Some ramps have a pedestrian walkway across the top of the ramp near the start, this was not considered when determining storage if the lane needs to be clear storage could be recalculated. This walkway was measured at approx. 10' wide and is as long as the width of the ramp.

Only current data was used for this version. Future data 2040 can be added if needed. The new mile 12 ramp was added but not calculated as the ramp geometry was not available.

SB – Southbound, NB – Northbound, WB – Westbound, EB – Eastbound, SWB - Southwest Bound, NEB - Northeast Bound, MD – Maryland, I - Interstate

Images from google maps, google earth Map data ©2016 Google

Mile 31 NB & SB MD-85 to NB I-270

This 2 lane ramp has 15 minute volumes exceeding 425. This ramp will require a more detailed review to finalize the metering strategy for this ramp. May require two cars per green.

Length to Merge: 1000'+ (lanes added to NB)

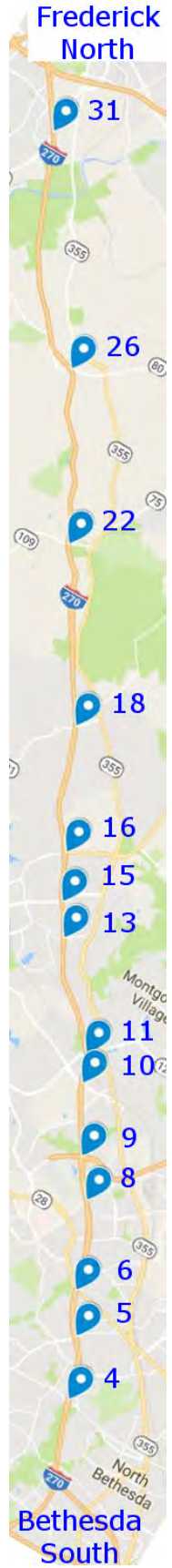
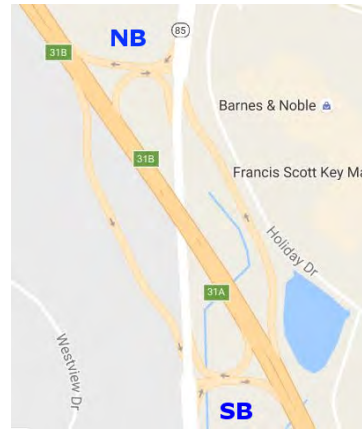
Length to Gore: 625'

Lanes: 2

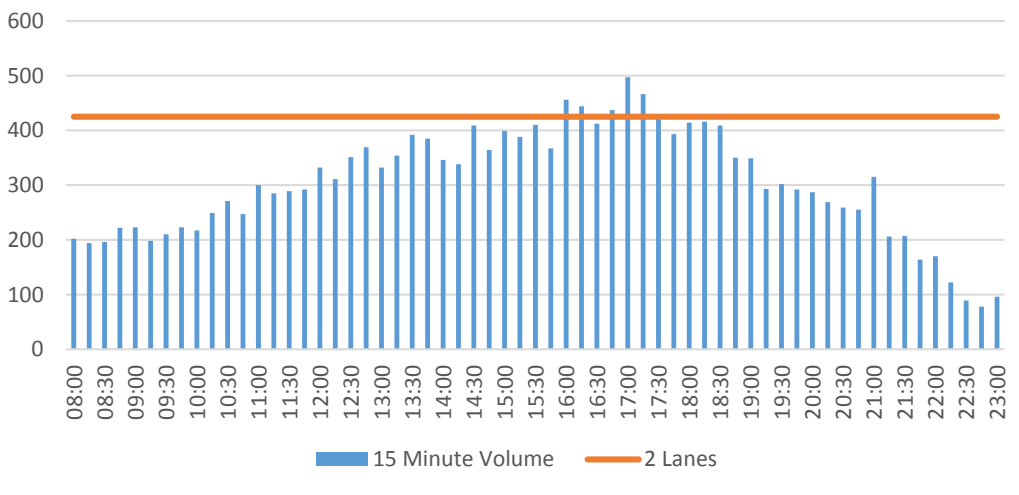
Storage: 70

Score: 8

RTMS: 925' South & 5400' North of MD-85 & I-270 on



NB & SB MD-85 to NB I-270



Mile 31 NB & SB MD-85 to SB I-270

This single lane ramp should operate efficiently.

Length to Merge: 800

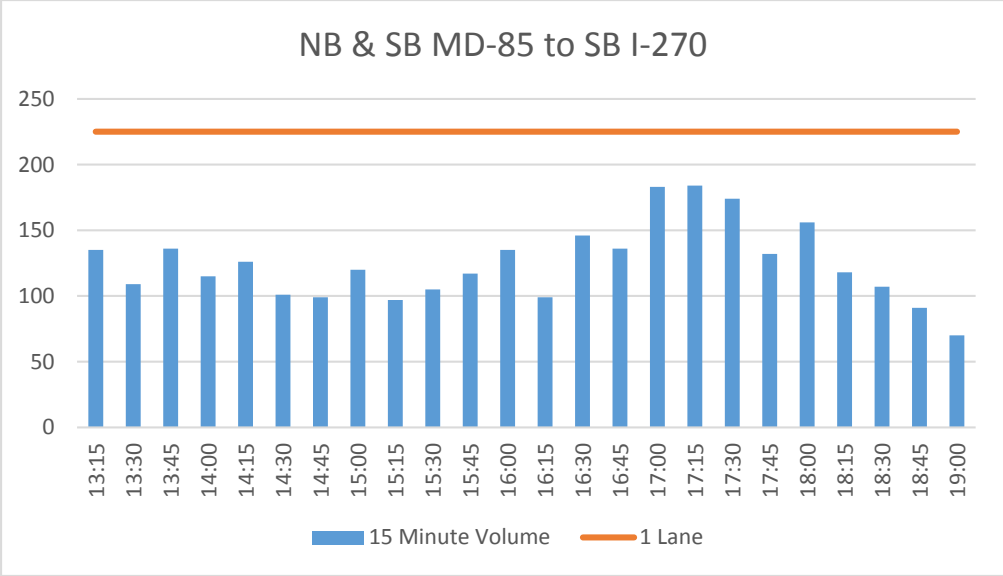
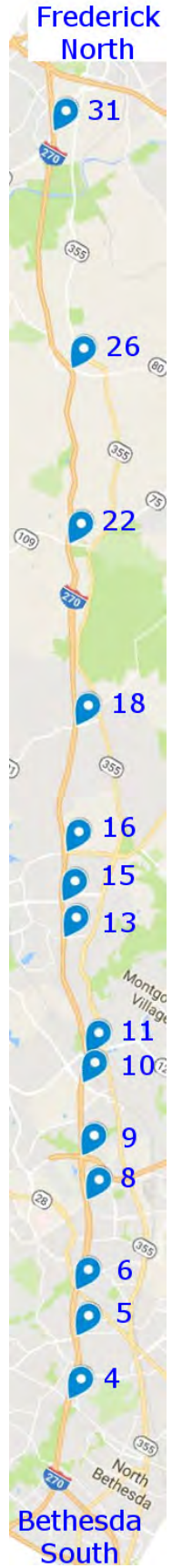
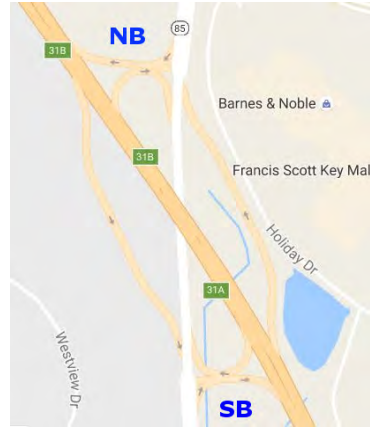
Length to Gore: 500

Lanes: 1

Storage: 19

Score: 8

RTMS: 925' South & 5400' North of MD-85 & I-270 on I-270



Mile 26, EB & WB MD-80 Fingerboard Rd. to SB I-270

This single lane ramp should operate efficiently.

Length to Merge: 1270'

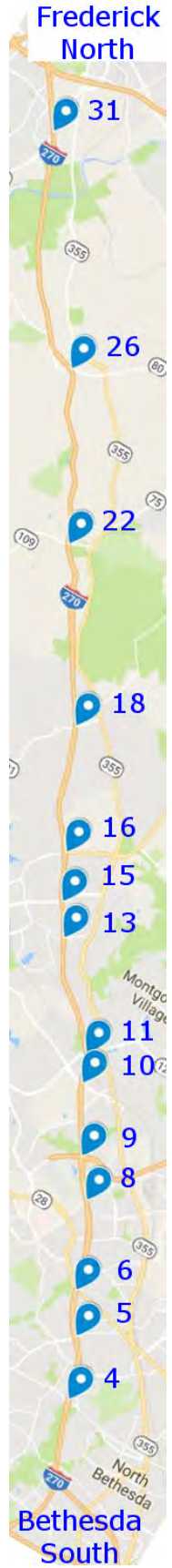
Length to Gore: 920'

Lanes: 1

Storage: 24

Score: 9

RTMS: 1050' South & 4700' North of MD-80 & I-270 on I-270



There is no table for this ramp.

The peak hour volume is 670 am and 360 pm. Using the peak hour factor we determined the peak 15 minute volume is estimated at 182 am and 97 pm using peak hour factor of .92.



Mile 26, EB & WB MD-80 Fingerboard Rd. to NB I-270

The single lane ramp should operate efficiently.

Length to Merge: 1475'

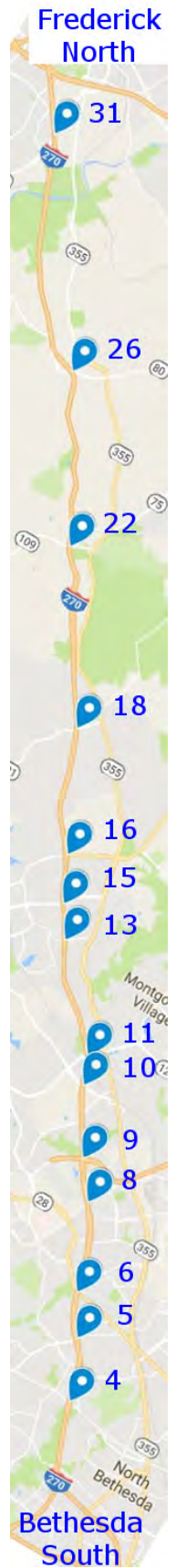
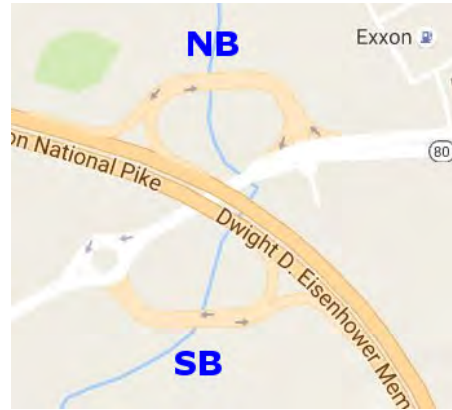
Length to Gore: 1035'

Lanes: 1

Storage: 40

Score: 10

RTMS: 1050' South & 4700' North of MD-80 & I-270 on I-270



There is no table for this ramp.

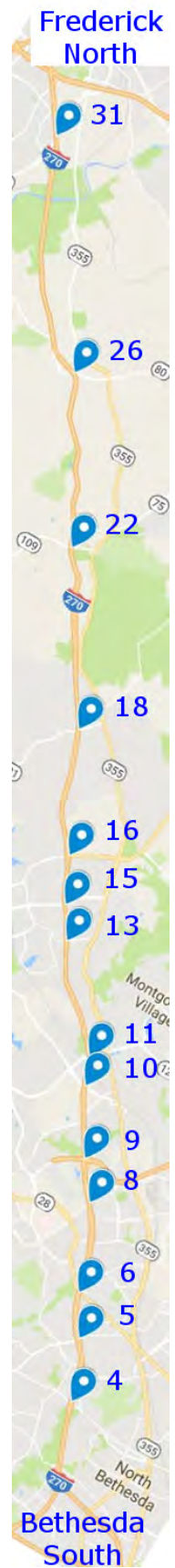
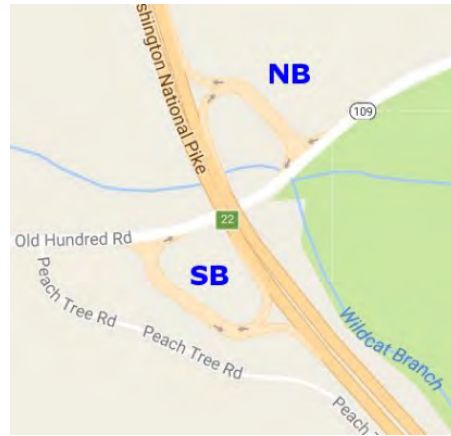
The peak hour volume is 535 am and 600 pm. Using the peak hour factor we determined the peak 15 minute volume is estimated at 145 am and 163 pm using peak hour factor of .92.



Mile 22 EB & WB MD-109 Old Hundred Rd. to SB I-270

The single lane ramp should operate efficiently.

Length to Merge: 1384'
 Length to Gore: 1033'
 Lanes: 1
 Storage: 32
 Score: 10
 RTMS: 150' South of MD-109 & I-270 on I-270



There is no table for this ramp.

The peak hour volume is 465 am and 125 pm. Using the peak hour factor we determined the peak 15 minute volume is estimated at 126 am and 34 pm using peak hour factor of .92.



Mile 22 EB & WB MD-109 Old Hundred Rd. to NB I-270

The single lane ramp should operate efficiently.

Length to Merge: 1384'

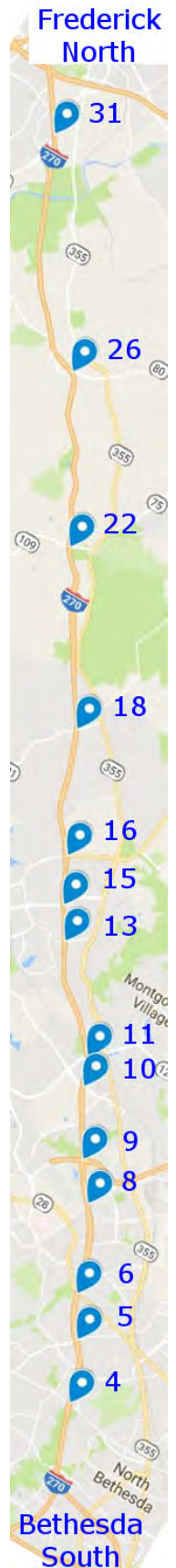
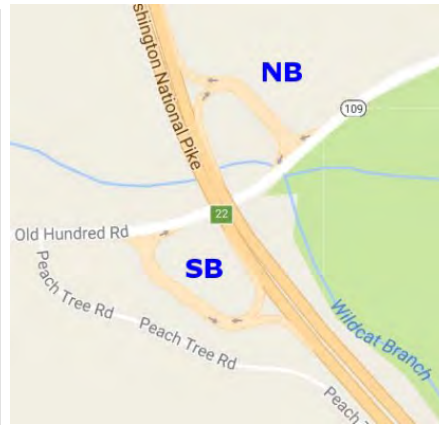
Length to Gore: 1033'

Lanes: 1

Storage: 32

Score: 10

RTMS: 150' South of MD-109 & I-270 on I-270



There is no table for this ramp.

The peak hour volume is 100 am and 115 pm. Using the peak hour factor we determined the peak 15 minute volume is estimated at 31 am and 27 pm using peak hour factor of .92.



Mile 18 EB & WB MD-121 Clarksburg Rd. to SB I-270

The single lane ramp should operate efficiently.

Length to Merge: 1693'

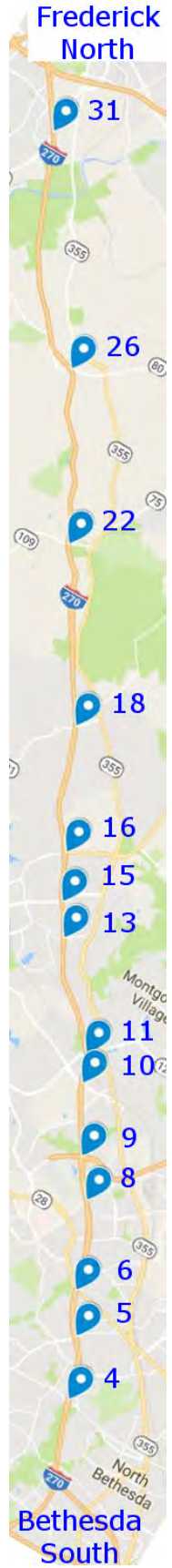
Length to Gore: 1015'

Lanes: 1

Storage: 36

Score: 9

RTMS: 100' South of MD-121 on I-270



There is no table for this ramp.

The peak hour volume is 850 am and 375 pm. Using the peak hour factor we determined the peak 15 minute volume is estimated at 231 am and 102 pm using peak hour factor of .92.



Mile 18 EB & WB MD-121 Clarksburg Rd. to NB I-270

The single lane ramp should operate efficiently..

Length to Merge: 1865'

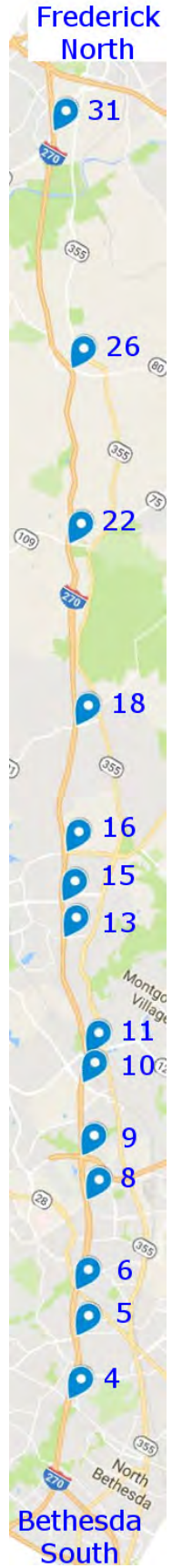
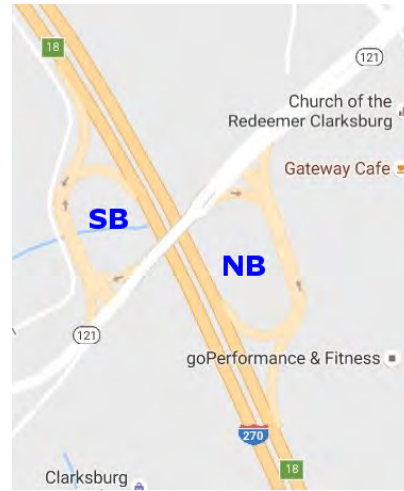
Length to Gore: 1195'

Lanes: 1

Storage: 44

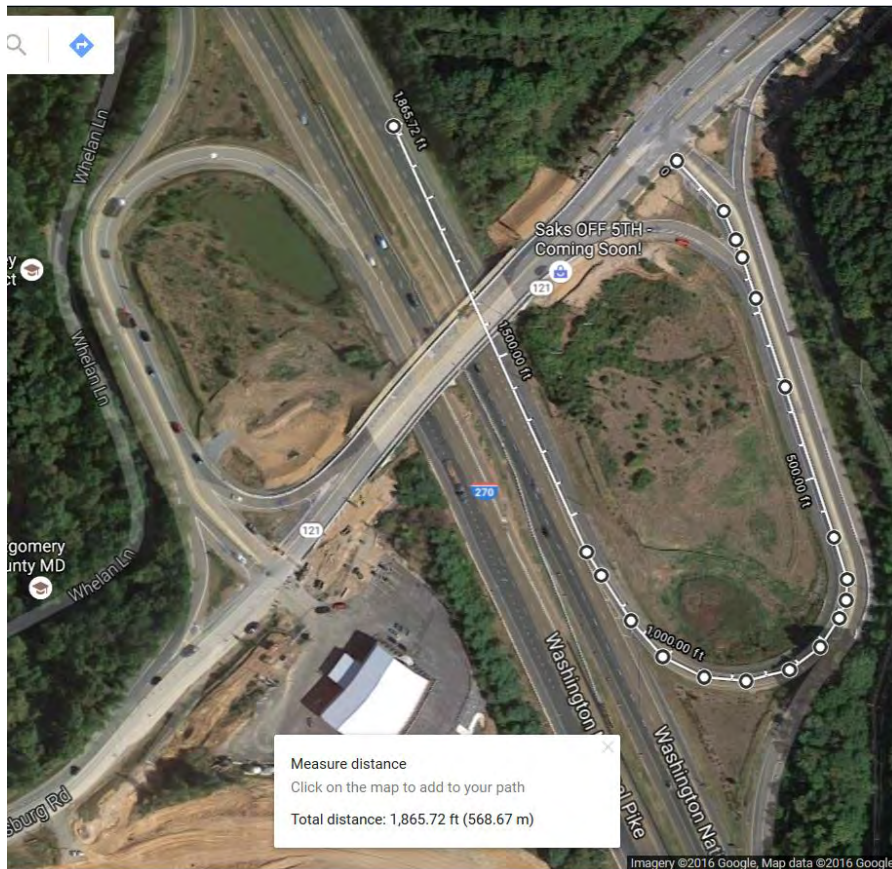
Score: 9

RTMS: 100' South of MD-121 on I-270



There is no table for this ramp.

The peak hour volume is 200 am and 155 pm. Using the peak hour factor we determined the peak 15 minute volume is estimated at 54 am and 42 pm using peak hour factor of .92.



Mile 16 EB Father Hurley Blvd to SB I-270

The single lane ramp should operate efficiently.

Length to Merge: 2100'

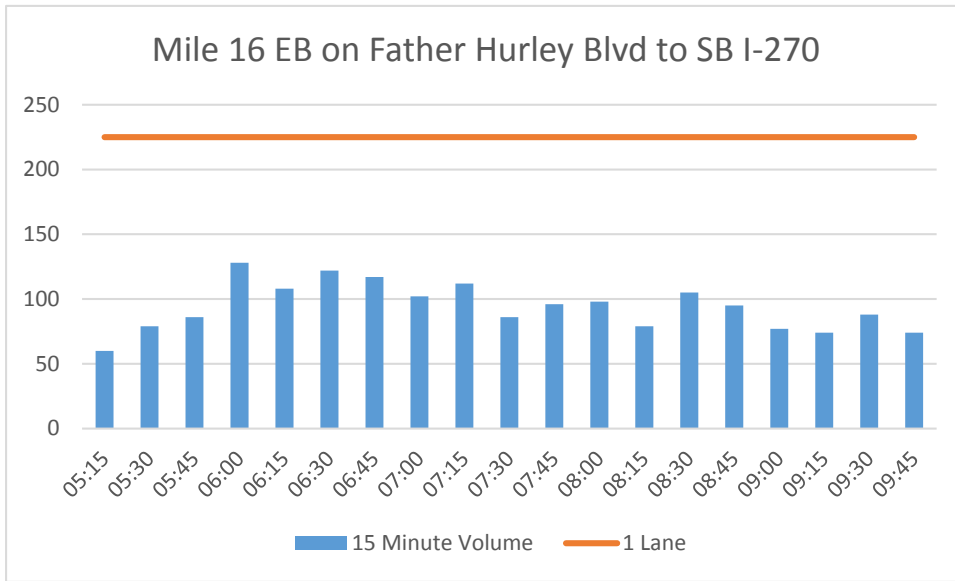
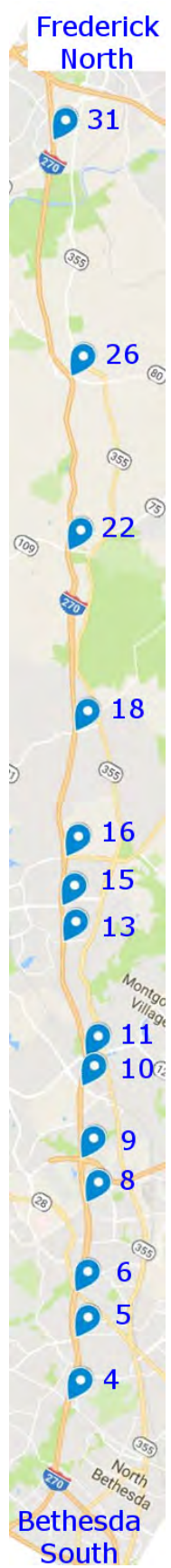
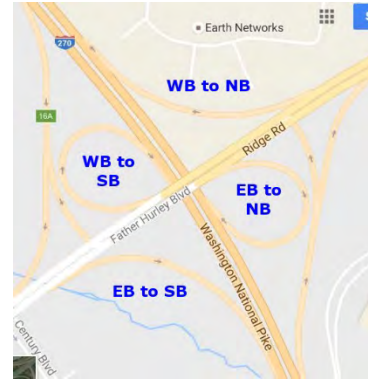
Length to Gore: 1800'

Lanes: 1

Storage: 58

Score: 10

RTMS: 2 Miles North & 1 Mile South on I-270



Mile 16 WB Ridge Rd. to SB I-270

The ramp might need to be widened or restriped to support two lane metering. Ramp width is 28'.

Length to Merge: 2250'

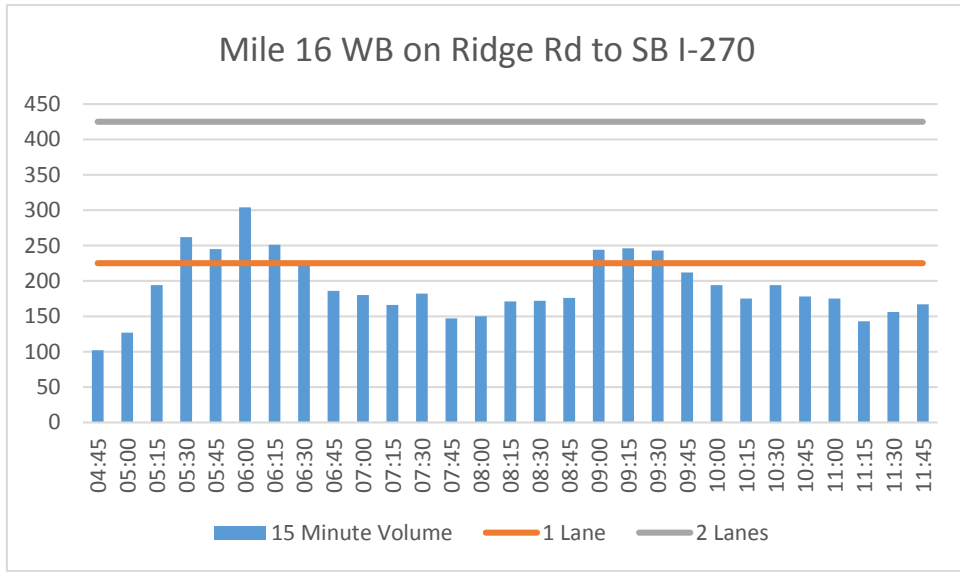
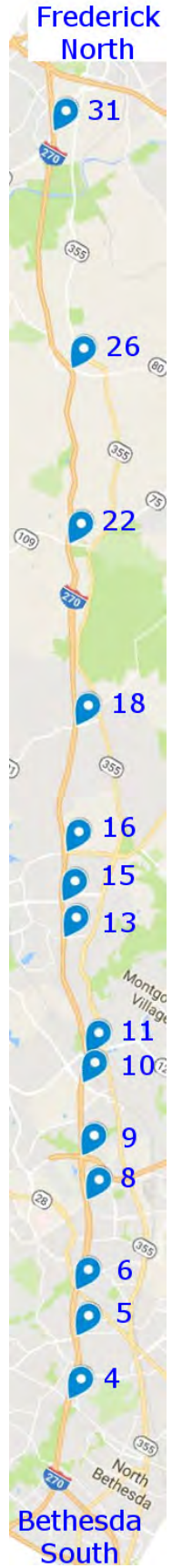
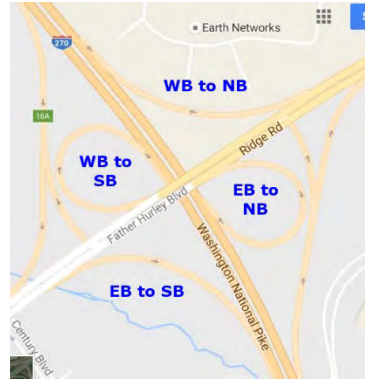
Length to Gore: 1750'

Lanes: 1

Storage: 56

Score: 4

RTMS: 2 Miles North & 1 Mile South on I-270



Mile 16 EB Father Hurley Blvd. to NB I-270

The single lane should operate efficiently.

Length to Merge: 2300'

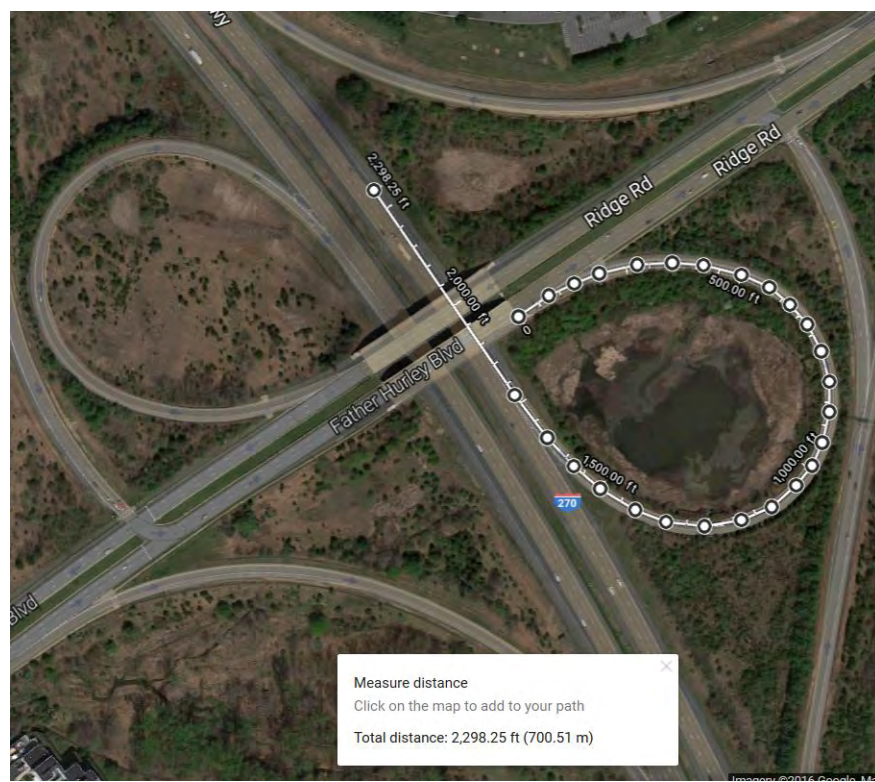
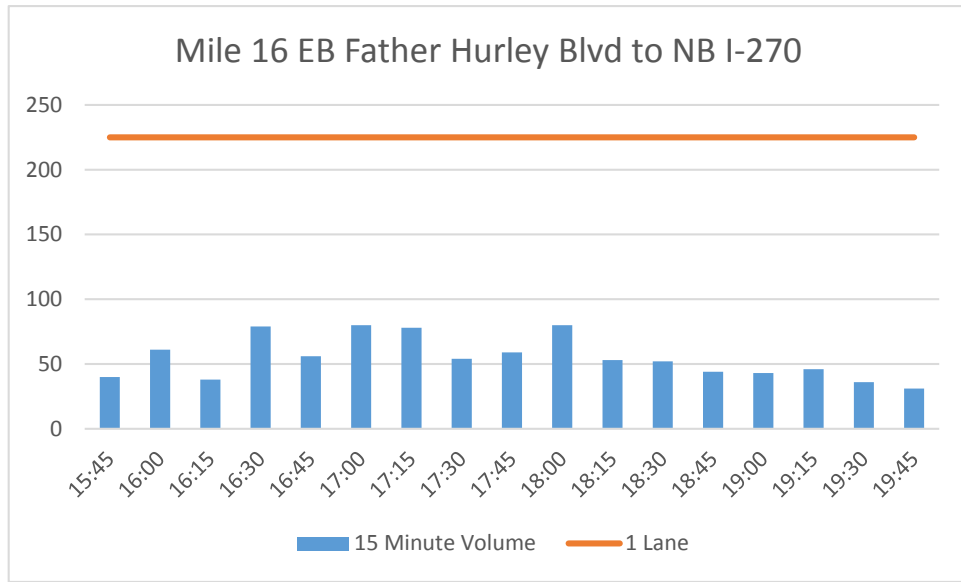
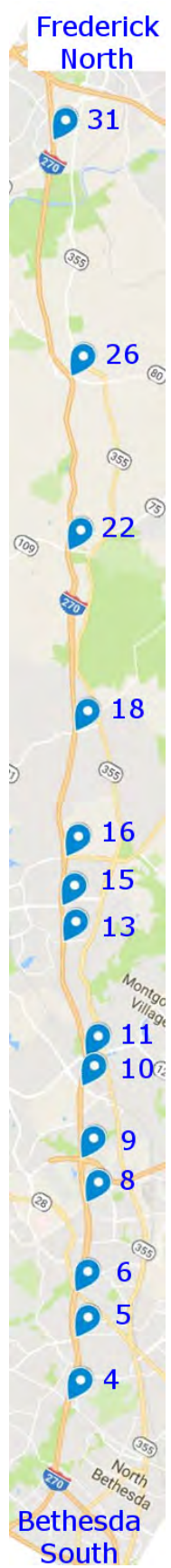
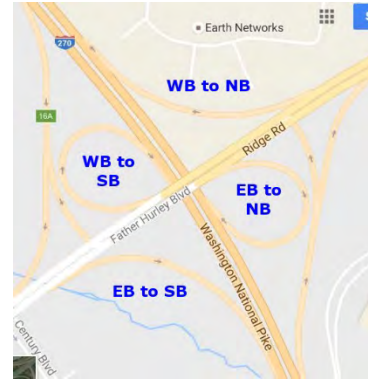
Length to Gore: 1772'

Lanes: 1

Storage: 57

Score: 10

RTMS: 2 Miles North & 1 Mile South on I-270



Mile 16 WB Ridge Rd. to NB I-270

The single lane should operate efficiently.

Length to Merge: 2215'

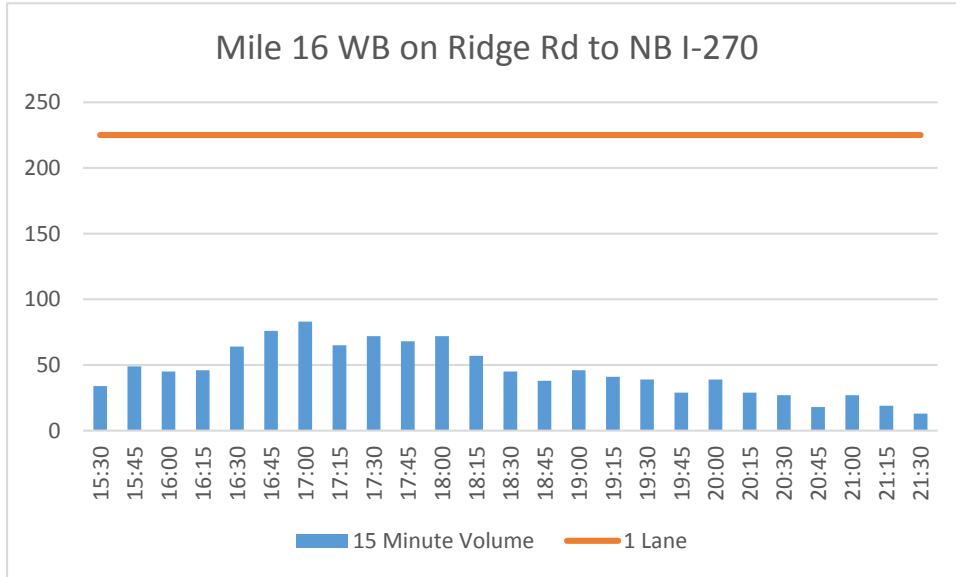
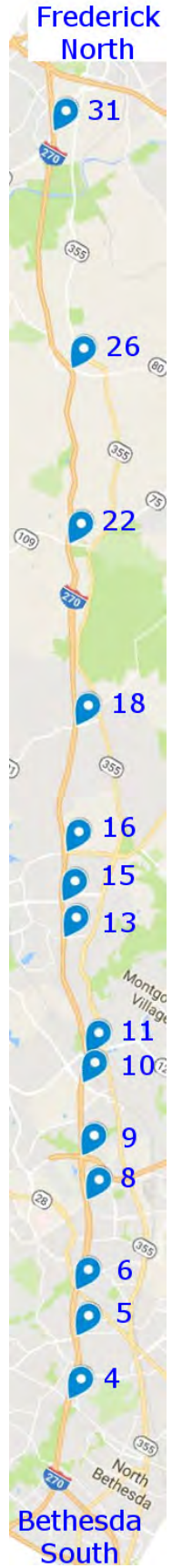
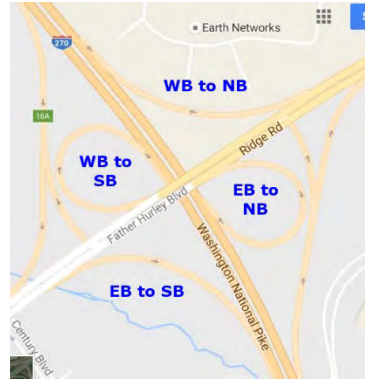
Length to Gore: 1895'

Lanes: 1

Storage: 61

Score: 10

RTMS: 2 Miles North & 1 Mile South on I-270



Mile 15 EB MD-118 Germantown Rd. to SB I-270

The single lane should operate efficiently

Length to Merge: 2141'

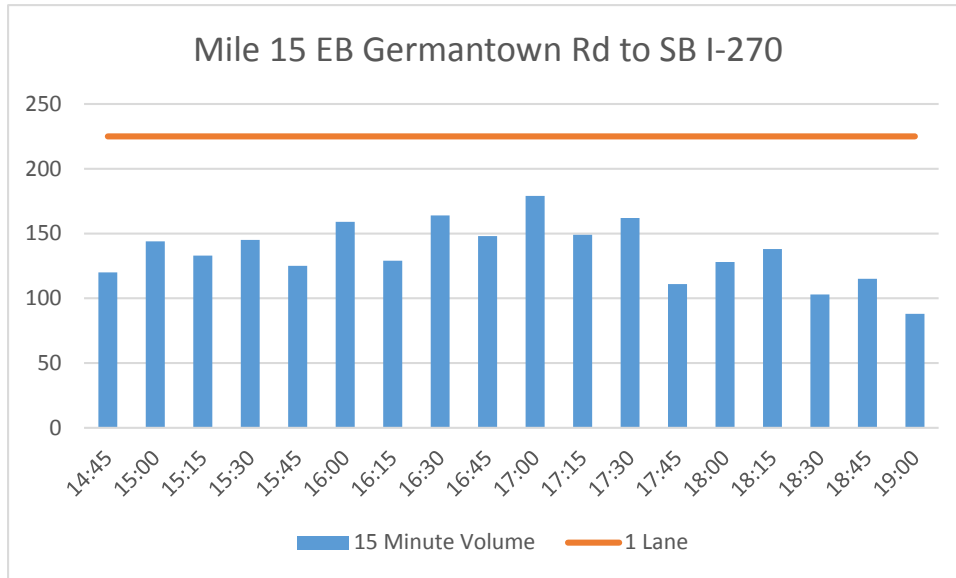
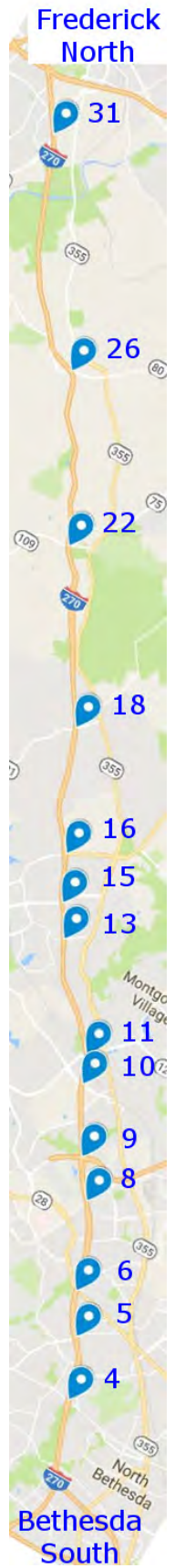
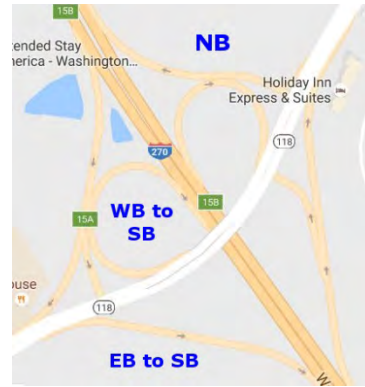
Length to Gore: 1730'

Lanes: 1

Storage: 55

Score: 10

RTMS: 185' South of MD-118 & I-270 on I-270



Mile 15 WB MD-118 Germantown Rd. to SB I-270

The single lane ramp should operate efficiently.

Length to Merge: 2040'

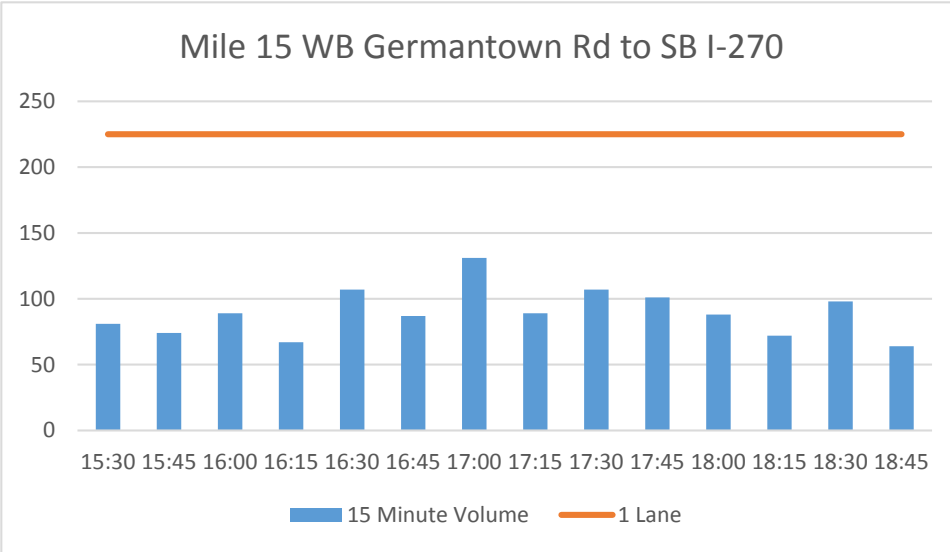
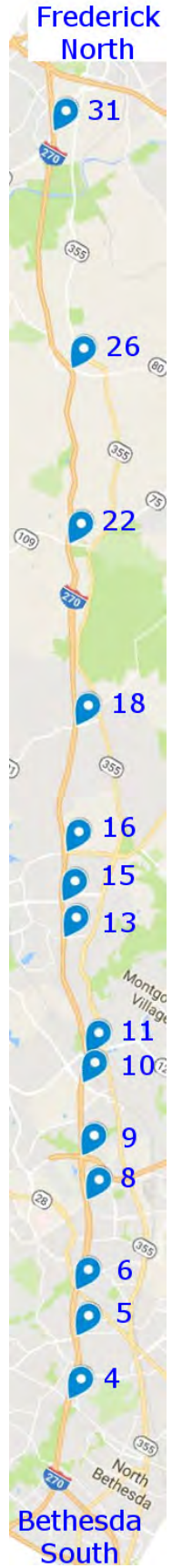
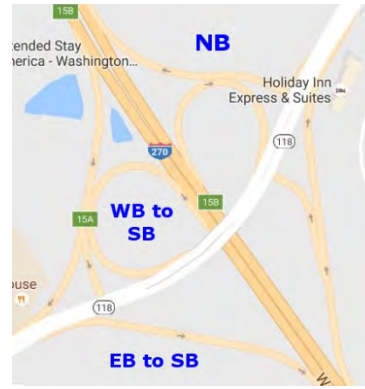
Length to Gore: 1600'

Lanes: 1

Storage: 50

Score: 10

RTMS: 185' South of MD-118 & I-270 on I-270



Mile 15 EB & WB MD-118 Germantown Rd. to NB I-270.

The double lane configuration should operate efficiently.

Length to Merge: 1750'

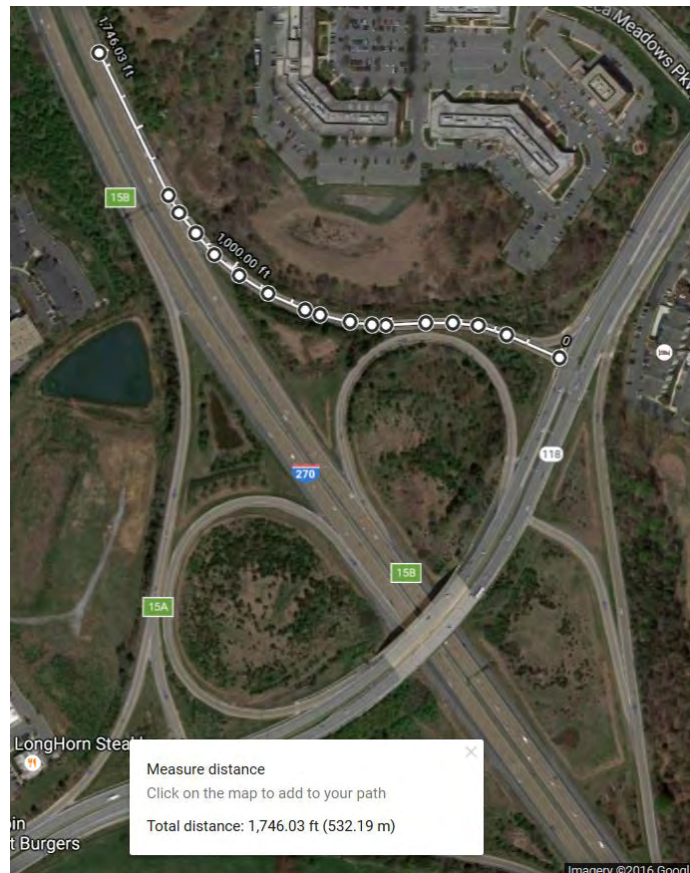
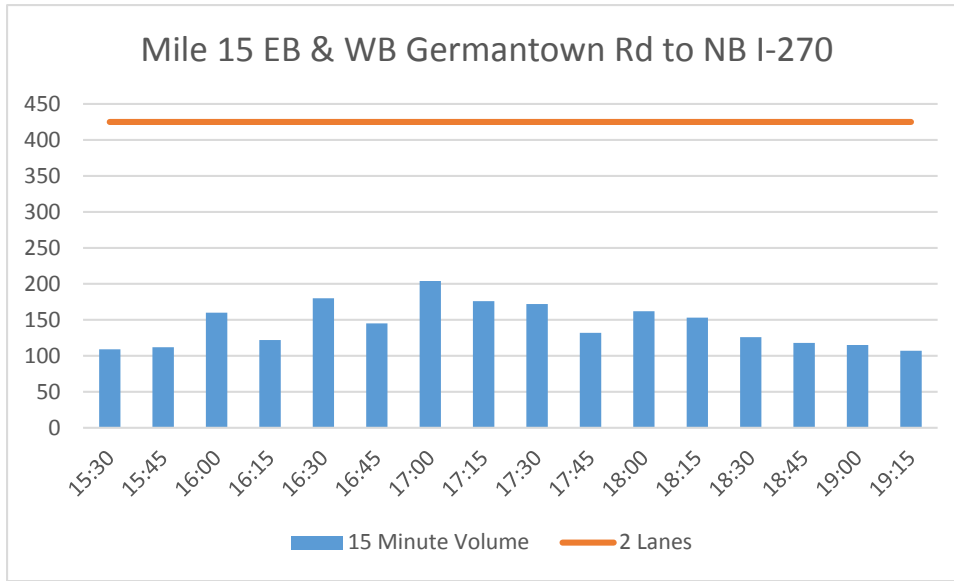
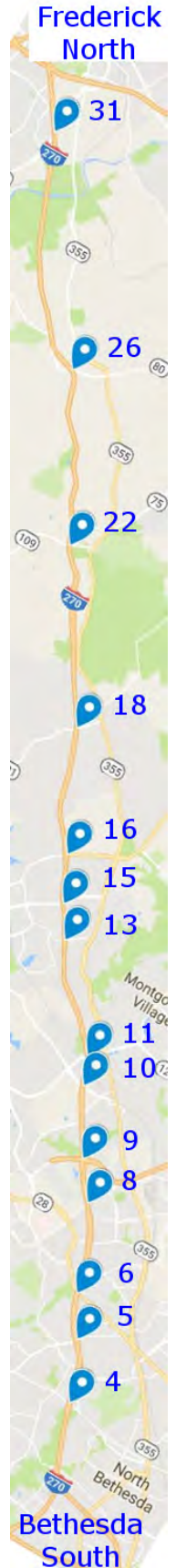
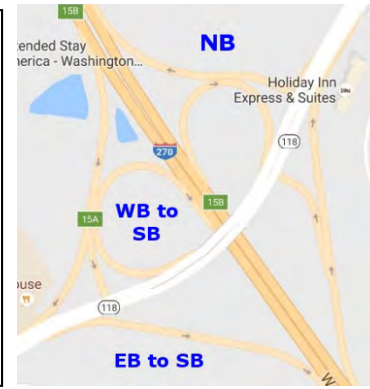
Length to Gore: 1285'

Lanes: 2

Storage: 115

Score: 9

RTMS: 185' south of MD-118 & I-270 on I-270



Mile 13 EB & WB Middlebrook Rd. to SB I-270

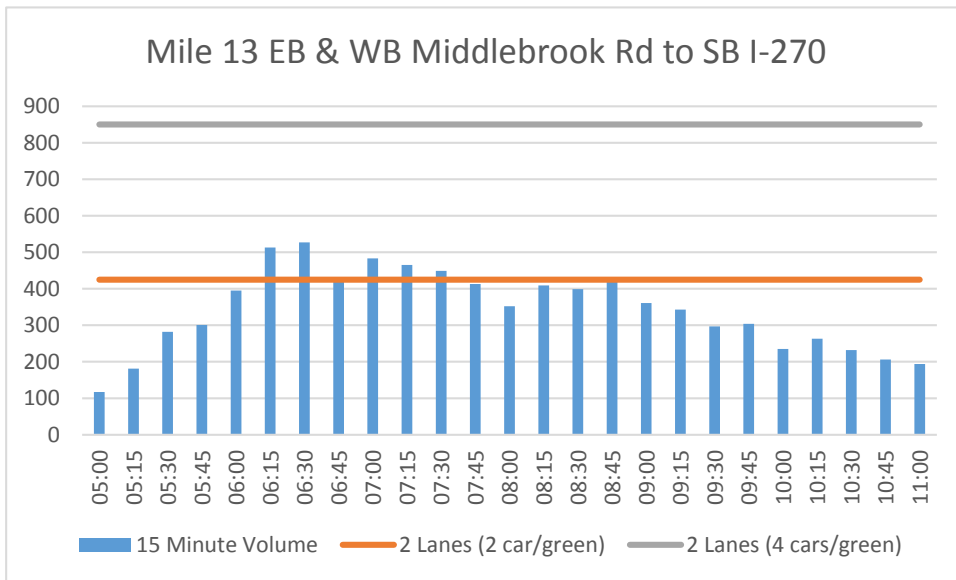
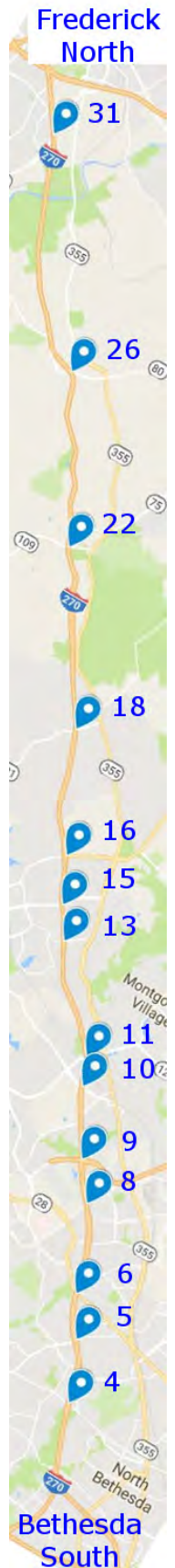
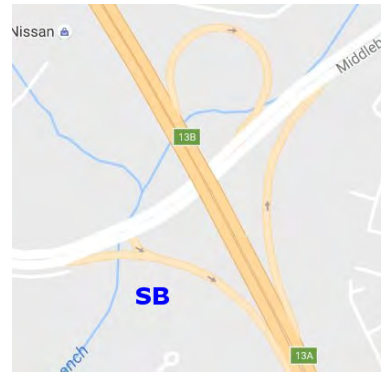
This double lane ramp may require 2 cars per green per lane (4 cars total) to operate efficiently. Alternatively, flush strategies may be considered when ramp queues back up close to the cross street.

Length to Merge: 1525'+ (adds lane to I-270)

Length to Gore: 1300'

Lanes: 2

Storage: 93



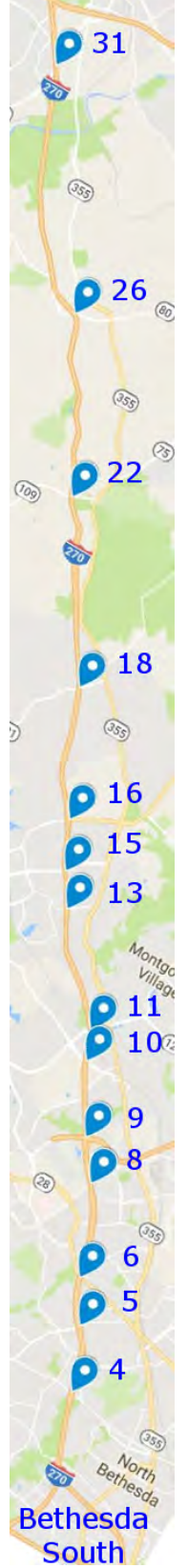
Watkins Mill Rd. Future Ramp 12

Should be designed to support ramp metering.

RTMS: 3500' south on I-270



Frederick North



Mile 11 EB & WB MD-124 Montgomery Village Dr. to SB I-270

A second lane will need to be added. The ramp width is 28'.

Length to Merge: 1785'

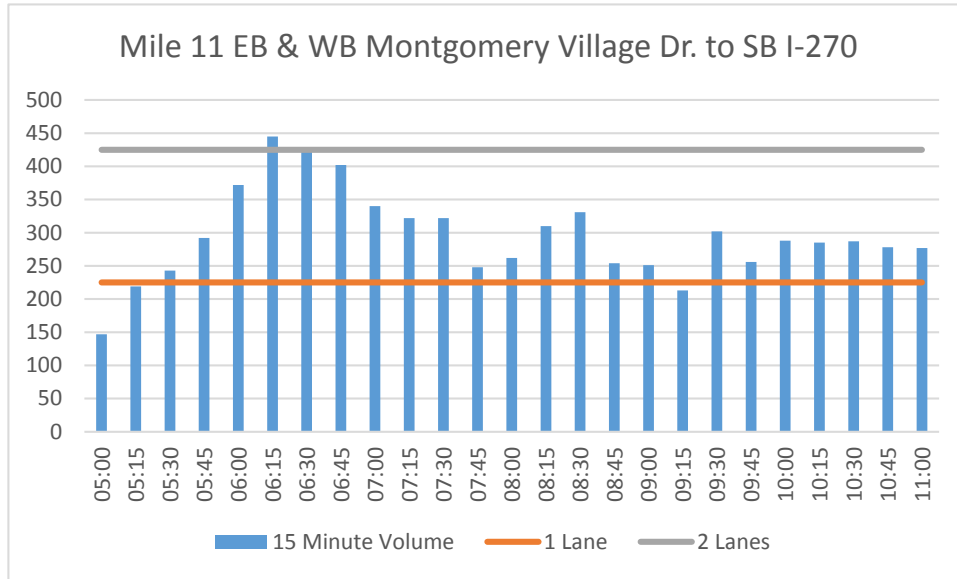
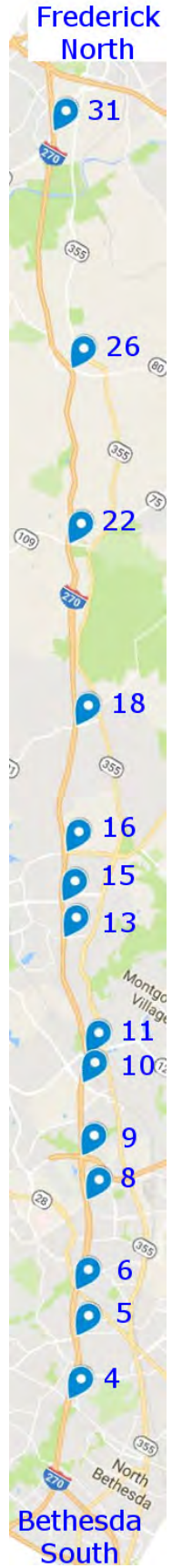
Length to Gore: 1050'

Lanes: 1

Storage: 40

Score: 4

RTMS: 150' north on I-270



Mile 11 EB MD-124 Montgomery Village Dr. to NB I-270

The single lane ramp should operate efficiently.

Length to Merge: 1400'

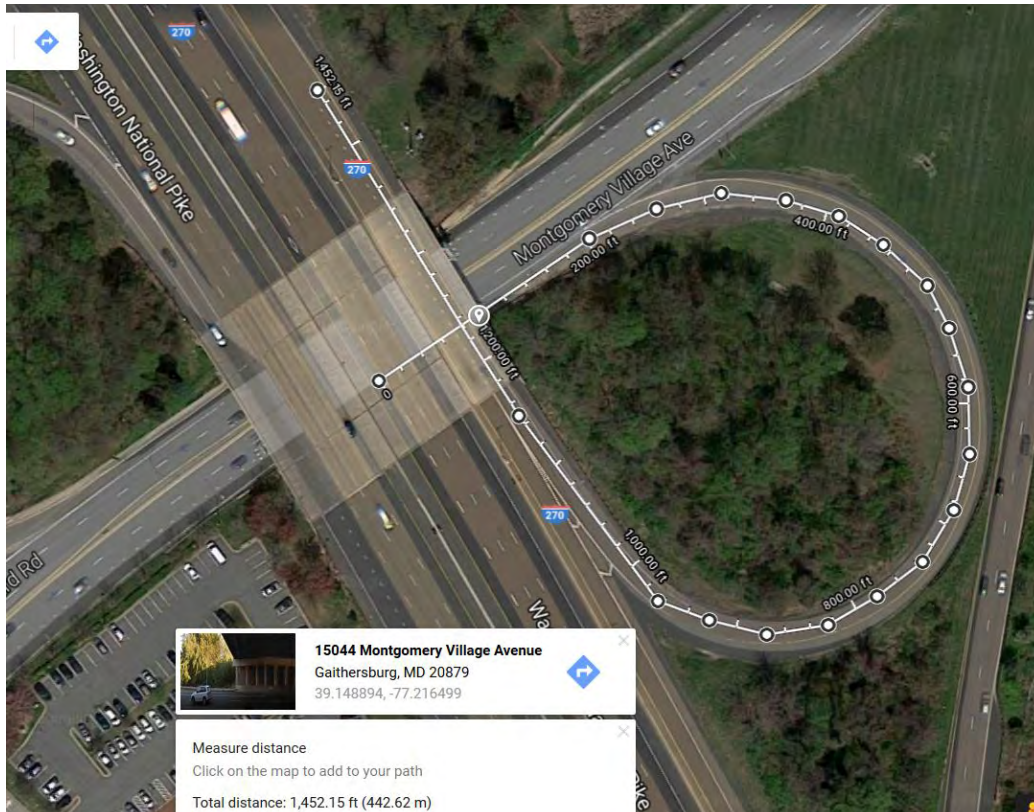
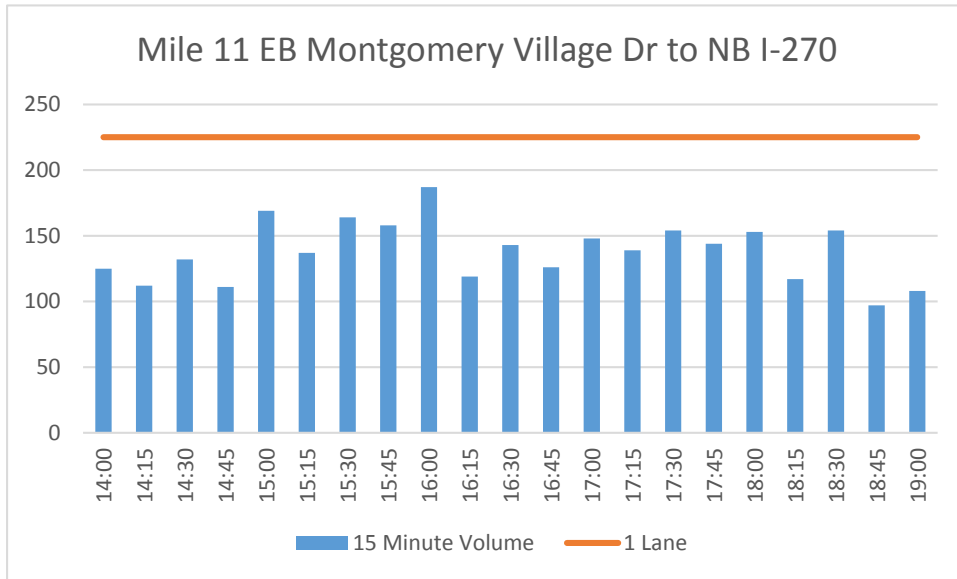
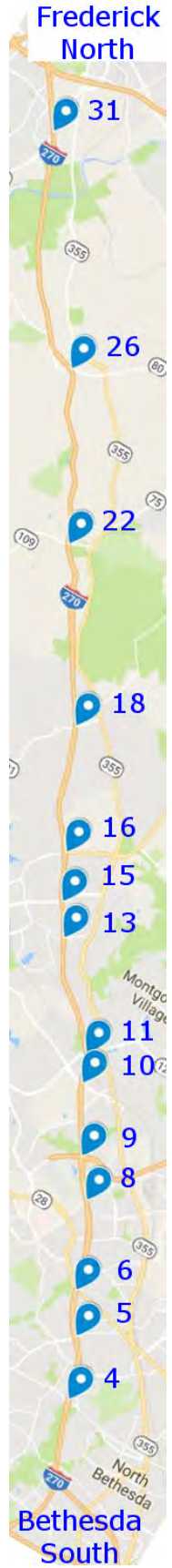
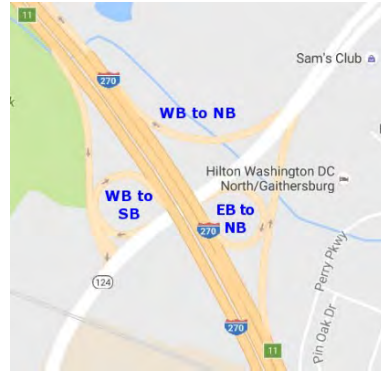
Length to Gore: 1100'

Lanes: 1

Storage: 42

Score: 10

RTMS: 150' north on I-270



Mile 11 WB MD-124 Montgomery Village Dr. to NB I-270

The single lane ramp should operate efficiently.

Length to Merge: 1855'

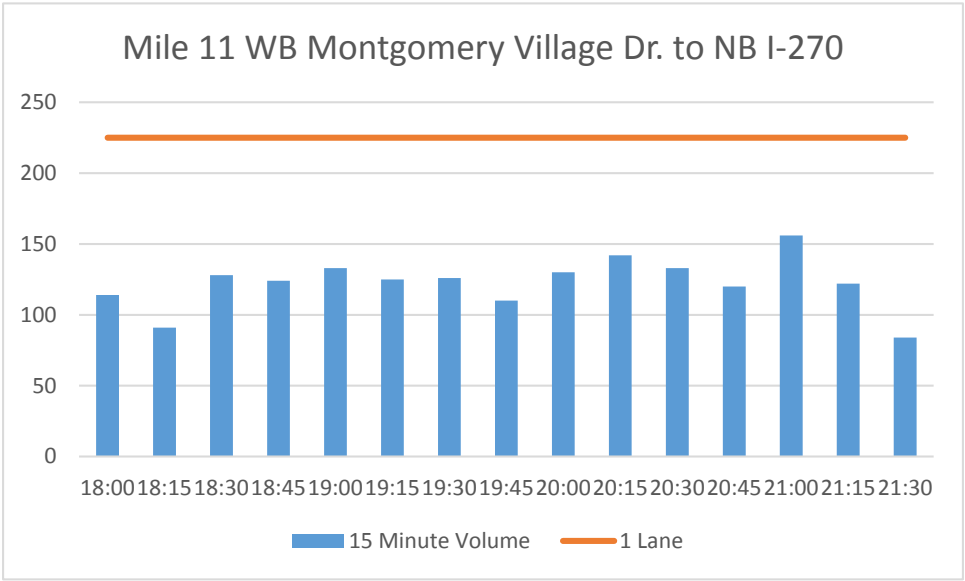
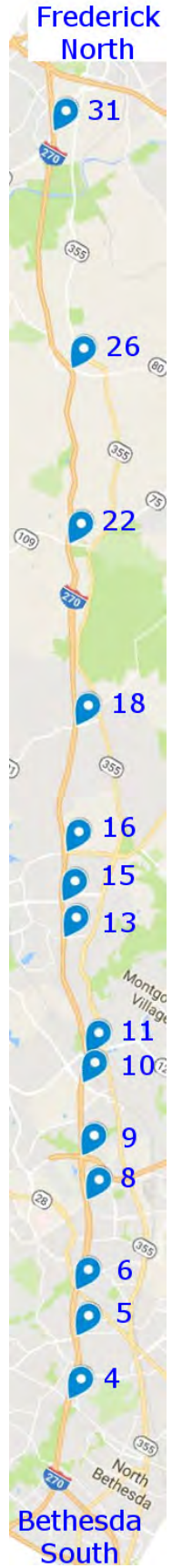
Length to Gore: 1275'

Lanes: 1

Storage: 49

Score: 10

RTMS: 150' north on I-270



Mile 10 EB & WB MD-117 Diamond Ave. to SB I-270

This double lane ramp should operate efficiently.

Length to Merge: 1490'+ (adds lane to I-270)

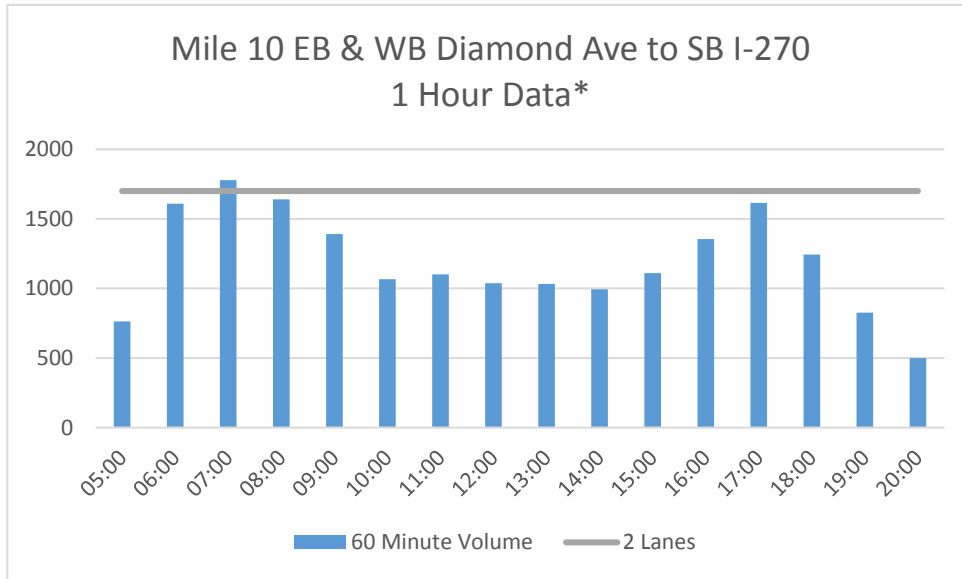
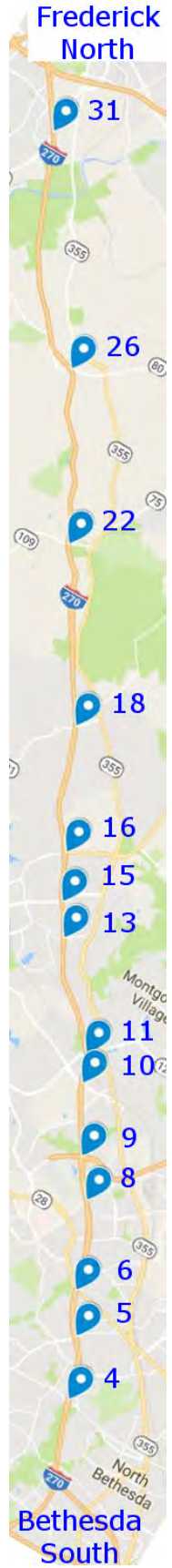
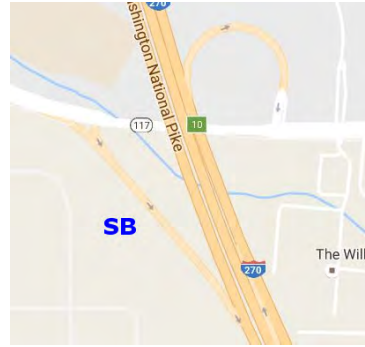
Length to Gore: 1370'

Lanes: 2

Storage: 95

Score: 7

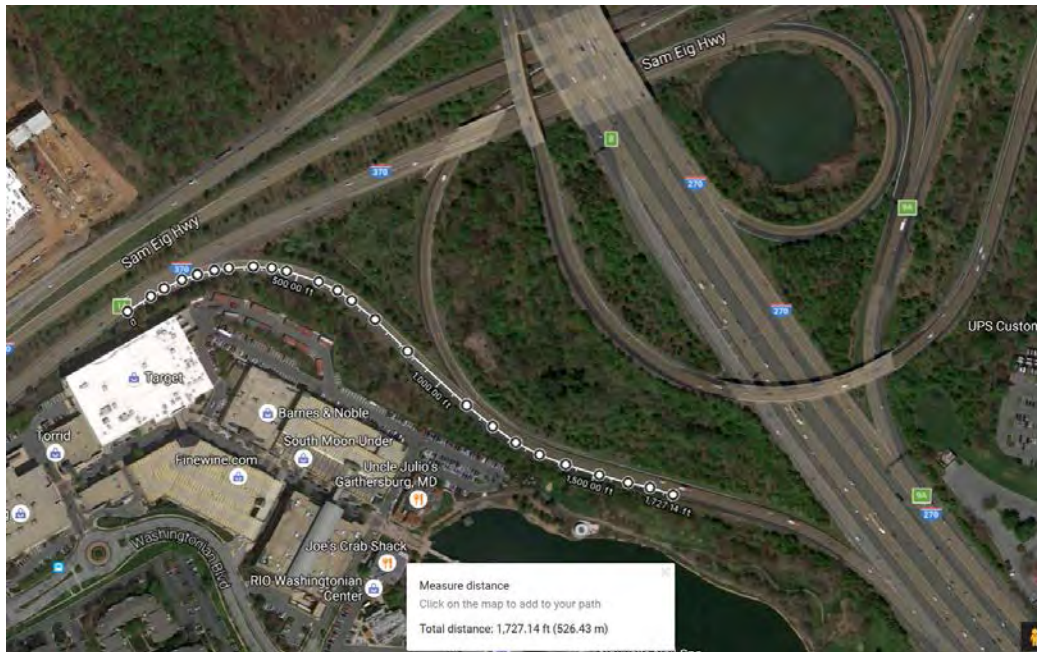
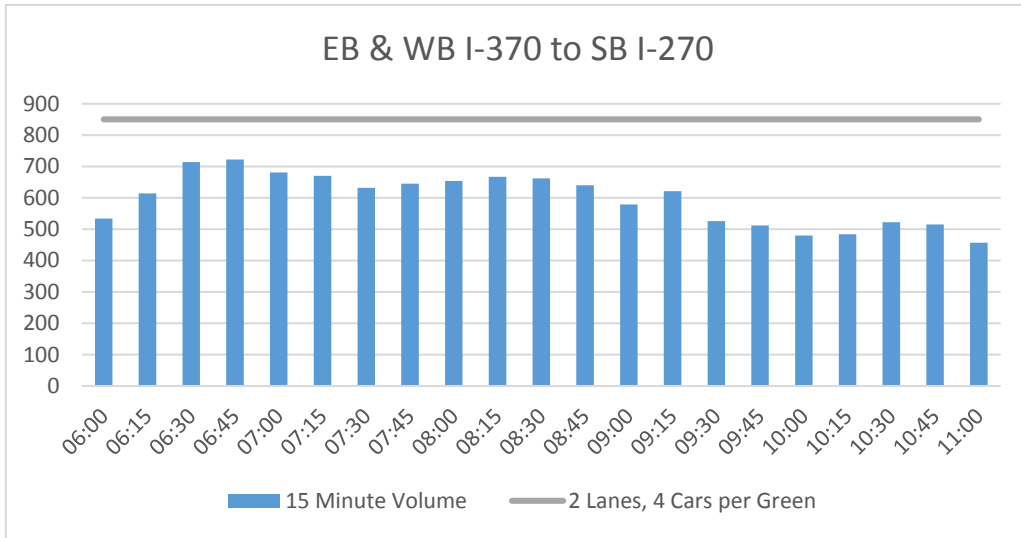
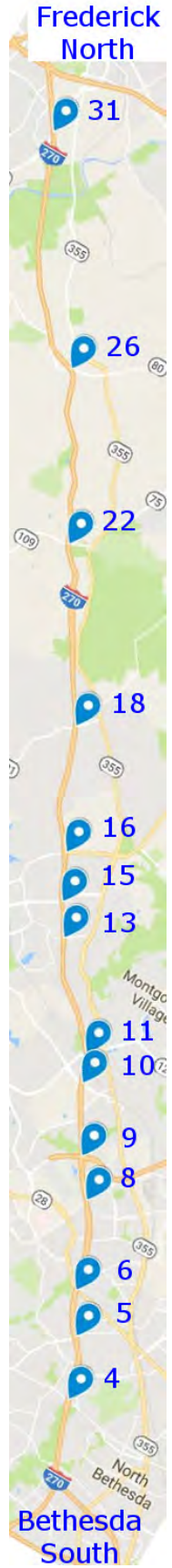
RTMS: 3600' north on I-270



Mile 9 EB & WB I-370 to SB I-270

This two lane ramp should operate efficiently at two cars per green per lane (four cars total).

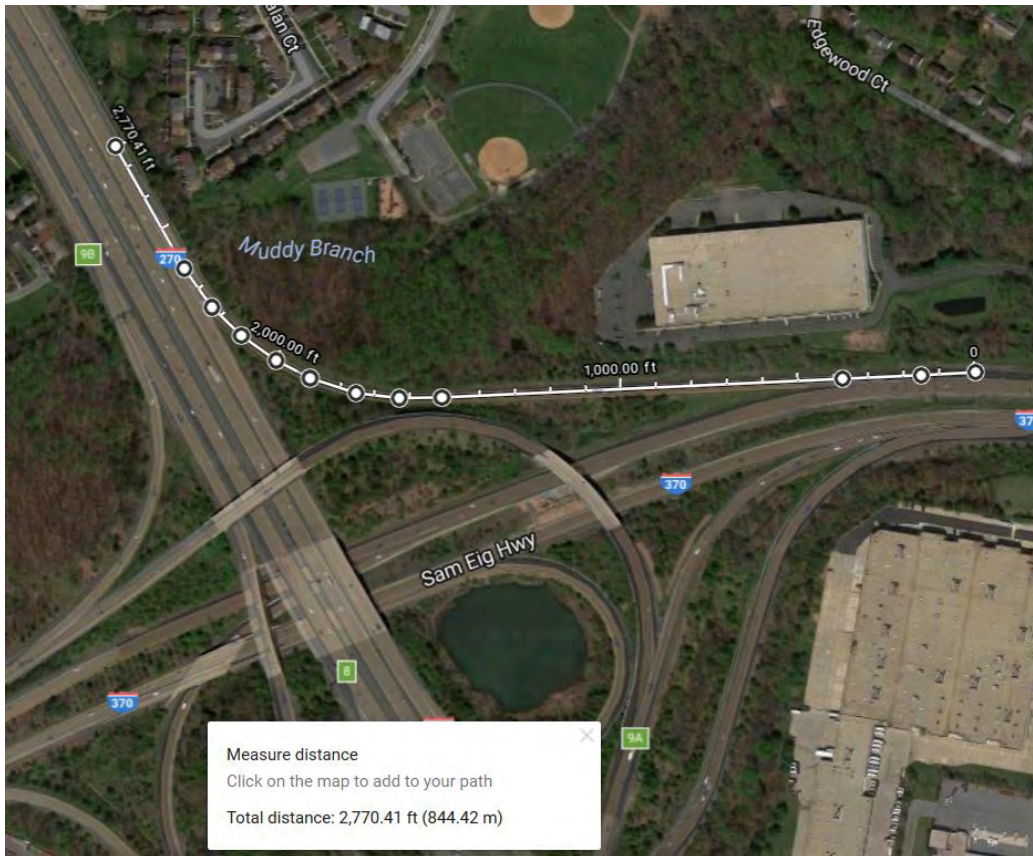
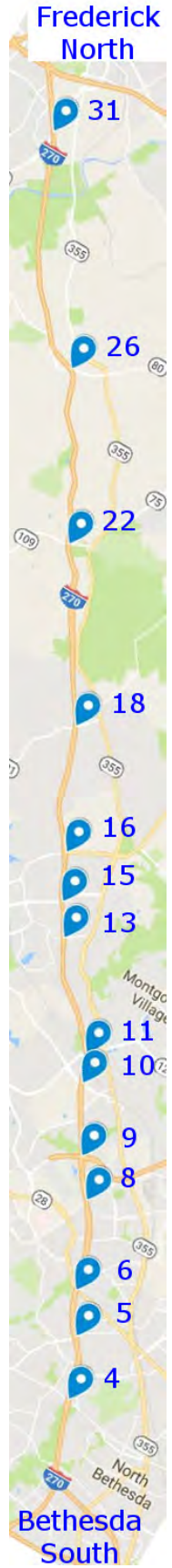
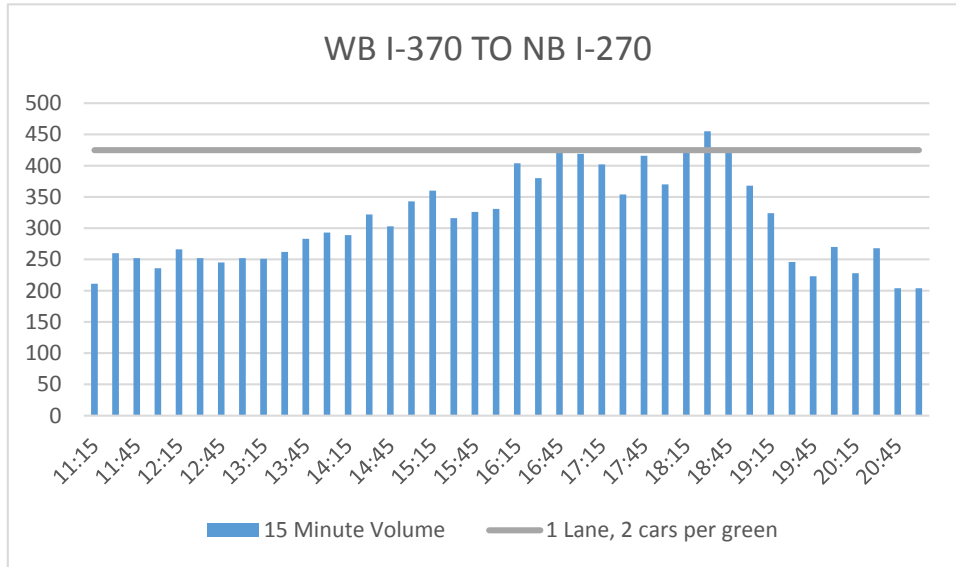
RTMS: 1200' south of I-270 & I-370 on I-270



Mile 9 WB I-370 to NB I-270

This ramp will be widened to two lanes or kept as a single lane with two cars per green. Either configuration will operate efficiently.

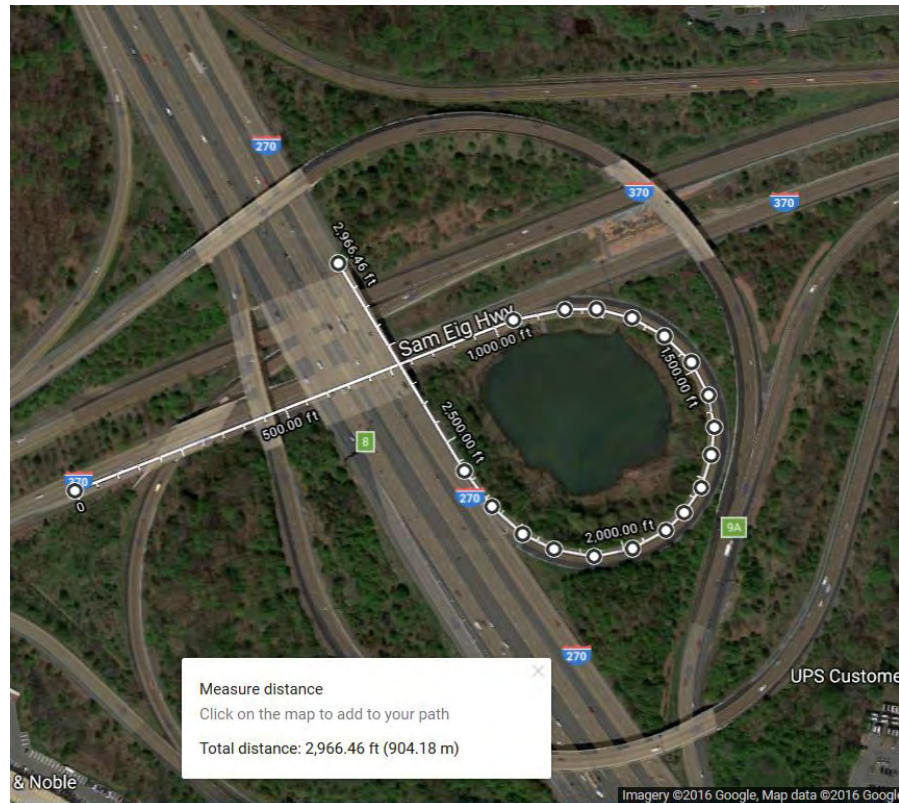
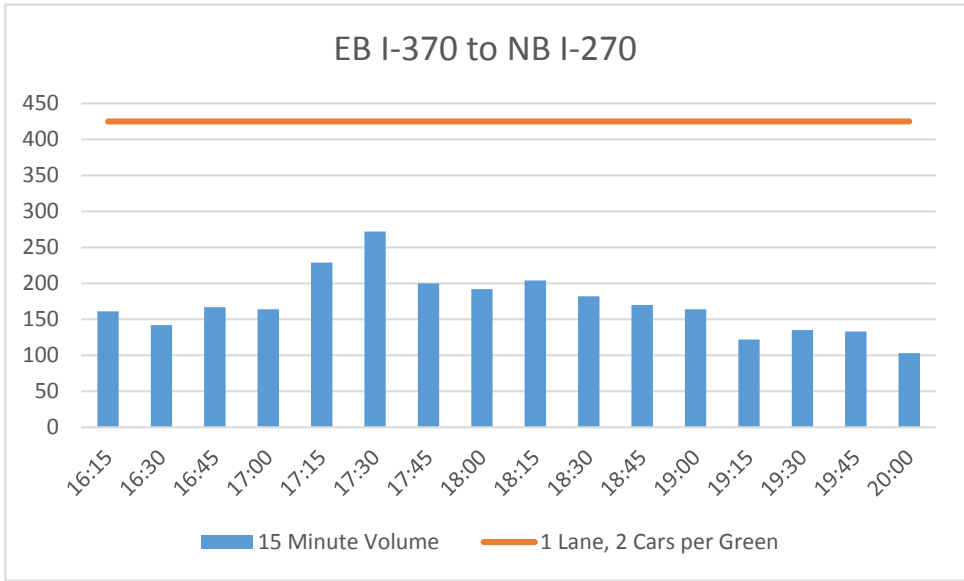
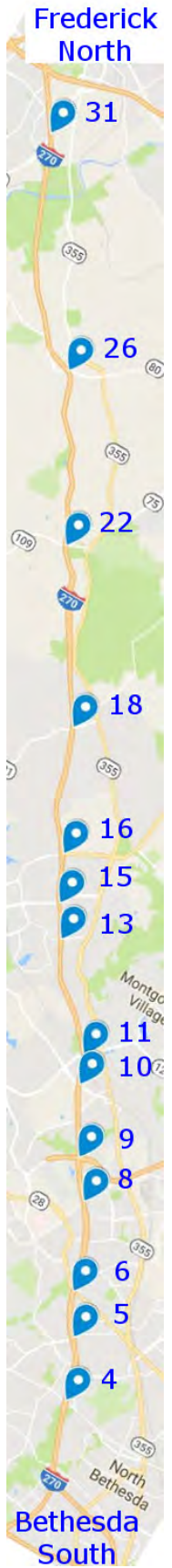
RTMS: 1200' south of I-270 & I-370 on I-270



Mile 9 EB I-370 to NB I-270

This ramp will be widened to two lanes or kept as a single lane with two cars per green. Either configuration will operate efficiently.

RTMS: 1200' south of I-270 & I-370 on I-270



Mile 8 NEB Shady Grove Rd to SB I-270

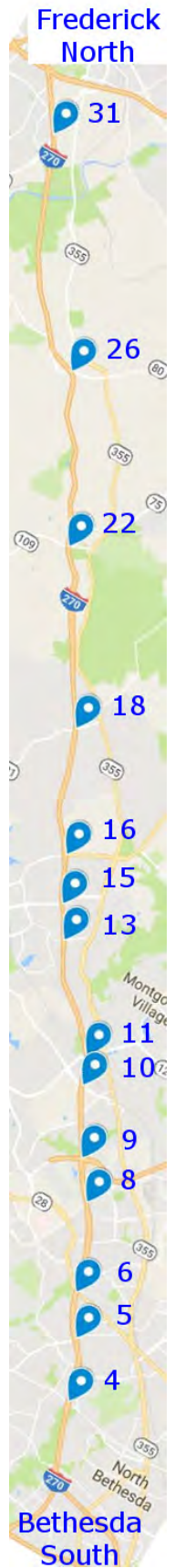
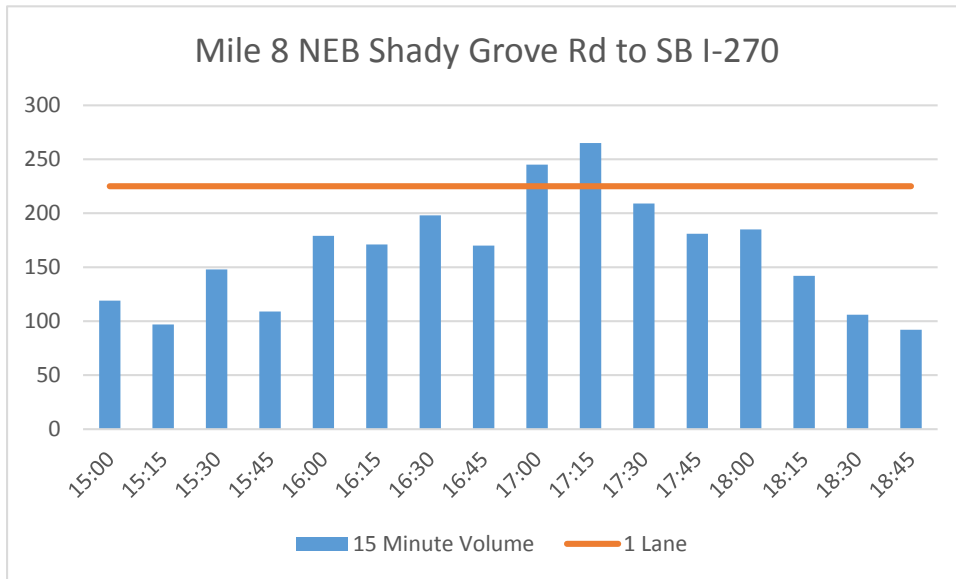
Two 15 minute periods exceed single lane metering capacity, but this ramp has good storage capacity, so we would expect this ramp to operate efficiently.

Length to Merge: 1650'

Length to Gore: 1000'

Lanes: 1

Storage: 27



Mile 8 NEB Shady Grove Rd to NB I 270

The single lane ramp should operate efficiently.

Length to Merge: 2025'

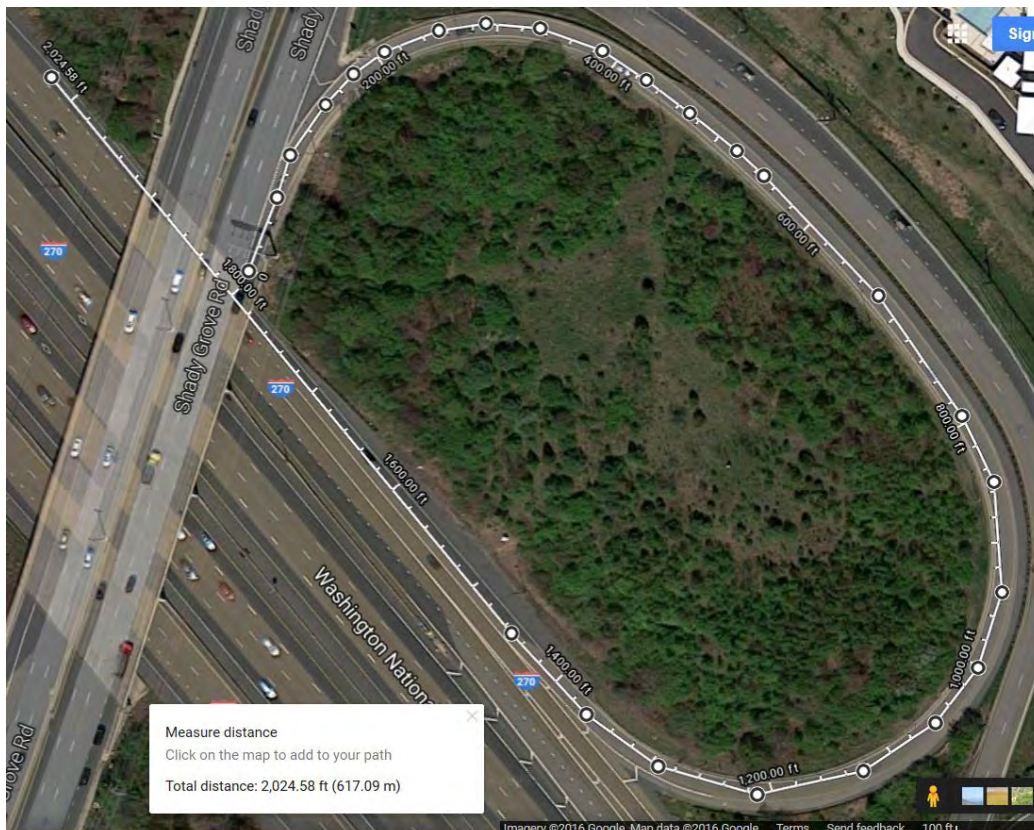
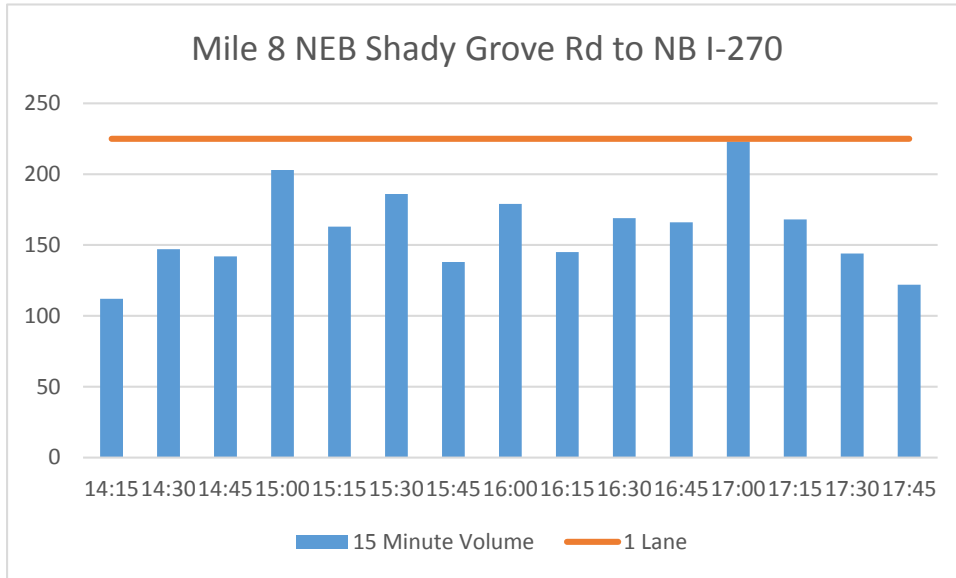
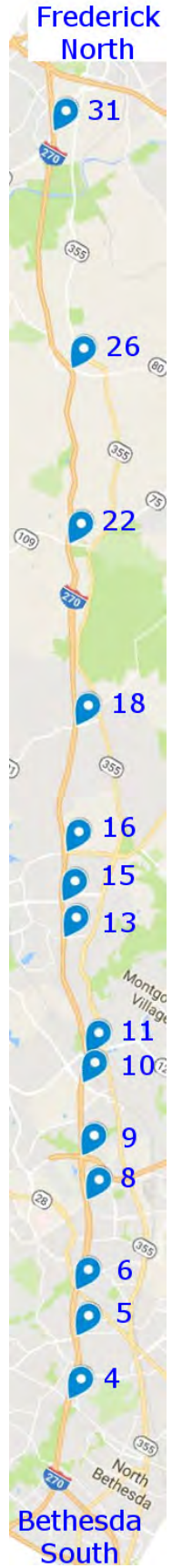
Length to Gore: 1425'

Lanes: 1

Storage: 44

Score: 10

RTMS: 3700' north on I-270



Mile 8 SWB Shady Grove Rd to SB I-270

The single lane ramp should operate efficiently.

Length to Merge: 2550'

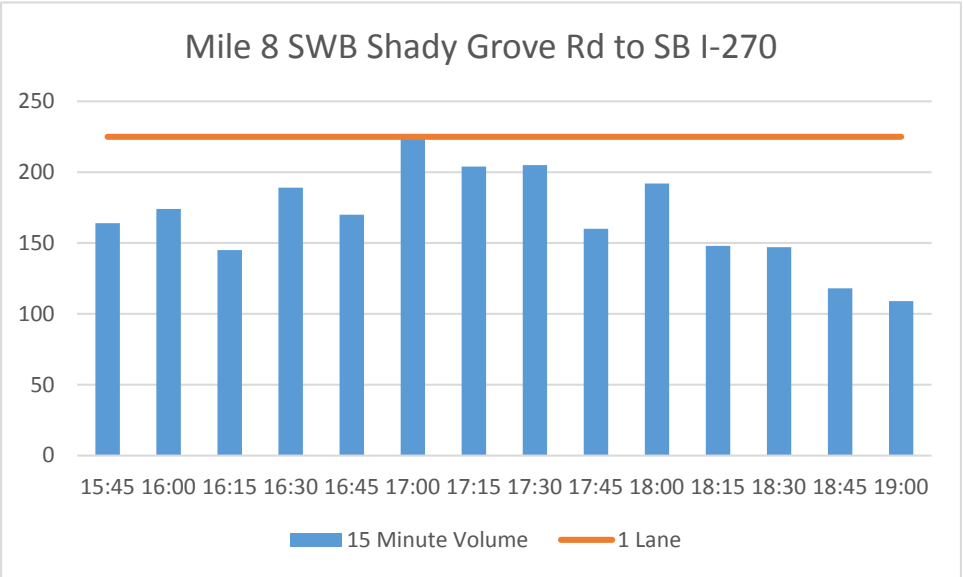
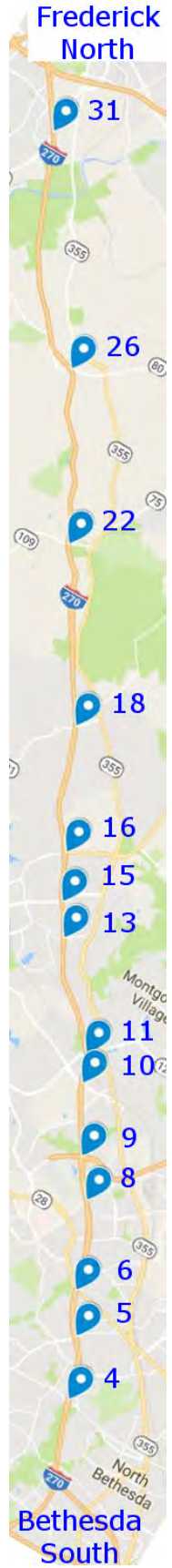
Length to Gore: 1950'

Lanes: 1

Storage: 63

Score: 9

RTMS: 3700' north on I-270



Mile 8 SWB Shady Grove Rd. to NB I-270

One 15 minute periods exceeds single lane metering capacity, but this ramp has good storage capacity, so we would expect this ramp to operate efficiently.

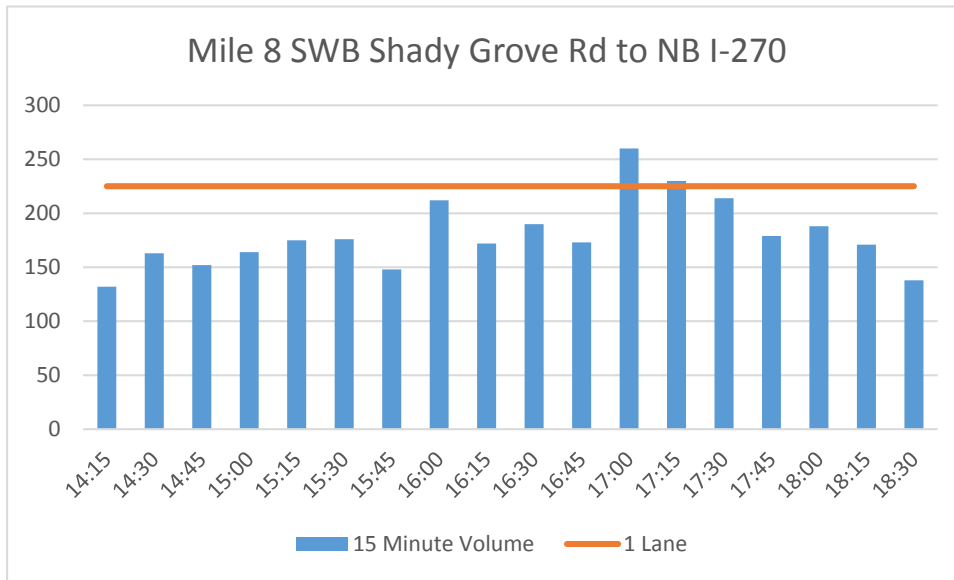
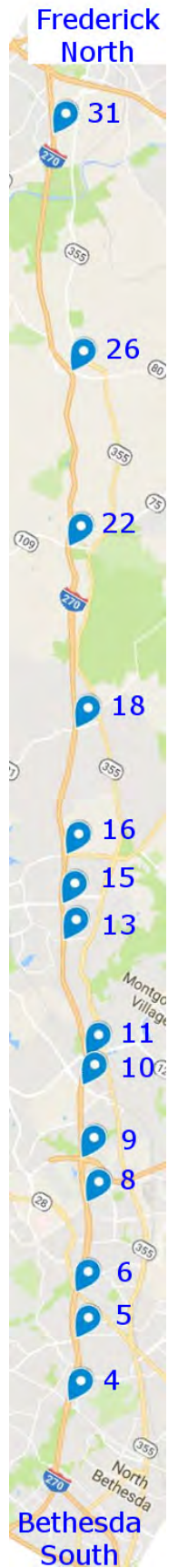
Length to Merge: 1310'

Length to Gore: 885'

Lanes: 1

Storage: 34

Score: 9



Mile 6 EB MD-28 Montgomery Ave. to SB I-270

This ramp will need to be restriped to accommodate this volume. The width of the ramp is 28' to 38' in sections.

Length to Merge: 2590'

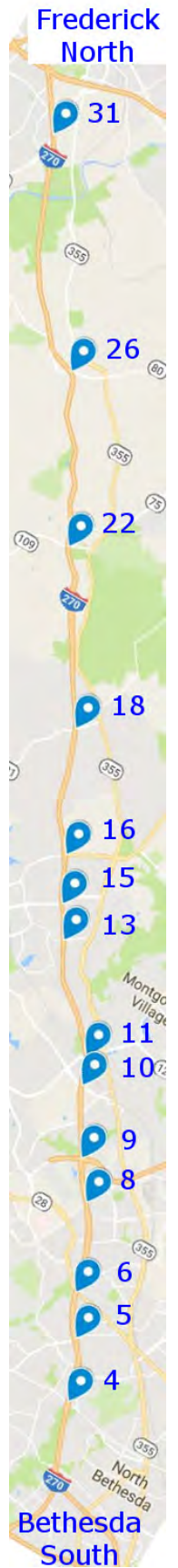
Length to Gore: 2020'

Lanes: 1

Storage: 66

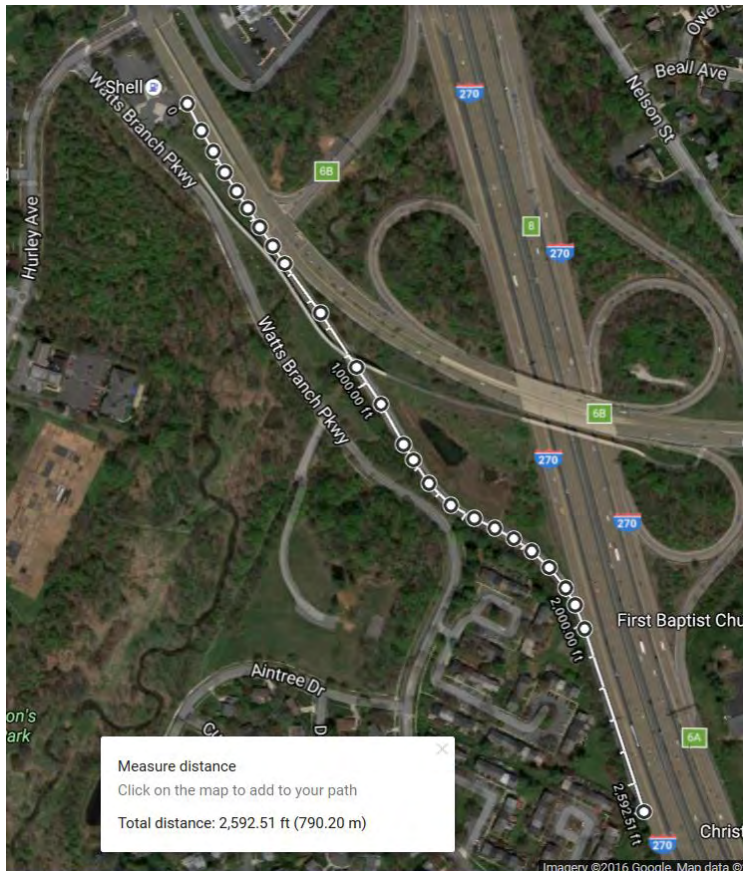
Score: 4

RTMS: south at spur or north at I-370



There is no table for this ramp.

The peak hour volume is 1410 am and 1495 pm. Using the peak hour factor we determined the peak 15 minute volume is estimated at 383 am and 406 pm using peak hour factor of .92.



Mile 6 EB MD-28 Montgomery Ave. to NB I-270

The single lane ramp should operate efficiently.

Length to Merge: 1180'

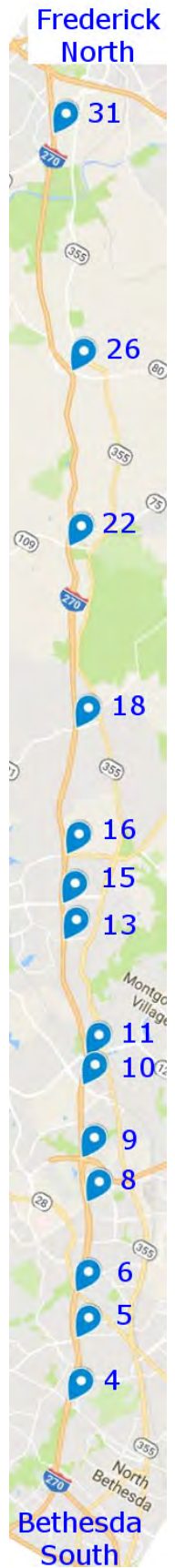
Length to Gore: 985'

Lanes: 1

Storage: 38

Score: 10

RTMS: south at spur or north at I-370



There is no table for this ramp.

The peak hour volume is 85 am and 125 pm.
Using the peak hour factor we determined the peak 15 minute volume is estimated at 23 am and 34 pm using peak hour factor of .92.



Mile 6 WB MD-28 Montgomery Ave. to SB I-270

The single lane ramp should operate efficiently.

Length to Merge: 956'

Length to Gore: 870'

Lanes: 1

Storage: 22

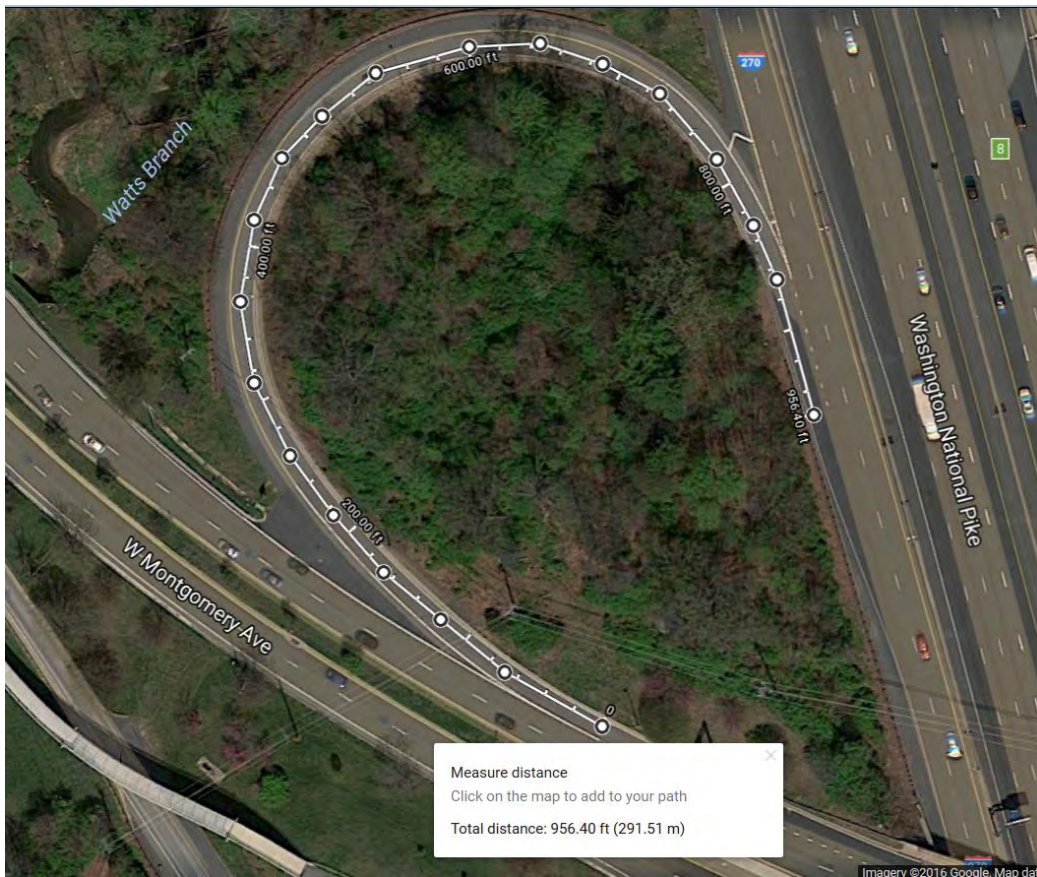
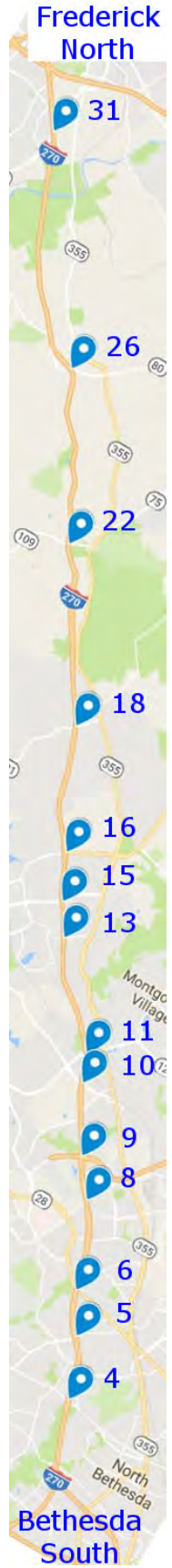
Score: 9

RTMS: south at spur or north at I-370



There is no table for this ramp.

The peak hour volume is 300 am and 255 pm. Using the peak hour factor we determined the peak 15 minute volume is estimated at 82 am and 69 pm using peak hour factor of .92.



Mile 6 WB MD-28 Montgomery Ave. to NB I-270

The single lane ramp should operate efficiently.

Length to Merge: 1660'

Length to Gore: 1212'

Lanes: 1

Storage: 47

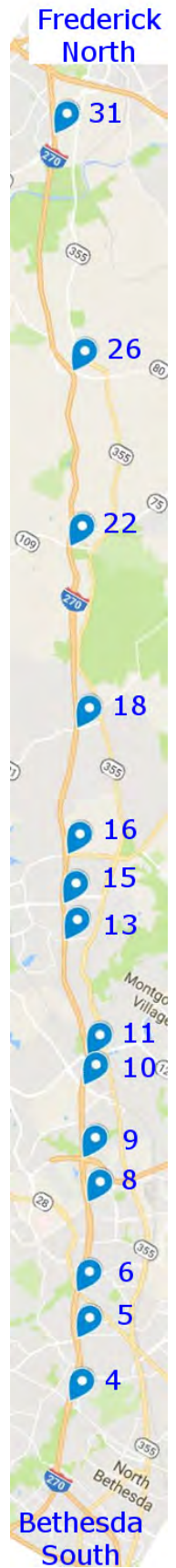
Score: 10

RTMS: south at spur or north at I-370



There is no table for this ramp.

The peak hour volume is 465 am and 700 pm.
Using the peak hour factor we determined the peak 15 minute volume is estimated at 126 am and 190 pm using peak hour factor of .92.



Mile 5 EB & WB MD-189 Falls Rd. to SB I-270

The double lane ramp should operate efficiently.

Length to Merge: 2145'

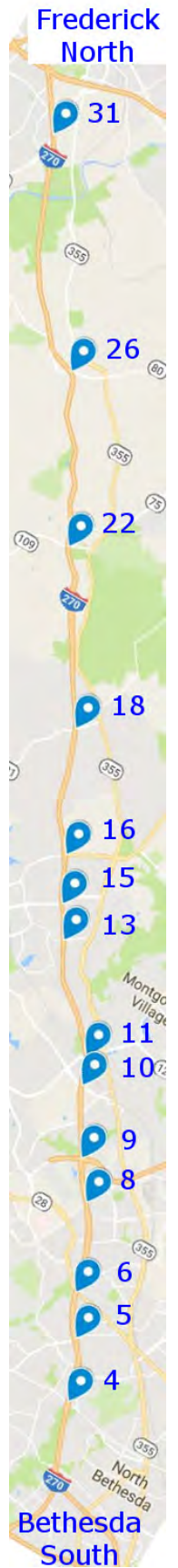
Length to Gore: 1470'

Lanes: 2

Storage: 90

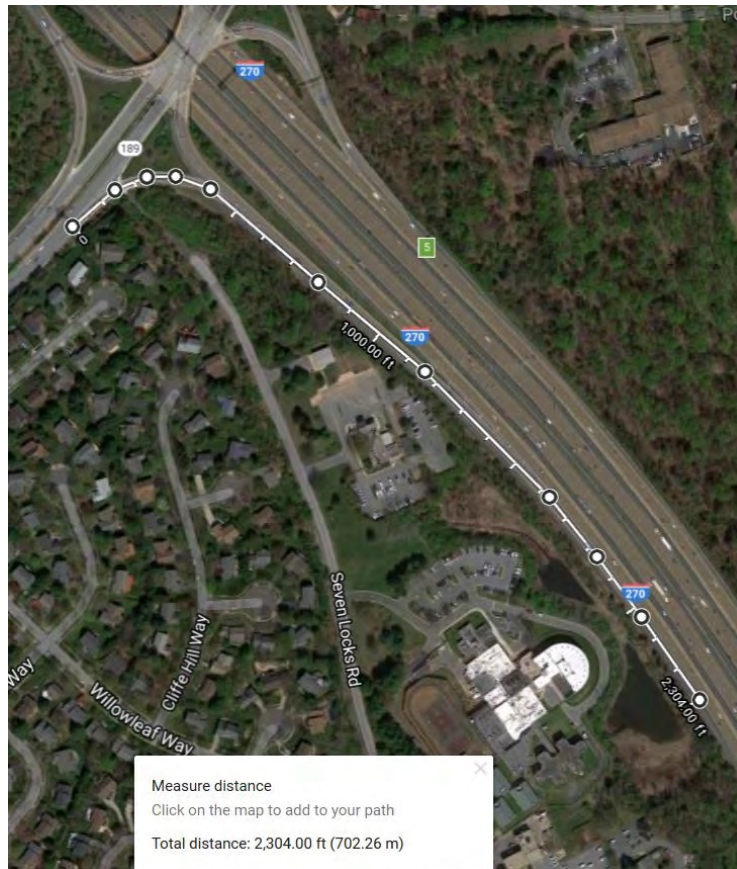
Score: 10

RTMS: south at spur or north at I-370



There is no table for this ramp.

The peak hour volume is 1135 am and 560 pm. Using the peak hour factor we determined the peak 15 minute volume is estimated at 308 am and 152 pm using peak hour factor of .92.



Mile 5 EB & WB MD-189 Falls Rd.to NB I-270

This single lane ramp may need to be widened to operate efficiently with the pm volume. The ramp is approx. 30' wide.

Length to Merge: 860'

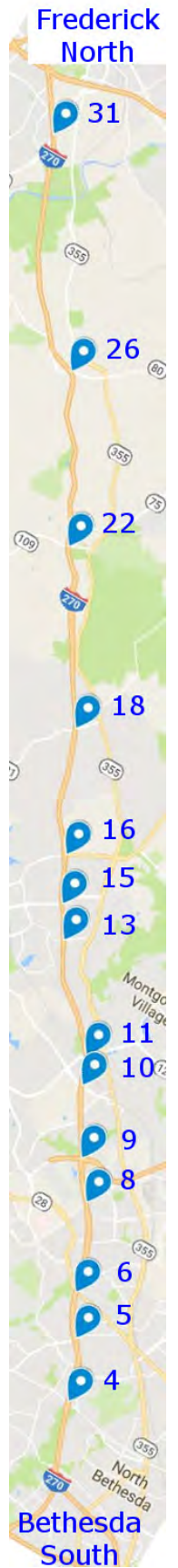
Length to Gore: 790'

Lanes: 1

Storage: 45

Score: 4

RTMS: south at spur or north at I-370



There is no table for this ramp.

The peak hour volume is 555 am and 900 pm. Using the peak hour factor we determined the peak 15 minute volume is estimated at 151 am and 245 pm using peak hour factor of .92.



Mile 4 EB Montrose Rd. to SB I-270

The single lane ramp should operate efficiently.

Length to Merge: 2100'

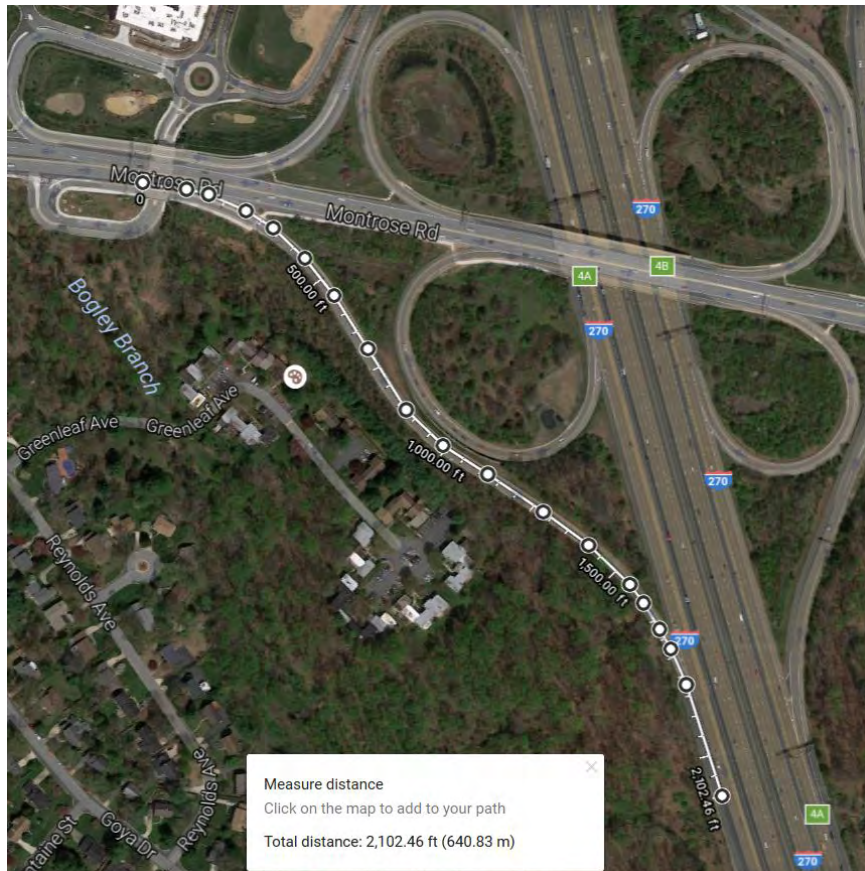
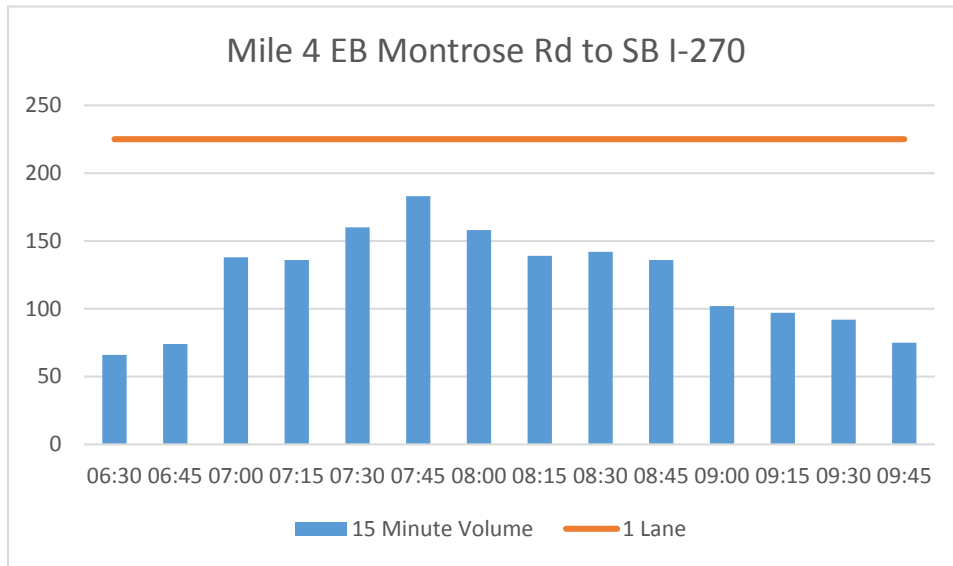
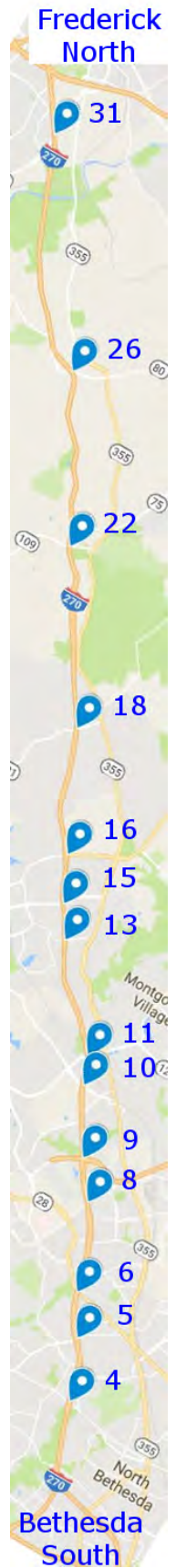
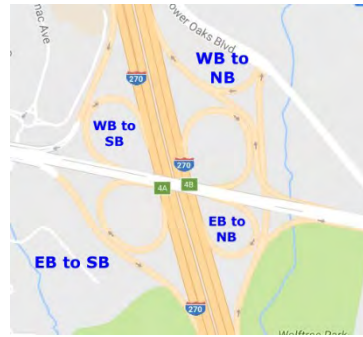
Length to Gore: 1815'

Lanes: 1

Storage: 76

Score: 8

RTMS: south at spur or north at I-370



Mile 4 EB to Montrose Rd. NB I-270

The single lane ramp should operate efficiently.

Length to Merge: 1325'

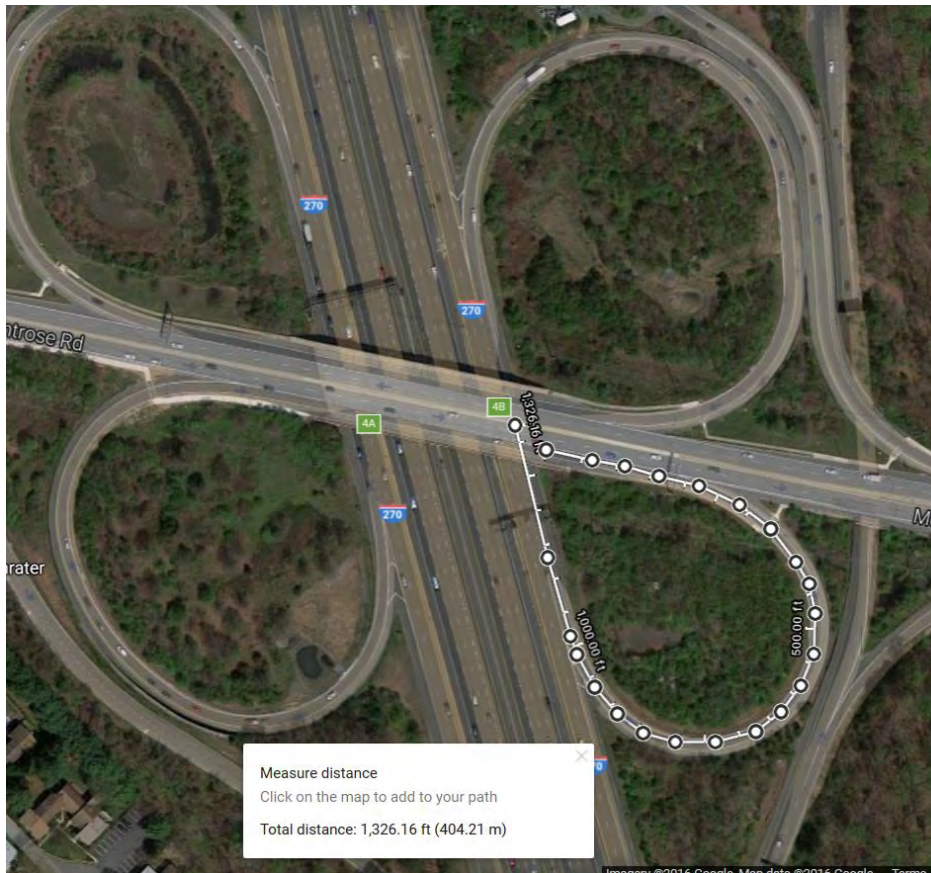
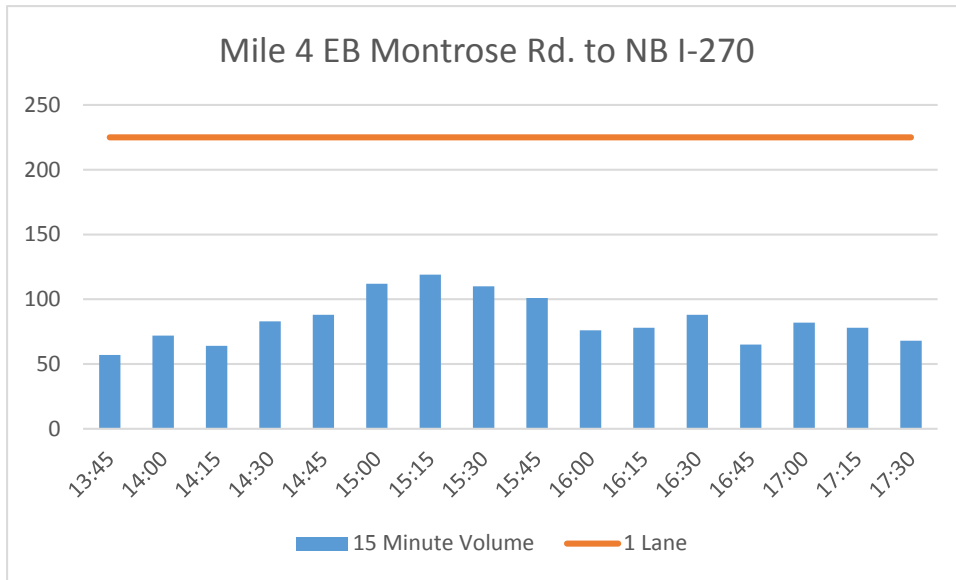
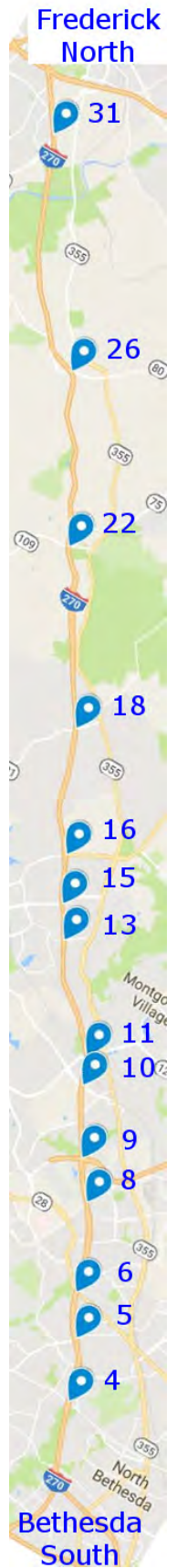
Length to Gore: 1020'

Lanes: 1

Storage: 39

Score: 10

RTMS: south at spur or north at I-370



Mile 4 WB Montrose Rd. to SB I-270

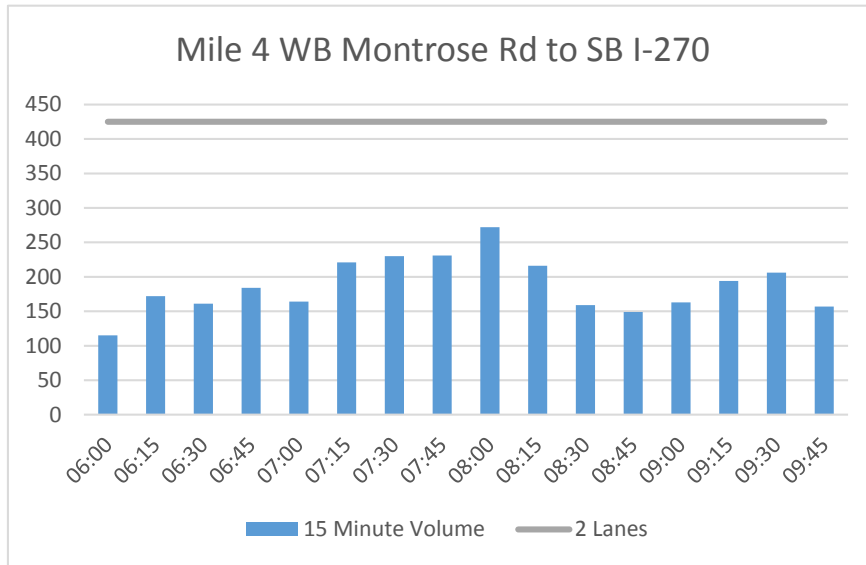
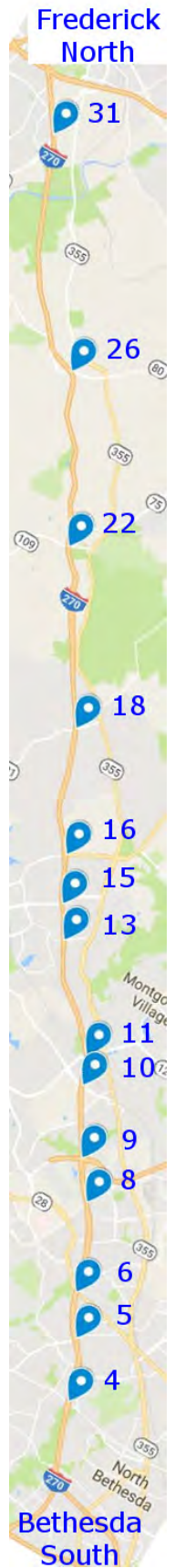
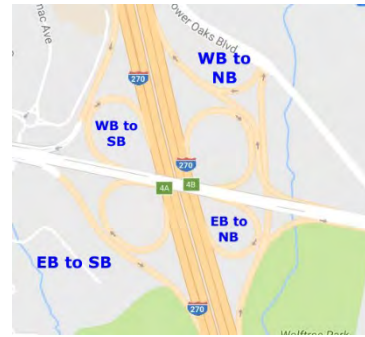
This ramp is showing demand slightly past capacity, with a 15 minute spike. We may be able to just restripe this ramp for about 200 ft to allow for two lane metering.

Length to Merge: 1480'

Length to Gore: 1010'

Lanes: 1

Storage: 40



**Mile 4 WB Montrose Rd & Tower Oaks Blvd.
to NB I-270**

We may be able to just restripe this ramp for about 250 ft. to allow for two lane metering or we will keep the single lane and run two cars per green.

Length to Merge: 2145'

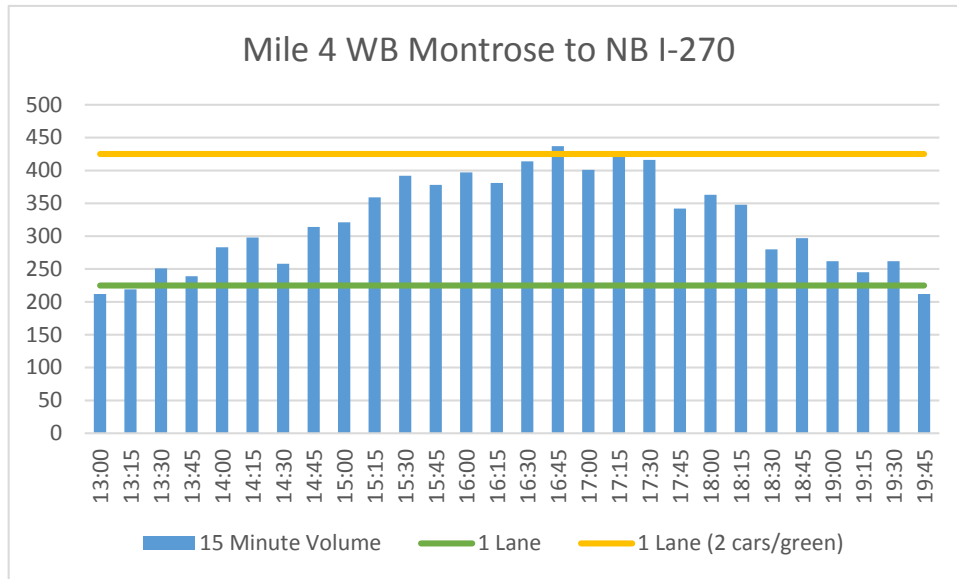
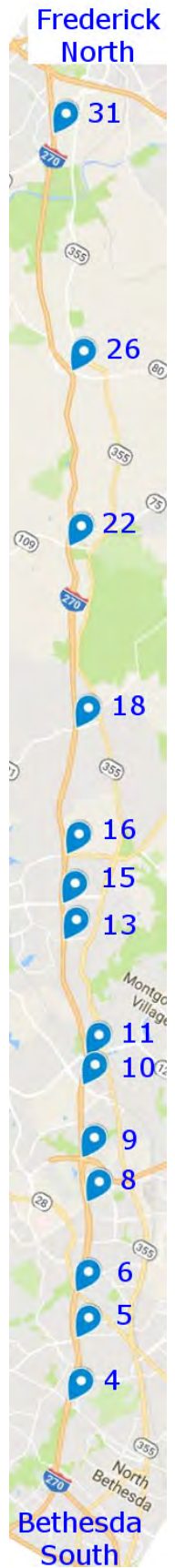
Length to Gore: 1815'

Lanes: 1

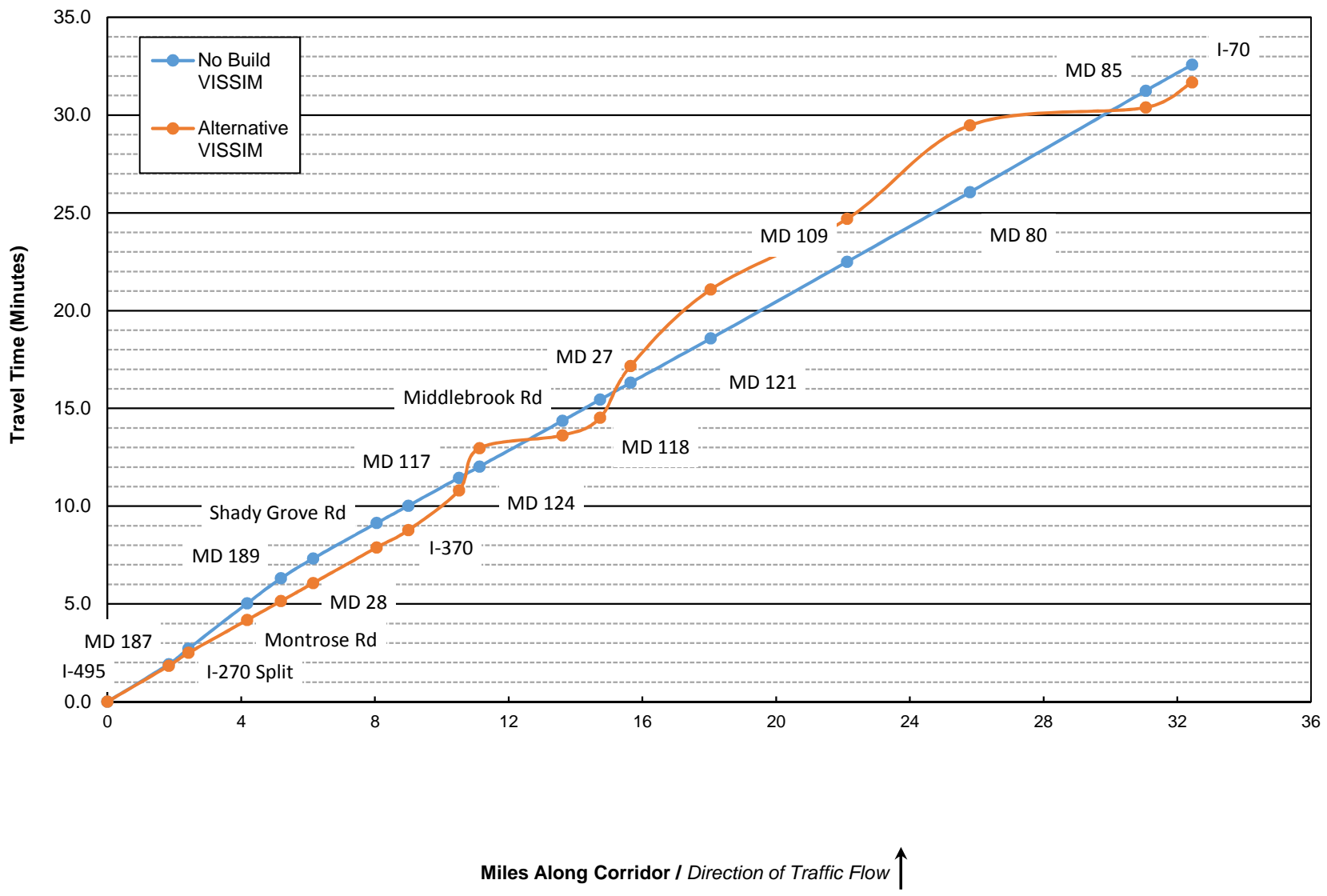
Storage: 81

Score: 4

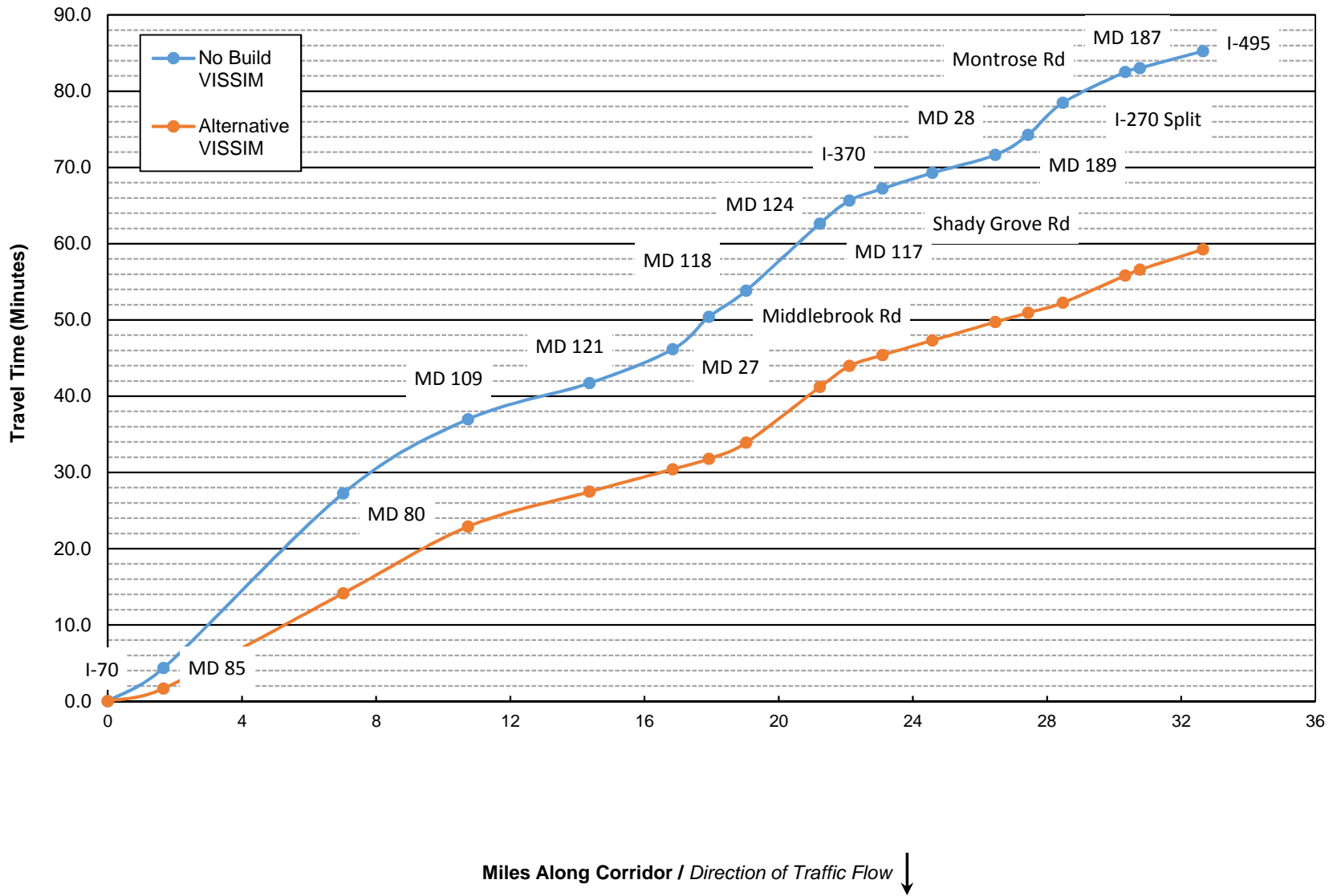
RTMS: south at spur or north at I-370



**Figure C.1: AM Peak - 2040 Adaptive Ramp Metering
I-270 Travel Time Graph - Northbound**



**Figure C.2: AM Peak - 2040 Adaptive Ramp Metering
I-270 Travel Time Graph - Southbound**



**Figure C.3: AM Peak - 2040 Adaptive Ramp Metering
I-270 Spur Travel Time Graph - Northbound**

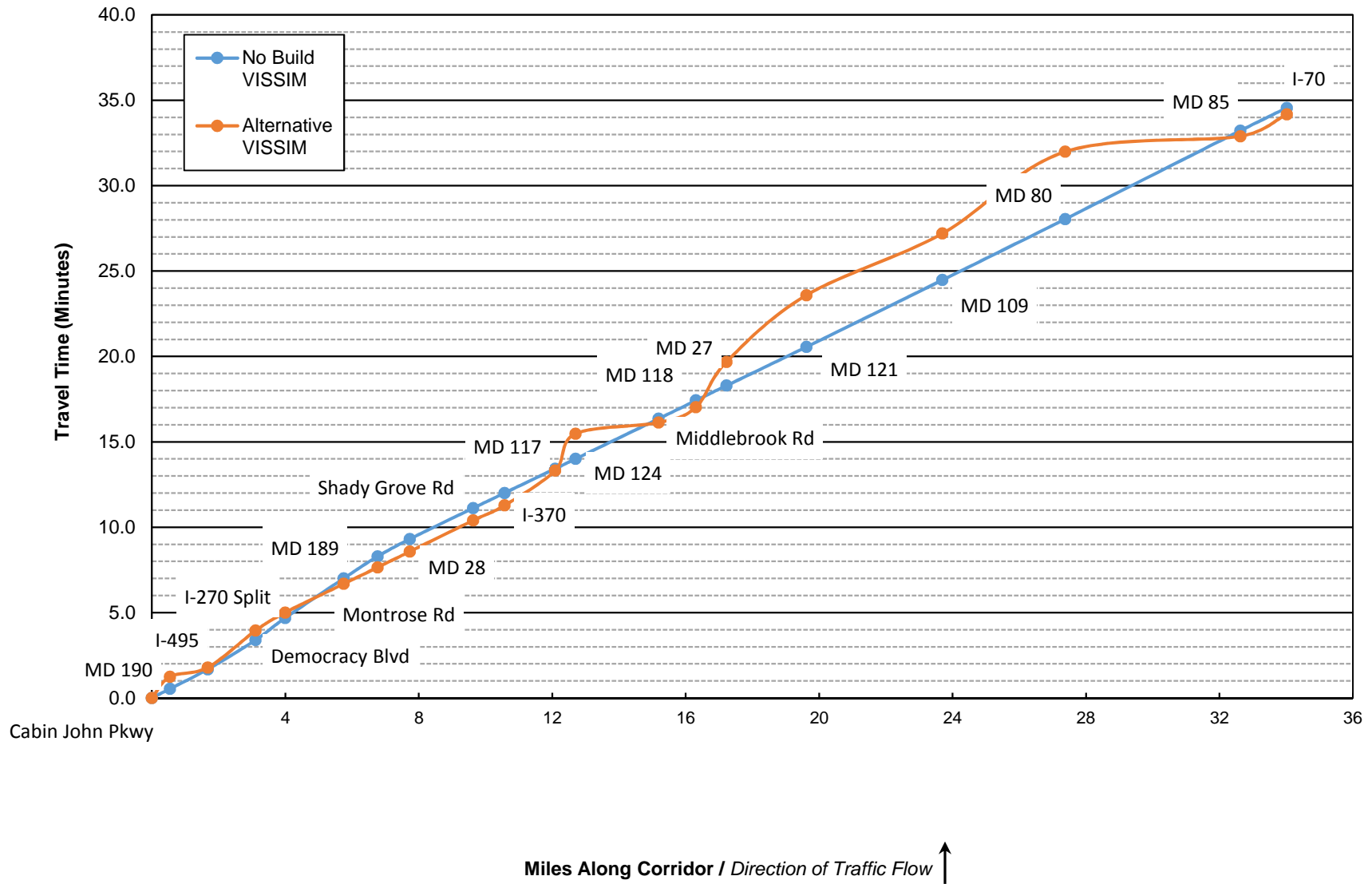
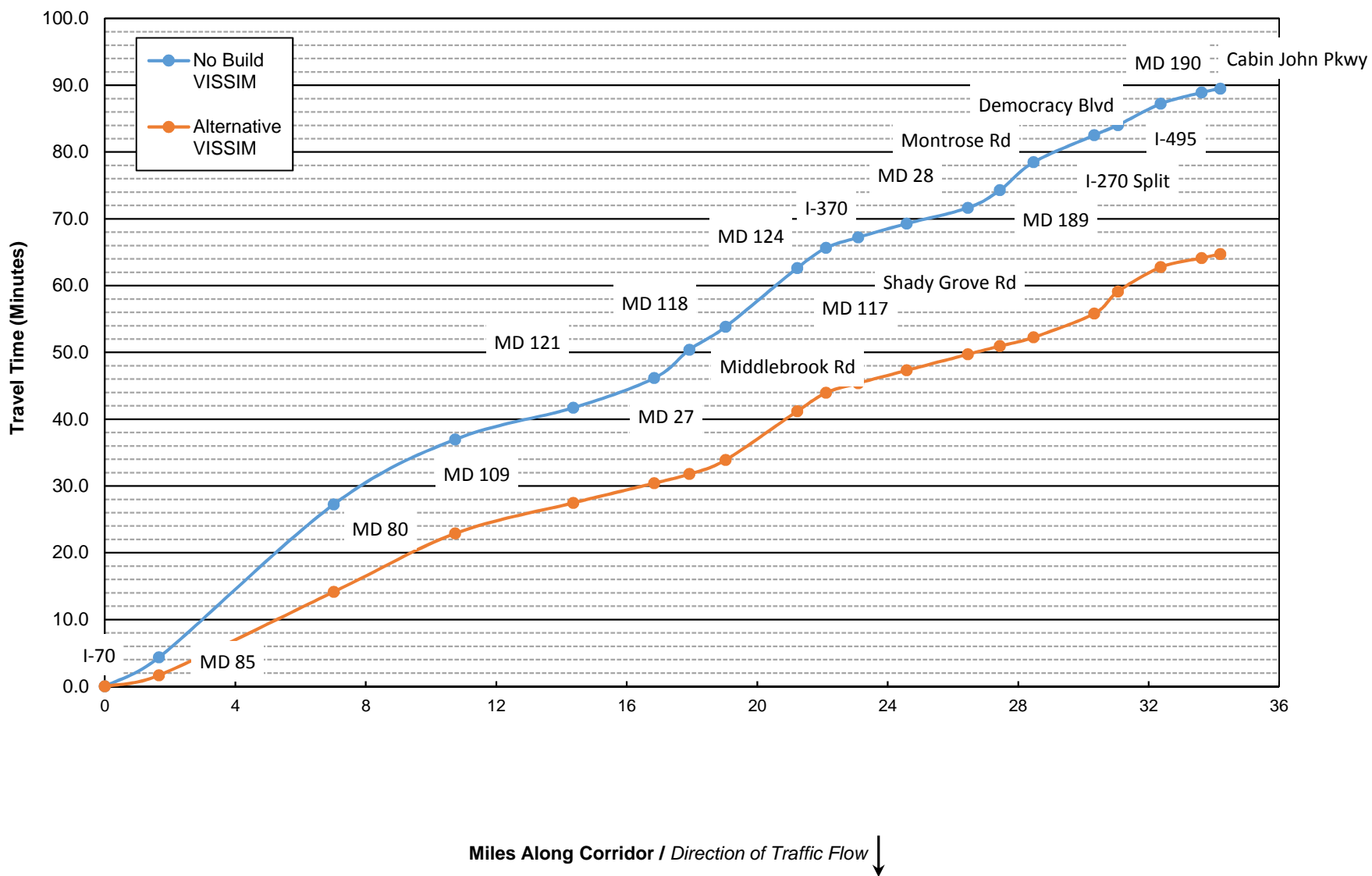
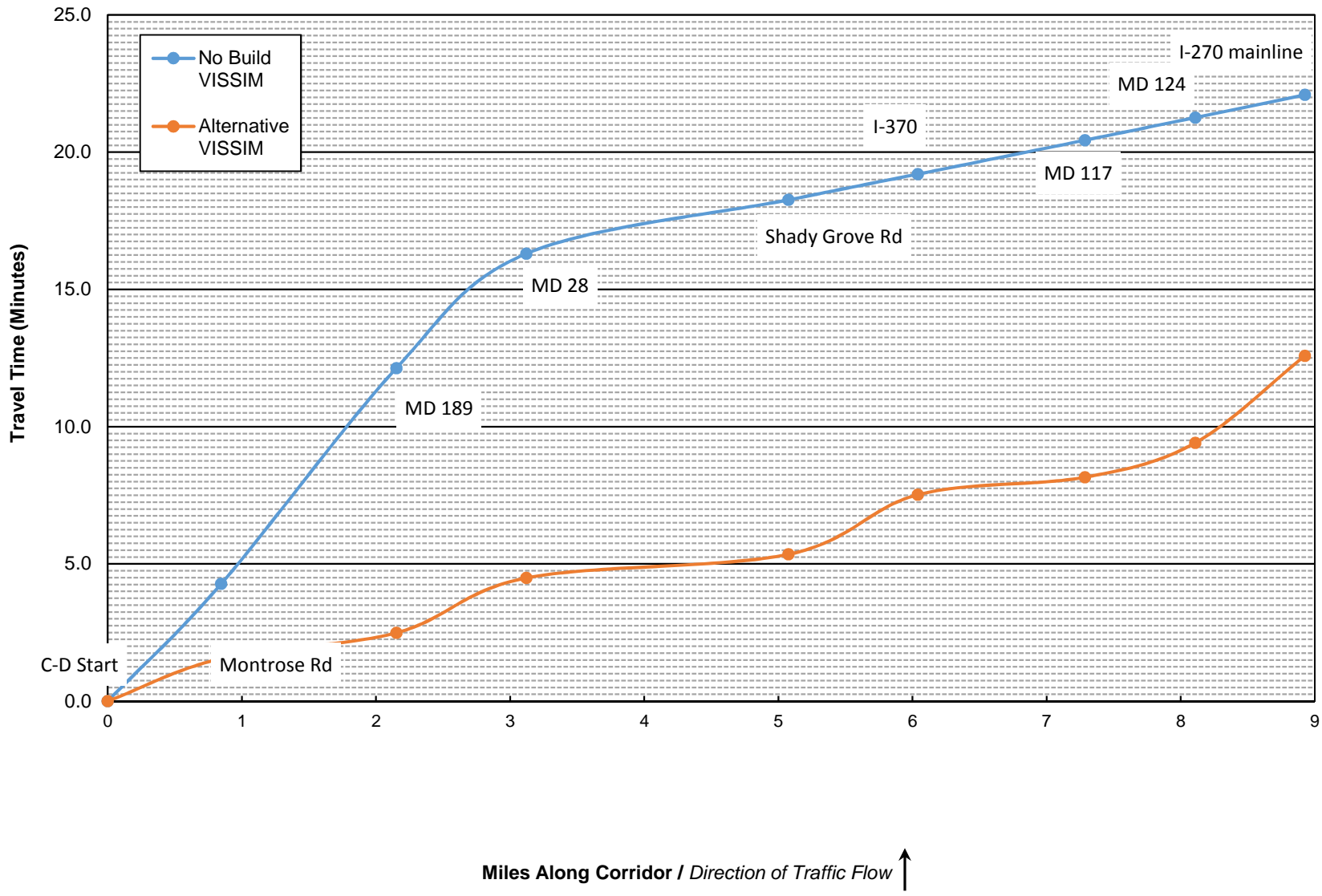


Figure C.4: AM Peak - 2040 Adaptive Ramp Metering I-270 Spur Travel Time Graph - Southbound



**Figure C.5: AM Peak - 2040 AdaptiveRamp Metering
I-270 Local Travel Time Graph - Northbound**



**Figure C.6: AM Peak - 2040 Adaptive Ramp Metering
I-270 Local Travel Time Graph - Southbound**

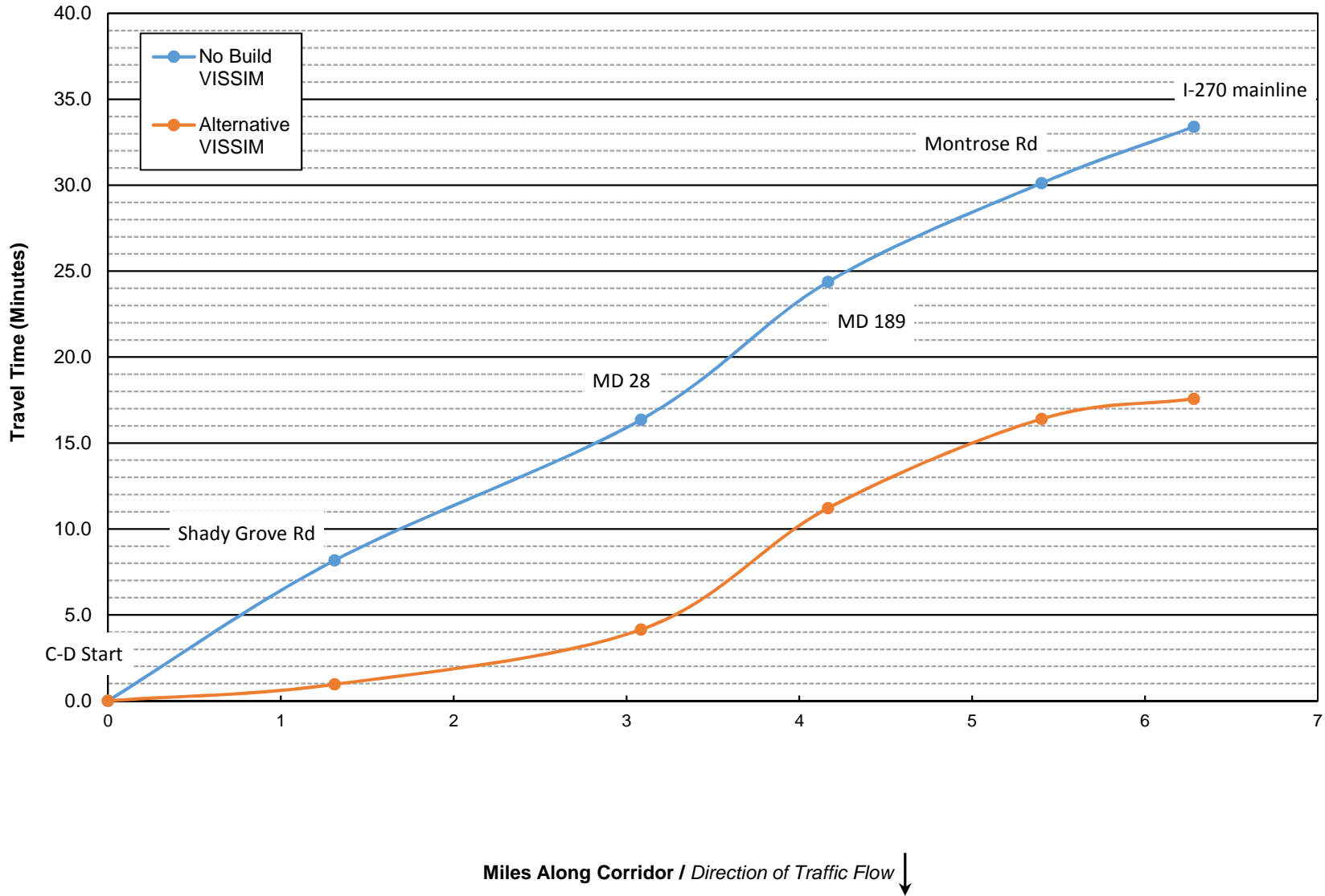


Table C.1: AM Peak - 2040 Adaptive Ramp Metering - I-270 Vehicle Travel Time

I-270 Northbound	No Build VISSIM Travel Time (seconds)	ARM VISSIM Travel Time (seconds)	% Change	I-270 Southbound	No Build VISSIM Travel Time (seconds)	ARM VISSIM Travel Time (seconds)	% Change
From I-495 interchange				From I-70			
to MD 187	115.1	110.2	-4%	to MD 85	260.9	99.9	-62%
to I-270 Split	47.5	39.6	-17%	to MD 80	1,374.0	749.0	-45%
to Montrose Rd	139.0	100.8	-27%	to MD 109	583.2	524.6	-10%
to MD 189	77.0	58.0	-25%	to MD 121	284.4	274.5	-3%
to MD 28	61.0	55.4	-9%	to MD 27	266.9	177.0	-34%
to Shady Grove Rd	108.7	109.2	0%	to MD 118	254.6	81.9	-68%
to I-370	53.0	53.1	0%	to Middlebrook Rd	206.2	126.3	-39%
to MD 117	85.5	122.2	43%	to MD 124	528.0	438.7	-17%
to MD 124	34.5	129.4	275%	to MD 117	180.6	165.6	-8%
to Middlebrook Rd	140.8	39.5	-72%	to I-370	94.3	85.9	-9%
to MD 118	64.7	53.9	-17%	to Shady Grove Rd	124.1	115.1	-7%
to MD 27	52.0	159.1	206%	to MD 28	141.9	144.8	2%
to MD 121	135.6	234.4	73%	to MD 189	157.8	73.5	-53%
to MD 109	235.2	216.7	-8%	to Montrose Rd	251.0	78.3	-69%
to MD 80	214.0	287.3	34%	to I-270 Split	243.1	213.3	-12%
to MD 85	310.9	54.6	-82%	to MD 187	30.7	46.5	51%
to I-70	80.1	77.3	-3%	to I-495 interchange	134.0	161.0	20%
I-270 Total (miles/minutes)	32.6	31.7	-3%	I-270 Total (miles/minutes)	85.3	59.3	-30%
I-270 Spur Northbound				I-270 Spur Southbound			
From Cabin John Pkwy				From I-70			
to MD 190	32.4	74.7	131%	to I-270 Split	4,951.1	3,348.5	-32%
to I-495	68.6	32.4	-53%	to Democracy Blvd	91.3	198.1	117%
to Democracy Blvd	102.7	129.6	26%	to I-495	191.0	219.2	15%
to I-270 Split	77.7	63.5	-18%	to MD 190	101.6	81.9	-19%
to I-70	1,792.1	1,750.8	-2%	to Cabin John Pkwy	35.1	35.2	0%
I-270 Spur Total (miles/minutes)	34.6	34.2	-1%	I-270 Spur Total (miles/minutes)	89.5	64.7	-28%

Table C.2: AM Peak - 2040 Adaptive Ramp Metering - I-270 Local Vehicle Travel Time

I-270 Northbound	No Build VISSIM Travel Time (seconds)	ARM VISSIM Travel Time (seconds)	% Change	I-270 Southbound	No Build VISSIM Travel Time (seconds)	ARM VISSIM Travel Time (seconds)	% Change
From C-D start				From C-D start			
to Montrose Rd	256.2	93.1	-64%	to Shady Grove	490.1	57.5	-88%
to MD 189	471.8	56.3	-88%	to MD 28	491.5	191.1	-61%
to MD 28	250.0	120.1	-52%	to MD 189	481.0	423.8	-12%
to Shady Grove	117.6	51.5	-56%	to Montrose	344.5	311.6	-10%
to I-370	56.5	130.4	131%	to I-270 mainline	197.1	70.5	-64%
to MD 117	74.0	38.2	-48%				
to MD 124	49.5	75.2	52%				
to I-270 mainline	49.7	190.2	283%				
I-270 Local Total (miles/minutes)	22.1	12.6	-43%	I-270 Local Total (miles/minutes)	33.4	17.6	-47%

Table C.3: AM Peak - 2040 Adaptive Ramp Metering - I-270 Vehicle Speed

I-270 Northbound	No Build VISSIM Speed (MPH)	ARM VISSIM Speed (MPH)	% Change	I-270 Southbound	No Build VISSIM Speed (MPH)	ARM VISSIM Speed (MPH)	% Change
From I-495 interchange				From I-70			
to MD 187	57.4	59.9	4%	to MD 85	22.9	59.9	161%
to I-270 Split	44.8	53.8	20%	to MD 80	14.0	25.7	83%
to Montrose Rd	45.4	62.6	38%	to MD 109	23.0	25.5	11%
to MD 189	47.4	63.0	33%	to MD 121	45.8	47.5	4%
to MD 28	56.9	62.7	10%	to MD 27	33.5	50.5	51%
to Shady Grove Rd	62.9	62.6	0%	to MD 118	15.2	47.1	211%
to I-370	64.1	64.0	0%	to Middlebrook Rd	19.4	31.7	63%
to MD 117	63.8	44.6	-30%	to MD 124	15.0	18.0	20%
to MD 124	64.0	17.0	-73%	to MD 117	17.7	19.3	9%
to Middlebrook Rd	63.6	226.8	257%	to I-370	37.6	41.3	10%
to MD 118	62.3	74.9	20%	to Shady Grove Rd	43.1	46.5	8%
to MD 27	63.4	20.7	-67%	to MD 28	47.6	46.6	-2%
to MD 121	63.6	36.8	-42%	to MD 189	22.3	47.9	115%
to MD 109	62.4	67.7	9%	to Montrose Rd	14.8	47.4	220%
to MD 80	61.9	46.1	-26%	to I-270 Split	27.5	31.4	14%
to MD 85	60.8	346.6	470%	to MD 187	51.0	33.7	-34%
to I-70	62.5	64.7	4%	to I-495 interchange	50.8	42.3	-17%
I-270 Total (miles/minutes)	59.8	61.5	3%	I-270 Total (miles/minutes)	23.0	33.1	44%
I-270 Spur Northbound				I-270 Spur Southbound			
From Cabin John Pkwy				From I-70			
to MD 190	59.9	26.0	-57%	to I-270 Split	22.1	32.6	48%
to I-495	59.5	126.0	112%	to Democracy Blvd	28.8	13.3	-54%
to Democracy Blvd	50.3	39.8	-21%	to I-495	24.7	21.5	-13%
to I-270 Split	41.3	50.6	22%	to MD 190	44.4	55.1	24%
to I-70	60.3	61.7	2%	to Cabin John Pkwy	58.5	58.3	0%
I-270 Spur Total (miles/minutes)	59.1	59.7	1%	I-270 Spur Total (miles/minutes)	22.9	31.7	38%

Table C.4: AM Peak - 2040 Adaptive Ramp Metering - I-270 Local Vehicle Speed

I-270 Northbound	No Build VISSIM Speed (MPH)	ARM VISSIM Speed (MPH)	% Change	I-270 Southbound	No Build VISSIM Speed (MPH)	ARM VISSIM Speed (MPH)	% Change
From C-D start				From C-D start			
to Montrose Rd	11.9	32.7	175%	to Shady Grove	9.6	82.1	753%
to MD 189	10.0	83.6	739%	to MD 28	13.0	33.4	157%
to MD 28	13.9	29.0	108%	to MD 189	8.1	9.2	13%
to Shady Grove	59.8	136.6	128%	to Montrose	12.9	14.3	11%
to I-370	61.5	26.7	-57%	to I-270 mainline	16.1	45.0	180%
to MD 117	60.6	117.3	94%				
to MD 124	59.8	39.4	-34%				
to I-270 mainline	59.3	15.5	-74%				
I-270 Local Total (miles/minutes)	24.2	42.6	76%	I-270 Local Total (miles/minutes)	11.3	21.5	90%

Table C.5: AM Peak - 2040 Adaptive Ramp Metering - I-270 Vehicle Density

I-270 Northbound	Type	No Build		ARM		% Change	I-270 Southbound	Type	No Build		ARM		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS			
I-270	Freeway	40	E	27	D	-31%	I-270	Freeway	45	F	22	C	-52%
I-270 Diverge to MD 187	Diverge	33	D	21	C	-36%	I-270 Merge from WB I-70	Merge	62	F	14	B	-77%
I-270	Freeway	45	F	24	C	-46%	I-270	Freeway	67	F	26	D	-61%
I-270 Diverge to Rockledge Rd	Diverge	35	D	21	C	-40%	I-270 Merge from EB I-70	Merge	57	F	22	C	-61%
I-270	Freeway	48	F	20	C	-58%	I-270	Freeway	67	F	32	D	-53%
I-270 Weave from MD 187 to I-270 HOV	Weave	30	D	12	B	-60%	I-270 Diverge to SB MD 85	Diverge	70	F	36	E	-48%
I-270 Lane Drop	Merge	47	F	16	B	-65%	I-270	Freeway	92	F	29	D	-68%
I-270	Freeway	64	F	30	D	-54%	I-270 Diverge to NB MD 85	Diverge	56	F	17	B	-70%
I-270 Merge from I-270 Spur	Merge	63	F	26	C	-60%	I-270	Freeway	119	F	24	C	-80%
I-270 Weave from I-270 HOV to I-270 C-D	Weave	49	F	23	C	-52%	I-270 Merge from MD 85	Merge	104	F	17	B	-84%
I-270	Freeway	38	E	25	C	-33%	I-270	Freeway	112	F	73	F	-35%
I-270 Diverge to C-D (MD 189)	Diverge	31	D	23	C	-25%	I-270 Diverge to MD 80	Diverge	61	F	55	F	-10%
I-270	Freeway	23	C	19	C	-16%	I-270	Freeway	108	F	99	F	-9%
I-270 Diverge to C-D (MD 28)	Diverge	50	F	21	C	-59%	I-270 Merge from MD 80	Merge	111	F	75	F	-32%
I-270	Freeway	14	B	16	B	13%	I-270	Freeway	75	F	70	F	-6%
I-270 Merge from C-D (MD 189)	Merge	14	B	19	B	39%	I-270 Diverge to MD 109	Diverge	41	F	37	E	-10%
I-270 Diverge to C-D (Shady Grove Rd)	Diverge	18	B	22	C	21%	I-270	Freeway	80	F	74	F	-7%
I-270	Freeway	12	B	16	B	29%	I-270 Merge from MD 109	Merge	87	F	58	F	-33%
I-270 Weave from C-D (MD 28) to C-D (Shady Grove Rd)	Weave	10	B	14	B	32%	I-270	Freeway	44	E	46	F	3%
I-270	Freeway	10	A	13	B	28%	I-270 Diverge to SB Weigh Station	Diverge	19	B	19	B	3%
I-270 Merge from C-D (Shady Grove Rd)	Merge	9	A	11	B	26%	I-270	Freeway	38	E	39	E	2%
I-270	Freeway	12	B	14	B	25%	I-270 Merge from SB Weigh Station	Merge	20	B	20	C	1%
I-270 Merge from C-D (I-370)	Merge	10	B	12	B	15%	I-270	Freeway	41	E	41	E	1%
I-270 Diverge to C-D (MD 117)	Diverge	16	B	28	D	76%	I-270 Diverge to MD 121	Diverge	20	B	18	B	-9%
I-270	Freeway	12	B	14	B	16%	I-270	Freeway	28	D	24	C	-16%
I-270 Merge from C-D (MD 124)	Merge	14	B	15	B	8%	I-270 Merge from WB MD 121	Merge	33	D	21	C	-37%
I-270	Freeway	16	B	18	C	12%	I-270	Freeway	43	E	31	D	-28%
I-270 Diverge to EB Middlebrook Rd	Diverge	10	B	12	B	10%	I-270 Merge from EB MD 121	Merge	37	E	26	C	-30%
I-270	Freeway	15	B	17	B	12%	I-270	Freeway	55	F	34	D	-38%
I-270 Diverge to WB Middlebrook Rd	Diverge	10	A	11	B	10%	I-270 Diverge to MD 27	Diverge	57	F	22	C	-61%
I-270	Freeway	13	B	15	B	12%	I-270	Freeway	81	F	24	C	-70%
I-270 Diverge to EB MD 118	Diverge	11	B	12	B	11%	I-270 Merge from WB MD 27	Merge	90	F	23	C	-74%
I-270 Diverge to WB MD 118	Diverge	15	B	16	B	11%	I-270	Freeway	82	F	34	D	-59%
I-270	Freeway	13	B	14	B	11%	I-270 Weave from EB MD 27 to MD 118	Weave	81	F	32	D	-61%
I-270 Weave from MD 118 to MD 27	Weave	13	B	14	B	7%	I-270	Freeway	91	F	51	F	-44%
I-270	Freeway	12	B	13	B	9%	I-270 Merge from WB MD 118	Merge	73	F	50	F	-32%
I-270 Merge from EB MD 27	Merge	13	B	14	B	7%	I-270	Freeway	85	F	67	F	-21%
I-270	Freeway	14	B	15	B	8%	I-270 Merge from EB MD 118	Merge	73	F	59	F	-18%
I-270 Merge from WB MD 27	Merge	11	B	11	B	5%	I-270	Freeway	70	F	50	F	-28%
I-270	Freeway	14	B	15	B	7%	I-270 Merge from Middlebrook Rd	Merge	113	F	68	F	-40%
I-270 Diverge to MD 121	Diverge	11	B	12	B	6%	I-270	Freeway	86	F	79	F	-8%

Table C.5: AM Peak - 2040 Adaptive Ramp Metering - I-270 Vehicle Density

I-270 Northbound	Type	No Build		ARM		% Change	I-270 Southbound	Type	No Build		ARM		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS	
I-270	Freeway	11	A	11	B	6%	I-270 Diverge to Watkins Mill Rd	Diverge	81	F	65	F	-20%
I-270 Merge from EB MD 121	Merge	10	A	10	A	0%	I-270	Freeway	124	F	109	F	-12%
I-270 Lane Drop	Merge	13	B	13	B	0%	I-270 Diverge to MD 124	Diverge	89	F	80	F	-10%
I-270	Freeway	19	C	20	C	4%	I-270	Freeway	133	F	130	F	-2%
I-270 Diverge to NB Weigh Station	Diverge	10	B	10	B	1%	I-270 Merge from Watkins Mill	Merge	158	F	154	F	-2%
I-270	Freeway	21	C	21	C	1%	I-270	Freeway	99	F	95	F	-4%
I-270 Merge from NB Weight Station	Merge	10	B	10	B	1%	I-270 Merge from WB MD 124	Merge	132	F	125	F	-5%
I-270	Freeway	21	C	21	C	1%	I-270	Freeway	53	F	50	F	-6%
I-270 Diverge to MD 109	Diverge	11	B	11	B	0%	I-270 Merge from MD 117	Merge	49	F	48	F	-2%
I-270	Freeway	19	C	19	C	1%	I-270	Freeway	48	F	43	E	-10%
I-270 Merge from MD 109	Merge	11	B	11	B	-1%	I-270 Diverge to I-370	Diverge	41	F	34	D	-17%
I-270	Freeway	21	C	20	C	-1%	I-270	Freeway	49	F	36	E	-27%
I-270 Diverge to MD 80	Diverge	12	B	12	B	-1%	I-270 Diverge to I-270 C-D	Diverge	96	F	28	D	-70%
I-270	Freeway	19	C	18	C	-1%	I-270	Freeway	20	C	23	C	16%
I-270 Merge from MD 80	Merge	14	B	13	B	-8%	I-270 Merge from I-270 (I-370)	Merge	20	C	21	C	2%
I-270	Freeway	24	C	23	C	-7%	I-270 Diverge to I-270 C-D (Shady Grove Rd)	Diverge	27	C	29	D	9%
I-270 Diverge to Scenic View	Diverge	12	B	12	B	-7%	I-270	Freeway	21	C	23	C	11%
I-270	Freeway	24	C	23	C	-7%	I-270 Merge from I-270 C-D (Shady Grove Rd Northern)	Merge	18	B	18	B	4%
I-270 Merge from Scenic View	Merge	12	B	11	B	-7%	I-270	Freeway	26	C	26	D	2%
I-270	Freeway	25	C	23	C	-7%	I-270 Merge from I-270 C-D (Shady Grove Rd Southern)	Merge	32	D	25	C	-22%
I-270 Diverge to NB MD 85	Diverge	14	B	13	B	-7%	I-270 Diverge to I-270 C-D (MD 189)	Diverge	46	F	33	D	-28%
I-270	Freeway	23	C	22	C	-8%	I-270	Freeway	82	F	27	D	-66%
I-270 Diverge to SB MD 85	Diverge	17	B	17	B	-5%	I-270 Merge from I-270 C-D (MD 189)	Merge	106	F	34	D	-68%
I-270	Freeway	19	C	18	B	-7%	I-270	Freeway	77	F	52	F	-33%
I-270 Weave from MD 85 to I-70	Weave	13	B	13	B	-5%	I-270 Merge from I-270 C-D	Merge	39	E	54	F	39%
I-270	Freeway	17	B	16	B	-5%	I-270 Diverge to I-270 HOV Lane	Diverge	19	B	26	C	37%
							I-270 Diverge to I-270 Spur	Diverge	37	E	64	F	75%
							I-270	Freeway	23	C	35	D	51%
							I-270 Diverge to Rockledge Dr / MD 187	Diverge	17	B	39	E	134%
							I-270	Freeway	23	C	24	C	5%
							I-270 Merge from Rockledge Dr	Merge	19	B	21	C	7%
							I-270	Freeway	24	C	27	D	11%
							I-270 Merge from Rockledge Dr / MD 187	Merge	22	C	24	C	8%
							I-270	Freeway	26	C	27	D	6%

Table C.6: AM Peak - 2040 Adaptive Ramp Metering - I-270 Spur Vehicle Density

I-270 Spur Northbound	Type	No Build		ARM		% Change	I-270 Southbound	Type	No Build		ARM		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS			
I-270 Spur	Freeway	57	F	57	F	0%	I-270 Spur	Freeway	49	F	111	F	129%
I-270 Spur Merge from Clara Barton Parkway	Merge	25	C	25	C	0%	I-270 Spur Weave from I-270 HOV to Democracy Blvd	Weave	60	F	88	F	45%
I-270 Spur	Freeway	39	E	39	E	0%	I-270 Spur	Freeway	54	F	68	F	25%
I-270 Diverge to MD 190	Diverge	28	D	28	D	0%	I-270 Merge from Democracy Blvd	Merge	30	D	34	D	12%
I-270 Spur	Freeway	34	D	34	D	0%	I-270 Spur Lane Drop	Merge	54	F	59	F	10%
I-270 Spur Merge from Cabin John Parkway	Merge	25	C	25	C	-3%	I-270 Spur	Freeway	75	F	80	F	6%
I-270 Spur Merge from MD 190	Merge	26	C	24	C	-6%	I-270 Spur Merge from I-495	Merge	37	E	32	D	-15%
I-270 Spur	Freeway	35	D	32	D	-9%	I-270 Spur	Freeway	45	F	32	D	-28%
I-270 Spur Diverge to I-495	Merge	38	E	35	D	-9%	I-270 Spur Diverve to EB MD 190	Diverge	56	F	42	F	-25%
I-270 Spur	Freeway	40	E	33	D	-16%	I-270 Spur Diverve to Cabin John Pkwy	Diverge	27	C	28	D	3%
I-270 Spur Diverge to Democracy Blvd	Diverge	33	D	27	C	-19%	I-270 Spur	Freeway	29	D	29	D	0%
I-270 Spur	Freeway	36	E	25	C	-31%	I-270 Merge from MD 190	Merge	26	C	26	C	1%
I-270 Spur Merge from EB Democracy Blvd	Merge	30	D	16	B	-48%	I-270 Spur	Freeway	34	D	34	D	0%
I-270 Spur	Freeway	39	E	24	C	-38%	I-270 Diverge to WB Clara Barton Pkwy	Diverge	23	C	23	C	1%
I-270 Spur Merge from WB Democracy Blvd	Merge	30	D	16	B	-46%	I-270 Spur	Freeway	33	D	34	D	1%
I-270 Spur	Freeway	43	E	25	C	-41%	I-270 Merge from Clara Barton Pkwy	Merge	30	D	30	D	0%
I-270 Spur Merge from Westlake Terrace	Merge	45	F	25	C	-45%							
I-270 Spur	Freeway	50	F	26	C	-49%							

Table C.7: AM Peak - 2040 Adaptive Ramp Metering - I-270 Local Vehicle Density

I-270 Northbound	Type	No Build		ARM		% Change	I-270 Southbound	Type	No Build		ARM		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS			
I-270 C-D	Freeway	84	F	36	E	-58%	I-270 C-D	Freeway	107	F	27	D	-75%
I-270 C-D Diverge to EB Montrose Rd	Diverge	48	F	23	C	-53%	I-270 C-D Weave from I-370 EB to I-270	Weave	110	F	19	B	-82%
I-270 C-D	Freeway	80	F	19	C	-76%	I-270 C-D Diverge to Shady Grove Rd	Diverge	115	F	20	B	-83%
I-270 C-D Weave between Montrose Rd Loop Ramps	Weave	69	F	13	B	-81%	I-270 C-D	Freeway	137	F	15	B	-89%
I-270 C-D	Freeway	84	F	18	C	-78%	I-270 C-D Merge from WB Shady Grove Rd	Merge	106	F	13	B	-88%
I-270 C-D Merge from WB Montrose Rd	Merge	89	F	25	C	-72%	I-270 C-D	Freeway	113	F	21	C	-81%
I-270 C-D	Freeway	98	F	31	D	-69%	I-270 C-D Merge from EB Shady Grove Rd	Merge	77	F	12	B	-85%
I-270 C-D Merge from I-270	Merge	86	F	18	B	-79%	I-270 C-D	Freeway	93	F	28	D	-70%
I-270 C-D	Freeway	104	F	31	D	-70%	I-270 C-D Merge from I-270	Merge	78	F	30	D	-61%
I-270 C-D Diverge to MD 189	Diverge	58	F	17	B	-70%	I-270 C-D Diverge to I-270	Diverge	56	F	38	E	-32%
I-270 C-D	Freeway	111	F	24	C	-78%	I-270 C-D Diverge to I-270	Diverge	64	F	30	D	-53%
I-270 C-D Merge from MD 189	Merge	101	F	18	B	-83%	I-270 C-D	Freeway	75	F	20	C	-73%
I-270 C-D	Freeway	114	F	32	D	-72%	I-270 C-D Diverge to MD 28	Diverge	62	F	12	B	-80%
I-270 C-D Weave between I-270 (to MD 28 from MD 189)	Weave	86	F	25	C	-71%	I-270 C-D	Freeway	128	F	21	C	-83%
I-270 C-D	Freeway	106	F	33	D	-69%	I-270 C-D Merge from WB MD 28	Merge	160	F	36	E	-78%
I-270 C-D Diverge to MD 28	Diverge	64	F	22	C	-65%	I-270 C-D	Freeway	132	F	71	F	-46%
I-270 C-D	Freeway	87	F	27	D	-69%	I-270 C-D Merge from EB MD 28	Merge	152	F	135	F	-11%
I-270 C-D Weave between MD 28 Ramps	Weave	109	F	34	D	-68%	I-270 C-D	Freeway	123	F	119	F	-3%
I-270 C-D	Freeway	7	A	10	A	60%	I-270 C-D Merge from I-270	Merge	84	F	82	F	-3%
I-270 C-D Merge from MD 28 WB	Merge	6	A	7	A	14%	I-270 C-D	Freeway	95	F	96	F	1%
I-270 C-D Merge from I-270 and Drop Lane	Merge	7	A	10	A	36%	I-270 C-D Diverge to MD 189	Diverge	60	F	61	F	2%
I-270 C-D Diverge to I-270	Diverge	12	B	14	B	25%	I-270 C-D	Freeway	117	F	124	F	6%
I-270 C-D	Freeway	19	C	26	C	32%	I-270 C-D Merge from MD 189	Merge	120	F	122	F	2%
I-270 C-D Diverge to Shady Grove Rd	Diverge	15	B	19	B	26%	I-270 C-D Diverge to I-270	Diverge	84	F	80	F	-5%
I-270 C-D	Freeway	5	A	6	A	24%	I-270 C-D	Freeway	92	F	95	F	4%
I-270 C-D Merge from I-270 and EB Shady Grove Rd	Merge	8	A	10	A	19%	I-270 C-D Diverge to WB Montrose Rd	Diverge	55	F	58	F	6%
I-270 C-D	Freeway	8	A	9	A	19%	I-270 C-D	Freeway	98	F	110	F	12%
I-270 C-D Merge from WB Shady Grove Rd	Merge	10	A	11	B	16%	I-270 Weave between Montrose Rd Loops	Weave	94	F	99	F	5%
I-270 C-D Diverge to I-270	Diverge	5	A	5	A	15%	I-270 C-D	Freeway	76	F	86	F	14%
I-270 C-D	Freeway	13	B	15	B	17%	I-270 C-D Merge from EB Montrose Rd	Merge	56	F	63	F	13%
I-270 C-D Diverge to I-370	Diverge	13	B	15	B	16%	I-270 C-D	Freeway	54	F	58	F	7%
I-270 C-D	Freeway	2	A	3	A	15%							
I-270 Merge from I-370 EB	Merge	7	A	8	A	3%							
I-270 C-D	Freeway	8	A	8	A	5%							
I-270 C-D Weave from I-370 to I-270	Weave	19	B	19	B	0%							
I-270 C-D	Freeway	14	B	23	C	71%							
I-270 C-D Weave from I-270 to MD 117	Weave	19	B	39	E	106%							
I-270 C-D Diverge to MD 124	Diverge	13	B	14	B	10%							
I-270 C-D	Freeway	13	B	14	B	8%							
I-270 C-D Merge from EB MD 124	Merge	12	B	12	B	6%							
I-270 C-D Merge From WB MD 124	Merge	12	B	13	B	8%							
I-270 C-D	Freeway	10	A	10	A	5%							

Table C.7: AM Peak - 2040 Adaptive Ramp Metering - I-270 Local Vehicle Density

I-270 Northbound	Type	No Build		ARM		% Change	I-270 Southbound	Type	No Build		ARM		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS	
I-270 C-D Merge from Watkins Mill	Merge	10	A	10	B	3%							

Table C.8: AM Peak - 2040 Adaptive Ramp Metering - I-270 Vehicle Throughput

I-270 Northbound	No-Build VISSIM Throughput	ARM VISSIM Throughput	Change %	I-270 Southbound	No-Build VISSIM Throughput	ARM VISSIM Throughput	Change %
Between I-495 and MD 187	4485	4861	8%	North of I-70	2514	2637	5%
Between MD 187 on and off ramps	3881	4320	11%	Between I-70 on ramps	2842	3038	7%
Between Rockledge Blvd on and off ramps	3138	3624	15%	From I-70 interchange to MD-85	4882	5380	10%
Between Rockledge Dr and I-270 Spur	2720	3297	21%	Between MD-85 on and off ramps	2530	2905	15%
Between I-270 Spur and Montrose Rd	7422	8830	19%	Between MD-85 and MD-80	3043	3354	10%
Between Montrose Rd on and off ramps	4321	5077	17%	Between MD-80 on and off ramps	2724	3024	11%
Between Montrose Rd and MD 189	4064	4745	17%	Between MD-80 and Md-109	3532	3695	5%
Between MD 189 and MD 28	4018	4745	18%	Between MD-109 on and off ramps	3430	3661	7%
Between MD 28 on and off ramps	4122	5143	25%	Between MD-109 and MD-121	4100	4238	3%
Between MD 28 and Shady Grove Rd	2980	3809	28%	Between MD-121 on and off ramps	3551	3719	5%
Between Shady Grove Rd and I-370	2552	3266	28%	Between MD-121 and MD-27	4802	5005	4%
Between I-370 on and off ramps	2849	3571	25%	Between MD-27 on and off ramps	4223	4664	10%
Between I-370 and MD 117	3979	4705	18%	Between MD-27 and MD-118	4688	5238	12%
Between MD 117 and MD 124	3010	3487	16%	Between MD-118 on and off ramps	4542	5026	11%
Between MD-124 on and off ramps	3023	3485	15%	Between MD-118 and Middlebrook Rd	5199	5688	9%
Between Watkins Mill Rd and Middlebrook Rd	3974	4465	12%	Between Middlebrook Rd on and off ramps	5197	5681	9%
Between Middlebrook Rd on and off ramps	3705	4132	12%	Between Middlebrook Rd and MD-124	6832	7126	4%
Between Middlebrook Rd and MD 118	3293	3669	11%	Between MD-124 on and off ramps	5415	5633	4%
Between MD-118 on and off ramps	2981	3314	11%	Between MD-124 and MD-117	6469	6809	5%
Between MD 118 and MD 27	2827	3081	9%	Between MD-117 and I-370	8146	8402	3%
Between MD-27 on and off ramps	2280	2488	9%	Between I-370 on and off ramps	2997	3007	0%
Between MD 27 and MD 121	2687	2877	7%	Between I-370 on ramp to Shady Grove Rd	3871	3743	-3%
Between MD-121 on and off ramps	1970	2099	7%	Between Shady Grove Rd and MD 28	3552	3451	-3%
Between MD 121 and MD 109	2497	2545	2%	Between MD 28 on and off ramps	4372	4255	-3%
Between MD-109 on and off ramps	2327	2359	1%	Between MD 28 and MD 189	3946	3813	-3%
Between MD 109 and MD 80	2487	2467	-1%	Between MD 189 and Montrose Rd	4070	3811	-6%
Between MD-80 on and off ramps	2222	2206	-1%	Between Montrose Rd on and off ramps	5046	4784	-5%
Between MD 80 and MD 85	2916	2722	-7%	Between Montrose Rd and I-270 Spur	8064	7950	-1%
Between MD-85 on and off ramps	2213	2056	-7%	Between I-270 Spur and Rockledge Blvd	3823	3735	-2%
Between MD 85 and I-70	3227	3064	-5%	Between Rockledge Blvd on and off ramps	2733	2660	-3%
North of I-70	2081	1979	-5%	Between MD 187 on and off ramps	2887	2859	-1%
				Between MD 187 and I-495	2902	2824	-3%
I-270 Spur Northbound				I-270 Spur Southbound			
Between I-495 and Democracy Blvd	5264	5468	4%	Between I-270 Split and HOV on ramp	4251	4062	-4%
Between Democracy Blvd on and off ramps	4077	4289	5%	Between HOV on ramp and Democracy Blvd	4186	4018	-4%
Between Democracy Blvd and I-270 Split	4219	4580	9%	Between Democracy Blvd on and off ramps	3670	3537	-4%
				Between Democracy Blvd and I-495	4194	4102	-2%

Table C.9: AM Peak -2040 Adaptive Ramp Metering- I-270 Local Vehicle Throughput

I-270 Local Northbound	No-Build VISSIM Throughput	ARM VISSIM Throughput	Change %	I-270 Local Southbound	No-Build VISSIM Throughput	ARM VISSIM Throughput	Change %
Between Montrose Rd EB off ramp and EB on ramp	1707	2367	39%	Between I-370 on ramp and I-270 off ramp	3627	3416	-6%
Between Montrose Rd EB on ramp and WB off ramp	1884	2612	39%	Between I-270 off ramp and Shady Grove off ramp	2767	2684	-3%
Between Montrose Rd WB off ramp and on ramp	1556	2193	41%	Between Shady Grove off ramp and Shady Grove WB on ramp	1593	1538	-3%
Between Montrose Rd WB on ramp and I-270 on ramp	2215	3309	49%	Between Shady Grove WB and EB on ramps	2225	2166	-3%
Between I-270 on ramp and MD 189 off ramp	2316	3648	58%	Between Shady Grove on ramp and I-270 on ramp	2594	2549	-2%
Between MD 189 ramps	1739	2943	69%	Between I-270 on ramp and I-270 off ramp1	3272	3193	-2%
Between MD 189 off ramp and I-270 on ramp	2036	3523	73%	Between I-270 off ramp1 and I-270 off ramp2	2767	2683	-3%
Between I-270 on ramp and I-270 off ramp	2547	4300	69%	Between I-270 off ramp2 and MD 28 off ramp	1961	1889	-4%
Between I-270 off ramp and MD 28 EB off ramp	1823	3109	71%	Between MD 28 off ramp and MD 28 WB on ramp	1428	1370	-4%
Between MD 28 EB off ramp to MD 28 EB on ramp	1585	2744	73%	Between MD 28 WB on ramp and MD 28 EB on ramp	1700	1653	-3%
Between MD 28 EB on ramp and MD 28 WB off ramp	1616	2794	73%	Between MD 28 EB on ramp and I-270 on ramp	2375	2462	4%
Between MD 28 WB off ramp and MD 28 WB on ramp	751	1253	67%	Between I-270 on ramp and MD 189 off ramp	2871	2886	1%
Between MD 28 WB on ramp and I-270 on ramp	1263	1772	40%	Between MD 189 on and off ramps	2353	2355	0%
Between I-270 on ramp and I-270 off ramp	2439	3103	27%	Between MD 189 on ramp and I-270 off ramp	3387	3520	4%
Between I-270 off ramp and Shady Grove off ramp	2131	2663	25%	Between I-270 off ramp and Montrose Rd off ramp	2357	2429	3%
Between Shady Grove off ramp and I-270 on ramp	322	400	24%	Between Montrose Rd off ramp and Montrose Rd WB on ramp	2251	2308	3%
Between I-270 on ramp and Shady Grove WB on ramp	1448	1723	19%	Between Montrose Rd WB on ramp and EB off ramp	2992	3331	11%
Between Shady Grove WB on ramp and I-270 off ramp	1788	2059	15%	Between Montrose Rd EB off and on ramps	2336	2633	13%
Between I-270 off ramp and I-370 off ramp	1515	1762	16%	Between Montrose Rd EB off ramp and I-270	3139	3418	9%
Between I-370 off ramp and I-370 EB on ramp	286	333	16%				
Between I-370 EB and WB on ramps	919	965	5%				
Between I-370 WB on ramp and I-270 off ramp	2785	2832	2%				
Between I-270 off ramp and I-270 on ramp	1670	1694	1%				
Between I-270 on ramp and MD 117 off ramp	2654	2884	9%				
Between MD 117 off ramp and MD 124 off ramp	1509	1634	8%				
Between MD 124 off ramp and MD 124 EB on ramp	789	851	8%				
Between MD 124 EB and WB on ramps	1183	1243	5%				
Between MD 124 on ramp I-270	573	600	5%				

Table C.10: AM Peak -2040 Adaptive Ramp Metering- I-270 On Ramp Queue Length - Northbound

I-270 Northbound	No Build VISSIM Average Queue (feet)	ARM VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	ARM VISSIM Maximum Queue (feet)	% Change
Rockledge Dr on ramp	67	0	-100%	421	0	-100%
MD 189 C-D on ramp	0	0	-	0	0	-
MD 28 C-D on ramp	0	0	-	0	0	-
Shady Grove Rd C-D on ramp	0	0	-	0	0	-
I-370 C-D on ramp	0	0	-	0	0	-
MD 124 C-D on ramp	0	0	-	0	0	-
MD 118 on ramp	0	0	-	0	0	-
MD 27 EB on ramp	0	0	-	0	0	-
MD 27 WB on ramp	0	0	-	0	0	-
MD 121 on ramp	0	0	-	0	0	-
MD 109 on ramp	0	0	-	0	0	-
MD 80 on ramp	0	0	-	0	0	-
MD 85 on ramp	0	0	-	0	0	-
I-270 Spur Northbound	No Build VISSIM Average Queue (feet)	ARM VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	ARM VISSIM Maximum Queue (feet)	% Change
Democracy Blvd EB on ramp	4	0	-100%	57	0	-100%
Democracy Blvd WB on ramp	0	0	-100%	5	0	-100%
I-495 Northbound	No Build VISSIM Average Queue (feet)	ARM VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	ARM VISSIM Maximum Queue (feet)	% Change
Cabin John Pkwy on ramp	0	0	-	0	0	-
MD 190 on ramp	0	0	-	0	0	-
I-270 C-D Northbound	No Build VISSIM Average Queue (feet)	ARM VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	ARM VISSIM Maximum Queue (feet)	% Change
Montrose Rd EB on ramp	436	0	-100%	1548	0	-100%
Montrose Rd WB on ramp	1047	0	-100%	2581	0	-100%
I-270 on ramp	409	0	-100%	1171	0	-100%
MD 189 on ramp	1304	0	-100%	2877	5	-100%
I-270 on ramp	1354	0	-100%	3378	10	-100%
MD 28 EB on ramp	3	0	-100%	55	0	-100%
MD 28 WB on ramp	0	0	-	0	0	-
Shady Grove Rd EB on ramp	0	0	-	0	0	-
I-270 on ramp	0	0	-	0	0	-
Shady Grove Rd WB on ramp	0	0	-	0	0	-
I-370 EB on ramp	0	0	-	0	0	-
I-370 WB on ramp	0	0	-	0	0	-
I-270 on ramp	0	318	279154%	29	538	1783%
MD 124 EB on ramp	0	0	-	0	0	-
MD 124 WB on ramp	0	0	-	0	0	-
Watkins Mill Rd on ramp	0	0	-100%	24	0	-100%

Table C.11: AM Peak -2040 Adaptive Ramp Metering- I-270 Off Ramp Queue Length - Northbound

I-270 Northbound	No Build VISSIM Average Queue (feet)	ARM VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	ARM VISSIM Maximum Queue (feet)	% Change
MD 187 off ramp NB	28	31	8%	242	239	-1%
MD 187 off ramp SB	0	0	-	0	0	-
Rockledge Dr off ramp	6	9	53%	359	415	16%
Tower Oaks Blvd off ramp	19	24	31%	179	173	-3%
Montrose Rd off ramp EB	0	0	-	0	0	-
Montrose Rd off ramp WB	0	0	-	0	9	-
MD 189 off ramp WB	8	12	53%	99	115	16%
MD 189 off ramp EB	60	5	-92%	1148	270	-76%
MD 28 off ramp EB	28	50	78%	227	303	33%
MD 28 off ramp WB	2636	0	-100%	5046	0	-100%
Shady Grove Rd off ramp - Redland Blvd	0	0	-	0	0	-
Shady Grove Rd off ramp WB	151	199	32%	605	693	15%
Shady Grove Rd off ramp EB	0	0	-	0	0	-
I-370 off ramp WB	0	0	-	0	0	-
I-370 off ramp EB	0	0	-	0	0	-
MD 117 off ramp	311	904	191%	1011	1828	81%
MD 124 off ramp	95	103	8%	453	480	6%
Watkins Mill Rd off ramp	78	80	3%	366	396	8%
Middlebrook Rd EB off ramp	0	0	-	0	0	-
Middlebrook Rd WB off ramp	0	0	-	0	0	-
MD 118 WB off ramp - Seneca Meadows	0	0	-	0	13	-
MD 118 WB off ramp	0	0	-	0	0	-
MD 118 EB off ramp	0	0	-	0	0	-
MD 27 off ramp WB	7	8	13%	81	88	9%
MD 27 off ramp EB	0	0	-	0	0	-
MD 121 off ramp WB	62	68	10%	250	260	4%
MD 121 off ramp EB	0	0	-	0	0	-
MD 109 off ramp EB	29	12	-57%	228	149	-34%
MD 109 off ramp WB	8	0	-98%	84	23	-72%
MD 80 off ramp EB	7	7	0%	102	105	2%
MD 80 off ramp WB	0	2	335%	26	66	148%
MD 85 NB off ramp	0	0	-	0	0	-
MD 85 SB off ramp	1	0	-30%	126	97	-23%
I-270 Spur Northbound	No Build VISSIM Average Queue (feet)	ARM VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	ARM VISSIM Maximum Queue (feet)	% Change
Clara Barton Pkwy off ramp EB	1	1	0%	214	214	0%
Clara Barton Pkwy off ramp WB	0	0	-	0	0	-
MD 190 off ramp EB	0	1	2531%	10	101	893%
MD 190 off ramp WB	0	0	-	0	13	-
Democracy Blvd off ramp WB	104	107	3%	563	526	-7%
Democracy Blvd off ramp EB	15	17	11%	143	126	-12%

Table C.12: AM Peak - 2040 Adaptive Ramp Metering- I-270 On Ramp Queue Length - Southbound

I-270 Southbound	No Build VISSIM Average Queue (feet)	ARM VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	ARM VISSIM Maximum Queue (feet)	% Change
MD 85 on ramp	41	0	-100%	528	0	-100%
MD 80 on ramp	1039	1529	47%	2688	1927	-28%
MD 109 on ramp	995	2086	110%	1914	2965	55%
MD 121 WB on ramp	135	0	-100%	972	0	-100%
MD 121 EB on ramp	0	0	-	0	0	-
MD 27 WB on ramp	552	0	-100%	2591	0	-100%
MD 27 EB on ramp	3	0	-100%	173	4	-98%
MD 118 WB on ramp	0	0	-	0	0	-
MD 118 EB on ramp	0	0	-100%	44	0	-100%
Middlebrook Rd on ramp	2842	366	-87%	4433	1770	-60%
Watkins Mill Rd on ramp	3066	3073	0%	3136	3161	1%
MD 124 WB on ramp	2789	1542	-45%	4158	3053	-27%
MD 117 on ramp	293	4145	1316%	1898	4388	131%
I-370 C-D on ramp	0	0	-	0	0	-
Shady Grove Rd C-D on ramp North	0	0	-	0	0	-
Shady Grove Rd C-D on ramp South	2	0	-100%	127	0	-100%
MD 189 C-D on ramp	1787	1	-100%	3610	182	-95%
Montrose Rd C-D on ramp	2	310	12983%	227	2024	792%
Rockledge Dr on ramp	0	0	-	0	0	-
MD 187 on ramp	0	0	-	0	0	-
I-270 Spur Southbound	No Build VISSIM Average Queue (feet)	ARM VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	ARM VISSIM Maximum Queue (feet)	% Change
Democracy Blvd on ramp	0	0	-	0	0	-
I-495 Southbound	No Build VISSIM Average Queue (feet)	ARM VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	ARM VISSIM Maximum Queue (feet)	% Change
I-270 Spur on ramp	147	0	-100%	1557	0	-100%
MD 190 on ramp	0	0	-	0	0	-
I-270 C-D Southbound	No Build VISSIM Average Queue (feet)	ARM VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	ARM VISSIM Maximum Queue (feet)	% Change
I-270 on ramp	2947	0	-100%	4900	0	-100%
I-370 on ramp	2511	0	-100%	2932	0	-100%
Shady Grove Rd WB on ramp	28	0	-100%	597	0	-100%
Shady Grove Rd EB on ramp	0	0	-100%	37	0	-100%
I-270 on ramp	0	0	-100%	42	0	-100%
MD 28 WB on ramp	1406	62	-96%	2299	486	-79%
MD 28 EB on ramp	3724	3205	-14%	3882	3873	0%
I-270 on ramp	1	0	-100%	74	0	-100%
MD 189 on ramp	3725	925	-75%	4200	2143	-49%
Montrose Rd WB on ramp	68	90	31%	926	691	-25%
Montrose Rd EB on ramp	0	2	586%	69	153	121%

Table C.13: AM Peak -2040 Adaptive Ramp Metering- I-270 Off Ramp Queue Length - Southbound

I-270 Southbound	No Build VISSIM Average Queue (feet)	ARM VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	ARM VISSIM Maximum Queue (feet)	% Change
MD 85 SB off ramp	297	17	-94%	1410	624	-56%
MD 85 NB off ramp	0	0	-73%	43	33	-22%
MD 80 off ramp	1	6	512%	99	142	44%
MD 109 off ramp WB	0	0	-96%	25	23	-9%
MD 109 off ramp EB	0	0	-	0	0	-
MD 121 off ramp EB	219	200	-9%	946	938	-1%
MD 121 off ramp WB	10	10	2%	519	383	-26%
MD 27 off ramp EB	50	53	7%	262	264	1%
MD 27 off ramp WB	881	38	-96%	3309	616	-81%
MD 118 off ramp EB	31	34	10%	160	163	2%
MD 118 off ramp WB	0	0	-	0	0	-
Watkins Mill Rd off ramp	2034	635	-69%	5055	2833	-44%
MD 124 off ramp EB	70	66	-6%	368	373	1%
MD 124 off ramp WB	19	21	11%	419	447	7%
I-370 off ramp WB	0	0	-	0	0	-
I-370 off ramp EB	0	0	-	0	0	-
Shady Grove Rd off ramp - Omega Drive	4	2	-49%	172	110	-36%
Shady Grove Rd off ramp	0	0	-	0	0	-
MD 28 off ramp	4	2	-51%	154	119	-23%
MD 189 off ramp EB	35	33	-7%	238	225	-6%
MD 189 off ramp WB	0	0	-	0	0	-
Montrose Rd off ramp WB	0	0	-	0	0	-
Montrose Rd off ramp EB	382	0	-100%	1566	0	-100%
Rockledge Dr off ramp	27	1396	5046%	343	2676	679%
I-270 Spur Southbound	No Build VISSIM Average Queue (feet)	ARM VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	ARM VISSIM Maximum Queue (feet)	% Change
Democracy Blvd off ramp EB	50	48	-3%	219	231	5%
Democracy Blvd off ramp WB	0	0	-	0	0	-
MD 190 off ramp WB	1389	531	-62%	3571	2923	-18%
MD 190 off ramp EB	0	3	-	0	159	-
Clara Barton Pkwy WB off ramp	0	0	-100%	5	0	-100%

Table C.14: AM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
1- MD 85 at Sam's Club Drive											
1	NB	23.0	C	NB Left	119	77	82	496	E	38.6	D
				NB Through	365	28	82	496	C		
				NB Right	664	11	22	438	B		
	SB	50.1	D	SB Left	137	63	174	771	E		
				SB Through	599	50	174	771	D		
				SB Right	68	26	174	771	C		
	EB	50.9	D	EB Left	105	78	56	182	E		
				EB Through	62	81	56	182	F		
				EB Right	113	9	56	182	A		
	WB	52.7	D	WB Left	230	77	90	355	E		
				WB Through	15	67	90	355	E		
				WB Right	126	7	90	355	A		
2- MD 85 at I-270 NB on and off ramp											
2	NB	52.1	D	NB Left	683	52	265	1136	D	36.3	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	18.8	B	SB Left	0	0	0	0	A		
				SB Through	611	19	56	562	B		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
3- MD 85 at I-270 SB on and off ramp											
3	NB	5.3	A	NB Left	0	0	0	0	A	10.2	B
				NB Through	1071	5	19	413	A		
				NB Right	0	0	0	0	A		
	SB	40.9	D	SB Left	172	41	43	440	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
4- MD 85 at Crestwood Blvd											
4	NB	19.4	C	NB Left	13	71	54	382	E	25.0	C
				NB Through	762	19	54	382	B		
				NB U-Turn	0	0	0	0	A		
	SB	18.8	B	SB Left	64	69	25	156	E		
				SB Through	1783	18	80	627	B		
				SB Right	808	16	68	617	B		
	EB	52.7	D	EB Left	621	54	91	276	D		
				EB Through	28	68	91	276	E		
				EB Right	42	17	91	276	B		
	WB	44.1	D	WB Left	52	53	21	137	D		
				WB Through	18	56	21	137	E		
				WB Right	19	9	21	137	A		
5- MD 80 at I-270 NB on and ramp											
5	NB	-1.0	A	NB Left	3	1	0	4	A	21.2	C
				NB Through	1	1	0	4	A		
				NB Right	5	-3	0	4	A		
	SB	13.0	B	SB Left	204	16	14	108	B		
				SB Through	6	20	14	108	B		
				SB Right	59	2	0	0	A		
	EB	11.3	B	EB Left	54	12	11	183	B		
				EB Through	0	0	8	0	A		
				EB Right	5	5	19	213	A		
	WB	23.1	C	WB Left	35	24	1	56	C		
				WB Through	879	31	182	786	C		
				WB Right	639	12	11	442	B		
6- MD 80 at I-270 SB on and off ramp											
6	NB	6.2	A	NB Left	24	37	2	134	E	31.6	D
				NB Through	0	0	0	0	A		
				NB Right	258	3	2	134	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	36.7	E	EB Left	0	0	0	0	A		
				EB Through	360	36	67	436	E		
				EB Right	161	38	68	446	E		
	WB	47.8	E	WB Left	0	0	0	0	A		
				WB Through	278	48	157	758	E		
				WB Right	0	0	0	0	A		
7- MD 109 at I-270 NB on and off ramp											
7	NB			NB Left	0	0	0	0	A	29.9	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	33.1	D	SB Left	143	37	37	244	E		
				SB Through	0	0	0	0	A		
				SB Right	47	20	17	177	C		
	EB	15.7	C	EB Left	88	11	5	149	B		
				EB Through	0	0	0	0	A		
				EB Right	63	22	0	0	C		
	WB	32.2	D	WB Left	0	0	0	0	A		
				WB Through	671	32	399	555	D		
				WB Right	0	0	0	0	A		
8- MD 80 at I-270 SB on and off ramp											
8	NB	9.3	A	NB Left	17	36	4	78	E	33.7	D
				NB Through	0	0	0	0	A		
				NB Right	48	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	50.0	E	EB Left	0	0	0	0	A		
				EB Through	92	34	58	270	D		
				EB Right	102	64	60	268	F		
	WB	31.6	D	WB Left	570	29	158	594	D		
				WB Through	156	39	152	571	E		
				WB Right	0	0	0	0	A		
9- MD 121 at Gateway Center Dr											
9	NB	17.8	C	NB Left	154	27	43	285	C	51.2	D
				NB Through	434	22	43	285	C		
				NB Right	327	8	52	311	A		
	SB	32.3	D	SB Left	55	22	113	555	C		
				SB Through	792	33	123	555	C		
				SB Right	8	26	131	576	C		
	EB	120.4	F	EB Left	8	97	421	525	F		
				EB Through	99	125	422	525	F		
				EB Right	646	120	452	557	F		
	WB	21.8	C	WB Left	137	25	18	147	C		
				WB Through	17	22	18	147	C		
				WB Right	28	6	16	171	A		
10- MD 121 at I-270 NB on and off ramp											
10	NB	28.3	D	NB Left	324	59	67	255	F	19.0	B
				NB Through	0	0	0	0	A		
				NB Right	402	3	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	11.5	B	EB Left	0	0	0	0	A		
				EB Through	513	18	32	325	C		
				EB Right	285	1	0	0	A		
	WB	18.6	C	WB Left	233	63	145	805	F		
				WB Through	1337	11	145	805	B		
				WB Right	0	0	0	0	A		

Table C.14: AM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
11- MD 121 at I-270 SB on and off ramp											
11	NB			NB Left	0	0	0	0	A	18.3	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	62.8	E	SB Left	218	94	225	953	F		
				SB Through	0	0	0	0	A		
				SB Right	304	40	8	439	E		
	EB	5.2	A	EB Left	0	0	0	0	A		
				EB Through	578	5	12	206	A		
				EB Right	0	0	0	0	A		
	WB	8.8	A	WB Left	0	0	0	0	A		
WB Through				642	18	61	438	C			
WB Right				1010	3	30	185	A			
12- MD 27 at Observation Dr											
12	NB	48.1	D	NB U-Turn	0	0	0	0	A	37.1	D
				NB Through	48	58	14	72	E		
				NB Right	12	7	14	72	A		
	SB	44.0	D	SB Left	91	52	29	192	D		
				SB Through	54	52	39	261	D		
				SB Right	178	38	64	298	D		
	EB	16.9	B	EB Left	151	40	40	324	D		
				EB Through	1217	14	42	325	B		
				EB Right	48	10	49	363	B		
	WB	48.1	D	WB Left	100	32	333	847	C		
WB Through				2130	50	333	847	D			
WB Right				109	30	333	847	C			
13- MD 27 at I-270 NB off ramp											
13	NB	35.6	D	NB Left	106	36	15	88	D	52.4	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.1	A	EB Left	0	0	0	0	A		
				EB Through	973	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	76.7	E	WB Left	0	0	0	0	A		
WB Through				2166	77	1092	2164	E			
WB Right				0	0	0	0	A			
14- MD 27 at I-270 SB off ramp											
14	NB			NB Left	0	0	0	0	A	70.6	E
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	49.4	D	SB Left	384	49	61	275	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	2.6	A	EB Left	0	0	0	0	A		
				EB Through	840	3	2	62	A		
				EB Right	0	0	0	0	A		
	WB	118.3	F	WB Left	0	0	0	0	A		
WB Through				1365	118	1106	1497	F			
WB Right				0	0	0	0	A			
15- MD 27 at Crystal Rock Dr											
15	NB	64.8	E	NB Left	30	38	296	736	D	92.0	F
				NB Through	1051	65	316	736	E		
				NB Right	92	70	327	748	E		
	SB	119.1	F	SB Left	514	118	1842	3792	F		
				SB Through	1620	121	1842	3792	F		
				SB Right	51	81	1836	3787	F		
	EB	44.2	D	EB Left	224	50	59	199	D		
				EB Through	97	43	55	194	D		
				EB Right	75	29	60	228	C		
	WB	46.8	D	WB Left	11	56	32	103	E		
WB Through				32	224	32	103	F			
WB Right				142	6	32	103	A			
16- MD 118 at Seneca Meadows Pkwy											
16	NB	3.6	A	NB Left	109	11	1	72	B	6.1	A
				NB Through	725	3	4	134	A		
				NB Right	60	1	9	187	A		
	SB	4.0	A	SB Left	31	4	7	238	A		
				SB Through	948	4	10	238	A		
				SB Right	41	2	12	271	A		
	EB	18.4	B	EB Left	20	65	10	77	E		
				EB Through	6	82	10	77	F		
				EB Right	115	7	10	77	A		
	WB	44.2	D	WB Left	35	71	16	102	E		
WB Through				6	55	11	101	D			
WB Right				27	7	14	111	A			
17- MD 118 at I-270 NB on ramp											
17	NB			NB Left	0	0	0	0	A	10.2	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	29.6	C	EB Left	274	30	31	194	C		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	5.4	A	WB Left	0	0	0	0	A		
WB Through				188	1	0	0	A			
WB Right				911	6	15	309	A			
18- MD 118 at I-270 SB off ramp											
18	NB			NB Left	0	0	0	0	A	7.5	A
				NB Through	0	0.0	0	0	A		
				NB Right	0	0.0	0	0	A		
	SB	38.1	D	SB Left	215	38.1	34	163	D		
				SB Through	0	0.0	0	0	A		
				SB Right	0	0.0	0	0	A		
	EB	3.7	A	EB Left	0	0.0	0	0	A		
				EB Through	631	3.7	5	194	A		
				EB Right	0	0.0	0	0	A		
	WB	4.1	A	WB Left	0	0.0	0	0	A		
WB Through				1214	4.1	9	173	A			
WB Right				0	0.0	0	0	A			
19- MD 118 at Aircraft Dr											
19	NB	46.2	D	NB Left	9	78	9	75	E	20.6	C
				NB Through	13	80	9	75	F		
				NB Right	17	3	0	24	A		
	SB	60.5	E	SB Left	267	55	112	418	E		
				SB Through	53	72	112	418	E		
				SB Right	96	68	112	418	E		
	EB	12.4	B	EB Left	132	16	37	329	B		
				EB Through	1019	12	37	329	B		
				EB Right	34	12	37	329	B		
	WB	15.1	B	WB Left	83	23	47	310	C		
WB Through				1046	17	47	310	B			
WB Right				324	6	47	310	A			
20- Middlebrook Rd at Observation Dr											
20	NB			NB Left	0	0	0	0	A	16.4	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	20.4	C	SB Left	26	36	5	63	D		
				SB Through	0	0	0	0	A		
				SB Right	27	5	5	63	A		
	EB	14.1	B	EB Left	231	21	29	249	C		
				EB Through	825	12	29	249	B		
				EB Right	0	0	0	0	A		
	WB	18.0	B	WB Left	0	0	0	0	A		
WB Through				1141	19	72	392	B			
WB Right				275	15	97	441	B			

Table C.14: AM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
21- Middlebrook Rd at I-270 SB on ramp											
21	NB			NB Left	0	0	0	0	A	19.5	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	13.7	B	EB Left	0	0	0	0	A		
				EB Through	763	14	31	203	B		
				EB Right	0	0	0	0	A		
	WB	25.4	C	WB Left	761	25	104	893	C		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
22- Middlebrook Rd at Waring Station Rd											
22	NB	179.6	F	NB Left	145	136	348	485	F	70.4	E
				NB Through	6	133	348	485	F		
				NB Right	268	204	348	485	F		
	SB	17.6	B	SB Left	3	39	1	29	D		
				SB Through	0	0	1	29	A		
				SB Right	5	5	2	67	A		
	EB	69.3	E	EB Left	31	21	645	1297	C		
				EB Through	1448	71	645	1297	E		
				EB Right	80	62	645	1297	E		
	WB	18.4	B	WB Left	80	23	33	237	C		
				WB Through	719	19	33	237	B		
				WB Right	41	4	33	237	A		
23- MD 124 at MD 355											
23	NB	52.9	D	NB Left	228	73	86	264	E	96.2	F
				NB Through	390	48	84	262	D		
				NB Right	54	3	0	0	A		
	SB	104.2	F	SB Left	64	166	490	804	F		
				SB Through	1188	124	490	804	F		
				SB Right	559	54	284	780	D		
	EB	54.5	D	EB Left	610	130	444	1095	F		
				EB Through	494	17	444	1095	B		
				EB Right	555	5	236	1008	A		
	WB	143.6	F	WB Left	0	0	0	0	A		
				WB Through	1717	146	760	1115	F		
				WB Right	52	73	0	0	E		
24- MD 124 at I-270 SB on and off											
24	NB	65.3	F	NB Left	16	62	18	95	E	29.3	C
				NB Through	37	67	18	95	E		
				NB U-Turn	0	0	0	0	A		
	SB	26.0	C	SB Left	285	65	77	373	E		
				SB Through	11	65	77	373	E		
				SB Right	588	6	14	350	A		
	EB	17.0	B	EB Left	0	0	0	0	A		
				EB Through	1037	17	50	409	B		
				EB Right	67	14	60	433	B		
	WB	41.6	D	WB Left	43	47	1679	2437	D		
				WB Through	1136	41	1679	2437	D		
				WB Right	0	0	0	0	A		
25- MD 117 at MD 124											
25	NB	49.7	D	NB Left	20	108	157	726	F	48.5	D
				NB Through	541	64	157	726	E		
				NB Right	433	30	76	717	C		
	SB	47.0	D	SB Left	181	69	221	826	E		
				SB Through	1072	48	221	826	D		
				SB Right	131	9	0	0	A		
	EB	54.0	D	EB Left	102	119	217	782	F		
				EB Through	1470	50	217	783	D		
				EB Right	82	47	229	811	D		
	WB	39.4	D	WB Left	319	70	103	304	E		
				WB Through	478	27	103	304	C		
				WB Right	99	0	0	0	A		
26- MD 117 at Bureau Dr											
26	NB	50.3	D	NB Left	25	64	19	125	E	41.1	D
				NB Through	24	65	19	125	E		
				NB Right	26	23	19	125	C		
	SB	174.5	F	SB Left	197	177	223	397	F		
				SB Through	55	190	223	397	F		
				SB Right	32	130	223	397	F		
	EB	36.8	D	EB Left	33	26	272	958	C		
				EB Through	2020	37	278	958	D		
				EB Right	29	43	271	948	D		
	WB	20.8	C	WB Left	299	67	134	543	E		
				WB Through	840	10	134	544	A		
				WB Right	314	6	100	582	A		
27- MD 117 at I-270 SB off ramp											
27	NB			NB Left	0	0	0	0	A	9.3	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	2.0	A	EB Left	0	0	0	0	A		
				EB Through	835	2	1	180	A		
				EB Right	0	0	0	0	A		
	WB	28.1	D	WB Left	328	28	59	453	D		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
28- MD 117 at I-270 NB off ramp											
28	NB			NB Left	0	0	0	0	A	34.5	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	60.5	E	SB Left	287	63	325	1037	E		
				SB Through	0	0	0	0	A		
				SB Right	871	60	329	1039	E		
	EB	19.2	B	EB Left	14	123	74	848	F		
				EB Through	821	17	74	848	B		
				EB Right	0	0	0	0	A		
	WB	15.6	B	WB Left	0	0	0	0	A		
				WB Through	909	16	60	360	B		
				WB Right	9	8	66	390	A		
29- MD 117 at Perry Pkwy											
29	NB	44.5	D	NB Left	36	76	17	120	E	15.9	B
				NB Through	7	58	17	119	E		
				NB Right	38	12	27	140	B		
	SB	48.7	D	SB Left	112	96	60	247	F		
				SB Through	14	102	60	247	F		
				SB Right	133	3	60	247	A		
	EB	10.6	B	EB Left	119	70	44	269	E		
				EB Through	975	3	44	269	A		
				EB Right	10	1	31	254	A		
	WB	10.4	B	WB Left	8	89	21	297	F		
				WB Through	747	10	21	297	B		
				WB Right	136	6	21	297	A		
30- Shady Grove Rd at I-270 NB off ramp											
30	NB	9.8	A	NB Left	0	0	0	0	A	22.3	C
				NB Through	959	10	22	267	A		
				NB Right	0	0	0	0	A		
	SB	10.4	B	SB Left	0	0	0	0	A		
				SB Through	1349	10	34	334	B		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	55.7	E	WB Left	846	56	160	616	E		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table C.14: AM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
31- Shady Grove Rd at I-270 SB off ramp											
31	NB	12.7	B	NB Left	0	0	0	0	A	19.9	B
				NB Through	1004	13	37	399	B		
				NB Right	0	0	0	0	A		
	SB	9.3	A	SB Left	0	0	0	0	A		
				SB Through	1565	9	32	563	A		
				SB Right	0	0	0	0	A		
	EB	47.4	D	EB Left	286	41	42	360	D		
				EB Through	0	0	0	0	A		
				EB Right	576	51	98	441	D		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
32- MD 28 at I-270 SB off ramp											
32	NB			NB U-Turn	0	0	0	0	A	67.9	E
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	35.7	D	SB Left	426	44	68	327	D		
				SB Through	0	0	0	0	A		
				SB Right	103	3	0	36	A		
	EB	131.7	F	EB Left	0	0	0	0	A		
				EB Through	683	200	1979	2136	F		
				EB Right	409	18	1925	2144	B		
	WB	25.4	C	WB Left	0	0	0	0	A		
				WB Through	1235	25	23	384	C		
				WB Right	0	0	0	0	A		
33- MD 28 at I-270 on and off ramps											
33	NB	36.5	D	NB Left	0	0	32	238	A	36.3	D
				NB Through	128	53	38	247	D		
				NB Right	80	10	38	247	A		
	SB	84.5	F	SB Left	26	102	128	357	F		
				SB Through	0	0	0	0	A		
				SB Right	273	83	128	357	F		
	EB	21.4	C	EB Left	177	45	57	407	D		
				EB Through	599	15	57	407	B		
				EB Right	0	0	0	0	A		
	WB	33.3	C	WB Left	26	37	101	391	D		
				WB Through	944	33	83	354	C		
				WB Right	0	0	0	0	A		
34- MD 189 at Great Falls Rd											
34	NB	37.3	D	NB Left	63	42	17	117	D	23.3	C
				NB Through	8	40	14	117	D		
				NB Right	10	8	16	128	A		
	SB	17.3	B	SB Left	63	45	19	229	D		
				SB Through	6	45	19	229	D		
				SB Right	478	13	54	147	B		
	EB	24.6	C	EB Left	227	55	111	1165	E		
				EB Through	680	15	17	199	B		
				EB Right	10	10	26	236	A		
	WB	26.4	C	WB Left	4	26	64	389	C		
				WB Through	311	27	63	388	C		
				WB Right	11	13	77	422	B		
35- MD 189 at I-270 Ramps											
35	NB	60.5	E	NB Left	88	61	18	121	E	79.7	E
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	55.9	E	SB Left	150	56	48	258	E		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	106.2	F	EB Left	284	138	627	1494	F		
				EB Through	436	85	627	1494	F		
				EB Right	0	0	0	0	A		
	WB	60.0	E	WB Left	457	53	107	429	D		
				WB Through	244	73	107	429	E		
				WB Right	0	0	0	0	A		
36- MD 189 at Wootton Pkwy											
36	NB	71.9	E	NB Left	161	48	85	311	D	117.9	F
				NB Through	125	95	85	311	F		
				NB Right	155	78	85	311	E		
	SB	142.8	F	SB Left	325	210	509	805	F		
				SB Through	593	106	482	792	F		
				SB Right	0	0	0	0	A		
	EB	162.3	F	EB Left	137	157	650	1047	F		
				EB Through	803	170	650	1047	F		
				EB Right	101	106	650	1047	F		
	WB	49.3	D	WB Left	346	69	104	353	E		
				WB Through	318	34	104	353	C		
				WB Right	47	6	104	353	A		
37- Montrose Rd at Tower Oaks Blvd											
37	NB			NB Left	0	0	0	0	A	104.5	F
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	235.8	F	SB Left	123	49	1098	1406	D		
				SB Through	0	0	0	0	A		
				SB Right	435	289	1123	1402	F		
	EB	25.5	C	EB Left	28	65	136	923	E		
				EB Through	1513	25	136	923	C		
				EB Right	0	0	0	0	A		
	WB	141.4	F	WB Left	0	0	0	0	A		
				WB Through	1255	145	491	850	F		
				WB Right	58	60	491	850	E		
38- Tower Oaks Blvd at I-270 off ramp											
38	NB	24.1	C	NB Left	385	22	30	200	C	78.2	E
				NB Through	8	22.5	25	192	C		
				NB Right	22	64.1	30	200	E		
	SB	0.6	A	SB Left	0	800.1	0	20	F		
				SB Through	0	0.0	0	20	A		
				SB Right	4	0.6	0	0	A		
	EB	122.8	F	EB Left	6	113.7	347	465	F		
				EB Through	558	122.3	347	465	F		
				EB Right	82	126.7	338	456	F		
	WB	9.5	A	WB Left	0	0.0	3	80	A		
				WB Through	81	9.9	3	80	A		
				WB Right	6	5.0	0	25	A		
39- Montrose Rd at Tower Oaks Blvd											
39	NB	17.9	B	NB Left	37	71	49	285	E	50.9	D
				NB Through	240	42	49	285	D		
				NB Right	555	4	12	151	A		
	SB	41.1	D	SB Left	334	54	163	619	D		
				SB Through	778	37	163	618	D		
				SB Right	78	29	124	658	C		
	EB	90.2	F	EB Left	76	74	416	718	E		
				EB Through	971	92	418	718	F		
				EB Right	62	89	439	742	F		
	WB	43.4	D	WB Left	300	52	68	290	D		
				WB Through	188	50	68	290	D		
				WB Right	109	7	77	321	A		
40- Rockledge Blvd at I-270 NB on and off ramp											
40	NB	34.1	C	NB Left	0	0	0	0	A	18.0	B
				NB Through	92	32	33	165	C		
				NB Right	216	35	33	165	C		
	SB	2.0	A	SB Left	0	0	4	61	A		
				SB Through	923	2	4	61	A		
				SB Right	0	0	0	0	A		
	EB	26.9	C	EB Left	7	48	126	506	D		
				EB Through	529	54	126	506	D		
				EB Right	563	1	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table C.14: AM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS	
41- Rockledge Blvd at I-270 SB on and off ramps												
41	NB	2.6	A	NB Left	97	3	5	72	A	20.4	C	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	21.7	C		WB Left	923	23	92	655			C
					WB Through	403	20	92	655			B
					WB Right	0	0	0	0			A
42- MD 187 at Tuckerman Ln												
42	NB	58.8	E	NB Left	230	25	265	793	C	153.0	F	
				NB Through	1468	55	265	793	D			
				NB Right	213	124	265	793	F			
	SB	224.9	F		SB Left	60	164	2605	2704			F
					SB Through	1204	225	2605	2704			F
					SB Right	162	247	2605	2704			F
	EB	186.0	F		EB Left	223	128	1864	1988			F
					EB Through	624	205	1865	1989			F
					EB Right	129	194	1889	2013			F
	WB	188.4	F		WB Left	721	229	1921	2147			F
					WB Through	393	152	1921	2147			F
					WB Right	159	92	1921	2147			F
43- MD 187 at I-270 NB on and off ramps												
43	NB	11.2	B	NB Left	163	76	57	257	E	19.1	B	
				NB Through	1541	4	57	257	A			
				NB Right	0	0	0	0	A			
	SB	25.4	C		SB Left	0	0	0	0			A
					SB Through	1529	25	81	553			C
					SB Right	0	0	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	49.5	D		WB Left	114	50	35	250			D
					WB Through	10	47	35	250			D
					WB Right	0	0	0	0			A
44- MD 187 at I-270 NB on and off ramps												
44	NB	23.9	C	NB Left	0	0	0	0	A	25.9	C	
				NB Through	1478	24	68	404	C			
				NB Right	0	0	0	0	A			
	SB	7.7	A		SB Left	178	49	58	295			D
					SB Through	1465	3	58	295			A
					SB Right	0	0	0	0			A
	EB	80.8	F		EB Left	228	58	187	740			E
					EB Through	0	0	187	740			A
					EB Right	371	95	232	784			F
	WB				WB Left	0	0	0	0			A
					WB Through	0	0	0	0			A
					WB Right	0	0	0	0			A
45- MD 187 at Rock Spring Dr												
45	NB	14.9	B	NB Left	255	57	68	257	E	20.8	C	
				NB Through	1383	7	69	258	A			
				NB Right	10	6	93	291	A			
	SB	21.9	C		SB Left	13	25	98	632			C
					SB Through	1668	24	98	632			C
					SB Right	144	1	63	619			A
	EB	37.9	D		EB Left	190	59	56	222			E
					EB Through	26	54	56	222			D
					EB Right	251	20	56	222			C
	WB	7.2	A		WB Left	1	7	1	29			A
					WB Through	9	11	1	29			B
					WB Right	5	0	0	7			A
47-Democracy Blvd at I-270 NB off ramp												
47	NB	29.7	C	NB Left	217	30	24	159	C	13.4	B	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB	12.7	B		EB Left	0	0	0	0			A
					EB Through	1654	13	50	446			B
					EB Right	0	0	0	0			A
	WB	10.4	B		WB Left	0	0	0	0			A
					WB Through	778	10	23	187			B
					WB Right	0	0	0	0			A
48- Democracy Blvd at I-270 SB on ramp												
48	NB			NB Left	0	0	0	0	A	6.6	A	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB	5.4	A		EB Left	0	0	0	0			A
					EB Through	1768	5	23	270			A
					EB Right	0	0	0	0			A
	WB	8.7	A		WB Left	223	37	31	173			D
					WB Through	771	1	21	152			A
					WB Right	0	0	0	0			A
49- Democracy Blvd at I-270 SB off ramp												
49	NB			NB Left	0	0	0	0	A	12.1	B	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB	32.9	C		SB Left	329	49	57	226			D
					SB Through	0	0	0	0			A
					SB Right	171	2	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	2.6	A		WB Left	0	0	0	0			A
					WB Through	770	3	4	133			A
					WB Right	334	2	1	163			A
50- MD 190 at Burdette Rd												
50	NB	73.2	E	NB Left	20	80	15	118	E	13.2	B	
				NB Through	4	59	15	118	E			
				NB Right	11	67	15	118	E			
	SB	34.4	C		SB Left	50	79	31	151			E
					SB Through	17	64	31	151			E
					SB Right	120	12	31	151			B
	EB	10.5	B		EB Left	53	93	61	561			F
					EB Through	1814	8	60	561			A
					EB Right	15	6	51	584			A
	WB	12.5	B		WB Left	1	106	61	828			F
					WB Through	1494	13	62	828			B
					WB Right	21	2	55	834			A

Table C.14: AM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
51- MD 190 at I-270 NB on ramp											
51	NB			NB Left	0	0	0	0	A	53.3	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	123.2	F	EB Left	531	123	347	715	F		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	15.9	B	WB Left	0	0	0	0	A		
				WB Through	994	16	76	747	B		
				WB Right	0	0	0	0	A		
52- MD 190 at I-270 SB off ramp											
52	NB	79.3	E	NB Left	258	79	1392	3574	E	14.2	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	2.9	A	EB Left	0	0	0	0	A		
				EB Through	982	3	6	151	A		
				EB Right	0	0	0	0	A		
	WB	5.7	A	WB Left	0	0	0	0	A		
				WB Through	667	6	8	160	A		
				WB Right	0	0	0	0	A		
53- MD 190 at Seven Locks Rd											
53	NB	68.2	E	NB Left	21	67	23	149	E	45.0	D
				NB Through	59	69	25	148	E		
				NB Right	0	0	0	0	A		
	SB	56.9	E	SB Left	624	56	184	777	E		
				SB Through	183	59	185	778	E		
				SB Right	18	54	184	777	D		
	EB	37.5	D	EB Left	24	30	135	584	C		
				EB Through	846	38	135	584	D		
				EB Right	42	42	135	584	D		
	WB	39.7	D	WB Left	119	127	125	418	F		
				WB Through	639	33	128	421	C		
				WB Right	157	1	4	127	A		
54- MD 124 at I-270 NB off ramp											
54	NB	40.6	D	NB Left	0	0	0	0	A	26.5	C
				NB Through	0	0	0	0	A		
				NB Right	723	41	100	459	D		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	15.6	B	EB Left	0	0	0	0	A		
				EB Through	933	16	37	359	B		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
55- Democracy Blvd at I-270 NB off ramp											
55	NB	37.1	D	NB Left	0	0	0	0	A	16.2	B
				NB Through	0	0	0	0	A		
				NB Right	928	37	113	575	D		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	4.5	A	EB Left	0	0	0	0	A		
				EB Through	1657	5	18	95	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
56- Watkins Mill Rd at I-270 SB off ramp/Parkview Ave											
56	NB	747.0	F	NB Left	46	222	668	726	F	174.0	F
				NB Through	0	0	0	0	A		
				NB Right	86	1028	668	726	F		
	SB	83.5	F	SB Left	552	113	2037	5048	F		
				SB Through	131	109	2037	5048	F		
				SB Right	447	39	2037	5048	D		
	EB	463.4	F	EB Left	0	0	0	0	A		
				EB Through	494	463	1163	1232	F		
				EB Right	2	599	1163	1232	F		
	WB	41.8	D	WB Left	116	87	120	459	F		
				WB Through	769	35	117	457	D		
				WB Right	0	0	0	0	A		
57- Watkins Mill Rd at I-270 NB on ramp											
57	NB	35.2	D	NB Left	386	51	92	383	D	70.0	E
				NB Through	0	0	0	0	A		
				NB Right	478	23	92	383	C		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	19.1	B	EB Left	190	61	49	301	E		
				EB Through	749	8	49	301	A		
				EB Right	0	0	0	0	A		
	WB	139.2	F	WB Left	0	0	0	0	A		
				WB Through	954	150	640	849	F		
				WB Right	174	78	640	849	E		
58- Watkins Mill Rd at I-270 SB on ramp											
58	NB			NB Left	0	0	0	0	A	60.7	E
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	73.4	E	EB Left	0	0	0	0	A		
				EB Through	938	30	483	620	C		
				EB Right	182	299	483	620	F		
	WB	50.0	D	WB Left	456	142	273	516	F		
				WB Through	883	2	273	516	A		
				WB Right	0	0	0	0	A		

Table C.15: AM Peak -2040 Adaptive Ramp Metering - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
1- MD 85 at Sam's Club Drive											
1	NB	21.9	C	NB Left	122	79	79	431	E	37.8	D
				NB Through	379	25	79	431	C		
				NB Right	696	10	25	442	B		
	SB	51.5	D	SB Left	136	65	175	772	E		
				SB Through	603	51	175	772	D		
				SB Right	68	31	175	772	C		
	EB	49.2	D	EB Left	107	76	55	181	E		
				EB Through	62	76	55	181	E		
				EB Right	113	9	55	181	A		
	WB	49.9	D	WB Left	233	72	85	349	E		
				WB Through	16	68	85	349	E		
				WB Right	127	7	85	349	A		
2- MD 85 at I-270 NB on and off ramp											
2	NB	53.2	D	NB Left	686	53	278	1258	D	36.9	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	18.6	B	SB Left	0	0	0	0	A		
				SB Through	612	19	52	592	B		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
3- MD 85 at I-270 SB on and off ramp											
3	NB	4.9	A	NB Left	0	0	0	0	A	9.9	A
				NB Through	1070	5	18	410	A		
				NB Right	0	0	0	0	A		
	SB	40.4	D	SB Left	174	40	61	910	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
4- MD 85 at Crestwood Blvd											
4	NB	19.3	C	NB Left	13	52	54	391	D	24.6	C
				NB Through	762	19	54	391	B		
				NB U-Turn	0	0	0	0	A		
	SB	18.4	B	SB Left	68	69	26	177	E		
				SB Through	1870	18	81	578	B		
				SB Right	845	16	70	568	B		
	EB	53.2	D	EB Left	620	55	92	290	D		
				EB Through	28	71	92	290	E		
				EB Right	42	18	92	290	B		
	WB	43.9	D	WB Left	52	53	21	132	D		
				WB Through	18	55	21	132	D		
				WB Right	19	9	21	132	A		
5- MD 80 at I-270 NB on and off ramp											
5	NB	4.1	A	NB Left	4	12	0	0	B	116.7	F
				NB Through	1	0	0	0	A		
				NB Right	4	-3	0	0	A		
	SB	13.4	B	SB Left	204	16	14	110	B		
				SB Through	6	16	14	110	B		
				SB Right	58	3	0	18	A		
	EB	19.4	B	EB Left	54	21	10	192	C		
				EB Through	0	0	8	0	A		
				EB Right	5	5	19	222	A		
	WB	146.4	F	WB Left	29	120	1	60	F		
				WB Through	662	180	805	941	F		
				WB Right	469	101	317	745	F		
6- MD 80 at I-270 SB on and off ramp											
6	NB	10.5	B	NB Left	25	73	7	181	F	60.5	F
				NB Through	0	0	0	0	A		
				NB Right	294	5	7	181	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	40.8	E	EB Left	0	0	0	0	A		
				EB Through	357	39	73	351	E		
				EB Right	159	45	74	360	E		
	WB	182.7	F	WB Left	0	0	0	0	A		
				WB Through	214	183	655	908	F		
				WB Right	0	0	0	0	A		
7- MD 109 at I-270 NB on and off ramp											
7	NB			NB Left	0	0	0	0	A	58.9	F
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	16.7	C	SB Left	145	21	21	166	C		
				SB Through	0	0	0	0	A		
				SB Right	48	3	1	87	A		
	EB	36.0	E	EB Left	58	9	2	147	A		
				EB Through	0	0	0	0	A		
				EB Right	60	62	0	0	F		
	WB	76.1	F	WB Left	0	0	0	0	A		
				WB Through	632	76	630	1538	F		
				WB Right	0	0	0	0	A		
8- MD 80 at I-270 SB on and off ramp											
8	NB	2.8	A	NB Left	17	12	1	77	B	136.7	F
				NB Through	0	0	0	0	A		
				NB Right	49	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	496.4	F	EB Left	0	0	0	0	A		
				EB Through	61	409	397	492	F		
				EB Right	49	605	400	489	F		
	WB	91.4	F	WB Left	531	91	574	911	F		
				WB Through	148	91	553	887	F		
				WB Right	0	0	0	0	A		
9- MD 121 at Gateway Center Dr											
9	NB	17.6	C	NB Left	150	30	42	271	C	113.3	F
				NB Through	430	22	42	271	C		
				NB Right	323	6	50	297	A		
	SB	163.4	F	SB Left	58	103	688	847	F		
				SB Through	827	167	689	847	F		
				SB Right	8	181	707	868	F		
	EB	250.3	F	EB Left	5	154	459	517	F		
				EB Through	54	227	459	517	F		
				EB Right	369	255	491	549	F		
	WB	21.1	C	WB Left	138	24	17	144	C		
				WB Through	17	21	18	144	C		
				WB Right	28	6	15	165	A		
10- MD 121 at I-270 NB on and off ramp											
10	NB	28.6	D	NB Left	347	60	74	266	F	45.7	D
				NB Through	0	0	0	0	A		
				NB Right	432	3	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	10.6	B	EB Left	0	0	0	0	A		
				EB Through	472	16	27	301	C		
				EB Right	245	0	0	0	A		
	WB	74.6	F	WB Left	191	76	542	1045	F		
				WB Through	1140	74	542	1045	F		
				WB Right	0	0	0	0	A		

Table C.15: AM Peak -2040 Adaptive Ramp Metering - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
11- MD 121 at I-270 SB on and off ramp											
11	NB			NB Left	0	0	0	0	A	43.3	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	60.0	E	SB Left	213	91	208	945	F		
				SB Through	0	0	0	0	A		
				SB Right	295	38	8	311	E		
	EB	15.0	B	EB Left	0	0	0	0	A		
				EB Through	501	15	10	214	C		
				EB Right	0	0	0	0	A		
	WB	47.0	D	WB Left	0	0	0	0	A		
WB Through				607	20	107	887	C			
WB Right				884	66	320	879	F			
12- MD 27 at Observation Dr											
12	NB	46.3	D	NB U-Turn	0	0	0	0	A	55.5	E
				NB Through	48	56	13	75	E		
				NB Right	12	7	13	75	A		
	SB	49.6	D	SB Left	92	49	27	177	D		
				SB Through	54	48	48	278	D		
				SB Right	180	50	75	315	D		
	EB	18.7	B	EB Left	155	43	47	306	D		
				EB Through	1245	16	48	307	B		
				EB Right	49	14	56	345	B		
	WB	80.7	F	WB Left	98	58	527	840	E		
WB Through				2020	83	527	840	F			
WB Right				99	57	527	840	E			
13- MD 27 at I-270 NB off ramp											
13	NB	34.0	C	NB Left	115	34	15	96	C	47.9	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.1	A	EB Left	0	0	0	0	A		
				EB Through	967	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	70.3	E	WB Left	0	0	0	0	A		
WB Through				2128	70	1644	2463	E			
WB Right				0	0	0	0	A			
14- MD 27 at I-270 SB off ramp											
14	NB			NB Left	0	0	0	0	A	51.5	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	47.6	D	SB Left	379	48	65	277	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	2.9	A	EB Left	0	0	0	0	A		
				EB Through	839	3	2	80	A		
				EB Right	0	0	0	0	A		
	WB	82.2	F	WB Left	0	0	0	0	A		
WB Through				1375	82	893	1399	F			
WB Right				0	0	0	0	A			
15- MD 27 at Crystal Rock Dr											
15	NB	62.0	E	NB Left	30	33	283	738	C	76.2	E
				NB Through	1048	62	305	738	E		
				NB Right	94	68	314	751	E		
	SB	92.1	F	SB Left	504	91	1072	1676	F		
				SB Through	1623	93	1072	1676	F		
				SB Right	48	55	1064	1670	E		
	EB	44.4	D	EB Left	224	50	59	201	D		
				EB Through	97	44	55	196	D		
				EB Right	76	28	60	230	C		
	WB	47.5	D	WB Left	11	56	34	103	E		
WB Through				31	234	34	103	F			
WB Right				142	6	34	103	A			
16- MD 118 at Seneca Meadows Pkwy											
16	NB	3.7	A	NB Left	118	10	1	64	B	6.1	A
				NB Through	763	3	5	139	A		
				NB Right	61	1	10	192	A		
	SB	4.0	A	SB Left	31	5	6	212	A		
				SB Through	948	4	10	212	A		
				SB Right	41	3	12	242	A		
	EB	18.4	B	EB Left	20	65	10	77	E		
				EB Through	6	82	10	77	F		
				EB Right	115	7	10	77	A		
	WB	44.8	D	WB Left	35	72	16	102	E		
WB Through				6	55	11	101	D			
WB Right				27	8	14	111	A			
17- MD 118 at I-270 NB on ramp											
17	NB			NB Left	0	0	0	0	A	10.3	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	29.4	C	EB Left	274	29	30	194	C		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	5.5	A	WB Left	0	0	0	0	A		
WB Through				188	1	0	0	A			
WB Right				911	6	16	295	A			
18- MD 118 at I-270 SB off ramp											
18	NB			NB Left	0	0	0	0	A	8.2	A
				NB Through	0	0.0	0	0	A		
				NB Right	0	0.0	0	0	A		
	SB	39.5	D	SB Left	230	39.5	37	166	D		
				SB Through	0	0.0	0	0	A		
				SB Right	0	0.0	0	0	A		
	EB	3.8	A	EB Left	0	0.0	0	0	A		
				EB Through	631	3.8	5	188	A		
				EB Right	0	0.0	0	0	A		
	WB	4.7	A	WB Left	0	0.0	0	0	A		
WB Through				1281	4.7	11	246	A			
WB Right				0	0.0	0	0	A			
19- MD 118 at Aircraft Dr											
19	NB	46.2	D	NB Left	9	78	9	75	E	20.5	C
				NB Through	13	80	9	75	F		
				NB Right	17	3	0	24	A		
	SB	60.4	E	SB Left	267	55	112	414	E		
				SB Through	53	72	112	414	E		
				SB Right	96	68	112	414	E		
	EB	12.3	B	EB Left	132	16	37	329	B		
				EB Through	1019	12	37	329	B		
				EB Right	34	12	37	329	B		
	WB	15.3	B	WB Left	87	25	49	289	C		
WB Through				1106	17	49	289	B			
WB Right				337	6	49	289	A			
20- Middlebrook Rd at Observation Dr											
20	NB			NB Left	0	0	0	0	A	48.2	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	21.2	C	SB Left	26	36	6	62	D		
				SB Through	0	0	0	0	A		
				SB Right	27	7	6	62	A		
	EB	17.6	B	EB Left	209	28	35	299	C		
				EB Through	752	15	35	299	B		
				EB Right	0	0	0	0	A		
	WB	71.1	E	WB Left	0	0	0	0	A		
WB Through				1089	78	296	508	E			
WB Right				262	41	322	558	D			

Table C.15: AM Peak -2040 Adaptive Ramp Metering - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
21- Middlebrook Rd at I-270 SB on ramp											
21	NB			NB Left	0	0	0	0	A	99.6	F
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	18.7	B	EB Left	0	0	0	0	A		
				EB Through	632	19	36	211	B		
				EB Right	0	0	0	0	A		
	WB	171.6	F	WB Left	711	172	2037	2387	F		
WB Through				0	0	0	0	A			
WB Right				0	0	0	0	A			
22- Middlebrook Rd at Waring Station Rd											
22	NB	332.5	F	NB Left	96	247	439	484	F	111.8	F
				NB Through	4	217	439	484	F		
				NB Right	192	378	439	484	F		
	SB	18.3	B	SB Left	3	38	1	29	D		
				SB Through	0	0	1	29	A		
				SB Right	5	6	2	67	A		
	EB	124.5	F	EB Left	29	37	1064	1307	D		
				EB Through	1229	126	1064	1307	F		
				EB Right	71	126	1064	1307	F		
	WB	17.1	B	WB Left	81	22	33	229	C		
WB Through				726	17	33	229	B			
WB Right				43	4	33	229	A			
23- MD 124 at MD 355											
23	NB	52.1	D	NB Left	228	69	86	253	E	88.4	F
				NB Through	390	49	84	251	D		
				NB Right	54	3	0	0	A		
	SB	95.1	F	SB Left	65	168	466	797	F		
				SB Through	1228	120	466	797	F		
				SB Right	578	35	271	775	C		
	EB	57.6	E	EB Left	620	138	507	1119	F		
				EB Through	511	18	507	1119	B		
				EB Right	569	5	287	1085	A		
	WB	121.7	F	WB Left	0	0	0	0	A		
WB Through				1870	123	726	1114	F			
WB Right				57	68	0	0	E			
24- MD 124 at I-270 SB on and off											
24	NB	65.1	F	NB Left	16	61	18	95	E	26.7	C
				NB Through	37	67	18	95	E		
				NB U-Turn	0	0	0	0	A		
	SB	25.5	C	SB Left	273	64	72	379	E		
				SB Through	11	66	72	379	E		
				SB Right	567	6	14	378	A		
	EB	17.6	B	EB Left	0	0	0	0	A		
				EB Through	1037	18	52	405	B		
				EB Right	67	14	62	429	B		
	WB	33.7	C	WB Left	47	36	825	2366	D		
WB Through				1231	34	825	2366	C			
WB Right				0	0	0	0	A			
25- MD 117 at MD 124											
25	NB	157.3	F	NB Left	18	202	413	763	F	107.7	F
				NB Through	511	159	413	763	F		
				NB Right	386	153	500	754	F		
	SB	57.5	E	SB Left	179	105	272	837	F		
				SB Through	1076	55	272	837	D		
				SB Right	130	15	0	0	B		
	EB	164.8	F	EB Left	98	211	644	861	F		
				EB Through	1309	163	645	862	F		
				EB Right	74	140	671	889	F		
	WB	42.7	D	WB Left	332	78	114	349	E		
WB Through				496	27	114	349	C			
WB Right				101	0	0	0	A			
26- MD 117 at Bureau Dr											
26	NB	57.9	E	NB Left	25	62	20	118	E	92.1	F
				NB Through	24	74	20	118	E		
				NB Right	26	39	20	118	D		
	SB	375.2	F	SB Left	176	372	397	460	F		
				SB Through	50	389	397	460	F		
				SB Right	30	370	397	460	F		
	EB	104.7	F	EB Left	30	75	662	996	E		
				EB Through	1815	106	674	996	F		
				EB Right	28	82	663	986	F		
	WB	30.6	C	WB Left	316	96	206	718	F		
WB Through				880	16	207	719	B			
WB Right				326	6	182	768	A			
27- MD 117 at I-270 SB off ramp											
27	NB			NB Left	0	0	0	0	A	22.4	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	10.4	B	EB Left	0	0	0	0	A		
				EB Through	748	10	6	340	B		
				EB Right	0	0	0	0	A		
	WB	49.4	E	WB Left	333	49	143	703	E		
WB Through				0	0	0	0	A			
WB Right				0	0	0	0	A			
28- MD 117 at I-270 NB off ramp											
28	NB			NB Left	0	0	0	0	A	44.2	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	76.1	E	SB Left	312	71	938	1841	E		
				SB Through	0	0	0	0	A		
				SB Right	934	78	943	1843	E		
	EB	22.5	C	EB Left	13	117	85	860	F		
				EB Through	734	21	85	860	C		
				EB Right	0	0	0	0	A		
	WB	18.7	B	WB Left	0	0	0	0	A		
WB Through				909	19	78	375	B			
WB Right				9	6	85	405	A			
29- MD 117 at Perry Pkwy											
29	NB	45.8	D	NB Left	36	79	18	125	E	17.8	B
				NB Through	7	63	17	124	E		
				NB Right	38	11	28	145	B		
	SB	48.7	D	SB Left	113	97	60	241	F		
				SB Through	13	96	60	241	F		
				SB Right	133	3	60	241	A		
	EB	10.5	B	EB Left	113	70	42	260	E		
				EB Through	923	3	42	260	A		
				EB Right	8	4	29	244	A		
	WB	14.9	B	WB Left	8	86	32	299	F		
WB Through				750	16	32	299	B			
WB Right				136	7	32	299	A			
30- Shady Grove Rd at I-270 NB off ramp											
30	NB	8.7	A	NB Left	0	0	0	0	A	24.7	C
				NB Through	948	9	19	232	A		
				NB Right	0	0	0	0	A		
	SB	10.8	B	SB Left	0	0	0	0	A		
				SB Through	1349	11	35	314	B		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	57.5	E	WB Left	1036	58	209	704	E		
WB Through				0	0	0	0	A			
WB Right				0	0	0	0	A			

Table C.15: AM Peak -2040 Adaptive Ramp Metering - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
31- Shady Grove Rd at I-270 SB off ramp											
31	NB	12.0	B	NB Left	0	0	0	0	A	18.4	B
				NB Through	1004	12	34	317	B		
				NB Right	0	0	0	0	A		
	SB	8.1	A	SB Left	0	0	0	0	A		
				SB Through	1755	8	41	653	A		
				SB Right	0	0	0	0	A		
	EB	47.6	D	EB Left	275	42	42	201	D		
				EB Through	0	0	0	0	A		
				EB Right	567	50	95	379	D		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
32- MD 28 at I-270 SB off ramp											
32	NB			NB U-Turn	0	0	0	0	A	39.3	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	35.6	D	SB Left	409	44	65	291	D		
				SB Through	0	0	0	0	A		
				SB Right	103	3	0	62	A		
	EB	0 *	F	EB Left	0	0	0	0	A		
				EB Through	848	132	1686	2131	F		
				EB Right	566	13	1095	2140	B		
	WB	8.3	A	WB Left	0	0	0	0	A		
				WB Through	1997	8	38	453	A		
				WB Right	0	0	0	0	A		
33- MD 28 at I-270 on and off ramps											
33	NB	34.8	C	NB Left	0	0	55	303	A	21.9	C
				NB Through	218	50	64	323	D		
				NB Right	143	11	64	323	B		
	SB	25.2	C	SB Left	31	59	30	224	E		
				SB Through	0	0	0	0	A		
				SB Right	317	22	30	224	C		
	EB	23.8	C	EB Left	218	45	71	522	D		
				EB Through	715	17	71	522	B		
				EB Right	0	0	0	0	A		
	WB	14.3	B	WB Left	26	15	51	319	B		
				WB Through	969	14	38	282	B		
				WB Right	0	0	0	0	A		
34- MD 189 at Great Falls Rd											
34	NB	38.1	D	NB Left	65	43	15	102	D	13.7	B
				NB Through	8	37	12	102	D		
				NB Right	10	5	14	113	A		
	SB	9.4	A	SB Left	84	44	32	199	D		
				SB Through	8	47	32	199	D		
				SB Right	625	4	13	99	A		
	EB	11.8	B	EB Left	332	18	17	214	B		
				EB Through	941	10	20	219	A		
				EB Right	14	8	29	255	A		
	WB	23.8	C	WB Left	5	15	42	304	B		
				WB Through	329	24	42	304	C		
				WB Right	11	11	54	338	B		
35- MD 189 at I-270 Ramps											
35	NB	50.6	D	NB Left	141	51	27	137	D	50.4	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	51.2	D	SB Left	152	51	45	245	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	24.9	C	EB Left	420	21	87	456	C		
				EB Through	569	28	87	456	C		
				EB Right	0	0	0	0	A		
	WB	79.7	E	WB Left	563	65	233	739	E		
				WB Through	295	108	233	739	F		
				WB Right	0	0	0	0	A		
36- MD 189 at Wooton Pkwy											
36	NB	40.8	D	NB Left	160	55	60	237	E	63.6	E
				NB Through	125	55	60	237	E		
				NB Right	159	15	60	237	B		
	SB	81.5	F	SB Left	480	91	363	793	F		
				SB Through	831	76	329	779	E		
				SB Right	0	0	0	0	A		
	EB	61.3	E	EB Left	166	82	287	968	F		
				EB Through	974	62	287	968	E		
				EB Right	125	32	287	968	C		
	WB	50.8	D	WB Left	394	68	115	367	E		
				WB Through	362	39	115	367	D		
				WB Right	54	7	115	367	A		
37- Montrose Rd at Tower Oaks Blvd											
37	NB			NB Left	0	0	0	0	A	79.6	E
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	200.6	F	SB Left	159	45	1100	1394	D		
				SB Through	0	0	0	0	A		
				SB Right	604	242	1095	1388	F		
	EB	25.3	C	EB Left	29	37	148	923	D		
				EB Through	1575	25	148	923	C		
				EB Right	0	0	0	0	A		
	WB	76.9	E	WB Left	0	0	0	0	A		
				WB Through	1757	79	401	851	E		
				WB Right	85	28	401	851	C		
38- Tower Oaks Blvd at I-270 off ramp											
38	NB	21.5	C	NB Left	538	22	37	194	C	61.1	E
				NB Through	10	21.1	31	186	C		
				NB Right	29	16.2	37	194	B		
	SB	0.7	A	SB Left	0	1.7	0	24	A		
				SB Through	0	0.0	0	24	A		
				SB Right	4	0.7	0	0	A		
	EB	94.7	F	EB Left	9	74.7	327	471	E		
				EB Through	739	95.7	327	471	F		
				EB Right	109	90.0	318	462	F		
	WB	10.8	B	WB Left	0	0.0	4	78	A		
				WB Through	106	11.3	4	78	B		
				WB Right	7	4.0	0	15	A		
39- Montrose Rd at Tower Oaks Blvd											
39	NB	16.7	B	NB Left	37	79	42	180	E	49.4	D
				NB Through	240	45	42	180	D		
				NB Right	560	0	0	0	A		
	SB	44.5	D	SB Left	333	55	181	628	E		
				SB Through	773	41	181	627	D		
				SB Right	77	34	136	666	C		
	EB	84.4	F	EB Left	77	74	392	719	E		
				EB Through	989	85	394	719	F		
				EB Right	63	87	411	740	F		
	WB	41.6	D	WB Left	403	51	90	292	D		
				WB Through	247	47	90	292	D		
				WB Right	147	8	105	322	A		
40- Rockledge Blvd at I-270 NB on and off ramp											
40	NB	34.9	C	NB Left	0	0	0	0	A	57.4	E
				NB Through	93	35	33	150	D		
				NB Right	216	35	33	150	C		
	SB	2.6	A	SB Left	0	0	7	80	A		
				SB Through	980	3	7	80	A		
				SB Right	0	0	0	0	A		
	EB	111.1	F	EB Left	6	327	1547	2810	F		
				EB Through	588	209	1547	2810	F		
				EB Right	538	1	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

* Queue on the on-ramp has impacted on the upstream intersection

Table C.15: AM Peak -2040 Adaptive Ramp Metering - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS	
41- Rockledge Blvd at I-270 SB on and off ramps												
41	NB	3.1	A	NB Left	98	3	1	39	A	22.3	C	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	23.6	C		WB Left	978	25	108	710			C
					WB Through	428	22	108	710			C
					WB Right	0	0	0	0			A
42- MD 187 at Tuckerman Ln												
42	NB	53.8	D	NB Left	232	22	244	692	C	150.1	F	
				NB Through	1475	51	244	692	D			
				NB Right	217	110	244	692	F			
	SB	220.7	F		SB Left	60	161	2601	2705			F
					SB Through	1226	220	2601	2705			F
					SB Right	164	248	2601	2705			F
	EB	186.4	F		EB Left	221	128	1872	1987			F
					EB Through	622	205	1873	1988			F
					EB Right	132	198	1897	2012			F
	WB	187.2	F		WB Left	721	226	1923	2151			F
					WB Through	397	154	1923	2151			F
					WB Right	157	94	1923	2151			F
43- MD 187 at I-270 NB on and off ramps												
43	NB	11.5	B	NB Left	165	82	59	244	F	18.9	B	
				NB Through	1525	4	59	244	A			
				NB Right	0	0	0	0	A			
	SB	24.5	C		SB Left	0	0	0	0			A
					SB Through	1540	24	79	553			C
					SB Right	0	0	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	48.2	D		WB Left	125	48	37	247			D
					WB Through	10	46	37	247			D
					WB Right	0	0	0	0			A
44- MD 187 at I-270 NB on and off ramps												
44	NB	23.2	C	NB Left	0	0	0	0	A	24.4	C	
				NB Through	1479	23	66	407	C			
				NB Right	0	0	0	0	A			
	SB	8.0	A		SB Left	180	51	59	271			D
					SB Through	1487	3	59	271			A
					SB Right	0	0	0	0			A
	EB	74.9	E		EB Left	213	59	168	689			E
					EB Through	0	0	168	689			A
					EB Right	358	84	200	677			F
	WB				WB Left	0	0	0	0			A
					WB Through	0	0	0	0			A
					WB Right	0	0	0	0			A
45- MD 187 at Rock Spring Dr												
45	NB	14.8	B	NB Left	255	57	68	264	E	20.7	C	
				NB Through	1383	7	69	264	A			
				NB Right	10	6	92	298	A			
	SB	21.7	C		SB Left	13	29	98	629			C
					SB Through	1687	23	98	629			C
					SB Right	146	1	62	623			A
	EB	37.7	D		EB Left	190	60	55	228			E
					EB Through	26	54	55	228			D
					EB Right	252	19	55	228			B
	WB	7.2	A		WB Left	1	7	1	29			A
					WB Through	9	11	1	29			B
					WB Right	5	0	0	7			A
47-Democracy Blvd at I-270 NB off ramp												
47	NB	30.8	C	NB Left	228	31	26	142	C	14.1	B	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB	13.4	B		EB Left	0	0	0	0			A
					EB Through	1640	13	53	463			B
					EB Right	0	0	0	0			A
	WB	10.8	B		WB Left	0	0	0	0			A
					WB Through	778	11	24	191			B
					WB Right	0	0	0	0			A
48- Democracy Blvd at I-270 SB on ramp												
48	NB			NB Left	0	0	0	0	A	6.4	A	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB	5.3	A		EB Left	0	0	0	0			A
					EB Through	1756	5	22	275			A
					EB Right	0	0	0	0			A
	WB	8.5	A		WB Left	222	36	31	173			D
					WB Through	781	1	20	152			A
					WB Right	0	0	0	0			A
49- Democracy Blvd at I-270 SB off ramp												
49	NB			NB Left	0	0	0	0	A	11.9	B	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB	33.7	C		SB Left	320	49	55	238			D
					SB Through	0	0	0	0			A
					SB Right	158	2	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	2.5	A		WB Left	0	0	0	0			A
					WB Through	780	3	4	121			A
					WB Right	335	2	1	139			A
50- MD 190 at Burdette Rd												
50	NB	73.3	E	NB Left	20	80	15	118	E	13.3	B	
				NB Through	4	59	15	118	E			
				NB Right	11	67	15	118	E			
	SB	34.6	C		SB Left	50	79	31	150			E
					SB Through	17	64	31	150			E
					SB Right	120	12	31	150			B
	EB	10.5	B		EB Left	52	94	61	605			F
					EB Through	1818	8	60	604			A
					EB Right	15	3	53	628			A
	WB	12.7	B		WB Left	1	106	62	840			F
					WB Through	1498	13	64	841			B
					WB Right	21	2	57	853			A

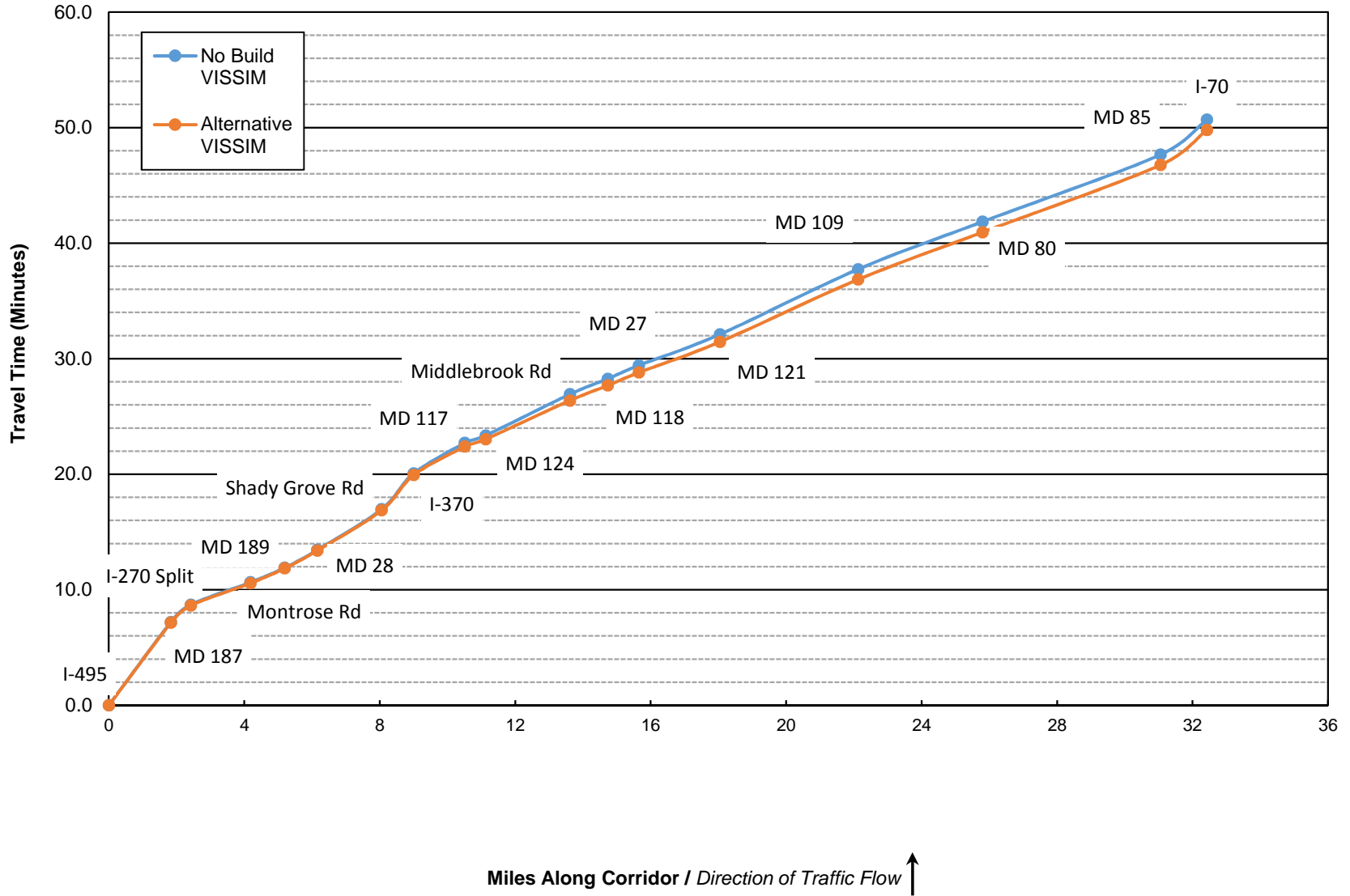
Table C.15: AM Peak -2040 Adaptive Ramp Metering - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
51- MD 190 at I-270 NB on ramp											
51	NB			NB Left	0	0	0	0	A	57.5	E
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	136.0	F	EB Left	526	136	384	691	F		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	16.0	B	WB Left	0	0	0	0	A		
WB Through				994	16	76	735	B			
WB Right				0	0	0	0	A			
52- MD 190 at I-270 SB off ramp											
52	NB	78.5	E	NB Left	256	79	535	2926	E	16.1	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	7.0	A	EB Left	0	0	0	0	A		
				EB Through	981	7	23	279	A		
				EB Right	0	0	0	0	A		
	WB	5.4	A	WB Left	0	0	0	0	A		
WB Through				667	5	7	158	A			
WB Right				0	0	0	0	A			
53- MD 190 at Seven Locks Rd											
53	NB	68.2	E	NB Left	21	67	23	149	E	44.4	D
				NB Through	59	69	25	148	E		
				NB Right	0	0	0	0	A		
	SB	56.8	E	SB Left	624	56	184	777	E		
				SB Through	183	59	185	778	E		
				SB Right	18	54	184	777	D		
	EB	37.5	D	EB Left	24	31	135	584	C		
				EB Through	846	38	135	584	D		
				EB Right	42	42	135	584	D		
	WB	38.0	D	WB Left	121	115	116	378	F		
WB Through				637	33	119	380	C			
WB Right				160	1	8	133	A			
54- MD 124 at I-270 NB off ramp											
54	NB	40.4	D	NB Left	0	0	0	0	A	28.8	C
				NB Through	0	0	0	0	A		
				NB Right	775	40	108	486	D		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	19.1	B	EB Left	0	0	0	0	A		
				EB Through	921	19	47	423	B		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
WB Through				0	0	0	0	A			
WB Right				0	0	0	0	A			
55- Democracy Blvd at I-270 NB off ramp											
55	NB	36.3	D	NB Left	0	0	0	0	A	16.3	B
				NB Through	0	0	0	0	A		
				NB Right	964	36	116	538	D		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	4.6	A	EB Left	0	0	0	0	A		
				EB Through	1641	5	18	95	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
WB Through				0	0	0	0	A			
WB Right				0	0	0	0	A			
56- Watkins Mill Rd at I-270 SB off ramp/Parkview Ave											
56	NB	703.8	F	NB Left	47	190	645	735	F	164.0	F
				NB Through	0	0	0	0	A		
				NB Right	79	1009	645	735	F		
	SB	75.7	E	SB Left	530	105	640	2837	F		
				SB Through	130	96	640	2837	F		
				SB Right	434	34	640	2837	C		
	EB	443.1	F	EB Left	0	0	0	0	A		
				EB Through	520	443	1149	1240	F		
				EB Right	3	398	1149	1240	F		
	WB	41.1	D	WB Left	126	83	122	478	F		
WB Through				829	35	120	477	C			
WB Right				0	0	0	0	A			
57- Watkins Mill Rd at I-270 NB on ramp											
57	NB	33.5	C	NB Left	414	45	93	413	D	66.0	E
				NB Through	0	0	0	0	A		
				NB Right	511	24	93	413	C		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	21.0	C	EB Left	192	66	54	306	E		
				EB Through	742	9	54	306	A		
				EB Right	0	0	0	0	A		
	WB	124.3	F	WB Left	0	0	0	0	A		
WB Through				1045	133	612	865	F			
WB Right				192	75	612	865	E			
58- Watkins Mill Rd at I-270 SB on ramp											
58	NB			NB Left	0	0	0	0	A	54.8	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	74.5	E	EB Left	0	0	0	0	A		
				EB Through	190	288	488	625	F		
				EB Right	928	31	488	625	C		
	WB	39.7	D	WB Left	955	2	228	509	A		
WB Through				498	111	228	509	F			
WB Right				0	0	0	0	A			

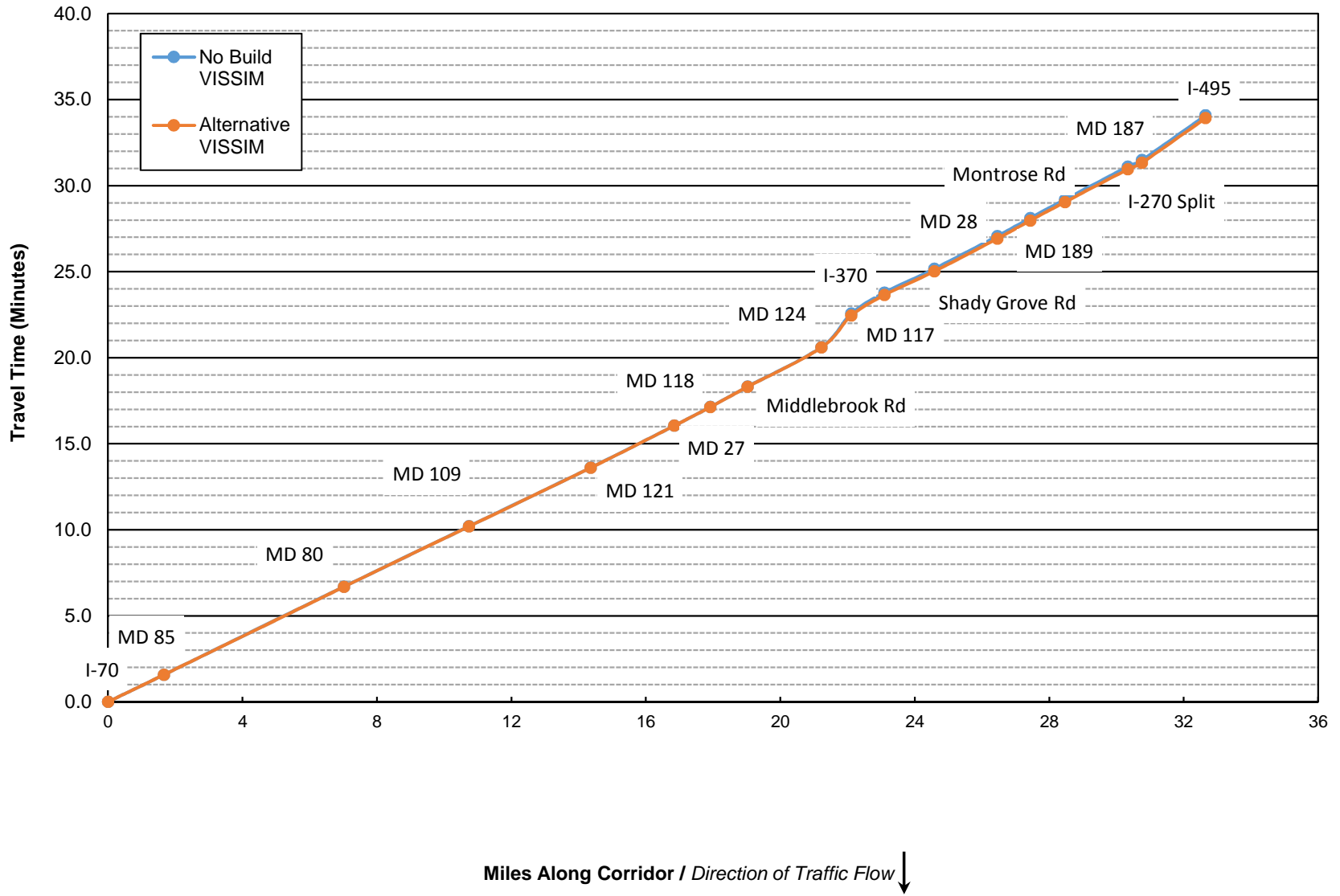
Table C.16: AM Peak - 2040 Adaptive Ramp Metering - I-270 Vehicle Network Performance

	No Build	ARM	% Change
Total Delay	35,032,576	24,961,667	-29%
Average Delay per Vehicle	326	233	-29%
Total Travel Time	64,317,886	55,856,620	-13%
Vehicles (Arrived)	87,894	91,423	4%
Latent Demand	44,530	46,296	4%
Latent Delay	120,600,723	129,765,371	8%
Total Distance	463,125	487,947	5%
Average Speed	26	31	21%

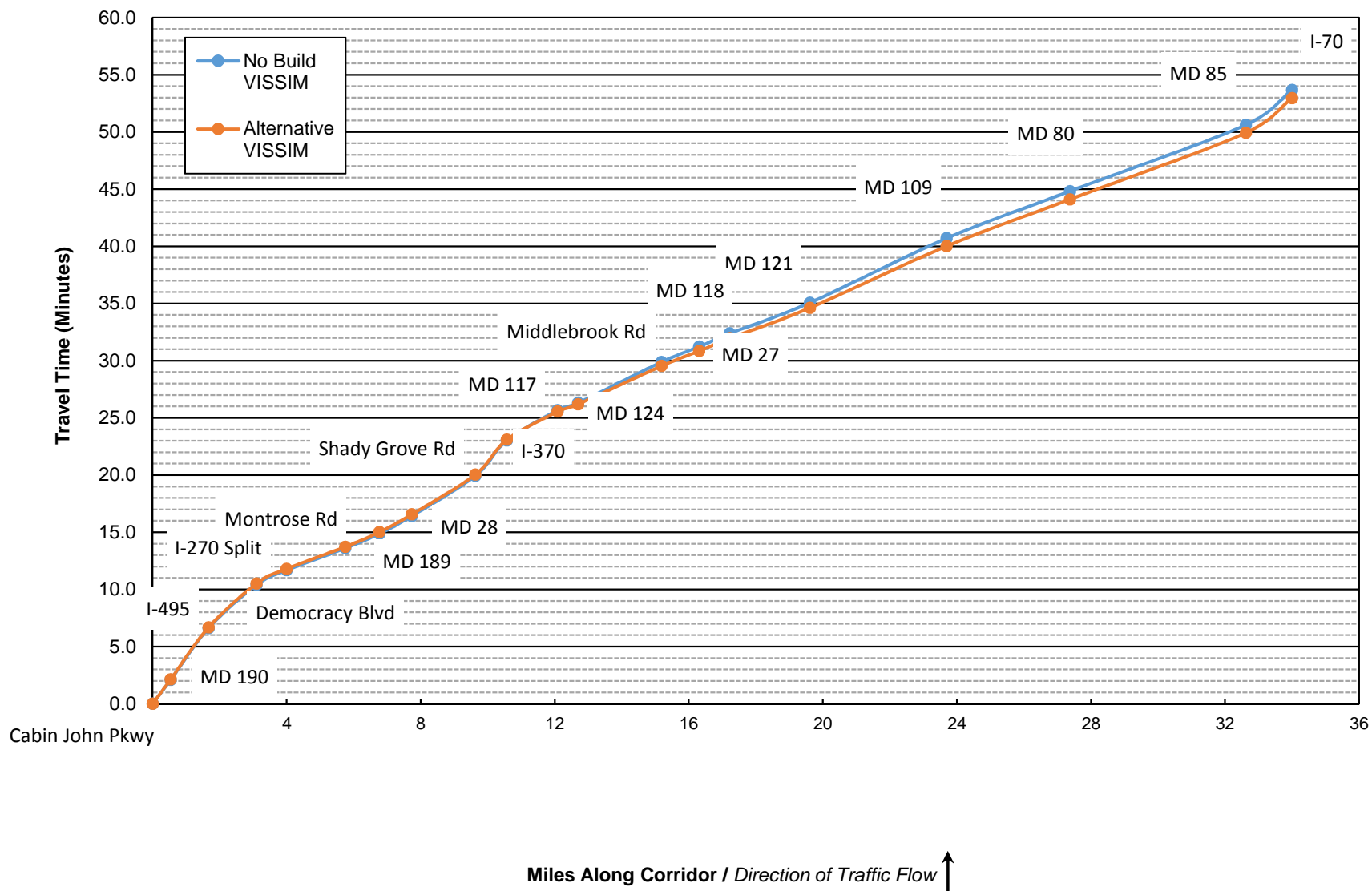
**Figure D.1: PM Peak - 2040 Adaptive Ramp Metering
I-270 Travel Time Graph - Northbound**



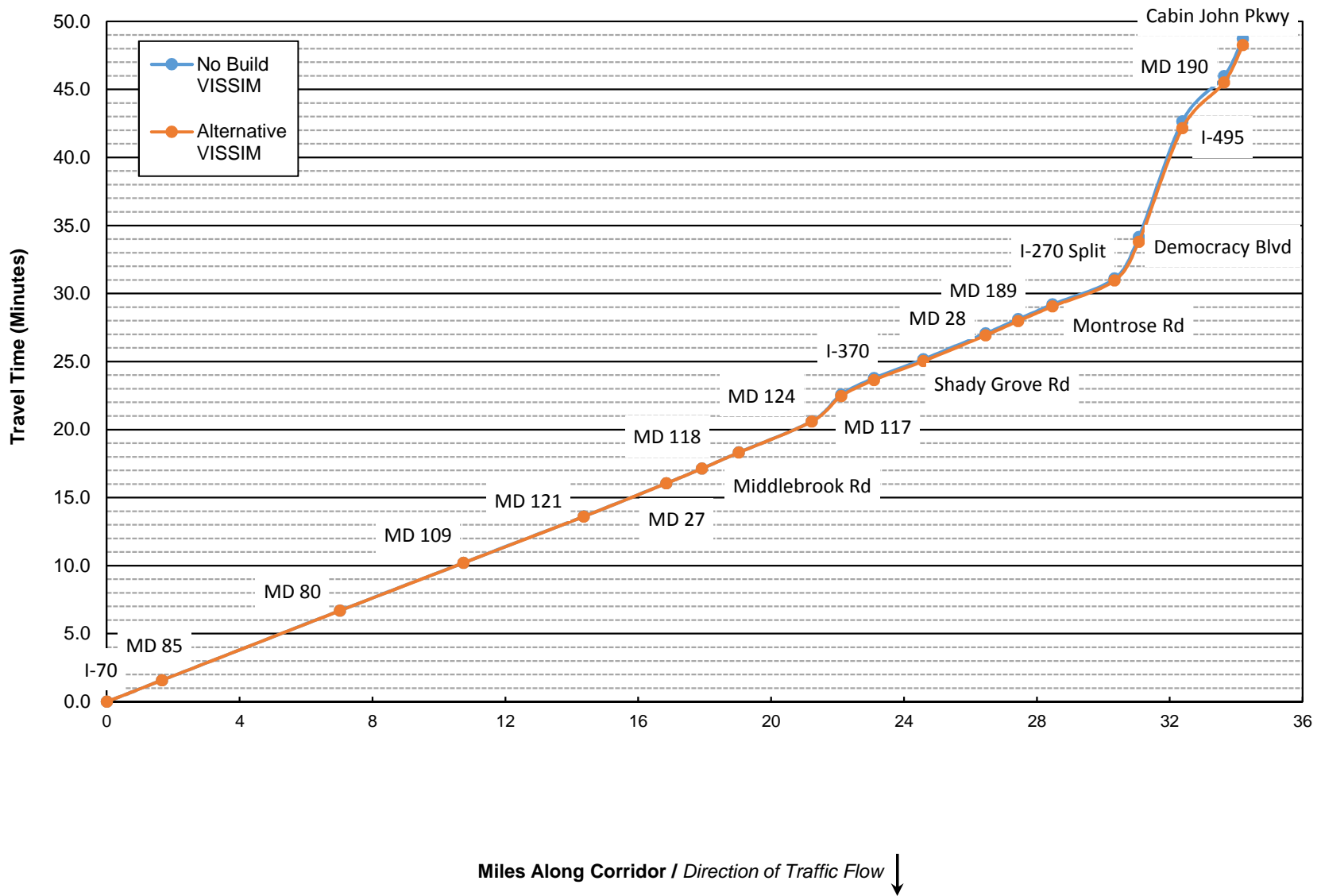
**Figure D.2: PM Peak - 2040 Adaptive Ramp Metering
I-270 Travel Time Graph - Southbound**



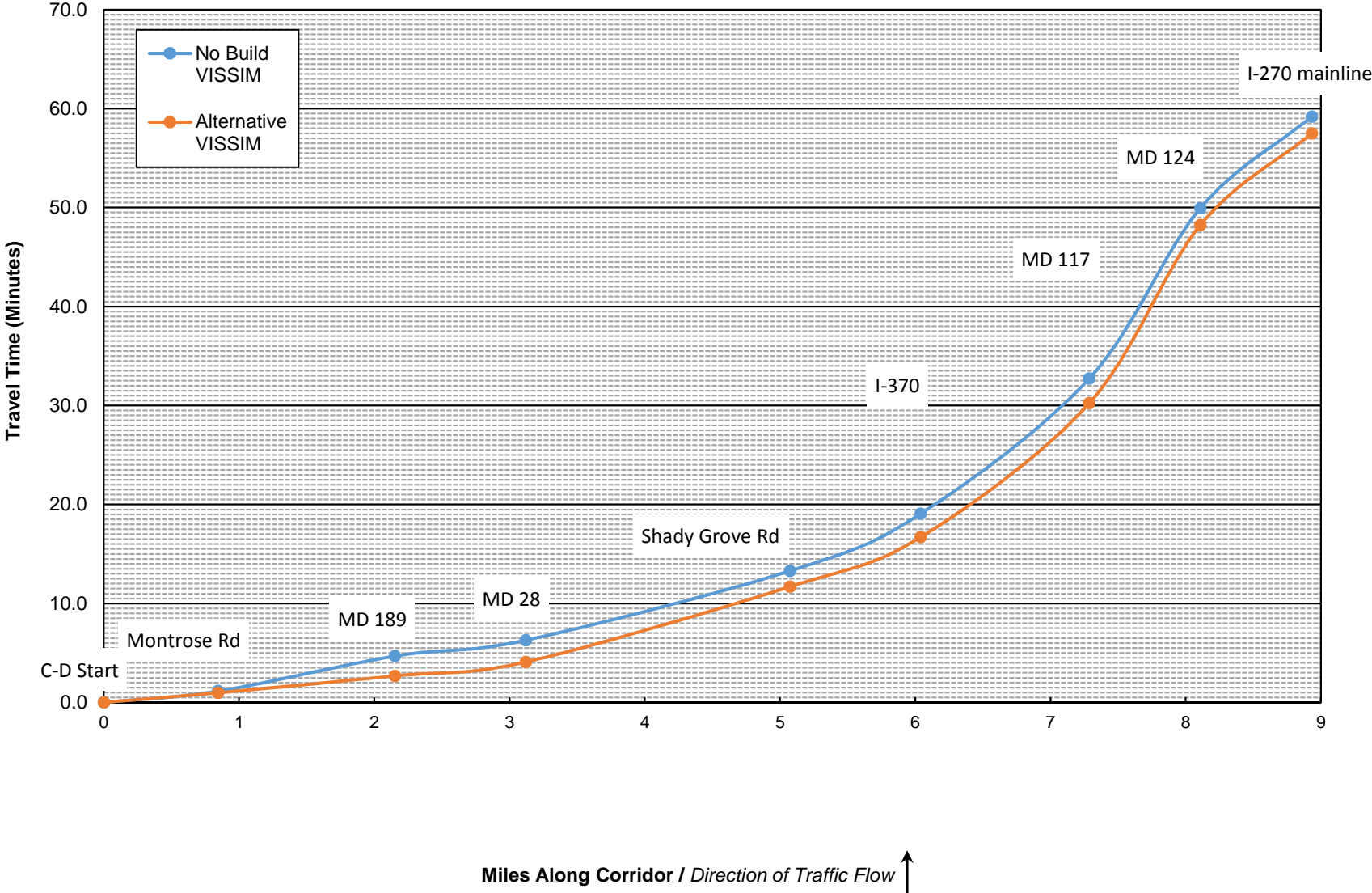
**Figure D.3: PM Peak - 2040 Adaptive Ramp Metering
I-270 Spur Travel Time Graph - Northbound**



**Figure D.4: PM Peak - 2040 Adaptive Ramp Metering
I-270 Spur Travel Time Graph - Southbound**



**Figure D.5: PM Peak - 2040 Adaptive Ramp Metering
I-270 Local Travel Time Graph - Northbound**



**Figure D.6: PM Peak - 2040 Adaptive Ramp Metering
I-270 Local Travel Time Graph - Southbound**

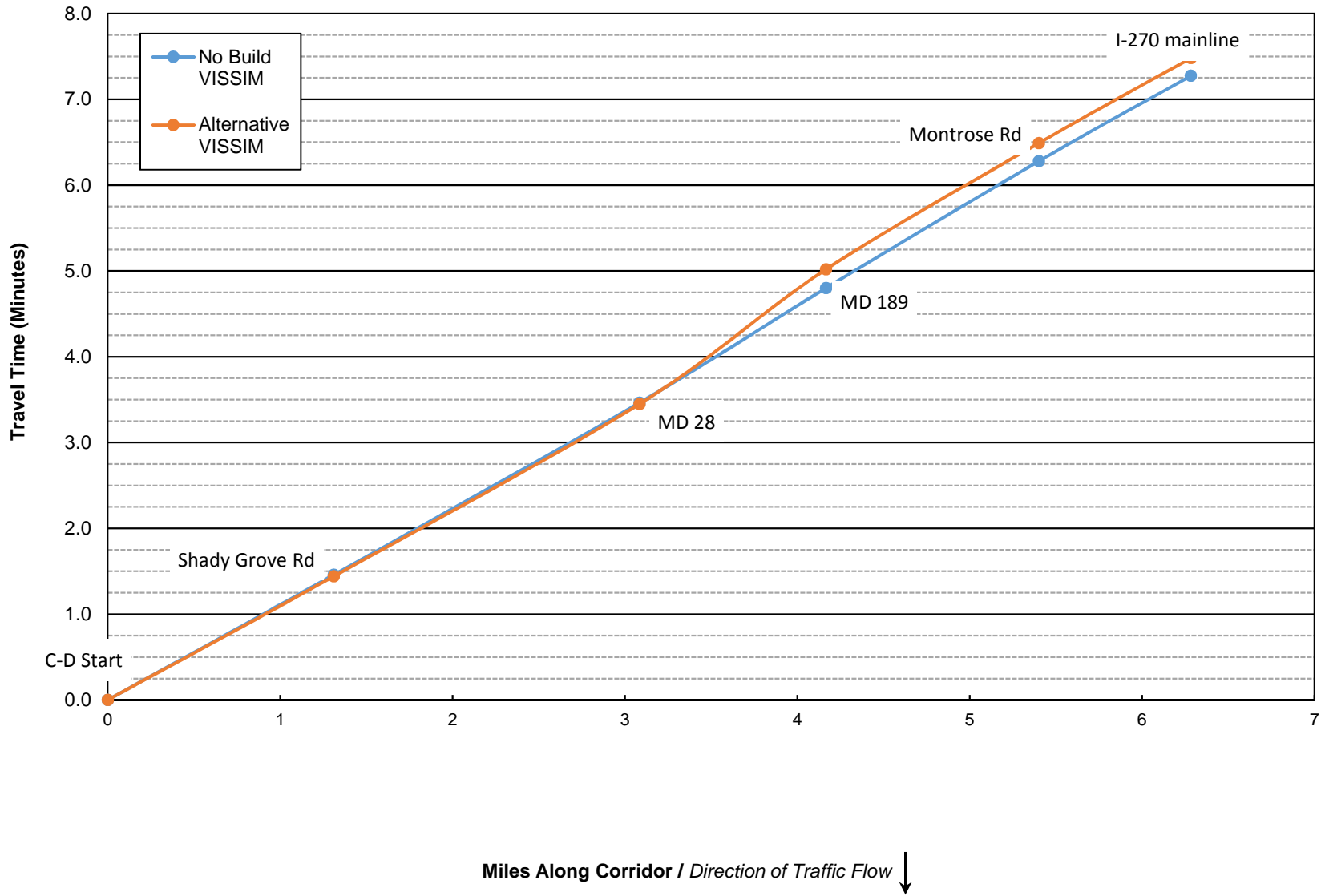


Table D.1: PM Peak - 2040 Adaptive Ramp Metering- I-270 Vehicle Travel Time

I-270 Northbound	Segment Length (miles)	No Build VISSIM Travel Time (seconds)	ARM VISSIM Travel Time (seconds)	% Change	I-270 Southbound	Segment Length (miles)	No Build VISSIM Travel Time (seconds)	ARM VISSIM Travel Time (seconds)	% Change
From I-495 interchange					From I-70				
to MD 187	1.8	432.3	428.6	-0.8%	to MD 85	1.7	94.6	94.6	0.0%
to I-270 Split	0.6	90.3	89.8	-0.6%	to MD 80	5.4	307.1	306.6	0.1%
to Montrose Rd	1.8	115.8	115.7	-0.1%	to MD 109	3.7	210.7	210.8	0.0%
to MD 189	1.0	76.0	77.2	1.5%	to MD 121	3.6	204.4	204.4	0.0%
to MD 28	1.0	92.5	92.6	0.1%	to MD 27	2.5	146.4	146.4	0.0%
to Shady Grove Rd	1.9	211.0	208.6	-1.1%	to MD 118	1.1	65.1	65.1	0.0%
to I-370	0.9	185.6	183.0	-1.4%	to Middlebrook Rd	1.1	71.2	70.7	0.7%
to MD 117	1.5	158.7	147.7	-6.9%	to MD 124	2.2	137.5	137.0	0.4%
to MD 124	0.6	38.8	38.8	0.1%	to MD 117	0.9	117.3	111.5	5.0%
to Middlebrook Rd	2.5	214.3	200.6	-6.4%	to I-370	1.0	72.5	71.5	1.4%
to MD 118	1.1	80.3	78.3	-2.6%	to Shady Grove Rd	1.5	83.4	83.1	0.4%
to MD 27	0.9	69.9	67.4	-3.5%	to MD 28	1.9	114.1	113.8	0.2%
to MD 121	2.4	161.1	159.1	-1.3%	to MD 189	1.0	62.7	62.7	0.0%
to MD 109	4.1	337.8	323.7	-4.2%	to Montrose Rd	1.0	64.8	64.6	0.2%
to MD 80	3.7	247.0	245.7	-0.5%	to I-270 Split	1.9	114.7	114.2	0.5%
to MD 85	5.3	348.1	348.8	0.2%	to MD 187	0.4	23.0	22.9	0.4%
to I-70	1.4	182.3	181.7	-0.4%	to I-495 interchange	1.9	155.6	155.4	0.2%
I-270 Total (miles/minutes)	32.4	50.7	49.8	-1.8%	I-270 Total (miles/minutes)	32.6	34.1	33.9	0.5%
I-270 Spur Northbound					I-270 Spur Southbound				
From Cabin John Pkwy					From I-70				
to MD 190	0.5	125.4	127.8	1.8%	to I-270 Split	30.3	1,866.3	1,856.9	-0.5%
to I-495	1.1	271.9	273.9	0.7%	to Democracy Blvd	0.7	183.2	171.4	-6.5%
to Democracy Blvd	1.4	226.8	229.8	1.4%	to I-495	1.3	509.9	501.0	-1.7%
to I-270 Split	0.9	76.4	76.6	0.3%	to MD 190	1.3	199.4	201.2	0.9%
to I-70	30.0	2,519.1	2,468.8	-2.0%	to Cabin John Pkwy	0.6	164.4	164.9	0.3%
I-270 Spur Total (miles/minutes)	34.0	53.7	52.9	-1.3%	I-270 Spur Total (miles/minutes)	34.2	48.7	48.3	-1.0%

Table D.2: PM Peak - 2040 Adaptive Ramp Metering- I-270 Local Vehicle Travel Time

I-270 Northbound	Segment Length (miles)	No Build VISSIM Travel Time (seconds)	ARM VISSIM Travel Time (seconds)	% Change	I-270 Southbound	Segment Length (miles)	No Build VISSIM Travel Time (seconds)	ARM VISSIM Travel Time (seconds)	% Change
From C-D start					From C-D start				
to Montrose Rd	0.8	68.8	58.6	-14.8%	to Shady Grove	1.3	87.5	86.5	-1.2%
to MD 189	1.3	212.1	102.4	-51.7%	to MD 28	1.8	120.3	120.5	0.2%
to MD 28	1.0	96.2	84.6	-12.1%	to MD 189	1.1	80.2	94.1	17.4%
to Shady Grove	2.0	420.6	456.3	8.5%	to Montrose	1.2	88.8	88.3	-0.5%
to I-370	1.0	346.7	300.7	-13.3%	to I-270 mainline	0.9	59.7	59.5	-0.4%
to MD 117	1.2	819.0	811.3	-0.9%					
to MD 124	0.8	1,033.2	1,079.9	4.5%					
to I-270 mainline	0.8	555.0	556.3	0.2%					
I-270 Local Total (miles/minutes)	8.9	59.2	57.5	-2.9%	I-270 Local Total (miles/minutes)	6.3	7.3	7.5	2.8%

Table D.3: PM Peak -2040 Adaptive Ramp Metering- I-270 Vehicle Speed

I-270 Northbound	Cumulative Length (miles)	No Build VISSIM Speed (MPH)	ARM VISSIM Speed (MPH)	% Change	I-270 Southbound	No Build VISSIM Speed (MPH)	ARM VISSIM Speed (MPH)	% Change	
From I-495 interchange	0.0				From I-70				
to MD 187	1.8	15.3	15.4	0.9%	to MD 85	63.3	63.3	0.0%	
to I-270 Split	2.4	23.6	23.7	0.6%	to MD 80	62.8	62.9	0.1%	
to Montrose Rd	4.2	54.5	54.6	0.1%	to MD 109	63.6	63.6	0.0%	
to MD 189	5.2	48.0	47.3	-1.5%	to MD 121	63.8	63.8	0.0%	
to MD 28	6.2	37.5	37.5	-0.1%	to MD 27	61.1	61.1	0.0%	
to Shady Grove Rd	8.1	32.4	32.8	1.2%	to MD 118	59.3	59.3	0.0%	
to I-370	9.0	18.3	18.6	1.4%	to Middlebrook Rd	56.2	56.6	0.7%	
to MD 117	10.5	34.4	36.9	7.4%	to MD 124	57.5	57.7	0.4%	
to MD 124	11.1	56.9	56.9	-0.1%	to MD 117	27.2	28.6	5.3%	
to Middlebrook Rd	13.6	41.8	44.6	6.8%	to I-370	48.9	49.6	1.4%	
to MD 118	14.7	50.2	51.6	2.6%	to Shady Grove Rd	64.2	64.5	0.4%	
to MD 27	15.7	47.2	48.9	3.6%	to MD 28	59.1	59.2	0.2%	
to MD 121	18.0	53.5	54.2	1.3%	to MD 189	56.2	56.2	0.0%	
to MD 109	22.1	43.5	45.3	4.4%	to Montrose Rd	57.4	57.5	0.2%	
to MD 80	25.8	53.6	53.9	0.5%	to I-270 Split	58.7	59.0	0.5%	
to MD 85	31.1	54.3	54.2	-0.2%	to MD 187	65.7	66.0	0.4%	
to I-70	32.4	27.1	27.2	0.4%	to I-495 interchange	43.7	43.8	0.2%	
I-270 Total (miles/minutes)		38.4	39.1	1.8%	I-270 Total (miles/minutes)	57.5	57.8	0.5%	
I-270 Spur Northbound					I-270 Spur Southbound				
From Cabin John Pkwy	0.0				From I-70				
to MD 190	0.5	15.5	15.2	-1.8%	to I-270 Split	58.5	58.8	0.5%	
to I-495	1.7	15.0	14.9	-0.7%	to Democracy Blvd	14.4	15.4	6.9%	
to Democracy Blvd	3.1	22.8	22.5	-1.3%	to I-495	9.3	9.4	1.8%	
to I-270 Split	4.0	42.0	41.9	-0.3%	to MD 190	22.6	22.4	-0.9%	
to I-70	34.0	42.9	43.7	2.0%	to Cabin John Pkwy	12.5	12.4	-0.3%	
I-270 Spur Total (miles/minutes)		38.0	38.5	1.3%	I-270 Spur Total (miles/minutes)	42.1	42.5	1.0%	

Table D.4: PM Peak -2040 Adaptive Ramp Metering- I-270 Local Vehicle Speed

I-270 Northbound	No Build VISSIM Speed (MPH)	ARM VISSIM Speed (MPH)	% Change	I-270 Southbound	No Build VISSIM Speed (MPH)	ARM VISSIM Speed (MPH)	% Change
From C-D start				From C-D start			
to Montrose Rd	44.2	51.9	17.4%	to Shady Grove	53.9	54.6	1.2%
to MD 189	22.2	46.0	107.2%	to MD 28	53.1	53.0	-0.2%
to MD 28	36.2	41.2	13.7%	to MD 189	48.6	41.4	-14.8%
to Shady Grove	16.7	15.4	-7.8%	to Montrose	50.1	50.4	0.5%
to I-370	10.0	11.6	15.3%	to I-270 mainline	53.2	53.4	0.4%
to MD 117	5.5	5.5	1.0%				
to MD 124	2.9	2.7	-4.3%				
to I-270 mainline	5.3	5.3	-0.2%				
I-270 Local Total (miles/minutes)	9.1	9.3	2.9%	I-270 Local Total (miles/minutes)	51.8	50.4	-2.8%

Table D.5: PM Peak - 2040 Adaptive Ramp Metering- I-270 Vehicle Density

I-270 Northbound	Type	No Build		ARM		% Change	I-270 Southbound	Type	No Build		ARM		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS			
I-270	Freeway	91	F	91	F	0%	I-270	Freeway	19	C	19	C	0%
I-270 Diverge to MD 187	Diverge	77	F	76	F	0%	I-270 Merge from WB I-70	Merge	17	B	17	B	0%
I-270	Freeway	84	F	84	F	-1%	I-270	Freeway	24	C	24	C	0%
I-270 Diverge to Rockledge Rd	Diverge	77	F	77	F	0%	I-270 Merge from EB I-70	Merge	16	B	16	B	0%
I-270	Freeway	85	F	85	F	0%	I-270	Freeway	22	C	22	C	0%
I-270 Weave from MD 187 to I-270 HOV	Weave	57	F	57	F	1%	I-270 Diverge to SB MD 85	Diverge	23	C	23	C	1%
I-270 Lane Drop	Merge	65	F	64	F	-1%	I-270	Freeway	24	C	24	C	0%
I-270	Freeway	51	F	51	F	1%	I-270 Diverge to NB MD 85	Diverge	15	B	15	B	0%
I-270 Merge from I-270 Spur	Merge	37	E	38	E	2%	I-270	Freeway	19	C	19	C	0%
I-270 Weave from I-270 HOV to I-270 C-D	Weave	34	D	33	D	-1%	I-270 Merge from MD 85	Merge	20	C	20	B	-1%
I-270	Freeway	34	D	33	D	-3%	I-270	Freeway	25	C	25	C	0%
I-270 Diverge to C-D (MD 189)	Diverge	46	F	43	F	-6%	I-270 Diverge to MD 80	Diverge	17	B	17	B	0%
I-270	Freeway	46	F	44	E	-4%	I-270	Freeway	20	C	20	C	1%
I-270 Diverge to C-D (MD 28)	Diverge	62	F	59	F	-3%	I-270 Merge from MD 80	Merge	14	B	14	B	-2%
I-270	Freeway	55	F	52	F	-4%	I-270	Freeway	23	C	23	C	0%
I-270 Merge from C-D (MD 189)	Merge	72	F	71	F	-2%	I-270 Diverge to MD 109	Diverge	12	B	12	B	1%
I-270 Diverge to C-D (Shady Grove Rd)	Diverge	77	F	75	F	-3%	I-270	Freeway	22	C	22	C	0%
I-270	Freeway	65	F	64	F	-2%	I-270 Merge from MD 109	Merge	13	B	14	B	3%
I-270 Weave from C-D (MD 28) to C-D (Shady Grove Rd)	Weave	90	F	89	F	-1%	I-270	Freeway	24	C	24	C	0%
I-270	Freeway	90	F	87	F	-3%	I-270 Diverge to SB Weigh Station	Diverge	12	B	12	B	1%
I-270 Merge from C-D (Shady Grove Rd)	Merge	124	F	124	F	1%	I-270	Freeway	24	C	24	C	0%
I-270	Freeway	88	F	88	F	-1%	I-270 Merge from SB Weigh Station	Merge	12	B	12	B	1%
I-270 Merge from C-D (I-370)	Merge	155	F	153	F	-1%	I-270	Freeway	23	C	23	C	0%
I-270 Diverge to C-D (MD 117)	Diverge	159	F	157	F	-2%	I-270 Diverge to MD 121	Diverge	9	A	9	A	0%
I-270	Freeway	21	C	19	C	-11%	I-270	Freeway	12	B	12	B	0%
I-270 Merge from C-D (MD 124)	Merge	47	F	46	F	-4%	I-270 Merge from WB MD 121	Merge	10	B	10	B	1%
I-270	Freeway	27	D	27	D	-1%	I-270	Freeway	15	B	15	B	0%
I-270 Diverge to EB Middlebrook Rd	Diverge	20	B	20	B	-1%	I-270 Merge from EB MD 121	Merge	13	B	13	B	0%
I-270	Freeway	25	C	25	C	-1%	I-270	Freeway	20	C	20	C	0%
I-270 Diverge to WB Middlebrook Rd	Diverge	20	C	20	B	-3%	I-270 Diverge to MD 27	Diverge	13	B	13	B	0%
I-270	Freeway	22	C	22	C	1%	I-270	Freeway	16	B	17	B	0%
I-270 Diverge to EB MD 118	Diverge	17	B	19	B	7%	I-270 Merge from WB MD 27	Merge	14	B	14	B	0%
I-270 Diverge to WB MD 118	Diverge	31	D	28	D	-8%	I-270	Freeway	20	C	20	C	0%
I-270	Freeway	27	D	26	C	-5%	I-270 Weave from EB MD 27 to MD 118	Weave	15	B	15	B	0%
I-270 Weave from MD 118 to MD 27	Weave	36	E	32	D	-11%	I-270	Freeway	19	C	19	C	0%
I-270	Freeway	25	C	25	C	-1%	I-270 Merge from WB MD 118	Merge	15	B	15	B	-2%
I-270 Merge from EB MD 27	Merge	36	E	32	D	-11%	I-270	Freeway	22	C	22	C	-1%
I-270	Freeway	26	C	25	C	-2%	I-270 Merge from EB MD 118	Merge	18	B	18	B	0%
I-270 Merge from WB MD 27	Merge	22	C	21	C	-3%	I-270	Freeway	28	D	28	D	-1%
I-270	Freeway	28	D	28	D	-1%	I-270 Merge from Middlebrook Rd	Merge	30	D	30	D	0%
I-270 Diverge to MD 121	Diverge	22	C	21	C	-1%	I-270 Diverge to Watkins Mill Rd	Diverge	24	C	24	C	1%

Table D.5: PM Peak - 2040 Adaptive Ramp Metering - I-270 Vehicle Density

I-270 Northbound	Type	No Build		ARM		% Change	I-270 Southbound	Type	No Build		ARM		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS			
I-270	Freeway	22	C	20	C	-10%	I-270	Freeway	19	C	19	C	0%
I-270 Merge from EB MD 121	Merge	35	E	30	D	-16%	I-270 Diverge to MD 124	Diverge	17	B	16	B	-2%
I-270 Lane Drop	Merge	78	F	67	F	-15%	I-270	Freeway	14	B	14	B	0%
I-270	Freeway	37	E	36	E	-3%	I-270 Merge from Watkins Mill	Merge	17	B	16	B	-2%
I-270 Diverge to NB Weigh Station	Diverge	18	B	18	B	0%	I-270	Freeway	58	F	56	F	-3%
I-270	Freeway	36	E	36	E	0%	I-270 Merge from WB MD 124	Merge	96	F	92	F	-4%
I-270 Merge from NB Weight Station	Merge	18	B	18	B	3%	I-270	Freeway	0	A	0	A	-
I-270	Freeway	38	E	37	E	0%	I-270 Merge from MD 117	Merge	39	E	40	E	2%
I-270 Diverge to MD 109	Diverge	22	C	22	C	-1%	I-270	Freeway	28	D	28	D	1%
I-270	Freeway	34	D	33	D	-1%	I-270 Diverge to I-370	Diverge	22	C	21	C	-1%
I-270 Merge from MD 109	Merge	19	B	19	B	0%	I-270	Freeway	18	B	18	B	-1%
I-270	Freeway	36	E	36	E	-1%	I-270 Diverge to I-270 C-D	Diverge	14	B	14	B	-1%
I-270 Diverge to MD 80	Diverge	27	C	26	C	-3%	I-270	Freeway	14	B	14	B	0%
I-270	Freeway	30	D	30	D	0%	I-270 Merge from I-270 (I-370)	Merge	21	C	21	C	0%
I-270 Merge from MD 80	Merge	18	B	18	B	2%	I-270 Diverge to I-270 C-D (Shady Grove Rd)	Diverge	23	C	23	C	0%
I-270	Freeway	36	E	36	E	0%	I-270	Freeway	19	C	19	C	0%
I-270 Diverge to Scenic View	Diverge	19	B	19	B	-1%	I-270 Merge from I-270 C-D (Shady Grove Rd Northern)	Merge	18	B	18	B	-1%
I-270	Freeway	36	E	36	E	0%	I-270	Freeway	23	C	23	C	0%
I-270 Merge from Scenic View	Merge	18	B	18	B	-1%	I-270 Merge from I-270 C-D (Shady Grove Rd Southern)	Merge	18	B	18	B	0%
I-270	Freeway	36	E	36	E	0%	I-270 Diverge to I-270 C-D (MD 189)	Diverge	25	C	25	C	0%
I-270 Diverge to NB MD 85	Diverge	20	C	20	C	2%	I-270	Freeway	21	C	21	C	0%
I-270	Freeway	34	D	34	D	0%	I-270 Merge from I-270 C-D (MD 189)	Merge	20	C	20	C	-1%
I-270 Diverge to SB MD 85	Diverge	20	C	20	C	0%	I-270	Freeway	26	C	26	C	0%
I-270	Freeway	30	D	30	D	0%	I-270 Merge from I-270 C-D	Merge	25	C	24	C	-6%
I-270 Weave from MD 85 to I-70	Weave	22	C	22	C	-1%	I-270 Diverge to I-270 HOV Lane	Diverge	17	B	17	B	-2%
I-270	Freeway	64	F	64	F	0%	I-270 Diverge to I-270 Spur	Diverge	38	E	36	E	-5%
							I-270	Freeway	13	B	13	B	-1%
							I-270 Diverge to Rockledge Dr / MD 187	Diverge	9	A	9	A	-2%
							I-270	Freeway	13	B	13	B	-1%
							I-270 Merge from Rockledge Dr	Merge	11	B	11	B	0%
							I-270	Freeway	16	B	16	B	0%
							I-270 Merge from Rockledge Dr / MD 187	Merge	14	B	14	B	0%
							I-270	Freeway	35	E	35	E	0%

Table D.6: PM Peak - 2040 Adaptive Ramp Metering- I-270 Spur Vehicle Density

I-270 Spur Northbound	Type	No Build		ARM		% Change	I-270 Southbound	Type	No Build		ARM		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS			
I-270 Spur	Freeway	62	F	63	F	1%	I-270 Spur	Freeway	72	F	67	F	-6%
I-270 Spur Merge from Clara Barton Parkway	Merge	64	F	64	F	0%	I-270 Spur Weave from I-270 HOV to Democracy Blvd	Weave	94	F	89	F	-5%
I-270 Spur	Freeway	78	F	78	F	1%	I-270 Spur	Freeway	108	F	105	F	-2%
I-270 Diverge to MD 190	Diverge	49	F	49	F	-1%	I-270 Merge from Democracy Blvd	Merge	152	F	146	F	-5%
I-270 Spur	Freeway	89	F	90	F	1%	I-270 Spur Lane Drop	Merge	144	F	140	F	-2%
I-270 Spur Merge from Cabin John Parkway	Merge	105	F	107	F	1%	I-270 Spur	Freeway	125	F	125	F	0%
I-270 Spur Merge from MD 190	Merge	97	F	97	F	0%	I-270 Spur Merge from I-495	Merge	124	F	124	F	0%
I-270 Spur	Freeway	84	F	84	F	0%	I-270 Spur	Freeway	49	F	49	F	1%
I-270 Spur Diverge to I-495	Merge	66	F	67	F	1%	I-270 Spur Diverve to EB MD 190	Diverge	50	F	50	F	1%
I-270 Spur	Freeway	45	F	46	F	2%	I-270 Spur Diverve to Cabin John Pkwy	Diverge	67	F	68	F	1%
I-270 Spur Diverge to Democracy Blvd	Diverge	50	F	51	F	2%	I-270 Spur	Freeway	95	F	95	F	0%
I-270 Spur	Freeway	58	F	59	F	1%	I-270 Merge from MD 190	Merge	120	F	119	F	-1%
I-270 Spur Merge from EB Democracy Blvd	Merge	97	F	98	F	1%	I-270 Spur	Freeway	93	F	94	F	0%
I-270 Spur	Freeway	58	F	58	F	1%	I-270 Diverge to WB Clara Barton Pkwy	Diverge	60	F	61	F	0%
I-270 Spur Merge from WB Democracy Blvd	Merge	65	F	66	F	1%	I-270 Spur	Freeway	83	F	83	F	0%
I-270 Spur	Freeway	39	E	38	E	-1%	I-270 Merge from Clara Barton Pkwy	Merge	77	F	77	F	0%
I-270 Spur Merge from Westlake Terrace	Merge	31	D	31	D	0%							
I-270 Spur	Freeway	34	D	34	D	0%							

Table D.7: PM Peak -2040 Adaptive Ramp Metering - I-270 Local Vehicle Density

I-270 Northbound	Type	No Build		ARM		% Change	I-270 Southbound	Type	No Build		ARM		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS	
I-270 C-D	Freeway	29	D	29	D	0%	I-270 C-D	Freeway	8	A	9	A	2%
I-270 C-D Diverge to EB Montrose Rd	Diverge	21	C	21	C	2%	I-270 C-D Weave from I-370 EB to I-270	Weave	23	B	23	B	-2%
I-270 C-D	Freeway	16	B	16	B	-2%	I-270 C-D Diverge to Shady Grove Rd	Diverge	11	B	11	B	1%
I-270 C-D Weave between Montrose Rd Loop Ramps	Weave	13	B	12	B	-8%	I-270 C-D	Freeway	8	A	8	A	1%
I-270 C-D	Freeway	28	D	17	B	-41%	I-270 C-D Merge from WB Shady Grove Rd	Merge	8	A	8	A	-3%
I-270 C-D Merge from WB Montrose Rd	Merge	83	F	23	C	-73%	I-270 C-D	Freeway	14	B	13	B	-2%
I-270 C-D	Freeway	67	F	33	D	-51%	I-270 C-D Merge from EB Shady Grove Rd	Merge	10	A	10	A	-1%
I-270 C-D Merge from I-270	Merge	42	F	17	B	-59%	I-270 C-D	Freeway	19	C	19	C	-1%
I-270 C-D	Freeway	65	F	37	E	-44%	I-270 C-D Merge from I-270	Merge	18	B	19	B	6%
I-270 C-D Diverge to MD 189	Diverge	43	F	23	C	-47%	I-270 C-D Diverge to I-270	Diverge	25	C	25	C	0%
I-270 C-D	Freeway	91	F	39	E	-57%	I-270 C-D Diverge to I-270	Diverge	17	B	17	B	0%
I-270 C-D Merge from MD 189	Merge	112	F	57	F	-49%	I-270 C-D	Freeway	16	B	16	B	0%
I-270 C-D	Freeway	62	F	54	F	-12%	I-270 C-D Diverge to MD 28	Diverge	11	B	11	B	1%
I-270 C-D Weave between I-270 (to MD 28 from MD 189)	Weave	63	F	57	F	-10%	I-270 C-D	Freeway	11	A	11	A	0%
I-270 C-D	Freeway	42	E	39	E	-8%	I-270 C-D Merge from WB MD 28	Merge	12	B	13	B	6%
I-270 C-D Diverge to MD 28	Diverge	18	B	18	B	2%	I-270 C-D	Freeway	14	B	14	B	0%
I-270 C-D	Freeway	28	D	28	D	-1%	I-270 C-D Merge from EB MD 28	Merge	26	C	36	E	41%
I-270 C-D Weave between MD 28 Ramps	Weave	28	C	26	C	-6%	I-270 C-D	Freeway	32	D	43	E	37%
I-270 C-D	Freeway	26	D	21	C	-22%	I-270 C-D Merge from I-270	Merge	20	B	30	D	53%
I-270 C-D Merge from MD 28 WB	Merge	28	C	27	C	-2%	I-270 C-D	Freeway	44	E	47	F	5%
I-270 C-D Merge from I-270 and Drop Lane	Merge	34	D	33	D	-2%	I-270 C-D Diverge to MD 189	Diverge	25	C	25	C	0%
I-270 C-D Diverge to I-270	Diverge	61	F	60	F	-3%	I-270 C-D	Freeway	27	D	27	D	0%
I-270 C-D	Freeway	48	F	51	F	7%	I-270 C-D Merge from MD 189	Merge	27	C	26	C	-4%
I-270 C-D Diverge to Shady Grove Rd	Diverge	14	B	14	B	-1%	I-270 C-D Diverge to I-270	Diverge	34	D	34	D	-1%
I-270 C-D	Freeway	130	F	133	F	2%	I-270 C-D	Freeway	24	C	23	C	-3%
I-270 C-D Merge from I-270 and EB Shady Grove Rd	Merge	140	F	143	F	2%	I-270 C-D Diverge to WB Montrose Rd	Diverge	18	B	17	B	-5%
I-270 C-D	Freeway	144	F	144	F	0%	I-270 C-D	Freeway	23	C	21	C	-8%
I-270 C-D Merge from WB Shady Grove Rd	Merge	146	F	142	F	-3%	I-270 Weave between Montrose Rd Loops	Weave	41	F	36	E	-12%
I-270 C-D Diverge to I-270	Diverge	113	F	114	F	1%	I-270 C-D	Freeway	15	B	14	B	-5%
I-270 C-D	Freeway	94	F	89	F	-5%	I-270 C-D Merge from EB Montrose Rd	Merge	9	A	9	A	-3%
I-270 C-D Diverge to I-370	Diverge	64	F	63	F	0%	I-270 C-D	Freeway	18	B	17	B	-4%
I-270 C-D	Freeway	120	F	114	F	-5%							
I-270 Merge from I-370 EB	Merge	129	F	125	F	-3%							
I-270 C-D	Freeway	139	F	137	F	-1%							
I-270 C-D Weave from I-370 to I-270	Weave	134	F	133	F	-1%							
I-270 C-D	Freeway	110	F	111	F	1%							
I-270 C-D Weave from I-270 to MD 117	Weave	114	F	109	F	-4%							
I-270 C-D Diverge to MD 124	Diverge	142	F	142	F	0%							
I-270 C-D	Freeway	178	F	181	F	2%							
I-270 C-D Merge from EB MD 124	Merge	168	F	171	F	2%							
I-270 C-D Merge From WB MD 124	Merge	154	F	155	F	1%							
I-270 C-D	Freeway	144	F	144	F	0%							
I-270 C-D Merge from Watkins Mill	Merge	133	F	141	F	6%							

Table D.8: PM Peak - 2040 Adaptive Ramp Metering- I-270 Vehicle Throughput

I-270 Northbound	No Build VISSIM Throughput	ARM VISSIM Throughput	% Change	I-270 Southbound	No Build VISSIM Throughput	ARM VISSIM Throughput	% Change
Between I-495 and MD 187	4113	4124	0%	North of I-70	2366	2366	0%
Between MD 187 on and off ramps	3710	3722	0%	Between I-70 on ramps	2703	2703	0%
Between Rockledge Blvd on and off ramps	3540	3552	0%	From I-70 interchange to MD-85	4047	4047	0%
Between Rockledge Dr and I-270 Spur	3873	3872	0%	Between MD-85 on and off ramps	2379	2379	0%
Between I-270 Spur and Montrose Rd	8718	8700	0%	Between MD-85 and MD-80	3075	3075	0%
Between Montrose Rd on and off ramps	5582	5641	1%	Between MD-80 on and off ramps	2415	2418	0%
Between Montrose Rd and MD 189	5102	5164	1%	Between MD-80 and Md-109	2866	2864	0%
Between MD 189 and MD 28	5078	5134	1%	Between MD-109 on and off ramps	2767	2764	0%
Between MD 28 on and off ramps	5014	5068	1%	Between MD-109 and MD-121	2935	2938	0%
Between MD 28 and Shady Grove Rd	4214	4243	1%	Between MD-121 on and off ramps	2413	2415	0%
Between Shady Grove Rd and I-370	3243	3289	1%	Between MD-121 and MD-27	3354	3359	0%
Between I-370 on and off ramps	2749	2797	2%	Between MD-27 on and off ramps	3458	3455	0%
Between I-370 and MD 117	2851	2844	0%	Between MD-27 and MD-118	3773	3765	0%
Between MD 117 and MD 124	2432	2380	-2%	Between MD-118 on and off ramps	3719	3710	0%
Between MD-124 on and off ramps	2547	2504	-2%	Between MD-118 and Middlebrook Rd	4384	4375	0%
Between Watkins Mill Rd and Middlebrook Rd	4564	4515	-1%	Between Middlebrook Rd on and off ramps	4382	4370	0%
Between Middlebrook Rd on and off ramps	4337	4299	-1%	Between Middlebrook Rd and MD-124	5462	5476	0%
Between Middlebrook Rd and MD 118	3776	3744	-1%	Between MD-124 on and off ramps	4179	4236	1%
Between MD-118 on and off ramps	3479	3454	-1%	Between MD-124 and MD-117	5347	5420	1%
Between MD 118 and MD 27	3770	3740	-1%	Between MD-117 and I-370	6905	6981	1%
Between MD-27 on and off ramps	2754	2739	-1%	Between I-370 on and off ramps	3456	3474	1%
Between MD 27 and MD 121	3428	3413	0%	Between I-370 on ramp to Shady Grove Rd	4990	5018	1%
Between MD-121 on and off ramps	2299	2294	0%	Between Shady Grove Rd and MD 28	5157	5189	1%
Between MD 121 and MD 109	3931	3915	0%	Between MD 28 on and off ramps	5327	5361	1%
Between MD-109 on and off ramps	3643	3627	0%	Between MD 28 and MD 189	4678	4699	0%
Between MD 109 and MD 80	3831	3818	0%	Between MD 189 and Montrose Rd	4678	4701	0%
Between MD-80 on and off ramps	3186	3188	0%	Between Montrose Rd on and off ramps	5599	5613	0%
Between MD 80 and MD 85	3875	3885	0%	Between Montrose Rd and I-270 Spur	7355	7323	0%
Between MD-85 on and off ramps	3257	3253	0%	Between I-270 Spur and Rockledge Blvd	3320	3305	0%
Between MD 85 and I-70	5239	5229	0%	Between Rockledge Blvd on and off ramps	2542	2534	0%
North of I-70	2739	2733	0%	Between MD 187 on and off ramps	3011	3008	0%
				Between MD 187 and I-495	3393	3389	0%
I-270 Spur Northbound				I-270 Spur Southbound			
Between I-495 and Democracy Blvd	4568	4554	0%	Between I-270 Split and HOV on ramp	3187	3188	0%
Between Democracy Blvd on and off ramps	4101	4095	0%	Between HOV on ramp and Democracy Blvd	2329	2350	1%
Between Democracy Blvd and I-270 Split	4833	4825	0%	Between Democracy Blvd on and off ramps	1856	1871	1%
				Between Democracy Blvd and I-495	2227	2233	0%

Table D.9: PM Peak - 2040 Adaptive Ramp Metering- I-270 Local Vehicle Throughput

I-270 Local Northbound	No Build VISSIM Throughput	ARM VISSIM Throughput	% Change	I-270 Local Southbound	No Build VISSIM Throughput	ARM VISSIM Throughput	% Change
Between Montrose Rd EB off ramp and EB on ramp	1766	1768	0%	Between I-370 on ramp and I-270 off ramp	3064	3074	0%
Between Montrose Rd EB on ramp and WB off ramp	2079	2090	1%	Between I-270 off ramp and Shady Grove off ramp	1525	1532	0%
Between Montrose Rd WB off ramp and on ramp	1811	1834	1%	Between Shady Grove off ramp and Shady Grove WB on ramp	811	817	1%
Between Montrose Rd WB on ramp and I-270 on ramp	3211	3136	-2%	Between Shady Grove WB and EB on ramps	1431	1401	-2%
Between I-270 on ramp and MD 189 off ramp	3392	3377	0%	Between Shady Grove on ramp and I-270 on ramp	1957	1939	-1%
Between MD 189 ramps	2697	2707	0%	Between I-270 on ramp and I-270 off ramp1	2571	2562	0%
Between MD 189 off ramp and I-270 on ramp	3503	3465	-1%	Between I-270 off ramp1 and I-270 off ramp2	1808	1803	0%
Between I-270 on ramp and I-270 off ramp	4032	3983	-1%	Between I-270 off ramp2 and MD 28 off ramp	1648	1645	0%
Between I-270 off ramp and MD 28 EB off ramp	3156	3133	-1%	Between MD 28 off ramp and MD 28 WB on ramp	1153	1151	0%
Between MD 28 EB off ramp to MD 28 EB on ramp	2855	2834	-1%	Between MD 28 WB on ramp and MD 28 EB on ramp	1423	1416	0%
Between MD 28 EB on ramp and MD 28 WB off ramp	2994	2970	-1%	Between MD 28 EB on ramp and I-270 on ramp	2987	2977	0%
Between MD 28 WB off ramp and MD 28 WB on ramp	1879	1873	0%	Between I-270 on ramp and MD 189 off ramp	3660	3651	0%
Between MD 28 WB on ramp and I-270 on ramp	2552	2548	0%	Between MD 189 on and off ramps	2740	2734	0%
Between I-270 on ramp and I-270 off ramp	3027	3016	0%	Between MD 189 on ramp and I-270 off ramp	3316	3284	-1%
Between I-270 off ramp and Shady Grove off ramp	1718	1719	0%	Between I-270 off ramp and Montrose Rd off ramp	2399	2379	-1%
Between Shady Grove off ramp and I-270 on ramp	468	480	3%	Between Montrose Rd off ramp and Montrose Rd WB on ramp	2155	2140	-1%
Between I-270 on ramp and Shady Grove WB on ramp	2182	2186	0%	Between Montrose Rd WB on ramp and EB off ramp	2705	2641	-2%
Between Shady Grove WB on ramp and I-270 off ramp	2671	2658	0%	Between Montrose Rd EB off and on ramps	1525	1467	-4%
Between I-270 off ramp and I-370 off ramp	2310	2324	1%	Between Montrose Rd EB off ramp and I-270	1845	1787	-3%
Between I-370 off ramp and I-370 EB on ramp	529	541	2%				
Between I-370 EB and WB on ramps	896	932	4%				
Between I-370 WB on ramp and I-270 off ramp	1577	1550	-2%				
Between I-270 off ramp and I-270 on ramp	1008	982	-3%				
Between I-270 on ramp and MD 117 off ramp	1386	1339	-3%				
Between MD 117 off ramp and MD 124 off ramp	920	879	-4%				
Between MD 124 off ramp and MD 124 EB on ramp	346	325	-6%				
Between MD 124 EB and WB on ramps	651	638	-2%				
Between MD 124 on ramp I-270	812	818	1%				

Table D.10: PM Peak - 2040 Adaptive Ramp Metering- I-270 On Ramp Queue Length - Northbound

I-270 Northbound	No Build VISSIM Average Queue (feet)	ARM VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	ARM VISSIM Maximum Queue (feet)	% Change
Rockledge Dr on ramp	1	1	51%	192	214	12%
MD 189 C-D on ramp	610	498	-18%	4780	4487	-6%
MD 28 C-D on ramp	994	917	-8%	4333	4294	-1%
Shady Grove Rd C-D on ramp	1762	1988	13%	4090	5040	23%
I-370 C-D on ramp	3386	3289	-3%	5049	5049	0%
MD 124 C-D on ramp	4875	4902	1%	5069	5073	0%
MD 118 on ramp	0	0	-100%	43	0	-100%
MD 27 EB on ramp	0	7	-	0	203	-
MD 27 WB on ramp	0	0	-	0	0	-
MD 121 on ramp	0	0	-	4	0	-100%
MD 109 on ramp	0	0	-	0	0	-
MD 80 on ramp	0	0	-	0	0	-
MD 85 on ramp	0	0	-	0	0	-
I-270 Spur Northbound	No Build VISSIM Average Queue (feet)	ARM VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	ARM VISSIM Maximum Queue (feet)	% Change
Democracy Blvd EB on ramp	0	0	-	9	4	-55%
Democracy Blvd WB on ramp	0	0	-	0	0	-
I-495 Northbound	No Build VISSIM Average Queue (feet)	ARM VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	ARM VISSIM Maximum Queue (feet)	% Change
Cabin John Pkwy on ramp	46	31	-32%	903	788	-13%
MD 190 on ramp	0	0	5%	48	102	112%
I-270 C-D Northbound	No Build VISSIM Average Queue (feet)	ARM VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	ARM VISSIM Maximum Queue (feet)	% Change
Montrose Rd EB on ramp	0	0	-	0	0	-
Montrose Rd WB on ramp	916	3	-100%	2556	261	-90%
I-270 on ramp	0	0	-	0	0	-
MD 189 on ramp	104	50	-52%	1084	1099	1%
I-270 on ramp	1	2	81%	109	98	-10%
MD 28 EB on ramp	0	0	-	0	0	-
MD 28 WB on ramp	38	9	-75%	652	169	-74%
Shady Grove Rd EB on ramp	1396	1544	11%	4077	4087	0%
I-270 on ramp	1555	250	-84%	5058	2441	-52%
Shady Grove Rd WB on ramp	739	676	-9%	1949	1955	0%
I-370 EB on ramp	1319	1207	-9%	2422	2459	2%
I-370 WB on ramp	1606	1655	3%	2548	2583	1%
I-270 on ramp	4357	4242	-3%	5055	5054	0%
MD 124 EB on ramp	1831	1908	4%	2796	2790	0%
MD 124 WB on ramp	98	104	6%	700	695	-1%
Watkins Mill Rd on ramp	2665	2103	-21%	3270	3258	0%

Table D.11: PM Peak - 2040 Adaptive Ramp Metering- I-270 Off Ramp Queue Length - Northbound

I-270 Northbound	No Build VISSIM Average Queue (feet)	ARM VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	ARM VISSIM Maximum Queue (feet)	% Change
MD 187 off ramp NB	39	36	-9%	309	266	-14%
MD 187 off ramp SB	0	0	-	0	0	-
Rockledge Dr off ramp	1	1	27%	88	83	-5%
Tower Oaks Blvd off ramp	37	37	2%	219	232	6%
Montrose Rd off ramp EB	0	0	-	0	0	-
Montrose Rd off ramp WB	0	0	-	0	0	-
MD 189 off ramp WB	26	26	0%	174	141	-19%
MD 189 off ramp EB	0	59	15144%	78	889	1034%
MD 28 off ramp EB	35	35	2%	215	199	-8%
MD 28 off ramp WB	0	0	-	0	0	-
Shady Grove Rd off ramp - Redland Blvd	0	0	-	0	0	-
Shady Grove Rd off ramp WB	40	41	3%	253	237	-6%
Shady Grove Rd off ramp EB	0	0	-	0	0	-
I-370 off ramp WB	8	11	38%	162	229	41%
I-370 off ramp EB	0	0	-	0	0	-
MD 117 off ramp	1835	1042	-43%	2770	2218	-20%
MD 124 off ramp	55	51	-7%	626	646	3%
Watkins Mill Rd off ramp	45	27	-41%	627	405	-35%
Middlebrook Rd EB off ramp	0	0	-	0	0	-
Middlebrook Rd WB off ramp	0	0	-	0	0	-
MD 118 WB off ramp - Seneca Meadows	0	0	-100%	8	0	-100%
MD 118 WB off ramp	0	0	-	0	0	-
MD 118 EB off ramp	0	0	-100%	16	0	-100%
MD 27 off ramp WB	44	47	8%	252	244	-3%
MD 27 off ramp EB	0	0	-	0	0	-
MD 121 off ramp WB	70	72	2%	314	288	-8%
MD 121 off ramp EB	2	0	-100%	94	0	-100%
MD 109 off ramp EB	26	22	-15%	251	207	-17%
MD 109 off ramp WB	0	0	-	0	0	-
MD 80 off ramp EB	21	20	-2%	233	179	-23%
MD 80 off ramp WB	0	0	40%	24	22	-8%
MD 85 NB off ramp	1	0	-89%	53	18	-67%
MD 85 SB off ramp	1	1	-46%	141	101	-28%
I-270 Spur Northbound	No Build VISSIM Average Queue (feet)	ARM VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	ARM VISSIM Maximum Queue (feet)	% Change
Clara Barton Pkwy off ramp EB	0	0	-	0	0	-
Clara Barton Pkwy off ramp WB	0	0	-	0	0	-
MD 190 off ramp EB	0	0	-	0	0	-
MD 190 off ramp WB	5	4	-21%	354	231	-35%
Democracy Blvd off ramp WB	41	42	2%	194	214	10%
Democracy Blvd off ramp EB	17	17	1%	120	130	8%

Table D.12: PM Peak-2040 Adaptive Ramp Metering- I-270 On Ramp Queue Length - Southbound

I-270 Southbound	No Build VISSIM Average Queue (feet)	ARM VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	ARM VISSIM Maximum Queue (feet)	% Change
MD 85 on ramp	0	0	-100%	12	0	-100%
MD 80 on ramp	0	0	-	0	0	-
MD 109 on ramp	0	0	-	0	0	-
MD 121 WB on ramp	0	0	-	0	0	-
MD 121 EB on ramp	0	0	-	0	0	-
MD 27 WB on ramp	0	0	-	0	0	-
MD 27 EB on ramp	0	0	-	0	0	-
MD 118 WB on ramp	0	0	-	0	0	-
MD 118 EB on ramp	0	0	-	0	0	-
Middlebrook Rd on ramp	0	0	-	0	0	-
Watkins Mill Rd on ramp	0	0	-	0	0	-
MD 124 WB on ramp	1368	1257	-8%	3492	3381	-3%
MD 117 on ramp	29	19	-34%	837	596	-29%
I-370 C-D on ramp	0	0	-	0	0	-
Shady Grove Rd C-D on ramp North	0	0	-	0	0	-
Shady Grove Rd C-D on ramp South	0	0	-	0	0	-
MD 189 C-D on ramp	0	0	-	0	0	-
Montrose Rd C-D on ramp	0	0	-	0	0	-
Rockledge Dr on ramp	0	0	-	0	0	-
MD 187 on ramp	0	0	-	0	0	-
I-270 Spur Southbound	No Build VISSIM Average Queue (feet)	ARM VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	ARM VISSIM Maximum Queue (feet)	% Change
Democracy Blvd on ramp	698	601	-14%	1919	1855	-3%
I-495 Southbound	No Build VISSIM Average Queue (feet)	ARM VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	ARM VISSIM Maximum Queue (feet)	% Change
I-270 Spur on ramp	4555	4472	-2%	5065	5066	0%
MD 190 on ramp	184	6	-96%	956	365	-62%
I-270 C-D Southbound	No Build VISSIM Average Queue (feet)	ARM VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	ARM VISSIM Maximum Queue (feet)	% Change
I-270 on ramp	0	0	-100%	10	0	-100%
I-370 on ramp	0	0	-19%	80	62	-22%
Shady Grove Rd WB on ramp	0	0	-	0	0	-
Shady Grove Rd EB on ramp	0	0	-	0	0	-
I-270 on ramp	0	0	-	0	0	-
MD 28 WB on ramp	0	0	-	0	19	-
MD 28 EB on ramp	0	124	29536%	63	974	1438%
I-270 on ramp	0	0	-	0	0	-
MD 189 on ramp	0	0	-	0	36	-
Montrose Rd WB on ramp	1	0	-90%	115	23	-80%
Montrose Rd EB on ramp	0	0	-	0	0	-

Table D.13: PM Peak - 2040 Adaptive Ramp Metering- I-270 Off Ramp Queue Length - Southbound

I-270 Southbound	No Build VISSIM Average Queue (feet)	ARM VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	ARM VISSIM Maximum Queue (feet)	% Change
MD 85 SB off ramp	22	57	163%	383	446	17%
MD 85 NB off ramp	17	22	35%	354	406	15%
MD 80 off ramp	2	2	50%	204	232	14%
MD 109 off ramp WB	1	0	-18%	88	92	5%
MD 109 off ramp EB	0	0	-	0	0	-
MD 121 off ramp EB	217	225	4%	970	956	-1%
MD 121 off ramp WB	0	0	-18%	137	75	-46%
MD 27 off ramp EB	22	23	4%	137	159	16%
MD 27 off ramp WB	1	0	-100%	65	0	-100%
MD 118 off ramp EB	24	23	-2%	142	146	3%
MD 118 off ramp WB	0	0	-100%	23	0	-100%
Watkins Mill Rd off ramp	103	113	10%	384	419	9%
MD 124 off ramp EB	185	180	-3%	731	867	19%
MD 124 off ramp WB	17	19	10%	445	462	4%
I-370 off ramp WB	147	36	-76%	725	500	-31%
I-370 off ramp EB	0	0	-	0	0	-
Shady Grove Rd off ramp - Omega Drive	1	0	-20%	52	52	1%
Shady Grove Rd off ramp	0	0	-	0	0	-
MD 28 off ramp	3	3	16%	149	145	-3%
MD 189 off ramp EB	108	132	22%	433	705	63%
MD 189 off ramp WB	0	0	-	0	0	-
Montrose Rd off ramp WB	0	0	-	0	0	-
Montrose Rd off ramp EB	4	4	6%	337	243	-28%
Rockledge Dr off ramp	155	168	8%	641	650	1%
I-270 Spur Southbound	No Build VISSIM Average Queue (feet)	ARM VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	ARM VISSIM Maximum Queue (feet)	% Change
Democracy Blvd off ramp EB	20	22	5%	136	172	26%
Democracy Blvd off ramp WB	0	0	-	0	0	-
MD 190 off ramp WB	80	94	17%	797	909	14%
MD 190 off ramp EB	0	0	-	0	0	-
Clara Barton Pkwy WB off ramp	0	0	500%	6	12	103%

Table D.14: PM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
1- MD 85 at Sam's Club Drive											
1	NB	60.8	E	NB Left	134	78	463	889	E	115.6	F
				NB Through	570	38	463	889	D		
				NB Right	935	72	443	912	E		
	SB	179.8	F	SB Left	153	131	1021	1231	F		
				SB Through	874	186	1021	1231	F		
				SB Right	74	209	1021	1231	F		
	EB	35.0	C	EB Left	55	84	32	144	F		
				EB Through	24	81	32	144	F		
				EB Right	169	13	32	144	B		
	WB	163.6	F	WB Left	561	181	536	762	F		
				WB Through	30	166	536	762	F		
				WB Right	224	119	536	762	F		
2- MD 85 at I-270 NB on and off ramp											
2	NB	58.5	E	NB Left	1136	58	700	1857	E	48.2	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	32.6	C	SB Left	0	0	0	0	A		
				SB Through	743	33	132	737	C		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
3- MD 85 at I-270 SB on and off ramp											
3	NB	17.3	B	NB Left	0	0	0	0	A	19.5	B
				NB Through	1975	17	181	1210	B		
				NB Right	0	0	0	0	A		
	SB	44.0	D	SB Left	173	44	74	582	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
4- MD 85 at Crestwood Blvd											
4	NB	68.0	F	NB Left	74	103	368	830	F	51.3	D
				NB Through	1450	66	367	830	E		
				NB U-Turn	0	0	0	0	A		
	SB	31.9	C	SB Left	105	83	53	246	F		
				SB Through	940	30	105	1039	C		
				SB Right	923	28	92	1030	C		
	EB	63.3	E	EB Left	949	66	196	744	E		
				EB Through	43	51	196	744	D		
				EB Right	28	1	196	744	A		
	WB	53.0	D	WB Left	44	78	60	230	E		
				WB Through	79	81	60	230	F		
				WB Right	94	18	60	230	B		
5- MD 80 at I-270 NB on and off ramp											
5	NB	-0.9	A	NB Left	1	9	0	4	A	11.5	B
				NB Through	2	0	0	4	A		
				NB Right	7	-3	0	4	A		
	SB	12.8	B	SB Left	479	16	27	238	B		
				SB Through	22	16	27	238	B		
				SB Right	149	3	0	0	A		
	EB	13.6	B	EB Left	97	14	24	208	B		
				EB Through	0	0	8	0	A		
				EB Right	5	10	37	239	B		
	WB	10.7	B	WB Left	15	14	0	38	B		
				WB Through	670	18	66	419	B		
				WB Right	612	2	0	0	A		
6- MD 80 at I-270 SB on and off ramp											
6	NB	3.4	A	NB Left	55	5	3	239	A	5.9	A
				NB Through	0	0	0	0	A		
				NB Right	605	3	3	239	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	7.1	A	EB Left	0	0	0	0	A		
				EB Through	382	8	4	111	A		
				EB Right	66	4	4	119	A		
	WB	8.4	A	WB Left	0	0	0	0	A		
				WB Through	446	8	3	163	A		
				WB Right	0	0	0	0	A		
7- MD 109 at I-270 NB on and off ramp											
7	NB			NB Left	0	0	0	0	A	7.9	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	15.2	C	SB Left	317	16	34	268	C		
				SB Through	0	0	0	0	A		
				SB Right	25	6	1	162	A		
	EB	2.5	A	EB Left	80	2	0	47	A		
				EB Through	0	0	0	0	A		
				EB Right	83	3	0	0	A		
	WB	0.4	A	WB Left	0	0	0	0	A		
				WB Through	222	0	0	0	A		
				WB Right	0	0	0	0	A		
8- MD 80 at I-270 SB on and off ramp											
8	NB	4.9	A	NB Left	63	8	3	120	A	1.8	A
				NB Through	0	0	0	0	A		
				NB Right	36	0	0	63	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.9	A	EB Left	0	0	0	0	A		
				EB Through	166	0	0	0	A		
				EB Right	34	4	0	0	A		
	WB	1.4	A	WB Left	137	1	0	58	A		
				WB Through	110	2	0	30	A		
				WB Right	0	0	0	0	A		
9- MD 121 at Gateway Center Dr											
9	NB	29.4	D	NB Left	590	33	112	604	C	47.0	D
				NB Through	795	28	112	604	C		
				NB Right	64	16	119	630	B		
	SB	22.6	C	SB Left	28	15	19	219	B		
				SB Through	300	24	31	223	C		
				SB Right	9	13	34	244	B		
	EB	14.9	B	EB Left	4	40	8	196	D		
				EB Through	24	41	15	229	D		
				EB Right	248	12	27	261	B		
	WB	117.1	F	WB Left	349	162	304	715	F		
				WB Through	75	73	304	714	E		
				WB Right	186	51	327	739	D		
10- MD 121 at I-270 NB on and off ramp											
10	NB	22.1	C	NB Left	372	59	77	320	F	18.1	B
				NB Through	0	0	0	0	A		
				NB Right	785	4	1	73	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	11.8	B	EB Left	0	0	0	0	A		
				EB Through	651	18	38	367	C		
				EB Right	336	1	0	0	A		
	WB	20.0	C	WB Left	219	60	86	412	F		
				WB Through	682	7	86	412	A		
				WB Right	0	0	0	0	A		

Table D.14: PM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
11- MD 121 at I-270 SB on and off ramp											
11	NB			NB Left	0	0	0	0	A	22.3	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	62.3	E	SB Left	271	85	226	977	F		
				SB Through	0	0	0	0	A		
				SB Right	254	39	0	49	E		
	EB	6.5	A	EB Left	0	0	0	0	A		
				EB Through	717	6	16	229	A		
				EB Right	0	0	0	0	A		
	WB	13.2	B	WB Left	0	0	0	0	A		
WB Through				520	27	46	382	D			
WB Right				538	0	0	0	A			
12- MD 27 at Observation Dr											
12	NB	37.7	D	NB U-Turn	0	0	0	0	A	24.8	C
				NB Through	94	55	22	98	E		
				NB Right	61	11	22	98	B		
	SB	41.3	D	SB Left	146	44	38	216	D		
				SB Through	57	62	43	250	E		
				SB Right	188	33	69	287	C		
	EB	18.6	B	EB Left	189	33	70	458	C		
				EB Through	2012	17	71	459	B		
				EB Right	97	16	84	497	B		
	WB	27.9	C	WB Left	41	24	149	731	C		
WB Through				1695	29	149	731	C			
WB Right				69	9	149	731	A			
13- MD 27 at I-270 NB off ramp											
13	NB	47.2	D	NB Left	303	47	52	260	D	6.5	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.1	A	EB Left	0	0	0	0	A		
				EB Through	1512	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	4.9	A	WB Left	0	0	0	0	A		
WB Through				1791	5	37	726	A			
WB Right				0	0	0	0	A			
14- MD 27 at I-270 SB off ramp											
14	NB			NB Left	0	0	0	0	A	5.2	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	50.1	D	SB Left	174	50	33	150	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	1.8	A	EB Left	0	0	0	0	A		
				EB Through	1677	2	4	89	A		
				EB Right	0	0	0	0	A		
	WB	3.7	A	WB Left	0	0	0	0	A		
WB Through				1541	4	12	384	A			
WB Right				0	0	0	0	A			
15- MD 27 at Crystal Rock Dr											
15	NB	31.1	C	NB Left	77	30	107	545	C	70.1	E
				NB Through	1196	31	116	545	C		
				NB Right	55	29	123	558	C		
	SB	56.5	E	SB Left	157	74	381	1298	E		
				SB Through	1468	58	381	1298	E		
				SB Right	225	33	368	1291	C		
	EB	40.4	D	EB Left	125	53	34	129	D		
				EB Through	49	36	30	124	D		
				EB Right	62	18	23	156	B		
	WB	163.8	F	WB Left	104	99	1056	1511	F		
WB Through				127	110	1056	1511	F			
WB Right				665	184	1056	1511	F			
16- MD 118 at Seneca Meadows Pkwy											
16	NB	4.9	A	NB Left	97	14	2	77	B	9.0	A
				NB Through	1309	4	11	182	A		
				NB Right	1	-1	19	235	A		
	SB	7.4	A	SB Left	15	8	19	307	A		
				SB Through	1226	7	22	307	A		
				SB Right	11	5	25	340	A		
	EB	14.0	B	EB Left	23	59	14	138	E		
				EB Through	0	65	14	138	E		
				EB Right	312	11	14	138	B		
	WB	53.8	D	WB Left	103	65	43	243	E		
WB Through				7	69	39	242	E			
WB Right				30	13	48	262	B			
17- MD 118 at I-270 NB on ramp											
17	NB			NB Left	0	0	0	0	A	13.8	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	26.5	C	EB Left	493	26	43	299	C		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	10.0	A	WB Left	0	0	0	0	A		
WB Through				283	2	1	139	A			
WB Right				1361	12	46	611	B			
18- MD 118 at I-270 SB off ramp											
18	NB			NB Left	0	0	0	0	A	7.1	A
				NB Through	0	0.0	0	0	A		
				NB Right	0	0.0	0	0	A		
	SB	37.7	D	SB Left	169	37.7	27	145	D		
				SB Through	0	0.0	0	0	A		
				SB Right	0	0.0	0	0	A		
	EB	5.5	A	EB Left	0	0.0	0	0	A		
				EB Through	1407	5.5	13	384	A		
				EB Right	0	0.0	0	0	A		
	WB	5.1	A	WB Left	0	0.0	0	0	A		
WB Through				1499	5.1	10	218	A			
WB Right				0	0.0	0	0	A			
19- MD 118 at Aircraft Dr											
19	NB	26.2	C	NB Left	53	72	43	241	E	43.0	D
				NB Through	53	70	43	241	E		
				NB Right	227	5	5	87	A		
	SB	165.9	F	SB Left	436	156	419	656	F		
				SB Through	14	205	419	656	F		
				SB Right	126	195	419	656	F		
	EB	22.6	C	EB Left	125	31	89	536	C		
				EB Through	1415	22	89	536	C		
				EB Right	21	20	89	536	B		
	WB	24.3	C	WB Left	15	30	107	749	C		
WB Through				1399	28	107	749	C			
WB Right				367	8	107	749	A			
20- Middlebrook Rd at Observation Dr											
20	NB			NB Left	0	0	0	0	A	9.0	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	20.5	C	SB Left	124	36	23	150	D		
				SB Through	0	0	0	0	A		
				SB Right	186	10	23	150	B		
	EB	6.0	A	EB Left	14	11	15	149	B		
				EB Through	1053	6	15	149	A		
				EB Right	0	0	0	0	A		
	WB	8.8	A	WB Left	0	0	0	0	A		
WB Through				1313	9	27	253	A			
WB Right				17	7	42	302	A			

Table D.14: PM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
21- Middlebrook Rd at I-270 SB on ramp											
21	NB			NB Left	0	0	0	0	A	4.6	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	2.7	A	EB Left	0	0	0	0	A		
				EB Through	742	3	4	110	A		
				EB Right	0	0	0	0	A		
	WB	7.8	A	WB Left	438	8	5	236	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
22- Middlebrook Rd at Waring Station Rd											
22	NB	48.4	D	NB Left	200	46	83	309	D	13.7	B
				NB Through	1	55	83	309	D		
				NB Right	236	50	83	309	D		
	SB	30.1	C	SB Left	32	47	8	72	D		
				SB Through	2	38	8	72	D		
				SB Right	24	7	19	110	A		
	EB	8.0	A	EB Left	4	11	28	285	B		
				EB Through	1125	8	28	285	A		
				EB Right	198	7	28	285	A		
	WB	8.6	A	WB Left	210	21	28	289	C		
				WB Through	1437	7	28	289	A		
				WB Right	3	3	28	289	A		
23- MD 124 at MD 355											
23	NB	130.8	F	NB Left	490	115	682	1082	F	78.6	E
				NB Through	1162	138	680	1079	F		
				NB Right	7	85	0	0	F		
	SB	44.6	D	SB Left	180	92	146	490	F		
				SB Through	698	66	146	490	E		
				SB Right	720	12	44	383	B		
	EB	27.2	C	EB Left	291	68	108	598	E		
				EB Through	1615	25	108	598	C		
				EB Right	338	3	28	551	A		
	WB	126.4	F	WB Left	0	0	0	0	A		
				WB Through	1645	129	683	946	F		
				WB Right	88	83	0	3	F		
24- MD 124 at I-270 SB on and off											
24	NB	95.9	F	NB Left	55	84	67	182	F	63.0	E
				NB Through	21	127	67	182	F		
				NB U-Turn	0	0	0	0	A		
	SB	55.4	E	SB Left	547	95	190	736	F		
				SB Through	8	98	190	736	F		
				SB Right	456	7	13	379	A		
	EB	101.1	F	EB Left	0	0	0	0	A		
				EB Through	1409	100	584	1113	F		
				EB Right	22	162	604	1137	F		
	WB	21.7	C	WB Left	5	78	653	2194	E		
				WB Through	1192	22	653	2194	C		
				WB Right	0	0	0	0	A		
25- MD 117 at MD 124											
25	NB	78.5	E	NB Left	54	158	328	743	F	50.1	D
				NB Through	686	93	328	743	F		
				NB Right	461	48	29	665	D		
	SB	37.8	D	SB Left	134	61	153	737	E		
				SB Through	969	41	153	737	D		
				SB Right	182	5	0	0	A		
	EB	44.9	D	EB Left	153	80	152	574	E		
				EB Through	1156	41	152	576	D		
				EB Right	57	37	156	603	D		
	WB	42.6	D	WB Left	315	71	205	1006	E		
				WB Through	1069	38	205	1006	D		
				WB Right	99	1	0	0	A		
26- MD 117 at Bureau Dr											
26	NB	50.3	D	NB Left	98	76	81	296	E	37.8	D
				NB Through	35	77	81	296	E		
				NB Right	272	38	81	296	D		
	SB	80.7	F	SB Left	284	95	132	405	F		
				SB Through	23	83	132	405	F		
				SB Right	83	32	132	405	C		
	EB	30.3	C	EB Left	52	54	165	806	D		
				EB Through	1683	30	166	806	C		
				EB Right	6	18	160	795	B		
	WB	31.9	C	WB Left	14	35	185	997	D		
				WB Through	1272	34	186	998	C		
				WB Right	213	19	211	1046	B		
27- MD 117 at I-270 SB off ramp											
27	NB			NB Left	0	0	0	0	A	12.8	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	3.7	A	EB Left	0	0	0	0	A		
				EB Through	944	4	6	464	A		
				EB Right	0	0	0	0	A		
	WB	40.7	E	WB Left	306	41	98	848	E		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
28- MD 117 at I-270 NB off ramp											
28	NB			NB Left	0	0	0	0	A	24.3	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	89.3	F	SB Left	97	91	1950	2779	F		
				SB Through	0	0	0	0	A		
				SB Right	374	89	1949	2779	F		
	EB	17.3	B	EB Left	3	120	90	983	F		
				EB Through	947	17	90	983	B		
				EB Right	0	0	0	0	A		
	WB	7.3	A	WB Left	0	0	0	0	A		
				WB Through	1403	7	52	390	A		
				WB Right	0	0	52	390	A		
29- MD 117 at Perry Pkwy											
29	NB	40.8	D	NB Left	19	59	17	125	E	49.4	D
				NB Through	26	59	17	124	E		
				NB Right	34	17	27	145	B		
	SB	162.4	F	SB Left	241	198	280	446	F		
				SB Through	21	220	280	446	F		
				SB Right	121	82	280	446	F		
	EB	21.1	C	EB Left	223	69	74	337	E		
				EB Through	778	8	74	337	A		
				EB Right	30	7	60	321	A		
	WB	41.4	D	WB Left	37	108	248	736	F		
				WB Through	1260	42	248	736	D		
				WB Right	382	33	248	736	C		
30- Shady Grove Rd at I-270 NB off ramp											
30	NB	7.6	A	NB Left	0	0	0	0	A	30.1	C
				NB Through	914	8	87	483	A		
				NB Right	0	0	0	0	A		
	SB	44.7	D	SB Left	0	0	0	0	A		
				SB Through	1013	45	163	681	D		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	51.6	D	WB Left	267	52	48	264	D		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table D.14: PM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
31- Shady Grove Rd at I-270 SB off ramp											
31	NB	31.3	C	NB Left	0	0	0	0	A	29.5	C
				NB Through	1229	31	435	1759	C		
				NB Right	0	0	0	0	A		
	SB	5.6	A	SB Left	0	0	0	0	A		
				SB Through	676	6	7	154	A		
				SB Right	0	0	0	0	A		
	EB	55.6	E	EB Left	232	54	43	211	D		
				EB Through	0	0	0	0	A		
				EB Right	304	57	62	297	E		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
32- MD 28 at I-270 SB off ramp											
32	NB			NB U-Turn	0	0	0	0	A	7.9	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	37.2	D	SB Left	406	46	71	322	D		
				SB Through	0	0	0	0	A		
				SB Right	97	3	0	28	A		
	EB	2.8	A	EB Left	0	0	0	0	A		
				EB Through	1560	1	0	0	A		
				EB Right	932	6	16	224	A		
	WB	6.7	A	WB Left	0	0	0	0	A		
				WB Through	1642	7	20	253	A		
				WB Right	0	0	0	0	A		
33- MD 28 at I-270 on and off ramps											
33	NB	36.9	D	NB Left	0	0	41	226	A	39.9	D
				NB Through	185	49	49	235	D		
				NB Right	123	18	49	235	B		
	SB	137.2	F	SB Left	14	160	361	412	F		
				SB Through	0	0	0	0	A		
				SB Right	219	136	361	412	F		
	EB	20.0	B	EB Left	283	61	94	334	E		
				EB Through	920	7	94	334	A		
				EB Right	0	0	0	0	A		
	WB	41.7	D	WB Left	40	37	168	432	D		
				WB Through	1279	42	144	396	D		
				WB Right	0	0	0	0	A		
34- MD 189 at Great Falls Rd											
34	NB	36.7	D	NB Left	43	45	12	90	D	13.2	B
				NB Through	14	48	9	90	D		
				NB Right	19	9	9	101	A		
	SB	3.4	A	SB Left	18	41	7	83	D		
				SB Through	13	48	7	83	D		
				SB Right	408	0	3	48	A		
	EB	11.6	B	EB Left	410	23	37	417	C		
				EB Through	644	5	6	200	A		
				EB Right	55	5	10	236	A		
	WB	18.0	B	WB Left	14	19	52	406	B		
				WB Through	842	18	51	406	B		
				WB Right	18	12	67	440	B		
35- MD 189 at I-270 Ramps											
35	NB	47.1	D	NB Left	225	47	41	196	D	42.5	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	54.4	D	SB Left	348	54	124	453	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	28.0	C	EB Left	479	32	91	341	C		
				EB Through	373	23	91	341	C		
				EB Right	0	0	0	0	A		
	WB	50.8	D	WB Left	443	54	111	336	D		
				WB Through	428	47	111	336	D		
				WB Right	0	0	0	0	A		
36- MD 189 at Wooton Pkwy											
36	NB	45.9	D	NB Left	238	57	142	506	E	52.4	D
				NB Through	694	51	142	506	D		
				NB Right	176	12	142	506	B		
	SB	82.8	F	SB Left	250	101	295	794	F		
				SB Through	926	78	312	780	E		
				SB Right	0	0	0	0	A		
	EB	38.7	D	EB Left	153	72	123	486	E		
				EB Through	552	38	123	486	D		
				EB Right	204	15	123	486	B		
	WB	39.5	D	WB Left	157	72	141	743	E		
				WB Through	775	41	141	743	D		
				WB Right	315	19	141	743	B		
37- Montrose Rd at Tower Oaks Blvd											
37	NB	0.4	A	NB Left	0	0	0	0	A	32.4	C
				NB Through	0	0	0	0	A		
				NB Right	537	0	0	0	A		
	SB	143.6	F	SB Left	87	49	213	902	D		
				SB Through	0	0	0	0	A		
				SB Right	305	171	269	899	F		
	EB	6.9	A	EB Left	0	0	0	0	A		
				EB Through	1868	7	39	520	A		
				EB Right	0	0	0	0	A		
	WB	40.0	D	WB Left	79	37	39	520	D		
				WB Through	2426	41	277	780	D		
				WB Right	261	30	277	780	C		
38- Tower Oaks Blvd at I-270 off ramp											
38	NB	23.3	C	NB Left	707	24	50	240	C	17.3	B
				NB Through	0	0.0	43	232	A		
				NB Right	26	7.0	50	240	A		
	SB	9.8	A	SB Left	8	18.4	1	39	B		
				SB Through	0	0.0	1	39	A		
				SB Right	9	2.2	0	23	A		
	EB	10.8	B	EB Left	1	11.5	16	177	B		
				EB Through	363	11.2	16	177	B		
				EB Right	37	7.0	11	167	A		
	WB	12.7	B	WB Left	139	16.3	16	145	B		
				WB Through	203	10.4	16	145	B		
				WB Right	3	3.4	3	100	A		
39- Montrose Rd at Tower Oaks Blvd											
39	NB	20.0	C	NB Left	97	42	83	387	D	45.0	D
				NB Through	773	32	83	387	C		
				NB Right	621	2	0	0	A		
	SB	32.1	C	SB Left	210	63	76	334	E		
				SB Through	506	23	74	333	C		
				SB Right	131	15	72	340	B		
	EB	133.4	F	EB Left	104	112	358	697	F		
				EB Through	518	136	360	698	F		
				EB Right	44	149	382	722	F		
	WB	36.9	D	WB Left	542	46	109	374	D		
				WB Through	456	42	110	374	D		
				WB Right	315	13	129	404	B		
40- Rockledge Blvd at I-270 NB on and off ramp											
40	NB	132.4	F	NB Left	0	0	0	0	A	112.4	F
				NB Through	335	121	557	836	F		
				NB Right	854	137	557	836	F		
	SB	85.9	F	SB Left	0	0	89	217	A		
				SB Through	352	86	89	217	F		
				SB Right	0	0	0	0	A		
	EB	93.5	F	EB Left	6	184	288	804	F		
				EB Through	459	148	288	804	F		
				EB Right	304	10	0	0	B		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table D.14: PM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS	
41- Rockledge Blvd at I-270 SB on and off ramps												
41	NB	30.3	C	NB Left	343	30	76	273	C	48.1	D	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	53.0	D		WB Left	355	59	195	867			E
					WB Through	890	51	195	867			D
					WB Right	0	0	0	0			A
42- MD 187 at Tuckerman Ln												
42	NB	66.6	E	NB Left	216	39	567	1282	D	128.7	F	
				NB Through	2309	68	567	1282	E			
				NB Right	200	76	567	1282	E			
	SB	187.6	F		SB Left	205	172	2555	2693			F
					SB Through	1151	185	2555	2693			F
					SB Right	306	209	2555	2693			F
	EB	112.4	F		EB Left	302	66	540	1403			E
					EB Through	534	136	541	1404			F
					EB Right	118	121	564	1428			F
	WB	195.5	F		WB Left	465	191	1941	2142			F
					WB Through	674	211	1941	2142			F
					WB Right	166	145	1941	2142			F
43- MD 187 at I-270 NB on and off ramps												
43	NB	16.8	B	NB Left	566	35	117	404	C	20.4	C	
				NB Through	2515	13	117	404	B			
				NB Right	0	0	0	0	A			
	SB	25.1	C		SB Left	0	0	0	0			A
					SB Through	1290	25	66	269			C
					SB Right	0	0	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	60.3	E		WB Left	59	60	47	317			E
					WB Through	67	60	47	317			E
					WB Right	0	0	0	0			A
44- MD 187 at I-270 NB on and off ramps												
44	NB	40.0	E	NB Left	0	0	0	0	A	36.9	D	
				NB Through	2426	40	155	739	D			
				NB Right	0	0	0	0	A			
	SB	18.1	B		SB Left	147	56	67	271			E
					SB Through	1203	13	67	271			B
					SB Right	0	0	0	0			A
	EB	58.2	E		EB Left	652	60	143	560			E
					EB Through	0	0	143	560			A
					EB Right	179	53	82	486			D
	WB				WB Left	0	0	0	0			A
					WB Through	0	0	0	0			A
					WB Right	0	0	0	0			A
45- MD 187 at Rock Spring Dr												
45	NB	20.6	C	NB Left	492	37	123	826	D	29.8	C	
				NB Through	2174	17	124	827	B			
				NB Right	18	14	145	860	B			
	SB	34.2	C		SB Left	21	62	111	472			E
					SB Through	1186	39	111	472			D
					SB Right	173	1	69	465			A
	EB	50.0	D		EB Left	431	60	146	519			E
					EB Through	50	68	146	519			E
					EB Right	484	39	146	519			D
	WB	17.1	B		WB Left	7	29	6	108			C
					WB Through	16	33	6	108			C
					WB Right	36	8	3	97			A
47-Democracy Blvd at I-270 NB off ramp												
47	NB	45.3	D	NB Left	154	45	28	136	D	3.0	A	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB	1.2	A		EB Left	0	0	0	0			A
					EB Through	1127	1	3	66			A
					EB Right	0	0	0	0			A
	WB	1.1	A		WB Left	0	0	0	0			A
					WB Through	2241	1	3	84			A
					WB Right	0	0	0	0			A
48- Democracy Blvd at I-270 SB on ramp												
48	NB			NB Left	0	0	0	0	A	8.4	A	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB	5.5	A		EB Left	0	0	0	0			A
					EB Through	1336	5	19	232			A
					EB Right	0	0	0	0			A
	WB	10.1	B		WB Left	543	35	59	404			D
					WB Through	1827	3	49	383			A
					WB Right	0	0	0	0			A
49- Democracy Blvd at I-270 SB off ramp												
49	NB			NB Left	0	0	0	0	A	8.8	A	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB	37.4	D		SB Left	154	51	28	143			D
					SB Through	0	0	0	0			A
					SB Right	59	2	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	5.8	A		WB Left	0	0	0	0			A
					WB Through	1827	4	19	305			A
					WB Right	156	29	116	746			C
50- MD 190 at Burdette Rd												
50	NB	76.4	E	NB Left	27	79	18	118	E	36.6	D	
				NB Through	7	69	18	118	E			
				NB Right	6	75	18	118	E			
	SB	37.5	D		SB Left	45	77	25	148			E
					SB Through	9	72	25	148			E
					SB Right	122	20	25	148			C
	EB	21.6	C		EB Left	138	99	113	625			F
					EB Through	1297	14	113	625			B
					EB Right	31	4	99	653			A
	WB	45.7	D		WB Left	13	114	390	1119			F
					WB Through	2161	46	390	1119			D
					WB Right	65	35	390	1119			C

Table D.14: PM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
51- MD 190 at I-270 NB on ramp											
51	NB			NB Left	0	0	0	0	A	17.6	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	65.7	E	EB Left	254	66	101	343	E		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	9.3	A	WB Left	0	0	0	0	A		
WB Through				1471	9	49	692	A			
WB Right				0	0	0	0	A			
52- MD 190 at I-270 SB off ramp											
52	NB	70.5	E	NB Left	225	70	84	800	E	12.3	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	3.6	A	EB Left	0	0	0	0	A		
				EB Through	1062	4	8	176	A		
				EB Right	0	0	0	0	A		
	WB	10.0	A	WB Left	0	0	0	0	A		
WB Through				1641	10	30	635	A			
WB Right				0	0	0	0	A			
53- MD 190 at Seven Locks Rd											
53	NB	0.5	A	NB Left	28	1	0	0	A	26.9	C
				NB Through	314	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	52.6	D	SB Left	364	52	120	414	D		
				SB Through	232	53	120	414	D		
				SB Right	20	50	120	414	D		
	EB	32.0	C	EB Left	27	30	95	436	C		
				EB Through	800	32	95	436	C		
				EB Right	45	32	95	436	C		
	WB	20.8	C	WB Left	255	75	124	491	E		
WB Through				914	18	124	491	B			
WB Right				693	5	124	491	A			
54- MD 124 at I-270 NB off ramp											
54	NB	31.3	C	NB Left	0	0	0	0	A	23.6	C
				NB Through	0	0	0	0	A		
				NB Right	556	31	56	630	C		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	21.1	C	EB Left	0	0	0	0	A		
				EB Through	1661	21	57	938	C		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
WB Through				0	0	0	0	A			
WB Right				0	0	0	0	A			
55- Democracy Blvd at I-270 NB off ramp											
55	NB	46.2	D	NB Left	0	0	0	0	A	11.2	B
				NB Through	0	0	0	0	A		
				NB Right	313	46	51	205	D		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	1.5	A	EB Left	0	0	0	0	A		
				EB Through	1128	2	4	59	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
WB Through				0	0	0	0	A			
WB Right				0	0	0	0	A			
56- Watkins Mill Rd at I-270 SB off ramp/Parkview Ave											
56	NB	71.3	E	NB Left	145	53	170	656	D	87.9	F
				NB Through	0	0	0	0	A		
				NB Right	342	79	170	656	E		
	SB	42.7	D	SB Left	410	63	107	388	E		
				SB Through	110	59	107	388	E		
				SB Right	441	20	107	388	C		
	EB	143.5	F	EB Left	0	0	0	0	A		
				EB Through	1216	144	961	1246	F		
				EB Right	4	136	961	1246	F		
	WB	41.9	D	WB Left	62	85	49	220	F		
WB Through				295	33	47	219	C			
WB Right				0	0	0	0	A			
57- Watkins Mill Rd at I-270 NB on ramp											
57	NB	40.5	D	NB Left	77	65	56	638	E	72.4	E
				NB Through	0	0	0	0	A		
				NB Right	193	31	56	638	C		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	26.1	C	EB Left	644	66	146	438	E		
				EB Through	1051	2	146	438	A		
				EB Right	0	0	0	0	A		
	WB	157.1	F	WB Left	0	0	0	0	A		
WB Through				684	122	651	866	F			
WB Right				343	227	651	866	F			
58- Watkins Mill Rd at I-270 SB on ramp											
58	NB			NB Left	0	0	0	0	A	16.5	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	17.2	B	EB Left	0	0	0	0	A		
				EB Through	1691	19	150	598	B		
				EB Right	286	8	150	598	A		
	WB	14.8	B	WB Left	409	27	46	464	C		
WB Through				352	1	46	464	A			
WB Right				0	0	0	0	A			

Table D.15: PM Peak - 2040 Adaptive Ramp Metering- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
1- MD 85 at Sam's Club Drive											
1	NB	64.6	E	NB Left	136	75	502	897	E	122.5	F
				NB Through	573	39	502	897	D		
				NB Right	930	79	487	920	E		
	SB	182.5	F	SB Left	153	136	1021	1231	F		
				SB Through	869	189	1021	1231	F		
				SB Right	73	205	1021	1231	F		
	EB	35.3	D	EB Left	55	84	32	144	F		
				EB Through	24	81	32	144	F		
				EB Right	169	13	32	144	B		
	WB	186.2	F	WB Left	546	204	583	760	F		
				WB Through	29	193	583	760	F		
				WB Right	221	142	583	760	F		
2- MD 85 at I-270 NB on and off ramp											
2	NB	57.6	E	NB Left	1127	58	707	1877	E	47.0	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	30.7	C	SB Left	0	0	0	0	A		
				SB Through	736	31	125	615	C		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
3- MD 85 at I-270 SB on and off ramp											
3	NB	16.3	B	NB Left	0	0	0	0	A	18.4	B
				NB Through	1959	16	155	1201	B		
				NB Right	0	0	0	0	A		
	SB	42.4	D	SB Left	172	42	109	747	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
4- MD 85 at Crestwood Blvd											
4	NB	51.5	F	NB Left	76	78	292	833	E	45.2	D
				NB Through	1448	50	292	833	D		
				NB U-Turn	0	0	0	0	A		
	SB	30.6	C	SB Left	105	79	50	285	E		
				SB Through	938	30	103	843	C		
				SB Right	920	26	87	834	C		
	EB	62.2	E	EB Left	950	65	193	731	E		
				EB Through	43	49	193	731	D		
				EB Right	28	0	193	731	A		
	WB	53.3	D	WB Left	43	78	60	231	E		
				WB Through	79	81	60	231	F		
				WB Right	94	18	60	231	B		
5- MD 80 at I-270 NB on and off ramp											
5	NB	-1.1	A	NB Left	2	0	0	0	A	11.7	B
				NB Through	3	0	0	0	A		
				NB Right	6	-2	0	0	A		
	SB	12.5	B	SB Left	479	15	26	185	B		
				SB Through	22	16	26	185	B		
				SB Right	149	3	0	0	A		
	EB	12.9	B	EB Left	97	13	24	217	B		
				EB Through	0	0	8	0	A		
				EB Right	5	7	36	247	A		
	WB	11.3	B	WB Left	15	12	0	35	B		
				WB Through	674	19	70	473	B		
				WB Right	612	3	0	7	A		
6- MD 80 at I-270 SB on and off ramp											
6	NB	3.4	A	NB Left	56	4	4	268	A	5.7	A
				NB Through	0	0	0	0	A		
				NB Right	608	3	4	268	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	6.9	A	EB Left	0	0	0	0	A		
				EB Through	382	7	4	104	A		
				EB Right	66	5	3	112	A		
	WB	7.9	A	WB Left	0	0	0	0	A		
				WB Through	447	8	3	158	A		
				WB Right	0	0	0	0	A		
7- MD 109 at I-270 NB on and off ramp											
7	NB			NB Left	0	0	0	0	A	7.4	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	14.2	B	SB Left	315	15	30	224	C		
				SB Through	0	0	0	0	A		
				SB Right	25	4	1	169	A		
	EB	2.5	A	EB Left	80	2	0	53	A		
				EB Through	0	0	0	0	A		
				EB Right	83	3	0	0	A		
	WB	0.4	A	WB Left	0	0	0	0	A		
				WB Through	222	0	0	0	A		
				WB Right	0	0	0	0	A		
8- MD 80 at I-270 SB on and off ramp											
8	NB	5.2	A	NB Left	63	8	3	126	A	1.9	A
				NB Through	0	0	0	0	A		
				NB Right	36	0	0	55	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.9	A	EB Left	0	0	0	0	A		
				EB Through	166	0	0	0	A		
				EB Right	34	4	0	0	A		
	WB	1.5	A	WB Left	137	1	0	60	A		
				WB Through	109	2	0	37	A		
				WB Right	0	0	0	0	A		
9- MD 121 at Gateway Center Dr											
9	NB	25.8	D	NB Left	587	31	97	538	C	45.6	D
				NB Through	801	23	97	538	C		
				NB Right	64	11	103	564	B		
	SB	21.4	C	SB Left	27	14	17	226	B		
				SB Through	304	22	29	226	C		
				SB Right	9	10	32	247	A		
	EB	15.2	C	EB Left	4	49	8	238	D		
				EB Through	24	37	16	257	D		
				EB Right	248	13	28	289	B		
	WB	120.3	F	WB Left	348	167	308	735	F		
				WB Through	74	78	308	735	E		
				WB Right	183	49	331	759	D		
10- MD 121 at I-270 NB on and off ramp											
10	NB	22.5	C	NB Left	373	61	78	294	F	18.3	B
				NB Through	0	0	0	0	A		
				NB Right	784	4	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	11.4	B	EB Left	0	0	0	0	A		
				EB Through	649	17	37	340	C		
				EB Right	335	0	0	0	A		
	WB	20.4	C	WB Left	218	62	90	442	F		
				WB Through	685	7	90	442	A		
				WB Right	0	0	0	0	A		

Table D.15: PM Peak - 2040 Adaptive Ramp Metering- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
11- MD 121 at I-270 SB on and off ramp											
11	NB			NB Left	0	0	0	0	A	22.4	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	63.1	E	SB Left	270	85	231	963	F		
				SB Through	0	0	0	0	A		
				SB Right	252	40	0	22	E		
	EB	6.4	A	EB Left	0	0	0	0	A		
				EB Through	717	6	16	202	A		
				EB Right	0	0	0	0	A		
				WB Left	0	0	0	0	A		
WB	13.1	B	WB Through	519	26	46	352	D			
			WB Right	541	0	0	0	A			
12- MD 27 at Observation Dr											
12	NB	37.6	D	NB U-Turn	0	0	0	0	A	25.0	C
				NB Through	94	55	22	98	E		
				NB Right	61	11	22	98	B		
	SB	41.0	D	SB Left	146	44	38	216	D		
				SB Through	57	62	43	250	E		
				SB Right	188	32	68	287	C		
	EB	19.2	B	EB Left	190	32	74	526	C		
				EB Through	2013	18	76	527	B		
				EB Right	97	16	89	566	B		
				WB Left	41	24	147	721	C		
WB	27.8	C	WB Through	1695	29	147	721	C			
			WB Right	69	8	147	721	A			
13- MD 27 at I-270 NB off ramp											
13	NB	49.4	D	NB Left	302	49	55	252	D	6.5	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.1	A	EB Left	0	0	0	0	A		
				EB Through	1515	0	0	0	A		
				EB Right	0	0	0	0	A		
				WB Left	0	0	0	0	A		
WB	4.7	A	WB Through	1790	5	35	661	A			
			WB Right	0	0	0	0	A			
14- MD 27 at I-270 SB off ramp											
14	NB			NB Left	0	0	0	0	A	5.1	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	51.5	D	SB Left	175	51	34	173	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	1.9	A	EB Left	0	0	0	0	A		
				EB Through	1677	2	4	81	A		
				EB Right	0	0	0	0	A		
				WB Left	0	0	0	0	A		
WB	3.3	A	WB Through	1536	3	11	383	A			
			WB Right	0	0	0	0	A			
15- MD 27 at Crystal Rock Dr											
15	NB	31.3	C	NB Left	77	30	109	559	C	67.8	E
				NB Through	1196	31	118	558	C		
				NB Right	55	30	124	571	C		
	SB	51.8	D	SB Left	157	73	333	1111	E		
				SB Through	1463	54	333	1111	D		
				SB Right	223	21	316	1105	C		
	EB	40.8	D	EB Left	125	54	35	131	D		
				EB Through	49	36	30	126	D		
				EB Right	62	18	23	160	B		
				WB Left	104	94	1020	1491	F		
WB	162.4	F	WB Through	126	106	1020	1491	F			
			WB Right	664	184	1020	1491	F			
16- MD 118 at Seneca Meadows Pkwy											
16	NB	5.0	A	NB Left	97	14	2	68	B	9.1	A
				NB Through	1306	4	11	185	A		
				NB Right	1	-1	20	238	A		
	SB	7.4	A	SB Left	15	9	19	295	A		
				SB Through	1226	7	22	295	A		
				SB Right	11	5	25	327	A		
	EB	13.9	B	EB Left	23	59	14	134	E		
				EB Through	0	65	14	134	E		
				EB Right	312	11	14	134	B		
				WB Left	103	65	43	243	E		
WB	53.8	D	WB Through	7	69	39	242	E			
			WB Right	30	13	48	262	B			
17- MD 118 at I-270 NB on ramp											
17	NB			NB Left	0	0	0	0	A	13.8	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	26.4	C	EB Left	491	26	44	354	C		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
				WB Left	0	0	0	0	A		
WB	10.0	A	WB Through	283	2	0	27	A			
			WB Right	1363	12	46	527	B			
18- MD 118 at I-270 SB off ramp											
18	NB			NB Left	0	0	0	0	A	6.8	A
				NB Through	0	0.0	0	0	A		
				NB Right	0	0.0	0	0	A		
	SB	36.7	D	SB Left	169	36.7	26	149	D		
				SB Through	0	0.0	0	0	A		
				SB Right	0	0.0	0	0	A		
	EB	5.6	A	EB Left	0	0.0	0	0	A		
				EB Through	1409	5.6	14	409	A		
				EB Right	0	0.0	0	0	A		
				WB Left	0	0.0	0	0	A		
WB	4.6	A	WB Through	1500	4.6	10	228	A			
			WB Right	0	0.0	0	0	A			
19- MD 118 at Aircraft Dr											
19	NB	26.3	C	NB Left	53	71	43	237	E	41.5	D
				NB Through	52	70	43	237	E		
				NB Right	227	6	5	94	A		
	SB	155.4	F	SB Left	436	144	399	644	F		
				SB Through	14	203	399	644	F		
				SB Right	127	190	399	644	F		
	EB	22.5	C	EB Left	125	31	89	545	C		
				EB Through	1415	22	89	545	C		
				EB Right	21	20	89	545	B		
				WB Left	14	27	105	679	C		
WB	24.1	C	WB Through	1398	28	105	679	C			
			WB Right	365	8	105	679	A			
20- Middlebrook Rd at Observation Dr											
20	NB			NB Left	0	0	0	0	A	8.9	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	20.5	C	SB Left	125	36	23	150	D		
				SB Through	0	0	0	0	A		
				SB Right	186	10	23	150	B		
	EB	5.9	A	EB Left	14	8	14	150	A		
				EB Through	1054	6	14	150	A		
				EB Right	0	0	0	0	A		
				WB Left	0	0	0	0	A		
WB	8.5	A	WB Through	1313	9	26	271	A			
			WB Right	17	7	41	320	A			

Table D.15: PM Peak - 2040 Adaptive Ramp Metering- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
21- Middlebrook Rd at I-270 SB on ramp											
21	NB			NB Left	0	0	0	0	A	4.5	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	2.5	A	EB Left	0	0	0	0	A		
				EB Through	742	2	4	104	A		
				EB Right	0	0	0	0	A		
	WB	7.9	A	WB Left	438	8	5	230	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
22- Middlebrook Rd at Waring Station Rd											
22	NB	48.4	D	NB Left	200	46	83	309	D	13.7	B
				NB Through	1	55	83	309	D		
				NB Right	236	50	83	309	D		
	SB	30.4	C	SB Left	32	47	8	72	D		
				SB Through	2	38	8	72	D		
				SB Right	24	7	20	110	A		
	EB	7.9	A	EB Left	4	12	27	283	B		
				EB Through	1125	8	27	283	A		
				EB Right	198	7	27	283	A		
	WB	8.4	A	WB Left	209	21	28	288	C		
				WB Through	1433	7	28	288	A		
				WB Right	3	5	28	288	A		
23- MD 124 at MD 355											
23	NB	136.1	F	NB Left	495	122	723	1090	F	81.3	F
				NB Through	1162	143	720	1087	F		
				NB Right	7	97	0	0	F		
	SB	46.2	D	SB Left	183	95	150	496	F		
				SB Through	701	67	150	496	E		
				SB Right	723	14	43	443	B		
	EB	27.6	C	EB Left	285	70	105	624	E		
				EB Through	1595	25	105	624	C		
				EB Right	330	3	31	532	A		
	WB	130.2	F	WB Left	0	0	0	0	A		
				WB Through	1626	132	686	946	F		
				WB Right	88	87	4	179	F		
24- MD 124 at I-270 SB on and off											
24	NB	82.8	F	NB Left	54	75	63	174	E	63.1	E
				NB Through	20	104	63	174	F		
				NB U-Turn	0	0	0	0	A		
	SB	53.7	D	SB Left	551	92	185	872	F		
				SB Through	8	110	185	872	F		
				SB Right	454	7	15	393	A		
	EB	103.9	F	EB Left	0	0	0	0	A		
				EB Through	1394	103	613	1107	F		
				EB Right	22	155	633	1130	F		
	WB	21.1	C	WB Left	5	62	598	2099	E		
				WB Through	1182	21	598	2099	C		
				WB Right	0	0	0	0	A		
25- MD 117 at MD 124											
25	NB	74.8	E	NB Left	56	147	308	744	F	49.8	D
				NB Through	681	90	308	744	F		
				NB Right	464	44	28	603	D		
	SB	37.9	D	SB Left	136	60	152	699	E		
				SB Through	968	41	152	699	D		
				SB Right	182	4	0	0	A		
	EB	45.7	D	EB Left	155	81	154	601	F		
				EB Through	1157	41	153	602	D		
				EB Right	57	38	158	629	D		
	WB	43.7	D	WB Left	314	72	204	1013	E		
				WB Through	1054	39	204	1013	D		
				WB Right	99	1	0	0	A		
26- MD 117 at Bureau Dr											
26	NB	46.3	D	NB Left	99	71	73	273	E	36.1	D
				NB Through	34	79	73	273	E		
				NB Right	271	33	73	273	C		
	SB	73.8	E	SB Left	284	86	122	376	F		
				SB Through	22	81	122	376	F		
				SB Right	83	28	122	376	C		
	EB	30.0	C	EB Left	52	52	164	863	D		
				EB Through	1695	29	166	863	C		
				EB Right	6	35	160	853	D		
	WB	30.7	C	WB Left	14	37	175	983	D		
				WB Through	1260	33	176	983	C		
				WB Right	210	18	202	1032	B		
27- MD 117 at I-270 SB off ramp											
27	NB			NB Left	0	0	0	0	A	12.2	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	3.2	A	EB Left	0	0	0	0	A		
				EB Through	951	3	4	354	A		
				EB Right	0	0	0	0	A		
	WB	40.6	E	WB Left	303	41	97	780	E		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
28- MD 117 at I-270 NB off ramp											
28	NB			NB Left	0	0	0	0	A	21.8	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	76.5	E	SB Left	97	77	1947	2557	E		
				SB Through	0	0	0	0	A		
				SB Right	364	76	1948	2556	E		
	EB	17.0	B	EB Left	4	83	81	971	F		
				EB Through	949	17	81	971	B		
				EB Right	0	0	0	0	A		
	WB	7.0	A	WB Left	0	0	0	0	A		
				WB Through	1396	7	48	387	A		
				WB Right	0	0	48	387	A		
29- MD 117 at Perry Pkwy											
29	NB	38.1	D	NB Left	19	55	15	122	D	48.5	D
				NB Through	26	52	15	122	D		
				NB Right	33	18	23	142	B		
	SB	158.6	F	SB Left	242	194	276	445	F		
				SB Through	21	216	276	445	F		
				SB Right	118	75	276	445	E		
	EB	21.0	C	EB Left	219	71	78	329	E		
				EB Through	779	7	78	330	A		
				EB Right	29	6	64	314	A		
	WB	40.7	D	WB Left	36	108	246	739	F		
				WB Through	1252	41	246	739	D		
				WB Right	380	32	246	739	C		
30- Shady Grove Rd at I-270 NB off ramp											
30	NB	7.2	A	NB Left	0	0	0	0	A	41.9	D
				NB Through	941	7	28	335	A		
				NB Right	0	0	0	0	A		
	SB	73.0	E	SB Left	0	0	0	0	A		
				SB Through	954	73	337	780	E		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	52.9	D	WB Left	267	53	49	248	D		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table D.15: PM Peak - 2040 Adaptive Ramp Metering- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
31- Shady Grove Rd at I-270 SB off ramp											
31	NB	15.6	B	NB Left	0	0	0	0	A	21.8	C
				NB Through	1262	16	380	1767	B		
				NB Right	0	0	0	0	A		
	SB	5.9	A	SB Left	0	0	0	0	A		
				SB Through	657	6	7	166	A		
				SB Right	0	0	0	0	A		
	EB	55.6	E	EB Left	233	55	45	183	E		
				EB Through	0	0	0	0	A		
				EB Right	307	56	61	254	E		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
32- MD 28 at I-270 SB off ramp											
32	NB			NB U-Turn	0	0	0	0	A	8.6	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	37.5	D	SB Left	406	46	71	318	D		
				SB Through	0	0	0	0	A		
				SB Right	95	3	0	38	A		
	EB	3.6	A	EB Left	0	0	0	0	A		
				EB Through	1560	2	30	512	A		
				EB Right	932	6	16	269	A		
	WB	7.3	A	WB Left	0	0	0	0	A		
				WB Through	1707	7	23	336	A		
				WB Right	0	0	0	0	A		
33- MD 28 at I-270 on and off ramps											
33	NB	38.1	D	NB Left	0	0	41	209	A	56.2	E
				NB Through	186	50	49	218	D		
				NB Right	123	21	49	218	C		
	SB	141.9	F	SB Left	20	169	351	422	F		
				SB Through	0	0	0	0	A		
				SB Right	286	140	351	422	F		
	EB	38.3	D	EB Left	276	131	183	379	F		
				EB Through	919	11	183	379	B		
				EB Right	0	0	0	0	A		
	WB	56.8	E	WB Left	41	51	224	429	D		
				WB Through	1279	57	199	392	E		
				WB Right	0	0	0	0	A		
34- MD 189 at Great Falls Rd											
34	NB	37.6	D	NB Left	43	48	11	87	D	30.5	C
				NB Through	14	46	9	86	D		
				NB Right	19	8	9	97	A		
	SB	21.7	C	SB Left	17	45	18	243	D		
				SB Through	13	46	18	243	D		
				SB Right	382	20	52	257	B		
	EB	24.9	C	EB Left	396	45	165	1310	D		
				EB Through	634	14	10	200	B		
				EB Right	54	9	17	236	A		
	WB	41.4	D	WB Left	14	31	133	678	C		
				WB Through	803	42	133	677	D		
				WB Right	17	33	154	711	C		
35- MD 189 at I-270 Ramps											
35	NB	49.2	D	NB Left	224	49	41	163	D	54.3	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	62.8	E	SB Left	345	63	148	725	E		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	30.5	C	EB Left	479	36	93	350	D		
				EB Through	373	23	93	350	C		
				EB Right	0	0	0	0	A		
	WB	76.8	E	WB Left	416	83	104	292	F		
				WB Through	403	70	104	292	E		
				WB Right	0	0	0	0	A		
36- MD 189 at Wootton Pkwy											
36	NB	46.2	D	NB Left	237	58	144	489	E	52.9	D
				NB Through	694	51	144	489	D		
				NB Right	176	12	144	489	B		
	SB	84.6	F	SB Left	251	107	297	789	F		
				SB Through	931	79	321	776	E		
				SB Right	0	0	0	0	A		
	EB	38.2	D	EB Left	152	72	120	456	E		
				EB Through	554	38	120	456	D		
				EB Right	205	15	120	456	B		
	WB	39.2	D	WB Left	155	74	133	678	E		
				WB Through	755	41	133	678	D		
				WB Right	306	18	133	678	B		
37- Montrose Rd at Tower Oaks Blvd											
37	NB	0.4	A	NB Left	0	0	0	0	A	50.7	D
				NB Through	0	0	0	0	A		
				NB Right	538	0	0	0	A		
	SB	362.2	F	SB Left	83	74	760	1248	E		
				SB Through	0	0	0	0	A		
				SB Right	267	452	795	1245	F		
	EB	7.4	A	EB Left	0	0	0	0	A		
				EB Through	1865	7	42	516	A		
				EB Right	0	0	0	0	A		
	WB	50.2	D	WB Left	77	35	42	516	C		
				WB Through	2215	52	319	776	D		
				WB Right	237	36	319	776	D		
38- Tower Oaks Blvd at I-270 off ramp											
38	NB	24.1	C	NB Left	705	24	51	254	C	25.4	C
				NB Through	0	0.0	44	246	A		
				NB Right	26	23.5	51	254	C		
	SB	17.1	B	SB Left	9	31.4	1	40	C		
				SB Through	0	0.0	1	39	A		
				SB Right	9	2.7	0	23	A		
	EB	37.4	D	EB Left	1	11.0	56	216	B		
				EB Through	357	37.5	56	216	D		
				EB Right	36	36.7	51	207	D		
	WB	13.9	B	WB Left	130	18.6	16	168	B		
				WB Through	184	10.6	16	168	B		
				WB Right	2	6.5	4	124	A		
39- Montrose Rd at Tower Oaks Blvd											
39	NB	19.3	B	NB Left	97	41	79	380	D	44.2	D
				NB Through	773	30	79	380	C		
				NB Right	621	2	0	0	A		
	SB	31.5	C	SB Left	211	63	74	329	E		
				SB Through	506	23	72	328	C		
				SB Right	131	15	69	279	B		
	EB	129.4	F	EB Left	103	110	345	678	F		
				EB Through	519	132	347	678	F		
				EB Right	44	141	369	702	F		
	WB	36.8	D	WB Left	507	46	102	410	D		
				WB Through	421	43	103	410	D		
				WB Right	290	13	122	441	B		
40- Rockledge Blvd at I-270 NB on and off ramp											
40	NB	138.5	F	NB Left	0	0	0	0	A	116.5	F
				NB Through	333	126	580	847	F		
				NB Right	848	143	580	847	F		
	SB	86.3	F	SB Left	0	0	88	224	A		
				SB Through	349	86	88	224	F		
				SB Right	0	0	0	0	A		
	EB	96.4	F	EB Left	6	184	299	813	F		
				EB Through	455	151	299	813	F		
				EB Right	299	12	0	0	B		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table D.15: PM Peak - 2040 Adaptive Ramp Metering- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS	
41- Rockledge Blvd at I-270 SB on and off ramps												
41	NB	32.8	C	NB Left	339	33	81	261	C	48.9	D	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	53.3	D		WB Left	351	58	192	722			E
					WB Through	891	51	192	722			D
					WB Right	0	0	0	0			A
42- MD 187 at Tuckerman Ln												
42	NB	74.3	E	NB Left	217	49	631	1323	D	132.1	F	
				NB Through	2288	76	631	1323	E			
				NB Right	201	80	631	1323	F			
	SB	187.9	F		SB Left	205	169	2556	2681			F
					SB Through	1145	185	2556	2681			F
					SB Right	304	210	2556	2681			F
	EB	113.9	F		EB Left	301	63	514	1368			E
					EB Through	533	139	515	1369			F
					EB Right	118	130	539	1393			F
	WB	194.6	F		WB Left	466	189	1933	2138			F
					WB Through	675	210	1933	2138			F
					WB Right	166	145	1933	2138			F
43- MD 187 at I-270 NB on and off ramps												
43	NB	19.2	B	NB Left	562	35	130	410	D	22.0	C	
				NB Through	2498	16	130	410	B			
				NB Right	0	0	0	0	A			
	SB	25.0	C		SB Left	0	0	0	0			A
					SB Through	1286	25	65	299			C
					SB Right	0	0	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	58.7	E		WB Left	60	58	44	274			E
					WB Through	68	59	44	274			E
					WB Right	0	0	0	0			A
44- MD 187 at I-270 NB on and off ramps												
44	NB	47.5	E	NB Left	0	0	0	0	A	43.2	D	
				NB Through	2416	48	205	933	D			
				NB Right	0	0	0	0	A			
	SB	18.9	B		SB Left	149	58	72	305			E
					SB Through	1199	14	72	305			B
					SB Right	0	0	0	0			A
	EB	70.7	E		EB Left	643	72	180	669			E
					EB Through	0	0	180	669			A
					EB Right	178	65	99	604			E
	WB				WB Left	0	0	0	0			A
					WB Through	0	0	0	0			A
					WB Right	0	0	0	0			A
45- MD 187 at Rock Spring Dr												
45	NB	20.3	C	NB Left	492	36	118	783	D	30.0	C	
				NB Through	2181	17	118	784	B			
				NB Right	18	13	139	817	B			
	SB	36.4	D		SB Left	21	59	119	588			E
					SB Through	1187	41	119	588			D
					SB Right	173	1	72	582			A
	EB	48.6	D		EB Left	431	60	141	511			E
					EB Through	50	64	141	511			E
					EB Right	484	37	141	511			D
	WB	17.1	B		WB Left	7	30	6	108			C
					WB Through	16	33	6	108			C
					WB Right	36	8	3	97			A
47-Democracy Blvd at I-270 NB off ramp												
47	NB	44.0	D	NB Left	152	44	28	146	D	2.9	A	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB	1.2	A		EB Left	0	0	0	0			A
					EB Through	1151	1	3	54			A
					EB Right	0	0	0	0			A
	WB	1.0	A		WB Left	0	0	0	0			A
					WB Through	2240	1	3	57			A
					WB Right	0	0	0	0			A
48- Democracy Blvd at I-270 SB on ramp												
48	NB			NB Left	0	0	0	0	A	8.1	A	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB	5.3	A		EB Left	0	0	0	0			A
					EB Through	1364	5	19	249			A
					EB Right	0	0	0	0			A
	WB	9.8	A		WB Left	553	33	55	351			C
					WB Through	1825	3	44	330			A
					WB Right	0	0	0	0			A
49- Democracy Blvd at I-270 SB off ramp												
49	NB			NB Left	0	0	0	0	A	8.2	A	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB	37.4	D		SB Left	153	51	29	179			D
					SB Through	0	0	0	0			A
					SB Right	59	3	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	5.1	A		WB Left	0	0	0	0			A
					WB Through	1825	4	19	288			A
					WB Right	160	20	80	685			B
50- MD 190 at Burdette Rd												
50	NB	76.5	E	NB Left	27	79	18	118	E	38.0	D	
				NB Through	7	69	18	118	E			
				NB Right	6	75	18	118	E			
	SB	35.9	D		SB Left	45	76	25	158			E
					SB Through	9	70	25	158			E
					SB Right	122	19	25	158			B
	EB	25.1	C		EB Left	137	107	135	710			F
					EB Through	1293	17	135	710			B
					EB Right	30	4	129	737			A
	WB	45.9	D		WB Left	13	117	396	1108			F
					WB Through	2146	46	396	1108			D
					WB Right	65	37	396	1108			D

Table D.15: PM Peak - 2040 Adaptive Ramp Metering- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
51- MD 190 at I-270 NB on ramp											
51	NB			NB Left	0	0	0	0	A	17.8	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	66.1	E	EB Left	253	66	101	354	E		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	9.4	A	WB Left	0	0	0	0	A		
WB Through				1465	9	51	832	A			
WB Right				0	0	0	0	A			
52- MD 190 at I-270 SB off ramp											
52	NB	73.2	E	NB Left	230	73	98	913	E	12.8	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	3.5	A	EB Left	0	0	0	0	A		
				EB Through	1062	4	8	187	A		
				EB Right	0	0	0	0	A		
	WB	10.3	B	WB Left	0	0	0	0	A		
WB Through				1633	10	26	530	B			
WB Right				0	0	0	0	A			
53- MD 190 at Seven Locks Rd											
53	NB	0.5	A	NB Left	28	1	0	0	A	26.8	C
				NB Through	314	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	52.8	D	SB Left	364	53	120	414	D		
				SB Through	232	53	120	414	D		
				SB Right	20	52	120	414	D		
	EB	32.0	C	EB Left	27	29	95	437	C		
				EB Through	800	32	95	437	C		
				EB Right	45	32	95	437	C		
	WB	20.6	C	WB Left	255	75	123	506	E		
WB Through				908	17	123	506	B			
WB Right				693	5	123	506	A			
54- MD 124 at I-270 NB off ramp											
54	NB	30.3	C	NB Left	0	0	0	0	A	22.6	C
				NB Through	0	0	0	0	A		
				NB Right	537	30	52	649	C		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	20.1	C	EB Left	0	0	0	0	A		
				EB Through	1640	20	52	1002	C		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
WB Through				0	0	0	0	A			
WB Right				0	0	0	0	A			
55- Democracy Blvd at I-270 NB off ramp											
55	NB	48.5	D	NB Left	0	0	0	0	A	11.5	B
				NB Through	0	0	0	0	A		
				NB Right	313	48	51	225	D		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	1.5	A	EB Left	0	0	0	0	A		
				EB Through	1153	1	4	61	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
WB Through				0	0	0	0	A			
WB Right				0	0	0	0	A			
56- Watkins Mill Rd at I-270 SB off ramp/Parkview Ave											
56	NB	67.0	E	NB Left	145	51	152	619	D	87.3	F
				NB Through	0	0	0	0	A		
				NB Right	344	74	152	619	E		
	SB	44.4	D	SB Left	405	65	118	424	E		
				SB Through	110	61	118	424	E		
				SB Right	441	22	118	424	C		
	EB	143.1	F	EB Left	0	0	0	0	A		
				EB Through	1220	143	959	1251	F		
				EB Right	4	125	959	1251	F		
	WB	41.7	D	WB Left	67	92	57	228	F		
WB Through				315	31	54	226	C			
WB Right				0	0	0	0	A			
57- Watkins Mill Rd at I-270 NB on ramp											
57	NB	36.7	D	NB Left	72	71	37	416	E	65.0	E
				NB Through	0	0	0	0	A		
				NB Right	180	23	37	416	C		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	24.3	C	EB Left	642	61	135	451	E		
				EB Through	1052	2	135	451	A		
				EB Right	0	0	0	0	A		
	WB	131.4	F	WB Left	0	0	0	0	A		
WB Through				761	107	615	872	F			
WB Right				386	180	615	872	F			
58- Watkins Mill Rd at I-270 SB on ramp											
58	NB			NB Left	0	0	0	0	A	16.3	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	16.4	B	EB Left	0	0	0	0	A		
				EB Through	1686	18	149	596	B		
				EB Right	286	8	149	596	A		
	WB	15.9	B	WB Left	458	28	60	488	C		
WB Through				377	1	60	488	A			
WB Right				0	0	0	0	A			

Table D.16: PM Peak - 2040 Adaptive Ramp Metering- I-270 Vehicle Network Performance

	No-Build	ARM	% Change
Total Delay	36,237,078	36,442,816	1%
Average Delay per Vehicle	307	309	1%
Total Travel Time	67,865,560	68,043,530	0%
Vehicles (Arrived)	95,124	94,948	0%
Latent Demand	8,861	9,170	3%
Latent Delay	13,484,325	14,252,737	6%
Total Distance	477,455	477,055	0%
Average Speed	25	25	0%

Larry Hogan, *Governor*
Boyd K. Rutherford, *Lt. Governor*



Pete K. Rahn, *Secretary*
Gregory C. Johnson, P.E., *Administrator*

November 30, 2016

Brian Quinlan, P.E.
Parsons Construction Group, Inc.
10 East Baltimore Street, Suite 801
Baltimore MD 21202

Dear Mr. Quinlan:

The Maryland Department of Transportation's State Highway Administration's (SHA) is in receipt of Proposed Technical Concept (PTC) No. 3 for the I-270 Innovative Congestion Management Progressive Design-Build contract (Contract No. MO0695172), submitted by your Design-Build Team on November 17, 2016. The SHA has completed our review of the PTC and offers the following comments for your consideration in the further development of your technical concepts and proposal:

1. Generally, the concept appears to be a reasonable solution to address the goals of this contract.
2. The PTC does not commit to any particular algorithm. Could the selection of the algorithm affect costs, which would in turn affect the level of improvements the budget can accommodate? If so, and the Design-Builder defers the decision for which algorithm to utilize until after Notice to Proceed, please add a note that the Design-Builder has considered the costs of any algorithm for the proposed improvements. Also, consider making a recommendation or commitment concerning which algorithm to use based on your knowledge of the algorithms, I-270 corridor, and contract goals.
3. Adaptive metering is most effective when all entrance ramps are metered; however, this PTC does not meter the freeway connector ramps from I-370. Other states have successfully implemented freeway connector metering. Are there conditions that prevent the metering of the I-370 ramps? If so, can the Design-Builder propose improvements that could change those conditions to make freeway connector metering feasible at I-370?
4. Page 1, Section A, Description: The PTC indicates that the Ramp metering will use "...two and/or three..." head traffic signals. We would request that an assessment of the pros and cons of each configuration be presented and a specific recommendation made.

My telephone number/toll-free number is 410-545-8800 or 1-888-228-6971
Maryland Relay Service for Impaired Hearing or Speech 1.800.735.2258 Statewide Toll Free


Street Address: 707 North Calvert Street • Baltimore, Maryland 21202 • Phone 410.545.0300 • www.roads.maryland.gov

5. Page 3, Section A, Description: The PTC presents three potential operational modes: Time of Day, Responsive Ramp Metering Control or Adaptive Ramp Metering Control (ARMC); however, the recommended mode, ARMC, is presented later in the document under Section B, Location. This presentation in the document was a bit confusing (i.e. at first it seemed as though the PTC wasn't going to propose a specific mode of operation for ramp metering).
6. Page 4, Traffic Analysis: The Administration recognizes the difficulties associated with modeling ramp metering and appreciate the attempts to demonstrate the mobility benefits of this PTC. Please ensure that all assumptions made during your modeling efforts are documented so the Administration can efficiently follow your methodologies and analysis techniques.
7. Page 4, Section C, Analysis: Although the rationale for not modeling ARMC (i.e. the complexity of modeling this mode of operational) is understood, we're not sure what the mode that was modeled (Fixed Time of Day) reveals, since the performance dynamics are significantly different.
8. Page 6, Section C, Analysis, Safety: The safety improvements to I-270 mainline operations are intuitive (due to smoother merging and traffic flow), but there could also be an expectation that the occurrence of collisions on the ramps might increase due to queued traffic.
9. Page 7, Analysis, Operability, Maintainability, Adaptability: There will be Operations and Maintenance expenses associated with any active traffic management. It is understood that this project will not include funding for ongoing Operations and Maintenance. However, per the goal of providing a sustainable solution, we would anticipate the final technical solution would include a plan and estimate of the operations and maintenance requirements and costs, in order to program ongoing support and provide documentation and justification for the required Operational Budget enhancements.

Any questions or communications regarding the response to this PTC should be directed to Mr. Jason A. Ridgway, Director, Office of Highway Development at the project specific email address, MO069_IS_270@sha.state.md.us.

Sincerely,



 Jason A. Ridgway, P.E.
Director, Office of Highway Development

cc: Olu Adeyinka, P.E., DBIA, Parsons Transportation Group, Inc.

Responses to SHA Comments on PTC No. 5 Connected Vehicles

1 COMMENT: Maryland acknowledges the important role that data shared with Connected Vehicles will most likely play, influencing traffic management in the near future. However, the Administration is skeptical that the deployment of Connected Vehicle (CV) technology will realize the Mobility and Safety benefits stated on page 6, both immediately after construction and in the future. Immediately, because not enough vehicles will be equipped with the technology, and in the future because the technology may not gain traction within a reasonable timeframe, as implied in the PTC under the Administration’s Risk section.

RESPONSE: No response required.

PTC REFERENCE: None.

2 COMMENT: Section E, Other Projects: The RFP requested other projects on which the PTC has been used and the degree of success or failure of such usage. All the projects presented in this section are either prototypes or pilot projects that have yet to be constructed. The Administration understands this data is perhaps the best available for a technology as young as CVs, yet the lack of real life projects only underscores the risk presented in the Administration’s Risk section.

RESPONSE: Parsons acknowledges that there is some risk due to the low level of deployment to date. As a result, we have altered the nature and scope of our proposed solution to focus on cellular phone applications, rather than one that requires deployment of device infrastructure on the corridor. The base programming for these applications is available from the FHWA Open Source Application Development Portal (OSADP). Parsons’ role will be to adapt them to the IS 270 corridor and make them available for free download to users, and tie them to the Parsons Intelligent NETWORKS® ATMS. This reduces costs substantially, also reducing risk. Parsons believes that this is an important first

step in preparing the corridor for future CV capabilities.

PTC REFERENCE: See additional text in section titled “B. Location.”

3 COMMENT: Page 1, Section A, Description: The current Federal guidance on Connected Vehicles is broad, encompassing all potential applications that could be supported by Vehicle to Vehicle (V2V) and Vehicle to Infrastructure (V2I) systems. The PTC should present a recommended plan to leverage the state-of-the-practice, within the scope of the I-270 Innovative Congestion Management project. As presented, the PTC includes a broad array of possible service packages, and summarizes two as examples.

RESPONSE: Parsons now proposes five specific capabilities to be delivered under a single cell phone application.

PTC REFERENCE: See additional text in section titled “B. Location.”

4 COMMENT: Page 4, Section A, Description: The two examples provided; Speed Harmonization and Queue Warning, are services already addressed by traditional means (roadway sensors and signing) in the other PTC’s.

RESPONSE: These capabilities are, as SHA notes, included in other PTCs. However, deploying them via a cell phone application will: 1) Supplement/complement those systems to ensure that motorists are adequately warned of downstream conditions at the earliest possible point, rather than forcing them to wait for the next roadside notification, which they may miss, and 2) “plants the seeds” for the eventual evolution away from fixed roadside infrastructure by making motorists familiar with and comfortable heeding information delivered directly to in-vehicle devices, which will evolve away from cell phone applications to built-in

vehicle systems with the next generation of automobiles.

PTC REFERENCE: See additional text in section titled “B. Location.”

- 5 COMMENT:** Page 5, Section B, Location: The proposal presents 4 different deployment scenarios, which makes it challenging to assess the feasibility and value of the overall PTC. We would suggest that the Design-Builder assess the relative merits and provide a recommended deployment scenario that would be achievable within the scope of the project.

RESPONSE: PTC has been modified to specifically stipulate what Parsons will deploy.

PTC REFERENCE: See additional text in section titled “B. Location.”

- 6 COMMENT:** Page 8, Section C, Analysis: The benefits presented (e.g. 8. Reduce Number of Primary Crashes: 75% near term to 95% long term) are based on the projected widespread, substantial deployment of a Connected Vehicle Infrastructure, likely in combination with Automated Vehicle Control technology. It’s difficult to tie these benefits to what would be deployable as part of the I-270 Innovative Congestion Management project. From the 4 scenarios, it would involve either incentivizing 5000 motorist to equip their vehicles with CV units, and/or deploying 192 DSRC RSU’s; neither of which would have a substantial impact on I-270 traffic.

RESPONSE: Parsons understands that for the benefits to accrue, a substantial portion of the vehicles on the corridor would need to be equipped with the applications, which is why we revised our deployment plan to provide cell phone applications at no cost, and provide an extensive outreach program to inform motorists, which will accelerate adoption significantly.

PTC REFERENCE: See additional text in section titled “B. Location.”

- 7 COMMENT:** Page 12, Section D, Potential Impacts: It may be difficult (by regulations and policies) for the State to incentivize motorist to install Connected Vehicle devices in their vehicles. Also, 5000 equipped vehicles seem too low a penetration rate compared to 240,000 vehicles per day to be usable for traffic management purposes.

RESPONSE: Parsons understands that for the benefits to accrue, a substantial portion of the vehicles on the corridor would need to be equipped with the applications, which is why we revised our deployment plan to provide cell phone applications at no cost, and provide an extensive outreach program to inform motorists, which will accelerate adoption significantly.

PTC REFERENCE: See additional text in section titled “B. Location.”

- 8 COMMENT:** Page 12, Section D, Potential Impacts: Regarding the 192 DSRC RSU’s, we would like additional discussion and information on the management of the CV data; how it would be collected, managed, processed and archived. What rights and license would the State have to access and use the data for other applications?

RESPONSE: Parsons acknowledges the value of the operational data that the application will produce, and will make consent for the use of this data for analytical purposes a pre-condition for the download of the data. Users will be permitted to download and use the application without granting consent, in a manner similar to that employed by existing traffic information services (e.g., Google, WAZE).

PTC REFERENCE: See additional text in section titled “D. Potential Impacts.”

05 Connected Vehicles

A. Description

The USDOT Connected Vehicle (CV) initiative has the potential to be highly transformative of the national transportation system. By connecting vehicles to each other and to the infrastructure through ubiquitous high-capacity wireless communications, it provides a foundation for the development and deployment of devices and applications that may ultimately change the way the transportation system is used and managed. In doing so, it facilitates the USDOT's efforts to "enhance safety, mobility, and the quality of life for all Americans."

In 2014, the National Highway Traffic Safety Administration (NHTSA) proposed to create a new Federal Motor Vehicle Safety Standard (FMVSS), FMVSS No. 150, to require vehicle-to-vehicle (V2V) communication capability for light vehicles (passenger cars and light truck vehicles (LTVs)) and to create minimum performance requirements for V2V devices and messages. The agency believes that requiring V2V communication capability in new light vehicles would facilitate the development and introduction of a number of advanced vehicle safety applications. An extension of these CV applications includes Vehicle-to-Infrastructure (V2I) and/or V2V applications called Dynamic Mobility Applications (DMA) that are designed to increase mobility (e.g. improve vehicle throughput, reduce travel times, etc.).

There are a number of key Connected Vehicle (CV) Dynamic Mobility Applications (DMA) designed to meet the two primary IS 270 performance benefits goal areas of: 1) Increased Throughput and 2) Improved Safety. The DMAs applicable to IS 270 are described below:

- **Integrated Network Flow Optimization (INFLO)** is the DMA Bundle that includes the following three applications:
 - **Dynamic Speed Harmonization (SPD-HARM)** - The objective of speed harmonization is to dynamically adjust and coordinate maximum appropriate vehicle speeds in response to downstream congestion, incidents, and weather or road conditions in order to maximize traffic throughput and reduce crashes. Research and experimental evidence have consistently demonstrated that by that reducing speed variability among vehicles, especially in near-onset flow breakdown conditions, traffic throughput is improved, flow breakdown formation is delayed or even eliminated, and collisions and severity of collisions are reduced.
 - **Queue Warning (Q-WARN)** - The objective of queue warning is to provide a vehicle operator sufficient warning of impending queue backup in order to brake safely, change lanes, or modify route such that secondary collisions can be minimized or even eliminated.
 - **Cooperative Adaptive Cruise Control (CACC)** - The objective of cooperative adaptive cruise control (or CACC) is to dynamically and

automatically coordinate cruise control speeds among platooning vehicles in order to significantly increase traffic throughput. By tightly coordinating in-platoon vehicle movements, headways among vehicles can be significantly reduced, resulting in a smoothing of traffic flow and an improvement in traffic flow stability. Additionally, by reducing drag, shorter headways can result in improved fuel economy and provides the environmental benefits of lowered energy consumption and reduced greenhouse gas emissions.

- **Response, Emergency Staging, Communications, Uniform Management, and Evacuation (R.E.S.C.U.M.E.)** is a DMA application bundle consisting of four individual components:
 - Incident Scene Pre-Arrival Staging Guidance for Emergency Responders (RESP-STG)
 - Incident Scene Work Zone Alerts for Drivers and Workers (INC-ZONE)
 - Emergency Communications and Evacuation (EVAC)
 - Advanced Automated Crash Notification Relay (AACN - RELAY)

When accidents, especially serious ones, occur on a roadway like IS 270 overall throughput is greatly impacted while incident responders, traffic management teams, HAZMAT crews, etc. perform their job functions in order to clear the scene and bring the roadway back to normal traffic flow. However, there is a great deal of inefficiency in the process, (e.g. details on nature of the incident and its impact). With this bundle, emergency responders can instantly know the exact nature of the accident. Now responders can respond instantly and accurately as opposed to today when it takes a great deal of time to obtain the true nature of the accident. Through RESCUME, a wide variety of data will be collected from various vehicles and subsystems including autos, commercial vehicles, transit vehicles, roadside infrastructure, roadside subsystems and other location data sources. These data will be collected into the correct data environments via the data capture subsystems and then be made available to the R.E.S.C.U.M.E. bundle of applications.

- **Motorist Advisories and Warning (MAW)** – Through this CV application, advisories can automatically be pushed into the vehicles at any point during their journey and appear on the vehicle's dashboards or aftermarket devices. This can include information on major delays, hazmat spills, major accidents, etc. Motorists can take actions much sooner (e.g. take a different route, delay their trip) thus improving conditions on IS 270
- **Weather Responsive Traffic Information (WxTINFO)** – Today, traffic management centers depend on weather radar, media weather reports and spot weather stations which in most cases provide somewhat general information on weather conditions, e.g. "30% chance of rain or snow", "potentially icy conditions". Through connected vehicle, this information can become very precise. We can see exactly which cars have their wipers

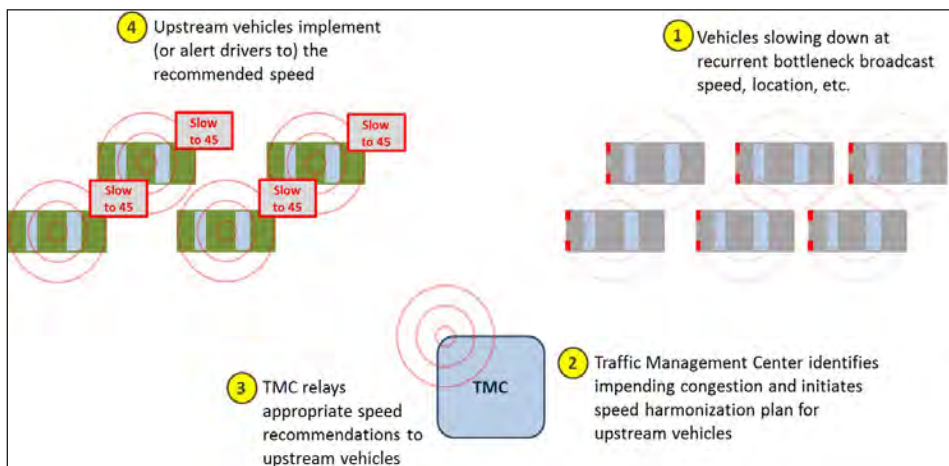
on and at what rate. We can see the measured outside temperature of every vehicle. Through this, we can advise motorists very precisely on weather and issue advisories which will help prevent accidents, e.g. “HEAVY RAINFALL IN 1.5 MILES, PLEASE SLOW SPEED TO 40 MPH”

- **Probe Enabled Traffic Monitoring** – Through CV, all vehicles become traffic probes where we can obtain precise information on lane-by-lane speeds and volumes directly from the vehicles. Through this, we will have the most accurate traffic monitoring possible, eventually replacing all intrusive and non-intrusive sensors. In turn, our management algorithms for variable speed limits, ramp metering, travel time calculations will be the most accurate which will help the efficiency of all throughput based management concepts.
- **ICM Decision Support Services** – Current ICM Decision Support is based upon directing motorists to alternate routes and modes using traditional methods (e.g. dynamic message signs on the highway or arterials). Through CV, we can tell motorists to take alternate routes around and incident and get back on the highway, thus increasing the end-to-end throughput on IS 270. This allows us to use the available capacity on all routes to manage IS 270 congestion.
- **Reduced Speed/Work Zone Warnings** – When maintenance or roadwork activities occur on IS 270, typically motorists are advised of this using message signs on the highway asking motorists to “SLOW DOWN, ROADWORK AHEAD”. Through CV, we can provide the information in a more timely and accurate manner directly into the vehicle. We can also advise the motorist long before the work zone area and direct them to alternate routes well before they hit the bumper-to-bumper congestion often associated with this type of work.

EXAMPLE IS 270 CONNECTED VEHICLE APPLICATION #1 – SPEED HARMONIZATION

The INFLO SPD-HARM application concept utilizes connected vehicle V2V and V2I communication to detect the prevailing roadway or congestion conditions that might necessitate speed harmonization, to generate the appropriate response plans and speed recommendation strategies for upstream traffic, and to broadcast such recommendations to the affected vehicles. See Figure 1.

Figure 1: Speed Harmonization via Connected Vehicle

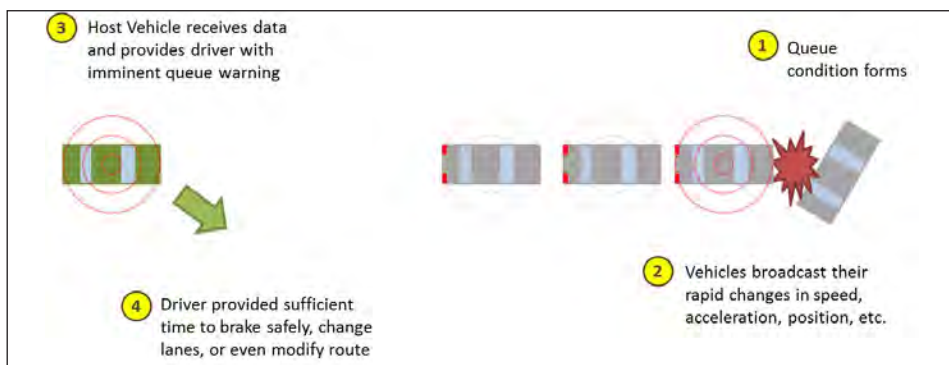


The SPD-HARM concept reflects an operational environment in which speed recommendation decisions are made at a Maryland CHART TMC and then communicated to the affected traffic area vehicles. This can and should be done in close coordination and “synchronization” with the Variable Speed Limit (VSL) signing on the highway. In such an environment, the SPD-HARM application is considered to reside CHART TMC and be external to the vehicle. This approach was taken because it was agreed that effective speed harmonization requires the coordination of traffic across large portions of the road network, a task not well suited to ad-hoc vehicle-to-vehicle communication.

EXAMPLE IS 270 CONNECTED VEHICLE APPLICATION #2 – QUEUE WARNING (Q-WARN)

The INFLO Q-WARN application concept aims to minimize the occurrence and impact of traffic queues by utilizing connected vehicle technologies, including vehicle-to-infrastructure (V2I) and vehicle-to-vehicle (V2V) communications, whereby the vehicles within the queue event broadcast their queued status information (e.g., rapid deceleration, disabled status, lane location) to nearby upstream vehicles and to infrastructure-based central entities (such as the TMC) in order to minimize or prevent rear-end or other secondary collisions.

Figure 2: Queue Warning using Connected Vehicle



The conceptual Q-WARN application performs two essential tasks: queue determination (detection and/or prediction) and queue information dissemination. In order to perform these tasks, Q-WARN solutions can be vehicle-based or infrastructure-based or utilize a combination of each. See Figure 3 for a summary of the capabilities and advantages of these approaches for essential Q-WARN tasks.

Figure 3: Capabilities and Advantages of Approaches for Essential Q-WARN Tasks

Task	Vehicle-Based Q-WARN	Infrastructure-based Q-WARN
Queue determination – detection	Yes (less precise, wider range)	Yes (more precise, limited range)
Queue determination – prediction	No (insufficient visibility into traffic state)	Yes (able to monitor traffic state for given locations)
Queue information dissemination	Yes (V2V)	Yes (I2V)

B. Location

There are four (4) potential options for deploying this PTC for IS 270:

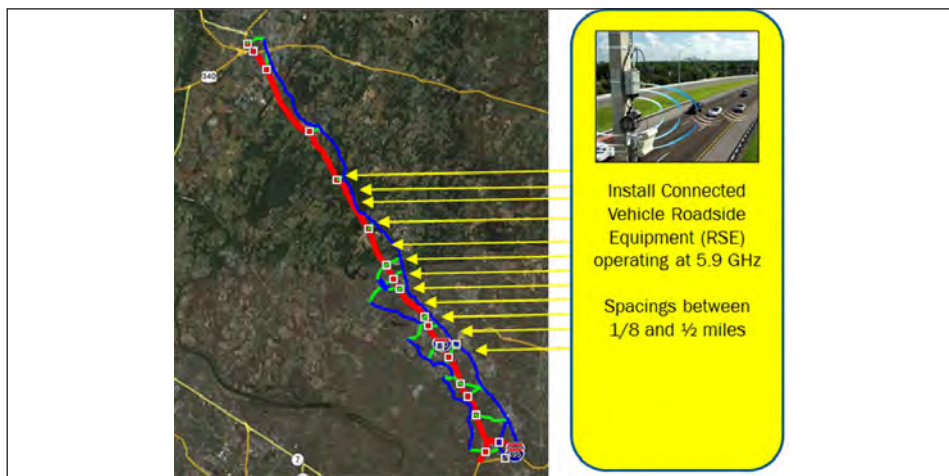
1. Deploy the system as a central transportation management center concept only (i.e. no field infrastructure). Most current CV thinking looks at 5.9GHz as the low latency communications for V2V safety applications (Between cars); however, for the dynamic mobility applications listed above, cellular communications such as 4G or 5G cellular will likely be leveraged to pull this “less time critical” data from the vehicle and then relay communications back into the vehicle (e.g. recommendations for lowering speed). Where available, we will leverage already developed DMA software available from the USDOT Open Data Portal repository and modify it as necessary. When the penetration of vehicles DSRC (5.9GHz) vehicles gradually increases, these applications will become more and more effective.
2. Deploy a “Connected Vehicle/DSRC Corridor”. This would entail installation of hardened DSRC Transceivers at regular intervals along the corridor (e.g. every ¼ to ½ mile). These transceivers would relay commands to and from the vehicles along IS 270 using low latency DSRC. This type of deployment would be much more expensive than option 1, but it would enable all V2V and V2I applications of which there are potentially 90 or more that could be investigated for deployment (e.g. numerous freight CV applications). See Figure 4.
3. Same as option 1, but includes an incentive program to retrofit existing vehicle with On-Board Units (OBU) which includes 5.9GHz DSRC transceivers.
4. Same as option 2, but includes an incentive program to retrofit existing vehicle with On-Board Units (OBU) which includes 5.9GHz DSRC transceivers.

RECOMMENDATION

Based upon feedback received in the initial PTC submittal, our recommendation is to move forward with implementing five (5) CV applications that can provide benefit now through the use of cell phone applications and cell phone probe tracking capabilities now. As CV technology penetrations occur (e.g. more vehicle become equipped with DSRC technology) and there is more extensive providing of CV technologies and applications through the USDOT testbeds, these applications can be switched to use in-vehicle and roadside CV technology (e.g. DSRC transceivers, V2V and V2I). For example, we can implement Speed Harmonization (SPD-HARM) using a cell phone application. We can collect the location of the vehicle, its current speed and then relay recommendation for speed reductions to the application based upon downstream congestion, incidents or weather alerts, This will compliment well with the other PTCs we have recommended such as the Variable Speed Limit Active Traffic Management (ATM) concept that we will be deploying using more traditional roadside signs. The five applications that we recommend deploying new use cellphone apps or aftermarket products are:

- Speed Harmonization (SPD-HARM)
- Queue Warning (Q-WARN)
- Probe Enabled Traffic Monitoring
- Motorist Advisory Warning (MAW)
- Weather Responsive Traffic Information (WxINFO)

Figure 4: Connected Vehicle Roadside Equipment Installation



C. Analysis



Mobility

Provide improvements that maximize vehicle throughput, minimize vehicle travel times, and create a more predictable commuter trip along IS 270.

The potential mobility benefits are estimated in Figures 5 and 6. A summary of the potential mobility improvements includes:

- 10-50% potential increase in throughput, depending on the penetration of connected vehicles
- Improved Travel times between 25 and 50%
- Improved Travel Time reliability up to 75%



Safety

Provide for a safer IS 270 corridor

The potential safety benefits are estimated in Figures 5 and 6, based upon estimates from the “USDOT Concept Development and Needs Identification for Intelligent Network Flow Optimization (INFLO) - Concept of Operations”. A summary of the potential safety improvements includes:

- Estimated reduction in secondary crashes: 15-50%
- Estimated reduction in fatalities: 25-50%
- Estimated reduction in the occurrence of shockwaves: up to 50%
- Estimated reduction in the severity of shockwaves: up to 50%



Operability/Maintainability/Adaptability

Provide improvements that minimize SHA operations and maintenance activities while being adaptable to future transportation technological advancements.

These connected vehicle applications can be deployed with little to no roadside infrastructure, making operability and maintainability extremely low. In addition, with the acceptance and deployment of connected vehicle technology, there are over 90 CV Dynamic Mobility Applications that can be considered for future deployment (See Figure 5). Most of these are references in the Connected Vehicle Reference Implementation Architecture (CVRIA). This allows for adaptability to any of the other applications referenced in the figure below, among many others:

Figure 5: Example Connected Vehicle Dynamic Mobility Applications (Source: USDOT)

V2I Safety	Environment	Mobility
Red Light Violation Warning Curve Speed Warning Stop Sign Gap Assist Spot Weather Impact Warning Reduced Speed/Work Zone Warning Pedestrian in Signalized Crosswalk Warning (Transit)	Eco-Approach and Departure at Signalized Intersections Eco-Traffic Signal Timing Eco-Traffic Signal Priority Connected Eco-Driving Wireless Inductive/Resonance Charging Eco-Lanes Management Eco-Speed Harmonization Eco-Cooperative Adaptive Cruise Control Eco-Traveler Information Eco-Ramp Metering Low Emissions Zone Management AFV Charging/ Fueling Information Eco-Smart Parking Dynamic Eco-Routing (light	Advanced Traveler Information System Intelligent Traffic Signal System (I-SIG) Signal Priority (transit, freight) Mobile Accessible Pedestrian Signal System (PED-SIG) Emergency Vehicle Preemption (PREEMPT) Dynamic Speed Harmonization (SPD-HARM) Queue Warning (Q-WARN) Cooperative Adaptive Cruise Control (CACC) Incident Scene Pre-Arrival Staging Guidance for Emergency Responders (RESP-STG) Incident Scene Work Zone Alerts for Drivers and Workers (INC-ZONE) Emergency Communications and Evacuation (EVAC) Connection Protection (T-CONNECT) Dynamic Transit Operations (T-DISP)
V2V Safety	Road Weather	Smart Roadside
Emergency Electronic Brake Lights (EEBL) Forward Collision Warning (FCW) Intersection Movement Assist (IMA) Left Turn Assist (LTA) Blind Spot/Lane Change Warning (BSW/LCW) Do Not Pass Warning (DNPW)	Motorist Advisories and Warnings (MAW) Enhanced MDSS Vehicle Data Translator (VDT) Weather Response Traffic Information (WxTINFO)	Wireless Inspection Smart Truck Parking
Agency Data		
Probe-based Pavement Maintenance Probe-enabled Traffic Monitoring Vehicle Classification-based Traffic Studies CV-enabled Turning Movement & Intersection Analysis CV-enabled Origin-Destination Studies Work Zone Traveler Information		



Well-Managed Project

Provide a Project Management and Work Plan that addresses communications, coordination and risk management, achieves a collaborative partnership with all members of the project team and stakeholders, and successfully advances the project goals.

Because many CV applications have already been prototyped, including the INFLO bundle, much of the implementation risk—including budgetary risk—is reduced substantially. For projects such as this, strict systems engineering process (SEE SE Process) as well as project management process resulting in PMBOK guidelines will be followed. If done correctly, this will result in a well-managed and successful project.

SYSTEM BENEFITS

Since the deployment of connected vehicle applications such as those above have only been done within small pilot corridors, there are not many projects which have directly measured the benefits. However, there are published USDOT Research Reports which have provided rough estimated benefits. See Figures 6 and 7 for estimated benefits for the Speed Harmonization and Queue Warning applications noted above. Within these tables, the references to “near, mid and long” make reference to the penetration of connected vehicles on our roadways.

Figure 6: Speed Harmonization Performance Improvements ¹

Goal	Performance Measure	Transformative Performance Target (near-, mid-, or long-term)
1. Reduce occurrence of traffic shockwaves	Number of shockwaves formed	<ul style="list-style-type: none"> Reduce number by 25% (near) Reduce number by 50% (mid) Reduce number by 75% (long)
2. Reduce severity of traffic shockwaves	Length of formed shockwaves	<ul style="list-style-type: none"> Reduce average shockwave length by 25% (near) Reduce average shockwave length by 50% (mid) Reduce average shockwave length by 75% (long)
	Propagation speed of formed shockwaves	<ul style="list-style-type: none"> Reduce average (backwards) shockwave propagation speed by 25% (near) Reduce average (backwards) shockwave propagation speed by 50% (mid) Eliminate (backwards) shockwave propagation (long)
3. Improve throughput	Vehicles per hour	<ul style="list-style-type: none"> 10% increase in number of vehicles per hour (near) 25% increase in number of vehicles per hour (mid) 50% increase in number of vehicles per hour (long)
4. Improve speed compliance	Compliance rate of posted or recommended speeds	<ul style="list-style-type: none"> 75% compliance (near) 95% compliance (mid) 100% compliance (long)
5. Improve smoothness of traffic flow	Variability (spread) of speeds within traffic stream (in-lane, between-lane, and over time)	<ul style="list-style-type: none"> 1/2/3 (near/mid/long) standard deviations of traffic speeds are within 2 mph of average stream speed
6. Improve expected travel time	Average travel time	<ul style="list-style-type: none"> Reduce average travel time delay by 10% (near) Reduce average travel time delay by 25% (mid) Reduce average travel time delay by 50% (long)
	Travel time reliability (over time)	<ul style="list-style-type: none"> Reduce buffer/planning time index by 25% (near) Reduce buffer/planning time index by 55% (mid) Reduce buffer/planning time index by 75% (long)

Figure 6: Speed Harmonization Performance Improvements ¹

Goal	Performance Measure	Transformative Performance Target (near-, mid-, or long-term)
7. Achieve user acceptance and support of system	Ratings on public opinion surveys	<ul style="list-style-type: none"> • 75% positive ratings of system (near) • 85% positive ratings of system (mid) • 95% positive ratings of system (long)
	Voluntary compliance with recommended SPD-HARM operating strategies	<ul style="list-style-type: none"> • 75% compliance of enabled vehicles (near) • 85% compliance of enabled vehicles (near) • 95% compliance of enabled vehicles (near)
8. Reduce number of primary crashes	Number of primary crashes	<ul style="list-style-type: none"> • 75% compliance of enabled vehicles (near) • 85% compliance of enabled vehicles (near) • 95% compliance of enabled vehicles (near)
9. Improve safety outcomes of crashes	Severity of crashes	<ul style="list-style-type: none"> • Reduce fatalities by 25% (near) • Reduce fatalities by 50% (mid) • Reduce fatalities by 75% (long) • Reduce serious injuries by 25% (near) • Reduce serious injuries by 50% (mid) • Reduce serious injuries by 75% (long)
10. Reduce number of secondary crashes	Number of secondary crashes	<ul style="list-style-type: none"> • Reduce number by 50% (near) • Reduce number by 75% (mid) • Zero secondary crashes (long)
11. Improve environmental impact of roadway	Level of CO2 (equivalent) emissions	<ul style="list-style-type: none"> • Reduce total roadway emissions levels by 25% (near) • Reduce total roadway emissions levels by 33% (mid) • Reduce total roadway emissions levels by 50% (long)
	Amount of energy consumed	<ul style="list-style-type: none"> • Reduce facility fuel consumption by 10% (near) • Reduce facility fuel consumption by 25% (mid) • Reduce facility fuel consumption by 50% (long)
12. Reduce speed harmonization-related system costs	Cost of SPD-HARM infrastructure and related systems construction	<ul style="list-style-type: none"> • Reduce infrastructure costs by 25% (near) • Reduce infrastructure costs by 50% (mid) • Reduce infrastructure costs by 75% (long)
	Cost of SPD-HARM infrastructure and related systems operations and maintenance	<ul style="list-style-type: none"> • Reduce infrastructure costs by 25% (near) • Reduce infrastructure costs by 50% (mid) • Reduce infrastructure costs by 75% (long)

Figure 7: Queue Warning Performance Improvements ²

Goal	Performance Measure	Transformative Performance Target (near-, mid-, or long-term)
1. Reduce secondary crashes at fixed queue points (Border crossings, ramp spillover locations, construction zones, etc.)	Number of secondary crashes at fixed queue point locations	<ul style="list-style-type: none"> • Reduce number by 50% (near) • Reduce number by 75% (mid) • Zero secondary crashes (long)
2. Reduce secondary crashes at variable locations (Due to incidents, weather, traffic stops, etc.)	Length of formed shockwaves	<ul style="list-style-type: none"> • Reduce number by 50% (near) • Reduce number by 75% (mid) • Zero secondary crashes (long)
3. Improve safety outcomes of queue-related crashes	Severity of crashes	<ul style="list-style-type: none"> • Reduce fatalities by 25% (near) • Reduce fatalities by 50% (mid) • Reduce fatalities by 75% (long) • Reduce serious injuries by 25% (near) • Reduce serious injuries by 50% (mid) • Reduce serious injuries by 75% (long)
4. Reduce intensity of formed queues	Length (distance) of formed queues at variable locations	<ul style="list-style-type: none"> • Reduce average length of formed queues by 50% (near) • Reduce average length of formed queues by 75% (mid) • Queue formation at variable locations eliminated (long)
	Duration of formed queues at variable locations	<ul style="list-style-type: none"> • Reduce average duration of formed queues by 50% (near) • Reduce average duration of formed queues by 75% (mid) • Queue formation at variable locations eliminated (long)
5. Reduce occurrence of traffic shockwaves upstream of queue	Number of shockwaves formed	<ul style="list-style-type: none"> • Reduce number by 25% (near) • Reduce number by 50% (mid) • Reduce number by 75% (long)
6. Reduce severity of traffic shockwaves	Average travel time	<ul style="list-style-type: none"> • Reduce average travel time delay by 10% (near) • Reduce average travel time delay by 25% (mid) • Reduce average travel time delay by 50% (long)
	Travel time reliability (over time)	<ul style="list-style-type: none"> • Reduce buffer/planning time index by 25% (near) • Reduce buffer/planning time index by 55% (mid) • Reduce buffer/planning time index by 75% (long)

Figure 7: Queue Warning Performance Improvements ²

Goal	Performance Measure	Transformative Performance Target (near-, mid-, or long-term)
7. Achieve user acceptance and support of system	Ratings on public opinion surveys	<ul style="list-style-type: none"> 75% positive ratings of system (near) 85% positive ratings of system (mid) 95% positive ratings of system (long)
	Voluntary compliance with recommended SPD-HARM operating strategies	<ul style="list-style-type: none"> 75% compliance of enabled vehicles (near) 85% compliance of enabled vehicles (mid) 95% compliance of enabled vehicles (long)
8. Accurately detect queue formation	Number of false positive queue detection alerts	<ul style="list-style-type: none"> 5% rate of false positive queue detection alerts (near) 1% rate of false positive queue detection alerts (mid) Zero false positive queue detection alerts (long)
	Number of non-detected queue events	<ul style="list-style-type: none"> 10% rate of non-detected queue events (near) 5% rate of non-detected queue events (mid) Zero non-detected queue events (long)
9. Reduce queue warning-related system costs	Cost of Q-WARN infrastructure and related systems construction	<ul style="list-style-type: none"> Reduce infrastructure costs by 25% (near) Reduce infrastructure costs by 50% (mid) Reduce infrastructure costs by 75% (long)
	Cost of Q-WARN infrastructure and related systems operations and maintenance	<ul style="list-style-type: none"> Reduce infrastructure costs by 25% (near) Reduce infrastructure costs by 50% (mid) Reduce infrastructure costs by 75% (long)

D. POTENTIAL IMPACTS

User Impacts: Through the deployment of these applications, users will experience improved throughput, travel times and significant reduction reduced accidents, injuries and deaths.

Right-of-Way: Very limited impact. If DSRC transceivers are installed (Option 2), they can be installed on existing poles or small poles with foundations can be installed, all within existing DOT right of way.

Geotechnical: Little geotechnical impact. If DSRC transceivers are installed (Option 2), they can be installed on existing poles or small poles with foundations can be installed.

Utilities: Very limited impact. If DSRC transceivers are installed (Option 2), they can be installed on existing poles or small poles with foundations can be installed. Electrical power will need to be dropped to each DSRC roadside unit.

Environmental Permitting: Small poles may need to be installed within existing DOT right of way. The level of ROW permitted is minimal to none.

Local Community: Since this relates to individual driver applications and behavior, local community engagement and involvement is not expected, perhaps some community outreach.

Safety: As identified in Tables 1 and 2 above, there are significant safety impacts. These application promise to greatly reduce accidents, injuries and deaths.

Life-Cycle Costs: See Figures 8 – 11.

Figure 8: Connected Vehicle (Option 1)

Item	Unit	Qty	Unit Cost	Total Cost
Systems Integration				
ATMS Software - for CV DMA Development	LS	1	\$2,000,000	\$2,000,000
Systems Integration	LS	1	\$500,000	\$500,000
System Testing	LS	1	\$400,000	\$400,000
Central System Hardware	LS	1	\$150,000	\$150,000
Project Mngagment and Coordination	LS	1	\$400,000	\$400,000
<i>TOTAL - Systems Integration</i>				\$3,450,000
System Testing				
Systems Integration Testing (SI)	LS	1	\$300,000	\$300,000
Master Test Plan	LS	1	\$75,000	\$75,000
Acceptance Test Procedures	LS	1	\$150,000	\$150,000
Conduct AT and Submit report	LS	1	\$50,000	\$50,000
Conduct ATP and submit Report	LS	1	\$25,000	\$25,000
<i>TOTAL - System Testing</i>				\$600,000
System Documentation and Training				
System O&M Plan	LS	1	\$50,000	\$50,000
System Maintenance Manuals	LS	1	\$40,000	\$40,000
System User Manuals	LS	1	\$50,000	\$50,000
System Admin Manuals	LS	1	\$50,000	\$50,000
As-Built Drawings	LS	1	\$30,000	\$30,000
Conduct Mainteance Training	LS	1	\$30,000	\$30,000
Conduct User Training	LS	1	\$20,000	\$20,000
Conduct System Admin Training	LS	1	\$20,000	\$20,000
Project Outreach	LS	1	\$250,000	\$250,000
<i>TOTAL - System Documentation and Training</i>				\$540,000
Subtotal				\$4,590,000
Contingency (25%)				\$1,147,500
TOTAL CAPITAL COSTS				\$5,737,500

Figure 9: Operations and Maintenance (Annual)

Item	Unit	Qty	Unit Cost	Total Cost
Preventive and Corrective Maintenance				
Central System/Application Maintenance (1 year)	LS	1	\$120,000	\$120,000
System Tuning	LS	1	\$50,000	\$30,000
<i>TOTAL - Preventive and Corrective Maintenance</i>				\$150,000
Operations & Enforcement				
ICM System Operator	LS	1	\$100,000	\$100,000
<i>TOTAL - Operations and Enforcement</i>				\$100,000
TOTAL O&M ANNUALLY				\$250,000

E. OTHER PROJECTS

DYNAMIC MOBILITY APPLICATION PROGRAM (DMA)

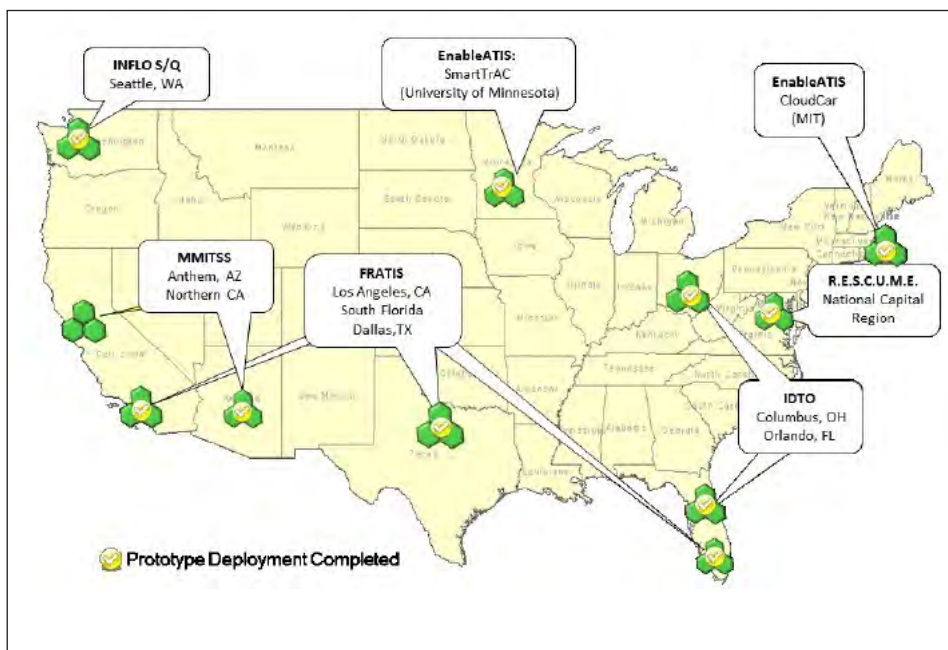
The USDOT ITS Joint Program Office initiated the Dynamic Mobility Program, which creates applications that leverage frequently collected multi-source data from connected vehicles, travelers and infrastructure to improve mobility. These mobility applications were grouped into 6 bundles, as shown in Figure 12.

Figure 12: Dynamic Mobility Applications and Bundles (Source: USDOT)

Bundle Name			Applications
Enable ATIS			
Enable Information Systems	Advanced Traveler	Traveler	EnableATIS (Advanced Traveler Information System 2.0)
FRATIS			
Freight Information Systems	Advanced Traveler	Traveler	Freight-Specific Dynamic Travel Planning Performance, Drayage Optimization (DR-OPT)
IDTO			
Integrated Operations	Dynamic Transit	Transit	Connection Protection (T-CONNECT) Dynamic Transit Operations (T-DISP) Dynamic Ridesharing (D-RIDE)
INFLO			
Intelligent Optimization	Network Flow	Flow	Dynamic Speed Harmonization (SPD-HARM) Queue Warning (Q-WARN) Cooperative Adaptive Cruise Control (CACC)
MMITSS			
Multimodal Traffic Signal System	Intelligent		Intelligent Traffic Signal System (I-SIG) Transit Signal Priority (TSP) Freight Signal Priority (FSP) Mobile Accessible Pedestrian Signal System (PED-SIG) Emergency Vehicle Preemption (PREEMPT)
R.E.S.C.U.M.E.			
Response and Management	Emergency Communications, Staging and Uniform	Staging Uniform	Incident Scene Pre-Arrival Staging Guidance for Emergency Responders (RESP-STG) Incident Scene Work Zone Alerts for Drivers and Workers (INC-ZONE) Emergency Communications and Evacuation (EVAC)

Figure 13 depicts the locations throughout the country where these applications have had prototype demonstrations.

Figure 13: Locations of DMA Prototype Demonstrations (Source: USDOT)



INFLO (SOURCE: USDOT)

Prototype demonstrations for the INFLO DMA bundle have been implemented in two areas:

- A prototype of the INFLO SPD-HARM and Q-WARN applications was developed and a demonstration was conducted with 20 vehicles on the I-5 corridor in Seattle, Washington. Vehicle speed data from both the Washington State Department of Transportation (WSDOT) infrastructure-based speed detectors and the 20 connected vehicles were collected and processed. Q-WARN and SPD-HARM messages were sent to the drivers at least a mile in advance of the congestion and within 5 seconds of detection of congestion.
- Using a simulation model, the SPD-HARM application was evaluated for the US 101 in San Mateo, CA.

The assessment team determined that the prototypes significantly reduced the magnitude of the speed drops between vehicles. It also reduced average speed on freeways by 10% to 20%. Drivers who participated in the demonstration noted that the messages sent to them allowed them to take action in advance of the congestion.

R.E.S.C.U.M.E. (SOURCE: USDOT)

A prototype for the R.E.S.C.U.M.E. DMA application bundle was developed and demonstrated in Columbus, Ohio and Sykesville, Maryland. The Incident Scene Pre-Arrival Staging Guidance for Emergency Responders (RESP-STG)

application and the Incident Scene Work Zone Alerts for Drivers and Workers (INC-ZONE) application were put through twelve scenarios. The impacts assessment included an evaluation of the prototype through interviews with test participants, and an evaluation applied to the US 101 San Mateo Corridor. The Emergency Communications and Evacuation (EVAC) application was evaluated through modeling and simulation using the Greater New Orleans evacuation model.

The majority of those interviewed recognized the potential reduction in total response and clearance times, delays and secondary incidents once the applications was widely adopted. In addition, network simulations demonstrated the following:

- Average network-wide delay was reduced by up to 14% when INC-ZONE was used in addition to an increase in average speeds by up to 8%. Fewer instances of hard braking in the incident zone occurred with up to an 89% reduction in maximum deceleration.
- RESP-STG could potentially reduce the emergency vehicles' travel time by up to 23% and their number of stops by up to 15%.
- EVAC functionalities such as route guidance, communications about transit services, and lodging or fueling assistance could be beneficial to evacuees to reduce travel time and overall network congestion.

CONNECTED VEHICLE PILOT DEPLOYMENTS

As part of the Connected Vehicle Pilot Deployment Program, the USDOT has initiated a Design/Build/Test phase to three sites: Wyoming, New York City, and Tampa. The CV applications and technologies used are designed to save lives, and improve personal mobility, among other benefits. These pilot deployments include several of the DMAs applicable to the IS270, as described in Section A.

NEW YORK CITY DEPARTMENT OF TRANSPORTATION (NYCDOT) CONNECTED VEHICLE PILOT *(SOURCE: USDOT)*

The NYCDOT CV Pilot Deployment project aims to reduce the high accident and pedestrian fatality rate, in addition to improving the mobility of travelers. The project encompasses three areas of Manhattan and Brooklyn: a 4-mile segment of Franklin D. Roosevelt (FDR) Drive; four one-way corridors in Manhattan; and a 1.6-mile segment of Flatbush Avenue in Brooklyn. Approximately 5,800 cabs, 1,250 MTA buses, 400 commercial delivery trucks and 500 city-owned vehicles will be equipped with Connected Vehicle technology. In addition, Vehicle to Infrastructure (V2I) technology will be installed in areas with high accident rates, and pedestrians will be equipped with personal devices to assist them in safely crossing the street. Figure 14 shows the CV applications that will be included in the NYCDOT pilot.

Figure 14: NYCDOT Connected Vehicle Pilot Dynamic Mobility Applications (Source: USDOT)

ID	Category	NYCDOT – CV Application
1	V2I/I2V Safety	Speed Compliance
2		Curve Speed Compliance
3		Speed Compliance/Work Zone
4		Red Light Violation Warning
5		Oversize Vehicle Compliance
6		Emergency Communications and Evacuation Information
7	V2V Safety	Forward Crash Warning (FCW)
8		Emergency Electronics Brake Lights (EEBL)
9		Blind Spot Warning (BSW)
10		Lane Change Warning/Assist (LCA)
11		Intersection Movement Assist (IMA)
12		Vehicle Turning Right in Front of Bus Warning
13	V2I/I2V Pedestrian	Pedestrian in Signalized Crosswalk
14		Mobile Accessible Pedestrian Signal System (PED-SIG)
15	Mobility	Intelligent Traffic Signal System (I-SIGCVDATA)

TAMPA HILLSBOROUGH EXPRESSWAY AUTHORITY (THETA) CONNECTED VEHICLE PILOT (SOURCE: USDOT)

The primary objective of Tampa deployment is to alleviate congestion and improve safety during morning commuting hours. To accomplish this goal, the project will use connected vehicle technologies in the vicinity of reversible express lanes and three major arterials in downtown Tampa to solve the transportation challenges: morning peak hour queues, wrong-way entries, pedestrian safety, bus rapid transit (BRT) signal priority optimization, trip time and safety, and streetcar trolley conflicts. Vehicle On-board Equipment (OBE), Transit Vehicle OBE, Roadside Units (RSU), pedestrian detectors, and advanced traffic signal controllers, along with mobile devices will be used in this pilot.

Figure 15 shows the CV applications that will be included in the Tampa pilot.

Figure 15: Tampa Connected Vehicle Pilot Dynamic Mobility Applications (Source: USDOT)

ID	Category	Tampa (THEA) – CV Application
1	V2I Safety	Curve Speed Warning (CSW)
2		Pedestrian in Signalized Crosswalk Warning (PED-X)
3		Red Light Violation Warning (RLVW)
4	V2V Safety	Emergency Electronic Brake Lights (EEBL)
5		Forward Collision Warning (FCW)
6		Intersection Movement Assist (IMA)
7		Vehicle Turning Right in Front of a Transit Vehicle (VTRFTV)
8	Mobility	Mobile Accessible Pedestrian Signal System (PED-SIG)
9		Intelligent Traffic Signal System (I-SIG)
10		Transit Signal Priority (TSP)
11	Agency Data	Probe-enabled Data Monitoring (PeDM)

**WYOMING DEPARTMENT OF TRANSPORTATION (WYDOT)
 CONNECTED VEHICLE PILOT (SOURCE: USDOT)**

The Wyoming DOT deployment aims to reduce the number of weather-related incidents in the I-80 Corridor in order to better meet the needs of the commercial vehicle operators in the state. By equipping fleet vehicles (snow plows, maintenance fleet vehicles, and emergency vehicles) with the ability to transmit basic safety messages, and to collect vehicle and roadside data and transmit it to the TMCs, road weather data will be shared with freight carriers who will transmit the information to their trucks using in-vehicle systems. Figure 16 shows the CV applications that will be included in the WYDOT pilot.

Figure 16: WYDOT Connected Vehicle Pilot Dynamic Mobility Applications (Source: USDOT)

ID	Category	ICF/WYDOT – CV Application
1	V2V Safety	Forward Collision Warning (FCW)
2	V2I/I2V Safety	I2V Situational Awareness*
3		Work Zone Warnings (WZW)*
4		Spot Weather Impact Warning (SWIW)*
5	V2I and V2V Safety	Distress Notification (DN)

F. ADMINISTRATIVE RISK

Although there have been a number of CV pilots, a tremendous amount of research completed, development of various prototype applications and the fact that there are three large deployment locations that are testing CV Dynamic Mobility Applications (New York, Tampa and Miami), the technology to many is still very young. Furthermore, the technologies that will be used are still not set in

stone. For example, the 5.9 GHz DSRC spectrum that is desired for all CV V2V applications is being tested for “spectrum sharing” with other groups that also want to use the same spectrum. The preference from the ITS perspective is that this entire spectrum should be dedicated for CV purposes.

G. DESIGN-BUILD RISK

There is minimal design build risk associated with this PTC. Options 2 and 4 relate to the installation of roadside equipment, which has some minor risk, but the complexity of the construction (equipment cabinets with small poles and transceivers) is quite simple, so the risk is very minor.

H. COST/SCHEDULE BENEFIT

See Figures 8 – 11. The Cost Benefit Analysis for implementing CV projects of this type are estimated between 20:1 to 50:1. This exceeds most civil construction improvement projects that would be used to achieve the same benefits by at least 50:1.

I. MISCELLANEOUS

Any additional information that would assist the Administration in the review of this PTC.

RECOMMENDATIONS

The recommendation is to deploy Connected Vehicle applications that can be leveraged now without the widespread deployment of DSRC technologies within vehicles and along the roadside. This can be done by using cellular communications with cell phone or aftermarket applications within the vehicles themselves. For example, we can implement Speed Harmonization (SPD-HARM) using a cell phone application. We can collect the location of the vehicle, its current speed and then relay recommendation for speed reductions to the application based upon downstream congestion, incidents or weather alerts. This will compliment well with the other PTCs we have recommended such as the Variable Speed Limit Active Traffic Management (ATM) concept that we will be deploying using more traditional roadside signs. The five applications that we recommend deploying new use cellphone apps or aftermarket products are:

- Speed Harmonization (SPD-HARM)
- Queue Warning (Q-WARN)
- Probe Enabled Traffic Monitoring
- Motorist Advisory Warning (MAW)
- Weather Responsive Traffic Information (WxINFO)

Larry Hogan, *Governor*
Boyd K. Rutherford, *Lt. Governor*



Pete K. Rahn, *Secretary*
Gregory C. Johnson, P.E., *Administrator*

December 1, 2016

Brian Quinlan, P.E.
Parsons Construction Group, Inc.
10 East Baltimore Street, Suite 801
Baltimore MD 21202

Dear Mr. Quinlan:

The Maryland Department of Transportation's State Highway Administration's (SHA) is in receipt of Proposed Technical Concept (PTC) No. 5 for the I-270 Innovative Congestion Management Progressive Design-Build contract (Contract No. MO0695172), submitted by your Design-Build Team on November 17, 2016. The SHA has completed our review of the PTC and offers the following comments for your consideration in the further development of your technical concepts and proposal:

1. Maryland acknowledges the important role that data shared with Connected Vehicles will most likely play, influencing traffic management in the near future. However, the Administration is skeptical that the deployment of Connected Vehicle (CV) technology will realize the Mobility and Safety benefits stated on page 6, both immediately after construction and in the future. Immediately, because not enough vehicles will be equipped with the technology, and in the future because the technology may not gain traction within a reasonable timeframe, as implied in the PTC under the Administration's Risk section.
2. Section E, Other Projects: The RFP requested other projects on which the PTC has been used and the degree of success or failure of such usage. All the projects presented in this section are either prototypes or pilot projects that have yet to be constructed. The Administration understands this data is perhaps the best available for a technology as young as CVs, yet the lack of real life projects only underscores the risk presented in the Administration's Risk section.
3. Page 1, Section A, Description: The current Federal guidance on Connected Vehicles is broad, encompassing all potential applications that could be supported by Vehicle to Vehicle (V2V) and Vehicle to Infrastructure (V2I) systems. The PTC should present a recommended plan to leverage the state-of-the-practice, within the scope of the I-270 Innovative Congestion Management project. As presented, the PTC includes a broad array of possible service packages, and summarizes two as examples.

My telephone number/toll-free number is 410-545-8800 or 1-888-228-6971
Maryland Relay Service for Impaired Hearing or Speech 1.800.735.2258 Statewide Toll Free

Street Address: 707 North Calvert Street • Baltimore, Maryland 21202 • Phone 410.545.0300 • www.roads.maryland.gov

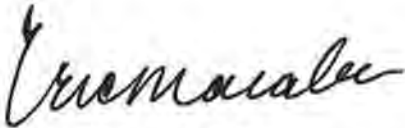
Brian Quinlan, P.E.

Page Two

4. Page 4, Section A, Description: The two examples provided; Speed Harmonization and Queue Warning, are services already addressed by traditional means (roadway sensors and signing) in the other PTC's.
5. Page 5, Section B, Location: The proposal presents 4 different deployment scenarios, which makes it challenging to assess the feasibility and value of the overall PTC. We would suggest that the Design-Builder assess the relative merits and provide a recommended deployment scenario that would be achievable within the scope of the project.
6. Page 8, Section C, Analysis: The benefits presented (e.g. 8. Reduce Number of Primary Crashes: 75% near term to 95% long term) are based on the projected widespread, substantial deployment of a Connected Vehicle Infrastructure, likely in combination with Automated Vehicle Control technology. It's difficult to tie these benefits to what would be deployable as part of the I-270 Innovative Congestion Management project. From the 4 scenarios, it would involve either incentivizing 5000 motorists to equip their vehicles with CV units, and/or deploying 192 DSRC RSU's; neither of which would have a substantial impact on I-270 traffic.
7. Page 12, Section D, Potential Impacts: It may be difficult (by regulations and policies) for the State to incentivize motorists to install Connected Vehicle devices in their vehicles. Also, 5000 equipped vehicles seem too low a penetration rate compared to 240,000 vehicles per day to be usable for traffic management purposes.
8. Page 12, Section D, Potential Impacts: Regarding the 192 DSRC RSU's, we would like additional discussion and information on the management of the CV data; how it would be collected, managed, processed and archived. What rights and license would the State have to access and use the data for other applications?

Any questions or communications regarding the response to this PTC should be directed to Mr. Jason A. Ridgway, Director, Office of Highway Development at the project specific email address, MO069_IS_270@sha.state.md.us.

Sincerely,



Jason A. Ridgway, P.E.
Director, Office of Highway Development

cc: Olu Adeyinka, P.E., DBIA, Parsons Transportation Group, Inc.

Responses to SHA Comments on PTC No. 6 TRIP

1 COMMENT: We can see the need and potential positive impact of expediting towing resources, particularly where shoulder space is constrained. The Maryland State Police (MSP) maintain the call-down lists for managing tow service calls (and providing equitable opportunities for tow service calls). We are not aware of any policy or regulatory constraints on incentive programs, but recommend the proposer confirm the facts related to the feasibility of this program (i.e. review applicable regulations and confirm with the MSP). Generally, however, the concept appears to be a solution that the Design-Builder may be unable to deliver given that the contract budget does not include long-term Operations and Maintenance (O&M) costs. In essence, the Design-Builder is proposing in this PTC to only set up the program, because the implementation would have to be done by the Administration to realize Mobility and Safety benefits. The contract budget includes design and construction of a fully functional project(s) that the Design-Builder will turn over to the State at the completion of construction. The Design-Builder should propose how the Design-Builder will achieve the goals of the contract through its implementation of this PTC.

RESPONSE: 1) Parsons has examined applicable regulations and found no existing legal barriers to implementation. 2) Parsons has contacted representatives from MSP to begin discussions regarding how TRIP would work with existing towing call-out programs. 3) SHA has the option of assuming complete operational responsibility for TRIP post-implementation. Parsons' proposal includes the option of having Parsons continue to support the program after implementation, as well. While this is not essential, due our extensive experience with such programs, we highly recommend Parsons be retained to provide consulting services, at a minimum. 4) Parsons has amended the PTC to offer options and an approach for obtaining

operations & maintenance funding. As with all of the solutions Parsons proposes for this project, benefits for TRIP will accumulate only after it is in place and operational. 5) With regard to achieving the goals of the program, the PTC offers an initial estimate of benefits to mobility and safety due to TRIP implementation. These benefits should accrue whether or not Parsons is retained to manage the program post-implementation. Should SHA opt to retain all operations and maintenance responsibilities, Parsons considers the design and deployment of TRIP equivalent to the implementation and turnover of any turnkey operation.

PTC REFERENCE: See additional text in section titled "How would this work on the IS 270 Corridor?" and in section titled "Operability/ Maintainability/ Adaptability."

2 COMMENT: Page 1, Section A, Description: This PTC should take into account the current efforts in Maryland to develop a cooperative relationship with our partners in the towing and recovery industry. As a suggestion, the proposal should include coordination and/or feedback from the Towing and Recovery Professionals of Maryland <http://trpm-assn.net/>, to confirm some of the assumptions about the industry in Maryland.

RESPONSE: Parsons has amended the PTC to indicate that our program development effort will include coordination with TRPM. Parsons has reached out to the TRPM Executive Director to discuss member concerns and ideas regarding a MD TRIP program for the IS 270 corridor.

PTC REFERENCE: See additional text in section titled "How would this work on the IS 270 Corridor?"

3 COMMENT: Page 4, Section A, Description: As noted above, the I-270 Innovative Congestion Management project does not include funding

for Operations and Maintenance. Incentives would not be a capital expense. Therefore, incentive payments would need to come from State Operating Budgets. Enhancements to operating budgets are submitted for approval once a year, 18-months in advance of the applicable Fiscal Year, and require rigorous justification to receive approval.

RESPONSE: Parsons recognizes that this Design-Build contract does not include funding for operations, but anticipates that: 1) we will be successful in helping SHA & CHART to identify and secure operational funding; and 2) operations funding for TRIP would be appropriated in a manner similar to those associated with operating the ITS elements deployed as part of our other proposed solutions.

PTC REFERENCE: See additional text in section titled “How would this work on the IS 270 Corridor?”

PTC REFERENCE: See additional text in section titled “How would this work on the IS 270 Corridor?”

4 COMMENT: Page 12, Section F, Administration Risks: There is an Administration risk, in that an essential element of efficient incident response is a strong cooperative working relationship with the towing and recovery industry. The implications of providing incentives for tows on I-270 (but not elsewhere in the State), and assuring that all qualified companies have an equitable opportunity to participate in the incentive tow program, need to be carefully considered, to avoid any negative impacts to the cooperation between the State and tow companies.

RESPONSE: These are all important considerations. Our experience in Georgia and our staff experience in Florida offer us a considerable knowledge base and lessons learned, upon which our program design and implementation approach are based. As indicated in our responses to SHA comments 1 and 2, Parsons already has begun the process of coordination with the MSP and TRPM leadership.

06 Towing and Recovery Incentive Program

A. Description

WHAT IS TRIP?

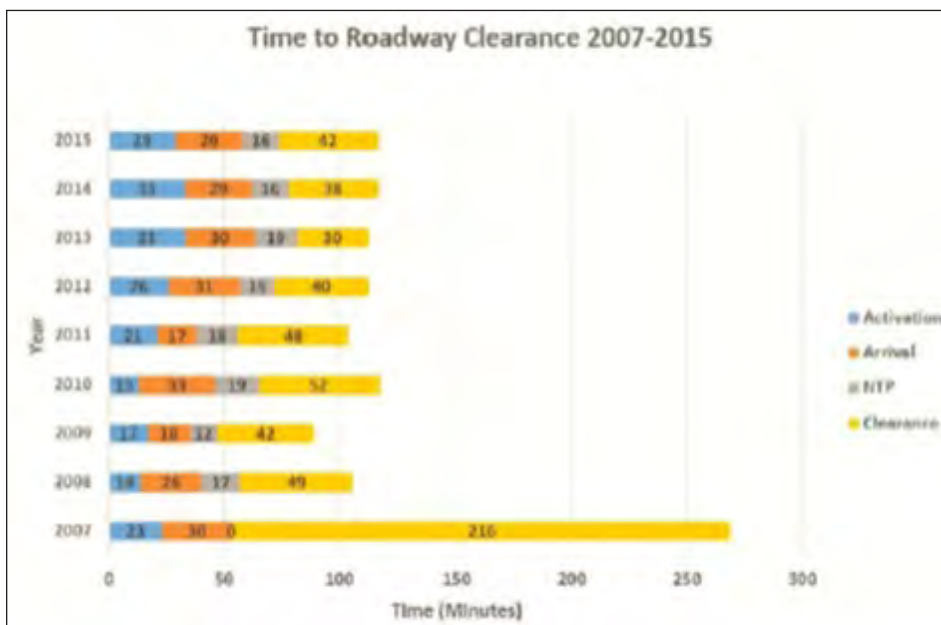
A Towing and Recovery Incentive Program (TRIP) speeds the clearance of incidents involving large vehicles by providing towing and recovery companies monetary rewards for meeting performance criteria. Qualified towing companies agree to reach an incident scene within a specified timeframe, and, once directed to complete the recovery operation, are required to reopen all affected travel lanes within a defined period of time. If they are successful, they are provided a monetary bonus.

WHERE HAS TRIP BEEN DONE BEFORE?

Similar programs have been implemented successfully in States such as Georgia and Florida, where the program is typically activated for incidents involving tractor-trailers, trucks above a certain weight, motorhomes, buses, mobile homes and even aircraft. Due to the size and characteristics of these vehicles, specialized equipment is required, as well as close coordination with other support services such as a freeway service patrol.

Statistics published by the Georgia Traffic Incident Management (TIME) Task Force show a dramatic reduction in the time to clear the roadways covered by the program, as illustrated in Figure 1.

Figure 1: Comparison of Average Time to Clear Roadway Pre- and Post-TRIP Implementation – Atlanta, GA¹



Georgia has had a TRIP program in place since 2008, and has activated TRIP operations more than 668 times during that period.

¹ <http://www.timetaskforce.com/time-initiatives/trip>.

The coverage area in Georgia includes IS285 in its entirety, as well as significant sections of IS75, IS575, IS85, IS585, IS985, IS20, GA-400 and SR 316. In total, TRIP covers more than 500 miles of Interstate roadway through TRIP service agreements with 13 towing providers. A map of the coverage area and the assignment areas of each provider is shown in Figure 2.

Figure 2: Map of TRIP Coverage Area in Atlanta ²



Parsons helped to establish the program in conjunction with the Georgia Traffic Incident Management Task Force (TIME), which includes representation from Georgia DOT, the Georgia Regional Transportation Authority (GRTA) and the Federal Highway Administration (FHWA). As part of that effort, Parsons worked with the stakeholders to craft the TRIP Specifications³, which detail the following:

- Program Purpose and Objectives
- Terms of Agreement among all the stakeholders, including towing contract terms and conditions
- The Recovery Zones
- Qualifications for participation in the program
- The Compensation model, which includes the incentive structure

² http://www.timetaskforce.com/images/stories/TRIP_map.pdf.

³ Georgia's Towing and Recovery Program Specifications, Georgia Traffic Incident Management Task Force (TIME), March 28, 2016.

- Criteria for Activating the Program (i.e., the conditions under which a TRIP activation occurs)
- Equipment and Vehicle Requirements that towing companies must provide (including tools and supplies)
- Program Maintenance provisions, including periodic inspections and ongoing training requirements.

The successful implementation of the Georgia program and its ongoing success provide SHA with an appropriate and effective model to replicate along the IS 270 corridor. The body of knowledge already in existence, to include the above specification as well as a considerable collection of lessons learned, effectively mitigate a substantial share of the risk associate with implementation in Maryland.

HOW IS TRIP ACTIVATED?

TRIP is activated when the conditions of an incident meet specific criteria—specifically, when an incident occurs for which clearance is complicated, such as when large vehicles are involved, large loads of materials are spilled, or resulting conditions create a hazard to other traffic on the roadway. Often, these incidents require specialized towing and recovery operations. Activation results from the coordinated decision making of the transportation agency responsible for the roadway where the event occurs—for IS 270, this would be CHART, probably in the form of a freeway service patrol—and the appropriate police agency, which for IS 270 would be the Maryland State Police (MSP).

The details regarding activation on the IS 270 corridor would need to be developed, but the following hypothetical example offers one possible scenario. An incident occurs involving one or more large vehicles, and a motorist calls the MSP to notify them. The MSP notifies CHART, who dispatches a freeway service patrol (FSP) to the scene. FSP and MSP arrive on the scene and secure it according to established protocols. Once an initial assessment is performed, the MSP and FSP representatives agree that TRIP should be activated, and the FSP operator notifies CHART. The MSP officer contacts the appropriate MSP towing coordinator, who notifies the TRIP towing company of the incident and the activation of TRIP. The TRIP towing company then acts in compliance with the terms of the response agreement. The FSP operator remains on the scene and documents the clearance process, noting the arrival of personnel and equipment, the clearance of the incident and the reopening of travel lanes—all of which is necessary to determine the awarding of incentives to the TRIP towing company.

Activation guidelines are defined in advance to ensure that decision-making delay does not interfere with the program goal of rapid incident clearance. Fortunately for SHA, guidelines developed on behalf of the Georgia DOT by Parsons are included in the Georgia TRIP Specifications document available as a reference, significantly reducing the risk of inappropriate conditions and streamlining the development of guidelines for the IS 270 corridor ⁴. In addition to the activation guidelines, the TRIP Specifications document provides details regarding the terms of agreement with towing providers, stipulates qualifications

⁴ Georgia's Towing and Recovery Incentive Program Specifications, Georgia Department of Transportation, with Georgia Regional Transportation Authority (GRTA), US Federal Highway Administration (FHWA) and the Traffic Incident Management Task Force (TIME), March 28, 2016.

for participation in the program, lays out compensation methods and incentives and describes program maintenance.

HOW DO THE INCENTIVES WORK?

Once an incident is declared a TRIP event, the responsible entity (DOT or police) notifies the towing company assigned to respond to the area. More than one company can be on a call-out list if the incident frequency in the area is high enough to warrant the additional response capability. The company contacted must have a supervisor on scene within a prescribed time limit (in Atlanta this is 30 minutes) and all basic equipment on scene within a slightly longer period (45 minutes in Atlanta). These criteria would be set based on the response area and the proximity of the TRIP company, and may vary based on the time of day or day of the week. Shorter response times are desired during peak travel periods, since the effects of any roadway closures will be more severe.

The TRIP company then remains on the scene until they are authorized to proceed, after which time they are required to complete clean-up and have the roadway ready for full reopening within a set period of time (in Atlanta, this is 90 minutes) in order to receive the incentives. If the clearance takes longer than 90 minutes, no incentives are paid.

The SHA would designate an entity—again, this would most naturally fall under CHART and the FSP program—that would conduct monthly after incident reviews (AIRs) to review data and evaluate the TRIP company’s compliance with program requirements, and determine eligibility for an incentive payment for each event. Figure 3 shows the Atlanta program incentive structure that is in place.

Figure 3: Georgia’s Towing and Recovery Incentive Program Specifications ⁴

Incentive Amount	TRIP Company Called	TRIP Company Responds in Time	TRIP Services Not Needed	TRIP Company Clears & Reopens Roadway in Time	TRIP Company Provides Additional Special Equipment
\$600	✓	✓	✓		
\$2,500	✓	✓		✓	
\$3,500	✓	✓		✓	✓

The Atlanta program also applies liquidated damages to any TRIP company that fails to have the roadway cleared within three hours from the time they are directed to begin clearance activities. The TRIP company is fined \$600 if it fails to meet the three-hour limit, and an additional amount of \$10 per minute for every minute beyond the three hour period that the roadway remains blocked.

WHO CAN PARTICIPATE?

Any interested wrecker company that meets program criteria can participate in TRIP by responding to an Invitation to Negotiate. Companies that meet program criteria are assigned geographic response zones based on negotiations with CHART and MSP. These zones are not exclusive to one company. Any qualifying company can participate on a rotational basis.

The basic qualification requirements for an interested company are as follows:

- Prompt, reliable response and 24/7 equipment and personnel availability
- Modern, powerful 35- and 50-ton recovery wreckers with full sets of tools
- A support truck with a requisite array of equipment and full traffic control and spill mitigation capability
- Other specialized heavy equipment (e.g., loaders, bobcats and tractor-trailers, etc.)
- Fully-trained operators with national or industry certifications in advanced heavy towing and recovery, as well as MUTCD control and Hazardous Materials awareness

HOW MUCH DOES IT COST?

The total program costs are based on the amount of incentives paid and the frequency of occurrence of incidents requiring TRIP activation, plus whatever costs are incurred implementing and managing the program. Program implementation includes the activities described in the following section, and include the design of the incentive structure, the recruitment and training of TRIP companies, the formulation of activation guidelines.

For the entire IS270 corridor, program development and implementation would likely cost approximately \$250,000. Annual operating costs for the program, which include incentive payments and overall program operations and maintenance, could range from \$50,000 to \$100,000, depending upon the frequency of activation (Estimated MD TRIP Program Costs are discussed in the "Potential Impacts" section of this PTC). Program operations and maintenance activities include ongoing recruitment and training of TRIP companies, capture and analysis of program operational data, managing incentive invoices and support for public outreach activities.

It is important to note that the SHA would fund only the incentive program, and would not assume any costs associated with the actual towing and recovery. These costs would be borne by the parties that currently pay them.

HOW WOULD THIS WORK ON THE IS 270 CORRIDOR?

Once Parsons is selected to implement the program, it would act as the program administrator and, in that capacity, would undertake the following tasks.

PROGRAM IMPLEMENTATION

- Identify and implement the process, players, procedures, documentation, and oversight necessary to ensure a successful TRIP program;
- Identify the appropriate legal authority to implement TRIP in Maryland;
- Identify major impacts, both positive and potentially negative, and determine potential issues to be resolved or mitigated to ensure the successful operation of the program.
- Meet with towing company owners and appropriate representatives from the Towing and Recovery Professionals of Maryland to present TRIP, explore program implementation and answer questions;
- Review crash data, truck traffic, impact and alternate route information in order to affirm the IS 270 corridor as an appropriate location for the pilot TRIP program;
- Specifically quantify the costs of deploying, instituting and operating the TRIP program;
- Define contribution costs necessary from SHA to 1) supplement the costs of tow operator training certification and, 2) costs for SHA to fulfill towing based incentives;
- Design the procedures for a multi-agency after action review (AAR) process that would provide ongoing quality assurance;
- To make recommendations based on the pilot project implementation to expand the TRIP program to statewide. Any expansion of TRIP will occur based on crash data and an impact study of the availability of alternate routes.

Parsons acknowledges that this solution will require us to work with the SHA to address two significant, but surmountable issues related to its long-term viability. The first is coordination with all appropriate stakeholders (including the MSP) to address any regulatory barriers. At present, there are no provisions within the Maryland Code that address traffic incident management as it relates to vehicle clearance by a third party (i.e., a towing provider). Additionally, precedent exists in the State of Georgia for the replacement of rotational call-out lists with TRIP-certified providers.⁵ There, Parsons worked with the Georgia State Patrol to educate officers and provide leadership with the tools necessary to fully implement the program.

Parsons will work with SHA and MSP to coordinate an orderly transition to TRIP from current callout lists. Additionally, Parsons will ensure that appropriate contract law is complied with regarding the selection of responders, and that all agreements entered into by SHA contain indemnification language similar to that which was incorporated into agreements with Georgia responders.⁶

The second issue Parsons will work with SHA to address is to identify and secure funding for operations of TRIP on the corridor. The most logical pathway for funding would be through the CHART program. As such, Parsons will work

⁵ Georgia's Towing and Recovery Incentive Program Specifications, Georgia Department of Transportation, with Georgia Regional Transportation Authority (GRTA), US Federal Highway Administration (FHWA) and the Traffic Incident Management Task Force (TIME), March 28, 2016, Appendix D.

⁶Ibid, p. 11.

with CHART officials to specifically define funding needs, will prepare materials necessary to justify adding TRIP funding as a line item in the CHART budget, and will incorporate all necessary reporting requirements within the program specifications document we will prepare for SHA. If necessary, we will provide expert advisory services to support outreach presentations and Q&A sessions for senior MD DOT and MD State legislative officials.

Parsons acknowledges that the execution of the program will be dependent upon the ability of SHA to secure funding for operations, and that the process may require a lengthy and rigorous justification process. Parsons will work in coordination with CHART to begin the process immediately upon award. Additionally, we will explore alternate sources of funding, as we did in Georgia. These could include, but not be limited to existing freeway service patrol sponsors and the Maryland congestion mitigation and air quality (CMAQ) program. Ultimately, because the program design, recruitment and enrollment of towing providers and coordinated planning with MSP may take up to a year to complete, we are confident that any delays between program set-up and receipt of operations funding will be brief.

PROGRAM MANAGEMENT

Once Parsons has defined the program and engaged all of the relevant stakeholders, it then transitions to an administrative role where its activities focus on enrolling tow operators in the program, and making sure they maintain the level of equipment and training certified staff are engaged in the program. This will require a team of Parsons' staff adept in the TRIP program to be engaged in monitoring progress, coordinating meetings, participating in after action reviews (AARs), producing program summaries and updating policies and procedures as needed. Parsons' staff will be an active participant in reviewing data to ensure that any issues or disputes involving recovery companies are fairly and amicably resolved. The specific activities falling under program management include:

- Managing the project and coordinating with the SHA project manager and senior MSP leadership;
- Collecting and evaluating towing company applications and submitting approve/reject recommendations to SHA & MSP;
- Scheduling and conducting initial and periodic/random inspections to ensure towing company compliance with TRIP contract provisions;
- Facilitating negotiations for route assignments to new applicants;
- Maintaining TRIP records for SHA for all TRIP activations, to include all data necessary to validate compliance with program incentive thresholds. This will require close coordination with CHART, MSP and RITIS;
- Managing TRIP invoices, to include verification of appropriate payment amounts based on compliance with performance criteria;
- Conducting program performance monitoring, to include analyzing performance measures and generating pertinent benefit-cost statistics; and

- Providing SHA with the necessary administrative reporting and public outreach materials.

Delivery of these services by Parsons will be dependent upon the successful assignment of funding for the program by the responsible entity (or entities) within the MD Department of Transportation, and the execution of an agreement between Parsons and SHA. Parsons proposes that the operations component be administered under a separate multi-year contract vehicle that will enable expansion of TRIP geographical boundaries, as deemed necessary by the SHA.

B. LOCATION

A TRIP is most effective where the effects of a large vehicle incident are likely to include substantial delays for a large number of motorists. The volume of traffic on the IS 270 corridor and the roadways that connect (i.e., IS70 and IS495) and the delay and travel time reliability effects that result from incidents—particularly during peak periods—make a TRIP an ideal solution to address non-recurring congestion across the entire corridor.

For the corridor, TRIP responders would be notified of incidents by a designated contact person (i.e., CHART or MSP first responder), who would then assume the responsibility to monitor the responder's performance to verify compliance with program requirements. These requirements would be established by SHA through an analytical process that includes consideration of the ability of responders to reach an incident scene based on location, existing traffic conditions and scene accessibility.

It is important to understand that the performance criteria implemented with the program need to reflect the geography of the corridor and the proximity of TRIP responder companies. Arrival criteria, in particular, must be developed only after reviewing historical data regarding the frequency and location of incidents that meet TRIP activation thresholds. Such analysis may dictate that in order to accomplish program goals, multiple providers may be needed for a given response area, or have response territories that overlap. Consideration should also be given to ability of the TRIP company to reach the incident scene safely and without delay beyond their control (i.e., negotiating segments of roadway that may be impassable due to congestion and roadway dimensions). These analyses should be conducted as part of the program design and implementation activities.

C. ANALYSIS

A TRIP implementation on the IS 270 corridor would address all of the project goals for mobility, safety and operability/maintainability/adaptability. The remainder of this section details the outcomes from the Atlanta implementation, which include improved incident clearance times during non-recurring congestion by significantly reducing motorist delay, thereby improving the predictability of commuter trips. Additionally, the rapid incident clearance afforded by TRIP reduces the likelihood of secondary incidents—a natural byproduct of a reduction in incident-related queuing, and allows freeway service patrol and police assets

to reposition to address other needs more quickly. That a similar program has been successfully deployed elsewhere significantly minimizes risk for an IS 270 implementation. Specific benefits-related information is provided in the subsections below.



Mobility

Provide improvements that maximize vehicle throughput, minimize vehicle travel times, and create a more predictable commuter trip along IS 270.

In 2011, Georgia DOT completed an evaluation and published a report detailing the results the first few years of its TRIP program.⁷ The study examined the incidents for which TRIP was activated since its inception in 2008 against similar incidents that occurred prior to implementation. The intent of the study was to quantify the benefits that accrued to motorists resulting from the rapid clearance of incidents under TRIP, and compare them to the cost of the program.

The study examined data from the 110 incidents that occurred in the 2008-2009 timeframe for which TRIP was activated, and compared them to similar accidents—24 in total—that occurred during 2007. The analysis indicated that TRIP allowed the roadway to be opened to traffic at least 165 minutes (2 hours and 45 minutes) faster on average than in 2007. Figure 4 summarizes the effects of TRIP on incident duration.

*Figure 4: Duration of Incidents Pre- and Post-TRIP Implementation*⁸

Average Incident Duration (Excluding Outliers)		
Year	All Incidents	"Typical" Incidents
2007	4 hours 43 minutes	4 hours 52 minutes
2008	1 hour 58 minutes (58% improvement from 2007)	1 hour 35 minutes (67% improvement from 2007)
2009	1 hour 37 minutes (66% improvement from 2007)	1 hour 30 minutes (69% improvement from 2007)

Incident timelines were examined and the cost of each incident in terms of delay, wasted fuel and excess emissions from vehicles queued upstream were calculated by modeling each incident based on incident location, typical traffic volumes during the incident, the roadway geometrics at each incident location and other factors specific to each incident. According to the study, "Using TRIP reduces incident cost an average of 71 percent when compared to the pre-TRIP experience of 2007. This significant decrease in the impacts of these incidents after the implementation of TRIP is attributable to the quick clearance of the roadways. The faster clearance of the roadway creates a measurable reduction in the vehicle hours of delay imposed by an incident with an average savings of

⁷ Evaluation of the Towing and Recovery Incentive Program (TRIP), Prepared for Georgia Department of Transportation, by PBS&J and SERCO, Document No. NAV01-203, February 4, 2011.

⁸ Ibid, p.27

\$456,216 per incident.”⁹ Figure 5 shows the number of incidents modeled and their associated costs.

*Figure 5: Incident Costs*¹⁰

Year	TRIP Incidents	Incidents Modeled	Total Cost of Modeled Incidents	Average Cost of Modeled Incident
2007 (Before TRIP)	24	19	\$12,218,517	\$643,080
2008	59	46	\$9,710,454	\$211,097
2009	51	48	\$7,854,812	\$163,641
2008 and 2009	110	94	\$17,565,266	\$186,864

According to the Maryland Accident Analysis Reporting System (MAARS), a total of 220 crashes involving heavy vehicles occurred on IS 270 in the 2013 – 2015 period. Of those incidents, 73 occurred on SB IS 270 during morning hours, and 37 occurred in the NB direction in the afternoon and evening. Specific information regarding lane closures and towing requirements is impossible to pinpoint, since that data is resident in a different dataset that is not indexed to the MAARS data. This makes a specific side-by-side comparison to the GDOT experience impossible.

Nonetheless, it appears that a significant number of opportunities exists to leverage a TRIP on the corridor. If a conservative estimate of one-half of the incidents required the travel lanes to be closed for a period of time, then the total number of incidents requiring TRIP activation would be approximately 110. Assuming a comparable reduction in per-incident costs and similar roadway configuration and lane closure requirements would yield a benefit of \$49.5 million over the three-year period (\$450,000 x 110).



Safety

Provide for a safer IS 270 corridor

In addition to reducing motorist delay and delivering significant monetary benefit, TRIP provides for improved safety by reducing the amount of time vehicles are queued, thereby reducing the potential for secondary incidents.

Rear-end collisions are commonplace on IS 270, and are often the result of the inability of motorists to react to events ahead in a timely manner. This is exacerbated when congestion levels are high and motorists are anxious to reach their destination. Several members of the Parsons team routinely commute on the corridor, and have first-hand experience with the aggressive driver behavior that is common during AM and PM peak periods.

Rapid incident clearance is essential to reduce exposure of motorists—and responder personnel—to the potentially deadly consequences of secondary incidents. The TRIP solution deployed by Parsons in Georgia has demonstrably

⁹ Ibid, p.26.

¹⁰ Ibid, p.26.

reduced overall incident duration, as shown in Figure 5.

CHART's own data indicates that in 2014, CHART incident management activities to rapidly clear incidents from the State's roadways reduced the likelihood of secondary incidents by 33%. This finding supports the position that a TRIP solution for IS 270 would support similar outcomes.



Operability/Maintainability/Adaptability

Provide improvements that minimize SHA operations and maintenance activities while being adaptable to future transportation technological advancements.

The primary operations and maintenance burden associated with a TRIP solution comes in the form of the incentives paid to TRIP service providers, the quality monitoring activities necessary to ensure accurate payment of those incentives, and the recruitment and training of additional providers. Since incentives are linked directly to performance, the payments are clearly justifiable based on the benefits that result. The results of the Georgia project estimate a benefit-cost ratio of nearly 11 to 1.

SHA has options regarding how it operates and maintains TRIP post-implementation. Parsons proposes to support the program for at least three years (2017-2019), and will work with SHA to identify and secure funding for maintenance, operations and the incentives to towing providers. Should SHA opt to manage the program internally (i.e., as a turnkey solution), it has no obligation to Parsons. However, due to our extensive experience managing similar operations, we recommend retaining Parsons, at a minimum, as a consultant. Whichever approach SHA chooses, Parsons is committed to helping SHA secure operations and maintenance funding as part of our program design and implementation effort under this contract.

Quality monitoring activities are expected to be modest, and again will be a function of the number of incidents for which incentives are applicable. Finally, if the coverage area remains constant, the costs associated with ongoing recruitment and training will be minimal. However, should the program show success, MD SHA may opt to expand the geographic scope as Georgia DOT has done. Under such a scenario, the benefits of the program will have clearly provided justification for expansion, and that expansion will be relatively easy and straightforward.

If the program produces results that fall below expectations, terminating it would be relatively simple, and the only sunk costs will have been for program implementation, which Parsons projects will be modest (see Potential Impacts section below).

Ultimately, reductions in incident-related delay and risk of secondary incidents also can minimize SHA operations and maintenance costs by reducing the time and expense associated with requiring FSP staff and vehicles to remain on scene, reducing the likelihood of overtime expenses and freeing them to provide assistance in other areas on and off the corridor.



Well-Managed Project

Provide a Project Management and Work Plan that addresses communications, coordination and risk management, achieves a collaborative partnership with all members of the project team and stakeholders, and successfully advances the project goals.

Because TRIP has been successfully implemented elsewhere by Parsons, much of the implementation and operational risk—including budgetary risk—is reduced substantially. As a result, the foundation for a well-managed project already is established. Moreover, established and accepted standards and procedures already exist in the form of implementation specifications, and will be leveraged for the IS 270 implementation. Reference costs are available from the Georgia implementation, reducing the risk of improper budgeting. Finally, the methods used for evaluating the program efficacy in Georgia are available for reuse, should the need arise to justify continuing the program.

All that remains is the application of lessons learned by Parsons and the careful formulation of an appropriate stakeholder framework for implementation and operation on the IS 270 corridor. For this, Parsons staff that implemented the Georgia program are available to assist the SHA in implementing and managing the program.

D. POTENTIAL IMPACTS

No adverse impacts to users, infrastructure, operations, environment or utilities are anticipated as the result of the implementation of TRIP. The most significant impact will be to the SHA operating budget, but as the previous section illustrates, the public safety and quality of life benefits are considerable, particularly given the relatively modest implementation and operating costs. The Atlanta TRIP program cost a total of \$835,000 over a three-year period, during which the program was expanded twice, as illustrated in Figure 6.

Figure 6: Program Costs ¹¹

Year	Description	Cost
2007	Program Development and First Year Implementation	\$256,000
2008	Incentive Payments to TRIP Operators	\$156,400



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¹¹ Performance Evaluation and Benefit Analysis for CHART, in Year 2014, Chang, Gang-Len and Egua Igbinosun for the MD State Highway Administration, September 2015

Year	Description	Cost
2008	Program Maintenance (12 Months) and Program Expansion	\$125,000
2009	Incentive Payments to TRIP Operators	\$127,600
2009	Program Maintenance (15 Months) and Program Expansion	\$170,000
Total 3-Year Program Costs:		\$835,000

Program implementation and operations and maintenance costs for the IS 270 corridor reasonably can be expected to be substantially less, given that the length of roadway is substantially less than in the Georgia example. Assuming the figure cited in the Description section of this PTC are accurate, the costs for a TRIP for the IS 270 corridor, including implementation and 3 years of operating costs and assuming payment of \$75,000 in annual incentive payments, would be as shown in Figure 7.

Figure 7: Estimated IS 270 TRIP Program Costs

Year	Description	Cost
2017	Program Development and First Year Implementation	\$250,000
2017	Incentive Payments to TRIP Operators	\$75,000
2018	Incentive Payments to TRIP Operators	\$75,000
2019	Incentive Payments to TRIP Operators	\$75,000
Total 3-Year Program Costs:		\$475,000

E. OTHER PROJECTS

As described extensively throughout this PTC, the most recent and comparable implementation of TRIP by Parsons was in Atlanta, where the referenced evaluation report cites both the costs and benefits of the program. The report indicates that the benefit-cost ratio for the program is at least 10.96 to 1, and suggests this is a conservative figure due to modeling assumptions that underestimate the impacts of incidents, thereby lowering the calculated benefits.

F. ADMINISTRATIVE RISK

The risk to the SHA related to this PTC is nominal. It consists primarily of the possibility of overpayment of incentive fees to the TRIP service providers. The potential exists that one or more of the providers could meet the intended performance thresholds without the incentives. However, a thorough analysis of incident clearance data for the prior 3-year period, coupled with discussions among representatives from SHA (including CHART and FSP) and MSP and negotiations with TRIP service providers will effectively mitigate this risk. Further, once the program has been implemented, after incident reviews will offer SHA the

ability to re-examine incident response history for pre- and post-implementation periods to determine whether the program should be continued.

A second, more remote risk, is that the frequency of TRIP activations is so low that the initial investment associated with establishing the program (including the recruitment and training of TRIP providers) is not recovered in the form of accumulated benefits to IS 270 users. This is considered unlikely given the level of congestion that will result from a very small number of incidents on the corridor.

Finally, there is a risk that an insufficient number of TRIP providers that meet program participation requirements can be recruited and complete negotiations for entry into the program. If the number of potential providers is so low that there is no incentive to participate (i.e., there is no business reason to agree to the program terms), then the initial program implementation costs would be the extent of the risk to SHA. Conversely, the remote potential exists for the number of activations to be so high such that the costs associated with incentive payments could become prohibitively expensive and unsustainable for SHA.

The second and third risks can be mitigated effectively through an initial program task to conduct a coordinated analysis of incident data between Parsons and CHART, and a coordinated outreach program what includes FSP and MSP staff, and the potential TRIP provider community. If the incident analysis yields sufficient justification and the potential provider community is large enough, then the program could move forward.

The remainder of the risks associated with TRIP are shouldered by the TRIP service providers in the form of exposure to liquidated damages for failure to meet performance requirements, and the costs associated with ensuring that equipment meets standards and personnel are compensated for performance. This is considered a business risk.

G. DESIGN-BUILD RISK

The risk to the Design-Builder associated with implementing TRIP also is nominal. Since the design-build contractor would complete design and implementation under contract with SHA, who would bear the costs according to contractual agreement.

H. COST/SCHEDULE BENEFIT

One benefit to the program schedule associated with this PTC is that TRIP can be implemented quickly, offering SHA an inexpensive early win. Including the aforementioned incident analysis and outreach effort, it is reasonable to expect that TRIP can be implemented within nine months of the start of the contract.

I. MISCELLANEOUS

Any additional information that would assist the Administration in the review of this PTC.

ATTACHMENTS:

1. Georgia's Towing and Recovery Incentive Program Specifications, March 2016.
2. Evaluation of the Towing and Recovery Incentive Program, Georgia DOT Navigator, February 2011.

Georgia's Towing and Recovery Incentive Program Specifications

March 28, 2016



U.S. Department
of Transportation

Federal Highway
Administration



I-95 CORRIDOR
COALITION



PARSONS



Towing and Recovery Incentive Program (TRIP)

DATE	REVISED BY:	REVISION	FILE NAME
5/19/09	Macaulay	<ol style="list-style-type: none"> 1. Delete GDOT AIR Phone Number; Pg 5, Para 2 2. Replaced sample invoice; App B 3. Updated program boundaries text; Pg 2 4. Added Highway Safety Vest Requirements; Pg 5 5. Modified <i>Miscellaneous</i> Terms and Agreement section to include penalties for influencing TRIP activation; PG 7 & 8 6. Added revision table 7. Updated Program Boundary Map; Pg 3 	Fv_07_05.18.09
6/2/09	Macaulay	<ol style="list-style-type: none"> 1. Contact information in Appendix D (Millsaps email; GRTA) 2. Included Safety Vest Penalty; Pg 5 	Fv_09_06.02.09
7/8/09	Macaulay	<ol style="list-style-type: none"> 1. “Three Stike” penalties under safety vest req’a; Pg 5 	Fv_09_07.08.09
12/02/09	Simonton	<ol style="list-style-type: none"> 1. Open enrollment period for applications; Pg 9 	Fv_10_12.02.09
02/03/10	Simonton	<ol style="list-style-type: none"> 1. Deleted Todd Long’s name from contact list; Pg D-1 2. Added, “A map of these project boundaries, <u>in place until March 1, 2010</u>, can be found on the next page; Pg 2 	Fv_10_02.03.10
10/28/11	Simonton	<ol style="list-style-type: none"> 1. Removed reference to the Open Road Policy status as pending. The Open Road Policy is signed and endorsed by the Governor as of October 2011. 2. Section 1.3 Performance Measures 3. Pg 21-22, included orange chemical flares in support equipment for both the wrecker and support vehicle. Reduced the quantity of flares in the support vehicle. 4. Appendix D – Updated contact info 5. Updated date on cover 6. Section 1.4 Program Boundaries, added GA-400 	Fv_11_10.28.11
1/31/12	Simonton	<ol style="list-style-type: none"> 1. Changed the equip specs to allow for an under reach of 35,000 lbs for the NRC 40 ton rotator, Pg 17. This changed based on the January 2012 TRIP manager’s meeting. 	Fv_12_1.31.12
3/6/13	TRIP Managers	<ol style="list-style-type: none"> 1. Updated TRIP boundaries map. 2. Section 3.3, changed “GRTA” to GDOT. 3. Section 7.2, deleted paragraph that stated the 30-ton wrecker requirement would be reviewed 12 months after program inception. 4. Additional Trucks and Heavy Equipment: LED flares added as an option. 5. Updated address and contact email on the application. 	Fv_13_3.6.2013
6/5/13	Simonton	<ol style="list-style-type: none"> 6. Accepted track changed from 4/5/13 TRIP Manager’s Meeting and included updated route map. 7. Section 3.7, included penalties for unauthorized tows. 8. Updated contact information from Emanuel Jackson to Michael Roberson. 	Fv_14_6.5.13
7/11/13	TRIP Managers	<ol style="list-style-type: none"> 1. Section 3.7, Pg 7, Penalty for responding to unauthorized TRIP incidents. 	Fv_15_7.11.13



Towing and Recovery Incentive Program (TRIP)

DATE	REVISED BY:	REVISION	FILE NAME
1/13/14	TRIP Managers	<ol style="list-style-type: none"> 1. Date on cover updated (Pg 1) 2. Page numbering updated universally 3. Table updated on Pg 4 4. Second page of revision table added to Pg 3 5. Renamed section 3.7 from “Miscellaneous” to “Penalty Assessment” 6. Added information to Section 2 final paragraph on Pg 8 regarding Relationship of the Parties. 7. Revised Section 3.2 on Pg 9 regarding Highway Safety Vests violation penalties. 8. Revised last two paragraphs of 3.4 at the top of Pg 11 regarding mutual aid and collaboration agreements. 9. Added “or its authorized representative” to Section 3.7 on Pg 11 10. Revised penalty language in Section 3.7 on Pg 12 11. Replaced “State of Georgia Public Service Commission” with “Georgia Department of Public Safety” in Section 4.1 on Pa 14. 12. Changed section numbers referenced under “<u>Event Type 2</u>” in Section 5.2 on Page 18 referencing Emergency Response Incentive. 13. Included parenthetical notation under “<u>Event Type 2</u>” in Section 5.2 on Page 18 referencing Emergency Response Incentive and support vehicles. 14. Added “orange” to cone requirements in Section 7.4 on Pg 25 regarding Recovery Wrecker Tools and Supplies. 15. Added “orange” to cone requirements in Section 7.5 on Pg 25 regarding Support Vehicle Tools and Supplies. 	Fv_16_1.13.13
7/2/14	TRIP Managers	<ol style="list-style-type: none"> 1. Added segment concerning severe weather and other emergency situations to Section 6 regarding Criteria for Activating Program on Pg 20. 2. Adjusted / updated route assignment schedule to reflect new routes beginning in April in the section addressing Recovery Zones on Pg 13. 	Fv_17_3.31.14
9/24/15	TRIP Managers	<ol style="list-style-type: none"> 1. Adjust date and Parsons logo on cover 2. Added new application and adjusted 1st page of Appendix A to reflect current contact details. 3. Added current TRIP invoice example to Appendix B. 4. Added GSP memo regarding TRIP as Appendix D. 	Fv_18_9.24.15
10/7/15	TRIP Managers	<ol style="list-style-type: none"> 1. Added requirement to use TRIP LMS under 4.2 Staffing Requirements on Pg 15. 	FV_19_10.7.15
2/2/16	TRIP Managers	<ol style="list-style-type: none"> 1. Changed vest requirement to Level 3 on page 9, Section 3.2 Highway Safety Vests. 	FV_20_2.2.16
3/28/16	TRIP Managers	<ol style="list-style-type: none"> 1. Pages 6 & 7 – Change route ending points, added new route overview map. 	FV_20_2.2.16



Towing and Recovery Incentive Program (TRIP)

- 1. INTRODUCTION..... 5**
 - 1.1. PROGRAM OBJECTIVES..... 5
 - 1.2. PROGRAM BENEFITS 5
 - 1.3. PERFORMANCE MEASURES 6
 - 1.4. PROGRAM BOUNDARIES..... 6
- 2. RELATIONSHIP OF THE PARTIES..... 8**
- 3. TERMS AND AGREEMENT..... 9**
 - 3.1. AFTER INCIDENT REVIEW (AIR) 9
 - 3.2. HIGHWAY SAFETY VESTS 9
 - 3.3. BOOKS, RECORDS AND INVOICES 9
 - 3.4. RESPONSE REQUIREMENTS.....10
 - 3.5. TERMINATION11
 - 3.6. INDEMNITY AND INSURANCE.....11
 - 3.7. MISCELLANEOUS PENALTY ASSESSMENT11
- RECOVERY ZONES.....13**
- 4. QUALIFICATIONS14**
 - 4.1. COMPANY REQUIREMENTS.....14
 - 4.2. STAFF REQUIREMENTS15
 - 4.2.1. OPERATORS.....15
 - 4.2.2. SUPERVISORS.....16
 - 4.2.3. SUPERVISOR-IN-TRAINING17
 - 4.3. PROPER IDENTIFICATION17
- 5. COMPENSATION17**
 - 5.1. BILLING VEHICLE OWNERS.....17
 - 5.2. EMERGENCY RESPONSE INCENTIVE17
 - 5.3. FORFEITURE OF MOBILIZATION COMPENSATION19
 - 5.4. LIQUIDATED DAMAGES.....19
- 6. CRITERIA FOR ACTIVATING PROGRAM20**
- 7. EQUIPMENT AND VEHICLE REQUIREMENTS22**
 - 7.1. RECOVERY WRECKER SPECIFICATIONS.....22
 - 7.2. ADDITIONAL TRUCKS AND HEAVY EQUIPMENT23
 - 7.3. CONTRACTED SERVICES AND HEAVY EQUIPMENT23
 - 7.4. RECOVERY WRECKER TOOLS AND SUPPLIES24
 - 7.5. SUPPORT VEHICLE TOOLS AND SUPPLIES.....25
- 8. PROGRAM MAINTENANCE.....27**
 - 8.1. PERIODIC INSPECTIONS27
 - 8.2. ON-GOING TRAINING27
- APPENDIX A: RECOVERY WRECKER SERVICES APPLICATION 1**
- APPENDIX B: SAMPLE INVOICE 1**
- APPENDIX C: TRIP TEAM MEMBERS AND PARTNERS 2**
- APPENDIX D: GEORGIA STATE PATROL MEMO RE: TRIP 3**



1. Introduction

Georgia's Towing and Recovery Incentive Program (TRIP) will pay heavy-duty towing and recovery companies monetary bonuses for the quick clearance of large commercial vehicle incidents in the Metro Atlanta area. The Program is designed to promote safe, fast, and efficient management of commercial vehicle incidents in an effort to reduce congestion, crashes and secondary incidents.

TRIP is a result of collaboration among several organizations in Georgia. The Georgia Department of Transportation (GDOT), the Georgia Regional Transportation Authority (GRTA), and the (FHWA), in close coordination with the Traffic Incident Management Task Force (TIME), have determined that new and innovative solutions for congestion mitigation should be considered and implemented in Metro Atlanta. As one of these innovative solutions, TRIP will help to reduce the impact of major traffic incidents in Metro Atlanta while meeting aggressive clearance goals.

TRIP is based on a comprehensive set of guidelines designed to ensure only well-trained, competent operators with proper heavy duty equipment are dispatched to large commercial vehicle incidents that have a significant impact on major interstate traffic. These guidelines replace long-standing regulations that do not require modern hydraulic wreckers or formally-trained operators. These new guidelines also require support equipment to address the prompt cleanup of spilled loads and vehicle fluids as well as providing required traffic control and scene safety devices.

Metro Atlanta towing and recovery companies have an open invitation to participate in this Program. Once the guidelines outlined in this document are met, a company will be added to the Program and will become eligible to receive a monetary incentive for prompt response to an incident and quick clearance of the highway within established time parameters.

1.1. Program Objectives

TRIP's key objective is the facilitation of quick and safe clearance of commercial vehicle crashes through the improvement of towing standards, procedures and training. This Program will improve incident management in Metro Atlanta while building a mutually beneficial relationship within the towing community by making it more profitable for them to meet quick clearance goals. TRIP is designed to reduce the impact of major traffic incidents in Metro Atlanta by establishing clearance goals of 90 minutes or less.

1.2. Program Benefits

TRIP will benefit emergency responders, traveling motorists, and anyone concerned about traffic incidents in the region by facilitating the quick clearance of large commercial vehicle incidents, resulting in a reduction of congestion and secondary incidents. Responders will benefit from increased safety with decreased time on the dangerous interstates during incident clearance. The benefits for the traveling motorists will be interstate reliability, increased safety, saved time and less frustration. The entire region can benefit from the saved costs from reduced congestion and secondary incidents.



Towing and recovery companies will benefit from safety resulting from proper training and monetary incentives given for well trained operators, proper equipment and quick clearance.

1.3. Performance Measures

Performance measures are the key to validating the improvements and benefits of TRIP to the region, traveling motorists and transportation agencies. The following measures will be calculated to show long-term benefits in the Program:

- Reduction in Response Times
- Improvement in Roadway Clearance Times
- Reduction in Travel-Lane Blockage
- Reduction in Incident Clearance Times
- Dollar Saving from Reduced Congestion

In 2011 an independent performance measures report¹ showed a 10.96:1 benefit cost of TRIP. This study showed a benefit of TRIP calculated as \$9,154,431 of avoided delay, wasted fuel and excess emissions. The average savings per incident was estimated at a cost savings of \$456,396 per incident.

1.4. Program Boundaries

The Program covers I-285, all interstates inside the perimeter including GA-400, all interchange ramps, I-675 and the following boundaries outside the perimeter:

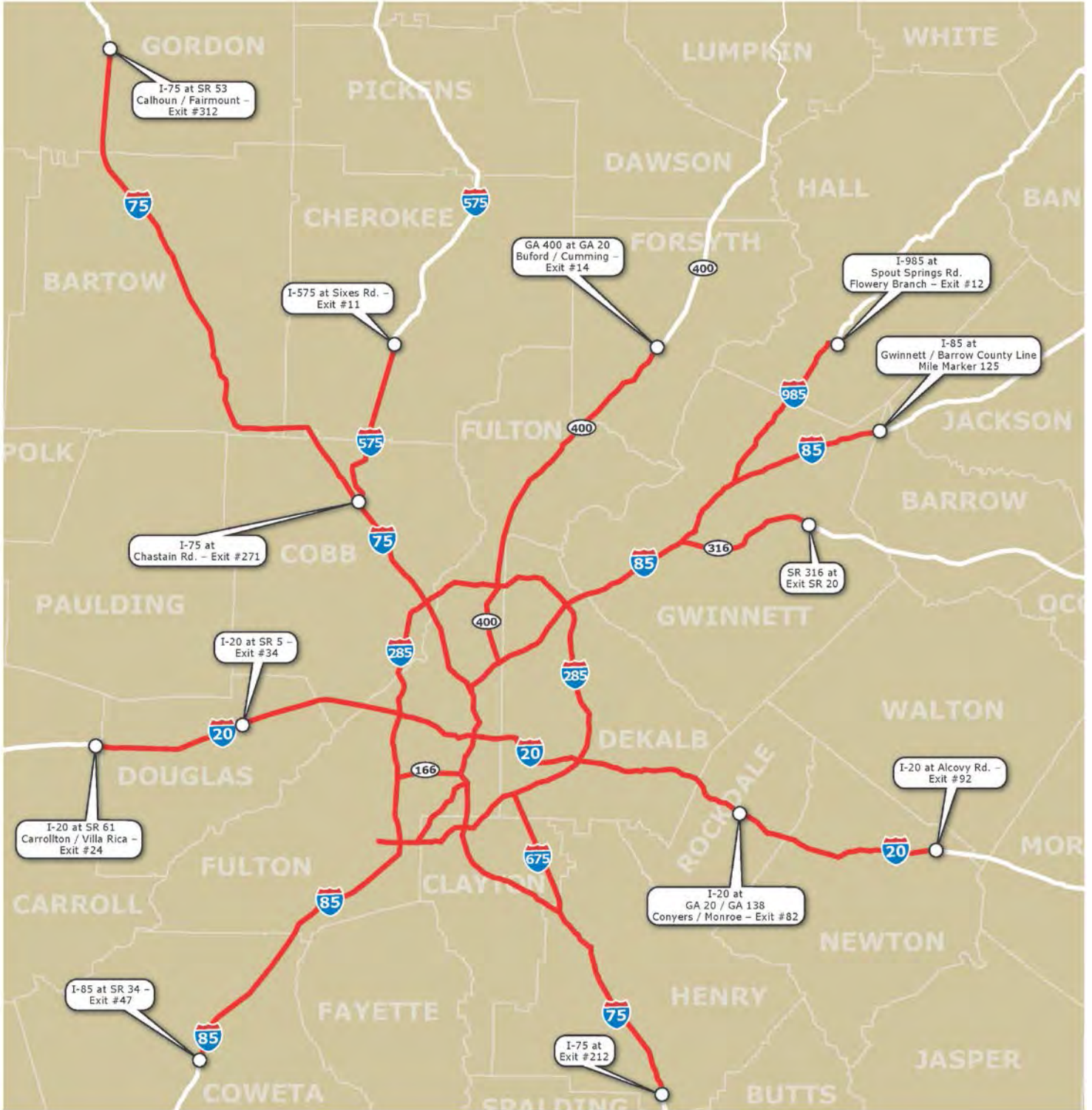
- I-85 Northside: To Gwinnett/Barrow County Line, Mile Marker 125
- I-985 Northside: To Exit 12, Flowery Branch
- SR 316: To State Route 20
- I-75 Northside: To Exit 312, SR 53 Calhoun / Fairmount
- I-575 Northside: To Exit 11, Sixes Rd
- I-20 Westside: To Exit 24, SR 61 Carrollton / Villa Rica
- I-20 Eastside: To Exit 92, Alcovy Road
- GA-400 North: To Exit 14, GA 20
- I-85 Southside: To Exit 47, SR 34
- I-75 Southside: To Exit 212 / Locust Grove

The current TRIP route map effective April 2014 through March 2016 is shown on the next page.

¹ Evaluation of the Towing and Recovery Incentive Program (TRIP), Georgia Department of Transportation, February 4, 2011, Document NAV01-203



Towing and Recovery Incentive Program (TRIP)





2. Relationship of the Parties

GDOT shall grant to the Heavy Vehicle Recovery Company (“COMPANY”) a nonexclusive privilege to provide vehicle recovery and incident scene clearance services, further defined herein, for a designated section(s)/zone(s) of the Metro Atlanta Interstate System.

The COMPANY agrees to provide the professional vehicle recovery services in accordance with the terms and conditions contained herein and in compliance with all the Georgia Department of Public Safety wrecker qualifications and GDOT rules and regulations. The COMPANY also agrees to abide by all local police wrecker regulations and applicable provisions of the Georgia Motor Vehicle Statutes.

The COMPANY’S relationship to GDOT is that of an independent contractor authorized to perform vehicle recovery and incident scene clearance services on a designated section(s) of Metro Atlanta’s Interstate System in strict compliance with the terms and conditions contained herein.

Should GDOT determine that the COMPANY under these Program Specifications is unable to assist, perform or provide adequate services or equipment, GDOT reserves the right to request additional services or equipment from any available source. GDOT also reserves the right to modify or cancel the assigned section, zone or territory covered by the COMPANY due to poor performance with 30 days notice to the affected COMPANY (S), except for in extreme cases, where termination may be immediate.

The COMPANY and all of their operators, employees and sub-let contractors shall cooperate and comply with the instructions and guidance pertaining to incident scene safety, vehicle positioning and traffic control from GDOT officials, GDOT Highway Emergency Response Operators (HERO) supervisors or operators, Georgia State Patrol Troopers, local Police Department officers, appropriate law enforcement / public safety agencies and contractors or consultants as authorized by GDOT and the TRIP Managers.



3. Terms and Agreement

3.1. After Incident Review (AIR)

The COMPANY agrees to attend an after incident review (AIR) for each TRIP activation. This review will use an after-event learning process to achieve continuous improvement by building on successes while correcting mistakes. The AIR will be used to reach a consensus between the COMPANY and TRIP manager, to collect feedback to improve incident recoveries and to approve invoices for payment.

The COMPANY agrees to participate in monthly AIRs located at GDOT HERO Unit. All reviews shall occur the first Thursday of each month, unless notified otherwise.

3.2. Highway Safety Vests

The COMPANY agrees to have all personnel wear regulation Highway Safety Vests according to Code of Federal Regulations 23 CFR Part 634 stating:

All workers within the right-of-way of a Federal-aid highway who are exposed either to traffic (vehicles using the highway for purposes of travel) or to construction equipment within the work area shall wear high-visibility safety apparel.

All persons responding on behalf of the COMPANY – including all subcontractors – must wear an ANSI Class 3 safety vest, coat, jacket or other compliant outerwear-type clothing at all times while on scene.

Failure to comply with the Highway Safety Vest requirements as stated above by the COMPANY and/or any of the COMPANY’S owners, operators, employees, agents or subcontractors will result in the immediate forfeit of any incentive payment for the incident where the violation occurred.

3.3. Books, Records and Invoices

The COMPANY agrees to maintain accurate records of services provided under these Specifications for vehicle recovery, scene clearance and towing. The COMPANY’S books and records pertinent to any GDOT requested vehicle recovery services shall be made available for inspection upon request from GDOT or appropriate law enforcement agencies. Furthermore, the COMPANY agrees to provide GDOT with a TRIP Manager’s approved invoice (as outlined in Section 3.1) for mobilization or crash vehicle relocation and scene clearance activities rendered under these Specifications within ten (10) days of the AIR. The completed invoice shall include a detailed description of the incident, the location with cross street and direction, the date, and the time of the incident, including a notation of the exact time the TMC issued a “notice to proceed” and the exact time the TMC issued an “all lanes opened” for traffic notice . A sample invoice template is provided in Appendix B to facilitate processing and payment. Completed invoices shall be brought to the scheduled AIR. GDOT on-scene supervisors and the TRIP manager will sign approved invoices at the review. It will be the responsibility of the COMPANY to submit signed invoices to GDOT for payment.



3.4. Response Requirements

The COMPANY agrees to provide the services outlined in this document on a twenty-four (24)-hour-per-day basis, seven (7)-days-per-week. The COMPANY will continually maintain with GDOT Transportation Management Center (TMC) a designated telephone number at which a live representative of the COMPANY can be reached twenty-four (24) hours-per-day, seven (7)-days-per-week, on a direct phone line. The use of pagers, answering services or voicemail systems is not acceptable.

The COMPANY must have a certified heavy recovery supervisor (based on required training in Section 5.2.2) available to respond to the incident scene when notified by GDOT within thirty (30) minutes between the hours of 5:30am and 7:00pm, Monday – Friday and within forty-five (45) minutes at any other time outside of these hours. The supervisor is not required to have with them all necessary equipment when they arrive on scene as he/she may be coming from a location separate from where equipment is stored. However, equipment is expected to arrive on-scene within the time frames specified in the sections below.

The COMPANY will not transfer a call for services to another company. A missed call will be considered a failure to meet the Program Specifications and may be cause for suspension or removal from TRIP. If the COMPANY is using the required heavy-recovery equipment elsewhere and it is not available for TRIP activation, a representative must immediately notify the GDOT TMC that the equipment is out of service and the COMPANY cannot respond. The representative of the COMPANY should call back when all equipment is available again to place the COMPANY back in “on-call and in-service” mode.

The COMPANY will notify the GDOT TMC of its “actual” response time if a representative cannot respond within the prescribed time frames. The COMPANY will always provide the TMC with estimated time of arrival (ETA’s) of the entire response crew and their equipment.

The COMPANY will dispatch two (2) Heavy Duty Recovery Trucks, as defined in Section 8 of this document, and a Support Truck with all required equipment. All trucks must arrive on the scene within forty-five (45) minutes between the hours of 5:30am and 7:00pm, Monday - Friday and within sixty (60) minutes any other time outside of these hours to qualify for incentives detailed in Section 6. Any additional specialized equipment defined herein shall also be deployed to the scene within sixty (60) minutes after request for this equipment by GDOT’s TMC. The need for additional follow-up equipment from the COMPANY or from an approved sub-let vendor shall be jointly decided on and approved by on-scene GDOT managers with input by other agency incident commanders and COMPANY representatives.

As part of its application to participate in TRIP, the COMPANY must supply a detailed account of all mutual aid, support or collaborative partnerships with other TRIP companies, TRIP Operators and/or Supervisors, and/or service providers (including HAZMAT operators). TRIP managers will retain and observe these records for the term of the TRIP route assignments.



TRIP companies are permitted to supply approved TRIP Operators, Supervisors and equipment to each other to render mutual aid and in consideration for meeting their response and clearance obligations. No other personnel will be accepted as approved TRIP participants for the sake of meeting TRIP response requirements.

3.5. Termination

GDOT reserves the right to terminate the COMPANY as a participant in this Program for not meeting the Specification outlined here-in. Termination for cause would be effective thirty (30) days after written notice to the COMPANY by certified mail, except for in extreme cases, where termination may be immediate. The COMPANY has the right to meet with GDOT representative(s) and seek alternative remedies prior to termination. GDOT reserves the right to terminate the COMPANY as a participant in this Program for any cause.

Termination of the COMPANY'S right to do business in the State of Georgia or any of its political sub-divisions under the existing name shall be grounds for immediate termination of the COMPANY as a participant in this Program. A change in ownership will require a new application filed within 60 days and inspection process prior to reinstatement to TRIP.

3.6. Indemnity and Insurance

The COMPANY shall maintain all insurance coverage in compliance with the Georgia Department of Public Safety wrecker qualification policy. In addition, the **COMPANY will indemnify and hold harmless the Georgia Department of Transportation and/or the Georgia Regional Transportation Authority, their officials, officers employees, consultants and agents from and against any and all liabilities, claims, injuries, damages, penalties, actions, suits, losses, costs, expenses and attorneys' fees resulting from or arising out of GDOT requests for vehicle recovery services or incident scene clearance on the Metro Atlanta Interstate System.**

3.7. Miscellaneous Penalty Assessment

This is a non-exclusive arrangement. GDOT reserves the right to request other companies or local or state resources to perform vehicle recovery and incident scene clearance within this or any other section of the interstate system at any time.

If the COMPANY is contacted by a vehicle owner, another governmental agency, or a third party (other than GDOT or its authorized representative) to respond to or provide heavy duty recovery or towing services on the Metro Atlanta Interstate System, the COMPANY shall notify the GDOT TMC immediately @ (404) 624-2655. The TMC will document the details of the request to coordinate the response to avoid any confusion. If it is determined that the COMPANY has provided heavy duty recovery or towing services on a TRIP scene without being authorized by the TMC, the following penalties will occur in sequential order:



Towing and Recovery Incentive Program (TRIP)

- 1st Offense: The COMPANY will forfeit the next \$2500 or \$3500 incentive payment following the offense.
- 2nd Offense: The COMPANY will forfeit the next three (3) \$2500 or \$3500 incentive payments following the offense.
- 3rd Offense: The COMPANY will forfeit the next five (5) \$2500 or \$3500 incentive payments following the offense and could be removed from the program.

The on-scene COMPANY supervisor will report to the command post, police supervisor, or GDOT HERO supervisor upon arrival. The COMPANY supervisor will participate in recovery discussions and participate in the 'Unified Command Process' with the incident commanders. All communications from the COMPANY to GDOT or any other off-scene public agency personnel will be routed through the TMC or will take place in person with the GDOT on-scene supervisor.

The COMPANY or any of its owners, operators, employees or agents will not provide any gratuities, commissions, kick-backs or complimentary services of any kind to any GDOT, GRTA or local agency officials, officers, employees or consultants.

The COMPANY or any of its owners, operators, employees or agents will not discuss, in an attempt to influence, activating TRIP with any HERO, Police or other on-scene incident responder prior to official Notice to Proceed from GDOT TMC. For example, the Company shall not "persuade" or "advise" on-scene responders to activate a TRIP incident. If it is determined that the COMPANY has, in any way, tried to influence the decision to activate TRIP, the following penalties will occur in sequential order:

- 1st Offense: The COMPANY will receive no payment including Flat Rate Service Charge or Emergency Response and Mobilization Incentive.
- 2nd Offense: The COMPANY will be suspended from the Program for three (3) months.
- 3rd Offense: The COMPANY will be removed from the Program.

These offenses will be documented, including written notification to the COMPANY, and will be retained for the duration of the COMPANY's involvement in a two-year TRIP route assignment and may be considered during future route assignments.



Recovery Zones

Wrecker Companies interested in participating in TRIP must submit an application to TRIP according to the steps provided in the TRIP Applications (Appendix A). Applications will be accepted every two (2) years only, starting in November, according to the final schedule:

- Open enrollment period starts: November 1
- Application Deadline: November 30
- Manager application review, company corrections, re-submittals (if necessary): December
- Manager inspections: January – February
- Route Negotiations: March
- Route Activations: April

Routes will be determined every 2 years, starting in 2010, depending on the applications received and the outcome of route negotiations with each company. A rotation may be implemented for those routes that may overlap with multiple

TRIP managers, who will be jointly appointed by GDOT as the representatives for those organizations under this Program, will perform initial reviews of submitted applications to verify completeness and general resource qualifications; schedule necessary meetings or teleconferences with applicants to discuss the Program in detail and offer the opportunity to answer questions; and qualify applicants. Qualified applicants will then be contacted and visited by Program representatives for an on-site inspection validating compliance with both staff and equipment requirements and stated company ability to perform the required quick clearance functions.

In the next step of the process, GDOT will negotiate with the COMPANY to establish the “**recovery zone(s)**” assigned to the applicant(s). The COMPANY need not be located within the zone boundaries, but they must have the ability to mobilize and respond to calls within the indicated response time requirements included in Section 3.3.

GDOT may review the geographic limits of the Program and the recovery zone boundaries periodically to ensure that the level of service in each zone is consistent with the 90 minute quick clearance goals established by TIME and included in Georgia’s Open Roads Policy.

By letter of authorization, GDOT will identify an approved company as the **Preferred Vehicle Recovery and Incident Scene Clearance Provider** (as outlined herein) for said zone or section of the mainline interstate, including all interchange ramps and approaches within the Right-of Way under the operational control of GDOT.

The zone will be identified by the facility name from mile post to mile post and by cross street when possible.



4. Qualifications

4.1. Company Requirements

1. The ultimate equitable owner/owners of all the COMPANIES participating must have been in the heavy duty towing and recovery business for a minimum of three (3) years prior to applying for participation as a TRIP contractor.
2. The COMPANY must meet applicable county, city and state registration requirements and maintain all required occupational and business licenses.
3. The COMPANY must comply with all rules and requirements and provide evidence of current and valid insurance coverage required by the Georgia Department of Public Safety and those outlined in the Federal Office of Motor Carrier Safety/ MCS-90 regulations.
4. The COMPANY must maintain proper, current Commercial Drivers License (CDL) records in compliance with the Georgia Department of Motor Vehicles as well as complete the towing and recovery training and certification documentation as described in Section 5.2. All required records and files shall be made available for inspection by the GDOT or their authorized agents upon request.
5. The COMPANY staff members who will be responding to TRIP call-outs **must be proficient in “Traffic Incident Management and Quick Clearance” practices**. The COMPANY’S towing and recovery staff identified in the TRIP application will be required to demonstrate their knowledge and ability to perform the following expedited roadway clearance and incident scene safety procedures:
 - Single lane up-righting of a loaded tractor trailer (wreckers and the casualty within a 24 foot lateral space).
 - Multiple techniques for the relocation of overturned heavy trucks, including tractor trailers from travel lanes while loaded (100 feet minimum).
 - Safe work zone setup utilizing, at a minimum, advanced warning signs and an arrow board and traffic cones as outlined in the Manual on Uniform Traffic Control Devices (MUTCD) Chapter 6-I.
 - Containment and mitigation of accidental discharges of motor vehicle fluids (non-cargo)—primarily diesel fuel, including application of traction enhancement material.
 - Clearance of non-hazardous spilled cargo and debris at large crash scenes (utilizing equipment with a bucket and a broom).



4.2. Staff Requirements

At least one TRIP certified supervisor must be on scene at all times in addition to a minimum of two certified operators. All operators and supervisors must have a valid CDL and must have successfully completed the required training and obtained certification with all required endorsements from the TIME Task Force prior to being accepted in TRIP (applications for the Program can be submitted for review while staff is in training).

The training requirements set by the TIME Task force for this Program were developed with input from the Towing and Recovery Association of Georgia (TRAG) and are intended to be consistent with or exceeding the standards developed by the Towing and Recovery Association of America (TRAA) under Federal Highway Administration (FHWA) sponsorship.

Additional or previous courses completed by operators or supervisors considered “equivalent” to the TRIP training requirements outlined in these Specifications must be submitted to the TIME Task Force for approval before they may be considered “acceptable” TRIP training. Examples of potentially acceptable courses are included in Sections 5.2.1 and 5.2.2 for both operators and supervisors.

The COMPANY is required to monitor the training status of all of its TRIP personnel using the learning management system available online at TRIP.Wreckmaster.com and notify TRIP managers of any necessary updates.

4.2.1. OPERATORS

Each TRIP operator will operate under the National Incident Management Systems (NIMS) Unified Command process and the quick clearance guidelines outlined in Georgia’s Open Roads Policy.

Required training to qualify as a TRIP operator:

- Level I Towing and Recovery Operator Training offered by the TIME Task Force (16 hours)

Required Endorsements:

- Hazardous Materials Awareness (4 hours)
- MUTCD and GDOT Flagger training
- NIMS 700 (National Incident Management Systems)
- Traffic Incident Management Practices (8 hours) including quick clearance strategies outlined in the Georgia Open Roads Policy

Acceptable TRIP operator training² might include the following examples:

- Level I Towing and Recovery Operator Training approved by the TIME Task Force (16 hours): WreckMaster[®] Level 6/7

² This is only an EXAMPLE; all training must be submitted to the TIME Task Force for final approval.



Towing and Recovery Incentive Program (TRIP)

- Hazardous Materials Awareness (4 hours): Any previous awareness class taken within a year of the applications submittal date.
- Traffic incident management practices (8 hours) including quick clearance strategies outlined in the Georgia Open Roads Policy: National Highway Institute (NHI) Managing Traffic Incident and Roadway Emergencies Course 133048

All responding towing and recovery operators working under the direction of the on-scene supervisor shall be fully qualified (including all necessary training) to operate all the equipment deployed to the scene (including but not limited to trucks, loaders, skid steer bucket and sweeper).

4.2.2. SUPERVISORS

Each TRIP call from the GDOT TMC for incident scene clearance will require an owner, manager, or crew leader who has been certified by the TIME Task Force. This person will serve as the on-scene supervisor and will become the incident commander for towing and recovery. He/she will operate under the National Incident Management Systems (NIMS) Unified Command process and the quick clearance guidelines outlined in Georgia's Open Roads Policy.

Required training to qualify as a TRIP supervisor:

- Level I Towing and Recovery 'Operator' Training offered by the TIME Task Force (16 hours) and
- Level II Towing and Recovery 'Supervisor' Training offered by the TIME Task Force (16 hours)

Required Endorsements:

- Hazardous Materials Awareness (8 hours)
- MUTCD and GDOT Flagger training
- NIMS 700 (National Incident Management Systems)
- NIMS 100 (the second level NIMS training as outlined by Homeland Security)
- Traffic Incident Management Practices (8 hours) includes quick clearance outlined in Georgia's Open Roads Policy

An example of acceptable TRIP supervisor training³ might include the following:

- Hazardous Materials Awareness (8 hours): Any previous awareness class taken within a year of the applications submittal date.
- Traffic incident management practices (8 hours) including quick clearance strategies outlined in the Georgia Open Roads Policy: National Highway Institute (NHI) Managing Traffic Incident and Roadway Emergencies Course 133048

³ This is only an EXAMPLE; all training must be submitted to the TIME Task Force for final approval.



4.2.3. SUPERVISOR-IN-TRAINING

GDOT strongly endorses training, education and certification in the towing and recovery industry. To qualify and advance to supervisor under this Program, an experienced operator must attend formal approved training courses and obtain TRIP supervisor level certification. After review, qualified applicants will be added to the approved supervisor list.

Records of training and certification endorsements for all supervisors and operators will be maintained and updated by the COMPANY and made available to GDOT program managers upon request at the COMPANY offices.

4.3. *Proper Identification*

All operators and supervisors should wear an official TRIP photo ID, which will be provided by TRIP upon successful registration to the Program. This ID identifies them to the other on-scene officials. It should also contain verification of their level of certification with all endorsements. Additional needed personnel are allowed on-scene without TRIP badges as long as one supervisor and two operators, at a minimum, are on-scene at all times.

5. Compensation

5.1. *Billing Vehicle Owners*

The COMPANY agrees to seek all compensation for actual vehicle recovery and towing services performed pursuant to this Program solely from the owner of the vehicle or their insurance company. The COMPANY agrees that no claim for compensation will be made to GDOT, GRTA or any Public Safety agency or their employees or agents for any recovery or towing services, unless the COMPANY is permitted to do so by GDOT.

5.2. *Emergency Response Incentive*

Notwithstanding Section 6.1 above, companies will receive an incentive if the incident meets the conditions of either Event Type 1 *or* Event Type 2, as set forth below. Each incident will only be categorized under one of the two event types. Under no circumstances will a company receive incentives corresponding with both event types for a single incident.



Towing and Recovery Incentive Program (TRIP)

Event Type 1

GDOT agrees to pay a **Flat Rate Service Charge of \$600** in the following situations:

1. The COMPANY is contacted by GDOT, mobilizes, and arrives at the crash scene with two wreckers and the support vehicle within forty-five (45) minutes between the hours of 5:30am and 7:00pm Monday - Friday and within sixty (60) minutes any other time outside of these time and day boundaries, **AND**
2. A second towing and recovery firm hired or engaged by the vehicle owner is allowed by GDOT and the Public Safety incident managers to complete the clearance of the incident and towing of the vehicles.

OR

Event Type 2

GDOT agrees to pay an **emergency response and mobilization incentive** payment of \$2500 if two wreckers and one support truck:

1. Have responded to the incident scene with all requested recovery, clearance and traffic control equipment and necessary personnel within forty-five (45) minutes between the hours of 5:30am and 7:00pm Monday - Friday and within sixty (60) minutes any other time outside of these time and day boundaries from the official notification by the GDOT TMC, **AND**
2. Have completed the removal and clearance of all crash scene vehicles, cargo, debris and non-hazardous vehicle fluids from all travel lanes and opened them to traffic within ninety (90) minutes after the official notice to proceed (NTP) was given by Public Safety and GDOT incident managers. **AND**
3. Have the approval of the GDOT on-scene incident manager verifying conditions 1 and 2 above were met.

If any of the additional special equipment outlined in Section 7.2 and 7.3 (**with the exception of the support vehicle with an enclosed, utility body and/or a tandem axle, enclosed utility trailer**) is requested by GDOT and arrives on-scene within the required response time outlined above, an additional \$1,000 is offered for a maximum total **emergency response and mobilization incentive** payment of \$3,500.

Note: GDOT documented “**notice to proceed**” and “**all lanes open**” times recorded at the GDOT TMC will be used to verify the request for emergency response and mobilization payment. It is imperative that these “milestone” times are communicated from the scene to the TMC.



5.3. Forfeiture of Mobilization Compensation

Emergency Response and Mobilization Incentive payment will not be paid if any of the following are true:

1. The required equipment and personnel failed to arrive on scene in the established time.
2. The COMPANY has not completed all required work needed to open travel lanes.
3. All travel lanes are not open to traffic **ninety (90) minutes** after notice to proceed.

However, if the COMPANY is ordered to stop their roadway clearance activity by Fire Rescue, Public Safety or a GDOT Incident Commander, the COMPANY will not be penalized for the time they were delayed and shall receive payment if the total time spent clearing the incident is 90 minutes or less. This extended time must be documented by the GDOT TMC and verified by an on-scene manager or their authorized representative.

5.4. Liquidated Damages

If the COMPANY has not completed the removal and clearance of the vehicles, non-hazardous cargo, debris and vehicle fluids within three (3) hours from the Notice to Proceed (NTP) and/or all travel lanes are not open to traffic as a result, a flat rate of **\$600** can be assessed against the COMPANY at the discretion of the GDOT TRIP Project Manager, except where the COMPANY has been ordered to stop roadway clearance activity by the GDOT incident commander or an appropriate law enforcement official in charge of the incident. An additional **\$10.00 per minute (or \$600/hour)** after three (3) hours from notice to proceed **may** be assessed for each additional minute (or hour) it takes the COMPANY to completely open the roadway to traffic.

The following exemptions are allowed as part of the Liquidated Damages Provisions:

1. Incidents involving trucks hauling a Hazardous Material cargo that require special precautions by direction of the incident commanders.
2. Incidents involving damage to the roadway infrastructure that prohibit reopening the travel lanes.
3. Upon direction of the GDOT TRIP program manager.



6. Criteria for Activating Program

A. Truck Tractor Semi-Trailer Combinations (DOT Class 8)

- Rollover blocking any of the travel lanes
- Multiple truck crash
- Jack-knifed and not drivable
- Lost Load on or affecting the travel lanes
- Load Shifted on or affecting a travel lane
- Lost tandems or axle or buckled trailer on or affecting a travel lane
- Truck fire with tires burned off or cargo spilled
- Major impact with guard rail, bridge support or structure on top of a barrier wall

B. Trucks over 26,000 lbs. and ‘Bobtail’ Tractors (DOT Class 7 or 8)

- Rollover blocking any of the travel lanes
- Lost load on or affecting the travel lanes
- Load shifted on or affecting travel lanes
- Lost tandems or front axle
- Truck fire with tires burned off or cargo spilled
- Major impact with a guard rail, bridge support or structure on top of a wall

C. Large Motor Homes (40ft plus) and Motor Coaches (DOT Class 5 and 6)

- Rollover on the travel lanes
- Fire with tires burned off
- Major impact with a guard rail, bridge support or structure on top of a barrier wall

D. Busses (16 passenger or more, DOT Class 6, 7 & 8)

- Rollover on or off travel lanes
- Crash with multiple injuries
- Fire with tires burned off or burned luggage on the roadway
- Major impact with a guard rail, bridge support or structure on top of a barrier wall

E. Aircraft

- Any incident involving an aircraft on the Atlanta Interstate System

Note: In addition, any complex or extended incident where vehicles cannot be easily towed from the scene or are creating a hazard to traffic may be candidates for activating this Program. On-scene incident commanders can request activation with concurrence of the GDOT HERO shift supervisor.

During incidents of severe weather and other emergency situations, including an officially declared state of emergency, TRIP may be activated as a resource to assist GDOT in addressing recovery and clearance needs. In such instances, program requirements relative to meeting response or recovery times may be waived. Incentives may be supplied to responding TRIP service providers following these incidents.



TRAA VEHICLE IDENTIFICATION GUIDE[®]

CLASS 1 • LIGHT-DUTY • (6,000 lbs. or less GVW - 4 tires)*



CLASS 2 • LIGHT-DUTY • (6,001 - 10,000 lbs. GVW - 4 tires)*



Classes 1 and 2 include passenger vehicles, light trucks, minivans, full size pickups, sport utility vehicles and full size vans.

CLASS 3 • MEDIUM-DUTY • (10,001 - 14,000 lbs. GVW - 6 tires or more)*



CLASS 4 • MEDIUM-DUTY • (14,001 - 16,000 lbs. GVW - 6 tires or more)*



CLASS 5 • MEDIUM-DUTY • (16,001 - 19,500 lbs. GVW - 6 tires or more)*



CLASS 6 • MEDIUM-DUTY • (19,501 - 26,000 lbs. GVW - 6 tires or more)*



Classes 3 through 6 include a wide range of mid-size vehicles, delivery trucks, utility vehicles, motorhomes, parcel trucks, ambulances, small dump trucks, landscape trucks, flatbed and stake trucks, refrigerated and box trucks, small and medium school and transit busses.

CLASS 7 • HEAVY-DUTY • (26,001 - 33,000 lbs. GVW - 6 tires or more)*



CLASS 8 • HEAVY-DUTY • (33,001 lbs. and over GVW - 10 tires or more)*



Information Needed To Correctly Dispatch Towing and Recovery Units:

- Year, Make and Model of Vehicle to be Towed or Recovered
- DOT Classification (Class 1 – 8 based on GVW)
- Location of Vehicle
- Type of Tow (impound, accident, recovery motorist assist, etc.)
- Additional Vehicle Information
 - 2 wheel drive, 4 wheel drive, all wheel drive
 - damage to vehicle, tire condition
 - vehicle loaded or empty
 - cargo contents
 - does the vehicle have a trailer
 - are the keys with the vehicle

Note: Any vehicle may carry hazardous materials. Advise if placarded.

** Note:* The Gross Vehicle Weight Rating (GVWR) of the vehicle to be towed or recovered can be found on the identification label on the vehicle's driver's side doorframe. The number of pounds listed on the label can then be compared with the DOT Classification Vehicle Type Chart for the correct DOT class.

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7. Equipment and Vehicle Requirements

This section details the equipment requirements for wrecker and recovery trucks; additional trucks and heavy equipment; contracted services and equipment; tools, materials, rigging and supplies on wrecker; and, materials, equipment, and supplies on support vehicle.

7.1. Recovery Wrecker Specifications

All eligible COMPANIES must have either one 50-Ton Recovery Truck **OR** one 40-Ton Rotator **AND** One 30-Ton Heavy Duty Wrecker. The qualifications listed below are minimums that must be met for each piece of equipment.

50-Ton Recovery Truck	40-Ton Rotator	30-Ton Heavy Duty Truck
<ul style="list-style-type: none"> ▪ Hydraulic extendable, fixed boom, ultra heavy duty Recovery Truck. 	<ul style="list-style-type: none"> ▪ A boom structural rating (TEMA or SAE) of 80,000 lbs. 	<ul style="list-style-type: none"> ▪ 30-Ton Hydraulic, extendable boom, heavy duty Wrecker.
<ul style="list-style-type: none"> ▪ A boom structural rating (TEMA or SAE) of 100,000 lbs. 	<ul style="list-style-type: none"> ▪ A minimum of two planetary or worm drive winches with a minimum of 200 ft. of 3/4" wire rope on each. 	<ul style="list-style-type: none"> ▪ A boom structural rating (TEMA or SAE) of 60,000 lbs.
<ul style="list-style-type: none"> ▪ A minimum of two planetary or worm drive winches with a minimum of 200 ft. of 3/4" wire rope each. 	<ul style="list-style-type: none"> ▪ The boom shall extend a minimum of 240" beyond the tailgate (level). 	<ul style="list-style-type: none"> ▪ A minimum of two winches each with 200 ft. of 3/4" or 200 ft. of 5/8" wire rope.
<ul style="list-style-type: none"> ▪ The boom shall extend a minimum of 150" beyond the tailgate (level). 	OR	AND
<ul style="list-style-type: none"> ▪ The boom shall elevate to a working height of 21 ft. (@ 30 degrees) at a minimum. 	<ul style="list-style-type: none"> ▪ The boom shall elevate to a working height of 30 ft. (@ 50 degrees) at a minimum. 	<ul style="list-style-type: none"> ▪ The boom shall extend beyond the tailgate a minimum of 120" (level).
<ul style="list-style-type: none"> ▪ The truck chassis shall be a minimum of 62,000 lbs. GVW. 	<ul style="list-style-type: none"> ▪ The truck chassis shall be a minimum of 62,000 lbs. GVW. 	<ul style="list-style-type: none"> ▪ The boom shall elevate to a working height of 18 ft (@30 degrees) at a minimum.
<ul style="list-style-type: none"> ▪ The unit shall be equipped with a hydraulic, extendable under reach tow unit with a capacity of 50,000 lbs.(Retracted) 	<ul style="list-style-type: none"> ▪ The unit shall be equipped with a hydraulic, extendable under reach tow unit with a capacity of 50,000 lbs⁴.(Retracted) 	<ul style="list-style-type: none"> ▪ The truck chassis shall be a minimum of 52,000 lbs. GVW
		<ul style="list-style-type: none"> ▪ The unit shall have an under reach tow unit rated at 35,000 lbs.(retracted)

⁴ An under reach of 35,000 lbs is acceptable for the NRC 40 ton rotator.



Towing and Recovery Incentive Program (TRIP)

It is strongly suggested that the recovery truck chassis and frame be designed for or reinforced for severe service. The drive line should also be severe service and geared for the low-end, high-torque applications frequently required for quick lane clearance. This Program frequently requires the relocation (dragging) of wrecked heavy trucks out of the roadway while still loaded and overturned.

7.2. Additional Trucks and Heavy Equipment

The following equipment is required to be owned and stored at the yard:

Quantity	Equipment
1	Tilt bed, hydraulic, lowboy semi-trailer (Landoll or equivalent) with a 35 ton capacity, 40-48 ft. bed and a winch with 75 ft. of 5/8" cable.
1	Tandem axle road tractor with a sliding fifth wheel.
1	Rollback flatbed wrecker.
1	Self contained, V-hopper, pick-up or trailer mounted Sand Spreader. The unit shall have a minimum capacity of 1½ cu. yd. with a conveyor or auger feed and adjustable rate spinner. Sand must be kept dry!
1	Heavy-duty skid steer or rubber tracked loader with bucket, broom, and fork attachments.
1	Support vehicle with an enclosed, utility body and a roof mounted GDOT approved MUTCD Type B arrow board. The truck shall be stocked with MUTCD traffic control devices (signs, sign stands and cones etc.) and the additional tools, equipment and material listed for the TRIP support vehicle <b style="text-align: center;">OR A tandem axle, enclosed utility trailer pulled by a tow vehicle with a roof mounted GDOT approved MUTCD Type B arrow board.

7.3. Contracted Services and Heavy Equipment

The COMPANIES participating in TRIP must show proof of an existing account or agreement in good standing with a local vendor, contractor or equipment supplier to provide the services or equipment outlined below. These services must have a means and capability to respond to an incident scene where TRIP has been activated within the required response time 24/7.

Contract Equipment
A Maintenance of Traffic (MOT) Contractor that can provide and set up full MUTCD and GDOT approved work zone traffic controls.
A Disposal Company that can deliver to the scene of an incident, dumpsters or hoppers



Towing and Recovery Incentive Program (TRIP)

for crash debris, fire debris and or spilled non-hazardous cargo.
A Vacuum or Suction Service for off-loading or recovering and transporting large quantities of spilled grain, powders, plastic pellets or non-hazardous liquids and sludge, etc.
A Trucking or Transport company that can provide van, dump, refrigerator or flat bed trucks and/or semi- trailers.
A Construction Crane Rental Company with 50 ton and larger mobile cranes.
A contactor or equipment rental company that can deliver a heavy duty, rubber tired, articulated, construction, end-loader

7.4. Recovery Wrecker Tools and Supplies

Each TRIP heavy duty wrecker shall carry the items outlined below:

Quantity	Equipment
8	Alloy (grade #8) chains: <ul style="list-style-type: none"> ▪ 3/8" x 10' (2 each) ▪ 5/8" x 10' (2 each) ▪ 1/2" x 10' (4 each)
4 (2 Pairs)	Wide profile, recovery straps matching wrecker capacity
4	Heavy duty snatch blocks (working load matched to the winches)
Various	Hooks, clevis' and chokers (matched to the wrecker capacity)
1 (24" x 24")	High Pressure air cushion with control module and hose
4 (4" x 6")	4-foot hardwood timbers
8 (4"x4")	2-foot, hard wood cribbing
1 (20 ft)	Folding or extension ladder
1	36" bolt cutters
2	BC Fire extinguishers (10 lbs)
1	Long handle axe
2	D-handle shovels (flat blade)
1	Long handle shovel (round pointed blade)
2	Street brooms
4	Wheel chocks
1 (5 ft)	Pike bar
1	Crow bars (36")
1	Sledge hammer (8-10 or 12 lbs)
2	Large capacity trash cans
1	Hydraulic jack (20 ton)
1	Fuel tank plug/spill/leak kit, fully stocked
Various	Angle iron or aluminum, wide flange at various lengths
1	Complete brake release kit: (hand tools, air hoses, glad hands, numerous brass fittings and brake caging bolts)



Towing and Recovery Incentive Program (TRIP)

Quantity	Equipment
2	Heavy duty, Industrial flashlights
10	28 inch, reflectorized orange traffic cones (clean)
4 Dozen Or 2 Dozen Or 10	30-minute highway flares (wire stand) or orange chemical flares Or 1-hour orange chemical flares Or Light Emitting Diodes (LED) flares with in-vehicle chargers or replacement batteries
120 lbs or 30 gallon	oil dry or approved high performance absorbent
50 ft	Rope (1/2")
4	Load binders, transport chains and cheater pipe
1	Tarpaulin (20 ft x 20 ft.)
2	Rolls of duct tape
2	Sewer, drain or inlet covers (mud flaps acceptable)
1	Complete mechanics hand tool set
1	Complete first-aid kit
<p>Note: The above listed items are required as a minimum. It is expected that a professional towing and recovery wrecker operation will supplement this list with any and all items needed to operate in a completely safe and efficient manner.</p>	

7.5. Support Vehicle Tools and Supplies

The support truck or trailer shall carry the following:

Quantity	Equipment
60	28 inch reflectorized orange traffic cones (clean)
4	Fabric, 48" MUTCD approved, GDOT authorized, Incident Management warning signs
4	Portable sign stands for 48" warning signs (see item above)
1	Gas powered cut-off saw
4	Auxiliary flood lights w/stands, w/ generator
1	Portable air compressor
1	Air impact wrench with sockets
1	Air powered metal chisel
1	Acetylene/Oxygen cutting torch w/tanks
1	Bolt cutters (36")
4	D-handle shovels (flat blade)
2	Long handle shovels (round pointed blade)
2	Aluminum or plastic, non-sparking coal or grain shovels
4	Street brooms
1	Adjustable drum moving dolly
1	Hand truck



Towing and Recovery Incentive Program (TRIP)

Quantity	Equipment
1	Pallet puller
1	Dock plate with clamps
2	Large Tarpaulins (20 ft. x 20 ft.)
6 Dozen Or 2 Dozen Or 18	30-minute Highway flares (wire stand) or orange chemical flares Or 1-hour orange chemical flares Or Light Emitting Diodes (LED) flares with in-vehicle chargers or replacement batteries
200 lbs or 50 gallons	Oil dry or approved high performance absorbent
4 Bags	Asphalt cold patch
1	Roll of rubber floor runner (36" wide)
10 lbs	16D nails
Numerous	Softwood 2x4 studs
2	Rolls of heavy duty (80 gauge) stretch wrap with dispenser
4	Rolls of duct tape
Sufficient	Load binders and securement chain for a 30 ton load
1	Case of heavy duty, 55 gallon, contractor trash bags
1	Roll of heavy gauge visqueen plastic sheeting
1	Complete , industrial first-aid kit
<p>Note: These tools, supplies and material are required as a minimum. It is expected that a professional recovery wrecker operation will supplement this list with all items needed to operate in a safe and efficient manner.</p>	



8. Program Maintenance

8.1. Periodic Inspections

Program managers will inspect and photograph the tow yard and all required trucks and heavy equipment during the approval process. Official TRIP decals will be applied by TRIP managers **to all** the COMPANY'S trucks that are qualified to respond to a call-out, identifying them as approved TRIP vehicles. Any new equipment must be inspected and approved prior to being used to respond to a TRIP callout. TRIP vehicle decals must be on all on-scene vehicles and shall be removed from vehicles taken out of service.

The tow yard will be inspected to assure it has reserve capacity available to securely store several large commercial vehicles removed from crash scenes.

During the initial inspection, there will also be a review of all the operator and supervisor training, certification documentation and safety and driving records. Periodic subsequent inspections will be scheduled at least every 12 months or sooner at the discretion of the TRIP managers.

All trucks and equipment will be kept clean and in excellent mechanical condition. The TRIP operators and supervisor shall maintain a professional personal appearance and demeanor at all times. The adherence to on-scene safety practices by the entire crew shall be a top priority.

Special attention should be given to maintaining the wreckers, especially items used for heavy lifting and winching. This special attention includes, but is not limited to, winches, wire rope, snatch block maintenance, hook attachment devices, and monitoring for or chain wear/ link stretching or recovery strap abrasion.

Inspections may be made periodically at specified times. In addition, unannounced inspections may take place at any time. Complaints from TRIP managers or other response agencies indicating breaches of safe operating practices or any of the above could prompt an unannounced inspection.

8.2. On-going Training

TRIP operators and supervisors will need to maintain TIME Task Force certifications and endorsements. In addition, COMPANY towing and recovery professionals are required to attend at least eight (8) hours of training or continuing education every 12 months. This training could include Traffic Incident Management workshops, MUTCD traffic control flagger training, or advanced towing and recovery practices. Other training programs will be approved by the TIME Task Force as requested.

COMPANIES participating in TRIP are urged to attend multi-agency training exercises or practice drills with local fire departments and other Metro Atlanta response agencies.



Towing and Recovery Incentive Program (TRIP)

Active involvement in a formal training exercise involving heavy rescue, mass casualty, tank truck emergencies or hazardous material incident response can satisfy 50 percent or four (4) of the required eight (8) hours of continuing education and training requirement for each year.

Documentation of attendance and participation must be provided to the TIME Task Force and be placed in the company maintained employee training files, which is part of the OSHA requirements.

Appendix A: Recovery Wrecker Services Application

TRIP Application Instructions

The Towing and Recovery Incentive Program (TRIP) is a financial incentive program for expedited towing and recovery services for large commercial vehicle incidents on the Metro Atlanta Interstate system. The incentive Program will help meet the region's goal of clearing major incidents in less than 90 minutes.

Membership in this Program means an approved wrecker company is assigned a designated route of the interstate to respond to qualifying large-scale incidents. When called to a TRIP activated incident, approved COMPANIES will receive a monetary bonus for response and clearance within the designated time frames.

To become a member of TRIP the COMPANY/COMPANIES must:

- Must have been in the heavy duty towing and recovery business for a minimum of three years prior to applying
- Fill out the attached TRIP application completely
- Own and maintain all required equipment
- Have the ability to meet response and clearance time requirements
- Meet all Training and Certification requirements
- Attend eight (8) hours of training annually
- Agree to the terms and conditions included in the TRIP Specifications

The application process for membership in TRIP includes the following steps:

- Interested COMPANIES can submit applications to the following:
Email to jeff.corbin@parsons.com
Or send to Jeff Corbin c/o Parsons
2055 Sugarloaf Circle, Ste 500 Duluth, GA 30097
Please return typed – PDF or Word document preferred
- TRIP managers will review applications for completeness.
- Applications will be qualified based on TRIP Specifications.
- TRIP managers will conduct on-site inspections of equipment, facility, and staff.
- TRIP managers will work with COMPANIES to assign appropriate Response Zones.
- Applicants will be evaluated on an annual basis to ensure Program adherence.

Participation in this Program is voluntary and at the discretion of GDOT. However, only approved TRIP COMPANIES will be called for TRIP Incidents or be eligible to receive financial incentives.

For complete information on TRIP terms, compensation, requirements and maintenance, please refer to the TRIP Specifications.



Georgia Department of Transportation Towing and Recovery Incentive Program (TRIP)

TRIP APPLICATION: 2016-2018 Route Assignments

Please return typed – PDF or Word document preferred.

Email to jeff.corbin@parsons.com

Or send to Jeff Corbin c/o Parsons

2055 Sugarloaf Circle, Ste 500 Duluth, GA 30097

Deadline – Nov. 30, 2015 by 5:00 p.m. EST

Date of application:

1. Company legal name:
2. Company type (Proprietorship, Partnership, Corp., etc.):
3. Business Address:
 - Street:
 - City:
 - State:
 - Zip:
4. Date company operations started:
5. City where company operations started:
6. Business telephone numbers:
 - Daytime number:
 - 24-hour number:
 - FAX number:
7. Primary email address:
8. Federal Employer ID number:
9. Names of ultimate equitable owner(s) or officers and number of years in heavy-duty towing and recovery:
 - Name/years:
 - Name/years:
 - Name/years:
 - Name/years:

10. Business location where equipment is stationed:

- Location 1 (primary location) - Street address, City, State, Zip:
- Location 2 - Street address, City, State, Zip:
- Location 3 - Street address, City, State, Zip:
- Location 4 - Street address, City, State, Zip:

11. Own or lease the business buildings and/or adjoining land at each location? Please explain below for each location listed above:

- Location 1 (primary location)
Street address:
Own or lease? If lease, date lease began:
Lease expiration date:
Can lease be renewed?
- Location 2 - Street address, City, State, Zip:
Street address:
Own or lease? If lease, date lease began:
Lease expiration date:
Can lease be renewed?
- Location 3 - Street address, City, State, Zip:
Street address:
Own or lease? If lease, date lease began:
Lease expiration date:
Can lease be renewed?
- Location 4 - Street address, City, State, Zip:
Street address:
Own or lease? If lease, date lease began:
Lease expiration date:
Can lease be renewed?

12. Number of years operating from primary location:

13. Number of years operating from each of the other locations (list individually):

14. Is the company's garage a commercial vehicle repair facility (non-towing fleet)? If yes, legal name of repair business:

15. List hours and days of operation for garage and tow yard office:

- Garage days/hours:
- Tow yard office days/hours:

16. Are the business hours clearly posted?
17. Size of secure storage yard (primary location):
18. Is the secure storage yard fenced?
19. Briefly describe yard security measures:
20. Indicate the closest access point and entrance ramp to the Interstate and the route to get there from the yard/garage: (Attach map, if necessary)
21. Distance from yard/garage to this access point (miles and tenths):
22. Estimated travel time to this access point between 5:30 a.m. and 7:00 p.m.:
 - Monday – Friday:
 - All other times (weekends, off-peak hours):
23. Has the company participated in or hosted training sessions with local fire-rescue, EMS, hazmat, public safety or DOT agencies?
 - Type of exercise, dates and location(s):
 - Type of exercise, dates and location(s):
 - Type of exercise, dates and location(s):
24. Has the company participated in any Traffic Incident Management Enhancement (TIME) Task Force meetings or activities?
25. Does the company now provide on-call/rotational towing and recovery services for any county or city governments? If so, which ones and for how many years?
26. Is the company in good standing with federal, state, city and county governmental and regulatory departments, including currently having all licenses and other required authorizations and documentation completely up-to-date?
 - If no, please explain:
27. Does the company have any ongoing or pending legal complaints or actions against it filed on behalf of any federal, state, city and county governmental and regulatory departments/agencies?
 - If yes, please explain:

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Recovery Wreckers and Equipment Information

List all of the Recovery Trucks that will be used to qualify for TRIP. Fill out all information for each vehicle.

Truck Chassis				
	Unit #1	Unit #2	Unit #3	Unit #4
Make, model, and year				
VIN #				
GVW, Wheel base, Number of axles, Frame				
Engine make, horsepower and torque output				
Details of driveline (transmission, transfer case, drive shafts ,etc)				
Push Bumper (Yes or No)				

Recovery Wrecker Equipment				
	Unit #1	Unit #2	Unit #3	Unit #4
Wrecker and body manufacturer and model				
Winch capacity w/wire rope size				
Boom capacity (TEMA) and reach				
Under-lift capacity and reach				

Additional Trucks and Equipment Information

List with a detailed description all additional COMPANY-owned equipment that is required for a Georgia DOT TRIP wrecker COMPANY.

Equipment	Make, model, and year	Capacity	Serial Number of VIN Number
Tilt bed, hydraulic, lowboy semi-trailer (Landoll or equivalent) with a 35 ton capacity, 40-48 ft. bed and a winch with 75 ft. of 5/8" cable.			
Tandem axle road tractor with a sliding fifth wheel.			
Rollback flatbed wrecker.			
Self contained, V-hopper, pick-up or trailer mounted Sand Spreader. The unit shall have a minimum capacity of 1½ cu. yd. with a conveyor or auger feed and adjustable rate spinner. Sand must be kept dry!			
Heavy-duty skid steer or rubber tracked loader with bucket, broom, and fork attachments.			
Support vehicle with an enclosed, utility body and a roof mounted GDOT approved MUTCD Type B arrow board. The truck shall be stocked with MUTCD traffic control devices (signs, sign stands and cones etc.) and the additional tools, equipment and material listed for the TRIP support vehicle,			
OR			
A tandem axle, enclosed utility trailer pulled by a tow vehicle with a roof mounted GDOT approved MUTCD Type B arrow board.			

Contract Equipment and Service Provider Information

List your sub-let service providers with which agreements exist to respond to the Interstate on a 24-hour basis as required by the TRIP Specifications.

Contract Equipment	Contract company name address, and phone number	Contract location (where the equipment will be deployed from)
A Maintenance of Traffic (MOT) Contractor that can provide and set up full MUTCD and GDOT approved work zone traffic controls.		
A Disposal Company that can deliver to the scene of an incident, dumpsters or hoppers for crash debris, fire debris and or spilled non-hazardous cargo.		
A Vacuum or Suction Service for off-loading or recovering and transporting large quantities of spilled grain, powders, plastic pellets or non-hazardous liquids and sludge, etc.		
A Trucking or Transport company that can provide van, dump, refrigerator or flat bed trucks and/or semi- trailers.		
A Construction Crane Rental Company with 50 ton and larger mobile cranes.		
A contractor or equipment rental company that can deliver a heavy duty, rubber tired, articulated, construction, end-loader		

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Appendix B: Sample Invoice



INVOICE

[Your Company Name]
 [Street Address]
 [City, ST ZIP Code]
 [Phone] [Fax]
 [e-mail]

INVOICE NO:
 DATE:
 TRIP INCIDENT #:
 VENDOR ID #:

TO: Georgia Department of Transportation
 HERO Unit
 515 Plasters Avenue
 Atlanta, Ga 30324

Recovery Agent	Trip Incident Date	Date of AIR	TA Number

QUANTITY	DESCRIPTION	UNIT PRICE	LINE TOTAL
	Event Type 1- Flat Rate Service Charge. (Recovery Agent Name Here) arrived at the incident within the allotted time, but was not utilized.	\$600	
	Event Type 2- (Recovery Agent Name Here) responded to scene within allotted time, with proper equipment and completely cleared the travel lanes, opening the roadway.	\$2,500	
	GDOT asked (Recovery Agent Name Here) for additional equipment, and it arrived on-scene within response time. Extra Equipment Requested by GDOT: (List Equipment Here)	\$1,000	
		TOTAL	

Make all checks payable to [Your Company Name]
THANK YOU FOR YOUR BUSINESS!

OFFICE USE ONLY					
Incident Start Time	TRIP Activation	Supervisor Arrival	Equipment/Operator On Scene	MTP	Response time met?
Stop Time	Restict Time	Roadway Clearance	Edwy Clearance Duration (min)	Incident Clearance Duration (min)	Clearance time met?

 GDOT HERO MANAGER SIGNATURE

 TOWING RECOVERY AGENT SIGNATURE

Appendix C: TRIP Team Members and Partners

The core TRIP working group consisted of GDOT, GRTA and Delcan. If you would like any information regarding TRIP, please contact the any of the following individuals:

Jason Josey, GDOT HERO
(404) 635-2430
jjosey@dot.ga.gov

Christine Simonton, Parsons
(404) 320-1776 x7409
Christine.simonton@parsons.com

The following agencies served on the TRIP Steering Committee, which monitored and fine tuned the Program:

- Atlanta Police Dept
- Atlanta Regional Commission (ARC)
- Coroner's Association
- FHWA
- GDOT
- Georgia Motor Trucking Assoc (GMTA)
- Georgia State Firefighter's Association Inc.
- Georgia State Patrol (GSP)
- Governor's Office of Highway Safety (GOHS)
- Georgia Regional Transportation Agency (GRTA)
- Towing and Recovery Association of Georgia (TRAG)
- Georgia Department of Public Safety Motor Carrier Compliance Division

Thank you to all TRIP Partners who are helping to improve congestion in the region.

Appendix D: Georgia State Patrol Memo Re: TRIP

From: Capt. Mark Hambert
Sent: Friday, March 27, 2015 4:26 PM
To: Troop A Command; Troop B Command; Troop C Command; Troop D Command;
Troop E Command
Subject: Expanding TRIP Coverage to Troops A,B,D,E

Commanders,

I wanted to make you aware the TRIP Program has expanded out from Troop C, via interstates, to Troops A, B, D and E (See attached map). Due to these changes and Troopers not being familiar with the program and with Troop C having new personnel come into the Metro-Atlanta area, I think this would be a good time to train everyone on the TRIP Program. This training should be given to all sworn members and Communication Operators. TRIP is a valuable program that assists emergency responders in promoting The Open Roads Policy that has the backing of The Governor's Office, the DOT Commissioner, and Colonel McDonough.

Also, be aware that the Georgia State Patrol will exclusively use TRIP-certified companies starting January 1, 2016 in place of a rotational list for all heavy duty and commercial vehicle traffic incidents within the Troops that have established TRIP routes. Georgia State Patrol, GDOT, or other emergency personnel would activate the TRIP process for all heavy duty vehicle incidents; however, not every incident would receive the monetary bonus. For those commercial incidents that do not meet TRIP requirements, a TRIP company would still be used while not being eligible for the bonus. The exclusive use of TRIP Wrecker Services applies to Commercial and Heavy Duty Incidents that occur on the Interstate. You will still be allowed to use rotational big wreckers on other roadways.

To schedule this training in your Troops, please contact the TRIP Mangers by email jeff.corbin@parsons.com or mroberson@dot.ga.gov or by calling (404) 320-1776 (Jeff Corbin). If you have specific questions or concerns Captain Renfroe may be able to address them. She is the Co-Chair of the TIME Task force and is well versed on this program.

Thanks,
Mark

Deo Valente
Captain Mark A. Hambert #10
Executive Assistant
Office of the Commanding Officer
Georgia State Patrol

Georgia Department of Transportation



Evaluation of the Towing and Recovery Incentive Program (TRIP)

Prepared for:

**Georgia Department of Transportation
935 East Confederate Avenue, Building 24
Atlanta, Georgia 30316**

Prepared By:



an **Atkins** company

1600 RiverEdge Parkway
Suite 600
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EXECUTIVE SUMMARY

The Georgia Department of Transportation (GDOT) introduced the Towing and Recovery Incentive Program (TRIP) in early 2008 to provide monetary incentives to qualified towing operators for the quick clearance of large commercial vehicle incidents. This program is a critical component of the metropolitan Atlanta traffic incident management quick clearance program.

A TRIP certified towing operator receives an incentive payment if they arrive at the incident scene and open all lanes to traffic within time frames set by the program. TRIP was activated for 110 incidents during 2008 and 2009. TRIP operators met all program guidelines and received payment for 98 incidents and failed to meet program guidelines and, therefore, received no payment for eight incidents. GDOT determined that TRIP operators were not necessary for four of these incidents and received a token payment for arriving on time.

The total incentive payments paid to towing operators in 2008 and 2009 totaled \$284,000. In addition, the administrative costs of the program (including program development, outreach, training, and coordination) from 2007 through 2010 were \$551,000. The total cost of TRIP was \$835,000.

The goal of the program is the quick clearance of incidents. The study identified 24 incidents from 2007 (pre-TRIP) that would likely have used the program. The clearance times for the 24 pre-trip incidents were compared to the timelines of TRIP incidents. This study determined that TRIP allowed the roadway to be opened to traffic at least 165 minutes (2 hours and 45 minutes) faster than experienced in 2007.

The cost of each incident (in terms of delay, wasted fuel, and excess emissions) was calculated by modeling each incident based on the incident location, typical traffic volumes during the incident, the roadway geometrics at the incident location, and other factors specific to each incident. The average cost of TRIP incidents was determined to be \$186,684, a 71 percent decrease from the pre-trip average incident cost of \$643,080.

The study evaluated the benefit of TRIP by comparing the cost of each TRIP incident against the cost had the incident taken an additional 60 minutes to clear. This logic assumes that TRIP is only clearing the incident 60 minutes faster, although the research shows an average savings of 165 minutes. This approach, and all others in the study, was designed to underestimate the benefits of the program.

The difference in the cost of the TRIP incident and the same incident with a longer clearance time is the cost savings (the benefit) of having the program in place. The benefit of TRIP (from inception through the end of 2009) was calculated as \$9,154,431 of avoided delay, wasted fuel and excess emissions.

With a benefit to cost ratio of 10.96 to 1, TRIP is saving almost eleven dollars for every dollar invested.

Table of Contents

Executive Summary	ii
1 Background.....	1
1.1 TRIP Coverage	2
1.2 Purpose.....	2
2 Program Costs.....	4
3 Incident Information.....	5
3.1 Incident Location and Sequence of Events	6
3.1.1 TRIP Incident Logs	6
3.1.2 NAVIGATOR Logs	6
3.2 Traffic Volume Data	7
3.3 Percentage of Trucks.....	9
3.3 Geometric Data.....	9
4 Methodology and Assumptions	11
4.1 Incident Analysis Methodology.....	11
4.1.1 Incident Analysis Assumptions.....	18
4.1.1.1 Approach Volumes	18
4.1.1.2 Available Capacity.....	18
4.1.1.3 Percentage of Trucks.....	20
4.1.1.4 Incidents on Ramps.....	21
4.2 Incident Cost Methodology.....	22
4.2.1 Incident Cost Assumptions	22
4.2.1.1 Cost of Delay	23
4.2.1.2 Cost of Emissions	23
4.2.1.3 Cost of Fuel	24
5 Benefits of TRIP	26
5.1 Comparison of Incident Timelines	26
5.2 TRIP Benefits	27
5.3 Non-Monetary Benefits of TRIP	29
5.4 Accident Experience	31
6 Conclusions.....	33
Appendix A.....	1
Appendix B.....	1
Appendix C.....	1

Tables

Table 2.1: Cost of the Towing and Recovery Incentive Program	4
Table 3.1: Percentage of Trucks	9
Table 4.1: Lanes Blocked During September 30, 2009 Incident.....	14
Table 4.2: Capacity Reduction Factors (Percentage of Capacity Remaining)	19
Table 4.3: Cost of Delay.....	23
Table 4.4: Cost of Emissions	24
Table 4.5: Cost of Fuel (Georgia).....	25
Table 5.1: Incident Costs.....	26
Table 5.2: Duration of Incidents	27
Table 5.3: Lanes Blocked during September 30, 2009 Incident.....	28
Table 5.4: Benefit of TRIP for September 30, 2009 Incident	29
Table 5.5: Benefit of TRIP	29
Table 5.6: Secondary Incidents.....	31

Figures

Figure 1.1: Current TRIP Boundaries	3
Figure 3.1: Location of September 30, 2009 Incident	5
Figure 3.2: TRIP Incident Log for September 30, 2009 Incident.....	6
Figure 3.3: NaviGator Log for September 30, 2009 Incident	7
Figure 3.4: NaviGator Detector Data Requested for September 30, 2009 Incident	8
Figure 3.5: NaviGator Detector Data for September 30, 2009 Incident	8
Figure 3.6: Lane Geometry for September 30, 2009 Incident.....	10
Figure 4.1: Simple Incident	12
Figure 4.2: Representative Incident	13
Figure 4.3: Queuing Spreadsheet for September 30, 2009 Incident (Part 1, Vehicles in Queue) .	15
Figure 4.4: Queue Length Calculations for September 30, 2009 Incident (Part 2, Queue Length)	16
Figure 4.5: Queuing Results for September 30, 2009 Incident	17
Figure 4.6: Available Capacities for September 30, 2009 Incident.....	20
Figure 4.7: Calculation of Truck Percentage for September 30, 2009 Incident.....	21

1 BACKGROUND

The Towing Recovery and Incentive Program (TRIP) is a component of the metropolitan Atlanta traffic incident management program. Administered by the Georgia Department of Transportation (GDOT), TRIP is an incentive program that provides monetary bonuses to heavy-duty towing and recovery companies for the quick clearance of incidents involving large commercial vehicles.

Towing and recovery companies that desire to participate in TRIP must complete a stringent application process. Qualified TRIP companies are required to maintain a staff of supervisors and operators who must acquire and maintain national or industry certifications. In addition, each TRIP company must maintain up-to-date equipment and is required to have heavy-duty wreckers and support vehicles with traffic control and fluid spill mitigation equipment.

TRIP incidents involve large vehicles and complicated debris or hazardous material (HAZMAT) spills, which would normally take a significant amount of time to clear from a roadway. TRIP can only be activated by designated personnel, such as a GDOT Highway Emergency Response Operator (HERO) supervisor or a police officer on-scene, based upon specific criteria and procedures.

Once declared a TRIP incident, the designated TRIP company for that area is notified. The TRIP company supervisor must arrive on scene within 30 minutes of notification and all basic equipment must arrive within 45 minutes if called between 5:30 am and 7:00 pm, Monday through Friday; at other times, the equipment is allowed 60 minutes to arrive. The TRIP company remains on scene until they receive an official notice to proceed to clear the incident from the roadway. Upon receiving the notice to proceed, the TRIP company must have the roadway cleared and open to traffic within 90 minutes.

The GDOT HERO unit holds monthly After Incident Reviews (AIR) to discuss and evaluate recent TRIP incidents. During these meetings, the incident timeline is evaluated to determine if the TRIP operator met all time requirements and is eligible for an incentive bonus. TRIP incentive bonus payments are as follows:

- \$600 if the TRIP company is called, responds within the specified time, but is not needed.
- \$2,500 if the TRIP company is called, responds within the specified time, and has the roadway cleared and opened to traffic within 90 minutes after receiving the notice to proceed.
- An extra \$1,000 is paid if additional special equipment was required and provided, and all time requirements were met.

In addition to these bonus incentives, the program provides for liquidated damages to be paid by the TRIP company if the roadway is not cleared and opened to traffic within three hours of the notice to proceed. If the failure to clear the roadway in three hours is determined to be the fault of the TRIP company, they will be fined \$600 in liquidated damages and an additional \$10 per minute for each minute over three hours that the roadway remains blocked.

The complete TRIP is described in detail in the *Towing & Recovery Incentive Program (TRIP) Research Summary*¹ prepared by Gresham, Smith and Partners, February 26, 2010 and the entire program specifications can be found at <http://www.timetaskforce.com/trip.html>

1.1 TRIP Coverage

When the program began in 2008 it covered I-285 and all interstates inside I-285, including GA-400, all interchange ramps and the following four “hot spots:”

- I-85 Northside: to Pleasantdale Exit
- I-75 Northside to Windy Hill Exist
- I-20 Westside: to Fulton Industrial Exist
- I-20 Eastside: to Wesley Chapel Exit

The coverage boundaries were expanded in June 2009 and again in April 2010. The current program boundaries are shown in Figure 1.1.

1.2 Purpose

The purpose of this document is to summarize the results of an in depth evaluation of the effectiveness of TRIP and the benefits and costs of the program. The study analyzed 110 incidents in 2008 and 2009 in which TRIP was activated. The study also analyzed 23 incidents that occurred in 2007 (before TRIP was active), that would have been candidates for TRIP activation.

¹ *Towing & Recovery Incentive Program (TRIP) Research Summary, in Support of a TRIP Benefit-Cost Study.* Gresham, Smith and Partners. Final Draft. February 26, 2010.

Figure 1.1: Current TRIP Boundaries



2 PROGRAM COSTS

Since its first use on January 8, 2008, TRIP has been used 110 times (59 times in 2008 and 51 times in 2009). TRIP companies were paid bonuses of \$284,000 for their responses to these incidents.

In addition to the bonus payments to the towing companies, GDOT’s HERO unit is supported by Delcan for the administration of TRIP, including development of the program, outreach to towing operators, training of operators and emergency response personnel, documentation of individual TRIP incidents, and coordination of After Incident Reviews (AIR). HERO administrative costs were \$551,000 from the program’s inception in 2007 through the end of 2010.

The total cost of TRIP from inception through the end of 2010 was \$835,000, as shown in Table 2.1. This is used as the cost of the program through 2009, even though this includes administrative costs through the end of 2010.

Table 2.1: Cost of the Towing and Recovery Incentive Program

Year	Description	Cost
2007	Program Development and First Year Implementation	\$ 256,000
2008	Incentive Payments to TRIP Operators	\$ 156,400
2008	Program Maintenance (12 Months) and Program Expansion	\$ 125,000
2009	Incentive Payments to TRIP Operators	\$ 127,600
2009	Program Maintenance (15 Months) and Program Expansion	\$ 170,000

Total Program Cost \$ 835,000

3 INCIDENT INFORMATION

This study analyzed the costs of the 110 TRIP incidents that occurred in 2008 and 2009, and 24 incidents that occurred in 2007 that would have been candidates for TRIP activation. The incidents from 2007 (prior to the implementation of TRIP) were selected from a critical review of the NaviGator logs that identified these incidents as ones that clearly would have met the criteria for activation of TRIP had it existed at the time of the incident.

As each incident is unique (in terms of spatial, temporal, geographical, lane closure durations, and other factors), the specific details of each incident were collected and used to allow a distinct analysis of each incident and its impact on traffic. The specific details for each incident were collected from various sources as outlined in the sections below.

Throughout the remainder of this document, most figures and tables used to describe the study use the details of the TRIP incident that occurred on September 30, 2009. This incident occurred on Southbound I-285 at the I-285/I-85 interchange southwest of Atlanta. Figure 3.1 shows the location of the incident.

Figure 3.1: Location of September 30, 2009 Incident



The incident occurred on a Wednesday at 1:32 pm; all lanes were re-opened to traffic at 3:06 pm. The incident involved a single tractor trailer that overturned and spilled its load on the roadway. In addition to the spilled load, the tractor’s fuel tanks also ruptured and spilled a small amount of fuel on the pavement. Southbound I-285 is a three-lane roadway at this location. The number of lanes blocked to traffic varied during the incident clearance, including two instances when all lanes were blocked.

3.1 Incident Location and Sequence of Events

The location and sequence of events for each incident were collected from the TRIP Incident Logs and the GDOT NaviGator logs.

3.1.1 TRIP Incident Logs

The TMC maintains TRIP Incident Logs for each TRIP activation. These logs establish response and clearance times and are used to determine if incentives are paid to the towing company.

Figure 3.2 shows a sample incident log .

Figure 3.2: TRIP Incident Log for September 30, 2009 Incident

<u>TOWING RECOVERY INCENTIVE PROGRAM</u>	
	
Navigator Incident Number	1513651
Time Entered in X-WIN	13:32
Date/TMC Operator	09/30/2009 L MILTON
Time of Call	13:33
Location of TRIP Incident	285EB AT I-85
Name of person who activated TRIP	OFFICER STARK - FULTON COUNTY (404) 612-3001
Name of Towing Company	SOUTHSIDE TOWING
Towing Company Contact Person and Number	BRENDA / 770-964-8220 @ 1340
Time of TRIP Activation	13:33
Time Wrecker Supervisor on Scene	13:56
Time Operator/50 Ton Wrecker on Scene	14:01
Time Operator/30 Ton Wrecker on Scene	14:24
Time Operator and Support Truck on Scene	14:24
Name of Person giving proceed time/ Time.	14:05//HERO SUPV. 514
Name of Person calling in Emergency or Investigation Time (Pause Time)/Time	N/A
Name of Person calling in RE-Start Time/Time	N/A
Name of Person calling for Required Extra Equipment/Time	N/A
Name and time when extra Equipment arrived on scene	N/A
Name of Person calling in time when extra equipment arrived on scene/Time	N/A
Name of Person who approved extra equipment/Time	N/A
Name of Person calling in 10-72 (Roadway clearance time)	3:06:00 PM / HERO SUPERVISOR 514
Name of Person calling in 10-79 (Incident clearance time)	03:08 AM / BILL (678-873-1273) RHINO SERVICES



3.1.2 NAVIGATOR Logs

The GDOT Transportation Management Center (TMC) manages every incident on the metropolitan Atlanta interstate system. They assign a unique NaviGator log number to each incident and the incident data is entered and updated until the incident is cleared. These logs are saved and provide details and time stamps of changes in the numbers of lanes blocked throughout the incident. A portion of the NaviGator log for the September 30, 2009 incident is shown in Figure 3.3.

Figure 3.3: NaviGator Log for September 30, 2009 Incident

Incident Report :: GDOT-INC-1513651	
Sep 30, 2009 13:32:19	Incident declared by Linarra Milton, GDOT - TMC Operations
IncidentType	Accident
IncidentLevel	3
ImpactType	Medium
LocationType	Freeway
LocationText	Eastbound I-285 AT I-85
County	Fulton (District-7)
AffectedLane	1 Left Lanes
DetectionType	Call Report
Need Police?	Yes
Need HERO?	Yes
NumberCalls	1
EstimatedEnd	Sep 30 2009 2:32PM
Confirmed?	Yes
ConfirmTime	Sep 30 2009 1:32PM
Confirmed By	Linarra Milton, GDOT - TMC Operations
Alarm Interval	01:15:00
Comment	FULTON KEISHA OVERTURNED TT LOADED WITH VEGETABLES. THEY HAVE A UNIT ON SCENE
Sep 30, 2009 13:33:07	Incident updated by Linarra Milton, GDOT - TMC Operations
Comment	OFFICER STARK WITH FULTON COUNTY ADVISED THAT THEY WOULD LIKE TO ACTIVATE TRIP FOR THIS INCIDENT
Sep 30, 2009 13:36:03	Incident updated by Linarra Milton, GDOT - TMC Operations
EstimatedEnd	Sep 30 2009 3:32PM
Comment	HERO 514 AND HERO 578 ARE EN ROUTE
Sep 30, 2009 13:37:45	Incident updated by Linarra Milton, GDOT - TMC Operations
AffectedLane	2 Right Lanes
Lanes Affected	2
Comment	HAVE VISUAL ON CAM 930. FIRE, EMS AND PD ON SCENE.
Sep 30, 2009 13:39:56	Incident updated by Mohammed Kalisha, GDOT - TMC Operations

3.2 Traffic Volume Data

Once the incident location, date, and time were determined from reviewing the TRIP and NaviGator logs, the Detector IDs of GDOT traffic detectors in the area of the incident were identified.

The Georgia Institute of Technology maintains an archive of GDOT NaviGator detector data used during this project. The Detector IDs and incident dates were forwarded to Dr. A. Guin who queried the database and provided hourly volumes for the detectors and dates identified.

To ensure the availability of detector data, the detector archive to find the date of the incident, the date one week prior to the incident, and equivalent dates (same day of week) from 2007 through 2010. Figure 3.4 shows the combination of requested detectors and dates for the September 30, 2009 incident.

Figure 3.4: NaviGator Detector Data Requested for September 30, 2009 Incident

Trip Activation	Date	Detector Station ID	Detector Station ID	Detector Station ID	Detector Station ID	Detector Station ID
102	Incident Date	2009-09-30				
	One week Prior	2009-09-23	X			
	Equivalent 2007 Date	2007-10-03				
	Equivalent 2008 Date	2008-10-01				
	Equivalent 2009 date	n/a				
	Equivalent 2010 Date	2010-09-29	X	X		

Two detector stations were identified (2851103 and 2851101) and ten date/detector combinations were queried (incident date, one week prior, equivalent 2007 date, equivalent 2008 date, and equivalent 2010 date). Of these ten date sets, the archive only had complete counts for three date/detector combinations (indicated by an “x” in Figure 3.4).

Figure 3.5 shows the hourly traffic volumes recorded by detector 2851103 (just upstream of the September 30, 2009 incident location) one week prior to the incident.

Figure 3.5: NaviGator Detector Data for September 30, 2009 Incident

#id	sample_start	volume
2851103	9/23/2009 0:00	867
2851103	9/23/2009 1:00	850
2851103	9/23/2009 2:00	568
2851103	9/23/2009 3:00	602
2851103	9/23/2009 4:00	597
2851103	9/23/2009 5:00	816
2851103	9/23/2009 6:00	1178
2851103	9/23/2009 7:00	1804
2851103	9/23/2009 8:00	1940
2851103	9/23/2009 9:00	1987
2851103	9/23/2009 10:00	1987
2851103	9/23/2009 11:00	2130
2851103	9/23/2009 12:00	2405
2851103	9/23/2009 13:00	2382
2851103	9/23/2009 14:00	2388
2851103	9/23/2009 15:00	2535
2851103	9/23/2009 16:00	2828
2851103	9/23/2009 17:00	3077
2851103	9/23/2009 18:00	2579
2851103	9/23/2009 19:00	2007
2851103	9/23/2009 20:00	1754
2851103	9/23/2009 21:00	1345
2851103	9/23/2009 22:00	1166
2851103	9/23/2009 23:00	952

The GDOT publishes the *Average Annual Daily Traffic (AADT) on the State Traffic and Report Statistics* on their web site (<http://www.dot.state.ga.us/statistics/TrafficData/Pages/default.aspx>). GDOT updates this web site annually and provides AADT counts collected from permanent and

portable traffic collection devices for every segment of Georgia’s State Highway System throughout the state. The AADT records were used to verify the NaviGator detector counts and to adjust the counts if the hourly count and incident occurred in different years.

3.3 Percentage of Trucks

The percentage of trucks on the interstate was collected from the published reports *Vehicle Classification by Functional Classification and Hour* found on the GDOT Office of Transportation Data (OTD) web site (<http://www.dot.state.ga.us/statistics/TrafficData/Pages/atr.aspx>). This data was collected for the Urban Principal Arterial – Interstate for 2007, 2008, and 2009 to provide hourly truck percentages for use in determining the delay attributed to trucks. The truck percentages are averages (by hour) for the metropolitan Atlanta Interstates as shown in Table 3.1.

Table 3.1: Percentage of Trucks

	2007	2008	2009
Midnight – 1 am	18.00	14.44	11.43
1 am – 2 am	22.79	18.80	15.06
2 am – 3 am	26.27	21.99	18.21
3 am – 4 am	27.66	23.69	19.75
4 am – 5 am	24.25	23.56	21.09
5 am – 6 am	15.52	14.98	14.58
6 am – 7 am	10.78	9.98	9.59
7 am – 8 am	9.18	8.19	7.48
8 am – 9 am	10.94	9.65	8.12
9 am – 10 am	13.17	12.00	10.20
10 am – 11 am	13.50	12.52	10.78
11 am – Noon	13.10	12.24	10.69
Noon – 1 pm	12.36	11.52	10.09
1 pm – 2 pm	11.84	10.94	9.55
2 pm – 3 pm	11.10	10.18	8.96
3 pm – 4 pm	10.07	9.08	8.14
4 pm – 5 pm	8.98	7.92	7.13
5 pm – 6 pm	8.16	6.95	6.24
6 pm – 7 pm	8.84	7.42	6.48
7 pm – 8 pm	9.83	8.11	7.06
8 pm – 9 pm	10.70	8.72	7.51
9 pm -10 pm	11.21	8.78	7.52
10 pm – 11 pm	12.27	9.52	7.90
11 pm - Midnight	14.34	11.23	9.13

3.3 Geometric Data

The number of lanes at each incident location was determined using data from the NaviGator logs and online **Google Maps**. Information on the number and length of lanes upstream of the incident needed to identify the length of the vehicles queues was determined using the **Google Maps** distance measuring tool.

Figure 3.6 shows the available lane geometric information for the September 30, 2009 incident.

Figure 3.6: Lane Geometry for September 30, 2009 Incident

Incident Location	← Direction of travel					
Lanes	3	4	3	4	3	4
Distance (ft)	3540	48460	1780	1090	2350	7110

4 METHODOLOGY AND ASSUMPTIONS

The unique data collected for each incident was used to model traffic flow throughout the duration of the incident. The traffic flow analysis for each incident determined the amount of delay caused by the incident and the queue length of vehicles. Based on the results of the analysis, the corresponding cost of each incident was calculated. This section presents the methodology and assumptions used during each of these steps.

4.1 Incident Analysis Methodology

The traffic flow analysis for each incident used a deterministic model of traffic flow based on the **approach volume** and **available capacity** of the roadway during each incident. The deterministic approach assumes no variation in traffic volumes, so a measured traffic volume of 6000 vehicles per hour would indicate the passage of 100 vehicles per minute (6000 vehicles each hour ÷ 60 minutes in each hour) without any variation from minute-to-minute.

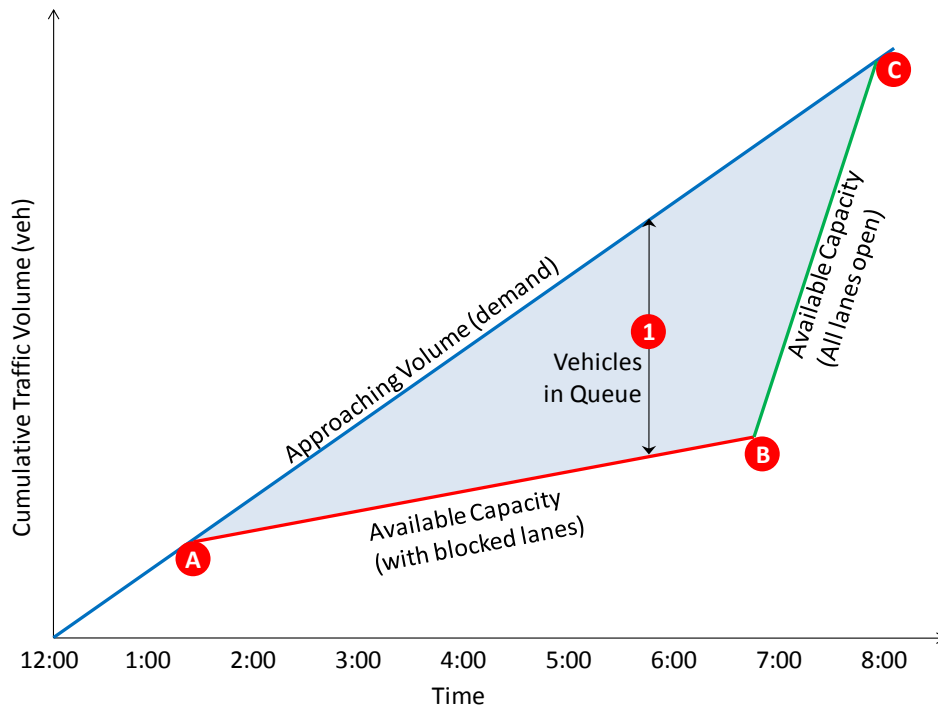
Approach Volume measures how many vehicles want to use the roadway (expressed as vehicles per hour) and is often referred to as demand. In this study, the hourly traffic volumes from the NaviGator detectors are used as the indication of the typical demand on the roadway at the time of the incident.

Available Capacity of the roadway indicates the number of vehicles that can pass by a certain point on the roadway. During times when no lanes are blocked, a roadway can carry approximately 2250 passenger vehicles per hour per lane; this is diminished during an incident as varying numbers of lanes are blocked.

A queue of vehicles will form if the approach volume (demand) is greater than the available capacity of the roadway. This queue, or un-served vehicles (the difference between demand and capacity), will continue to increase until a time when the demand decreases below the available capacity. In the case of an incident, the available capacity of the roadway is typically decreased below demand (due to lanes being blocked by an incident) and vehicles queue until the lanes are cleared and full capacity is restored.

Figure 4.1 is a graphical representation (arrival and departure curves) of a simple incident on a roadway. It is simplistic in the assumption that the demand and capacity do not change throughout the day and represents ideal conditions for analysis. As long as there is no blockage and the approach volume is less than the available capacity of the roadway, then no queue will build on the roadway.

Figure 4.1: Simple Incident



Point A represents the beginning of an incident that reduces the available capacity of the roadway to less than the approaching traffic volumes.

Point B represents the time when the incident is cleared and the roadway capacity has been restored. The shaded area represents the queue of vehicles that builds during the time when the approaching traffic is greater than the available capacity.

Point C represents the time when the queue that built up during the blockage has completely dissipated.

Line AC represents the approaching volume.

Line AB represents the available capacity of the roadway during an incident that starts at 1:30 pm and ends at 7:00 pm.

Line BC represents the available capacity of the roadway with the incident cleared and all lanes open to traffic. The slopes of the volume and capacity lines represent the demand and capacity in vehicles per hour.

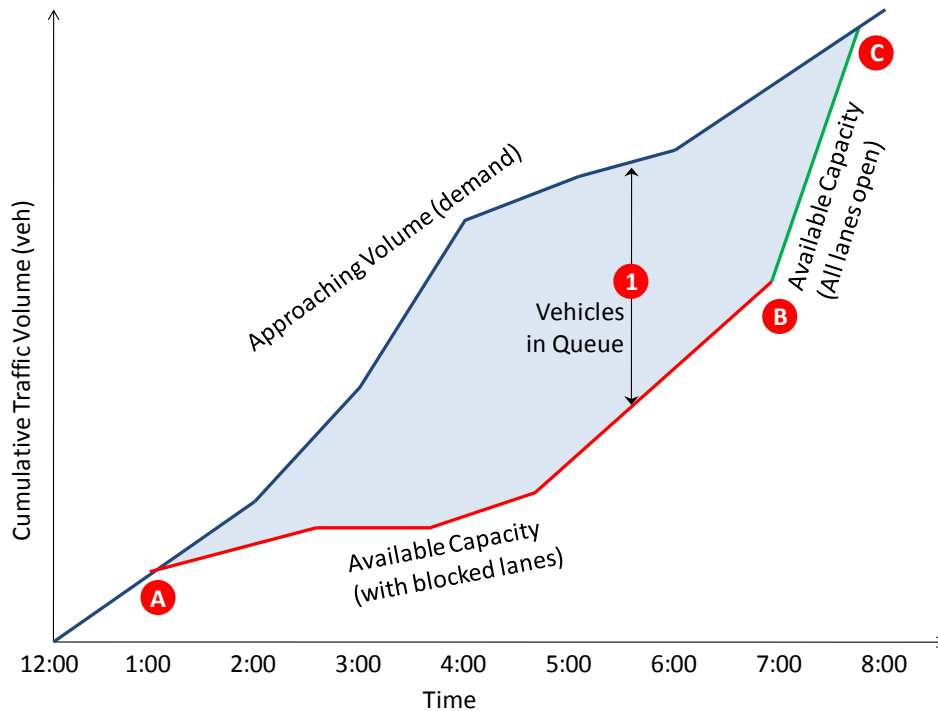
Triangle ABC represents the difference between the number of vehicles approaching the incident and the number of vehicles that can pass the incident. The vehicle hours of delay caused by the incident is found by calculating the area of the shaded triangle.

Line 1 (the vertical distance between the arrival and departure curves) represents the number of vehicles in the queue at any given time. The number of queued vehicles can also be converted to the length of the queue.

For all of the incidents studied, the simplistic model does not apply. Each of the 110 TRIP incidents lasted for more than one hour which required the analysis to address changing approach volumes over time as shown in Figure 4.2. In addition, the number of lanes blocked changed throughout the incident depending upon the actions of the emergency responders and TRIP operator.

Figure 4.2 provides a graphical representation of an incident where the approach volume changes each hour and the available capacity changes several times.

Figure 4.2: Representative Incident



The shaded area still represents the vehicle delay; however, with this more realistic representation of the changing approach volumes and available capacity, the ability to manually calculate the area of the shape becomes increasingly difficult to perform.

This approach to calculating the vehicle hours of delay was coded into a Microsoft® Excel spreadsheet, effectively creating a balance sheet for each minute of the incident. During each minute, a number of vehicles approach the incident (approach volume) and a number of those vehicles can pass the incident (available capacity). If the approach volume is greater than the available capacity, the excess vehicles are added to the queue.

Table 4.1 shows the sequence of lane blockages documented from the NaviGator logs for the TRIP incident that occurred on September 30, 2009.

Table 4.1: Lanes Blocked During September 30, 2009 Incident

Time	Description
13:32	1 of 3 lanes blocked.
13:37	2 of 3 lanes blocked
14:07	3 of 3 lanes blocked for wrecker maneuvers
14:24	2 of 3 lanes blocked
14:28	3 of 3 lanes blocked for wrecker maneuvers
14:50	2 of 3 lanes blocked
14:56	1 of 3 lanes blocked
15:06	Lanes clear

Figure 4.3 shows the beginning, middle, and end of the analysis spreadsheet for this incident:

Figure 4.3: Queuing Spreadsheet for September 30, 2009 Incident (Part 1, Vehicles in Queue)

Date-Time	Available Capacity (VPH)	Approaching Traffic (VPH)	% Trucks	Vehicles in Queue (beginning of minute)	Vehicles Added to Queue	Vehicles Exiting Queue	Vehicles in Queue (end of minute)	Cars in Queue	Trucks in Queue
9/30/09 13:32	2999	2382	8.8%	0	0	50	0	0	0
9/30/09 13:33	2999	2382	8.8%	0	0	50	0	0	0
9/30/09 13:34	2999	2382	8.8%	0	0	50	0	0	0
9/30/09 13:35	2999	2382	8.8%	0	0	50	0	0	0
9/30/09 13:36	2999	2382	8.8%	0	0	50	0	0	0
9/30/09 13:37	1040	2382	8.8%	0	40	17	22	20	2
9/30/09 13:38	1040	2382	8.8%	22	40	17	45	41	4
9/30/09 13:39	1040	2382	8.8%	45	40	17	67	61	6
9/30/09 13:40	1040	2382	8.8%	67	40	17	89	82	8

9/30/09 14:05	1043	2388	8.8%	627	40	17	649	592	57
9/30/09 14:06	1043	2388	8.8%	649	40	17	671	612	59
9/30/09 14:07	0	2388	8.8%	671	40	0	711	649	63
9/30/09 14:08	0	2388	8.8%	711	40	0	751	685	66
9/30/09 14:09	0	2388	8.8%	751	40	0	791	721	70
9/30/09 14:10	0	2388	8.8%	791	40	0	831	758	73
9/30/09 14:11	0	2388	8.8%	831	40	0	870	794	77
9/30/09 14:12	0	2388	8.8%	870	40	0	910	830	80
9/30/09 14:13	0	2388	8.8%	910	40	0	950	866	84
9/30/09 14:14	0	2388	8.8%	950	40	0	990	903	87
9/30/09 14:15	0	2388	8.8%	990	40	0	1030	939	91
9/30/09 14:16	0	2388	8.8%	1030	40	0	1069	975	94

9/30/09 15:36	6162	2535	8.8%	545	42	103	484	442	43
9/30/09 15:37	6162	2535	8.8%	484	42	103	424	386	37
9/30/09 15:38	6162	2535	8.8%	424	42	103	363	331	32
9/30/09 15:39	6162	2535	8.8%	363	42	103	303	276	27
9/30/09 15:40	6162	2535	8.8%	303	42	103	242	221	21
9/30/09 15:41	6162	2535	8.8%	242	42	103	182	166	16
9/30/09 15:42	6162	2535	8.8%	182	42	103	121	111	11
9/30/09 15:43	6162	2535	8.8%	121	42	103	61	56	5
9/30/09 15:44	6162	2535	8.8%	61	42	103	1	0	0
9/30/09 15:45	6162	2535	8.8%	1	42	103	0	0	0

Each line of the queuing spreadsheet represents a single minute of the incident and accounts for the vehicle volumes approaching the incident, the available capacity, and the number of vehicles entering, exiting, and remaining in the queue. Each of these values represents a single vehicle without distinguishing between cars and trucks.

The percentage of trucks during this incident was based upon the time between the start of the incident and total dissipation of the queue (the calculation of the percentage of trucks is discussed in the assumptions section below). Using the percentage of trucks, the number of queued vehicles can be separated into cars and trucks. The length of the queue during each minute is calculated based on the number of cars and trucks in the queue and the length of each vehicle (assumed to be 25 feet for cars and 75 feet for trucks). The calculated queue length assumes that all vehicles are in a single file line. The queue is spread over the available number of lanes to determine the physical length from the point of the incident to the back of the queue.

Figure 4.4 shows the calculations used to convert the number of queued vehicles to the queue length, which is part of the same spreadsheet shown in Figure 4.3.

Figure 4.4: Queue Length Calculations for September 30, 2009 Incident (Part 2, Queue Length)

Date-Time	% Trucks	Cars in Queue	Trucks in Queue	Length of Queue (feet)	Physical length of queue from incident	Segment 1			Segment 2		
						Capacity Filled (feet)	Physical Length Filled (feet)	Queue Overflow to next segment	Capacity Filled (feet)	Physical Length Filled (feet)	Queue Overflow to next segment
						Number of Lanes: 3 Length of Segment (ft): 3,540 Queue Storage Capacity (ft): 10,620			Number of Lanes: 4 Length of Segment (ft): 48,460 Queue Storage Capacity (ft): 193,840		
9/30/09 13:32	8.8%	0	0	0	0	-	-	-	-	-	-
9/30/09 13:33	8.8%	0	0	0	0	-	-	-	-	-	-
9/30/09 13:34	8.8%	0	0	0	0	-	-	-	-	-	-
9/30/09 13:35	8.8%	0	0	0	0	-	-	-	-	-	-
9/30/09 13:36	8.8%	0	0	0	0	-	-	-	-	-	-
9/30/09 13:37	8.8%	20	2	657	219	657	219	-	-	-	-
9/30/09 13:38	8.8%	41	4	1315	438	1,315	438	-	-	-	-
9/30/09 13:39	8.8%	61	6	1972	657	1,972	657	-	-	-	-
9/30/09 13:40	8.8%	82	8	2630	877	2,630	877	-	-	-	-
...											
9/30/09 14:05	8.8%	592	57	19076	5654	10,620	3,540	8,456	8,456	2,114	-
9/30/09 14:06	8.8%	612	59	19735	5819	10,620	3,540	9,115	9,115	2,279	-
9/30/09 14:07	8.8%	649	63	20905	6111	10,620	3,540	10,285	10,285	2,571	-
9/30/09 14:08	8.8%	685	66	22075	6404	10,620	3,540	11,455	11,455	2,864	-
9/30/09 14:09	8.8%	721	70	23245	6696	10,620	3,540	12,625	12,625	3,156	-
9/30/09 14:10	8.8%	758	73	24415	6989	10,620	3,540	13,795	13,795	3,449	-
9/30/09 14:11	8.8%	794	77	25585	7281	10,620	3,540	14,965	14,965	3,741	-
9/30/09 14:12	8.8%	830	80	26755	7574	10,620	3,540	16,135	16,135	4,034	-
9/30/09 14:13	8.8%	866	84	27925	7866	10,620	3,540	17,305	17,305	4,326	-
9/30/09 14:14	8.8%	903	87	29095	8159	10,620	3,540	18,475	18,475	4,619	-
9/30/09 14:15	8.8%	939	91	30265	8451	10,620	3,540	19,645	19,645	4,911	-
9/30/09 14:16	8.8%	975	94	31435	8744	10,620	3,540	20,815	20,815	5,204	-
...											
9/30/09 15:36	8.8%	442	43	14231	4443	10,620	3,540	3,611	3,611	903	-
9/30/09 15:37	8.8%	386	37	12454	3998	10,620	3,540	1,834	1,834	458	-
9/30/09 15:38	8.8%	331	32	10677	3554	10,620	3,540	57	57	14	-
9/30/09 15:39	8.8%	276	27	8900	2967	8,900	2,967	-	-	-	-
9/30/09 15:40	8.8%	221	21	7123	2374	7,123	2,374	-	-	-	-
9/30/09 15:41	8.8%	166	16	5346	1782	5,346	1,782	-	-	-	-
9/30/09 15:42	8.8%	111	11	3569	1190	3,569	1,190	-	-	-	-
9/30/09 15:43	8.8%	56	5	1792	597	1,792	597	-	-	-	-
9/30/09 15:44	8.8%	0	0	15	5	15	5	-	-	-	-
9/30/09 15:45	8.8%	0	0	0	0	-	-	-	-	-	-

This incident started at 13:32 and all lanes were cleared and opened to traffic at 15:06. At 15:45, 39 minutes after all lanes were opened to traffic, no vehicles remained in the queue.

Figure 4.5 shows the summary of the September 30, 2009 TRIP incident.

Figure 4.5: Queuing Results for September 30, 2009 Incident

Results Summary			
	Total	Cars	Trucks
Total Vehicle Delay (Minutes)	158,337	144,415	13,922
Total Vehicle Delay (Hours)	2639.0	2406.9	232.0
Vehicles Entering Queue	5,443		
Average Delay per Vehicle (Minutes)	29.1		
	Feet	Vehicles	
Maximum Queue Length	18,874	2,448	
Average Queue Length	9,456	1,182	
Incident Start	13:32		
Lanes Clear	15:06		
Queue Dissipated	15:45		

Total Vehicle Delay (Minutes) is calculated by summing the values in each of the columns “*Vehicles in Queue (End of Minute)*”, “*Cars in Queue*” and “*Trucks in Queue*”.

Total Vehicle Delay (Hours) is the vehicle minutes of delay converted to hours.

Vehicles Entering Queue is calculated by summing the values in the column “*Vehicles Added to Queue*” which does not count any vehicles that arrived when no queue existed.

Average Delay per Vehicle (Minutes) is calculated by dividing the total vehicle delay by the number of vehicles that entered the queue during the incident.

Maximum Queue Length is the maximum values from the columns “*Physical length of queue from incident*” and the maximum of the column “*Vehicles in Queue (End of Minute)*”.

Average Queue Length is the average values from the columns “*Physical length of queue from incident*” and the maximum of the column “*Vehicles in Queue (End of Minute)*”.

Incident Start and **Lanes Clear** times are known values for each incident.

Queue Dissipated is determined by adding rows (time) to the incident analysis spreadsheet until the number of “*Vehicles in Queue (End of Minute)*” is zero.

A separate spreadsheet was developed for each incident studied, which allowed flexibility to create each spreadsheet with the approach volumes, capacity, truck percentages, and changes in

each of these factors specific to each incident. The separate modeling of each incident with incident-specific information provided the ability to determine the cost of each incident using a methodical approach instead of attempting to develop an “average cost per incident.”

4.1.1 Incident Analysis Assumptions

The assumptions and approaches described in this section were developed and used consistently during the analysis of each incident.

The project team discussed the major assumptions made during this study; the approaches taken were those that would produce the most conservative calculation of the benefit of the TRIP. The approaches underestimate the number of vehicles delayed during each incident, thereby creating a lower cost of the incident.

4.1.1.1 Approach Volumes

The hourly traffic volumes approaching each incident were determined using actual traffic counts from NaviGator. GDOT NaviGator detector stations are located approximately every one-third mile along the interstate. Data is collected and archived by the Georgia Institute of Technology (Georgia Tech) for other projects and was made available to this project. This data is not complete as many stations may not have reported for the day in question, or the data was not available for long periods of time.

For each incident, the NaviGator detectors directly upstream of the incident were identified and Georgia Tech queried their detector archive to provide hourly volumes from those detectors for:

- The day of the incident,
- One week prior to the incident (same day of week), and
- The equivalent dates in 2007 through 2010. The equivalent date from each year is the same day of week and week of the year. Corrections were made for holiday time frames to address the most similar day.

In most cases, the volumes from the prior week were used as the typical volume on that segment of interstate. If the prior week data was not available, the 2008, 2009, or 2010 NaviGator data (whichever was closest to the incident date and available) was used. The measured volumes were adjusted to the year of the incident using the growth/reduction of traffic as measured by the annual average daily traffic (AADT) data available from the GDOT OTD web site.

4.1.1.2 Available Capacity

The capacity of roadway depends upon a number of factors, including the number of available lanes, the number of lanes blocked, and the percentage of trucks in the traffic stream.

Research has shown that the capacity reduction of a lane blockage cannot be calculated as the ratio between the number of lanes blocked versus the number of available lanes. The effect of emergency vehicles, lane clearing activities, and the rubbernecking factor for passing drivers makes the capacity reduction greater than just the percentage of available lanes.

The *2000 Highway Capacity Manual (HCM)*, provides guidance for a capacity reduction factor for up to three lanes of blockage. The 2006 URS report entitled *Benefit Analysis for the GDOT*

NaviGator Program² expanded this table by extrapolation to cover up to seven lanes of blockage. The capacity reduction factors used in this research are shown in Table 4.2.

Table 4.2: Capacity Reduction Factors (Percentage of Capacity Remaining)

Number of Lanes	Number of Lanes Blocked						
	1	2	3	4	5	6	7
2	0.35	0					
3	0.49	0.17	0				
4	0.58	0.25	0.13	0			
5	0.65	0.40	0.20	0.1	0		
6	0.71	0.50	0.25	0.17	0.08	0	
7	0.75	0.57	0.36	0.21	0.14	0.07	0
8	0.78	0.63	0.41	0.25	0.19	0.13	0.06

According to the *HCM*, the flow rate corresponding to capacity is 2250 passenger cars per hour per lane (pcphpl). A truck factor based on the hourly percent of trucks and a truck equivalent factor of 1.5 was calculated for each hour (based upon the hourly truck percentages from the GDOT OTD). Hourly truck percentages are obtained from the GDOT Office of Transportation Data. This factor is used to convert the capacity from passenger cars per hour per lane to the number of vehicles based on the percentage of trucks in the traffic stream. The truck factor is calculated as:

$$Truck\ Factor = \frac{1}{1 + (Percentage\ of\ Trucks * (1.5 - 1))}$$

Assuming a peak hour factor of 0.95, the available capacity is calculated as:

$$\begin{aligned}
 Available\ Capacity & \\
 &= 2,250 * Number\ of\ Lanes * Capacity\ Reduction\ Factor \\
 & * Truck\ Factor * Peak\ Hour\ Factor
 \end{aligned}$$

Figure 4.6 shows the available capacities calculated for the September 30, 2009 incident.

² *Benefits Analysis for the Georgia Department of Transportation NaviGator Program*. URS. August 2006. GDOT Document Number NAV01-127 Revision 2.0

Figure 4.6: Available Capacities for September 30, 2009 Incident

Time	# of lanes	# of lanes blocked	Available capacity rate	Peak hour factor	Truck %	Truck factor	Available Capacity
13:32 - 13:37	3	1	0.49	0.95	9.55%	95.44%	2,999
13:37 - 14:00	3	2	0.17	0.95	9.55%	95.44%	1,040
14:00 - 14:07	3	2	0.17	0.95	8.96%	95.71%	1,043
14:07 - 14:24	3	3	0	0.95	8.96%	95.71%	0
14:24 - 14:28	3	2	0.17	0.95	8.96%	95.71%	1,043
14:28 - 14:50	3	3	0	0.95	8.96%	95.71%	0
14:50 - 14:56	3	2	0.17	0.95	8.96%	95.71%	1,043
14:56 - 15:00	3	1	0.49	0.95	8.96%	95.71%	3,007
15:00 - 15:06	3	1	0.49	0.95	8.14%	96.09%	3,019
15:06 - 16:00	3	0	1	0.95	8.14%	96.09%	6,162
16:00 - 17:00	3	0	1	0.95	7.13%	96.56%	6,192
17:00 - 18:00	3	0	1	0.95	6.24%	96.97%	6,218
18:00 - 19:00	3	0	1	0.95	6.48%	96.86%	6,211
19:00 - 20:00	3	0	1	0.95	7.06%	96.59%	6,194
20:00 - 21:00	3	0	1	0.95	7.51%	96.38%	6,180
21:00 - 22:00	3	0	1	0.95	7.52%	96.38%	6,180
22:00 - 23:00	3	0	1	0.95	7.90%	96.20%	6,169

4.1.1.3 Percentage of Trucks

The GDOT OTD web site provided measured hourly truck percentages on the interstate system in metropolitan Atlanta. All of the TRIP incidents lasted more than one hour so the percentage of trucks in the traffic stream changes dynamically over time throughout an incident. The percentage of trucks during a specific incident was determined by taking a weighted average of the truck percentages for the duration of the incident (from the beginning of the incident through the dissipation of the queue). Figure 4.7 shows the truck percentage calculation for the September 30, 2009 incident that started at 13:32 and cleared at 15:45.

Figure 4.7: Calculation of Truck Percentage for September 30, 2009 Incident

Time	Truck % 2009	Incident Duration	Vehicle Volumes	Trucks
9/23/2009 0:00	11.43		0	0
9/23/2009 1:00	15.06		0	0
9/23/2009 2:00	18.21		0	0
9/23/2009 3:00	19.75		0	0
9/23/2009 4:00	21.09		0	0
9/23/2009 5:00	14.58		0	0
9/23/2009 6:00	9.59		0	0
9/23/2009 7:00	7.48		0	0
9/23/2009 8:00	8.12		0	0
9/23/2009 9:00	10.2		0	0
9/23/2009 10:00	10.78		0	0
9/23/2009 11:00	10.69		0	0
9/23/2009 12:00	10.09		0	0
9/23/2009 13:00	9.55	47%	1112	106
9/23/2009 14:00	8.96	100%	2388	214
9/23/2009 15:00	8.14	75%	1901	155
9/23/2009 16:00	7.13		0	0
9/23/2009 17:00	6.24		0	0
9/23/2009 18:00	6.48		0	0
9/23/2009 19:00	7.06		0	0
9/23/2009 20:00	7.51		0	0
9/23/2009 21:00	7.52		0	0
9/23/2009 22:00	7.9		0	0
9/23/2009 23:00	9.13		0	0
			5401	475
				8.8%

4.1.1.4 Incidents on Ramps

Incidents that occurred on ramps presented a special set of challenges for calculating the impacts of such incidents. Entrance and exit ramps are not typically instrumented with vehicle detection like the mainline interstates. For the few ramps that are instrumented, the detectors are not easily identifiable for retrieving data from the Georgia Tech data archive. In addition to difficulties in determining traffic volumes, the impacts of ramp incidents on mainline traffic lanes is not typically documented in the NaviGator or TRIP logs.

Approaching traffic volumes on the ramps was calculated by determining the hourly traffic volumes on the mainline (from the NaviGator detector data) and factoring those hourly volumes by the ration of the ramp AADT and mainline AADT, available from the GDOT OTD web site. This provided an hourly distribution of traffic using the ramp.

Based on the NaviGator incident logs, the traffic impacts of ramp incidents depend upon whether the ramp was completely or partially closed during the incident. Of the 56 TRIP incidents that occurred on ramps, 47 were modeled. Thirty-four incidents involved total ramp

closures, while 13 ramp incidents were partial closures. To determine the impacts of ramp incidents, the team made the following assumptions.

- **Ramp Completely Closed During Incident** – If the ramp was completely closed during an incident, it was assumed that the emergency responders would block the ramp with vehicles at the exit point from the interstate. At that time, the NaviGator changeable message signs would inform motorists that the ramp was closed. Typically, traffic on the mainline would not queue, but would be forced to find a different route to their destination. In reality, during a complete ramp closure, the emergency response vehicles would clear the ramp of vehicles by either letting them pass the incident on a shoulder, or back them down the ramp and re-direct them onto the mainline.

For this analysis, the number of vehicles that could physically fit on the ramp (from the merge point from the mainline to the point of the incident) was assumed to be delayed on the ramp for the duration of the incident. The delay calculated for this small number of vehicles is a relatively small portion of the delay imposed upon all of the diverted traffic; therefore, the cost of these incidents is undervalued.

- **Ramp Partially Closed During Incident** – If the ramp was partially closed during the incident, it was assumed that traffic would queue on the mainline interstate as they approached the incident. This traffic was allowed to queue in the right-most lanes of the mainline in the same number of lanes as exists on the ramp. This assumption ignored any impacts to mainline through traffic, which lost the use of these lanes during the incident. This approach only calculated the delay on traffic that used the ramp, thereby underestimating the cost of the incident on the system.

4.2 Incident Cost Methodology

The calculations presented above provided delay data that could be used to determine the costs of each incident. The delay imposed upon the system has costs associated with the delay for the motorists involved, the extra emissions introduced into the environment, and the cost of extra fuel wasted.

4.2.1 Incident Cost Assumptions

The study team reviewed three documents to determine appropriate values for each of these factors. The documents reviewed were:

- *TRIP Research Summary* by Gresham, Smith and Partners, February 2010
- *Benefit Analysis for the GDOT NaviGator Program* by URS, August 2006
- *Road Ranger Benefit Cost Analysis (Florida)* by Center for Urban Transportation Research, November 2005³

The values used in this study are discussed in the following sections.

³ Road Ranger Benefit Cost Analysis. Center for Urban Transportation Research. November 2005

4.2.1.1 Cost of Delay

The cost of delay used in each report and the average value for each factor is shown in Table 4.3. The value of truck time varied significantly, so an average value of \$69.49 was used for this analysis.

Table 4.3: Cost of Delay

Report	Value of a Person's Time (\$/hr)	Vehicle Occupancy	Value of Truck Time (\$/hr)
TRIP Research Summary	\$ 13.75	1	\$ 72.65
Benefit Analysis for the GDOT NaviGator Program	\$ 17.23	1.16	\$ 32.15
Road Ranger Benefit Cost Analysis	\$ 13.45	1.5	\$ 71.05
2009 Urban Transportation Mobility Report			\$ 102.12
Average Value	\$ 14.81	1.22	\$ 69.49

The Atlanta Regional Commission uses different car occupancy rates for various types of trips. The occupancy rate is 1.08 for home-based work trips, which is the primary type of trip during peak hours. During off-peak hours, the occupancy rates are normally higher due to other types of trips, such as shopping and social, which often involve more than one person in a car. This study included both peak and off-peak travel and does not distinguish between traditional and high-occupancy vehicle (HOV) lanes. As such, an occupancy rate of 1.22 persons per passenger vehicles was determined to be an acceptable, yet conservative, occupancy rate for this study. Using the average cost of vehicle delay (\$14.81) and an occupancy rate of 1.22, the cost of delay for passenger vehicles is \$14.81 multiplied by 1.22 = \$18.07 per vehicle per hour.

Rounding the average costs, the rates for vehicle delay used in this study were:

Passenger vehicles: **\$18.07 per hour of delay**

Trucks: **\$69.49 per hour of delay**

4.2.1.2 Cost of Emissions

Of the three reports quoted above, only the URS report, entitled *Benefit Analysis for the GDOT NaviGator Program*, included air pollution costs. The amount of vehicle emissions and associated costs used in the report are shown in Table 4.4.

Table 4.4: Cost of Emissions

Emission	Emission Rate (Tons per Vehicle Hour of Delay)	Cost per Ton
HC	0.000025676	\$6,700
CO	0.00033868	\$6,360
NOx	0.000036064	\$12,875

These costs were used in this study. The cost for each pollutant type was calculated as:

$$Pollution\ Cost = Total\ Delay(vehicle\ hours) * Emission\ Rate * Unit\ Cost\ per\ Ton$$

4.2.1.3 Cost of Fuel

The three previously quoted reports used different approaches to determine fuel. Each of these approaches are summarized below:

- **TRIP Research Summary** – used an average fuel economy in congested conditions of 18.36 miles per gallon for all vehicles. The fuel consumption was calculated as vehicle miles traveled divided by average fuel economy.
- **Benefit Analysis for the GDOT NaviGator Program** – used a fuel economy of 21.5 miles per gallon for cars (quoted from a 2006 Environmental Protection Agency report) and 7 miles per gallon for trucks (quoted from a 2002 TRB report). Fuel consumption for cars and trucks was calculated separately using their specific consumption rates.
- **Road Ranger Benefit Cost Analysis** – used software called “Freeway Service Patrol Evaluation (FSPE),” developed by the University of California at Berkeley to assess delay and fuel consumption. The report included a brief description of the software, but did not provide detail about how delay and fuel consumption were calculated by the software.

The approach used in this study accounts for the number of trucks impacted by each incident based on the time and duration of the incident; therefore, separate fuel consumption rates can be used. The fuel economy rates used in the *Benefit Analysis for the GDOT NaviGator Program* report were employed in this study.

The web site www.GasBuddy.com provides reported costs of both regular and diesel fuel and can be queried by state to provide the lowest, average, and highest prices of fuel. The prices listed on January 17, 2011, are provided in Table 4.5. A gasoline price of \$2.84 and a diesel price of \$3.01 were used in this study.

Table 4.5: Cost of Fuel (Georgia)

	Regular Unleaded	Diesel
Lowest	\$ 2.84 per gallon	\$ 3.01 per gallon
Average	\$ 3.00 per gallon	Not reported
Highest	\$ 3.39 per gallon	\$ 3.59 per gallon

The fuel cost calculation is shown below:

$$\begin{aligned}
 \text{Fuel Cost} = & \text{Miles of Travel} * \text{Percent of Trucks} * \frac{\text{Unit Diesel Price per gallon}}{\text{Truck Fuel Economy}} \\
 & + \text{Miles of Travel} * \text{Percent of Cars} * \frac{\text{Unit Gas Price per gallon}}{\text{Car Fuel Economy}}
 \end{aligned}$$

Where:

$$\text{Miles of Travel} = \text{Total Delay (vehicle hours)} * \text{Average Speed (mph)}$$

$$\text{Average Speed} = \frac{\text{Average Queue Length in miles}}{\text{Average Delay per veh in hours}}$$

5 BENEFITS OF TRIP

Cost calculations for delay, emissions, and fuel consumption were performed for each of the incidents modeled and documented in a summary spreadsheet. The spreadsheet results are included in Appendix A.

During the evaluation of incident costs, it became apparent that every incident is unique with its own set of spatial, temporal, and geographic characteristics. These intrinsic differences make it difficult to create direct comparisons between any two individual incidents, as it is difficult to find two incidents with the same amounts of approaching traffic, similar incident clearance timelines, or similar patterns of lane availability.

Table 5.1 shows the number of incidents modeled and their associated costs.

Table 5.1: Incident Costs

Year	TRIP Incidents	Incidents Modeled	Total Cost of Modeled Incidents	Average Cost of Modeled Incident
2007 (Before TRIP)	24	19	\$ 12,218,517	\$ 643,080
2008	59	46	\$ 9,710,454	\$ 211,097
2009	51	48	\$ 7,854,812	\$ 163,641
2008 and 2009 (With TRIP)	110	94	\$ 17,565,266	\$ 186,864

Using TRIP reduces incident cost an average of 71 percent when compared to the pre-TRIP experience of 2007. This significant decrease in the impacts of these incidents after the implementation of TRIP is attributable to the quick clearance of the roadways. The faster clearance of the roadway creates a measurable reduction in the vehicle hours of delay imposed by an incident with an average savings of \$456,216 per incident.

The goal of TRIP, to reduce the clearance time of large incidents, has a direct benefit of reducing the cost of these incidents in terms of lost time, wasted fuel, and excess emissions.

5.1 Comparison of Incident Timelines

Two timestamps were used in this study to determine the clearance time of an incident — the incident start time and all lanes clear time. These timestamps are well documented in the TRIP logs and the NaviGator logs for the 2007 incidents. They provide documentation for the amount of time each incident blocked the roadway.

During the review of each incident, the following attributes were documented to provide a quick summary for each incident. These attributes are:

- Number of Trucks – The number of large vehicles involved in the incident.
- Number of Cars – The number of passenger vehicles involved in the incident.

- Overturn – The truck overturned during the incident.
- Spilled Load – The truck spilled its load during the incident.
- Spilled Fuel – The truck spilled fuel (from the tractor’s fuel tanks) during the incident.
- Fire – A fire was involved that required the fire department to respond.
- HAZMAT – Hazardous materials spilled during the incident requiring HAZMAT response.
- Injury – The number of injuries incurred during the incident.
- Fatality – The number of fatalities incurred during the incident.

Incidents involving a few vehicles with an overturned truck, a spilled load, some spilled fuel, and minor or few injuries are “**typical**” incidents that allow GDOT and the TRIP operators to quickly respond and clear the roadway.

During incidents involving fire, HAZMAT, serious or multiple injuries, or fatalities, the work effort to clear the incident from the roadway increased dramatically. These events required additional resources from other departments and agencies to respond to assist with the incident clean up or investigation. During these incidents, GDOT and the TRIP operator must wait until all other agencies give the go-ahead for cleanup. Each incident involving any of these factors was labeled as “**atypical,**” and was removed from the comparison of TRIP and pre-TRIP incident timelines.

The summary of the incident timelines for all of the incidents is shown in Appendix B. The average duration for each incident was determined by calculating the standard deviation of incident durations and removing outliers that were more than one standard deviation from the mean incident duration. Table 5.2 summarizes the incident durations for each year of the study.

Table 5.2: Duration of Incidents

Year	Average Duration (Excluding Outliers)	
	All Incidents	“Typical” Incidents
2007 (pre-TRIP)	4 hours 43 minutes	4 hours 52 minutes
2008	1 hour 58 minutes (58% improvement from 2007)	1 hour 35 minutes (67% improvement from 2007)
2009	1 hour 37 minutes (66% improvement from 2007)	1 hour 30 minutes (69% improvement from 2007)

TRIP is clearing the roadway in less than half the time it used to take to clear similar incidents. The significant improvement in clearance time is directly responsible for the 71 percent reduction in the average costs of these incidents since the program’s inception.

5.2 TRIP Benefits

Comparing the costs of 2007 incidents directly to 2008 and 2009 incidents was determined to be unrealistic due to the unique characteristics of each incident being studied. This study calculated the benefit of TRIP for each incident in 2008 and 2009 by:

- 1) Determining the cost of the incident using the actual timeline (with TRIP).
- 2) Creating a hypothetical timeline for the same incident and determining the cost of the incident (without TRIP).
- 3) Comparing the difference in cost of the incident with and without TRIP to determine the benefits of the program.

The hypothetical clearance timeline was determined by adding one hour of roadway blockage to each 2008 and 2009 incident. This approach allowed the characteristics of each incident to be used to determine the cost of the incident with TRIP (the actual timeline) and without TRIP (the extended timeline). Table 5.1 shows that TRIP saved more than 165 minutes of clearance time, on average, per incident; however, to utilize the most conservative approach. This study only assumed a 60-minute time savings.

Table 5.3 shows the actual and “extended” timeline for the September 30, 2009 incident.

Table 5.3: Lanes Blocked during September 30, 2009 Incident

Time (actual)	Description	Time (Extended)
13:32	1 of 3 lanes blocked.	13:32
13:37	2 of 3 lanes blocked	13:37
14:07	3 of 3 lanes blocked for wrecker maneuvers	14:07
14:24	2 of 3 lanes blocked	14:24
14:28	3 of 3 lanes blocked for wrecker maneuvers	14:28
14:50	2 of 3 lanes blocked	14:50
14:56	1 of 3 lanes blocked	14:56
15:06	Lanes clear	16:06

In a further effort to remain conservative, the study evaluated the value of TRIP if a 30-minute savings in clearance time was considered. This assumes a worst case scenario that a TRIP operator will only save 30 minutes of clearance time on each incident. This scenario will provide an extremely low confidence bound for the effectiveness of the program.

This cost of the “extended” timeline was compared to the cost of the actual incident with the difference being the benefit of TRIP for that incident.

Benefit of TRIP

$$= \text{Cost of Incident (extended timeline)} - \text{Cost of Incident (actual timeline)}$$

Table 5.4 summarizes the findings for the benefit of the TRIP for the September 30, 2009 incident.

Table 5.4: Benefit of TRIP for September 30, 2009 Incident

Timeline Description	Incident Timeline			Total Delay (Veh Hrs)	Incident Costs				Benefit of TRIP
	Incident Start	All Lanes Clear	Queue Cleared		Delay	Fuel	Emission	Total	
Actual Timeline	13:32	15:06	15:45	2639.0	\$59,610.03	\$1,486.49	\$7,363.92	\$68,460.44	Baseline
30 Minute Extension	13:32	15:36	16:11	3613.0	\$81,250.21	\$2,115.89	\$10,081.79	\$93,447.89	\$24,987.45
60 Minute Extension	13:32	16:06	16:39	4527.5	\$101,246.36	\$2,674.15	\$12,633.63	\$116,554.15	\$48,093.70

Each of the 2008 and 2009 incidents were run with an “extended” timelines and the results were documented in a summary spreadsheet. This summary spreadsheet is included in Appendix C. The benefits calculated for several TRIP activations were removed from the final total of benefits as the incidents were ones where the TRIP operator was not used, or in instances where the TRIP operator did not get paid due to not meeting the criteria for quick opening of the roadway. These incidents were not removed from the cost of the program.

The benefits for 72 of the 110 TRIP activations in 2008 and 2009 were used to determine the benefit of TRIP. The average benefit of these 72 incidents was \$127,145.

Table 5.5 summarizes the benefits of TRIP.

Table 5.5: Benefit of TRIP

	60 Minute Extensions	30 Minute Extensions
Benefit of TRIP	\$9,154,430.63	\$4,462,567.05
Cost of TRIP	\$835,000	
Benefit-Cost Ratio	10.96 to 1	5.34 to 1

The benefit-cost ratios calculated for this program are conservative estimates of the value of the program. Some of the reasons that the benefits of TRIP are higher than this study suggests are:

- The cost of the program used in the benefit-cost calculation included the administrative costs for the program through December 2010, but only the benefits for 2008 and 2009 were included.
- TRIP benefits from 72 incidents were included in the benefit-cost calculation. The costs of all 110 incidents were included in the program costs.
- The modeling assumptions used to analyze each incident were developed to underestimate the impact of the incident, thus lowering the calculated benefit of the quick clearance of the incident.

5.3 Non-Monetary Benefits of TRIP

The implementation of TRIP has created an environment where the towing and recovery operator is a valued team member at an incident scene. The towing company employees were historically seen as “by-the-hour” guys that were more interested in logging hours to bill the

insurance and freight companies than in actually getting the roadway opened. TRIP encourages these operators to use their expertise to assist the public agencies in getting the roadway opened as quickly as possible.

TRIP is managed by the GDOT HERO unit. As part of this study, the HERO operators were asked for their thoughts of TRIP. Some of their replies are listed here:

“The TRIP program stresses the primary goal of opening travel lanes. This becomes well known by all the responders and even if they don’t say it they know „someone is watching” and avoid un-necessary activity and try to reduce closure time.”

“Obviously they want the bonus. However, because of the AIR they do not want to fail or screw up. There is a sense of competition between the guys and they don’t want to be the one called out. They want to be the one praised for a job well done.”

“Fire Rescue personnel feel secure working with TRIP operators and will frequently utilize them to assist with extrication and even fuel tank securement.”

“The TRIP program has a way of responders willing to assist each other with tasks that are outside their normal role. There is just more of an atmosphere of cooperation all the way around.”

“The professional wrecker companies want the standard raised in their profession. They want to be accepted as team member with the emergency responders. TRIP raises the bar. Because of that, they are being accepted as a team member. They are now meeting and training together.”

“The right, well maintained and well operated equipment shows up on the scene.”

“As emergency responders (police and fire) became more experienced in working with TRIP companies, they became more receptive to more aggressive clearing techniques. They realized that the TRIP companies knew what they were doing and did it in a safe manner. The responders began to trust the TRIP companies.”

The conclusion derived from these comments is that TRIP provides a sense of purpose for responders. The towing operator is rewarded for assisting the quick clearance of the incident and responding with the right equipment and qualified operators that can open the road as safely and quickly as possible.

TRIP provides a unique incentive to the towing operators and the After Incident Review process allows the public and private agencies to review and refine procedures for future incidents. The results of this process have been a 71 percent reduction in the average incident cost since the implementation of TRIP.

5.4 Accident Experience

One of the goals of quick clearance initiatives such as TRIP is to minimize the exposure to secondary incidents by limiting the amount of time that vehicles are standing still (queued) on the interstate. The queuing models developed for each incident provide an estimate of the queue length and duration of the queue for each incident. The following data points were used to query the NaviGator incident logs to determine how many possible secondary incidents may have occurred during each of the TRIP (and pre-TRIP) incidents studied.

- Incident Start Time
- Queue Clear Time
- Maximum Queue Length (ft)

These parameters allowed GDOT TMC staff to query the NaviGator database and attempt to identify incidents that occurred within the traffic queue of each incident. The NaviGator database allows the incident logs to be sorted by Interstate, County, Date, and Time. From this initial sorting of incidents, the NaviGator incident log for each possible secondary incident had to be read individually to determine if the incident:

- 1) was within the physical boundaries of the queue;
- 2) occurred between the incident start and queue clear times; and
- 3) was an accident or a stall.

Table 5.6 presents the summary of secondary incidents that were found during this study.

Table 5.6: Secondary Incidents

Year	Total NaviGator Incident Logs	TRIP Incidents	Accidents in Incident Queue	Stalls in Incident Queue
2007	32,610	24	0	9
2008	51,684	59	5	18
2009	55,503	51	5	19

The secondary accidents found during this study do not prove, nor disprove the generally accepted theory that queues of stopped vehicles create a hazard that will result in secondary incidents. The data indicates an extreme difference in the number of incidents recorded within NaviGator between 2007 and 2008. The data presented above indicates that additional work to define and interpret the data to find secondary incidents may be needed. Non-linear statistical models need to be developed in future studies to better explain the spatial and temporal characteristics of secondary incidents before concrete recommendations can be made.

Several factors make the secondary incident data subject to further questioning, such as:

- During 2007, the TMC staff was transitioning from a mix of GDOT and private employees to completely private. After this transition, aggressive training, process management, and quality assurance practices have been put in place within the TMC. This may have an impact on the numbers of incidents reported, and how they are described in the NaviGator log.

- The NaviGator software does not allow for an incident to be easily characterized as secondary to another incident. In some cases the TMC operator will add a comment in the log that the incident is related to a separate NaviGator incident, but this practice appeared to be inconsistent in the early logs. The NaviGator software is currently being replaced and the new software provides a specific “check-box” that allows an operator to document an incident as a secondary.

The secondary incident information found in this study can be useful in future studies, but the information on the reduction in secondary accidents attributed to TRIP is inconclusive, as the pattern shown is inconsistent with typical expectations. This could be due to the dynamic nature of secondary incidents and could be remedied in the future by developing a statistical model that accounts for the temporal and spatial characteristics of secondary incidents. Furthermore, there are some existing data quality issues that could inhibit identification of secondary incidents.

6 CONCLUSIONS

TRIP has cost \$835,000 from its inception through the end of 2010. This includes \$284,000 in monetary incentives paid to TRIP operators and \$551,000 in management and administrative costs from inception through November 2010. During 2008 and 2009, TRIP was activated for 110 incidents.

Prior to TRIP it required an average of 283 minutes from the beginning of an incident to open the roadway. During the first year of TRIP (2008), the average clearance time dropped 58 percent to 118 minutes. In 2009, the roadway was opened in 97 minutes, a 66 percent improvement.

This study calculated the value of TRIP by calculating the actual cost of each TRIP incident in 2008 and 2009. These actual costs were compared with the first alternative, which assumes it would have taken 60 minutes longer to open the lane. The addition of 60 minutes to the actual incident timelines is a conservative approach to calculating the cost of the incident as the data shows that, on average, TRIP saved more than 165 minutes. Assuming a 60-minute savings, the value of TRIP is \$9,154,431, giving a benefit-to-cost ratio of 10.98 to 1. Using a more conservative scenario, the second alternative assumes that TRIP provided only 30 minutes of savings in clearing the lanes. Even with this extremely conservative approach, the value of TRIP is \$4,462,567 with a benefit-to-cost ratio of 5.35 to 1.

In addition to the monetary benefits of the program, TRIP ensures that qualified operators respond to the incident scene with trained staff, the appropriate equipment, and a desire to do the job right and open the road quickly. The value of these other benefits should not be overlooked when reviewing the benefits of the program

TRIP provides a direct method to minimize the number of hours of delay imposed upon the public due to large incidents. The costs of the program are extremely small when compared to the value of time, wasted fuel, and excess emissions that it helps to avoid.

APPENDIX A

Cost of Incidents

2007 Cost of Incidents

Trip Activation	Incident Date	Vehicle Hours of Delay			Delay Minutes per vehicle	Average Queue		Incident Timeline				Percent of Trucks	Fuel Consumed (gal)		Emissions (Tons)			Delay Costs			
		All	Cars	Trucks		Feet	Vehicles	T3: Incident Start (time)	T5: All Lanes Clear (time)	Queue Cleared (time)	Cars		Trucks	HC	CO	NOx	Delay	Fuel	Emissions	Total	
2007-01	Friday, January 05, 2007	992.1	847.5	144.6	503.5	3,012	93	19:59	6:33	6:36	14.6%	2.7	1.4	0.025	0.336	0.036	\$ 25,361.05	\$ 11.84	\$ 2,768.38	\$ 28,141.27	
2007-02	Tuesday, February 13, 2007	238.0	197.2	40.8	12.1	159	24	22:59	4:15	4:15	17.1%	1.4	0.9	0.006	0.081	0.009	\$ 6,398.24	\$ 6.50	\$ 664.12	\$ 7,068.87	
2007-03	Friday, March 02, 2007	3,490.0	3,101.1	388.9	33.0	4,523	748	5:49	10:17	10:17	11.1%	224.8	86.2	0.090	1.182	0.126	\$ 83,055.96	\$ 897.76	\$ 9,738.57	\$ 93,692.29	
2007-04	Monday, March 12, 2007	555.0	488.5	66.5	27.3	2,389	154	6:32	12:03	12:03	12.0%	22.6	9.5	0.014	0.188	0.020	\$ 13,447.40	\$ 92.63	\$ 1,548.68	\$ 15,088.72	
2007-05	Monday, March 12, 2007	3,997.1	3,543.7	453.4	29.2	7,005	1,370	13:38	16:15	16:31	11.3%	449.5	175.9	0.103	1.354	0.144	\$ 95,535.05	\$ 1,806.17	\$ 11,153.59	\$ 108,494.81	
2007-06	Friday, March 30, 2007	982.7	864.6	118.2	13.7	1,517	211	12:10	15:26	15:27	11.2%	51.1	19.8	0.025	0.333	0.035	\$ 23,835.48	\$ 204.59	\$ 2,742.15	\$ 26,782.22	
2007-07	Monday, April 09, 2007							11:26	14:40								\$ -	\$ -	\$ -	\$ -	
2007-08	Tuesday, April 10, 2007																				
2007-09	Tuesday, April 10, 2007	445.4	386.5	58.9	6.5	1,729	151	9:13	12:05	12:09	13.2%	54.4	25.4	0.011	0.151	0.016	\$ 11,076.32	\$ 230.78	\$ 1,242.85	\$ 12,549.96	
2007-10	Monday, April 16, 2007																				
2007-11	Friday, April 27, 2007	1,582.4	1,405.0	177.4	67.7	4,895	318	11:19	16:08	16:16	11.2%	53.7	20.8	0.041	0.536	0.057	\$ 37,713.35	\$ 215.12	\$ 4,415.56	\$ 42,344.03	
2007-12	Monday, June 04, 2007	379.5	346.9	32.6	88.1	2,254	154	16:13	23:21	23:21	8.6%	4.7	1.4	0.010	0.129	0.014	\$ 8,533.23	\$ 17.40	\$ 1,058.96	\$ 9,609.60	
2007-13	Tuesday, June 05, 2007	164,996.1	147,288.7	17,707.4	177.5	28,337	10,321	7:12	16:27	23:10	10.7%	12432.5	4575.4	4.236	55.883	5.950	\$ 3,891,728.92	\$ 49,080.44	\$ 460,408.68	\$ 4,401,218.04	
2007-14	Friday, June 08, 2007	91,800.3	81,741.5	10,058.9	118.7	16,627	5,053	3:02	16:09	21:11	11.0%	6048.9	2296.3	2.357	31.092	3.311	\$ 2,175,914.73	\$ 24,090.58	\$ 256,161.54	\$ 2,456,166.85	
2007-15	Tuesday, June 19, 2007	8,815.7	8,007.8	807.8	46.8	14,185	2,011	14:37	18:37	18:59	9.2%	1282.3	399.1	0.226	2.986	0.318	\$ 200,820.55	\$ 4,843.06	\$ 24,599.52	\$ 230,263.13	
2007-16	Monday, July 16, 2007	1,182.4	1,031.4	151.0	17.5	2,001	191	19:50	1:35	1:35	12.8%	62.3	28.1	0.030	0.400	0.043	\$ 29,128.53	\$ 261.53	\$ 3,299.39	\$ 32,689.45	
2007-17	Wednesday, July 18, 2007																				
2007-18	Tuesday, July 24, 2007	120,486.0	106,951.6	13,534.5	289.7	40,451	11,832	18:50	0:40	4:59	11.2%	7896.0	3058.8	3.094	40.807	4.345	\$ 2,872,935.30	\$ 31,631.81	\$ 336,206.74	\$ 3,240,773.85	
2007-19	Thursday, July 26, 2007	17,519.5	15,623.5	1,896.0	29.4	19,903	2,485	10:40	15:49	17:42	10.8%	5591.6	2079.4	0.450	5.934	0.632	\$ 414,041.56	\$ 22,139.13	\$ 48,886.79	\$ 485,067.48	
2007-20	Saturday, July 28, 2007	93.6	81.3	12.3	3.8	101	19	21:43	2:04	2:04	13.1%	1.1	0.5	0.002	0.032	0.003	\$ 2,323.67	\$ 4.84	\$ 261.18	\$ 2,589.69	
2007-21	Monday, July 30, 2007																				
2007-22	Friday, August 03, 2007	7,403.6	6,592.4	811.2	38.1	8,483	1,670	11:57	16:09	16:22	11.0%	775.4	294.4	0.190	2.508	0.267	\$ 175,483.09	\$ 3,088.21	\$ 20,659.17	\$ 199,230.47	
2007-23	Wednesday, August 22, 2007	8,515.0	6,932.3	1,582.7	94.1	14,949	1,744	22:05	4:34	4:34	18.6%	582.0	408.5	0.219	2.884	0.307	\$ 235,236.01	\$ 2,882.27	\$ 23,760.44	\$ 261,878.71	
2007-24	Friday, August 31, 2007	7.0	6.1	0.9	0.6	25	2	4:17	7:11	7:12	12.9%	0.1	0.1	0.000	0.002	0.000	\$ 172.76	\$ 0.57	\$ 19.53	\$ 192.86	
2007-25	Tuesday, September 04, 2007	2,496.9	2,216.4	280.5	6.7	2,919	485	4:27	7:40	9:35	11.2%	510.6	197.8	0.064	0.846	0.090	\$ 59,538.30	\$ 2,045.35	\$ 6,967.40	\$ 68,551.05	
2007-26	Friday, September 07, 2007	12,887.4	11,369.4	1,518.0	31.2	14,249	2,569	5:55	9:15	10:54	11.8%	2743.7	1127.4	0.331	4.365	0.465	\$ 310,910.41	\$ 11,185.83	\$ 35,961.28	\$ 358,057.52	
2007-27	Wednesday, September 12, 2007	5,081.0	4,546.3	535.0	26.2	12,686	1,773	5:26	13:18	13:18	10.5%	1163.8	419.4	0.130	1.721	0.183	\$ 119,320.61	\$ 4,567.42	\$ 14,178.13	\$ 138,066.16	

Cost of Incidents: 2007 \$ 12,218,517.04

2008 Cost of Incidents

Trip Activation	Incident Date	Vehicle Hours of Delay			Delay Minutes per vehicle	Average Queue		Incident Timeline			Percent of Trucks	Fuel Consumed (gal)		Emissions (Tons)			Delay Costs			
		All	Cars	Trucks		Feet	Vehicles	T3: Incident Start (time)	T5: All Lanes Clear (time)	Queue Cleared (time)		Cars	Trucks	HC	CO	NOx	Delay	Fuel	Emissions	Total
1	Sunday, January 13, 2008	54.6	47.8	6.7	41.7	614	39	10:35	11:55	11:57	12.3%	0.4	0.2	0.001	0.018	0.002	\$ 1,331.41	\$ 1.54	\$ 152.24	\$ 1,485.19
2	Wednesday, January 16, 2008	915.0	832.4	82.6	5.9	4,559	549	7:22	7:39	9:01	9.0%	340.1	103.3	0.023	0.310	0.033	\$ 20,779.84	\$ 1,276.71	\$ 2,553.24	\$ 24,609.79
3	Tuesday, January 22, 2008																			
4	Sunday, February 24, 2008	184,536.2	166,835.1	17,701.2	229.9	32,891	10,802	6:23	19:45	23:27	9.6%	12614.4	4114.4	4.738	62.501	6.655	\$ 4,244,466.34	\$ 48,209.38	\$ 514,933.80	\$ 4,807,609.52
5	Tuesday, March 04, 2008	118.4	104.6	13.8	3.1	1,129	70	11:32	13:10	13:11	11.6%	20.1	8.1	0.003	0.040	0.004	\$ 2,847.64	\$ 81.67	\$ 330.36	\$ 3,259.67
6	Wednesday, March 05, 2008	110.1	98.6	11.5	1.2	489	83	5:15	6:15	6:19	10.4%	21.2	7.6	0.003	0.037	0.004	\$ 2,580.66	\$ 83.14	\$ 307.23	\$ 2,971.03
7	Wednesday, March 05, 2008	2,310.6	2,143.5	167.1	26.5	12,367	1,540	16:34	17:37	18:03	7.2%	528.9	126.0	0.059	0.783	0.083	\$ 50,340.97	\$ 1,881.43	\$ 6,447.55	\$ 58,669.95
8	Thursday, April 10, 2008	18,982.7	17,480.3	1,502.4	50.9	33,255	4,706	17:37	19:17	21:38	7.9%	6037.2	1590.5	0.487	6.429	0.685	\$ 420,239.33	\$ 21,933.17	\$ 52,969.74	\$ 495,142.23
9	Wednesday, April 23, 2008	94.8	87.0	7.8	52.5	760	52	18:52	20:39	20:40	8.2%	0.7	0.2	0.002	0.032	0.003	\$ 2,113.96	\$ 2.44	\$ 264.53	\$ 2,380.93
10	Thursday, May 01, 2008	177.4	159.3	18.1	51.5	2,189	152	13:54	15:02	15:03	10.0%	3.6	1.2	0.005	0.060	0.006	\$ 4,136.03	\$ 13.87	\$ 495.02	\$ 4,644.93
11	Wednesday, May 14, 2008							18:49	19:46											
12	Friday, May 16, 2008	116.7	106.5	10.2	28.5	2,057	140	7:27	8:13	8:16	8.7%	4.1	1.2	0.003	0.040	0.004	\$ 2,633.06	\$ 15.12	\$ 325.64	\$ 2,973.83
13	Friday, June 06, 2008	154.6	137.4	17.2	26.3	1,751	115	12:31	13:50	13:51	11.1%	4.8	1.9	0.004	0.052	0.006	\$ 3,677.80	\$ 19.32	\$ 431.40	\$ 4,128.52
14	Thursday, June 12, 2008							2:42	3:51											
15	Thursday, June 12, 2008							5:39	6:46											
16	Monday, June 16, 2008	154.6	136.4	18.2	7.8	560	41	4:41	7:55	7:55	11.8%	5.2	2.1	0.004	0.052	0.006	\$ 3,729.22	\$ 21.09	\$ 431.40	\$ 4,181.71
17	Saturday, June 21, 2008	176.2	157.9	18.2	113.2	1,204	40	5:27	9:49	9:51	10.4%	0.9	0.3	0.005	0.060	0.006	\$ 4,121.29	\$ 3.47	\$ 491.63	\$ 4,616.39
18	Sunday, June 22, 2008	24,700.1	22,771.1	1,929.1	75.7	26,285	5,058	15:37	18:31	20:29	7.8%	4179.5	1086.0	0.634	8.366	0.891	\$ 545,485.95	\$ 15,138.50	\$ 68,923.69	\$ 629,548.14
19	Monday, June 23, 2008	35,681.1	32,853.4	2,827.7	100.6	24,120	5,947	15:16	17:51	21:15	7.9%	4164.4	1097.1	0.916	12.085	1.287	\$ 790,098.67	\$ 15,129.40	\$ 99,565.31	\$ 904,793.39
20	Tuesday, July 01, 2008	2,864.4	2,627.7	236.7	18.3	6,524	859	18:29	21:43	21:48	8.3%	494.9	137.6	0.074	0.970	0.103	\$ 63,926.09	\$ 1,819.76	\$ 7,992.88	\$ 73,738.73
21	Wednesday, July 09, 2008							14:46	16:34											
22	Thursday, July 10, 2008	6,017.7	5,498.6	519.1	27.9	14,942	2,028	14:24	16:15	17:21	8.6%	1556.9	449.9	0.155	2.038	0.217	\$ 135,422.06	\$ 5,775.90	\$ 16,791.92	\$ 157,989.89
23	Saturday, July 12, 2008							8:04	10:19											
24	Wednesday, July 30, 2008	7,231.4	6,599.7	631.7	33.0	9,166	2,028	19:40	21:51	22:35	8.8%	968.2	286.9	0.186	2.449	0.261	\$ 163,141.53	\$ 3,613.36	\$ 20,178.65	\$ 186,933.54
25	Thursday, July 31, 2008	4,163.1	3,757.2	405.9	17.9	10,030	1,343	13:14	15:03	16:19	9.7%	1113.3	367.3	0.107	1.410	0.150	\$ 96,091.83	\$ 4,267.57	\$ 11,616.80	\$ 111,976.21
26	Thursday, July 31, 2008	5,660.6	5,179.1	481.6	45.8	19,104	2,633	19:23	20:38	21:31	8.5%	1141.9	325.8	0.145	1.917	0.204	\$ 127,043.40	\$ 4,223.62	\$ 15,795.46	\$ 147,062.48
27	Saturday, August 02, 2008							9:45	11:21											
28	Saturday, August 09, 2008	4,127.7	3,634.0	493.6	23.7	4,834	935	9:00	13:06	13:24	12.0%	391.6	164.0	0.106	1.398	0.149	\$ 99,960.10	\$ 1,605.77	\$ 11,518.02	\$ 113,083.90
29	Wednesday, August 20, 2008							4:51	8:02											
30	Wednesday, August 20, 2008							7:16	9:06											
31	Wednesday, August 20, 2008	1,587.7	1,404.7	183.0	21.8	7,476	972	8:37	10:13	10:14	11.5%	254.7	101.6	0.041	0.538	0.057	\$ 38,097.07	\$ 1,029.27	\$ 4,430.35	\$ 43,556.69
32	Wednesday, August 20, 2008	183.0	165.6	17.3	63.1	1,877	126	14:24	15:48	15:50	9.5%	2.6	0.8	0.005	0.062	0.007	\$ 4,194.27	\$ 9.92	\$ 510.65	\$ 4,714.84
33	Tuesday, August 26, 2008	755.2	652.3	102.8	45.3	2,469	213	3:22	6:26	6:40	13.6%	18.8	9.1	0.019	0.256	0.027	\$ 18,929.46	\$ 80.74	\$ 2,107.33	\$ 21,117.52
34	Tuesday, August 26, 2008	612.8	1,412.9	199.9	14.9	8,144	1,052	10:09	11:07	11:40	12.4%	155.1	67.4	0.016	0.208	0.022	\$ 39,419.61	\$ 643.37	\$ 1,709.97	\$ 41,772.95
35	Tuesday, August 26, 2008							11:23	12:14											
36	Tuesday, August 26, 2008	12,787.6	11,721.5	1,066.1	59.8	14,650	2,051	18:38	21:24	22:03	8.3%	1518.4	422.1	0.328	4.331	0.461	\$ 285,869.70	\$ 5,582.67	\$ 35,682.80	\$ 327,135.17
37	Tuesday, September 02, 2008	49.4	43.2	6.2	43.7	1,031	33	4:57	6:25	6:26	12.6%	0.5	0.2	0.001	0.017	0.002	\$ 1,211.38	\$ 2.25	\$ 137.85	\$ 1,351.48
38	Wednesday, September 03, 2008	10,757.2	9,832.8	924.4	49.6	15,949	2,144	13:27	15:20	18:26	8.6%	1671.0	482.9	0.276	3.643	0.388	\$ 241,896.61	\$ 6,199.39	\$ 30,017.12	\$ 278,113.12
39	Friday, September 05, 2008	54.3	48.5	5.8	104.0	727	24	12:32	14:47	14:47	10.7%	0.2	0.1	0.001	0.018	0.002	\$ 1,279.35	\$ 0.71	\$ 151.52	\$ 1,431.58
40	Saturday, September 06, 2008							11:46	13:13											
41	Monday, September 08, 2008	2,787.5	2,577.1	210.4	28.5	13,583	1,002	15:56	18:00	18:42	7.5%	649.5	161.8	0.072	0.944	0.101	\$ 61,184.25	\$ 2,331.48	\$ 7,778.30	\$ 71,294.03
42	Monday, September 15, 2008	659.0	489.9	69.1	15.5	945	94	22:16	5:14	5:17	10.5%	19.0	6.8	0.017	0.223	0.024	\$ 13,653.37	\$ 74.59	\$ 1,838.89	\$ 15,566.85
43	Tuesday, September 23, 2008	983.5	883.6	99.8	108.5	3,170	228	6:06	10:21	10:24	10.2%	13.6	4.8	0.025	0.333	0.035	\$ 22,900.16	\$ 53.05	\$ 2,744.38	\$ 25,697.60
44	Saturday, September 27, 2008	16,726.0	14,841.8	1,884.3	41.4	13,430	3,014	9:55	11:55	15:27	11.3%	2543.7	995.3	0.429	5.665	0.603	\$ 399,104.62	\$ 10,220.11	\$ 46,672.59	\$ 455,997.32
45	Wednesday, October 01, 2008	14,968.4	13,544.3	1,424.1	34.4	19,912	2,673	11:55	15:45	17:29	9.5%	4144.4	1336.2	0.384	5.070	0.540	\$ 343,681.83	\$ 15,792.02	\$ 41,768.15	\$ 401,242.00
46	Tuesday, October 21, 2008	128.1	112.2	15.9	63.8	1,289	83	10:07	11:38	11:39	12.4%	1.2	0.5	0.003	0.043	0.005	\$ 3,132.14	\$ 4.97	\$ 357.45	\$ 3,494.57
47	Thursday, October 23, 2008	1,716.6	1,536.8	179.9	7.4	3,929	858	5:21	6:44	7:20	10.5%	431.1	155.4	0.044	0.581	0.062	\$ 40,268.46	\$ 1,692.07	\$ 4,790.04	\$ 46,750.57
48	Friday, October 24, 2008	3,879.7	3,501.7	378.0	28.5	6,791	916	5:15	7:01	7:59	9.6%	441.7	144.1	0.100	1.314	0.140	\$ 89,536.64	\$ 1,688.10	\$ 10,826.00	\$ 102,050.74
49	Saturday, October 25, 2008	179.9	160.0	19.9	123.4	1,282	42	11:02	15:16	15:18	11.1%	0.9	0.3	0.005	0.061	0.006	\$ 4,273.76	\$ 3.51	\$ 502.00	\$ 4,779.27
50	Monday, October 27, 2008	2,394.9	2,184.9	209.9	21.8	9,755	887	14:28	16:09	17:09	8.8%	516.6	153.1	0.061	0.811	0.086	\$ 54,063.16	\$ 1,927.88	\$ 6,682.78	\$ 62,673.82
51	Saturday, November 15, 2008							4:30	7:50											
52	Tuesday, November 18, 2008							17:38	0:56											
53	Saturday, November 29, 2008	224.6	182.4	42.2	18.8	916	110	0:42	2:43	2:43	18.8%	4.7	3.3	0.006	0.076	0.008	\$ 6,228.12	\$ 23.39	\$ 626.73	\$ 6,878.24
54	Wednesday, December 03, 2008	39.9	36.0	3.9	42.5	554	19	13:52	15:59	16:00	9.7%	0.2	0.1	0.001	0.014	0.001	\$ 921.47	\$ 0.95	\$ 111.34	\$ 1,033.76
55	Friday, December 05, 2008	107.8	94.5	13.4	56.2	748	72	9:43	11:11	11:12	12.4%	0.7	0.3	0.003	0.037	0.004	\$ 2,638.61	\$ 2.76	\$ 300.81	\$ 2,942.17
56	Wednesday, December 10, 2008	1,093.2	977.5	115.7	14.6	6,133	810	13:27	14:32	14:47	10.6%	217.0	79.0	0.028	0.370	0.039	\$ 25,701.66	\$ 854.10	\$ 3,050.49	\$ 29,606.25
57	Friday, December 12, 2008	63.1	57.3	5.9	39.6	1,182	40	14:43	16:15	16:17	9.3%	0.9	0.3	0.002	0.021	0.002	\$ 1,445.30	\$ 3.42	\$ 176.08	\$ 1,624.79
58	Thursday, December 18, 2008	155.7	127.2	28.5	7.5	625	77	3:47	5:47	5:47	18.3%	5.6	3.9	0.004	0.053	0.006	\$ 4,278.74	\$ 27.51	\$ 434.47	\$ 4,740.72
59	Sunday, December 28, 2008	482.3	425.9	56.4	6.9	966	125	7:45	9:51	9:55	11.7%									

2009 Cost of Incidents

Trip Activation	Incident Date	Vehicle Hours of Delay			Delay Minutes per vehicle	Average Queue		Incident Timeline			Percent of Trucks	Fuel Consumed (gal)		Emissions (Tons)			Delay Costs			
		All	Cars	Trucks		Feet	Vehicles	T3: Incident Start (time)	T5: All Lanes Clear (time)	Queue Cleared (time)		Cars	Trucks	HC	CO	NOx	Delay	Fuel	Emissions	Total
60	Friday, January 02, 2009	66.0	58.9	7.1	3.3	248	25	10:39	11:54	12:00	10.7%	2.3	0.9	0.002	0.022	0.002	\$ 1,557.60	\$ 9.24	\$ 184.17	\$ 1,751.01
61	Tuesday, January 06, 2009	481.6	430.3	51.4	96.4	2,555	206	9:49	12:03	12:07	10.7%	6.0	2.2	0.012	0.163	0.017	\$ 11,346.53	\$ 23.78	\$ 1,343.87	\$ 12,714.18
62	Wednesday, January 07, 2009	3,503.8	3,414.5	362.2	14.7	9,383	1,374	10:48	12:39	13:20	10.3%	1060.3	374.0	0.090	1.187	0.126	\$ 86,863.15	\$ 4,136.90	\$ 9,777.08	\$ 100,777.13
63	Thursday, January 08, 2009	61,915.0	56,974.4	4,940.6	113.8	18,193	9,776	13:31	19:12	19:49	8.0%	4813.1	1285.5	1.590	20.970	2.233	\$ 1,372,747.15	\$ 17,538.51	\$ 172,768.95	\$ 1,563,054.61
64	Tuesday, January 13, 2009	33.6	31.2	2.3	17.9	279	20	15:49	17:30	17:30	7.0%	0.3	0.1	0.001	0.011	0.001	\$ 723.55	\$ 0.91	\$ 93.76	\$ 818.22
65	Saturday, January 24, 2009	582.1	527.0	55.1	19.6	1,091	147	6:20	10:15	10:16	9.5%	15.5	5.0	0.015	0.197	0.021	\$ 13,350.84	\$ 59.06	\$ 1,624.30	\$ 15,034.20
66	Sunday, January 25, 2009	82.0	74.4	7.6	78.9	1,457	49	13:11	14:49	14:50	9.2%	0.7	0.2	0.002	0.028	0.003	\$ 1,872.40	\$ 2.74	\$ 228.81	\$ 2,103.96
67	Thursday, January 29, 2009	8,316.8	7,526.6	790.2	17.1	7,270	1,338	4:46	6:46	9:13	9.3%	1695.0	533.8	0.214	2.817	0.300	\$ 190,903.11	\$ 6,420.73	\$ 23,207.38	\$ 220,531.22
68	Friday, February 13, 2009																			
69	Wednesday, February 25, 2009	30.2	27.9	2.4	2.3	427	44	21:58	22:37	22:38	7.9%	2.7	0.7	0.001	0.010	0.001	\$ 670.88	\$ 9.92	\$ 84.27	\$ 765.06
70	Thursday, February 26, 2009	91.0	82.2	8.8	98.1	651	44	12:11	14:14	14:14	9.7%	0.3	0.1	0.002	0.031	0.003	\$ 2,096.72	\$ 1.10	\$ 253.93	\$ 2,351.75
71	Friday, February 27, 2009	1,884.9	1,743.2	141.7	22.1	9,716	1,257	20:24	21:24	21:53	7.5%	405.1	100.9	0.048	0.638	0.068	\$ 41,343.22	\$ 1,454.29	\$ 5,259.67	\$ 48,057.17
72	Monday, March 02, 2009	23,308.3	21,453.4	1,854.8	39.6	23,570	3,122	11:45	13:39	19:11	8.0%	6745.9	1801.7	0.598	7.894	0.841	\$ 516,514.37	\$ 24,581.57	\$ 65,039.98	\$ 606,135.93
73	Thursday, March 05, 2009	26,971.5	25,069.3	1,902.2	60.3	25,049	3,443	14:58	16:53	20:50	7.0%	5507.3	1273.2	0.693	9.135	0.973	\$ 585,141.00	\$ 19,473.10	\$ 75,261.86	\$ 679,875.96
74	Friday, March 06, 2009	2,406.2	2,179.6	226.6	47.5	6,556	969	8:13	10:03	10:40	9.4%	159.0	50.7	0.062	0.815	0.087	\$ 55,127.88	\$ 604.19	\$ 6,714.31	\$ 62,446.39
75	Tuesday, March 10, 2009	2,117.4	1,981.1	136.2	20.9	9,434	1,337	17:36	18:44	19:10	6.4%	472.8	99.3	0.054	0.717	0.076	\$ 45,259.45	\$ 1,641.74	\$ 5,908.44	\$ 52,809.63
76	Sunday, March 15, 2009	414.6	379.1	35.5	48.8	3,642	249	7:37	9:09	9:16	8.6%	14.9	4.3	0.011	0.140	0.015	\$ 9,316.55	\$ 55.45	\$ 1,156.91	\$ 10,528.91
77	Monday, March 16, 2009	1,499.0	1,391.4	107.6	13.2	8,458	1,183	19:10	19:45	20:25	7.2%	471.1	112.3	0.038	0.508	0.054	\$ 32,617.22	\$ 1,675.87	\$ 4,182.84	\$ 38,475.93
78	Monday, March 16, 2009	212.7	196.7	16.0	5.6	1,638	228	20:38	21:30	21:33	7.5%	30.4	7.6	0.005	0.072	0.008	\$ 4,665.85	\$ 109.18	\$ 593.52	\$ 5,368.56
79	Friday, March 27, 2009	11,769.9	10,520.2	1,249.7	36.8	17,206	2,271	9:58	11:38	12:41	10.6%	2600.3	947.0	0.302	3.986	0.424	\$ 276,922.73	\$ 10,235.15	\$ 32,842.98	\$ 320,000.87
80	Saturday, March 28, 2009	8,959.2	8,119.0	840.2	34.6	7,348	990	11:27	12:55	14:30	9.4%	911.1	290.3	0.230	3.034	0.323	\$ 205,081.21	\$ 3,461.47	\$ 24,999.95	\$ 233,542.63
81	Sunday, March 29, 2009	5.6	5.1	0.4	4.6	39	3	6:45	8:48	8:48	7.9%	0.0	0.0	0.000	0.002	0.000	\$ 119.94	\$ 0.08	\$ 15.63	\$ 135.65
82	Wednesday, April 01, 2009	7,968.7	7,148.6	820.1	35.3	19,118	2,598	10:31	12:11	13:33	10.3%	2046.1	721.6	0.205	2.699	0.287	\$ 186,151.08	\$ 7,983.01	\$ 22,236.03	\$ 216,370.13
83	Friday, April 03, 2009	11,596.4	10,571.5	1,024.9	30.8	21,353	3,802	7:13	8:42	10:15	8.8%	3875.3	1148.5	0.298	3.928	0.418	\$ 262,228.28	\$ 14,462.85	\$ 32,358.85	\$ 309,049.97
84	Wednesday, April 08, 2009	76.0	64.5	11.5	44.9	546	34	0:44	2:58	2:59	15.2%	0.4	0.2	0.002	0.026	0.003	\$ 1,964.53	\$ 1.86	\$ 212.07	\$ 2,178.47
85	Thursday, May 07, 2009	401.7	369.0	32.7	17.9	5,005	344	7:54	8:50	9:03	8.1%	54.6	14.8	0.010	0.136	0.014	\$ 8,939.49	\$ 199.40	\$ 1,120.91	\$ 10,259.80
86	Tuesday, May 12, 2009	69,805.5	64,903.3	4,902.3	125.1	27,206	11,199	17:15	21:25	23:28	7.0%	7462.1	1725.1	1.792	23.642	2.517	\$ 1,513,346.63	\$ 26,384.81	\$ 194,786.77	\$ 1,734,518.21
87	Wednesday, May 13, 2009	161.2	149.3	12.0	105.0	2,240	78	19:44	21:44	21:46	7.4%	1.7	0.4	0.004	0.055	0.006	\$ 3,531.46	\$ 6.02	\$ 449.82	\$ 3,987.30
88	Friday, May 15, 2009	3,620.8	331.2	289.6	19.4	13,246	1,597	7:00	8:17	9:15	8.0%	1202.1	321.1	0.093	1.226	0.131	\$ 26,108.49	\$ 4,380.49	\$ 10,103.56	\$ 40,592.54
89	Tuesday, June 16, 2009	521.9	471.8	50.1	82.4	2,879	125	12:30	14:40	14:44	9.6%	8.7	2.8	0.013	0.177	0.019	\$ 12,006.03	\$ 33.30	\$ 1,456.32	\$ 13,495.64
90	Thursday, June 18, 2009	70,978.2	64,300.8	6,677.4	110.1	42,755	8,638	6:04	10:10	14:15	9.4%	13198.7	4206.0	1.822	24.040	2.560	\$ 1,625,812.24	\$ 50,144.48	\$ 198,059.10	\$ 1,874,015.82
91	Monday, June 22, 2009	11,123.4	10,258.1	865.3	76.5	16,955	2,889	19:51	2:14	2:14	7.8%	1201.4	312.2	0.286	3.767	0.401	\$ 245,475.10	\$ 4,351.57	\$ 31,038.98	\$ 280,865.64
92	Tuesday, July 07, 2009							12:30	13:27											
93	Monday, July 27, 2009	15,305.1	13,206.1	2,099.0	179.0	22,926	2,791	23:03	3:51	4:30	13.7%	894.1	436.0	0.393	5.184	0.552	\$ 384,469.97	\$ 3,851.59	\$ 42,707.68	\$ 431,029.23
94	Thursday, July 30, 2009	5,370.8	4,959.0	411.8	21.3	13,198	1,831	14:24	15:52	17:19	7.7%	1623.5	416.0	0.138	1.819	0.194	\$ 118,216.19	\$ 5,862.81	\$ 14,986.80	\$ 139,065.79
95	Wednesday, August 05, 2009	90.6	76.5	14.1	41.9	707	43	4:02	6:05	6:07	15.5%	0.7	0.4	0.002	0.031	0.003	\$ 2,362.03	\$ 3.10	\$ 252.81	\$ 2,617.94
96	Monday, August 10, 2009	1,707.8	1,551.3	156.5	21.0	8,268	1,281	13:32	14:35	14:51	9.2%	322.7	100.4	0.044	0.578	0.062	\$ 38,904.38	\$ 1,218.70	\$ 4,765.48	\$ 44,888.57
97	Sunday, August 23, 2009	1,933.5	1,791.3	142.2	97.6	5,676	707	19:12	21:43	21:54	7.4%	55.0	13.5	0.050	0.655	0.070	\$ 42,247.04	\$ 196.95	\$ 5,395.28	\$ 47,839.28
98	Monday, August 31, 2009	53.2	48.6	4.6	36.7	1,185	40	14:11	15:27	15:29	8.7%	0.8	0.2	0.001	0.018	0.002	\$ 1,197.77	\$ 3.08	\$ 148.45	\$ 1,349.30
99	Monday, September 14, 2009	393.3	360.4	32.9	233.7	2,374	93	20:33	0:46	0:47	8.4%	1.9	0.5	0.010	0.133	0.014	\$ 8,798.00	\$ 7.13	\$ 1,097.47	\$ 9,902.61
100	Sunday, September 20, 2009	882.9	813.9	69.1	16.9	8,067	631	15:03	16:07	16:26	7.8%	205.4	53.4	0.023	0.299	0.032	\$ 19,507.47	\$ 743.89	\$ 2,463.66	\$ 22,715.02
101	Monday, September 21, 2009	1,017.5	932.4	85.1	29.6	5,347	269	13:11	15:58	16:57	8.4%	89.0	25.1	0.026	0.345	0.037	\$ 22,760.39	\$ 328.17	\$ 2,839.25	\$ 25,927.81
102	Wednesday, September 30, 2009	2,639.0	2,406.9	232.0	30.2	9,456	1,182	13:32	15:06	15:45	8.8%	398.3	118.0	0.068	0.894	0.095	\$ 59,610.03	\$ 1,486.49	\$ 7,363.92	\$ 68,460.44
103	Wednesday, October 07, 2009	10,662.7	9,927.6	735.1	25.8	19,432	2,734	15:19	16:21	19:12	6.9%	3951.8	899.6	0.274	3.611	0.385	\$ 230,455.96	\$ 13,930.77	\$ 29,753.43	\$ 274,140.16
104	Sunday, October 18, 2009	211.7	193.1	18.6	87.8	2,894	98	13:36	15:42	15:44	8.8%	3.4	1.0	0.005	0.072	0.008	\$ 4,781.48	\$ 12.55	\$ 590.73	\$ 5,384.77
105	Wednesday, November 04, 2009	684.5	624.1	60.4	64.9	5,149	403	8:01	9:33	9:42	8.8%	26.2	7.8	0.018	0.232	0.025	\$ 15,473.56	\$ 97.70	\$ 1,910.04	\$ 17,481.30
106	Thursday, November 05, 2009	7,244.9	6,640.6	604.3	41.9	24,430	2,300	6:36	8:26	9:43	8.3%	2047.3	569.2	0.186	2.454	0.261	\$ 161,976.50	\$ 7,527.64	\$ 20,216.33	\$ 189,720.46
107	Tuesday, November 10, 2009	269.4	241.6	27.8	26.6	2,539	137	11:08	12:48	13:05	10.3%	12.2	4.3	0.007	0.091	0.010	\$ 6,297.10	\$ 47.57	\$ 751.74	\$ 7,096.40
108	Wednesday, November 25, 2009							18:48	19:52											
109	Wednesday, December 02, 2009	223.3	202.8	20.5	28.4	1,914	144	13:21	14:47	14:53	9.2%	7.2	2.2	0.006	0.076	0.008	\$ 5,088.78	\$ 27.28	\$ 623.10	\$ 5,739.15
110	Wednesday, December 30, 2009	595.3	539.2	56.2	15.3	4,472	340	12:47	14:22	14:31	9.4%	83.3	26.6	0.015	0.202	0.021	\$ 13,647.71	\$ 316.55	\$ 1,661.14	\$ 15,625.40

Cost of Incidents: 2009 \$ 7,854,811.62

APPENDIX B

Incident Timelines

2007 Incident Timelines (Typical Incidents)

Trip Activation	Incident Date	Tractor Trailers	Cars	Overturn	Spilled Load	Spilled Fuel	Fire	HAZMAT	Injury	Fatality	Typical/Atypical	Reason	Incident Timeline			
													T3: Incident Start (time)	T5: All Lanes Clear (time)	Typical Incidents Only Roadway Clearance (HH:MM)	
2007-01	Friday, January 05, 2007	2					X				Atypical	Fire	19:59	6:33		
2007-02	Tuesday, February 13, 2007	1	5		X	X				1	typical		22:59	4:15	5:16	
2007-03	Friday, March 02, 2007		Bus	X					X	6	Atypical	Fatality	5:49	10:17		
2007-04	Monday, March 12, 2007	1		X	X						typical		6:32	12:03	5:31	
2007-05	Monday, March 12, 2007	2		X	X	X					typical		13:38	16:15	2:37	
2007-06	Friday, March 30, 2007	Light truck		X	X					1	1	Atypical	Fatality	12:10	15:26	
2007-07	Monday, April 09, 2007	1		X	X	X				1		typical		11:26	14:40	3:14
2007-08	Tuesday, April 10, 2007	? ?	? ?	? ?												
2007-09	Tuesday, April 10, 2007	Cement Truck		X	X	X						typical		9:13	12:05	2:52
2007-10	Monday, April 16, 2007															
2007-11	Friday, April 27, 2007	1	1	X	X					2		typical		11:19	16:08	4:49
2007-12	Monday, June 04, 2007	1		X	X					1		typical		16:13	23:21	7:08
2007-13	Tuesday, June 05, 2007	1		X	X							typical		7:12	16:27	9:15
2007-14	Friday, June 08, 2007	2			X					1		typical		3:02	16:09	13:07
2007-15	Tuesday, June 19, 2007	2				X						typical		14:37	18:37	4:00
2007-16	Monday, July 16, 2007	1	1	X	X	X		X		1		Atypical	HAZMAT	19:50	1:35	
2007-17	Wednesday, July 18, 2007															
2007-18	Tuesday, July 24, 2007	1		X								typical		18:50	0:40	5:50
2007-19	Thursday, July 26, 2007	2										typical		10:40	15:49	5:09
2007-20	Saturday, July 28, 2007	1		X	X	X				3		typical		21:43	2:04	4:21
2007-21	Monday, July 30, 2007															
2007-22	Friday, August 03, 2007	1		X	X					1		typical		11:57	16:09	4:12
2007-23	Wednesday, August 22, 2007	1		X	X						1	Atypical	Fatality	22:05	4:34	
2007-24	Friday, August 31, 2007	1						X				Atypical	Fire	4:17	7:11	
2007-25	Tuesday, September 04, 2007	1										typical		4:27	7:40	3:13
2007-26	Friday, September 07, 2007	1	1	X	X					3	2	Atypical	Fatality	5:55	9:15	
2007-27	Wednesday, September 12, 2007	1		X						1		typical		5:26	13:18	7:52

Average 5:31
 Std. Deviation 2:43
 Avg. + 1 Std Dev 8:15
 Avg - 1 Std Dev 2:47
 Average (without Outliers) 4:52

2008 Incident Timelines (Typical Incidents)

Trip Activation	Incident Date	Tractor Trailers	Cars	Overturn	Spilled Load	Spilled Fuel	Fire	HAZMAT	Injury	Fatality	Typical/Atypical	Reason	Incident Timeline		
													T3: Incident Start (time)	T5: All Lanes Clear (time)	Typical Incidents Only Roadway Clearance (HH:MM)
1	Sunday, January 13, 2008	1		X							Typical		10:35	11:55	1:20
2	Wednesday, January 16, 2008	1	1								Typical		7:22	7:39	0:17
3	Tuesday, January 22, 2008	1		X	X						Typical				0:00
4	Sunday, February 24, 2008	1		X				X	X		Atypical	HAZMAT	6:23	19:45	
5	Tuesday, March 04, 2008	1				X					typical		11:32	13:10	1:38
6	Wednesday, March 05, 2008	1		X							typical		5:15	6:15	1:00
7	Wednesday, March 05, 2008	1									typical		16:34	17:37	1:03
8	Thursday, April 10, 2008	2			X						typical		17:37	19:17	1:40
9	Wednesday, April 23, 2008	1		X							typical		18:52	20:39	1:47
10	Thursday, May 01, 2008	1		X							typical		13:54	15:02	1:08
11	Wednesday, May 14, 2008	1									typical		18:49	19:46	0:57
12	Friday, May 16, 2008	1	2	X							typical		7:27	8:13	0:46
13	Friday, June 06, 2008	1							1		typical		12:31	13:50	1:19
14	Thursday, June 12, 2008	1							1		typical		2:42	3:51	1:09
15	Thursday, June 12, 2008	1	3						1		typical		5:39	6:46	1:07
16	Monday, June 16, 2008	2		X							typical		4:41	7:55	3:14
17	Saturday, June 21, 2008	1		X				X			Atypical	HAZMAT	5:27	9:49	
18	Sunday, June 22, 2008	1	10			X			10		Atypical	Multiple injuries	15:37	18:31	
19	Monday, June 23, 2008	1	2							1	Atypical	Fatality	15:16	17:51	
20	Tuesday, July 01, 2008	1		X							typical		18:29	21:43	3:14
21	Wednesday, July 09, 2008	1		X		X			1		typical		14:46	16:34	1:48
22	Thursday, July 10, 2008	1									typical		14:24	16:15	1:51
23	Saturday, July 12, 2008	1		X							typical		8:04	10:19	2:15
24	Wednesday, July 30, 2008	1					X				Atypical	Fire	19:40	21:51	
25	Thursday, July 31, 2008	1				X			1		typical		13:14	15:03	1:49
26	Thursday, July 31, 2008	Box truck	3		X				1		Atypical	Life Flight/Serious Injury	19:23	20:38	
27	Saturday, August 02, 2008	1		X	X						typical		9:45	11:21	1:36
28	Saturday, August 09, 2008	1		X	X						typical		9:00	13:06	4:06
29	Wednesday, August 20, 2008	1				X	X		1		Atypical	Fire	4:51	8:02	
30	Wednesday, August 20, 2008	1		X	X	X					typical		7:16	9:06	1:50
31	Wednesday, August 20, 2008		3						3		typical		8:37	10:13	1:36
32	Wednesday, August 20, 2008	1		X							typical		14:24	15:48	1:24
33	Tuesday, August 26, 2008	1	1				X			2	Atypical	Fatality	3:22	6:26	
34	Tuesday, August 26, 2008	2	2								typical		10:09	11:07	0:58
35	Tuesday, August 26, 2008	2									typical		11:23	12:14	0:51
36	Tuesday, August 26, 2008	1					X				Atypical	Fire	18:38	21:24	
37	Tuesday, September 02, 2008	2		X					1		typical		4:57	6:25	1:28
38	Wednesday, September 03, 2008	1		X							typical		13:27	15:20	1:53
39	Friday, September 05, 2008	1		X					1		typical		12:32	14:47	2:15
40	Saturday, September 06, 2008	1		X							typical		11:46	13:13	1:27
41	Monday, September 08, 2008	1			X						typical		15:56	18:00	2:04
42	Monday, September 15, 2008	1		X	X	X					typical		22:16	5:14	6:58
43	Tuesday, September 23, 2008	1		X	X	X	X				Atypical	Fire	6:06	10:21	
44	Saturday, September 27, 2008	Light Truck		X	X				2		typical		9:55	11:55	2:00
45	Wednesday, October 01, 2008	1	2	X	X				1		Atypical	Life Flight/long delay	11:55	15:45	
46	Tuesday, October 21, 2008	1									typical		10:07	11:38	1:31
47	Thursday, October 23, 2008	1				X					typical		5:21	6:44	1:23
48	Friday, October 24, 2008	Dump Truck	1		X						typical		5:15	7:01	1:46
49	Saturday, October 25, 2008	1		X		X					typical		11:02	15:16	4:14
50	Monday, October 27, 2008	Dump Truck		X	X						typical		14:28	16:09	1:41
51	Saturday, November 15, 2008	3		X	X				1		typical		4:30	7:50	3:20
52	Tuesday, November 18, 2008	1				X		X			Atypical	HAZMAT	17:38	0:56	
53	Saturday, November 29, 2008		Bus						1		typical		0:42	2:43	2:01
54	Wednesday, December 03, 2008	1		X	X						typical		13:52	15:59	2:07
55	Friday, December 05, 2008	1		X		X					typical		9:43	11:11	1:28
56	Wednesday, December 10, 2008	1	1								typical		13:27	14:32	1:05
57	Friday, December 12, 2008	1		X					1		typical		14:43	16:15	1:32
58	Thursday, December 18, 2008	1	1	X				X	1		Atypical	HAZMAT	3:47	5:47	
59	Sunday, December 28, 2008	1				X					typical		7:45	9:51	2:06

Average 1:49
 Std. Deviation 1:08
 Avg. + 1 Std Dev 2:58
 Avg - 1 Std Dev 0:41
 Average (without Outliers) 1:32

2009 Incident Timelines (Typical Incidents)

Trip Activation	Incident Date	Tractor Trailers	Cars	Overturn	Spilled Load	Spilled Fuel	Fire	HAZMAT	Injury	Fatality	Typical/ Atypical	Reason	Incident Timeline		
													T3: Incident Start (time)	T5: All Lanes Clear (time)	Typical Incidents Only Roadway Clearance (HH:MM)
60	Friday, January 02, 2009	1		X							Typical		10:39	11:54	1:15
61	Tuesday, January 06, 2009	1				X					Typical		9:49	12:03	2:14
62	Wednesday, January 07, 2009	1									Typical		10:48	12:39	1:51
63	Thursday, January 08, 2009	1					X				Typical		13:31	19:12	5:41
64	Tuesday, January 13, 2009	1		X	X				1		Typical		15:49	17:30	1:41
65	Saturday, January 24, 2009	Box Truck	1				X		3		Atypical	Fire	6:20	10:15	
66	Sunday, January 25, 2009	1	1		X						Typical		13:11	14:49	1:38
67	Thursday, January 29, 2009	1		X	X	X					Typical		4:46	6:46	2:00
68	Friday, February 13, 2009	1									Typical				
69	Wednesday, February 25, 2009	1									Typical		21:58	22:37	0:39
70	Thursday, February 26, 2009	Bucket		X					1		Typical		12:11	14:14	2:03
71	Friday, February 27, 2009	Box Truck		X							Typical		20:24	21:24	1:00
72	Monday, March 02, 2009	2							1		Typical		11:45	13:39	1:54
73	Thursday, March 05, 2009	1		X	X						Typical		14:58	16:53	1:55
74	Friday, March 06, 2009	1	2						3		Typical		8:13	10:03	1:50
75	Tuesday, March 10, 2009	2							1		Typical		17:36	18:44	1:08
76	Sunday, March 15, 2009	1									Typical		7:37	9:09	1:32
77	Monday, March 16, 2009	1									Typical		19:10	19:45	0:35
78	Monday, March 16, 2009	1				X		X			Atypical	HAZMAT	20:38	21:30	
79	Friday, March 27, 2009	1	3		X	X			2		Typical		9:58	11:38	1:40
80	Saturday, March 28, 2009	1		X	X				1		Typical		11:27	12:55	1:28
81	Sunday, March 29, 2009	1		X							Typical		6:45	8:48	2:03
82	Wednesday, April 01, 2009	1	1			X					Typical		10:31	12:11	1:40
83	Friday, April 03, 2009	RV		X		X		X	1		Atypical	HAZMAT	7:13	8:42	
84	Wednesday, April 08, 2009	1		X							Typical		0:44	2:58	2:14
85	Thursday, May 07, 2009	1				X					Typical		7:54	8:50	0:56
86	Tuesday, May 12, 2009	Dump Truck			X						Typical		17:15	21:25	4:10
87	Wednesday, May 13, 2009	1		X							Typical		19:44	21:44	2:00
88	Friday, May 15, 2009	1			X						Typical		7:00	8:17	1:17
89	Tuesday, June 16, 2009	1			X						Typical		12:30	14:40	2:10
90	Thursday, June 18, 2009	1			X		X				Atypical	Fire	6:04	10:10	
91	Monday, June 22, 2009	1			X		X				Atypical	Fire	19:51	2:14	
92	Tuesday, July 07, 2009	1									Typical		12:30	13:27	0:57
93	Monday, July 27, 2009	2	2	X	X	X		X	2		Atypical	HAZMAT	23:03	3:51	
94	Thursday, July 30, 2009	1				X					Typical		14:24	15:52	1:28
95	Wednesday, August 05, 2009	1	3	X		X					Typical		4:02	6:05	2:03
96	Monday, August 10, 2009	and Dump Tr	4						8		Typical		13:32	14:35	1:03
97	Sunday, August 23, 2009	1	2						1	1	Atypical	Fatality	19:12	21:43	
98	Monday, August 31, 2009	1		X	X						Typical		14:11	15:27	1:16
99	Monday, September 14, 2009	1		X	X	X	X	X	1		Atypical	HAZMAT	20:33	0:46	
100	Sunday, September 20, 2009	1		X							Typical		15:03	16:07	1:04
101	Monday, September 21, 2009	1	arta Bus						1		Typical		13:11	15:58	2:47
102	Wednesday, September 30, 2009	1		X	X	X			1		Typical		13:32	15:06	1:34
103	Wednesday, October 07, 2009	2							1		Typical		15:19	16:21	1:02
104	Sunday, October 18, 2009	1									Typical		13:36	15:42	2:06
105	Wednesday, November 04, 2009	1		X							Typical		8:01	9:33	1:32
106	Thursday, November 05, 2009	1		X	X						Typical		6:36	8:26	1:50
107	Tuesday, November 10, 2009	1		X		X					Typical		11:08	12:48	1:40
108	Wednesday, November 25, 2009	1	2						1		Typical		18:48	19:52	1:04
109	Wednesday, December 02, 2009	1				X					Typical		13:21	14:47	1:26
110	Wednesday, December 30, 2009	1		X							Typical		12:47	14:22	1:35

Average 1:44
 Std. Deviation 0:52
 Avg. + 1 Std Dev 2:36
 Avg - 1 Std Dev 0:51
 Average (without Outliers) 1:35

APPENDIX C

Incident Timelines

Trip Activation	Incident Date	Delay Costs		Value of Avoided Delay (Benefit of TRIP)	Use Benefit Value?	Value of TRIP Benefit
		Actual Timeline	Extended Timeline			
1	Sunday, January 13, 2008	\$ 1,485.19	\$ 2,630.66	\$ 1,145.47		\$ 1,145.47
2	Wednesday, January 16, 2008	\$ 24,609.79	\$ 157,899.44	\$ 133,289.65		\$ 133,289.65
3	Tuesday, January 22, 2008				No	\$ -
4	Sunday, February 24, 2008	\$ 4,807,609.52	\$ 5,399,585.18	\$ 591,975.66		\$ 591,975.66
5	Tuesday, March 04, 2008	\$ 3,259.67	\$ 3,945.76	\$ 686.09		\$ 686.09
6	Wednesday, March 05, 2008	\$ 2,971.03	\$ 60,839.94	\$ 57,868.92		\$ 57,868.92
7	Wednesday, March 05, 2008	\$ 58,669.95	\$ 188,106.12	\$ 129,436.17		\$ 129,436.17
8	Thursday, April 10, 2008	\$ 495,142.23	\$ 877,956.64	\$ 382,814.40		\$ 382,814.40
9	Wednesday, April 23, 2008	\$ 2,380.93	\$ 4,716.90	\$ 2,335.97		\$ 2,335.97
10	Thursday, May 01, 2008	\$ 4,644.93	\$ 8,816.56	\$ 4,171.63		\$ 4,171.63
11	Wednesday, May 14, 2008					\$ -
12	Friday, May 16, 2008	\$ 2,973.83	\$ 8,447.64	\$ 5,473.81		\$ 5,473.81
13	Friday, June 06, 2008	\$ 4,128.52	\$ 7,286.70	\$ 3,158.19		\$ 3,158.19
14	Thursday, June 12, 2008					\$ -
15	Thursday, June 12, 2008					\$ -
16	Monday, June 16, 2008	\$ 4,181.71	\$ 4,179.73	\$ (1.98)		\$ (1.98)
17	Saturday, June 21, 2008	\$ 4,616.39	\$ 5,750.85	\$ 1,134.46	No	\$ -
18	Sunday, June 22, 2008	\$ 629,548.14	\$ 792,229.19	\$ 162,681.05		\$ 162,681.05
19	Monday, June 23, 2008	\$ 904,793.39	\$ 1,360,054.11	\$ 455,260.73		\$ 455,260.73
20	Tuesday, July 01, 2008	\$ 73,738.73	\$ 90,676.12	\$ 16,937.39	No	\$ -
21	Wednesday, July 09, 2008					\$ -
22	Thursday, July 10, 2008	\$ 157,989.89	\$ 377,489.28	\$ 219,499.39		\$ 219,499.39
23	Saturday, July 12, 2008					\$ -
24	Wednesday, July 30, 2008	\$ 186,933.54	\$ 309,584.79	\$ 122,651.25		\$ 122,651.25
25	Thursday, July 31, 2008	\$ 111,976.21	\$ 439,786.79	\$ 327,810.58		\$ 327,810.58
26	Thursday, July 31, 2008	\$ 147,062.48	\$ 359,702.46	\$ 212,639.98		\$ 212,639.98
27	Saturday, August 02, 2008					\$ -
28	Saturday, August 09, 2008	\$ 113,083.90	\$ 172,987.70	\$ 59,903.80	No	\$ -
29	Wednesday, August 20, 2008					\$ -
30	Wednesday, August 20, 2008					\$ -
31	Wednesday, August 20, 2008	\$ 43,556.69	\$ 223,146.18	\$ 179,589.49		\$ 179,589.49
32	Wednesday, August 20, 2008	\$ 4,714.84	\$ 8,325.79	\$ 3,610.95		\$ 3,610.95
33	Wednesday, August 26, 2008	\$ 21,117.52	\$ 32,968.91	\$ 11,851.39		\$ 11,851.39
34	Tuesday, August 26, 2008	\$ 41,772.95	\$ 192,627.75	\$ 150,854.80	No	\$ -
35	Tuesday, August 26, 2008					\$ -
36	Tuesday, August 26, 2008	\$ 327,135.17	\$ 494,104.34	\$ 166,969.18		\$ 166,969.18
37	Tuesday, September 02, 2008	\$ 1,351.48	\$ 2,241.02	\$ 889.55		\$ 889.55
38	Wednesday, September 03, 2008	\$ 278,113.12	\$ 506,083.38	\$ 227,970.26		\$ 227,970.26
39	Friday, September 05, 2008	\$ 1,431.58	\$ 2,062.02	\$ 630.44		\$ 630.44
40	Saturday, September 06, 2008					\$ -
41	Monday, September 08, 2008	\$ 71,294.03	\$ 122,220.31	\$ 50,926.28		\$ 50,926.28
42	Monday, September 15, 2008	\$ 15,566.85	\$ 39,452.94	\$ 23,886.09		\$ 23,886.09
43	Tuesday, September 23, 2008	\$ 25,697.60	\$ 32,151.45	\$ 6,453.85		\$ 6,453.85
44	Saturday, September 27, 2008	\$ 455,997.32	\$ 778,110.11	\$ 322,112.79		\$ 322,112.79
45	Wednesday, October 01, 2008	\$ 401,242.00	\$ 561,259.27	\$ 160,017.27	No	\$ -
46	Tuesday, October 21, 2008	\$ 3,494.57	\$ 5,807.84	\$ 2,313.27		\$ 2,313.27
47	Thursday, October 23, 2008	\$ 46,750.57	\$ 106,132.79	\$ 59,382.22		\$ 59,382.22
48	Friday, October 24, 2008	\$ 102,050.74	\$ 477,298.76	\$ 375,248.03	No	\$ -
49	Saturday, October 25, 2008	\$ 4,779.27	\$ 5,857.62	\$ 1,078.36		\$ 1,078.36
50	Monday, October 27, 2008	\$ 62,673.82	\$ 138,390.88	\$ 75,717.05		\$ 75,717.05
51	Saturday, November 15, 2008					\$ -
52	Tuesday, November 18, 2008					\$ -
53	Saturday, November 29, 2008	\$ 6,878.24	\$ 6,994.47	\$ 116.23		\$ 116.23
54	Wednesday, December 03, 2008	\$ 1,033.76	\$ 1,622.33	\$ 588.57		\$ 588.57
55	Friday, December 05, 2008	\$ 2,942.17	\$ 5,415.11	\$ 2,472.94		\$ 2,472.94
56	Wednesday, December 10, 2008	\$ 29,606.25	\$ 78,207.05	\$ 48,600.81		\$ 48,600.81
57	Friday, December 12, 2008	\$ 1,624.79	\$ 2,634.22	\$ 1,009.43		\$ 1,009.43
58	Thursday, December 18, 2008	\$ 4,740.72	\$ 73,775.20	\$ 69,034.48		\$ 69,034.48
59	Sunday, December 28, 2008	\$ 13,088.40	\$ 70,802.98	\$ 57,714.58		\$ 57,714.58
60	Friday, January 02, 2009	\$ 1,751.01	\$ 2,443.87	\$ 692.86		\$ 692.86
61	Tuesday, January 06, 2009	\$ 12,714.18	\$ 19,801.13	\$ 7,086.95		\$ 7,086.95
62	Wednesday, January 07, 2009	\$ 100,777.13	\$ 268,015.51	\$ 167,238.38		\$ 167,238.38
63	Thursday, January 08, 2009	\$ 1,563,054.61	\$ 1,622,476.53	\$ 59,421.93	No	\$ -
64	Tuesday, January 13, 2009	\$ 818.22	\$ 2,050.82	\$ 1,232.60		\$ 1,232.60
65	Saturday, January 24, 2009	\$ 15,034.20	\$ 27,489.12	\$ 12,454.92		\$ 12,454.92
66	Sunday, January 25, 2009	\$ 2,403.96	\$ 3,422.57	\$ 1,018.61		\$ 1,018.61
67	Thursday, January 29, 2009	\$ 220,531.22	\$ 1,051,770.68	\$ 831,239.46		\$ 831,239.46
68	Friday, February 13, 2009					\$ -
69	Wednesday, February 25, 2009	\$ 765.06	\$ 2,630.02	\$ 1,864.96		\$ 1,864.96
70	Thursday, February 26, 2009	\$ 2,351.75	\$ 3,486.80	\$ 1,135.05		\$ 1,135.05
71	Friday, February 27, 2009	\$ 48,057.17	\$ 173,249.38	\$ 125,192.21		\$ 125,192.21
72	Monday, March 02, 2009	\$ 606,135.93	\$ 1,368,976.71	\$ 762,840.78	No	\$ -
73	Thursday, March 05, 2009	\$ 679,875.96	\$ 987,348.52	\$ 307,472.56		\$ 307,472.56
74	Friday, March 06, 2009	\$ 62,446.39	\$ 145,865.60	\$ 83,419.22		\$ 83,419.22
75	Tuesday, March 10, 2009	\$ 52,809.63	\$ 124,643.26	\$ 71,833.63		\$ 71,833.63
76	Sunday, March 15, 2009	\$ 10,528.91	\$ 19,146.13	\$ 8,617.21		\$ 8,617.21
77	Monday, March 16, 2009	\$ 38,475.93	\$ 181,496.78	\$ 143,020.85		\$ 143,020.85
78	Monday, March 16, 2009	\$ 5,368.56	\$ 14,890.41	\$ 9,521.85		\$ 9,521.85
79	Friday, March 27, 2009	\$ 320,000.87	\$ 477,005.36	\$ 157,004.49		\$ 157,004.49
80	Saturday, March 28, 2009	\$ 233,542.63	\$ 704,222.11	\$ 470,679.48		\$ 470,679.48
81	Sunday, March 29, 2009	\$ 135.65	\$ 172.78	\$ 37.13		\$ 37.13
82	Wednesday, April 01, 2009	\$ 216,370.13	\$ 499,627.77	\$ 283,257.64		\$ 283,257.64
83	Friday, April 03, 2009	\$ 309,049.97	\$ 834,816.47	\$ 525,766.50		\$ 525,766.50
84	Wednesday, April 08, 2009	\$ 2,178.47	\$ 5,244.20	\$ 3,065.73		\$ 3,065.73
85	Thursday, May 07, 2009	\$ 10,259.80	\$ 46,531.45	\$ 36,271.66		\$ 36,271.66
86	Tuesday, May 12, 2009	\$ 1,734,518.21	\$ 1,734,518.21	\$ -		\$ -
87	Wednesday, May 13, 2009	\$ 3,987.30	\$ 6,064.61	\$ 2,077.31		\$ 2,077.31
88	Friday, May 15, 2009	\$ 40,592.54	\$ 329,515.93	\$ 288,923.39		\$ 288,923.39
89	Tuesday, June 16, 2009	\$ 13,495.64	\$ 20,366.20	\$ 6,870.55	No	\$ -
90	Thursday, June 18, 2009	\$ 1,874,015.82	\$ 2,535,010.00	\$ 660,994.17	No	\$ -
91	Monday, June 22, 2009	\$ 280,865.64	\$ 522,999.69	\$ 242,134.05		\$ 242,134.05
92	Tuesday, July 07, 2009					\$ -
93	Monday, July 27, 2009	\$ 431,029.23	\$ 995,024.78	\$ 564,005.55		\$ 564,005.55
94	Thursday, July 30, 2009	\$ 130,065.79	\$ 458,434.38	\$ 319,368.59	No	\$ -
95	Wednesday, August 05, 2009	\$ 2,617.94	\$ 4,733.45	\$ 2,115.51		\$ 2,115.51
96	Monday, August 10, 2009	\$ 44,888.57	\$ 150,660.20	\$ 105,771.63		\$ 105,771.63
97	Sunday, August 23, 2009	\$ 47,839.28	\$ 66,798.60	\$ 18,959.32		\$ 18,959.32
98	Monday, August 31, 2009	\$ 1,349.30	\$ 2,391.95	\$ 1,042.65		\$ 1,042.65
99	Monday, September 14, 2009	\$ 9,902.61	\$ 12,485.34	\$ 2,582.74		\$ 2,582.74
100	Sunday, September 20, 2009	\$ 22,715.02	\$ 83,722.44	\$ 61,007.42		\$ 61,007.42
101	Monday, September 21, 2009	\$ 25,927.81	\$ 33,606.29	\$ 7,678.48		\$ 7,678.48
102	Wednesday, September 30, 2009	\$ 68,460.44	\$ 116,554.15	\$ 48,093.70		\$ 48,093.70
103	Wednesday, October 07, 2009	\$ 274,140.16	\$ 886,249.43	\$ 612,109.27		\$ 612,109.27
104	Sunday, October 18, 2009	\$ 5,384.77	\$ 8,822.24	\$ 3,437.48		\$ 3,437.48
105	Wednesday, November 04, 2009	\$ 17,481.30	\$ 30,101.60	\$ 12,620.31		\$ 12,620.31
106	Thursday, November 05, 2009	\$ 189,720.46	\$ 373,908.97	\$ 184,188.52		\$ 184,188.52
107	Tuesday, November 10, 2009	\$ 7,096.40	\$ 11,604.09	\$ 4,507.69		\$ 4,507.69
108	Wednesday, November 25, 2009					\$ -
109	Wednesday, December 02, 2009	\$ 5,739.15	\$ 12,737.82	\$ 6,998.67		\$ 6,998.67
110	Wednesday, December 30, 2009	\$ 15,625.40	\$ 25,671.27	\$ 10,045.87		\$ 10,045.87

Value of TRIP \$ 9,154,430.63

Larry Hogan, *Governor*
Boyd K. Rutherford, *Lt. Governor*



Pete K. Rahn, *Secretary*
Gregory C. Johnson, P.E., *Administrator*

December 1, 2016

Brian Quinlan, P.E.
Parsons Construction Group, Inc.
10 East Baltimore Street, Suite 801
Baltimore MD 21202

Dear Mr. Quinlan:

The Maryland Department of Transportation's State Highway Administration's (SHA) is in receipt of Proposed Technical Concept (PTC) No. 6 for the I-270 Innovative Congestion Management Progressive Design-Build contract (Contract No. MO0695172), submitted by your Design-Build Team on November 17, 2016. The SHA has completed our review of the PTC and offers the following comments for your consideration in the further development of your technical concepts and proposal:

1. We can see the need and potential positive impact of expediting towing resources, particularly where shoulder space is constrained. The Maryland State Police (MSP) maintain the call-down lists for managing tow service calls (and providing equitable opportunities for tow service calls). We are not aware of any policy or regulatory constraints on incentive programs, but recommend the proposer confirm the facts related to the feasibility of this program (i.e. review applicable regulations and confirm with the MSP). Generally, however, the concept appears to be a solution that the Design-Builder may be unable to deliver given that the contract budget does not include long-term Operations and Maintenance (O&M) costs. In essence, the Design-Builder is proposing in this PTC to only set up the program, because the implementation would have to be done by the Administration to realize Mobility and Safety benefits. The contract budget includes design and construction of a fully functional project(s) that the Design-Builder will turn over to the State at the completion of construction. The Design-Builder should propose how the *Design-Builder* will achieve the goals of the contract through its implementation of this PTC.
2. Page 1, Section A, Description: This PTC should take into account the current efforts in Maryland to develop a cooperative relationship with our partners in the towing and recovery industry. As a suggestion, the proposal should include coordination and/or feedback from the Towing and Recovery Professionals of Maryland <http://trpm-assn.net/>, to confirm some of the assumptions about the industry in Maryland.

My telephone number/toll-free number is 410-545-8800 or 1-888-228-6971
Maryland Relay Service for Impaired Hearing or Speech 1.800.735.2258 Statewide Toll Free

Street Address: 707 North Calvert Street • Baltimore, Maryland 21202 • Phone 410.545.0300 • www.roads.maryland.gov

Brian Quinlan, P.E.
Page Two

3. Page 4, Section A, Description: As noted above, the I-270 Innovative Congestion Management project does not include funding for Operations and Maintenance. Incentives would not be a capital expense. Therefore, incentive payments would need to come from State Operating Budgets. Enhancements to operating budgets are submitted for approval once a year, 18-months in advance of the applicable Fiscal Year, and require rigorous justification to receive approval.
4. Page 12, Section F, Administration Risks: There is an Administration risk, in that an essential element of efficient incident response is a strong cooperative working relationship with the towing and recovery industry. The implications of providing incentives for tows on I-270 (but not elsewhere in the State), and assuring that all qualified companies have an equitable opportunity to participate in the incentive tow program, need to be carefully considered, to avoid any negative impacts to the cooperation between the State and tow companies.

Any questions or communications regarding the response to this PTC should be directed to Mr. Jason A. Ridgway, Director, Office of Highway Development at the project specific email address, MO069_IS_270@sha.state.md.us.

Sincerely,



Jason A. Ridgway, P.E.
Director, Office of Highway Development

cc: Olu Adeyinka, P.E., DBIA, Parsons Transportation Group, Inc.

Responses to SHA Comments on PTC No. 7 Mobility Options Discovery & Engagement

1 COMMENT: The description of the PTC is unfortunately too general and indefinite to determine exactly what “Mobility Options Discovery and Engagement” is. It appears to be a traveler information mobile application combined with a points-based incentive program. The actual function, promotion, distribution, and execution of this type of program would need to be more clearly defined to determine its applicability and benefit in the I-270 corridor.

RESPONSE: Mobility Options Discovery and Engagement (MODE®) is an incentive-based congestion management platform that incorporates a dynamic ridesharing and casual carpooling solution for increasing vehicle occupancy and promote greater HOV lane use. MODE® is powered by Metropia Synergy’s proprietary algorithms and data analytics capabilities that includes various sub-systems to influence personal travel choices but also helps agencies manage transportation systems operations (TSM&O). Therein lies the inherent benefit of the proposed Metropia solution—the linkage to influencing personal mobility decisions (through MODE® and DUO) through Active Transportation Demand Management and affecting transportation system operations and management efficiencies. Metropia’s goal is to prevent traffic congestion from forming in the first place and partner with transportation agencies and other community stakeholders to maximize the efficiency of underutilized capacity.

PTC REFERENCE: See additional text in section titled “DESCRIPTION”

2 COMMENT: Generally, the concept fails to demonstrate a high likelihood that it will produce the touted Mobility and Safety benefits. The Analysis section discusses what the technology allows travelers to do and how it incentivizes them to change their behavior, but it fails to put forth a convincing argument that

the technology and the incentives will indeed change the behavior of enough travelers to produce real, significant improvements to Mobility and Safety on I-270. In the same vein, the RFP requested other projects on which the PTC has been used and the degree of success or failure of such usage. The deployment in Austin is currently underway and incomplete, and the other two projects make no mention of the degree of success or failure Metropia had in achieving Mobility and/or Safety benefits.

RESPONSE: Metropia’s platform is fully deployed in Austin, Tucson and El Paso and continues to deliver both in personal and system-wide mobility improvements. The improvements we documented in Austin have also been observed in Tucson and El Paso with similar if not even better results with higher carpooling rates in Tucson. Furthermore, the current award of FHWA’s Advance Transportation & Congestion Management Technology Deployment (ATCMTD) in Houston and FTA’s Mobility-on-Demand (MOD) for Tucson is a further recognition of the expected benefits delivered by Metropia’s platform. In the PTC, Metropia provided evidence of the platform’s ability to realize user behavior shifts away from morning and afternoon rush hours—this finding was consistent across all markets in which the application is deployed. We also shared the growth in DUO adoption rates (increase from 5% to 10% of carpool trips) across all markets combined. Finally, results from our VISSIM analysis have been added, which show a pronounced mobility benefit at a modest adoption rate.

PTC REFERENCE: See additional text in section titled “ANALYSIS”

3 COMMENT: Page 10, Section E, Other Projects: Not being deployed in Maryland, Metropia has zero traction in this state. Therefore, the SHA would have to promote the application and

attempt to capture a significant number of users to render the effort cost effective.

RESPONSE: SHA is correct that the Metropia platform has not been deployed in Maryland and we fully understand the level of promotional resources required. However, since Maryland will not be our first deployment, we are confident in our ability and the team's ability to lead the promotional activities. We will bring our own local Community/Program manager, local resources in terms of PR & Marketing and most importantly we view each project as a partnership with our funding agencies. As such, we do work closely with Agency public information officers and others, in planning and executing marketing efforts.

PTC REFERENCE: See additional text in section titled "OTHER PROJECTS"

- 3 COMMENT:** Page 11, Section F, Administration Risk: As stated in the RFP, one of the goals of this procurement is to obtain the best value for the public. However, the first sentence mentions the potential for small throughput improvements compared to the investment requirements. Based on the other parts of the PTC (refer to comment 1 above), this risk appears to be high.

RESPONSE: Active Demand Management (ADM) offers travelers mobility options that are personalized and compatible with the lifestyle, daily activity patterns and personal preferences. MODE® supports ADM strategies by providing a multidimensional demand management framework reflecting route, departure time and mode. A cost-benefit analysis has not been performed in the markets Metropia currently has deployed the platform but we see substantial personal travel time savings and system-wide CO2 reductions. Furthermore, as was indicated in Section H of the PTC, based on a simulated analysis a few years ago for the I-70 corridor in Denver, findings indicated that Metropia strategies influencing travel behavior could result in a higher decrease travel time

as compared to a \$20 million HSR. When the multi-dimensional aspect is considered, we believe the overall benefits are substantial and justify the anticipated investment. The referenced first sentence in the PTC reflected a conservative view with focus on only one aspect of the multi-dimensional framework. Finally, results from our VISSIM analysis have been added, which show a pronounced mobility benefit at a modest adoption rate.

PTC REFERENCE: See additional text in section titled "COST/SCHEDULE BENEFIT" and "RESULTS"

- 4 COMMENT:** Page 7, Section A, Description, Phase 2: The maintenance of the service beyond the term of the I-270 Innovative Congestion Management project is concerning. From the PTC it appears the cost could be \$2.5 million for 2 years. Again, this appears to be more of an ongoing Operations and Management program (similar to PTC #6), and a substantial risk is associated with receiving approval for sustainable operations funding to support the service.

RESPONSE: To clarify the costs associated with Phases 1 and 2 reflect the costs pertaining to the deployment of Metropia's platform during the term of the I-270 Innovative Congestion Management project. Beyond that term the maintenance cost are expected to be significantly lower but could vary by market. For instance, while the costs associated with incentives are initially covered by SHA (100% in phase 1 and 90% in phase 2), the incentive program will become fully self-sustainable with local businesses supplying the incentives. One of the principles underlying the Metropia's platform is the mobility ecosystem which calls for win-win synergistic collaboration between government agencies, employers, local merchants, and commuters. Agencies jump-start the ecosystem and provide initial incentives, while Metropia continues working with local stakeholders, employers, and

merchants to financially sustain the incentives offering and create a mobility ecosystem that is financial sustainable and mutually beneficial. It has been proven that the mobility ecosystem approach is more synergistic and cost effective than traditional supply expansion and/or technology procurement. The value proposition for all types of stakeholders in that the mobility ecosystem aims to reduce the total costs (internal and external) for the entire transportation system from all the stakeholders' standpoints. Furthermore, implementation of the proposed concept may require institutional collaboration outside of the Maryland State Highway Administration (SHA). Metropia will assist SHA by partnering in the preparation of materials and delivery of presentations to transportation stakeholders outside of SHA. This extends to identifying and partnering on material development and presentation delivery to the Maryland Legislature and other funding bodies.

PTC REFERENCE: See additional text in sections titled “DESCRIPTION” and “ADMINISTRATIVE RISK ”

07 Mobility Options Discovery and Engagement

A. DESCRIPTION

Urban traffic congestion is caused by the demand and supply imbalance in the transportation system and traditionally solving congestion has focused on capacity expansion and transportation system management and operations (TSMO) investments, driven primarily by intelligent transportation system (ITS) strategies. But the effectiveness of these solutions appears to be reaching a plateau, as evidenced by the ever-growing congestion. What is missing from the traditional thinking is that we have not focused on influencing travel behavior, beyond the various forms of congestion pricing.

According to the Motivation Theory by Prof BJ Fogg at Stanford University ¹, if we can make things easy to do then there is a better chance for both high and low motivated commuters to trigger a behavior change. Therefore, making an array of mobility options available to commuters through Mobility Options Discovery becomes the first behavior tenet of the proposed framework. However, making the mobility options available to commuters does not mean we should take it for granted that the commuters will change their behavior immediately or at all (otherwise, Google Map with the multi-modal information would have created a massive alternate mode adoption since the multi-modal functionality inception years ago). What is missing is actively presenting the mobility options to commuters and engaging them through appropriate means (e.g. gamification and incentives) to trigger desired behavior changes. As such, Mobility Option Engagement becomes the second framework behavior tenet.

This Proposed Technical Concept (PTC) introduces the Mobility Options Discovery and Engagement (MODE) ® platform, pioneered by Metropia. MODE® is an innovative and incentive-based platform, aiming to motivate rather than penalize travelers to change behavior and explore the behavior insights that lead to new travel options and opportunities to reduce congestion. MODE® is powered by Metropia's Synergy proprietary algorithms and data analytics capabilities and the various sub-systems could provide the following:

- A set of predictive and load balancing proprietary algorithms that allow travelers to reserve their trip ahead of time while enabling a better distribution of the demand on the transportation system
- Planned and unplanned event management systems that enable collaborative data-sharing and operational strategy implementation
- Modeling capabilities to support online and offline scenario analysis as part of a Decision Support System (DSS)
- A set of behavior influencing algorithms which employ gamification and

The opportunity facing us today is making demand management more robust through mobile tools leveraging technology, psychology, personalization, system goals, and institutional readiness to overcome barriers inhibiting discovering and selecting a new and efficient mode not engaged before.

¹ <http://behaviormodel.org>.

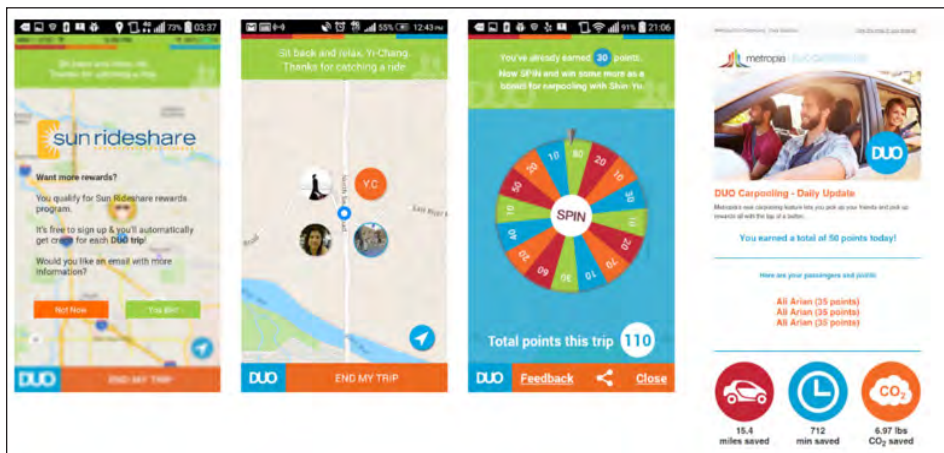
behavioral economic strategies to empower travelers to make more informed personal mobility decisions that include shifting their travel to off-peak times, taking under-utilized corridors, and opting for alternative modes of transportation

- Real-time information broadcasting systems which allow agencies to directly deliver important messaging to travelers via the Metropia mobile app
- A consumer-facing multi-modal mobile application which provides travelers with robust, high-quality information and allows them to discover and engage with personal mobility options
- Mobility-as-a-Service (MaaS) partnership management systems powered by effective, flexible incentive-based and multimodal collaboration

MODE® aligns with the guiding principles of a number of federally supported programs including Active Transportation Demand Management (ATDM), Integrated Corridor Management (ICM) and Dynamic Mobility Applications (DMA), and the technology could be incorporated as part of a Connected Vehicles (CV) deployment program enabling vehicles to continuous real-time connectivity to all system users. MODE® is currently operational in Austin, El Paso, Tucson and the NY-NJ-CT metropolitan region and will be deployed in Houston Q1 2017, as part of FHWA's Advanced Transportation and Congestion Management Technology Deployment (ATCMTD) grant.

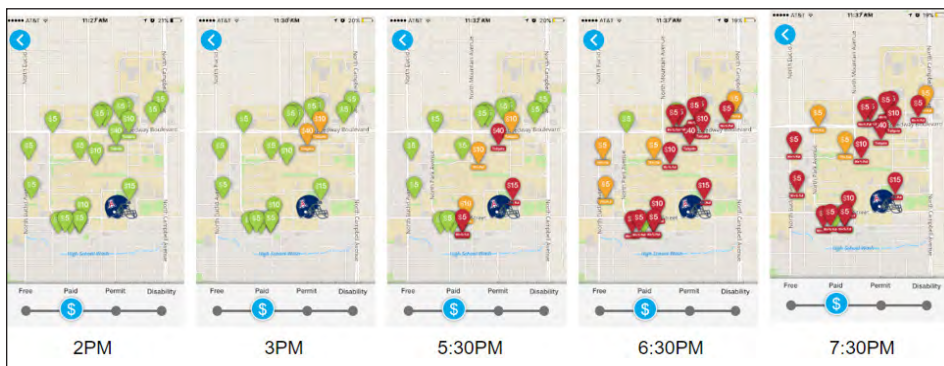
Active Demand Management (ADM) offers travelers mobility options that are personalized and compatible with their life style, daily activity patterns and personal preferences. MODE® supports ADM strategies by currently providing a multi-dimension demand management framework reflecting route, departure time and mode. Based on Metropia's proprietary and patented algorithms, when a user selects the optimal combination of departure time and route both the system and the individual traveler benefit. This benefit is further enhanced utilizing "DUO" (Driving Up Occupancy), an integral feature of MODE® reflecting a carpooling mobility option based on the concept of Casual or Social Carpooling, i.e.; opportunities to fill empty seats are found within the existing social network such as traveling with coworkers, being affiliated with the same sports team, schools, etc. DUO matches drivers and riders as carpoolers once they are inside a vehicle and does not require pre-matching nor cash payments, but rather offers incentives to spur drivers and riders to carpool on a daily basis or on a special occasion. DUO riders and drivers receive points which they can redeem for rewards. Screenshots of the DUO functionality are illustrated in Figure 1

Figure 1: Example of DUO Screens



In addition, by mining crowd-sourced real-time data acquired from the Metropia users, operations of Park&Ride facilities could be assessed and information pertaining to parking space availability to be transmitted to travelers. Figure 2 below illustrates a timeline of parking space availability based on information acquired by Metropia users (green =spots available to red=spots not available) during a University of Arizona (UA) football game.

Figure 2: Real-Time Parking Space availability



Metropia Inc. will deploy the multi-dimensional demand management strategies of MODE® to enhance the mobility and reliability of IS 270. The proposed deployment is envisioned to be completed in two Phases with each phase providing the opportunity to assess success before the next phase is initiated. The objective of the overall framework is to deliver the following benefits to the IS 270 corridor:

- Introduce emerging multi-modal mobility options to travelers to better utilize corridor/system capacities.
- Increase SHA's understanding of traveler responses to information and mobility options and use of travel behavior data to improve operational

planning decisions.

- Enhance and strengthen working partnerships among transportation agencies through the shared big-data analytics.
- Provide real-time and predictive future roadway segment traveler information (i.e., travel times, delay, reliability, speeds, etc.) for both recurrent and non-recurrent traffic conditions such as large scale construction projects.
- Enhance TSM&O effectiveness and efficiency through more system/user data and analytics to proactively manage and influence traffic network/ conditions and capacity.
- Finally, SHA will also benefit from the principle underlying the Metropia platform that the mobility ecosystem calls for win-win synergistic collaboration between government agencies, employers, local merchants, and commuters. Agencies jump-start the ecosystem and provide initial incentives, while Metropia continues working with local stakeholders, employers, and merchants to financially sustain the incentives offering and create a mobility ecosystem that is financial sustainable and mutually beneficial. For instance, while the costs associated with incentives are initially covered by SHA (100% in phase 1 and 90% in phase 2), the incentive program will evolve to become fully self-sustainable with local businesses supplying the incentives. It has been proven that the mobility ecosystem approach is more synergistic and cost effective than traditional supply expansion and/or technology procurement. The value proposition for all types of stakeholders in that the mobility ecosystem aims to reduce the total costs (internal and external) for the entire transportation system from all the stakeholders' standpoints.



Figure 3: Metropia's Ecosystem: Community Based & Incentivizing Change

PHASE 1: SET-UP AND CONFIGURATION OF MODE® DEPLOYMENT

The first Phase of the program deployment focuses on the setup and configuration activities of MODE®. The first set of activities is conducted by Metropia employees and focuses on the data and computing infrastructure setup and configuration needed for Metropia Synergy to function in the IS 270 travel shed. Technical activities include, but are not limited to, acquiring all necessary data and routable maps local sources for information about construction/work zones and incidents, converting acquired data to Metropia's own formats, inputting additional data such as time-dependent turning restrictions, toll roads, high occupancy vehicle (HOV) lanes, etc., setting up necessary cloud servers and database instances for the region, undertaking field testing verification and identifying all technical challenges and producing the optimal integration framework

The second set of activities is associated with the launch of a limited users program where members of the general public are recruited to become early adopters of the platform, evaluate the performance of the platform and provide feedback. They will be encouraged to communicate and share their experiences

with the App and DUO module as the community grows from the first few users, to growing increments of 100 users. Recruitment will continue for this task until the required number of active beta test users have been secured. At the end of the first five trips, an optional short survey is sent to them asking for comments regarding the quality of the trips made during the day. Metropia engineers will then take this information to conduct detailed, quality checks and debugging.

Metropia will also set up and make accessible to IS 270 project manager/team for the duration of the DUO program, a Web-based and password protected dashboard summarizing on a daily basis the status of DUO casual carpooling in the IS 270 region. The dashboard will contain key user and trend statistics such as:

- Number of Active DUO program sign ups/participants
- Number of DUO trips taken overall and number of trips taken per driver and/or passenger
- Average miles traveled per trip and points awarded to drivers and passengers
- Number of passengers per vehicle
- Cumulative travel time savings, CO2 savings, points earned and rewards redeemed, etc.

At the conclusion of the Phase 1, Metropia will provide data associated with DUO program participation and an end of phase summary report. Metropia will also provide a concise 5-10 page project report summarizing the set-up of DUO program for the region and DUO pilot program participation / cumulative program results. The report will also contain lessons learned and recommendations for continuing a full launch of the DUO program in the subsequent year.

The estimated cost for the Phase 1 deployment is estimated to be \$554,300

PHASE 2: FULL MODE® DEPLOYMENT

The full deployment builds upon and expands on Phase 1. During Phase 2, an integrated media plan utilizing a mix of media and outreach channels will be developed and deployed. This campaign will be highly targeted to provide the necessary brand awareness prior to the official launch of the product, while increasing post launch brand awareness and messaging recall. The incentive program for users and partners built out during the Phase 1 will now be rolled out in its entirety. This includes a points-base program, in which users will be offered the opportunity to earn points based on their driving and mode choice behaviors and redeem points for rewards offered through brand partners.

Consumers will be offered opportunities to earn additional points by sharing on social networks how the App has made their commutes easier, or of the special offers they redeemed with points earned. Encouraging social sharing creates positive word of mouth marketing, while increasing brand awareness and attracting new customers. Merchants and sponsors may also have promotions,

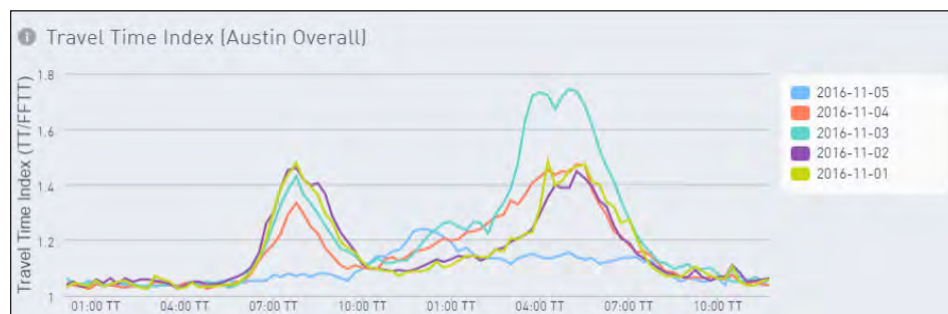
such as discounts sent to App users, contests to create a competition between partners, and perhaps non-profit fundraising (“for every point you earn, we’ll donate a quarter in your name to XYZ organization”), resulting in increased interest in the success of the App.

Engaging with major employers, including Federal, State and local government entities, located along the IS 270 corridor and beyond is another source of outreach and marketing. Metropia will develop and implement a plan to reach out to major employers, and invite them to participate in the DUO program. Participating Employers will receive customized outreach materials and unique code for their employees to enter when they download the app and create a Metropia account. This will allow Metropia to match users with an employer, enabling cumulative and anonymized web-based dashboard reporting of DUO carpooling activities (number of trips, number of carpool trips with 2, 3, or more passengers, origins and time of day arrivals and departures) for each employer. This can be used for sustainability or other reporting.

In addition, during Phase 2, Metropia will produce a Concept of Operations (ConOps) plan for real-time and offline data sharing for SHA. The ConOps documentation will start on understanding the current real-time and offline data availability, regional traffic management goals and approaches, then design a system engineering ConOps document that meets the goal and system environment. This task will involve several meetings with SHA staff and other stakeholders for system integration discussions.

Furthermore, Metropia will provide SHA with a web-based dashboard to monitor mobility and reliability performance of IS 270. Performance metrics including Travel Time Index (TTI) for the corridor and the Metropia coverage region, planning index, speeds and travel times will be provided if data volume is sufficient. Figure 4 illustrates a sample of TTI for the Austin market.

Figure 4: Sample regional TTI calculation



Finally, data acquired by Metropia users could be leveraged to perform the following, among others:

- Travel patterns analysis
- Transportation model validation and calibration

- Mobility and reliability Performance Measures
- Real-time management of transportation networks
- Driving behavior & safety analysis
- Incentive-based strategies such as User-Based Insurance (UBI),
- Congestion pricing, non-toll strategies such as VMT Fee-based strategies
- Parking management strategies
- Special event and large venue management
- Ridesharing
- Transit Lead Generation

The estimated cost for the Phase 2 deployment is estimated to be \$1,554,600.

B. LOCATION

While the Metropia platform and mobile application will be made available for drivers along the IS 270 corridor, the service availability coverage will include the travel-shed area and can be expanded for a greater network coverage in subsequent years.

C. ANALYSIS

The MODE® platform allows travelers to better assess their alternatives and make informed and smarter trip planning decisions before and during their trip, while agencies can proactively and effectively manage available capacity as demand varies. The basic premise is an innovative approach of using rewards to incentivize motorists to alter their behavior. Using rewards to reinforce a desirable behavior has shown to be an effective strategy to trigger and anchor behavior change and is supported by a sizeable volume of empirical evidence (Kreps 1997, Berridge 2001). Combined with advanced traffic prediction and coordinating technology, MODE® encourages motorists to cooperate, balance traffic load on the network, and ultimately, reduce traffic congestion. Motorists are rewarded for using alternate routes and times, avoiding peak congested traffic, and using alternative modes of transportation rather than driving alone. Figures 5a and 5b illustrate the correlation of departure times and reward points based on data from a current Metropia market.

Figure 5a and 5b: Reward Points and User Behavior

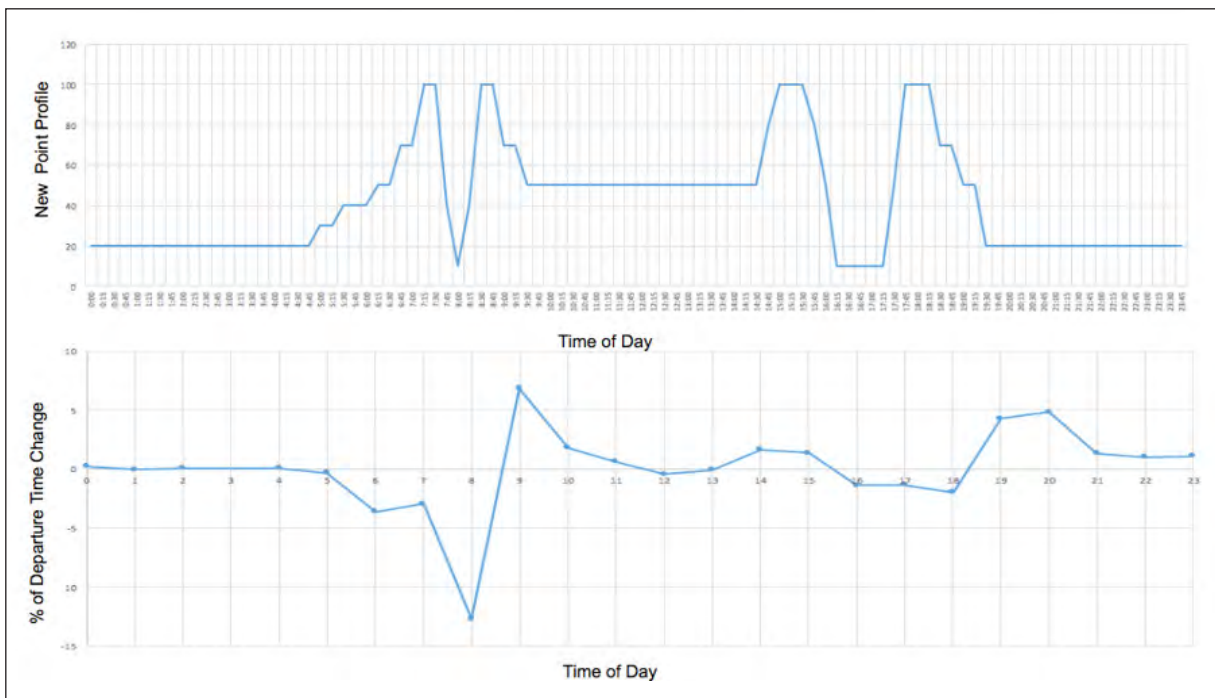
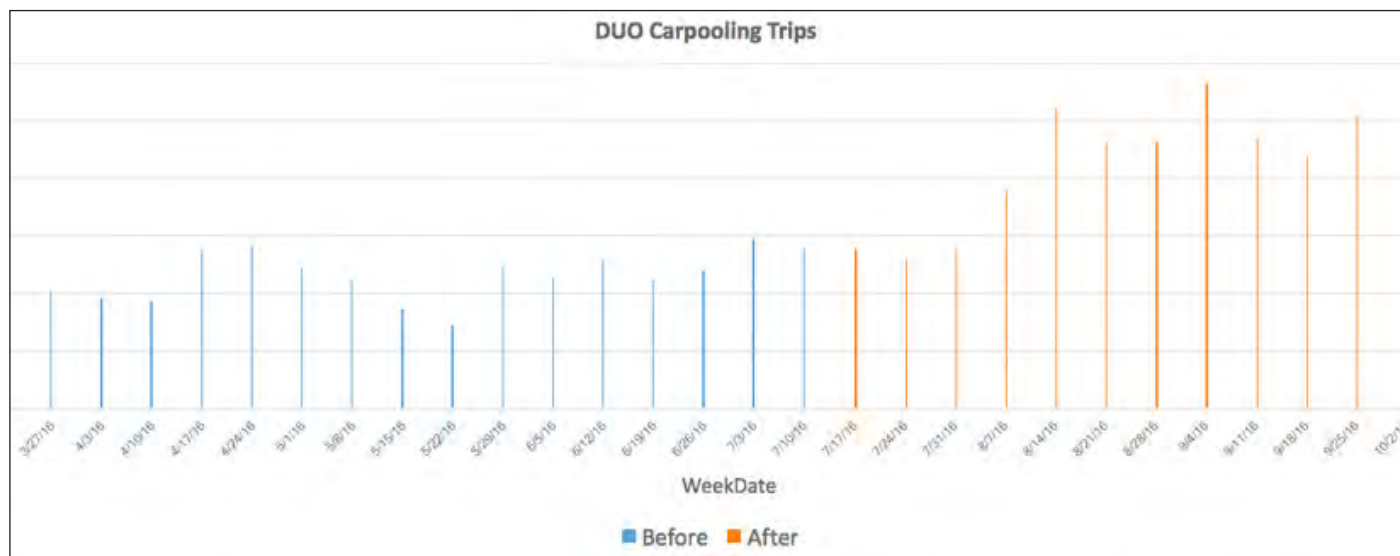


Figure 5a and 5b: Reward Points and User Behavior. (Caption): “Top chart: Metropia’s point distribution profile was adjusted to lure drivers away from am/pm rush hours. Bottom chart: The blue line represents the % change in trip departure times following the deployment of the New Point Profile. Below zero signifies a decrease in trips departing at that time; Above zero signifies an increase in trips at that time.”

DUO is being received well by Metropia users and we have observed a gradual improvement in the adoption rate and increase of trips using this mode. Offering relatively higher points for DUO carpoolers than driving alone is an ADM strategy for agencies to increase the carpooling market share within their region. Data provided in Figure 6 on the following page indicates an increasing trend of DUO trips, from 5% to 10% within 2 months in Austin, after implementing a new point earning scheme that favored DUO carpoolers.

Figure 6: Impact of Point Rewards on DUO Trips



VISSIM RESULTS

Parsons recognizes that the primary measurable mobility benefit of MODE® DUO will be the increase in HOV usage, and commensurate reduction in vehicles using general purpose lanes. Parsons conservatively estimates that implementation of DUO on the IS 270 corridor will result in an increase in HOV use by 15%. This increase was factored into the VISSIM results Parsons generated for the 2015 build condition. In order to address SHA comments to the MODE® PTC, Parsons ran VISSIM without it to illustrate its contribution to our overall improvement calculations. The comparison with and without MODE® are illustrated in Figure 7.

Figure 7: Comprehensive VISSIM Mobility Results with and without MODE® - 2015

Measure	% Change AM Peak 2015		% Change PM Peak 2015	
	With MODE	Without MODE	With MODE	Without MODE
Total Delay	-41%	-37%	-13%	-9%
Average Delay per Vehicle	-39%	-35%	-13%	-9%
Total Travel Time	-14%	-12%	-3%	-1%
Vehicles (Arrived)	0%	0%	0%	0%
Latent Demand	34%	59%	-1%	11%
Latent Delay	33%	64%	2%	7%
Total Distance	-2%	-2%	-1%	-1%
Average Speed	14%	12%	2%	1%

These results suggest that the implementation of MODE® would have a pronounced positive effect on overall throughput on IS 270 during both AM and

PM Peak periods, even with a modest increase in ridesharing of 15%. Given its relatively small deployment and operating costs, the return would be impressive.

Parsons did not conduct an analysis of the effects of MODE for the 2040 build model because the results of the 2040 no-build model indicate that the HOV lanes for that year will be at capacity.

D. POTENTIAL IMPACTS

No adverse impacts are anticipated as a result of the implementation of the services described in this PTC. Aside from the anticipated benefits (increased ridesharing and HOV utilization rates), users of IS 270 will not be affected.

E. OTHER PROJECTS

Metropia is currently deployed in Austin, Tucson, El Paso and the NY-NJ-CT metropolitan region and is expected to be deployed in a number of regions in 2017. The following provides references from Austin, El Paso and Tucson.

AN ACTIVE TRAFFIC MANAGEMENT EXPERIMENTAL PROJECT

Metropia is deploying its mobile technology and active traffic management platform in Austin, Texas as part of the Central Texas Regional Mobility Authority's (CTRMA) MoPac Improvement Project to directly benefit the region's commuters during construction of Express Lanes on north MoPac between Lady Bird Lake and Parmer Lane. We've been successfully working with the Mobility Authority to create and communicate pre-determined construction-related roadway closures and updates to the driving public in real time while offering accurate traffic predictions that help determine the best routes for their commutes. Also, we are integrating traffic data from the Mobility Authority and other sources with Metropia user data to manage roadway capacity and incentivize drivers to make smarter commuting decisions such as driving during off-peak periods, using less congested routes and using alternative modes to driving alone.

Contact: Mike Heiligenstein, Executive Director – CTRMA (512-996-9778, mstein@ctrma.org)

REGIONAL WIDE TRAFFIC DATA COLLECTION FOR ATDM

The Metropia mobile technology platform was deployed within the El Paso region as a congestion mitigation tool and to enhance the performance measure reporting for transportation management. Using Metropia and fused data, real-time travel time indexes (TTIs) were calculated for major corridors and a web-based dashboard that featured the corridor TTIs and other requested data points were shared with TxDOT agency personnel. Existing data sources and models focused primarily on freeways, arterials, and some collectors. Metropia's data was shown to provide higher spreads of coverage, including data down to the local street level.

Contact: Thelma Ramirez, Advanced Transportation Planning – TxDOT (915-790-4392, Thelma.Ramirez@txdot.gov)

SUN RIDESHARE PROGRAM INTEGRATION WITH METROPIA DUO CASUAL CARPOOLING.

The Sun Rideshare Program managed by the Pima Associations of Governments (PAG) Travel Reduction Program chose to collaborate with Metropia to strengthen the existing Sun Rideshare Program. The collaboration is enhanced through seamless backend system integration and joint promotion. Each time a Metropia driver and rider(s) with a Sun Rideshare account completes a carpool activity, the event is automatically captured by the users' Sun Rideshare account. Existing Metropia users, who are not Sun Rideshare program registrants, are also prompted to create an account in the PAG Sun Rideshare website after using Metropia DUO five times. This is a win-win collaboration between PAG and Metropia where Metropia users can automatically log their carpool activities into the Sun Rideshare system without manually entering them each instance, and can be rewarded by both Metropia and PAG. PAG obtains more Sun Rideshare program registrants via Metropia and also receives highly reliable carpool records for the Sun Rideshare program.

Contact: Ruth Reiman, Sun Rideshare/Travel Demand Manager (520-495-1482, rreiman@pagnet.org)

F. ADMINISTRATIVE RISK

Implementation of the concept may require institutional collaboration outside of the Maryland State Highway Administration (SHA). Metropia will assist SHA by partnering in the preparation of materials and delivery of presentations to transportation stakeholders outside of SHA. This extends to identifying and partnering on material development and presentation delivery to the Maryland Legislature and other funding bodies.

G. DESIGN-BUILD RISK

None is envisioned at this point.

H. COST/SCHEDULE BENEFIT

Managing demand and altering travel behavior could potentially reduce significantly potential infrastructure costs. Based on a simulated analysis a few years ago for the I-70 corridor in Denver, findings indicated that Metropia strategies influencing travel behavior could result in a higher decrease travel time as compared to a \$20 million HSR.

In addition, Metropia's solutions could be brought to field without additional infrastructure requirements and in significant less time compared with other infrastructure improvements.

I. MISCELLANEOUS

Metropia's platform will also support two agencies that recently were awarded a FHWA Advanced Technology and Congestion Management (ATCM) grant and a FTA Mobility On Demand (MOD) grant, respectively.

Larry Hogan, *Governor*
Boyd K. Rutherford, *Lt. Governor*



Pete K. Rahn, *Secretary*
Gregory C. Johnson, P.E., *Administrator*

December 1, 2016

Brian Quinlan, P.E.
Parsons Construction Group, Inc.
10 East Baltimore Street, Suite 801
Baltimore MD 21202

Dear Mr. Quinlan:

The Maryland Department of Transportation's State Highway Administration's (SHA) is in receipt of Proposed Technical Concept (PTC) No. 7 for the I-270 Innovative Congestion Management Progressive Design-Build contract (Contract No. MO0695172), submitted by your Design-Build Team on November 17, 2016. The SHA has completed our review of the PTC and offers the following comments for your consideration in the further development of your technical concepts and proposal:

1. The description of the PTC is unfortunately too general and indefinite to determine exactly what "Mobility Options Discovery and Engagement" is. It appears to be a traveler information mobile application combined with a points based incentive program. The actual function, promotion, distribution, and execution of this type of program would need to be more clearly defined to determine its applicability and benefit in the I-270 corridor.
2. Generally, the concept fails to demonstrate a high likelihood that it will produce the touted Mobility and Safety benefits. The Analysis section discusses what the technology allows travelers to do and how it incentivizes them to change their behavior, but it fails to put forth a convincing argument that the technology and the incentives will indeed change the behavior of enough travelers to produce real, significant improvements to Mobility and Safety on I-270. In the same vein, the RFP requested other projects on which the PTC has been used and the degree of success or failure of such usage. The deployment in Austin is currently underway and incomplete, and the other two projects make no mention of the degree of success or failure Metropia had in achieving Mobility and/or Safety benefits.
3. Page 10, Section E, Other Projects: Not being deployed in Maryland, Metropia has zero traction in this state. Therefore, the SHA would have to promote the application and attempt to capture a significant number of users to render the effort cost effective.

My telephone number/toll-free number is 410-545-8800 or 1-888-228-6971
Maryland Relay Service for Impaired Hearing or Speech 1.800.735.2258 Statewide Toll Free

Street Address: 707 North Calvert Street • Baltimore, Maryland 21202 • Phone 410.545.0300 • www.roads.maryland.gov


Brian Quinlan, P.E.
Page Two

4. Page 11, Section F, Administration Risk: As stated in the RFP, one of the goals of this procurement is to obtain the best value for the public. However, the first sentence mentions the potential for small throughput improvements compared to the investment requirements. Based on the other parts of the PTC (refer to comment 1 above), this risk appears to be high.
5. Page 7, Section A, Description, Phase 2: The maintenance of the service beyond the term of the I-270 Innovative Congestion Management project is concerning. From the PTC it appears the cost could be \$2.5 million for 2 years. Again, this appears to be more of an ongoing Operations and Management program (similar to PTC #6), and a substantial risk is associated with receiving approval for sustainable operations funding to support the service.

Any questions or communications regarding the response to this PTC should be directed to Mr. Jason A. Ridgway, Director, Office of Highway Development at the project specific email address, MO069_IS_270@sha.state.md.us.

Sincerely,



 Jason A. Ridgway, P.E.
Director, Office of Highway Development

cc: Olu Adeyinka, P.E., DBIA, Parsons Transportation Group, Inc.



**VISSIM Traffic Model
for 2015 and 2040
Build Design
Years**



7 Appendix

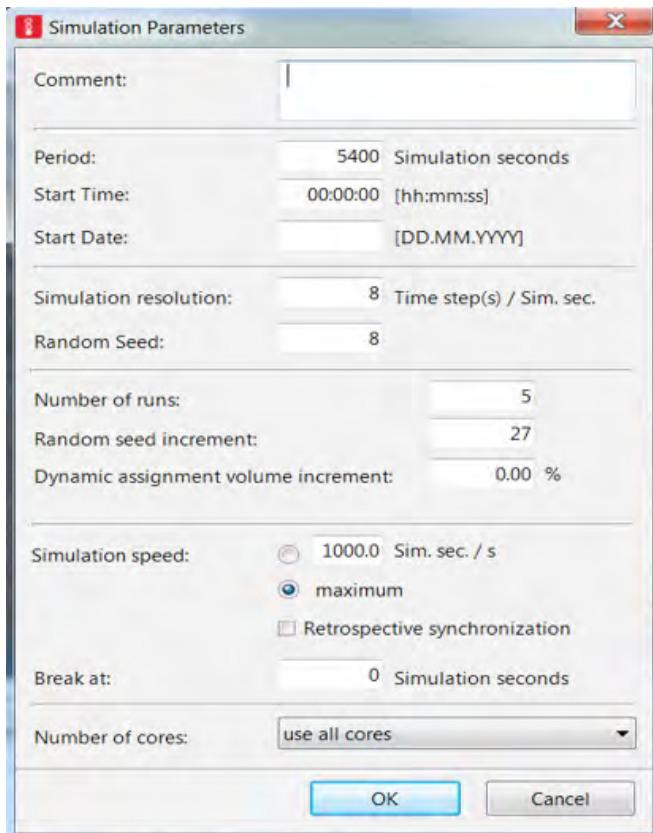
iii. VISSIM Traffic Model for 2015 and 2040 Build Design Years

VISSIM Modeling Methodology Report

Model Setting

Calibrated VISSIM models for existing base year and future no-build conditions were provided to Parsons as part of the RFP package for the project. The models received from SHA included existing conditions (2015) AM & PM and no-build conditions (2040) AM & PM. The model outputs provided with the RFP directed that we use VISSIM version 7.00-13 for the analysis and for the results comparison. Concept Evaluation Templates (.pdf and excel files) populated with the VISSIM existing and no build traffic model results were also included as a part of RFP.

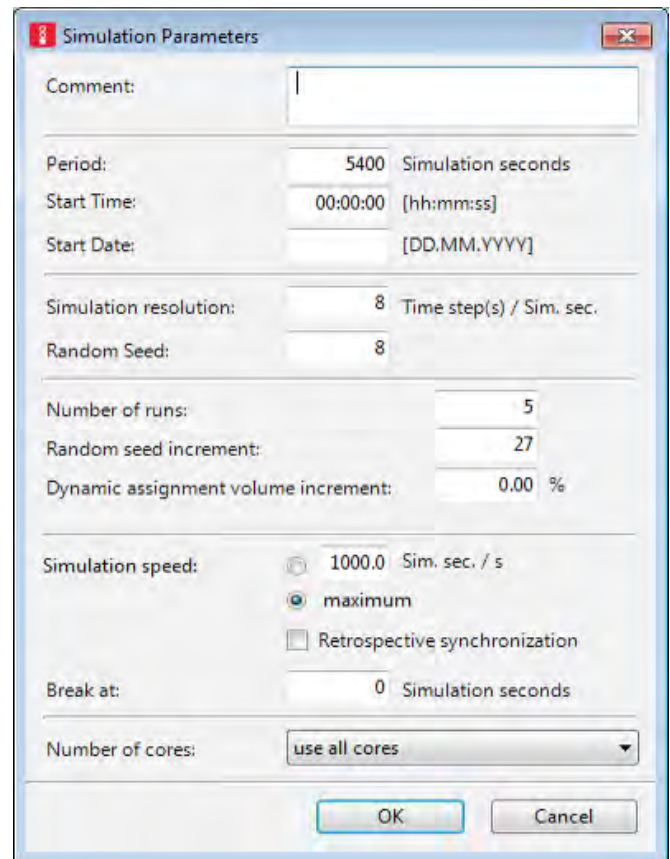
Figure 1A. Simulation Parameters (AM Models)



As directed in the RFP, Parsons used VISSIM version 7.00-13 and followed SHA's VISSIM Modeling Techniques guidance to develop build models for our proposed concepts. Parsons did not modify calibration parameters, such as vehicle inputs, vehicle routes, driving behavior, link behavior type, lane change distance, speed distributions and decisions for model runs. However, some model characteristics had to be modified to reflect our ATM solutions. All modifications to the model are listed in this document and justification is provided.

Parsons used the simulation parameters and random seeds provided in the VISSIM files in the final models that were used for reporting results. Figures 1A and 1B show the simulation parameters used in all build models. AM and PM Models were run on

Figure 1B. Simulation Parameters (PM Models)



a 64-bit system and for the morning and evening one-hour peak periods as directed in the RFP.

Model Observations

Parsons re-ran the RFP models as received (with no changes) to establish baseline values. As directed, Parsons used VISSIM version 7.00-13 for these baseline runs, as well as the evaluation templates provided to summarize the results.

During the model runs, Parsons observed that the peak period direction of travel was southbound in the morning peak hour and northbound in the evening peak hour. Additionally, we noted that the model showed more severe congestion on the collector/distributor (C/D) road than on the mainline of IS 270. Based on model run observations and with the local knowledge of the corridor, we concluded that most of the congestion along the corridor is being caused by short auxiliary lanes from on ramps and to off ramps, slip ramps along local roads and lane drops at interchanges.

The summarized results generated at the end of these baseline runs did not match exactly with the results provided by SHA in the RFP. However, as recommended by SHA, Parsons proceeded with the RFP provided results as baseline results and used them to compare to the final build model results.

PTC Development

Parsons formulated a series of Proposed Technical Concepts (PTC) to improve the operations along IS 270 by improving throughput, reducing delay and improving travel times. To evaluate potential outcomes, Parsons incorporated into both the 2015 and 2040 VISSIM models characteristics related to the proposed changes. These include changes to lane geometry and some calibration parameters to reflect the effects of

the proposed ATM solutions. The changes made to the modeling parameters include:

- Lane change distance
- Geometry changes that were made to reflect proposed PTCs include:
 - Lane geometry changes (as a part of Hard Shoulder Running PTC)
 - Shoulder treatment (as a part of Hard Shoulder Running PTC)
 - Lateral shift of HOV lanes (as a part of Hard Shoulder Running PTC)
 - Minor Ramp layout modifications (as a part of Ramp Metering PTC)

Geometric changes were made separately on AM and PM models. The southbound direction was modified in the AM peak hour model and northbound direction was modified in the PM peak hour model.

Changes/Modifications to the Base Model

The emergency stop and lane change parameters are used to help control the lane change behavior for vehicles. Emergency stop defines the last possible position for a vehicle to change lanes. Lane change defines the distance at which vehicles will begin to attempt to change lanes. Parsons modified these parameters at the locations where we plan to add new lanes to the build model, or where we propose to change the geometry of the links. We also added new reduced speed areas to the network wherever we propose to add an additional lane to an on-ramp with reduced speed area. Parsons exercised caution regarding these settings with respect to proper lane utilization and lane change planning. Locations with these modifications are as follows:

- A one-lane outside shoulder ended on the SB direction, just before the bridge at the Middlebrook Road interchange. Therefore, vehicles need to decide to change lane before they reach this point.

To address this, Parsons increased the lane change parameter from 656 ft. to 1500 ft.

- A longer deceleration lane before the Watkins Mill Rd SB off-ramp was used in the build model. As a result, a longer lane change distance was assigned to the downstream connector so that vehicles can start changing lanes in advance.
- One of the lanes on IS 370 SB on-ramp was blocked for HOV vehicles, to represent how HOVs change lane in advance of slip ramp from CD to IS 270, merge to the IS 270 mainline and use the HOV lane. Since we have removed this slip ramp in the build model, the HOV drivers' behavior will change. Therefore, we lifted the restriction, meaning that HOVs can now use both on-ramp lanes.
- After removing the above-mentioned slip ramp, we modified routing decisions accordingly for the vehicles that were using this ramp. Vehicles using the removed slip ramp were rerouted so they could use the next slip ramp between Shady Grove Rd. and MD 28 to enter the IS 270 mainline.
- In the build model we place Adaptive Ramp Meters (ARM) on the IS 370 SB on-ramp, 200 feet before the gore point. The emergency stop and lane change parameters in the no-build model were, however, longer than 200 feet, meaning that vehicles start making a lane change before the ARM location. This action causes a long queue on this ramp, especially when they stop at the signal head and attempt to move to the other lane. Considering the high volume on the on-ramp (3165 vph) and the queue spillback at the ramp, vehicles will not be able to timely and properly change lanes before the ARM; however, they can do so after crossing the stop line. Hence, we have shortened the emergency stop and

lane change parameters at this location to better represent the real situation.

Parsons also modified the lane change distance parameter at several merge points between the on-ramps and IS 270 in the ARM models. We also modified the lane change distance for the proposed two-lane ramps. This was done to prevent vehicles changing lanes at the ARM location and blocking the ramp meters. Additionally, for some two-lane ramps, we modified vehicle routing decisions and added lane change restrictions to provide a balanced use of both ramp lanes.

Proposed Technical Concepts

Hard Shoulder Running (HSR)

Based on queuing and congestion noticed in the existing and no-build models provided in the RFP and our staff's general knowledge of the area, Parsons identified several locations for hard shoulder running to add capacity and to help vehicles transition and avoid weaving. Below is a list of locations where Parsons proposes to implement HSR in the southbound direction for morning peak hour and northbound direction for the evening peak hour. Parsons modified the geometry of existing and no-build 2040 models to reflect this added capacity, and altered some modeling parameters to fit with the modified geometry.

AM Model- Southbound Direction

In the AM model, Parsons added HSR lanes at the locations indicated in Table 1 on page 4.

PM Model – Northbound Direction

In the PM model, Parsons added HSR at the locations in the northbound direction shown in Table 2 on page 5.

Adaptive Ramp Metering Control (ARMC)

Generally, the two primary categories for metering operation are fixed-time (pre-timed) control and adaptive (traffic responsive) control. Parsons modeled the deployment

Table 1. AM Model HSR Lane Locations

Location	Description
MD 85	Inside shoulder converted to HSR, adding third lane south of the bridge over MD 85 extending to MD 80. Excludes section between railroad bridge and Monocacy River where IS 270 southbound will continue to be 2 lanes
MD 80	Outside shoulder on the southbound on ramp used to extend the auxiliary lane.
MD 121	Outside shoulder used to extend the auxiliary lane and then create a 4-lane segment extending to Ridge Road.
MD 118 to Middlebrook Road	Outside shoulder used to add a lane after Middlebrook Road on-ramp extending to the bridge at MD 118
Watkins Mill Rd (2040 model only)	Outside shoulder used to extend the on-ramp acceleration lane length
MD 124	Outside shoulder before the loop on-ramp used to increase number of lanes from 4 to 5 for a total of 950ft, and outside shoulder after the loop on-ramp used to provide an additional lane to the railroad bridge
IS 370 to Shady Grove Rd	Slip ramp from local road to mainline removed and the 5-lane section on the mainline after slip ramp changed to a four-lane link. This change has been made because of the short weaving section (800ft) on the local lanes between the IS 370 SB on-ramp and the slip ramp to IS 270. The traffic volume using a single lane slip ramp is 1540 vph. This causes a queue on the slip ramp and backs up to the weaving section, which ultimately blocks the vehicles entering from C/D and IS 370 on-ramp. To remove this turbulence, the first slip ramp after IS 370 enters the C/D is removed. This will force all IS 370 traffic to use C/D until after Shady Grove Road interchange. Access to mainline IS 270 provided via slips ramps south of Shady Grove Road.
Shady Grove Rd	Outside shoulder used for additional lane capacity on C/D starting from end of the auxiliary lane to the slip ramp to the IS 270 mainline. Accommodates the additional traffic volume which was rerouted from IS 370 onto the local road, as mentioned previously.
MD 28	Outside shoulder on the local road used to extend the auxiliary lane for loop on ramp.
MD 28 to MD 189	Section with two lanes between the 2-three lane segments widened using outside HSR to add additional lane capacity, making that section a continuous 3-lane section.
MD 189	Outside shoulder used for HSR on local road between off- and on-ramps to make a 3- lane segment. The taper from the on ramp slip ramp into the C/D to the off ramp slip ramp from C/D to mainline. Also, inside shoulder used on the mainline from slip ramp before MD 189 until the next slip ramp before Montrose providing a 5-lane segment.
Montrose Rd	Using inside shoulder on the mainline from slip ramp north of Montrose until C/D and mainline merge point providing a 5-lane segment.

of an Adaptive Ramp Metering Control (ARMC) system on all on-ramps within the project corridor. All ramps were metered to replicate an existing condition where no trip pattern changes have occurred (i.e., due to

commuters adjusting their route choices when certain ramps are left un-metered). Parsons determined the number of lanes for the ramp metering based on the evaluation of existing and forecasted no-build ramp volumes. At

Table 2. PM Model HSR Lane Locations

Location	Description
Ridge Rd	Inside shoulder is used between the off-ramp and the loop on-ramp, increasing the number of lanes to 4. At the same location, right shoulder is used to provide auxiliary lane, increasing the number of lanes to five in this section. Lanes continue until the second on-ramp and end before the gore point.
Ridge Rd to MD 118	Inside shoulder is used to provide additional lane capacity between the MD 118 on-ramp and the Ridge Rd off-ramp.
MD 118	Inside shoulder is used between two off-ramps for 1550ft, creating a 5-lane section. Continues until the second on-ramp for 1590ft, making that part of the highway a 4-lane section.
MD 118 to Middlebrook Road	Inside shoulder along IS 270 is converted to shoulder lane between the Middlebrook Road on-ramp and the MD 118 off-ramp.
Middlebrook Rd	Inside shoulder is used between the Middlebrook Road off-ramps, increasing the number of lanes from five to six.
Middlebrook Road to Watkins Mill Road (2040 Model only)	Inside shoulder lane is added between two interchanges, making this a 5-lane section.
Watkins Mill Rd (2040 Model only)	The IS 270 mainline and local road are merged between the off-ramp and on-ramps to Watkins Mill Road. Also, the on-ramp auxiliary lane is extended from 350 feet to 600 feet using an inside shoulder.
MD 124	Outside shoulder is used between the two on-ramps, to extend the auxiliary lane, creating a 2-lane section between two ramps.
IS 370	Outside shoulder is used between the bridge and the second IS 370 on-ramp. Also, on-ramp shifts to the outside shoulder, on-ramp and local road merge point move to the gore point and a 900 feet auxiliary lane is provided.
Shady Grove Rd to IS 370	There is a lane-drop before the first off-ramp at IS 370 interchange. An outside shoulder is used between the two interchanges in order to maintain this lane.
Shady Grove Rd	Outside shoulder is used between the two on-ramps to remove the lane-drop. Also, outside shoulder is used to create a new auxiliary lane for the second on-ramp.
MD 189	The on-ramp auxiliary lane is extended for 850ft using an outside shoulder on the local road.
Montrose Rd	Outside shoulder is used on the local road starting from the second on-ramp auxiliary lane and until the bridge eliminating the lane-drop at the end of the auxiliary lane.

interchange ramp locations where ramp volume is greater than 1000 vehicles per hour (vph), Parsons plans to implement 2-lane ramp metering. In such cases, if the on-ramp has only a single lane in existing condition, Parsons widened the ramp section where metering is being applied to a 2-lane section to accommodate 2-lane metering (the HSR PTC provides more detail about

this widening). Geometry was modified at the following locations:

- Southbound – AM Peak Condition
 - Montrose Rd loop ramp (No-Build)
 - MD 28 on ramp (Existing / No-Build)
 - MD 124 loop on-ramp (Existing / No-Build)

- Watkins Mill Rd (No-Build)
- Northbound – PM Peak Condition
 - Watkins Mill Rd on-ramp (No-Build)
 - IS 370 on-ramps (Existing / No-Build)
 - Montrose Rd on-ramp (Existing / No-Build)

At all 2-lane ramp locations, Parsons modified lane change distance to 100 feet or less before merging to eliminate erratic lane change behavior upstream of the signals. Additionally, at locations where a lane change distance was insufficient to resolve erratic lane change behavior, the routing decisions were modified in conjunction with minimal lane change restriction just upstream of the signals to replicate a field condition of equal volume distribution on both lanes.

Parsons implemented changes to the models for ARMC through the definition of demand, passage, and queue detectors on the ramps as well as upstream mainline speed data and downstream mainline volume. We deployed control of the signals in the model using VAP signal logic. The meter rates for the signal logic are shown in Table 3 below. Based on the meter rates shown in the table, an initial meter rate is computed for the subject on-ramp with upstream speed data and then further refined through a check of the occupancy of the queue detector and the capacity of the downstream mainline segment, while ensuring that the maximum rate as specified is not exceeded.

In conditions where the queue occupancy is exceeded continuously with no effective flushing observed, the ramp signals are maintained as a continuous green. This mimics a ramp meter suspension in the field. Based on preliminary simulation and results reviews, Parsons also modified certain locations to allow release of two cars per green cycle.

Parsons determined that this approach is the most feasible deployment for a solid

preliminary assessment of ARMC logic for IS 270. Parsons implemented no changes to the signal timings at the ramp junctions as longer portions of the arterials were not coded into the model.

Table 3. Adaptive Ramp Metering Rates

Single-lane		Dual-lanes	
Mainline Average Speed	Metering Rate (V/H)	Mainline Average Speed	Metering Rate (V/H/L)
50	900	50	720
45	800	45	640
40	700	40	560
35	600	35	480
30	500	30	400
25	400	25	320

***Ramps operating on one car per green setting**

Variable Speed Limit (VSL)

For evaluation of variable speed limits in the peak conditions, Parsons placed desired speed decisions at the identified field locations for the posted variable speed limit signs as shown on the PTC exhibit (see PTC 02 in the proposal appendix). The variable speed decisions can be deployed through VAP logic; however, Parsons determined that using simple speed decisions that were only active during the data collection period of one hour is appropriate. This is because VAP logic is better suited when the simulated peak conditions exceed more than one hour and the subject corridor has a multiple-hour peak period with fluctuating volumes. Since the project corridor was evaluated for one peak hour, with stable vehicle throughput during this time, we used active speed decisions only during 5400-9000s and 1800-5400s for the AM and PM peak hours, respectively.

MODE

The Mobility Options Discovery & Engagement (MODE) solution is aimed at increasing carpool and vanpool use, thereby increasing High Occupancy Vehicle

(HOV) usage along the corridor during peak periods. Model geometry modification within the model was not necessary as a part of this implementation. Parsons only made changes to the HOV and Single Occupancy Vehicle (SOV) input at each routing location at which HOV volume originates. At these locations, Parsons increased HOV volume by 15%, and reduced SOV volume by a corresponding amount. This redistribution of volume between HOV and SOV shows mode shift in the vehicle population.

Parsons applied this solution only to the 2015 AM and PM models, and not to the 2040 future year model. We anticipate this solution will have a 5- to 10-year functional life due to forecasted growth in driver population. By year 2040, the model indicates that HOV lanes along IS 270 will be operating at capacity.

Results

Parsons ran 2015 and 2040 year models for each solution for AM and PM peak hour conditions, as required by the RFP. Summary results of these individual PTC models are presented within the corresponding PTCs. Parsons also developed a final “Build” model with all proposed solution elements combined for both 2015 and 2040 for both peak periods. Summary results for these models are included in the Mobility section of the proposal. Detailed results in the prescribed evaluation template format are attached to the end of this appendix section. The VISSIM model files are provided electronically, Appendix: VISSIM Traffic Model for 2015 and 2040 Build Design Years.

Final Model Results

There are many data output options available in VISSIM, ranging from network-wide statistics to individual intersection movement delays. The RFP required presentation of six data outputs:

- Network Performance

- Node Evaluation (including intersection delay and LOS)
- Queue Counters
- Vehicle Throughput
- Vehicle Density, and
- Travel Time and Speed.

VISSIM does not record speed. Parsons manually calculated these values using the travel time and link length information. Network Performance Evaluation is an overall snapshot of the network useful for quickly comparing the MOEs between no-build and build models. In this project, the following eight MOEs are reported and compared between No-build and Build models for the entire model duration:

- Total Delay (s)
- Average delay (s/veh)
- Total travel time (s)
- Arrived vehicles
- Latent demand
- Latent delay (s)
- Total distance (mile), and
- Average speed (mile/hr).

Details of these results can be found behind Tab (2015 Final Model AM/PM), electronically (2015 AM Final Results.PDF) and Tab (2040 HSR + VSL + ARM), electronically (2040 AM Final Results.PDF) documents in this Appendix.

Southbound – AM Peak Condition

The effects of proposed technical concepts on the southbound AM peak network performance are shown in Tables A.16 and C.16 for 2015 and for 2040 final year models, respectively. As shown in Tables A.16 and C.16, the total delay in the build model is 41% and 45% less than the no-build model for years 2015 and 2040, respectively. The improvement in the average delay is about the same in the build model for 2015 and 2040, at 39 to 45%. The results show that travel time,

and consequently the speed, improve in build models. Travel time is reduced by 14% in 2015 and 18% in 2040. The average speed of all vehicles in the network also increases by 14% in 2015 and 29% in 2040.

Arrived vehicles is a measure of throughput that shows the number of vehicles which have reached destination and left the network during simulation. Build model results indicate that Parsons' solution will not have any negative impact on this MOE in 2015 (Table A.16), and the throughput will increase in 2040 (Table C.16).

The next selected MOE is the latent demand, which is the number of vehicles that still wait to enter to the network at the end of the simulation. This parameter increases by 34% in the 2015 year-model and is unchanged in the 2040 year-model. As a result, an increase in the latent delay of 33% was observed for 2015, and 4% for 2040. Out-of-network latent delay and demand can be reduced by synchronizing traffic signal timing along the corridors in the future year conditions.

Table A.16 indicates that the total distance is reduced by 2% in 2015 build model. This could be due to a reduction in number of vehicles entering the network (or an increase in latent demand). Since this MOE does not take into account the distance that could be traveled by vehicles out of the network, a 2% reduction can be justified. Total distance is increased by 6% in 2040 model while no change in latent demand is observed.

Overall, we notice greater improvement in MOEs in 2040 than in 2015. By observing the model simulation we conclude that the improvement is greater in the 2040 year models due to inclusion of Parsons' proposed solutions in conjunction with the Watkins Mill Road interchange.

Northbound – PM Peak Condition

The effects of proposed technical concepts on the northbound PM peak network

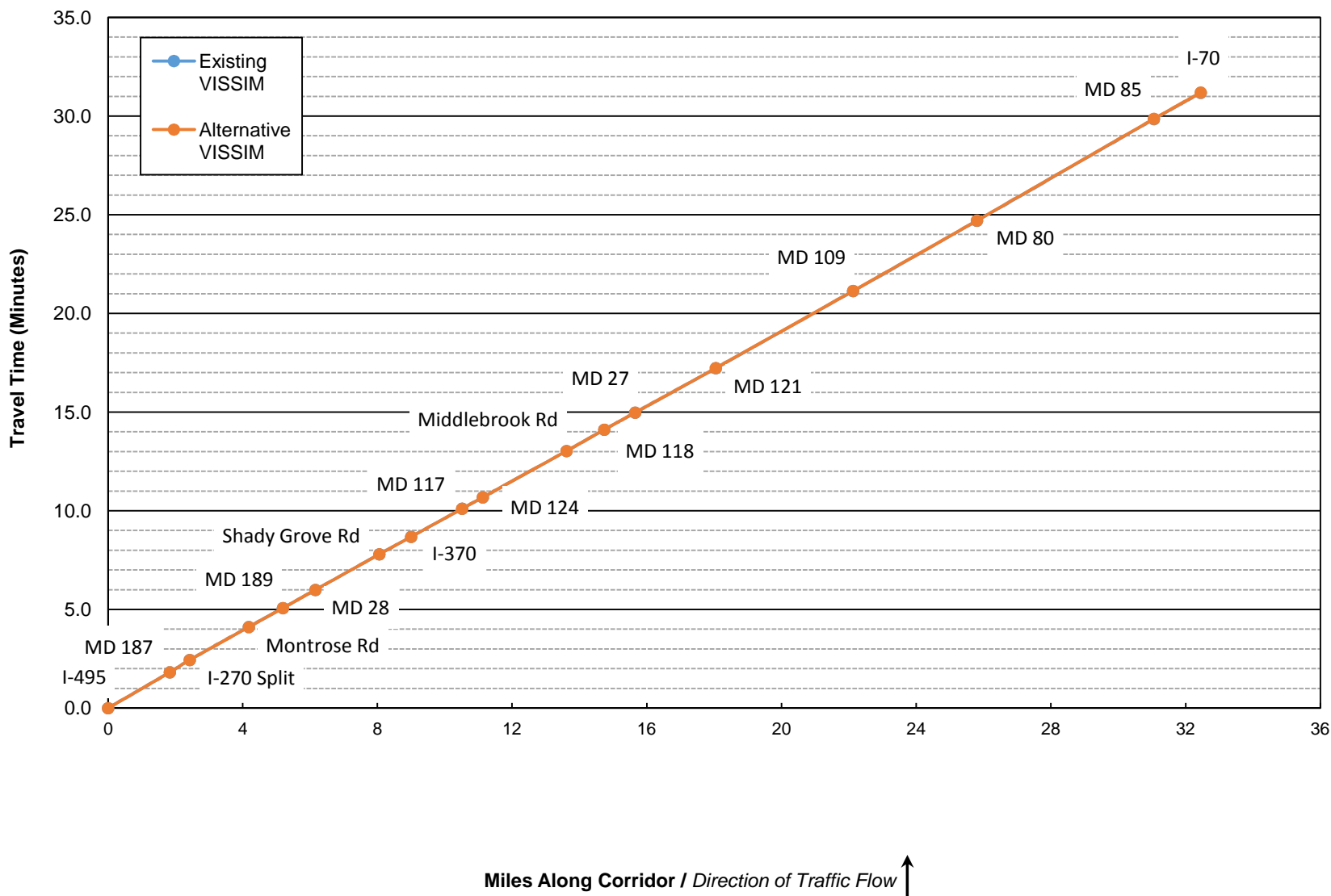
performance are shown in Tables B.16 and D.16 for 2015 and 2040 year Final models, respectively. Results show that Parsons' solution will reduce the total delay by 13% in 2015 build model and by 19% in 2040 build model in the NB direction. Likewise, our solution will improve the average delay by 13% for 2015 and 22% for 2040.

Our solution also reduces travel time by 3% in 2015 and 5% in 2040. The average speed of all vehicles in the network increases by 2% and 13% compared to the no-build model for years 2015 and 2040, respectively. Figures B.5 and D.5 and Tables B.4 and D.4 show that the majority of travel time savings and speed increase happen on the NB C/D road.

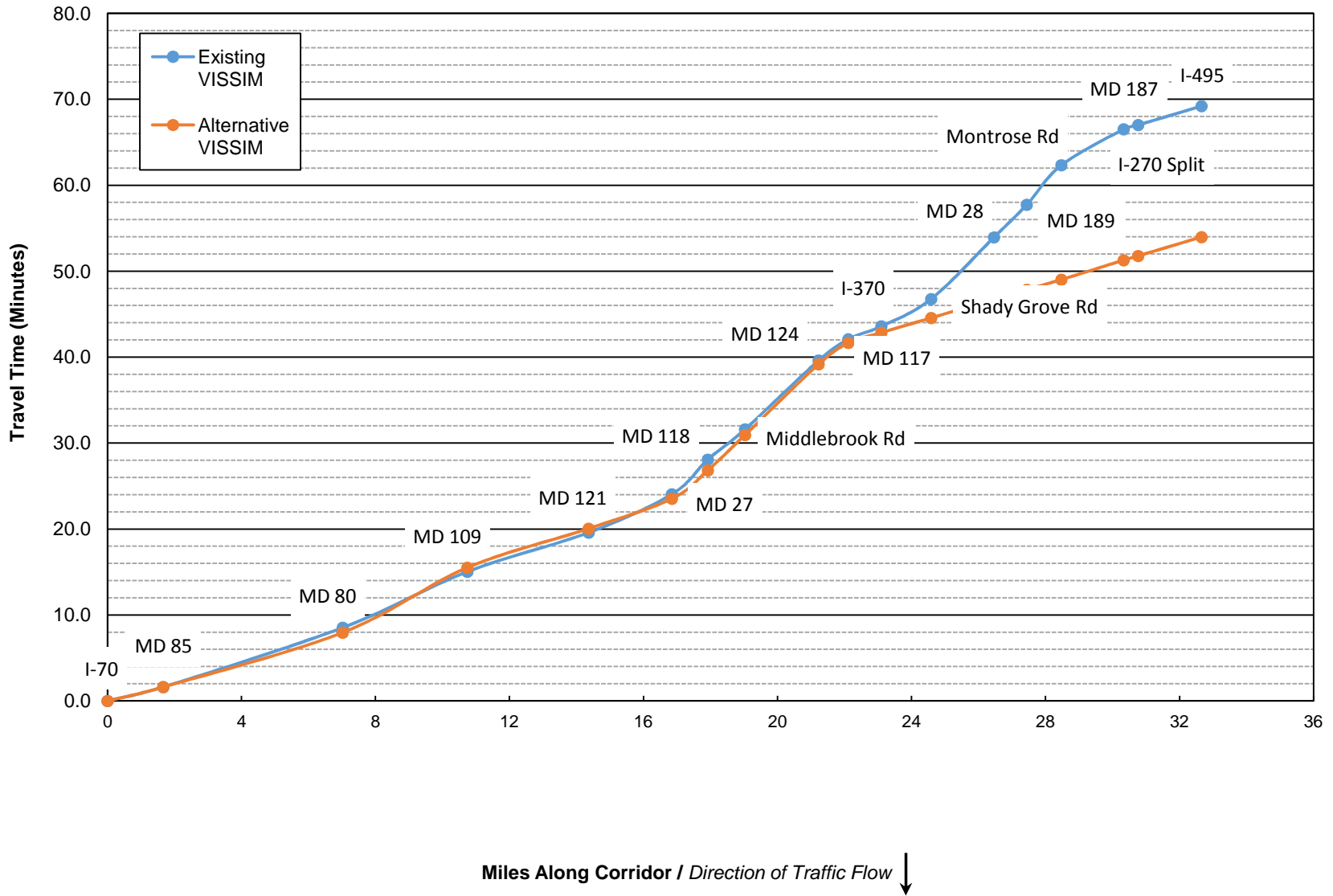
As with the AM peak condition models, the arrived vehicles in the PM condition will not change in the 2015 year-model (Table B.16) but will increase by 5% in the 2040 year-model (Table D.16). Demand and delay of vehicles out of network (latent demand and latent delay) do not change significantly in the 2015 model (1% decrease in demand and 2% increase in delay) but they both increase by 30% and 20% in the 2040 model, respectively. Out-of-network latent delay and demand can be reduced by synchronizing traffic signal timing along the corridors in the future year conditions.

Distance traveled drops by 1% in the 2015 model and increases by 7% in the 2040 model. Since more vehicles could enter the network in the 2040 model (reduction in latent demand), an increase in total distance is expected. The network performance tables developed for each individual PTC reveal that the increase in total distance is largely due to the HSR implementation. More detailed results for this discussion can be found behind Tab (2015 Final Model AM/PM), electronically (2015 PM Final Results.PDF) and Tab (2040 HSR + VSL + ARM), electronically (2040 PM Final Results.PDF) attachments in this Appendix.

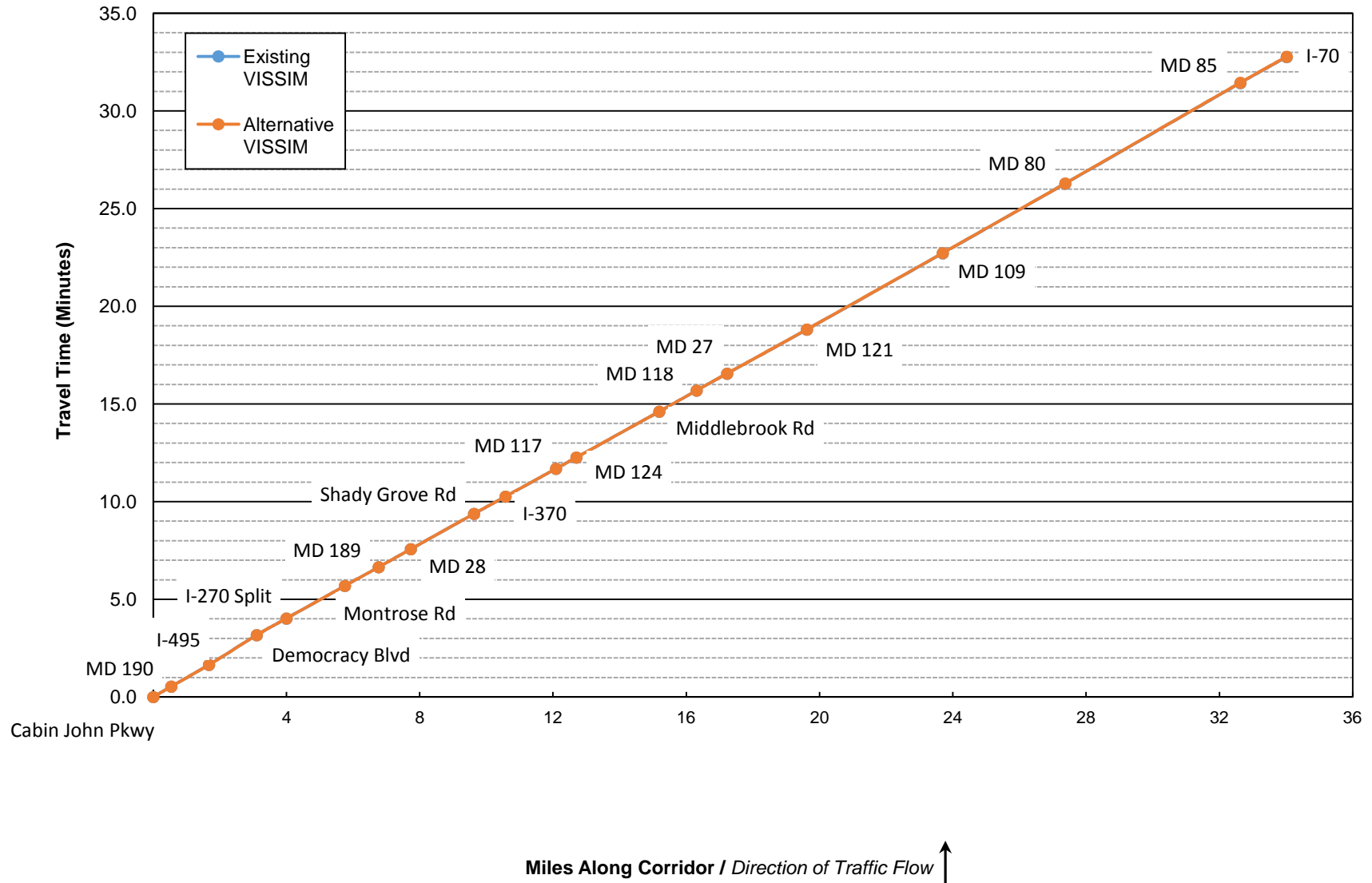
**Figure A.1: AM Peak - 2015 Hard Shoulder Running
I-270 Travel Time Graph - Northbound**



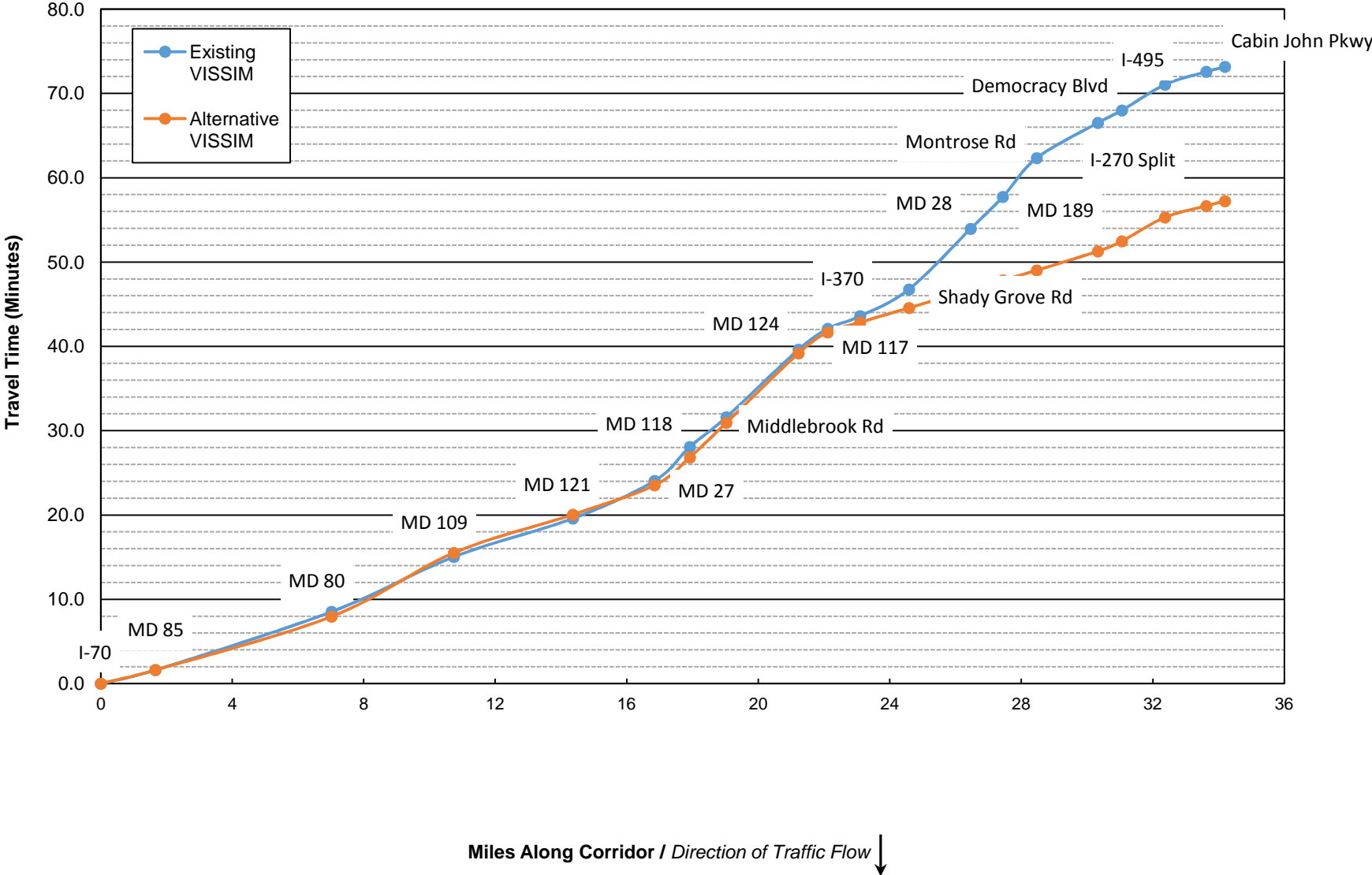
**Figure A.2: AM Peak - 2015 Hard Shoulder Running
I-270 Travel Time Graph - Southbound**



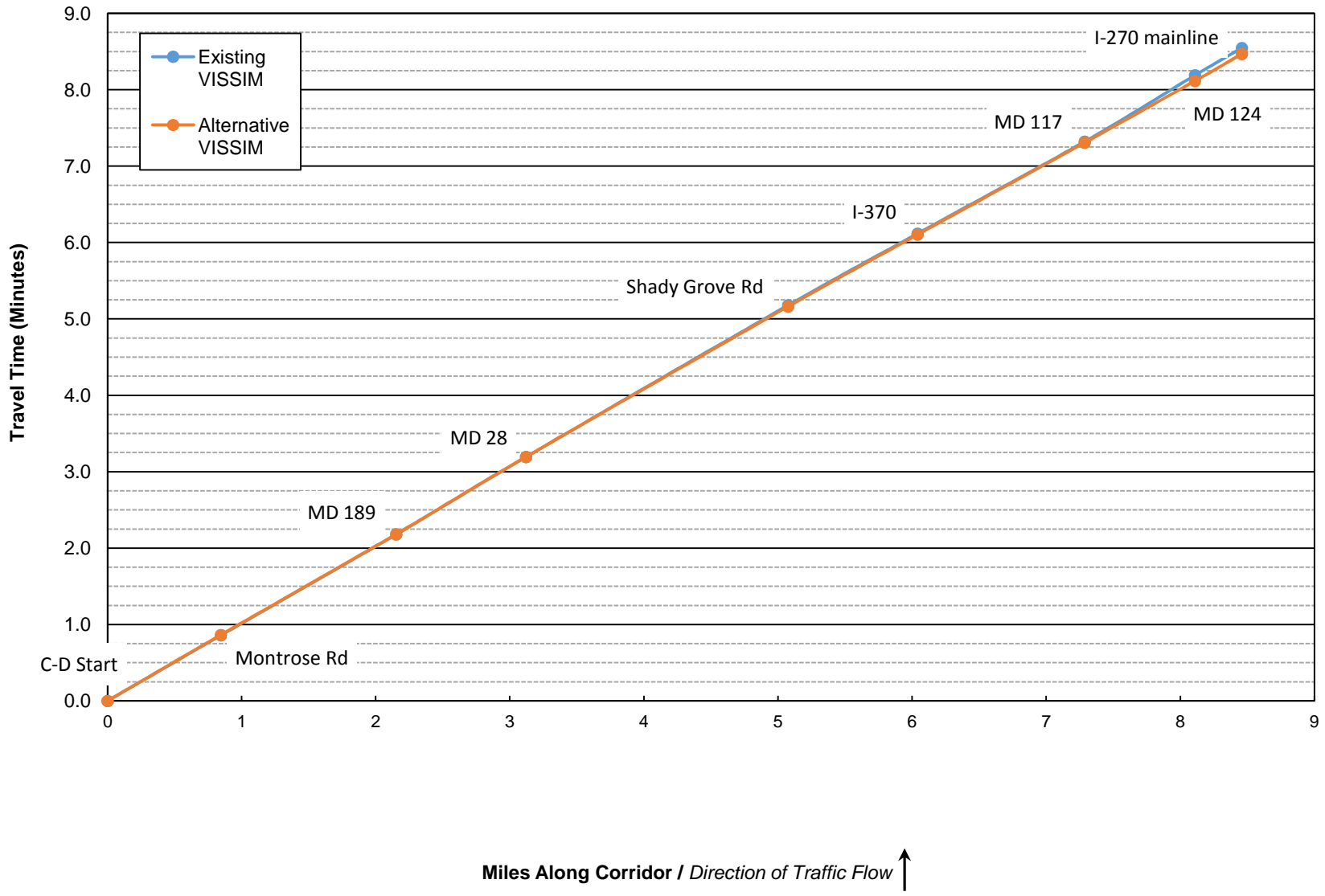
**Figure A.3: AM Peak - 2015 Hard Shoulder Running
I-270 Spur Travel Time Graph - Northbound**



**Figure A.4: AM Peak - 2015 Hard Shoulder Running
I-270 Spur Travel Time Graph - Southbound**



**Figure A.5: AM Peak - 2015 Hard Shoulder Running
I-270 Local Travel Time Graph - Northbound**



**Figure A.6: AM Peak - 2015 Hard Shoulder Running
I-270 Local Travel Time Graph - Southbound**

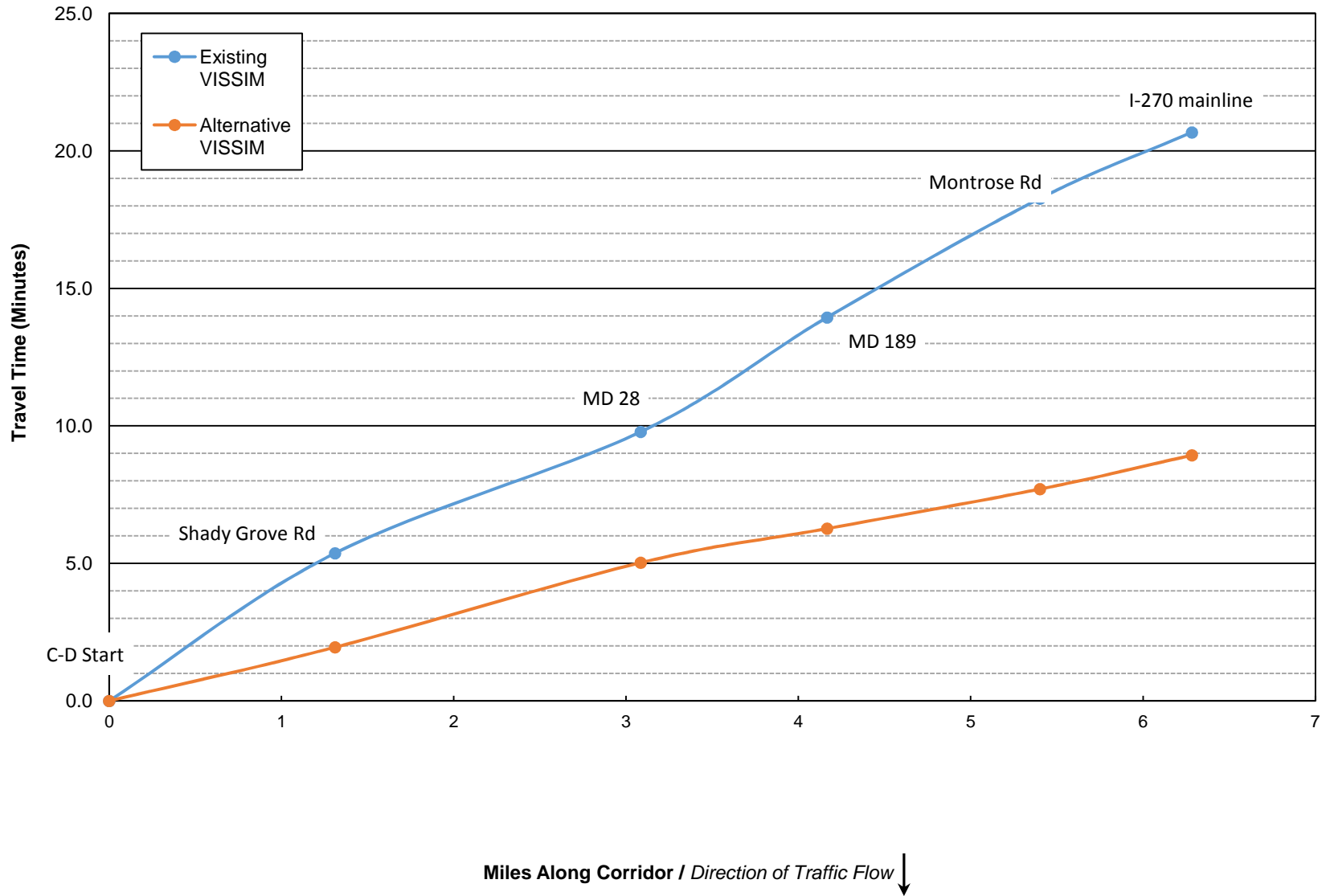


Table A.1: AM Peak -2015 Hard Shoulder Running- I-270 Vehicle Travel Time

I-270 Northbound	Segment Length (miles)	Existing VISSIM Travel Time (seconds)	HSR VISSIM Travel Time (seconds)	% Change	I-270 Southbound	Segment Length (miles)	Existing VISSIM Travel Time (seconds)	HSR VISSIM Travel Time (seconds)	% Change
From I-495 interchange					From I-70				
to MD 187	1.8	109.0	109.1	0%	to MD 85	1.7	97.0	97.0	0%
to I-270 Split	0.6	37.5	37.4	0%	to MD 80	5.4	414.5	380.0	-8%
to Montrose Rd	1.8	100.1	100.1	0%	to MD 109	3.7	390.6	453.4	16%
to MD 189	1.0	57.6	57.6	0%	to MD 121	3.6	273.2	272.3	0%
to MD 28	1.0	55.1	55.2	0%	to MD 27	2.5	267.9	209.2	-22%
to Shady Grove Rd	1.9	108.4	108.5	0%	to MD 118	1.1	241.4	197.7	-18%
to I-370	0.9	53.0	53.0	0%	to Middlebrook Rd	1.1	211.7	246.7	17%
to MD 117	1.5	85.5	85.5	0%	to MD 124	2.2	480.5	494.4	3%
to MD 124	0.6	34.5	34.5	0%	to MD 117	0.9	148.4	149.1	0%
to Middlebrook Rd	2.5	140.9	141.0	0%	to I-370	1.0	90.2	71.1	-21%
to MD 118	1.1	64.8	64.8	0%	to Shady Grove Rd	1.5	190.3	102.6	-46%
to MD 27	0.9	51.8	52.0	0%	to MD 28	1.9	431.1	129.9	-70%
to MD 121	2.4	135.3	135.4	0%	to MD 189	1.0	227.1	67.1	-70%
to MD 109	4.1	234.5	234.7	0%	to Montrose Rd	1.0	276.2	70.4	-75%
to MD 80	3.7	213.8	213.9	0%	to I-270 Split	1.9	250.6	135.6	-46%
to MD 85	5.3	309.0	309.3	0%	to MD 187	0.4	30.0	29.9	0%
to I-70	1.4	79.9	79.9	0%	to I-495 interchange	1.9	131.8	131.7	0%
I-270 Total (miles/minutes)	32.4	31.2	31.2	0%	I-270 Total (miles/minutes)	32.7	69.2	54.0	-22%
I-270 Spur Northbound					I-270 Spur Southbound				
From Cabin John Pkwy					From I-70				
to MD 190	0.5	32.2	32.2	0%	to I-270 Split	30.3	3,990.6	3,076.3	-23%
to I-495	1.1	66.7	66.6	0%	to Democracy Blvd	0.7	88.4	71.5	-19%
to Democracy Blvd	1.4	91.2	91.4	0%	to I-495	1.3	183.1	169.6	-7%
to I-270 Split	0.9	51.0	51.0	0%	to MD 190	1.3	92.2	80.9	-12%
to I-70	30.0	1,724.3	1,725.2	0%	to Cabin John Pkwy	0.6	35.0	34.9	0%
I-270 Spur Total (miles/minutes)	34.0	32.8	32.8	0%	I-270 Spur Total (miles/minutes)	34.2	73.2	57.2	-22%

Table A.2: AM Peak -2015 Hard Shoulder Running- I-270 Local Vehicle Travel Time

I-270 Northbound	Segment Length (miles)	Existing VISSIM Travel Time (seconds)	HSR VISSIM Travel Time (seconds)	% Change	I-270 Southbound	Segment Length (miles)	Existing VISSIM Travel Time (seconds)	HSR VISSIM Travel Time (seconds)	% Change
From C-D start					From C-D start				
to Montrose Rd	0.8	51.6	51.8	0%	to Shady Grove	1.3	322.1	117.1	-64%
to MD 189	1.3	79.3	79.0	0%	to MD 28	1.8	264.8	184.5	-30%
to MD 28	1.0	60.7	60.8	0%	to MD 189	1.1	249.5	74.3	-70%
to Shady Grove	2.0	119.1	118.1	-1%	to Montrose	1.2	259.4	86.3	-67%
to I-370	1.0	56.3	56.5	0%	to I-270 mainline	0.9	144.4	73.7	-49%
to MD 117	1.2	72.3	72.2	0%					
to MD 124	0.8	52.1	48.4	-7%					
to I-270 mainline	0.4	21.4	21.2	-1%					
I-270 Local Total (miles/minutes)	8.5	8.5	8.5	-1%	I-270 Local Total (miles/minutes)	6.3	20.7	8.9	-57%

Table A.3: AM Peak -2015 Hard Shoulder Running- I-270 Vehicle Speed

I-270 Northbound	Segment Length (miles)	Existing VISSIM Speed (MPH)	HSR VISSIM Speed (MPH)	% Change	I-270 Southbound	Segment Length (miles)	Existing VISSIM Speed (MPH)	HSR VISSIM Speed (MPH)	% Change
From I-495 interchange					From I-70				
to MD 187	1.8	60.5	60.5	0%	to MD 85	1.7	61.7	61.7	0%
to I-270 Split	0.6	56.7	56.8	0%	to MD 80	5.4	46.5	50.7	9%
to Montrose Rd	1.8	63.0	63.0	0%	to MD 109	3.7	34.3	29.5	-14%
to MD 189	1.0	63.3	63.3	0%	to MD 121	3.6	47.7	47.9	0%
to MD 28	1.0	62.9	62.9	0%	to MD 27	2.5	33.4	42.7	28%
to Shady Grove Rd	1.9	63.0	63.0	0%	to MD 118	1.1	16.0	19.5	22%
to I-370	0.9	64.1	64.1	0%	to Middlebrook Rd	1.1	18.9	16.2	-14%
to MD 117	1.5	63.8	63.8	0%	to MD 124	2.2	16.5	16.0	-3%
to MD 124	0.6	63.9	63.9	0%	to MD 117	0.9	21.5	21.4	0%
to Middlebrook Rd	2.5	63.6	63.5	0%	to I-370	1.0	39.3	49.9	27%
to MD 118	1.1	62.3	62.3	0%	to Shady Grove Rd	1.5	28.1	52.2	85%
to MD 27	0.9	63.6	63.4	0%	to MD 28	1.9	15.7	52.0	232%
to MD 121	2.4	63.7	63.7	0%	to MD 189	1.0	15.5	52.5	239%
to MD 109	4.1	62.6	62.6	0%	to Montrose Rd	1.0	13.5	52.8	292%
to MD 80	3.7	61.9	61.9	0%	to I-270 Split	1.9	26.7	49.3	85%
to MD 85	5.3	61.2	61.2	0%	to MD 187	0.4	52.3	52.5	0%
to I-70	1.4	62.7	62.7	0%	to I-495 interchange	1.9	51.7	51.7	0%
I-270 Total (miles/minutes)	32.4	62.4	62.4	0%	I-270 Total (miles/minutes)	32.7	28.3	36.3	28%
I-270 Spur Northbound					I-270 Spur Southbound				
From Cabin John Pkwy					From I-70				
to MD 190	0.5	60.3	60.3	0%	to I-270 Split	30.3	27.4	35.5	30%
to I-495	1.1	61.2	61.2	0%	to Democracy Blvd	0.7	29.8	36.8	24%
to Democracy Blvd	1.4	56.6	56.5	0%	to I-495	1.3	25.8	27.8	8%
to I-270 Split	0.9	62.9	62.9	0%	to MD 190	1.3	48.9	55.8	14%
to I-70	30.0	62.7	62.6	0%	to Cabin John Pkwy	0.6	58.6	58.8	0%
I-270 Spur Total (miles/minutes)	34.0	62.3	62.3	0%	I-270 Spur Total (miles/minutes)	34.2	28.0	35.9	28%

Table A.4: AM Peak -2015 Hard Shoulder Running- I-270 Local Vehicle Speed

I-270 Northbound	Segment Length (miles)	Existing VISSIM Speed (MPH)	HSR VISSIM Speed (MPH)	% Change	I-270 Southbound	Segment Length (miles)	Existing VISSIM Speed (MPH)	HSR VISSIM Speed (MPH)	% Change
From C-D start					From C-D start				
to Montrose Rd	0.8	59.0	58.7	0%	to Shady Grove	1.3	14.6	40.3	175%
to MD 189	1.3	59.3	59.5	0%	to MD 28	1.8	24.1	34.6	44%
to MD 28	1.0	57.4	57.3	0%	to MD 189	1.1	15.6	52.4	236%
to Shady Grove	2.0	59.1	59.6	1%	to Montrose	1.2	17.1	51.5	201%
to I-370	1.0	61.7	61.5	0%	to I-270 mainline	0.9	22.0	43.1	96%
to MD 117	1.2	62.1	62.1	0%					
to MD 124	0.8	56.8	61.2	8%					
to I-270 mainline	0.4	58.9	59.3	1%					
I-270 Local Total (miles/minutes)	8.5	59.4	59.9	1%	I-270 Local Total (miles/minutes)	6.3	18.2	42.2	131%

Table A.5: AM Peak -2015 Hard Shoulder Running- I-270 Vehicle Density

I-270 Northbound	Type	Existing		HSR		% Change	I-270 Southbound	Type	Existing		HSR		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS	
I-270	Freeway	25	C	25	C	0%	I-270	Freeway	20	C	20	C	0%
I-270 Diverge to MD 187	Diverge	19	B	19	B	0%	I-270 Merge from WB I-70	Merge	13	B	13	B	0%
I-270	Freeway	22	C	22	C	0%	I-270	Freeway	24	C	24	C	0%
I-270 Diverge to Rockledge Rd	Diverge	19	B	19	B	0%	I-270 Merge from EB I-70	Merge	20	B	20	B	0%
I-270	Freeway	19	C	19	C	0%	I-270	Freeway	28	D	28	D	0%
I-270 Weave from MD 187 to I-270 HOV	Weave	10	B	10	B	0%	I-270 Diverge to SB MD 85	Diverge	31	D	31	D	0%
I-270 Lane Drop	Merge	15	B	15	B	0%	I-270	Freeway	27	D	27	D	0%
I-270	Freeway	27	D	26	D	-1%	I-270 Diverge to NB MD 85	Diverge	15	B	15	B	-4%
I-270 Merge from I-270 Spur	Merge	24	C	24	C	0%	I-270	Freeway	23	C	19	C	-18%
I-270 Weave from I-270 HOV to I-270 C-D	Weave	27	C	27	C	0%	I-270 Merge from MD 85	Merge	14	B	11	B	-20%
I-270	Freeway	23	C	23	C	0%	I-270	Freeway	36	E	25	C	-30%
I-270 Diverge to C-D (MD 189)	Diverge	21	C	21	C	0%	I-270 Diverge to MD 80	Diverge	39	E	72	F	84%
I-270	Freeway	18	B	18	B	0%	I-270	Freeway	75	F	73	F	-4%
I-270 Diverge to C-D (MD 28)	Diverge	19	B	19	B	0%	I-270 Merge from MD 80	Merge	85	F	43	F	-49%
I-270	Freeway	15	B	15	B	0%	I-270	Freeway	55	F	63	F	14%
I-270 Merge from C-D (MD 189)	Merge	18	B	18	B	0%	I-270 Diverge to MD 109	Diverge	33	D	34	D	4%
I-270 Diverge to C-D (Shady Grove Rd)	Diverge	26	C	26	C	-1%	I-270	Freeway	66	F	68	F	3%
I-270	Freeway	14	B	14	B	0%	I-270 Merge from MD 109	Merge	55	F	51	F	-7%
I-270 Weave from C-D (MD 28) to C-D (Shady Grove Rd)	Weave	13	B	13	B	1%	I-270	Freeway	47	F	47	F	-1%
I-270	Freeway	11	B	11	B	0%	I-270 Diverge to SB Weigh Station	Diverge	19	B	19	B	-1%
I-270 Merge from C-D (Shady Grove Rd)	Merge	10	B	10	B	0%	I-270	Freeway	39	E	39	E	-1%
I-270	Freeway	13	B	13	B	0%	I-270 Merge from SB Weigh Station	Merge	20	C	20	C	-1%
I-270 Merge from C-D (I-370)	Merge	11	B	11	B	0%	I-270	Freeway	41	E	41	E	0%
I-270 Diverge to C-D (MD 117)	Diverge	16	B	17	B	0%	I-270 Diverge to MD 121	Diverge	20	C	18	B	-12%
I-270	Freeway	13	B	13	B	0%	I-270	Freeway	31	D	27	D	-15%
I-270 Merge from C-D (MD 124)	Merge	14	B	14	B	0%	I-270 Merge from MD 121	Merge	32	D	22	C	-30%
I-270	Freeway	17	B	17	B	0%	I-270	Freeway	53	F	29	D	-44%
I-270 Diverge to EB Middlebrook Rd	Diverge	11	B	11	B	0%	I-270 Diverge to MD 27	Diverge	55	F	46	F	-16%
I-270	Freeway	15	B	15	B	1%	I-270	Freeway	80	F	64	F	-20%
I-270 Diverge to WB Middlebrook Rd	Diverge	10	A	10	A	0%	I-270 Merge from WB MD 27	Merge	83	F	69	F	-17%
I-270	Freeway	14	B	14	B	0%	I-270	Freeway	78	F	68	F	-12%
I-270 Diverge to EB MD 118	Diverge	11	B	11	B	-2%	I-270 Weave from EB MD 27 to MD 118	Weave	76	F	68	F	-11%
I-270 Diverge to WB MD 118	Diverge	14	B	15	B	1%	I-270	Freeway	89	F	81	F	-9%
I-270	Freeway	13	B	13	B	0%	I-270 Merge from WB MD 118	Merge	70	F	64	F	-8%
I-270 Weave from MD 118 to MD 27	Weave	13	B	13	B	1%	I-270	Freeway	85	F	82	F	-4%
I-270	Freeway	12	B	12	B	0%	I-270 Merge from EB MD 118	Merge	70	F	91	F	29%
I-270 Merge from EB MD 27	Merge	13	B	13	B	1%	I-270	Freeway	75	F	103	F	37%
I-270	Freeway	13	B	13	B	0%	I-270 Merge from Middlebrook Rd	Merge	99	F	97	F	-3%
I-270 Merge from WB MD 27	Merge	10	A	10	A	-1%	I-270	Freeway	107	F	106	F	-1%
I-270	Freeway	14	B	14	B	0%	I-270 Diverge to MD 124	Diverge	93	F	124	F	33%
I-270 Diverge to MD 121	Diverge	10	A	10	A	0%	I-270	Freeway	92	F	90	F	-2%

Table A.5: AM Peak -2015 Hard Shoulder Running- I-270 Vehicle Density

I-270 Northbound	Type	Existing		HSR		% Change	I-270 Southbound	Type	Existing		HSR		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS			
I-270	Freeway	12	B	12	B	0%	I-270 Merge from WB MD 124	Merge	119	F	102	F	-14%
I-270 Merge from EB MD 121	Merge	9	A	9	A	0%	I-270	Freeway	47	F	43	E	-9%
I-270 Lane Drop	Merge	13	B	13	B	0%	I-270 Merge from MD 117	Merge	46	F	38	E	-19%
I-270	Freeway	18	C	18	C	0%	I-270	Freeway	48	F	36	E	-24%
I-270 Diverge to NB Weigh Station	Diverge	10	A	10	B	0%	I-270 Diverge to I-370	Diverge	43	F	31	D	-27%
I-270	Freeway	20	C	20	C	0%	I-270	Freeway	51	F	32	D	-36%
I-270 Merge from NB Weight Station	Merge	10	B	10	A	-1%	I-270 Diverge to I-270 C-D	Diverge	81	F	25	C	-69%
I-270	Freeway	20	C	20	C	1%	I-270	Freeway	36	E	21	C	-42%
I-270 Diverge to MD 109	Diverge	11	B	11	B	2%	I-270 Merge from I-270 (I-370)	Merge	94	F	20	C	-78%
I-270	Freeway	19	C	19	C	1%	I-270 Diverge to I-270 C-D (Shady Grove Rd)	Diverge	87	F	21	C	-76%
I-270 Merge from MD 109	Merge	10	B	10	A	-1%	I-270	Freeway	90	F	18	C	-79%
I-270	Freeway	20	C	20	C	0%	I-270 Merge from I-270 C-D (Shady Grove Rd Northern)	Merge	102	F	22	C	-79%
I-270 Diverge to MD 80	Diverge	12	B	11	B	-3%	I-270	Freeway	86	F	22	C	-74%
I-270	Freeway	18	B	18	B	-1%	I-270 Merge from I-270 C-D (Shady Grove Rd Southern)	Merge	107	F	20	C	-81%
I-270 Merge from MD 80	Merge	12	B	12	B	-1%	I-270 Diverge to I-270 C-D (MD 189)	Diverge	89	F	27	C	-69%
I-270	Freeway	22	C	22	C	0%	I-270	Freeway	100	F	18	B	-82%
I-270 Diverge to Scenic View	Diverge	11	B	11	B	0%	I-270 Merge from I-270 C-D (MD 189)	Merge	123	F	18	B	-86%
I-270	Freeway	22	C	22	C	0%	I-270	Freeway	83	F	26	C	-69%
I-270 Merge from Scenic View	Merge	11	B	11	B	0%	I-270 Merge from I-270 C-D	Merge	41	F	32	D	-21%
I-270	Freeway	22	C	22	C	0%	I-270 Diverge to I-270 HOV Lane	Diverge	21	C	21	C	0%
I-270 Diverge to NB MD 85	Diverge	12	B	13	B	1%	I-270 Diverge to I-270 Spur	Diverge	40	E	33	D	-18%
I-270	Freeway	21	C	21	C	2%	I-270	Freeway	24	C	23	C	-1%
I-270 Diverge to SB MD 85	Diverge	16	B	16	B	4%	I-270 Diverge to Rockledge Dr / MD 187	Diverge	16	B	16	B	-2%
I-270	Freeway	17	B	17	B	1%	I-270	Freeway	25	C	25	C	0%
I-270 Weave from MD 85 to I-70	Weave	11	B	11	B	-1%	I-270 Merge from Rockledge Dr	Merge	20	B	19	B	-2%
I-270	Freeway	15	B	15	B	0%	I-270	Freeway	25	C	25	C	0%
							I-270 Merge from Rockledge Dr / MD 187	Merge	22	C	22	C	-1%
							I-270	Freeway	27	D	27	D	0%

Table A.6: AM Peak -2015 Hard Shoulder Running- I-270 Spur Vehicle Density

I-270 Spur Northbound	Type	Existing		HSR		% Change	I-270 Southbound	Type	Existing		HSR		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS			
I-270 Spur	Freeway	34	D	34	D	0%	I-270 Spur	Freeway	48	F	37	E	-23%
I-270 Spur Merge from Clara Barton Parkway	Merge	24	C	24	C	0%	I-270 Spur Weave from I-270 HOV to Democracy Blvd	Weave	53	F	48	F	-10%
I-270 Spur	Freeway	37	E	37	E	0%	I-270 Spur	Freeway	52	F	45	F	-13%
I-270 Diverge to MD 190	Diverge	27	C	27	C	0%	I-270 Merge from Democracy Blvd	Merge	28	D	26	C	-8%
I-270 Spur	Freeway	32	D	32	D	0%	I-270 Spur Lane Drop	Merge	52	F	49	F	-4%
I-270 Spur Merge from Cabin John Parkway	Merge	23	C	23	C	0%	I-270 Spur	Freeway	72	F	71	F	-1%
I-270 Spur Merge from MD 190	Merge	23	C	23	C	0%	I-270 Spur Merge from I-495	Merge	37	E	31	D	-17%
I-270 Spur	Freeway	30	D	30	D	0%	I-270 Spur	Freeway	39	E	32	D	-17%
I-270 Spur Diverge to I-495	Merge	32	D	32	D	-1%	I-270 Spur Diverve to EB MD 190	Diverge	46	F	39	E	-15%
I-270 Spur	Freeway	31	D	31	D	0%	I-270 Spur Diverve to Cabin John Pkwy	Diverge	27	C	27	C	1%
I-270 Spur Diverge to Democracy Blvd	Diverge	25	C	25	C	2%	I-270 Spur	Freeway	28	D	29	D	1%
I-270 Spur	Freeway	23	C	24	C	1%	I-270 Merge from MD 190	Merge	25	C	25	C	1%
I-270 Spur Merge from EB Democracy Blvd	Merge	15	B	15	B	1%	I-270 Spur	Freeway	33	D	33	D	1%
I-270 Spur	Freeway	23	C	23	C	0%	I-270 Diverge to WB Clara Barton Pkwy	Diverge	22	C	22	C	1%
I-270 Spur Merge from WB Democracy Blvd	Merge	15	B	15	B	0%	I-270 Spur	Freeway	32	D	33	D	1%
I-270 Spur	Freeway	23	C	23	C	0%	I-270 Merge from Clara Barton Pkwy	Merge	28	D	28	D	1%
I-270 Spur Merge from Westlake Terrace	Merge	23	C	23	C	0%							
I-270 Spur	Freeway	24	C	24	C	0%							

Table A.7: AM Peak -2015 Hard Shoulder Running- I-270 Local Vehicle Density

I-270 Northbound	Type	Existing		HSR		% Change	I-270 Southbound	Type	Existing		HSR		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS			
I-270 C-D	Freeway	33	D	33	D	1%	I-270 C-D	Freeway	87	F	21	C	-76%
I-270 C-D Diverge to EB Montrose Rd	Diverge	21	C	21	C	1%	I-270 C-D Weave from I-370 EB to I-270	Weave	88	F	30	C	-66%
I-270 C-D	Freeway	19	C	19	C	0%	I-270 C-D Diverge to Shady Grove Rd	Diverge	53	F	30	D	-44%
I-270 C-D Weave between Montrose Rd Loop Ramps	Weave	13	B	12	B	-1%	I-270 C-D	Freeway	76	F	63	F	-18%
I-270 C-D	Freeway	18	B	18	B	0%	I-270 C-D Merge from WB Shady Grove Rd	Merge	62	F	51	F	-17%
I-270 C-D Merge from WB Montrose Rd	Merge	20	B	20	B	1%	I-270 C-D	Freeway	75	F	64	F	-15%
I-270 C-D	Freeway	28	D	28	D	-1%	I-270 C-D Merge from EB Shady Grove Rd	Merge	53	F	46	F	-13%
I-270 C-D Merge from I-270	Merge	28	D	28	D	-1%	I-270 C-D	Freeway	68	F	33	D	-52%
I-270 C-D	Freeway	29	D	29	D	0%	I-270 C-D Merge from I-270	Merge	75	F	19	B	-75%
I-270 C-D Diverge to MD 189	Diverge	16	B	16	B	-1%	I-270 C-D Diverge to I-270	Diverge	42	F	38	E	-8%
I-270 C-D	Freeway	22	C	22	C	0%	I-270 C-D Diverge to I-270	Diverge	29	D	28	C	-6%
I-270 C-D Merge from MD 189	Merge	15	B	16	B	3%	I-270 C-D	Freeway	20	C	19	C	-9%
I-270 C-D	Freeway	29	D	29	D	0%	I-270 C-D Diverge to MD 28	Diverge	13	B	12	B	-8%
I-270 C-D Weave between I-270 (to MD 28 from MD 189)	Weave	28	C	28	C	-1%	I-270 C-D	Freeway	20	C	13	B	-34%
I-270 C-D	Freeway	30	D	30	D	-1%	I-270 C-D Merge from WB MD 28	Merge	36	E	9	A	-75%
I-270 C-D Diverge to MD 28	Diverge	21	C	21	C	-1%	I-270 C-D	Freeway	64	F	16	B	-74%
I-270 C-D	Freeway	26	C	26	C	0%	I-270 C-D Merge from EB MD 28	Merge	134	F	19	B	-86%
I-270 C-D Weave between MD 28 Ramps	Weave	35	D	37	E	8%	I-270 C-D	Freeway	109	F	31	D	-71%
I-270 C-D	Freeway	10	A	10	A	3%	I-270 C-D Merge from I-270	Merge	112	F	23	C	-79%
I-270 C-D Merge from MD 28 WB	Merge	7	A	7	A	1%	I-270 C-D	Freeway	79	F	20	C	-75%
I-270 C-D Merge from I-270 and Drop Lane	Merge	9	A	9	A	2%	I-270 C-D Diverge to MD 189	Diverge	48	F	19	B	-62%
I-270 C-D Diverge to I-270	Diverge	14	B	15	B	1%	I-270 C-D	Freeway	113	F	14	B	-88%
I-270 C-D	Freeway	23	C	23	C	-1%	I-270 C-D Merge from MD 189	Merge	110	F	20	B	-82%
I-270 C-D Diverge to Shady Grove Rd	Diverge	19	B	19	B	-1%	I-270 C-D Diverge to I-270	Diverge	68	F	25	C	-63%
I-270 C-D	Freeway	5	A	5	A	0%	I-270 C-D	Freeway	40	E	27	D	-34%
I-270 C- D Merge from I-270 and EB Shady Grove Rd	Merge	9	A	9	A	0%	I-270 C-D Diverge to WB Montrose Rd	Diverge	26	C	14	B	-45%
I-270 C-D	Freeway	9	A	9	A	0%	I-270 C-D	Freeway	53	F	25	C	-53%
I-270 C-D Merge from WB Shady Grove Rd	Merge	10	B	11	B	1%	I-270 Weave between Montrose Rd Loops	Weave	61	F	34	D	-44%
I-270 C-D Diverge to I-270	Diverge	15	B	15	B	2%	I-270 C-D	Freeway	67	F	32	D	-53%
I-270 C-D	Freeway	14	B	14	B	0%	I-270 C-D Merge from EB Montrose Rd	Merge	54	F	24	C	-55%
I-270 C-D Diverge to I-370	Diverge	13	B	13	B	-1%	I-270 C-D	Freeway	59	F	43	E	-27%
I-270 C-D	Freeway	3	A	3	A	0%							
I-270 Merge from I-370 EB	Merge	6	A	6	A	-2%							
I-270 C-D	Freeway	7	A	7	A	0%							
I-270 C-D Weave from I-370 to I-270	Weave	16	B	16	B	0%							
I-270 C-D	Freeway	11	A	11	A	0%							
I-270 C-D Weave from I-270 to MD 117	Weave	16	B	16	B	-1%							
I-270 C-D Diverge to MD 124	Diverge	11	B	9	A	-19%							
I-270 C-D	Freeway	2	A	2	A	2%							
I-270 C-D Merge from EB MD 124	Merge	5	A	5	A	2%							
I-270 C-D Merge From WB MD 124	Merge	8	A	7	A	-2%							

Table A.8: AM Peak -2015 Hard Shoulder Running- I-270 Vehicle Throughput

I-270 Northbound	Existing VISSIM Throughput	HSR VISSIM Throughput	% Change	I-270 Southbound	Existing VISSIM Throughput	HSR VISSIM Throughput	% Change
Between I-495 and MD 187	4495	4495	0%	North of I-70	2502	2502	0%
Between MD 187 on and off ramps	3999	3999	0%	Between I-70 on ramps	2857	2857	0%
Between Rockledge Blvd on and off ramps	3361	3361	0%	From I-70 interchange to MD-85	4925	4925	0%
Between Rockledge Dr and I-270 Spur	3094	3090	0%	Between MD-85 on and off ramps	2771	2770	0%
Between I-270 Spur and Montrose Rd	8311	8301	0%	Between MD-85 and MD-80	3221	1972	-39%
Between Montrose Rd on and off ramps	4705	4694	0%	Between MD-80 on and off ramps	3185	3087	-3%
Between Montrose Rd and MD 189	4376	4376	0%	Between MD-80 and Md-109	3861	3810	-1%
Between MD 189 and MD 28	4381	4373	0%	Between MD-109 on and off ramps	3800	3783	0%
Between MD 28 on and off ramps	4677	4683	0%	Between MD-109 and MD-121	4257	4246	0%
Between MD 28 and Shady Grove Rd	3378	3380	0%	Between MD-121 on and off ramps	4043	4076	1%
Between Shady Grove Rd and I-370	2853	2860	0%	Between MD-121 and MD-27	4694	4857	3%
Between I-370 on and off ramps	3129	3134	0%	Between MD-27 on and off ramps	4342	4459	3%
Between I-370 and MD 117	4195	4197	0%	Between MD-27 and MD-118	4665	4797	3%
Between MD 117 and MD 124	3275	3274	0%	Between MD-118 on and off ramps	4480	4577	2%
Between MD-124 on and off ramps	3278	3276	0%	Between MD-118 and Middlebrook Rd	5032	5110	2%
Between MD 124 and Middlebrook Rd	4082	4082	0%	Between Middlebrook Rd on and off ramps	5031	5101	1%
Between Middlebrook Rd on and off ramps	3784	3783	0%	Between Middlebrook Rd and MD-124	6737	6824	1%
Between Middlebrook Rd and MD 118	3344	3345	0%	Between MD-124 on and off ramps	5818	5918	2%
Between MD-118 on and off ramps	3008	3005	0%	Between MD-124 and MD-117	6930	7108	3%
Between MD 118 and MD 27	2831	2832	0%	Between MD-117 and I-370	8479	8755	3%
Between MD-27 on and off ramps	2232	2235	0%	Between I-370 on and off ramps	3024	3173	5%
Between MD 27 and MD 121	2515	2512	0%	Between I-370 on ramp to Shady Grove Rd	4111	3180	-23%
Between MD-121 on and off ramps	2211	2213	0%	Between Shady Grove Rd and MD 28	3568	3272	-8%
Between MD 121 and MD 109	2420	2419	0%	Between MD 28 on and off ramps	4420	4137	-6%
Between MD-109 on and off ramps	2263	2264	0%	Between MD 28 and MD 189	3950	3674	-7%
Between MD 109 and MD 80	2363	2360	0%	Between MD 189 and Montrose Rd	3941	3687	-6%
Between MD-80 on and off ramps	2126	2119	0%	Between Montrose Rd on and off ramps	4968	4840	-3%
Between MD 80 and MD 85	2656	2652	0%	Between Montrose Rd and I-270 Spur	8098	7987	-1%
Between MD-85 on and off ramps	2016	2014	0%	Between I-270 Spur and Rockledge Blvd	3901	3841	-2%
Between MD 85 and I-70	2858	2855	0%	Between Rockledge Blvd on and off ramps	2845	2803	-1%
North of I-70	1832	1825	0%	Between MD 187 on and off ramps	2986	2943	-1%
				Between MD 187 and I-495	3083	3071	0%
I-270 Spur Northbound				I-270 Spur Southbound			
Between I-495 and Democracy Blvd	5178	5182	0%	Between I-270 Split and HOV on ramp	4233	4210	-1%
Between Democracy Blvd on and off ramps	4035	4025	0%	Between HOV on ramp and Democracy Blvd	4165	4166	0%
Between Democracy Blvd and I-270 Split	4304	4291	0%	Between Democracy Blvd on and off ramps	3636	3642	0%
				Between Democracy Blvd and I-495	4140	4150	0%

Table A.9: AM Peak -2015 Hard Shoulder Running- I-270 Local Vehicle Throughput

I-270 Local Northbound	Existing VISSIM Throughput	HSR VISSIM Throughput	% Change	I-270 Local Southbound	Existing VISSIM Throughput	HSR VISSIM Throughput	% Change
Between Montrose Rd EB off ramp and EB on ramp	2355	2355	0%	Between I-370 on ramp and I-270 off ramp	4068	4171	3%
Between Montrose Rd EB on ramp and WB off ramp	2567	2570	0%	Between I-270 off ramp and Shady Grove off ramp	2942	4149	41%
Between Montrose Rd WB off ramp and on ramp	2151	2152	0%	Between Shady Grove off ramp and Shady Grove WB on ramp	1759	2873	63%
Between Montrose Rd WB on ramp and I-270 on ramp	3067	3070	0%	Between Shady Grove WB and EB on ramps	2398	3463	44%
Between I-270 on ramp and MD 189 off ramp	3387	3391	0%	Between Shady Grove on ramp and I-270 on ramp	2797	3830	37%
Between MD 189 ramps	2705	2706	0%	Between I-270 on ramp and I-270 off ramp1	3423	4317	26%
Between MD 189 off ramp and I-270 on ramp	3252	3259	0%	Between I-270 off ramp1 and I-270 off ramp2	2902	2751	-5%
Between I-270 on ramp and I-270 off ramp	3988	3993	0%	Between I-270 off ramp2 and MD 28 off ramp	2031	1888	-7%
Between I-270 off ramp and MD 28 EB off ramp	2948	2962	0%	Between MD 28 off ramp and MD 28 WB on ramp	1466	1361	-7%
Between MD 28 EB off ramp to MD 28 EB on ramp	2599	2609	0%	Between MD 28 WB on ramp and MD 28 EB on ramp	1781	1660	-7%
Between MD 28 EB on ramp and MD 28 WB off ramp	2664	2696	1%	Between MD 28 EB on ramp and I-270 on ramp	2841	3077	8%
Between MD 28 WB off ramp and MD 28 WB on ramp	1160	1183	2%	Between I-270 on ramp and MD 189 off ramp	3310	3482	5%
Between MD 28 WB on ramp and I-270 on ramp	1631	1655	1%	Between MD 189 on and off ramps	2671	2823	6%
Between I-270 on ramp and I-270 off ramp	2926	2946	1%	Between MD 189 on ramp and I-270 off ramp	3800	2571	-32%
Between I-270 off ramp and Shady Grove off ramp	2518	2533	1%	Between I-270 off ramp and Montrose Rd off ramp	2573	2612	2%
Between Shady Grove off ramp and I-270 on ramp	321	322	0%	Between Montrose Rd off ramp and Montrose Rd WB on ramp	2455	2477	1%
Between I-270 on ramp and Shady Grove WB on ramp	1562	1565	0%	Between Montrose Rd WB on ramp and EB off ramp	3375	3384	0%
Between Shady Grove WB on ramp and I-270 off ramp	1887	1886	0%	Between Montrose Rd EB off and on ramps	2652	2661	0%
Between I-270 off ramp and I-370 off ramp	1609	1609	0%	Between Montrose Rd EB off ramp and I-270	3384	3389	0%
Between I-370 off ramp and I-370 EB on ramp	332	331	0%				
Between I-370 EB and WB on ramps	826	825	0%				
Between I-370 WB on ramp and I-270 off ramp	2397	2398	0%				
Between I-270 off ramp and I-270 on ramp	1334	1334	0%				
Between I-270 on ramp and MD 117 off ramp	2251	2248	0%				
Between MD 117 off ramp and MD 124 off ramp	1034	1035	0%				
Between MD 124 off ramp and MD 124 EB on ramp	98	99	1%				
Between MD 124 EB and WB on ramps	487	491	1%				
Between MD 124 on ramp I-270	815	814	0%				

Table A.10: AM Peak -2015 Hard Shoulder Running - I-270 On Ramp Queue Length - Northbound

I-270 Northbound	Existing VISSIM Average Queue (feet)	HSR VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	HSR VISSIM Maximum Queue (feet)	% Change
Rockledge Dr on ramp	0	0	-	0	0	-
MD 189 C-D on ramp	0	0	-	0	0	-
MD 28 C-D on ramp	0	0	-	0	0	-
Shady Grove Rd C-D on ramp	0	0	-	0	0	-
I-370 C-D on ramp	0	0	-	0	0	-
MD 124 C-D on ramp	0	0	-	0	0	-
MD 118 on ramp	0	0	-	0	0	-
MD 27 EB on ramp	0	0	-	0	0	-
MD 27 WB on ramp	0	0	-	0	0	-
MD 121 on ramp	0	0	-	0	0	-
MD 109 on ramp	0	0	-	0	0	-
MD 80 on ramp	0	0	-	0	0	-
MD 85 on ramp	0	0	-	0	0	-
I-270 Spur Northbound	Existing VISSIM Average Queue (feet)	HSR VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	HSR VISSIM Maximum Queue (feet)	% Change
Democracy Blvd EB on ramp	0	0	-	0	0	-
Democracy Blvd WB on ramp	0	0	-	0	0	-
I-495 Northbound	Existing VISSIM Average Queue (feet)	HSR VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	HSR VISSIM Maximum Queue (feet)	% Change
Cabin John Pkwy on ramp	0	0	-	0	0	-
MD 190 on ramp	0	0	-	0	0	-
I-270 C-D Northbound	Existing VISSIM Average Queue (feet)	HSR VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	HSR VISSIM Maximum Queue (feet)	% Change
Montrose Rd EB on ramp	0	0	-	0	0	-
Montrose Rd WB on ramp	0	0	-	0	0	-
I-270 on ramp	0	0	-	0	0	-
MD 189 on ramp	0	0	-	0	0	-
I-270 on ramp	0	0	-	0	0	-
MD 28 EB on ramp	0	0	-100%	17	0	-100%
MD 28 WB on ramp	0	0	-	0	0	-
Shady Grove Rd EB on ramp	0	0	-	0	0	-
I-270 on ramp	0	0	-	0	0	-
Shady Grove Rd WB on ramp	0	0	-	0	0	-
I-370 EB on ramp	0	0	-	0	0	-
I-370 WB on ramp	0	0	-	0	0	-
I-270 on ramp	0	0	-	0	0	-
MD 124 EB on ramp	0	0	-	0	0	-
MD 124 WB on ramp	0	0	-	0	0	-

Table A.11: AM Peak -2015 Hard Shoulder Running - I-270 Off Ramp Queue Length - Northbound

I-270 Northbound	Existing VISSIM Average Queue (feet)	HSR VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	HSR VISSIM Maximum Queue (feet)	% Change
MD 187 off ramp NB	56	82	47%	347	416	20%
MD 187 off ramp SB	87	98	12%	439	393	-10%
Rockledge Dr off ramp	4.64	7.27	57%	316	317	0%
Tower Oaks Blvd off ramp	14.02	12.46	-11%	165	151	-8%
Montrose Rd off ramp EB	0	0	-	0	0	-
Montrose Rd off ramp WB	0	0	-	0	0	-
MD 189 off ramp WB	11	11	1%	97	115	19%
MD 189 off ramp EB	1	3	137%	131	230	75%
MD 28 off ramp EB	48	46	-4%	296	268	-9%
MD 28 off ramp WB	1	0	-100%	119	0	-100%
Shady Grove Rd off ramp - Redland Blvd	0	0	-	0	0	-
Shady Grove Rd off ramp WB	191	191	0%	620	643	4%
Shady Grove Rd off ramp EB	0	0	-	0	0	-
I-370 off ramp WB	0	0	-	0	0	-
I-370 off ramp EB	0	0	-	0	0	-
MD 117 off ramp	218	216	-1%	793	742	-6%
MD 124 off ramp	340	223	-34%	957	716	-25%
Watkins Mill Rd off ramp*			-			-
Middlebrook Rd EB off ramp	0	0	-	0	0	-
Middlebrook Rd WB off ramp	0	0	-	0	0	-
MD 118 WB off ramp - Seneca Meadows	0	0	3%	19	24	29%
MD 118 WB off ramp	0	0	-	0	0	-
MD 118 EB off ramp	0	0	-	0	0	-
MD 27 off ramp WB	5	6	7%	83	92	10%
MD 27 off ramp EB	0	0	-	0	0	-
MD 121 off ramp WB	0	0	-19%	37	39	6%
MD 121 off ramp EB	0	0	-	0	0	-
MD 109 off ramp EB	3	2	-8%	97	86	-11%
MD 109 off ramp WB	0	0	-	0	0	-
MD 80 off ramp EB	5	5	-1%	110	117	7%
MD 80 off ramp WB	2	0	-100%	34	0	-100%
MD 85 NB off ramp	0	0	-	0	0	-
MD 85 SB off ramp	0	1	122%	66	90	37%
I-270 Spur Northbound	Existing VISSIM Average Queue (feet)	HSR VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	HSR VISSIM Maximum Queue (feet)	% Change
Clara Barton Pkwy off ramp EB	1	1	-1%	157	157	0%
Clara Barton Pkwy off ramp WB	0	0	-	0	0	-
MD 190 off ramp EB	0	0	-	0	0	-
MD 190 off ramp WB	0	0	-	0	0	-
Democracy Blvd off ramp WB	108	104	-4%	589	503	-15%
Democracy Blvd off ramp EB	16	15	-7%	149	136	-8%

* Ramp in Future Scenario

Table A.12: AM Peak -2015 Hard Shoulder Running - I-270 On Ramp Queue Length - Southbound

I-270 Southbound	Existing VISSIM Average Queue (feet)	HSR VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	HSR VISSIM Maximum Queue (feet)	% Change
MD 85 on ramp	0	0	-	0	0	-
MD 80 on ramp	575	0	-100%	2307	0	-100%
MD 109 on ramp	66.39	7.59	-89%	841	282	-66%
MD 121 WB on ramp	8.05	0.00	-100%	263	0	-100%
MD 121 EB on ramp*			-			-
MD 27 WB on ramp	145	74	-49%	1297	1226	-5%
MD 27 EB on ramp	1	0	-12%	89	83	-7%
MD 118 WB on ramp	0	0	-	0	0	-
MD 118 EB on ramp	0.015	2.110	14397%	9	181	1976%
Middlebrook Rd on ramp	161	110	-32%	1641	934	-43%
MD 124 WB on ramp	254	19	-92%	2615	565	-78%
MD 117 on ramp	94	0	-100%	1640	46	-97%
I-370 C-D on ramp	805	0	-100%	1861	0	-100%
Shady Grove Rd C-D on ramp North	2	0	-100%	160	0	-100%
Shady Grove Rd C-D on ramp South	68	0	-100%	927	0	-100%
MD 189 C-D on ramp	1393	0	-100%	3991	0	-100%
Montrose Rd C-D on ramp	2	0	-100%	246	12	-95%
Rockledge Dr on ramp	0	0	-	0	0	-
MD 187 on ramp	0	0	-	0	0	-
I-270 Spur Southbound	Existing VISSIM Average Queue (feet)	HSR VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	HSR VISSIM Maximum Queue (feet)	% Change
Democracy Blvd on ramp	0	0	-	0	0	-
I-495 Southbound	Existing VISSIM Average Queue (feet)	HSR VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	HSR VISSIM Maximum Queue (feet)	% Change
I-270 Spur on ramp	260	0	-100%	1015	0	-100%
MD 190 on ramp	0	0	-	0	0	-
I-270 C-D Southbound	Existing VISSIM Average Queue (feet)	HSR VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	HSR VISSIM Maximum Queue (feet)	% Change
I-270 on ramp	2305	0	-100%	5053	0	-100%
I-370 on ramp	1241	61	-95%	2914	579	-80%
Shady Grove Rd WB on ramp	1	0	-98%	150	10	-93%
Shady Grove Rd EB on ramp	0	0	-100%	29	0	-100%
I-270 on ramp	0	0	-100%	39	0	-100%
MD 28 WB on ramp	6	0	-100%	121	0	-100%
MD 28 EB on ramp	3166	0	-100%	3877	0	-100%
I-270 on ramp	0	0	-100%	55	0	-100%
MD 189 on ramp	111	0	-100%	1104	0	-100%
Montrose Rd WB on ramp	8	1	-93%	440	126	-71%
Montrose Rd EB on ramp	0	0	-97%	95	6	-94%

* Ramp in Future Scenario

Table A.13: AM Peak -2015 Hard Shoulder Running - I-270 Off Ramp Queue Length - Southbound

I-270 Southbound	Existing VISSIM Average Queue (feet)	HSR VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	HSR VISSIM Maximum Queue (feet)	% Change
MD 85 SB off ramp	0	0	-	0	0	-
MD 85 NB off ramp	0	0	-	0	0	-
MD 80 off ramp	0.41	0.53	29%	69	134	94%
MD 109 off ramp WB	0.00	0.01	130%	7	13	81%
MD 109 off ramp EB	0	0	-	0	0	-
MD 121 off ramp EB	1	1	-12%	93	95	2%
MD 121 off ramp WB	0	0	-	0	0	-
MD 27 off ramp EB	53	56	5%	279	265	-5%
MD 27 off ramp WB	45	1	-98%	289	49	-83%
MD 118 off ramp EB	31	32	3%	161	177	10%
MD 118 off ramp WB	0	0	-	0	0	-
Watkins Mill Rd off ramp*						
MD 124 off ramp EB	75	77	2%	342	397	16%
MD 124 off ramp WB	18	25	37%	405	463	14%
I-370 off ramp WB	0	0	-	0	0	-
I-370 off ramp EB	0	0	-	0	0	-
Shady Grove Rd off ramp - Omega Drive	6	3	-46%	194	139	-28%
Shady Grove Rd off ramp	0	0	-	0	0	-
MD 28 off ramp	3	1	-48%	132	113	-14%
MD 189 off ramp EB	40	41	4%	296	266	-10%
MD 189 off ramp WB	0	0	-	0	0	-
Montrose Rd off ramp WB	0	0	-	0	0	-
Montrose Rd off ramp EB	0	0	-	0	0	-
Rockledge Dr off ramp	18	9	-48%	261	178	-32%
I-270 Spur Southbound	Existing VISSIM Average Queue (feet)	HSR VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	HSR VISSIM Maximum Queue (feet)	% Change
Democracy Blvd off ramp EB	51	50	-1%	230	222	-3%
Democracy Blvd off ramp WB	0	0	-	0	0	-
MD 190 off ramp WB	995	500	-50%	2271	2327	2%
MD 190 off ramp EB	0	0	-	0	0	-
Clara Barton Pkwy WB off ramp	0	0	-	0	0	-

* Ramp in Future Scenario

Table A.14: AM Peak - Existing - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
1- MD 85 at Sam's Club Drive											
1	NB	18.8	B	NB Left	103	76	57	282	E	33.3	C
				NB Through	312	24	57	282	C		
				NB Right	581	6	6	284	A		
	SB	42.4	D	SB Left	110	57	123	552	E		
				SB Through	535	41	123	552	D		
				SB Right	52	24	123	552	C		
	EB	44.4	D	EB Left	81	70	42	165	E		
				EB Through	47	81	42	165	F		
				EB Right	102	7	42	165	A		
	WB	50.7	D	WB Left	204	72	75	302	E		
				WB Through	12	61	75	302	E		
				WB Right	100	6	75	302	A		
2- MD 85 at I-270 NB on and off ramp											
2	NB	42.6	D	NB Left	560	43	155	745	D	28.8	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	14.6	B	SB Left	0	0	0	0	A		
				SB Through	547	15	36	483	B		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
3- MD 85 at I-270 SB on and off ramp											
3	NB	4.3	A	NB Left	0	0	0	0	A	10.2	B
				NB Through	812	4	12	316	A		
				NB Right	0	0	0	0	A		
	SB	41.3	D	SB Left	154	41	37	267	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
4- MD 85 at Crestwood Blvd											
4	NB	15.8	C	NB Left	10	57	34	262	E	19.8	B
				NB Through	585	15	34	262	B		
				NB U-Turn	0	0	0	0	A		
	SB	13.7	B	SB Left	57	68	23	146	E		
				SB Through	1657	14	55	477	B		
				SB Right	751	9	43	467	A		
	EB	49.1	D	EB Left	481	51	70	208	D		
				EB Through	19	62	70	208	E		
				EB Right	32	10	70	208	A		
	WB	43.1	D	WB Left	37	56	17	111	E		
				WB Through	15	59	17	111	E		
				WB Right	19	6	17	111	A		
5- MD 80 at I-270 NB on and ramp											
5	NB	-1.1	A	NB Left	3	0	0	0	A	16.1	B
				NB Through	2	0	0	0	A		
				NB Right	4	-2	0	0	A		
	SB	12.8	B	SB Left	183	15	12	115	B		
				SB Through	5	17	12	115	B		
				SB Right	52	4	1	16	A		
	EB	7.0	A	EB Left	38	8	6	165	A		
				EB Through	0	0	8	0	A		
				EB Right	7	4	13	196	A		
	WB	17.2	B	WB Left	31	13	1	48	B		
				WB Through	684	24	94	544	C		
				WB Right	504	8	6	182	A		
6- MD 80 at I-270 SB on and off ramp											
6	NB	4.1	A	NB Left	22	25	1	113	C	22.2	C
				NB Through	0	0	0	0	A		
				NB Right	262	2	1	113	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	23.0	C	EB Left	0	0	0	0	A		
				EB Through	241	22	26	226	C		
				EB Right	133	25	26	235	D		
	WB	47.1	E	WB Left	0	0	0	0	A		
				WB Through	194	47	126	641	E		
				WB Right	0	0	0	0	A		
7- MD 109 at I-270 NB on and off ramp											
7	NB			NB Left	0	0	0	0	A	2.5	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	8.3	A	SB Left	118	11	7	116	B		
				SB Through	0	0	0	0	A		
				SB Right	38	1	0	0	A		
	EB	3.2	A	EB Left	59	3	0	36	A		
				EB Through	0	0	0	0	A		
				EB Right	40	3	0	0	A		
	WB	0.4	A	WB Left	0	0	0	0	A		
				WB Through	462	0	0	54	A		
				WB Right	0	0	0	0	A		
8- MD 80 at I-270 SB on and off ramp											
8	NB	2.5	A	NB Left	15	10	1	65	B	3.5	A
				NB Through	0	0	0	0	A		
				NB Right	41	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	3.4	A	EB Left	0	0	0	0	A		
				EB Through	59	0	0	34	A		
				EB Right	70	6	1	34	A		
	WB	3.6	A	WB Left	393	3	8	292	A		
				WB Through	109	5	8	269	A		
				WB Right	0	0	0	0	A		
9- MD 121 at Gateway Center Dr											
9	NB	8.4	A	NB Left	95	11	13	147	B	20.7	C
				NB Through	279	12	13	147	B		
				NB Right	198	2	17	173	A		
	SB	16.8	C	SB Left	47	11	31	312	B		
				SB Through	577	17	41	312	B		
				SB Right	6	13	46	333	B		
	EB	33.6	D	EB Left	7	37	86	427	D		
				EB Through	88	44	93	427	D		
				EB Right	547	32	117	459	C		
	WB	30.3	D	WB Left	96	35	19	123	D		
				WB Through	12	33	19	123	C		
				WB Right	21	7	13	142	A		
10- MD 121 at I-270 NB on and off ramp											
10	NB	1.7	A	NB Left	40	10	2	86	A	0.7	A
				NB Through	0	0	0	0	A		
				NB Right	253	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.1	A	EB Left	0	0	0	0	A		
				EB Through	318	0	0	0	A		
				EB Right	49	0	0	0	A		
	WB	0.6	A	WB Left	151	2	1	87	A		
				WB Through	1070	0	0	58	A		
				WB Right	0	0	0	0	A		

Table A.14: AM Peak - Existing - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
11- MD 121 at I-270 SB on and off ramp											
11	NB			NB Left	0	0	0	0	A	1.3	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	7.7	A	SB Left	123	10	6	120	B		
				SB Through	0	0	0	0	A		
				SB Right	46	1	0	0	A		
	EB	0.4	A	EB Left	25	2	0	35	A		
				EB Through	0	0	0	0	A		
				EB Right	833	0	0	0	A		
	WB	0.1	A	WB Left	0	0	0	0	A		
WB Through				277	0	0	0	A			
WB Right				0	0	0	0	A			
12- MD 27 at Observation Dr											
12	NB	48.0	D	NB U-Turn	0	0	0	0	A	19.3	B
				NB Through	34	63	10	64	E		
				NB Right	12	7	10	64	A		
	SB	40.9	D	SB Left	75	52	23	142	D		
				SB Through	43	60	30	226	E		
				SB Right	157	30	52	263	C		
	EB	13.0	B	EB Left	149	30	29	290	C		
				EB Through	1202	11	31	291	B		
				EB Right	50	9	38	329	A		
	WB	20.1	C	WB Left	83	15	138	788	B		
WB Through				2047	21	138	788	C			
WB Right				94	10	138	788	A			
13- MD 27 at I-270 NB off ramp											
13	NB	30.7	C	NB Left	89	31	12	90	C	11.6	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.1	A	EB Left	0	0	0	0	A		
				EB Through	891	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	15.7	B	WB Left	0	0	0	0	A		
WB Through				2110	16	194	1341	B			
WB Right				0	0	0	0	A			
14- MD 27 at I-270 SB off ramp											
14	NB			NB Left	0	0	0	0	A	24.7	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	49.6	D	SB Left	376	50	64	293	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	9.0	A	EB Left	0	0	0	0	A		
				EB Through	657	9	12	192	A		
				EB Right	0	0	0	0	A		
	WB	25.5	C	WB Left	0	0	0	0	A		
WB Through				1263	25	195	645	C			
WB Right				0	0	0	0	A			
15- MD 27 at Crystal Rock Dr											
15	NB	17.8	B	NB Left	22	18	31	405	B	38.3	D
				NB Through	819	18	57	405	B		
				NB Right	72	16	60	418	B		
	SB	46.4	D	SB Left	407	69	356	1190	E		
				SB Through	1333	40	356	1190	D		
				SB Right	40	27	320	1184	C		
	EB	44.6	D	EB Left	177	49	47	169	D		
				EB Through	74	49	43	164	D		
				EB Right	60	27	44	196	C		
	WB	56.0	E	WB Left	8	63	85	273	E		
WB Through				21	302	85	273	F			
WB Right				104	6	85	273	A			
16- MD 118 at Seneca Meadows Pkwy											
16	NB	3.4	A	NB Left	123	10	1	70	A	5.5	A
				NB Through	727	3	4	119	A		
				NB Right	79	1	8	171	A		
	SB	3.7	A	SB Left	25	5	5	169	A		
				SB Through	808	4	8	169	A		
				SB Right	32	2	9	202	A		
	EB	16.9	B	EB Left	15	64	8	69	E		
				EB Through	6	59	8	69	E		
				EB Right	96	7	8	69	A		
	WB	44.2	D	WB Left	30	65	12	94	E		
WB Through				5	68	8	94	E			
WB Right				21	9	11	113	A			
17- MD 118 at I-270 NB on ramp											
17	NB			NB Left	0	0	0	0	A	11.1	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	33.0	C	EB Left	222	33	44	277	C		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	6.0	A	WB Left	0	0	0	0	A		
WB Through				155	1	0	4	A			
WB Right				778	7	16	276	A			
18- MD 118 at I-270 SB off ramp											
18	NB			NB Left	0	0	0	0	A	7.4	A
				NB Through	0	0.0	0	0	A		
				NB Right	0	0.0	0	0	A		
	SB	41.5	D	SB Left	193	41.5	34	164	D		
				SB Through	0	0.0	0	0	A		
				SB Right	0	0.0	0	0	A		
	EB	3.1	A	EB Left	0	0.0	0	0	A		
				EB Through	615	3.1	4	135	A		
				EB Right	0	0.0	0	0	A		
	WB	3.6	A	WB Left	0	0.0	0	0	A		
WB Through				1036	3.6	7	209	A			
WB Right				0	0.0	0	0	A			
19- MD 118 at Aircraft Dr											
19	NB	45.2	D	NB Left	7	70	8	75	E	18.1	B
				NB Through	12	80	8	75	F		
				NB Right	14	3	0	22	A		
	SB	60.7	E	SB Left	241	58	98	368	E		
				SB Through	41	66	98	368	E		
				SB Right	81	67	98	368	E		
	EB	10.4	B	EB Left	102	13	28	310	B		
				EB Through	932	10	28	310	B		
				EB Right	27	9	28	310	A		
	WB	11.5	B	WB Left	73	17	31	246	B		
WB Through				899	14	31	246	B			
WB Right				277	4	31	246	A			
20- Middlebrook Rd at Observation Dr											
20	NB			NB Left	0	0	0	0	A	16.1	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	18.7	B	SB Left	22	35	4	44	D		
				SB Through	0	0	0	0	A		
				SB Right	25	4	4	44	A		
	EB	14.2	B	EB Left	240	21	31	226	C		
				EB Through	865	12	31	226	B		
				EB Right	0	0	0	0	A		
	WB	17.7	B	WB Left	0	0	0	0	A		
WB Through				1072	19	69	381	B			
WB Right				215	13	92	431	B			

Table A.14: AM Peak - Existing - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
21- Middlebrook Rd at I-270 SB on ramp											
21	NB			NB Left	0	0	0	0	A	16.0	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	11.2	B	EB Left	0	0	0	0	A		
				EB Through	805	11	26	186	B		
				EB Right	0	0	0	0	A		
	WB	21.3	C	WB Left	743	21	64	867	C		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
22- Middlebrook Rd at Waring Station Rd											
22	NB	63.1	E	NB Left	147	52	145	449	D	25.3	C
				NB Through	6	52	145	449	D		
				NB Right	342	68	145	449	E		
	SB	21.9	C	SB Left	3	37	1	29	D		
				SB Through	0	0	1	29	A		
				SB Right	3	7	2	67	A		
	EB	18.2	B	EB Left	28	12	124	845	B		
				EB Through	1483	19	124	845	B		
				EB Right	76	10	124	845	A		
	WB	16.1	B	WB Left	78	20	28	213	C		
				WB Through	682	16	28	213	B		
				WB Right	35	4	28	213	A		
23- MD 124 at MD 355											
23	NB	50.5	D	NB Left	229	69	72	198	E	83.6	F
				NB Through	306	42	70	196	D		
				NB Right	37	2	0	0	A		
	SB	33.5	C	SB Left	49	86	121	406	F		
				SB Through	966	50	121	406	D		
				SB Right	619	3	34	375	A		
	EB	99.1	F	EB Left	615	255	1024	1207	F		
				EB Through	528	22	1024	1207	C		
				EB Right	582	5	921	1184	A		
	WB	122.0	F	WB Left	0	0	0	0	A		
				WB Through	1884	123	727	1112	F		
				WB Right	42	68	0	0	E		
24- MD 124 at I-270 SB on and off											
24	NB	65.0	F	NB Left	15	66	15	78	E	22.2	C
				NB Through	29	64	15	78	E		
				NB U-Turn	0	0	0	0	A		
	SB	27.6	C	SB Left	306	67	81	347	E		
				SB Through	4	87	81	347	F		
				SB Right	572	6	13	335	A		
	EB	15.7	B	EB Left	0	0	0	0	A		
				EB Through	904	16	41	321	B		
				EB Right	67	12	50	345	B		
	WB	22.0	C	WB Left	33	27	116	1390	C		
				WB Through	1193	22	116	1390	C		
				WB Right	0	0	0	0	A		
25- MD 117 at MD 124											
25	NB	42.7	D	NB Left	16	65	95	577	E	43.0	D
				NB Through	421	58	95	577	E		
				NB Right	407	26	61	641	C		
	SB	37.8	D	SB Left	181	47	126	605	D		
				SB Through	839	40	126	605	D		
				SB Right	95	2	0	0	A		
	EB	48.4	D	EB Left	80	108	175	722	F		
				EB Through	1383	45	174	723	D		
				EB Right	66	44	187	750	D		
	WB	40.7	D	WB Left	314	73	108	332	E		
				WB Through	480	27	108	332	C		
				WB Right	95	0	0	0	A		
26- MD 117 at Bureau Dr											
26	NB	52.3	D	NB Left	18	70	16	93	E	42.3	D
				NB Through	17	79	16	93	E		
				NB Right	25	21	16	93	C		
	SB	63.4	E	SB Left	191	70	80	297	E		
				SB Through	43	68	80	297	E		
				SB Right	28	13	80	297	B		
	EB	47.0	D	EB Left	28	36	314	962	D		
				EB Through	1928	47	322	962	D		
				EB Right	20	59	315	951	E		
	WB	31.8	C	WB Left	298	93	195	602	F		
				WB Through	852	19	195	603	B		
				WB Right	316	8	169	651	A		
27- MD 117 at I-270 SB off ramp											
27	NB			NB Left	0	0	0	0	A	8.0	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	1.8	A	EB Left	0	0	0	0	A		
				EB Through	799	2	1	180	A		
				EB Right	0	0	0	0	A		
	WB	24.0	C	WB Left	310	24	45	344	C		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
28- MD 117 at I-270 NB off ramp											
28	NB			NB Left	0	0	0	0	A	30.5	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	49.1	D	SB Left	307	54	230	811	D		
				SB Through	0	0	0	0	A		
				SB Right	915	48	236	813	D		
	EB	19.4	B	EB Left	10	111	80	888	F		
				EB Through	782	18	80	888	B		
				EB Right	0	0	0	0	A		
	WB	14.2	B	WB Left	0	0	0	0	A		
				WB Through	860	14	51	343	B		
				WB Right	9	5	55	373	A		
29- MD 117 at Perry Pkwy											
29	NB	42.5	D	NB Left	35	67	14	97	E	13.6	B
				NB Through	6	61	14	96	E		
				NB Right	31	11	23	117	B		
	SB	33.8	C	SB Left	91	72	37	167	E		
				SB Through	13	72	37	167	E		
				SB Right	124	2	37	167	A		
	EB	10.3	B	EB Left	119	69	42	237	E		
				EB Through	957	3	42	237	A		
				EB Right	9	1	29	221	A		
	WB	9.9	A	WB Left	5	87	20	261	F		
				WB Through	709	10	20	261	A		
				WB Right	104	5	20	261	A		
30- Shady Grove Rd at I-270 NB off ramp											
30	NB	9.5	A	NB Left	0	0	0	0	A	24.6	C
				NB Through	917	9	21	216	A		
				NB Right	0	0	0	0	A		
	SB	10.1	B	SB Left	0	0	0	0	A		
				SB Through	1284	10	31	344	B		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	56.8	E	WB Left	1008	57	201	631	E		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table A.14: AM Peak - Existing - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
31- Shady Grove Rd at I-270 SB off ramp											
31	NB	14.6	B	NB Left	0	0	0	0	A	21.0	C
				NB Through	920	15	41	379	B		
				NB Right	0	0	0	0	A		
	SB	11.4	B	SB Left	0	0	0	0	A		
				SB Through	1692	11	46	658	B		
				SB Right	0	0	0	0	A		
	EB	44.2	D	EB Left	313	37	42	360	D		
				EB Through	0	0	0	0	A		
				EB Right	642	48	102	463	D		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
32- MD 28 at I-270 SB off ramp											
32	NB			NB U-Turn	0	0	0	0	A	32.6	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	35.9	D	SB Left	456	44	72	304	D		
				SB Through	0	0	0	0	A		
				SB Right	108	3	0	59	A		
	EB	57.4	E	EB Left	0	0	0	0	A		
				EB Through	1050	87	1521	2131	F		
				EB Right	663	11	1050	2134	B		
	WB	9.1	A	WB Left	0	0	0	0	A		
				WB Through	1879	9	32	405	A		
				WB Right	0	0	0	0	A		
33- MD 28 at I-270 on and off ramps											
33	NB	34.9	C	NB Left	0	0	54	306	A	17.4	B
				NB Through	213	51	62	315	D		
				NB Right	139	11	62	315	B		
	SB	21.1	C	SB Left	25	60	19	169	E		
				SB Through	0	0	0	0	A		
				SB Right	260	17	19	169	B		
	EB	15.0	B	EB Left	224	28	46	333	C		
				EB Through	829	11	46	333	B		
				EB Right	0	0	0	0	A		
	WB	12.3	B	WB Left	22	11	41	286	B		
				WB Through	887	12	29	249	B		
				WB Right	0	0	0	0	A		
34- MD 189 at Great Falls Rd											
34	NB	40.7	D	NB Left	62	45	16	111	D	10.0	B
				NB Through	6	42	13	110	D		
				NB Right	8	8	15	121	A		
	SB	5.2	A	SB Left	66	46	20	162	D		
				SB Through	7	40	20	162	D		
				SB Right	601	0	0	0	A		
	EB	10.2	B	EB Left	325	16	14	215	B		
				EB Through	920	8	18	229	A		
				EB Right	13	6	26	265	A		
	WB	12.1	B	WB Left	3	21	16	184	C		
				WB Through	315	12	16	184	B		
				WB Right	10	9	27	218	A		
35- MD 189 at I-270 Ramps											
35	NB	50.5	D	NB Left	133	51	25	119	D	41.6	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	48.3	D	SB Left	184	48	54	316	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	23.2	C	EB Left	384	20	81	458	B		
				EB Through	529	26	81	458	C		
				EB Right	0	0	0	0	A		
	WB	59.1	E	WB Left	533	50	137	497	D		
				WB Through	284	76	137	497	E		
				WB Right	0	0	0	0	A		
36- MD 189 at Wootton Pkwy											
36	NB	43.1	D	NB Left	129	52	52	178	D	58.1	E
				NB Through	100	80	52	178	E		
				NB Right	151	12	52	178	B		
	SB	91.5	F	SB Left	385	105	294	792	F		
				SB Through	516	81	218	720	F		
				SB Right	0	0	0	0	A		
	EB	48.8	D	EB Left	132	75	214	884	E		
				EB Through	958	48	214	884	D		
				EB Right	95	23	214	884	C		
	WB	42.6	D	WB Left	423	62	108	314	E		
				WB Through	390	27	108	314	C		
				WB Right	58	5	108	314	A		
37- Montrose Rd at Tower Oaks Blvd											
37	NB			NB Left	0	0	0	0	A	26.1	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	106.3	F	SB Left	126	40	201	957	D		
				SB Through	0	0	0	0	A		
				SB Right	521	122	323	955	F		
	EB	7.9	A	EB Left	28	16	25	421	B		
				EB Through	1424	8	25	421	A		
				EB Right	0	0	0	0	A		
	WB	9.2	A	WB Left	0	0	0	0	A		
				WB Through	1443	9	26	286	A		
				WB Right	62	4	26	286	A		
38- Tower Oaks Blvd at I-270 off ramp											
38	NB	15.7	B	NB Left	475	16	25	187	B	14.8	B
				NB Through	12	17.0	19	179	B		
				NB Right	26	4.9	25	187	A		
	SB	0.1	A	SB Left	2	-0.2	0	16	A		
				SB Through	0	0.0	0	16	A		
				SB Right	2	0.5	0	0	A		
	EB	14.6	B	EB Left	7	11.4	39	282	B		
				EB Through	621	15.1	39	282	B		
				EB Right	91	11.5	32	272	B		
	WB	11.9	B	WB Left	0	0.0	4	71	A		
				WB Through	84	12.6	4	71	B		
				WB Right	7	4.2	0	0	A		
39- Montrose Rd at Tower Oaks Blvd											
39	NB	9.6	A	NB Left	26	45	21	127	D	61.8	E
				NB Through	188	30	21	127	C		
				NB Right	507	0	0	0	A		
	SB	38.9	D	SB Left	297	70	128	520	E		
				SB Through	605	26	127	519	C		
				SB Right	64	18	130	533	B		
	EB	144.4	F	EB Left	56	123	558	723	F		
				EB Through	816	146	559	724	F		
				EB Right	45	147	582	747	F		
	WB	39.8	D	WB Left	362	48	77	299	D		
				WB Through	231	46	77	299	D		
				WB Right	134	7	91	329	A		
40- Rockledge Blvd at I-270 NB on and off ramp											
40	NB			NB Left	0	0	0	0	A	16.0	B
				NB Through	85	32	30	146	C		
				NB Right	195	34	30	146	C		
	SB	2.3	A	SB Left	0	0	6	75	A		
				SB Through	986	2	6	75	A		
				SB Right	0	0	0	0	A		
	EB	24.3	C	EB Left	5	35	109	424	C		
				EB Through	501	50	109	424	D		
				EB Right	550	1	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table A.14: AM Peak - Existing - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS	
41- Rockledge Blvd at I-270 SB on and off ramps												
41	NB	2.6	A	NB Left	89	3	1	25	A	20.5	C	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	21.6	C		WB Left	986	23	98	664			C
					WB Through	452	19	98	664			B
					WB Right	0	0	0	0			A
42- MD 187 at Tuckerman Ln												
42	NB	290.3	F	NB Left	184	172	1149	1512	F	195.3	F	
				NB Through	1181	240	1149	1512	F			
				NB Right	143	859	1149	1512	F			
	SB	172.4	F		SB Left	60	147	2547	2696			F
					SB Through	1511	171	2547	2696			F
					SB Right	177	192	2547	2696			F
	EB	65.2	E		EB Left	185	47	206	895			D
					EB Through	548	73	207	896			E
					EB Right	135	58	228	920			E
	WB	203.3	F		WB Left	702	243	1957	2147			F
					WB Through	354	165	1957	2147			F
					WB Right	135	100	1957	2147			F
43- MD 187 at I-270 NB on and off ramps												
43	NB	67.1	E	NB Left	153	90	240	435	F	44.4	D	
				NB Through	1250	64	240	435	E			
				NB Right	0	0	0	0	A			
	SB	24.4	C		SB Left	0	0	0	0			A
					SB Through	1718	24	91	590			C
					SB Right	0	0	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	64.9	E		WB Left	120	64	63	355			E
					WB Through	10	75	63	355			E
					WB Right	0	0	0	0			A
44- MD 187 at I-270 NB on and off ramps												
44	NB	131.6	F	NB Left	0	0	0	0	A	62.8	E	
				NB Through	1241	132	392	892	F			
				NB Right	0	0	0	0	A			
	SB	7.5	A		SB Left	193	56	63	268			E
					SB Through	1641	2	63	268			A
					SB Right	0	0	0	0			A
	EB	91.6	F		EB Left	190	98	179	700			F
					EB Through	0	0	179	700			A
					EB Right	370	88	218	693			F
	WB				WB Left	0	0	0	0			A
					WB Through	0	0	0	0			A
					WB Right	0	0	0	0			A
45- MD 187 at Rock Spring Dr												
45	NB	19.7	B	NB Left	192	61	84	380	E	22.2	C	
				NB Through	1193	13	84	381	B			
				NB Right	6	16	104	414	B			
	SB	21.0	C		SB Left	12	25	104	666			C
					SB Through	1837	23	104	666			C
					SB Right	160	1	74	661			A
	EB	38.3	D		EB Left	160	64	45	180			E
					EB Through	22	54	45	180			D
					EB Right	197	16	45	180			B
	WB	4.8	A		WB Left	1	14	0	19			B
					WB Through	8	6	0	19			A
					WB Right	4	-1	0	0			A
47-Democracy Blvd at I-270 NB off ramp												
47	NB	31.2	C	NB Left	212	31	26	165	C	14.0	B	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB	13.5	B		EB Left	0	0	0	0			A
					EB Through	1585	13	52	439			B
					EB Right	0	0	0	0			A
	WB	10.1	B		WB Left	0	0	0	0			A
					WB Through	736	10	21	176			B
					WB Right	0	0	0	0			A
48- Democracy Blvd at I-270 SB on ramp												
48	NB			NB Left	0	0	0	0	A	6.3	A	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB	5.0	A		EB Left	0	0	0	0			A
					EB Through	1691	5	20	274			A
					EB Right	0	0	0	0			A
	WB	8.6	A		WB Left	210	37	30	188			D
					WB Through	733	1	19	167			A
					WB Right	0	0	0	0			A
49- Democracy Blvd at I-270 SB off ramp												
49	NB			NB Left	0	0	0	0	A	12.4	B	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB	33.1	C		SB Left	334	49	58	237			D
					SB Through	0	0	0	0			A
					SB Right	173	2	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	2.5	A		WB Left	0	0	0	0			A
					WB Through	732	3	4	112			A
					WB Right	323	2	0	103			A
50- MD 190 at Burdette Rd												
50	NB	76.6	E	NB Left	19	69	12	111	E	11.8	B	
				NB Through	3	74	12	111	E			
				NB Right	8	95	12	111	F			
	SB	33.2	C		SB Left	41	84	27	151			F
					SB Through	13	84	27	151			F
					SB Right	113	9	27	151			A
	EB	9.6	A		EB Left	47	98	53	454			F
					EB Through	1709	7	52	453			A
					EB Right	15	5	42	477			A
	WB	10.7	B		WB Left	0	87	45	661			F
					WB Through	1437	11	46	662			B
					WB Right	18	3	41	702			A

Table A.14: AM Peak - Existing - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
51- MD 190 at I-270 NB on ramp											
51	NB			NB Left	0	0	0	0	A	37.1	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	81.7	F	EB Left	493	82	233	519	F		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	14.6	B	WB Left	0	0	0	0	A		
				WB Through	975	15	62	601	B		
				WB Right	0	0	0	0	A		
52- MD 190 at I-270 SB off ramp											
52	NB	78.7	E	NB Left	251	79	996	2228	E	14.3	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	2.9	A	EB Left	0	0	0	0	A		
				EB Through	864	3	6	140	A		
				EB Right	0	0	0	0	A		
	WB	4.8	A	WB Left	0	0	0	0	A		
				WB Through	675	5	6	147	A		
				WB Right	0	0	0	0	A		
53- MD 190 at Seven Locks Rd											
53	NB	66.4	E	NB Left	17	67	16	123	E	43.0	D
				NB Through	44	66	19	123	E		
				NB Right	0	0	0	0	A		
	SB	67.6	E	SB Left	581	67	199	696	E		
				SB Through	145	68	199	696	E		
				SB Right	13	73	198	696	E		
	EB	29.4	C	EB Left	18	25	93	480	C		
				EB Through	781	29	93	480	C		
				EB Right	32	30	93	480	C		
	WB	34.1	C	WB Left	121	113	109	329	F		
				WB Through	642	27	112	331	C		
				WB Right	159	1	2	57	A		
54- MD 124 at I-270 NB off ramp											
54	NB	84.3	F	NB Left	0	0	0	0	A	95.4	F
				NB Through	0	0	0	0	A		
				NB Right	920	84	345	963	F		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	107.9	F	EB Left	0	0	0	0	A		
				EB Through	813	108	473	1086	F		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
55- Democracy Blvd at I-270 NB off ramp											
55	NB	37.9	D	NB Left	0	0	0	0	A	16.9	B
				NB Through	0	0	0	0	A		
				NB Right	926	38	117	601	D		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	4.6	A	EB Left	0	0	0	0	A		
				EB Through	1586	5	18	88	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table A.15: AM Peak -2015 Hard Shoulder Running - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
1- MD 85 at Sam's Club Drive											
1	NB	18.5	B	NB Left	103	76	57	253	E	33.0	C
				NB Through	315	24	57	253	C		
				NB Right	580	5	6	213	A		
	SB	42.0	D	SB Left	110	58	124	542	E		
				SB Through	533	41	124	542	D		
				SB Right	52	21	124	542	C		
	EB	44.9	D	EB Left	80	71	43	150	E		
				EB Through	47	82	43	150	F		
				EB Right	102	8	43	150	A		
	WB	50.4	D	WB Left	207	71	74	303	E		
				WB Through	12	62	74	303	E		
				WB Right	100	6	74	303	A		
2- MD 85 at I-270 NB on and off ramp											
2	NB	37.3	D	NB Left	559	37	130	672	D	26.3	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	15.1	B	SB Left	0	0	0	0	A		
				SB Through	547	15	38	459	B		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
3- MD 85 at I-270 SB on and off ramp											
3	NB	4.3	A	NB Left	0	0	0	0	A	10.7	B
				NB Through	814	4	12	352	A		
				NB Right	0	0	0	0	A		
	SB	44.9	D	SB Left	153	45	41	262	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
4- MD 85 at Crestwood Blvd											
4	NB	15.8	C	NB Left	10	59	34	268	E	19.7	B
				NB Through	585	15	34	268	B		
				NB U-Turn	0	0	0	0	A		
	SB	13.8	B	SB Left	57	68	23	138	E		
				SB Through	1654	14	55	500	B		
				SB Right	751	10	45	490	A		
	EB	48.3	D	EB Left	483	50	68	212	D		
				EB Through	19	59	68	212	E		
				EB Right	32	10	68	212	A		
	WB	43.0	D	WB Left	37	56	16	111	E		
				WB Through	15	59	16	111	E		
				WB Right	19	6	16	111	A		
5- MD 80 at I-270 NB on and ramp											
5	NB	-1.5	A	NB Left	2	0	0	0	A	7.0	A
				NB Through	2	0	0	0	A		
				NB Right	4	-3	0	0	A		
	SB	12.1	B	SB Left	183	15	11	123	B		
				SB Through	5	17	11	123	B		
				SB Right	52	2	0	0	A		
	EB	7.9	A	EB Left	38	9	7	141	A		
				EB Through	0	0	8	0	A		
				EB Right	7	5	13	171	A		
	WB	6.0	A	WB Left	31	8	1	48	A		
				WB Through	681	9	29	356	A		
				WB Right	503	1	0	0	A		
6- MD 80 at I-270 SB on and off ramp											
6	NB	5.6	A	NB Left	21	6	1	179	A	7.1	A
				NB Through	0	0	0	0	A		
				NB Right	256	6	1	179	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	8.0	A	EB Left	0	0	0	0	A		
				EB Through	241	8	6	116	A		
				EB Right	133	7	6	123	A		
	WB	7.6	A	WB Left	0	0	0	0	A		
				WB Through	192	8	2	194	A		
				WB Right	0	0	0	0	A		
7- MD 109 at I-270 NB on and off ramp											
7	NB			NB Left	0	0	0	0	A	2.4	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	7.8	A	SB Left	119	10	7	103	B		
				SB Through	0	0	0	0	A		
				SB Right	38	1	0	0	A		
	EB	3.3	A	EB Left	59	3	0	39	A		
				EB Through	0	0	0	0	A		
				EB Right	40	3	0	0	A		
	WB	0.3	A	WB Left	0	0	0	0	A		
				WB Through	462	0	0	0	A		
				WB Right	0	0	0	0	A		
8- MD 80 at I-270 SB on and off ramp											
8	NB	2.6	A	NB Left	15	11	1	68	B	2.0	A
				NB Through	0	0	0	0	A		
				NB Right	42	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	2.7	A	EB Left	0	0	0	0	A		
				EB Through	59	0	0	30	A		
				EB Right	70	5	0	30	A		
	WB	1.7	A	WB Left	393	1	0	97	A		
				WB Through	109	3	0	91	A		
				WB Right	0	0	0	0	A		
9- MD 121 at Gateway Center Dr											
9	NB	8.6	A	NB Left	97	12	14	145	B	21.2	C
				NB Through	280	12	14	145	B		
				NB Right	197	2	18	171	A		
	SB	16.5	C	SB Left	47	11	32	362	B		
				SB Through	583	17	42	362	B		
				SB Right	6	15	47	383	B		
	EB	35.2	E	EB Left	7	35	97	436	C		
				EB Through	87	43	102	436	D		
				EB Right	543	34	126	469	C		
	WB	31.4	D	WB Left	95	37	21	133	D		
				WB Through	12	28	21	132	C		
				WB Right	21	6	13	149	A		
10- MD 121 at I-270 NB on and off ramp											
10	NB	1.7	A	NB Left	40	10	2	85	A	0.7	A
				NB Through	0	0	0	0	A		
				NB Right	254	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.1	A	EB Left	0	0	0	0	A		
				EB Through	318	0	0	0	A		
				EB Right	49	0	0	0	A		
	WB	0.7	A	WB Left	151	2	1	82	A		
				WB Through	1071	1	0	52	A		
				WB Right	0	0	0	0	A		

Table A.15: AM Peak -2015 Hard Shoulder Running - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
11- MD 121 at I-270 SB on and off ramp											
11	NB			NB Left	0	0	0	0	A	1.3	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	7.6	A	SB Left	123	10	6	122	B		
				SB Through	0	0	0	0	A		
				SB Right	47	1	0	0	A		
	EB	0.4	A	EB Left	26	2	0	44	A		
				EB Through	0	0	0	0	A		
				EB Right	833	0	0	0	A		
	WB	0.2	A	WB Left	0	0	0	0	A		
WB Through				277	0	0	0	A			
WB Right				0	0	0	0	A			
12- MD 27 at Observation Dr											
12	NB	48.1	D	NB U-Turn	0	0	0	0	A	20.5	C
				NB Through	34	63	10	64	E		
				NB Right	12	7	10	64	A		
	SB	41.1	D	SB Left	75	52	23	142	D		
				SB Through	43	59	30	226	E		
				SB Right	158	31	52	263	C		
	EB	13.4	B	EB Left	154	30	32	300	C		
				EB Through	1238	12	34	301	B		
				EB Right	49	10	41	339	B		
	WB	21.9	C	WB Left	83	17	150	806	B		
WB Through				2047	23	150	806	C			
WB Right				93	10	150	806	B			
13- MD 27 at I-270 NB off ramp											
13	NB	29.8	C	NB Left	89	30	12	99	C	7.9	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.1	A	EB Left	0	0	0	0	A		
				EB Through	931	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	10.4	B	WB Left	0	0	0	0	A		
WB Through				2106	10	158	1232	B			
WB Right				0	0	0	0	A			
14- MD 27 at I-270 SB off ramp											
14	NB			NB Left	0	0	0	0	A	14.7	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	46.6	D	SB Left	415	47	67	279	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	9.8	A	EB Left	0	0	0	0	A		
				EB Through	657	10	13	206	A		
				EB Right	0	0	0	0	A		
	WB	6.7	A	WB Left	0	0	0	0	A		
WB Through				1260	7	24	487	A			
WB Right				0	0	0	0	A			
15- MD 27 at Crystal Rock Dr											
15	NB	18.1	B	NB Left	23	21	33	410	C	31.1	C
				NB Through	818	18	58	410	B		
				NB Right	72	17	61	423	B		
	SB	33.6	C	SB Left	420	59	197	1017	E		
				SB Through	1375	26	197	1017	C		
				SB Right	41	14	156	1011	B		
	EB	44.2	D	EB Left	177	49	47	169	D		
				EB Through	74	49	43	164	D		
				EB Right	60	25	43	196	C		
	WB	56.0	E	WB Left	8	63	85	273	E		
WB Through				21	302	85	273	F			
WB Right				104	6	85	273	A			
16- MD 118 at Seneca Meadows Pkwy											
16	NB	3.4	A	NB Left	123	10	1	74	A	5.5	A
				NB Through	733	3	4	133	A		
				NB Right	79	1	8	186	A		
	SB	3.7	A	SB Left	25	5	5	164	A		
				SB Through	808	4	8	165	A		
				SB Right	32	2	9	191	A		
	EB	16.6	B	EB Left	15	62	8	69	E		
				EB Through	6	59	8	69	E		
				EB Right	96	7	8	69	A		
	WB	43.7	D	WB Left	30	64	12	94	E		
WB Through				5	69	8	94	E			
WB Right				21	9	11	113	A			
17- MD 118 at I-270 NB on ramp											
17	NB			NB Left	0	0	0	0	A	11.0	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	32.8	C	EB Left	222	33	44	278	C		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	5.8	A	WB Left	0	0	0	0	A		
WB Through				155	1	0	4	A			
WB Right				778	7	15	282	A			
18- MD 118 at I-270 SB off ramp											
18	NB			NB Left	0	0	0	0	A	7.6	A
				NB Through	0	0.0	0	0	A		
				NB Right	0	0.0	0	0	A		
	SB	40.5	D	SB Left	200	40.5	35	180	D		
				SB Through	0	0.0	0	0	A		
				SB Right	0	0.0	0	0	A		
	EB	3.2	A	EB Left	0	0.0	0	0	A		
				EB Through	615	3.2	4	151	A		
				EB Right	0	0.0	0	0	A		
	WB	3.8	A	WB Left	0	0.0	0	0	A		
WB Through				1037	3.8	7	168	A			
WB Right				0	0.0	0	0	A			
19- MD 118 at Aircraft Dr											
19	NB	45.1	D	NB Left	7	70	8	75	E	18.1	B
				NB Through	12	80	8	75	F		
				NB Right	14	2	0	22	A		
	SB	60.7	E	SB Left	241	58	98	368	E		
				SB Through	41	66	98	368	E		
				SB Right	81	67	98	368	E		
	EB	10.3	B	EB Left	102	13	28	310	B		
				EB Through	932	10	28	310	B		
				EB Right	27	9	28	310	A		
	WB	11.6	B	WB Left	73	20	32	241	B		
WB Through				909	13	32	241	B			
WB Right				275	4	32	241	A			
20- Middlebrook Rd at Observation Dr											
20	NB			NB Left	0	0	0	0	A	16.1	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	18.8	B	SB Left	22	35	4	43	D		
				SB Through	0	0	0	0	A		
				SB Right	25	4	4	43	A		
	EB	14.2	B	EB Left	240	21	31	233	C		
				EB Through	865	12	31	233	B		
				EB Right	0	0	0	0	A		
	WB	17.5	B	WB Left	0	0	0	0	A		
WB Through				1071	18	67	382	B			
WB Right				214	13	91	431	B			

Table A.15: AM Peak -2015 Hard Shoulder Running - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
21- Middlebrook Rd at I-270 SB on ramp											
21	NB			NB Left	0	0	0	0	A	16.2	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	11.2	B	EB Left	0	0	0	0	A		
				EB Through	804	11	26	184	B		
				EB Right	0	0	0	0	A		
	WB	21.6	C	WB Left	743	22	68	850	C		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
22- Middlebrook Rd at Waring Station Rd											
22	NB	64.4	E	NB Left	147	53	147	449	D	25.5	C
				NB Through	6	58	147	449	E		
				NB Right	342	69	147	449	E		
	SB	21.5	C	SB Left	3	37	1	29	D		
				SB Through	0	0	1	29	A		
				SB Right	3	6	2	67	A		
	EB	18.2	B	EB Left	28	11	123	831	B		
				EB Through	1483	19	123	831	B		
				EB Right	76	10	123	831	B		
	WB	15.9	B	WB Left	78	20	28	227	B		
				WB Through	680	16	28	227	B		
				WB Right	35	4	28	227	A		
23- MD 124 at MD 355											
23	NB	50.5	D	NB Left	230	69	72	197	E	84.2	F
				NB Through	306	42	69	195	D		
				NB Right	37	2	0	0	A		
	SB	33.4	C	SB Left	49	85	121	409	F		
				SB Through	966	50	121	409	D		
				SB Right	619	3	31	374	A		
	EB	100.6	F	EB Left	613	259	1028	1204	F		
				EB Through	533	23	1028	1204	C		
				EB Right	582	5	1010	1187	A		
	WB	122.4	F	WB Left	0	0	0	0	A		
				WB Through	1888	123	724	1114	F		
				WB Right	43	75	0	0	E		
24- MD 124 at I-270 SB on and off											
24	NB	63.6	F	NB Left	15	66	15	80	E	21.6	C
				NB Through	28	63	15	80	E		
				NB U-Turn	0	0	0	0	A		
	SB	29.3	C	SB Left	311	69	83	402	E		
				SB Through	4	69	83	402	E		
				SB Right	581	8	18	393	A		
	EB	16.2	B	EB Left	0	0	0	0	A		
				EB Through	904	16	43	304	B		
				EB Right	67	13	52	327	B		
	WB	18.7	B	WB Left	34	24	77	675	C		
				WB Through	1209	19	77	675	B		
				WB Right	0	0	0	0	A		
25- MD 117 at MD 124											
25	NB	41.1	D	NB Left	16	63	101	590	E	42.4	D
				NB Through	422	59	101	590	E		
				NB Right	413	22	44	600	C		
	SB	37.7	D	SB Left	181	48	126	585	D		
				SB Through	837	39	126	585	D		
				SB Right	95	3	0	0	A		
	EB	48.4	D	EB Left	79	106	174	653	F		
				EB Through	1381	46	173	654	D		
				EB Right	65	39	186	681	D		
	WB	39.5	D	WB Left	318	73	105	357	E		
				WB Through	481	25	105	357	C		
				WB Right	95	0	0	0	A		
26- MD 117 at Bureau Dr											
26	NB	52.9	D	NB Left	18	73	16	94	E	42.9	D
				NB Through	17	79	16	94	E		
				NB Right	25	21	16	94	C		
	SB	62.2	E	SB Left	192	68	79	286	E		
				SB Through	43	66	79	286	E		
				SB Right	28	15	79	286	B		
	EB	45.0	D	EB Left	28	34	317	965	C		
				EB Through	1951	45	324	964	D		
				EB Right	20	56	316	954	E		
	WB	36.1	D	WB Left	299	106	228	724	F		
				WB Through	852	22	229	725	C		
				WB Right	317	8	200	773	A		
27- MD 117 at I-270 SB off ramp											
27	NB			NB Left	0	0	0	0	A	8.6	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	2.2	A	EB Left	0	0	0	0	A		
				EB Through	803	2	2	190	A		
				EB Right	0	0	0	0	A		
	WB	25.3	D	WB Left	309	25	50	400	D		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
28- MD 117 at I-270 NB off ramp											
28	NB			NB Left	0	0	0	0	A	31.2	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	50.4	D	SB Left	307	57	229	760	E		
				SB Through	0	0	0	0	A		
				SB Right	919	48	234	762	D		
	EB	19.7	B	EB Left	10	109	86	922	F		
				EB Through	790	19	86	922	B		
				EB Right	0	0	0	0	A		
	WB	14.5	B	WB Left	0	0	0	0	A		
				WB Through	859	15	52	348	B		
				WB Right	9	6	57	379	A		
29- MD 117 at Perry Pkwy											
29	NB	44.0	D	NB Left	35	69	14	97	E	13.6	B
				NB Through	6	67	14	96	E		
				NB Right	31	12	24	117	B		
	SB	32.8	C	SB Left	90	71	36	172	E		
				SB Through	13	65	36	172	E		
				SB Right	124	2	36	172	A		
	EB	10.6	B	EB Left	121	70	44	244	E		
				EB Through	964	3	44	244	A		
				EB Right	9	2	30	229	A		
	WB	9.6	A	WB Left	5	75	19	242	E		
				WB Through	709	10	19	242	A		
				WB Right	104	5	19	242	A		
30- Shady Grove Rd at I-270 NB off ramp											
30	NB	8.8	A	NB Left	0	0	0	0	A	24.5	C
				NB Through	926	9	20	230	A		
				NB Right	0	0	0	0	A		
	SB	10.1	B	SB Left	0	0	0	0	A		
				SB Through	1284	10	31	351	B		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	57.0	E	WB Left	1018	57	201	654	E		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table A.15: AM Peak -2015 Hard Shoulder Running - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
31- Shady Grove Rd at I-270 SB off ramp											
31	NB	15.3	B	NB Left	0	0	0	0	A	21.3	C
				NB Through	920	15	42	339	B		
				NB Right	0	0	0	0	A		
	SB	11.4	B	SB Left	0	0	0	0	A		
				SB Through	1701	11	44	633	B		
				SB Right	0	0	0	0	A		
	EB	43.8	D	EB Left	322	39	45	313	D		
				EB Through	0	0	0	0	A		
				EB Right	677	46	103	407	D		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
32- MD 28 at I-270 SB off ramp											
32	NB			NB U-Turn	0	0	0	0	A	9.0	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	36.3	D	SB Left	427	45	67	285	D		
				SB Through	0	0	0	0	A		
				SB Right	105	3	0	33	A		
	EB	2.9	A	EB Left	0	0	0	0	A		
				EB Through	1422	1	0	0	A		
				EB Right	892	7	17	230	A		
	WB	8.8	A	WB Left	0	0	0	0	A		
				WB Through	1879	9	30	352	A		
				WB Right	0	0	0	0	A		
33- MD 28 at I-270 on and off ramps											
33	NB	34.7	C	NB Left	0	0	52	279	A	19.2	B
				NB Through	208	50	60	288	D		
				NB Right	138	12	60	288	B		
	SB	20.9	C	SB Left	24	59	19	155	E		
				SB Through	0	0	0	0	A		
				SB Right	259	17	19	155	B		
	EB	19.5	B	EB Left	263	36	74	476	D		
				EB Through	971	15	74	476	B		
				EB Right	0	0	0	0	A		
	WB	12.3	B	WB Left	22	10	42	291	B		
				WB Through	890	12	29	254	B		
				WB Right	0	0	0	0	A		
34- MD 189 at Great Falls Rd											
34	NB	40.6	D	NB Left	62	45	16	111	D	10.3	B
				NB Through	6	42	13	110	D		
				NB Right	8	7	15	121	A		
	SB	5.2	A	SB Left	66	46	20	162	D		
				SB Through	7	40	20	162	D		
				SB Right	601	0	0	7	A		
	EB	10.6	B	EB Left	327	15	12	206	B		
				EB Through	926	9	19	217	A		
				EB Right	13	5	28	253	A		
	WB	12.1	B	WB Left	3	16	17	190	B		
				WB Through	316	12	17	190	B		
				WB Right	10	9	27	224	A		
35- MD 189 at I-270 Ramps											
35	NB	47.6	D	NB Left	133	48	25	137	D	41.9	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	47.3	D	SB Left	188	47	55	286	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	25.0	C	EB Left	384	22	88	444	C		
				EB Through	528	27	88	444	C		
				EB Right	0	0	0	0	A		
	WB	58.7	E	WB Left	531	48	138	430	D		
				WB Through	280	78	138	430	E		
				WB Right	0	0	0	0	A		
36- MD 189 at Wootton Pkwy											
36	NB	43.5	D	NB Left	129	53	53	187	D	59.1	E
				NB Through	101	79	53	187	E		
				NB Right	151	11	53	187	B		
	SB	95.9	F	SB Left	387	109	304	789	F		
				SB Through	521	86	245	776	F		
				SB Right	0	0	0	0	A		
	EB	48.4	D	EB Left	132	74	212	876	E		
				EB Through	959	47	212	876	D		
				EB Right	96	23	212	876	C		
	WB	42.4	D	WB Left	428	62	111	365	E		
				WB Through	391	26	111	365	C		
				WB Right	60	5	111	365	A		
37- Montrose Rd at Tower Oaks Blvd											
37	NB			NB Left	0	0	0	0	A	26.5	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	109.1	F	SB Left	126	42	206	893	D		
				SB Through	0	0	0	0	A		
				SB Right	527	125	352	888	F		
	EB	7.2	A	EB Left	27	14	23	302	B		
				EB Through	1428	7	23	302	A		
				EB Right	0	0	0	0	A		
	WB	9.4	A	WB Left	0	0	0	0	A		
				WB Through	1443	10	26	272	A		
				WB Right	62	4	26	272	A		
38- Tower Oaks Blvd at I-270 off ramp											
38	NB	14.7	B	NB Left	477	15	23	173	B	14.7	B
				NB Through	12	14.1	17	164	B		
				NB Right	26	4.5	23	173	A		
	SB	0.3	A	SB Left	2	-0.8	0	24	A		
				SB Through	0	0.0	0	24	A		
				SB Right	2	1.4	0	0	A		
	EB	15.1	B	EB Left	7	9.6	40	269	A		
				EB Through	621	15.7	39	269	B		
				EB Right	91	12.0	33	260	B		
	WB	11.3	B	WB Left	0	0.0	4	68	A		
				WB Through	83	12.0	4	68	B		
				WB Right	7	3.1	0	4	A		
39- Montrose Rd at Tower Oaks Blvd											
39	NB	9.6	A	NB Left	26	44	21	135	D	61.8	E
				NB Through	188	30	21	135	C		
				NB Right	507	0	0	0	A		
	SB	38.2	D	SB Left	297	70	125	470	E		
				SB Through	605	25	124	469	C		
				SB Right	64	16	125	513	B		
	EB	145.2	F	EB Left	57	122	555	725	F		
				EB Through	809	147	556	726	F		
				EB Right	45	146	580	749	F		
	WB	40.5	D	WB Left	365	48	78	259	D		
				WB Through	233	47	78	259	D		
				WB Right	133	7	90	289	A		
40- Rockledge Blvd at I-270 NB on and off ramp											
40	NB			NB Left	0	0	0	0	A	15.1	B
				NB Through	84	32	30	157	C		
				NB Right	195	34	30	157	C		
	SB	2.3	A	SB Left	0	0	6	86	A		
				SB Through	978	2	6	86	A		
				SB Right	0	0	0	0	A		
	EB	22.2	C	EB Left	5	47	94	340	D		
				EB Through	495	46	94	340	D		
				EB Right	545	1	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table A.15: AM Peak -2015 Hard Shoulder Running - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS	
41- Rockledge Blvd at I-270 SB on and off ramps												
41	NB	1.7	A	NB Left	88	2	0	13	A	21.1	C	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	22.3	C		WB Left	980	23	101	712			C
					WB Through	448	20	101	712			C
					WB Right	0	0	0	0			A
42- MD 187 at Tuckerman Ln												
42	NB	283.3	F	NB Left	176	150	1050	1480	F	190.7	F	
				NB Through	1094	233	1050	1480	F			
				NB Right	138	849	1050	1480	F			
	SB	169.2	F		SB Left	59	142	2538	2701			F
					SB Through	1528	168	2538	2701			F
					SB Right	177	188	2538	2701			F
	EB	66.2	E		EB Left	185	47	214	947			D
					EB Through	548	74	215	949			E
					EB Right	135	60	235	973			E
	WB	204.2	F		WB Left	703	244	1958	2149			F
					WB Through	344	164	1958	2149			F
					WB Right	133	99	1958	2149			F
43- MD 187 at I-270 NB on and off ramps												
43	NB	61.5	E	NB Left	143	84	198	369	F	42.2	D	
				NB Through	1172	59	198	369	E			
				NB Right	0	0	0	0	A			
	SB	26.0	C		SB Left	0	0	0	0			A
					SB Through	1729	26	95	634			C
					SB Right	0	0	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	63.9	E		WB Left	119	64	89	424			E
					WB Through	9	67	89	424			E
					WB Right	0	0	0	0			A
44- MD 187 at I-270 NB on and off ramps												
44	NB	149.0	F	NB Left	0	0	0	0	A	67.7	E	
				NB Through	1146	149	391	784	F			
				NB Right	0	0	0	0	A			
	SB	9.2	A		SB Left	196	59	72	300			E
					SB Through	1650	3	72	300			A
					SB Right	0	0	0	0			A
	EB	94.7	F		EB Left	188	106	182	772			F
					EB Through	0	0	182	772			A
					EB Right	365	89	220	773			F
	WB				WB Left	0	0	0	0			A
					WB Through	0	0	0	0			A
					WB Right	0	0	0	0			A
45- MD 187 at Rock Spring Dr												
45	NB	53.9	D	NB Left	180	84	250	748	F	35.0	D	
				NB Through	1134	49	251	749	D			
				NB Right	6	21	271	782	C			
	SB	21.0	C		SB Left	13	30	106	751			C
					SB Through	1838	23	106	751			C
					SB Right	161	1	69	742			A
	EB	44.9	D		EB Left	159	78	48	185			E
					EB Through	22	57	48	185			E
					EB Right	196	17	48	185			B
	WB	4.7	A		WB Left	1	15	0	19			B
					WB Through	8	6	0	19			A
					WB Right	4	-1	0	0			A
47-Democracy Blvd at I-270 NB off ramp												
47	NB	30.1	C	NB Left	212	30	25	152	C	13.7	B	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB	13.1	B		EB Left	0	0	0	0			A
					EB Through	1592	13	50	454			B
					EB Right	0	0	0	0			A
	WB	10.2	B		WB Left	0	0	0	0			A
					WB Through	736	10	21	176			B
					WB Right	0	0	0	0			A
48- Democracy Blvd at I-270 SB on ramp												
48	NB			NB Left	0	0	0	0	A	6.3	A	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB	5.0	A		EB Left	0	0	0	0			A
					EB Through	1697	5	20	267			A
					EB Right	0	0	0	0			A
	WB	8.6	A		WB Left	210	37	30	188			D
					WB Through	733	1	19	167			A
					WB Right	0	0	0	0			A
49- Democracy Blvd at I-270 SB off ramp												
49	NB			NB Left	0	0	0	0	A	12.6	B	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB	33.3	C		SB Left	338	49	57	229			D
					SB Through	0	0	0	0			A
					SB Right	168	2	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	2.7	A		WB Left	0	0	0	0			A
					WB Through	732	3	4	124			A
					WB Right	324	2	0	111			A
50- MD 190 at Burdette Rd												
50	NB	76.6	E	NB Left	19	69	12	111	E	11.2	B	
				NB Through	3	74	12	111	E			
				NB Right	8	95	12	111	F			
	SB	33.2	C		SB Left	41	84	28	151			F
					SB Through	13	84	28	151			F
					SB Right	114	9	28	151			A
	EB	8.7	A		EB Left	49	97	49	426			F
					EB Through	1741	6	48	425			A
					EB Right	15	2	35	449			A
	WB	10.5	B		WB Left	0	87	45	619			F
					WB Through	1436	11	46	620			B
					WB Right	18	3	40	652			A

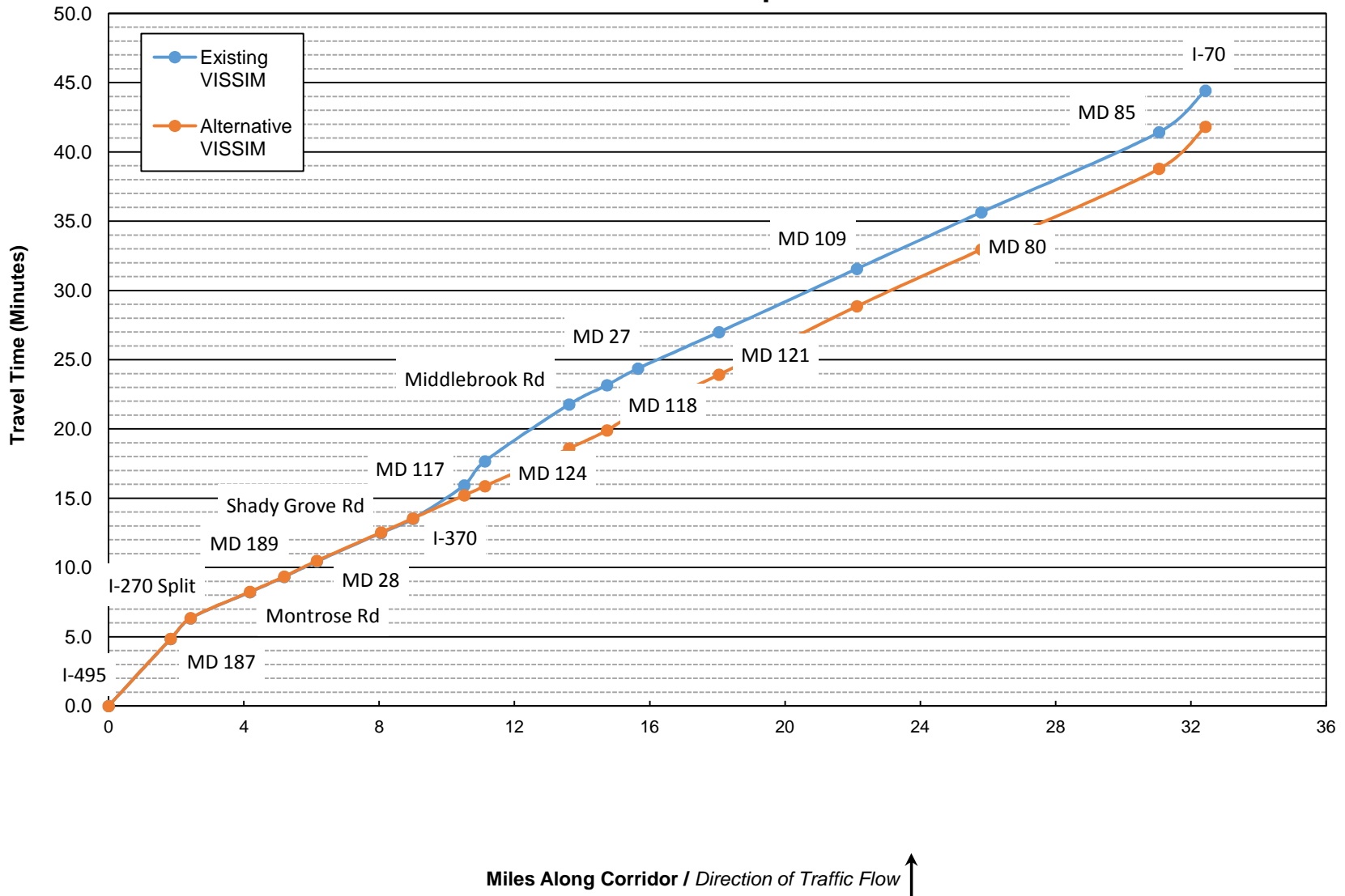
Table A.15: AM Peak -2015 Hard Shoulder Running - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
51- MD 190 at I-270 NB on ramp											
51	NB			NB Left	0	0	0	0	A	36.4	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	80.6	F	EB Left	491	81	233	533	F		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	14.1	B	WB Left	0	0	0	0	A		
				WB Through	975	14	59	569	B		
				WB Right	0	0	0	0	A		
52- MD 190 at I-270 SB off ramp											
52	NB	77.2	E	NB Left	259	77	504	2325	E	14.3	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	2.9	A	EB Left	0	0	0	0	A		
				EB Through	864	3	6	129	A		
				EB Right	0	0	0	0	A		
	WB	4.8	A	WB Left	0	0	0	0	A		
				WB Through	675	5	7	170	A		
				WB Right	0	0	0	0	A		
53- MD 190 at Seven Locks Rd											
53	NB	66.4	E	NB Left	17	67	16	123	E	43.1	D
				NB Through	44	66	19	123	E		
				NB Right	0	0	0	0	A		
	SB	67.6	E	SB Left	581	67	199	696	E		
				SB Through	145	68	199	696	E		
				SB Right	13	73	198	696	E		
	EB	29.4	C	EB Left	18	24	93	480	C		
				EB Through	781	29	93	480	C		
				EB Right	32	30	93	480	C		
	WB	34.4	C	WB Left	123	112	107	336	F		
				WB Through	645	28	110	339	C		
				WB Right	160	1	2	57	A		
54- MD 124 at I-270 NB off ramp											
54	NB	62.9	E	NB Left	0	0	0	0	A	86.4	F
				NB Through	0	0	0	0	A		
				NB Right	928	63	228	722	E		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	113.6	F	EB Left	0	0	0	0	A		
				EB Through	804	114	508	1090	F		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
55- Democracy Blvd at I-270 NB off ramp											
55	NB	37.2	D	NB Left	0	0	0	0	A	16.8	B
				NB Through	0	0	0	0	A		
				NB Right	927	37	113	515	D		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	4.8	A	EB Left	0	0	0	0	A		
				EB Through	1592	5	19	91	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

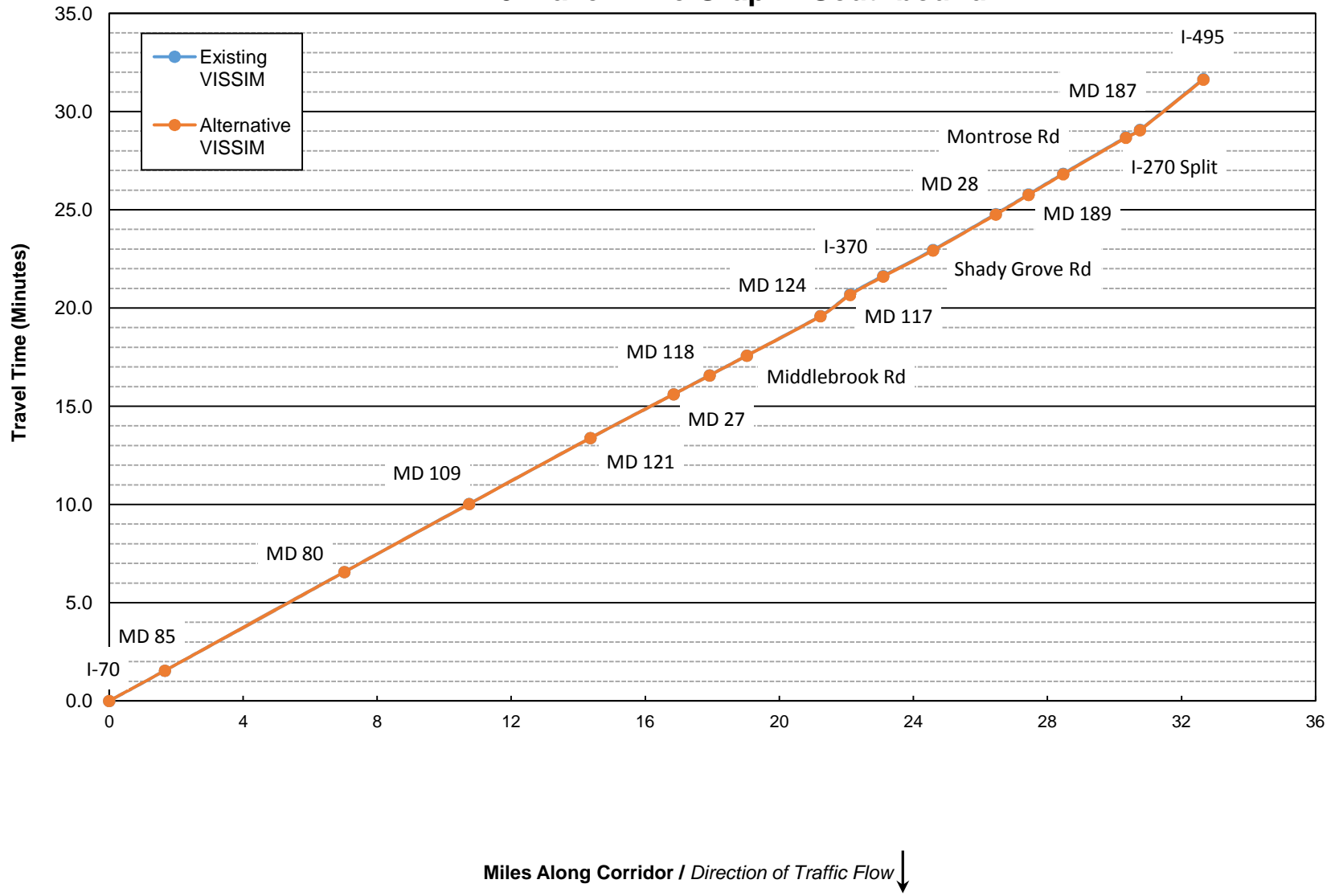
Table A.16: AM Peak -2015 Hard Shoulder Running - I-270 Vehicle Network Performance

	Existing	HSR	% Change
Total Delay	21,906,753	14,450,441	-34%
Average Delay per Vehicle	227	152	-33%
Total Travel Time	51,252,838	43,937,510	-14%
Vehicles (Arrived)	81,275	82,672	2%
Latent Demand	4,969	5,245	6%
Latent Delay	13,122,672	15,094,905	15%
Total Distance	467,210	469,209	0%
Average Speed	33	38	17%

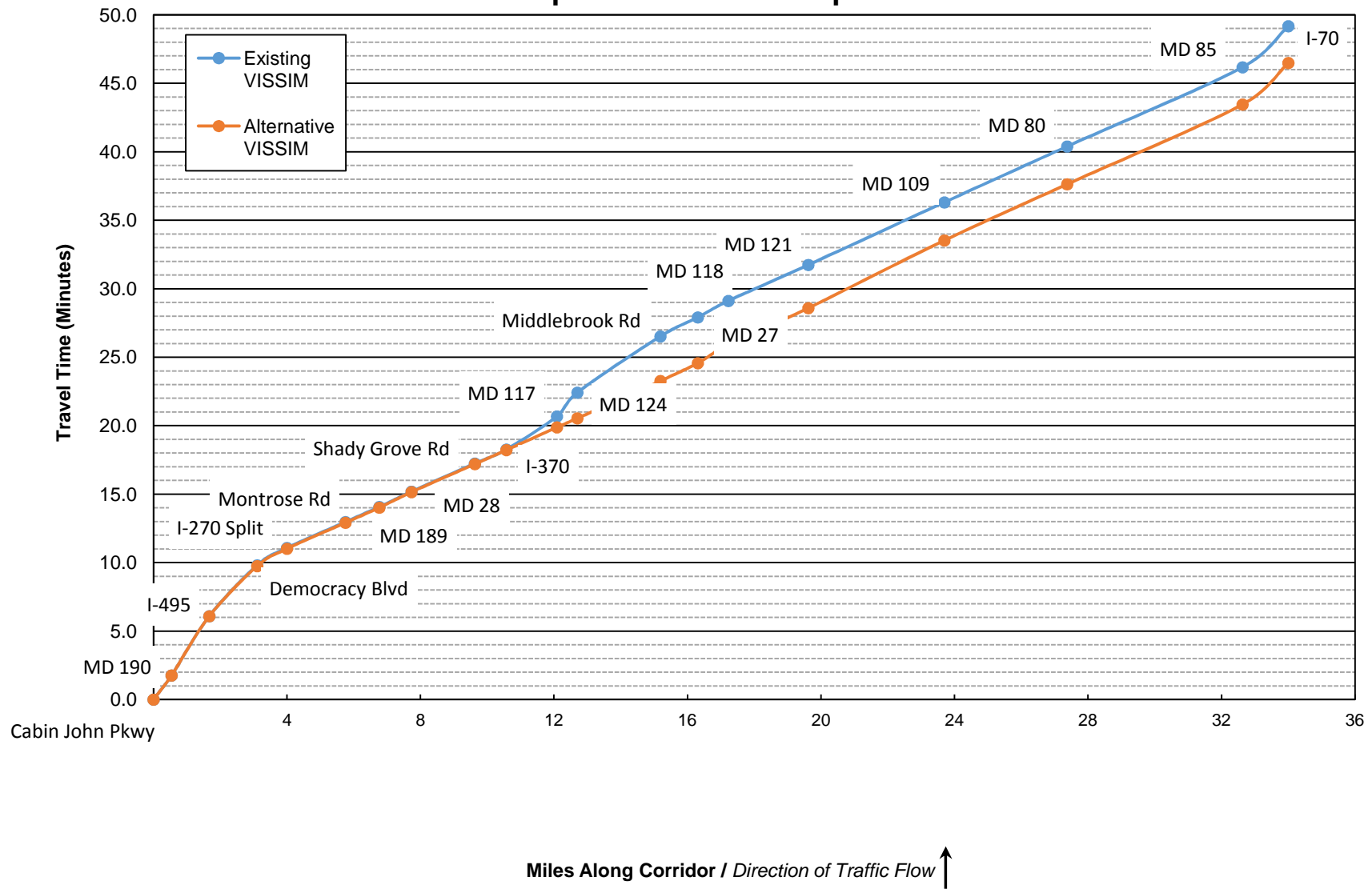
**Figure B.1: PM Peak -
2015 Hard Shoulder Running
I-270 Travel Time Graph - Northbound**



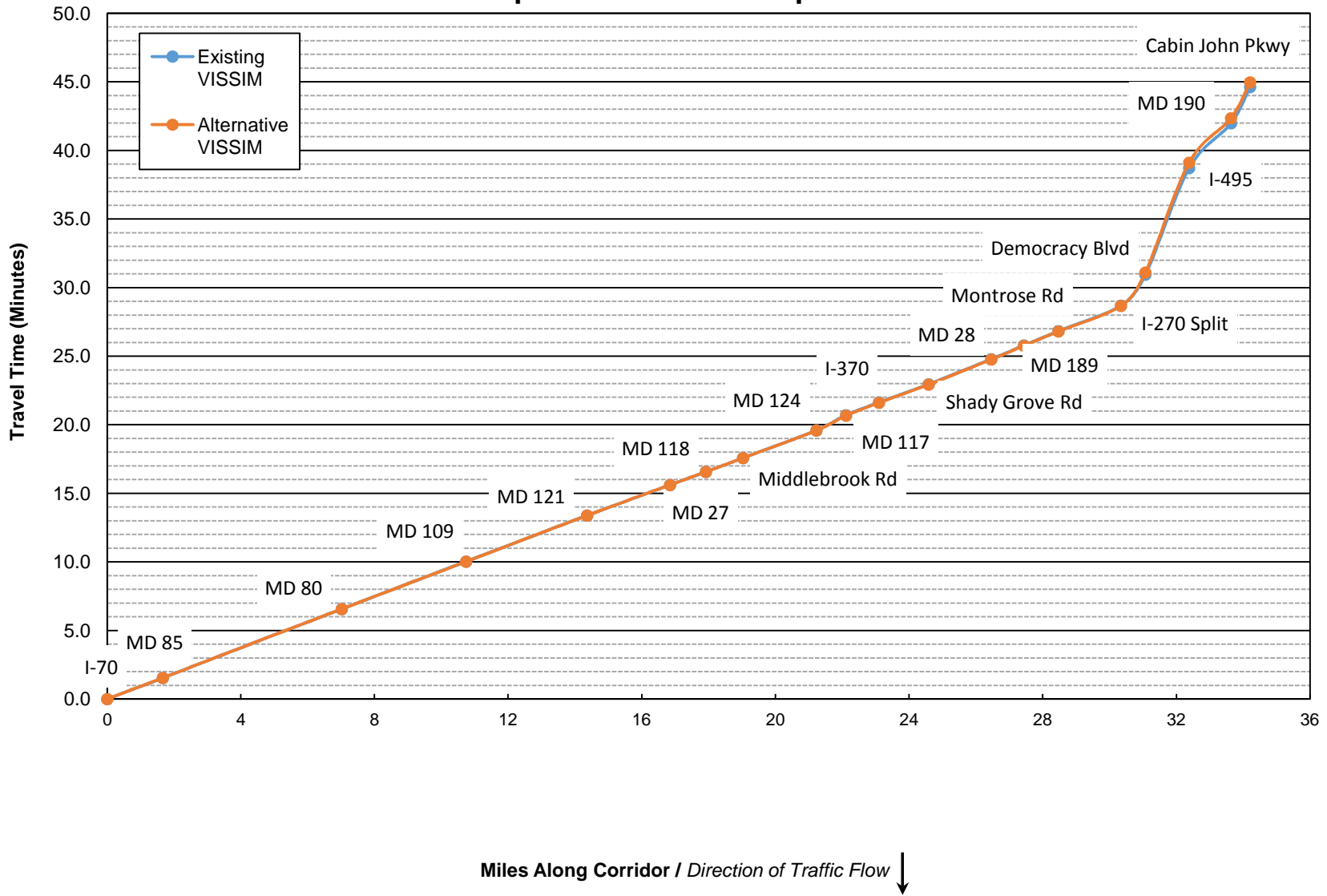
**Figure B.2: PM Peak -
2015 Hard Shoulder Running
I-270 Travel Time Graph - Southbound**



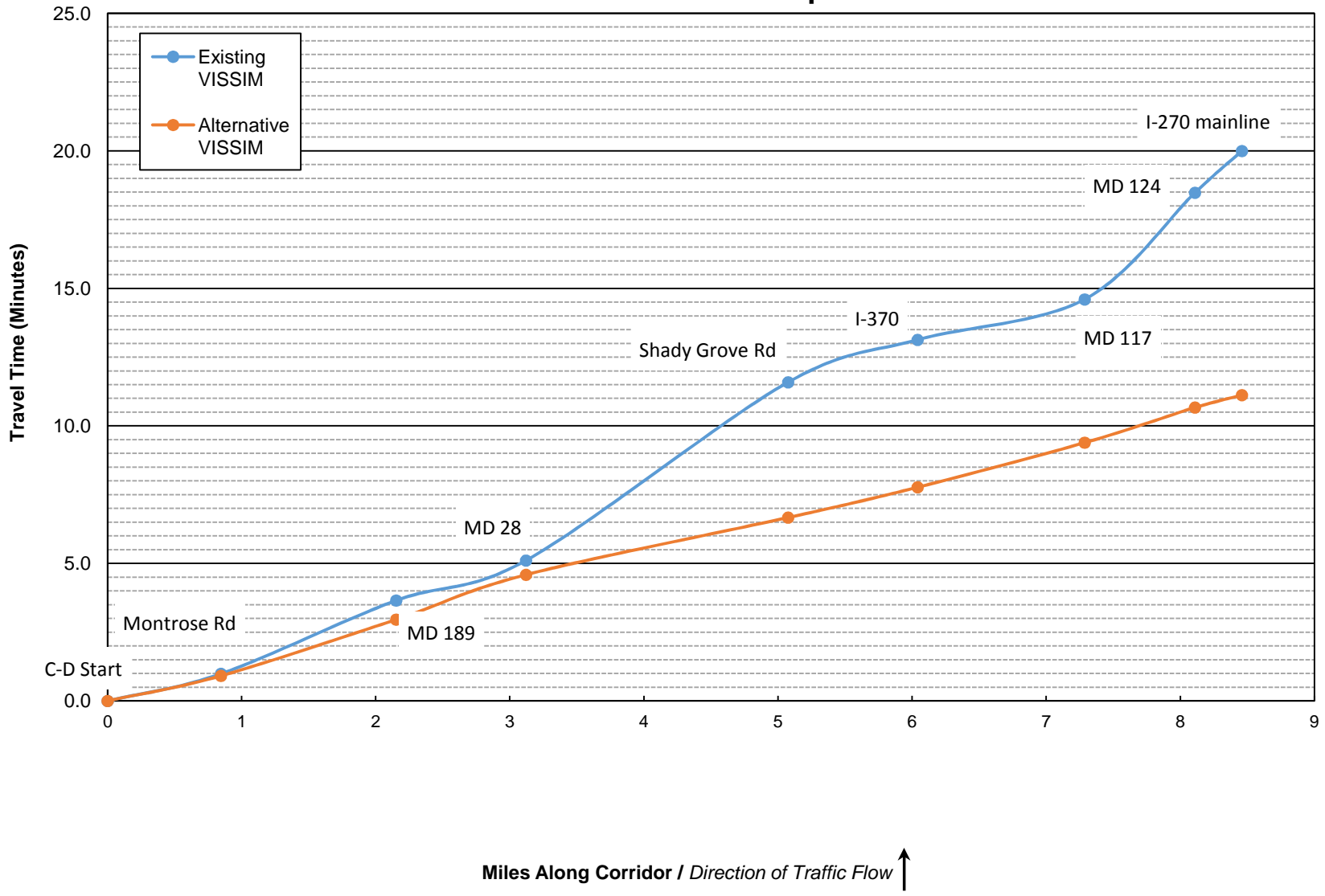
**Figure B.3: PM Peak -
2015 Hard Shoulder Running
I-270 Spur Travel Time Graph - Northbound**



**Figure B4: PM Peak -
2015 Hard Shoulder Running
I-270 Spur Travel Time Graph - Southbound**



**Figure B.5: PM Peak -
2015 Hard Shoulder Running
I-270 Local Travel Time Graph - Northbound**



**Figure B.6: PM Peak -
2015 Hard Shoulder Running
I-270 Local Travel Time Graph - Southbound**

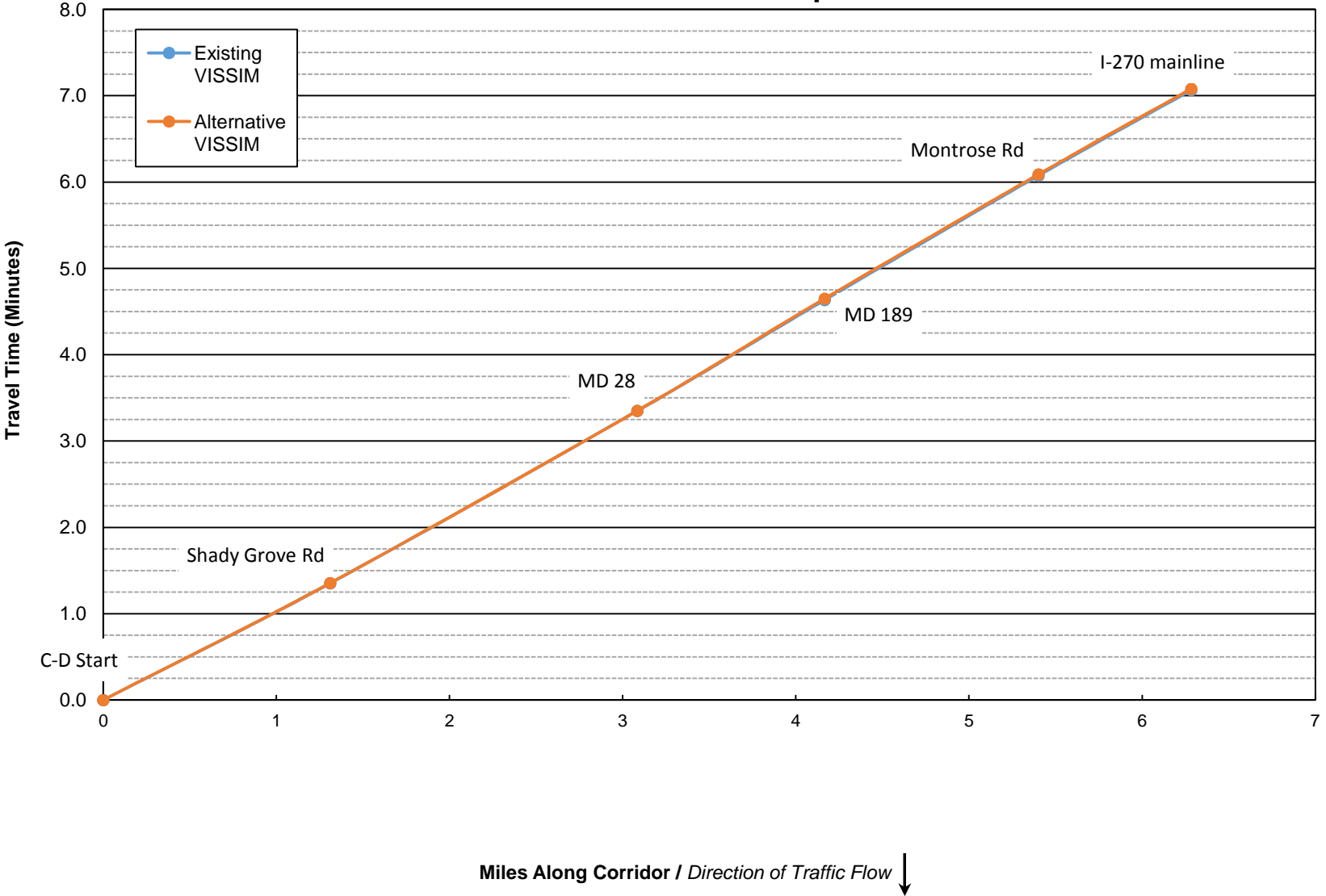


Table B.1: PM Peak - 2015 Hard Shoulder Running - I-270 Vehicle Travel Time

I-270 Northbound	Segment Length (miles)	Existing VISSIM Travel Time (seconds)	HSR VISSIM Travel Time (seconds)	% Change	I-270 Southbound	Segment Length (miles)	Existing VISSIM Travel Time (seconds)	HSR VISSIM Travel Time (seconds)	% Change
From I-495 interchange					From I-70				
to MD 187	1.8	290.1	291.2	0.4%	to MD 85	1.7	92.4	92.4	0.0%
to I-270 Split	0.6	89.3	89.5	0.1%	to MD 80	5.4	301.4	301.2	-0.1%
to Montrose Rd	1.8	113.6	114.0	0.4%	to MD 109	3.7	207.9	207.7	-0.1%
to MD 189	1.0	66.0	66.1	0.1%	to MD 121	3.6	201.4	201.5	0.1%
to MD 28	1.0	67.1	68.2	1.6%	to MD 27	2.5	133.7	133.6	-0.1%
to Shady Grove Rd	1.9	123.3	122.9	-0.3%	to MD 118	1.1	57.6	57.5	-0.2%
to I-370	0.9	61.3	61.1	-0.3%	to Middlebrook Rd	1.1	60.4	60.5	0.1%
to MD 117	1.5	145.0	99.8	-31.2%	to MD 124	2.2	120.9	120.5	-0.4%
to MD 124	0.6	104.3	39.6	-62.1%	to MD 117	0.9	66.4	65.0	-2.1%
to Middlebrook Rd	2.5	246.0	163.4	-33.6%	to I-370	1.0	55.8	56.2	0.7%
to MD 118	1.1	83.6	78.2	-6.4%	to Shady Grove Rd	1.5	79.7	79.7	0.0%
to MD 27	0.9	72.2	80.9	12.1%	to MD 28	1.9	109.5	109.6	0.1%
to MD 121	2.4	157.6	160.3	1.7%	to MD 189	1.0	60.1	60.1	0.0%
to MD 109	4.1	274.2	296.5	8.1%	to Montrose Rd	1.0	62.9	62.9	0.0%
to MD 80	3.7	244.9	246.2	0.5%	to I-270 Split	1.9	111.5	111.6	0.1%
to MD 85	5.3	346.9	349.4	0.7%	to MD 187	0.4	22.8	22.9	0.4%
to I-70	1.4	180.2	181.9	0.9%	to I-495 interchange	1.9	154.8	154.5	-0.2%
I-270 Total (miles/minutes)	32.4	44.4	41.8	-5.9%	I-270 Total (miles/minutes)	32.6	31.7	31.6	-0.1%
I-270 Spur Northbound					I-270 Spur Southbound				
From Cabin John Pkwy					From I-70				
to MD 190	0.5	105.6	105.6	0.0%	to I-270 Split	30.3	1,721.6	1,720.1	-0.1%
to I-495	1.1	259.8	259.6	-0.1%	to Democracy Blvd	0.7	135.0	146.1	8.2%
to Democracy Blvd	1.4	222.8	219.5	-1.5%	to I-495	1.3	466.2	480.4	3.0%
to I-270 Split	0.9	76.3	76.1	-0.3%	to MD 190	1.3	196.3	194.8	-0.8%
to I-70	30.0	2,286.1	2,128.4	-6.9%	to Cabin John Pkwy	0.6	158.2	156.9	-0.8%
I-270 Spur Total (miles/minutes)	34.0	49.2	46.5	-5.5%	I-270 Spur Total (miles/minutes)	34.2	44.6	45.0	0.8%

Table B.2: PM Peak - 2015 Hard Shoulder Running - I-270 Local Vehicle Travel Time

I-270 Northbound	Segment Length (miles)	Existing VISSIM Travel Time (seconds)	HSR VISSIM Travel Time (seconds)	% Change	I-270 Southbound	Segment Length (miles)	Existing VISSIM Travel Time (seconds)	HSR VISSIM Travel Time (seconds)	% Change
From C-D start					From C-D start				
to Montrose Rd	0.8	59.3	54.8	-7.6%	to Shady Grove	1.3	81.2	81.3	0.2%
to MD 189	1.3	159.8	122.7	-23.2%	to MD 28	1.8	119.8	119.7	-0.1%
to MD 28	1.0	87.2	97.8	12.1%	to MD 189	1.1	77.1	77.9	1.1%
to Shady Grove	2.0	388.8	124.7	-67.9%	to Montrose	1.2	86.4	86.4	0.0%
to I-370	1.0	92.6	66.2	-28.5%	to I-270 mainline	0.9	59.4	59.4	0.0%
to MD 117	1.2	88.2	97.3	10.3%					
to MD 124	0.8	232.8	76.6	-67.1%					
to I-270 mainline	0.4	91.1	27.0	-70.3%					
I-270 Local Total (miles/minutes)	8.5	20.0	11.1	-44.4%	I-270 Local Total (miles/minutes)	6.3	7.1	7.1	0.2%

Table B.3: PM Peak - 2015 Hard Shoulder Running - I-270 Vehicle Speed

I-270 Northbound	Segment Length (miles)	Existing VISSIM Speed (MPH)	HSR VISSIM Speed (MPH)	% Change	I-270 Southbound	Existing VISSIM Speed (MPH)	HSR VISSIM Speed (MPH)	% Change
From I-495 interchange					From I-70			
to MD 187	1.8	22.8	22.7	-0.4%	to MD 85	64.8	64.8	0.0%
to I-270 Split	0.6	23.8	23.8	-0.1%	to MD 80	64.0	64.0	0.1%
to Montrose Rd	1.8	55.6	55.4	-0.4%	to MD 109	64.4	64.5	0.1%
to MD 189	1.0	55.3	55.3	-0.1%	to MD 121	64.7	64.7	-0.1%
to MD 28	1.0	51.8	50.9	-1.6%	to MD 27	66.9	66.9	0.1%
to Shady Grove Rd	1.9	55.4	55.6	0.3%	to MD 118	67.0	67.1	0.2%
to I-370	0.9	55.5	55.6	0.3%	to Middlebrook Rd	66.2	66.2	-0.1%
to MD 117	1.5	37.6	54.6	45.3%	to MD 124	65.4	65.6	0.4%
to MD 124	0.6	21.1	55.7	163.6%	to MD 117	48.1	49.1	2.1%
to Middlebrook Rd	2.5	36.4	54.8	50.5%	to I-370	63.6	63.2	-0.7%
to MD 118	1.1	48.3	51.6	6.9%	to Shady Grove Rd	67.2	67.2	0.0%
to MD 27	0.9	45.7	40.7	-10.8%	to MD 28	61.6	61.5	-0.1%
to MD 121	2.4	54.7	53.8	-1.7%	to MD 189	58.6	58.6	0.0%
to MD 109	4.1	53.5	49.5	-7.5%	to Montrose Rd	59.1	59.0	0.0%
to MD 80	3.7	54.1	53.8	-0.5%	to I-270 Split	60.4	60.4	-0.1%
to MD 85	5.3	54.5	54.2	-0.7%	to MD 187	66.4	66.1	-0.4%
to I-70	1.4	27.4	27.1	-0.9%	to I-495 interchange	44.0	44.1	0.2%
I-270 Total (miles/minutes)	32.4	43.8	46.5	6.2%	I-270 Total (miles/minutes)	61.9	61.9	0.0%
I-270 Spur Northbound					I-270 Spur Southbound			
From Cabin John Pkwy					From I-70			
to MD 190	0.5	18.4	18.4	0.0%	to I-270 Split	63.4	63.5	0.1%
to I-495	1.1	15.7	15.7	0.1%	to Democracy Blvd	19.5	18.0	-7.6%
to Democracy Blvd	1.4	23.2	23.5	1.5%	to I-495	10.1	9.8	-2.9%
to I-270 Split	0.9	42.1	42.2	0.3%	to MD 190	23.0	23.2	0.8%
to I-70	30.0	47.2	50.7	7.4%	to Cabin John Pkwy	13.0	13.1	0.8%
I-270 Spur Total (miles/minutes)	34.0	41.5	43.9	5.8%	I-270 Spur Total (miles/minutes)	46.0	45.6	-0.8%

Table B.4: PM Peak - 2015 Hard Shoulder Running - I-270 Local Vehicle Speed

I-270 Northbound	Existing VISSIM Speed (MPH)	HSR VISSIM Speed (MPH)	% Change	I-270 Southbound	Segment Length (miles)	Existing VISSIM Speed (MPH)	HSR VISSIM Speed (MPH)	% Change
From C-D start				From C-D start				
to Montrose Rd	51.3	55.5	8.2%	to Shady Grove	1.3	58.1	58.0	-0.2%
to MD 189	29.4	38.3	30.2%	to MD 28	1.8	53.3	53.3	0.1%
to MD 28	40.0	35.6	-10.8%	to MD 189	1.1	50.5	50.0	-1.1%
to Shady Grove	18.1	56.4	211.7%	to Montrose	1.2	51.4	51.5	0.0%
to I-370	37.5	52.5	39.9%	to I-270 mainline	0.9	53.5	53.5	0.0%
to MD 117	50.9	46.1	-9.4%					
to MD 124	12.7	38.6	203.8%					
to I-270 mainline	13.8	46.6	236.8%					
I-270 Local Total (miles/minutes)	25.4	45.6	79.8%	I-270 Local Total (miles/minutes)	6.3	53.4	53.3	-0.2%

Table B.5: PM Peak - 2015 Hard Shoulder Running - I-270 Vehicle Density

I-270 Northbound	Type	Existing		HSR		% Change	I-270 Southbound	Type	Existing		HSR		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS	
I-270	Freeway	47	F	48	F	2%	I-270	Freeway	16	B	16	B	0%
I-270 Diverge to MD 187	Diverge	60	F	59	F	-2%	I-270 Merge from WB I-70	Merge	13	B	13	B	0%
I-270	Freeway	73	F	72	F	-2%	I-270	Freeway	19	C	19	C	0%
I-270 Diverge to Rockledge Rd	Diverge	69	F	67	F	-3%	I-270 Merge from EB I-70	Merge	14	B	14	B	0%
I-270	Freeway	82	F	81	F	-1%	I-270	Freeway	18	C	18	C	0%
I-270 Weave from MD 187 to I-270 HOV	Weave	56	F	57	F	2%	I-270 Diverge to SB MD 85	Diverge	19	B	19	B	0%
I-270 Lane Drop	Merge	65	F	64	F	-2%	I-270	Freeway	20	C	20	C	0%
I-270	Freeway	51	F	51	F	0%	I-270 Diverge to NB MD 85	Diverge	12	B	12	B	0%
I-270 Merge from I-270 Spur	Merge	37	E	37	E	0%	I-270	Freeway	16	B	16	B	0%
I-270 Weave from I-270 HOV to I-270 C-D	Weave	33	D	33	D	0%	I-270 Merge from MD 85	Merge	14	B	14	B	0%
I-270	Freeway	32	D	32	D	0%	I-270	Freeway	21	C	21	C	0%
I-270 Diverge to C-D (MD 189)	Diverge	37	E	38	E	2%	I-270 Diverge to MD 80	Diverge	13	B	14	B	1%
I-270	Freeway	32	D	32	D	0%	I-270	Freeway	17	B	17	B	0%
I-270 Diverge to C-D (MD 28)	Diverge	38	E	38	E	-1%	I-270 Merge from MD 80	Merge	11	B	11	B	0%
I-270	Freeway	30	D	31	D	3%	I-270	Freeway	20	C	20	C	0%
I-270 Merge from C-D (MD 189)	Merge	41	F	45	F	9%	I-270 Diverge to MD 109	Diverge	10	B	10	B	0%
I-270 Diverge to C-D (Shady Grove Rd)	Diverge	42	F	42	F	0%	I-270	Freeway	19	C	19	C	0%
I-270	Freeway	30	D	29	D	0%	I-270 Merge from MD 109	Merge	11	B	11	B	0%
I-270 Weave from C-D (MD 28) to C-D (Shady Grove Rd)	Weave	32	D	32	D	0%	I-270	Freeway	20	C	20	C	0%
I-270	Freeway	26	D	26	D	0%	I-270 Diverge to SB Weigh Station	Diverge	10	B	10	B	0%
I-270 Merge from C-D (Shady Grove Rd)	Merge	21	C	21	C	2%	I-270	Freeway	20	C	20	C	1%
I-270	Freeway	33	D	30	D	-10%	I-270 Merge from SB Weigh Station	Merge	10	B	10	B	0%
I-270 Merge from C-D (I-370)	Merge	32	D	23	C	-29%	I-270	Freeway	19	C	19	C	0%
I-270 Diverge to C-D (MD 117)	Diverge	53	F	30	D	-44%	I-270 Diverge to MD 121	Diverge	7	A	7	A	0%
I-270	Freeway	74	F	29	D	-61%	I-270	Freeway	12	B	12	B	0%
I-270 Merge from C-D (MD 124)	Merge	101	F	30	D	-70%	I-270 Merge from MD 121	Merge	9	A	9	A	-1%
I-270	Freeway	36	E	29	D	-19%	I-270	Freeway	14	B	14	B	0%
I-270 Diverge to EB Middlebrook Rd	Diverge	28	D	25	C	-9%	I-270 Diverge to MD 27	Diverge	10	A	9	A	-1%
I-270	Freeway	34	D	28	D	-15%	I-270	Freeway	12	B	12	B	0%
I-270 Diverge to WB Middlebrook Rd	Diverge	30	D	27	C	-11%	I-270 Merge from WB MD 27	Merge	11	B	11	B	0%
I-270	Freeway	27	D	24	C	-14%	I-270	Freeway	15	B	15	B	0%
I-270 Diverge to EB MD 118	Diverge	24	C	20	C	-15%	I-270 Weave from EB MD 27 to MD 118	Weave	12	B	12	B	-1%
I-270 Diverge to WB MD 118	Diverge	42	F	26	C	-38%	I-270	Freeway	14	B	14	B	0%
I-270	Freeway	33	D	25	C	-25%	I-270 Merge from WB MD 118	Merge	12	B	12	B	-1%
I-270 Weave from MD 118 to MD 27	Weave	46	F	49	F	7%	I-270	Freeway	17	B	17	B	0%
I-270	Freeway	26	D	21	C	-21%	I-270 Merge from EB MD 118	Merge	15	B	15	B	0%
I-270 Merge from EB MD 27	Merge	46	F	49	F	7%	I-270	Freeway	20	C	20	C	0%
I-270	Freeway	26	C	23	C	-9%	I-270 Merge from Middlebrook Rd	Merge	21	C	21	C	0%
I-270 Merge from WB MD 27	Merge	20	C	24	C	21%	I-270	Freeway	21	C	21	C	0%
I-270	Freeway	27	D	29	D	7%	I-270 Diverge to MD 124	Diverge	18	B	18	B	-2%
I-270 Diverge to MD 121	Diverge	21	C	22	C	7%	I-270	Freeway	22	C	21	C	-6%

Table B.5: PM Peak - 2015 Hard Shoulder Running - I-270 Vehicle Density

I-270 Northbound	Type	Existing		HSR		% Change	I-270 Southbound	Type	Existing		HSR		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS	
I-270	Freeway	22	C	24	C	6%	I-270 Merge from WB MD 124	Merge	44	F	44	F	0%
I-270 Merge from EB MD 121	Merge	16	B	18	B	7%	I-270	Freeway	21	C	21	C	0%
I-270 Lane Drop	Merge	27	C	49	F	86%	I-270 Merge from MD 117	Merge	25	C	25	C	3%
I-270	Freeway	40	E	36	E	-9%	I-270	Freeway	21	C	21	C	0%
I-270 Diverge to NB Weigh Station	Diverge	17	B	18	B	5%	I-270 Diverge to I-370	Diverge	19	B	18	B	-1%
I-270	Freeway	35	D	37	E	5%	I-270	Freeway	16	B	16	B	0%
I-270 Merge from NB Weight Station	Merge	17	B	18	B	5%	I-270 Diverge to I-270 C-D	Diverge	13	B	13	B	0%
I-270	Freeway	36	E	38	E	5%	I-270	Freeway	13	B	13	B	0%
I-270 Diverge to MD 109	Diverge	20	B	21	C	5%	I-270 Merge from I-270 (I-370)	Merge	18	B	18	B	0%
I-270	Freeway	33	D	34	D	5%	I-270 Diverge to I-270 C-D (Shady Grove Rd)	Diverge	22	C	22	C	0%
I-270 Merge from MD 109	Merge	17	B	18	B	6%	I-270	Freeway	17	B	17	B	0%
I-270	Freeway	34	D	36	E	5%	I-270 Merge from I-270 C-D (Shady Grove Rd Northern)	Merge	16	B	16	B	1%
I-270 Diverge to MD 80	Diverge	24	C	25	C	3%	I-270	Freeway	22	C	22	C	0%
I-270	Freeway	29	D	30	D	5%	I-270 Merge from I-270 C-D (Shady Grove Rd Southern)	Merge	17	B	17	B	1%
I-270 Merge from MD 80	Merge	16	B	17	B	4%	I-270 Diverge to I-270 C-D (MD 189)	Diverge	23	C	23	C	0%
I-270	Freeway	33	D	35	D	4%	I-270	Freeway	20	C	20	C	0%
I-270 Diverge to Scenic View	Diverge	17	B	18	B	5%	I-270 Merge from I-270 C-D (MD 189)	Merge	18	B	19	B	1%
I-270	Freeway	33	D	35	D	4%	I-270	Freeway	24	C	24	C	1%
I-270 Merge from Scenic View	Merge	17	B	18	B	6%	I-270 Merge from I-270 C-D	Merge	20	C	20	C	1%
I-270	Freeway	33	D	35	D	4%	I-270 Diverge to I-270 HOV Lane	Diverge	17	B	16	B	-1%
I-270 Diverge to NB MD 85	Diverge	19	B	20	B	2%	I-270 Diverge to I-270 Spur	Diverge	33	D	35	D	6%
I-270	Freeway	32	D	33	D	5%	I-270	Freeway	13	B	13	B	0%
I-270 Diverge to SB MD 85	Diverge	18	B	19	B	4%	I-270 Diverge to Rockledge Dr / MD 187	Diverge	9	A	9	A	3%
I-270	Freeway	28	D	29	D	3%	I-270	Freeway	13	B	13	B	0%
I-270 Weave from MD 85 to I-70	Weave	21	C	21	C	2%	I-270 Merge from Rockledge Dr	Merge	11	B	12	B	1%
I-270	Freeway	59	F	61	F	4%	I-270	Freeway	16	B	16	B	0%
							I-270 Merge from Rockledge Dr / MD 187	Merge	14	B	14	B	0%
							I-270	Freeway	35	D	35	D	0%

Table B.6: PM Peak - 2015 Hard Shoulder Running - I-270 Spur Vehicle Density

I-270 Spur Northbound	Type	Existing		HSR		% Change	I-270 Southbound	Type	Existing		HSR		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS			
I-270 Spur	Freeway	45	F	45	F	-1%	I-270 Spur	Freeway	53	F	57	F	7%
I-270 Spur Merge from Clara Barton Parkway	Merge	51	F	52	F	2%	I-270 Spur Weave from I-270 HOV to Democracy Blvd	Weave	76	F	78	F	4%
I-270 Spur	Freeway	66	F	66	F	0%	I-270 Spur	Freeway	95	F	98	F	3%
I-270 Diverge to MD 190	Diverge	43	F	43	F	0%	I-270 Merge from Democracy Blvd	Merge	134	F	140	F	4%
I-270 Spur	Freeway	78	F	78	F	0%	I-270 Spur Lane Drop	Merge	131	F	136	F	4%
I-270 Spur Merge from Cabin John Parkway	Merge	95	F	97	F	2%	I-270 Spur	Freeway	123	F	124	F	1%
I-270 Spur Merge from MD 190	Merge	94	F	96	F	1%	I-270 Spur Merge from I-495	Merge	124	F	124	F	0%
I-270 Spur	Freeway	83	F	83	F	0%	I-270 Spur	Freeway	48	F	47	F	-2%
I-270 Spur Diverge to I-495	Merge	65	F	65	F	1%	I-270 Spur Diverve to EB MD 190	Diverge	49	F	49	F	0%
I-270 Spur	Freeway	45	E	44	E	-3%	I-270 Spur Diverve to Cabin John Pkwy	Diverge	66	F	66	F	0%
I-270 Spur Diverge to Democracy Blvd	Diverge	49	F	48	F	-1%	I-270 Spur	Freeway	93	F	93	F	0%
I-270 Spur	Freeway	58	F	57	F	-2%	I-270 Merge from MD 190	Merge	111	F	115	F	3%
I-270 Spur Merge from EB Democracy Blvd	Merge	98	F	97	F	-1%	I-270 Spur	Freeway	94	F	94	F	0%
I-270 Spur	Freeway	58	F	58	F	0%	I-270 Diverge to WB Clara Barton Pkwy	Diverge	60	F	61	F	0%
I-270 Spur Merge from WB Democracy Blvd	Merge	65	F	65	F	0%	I-270 Spur	Freeway	83	F	83	F	0%
I-270 Spur	Freeway	39	E	39	E	-1%	I-270 Merge from Clara Barton Pkwy	Merge	72	F	72	F	0%
I-270 Spur Merge from Westlake Terrace	Merge	31	D	31	D	0%							
I-270 Spur	Freeway	35	D	35	D	0%							

Table B.7: PM Peak - 2015 Hard Shoulder Running - I-270 Local Vehicle Density

I-270 Northbound	Type	Existing		HSR		% Change	I-270 Southbound	Type	Existing		HSR		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS			
I-270 C-D	Freeway	29	D	29	D	-1%	I-270 C-D	Freeway	8	A	8	A	1%
I-270 C-D Diverge to EB Montrose Rd	Diverge	20	B	20	B	-1%	I-270 C-D Weave from I-370 EB to I-270	Weave	15	B	15	B	1%
I-270 C-D	Freeway	17	B	17	B	0%	I-270 C-D Diverge to Shady Grove Rd	Diverge	10	A	10	A	0%
I-270 C-D Weave between Montrose Rd Loop Ramps	Weave	12	A	12	A	-2%	I-270 C-D	Freeway	7	A	7	A	0%
I-270 C-D	Freeway	20	C	17	B	-14%	I-270 C-D Merge from WB Shady Grove Rd	Merge	9	A	10	A	1%
I-270 C-D Merge from WB Montrose Rd	Merge	52	F	22	C	-59%	I-270 C-D	Freeway	15	B	15	B	0%
I-270 C-D	Freeway	51	F	24	C	-53%	I-270 C-D Merge from EB Shady Grove Rd	Merge	11	B	11	B	0%
I-270 C-D Merge from I-270	Merge	34	D	25	C	-25%	I-270 C-D	Freeway	21	C	21	C	0%
I-270 C-D	Freeway	51	F	41	E	-20%	I-270 C-D Merge from I-270	Merge	25	C	24	C	-3%
I-270 C-D Diverge to MD 189	Diverge	31	D	23	C	-27%	I-270 C-D Diverge to I-270	Diverge	26	C	26	C	0%
I-270 C-D	Freeway	67	F	45	E	-33%	I-270 C-D Diverge to I-270	Diverge	18	B	18	B	0%
I-270 C-D Merge from MD 189	Merge	94	F	60	F	-37%	I-270 C-D	Freeway	16	B	16	B	0%
I-270 C-D	Freeway	49	F	59	F	18%	I-270 C-D Diverge to MD 28	Diverge	12	B	12	B	1%
I-270 C-D Weave between I-270 (to MD 28 from MD 189)	Weave	44	F	48	F	10%	I-270 C-D	Freeway	11	A	11	A	0%
I-270 C-D	Freeway	48	F	50	F	4%	I-270 C-D Merge from WB MD 28	Merge	13	B	13	B	2%
I-270 C-D Diverge to MD 28	Diverge	20	B	20	C	1%	I-270 C-D	Freeway	13	B	13	B	0%
I-270 C-D	Freeway	31	D	31	D	1%	I-270 C-D Merge from EB MD 28	Merge	25	C	25	C	1%
I-270 C-D Weave between MD 28 Ramps	Weave	28	C	28	C	0%	I-270 C-D	Freeway	29	D	30	D	1%
I-270 C-D	Freeway	18	C	19	C	0%	I-270 C-D Merge from I-270	Merge	35	E	36	E	1%
I-270 C-D Merge from MD 28 WB	Merge	13	B	13	B	-1%	I-270 C-D	Freeway	40	E	41	E	2%
I-270 C-D Merge from I-270 and Drop Lane	Merge	18	B	18	B	-1%	I-270 C-D Diverge to MD 189	Diverge	24	C	26	C	5%
I-270 C-D Diverge to I-270	Diverge	23	C	22	C	-1%	I-270 C-D	Freeway	25	C	25	C	0%
I-270 C-D	Freeway	39	E	20	C	-49%	I-270 C-D Merge from MD 189	Merge	23	C	22	C	-4%
I-270 C-D Diverge to Shady Grove Rd	Diverge	14	B	13	B	-9%	I-270 C-D Diverge to I-270	Diverge	32	D	32	D	0%
I-270 C-D	Freeway	111	F	14	B	-87%	I-270 C-D	Freeway	22	C	22	C	0%
I-270 C-D Merge from I-270 and EB Shady Grove Rd	Merge	116	F	16	B	-86%	I-270 C-D Diverge to WB Montrose Rd	Diverge	16	B	16	B	0%
I-270 C-D	Freeway	112	F	16	B	-86%	I-270 C-D	Freeway	20	C	20	C	-1%
I-270 C-D Merge from WB Shady Grove Rd	Merge	108	F	16	B	-85%	I-270 Weave between Montrose Rd Loops	Weave	35	D	32	C	-8%
I-270 C-D Diverge to I-270	Diverge	90	F	30	D	-67%	I-270 C-D	Freeway	15	B	15	B	0%
I-270 C-D	Freeway	60	F	27	D	-54%	I-270 C-D Merge from EB Montrose Rd	Merge	9	A	9	A	1%
I-270 C-D Diverge to I-370	Diverge	28	C	31	D	14%	I-270 C-D	Freeway	18	B	18	B	0%
I-270 C-D	Freeway	10	A	10	A	5%							
I-270 Merge from I-370 EB	Merge	11	B	13	B	16%							
I-270 C-D	Freeway	19	C	11	B	-40%							
I-270 C-D Weave from I-370 to I-270	Weave	27	C	16	B	-40%							
I-270 C-D	Freeway	22	C	25	C	13%							
I-270 C-D Weave from I-270 to MD 117	Weave	33	D	42	F	28%							
I-270 C-D Diverge to MD 124	Diverge	39	E	43	F	10%							
I-270 C-D	Freeway	55	F	10	A	-82%							
I-270 C-D Merge from EB MD 124	Merge	96	F	10	A	-90%							
I-270 C-D Merge From WB MD 124	Merge	81	F	8	A	-91%							

Table B.8: PM Peak - 2015 Hard Shoulder Running - I-270 Vehicle Throughput

I-270 Northbound	Existing VISSIM Throughput	HSR VISSIM Throughput	% Change	I-270 Southbound	Existing VISSIM Throughput	HSR VISSIM Throughput	% Change
Between I-495 and MD 187	4350	4327	-1%	North of I-70	1975	1975	0%
Between MD 187 on and off ramps	3888	3862	-1%	Between I-70 on ramps	2287	2287	0%
Between Rockledge Blvd on and off ramps	3666	3634	-1%	From I-70 interchange to MD-85	3429	3429	0%
Between Rockledge Dr and I-270 Spur	3880	3872	0%	Between MD-85 on and off ramps	2006	2006	0%
Between I-270 Spur and Montrose Rd	8718	8718	0%	Between MD-85 and MD-80	2633	2630	0%
Between Montrose Rd on and off ramps	5750	5739	0%	Between MD-80 on and off ramps	2093	2095	0%
Between Montrose Rd and MD 189	5477	5491	0%	Between MD-80 and Md-109	2457	2451	0%
Between MD 189 and MD 28	5905	5912	0%	Between MD-109 on and off ramps	2395	2398	0%
Between MD 28 on and off ramps	6240	6224	0%	Between MD-109 and MD-121	2521	2522	0%
Between MD 28 and Shady Grove Rd	5494	5481	0%	Between MD-121 on and off ramps	2351	2349	0%
Between Shady Grove Rd and I-370	4789	4791	0%	Between MD-121 and MD-27	2723	2728	0%
Between I-370 on and off ramps	4814	4871	1%	Between MD-27 on and off ramps	2890	2896	0%
Between I-370 and MD 117	6142	6323	3%	Between MD-27 and MD-118	3164	3167	0%
Between MD 117 and MD 124	4713	5061	7%	Between MD-118 on and off ramps	3197	3196	0%
Between MD-124 on and off ramps	4706	5154	10%	Between MD-118 and Middlebrook Rd	3798	3798	0%
Between MD 124 and Middlebrook Rd	6115	6668	9%	Between Middlebrook Rd on and off ramps	3796	3800	0%
Between Middlebrook Rd on and off ramps	5713	6223	9%	Between Middlebrook Rd and MD-124	4826	4821	0%
Between Middlebrook Rd and MD 118	4798	3902	-19%	Between MD-124 on and off ramps	3765	3769	0%
Between MD-118 on and off ramps	4409	4804	9%	Between MD-124 and MD-117	4938	4949	0%
Between MD 118 and MD 27	4456	4798	8%	Between MD-117 and I-370	6461	6476	0%
Between MD-27 on and off ramps	2842	3052	7%	Between I-370 on and off ramps	3327	3335	0%
Between MD 27 and MD 121	3330	3542	6%	Between I-370 on ramp to Shady Grove Rd	4663	4672	0%
Between MD-121 on and off ramps	2574	2743	7%	Between Shady Grove Rd and MD 28	4984	4991	0%
Between MD 121 and MD 109	3787	3951	4%	Between MD 28 on and off ramps	5158	5162	0%
Between MD-109 on and off ramps	3547	3696	4%	Between MD 28 and MD 189	4536	4536	0%
Between MD 109 and MD 80	3657	3793	4%	Between MD 189 and Montrose Rd	4527	4534	0%
Between MD-80 on and off ramps	3096	3227	4%	Between Montrose Rd on and off ramps	5414	5424	0%
Between MD 80 and MD 85	3596	3716	3%	Between Montrose Rd and I-270 Spur	7201	7209	0%
Between MD-85 on and off ramps	3046	3148	3%	Between I-270 Spur and Rockledge Blvd	3293	3291	0%
Between MD 85 and I-70	4867	4958	2%	Between Rockledge Blvd on and off ramps	2549	2549	0%
North of I-70	2562	2620	2%	Between MD 187 on and off ramps	3017	3017	0%
				Between MD 187 and I-495	3372	3370	0%
I-270 Spur Northbound				I-270 Spur Southbound			
Between I-495 and Democracy Blvd	4608	4622	0%	Between I-270 Split and HOV on ramp	3113	3115	0%
Between Democracy Blvd on and off ramps	4128	4143	0%	Between HOV on ramp and Democracy Blvd	2461	2448	-1%
Between Democracy Blvd and I-270 Split	4849	4860	0%	Between Democracy Blvd on and off ramps	1970	1967	0%
				Between Democracy Blvd and I-495	2297	2273	-1%

Table B.9: PM Peak - 2015 Hard Shoulder Running - I-270 Local Vehicle Throughput

I-270 Local Northbound	Existing VISSIM Throughput	HSR VISSIM Throughput	% Change	I-270 Local Southbound	Existing VISSIM Throughput	HSR VISSIM Throughput	% Change
Between Montrose Rd EB off ramp and and EB on ramp	1881	1884	0%	Between I-370 on ramp and I-270 off ramp	2740	2743	0%
Between Montrose Rd EB on ramp and WB off ramp	2172	2171	0%	Between I-270 off ramp and Shady Grove off ramp	1420	1421	0%
Between Montrose Rd WB off ramp and on ramp	1921	1920	0%	Between Shady Grove off ramp and Shady Grove WB on ramp	764	765	0%
Between Montrose Rd WB on ramp and I-270 on ramp	3366	3386	1%	Between Shady Grove WB and EB on ramps	1543	1542	0%
Between I-270 on ramp and MD 189 off ramp	3611	3663	1%	Between Shady Grove on ramp and I-270 on ramp	2168	2166	0%
Between MD 189 ramps	2908	2952	2%	Between I-270 on ramp and I-270 off ramp1	2660	2662	0%
Between MD 189 off ramp and I-270 on ramp	3782	3821	1%	Between I-270 off ramp1 and I-270 off ramp2	1854	1855	0%
Between I-270 on ramp and I-270 off ramp	4472	4507	1%	Between I-270 off ramp2 and MD 28 off ramp	1681	1682	0%
Between I-270 off ramp and MD 28 EB off ramp	3481	3504	1%	Between MD 28 off ramp and MD 28 WB on ramp	1149	1149	0%
Between MD 28 EB off ramp to MD 28 EB on ramp	3133	3155	1%	Between MD 28 WB on ramp and MD 28 EB on ramp	1401	1402	0%
Between MD 28 EB on ramp and MD 28 WB off ramp	3262	3283	1%	Between MD 28 EB on ramp and I-270 on ramp	2908	2908	0%
Between MD 28 WB off ramp and MD 28 WB on ramp	2023	2032	0%	Between I-270 on ramp and MD 189 off ramp	3530	3538	0%
Between MD 28 WB on ramp and I-270 on ramp	2725	2736	0%	Between MD 189 on and off ramps	2601	2607	0%
Between I-270 on ramp and I-270 off ramp	3565	3578	0%	Between MD 189 on ramp and I-270 off ramp	3166	3168	0%
Between I-270 off ramp and Shady Grove off ramp	2136	2180	2%	Between I-270 off ramp and Montrose Rd off ramp	2280	2279	0%
Between Shady Grove off ramp and I-270 on ramp	673	772	15%	Between Montrose Rd off ramp and Montrose Rd WB on ramp	2039	2045	0%
Between I-270 on ramp and Shady Grove WB on ramp	3348	2945	-12%	Between Montrose Rd WB on ramp and EB off ramp	2605	2612	0%
Between Shady Grove WB on ramp and I-270 off ramp	4148	4345	5%	Between Montrose Rd EB off and on ramps	1525	1527	0%
Between I-270 off ramp and I-370 off ramp	3663	2179	-41%	Between Montrose Rd EB off ramp and I-270	1846	1842	0%
Between I-370 off ramp and I-370 EB on ramp	1138	1191	5%				
Between I-370 EB and WB on ramps	2096	1587	-24%				
Between I-370 WB on ramp and I-270 off ramp	3687	3736	1%				
Between I-270 off ramp and I-270 on ramp	2254	2289	2%				
Between I-270 on ramp and MD 117 off ramp	3661	3742	2%				
Between MD 117 off ramp and MD 124 off ramp	2448	2493	2%				
Between MD 124 off ramp and MD 124 EB on ramp	479	498	4%				
Between MD 124 EB and WB on ramps	943	1012	7%				
Between MD 124 on ramp I-270	1427	1525	7%				

Table B.10: PM Peak - 2015 Hard Shoulder Running - I-270 On Ramp Queue Length - Northbound

I-270 Northbound	Existing VISSIM Average Queue (feet)	HSR VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	HSR VISSIM Maximum Queue (feet)	% Change
Rockledge Dr on ramp	1	2	121%	181	267	48%
MD 189 C-D on ramp	0	0	24%	33	38	14%
MD 28 C-D on ramp	0	0	-	0	0	-
Shady Grove Rd C-D on ramp	0	0	-	0	0	-
I-370 C-D on ramp	2	0	-100%	233	0	-100%
MD 124 C-D on ramp	2459	4	-100%	3978	306	-92%
MD 118 on ramp	0	0	-100%	37	0	-100%
MD 27 EB on ramp	0	0	-	0	0	-
MD 27 WB on ramp	0	0	-	0	0	-
MD 121 on ramp	0	0	-	0	0	-
MD 109 on ramp	0	0	-	0	0	-
MD 80 on ramp	0	0	-	0	0	-
MD 85 on ramp	0	0	-	0	0	-
I-270 Spur Northbound	Existing VISSIM Average Queue (feet)	HSR VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	HSR VISSIM Maximum Queue (feet)	% Change
Democracy Blvd EB on ramp	0	0	-	0	0	-
Democracy Blvd WB on ramp	0	0	-	0	0	-
I-495 Northbound	Existing VISSIM Average Queue (feet)	HSR VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	HSR VISSIM Maximum Queue (feet)	% Change
Cabin John Pkwy on ramp	16	24	50%	661	772	17%
MD 190 on ramp	0	0	-	0	17	-
I-270 C-D Northbound	Existing VISSIM Average Queue (feet)	HSR VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	HSR VISSIM Maximum Queue (feet)	% Change
Montrose Rd EB on ramp	0	0	-	0	0	-
Montrose Rd WB on ramp	265	0	-100%	1386	0	-100%
I-270 on ramp	0	0	-	0	0	-
MD 189 on ramp	15	0	-100%	555	0	-100%
I-270 on ramp	0	0	-100%	23	0	-100%
MD 28 EB on ramp	0	0	-	0	0	-
MD 28 WB on ramp	0	0	-	0	0	-
Shady Grove Rd EB on ramp	78	0	-100%	836	0	-100%
I-270 on ramp	178	0	-100%	1103	0	-100%
Shady Grove Rd WB on ramp	12	0	-100%	340	0	-100%
I-370 EB on ramp	0	0	-	0	0	-
I-370 WB on ramp	0	0	-	0	0	-
I-270 on ramp	12	43	247%	658	915	39%
MD 124 EB on ramp	257	0	-100%	1230	0	-100%
MD 124 WB on ramp	1	0	-100%	63	0	-100%

Table B.11: PM Peak - 2015 Hard Shoulder Running - I-270 Off Ramp Queue Length - Northbound

I-270 Northbound	Existing VISSIM Average Queue (feet)	HSR VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	HSR VISSIM Maximum Queue (feet)	% Change
MD 187 off ramp NB	42	38	-7%	278	290	4%
MD 187 off ramp SB	0	0	-	0	0	-
Rockledge Dr off ramp	1	1	55%	73	93	27%
Tower Oaks Blvd off ramp	32	33	1%	235	220	-7%
Montrose Rd off ramp EB	0	0	-	0	0	-
Montrose Rd off ramp WB	0	0	-	0	0	-
MD 189 off ramp WB	29	30	4%	168	177	5%
MD 189 off ramp EB	1	0	-58%	122	89	-27%
MD 28 off ramp EB	37	38	3%	231	210	-9%
MD 28 off ramp WB	0	0	-	0	0	-
Shady Grove Rd off ramp - Redland Blvd	0	0	-	0	0	-
Shady Grove Rd off ramp WB	49	49	1%	248	228	-8%
Shady Grove Rd off ramp EB	0	0	-	0	0	-
I-370 off ramp WB	0	0	-	0	62	-
I-370 off ramp EB	0	0	-	0	0	-
MD 117 off ramp	205	559	173%	859	2422	182%
MD 124 off ramp	799	1043	31%	2471	3265	32%
Watkins Mill Rd off ramp*			-			-
Middlebrook Rd EB off ramp	0	0	-	0	0	-
Middlebrook Rd WB off ramp	0	0	-	0	0	-
MD 118 WB off ramp - Seneca Meadows	0	0	-100%	20	0	-100%
MD 118 WB off ramp	0	0	-	0	0	-
MD 118 EB off ramp	0	0	-	0	0	-
MD 27 off ramp WB	56	58	4%	290	249	-14%
MD 27 off ramp EB	0	0	-	0	0	-
MD 121 off ramp WB	0	0	-	0	0	-
MD 121 off ramp EB	0	0	-	0	0	-
MD 109 off ramp EB	9	9	-2%	158	140	-12%
MD 109 off ramp WB	0	0	-	0	0	-
MD 80 off ramp EB	15	15	6%	140	171	23%
MD 80 off ramp WB	0	0	-72%	11	17	51%
MD 85 NB off ramp	0	0	-	0	0	-
MD 85 SB off ramp	0	0	-47%	72	44	-39%
I-270 Spur Northbound	Existing VISSIM Average Queue (feet)	HSR VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	HSR VISSIM Maximum Queue (feet)	% Change
Clara Barton Pkwy off ramp EB	0	0	-	0	4	-
Clara Barton Pkwy off ramp WB	0	0	-	0	0	-
MD 190 off ramp EB	0	0	-	0	0	-
MD 190 off ramp WB	2	1	-66%	287	103	-64%
Democracy Blvd off ramp WB	42	41	-1%	188	215	14%
Democracy Blvd off ramp EB	18	16	-13%	143	133	-7%

* Ramp in Future Scenario

Table B.12: PM Peak - 2015 Hard Shoulder Running - I-270 On Ramp Queue Length - Southbound

I-270 Southbound	Existing VISSIM Average Queue (feet)	HSR VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	HSR VISSIM Maximum Queue (feet)	% Change
MD 85 on ramp	0	0	-	0	0	-
MD 80 on ramp	0	0	-	0	0	-
MD 109 on ramp	0	0	-	0	0	-
MD 121 WB on ramp	0	0	-	0	0	-
MD 121 EB on ramp*			-			-
MD 27 WB on ramp	0	0	-	0	0	-
MD 27 EB on ramp	0	0	-	0	0	-
MD 118 WB on ramp	0	0	-	0	0	-
MD 118 EB on ramp	0	0	-	0	0	-
Middlebrook Rd on ramp	0	0	-	0	0	-
MD 124 WB on ramp	5	10	109%	332	401	21%
MD 117 on ramp	0	1	-	0	91	-
I-370 C-D on ramp	0	0	-	0	0	-
Shady Grove Rd C-D on ramp North	0	0	-	0	0	-
Shady Grove Rd C-D on ramp South	0	0	-	0	0	-
MD 189 C-D on ramp	0	0	-	0	0	-
Montrose Rd C-D on ramp	0	0	-	0	0	-
Rockledge Dr on ramp	0	0	-	0	0	-
MD 187 on ramp	0	0	-	0	0	-
I-270 Spur Southbound	Existing VISSIM Average Queue (feet)	HSR VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	HSR VISSIM Maximum Queue (feet)	% Change
Democracy Blvd on ramp	335	479	43%	1366	1593	17%
I-495 Southbound	Existing VISSIM Average Queue (feet)	HSR VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	HSR VISSIM Maximum Queue (feet)	% Change
I-270 Spur on ramp	4212	4334	3%	5058	5062	0%
MD 190 on ramp	1	13	1170%	107	312	191%
I-270 C-D Southbound	Existing VISSIM Average Queue (feet)	HSR VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	HSR VISSIM Maximum Queue (feet)	% Change
I-270 on ramp	0	0	-	0	0	-
I-370 on ramp	0	0	-	0	0	-
Shady Grove Rd WB on ramp	0	0	-	0	0	-
Shady Grove Rd EB on ramp	0	0	-	0	0	-
I-270 on ramp	0	0	-	0	0	-
MD 28 WB on ramp	0	0	-71%	14	5	-63%
MD 28 EB on ramp	2	0	-100%	219	0	-100%
I-270 on ramp	0	0	-	0	0	-
MD 189 on ramp	0	0	-	0	0	-
Montrose Rd WB on ramp	1	0	-78%	107	37	-65%
Montrose Rd EB on ramp	0	0	-	0	0	-

* Ramp in Future Scenario

Table B.13: PM Peak -2015 Hard Shoulder Running - I-270 Off Ramp Queue Length - Southbound

I-270 Southbound	Existing VISSIM Average Queue (feet)	HSR VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	HSR VISSIM Maximum Queue (feet)	% Change
MD 85 SB off ramp	0	0	-	0	0	-
MD 85 NB off ramp	0	0	-36%	114	91	-20%
MD 80 off ramp	1	0	-30%	154	99	-36%
MD 109 off ramp WB	0	0	12%	58	61	5%
MD 109 off ramp EB	0	0	-	0	0	-
MD 121 off ramp EB	2	2	5%	98	119	22%
MD 121 off ramp WB	0	0	-	0	0	-
MD 27 off ramp EB	23	22	-4%	149	152	2%
MD 27 off ramp WB	0	0	-	0	0	-
MD 118 off ramp EB	19	19	4%	110	119	8%
MD 118 off ramp WB	0	0	-	0	0	-
Watkins Mill Rd off ramp*			-			-
MD 124 off ramp EB	310	334	8%	1658	1515	-9%
MD 124 off ramp WB	147	68	-54%	1129	728	-36%
I-370 off ramp WB	0	0	-	0	0	-
I-370 off ramp EB	0	0	-	0	0	-
Shady Grove Rd off ramp - Omega Drive	1	0	-15%	42	48	16%
Shady Grove Rd off ramp	0	0	-	0	0	-
MD 28 off ramp	3	3	7%	127	134	5%
MD 189 off ramp EB	123	143	16%	849	1001	18%
MD 189 off ramp WB	0	0	-	0	0	-
Montrose Rd off ramp WB	0	0	-	0	0	-
Montrose Rd off ramp EB	0	0	-	0	43	-
Rockledge Dr off ramp	51	61	18%	295	383	30%
I-270 Spur Southbound	Existing VISSIM Average Queue (feet)	HSR VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	HSR VISSIM Maximum Queue (feet)	% Change
Democracy Blvd off ramp EB	24	23	-4%	157	151	-3%
Democracy Blvd off ramp WB	0	0	-	0	0	-
MD 190 off ramp WB	85	87	2%	826	747	-10%
MD 190 off ramp EB	0	0	-	0	0	-
Clara Barton Pkwy WB off ramp	0	0	-	0	0	-

* Ramp in Future Scenario

Table B.14: PM Peak - Existing - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
1- MD 85 at Sam's Club Drive											
1	NB	28.2	C	NB Left	115	79	116	611	E	53.2	D
				NB Through	503	33	116	611	C		
				NB Right	824	18	55	634	B		
	SB	82.9	F	SB Left	142	77	401	1055	E		
				SB Through	875	84	401	1055	F		
				SB Right	67	87	401	1055	F		
	EB	33.5	C	EB Left	43	83	26	115	F		
				EB Through	20	91	26	115	F		
				EB Right	144	11	26	115	B		
	WB	63.9	E	WB Left	508	77	221	686	E		
				WB Through	27	67	221	686	E		
				WB Right	192	29	221	686	C		
2- MD 85 at I-270 NB on and off ramp											
2	NB	36.0	D	NB Left	977	36	187	908	D	32.7	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	27.9	C	SB Left	0	0	0	0	A		
				SB Through	671	28	100	634	C		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
3- MD 85 at I-270 SB on and off ramp											
3	NB	6.0	A	NB Left	0	0	0	0	A	9.4	A
				NB Through	1699	6	41	829	A		
				NB Right	0	0	0	0	A		
	SB	43.8	D	SB Left	170	44	46	320	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
4- MD 85 at Crestwood Blvd											
4	NB	33.3	D	NB Left	60	70	154	653	E	33.5	C
				NB Through	1255	32	154	654	C		
				NB U-Turn	0	0	0	0	A		
	SB	22.0	C	SB Left	91	80	45	208	E		
				SB Through	810	25	59	445	C		
				SB Right	796	12	45	436	B		
	EB	54.8	D	EB Left	802	57	133	610	E		
				EB Through	31	44	133	610	D		
				EB Right	22	0	133	610	A		
	WB	43.4	D	WB Left	36	75	39	162	E		
				WB Through	61	65	39	162	E		
				WB Right	81	13	39	162	B		
5- MD 80 at I-270 NB on and off ramp											
5	NB	-1.8	A	NB Left	1	0	0	0	A	8.6	A
				NB Through	2	0	0	0	A		
				NB Right	8	-3	0	0	A		
	SB	12.2	B	SB Left	385	15	21	145	B		
				SB Through	17	17	21	145	B		
				SB Right	122	2	0	0	A		
	EB	8.9	A	EB Left	70	9	13	171	A		
				EB Through	0	0	8	0	A		
				EB Right	6	5	24	202	A		
	WB	6.9	A	WB Left	16	10	0	40	B		
				WB Through	510	12	28	281	B		
				WB Right	482	1	0	0	A		
6- MD 80 at I-270 SB on and off ramp											
6	NB	2.3	A	NB Left	47	3	1	190	A	4.2	A
				NB Through	0	0	0	0	A		
				NB Right	491	2	1	190	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	5.0	A	EB Left	0	0	0	0	A		
				EB Through	271	5	2	61	A		
				EB Right	53	3	1	69	A		
	WB	6.6	A	WB Left	0	0	0	0	A		
				WB Through	316	7	1	89	A		
				WB Right	0	0	0	0	A		
7- MD 109 at I-270 NB on and off ramp											
7	NB			NB Left	0	0	0	0	A	5.3	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	10.2	B	SB Left	224	11	14	175	B		
				SB Through	0	0	0	0	A		
				SB Right	17	2	0	67	A		
	EB	2.2	A	EB Left	56	1	0	37	A		
				EB Through	0	0	0	0	A		
				EB Right	59	3	0	0	A		
	WB	0.3	A	WB Left	0	0	0	0	A		
				WB Through	160	0	0	0	A		
				WB Right	0	0	0	0	A		
8- MD 80 at I-270 SB on and off ramp											
8	NB	4.0	A	NB Left	44	7	2	115	A	1.6	A
				NB Through	0	0	0	0	A		
				NB Right	29	0	0	43	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.8	A	EB Left	0	0	0	0	A		
				EB Through	114	0	0	0	A		
				EB Right	24	4	0	0	A		
	WB	1.2	A	WB Left	98	1	0	42	A		
				WB Through	78	1	0	19	A		
				WB Right	0	0	0	0	A		
9- MD 121 at Gateway Center Dr											
9	NB	10.6	B	NB Left	471	13	31	242	B	17.0	B
				NB Through	638	10	31	242	A		
				NB Right	54	2	36	268	A		
	SB	17.8	C	SB Left	20	13	5	143	B		
				SB Through	169	19	14	163	B		
				SB Right	8	4	13	184	A		
	EB	16.6	C	EB Left	2	50	3	93	D		
				EB Through	19	51	11	170	D		
				EB Right	142	12	21	202	B		
	WB	34.8	D	WB Left	214	46	57	220	D		
				WB Through	56	41	57	219	D		
				WB Right	140	16	71	244	B		
10- MD 121 at I-270 NB on and off ramp											
10	NB	0.8	A	NB Left	25	9	1	67	A	0.6	A
				NB Through	0	0	0	0	A		
				NB Right	718	1	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.1	A	EB Left	0	0	0	0	A		
				EB Through	447	0	0	0	A		
				EB Right	58	0	0	0	A		
	WB	0.8	A	WB Left	100	3	1	73	A		
				WB Through	423	0	0	48	A		
				WB Right	0	0	0	0	A		

Table B.14: PM Peak - Existing - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
11- MD 121 at I-270 SB on and off ramp											
11	NB			NB Left	0	0	0	0	A	2.2	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	7.7	A	SB Left	136	10	8	125	A		
				SB Through	0	0	0	0	A		
				SB Right	36	0	0	0	A		
	EB	0.3	A	EB Left	29	1	0	23	A		
				EB Through	0	0	0	0	A		
				EB Right	349	0	0	0	A		
	WB	0.1	A	WB Left	0	0	0	0	A		
WB Through				99	0	0	0	A			
WB Right				0	0	0	0	A			
12- MD 27 at Observation Dr											
12	NB	40.1	D	NB U-Turn	0	0	0	0	A	22.2	C
				NB Through	73	57	19	86	E		
				NB Right	47	13	19	86	B		
	SB	39.7	D	SB Left	114	46	31	182	D		
				SB Through	41	62	35	244	E		
				SB Right	173	30	57	281	C		
	EB	16.8	B	EB Left	208	27	68	502	C		
				EB Through	2223	16	70	503	B		
				EB Right	106	15	82	541	B		
	WB	25.8	C	WB Left	31	22	123	627	C		
WB Through				1503	26	123	627	C			
WB Right				54	9	123	627	A			
13- MD 27 at I-270 NB off ramp											
13	NB	44.8	D	NB Left	390	45	63	297	D	8.1	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.1	A	EB Left	0	0	0	0	A		
				EB Through	1284	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	5.5	A	WB Left	0	0	0	0	A		
WB Through				1582	6	41	680	A			
WB Right				0	0	0	0	A			
14- MD 27 at I-270 SB off ramp											
14	NB			NB Left	0	0	0	0	A	5.4	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	52.2	D	SB Left	171	52	35	162	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	2.3	A	EB Left	0	0	0	0	A		
				EB Through	1351	2	4	149	A		
				EB Right	0	0	0	0	A		
	WB	2.7	A	WB Left	0	0	0	0	A		
WB Through				1433	3	7	257	A			
WB Right				0	0	0	0	A			
15- MD 27 at Crystal Rock Dr											
15	NB	22.6	C	NB Left	58	20	55	379	C	29.8	C
				NB Through	965	23	68	379	C		
				NB Right	43	20	72	391	B		
	SB	33.9	C	SB Left	140	57	185	770	E		
				SB Through	1310	35	185	770	D		
				SB Right	196	9	164	764	A		
	EB	43.0	D	EB Left	103	54	28	120	D		
				EB Through	37	46	25	115	D		
				EB Right	47	17	17	141	B		
	WB	27.6	C	WB Left	83	49	70	297	D		
WB Through				102	43	70	297	D			
WB Right				552	22	70	297	C			
16- MD 118 at Seneca Meadows Pkwy											
16	NB	4.0	A	NB Left	90	12	1	82	B	8.2	A
				NB Through	1174	3	7	154	A		
				NB Right	0	0	15	207	A		
	SB	6.5	A	SB Left	11	6	14	270	A		
				SB Through	1091	7	18	270	A		
				SB Right	9	3	21	302	A		
	EB	13.1	B	EB Left	18	55	12	130	E		
				EB Through	1	76	12	130	E		
				EB Right	275	10	12	130	B		
	WB	53.5	D	WB Left	93	64	37	199	E		
WB Through				6	61	33	198	E			
WB Right				25	13	42	218	B			
17- MD 118 at I-270 NB on ramp											
17	NB			NB Left	0	0	0	0	A	16.1	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	33.9	C	EB Left	435	34	90	501	C		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	10.8	B	WB Left	0	0	0	0	A		
WB Through				246	2	1	116	A			
WB Right				1216	13	46	480	B			
18- MD 118 at I-270 SB off ramp											
18	NB			NB Left	0	0	0	0	A	6.1	A
				NB Through	0	0.0	0	0	A		
				NB Right	0	0.0	0	0	A		
	SB	37.1	D	SB Left	129	37.1	22	114	D		
				SB Through	0	0.0	0	0	A		
				SB Right	0	0.0	0	0	A		
	EB	4.8	A	EB Left	0	0.0	0	0	A		
				EB Through	1182	4.8	10	322	A		
				EB Right	0	0.0	0	0	A		
	WB	4.5	A	WB Left	0	0.0	0	0	A		
WB Through				1465	4.5	8	237	A			
WB Right				0	0.0	0	0	A			
19- MD 118 at Aircraft Dr											
19	NB	24.0	C	NB Left	42	69	33	176	E	27.5	C
				NB Through	43	70	33	176	E		
				NB Right	196	4	3	77	A		
	SB	90.2	F	SB Left	381	90	221	577	F		
				SB Through	12	82	221	577	F		
				SB Right	97	91	221	577	F		
	EB	17.8	B	EB Left	98	22	60	395	C		
				EB Through	1215	17	60	395	B		
				EB Right	17	15	60	395	B		
	WB	17.6	B	WB Left	12	17	66	441	B		
WB Through				1324	21	66	441	C			
WB Right				351	5	66	441	A			
20- Middlebrook Rd at Observation Dr											
20	NB			NB Left	0	0	0	0	A	8.5	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	18.0	B	SB Left	96	35	18	131	D		
				SB Through	0	0	0	0	A		
				SB Right	179	9	18	131	A		
	EB	6.4	A	EB Left	15	9	17	155	A		
				EB Through	1180	6	17	155	A		
				EB Right	0	0	0	0	A		
	WB	8.4	A	WB Left	0	0	0	0	A		
WB Through				1238	8	24	251	A			
WB Right				12	6	39	300	A			

Table B.14: PM Peak - Existing - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
21- Middlebrook Rd at I-270 SB on ramp											
21	NB			NB Left	0	0	0	0	A	4.4	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	2.8	A	EB Left	0	0	0	0	A		
				EB Through	686	3	4	96	A		
				EB Right	0	0	0	0	A		
	WB	7.1	A	WB Left	429	7	4	194	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
22- Middlebrook Rd at Waring Station Rd											
22	NB	48.4	D	NB Left	156	45	75	316	D	12.5	B
				NB Through	0	0	75	316	A		
				NB Right	219	51	75	316	D		
	SB	30.6	C	SB Left	30	44	7	66	D		
				SB Through	2	37	7	66	D		
				SB Right	19	9	18	104	A		
	EB	7.3	A	EB Left	3	10	23	262	B		
				EB Through	1035	7	23	262	A		
				EB Right	160	7	23	262	A		
	WB	8.3	A	WB Left	242	20	33	332	C		
				WB Through	1650	7	33	332	A		
				WB Right	4	2	33	332	A		
23- MD 124 at MD 355											
23	NB	51.6	D	NB Left	507	63	186	529	E	63.0	E
				NB Through	942	46	183	527	D		
				NB Right	6	12	0	0	B		
	SB	30.7	C	SB Left	141	71	99	395	E		
				SB Through	554	53	99	395	D		
				SB Right	736	6	20	339	A		
	EB	42.4	D	EB Left	468	93	363	1176	F		
				EB Through	2720	41	363	1176	D		
				EB Right	575	7	160	1150	A		
	WB	153.9	F	WB Left	0	0	0	0	A		
				WB Through	1481	156	718	950	F		
				WB Right	65	101	0	0	F		
24- MD 124 at I-270 SB on and off											
24	NB	64.4	F	NB Left	55	65	23	98	E	40.8	D
				NB Through	23	64	23	98	E		
				NB U-Turn	0	0	0	0	A		
	SB	57.0	E	SB Left	572	94	316	1663	F		
				SB Through	10	80	316	1663	F		
				SB Right	452	9	141	1059	A		
	EB	43.4	D	EB Left	0	0	0	0	A		
				EB Through	1738	44	307	1098	D		
				EB Right	31	34	323	1121	C		
	WB	18.7	B	WB Left	4	66	77	588	E		
				WB Through	1046	19	77	588	B		
				WB Right	0	0	0	0	A		
25- MD 117 at MD 124											
25	NB	36.4	D	NB Left	45	63	116	666	E	40.6	D
				NB Through	545	54	116	666	D		
				NB Right	447	13	4	216	B		
	SB	32.8	C	SB Left	119	44	98	447	D		
				SB Through	762	37	98	447	D		
				SB Right	144	2	0	0	A		
	EB	46.1	D	EB Left	120	82	142	477	F		
				EB Through	1092	42	142	478	D		
				EB Right	43	39	149	506	D		
	WB	43.5	D	WB Left	402	70	280	1027	E		
				WB Through	1338	39	280	1027	D		
				WB Right	129	2	0	0	A		
26- MD 117 at Bureau Dr											
26	NB	45.7	D	NB Left	78	79	65	281	E	38.8	D
				NB Through	27	75	65	281	E		
				NB Right	260	33	65	281	C		
	SB	71.9	E	SB Left	274	83	109	351	F		
				SB Through	17	82	109	351	F		
				SB Right	65	21	109	351	C		
	EB	31.4	C	EB Left	41	80	156	829	F		
				EB Through	1593	30	157	829	C		
				EB Right	3	13	151	818	B		
	WB	37.7	D	WB Left	19	43	337	1058	D		
				WB Through	1703	40	337	1059	D		
				WB Right	292	26	368	1107	C		
27- MD 117 at I-270 SB off ramp											
27	NB			NB Left	0	0	0	0	A	13.3	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	4.6	A	EB Left	0	0	0	0	A		
				EB Through	896	5	10	466	A		
				EB Right	0	0	0	0	A		
	WB	39.8	E	WB Left	294	40	140	1068	E		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
28- MD 117 at I-270 NB off ramp											
28	NB			NB Left	0	0	0	0	A	30.5	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	52.1	D	SB Left	256	46	214	871	D		
				SB Through	0	0	0	0	A		
				SB Right	951	54	214	870	D		
	EB	27.6	C	EB Left	3	125	152	980	F		
				EB Through	897	27	152	980	C		
				EB Right	0	0	0	0	A		
	WB	13.3	B	WB Left	0	0	0	0	A		
				WB Through	1359	13	87	383	B		
				WB Right	0	0	87	383	A		
29- MD 117 at Perry Pkwy											
29	NB	42.6	D	NB Left	18	69	13	110	E	37.0	D
				NB Through	21	50	13	109	D		
				NB Right	23	15	21	129	B		
	SB	57.1	E	SB Left	194	85	89	332	F		
				SB Through	14	84	89	332	F		
				SB Right	112	6	89	332	A		
	EB	20.8	C	EB Left	240	69	84	355	E		
				EB Through	864	8	84	355	A		
				EB Right	32	6	69	339	A		
	WB	44.4	D	WB Left	36	105	245	752	F		
				WB Through	1228	46	245	752	D		
				WB Right	300	33	245	752	C		
30- Shady Grove Rd at I-270 NB off ramp											
30	NB	7.1	A	NB Left	0	0	0	0	A	13.8	B
				NB Through	1025	7	16	209	A		
				NB Right	0	0	0	0	A		
	SB	9.5	A	SB Left	0	0	0	0	A		
				SB Through	1280	9	41	481	A		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	52.9	D	WB Left	317	53	58	260	D		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table B.14: PM Peak - Existing - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
31- Shady Grove Rd at I-270 SB off ramp											
31	NB	6.8	A	NB Left	0	0	0	0	A	15.9	B
				NB Through	1463	7	28	378	A		
				NB Right	0	0	0	0	A		
	SB	5.5	A	SB Left	0	0	0	0	A		
				SB Through	817	5	8	156	A		
				SB Right	0	0	0	0	A		
	EB	57.5	E	EB Left	229	55	44	200	D		
				EB Through	0	0	0	0	A		
				EB Right	295	60	63	241	E		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
32- MD 28 at I-270 SB off ramp											
32	NB			NB U-Turn	0	0	0	0	A	8.0	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	36.5	D	SB Left	440	44	74	300	D		
				SB Through	0	0	0	0	A		
				SB Right	98	3	1	70	A		
	EB	2.7	A	EB Left	0	0	0	0	A		
				EB Through	1505	1	0	0	A		
				EB Right	830	6	14	245	A		
	WB	6.1	A	WB Left	0	0	0	0	A		
				WB Through	1693	6	18	227	A		
				WB Right	0	0	0	0	A		
33- MD 28 at I-270 on and off ramps											
33	NB	34.9	C	NB Left	0	0	43	241	A	21.5	C
				NB Through	208	47	51	250	D		
				NB Right	134	16	51	250	B		
	SB	33.6	C	SB Left	11	101	175	288	F		
				SB Through	0	0	0	0	A		
				SB Right	164	29	175	288	C		
	EB	12.7	B	EB Left	254	38	53	287	D		
				EB Through	885	5	53	287	A		
				EB Right	0	0	0	0	A		
	WB	24.1	C	WB Left	36	20	96	383	B		
				WB Through	1241	24	77	346	C		
				WB Right	0	0	0	0	A		
34- MD 189 at Great Falls Rd											
34	NB	38.6	D	NB Left	45	44	12	86	D	13.4	B
				NB Through	11	50	8	84	D		
				NB Right	12	10	8	94	A		
	SB	3.3	A	SB Left	14	51	7	73	D		
				SB Through	11	51	7	73	D		
				SB Right	401	0	0	0	A		
	EB	12.0	B	EB Left	425	24	38	464	C		
				EB Through	669	5	5	161	A		
				EB Right	58	4	9	198	A		
	WB	18.4	B	WB Left	11	18	48	405	B		
				WB Through	827	18	48	405	B		
				WB Right	14	17	63	439	B		
35- MD 189 at I-270 Ramps											
35	NB	46.1	D	NB Left	250	46	44	190	D	41.7	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	55.4	E	SB Left	350	55	139	869	E		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	27.5	C	EB Left	480	31	89	371	C		
				EB Through	367	23	89	371	C		
				EB Right	0	0	0	0	A		
	WB	48.9	D	WB Left	440	54	106	299	D		
				WB Through	417	43	106	299	D		
				WB Right	0	0	0	0	A		
36- MD 189 at Wooton Pkwy											
36	NB	45.1	D	NB Left	187	57	113	410	E	43.8	D
				NB Through	536	52	113	410	D		
				NB Right	174	10	113	410	B		
	SB	62.3	E	SB Left	247	79	151	606	E		
				SB Through	729	57	154	631	E		
				SB Right	0	0	0	0	A		
	EB	34.6	C	EB Left	118	71	101	438	E		
				EB Through	543	34	101	438	C		
				EB Right	160	10	101	438	B		
	WB	34.5	C	WB Left	160	71	123	603	E		
				WB Through	781	35	123	603	C		
				WB Right	317	15	123	603	B		
37- Montrose Rd at Tower Oaks Blvd											
37	NB	0.4	A	NB Left	0	0	0	0	A	16.2	B
				NB Through	0	0	0	0	A		
				NB Right	490	0	0	0	A		
	SB	71.2	E	SB Left	68	48	37	256	D		
				SB Through	0	0	0	0	A		
				SB Right	270	77	97	348	E		
	EB	6.1	A	EB Left	0	0	0	0	A		
				EB Through	1685	6	30	360	A		
				EB Right	0	0	0	0	A		
	WB	18.3	B	WB Left	69	35	30	360	C		
				WB Through	2563	18	105	727	B		
				WB Right	244	12	105	727	B		
38- Tower Oaks Blvd at I-270 off ramp											
38	NB	22.9	C	NB Left	650	23	46	257	C	17.4	B
				NB Through	0	0.0	39	249	A		
				NB Right	21	6.3	46	257	A		
	SB	15.4	B	SB Left	8	24.8	1	43	C		
				SB Through	0	0.0	1	43	A		
				SB Right	7	4.7	0	30	A		
	EB	11.1	B	EB Left	1	11.0	14	153	B		
				EB Through	310	11.6	14	153	B		
				EB Right	33	6.4	9	144	A		
	WB	12.7	B	WB Left	121	15.9	14	122	B		
				WB Through	192	10.8	14	122	B		
				WB Right	1	3.7	2	78	A		
39- Montrose Rd at Tower Oaks Blvd											
39	NB	17.3	B	NB Left	76	34	62	288	C	55.3	E
				NB Through	606	30	62	288	C		
				NB Right	572	1	0	0	A		
	SB	30.3	C	SB Left	193	62	61	206	E		
				SB Through	394	20	59	205	C		
				SB Right	105	11	54	250	B		
	EB	216.7	F	EB Left	81	178	517	714	F		
				EB Through	458	222	518	715	F		
				EB Right	32	240	542	739	F		
	WB	35.5	D	WB Left	565	44	110	402	D		
				WB Through	473	41	111	402	D		
				WB Right	330	13	130	433	B		
40- Rockledge Blvd at I-270 NB on and off ramp											
40	NB	124.2	F	NB Left	0	0	0	0	A	98.5	F
				NB Through	335	113	520	837	F		
				NB Right	854	129	520	837	F		
	SB	86.6	F	SB Left	0	0	86	220	A		
				SB Through	346	87	86	220	F		
				SB Right	0	0	0	0	A		
	EB	62.2	E	EB Left	5	127	169	458	F		
				EB Through	428	103	169	458	F		
				EB Right	297	2	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table B.14: PM Peak - Existing - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS		
41- Rockledge Blvd at I-270 SB on and off ramps													
41	NB	30.2	C	NB Left	341	30	76	261	C	49.5	D		
				NB Through	0	0	0	0	A				
				NB Right	0	0	0	0	A				
	SB				SB Left	0	0	0	0			A	
					SB Through	0	0	0	0			A	
					SB Right	0	0	0	0			A	
	EB				EB Left	0	0	0	0			A	
					EB Through	0	0	0	0			A	
					EB Right	0	0	0	0			A	
	WB	54.7	D		WB Left	345	59	193	786			E	
					WB Through	894	53	193	786			D	
					WB Right	0	0	0	0			A	
42- MD 187 at Tuckerman Ln													
42	NB	43.7	D	NB Left	198	21	316	1253	C	120.3	F		
				NB Through	2133	43	316	1253	D				
				NB Right	188	73	316	1253	E				
	SB	201.4	F		SB Left	185	168	2553	2702			F	
					SB Through	1122	201	2553	2702			F	
					SB Right	270	226	2553	2702			F	
	EB	51.7	D		EB Left	238	52	94	407			D	
					EB Through	409	54	95	408			D	
					EB Right	103	43	113	432			D	
	WB	215.4	F		WB Left	459	211	1918	2138			F	
					WB Through	614	233	1918	2138			F	
					WB Right	151	158	1918	2138			F	
43- MD 187 at I-270 NB on and off ramps													
43	NB	14.8	B	NB Left	552	34	103	399	C	18.5	B		
				NB Through	2291	10	103	399	B				
				NB Right	0	0	0	0	A				
	SB	22.7	C		SB Left	0	0	0	0			A	
					SB Through	1247	23	57	248			C	
					SB Right	0	0	0	0			A	
	EB				EB Left	0	0	0	0			A	
					EB Through	0	0	0	0			A	
					EB Right	0	0	0	0			A	
	WB	61.4	E		WB Left	65	60	50	290			E	
					WB Through	65	63	50	290			E	
					WB Right	0	0	0	0			A	
44- MD 187 at I-270 NB on and off ramps													
44	NB	32.2	D	NB Left	0	0	0	0	A	33.3	C		
				NB Through	2211	32	103	485	C				
				NB Right	0	0	0	0	A				
	SB	20.4	C		SB Left	150	59	74	305			E	
					SB Through	1163	15	74	305			B	
					SB Right	0	0	0	0			A	
	EB	57.1	E		EB Left	636	57	137	558			E	
					EB Through	0	0	137	558			A	
					EB Right	185	57	77	519			E	
	WB				WB Left	0	0	0	0			A	
					WB Through	0	0	0	0			A	
					WB Right	0	0	0	0			A	
45- MD 187 at Rock Spring Dr													
45	NB	16.8	B	NB Left	383	34	90	614	C	23.8	C		
				NB Through	2000	14	91	614	B				
				NB Right	14	12	111	647	B				
	SB	26.7	C		SB Left	20	47	82	400			D	
					SB Through	1160	30	82	400			C	
					SB Right	172	1	54	356			A	
	EB	40.2	D		EB Left	396	59	98	362			E	
					EB Through	37	63	98	362			E	
					EB Right	375	18	98	362			B	
	WB	11.6	B		WB Left	5	32	3	77			C	
					WB Through	12	25	3	77			C	
					WB Right	32	4	1	67			A	
47- Democracy Blvd at I-270 NB off ramp													
47	NB	45.7	D	NB Left	152	46	29	159	D	3.0	A		
				NB Through	0	0	0	0	A				
				NB Right	0	0	0	0	A				
	SB				SB Left	0	0	0	0			A	
					SB Through	0	0	0	0			A	
					SB Right	0	0	0	0			A	
	EB	1.2	A		EB Left	0	0	0	0			A	
					EB Through	1114	1	3	51			A	
					EB Right	0	0	0	0			A	
	WB	0.9	A		WB Left	0	0	0	0			A	
					WB Through	2129	1	2	62			A	
					WB Right	0	0	0	0			A	
48- Democracy Blvd at I-270 SB on ramp													
48	NB				NB Left	0	0	0	0	A	6.3	A	
					NB Through	0	0	0	0	A			
					NB Right	0	0	0	0	A			
	SB					SB Left	0	0	0	0			A
						SB Through	0	0	0	0			A
						SB Right	0	0	0	0			A
	EB	5.0	A			EB Left	0	0	0	0			A
						EB Through	1326	5	17	250			A
						EB Right	0	0	0	0			A
	WB	7.0	A			WB Left	531	24	39	287			C
						WB Through	1748	2	30	266			A
						WB Right	0	0	0	0			A
49- Democracy Blvd at I-270 SB off ramp													
49	NB				NB Left	0	0	0	0	A	7.4	A	
					NB Through	0	0	0	0	A			
					NB Right	0	0	0	0	A			
	SB	38.9	D			SB Left	159	53	31	164			D
						SB Through	0	0	0	0			A
						SB Right	60	2	0	0			A
	EB					EB Left	0	0	0	0			A
						EB Through	0	0	0	0			A
						EB Right	0	0	0	0			A
	WB	3.8	A			WB Left	0	0	0	0			A
						WB Through	1748	4	16	274			A
						WB Right	168	3	12	305			A
50- MD 190 at Burdette Rd													
50	NB	72.8	E		NB Left	26	74	15	100	E	31.1	C	
					NB Through	4	84	15	100	F			
					NB Right	5	56	15	100	E			
	SB	32.1	C			SB Left	34	78	19	122			E
						SB Through	7	56	19	122			E
						SB Right	118	18	19	122			B
	EB	17.6	B			EB Left	122	85	82	513			F
						EB Through	1151	11	82	513			B
						EB Right	28	4	68	540			A
	WB	38.3	D			WB Left	11	113	334	1111			F
						WB Through	2146	38	334	1111			D
						WB Right	52	28	334	1111			C

Table B.14: PM Peak - Existing - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
51- MD 190 at I-270 NB on ramp											
51	NB			NB Left	0	0	0	0	A	16.9	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	70.2	E	EB Left	233	70	101	369	E		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	8.4	A	WB Left	0	0	0	0	A		
				WB Through	1464	8	42	713	A		
				WB Right	0	0	0	0	A		
52- MD 190 at I-270 SB off ramp											
52	NB	73.8	E	NB Left	222	74	89	830	E	12.4	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	2.9	A	EB Left	0	0	0	0	A		
				EB Through	840	3	6	143	A		
				EB Right	0	0	0	0	A		
	WB	9.1	A	WB Left	0	0	0	0	A		
				WB Through	1705	9	26	545	A		
				WB Right	0	0	0	0	A		
53- MD 190 at Seven Locks Rd											
53	NB	0.3	A	NB Left	21	1	0	0	A	24.7	C
				NB Through	243	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	55.7	E	SB Left	306	56	103	375	E		
				SB Through	180	56	103	375	E		
				SB Right	17	56	103	375	E		
	EB	27.1	C	EB Left	22	33	66	355	C		
				EB Through	664	27	66	355	C		
				EB Right	34	25	66	355	C		
	WB	19.0	B	WB Left	262	75	125	534	E		
				WB Through	935	15	125	534	B		
				WB Right	715	4	125	534	A		
54- MD 124 at I-270 NB off ramp											
54	NB	59.5	E	NB Left	0	0	0	0	A	64.0	E
				NB Through	0	0	0	0	A		
				NB Right	1911	59	802	2475	E		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	68.6	E	EB Left	0	0	0	0	A		
				EB Through	1874	69	579	1267	E		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
55- Democracy Blvd at I-270 NB off ramp											
55	NB	47.0	D	NB Left	0	0	0	0	A	11.5	B
				NB Through	0	0	0	0	A		
				NB Right	314	47	51	199	D		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	1.5	A	EB Left	0	0	0	0	A		
				EB Through	1113	2	4	65	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table B.15: PM Peak - 2015 Hard Shoulder Running - Alternative Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
1- MD 85 at Sam's Club Drive											
1	NB	27.9	C	NB Left	114	77	109	581	E	52.5	D
				NB Through	502	34	109	581	C		
				NB Right	830	18	54	592	B		
	SB	82.1	F	SB Left	142	78	406	1068	E		
				SB Through	871	82	406	1068	F		
				SB Right	66	87	406	1068	F		
	EB	33.5	C	EB Left	43	83	26	114	F		
				EB Through	20	91	26	114	F		
				EB Right	144	11	26	114	B		
	WB	63.0	E	WB Left	509	76	221	688	E		
				WB Through	28	65	221	688	E		
				WB Right	193	28	221	688	C		
2- MD 85 at I-270 NB on and off ramp											
2	NB	36.8	D	NB Left	973	37	198	948	D	32.6	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	26.6	C	SB Left	0	0	0	0	A		
				SB Through	675	27	94	707	C		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
3- MD 85 at I-270 SB on and off ramp											
3	NB	5.9	A	NB Left	0	0	0	0	A	9.5	A
				NB Through	1697	6	43	807	A		
				NB Right	0	0	0	0	A		
	SB	44.6	D	SB Left	173	45	47	325	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
4- MD 85 at Crestwood Blvd											
4	NB	33.2	D	NB Left	60	70	155	656	E	33.4	C
				NB Through	1255	31	154	656	C		
				NB U-Turn	0	0	0	0	A		
	SB	21.9	C	SB Left	92	77	43	202	E		
				SB Through	813	25	58	477	C		
				SB Right	800	12	45	468	B		
	EB	54.6	D	EB Left	801	57	132	594	E		
				EB Through	31	44	132	594	D		
				EB Right	22	0	132	594	A		
	WB	43.4	D	WB Left	36	74	39	162	E		
				WB Through	61	65	39	162	E		
				WB Right	81	13	39	162	B		
5- MD 80 at I-270 NB on and off ramp											
5	NB	-1.8	A	NB Left	2	0	0	7	A	8.5	A
				NB Through	2	0	0	7	A		
				NB Right	8	-3	0	7	A		
	SB	12.0	B	SB Left	402	15	22	177	B		
				SB Through	17	16	22	177	B		
				SB Right	127	3	0	0	A		
	EB	9.7	A	EB Left	70	10	14	179	A		
				EB Through	0	0	8	0	A		
				EB Right	6	6	24	210	A		
	WB	6.7	A	WB Left	16	11	0	30	B		
				WB Through	509	12	27	279	B		
				WB Right	482	1	0	14	A		
6- MD 80 at I-270 SB on and off ramp											
6	NB	2.1	A	NB Left	48	2	1	139	A	4.1	A
				NB Through	0	0	0	0	A		
				NB Right	490	2	1	139	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	5.4	A	EB Left	0	0	0	0	A		
				EB Through	271	6	2	76	A		
				EB Right	54	3	1	85	A		
	WB	6.2	A	WB Left	0	0	0	0	A		
				WB Through	323	6	1	80	A		
				WB Right	0	0	0	0	A		
7- MD 109 at I-270 NB on and off ramp											
7	NB			NB Left	0	0	0	0	A	5.4	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	10.2	B	SB Left	234	11	14	156	B		
				SB Through	0	0	0	0	A		
				SB Right	17	2	0	60	A		
	EB	2.2	A	EB Left	56	1	0	31	A		
				EB Through	0	0	0	0	A		
				EB Right	59	3	0	0	A		
	WB	0.3	A	WB Left	0	0	0	0	A		
				WB Through	160	0	0	0	A		
				WB Right	0	0	0	0	A		
8- MD 80 at I-270 SB on and off ramp											
8	NB	4.1	A	NB Left	44	7	2	100	A	1.6	A
				NB Through	0	0	0	0	A		
				NB Right	29	0	0	21	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.8	A	EB Left	0	0	0	0	A		
				EB Through	114	0	0	0	A		
				EB Right	24	4	0	0	A		
	WB	1.2	A	WB Left	98	1	0	41	A		
				WB Through	79	1	0	18	A		
				WB Right	0	0	0	0	A		
9- MD 121 at Gateway Center Dr											
9	NB	10.8	B	NB Left	488	13	33	241	B	16.7	B
				NB Through	664	10	33	241	B		
				NB Right	58	2	39	267	A		
	SB	18.0	C	SB Left	20	14	5	123	B		
				SB Through	170	19	14	150	B		
				SB Right	8	10	14	166	B		
	EB	13.0	B	EB Left	2	45	3	58	D		
				EB Through	19	43	7	129	D		
				EB Right	142	9	16	161	A		
	WB	34.8	D	WB Left	213	46	56	213	D		
				WB Through	57	41	57	213	D		
				WB Right	141	16	69	237	B		
10- MD 121 at I-270 NB on and off ramp											
10	NB	0.8	A	NB Left	26	9	1	69	A	0.6	A
				NB Through	0	0	0	0	A		
				NB Right	765	1	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.1	A	EB Left	0	0	0	0	A		
				EB Through	448	0	0	0	A		
				EB Right	58	0	0	0	A		
	WB	0.9	A	WB Left	100	3	1	83	A		
				WB Through	424	0	0	55	A		
				WB Right	0	0	0	0	A		

Table B.15: PM Peak - 2015 Hard Shoulder Running - Alternative Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
11- MD 121 at I-270 SB on and off ramp											
11	NB			NB Left	0	0	0	0	A	2.2	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	7.8	A	SB Left	137	10	8	145	A		
				SB Through	0	0	0	0	A		
				SB Right	36	0	0	0	A		
	EB	0.3	A	EB Left	29	1	0	44	A		
				EB Through	0	0	0	0	A		
				EB Right	350	0	0	0	A		
	WB	0.1	A	WB Left	0	0	0	0	A		
				WB Through	100	0	0	0	A		
				WB Right	0	0	0	0	A		
12- MD 27 at Observation Dr											
12	NB	40.6	D	NB U-Turn	0	0	0	0	A	22.4	C
				NB Through	73	57	19	86	E		
				NB Right	47	16	19	86	B		
	SB	39.9	D	SB Left	114	46	31	182	D		
				SB Through	41	62	36	244	E		
				SB Right	172	30	58	281	C		
	EB	17.4	B	EB Left	218	28	73	494	C		
				EB Through	2298	16	75	495	B		
				EB Right	111	17	88	533	B		
	WB	25.5	C	WB Left	31	23	121	592	C		
				WB Through	1503	26	121	592	C		
				WB Right	54	7	121	592	A		
13- MD 27 at I-270 NB off ramp											
13	NB	44.6	D	NB Left	415	45	66	257	D	8.5	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.1	A	EB Left	0	0	0	0	A		
				EB Through	1284	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	5.9	A	WB Left	0	0	0	0	A		
				WB Through	1582	6	44	605	A		
				WB Right	0	0	0	0	A		
14- MD 27 at I-270 SB off ramp											
14	NB			NB Left	0	0	0	0	A	5.2	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	50.1	D	SB Left	171	50	34	166	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	2.3	A	EB Left	0	0	0	0	A		
				EB Through	1352	2	4	145	A		
				EB Right	0	0	0	0	A		
	WB	2.7	A	WB Left	0	0	0	0	A		
				WB Through	1458	3	7	281	A		
				WB Right	0	0	0	0	A		
15- MD 27 at Crystal Rock Dr											
15	NB	22.6	C	NB Left	58	20	55	380	C	30.3	C
				NB Through	965	23	68	379	C		
				NB Right	43	20	72	392	B		
	SB	34.9	C	SB Left	142	57	195	793	E		
				SB Through	1336	36	195	793	D		
				SB Right	200	9	175	787	A		
	EB	42.9	D	EB Left	103	54	28	120	D		
				EB Through	37	46	25	115	D		
				EB Right	47	17	17	141	B		
	WB	27.6	C	WB Left	83	49	70	297	D		
				WB Through	102	42	70	297	D		
				WB Right	552	22	70	297	C		
16- MD 118 at Seneca Meadows Pkwy											
16	NB	3.7	A	NB Left	94	12	1	80	B	8.0	A
				NB Through	1201	3	7	142	A		
				NB Right	0	0	14	195	A		
	SB	6.5	A	SB Left	11	7	14	269	A		
				SB Through	1091	7	18	269	A		
				SB Right	9	2	21	302	A		
	EB	13.1	B	EB Left	18	55	11	127	E		
				EB Through	1	76	11	127	E		
				EB Right	275	10	11	127	B		
	WB	53.6	D	WB Left	93	64	37	199	E		
				WB Through	6	61	33	198	E		
				WB Right	25	13	42	218	B		
17- MD 118 at I-270 NB on ramp											
17	NB			NB Left	0	0	0	0	A	15.8	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	33.6	C	EB Left	434	34	89	483	C		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	10.6	B	WB Left	0	0	0	0	A		
				WB Through	246	2	0	62	A		
				WB Right	1215	12	45	448	B		
18- MD 118 at I-270 SB off ramp											
18	NB			NB Left	0	0	0	0	A	6.2	A
				NB Through	0	0.0	0	0	A		
				NB Right	0	0.0	0	0	A		
	SB	36.7	D	SB Left	130	36.7	22	122	D		
				SB Through	0	0.0	0	0	A		
				SB Right	0	0.0	0	0	A		
	EB	4.6	A	EB Left	0	0.0	0	0	A		
				EB Through	1183	4.6	10	314	A		
				EB Right	0	0.0	0	0	A		
	WB	4.9	A	WB Left	0	0.0	0	0	A		
				WB Through	1519	4.9	10	262	A		
				WB Right	0	0.0	0	0	A		
19- MD 118 at Aircraft Dr											
19	NB	24.0	C	NB Left	41	68	34	176	E	28.3	C
				NB Through	43	71	34	176	E		
				NB Right	196	4	3	77	A		
	SB	94.0	F	SB Left	382	92	226	583	F		
				SB Through	12	93	226	583	F		
				SB Right	97	100	226	583	F		
	EB	17.7	B	EB Left	98	23	60	405	C		
				EB Through	1215	17	60	405	B		
				EB Right	17	14	60	405	B		
	WB	18.6	B	WB Left	13	18	75	547	B		
				WB Through	1365	22	75	547	C		
				WB Right	366	5	75	547	A		
20- Middlebrook Rd at Observation Dr											
20	NB			NB Left	0	0	0	0	A	8.6	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	18.1	B	SB Left	96	35	18	131	D		
				SB Through	0	0	0	0	A		
				SB Right	179	9	18	131	A		
	EB	6.6	A	EB Left	16	12	17	160	B		
				EB Through	1220	7	17	160	A		
				EB Right	0	0	0	0	A		
	WB	8.5	A	WB Left	0	0	0	0	A		
				WB Through	1238	9	24	245	A		
				WB Right	12	7	39	294	A		

Table B.15: PM Peak - 2015 Hard Shoulder Running - Alternative Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
21- Middlebrook Rd at I-270 SB on ramp											
21	NB			NB Left	0	0	0	0	A	4.5	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	2.8	A	EB Left	0	0	0	0	A		
				EB Through	686	3	4	103	A		
				EB Right	0	0	0	0	A		
	WB	7.1	A	WB Left	429	7	4	194	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
22- Middlebrook Rd at Waring Station Rd											
22	NB	48.4	D	NB Left	156	45	75	316	D	12.8	B
				NB Through	0	0	75	316	A		
				NB Right	219	51	75	316	D		
	SB	30.8	C	SB Left	30	44	7	66	D		
				SB Through	2	37	7	66	D		
				SB Right	19	9	18	104	A		
	EB	7.4	A	EB Left	3	13	23	262	B		
				EB Through	1035	7	23	262	A		
				EB Right	160	7	23	262	A		
	WB	8.8	A	WB Left	254	21	36	344	C		
				WB Through	1727	7	36	344	A		
				WB Right	4	2	36	344	A		
23- MD 124 at MD 355											
23	NB	52.5	D	NB Left	505	65	191	539	E	63.3	E
				NB Through	939	46	189	537	D		
				NB Right	6	16	0	0	B		
	SB	30.3	C	SB Left	144	69	96	331	E		
				SB Through	558	53	96	331	D		
				SB Right	735	6	20	265	A		
	EB	43.6	D	EB Left	468	91	391	1195	F		
				EB Through	2729	43	391	1195	D		
				EB Right	582	8	159	1168	A		
	WB	152.8	F	WB Left	0	0	0	0	A		
				WB Through	1477	155	716	946	F		
				WB Right	63	101	0	0	F		
24- MD 124 at I-270 SB on and off											
24	NB	65.8	F	NB Left	55	65	24	103	E	43.5	D
				NB Through	22	68	24	103	E		
				NB U-Turn	0	0	0	0	A		
	SB	60.2	E	SB Left	561	99	340	1521	F		
				SB Through	9	96	340	1521	F		
				SB Right	452	11	62	664	B		
	EB	47.1	D	EB Left	0	0	0	0	A		
				EB Through	1758	47	344	1083	D		
				EB Right	31	34	360	1107	C		
	WB	19.4	B	WB Left	4	55	81	612	D		
				WB Through	1046	19	81	612	B		
				WB Right	0	0	0	0	A		
25- MD 117 at MD 124											
25	NB	34.6	C	NB Left	44	62	108	618	E	40.5	D
				NB Through	539	52	108	618	D		
				NB Right	445	11	5	354	B		
	SB	32.7	C	SB Left	120	40	99	487	D		
				SB Through	764	37	99	487	D		
				SB Right	144	2	0	0	A		
	EB	45.8	D	EB Left	119	83	140	495	F		
				EB Through	1096	42	139	497	D		
				EB Right	43	38	148	524	D		
	WB	44.5	D	WB Left	400	71	287	1024	E		
				WB Through	1349	41	287	1024	D		
				WB Right	131	1	0	0	A		
26- MD 117 at Bureau Dr											
26	NB	45.1	D	NB Left	79	79	64	271	E	40.5	D
				NB Through	28	75	64	271	E		
				NB Right	259	31	64	271	C		
	SB	75.2	E	SB Left	275	86	113	364	F		
				SB Through	17	91	113	364	F		
				SB Right	65	25	113	364	C		
	EB	31.6	C	EB Left	41	85	160	856	F		
				EB Through	1608	30	161	856	C		
				EB Right	3	16	154	845	B		
	WB	40.7	D	WB Left	19	39	375	1060	D		
				WB Through	1728	43	376	1061	D		
				WB Right	294	30	408	1109	C		
27- MD 117 at I-270 SB off ramp											
27	NB			NB Left	0	0	0	0	A	15.4	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	5.9	A	EB Left	0	0	0	0	A		
				EB Through	903	6	19	668	A		
				EB Right	0	0	0	0	A		
	WB	44.4	E	WB Left	294	44	176	1071	E		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
28- MD 117 at I-270 NB off ramp											
28	NB			NB Left	0	0	0	0	A	38.9	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	74.5	E	SB Left	260	63	548	2434	E		
				SB Through	0	0	0	0	A		
				SB Right	968	78	547	2433	E		
	EB	28.0	C	EB Left	4	136	157	974	F		
				EB Through	902	27	157	974	C		
				EB Right	0	0	0	0	A		
	WB	14.2	B	WB Left	0	0	0	0	A		
				WB Through	1368	14	88	384	B		
				WB Right	0	0	88	384	A		
29- MD 117 at Perry Pkwy											
29	NB	44.3	D	NB Left	18	71	13	108	E	37.8	D
				NB Through	22	53	12	107	D		
				NB Right	24	16	21	128	B		
	SB	55.7	E	SB Left	196	83	86	332	F		
				SB Through	15	80	86	332	F		
				SB Right	112	5	86	332	A		
	EB	20.6	C	EB Left	239	70	84	354	E		
				EB Through	869	7	84	354	A		
				EB Right	31	7	69	338	A		
	WB	46.3	D	WB Left	37	102	251	754	F		
				WB Through	1234	47	251	754	D		
				WB Right	300	35	251	754	D		
30- Shady Grove Rd at I-270 NB off ramp											
30	NB	7.0	A	NB Left	0	0	0	0	A	13.8	B
				NB Through	1024	7	16	184	A		
				NB Right	0	0	0	0	A		
	SB	9.4	A	SB Left	0	0	0	0	A		
				SB Through	1280	9	41	481	A		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	52.4	D	WB Left	323	52	59	240	D		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table B.15: PM Peak - 2015 Hard Shoulder Running - Alternative Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
31- Shady Grove Rd at I-270 SB off ramp											
31	NB	6.7	A	NB Left	0	0	0	0	A	15.7	B
				NB Through	1463	7	27	389	A		
				NB Right	0	0	0	0	A		
	SB	5.5	A	SB Left	0	0	0	0	A		
				SB Through	821	6	8	177	A		
				SB Right	0	0	0	0	A		
	EB	57.1	E	EB Left	228	54	45	186	D		
				EB Through	0	0	0	0	A		
				EB Right	294	59	63	237	E		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
32- MD 28 at I-270 SB off ramp											
32	NB			NB U-Turn	0	0	0	0	A	8.1	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	36.4	D	SB Left	440	44	74	303	D		
				SB Through	0	0	0	0	A		
				SB Right	98	3	0	61	A		
	EB	2.6	A	EB Left	0	0	0	0	A		
				EB Through	1506	1	0	0	A		
				EB Right	829	6	15	237	A		
	WB	6.7	A	WB Left	0	0	0	0	A		
				WB Through	1703	7	20	243	A		
				WB Right	0	0	0	0	A		
33- MD 28 at I-270 on and off ramps											
33	NB	34.9	C	NB Left	0	0	44	221	A	21.8	C
				NB Through	212	47	52	230	D		
				NB Right	134	16	52	230	B		
	SB	33.2	C	SB Left	11	107	173	279	F		
				SB Through	0	0	0	0	A		
				SB Right	163	28	173	279	C		
	EB	12.3	B	EB Left	254	37	50	298	D		
				EB Through	884	5	50	298	A		
				EB Right	0	0	0	0	A		
	WB	25.2	C	WB Left	36	21	100	393	C		
				WB Through	1245	25	81	357	C		
				WB Right	0	0	0	0	A		
34- MD 189 at Great Falls Rd											
34	NB	38.9	D	NB Left	45	44	12	86	D	13.5	B
				NB Through	11	48	8	84	D		
				NB Right	12	10	8	94	B		
	SB	3.2	A	SB Left	14	51	7	73	D		
				SB Through	11	49	7	73	D		
				SB Right	401	0	0	0	A		
	EB	11.7	B	EB Left	429	23	39	466	C		
				EB Through	669	5	6	185	A		
				EB Right	58	4	10	222	A		
	WB	19.0	B	WB Left	11	17	50	320	B		
				WB Through	827	19	49	319	B		
				WB Right	14	18	65	353	B		
35- MD 189 at I-270 Ramps											
35	NB	44.9	D	NB Left	257	45	46	199	D	42.1	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	58.8	E	SB Left	349	59	159	1021	E		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	27.3	C	EB Left	477	30	90	357	C		
				EB Through	366	24	90	357	C		
				EB Right	0	0	0	0	A		
	WB	49.1	D	WB Left	440	54	108	276	D		
				WB Through	418	43	108	276	D		
				WB Right	0	0	0	0	A		
36- MD 189 at Wootton Pkwy											
36	NB	44.6	D	NB Left	187	57	112	407	E	43.8	D
				NB Through	535	52	112	407	D		
				NB Right	174	10	112	407	B		
	SB	63.1	E	SB Left	246	82	159	604	F		
				SB Through	729	57	158	629	E		
				SB Right	0	0	0	0	A		
	EB	34.8	C	EB Left	118	71	102	424	E		
				EB Through	542	34	102	424	C		
				EB Right	160	11	102	424	B		
	WB	34.2	C	WB Left	161	74	122	597	E		
				WB Through	788	34	122	597	C		
				WB Right	321	16	122	597	B		
37- Montrose Rd at Tower Oaks Blvd											
37	NB	0.3	A	NB Left	0	0	0	0	A	12.9	B
				NB Through	0	0	0	0	A		
				NB Right	491	0	0	0	A		
	SB	46.7	D	SB Left	68	51	17	140	D		
				SB Through	0	0	0	0	A		
				SB Right	271	46	57	214	D		
	EB	6.0	A	EB Left	0	0	0	0	A		
				EB Through	1680	6	29	384	A		
				EB Right	0	0	0	0	A		
	WB	15.2	B	WB Left	70	32	29	384	C		
				WB Through	2568	15	81	662	B		
				WB Right	245	10	81	662	B		
38- Tower Oaks Blvd at I-270 off ramp											
38	NB	22.9	C	NB Left	651	23	46	241	C	17.4	B
				NB Through	0	0.0	39	233	A		
				NB Right	21	6.3	46	241	A		
	SB	14.6	B	SB Left	8	23.9	1	43	C		
				SB Through	0	0.0	1	43	A		
				SB Right	7	3.9	0	30	A		
	EB	11.1	B	EB Left	1	18.2	14	158	B		
				EB Through	308	11.6	14	158	B		
				EB Right	33	5.7	9	148	A		
	WB	12.8	B	WB Left	122	16.5	15	143	B		
				WB Through	193	10.6	15	143	B		
				WB Right	1	1.7	2	100	A		
39- Montrose Rd at Tower Oaks Blvd											
39	NB	17.2	B	NB Left	76	33	62	271	C	57.5	E
				NB Through	606	30	62	271	C		
				NB Right	572	1	0	0	A		
	SB	29.9	C	SB Left	193	61	61	206	E		
				SB Through	395	20	59	205	B		
				SB Right	105	11	53	242	B		
	EB	236.4	F	EB Left	79	198	554	726	F		
				EB Through	446	242	555	727	F		
				EB Right	30	256	579	751	F		
	WB	35.8	D	WB Left	568	44	112	394	D		
				WB Through	472	42	112	394	D		
				WB Right	330	13	132	424	B		
40- Rockledge Blvd at I-270 NB on and off ramp											
40	NB	123.9	F	NB Left	0	0	0	0	A	99.3	F
				NB Through	342	110	524	832	F		
				NB Right	867	129	524	832	F		
	SB	87.3	F	SB Left	0	0	86	223	A		
				SB Through	351	87	86	223	F		
				SB Right	0	0	0	0	A		
	EB	64.5	E	EB Left	5	111	176	545	F		
				EB Through	434	106	176	545	F		
				EB Right	296	3	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table B.15: PM Peak - 2015 Hard Shoulder Running - Alternative Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS	
41- Rockledge Blvd at I-270 SB on and off ramps												
41	NB	30.7	C	NB Left	347	31	75	270	C	51.3	D	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	57.1	E		WB Left	342	62	205	822			E
					WB Through	890	55	205	822			E
					WB Right	0	0	0	0			A
42- MD 187 at Tuckerman Ln												
42	NB	37.8	D	NB Left	199	15	262	1149	B	117.9	F	
				NB Through	2161	37	262	1149	D			
				NB Right	191	68	262	1149	E			
	SB	203.3	F		SB Left	179	170	2560	2707			F
					SB Through	1112	203	2560	2707			F
					SB Right	270	228	2560	2707			F
	EB	51.7	D		EB Left	238	52	94	407			D
					EB Through	409	54	95	408			D
					EB Right	103	43	113	432			D
	WB	216.8	F		WB Left	460	211	1917	2141			F
					WB Through	612	236	1917	2141			F
					WB Right	150	159	1917	2141			F
43- MD 187 at I-270 NB on and off ramps												
43	NB	13.4	B	NB Left	551	30	96	384	C	17.8	B	
				NB Through	2299	9	96	384	A			
				NB Right	0	0	0	0	A			
	SB	23.5	C		SB Left	0	0	0	0			A
					SB Through	1239	23	58	245			C
					SB Right	0	0	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	59.8	E		WB Left	64	59	48	301			E
					WB Through	65	61	48	301			E
					WB Right	0	0	0	0			A
44- MD 187 at I-270 NB on and off ramps												
44	NB	32.1	D	NB Left	0	0	0	0	A	34.2	C	
				NB Through	2213	32	103	463	C			
				NB Right	0	0	0	0	A			
	SB	20.2	C		SB Left	148	62	74	308			E
					SB Through	1157	15	74	308			B
					SB Right	0	0	0	0			A
	EB	61.9	E		EB Left	642	62	154	600			E
					EB Through	0	0	154	600			A
					EB Right	184	60	84	532			E
	WB				WB Left	0	0	0	0			A
					WB Through	0	0	0	0			A
					WB Right	0	0	0	0			A
45- MD 187 at Rock Spring Dr												
45	NB	16.5	B	NB Left	383	35	88	591	C	23.7	C	
				NB Through	2003	13	88	592	B			
				NB Right	14	13	108	625	B			
	SB	27.0	C		SB Left	20	49	83	374			D
					SB Through	1156	31	83	374			C
					SB Right	170	1	55	369			A
	EB	40.2	D		EB Left	396	59	98	360			E
					EB Through	38	64	98	360			E
					EB Right	375	18	98	360			B
	WB	11.3	B		WB Left	5	32	3	77			C
					WB Through	12	23	3	77			C
					WB Right	32	4	1	67			A
47- Democracy Blvd at I-270 NB off ramp												
47	NB	42.4	D	NB Left	152	42	27	149	D	2.9	A	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB	1.2	A		EB Left	0	0	0	0			A
					EB Through	1111	1	3	59			A
					EB Right	0	0	0	0			A
	WB	0.9	A		WB Left	0	0	0	0			A
					WB Through	2130	1	2	62			A
					WB Right	0	0	0	0			A
48- Democracy Blvd at I-270 SB on ramp												
48	NB			NB Left	0	0	0	0	A	6.4	A	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB	5.1	A		EB Left	0	0	0	0			A
					EB Through	1319	5	18	251			A
					EB Right	0	0	0	0			A
	WB	7.2	A		WB Left	528	24	39	282			C
					WB Through	1749	2	31	261			A
					WB Right	0	0	0	0			A
49- Democracy Blvd at I-270 SB off ramp												
49	NB			NB Left	0	0	0	0	A	7.6	A	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB	37.8	D		SB Left	156	51	30	158			D
					SB Through	0	0	0	0			A
					SB Right	58	3	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	4.2	A		WB Left	0	0	0	0			A
					WB Through	1749	4	16	268			A
					WB Right	161	10	43	453			A
50- MD 190 at Burdette Rd												
50	NB	73.7	E	NB Left	26	76	15	100	E	30.4	C	
				NB Through	4	84	15	100	F			
				NB Right	5	56	15	100	E			
	SB	31.4	C		SB Left	34	77	19	127			E
					SB Through	7	56	19	127			E
					SB Right	118	17	19	127			B
	EB	17.3	B		EB Left	120	90	82	499			F
					EB Through	1148	10	82	499			B
					EB Right	27	3	69	526			A
	WB	37.2	D		WB Left	11	124	325	1109			F
					WB Through	2156	37	325	1109			D
					WB Right	51	27	325	1109			C

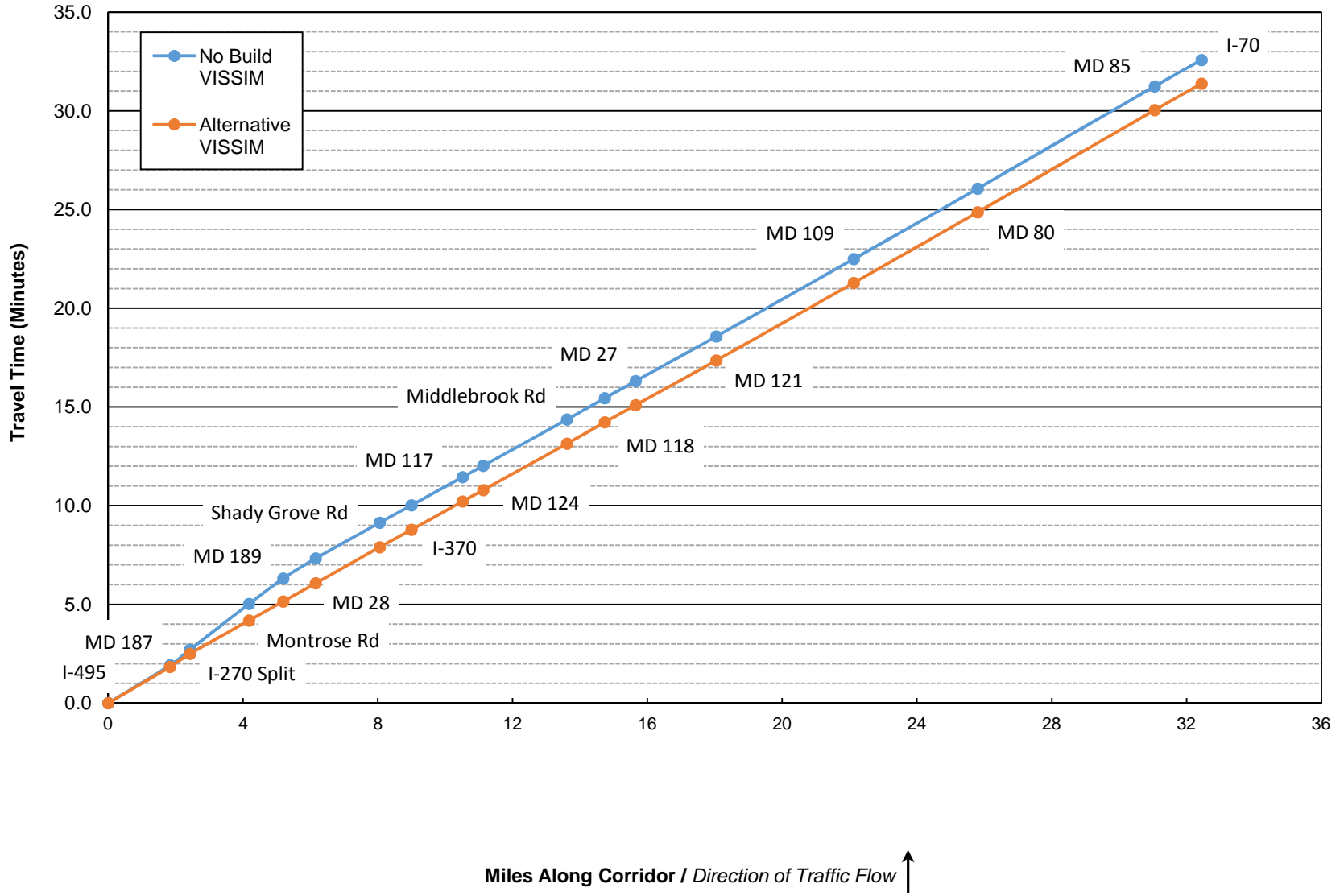
Table B.15: PM Peak - 2015 Hard Shoulder Running - Alternative Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
51- MD 190 at I-270 NB on ramp											
51	NB			NB Left	0	0	0	0	A	17.0	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	70.3	E	EB Left	233	70	101	363	E		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	8.5	A	WB Left	0	0	0	0	A		
				WB Through	1473	9	46	694	A		
				WB Right	0	0	0	0	A		
52- MD 190 at I-270 SB off ramp											
52	NB	69.4	E	NB Left	224	69	91	751	E	12.1	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	2.9	A	EB Left	0	0	0	0	A		
				EB Through	840	3	6	133	A		
				EB Right	0	0	0	0	A		
	WB	9.1	A	WB Left	0	0	0	0	A		
				WB Through	1709	9	26	574	A		
				WB Right	0	0	0	0	A		
53- MD 190 at Seven Locks Rd											
53	NB	0.4	A	NB Left	21	1	0	0	A	24.5	C
				NB Through	243	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	56.0	E	SB Left	306	56	104	375	E		
				SB Through	180	56	104	375	E		
				SB Right	17	56	104	375	E		
	EB	27.4	C	EB Left	22	34	66	377	C		
				EB Through	664	27	66	377	C		
				EB Right	34	25	66	377	C		
	WB	18.5	B	WB Left	265	75	123	466	E		
				WB Through	943	14	123	466	B		
				WB Right	719	3	123	466	A		
54- MD 124 at I-270 NB off ramp											
54	NB	69.5	E	NB Left	0	0	0	0	A	69.6	E
				NB Through	0	0	0	0	A		
				NB Right	1941	69	1047	3268	E		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	69.8	E	EB Left	0	0	0	0	A		
				EB Through	1869	70	562	1276	E		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
55- Democracy Blvd at I-270 NB off ramp											
55	NB	45.7	D	NB Left	0	0	0	0	A	11.3	B
				NB Through	0	0	0	0	A		
				NB Right	314	46	50	226	D		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	1.6	A	EB Left	0	0	0	0	A		
				EB Through	1110	2	4	61	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

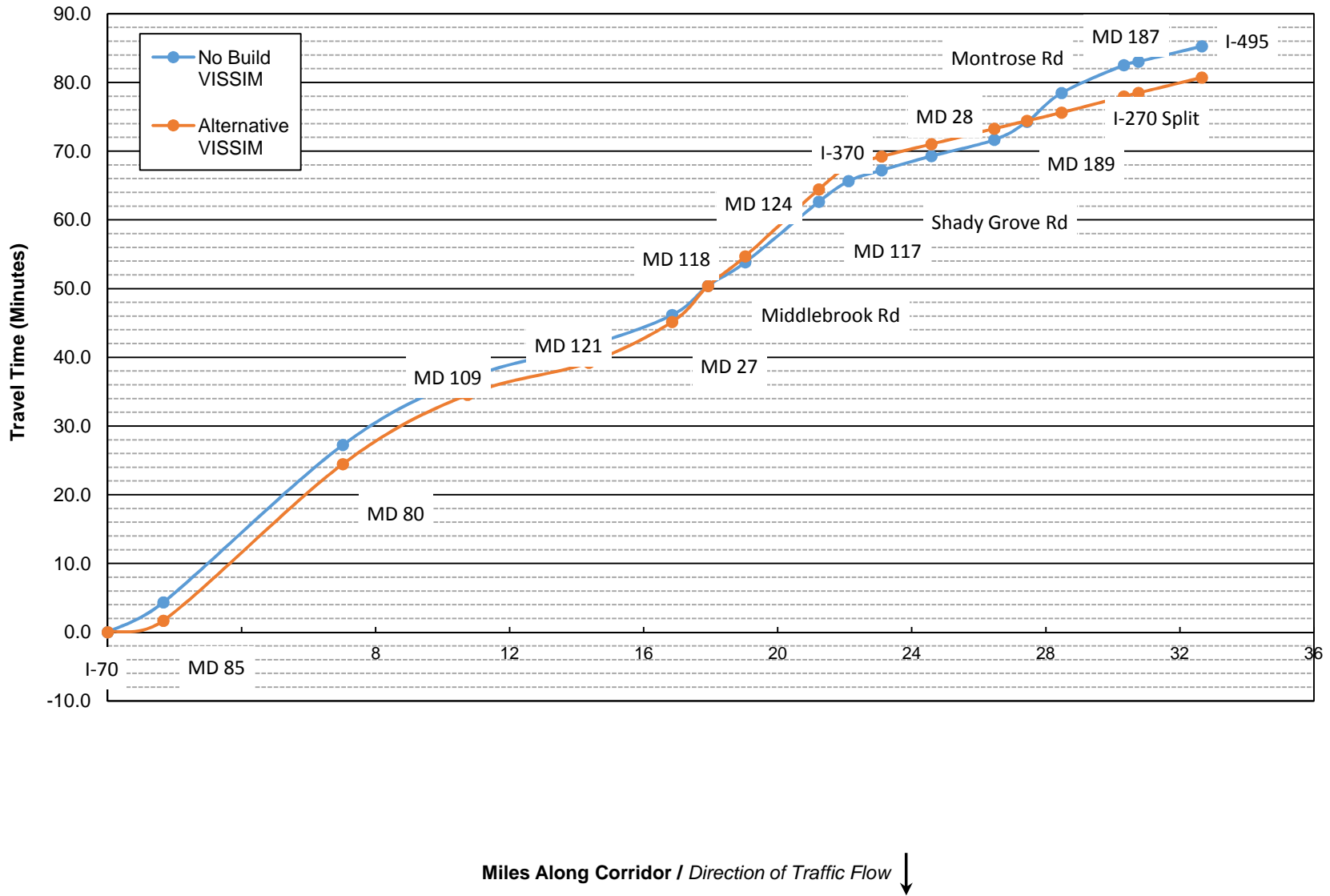
Table B.16: PM Peak - 2015 Hard Shoulder Running - I-270 Vehicle Network Performance

	EXISTING	HSR	% Change
Total Delay	21,792,153	19,758,630	-9%
Average Delay per Vehicle	206	187	-9%
Total Travel Time	53,628,278	51,993,946	-3%
Vehicles (Arrived)	88,401	89,196	1%
Latent Demand	1,544	1,518	-2%
Latent Delay	2,650,217	2,741,865	3%
Total Distance	484,473	490,672	1%
Average Speed	33	34	4%

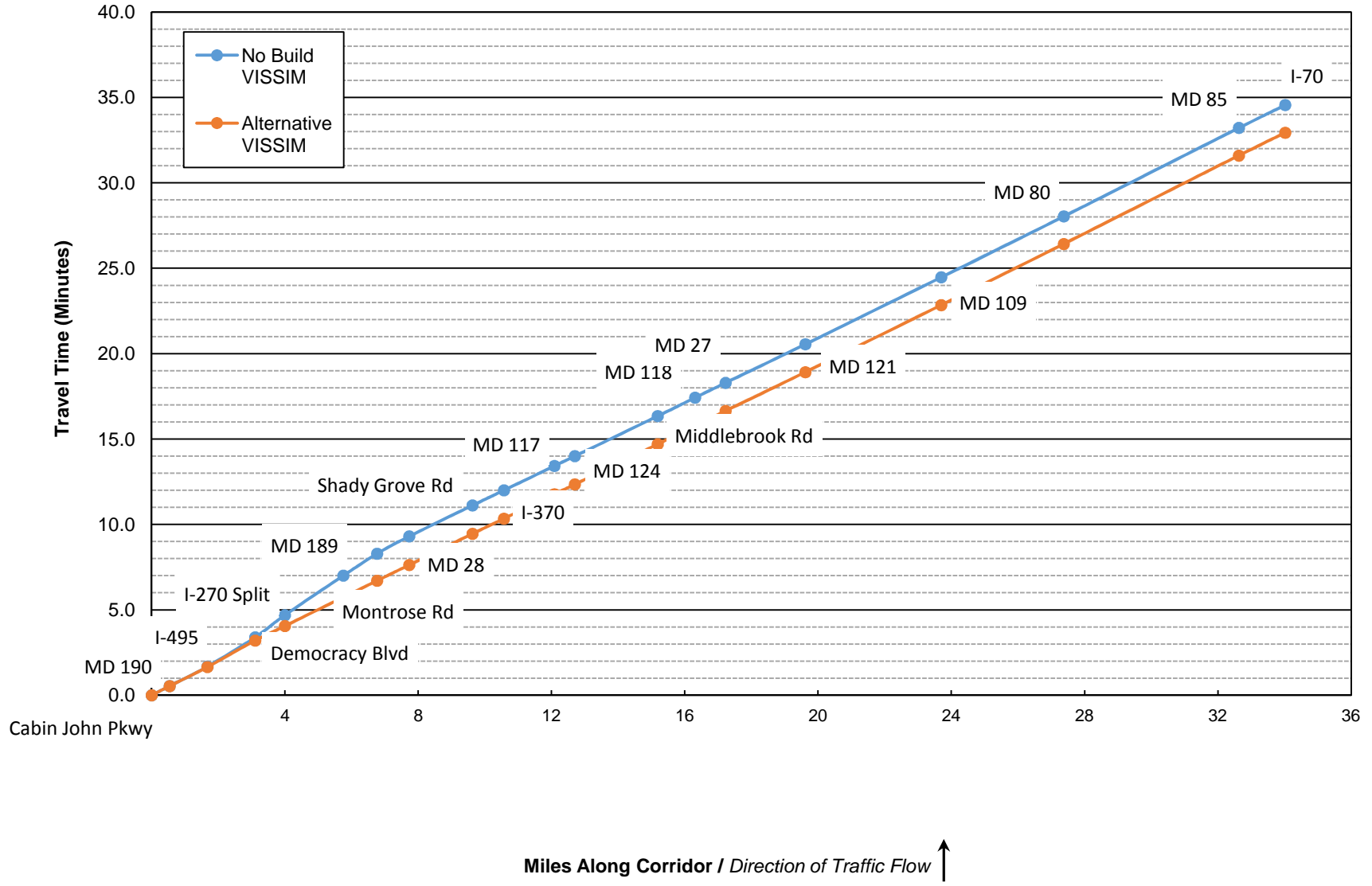
**Figure C.1: AM Peak - 2040 Hard Shoulder Running
I-270 Travel Time Graph - Northbound**



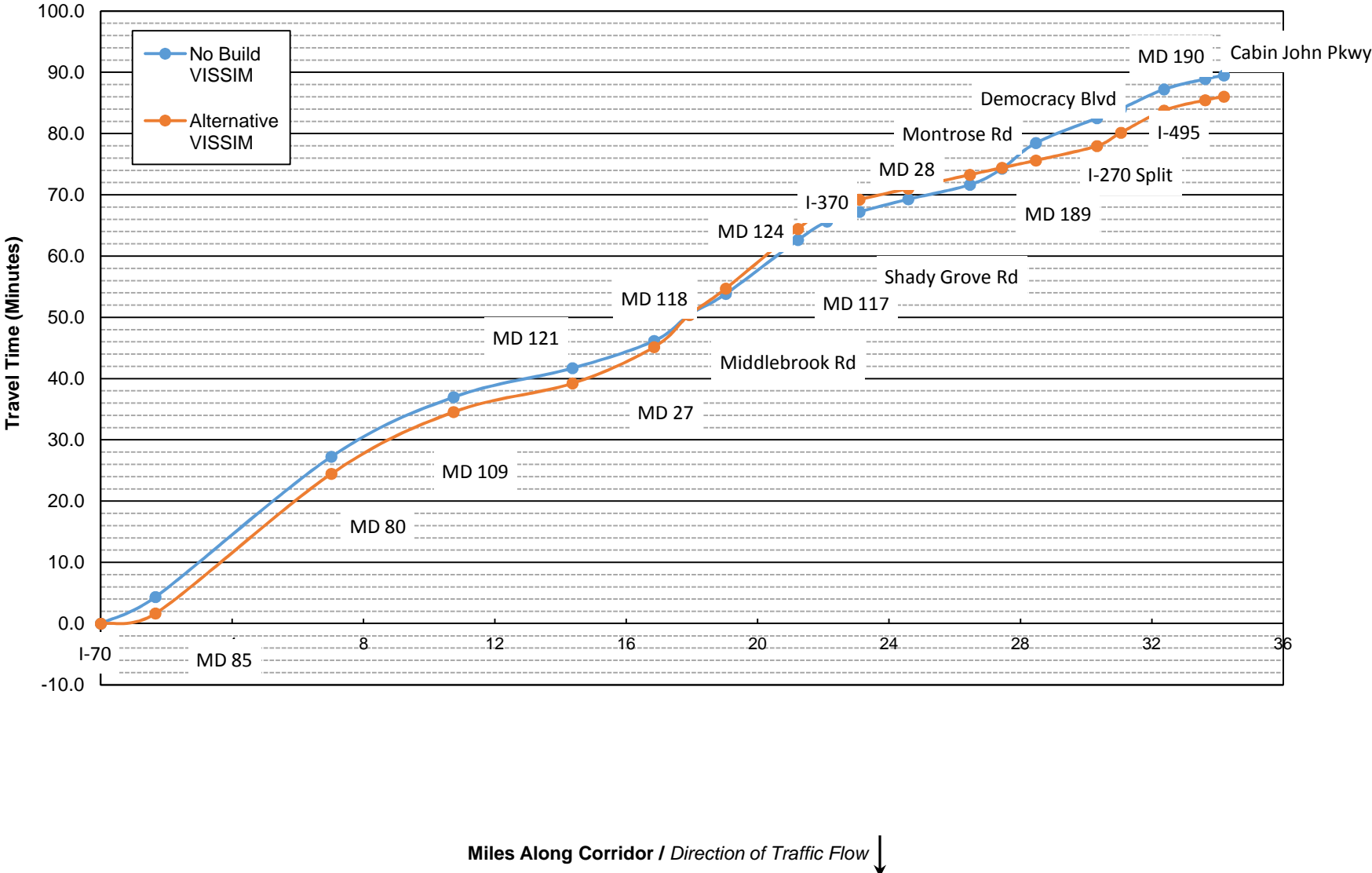
**Figure C.2: AM Peak - 2040 Hard Shoulder Running
I-270 Travel Time Graph - Southbound**



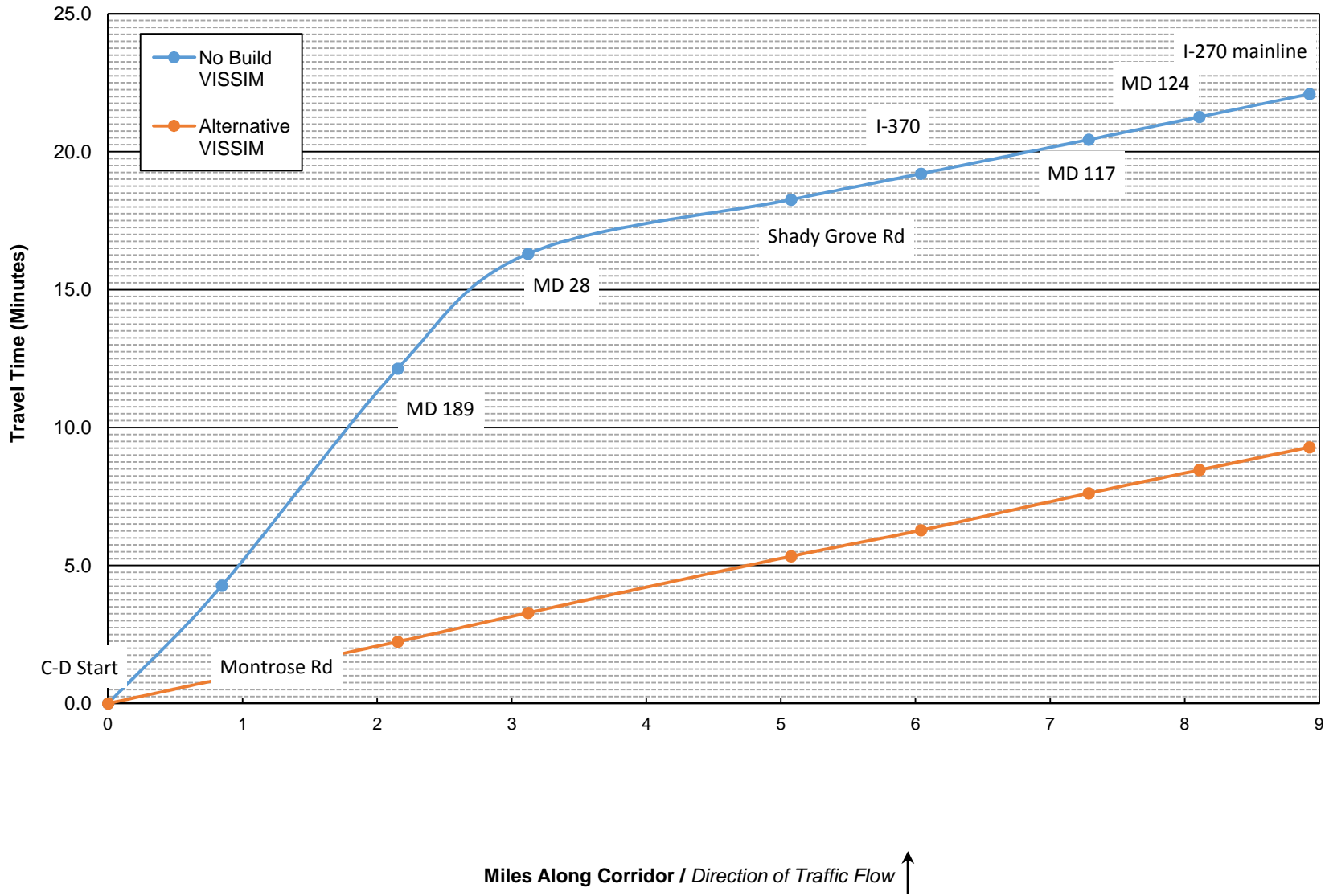
**Figure C.3: AM Peak - 2040 Hard Shoulder Running
I-270 Spur Travel Time Graph - Northbound**



**Figure C.4: AM Peak - 2040 Hard Shoulder Running
I-270 Spur Travel Time Graph - Southbound**



**Figure C.5: AM Peak - 2040 Hard Shoulder Running
I-270 Local Travel Time Graph - Northbound**



**Figure C.6: AM Peak - 2040 Hard Shoulder Running
I-270 Local Travel Time Graph - Southbound**

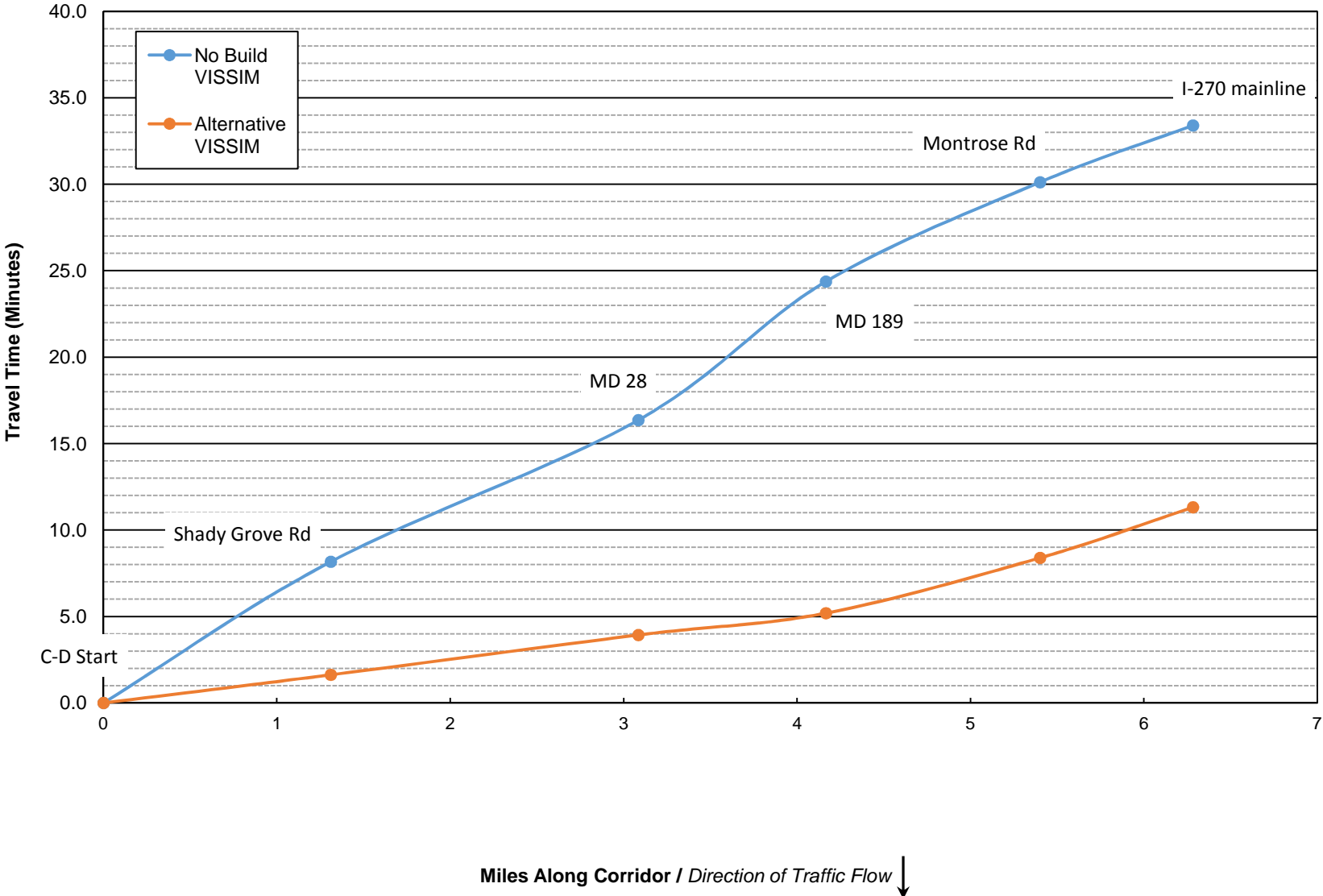


Table C.1: AM Peak -2040 Hard Shoulder Running- I-270 Vehicle Travel Time

I-270 Northbound	Segment Length (miles)	No Build VISSIM Travel Time (seconds)	HSR VISSIM Travel Time (seconds)	% Change	I-270 Southbound	Segment Length (miles)	No Build VISSIM Travel Time (seconds)	HSR VISSIM Travel Time (seconds)	% Change
From I-495 interchange					From I-70				
to MD 187	1.8	115.1	110.3	-4%	to MD 85	1.7	260.9	100.1	-62%
to I-270 Split	0.6	47.5	39.7	-16%	to MD 80	5.4	1,374.0	1,367.4	0%
to Montrose Rd	1.8	139.0	101.1	-27%	to MD 109	3.7	583.2	605.5	4%
to MD 189	1.0	77.0	58.0	-25%	to MD 121	3.6	284.4	280.3	-1%
to MD 28	1.0	61.0	55.4	-9%	to MD 27	2.5	266.9	355.3	33%
to Shady Grove Rd	1.9	108.7	109.4	1%	to MD 118	1.1	254.6	314.5	23%
to I-370	0.9	53.0	53.2	0%	to Middlebrook Rd	1.1	206.2	258.7	25%
to MD 117	1.5	85.5	85.9	0%	to MD 124	2.2	528.0	584.5	11%
to MD 124	0.6	34.5	34.5	0%	to MD 117	0.9	180.6	201.6	12%
to Middlebrook Rd	2.5	140.8	141.2	0%	to I-370	1.0	94.3	85.5	-9%
to MD 118	1.1	64.7	65.0	0%	to Shady Grove Rd	1.5	124.1	107.9	-13%
to MD 27	0.9	52.0	52.0	0%	to MD 28	1.9	141.9	135.0	-5%
to MD 121	2.4	135.6	136.0	0%	to MD 189	1.0	157.8	68.9	-56%
to MD 109	4.1	235.2	235.6	0%	to Montrose Rd	1.0	251.0	71.4	-72%
to MD 80	3.7	214.0	214.7	0%	to I-270 Split	1.9	243.1	141.3	-42%
to MD 85	5.3	310.9	310.5	0%	to MD 187	0.4	30.7	30.7	0%
to I-70	1.4	80.1	80.4	0%	to I-495 interchange	1.9	134.0	133.9	0%
I-270 Total (miles/minutes)	32.4	32.6	31.4	-4%	I-270 Total (miles/minutes)	32.7	85.3	80.7	-5%
I-270 Spur Northbound					I-270 Spur Southbound				
From Cabin John Pkwy					From I-70				
to MD 190	0.5	32.4	32.3	0%	to I-270 Split	30.3	4,951.1	4,677.9	-6%
to I-495	1.1	68.6	66.9	-2%	to Democracy Blvd	0.7	91.3	130.6	43%
to Democracy Blvd	1.4	102.7	92.9	-9%	to I-495	1.3	191.0	216.7	13%
to I-270 Split	0.9	77.7	51.2	-34%	to MD 190	1.3	101.6	101.8	0%
to I-70	30.0	1,792.1	1,732.8	-3%	to Cabin John Pkwy	0.6	35.1	35.1	0%
I-270 Spur Total (miles/minutes)	34.0	34.6	32.9	-5%	I-270 Spur Total (miles/minutes)	34.2	89.5	86.0	-4%

Table C.2: AM Peak -2040 Hard Shoulder Running- I-270 Local Vehicle Travel Time

I-270 Northbound	Segment Length (miles)	No Build VISSIM Travel Time (seconds)	HSR VISSIM Travel Time (seconds)	% Change	I-270 Southbound	Segment Length (miles)	No Build VISSIM Travel Time (seconds)	HSR VISSIM Travel Time (seconds)	% Change
From C-D start					From C-D start				
to Montrose Rd	0.8	256.2	53.4	-79%	to Shady Grove	1.3	490.1	97.8	-80%
to MD 189	1.3	471.8	80.9	-83%	to MD 28	1.8	491.5	138.1	-72%
to MD 28	1.0	250.0	62.9	-75%	to MD 189	1.1	481.0	75.7	-84%
to Shady Grove	2.0	117.6	123.0	5%	to Montrose	1.2	344.5	192.1	-44%
to I-370	1.0	56.5	56.8	1%	to I-270 mainline	0.9	197.1	175.5	-11%
to MD 117	1.2	74.0	80.3	8%					
to MD 124	0.8	49.5	50.5	2%					
to I-270 mainline	0.8	49.7	49.4	-1%					
I-270 Local Total (miles/minutes)	8.9	22.1	9.3	-58%	I-270 Local Total (miles/minutes)	6.3	33.4	11.3	-66%

Table C.3: AM Peak -2040 Hard Shoulder Running- I-270 Vehicle Speed

I-270 Northbound	Segment Length (miles)	No Build VISSIM Speed (MPH)	HSR VISSIM Speed (MPH)	% Change	I-270 Southbound	Segment Length (miles)	No Build VISSIM Speed (MPH)	HSR VISSIM Speed (MPH)	% Change
From I-495 interchange					From I-70				
to MD 187	1.8	57.4	59.9	4%	to MD 85	1.7	22.9	59.8	161%
to I-270 Split	0.6	44.8	53.6	20%	to MD 80	5.4	14.0	14.1	0%
to Montrose Rd	1.8	45.4	62.4	38%	to MD 109	3.7	23.0	22.1	-4%
to MD 189	1.0	47.4	62.9	33%	to MD 121	3.6	45.8	46.5	1%
to MD 28	1.0	56.9	62.7	10%	to MD 27	2.5	33.5	25.2	-25%
to Shady Grove Rd	1.9	62.9	62.4	-1%	to MD 118	1.1	15.2	12.3	-19%
to I-370	0.9	64.1	63.9	0%	to Middlebrook Rd	1.1	19.4	15.5	-20%
to MD 117	1.5	63.8	63.5	0%	to MD 124	2.2	15.0	13.5	-10%
to MD 124	0.6	64.0	63.9	0%	to MD 117	0.9	17.7	15.8	-10%
to Middlebrook Rd	2.5	63.6	63.4	0%	to I-370	1.0	37.6	41.5	10%
to MD 118	1.1	62.3	62.1	0%	to Shady Grove Rd	1.5	43.1	49.6	15%
to MD 27	0.9	63.4	63.4	0%	to MD 28	1.9	47.6	50.0	5%
to MD 121	2.4	63.6	63.4	0%	to MD 189	1.0	22.3	51.1	129%
to MD 109	4.1	62.4	62.3	0%	to Montrose Rd	1.0	14.8	52.0	251%
to MD 80	3.7	61.9	61.7	0%	to I-270 Split	1.9	27.5	47.4	72%
to MD 85	5.3	60.8	60.9	0%	to MD 187	0.4	51.0	51.0	0%
to I-70	1.4	62.5	62.3	0%	to I-495 interchange	1.9	50.8	50.8	0%
I-270 Total (miles/minutes)	32.4	59.8	62.0	4%	I-270 Total (miles/minutes)	32.7	23.0	24.3	6%
I-270 Spur Northbound					I-270 Spur Southbound				
From Cabin John Pkwy					From I-70				
to MD 190	0.5	59.9	60.1	0%	to I-270 Split	30.3	22.1	23.3	6%
to I-495	1.1	59.5	61.0	3%	to Democracy Blvd	0.7	28.8	20.2	-30%
to Democracy Blvd	1.4	50.3	55.5	10%	to I-495	1.3	24.7	21.8	-12%
to I-270 Split	0.9	41.3	62.7	52%	to MD 190	1.3	44.4	44.3	0%
to I-70	30.0	60.3	62.4	3%	to Cabin John Pkwy	0.6	58.5	58.5	0%
I-270 Spur Total (miles/minutes)	34.0	59.1	62.0	5%	I-270 Spur Total (miles/minutes)	34.2	22.9	23.8	4%

Table C.4: AM Peak -2040 Hard Shoulder Running- I-270 Local Vehicle Speed

I-270 Northbound	Segment Length (miles)	No Build VISSIM Speed (MPH)	HSR VISSIM Speed (MPH)	% Change	I-270 Southbound	Segment Length (miles)	No Build VISSIM Speed (MPH)	HSR VISSIM Speed (MPH)	% Change
From C-D start					From C-D start				
to Montrose Rd	0.8	11.9	57.0	380%	to Shady Grove	1.3	9.6	48.2	401%
to MD 189	1.3	10.0	58.2	483%	to MD 28	1.8	13.0	46.2	256%
to MD 28	1.0	13.9	55.4	297%	to MD 189	1.1	8.1	51.5	536%
to Shady Grove	2.0	59.8	57.2	-4%	to Montrose	1.2	12.9	23.2	79%
to I-370	1.0	61.5	61.2	-1%	to I-270 mainline	0.9	16.1	18.1	12%
to MD 117	1.2	60.6	55.9	-8%					
to MD 124	0.8	59.8	58.6	-2%					
to I-270 mainline	0.8	59.3	59.7	1%					
I-270 Local Total (miles/minutes)	8.9	24.2	57.7	138%	I-270 Local Total (miles/minutes)	6.3	11.3	33.3	195%

Table C.5: AM Peak -2040 Hard Shoulder Running- I-270 Vehicle Density

I-270 Northbound	Type	No Build		HSR		% Change	I-270 Southbound	Type	No Build		HSR		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS			
I-270	Freeway	40	E	27	D	-31%	I-270	Freeway	45	F	22	C	-52%
I-270 Diverge to MD 187	Diverge	33	D	21	C	-36%	I-270 Merge from WB I-70	Merge	62	F	14	B	-77%
I-270	Freeway	45	F	24	C	-46%	I-270	Freeway	67	F	26	D	-61%
I-270 Diverge to Rockledge Rd	Diverge	35	D	21	C	-40%	I-270 Merge from EB I-70	Merge	57	F	22	C	-61%
I-270	Freeway	48	F	20	C	-58%	I-270	Freeway	67	F	32	D	-52%
I-270 Weave from MD 187 to I-270 HOV	Weave	30	D	12	B	-60%	I-270 Diverge to SB MD 85	Diverge	70	F	37	E	-48%
I-270 Lane Drop	Merge	47	F	17	B	-65%	I-270	Freeway	92	F	30	D	-68%
I-270	Freeway	64	F	29	D	-54%	I-270 Diverge to NB MD 85	Diverge	56	F	16	B	-72%
I-270 Merge from I-270 Spur	Merge	63	F	25	C	-60%	I-270	Freeway	119	F	15	B	-87%
I-270 Weave from I-270 HOV to I-270 C-D	Weave	68	F	29	D	-58%	I-270 Merge from MD 85	Merge	104	F	16	B	-84%
I-270	Freeway	38	E	25	C	-33%	I-270	Freeway	112	F	119	F	6%
I-270 Diverge to C-D (MD 189)	Diverge	31	D	23	C	-25%	I-270 Diverge to MD 80	Diverge	61	F	114	F	87%
I-270	Freeway	23	C	19	C	-16%	I-270	Freeway	108	F	108	F	0%
I-270 Diverge to C-D (MD 28)	Diverge	50	F	21	C	-59%	I-270 Merge from MD 80	Merge	111	F	62	F	-44%
I-270	Freeway	14	B	16	B	13%	I-270	Freeway	75	F	76	F	2%
I-270 Merge from C-D (MD 189)	Merge	14	B	19	B	37%	I-270 Diverge to MD 109	Diverge	41	F	40	E	-2%
I-270 Diverge to C-D (Shady Grove Rd)	Diverge	18	B	22	C	19%	I-270	Freeway	80	F	79	F	-2%
I-270	Freeway	12	B	16	B	30%	I-270 Merge from MD 109	Merge	87	F	75	F	-13%
I-270 Weave from C-D (MD 28) to C-D (Shady Grove Rd)	Weave	10	B	14	B	33%	I-270	Freeway	44	E	45	E	1%
I-270	Freeway	10	A	13	B	29%	I-270 Diverge to SB Weigh Station	Diverge	19	B	19	B	0%
I-270 Merge from C-D (Shady Grove Rd)	Merge	9	A	11	B	29%	I-270	Freeway	38	E	38	E	0%
I-270	Freeway	12	B	14	B	26%	I-270 Merge from SB Weigh Station	Merge	20	B	20	B	-1%
I-270 Merge from C-D (I-370)	Merge	10	B	12	B	15%	I-270	Freeway	41	E	40	E	-1%
I-270 Diverge to C-D (MD 117)	Diverge	16	B	19	B	17%	I-270 Diverge to MD 121	Diverge	20	B	22	C	12%
I-270	Freeway	12	B	14	B	16%	I-270	Freeway	28	D	34	D	20%
I-270 Merge from C-D (MD 124)	Merge	14	B	16	B	10%	I-270 Merge from WB MD 121	Merge	33	D	42	F	27%
I-270	Freeway	16	B	18	C	13%	I-270	Freeway	43	E	43	E	-1%
I-270 Diverge to EB Middlebrook Rd	Diverge	10	B	12	B	10%	I-270 Merge from EB MD 121	Merge	37	E	35	E	-5%
I-270	Freeway	15	B	17	B	12%	I-270	Freeway	55	F	56	F	3%
I-270 Diverge to WB Middlebrook Rd	Diverge	10	A	11	B	11%	I-270 Diverge to MD 27	Diverge	57	F	78	F	37%
I-270	Freeway	13	B	15	B	12%	I-270	Freeway	81	F	102	F	26%
I-270 Diverge to EB MD 118	Diverge	11	B	12	B	12%	I-270 Merge from WB MD 27	Merge	90	F	106	F	18%
I-270 Diverge to WB MD 118	Diverge	15	B	16	B	11%	I-270	Freeway	82	F	91	F	11%
I-270	Freeway	13	B	14	B	11%	I-270 Weave from EB MD 27 to MD 118	Weave	81	F	87	F	7%
I-270 Weave from MD 118 to MD 27	Weave	13	B	14	B	7%	I-270	Freeway	91	F	95	F	5%
I-270	Freeway	12	B	13	B	9%	I-270 Merge from WB MD 118	Merge	73	F	74	F	1%
I-270 Merge from EB MD 27	Merge	13	B	14	B	7%	I-270	Freeway	85	F	87	F	2%
I-270	Freeway	14	B	15	B	8%	I-270 Merge from EB MD 118	Merge	73	F	94	F	30%
I-270 Merge from WB MD 27	Merge	11	B	11	B	7%	I-270	Freeway	70	F	79	F	13%
I-270	Freeway	14	B	16	B	8%	I-270 Merge from Middlebrook Rd	Merge	113	F	116	F	3%
I-270 Diverge to MD 121	Diverge	11	B	12	B	7%	I-270	Freeway	86	F	89	F	3%

Table C.5: AM Peak -2040 Hard Shoulder Running- I-270 Vehicle Density

I-270 Northbound	Type	No Build		HSR		% Change	I-270 Southbound	Type	No Build		HSR		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS			
I-270	Freeway	11	A	11	B	7%	I-270 Diverge to Watkins Mill Rd	Diverge	81	F	81	F	0%
I-270 Merge from EB MD 121	Merge	10	A	10	B	4%	I-270	Freeway	124	F	125	F	1%
I-270 Lane Drop	Merge	13	B	14	B	4%	I-270 Diverge to MD 124	Diverge	89	F	80	F	-10%
I-270	Freeway	19	C	20	C	7%	I-270	Freeway	133	F	134	F	1%
I-270 Diverge to NB Weigh Station	Diverge	10	B	11	B	5%	I-270 Merge from Watkins Mill	Merge	158	F	159	F	1%
I-270	Freeway	21	C	22	C	5%	I-270	Freeway	99	F	115	F	16%
I-270 Merge from NB Weight Station	Merge	10	B	11	B	5%	I-270 Merge from WB MD 124	Merge	132	F	112	F	-15%
I-270	Freeway	21	C	22	C	5%	I-270	Freeway	53	F	49	F	-8%
I-270 Diverge to MD 109	Diverge	11	B	12	B	4%	I-270 Merge from MD 117	Merge	49	F	46	F	-6%
I-270	Freeway	19	C	20	C	4%	I-270	Freeway	48	F	42	E	-13%
I-270 Merge from MD 109	Merge	11	B	11	B	5%	I-270 Diverge to I-370	Diverge	41	F	33	D	-19%
I-270	Freeway	21	C	21	C	4%	I-270	Freeway	49	F	33	D	-32%
I-270 Diverge to MD 80	Diverge	12	B	13	B	5%	I-270 Diverge to I-270 C-D	Diverge	96	F	26	C	-73%
I-270	Freeway	19	C	19	C	4%	I-270	Freeway	20	C	21	C	4%
I-270 Merge from MD 80	Merge	14	B	14	B	3%	I-270 Merge from I-270 (I-370)	Merge	20	C	21	C	3%
I-270	Freeway	24	C	25	C	2%	I-270 Diverge to I-270 C-D (Shady Grove Rd)	Diverge	27	C	22	C	-19%
I-270 Diverge to Scenic View	Diverge	12	B	13	B	2%	I-270	Freeway	21	C	17	B	-15%
I-270	Freeway	24	C	25	C	2%	I-270 Merge from I-270 C-D (Shady Grove Rd Northern)	Merge	18	B	22	C	24%
I-270 Merge from Scenic View	Merge	12	B	13	B	3%	I-270	Freeway	26	C	21	C	-18%
I-270	Freeway	25	C	25	C	2%	I-270 Merge from I-270 C-D (Shady Grove Rd Southern)	Merge	32	D	21	C	-33%
I-270 Diverge to NB MD 85	Diverge	14	B	14	B	1%	I-270 Diverge to I-270 C-D (MD 189)	Diverge	46	F	28	D	-38%
I-270	Freeway	23	C	24	C	2%	I-270	Freeway	82	F	18	B	-79%
I-270 Diverge to SB MD 85	Diverge	17	B	18	B	3%	I-270 Merge from I-270 C-D (MD 189)	Merge	106	F	20	B	-82%
I-270	Freeway	19	C	20	C	3%	I-270	Freeway	77	F	25	C	-67%
I-270 Weave from MD 85 to I-70	Weave	13	B	13	B	2%	I-270 Merge from I-270 C-D	Merge	39	E	34	D	-12%
I-270	Freeway	17	B	17	B	1%	I-270 Diverge to I-270 HOV Lane	Diverge	19	B	20	C	7%
							I-270 Diverge to I-270 Spur	Diverge	40	E	40	F	1%
							I-270	Freeway	23	C	23	C	2%
							I-270 Diverge to Rockledge Dr / MD 187	Diverge	17	B	17	B	-1%
							I-270	Freeway	23	C	24	C	2%
							I-270 Merge from Rockledge Dr	Merge	19	B	19	B	-1%
							I-270	Freeway	24	C	25	C	2%
							I-270 Merge from Rockledge Dr / MD 187	Merge	22	C	22	C	0%
							I-270	Freeway	26	C	26	D	2%

Table C.6: AM Peak -2040 Hard Shoulder Running- I-270 Spur Vehicle Density

I-270 Spur Northbound	Type	No Build		HSR		% Change	I-270 Southbound	Type	No Build		HSR		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS			
I-270 Spur	Freeway	57	F	56	F	-2%	I-270 Spur	Freeway	49	F	70	F	44%
I-270 Spur Merge from Clara Barton Parkway	Merge	25	C	25	C	0%	I-270 Spur Weave from I-270 HOV to Democracy Blvd	Weave	60	F	76	F	26%
I-270 Spur	Freeway	39	E	39	E	0%	I-270 Spur	Freeway	54	F	64	F	17%
I-270 Diverge to MD 190	Diverge	28	D	28	D	0%	I-270 Merge from Democracy Blvd	Merge	30	D	34	D	11%
I-270 Spur	Freeway	34	D	34	D	0%	I-270 Spur Lane Drop	Merge	54	F	59	F	9%
I-270 Spur Merge from Cabin John Parkway	Merge	25	C	24	C	-4%	I-270 Spur	Freeway	75	F	81	F	8%
I-270 Spur Merge from MD 190	Merge	26	C	24	C	-6%	I-270 Spur Merge from I-495	Merge	37	E	40	E	7%
I-270 Spur	Freeway	35	D	32	D	-9%	I-270 Spur	Freeway	45	F	43	E	-5%
I-270 Spur Diverge to I-495	Merge	38	E	34	D	-9%	I-270 Spur Diverve to EB MD 190	Diverge	56	F	61	F	9%
I-270 Spur	Freeway	40	E	33	D	-18%	I-270 Spur Diverve to Cabin John Pkwy	Diverge	27	C	26	C	-5%
I-270 Spur Diverge to Democracy Blvd	Diverge	33	D	27	C	-18%	I-270 Spur	Freeway	29	D	28	D	-3%
I-270 Spur	Freeway	36	E	25	C	-31%	I-270 Merge from MD 190	Merge	26	C	25	C	-3%
I-270 Spur Merge from EB Democracy Blvd	Merge	30	D	16	B	-48%	I-270 Spur	Freeway	34	D	34	D	-2%
I-270 Spur	Freeway	39	E	24	C	-38%	I-270 Diverge to WB Clara Barton Pkwy	Diverge	23	C	22	C	-1%
I-270 Spur Merge from WB Democracy Blvd	Merge	30	D	16	B	-46%	I-270 Spur	Freeway	33	D	33	D	-2%
I-270 Spur	Freeway	43	E	25	C	-42%	I-270 Merge from Clara Barton Pkwy	Merge	30	D	30	D	-2%
I-270 Spur Merge from Westlake Terrace	Merge	45	F	25	C	-45%							
I-270 Spur	Freeway	50	F	25	C	-49%							

Table C.7: AM Peak -2040 Hard Shoulder Running- I-270 Local Vehicle Density

I-270 Northbound	Type	No Build		HSR		% Change	I-270 Southbound	Type	No Build		HSR		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS			
I-270 C-D	Freeway	84	F	36	E	-57%	I-270 C-D	Freeway	107	F	20	C	-81%
I-270 C-D Diverge to EB Montrose Rd	Diverge	48	F	23	C	-53%	I-270 C-D Weave from I-370 EB to I-270	Weave	128	F	24	B	-82%
I-270 C-D	Freeway	80	F	19	C	-76%	I-270 C-D Diverge to Shady Grove Rd	Diverge	115	F	20	B	-83%
I-270 C-D Weave between Montrose Rd Loop Ramps	Weave	69	F	13	B	-81%	I-270 C-D	Freeway	137	F	28	D	-80%
I-270 C-D	Freeway	84	F	18	C	-78%	I-270 C-D Merge from WB Shady Grove Rd	Merge	106	F	23	C	-78%
I-270 C-D Merge from WB Montrose Rd	Merge	89	F	25	C	-72%	I-270 C-D	Freeway	113	F	38	E	-67%
I-270 C-D	Freeway	98	F	31	D	-68%	I-270 C-D Merge from EB Shady Grove Rd	Merge	77	F	35	E	-54%
I-270 C-D Merge from I-270	Merge	96	F	31	D	-67%	I-270 C-D	Freeway	93	F	37	E	-61%
I-270 C-D	Freeway	104	F	31	D	-70%	I-270 C-D Merge from I-270	Merge	98	F	25	C	-74%
I-270 C-D Diverge to MD 189	Diverge	58	F	17	B	-70%	I-270 C-D Diverge to I-270	Diverge	56	F	38	E	-32%
I-270 C-D	Freeway	111	F	24	C	-78%	I-270 C-D Diverge to I-270	Diverge	64	F	29	D	-55%
I-270 C-D Merge from MD 189	Merge	101	F	18	B	-82%	I-270 C-D	Freeway	75	F	19	C	-75%
I-270 C-D	Freeway	114	F	32	D	-72%	I-270 C-D Diverge to MD 28	Diverge	62	F	12	B	-80%
I-270 C-D Weave between I-270 (to MD 28 from MD 189)	Weave	108	F	31	C	-71%	I-270 C-D	Freeway	128	F	13	B	-90%
I-270 C-D	Freeway	106	F	34	D	-68%	I-270 C-D Merge from WB MD 28	Merge	160	F	10	A	-94%
I-270 C-D Diverge to MD 28	Diverge	64	F	23	C	-64%	I-270 C-D	Freeway	132	F	17	B	-87%
I-270 C-D	Freeway	87	F	28	D	-67%	I-270 C-D Merge from EB MD 28	Merge	152	F	21	C	-86%
I-270 C-D Weave between MD 28 Ramps	Weave	109	F	39	E	-64%	I-270 C-D	Freeway	123	F	34	D	-73%
I-270 C-D	Freeway	7	A	11	A	67%	I-270 C-D Merge from I-270	Merge	124	F	24	C	-80%
I-270 C-D Merge from MD 28 WB	Merge	6	A	8	A	18%	I-270 C-D	Freeway	95	F	25	C	-74%
I-270 C-D Merge from I-270 and Drop Lane	Merge	7	A	10	A	39%	I-270 C-D Diverge to MD 189	Diverge	60	F	20	B	-67%
I-270 C-D Diverge to I-270	Diverge	12	B	16	B	35%	I-270 C-D	Freeway	117	F	23	C	-80%
I-270 C-D	Freeway	19	C	26	D	36%	I-270 C-D Merge from MD 189	Merge	120	F	74	F	-38%
I-270 C-D Diverge to Shady Grove Rd	Diverge	15	B	20	B	29%	I-270 C-D Diverge to I-270	Diverge	84	F	74	F	-12%
I-270 C-D	Freeway	5	A	7	A	27%	I-270 C-D	Freeway	92	F	83	F	-9%
I-270 C- D Merge from I-270 and EB Shady Grove Rd	Merge	8	A	10	A	19%	I-270 C-D Diverge to WB Montrose Rd	Diverge	55	F	45	F	-18%
I-270 C-D	Freeway	8	A	9	A	20%	I-270 C-D	Freeway	98	F	90	F	-8%
I-270 C-D Merge from WB Shady Grove Rd	Merge	10	A	12	B	19%	I-270 Weave between Montrose Rd Loops	Weave	94	F	89	F	-5%
I-270 C-D Diverge to I-270	Diverge	14	B	17	B	17%	I-270 C-D	Freeway	76	F	81	F	7%
I-270 C-D	Freeway	13	B	15	B	17%	I-270 C-D Merge from EB Montrose Rd	Merge	56	F	63	F	13%
I-270 C-D Diverge to I-370	Diverge	13	B	15	B	17%	I-270 C-D	Freeway	54	F	50	F	-8%
I-270 C-D	Freeway	2	A	3	A	18%							
I-270 Merge from I-370 EB	Merge	7	A	8	A	4%							
I-270 C-D	Freeway	8	A	8	A	6%							
I-270 C-D Weave from I-370 to I-270	Weave	19	B	19	B	1%							
I-270 C-D	Freeway	14	B	15	B	8%							
I-270 C-D Weave from I-270 to MD 117	Weave	19	B	32	C	68%							
I-270 C-D Diverge to MD 124	Diverge	13	B	14	B	12%							
I-270 C-D	Freeway	13	B	15	B	10%							
I-270 C-D Merge from EB MD 124	Merge	12	B	13	B	8%							
I-270 C-D Merge From WB MD 124	Merge	12	B	13	B	8%							
I-270 C-D	Freeway	10	A	10	A	3%							

Table C.7: AM Peak -2040 Hard Shoulder Running- I-270 Local Vehicle Density

		No Build		HSR		% Change			No Build		HSR		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS	
I-270 Northbound	Type						I-270 Souhbound	Type					
I-270 C-D Merge from Watkins Mill	Merge	10	A	10	B	3%							

Table C.8: AM Peak - 2040 Hard Shoulder Running- I-270 Vehicle Throughput

I-270 Northbound	No-Build VISSIM Throughput	HSR VISSIM Throughput	Change %	I-270 Southbound	No-Build VISSIM Throughput	HSR VISSIM Throughput	Change %
Between I-495 and MD 187	4485	4860	8%	North of I-70	2514	2636	5%
Between MD 187 on and off ramps	3881	4319	11%	Between I-70 on ramps	2842	3038	7%
Between Rockledge Blvd on and off ramps	3138	3623	15%	From I-70 interchange to MD-85	4882	5374	10%
Between Rockledge Dr and I-270 Spur	2720	3287	21%	Between MD-85 on and off ramps	2530	2910	15%
Between I-270 Spur and Montrose Rd	7422	8811	19%	Between MD-85 and MD-80	3043	3078	1%
Between Montrose Rd on and off ramps	4321	5065	17%	Between MD-80 on and off ramps	2724	2713	0%
Between Montrose Rd and MD 189	4064	4729	16%	Between MD-80 and Md-109	3532	3537	0%
Between MD 189 and MD 28	4018	4725	18%	Between MD-109 on and off ramps	3430	3488	2%
Between MD 28 on and off ramps	4122	5141	25%	Between MD-109 and MD-121	4100	4141	1%
Between MD 28 and Shady Grove Rd	2980	3819	28%	Between MD-121 on and off ramps	3551	3521	-1%
Between Shady Grove Rd and I-370	2552	3288	29%	Between MD-121 and MD-27	4802	4621	-4%
Between I-370 on and off ramps	2849	3588	26%	Between MD-27 on and off ramps	4223	4014	-5%
Between I-370 and MD 117	3979	4725	19%	Between MD-27 and MD-118	4688	4504	-4%
Between MD 117 and MD 124	3010	3512	17%	Between MD-118 on and off ramps	4542	4392	-3%
Between MD-124 on and off ramps	3023	3510	16%	Between MD-118 and Middlebrook Rd	5199	5047	-3%
Between Watkins Mill Rd and Middlebrook Rd	3974	4485	13%	Between Middlebrook Rd on and off ramps	5197	5064	-3%
Between Middlebrook Rd on and off ramps	3705	4139	12%	Between Middlebrook Rd and MD-124	6832	6654	-3%
Between Middlebrook Rd and MD 118	3293	3672	12%	Between MD-124 on and off ramps	5415	5494	1%
Between MD-118 on and off ramps	2981	3335	12%	Between MD-124 and MD-117	6469	6727	4%
Between MD 118 and MD 27	2827	3071	9%	Between MD-117 and I-370	8146	8460	4%
Between MD-27 on and off ramps	2280	2486	9%	Between I-370 on and off ramps	2997	3153	5%
Between MD 27 and MD 121	2687	2890	8%	Between I-370 on ramp to Shady Grove Rd	3871	3151	-19%
Between MD-121 on and off ramps	1970	2100	7%	Between Shady Grove Rd and MD 28	3552	3190	-10%
Between MD 121 and MD 109	2497	2628	5%	Between MD 28 on and off ramps	4372	4061	-7%
Between MD-109 on and off ramps	2327	2428	4%	Between MD 28 and MD 189	3946	3211	-19%
Between MD 109 and MD 80	2487	2579	4%	Between MD 189 and Montrose Rd	4070	2795	-31%
Between MD-80 on and off ramps	2222	2291	3%	Between Montrose Rd on and off ramps	5046	3711	-26%
Between MD 80 and MD 85	2916	2982	2%	Between Montrose Rd and I-270 Spur	8064	7979	-1%
Between MD-85 on and off ramps	2213	2260	2%	Between I-270 Spur and Rockledge Blvd	3823	3791	-1%
Between MD 85 and I-70	3227	3261	1%	Between Rockledge Blvd on and off ramps	2733	2707	-1%
North of I-70	2081	2097	1%	Between MD 187 on and off ramps	2887	2868	-1%
				Between MD 187 and I-495	2902	2917	1%
I-270 Spur Northbound				I-270 Spur Southbound			
Between I-495 and Democracy Blvd	5264	5476	4%	Between I-270 Split and HOV on ramp	4251	4179	-2%
Between Democracy Blvd on and off ramps	4077	4281	5%	Between HOV on ramp and Democracy Blvd	4186	4063	-3%
Between Democracy Blvd and I-270 Split	4219	4562	8%	Between Democracy Blvd on and off ramps	3670	3554	-3%
				Between Democracy Blvd and I-495	4194	4080	-3%

Table C.9: AM Peak -2040 Hard Shoulder Running- I-270 Local Vehicle Throughput

I-270 Local Northbound	No-Build VISSIM Throughput	HSR VISSIM Throughput	Change %	I-270 Local Southbound	No-Build VISSIM Throughput	HSR VISSIM Throughput	Change %
Between Montrose Rd EB off ramp and EB on ramp	1707	2370	39%	Between I-370 on ramp and I-270 off ramp	3627	4039	11%
Between Montrose Rd EB on ramp and WB off ramp	1884	2621	39%	Between I-270 off ramp and Shady Grove off ramp	2767	3199	16%
Between Montrose Rd WB off ramp and on ramp	1556	2196	41%	Between Shady Grove off ramp and Shady Grove WB on ramp	1593	2749	73%
Between Montrose Rd WB on ramp and I-270 on ramp	2215	3322	50%	Between Shady Grove WB and EB on ramps	2225	3380	52%
Between I-270 on ramp and MD 189 off ramp	2316	3655	58%	Between Shady Grove on ramp and I-270 on ramp	2594	3770	45%
Between MD 189 ramps	1739	2952	70%	Between I-270 on ramp and I-270 off ramp1	3272	4345	33%
Between MD 189 off ramp and I-270 on ramp	2036	3530	73%	Between I-270 off ramp1 and I-270 off ramp2	2767	2762	0%
Between I-270 on ramp and I-270 off ramp	2547	4315	69%	Between I-270 off ramp2 and MD 28 off ramp	1961	1886	-4%
Between I-270 off ramp and MD 28 EB off ramp	1823	3111	71%	Between MD 28 off ramp and MD 28 WB on ramp	1428	1377	-4%
Between MD 28 EB off ramp to MD 28 EB on ramp	1585	2742	73%	Between MD 28 WB on ramp and MD 28 EB on ramp	1700	1697	0%
Between MD 28 EB on ramp and MD 28 WB off ramp	1616	2839	76%	Between MD 28 EB on ramp and I-270 on ramp	2375	3206	35%
Between MD 28 WB off ramp and MD 28 WB on ramp	751	1285	71%	Between I-270 on ramp and MD 189 off ramp	2871	2997	4%
Between MD 28 WB on ramp and I-270 on ramp	1263	1808	43%	Between MD 189 on and off ramps	2353	1615	-31%
Between I-270 on ramp and I-270 off ramp	2439	3140	29%	Between MD 189 on ramp and I-270 off ramp	3387	2528	-25%
Between I-270 off ramp and Shady Grove off ramp	2131	2684	26%	Between I-270 off ramp and Montrose Rd off ramp	2357	2690	14%
Between Shady Grove off ramp and I-270 on ramp	322	406	26%	Between Montrose Rd off ramp and Montrose Rd WB on ramp	2251	2550	13%
Between I-270 on ramp and Shady Grove WB on ramp	1448	1730	19%	Between Montrose Rd WB on ramp and EB off ramp	2992	3559	19%
Between Shady Grove WB on ramp and I-270 off ramp	1788	2066	16%	Between Montrose Rd EB off and on ramps	2336	2798	20%
Between I-270 off ramp and I-370 off ramp	1515	1771	17%	Between Montrose Rd EB off ramp and I-270	3139	3578	14%
Between I-370 off ramp and I-370 EB on ramp	286	340	19%				
Between I-370 EB and WB on ramps	919	979	7%				
Between I-370 WB on ramp and I-270 off ramp	2785	2843	2%				
Between I-270 off ramp and I-270 on ramp	1670	1705	2%				
Between I-270 on ramp and MD 117 off ramp	2654	2921	10%				
Between MD 117 off ramp and MD 124 off ramp	1509	1649	9%				
Between MD 124 off ramp and MD 124 EB on ramp	789	866	10%				
Between MD 124 EB and WB on ramps	1183	1262	7%				
Between MD 124 on ramp I-270	573	595	4%				

Table C.10: AM Peak - 2040 Hard Shoulder Running - I-270 On Ramp Queue Length - Northbound

I-270 Northbound	No Build VISSIM Average Queue (feet)	HSR VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	HSR VISSIM Maximum Queue (feet)	% Change
Rockledge Dr on ramp	67	0	-100%	421	0	-100%
MD 189 C-D on ramp	0	0	-	0	0	-
MD 28 C-D on ramp	0	0	-	0	0	-
Shady Grove Rd C-D on ramp	0	0	-	0	0	-
I-370 C-D on ramp	0	0	-	0	0	-
MD 124 C-D on ramp	0	0	-	0	0	-
MD 118 on ramp	0	0	-	0	0	-
MD 27 EB on ramp	0	0	-	0	0	-
MD 27 WB on ramp	0	0	-	0	0	-
MD 121 on ramp	0	0	-	0	0	-
MD 109 on ramp	0	0	-	0	0	-
MD 80 on ramp	0	0	-	0	0	-
MD 85 on ramp	0	0	-	0	0	-
I-270 Spur Northbound	No Build VISSIM Average Queue (feet)	HSR VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	HSR VISSIM Maximum Queue (feet)	% Change
Democracy Blvd EB on ramp	4	0	-100%	57	0	-100%
Democracy Blvd WB on ramp	0	0	-100%	5	0	-100%
I-495 Northbound	No Build VISSIM Average Queue (feet)	HSR VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	HSR VISSIM Maximum Queue (feet)	% Change
Cabin John Pkwy on ramp	0	0	-	0	0	-
MD 190 on ramp	0	0	-	0	0	-
I-270 C-D Northbound	No Build VISSIM Average Queue (feet)	HSR VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	HSR VISSIM Maximum Queue (feet)	% Change
Montrose Rd EB on ramp	436	1	-100%	1548	125	-92%
Montrose Rd WB on ramp	1047	0	-100%	2581	0	-100%
I-270 on ramp	409	0	-100%	1171	0	-100%
MD 189 on ramp	1304	0	-100%	2877	0	-100%
I-270 on ramp	1354	0	-100%	3378	0	-100%
MD 28 EB on ramp	3	0	-100%	55	0	-100%
MD 28 WB on ramp	0	0	-	0	0	-
Shady Grove Rd EB on ramp	0	0	-	0	0	-
I-270 on ramp	0	0	-	0	0	-
Shady Grove Rd WB on ramp	0	0	-	0	0	-
I-370 EB on ramp	0	0	-	0	0	-
I-370 WB on ramp	0	9	-	0	159	-
I-270 on ramp	0	0	-100%	29	0	-100%
MD 124 EB on ramp	0	0	-	0	0	-
MD 124 WB on ramp	0	68	-	0	1235	-
Watkins Mill Rd on ramp	0	3023	3043529%	24	3131	13033%

Table C.11: AM Peak - 2040 Hard Shoulder Running - I-270 Off Ramp Queue Length - Northbound

I-270 Northbound	No Build VISSIM Average Queue (feet)	HSR VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	HSR VISSIM Maximum Queue (feet)	% Change
MD 187 off ramp NB	28	0	-100%	242	0	-100%
MD 187 off ramp SB	0	8	-	0	355	-
Rockledge Dr off ramp	6	24	334%	359	185	-48%
Tower Oaks Blvd off ramp	19	0	-100%	179	0	-100%
Montrose Rd off ramp EB	0	0	-	0	0	-
Montrose Rd off ramp WB	0	14	-	0	116	-
MD 189 off ramp WB	8	4	-51%	99	272	174%
MD 189 off ramp EB	60	56	-8%	1148	292	-75%
MD 28 off ramp EB	28	0	-100%	227	0	-100%
MD 28 off ramp WB	2636	0	-100%	5046	0	-100%
Shady Grove Rd off ramp - Redland Blvd	0	209	-	0	679	-
Shady Grove Rd off ramp WB	151	0	-100%	605	0	-100%
Shady Grove Rd off ramp EB	0	0	-	0	0	-
I-370 off ramp WB	0	0	-	0	0	-
I-370 off ramp EB	0	515	-	0	1588	-
MD 117 off ramp	311	101	-67%	1011	448	-56%
MD 124 off ramp	95	0	-100%	453	0	-100%
Watkins Mill Rd off ramp	78	0	-100%	366	0	-100%
Middlebrook Rd EB off ramp	0	0	-	0	0	-
Middlebrook Rd WB off ramp	0	0	-	0	5	-
MD 118 WB off ramp - Seneca Meadows	0	0	-	0	0	-
MD 118 WB off ramp	0	0	-	0	0	-
MD 118 EB off ramp	0	8	-	0	85	-
MD 27 off ramp WB	7	0	-100%	81	0	-100%
MD 27 off ramp EB	0	66	-	0	252	-
MD 121 off ramp WB	62	0	-100%	250	0	-100%
MD 121 off ramp EB	0	11	-	0	144	-
MD 109 off ramp EB	29	0	-100%	228	0	-100%
MD 109 off ramp WB	8	8	1%	84	146	74%
MD 80 off ramp EB	7	0	-100%	102	9	-91%
MD 80 off ramp WB	0	0	-100%	26	0	-100%
MD 85 NB off ramp	0	1	-	0	124	-
MD 85 SB off ramp	1	1	152%	126	261	107%
I-270 Spur Northbound	No Build VISSIM Average Queue (feet)	HSR VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	HSR VISSIM Maximum Queue (feet)	% Change
Clara Barton Pkwy off ramp EB	1	0	-100%	214	0	-100%
Clara Barton Pkwy off ramp WB	0	0	-	0	80	-
MD 190 off ramp EB	0	0	-100%	10	0	-100%
MD 190 off ramp WB	0	110	-	0	570	-
Democracy Blvd off ramp WB	104	16	-84%	563	146	-74%
Democracy Blvd off ramp EB	15	0	-100%	143	0	-100%

Table C.12: AM Peak - 2040 Hard Shoulder Running- I-270 On Ramp Queue Length - Southbound

I-270 Southbound	No Build VISSIM Average Queue (feet)	HSR VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	HSR VISSIM Maximum Queue (feet)	% Change
MD 85 on ramp	41	0	-100%	528	0	-100%
MD 80 on ramp	1039	0	-100%	2688	0	-100%
MD 109 on ramp	995	211	-79%	1914	1389	-27%
MD 121 WB on ramp	135	90	-33%	972	1579	62%
MD 121 EB on ramp	0	2446	-	0	5042	-
MD 27 WB on ramp	552	667	21%	2591	2905	12%
MD 27 EB on ramp	3	3	16%	173	304	76%
MD 118 WB on ramp	0	0	-	0	0	-
MD 118 EB on ramp	0	5	2257%	44	277	525%
Middlebrook Rd on ramp	2842	3834	35%	4433	4421	0%
Watkins Mill Rd on ramp	3066	3063	0%	3136	3143	0%
MD 124 WB on ramp	2789	316	-89%	4158	1544	-63%
MD 117 on ramp	293	23	-92%	1898	1008	-47%
I-370 C-D on ramp	0	0	-	0	0	-
Shady Grove Rd C-D on ramp North	0	0	-	0	0	-
Shady Grove Rd C-D on ramp South	2	0	-100%	127	0	-100%
MD 189 C-D on ramp	1787	0	-100%	3610	0	-100%
Montrose Rd C-D on ramp	2	0	-100%	227	0	-100%
Rockledge Dr on ramp	0	0	-	0	0	-
MD 187 on ramp	0	0	-	0	0	-
I-270 Spur Southbound	No Build VISSIM Average Queue (feet)	HSR VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	HSR VISSIM Maximum Queue (feet)	% Change
Democracy Blvd on ramp	0	340	-	0	1268	-
I-495 Southbound	No Build VISSIM Average Queue (feet)	HSR VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	HSR VISSIM Maximum Queue (feet)	% Change
I-270 Spur on ramp	147	0	-100%	1557	0	-100%
MD 190 on ramp	0	0	-	0	0	-
I-270 C-D Southbound	No Build VISSIM Average Queue (feet)	HSR VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	HSR VISSIM Maximum Queue (feet)	% Change
I-270 on ramp	2947	0	-100%	4900	0	-100%
I-370 on ramp	2511	0	-100%	2932	0	-100%
Shady Grove Rd WB on ramp	28	0	-100%	597	0	-100%
Shady Grove Rd EB on ramp	0	0	-100%	37	0	-100%
I-270 on ramp	0	0	-100%	42	0	-100%
MD 28 WB on ramp	1406	0	-100%	2299	0	-100%
MD 28 EB on ramp	3724	0	-100%	3882	0	-100%
I-270 on ramp	1	1514	231830%	74	2494	3256%
MD 189 on ramp	3725	27	-99%	4200	708	-83%
Montrose Rd WB on ramp	68	0	-100%	926	41	-96%
Montrose Rd EB on ramp	0	0	-100%	69	0	-100%

Table C.13: AM Peak -2040 Hard Shoulder Running- I-270 Off Ramp Queue Length - Southbound

I-270 Southbound	No Build VISSIM Average Queue (feet)	HSR VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	HSR VISSIM Maximum Queue (feet)	% Change
MD 85 SB off ramp	297	0	-100%	1410	17	-99%
MD 85 NB off ramp	0	0	22%	43	69	60%
MD 80 off ramp	1	0	-59%	99	23	-77%
MD 109 off ramp WB	0	0	-100%	25	0	-100%
MD 109 off ramp EB	0	284	-	0	1936	-
MD 121 off ramp EB	219	87	-60%	946	1315	39%
MD 121 off ramp WB	10	52	423%	519	272	-48%
MD 27 off ramp EB	50	258	417%	262	1871	615%
MD 27 off ramp WB	881	31	-97%	3309	168	-95%
MD 118 off ramp EB	31	0	-100%	160	0	-100%
MD 118 off ramp WB	0	69	-	0	296	-
Watkins Mill Rd off ramp	2034	91	-96%	5055	424	-92%
MD 124 off ramp EB	70	19	-74%	368	356	-3%
MD 124 off ramp WB	19	0	-100%	419	0	-100%
I-370 off ramp WB	0	0	-	0	0	-
I-370 off ramp EB	0	3	-	0	138	-
Shady Grove Rd off ramp - Omega Drive	4	0	-100%	172	0	-100%
Shady Grove Rd off ramp	0	1	-	0	99	-
MD 28 off ramp	4	43	938%	154	341	121%
MD 189 off ramp EB	35	0	-100%	238	0	-100%
MD 189 off ramp WB	0	0	-	0	0	-
Montrose Rd off ramp WB	0	1	-	0	119	-
Montrose Rd off ramp EB	382	17	-96%	1566	238	-85%
Rockledge Dr off ramp	27	49	82%	343	247	-28%
I-270 Spur Southbound	No Build VISSIM Average Queue (feet)	HSR VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	HSR VISSIM Maximum Queue (feet)	% Change
Democracy Blvd off ramp EB	50	0	-100%	219	0	-100%
Democracy Blvd off ramp WB	0	1483	-	0	3336	-
MD 190 off ramp WB	1389	0	-100%	3571	0	-100%
MD 190 off ramp EB	0	0	-	0	0	-
Clara Barton Pkwy WB off ramp	0	33	1119166%	5	258	4790%

Table C.14: AM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
1- MD 85 at Sam's Club Drive											
1	NB	23.0	C	NB Left	119	77	82	496	E	38.6	D
				NB Through	365	28	82	496	C		
				NB Right	664	11	22	438	B		
	SB	50.1	D	SB Left	137	63	174	771	E		
				SB Through	599	50	174	771	D		
				SB Right	68	26	174	771	C		
	EB	50.9	D	EB Left	105	78	56	182	E		
				EB Through	62	81	56	182	F		
				EB Right	113	9	56	182	A		
	WB	52.7	D	WB Left	230	77	90	355	E		
				WB Through	15	67	90	355	E		
				WB Right	126	7	90	355	A		
2- MD 85 at I-270 NB on and off ramp											
2	NB	52.1	D	NB Left	683	52	265	1136	D	36.3	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	18.8	B	SB Left	0	0	0	0	A		
				SB Through	611	19	56	562	B		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
3- MD 85 at I-270 SB on and off ramp											
3	NB	5.3	A	NB Left	0	0	0	0	A	10.2	B
				NB Through	1071	5	19	413	A		
				NB Right	0	0	0	0	A		
	SB	40.9	D	SB Left	172	41	43	440	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
4- MD 85 at Crestwood Blvd											
4	NB	19.4	C	NB Left	13	71	54	382	E	25.0	C
				NB Through	762	19	54	382	B		
				NB U-Turn	0	0	0	0	A		
	SB	18.8	B	SB Left	64	69	25	156	E		
				SB Through	1783	18	80	627	B		
				SB Right	808	16	68	617	B		
	EB	52.7	D	EB Left	621	54	91	276	D		
				EB Through	28	68	91	276	E		
				EB Right	42	17	91	276	B		
	WB	44.1	D	WB Left	52	53	21	137	D		
				WB Through	18	56	21	137	E		
				WB Right	19	9	21	137	A		
5- MD 80 at I-270 NB on and ramp											
5	NB	-1.0	A	NB Left	3	1	0	4	A	21.2	C
				NB Through	1	1	0	4	A		
				NB Right	5	-3	0	4	A		
	SB	13.0	B	SB Left	204	16	14	108	B		
				SB Through	6	20	14	108	B		
				SB Right	59	2	0	0	A		
	EB	11.3	B	EB Left	54	12	11	183	B		
				EB Through	0	0	8	0	A		
				EB Right	5	5	19	213	A		
	WB	23.1	C	WB Left	35	24	1	56	C		
				WB Through	879	31	182	786	C		
				WB Right	639	12	11	442	B		
6- MD 80 at I-270 SB on and off ramp											
6	NB	6.2	A	NB Left	24	37	2	134	E	31.6	D
				NB Through	0	0	0	0	A		
				NB Right	258	3	2	134	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	36.7	E	EB Left	0	0	0	0	A		
				EB Through	360	36	67	436	E		
				EB Right	161	38	68	446	E		
	WB	47.8	E	WB Left	0	0	0	0	A		
				WB Through	278	48	157	758	E		
				WB Right	0	0	0	0	A		
7- MD 109 at I-270 NB on and off ramp											
7	NB			NB Left	0	0	0	0	A	29.9	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	33.1	D	SB Left	143	37	37	244	E		
				SB Through	0	0	0	0	A		
				SB Right	47	20	17	177	C		
	EB	15.7	C	EB Left	88	11	5	149	B		
				EB Through	0	0	0	0	A		
				EB Right	63	22	0	0	C		
	WB	32.2	D	WB Left	0	0	0	0	A		
				WB Through	671	32	399	555	D		
				WB Right	0	0	0	0	A		
8- MD 80 at I-270 SB on and off ramp											
8	NB	9.3	A	NB Left	17	36	4	78	E	33.7	D
				NB Through	0	0	0	0	A		
				NB Right	48	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	50.0	E	EB Left	0	0	0	0	A		
				EB Through	92	34	58	270	D		
				EB Right	102	64	60	268	F		
	WB	31.6	D	WB Left	570	29	158	594	D		
				WB Through	156	39	152	571	E		
				WB Right	0	0	0	0	A		
9- MD 121 at Gateway Center Dr											
9	NB	17.8	C	NB Left	154	27	43	285	C	51.2	D
				NB Through	434	22	43	285	C		
				NB Right	327	8	52	311	A		
	SB	32.3	D	SB Left	55	22	113	555	C		
				SB Through	792	33	123	555	C		
				SB Right	8	26	131	576	C		
	EB	120.4	F	EB Left	8	97	421	525	F		
				EB Through	99	125	422	525	F		
				EB Right	646	120	452	557	F		
	WB	21.8	C	WB Left	137	25	18	147	C		
				WB Through	17	22	18	147	C		
				WB Right	28	6	16	171	A		
10- MD 121 at I-270 NB on and off ramp											
10	NB	28.3	D	NB Left	324	59	67	255	F	19.0	B
				NB Through	0	0	0	0	A		
				NB Right	402	3	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	11.5	B	EB Left	0	0	0	0	A		
				EB Through	513	18	32	325	C		
				EB Right	285	1	0	0	A		
	WB	18.6	C	WB Left	233	63	145	805	F		
				WB Through	1337	11	145	805	B		
				WB Right	0	0	0	0	A		

Table C.14: AM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
11- MD 121 at I-270 SB on and off ramp											
11	NB			NB Left	0	0	0	0	A	18.3	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	62.8	E	SB Left	218	94	225	953	F		
				SB Through	0	0	0	0	A		
				SB Right	304	40	8	439	E		
	EB	5.2	A	EB Left	0	0	0	0	A		
				EB Through	578	5	12	206	A		
				EB Right	0	0	0	0	A		
	WB	8.8	A	WB Left	0	0	0	0	A		
WB Through				642	18	61	438	C			
WB Right				1010	3	30	185	A			
12- MD 27 at Observation Dr											
12	NB	48.1	D	NB U-Turn	0	0	0	0	A	37.1	D
				NB Through	48	58	14	72	E		
				NB Right	12	7	14	72	A		
	SB	44.0	D	SB Left	91	52	29	192	D		
				SB Through	54	52	39	261	D		
				SB Right	178	38	64	298	D		
	EB	16.9	B	EB Left	151	40	40	324	D		
				EB Through	1217	14	42	325	B		
				EB Right	48	10	49	363	B		
	WB	48.1	D	WB Left	100	32	333	847	C		
WB Through				2130	50	333	847	D			
WB Right				109	30	333	847	C			
13- MD 27 at I-270 NB off ramp											
13	NB	35.6	D	NB Left	106	36	15	88	D	52.4	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.1	A	EB Left	0	0	0	0	A		
				EB Through	973	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	76.7	E	WB Left	0	0	0	0	A		
WB Through				2166	77	1092	2164	E			
WB Right				0	0	0	0	A			
14- MD 27 at I-270 SB off ramp											
14	NB			NB Left	0	0	0	0	A	70.6	E
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	49.4	D	SB Left	384	49	61	275	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	2.6	A	EB Left	0	0	0	0	A		
				EB Through	840	3	2	62	A		
				EB Right	0	0	0	0	A		
	WB	118.3	F	WB Left	0	0	0	0	A		
WB Through				1365	118	1106	1497	F			
WB Right				0	0	0	0	A			
15- MD 27 at Crystal Rock Dr											
15	NB	64.8	E	NB Left	30	38	296	736	D	92.0	F
				NB Through	1051	65	316	736	E		
				NB Right	92	70	327	748	E		
	SB	119.1	F	SB Left	514	118	1842	3792	F		
				SB Through	1620	121	1842	3792	F		
				SB Right	51	81	1836	3787	F		
	EB	44.2	D	EB Left	224	50	59	199	D		
				EB Through	97	43	55	194	D		
				EB Right	75	29	60	228	C		
	WB	46.8	D	WB Left	11	56	32	103	E		
WB Through				32	224	32	103	F			
WB Right				142	6	32	103	A			
16- MD 118 at Seneca Meadows Pkwy											
16	NB	3.6	A	NB Left	109	11	1	72	B	6.1	A
				NB Through	725	3	4	134	A		
				NB Right	60	1	9	187	A		
	SB	4.0	A	SB Left	31	4	7	238	A		
				SB Through	948	4	10	238	A		
				SB Right	41	2	12	271	A		
	EB	18.4	B	EB Left	20	65	10	77	E		
				EB Through	6	82	10	77	F		
				EB Right	115	7	10	77	A		
	WB	44.2	D	WB Left	35	71	16	102	E		
WB Through				6	55	11	101	D			
WB Right				27	7	14	111	A			
17- MD 118 at I-270 NB on ramp											
17	NB			NB Left	0	0	0	0	A	10.2	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	29.6	C	EB Left	274	30	31	194	C		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	5.4	A	WB Left	0	0	0	0	A		
WB Through				188	1	0	0	A			
WB Right				911	6	15	309	A			
18- MD 118 at I-270 SB off ramp											
18	NB			NB Left	0	0	0	0	A	7.5	A
				NB Through	0	0.0	0	0	A		
				NB Right	0	0.0	0	0	A		
	SB	38.1	D	SB Left	215	38.1	34	163	D		
				SB Through	0	0.0	0	0	A		
				SB Right	0	0.0	0	0	A		
	EB	3.7	A	EB Left	0	0.0	0	0	A		
				EB Through	631	3.7	5	194	A		
				EB Right	0	0.0	0	0	A		
	WB	4.1	A	WB Left	0	0.0	0	0	A		
WB Through				1214	4.1	9	173	A			
WB Right				0	0.0	0	0	A			
19- MD 118 at Aircraft Dr											
19	NB	46.2	D	NB Left	9	78	9	75	E	20.6	C
				NB Through	13	80	9	75	F		
				NB Right	17	3	0	24	A		
	SB	60.5	E	SB Left	267	55	112	418	E		
				SB Through	53	72	112	418	E		
				SB Right	96	68	112	418	E		
	EB	12.4	B	EB Left	132	16	37	329	B		
				EB Through	1019	12	37	329	B		
				EB Right	34	12	37	329	B		
	WB	15.1	B	WB Left	83	23	47	310	C		
WB Through				1046	17	47	310	B			
WB Right				324	6	47	310	A			
20- Middlebrook Rd at Observation Dr											
20	NB			NB Left	0	0	0	0	A	16.4	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	20.4	C	SB Left	26	36	5	63	D		
				SB Through	0	0	0	0	A		
				SB Right	27	5	5	63	A		
	EB	14.1	B	EB Left	231	21	29	249	C		
				EB Through	825	12	29	249	B		
				EB Right	0	0	0	0	A		
	WB	18.0	B	WB Left	0	0	0	0	A		
WB Through				1141	19	72	392	B			
WB Right				275	15	97	441	B			

Table C.14: AM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
21- Middlebrook Rd at I-270 SB on ramp											
21	NB			NB Left	0	0	0	0	A	19.5	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	13.7	B	EB Left	0	0	0	0	A		
				EB Through	763	14	31	203	B		
				EB Right	0	0	0	0	A		
	WB	25.4	C	WB Left	761	25	104	893	C		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
22- Middlebrook Rd at Waring Station Rd											
22	NB	179.6	F	NB Left	145	136	348	485	F	70.4	E
				NB Through	6	133	348	485	F		
				NB Right	268	204	348	485	F		
	SB	17.6	B	SB Left	3	39	1	29	D		
				SB Through	0	0	1	29	A		
				SB Right	5	5	2	67	A		
	EB	69.3	E	EB Left	31	21	645	1297	C		
				EB Through	1448	71	645	1297	E		
				EB Right	80	62	645	1297	E		
	WB	18.4	B	WB Left	80	23	33	237	C		
				WB Through	719	19	33	237	B		
				WB Right	41	4	33	237	A		
23- MD 124 at MD 355											
23	NB	52.9	D	NB Left	228	73	86	264	E	96.2	F
				NB Through	390	48	84	262	D		
				NB Right	54	3	0	0	A		
	SB	104.2	F	SB Left	64	166	490	804	F		
				SB Through	1188	124	490	804	F		
				SB Right	559	54	284	780	D		
	EB	54.5	D	EB Left	610	130	444	1095	F		
				EB Through	494	17	444	1095	B		
				EB Right	555	5	236	1008	A		
	WB	143.6	F	WB Left	0	0	0	0	A		
				WB Through	1717	146	760	1115	F		
				WB Right	52	73	0	0	E		
24- MD 124 at I-270 SB on and off											
24	NB	65.3	F	NB Left	16	62	18	95	E	29.3	C
				NB Through	37	67	18	95	E		
				NB U-Turn	0	0	0	0	A		
	SB	26.0	C	SB Left	285	65	77	373	E		
				SB Through	11	65	77	373	E		
				SB Right	588	6	14	350	A		
	EB	17.0	B	EB Left	0	0	0	0	A		
				EB Through	1037	17	50	409	B		
				EB Right	67	14	60	433	B		
	WB	41.6	D	WB Left	43	47	1679	2437	D		
				WB Through	1136	41	1679	2437	D		
				WB Right	0	0	0	0	A		
25- MD 117 at MD 124											
25	NB	49.7	D	NB Left	20	108	157	726	F	48.5	D
				NB Through	541	64	157	726	E		
				NB Right	433	30	76	717	C		
	SB	47.0	D	SB Left	181	69	221	826	E		
				SB Through	1072	48	221	826	D		
				SB Right	131	9	0	0	A		
	EB	54.0	D	EB Left	102	119	217	782	F		
				EB Through	1470	50	217	783	D		
				EB Right	82	47	229	811	D		
	WB	39.4	D	WB Left	319	70	103	304	E		
				WB Through	478	27	103	304	C		
				WB Right	99	0	0	0	A		
26- MD 117 at Bureau Dr											
26	NB	50.3	D	NB Left	25	64	19	125	E	41.1	D
				NB Through	24	65	19	125	E		
				NB Right	26	23	19	125	C		
	SB	174.5	F	SB Left	197	177	223	397	F		
				SB Through	55	190	223	397	F		
				SB Right	32	130	223	397	F		
	EB	36.8	D	EB Left	33	26	272	958	C		
				EB Through	2020	37	278	958	D		
				EB Right	29	43	271	948	D		
	WB	20.8	C	WB Left	299	67	134	543	E		
				WB Through	840	10	134	544	A		
				WB Right	314	6	100	582	A		
27- MD 117 at I-270 SB off ramp											
27	NB			NB Left	0	0	0	0	A	9.3	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	2.0	A	EB Left	0	0	0	0	A		
				EB Through	835	2	1	180	A		
				EB Right	0	0	0	0	A		
	WB	28.1	D	WB Left	328	28	59	453	D		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
28- MD 117 at I-270 NB off ramp											
28	NB			NB Left	0	0	0	0	A	34.5	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	60.5	E	SB Left	287	63	325	1037	E		
				SB Through	0	0	0	0	A		
				SB Right	871	60	329	1039	E		
	EB	19.2	B	EB Left	14	123	74	848	F		
				EB Through	821	17	74	848	B		
				EB Right	0	0	0	0	A		
	WB	15.6	B	WB Left	0	0	0	0	A		
				WB Through	909	16	60	360	B		
				WB Right	9	8	66	390	A		
29- MD 117 at Perry Pkwy											
29	NB	44.5	D	NB Left	36	76	17	120	E	15.9	B
				NB Through	7	58	17	119	E		
				NB Right	38	12	27	140	B		
	SB	48.7	D	SB Left	112	96	60	247	F		
				SB Through	14	102	60	247	F		
				SB Right	133	3	60	247	A		
	EB	10.6	B	EB Left	119	70	44	269	E		
				EB Through	975	3	44	269	A		
				EB Right	10	1	31	254	A		
	WB	10.4	B	WB Left	8	89	21	297	F		
				WB Through	747	10	21	297	B		
				WB Right	136	6	21	297	A		
30- Shady Grove Rd at I-270 NB off ramp											
30	NB	9.8	A	NB Left	0	0	0	0	A	22.3	C
				NB Through	959	10	22	267	A		
				NB Right	0	0	0	0	A		
	SB	10.4	B	SB Left	0	0	0	0	A		
				SB Through	1349	10	34	334	B		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	55.7	E	WB Left	846	56	160	616	E		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table C.14: AM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
31- Shady Grove Rd at I-270 SB off ramp											
31	NB	12.7	B	NB Left	0	0	0	0	A	19.9	B
				NB Through	1004	13	37	399	B		
				NB Right	0	0	0	0	A		
	SB	9.3	A	SB Left	0	0	0	0	A		
				SB Through	1565	9	32	563	A		
				SB Right	0	0	0	0	A		
	EB	47.4	D	EB Left	286	41	42	360	D		
				EB Through	0	0	0	0	A		
				EB Right	576	51	98	441	D		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
32- MD 28 at I-270 SB off ramp											
32	NB			NB U-Turn	0	0	0	0	A	67.9	E
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	35.7	D	SB Left	426	44	68	327	D		
				SB Through	0	0	0	0	A		
				SB Right	103	3	0	36	A		
	EB	131.7	F	EB Left	0	0	0	0	A		
				EB Through	683	200	1979	2136	F		
				EB Right	409	18	1925	2144	B		
	WB	25.4	C	WB Left	0	0	0	0	A		
				WB Through	1235	25	23	384	C		
				WB Right	0	0	0	0	A		
33- MD 28 at I-270 on and off ramps											
33	NB	36.5	D	NB Left	0	0	32	238	A	36.3	D
				NB Through	128	53	38	247	D		
				NB Right	80	10	38	247	A		
	SB	84.5	F	SB Left	26	102	128	357	F		
				SB Through	0	0	0	0	A		
				SB Right	273	83	128	357	F		
	EB	21.4	C	EB Left	177	45	57	407	D		
				EB Through	599	15	57	407	B		
				EB Right	0	0	0	0	A		
	WB	33.3	C	WB Left	26	37	101	391	D		
				WB Through	944	33	83	354	C		
				WB Right	0	0	0	0	A		
34- MD 189 at Great Falls Rd											
34	NB	37.3	D	NB Left	63	42	17	117	D	23.3	C
				NB Through	8	40	14	117	D		
				NB Right	10	8	16	128	A		
	SB	17.3	B	SB Left	63	45	19	229	D		
				SB Through	6	45	19	229	D		
				SB Right	478	13	54	147	B		
	EB	24.6	C	EB Left	227	55	111	1165	E		
				EB Through	680	15	17	199	B		
				EB Right	10	10	26	236	A		
	WB	26.4	C	WB Left	4	26	64	389	C		
				WB Through	311	27	63	388	C		
				WB Right	11	13	77	422	B		
35- MD 189 at I-270 Ramps											
35	NB	60.5	E	NB Left	88	61	18	121	E	79.7	E
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	55.9	E	SB Left	150	56	48	258	E		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	106.2	F	EB Left	284	138	627	1494	F		
				EB Through	436	85	627	1494	F		
				EB Right	0	0	0	0	A		
	WB	60.0	E	WB Left	457	53	107	429	D		
				WB Through	244	73	107	429	E		
				WB Right	0	0	0	0	A		
36- MD 189 at Wootton Pkwy											
36	NB	71.9	E	NB Left	161	48	85	311	D	117.9	F
				NB Through	125	95	85	311	F		
				NB Right	155	78	85	311	E		
	SB	142.8	F	SB Left	325	210	509	805	F		
				SB Through	593	106	482	792	F		
				SB Right	0	0	0	0	A		
	EB	162.3	F	EB Left	137	157	650	1047	F		
				EB Through	803	170	650	1047	F		
				EB Right	101	106	650	1047	F		
	WB	49.3	D	WB Left	346	69	104	353	E		
				WB Through	318	34	104	353	C		
				WB Right	47	6	104	353	A		
37- Montrose Rd at Tower Oaks Blvd											
37	NB			NB Left	0	0	0	0	A	104.5	F
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	235.8	F	SB Left	123	49	1098	1406	D		
				SB Through	0	0	0	0	A		
				SB Right	435	289	1123	1402	F		
	EB	25.5	C	EB Left	28	65	136	923	E		
				EB Through	1513	25	136	923	C		
				EB Right	0	0	0	0	A		
	WB	141.4	F	WB Left	0	0	0	0	A		
				WB Through	1255	145	491	850	F		
				WB Right	58	60	491	850	E		
38- Tower Oaks Blvd at I-270 off ramp											
38	NB	24.1	C	NB Left	385	22	30	200	C	78.2	E
				NB Through	8	22.5	25	192	C		
				NB Right	22	64.1	30	200	E		
	SB	0.6	A	SB Left	0	800.1	0	20	F		
				SB Through	0	0.0	0	20	A		
				SB Right	4	0.6	0	0	A		
	EB	122.8	F	EB Left	6	113.7	347	465	F		
				EB Through	558	122.3	347	465	F		
				EB Right	82	126.7	338	456	F		
	WB	9.5	A	WB Left	0	0.0	3	80	A		
				WB Through	81	9.9	3	80	A		
				WB Right	6	5.0	0	25	A		
39- Montrose Rd at Tower Oaks Blvd											
39	NB	17.9	B	NB Left	37	71	49	285	E	50.9	D
				NB Through	240	42	49	285	D		
				NB Right	555	4	12	151	A		
	SB	41.1	D	SB Left	334	54	163	619	D		
				SB Through	778	37	163	618	D		
				SB Right	78	29	124	658	C		
	EB	90.2	F	EB Left	76	74	416	718	E		
				EB Through	971	92	418	718	F		
				EB Right	62	89	439	742	F		
	WB	43.4	D	WB Left	300	52	68	290	D		
				WB Through	188	50	68	290	D		
				WB Right	109	7	77	321	A		
40- Rockledge Blvd at I-270 NB on and off ramp											
40	NB	34.1	C	NB Left	0	0	0	0	A	18.0	B
				NB Through	92	32	33	165	C		
				NB Right	216	35	33	165	C		
	SB	2.0	A	SB Left	0	0	4	61	A		
				SB Through	923	2	4	61	A		
				SB Right	0	0	0	0	A		
	EB	26.9	C	EB Left	7	48	126	506	D		
				EB Through	529	54	126	506	D		
				EB Right	563	1	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table C.14: AM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS	
41- Rockledge Blvd at I-270 SB on and off ramps												
41	NB	2.6	A	NB Left	97	3	5	72	A	20.4	C	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	21.7	C		WB Left	923	23	92	655			C
					WB Through	403	20	92	655			B
					WB Right	0	0	0	0			A
42- MD 187 at Tuckerman Ln												
42	NB	58.8	E	NB Left	230	25	265	793	C	153.0	F	
				NB Through	1468	55	265	793	D			
				NB Right	213	124	265	793	F			
	SB	224.9	F		SB Left	60	164	2605	2704			F
					SB Through	1204	225	2605	2704			F
					SB Right	162	247	2605	2704			F
	EB	186.0	F		EB Left	223	128	1864	1988			F
					EB Through	624	205	1865	1989			F
					EB Right	129	194	1889	2013			F
	WB	188.4	F		WB Left	721	229	1921	2147			F
					WB Through	393	152	1921	2147			F
					WB Right	159	92	1921	2147			F
43- MD 187 at I-270 NB on and off ramps												
43	NB	11.2	B	NB Left	163	76	57	257	E	19.1	B	
				NB Through	1541	4	57	257	A			
				NB Right	0	0	0	0	A			
	SB	25.4	C		SB Left	0	0	0	0			A
					SB Through	1529	25	81	553			C
					SB Right	0	0	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	49.5	D		WB Left	114	50	35	250			D
					WB Through	10	47	35	250			D
					WB Right	0	0	0	0			A
44- MD 187 at I-270 NB on and off ramps												
44	NB	23.9	C	NB Left	0	0	0	0	A	25.9	C	
				NB Through	1478	24	68	404	C			
				NB Right	0	0	0	0	A			
	SB	7.7	A		SB Left	178	49	58	295			D
					SB Through	1465	3	58	295			A
					SB Right	0	0	0	0			A
	EB	80.8	F		EB Left	228	58	187	740			E
					EB Through	0	0	187	740			A
					EB Right	371	95	232	784			F
	WB				WB Left	0	0	0	0			A
					WB Through	0	0	0	0			A
					WB Right	0	0	0	0			A
45- MD 187 at Rock Spring Dr												
45	NB	14.9	B	NB Left	255	57	68	257	E	20.8	C	
				NB Through	1383	7	69	258	A			
				NB Right	10	6	93	291	A			
	SB	21.9	C		SB Left	13	25	98	632			C
					SB Through	1668	24	98	632			C
					SB Right	144	1	63	619			A
	EB	37.9	D		EB Left	190	59	56	222			E
					EB Through	26	54	56	222			D
					EB Right	251	20	56	222			C
	WB	7.2	A		WB Left	1	7	1	29			A
					WB Through	9	11	1	29			B
					WB Right	5	0	0	7			A
47-Democracy Blvd at I-270 NB off ramp												
47	NB	29.7	C	NB Left	217	30	24	159	C	13.4	B	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB	12.7	B		EB Left	0	0	0	0			A
					EB Through	1654	13	50	446			B
					EB Right	0	0	0	0			A
	WB	10.4	B		WB Left	0	0	0	0			A
					WB Through	778	10	23	187			B
					WB Right	0	0	0	0			A
48- Democracy Blvd at I-270 SB on ramp												
48	NB			NB Left	0	0	0	0	A	6.6	A	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB	5.4	A		EB Left	0	0	0	0			A
					EB Through	1768	5	23	270			A
					EB Right	0	0	0	0			A
	WB	8.7	A		WB Left	223	37	31	173			D
					WB Through	771	1	21	152			A
					WB Right	0	0	0	0			A
49- Democracy Blvd at I-270 SB off ramp												
49	NB			NB Left	0	0	0	0	A	12.1	B	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB	32.9	C		SB Left	329	49	57	226			D
					SB Through	0	0	0	0			A
					SB Right	171	2	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	2.6	A		WB Left	0	0	0	0			A
					WB Through	770	3	4	133			A
					WB Right	334	2	1	163			A
50- MD 190 at Burdette Rd												
50	NB	73.2	E	NB Left	20	80	15	118	E	13.2	B	
				NB Through	4	59	15	118	E			
				NB Right	11	67	15	118	E			
	SB	34.4	C		SB Left	50	79	31	151			E
					SB Through	17	64	31	151			E
					SB Right	120	12	31	151			B
	EB	10.5	B		EB Left	53	93	61	561			F
					EB Through	1814	8	60	561			A
					EB Right	15	6	51	584			A
	WB	12.5	B		WB Left	1	106	61	828			F
					WB Through	1494	13	62	828			B
					WB Right	21	2	55	834			A

Table C.14: AM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
51- MD 190 at I-270 NB on ramp											
51	NB			NB Left	0	0	0	0	A	53.3	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	123.2	F	EB Left	531	123	347	715	F		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	15.9	B	WB Left	0	0	0	0	A		
				WB Through	994	16	76	747	B		
				WB Right	0	0	0	0	A		
52- MD 190 at I-270 SB off ramp											
52	NB	79.3	E	NB Left	258	79	1392	3574	E	14.2	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	2.9	A	EB Left	0	0	0	0	A		
				EB Through	982	3	6	151	A		
				EB Right	0	0	0	0	A		
	WB	5.7	A	WB Left	0	0	0	0	A		
				WB Through	667	6	8	160	A		
				WB Right	0	0	0	0	A		
53- MD 190 at Seven Locks Rd											
53	NB	68.2	E	NB Left	21	67	23	149	E	45.0	D
				NB Through	59	69	25	148	E		
				NB Right	0	0	0	0	A		
	SB	56.9	E	SB Left	624	56	184	777	E		
				SB Through	183	59	185	778	E		
				SB Right	18	54	184	777	D		
	EB	37.5	D	EB Left	24	30	135	584	C		
				EB Through	846	38	135	584	D		
				EB Right	42	42	135	584	D		
	WB	39.7	D	WB Left	119	127	125	418	F		
				WB Through	639	33	128	421	C		
				WB Right	157	1	4	127	A		
54- MD 124 at I-270 NB off ramp											
54	NB	40.6	D	NB Left	0	0	0	0	A	26.5	C
				NB Through	0	0	0	0	A		
				NB Right	723	41	100	459	D		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	15.6	B	EB Left	0	0	0	0	A		
				EB Through	933	16	37	359	B		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
55- Democracy Blvd at I-270 NB off ramp											
55	NB	37.1	D	NB Left	0	0	0	0	A	16.2	B
				NB Through	0	0	0	0	A		
				NB Right	928	37	113	575	D		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	4.5	A	EB Left	0	0	0	0	A		
				EB Through	1657	5	18	95	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
56- Watkins Mill Rd at I-270 SB off ramp/Parkview Ave											
56	NB	747.0	F	NB Left	46	222	668	726	F	174.0	F
				NB Through	0	0	0	0	A		
				NB Right	86	1028	668	726	F		
	SB	83.5	F	SB Left	552	113	2037	5048	F		
				SB Through	131	109	2037	5048	F		
				SB Right	447	39	2037	5048	D		
	EB	463.4	F	EB Left	0	0	0	0	A		
				EB Through	494	463	1163	1232	F		
				EB Right	2	599	1163	1232	F		
	WB	41.8	D	WB Left	116	87	120	459	F		
				WB Through	769	35	117	457	D		
				WB Right	0	0	0	0	A		
57- Watkins Mill Rd at I-270 NB on ramp											
57	NB	35.2	D	NB Left	386	51	92	383	D	70.0	E
				NB Through	0	0	0	0	A		
				NB Right	478	23	92	383	C		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	19.1	B	EB Left	190	61	49	301	E		
				EB Through	749	8	49	301	A		
				EB Right	0	0	0	0	A		
	WB	139.2	F	WB Left	0	0	0	0	A		
				WB Through	954	150	640	849	F		
				WB Right	174	78	640	849	E		
58- Watkins Mill Rd at I-270 SB on ramp											
58	NB			NB Left	0	0	0	0	A	60.7	E
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	73.4	E	EB Left	0	0	0	0	A		
				EB Through	938	30	483	620	C		
				EB Right	182	299	483	620	F		
	WB	50.0	D	WB Left	456	142	273	516	F		
				WB Through	883	2	273	516	A		
				WB Right	0	0	0	0	A		

Table C.15: AM Peak -2040 Hard Shoulder Running- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
1- MD 85 at Sam's Club Drive											
1	NB	23.2	C	NB Left	124	82	86	481	F	37.4	D
				NB Through	397	27	86	481	C		
				NB Right	708	11	25	477	B		
	SB	48.5	D	SB Left	137	62	163	691	E		
				SB Through	597	48	163	691	D		
				SB Right	68	26	163	691	C		
	EB	48.1	D	EB Left	106	74	53	202	E		
				EB Through	62	75	53	202	E		
				EB Right	112	9	53	202	A		
	WB	52.3	D	WB Left	230	75	89	294	E		
				WB Through	16	74	89	294	E		
				WB Right	125	7	89	294	A		
2- MD 85 at I-270 NB on and off ramp											
2	NB	52.3	D	NB Left	686	52	263	1160	D	36.4	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	18.6	B	SB Left	0	0	0	0	A		
				SB Through	608	19	52	545	B		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
3- MD 85 at I-270 SB on and off ramp											
3	NB	5.1	A	NB Left	0	0	0	0	A	10.1	B
				NB Through	1074	5	17	426	A		
				NB Right	0	0	0	0	A		
	SB	42.7	D	SB Left	167	43	113	1457	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
4- MD 85 at Crestwood Blvd											
4	NB	19.5	C	NB Left	13	48	56	383	D	25.4	C
				NB Through	769	19	56	383	B		
				NB U-Turn	0	0	0	0	A		
	SB	19.3	B	SB Left	67	71	26	145	E		
				SB Through	1886	18	83	710	B		
				SB Right	858	18	72	700	B		
	EB	54.1	D	EB Left	624	56	93	279	E		
				EB Through	28	72	93	279	E		
				EB Right	41	21	93	279	C		
	WB	43.1	D	WB Left	51	52	21	133	D		
				WB Through	18	57	21	133	E		
				WB Right	20	8	21	133	A		
5- MD 80 at I-270 NB on and ramp											
5	NB	-1.3	A	NB Left	3	0	0	0	A	10.5	B
				NB Through	3	0	0	0	A		
				NB Right	5	-3	0	0	A		
	SB	13.2	B	SB Left	215	16	15	152	B		
				SB Through	6	20	15	152	B		
				SB Right	63	2	0	0	A		
	EB	11.0	B	EB Left	56	12	10	164	B		
				EB Through	0	0	8	0	A		
				EB Right	6	5	18	195	A		
	WB	10.1	B	WB Left	36	10	1	40	B		
				WB Through	880	15	76	568	B		
				WB Right	628	3	0	0	A		
6- MD 80 at I-270 SB on and off ramp											
6	NB	8.2	A	NB Left	22	10	1	100	A	10.1	B
				NB Through	0	0	0	0	A		
				NB Right	260	8	1	100	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	11.0	B	EB Left	0	0	0	0	A		
				EB Through	360	12	13	148	B		
				EB Right	166	10	13	156	A		
	WB	10.3	B	WB Left	0	0	0	0	A		
				WB Through	281	10	6	246	B		
				WB Right	0	0	0	0	A		
7- MD 109 at I-270 NB on and off ramp											
7	NB			NB Left	0	0	0	0	A	5.7	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	15.2	C	SB Left	150	19	19	160	C		
				SB Through	0	0	0	0	A		
				SB Right	48	2	0	99	A		
	EB	5.1	A	EB Left	90	5	0	58	A		
				EB Through	0	0	0	0	A		
				EB Right	62	6	0	0	A		
	WB	2.9	A	WB Left	0	0	0	0	A		
				WB Through	651	3	12	315	A		
				WB Right	0	0	0	0	A		
8- MD 80 at I-270 SB on and off ramp											
8	NB	8.1	A	NB Left	19	29	4	90	D	13.0	B
				NB Through	0	0	0	0	A		
				NB Right	48	0	0	20	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	28.3	D	EB Left	0	0	0	0	A		
				EB Through	94	21	32	145	C		
				EB Right	101	35	32	159	E		
	WB	9.3	A	WB Left	552	8	36	414	A		
				WB Through	154	15	33	391	B		
				WB Right	0	0	0	0	A		
9- MD 121 at Gateway Center Dr											
9	NB	18.7	C	NB Left	154	25	46	373	C	50.2	D
				NB Through	448	24	46	373	C		
				NB Right	340	8	57	399	A		
	SB	30.6	D	SB Left	57	20	101	486	B		
				SB Through	808	31	110	486	C		
				SB Right	8	25	121	507	C		
	EB	117.1	F	EB Left	9	88	413	523	F		
				EB Through	104	123	414	523	F		
				EB Right	663	117	443	555	F		
	WB	22.6	C	WB Left	138	26	19	124	C		
				WB Through	18	20	19	124	B		
				WB Right	28	5	15	149	A		
10- MD 121 at I-270 NB on and off ramp											
10	NB	27.8	D	NB Left	352	58	72	258	F	18.3	B
				NB Through	0	0	0	0	A		
				NB Right	438	4	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	11.4	B	EB Left	0	0	0	0	A		
				EB Through	501	18	33	277	C		
				EB Right	288	1	0	0	A		
	WB	17.0	C	WB Left	232	63	124	759	F		
				WB Through	1369	9	124	759	A		
				WB Right	0	0	0	0	A		

Table C.15: AM Peak -2040 Hard Shoulder Running- Intersection Delay and Level of Service

11- MD 121 at I-270 SB on and off ramp											
11	NB			NB Left	0	0	0	0	A	18.4	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	67.6	E	SB Left	205	100	298	1942	F		
				SB Through	0	0	0	0	A		
				SB Right	302	46	81	1228	E		
	EB	4.9	A	EB Left	0	0	0	0	A		
				EB Through	584	5	11	189	A		
				EB Right	0	0	0	0	A		
	WB	8.5	A	WB Left	0	0	0	0	A		
WB Through				673	18	47	626	C			
WB Right				1040	2	16	515	A			
12- MD 27 at Observation Dr											
12	NB	46.9	D	NB U-Turn	0	0	0	0	A	38.0	D
				NB Through	48	57	13	74	E		
				NB Right	12	7	13	74	A		
	SB	43.3	D	SB Left	89	52	28	175	D		
				SB Through	52	52	38	271	D		
				SB Right	180	37	63	308	D		
	EB	17.6	B	EB Left	154	40	43	312	D		
				EB Through	1242	15	44	313	B		
				EB Right	48	13	52	351	B		
	WB	49.3	D	WB Left	102	35	352	839	C		
WB Through				2195	51	352	839	D			
WB Right				110	28	352	839	C			
13- MD 27 at I-270 NB off ramp											
13	NB	34.4	C	NB Left	110	34	15	93	C	53.2	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.1	A	EB Left	0	0	0	0	A		
				EB Through	965	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	76.9	E	WB Left	0	0	0	0	A		
WB Through				2251	77	1144	2270	E			
WB Right				0	0	0	0	A			
14- MD 27 at I-270 SB off ramp											
14	NB			NB Left	0	0	0	0	A	75.3	E
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	47.9	D	SB Left	382	48	63	286	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	2.6	A	EB Left	0	0	0	0	A		
				EB Through	835	3	1	54	A		
				EB Right	0	0	0	0	A		
	WB	123.8	F	WB Left	0	0	0	0	A		
WB Through				1469	124	1291	1651	F			
WB Right				0	0	0	0	A			
15- MD 27 at Crystal Rock Dr											
15	NB	62.3	E	NB Left	30	35	283	746	C	90.1	F
				NB Through	1041	63	309	745	E		
				NB Right	94	68	319	758	E		
	SB	115.4	F	SB Left	536	115	1501	2660	F		
				SB Through	1695	117	1501	2660	F		
				SB Right	53	77	1495	2654	E		
	EB	44.0	D	EB Left	230	50	58	195	D		
				EB Through	95	44	55	190	D		
				EB Right	75	26	59	225	C		
	WB	53.0	D	WB Left	11	57	34	116	E		
WB Through				31	267	34	116	F			
WB Right				142	6	34	116	A			
16- MD 118 at Seneca Meadows Pkwy											
16	NB	3.5	A	NB Left	113	11	1	81	B	6.3	A
				NB Through	739	3	4	131	A		
				NB Right	60	1	9	184	A		
	SB	4.2	A	SB Left	31	4	7	236	A		
				SB Through	951	4	11	237	A		
				SB Right	42	2	13	269	A		
	EB	18.8	B	EB Left	20	66	11	69	E		
				EB Through	7	81	11	69	F		
				EB Right	119	7	11	69	A		
	WB	45.6	D	WB Left	36	74	18	105	E		
WB Through				6	54	12	103	D			
WB Right				28	8	16	111	A			
17- MD 118 at I-270 NB on ramp											
17	NB			NB Left	0	0	0	0	A	10.2	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	30.5	C	EB Left	267	30	31	195	C		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	5.3	A	WB Left	0	0	0	0	A		
WB Through				183	1	0	0	A			
WB Right				925	6	15	303	A			
18- MD 118 at I-270 SB off ramp											
18	NB			NB Left	0	0	0	0	A	7.4	A
				NB Through	0	0.0	0	0	A		
				NB Right	0	0.0	0	0	A		
	SB	40.8	D	SB Left	201	40.8	34	172	D		
				SB Through	0	0.0	0	0	A		
				SB Right	0	0.0	0	0	A		
	EB	3.6	A	EB Left	0	0.0	0	0	A		
				EB Through	629	3.6	5	170	A		
				EB Right	0	0.0	0	0	A		
	WB	4.1	A	WB Left	0	0.0	0	0	A		
WB Through				1297	4.1	9	196	A			
WB Right				0	0.0	0	0	A			
19- MD 118 at Aircraft Dr											
19	NB	43.8	D	NB Left	9	83	9	63	F	20.3	C
				NB Through	13	77	9	63	E		
				NB Right	19	2	0	23	A		
	SB	61.0	E	SB Left	264	55	113	416	E		
				SB Through	54	73	113	416	E		
				SB Right	97	70	113	416	E		
	EB	12.4	B	EB Left	129	16	37	316	B		
				EB Through	1023	12	37	316	B		
				EB Right	33	13	37	316	B		
	WB	14.8	B	WB Left	88	26	48	304	C		
WB Through				1111	17	48	304	B			
WB Right				331	6	48	304	A			
20- Middlebrook Rd at Observation Dr											
20	NB			NB Left	0	0	0	0	A	15.6	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	20.5	C	SB Left	27	35	5	65	C		
				SB Through	0	0	0	0	A		
				SB Right	26	6	5	65	A		
	EB	13.4	B	EB Left	214	20	25	237	C		
				EB Through	764	12	25	237	B		
				EB Right	0	0	0	0	A		
	WB	17.0	B	WB Left	0	0	0	0	A		
WB Through				1138	18	70	369	B			
WB Right				284	14	94	418	B			

Table C.15: AM Peak -2040 Hard Shoulder Running- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
21- Middlebrook Rd at I-270 SB on ramp											
21	NB			NB Left	0	0	0	0	A	21.1	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	14.2	B	EB Left	0	0	0	0	A		
				EB Through	649	14	28	190	B		
				EB Right	0	0	0	0	A		
	WB	27.0	C	WB Left	757	27	118	900	C		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
22- Middlebrook Rd at Waring Station Rd											
22	NB	276.5	F	NB Left	110	206	415	492	F	101.8	F
				NB Through	4	225	415	492	F		
				NB Right	211	314	415	492	F		
	SB	18.3	B	SB Left	3	38	1	30	D		
				SB Through	0	0	1	30	A		
				SB Right	5	7	2	67	A		
	EB	115.2	F	EB Left	26	34	961	1293	C		
				EB Through	1260	117	961	1293	F		
				EB Right	68	115	961	1293	F		
	WB	17.9	B	WB Left	87	22	34	228	C		
				WB Through	759	18	34	228	B		
				WB Right	41	5	34	228	A		
23- MD 124 at MD 355											
23	NB	51.7	D	NB Left	224	69	86	258	E	82.6	F
				NB Through	388	49	83	256	D		
				NB Right	56	3	0	0	A		
	SB	83.4	F	SB Left	67	155	402	786	F		
				SB Through	1233	109	402	786	F		
				SB Right	594	22	155	709	C		
	EB	55.0	E	EB Left	619	131	460	1149	F		
				EB Through	513	19	460	1149	B		
				EB Right	574	5	274	1127	A		
	WB	116.1	F	WB Left	0	0	0	0	A		
				WB Through	1924	118	711	1107	F		
				WB Right	59	67	0	0	E		
24- MD 124 at I-270 SB on and off											
24	NB	66.7	F	NB Left	16	62	20	93	E	22.4	C
				NB Through	39	69	20	93	E		
				NB U-Turn	0	0	0	0	A		
	SB	25.8	C	SB Left	276	65	74	302	E		
				SB Through	11	66	74	302	E		
				SB Right	581	6	12	286	A		
	EB	16.6	B	EB Left	0	0	0	0	A		
				EB Through	1044	17	51	425	B		
				EB Right	69	12	61	449	B		
	WB	23.1	C	WB Left	49	28	250	1255	C		
				WB Through	1262	23	250	1255	C		
				WB Right	0	0	0	0	A		
25- MD 117 at MD 124											
25	NB	49.5	D	NB Left	20	126	147	704	F	47.3	D
				NB Through	533	64	147	704	E		
				NB Right	443	29	73	691	C		
	SB	45.1	D	SB Left	180	65	208	824	E		
				SB Through	1070	46	208	824	D		
				SB Right	131	9	0	0	A		
	EB	52.6	D	EB Left	101	115	210	808	F		
				EB Through	1470	49	209	809	D		
				EB Right	82	43	223	836	D		
	WB	38.9	D	WB Left	331	69	108	371	E		
				WB Through	504	27	108	371	C		
				WB Right	103	0	0	0	A		
26- MD 117 at Bureau Dr											
26	NB	53.2	D	NB Left	24	69	20	122	E	40.5	D
				NB Through	23	72	20	122	E		
				NB Right	27	23	20	122	C		
	SB	183.1	F	SB Left	206	182	229	405	F		
				SB Through	54	200	229	405	F		
				SB Right	31	161	229	405	F		
	EB	34.4	C	EB Left	31	26	256	964	C		
				EB Through	2031	35	262	964	C		
				EB Right	31	39	255	954	D		
	WB	20.8	C	WB Left	311	65	134	569	E		
				WB Through	879	11	135	570	B		
				WB Right	326	6	109	618	A		
27- MD 117 at I-270 SB off ramp											
27	NB			NB Left	0	0	0	0	A	8.8	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	1.8	A	EB Left	0	0	0	0	A		
				EB Through	844	2	1	155	A		
				EB Right	0	0	0	0	A		
	WB	26.8	D	WB Left	326	27	55	321	D		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
28- MD 117 at I-270 NB off ramp											
28	NB			NB Left	0	0	0	0	A	41.5	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	72.2	E	SB Left	308	66	534	1605	E		
				SB Through	0	0	0	0	A		
				SB Right	948	74	539	1607	E		
	EB	21.7	C	EB Left	15	123	86	789	F		
				EB Through	827	20	86	789	B		
				EB Right	0	0	0	0	A		
	WB	17.2	B	WB Left	0	0	0	0	A		
				WB Through	899	17	69	365	B		
				WB Right	9	4	76	396	A		
29- MD 117 at Perry Pkwy											
29	NB	42.8	D	NB Left	36	72	17	126	E	16.1	B
				NB Through	8	58	16	125	E		
				NB Right	38	12	27	146	B		
	SB	48.6	D	SB Left	111	96	59	221	F		
				SB Through	14	99	59	221	F		
				SB Right	130	3	59	221	A		
	EB	10.3	B	EB Left	125	69	45	301	E		
				EB Through	996	3	45	301	A		
				EB Right	9	3	32	285	A		
	WB	11.6	B	WB Left	8	78	22	284	E		
				WB Through	739	12	22	284	B		
				WB Right	133	6	22	284	A		
30- Shady Grove Rd at I-270 NB off ramp											
30	NB	8.4	A	NB Left	0	0	0	0	A	25.0	C
				NB Through	977	8	19	255	A		
				NB Right	0	0	0	0	A		
	SB	10.7	B	SB Left	0	0	0	0	A		
				SB Through	1344	11	35	327	B		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	59.3	E	WB Left	1039	59	219	690	E		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table C.15: AM Peak -2040 Hard Shoulder Running- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
31- Shady Grove Rd at I-270 SB off ramp											
31	NB	14.5	B	NB Left	0	0	0	0	A	20.8	C
				NB Through	993	15	40	334	B		
				NB Right	0	0	0	0	A		
	SB	11.2	B	SB Left	0	0	0	0	A		
				SB Through	1752	11	46	674	B		
				SB Right	0	0	0	0	A		
	EB	45.7	D	EB Left	308	41	44	269	D		
				EB Through	0	0	0	0	A		
				EB Right	621	48	99	407	D		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
32- MD 28 at I-270 SB off ramp											
32	NB			NB U-Turn	0	0	0	0	A	8.6	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	34.6	C	SB Left	414	42	63	271	D		
				SB Through	0	0	0	0	A		
				SB Right	99	3	0	63	A		
	EB	3.4	A	EB Left	0	0	0	0	A		
				EB Through	1512	1	0	0	A		
				EB Right	966	7	18	246	A		
	WB	8.4	A	WB Left	0	0	0	0	A		
				WB Through	2007	8	40	407	A		
				WB Right	0	0	0	0	A		
33- MD 28 at I-270 on and off ramps											
33	NB	37.3	D	NB Left	0	0	61	303	A	25.7	C
				NB Through	219	53	70	312	D		
				NB Right	146	14	70	312	B		
	SB	25.6	C	SB Left	29	64	30	217	E		
				SB Through	0	0	0	0	A		
				SB Right	311	22	30	217	C		
	EB	31.7	C	EB Left	298	59	130	684	E		
				EB Through	991	23	130	684	C		
				EB Right	0	0	0	0	A		
	WB	13.7	B	WB Left	28	14	49	311	B		
				WB Through	973	14	35	275	B		
				WB Right	0	0	0	0	A		
34- MD 189 at Great Falls Rd											
34	NB	36.2	D	NB Left	67	40	15	109	D	11.1	B
				NB Through	9	38	12	109	D		
				NB Right	10	6	13	120	A		
	SB	5.9	A	SB Left	83	44	23	184	D		
				SB Through	7	47	23	184	D		
				SB Right	625	0	0	0	A		
	EB	11.5	B	EB Left	325	17	16	245	B		
				EB Through	944	9	20	248	A		
				EB Right	14	6	29	285	A		
	WB	14.2	B	WB Left	5	19	21	203	B		
				WB Through	329	14	21	202	B		
				WB Right	11	10	33	236	B		
35- MD 189 at I-270 Ramps											
35	NB	50.9	D	NB Left	144	51	28	138	D	46.2	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	50.0	D	SB Left	185	50	57	361	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	32.7	C	EB Left	413	26	94	802	C		
				EB Through	539	38	94	802	D		
				EB Right	0	0	0	0	A		
	WB	59.8	E	WB Left	560	49	144	445	D		
				WB Through	285	81	144	445	F		
				WB Right	0	0	0	0	A		
36- MD 189 at Wootton Pkwy											
36	NB	44.3	D	NB Left	154	51	59	239	D	73.6	E
				NB Through	126	57	59	239	E		
				NB Right	157	28	59	239	C		
	SB	88.9	F	SB Left	443	108	394	803	F		
				SB Through	794	79	359	790	E		
				SB Right	0	0	0	0	A		
	EB	84.9	F	EB Left	163	104	403	1016	F		
				EB Through	964	86	403	1016	F		
				EB Right	127	52	403	1016	D		
	WB	50.7	D	WB Left	432	70	128	312	E		
				WB Through	389	36	128	312	D		
				WB Right	61	6	128	312	A		
37- Montrose Rd at Tower Oaks Blvd											
37	NB			NB Left	0	0	0	0	A	82.4	F
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	195.6	F	SB Left	163	45	1071	1397	D		
				SB Through	0	0	0	0	A		
				SB Right	606	236	1066	1392	F		
	EB	29.1	C	EB Left	30	42	195	1179	D		
				EB Through	1648	29	195	1179	C		
				EB Right	0	0	0	0	A		
	WB	83.9	F	WB Left	0	0	0	0	A		
				WB Through	1738	86	442	852	F		
				WB Right	83	32	442	852	C		
38- Tower Oaks Blvd at I-270 off ramp											
38	NB	21.5	C	NB Left	543	22	37	206	C	54.1	D
				NB Through	11	17.5	30	198	B		
				NB Right	29	20.5	37	206	C		
	SB	3.0	A	SB Left	1	8.9	0	22	A		
				SB Through	0	0.0	0	22	A		
				SB Right	3	1.1	0	0	A		
	EB	82.1	F	EB Left	9	69.2	285	452	E		
				EB Through	745	82.7	285	452	F		
				EB Right	114	78.7	277	442	E		
	WB	10.4	B	WB Left	0	0.0	4	74	A		
				WB Through	106	10.8	4	74	B		
				WB Right	8	4.8	0	16	A		
39- Montrose Rd at Tower Oaks Blvd											
39	NB	16.6	B	NB Left	35	74	41	178	E	51.1	D
				NB Through	246	45	41	178	D		
				NB Right	559	0	0	0	A		
	SB	40.6	D	SB Left	331	52	167	622	D		
				SB Through	777	37	166	621	D		
				SB Right	75	29	139	664	C		
	EB	94.6	F	EB Left	80	82	444	730	F		
				EB Through	981	96	446	731	F		
				EB Right	61	94	467	754	F		
	WB	41.8	D	WB Left	405	51	89	283	D		
				WB Through	254	48	89	283	D		
				WB Right	148	8	104	314	A		
40- Rockledge Blvd at I-270 NB on and off ramp											
40	NB	33.4	C	NB Left	0	0	0	0	A	16.3	B
				NB Through	90	35	33	145	D		
				NB Right	217	33	33	145	C		
	SB	2.2	A	SB Left	0	0	5	63	A		
				SB Through	976	2	5	63	A		
				SB Right	0	0	0	0	A		
	EB	24.0	C	EB Left	7	46	109	401	D		
				EB Through	521	49	109	401	D		
				EB Right	562	1	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table C.15: AM Peak -2040 Hard Shoulder Running- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS	
41- Rockledge Blvd at I-270 SB on and off ramps												
41	NB	3.0	A	NB Left	98	3	1	42	A	21.5	C	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	22.7	C		WB Left	976	24	102	658			C
					WB Through	433	21	102	658			C
					WB Right	0	0	0	0			A
42- MD 187 at Tuckerman Ln												
42	NB	64.9	E	NB Left	229	29	299	923	C	154.8	F	
				NB Through	1483	62	299	923	E			
				NB Right	211	125	299	923	F			
	SB	217.8	F		SB Left	59	158	2598	2708			F
					SB Through	1243	217	2598	2708			F
					SB Right	167	244	2598	2708			F
	EB	185.7	F		EB Left	221	126	1858	1980			F
					EB Through	619	205	1860	1981			F
					EB Right	132	194	1883	2005			F
	WB	195.3	F		WB Left	697	237	1929	2146			F
					WB Through	386	158	1929	2146			F
					WB Right	155	101	1929	2146			F
43- MD 187 at I-270 NB on and off ramps												
43	NB	10.8	B	NB Left	163	78	56	256	E	18.5	B	
				NB Through	1533	4	56	256	A			
				NB Right	0	0	0	0	A			
	SB	24.3	C		SB Left	0	0	0	0			A
					SB Through	1541	24	80	523			C
					SB Right	0	0	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	48.8	D		WB Left	129	50	40	266			D
					WB Through	11	40	40	266			D
					WB Right	0	0	0	0			A
44- MD 187 at I-270 NB on and off ramps												
44	NB	23.9	C	NB Left	0	0	0	0	A	24.7	C	
				NB Through	1481	24	68	397	C			
				NB Right	0	0	0	0	A			
	SB	6.8	A		SB Left	178	43	52	230			D
					SB Through	1492	3	52	230			A
					SB Right	0	0	0	0			A
	EB	77.3	E		EB Left	222	62	187	769			E
					EB Through	0	0	187	769			A
					EB Right	367	87	211	757			F
	WB				WB Left	0	0	0	0			A
					WB Through	0	0	0	0			A
					WB Right	0	0	0	0			A
45- MD 187 at Rock Spring Dr												
45	NB	15.0	B	NB Left	252	56	68	303	E	20.7	C	
				NB Through	1381	8	68	304	A			
				NB Right	10	6	91	337	A			
	SB	21.8	C		SB Left	12	31	97	579			C
					SB Through	1685	24	97	579			C
					SB Right	148	1	61	574			A
	EB	36.9	D		EB Left	194	58	54	222			E
					EB Through	26	52	54	222			D
					EB Right	254	20	54	222			B
	WB	7.4	A		WB Left	0	-1	1	25			A
					WB Through	9	11	1	25			B
					WB Right	5	0	0	0			A
47-Democracy Blvd at I-270 NB off ramp												
47	NB	29.7	C	NB Left	225	30	25	162	C	13.9	B	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB	13.3	B		EB Left	0	0	0	0			A
					EB Through	1662	13	54	479			B
					EB Right	0	0	0	0			A
	WB	10.5	B		WB Left	0	0	0	0			A
					WB Through	788	11	23	193			B
					WB Right	0	0	0	0			A
48- Democracy Blvd at I-270 SB on ramp												
48	NB			NB Left	0	0	0	0	A	6.4	A	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB	5.3	A		EB Left	0	0	0	0			A
					EB Through	1778	5	22	270			A
					EB Right	0	0	0	0			A
	WB	8.3	A		WB Left	219	36	31	171			D
					WB Through	790	1	20	150			A
					WB Right	0	0	0	0			A
49- Democracy Blvd at I-270 SB off ramp												
49	NB			NB Left	0	0	0	0	A	11.9	B	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB	33.3	C		SB Left	327	49	57	254			D
					SB Through	0	0	0	0			A
					SB Right	165	2	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	2.6	A		WB Left	0	0	0	0			A
					WB Through	790	3	4	129			A
					WB Right	341	2	1	173			A
50- MD 190 at Burdette Rd												
50	NB	74.3	E	NB Left	18	80	14	123	E	13.2	B	
				NB Through	4	70	14	123	E			
				NB Right	11	67	14	123	E			
	SB	34.9	C		SB Left	50	80	32	157			E
					SB Through	17	63	32	157			E
					SB Right	121	12	32	157			B
	EB	10.7	B		EB Left	52	98	60	516			F
					EB Through	1783	8	58	515			A
					EB Right	15	5	49	539			A
	WB	12.2	B		WB Left	1	106	60	824			F
					WB Through	1509	12	61	824			B
					WB Right	21	2	55	853			A

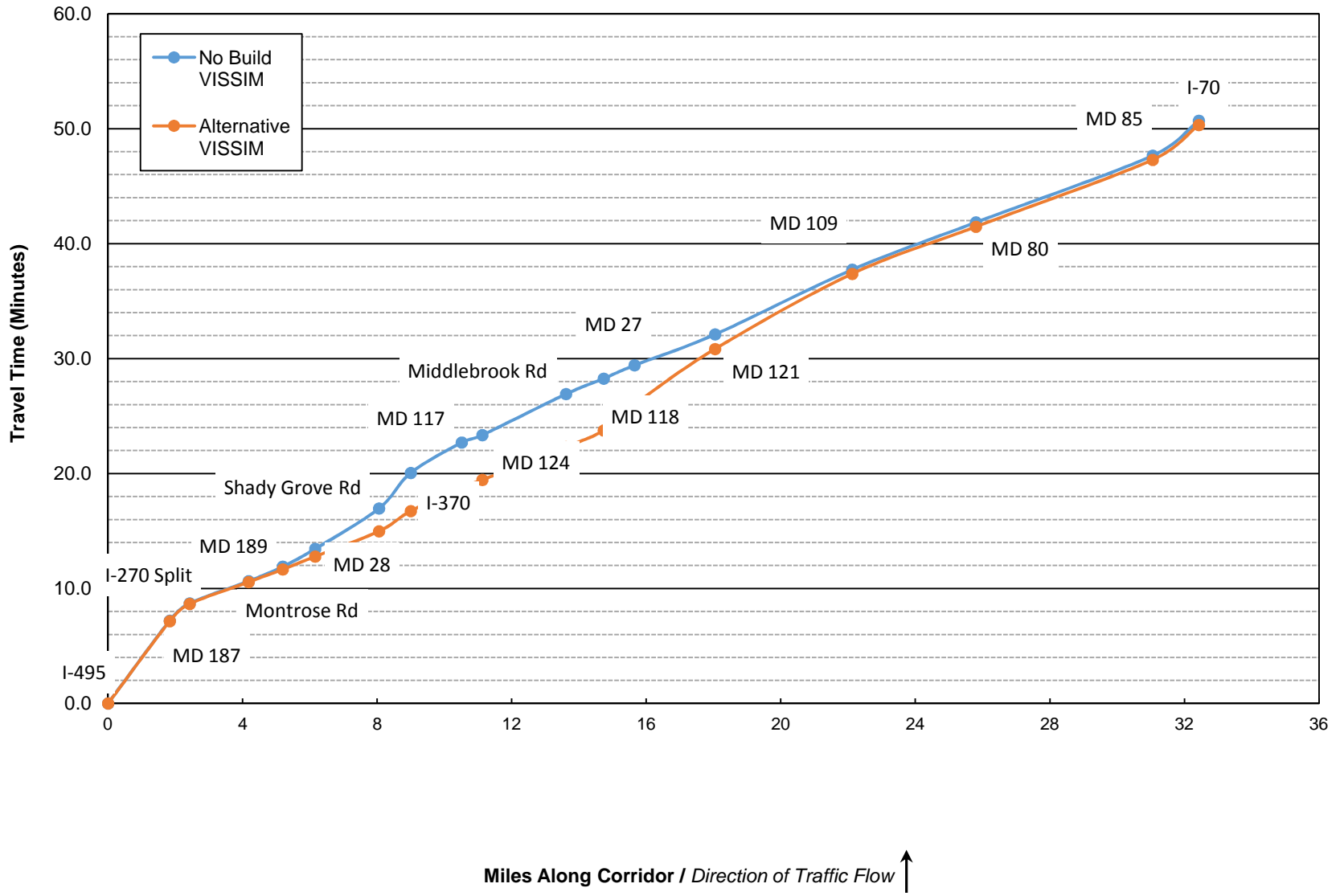
Table C.15: AM Peak -2040 Hard Shoulder Running- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
51- MD 190 at I-270 NB on ramp											
51	NB			NB Left	0	0	0	0	A	59.0	E
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	137.1	F	EB Left	542	137	390	809	F		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
				WB Left	0	0	0	0	A		
WB	16.6	B	WB Through	1000	17	78	733	B			
			WB Right	0	0	0	0	A			
52- MD 190 at I-270 SB off ramp											
52	NB	77.2	E	NB Left	240	77	1486	3338	E	13.6	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	3.9	A	EB Left	0	0	0	0	A		
				EB Through	990	4	10	208	A		
				EB Right	0	0	0	0	A		
				WB Left	0	0	0	0	A		
WB	5.1	A	WB Through	671	5	7	150	A			
			WB Right	0	0	0	0	A			
53- MD 190 at Seven Locks Rd											
53	NB	67.2	E	NB Left	20	64	24	151	E	44.1	D
				NB Through	62	68	26	151	E		
				NB Right	0	0	0	0	A		
	SB	58.3	E	SB Left	633	58	194	857	E		
				SB Through	187	60	195	857	E		
				SB Right	18	55	194	857	E		
	EB	37.0	D	EB Left	25	27	134	592	C		
				EB Through	845	37	134	592	D		
				EB Right	44	40	134	592	D		
				WB Left	118	103	106	350	F		
WB	35.9	D	WB Through	636	32	109	353	C			
			WB Right	156	1	1	97	A			
54- MD 124 at I-270 NB off ramp											
54	NB	39.6	D	NB Left	0	0	0	0	A	26.0	C
				NB Through	0	0	0	0	A		
				NB Right	781	40	106	454	D		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	14.5	B	EB Left	0	0	0	0	A		
				EB Through	929	15	32	326	B		
				EB Right	0	0	0	0	A		
				WB Left	0	0	0	0	A		
WB			WB Through	0	0	0	0	A			
			WB Right	0	0	0	0	A			
55- Democracy Blvd at I-270 NB off ramp											
55	NB	37.5	D	NB Left	0	0	0	0	A	16.6	B
				NB Through	0	0	0	0	A		
				NB Right	960	38	119	582	D		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	4.5	A	EB Left	0	0	0	0	A		
				EB Through	1662	4	19	92	A		
				EB Right	0	0	0	0	A		
				WB Left	0	0	0	0	A		
WB			WB Through	0	0	0	0	A			
			WB Right	0	0	0	0	A			
56- Watkins Mill Rd at I-270 SB off ramp/Parkview Ave											
56	NB	863.4	F	NB Left	44	234	676	721	F	183.7	F
				NB Through	0	0	0	0	A		
				NB Right	94	1158	676	721	F		
	SB	69.8	E	SB Left	558	95	2436	5045	F		
				SB Through	131	82	2436	5045	F		
				SB Right	445	35	2436	5045	C		
	EB	519.4	F	EB Left	0	0	0	0	A		
				EB Through	527	520	1148	1230	F		
				EB Right	3	505	1148	1230	F		
				WB Left	133	87	142	492	F		
WB	43.0	D	WB Through	880	36	140	491	D			
			WB Right	0	0	0	0	A			
57- Watkins Mill Rd at I-270 NB on ramp											
57	NB	34.8	C	NB Left	422	45	103	442	D	64.3	E
				NB Through	0	0	0	0	A		
				NB Right	523	27	103	442	C		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	21.4	C	EB Left	186	71	58	346	E		
				EB Through	757	9	58	346	A		
				EB Right	0	0	0	0	A		
				WB Left	0	0	0	0	A		
WB	115.0	F	WB Through	1148	122	595	867	F			
			WB Right	203	75	595	867	E			
58- Watkins Mill Rd at I-270 SB on ramp											
58	NB			NB Left	0	0	0	0	A	47.8	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	72.0	E	EB Left	0	0	0	0	A		
				EB Through	958	27	455	619	C		
				EB Right	213	276	455	619	F		
				WB Left	563	78	147	509	E		
WB	29.9	C	WB Through	1018	3	147	509	A			
			WB Right	0	0	0	0	A			

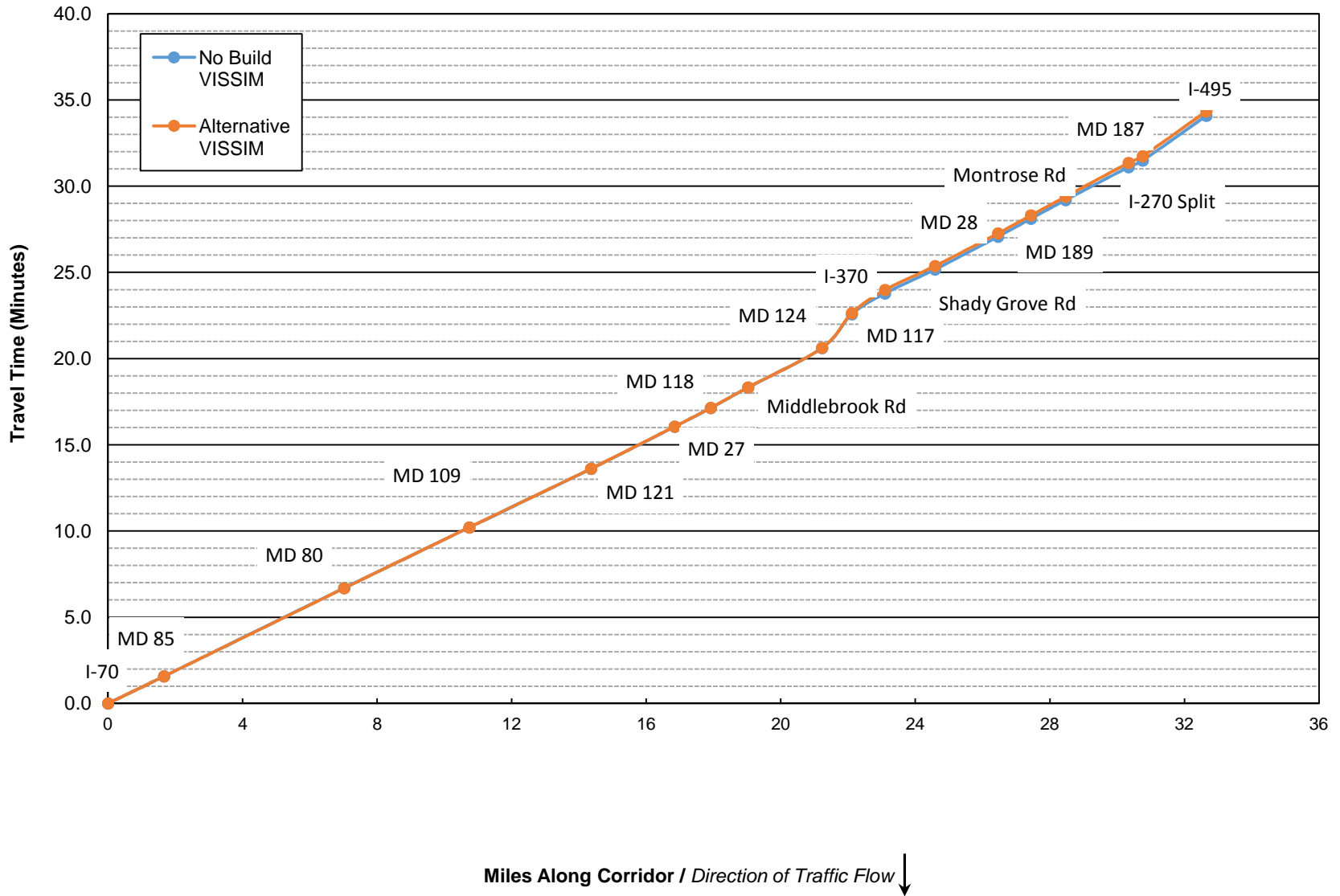
Table C.16: AM Peak -2040 Hard Shoulder Running- I-270 Vehicle Network Performance

	No Build	HSR- Alternative	% Change
Total Delay	35,032,576	25,737,836	-27%
Average Delay per Vehicle	326	233	-28%
Total Travel Time	64,317,886	56,499,525	-12%
Vehicles (Arrived)	87,894	93,550	6%
Latent Demand	44,530	40,664	-9%
Latent Delay	120,600,723	115,384,506	-4%
Total Distance	463,125	486,877	5%
Average Speed	26	31	19%

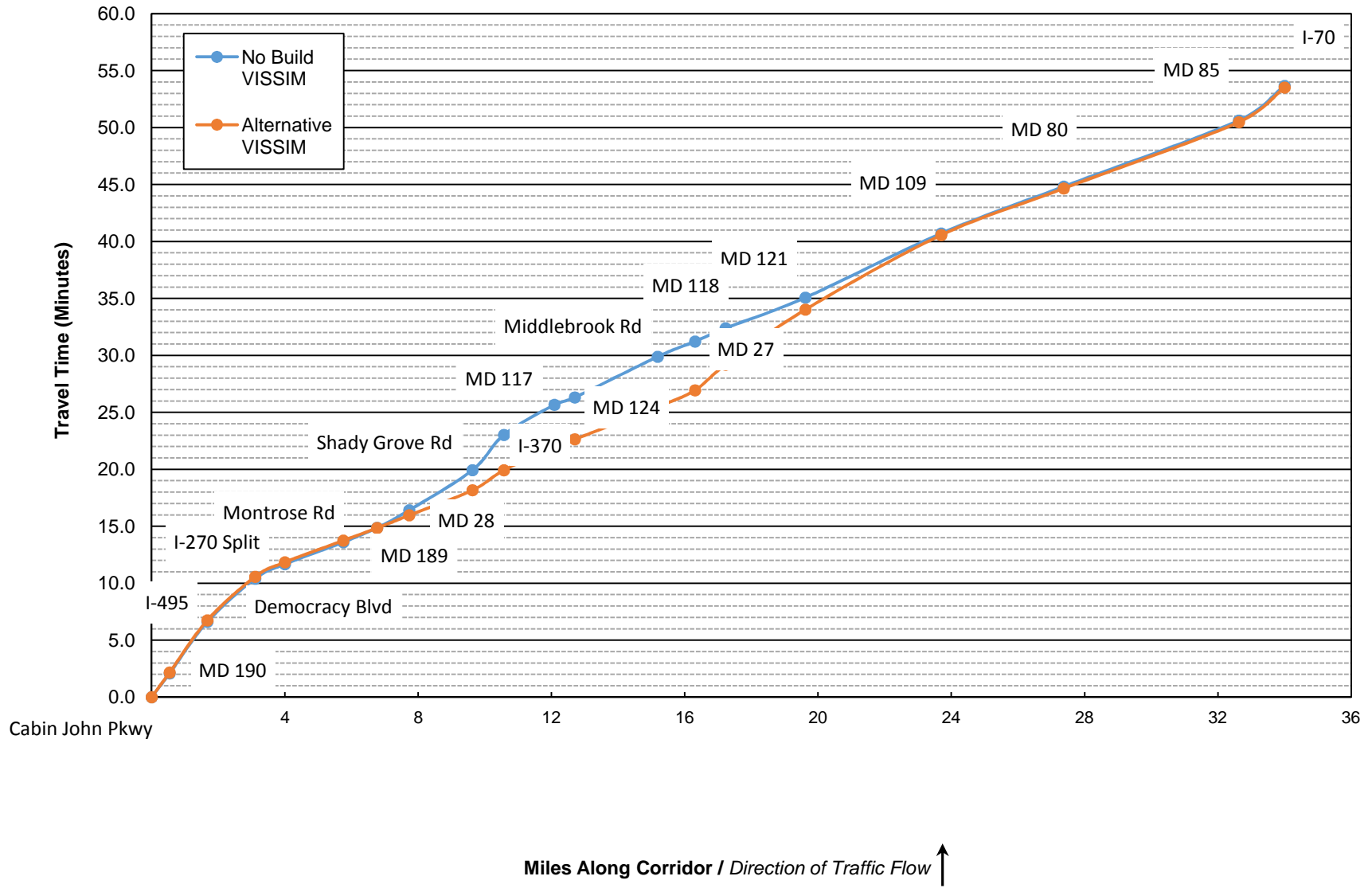
**Figure D.1: PM Peak - 2040 Hard Shoulder Running
I-270 Travel Time Graph - Northbound**



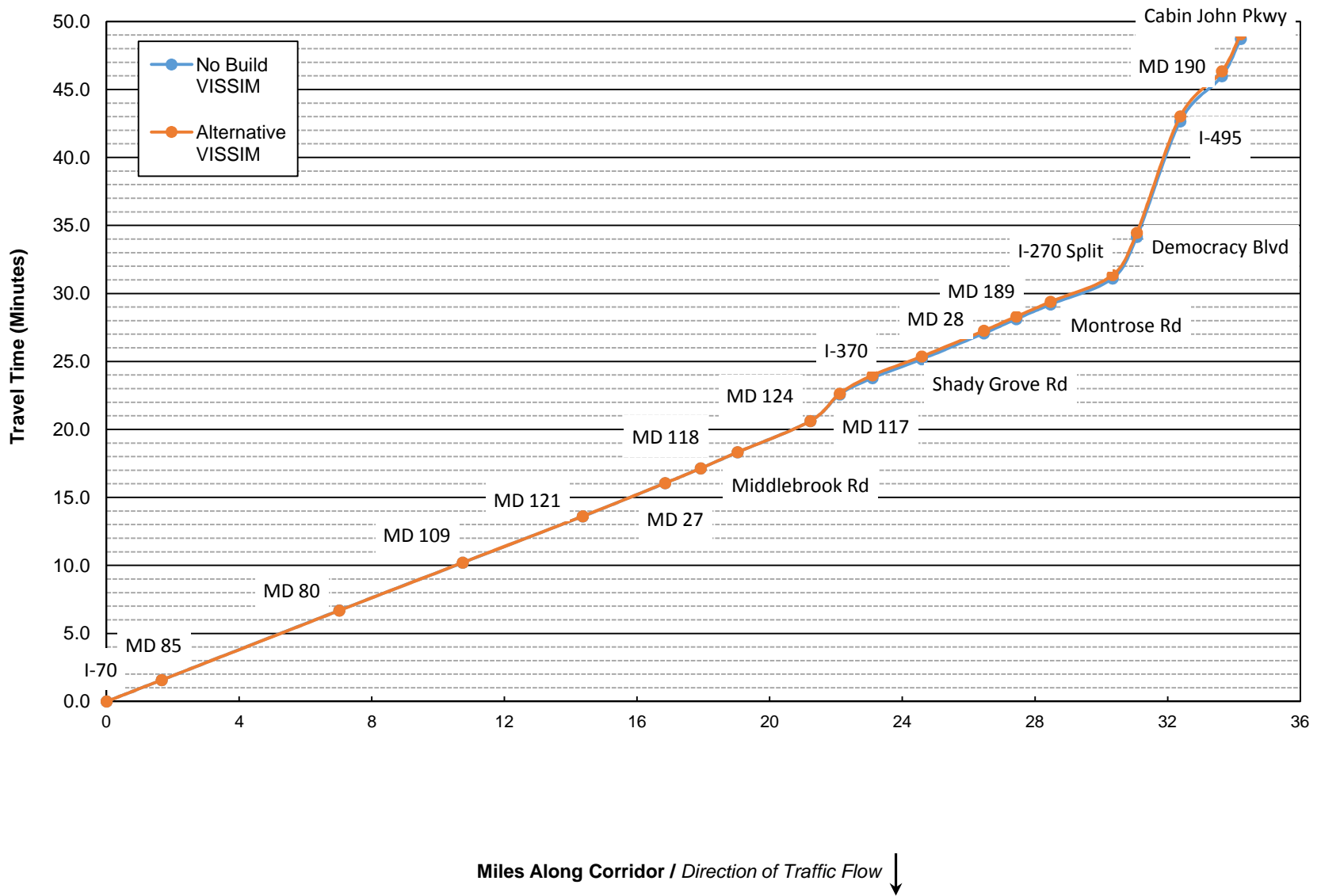
**Figure D.2: PM Peak - 2040 Hard Shoulder Running
I-270 Travel Time Graph - Southbound**



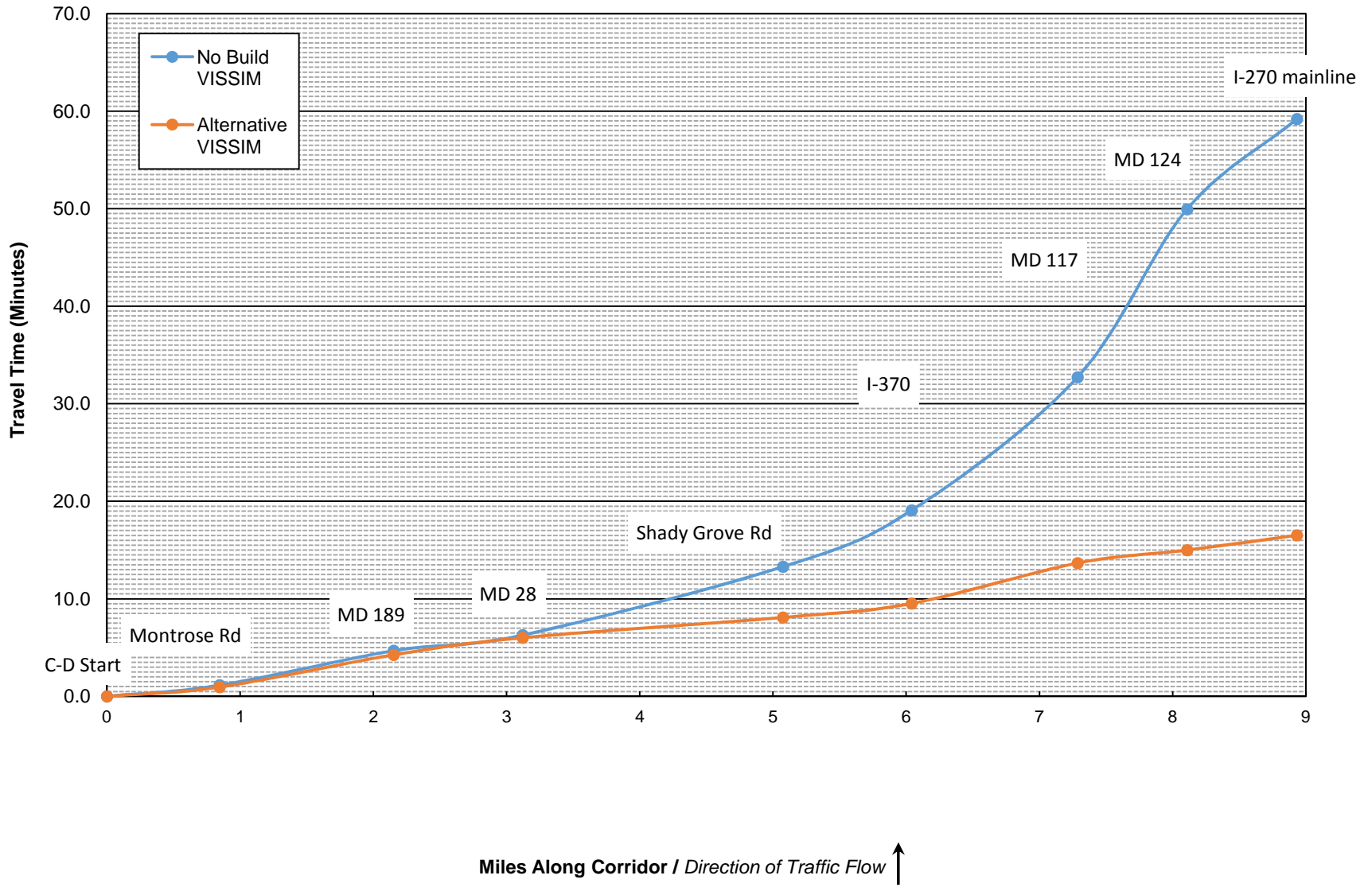
**Figure D.3: PM Peak - 2040 Hard Shoulder Running
I-270 Spur Travel Time Graph - Northbound**



**Figure D.4: PM Peak - 2040 Hard Shoulder Running
I-270 Spur Travel Time Graph - Southbound**



**Figure D.5: PM Peak -2040 Hard Shoulder Running
I-270 Local Travel Time Graph - Northbound**



**Figure D.6: PM Peak - 2040 Hard Shoulder Running
I-270 Local Travel Time Graph - Southbound**

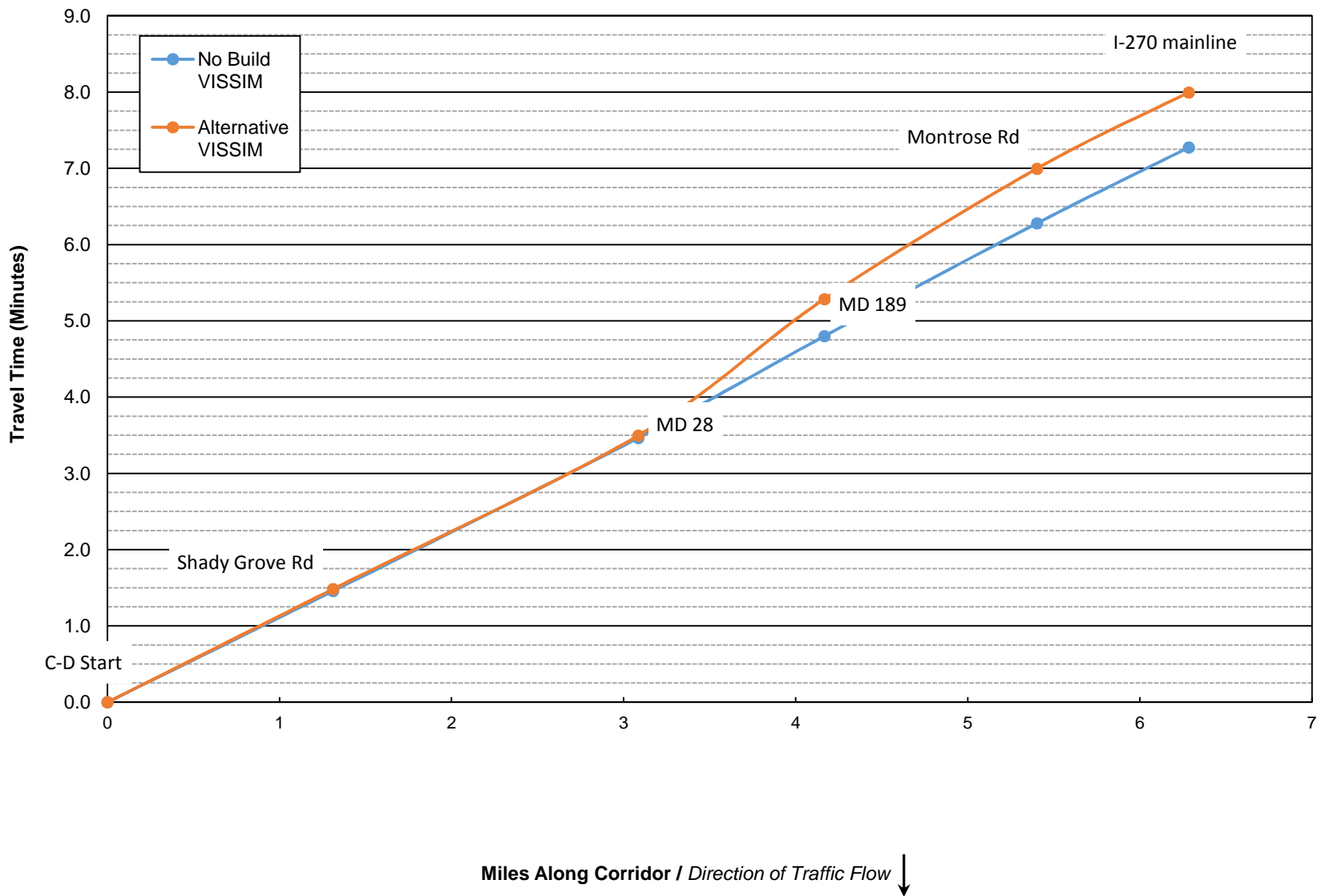


Table D.1: PM Peak 2040 Hard Shoulder Running-I-270 Vehicle Travel Time

I-270 Northbound	Segment Length (miles)	No Build VISSIM Travel Time (seconds)	HSR VISSIM Travel Time (seconds)	% Change	I-270 Southbound	Segment Length (miles)	No Build VISSIM Travel Time (seconds)	HSR VISSIM Travel Time (seconds)	% Change
From I-495 interchange					From I-70				
to MD 187	1.8	432.3	429.4	-0.7%	to MD 85	1.7	94.6	94.6	0.0%
to I-270 Split	0.6	90.3	89.9	-0.4%	to MD 80	5.4	307.1	306.5	0.2%
to Montrose Rd	1.8	115.8	114.3	-1.4%	to MD 109	3.7	210.7	211.6	-0.4%
to MD 189	1.0	76.0	66.2	-12.9%	to MD 121	3.6	204.4	204.6	-0.1%
to MD 28	1.0	92.5	67.1	-27.4%	to MD 27	2.5	146.4	146.2	0.1%
to Shady Grove Rd	1.9	211.0	132.1	-37.4%	to MD 118	1.1	65.1	65.2	-0.1%
to I-370	0.9	185.6	105.2	-43.3%	to Middlebrook Rd	1.1	71.2	71.2	-0.1%
to MD 117	1.5	158.7	123.7	-22.1%	to MD 124	2.2	137.5	137.5	0.0%
to MD 124	0.6	38.8	39.1	1.0%	to MD 117	0.9	117.3	120.9	-3.0%
to Middlebrook Rd	2.5	214.3	171.2	-20.1%	to I-370	1.0	72.5	80.8	-11.5%
to MD 118	1.1	80.3	86.9	8.1%	to Shady Grove Rd	1.5	83.4	83.1	0.4%
to MD 27	0.9	69.9	134.1	91.9%	to MD 28	1.9	114.1	113.7	0.3%
to MD 121	2.4	161.1	290.8	80.5%	to MD 189	1.0	62.7	62.8	-0.2%
to MD 109	4.1	337.8	392.4	16.2%	to Montrose Rd	1.0	64.8	64.9	-0.2%
to MD 80	3.7	247.0	246.0	-0.4%	to I-270 Split	1.9	114.7	117.7	-2.6%
to MD 85	5.3	348.1	349.0	0.2%	to MD 187	0.4	23.0	23.1	-0.4%
to I-70	1.4	182.3	182.2	0.0%	to I-495 interchange	1.9	155.6	156.1	-0.3%
I-270 Total (miles/minutes)	32.4	50.7	50.3	-0.7%	I-270 Total (miles/minutes)	32.6	34.1	34.3	-0.8%
I-270 Spur Northbound					I-270 Spur Southbound				
From Cabin John Pkwy					From I-70				
to MD 190	0.5	125.4	130.1	3.7%	to I-270 Split	30.3	1,866.3	1,881.2	0.8%
to I-495	1.1	271.9	274.9	1.1%	to Democracy Blvd	0.7	183.2	186.6	1.9%
to Democracy Blvd	1.4	226.8	229.4	1.2%	to I-495	1.3	509.9	513.9	0.8%
to I-270 Split	0.9	76.4	76.4	0.0%	to MD 190	1.3	199.4	199.0	-0.2%
to I-70	30.0	2,519.1	2,500.2	-0.8%	to Cabin John Pkwy	0.6	164.4	163.3	-0.7%
I-270 Spur Total (miles/minutes)	34.0	53.7	53.5	-0.3%	I-270 Spur Total (miles/minutes)	34.2	48.7	49.1	0.7%

Table D.2: PM Peak - 2040 Hard Shoulder Running- I-270 Local Vehicle Travel Time

I-270 Northbound	Segment Length (miles)	No Build VISSIM Travel Time (seconds)	HSR VISSIM Travel Time (seconds)	% Change	I-270 Southbound	Segment Length (miles)	No Build VISSIM Travel Time (seconds)	HSR VISSIM Travel Time (seconds)	% Change
From C-D start					From C-D start				
to Montrose Rd	0.8	68.8	57.2	-16.8%	to Shady Grove	1.3	87.5	89.0	1.7%
to MD 189	1.3	212.1	198.1	-6.6%	to MD 28	1.8	120.3	120.8	0.4%
to MD 28	1.0	96.2	105.4	9.6%	to MD 189	1.1	80.2	107.3	33.8%
to Shady Grove	2.0	420.6	124.8	-70.3%	to Montrose	1.2	88.8	102.6	15.6%
to I-370	1.0	346.7	86.1	-75.2%	to I-270 mainline	0.9	59.7	60.0	0.5%
to MD 117	1.2	819.0	248.1	-69.7%					
to MD 124	0.8	1,033.2	79.7	-92.3%					
to I-270 mainline	0.8	555.0	91.4	-83.5%					
I-270 Local Total (miles/minutes)	8.9	59.2	16.5	-72.1%	I-270 Local Total (miles/minutes)	6.3	7.3	8.0	9.9%

Table D.3: PM Peak - 2040 Hard Shoulder Running- I-270 Vehicle Speed

I-270 Northbound	Segment Length (miles)	No Build VISSIM Speed (MPH)	HSR VISSIM Speed (MPH)	% Change	I-270 Southbound	Segment Length (miles)	No Build VISSIM Speed (MPH)	HSR VISSIM Speed (MPH)	% Change
From I-495 interchange					From I-70				
to MD 187	1.8	15.3	15.4	0.7%	to MD 85	1.7	63.3	63.3	0.0%
to I-270 Split	0.6	23.6	23.7	0.4%	to MD 80	5.4	62.8	62.9	0.2%
to Montrose Rd	1.8	54.5	55.3	1.4%	to MD 109	3.7	63.6	63.3	-0.4%
to MD 189	1.0	48.0	55.2	14.9%	to MD 121	3.6	63.8	63.7	-0.1%
to MD 28	1.0	37.5	51.7	37.8%	to MD 27	2.5	61.1	61.1	0.1%
to Shady Grove Rd	1.9	32.4	51.8	59.8%	to MD 118	1.1	59.3	59.3	-0.1%
to I-370	0.9	18.3	32.3	76.4%	to Middlebrook Rd	1.1	56.2	56.2	-0.1%
to MD 117	1.5	34.4	44.1	28.3%	to MD 124	2.2	57.5	57.5	0.0%
to MD 124	0.6	56.9	56.4	-1.0%	to MD 117	0.9	27.2	26.4	-2.9%
to Middlebrook Rd	2.5	41.8	52.3	25.1%	to I-370	1.0	48.9	43.9	-10.3%
to MD 118	1.1	50.2	46.5	-7.5%	to Shady Grove Rd	1.5	64.2	64.4	0.4%
to MD 27	0.9	47.2	24.6	-47.9%	to MD 28	1.9	59.1	59.3	0.3%
to MD 121	2.4	53.5	29.6	-44.6%	to MD 189	1.0	56.2	56.1	-0.2%
to MD 109	4.1	43.5	37.4	-13.9%	to Montrose Rd	1.0	57.4	57.2	-0.2%
to MD 80	3.7	53.6	53.8	0.4%	to I-270 Split	1.9	58.7	57.3	-2.5%
to MD 85	5.3	54.3	54.2	-0.2%	to MD 187	0.4	65.7	65.4	-0.4%
to I-70	1.4	27.1	27.1	0.0%	to I-495 interchange	1.9	43.7	43.6	-0.3%
I-270 Total (miles/minutes)	32.4	38.4	38.7	0.7%	I-270 Total (miles/minutes)	32.6	57.5	57.0	-0.7%
I-270 Spur Northbound					I-270 Spur Southbound				
From Cabin John Pkwy					From I-70				
to MD 190	0.5	15.5	14.9	-3.6%	to I-270 Split	30.3	58.5	58.1	-0.8%
to I-495	1.1	15.0	14.8	-1.1%	to Democracy Blvd	0.7	14.4	14.1	-1.8%
to Democracy Blvd	1.4	22.8	22.5	-1.2%	to I-495	1.3	9.3	9.2	-0.8%
to I-270 Split	0.9	42.0	42.1	0.0%	to MD 190	1.3	22.6	22.7	0.2%
to I-70	30.0	42.9	43.2	0.8%	to Cabin John Pkwy	0.6	12.5	12.6	0.7%
I-270 Spur Total (miles/minutes)	34.0	38.0	38.1	0.3%	I-270 Spur Total (miles/minutes)	34.2	42.1	41.8	-0.7%

Table D.4: PM Peak -2040 Hard Shoulder Running- I-270 Local Vehicle Speed

I-270 Northbound	No Build VISSIM Speed (MPH)	HSR VISSIM Speed (MPH)	% Change	I-270 Southbound	No Build VISSIM Speed (MPH)	HSR VISSIM Speed (MPH)	% Change
From C-D start				From C-D start			
to Montrose Rd	44.2	53.2	20.1%	to Shady Grove	53.9	53.0	-1.7%
to MD 189	22.2	23.7	7.1%	to MD 28	53.1	52.9	-0.4%
to MD 28	36.2	33.1	-8.8%	to MD 189	48.6	36.3	-25.3%
to Shady Grove	16.7	56.4	237.0%	to Montrose	50.1	43.3	-13.5%
to I-370	10.0	40.4	302.8%	to I-270 mainline	53.2	52.9	-0.5%
to MD 117	5.5	18.1	230.1%				
to MD 124	2.9	37.1	1196.0%				
to I-270 mainline	5.3	32.5	507.3%				
I-270 Local Total (miles/minutes)	9.1	32.5	258.4%	I-270 Local Total (miles/minutes)	51.8	47.2	-9.0%

Table D.5: PM Peak -2040 Hard Shoulder Running- I-270 Vehicle Density

I-270 Northbound	Type	No Build		HSR		% Change	I-270 Southbound	Type	No Build		HSR		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS			
I-270	Freeway	91	F	91	F	0%	I-270	Freeway	19	C	19	C	0%
I-270 Diverge to MD 187	Diverge	77	F	77	F	0%	I-270 Merge from WB I-70	Merge	17	B	17	B	0%
I-270	Freeway	84	F	84	F	-1%	I-270	Freeway	24	C	24	C	0%
I-270 Diverge to Rockledge Rd	Diverge	77	F	78	F	1%	I-270 Merge from EB I-70	Merge	16	B	16	B	0%
I-270	Freeway	85	F	85	F	-1%	I-270	Freeway	22	C	22	C	0%
I-270 Weave from MD 187 to I-270 HOV	Weave	57	F	57	F	0%	I-270 Diverge to SB MD 85	Diverge	23	C	23	C	0%
I-270 Lane Drop	Merge	65	F	64	F	-1%	I-270	Freeway	24	C	24	C	0%
I-270	Freeway	51	F	51	F	0%	I-270 Diverge to NB MD 85	Diverge	15	B	15	B	0%
I-270 Merge from I-270 Spur	Merge	37	E	37	E	0%	I-270	Freeway	19	C	19	C	0%
I-270 Weave from I-270 HOV to I-270 C-D	Weave	34	D	33	D	-3%	I-270 Merge from MD 85	Merge	20	C	20	B	-3%
I-270	Freeway	34	D	32	D	-7%	I-270	Freeway	25	C	25	C	0%
I-270 Diverge to C-D (MD 189)	Diverge	46	F	39	E	-16%	I-270 Diverge to MD 80	Diverge	17	B	17	B	0%
I-270	Freeway	46	F	32	D	-30%	I-270	Freeway	20	C	20	C	0%
I-270 Diverge to C-D (MD 28)	Diverge	62	F	39	E	-37%	I-270 Merge from MD 80	Merge	14	B	14	B	0%
I-270	Freeway	55	F	29	D	-47%	I-270	Freeway	23	C	23	C	0%
I-270 Merge from C-D (MD 189)	Merge	72	F	40	E	-45%	I-270 Diverge to MD 109	Diverge	12	B	12	B	0%
I-270 Diverge to C-D (Shady Grove Rd)	Diverge	77	F	41	F	-46%	I-270	Freeway	22	C	22	C	1%
I-270	Freeway	65	F	30	D	-55%	I-270 Merge from MD 109	Merge	13	B	14	B	5%
I-270 Weave from C-D (MD 28) to C-D (Shady Grove Rd)	Weave	90	F	36	E	-60%	I-270	Freeway	24	C	24	C	1%
I-270	Freeway	90	F	43	E	-52%	I-270 Diverge to SB Weigh Station	Diverge	12	B	12	B	1%
I-270 Merge from C-D (Shady Grove Rd)	Merge	124	F	60	F	-51%	I-270	Freeway	24	C	24	C	0%
I-270	Freeway	88	F	54	F	-39%	I-270 Merge from SB Weigh Station	Merge	12	B	12	B	0%
I-270 Merge from C-D (I-370)	Merge	155	F	78	F	-50%	I-270	Freeway	23	C	22	C	0%
I-270 Diverge to C-D (MD 117)	Diverge	159	F	78	F	-51%	I-270 Diverge to MD 121	Diverge	9	A	9	A	0%
I-270	Freeway	21	C	26	C	20%	I-270	Freeway	12	B	12	B	0%
I-270 Merge from C-D (MD 124)	Merge	47	F	30	D	-37%	I-270 Merge from WB MD 121	Merge	10	B	10	B	0%
I-270	Freeway	27	D	33	D	23%	I-270	Freeway	15	B	15	B	0%
I-270 Diverge to EB Middlebrook Rd	Diverge	20	B	28	D	42%	I-270 Merge from EB MD 121	Merge	13	B	13	B	-1%
I-270	Freeway	25	C	32	D	29%	I-270	Freeway	20	C	20	C	0%
I-270 Diverge to WB Middlebrook Rd	Diverge	20	C	30	D	47%	I-270 Diverge to MD 27	Diverge	13	B	13	B	-1%
I-270	Freeway	22	C	26	D	23%	I-270	Freeway	16	B	16	B	0%
I-270 Diverge to EB MD 118	Diverge	17	B	25	C	45%	I-270 Merge from WB MD 27	Merge	14	B	14	B	1%
I-270 Diverge to WB MD 118	Diverge	31	D	31	D	0%	I-270	Freeway	20	C	20	C	0%
I-270	Freeway	27	D	31	D	14%	I-270 Weave from EB MD 27 to MD 118	Weave	15	B	15	B	0%
I-270 Weave from MD 118 to MD 27	Weave	36	E	41	F	14%	I-270	Freeway	19	C	19	C	0%
I-270	Freeway	25	C	42	E	70%	I-270 Merge from WB MD 118	Merge	15	B	15	B	-1%
I-270 Merge from EB MD 27	Merge	36	E	41	F	14%	I-270	Freeway	22	C	22	C	0%
I-270	Freeway	26	C	89	F	247%	I-270 Merge from EB MD 118	Merge	18	B	19	B	3%
I-270 Merge from WB MD 27	Merge	22	C	43	F	101%	I-270	Freeway	28	D	28	D	0%
I-270	Freeway	28	D	56	F	101%	I-270 Merge from Middlebrook Rd	Merge	30	D	30	D	0%
I-270 Diverge to MD 121	Diverge	22	C	57	F	160%	I-270 Diverge to Watkins Mill Rd	Diverge	24	C	24	C	0%

Table D.5: PM Peak -2040 Hard Shoulder Running- I-270 Vehicle Density

I-270 Northbound	Type	No Build		HSR		% Change	I-270 Southbound	Type	No Build		HSR		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS			
I-270	Freeway	22	C	67	F	198%	I-270	Freeway	19	C	20	C	1%
I-270 Merge from EB MD 121	Merge	35	E	96	F	171%	I-270 Diverge to MD 124	Diverge	17	B	17	B	0%
I-270 Lane Drop	Merge	78	F	112	F	43%	I-270	Freeway	14	B	14	B	0%
I-270	Freeway	37	E	43	E	14%	I-270 Merge from Watkins Mill	Merge	17	B	17	B	0%
I-270 Diverge to NB Weigh Station	Diverge	18	B	19	B	4%	I-270	Freeway	58	F	59	F	2%
I-270	Freeway	36	E	38	E	4%	I-270 Merge from WB MD 124	Merge	96	F	97	F	1%
I-270 Merge from NB Weight Station	Merge	18	B	19	B	5%	I-270	Freeway	0	A	0	A	#DIV/0!
I-270	Freeway	38	E	39	E	3%	I-270 Merge from MD 117	Merge	39	E	43	F	10%
I-270 Diverge to MD 109	Diverge	22	C	22	C	1%	I-270	Freeway	28	D	30	D	8%
I-270	Freeway	34	D	35	D	3%	I-270 Diverge to I-370	Diverge	22	C	32	D	48%
I-270 Merge from MD 109	Merge	19	B	19	B	3%	I-270	Freeway	18	B	18	B	0%
I-270	Freeway	36	E	37	E	2%	I-270 Diverge to I-270 C-D	Diverge	14	B	14	B	-3%
I-270 Diverge to MD 80	Diverge	27	C	26	C	-5%	I-270	Freeway	14	B	13	B	-1%
I-270	Freeway	30	D	30	D	0%	I-270 Merge from I-270 (I-370)	Merge	21	C	20	C	-3%
I-270 Merge from MD 80	Merge	18	B	18	B	1%	I-270 Diverge to I-270 C-D (Shady Grove Rd)	Diverge	23	C	23	C	-1%
I-270	Freeway	36	E	36	E	1%	I-270	Freeway	19	C	19	C	0%
I-270 Diverge to Scenic View	Diverge	19	B	19	B	2%	I-270 Merge from I-270 C-D (Shady Grove Rd Northern)	Merge	18	B	19	B	3%
I-270	Freeway	36	E	37	E	2%	I-270	Freeway	23	C	24	C	2%
I-270 Merge from Scenic View	Merge	18	B	19	B	1%	I-270 Merge from I-270 C-D (Shady Grove Rd Southern)	Merge	18	B	19	B	3%
I-270	Freeway	36	E	36	E	1%	I-270 Diverge to I-270 C-D (MD 189)	Diverge	25	C	26	C	3%
I-270 Diverge to NB MD 85	Diverge	20	C	21	C	2%	I-270	Freeway	21	C	22	C	2%
I-270	Freeway	34	D	34	D	0%	I-270 Merge from I-270 C-D (MD 189)	Merge	20	C	21	C	2%
I-270 Diverge to SB MD 85	Diverge	20	C	20	B	-2%	I-270	Freeway	26	C	26	D	2%
I-270	Freeway	30	D	30	D	-1%	I-270 Merge from I-270 C-D	Merge	25	C	29	D	15%
I-270 Weave from MD 85 to I-70	Weave	22	C	22	C	0%	I-270 Diverge to I-270 HOV Lane	Diverge	17	B	19	B	8%
I-270	Freeway	64	F	64	F	0%	I-270 Diverge to I-270 Spur	Diverge	38	E	41	F	8%
							I-270	Freeway	13	B	13	B	2%
							I-270 Diverge to Rockledge Dr / MD 187	Diverge	9	A	9	A	-1%
							I-270	Freeway	13	B	13	B	1%
							I-270 Merge from Rockledge Dr	Merge	11	B	12	B	2%
							I-270	Freeway	16	B	16	B	2%
							I-270 Merge from Rockledge Dr / MD 187	Merge	14	B	14	B	1%
							I-270	Freeway	35	E	36	E	1%

Table D.6: PM Peak -2040 Hard Shoulder Running- I-270 Spur Vehicle Density

I-270 Spur Northbound	Type	No Build		HSR		% Change	I-270 Southbound	Type	No Build		HSR		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS			
I-270 Spur	Freeway	62	F	63	F	2%	I-270 Spur	Freeway	72	F	73	F	2%
I-270 Spur Merge from Clara Barton Parkway	Merge	64	F	65	F	1%	I-270 Spur Weave from I-270 HOV to Democracy Blvd	Weave	94	F	96	F	2%
I-270 Spur	Freeway	78	F	79	F	2%	I-270 Spur	Freeway	108	F	109	F	1%
I-270 Diverge to MD 190	Diverge	49	F	49	F	0%	I-270 Merge from Democracy Blvd	Merge	152	F	154	F	1%
I-270 Spur	Freeway	89	F	91	F	2%	I-270 Spur Lane Drop	Merge	144	F	146	F	1%
I-270 Spur Merge from Cabin John Parkway	Merge	105	F	106	F	1%	I-270 Spur	Freeway	125	F	125	F	0%
I-270 Spur Merge from MD 190	Merge	97	F	97	F	0%	I-270 Spur Merge from I-495	Merge	124	F	125	F	0%
I-270 Spur	Freeway	84	F	84	F	0%	I-270 Spur	Freeway	49	F	48	F	-1%
I-270 Spur Diverge to I-495	Merge	66	F	65	F	-2%	I-270 Spur Diverve to EB MD 190	Diverge	50	F	49	F	-1%
I-270 Spur	Freeway	45	F	46	F	2%	I-270 Spur Diverve to Cabin John Pkwy	Diverge	67	F	68	F	1%
I-270 Spur Diverge to Democracy Blvd	Diverge	50	F	50	F	0%	I-270 Spur	Freeway	95	F	95	F	-1%
I-270 Spur	Freeway	58	F	59	F	2%	I-270 Merge from MD 190	Merge	120	F	122	F	2%
I-270 Spur Merge from EB Democracy Blvd	Merge	97	F	99	F	2%	I-270 Spur	Freeway	93	F	94	F	0%
I-270 Spur	Freeway	58	F	58	F	1%	I-270 Diverge to WB Clara Barton Pkwy	Diverge	60	F	61	F	0%
I-270 Spur Merge from WB Democracy Blvd	Merge	65	F	66	F	0%	I-270 Spur	Freeway	83	F	83	F	0%
I-270 Spur	Freeway	39	E	38	E	-1%	I-270 Merge from Clara Barton Pkwy	Merge	77	F	76	F	0%
I-270 Spur Merge from Westlake Terrace	Merge	31	D	31	D	-1%							
I-270 Spur	Freeway	34	D	34	D	-1%							

Table D.7: PM Peak -2040 Hard Shoulder Running- I-270 Local Vehicle Density

I-270 Northbound	Type	No Build		HSR		% Change	I-270 Southbound	Type	No Build		HSR		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS			
I-270 C-D	Freeway	29	D	29	D	0%	I-270 C-D	Freeway	8	A	8	A	0%
I-270 C-D Diverge to EB Montrose Rd	Diverge	21	C	21	C	0%	I-270 C-D Weave from I-370 EB to I-270	Weave	23	B	22	B	-5%
I-270 C-D	Freeway	16	B	16	B	-2%	I-270 C-D Diverge to Shady Grove Rd	Diverge	11	B	11	B	0%
I-270 C-D Weave between Montrose Rd Loop Ramps	Weave	13	B	12	A	-9%	I-270 C-D	Freeway	8	A	8	A	0%
I-270 C-D	Freeway	28	D	18	B	-38%	I-270 C-D Merge from WB Shady Grove Rd	Merge	8	A	10	B	22%
I-270 C-D Merge from WB Montrose Rd	Merge	83	F	41	F	-50%	I-270 C-D	Freeway	14	B	15	B	14%
I-270 C-D	Freeway	67	F	48	F	-27%	I-270 C-D Merge from EB Shady Grove Rd	Merge	10	A	12	B	20%
I-270 C-D Merge from I-270	Merge	42	F	53	F	26%	I-270 C-D	Freeway	19	C	22	C	17%
I-270 C-D	Freeway	65	F	61	F	-6%	I-270 C-D Merge from I-270	Merge	18	B	21	C	17%
I-270 C-D Diverge to MD 189	Diverge	43	F	31	D	-27%	I-270 C-D Diverge to I-270	Diverge	25	C	29	D	14%
I-270 C-D	Freeway	91	F	71	F	-22%	I-270 C-D Diverge to I-270	Diverge	17	B	19	B	11%
I-270 C-D Merge from MD 189	Merge	112	F	72	F	-35%	I-270 C-D	Freeway	16	B	17	B	10%
I-270 C-D	Freeway	62	F	58	F	-5%	I-270 C-D Diverge to MD 28	Diverge	11	B	12	B	11%
I-270 C-D Weave between I-270 (to MD 28 from MD 189)	Weave	63	F	49	F	-22%	I-270 C-D	Freeway	11	A	12	B	10%
I-270 C-D	Freeway	42	E	50	F	19%	I-270 C-D Merge from WB MD 28	Merge	12	B	14	B	17%
I-270 C-D Diverge to MD 28	Diverge	18	B	20	B	11%	I-270 C-D	Freeway	14	B	15	B	11%
I-270 C-D	Freeway	28	D	31	D	11%	I-270 C-D Merge from EB MD 28	Merge	26	C	42	F	64%
I-270 C-D Weave between MD 28 Ramps	Weave	28	C	30	C	6%	I-270 C-D	Freeway	32	D	58	F	84%
I-270 C-D	Freeway	26	D	19	C	-28%	I-270 C-D Merge from I-270	Merge	20	B	38	E	94%
I-270 C-D Merge from MD 28 WB	Merge	28	C	14	B	-49%	I-270 C-D	Freeway	44	E	51	F	15%
I-270 C-D Merge from I-270 and Drop Lane	Merge	34	D	18	B	-46%	I-270 C-D Diverge to MD 189	Diverge	25	C	26	C	4%
I-270 C-D Diverge to I-270	Diverge	61	F	23	C	-62%	I-270 C-D	Freeway	27	D	32	D	17%
I-270 C-D	Freeway	48	F	20	C	-59%	I-270 C-D Merge from MD 189	Merge	27	C	32	D	17%
I-270 C-D Diverge to Shady Grove Rd	Diverge	14	B	13	B	-9%	I-270 C-D Diverge to I-270	Diverge	34	D	39	E	13%
I-270 C-D	Freeway	130	F	14	B	-89%	I-270 C-D	Freeway	24	C	29	D	20%
I-270 C-D Merge from I-270 and EB Shady Grove Rd	Merge	140	F	16	B	-89%	I-270 C-D Diverge to WB Montrose Rd	Diverge	18	B	22	C	26%
I-270 C-D	Freeway	144	F	16	B	-89%	I-270 C-D	Freeway	23	C	28	D	20%
I-270 C-D Merge from WB Shady Grove Rd	Merge	146	F	16	B	-89%	I-270 Weave between Montrose Rd Loops	Weave	41	F	52	F	26%
I-270 C-D Diverge to I-270	Diverge	113	F	30	D	-74%	I-270 C-D	Freeway	15	B	16	B	5%
I-270 C-D	Freeway	94	F	28	D	-71%	I-270 C-D Merge from EB Montrose Rd	Merge	9	A	9	A	2%
I-270 C-D Diverge to I-370	Diverge	64	F	33	D	-49%	I-270 C-D	Freeway	18	B	18	C	4%
I-270 C-D	Freeway	120	F	9	A	-93%							
I-270 Merge from I-370 EB	Merge	129	F	16	B	-88%							
I-270 C-D	Freeway	139	F	26	D	-81%							
I-270 C-D Weave from I-370 to I-270	Weave	134	F	54	F	-60%							
I-270 C-D	Freeway	110	F	70	F	-36%							
I-270 C-D Weave from I-270 to MD 117	Weave	114	F	90	F	-22%							
I-270 C-D Diverge to MD 124	Diverge	142	F	28	D	-80%							
I-270 C-D	Freeway	178	F	30	D	-83%							
I-270 C-D Merge from EB MD 124	Merge	168	F	33	D	-80%							
I-270 C-D Merge From WB MD 124	Merge	154	F	38	E	-76%							
I-270 C-D	Freeway	144	F	35	D	-76%							

Table D.7: PM Peak -2040 Hard Shoulder Running- I-270 Local Vehicle Density

		No Build		HSR					No Build		HSR				
I-270 Northbound		Type	Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS	% Change	I-270 Souhbound		Type	Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS	% Change
I-270 C-D Merge from Watkins Mill		Merge	133	F	37	E	-72%								

Table D.8: PM Peak -2040 Hard Shoulder Running- I-270 Vehicle Throughput

I-270 Northbound	No Build VISSIM Throughput	HSR VISSIM Throughput	% Change	I-270 Southbound	No Build VISSIM Throughput	HSR VISSIM Throughput	% Change
Between I-495 and MD 187	4113	4119	0%	North of I-70	2366	2366	0%
Between MD 187 on and off ramps	3710	3709	0%	Between I-70 on ramps	2703	2703	0%
Between Rockledge Blvd on and off ramps	3540	3545	0%	From I-70 interchange to MD-85	4047	4047	0%
Between Rockledge Dr and I-270 Spur	3873	3870	0%	Between MD-85 on and off ramps	2379	2379	0%
Between I-270 Spur and Montrose Rd	8718	8705	0%	Between MD-85 and MD-80	3075	3079	0%
Between Montrose Rd on and off ramps	5582	5737	3%	Between MD-80 on and off ramps	2415	2412	0%
Between Montrose Rd and MD 189	5102	5467	7%	Between MD-80 and Md-109	2866	2868	0%
Between MD 189 and MD 28	5078	5838	15%	Between MD-109 on and off ramps	2767	2769	0%
Between MD 28 on and off ramps	5014	6179	23%	Between MD-109 and MD-121	2935	2930	0%
Between MD 28 and Shady Grove Rd	4214	5447	29%	Between MD-121 on and off ramps	2413	2409	0%
Between Shady Grove Rd and I-370	3243	4774	47%	Between MD-121 and MD-27	3354	3349	0%
Between I-370 on and off ramps	2749	4629	68%	Between MD-27 on and off ramps	3458	3456	0%
Between I-370 and MD 117	2851	5818	104%	Between MD-27 and MD-118	3773	3762	0%
Between MD 117 and MD 124	2432	4441	83%	Between MD-118 on and off ramps	3719	3705	0%
Between MD-124 on and off ramps	2547	4534	78%	Between MD-118 and Middlebrook Rd	4384	4369	0%
Between Watkins Mill Rd and Middlebrook Rd	4564	6671	46%	Between Middlebrook Rd on and off ramps	4382	4373	0%
Between Middlebrook Rd on and off ramps	4337	6266	44%	Between Middlebrook Rd and MD-124	5462	5467	0%
Between Middlebrook Rd and MD 118	3776	4224	12%	Between MD-124 on and off ramps	4179	4195	0%
Between MD-118 on and off ramps	3479	5011	44%	Between MD-124 and MD-117	5347	5322	0%
Between MD 118 and MD 27	3770	5010	33%	Between MD-117 and I-370	6905	6834	-1%
Between MD-27 on and off ramps	2754	3573	30%	Between I-370 on and off ramps	3456	3436	-1%
Between MD 27 and MD 121	3428	3901	14%	Between I-370 on ramp to Shady Grove Rd	4990	4994	0%
Between MD-121 on and off ramps	2299	2593	13%	Between Shady Grove Rd and MD 28	5157	5262	2%
Between MD 121 and MD 109	3931	4101	4%	Between MD 28 on and off ramps	5327	5460	2%
Between MD-109 on and off ramps	3643	3752	3%	Between MD 28 and MD 189	4678	4776	2%
Between MD 109 and MD 80	3831	3909	2%	Between MD 189 and Montrose Rd	4678	4773	2%
Between MD-80 on and off ramps	3186	3222	1%	Between Montrose Rd on and off ramps	5599	5692	2%
Between MD 80 and MD 85	3875	3901	1%	Between Montrose Rd and I-270 Spur	7355	7392	1%
Between MD-85 on and off ramps	3257	3250	0%	Between I-270 Spur and Rockledge Blvd	3320	3363	1%
Between MD 85 and I-70	5239	5236	0%	Between Rockledge Blvd on and off ramps	2542	2576	1%
North of I-70	2739	2728	0%	Between MD 187 on and off ramps	3011	3047	1%
				Between MD 187 and I-495	3393	3426	1%
I-270 Spur Northbound				I-270 Spur Southbound			
Between I-495 and Democracy Blvd	4568	4558	0%	Between I-270 Split and HOV on ramp	3187	3175	0%
Between Democracy Blvd on and off ramps	4101	4087	0%	Between HOV on ramp and Democracy Blvd	2329	2332	0%
Between Democracy Blvd and I-270 Split	4833	4822	0%	Between Democracy Blvd on and off ramps	1856	1857	0%
				Between Democracy Blvd and I-495	2227	2186	-2%

Table D.9: PM Peak -2040 Hard Shoulder Running- I-270 Local Vehicle Throughput

I-270 Local Northbound	No Build VISSIM Throughput	HSR VISSIM Throughput	% Change	I-270 Local Southbound	No Build VISSIM Throughput	HSR VISSIM Throughput	% Change
Between Montrose Rd EB off ramp and EB on ramp	1766	1768	0%	Between I-370 on ramp and I-270 off ramp	3064	3059	0%
Between Montrose Rd EB on ramp and WB off ramp	2079	2089	0%	Between I-270 off ramp and Shady Grove off ramp	1525	1522	0%
Between Montrose Rd WB off ramp and on ramp	1811	1833	1%	Between Shady Grove off ramp and Shady Grove WB on ramp	811	809	0%
Between Montrose Rd WB on ramp and I-270 on ramp	3211	3408	6%	Between Shady Grove WB and EB on ramps	1431	1632	14%
Between I-270 on ramp and MD 189 off ramp	3392	3641	7%	Between Shady Grove on ramp and I-270 on ramp	1957	2287	17%
Between MD 189 ramps	2697	2950	9%	Between I-270 on ramp and I-270 off ramp1	2571	2892	12%
Between MD 189 off ramp and I-270 on ramp	3503	3818	9%	Between I-270 off ramp1 and I-270 off ramp2	1808	1997	10%
Between I-270 on ramp and I-270 off ramp	4032	4511	12%	Between I-270 off ramp2 and MD 28 off ramp	1648	1808	10%
Between I-270 off ramp and MD 28 EB off ramp	3156	3507	11%	Between MD 28 off ramp and MD 28 WB on ramp	1153	1263	10%
Between MD 28 EB off ramp to MD 28 EB on ramp	2855	3161	11%	Between MD 28 WB on ramp and MD 28 EB on ramp	1423	1526	7%
Between MD 28 EB on ramp and MD 28 WB off ramp	2994	3298	10%	Between MD 28 EB on ramp and I-270 on ramp	2987	3057	2%
Between MD 28 WB off ramp and MD 28 WB on ramp	1879	2080	11%	Between I-270 on ramp and MD 189 off ramp	3660	3725	2%
Between MD 28 WB on ramp and I-270 on ramp	2552	2802	10%	Between MD 189 on and off ramps	2740	2788	2%
Between I-270 on ramp and I-270 off ramp	3027	3640	20%	Between MD 189 on ramp and I-270 off ramp	3316	3357	1%
Between I-270 off ramp and Shady Grove off ramp	1718	2170	26%	Between I-270 off ramp and Montrose Rd off ramp	2399	2422	1%
Between Shady Grove off ramp and I-270 on ramp	468	769	64%	Between Montrose Rd off ramp and Montrose Rd WB on ramp	2155	2173	1%
Between I-270 on ramp and Shady Grove WB on ramp	2182	3501	60%	Between Montrose Rd WB on ramp and EB off ramp	2705	2773	3%
Between Shady Grove WB on ramp and I-270 off ramp	2671	4351	63%	Between Montrose Rd EB off and on ramps	1525	1590	4%
Between I-270 off ramp and I-370 off ramp	2310	3809	65%	Between Montrose Rd EB off ramp and I-270	1845	1907	3%
Between I-370 off ramp and I-370 EB on ramp	529	1016	92%				
Between I-370 EB and WB on ramps	896	2164	142%				
Between I-370 WB on ramp and I-270 off ramp	1577	3762	139%				
Between I-270 off ramp and I-270 on ramp	1008	2315	130%				
Between I-270 on ramp and MD 117 off ramp	1386	3767	172%				
Between MD 117 off ramp and MD 124 off ramp	920	2661	189%				
Between MD 124 off ramp and MD 124 EB on ramp	346	1124	225%				
Between MD 124 EB and WB on ramps	651	1632	151%				
Between MD 124 on ramp I-270	812	1167	44%				

Table D.10: PM Peak -2040 Hard Shoulder Running- I-270 On Ramp Queue Length - Northbound

I-270 Northbound	No Build VISSIM Average Queue (feet)	HSR VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	HSR VISSIM Maximum Queue (feet)	% Change
Rockledge Dr on ramp	1	2	122%	192	226	18%
MD 189 C-D on ramp	610	0	-100%	4780	0	-100%
MD 28 C-D on ramp	994	2	-100%	4333	140	-97%
Shady Grove Rd C-D on ramp	1762	2	-100%	4090	126	-97%
I-370 C-D on ramp	3386	1257	-63%	5049	3284	-35%
MD 124 C-D on ramp	4875	2	-100%	5069	70	-99%
MD 118 on ramp	0	0	-100%	43	0	-100%
MD 27 EB on ramp	0	0	-	0	0	-
MD 27 WB on ramp	0	1	-	0	148	-
MD 121 on ramp	0	0	-	4	0	-100%
MD 109 on ramp	0	0	-	0	0	-
MD 80 on ramp	0	0	-	0	0	-
MD 85 on ramp	0	0	-	0	9	-
I-270 Spur Northbound	No Build VISSIM Average Queue (feet)	HSR VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	HSR VISSIM Maximum Queue (feet)	% Change
Democracy Blvd EB on ramp	0	0	-	9	0	-100%
Democracy Blvd WB on ramp	0	82	-	0	1271	-
I-495 Northbound	No Build VISSIM Average Queue (feet)	HSR VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	HSR VISSIM Maximum Queue (feet)	% Change
Cabin John Pkwy on ramp	46	0	-100%	903	24	-97%
MD 190 on ramp	0	0	-100%	48	0	-100%
I-270 C-D Northbound	No Build VISSIM Average Queue (feet)	HSR VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	HSR VISSIM Maximum Queue (feet)	% Change
Montrose Rd EB on ramp	0	217	-	0	1269	-
Montrose Rd WB on ramp	916	0	-100%	2556	0	-100%
I-270 on ramp	0	0	-	0	0	-
MD 189 on ramp	104	0	-100%	1084	32	-97%
I-270 on ramp	1	0	-99%	109	10	-90%
MD 28 EB on ramp	0	0	-	0	0	-
MD 28 WB on ramp	38	0	-100%	652	0	-100%
Shady Grove Rd EB on ramp	1396	0	-100%	4077	0	-100%
I-270 on ramp	1555	0	-100%	5058	0	-100%
Shady Grove Rd WB on ramp	739	1	-100%	1949	148	-92%
I-370 EB on ramp	1319	394	-70%	2422	1654	-32%
I-370 WB on ramp	1606	3436	114%	2548	5054	98%
I-270 on ramp	4357	12	-100%	5055	233	-95%
MD 124 EB on ramp	1831	1	-100%	2796	52	-98%
MD 124 WB on ramp	98	56	-43%	700	364	-48%
Watkins Mill Rd on ramp	2665	0	-100%	3270	0	-100%

Table D.11: PM Peak -2040 Hard Shoulder Running- I-270 Off Ramp Queue Length - Northbound

I-270 Northbound	No Build VISSIM Average Queue (feet)	HSR VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	HSR VISSIM Maximum Queue (feet)	% Change
MD 187 off ramp NB	39	0	-100%	309	0	-100%
MD 187 off ramp SB	0	1	-	0	85	-
Rockledge Dr off ramp	1	36	3957%	88	208	137%
Tower Oaks Blvd off ramp	37	0	-100%	219	0	-100%
Montrose Rd off ramp EB	0	0	-	0	0	-
Montrose Rd off ramp WB	0	28	-	0	153	-
MD 189 off ramp WB	26	1	-98%	174	108	-38%
MD 189 off ramp EB	0	38	9577%	78	250	219%
MD 28 off ramp EB	35	0	-100%	215	0	-100%
MD 28 off ramp WB	0	0	-	0	0	-
Shady Grove Rd off ramp - Redland Blvd	0	48	-	0	214	-
Shady Grove Rd off ramp WB	40	0	-100%	253	0	-100%
Shady Grove Rd off ramp EB	0	37	-	0	630	-
I-370 off ramp WB	8	0	-100%	162	0	-100%
I-370 off ramp EB	0	3473	-	0	5073	-
MD 117 off ramp	1835	199	-89%	2770	895	-68%
MD 124 off ramp	55	0	-100%	626	0	-100%
Watkins Mill Rd off ramp	45	0	-100%	627	0	-100%
Middlebrook Rd EB off ramp	0	0	-	0	0	-
Middlebrook Rd WB off ramp	0	0	-	0	0	-
MD 118 WB off ramp - Seneca Meadows	0	0	-100%	8	0	-100%
MD 118 WB off ramp	0	0	-	0	0	-
MD 118 EB off ramp	0	55	136250%	16	267	1521%
MD 27 off ramp WB	44	0	-100%	252	0	-100%
MD 27 off ramp EB	0	74	-	0	287	-
MD 121 off ramp WB	70	1	-99%	314	130	-59%
MD 121 off ramp EB	2	30	1300%	94	300	220%
MD 109 off ramp EB	26	0	-100%	251	0	-100%
MD 109 off ramp WB	0	20	-	0	171	-
MD 80 off ramp EB	21	0	-100%	233	17	-93%
MD 80 off ramp WB	0	0	260%	24	28	18%
MD 85 NB off ramp	1	0	-60%	53	79	50%
MD 85 SB off ramp	1	0	-100%	141	0	-100%
I-270 Spur Northbound	No Build VISSIM Average Queue (feet)	HSR VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	HSR VISSIM Maximum Queue (feet)	% Change
Clara Barton Pkwy off ramp EB	0	0	-	0	0	-
Clara Barton Pkwy off ramp WB	0	0	-	0	0	-
MD 190 off ramp EB	0	4	-	0	282	-
MD 190 off ramp WB	5	42	791%	354	204	-42%
Democracy Blvd off ramp WB	41	17	-60%	194	111	-43%
Democracy Blvd off ramp EB	17	0	-100%	120	0	-100%

Table D.12: PM Peak -2040 Hard Shoulder Running- I-270 On Ramp Queue Length - Southbound

I-270 Southbound	No Build VISSIM Average Queue (feet)	HSR VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	HSR VISSIM Maximum Queue (feet)	% Change
MD 85 on ramp	0	0	-100%	12	0	-100%
MD 80 on ramp	0	0	-	0	0	-
MD 109 on ramp	0	0	-	0	0	-
MD 121 WB on ramp	0	0	-	0	0	-
MD 121 EB on ramp	0	116	-	0	620	-
MD 27 WB on ramp	0	0	-	0	0	-
MD 27 EB on ramp	0	0	-	0	0	-
MD 118 WB on ramp	0	0	-	0	0	-
MD 118 EB on ramp	0	0	-	0	0	-
Middlebrook Rd on ramp	0	0	-	0	0	-
Watkins Mill Rd on ramp	0	0	-	0	0	-
MD 124 WB on ramp	1368	1028	-25%	3492	3749	7%
MD 117 on ramp	29	208	623%	837	1571	88%
I-370 C-D on ramp	0	0	-	0	0	-
Shady Grove Rd C-D on ramp North	0	0	-	0	0	-
Shady Grove Rd C-D on ramp South	0	0	-	0	0	-
MD 189 C-D on ramp	0	0	-	0	0	-
Montrose Rd C-D on ramp	0	0	-	0	0	-
Rockledge Dr on ramp	0	0	-	0	0	-
MD 187 on ramp	0	0	-	0	0	-
I-270 Spur Southbound	No Build VISSIM Average Queue (feet)	HSR VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	HSR VISSIM Maximum Queue (feet)	% Change
Democracy Blvd on ramp	698	698	0%	1919	2077	8%
I-495 Southbound	No Build VISSIM Average Queue (feet)	HSR VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	HSR VISSIM Maximum Queue (feet)	% Change
I-270 Spur on ramp	4555	4573	0%	5065	5065	0%
MD 190 on ramp	184	65	-64%	956	595	-38%
I-270 C-D Southbound	No Build VISSIM Average Queue (feet)	HSR VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	HSR VISSIM Maximum Queue (feet)	% Change
I-270 on ramp	0	0	-100%	10	0	-100%
I-370 on ramp	0	0	-100%	80	0	-100%
Shady Grove Rd WB on ramp	0	0	-	0	0	-
Shady Grove Rd EB on ramp	0	0	-	0	0	-
I-270 on ramp	0	0	-	0	0	-
MD 28 WB on ramp	0	0	-	0	14	-
MD 28 EB on ramp	0	302	71779%	63	2024	3095%
I-270 on ramp	0	0	-	0	0	-
MD 189 on ramp	0	3	-	0	115	-
Montrose Rd WB on ramp	1	25	1955%	115	284	146%
Montrose Rd EB on ramp	0	0	-	0	0	-

Table D.13: PM Peak -2040 Hard Shoulder Running- I-270 Off Ramp Queue Length - Southbound

I-270 Southbound	No Build VISSIM Average Queue (feet)	HSR VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	HSR VISSIM Maximum Queue (feet)	% Change
MD 85 SB off ramp	22	13	-38%	383	341	-11%
MD 85 NB off ramp	17	2	-88%	354	221	-37%
MD 80 off ramp	2	1	-66%	204	69	-66%
MD 109 off ramp WB	1	0	-100%	88	0	-100%
MD 109 off ramp EB	0	233	-	0	1056	-
MD 121 off ramp EB	217	0	-100%	970	111	-89%
MD 121 off ramp WB	0	23	5668%	137	143	4%
MD 27 off ramp EB	22	0	-100%	137	0	-100%
MD 27 off ramp WB	1	24	2493%	65	146	126%
MD 118 off ramp EB	24	0	-100%	142	22	-84%
MD 118 off ramp WB	0	125	416867%	23	646	2759%
Watkins Mill Rd off ramp	103	1517	1376%	384	3730	872%
MD 124 off ramp EB	185	7	-96%	731	309	-58%
MD 124 off ramp WB	17	1202	7051%	445	3834	762%
I-370 off ramp WB	147	0	-100%	725	0	-100%
I-370 off ramp EB	0	1	-	0	49	-
Shady Grove Rd off ramp - Omega Drive	1	0	-100%	52	0	-100%
Shady Grove Rd off ramp	0	4	-	0	140	-
MD 28 off ramp	3	110	3905%	149	461	209%
MD 189 off ramp EB	108	0	-100%	433	0	-100%
MD 189 off ramp WB	0	0	-	0	0	-
Montrose Rd off ramp WB	0	3	-	0	321	-
Montrose Rd off ramp EB	4	205	5140%	337	695	106%
Rockledge Dr off ramp	155	21	-87%	641	164	-74%
I-270 Spur Southbound	No Build VISSIM Average Queue (feet)	HSR VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	HSR VISSIM Maximum Queue (feet)	% Change
Democracy Blvd off ramp EB	20	0	-100%	136	0	-100%
Democracy Blvd off ramp WB	0	82	-	0	826	-
MD 190 off ramp WB	80	0	-100%	797	0	-100%
MD 190 off ramp EB	0	0	-	0	6	-
Clara Barton Pkwy WB off ramp	0	36	359000%	6	313	5119%

Table D.14: PM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
1- MD 85 at Sam's Club Drive											
1	NB	60.8	E	NB Left	134	78	463	889	E	115.6	F
				NB Through	570	38	463	889	D		
				NB Right	935	72	443	912	E		
	SB	179.8	F	SB Left	153	131	1021	1231	F		
				SB Through	874	186	1021	1231	F		
				SB Right	74	209	1021	1231	F		
	EB	35.0	C	EB Left	55	84	32	144	F		
				EB Through	24	81	32	144	F		
				EB Right	169	13	32	144	B		
	WB	163.6	F	WB Left	561	181	536	762	F		
				WB Through	30	166	536	762	F		
				WB Right	224	119	536	762	F		
2- MD 85 at I-270 NB on and off ramp											
2	NB	58.5	E	NB Left	1136	58	700	1857	E	48.2	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	32.6	C	SB Left	0	0	0	0	A		
				SB Through	743	33	132	737	C		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
3- MD 85 at I-270 SB on and off ramp											
3	NB	17.3	B	NB Left	0	0	0	0	A	19.5	B
				NB Through	1975	17	181	1210	B		
				NB Right	0	0	0	0	A		
	SB	44.0	D	SB Left	173	44	74	582	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
4- MD 85 at Crestwood Blvd											
4	NB	68.0	F	NB Left	74	103	368	830	F	51.3	D
				NB Through	1450	66	367	830	E		
				NB U-Turn	0	0	0	0	A		
	SB	31.9	C	SB Left	105	83	53	246	F		
				SB Through	940	30	105	1039	C		
				SB Right	923	28	92	1030	C		
	EB	63.3	E	EB Left	949	66	196	744	E		
				EB Through	43	51	196	744	D		
				EB Right	28	1	196	744	A		
	WB	53.0	D	WB Left	44	78	60	230	E		
				WB Through	79	81	60	230	F		
				WB Right	94	18	60	230	B		
5- MD 80 at I-270 NB on and ramp											
5	NB	-0.9	A	NB Left	1	9	0	4	A	11.5	B
				NB Through	2	0	0	4	A		
				NB Right	7	-3	0	4	A		
	SB	12.8	B	SB Left	479	16	27	238	B		
				SB Through	22	16	27	238	B		
				SB Right	149	3	0	0	A		
	EB	13.6	B	EB Left	97	14	24	208	B		
				EB Through	0	0	8	0	A		
				EB Right	5	10	37	239	B		
	WB	10.7	B	WB Left	15	14	0	38	B		
				WB Through	670	18	66	419	B		
				WB Right	612	2	0	0	A		
6- MD 80 at I-270 SB on and off ramp											
6	NB	3.4	A	NB Left	55	5	3	239	A	5.9	A
				NB Through	0	0	0	0	A		
				NB Right	605	3	3	239	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	7.1	A	EB Left	0	0	0	0	A		
				EB Through	382	8	4	111	A		
				EB Right	66	4	4	119	A		
	WB	8.4	A	WB Left	0	0	0	0	A		
				WB Through	446	8	3	163	A		
				WB Right	0	0	0	0	A		
7- MD 109 at I-270 NB on and off ramp											
7	NB			NB Left	0	0	0	0	A	7.9	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	15.2	C	SB Left	317	16	34	268	C		
				SB Through	0	0	0	0	A		
				SB Right	25	6	1	162	A		
	EB	2.5	A	EB Left	80	2	0	47	A		
				EB Through	0	0	0	0	A		
				EB Right	83	3	0	0	A		
	WB	0.4	A	WB Left	0	0	0	0	A		
				WB Through	222	0	0	0	A		
				WB Right	0	0	0	0	A		
8- MD 80 at I-270 SB on and off ramp											
8	NB	4.9	A	NB Left	63	8	3	120	A	1.8	A
				NB Through	0	0	0	0	A		
				NB Right	36	0	0	63	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.9	A	EB Left	0	0	0	0	A		
				EB Through	166	0	0	0	A		
				EB Right	34	4	0	0	A		
	WB	1.4	A	WB Left	137	1	0	58	A		
				WB Through	110	2	0	30	A		
				WB Right	0	0	0	0	A		
9- MD 121 at Gateway Center Dr											
9	NB	29.4	D	NB Left	590	33	112	604	C	47.0	D
				NB Through	795	28	112	604	C		
				NB Right	64	16	119	630	B		
	SB	22.6	C	SB Left	28	15	19	219	B		
				SB Through	300	24	31	223	C		
				SB Right	9	13	34	244	B		
	EB	14.9	B	EB Left	4	40	8	196	D		
				EB Through	24	41	15	229	D		
				EB Right	248	12	27	261	B		
	WB	117.1	F	WB Left	349	162	304	715	F		
				WB Through	75	73	304	714	E		
				WB Right	186	51	327	739	D		
10- MD 121 at I-270 NB on and off ramp											
10	NB	22.1	C	NB Left	372	59	77	320	F	18.1	B
				NB Through	0	0	0	0	A		
				NB Right	785	4	1	73	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	11.8	B	EB Left	0	0	0	0	A		
				EB Through	651	18	38	367	C		
				EB Right	336	1	0	0	A		
	WB	20.0	C	WB Left	219	60	86	412	F		
				WB Through	682	7	86	412	A		
				WB Right	0	0	0	0	A		

Table D.14: PM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
11- MD 121 at I-270 SB on and off ramp											
11	NB			NB Left	0	0	0	0	A	22.3	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	62.3	E	SB Left	271	85	226	977	F		
				SB Through	0	0	0	0	A		
				SB Right	254	39	0	49	E		
	EB	6.5	A	EB Left	0	0	0	0	A		
				EB Through	717	6	16	229	A		
				EB Right	0	0	0	0	A		
	WB	13.2	B	WB Left	0	0	0	0	A		
WB Through				520	27	46	382	D			
WB Right				538	0	0	0	A			
12- MD 27 at Observation Dr											
12	NB	37.7	D	NB U-Turn	0	0	0	0	A	24.8	C
				NB Through	94	55	22	98	E		
				NB Right	61	11	22	98	B		
	SB	41.3	D	SB Left	146	44	38	216	D		
				SB Through	57	62	43	250	E		
				SB Right	188	33	69	287	C		
	EB	18.6	B	EB Left	189	33	70	458	C		
				EB Through	2012	17	71	459	B		
				EB Right	97	16	84	497	B		
	WB	27.9	C	WB Left	41	24	149	731	C		
WB Through				1695	29	149	731	C			
WB Right				69	9	149	731	A			
13- MD 27 at I-270 NB off ramp											
13	NB	47.2	D	NB Left	303	47	52	260	D	6.5	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.1	A	EB Left	0	0	0	0	A		
				EB Through	1512	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	4.9	A	WB Left	0	0	0	0	A		
WB Through				1791	5	37	726	A			
WB Right				0	0	0	0	A			
14- MD 27 at I-270 SB off ramp											
14	NB			NB Left	0	0	0	0	A	5.2	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	50.1	D	SB Left	174	50	33	150	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	1.8	A	EB Left	0	0	0	0	A		
				EB Through	1677	2	4	89	A		
				EB Right	0	0	0	0	A		
	WB	3.7	A	WB Left	0	0	0	0	A		
WB Through				1541	4	12	384	A			
WB Right				0	0	0	0	A			
15- MD 27 at Crystal Rock Dr											
15	NB	31.1	C	NB Left	77	30	107	545	C	70.1	E
				NB Through	1196	31	116	545	C		
				NB Right	55	29	123	558	C		
	SB	56.5	E	SB Left	157	74	381	1298	E		
				SB Through	1468	58	381	1298	E		
				SB Right	225	33	368	1291	C		
	EB	40.4	D	EB Left	125	53	34	129	D		
				EB Through	49	36	30	124	D		
				EB Right	62	18	23	156	B		
	WB	163.8	F	WB Left	104	99	1056	1511	F		
WB Through				127	110	1056	1511	F			
WB Right				665	184	1056	1511	F			
16- MD 118 at Seneca Meadows Pkwy											
16	NB	4.9	A	NB Left	97	14	2	77	B	9.0	A
				NB Through	1309	4	11	182	A		
				NB Right	1	-1	19	235	A		
	SB	7.4	A	SB Left	15	8	19	307	A		
				SB Through	1226	7	22	307	A		
				SB Right	11	5	25	340	A		
	EB	14.0	B	EB Left	23	59	14	138	E		
				EB Through	0	65	14	138	E		
				EB Right	312	11	14	138	B		
	WB	53.8	D	WB Left	103	65	43	243	E		
WB Through				7	69	39	242	E			
WB Right				30	13	48	262	B			
17- MD 118 at I-270 NB on ramp											
17	NB			NB Left	0	0	0	0	A	13.8	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	26.5	C	EB Left	493	26	43	299	C		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	10.0	A	WB Left	0	0	0	0	A		
WB Through				283	2	1	139	A			
WB Right				1361	12	46	611	B			
18- MD 118 at I-270 SB off ramp											
18	NB			NB Left	0	0	0	0	A	7.1	A
				NB Through	0	0.0	0	0	A		
				NB Right	0	0.0	0	0	A		
	SB	37.7	D	SB Left	169	37.7	27	145	D		
				SB Through	0	0.0	0	0	A		
				SB Right	0	0.0	0	0	A		
	EB	5.5	A	EB Left	0	0.0	0	0	A		
				EB Through	1407	5.5	13	384	A		
				EB Right	0	0.0	0	0	A		
	WB	5.1	A	WB Left	0	0.0	0	0	A		
WB Through				1499	5.1	10	218	A			
WB Right				0	0.0	0	0	A			
19- MD 118 at Aircraft Dr											
19	NB	26.2	C	NB Left	53	72	43	241	E	43.0	D
				NB Through	53	70	43	241	E		
				NB Right	227	5	5	87	A		
	SB	165.9	F	SB Left	436	156	419	656	F		
				SB Through	14	205	419	656	F		
				SB Right	126	195	419	656	F		
	EB	22.6	C	EB Left	125	31	89	536	C		
				EB Through	1415	22	89	536	C		
				EB Right	21	20	89	536	B		
	WB	24.3	C	WB Left	15	30	107	749	C		
WB Through				1399	28	107	749	C			
WB Right				367	8	107	749	A			
20- Middlebrook Rd at Observation Dr											
20	NB			NB Left	0	0	0	0	A	9.0	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	20.5	C	SB Left	124	36	23	150	D		
				SB Through	0	0	0	0	A		
				SB Right	186	10	23	150	B		
	EB	6.0	A	EB Left	14	11	15	149	B		
				EB Through	1053	6	15	149	A		
				EB Right	0	0	0	0	A		
	WB	8.8	A	WB Left	0	0	0	0	A		
WB Through				1313	9	27	253	A			
WB Right				17	7	42	302	A			

Table D.14: PM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
21- Middlebrook Rd at I-270 SB on ramp											
21	NB			NB Left	0	0	0	0	A	4.6	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	2.7	A	EB Left	0	0	0	0	A		
				EB Through	742	3	4	110	A		
				EB Right	0	0	0	0	A		
	WB	7.8	A	WB Left	438	8	5	236	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
22- Middlebrook Rd at Waring Station Rd											
22	NB	48.4	D	NB Left	200	46	83	309	D	13.7	B
				NB Through	1	55	83	309	D		
				NB Right	236	50	83	309	D		
	SB	30.1	C	SB Left	32	47	8	72	D		
				SB Through	2	38	8	72	D		
				SB Right	24	7	19	110	A		
	EB	8.0	A	EB Left	4	11	28	285	B		
				EB Through	1125	8	28	285	A		
				EB Right	198	7	28	285	A		
	WB	8.6	A	WB Left	210	21	28	289	C		
				WB Through	1437	7	28	289	A		
				WB Right	3	3	28	289	A		
23- MD 124 at MD 355											
23	NB	130.8	F	NB Left	490	115	682	1082	F	78.6	E
				NB Through	1162	138	680	1079	F		
				NB Right	7	85	0	0	F		
	SB	44.6	D	SB Left	180	92	146	490	F		
				SB Through	698	66	146	490	E		
				SB Right	720	12	44	383	B		
	EB	27.2	C	EB Left	291	68	108	598	E		
				EB Through	1615	25	108	598	C		
				EB Right	338	3	28	551	A		
	WB	126.4	F	WB Left	0	0	0	0	A		
				WB Through	1645	129	683	946	F		
				WB Right	88	83	0	3	F		
24- MD 124 at I-270 SB on and off											
24	NB	95.9	F	NB Left	55	84	67	182	F	63.0	E
				NB Through	21	127	67	182	F		
				NB U-Turn	0	0	0	0	A		
	SB	55.4	E	SB Left	547	95	190	736	F		
				SB Through	8	98	190	736	F		
				SB Right	456	7	13	379	A		
	EB	101.1	F	EB Left	0	0	0	0	A		
				EB Through	1409	100	584	1113	F		
				EB Right	22	162	604	1137	F		
	WB	21.7	C	WB Left	5	78	653	2194	E		
				WB Through	1192	22	653	2194	C		
				WB Right	0	0	0	0	A		
25- MD 117 at MD 124											
25	NB	78.5	E	NB Left	54	158	328	743	F	50.1	D
				NB Through	686	93	328	743	F		
				NB Right	461	48	29	665	D		
	SB	37.8	D	SB Left	134	61	153	737	E		
				SB Through	969	41	153	737	D		
				SB Right	182	5	0	0	A		
	EB	44.9	D	EB Left	153	80	152	574	E		
				EB Through	1156	41	152	576	D		
				EB Right	57	37	156	603	D		
	WB	42.6	D	WB Left	315	71	205	1006	E		
				WB Through	1069	38	205	1006	D		
				WB Right	99	1	0	0	A		
26- MD 117 at Bureau Dr											
26	NB	50.3	D	NB Left	98	76	81	296	E	37.8	D
				NB Through	35	77	81	296	E		
				NB Right	272	38	81	296	D		
	SB	80.7	F	SB Left	284	95	132	405	F		
				SB Through	23	83	132	405	F		
				SB Right	83	32	132	405	C		
	EB	30.3	C	EB Left	52	54	165	806	D		
				EB Through	1683	30	166	806	C		
				EB Right	6	18	160	795	B		
	WB	31.9	C	WB Left	14	35	185	997	D		
				WB Through	1272	34	186	998	C		
				WB Right	213	19	211	1046	B		
27- MD 117 at I-270 SB off ramp											
27	NB			NB Left	0	0	0	0	A	12.8	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	3.7	A	EB Left	0	0	0	0	A		
				EB Through	944	4	6	464	A		
				EB Right	0	0	0	0	A		
	WB	40.7	E	WB Left	306	41	98	848	E		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
28- MD 117 at I-270 NB off ramp											
28	NB			NB Left	0	0	0	0	A	24.3	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	89.3	F	SB Left	97	91	1950	2779	F		
				SB Through	0	0	0	0	A		
				SB Right	374	89	1949	2779	F		
	EB	17.3	B	EB Left	3	120	90	983	F		
				EB Through	947	17	90	983	B		
				EB Right	0	0	0	0	A		
	WB	7.3	A	WB Left	0	0	0	0	A		
				WB Through	1403	7	52	390	A		
				WB Right	0	0	52	390	A		
29- MD 117 at Perry Pkwy											
29	NB	40.8	D	NB Left	19	59	17	125	E	49.4	D
				NB Through	26	59	17	124	E		
				NB Right	34	17	27	145	B		
	SB	162.4	F	SB Left	241	198	280	446	F		
				SB Through	21	220	280	446	F		
				SB Right	121	82	280	446	F		
	EB	21.1	C	EB Left	223	69	74	337	E		
				EB Through	778	8	74	337	A		
				EB Right	30	7	60	321	A		
	WB	41.4	D	WB Left	37	108	248	736	F		
				WB Through	1260	42	248	736	D		
				WB Right	382	33	248	736	C		
30- Shady Grove Rd at I-270 NB off ramp											
30	NB	7.6	A	NB Left	0	0	0	0	A	30.1	C
				NB Through	914	8	87	483	A		
				NB Right	0	0	0	0	A		
	SB	44.7	D	SB Left	0	0	0	0	A		
				SB Through	1013	45	163	681	D		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	51.6	D	WB Left	267	52	48	264	D		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table D.14: PM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
31- Shady Grove Rd at I-270 SB off ramp											
31	NB	31.3	C	NB Left	0	0	0	0	A	29.5	C
				NB Through	1229	31	435	1759	C		
				NB Right	0	0	0	0	A		
	SB	5.6	A	SB Left	0	0	0	0	A		
				SB Through	676	6	7	154	A		
				SB Right	0	0	0	0	A		
	EB	55.6	E	EB Left	232	54	43	211	D		
				EB Through	0	0	0	0	A		
				EB Right	304	57	62	297	E		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
32- MD 28 at I-270 SB off ramp											
32	NB			NB U-Turn	0	0	0	0	A	7.9	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	37.2	D	SB Left	406	46	71	322	D		
				SB Through	0	0	0	0	A		
				SB Right	97	3	0	28	A		
	EB	2.8	A	EB Left	0	0	0	0	A		
				EB Through	1560	1	0	0	A		
				EB Right	932	6	16	224	A		
	WB	6.7	A	WB Left	0	0	0	0	A		
				WB Through	1642	7	20	253	A		
				WB Right	0	0	0	0	A		
33- MD 28 at I-270 on and off ramps											
33	NB	36.9	D	NB Left	0	0	41	226	A	39.9	D
				NB Through	185	49	49	235	D		
				NB Right	123	18	49	235	B		
	SB	137.2	F	SB Left	14	160	361	412	F		
				SB Through	0	0	0	0	A		
				SB Right	219	136	361	412	F		
	EB	20.0	B	EB Left	283	61	94	334	E		
				EB Through	920	7	94	334	A		
				EB Right	0	0	0	0	A		
	WB	41.7	D	WB Left	40	37	168	432	D		
				WB Through	1279	42	144	396	D		
				WB Right	0	0	0	0	A		
34- MD 189 at Great Falls Rd											
34	NB	36.7	D	NB Left	43	45	12	90	D	13.2	B
				NB Through	14	48	9	90	D		
				NB Right	19	9	9	101	A		
	SB	3.4	A	SB Left	18	41	7	83	D		
				SB Through	13	48	7	83	D		
				SB Right	408	0	3	48	A		
	EB	11.6	B	EB Left	410	23	37	417	C		
				EB Through	644	5	6	200	A		
				EB Right	55	5	10	236	A		
	WB	18.0	B	WB Left	14	19	52	406	B		
				WB Through	842	18	51	406	B		
				WB Right	18	12	67	440	B		
35- MD 189 at I-270 Ramps											
35	NB	47.1	D	NB Left	225	47	41	196	D	42.5	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	54.4	D	SB Left	348	54	124	453	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	28.0	C	EB Left	479	32	91	341	C		
				EB Through	373	23	91	341	C		
				EB Right	0	0	0	0	A		
	WB	50.8	D	WB Left	443	54	111	336	D		
				WB Through	428	47	111	336	D		
				WB Right	0	0	0	0	A		
36- MD 189 at Wootton Pkwy											
36	NB	45.9	D	NB Left	238	57	142	506	E	52.4	D
				NB Through	694	51	142	506	D		
				NB Right	176	12	142	506	B		
	SB	82.8	F	SB Left	250	101	295	794	F		
				SB Through	926	78	312	780	E		
				SB Right	0	0	0	0	A		
	EB	38.7	D	EB Left	153	72	123	486	E		
				EB Through	552	38	123	486	D		
				EB Right	204	15	123	486	B		
	WB	39.5	D	WB Left	157	72	141	743	E		
				WB Through	775	41	141	743	D		
				WB Right	315	19	141	743	B		
37- Montrose Rd at Tower Oaks Blvd											
37	NB	0.4	A	NB Left	0	0	0	0	A	32.4	C
				NB Through	0	0	0	0	A		
				NB Right	537	0	0	0	A		
	SB	143.6	F	SB Left	87	49	213	902	D		
				SB Through	0	0	0	0	A		
				SB Right	305	171	269	899	F		
	EB	6.9	A	EB Left	0	0	0	0	A		
				EB Through	1868	7	39	520	A		
				EB Right	0	0	0	0	A		
	WB	40.0	D	WB Left	79	37	39	520	D		
				WB Through	2426	41	277	780	D		
				WB Right	261	30	277	780	C		
38- Tower Oaks Blvd at I-270 off ramp											
38	NB	23.3	C	NB Left	707	24	50	240	C	17.3	B
				NB Through	0	0.0	43	232	A		
				NB Right	26	7.0	50	240	A		
	SB	9.8	A	SB Left	8	18.4	1	39	B		
				SB Through	0	0.0	1	39	A		
				SB Right	9	2.2	0	23	A		
	EB	10.8	B	EB Left	1	11.5	16	177	B		
				EB Through	363	11.2	16	177	B		
				EB Right	37	7.0	11	167	A		
	WB	12.7	B	WB Left	139	16.3	16	145	B		
				WB Through	203	10.4	16	145	B		
				WB Right	3	3.4	3	100	A		
39- Montrose Rd at Tower Oaks Blvd											
39	NB	20.0	C	NB Left	97	42	83	387	D	45.0	D
				NB Through	773	32	83	387	C		
				NB Right	621	2	0	0	A		
	SB	32.1	C	SB Left	210	63	76	334	E		
				SB Through	506	23	74	333	C		
				SB Right	131	15	72	340	B		
	EB	133.4	F	EB Left	104	112	358	697	F		
				EB Through	518	136	360	698	F		
				EB Right	44	149	382	722	F		
	WB	36.9	D	WB Left	542	46	109	374	D		
				WB Through	456	42	110	374	D		
				WB Right	315	13	129	404	B		
40- Rockledge Blvd at I-270 NB on and off ramp											
40	NB	132.4	F	NB Left	0	0	0	0	A	112.4	F
				NB Through	335	121	557	836	F		
				NB Right	854	137	557	836	F		
	SB	85.9	F	SB Left	0	0	89	217	A		
				SB Through	352	86	89	217	F		
				SB Right	0	0	0	0	A		
	EB	93.5	F	EB Left	6	184	288	804	F		
				EB Through	459	148	288	804	F		
				EB Right	304	10	0	0	B		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table D.14: PM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
41- Rockledge Blvd at I-270 SB on and off ramps											
41	NB	30.3	C	NB Left	343	30	76	273	C	48.1	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	53.0	D	WB Left	355	59	195	867	E		
				WB Through	890	51	195	867	D		
				WB Right	0	0	0	0	A		
42- MD 187 at Tuckerman Ln											
42	NB	66.6	E	NB Left	216	39	567	1282	D	128.7	F
				NB Through	2309	68	567	1282	E		
				NB Right	200	76	567	1282	E		
	SB	187.6	F	SB Left	205	172	2555	2693	F		
				SB Through	1151	185	2555	2693	F		
				SB Right	306	209	2555	2693	F		
	EB	112.4	F	EB Left	302	66	540	1403	E		
				EB Through	534	136	541	1404	F		
				EB Right	118	121	564	1428	F		
	WB	195.5	F	WB Left	465	191	1941	2142	F		
				WB Through	674	211	1941	2142	F		
				WB Right	166	145	1941	2142	F		
43- MD 187 at I-270 NB on and off ramps											
43	NB	16.8	B	NB Left	566	35	117	404	C	20.4	C
				NB Through	2515	13	117	404	B		
				NB Right	0	0	0	0	A		
	SB	25.1	C	SB Left	0	0	0	0	A		
				SB Through	1290	25	66	269	C		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	60.3	E	WB Left	59	60	47	317	E		
				WB Through	67	60	47	317	E		
				WB Right	0	0	0	0	A		
44- MD 187 at I-270 NB on and off ramps											
44	NB	40.0	E	NB Left	0	0	0	0	A	36.9	D
				NB Through	2426	40	155	739	D		
				NB Right	0	0	0	0	A		
	SB	18.1	B	SB Left	147	56	67	271	E		
				SB Through	1203	13	67	271	B		
				SB Right	0	0	0	0	A		
	EB	58.2	E	EB Left	652	60	143	560	E		
				EB Through	0	0	143	560	A		
				EB Right	179	53	82	486	D		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
45- MD 187 at Rock Spring Dr											
45	NB	20.6	C	NB Left	492	37	123	826	D	29.8	C
				NB Through	2174	17	124	827	B		
				NB Right	18	14	145	860	B		
	SB	34.2	C	SB Left	21	62	111	472	E		
				SB Through	1186	39	111	472	D		
				SB Right	173	1	69	465	A		
	EB	50.0	D	EB Left	431	60	146	519	E		
				EB Through	50	68	146	519	E		
				EB Right	484	39	146	519	D		
	WB	17.1	B	WB Left	7	29	6	108	C		
				WB Through	16	33	6	108	C		
				WB Right	36	8	3	97	A		
47-Democracy Blvd at I-270 NB off ramp											
47	NB	45.3	D	NB Left	154	45	28	136	D	3.0	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	1.2	A	EB Left	0	0	0	0	A		
				EB Through	1127	1	3	66	A		
				EB Right	0	0	0	0	A		
	WB	1.1	A	WB Left	0	0	0	0	A		
				WB Through	2241	1	3	84	A		
				WB Right	0	0	0	0	A		
48- Democracy Blvd at I-270 SB on ramp											
48	NB			NB Left	0	0	0	0	A	8.4	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	5.5	A	EB Left	0	0	0	0	A		
				EB Through	1336	5	19	232	A		
				EB Right	0	0	0	0	A		
	WB	10.1	B	WB Left	543	35	59	404	D		
				WB Through	1827	3	49	383	A		
				WB Right	0	0	0	0	A		
49- Democracy Blvd at I-270 SB off ramp											
49	NB			NB Left	0	0	0	0	A	8.8	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	37.4	D	SB Left	154	51	28	143	D		
				SB Through	0	0	0	0	A		
				SB Right	59	2	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	5.8	A	WB Left	0	0	0	0	A		
				WB Through	1827	4	19	305	A		
				WB Right	156	29	116	746	C		
50- MD 190 at Burdette Rd											
50	NB	76.4	E	NB Left	27	79	18	118	E	36.6	D
				NB Through	7	69	18	118	E		
				NB Right	6	75	18	118	E		
	SB	37.5	D	SB Left	45	77	25	148	E		
				SB Through	9	72	25	148	E		
				SB Right	122	20	25	148	C		
	EB	21.6	C	EB Left	138	99	113	625	F		
				EB Through	1297	14	113	625	B		
				EB Right	31	4	99	653	A		
	WB	45.7	D	WB Left	13	114	390	1119	F		
				WB Through	2161	46	390	1119	D		
				WB Right	65	35	390	1119	C		

Table D.14: PM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
51- MD 190 at I-270 NB on ramp											
51	NB			NB Left	0	0	0	0	A	17.6	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	65.7	E	EB Left	254	66	101	343	E		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	9.3	A	WB Left	0	0	0	0	A		
				WB Through	1471	9	49	692	A		
				WB Right	0	0	0	0	A		
52- MD 190 at I-270 SB off ramp											
52	NB	70.5	E	NB Left	225	70	84	800	E	12.3	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	3.6	A	EB Left	0	0	0	0	A		
				EB Through	1062	4	8	176	A		
				EB Right	0	0	0	0	A		
	WB	10.0	A	WB Left	0	0	0	0	A		
				WB Through	1641	10	30	635	A		
				WB Right	0	0	0	0	A		
53- MD 190 at Seven Locks Rd											
53	NB	0.5	A	NB Left	28	1	0	0	A	26.9	C
				NB Through	314	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	52.6	D	SB Left	364	52	120	414	D		
				SB Through	232	53	120	414	D		
				SB Right	20	50	120	414	D		
	EB	32.0	C	EB Left	27	30	95	436	C		
				EB Through	800	32	95	436	C		
				EB Right	45	32	95	436	C		
	WB	20.8	C	WB Left	255	75	124	491	E		
				WB Through	914	18	124	491	B		
				WB Right	693	5	124	491	A		
54- MD 124 at I-270 NB off ramp											
54	NB	31.3	C	NB Left	0	0	0	0	A	23.6	C
				NB Through	0	0	0	0	A		
				NB Right	556	31	56	630	C		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	21.1	C	EB Left	0	0	0	0	A		
				EB Through	1661	21	57	938	C		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
55- Democracy Blvd at I-270 NB off ramp											
55	NB	46.2	D	NB Left	0	0	0	0	A	11.2	B
				NB Through	0	0	0	0	A		
				NB Right	313	46	51	205	D		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	1.5	A	EB Left	0	0	0	0	A		
				EB Through	1128	2	4	59	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
56- Watkins Mill Rd at I-270 SB off ramp/Parkview Ave											
56	NB	71.3	E	NB Left	145	53	170	656	D	87.9	F
				NB Through	0	0	0	0	A		
				NB Right	342	79	170	656	E		
	SB	42.7	D	SB Left	410	63	107	388	E		
				SB Through	110	59	107	388	E		
				SB Right	441	20	107	388	C		
	EB	143.5	F	EB Left	0	0	0	0	A		
				EB Through	1216	144	961	1246	F		
				EB Right	4	136	961	1246	F		
	WB	41.9	D	WB Left	62	85	49	220	F		
				WB Through	295	33	47	219	C		
				WB Right	0	0	0	0	A		
57- Watkins Mill Rd at I-270 NB on ramp											
57	NB	40.5	D	NB Left	77	65	56	638	E	72.4	E
				NB Through	0	0	0	0	A		
				NB Right	193	31	56	638	C		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	26.1	C	EB Left	644	66	146	438	E		
				EB Through	1051	2	146	438	A		
				EB Right	0	0	0	0	A		
	WB	157.1	F	WB Left	0	0	0	0	A		
				WB Through	684	122	651	866	F		
				WB Right	343	227	651	866	F		
58- Watkins Mill Rd at I-270 SB on ramp											
58	NB			NB Left	0	0	0	0	A	16.5	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	17.2	B	EB Left	0	0	0	0	A		
				EB Through	1691	19	150	598	B		
				EB Right	286	8	150	598	A		
	WB	14.8	B	WB Left	409	27	46	464	C		
				WB Through	352	1	46	464	A		
				WB Right	0	0	0	0	A		

Table D.15: PM Peak -2040 Hard Shoulder Running- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
1- MD 85 at Sam's Club Drive											
1	NB	60.2	E	NB Left	133	77	451	887	E	118.0	F
				NB Through	566	37	451	887	D		
				NB Right	934	72	422	910	E		
	SB	178.8	F	SB Left	153	128	1025	1234	F		
				SB Through	870	186	1025	1234	F		
				SB Right	72	202	1025	1234	F		
	EB	34.5	C	EB Left	55	84	31	138	F		
				EB Through	24	81	31	138	F		
				EB Right	169	12	31	138	B		
	WB	177.5	F	WB Left	563	196	565	760	F		
				WB Through	31	171	565	760	F		
				WB Right	223	131	565	760	F		
2- MD 85 at I-270 NB on and off ramp											
2	NB	57.0	E	NB Left	1130	57	660	1799	E	47.0	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	31.9	C	SB Left	0	0	0	0	A		
				SB Through	743	32	130	695	C		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
3- MD 85 at I-270 SB on and off ramp											
3	NB	18.5	B	NB Left	0	0	0	0	A	20.5	C
				NB Through	1956	18	190	1287	B		
				NB Right	0	0	0	0	A		
	SB	43.8	D	SB Left	174	44	110	692	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
4- MD 85 at Crestwood Blvd											
4	NB	77.6	F	NB Left	73	110	419	900	F	54.6	D
				NB Through	1437	76	419	901	E		
				NB U-Turn	0	0	0	0	A		
	SB	31.9	C	SB Left	105	76	47	199	E		
				SB Through	941	30	102	850	C		
				SB Right	919	29	89	841	C		
	EB	64.3	E	EB Left	950	67	203	757	E		
				EB Through	43	52	203	757	D		
				EB Right	28	2	203	757	A		
	WB	54.9	D	WB Left	44	78	62	236	E		
				WB Through	79	84	62	236	F		
				WB Right	94	19	62	236	B		
5- MD 80 at I-270 NB on and ramp											
5	NB	-1.8	A	NB Left	1	0	0	5	A	11.4	B
				NB Through	2	0	0	5	A		
				NB Right	7	-3	0	5	A		
	SB	12.6	B	SB Left	481	16	27	177	B		
				SB Through	22	17	27	177	B		
				SB Right	151	3	0	0	A		
	EB	13.4	B	EB Left	97	14	23	229	B		
				EB Through	0	0	8	0	A		
				EB Right	5	5	36	259	A		
	WB	10.7	B	WB Left	15	15	1	35	B		
				WB Through	675	18	65	503	B		
				WB Right	612	2	0	14	A		
6- MD 80 at I-270 SB on and off ramp											
6	NB	3.5	A	NB Left	55	4	4	257	A	5.8	A
				NB Through	0	0	0	0	A		
				NB Right	604	3	4	257	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	7.0	A	EB Left	0	0	0	0	A		
				EB Through	381	7	4	105	A		
				EB Right	66	4	3	114	A		
	WB	7.9	A	WB Left	0	0	0	0	A		
				WB Through	447	8	2	118	A		
				WB Right	0	0	0	0	A		
7- MD 109 at I-270 NB on and off ramp											
7	NB			NB Left	0	0	0	0	A	8.5	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	16.6	C	SB Left	320	18	38	317	C		
				SB Through	0	0	0	0	A		
				SB Right	25	5	0	182	A		
	EB	2.5	A	EB Left	80	2	0	55	A		
				EB Through	0	0	0	0	A		
				EB Right	83	3	0	0	A		
	WB	0.4	A	WB Left	0	0	0	0	A		
				WB Through	222	0	0	0	A		
				WB Right	0	0	0	0	A		
8- MD 80 at I-270 SB on and off ramp											
8	NB	4.7	A	NB Left	63	8	3	105	A	1.8	A
				NB Through	0	0	0	0	A		
				NB Right	37	0	0	23	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.9	A	EB Left	0	0	0	0	A		
				EB Through	166	0	0	0	A		
				EB Right	34	4	0	0	A		
	WB	1.5	A	WB Left	137	1	0	55	A		
				WB Through	109	2	0	26	A		
				WB Right	0	0	0	0	A		
9- MD 121 at Gateway Center Dr											
9	NB	30.0	D	NB Left	632	35	128	658	C	46.3	D
				NB Through	857	28	128	658	C		
				NB Right	70	11	136	684	B		
	SB	21.7	C	SB Left	27	15	19	217	B		
				SB Through	301	23	30	217	C		
				SB Right	9	9	32	237	A		
	EB	14.2	B	EB Left	4	43	8	248	D		
				EB Through	24	37	14	248	D		
				EB Right	248	12	26	281	B		
	WB	116.2	F	WB Left	350	160	295	690	F		
				WB Through	75	77	295	689	E		
				WB Right	185	49	318	714	D		
10- MD 121 at I-270 NB on and off ramp											
10	NB	21.3	C	NB Left	422	57	80	293	F	18.4	B
				NB Through	0	0	0	0	A		
				NB Right	900	4	0	88	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	12.6	B	EB Left	0	0	0	0	A		
				EB Through	648	19	41	375	C		
				EB Right	336	1	0	0	A		
	WB	20.5	C	WB Left	219	60	89	448	F		
				WB Through	677	8	89	448	A		
				WB Right	0	0	0	0	A		

Table D.15: PM Peak -2040 Hard Shoulder Running- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
11- MD 121 at I-270 SB on and off ramp											
11	NB			NB Left	0	0	0	0	A	22.9	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	64.8	E	SB Left	269	87	239	1062	F		
				SB Through	0	0	0	0	A		
				SB Right	251	41	0	49	E		
	EB	6.4	A	EB Left	0	0	0	0	A		
				EB Through	717	6	16	218	A		
				EB Right	0	0	0	0	A		
	WB	13.8	B	WB Left	0	0	0	0	A		
				WB Through	562	27	49	369	D		
				WB Right	535	0	0	0	A		
12- MD 27 at Observation Dr											
12	NB	38.4	D	NB U-Turn	0	0	0	0	A	26.1	C
				NB Through	94	55	22	98	E		
				NB Right	61	13	22	98	B		
	SB	41.3	D	SB Left	146	44	38	216	D		
				SB Through	57	62	44	250	E		
				SB Right	188	33	68	287	C		
	EB	20.2	C	EB Left	211	34	88	520	C		
				EB Through	2246	19	90	521	B		
				EB Right	107	17	103	560	B		
	WB	30.0	C	WB Left	41	27	161	720	C		
				WB Through	1695	31	161	720	C		
				WB Right	69	11	161	720	B		
13- MD 27 at I-270 NB off ramp											
13	NB	44.0	D	NB Left	388	44	62	275	D	7.6	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.1	A	EB Left	0	0	0	0	A		
				EB Through	1515	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	6.1	A	WB Left	0	0	0	0	A		
				WB Through	1790	6	50	763	A		
				WB Right	0	0	0	0	A		
14- MD 27 at I-270 SB off ramp											
14	NB			NB Left	0	0	0	0	A	6.0	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	51.7	D	SB Left	175	52	34	156	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	1.9	A	EB Left	0	0	0	0	A		
				EB Through	1678	2	4	97	A		
				EB Right	0	0	0	0	A		
	WB	5.2	A	WB Left	0	0	0	0	A		
				WB Through	1624	5	22	412	A		
				WB Right	0	0	0	0	A		
15- MD 27 at Crystal Rock Dr											
15	NB	31.5	C	NB Left	76	33	109	578	C	72.1	E
				NB Through	1196	31	118	577	C		
				NB Right	55	30	125	590	C		
	SB	62.3	E	SB Left	164	80	468	1217	F		
				SB Through	1526	64	468	1217	E		
				SB Right	233	36	453	1211	D		
	EB	40.8	D	EB Left	125	54	35	129	D		
				EB Through	49	36	30	124	D		
				EB Right	62	19	23	158	B		
	WB	161.3	F	WB Left	104	95	1023	1500	F		
				WB Through	128	107	1023	1500	F		
				WB Right	665	182	1023	1500	F		
16- MD 118 at Seneca Meadows Pkwy											
16	NB	5.7	A	NB Left	109	15	2	90	B	9.5	A
				NB Through	1417	5	14	229	A		
				NB Right	1	2	23	282	A		
	SB	7.9	A	SB Left	16	8	21	314	A		
				SB Through	1226	8	24	314	A		
				SB Right	11	4	28	347	A		
	EB	14.0	B	EB Left	23	59	14	140	E		
				EB Through	0	65	14	140	E		
				EB Right	312	11	14	140	B		
	WB	53.9	D	WB Left	103	65	43	243	E		
				WB Through	7	69	39	242	E		
				WB Right	30	13	48	262	B		
17- MD 118 at I-270 NB on ramp											
17	NB			NB Left	0	0	0	0	A	13.6	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	25.7	C	EB Left	495	26	42	296	C		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	9.9	A	WB Left	0	0	0	0	A		
				WB Through	283	2	0	35	A		
				WB Right	1362	12	45	535	B		
18- MD 118 at I-270 SB off ramp											
18	NB			NB Left	0	0	0	0	A	7.5	A
				NB Through	0	0.0	0	0	A		
				NB Right	0	0.0	0	0	A		
	SB	36.4	D	SB Left	168	36.4	27	150	D		
				SB Through	0	0.0	0	0	A		
				SB Right	0	0.0	0	0	A		
	EB	6.0	A	EB Left	0	0.0	0	0	A		
				EB Through	1412	6.0	14	412	A		
				EB Right	0	0.0	0	0	A		
	WB	6.0	A	WB Left	0	0.0	0	0	A		
				WB Through	1713	6.0	14	295	A		
				WB Right	0	0.0	0	0	A		
19- MD 118 at Aircraft Dr											
19	NB	26.1	C	NB Left	52	71	42	242	E	41.9	D
				NB Through	53	69	42	242	E		
				NB Right	227	6	5	102	A		
	SB	153.1	F	SB Left	441	143	393	653	F		
				SB Through	14	204	393	653	F		
				SB Right	129	184	393	653	F		
	EB	22.8	C	EB Left	125	36	89	527	D		
				EB Through	1415	22	89	527	C		
				EB Right	21	20	89	527	C		
	WB	27.0	C	WB Left	16	31	140	971	C		
				WB Through	1566	31	140	971	C		
				WB Right	411	11	140	971	B		
20- Middlebrook Rd at Observation Dr											
20	NB			NB Left	0	0	0	0	A	9.0	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	20.5	C	SB Left	125	36	23	150	D		
				SB Through	0	0	0	0	A		
				SB Right	186	10	23	150	B		
	EB	6.4	A	EB Left	15	11	17	168	B		
				EB Through	1184	6	17	168	A		
				EB Right	0	0	0	0	A		
	WB	8.7	A	WB Left	0	0	0	0	A		
				WB Through	1313	9	27	275	A		
				WB Right	17	7	42	324	A		

Table D.15: PM Peak -2040 Hard Shoulder Running- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
21- Middlebrook Rd at I-270 SB on ramp											
21	NB			NB Left	0	0	0	0	A	4.6	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	2.6	A	EB Left	0	0	0	0	A		
				EB Through	742	3	4	103	A		
				EB Right	0	0	0	0	A		
	WB	7.9	A	WB Left	438	8	5	227	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
22- Middlebrook Rd at Waring Station Rd											
22	NB	48.4	D	NB Left	200	46	83	309	D	13.8	B
				NB Through	1	55	83	309	D		
				NB Right	236	50	83	309	D		
	SB	30.2	C	SB Left	32	47	8	72	D		
				SB Through	2	38	8	72	D		
				SB Right	24	8	19	110	A		
	EB	8.1	A	EB Left	4	15	28	285	B		
				EB Through	1125	8	28	285	A		
				EB Right	198	8	28	285	A		
	WB	9.4	A	WB Left	243	24	39	298	C		
				WB Through	1651	7	39	298	A		
				WB Right	3	2	39	298	A		
23- MD 124 at MD 355											
23	NB	140.6	F	NB Left	487	121	730	1135	F	74.8	E
				NB Through	1141	149	727	1133	F		
				NB Right	7	109	0	0	F		
	SB	44.5	D	SB Left	182	93	143	467	F		
				SB Through	702	65	143	467	E		
				SB Right	719	12	42	429	B		
	EB	29.7	C	EB Left	448	72	187	869	E		
				EB Through	2578	28	187	869	C		
				EB Right	534	3	75	804	A		
	WB	136.2	F	WB Left	0	0	0	0	A		
				WB Through	1573	139	693	947	F		
				WB Right	85	90	0	0	F		
24- MD 124 at I-270 SB on and off											
24	NB	57.7	F	NB Left	53	57	21	97	E	29.0	C
				NB Through	21	59	21	97	E		
				NB U-Turn	0	0	0	0	A		
	SB	38.8	D	SB Left	561	65	130	651	E		
				SB Through	8	67	130	651	E		
				SB Right	455	5	4	232	A		
	EB	25.6	C	EB Left	0	0	0	0	A		
				EB Through	1888	26	184	1062	C		
				EB Right	36	27	197	1085	C		
	WB	24.1	C	WB Left	5	72	319	1768	E		
				WB Through	1155	24	319	1768	C		
				WB Right	0	0	0	0	A		
25- MD 117 at MD 124											
25	NB	77.9	E	NB Left	56	147	323	747	F	51.3	D
				NB Through	681	93	323	747	F		
				NB Right	461	47	27	719	D		
	SB	38.5	D	SB Left	135	65	155	679	E		
				SB Through	968	41	155	679	D		
				SB Right	182	5	0	0	A		
	EB	48.7	D	EB Left	150	81	166	573	F		
				EB Through	1162	45	166	574	D		
				EB Right	57	41	174	601	D		
	WB	44.8	D	WB Left	395	73	277	1029	E		
				WB Through	1327	40	277	1029	D		
				WB Right	128	2	0	0	A		
26- MD 117 at Bureau Dr											
26	NB	52.8	D	NB Left	98	79	86	293	E	40.9	D
				NB Through	35	79	86	293	E		
				NB Right	266	40	86	293	D		
	SB	81.7	F	SB Left	285	95	134	423	F		
				SB Through	22	94	134	423	F		
				SB Right	83	31	134	423	C		
	EB	33.9	C	EB Left	52	81	184	873	F		
				EB Through	1681	32	185	873	C		
				EB Right	6	25	178	862	C		
	WB	36.5	D	WB Left	18	36	306	1058	D		
				WB Through	1655	38	307	1059	D		
				WB Right	282	25	337	1107	C		
27- MD 117 at I-270 SB off ramp											
27	NB			NB Left	0	0	0	0	A	12.9	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	3.8	A	EB Left	0	0	0	0	A		
				EB Through	944	4	13	532	A		
				EB Right	0	0	0	0	A		
	WB	41.6	E	WB Left	301	42	115	1067	E		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
28- MD 117 at I-270 NB off ramp											
28	NB			NB Left	0	0	0	0	A	60.7	E
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	162.2	F	SB Left	239	154	3992	5069	F		
				SB Through	0	0	0	0	A		
				SB Right	871	165	3991	5068	F		
	EB	17.7	B	EB Left	3	122	86	973	F		
				EB Through	943	17	86	973	B		
				EB Right	0	0	0	0	A		
	WB	8.2	A	WB Left	0	0	0	0	A		
				WB Through	1374	8	56	383	A		
				WB Right	0	0	56	383	A		
29- MD 117 at Perry Pkwy											
29	NB	38.1	D	NB Left	18	54	16	126	D	47.8	D
				NB Through	26	55	15	125	E		
				NB Right	34	17	24	146	B		
	SB	159.9	F	SB Left	233	196	277	452	F		
				SB Through	20	216	277	452	F		
				SB Right	118	79	277	452	E		
	EB	21.7	C	EB Left	247	71	91	360	E		
				EB Through	884	9	91	360	A		
				EB Right	33	6	76	344	A		
	WB	41.4	D	WB Left	36	108	246	746	F		
				WB Through	1236	42	246	746	D		
				WB Right	376	32	246	746	C		
30- Shady Grove Rd at I-270 NB off ramp											
30	NB	6.7	A	NB Left	0	0	0	0	A	13.6	B
				NB Through	1058	7	16	199	A		
				NB Right	0	0	0	0	A		
	SB	10.0	B	SB Left	0	0	0	0	A		
				SB Through	1363	10	49	553	B		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	51.2	D	WB Left	323	51	58	225	D		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table D.15: PM Peak -2040 Hard Shoulder Running- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
31- Shady Grove Rd at I-270 SB off ramp											
31	NB	7.1	A	NB Left	0	0	0	0	A	15.8	B
				NB Through	1529	7	33	433	A		
				NB Right	0	0	0	0	A		
	SB	5.5	A	SB Left	0	0	0	0	A		
				SB Through	864	5	8	159	A		
				SB Right	0	0	0	0	A		
	EB	58.1	E	EB Left	230	56	45	191	E		
				EB Through	0	0	0	0	A		
				EB Right	300	60	64	266	E		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
32- MD 28 at I-270 SB off ramp											
32	NB			NB U-Turn	0	0	0	0	A	9.4	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	37.1	D	SB Left	443	45	76	312	D		
				SB Through	0	0	0	0	A		
				SB Right	104	3	0	20	A		
	EB	4.9	A	EB Left	0	0	0	0	A		
				EB Through	1540	4	132	1179	A		
				EB Right	929	6	16	344	A		
	WB	7.1	A	WB Left	0	0	0	0	A		
				WB Through	1807	7	23	288	A		
				WB Right	0	0	0	0	A		
33- MD 28 at I-270 on and off ramps											
33	NB	37.0	D	NB Left	0	0	44	261	A	51.1	D
				NB Through	208	48	52	270	D		
				NB Right	137	20	52	270	B		
	SB	140.3	F	SB Left	21	171	349	415	F		
				SB Through	0	0	0	0	A		
				SB Right	291	138	349	415	F		
	EB	34.7	C	EB Left	273	122	185	414	F		
				EB Through	946	10	185	414	A		
				EB Right	0	0	0	0	A		
	WB	48.9	D	WB Left	41	43	193	419	D		
				WB Through	1284	49	168	382	D		
				WB Right	0	0	0	0	A		
34- MD 189 at Great Falls Rd											
34	NB	36.7	D	NB Left	43	45	12	95	D	13.8	B
				NB Through	14	48	9	94	D		
				NB Right	19	9	9	105	A		
	SB	3.3	A	SB Left	18	41	7	83	D		
				SB Through	13	46	7	83	D		
				SB Right	414	0	0	0	A		
	EB	12.2	B	EB Left	422	24	40	433	C		
				EB Through	663	5	5	180	A		
				EB Right	57	4	10	217	A		
	WB	19.0	B	WB Left	15	21	52	514	C		
				WB Through	852	19	52	514	B		
				WB Right	18	13	67	548	B		
35- MD 189 at I-270 Ramps											
35	NB	45.8	D	NB Left	243	46	44	175	D	41.5	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	54.6	D	SB Left	349	55	126	481	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	27.2	C	EB Left	485	30	91	368	C		
				EB Through	374	23	91	368	C		
				EB Right	0	0	0	0	A		
	WB	49.0	D	WB Left	448	53	110	269	D		
				WB Through	436	45	110	269	D		
				WB Right	0	0	0	0	A		
36- MD 189 at Wootton Pkwy											
36	NB	45.5	D	NB Left	237	57	141	487	E	53.0	D
				NB Through	694	50	141	487	D		
				NB Right	176	12	141	487	B		
	SB	83.9	F	SB Left	252	104	287	801	F		
				SB Through	929	78	317	791	E		
				SB Right	0	0	0	0	A		
	EB	39.4	D	EB Left	152	73	127	450	E		
				EB Through	553	39	127	450	D		
				EB Right	205	15	127	450	B		
	WB	40.4	D	WB Left	162	71	149	796	E		
				WB Through	784	42	149	796	D		
				WB Right	320	20	149	796	C		
37- Montrose Rd at Tower Oaks Blvd											
37	NB	0.4	A	NB Left	0	0	0	0	A	24.0	C
				NB Through	0	0	0	0	A		
				NB Right	540	0	0	0	A		
	SB	74.7	E	SB Left	88	49	38	355	D		
				SB Through	0	0	0	0	A		
				SB Right	312	82	112	433	F		
	EB	7.3	A	EB Left	0	0	0	0	A		
				EB Through	1859	7	43	518	A		
				EB Right	0	0	0	0	A		
	WB	31.7	C	WB Left	78	41	43	518	D		
				WB Through	2682	32	212	778	C		
				WB Right	288	24	212	778	C		
38- Tower Oaks Blvd at I-270 off ramp											
38	NB	22.9	C	NB Left	707	24	49	229	C	17.1	B
				NB Through	0	0.0	43	221	A		
				NB Right	26	6.3	49	229	A		
	SB	10.3	B	SB Left	9	17.9	1	40	B		
				SB Through	0	0.0	1	39	A		
				SB Right	9	2.8	0	23	A		
	EB	10.6	B	EB Left	1	10.3	16	185	B		
				EB Through	363	10.9	16	185	B		
				EB Right	37	7.0	11	176	A		
	WB	13.0	B	WB Left	149	16.2	17	161	B		
				WB Through	215	10.9	17	161	B		
				WB Right	3	3.0	3	117	A		
39- Montrose Rd at Tower Oaks Blvd											
39	NB	20.4	C	NB Left	97	43	85	392	D	44.9	D
				NB Through	773	32	85	392	C		
				NB Right	621	2	0	0	A		
	SB	32.7	C	SB Left	210	64	76	319	E		
				SB Through	506	24	75	318	C		
				SB Right	131	16	77	321	B		
	EB	130.6	F	EB Left	103	108	354	709	F		
				EB Through	518	134	356	710	F		
				EB Right	44	145	378	733	F		
	WB	37.6	D	WB Left	576	46	120	416	D		
				WB Through	482	43	120	416	D		
				WB Right	333	15	141	446	B		
40- Rockledge Blvd at I-270 NB on and off ramp											
40	NB	134.8	F	NB Left	0	0	0	0	A	117.7	F
				NB Through	335	123	568	845	F		
				NB Right	853	140	568	845	F		
	SB	85.6	F	SB Left	0	0	89	232	A		
				SB Through	357	86	89	232	F		
				SB Right	0	0	0	0	A		
	EB	106.2	F	EB Left	6	205	339	857	F		
				EB Through	455	164	339	857	F		
				EB Right	306	18	0	0	B		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table D.15: PM Peak -2040 Hard Shoulder Running- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS	
41- Rockledge Blvd at I-270 SB on and off ramps												
41	NB	31.8	C	NB Left	338	32	79	267	C	50.9	D	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	56.1	E		WB Left	355	60	203	753			E
					WB Through	890	55	203	753			D
					WB Right	0	0	0	0			A
42- MD 187 at Tuckerman Ln												
42	NB	76.3	E	NB Left	212	53	644	1328	D	136.4	F	
				NB Through	2261	78	644	1328	E			
				NB Right	199	80	644	1328	F			
	SB	187.2	F		SB Left	208	168	2556	2694			F
					SB Through	1159	184	2556	2694			F
					SB Right	307	210	2556	2694			F
	EB	134.8	F		EB Left	301	75	686	1504			E
					EB Through	531	165	687	1505			F
					EB Right	117	150	711	1529			F
	WB	195.2	F		WB Left	464	186	1937	2140			F
					WB Through	675	213	1937	2140			F
					WB Right	167	147	1937	2140			F
43- MD 187 at I-270 NB on and off ramps												
43	NB	19.2	B	NB Left	561	34	131	429	C	21.8	C	
				NB Through	2483	16	131	429	B			
				NB Right	0	0	0	0	A			
	SB	24.3	C		SB Left	0	0	0	0			A
					SB Through	1295	24	65	264			C
					SB Right	0	0	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	57.8	E		WB Left	60	57	43	321			E
					WB Through	67	59	43	321			E
					WB Right	0	0	0	0			A
44- MD 187 at I-270 NB on and off ramps												
44	NB	45.3	E	NB Left	0	0	0	0	A	43.1	D	
				NB Through	2401	45	192	837	D			
				NB Right	0	0	0	0	A			
	SB	19.1	B		SB Left	149	60	71	288			E
					SB Through	1207	14	71	288			B
					SB Right	0	0	0	0			A
	EB	76.3	E		EB Left	642	78	198	701			E
					EB Through	0	0	198	701			A
					EB Right	178	69	112	656			E
	WB				WB Left	0	0	0	0			A
					WB Through	0	0	0	0			A
					WB Right	0	0	0	0			A
45- MD 187 at Rock Spring Dr												
45	NB	20.7	C	NB Left	492	36	120	759	D	29.5	C	
				NB Through	2184	17	121	760	B			
				NB Right	18	14	141	793	B			
	SB	33.2	C		SB Left	21	61	108	556			E
					SB Through	1190	37	108	556			D
					SB Right	174	1	73	551			A
	EB	49.6	D		EB Left	431	61	144	542			E
					EB Through	50	69	144	542			E
					EB Right	482	38	144	542			D
	WB	16.6	B		WB Left	7	28	5	108			C
					WB Through	16	32	5	108			C
					WB Right	36	8	3	97			A
47-Democracy Blvd at I-270 NB off ramp												
47	NB	44.3	D	NB Left	153	44	28	127	D	2.9	A	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB	1.1	A		EB Left	0	0	0	0			A
					EB Through	1124	1	3	55			A
					EB Right	0	0	0	0			A
	WB	1.0	A		WB Left	0	0	0	0			A
					WB Through	2239	1	3	57			A
					WB Right	0	0	0	0			A
48- Democracy Blvd at I-270 SB on ramp												
48	NB			NB Left	0	0	0	0	A	8.5	A	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB	5.4	A		EB Left	0	0	0	0			A
					EB Through	1328	5	19	246			A
					EB Right	0	0	0	0			A
	WB	10.2	B		WB Left	533	36	63	418			D
					WB Through	1826	3	53	397			A
					WB Right	0	0	0	0			A
49- Democracy Blvd at I-270 SB off ramp												
49	NB			NB Left	0	0	0	0	A	8.4	A	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB	35.5	D		SB Left	154	48	27	171			D
					SB Through	0	0	0	0			A
					SB Right	59	3	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	5.5	A		WB Left	0	0	0	0			A
					WB Through	1826	4	20	288			A
					WB Right	153	28	120	901			C
50- MD 190 at Burdette Rd												
50	NB	75.4	E	NB Left	27	79	18	118	E	36.8	D	
				NB Through	7	69	18	118	E			
				NB Right	6	68	18	118	E			
	SB	36.3	D		SB Left	45	77	25	147			E
					SB Through	9	71	25	147			E
					SB Right	122	19	25	147			B
	EB	22.9	C		EB Left	138	101	124	621			F
					EB Through	1287	15	124	621			B
					EB Right	30	4	117	648			A
	WB	45.2	D		WB Left	13	124	390	1119			F
					WB Through	2159	45	390	1119			D
					WB Right	65	35	390	1119			C

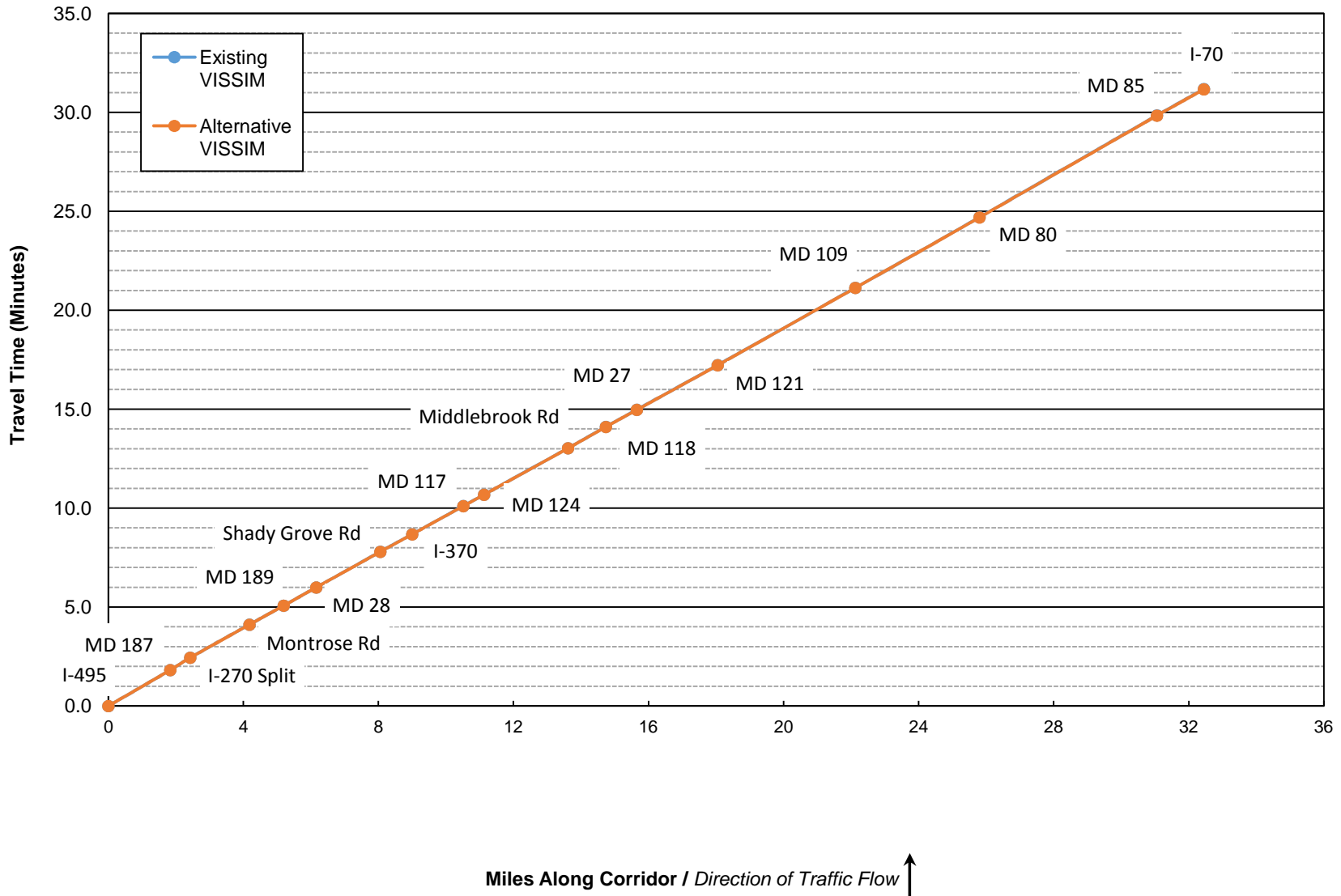
Table D.15: PM Peak -2040 Hard Shoulder Running- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
51- MD 190 at I-270 NB on ramp											
51	NB			NB Left	0	0	0	0	A	18.2	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	66.2	E	EB Left	253	66	101	342	E		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	10.0	A	WB Left	0	0	0	0	A		
				WB Through	1473	10	54	766	A		
				WB Right	0	0	0	0	A		
52- MD 190 at I-270 SB off ramp											
52	NB	72.6	E	NB Left	223	73	86	829	E	12.8	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	3.5	A	EB Left	0	0	0	0	A		
				EB Through	1062	4	8	181	A		
				EB Right	0	0	0	0	A		
	WB	10.8	B	WB Left	0	0	0	0	A		
				WB Through	1636	11	28	629	B		
				WB Right	0	0	0	0	A		
53- MD 190 at Seven Locks Rd											
53	NB	0.5	A	NB Left	28	1	0	0	A	27.2	C
				NB Through	314	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	52.6	D	SB Left	364	52	120	414	D		
				SB Through	232	53	120	414	D		
				SB Right	20	51	120	414	D		
	EB	32.0	C	EB Left	27	30	95	442	C		
				EB Through	800	32	95	442	C		
				EB Right	45	32	95	442	C		
	WB	21.4	C	WB Left	256	77	126	535	E		
				WB Through	908	18	126	535	B		
				WB Right	691	5	126	535	A		
54- MD 124 at I-270 NB off ramp											
54	NB	36.8	D	NB Left	0	0	0	0	A	35.9	D
				NB Through	0	0	0	0	A		
				NB Right	1532	37	201	898	D		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	35.2	D	EB Left	0	0	0	0	A		
				EB Through	2009	35	257	1195	D		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
55- Democracy Blvd at I-270 NB off ramp											
55	NB	47.3	D	NB Left	0	0	0	0	A	11.4	B
				NB Through	0	0	0	0	A		
				NB Right	314	47	51	214	D		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	1.4	A	EB Left	0	0	0	0	A		
				EB Through	1125	1	4	63	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
56- Watkins Mill Rd at I-270 SB off ramp/Parkview Ave											
56	NB	135.0	F	NB Left	139	66	391	721	E	110.3	F
				NB Through	0	0	0	0	A		
				NB Right	327	164	391	721	F		
	SB	46.7	D	SB Left	404	70	120	625	E		
				SB Through	111	60	120	625	E		
				SB Right	442	22	120	625	C		
	EB	194.1	F	EB Left	0	0	0	0	A		
				EB Through	989	194	1030	1251	F		
				EB Right	3	146	1030	1251	F		
	WB	50.2	D	WB Left	95	91	87	305	F		
				WB Through	467	42	85	304	D		
				WB Right	0	0	0	0	A		
57- Watkins Mill Rd at I-270 NB on ramp											
57	NB	113.6	F	NB Left	238	68	1529	3740	E	87.0	F
				NB Through	0	0	0	0	A		
				NB Right	611	132	1529	3740	F		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	45.5	D	EB Left	529	107	263	440	F		
				EB Through	950	11	263	440	B		
				EB Right	0	0	0	0	A		
	WB	119.0	F	WB Left	0	0	0	0	A		
				WB Through	789	137	617	875	F		
				WB Right	420	85	617	875	F		
58- Watkins Mill Rd at I-270 SB on ramp											
58	NB			NB Left	0	0	0	0	A	24.9	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	31.9	C	EB Left	0	0	0	0	A		
				EB Through	1479	35	271	601	D		
				EB Right	242	11	271	601	B		
	WB	13.2	B	WB Left	472	28	57	478	C		
				WB Through	555	1	57	478	A		
				WB Right	0	0	0	0	A		

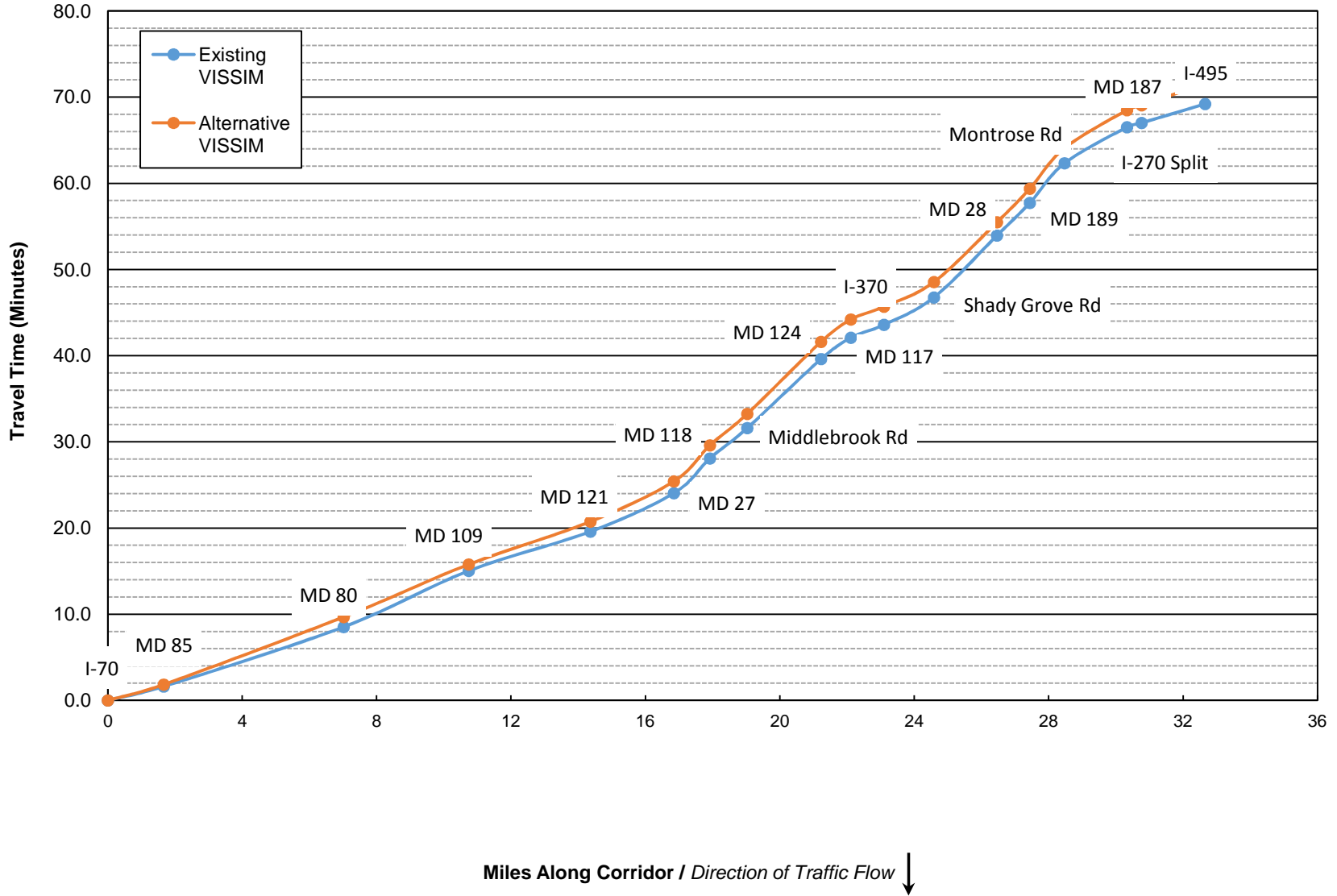
Table D.16: PM Peak- 2040 Hard Shoulder Running- I-270 Vehicle Network Performance

	No Build	HSR	% Change
Total Delay	36,237,078	30,149,654	-17%
Average Delay per Vehicle	307	250	-19%
Total Travel Time	67,865,560	64,132,685	-6%
Vehicles (Arrived)	95,124	100,280	5%
Latent Demand	8,861	5,939	-33%
Latent Delay	13,484,325	10,176,973	-25%
Total Distance	477,455	512,488	7%
Average Speed	25	29	14%

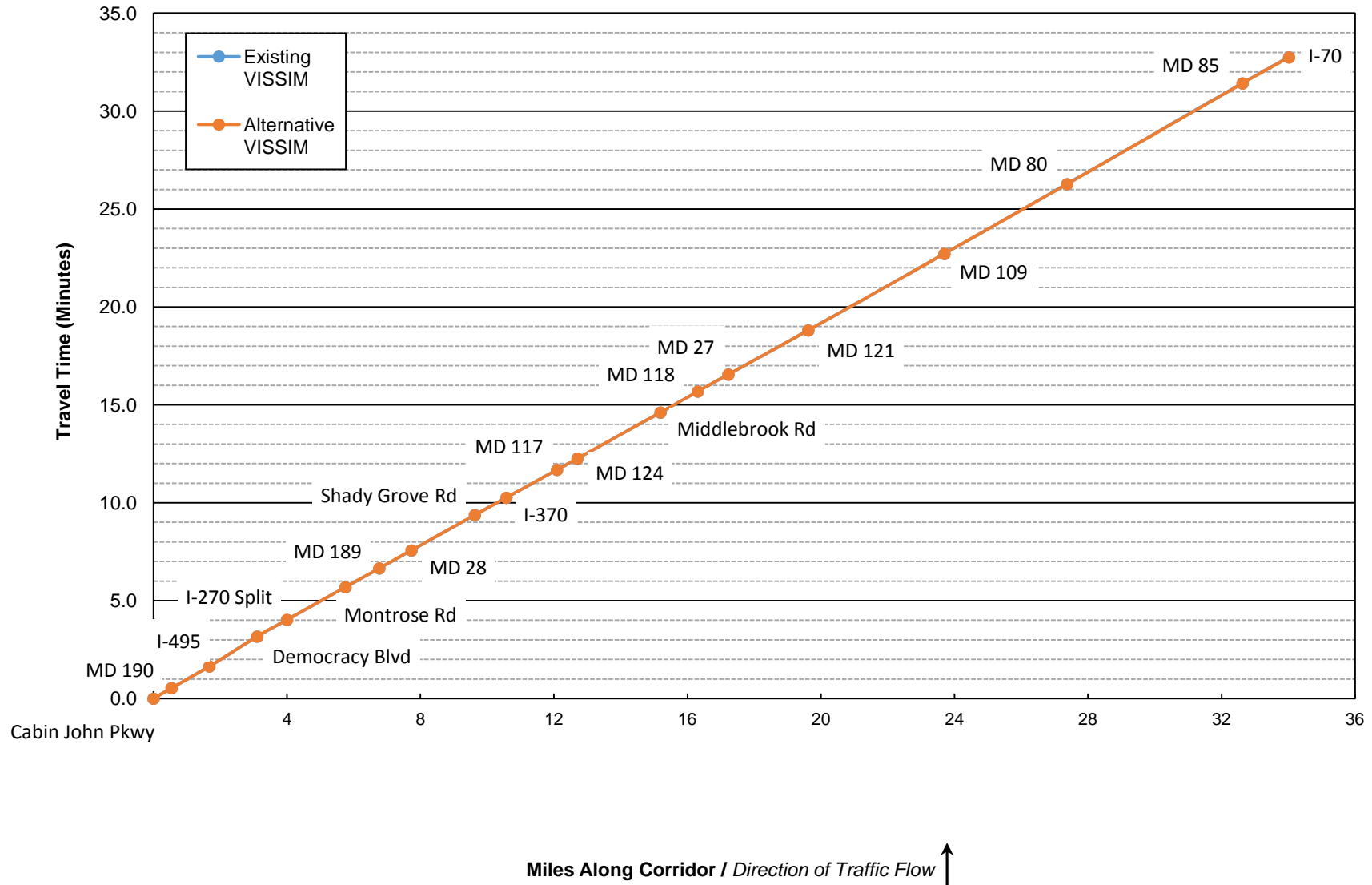
**Figure A.1: AM Peak - 2015 Variable Speed Limit
I-270 Travel Time Graph - Northbound**



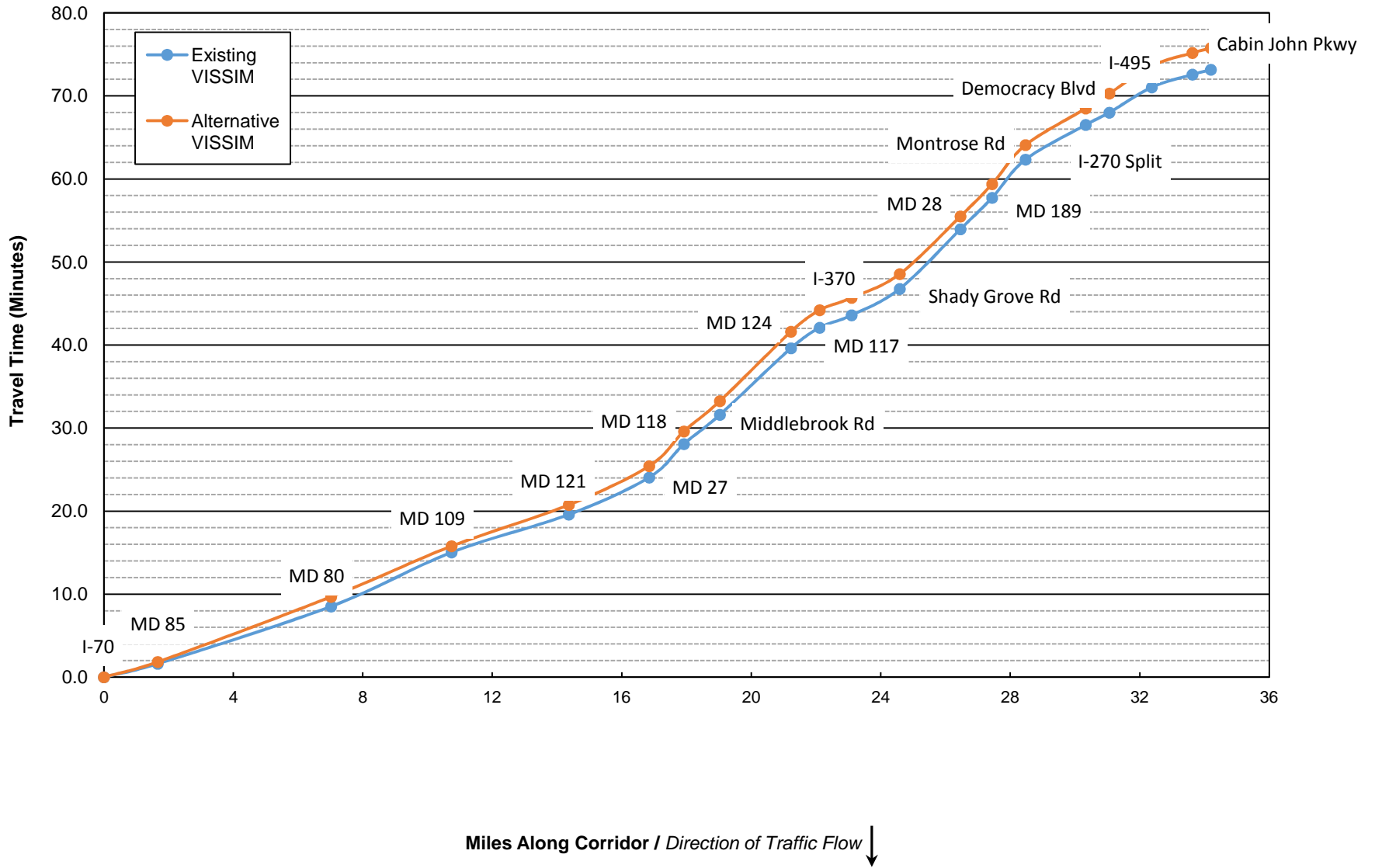
**Figure A.2: AM Peak - 2015 Variable Speed Limit
I-270 Travel Time Graph - Southbound**



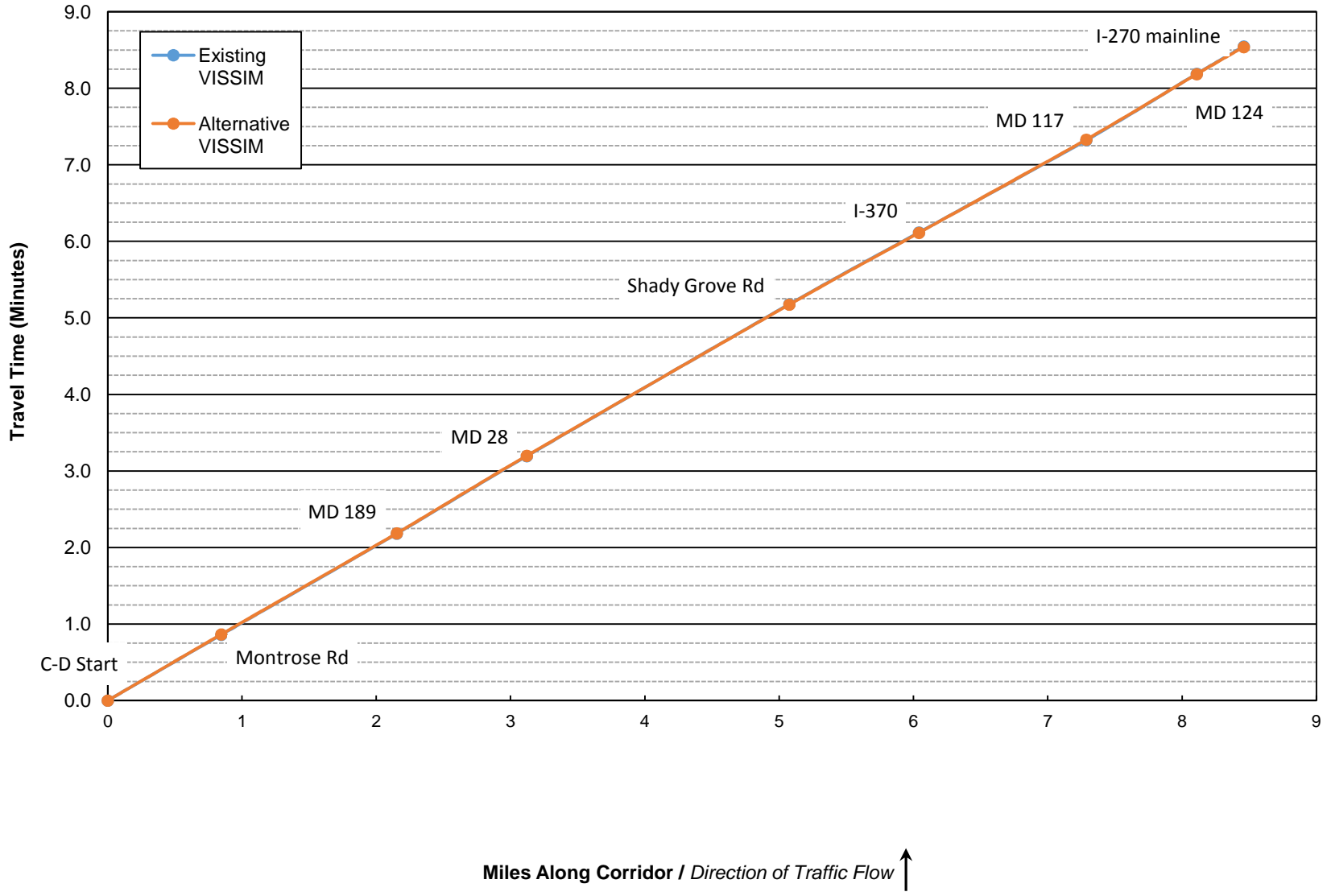
**Figure A.3: AM Peak - 2015 Variable Speed Limit
I-270 Spur Travel Time Graph - Northbound**



**Figure A.4: AM Peak - 2015 Variable Speed Limit
I-270 Spur Travel Time Graph - Southbound**



**Figure A.5: AM Peak - 2015 Variable Speed Limit
I-270 Local Travel Time Graph - Northbound**



**Figure A.6: AM Peak - 2015 Variable Speed Limit
I-270 Local Travel Time Graph - Southbound**

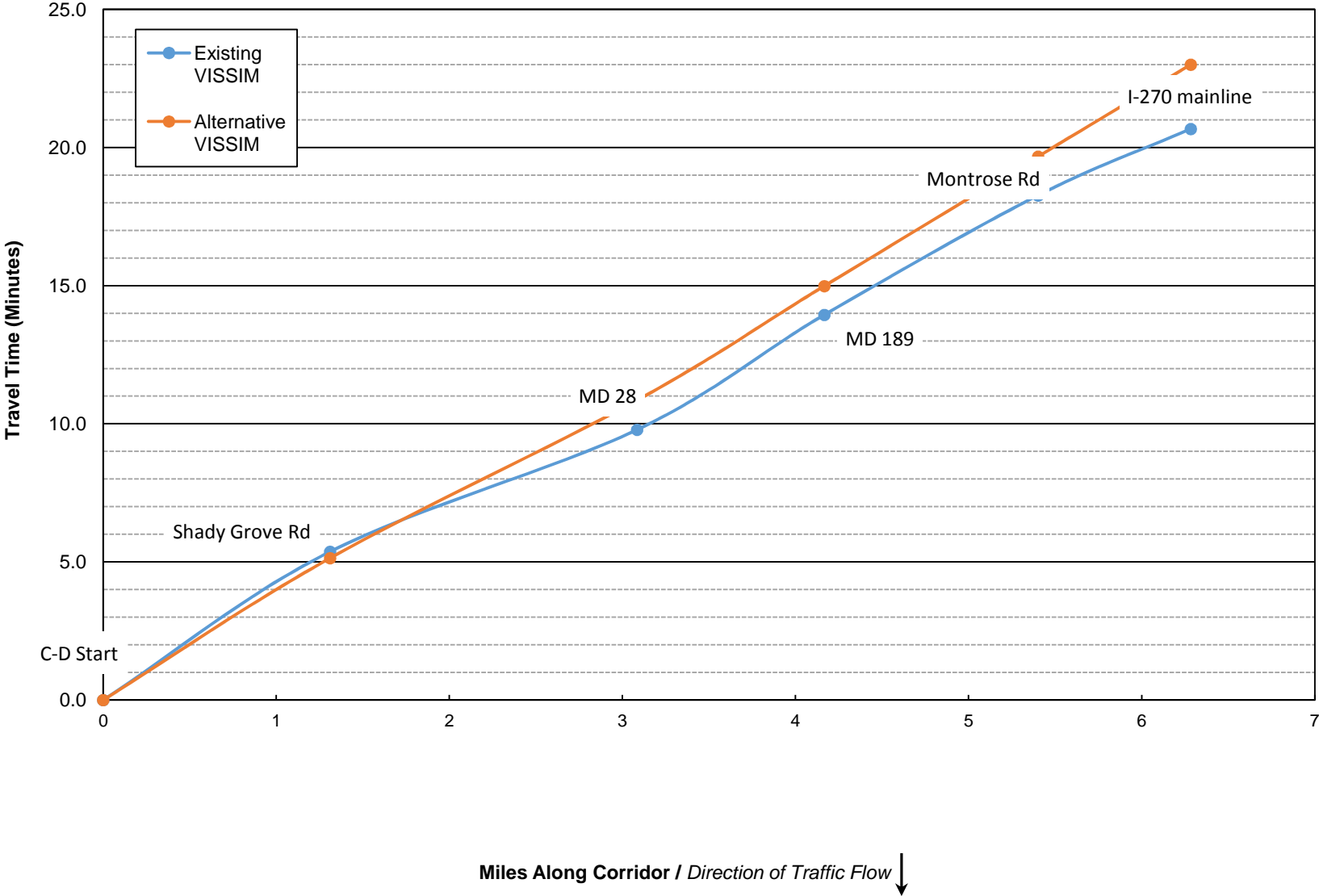


Table A.1: AM Peak -2015 Variable Speed Limit- I-270 Vehicle Travel Time

I-270 Northbound	Segment Length (miles)	Existing VISSIM Travel Time (seconds)	VSL VISSIM Travel Time (seconds)	% Change	I-270 Southbound	RITIS Segment Number	Segment Length (miles)	Existing VISSIM Travel Time (seconds)	VSL VISSIM Travel Time (seconds)	% Change
From I-495 interchange					From I-70					
to MD 187	1.8	109.0	109.0	0%	to MD 85	5001+5002	1.7	97.0	110.2	14%
to I-270 Split	0.6	37.5	37.5	0%	to MD 80	5003+5004	5.4	414.5	470.5	13%
to Montrose Rd	1.8	100.1	100.2	0%	to MD 109	5005+5006	3.7	390.6	366.1	-6%
to MD 189	1.0	57.6	57.7	0%	to MD 121	5007+5008	3.6	273.2	298.1	9%
to MD 28	1.0	55.1	55.1	0%	to MD 27	5009+5010	2.5	267.9	280.2	5%
to Shady Grove Rd	1.9	108.4	108.2	0%	to MD 118	5011+5012	1.1	241.4	250.8	4%
to I-370	0.9	53.0	53.0	0%	to Middlebrook Rd	5013+5014	1.1	211.7	219.2	4%
to MD 117	1.5	85.5	85.5	0%	to MD 124	5015+5016	2.2	480.5	501.6	4%
to MD 124	0.6	34.5	34.5	0%	to MD 117	5017+5018	0.9	148.4	155.6	5%
to Middlebrook Rd	2.5	140.9	141.0	0%	to I-370	5019+5020	1.0	90.2	89.2	-1%
to MD 118	1.1	64.8	64.6	0%	to Shady Grove Rd	5021+5022	1.5	190.3	171.6	-10%
to MD 27	0.9	51.8	51.9	0%	to MD 28	5023+5024	1.9	431.1	416.3	-3%
to MD 121	2.4	135.3	135.2	0%	to MD 189	5025+5026	1.0	227.1	233.5	3%
to MD 109	4.1	234.5	234.5	0%	to Montrose Rd	5027+5028	1.0	276.2	282.3	2%
to MD 80	3.7	213.8	213.6	0%	to I-270 Split	5029+5030	1.9	250.6	263.9	5%
to MD 85	5.3	309.0	308.7	0%	to MD 187	5031+5032	0.4	30.0	34.5	15%
to I-70	1.4	79.9	79.8	0%	to I-495 interchange	5033+5034	1.9	131.8	150.6	14%
I-270 Total (miles/minutes)	32.4	31.2	31.2	0%	I-270 Total (miles/minutes)		32.7	69.2	71.6	3%
I-270 Spur Northbound					I-270 Spur Southbound					
From Cabin John Pkwy					From I-70					
to MD 190	0.5	32.2	32.2	0%	to I-270 Split	5001 - 5030	30.3	3,990.6	4,109.1	3%
to I-495	1.1	66.7	66.7	0%	to Democracy Blvd	5040+5041	0.7	88.4	108.1	22%
to Democracy Blvd	1.4	91.2	91.5	0%	to I-495	5042+5043	1.3	183.1	200.9	10%
to I-270 Split	0.9	51.0	51.1	0%	to MD 190	5044	1.3	92.2	92.9	1%
to I-70	30.0	1,724.3	1,723.5	0%	to Cabin John Pkwy	5045	0.6	35.0	35.0	0%
I-270 Spur Total (miles/minutes)	34.0	32.8	32.7	0%	I-270 Spur Total (miles/minutes)		34.2	73.2	75.8	4%

Table A.2: AM Peak -2015 Variable Speed Limit- I-270 Local Vehicle Travel Time

I-270 Northbound	Segment Length (miles)	Existing VISSIM Travel Time (seconds)	VSL VISSIM Travel Time (seconds)	% Change	I-270 Southbound	Segment Length (miles)	Existing VISSIM Travel Time (seconds)	VSL VISSIM Travel Time (seconds)	% Change
From C-D start					From C-D start				
to Montrose Rd	0.8	51.6	51.9	1%	to Shady Grove	1.3	322.1	308.1	-4%
to MD 189	1.3	79.3	79.3	0%	to MD 28	1.8	264.8	342.9	29%
to MD 28	1.0	60.7	60.8	0%	to MD 189	1.1	249.5	248.0	-1%
to Shady Grove	2.0	119.1	118.5	0%	to Montrose	1.2	259.4	281.2	8%
to I-370	1.0	56.3	56.3	0%	to I-270 mainline	0.9	144.4	199.7	38%
to MD 117	1.2	72.3	73.0	1%					
to MD 124	0.8	52.1	51.3	-2%					
to I-270 mainline	0.4	21.4	21.2	-1%					
I-270 Local Total (miles/minutes)	8.5	8.5	8.5	0%	I-270 Local Total (miles/minutes)	6.3	20.7	23.0	11%

Table A.3: AM Peak -2015 Variable Speed Limit- I-270 Vehicle Speed

I-270 Northbound	Segment Length (miles)	Existing VISSIM Speed (MPH)	VSL VISSIM Speed (MPH)	% Change	I-270 Southbound	Segment Length (miles)	Existing VISSIM Speed (MPH)	VSL VISSIM Speed (MPH)	% Change
From I-495 interchange					From I-70				
to MD 187	1.8	60.5	60.6	0%	to MD 85	1.7	61.7	54.3	-12%
to I-270 Split	0.6	56.7	56.7	0%	to MD 80	5.4	46.5	41.0	-12%
to Montrose Rd	1.8	63.0	63.0	0%	to MD 109	3.7	34.3	36.6	7%
to MD 189	1.0	63.3	63.3	0%	to MD 121	3.6	47.7	43.7	-8%
to MD 28	1.0	62.9	63.0	0%	to MD 27	2.5	33.4	31.9	-4%
to Shady Grove Rd	1.9	63.0	63.2	0%	to MD 118	1.1	16.0	15.4	-4%
to I-370	0.9	64.1	64.1	0%	to Middlebrook Rd	1.1	18.9	18.3	-3%
to MD 117	1.5	63.8	63.8	0%	to MD 124	2.2	16.5	15.8	-4%
to MD 124	0.6	63.9	63.9	0%	to MD 117	0.9	21.5	20.5	-5%
to Middlebrook Rd	2.5	63.6	63.5	0%	to I-370	1.0	39.3	39.8	1%
to MD 118	1.1	62.3	62.5	0%	to Shady Grove Rd	1.5	28.1	31.2	11%
to MD 27	0.9	63.6	63.5	0%	to MD 28	1.9	15.7	16.2	4%
to MD 121	2.4	63.7	63.7	0%	to MD 189	1.0	15.5	15.1	-3%
to MD 109	4.1	62.6	62.6	0%	to Montrose Rd	1.0	13.5	13.2	-2%
to MD 80	3.7	61.9	62.0	0%	to I-270 Split	1.9	26.7	25.4	-5%
to MD 85	5.3	61.2	61.3	0%	to MD 187	0.4	52.3	45.4	-13%
to I-70	1.4	62.7	62.7	0%	to I-495 interchange	1.9	51.7	45.2	-13%
I-270 Total (miles/minutes)	32.4	62.4	62.5	0%	I-270 Total (miles/minutes)	32.7	28.3	27.4	-3%
I-270 Spur Northbound					I-270 Spur Southbound				
From Cabin John Pkwy					From I-70				
to MD 190	0.5	60.3	60.3	0%	to I-270 Split	30.3	27.4	26.6	-3%
to I-495	1.1	61.2	61.2	0%	to Democracy Blvd	0.7	29.8	24.3	-18%
to Democracy Blvd	1.4	56.6	56.4	0%	to I-495	1.3	25.8	23.5	-9%
to I-270 Split	0.9	62.9	62.9	0%	to MD 190	1.3	48.9	48.6	-1%
to I-70	30.0	62.7	62.7	0%	to Cabin John Pkwy	0.6	58.6	58.6	0%
I-270 Spur Total (miles/minutes)	34.0	62.3	62.3	0%	I-270 Spur Total (miles/minutes)	34.2	28.0	27.1	-3%

Table A.4: AM Peak -2015 Variable Speed Limit- I-270 Local Vehicle Speed

I-270 Northbound	Segment Length (miles)	Existing VISSIM Speed (MPH)	VSL VISSIM Speed (MPH)	% Change	I-270 Southbound	Segment Length (miles)	Existing VISSIM Speed (MPH)	VSL VISSIM Speed (MPH)	% Change
From C-D start					From C-D start				
to Montrose Rd	0.8	59.0	58.6	-1%	to Shady Grove	1.3	14.6	15.3	5%
to MD 189	1.3	59.3	59.4	0%	to MD 28	1.8	24.1	18.6	-23%
to MD 28	1.0	57.4	57.3	0%	to MD 189	1.1	15.6	15.7	1%
to Shady Grove	2.0	59.1	59.4	1%	to Montrose	1.2	17.1	15.8	-8%
to I-370	1.0	61.7	61.7	0%	to I-270 mainline	0.9	22.0	15.9	-28%
to MD 117	1.2	62.1	61.4	-1%					
to MD 124	0.8	56.8	57.7	2%					
to I-270 mainline	0.4	58.9	59.4	1%					
I-270 Local Total (miles/minutes)	8.5	59.4	59.4	0%	I-270 Local Total (miles/minutes)	6.3	18.2	16.4	-10%

Table A.5: AM Peak - 2015 Variable Speed Limit - I-270 Vehicle Density

I-270 Northbound	Type	Existing		VSL		% Change	I-270 Southbound	Type	Existing		VSL		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS	
I-270	Freeway	25	C	25	C	0%	I-270	Freeway	20	C	20	C	0%
I-270 Diverge to MD 187	Diverge	19	B	19	B	0%	I-270 Merge from WB I-70	Merge	13	B	13	B	0%
I-270	Freeway	22	C	22	C	0%	I-270	Freeway	24	C	24	C	0%
I-270 Diverge to Rockledge Rd	Diverge	19	B	19	B	0%	I-270 Merge from EB I-70	Merge	20	B	20	B	0%
I-270	Freeway	19	C	19	C	0%	I-270	Freeway	28	D	35	D	26%
I-270 Weave from MD 187 to I-270 HOV	Weave	10	B	10	B	1%	I-270 Diverge to SB MD 85	Diverge	31	D	40	E	28%
I-270 Lane Drop	Merge	15	B	15	B	0%	I-270	Freeway	27	D	37	E	35%
I-270	Freeway	27	D	26	D	-1%	I-270 Diverge to NB MD 85	Diverge	15	B	19	B	25%
I-270 Merge from I-270 Spur	Merge	24	C	24	C	0%	I-270	Freeway	23	C	31	D	36%
I-270 Weave from I-270 HOV to I-270 C-D	Weave	27	C	27	C	0%	I-270 Merge from MD 85	Merge	14	B	17	B	23%
I-270	Freeway	23	C	23	C	0%	I-270	Freeway	36	E	40	E	11%
I-270 Diverge to C-D (MD 189)	Diverge	21	C	21	C	0%	I-270 Diverge to MD 80	Diverge	39	E	31	D	-20%
I-270	Freeway	18	B	18	B	0%	I-270	Freeway	75	F	60	F	-21%
I-270 Diverge to C-D (MD 28)	Diverge	19	B	19	B	0%	I-270 Merge from MD 80	Merge	85	F	62	F	-27%
I-270	Freeway	15	B	15	B	0%	I-270	Freeway	55	F	51	F	-7%
I-270 Merge from C-D (MD 189)	Merge	18	B	18	B	1%	I-270 Diverge to MD 109	Diverge	33	D	30	D	-9%
I-270 Diverge to C-D (Shady Grove Rd)	Diverge	26	C	26	C	-2%	I-270	Freeway	66	F	60	F	-10%
I-270	Freeway	14	B	14	B	0%	I-270 Merge from MD 109	Merge	55	F	41	F	-26%
I-270 Weave from C-D (MD 28) to C-D (Shady Grove Rd)	Weave	13	B	13	B	1%	I-270	Freeway	47	F	51	F	10%
I-270	Freeway	11	B	11	B	0%	I-270 Diverge to SB Weigh Station	Diverge	19	B	23	C	20%
I-270 Merge from C-D (Shady Grove Rd)	Merge	10	B	10	B	0%	I-270	Freeway	39	E	48	F	22%
I-270	Freeway	13	B	13	B	0%	I-270 Merge from SB Weigh Station	Merge	20	C	24	C	18%
I-270 Merge from C-D (I-370)	Merge	11	B	11	B	0%	I-270	Freeway	41	E	45	E	8%
I-270 Diverge to C-D (MD 117)	Diverge	16	B	17	B	0%	I-270 Diverge to MD 121	Diverge	20	C	23	C	12%
I-270	Freeway	13	B	13	B	0%	I-270	Freeway	31	D	35	D	12%
I-270 Merge from C-D (MD 124)	Merge	14	B	14	B	-1%	I-270 Merge from MD 121	Merge	32	D	35	E	11%
I-270	Freeway	17	B	17	B	0%	I-270	Freeway	53	F	54	F	4%
I-270 Diverge to EB Middlebrook Rd	Diverge	11	B	11	B	0%	I-270 Diverge to MD 27	Diverge	55	F	55	F	0%
I-270	Freeway	15	B	15	B	0%	I-270	Freeway	80	F	80	F	0%
I-270 Diverge to WB Middlebrook Rd	Diverge	10	A	10	A	0%	I-270 Merge from WB MD 27	Merge	83	F	84	F	2%
I-270	Freeway	14	B	14	B	0%	I-270	Freeway	78	F	79	F	2%
I-270 Diverge to EB MD 118	Diverge	11	B	11	B	-2%	I-270 Weave from EB MD 27 to MD 118	Weave	76	F	78	F	2%
I-270 Diverge to WB MD 118	Diverge	14	B	14	B	-1%	I-270	Freeway	89	F	89	F	0%
I-270	Freeway	13	B	13	B	-1%	I-270 Merge from WB MD 118	Merge	70	F	70	F	0%
I-270 Weave from MD 118 to MD 27	Weave	13	B	13	B	0%	I-270	Freeway	85	F	86	F	1%
I-270	Freeway	12	B	12	B	0%	I-270 Merge from EB MD 118	Merge	70	F	71	F	1%
I-270 Merge from EB MD 27	Merge	13	B	13	B	0%	I-270	Freeway	75	F	77	F	3%
I-270	Freeway	13	B	13	B	0%	I-270 Merge from Middlebrook Rd	Merge	99	F	105	F	6%
I-270 Merge from WB MD 27	Merge	10	A	10	A	0%	I-270	Freeway	107	F	109	F	2%
I-270	Freeway	14	B	13	B	0%	I-270 Diverge to MD 124	Diverge	93	F	95	F	2%
I-270 Diverge to MD 121	Diverge	10	A	10	A	0%	I-270	Freeway	92	F	93	F	1%

Table A.5: AM Peak - 2015 Variable Speed Limit - I-270 Vehicle Density

I-270 Northbound	Type	Existing		VSL		% Change	I-270 Southbound	Type	Existing		VSL		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS			
I-270	Freeway	12	B	12	B	0%	I-270 Merge from WB MD 124	Merge	119	F	122	F	3%
I-270 Merge from EB MD 121	Merge	9	A	9	A	0%	I-270	Freeway	47	F	50	F	6%
I-270 Lane Drop	Merge	13	B	13	B	-1%	I-270 Merge from MD 117	Merge	46	F	46	F	-2%
I-270	Freeway	18	C	18	C	0%	I-270	Freeway	48	F	45	E	-7%
I-270 Diverge to NB Weigh Station	Diverge	10	A	10	A	-1%	I-270 Diverge to I-370	Diverge	43	F	41	F	-5%
I-270	Freeway	20	C	20	C	0%	I-270	Freeway	51	F	47	F	-7%
I-270 Merge from NB Weight Station	Merge	10	B	10	A	0%	I-270 Diverge to I-270 C-D	Diverge	81	F	74	F	-9%
I-270	Freeway	20	C	20	C	0%	I-270	Freeway	36	E	30	D	-17%
I-270 Diverge to MD 109	Diverge	11	B	11	B	-1%	I-270 Merge from I-270 (I-370)	Merge	94	F	79	F	-16%
I-270	Freeway	19	C	19	C	0%	I-270 Diverge to I-270 C-D (Shady Grove Rd)	Diverge	87	F	79	F	-9%
I-270 Merge from MD 109	Merge	10	B	10	A	-1%	I-270	Freeway	90	F	85	F	-5%
I-270	Freeway	20	C	20	C	0%	I-270 Merge from I-270 C-D (Shady Grove Rd Northern)	Merge	102	F	96	F	-6%
I-270 Diverge to MD 80	Diverge	12	B	11	B	-2%	I-270	Freeway	86	F	87	F	1%
I-270	Freeway	18	B	18	B	0%	I-270 Merge from I-270 C-D (Shady Grove Rd Southern)	Merge	107	F	105	F	-2%
I-270 Merge from MD 80	Merge	12	B	12	B	-2%	I-270 Diverge to I-270 C-D (MD 189)	Diverge	89	F	89	F	0%
I-270	Freeway	22	C	22	C	0%	I-270	Freeway	100	F	101	F	2%
I-270 Diverge to Scenic View	Diverge	11	B	11	B	0%	I-270 Merge from I-270 C-D (MD 189)	Merge	123	F	119	F	-3%
I-270	Freeway	22	C	22	C	0%	I-270	Freeway	83	F	85	F	3%
I-270 Merge from Scenic View	Merge	11	B	11	B	1%	I-270 Merge from I-270 C-D	Merge	41	F	43	F	5%
I-270	Freeway	22	C	22	C	0%	I-270 Diverge to I-270 HOV Lane	Diverge	21	C	24	C	15%
I-270 Diverge to NB MD 85	Diverge	12	B	13	B	1%	I-270 Diverge to I-270 Spur	Diverge	40	E	45	F	12%
I-270	Freeway	21	C	21	C	1%	I-270	Freeway	24	C	27	D	13%
I-270 Diverge to SB MD 85	Diverge	16	B	16	B	2%	I-270 Diverge to Rockledge Dr / MD 187	Diverge	16	B	18	B	9%
I-270	Freeway	17	B	17	B	0%	I-270	Freeway	25	C	28	D	13%
I-270 Weave from MD 85 to I-70	Weave	11	B	11	B	0%	I-270 Merge from Rockledge Dr	Merge	20	B	22	C	12%
I-270	Freeway	15	B	15	B	0%	I-270	Freeway	25	C	29	D	13%
							I-270 Merge from Rockledge Dr / MD 187	Merge	22	C	25	C	11%
							I-270	Freeway	27	D	31	D	12%

Table A.6: AM Peak - 2015 Variable Speed Limit - I-270 Spur Vehicle Density

I-270 Spur Northbound	Type	Existing		VSL		% Change	I-270 Southbound	Type	Existing		VSL		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS			
I-270 Spur	Freeway	34	D	34	D	0%	I-270 Spur	Freeway	48	F	58	F	22%
I-270 Spur Merge from Clara Barton Parkway	Merge	24	C	24	C	0%	I-270 Spur Weave from I-270 HOV to Democracy Blvd	Weave	53	F	63	F	20%
I-270 Spur	Freeway	37	E	37	E	0%	I-270 Spur	Freeway	52	F	58	F	11%
I-270 Diverge to MD 190	Diverge	27	C	27	C	0%	I-270 Merge from Democracy Blvd	Merge	28	D	30	D	7%
I-270 Spur	Freeway	32	D	32	D	0%	I-270 Spur Lane Drop	Merge	52	F	57	F	10%
I-270 Spur Merge from Cabin John Parkway	Merge	23	C	23	C	0%	I-270 Spur	Freeway	72	F	78	F	8%
I-270 Spur Merge from MD 190	Merge	23	C	23	C	0%	I-270 Spur Merge from I-495	Merge	37	E	34	D	-9%
I-270 Spur	Freeway	30	D	30	D	0%	I-270 Spur	Freeway	39	E	38	E	-4%
I-270 Spur Diverge to I-495	Merge	32	D	32	D	-1%	I-270 Spur Diverve to EB MD 190	Diverge	46	F	55	F	20%
I-270 Spur	Freeway	31	D	31	D	0%	I-270 Spur Diverve to Cabin John Pkwy	Diverge	27	C	27	C	0%
I-270 Spur Diverge to Democracy Blvd	Diverge	25	C	25	C	2%	I-270 Spur	Freeway	28	D	28	D	0%
I-270 Spur	Freeway	23	C	24	C	1%	I-270 Merge from MD 190	Merge	25	C	25	C	-1%
I-270 Spur Merge from EB Democracy Blvd	Merge	15	B	15	B	0%	I-270 Spur	Freeway	33	D	33	D	0%
I-270 Spur	Freeway	23	C	23	C	0%	I-270 Diverge to WB Clara Barton Pkwy	Diverge	22	C	22	C	0%
I-270 Spur Merge from WB Democracy Blvd	Merge	15	B	15	B	0%	I-270 Spur	Freeway	32	D	33	D	0%
I-270 Spur	Freeway	23	C	23	C	0%	I-270 Merge from Clara Barton Pkwy	Merge	28	D	28	D	0%
I-270 Spur Merge from Westlake Terrace	Merge	23	C	23	C	0%							
I-270 Spur	Freeway	24	C	24	C	0%							

Table A.7: AM Peak - 2015 Variable Speed Limit - I-270 Local Vehicle Density

I-270 Northbound	Type	Existing		VSL		% Change	I-270 Southbound	Type	Existing		VSL		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS			
I-270 C-D	Freeway	33	D	33	D	0%	I-270 C-D	Freeway	87	F	78	F	-11%
I-270 C-D Diverge to EB Montrose Rd	Diverge	21	C	21	C	0%	I-270 C-D Weave from I-370 EB to I-270	Weave	88	F	84	F	-4%
I-270 C-D	Freeway	19	C	19	C	0%	I-270 C-D Diverge to Shady Grove Rd	Diverge	53	F	65	F	22%
I-270 C-D Weave between Montrose Rd Loop Ramps	Weave	13	B	13	B	0%	I-270 C-D	Freeway	76	F	96	F	26%
I-270 C-D	Freeway	18	B	18	B	0%	I-270 C-D Merge from WB Shady Grove Rd	Merge	62	F	77	F	25%
I-270 C-D Merge from WB Montrose Rd	Merge	20	B	20	B	1%	I-270 C-D	Freeway	75	F	93	F	24%
I-270 C-D	Freeway	28	D	28	D	0%	I-270 C-D Merge from EB Shady Grove Rd	Merge	53	F	66	F	24%
I-270 C-D Merge from I-270	Merge	28	D	28	D	0%	I-270 C-D	Freeway	68	F	84	F	24%
I-270 C-D	Freeway	29	D	29	D	0%	I-270 C-D Merge from I-270	Merge	75	F	91	F	21%
I-270 C-D Diverge to MD 189	Diverge	16	B	16	B	-1%	I-270 C-D Diverge to I-270	Diverge	42	F	54	F	29%
I-270 C-D	Freeway	22	C	22	C	0%	I-270 C-D Diverge to I-270	Diverge	29	D	42	F	43%
I-270 C-D Merge from MD 189	Merge	15	B	16	B	3%	I-270 C-D	Freeway	20	C	29	D	42%
I-270 C-D	Freeway	29	D	29	D	0%	I-270 C-D Diverge to MD 28	Diverge	13	B	20	B	48%
I-270 C-D Weave between I-270 (to MD 28 from MD 189)	Weave	28	C	28	C	-1%	I-270 C-D	Freeway	20	C	21	C	5%
I-270 C-D	Freeway	30	D	30	D	0%	I-270 C-D Merge from WB MD 28	Merge	36	E	20	C	-44%
I-270 C-D Diverge to MD 28	Diverge	21	C	22	C	1%	I-270 C-D	Freeway	64	F	56	F	-13%
I-270 C-D	Freeway	26	C	25	C	-1%	I-270 C-D Merge from EB MD 28	Merge	134	F	134	F	0%
I-270 C-D Weave between MD 28 Ramps	Weave	35	D	33	D	-6%	I-270 C-D	Freeway	109	F	111	F	2%
I-270 C-D	Freeway	10	A	10	A	0%	I-270 C-D Merge from I-270	Merge	112	F	114	F	2%
I-270 C-D Merge from MD 28 WB	Merge	7	A	7	A	-1%	I-270 C-D	Freeway	79	F	84	F	6%
I-270 C-D Merge from I-270 and Drop Lane	Merge	9	A	9	A	0%	I-270 C-D Diverge to MD 189	Diverge	48	F	51	F	5%
I-270 C-D Diverge to I-270	Diverge	14	B	15	B	1%	I-270 C-D	Freeway	113	F	114	F	1%
I-270 C-D	Freeway	23	C	23	C	-2%	I-270 C-D Merge from MD 189	Merge	110	F	112	F	2%
I-270 C-D Diverge to Shady Grove Rd	Diverge	19	B	19	B	0%	I-270 C-D Diverge to I-270	Diverge	68	F	74	F	9%
I-270 C-D	Freeway	5	A	5	A	1%	I-270 C-D	Freeway	40	E	59	F	45%
I-270 C-D Merge from I-270 and EB Shady Grove Rd	Merge	9	A	9	A	0%	I-270 C-D Diverge to WB Montrose Rd	Diverge	26	C	38	E	49%
I-270 C-D	Freeway	9	A	9	A	0%	I-270 C-D	Freeway	53	F	81	F	52%
I-270 C-D Merge from WB Shady Grove Rd	Merge	10	B	10	B	0%	I-270 Weave between Montrose Rd Loops	Weave	61	F	83	F	37%
I-270 C-D Diverge to I-270	Diverge	15	B	15	B	0%	I-270 C-D	Freeway	67	F	89	F	34%
I-270 C-D	Freeway	14	B	14	B	0%	I-270 C-D Merge from EB Montrose Rd	Merge	54	F	66	F	24%
I-270 C-D Diverge to I-370	Diverge	13	B	13	B	0%	I-270 C-D	Freeway	59	F	66	F	13%
I-270 C-D	Freeway	3	A	3	A	1%							
I-270 Merge from I-370 EB	Merge	6	A	6	A	0%							
I-270 C-D	Freeway	7	A	7	A	0%							
I-270 C-D Weave from I-370 to I-270	Weave	16	B	16	B	-1%							
I-270 C-D	Freeway	11	A	11	A	0%							
I-270 C-D Weave from I-270 to MD 117	Weave	16	B	19	B	14%							
I-270 C-D Diverge to MD 124	Diverge	11	B	10	B	-5%							
I-270 C-D	Freeway	2	A	2	A	-1%							
I-270 C-D Merge from EB MD 124	Merge	5	A	5	A	0%							
I-270 C-D Merge From WB MD 124	Merge	8	A	7	A	-3%							

Table A.8: AM Peak -2015 Variable Speed Limit- I-270 Vehicle Throughput

I-270 Northbound	Existing VISSIM Throughput	VSL VISSIM Throughput	% Change	I-270 Southbound	Existing VISSIM Throughput	VSL VISSIM Throughput	% Change
Between I-495 and MD 187	4495	4495	0%	North of I-70	2502	2502	0%
Between MD 187 on and off ramps	3999	3999	0%	Between I-70 on ramps	2857	2857	0%
Between Rockledge Blvd on and off ramps	3361	3361	0%	From I-70 interchange to MD-85	4925	4917	0%
Between Rockledge Dr and I-270 Spur	3094	3092	0%	Between MD-85 on and off ramps	2771	2754	-1%
Between I-270 Spur and Montrose Rd	8311	8309	0%	Between MD-85 and MD-80	3221	3158	-2%
Between Montrose Rd on and off ramps	4705	4696	0%	Between MD-80 on and off ramps	3185	3093	-3%
Between Montrose Rd and MD 189	4376	4366	0%	Between MD-80 and Md-109	3861	3769	-2%
Between MD 189 and MD 28	4381	4369	0%	Between MD-109 on and off ramps	3800	3767	-1%
Between MD 28 on and off ramps	4677	4683	0%	Between MD-109 and MD-121	4257	4210	-1%
Between MD 28 and Shady Grove Rd	3378	3384	0%	Between MD-121 on and off ramps	4043	3980	-2%
Between Shady Grove Rd and I-370	2853	2858	0%	Between MD-121 and MD-27	4694	4573	-3%
Between I-370 on and off ramps	3129	3133	0%	Between MD-27 on and off ramps	4342	4231	-3%
Between I-370 and MD 117	4195	4197	0%	Between MD-27 and MD-118	4665	4568	-2%
Between MD 117 and MD 124	3275	3277	0%	Between MD-118 on and off ramps	4480	4383	-2%
Between MD-124 on and off ramps	3278	3280	0%	Between MD-118 and Middlebrook Rd	5032	4912	-2%
Between MD 124 and Middlebrook Rd	4082	4078	0%	Between Middlebrook Rd on and off ramps	5031	4905	-3%
Between Middlebrook Rd on and off ramps	3784	3780	0%	Between Middlebrook Rd and MD-124	6737	6614	-2%
Between Middlebrook Rd and MD 118	3344	3342	0%	Between MD-124 on and off ramps	5818	5725	-2%
Between MD-118 on and off ramps	3008	3000	0%	Between MD-124 and MD-117	6930	6863	-1%
Between MD 118 and MD 27	2831	2825	0%	Between MD-117 and I-370	8479	8454	0%
Between MD-27 on and off ramps	2232	2230	0%	Between I-370 on and off ramps	3024	3033	0%
Between MD 27 and MD 121	2515	2516	0%	Between I-370 on ramp to Shady Grove Rd	4111	4185	2%
Between MD-121 on and off ramps	2211	2217	0%	Between Shady Grove Rd and MD 28	3568	3590	1%
Between MD 121 and MD 109	2420	2420	0%	Between MD 28 on and off ramps	4420	4406	0%
Between MD-109 on and off ramps	2263	2264	0%	Between MD 28 and MD 189	3950	3967	0%
Between MD 109 and MD 80	2363	2356	0%	Between MD 189 and Montrose Rd	3941	3985	1%
Between MD-80 on and off ramps	2126	2128	0%	Between Montrose Rd on and off ramps	4968	4989	0%
Between MD 80 and MD 85	2656	2654	0%	Between Montrose Rd and I-270 Spur	8098	8034	-1%
Between MD-85 on and off ramps	2016	2018	0%	Between I-270 Spur and Rockledge Blvd	3901	3814	-2%
Between MD 85 and I-70	2858	2861	0%	Between Rockledge Blvd on and off ramps	2845	2777	-2%
North of I-70	1832	1833	0%	Between MD 187 on and off ramps	2986	2913	-2%
				Between MD 187 and I-495	3083	3050	-1%
I-270 Spur Northbound				I-270 Spur Southbound			
Between I-495 and Democracy Blvd	5178	5176	0%	Between I-270 Split and HOV on ramp	4233	4178	-1%
Between Democracy Blvd on and off ramps	4035	4033	0%	Between HOV on ramp and Democracy Blvd	4165	4127	-1%
Between Democracy Blvd and I-270 Split	4304	4297	0%	Between Democracy Blvd on and off ramps	3636	3608	-1%
				Between Democracy Blvd and I-495	4140	4100	-1%

Table A.9: AM Peak -2015 Variable Speed Limit- I-270 Local Vehicle Throughput

I-270 Local Northbound	Existing VISSIM Throughput	VSL VISSIM Throughput	% Change	I-270 Local Southbound	Existing VISSIM Throughput	VSL VISSIM Throughput	% Change
Between Montrose Rd EB off ramp and EB on ramp	2355	2349	0%	Between I-370 on ramp and I-270 off ramp	4068	4176	3%
Between Montrose Rd EB on ramp and WB off ramp	2567	2563	0%	Between I-270 off ramp and Shady Grove off ramp	2942	2992	2%
Between Montrose Rd WB off ramp and on ramp	2151	2147	0%	Between Shady Grove off ramp and Shady Grove WB on ramp	1759	1749	-1%
Between Montrose Rd WB on ramp and I-270 on ramp	3067	3074	0%	Between Shady Grove WB and EB on ramps	2398	2361	-2%
Between I-270 on ramp and MD 189 off ramp	3387	3392	0%	Between Shady Grove on ramp and I-270 on ramp	2797	2725	-3%
Between MD 189 ramps	2705	2708	0%	Between I-270 on ramp and I-270 off ramp1	3423	3358	-2%
Between MD 189 off ramp and I-270 on ramp	3252	3260	0%	Between I-270 off ramp1 and I-270 off ramp2	2902	2838	-2%
Between I-270 on ramp and I-270 off ramp	3988	3999	0%	Between I-270 off ramp2 and MD 28 off ramp	2031	1991	-2%
Between I-270 off ramp and MD 28 EB off ramp	2948	2959	0%	Between MD 28 off ramp and MD 28 WB on ramp	1466	1436	-2%
Between MD 28 EB off ramp to MD 28 EB on ramp	2599	2608	0%	Between MD 28 WB on ramp and MD 28 EB on ramp	1781	1728	-3%
Between MD 28 EB on ramp and MD 28 WB off ramp	2664	2673	0%	Between MD 28 EB on ramp and I-270 on ramp	2841	2780	-2%
Between MD 28 WB off ramp and MD 28 WB on ramp	1160	1164	0%	Between I-270 on ramp and MD 189 off ramp	3310	3239	-2%
Between MD 28 WB on ramp and I-270 on ramp	1631	1633	0%	Between MD 189 on and off ramps	2671	2618	-2%
Between I-270 on ramp and I-270 off ramp	2926	2933	0%	Between MD 189 on ramp and I-270 off ramp	3800	3702	-3%
Between I-270 off ramp and Shady Grove off ramp	2518	2523	0%	Between I-270 off ramp and Montrose Rd off ramp	2573	2482	-4%
Between Shady Grove off ramp and I-270 on ramp	321	322	0%	Between Montrose Rd off ramp and Montrose Rd WB on ramp	2455	2334	-5%
Between I-270 on ramp and Shady Grove WB on ramp	1562	1565	0%	Between Montrose Rd WB on ramp and EB off ramp	3375	3234	-4%
Between Shady Grove WB on ramp and I-270 off ramp	1887	1887	0%	Between Montrose Rd EB off and on ramps	2652	2547	-4%
Between I-270 off ramp and I-370 off ramp	1609	1611	0%	Between Montrose Rd EB off ramp and I-270	3384	3273	-3%
Between I-370 off ramp and I-370 EB on ramp	332	333	0%				
Between I-370 EB and WB on ramps	826	828	0%				
Between I-370 WB on ramp and I-270 off ramp	2397	2399	0%				
Between I-270 off ramp and I-270 on ramp	1334	1335	0%				
Between I-270 on ramp and MD 117 off ramp	2251	2253	0%				
Between MD 117 off ramp and MD 124 off ramp	1034	1036	0%				
Between MD 124 off ramp and MD 124 EB on ramp	98	97	-1%				
Between MD 124 EB and WB on ramps	487	488	0%				
Between MD 124 on ramp I-270	815	809	-1%				

Table A.10: AM Peak -2015 Variable Speed Limit- I-270 On Ramp Queue Length - Northbound

I-270 Northbound	Existing VISSIM Average Queue (feet)	VSL VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	VSL VISSIM Maximum Queue (feet)	% Change
Rockledge Dr on ramp	0	0	-	0	0	-
MD 189 C-D on ramp	0	0	-	0	0	-
MD 28 C-D on ramp	0	0	-	0	0	-
Shady Grove Rd C-D on ramp	0	0	-	0	0	-
I-370 C-D on ramp	0	0	-	0	0	-
MD 124 C-D on ramp	0	0	-	0	0	-
MD 118 on ramp	0	0	-	0	0	-
MD 27 EB on ramp	0	0	-	0	0	-
MD 27 WB on ramp	0	0	-	0	0	-
MD 121 on ramp	0	0	-	0	0	-
MD 109 on ramp	0	0	-	0	0	-
MD 80 on ramp	0	0	-	0	0	-
MD 85 on ramp	0	0	-	0	0	-
I-270 Spur Northbound	Existing VISSIM Average Queue (feet)	VSL VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	VSL VISSIM Maximum Queue (feet)	% Change
Democracy Blvd EB on ramp	0	0	-	0	0	-
Democracy Blvd WB on ramp	0	0	-	0	0	-
I-495 Northbound	Existing VISSIM Average Queue (feet)	VSL VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	VSL VISSIM Maximum Queue (feet)	% Change
Cabin John Pkwy on ramp	0	0	-	0	0	-
MD 190 on ramp	0	0	-	0	0	-
I-270 C-D Northbound	Existing VISSIM Average Queue (feet)	VSL VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	VSL VISSIM Maximum Queue (feet)	% Change
Montrose Rd EB on ramp	0	0	-	0	0	-
Montrose Rd WB on ramp	0	0	-	0	0	-
I-270 on ramp	0	0	-	0	0	-
MD 189 on ramp	0	0	-	0	0	-
I-270 on ramp	0	0	-	0	0	-
MD 28 EB on ramp	0	0	-100%	17	0	-100%
MD 28 WB on ramp	0	0	-	0	0	-
Shady Grove Rd EB on ramp	0	0	-	0	0	-
I-270 on ramp	0	0	-	0	0	-
Shady Grove Rd WB on ramp	0	0	-	0	0	-
I-370 EB on ramp	0	0	-	0	0	-
I-370 WB on ramp	0	0	-	0	0	-
I-270 on ramp	0	0	-	0	0	-
MD 124 EB on ramp	0	0	-	0	0	-
MD 124 WB on ramp	0	0	-	0	0	-

Table A.11: AM Peak -2015 Variable Speed Limit- I-270 Off Ramp Queue Length - Northbound

I-270 Northbound	Existing VISSIM Average Queue (feet)	VSL VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	VSL VISSIM Maximum Queue (feet)	% Change
MD 187 off ramp NB	56	46	-17%	347	374	8%
MD 187 off ramp SB	87	60	-32%	439	362	-18%
Rockledge Dr off ramp	4.64	3.36	-28%	316	254	-20%
Tower Oaks Blvd off ramp	14.02	14.12	1%	165	132	-20%
Montrose Rd off ramp EB	0	0	-	0	0	-
Montrose Rd off ramp WB	0	0	-	0	0	-
MD 189 off ramp WB	11	11	1%	97	117	21%
MD 189 off ramp EB	1	4	239%	131	280	114%
MD 28 off ramp EB	48	44	-7%	296	260	-12%
MD 28 off ramp WB	1	0	-100%	119	0	-100%
Shady Grove Rd off ramp - Redland Blvd	0	0	-	0	0	-
Shady Grove Rd off ramp WB	191	191	0%	620	655	6%
Shady Grove Rd off ramp EB	0	0	-	0	0	-
I-370 off ramp WB	0	0	-	0	0	-
I-370 off ramp EB	0	0	-	0	0	-
MD 117 off ramp	218	288	32%	793	1067	34%
MD 124 off ramp	340	280	-18%	957	834	-13%
Watkins Mill Rd off ramp*			-			-
Middlebrook Rd EB off ramp	0	0	-	0	0	-
Middlebrook Rd WB off ramp	0	0	-	0	0	-
MD 118 WB off ramp - Seneca Meadows	0	0	-100%	19	0	-100%
MD 118 WB off ramp	0	0	-	0	0	-
MD 118 EB off ramp	0	0	-	0	0	-
MD 27 off ramp WB	5	6	1%	83	91	9%
MD 27 off ramp EB	0	0	-	0	0	-
MD 121 off ramp WB	0	0	-46%	37	29	-22%
MD 121 off ramp EB	0	0	-	0	0	-
MD 109 off ramp EB	3	3	2%	97	107	10%
MD 109 off ramp WB	0	0	-	0	0	-
MD 80 off ramp EB	5	5	-9%	110	101	-8%
MD 80 off ramp WB	2	0	-91%	34	21	-38%
MD 85 NB off ramp	0	0	-	0	0	-
MD 85 SB off ramp	0	0	-3%	66	69	5%
I-270 Spur Northbound	Existing VISSIM Average Queue (feet)	VSL VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	VSL VISSIM Maximum Queue (feet)	% Change
Clara Barton Pkwy off ramp EB	1	1	-1%	157	157	0%
Clara Barton Pkwy off ramp WB	0	0	-	0	0	-
MD 190 off ramp EB	0	0	-	0	0	-
MD 190 off ramp WB	0	0	-	0	0	-
Democracy Blvd off ramp WB	108	103	-5%	589	526	-11%
Democracy Blvd off ramp EB	16	15	-6%	149	131	-12%

* Ramp in Future Scenario

Table A.12: AM Peak -2015 Variable Speed Limit- I-270 On Ramp Queue Length - Southbound

I-270 Southbound	Existing VISSIM Average Queue (feet)	VSL VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	VSL VISSIM Maximum Queue (feet)	% Change
MD 85 on ramp	0	0	-	0	0	-
MD 80 on ramp	575	206	-64%	2307	1405	-39%
MD 109 on ramp	66.39	4.62	-93%	841	122	-86%
MD 121 WB on ramp	8.05	28.28	251%	263	405	54%
MD 121 EB on ramp*			-			-
MD 27 WB on ramp	145	100	-31%	1297	1186	-9%
MD 27 EB on ramp	1	0	-12%	89	105	18%
MD 118 WB on ramp	0	0	-	0	0	-
MD 118 EB on ramp	0.015	0.030	106%	9	21	136%
Middlebrook Rd on ramp	161	364	126%	1641	1984	21%
MD 124 WB on ramp	254	870	243%	2615	2462	-6%
MD 117 on ramp	94	71	-25%	1640	1539	-6%
I-370 C-D on ramp	805	540	-33%	1861	1490	-20%
Shady Grove Rd C-D on ramp North	2	0	-85%	160	56	-65%
Shady Grove Rd C-D on ramp South	68	36	-47%	927	700	-25%
MD 189 C-D on ramp	1393	1720	24%	3991	3775	-5%
Montrose Rd C-D on ramp	2	244	11036%	246	1962	698%
Rockledge Dr on ramp	0	0	-	0	0	-
MD 187 on ramp	0	0	-	0	0	-
I-270 Spur Southbound	Existing VISSIM Average Queue (feet)	VSL VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	VSL VISSIM Maximum Queue (feet)	% Change
Democracy Blvd on ramp	0	0	-	0	0	-
I-495 Southbound	Existing VISSIM Average Queue (feet)	VSL VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	VSL VISSIM Maximum Queue (feet)	% Change
I-270 Spur on ramp	260	271	4%	1015	1015	0%
MD 190 on ramp	0	0	-	0	0	-
I-270 C-D Southbound	Existing VISSIM Average Queue (feet)	VSL VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	VSL VISSIM Maximum Queue (feet)	% Change
I-270 on ramp	2305	1964	-15%	5053	4902	-3%
I-370 on ramp	1241	1155	-7%	2914	2921	0%
Shady Grove Rd WB on ramp	1	1	42%	150	130	-13%
Shady Grove Rd EB on ramp	0	0	-100%	29	8	-71%
I-270 on ramp	0	0	10%	39	60	54%
MD 28 WB on ramp	6	0	-94%	121	45	-63%
MD 28 EB on ramp	3166	3094	-2%	3877	3880	0%
I-270 on ramp	0	0	-95%	55	14	-74%
MD 189 on ramp	111	219	96%	1104	1275	16%
Montrose Rd WB on ramp	8	19	130%	440	524	19%
Montrose Rd EB on ramp	0	1	202%	95	148	56%

* Ramp in Future Scenario

Table A.13: AM Peak -2015 Variable Speed Limit- I-270 Off Ramp Queue Length - Southbound

I-270 Southbound	Existing VISSIM Average Queue (feet)	VSL VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	VSL VISSIM Maximum Queue (feet)	% Change
MD 85 SB off ramp	0	0	-	0	0	-
MD 85 NB off ramp	0	0	-	0	10	-
MD 80 off ramp	0.41	0.08	-81%	69	50	-28%
MD 109 off ramp WB	0.00	0.07	1507%	7	21	197%
MD 109 off ramp EB	0	0	-	0	0	-
MD 121 off ramp EB	1	1	-21%	93	76	-18%
MD 121 off ramp WB	0	0	-	0	0	-
MD 27 off ramp EB	53	52	-3%	279	266	-5%
MD 27 off ramp WB	45	0	-99%	289	54	-81%
MD 118 off ramp EB	31	30	-3%	161	159	-1%
MD 118 off ramp WB	0	0	-	0	0	-
Watkins Mill Rd off ramp*						
MD 124 off ramp EB	75	68	-10%	342	356	4%
MD 124 off ramp WB	18	12	-32%	405	388	-4%
I-370 off ramp WB	0	0	-	0	0	-
I-370 off ramp EB	0	0	-	0	0	-
Shady Grove Rd off ramp - Omega Drive	6	6	-6%	194	191	-1%
Shady Grove Rd off ramp	0	0	-	0	0	-
MD 28 off ramp	3	3	3%	132	139	5%
MD 189 off ramp EB	40	40	1%	296	256	-14%
MD 189 off ramp WB	0	0	-	0	0	-
Montrose Rd off ramp WB	0	0	-	0	0	-
Montrose Rd off ramp EB	0	0	-	0	11	-
Rockledge Dr off ramp	18	19	6%	261	332	27%
I-270 Spur Southbound	Existing VISSIM Average Queue (feet)	VSL VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	VSL VISSIM Maximum Queue (feet)	% Change
Democracy Blvd off ramp EB	51	50	-1%	230	234	2%
Democracy Blvd off ramp WB	0	0	-	0	0	-
MD 190 off ramp WB	995	1305	31%	2271	3843	69%
MD 190 off ramp EB	0	0	-	0	0	-
Clara Barton Pkwy WB off ramp	0	0	-	0	0	-

* Ramp in Future Scenario

Table A.14: AM Peak - Existing - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
1- MD 85 at Sam's Club Drive											
1	NB	18.8	B	NB Left	103	76	57	282	E	33.3	C
				NB Through	312	24	57	282	C		
				NB Right	581	6	6	284	A		
	SB	42.4	D	SB Left	110	57	123	552	E		
				SB Through	535	41	123	552	D		
				SB Right	52	24	123	552	C		
	EB	44.4	D	EB Left	81	70	42	165	E		
				EB Through	47	81	42	165	F		
				EB Right	102	7	42	165	A		
	WB	50.7	D	WB Left	204	72	75	302	E		
				WB Through	12	61	75	302	E		
				WB Right	100	6	75	302	A		
2- MD 85 at I-270 NB on and off ramp											
2	NB	42.6	D	NB Left	560	43	155	745	D	28.8	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	14.6	B	SB Left	0	0	0	0	A		
				SB Through	547	15	36	483	B		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
3- MD 85 at I-270 SB on and off ramp											
3	NB	4.3	A	NB Left	0	0	0	0	A	10.2	B
				NB Through	812	4	12	316	A		
				NB Right	0	0	0	0	A		
	SB	41.3	D	SB Left	154	41	37	267	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
4- MD 85 at Crestwood Blvd											
4	NB	15.8	C	NB Left	10	57	34	262	E	19.8	B
				NB Through	585	15	34	262	B		
				NB U-Turn	0	0	0	0	A		
	SB	13.7	B	SB Left	57	68	23	146	E		
				SB Through	1657	14	55	477	B		
				SB Right	751	9	43	467	A		
	EB	49.1	D	EB Left	481	51	70	208	D		
				EB Through	19	62	70	208	E		
				EB Right	32	10	70	208	A		
	WB	43.1	D	WB Left	37	56	17	111	E		
				WB Through	15	59	17	111	E		
				WB Right	19	6	17	111	A		
5- MD 80 at I-270 NB on and ramp											
5	NB	-1.1	A	NB Left	3	0	0	0	A	16.1	B
				NB Through	2	0	0	0	A		
				NB Right	4	-2	0	0	A		
	SB	12.8	B	SB Left	183	15	12	115	B		
				SB Through	5	17	12	115	B		
				SB Right	52	4	1	16	A		
	EB	7.0	A	EB Left	38	8	6	165	A		
				EB Through	0	0	8	0	A		
				EB Right	7	4	13	196	A		
	WB	17.2	B	WB Left	31	13	1	48	B		
				WB Through	684	24	94	544	C		
				WB Right	504	8	6	182	A		
6- MD 80 at I-270 SB on and off ramp											
6	NB	4.1	A	NB Left	22	25	1	113	C	22.2	C
				NB Through	0	0	0	0	A		
				NB Right	262	2	1	113	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	23.0	C	EB Left	0	0	0	0	A		
				EB Through	241	22	26	226	C		
				EB Right	133	25	26	235	D		
	WB	47.1	E	WB Left	0	0	0	0	A		
				WB Through	194	47	126	641	E		
				WB Right	0	0	0	0	A		
7- MD 109 at I-270 NB on and off ramp											
7	NB			NB Left	0	0	0	0	A	2.5	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	8.3	A	SB Left	118	11	7	116	B		
				SB Through	0	0	0	0	A		
				SB Right	38	1	0	0	A		
	EB	3.2	A	EB Left	59	3	0	36	A		
				EB Through	0	0	0	0	A		
				EB Right	40	3	0	0	A		
	WB	0.4	A	WB Left	0	0	0	0	A		
				WB Through	462	0	0	54	A		
				WB Right	0	0	0	0	A		
8- MD 80 at I-270 SB on and off ramp											
8	NB	2.5	A	NB Left	15	10	1	65	B	3.5	A
				NB Through	0	0	0	0	A		
				NB Right	41	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	3.4	A	EB Left	0	0	0	0	A		
				EB Through	59	0	0	34	A		
				EB Right	70	6	1	34	A		
	WB	3.6	A	WB Left	393	3	8	292	A		
				WB Through	109	5	8	269	A		
				WB Right	0	0	0	0	A		
9- MD 121 at Gateway Center Dr											
9	NB	8.4	A	NB Left	95	11	13	147	B	20.7	C
				NB Through	279	12	13	147	B		
				NB Right	198	2	17	173	A		
	SB	16.8	C	SB Left	47	11	31	312	B		
				SB Through	577	17	41	312	B		
				SB Right	6	13	46	333	B		
	EB	33.6	D	EB Left	7	37	86	427	D		
				EB Through	88	44	93	427	D		
				EB Right	547	32	117	459	C		
	WB	30.3	D	WB Left	96	35	19	123	D		
				WB Through	12	33	19	123	C		
				WB Right	21	7	13	142	A		
10- MD 121 at I-270 NB on and off ramp											
10	NB	1.7	A	NB Left	40	10	2	86	A	0.7	A
				NB Through	0	0	0	0	A		
				NB Right	253	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.1	A	EB Left	0	0	0	0	A		
				EB Through	318	0	0	0	A		
				EB Right	49	0	0	0	A		
	WB	0.6	A	WB Left	151	2	1	87	A		
				WB Through	1070	0	0	58	A		
				WB Right	0	0	0	0	A		

Table A.14: AM Peak - Existing - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
11- MD 121 at I-270 SB on and off ramp											
11	NB			NB Left	0	0	0	0	A	1.3	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	7.7	A	SB Left	123	10	6	120	B		
				SB Through	0	0	0	0	A		
				SB Right	46	1	0	0	A		
	EB	0.4	A	EB Left	25	2	0	35	A		
				EB Through	0	0	0	0	A		
				EB Right	833	0	0	0	A		
	WB	0.1	A	WB Left	0	0	0	0	A		
WB Through				277	0	0	0	A			
WB Right				0	0	0	0	A			
12- MD 27 at Observation Dr											
12	NB	48.0	D	NB U-Turn	0	0	0	0	A	19.3	B
				NB Through	34	63	10	64	E		
				NB Right	12	7	10	64	A		
	SB	40.9	D	SB Left	75	52	23	142	D		
				SB Through	43	60	30	226	E		
				SB Right	157	30	52	263	C		
	EB	13.0	B	EB Left	149	30	29	290	C		
				EB Through	1202	11	31	291	B		
				EB Right	50	9	38	329	A		
	WB	20.1	C	WB Left	83	15	138	788	B		
WB Through				2047	21	138	788	C			
WB Right				94	10	138	788	A			
13- MD 27 at I-270 NB off ramp											
13	NB	30.7	C	NB Left	89	31	12	90	C	11.6	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.1	A	EB Left	0	0	0	0	A		
				EB Through	891	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	15.7	B	WB Left	0	0	0	0	A		
WB Through				2110	16	194	1341	B			
WB Right				0	0	0	0	A			
14- MD 27 at I-270 SB off ramp											
14	NB			NB Left	0	0	0	0	A	24.7	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	49.6	D	SB Left	376	50	64	293	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	9.0	A	EB Left	0	0	0	0	A		
				EB Through	657	9	12	192	A		
				EB Right	0	0	0	0	A		
	WB	25.5	C	WB Left	0	0	0	0	A		
WB Through				1263	25	195	645	C			
WB Right				0	0	0	0	A			
15- MD 27 at Crystal Rock Dr											
15	NB	17.8	B	NB Left	22	18	31	405	B	38.3	D
				NB Through	819	18	57	405	B		
				NB Right	72	16	60	418	B		
	SB	46.4	D	SB Left	407	69	356	1190	E		
				SB Through	1333	40	356	1190	D		
				SB Right	40	27	320	1184	C		
	EB	44.6	D	EB Left	177	49	47	169	D		
				EB Through	74	49	43	164	D		
				EB Right	60	27	44	196	C		
	WB	56.0	E	WB Left	8	63	85	273	E		
WB Through				21	302	85	273	F			
WB Right				104	6	85	273	A			
16- MD 118 at Seneca Meadows Pkwy											
16	NB	3.4	A	NB Left	123	10	1	70	A	5.5	A
				NB Through	727	3	4	119	A		
				NB Right	79	1	8	171	A		
	SB	3.7	A	SB Left	25	5	5	169	A		
				SB Through	808	4	8	169	A		
				SB Right	32	2	9	202	A		
	EB	16.9	B	EB Left	15	64	8	69	E		
				EB Through	6	59	8	69	E		
				EB Right	96	7	8	69	A		
	WB	44.2	D	WB Left	30	65	12	94	E		
WB Through				5	68	8	94	E			
WB Right				21	9	11	113	A			
17- MD 118 at I-270 NB on ramp											
17	NB			NB Left	0	0	0	0	A	11.1	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	33.0	C	EB Left	222	33	44	277	C		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	6.0	A	WB Left	0	0	0	0	A		
WB Through				155	1	0	4	A			
WB Right				778	7	16	276	A			
18- MD 118 at I-270 SB off ramp											
18	NB			NB Left	0	0	0	0	A	7.4	A
				NB Through	0	0.0	0	0	A		
				NB Right	0	0.0	0	0	A		
	SB	41.5	D	SB Left	193	41.5	34	164	D		
				SB Through	0	0.0	0	0	A		
				SB Right	0	0.0	0	0	A		
	EB	3.1	A	EB Left	0	0.0	0	0	A		
				EB Through	615	3.1	4	135	A		
				EB Right	0	0.0	0	0	A		
	WB	3.6	A	WB Left	0	0.0	0	0	A		
WB Through				1036	3.6	7	209	A			
WB Right				0	0.0	0	0	A			
19- MD 118 at Aircraft Dr											
19	NB	45.2	D	NB Left	7	70	8	75	E	18.1	B
				NB Through	12	80	8	75	F		
				NB Right	14	3	0	22	A		
	SB	60.7	E	SB Left	241	58	98	368	E		
				SB Through	41	66	98	368	E		
				SB Right	81	67	98	368	E		
	EB	10.4	B	EB Left	102	13	28	310	B		
				EB Through	932	10	28	310	B		
				EB Right	27	9	28	310	A		
	WB	11.5	B	WB Left	73	17	31	246	B		
WB Through				899	14	31	246	B			
WB Right				277	4	31	246	A			
20- Middlebrook Rd at Observation Dr											
20	NB			NB Left	0	0	0	0	A	16.1	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	18.7	B	SB Left	22	35	4	44	D		
				SB Through	0	0	0	0	A		
				SB Right	25	4	4	44	A		
	EB	14.2	B	EB Left	240	21	31	226	C		
				EB Through	865	12	31	226	B		
				EB Right	0	0	0	0	A		
	WB	17.7	B	WB Left	0	0	0	0	A		
WB Through				1072	19	69	381	B			
WB Right				215	13	92	431	B			

Table A.14: AM Peak - Existing - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
21- Middlebrook Rd at I-270 SB on ramp											
21	NB			NB Left	0	0	0	0	A	16.0	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	11.2	B	EB Left	0	0	0	0	A		
				EB Through	805	11	26	186	B		
				EB Right	0	0	0	0	A		
	WB	21.3	C	WB Left	743	21	64	867	C		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
22- Middlebrook Rd at Waring Station Rd											
22	NB	63.1	E	NB Left	147	52	145	449	D	25.3	C
				NB Through	6	52	145	449	D		
				NB Right	342	68	145	449	E		
	SB	21.9	C	SB Left	3	37	1	29	D		
				SB Through	0	0	1	29	A		
				SB Right	3	7	2	67	A		
	EB	18.2	B	EB Left	28	12	124	845	B		
				EB Through	1483	19	124	845	B		
				EB Right	76	10	124	845	A		
	WB	16.1	B	WB Left	78	20	28	213	C		
				WB Through	682	16	28	213	B		
				WB Right	35	4	28	213	A		
23- MD 124 at MD 355											
23	NB	50.5	D	NB Left	229	69	72	198	E	83.6	F
				NB Through	306	42	70	196	D		
				NB Right	37	2	0	0	A		
	SB	33.5	C	SB Left	49	86	121	406	F		
				SB Through	966	50	121	406	D		
				SB Right	619	3	34	375	A		
	EB	99.1	F	EB Left	615	255	1024	1207	F		
				EB Through	528	22	1024	1207	C		
				EB Right	582	5	921	1184	A		
	WB	122.0	F	WB Left	0	0	0	0	A		
				WB Through	1884	123	727	1112	F		
				WB Right	42	68	0	0	E		
24- MD 124 at I-270 SB on and off											
24	NB	65.0	F	NB Left	15	66	15	78	E	22.2	C
				NB Through	29	64	15	78	E		
				NB U-Turn	0	0	0	0	A		
	SB	27.6	C	SB Left	306	67	81	347	E		
				SB Through	4	87	81	347	F		
				SB Right	572	6	13	335	A		
	EB	15.7	B	EB Left	0	0	0	0	A		
				EB Through	904	16	41	321	B		
				EB Right	67	12	50	345	B		
	WB	22.0	C	WB Left	33	27	116	1390	C		
				WB Through	1193	22	116	1390	C		
				WB Right	0	0	0	0	A		
25- MD 117 at MD 124											
25	NB	42.7	D	NB Left	16	65	95	577	E	43.0	D
				NB Through	421	58	95	577	E		
				NB Right	407	26	61	641	C		
	SB	37.8	D	SB Left	181	47	126	605	D		
				SB Through	839	40	126	605	D		
				SB Right	95	2	0	0	A		
	EB	48.4	D	EB Left	80	108	175	722	F		
				EB Through	1383	45	174	723	D		
				EB Right	66	44	187	750	D		
	WB	40.7	D	WB Left	314	73	108	332	E		
				WB Through	480	27	108	332	C		
				WB Right	95	0	0	0	A		
26- MD 117 at Bureau Dr											
26	NB	52.3	D	NB Left	18	70	16	93	E	42.3	D
				NB Through	17	79	16	93	E		
				NB Right	25	21	16	93	C		
	SB	63.4	E	SB Left	191	70	80	297	E		
				SB Through	43	68	80	297	E		
				SB Right	28	13	80	297	B		
	EB	47.0	D	EB Left	28	36	314	962	D		
				EB Through	1928	47	322	962	D		
				EB Right	20	59	315	951	E		
	WB	31.8	C	WB Left	298	93	195	602	F		
				WB Through	852	19	195	603	B		
				WB Right	316	8	169	651	A		
27- MD 117 at I-270 SB off ramp											
27	NB			NB Left	0	0	0	0	A	8.0	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	1.8	A	EB Left	0	0	0	0	A		
				EB Through	799	2	1	180	A		
				EB Right	0	0	0	0	A		
	WB	24.0	C	WB Left	310	24	45	344	C		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
28- MD 117 at I-270 NB off ramp											
28	NB			NB Left	0	0	0	0	A	30.5	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	49.1	D	SB Left	307	54	230	811	D		
				SB Through	0	0	0	0	A		
				SB Right	915	48	236	813	D		
	EB	19.4	B	EB Left	10	111	80	888	F		
				EB Through	782	18	80	888	B		
				EB Right	0	0	0	0	A		
	WB	14.2	B	WB Left	0	0	0	0	A		
				WB Through	860	14	51	343	B		
				WB Right	9	5	55	373	A		
29- MD 117 at Perry Pkwy											
29	NB	42.5	D	NB Left	35	67	14	97	E	13.6	B
				NB Through	6	61	14	96	E		
				NB Right	31	11	23	117	B		
	SB	33.8	C	SB Left	91	72	37	167	E		
				SB Through	13	72	37	167	E		
				SB Right	124	2	37	167	A		
	EB	10.3	B	EB Left	119	69	42	237	E		
				EB Through	957	3	42	237	A		
				EB Right	9	1	29	221	A		
	WB	9.9	A	WB Left	5	87	20	261	F		
				WB Through	709	10	20	261	A		
				WB Right	104	5	20	261	A		
30- Shady Grove Rd at I-270 NB off ramp											
30	NB	9.5	A	NB Left	0	0	0	0	A	24.6	C
				NB Through	917	9	21	216	A		
				NB Right	0	0	0	0	A		
	SB	10.1	B	SB Left	0	0	0	0	A		
				SB Through	1284	10	31	344	B		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	56.8	E	WB Left	1008	57	201	631	E		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table A.14: AM Peak - Existing - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
31- Shady Grove Rd at I-270 SB off ramp											
31	NB	14.6	B	NB Left	0	0	0	0	A	21.0	C
				NB Through	920	15	41	379	B		
				NB Right	0	0	0	0	A		
	SB	11.4	B	SB Left	0	0	0	0	A		
				SB Through	1692	11	46	658	B		
				SB Right	0	0	0	0	A		
	EB	44.2	D	EB Left	313	37	42	360	D		
				EB Through	0	0	0	0	A		
				EB Right	642	48	102	463	D		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
32- MD 28 at I-270 SB off ramp											
32	NB			NB U-Turn	0	0	0	0	A	32.6	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	35.9	D	SB Left	456	44	72	304	D		
				SB Through	0	0	0	0	A		
				SB Right	108	3	0	59	A		
	EB	57.4	E	EB Left	0	0	0	0	A		
				EB Through	1050	87	1521	2131	F		
				EB Right	663	11	1050	2134	B		
	WB	9.1	A	WB Left	0	0	0	0	A		
				WB Through	1879	9	32	405	A		
				WB Right	0	0	0	0	A		
33- MD 28 at I-270 on and off ramps											
33	NB	34.9	C	NB Left	0	0	54	306	A	17.4	B
				NB Through	213	51	62	315	D		
				NB Right	139	11	62	315	B		
	SB	21.1	C	SB Left	25	60	19	169	E		
				SB Through	0	0	0	0	A		
				SB Right	260	17	19	169	B		
	EB	15.0	B	EB Left	224	28	46	333	C		
				EB Through	829	11	46	333	B		
				EB Right	0	0	0	0	A		
	WB	12.3	B	WB Left	22	11	41	286	B		
				WB Through	887	12	29	249	B		
				WB Right	0	0	0	0	A		
34- MD 189 at Great Falls Rd											
34	NB	40.7	D	NB Left	62	45	16	111	D	10.0	B
				NB Through	6	42	13	110	D		
				NB Right	8	8	15	121	A		
	SB	5.2	A	SB Left	66	46	20	162	D		
				SB Through	7	40	20	162	D		
				SB Right	601	0	0	0	A		
	EB	10.2	B	EB Left	325	16	14	215	B		
				EB Through	920	8	18	229	A		
				EB Right	13	6	26	265	A		
	WB	12.1	B	WB Left	3	21	16	184	C		
				WB Through	315	12	16	184	B		
				WB Right	10	9	27	218	A		
35- MD 189 at I-270 Ramps											
35	NB	50.5	D	NB Left	133	51	25	119	D	41.6	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	48.3	D	SB Left	184	48	54	316	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	23.2	C	EB Left	384	20	81	458	B		
				EB Through	529	26	81	458	C		
				EB Right	0	0	0	0	A		
	WB	59.1	E	WB Left	533	50	137	497	D		
				WB Through	284	76	137	497	E		
				WB Right	0	0	0	0	A		
36- MD 189 at Wootton Pkwy											
36	NB	43.1	D	NB Left	129	52	52	178	D	58.1	E
				NB Through	100	80	52	178	E		
				NB Right	151	12	52	178	B		
	SB	91.5	F	SB Left	385	105	294	792	F		
				SB Through	516	81	218	720	F		
				SB Right	0	0	0	0	A		
	EB	48.8	D	EB Left	132	75	214	884	E		
				EB Through	958	48	214	884	D		
				EB Right	95	23	214	884	C		
	WB	42.6	D	WB Left	423	62	108	314	E		
				WB Through	390	27	108	314	C		
				WB Right	58	5	108	314	A		
37- Montrose Rd at Tower Oaks Blvd											
37	NB			NB Left	0	0	0	0	A	26.1	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	106.3	F	SB Left	126	40	201	957	D		
				SB Through	0	0	0	0	A		
				SB Right	521	122	323	955	F		
	EB	7.9	A	EB Left	28	16	25	421	B		
				EB Through	1424	8	25	421	A		
				EB Right	0	0	0	0	A		
	WB	9.2	A	WB Left	0	0	0	0	A		
				WB Through	1443	9	26	286	A		
				WB Right	62	4	26	286	A		
38- Tower Oaks Blvd at I-270 off ramp											
38	NB	15.7	B	NB Left	475	16	25	187	B	14.8	B
				NB Through	12	17.0	19	179	B		
				NB Right	26	4.9	25	187	A		
	SB	0.1	A	SB Left	2	-0.2	0	16	A		
				SB Through	0	0.0	0	16	A		
				SB Right	2	0.5	0	0	A		
	EB	14.6	B	EB Left	7	11.4	39	282	B		
				EB Through	621	15.1	39	282	B		
				EB Right	91	11.5	32	272	B		
	WB	11.9	B	WB Left	0	0.0	4	71	A		
				WB Through	84	12.6	4	71	B		
				WB Right	7	4.2	0	0	A		
39- Montrose Rd at Tower Oaks Blvd											
39	NB	9.6	A	NB Left	26	45	21	127	D	61.8	E
				NB Through	188	30	21	127	C		
				NB Right	507	0	0	0	A		
	SB	38.9	D	SB Left	297	70	128	520	E		
				SB Through	605	26	127	519	C		
				SB Right	64	18	130	533	B		
	EB	144.4	F	EB Left	56	123	558	723	F		
				EB Through	816	146	559	724	F		
				EB Right	45	147	582	747	F		
	WB	39.8	D	WB Left	362	48	77	299	D		
				WB Through	231	46	77	299	D		
				WB Right	134	7	91	329	A		
40- Rockledge Blvd at I-270 NB on and off ramp											
40	NB			NB Left	0	0	0	0	A	16.0	B
				NB Through	85	32	30	146	C		
				NB Right	195	34	30	146	C		
	SB	2.3	A	SB Left	0	0	6	75	A		
				SB Through	986	2	6	75	A		
				SB Right	0	0	0	0	A		
	EB	24.3	C	EB Left	5	35	109	424	C		
				EB Through	501	50	109	424	D		
				EB Right	550	1	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table A.14: AM Peak - Existing - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS	
41- Rockledge Blvd at I-270 SB on and off ramps												
41	NB	2.6	A	NB Left	89	3	1	25	A	20.5	C	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	21.6	C		WB Left	986	23	98	664			C
					WB Through	452	19	98	664			B
					WB Right	0	0	0	0			A
42- MD 187 at Tuckerman Ln												
42	NB	290.3	F	NB Left	184	172	1149	1512	F	195.3	F	
				NB Through	1181	240	1149	1512	F			
				NB Right	143	859	1149	1512	F			
	SB	172.4	F		SB Left	60	147	2547	2696			F
					SB Through	1511	171	2547	2696			F
					SB Right	177	192	2547	2696			F
	EB	65.2	E		EB Left	185	47	206	895			D
					EB Through	548	73	207	896			E
					EB Right	135	58	228	920			E
	WB	203.3	F		WB Left	702	243	1957	2147			F
					WB Through	354	165	1957	2147			F
					WB Right	135	100	1957	2147			F
43- MD 187 at I-270 NB on and off ramps												
43	NB	67.1	E	NB Left	153	90	240	435	F	44.4	D	
				NB Through	1250	64	240	435	E			
				NB Right	0	0	0	0	A			
	SB	24.4	C		SB Left	0	0	0	0			A
					SB Through	1718	24	91	590			C
					SB Right	0	0	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	64.9	E		WB Left	120	64	63	355			E
					WB Through	10	75	63	355			E
					WB Right	0	0	0	0			A
44- MD 187 at I-270 NB on and off ramps												
44	NB	131.6	F	NB Left	0	0	0	0	A	62.8	E	
				NB Through	1241	132	392	892	F			
				NB Right	0	0	0	0	A			
	SB	7.5	A		SB Left	193	56	63	268			E
					SB Through	1641	2	63	268			A
					SB Right	0	0	0	0			A
	EB	91.6	F		EB Left	190	98	179	700			F
					EB Through	0	0	179	700			A
					EB Right	370	88	218	693			F
	WB				WB Left	0	0	0	0			A
					WB Through	0	0	0	0			A
					WB Right	0	0	0	0			A
45- MD 187 at Rock Spring Dr												
45	NB	19.7	B	NB Left	192	61	84	380	E	22.2	C	
				NB Through	1193	13	84	381	B			
				NB Right	6	16	104	414	B			
	SB	21.0	C		SB Left	12	25	104	666			C
					SB Through	1837	23	104	666			C
					SB Right	160	1	74	661			A
	EB	38.3	D		EB Left	160	64	45	180			E
					EB Through	22	54	45	180			D
					EB Right	197	16	45	180			B
	WB	4.8	A		WB Left	1	14	0	19			B
					WB Through	8	6	0	19			A
					WB Right	4	-1	0	0			A
47-Democracy Blvd at I-270 NB off ramp												
47	NB	31.2	C	NB Left	212	31	26	165	C	14.0	B	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB	13.5	B		EB Left	0	0	0	0			A
					EB Through	1585	13	52	439			B
					EB Right	0	0	0	0			A
	WB	10.1	B		WB Left	0	0	0	0			A
					WB Through	736	10	21	176			B
					WB Right	0	0	0	0			A
48- Democracy Blvd at I-270 SB on ramp												
48	NB			NB Left	0	0	0	0	A	6.3	A	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB	5.0	A		EB Left	0	0	0	0			A
					EB Through	1691	5	20	274			A
					EB Right	0	0	0	0			A
	WB	8.6	A		WB Left	210	37	30	188			D
					WB Through	733	1	19	167			A
					WB Right	0	0	0	0			A
49- Democracy Blvd at I-270 SB off ramp												
49	NB			NB Left	0	0	0	0	A	12.4	B	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB	33.1	C		SB Left	334	49	58	237			D
					SB Through	0	0	0	0			A
					SB Right	173	2	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	2.5	A		WB Left	0	0	0	0			A
					WB Through	732	3	4	112			A
					WB Right	323	2	0	103			A
50- MD 190 at Burdette Rd												
50	NB	76.6	E	NB Left	19	69	12	111	E	11.8	B	
				NB Through	3	74	12	111	E			
				NB Right	8	95	12	111	F			
	SB	33.2	C		SB Left	41	84	27	151			F
					SB Through	13	84	27	151			F
					SB Right	113	9	27	151			A
	EB	9.6	A		EB Left	47	98	53	454			F
					EB Through	1709	7	52	453			A
					EB Right	15	5	42	477			A
	WB	10.7	B		WB Left	0	87	45	661			F
					WB Through	1437	11	46	662			B
					WB Right	18	3	41	702			A

Table A.14: AM Peak - Existing - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
51- MD 190 at I-270 NB on ramp											
51	NB			NB Left	0	0	0	0	A	37.1	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	81.7	F	EB Left	493	82	233	519	F		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	14.6	B	WB Left	0	0	0	0	A		
				WB Through	975	15	62	601	B		
				WB Right	0	0	0	0	A		
52- MD 190 at I-270 SB off ramp											
52	NB	78.7	E	NB Left	251	79	996	2228	E	14.3	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	2.9	A	EB Left	0	0	0	0	A		
				EB Through	864	3	6	140	A		
				EB Right	0	0	0	0	A		
	WB	4.8	A	WB Left	0	0	0	0	A		
				WB Through	675	5	6	147	A		
				WB Right	0	0	0	0	A		
53- MD 190 at Seven Locks Rd											
53	NB	66.4	E	NB Left	17	67	16	123	E	43.0	D
				NB Through	44	66	19	123	E		
				NB Right	0	0	0	0	A		
	SB	67.6	E	SB Left	581	67	199	696	E		
				SB Through	145	68	199	696	E		
				SB Right	13	73	198	696	E		
	EB	29.4	C	EB Left	18	25	93	480	C		
				EB Through	781	29	93	480	C		
				EB Right	32	30	93	480	C		
	WB	34.1	C	WB Left	121	113	109	329	F		
				WB Through	642	27	112	331	C		
				WB Right	159	1	2	57	A		
54- MD 124 at I-270 NB off ramp											
54	NB	84.3	F	NB Left	0	0	0	0	A	95.4	F
				NB Through	0	0	0	0	A		
				NB Right	920	84	345	963	F		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	107.9	F	EB Left	0	0	0	0	A		
				EB Through	813	108	473	1086	F		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
55- Democracy Blvd at I-270 NB off ramp											
55	NB	37.9	D	NB Left	0	0	0	0	A	16.9	B
				NB Through	0	0	0	0	A		
				NB Right	926	38	117	601	D		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	4.6	A	EB Left	0	0	0	0	A		
				EB Through	1586	5	18	88	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table A.15: AM Peak -2015 Variable Speed Limit- Alternative Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
1- MD 85 at Sam's Club Drive											
1	NB	18.2	B	NB Left	102	76	57	245	E	33.1	C
				NB Through	310	23	57	245	C		
				NB Right	580	5	5	218	A		
	SB	42.3	D	SB Left	110	59	123	548	E		
				SB Through	535	41	123	548	D		
				SB Right	53	23	123	548	C		
	EB	44.8	D	EB Left	81	72	43	158	E		
				EB Through	47	79	43	158	E		
				EB Right	102	7	43	158	A		
	WB	51.0	D	WB Left	208	72	75	326	E		
				WB Through	12	65	75	326	E		
				WB Right	100	6	75	326	A		
2- MD 85 at I-270 NB on and off ramp											
2	NB	42.1	D	NB Left	559	42	152	732	D	28.7	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	14.9	B	SB Left	0	0	0	0	A		
				SB Through	545	15	39	525	B		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
3- MD 85 at I-270 SB on and off ramp											
3	NB	4.5	A	NB Left	0	0	0	0	A	10.5	B
				NB Through	812	4	12	355	A		
				NB Right	0	0	0	0	A		
	SB	42.3	D	SB Left	154	42	39	249	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
4- MD 85 at Crestwood Blvd											
4	NB	15.9	C	NB Left	10	56	34	267	E	19.6	B
				NB Through	585	15	34	267	B		
				NB U-Turn	0	0	0	0	A		
	SB	13.7	B	SB Left	58	68	22	143	E		
				SB Through	1649	14	56	546	B		
				SB Right	748	9	45	536	A		
	EB	48.3	D	EB Left	481	50	69	218	D		
				EB Through	19	60	69	218	E		
				EB Right	32	10	69	218	A		
	WB	43.2	D	WB Left	37	56	16	116	E		
				WB Through	15	59	16	116	E		
				WB Right	19	7	16	116	A		
5- MD 80 at I-270 NB on and ramp											
5	NB	-1.5	A	NB Left	3	0	0	0	A	8.0	A
				NB Through	1	0	0	0	A		
				NB Right	4	-3	0	0	A		
	SB	11.7	B	SB Left	184	14	11	106	B		
				SB Through	6	17	11	106	B		
				SB Right	52	2	0	0	A		
	EB	8.5	A	EB Left	38	9	6	134	A		
				EB Through	0	0	8	0	A		
				EB Right	7	6	14	174	A		
	WB	7.3	A	WB Left	31	8	0	39	A		
				WB Through	683	11	36	441	B		
				WB Right	503	2	0	0	A		
6- MD 80 at I-270 SB on and off ramp											
6	NB	3.0	A	NB Left	21	10	0	91	B	10.6	B
				NB Through	0	0	0	0	A		
				NB Right	255	2	0	91	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	13.5	B	EB Left	0	0	0	0	A		
				EB Through	241	13	13	205	B		
				EB Right	133	15	13	213	B		
	WB	15.8	C	WB Left	0	0	0	0	A		
				WB Through	193	16	28	354	C		
				WB Right	0	0	0	0	A		
7- MD 109 at I-270 NB on and off ramp											
7	NB			NB Left	0	0	0	0	A	2.4	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	8.1	A	SB Left	118	10	7	123	B		
				SB Through	0	0	0	0	A		
				SB Right	38	1	0	60	A		
	EB	3.3	A	EB Left	59	3	0	56	A		
				EB Through	0	0	0	0	A		
				EB Right	40	3	0	0	A		
	WB	0.3	A	WB Left	0	0	0	0	A		
				WB Through	462	0	0	0	A		
				WB Right	0	0	0	0	A		
8- MD 80 at I-270 SB on and off ramp											
8	NB	4.0	A	NB Left	15	13	1	80	B	2.1	A
				NB Through	0	0	0	0	A		
				NB Right	40	1	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	2.7	A	EB Left	0	0	0	0	A		
				EB Through	59	0	0	30	A		
				EB Right	70	5	0	30	A		
	WB	1.7	A	WB Left	393	1	0	91	A		
				WB Through	109	3	0	85	A		
				WB Right	0	0	0	0	A		
9- MD 121 at Gateway Center Dr											
9	NB	8.6	A	NB Left	95	13	14	126	B	21.2	C
				NB Through	279	12	14	126	B		
				NB Right	198	2	17	152	A		
	SB	16.9	C	SB Left	47	11	31	340	B		
				SB Through	583	17	43	341	B		
				SB Right	6	15	48	362	B		
	EB	34.4	D	EB Left	7	32	90	428	C		
				EB Through	87	46	95	428	D		
				EB Right	546	33	119	461	C		
	WB	33.4	D	WB Left	95	39	21	132	D		
				WB Through	12	36	22	132	D		
				WB Right	21	6	16	151	A		
10- MD 121 at I-270 NB on and off ramp											
10	NB	1.6	A	NB Left	40	9	2	79	A	0.7	A
				NB Through	0	0	0	0	A		
				NB Right	254	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.1	A	EB Left	0	0	0	0	A		
				EB Through	317	0	0	0	A		
				EB Right	49	0	0	0	A		
	WB	0.7	A	WB Left	151	2	1	92	A		
				WB Through	1073	1	0	63	A		
				WB Right	0	0	0	0	A		

Table A.15: AM Peak -2015 Variable Speed Limit- Alternative Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
11- MD 121 at I-270 SB on and off ramp											
11	NB			NB Left	0	0	0	0	A	1.4	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	7.7	A	SB Left	122	10	6	103	B		
				SB Through	0	0	0	0	A		
				SB Right	46	1	0	0	A		
	EB	0.6	A	EB Left	25	2	0	46	A		
				EB Through	0	0	0	0	A		
				EB Right	835	1	0	37	A		
	WB	0.1	A	WB Left	0	0	0	0	A		
				WB Through	278	0	0	0	A		
				WB Right	0	0	0	0	A		
12- MD 27 at Observation Dr											
12	NB	48.2	D	NB U-Turn	0	0	0	0	A	19.5	B
				NB Through	34	63	10	64	E		
				NB Right	12	8	10	64	A		
	SB	41.0	D	SB Left	75	52	23	142	D		
				SB Through	43	60	30	226	E		
				SB Right	158	31	53	263	C		
	EB	13.2	B	EB Left	150	30	29	284	C		
				EB Through	1193	11	31	285	B		
				EB Right	49	10	40	323	B		
	WB	20.2	C	WB Left	83	15	138	792	B		
				WB Through	2047	21	138	792	C		
				WB Right	93	9	138	792	A		
13- MD 27 at I-270 NB off ramp											
13	NB	29.9	C	NB Left	89	30	12	98	C	7.8	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.1	A	EB Left	0	0	0	0	A		
				EB Through	886	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	10.1	B	WB Left	0	0	0	0	A		
				WB Through	2108	10	153	1214	B		
				WB Right	0	0	0	0	A		
14- MD 27 at I-270 SB off ramp											
14	NB			NB Left	0	0	0	0	A	15.2	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	47.0	D	SB Left	371	47	63	279	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	8.9	A	EB Left	0	0	0	0	A		
				EB Through	658	9	12	184	A		
				EB Right	0	0	0	0	A		
	WB	9.1	A	WB Left	0	0	0	0	A		
				WB Through	1263	9	36	638	A		
				WB Right	0	0	0	0	A		
15- MD 27 at Crystal Rock Dr											
15	NB	18.0	B	NB Left	22	19	33	415	B	33.3	C
				NB Through	818	18	58	428	B		
				NB Right	73	17	61	441	B		
	SB	37.5	D	SB Left	407	60	246	1181	E		
				SB Through	1336	31	246	1181	C		
				SB Right	41	15	211	1175	B		
	EB	44.4	D	EB Left	177	49	47	169	D		
				EB Through	73	50	43	164	D		
				EB Right	60	26	44	196	C		
	WB	56.0	E	WB Left	8	63	85	273	E		
				WB Through	21	302	85	273	F		
				WB Right	104	6	85	273	A		
16- MD 118 at Seneca Meadows Pkwy											
16	NB	3.3	A	NB Left	122	10	1	72	B	5.4	A
				NB Through	727	2	4	117	A		
				NB Right	77	1	8	170	A		
	SB	3.7	A	SB Left	25	5	5	182	A		
				SB Through	808	4	8	182	A		
				SB Right	32	2	9	206	A		
	EB	16.6	B	EB Left	15	62	8	69	E		
				EB Through	6	59	8	69	E		
				EB Right	96	7	8	69	A		
	WB	43.6	D	WB Left	30	64	12	94	E		
				WB Through	5	69	8	94	E		
				WB Right	21	8	11	113	A		
17- MD 118 at I-270 NB on ramp											
17	NB			NB Left	0	0	0	0	A	11.0	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	32.8	C	EB Left	222	33	44	277	C		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	5.8	A	WB Left	0	0	0	0	A		
				WB Through	155	1	0	0	A		
				WB Right	778	7	15	250	A		
18- MD 118 at I-270 SB off ramp											
18	NB			NB Left	0	0	0	0	A	7.4	A
				NB Through	0	0.0	0	0	A		
				NB Right	0	0.0	0	0	A		
	SB	40.0	D	SB Left	192	40.0	33	162	D		
				SB Through	0	0.0	0	0	A		
				SB Right	0	0.0	0	0	A		
	EB	3.3	A	EB Left	0	0.0	0	0	A		
				EB Through	616	3.3	4	142	A		
				EB Right	0	0.0	0	0	A		
	WB	3.7	A	WB Left	0	0.0	0	0	A		
				WB Through	1035	3.7	7	168	A		
				WB Right	0	0.0	0	0	A		
19- MD 118 at Aircraft Dr											
19	NB	45.2	D	NB Left	7	70	8	75	E	17.9	B
				NB Through	12	80	8	75	F		
				NB Right	14	3	0	22	A		
	SB	60.7	E	SB Left	241	58	98	368	E		
				SB Through	41	66	98	368	E		
				SB Right	81	67	98	368	E		
	EB	10.4	B	EB Left	102	13	29	310	B		
				EB Through	932	10	29	310	B		
				EB Right	27	9	29	310	A		
	WB	11.2	B	WB Left	72	18	30	256	B		
				WB Through	896	13	30	256	B		
				WB Right	275	3	30	256	A		
20- Middlebrook Rd at Observation Dr											
20	NB			NB Left	0	0	0	0	A	16.2	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	18.7	B	SB Left	22	35	4	43	D		
				SB Through	0	0	0	0	A		
				SB Right	25	4	4	43	A		
	EB	14.3	B	EB Left	239	21	32	229	C		
				EB Through	864	12	32	229	B		
				EB Right	0	0	0	0	A		
	WB	17.7	B	WB Left	0	0	0	0	A		
				WB Through	1073	19	69	408	B		
				WB Right	215	13	93	457	B		

Table A.15: AM Peak -2015 Variable Speed Limit- Alternative Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
21- Middlebrook Rd at I-270 SB on ramp											
21	NB			NB Left	0	0	0	0	A	16.3	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	11.4	B	EB Left	0	0	0	0	A		
				EB Through	805	11	26	176	B		
				EB Right	0	0	0	0	A		
	WB	21.7	C	WB Left	743	22	68	893	C		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
22- Middlebrook Rd at Waring Station Rd											
22	NB	63.0	E	NB Left	147	52	145	449	D	25.3	C
				NB Through	6	52	145	449	D		
				NB Right	342	68	145	449	E		
	SB	21.6	C	SB Left	3	37	1	29	D		
				SB Through	0	0	1	29	A		
				SB Right	3	6	2	67	A		
	EB	18.1	B	EB Left	28	12	123	838	B		
				EB Through	1490	19	123	838	B		
				EB Right	76	10	123	838	B		
	WB	16.2	B	WB Left	78	22	28	215	C		
				WB Through	680	16	28	215	B		
				WB Right	35	4	28	215	A		
23- MD 124 at MD 355											
23	NB	50.9	D	NB Left	230	70	73	199	E	86.3	F
				NB Through	306	42	70	197	D		
				NB Right	37	2	0	0	A		
	SB	36.4	D	SB Left	49	87	137	460	F		
				SB Through	965	51	137	460	D		
				SB Right	615	10	54	415	A		
	EB	101.3	F	EB Left	613	257	1034	1199	F		
				EB Through	521	24	1034	1199	C		
				EB Right	575	5	984	1181	A		
	WB	126.5	F	WB Left	0	0	0	0	A		
				WB Through	1850	128	733	1124	F		
				WB Right	42	72	0	0	E		
24- MD 124 at I-270 SB on and off											
24	NB	65.0	F	NB Left	15	66	15	78	E	22.8	C
				NB Through	29	64	15	78	E		
				NB U-Turn	0	0	0	0	A		
	SB	24.6	C	SB Left	301	63	74	361	E		
				SB Through	3	79	74	361	E		
				SB Right	561	4	8	318	A		
	EB	15.4	B	EB Left	0	0	0	0	A		
				EB Through	907	16	40	312	B		
				EB Right	68	12	49	335	B		
	WB	25.8	C	WB Left	32	30	467	1647	C		
				WB Through	1183	26	467	1647	C		
				WB Right	0	0	0	0	A		
25- MD 117 at MD 124											
25	NB	42.6	D	NB Left	16	67	112	598	E	43.0	D
				NB Through	421	58	112	598	E		
				NB Right	408	26	60	553	C		
	SB	38.5	D	SB Left	182	51	128	561	D		
				SB Through	838	40	128	561	D		
				SB Right	95	3	0	0	A		
	EB	48.6	D	EB Left	79	109	175	697	F		
				EB Through	1385	45	174	699	D		
				EB Right	66	42	184	726	D		
	WB	39.4	D	WB Left	319	71	104	343	E		
				WB Through	483	27	104	343	C		
				WB Right	96	0	0	0	A		
26- MD 117 at Bureau Dr											
26	NB	50.5	D	NB Left	18	67	15	94	E	44.3	D
				NB Through	17	76	15	94	E		
				NB Right	25	22	15	94	C		
	SB	63.3	E	SB Left	193	69	80	299	E		
				SB Through	44	69	80	299	E		
				SB Right	28	14	80	299	B		
	EB	47.0	D	EB Left	28	34	320	891	C		
				EB Through	1946	47	327	891	D		
				EB Right	20	63	319	880	E		
	WB	37.1	D	WB Left	300	106	232	821	F		
				WB Through	856	23	233	822	C		
				WB Right	317	10	203	870	A		
27- MD 117 at I-270 SB off ramp											
27	NB			NB Left	0	0	0	0	A	8.5	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	2.0	A	EB Left	0	0	0	0	A		
				EB Through	801	2	1	211	A		
				EB Right	0	0	0	0	A		
	WB	25.2	D	WB Left	311	25	50	453	D		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
28- MD 117 at I-270 NB off ramp											
28	NB			NB Left	0	0	0	0	A	34.4	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	57.0	E	SB Left	307	64	301	1084	E		
				SB Through	0	0	0	0	A		
				SB Right	922	55	307	1086	D		
	EB	21.1	C	EB Left	10	124	92	931	F		
				EB Through	786	20	92	931	B		
				EB Right	0	0	0	0	A		
	WB	14.5	B	WB Left	0	0	0	0	A		
				WB Through	860	15	51	332	B		
				WB Right	9	5	55	362	A		
29- MD 117 at Perry Pkwy											
29	NB	45.1	D	NB Left	35	73	15	99	E	13.6	B
				NB Through	6	63	15	98	E		
				NB Right	31	11	25	119	B		
	SB	34.6	C	SB Left	90	75	38	168	E		
				SB Through	13	68	38	168	E		
				SB Right	124	2	38	168	A		
	EB	10.2	B	EB Left	120	67	42	241	E		
				EB Through	959	3	42	241	A		
				EB Right	9	2	29	226	A		
	WB	9.6	A	WB Left	5	88	20	260	F		
				WB Through	709	10	20	260	A		
				WB Right	104	5	20	260	A		
30- Shady Grove Rd at I-270 NB off ramp											
30	NB	8.8	A	NB Left	0	0	0	0	A	24.3	C
				NB Through	917	9	20	232	A		
				NB Right	0	0	0	0	A		
	SB	10.1	B	SB Left	0	0	0	0	A		
				SB Through	1284	10	31	344	B		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	56.6	E	WB Left	1011	57	201	667	E		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table A.15: AM Peak -2015 Variable Speed Limit- Alternative Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
31- Shady Grove Rd at I-270 SB off ramp											
31	NB	15.2	B	NB Left	0	0	0	0	A	21.5	C
				NB Through	920	15	42	348	B		
				NB Right	0	0	0	0	A		
	SB	12.0	B	SB Left	0	0	0	0	A		
				SB Through	1694	12	48	617	B		
				SB Right	0	0	0	0	A		
	EB	44.4	D	EB Left	313	38	43	295	D		
				EB Through	0	0	0	0	A		
				EB Right	651	48	104	460	D		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
32- MD 28 at I-270 SB off ramp											
32	NB			NB U-Turn	0	0	0	0	A	31.8	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	35.2	D	SB Left	445	43	74	311	D		
				SB Through	0	0	0	0	A		
				SB Right	105	1	0	43	A		
	EB	55.8	E	EB Left	0	0	0	0	A		
				EB Through	1054	85	1469	2135	F		
				EB Right	688	12	746	2133	B		
	WB	8.8	A	WB Left	0	0	0	0	A		
				WB Through	1890	9	30	379	A		
				WB Right	0	0	0	0	A		
33- MD 28 at I-270 on and off ramps											
33	NB	33.5	C	NB Left	0	0	49	271	A	18.3	B
				NB Through	212	48	59	280	D		
				NB Right	140	11	59	280	B		
	SB	21.0	C	SB Left	25	66	19	146	E		
				SB Through	0	0	0	0	A		
				SB Right	260	17	19	146	B		
	EB	17.7	B	EB Left	231	33	57	402	C		
				EB Through	842	13	57	402	B		
				EB Right	0	0	0	0	A		
	WB	12.3	B	WB Left	22	10	42	294	A		
				WB Through	887	12	29	258	B		
				WB Right	0	0	0	0	A		
34- MD 189 at Great Falls Rd											
34	NB	40.4	D	NB Left	62	44	16	111	D	10.4	B
				NB Through	6	42	13	110	D		
				NB Right	8	8	15	121	A		
	SB	5.2	A	SB Left	66	46	20	162	D		
				SB Through	7	40	20	162	D		
				SB Right	601	0	0	0	A		
	EB	10.9	B	EB Left	324	16	13	200	B		
				EB Through	920	9	18	225	A		
				EB Right	13	6	27	261	A		
	WB	12.5	B	WB Left	3	17	17	182	B		
				WB Through	316	13	17	181	B		
				WB Right	10	8	28	215	A		
35- MD 189 at I-270 Ramps											
35	NB	49.9	D	NB Left	134	50	25	139	D	43.6	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	48.4	D	SB Left	179	48	54	276	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	24.2	C	EB Left	382	21	86	482	C		
				EB Through	530	27	86	482	C		
				EB Right	0	0	0	0	A		
	WB	63.4	E	WB Left	533	51	145	395	D		
				WB Through	280	86	145	395	F		
				WB Right	0	0	0	0	A		
36- MD 189 at Wootton Pkwy											
36	NB	42.1	D	NB Left	129	51	50	179	D	57.2	E
				NB Through	101	76	50	179	E		
				NB Right	151	12	50	179	B		
	SB	91.1	F	SB Left	391	104	287	740	F		
				SB Through	523	82	227	727	F		
				SB Right	0	0	0	0	A		
	EB	46.4	D	EB Left	132	73	200	823	E		
				EB Through	955	45	200	823	D		
				EB Right	95	21	200	823	C		
	WB	43.0	D	WB Left	418	64	111	349	E		
				WB Through	383	26	111	349	C		
				WB Right	58	5	111	349	A		
37- Montrose Rd at Tower Oaks Blvd											
37	NB			NB Left	0	0	0	0	A	26.1	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	103.9	F	SB Left	126	43	185	880	D		
				SB Through	0	0	0	0	A		
				SB Right	531	118	322	917	F		
	EB	7.8	A	EB Left	25	15	24	394	B		
				EB Through	1387	8	24	394	A		
				EB Right	0	0	0	0	A		
	WB	9.3	A	WB Left	0	0	0	0	A		
				WB Through	1443	10	26	275	A		
				WB Right	62	4	26	275	A		
38- Tower Oaks Blvd at I-270 off ramp											
38	NB	15.7	B	NB Left	474	16	25	154	B	15.7	B
				NB Through	12	16.1	19	146	B		
				NB Right	26	4.7	25	154	A		
	SB	2.1	A	SB Left	2	3.3	0	21	A		
				SB Through	0	0.0	0	21	A		
				SB Right	2	0.9	0	0	A		
	EB	16.4	B	EB Left	7	14.7	44	285	B		
				EB Through	622	16.9	44	285	B		
				EB Right	92	13.4	37	276	B		
	WB	10.9	B	WB Left	0	0.0	4	86	A		
				WB Through	81	11.4	4	86	B		
				WB Right	6	3.8	0	18	A		
39- Montrose Rd at Tower Oaks Blvd											
39	NB	9.5	A	NB Left	26	44	21	131	D	60.4	E
				NB Through	188	30	21	131	C		
				NB Right	507	0	0	0	A		
	SB	35.2	D	SB Left	297	64	110	418	E		
				SB Through	606	23	109	417	C		
				SB Right	64	14	115	461	B		
	EB	142.2	F	EB Left	57	121	553	731	F		
				EB Through	819	144	554	732	F		
				EB Right	45	140	578	756	F		
	WB	40.7	D	WB Left	362	50	80	274	D		
				WB Through	232	46	79	274	D		
				WB Right	133	7	92	304	A		
40- Rockledge Blvd at I-270 NB on and off ramp											
40	NB			NB Left	0	0	0	0	A	15.1	B
				NB Through	84	35	31	139	C		
				NB Right	194	35	31	139	C		
	SB	2.4	A	SB Left	0	0	6	73	A		
				SB Through	990	2	6	73	A		
				SB Right	0	0	0	0	A		
	EB	22.1	C	EB Left	5	34	104	494	C		
				EB Through	491	46	104	494	D		
				EB Right	544	1	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table A.15: AM Peak -2015 Variable Speed Limit- Alternative Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS	
41- Rockledge Blvd at I-270 SB on and off ramps												
41	NB	2.4	A	NB Left	89	2	1	32	A	20.2	C	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	21.3	C		WB Left	990	22	95	563			C
					WB Through	451	19	95	563			B
					WB Right	0	0	0	0			A
42- MD 187 at Tuckerman Ln												
42	NB	278.9	F	NB Left	186	147	1140	1490	F	190.1	F	
				NB Through	1165	226	1140	1490	F			
				NB Right	138	906	1140	1490	F			
	SB	171.3	F		SB Left	59	145	2545	2699			F
					SB Through	1519	170	2545	2699			F
					SB Right	176	190	2545	2699			F
	EB	66.3	E		EB Left	185	47	214	937			D
					EB Through	548	74	216	939			E
					EB Right	135	61	236	962			E
	WB	197.0	F		WB Left	723	233	1941	2156			F
					WB Through	359	162	1941	2156			F
					WB Right	138	99	1941	2156			F
43- MD 187 at I-270 NB on and off ramps												
43	NB	62.7	E	NB Left	148	92	209	396	F	42.0	D	
				NB Through	1218	59	209	396	E			
				NB Right	0	0	0	0	A			
	SB	24.6	C		SB Left	0	0	0	0			A
					SB Through	1732	25	91	653			C
					SB Right	0	0	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	56.7	E		WB Left	119	56	53	382			E
					WB Through	10	68	53	382			E
					WB Right	0	0	0	0			A
44- MD 187 at I-270 NB on and off ramps												
44	NB	101.9	F	NB Left	0	0	0	0	A	51.5	D	
				NB Through	1196	102	289	850	F			
				NB Right	0	0	0	0	A			
	SB	7.9	A		SB Left	194	59	66	284			E
					SB Through	1654	2	66	284			A
					SB Right	0	0	0	0			A
	EB	88.4	F		EB Left	188	92	167	684			F
					EB Through	0	0	167	684			A
					EB Right	362	86	213	673			F
	WB				WB Left	0	0	0	0			A
					WB Through	0	0	0	0			A
					WB Right	0	0	0	0			A
45- MD 187 at Rock Spring Dr												
45	NB	22.2	C	NB Left	187	63	116	502	E	23.7	C	
				NB Through	1174	16	117	502	B			
				NB Right	6	8	136	535	A			
	SB	21.5	C		SB Left	13	30	106	678			C
					SB Through	1835	23	106	678			C
					SB Right	161	1	70	673			A
	EB	42.0	D		EB Left	158	72	48	186			E
					EB Through	22	56	48	186			E
					EB Right	197	16	48	186			B
	WB	4.9	A		WB Left	1	14	0	19			B
					WB Through	8	7	0	19			A
					WB Right	4	-1	0	0			A
47-Democracy Blvd at I-270 NB off ramp												
47	NB	30.2	C	NB Left	211	30	25	147	C	13.8	B	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB	13.3	B		EB Left	0	0	0	0			A
					EB Through	1581	13	50	433			B
					EB Right	0	0	0	0			A
	WB	10.3	B		WB Left	0	0	0	0			A
					WB Through	736	10	22	176			B
					WB Right	0	0	0	0			A
48- Democracy Blvd at I-270 SB on ramp												
48	NB			NB Left	0	0	0	0	A	6.3	A	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB	5.1	A		EB Left	0	0	0	0			A
					EB Through	1685	5	20	263			A
					EB Right	0	0	0	0			A
	WB	8.6	A		WB Left	211	36	30	188			D
					WB Through	732	1	19	167			A
					WB Right	0	0	0	0			A
49- Democracy Blvd at I-270 SB off ramp												
49	NB			NB Left	0	0	0	0	A	12.4	B	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB	33.3	C		SB Left	331	50	57	240			D
					SB Through	0	0	0	0			A
					SB Right	170	1	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	2.4	A		WB Left	0	0	0	0			A
					WB Through	731	3	4	113			A
					WB Right	323	2	0	79			A
50- MD 190 at Burdette Rd												
50	NB	75.7	E	NB Left	19	69	12	111	E	11.2	B	
				NB Through	3	74	12	111	E			
				NB Right	8	91	12	111	F			
	SB	33.7	C		SB Left	42	84	28	151			F
					SB Through	13	84	28	151			F
					SB Right	113	9	28	151			A
	EB	8.6	A		EB Left	50	93	49	462			F
					EB Through	1729	6	48	462			A
					EB Right	16	4	38	485			A
	WB	10.6	B		WB Left	0	87	45	672			F
					WB Through	1435	11	46	672			B
					WB Right	18	3	41	713			A

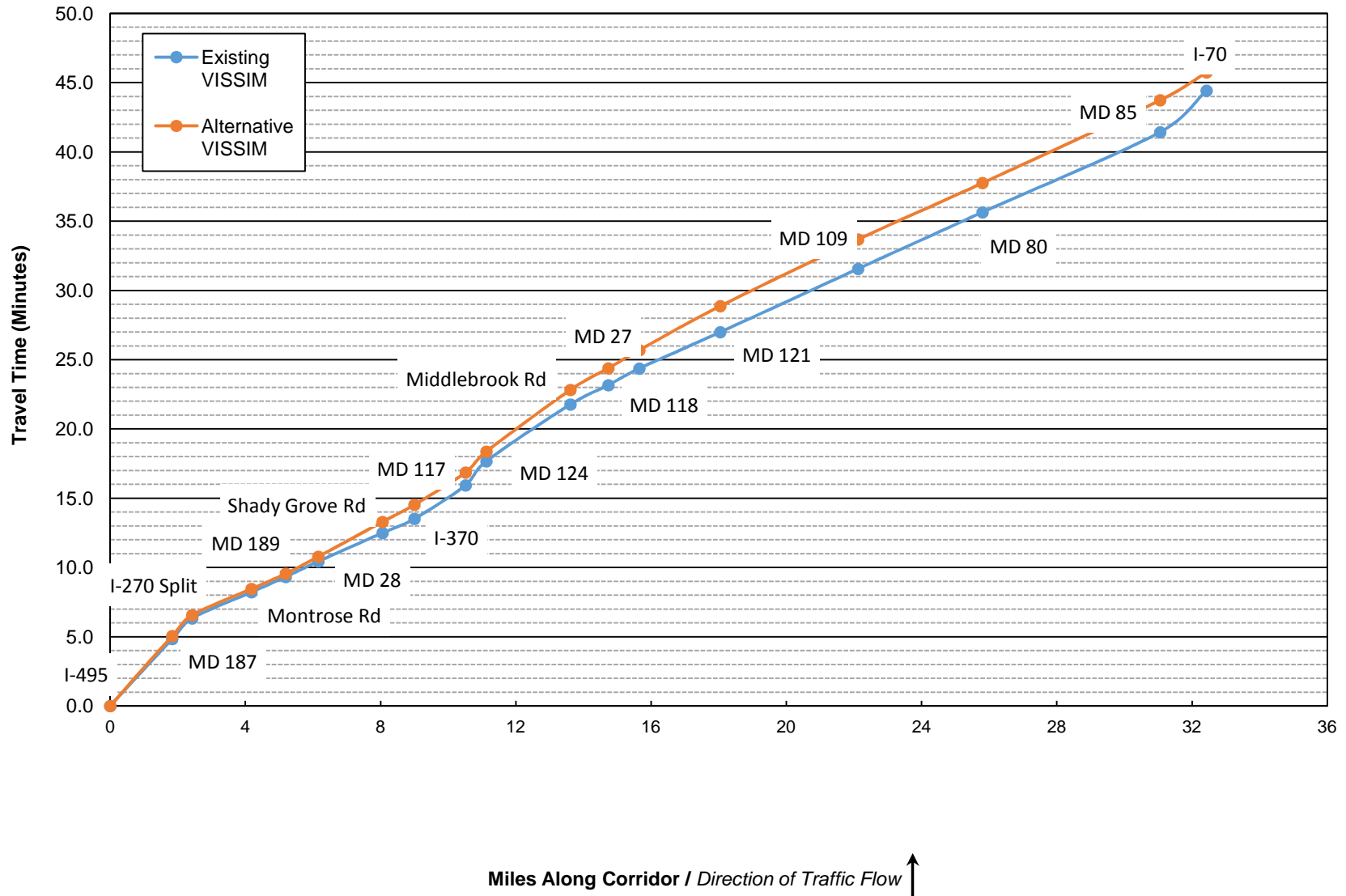
Table A.15: AM Peak -2015 Variable Speed Limit- Alternative Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
51- MD 190 at I-270 NB on ramp											
51	NB			NB Left	0	0	0	0	A	35.6	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	77.5	E	EB Left	493	78	224	528	E		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	14.4	B	WB Left	0	0	0	0	A		
				WB Through	975	14	60	567	B		
				WB Right	0	0	0	0	A		
52- MD 190 at I-270 SB off ramp											
52	NB	83.1	F	NB Left	260	83	1308	3847	F	15.2	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	2.9	A	EB Left	0	0	0	0	A		
				EB Through	864	3	6	136	A		
				EB Right	0	0	0	0	A		
	WB	4.9	A	WB Left	0	0	0	0	A		
				WB Through	675	5	7	157	A		
				WB Right	0	0	0	0	A		
53- MD 190 at Seven Locks Rd											
53	NB	66.4	E	NB Left	17	67	16	123	E	43.3	D
				NB Through	44	66	19	123	E		
				NB Right	0	0	0	0	A		
	SB	67.6	E	SB Left	581	67	199	696	E		
				SB Through	145	68	199	696	E		
				SB Right	13	73	198	696	E		
	EB	29.4	C	EB Left	18	25	93	480	C		
				EB Through	781	29	93	480	C		
				EB Right	32	30	93	480	C		
	WB	35.0	C	WB Left	119	120	114	344	F		
				WB Through	646	28	117	347	C		
				WB Right	160	1	0	0	A		
54- MD 124 at I-270 NB off ramp											
54	NB	69.3	E	NB Left	0	0	0	0	A	88.2	F
				NB Through	0	0	0	0	A		
				NB Right	913	69	285	839	E		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	109.8	F	EB Left	0	0	0	0	A		
				EB Through	800	110	474	1044	F		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
55- Democracy Blvd at I-270 NB off ramp											
55	NB	37.2	D	NB Left	0	0	0	0	A	16.8	B
				NB Through	0	0	0	0	A		
				NB Right	930	37	112	538	D		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	4.8	A	EB Left	0	0	0	0	A		
				EB Through	1581	5	19	91	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

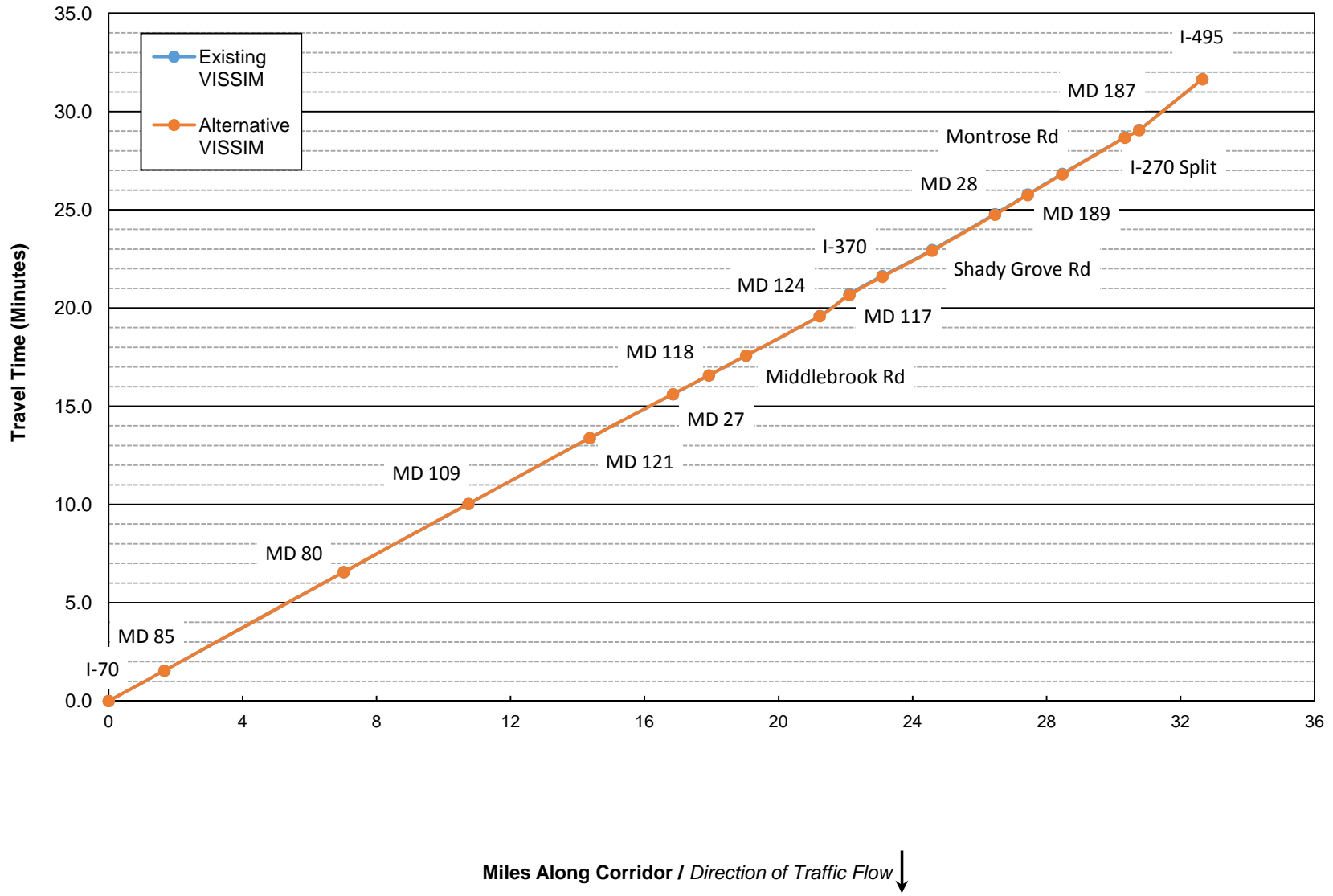
Table A.16: AM Peak -2015 Variable Speed Limit- I-270 Vehicle Network Performance

	Existing	VSL	% Change
Total Delay	21,906,753	20,406,516	-7%
Average Delay per Vehicle	227	212	-7%
Total Travel Time	51,252,838	52,130,610	2%
Vehicles (Arrived)	81,275	81,141	0%
Latent Demand	4,969	4,772	-4%
Latent Delay	13,122,672	12,429,885	-5%
Total Distance	467,210	464,929	0%
Average Speed	33	32	-2%

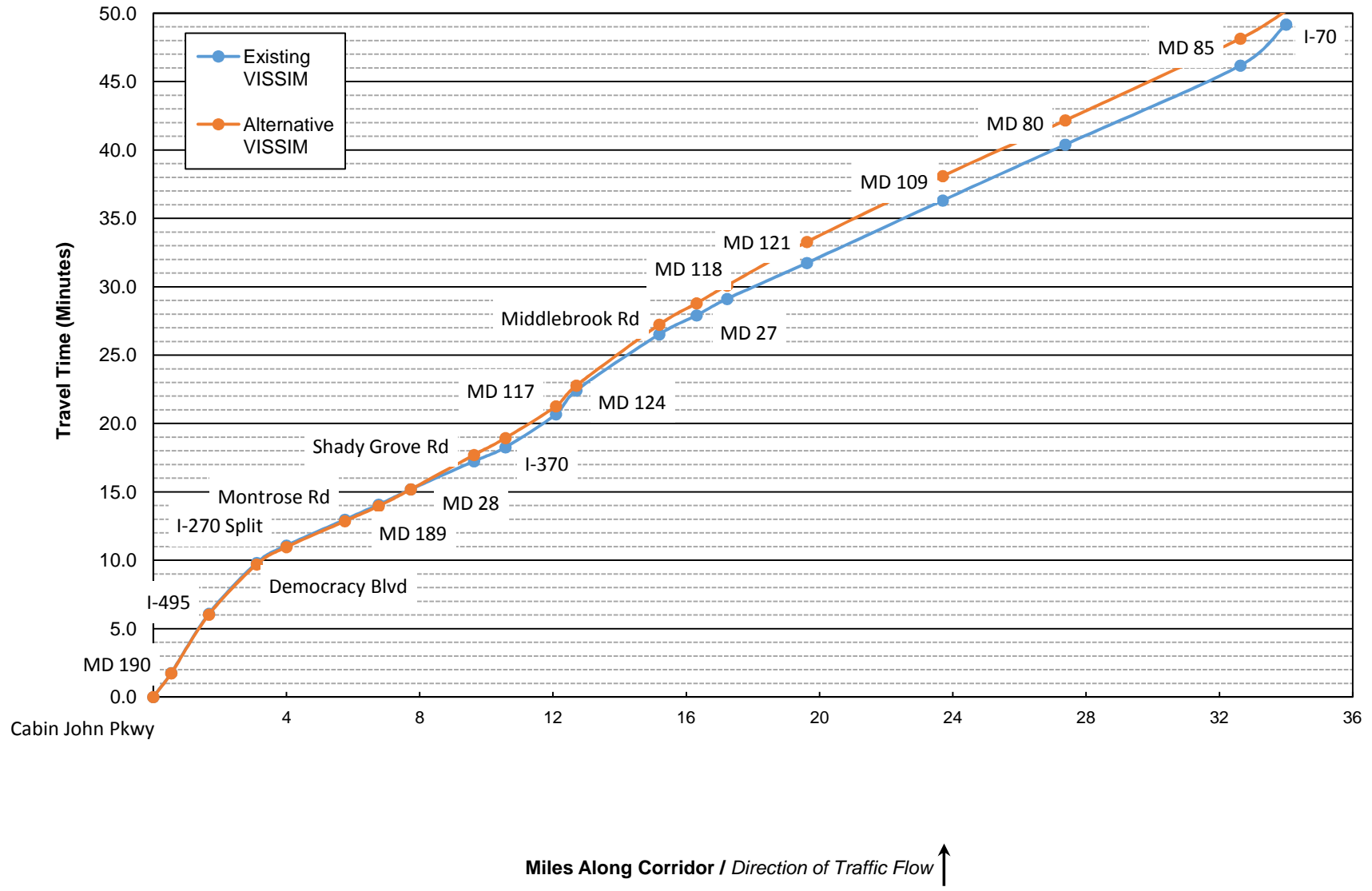
**Figure B.1: PM Peak - 2015 Variable Speed Limit
I-270 Travel Time Graph - Northbound**



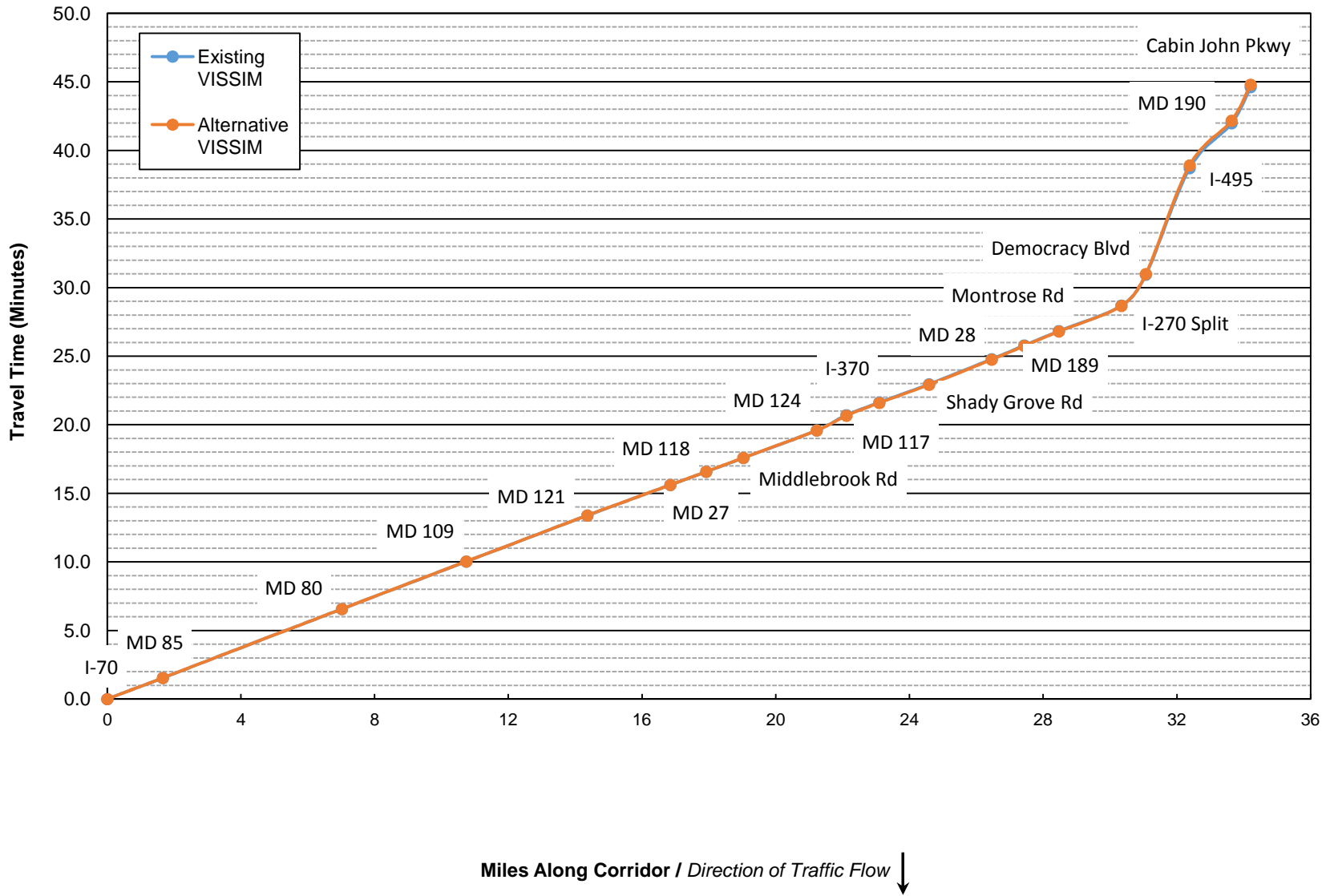
**Figure B.2: PM Peak - 2015 Variable Speed Limit
I-270 Travel Time Graph - Southbound**



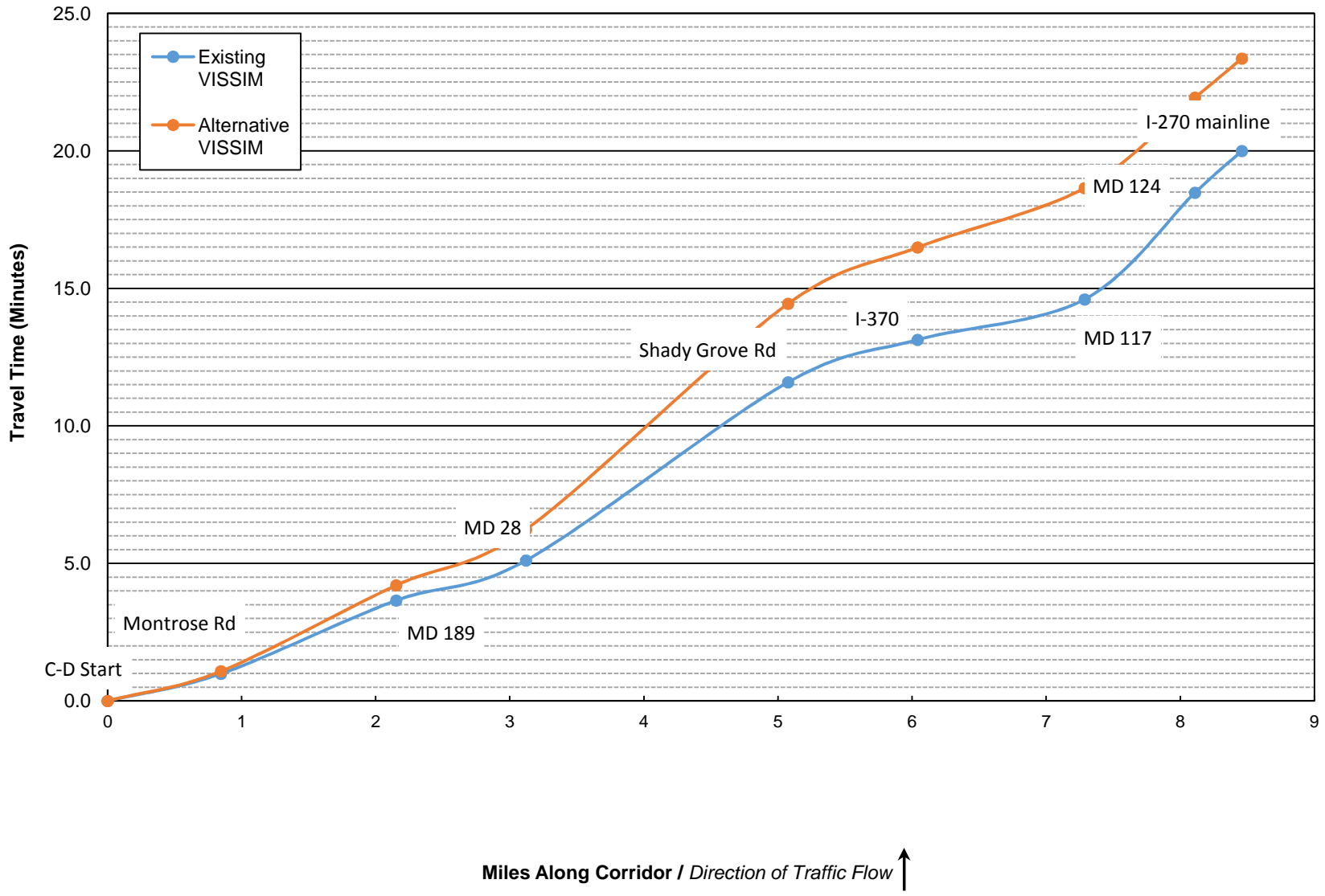
**Figure B.3: PM Peak - 2015 Variable Speed Limit
I-270 Spur Travel Time Graph - Northbound**



**Figure B4: PM Peak - 2015 Variable Speed Limit
I-270 Spur Travel Time Graph - Southbound**



**Figure B.5: PM Peak - 2015 Variable Speed Limit
I-270 Local Travel Time Graph - Northbound**



**Figure B.6: PM Peak - 2015 Variable Speed Limit
I-270 Local Travel Time Graph - Southbound**

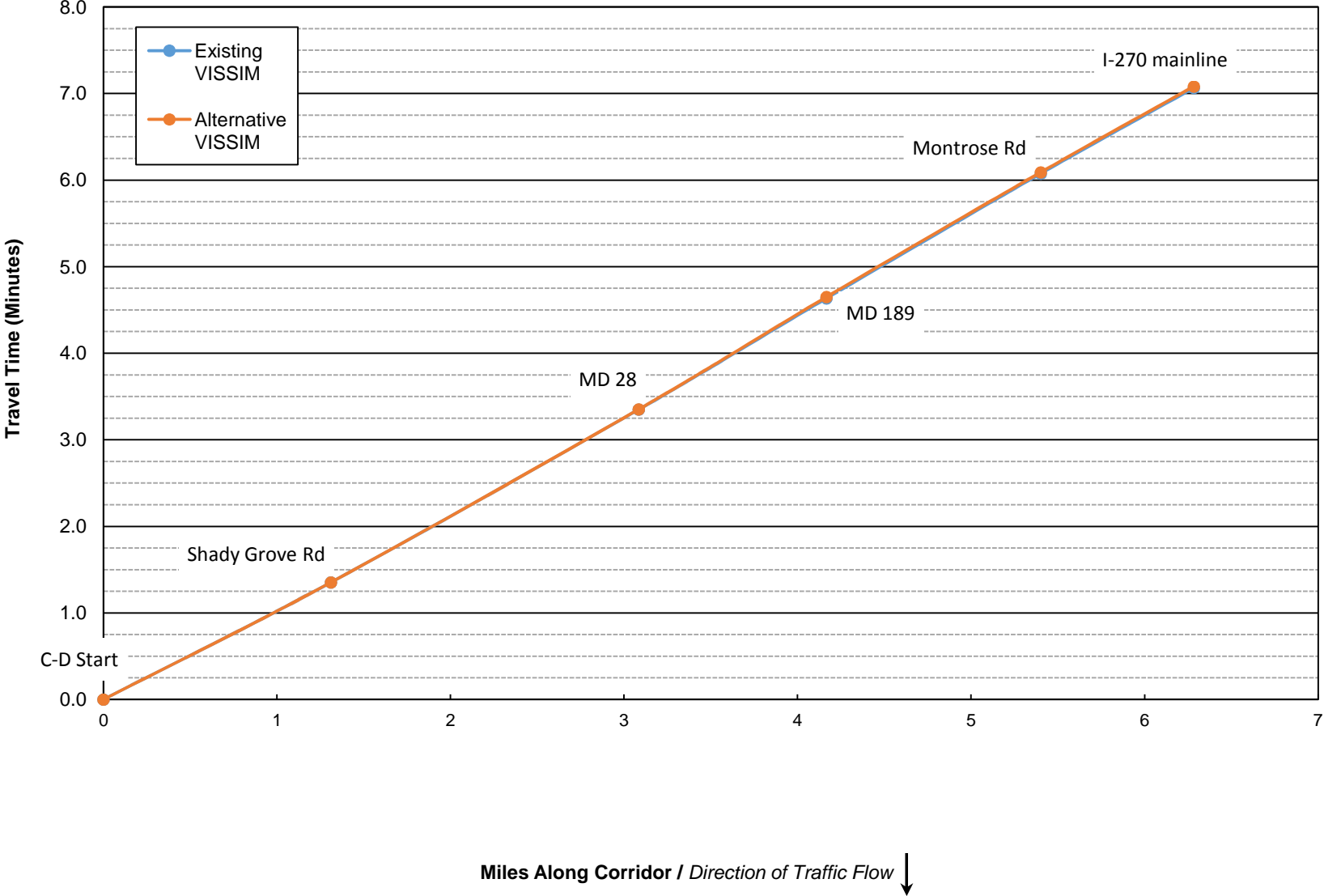


Table B.1: PM Peak -2015 Variable Speed Limit- I-270 Vehicle Travel Time

I-270 Northbound	RITIS Segment Number	Segment Length (miles)	Existing VISSIM Travel Time (seconds)	VSL VISSIM Travel Time (seconds)	% Change	I-270 Southbound	Segment Length (miles)	Existing VISSIM Travel Time (seconds)	VSL VISSIM Travel Time (seconds)	% Change
From I-495 interchange						From I-70				
to MD 187	6001+6002	1.8	290.1	303.1	4.5%	to MD 85	1.7	92.4	92.4	0.0%
to I-270 Split	6003+6004	0.6	89.3	90.2	1.0%	to MD 80	5.4	301.4	301.4	0.0%
to Montrose Rd	6005+6006	1.8	113.6	113.9	0.2%	to MD 109	3.7	207.9	207.9	0.0%
to MD 189	6007+6008	1.0	66.0	66.0	0.1%	to MD 121	3.6	201.4	201.3	0.0%
to MD 28	6009+6010	1.0	67.1	73.5	9.5%	to MD 27	2.5	133.7	133.7	0.1%
to Shady Grove Rd	6011+6012	1.9	123.3	150.8	22.3%	to MD 118	1.1	57.6	57.7	0.1%
to I-370	6013+6014	0.9	61.3	74.3	21.2%	to Middlebrook Rd	1.1	60.4	60.5	0.2%
to MD 117	6015+6016	1.5	145.0	139.4	-3.8%	to MD 124	2.2	120.9	119.9	-0.9%
to MD 124	6017+6018	0.6	104.3	90.7	-13.1%	to MD 117	0.9	66.4	64.6	-2.7%
to Middlebrook Rd	6019+6020	2.5	246.0	267.5	8.7%	to I-370	1.0	55.8	55.9	0.2%
to MD 118	6021+6022	1.1	83.6	93.5	11.9%	to Shady Grove Rd	1.5	79.7	79.7	0.0%
to MD 27	6023+6024	0.9	72.2	78.2	8.3%	to MD 28	1.9	109.5	109.6	0.1%
to MD 121	6025+6026	2.4	157.6	191.1	21.3%	to MD 189	1.0	60.1	60.3	0.3%
to MD 109	6027+6028	4.1	274.2	288.9	5.3%	to Montrose Rd	1.0	62.9	63.0	0.2%
to MD 80	6029+6030	3.7	244.9	244.6	-0.1%	to I-270 Split	1.9	111.5	112.0	0.5%
to MD 85	6031+6032	5.3	346.9	358.5	3.3%	to MD 187	0.4	22.8	23.1	1.0%
to I-70	6033+6034	1.4	180.2	120.6	-33.1%	to I-495 interchange	1.9	154.8	155.5	0.5%
I-270 Total (miles/minutes)		32.4	44.4	45.7	3.0%	I-270 Total (miles/minutes)	32.6	31.7	31.6	0.0%
I-270 Spur Northbound						I-270 Spur Southbound				
From Cabin John Pkwy						From I-70				
to MD 190	6045	0.5	105.6	104.3	-1.2%	to I-270 Split	30.3	1,721.6	1,720.1	-0.1%
to I-495	6044	1.1	259.8	257.2	-1.0%	to Democracy Blvd	0.7	135.0	139.5	3.3%
to Democracy Blvd	6042+6043	1.4	222.8	220.2	-1.2%	to I-495	1.3	466.2	475.1	1.9%
to I-270 Split	6040+6041	0.9	76.3	76.3	-0.1%	to MD 190	1.3	196.3	195.5	-0.4%
to I-70	6005 - 6034	30.0	2,286.1	2,351.3	2.9%	to Cabin John Pkwy	0.6	158.2	157.6	-0.4%
I-270 Spur Total (miles/minutes)		34.0	49.2	50.2	2.0%	I-270 Spur Total (miles/minutes)	34.2	44.6	44.8	0.4%

Table B.2: PM Peak -2015 Variable Speed Limit- I-270 Local Vehicle Travel Time

I-270 Northbound	Segment Length (miles)	Existing VISSIM Travel Time (seconds)	VSL VISSIM Travel Time (seconds)	% Change	I-270 Southbound	RITIS Segment Number	Segment Length (miles)	Cumulative Length (miles)	Existing VISSIM Travel Time (seconds)	VSL VISSIM Travel Time (seconds)	% Change
From C-D start					From C-D start			0.0			
to Montrose Rd	0.8	59.3	64.8	9.3%	to Shady Grove	7001+7002	1.3	1.3	81.2	81.2	0.0%
to MD 189	1.3	159.8	187.5	17.3%	to MD 28	7003+7004	1.8	3.1	119.8	119.9	0.1%
to MD 28	1.0	87.2	121.6	39.4%	to MD 189	7005+7006	1.1	4.2	77.1	77.9	1.1%
to Shady Grove	2.0	388.8	492.7	26.7%	to Montrose	7007+7008	1.2	5.4	86.4	86.4	-0.1%
to I-370	1.0	92.6	122.9	32.7%	to I-270 mainline	7009+7010	0.9	6.3	59.4	59.5	0.2%
to MD 117	1.2	88.2	129.4	46.8%							
to MD 124	0.8	232.8	197.3	-15.2%							
to I-270 mainline	0.4	91.1	85.2	-6.4%							
I-270 Local Total (miles/minutes)	8.5	20.0	23.4		I-270 Local Total (miles/minutes)		6.3		7.1	7.1	

Table B.3: PM Peak -2015 Variable Speed Limit- I-270 Vehicle Speed

I-270 Northbound	Existing VISSIM Speed (MPH)	VSL VISSIM Speed (MPH)	% Change	I-270 Southbound	Existing VISSIM Speed (MPH)	VSL VISSIM Speed (MPH)	% Change
From I-495 interchange				From I-70			
to MD 187	22.8	21.8	-4.3%	to MD 85	64.8	64.8	0.0%
to I-270 Split	23.8	23.6	-1.0%	to MD 80	64.0	64.0	0.0%
to Montrose Rd	55.6	55.4	-0.2%	to MD 109	64.4	64.4	0.0%
to MD 189	55.3	55.3	-0.1%	to MD 121	64.7	64.8	0.0%
to MD 28	51.8	47.3	-8.7%	to MD 27	66.9	66.9	-0.1%
to Shady Grove Rd	55.4	45.3	-18.3%	to MD 118	67.0	66.9	-0.1%
to I-370	55.5	45.8	-17.5%	to Middlebrook Rd	66.2	66.1	-0.2%
to MD 117	37.6	39.1	4.0%	to MD 124	65.4	65.9	0.9%
to MD 124	21.1	24.3	15.0%	to MD 117	48.1	49.4	2.8%
to Middlebrook Rd	36.4	33.5	-8.0%	to I-370	63.6	63.4	-0.2%
to MD 118	48.3	43.2	-10.7%	to Shady Grove Rd	67.2	67.2	0.0%
to MD 27	45.7	42.2	-7.7%	to MD 28	61.6	61.5	-0.1%
to MD 121	54.7	45.1	-17.5%	to MD 189	58.6	58.4	-0.3%
to MD 109	53.5	50.8	-5.1%	to Montrose Rd	59.1	58.9	-0.2%
to MD 80	54.1	54.1	0.1%	to I-270 Split	60.4	60.1	-0.5%
to MD 85	54.5	52.8	-3.2%	to MD 187	66.4	65.7	-1.0%
to I-70	27.4	41.0	49.5%	to I-495 interchange	44.0	43.8	-0.5%
I-270 Spur Northbound				I-270 Spur Southbound			
From Cabin John Pkwy				From I-70			
to MD 190	18.4	18.6	1.2%	to I-270 Split	63.4	63.5	0.1%
to I-495	15.7	15.9	1.0%	to Democracy Blvd	19.5	18.9	-3.2%
to Democracy Blvd	23.2	23.4	1.2%	to I-495	10.1	9.9	-1.9%
to I-270 Split	42.1	42.1	0.1%	to MD 190	23.0	23.1	0.4%
to I-70	47.2	45.9	-2.8%	to Cabin John Pkwy	13.0	13.0	0.4%
I-270 Spur Total (miles/minutes)	41.5	40.7		I-270 Spur Total (miles/minutes)	46.0	45.8	

Table B.4: PM Peak -2015 Variable Speed Limit- I-270 Local Vehicle Speed

I-270 Northbound	Segment Length (miles)	Cumulative Length (miles)	Existing VISSIM Speed (MPH)	VSL VISSIM Speed (MPH)	% Change	I-270 Southbound	Segment Length (miles)	Cumulative Length (miles)
From C-D start		0.0				From C-D start		0.0
to Montrose Rd	0.8	0.8	51.3	47.0	-8.5%	to Shady Grove	1.3	1.3
to MD 189	1.3	2.2	29.4	25.1	-14.7%	to MD 28	1.8	3.1
to MD 28	1.0	3.1	40.0	28.7	-28.3%	to MD 189	1.1	4.2
to Shady Grove	2.0	5.1	18.1	14.3	-21.1%	to Montrose	1.2	5.4
to I-370	1.0	6.0	37.5	28.3	-24.7%	to I-270 mainline	0.9	6.3
to MD 117	1.2	7.3	50.9	34.7	-31.9%			
to MD 124	0.8	8.1	12.7	15.0	18.0%			
to I-270 mainline	0.4	8.5	13.8	14.8	6.9%			
I-270 Local Total (miles/minutes)	8.5		25.4	21.7		I-270 Local Total (miles/minutes)	6.3	

Table B.5: PM Peak -2015 Variable Speed Limit- I-270 Vehicle Density

I-270 Northbound	Type	Existing		VSL		% Change	I-270 Southbound	Type	Existing		VSL		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS			
I-270	Freeway	47	F	50	F	7%	I-270	Freeway	16	B	16	B	0%
I-270 Diverge to MD 187	Diverge	69	F	70	F	2%	I-270 Merge from WB I-70	Merge	13	B	13	B	0%
I-270	Freeway	73	F	75	F	2%	I-270	Freeway	19	C	19	C	0%
I-270 Diverge to Rockledge Rd	Diverge	69	F	70	F	2%	I-270 Merge from EB I-70	Merge	14	B	14	B	0%
I-270	Freeway	82	F	83	F	1%	I-270	Freeway	18	C	18	C	0%
I-270 Weave from MD 187 to I-270 HOV	Weave	56	F	57	F	2%	I-270 Diverge to SB MD 85	Diverge	19	B	19	B	0%
I-270 Lane Drop	Merge	65	F	65	F	0%	I-270	Freeway	20	C	20	C	0%
I-270	Freeway	51	F	51	F	-1%	I-270 Diverge to NB MD 85	Diverge	12	B	12	B	0%
I-270 Merge from I-270 Spur	Merge	37	E	37	E	0%	I-270	Freeway	16	B	16	B	0%
I-270 Weave from I-270 HOV to I-270 C-D	Weave	33	D	33	D	0%	I-270 Merge from MD 85	Merge	14	B	14	B	0%
I-270	Freeway	32	D	32	D	0%	I-270	Freeway	21	C	21	C	0%
I-270 Diverge to C-D (MD 189)	Diverge	37	E	38	E	1%	I-270 Diverge to MD 80	Diverge	13	B	13	B	1%
I-270	Freeway	32	D	32	D	0%	I-270	Freeway	17	B	17	B	0%
I-270 Diverge to C-D (MD 28)	Diverge	38	E	38	E	1%	I-270 Merge from MD 80	Merge	11	B	11	B	1%
I-270	Freeway	30	D	33	D	10%	I-270	Freeway	20	C	20	C	0%
I-270 Merge from C-D (MD 189)	Merge	41	F	53	F	28%	I-270 Diverge to MD 109	Diverge	10	B	10	A	-1%
I-270 Diverge to C-D (Shady Grove Rd)	Diverge	42	F	49	F	16%	I-270	Freeway	19	C	19	C	0%
I-270	Freeway	30	D	35	E	20%	I-270 Merge from MD 109	Merge	11	B	11	B	-2%
I-270 Weave from C-D (MD 28) to C-D (Shady Grove Rd)	Weave	32	D	45	F	42%	I-270	Freeway	20	C	20	C	0%
I-270	Freeway	26	D	31	D	19%	I-270 Diverge to SB Weigh Station	Diverge	10	B	10	A	-1%
I-270 Merge from C-D (Shady Grove Rd)	Merge	21	C	25	C	17%	I-270	Freeway	20	C	20	C	0%
I-270	Freeway	33	D	36	E	7%	I-270 Merge from SB Weigh Station	Merge	10	B	10	B	0%
I-270 Merge from C-D (I-370)	Merge	32	D	29	D	-11%	I-270	Freeway	19	C	19	C	0%
I-270 Diverge to C-D (MD 117)	Diverge	53	F	43	F	-18%	I-270 Diverge to MD 121	Diverge	7	A	7	A	0%
I-270	Freeway	74	F	66	F	-11%	I-270	Freeway	12	B	12	B	0%
I-270 Merge from C-D (MD 124)	Merge	101	F	101	F	0%	I-270 Merge from MD 121	Merge	9	A	9	A	0%
I-270	Freeway	36	E	43	E	18%	I-270	Freeway	14	B	14	B	0%
I-270 Diverge to EB Middlebrook Rd	Diverge	28	D	33	D	18%	I-270 Diverge to MD 27	Diverge	10	A	9	A	-1%
I-270	Freeway	34	D	39	E	17%	I-270	Freeway	12	B	12	B	0%
I-270 Diverge to WB Middlebrook Rd	Diverge	30	D	32	D	5%	I-270 Merge from WB MD 27	Merge	11	B	11	B	-1%
I-270	Freeway	27	D	33	D	19%	I-270	Freeway	15	B	15	B	0%
I-270 Diverge to EB MD 118	Diverge	24	C	26	C	10%	I-270 Weave from EB MD 27 to MD 118	Weave	12	B	12	B	0%
I-270 Diverge to WB MD 118	Diverge	42	F	40	E	-6%	I-270	Freeway	14	B	14	B	0%
I-270	Freeway	33	D	37	E	14%	I-270 Merge from WB MD 118	Merge	12	B	12	B	0%
I-270 Weave from MD 118 to MD 27	Weave	46	F	42	F	-10%	I-270	Freeway	17	B	17	B	0%
I-270	Freeway	26	D	30	D	14%	I-270 Merge from EB MD 118	Merge	15	B	15	B	0%
I-270 Merge from EB MD 27	Merge	46	F	42	F	-10%	I-270	Freeway	20	C	20	C	0%
I-270	Freeway	26	C	31	D	20%	I-270 Merge from Middlebrook Rd	Merge	21	C	21	C	0%
I-270 Merge from WB MD 27	Merge	20	C	24	C	20%	I-270	Freeway	21	C	21	C	0%
I-270	Freeway	27	D	33	D	19%	I-270 Diverge to MD 124	Diverge	18	B	17	B	-6%
I-270 Diverge to MD 121	Diverge	21	C	25	C	19%	I-270	Freeway	22	C	21	C	-2%

Table B.5: PM Peak -2015 Variable Speed Limit- I-270 Vehicle Density

I-270 Northbound	Type	Existing		VSL		% Change	I-270 Southbound	Type	Existing		VSL		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS			
I-270	Freeway	22	C	26	D	18%	I-270 Merge from WB MD 124	Merge	44	F	42	F	-5%
I-270 Merge from EB MD 121	Merge	16	B	20	C	22%	I-270	Freeway	21	C	21	C	0%
I-270 Lane Drop	Merge	27	C	31	D	18%	I-270 Merge from MD 117	Merge	25	C	25	C	0%
I-270	Freeway	40	E	42	E	6%	I-270	Freeway	21	C	21	C	0%
I-270 Diverge to NB Weigh Station	Diverge	17	B	17	B	-4%	I-270 Diverge to I-370	Diverge	19	B	19	B	0%
I-270	Freeway	35	D	34	D	-4%	I-270	Freeway	16	B	16	B	0%
I-270 Merge from NB Weight Station	Merge	17	B	17	B	-4%	I-270 Diverge to I-270 C-D	Diverge	13	B	13	B	0%
I-270	Freeway	36	E	34	D	-4%	I-270	Freeway	13	B	13	B	0%
I-270 Diverge to MD 109	Diverge	20	B	19	B	-5%	I-270 Merge from I-270 (I-370)	Merge	18	B	18	B	0%
I-270	Freeway	33	D	31	D	-4%	I-270 Diverge to I-270 C-D (Shady Grove Rd)	Diverge	22	C	22	C	0%
I-270 Merge from MD 109	Merge	17	B	17	B	-3%	I-270	Freeway	17	B	17	B	0%
I-270	Freeway	34	D	33	D	-3%	I-270 Merge from I-270 C-D (Shady Grove Rd Northern)	Merge	16	B	16	B	1%
I-270 Diverge to MD 80	Diverge	24	C	23	C	-3%	I-270	Freeway	22	C	22	C	0%
I-270	Freeway	29	D	28	D	-3%	I-270 Merge from I-270 C-D (Shady Grove Rd Southern)	Merge	17	B	17	B	1%
I-270 Merge from MD 80	Merge	16	B	16	B	-2%	I-270 Diverge to I-270 C-D (MD 189)	Diverge	23	C	23	C	1%
I-270	Freeway	33	D	33	D	-2%	I-270	Freeway	20	C	20	C	0%
I-270 Diverge to Scenic View	Diverge	17	B	16	B	-2%	I-270 Merge from I-270 C-D (MD 189)	Merge	18	B	19	B	1%
I-270	Freeway	33	D	32	D	-2%	I-270	Freeway	24	C	24	C	0%
I-270 Merge from Scenic View	Merge	17	B	16	B	-2%	I-270 Merge from I-270 C-D	Merge	20	C	20	B	0%
I-270	Freeway	33	D	33	D	0%	I-270 Diverge to I-270 HOV Lane	Diverge	17	B	17	B	6%
I-270 Diverge to NB MD 85	Diverge	19	B	21	C	10%	I-270 Diverge to I-270 Spur	Diverge	33	D	34	D	5%
I-270	Freeway	32	D	37	E	16%	I-270	Freeway	13	B	13	B	1%
I-270 Diverge to SB MD 85	Diverge	18	B	20	B	8%	I-270 Diverge to Rockledge Dr / MD 187	Diverge	9	A	9	A	4%
I-270	Freeway	28	D	33	D	19%	I-270	Freeway	13	B	13	B	1%
I-270 Weave from MD 85 to I-70	Weave	21	C	23	C	12%	I-270 Merge from Rockledge Dr	Merge	11	B	11	B	-1%
I-270	Freeway	59	F	33	D	-44%	I-270	Freeway	16	B	16	B	0%
							I-270 Merge from Rockledge Dr / MD 187	Merge	14	B	14	B	0%
							I-270	Freeway	35	D	35	D	0%

Table B.6: PM Peak -2015 Variable Speed Limit- I-270 Spur Vehicle Density

I-270 Spur Northbound	Type	Existing		VSL		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS	
I-270 Spur	Freeway	45	F	45	F	0%
I-270 Spur Merge from Clara Barton Parkway	Merge	51	F	52	F	1%
I-270 Spur	Freeway	66	F	66	F	0%
I-270 Diverge to MD 190	Diverge	43	F	42	F	-1%
I-270 Spur	Freeway	78	F	77	F	-1%
I-270 Spur Merge from Cabin John Parkway	Merge	95	F	95	F	0%
I-270 Spur Merge from MD 190	Merge	94	F	95	F	1%
I-270 Spur	Freeway	83	F	83	F	0%
I-270 Spur Diverge to I-495	Merge	65	F	65	F	0%
I-270 Spur	Freeway	45	E	44	E	-2%
I-270 Spur Diverge to Democracy Blvd	Diverge	49	F	48	F	-2%
I-270 Spur	Freeway	58	F	58	F	0%
I-270 Spur Merge from EB Democracy Blvd	Merge	98	F	98	F	0%
I-270 Spur	Freeway	58	F	58	F	-1%
I-270 Spur Merge from WB Democracy Blvd	Merge	65	F	65	F	0%
I-270 Spur	Freeway	39	E	39	E	0%
I-270 Spur Merge from Westlake Terrace	Merge	31	D	32	D	1%
I-270 Spur	Freeway	35	D	35	D	0%

Table B.7: PM Peak -2015 Variable Speed Limit- I-270 Local Vehicle Density

I-270 Northbound	Type	Existing		VSL		% Change	I-270 Southbound	Type	Existing		VSL		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS			
I-270 C-D	Freeway	29	D	29	D	0%	I-270 C-D	Freeway	8	A	8	A	1%
I-270 C-D Diverge to EB Montrose Rd	Diverge	20	B	20	B	1%	I-270 C-D Weave from I-370 EB to I-270	Weave	15	B	15	B	1%
I-270 C-D	Freeway	17	B	17	B	-1%	I-270 C-D Diverge to Shady Grove Rd	Diverge	10	A	10	A	1%
I-270 C-D Weave between Montrose Rd Loop Ramps	Weave	12	A	12	B	4%	I-270 C-D	Freeway	7	A	7	A	0%
I-270 C-D	Freeway	20	C	25	C	26%	I-270 C-D Merge from WB Shady Grove Rd	Merge	9	A	10	A	1%
I-270 C-D Merge from WB Montrose Rd	Merge	52	F	67	F	28%	I-270 C-D	Freeway	15	B	15	B	0%
I-270 C-D	Freeway	51	F	59	F	15%	I-270 C-D Merge from EB Shady Grove Rd	Merge	11	B	11	B	0%
I-270 C-D Merge from I-270	Merge	66	F	75	F	13%	I-270 C-D	Freeway	21	C	21	C	0%
I-270 C-D	Freeway	51	F	57	F	12%	I-270 C-D Merge from I-270	Merge	25	C	24	C	-2%
I-270 C-D Diverge to MD 189	Diverge	31	D	37	E	17%	I-270 C-D Diverge to I-270	Diverge	26	C	26	C	0%
I-270 C-D	Freeway	67	F	77	F	16%	I-270 C-D Diverge to I-270	Diverge	18	B	18	B	0%
I-270 C-D Merge from MD 189	Merge	94	F	103	F	9%	I-270 C-D	Freeway	16	B	16	B	0%
I-270 C-D	Freeway	49	F	63	F	28%	I-270 C-D Diverge to MD 28	Diverge	12	B	12	B	0%
I-270 C-D Weave between I-270 (to MD 28 from MD 189)	Weave	57	F	76	F	33%	I-270 C-D	Freeway	11	A	11	A	0%
I-270 C-D	Freeway	48	F	61	F	28%	I-270 C-D Merge from WB MD 28	Merge	13	B	13	B	-1%
I-270 C-D Diverge to MD 28	Diverge	20	B	27	C	37%	I-270 C-D	Freeway	13	B	14	B	0%
I-270 C-D	Freeway	31	D	45	F	47%	I-270 C-D Merge from EB MD 28	Merge	25	C	24	C	-1%
I-270 C-D Weave between MD 28 Ramps	Weave	28	C	32	C	11%	I-270 C-D	Freeway	29	D	30	D	1%
I-270 C-D	Freeway	18	C	29	D	60%	I-270 C-D Merge from I-270	Merge	35	E	37	E	5%
I-270 C-D Merge from MD 28 WB	Merge	13	B	21	C	54%	I-270 C-D	Freeway	40	E	41	E	1%
I-270 C-D Merge from I-270 and Drop Lane	Merge	18	B	31	D	75%	I-270 C-D Diverge to MD 189	Diverge	24	C	24	C	0%
I-270 C-D Diverge to I-270	Diverge	25	C	46	F	79%	I-270 C-D	Freeway	25	C	25	C	0%
I-270 C-D	Freeway	39	E	58	F	51%	I-270 C-D Merge from MD 189	Merge	23	C	23	C	0%
I-270 C-D Diverge to Shady Grove Rd	Diverge	14	B	19	B	38%	I-270 C-D Diverge to I-270	Diverge	32	D	32	D	0%
I-270 C-D	Freeway	111	F	113	F	2%	I-270 C-D	Freeway	22	C	22	C	0%
I-270 C- D Merge from I-270 and EB Shady Grove Rd	Merge	116	F	115	F	0%	I-270 C-D Diverge to WB Montrose Rd	Diverge	16	B	16	B	1%
I-270 C-D	Freeway	112	F	110	F	-1%	I-270 C-D	Freeway	20	C	20	C	-1%
I-270 C-D Merge from WB Shady Grove Rd	Merge	108	F	112	F	4%	I-270 Weave between Montrose Rd Loops	Weave	35	D	34	D	-2%
I-270 C-D Diverge to I-270	Diverge	90	F	97	F	8%	I-270 C-D	Freeway	15	B	15	B	-1%
I-270 C-D	Freeway	60	F	68	F	13%	I-270 C-D Merge from EB Montrose Rd	Merge	9	A	9	A	-1%
I-270 C-D Diverge to I-370	Diverge	28	C	37	E	33%	I-270 C-D	Freeway	18	B	17	B	-1%
I-270 C-D	Freeway	10	A	15	B	46%							
I-270 Merge from I-370 EB	Merge	11	B	15	B	35%							
I-270 C-D	Freeway	19	C	30	D	56%							
I-270 C-D Weave from I-370 to I-270	Weave	27	C	41	F	53%							
I-270 C-D	Freeway	22	C	33	D	45%							
I-270 C-D Weave from I-270 to MD 117	Weave	33	D	38	E	16%							
I-270 C-D Diverge to MD 124	Diverge	39	E	42	F	6%							
I-270 C-D	Freeway	55	F	35	D	-36%							
I-270 C-D Merge from EB MD 124	Merge	96	F	83	F	-14%							
I-270 C-D Merge From WB MD 124	Merge	81	F	72	F	-11%							

Table B.8: PM Peak -2015 Variable Speed Limit- I-270 Vehicle Throughput

I-270 Northbound	Existing VISSIM Throughput	VSL VISSIM Throughput	% Change
Between I-495 and MD 187	4350	4312	-1%
Between MD 187 on and off ramps	3888	3845	-1%
Between Rockledge Blvd on and off ramps	3666	3625	-1%
Between Rockledge Dr and I-270 Spur	3880	3857	-1%
Between I-270 Spur and Montrose Rd	8718	8700	0%
Between Montrose Rd on and off ramps	5750	5741	0%
Between Montrose Rd and MD 189	5477	5467	0%
Between MD 189 and MD 28	5905	5889	0%
Between MD 28 on and off ramps	6240	6188	-1%
Between MD 28 and Shady Grove Rd	5494	5435	-1%
Between Shady Grove Rd and I-370	4789	4665	-3%
Between I-370 on and off ramps	4814	4684	-3%
Between I-370 and MD 117	6142	6038	-2%
Between MD 117 and MD 124	4713	4672	-1%
Between MD-124 on and off ramps	4706	4655	-1%
Between MD 124 and Middlebrook Rd	6115	6055	-1%
Between Middlebrook Rd on and off ramps	5713	5638	-1%
Between Middlebrook Rd and MD 118	4798	4732	-1%
Between MD-118 on and off ramps	4409	4354	-1%
Between MD 118 and MD 27	4456	4399	-1%
Between MD-27 on and off ramps	2842	2805	-1%
Between MD 27 and MD 121	3330	3278	-2%
Between MD-121 on and off ramps	2574	2528	-2%
Between MD 121 and MD 109	3787	3658	-3%
Between MD-109 on and off ramps	3547	3427	-3%
Between MD 109 and MD 80	3657	3539	-3%
Between MD-80 on and off ramps	3096	3011	-3%
Between MD 80 and MD 85	3596	3514	-2%
Between MD-85 on and off ramps	3046	2947	-3%
Between MD 85 and I-70	4867	4766	-2%
North of I-70	2562	2504	-2%
I-270 Spur Northbound			
Between I-495 and Democracy Blvd	4608	4625	0%
Between Democracy Blvd on and off ramps	4128	4144	0%
Between Democracy Blvd and I-270 Split	4849	4866	0%

Table B.9: PM Peak -2015 Variable Speed Limit- I-270 Local Vehicle Throughput

I-270 Local Northbound	Existing VISSIM Throughput	VSL VISSIM Throughput	% Change
Between Montrose Rd EB off ramp and and EB on ramp	1881	1876	0%
Between Montrose Rd EB on ramp and WB off ramp	2172	2167	0%
Between Montrose Rd WB off ramp and on ramp	1921	1917	0%
Between Montrose Rd WB on ramp and I-270 on ramp	3366	3288	-2%
Between I-270 on ramp and MD 189 off ramp	3611	3532	-2%
Between MD 189 ramps	2908	2833	-3%
Between MD 189 off ramp and I-270 on ramp	3782	3706	-2%
Between I-270 on ramp and I-270 off ramp	4472	4384	-2%
Between I-270 off ramp and MD 28 EB off ramp	3481	3405	-2%
Between MD 28 EB off ramp to MD 28 EB on ramp	3133	3047	-3%
Between MD 28 EB on ramp and MD 28 WB off ramp	3262	3169	-3%
Between MD 28 WB off ramp and MD 28 WB on ramp	2023	1961	-3%
Between MD 28 WB on ramp and I-270 on ramp	2725	2640	-3%
Between I-270 on ramp and I-270 off ramp	3565	3414	-4%
Between I-270 off ramp and Shady Grove off ramp	2136	1956	-8%
Between Shady Grove off ramp and I-270 on ramp	673	579	-14%
Between I-270 on ramp and Shady Grove WB on ramp	3348	3156	-6%
Between Shady Grove WB on ramp and I-270 off ramp	4148	3960	-5%
Between I-270 off ramp and I-370 off ramp	3663	3491	-5%
Between I-370 off ramp and I-370 EB on ramp	1138	1079	-5%
Between I-370 EB and WB on ramps	2096	2030	-3%
Between I-370 WB on ramp and I-270 off ramp	3687	3610	-2%
Between I-270 off ramp and I-270 on ramp	2254	2190	-3%
Between I-270 on ramp and MD 117 off ramp	3661	3565	-3%
Between MD 117 off ramp and MD 124 off ramp	2448	2398	-2%
Between MD 124 off ramp and MD 124 EB on ramp	479	477	0%
Between MD 124 EB and WB on ramps	943	946	0%
Between MD 124 on ramp I-270	1427	1428	0%

Table B.10: PM Peak - 2015 Variable Speed Limit - I-270 On Ramp Queue Length - Northbound

I-270 Northbound	Existing VISSIM Average Queue (feet)	VSL VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	VSL VISSIM Maximum Queue (feet)	% Change
Rockledge Dr on ramp	0.80	1.15	43%	181	198	10%
MD 189 C-D on ramp	0	0	-	33	75	125%
MD 28 C-D on ramp	0	0	-	0	7	-
Shady Grove Rd C-D on ramp	0	0	-	0	0	-
I-370 C-D on ramp	2	1	-60%	233	141	-40%
MD 124 C-D on ramp	2459	1887	-23%	3978	3458	-13%
MD 118 on ramp	0.12	0.01	-91%	37	5	-86%
MD 27 EB on ramp	0	0	-	0	0	-
MD 27 WB on ramp	0	0	-	0	0	-
MD 121 on ramp	0	0	-	0	0	-
MD 109 on ramp	0	0	-	0	0	-
MD 80 on ramp	0	0	-	0	0	-
MD 85 on ramp	0	0	-	0	0	-
I-270 Spur Northbound	Existing VISSIM Average Queue (feet)	VSL VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	VSL VISSIM Maximum Queue (feet)	% Change
Democracy Blvd EB on ramp	0	0	-	0	0	-
Democracy Blvd WB on ramp	0	0	-	0	0	-
I-495 Northbound	Existing VISSIM Average Queue (feet)	VSL VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	VSL VISSIM Maximum Queue (feet)	% Change
Cabin John Pkwy on ramp	16	17	3%	661	633	-4%
MD 190 on ramp	0	0	-	0	20	-
I-270 C-D Northbound	Existing VISSIM Average Queue (feet)	VSL VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	VSL VISSIM Maximum Queue (feet)	% Change
Montrose Rd EB on ramp	0	0	-	0	0	-
Montrose Rd WB on ramp	265	729	175%	1386	2353	70%
I-270 on ramp	0	0	-	0	0	-
MD 189 on ramp	15	24	59%	555	469	-15%
I-270 on ramp	0.19	0.00	-100%	23	0	-100%
MD 28 EB on ramp	0	0	-	0	14	-
MD 28 WB on ramp	0	5	-	0	155	-
Shady Grove Rd EB on ramp	78	389	400%	836	1566	87%
I-270 on ramp	178	537	201%	1103	2157	95%
Shady Grove Rd WB on ramp	12	33	168%	340	607	79%
I-370 EB on ramp	0	0	-	0	0	-
I-370 WB on ramp	0	0	-	0	0	-
I-270 on ramp	12	164	1234%	658	1068	62%
MD 124 EB on ramp	257	154	-40%	1230	1080	-12%
MD 124 WB on ramp	1	0	-90%	63	22	-65%

Table B.11: PM Peak - 2015 Variable Speed Limit - I-270 Off Ramp Queue Length - Northbound

I-270 Northbound	Existing VISSIM Average Queue (feet)	VSL VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	VSL VISSIM Maximum Queue (feet)	% Change
MD 187 off ramp NB	42	40	-5%	278	304	9%
MD 187 off ramp SB	0	0	-	0	0	-
Rockledge Dr off ramp	0.68	0.94	39%	73	88	20%
Tower Oaks Blvd off ramp	32	34	5%	235	254	8%
Montrose Rd off ramp EB	0	0	-	0	0	-
Montrose Rd off ramp WB	0	0	-	0	0	-
MD 189 off ramp WB	29	29	-1%	168	169	1%
MD 189 off ramp EB	1.06	0.77	-27%	122	119	-2%
MD 28 off ramp EB	37	39	5%	231	198	-14%
MD 28 off ramp WB	0	0	-	0	0	-
Shady Grove Rd off ramp - Redland Blvd	0	0	-	0	0	-
Shady Grove Rd off ramp WB	49	44	-10%	248	210	-15%
Shady Grove Rd off ramp EB	0	0	-	0	0	-
I-370 off ramp WB	0	0	-	0	0	-
I-370 off ramp EB	0	0	-	0	0	-
MD 117 off ramp	205	170	-17%	859	882	3%
MD 124 off ramp	799	644	-19%	2471	2269	-8%
Watkins Mill Rd off ramp*			-			-
Middlebrook Rd EB off ramp	0	0	-	0	0	-
Middlebrook Rd WB off ramp	0	0	-	0	0	-
MD 118 WB off ramp - Seneca Meadows	0.0	0	56%	20	11	-45%
MD 118 WB off ramp	0	0	-	0	0	-
MD 118 EB off ramp	0	0	-	0	0	-
MD 27 off ramp WB	56	56	1%	290	245	-15%
MD 27 off ramp EB	0	0	-	0	0	-
MD 121 off ramp WB	0	0	-	0	14	-
MD 121 off ramp EB	0	0	-	0	0	-
MD 109 off ramp EB	9	8	-16%	158	115	-27%
MD 109 off ramp WB	0	0	-	0	0	-
MD 80 off ramp EB	15	15	6%	140	154	10%
MD 80 off ramp WB	0	0	69%	11	18	59%
MD 85 NB off ramp	0	0	-	0	0	-
MD 85 SB off ramp	0.25	0.17	-31%	72	33	-54%
I-270 Spur Northbound	Existing VISSIM Average Queue (feet)	VSL VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	VSL VISSIM Maximum Queue (feet)	% Change
Clara Barton Pkwy off ramp EB	0	0	-	0	12	-
Clara Barton Pkwy off ramp WB	0	0	-	0	0	-
MD 190 off ramp EB	0	0	-	0	0	-
MD 190 off ramp WB	2	6	206%	287	351	22%
Democracy Blvd off ramp WB	42	42	0%	188	196	4%
Democracy Blvd off ramp EB	18	19	5%	143	137	-4%

* Ramp in Future Scenario

Table B.12: PM Peak - 2015 Variable Speed Limit - I-270 On Ramp Queue Length - Southbound

I-270 Southbound	Existing VISSIM Average Queue (feet)	VSL VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	VSL VISSIM Maximum Queue (feet)	% Change
MD 85 on ramp	0	0	-	0	0	-
MD 80 on ramp	0	0	-	0	0	-
MD 109 on ramp	0	0	-	0	0	-
MD 121 WB on ramp	0	0	-	0	0	-
MD 121 EB on ramp*			-			-
MD 27 WB on ramp	0	0	-	0	0	-
MD 27 EB on ramp	0	0	-	0	0	-
MD 118 WB on ramp	0	0	-	0	0	-
MD 118 EB on ramp	0	0	-	0	0	-
Middlebrook Rd on ramp	0	0	-	0	0	-
MD 124 WB on ramp	5	32	551%	332	476	43%
MD 117 on ramp	0	0	-	0	13	-
I-370 C-D on ramp	0	0	-	0	0	-
Shady Grove Rd C-D on ramp North	0	0	-	0	0	-
Shady Grove Rd C-D on ramp South	0	0	-	0	0	-
MD 189 C-D on ramp	0	0	-	0	0	-
Montrose Rd C-D on ramp	0	0	-	0	0	-
Rockledge Dr on ramp	0	0	-	0	0	-
MD 187 on ramp	0	0	-	0	0	-
I-270 Spur Southbound	Existing VISSIM Average Queue (feet)	VSL VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	VSL VISSIM Maximum Queue (feet)	% Change
Democracy Blvd on ramp	335	437	30%	1366	1537	13%
I-495 Southbound	Existing VISSIM Average Queue (feet)	VSL VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	VSL VISSIM Maximum Queue (feet)	% Change
I-270 Spur on ramp	4212	4272	1%	5058	5065	0%
MD 190 on ramp	1	0	-58%	107	78	-27%
I-270 C-D Southbound	Existing VISSIM Average Queue (feet)	VSL VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	VSL VISSIM Maximum Queue (feet)	% Change
I-270 on ramp	0	0	-	0	0	-
I-370 on ramp	0	0	-	0	0	-
Shady Grove Rd WB on ramp	0	0	-	0	0	-
Shady Grove Rd EB on ramp	0	0	-	0	0	-
I-270 on ramp	0	0	-	0	0	-
MD 28 WB on ramp	0	0	-100%	14	0	-100%
MD 28 EB on ramp	2	1	-52%	219	123	-44%
I-270 on ramp	0	0	-	0	0	-
MD 189 on ramp	0	0	-	0	0	-
Montrose Rd WB on ramp	1	1	-22%	107	99	-8%
Montrose Rd EB on ramp	0	0	-	0	0	-

* Ramp in Future Scenario

Table B.13: PM Peak - 2015 Variable Speed Limit - I-270 Off Ramp Queue Length - Southbound

I-270 Southbound	Existing VISSIM Average Queue (feet)	VSL VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	VSL VISSIM Maximum Queue (feet)	% Change
MD 85 SB off ramp	0	0	-	0	0	-
MD 85 NB off ramp	0.45	0.29	-36%	114	82	-28%
MD 80 off ramp	0.64	0.30	-53%	154	96	-38%
MD 109 off ramp WB	0.13	0.12	-10%	58	55	-5%
MD 109 off ramp EB	0	0	-	0	0	-
MD 121 off ramp EB	2	2	6%	98	106	9%
MD 121 off ramp WB	0	0	-	0	0	-
MD 27 off ramp EB	23	22	-6%	149	159	7%
MD 27 off ramp WB	0	0	-	0	0	-
MD 118 off ramp EB	19	18	-1%	110	132	20%
MD 118 off ramp WB	0	0	-	0	0	-
Watkins Mill Rd off ramp*			-			-
MD 124 off ramp EB	310	217	-30%	1658	1215	-27%
MD 124 off ramp WB	147	30	-80%	1129	794	-30%
I-370 off ramp WB	0	0	-	0	0	-
I-370 off ramp EB	0	0	-	0	0	-
Shady Grove Rd off ramp - Omega Drive	1	0	-15%	42	48	17%
Shady Grove Rd off ramp	0	0	-	0	0	-
MD 28 off ramp	3	3	-13%	127	112	-12%
MD 189 off ramp EB	123	115	-7%	849	508	-40%
MD 189 off ramp WB	0	0	-	0	0	-
Montrose Rd off ramp WB	0	0	-	0	0	-
Montrose Rd off ramp EB	0	1	-	0	224	-
Rockledge Dr off ramp	51	50	-3%	295	325	10%
I-270 Spur Southbound	Existing VISSIM Average Queue (feet)	VSL VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	VSL VISSIM Maximum Queue (feet)	% Change
Democracy Blvd off ramp EB	24	24	-2%	157	143	-9%
Democracy Blvd off ramp WB	0	0	-	0	0	-
MD 190 off ramp WB	85	88	4%	826	856	4%
MD 190 off ramp EB	0	0	-	0	0	-
Clara Barton Pkwy WB off ramp	0	0	-	0	0	-

* Ramp in Future Scenario

Table B.14: PM Peak - Existing - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
1- MD 85 at Sam's Club Drive											
1	NB	28.2	C	NB Left	115	79	116	611	E	53.2	D
				NB Through	503	33	116	611	C		
				NB Right	824	18	55	634	B		
	SB	82.9	F	SB Left	142	77	401	1055	E		
				SB Through	875	84	401	1055	F		
				SB Right	67	87	401	1055	F		
	EB	33.5	C	EB Left	43	83	26	115	F		
				EB Through	20	91	26	115	F		
				EB Right	144	11	26	115	B		
	WB	63.9	E	WB Left	508	77	221	686	E		
				WB Through	27	67	221	686	E		
				WB Right	192	29	221	686	C		
2- MD 85 at I-270 NB on and off ramp											
2	NB	36.0	D	NB Left	977	36	187	908	D	32.7	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	27.9	C	SB Left	0	0	0	0	A		
				SB Through	671	28	100	634	C		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
3- MD 85 at I-270 SB on and off ramp											
3	NB	6.0	A	NB Left	0	0	0	0	A	9.4	A
				NB Through	1699	6	41	829	A		
				NB Right	0	0	0	0	A		
	SB	43.8	D	SB Left	170	44	46	320	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
4- MD 85 at Crestwood Blvd											
4	NB	33.3	D	NB Left	60	70	154	653	E	33.5	C
				NB Through	1255	32	154	654	C		
				NB U-Turn	0	0	0	0	A		
	SB	22.0	C	SB Left	91	80	45	208	E		
				SB Through	810	25	59	445	C		
				SB Right	796	12	45	436	B		
	EB	54.8	D	EB Left	802	57	133	610	E		
				EB Through	31	44	133	610	D		
				EB Right	22	0	133	610	A		
	WB	43.4	D	WB Left	36	75	39	162	E		
				WB Through	61	65	39	162	E		
				WB Right	81	13	39	162	B		
5- MD 80 at I-270 NB on and off ramp											
5	NB	-1.8	A	NB Left	1	0	0	0	A	8.6	A
				NB Through	2	0	0	0	A		
				NB Right	8	-3	0	0	A		
	SB	12.2	B	SB Left	385	15	21	145	B		
				SB Through	17	17	21	145	B		
				SB Right	122	2	0	0	A		
	EB	8.9	A	EB Left	70	9	13	171	A		
				EB Through	0	0	8	0	A		
				EB Right	6	5	24	202	A		
	WB	6.9	A	WB Left	16	10	0	40	B		
				WB Through	510	12	28	281	B		
				WB Right	482	1	0	0	A		
6- MD 80 at I-270 SB on and off ramp											
6	NB	2.3	A	NB Left	47	3	1	190	A	4.2	A
				NB Through	0	0	0	0	A		
				NB Right	491	2	1	190	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	5.0	A	EB Left	0	0	0	0	A		
				EB Through	271	5	2	61	A		
				EB Right	53	3	1	69	A		
	WB	6.6	A	WB Left	0	0	0	0	A		
				WB Through	316	7	1	89	A		
				WB Right	0	0	0	0	A		
7- MD 109 at I-270 NB on and off ramp											
7	NB			NB Left	0	0	0	0	A	5.3	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	10.2	B	SB Left	224	11	14	175	B		
				SB Through	0	0	0	0	A		
				SB Right	17	2	0	67	A		
	EB	2.2	A	EB Left	56	1	0	37	A		
				EB Through	0	0	0	0	A		
				EB Right	59	3	0	0	A		
	WB	0.3	A	WB Left	0	0	0	0	A		
				WB Through	160	0	0	0	A		
				WB Right	0	0	0	0	A		
8- MD 80 at I-270 SB on and off ramp											
8	NB	4.0	A	NB Left	44	7	2	115	A	1.6	A
				NB Through	0	0	0	0	A		
				NB Right	29	0	0	43	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.8	A	EB Left	0	0	0	0	A		
				EB Through	114	0	0	0	A		
				EB Right	24	4	0	0	A		
	WB	1.2	A	WB Left	98	1	0	42	A		
				WB Through	78	1	0	19	A		
				WB Right	0	0	0	0	A		
9- MD 121 at Gateway Center Dr											
9	NB	10.6	B	NB Left	471	13	31	242	B	17.0	B
				NB Through	638	10	31	242	A		
				NB Right	54	2	36	268	A		
	SB	17.8	C	SB Left	20	13	5	143	B		
				SB Through	169	19	14	163	B		
				SB Right	8	4	13	184	A		
	EB	16.6	C	EB Left	2	50	3	93	D		
				EB Through	19	51	11	170	D		
				EB Right	142	12	21	202	B		
	WB	34.8	D	WB Left	214	46	57	220	D		
				WB Through	56	41	57	219	D		
				WB Right	140	16	71	244	B		
10- MD 121 at I-270 NB on and off ramp											
10	NB	0.8	A	NB Left	25	9	1	67	A	0.6	A
				NB Through	0	0	0	0	A		
				NB Right	718	1	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.1	A	EB Left	0	0	0	0	A		
				EB Through	447	0	0	0	A		
				EB Right	58	0	0	0	A		
	WB	0.8	A	WB Left	100	3	1	73	A		
				WB Through	423	0	0	48	A		
				WB Right	0	0	0	0	A		

Table B.14: PM Peak - Existing - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
11- MD 121 at I-270 SB on and off ramp											
11	NB			NB Left	0	0	0	0	A	2.2	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	7.7	A	SB Left	136	10	8	125	A		
				SB Through	0	0	0	0	A		
				SB Right	36	0	0	0	A		
	EB	0.3	A	EB Left	29	1	0	23	A		
				EB Through	0	0	0	0	A		
				EB Right	349	0	0	0	A		
	WB	0.1	A	WB Left	0	0	0	0	A		
WB Through				99	0	0	0	A			
WB Right				0	0	0	0	A			
12- MD 27 at Observation Dr											
12	NB	40.1	D	NB U-Turn	0	0	0	0	A	22.2	C
				NB Through	73	57	19	86	E		
				NB Right	47	13	19	86	B		
	SB	39.7	D	SB Left	114	46	31	182	D		
				SB Through	41	62	35	244	E		
				SB Right	173	30	57	281	C		
	EB	16.8	B	EB Left	208	27	68	502	C		
				EB Through	2223	16	70	503	B		
				EB Right	106	15	82	541	B		
	WB	25.8	C	WB Left	31	22	123	627	C		
WB Through				1503	26	123	627	C			
WB Right				54	9	123	627	A			
13- MD 27 at I-270 NB off ramp											
13	NB	44.8	D	NB Left	390	45	63	297	D	8.1	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.1	A	EB Left	0	0	0	0	A		
				EB Through	1284	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	5.5	A	WB Left	0	0	0	0	A		
WB Through				1582	6	41	680	A			
WB Right				0	0	0	0	A			
14- MD 27 at I-270 SB off ramp											
14	NB			NB Left	0	0	0	0	A	5.4	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	52.2	D	SB Left	171	52	35	162	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	2.3	A	EB Left	0	0	0	0	A		
				EB Through	1351	2	4	149	A		
				EB Right	0	0	0	0	A		
	WB	2.7	A	WB Left	0	0	0	0	A		
WB Through				1433	3	7	257	A			
WB Right				0	0	0	0	A			
15- MD 27 at Crystal Rock Dr											
15	NB	22.6	C	NB Left	58	20	55	379	C	29.8	C
				NB Through	965	23	68	379	C		
				NB Right	43	20	72	391	B		
	SB	33.9	C	SB Left	140	57	185	770	E		
				SB Through	1310	35	185	770	D		
				SB Right	196	9	164	764	A		
	EB	43.0	D	EB Left	103	54	28	120	D		
				EB Through	37	46	25	115	D		
				EB Right	47	17	17	141	B		
	WB	27.6	C	WB Left	83	49	70	297	D		
WB Through				102	43	70	297	D			
WB Right				552	22	70	297	C			
16- MD 118 at Seneca Meadows Pkwy											
16	NB	4.0	A	NB Left	90	12	1	82	B	8.2	A
				NB Through	1174	3	7	154	A		
				NB Right	0	0	15	207	A		
	SB	6.5	A	SB Left	11	6	14	270	A		
				SB Through	1091	7	18	270	A		
				SB Right	9	3	21	302	A		
	EB	13.1	B	EB Left	18	55	12	130	E		
				EB Through	1	76	12	130	E		
				EB Right	275	10	12	130	B		
	WB	53.5	D	WB Left	93	64	37	199	E		
WB Through				6	61	33	198	E			
WB Right				25	13	42	218	B			
17- MD 118 at I-270 NB on ramp											
17	NB			NB Left	0	0	0	0	A	16.1	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	33.9	C	EB Left	435	34	90	501	C		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	10.8	B	WB Left	0	0	0	0	A		
WB Through				246	2	1	116	A			
WB Right				1216	13	46	480	B			
18- MD 118 at I-270 SB off ramp											
18	NB			NB Left	0	0	0	0	A	6.1	A
				NB Through	0	0.0	0	0	A		
				NB Right	0	0.0	0	0	A		
	SB	37.1	D	SB Left	129	37.1	22	114	D		
				SB Through	0	0.0	0	0	A		
				SB Right	0	0.0	0	0	A		
	EB	4.8	A	EB Left	0	0.0	0	0	A		
				EB Through	1182	4.8	10	322	A		
				EB Right	0	0.0	0	0	A		
	WB	4.5	A	WB Left	0	0.0	0	0	A		
WB Through				1465	4.5	8	237	A			
WB Right				0	0.0	0	0	A			
19- MD 118 at Aircraft Dr											
19	NB	24.0	C	NB Left	42	69	33	176	E	27.5	C
				NB Through	43	70	33	176	E		
				NB Right	196	4	3	77	A		
	SB	90.2	F	SB Left	381	90	221	577	F		
				SB Through	12	82	221	577	F		
				SB Right	97	91	221	577	F		
	EB	17.8	B	EB Left	98	22	60	395	C		
				EB Through	1215	17	60	395	B		
				EB Right	17	15	60	395	B		
	WB	17.6	B	WB Left	12	17	66	441	B		
WB Through				1324	21	66	441	C			
WB Right				351	5	66	441	A			
20- Middlebrook Rd at Observation Dr											
20	NB			NB Left	0	0	0	0	A	8.5	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	18.0	B	SB Left	96	35	18	131	D		
				SB Through	0	0	0	0	A		
				SB Right	179	9	18	131	A		
	EB	6.4	A	EB Left	15	9	17	155	A		
				EB Through	1180	6	17	155	A		
				EB Right	0	0	0	0	A		
	WB	8.4	A	WB Left	0	0	0	0	A		
WB Through				1238	8	24	251	A			
WB Right				12	6	39	300	A			

Table B.14: PM Peak - Existing - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
21- Middlebrook Rd at I-270 SB on ramp											
21	NB			NB Left	0	0	0	0	A	4.4	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	2.8	A	EB Left	0	0	0	0	A		
				EB Through	686	3	4	96	A		
				EB Right	0	0	0	0	A		
	WB	7.1	A	WB Left	429	7	4	194	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
22- Middlebrook Rd at Waring Station Rd											
22	NB	48.4	D	NB Left	156	45	75	316	D	12.5	B
				NB Through	0	0	75	316	A		
				NB Right	219	51	75	316	D		
	SB	30.6	C	SB Left	30	44	7	66	D		
				SB Through	2	37	7	66	D		
				SB Right	19	9	18	104	A		
	EB	7.3	A	EB Left	3	10	23	262	B		
				EB Through	1035	7	23	262	A		
				EB Right	160	7	23	262	A		
	WB	8.3	A	WB Left	242	20	33	332	C		
				WB Through	1650	7	33	332	A		
				WB Right	4	2	33	332	A		
23- MD 124 at MD 355											
23	NB	51.6	D	NB Left	507	63	186	529	E	63.0	E
				NB Through	942	46	183	527	D		
				NB Right	6	12	0	0	B		
	SB	30.7	C	SB Left	141	71	99	395	E		
				SB Through	554	53	99	395	D		
				SB Right	736	6	20	339	A		
	EB	42.4	D	EB Left	468	93	363	1176	F		
				EB Through	2720	41	363	1176	D		
				EB Right	575	7	160	1150	A		
	WB	153.9	F	WB Left	0	0	0	0	A		
				WB Through	1481	156	718	950	F		
				WB Right	65	101	0	0	F		
24- MD 124 at I-270 SB on and off											
24	NB	64.4	F	NB Left	55	65	23	98	E	40.8	D
				NB Through	23	64	23	98	E		
				NB U-Turn	0	0	0	0	A		
	SB	57.0	E	SB Left	572	94	316	1663	F		
				SB Through	10	80	316	1663	F		
				SB Right	452	9	141	1059	A		
	EB	43.4	D	EB Left	0	0	0	0	A		
				EB Through	1738	44	307	1098	D		
				EB Right	31	34	323	1121	C		
	WB	18.7	B	WB Left	4	66	77	588	E		
				WB Through	1046	19	77	588	B		
				WB Right	0	0	0	0	A		
25- MD 117 at MD 124											
25	NB	36.4	D	NB Left	45	63	116	666	E	40.6	D
				NB Through	545	54	116	666	D		
				NB Right	447	13	4	216	B		
	SB	32.8	C	SB Left	119	44	98	447	D		
				SB Through	762	37	98	447	D		
				SB Right	144	2	0	0	A		
	EB	46.1	D	EB Left	120	82	142	477	F		
				EB Through	1092	42	142	478	D		
				EB Right	43	39	149	506	D		
	WB	43.5	D	WB Left	402	70	280	1027	E		
				WB Through	1338	39	280	1027	D		
				WB Right	129	2	0	0	A		
26- MD 117 at Bureau Dr											
26	NB	45.7	D	NB Left	78	79	65	281	E	38.8	D
				NB Through	27	75	65	281	E		
				NB Right	260	33	65	281	C		
	SB	71.9	E	SB Left	274	83	109	351	F		
				SB Through	17	82	109	351	F		
				SB Right	65	21	109	351	C		
	EB	31.4	C	EB Left	41	80	156	829	F		
				EB Through	1593	30	157	829	C		
				EB Right	3	13	151	818	B		
	WB	37.7	D	WB Left	19	43	337	1058	D		
				WB Through	1703	40	337	1059	D		
				WB Right	292	26	368	1107	C		
27- MD 117 at I-270 SB off ramp											
27	NB			NB Left	0	0	0	0	A	13.3	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	4.6	A	EB Left	0	0	0	0	A		
				EB Through	896	5	10	466	A		
				EB Right	0	0	0	0	A		
	WB	39.8	E	WB Left	294	40	140	1068	E		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
28- MD 117 at I-270 NB off ramp											
28	NB			NB Left	0	0	0	0	A	30.5	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	52.1	D	SB Left	256	46	214	871	D		
				SB Through	0	0	0	0	A		
				SB Right	951	54	214	870	D		
	EB	27.6	C	EB Left	3	125	152	980	F		
				EB Through	897	27	152	980	C		
				EB Right	0	0	0	0	A		
	WB	13.3	B	WB Left	0	0	0	0	A		
				WB Through	1359	13	87	383	B		
				WB Right	0	0	87	383	A		
29- MD 117 at Perry Pkwy											
29	NB	42.6	D	NB Left	18	69	13	110	E	37.0	D
				NB Through	21	50	13	109	D		
				NB Right	23	15	21	129	B		
	SB	57.1	E	SB Left	194	85	89	332	F		
				SB Through	14	84	89	332	F		
				SB Right	112	6	89	332	A		
	EB	20.8	C	EB Left	240	69	84	355	E		
				EB Through	864	8	84	355	A		
				EB Right	32	6	69	339	A		
	WB	44.4	D	WB Left	36	105	245	752	F		
				WB Through	1228	46	245	752	D		
				WB Right	300	33	245	752	C		
30- Shady Grove Rd at I-270 NB off ramp											
30	NB	7.1	A	NB Left	0	0	0	0	A	13.8	B
				NB Through	1025	7	16	209	A		
				NB Right	0	0	0	0	A		
	SB	9.5	A	SB Left	0	0	0	0	A		
				SB Through	1280	9	41	481	A		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	52.9	D	WB Left	317	53	58	260	D		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table B.14: PM Peak - Existing - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
31- Shady Grove Rd at I-270 SB off ramp											
31	NB	6.8	A	NB Left	0	0	0	0	A	15.9	B
				NB Through	1463	7	28	378	A		
				NB Right	0	0	0	0	A		
	SB	5.5	A	SB Left	0	0	0	0	A		
				SB Through	817	5	8	156	A		
				SB Right	0	0	0	0	A		
	EB	57.5	E	EB Left	229	55	44	200	D		
				EB Through	0	0	0	0	A		
				EB Right	295	60	63	241	E		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
32- MD 28 at I-270 SB off ramp											
32	NB			NB U-Turn	0	0	0	0	A	8.0	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	36.5	D	SB Left	440	44	74	300	D		
				SB Through	0	0	0	0	A		
				SB Right	98	3	1	70	A		
	EB	2.7	A	EB Left	0	0	0	0	A		
				EB Through	1505	1	0	0	A		
				EB Right	830	6	14	245	A		
	WB	6.1	A	WB Left	0	0	0	0	A		
				WB Through	1693	6	18	227	A		
				WB Right	0	0	0	0	A		
33- MD 28 at I-270 on and off ramps											
33	NB	34.9	C	NB Left	0	0	43	241	A	21.5	C
				NB Through	208	47	51	250	D		
				NB Right	134	16	51	250	B		
	SB	33.6	C	SB Left	11	101	175	288	F		
				SB Through	0	0	0	0	A		
				SB Right	164	29	175	288	C		
	EB	12.7	B	EB Left	254	38	53	287	D		
				EB Through	885	5	53	287	A		
				EB Right	0	0	0	0	A		
	WB	24.1	C	WB Left	36	20	96	383	B		
				WB Through	1241	24	77	346	C		
				WB Right	0	0	0	0	A		
34- MD 189 at Great Falls Rd											
34	NB	38.6	D	NB Left	45	44	12	86	D	13.4	B
				NB Through	11	50	8	84	D		
				NB Right	12	10	8	94	A		
	SB	3.3	A	SB Left	14	51	7	73	D		
				SB Through	11	51	7	73	D		
				SB Right	401	0	0	0	A		
	EB	12.0	B	EB Left	425	24	38	464	C		
				EB Through	669	5	5	161	A		
				EB Right	58	4	9	198	A		
	WB	18.4	B	WB Left	11	18	48	405	B		
				WB Through	827	18	48	405	B		
				WB Right	14	17	63	439	B		
35- MD 189 at I-270 Ramps											
35	NB	46.1	D	NB Left	250	46	44	190	D	41.7	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	55.4	E	SB Left	350	55	139	869	E		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	27.5	C	EB Left	480	31	89	371	C		
				EB Through	367	23	89	371	C		
				EB Right	0	0	0	0	A		
	WB	48.9	D	WB Left	440	54	106	299	D		
				WB Through	417	43	106	299	D		
				WB Right	0	0	0	0	A		
36- MD 189 at Wooton Pkwy											
36	NB	45.1	D	NB Left	187	57	113	410	E	43.8	D
				NB Through	536	52	113	410	D		
				NB Right	174	10	113	410	B		
	SB	62.3	E	SB Left	247	79	151	606	E		
				SB Through	729	57	154	631	E		
				SB Right	0	0	0	0	A		
	EB	34.6	C	EB Left	118	71	101	438	E		
				EB Through	543	34	101	438	C		
				EB Right	160	10	101	438	B		
	WB	34.5	C	WB Left	160	71	123	603	E		
				WB Through	781	35	123	603	C		
				WB Right	317	15	123	603	B		
37- Montrose Rd at Tower Oaks Blvd											
37	NB	0.4	A	NB Left	0	0	0	0	A	16.2	B
				NB Through	0	0	0	0	A		
				NB Right	490	0	0	0	A		
	SB	71.2	E	SB Left	68	48	37	256	D		
				SB Through	0	0	0	0	A		
				SB Right	270	77	97	348	E		
	EB	6.1	A	EB Left	0	0	0	0	A		
				EB Through	1685	6	30	360	A		
				EB Right	0	0	0	0	A		
	WB	18.3	B	WB Left	69	35	30	360	C		
				WB Through	2563	18	105	727	B		
				WB Right	244	12	105	727	B		
38- Tower Oaks Blvd at I-270 off ramp											
38	NB	22.9	C	NB Left	650	23	46	257	C	17.4	B
				NB Through	0	0.0	39	249	A		
				NB Right	21	6.3	46	257	A		
	SB	15.4	B	SB Left	8	24.8	1	43	C		
				SB Through	0	0.0	1	43	A		
				SB Right	7	4.7	0	30	A		
	EB	11.1	B	EB Left	1	11.0	14	153	B		
				EB Through	310	11.6	14	153	B		
				EB Right	33	6.4	9	144	A		
	WB	12.7	B	WB Left	121	15.9	14	122	B		
				WB Through	192	10.8	14	122	B		
				WB Right	1	3.7	2	78	A		
39- Montrose Rd at Tower Oaks Blvd											
39	NB	17.3	B	NB Left	76	34	62	288	C	55.3	E
				NB Through	606	30	62	288	C		
				NB Right	572	1	0	0	A		
	SB	30.3	C	SB Left	193	62	61	206	E		
				SB Through	394	20	59	205	C		
				SB Right	105	11	54	250	B		
	EB	216.7	F	EB Left	81	178	517	714	F		
				EB Through	458	222	518	715	F		
				EB Right	32	240	542	739	F		
	WB	35.5	D	WB Left	565	44	110	402	D		
				WB Through	473	41	111	402	D		
				WB Right	330	13	130	433	B		
40- Rockledge Blvd at I-270 NB on and off ramp											
40	NB	124.2	F	NB Left	0	0	0	0	A	98.5	F
				NB Through	335	113	520	837	F		
				NB Right	854	129	520	837	F		
	SB	86.6	F	SB Left	0	0	86	220	A		
				SB Through	346	87	86	220	F		
				SB Right	0	0	0	0	A		
	EB	62.2	E	EB Left	5	127	169	458	F		
				EB Through	428	103	169	458	F		
				EB Right	297	2	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table B.14: PM Peak - Existing - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
41- Rockledge Blvd at I-270 SB on and off ramps											
41	NB	30.2	C	NB Left	341	30	76	261	C	49.5	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	54.7	D	WB Left	345	59	193	786	E		
				WB Through	894	53	193	786	D		
				WB Right	0	0	0	0	A		
42- MD 187 at Tuckerman Ln											
42	NB	43.7	D	NB Left	198	21	316	1253	C	120.3	F
				NB Through	2133	43	316	1253	D		
				NB Right	188	73	316	1253	E		
	SB	201.4	F	SB Left	185	168	2553	2702	F		
				SB Through	1122	201	2553	2702	F		
				SB Right	270	226	2553	2702	F		
	EB	51.7	D	EB Left	238	52	94	407	D		
				EB Through	409	54	95	408	D		
				EB Right	103	43	113	432	D		
	WB	215.4	F	WB Left	459	211	1918	2138	F		
				WB Through	614	233	1918	2138	F		
				WB Right	151	158	1918	2138	F		
43- MD 187 at I-270 NB on and off ramps											
43	NB	14.8	B	NB Left	552	34	103	399	C	18.5	B
				NB Through	2291	10	103	399	B		
				NB Right	0	0	0	0	A		
	SB	22.7	C	SB Left	0	0	0	0	A		
				SB Through	1247	23	57	248	C		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	61.4	E	WB Left	65	60	50	290	E		
				WB Through	65	63	50	290	E		
				WB Right	0	0	0	0	A		
44- MD 187 at I-270 NB on and off ramps											
44	NB	32.2	D	NB Left	0	0	0	0	A	33.3	C
				NB Through	2211	32	103	485	C		
				NB Right	0	0	0	0	A		
	SB	20.4	C	SB Left	150	59	74	305	E		
				SB Through	1163	15	74	305	B		
				SB Right	0	0	0	0	A		
	EB	57.1	E	EB Left	636	57	137	558	E		
				EB Through	0	0	137	558	A		
				EB Right	185	57	77	519	E		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
45- MD 187 at Rock Spring Dr											
45	NB	16.8	B	NB Left	383	34	90	614	C	23.8	C
				NB Through	2000	14	91	614	B		
				NB Right	14	12	111	647	B		
	SB	26.7	C	SB Left	20	47	82	400	D		
				SB Through	1160	30	82	400	C		
				SB Right	172	1	54	356	A		
	EB	40.2	D	EB Left	396	59	98	362	E		
				EB Through	37	63	98	362	E		
				EB Right	375	18	98	362	B		
	WB	11.6	B	WB Left	5	32	3	77	C		
				WB Through	12	25	3	77	C		
				WB Right	32	4	1	67	A		
47-Democracy Blvd at I-270 NB off ramp											
47	NB	45.7	D	NB Left	152	46	29	159	D	3.0	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	1.2	A	EB Left	0	0	0	0	A		
				EB Through	1114	1	3	51	A		
				EB Right	0	0	0	0	A		
	WB	0.9	A	WB Left	0	0	0	0	A		
				WB Through	2129	1	2	62	A		
				WB Right	0	0	0	0	A		
48- Democracy Blvd at I-270 SB on ramp											
48	NB			NB Left	0	0	0	0	A	6.3	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	5.0	A	EB Left	0	0	0	0	A		
				EB Through	1326	5	17	250	A		
				EB Right	0	0	0	0	A		
	WB	7.0	A	WB Left	531	24	39	287	C		
				WB Through	1748	2	30	266	A		
				WB Right	0	0	0	0	A		
49- Democracy Blvd at I-270 SB off ramp											
49	NB			NB Left	0	0	0	0	A	7.4	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	38.9	D	SB Left	159	53	31	164	D		
				SB Through	0	0	0	0	A		
				SB Right	60	2	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	3.8	A	WB Left	0	0	0	0	A		
				WB Through	1748	4	16	274	A		
				WB Right	168	3	12	305	A		
50- MD 190 at Burdette Rd											
50	NB	72.8	E	NB Left	26	74	15	100	E	31.1	C
				NB Through	4	84	15	100	F		
				NB Right	5	56	15	100	E		
	SB	32.1	C	SB Left	34	78	19	122	E		
				SB Through	7	56	19	122	E		
				SB Right	118	18	19	122	B		
	EB	17.6	B	EB Left	122	85	82	513	F		
				EB Through	1151	11	82	513	B		
				EB Right	28	4	68	540	A		
	WB	38.3	D	WB Left	11	113	334	1111	F		
				WB Through	2146	38	334	1111	D		
				WB Right	52	28	334	1111	C		

Table B.14: PM Peak - Existing - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
51- MD 190 at I-270 NB on ramp											
51	NB			NB Left	0	0	0	0	A	16.9	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	70.2	E	EB Left	233	70	101	369	E		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	8.4	A	WB Left	0	0	0	0	A		
				WB Through	1464	8	42	713	A		
				WB Right	0	0	0	0	A		
52- MD 190 at I-270 SB off ramp											
52	NB	73.8	E	NB Left	222	74	89	830	E	12.4	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	2.9	A	EB Left	0	0	0	0	A		
				EB Through	840	3	6	143	A		
				EB Right	0	0	0	0	A		
	WB	9.1	A	WB Left	0	0	0	0	A		
				WB Through	1705	9	26	545	A		
				WB Right	0	0	0	0	A		
53- MD 190 at Seven Locks Rd											
53	NB	0.3	A	NB Left	21	1	0	0	A	24.7	C
				NB Through	243	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	55.7	E	SB Left	306	56	103	375	E		
				SB Through	180	56	103	375	E		
				SB Right	17	56	103	375	E		
	EB	27.1	C	EB Left	22	33	66	355	C		
				EB Through	664	27	66	355	C		
				EB Right	34	25	66	355	C		
	WB	19.0	B	WB Left	262	75	125	534	E		
				WB Through	935	15	125	534	B		
				WB Right	715	4	125	534	A		
54- MD 124 at I-270 NB off ramp											
54	NB	59.5	E	NB Left	0	0	0	0	A	64.0	E
				NB Through	0	0	0	0	A		
				NB Right	1911	59	802	2475	E		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	68.6	E	EB Left	0	0	0	0	A		
				EB Through	1874	69	579	1267	E		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
55- Democracy Blvd at I-270 NB off ramp											
55	NB	47.0	D	NB Left	0	0	0	0	A	11.5	B
				NB Through	0	0	0	0	A		
				NB Right	314	47	51	199	D		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	1.5	A	EB Left	0	0	0	0	A		
				EB Through	1113	2	4	65	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table B.15: PM Peak -2015 Variable Speed Limit- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
1- MD 85 at Sam's Club Drive											
1	NB	25.6	C	NB Left	113	80	95	622	E	51.8	D
				NB Through	496	32	95	622	C		
				NB Right	824	15	40	645	B		
	SB	80.9	F	SB Left	143	77	386	1049	E		
				SB Through	881	81	386	1049	F		
				SB Right	67	85	386	1049	F		
	EB	33.9	C	EB Left	43	83	27	117	F		
				EB Through	20	91	27	117	F		
				EB Right	144	11	27	117	B		
	WB	65.0	E	WB Left	509	78	225	711	E		
				WB Through	28	65	225	711	E		
				WB Right	193	29	225	711	C		
2- MD 85 at I-270 NB on and off ramp											
2	NB	37.0	D	NB Left	975	37	196	910	D	32.8	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	26.9	C	SB Left	0	0	0	0	A		
				SB Through	676	27	97	667	C		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
3- MD 85 at I-270 SB on and off ramp											
3	NB	6.2	A	NB Left	0	0	0	0	A	9.6	A
				NB Through	1698	6	44	791	A		
				NB Right	0	0	0	0	A		
	SB	43.4	D	SB Left	173	43	46	330	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
4- MD 85 at Crestwood Blvd											
4	NB	33.2	D	NB Left	60	70	154	648	E	33.2	C
				NB Through	1255	31	154	649	C		
				NB U-Turn	0	0	0	0	A		
	SB	21.5	C	SB Left	91	77	43	191	E		
				SB Through	809	25	56	510	C		
				SB Right	795	12	42	501	B		
	EB	54.4	D	EB Left	801	56	133	593	E		
				EB Through	31	44	133	593	D		
				EB Right	22	0	133	593	A		
	WB	43.5	D	WB Left	35	75	39	162	E		
				WB Through	61	65	39	162	E		
				WB Right	81	13	39	162	B		
5- MD 80 at I-270 NB on and off ramp											
5	NB	-2.1	A	NB Left	1	0	0	0	A	8.6	A
				NB Through	2	0	0	0	A		
				NB Right	9	-3	0	0	A		
	SB	12.8	B	SB Left	373	16	22	160	B		
				SB Through	16	17	22	160	B		
				SB Right	118	3	0	0	A		
	EB	10.3	B	EB Left	70	11	14	167	B		
				EB Through	0	0	8	0	A		
				EB Right	6	5	24	197	A		
	WB	6.5	A	WB Left	16	13	1	39	B		
				WB Through	508	11	26	280	B		
				WB Right	482	1	0	0	A		
6- MD 80 at I-270 SB on and off ramp											
6	NB	2.1	A	NB Left	47	3	1	132	A	4.1	A
				NB Through	0	0	0	0	A		
				NB Right	492	2	1	132	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	5.1	A	EB Left	0	0	0	0	A		
				EB Through	271	6	2	79	A		
				EB Right	54	3	1	88	A		
	WB	6.6	A	WB Left	0	0	0	0	A		
				WB Through	314	7	1	104	A		
				WB Right	0	0	0	0	A		
7- MD 109 at I-270 NB on and off ramp											
7	NB			NB Left	0	0	0	0	A	5.0	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	9.7	A	SB Left	218	10	12	132	B		
				SB Through	0	0	0	0	A		
				SB Right	16	1	0	17	A		
	EB	2.2	A	EB Left	56	1	0	39	A		
				EB Through	0	0	0	0	A		
				EB Right	59	3	0	0	A		
	WB	0.3	A	WB Left	0	0	0	0	A		
				WB Through	160	0	0	0	A		
				WB Right	0	0	0	0	A		
8- MD 80 at I-270 SB on and off ramp											
8	NB	3.9	A	NB Left	44	7	2	94	A	1.6	A
				NB Through	0	0	0	0	A		
				NB Right	29	0	0	16	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.8	A	EB Left	0	0	0	0	A		
				EB Through	114	0	0	0	A		
				EB Right	24	4	0	0	A		
	WB	1.2	A	WB Left	98	1	0	41	A		
				WB Through	77	1	0	18	A		
				WB Right	0	0	0	0	A		
9- MD 121 at Gateway Center Dr											
9	NB	9.9	A	NB Left	462	12	29	233	B	16.7	B
				NB Through	630	9	29	233	A		
				NB Right	53	1	35	259	A		
	SB	17.5	C	SB Left	20	11	5	133	B		
				SB Through	169	19	15	135	B		
				SB Right	8	8	13	156	A		
	EB	14.7	B	EB Left	2	60	3	99	E		
				EB Through	19	46	9	147	D		
				EB Right	142	10	18	179	A		
	WB	36.2	E	WB Left	212	48	59	223	D		
				WB Through	57	41	59	223	D		
				WB Right	141	17	72	247	B		
10- MD 121 at I-270 NB on and off ramp											
10	NB	0.6	A	NB Left	25	9	1	82	A	0.5	A
				NB Through	0	0	0	0	A		
				NB Right	702	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.1	A	EB Left	0	0	0	0	A		
				EB Through	448	0	0	0	A		
				EB Right	58	0	0	0	A		
	WB	0.8	A	WB Left	99	3	1	87	A		
				WB Through	422	0	0	58	A		
				WB Right	0	0	0	0	A		

Table B.15: PM Peak -2015 Variable Speed Limit- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
11- MD 121 at I-270 SB on and off ramp											
11	NB			NB Left	0	0	0	0	A	2.2	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	7.6	A	SB Left	136	9	8	132	A		
				SB Through	0	0	0	0	A		
				SB Right	36	1	0	0	A		
	EB	0.3	A	EB Left	29	1	0	22	A		
				EB Through	0	0	0	0	A		
				EB Right	348	0	0	0	A		
	WB	0.1	A	WB Left	0	0	0	0	A		
				WB Through	98	0	0	0	A		
				WB Right	0	0	0	0	A		
12- MD 27 at Observation Dr											
12	NB	40.0	D	NB U-Turn	0	0	0	0	A	22.2	C
				NB Through	73	57	19	86	E		
				NB Right	47	13	19	86	B		
	SB	40.1	D	SB Left	114	46	31	182	D		
				SB Through	41	62	36	244	E		
				SB Right	173	31	58	281	C		
	EB	16.8	B	EB Left	206	26	67	492	C		
				EB Through	2198	16	69	493	B		
				EB Right	105	15	82	531	B		
	WB	25.6	C	WB Left	31	21	122	598	C		
				WB Through	1503	26	122	598	C		
				WB Right	54	8	122	598	A		
13- MD 27 at I-270 NB off ramp											
13	NB	44.7	D	NB Left	382	45	63	253	D	7.9	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.1	A	EB Left	0	0	0	0	A		
				EB Through	1283	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	5.3	A	WB Left	0	0	0	0	A		
				WB Through	1582	5	38	715	A		
				WB Right	0	0	0	0	A		
14- MD 27 at I-270 SB off ramp											
14	NB			NB Left	0	0	0	0	A	5.3	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	49.5	D	SB Left	170	49	33	173	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	2.3	A	EB Left	0	0	0	0	A		
				EB Through	1351	2	4	149	A		
				EB Right	0	0	0	0	A		
	WB	2.8	A	WB Left	0	0	0	0	A		
				WB Through	1423	3	8	276	A		
				WB Right	0	0	0	0	A		
15- MD 27 at Crystal Rock Dr											
15	NB	22.5	C	NB Left	58	21	55	379	C	30.0	C
				NB Through	966	23	67	379	C		
				NB Right	43	19	72	392	B		
	SB	34.5	C	SB Left	140	57	184	769	E		
				SB Through	1307	36	184	769	D		
				SB Right	196	10	163	763	B		
	EB	42.9	D	EB Left	103	54	29	120	D		
				EB Through	37	46	25	115	D		
				EB Right	47	17	17	141	B		
	WB	27.6	C	WB Left	83	49	70	297	D		
				WB Through	102	43	70	297	D		
				WB Right	552	22	70	297	C		
16- MD 118 at Seneca Meadows Pkwy											
16	NB	3.9	A	NB Left	90	11	1	73	B	8.0	A
				NB Through	1172	3	8	164	A		
				NB Right	0	0	15	217	A		
	SB	6.1	A	SB Left	11	6	12	271	A		
				SB Through	1091	6	16	271	A		
				SB Right	9	2	19	304	A		
	EB	13.1	B	EB Left	18	55	12	132	E		
				EB Through	1	76	12	132	E		
				EB Right	275	10	12	132	B		
	WB	53.5	D	WB Left	93	64	37	199	E		
				WB Through	6	61	33	198	E		
				WB Right	25	13	42	218	B		
17- MD 118 at I-270 NB on ramp											
17	NB			NB Left	0	0	0	0	A	15.8	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	33.0	C	EB Left	435	33	87	493	C		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	10.7	B	WB Left	0	0	0	0	A		
				WB Through	246	2	0	45	A		
				WB Right	1216	12	45	436	B		
18- MD 118 at I-270 SB off ramp											
18	NB			NB Left	0	0	0	0	A	6.1	A
				NB Through	0	0.0	0	0	A		
				NB Right	0	0.0	0	0	A		
	SB	36.7	D	SB Left	130	36.7	22	136	D		
				SB Through	0	0.0	0	0	A		
				SB Right	0	0.0	0	0	A		
	EB	4.6	A	EB Left	0	0.0	0	0	A		
				EB Through	1182	4.6	10	316	A		
				EB Right	0	0.0	0	0	A		
	WB	4.6	A	WB Left	0	0.0	0	0	A		
				WB Through	1454	4.6	9	226	A		
				WB Right	0	0.0	0	0	A		
19- MD 118 at Aircraft Dr											
19	NB	24.2	C	NB Left	42	69	33	176	E	27.7	C
				NB Through	43	70	33	176	E		
				NB Right	196	5	3	79	A		
	SB	90.3	F	SB Left	381	90	221	577	F		
				SB Through	12	82	221	577	F		
				SB Right	96	91	221	577	F		
	EB	17.4	B	EB Left	98	21	59	383	C		
				EB Through	1215	17	59	383	B		
				EB Right	17	15	59	383	B		
	WB	18.2	B	WB Left	12	19	69	437	B		
				WB Through	1318	22	69	437	C		
				WB Right	346	5	69	437	A		
20- Middlebrook Rd at Observation Dr											
20	NB			NB Left	0	0	0	0	A	8.4	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	18.1	B	SB Left	96	35	18	131	D		
				SB Through	0	0	0	0	A		
				SB Right	179	9	18	131	A		
	EB	6.1	A	EB Left	15	11	16	150	B		
				EB Through	1171	6	16	150	A		
				EB Right	0	0	0	0	A		
	WB	8.5	A	WB Left	0	0	0	0	A		
				WB Through	1237	9	25	261	A		
				WB Right	12	7	39	310	A		

Table B.15: PM Peak -2015 Variable Speed Limit- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
21- Middlebrook Rd at I-270 SB on ramp											
21	NB			NB Left	0	0	0	0	A	4.4	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	2.8	A	EB Left	0	0	0	0	A		
				EB Through	686	3	4	113	A		
				EB Right	0	0	0	0	A		
	WB	6.9	A	WB Left	429	7	4	175	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
22- Middlebrook Rd at Waring Station Rd											
22	NB	48.4	D	NB Left	156	45	75	316	D	12.5	B
				NB Through	0	0	75	316	A		
				NB Right	219	51	75	316	D		
	SB	30.5	C	SB Left	30	44	7	66	D		
				SB Through	2	37	7	66	D		
				SB Right	19	8	18	104	A		
	EB	7.4	A	EB Left	3	11	23	251	B		
				EB Through	1035	7	23	251	A		
				EB Right	160	7	23	251	A		
	WB	8.2	A	WB Left	242	19	32	326	B		
				WB Through	1640	7	32	326	A		
				WB Right	3	3	32	326	A		
23- MD 124 at MD 355											
23	NB	50.9	D	NB Left	510	63	184	526	E	60.5	E
				NB Through	947	45	182	524	D		
				NB Right	6	11	0	0	B		
	SB	31.0	C	SB Left	141	72	100	350	E		
				SB Through	553	54	100	350	D		
				SB Right	736	6	22	299	A		
	EB	37.7	D	EB Left	460	84	297	1152	F		
				EB Through	2695	37	297	1152	D		
				EB Right	570	5	126	1135	A		
	WB	151.9	F	WB Left	0	0	0	0	A		
				WB Through	1483	154	707	941	F		
				WB Right	65	98	0	0	F		
24- MD 124 at I-270 SB on and off											
24	NB	66.8	F	NB Left	54	66	24	98	E	37.5	D
				NB Through	22	68	24	98	E		
				NB U-Turn	0	0	0	0	A		
	SB	50.9	D	SB Left	575	85	223	1220	F		
				SB Through	10	84	223	1220	F		
				SB Right	452	7	28	722	A		
	EB	39.8	D	EB Left	0	0	0	0	A		
				EB Through	1766	40	270	1082	D		
				EB Right	31	36	285	1105	D		
	WB	18.5	B	WB Left	4	56	78	626	E		
				WB Through	1055	18	78	626	B		
				WB Right	0	0	0	0	A		
25- MD 117 at MD 124											
25	NB	34.5	C	NB Left	44	62	107	618	E	40.3	D
				NB Through	544	51	107	618	D		
				NB Right	446	11	4	211	B		
	SB	32.5	C	SB Left	120	44	97	444	D		
				SB Through	764	37	97	444	D		
				SB Right	144	2	0	0	A		
	EB	46.1	D	EB Left	117	86	142	515	F		
				EB Through	1098	42	141	516	D		
				EB Right	43	40	150	543	D		
	WB	43.9	D	WB Left	393	70	281	1032	E		
				WB Through	1324	40	281	1032	D		
				WB Right	129	1	0	0	A		
26- MD 117 at Bureau Dr											
26	NB	44.1	D	NB Left	78	76	63	265	E	39.3	D
				NB Through	27	73	63	265	E		
				NB Right	262	31	63	265	C		
	SB	74.6	E	SB Left	276	86	110	377	F		
				SB Through	18	86	110	377	F		
				SB Right	65	23	110	377	C		
	EB	31.3	C	EB Left	42	76	153	816	E		
				EB Through	1606	30	155	815	C		
				EB Right	3	26	148	805	C		
	WB	38.6	D	WB Left	19	35	337	1059	D		
				WB Through	1693	41	338	1059	D		
				WB Right	289	26	369	1108	C		
27- MD 117 at I-270 SB off ramp											
27	NB			NB Left	0	0	0	0	A	13.7	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	5.2	A	EB Left	0	0	0	0	A		
				EB Through	903	5	13	542	A		
				EB Right	0	0	0	0	A		
	WB	39.6	E	WB Left	294	40	128	951	E		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
28- MD 117 at I-270 NB off ramp											
28	NB			NB Left	0	0	0	0	A	27.7	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	45.7	D	SB Left	250	42	178	894	D		
				SB Through	0	0	0	0	A		
				SB Right	926	47	179	893	D		
	EB	27.8	C	EB Left	4	118	157	983	F		
				EB Through	901	27	157	983	C		
				EB Right	0	0	0	0	A		
	WB	12.1	B	WB Left	0	0	0	0	A		
				WB Through	1358	12	78	381	B		
				WB Right	0	0	78	381	A		
29- MD 117 at Perry Pkwy											
29	NB	44.3	D	NB Left	18	70	14	98	E	37.0	D
				NB Through	22	55	13	97	D		
				NB Right	24	16	22	118	B		
	SB	52.6	D	SB Left	197	78	79	312	E		
				SB Through	15	79	79	312	E		
				SB Right	113	5	79	312	A		
	EB	20.9	C	EB Left	239	70	82	355	E		
				EB Through	861	8	82	355	A		
				EB Right	31	5	67	339	A		
	WB	45.2	D	WB Left	36	107	248	736	F		
				WB Through	1228	46	248	736	D		
				WB Right	299	35	248	736	C		
30- Shady Grove Rd at I-270 NB off ramp											
30	NB	7.1	A	NB Left	0	0	0	0	A	13.1	B
				NB Through	1023	7	16	188	A		
				NB Right	0	0	0	0	A		
	SB	9.5	A	SB Left	0	0	0	0	A		
				SB Through	1280	9	41	481	A		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	49.6	D	WB Left	295	50	53	222	D		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table B.15: PM Peak -2015 Variable Speed Limit- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
31- Shady Grove Rd at I-270 SB off ramp											
31	NB	6.7	A	NB Left	0	0	0	0	A	15.9	B
				NB Through	1463	7	27	410	A		
				NB Right	0	0	0	0	A		
	SB	5.4	A	SB Left	0	0	0	0	A		
				SB Through	795	5	8	159	A		
				SB Right	0	0	0	0	A		
	EB	57.5	E	EB Left	227	55	45	193	E		
				EB Through	0	0	0	0	A		
				EB Right	295	59	65	243	E		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
32- MD 28 at I-270 SB off ramp											
32	NB			NB U-Turn	0	0	0	0	A	8.2	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	37.1	D	SB Left	440	45	75	284	D		
				SB Through	0	0	0	0	A		
				SB Right	99	3	0	43	A		
	EB	2.7	A	EB Left	0	0	0	0	A		
				EB Through	1505	1	0	0	A		
				EB Right	830	6	14	217	A		
	WB	6.4	A	WB Left	0	0	0	0	A		
				WB Through	1656	6	18	208	A		
				WB Right	0	0	0	0	A		
33- MD 28 at I-270 on and off ramps											
33	NB	35.6	D	NB Left	0	0	45	209	A	21.4	C
				NB Through	208	48	54	218	D		
				NB Right	133	16	54	218	B		
	SB	33.6	C	SB Left	11	106	175	287	F		
				SB Through	0	0	0	0	A		
				SB Right	164	29	175	287	C		
	EB	12.2	B	EB Left	255	37	49	259	D		
				EB Through	884	5	49	259	A		
				EB Right	0	0	0	0	A		
	WB	24.2	C	WB Left	36	21	97	385	C		
				WB Through	1239	24	78	348	C		
				WB Right	0	0	0	0	A		
34- MD 189 at Great Falls Rd											
34	NB	38.5	D	NB Left	45	44	11	83	D	13.5	B
				NB Through	11	48	8	80	D		
				NB Right	12	10	8	91	A		
	SB	3.1	A	SB Left	14	50	7	71	D		
				SB Through	11	48	7	71	D		
				SB Right	401	0	0	0	A		
	EB	12.2	B	EB Left	420	25	41	486	C		
				EB Through	659	5	5	156	A		
				EB Right	58	4	9	192	A		
	WB	18.5	B	WB Left	11	17	48	369	B		
				WB Through	827	19	48	368	B		
				WB Right	14	16	63	402	B		
35- MD 189 at I-270 Ramps											
35	NB	47.5	D	NB Left	245	48	44	191	D	42.0	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	55.8	E	SB Left	349	56	131	528	E		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	27.2	C	EB Left	478	30	88	355	C		
				EB Through	366	24	88	355	C		
				EB Right	0	0	0	0	A		
	WB	49.4	D	WB Left	439	55	107	257	D		
				WB Through	418	44	107	257	D		
				WB Right	0	0	0	0	A		
36- MD 189 at Wooton Pkwy											
36	NB	44.8	D	NB Left	186	56	112	411	E	44.0	D
				NB Through	535	52	112	411	D		
				NB Right	173	10	112	411	B		
	SB	63.3	E	SB Left	246	82	159	660	F		
				SB Through	729	57	154	560	E		
				SB Right	0	0	0	0	A		
	EB	34.5	C	EB Left	118	72	101	427	E		
				EB Through	541	34	101	427	C		
				EB Right	160	10	101	427	B		
	WB	34.6	C	WB Left	159	74	121	627	E		
				WB Through	779	34	121	627	C		
				WB Right	316	15	121	627	B		
37- Montrose Rd at Tower Oaks Blvd											
37	NB	0.4	A	NB Left	0	0	0	0	A	19.3	B
				NB Through	0	0	0	0	A		
				NB Right	490	0	0	0	A		
	SB	64.3	E	SB Left	68	47	19	181	D		
				SB Through	0	0	0	0	A		
				SB Right	271	68	87	313	E		
	EB	6.1	A	EB Left	0	0	0	0	A		
				EB Through	1685	6	30	398	A		
				EB Right	0	0	0	0	A		
	WB	25.1	C	WB Left	69	33	30	398	C		
				WB Through	2478	26	161	771	C		
				WB Right	238	18	161	771	B		
38- Tower Oaks Blvd at I-270 off ramp											
38	NB	23.6	C	NB Left	649	24	48	275	C	17.8	B
				NB Through	0	0.0	41	267	A		
				NB Right	21	6.5	48	275	A		
	SB	16.9	B	SB Left	8	29.3	1	39	C		
				SB Through	0	0.0	1	38	A		
				SB Right	7	2.8	0	22	A		
	EB	11.1	B	EB Left	1	13.7	15	159	B		
				EB Through	308	11.6	15	158	B		
				EB Right	33	6.2	10	149	A		
	WB	12.7	B	WB Left	119	15.1	14	140	B		
				WB Through	188	11.3	14	140	B		
				WB Right	1	1.5	2	96	A		
39- Montrose Rd at Tower Oaks Blvd											
39	NB	17.1	B	NB Left	76	33	61	273	C	56.9	E
				NB Through	606	30	61	273	C		
				NB Right	572	1	0	0	A		
	SB	29.0	C	SB Left	193	59	58	178	E		
				SB Through	394	19	56	177	B		
				SB Right	105	11	52	217	B		
	EB	227.6	F	EB Left	81	186	542	722	F		
				EB Through	454	233	543	723	F		
				EB Right	31	254	566	747	F		
	WB	36.4	D	WB Left	553	44	111	425	D		
				WB Through	462	44	112	425	D		
				WB Right	323	13	131	455	B		
40- Rockledge Blvd at I-270 NB on and off ramp											
40	NB	128.5	F	NB Left	0	0	0	0	A	100.0	F
				NB Through	329	116	529	834	F		
				NB Right	850	133	529	834	F		
	SB	85.0	F	SB Left	0	0	84	232	A		
				SB Through	349	85	84	232	F		
				SB Right	0	0	0	0	A		
	EB	61.1	E	EB Left	5	135	163	487	F		
				EB Through	427	102	163	487	F		
				EB Right	297	2	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table B.15: PM Peak -2015 Variable Speed Limit- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
41- Rockledge Blvd at I-270 SB on and off ramps											
41	NB	29.7	C	NB Left	336	30	71	260	C	47.6	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	52.5	D	WB Left	342	57	186	781	E		
				WB Through	891	51	186	781	D		
				WB Right	0	0	0	0	A		
42- MD 187 at Tuckerman Ln											
42	NB	33.8	C	NB Left	198	10	231	1078	A	115.7	F
				NB Through	2150	33	231	1078	C		
				NB Right	189	67	231	1078	E		
	SB	200.3	F	SB Left	189	168	2550	2703	F		
				SB Through	1130	200	2550	2703	F		
				SB Right	272	225	2550	2703	F		
	EB	51.6	D	EB Left	238	52	94	407	D		
				EB Through	409	54	95	408	D		
				EB Right	103	43	113	432	D		
	WB	213.8	F	WB Left	462	209	1917	2140	F		
				WB Through	617	231	1917	2140	F		
				WB Right	152	157	1917	2140	F		
43- MD 187 at I-270 NB on and off ramps											
43	NB	13.7	B	NB Left	554	32	99	383	C	18.0	B
				NB Through	2288	9	99	383	A		
				NB Right	0	0	0	0	A		
	SB	23.5	C	SB Left	0	0	0	0	A		
				SB Through	1253	24	58	239	C		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	60.6	E	WB Left	64	61	50	315	E		
				WB Through	65	61	50	315	E		
				WB Right	0	0	0	0	A		
44- MD 187 at I-270 NB on and off ramps											
44	NB	32.6	D	NB Left	0	0	0	0	A	33.4	C
				NB Through	2210	33	104	491	C		
				NB Right	0	0	0	0	A		
	SB	19.8	B	SB Left	150	60	74	302	E		
				SB Through	1169	15	74	302	B		
				SB Right	0	0	0	0	A		
	EB	57.6	E	EB Left	635	58	138	618	E		
				EB Through	0	0	138	618	A		
				EB Right	183	57	77	515	E		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
45- MD 187 at Rock Spring Dr											
45	NB	16.6	B	NB Left	383	34	90	638	C	24.3	C
				NB Through	2001	13	90	639	B		
				NB Right	14	12	110	672	B		
	SB	28.7	C	SB Left	20	50	89	440	D		
				SB Through	1160	33	89	440	C		
				SB Right	173	1	54	409	A		
	EB	40.6	D	EB Left	396	59	99	372	E		
				EB Through	37	64	99	372	E		
				EB Right	375	19	99	372	B		
	WB	11.7	B	WB Left	5	32	3	77	C		
				WB Through	12	25	3	77	C		
				WB Right	32	4	1	67	A		
47-Democracy Blvd at I-270 NB off ramp											
47	NB	48.3	D	NB Left	151	48	31	153	D	3.1	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	1.2	A	EB Left	0	0	0	0	A		
				EB Through	1112	1	3	48	A		
				EB Right	0	0	0	0	A		
	WB	0.9	A	WB Left	0	0	0	0	A		
				WB Through	2129	1	2	62	A		
				WB Right	0	0	0	0	A		
48- Democracy Blvd at I-270 SB on ramp											
48	NB			NB Left	0	0	0	0	A	6.3	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	5.1	A	EB Left	0	0	0	0	A		
				EB Through	1323	5	18	237	A		
				EB Right	0	0	0	0	A		
	WB	7.0	A	WB Left	531	23	39	282	C		
				WB Through	1747	2	30	261	A		
				WB Right	0	0	0	0	A		
49- Democracy Blvd at I-270 SB off ramp											
49	NB			NB Left	0	0	0	0	A	7.6	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	37.9	D	SB Left	157	51	31	150	D		
				SB Through	0	0	0	0	A		
				SB Right	59	2	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	4.1	A	WB Left	0	0	0	0	A		
				WB Through	1747	4	16	258	A		
				WB Right	165	9	33	310	A		
50- MD 190 at Burdette Rd											
50	NB	72.7	E	NB Left	26	74	15	100	E	29.8	C
				NB Through	4	84	15	100	F		
				NB Right	5	56	15	100	E		
	SB	31.5	C	SB Left	33	77	19	126	E		
				SB Through	7	56	19	126	E		
				SB Right	118	17	19	126	B		
	EB	16.5	B	EB Left	121	87	77	417	F		
				EB Through	1144	9	77	417	A		
				EB Right	28	3	60	444	A		
	WB	36.8	D	WB Left	11	118	327	1104	F		
				WB Through	2152	37	327	1104	D		
				WB Right	52	27	327	1104	C		

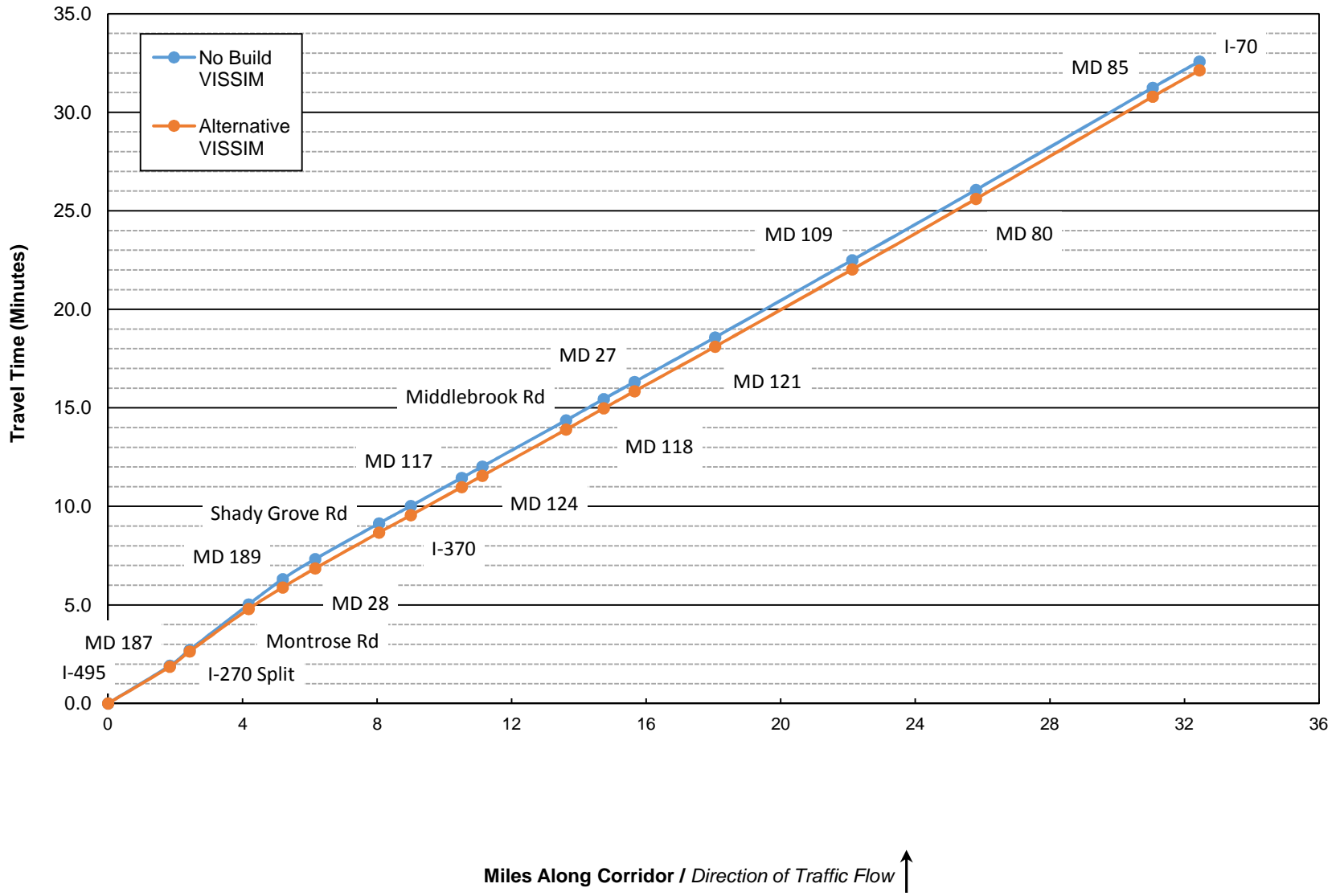
Table B.15: PM Peak -2015 Variable Speed Limit- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
51- MD 190 at I-270 NB on ramp											
51	NB			NB Left	0	0	0	0	A	17.5	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	72.2	E	EB Left	233	72	105	361	E		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	8.8	A	WB Left	0	0	0	0	A		
				WB Through	1467	9	43	685	A		
				WB Right	0	0	0	0	A		
52- MD 190 at I-270 SB off ramp											
52	NB	73.4	E	NB Left	225	73	93	859	E	13.0	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	3.0	A	EB Left	0	0	0	0	A		
				EB Through	840	3	6	131	A		
				EB Right	0	0	0	0	A		
	WB	10.0	B	WB Left	0	0	0	0	A		
				WB Through	1706	10	25	447	B		
				WB Right	0	0	0	0	A		
53- MD 190 at Seven Locks Rd											
53	NB	0.3	A	NB Left	21	1	0	0	A	25.1	C
				NB Through	243	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	55.7	E	SB Left	306	56	103	372	E		
				SB Through	180	56	103	372	E		
				SB Right	17	56	103	372	E		
	EB	27.1	C	EB Left	22	33	66	351	C		
				EB Through	664	27	66	351	C		
				EB Right	34	25	66	351	C		
	WB	19.7	B	WB Left	263	80	130	553	E		
				WB Through	939	15	130	553	B		
				WB Right	717	4	130	553	A		
54- MD 124 at I-270 NB off ramp											
54	NB	52.3	D	NB Left	0	0	0	0	A	57.8	E
				NB Through	0	0	0	0	A		
				NB Right	1882	52	646	2272	D		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	63.2	E	EB Left	0	0	0	0	A		
				EB Through	1882	63	541	1274	E		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
55- Democracy Blvd at I-270 NB off ramp											
55	NB	46.3	D	NB Left	0	0	0	0	A	11.4	B
				NB Through	0	0	0	0	A		
				NB Right	314	46	51	206	D		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	1.6	A	EB Left	0	0	0	0	A		
				EB Through	1112	2	5	66	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

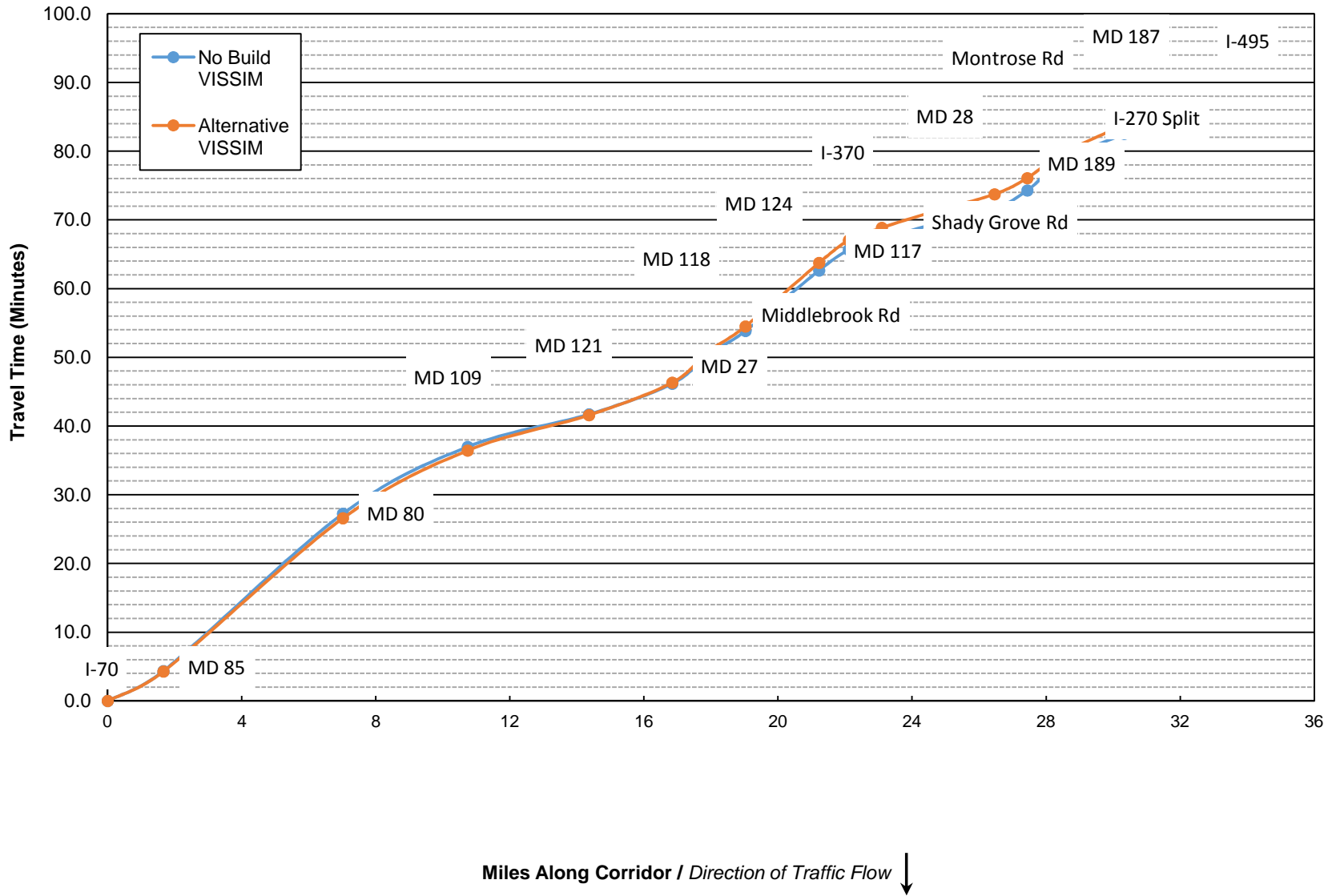
Table B.16: PM Peak - 2015 Variable Speed Limit - I-270 Vehicle Network Performance

	Existing	VSL	% Change
Total Delay	21,792,153	21,413,180	-2%
Average Delay per Vehicle	206	203	-2%
Total Travel Time	53,628,278	54,591,039	2%
Vehicles (Arrived)	88,401	87,885	-1%
Latent Demand	1,544	1,563	1%
Latent Delay	2,650,217	2,719,541	3%
Total Distance	484,473	480,763	-1%
Average Speed	33	32	-3%

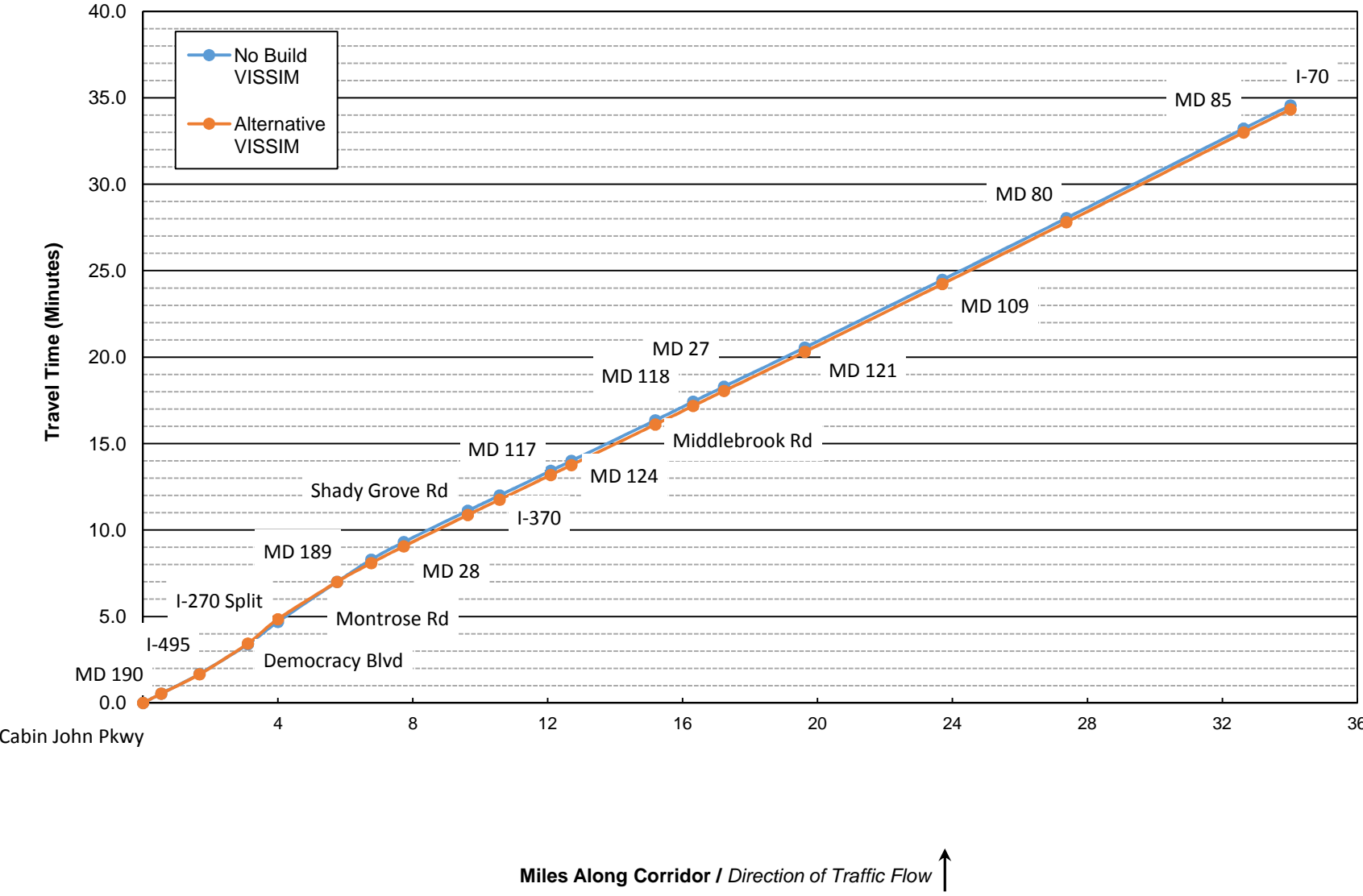
**Figure C.1: AM Peak - 2040 Variable Speed Limit
I-270 Travel Time Graph - Northbound**



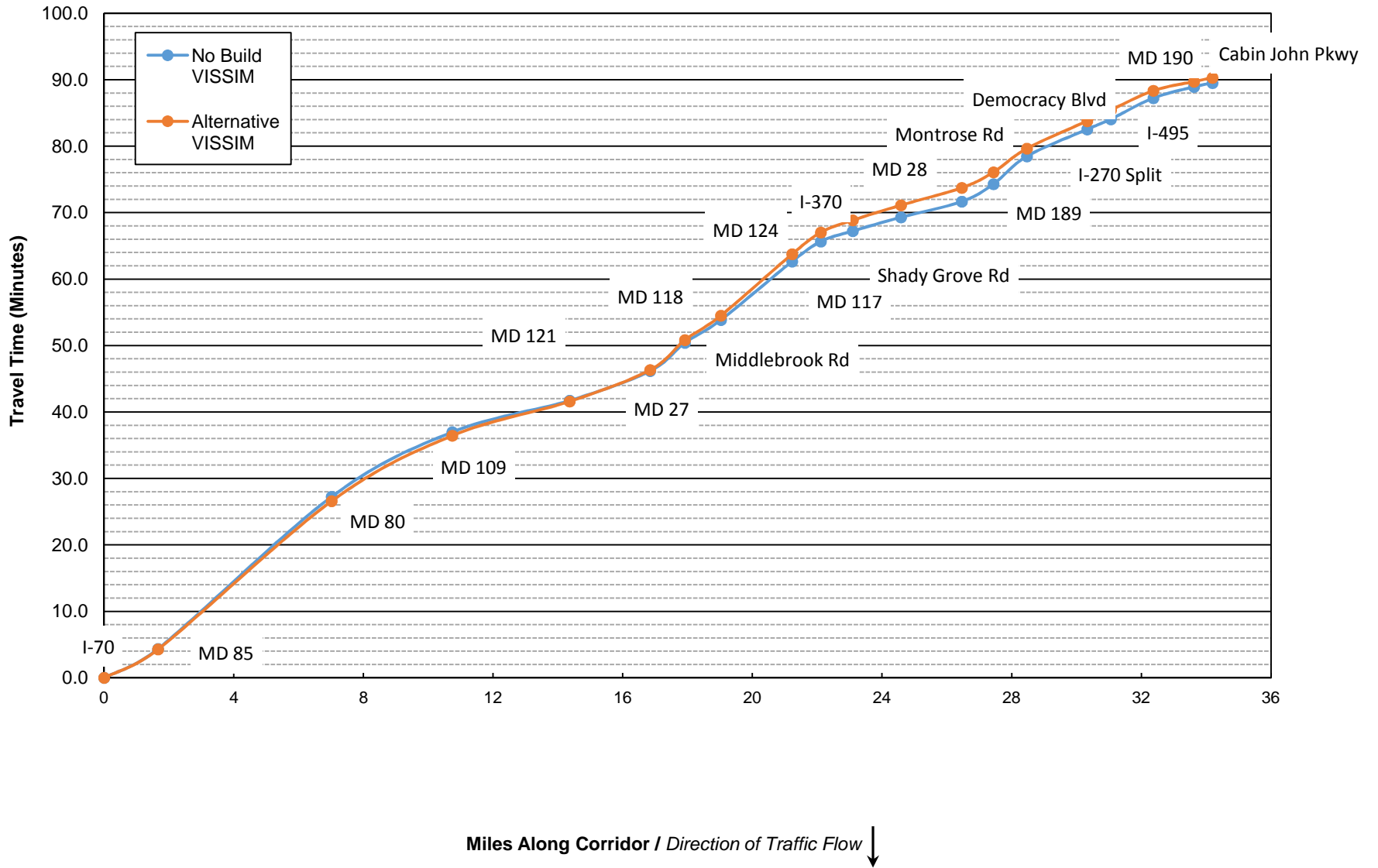
**Figure C.2: AM Peak - 2040 Variable Speed Limit
I-270 Travel Time Graph - Southbound**



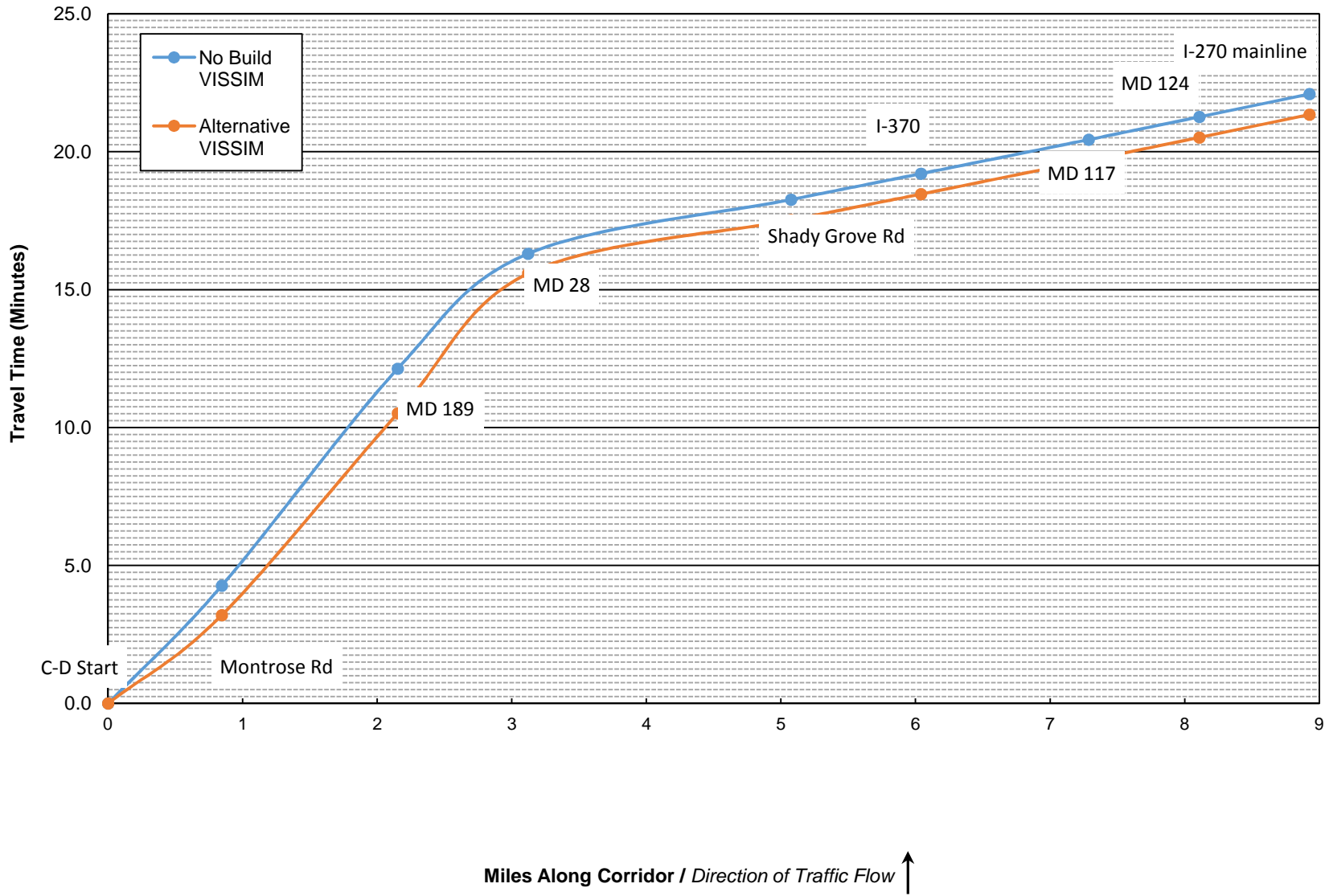
**Figure C.3: AM Peak - 2040 Variable Speed Limit
I-270 Spur Travel Time Graph - Northbound**



**Figure C.4: AM Peak - 2040 Variable Speed Limit
I-270 Spur Travel Time Graph - Southbound**



**Figure C.5: AM Peak - 2040 Variable Speed Limit
I-270 Local Travel Time Graph - Northbound**



**Figure C.6: AM Peak - 2040 Variable Speed Limit
I-270 Local Travel Time Graph - Southbound**

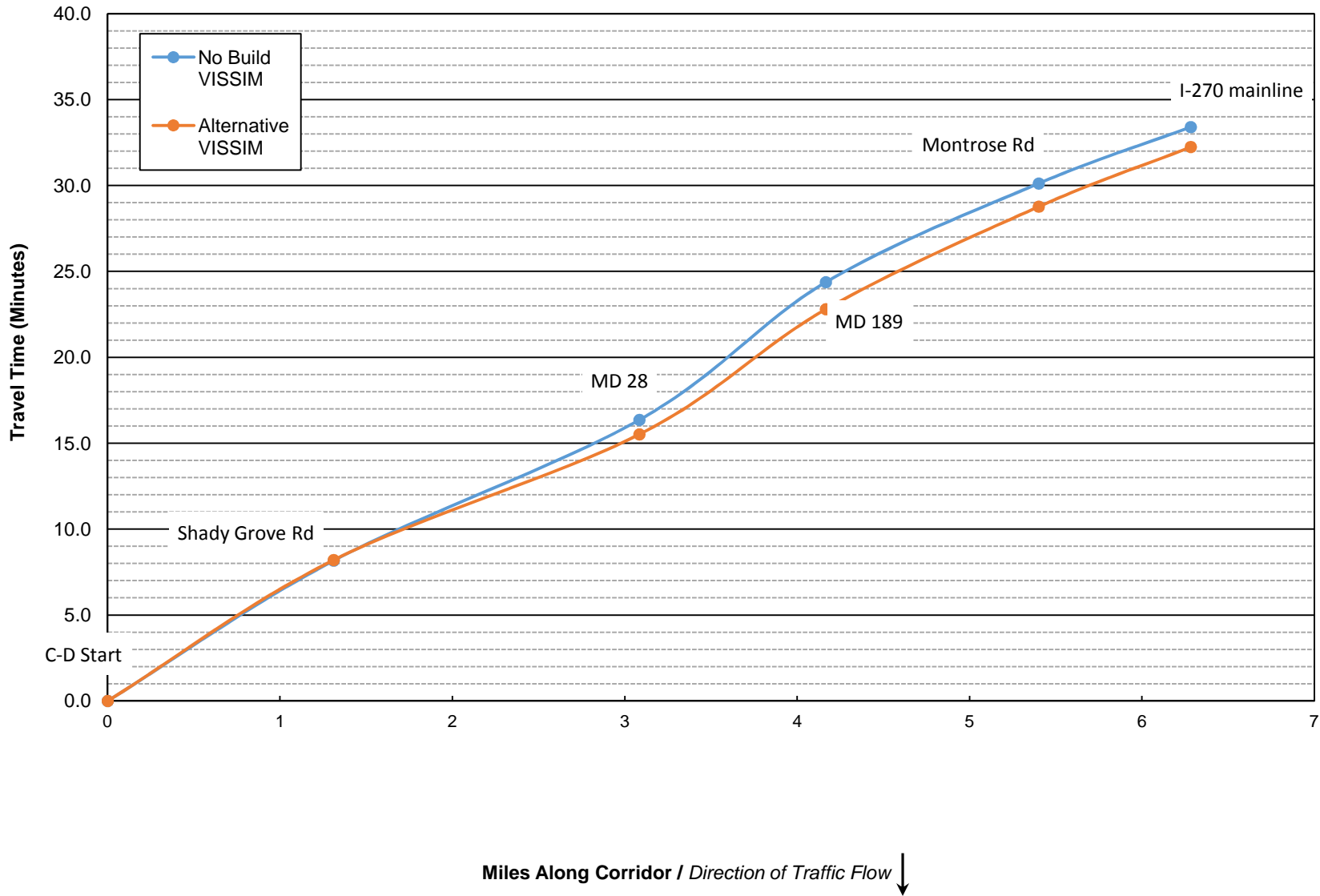


Table C.1: AM Peak -2040 Variable Speed Limit - I-270 Vehicle Travel Time

I-270 Northbound	Segment Length (miles)	No Build VISSIM Travel Time (seconds)	VSL VISSIM Travel Time (seconds)	% Change	I-270 Southbound	Segment Length (miles)	No Build VISSIM Travel Time (seconds)	VSL VISSIM Travel Time (seconds)	% Change
From I-495 interchange					From I-70				
to MD 187	1.8	115.1	111.9	-3%	to MD 85	1.7	260.9	257.0	-2%
to I-270 Split	0.6	47.5	46.5	-2%	to MD 80	5.4	1,374.0	1,337.9	-3%
to Montrose Rd	1.8	139.0	129.5	-7%	to MD 109	3.7	583.2	591.1	1%
to MD 189	1.0	77.0	65.3	-15%	to MD 121	3.6	284.4	309.1	9%
to MD 28	1.0	61.0	58.2	-5%	to MD 27	2.5	266.9	284.1	6%
to Shady Grove Rd	1.9	108.7	109.0	0%	to MD 118	1.1	254.6	270.0	6%
to I-370	0.9	53.0	53.0	0%	to Middlebrook Rd	1.1	206.2	220.7	7%
to MD 117	1.5	85.5	85.5	0%	to MD 124	2.2	528.0	554.9	5%
to MD 124	0.6	34.5	34.5	0%	to MD 117	0.9	180.6	196.1	9%
to Middlebrook Rd	2.5	140.8	140.8	0%	to I-370	1.0	94.3	109.9	17%
to MD 118	1.1	64.7	64.6	0%	to Shady Grove Rd	1.5	124.1	135.3	9%
to MD 27	0.9	52.0	51.9	0%	to MD 28	1.9	141.9	157.4	11%
to MD 121	2.4	135.6	135.7	0%	to MD 189	1.0	157.8	141.0	-11%
to MD 109	4.1	235.2	235.3	0%	to Montrose Rd	1.0	251.0	213.5	-15%
to MD 80	3.7	214.0	214.6	0%	to I-270 Split	1.9	243.1	247.8	2%
to MD 85	5.3	310.9	311.3	0%	to MD 187	0.4	30.7	34.4	12%
to I-70	1.4	80.1	80.2	0%	to I-495 interchange	1.9	134.0	150.9	13%
I-270 Total (miles/minutes)	32.4	32.6	32.1	-1%	I-270 Total (miles/minutes)	32.7	85.3	86.9	2%
I-270 Spur Northbound					I-270 Spur Southbound				
From Cabin John Pkwy					From I-70				
to MD 190	0.5	32.4	32.4	0%	to I-270 Split	30.3	4,951.1	5,025.8	2%
to I-495	1.1	68.6	67.3	-2%	to Democracy Blvd	0.7	91.3	98.9	8%
to Democracy Blvd	1.4	102.7	106.5	4%	to I-495	1.3	191.0	175.5	-8%
to I-270 Split	0.9	77.7	84.5	9%	to MD 190	1.3	101.6	82.1	-19%
to I-70	30.0	1,792.1	1,769.4	-1%	to Cabin John Pkwy	0.6	35.1	35.0	0%
I-270 Spur Total (miles/minutes)	34.0	34.6	34.3	-1%	I-270 Spur Total (miles/minutes)	34.2	89.5	90.3	1%

Table C.2: AM Peak -2040 Variable Speed Limit- I-270 Local Vehicle Travel Time

I-270 Northbound	Segment Length (miles)	No Build VISSIM Travel Time (seconds)	VSL VISSIM Travel Time (seconds)	% Change	I-270 Southbound	Segment Length (miles)	No Build VISSIM Travel Time (seconds)	VSL VISSIM Travel Time (seconds)	% Change
From C-D start					From C-D start				
to Montrose Rd	0.8	256.2	192.1	-25%	to Shady Grove	1.3	490.1	492.2	0%
to MD 189	1.3	471.8	438.9	-7%	to MD 28	1.8	491.5	439.0	-11%
to MD 28	1.0	250.0	304.2	22%	to MD 189	1.1	481.0	437.0	-9%
to Shady Grove	2.0	117.6	116.2	-1%	to Montrose	1.2	344.5	358.2	4%
to I-370	1.0	56.5	56.4	0%	to I-270 mainline	0.9	197.1	208.3	6%
to MD 117	1.2	74.0	73.6	-1%					
to MD 124	0.8	49.5	49.5	0%					
to I-270 mainline	0.8	49.7	49.8	0%					
I-270 Local Total (miles/minutes)	8.9	22.1	21.3	-3%	I-270 Local Total (miles/minutes)	6.3	33.4	32.2	-3%

Table C.3: AM Peak -2040 Variable Speed Limit - I-270 Vehicle Speed

I-270 Northbound	Segment Length (miles)	No Build VISSIM Speed (MPH)	VSL VISSIM Speed (MPH)	% Change	I-270 Southbound	Segment Length (miles)	No Build VISSIM Speed (MPH)	VSL VISSIM Speed (MPH)	% Change
From I-495 interchange					From I-70				
to MD 187	1.8	57.4	59.0	3%	to MD 85	1.7	22.9	23.3	2%
to I-270 Split	0.6	44.8	45.7	2%	to MD 80	5.4	14.0	14.4	3%
to Montrose Rd	1.8	45.4	48.8	7%	to MD 109	3.7	23.0	22.7	-1%
to MD 189	1.0	47.4	55.9	18%	to MD 121	3.6	45.8	42.2	-8%
to MD 28	1.0	56.9	59.6	5%	to MD 27	2.5	33.5	31.5	-6%
to Shady Grove Rd	1.9	62.9	62.7	0%	to MD 118	1.1	15.2	14.3	-6%
to I-370	0.9	64.1	64.1	0%	to Middlebrook Rd	1.1	19.4	18.1	-7%
to MD 117	1.5	63.8	63.8	0%	to MD 124	2.2	15.0	14.3	-5%
to MD 124	0.6	64.0	64.0	0%	to MD 117	0.9	17.7	16.3	-8%
to Middlebrook Rd	2.5	63.6	63.6	0%	to I-370	1.0	37.6	32.3	-14%
to MD 118	1.1	62.3	62.4	0%	to Shady Grove Rd	1.5	43.1	39.6	-8%
to MD 27	0.9	63.4	63.5	0%	to MD 28	1.9	47.6	42.9	-10%
to MD 121	2.4	63.6	63.5	0%	to MD 189	1.0	22.3	25.0	12%
to MD 109	4.1	62.4	62.4	0%	to Montrose Rd	1.0	14.8	17.4	18%
to MD 80	3.7	61.9	61.7	0%	to I-270 Split	1.9	27.5	27.0	-2%
to MD 85	5.3	60.8	60.8	0%	to MD 187	0.4	51.0	45.5	-11%
to I-70	1.4	62.5	62.4	0%	to I-495 interchange	1.9	50.8	45.1	-11%
I-270 Total (miles/minutes)	32.4	59.8	60.6	1%	I-270 Total (miles/minutes)	32.7	23.0	22.6	-2%
I-270 Spur Northbound					I-270 Spur Southbound				
From Cabin John Pkwy					From I-70				
to MD 190	0.5	59.9	59.9	0%	to I-270 Split	30.3	22.1	21.7	-1%
to I-495	1.1	59.5	60.6	2%	to Democracy Blvd	0.7	28.8	26.6	-8%
to Democracy Blvd	1.4	50.3	48.5	-4%	to I-495	1.3	24.7	26.9	9%
to I-270 Split	0.9	41.3	38.0	-8%	to MD 190	1.3	44.4	55.0	24%
to I-70	30.0	60.3	61.1	1%	to Cabin John Pkwy	0.6	58.5	58.5	0%
I-270 Spur Total (miles/minutes)	34.0	59.1	59.4	1%	I-270 Spur Total (miles/minutes)	34.2	22.9	22.7	-1%

Table C.4: AM Peak -2040 Variable Speed Limit- I-270 Local Vehicle Speed

I-270 Northbound	Segment Length (miles)	No Build VISSIM Speed (MPH)	VSL VISSIM Speed (MPH)	% Change	I-270 Southbound	Segment Length (miles)	No Build VISSIM Speed (MPH)	VSL VISSIM Speed (MPH)	% Change
From C-D start					From C-D start				
to Montrose Rd	0.8	11.9	15.8	33%	to Shady Grove	1.3	9.6	9.6	0%
to MD 189	1.3	10.0	10.7	8%	to MD 28	1.8	13.0	14.5	12%
to MD 28	1.0	13.9	11.5	-18%	to MD 189	1.1	8.1	8.9	10%
to Shady Grove	2.0	59.8	60.6	1%	to Montrose	1.2	12.9	12.4	-4%
to I-370	1.0	61.5	61.6	0%	to I-270 mainline	0.9	16.1	15.2	-5%
to MD 117	1.2	60.6	60.9	1%					
to MD 124	0.8	59.8	59.8	0%					
to I-270 mainline	0.8	59.3	59.2	0%					
I-270 Local Total (miles/minutes)	8.9	24.2	25.1	3%	I-270 Local Total (miles/minutes)	6.3	11.3	11.7	4%

Table C.5: AM Peak -2040 Variable Speed Limit- I-270 Vehicle Density

I-270 Northbound	Type	No Build		VSL		% Change	I-270 Southbound	Type	No Build		VSL		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS			
I-270	Freeway	40	E	41	E	3%	I-270	Freeway	45	F	49	F	8%
I-270 Diverge to MD 187	Diverge	35	D	35	E	1%	I-270 Merge from WB I-70	Merge	62	F	61	F	-1%
I-270	Freeway	45	F	46	F	3%	I-270	Freeway	67	F	63	F	-6%
I-270 Diverge to Rockledge Rd	Diverge	35	D	35	E	1%	I-270 Merge from EB I-70	Merge	57	F	57	F	-1%
I-270	Freeway	48	F	48	F	-1%	I-270	Freeway	67	F	68	F	2%
I-270 Weave from MD 187 to I-270 HOV	Weave	30	D	29	D	-4%	I-270 Diverge to SB MD 85	Diverge	70	F	73	F	5%
I-270 Lane Drop	Merge	47	F	47	F	0%	I-270	Freeway	92	F	94	F	2%
I-270	Freeway	64	F	57	F	-10%	I-270 Diverge to NB MD 85	Diverge	56	F	55	F	-2%
I-270 Merge from I-270 Spur	Merge	63	F	57	F	-10%	I-270	Freeway	119	F	108	F	-9%
I-270 Weave from I-270 HOV to I-270 C-D	Weave	68	F	65	F	-6%	I-270 Merge from MD 85	Merge	104	F	88	F	-15%
I-270	Freeway	38	E	36	E	-4%	I-270	Freeway	112	F	111	F	-1%
I-270 Diverge to C-D (MD 189)	Diverge	31	D	25	C	-20%	I-270 Diverge to MD 80	Diverge	61	F	61	F	1%
I-270	Freeway	23	C	18	C	-20%	I-270	Freeway	108	F	108	F	0%
I-270 Diverge to C-D (MD 28)	Diverge	50	F	36	E	-28%	I-270 Merge from MD 80	Merge	111	F	116	F	5%
I-270	Freeway	14	B	14	B	1%	I-270	Freeway	75	F	76	F	1%
I-270 Merge from C-D (MD 189)	Merge	14	B	15	B	7%	I-270 Diverge to MD 109	Diverge	41	F	41	F	1%
I-270 Diverge to C-D (Shady Grove Rd)	Diverge	18	B	18	B	2%	I-270	Freeway	80	F	80	F	-1%
I-270	Freeway	12	B	13	B	5%	I-270 Merge from MD 109	Merge	87	F	83	F	-5%
I-270 Weave from C-D (MD 28) to C-D (Shady Grove Rd)	Weave	10	B	11	B	6%	I-270	Freeway	44	E	50	F	13%
I-270	Freeway	10	A	11	A	5%	I-270 Diverge to SB Weigh Station	Diverge	19	B	23	C	22%
I-270 Merge from C-D (Shady Grove Rd)	Merge	9	A	9	A	5%	I-270	Freeway	38	E	47	F	23%
I-270	Freeway	12	B	12	B	4%	I-270 Merge from SB Weigh Station	Merge	20	B	23	C	16%
I-270 Merge from C-D (I-370)	Merge	10	B	11	B	3%	I-270	Freeway	41	E	43	E	6%
I-270 Diverge to C-D (MD 117)	Diverge	16	B	17	B	3%	I-270 Diverge to MD 121	Diverge	20	B	24	C	20%
I-270	Freeway	12	B	12	B	2%	I-270	Freeway	28	D	35	E	24%
I-270 Merge from C-D (MD 124)	Merge	14	B	14	B	0%	I-270 Merge from WB MD 121	Merge	33	D	41	F	25%
I-270	Freeway	16	B	16	B	0%	I-270	Freeway	43	E	51	F	18%
I-270 Diverge to EB Middlebrook Rd	Diverge	10	B	10	B	0%	I-270 Merge from EB MD 121	Merge	37	E	43	E	15%
I-270	Freeway	15	B	15	B	0%	I-270	Freeway	55	F	57	F	5%
I-270 Diverge to WB Middlebrook Rd	Diverge	10	A	10	A	0%	I-270 Diverge to MD 27	Diverge	57	F	58	F	2%
I-270	Freeway	13	B	13	B	0%	I-270	Freeway	81	F	86	F	6%
I-270 Diverge to EB MD 118	Diverge	11	B	11	B	-2%	I-270 Merge from WB MD 27	Merge	90	F	95	F	6%
I-270 Diverge to WB MD 118	Diverge	15	B	15	B	-1%	I-270	Freeway	82	F	85	F	4%
I-270	Freeway	13	B	13	B	0%	I-270 Weave from EB MD 27 to MD 118	Weave	81	F	83	F	2%
I-270 Weave from MD 118 to MD 27	Weave	13	B	13	B	0%	I-270	Freeway	91	F	94	F	4%
I-270	Freeway	12	B	12	B	0%	I-270 Merge from WB MD 118	Merge	73	F	76	F	5%
I-270 Merge from EB MD 27	Merge	13	B	13	B	0%	I-270	Freeway	85	F	89	F	4%
I-270	Freeway	14	B	14	B	0%	I-270 Merge from EB MD 118	Merge	73	F	77	F	5%
I-270 Merge from WB MD 27	Merge	11	B	11	B	1%	I-270	Freeway	70	F	74	F	5%
I-270	Freeway	14	B	15	B	0%	I-270 Merge from Middlebrook Rd	Merge	113	F	116	F	3%
I-270 Diverge to MD 121	Diverge	11	B	11	B	0%	I-270	Freeway	86	F	91	F	6%

Table C.5: AM Peak -2040 Variable Speed Limit- I-270 Vehicle Density

I-270 Northbound	Type	No Build		VSL		% Change	I-270 Southbound	Type	No Build		VSL		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS			
I-270	Freeway	11	A	11	A	0%	I-270 Diverge to Watkins Mill Rd	Diverge	81	F	84	F	4%
I-270 Merge from EB MD 121	Merge	10	A	10	A	1%	I-270	Freeway	124	F	121	F	-2%
I-270 Lane Drop	Merge	13	B	13	B	1%	I-270 Diverge to MD 124	Diverge	89	F	86	F	-3%
I-270	Freeway	19	C	19	C	0%	I-270	Freeway	133	F	133	F	0%
I-270 Diverge to NB Weigh Station	Diverge	10	B	10	B	2%	I-270 Merge from Watkins Mill	Merge	158	F	160	F	1%
I-270	Freeway	21	C	21	C	0%	I-270	Freeway	99	F	101	F	2%
I-270 Merge from NB Weight Station	Merge	10	B	11	B	1%	I-270 Merge from WB MD 124	Merge	132	F	136	F	3%
I-270	Freeway	21	C	21	C	0%	I-270	Freeway	53	F	59	F	11%
I-270 Diverge to MD 109	Diverge	11	B	11	B	1%	I-270 Merge from MD 117	Merge	49	F	53	F	9%
I-270	Freeway	19	C	19	C	0%	I-270	Freeway	48	F	50	F	4%
I-270 Merge from MD 109	Merge	11	B	11	B	1%	I-270 Diverge to I-370	Diverge	41	F	44	F	5%
I-270	Freeway	21	C	21	C	0%	I-270	Freeway	49	F	49	F	-1%
I-270 Diverge to MD 80	Diverge	12	B	13	B	4%	I-270 Diverge to I-270 C-D	Diverge	96	F	93	F	-3%
I-270	Freeway	19	C	19	C	1%	I-270	Freeway	20	C	21	C	9%
I-270 Merge from MD 80	Merge	14	B	14	B	5%	I-270 Merge from I-270 (I-370)	Merge	20	C	20	C	0%
I-270	Freeway	24	C	25	C	1%	I-270 Diverge to I-270 C-D (Shady Grove Rd)	Diverge	27	C	29	D	7%
I-270 Diverge to Scenic View	Diverge	12	B	13	B	1%	I-270	Freeway	21	C	23	C	11%
I-270	Freeway	24	C	25	C	1%	I-270 Merge from I-270 C-D (Shady Grove Rd Northern)	Merge	18	B	20	B	11%
I-270 Merge from Scenic View	Merge	12	B	12	B	3%	I-270	Freeway	26	C	28	D	9%
I-270	Freeway	25	C	25	C	1%	I-270 Merge from I-270 C-D (Shady Grove Rd Southern)	Merge	32	D	34	D	7%
I-270 Diverge to NB MD 85	Diverge	14	B	14	B	5%	I-270 Diverge to I-270 C-D (MD 189)	Diverge	46	F	49	F	6%
I-270	Freeway	23	C	24	C	2%	I-270	Freeway	82	F	69	F	-16%
I-270 Diverge to SB MD 85	Diverge	17	B	18	B	3%	I-270 Merge from I-270 C-D (MD 189)	Merge	106	F	93	F	-13%
I-270	Freeway	19	C	19	C	1%	I-270	Freeway	77	F	75	F	-3%
I-270 Weave from MD 85 to I-70	Weave	13	B	13	B	-1%	I-270 Merge from I-270 C-D	Merge	39	E	42	F	9%
I-270	Freeway	17	B	17	B	1%	I-270 Diverge to I-270 HOV Lane	Diverge	19	B	22	C	16%
							I-270 Diverge to I-270 Spur	Diverge	40	E	44	F	10%
							I-270	Freeway	23	C	25	C	10%
							I-270 Diverge to Rockledge Dr / MD 187	Diverge	17	B	18	B	6%
							I-270	Freeway	23	C	26	C	11%
							I-270 Merge from Rockledge Dr	Merge	19	B	21	C	8%
							I-270	Freeway	24	C	27	D	10%
							I-270 Merge from Rockledge Dr / MD 187	Merge	22	C	24	C	7%
							I-270	Freeway	26	C	29	D	11%

Table C.6: AM Peak -2040 Variable Speed Limit- I-270 Spur Vehicle Density

I-270 Spur Northbound	Type	No Build		VSL		% Change	I-270 Southbound	Type	No Build		VSL		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS			
I-270 Spur	Freeway	57	F	57	F	0%	I-270 Spur	Freeway	49	F	54	F	11%
I-270 Spur Merge from Clara Barton Parkway	Merge	25	C	25	C	0%	I-270 Spur Weave from I-270 HOV to Democracy Blvd	Weave	60	F	57	F	-6%
I-270 Spur	Freeway	39	E	39	E	0%	I-270 Spur	Freeway	54	F	50	F	-7%
I-270 Diverge to MD 190	Diverge	28	D	28	D	0%	I-270 Merge from Democracy Blvd	Merge	30	D	27	C	-11%
I-270 Spur	Freeway	34	D	34	D	0%	I-270 Spur Lane Drop	Merge	54	F	50	F	-7%
I-270 Spur Merge from Cabin John Parkway	Merge	25	C	25	C	-3%	I-270 Spur	Freeway	75	F	68	F	-10%
I-270 Spur Merge from MD 190	Merge	26	C	25	C	-5%	I-270 Spur Merge from I-495	Merge	37	E	32	D	-14%
I-270 Spur	Freeway	35	D	32	D	-7%	I-270 Spur	Freeway	45	F	33	D	-28%
I-270 Spur Diverge to I-495	Merge	38	E	36	E	-4%	I-270 Spur Diverve to EB MD 190	Diverge	56	F	45	F	-20%
I-270 Spur	Freeway	40	E	39	E	-1%	I-270 Spur Diverve to Cabin John Pkwy	Diverge	27	C	28	C	1%
I-270 Spur Diverge to Democracy Blvd	Diverge	33	D	34	D	3%	I-270 Spur	Freeway	29	D	29	D	0%
I-270 Spur	Freeway	36	E	37	E	1%	I-270 Merge from MD 190	Merge	26	C	26	C	1%
I-270 Spur Merge from EB Democracy Blvd	Merge	30	D	31	D	3%	I-270 Spur	Freeway	34	D	34	D	0%
I-270 Spur	Freeway	39	E	40	E	1%	I-270 Diverge to WB Clara Barton Pkwy	Diverge	23	C	23	C	1%
I-270 Spur Merge from WB Democracy Blvd	Merge	30	D	29	D	-3%	I-270 Spur	Freeway	33	D	33	D	1%
I-270 Spur	Freeway	43	E	44	E	3%	I-270 Merge from Clara Barton Pkwy	Merge	30	D	30	D	0%
I-270 Spur Merge from Westlake Terrace	Merge	45	F	46	F	2%							
I-270 Spur	Freeway	50	F	49	F	-3%							

Table C.7: AM Peak -2040 Variable Speed Limit- I-270 Local Vehicle Density

I-270 Northbound	Type	No Build		VSL		% Change	I-270 Southbound	Type	No Build		VSL		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS			
I-270 C-D	Freeway	84	F	79	F	-6%	I-270 C-D	Freeway	107	F	108	F	0%
I-270 C-D Diverge to EB Montrose Rd	Diverge	48	F	44	F	-9%	I-270 C-D Weave from I-370 EB to I-270	Weave	128	F	126	F	-2%
I-270 C-D	Freeway	80	F	73	F	-8%	I-270 C-D Diverge to Shady Grove Rd	Diverge	115	F	112	F	-2%
I-270 C-D Weave between Montrose Rd Loop Ramps	Weave	69	F	66	F	-4%	I-270 C-D	Freeway	137	F	133	F	-2%
I-270 C-D	Freeway	84	F	77	F	-9%	I-270 C-D Merge from WB Shady Grove Rd	Merge	106	F	103	F	-3%
I-270 C-D Merge from WB Montrose Rd	Merge	89	F	82	F	-8%	I-270 C-D	Freeway	113	F	110	F	-3%
I-270 C-D	Freeway	98	F	89	F	-10%	I-270 C-D Merge from EB Shady Grove Rd	Merge	77	F	75	F	-3%
I-270 C-D Merge from I-270	Merge	96	F	87	F	-9%	I-270 C-D	Freeway	93	F	91	F	-2%
I-270 C-D	Freeway	104	F	92	F	-11%	I-270 C-D Merge from I-270	Merge	98	F	96	F	-2%
I-270 C-D Diverge to MD 189	Diverge	58	F	50	F	-14%	I-270 C-D Diverge to I-270	Diverge	56	F	55	F	-3%
I-270 C-D	Freeway	111	F	98	F	-12%	I-270 C-D Diverge to I-270	Diverge	64	F	50	F	-22%
I-270 C-D Merge from MD 189	Merge	101	F	89	F	-12%	I-270 C-D	Freeway	75	F	51	F	-32%
I-270 C-D	Freeway	114	F	103	F	-10%	I-270 C-D Diverge to MD 28	Diverge	62	F	42	F	-33%
I-270 C-D Weave between I-270 (to MD 28 from MD 189)	Weave	108	F	102	F	-6%	I-270 C-D	Freeway	128	F	92	F	-28%
I-270 C-D	Freeway	106	F	93	F	-13%	I-270 C-D Merge from WB MD 28	Merge	160	F	148	F	-7%
I-270 C-D Diverge to MD 28	Diverge	64	F	58	F	-10%	I-270 C-D	Freeway	132	F	128	F	-3%
I-270 C-D	Freeway	87	F	84	F	-3%	I-270 C-D Merge from EB MD 28	Merge	152	F	153	F	0%
I-270 C-D Weave between MD 28 Ramps	Weave	109	F	96	F	-12%	I-270 C-D	Freeway	123	F	122	F	-1%
I-270 C-D	Freeway	7	A	8	A	16%	I-270 C-D Merge from I-270	Merge	124	F	125	F	1%
I-270 C-D Merge from MD 28 WB	Merge	6	A	7	A	7%	I-270 C-D	Freeway	95	F	97	F	2%
I-270 C-D Merge from I-270 and Drop Lane	Merge	7	A	8	A	9%	I-270 C-D Diverge to MD 189	Diverge	60	F	61	F	1%
I-270 C-D Diverge to I-270	Diverge	12	B	12	B	5%	I-270 C-D	Freeway	117	F	120	F	3%
I-270 C-D	Freeway	19	C	20	C	2%	I-270 C-D Merge from MD 189	Merge	120	F	121	F	0%
I-270 C-D Diverge to Shady Grove Rd	Diverge	15	B	16	B	3%	I-270 C-D Diverge to I-270	Diverge	84	F	87	F	3%
I-270 C-D	Freeway	5	A	5	A	4%	I-270 C-D	Freeway	92	F	92	F	1%
I-270 C-D Merge from I-270 and EB Shady Grove Rd	Merge	8	A	8	A	3%	I-270 C-D Diverge to WB Montrose Rd	Diverge	55	F	57	F	4%
I-270 C-D	Freeway	8	A	8	A	3%	I-270 C-D	Freeway	98	F	102	F	4%
I-270 C-D Merge from WB Shady Grove Rd	Merge	10	A	10	B	4%	I-270 Weave between Montrose Rd Loops	Weave	94	F	97	F	3%
I-270 C-D Diverge to I-270	Diverge	14	B	14	B	1%	I-270 C-D	Freeway	76	F	81	F	7%
I-270 C-D	Freeway	13	B	13	B	3%	I-270 C-D Merge from EB Montrose Rd	Merge	56	F	61	F	9%
I-270 C-D Diverge to I-370	Diverge	13	B	13	B	3%	I-270 C-D	Freeway	54	F	59	F	9%
I-270 C-D	Freeway	2	A	2	A	1%							
I-270 Merge from I-370 EB	Merge	7	A	7	A	0%							
I-270 C-D	Freeway	8	A	8	A	0%							
I-270 C-D Weave from I-370 to I-270	Weave	19	B	19	B	-1%							
I-270 C-D	Freeway	14	B	14	B	0%							
I-270 C-D Weave from I-270 to MD 117	Weave	19	B	19	B	0%							
I-270 C-D Diverge to MD 124	Diverge	13	B	13	B	2%							
I-270 C-D	Freeway	13	B	14	B	2%							
I-270 C-D Merge from EB MD 124	Merge	12	B	12	B	0%							
I-270 C-D Merge From WB MD 124	Merge	12	B	12	B	0%							
I-270 C-D	Freeway	10	A	9	A	-5%							
I-270 C-D Merge from Watkins Mill	Merge	10	A	9	A	-6%							

Table C.8: AM Peak -2040 Variable Speed Limit- I-270 Vehicle Throughput

I-270 Northbound	No-Build VISSIM Throughput	VSL Alternative VISSIM Throughput	% Change	I-270 Southbound	No-Build VISSIM Throughput	VSL Alternative VISSIM Throughput	% Change
Between I-495 and MD 187	4485	4436	-1%	North of I-70	2514	2559	2%
Between MD 187 on and off ramps	3881	3849	-1%	Between I-70 on ramps	2842	2904	2%
Between Rockledge Blvd on and off ramps	3138	3147	0%	From I-70 interchange to MD-85	4882	4949	1%
Between Rockledge Dr and I-270 Spur	2720	2774	2%	Between MD-85 on and off ramps	2530	2564	1%
Between I-270 Spur and Montrose Rd	7422	7542	2%	Between MD-85 and MD-80	3043	2997	-2%
Between Montrose Rd on and off ramps	4321	4363	1%	Between MD-80 on and off ramps	2724	2722	0%
Between Montrose Rd and MD 189	4064	4105	1%	Between MD-80 and Md-109	3532	3549	0%
Between MD 189 and MD 28	4018	4121	3%	Between MD-109 on and off ramps	3430	3448	1%
Between MD 28 on and off ramps	4122	4257	3%	Between MD-109 and MD-121	4100	4097	0%
Between MD 28 and Shady Grove Rd	2980	3097	4%	Between MD-121 on and off ramps	3551	3480	-2%
Between Shady Grove Rd and I-370	2552	2671	5%	Between MD-121 and MD-27	4802	4711	-2%
Between I-370 on and off ramps	2849	2973	4%	Between MD-27 on and off ramps	4223	4097	-3%
Between I-370 and MD 117	3979	4105	3%	Between MD-27 and MD-118	4688	4556	-3%
Between MD 117 and MD 124	3010	3088	3%	Between MD-118 on and off ramps	4542	4400	-3%
Between MD-124 on and off ramps	3023	3099	3%	Between MD-118 and Middlebrook Rd	5199	5045	-3%
Between Watkins Mill Rd and Middlebrook Rd	3974	3995	1%	Between Middlebrook Rd on and off ramps	5197	5015	-4%
Between Middlebrook Rd on and off ramps	3705	3713	0%	Between Middlebrook Rd and MD-124	6832	6566	-4%
Between Middlebrook Rd and MD 118	3293	3299	0%	Between MD-124 on and off ramps	5415	5310	-2%
Between MD-118 on and off ramps	2981	2988	0%	Between MD-124 and MD-117	6469	6254	-3%
Between MD 118 and MD 27	2827	2827	0%	Between MD-117 and I-370	8146	7910	-3%
Between MD-27 on and off ramps	2280	2284	0%	Between I-370 on and off ramps	2997	2946	-2%
Between MD 27 and MD 121	2687	2700	0%	Between I-370 on ramp to Shady Grove Rd	3871	3846	-1%
Between MD-121 on and off ramps	1970	1972	0%	Between Shady Grove Rd and MD 28	3552	3493	-2%
Between MD 121 and MD 109	2497	2508	0%	Between MD 28 on and off ramps	4372	4341	-1%
Between MD-109 on and off ramps	2327	2329	0%	Between MD 28 and MD 189	3946	3925	-1%
Between MD 109 and MD 80	2487	2487	0%	Between MD 189 and Montrose Rd	4070	3976	-2%
Between MD-80 on and off ramps	2222	2219	0%	Between Montrose Rd on and off ramps	5046	4958	-2%
Between MD 80 and MD 85	2916	2945	1%	Between Montrose Rd and I-270 Spur	8064	7942	-2%
Between MD-85 on and off ramps	2213	2228	1%	Between I-270 Spur and Rockledge Blvd	3823	3740	-2%
Between MD 85 and I-70	3227	3241	0%	Between Rockledge Blvd on and off ramps	2733	2658	-3%
North of I-70	2081	2091	0%	Between MD 187 on and off ramps	2887	2808	-3%
				Between MD 187 and I-495	2902	2930	1%
I-270 Spur Northbound				I-270 Spur Southbound			
Between I-495 and Democracy Blvd	5264	5257	0%	Between I-270 Split and HOV on ramp	4251	4205	-1%
Between Democracy Blvd on and off ramps	4077	4058	0%	Between HOV on ramp and Democracy Blvd	4186	4170	0%
Between Democracy Blvd and I-270 Split	4219	4209	0%	Between Democracy Blvd on and off ramps	3670	3659	0%
				Between Democracy Blvd and I-495	4194	4201	0%

Table C.9: AM Peak -2040 Variable Speed Limit- I-270 Local Vehicle Throughput

I-270 Local Northbound	No-Build VISSIM Throughput	VSL Alternative VISSIM Throughput	% Change	I-270 Local Southbound	No-Build VISSIM Throughput	VSL Alternative VISSIM Throughput	% Change
Between Montrose Rd EB off ramp and EB on ramp	1707	1780	4%	Between I-370 on ramp and I-270 off ramp	3627	3729	3%
Between Montrose Rd EB on ramp and WB off ramp	1884	1966	4%	Between I-270 off ramp and Shady Grove off ramp	2767	2838	3%
Between Montrose Rd WB off ramp and on ramp	1556	1633	5%	Between Shady Grove off ramp and Shady Grove WB on ramp	1593	1637	3%
Between Montrose Rd WB on ramp and I-270 on ramp	2215	2360	7%	Between Shady Grove WB and EB on ramps	2225	2279	2%
Between I-270 on ramp and MD 189 off ramp	2316	2550	10%	Between Shady Grove on ramp and I-270 on ramp	2594	2670	3%
Between MD 189 ramps	1739	1977	14%	Between I-270 on ramp and I-270 off ramp1	3272	3332	2%
Between MD 189 off ramp and I-270 on ramp	2036	2366	16%	Between I-270 off ramp1 and I-270 off ramp2	2767	2792	1%
Between I-270 on ramp and I-270 off ramp	2547	2959	16%	Between I-270 off ramp2 and MD 28 off ramp	1961	1958	0%
Between I-270 off ramp and MD 28 EB off ramp	1823	2132	17%	Between MD 28 off ramp and MD 28 WB on ramp	1428	1421	0%
Between MD 28 EB off ramp to MD 28 EB on ramp	1585	1866	18%	Between MD 28 WB on ramp and MD 28 EB on ramp	1700	1718	1%
Between MD 28 EB on ramp and MD 28 WB off ramp	1616	1897	17%	Between MD 28 EB on ramp and I-270 on ramp	2375	2388	1%
Between MD 28 WB off ramp and MD 28 WB on ramp	751	869	16%	Between I-270 on ramp and MD 189 off ramp	2871	2855	-1%
Between MD 28 WB on ramp and I-270 on ramp	1263	1390	10%	Between MD 189 on and off ramps	2353	2316	-2%
Between I-270 on ramp and I-270 off ramp	2439	2564	5%	Between MD 189 on ramp and I-270 off ramp	3387	3370	-1%
Between I-270 off ramp and Shady Grove off ramp	2131	2222	4%	Between I-270 off ramp and Montrose Rd off ramp	2357	2334	-1%
Between Shady Grove off ramp and I-270 on ramp	322	336	4%	Between Montrose Rd off ramp and Montrose Rd WB on ramp	2251	2224	-1%
Between I-270 on ramp and Shady Grove WB on ramp	1448	1488	3%	Between Montrose Rd WB on ramp and EB off ramp	2992	2990	0%
Between Shady Grove WB on ramp and I-270 off ramp	1788	1831	2%	Between Montrose Rd EB off and on ramps	2336	2345	0%
Between I-270 off ramp and I-370 off ramp	1515	1555	3%	Between Montrose Rd EB off ramp and I-270	3139	3124	0%
Between I-370 off ramp and I-370 EB on ramp	286	294	3%				
Between I-370 EB and WB on ramps	919	927	1%				
Between I-370 WB on ramp and I-270 off ramp	2785	2793	0%				
Between I-270 off ramp and I-270 on ramp	1670	1674	0%				
Between I-270 on ramp and MD 117 off ramp	2654	2697	2%				
Between MD 117 off ramp and MD 124 off ramp	1509	1532	2%				
Between MD 124 off ramp and MD 124 EB on ramp	789	802	2%				
Between MD 124 EB and WB on ramps	1183	1194	1%				
Between MD 124 on ramp I-270	573	548	-4%				

Table C.10: AM Peak -2040 Variable Speed Limit- I-270 On Ramp Queue Length - Northbound

I-270 Northbound	No Build VISSIM Average Queue (feet)	VSL VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	VSL VISSIM Maximum Queue (feet)	% Change
Rockledge Dr on ramp	67	67	0%	421	548	30%
MD 189 C-D on ramp	0	0	-	0	0	-
MD 28 C-D on ramp	0	0	-	0	0	-
Shady Grove Rd C-D on ramp	0	0	-	0	0	-
I-370 C-D on ramp	0	0	-	0	0	-
MD 124 C-D on ramp	0	0	-	0	0	-
MD 118 on ramp	0	0	-	0	0	-
MD 27 EB on ramp	0	0	-	0	0	-
MD 27 WB on ramp	0	0	-	0	0	-
MD 121 on ramp	0	0	-	0	0	-
MD 109 on ramp	0	0	-	0	0	-
MD 80 on ramp	0	0	-	0	0	-
MD 85 on ramp	0	0	-	0	0	-
I-270 Spur Northbound	No Build VISSIM Average Queue (feet)	VSL VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	VSL VISSIM Maximum Queue (feet)	% Change
Democracy Blvd EB on ramp	4	4	-2%	57	71	26%
Democracy Blvd WB on ramp	0	0	-100%	5	0	-100%
I-495 Northbound	No Build VISSIM Average Queue (feet)	VSL VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	VSL VISSIM Maximum Queue (feet)	% Change
Cabin John Pkwy on ramp	0	0	-	0	0	-
MD 190 on ramp	0	0	-	0	0	-
I-270 C-D Northbound	No Build VISSIM Average Queue (feet)	VSL VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	VSL VISSIM Maximum Queue (feet)	% Change
Montrose Rd EB on ramp	436	389	-11%	1548	1395	-10%
Montrose Rd WB on ramp	1047	945	-10%	2581	2173	-16%
I-270 on ramp	409	243	-41%	1171	749	-36%
MD 189 on ramp	1304	1091	-16%	2877	2430	-16%
I-270 on ramp	1354	784	-42%	3378	2437	-28%
MD 28 EB on ramp	3	2	-36%	55	56	0%
MD 28 WB on ramp	0	0	-	0	0	-
Shady Grove Rd EB on ramp	0	0	-	0	0	-
I-270 on ramp	0	0	-	0	0	-
Shady Grove Rd WB on ramp	0	0	-	0	0	-
I-370 EB on ramp	0	0	-	0	0	-
I-370 WB on ramp	0	0	-	0	0	-
I-270 on ramp	0	0	-100%	29	0	-100%
MD 124 EB on ramp	0	0	-	0	0	-
MD 124 WB on ramp	0	0	-	0	0	-
Watkins Mill Rd on ramp	0	0	-19%	24	23	-2%

Table C.11: AM Peak -2040 Variable Speed Limit- I-270 Off Ramp Queue Length - Northbound

I-270 Northbound	No Build VISSIM Average Queue (feet)	VSL VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	VSL VISSIM Maximum Queue (feet)	% Change
MD 187 off ramp NB	28	29	2%	242	255	5%
MD 187 off ramp SB	0	0	-	0	0	-
Rockledge Dr off ramp	6	7	17%	359	344	-4%
Tower Oaks Blvd off ramp	19	20	9%	179	172	-4%
Montrose Rd off ramp EB	0	0	-	0	0	-
Montrose Rd off ramp WB	0	0	-	0	0	-
MD 189 off ramp WB	8	9	11%	99	98	-2%
MD 189 off ramp EB	60	65	7%	1148	1156	1%
MD 28 off ramp EB	28	39	39%	227	337	48%
MD 28 off ramp WB	2636	2411	-9%	5046	5058	0%
Shady Grove Rd off ramp - Redland Blvd	0	0	-	0	0	-
Shady Grove Rd off ramp WB	151	150	-1%	605	593	-2%
Shady Grove Rd off ramp EB	0	0	-	0	0	-
I-370 off ramp WB	0	0	-	0	0	-
I-370 off ramp EB	0	0	-	0	0	-
MD 117 off ramp	311	324	4%	1011	945	-7%
MD 124 off ramp	95	95	0%	453	397	-12%
Watkins Mill Rd off ramp	78	84	7%	366	395	8%
Middlebrook Rd EB off ramp	0	0	-	0	0	-
Middlebrook Rd WB off ramp	0	0	-	0	0	-
MD 118 WB off ramp - Seneca Meadows	0	0	-	0	5	-
MD 118 WB off ramp	0	0	-	0	0	-
MD 118 EB off ramp	0	0	-	0	0	-
MD 27 off ramp WB	7	7	1%	81	83	3%
MD 27 off ramp EB	0	0	-	0	0	-
MD 121 off ramp WB	62	60	-3%	250	258	3%
MD 121 off ramp EB	0	0	-	0	0	-
MD 109 off ramp EB	29	29	0%	228	248	9%
MD 109 off ramp WB	8	0	-100%	84	0	-100%
MD 80 off ramp EB	7	7	-8%	102	110	7%
MD 80 off ramp WB	0	0	-16%	26	25	-6%
MD 85 NB off ramp	0	0	-	0	0	-
MD 85 SB off ramp	1	1	-6%	126	112	-12%
I-270 Spur Northbound	No Build VISSIM Average Queue (feet)	VSL VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	VSL VISSIM Maximum Queue (feet)	% Change
Clara Barton Pkwy off ramp EB	1	1	0%	214	214	0%
Clara Barton Pkwy off ramp WB	0	0	-	0	0	-
MD 190 off ramp EB	0	2	9978%	10	147	1343%
MD 190 off ramp WB	0	0	-	0	0	-
Democracy Blvd off ramp WB	104	103	-1%	563	550	-2%
Democracy Blvd off ramp EB	15	16	6%	143	146	2%

Table C.12: AM Peak -2040 Variable Speed Limit- I-270 On Ramp Queue Length - Southbound

I-270 Southbound	No Build VISSIM Average Queue (feet)	VSL VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	VSL VISSIM Maximum Queue (feet)	% Change
MD 85 on ramp	41	9	-78%	528	322	-39%
MD 80 on ramp	1039	1509	45%	2688	3057	14%
MD 109 on ramp	995	458	-54%	1914	2120	11%
MD 121 WB on ramp	135	127	-5%	972	2074	113%
MD 121 EB on ramp	0	2	-	0	137	-
MD 27 WB on ramp	552	605	10%	2591	2912	12%
MD 27 EB on ramp	3	9	244%	173	346	100%
MD 118 WB on ramp	0	0	-	0	0	-
MD 118 EB on ramp	0	2	658%	44	95	115%
Middlebrook Rd on ramp	2842	2751	-3%	4433	4399	-1%
Watkins Mill Rd on ramp	3066	3073	0%	3136	3134	0%
MD 124 WB on ramp	2789	2995	7%	4158	4167	0%
MD 117 on ramp	293	1338	357%	1898	2244	18%
I-370 C-D on ramp	0	0	-	0	0	-
Shady Grove Rd C-D on ramp North	0	0	-	0	0	-
Shady Grove Rd C-D on ramp South	2	0	-100%	127	0	-100%
MD 189 C-D on ramp	1787	2791	56%	3610	4087	13%
Montrose Rd C-D on ramp	2	0	-98%	227	53	-77%
Rockledge Dr on ramp	0	0	-	0	0	-
MD 187 on ramp	0	0	-	0	0	-
I-270 Spur Southbound	No Build VISSIM Average Queue (feet)	VSL VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	VSL VISSIM Maximum Queue (feet)	% Change
Democracy Blvd on ramp	0	0	-	0	0	-
I-495 Southbound	No Build VISSIM Average Queue (feet)	VSL VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	VSL VISSIM Maximum Queue (feet)	% Change
I-270 Spur on ramp	147	0	-100%	1557	0	-100%
MD 190 on ramp	0	0	-	0	0	-
I-270 C-D Southbound	No Build VISSIM Average Queue (feet)	VSL VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	VSL VISSIM Maximum Queue (feet)	% Change
I-270 on ramp	2947	2877	-2%	4900	4657	-5%
I-370 on ramp	2511	2565	2%	2932	2938	0%
Shady Grove Rd WB on ramp	28	45	62%	597	757	27%
Shady Grove Rd EB on ramp	0	0	-100%	37	5	-87%
I-270 on ramp	0	0	-100%	42	0	-100%
MD 28 WB on ramp	1406	1037	-26%	2299	2178	-5%
MD 28 EB on ramp	3724	3701	-1%	3882	3882	0%
I-270 on ramp	1	1	128%	74	115	54%
MD 189 on ramp	3725	3171	-15%	4200	4342	3%
Montrose Rd WB on ramp	68	41	-39%	926	684	-26%
Montrose Rd EB on ramp	0	9	2860%	69	391	464%

Table C.13: AM Peak -2040 Variable Speed Limit - I-270 Off Ramp Queue Length - Southbound

I-270 Southbound	No Build VISSIM Average Queue (feet)	VSL VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	VSL VISSIM Maximum Queue (feet)	% Change
MD 85 SB off ramp	297	5	-98%	1410	366	-74%
MD 85 NB off ramp	0	0	-19%	43	49	13%
MD 80 off ramp	1	11	1091%	99	214	116%
MD 109 off ramp WB	0	0	-96%	25	6	-75%
MD 109 off ramp EB	0	0	-	0	0	-
MD 121 off ramp EB	219	223	2%	946	1070	13%
MD 121 off ramp WB	10	21	110%	519	552	7%
MD 27 off ramp EB	50	53	6%	262	243	-7%
MD 27 off ramp WB	881	86	-90%	3309	956	-71%
MD 118 off ramp EB	31	32	4%	160	146	-9%
MD 118 off ramp WB	0	0	-	0	0	-
Watkins Mill Rd off ramp	2034	2771	36%	5055	5048	0%
MD 124 off ramp EB	70	60	-15%	368	313	-15%
MD 124 off ramp WB	19	10	-48%	419	347	-17%
I-370 off ramp WB	0	0	-	0	0	-
I-370 off ramp EB	0	0	-	0	0	-
Shady Grove Rd off ramp - Omega Drive	4	5	17%	172	212	24%
Shady Grove Rd off ramp	0	0	-	0	0	-
MD 28 off ramp	4	3	-17%	154	162	5%
MD 189 off ramp EB	35	36	3%	238	260	9%
MD 189 off ramp WB	0	0	-	0	0	-
Montrose Rd off ramp WB	0	0	-	0	0	-
Montrose Rd off ramp EB	382	434	14%	1566	2022	29%
Rockledge Dr off ramp	27	24	-13%	343	245	-29%
I-270 Spur Southbound	No Build VISSIM Average Queue (feet)	VSL VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	VSL VISSIM Maximum Queue (feet)	% Change
Democracy Blvd off ramp EB	50	52	4%	219	239	9%
Democracy Blvd off ramp WB	0	0	-	0	0	-
MD 190 off ramp WB	1389	719	-48%	3571	2839	-20%
MD 190 off ramp EB	0	0	-	0	0	-
Clara Barton Pkwy WB off ramp	0	0	-100%	5	0	-100%

Table C.14: AM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
1- MD 85 at Sam's Club Drive											
1	NB	23.0	C	NB Left	119	77	82	496	E	38.6	D
				NB Through	365	28	82	496	C		
				NB Right	664	11	22	438	B		
	SB	50.1	D	SB Left	137	63	174	771	E		
				SB Through	599	50	174	771	D		
				SB Right	68	26	174	771	C		
	EB	50.9	D	EB Left	105	78	56	182	E		
				EB Through	62	81	56	182	F		
				EB Right	113	9	56	182	A		
	WB	52.7	D	WB Left	230	77	90	355	E		
				WB Through	15	67	90	355	E		
				WB Right	126	7	90	355	A		
2- MD 85 at I-270 NB on and off ramp											
2	NB	52.1	D	NB Left	683	52	265	1136	D	36.3	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	18.8	B	SB Left	0	0	0	0	A		
				SB Through	611	19	56	562	B		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
3- MD 85 at I-270 SB on and off ramp											
3	NB	5.3	A	NB Left	0	0	0	0	A	10.2	B
				NB Through	1071	5	19	413	A		
				NB Right	0	0	0	0	A		
	SB	40.9	D	SB Left	172	41	43	440	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
4- MD 85 at Crestwood Blvd											
4	NB	19.4	C	NB Left	13	71	54	382	E	25.0	C
				NB Through	762	19	54	382	B		
				NB U-Turn	0	0	0	0	A		
	SB	18.8	B	SB Left	64	69	25	156	E		
				SB Through	1783	18	80	627	B		
				SB Right	808	16	68	617	B		
	EB	52.7	D	EB Left	621	54	91	276	D		
				EB Through	28	68	91	276	E		
				EB Right	42	17	91	276	B		
	WB	44.1	D	WB Left	52	53	21	137	D		
				WB Through	18	56	21	137	E		
				WB Right	19	9	21	137	A		
5- MD 80 at I-270 NB on and ramp											
5	NB	-1.0	A	NB Left	3	1	0	4	A	21.2	C
				NB Through	1	1	0	4	A		
				NB Right	5	-3	0	4	A		
	SB	13.0	B	SB Left	204	16	14	108	B		
				SB Through	6	20	14	108	B		
				SB Right	59	2	0	0	A		
	EB	11.3	B	EB Left	54	12	11	183	B		
				EB Through	0	0	8	0	A		
				EB Right	5	5	19	213	A		
	WB	23.1	C	WB Left	35	24	1	56	C		
				WB Through	879	31	182	786	C		
				WB Right	639	12	11	442	B		
6- MD 80 at I-270 SB on and off ramp											
6	NB	6.2	A	NB Left	24	37	2	134	E	31.6	D
				NB Through	0	0	0	0	A		
				NB Right	258	3	2	134	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	36.7	E	EB Left	0	0	0	0	A		
				EB Through	360	36	67	436	E		
				EB Right	161	38	68	446	E		
	WB	47.8	E	WB Left	0	0	0	0	A		
				WB Through	278	48	157	758	E		
				WB Right	0	0	0	0	A		
7- MD 109 at I-270 NB on and off ramp											
7	NB			NB Left	0	0	0	0	A	29.9	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	33.1	D	SB Left	143	37	37	244	E		
				SB Through	0	0	0	0	A		
				SB Right	47	20	17	177	C		
	EB	15.7	C	EB Left	88	11	5	149	B		
				EB Through	0	0	0	0	A		
				EB Right	63	22	0	0	C		
	WB	32.2	D	WB Left	0	0	0	0	A		
				WB Through	671	32	399	555	D		
				WB Right	0	0	0	0	A		
8- MD 80 at I-270 SB on and off ramp											
8	NB	9.3	A	NB Left	17	36	4	78	E	33.7	D
				NB Through	0	0	0	0	A		
				NB Right	48	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	50.0	E	EB Left	0	0	0	0	A		
				EB Through	92	34	58	270	D		
				EB Right	102	64	60	268	F		
	WB	31.6	D	WB Left	570	29	158	594	D		
				WB Through	156	39	152	571	E		
				WB Right	0	0	0	0	A		
9- MD 121 at Gateway Center Dr											
9	NB	17.8	C	NB Left	154	27	43	285	C	51.2	D
				NB Through	434	22	43	285	C		
				NB Right	327	8	52	311	A		
	SB	32.3	D	SB Left	55	22	113	555	C		
				SB Through	792	33	123	555	C		
				SB Right	8	26	131	576	C		
	EB	120.4	F	EB Left	8	97	421	525	F		
				EB Through	99	125	422	525	F		
				EB Right	646	120	452	557	F		
	WB	21.8	C	WB Left	137	25	18	147	C		
				WB Through	17	22	18	147	C		
				WB Right	28	6	16	171	A		
10- MD 121 at I-270 NB on and off ramp											
10	NB	28.3	D	NB Left	324	59	67	255	F	19.0	B
				NB Through	0	0	0	0	A		
				NB Right	402	3	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	11.5	B	EB Left	0	0	0	0	A		
				EB Through	513	18	32	325	C		
				EB Right	285	1	0	0	A		
	WB	18.6	C	WB Left	233	63	145	805	F		
				WB Through	1337	11	145	805	B		
				WB Right	0	0	0	0	A		

Table C.15: AM Peak -2040 Variable Speed Limit- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
11- MD 121 at I-270 SB on and off ramp											
11	NB			NB Left	0	0	0	0	A	17.9	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	62.7	E	SB Left	214	93	231	1076	F		
				SB Through	0	0	0	0	A		
				SB Right	303	41	19	522	E		
	EB	5.1	A	EB Left	0	0	0	0	A		
				EB Through	578	5	11	214	A		
				EB Right	0	0	0	0	A		
	WB	8.4	A	WB Left	0	0	0	0	A		
WB Through				647	18	41	549	C			
WB Right				1020	3	23	587	A			
12- MD 27 at Observation Dr											
12	NB	49.2	D	NB U-Turn	0	0	0	0	A	27.3	C
				NB Through	48	60	14	72	E		
				NB Right	12	8	14	72	A		
	SB	42.0	D	SB Left	91	53	30	192	D		
				SB Through	54	52	37	267	D		
				SB Right	177	33	61	304	C		
	EB	16.2	B	EB Left	151	37	38	319	D		
				EB Through	1203	14	39	320	B		
				EB Right	47	8	47	358	A		
	WB	31.2	C	WB Left	105	25	237	830	C		
WB Through				2232	32	237	830	C			
WB Right				115	17	237	830	B			
13- MD 27 at I-270 NB off ramp											
13	NB	32.5	C	NB Left	106	32	15	91	C	18.9	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.1	A	EB Left	0	0	0	0	A		
				EB Through	954	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	26.1	C	WB Left	0	0	0	0	A		
WB Through				2263	26	445	2263	C			
WB Right				0	0	0	0	A			
14- MD 27 at I-270 SB off ramp											
14	NB			NB Left	0	0	0	0	A	40.2	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	48.3	D	SB Left	370	48	64	256	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	2.5	A	EB Left	0	0	0	0	A		
				EB Through	834	3	1	57	A		
				EB Right	0	0	0	0	A		
	WB	60.1	E	WB Left	0	0	0	0	A		
WB Through				1433	60	539	1398	E			
WB Right				0	0	0	0	A			
15- MD 27 at Crystal Rock Dr											
15	NB	61.2	E	NB Left	30	34	279	728	C	79.0	E
				NB Through	1040	61	302	727	E		
				NB Right	93	68	312	740	E		
	SB	97.3	F	SB Left	515	97	1114	1995	F		
				SB Through	1653	98	1114	1995	F		
				SB Right	52	67	1105	1989	E		
	EB	43.8	D	EB Left	224	50	58	201	D		
				EB Through	97	43	55	196	D		
				EB Right	76	28	60	229	C		
	WB	48.0	D	WB Left	11	56	33	103	E		
WB Through				32	231	33	103	F			
WB Right				142	6	33	103	A			
16- MD 118 at Seneca Meadows Pkwy											
16	NB	3.6	A	NB Left	108	10	1	67	B	6.0	A
				NB Through	721	3	4	127	A		
				NB Right	59	2	9	180	A		
	SB	3.9	A	SB Left	31	4	6	231	A		
				SB Through	948	4	9	232	A		
				SB Right	41	3	11	264	A		
	EB	18.5	B	EB Left	20	65	10	77	E		
				EB Through	6	82	10	77	F		
				EB Right	115	7	10	77	A		
	WB	44.7	D	WB Left	35	72	16	102	E		
WB Through				6	55	11	101	D			
WB Right				27	7	14	111	A			
17- MD 118 at I-270 NB on ramp											
17	NB			NB Left	0	0	0	0	A	10.2	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	29.5	C	EB Left	274	29	31	194	C		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	5.4	A	WB Left	0	0	0	0	A		
WB Through				188	1	0	0	A			
WB Right				911	6	16	308	A			
18- MD 118 at I-270 SB off ramp											
18	NB			NB Left	0	0	0	0	A	7.8	A
				NB Through	0	0.0	0	0	A		
				NB Right	0	0.0	0	0	A		
	SB	39.9	D	SB Left	211	39.9	35	149	D		
				SB Through	0	0.0	0	0	A		
				SB Right	0	0.0	0	0	A		
	EB	3.7	A	EB Left	0	0.0	0	0	A		
				EB Through	631	3.7	5	191	A		
				EB Right	0	0.0	0	0	A		
	WB	4.4	A	WB Left	0	0.0	0	0	A		
WB Through				1214	4.4	9	221	A			
WB Right				0	0.0	0	0	A			
19- MD 118 at Aircraft Dr											
19	NB	46.1	D	NB Left	9	78	9	75	E	20.4	C
				NB Through	13	80	9	75	F		
				NB Right	17	3	0	23	A		
	SB	60.4	E	SB Left	267	55	112	418	E		
				SB Through	53	72	112	418	E		
				SB Right	96	68	112	418	E		
	EB	12.2	B	EB Left	132	16	37	329	B		
				EB Through	1019	12	37	329	B		
				EB Right	34	12	37	329	B		
	WB	14.8	B	WB Left	84	24	45	292	C		
WB Through				1041	17	45	292	B			
WB Right				322	5	45	292	A			
20- Middlebrook Rd at Observation Dr											
20	NB			NB Left	0	0	0	0	A	16.4	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	20.5	C	SB Left	26	36	6	63	D		
				SB Through	0	0	0	0	A		
				SB Right	27	5	6	63	A		
	EB	14.2	B	EB Left	223	22	30	244	C		
				EB Through	799	12	30	244	B		
				EB Right	0	0	0	0	A		
	WB	17.8	B	WB Left	0	0	0	0	A		
WB Through				1147	19	72	396	B			
WB Right				276	14	96	445	B			

Table C.14: AM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
21- Middlebrook Rd at I-270 SB on ramp											
21	NB			NB Left	0	0	0	0	A	19.5	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	13.7	B	EB Left	0	0	0	0	A		
				EB Through	763	14	31	203	B		
				EB Right	0	0	0	0	A		
	WB	25.4	C	WB Left	761	25	104	893	C		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
22- Middlebrook Rd at Waring Station Rd											
22	NB	179.6	F	NB Left	145	136	348	485	F	70.4	E
				NB Through	6	133	348	485	F		
				NB Right	268	204	348	485	F		
	SB	17.6	B	SB Left	3	39	1	29	D		
				SB Through	0	0	1	29	A		
				SB Right	5	5	2	67	A		
	EB	69.3	E	EB Left	31	21	645	1297	C		
				EB Through	1448	71	645	1297	E		
				EB Right	80	62	645	1297	E		
	WB	18.4	B	WB Left	80	23	33	237	C		
				WB Through	719	19	33	237	B		
				WB Right	41	4	33	237	A		
23- MD 124 at MD 355											
23	NB	52.9	D	NB Left	228	73	86	264	E	96.2	F
				NB Through	390	48	84	262	D		
				NB Right	54	3	0	0	A		
	SB	104.2	F	SB Left	64	166	490	804	F		
				SB Through	1188	124	490	804	F		
				SB Right	559	54	284	780	D		
	EB	54.5	D	EB Left	610	130	444	1095	F		
				EB Through	494	17	444	1095	B		
				EB Right	555	5	236	1008	A		
	WB	143.6	F	WB Left	0	0	0	0	A		
				WB Through	1717	146	760	1115	F		
				WB Right	52	73	0	0	E		
24- MD 124 at I-270 SB on and off											
24	NB	65.3	F	NB Left	16	62	18	95	E	29.3	C
				NB Through	37	67	18	95	E		
				NB U-Turn	0	0	0	0	A		
	SB	26.0	C	SB Left	285	65	77	373	E		
				SB Through	11	65	77	373	E		
				SB Right	588	6	14	350	A		
	EB	17.0	B	EB Left	0	0	0	0	A		
				EB Through	1037	17	50	409	B		
				EB Right	67	14	60	433	B		
	WB	41.6	D	WB Left	43	47	1679	2437	D		
				WB Through	1136	41	1679	2437	D		
				WB Right	0	0	0	0	A		
25- MD 117 at MD 124											
25	NB	49.7	D	NB Left	20	108	157	726	F	48.5	D
				NB Through	541	64	157	726	E		
				NB Right	433	30	76	717	C		
	SB	47.0	D	SB Left	181	69	221	826	E		
				SB Through	1072	48	221	826	D		
				SB Right	131	9	0	0	A		
	EB	54.0	D	EB Left	102	119	217	782	F		
				EB Through	1470	50	217	783	D		
				EB Right	82	47	229	811	D		
	WB	39.4	D	WB Left	319	70	103	304	E		
				WB Through	478	27	103	304	C		
				WB Right	99	0	0	0	A		
26- MD 117 at Bureau Dr											
26	NB	50.3	D	NB Left	25	64	19	125	E	41.1	D
				NB Through	24	65	19	125	E		
				NB Right	26	23	19	125	C		
	SB	174.5	F	SB Left	197	177	223	397	F		
				SB Through	55	190	223	397	F		
				SB Right	32	130	223	397	F		
	EB	36.8	D	EB Left	33	26	272	958	C		
				EB Through	2020	37	278	958	D		
				EB Right	29	43	271	948	D		
	WB	20.8	C	WB Left	299	67	134	543	E		
				WB Through	840	10	134	544	A		
				WB Right	314	6	100	582	A		
27- MD 117 at I-270 SB off ramp											
27	NB			NB Left	0	0	0	0	A	9.3	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	2.0	A	EB Left	0	0	0	0	A		
				EB Through	835	2	1	180	A		
				EB Right	0	0	0	0	A		
	WB	28.1	D	WB Left	328	28	59	453	D		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
28- MD 117 at I-270 NB off ramp											
28	NB			NB Left	0	0	0	0	A	34.5	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	60.5	E	SB Left	287	63	325	1037	E		
				SB Through	0	0	0	0	A		
				SB Right	871	60	329	1039	E		
	EB	19.2	B	EB Left	14	123	74	848	F		
				EB Through	821	17	74	848	B		
				EB Right	0	0	0	0	A		
	WB	15.6	B	WB Left	0	0	0	0	A		
				WB Through	909	16	60	360	B		
				WB Right	9	8	66	390	A		
29- MD 117 at Perry Pkwy											
29	NB	44.5	D	NB Left	36	76	17	120	E	15.9	B
				NB Through	7	58	17	119	E		
				NB Right	38	12	27	140	B		
	SB	48.7	D	SB Left	112	96	60	247	F		
				SB Through	14	102	60	247	F		
				SB Right	133	3	60	247	A		
	EB	10.6	B	EB Left	119	70	44	269	E		
				EB Through	975	3	44	269	A		
				EB Right	10	1	31	254	A		
	WB	10.4	B	WB Left	8	89	21	297	F		
				WB Through	747	10	21	297	B		
				WB Right	136	6	21	297	A		
30- Shady Grove Rd at I-270 NB off ramp											
30	NB	9.8	A	NB Left	0	0	0	0	A	22.3	C
				NB Through	959	10	22	267	A		
				NB Right	0	0	0	0	A		
	SB	10.4	B	SB Left	0	0	0	0	A		
				SB Through	1349	10	34	334	B		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	55.7	E	WB Left	846	56	160	616	E		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table C.14: AM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
31- Shady Grove Rd at I-270 SB off ramp											
31	NB	12.7	B	NB Left	0	0	0	0	A	19.9	B
				NB Through	1004	13	37	399	B		
				NB Right	0	0	0	0	A		
	SB	9.3	A	SB Left	0	0	0	0	A		
				SB Through	1565	9	32	563	A		
				SB Right	0	0	0	0	A		
	EB	47.4	D	EB Left	286	41	42	360	D		
				EB Through	0	0	0	0	A		
				EB Right	576	51	98	441	D		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
32- MD 28 at I-270 SB off ramp											
32	NB			NB U-Turn	0	0	0	0	A	67.9	E
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	35.7	D	SB Left	426	44	68	327	D		
				SB Through	0	0	0	0	A		
				SB Right	103	3	0	36	A		
	EB	131.7	F	EB Left	0	0	0	0	A		
				EB Through	683	200	1979	2136	F		
				EB Right	409	18	1925	2144	B		
	WB	25.4	C	WB Left	0	0	0	0	A		
				WB Through	1235	25	23	384	C		
				WB Right	0	0	0	0	A		
33- MD 28 at I-270 on and off ramps											
33	NB	36.5	D	NB Left	0	0	32	238	A	36.3	D
				NB Through	128	53	38	247	D		
				NB Right	80	10	38	247	A		
	SB	84.5	F	SB Left	26	102	128	357	F		
				SB Through	0	0	0	0	A		
				SB Right	273	83	128	357	F		
	EB	21.4	C	EB Left	177	45	57	407	D		
				EB Through	599	15	57	407	B		
				EB Right	0	0	0	0	A		
	WB	33.3	C	WB Left	26	37	101	391	D		
				WB Through	944	33	83	354	C		
				WB Right	0	0	0	0	A		
34- MD 189 at Great Falls Rd											
34	NB	37.3	D	NB Left	63	42	17	117	D	23.3	C
				NB Through	8	40	14	117	D		
				NB Right	10	8	16	128	A		
	SB	17.3	B	SB Left	63	45	19	229	D		
				SB Through	6	45	19	229	D		
				SB Right	478	13	54	147	B		
	EB	24.6	C	EB Left	227	55	111	1165	E		
				EB Through	680	15	17	199	B		
				EB Right	10	10	26	236	A		
	WB	26.4	C	WB Left	4	26	64	389	C		
				WB Through	311	27	63	388	C		
				WB Right	11	13	77	422	B		
35- MD 189 at I-270 Ramps											
35	NB	60.5	E	NB Left	88	61	18	121	E	79.7	E
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	55.9	E	SB Left	150	56	48	258	E		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	106.2	F	EB Left	284	138	627	1494	F		
				EB Through	436	85	627	1494	F		
				EB Right	0	0	0	0	A		
	WB	60.0	E	WB Left	457	53	107	429	D		
				WB Through	244	73	107	429	E		
				WB Right	0	0	0	0	A		
36- MD 189 at Wootton Pkwy											
36	NB	71.9	E	NB Left	161	48	85	311	D	117.9	F
				NB Through	125	95	85	311	F		
				NB Right	155	78	85	311	E		
	SB	142.8	F	SB Left	325	210	509	805	F		
				SB Through	593	106	482	792	F		
				SB Right	0	0	0	0	A		
	EB	162.3	F	EB Left	137	157	650	1047	F		
				EB Through	803	170	650	1047	F		
				EB Right	101	106	650	1047	F		
	WB	49.3	D	WB Left	346	69	104	353	E		
				WB Through	318	34	104	353	C		
				WB Right	47	6	104	353	A		
37- Montrose Rd at Tower Oaks Blvd											
37	NB			NB Left	0	0	0	0	A	104.5	F
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	235.8	F	SB Left	123	49	1098	1406	D		
				SB Through	0	0	0	0	A		
				SB Right	435	289	1123	1402	F		
	EB	25.5	C	EB Left	28	65	136	923	E		
				EB Through	1513	25	136	923	C		
				EB Right	0	0	0	0	A		
	WB	141.4	F	WB Left	0	0	0	0	A		
				WB Through	1255	145	491	850	F		
				WB Right	58	60	491	850	E		
38- Tower Oaks Blvd at I-270 off ramp											
38	NB	24.1	C	NB Left	385	22	30	200	C	78.2	E
				NB Through	8	22.5	25	192	C		
				NB Right	22	64.1	30	200	E		
	SB	0.6	A	SB Left	0	800.1	0	20	F		
				SB Through	0	0.0	0	20	A		
				SB Right	4	0.6	0	0	A		
	EB	122.8	F	EB Left	6	113.7	347	465	F		
				EB Through	558	122.3	347	465	F		
				EB Right	82	126.7	338	456	F		
	WB	9.5	A	WB Left	0	0.0	3	80	A		
				WB Through	81	9.9	3	80	A		
				WB Right	6	5.0	0	25	A		
39- Montrose Rd at Tower Oaks Blvd											
39	NB	17.9	B	NB Left	37	71	49	285	E	50.9	D
				NB Through	240	42	49	285	D		
				NB Right	555	4	12	151	A		
	SB	41.1	D	SB Left	334	54	163	619	D		
				SB Through	778	37	163	618	D		
				SB Right	78	29	124	658	C		
	EB	90.2	F	EB Left	76	74	416	718	E		
				EB Through	971	92	418	718	F		
				EB Right	62	89	439	742	F		
	WB	43.4	D	WB Left	300	52	68	290	D		
				WB Through	188	50	68	290	D		
				WB Right	109	7	77	321	A		
40- Rockledge Blvd at I-270 NB on and off ramp											
40	NB	34.1	C	NB Left	0	0	0	0	A	18.0	B
				NB Through	92	32	33	165	C		
				NB Right	216	35	33	165	C		
	SB	2.0	A	SB Left	0	0	4	61	A		
				SB Through	923	2	4	61	A		
				SB Right	0	0	0	0	A		
	EB	26.9	C	EB Left	7	48	126	506	D		
				EB Through	529	54	126	506	D		
				EB Right	563	1	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table C.14: AM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS	
41- Rockledge Blvd at I-270 SB on and off ramps												
41	NB	2.6	A	NB Left	97	3	5	72	A	20.4	C	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	21.7	C		WB Left	923	23	92	655			C
					WB Through	403	20	92	655			B
					WB Right	0	0	0	0			A
42- MD 187 at Tuckerman Ln												
42	NB	58.8	E	NB Left	230	25	265	793	C	153.0	F	
				NB Through	1468	55	265	793	D			
				NB Right	213	124	265	793	F			
	SB	224.9	F		SB Left	60	164	2605	2704			F
					SB Through	1204	225	2605	2704			F
					SB Right	162	247	2605	2704			F
	EB	186.0	F		EB Left	223	128	1864	1988			F
					EB Through	624	205	1865	1989			F
					EB Right	129	194	1889	2013			F
	WB	188.4	F		WB Left	721	229	1921	2147			F
					WB Through	393	152	1921	2147			F
					WB Right	159	92	1921	2147			F
43- MD 187 at I-270 NB on and off ramps												
43	NB	11.2	B	NB Left	163	76	57	257	E	19.1	B	
				NB Through	1541	4	57	257	A			
				NB Right	0	0	0	0	A			
	SB	25.4	C		SB Left	0	0	0	0			A
					SB Through	1529	25	81	553			C
					SB Right	0	0	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	49.5	D		WB Left	114	50	35	250			D
					WB Through	10	47	35	250			D
					WB Right	0	0	0	0			A
44- MD 187 at I-270 NB on and off ramps												
44	NB	23.9	C	NB Left	0	0	0	0	A	25.9	C	
				NB Through	1478	24	68	404	C			
				NB Right	0	0	0	0	A			
	SB	7.7	A		SB Left	178	49	58	295			D
					SB Through	1465	3	58	295			A
					SB Right	0	0	0	0			A
	EB	80.8	F		EB Left	228	58	187	740			E
					EB Through	0	0	187	740			A
					EB Right	371	95	232	784			F
	WB				WB Left	0	0	0	0			A
					WB Through	0	0	0	0			A
					WB Right	0	0	0	0			A
45- MD 187 at Rock Spring Dr												
45	NB	14.9	B	NB Left	255	57	68	257	E	20.8	C	
				NB Through	1383	7	69	258	A			
				NB Right	10	6	93	291	A			
	SB	21.9	C		SB Left	13	25	98	632			C
					SB Through	1668	24	98	632			C
					SB Right	144	1	63	619			A
	EB	37.9	D		EB Left	190	59	56	222			E
					EB Through	26	54	56	222			D
					EB Right	251	20	56	222			C
	WB	7.2	A		WB Left	1	7	1	29			A
					WB Through	9	11	1	29			B
					WB Right	5	0	0	7			A
47-Democracy Blvd at I-270 NB off ramp												
47	NB	29.7	C	NB Left	217	30	24	159	C	13.4	B	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB	12.7	B		EB Left	0	0	0	0			A
					EB Through	1654	13	50	446			B
					EB Right	0	0	0	0			A
	WB	10.4	B		WB Left	0	0	0	0			A
					WB Through	778	10	23	187			B
					WB Right	0	0	0	0			A
48- Democracy Blvd at I-270 SB on ramp												
48	NB			NB Left	0	0	0	0	A	6.6	A	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB	5.4	A		EB Left	0	0	0	0			A
					EB Through	1768	5	23	270			A
					EB Right	0	0	0	0			A
	WB	8.7	A		WB Left	223	37	31	173			D
					WB Through	771	1	21	152			A
					WB Right	0	0	0	0			A
49- Democracy Blvd at I-270 SB off ramp												
49	NB			NB Left	0	0	0	0	A	12.1	B	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB	32.9	C		SB Left	329	49	57	226			D
					SB Through	0	0	0	0			A
					SB Right	171	2	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	2.6	A		WB Left	0	0	0	0			A
					WB Through	770	3	4	133			A
					WB Right	334	2	1	163			A
50- MD 190 at Burdette Rd												
50	NB	73.2	E	NB Left	20	80	15	118	E	13.2	B	
				NB Through	4	59	15	118	E			
				NB Right	11	67	15	118	E			
	SB	34.4	C		SB Left	50	79	31	151			E
					SB Through	17	64	31	151			E
					SB Right	120	12	31	151			B
	EB	10.5	B		EB Left	53	93	61	561			F
					EB Through	1814	8	60	561			A
					EB Right	15	6	51	584			A
	WB	12.5	B		WB Left	1	106	61	828			F
					WB Through	1494	13	62	828			B
					WB Right	21	2	55	834			A

Table C.14: AM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
51- MD 190 at I-270 NB on ramp											
51	NB			NB Left	0	0	0	0	A	53.3	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	123.2	F	EB Left	531	123	347	715	F		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	15.9	B	WB Left	0	0	0	0	A		
				WB Through	994	16	76	747	B		
				WB Right	0	0	0	0	A		
52- MD 190 at I-270 SB off ramp											
52	NB	79.3	E	NB Left	258	79	1392	3574	E	14.2	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	2.9	A	EB Left	0	0	0	0	A		
				EB Through	982	3	6	151	A		
				EB Right	0	0	0	0	A		
	WB	5.7	A	WB Left	0	0	0	0	A		
				WB Through	667	6	8	160	A		
				WB Right	0	0	0	0	A		
53- MD 190 at Seven Locks Rd											
53	NB	68.2	E	NB Left	21	67	23	149	E	45.0	D
				NB Through	59	69	25	148	E		
				NB Right	0	0	0	0	A		
	SB	56.9	E	SB Left	624	56	184	777	E		
				SB Through	183	59	185	778	E		
				SB Right	18	54	184	777	D		
	EB	37.5	D	EB Left	24	30	135	584	C		
				EB Through	846	38	135	584	D		
				EB Right	42	42	135	584	D		
	WB	39.7	D	WB Left	119	127	125	418	F		
				WB Through	639	33	128	421	C		
				WB Right	157	1	4	127	A		
54- MD 124 at I-270 NB off ramp											
54	NB	40.6	D	NB Left	0	0	0	0	A	26.5	C
				NB Through	0	0	0	0	A		
				NB Right	723	41	100	459	D		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	15.6	B	EB Left	0	0	0	0	A		
				EB Through	933	16	37	359	B		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
55- Democracy Blvd at I-270 NB off ramp											
55	NB	37.1	D	NB Left	0	0	0	0	A	16.2	B
				NB Through	0	0	0	0	A		
				NB Right	928	37	113	575	D		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	4.5	A	EB Left	0	0	0	0	A		
				EB Through	1657	5	18	95	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
56- Watkins Mill Rd at I-270 SB off ramp/Parkview Ave											
56	NB	747.0	F	NB Left	46	222	668	726	F	174.0	F
				NB Through	0	0	0	0	A		
				NB Right	86	1028	668	726	F		
	SB	83.5	F	SB Left	552	113	2037	5048	F		
				SB Through	131	109	2037	5048	F		
				SB Right	447	39	2037	5048	D		
	EB	463.4	F	EB Left	0	0	0	0	A		
				EB Through	494	463	1163	1232	F		
				EB Right	2	599	1163	1232	F		
	WB	41.8	D	WB Left	116	87	120	459	F		
				WB Through	769	35	117	457	D		
				WB Right	0	0	0	0	A		
57- Watkins Mill Rd at I-270 NB on ramp											
57	NB	35.2	D	NB Left	386	51	92	383	D	70.0	E
				NB Through	0	0	0	0	A		
				NB Right	478	23	92	383	C		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	19.1	B	EB Left	190	61	49	301	E		
				EB Through	749	8	49	301	A		
				EB Right	0	0	0	0	A		
	WB	139.2	F	WB Left	0	0	0	0	A		
				WB Through	954	150	640	849	F		
				WB Right	174	78	640	849	E		
58- Watkins Mill Rd at I-270 SB on ramp											
58	NB			NB Left	0	0	0	0	A	60.7	E
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	73.4	E	EB Left	0	0	0	0	A		
				EB Through	938	30	483	620	C		
				EB Right	182	299	483	620	F		
	WB	50.0	D	WB Left	456	142	273	516	F		
				WB Through	883	2	273	516	A		
				WB Right	0	0	0	0	A		

Table C.15: AM Peak -2040 Variable Speed Limit- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
1- MD 85 at Sam's Club Drive											
1	NB	21.7	C	NB Left	118	77	76	357	E	36.6	D
				NB Through	363	26	76	357	C		
				NB Right	667	10	21	360	A		
	SB	47.1	D	SB Left	137	60	157	713	E		
				SB Through	601	46	157	713	D		
				SB Right	69	27	157	713	C		
	EB	49.3	D	EB Left	105	77	55	186	E		
				EB Through	61	77	55	186	E		
				EB Right	113	9	55	186	A		
	WB	50.2	D	WB Left	231	73	86	349	E		
				WB Through	15	67	86	349	E		
				WB Right	126	6	86	349	A		
2- MD 85 at I-270 NB on and off ramp											
2	NB	50.4	D	NB Left	685	50	254	1156	D	35.7	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	19.2	B	SB Left	0	0	0	0	A		
				SB Through	610	19	56	643	B		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
3- MD 85 at I-270 SB on and off ramp											
3	NB	5.4	A	NB Left	0	0	0	0	A	10.6	B
				NB Through	1068	5	19	452	A		
				NB Right	0	0	0	0	A		
	SB	43.2	D	SB Left	172	43	47	431	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
4- MD 85 at Crestwood Blvd											
4	NB	19.1	C	NB Left	13	52	53	382	D	24.9	C
				NB Through	762	18	53	382	B		
				NB U-Turn	0	0	0	0	A		
	SB	18.5	B	SB Left	65	70	25	158	E		
				SB Through	1799	18	80	587	B		
				SB Right	818	15	67	577	B		
	EB	53.9	D	EB Left	620	55	95	283	E		
				EB Through	28	76	95	283	E		
				EB Right	42	20	95	283	C		
	WB	44.0	D	WB Left	52	53	21	136	D		
				WB Through	18	55	21	136	E		
				WB Right	19	8	21	136	A		
5- MD 80 at I-270 NB on and ramp											
5	NB	3.7	A	NB Left	4	13	0	4	B	44.6	D
				NB Through	2	0	0	4	A		
				NB Right	5	-3	0	4	A		
	SB	12.6	B	SB Left	206	15	13	115	B		
				SB Through	6	18	13	115	B		
				SB Right	59	2	0	0	A		
	EB	16.0	B	EB Left	53	17	10	187	B		
				EB Through	0	0	8	0	A		
				EB Right	5	6	19	217	A		
	WB	51.3	D	WB Left	38	42	1	53	D		
				WB Through	918	65	435	930	E		
				WB Right	663	33	53	667	C		
6- MD 80 at I-270 SB on and off ramp											
6	NB	10.0	B	NB Left	22	50	13	250	F	39.6	E
				NB Through	0	0	0	0	A		
				NB Right	254	7	13	250	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	38.2	E	EB Left	0	0	0	0	A		
				EB Through	357	35	68	414	E		
				EB Right	158	45	69	423	E		
	WB	71.4	F	WB Left	0	0	0	0	A		
				WB Through	279	71	276	885	F		
				WB Right	0	0	0	0	A		
7- MD 109 at I-270 NB on and off ramp											
7	NB			NB Left	0	0	0	0	A	12.7	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	26.9	D	SB Left	143	31	37	265	D		
				SB Through	0	0	0	0	A		
				SB Right	47	14	14	209	B		
	EB	7.9	A	EB Left	87	7	1	103	A		
				EB Through	0	0	0	0	A		
				EB Right	63	9	0	0	A		
	WB	9.7	A	WB Left	0	0	0	0	A		
				WB Through	666	10	78	662	A		
				WB Right	0	0	0	0	A		
8- MD 80 at I-270 SB on and off ramp											
8	NB	5.7	A	NB Left	16	21	2	83	C	19.3	C
				NB Through	0	0	0	0	A		
				NB Right	49	1	0	25	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	33.7	D	EB Left	0	0	0	0	A		
				EB Through	92	27	24	241	D		
				EB Right	101	40	39	251	E		
	WB	16.6	C	WB Left	566	16	71	615	C		
				WB Through	154	20	67	592	C		
				WB Right	0	0	0	0	A		
9- MD 121 at Gateway Center Dr											
9	NB	18.2	C	NB Left	151	27	41	292	C	50.5	D
				NB Through	438	23	41	292	C		
				NB Right	326	7	52	318	A		
	SB	31.4	D	SB Left	58	21	102	579	C		
				SB Through	814	32	113	579	C		
				SB Right	8	26	122	600	C		
	EB	118.0	F	EB Left	8	96	419	521	F		
				EB Through	99	123	421	521	F		
				EB Right	660	118	451	553	F		
	WB	21.1	C	WB Left	136	24	18	149	C		
				WB Through	17	23	18	148	C		
				WB Right	28	5	15	162	A		
10- MD 121 at I-270 NB on and off ramp											
10	NB	27.5	D	NB Left	325	57	67	263	F	18.8	B
				NB Through	0	0	0	0	A		
				NB Right	402	3	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	11.9	B	EB Left	0	0	0	0	A		
				EB Through	508	18	34	321	C		
				EB Right	285	1	0	5	A		
	WB	18.2	C	WB Left	237	65	142	819	F		
				WB Through	1354	10	142	819	B		
				WB Right	0	0	0	0	A		

Table C.15: AM Peak -2040 Variable Speed Limit- Intersection Delay and Level of Service

11- MD 121 at I-270 SB on and off ramp											
11	NB			NB Left	0	0	0	0	A	17.9	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	62.7	E	SB Left	214	93	231	1076	F		
				SB Through	0	0	0	0	A		
				SB Right	303	41	19	522	E		
	EB	5.1	A	EB Left	0	0	0	0	A		
				EB Through	578	5	11	214	A		
				EB Right	0	0	0	0	A		
	WB	8.4	A	WB Left	0	0	0	0	A		
WB Through				647	18	41	549	C			
WB Right				1020	3	23	587	A			
12- MD 27 at Observation Dr											
12	NB	49.2	D	NB U-Turn	0	0	0	0	A	27.3	C
				NB Through	48	60	14	72	E		
				NB Right	12	8	14	72	A		
	SB	42.0	D	SB Left	91	53	30	192	D		
				SB Through	54	52	37	267	D		
				SB Right	177	33	61	304	C		
	EB	16.2	B	EB Left	151	37	38	319	D		
				EB Through	1203	14	39	320	B		
				EB Right	47	8	47	358	A		
	WB	31.2	C	WB Left	105	25	237	830	C		
WB Through				2232	32	237	830	C			
WB Right				115	17	237	830	B			
13- MD 27 at I-270 NB off ramp											
13	NB	32.5	C	NB Left	106	32	15	91	C	18.9	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.1	A	EB Left	0	0	0	0	A		
				EB Through	954	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	26.1	C	WB Left	0	0	0	0	A		
WB Through				2263	26	445	2263	C			
WB Right				0	0	0	0	A			
14- MD 27 at I-270 SB off ramp											
14	NB			NB Left	0	0	0	0	A	40.2	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	48.3	D	SB Left	370	48	64	256	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	2.5	A	EB Left	0	0	0	0	A		
				EB Through	834	3	1	57	A		
				EB Right	0	0	0	0	A		
	WB	60.1	E	WB Left	0	0	0	0	A		
WB Through				1433	60	539	1398	E			
WB Right				0	0	0	0	A			
15- MD 27 at Crystal Rock Dr											
15	NB	61.2	E	NB Left	30	34	279	728	C	79.0	E
				NB Through	1040	61	302	727	E		
				NB Right	93	68	312	740	E		
	SB	97.3	F	SB Left	515	97	1114	1995	F		
				SB Through	1653	98	1114	1995	F		
				SB Right	52	67	1105	1989	E		
	EB	43.8	D	EB Left	224	50	58	201	D		
				EB Through	97	43	55	196	D		
				EB Right	76	28	60	229	C		
	WB	48.0	D	WB Left	11	56	33	103	E		
WB Through				32	231	33	103	F			
WB Right				142	6	33	103	A			
16- MD 118 at Seneca Meadows Pkwy											
16	NB	3.6	A	NB Left	108	10	1	67	B	6.0	A
				NB Through	721	3	4	127	A		
				NB Right	59	2	9	180	A		
	SB	3.9	A	SB Left	31	4	6	231	A		
				SB Through	948	4	9	232	A		
				SB Right	41	3	11	264	A		
	EB	18.5	B	EB Left	20	65	10	77	E		
				EB Through	6	82	10	77	F		
				EB Right	115	7	10	77	A		
	WB	44.7	D	WB Left	35	72	16	102	E		
WB Through				6	55	11	101	D			
WB Right				27	7	14	111	A			
17- MD 118 at I-270 NB on ramp											
17	NB			NB Left	0	0	0	0	A	10.2	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	29.5	C	EB Left	274	29	31	194	C		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	5.4	A	WB Left	0	0	0	0	A		
WB Through				188	1	0	0	A			
WB Right				911	6	16	308	A			
18- MD 118 at I-270 SB off ramp											
18	NB			NB Left	0	0	0	0	A	7.8	A
				NB Through	0	0.0	0	0	A		
				NB Right	0	0.0	0	0	A		
	SB	39.9	D	SB Left	211	39.9	35	149	D		
				SB Through	0	0.0	0	0	A		
				SB Right	0	0.0	0	0	A		
	EB	3.7	A	EB Left	0	0.0	0	0	A		
				EB Through	631	3.7	5	191	A		
				EB Right	0	0.0	0	0	A		
	WB	4.4	A	WB Left	0	0.0	0	0	A		
WB Through				1214	4.4	9	221	A			
WB Right				0	0.0	0	0	A			
19- MD 118 at Aircraft Dr											
19	NB	46.1	D	NB Left	9	78	9	75	E	20.4	C
				NB Through	13	80	9	75	F		
				NB Right	17	3	0	23	A		
	SB	60.4	E	SB Left	267	55	112	418	E		
				SB Through	53	72	112	418	E		
				SB Right	96	68	112	418	E		
	EB	12.2	B	EB Left	132	16	37	329	B		
				EB Through	1019	12	37	329	B		
				EB Right	34	12	37	329	B		
	WB	14.8	B	WB Left	84	24	45	292	C		
WB Through				1041	17	45	292	B			
WB Right				322	5	45	292	A			
20- Middlebrook Rd at Observation Dr											
20	NB			NB Left	0	0	0	0	A	16.4	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	20.5	C	SB Left	26	36	6	63	D		
				SB Through	0	0	0	0	A		
				SB Right	27	5	6	63	A		
	EB	14.2	B	EB Left	223	22	30	244	C		
				EB Through	799	12	30	244	B		
				EB Right	0	0	0	0	A		
	WB	17.8	B	WB Left	0	0	0	0	A		
WB Through				1147	19	72	396	B			
WB Right				276	14	96	445	B			

Table C.15: AM Peak -2040 Variable Speed Limit- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
21- Middlebrook Rd at I-270 SB on ramp											
21	NB			NB Left	0	0	0	0	A	21.9	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	12.8	B	EB Left	0	0	0	0	A		
				EB Through	728	13	28	188	B		
				EB Right	0	0	0	0	A		
	WB	30.8	C	WB Left	750	31	154	1085	C		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
22- Middlebrook Rd at Waring Station Rd											
22	NB	190.1	F	NB Left	139	146	342	480	F	71.1	E
				NB Through	6	165	342	480	F		
				NB Right	252	215	342	480	F		
	SB	17.8	B	SB Left	3	38	1	29	D		
				SB Through	0	0	1	29	A		
				SB Right	5	6	2	67	A		
	EB	69.5	E	EB Left	29	20	611	1285	C		
				EB Through	1369	71	611	1285	E		
				EB Right	77	64	611	1285	E		
	WB	18.1	B	WB Left	80	23	33	238	C		
				WB Through	717	18	33	238	B		
				WB Right	41	5	33	238	A		
23- MD 124 at MD 355											
23	NB	59.0	E	NB Left	228	92	88	251	F	117.9	F
				NB Through	390	48	86	248	D		
				NB Right	54	3	0	0	A		
	SB	144.3	F	SB Left	56	173	566	797	F		
				SB Through	1019	142	566	797	F		
				SB Right	477	146	432	783	F		
	EB	47.8	D	EB Left	611	112	351	1023	F		
				EB Through	496	17	351	1023	B		
				EB Right	545	4	136	939	A		
	WB	191.8	F	WB Left	0	0	0	0	A		
				WB Through	1502	194	806	1123	F		
				WB Right	45	112	5	215	F		
24- MD 124 at I-270 SB on and off											
24	NB	66.3	F	NB Left	16	63	19	95	E	31.6	C
				NB Through	37	68	19	95	E		
				NB U-Turn	0	0	0	0	A		
	SB	22.7	C	SB Left	269	61	66	319	E		
				SB Through	10	64	66	319	E		
				SB Right	565	4	6	278	A		
	EB	16.2	B	EB Left	0	0	0	0	A		
				EB Through	1031	16	48	410	B		
				EB Right	67	13	57	433	B		
	WB	53.2	D	WB Left	39	54	1606	2419	D		
				WB Through	1014	53	1606	2419	D		
				WB Right	0	0	0	0	A		
25- MD 117 at MD 124											
25	NB	77.6	E	NB Left	19	129	244	699	F	64.4	E
				NB Through	521	88	244	699	F		
				NB Right	410	62	173	666	E		
	SB	47.5	D	SB Left	181	72	225	789	E		
				SB Through	1068	48	225	789	D		
				SB Right	131	9	0	0	A		
	EB	84.0	F	EB Left	102	144	346	812	F		
				EB Through	1432	80	346	813	E		
				EB Right	80	80	362	841	F		
	WB	41.2	D	WB Left	323	72	108	342	E		
				WB Through	482	29	108	342	C		
				WB Right	99	0	0	0	A		
26- MD 117 at Bureau Dr											
26	NB	55.0	D	NB Left	25	68	21	125	E	50.5	D
				NB Through	24	70	21	125	E		
				NB Right	25	27	21	125	C		
	SB	225.9	F	SB Left	195	228	285	433	F		
				SB Through	54	237	285	433	F		
				SB Right	33	198	285	433	F		
	EB	48.9	D	EB Left	32	29	357	974	C		
				EB Through	1942	49	364	974	D		
				EB Right	28	62	357	964	E		
	WB	18.8	B	WB Left	304	60	115	426	E		
				WB Through	848	9	116	426	A		
				WB Right	316	6	91	475	A		
27- MD 117 at I-270 SB off ramp											
27	NB			NB Left	0	0	0	0	A	7.9	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	1.8	A	EB Left	0	0	0	0	A		
				EB Through	803	2	1	151	A		
				EB Right	0	0	0	0	A		
	WB	22.7	C	WB Left	331	23	44	424	C		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
28- MD 117 at I-270 NB off ramp											
28	NB			NB Left	0	0	0	0	A	35.7	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	61.2	E	SB Left	289	65	338	963	E		
				SB Through	0	0	0	0	A		
				SB Right	877	60	342	965	E		
	EB	20.9	C	EB Left	14	120	84	923	F		
				EB Through	786	19	84	923	B		
				EB Right	0	0	0	0	A		
	WB	16.0	B	WB Left	0	0	0	0	A		
				WB Through	909	16	62	362	B		
				WB Right	9	6	67	392	A		
29- MD 117 at Perry Pkwy											
29	NB	44.9	D	NB Left	36	77	17	125	E	16.3	B
				NB Through	7	59	17	124	E		
				NB Right	38	12	27	145	B		
	SB	49.5	D	SB Left	113	98	61	249	F		
				SB Through	14	102	61	249	F		
				SB Right	133	3	61	249	A		
	EB	10.6	B	EB Left	115	72	45	306	E		
				EB Through	950	3	45	306	A		
				EB Right	9	3	32	290	A		
	WB	10.8	B	WB Left	8	87	22	278	F		
				WB Through	747	11	22	278	B		
				WB Right	136	6	22	278	A		
30- Shady Grove Rd at I-270 NB off ramp											
30	NB	9.2	A	NB Left	0	0	0	0	A	22.0	C
				NB Through	962	9	21	243	A		
				NB Right	0	0	0	0	A		
	SB	10.4	B	SB Left	0	0	0	0	A		
				SB Through	1349	10	34	334	B		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	53.6	D	WB Left	883	54	159	605	D		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table C.15: AM Peak -2040 Variable Speed Limit- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
31- Shady Grove Rd at I-270 SB off ramp											
31	NB	13.5	B	NB Left	0	0	0	0	A	20.0	B
				NB Through	1004	13	39	346	B		
				NB Right	0	0	0	0	A		
	SB	10.0	B	SB Left	0	0	0	0	A		
				SB Through	1601	10	36	512	B		
				SB Right	0	0	0	0	A		
	EB	45.8	D	EB Left	289	40	45	393	D		
				EB Through	0	0	0	0	A		
				EB Right	579	49	98	481	D		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
32- MD 28 at I-270 SB off ramp											
32	NB			NB U-Turn	0	0	0	0	A	60.1	E
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	34.8	C	SB Left	424	43	70	334	D		
				SB Through	0	0	0	0	A		
				SB Right	104	1	0	61	A		
	EB	130.6	F	EB Left	0	0	0	0	A		
				EB Through	662	200	1959	2137	F		
				EB Right	403	16	1956	2144	B		
	WB	17.6	B	WB Left	0	0	0	0	A		
				WB Through	1450	18	26	411	B		
				WB Right	0	0	0	0	A		
33- MD 28 at I-270 on and off ramps											
33	NB	37.4	D	NB Left	0	0	43	348	A	22.8	C
				NB Through	151	55	50	357	E		
				NB Right	98	10	50	357	A		
	SB	42.0	D	SB Left	29	64	73	357	E		
				SB Through	0	0	0	0	A		
				SB Right	307	40	73	357	D		
	EB	18.1	B	EB Left	182	37	44	294	D		
				EB Through	598	12	44	294	B		
				EB Right	0	0	0	0	A		
	WB	16.3	B	WB Left	26	16	55	330	B		
				WB Through	960	16	41	293	B		
				WB Right	0	0	0	0	A		
34- MD 189 at Great Falls Rd											
34	NB	36.8	D	NB Left	65	41	15	105	D	18.7	B
				NB Through	8	40	11	104	D		
				NB Right	10	7	13	115	A		
	SB	13.5	B	SB Left	69	47	63	238	D		
				SB Through	7	79	63	238	E		
				SB Right	521	8	42	112	A		
	EB	19.1	B	EB Left	258	39	122	1142	D		
				EB Through	751	12	17	192	B		
				EB Right	11	11	26	229	B		
	WB	22.5	C	WB Left	5	21	36	352	C		
				WB Through	322	22	36	351	C		
				WB Right	11	32	48	385	C		
35- MD 189 at I-270 Ramps											
35	NB	62.5	E	NB Left	101	63	19	120	E	81.8	F
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	56.5	E	SB Left	149	57	50	279	E		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	104.4	F	EB Left	340	152	579	1438	F		
				EB Through	496	72	579	1438	E		
				EB Right	0	0	0	0	A		
	WB	64.2	E	WB Left	491	58	136	479	E		
				WB Through	255	75	136	479	E		
				WB Right	0	0	0	0	A		
36- MD 189 at Wootton Pkwy											
36	NB	62.8	E	NB Left	159	52	91	356	D	97.4	F
				NB Through	120	79	91	356	E		
				NB Right	150	61	91	356	E		
	SB	125.6	F	SB Left	369	166	464	815	F		
				SB Through	644	102	434	801	F		
				SB Right	0	0	0	0	A		
	EB	116.6	F	EB Left	153	120	498	1015	F		
				EB Through	903	122	498	1015	F		
				EB Right	117	72	498	1015	E		
	WB	48.2	D	WB Left	356	66	103	266	E		
				WB Through	333	35	103	266	D		
				WB Right	49	6	103	266	A		
37- Montrose Rd at Tower Oaks Blvd											
37	NB			NB Left	0	0	0	0	A	100.6	F
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	246.4	F	SB Left	120	50	1175	1388	D		
				SB Through	0	0	0	0	A		
				SB Right	431	301	1170	1384	F		
	EB	26.5	C	EB Left	28	49	153	1013	D		
				EB Through	1504	26	153	1013	C		
				EB Right	0	0	0	0	A		
	WB	124.3	F	WB Left	0	0	0	0	A		
				WB Through	1326	128	519	850	F		
				WB Right	63	39	519	850	D		
38- Tower Oaks Blvd at I-270 off ramp											
38	NB	23.1	C	NB Left	408	23	31	194	C	78.3	E
				NB Through	9	20.1	25	186	C		
				NB Right	22	27.2	31	194	C		
	SB	0.6	A	SB Left	0	527.5	0	21	F		
				SB Through	0	0.0	0	21	A		
				SB Right	4	0.6	0	0	A		
	EB	127.7	F	EB Left	6	71.2	367	463	E		
				EB Through	539	128.3	367	463	F		
				EB Right	77	127.9	358	453	F		
	WB	9.8	A	WB Left	0	0.0	3	67	A		
				WB Through	85	10.3	3	67	B		
				WB Right	6	2.9	0	5	A		
39- Montrose Rd at Tower Oaks Blvd											
39	NB	15.7	B	NB Left	37	72	51	354	E	47.6	D
				NB Through	238	42	51	354	D		
				NB Right	546	0	14	218	A		
	SB	39.7	D	SB Left	324	54	168	634	D		
				SB Through	762	35	167	633	C		
				SB Right	75	28	133	665	C		
	EB	82.3	F	EB Left	76	70	387	715	E		
				EB Through	967	83	389	715	F		
				EB Right	61	80	409	739	E		
	WB	42.6	D	WB Left	310	52	71	298	D		
				WB Through	192	48	70	298	D		
				WB Right	114	7	79	328	A		
40- Rockledge Blvd at I-270 NB on and off ramp											
40	NB	33.0	C	NB Left	0	0	0	0	A	17.1	B
				NB Through	92	34	32	159	C		
				NB Right	214	33	32	159	C		
	SB	2.5	A	SB Left	0	0	6	77	A		
				SB Through	930	2	6	77	A		
				SB Right	0	0	0	0	A		
	EB	25.2	C	EB Left	7	48	118	407	D		
				EB Through	520	51	118	407	D		
				EB Right	556	1	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table C.15: AM Peak -2040 Variable Speed Limit- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS	
41- Rockledge Blvd at I-270 SB on and off ramps												
41	NB	2.7	A	NB Left	98	3	2	50	A	20.9	C	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	22.3	C		WB Left	931	23	96	680			C
					WB Through	405	21	96	680			C
					WB Right	0	0	0	0			A
42- MD 187 at Tuckerman Ln												
42	NB	53.1	D	NB Left	230	21	236	697	C	149.8	F	
				NB Through	1456	50	236	697	D			
				NB Right	216	105	236	697	F			
	SB	218.2	F		SB Left	61	158	2594	2708			F
					SB Through	1243	218	2594	2708			F
					SB Right	166	244	2594	2708			F
	EB	183.5	F		EB Left	224	131	1863	1985			F
					EB Through	631	200	1864	1986			F
					EB Right	133	191	1888	2010			F
	WB	188.9	F		WB Left	720	230	1913	2146			F
					WB Through	396	153	1913	2146			F
					WB Right	158	93	1913	2146			F
43- MD 187 at I-270 NB on and off ramps												
43	NB	11.1	B	NB Left	164	82	61	243	F	18.7	B	
				NB Through	1536	4	61	243	A			
				NB Right	0	0	0	0	A			
	SB	24.7	C		SB Left	0	0	0	0			A
					SB Through	1556	25	82	551			C
					SB Right	0	0	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	49.2	D		WB Left	115	50	35	263			D
					WB Through	10	42	35	263			D
					WB Right	0	0	0	0			A
44- MD 187 at I-270 NB on and off ramps												
44	NB	23.4	C	NB Left	0	0	0	0	A	25.0	C	
				NB Through	1481	23	67	385	C			
				NB Right	0	0	0	0	A			
	SB	7.0	A		SB Left	182	46	54	247			D
					SB Through	1490	2	54	247			A
					SB Right	0	0	0	0			A
	EB	80.2	F		EB Left	222	60	191	743			E
					EB Through	0	0	191	743			A
					EB Right	367	93	228	731			F
	WB				WB Left	0	0	0	0			A
					WB Through	0	0	0	0			A
					WB Right	0	0	0	0			A
45- MD 187 at Rock Spring Dr												
45	NB	15.0	B	NB Left	255	57	68	249	E	20.9	C	
				NB Through	1385	7	69	249	A			
				NB Right	10	6	93	283	A			
	SB	21.9	C		SB Left	12	35	97	592			C
					SB Through	1694	24	97	592			C
					SB Right	146	1	58	587			A
	EB	37.8	D		EB Left	190	59	55	225			E
					EB Through	25	53	55	225			D
					EB Right	252	20	55	225			C
	WB	7.2	A		WB Left	1	7	1	29			A
					WB Through	9	11	1	29			B
					WB Right	5	0	0	7			A
47-Democracy Blvd at I-270 NB off ramp												
47	NB	31.3	C	NB Left	219	31	26	161	C	13.7	B	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB	13.0	B		EB Left	0	0	0	0			A
					EB Through	1653	13	52	456			B
					EB Right	0	0	0	0			A
	WB	10.4	B		WB Left	0	0	0	0			A
					WB Through	778	10	23	186			B
					WB Right	0	0	0	0			A
48- Democracy Blvd at I-270 SB on ramp												
48	NB			NB Left	0	0	0	0	A	6.5	A	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB	5.3	A		EB Left	0	0	0	0			A
					EB Through	1767	5	23	276			A
					EB Right	0	0	0	0			A
	WB	8.6	A		WB Left	223	37	31	171			D
					WB Through	773	1	21	150			A
					WB Right	0	0	0	0			A
49- Democracy Blvd at I-270 SB off ramp												
49	NB			NB Left	0	0	0	0	A	12.3	B	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB	33.8	C		SB Left	330	50	59	246			D
					SB Through	0	0	0	0			A
					SB Right	166	1	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	2.6	A		WB Left	0	0	0	0			A
					WB Through	771	3	4	131			A
					WB Right	335	2	1	159			A
50- MD 190 at Burdette Rd												
50	NB	73.3	E	NB Left	20	80	15	118	E	13.8	B	
				NB Through	4	59	15	118	E			
				NB Right	11	67	15	118	E			
	SB	34.5	C		SB Left	50	79	31	150			E
					SB Through	17	65	31	150			E
					SB Right	120	12	31	150			B
	EB	11.5	B		EB Left	54	93	70	656			F
					EB Through	1813	9	70	656			A
					EB Right	15	5	62	680			A
	WB	12.7	B		WB Left	1	106	65	815			F
					WB Through	1497	13	66	815			B
					WB Right	21	2	61	856			A

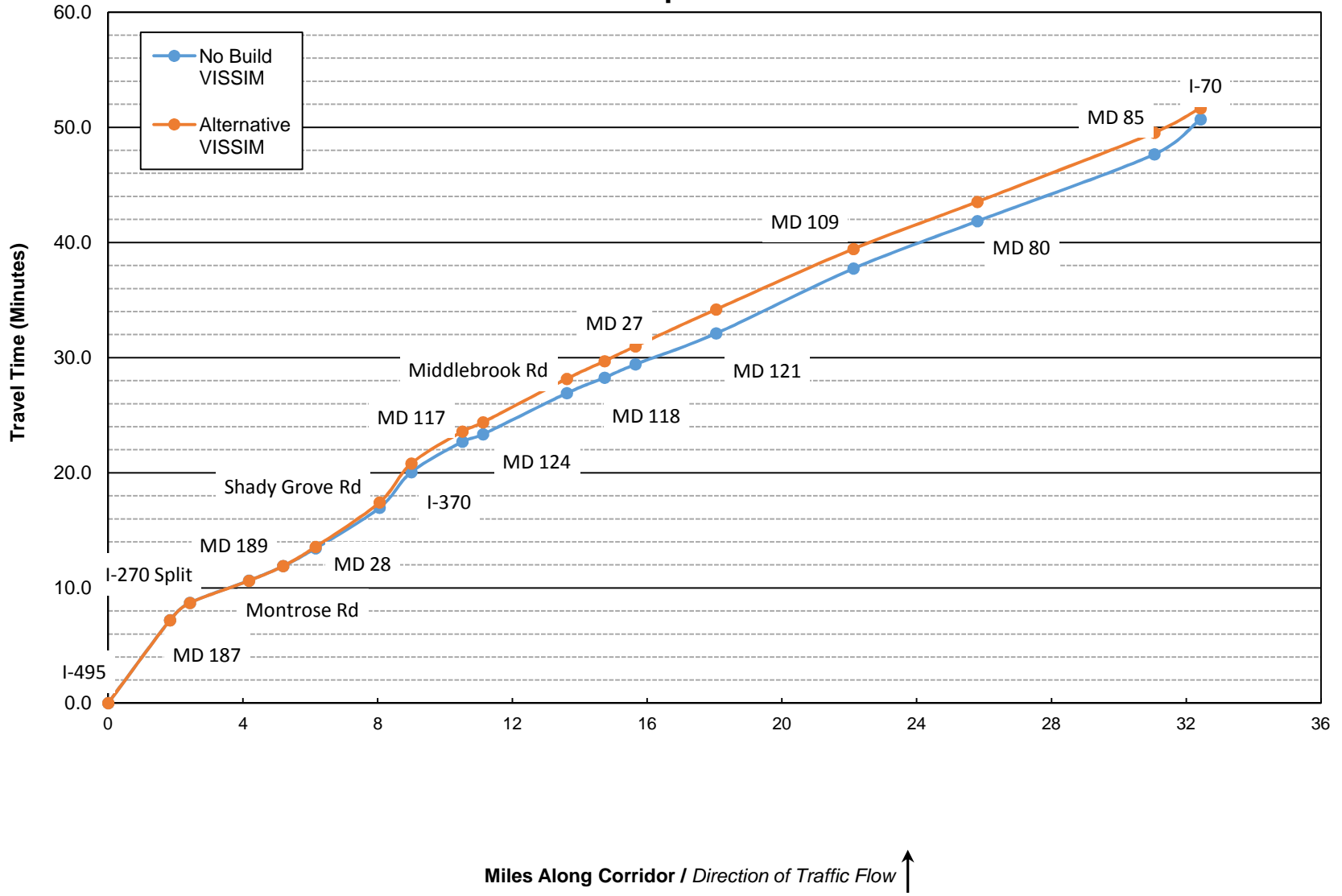
Table C.15: AM Peak -2040 Variable Speed Limit- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
51- MD 190 at I-270 NB on ramp											
51	NB			NB Left	0	0	0	0	A	53.9	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	125.2	F	EB Left	530	125	351	653	F		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	15.9	B	WB Left	0	0	0	0	A		
				WB Through	995	16	76	722	B		
				WB Right	0	0	0	0	A		
52- MD 190 at I-270 SB off ramp											
52	NB	77.8	E	NB Left	259	78	720	2843	E	14.1	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	3.3	A	EB Left	0	0	0	0	A		
				EB Through	982	3	7	183	A		
				EB Right	0	0	0	0	A		
	WB	5.3	A	WB Left	0	0	0	0	A		
				WB Through	667	5	7	164	A		
				WB Right	0	0	0	0	A		
53- MD 190 at Seven Locks Rd											
53	NB	68.2	E	NB Left	21	67	23	149	E	44.0	D
				NB Through	59	69	25	148	E		
				NB Right	0	0	0	0	A		
	SB	56.9	E	SB Left	624	56	184	777	E		
				SB Through	183	59	185	778	E		
				SB Right	18	54	184	777	D		
	EB	37.5	D	EB Left	24	30	135	584	C		
				EB Through	846	38	135	584	D		
				EB Right	42	42	135	584	D		
	WB	36.8	D	WB Left	121	110	113	367	F		
				WB Through	639	32	116	370	C		
				WB Right	158	1	0	31	A		
54- MD 124 at I-270 NB off ramp											
54	NB	40.4	D	NB Left	0	0	0	0	A	24.4	C
				NB Through	0	0	0	0	A		
				NB Right	726	40	100	403	D		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	11.7	B	EB Left	0	0	0	0	A		
				EB Through	918	12	27	292	B		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
55- Democracy Blvd at I-270 NB off ramp											
55	NB	37.4	D	NB Left	0	0	0	0	A	16.3	B
				NB Through	0	0	0	0	A		
				NB Right	929	37	112	562	D		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	4.5	A	EB Left	0	0	0	0	A		
				EB Through	1654	5	18	97	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
56- Watkins Mill Rd at I-270 SB off ramp/Parkview Ave											
56	NB	793.8	F	NB Left	42	279	677	721	F	186.5	F
				NB Through	0	0	0	0	A		
				NB Right	86	1045	677	721	F		
	SB	85.1	F	SB Left	519	120	2774	5052	F		
				SB Through	125	102	2774	5052	F		
				SB Right	420	37	2774	5052	D		
	EB	516.3	F	EB Left	0	0	0	0	A		
				EB Through	469	516	1168	1230	F		
				EB Right	2	555	1168	1230	F		
	WB	39.5	D	WB Left	111	81	109	469	F		
				WB Through	741	33	107	468	C		
				WB Right	0	0	0	0	A		
57- Watkins Mill Rd at I-270 NB on ramp											
57	NB	36.3	D	NB Left	390	52	97	412	D	75.3	E
				NB Through	0	0	0	0	A		
				NB Right	484	23	97	412	C		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	19.4	B	EB Left	181	63	46	275	E		
				EB Through	706	8	46	275	A		
				EB Right	0	0	0	0	A		
	WB	154.1	F	WB Left	0	0	0	0	A		
				WB Through	898	167	668	858	F		
				WB Right	163	83	668	858	F		
58- Watkins Mill Rd at I-270 SB on ramp											
58	NB			NB Left	0	0	0	0	A	67.7	E
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	83.8	F	EB Left	0	0	0	0	A		
				EB Through	884	37	485	617	D		
				EB Right	178	317	485	617	F		
	WB	54.5	D	WB Left	434	157	291	512	F		
				WB Through	860	3	291	512	A		
				WB Right	0	0	0	0	A		

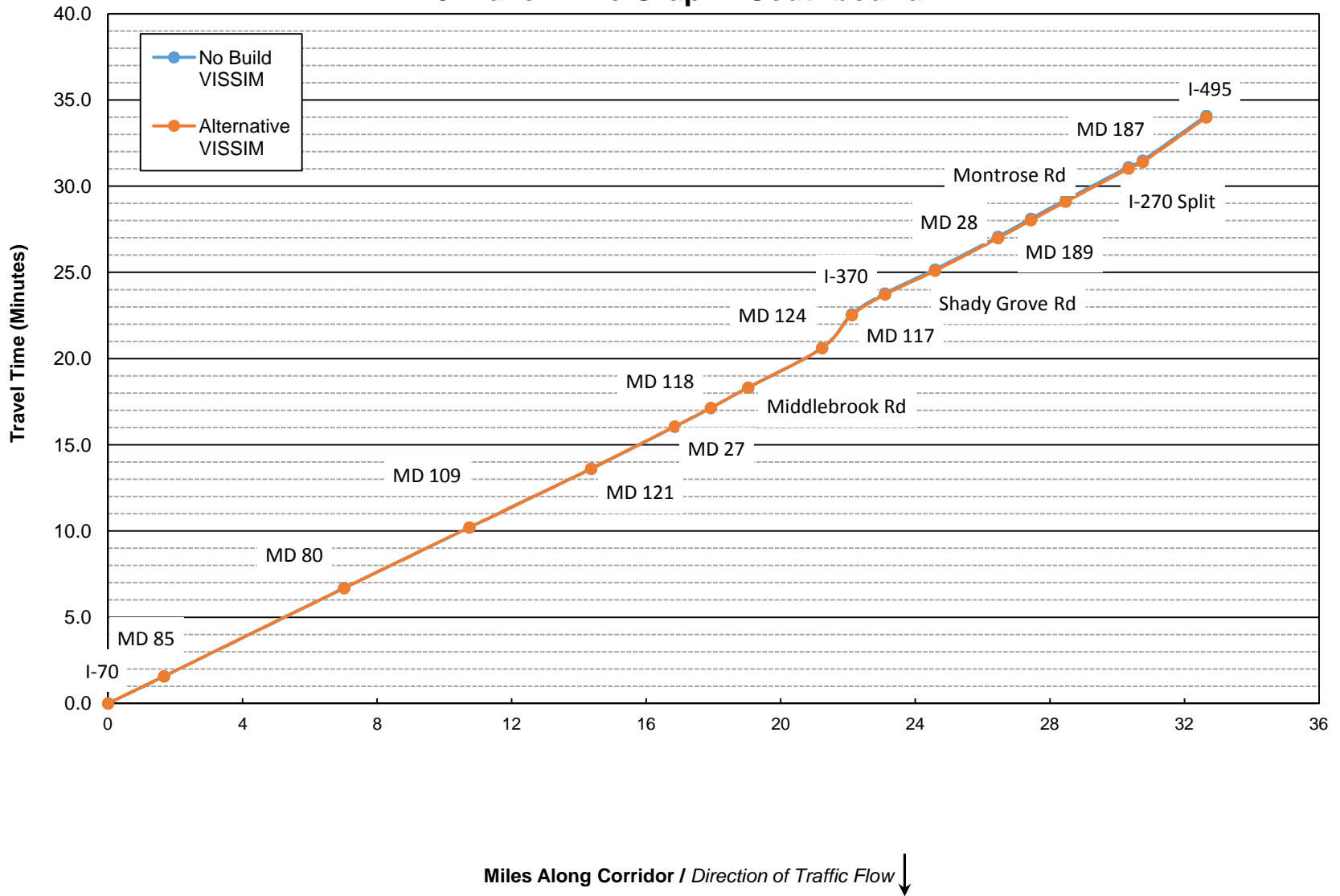
Table C.16: 2040 AM Peak - Variable Speed Limit - I-270 Vehicle Network Performance

	No Build	VSL	% Change
Total Delay	35,032,576	31,952,568	-9%
Average Delay per Vehicle	326	298	-8%
Total Travel Time	64,317,886	63,543,133	-1%
Vehicles (Arrived)	87,894	87,962	0%
Latent Demand	44,530	44,817	1%
Latent Delay	120,600,723	121,430,995	1%
Total Distance	463,125	463,143	0%
Average Speed	26	26	1%

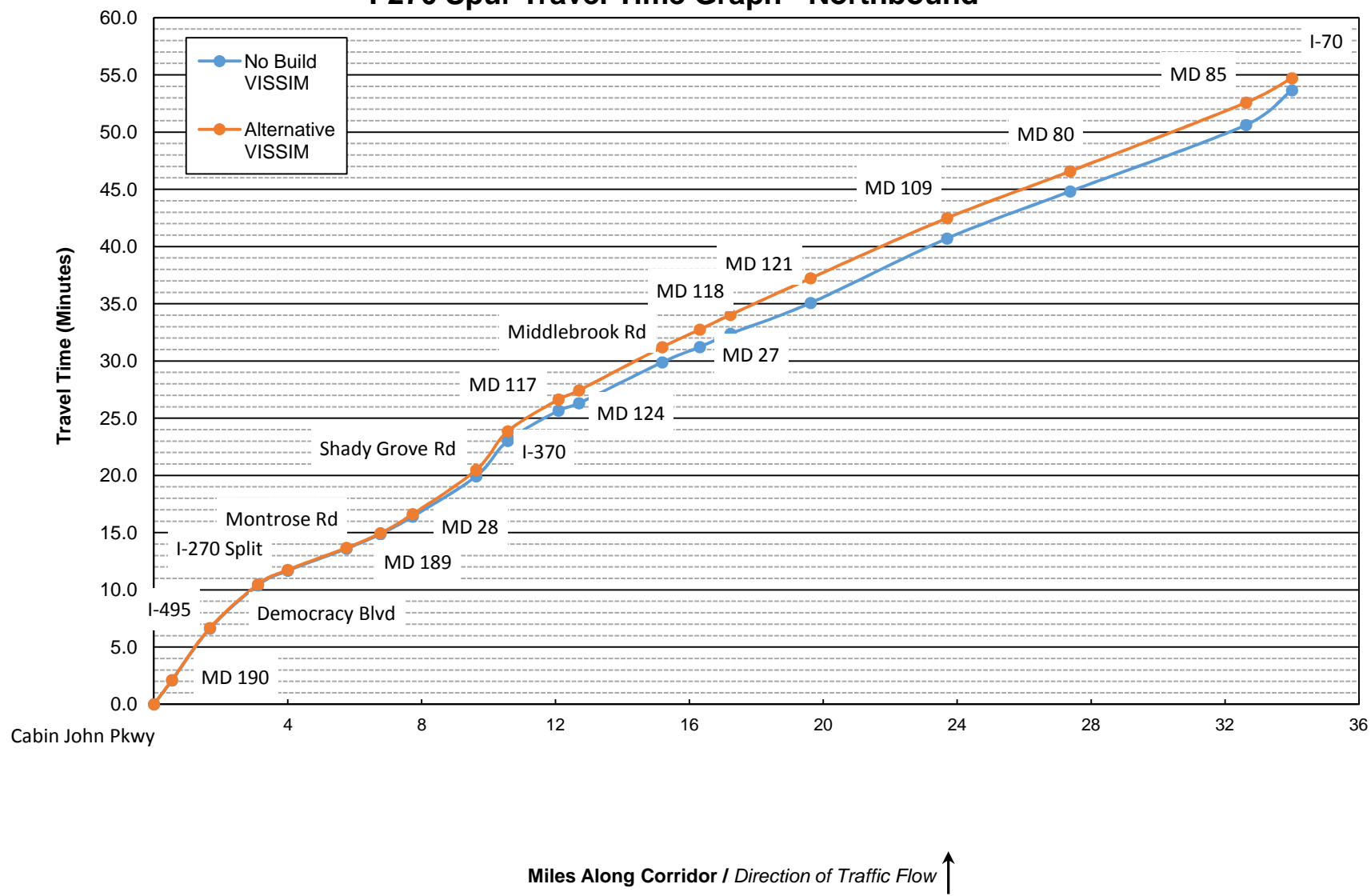
**Figure D.1: PM Peak -
2040 Variable Speed Limit
I-270 Travel Time Graph - Northbound**



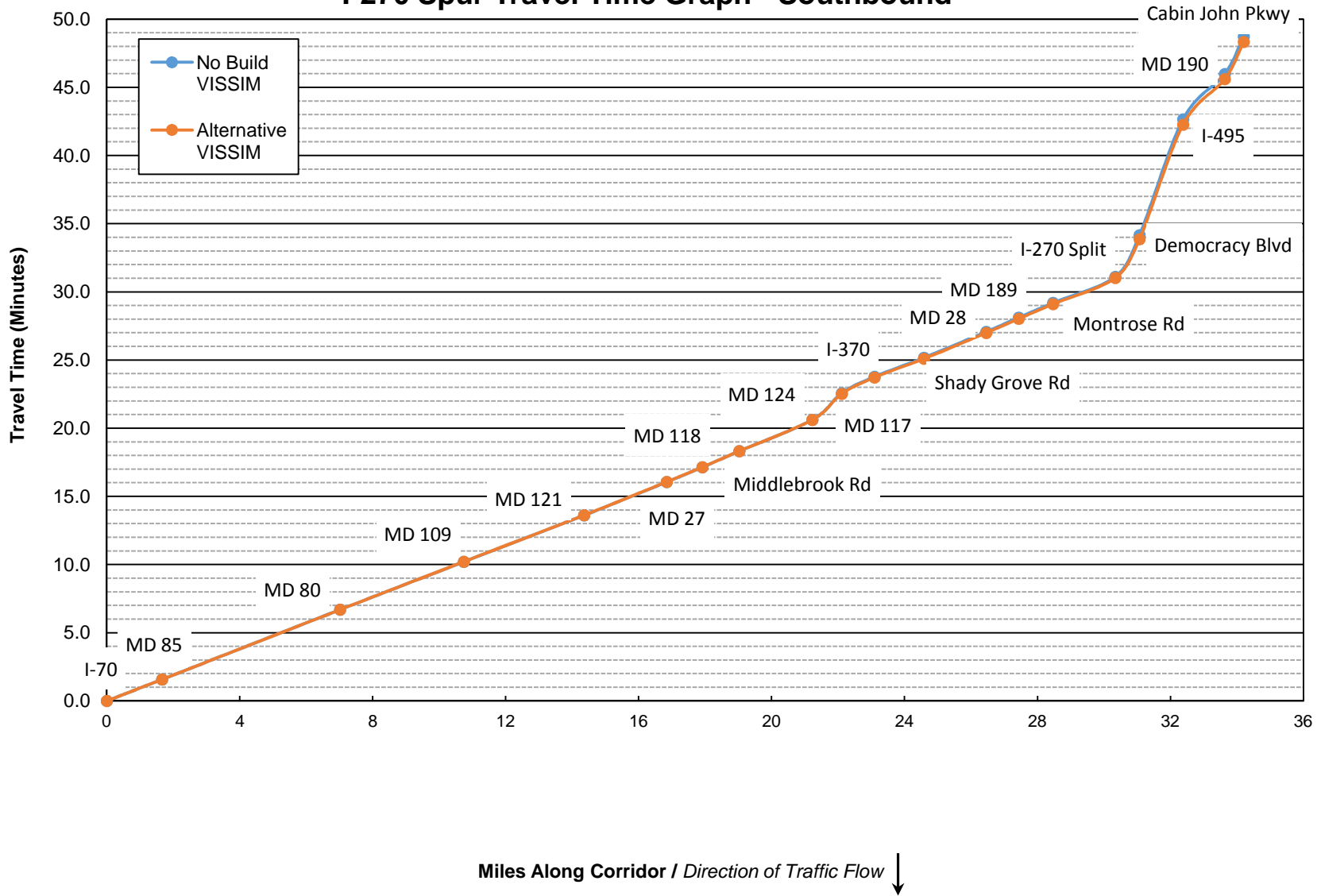
**Figure D.2: PM Peak -
2040 Variable Speed Limit
I-270 Travel Time Graph - Southbound**



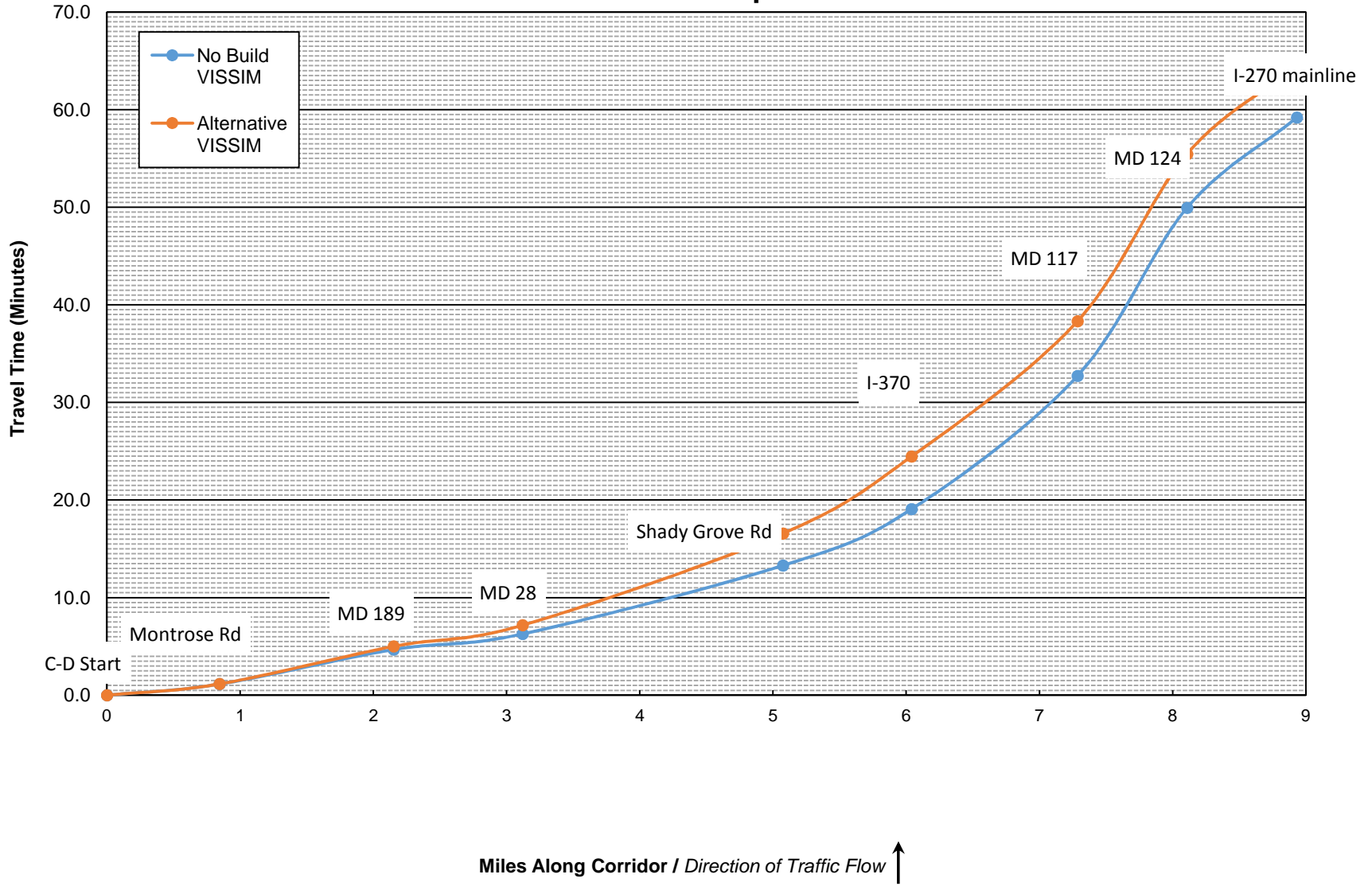
**Figure D.3: PM Peak -
2040 Variable Speed Limit
I-270 Spur Travel Time Graph - Northbound**



**Figure D.4: PM Peak -
2040 Variable Speed Limit
I-270 Spur Travel Time Graph - Southbound**



**Figure D.5: PM Peak -
2040 Variable Speed Limit
I-270 Local Travel Time Graph - Northbound**



**Figure D.6: PM Peak -
2040 Variable Speed Limit
I-270 Local Travel Time Graph - Southbound**

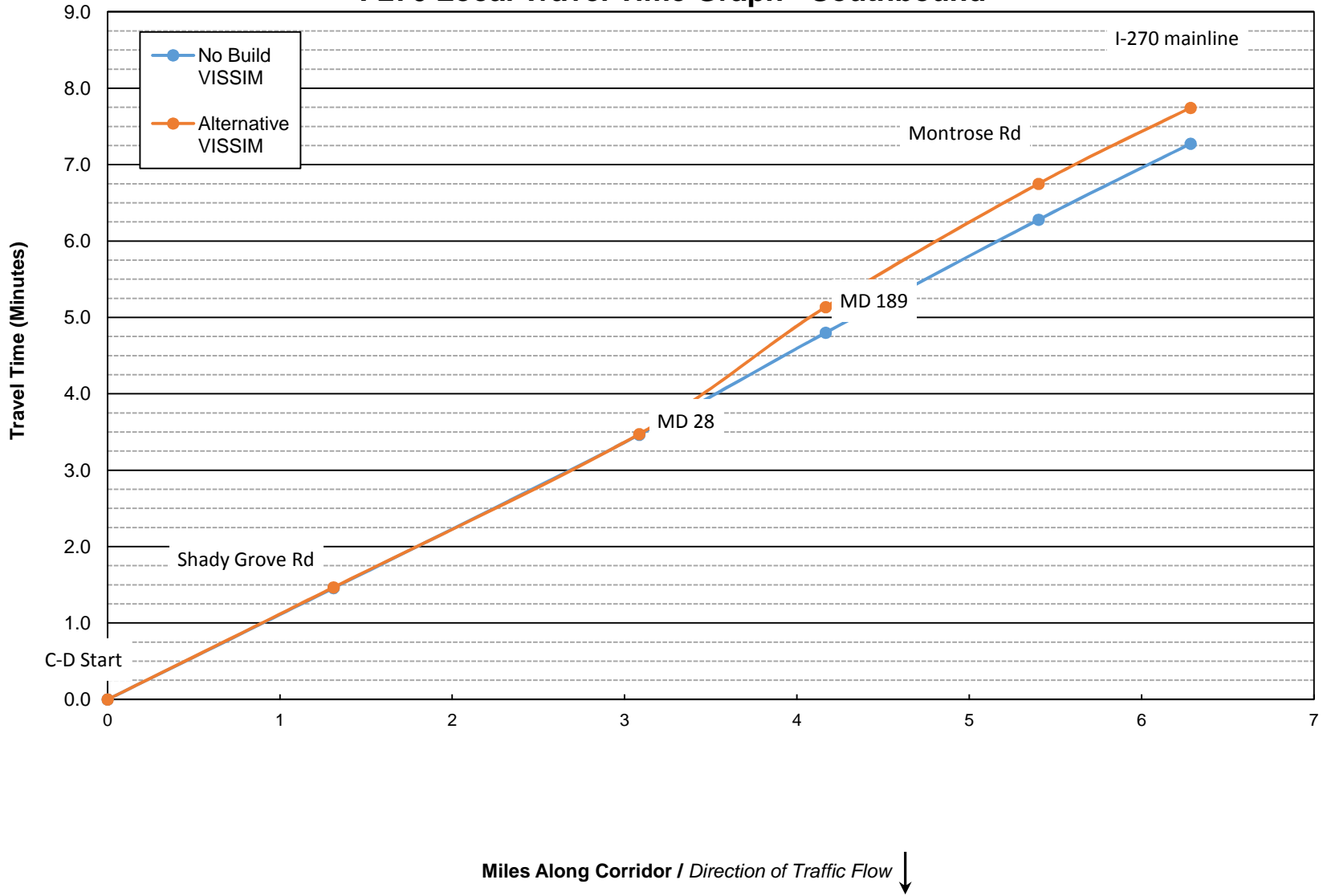


Table D.1: PM Peak -2040 Variable Speed Limit- I-270 Vehicle Travel Time

I-270 Northbound	Segment Length (miles)	No Build VISSIM Travel Time (seconds)	VSL VISSIM Travel Time (seconds)	% Change	I-270 Southbound	Segment Length (miles)	No Build VISSIM Travel Time (seconds)	VSL VISSIM Travel Time (seconds)	% Change
From I-495 interchange					From I-70				
to MD 187	1.8	432.3	431.6	-0.2%	to MD 85	1.7	94.6	94.6	0.0%
to I-270 Split	0.6	90.3	90.3	0.0%	to MD 80	5.4	307.1	306.9	0.1%
to Montrose Rd	1.8	115.8	115.5	-0.3%	to MD 109	3.7	210.7	211.0	-0.2%
to MD 189	1.0	76.0	76.8	1.1%	to MD 121	3.6	204.4	204.7	-0.2%
to MD 28	1.0	92.5	99.8	7.9%	to MD 27	2.5	146.4	146.6	-0.2%
to Shady Grove Rd	1.9	211.0	231.6	9.8%	to MD 118	1.1	65.1	64.9	0.4%
to I-370	0.9	185.6	202.6	9.2%	to Middlebrook Rd	1.1	71.2	70.5	1.0%
to MD 117	1.5	158.7	166.9	5.1%	to MD 124	2.2	137.5	137.6	-0.1%
to MD 124	0.6	38.8	47.8	23.4%	to MD 117	0.9	117.3	114.5	2.4%
to Middlebrook Rd	2.5	214.3	226.5	5.7%	to I-370	1.0	72.5	71.7	1.1%
to MD 118	1.1	80.3	92.1	14.6%	to Shady Grove Rd	1.5	83.4	82.8	0.7%
to MD 27	0.9	69.9	77.2	10.5%	to MD 28	1.9	114.1	113.5	0.5%
to MD 121	2.4	161.1	192.1	19.2%	to MD 189	1.0	62.7	62.3	0.5%
to MD 109	4.1	337.8	315.2	-6.7%	to Montrose Rd	1.0	64.8	64.5	0.4%
to MD 80	3.7	247.0	245.5	-0.6%	to I-270 Split	1.9	114.7	115.1	-0.3%
to MD 85	5.3	348.1	360.1	3.5%	to MD 187	0.4	23.0	23.1	-0.3%
to I-70	1.4	182.3	128.0	-29.8%	to I-495 interchange	1.9	155.6	155.1	0.3%
I-270 Total (miles/minutes)	32.4	50.7	51.7	1.9%	I-270 Total (miles/minutes)	32.6	34.1	34.0	0.3%
I-270 Spur Northbound					I-270 Spur Southbound				
From Cabin John Pkwy					From I-70				
to MD 190	0.5	125.4	127.2	1.4%	to I-270 Split	30.3	1,866.3	1,861.2	-0.3%
to I-495	1.1	271.9	273.1	0.5%	to Democracy Blvd	0.7	183.2	170.8	-6.8%
to Democracy Blvd	1.4	226.8	228.3	0.7%	to I-495	1.3	509.9	503.6	-1.2%
to I-270 Split	0.9	76.4	76.4	0.1%	to MD 190	1.3	199.4	200.6	0.6%
to I-70	30.0	2,519.1	2,577.8	2.3%	to Cabin John Pkwy	0.6	164.4	163.6	-0.5%
I-270 Spur Total (miles/minutes)	34.0	53.7	54.7	2.0%	I-270 Spur Total (miles/minutes)	34.2	48.7	48.3	-0.8%

Table D.2: PM Peak -2040 Variable Speed Limit- I-270 Local Vehicle Travel Time

I-270 Northbound	Segment Length (miles)	No Build VISSIM Travel Time (seconds)	VSL VISSIM Travel Time (seconds)	% Change	I-270 Southbound	Segment Length (miles)	No Build VISSIM Travel Time (seconds)	VSL VISSIM Travel Time (seconds)	% Change
From C-D start					From C-D start				
to Montrose Rd	0.8	68.8	69.7	1.3%	to Shady Grove	1.3	87.5	88.0	0.6%
to MD 189	1.3	212.1	231.1	8.9%	to MD 28	1.8	120.3	120.4	0.0%
to MD 28	1.0	96.2	129.9	35.1%	to MD 189	1.1	80.2	99.7	24.3%
to Shady Grove	2.0	420.6	563.8	34.0%	to Montrose	1.2	88.8	96.8	9.1%
to I-370	1.0	346.7	473.5	36.6%	to I-270 mainline	0.9	59.7	59.7	-0.1%
to MD 117	1.2	819.0	831.6	1.5%					
to MD 124	0.8	1,033.2	1,027.5	-0.6%					
to I-270 mainline	0.8	555.0	540.4	-2.6%					
I-270 Local Total (miles/minutes)	8.9	59.2	64.5	8.9%	I-270 Local Total (miles/minutes)	6.3	7.3	7.7	6.4%

Table D.3: PM Peak -2040 Variable Speed Limit- I-270 Vehicle Speed

I-270 Northbound	Cumulative Length (miles)	No Build VISSIM Speed (MPH)	VSL VISSIM Speed (MPH)	% Change	I-270 Southbound	No Build VISSIM Speed (MPH)	VSL VISSIM Speed (MPH)	% Change	
From I-495 interchange	0.0				From I-70				
to MD 187	1.8	15.3	15.3	0.2%	to MD 85	63.3	63.3	0.0%	
to I-270 Split	2.4	23.6	23.6	0.0%	to MD 80	62.8	62.8	0.1%	
to Montrose Rd	4.2	54.5	54.7	0.3%	to MD 109	63.6	63.5	-0.2%	
to MD 189	5.2	48.0	47.5	-1.1%	to MD 121	63.8	63.7	-0.2%	
to MD 28	6.2	37.5	34.8	-7.3%	to MD 27	61.1	61.0	-0.2%	
to Shady Grove Rd	8.1	32.4	29.5	-8.9%	to MD 118	59.3	59.5	0.4%	
to I-370	9.0	18.3	16.8	-8.4%	to Middlebrook Rd	56.2	56.8	1.0%	
to MD 117	10.5	34.4	32.7	-4.9%	to MD 124	57.5	57.5	-0.1%	
to MD 124	11.1	56.9	46.1	-19.0%	to MD 117	27.2	27.9	2.5%	
to Middlebrook Rd	13.6	41.8	39.5	-5.4%	to I-370	48.9	49.5	1.1%	
to MD 118	14.7	50.2	43.8	-12.8%	to Shady Grove Rd	64.2	64.6	0.7%	
to MD 27	15.7	47.2	42.7	-9.5%	to MD 28	59.1	59.4	0.5%	
to MD 121	18.0	53.5	44.9	-16.1%	to MD 189	56.2	56.5	0.5%	
to MD 109	22.1	43.5	46.6	7.2%	to Montrose Rd	57.4	57.6	0.4%	
to MD 80	25.8	53.6	53.9	0.6%	to I-270 Split	58.7	58.6	-0.3%	
to MD 85	31.1	54.3	52.5	-3.3%	to MD 187	65.7	65.6	-0.3%	
to I-70	32.4	27.1	38.6	42.4%	to I-495 interchange	43.7	43.9	0.3%	
I-270 Total (miles/minutes)		38.4	37.7	-1.9%	I-270 Total (miles/minutes)	57.5	57.6	0.3%	
I-270 Spur Northbound					I-270 Spur Southbound				
From Cabin John Pkwy	0.0				From I-70				
to MD 190	0.5	15.5	15.3	-1.4%	to I-270 Split	58.5	58.7	0.3%	
to I-495	1.7	15.0	14.9	-0.5%	to Democracy Blvd	14.4	15.4	7.3%	
to Democracy Blvd	3.1	22.8	22.6	-0.7%	to I-495	9.3	9.4	1.2%	
to I-270 Split	4.0	42.0	42.0	-0.1%	to MD 190	22.6	22.5	-0.6%	
to I-70	34.0	42.9	41.9	-2.3%	to Cabin John Pkwy	12.5	12.5	0.5%	
I-270 Spur Total (miles/minutes)		38.0	37.3	-1.9%	I-270 Spur Total (miles/minutes)	42.1	42.5	0.8%	

Table D.4: PM Peak -2040 Variable Speed Limit- I-270 Local Vehicle Speed

I-270 Northbound	No Build VISSIM Speed (MPH)	VSL VISSIM Speed (MPH)	% Change	I-270 Southbound	No Build VISSIM Speed (MPH)	VSL VISSIM Speed (MPH)	% Change
From C-D start				From C-D start			
to Montrose Rd	44.2	43.7	-1.3%	to Shady Grove	53.9	53.6	-0.6%
to MD 189	22.2	20.4	-8.2%	to MD 28	53.1	53.0	0.0%
to MD 28	36.2	26.8	-26.0%	to MD 189	48.6	39.1	-19.6%
to Shady Grove	16.7	12.5	-25.4%	to Montrose	50.1	45.9	-8.3%
to I-370	10.0	7.3	-26.8%	to I-270 mainline	53.2	53.2	0.1%
to MD 117	5.5	5.4	-1.5%				
to MD 124	2.9	2.9	0.6%				
to I-270 mainline	5.3	5.5	2.7%				
I-270 Local Total (miles/minutes)	9.1	8.3	-8.2%	I-270 Local Total (miles/minutes)	51.8	48.7	-6.1%

Table D.5: PM Peak -2040 Variable Speed Limit- I-270 Vehicle Density

I-270 Northbound	Type	No Build		VSL		% Change	I-270 Southbound	Type	No Build		VSL		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS			
I-270	Freeway	91	F	91	F	0%	I-270	Freeway	19	C	19	C	0%
I-270 Diverge to MD 187	Diverge	77	F	77	F	0%	I-270 Merge from WB I-70	Merge	17	B	17	B	0%
I-270	Freeway	84	F	85	F	1%	I-270	Freeway	24	C	24	C	0%
I-270 Diverge to Rockledge Rd	Diverge	77	F	79	F	2%	I-270 Merge from EB I-70	Merge	16	B	16	B	0%
I-270	Freeway	85	F	86	F	1%	I-270	Freeway	22	C	22	C	0%
I-270 Weave from MD 187 to I-270 HOV	Weave	57	F	57	F	0%	I-270 Diverge to SB MD 85	Diverge	23	C	23	C	0%
I-270 Lane Drop	Merge	65	F	65	F	0%	I-270	Freeway	24	C	24	C	0%
I-270	Freeway	51	F	51	F	0%	I-270 Diverge to NB MD 85	Diverge	15	B	15	B	0%
I-270 Merge from I-270 Spur	Merge	37	E	37	E	0%	I-270	Freeway	19	C	19	C	0%
I-270 Weave from I-270 HOV to I-270 C-D	Weave	34	D	34	D	0%	I-270 Merge from MD 85	Merge	20	C	20	C	-1%
I-270	Freeway	34	D	35	D	1%	I-270	Freeway	25	C	25	C	0%
I-270 Diverge to C-D (MD 189)	Diverge	46	F	45	F	-1%	I-270 Diverge to MD 80	Diverge	17	B	17	B	0%
I-270	Freeway	46	F	46	F	0%	I-270	Freeway	20	C	20	C	1%
I-270 Diverge to C-D (MD 28)	Diverge	62	F	63	F	3%	I-270 Merge from MD 80	Merge	14	B	14	B	0%
I-270	Freeway	55	F	57	F	5%	I-270	Freeway	23	C	23	C	0%
I-270 Merge from C-D (MD 189)	Merge	72	F	82	F	14%	I-270 Diverge to MD 109	Diverge	12	B	12	B	1%
I-270 Diverge to C-D (Shady Grove Rd)	Diverge	77	F	83	F	7%	I-270	Freeway	22	C	22	C	1%
I-270	Freeway	65	F	69	F	7%	I-270 Merge from MD 109	Merge	13	B	14	B	6%
I-270 Weave from C-D (MD 28) to C-D (Shady Grove Rd)	Weave	90	F	93	F	4%	I-270	Freeway	24	C	24	C	0%
I-270	Freeway	90	F	89	F	0%	I-270 Diverge to SB Weigh Station	Diverge	12	B	12	B	1%
I-270 Merge from C-D (Shady Grove Rd)	Merge	124	F	121	F	-2%	I-270	Freeway	24	C	24	C	0%
I-270	Freeway	88	F	88	F	0%	I-270 Merge from SB Weigh Station	Merge	12	B	12	B	0%
I-270 Merge from C-D (I-370)	Merge	155	F	136	F	-12%	I-270	Freeway	23	C	23	C	0%
I-270 Diverge to C-D (MD 117)	Diverge	159	F	155	F	-3%	I-270 Diverge to MD 121	Diverge	9	A	9	A	0%
I-270	Freeway	21	C	22	C	3%	I-270	Freeway	12	B	12	B	0%
I-270 Merge from C-D (MD 124)	Merge	47	F	48	F	0%	I-270 Merge from WB MD 121	Merge	10	B	10	B	0%
I-270	Freeway	27	D	32	D	21%	I-270	Freeway	15	B	15	B	0%
I-270 Diverge to EB Middlebrook Rd	Diverge	20	B	25	C	25%	I-270 Merge from EB MD 121	Merge	13	B	13	B	0%
I-270	Freeway	25	C	31	D	24%	I-270	Freeway	20	C	20	C	0%
I-270 Diverge to WB Middlebrook Rd	Diverge	20	C	24	C	20%	I-270 Diverge to MD 27	Diverge	13	B	13	B	0%
I-270	Freeway	22	C	27	D	24%	I-270	Freeway	16	B	16	B	0%
I-270 Diverge to EB MD 118	Diverge	17	B	21	C	24%	I-270 Merge from WB MD 27	Merge	14	B	14	B	0%
I-270 Diverge to WB MD 118	Diverge	31	D	31	D	2%	I-270	Freeway	20	C	20	C	0%
I-270	Freeway	27	D	30	D	12%	I-270 Weave from EB MD 27 to MD 118	Weave	15	B	15	B	-2%
I-270 Weave from MD 118 to MD 27	Weave	36	E	34	D	-7%	I-270	Freeway	19	C	19	C	-1%
I-270	Freeway	25	C	29	D	17%	I-270 Merge from WB MD 118	Merge	15	B	15	B	-2%
I-270 Merge from EB MD 27	Merge	36	E	34	D	-7%	I-270	Freeway	22	C	22	C	0%
I-270	Freeway	26	C	31	D	22%	I-270 Merge from EB MD 118	Merge	18	B	18	B	0%
I-270 Merge from WB MD 27	Merge	22	C	26	C	20%	I-270	Freeway	28	D	28	D	-1%
I-270	Freeway	28	D	33	D	20%	I-270 Merge from Middlebrook Rd	Merge	30	D	30	D	1%
I-270 Diverge to MD 121	Diverge	22	C	26	C	18%	I-270 Diverge to Watkins Mill Rd	Diverge	24	C	24	C	1%

Table D.5: PM Peak -2040 Variable Speed Limit - I-270 Vehicle Density

I-270 Northbound	Type	No Build		VSL		% Change	I-270 Southbound	Type	No Build		VSL		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS			
I-270	Freeway	22	C	24	C	8%	I-270	Freeway	19	C	20	C	0%
I-270 Merge from EB MD 121	Merge	35	E	21	C	-40%	I-270 Diverge to MD 124	Diverge	17	B	17	B	0%
I-270 Lane Drop	Merge	78	F	56	F	-29%	I-270	Freeway	14	B	14	B	0%
I-270	Freeway	37	E	41	E	10%	I-270 Merge from Watkins Mill	Merge	17	B	17	B	0%
I-270 Diverge to NB Weigh Station	Diverge	18	B	18	B	-2%	I-270	Freeway	58	F	56	F	-3%
I-270	Freeway	36	E	36	E	-2%	I-270 Merge from WB MD 124	Merge	96	F	92	F	-3%
I-270 Merge from NB Weight Station	Merge	18	B	18	B	-1%	I-270	Freeway	0	A	0	A	-
I-270	Freeway	38	E	37	E	-3%	I-270 Merge from MD 117	Merge	39	E	40	E	1%
I-270 Diverge to MD 109	Diverge	22	C	21	C	-5%	I-270	Freeway	28	D	28	D	1%
I-270	Freeway	34	D	33	D	-3%	I-270 Diverge to I-370	Diverge	22	C	21	C	-1%
I-270 Merge from MD 109	Merge	19	B	18	B	-2%	I-270	Freeway	18	B	18	B	0%
I-270	Freeway	36	E	35	E	-2%	I-270 Diverge to I-270 C-D	Diverge	14	B	14	B	-1%
I-270 Diverge to MD 80	Diverge	27	C	26	C	-6%	I-270	Freeway	14	B	14	B	0%
I-270	Freeway	30	D	29	D	-2%	I-270 Merge from I-270 (I-370)	Merge	21	C	20	C	-1%
I-270 Merge from MD 80	Merge	18	B	18	B	-2%	I-270 Diverge to I-270 C-D (Shady Grove Rd)	Diverge	23	C	23	C	0%
I-270	Freeway	36	E	36	E	-1%	I-270	Freeway	19	C	19	C	0%
I-270 Diverge to Scenic View	Diverge	19	B	18	B	-2%	I-270 Merge from I-270 C-D (Shady Grove Rd Northern)	Merge	18	B	18	B	0%
I-270	Freeway	36	E	35	E	-2%	I-270	Freeway	23	C	23	C	0%
I-270 Merge from Scenic View	Merge	18	B	18	B	-3%	I-270 Merge from I-270 C-D (Shady Grove Rd Southern)	Merge	18	B	18	B	0%
I-270	Freeway	36	E	37	E	1%	I-270 Diverge to I-270 C-D (MD 189)	Diverge	25	C	25	C	0%
I-270 Diverge to NB MD 85	Diverge	20	C	25	C	25%	I-270	Freeway	21	C	21	C	0%
I-270	Freeway	34	D	39	E	15%	I-270 Merge from I-270 C-D (MD 189)	Merge	20	C	21	C	0%
I-270 Diverge to SB MD 85	Diverge	20	C	23	C	14%	I-270	Freeway	26	C	26	C	0%
I-270	Freeway	30	D	35	E	17%	I-270 Merge from I-270 C-D	Merge	25	C	25	C	0%
I-270 Weave from MD 85 to I-70	Weave	22	C	25	C	13%	I-270 Diverge to I-270 HOV Lane	Diverge	17	B	18	B	3%
I-270	Freeway	64	F	39	E	-40%	I-270 Diverge to I-270 Spur	Diverge	38	E	37	E	-4%
							I-270	Freeway	13	B	13	B	1%
							I-270 Diverge to Rockledge Dr / MD 187	Diverge	9	A	9	A	-1%
							I-270	Freeway	13	B	13	B	0%
							I-270 Merge from Rockledge Dr	Merge	11	B	11	B	1%
							I-270	Freeway	16	B	16	B	1%
							I-270 Merge from Rockledge Dr / MD 187	Merge	14	B	14	B	0%
							I-270	Freeway	35	E	35	E	0%

Table D.6: PM Peak -2040 Variable Speed Limit- I-270 Spur Vehicle Density

I-270 Spur Northbound	Type	No Build		VSL		% Change	I-270 Southbound	Type	No Build		VSL		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS			
I-270 Spur	Freeway	62	F	63	F	0%	I-270 Spur	Freeway	72	F	67	F	-6%
I-270 Spur Merge from Clara Barton Parkway	Merge	64	F	64	F	0%	I-270 Spur Weave from I-270 HOV to Democracy Blvd	Weave	94	F	89	F	-5%
I-270 Spur	Freeway	78	F	78	F	1%	I-270 Spur	Freeway	108	F	107	F	-1%
I-270 Diverge to MD 190	Diverge	49	F	49	F	-1%	I-270 Merge from Democracy Blvd	Merge	152	F	150	F	-2%
I-270 Spur	Freeway	89	F	90	F	1%	I-270 Spur Lane Drop	Merge	144	F	143	F	0%
I-270 Spur Merge from Cabin John Parkway	Merge	105	F	106	F	0%	I-270 Spur	Freeway	125	F	125	F	0%
I-270 Spur Merge from MD 190	Merge	97	F	97	F	0%	I-270 Spur Merge from I-495	Merge	124	F	125	F	0%
I-270 Spur	Freeway	84	F	84	F	0%	I-270 Spur	Freeway	49	F	49	F	0%
I-270 Spur Diverge to I-495	Merge	66	F	65	F	-3%	I-270 Spur Diverve to EB MD 190	Diverge	50	F	50	F	0%
I-270 Spur	Freeway	45	F	46	F	0%	I-270 Spur Diverve to Cabin John Pkwy	Diverge	67	F	68	F	2%
I-270 Spur Diverge to Democracy Blvd	Diverge	50	F	50	F	1%	I-270 Spur	Freeway	95	F	95	F	-1%
I-270 Spur	Freeway	58	F	59	F	1%	I-270 Merge from MD 190	Merge	120	F	120	F	0%
I-270 Spur Merge from EB Democracy Blvd	Merge	97	F	99	F	1%	I-270 Spur	Freeway	93	F	94	F	0%
I-270 Spur	Freeway	58	F	58	F	1%	I-270 Diverge to WB Clara Barton Pkwy	Diverge	60	F	61	F	1%
I-270 Spur Merge from WB Democracy Blvd	Merge	65	F	66	F	0%	I-270 Spur	Freeway	83	F	83	F	0%
I-270 Spur	Freeway	39	E	38	E	0%	I-270 Merge from Clara Barton Pkwy	Merge	77	F	77	F	0%
I-270 Spur Merge from Westlake Terrace	Merge	31	D	31	D	0%							
I-270 Spur	Freeway	34	D	34	D	-1%							

Table D.7: PM Peak -2040 Variable Speed Limit - I-270 Local Vehicle Density

I-270 Northbound	Type	No Build		VSL		% Change	I-270 Southbound	Type	No Build		VSL		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS			
I-270 C-D	Freeway	29	D	29	D	0%	I-270 C-D	Freeway	8	A	9	A	2%
I-270 C-D Diverge to EB Montrose Rd	Diverge	21	C	21	C	-1%	I-270 C-D Weave from I-370 EB to I-270	Weave	23	B	26	C	10%
I-270 C-D	Freeway	16	B	16	B	1%	I-270 C-D Diverge to Shady Grove Rd	Diverge	11	B	11	B	1%
I-270 C-D Weave between Montrose Rd Loop Ramps	Weave	13	B	13	B	2%	I-270 C-D	Freeway	8	A	8	A	0%
I-270 C-D	Freeway	28	D	28	D	0%	I-270 C-D Merge from WB Shady Grove Rd	Merge	8	A	8	A	2%
I-270 C-D Merge from WB Montrose Rd	Merge	83	F	96	F	15%	I-270 C-D	Freeway	14	B	14	B	2%
I-270 C-D	Freeway	67	F	74	F	11%	I-270 C-D Merge from EB Shady Grove Rd	Merge	10	A	10	B	3%
I-270 C-D Merge from I-270	Merge	42	F	47	F	12%	I-270 C-D	Freeway	19	C	20	C	3%
I-270 C-D	Freeway	65	F	71	F	9%	I-270 C-D Merge from I-270	Merge	18	B	21	C	14%
I-270 C-D Diverge to MD 189	Diverge	43	F	48	F	11%	I-270 C-D Diverge to I-270	Diverge	25	C	26	C	3%
I-270 C-D	Freeway	91	F	97	F	7%	I-270 C-D Diverge to I-270	Diverge	17	B	18	B	2%
I-270 C-D Merge from MD 189	Merge	112	F	114	F	2%	I-270 C-D	Freeway	16	B	16	B	2%
I-270 C-D	Freeway	62	F	74	F	20%	I-270 C-D Diverge to MD 28	Diverge	11	B	11	B	4%
I-270 C-D Weave between I-270 (to MD 28 from MD 189)	Weave	63	F	74	F	16%	I-270 C-D	Freeway	11	A	11	A	2%
I-270 C-D	Freeway	42	E	54	F	29%	I-270 C-D Merge from WB MD 28	Merge	12	B	13	B	5%
I-270 C-D Diverge to MD 28	Diverge	18	B	25	C	40%	I-270 C-D	Freeway	14	B	14	B	2%
I-270 C-D	Freeway	28	D	42	E	47%	I-270 C-D Merge from EB MD 28	Merge	26	C	34	D	32%
I-270 C-D Weave between MD 28 Ramps	Weave	28	C	30	C	7%	I-270 C-D	Freeway	32	D	51	F	62%
I-270 C-D	Freeway	26	D	31	D	17%	I-270 C-D Merge from I-270	Merge	20	B	34	D	73%
I-270 C-D Merge from MD 28 WB	Merge	28	C	37	E	33%	I-270 C-D	Freeway	44	E	49	F	10%
I-270 C-D Merge from I-270 and Drop Lane	Merge	34	D	48	F	43%	I-270 C-D Diverge to MD 189	Diverge	25	C	26	C	4%
I-270 C-D Diverge to I-270	Diverge	61	F	72	F	18%	I-270 C-D	Freeway	27	D	29	D	8%
I-270 C-D	Freeway	48	F	56	F	15%	I-270 C-D Merge from MD 189	Merge	27	C	29	D	8%
I-270 C-D Diverge to Shady Grove Rd	Diverge	14	B	18	B	30%	I-270 C-D Diverge to I-270	Diverge	34	D	37	E	9%
I-270 C-D	Freeway	130	F	122	F	-6%	I-270 C-D	Freeway	24	C	27	D	14%
I-270 C-D Merge from I-270 and EB Shady Grove Rd	Merge	140	F	132	F	-6%	I-270 C-D Diverge to WB Montrose Rd	Diverge	18	B	21	C	17%
I-270 C-D	Freeway	144	F	133	F	-8%	I-270 C-D	Freeway	23	C	26	D	15%
I-270 C-D Merge from WB Shady Grove Rd	Merge	146	F	141	F	-3%	I-270 Weave between Montrose Rd Loops	Weave	41	F	46	F	11%
I-270 C-D Diverge to I-270	Diverge	113	F	105	F	-7%	I-270 C-D	Freeway	15	B	15	B	-1%
I-270 C-D	Freeway	94	F	102	F	8%	I-270 C-D Merge from EB Montrose Rd	Merge	9	A	9	A	-2%
I-270 C-D Diverge to I-370	Diverge	64	F	73	F	14%	I-270 C-D	Freeway	18	B	17	B	-1%
I-270 C-D	Freeway	120	F	116	F	-3%							
I-270 Merge from I-370 EB	Merge	129	F	131	F	2%							
I-270 C-D	Freeway	139	F	140	F	1%							
I-270 C-D Weave from I-370 to I-270	Weave	134	F	141	F	6%							
I-270 C-D	Freeway	110	F	110	F	0%							
I-270 C-D Weave from I-270 to MD 117	Weave	114	F	111	F	-3%							
I-270 C-D Diverge to MD 124	Diverge	142	F	145	F	2%							
I-270 C-D	Freeway	178	F	176	F	-1%							
I-270 C-D Merge from EB MD 124	Merge	168	F	167	F	-1%							
I-270 C-D Merge From WB MD 124	Merge	154	F	153	F	-1%							
I-270 C-D	Freeway	144	F	142	F	-1%							

Table D.7: PM Peak -2040 Variable Speed Limit - I-270 Local Vehicle Density

	Type	No Build		VSL		% Change		Type	No Build		VSL		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS	
I-270 Northbound							I-270 Southbound						
I-270 C-D Merge from Watkins Mill	Merge	133	F	131	F	-1%							

Table D.8: PM Peak -2040 Variable Speed Limit- I-270 Vehicle Throughput

I-270 Northbound	No Build VISSIM Throughput	VSL VISSIM Throughput	% Change	I-270 Southbound	No Build VISSIM Throughput	VSL VISSIM Throughput	% Change
Between I-495 and MD 187	4113	4121	0%	North of I-70	2366	2366	0%
Between MD 187 on and off ramps	3710	3708	0%	Between I-70 on ramps	2703	2703	0%
Between Rockledge Blvd on and off ramps	3540	3547	0%	From I-70 interchange to MD-85	4047	4047	0%
Between Rockledge Dr and I-270 Spur	3873	3871	0%	Between MD-85 on and off ramps	2379	2379	0%
Between I-270 Spur and Montrose Rd	8718	8707	0%	Between MD-85 and MD-80	3075	3075	0%
Between Montrose Rd on and off ramps	5582	5548	-1%	Between MD-80 on and off ramps	2415	2414	0%
Between Montrose Rd and MD 189	5102	5092	0%	Between MD-80 and Md-109	2866	2864	0%
Between MD 189 and MD 28	5078	5043	-1%	Between MD-109 on and off ramps	2767	2767	0%
Between MD 28 on and off ramps	5014	4982	-1%	Between MD-109 and MD-121	2935	2933	0%
Between MD 28 and Shady Grove Rd	4214	4184	-1%	Between MD-121 on and off ramps	2413	2409	0%
Between Shady Grove Rd and I-370	3243	3217	-1%	Between MD-121 and MD-27	3354	3354	0%
Between I-370 on and off ramps	2749	2767	1%	Between MD-27 on and off ramps	3458	3451	0%
Between I-370 and MD 117	2851	2869	1%	Between MD-27 and MD-118	3773	3763	0%
Between MD 117 and MD 124	2432	2434	0%	Between MD-118 on and off ramps	3719	3708	0%
Between MD-124 on and off ramps	2547	2553	0%	Between MD-118 and Middlebrook Rd	4384	4374	0%
Between Watkins Mill Rd and Middlebrook Rd	4564	4578	0%	Between Middlebrook Rd on and off ramps	4382	4374	0%
Between Middlebrook Rd on and off ramps	4337	4345	0%	Between Middlebrook Rd and MD-124	5462	5479	0%
Between Middlebrook Rd and MD 118	3776	3785	0%	Between MD-124 on and off ramps	4179	4177	0%
Between MD-118 on and off ramps	3479	3476	0%	Between MD-124 and MD-117	5347	5382	1%
Between MD 118 and MD 27	3770	3754	0%	Between MD-117 and I-370	6905	6942	1%
Between MD-27 on and off ramps	2754	2746	0%	Between I-370 on and off ramps	3456	3462	0%
Between MD 27 and MD 121	3428	3405	-1%	Between I-370 on ramp to Shady Grove Rd	4990	5007	0%
Between MD-121 on and off ramps	2299	2273	-1%	Between Shady Grove Rd and MD 28	5157	5191	1%
Between MD 121 and MD 109	3931	3864	-2%	Between MD 28 on and off ramps	5327	5371	1%
Between MD-109 on and off ramps	3643	3578	-2%	Between MD 28 and MD 189	4678	4707	1%
Between MD 109 and MD 80	3831	3771	-2%	Between MD 189 and Montrose Rd	4678	4711	1%
Between MD-80 on and off ramps	3186	3136	-2%	Between Montrose Rd on and off ramps	5599	5635	1%
Between MD 80 and MD 85	3875	3811	-2%	Between Montrose Rd and I-270 Spur	7355	7369	0%
Between MD-85 on and off ramps	3257	3204	-2%	Between I-270 Spur and Rockledge Blvd	3320	3333	0%
Between MD 85 and I-70	5239	5169	-1%	Between Rockledge Blvd on and off ramps	2542	2551	0%
North of I-70	2739	2701	-1%	Between MD 187 on and off ramps	3011	3022	0%
				Between MD 187 and I-495	3393	3397	0%
I-270 Spur Northbound				I-270 Spur Southbound			
Between I-495 and Democracy Blvd	4568	4560	0%	Between I-270 Split and HOV on ramp	3187	3212	1%
Between Democracy Blvd on and off ramps	4101	4088	0%	Between HOV on ramp and Democracy Blvd	2329	2376	2%
Between Democracy Blvd and I-270 Split	4833	4819	0%	Between Democracy Blvd on and off ramps	1856	1892	2%
				Between Democracy Blvd and I-495	2227	2214	-1%

Table D.9: PM Peak - 2040 Variable Speed Limit- I-270 Local Vehicle Throughput

I-270 Local Northbound	No Build VISSIM Throughput	VSL VISSIM Throughput	% Change	I-270 Local Southbound	No Build VISSIM Throughput	VSL VISSIM Throughput	% Change
Between Montrose Rd EB off ramp and EB on ramp	1766	1762	0%	Between I-370 on ramp and I-270 off ramp	3064	3072	0%
Between Montrose Rd EB on ramp and WB off ramp	2079	2073	0%	Between I-270 off ramp and Shady Grove off ramp	1525	1530	0%
Between Montrose Rd WB off ramp and on ramp	1811	1807	0%	Between Shady Grove off ramp and Shady Grove WB on ramp	811	814	0%
Between Montrose Rd WB on ramp and I-270 on ramp	3211	3136	-2%	Between Shady Grove WB and EB on ramps	1431	1455	2%
Between I-270 on ramp and MD 189 off ramp	3392	3299	-3%	Between Shady Grove on ramp and I-270 on ramp	1957	2020	3%
Between MD 189 ramps	2697	2595	-4%	Between I-270 on ramp and I-270 off ramp1	2571	2637	3%
Between MD 189 off ramp and I-270 on ramp	3503	3403	-3%	Between I-270 off ramp1 and I-270 off ramp2	1808	1851	2%
Between I-270 on ramp and I-270 off ramp	4032	3935	-2%	Between I-270 off ramp2 and MD 28 off ramp	1648	1689	2%
Between I-270 off ramp and MD 28 EB off ramp	3156	3084	-2%	Between MD 28 off ramp and MD 28 WB on ramp	1153	1180	2%
Between MD 28 EB off ramp to MD 28 EB on ramp	2855	2788	-2%	Between MD 28 WB on ramp and MD 28 EB on ramp	1423	1449	2%
Between MD 28 EB on ramp and MD 28 WB off ramp	2994	2926	-2%	Between MD 28 EB on ramp and I-270 on ramp	2987	3013	1%
Between MD 28 WB off ramp and MD 28 WB on ramp	1879	1840	-2%	Between I-270 on ramp and MD 189 off ramp	3660	3686	1%
Between MD 28 WB on ramp and I-270 on ramp	2552	2515	-1%	Between MD 189 on and off ramps	2740	2759	1%
Between I-270 on ramp and I-270 off ramp	3027	2988	-1%	Between MD 189 on ramp and I-270 off ramp	3316	3340	1%
Between I-270 off ramp and Shady Grove off ramp	1718	1712	0%	Between I-270 off ramp and Montrose Rd off ramp	2399	2416	1%
Between Shady Grove off ramp and I-270 on ramp	468	511	9%	Between Montrose Rd off ramp and Montrose Rd WB on ramp	2155	2172	1%
Between I-270 on ramp and Shady Grove WB on ramp	2182	2303	6%	Between Montrose Rd WB on ramp and EB off ramp	2705	2697	0%
Between Shady Grove WB on ramp and I-270 off ramp	2671	2835	6%	Between Montrose Rd EB off and on ramps	1525	1508	-1%
Between I-270 off ramp and I-370 off ramp	2310	2454	6%	Between Montrose Rd EB off ramp and I-270	1845	1830	-1%
Between I-370 off ramp and I-370 EB on ramp	529	564	7%				
Between I-370 EB and WB on ramps	896	943	5%				
Between I-370 WB on ramp and I-270 off ramp	1577	1621	3%				
Between I-270 off ramp and I-270 on ramp	1008	1012	0%				
Between I-270 on ramp and MD 117 off ramp	1386	1396	1%				
Between MD 117 off ramp and MD 124 off ramp	920	936	2%				
Between MD 124 off ramp and MD 124 EB on ramp	346	348	1%				
Between MD 124 EB and WB on ramps	651	667	2%				
Between MD 124 on ramp I-270	812	837	3%				

Table D.10: PM Peak -2040 Variable Speed Limit- I-270 On Ramp Queue Length - Northbound

I-270 Northbound	No Build VISSIM Average Queue (feet)	VSL VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	VSL VISSIM Maximum Queue (feet)	% Change
Rockledge Dr on ramp	1	50	5518%	192	1	-99%
MD 189 C-D on ramp	610	51	-92%	4780	641	-87%
MD 28 C-D on ramp	994	52	-95%	4333	1039	-76%
Shady Grove Rd C-D on ramp	1762	53	-97%	4090	1936	-53%
I-370 C-D on ramp	3386	54	-98%	5049	3414	-32%
MD 124 C-D on ramp	4875	55	-99%	5069	4876	-4%
MD 118 on ramp	0	56	39900%	43	0	-100%
MD 27 EB on ramp	0	57	-	0	0	-
MD 27 WB on ramp	0	58	-	0	0	-
MD 121 on ramp	0	59	-	4	0	-100%
MD 109 on ramp	0	60	-	0	0	-
MD 80 on ramp	0	61	-	0	0	-
MD 85 on ramp	0	62	-	0	0	-
I-270 Spur Northbound	No Build VISSIM Average Queue (feet)	VSL VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	VSL VISSIM Maximum Queue (feet)	% Change
Democracy Blvd EB on ramp	0	63	-	9	0	-99%
Democracy Blvd WB on ramp	0	64	-	0	0	-
I-495 Northbound	No Build VISSIM Average Queue (feet)	VSL VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	VSL VISSIM Maximum Queue (feet)	% Change
Cabin John Pkwy on ramp	46	65	42%	903	30	-97%
MD 190 on ramp	0	66	14900%	48	0	-100%
I-270 C-D Northbound	No Build VISSIM Average Queue (feet)	VSL VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	VSL VISSIM Maximum Queue (feet)	% Change
Montrose Rd EB on ramp	0	67	-	0	0	-
Montrose Rd WB on ramp	916	68	-93%	2556	1246	-51%
I-270 on ramp	0	69	-	0	0	-
MD 189 on ramp	104	70	-33%	1084	141	-87%
I-270 on ramp	1	71	5917%	109	3	-98%
MD 28 EB on ramp	0	72	-	0	0	-
MD 28 WB on ramp	38	73	90%	652	80	-88%
Shady Grove Rd EB on ramp	1396	74	-95%	4077	1204	-70%
I-270 on ramp	1555	75	-95%	5058	562	-89%
Shady Grove Rd WB on ramp	739	76	-90%	1949	682	-65%
I-370 EB on ramp	1319	77	-94%	2422	1346	-44%
I-370 WB on ramp	1606	78	-95%	2548	1643	-36%
I-270 on ramp	4357	79	-98%	5055	4165	-18%
MD 124 EB on ramp	1831	80	-96%	2796	1871	-33%
MD 124 WB on ramp	98	81	-18%	700	65	-91%
Watkins Mill Rd on ramp	2665	191	-93%	3270	2473	-24%

Table D.11: PM Peak -2040 Variable Speed Limit- I-270 Off Ramp Queue Length - Northbound

I-270 Northbound	No Build VISSIM Average Queue (feet)	VSL VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	VSL VISSIM Maximum Queue (feet)	% Change
MD 187 off ramp NB	39	150	283%	309	38	-88%
MD 187 off ramp SB	0	151	-	0	0	-
Rockledge Dr off ramp	1	152	17173%	88	1	-99%
Tower Oaks Blvd off ramp	37	153	319%	219	35	-84%
Montrose Rd off ramp EB	0	154	-	0	0	-
Montrose Rd off ramp WB	0	155	-	0	0	-
MD 189 off ramp WB	26	156	496%	174	24	-86%
MD 189 off ramp EB	0	157	40156%	78	0	-100%
MD 28 off ramp EB	35	158	354%	215	35	-84%
MD 28 off ramp WB	0	159	-	0	0	-
Shady Grove Rd off ramp - Redland Blvd	0	160	-	0	0	-
Shady Grove Rd off ramp WB	40	161	306%	253	37	-85%
Shady Grove Rd off ramp EB	0	162	-	0	0	-
I-370 off ramp WB	8	163	1900%	162	0	-100%
I-370 off ramp EB	0	164	-	0	0	-
MD 117 off ramp	1835	165	-91%	2770	984	-64%
MD 124 off ramp	55	166	204%	626	53	-92%
Watkins Mill Rd off ramp	45	190	319%	627	40	-94%
Middlebrook Rd EB off ramp	0	167	-	0	0	-
Middlebrook Rd WB off ramp	0	168	-	0	0	-
MD 118 WB off ramp - Seneca Meadows	0	169	844900%	8	0	-100%
MD 118 WB off ramp	0	170	-	0	0	-
MD 118 EB off ramp	0	171	427400%	16	0	-100%
MD 27 off ramp WB	44	172	292%	252	47	-81%
MD 27 off ramp EB	0	173	-	0	0	-
MD 121 off ramp WB	70	174	148%	314	68	-78%
MD 121 off ramp EB	2	175	8155%	94	0	-100%
MD 109 off ramp EB	26	176	584%	251	20	-92%
MD 109 off ramp WB	0	177	-	0	0	-
MD 80 off ramp EB	21	178	759%	233	21	-91%
MD 80 off ramp WB	0	179	357900%	24	0	-100%
MD 85 NB off ramp	1	180	15971%	53	0	-100%
MD 85 SB off ramp	1	181	16659%	141	1	-100%
I-270 Spur Northbound	No Build VISSIM Average Queue (feet)	VSL VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	VSL VISSIM Maximum Queue (feet)	% Change
Clara Barton Pkwy off ramp EB	0	182	-	0	0	-
Clara Barton Pkwy off ramp WB	0	183	-	0	0	-
MD 190 off ramp EB	0	184	-	0	0	-
MD 190 off ramp WB	5	185	3795%	354	10	-97%
Democracy Blvd off ramp WB	41	186	349%	194	42	-79%
Democracy Blvd off ramp EB	17	187	997%	120	17	-86%

Table D.12: PM Peak-2040 Variable Speed Limit- I-270 On Ramp Queue Length - Southbound

I-270 Southbound	No Build VISSIM Average Queue (feet)	VSL VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	VSL VISSIM Maximum Queue (feet)	% Change
MD 85 on ramp	0	1	1567%	12	0	-99%
MD 80 on ramp	0	2	-	0	0	-
MD 109 on ramp	0	3	-	0	0	-
MD 121 WB on ramp	0	4	-	0	0	-
MD 121 EB on ramp	0	188	-	0	0	-
MD 27 WB on ramp	0	5	-	0	0	-
MD 27 EB on ramp	0	6	-	0	0	-
MD 118 WB on ramp	0	7	-	0	0	-
MD 118 EB on ramp	0	8	-	0	0	-
Middlebrook Rd on ramp	0	9	-	0	0	-
Watkins Mill Rd on ramp	0	0	-	0	0	-
MD 124 WB on ramp	1368	10	-99%	3492	1160	-67%
MD 117 on ramp	29	11	-62%	837	33	-96%
I-370 C-D on ramp	0	12	-	0	0	-
Shady Grove Rd C-D on ramp North	0	13	-	0	0	-
Shady Grove Rd C-D on ramp South	0	14	-	0	0	-
MD 189 C-D on ramp	0	15	-	0	0	-
Montrose Rd C-D on ramp	0	16	-	0	0	-
Rockledge Dr on ramp	0	17	-	0	0	-
MD 187 on ramp	0	18	-	0	0	-
I-270 Spur Southbound	No Build VISSIM Average Queue (feet)	VSL VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	VSL VISSIM Maximum Queue (feet)	% Change
Democracy Blvd on ramp	698	19	-97%	1919	675	-65%
I-495 Southbound	No Build VISSIM Average Queue (feet)	VSL VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	VSL VISSIM Maximum Queue (feet)	% Change
I-270 Spur on ramp	4555	20	-100%	5065	4528	-11%
MD 190 on ramp	184	21	-89%	956	15	-98%
I-270 C-D Southbound	No Build VISSIM Average Queue (feet)	VSL VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	VSL VISSIM Maximum Queue (feet)	% Change
I-270 on ramp	0	22	73233%	10	0	-100%
I-370 on ramp	0	23	4794%	80	0	-100%
Shady Grove Rd WB on ramp	0	24	-	0	0	-
Shady Grove Rd EB on ramp	0	25	-	0	0	-
I-270 on ramp	0	26	-	0	0	-
MD 28 WB on ramp	0	27	-	0	0	-
MD 28 EB on ramp	0	28	6567%	63	19	-70%
I-270 on ramp	0	29	-	0	0	-
MD 189 on ramp	0	30	-	0	1	-
Montrose Rd WB on ramp	1	31	2462%	115	33	-72%
Montrose Rd EB on ramp	0	32	-	0	0	-

Table D.13: PM Peak -2040 Variable Speed Limit- I-270 Off Ramp Queue Length - Southbound

I-270 Southbound	No Build VISSIM Average Queue (feet)	VSL VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	VSL VISSIM Maximum Queue (feet)	% Change
MD 85 SB off ramp	22	100	363%	383	2	-99%
MD 85 NB off ramp	17	101	512%	354	12	-97%
MD 80 off ramp	2	102	6356%	204	3	-98%
MD 109 off ramp WB	1	103	20096%	88	1	-99%
MD 109 off ramp EB	0	104	-	0	0	-
MD 121 off ramp EB	217	105	-52%	970	236	-76%
MD 121 off ramp WB	0	106	26400%	137	0	-100%
MD 27 off ramp EB	22	107	390%	137	23	-83%
MD 27 off ramp WB	1	108	11639%	65	0	-99%
MD 118 off ramp EB	24	109	360%	142	24	-83%
MD 118 off ramp WB	0	110	366567%	23	0	-100%
Watkins Mill Rd off ramp	103	189	84%	384	108	-72%
MD 124 off ramp EB	185	111	-40%	731	200	-73%
MD 124 off ramp WB	17	112	566%	445	15	-97%
I-370 off ramp WB	147	113	-23%	725	0	-100%
I-370 off ramp EB	0	114	-	0	0	-
Shady Grove Rd off ramp - Omega Drive	1	115	19392%	52	0	-99%
Shady Grove Rd off ramp	0	116	-	0	0	-
MD 28 off ramp	3	117	4170%	149	3	-98%
MD 189 off ramp EB	108	118	9%	433	106	-75%
MD 189 off ramp WB	0	119	-	0	0	-
Montrose Rd off ramp WB	0	120	-	0	0	-
Montrose Rd off ramp EB	4	121	2987%	337	17	-95%
Rockledge Dr off ramp	155	122	-21%	641	123	-81%
I-270 Spur Southbound	No Build VISSIM Average Queue (feet)	VSL VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	VSL VISSIM Maximum Queue (feet)	% Change
Democracy Blvd off ramp EB	20	123	500%	136	23	-83%
Democracy Blvd off ramp WB	0	124	-	0	0	-
MD 190 off ramp WB	80	125	57%	797	83	-90%
MD 190 off ramp EB	0	126	-	0	0	-
Clara Barton Pkwy WB off ramp	0	127	1269900%	6	0	-100%

Table D.14: PM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
1- MD 85 at Sam's Club Drive											
1	NB	60.8	E	NB Left	134	78	463	889	E	115.6	F
				NB Through	570	38	463	889	D		
				NB Right	935	72	443	912	E		
	SB	179.8	F	SB Left	153	131	1021	1231	F		
				SB Through	874	186	1021	1231	F		
				SB Right	74	209	1021	1231	F		
	EB	35.0	C	EB Left	55	84	32	144	F		
				EB Through	24	81	32	144	F		
				EB Right	169	13	32	144	B		
	WB	163.6	F	WB Left	561	181	536	762	F		
				WB Through	30	166	536	762	F		
				WB Right	224	119	536	762	F		
2- MD 85 at I-270 NB on and off ramp											
2	NB	58.5	E	NB Left	1136	58	700	1857	E	48.2	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	32.6	C	SB Left	0	0	0	0	A		
				SB Through	743	33	132	737	C		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
3- MD 85 at I-270 SB on and off ramp											
3	NB	17.3	B	NB Left	0	0	0	0	A	19.5	B
				NB Through	1975	17	181	1210	B		
				NB Right	0	0	0	0	A		
	SB	44.0	D	SB Left	173	44	74	582	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
4- MD 85 at Crestwood Blvd											
4	NB	68.0	F	NB Left	74	103	368	830	F	51.3	D
				NB Through	1450	66	367	830	E		
				NB U-Turn	0	0	0	0	A		
	SB	31.9	C	SB Left	105	83	53	246	F		
				SB Through	940	30	105	1039	C		
				SB Right	923	28	92	1030	C		
	EB	63.3	E	EB Left	949	66	196	744	E		
				EB Through	43	51	196	744	D		
				EB Right	28	1	196	744	A		
	WB	53.0	D	WB Left	44	78	60	230	E		
				WB Through	79	81	60	230	F		
				WB Right	94	18	60	230	B		
5- MD 80 at I-270 NB on and ramp											
5	NB	-0.9	A	NB Left	1	9	0	4	A	11.5	B
				NB Through	2	0	0	4	A		
				NB Right	7	-3	0	4	A		
	SB	12.8	B	SB Left	479	16	27	238	B		
				SB Through	22	16	27	238	B		
				SB Right	149	3	0	0	A		
	EB	13.6	B	EB Left	97	14	24	208	B		
				EB Through	0	0	8	0	A		
				EB Right	5	10	37	239	B		
	WB	10.7	B	WB Left	15	14	0	38	B		
				WB Through	670	18	66	419	B		
				WB Right	612	2	0	0	A		
6- MD 80 at I-270 SB on and off ramp											
6	NB	3.4	A	NB Left	55	5	3	239	A	5.9	A
				NB Through	0	0	0	0	A		
				NB Right	605	3	3	239	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	7.1	A	EB Left	0	0	0	0	A		
				EB Through	382	8	4	111	A		
				EB Right	66	4	4	119	A		
	WB	8.4	A	WB Left	0	0	0	0	A		
				WB Through	446	8	3	163	A		
				WB Right	0	0	0	0	A		
7- MD 109 at I-270 NB on and off ramp											
7	NB			NB Left	0	0	0	0	A	7.9	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	15.2	C	SB Left	317	16	34	268	C		
				SB Through	0	0	0	0	A		
				SB Right	25	6	1	162	A		
	EB	2.5	A	EB Left	80	2	0	47	A		
				EB Through	0	0	0	0	A		
				EB Right	83	3	0	0	A		
	WB	0.4	A	WB Left	0	0	0	0	A		
				WB Through	222	0	0	0	A		
				WB Right	0	0	0	0	A		
8- MD 80 at I-270 SB on and off ramp											
8	NB	4.9	A	NB Left	63	8	3	120	A	1.8	A
				NB Through	0	0	0	0	A		
				NB Right	36	0	0	63	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.9	A	EB Left	0	0	0	0	A		
				EB Through	166	0	0	0	A		
				EB Right	34	4	0	0	A		
	WB	1.4	A	WB Left	137	1	0	58	A		
				WB Through	110	2	0	30	A		
				WB Right	0	0	0	0	A		
9- MD 121 at Gateway Center Dr											
9	NB	29.4	D	NB Left	590	33	112	604	C	47.0	D
				NB Through	795	28	112	604	C		
				NB Right	64	16	119	630	B		
	SB	22.6	C	SB Left	28	15	19	219	B		
				SB Through	300	24	31	223	C		
				SB Right	9	13	34	244	B		
	EB	14.9	B	EB Left	4	40	8	196	D		
				EB Through	24	41	15	229	D		
				EB Right	248	12	27	261	B		
	WB	117.1	F	WB Left	349	162	304	715	F		
				WB Through	75	73	304	714	E		
				WB Right	186	51	327	739	D		
10- MD 121 at I-270 NB on and off ramp											
10	NB	22.1	C	NB Left	372	59	77	320	F	18.1	B
				NB Through	0	0	0	0	A		
				NB Right	785	4	1	73	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	11.8	B	EB Left	0	0	0	0	A		
				EB Through	651	18	38	367	C		
				EB Right	336	1	0	0	A		
	WB	20.0	C	WB Left	219	60	86	412	F		
				WB Through	682	7	86	412	A		
				WB Right	0	0	0	0	A		

Table D.14: PM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
11- MD 121 at I-270 SB on and off ramp											
11	NB			NB Left	0	0	0	0	A	22.3	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	62.3	E	SB Left	271	85	226	977	F		
				SB Through	0	0	0	0	A		
				SB Right	254	39	0	49	E		
	EB	6.5	A	EB Left	0	0	0	0	A		
				EB Through	717	6	16	229	A		
				EB Right	0	0	0	0	A		
	WB	13.2	B	WB Left	0	0	0	0	A		
WB Through				520	27	46	382	D			
WB Right				538	0	0	0	A			
12- MD 27 at Observation Dr											
12	NB	37.7	D	NB U-Turn	0	0	0	0	A	24.8	C
				NB Through	94	55	22	98	E		
				NB Right	61	11	22	98	B		
	SB	41.3	D	SB Left	146	44	38	216	D		
				SB Through	57	62	43	250	E		
				SB Right	188	33	69	287	C		
	EB	18.6	B	EB Left	189	33	70	458	C		
				EB Through	2012	17	71	459	B		
				EB Right	97	16	84	497	B		
	WB	27.9	C	WB Left	41	24	149	731	C		
WB Through				1695	29	149	731	C			
WB Right				69	9	149	731	A			
13- MD 27 at I-270 NB off ramp											
13	NB	47.2	D	NB Left	303	47	52	260	D	6.5	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.1	A	EB Left	0	0	0	0	A		
				EB Through	1512	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	4.9	A	WB Left	0	0	0	0	A		
WB Through				1791	5	37	726	A			
WB Right				0	0	0	0	A			
14- MD 27 at I-270 SB off ramp											
14	NB			NB Left	0	0	0	0	A	5.2	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	50.1	D	SB Left	174	50	33	150	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	1.8	A	EB Left	0	0	0	0	A		
				EB Through	1677	2	4	89	A		
				EB Right	0	0	0	0	A		
	WB	3.7	A	WB Left	0	0	0	0	A		
WB Through				1541	4	12	384	A			
WB Right				0	0	0	0	A			
15- MD 27 at Crystal Rock Dr											
15	NB	31.1	C	NB Left	77	30	107	545	C	70.1	E
				NB Through	1196	31	116	545	C		
				NB Right	55	29	123	558	C		
	SB	56.5	E	SB Left	157	74	381	1298	E		
				SB Through	1468	58	381	1298	E		
				SB Right	225	33	368	1291	C		
	EB	40.4	D	EB Left	125	53	34	129	D		
				EB Through	49	36	30	124	D		
				EB Right	62	18	23	156	B		
	WB	163.8	F	WB Left	104	99	1056	1511	F		
WB Through				127	110	1056	1511	F			
WB Right				665	184	1056	1511	F			
16- MD 118 at Seneca Meadows Pkwy											
16	NB	4.9	A	NB Left	97	14	2	77	B	9.0	A
				NB Through	1309	4	11	182	A		
				NB Right	1	-1	19	235	A		
	SB	7.4	A	SB Left	15	8	19	307	A		
				SB Through	1226	7	22	307	A		
				SB Right	11	5	25	340	A		
	EB	14.0	B	EB Left	23	59	14	138	E		
				EB Through	0	65	14	138	E		
				EB Right	312	11	14	138	B		
	WB	53.8	D	WB Left	103	65	43	243	E		
WB Through				7	69	39	242	E			
WB Right				30	13	48	262	B			
17- MD 118 at I-270 NB on ramp											
17	NB			NB Left	0	0	0	0	A	13.8	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	26.5	C	EB Left	493	26	43	299	C		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	10.0	A	WB Left	0	0	0	0	A		
WB Through				283	2	1	139	A			
WB Right				1361	12	46	611	B			
18- MD 118 at I-270 SB off ramp											
18	NB			NB Left	0	0	0	0	A	7.1	A
				NB Through	0	0.0	0	0	A		
				NB Right	0	0.0	0	0	A		
	SB	37.7	D	SB Left	169	37.7	27	145	D		
				SB Through	0	0.0	0	0	A		
				SB Right	0	0.0	0	0	A		
	EB	5.5	A	EB Left	0	0.0	0	0	A		
				EB Through	1407	5.5	13	384	A		
				EB Right	0	0.0	0	0	A		
	WB	5.1	A	WB Left	0	0.0	0	0	A		
WB Through				1499	5.1	10	218	A			
WB Right				0	0.0	0	0	A			
19- MD 118 at Aircraft Dr											
19	NB	26.2	C	NB Left	53	72	43	241	E	43.0	D
				NB Through	53	70	43	241	E		
				NB Right	227	5	5	87	A		
	SB	165.9	F	SB Left	436	156	419	656	F		
				SB Through	14	205	419	656	F		
				SB Right	126	195	419	656	F		
	EB	22.6	C	EB Left	125	31	89	536	C		
				EB Through	1415	22	89	536	C		
				EB Right	21	20	89	536	B		
	WB	24.3	C	WB Left	15	30	107	749	C		
WB Through				1399	28	107	749	C			
WB Right				367	8	107	749	A			
20- Middlebrook Rd at Observation Dr											
20	NB			NB Left	0	0	0	0	A	9.0	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	20.5	C	SB Left	124	36	23	150	D		
				SB Through	0	0	0	0	A		
				SB Right	186	10	23	150	B		
	EB	6.0	A	EB Left	14	11	15	149	B		
				EB Through	1053	6	15	149	A		
				EB Right	0	0	0	0	A		
	WB	8.8	A	WB Left	0	0	0	0	A		
WB Through				1313	9	27	253	A			
WB Right				17	7	42	302	A			

Table D.14: PM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
21- Middlebrook Rd at I-270 SB on ramp											
21	NB			NB Left	0	0	0	0	A	4.6	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	2.7	A	EB Left	0	0	0	0	A		
				EB Through	742	3	4	110	A		
				EB Right	0	0	0	0	A		
	WB	7.8	A	WB Left	438	8	5	236	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
22- Middlebrook Rd at Waring Station Rd											
22	NB	48.4	D	NB Left	200	46	83	309	D	13.7	B
				NB Through	1	55	83	309	D		
				NB Right	236	50	83	309	D		
	SB	30.1	C	SB Left	32	47	8	72	D		
				SB Through	2	38	8	72	D		
				SB Right	24	7	19	110	A		
	EB	8.0	A	EB Left	4	11	28	285	B		
				EB Through	1125	8	28	285	A		
				EB Right	198	7	28	285	A		
	WB	8.6	A	WB Left	210	21	28	289	C		
				WB Through	1437	7	28	289	A		
				WB Right	3	3	28	289	A		
23- MD 124 at MD 355											
23	NB	130.8	F	NB Left	490	115	682	1082	F	78.6	E
				NB Through	1162	138	680	1079	F		
				NB Right	7	85	0	0	F		
	SB	44.6	D	SB Left	180	92	146	490	F		
				SB Through	698	66	146	490	E		
				SB Right	720	12	44	383	B		
	EB	27.2	C	EB Left	291	68	108	598	E		
				EB Through	1615	25	108	598	C		
				EB Right	338	3	28	551	A		
	WB	126.4	F	WB Left	0	0	0	0	A		
				WB Through	1645	129	683	946	F		
				WB Right	88	83	0	3	F		
24- MD 124 at I-270 SB on and off											
24	NB	95.9	F	NB Left	55	84	67	182	F	63.0	E
				NB Through	21	127	67	182	F		
				NB U-Turn	0	0	0	0	A		
	SB	55.4	E	SB Left	547	95	190	736	F		
				SB Through	8	98	190	736	F		
				SB Right	456	7	13	379	A		
	EB	101.1	F	EB Left	0	0	0	0	A		
				EB Through	1409	100	584	1113	F		
				EB Right	22	162	604	1137	F		
	WB	21.7	C	WB Left	5	78	653	2194	E		
				WB Through	1192	22	653	2194	C		
				WB Right	0	0	0	0	A		
25- MD 117 at MD 124											
25	NB	78.5	E	NB Left	54	158	328	743	F	50.1	D
				NB Through	686	93	328	743	F		
				NB Right	461	48	29	665	D		
	SB	37.8	D	SB Left	134	61	153	737	E		
				SB Through	969	41	153	737	D		
				SB Right	182	5	0	0	A		
	EB	44.9	D	EB Left	153	80	152	574	E		
				EB Through	1156	41	152	576	D		
				EB Right	57	37	156	603	D		
	WB	42.6	D	WB Left	315	71	205	1006	E		
				WB Through	1069	38	205	1006	D		
				WB Right	99	1	0	0	A		
26- MD 117 at Bureau Dr											
26	NB	50.3	D	NB Left	98	76	81	296	E	37.8	D
				NB Through	35	77	81	296	E		
				NB Right	272	38	81	296	D		
	SB	80.7	F	SB Left	284	95	132	405	F		
				SB Through	23	83	132	405	F		
				SB Right	83	32	132	405	C		
	EB	30.3	C	EB Left	52	54	165	806	D		
				EB Through	1683	30	166	806	C		
				EB Right	6	18	160	795	B		
	WB	31.9	C	WB Left	14	35	185	997	D		
				WB Through	1272	34	186	998	C		
				WB Right	213	19	211	1046	B		
27- MD 117 at I-270 SB off ramp											
27	NB			NB Left	0	0	0	0	A	12.8	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	3.7	A	EB Left	0	0	0	0	A		
				EB Through	944	4	6	464	A		
				EB Right	0	0	0	0	A		
	WB	40.7	E	WB Left	306	41	98	848	E		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
28- MD 117 at I-270 NB off ramp											
28	NB			NB Left	0	0	0	0	A	24.3	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	89.3	F	SB Left	97	91	1950	2779	F		
				SB Through	0	0	0	0	A		
				SB Right	374	89	1949	2779	F		
	EB	17.3	B	EB Left	3	120	90	983	F		
				EB Through	947	17	90	983	B		
				EB Right	0	0	0	0	A		
	WB	7.3	A	WB Left	0	0	0	0	A		
				WB Through	1403	7	52	390	A		
				WB Right	0	0	52	390	A		
29- MD 117 at Perry Pkwy											
29	NB	40.8	D	NB Left	19	59	17	125	E	49.4	D
				NB Through	26	59	17	124	E		
				NB Right	34	17	27	145	B		
	SB	162.4	F	SB Left	241	198	280	446	F		
				SB Through	21	220	280	446	F		
				SB Right	121	82	280	446	F		
	EB	21.1	C	EB Left	223	69	74	337	E		
				EB Through	778	8	74	337	A		
				EB Right	30	7	60	321	A		
	WB	41.4	D	WB Left	37	108	248	736	F		
				WB Through	1260	42	248	736	D		
				WB Right	382	33	248	736	C		
30- Shady Grove Rd at I-270 NB off ramp											
30	NB	7.6	A	NB Left	0	0	0	0	A	30.1	C
				NB Through	914	8	87	483	A		
				NB Right	0	0	0	0	A		
	SB	44.7	D	SB Left	0	0	0	0	A		
				SB Through	1013	45	163	681	D		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	51.6	D	WB Left	267	52	48	264	D		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table D.14: PM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
31- Shady Grove Rd at I-270 SB off ramp											
31	NB	31.3	C	NB Left	0	0	0	0	A	29.5	C
				NB Through	1229	31	435	1759	C		
				NB Right	0	0	0	0	A		
	SB	5.6	A	SB Left	0	0	0	0	A		
				SB Through	676	6	7	154	A		
				SB Right	0	0	0	0	A		
	EB	55.6	E	EB Left	232	54	43	211	D		
				EB Through	0	0	0	0	A		
				EB Right	304	57	62	297	E		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
32- MD 28 at I-270 SB off ramp											
32	NB			NB U-Turn	0	0	0	0	A	7.9	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	37.2	D	SB Left	406	46	71	322	D		
				SB Through	0	0	0	0	A		
				SB Right	97	3	0	28	A		
	EB	2.8	A	EB Left	0	0	0	0	A		
				EB Through	1560	1	0	0	A		
				EB Right	932	6	16	224	A		
	WB	6.7	A	WB Left	0	0	0	0	A		
				WB Through	1642	7	20	253	A		
				WB Right	0	0	0	0	A		
33- MD 28 at I-270 on and off ramps											
33	NB	36.9	D	NB Left	0	0	41	226	A	39.9	D
				NB Through	185	49	49	235	D		
				NB Right	123	18	49	235	B		
	SB	137.2	F	SB Left	14	160	361	412	F		
				SB Through	0	0	0	0	A		
				SB Right	219	136	361	412	F		
	EB	20.0	B	EB Left	283	61	94	334	E		
				EB Through	920	7	94	334	A		
				EB Right	0	0	0	0	A		
	WB	41.7	D	WB Left	40	37	168	432	D		
				WB Through	1279	42	144	396	D		
				WB Right	0	0	0	0	A		
34- MD 189 at Great Falls Rd											
34	NB	36.7	D	NB Left	43	45	12	90	D	13.2	B
				NB Through	14	48	9	90	D		
				NB Right	19	9	9	101	A		
	SB	3.4	A	SB Left	18	41	7	83	D		
				SB Through	13	48	7	83	D		
				SB Right	408	0	3	48	A		
	EB	11.6	B	EB Left	410	23	37	417	C		
				EB Through	644	5	6	200	A		
				EB Right	55	5	10	236	A		
	WB	18.0	B	WB Left	14	19	52	406	B		
				WB Through	842	18	51	406	B		
				WB Right	18	12	67	440	B		
35- MD 189 at I-270 Ramps											
35	NB	47.1	D	NB Left	225	47	41	196	D	42.5	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	54.4	D	SB Left	348	54	124	453	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	28.0	C	EB Left	479	32	91	341	C		
				EB Through	373	23	91	341	C		
				EB Right	0	0	0	0	A		
	WB	50.8	D	WB Left	443	54	111	336	D		
				WB Through	428	47	111	336	D		
				WB Right	0	0	0	0	A		
36- MD 189 at Wootton Pkwy											
36	NB	45.9	D	NB Left	238	57	142	506	E	52.4	D
				NB Through	694	51	142	506	D		
				NB Right	176	12	142	506	B		
	SB	82.8	F	SB Left	250	101	295	794	F		
				SB Through	926	78	312	780	E		
				SB Right	0	0	0	0	A		
	EB	38.7	D	EB Left	153	72	123	486	E		
				EB Through	552	38	123	486	D		
				EB Right	204	15	123	486	B		
	WB	39.5	D	WB Left	157	72	141	743	E		
				WB Through	775	41	141	743	D		
				WB Right	315	19	141	743	B		
37- Montrose Rd at Tower Oaks Blvd											
37	NB	0.4	A	NB Left	0	0	0	0	A	32.4	C
				NB Through	0	0	0	0	A		
				NB Right	537	0	0	0	A		
	SB	143.6	F	SB Left	87	49	213	902	D		
				SB Through	0	0	0	0	A		
				SB Right	305	171	269	899	F		
	EB	6.9	A	EB Left	0	0	0	0	A		
				EB Through	1868	7	39	520	A		
				EB Right	0	0	0	0	A		
	WB	40.0	D	WB Left	79	37	39	520	D		
				WB Through	2426	41	277	780	D		
				WB Right	261	30	277	780	C		
38- Tower Oaks Blvd at I-270 off ramp											
38	NB	23.3	C	NB Left	707	24	50	240	C	17.3	B
				NB Through	0	0.0	43	232	A		
				NB Right	26	7.0	50	240	A		
	SB	9.8	A	SB Left	8	18.4	1	39	B		
				SB Through	0	0.0	1	39	A		
				SB Right	9	2.2	0	23	A		
	EB	10.8	B	EB Left	1	11.5	16	177	B		
				EB Through	363	11.2	16	177	B		
				EB Right	37	7.0	11	167	A		
	WB	12.7	B	WB Left	139	16.3	16	145	B		
				WB Through	203	10.4	16	145	B		
				WB Right	3	3.4	3	100	A		
39- Montrose Rd at Tower Oaks Blvd											
39	NB	20.0	C	NB Left	97	42	83	387	D	45.0	D
				NB Through	773	32	83	387	C		
				NB Right	621	2	0	0	A		
	SB	32.1	C	SB Left	210	63	76	334	E		
				SB Through	506	23	74	333	C		
				SB Right	131	15	72	340	B		
	EB	133.4	F	EB Left	104	112	358	697	F		
				EB Through	518	136	360	698	F		
				EB Right	44	149	382	722	F		
	WB	36.9	D	WB Left	542	46	109	374	D		
				WB Through	456	42	110	374	D		
				WB Right	315	13	129	404	B		
40- Rockledge Blvd at I-270 NB on and off ramp											
40	NB	132.4	F	NB Left	0	0	0	0	A	112.4	F
				NB Through	335	121	557	836	F		
				NB Right	854	137	557	836	F		
	SB	85.9	F	SB Left	0	0	89	217	A		
				SB Through	352	86	89	217	F		
				SB Right	0	0	0	0	A		
	EB	93.5	F	EB Left	6	184	288	804	F		
				EB Through	459	148	288	804	F		
				EB Right	304	10	0	0	B		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table D.14: PM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
41- Rockledge Blvd at I-270 SB on and off ramps											
41	NB	30.3	C	NB Left	343	30	76	273	C	48.1	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	53.0	D	WB Left	355	59	195	867	E		
				WB Through	890	51	195	867	D		
				WB Right	0	0	0	0	A		
42- MD 187 at Tuckerman Ln											
42	NB	66.6	E	NB Left	216	39	567	1282	D	128.7	F
				NB Through	2309	68	567	1282	E		
				NB Right	200	76	567	1282	E		
	SB	187.6	F	SB Left	205	172	2555	2693	F		
				SB Through	1151	185	2555	2693	F		
				SB Right	306	209	2555	2693	F		
	EB	112.4	F	EB Left	302	66	540	1403	E		
				EB Through	534	136	541	1404	F		
				EB Right	118	121	564	1428	F		
	WB	195.5	F	WB Left	465	191	1941	2142	F		
				WB Through	674	211	1941	2142	F		
				WB Right	166	145	1941	2142	F		
43- MD 187 at I-270 NB on and off ramps											
43	NB	16.8	B	NB Left	566	35	117	404	C	20.4	C
				NB Through	2515	13	117	404	B		
				NB Right	0	0	0	0	A		
	SB	25.1	C	SB Left	0	0	0	0	A		
				SB Through	1290	25	66	269	C		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	60.3	E	WB Left	59	60	47	317	E		
				WB Through	67	60	47	317	E		
				WB Right	0	0	0	0	A		
44- MD 187 at I-270 NB on and off ramps											
44	NB	40.0	E	NB Left	0	0	0	0	A	36.9	D
				NB Through	2426	40	155	739	D		
				NB Right	0	0	0	0	A		
	SB	18.1	B	SB Left	147	56	67	271	E		
				SB Through	1203	13	67	271	B		
				SB Right	0	0	0	0	A		
	EB	58.2	E	EB Left	652	60	143	560	E		
				EB Through	0	0	143	560	A		
				EB Right	179	53	82	486	D		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
45- MD 187 at Rock Spring Dr											
45	NB	20.6	C	NB Left	492	37	123	826	D	29.8	C
				NB Through	2174	17	124	827	B		
				NB Right	18	14	145	860	B		
	SB	34.2	C	SB Left	21	62	111	472	E		
				SB Through	1186	39	111	472	D		
				SB Right	173	1	69	465	A		
	EB	50.0	D	EB Left	431	60	146	519	E		
				EB Through	50	68	146	519	E		
				EB Right	484	39	146	519	D		
	WB	17.1	B	WB Left	7	29	6	108	C		
				WB Through	16	33	6	108	C		
				WB Right	36	8	3	97	A		
47-Democracy Blvd at I-270 NB off ramp											
47	NB	45.3	D	NB Left	154	45	28	136	D	3.0	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	1.2	A	EB Left	0	0	0	0	A		
				EB Through	1127	1	3	66	A		
				EB Right	0	0	0	0	A		
	WB	1.1	A	WB Left	0	0	0	0	A		
				WB Through	2241	1	3	84	A		
				WB Right	0	0	0	0	A		
48- Democracy Blvd at I-270 SB on ramp											
48	NB			NB Left	0	0	0	0	A	8.4	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	5.5	A	EB Left	0	0	0	0	A		
				EB Through	1336	5	19	232	A		
				EB Right	0	0	0	0	A		
	WB	10.1	B	WB Left	543	35	59	404	D		
				WB Through	1827	3	49	383	A		
				WB Right	0	0	0	0	A		
49- Democracy Blvd at I-270 SB off ramp											
49	NB			NB Left	0	0	0	0	A	8.8	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	37.4	D	SB Left	154	51	28	143	D		
				SB Through	0	0	0	0	A		
				SB Right	59	2	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	5.8	A	WB Left	0	0	0	0	A		
				WB Through	1827	4	19	305	A		
				WB Right	156	29	116	746	C		
50- MD 190 at Burdette Rd											
50	NB	76.4	E	NB Left	27	79	18	118	E	36.6	D
				NB Through	7	69	18	118	E		
				NB Right	6	75	18	118	E		
	SB	37.5	D	SB Left	45	77	25	148	E		
				SB Through	9	72	25	148	E		
				SB Right	122	20	25	148	C		
	EB	21.6	C	EB Left	138	99	113	625	F		
				EB Through	1297	14	113	625	B		
				EB Right	31	4	99	653	A		
	WB	45.7	D	WB Left	13	114	390	1119	F		
				WB Through	2161	46	390	1119	D		
				WB Right	65	35	390	1119	C		

Table D.14: PM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
51- MD 190 at I-270 NB on ramp											
51	NB			NB Left	0	0	0	0	A	17.6	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	65.7	E	EB Left	254	66	101	343	E		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	9.3	A	WB Left	0	0	0	0	A		
				WB Through	1471	9	49	692	A		
				WB Right	0	0	0	0	A		
52- MD 190 at I-270 SB off ramp											
52	NB	70.5	E	NB Left	225	70	84	800	E	12.3	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	3.6	A	EB Left	0	0	0	0	A		
				EB Through	1062	4	8	176	A		
				EB Right	0	0	0	0	A		
	WB	10.0	A	WB Left	0	0	0	0	A		
				WB Through	1641	10	30	635	A		
				WB Right	0	0	0	0	A		
53- MD 190 at Seven Locks Rd											
53	NB	0.5	A	NB Left	28	1	0	0	A	26.9	C
				NB Through	314	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	52.6	D	SB Left	364	52	120	414	D		
				SB Through	232	53	120	414	D		
				SB Right	20	50	120	414	D		
	EB	32.0	C	EB Left	27	30	95	436	C		
				EB Through	800	32	95	436	C		
				EB Right	45	32	95	436	C		
	WB	20.8	C	WB Left	255	75	124	491	E		
				WB Through	914	18	124	491	B		
				WB Right	693	5	124	491	A		
54- MD 124 at I-270 NB off ramp											
54	NB	31.3	C	NB Left	0	0	0	0	A	23.6	C
				NB Through	0	0	0	0	A		
				NB Right	556	31	56	630	C		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	21.1	C	EB Left	0	0	0	0	A		
				EB Through	1661	21	57	938	C		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
55- Democracy Blvd at I-270 NB off ramp											
55	NB	46.2	D	NB Left	0	0	0	0	A	11.2	B
				NB Through	0	0	0	0	A		
				NB Right	313	46	51	205	D		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	1.5	A	EB Left	0	0	0	0	A		
				EB Through	1128	2	4	59	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
56- Watkins Mill Rd at I-270 SB off ramp/Parkview Ave											
56	NB	71.3	E	NB Left	145	53	170	656	D	87.9	F
				NB Through	0	0	0	0	A		
				NB Right	342	79	170	656	E		
	SB	42.7	D	SB Left	410	63	107	388	E		
				SB Through	110	59	107	388	E		
				SB Right	441	20	107	388	C		
	EB	143.5	F	EB Left	0	0	0	0	A		
				EB Through	1216	144	961	1246	F		
				EB Right	4	136	961	1246	F		
	WB	41.9	D	WB Left	62	85	49	220	F		
				WB Through	295	33	47	219	C		
				WB Right	0	0	0	0	A		
57- Watkins Mill Rd at I-270 NB on ramp											
57	NB	40.5	D	NB Left	77	65	56	638	E	72.4	E
				NB Through	0	0	0	0	A		
				NB Right	193	31	56	638	C		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	26.1	C	EB Left	644	66	146	438	E		
				EB Through	1051	2	146	438	A		
				EB Right	0	0	0	0	A		
	WB	157.1	F	WB Left	0	0	0	0	A		
				WB Through	684	122	651	866	F		
				WB Right	343	227	651	866	F		
58- Watkins Mill Rd at I-270 SB on ramp											
58	NB			NB Left	0	0	0	0	A	16.5	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	17.2	B	EB Left	0	0	0	0	A		
				EB Through	1691	19	150	598	B		
				EB Right	286	8	150	598	A		
	WB	14.8	B	WB Left	409	27	46	464	C		
				WB Through	352	1	46	464	A		
				WB Right	0	0	0	0	A		

Table D.15: PM Peak -2040 Variable Speed Limit- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
1- MD 85 at Sam's Club Drive											
1	NB	65.7	E	NB Left	134	78	507	885	E	120.1	F
				NB Through	571	40	507	885	D		
				NB Right	932	80	488	909	E		
	SB	181.0	F	SB Left	150	128	1023	1231	F		
				SB Through	861	187	1023	1231	F		
				SB Right	73	215	1023	1231	F		
	EB	34.5	C	EB Left	55	85	31	141	F		
				EB Through	24	81	31	141	F		
				EB Right	169	12	31	141	B		
	WB	175.2	F	WB Left	553	193	561	754	F		
				WB Through	29	184	561	754	F		
				WB Right	222	130	561	754	F		
2- MD 85 at I-270 NB on and off ramp											
2	NB	59.0	E	NB Left	1120	59	728	1874	E	47.5	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	30.1	C	SB Left	0	0	0	0	A		
				SB Through	736	30	115	551	C		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
3- MD 85 at I-270 SB on and off ramp											
3	NB	21.7	C	NB Left	0	0	0	0	A	23.4	C
				NB Through	1950	22	250	1380	C		
				NB Right	0	0	0	0	A		
	SB	42.8	D	SB Left	172	43	50	450	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
4- MD 85 at Crestwood Blvd											
4	NB	69.6	F	NB Left	74	97	373	869	F	51.3	D
				NB Through	1441	68	372	870	E		
				NB U-Turn	0	0	0	0	A		
	SB	29.3	C	SB Left	105	81	54	380	F		
				SB Through	938	29	89	801	C		
				SB Right	923	24	75	793	C		
	EB	65.5	E	EB Left	950	68	205	752	E		
				EB Through	43	52	205	752	D		
				EB Right	28	2	205	752	A		
	WB	54.5	D	WB Left	44	79	62	239	E		
				WB Through	78	82	62	239	F		
				WB Right	94	20	62	239	B		
5- MD 80 at I-270 NB on and ramp											
5	NB	2.4	A	NB Left	2	15	0	8	B	11.4	B
				NB Through	1	0	0	8	A		
				NB Right	6	-1	0	8	A		
	SB	13.1	B	SB Left	470	16	27	158	B		
				SB Through	22	18	27	158	B		
				SB Right	147	3	0	0	A		
	EB	13.3	B	EB Left	97	14	24	287	B		
				EB Through	0	0	8	0	A		
				EB Right	5	7	37	317	A		
	WB	10.5	B	WB Left	15	12	0	30	B		
				WB Through	673	18	65	472	B		
				WB Right	612	2	0	18	A		
6- MD 80 at I-270 SB on and off ramp											
6	NB	4.0	A	NB Left	55	4	5	269	A	6.2	A
				NB Through	0	0	0	0	A		
				NB Right	605	4	5	269	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	7.4	A	EB Left	0	0	0	0	A		
				EB Through	382	8	4	103	A		
				EB Right	66	5	4	111	A		
	WB	8.2	A	WB Left	0	0	0	0	A		
				WB Through	443	8	3	137	A		
				WB Right	0	0	0	0	A		
7- MD 109 at I-270 NB on and off ramp											
7	NB			NB Left	0	0	0	0	A	7.1	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	13.8	B	SB Left	310	14	28	217	B		
				SB Through	0	0	0	0	A		
				SB Right	24	5	1	147	A		
	EB	2.5	A	EB Left	80	2	0	60	A		
				EB Through	0	0	0	0	A		
				EB Right	83	3	0	0	A		
	WB	0.4	A	WB Left	0	0	0	0	A		
				WB Through	222	0	0	0	A		
				WB Right	0	0	0	0	A		
8- MD 80 at I-270 SB on and off ramp											
8	NB	4.9	A	NB Left	63	8	3	124	A	1.9	A
				NB Through	0	0	0	0	A		
				NB Right	37	0	0	36	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.9	A	EB Left	0	0	0	0	A		
				EB Through	166	0	0	0	A		
				EB Right	34	4	0	0	A		
	WB	1.4	A	WB Left	137	1	0	59	A		
				WB Through	109	2	0	36	A		
				WB Right	0	0	0	0	A		
9- MD 121 at Gateway Center Dr											
9	NB	23.8	C	NB Left	584	28	93	574	C	42.4	D
				NB Through	784	22	93	574	C		
				NB Right	64	10	96	600	B		
	SB	21.1	C	SB Left	28	15	17	221	B		
				SB Through	301	22	29	221	C		
				SB Right	9	11	32	242	B		
	EB	15.3	C	EB Left	4	39	8	201	D		
				EB Through	24	40	16	218	D		
				EB Right	249	13	29	250	B		
	WB	109.5	F	WB Left	352	153	278	643	F		
				WB Through	76	67	278	642	E		
				WB Right	186	44	301	667	D		
10- MD 121 at I-270 NB on and off ramp											
10	NB	21.1	C	NB Left	367	59	74	286	F	17.9	B
				NB Through	0	0	0	0	A		
				NB Right	773	3	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	11.5	B	EB Left	0	0	0	0	A		
				EB Through	652	17	37	351	C		
				EB Right	335	1	0	5	A		
	WB	20.9	C	WB Left	219	63	93	476	F		
				WB Through	680	7	93	476	A		
				WB Right	0	0	0	0	A		

Table D.15: PM Peak -2040 Variable Speed Limit- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
11- MD 121 at I-270 SB on and off ramp											
11	NB			NB Left	0	0	0	0	A	23.7	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	68.3	E	SB Left	272	91	249	1008	F		
				SB Through	0	0	0	0	A		
				SB Right	253	44	0	43	E		
	EB	6.4	A	EB Left	0	0	0	0	A		
				EB Through	717	6	16	212	A		
				EB Right	0	0	0	0	A		
	WB	13.2	B	WB Left	0	0	0	0	A		
				WB Through	514	27	45	346	D		
				WB Right	538	0	0	0	A		
12- MD 27 at Observation Dr											
12	NB	37.5	D	NB U-Turn	0	0	0	0	A	25.1	C
				NB Through	94	55	22	98	E		
				NB Right	61	11	22	98	B		
	SB	41.3	D	SB Left	146	44	38	216	D		
				SB Through	57	62	44	250	E		
				SB Right	188	33	69	287	C		
	EB	19.0	B	EB Left	189	33	72	452	C		
				EB Through	2018	18	73	453	B		
				EB Right	97	15	86	491	B		
	WB	28.3	C	WB Left	41	24	153	744	C		
				WB Through	1695	29	153	744	C		
				WB Right	69	9	153	744	A		
13- MD 27 at I-270 NB off ramp											
13	NB	46.8	D	NB Left	305	47	55	251	D	6.3	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.1	A	EB Left	0	0	0	0	A		
				EB Through	1513	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	4.6	A	WB Left	0	0	0	0	A		
				WB Through	1791	5	34	579	A		
				WB Right	0	0	0	0	A		
14- MD 27 at I-270 SB off ramp											
14	NB			NB Left	0	0	0	0	A	5.3	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	51.9	D	SB Left	175	52	34	139	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	1.9	A	EB Left	0	0	0	0	A		
				EB Through	1677	2	5	84	A		
				EB Right	0	0	0	0	A		
	WB	3.7	A	WB Left	0	0	0	0	A		
				WB Through	1542	4	12	440	A		
				WB Right	0	0	0	0	A		
15- MD 27 at Crystal Rock Dr											
15	NB	31.1	C	NB Left	77	30	106	532	C	70.3	E
				NB Through	1196	31	115	532	C		
				NB Right	55	29	121	545	C		
	SB	57.4	E	SB Left	155	78	375	1193	E		
				SB Through	1454	60	375	1193	E		
				SB Right	223	29	358	1187	C		
	EB	40.6	D	EB Left	125	54	35	130	D		
				EB Through	49	36	30	125	D		
				EB Right	62	18	23	155	B		
	WB	162.5	F	WB Left	104	93	1053	1490	F		
				WB Through	127	107	1053	1490	F		
				WB Right	664	184	1053	1490	F		
16- MD 118 at Seneca Meadows Pkwy											
16	NB	5.1	A	NB Left	96	14	2	79	B	9.2	A
				NB Through	1310	4	12	207	A		
				NB Right	1	-1	20	260	A		
	SB	7.5	A	SB Left	16	8	19	298	A		
				SB Through	1226	8	22	298	A		
				SB Right	11	4	26	330	A		
	EB	14.0	B	EB Left	23	58	14	136	E		
				EB Through	0	65	14	136	E		
				EB Right	312	11	14	136	B		
	WB	53.8	D	WB Left	103	65	43	243	E		
				WB Through	7	69	39	242	E		
				WB Right	30	13	48	262	B		
17- MD 118 at I-270 NB on ramp											
17	NB			NB Left	0	0	0	0	A	13.6	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	25.8	C	EB Left	494	26	43	338	C		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	10.0	A	WB Left	0	0	0	0	A		
				WB Through	283	2	0	25	A		
				WB Right	1362	12	46	566	B		
18- MD 118 at I-270 SB off ramp											
18	NB			NB Left	0	0	0	0	A	7.0	A
				NB Through	0	0.0	0	0	A		
				NB Right	0	0.0	0	0	A		
	SB	37.9	D	SB Left	167	37.9	27	125	D		
				SB Through	0	0.0	0	0	A		
				SB Right	0	0.0	0	0	A		
	EB	5.7	A	EB Left	0	0.0	0	0	A		
				EB Through	1408	5.7	13	346	A		
				EB Right	0	0.0	0	0	A		
	WB	4.8	A	WB Left	0	0.0	0	0	A		
				WB Through	1490	4.8	11	255	A		
				WB Right	0	0.0	0	0	A		
19- MD 118 at Aircraft Dr											
19	NB	25.9	C	NB Left	52	70	42	237	E	43.2	D
				NB Through	53	69	42	237	E		
				NB Right	227	6	5	112	A		
	SB	165.9	F	SB Left	438	153	423	658	F		
				SB Through	14	220	423	658	F		
				SB Right	127	205	423	658	F		
	EB	22.3	C	EB Left	125	32	88	506	C		
				EB Through	1415	22	88	506	C		
				EB Right	21	20	88	506	B		
	WB	24.8	C	WB Left	15	26	107	719	C		
				WB Through	1392	29	107	719	C		
				WB Right	364	8	107	719	A		
20- Middlebrook Rd at Observation Dr											
20	NB			NB Left	0	0	0	0	A	9.0	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	20.4	C	SB Left	125	36	23	150	D		
				SB Through	0	0	0	0	A		
				SB Right	186	10	23	150	B		
	EB	5.7	A	EB Left	14	11	14	148	B		
				EB Through	1052	6	14	148	A		
				EB Right	0	0	0	0	A		
	WB	8.9	A	WB Left	0	0	0	0	A		
				WB Through	1313	9	28	278	A		
				WB Right	17	7	43	328	A		

Table D.15: PM Peak -2040 Variable Speed Limit- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
21- Middlebrook Rd at I-270 SB on ramp											
21	NB			NB Left	0	0	0	0	A	4.5	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	2.6	A	EB Left	0	0	0	0	A		
				EB Through	742	3	4	105	A		
				EB Right	0	0	0	0	A		
	WB	7.8	A	WB Left	438	8	5	247	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
22- Middlebrook Rd at Waring Station Rd											
22	NB	48.4	D	NB Left	200	46	83	309	D	13.6	B
				NB Through	1	55	83	309	D		
				NB Right	236	50	83	309	D		
	SB	30.6	C	SB Left	32	48	8	72	D		
				SB Through	2	38	8	72	D		
				SB Right	24	7	20	110	A		
	EB	8.0	A	EB Left	4	11	28	300	B		
				EB Through	1125	8	28	300	A		
				EB Right	198	7	28	300	A		
	WB	8.3	A	WB Left	209	21	27	287	C		
				WB Through	1437	7	27	287	A		
				WB Right	3	3	27	287	A		
23- MD 124 at MD 355											
23	NB	136.2	F	NB Left	498	119	714	1077	F	80.3	F
				NB Through	1171	144	711	1075	F		
				NB Right	7	101	0	0	F		
	SB	45.0	D	SB Left	180	94	146	474	F		
				SB Through	695	66	146	474	E		
				SB Right	718	12	42	446	B		
	EB	27.4	C	EB Left	294	70	110	648	E		
				EB Through	1634	25	110	648	C		
				EB Right	344	2	26	524	A		
	WB	127.9	F	WB Left	0	0	0	0	A		
				WB Through	1642	130	684	950	F		
				WB Right	89	83	0	4	F		
24- MD 124 at I-270 SB on and off											
24	NB	104.6	F	NB Left	54	103	62	172	F	62.2	E
				NB Through	21	109	62	172	F		
				NB U-Turn	0	0	0	0	A		
	SB	58.4	E	SB Left	551	100	205	877	F		
				SB Through	8	118	205	877	F		
				SB Right	456	8	12	367	A		
	EB	95.9	F	EB Left	0	0	0	0	A		
				EB Through	1444	95	577	1103	F		
				EB Right	24	148	597	1126	F		
	WB	21.1	C	WB Left	5	66	582	1870	E		
				WB Through	1184	21	582	1870	C		
				WB Right	0	0	0	0	A		
25- MD 117 at MD 124											
25	NB	74.4	E	NB Left	56	149	309	746	F	48.7	D
				NB Through	690	88	309	746	F		
				NB Right	462	45	38	690	D		
	SB	37.2	D	SB Left	134	61	148	636	E		
				SB Through	971	40	148	636	D		
				SB Right	182	4	0	0	A		
	EB	45.2	D	EB Left	151	80	154	573	F		
				EB Through	1156	41	154	574	D		
				EB Right	57	37	157	601	D		
	WB	40.9	D	WB Left	310	70	192	990	E		
				WB Through	1062	36	192	990	D		
				WB Right	98	1	0	0	A		
26- MD 117 at Bureau Dr											
26	NB	49.4	D	NB Left	99	72	79	303	E	37.4	D
				NB Through	35	79	79	303	E		
				NB Right	271	37	79	303	D		
	SB	81.1	F	SB Left	286	95	132	408	F		
				SB Through	22	90	132	408	F		
				SB Right	83	31	132	408	C		
	EB	31.3	C	EB Left	52	60	166	836	E		
				EB Through	1687	30	167	836	C		
				EB Right	6	22	160	826	C		
	WB	29.9	C	WB Left	13	38	171	1024	D		
				WB Through	1264	32	172	1025	C		
				WB Right	212	19	197	1073	B		
27- MD 117 at I-270 SB off ramp											
27	NB			NB Left	0	0	0	0	A	12.4	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	3.7	A	EB Left	0	0	0	0	A		
				EB Through	944	4	7	471	A		
				EB Right	0	0	0	0	A		
	WB	39.3	E	WB Left	306	39	91	840	E		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
28- MD 117 at I-270 NB off ramp											
28	NB			NB Left	0	0	0	0	A	21.8	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	72.8	E	SB Left	100	82	1036	2118	F		
				SB Through	0	0	0	0	A		
				SB Right	381	70	1037	2117	E		
	EB	17.3	B	EB Left	4	104	89	968	F		
				EB Through	946	17	89	968	B		
				EB Right	0	0	0	0	A		
	WB	7.3	A	WB Left	0	0	0	0	A		
				WB Through	1391	7	49	381	A		
				WB Right	0	0	49	381	A		
29- MD 117 at Perry Pkwy											
29	NB	39.8	D	NB Left	19	61	16	125	E	46.9	D
				NB Through	26	53	16	124	D		
				NB Right	33	17	25	145	B		
	SB	157.8	F	SB Left	238	195	273	460	F		
				SB Through	20	212	273	460	F		
				SB Right	117	72	273	460	E		
	EB	20.1	C	EB Left	220	67	76	328	E		
				EB Through	777	7	76	328	A		
				EB Right	30	6	61	312	A		
	WB	38.9	D	WB Left	36	108	234	742	F		
				WB Through	1253	40	234	742	D		
				WB Right	381	30	234	742	C		
30- Shady Grove Rd at I-270 NB off ramp											
30	NB	7.0	A	NB Left	0	0	0	0	A	27.5	C
				NB Through	963	7	14	187	A		
				NB Right	0	0	0	0	A		
	SB	40.8	D	SB Left	0	0	0	0	A		
				SB Through	1051	41	129	560	D		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	48.9	D	WB Left	264	49	46	232	D		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table D.15: PM Peak -2040 Variable Speed Limit- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
31- Shady Grove Rd at I-270 SB off ramp											
31	NB	18.3	B	NB Left	0	0	0	0	A	23.1	C
				NB Through	1321	18	322	1766	B		
				NB Right	0	0	0	0	A		
	SB	5.4	A	SB Left	0	0	0	0	A		
				SB Through	688	5	7	173	A		
				SB Right	0	0	0	0	A		
	EB	57.9	E	EB Left	232	56	47	213	E		
				EB Through	0	0	0	0	A		
				EB Right	303	59	65	255	E		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
32- MD 28 at I-270 SB off ramp											
32	NB			NB U-Turn	0	0	0	0	A	8.0	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	36.8	D	SB Left	414	45	70	294	D		
				SB Through	0	0	0	0	A		
				SB Right	97	3	0	37	A		
	EB	3.0	A	EB Left	0	0	0	0	A		
				EB Through	1560	1	0	0	A		
				EB Right	931	6	15	216	A		
	WB	6.8	A	WB Left	0	0	0	0	A		
				WB Through	1623	7	20	271	A		
				WB Right	0	0	0	0	A		
33- MD 28 at I-270 on and off ramps											
33	NB	36.4	D	NB Left	0	0	40	227	A	38.0	D
				NB Through	184	50	48	236	D		
				NB Right	119	16	48	236	B		
	SB	137.6	F	SB Left	14	152	361	409	F		
				SB Through	0	0	0	0	A		
				SB Right	220	137	361	409	F		
	EB	19.3	B	EB Left	283	59	90	329	E		
				EB Through	925	7	90	329	A		
				EB Right	0	0	0	0	A		
	WB	37.9	D	WB Left	42	31	158	414	C		
				WB Through	1292	38	134	377	D		
				WB Right	0	0	0	0	A		
34- MD 189 at Great Falls Rd											
34	NB	36.9	D	NB Left	43	46	12	95	D	13.6	B
				NB Through	14	48	9	94	D		
				NB Right	19	9	9	105	A		
	SB	3.5	A	SB Left	18	42	7	83	D		
				SB Through	13	48	7	83	D		
				SB Right	408	0	3	89	A		
	EB	11.9	B	EB Left	406	24	41	445	C		
				EB Through	635	5	5	148	A		
				EB Right	55	3	10	184	A		
	WB	18.7	B	WB Left	14	19	53	489	B		
				WB Through	841	19	53	489	B		
				WB Right	18	14	68	523	B		
35- MD 189 at I-270 Ramps											
35	NB	46.9	D	NB Left	220	47	38	208	D	42.6	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	54.7	D	SB Left	349	55	122	469	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	28.6	C	EB Left	466	33	104	501	C		
				EB Through	372	23	104	501	C		
				EB Right	0	0	0	0	A		
	WB	50.2	D	WB Left	442	55	110	277	E		
				WB Through	428	45	110	277	D		
				WB Right	0	0	0	0	A		
36- MD 189 at Wootton Pkwy											
36	NB	46.8	D	NB Left	238	59	144	501	E	53.1	D
				NB Through	694	51	144	501	D		
				NB Right	176	13	144	501	B		
	SB	84.2	F	SB Left	250	107	297	795	F		
				SB Through	925	78	315	782	E		
				SB Right	0	0	0	0	A		
	EB	39.7	D	EB Left	152	73	129	471	E		
				EB Through	555	40	129	471	D		
				EB Right	204	15	129	471	B		
	WB	39.2	D	WB Left	156	71	136	649	E		
				WB Through	768	41	136	649	D		
				WB Right	314	19	136	649	B		
37- Montrose Rd at Tower Oaks Blvd											
37	NB	0.4	A	NB Left	0	0	0	0	A	33.5	C
				NB Through	0	0	0	0	A		
				NB Right	537	0	0	0	A		
	SB	135.3	F	SB Left	87	50	174	578	D		
				SB Through	0	0	0	0	A		
				SB Right	303	160	267	617	F		
	EB	6.9	A	EB Left	0	0	0	0	A		
				EB Through	1868	7	41	498	A		
				EB Right	0	0	0	0	A		
	WB	43.8	D	WB Left	78	40	41	498	D		
				WB Through	2342	45	287	788	D		
				WB Right	253	33	287	788	C		
38- Tower Oaks Blvd at I-270 off ramp											
38	NB	23.0	C	NB Left	705	24	49	235	C	17.7	B
				NB Through	0	0.0	42	227	A		
				NB Right	26	8.5	49	235	A		
	SB	10.8	B	SB Left	9	19.3	1	39	B		
				SB Through	0	0.0	1	39	A		
				SB Right	9	2.3	0	23	A		
	EB	12.5	B	EB Left	1	5.2	18	205	A		
				EB Through	363	12.9	18	205	B		
				EB Right	37	8.6	13	195	A		
	WB	12.8	B	WB Left	134	16.5	15	141	B		
				WB Through	197	10.4	16	141	B		
				WB Right	3	3.0	3	97	A		
39- Montrose Rd at Tower Oaks Blvd											
39	NB	19.8	B	NB Left	97	41	82	386	D	43.7	D
				NB Through	773	31	82	386	C		
				NB Right	621	2	0	0	A		
	SB	32.7	C	SB Left	211	65	77	343	E		
				SB Through	505	24	75	342	C		
				SB Right	131	15	78	360	B		
	EB	121.8	F	EB Left	104	103	323	670	F		
				EB Through	527	125	324	670	F		
				EB Right	44	128	346	694	F		
	WB	37.6	D	WB Left	530	46	109	377	D		
				WB Through	444	44	110	377	D		
				WB Right	307	14	130	407	B		
40- Rockledge Blvd at I-270 NB on and off ramp											
40	NB	134.6	F	NB Left	0	0	0	0	A	110.2	F
				NB Through	335	119	568	846	F		
				NB Right	851	141	568	846	F		
	SB	86.5	F	SB Left	0	0	90	219	A		
				SB Through	356	86	90	219	F		
				SB Right	0	0	0	0	A		
	EB	83.5	F	EB Left	6	152	255	764	F		
				EB Through	460	134	255	764	F		
				EB Right	307	7	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table D.15: PM Peak -2040 Variable Speed Limit- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS	
41- Rockledge Blvd at I-270 SB on and off ramps												
41	NB	30.5	C	NB Left	340	30	75	261	C	53.2	D	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	59.4	E		WB Left	355	67	225	901			E
					WB Through	891	57	225	901			E
					WB Right	0	0	0	0			A
42- MD 187 at Tuckerman Ln												
42	NB	72.2	E	NB Left	210	48	615	1306	D	132.0	F	
				NB Through	2298	74	615	1306	E			
				NB Right	200	78	615	1306	E			
	SB	191.7	F		SB Left	203	171	2567	2701			F
					SB Through	1137	190	2567	2701			F
					SB Right	301	211	2567	2701			F
	EB	111.4	F		EB Left	301	65	505	1390			E
					EB Through	535	135	506	1391			F
					EB Right	118	121	529	1415			F
	WB	196.7	F		WB Left	461	189	1940	2148			F
					WB Through	670	213	1940	2148			F
					WB Right	166	151	1940	2148			F
43- MD 187 at I-270 NB on and off ramps												
43	NB	17.6	B	NB Left	563	33	122	415	C	20.8	C	
				NB Through	2507	14	122	415	B			
				NB Right	0	0	0	0	A			
	SB	24.4	C		SB Left	0	0	0	0			A
					SB Through	1278	24	64	252			C
					SB Right	0	0	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	62.2	E		WB Left	60	62	47	310			E
					WB Through	67	63	47	310			E
					WB Right	0	0	0	0			A
44- MD 187 at I-270 NB on and off ramps												
44	NB	42.4	E	NB Left	0	0	0	0	A	39.4	D	
				NB Through	2421	42	174	824	D			
				NB Right	0	0	0	0	A			
	SB	18.6	B		SB Left	145	53	66	293			D
					SB Through	1192	14	66	293			B
					SB Right	0	0	0	0			A
	EB	64.6	E		EB Left	648	66	164	652			E
					EB Through	0	0	164	652			A
					EB Right	181	61	84	622			E
	WB				WB Left	0	0	0	0			A
					WB Through	0	0	0	0			A
					WB Right	0	0	0	0			A
45- MD 187 at Rock Spring Dr												
45	NB	20.1	C	NB Left	492	36	120	886	D	30.2	C	
				NB Through	2184	17	120	887	B			
				NB Right	18	14	141	920	B			
	SB	37.4	D		SB Left	20	65	122	596			E
					SB Through	1180	42	122	596			D
					SB Right	172	1	85	590			A
	EB	49.0	D		EB Left	431	60	143	522			E
					EB Through	50	66	143	522			E
					EB Right	482	38	143	522			D
	WB	16.8	B		WB Left	7	30	6	116			C
					WB Through	16	31	6	116			C
					WB Right	36	8	3	105			A
47-Democracy Blvd at I-270 NB off ramp												
47	NB	44.3	D	NB Left	153	44	29	128	D	2.9	A	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB	1.2	A		EB Left	0	0	0	0			A
					EB Through	1137	1	3	54			A
					EB Right	0	0	0	0			A
	WB	1.0	A		WB Left	0	0	0	0			A
					WB Through	2240	1	3	53			A
					WB Right	0	0	0	0			A
48- Democracy Blvd at I-270 SB on ramp												
48	NB			NB Left	0	0	0	0	A	8.2	A	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB	5.3	A		EB Left	0	0	0	0			A
					EB Through	1345	5	19	256			A
					EB Right	0	0	0	0			A
	WB	9.8	A		WB Left	542	34	58	349			C
					WB Through	1826	3	48	328			A
					WB Right	0	0	0	0			A
49- Democracy Blvd at I-270 SB off ramp												
49	NB			NB Left	0	0	0	0	A	9.0	A	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB	39.1	D		SB Left	154	53	30	161			D
					SB Through	0	0	0	0			A
					SB Right	59	3	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	5.8	A		WB Left	0	0	0	0			A
					WB Through	1826	4	20	290			A
					WB Right	157	29	105	755			C
50- MD 190 at Burdette Rd												
50	NB	76.5	E	NB Left	27	79	18	118	E	37.5	D	
				NB Through	7	69	18	118	E			
				NB Right	6	75	18	118	E			
	SB	35.0	C		SB Left	44	76	24	143			E
					SB Through	9	72	24	143			E
					SB Right	122	18	24	143			B
	EB	25.2	C		EB Left	136	102	136	754			F
					EB Through	1292	18	136	754			B
					EB Right	31	7	132	781			A
	WB	45.1	D		WB Left	13	126	393	1118			F
					WB Through	2143	45	393	1118			D
					WB Right	64	36	393	1118			D

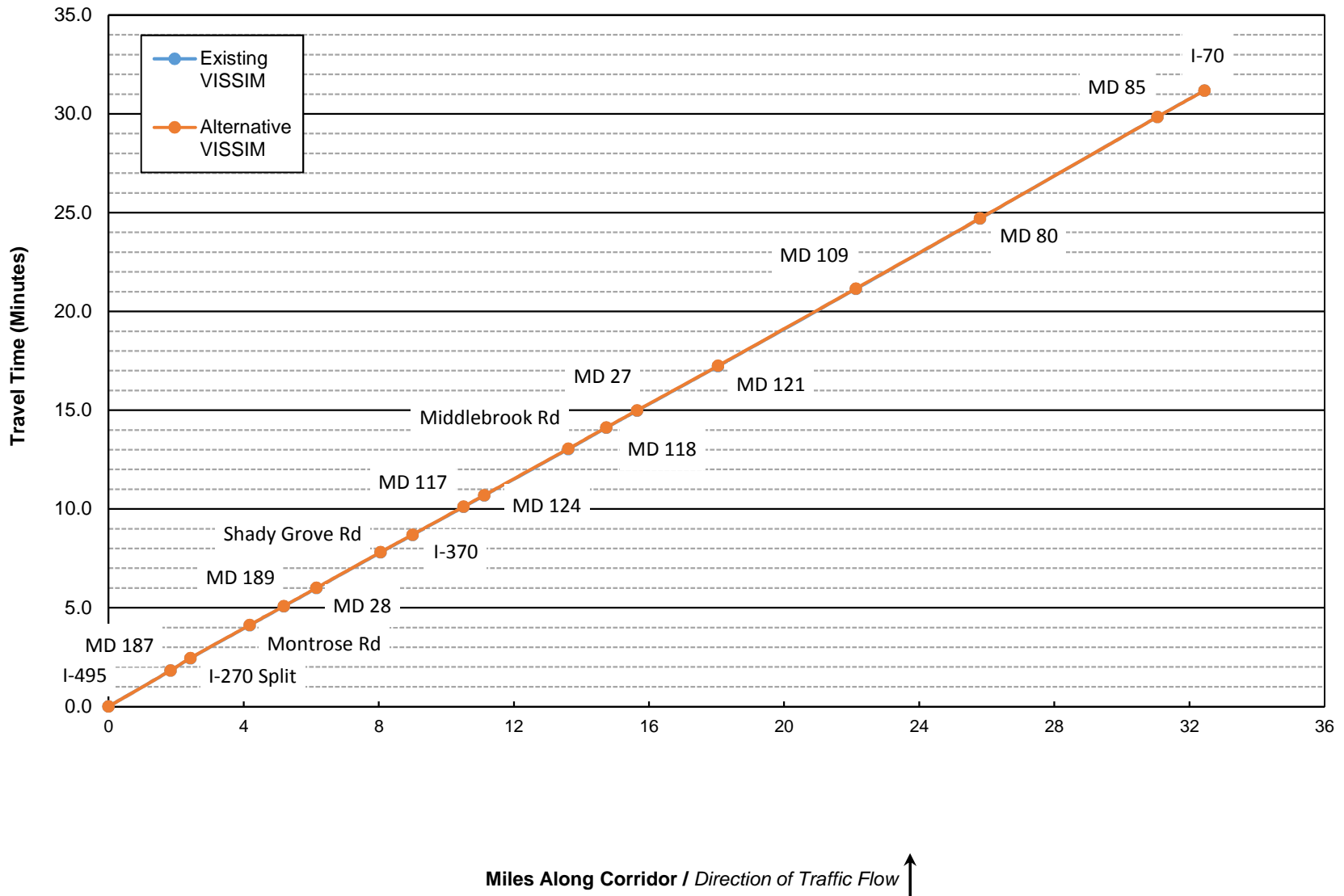
Table D.15: PM Peak -2040 Variable Speed Limit- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
51- MD 190 at I-270 NB on ramp											
51	NB			NB Left	0	0	0	0	A	18.4	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	67.0	E	EB Left	253	67	104	376	E		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	10.0	A	WB Left	0	0	0	0	A		
				WB Through	1461	10	51	754	A		
				WB Right	0	0	0	0	A		
52- MD 190 at I-270 SB off ramp											
52	NB	70.7	E	NB Left	228	71	87	769	E	12.6	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	3.5	A	EB Left	0	0	0	0	A		
				EB Through	1062	4	8	185	A		
				EB Right	0	0	0	0	A		
	WB	10.3	B	WB Left	0	0	0	0	A		
				WB Through	1629	10	27	704	B		
				WB Right	0	0	0	0	A		
53- MD 190 at Seven Locks Rd											
53	NB	0.5	A	NB Left	28	1	0	0	A	26.8	C
				NB Through	314	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	52.7	D	SB Left	364	53	120	414	D		
				SB Through	232	53	120	414	D		
				SB Right	20	50	120	414	D		
	EB	31.6	C	EB Left	27	30	94	436	C		
				EB Through	800	32	94	436	C		
				EB Right	45	32	94	436	C		
	WB	20.8	C	WB Left	253	76	124	566	E		
				WB Through	908	17	124	566	B		
				WB Right	691	5	124	566	A		
54- MD 124 at I-270 NB off ramp											
54	NB	26.7	C	NB Left	0	0	0	0	A	22.8	C
				NB Through	0	0	0	0	A		
				NB Right	553	27	54	653	C		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	21.6	C	EB Left	0	0	0	0	A		
				EB Through	1696	22	100	1104	C		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
55- Democracy Blvd at I-270 NB off ramp											
55	NB	47.0	D	NB Left	0	0	0	0	A	11.3	B
				NB Through	0	0	0	0	A		
				NB Right	313	47	50	189	D		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	1.5	A	EB Left	0	0	0	0	A		
				EB Through	1138	2	4	67	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
56- Watkins Mill Rd at I-270 SB off ramp/Parkview Ave											
56	NB	67.9	E	NB Left	145	54	154	597	D	84.6	F
				NB Through	0	0	0	0	A		
				NB Right	339	74	154	597	E		
	SB	43.1	D	SB Left	405	63	113	403	E		
				SB Through	110	60	113	403	E		
				SB Right	442	21	113	403	C		
	EB	134.9	F	EB Left	0	0	0	0	A		
				EB Through	1259	135	940	1247	F		
				EB Right	4	134	940	1247	F		
	WB	39.3	D	WB Left	61	80	48	240	F		
				WB Through	288	31	46	238	C		
				WB Right	0	0	0	0	A		
57- Watkins Mill Rd at I-270 NB on ramp											
57	NB	37.2	D	NB Left	80	72	50	579	E	71.4	E
				NB Through	0	0	0	0	A		
				NB Right	195	23	50	579	C		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	25.5	C	EB Left	654	64	141	439	E		
				EB Through	1064	2	141	439	A		
				EB Right	0	0	0	0	A		
	WB	158.8	F	WB Left	0	0	0	0	A		
				WB Through	671	123	649	863	F		
				WB Right	337	230	649	863	F		
58- Watkins Mill Rd at I-270 SB on ramp											
58	NB			NB Left	0	0	0	0	A	15.5	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	15.8	B	EB Left	0	0	0	0	A		
				EB Through	1712	17	147	564	B		
				EB Right	291	7	147	564	A		
	WB	14.6	B	WB Left	403	27	46	424	C		
				WB Through	348	1	46	424	A		
				WB Right	0	0	0	0	A		

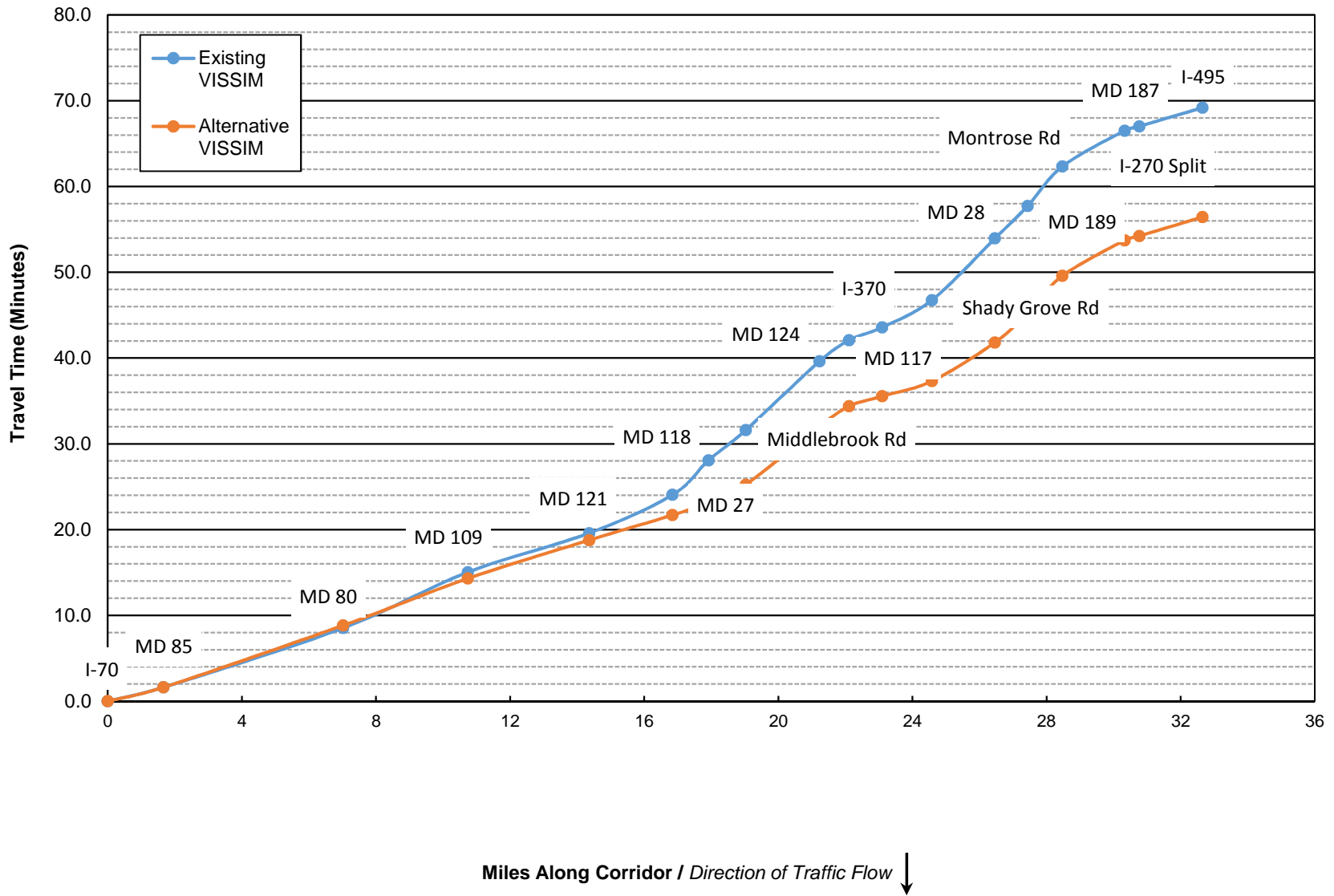
Table D.16: PM Peak - 2040 Variable Speed Limit- I-270 Vehicle Network Performance

	No-Build	VSL	% Change
Total Delay	36,237,078	35,698,182	-1%
Average Delay per Vehicle	307	303	-2%
Total Travel Time	67,865,560	68,362,656	1%
Vehicles (Arrived)	95,124	95,100	0%
Latent Demand	8,861	8,745	-1%
Latent Delay	13,484,325	13,554,643	1%
Total Distance	477,455	476,619	0%
Average Speed	25	25	-1%

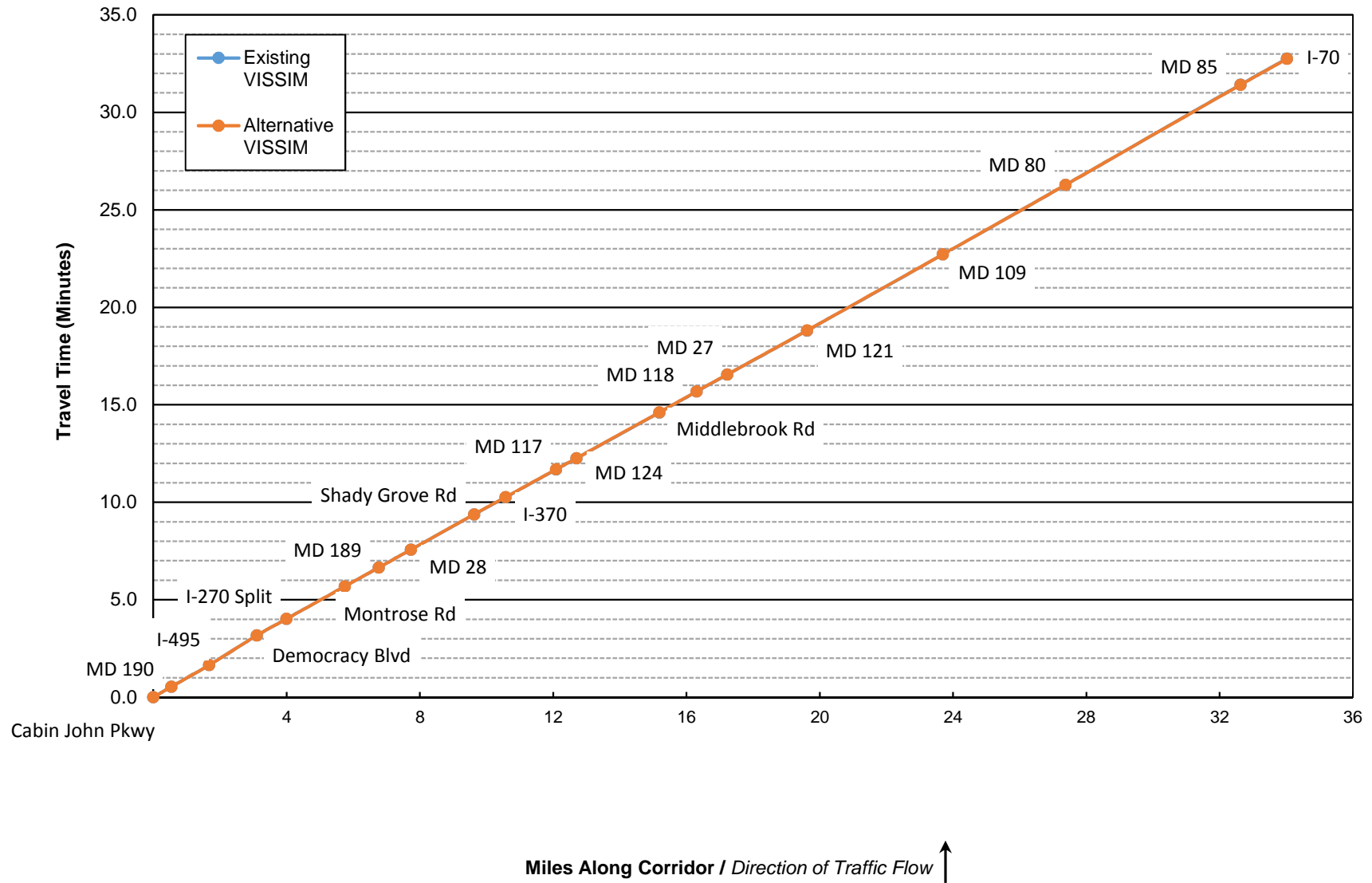
**Figure A.1: AM Peak - 2015 Adaptive Ramp Metering
I-270 Travel Time Graph - Northbound**



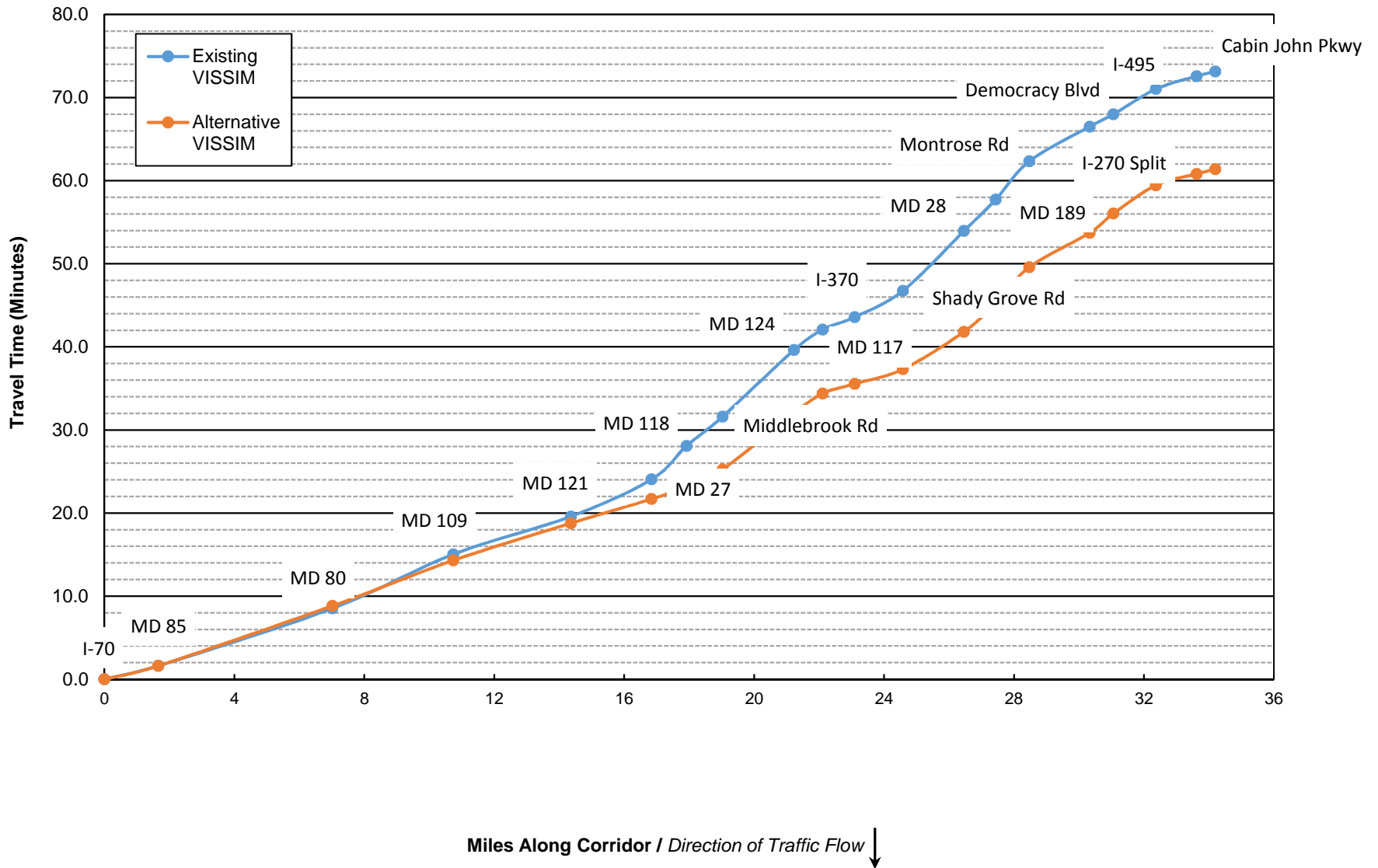
**Figure A.2: AM Peak - 2015 Adaptive Ramp Metering
I-270 Travel Time Graph - Southbound**



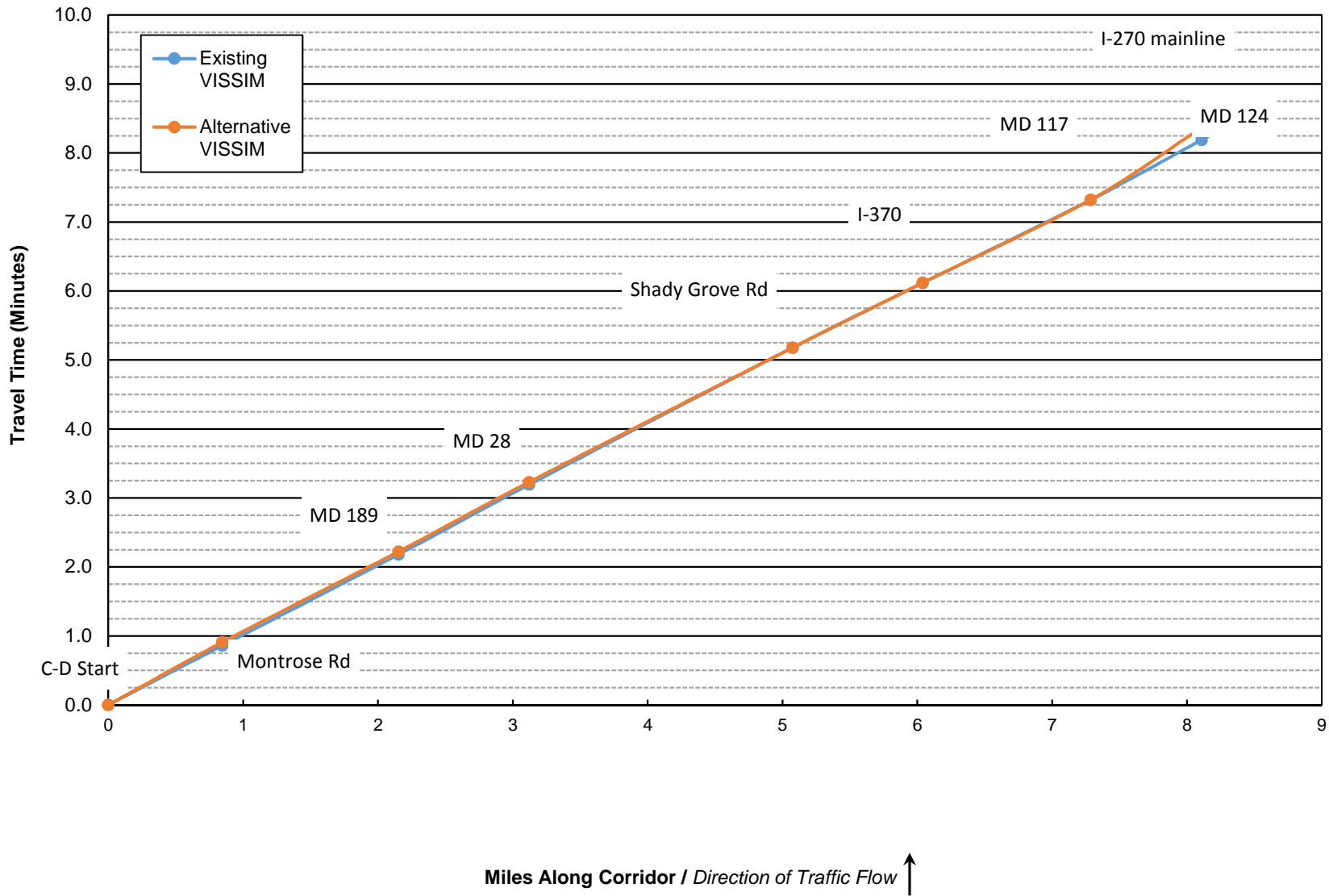
**Figure A.3: AM Peak - 2015 Adaptive Ramp Metering
I-270 Spur Travel Time Graph - Northbound**



**Figure A.4: AM Peak - 2015 Adaptive Ramp Metering
I-270 Spur Travel Time Graph - Southbound**



**Figure A.5: AM Peak - 2015 Adaptive Ramp Metering
I-270 Local Travel Time Graph - Northbound**



**Figure A.6: AM Peak - 2015 Adaptive Ramp Metering
I-270 Local Travel Time Graph - Southbound**

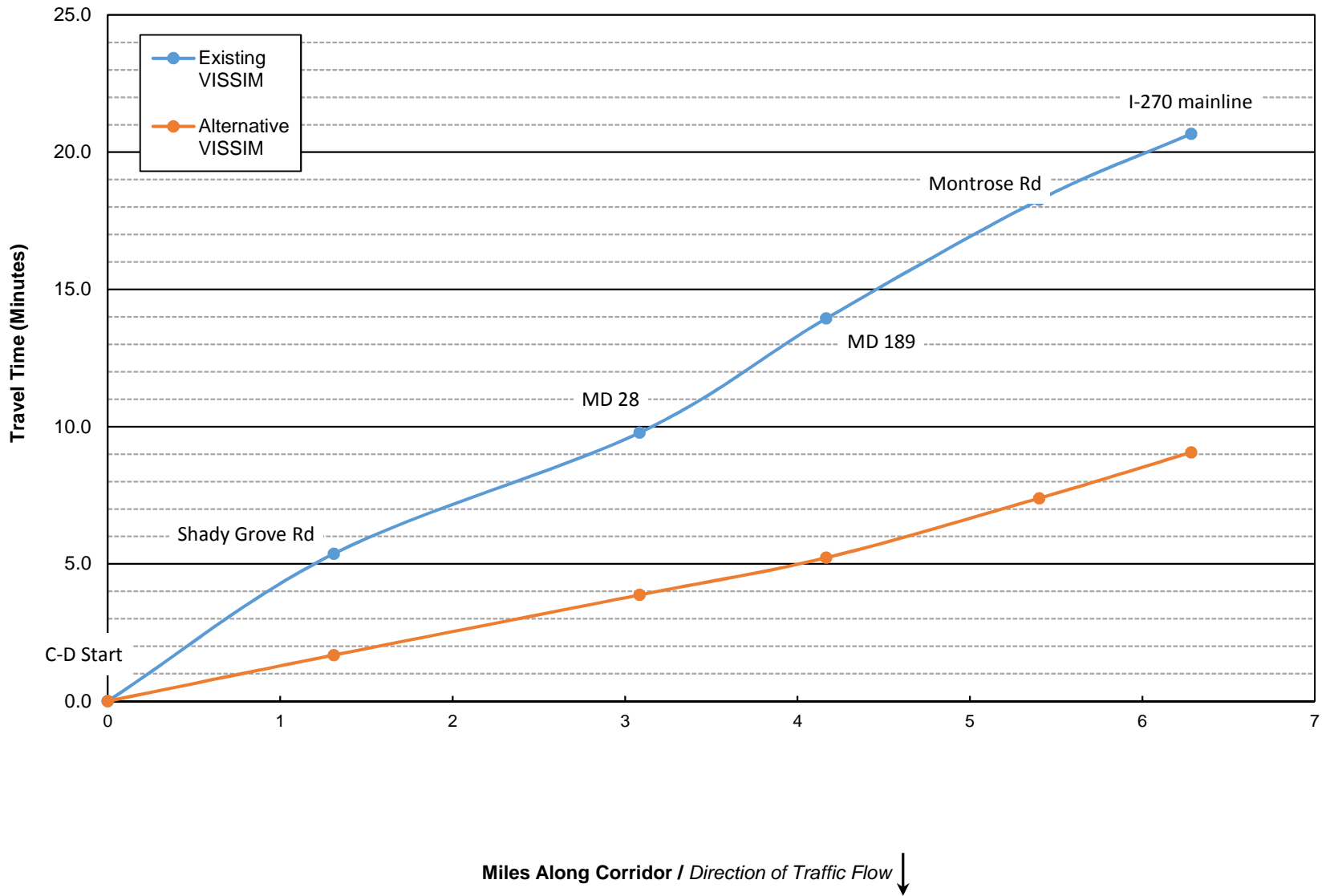


Table A.1: AM Peak -2015 Adaptive Ramp Metering- I-270 Vehicle Travel Time

I-270 Northbound	Segment Length (miles)	Existing VISSIM Travel Time (seconds)	ARM VISSIM Travel Time (seconds)	% Change	I-270 Southbound	RITIS Segment Number	Segment Length (miles)	Existing VISSIM Travel Time (seconds)	ARM VISSIM Travel Time (seconds)	% Change
From I-495 interchange					From I-70					
to MD 187	1.8	109.0	109.2	0%	to MD 85	5001+5002	1.7	97.0	97.0	0%
to I-270 Split	0.6	37.5	38.0	1%	to MD 80	5003+5004	5.4	414.5	432.9	4%
to Montrose Rd	1.8	100.1	100.3	0%	to MD 109	5005+5006	3.7	390.6	328.4	-16%
to MD 189	1.0	57.6	57.6	0%	to MD 121	5007+5008	3.6	273.2	268.1	-2%
to MD 28	1.0	55.1	55.2	0%	to MD 27	5009+5010	2.5	267.9	175.2	-35%
to Shady Grove Rd	1.9	108.4	108.6	0%	to MD 118	5011+5012	1.1	241.4	87.8	-64%
to I-370	0.9	53.0	53.0	0%	to Middlebrook Rd	5013+5014	1.1	211.7	125.4	-41%
to MD 117	1.5	85.5	85.4	0%	to MD 124	5015+5016	2.2	480.5	407.7	-15%
to MD 124	0.6	34.5	34.5	0%	to MD 117	5017+5018	0.9	148.4	141.2	-5%
to Middlebrook Rd	2.5	140.9	141.0	0%	to I-370	5019+5020	1.0	90.2	69.8	-23%
to MD 118	1.1	64.8	64.7	0%	to Shady Grove Rd	5021+5022	1.5	190.3	105.6	-44%
to MD 27	0.9	51.8	51.9	0%	to MD 28	5023+5024	1.9	431.1	270.2	-37%
to MD 121	2.4	135.3	135.3	0%	to MD 189	5025+5026	1.0	227.1	208.6	-8%
to MD 109	4.1	234.5	234.5	0%	to Montrose Rd	5027+5028	1.0	276.2	257.1	-7%
to MD 80	3.7	213.8	213.5	0%	to I-270 Split	5029+5030	1.9	250.6	248.4	-1%
to MD 85	5.3	309.0	308.1	0%	to MD 187	5031+5032	0.4	30.0	30.4	1%
to I-70	1.4	79.9	79.8	0%	to I-495 interchange	5033+5034	1.9	131.8	133.0	1%
I-270 Total (miles/minutes)	32.4	31.2	31.2	0%	I-270 Total (miles/minutes)		32.7	69.2	56.4	-18%
I-270 Spur Northbound					I-270 Spur Southbound					
From Cabin John Pkwy					From I-70					
to MD 190	0.5	32.2	32.2	0%	to I-270 Split	5001 - 5030	30.3	3,990.6	3,223.1	-19%
to I-495	1.1	66.7	66.7	0%	to Democracy Blvd	5040+5041	0.7	88.4	139.5	58%
to Democracy Blvd	1.4	91.2	91.2	0%	to I-495	5042+5043	1.3	183.1	204.0	11%
to I-270 Split	0.9	51.0	51.0	0%	to MD 190	5044	1.3	92.2	82.0	-11%
to I-70	30.0	1,724.3	1,723.5	0%	to Cabin John Pkwy	5045	0.6	35.0	34.9	0%
I-270 Spur Total (miles/minutes)	34.0	32.8	32.7	0%	I-270 Spur Total (miles/minutes)		34.2	73.2	61.4	-16%

Table A.2: AM Peak -2015 Adaptive Ramp Metering- I-270 Local Vehicle Travel Time

I-270 Northbound	Segment Length (miles)	Existing VISSIM Travel Time (seconds)	ARM VISSIM Travel Time (seconds)	% Change	I-270 Southbound	Segment Length (miles)	Existing VISSIM Travel Time (seconds)	ARM VISSIM Travel Time (seconds)	% Change
From C-D start					From C-D start				
to Montrose Rd	0.8	51.6	54.5	6%	to Shady Grove	1.3	322.1	100.7	-69%
to MD 189	1.3	79.3	78.8	-1%	to MD 28	1.8	264.8	131.6	-50%
to MD 28	1.0	60.7	60.5	0%	to MD 189	1.1	249.5	81.3	-67%
to Shady Grove	2.0	119.1	116.8	-2%	to Montrose	1.2	259.4	130.0	-50%
to I-370	1.0	56.3	56.5	0%	to I-270 mainline	0.9	144.4	100.3	-31%
to MD 117	1.2	72.3	72.2	0%					
to MD 124	0.8	52.1	62.5	20%					
to I-270 mainline	0.4	21.4	21.3	0%					
I-270 Local Total (miles/minutes)	8.5	8.5	8.7	2%	I-270 Local Total (miles/minutes)	6.3	20.7	9.1	-56%

Table A.3: AM Peak -2015 Adaptive Ramp Metering- I-270 Vehicle Speed

I-270 Northbound	Segment Length (miles)	Existing VISSIM Speed (MPH)	ARM VISSIM Speed (MPH)	% Change	I-270 Southbound	Segment Length (miles)	Existing VISSIM Speed (MPH)	ARM VISSIM Speed (MPH)	% Change
From I-495 interchange					From I-70				
to MD 187	1.8	60.5	60.4	0%	to MD 85	1.7	61.7	61.7	0%
to I-270 Split	0.6	56.7	56.0	-1%	to MD 80	5.4	46.5	44.5	-4%
to Montrose Rd	1.8	63.0	63.0	0%	to MD 109	3.7	34.3	40.8	19%
to MD 189	1.0	63.3	63.3	0%	to MD 121	3.6	47.7	48.6	2%
to MD 28	1.0	62.9	62.9	0%	to MD 27	2.5	33.4	51.1	53%
to Shady Grove Rd	1.9	63.0	62.9	0%	to MD 118	1.1	16.0	44.0	175%
to I-370	0.9	64.1	64.1	0%	to Middlebrook Rd	1.1	18.9	31.9	69%
to MD 117	1.5	63.8	63.8	0%	to MD 124	2.2	16.5	19.4	18%
to MD 124	0.6	63.9	63.9	0%	to MD 117	0.9	21.5	22.6	5%
to Middlebrook Rd	2.5	63.6	63.5	0%	to I-370	1.0	39.3	50.8	29%
to MD 118	1.1	62.3	62.4	0%	to Shady Grove Rd	1.5	28.1	50.7	80%
to MD 27	0.9	63.6	63.5	0%	to MD 28	1.9	15.7	25.0	60%
to MD 121	2.4	63.7	63.7	0%	to MD 189	1.0	15.5	16.9	9%
to MD 109	4.1	62.6	62.6	0%	to Montrose Rd	1.0	13.5	14.5	7%
to MD 80	3.7	61.9	62.0	0%	to I-270 Split	1.9	26.7	26.9	1%
to MD 85	5.3	61.2	61.4	0%	to MD 187	0.4	52.3	51.6	-1%
to I-70	1.4	62.7	62.7	0%	to I-495 interchange	1.9	51.7	51.2	-1%
I-270 Total (miles/minutes)	32.4	62.4	62.4	0%	I-270 Total (miles/minutes)	32.7	28.3	34.7	23%
I-270 Spur Northbound					I-270 Spur Southbound				
From Cabin John Pkwy					From I-70				
to MD 190	0.5	60.3	60.3	0%	to I-270 Split	30.3	27.4	33.9	24%
to I-495	1.1	61.2	61.2	0%	to Democracy Blvd	0.7	29.8	18.9	-37%
to Democracy Blvd	1.4	56.6	56.6	0%	to I-495	1.3	25.8	23.1	-10%
to I-270 Split	0.9	62.9	62.9	0%	to MD 190	1.3	48.9	55.1	13%
to I-70	30.0	62.7	62.7	0%	to Cabin John Pkwy	0.6	58.6	58.7	0%
I-270 Spur Total (miles/minutes)	34.0	62.3	62.3	0%	I-270 Spur Total (miles/minutes)	34.2	28.0	33.4	19%

Table A.4: AM Peak -2015 Adaptive Ramp Metering- I-270 Local Vehicle Speed

I-270 Northbound	Segment Length (miles)	Existing VISSIM Speed (MPH)	ARM VISSIM Speed (MPH)	% Change	I-270 Southbound	Segment Length (miles)	Existing VISSIM Speed (MPH)	ARM VISSIM Speed (MPH)	% Change
From C-D start					From C-D start				
to Montrose Rd	0.8	59.0	55.8	-5%	to Shady Grove	1.3	14.6	46.9	220%
to MD 189	1.3	59.3	59.7	1%	to MD 28	1.8	24.1	48.5	101%
to MD 28	1.0	57.4	57.6	0%	to MD 189	1.1	15.6	47.9	207%
to Shady Grove	2.0	59.1	60.2	2%	to Montrose	1.2	17.1	34.2	100%
to I-370	1.0	61.7	61.5	0%	to I-270 mainline	0.9	22.0	31.7	44%
to MD 117	1.2	62.1	62.1	0%					
to MD 124	0.8	56.8	47.4	-17%					
to I-270 mainline	0.4	58.9	59.1	0%					
I-270 Local Total (miles/minutes)	8.5	59.4	58.2	-2%	I-270 Local Total (miles/minutes)	6.3	18.2	41.6	128%

Table A.5: AM Peak -2015 Adaptive Ramp Metering- I-270 Vehicle Density

I-270 Northbound	Type	Existing		ARM		% Change	I-270 Southbound	Type	Existing		ARM		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS	
I-270	Freeway	25	C	25	C	0%	I-270	Freeway	20	C	20	C	0%
I-270 Diverge to MD 187	Diverge	19	B	19	B	0%	I-270 Merge from WB I-70	Merge	13	B	13	B	0%
I-270	Freeway	22	C	22	C	0%	I-270	Freeway	24	C	24	C	0%
I-270 Diverge to Rockledge Rd	Diverge	19	B	19	B	0%	I-270 Merge from EB I-70	Merge	20	B	20	B	0%
I-270	Freeway	19	C	19	C	0%	I-270	Freeway	28	D	28	D	0%
I-270 Weave from MD 187 to I-270 HOV	Weave	10	B	11	B	3%	I-270 Diverge to SB MD 85	Diverge	31	D	31	D	0%
I-270 Lane Drop	Merge	15	B	15	B	1%	I-270	Freeway	27	D	27	D	0%
I-270	Freeway	27	D	27	D	0%	I-270 Diverge to NB MD 85	Diverge	15	B	15	B	0%
I-270 Merge from I-270 Spur	Merge	24	C	24	C	0%	I-270	Freeway	23	C	23	C	0%
I-270 Weave from I-270 HOV to I-270 C-D	Weave	27	C	27	C	0%	I-270 Merge from MD 85	Merge	14	B	15	B	5%
I-270	Freeway	23	C	23	C	1%	I-270	Freeway	36	E	38	E	5%
I-270 Diverge to C-D (MD 189)	Diverge	21	C	21	C	1%	I-270 Diverge to MD 80	Diverge	39	E	44	F	13%
I-270	Freeway	18	B	18	B	0%	I-270	Freeway	75	F	80	F	6%
I-270 Diverge to C-D (MD 28)	Diverge	19	B	19	B	1%	I-270 Merge from MD 80	Merge	85	F	74	F	-13%
I-270	Freeway	15	B	15	B	0%	I-270	Freeway	55	F	45	E	-18%
I-270 Merge from C-D (MD 189)	Merge	18	B	18	B	-1%	I-270 Diverge to MD 109	Diverge	33	D	30	D	-7%
I-270 Diverge to C-D (Shady Grove Rd)	Diverge	26	C	26	C	-1%	I-270	Freeway	66	F	62	F	-7%
I-270	Freeway	14	B	14	B	-1%	I-270 Merge from MD 109	Merge	55	F	55	F	-1%
I-270 Weave from C-D (MD 28) to C-D (Shady Grove Rd)	Weave	13	B	13	B	-1%	I-270	Freeway	47	F	46	F	-2%
I-270	Freeway	11	B	11	B	-1%	I-270 Diverge to SB Weigh Station	Diverge	19	B	19	B	-1%
I-270 Merge from C-D (Shady Grove Rd)	Merge	10	B	10	A	-3%	I-270	Freeway	39	E	39	E	-1%
I-270	Freeway	13	B	12	B	-1%	I-270 Merge from SB Weigh Station	Merge	20	C	21	C	1%
I-270 Merge from C-D (I-370)	Merge	11	B	11	B	-1%	I-270	Freeway	41	E	41	E	0%
I-270 Diverge to C-D (MD 117)	Diverge	16	B	16	B	-1%	I-270 Diverge to MD 121	Diverge	20	C	18	B	-12%
I-270	Freeway	13	B	13	B	-1%	I-270	Freeway	31	D	27	D	-14%
I-270 Merge from C-D (MD 124)	Merge	14	B	14	B	0%	I-270 Merge from MD 121	Merge	32	D	22	C	-32%
I-270	Freeway	17	B	17	B	0%	I-270	Freeway	53	F	32	D	-39%
I-270 Diverge to EB Middlebrook Rd	Diverge	11	B	11	B	1%	I-270 Diverge to MD 27	Diverge	55	F	21	C	-61%
I-270	Freeway	15	B	15	B	0%	I-270	Freeway	80	F	26	C	-68%
I-270 Diverge to WB Middlebrook Rd	Diverge	10	A	10	B	2%	I-270 Merge from WB MD 27	Merge	83	F	26	C	-68%
I-270	Freeway	14	B	14	B	0%	I-270	Freeway	78	F	37	E	-53%
I-270 Diverge to EB MD 118	Diverge	11	B	11	B	-1%	I-270 Weave from EB MD 27 to MD 118	Weave	76	F	34	D	-55%
I-270 Diverge to WB MD 118	Diverge	14	B	14	B	0%	I-270	Freeway	89	F	49	F	-45%
I-270	Freeway	13	B	13	B	-1%	I-270 Merge from WB MD 118	Merge	70	F	43	F	-39%
I-270 Weave from MD 118 to MD 27	Weave	13	B	13	B	0%	I-270	Freeway	85	F	60	F	-29%
I-270	Freeway	12	B	12	B	0%	I-270 Merge from EB MD 118	Merge	70	F	51	F	-27%
I-270 Merge from EB MD 27	Merge	13	B	13	B	0%	I-270	Freeway	75	F	55	F	-27%
I-270	Freeway	13	B	13	B	0%	I-270 Merge from Middlebrook Rd	Merge	99	F	67	F	-33%
I-270 Merge from WB MD 27	Merge	10	A	10	A	-1%	I-270	Freeway	107	F	100	F	-7%
I-270	Freeway	14	B	13	B	-1%	I-270 Diverge to MD 124	Diverge	93	F	92	F	-1%
I-270 Diverge to MD 121	Diverge	10	A	10	A	0%	I-270	Freeway	92	F	90	F	-2%

Table A.5: AM Peak -2015 Adaptive Ramp Metering- I-270 Vehicle Density

I-270 Northbound	Type	Existing		ARM		% Change	I-270 Southbound	Type	Existing		ARM		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS			
I-270	Freeway	12	B	12	B	0%	I-270 Merge from WB MD 124	Merge	119	F	116	F	-2%
I-270 Merge from EB MD 121	Merge	9	A	9	A	-1%	I-270	Freeway	47	F	43	E	-8%
I-270 Lane Drop	Merge	13	B	13	B	-1%	I-270 Merge from MD 117	Merge	46	F	35	E	-24%
I-270	Freeway	18	C	18	C	-1%	I-270	Freeway	48	F	35	E	-27%
I-270 Diverge to NB Weigh Station	Diverge	10	A	10	A	-1%	I-270 Diverge to I-370	Diverge	43	F	30	D	-29%
I-270	Freeway	20	C	20	C	-1%	I-270	Freeway	51	F	32	D	-37%
I-270 Merge from NB Weight Station	Merge	10	B	10	A	-2%	I-270 Diverge to I-270 C-D	Diverge	81	F	26	C	-67%
I-270	Freeway	20	C	20	C	-1%	I-270	Freeway	36	E	21	C	-42%
I-270 Diverge to MD 109	Diverge	11	B	10	B	-2%	I-270 Merge from I-270 (I-370)	Merge	94	F	29	D	-70%
I-270	Freeway	19	C	18	C	-1%	I-270 Diverge to I-270 C-D (Shady Grove Rd)	Diverge	87	F	38	E	-57%
I-270 Merge from MD 109	Merge	10	B	10	A	-3%	I-270	Freeway	90	F	50	F	-44%
I-270	Freeway	20	C	19	C	-2%	I-270 Merge from I-270 C-D (Shady Grove Rd Northern)	Merge	102	F	70	F	-32%
I-270 Diverge to MD 80	Diverge	12	B	11	B	-3%	I-270	Freeway	86	F	75	F	-13%
I-270	Freeway	18	B	18	B	-2%	I-270 Merge from I-270 C-D (Shady Grove Rd Southern)	Merge	107	F	95	F	-11%
I-270 Merge from MD 80	Merge	12	B	12	B	-3%	I-270 Diverge to I-270 C-D (MD 189)	Diverge	89	F	83	F	-6%
I-270	Freeway	22	C	22	C	-1%	I-270	Freeway	100	F	98	F	-2%
I-270 Diverge to Scenic View	Diverge	11	B	11	B	-1%	I-270 Merge from I-270 C-D (MD 189)	Merge	123	F	116	F	-6%
I-270	Freeway	22	C	22	C	-2%	I-270	Freeway	83	F	81	F	-2%
I-270 Merge from Scenic View	Merge	11	B	11	B	-2%	I-270 Merge from I-270 C-D	Merge	41	F	45	F	11%
I-270	Freeway	22	C	22	C	-1%	I-270 Diverge to I-270 HOV Lane	Diverge	21	C	23	C	9%
I-270 Diverge to NB MD 85	Diverge	12	B	12	B	-1%	I-270 Diverge to I-270 Spur	Diverge	40	E	57	F	42%
I-270	Freeway	21	C	21	C	-1%	I-270	Freeway	24	C	24	C	4%
I-270 Diverge to SB MD 85	Diverge	16	B	15	B	-3%	I-270 Diverge to Rockledge Dr / MD 187	Diverge	16	B	17	B	2%
I-270	Freeway	17	B	17	B	-2%	I-270	Freeway	25	C	26	C	4%
I-270 Weave from MD 85 to I-70	Weave	11	B	11	B	-1%	I-270 Merge from Rockledge Dr	Merge	20	B	20	C	2%
I-270	Freeway	15	B	15	B	-1%	I-270	Freeway	25	C	26	D	4%
							I-270 Merge from Rockledge Dr / MD 187	Merge	22	C	23	C	3%
							I-270	Freeway	27	D	28	D	4%

Table A.6: AM Peak -2015 Adaptive Ramp Metering- I-270 Spur Vehicle Density

I-270 Spur Northbound	Type	Existing		ARM		% Change	I-270 Southbound	Type	Existing		ARM		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS			
I-270 Spur	Freeway	34	D	34	D	0%	I-270 Spur	Freeway	48	F	77	F	61%
I-270 Spur Merge from Clara Barton Parkway	Merge	24	C	24	C	0%	I-270 Spur Weave from I-270 HOV to Democracy Blvd	Weave	53	F	71	F	34%
I-270 Spur	Freeway	37	E	37	E	0%	I-270 Spur	Freeway	52	F	62	F	18%
I-270 Diverge to MD 190	Diverge	27	C	27	C	0%	I-270 Merge from Democracy Blvd	Merge	28	D	33	D	15%
I-270 Spur	Freeway	32	D	32	D	0%	I-270 Spur Lane Drop	Merge	52	F	58	F	12%
I-270 Spur Merge from Cabin John Parkway	Merge	23	C	23	C	0%	I-270 Spur	Freeway	72	F	77	F	7%
I-270 Spur Merge from MD 190	Merge	23	C	23	C	0%	I-270 Spur Merge from I-495	Merge	37	E	31	D	-18%
I-270 Spur	Freeway	30	D	30	D	0%	I-270 Spur	Freeway	39	E	33	D	-15%
I-270 Spur Diverge to I-495	Merge	32	D	32	D	0%	I-270 Spur Diverve to EB MD 190	Diverge	46	F	39	E	-15%
I-270 Spur	Freeway	31	D	31	D	0%	I-270 Spur Diverve to Cabin John Pkwy	Diverge	27	C	27	C	1%
I-270 Spur Diverge to Democracy Blvd	Diverge	25	C	24	C	-3%	I-270 Spur	Freeway	28	D	28	D	0%
I-270 Spur	Freeway	23	C	23	C	0%	I-270 Merge from MD 190	Merge	25	C	25	C	0%
I-270 Spur Merge from EB Democracy Blvd	Merge	15	B	15	B	0%	I-270 Spur	Freeway	33	D	33	D	1%
I-270 Spur	Freeway	23	C	23	C	0%	I-270 Diverge to WB Clara Barton Pkwy	Diverge	22	C	22	C	1%
I-270 Spur Merge from WB Democracy Blvd	Merge	15	B	15	B	0%	I-270 Spur	Freeway	32	D	33	D	1%
I-270 Spur	Freeway	23	C	23	C	0%	I-270 Merge from Clara Barton Pkwy	Merge	28	D	28	D	0%
I-270 Spur Merge from Westlake Terrace	Merge	23	C	23	C	0%							
I-270 Spur	Freeway	24	C	24	C	0%							

Table A.7: AM Peak -2015 Adaptive Ramp Metering- I-270 Local Vehicle Density

I-270 Northbound	Type	Existing		ARM		% Change	I-270 Southbound	Type	Existing		ARM		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS			
I-270 C-D	Freeway	33	D	33	D	2%	I-270 C-D	Freeway	87	F	25	C	-71%
I-270 C-D Diverge to EB Montrose Rd	Diverge	21	C	21	C	1%	I-270 C-D Weave from I-370 EB to I-270	Weave	88	F	31	C	-65%
I-270 C-D	Freeway	19	C	19	C	0%	I-270 C-D Diverge to Shady Grove Rd	Diverge	53	F	21	C	-60%
I-270 C-D Weave between Montrose Rd Loop Ramps	Weave	13	B	12	B	-2%	I-270 C-D	Freeway	76	F	17	B	-78%
I-270 C-D	Freeway	18	B	18	B	0%	I-270 C-D Merge from WB Shady Grove Rd	Merge	62	F	13	B	-78%
I-270 C-D Merge from WB Montrose Rd	Merge	20	B	18	B	-7%	I-270 C-D	Freeway	75	F	23	C	-69%
I-270 C-D	Freeway	28	D	26	D	-5%	I-270 C-D Merge from EB Shady Grove Rd	Merge	53	F	13	B	-76%
I-270 C-D Merge from I-270	Merge	28	D	27	C	-4%	I-270 C-D	Freeway	68	F	35	E	-48%
I-270 C-D	Freeway	29	D	28	D	-4%	I-270 C-D Merge from I-270	Merge	75	F	51	F	-33%
I-270 C-D Diverge to MD 189	Diverge	16	B	15	B	-4%	I-270 C-D Diverge to I-270	Diverge	42	F	39	E	-7%
I-270 C-D	Freeway	22	C	22	C	-3%	I-270 C-D Diverge to I-270	Diverge	29	D	29	D	-1%
I-270 C-D Merge from MD 189	Merge	15	B	16	B	3%	I-270 C-D	Freeway	20	C	21	C	1%
I-270 C-D	Freeway	29	D	28	D	-4%	I-270 C-D Diverge to MD 28	Diverge	13	B	13	B	1%
I-270 C-D Weave between I-270 (to MD 28 from MD 189)	Weave	28	C	26	C	-5%	I-270 C-D	Freeway	20	C	14	B	-27%
I-270 C-D	Freeway	30	D	29	D	-3%	I-270 C-D Merge from WB MD 28	Merge	36	E	13	B	-64%
I-270 C-D Diverge to MD 28	Diverge	21	C	21	C	-1%	I-270 C-D	Freeway	64	F	18	B	-73%
I-270 C-D	Freeway	26	C	25	C	-4%	I-270 C-D Merge from EB MD 28	Merge	134	F	18	B	-86%
I-270 C-D Weave between MD 28 Ramps	Weave	35	D	34	D	-3%	I-270 C-D	Freeway	109	F	32	D	-71%
I-270 C-D	Freeway	10	A	9	A	-2%	I-270 C-D Merge from I-270	Merge	112	F	38	E	-66%
I-270 C-D Merge from MD 28 WB	Merge	7	A	7	A	-1%	I-270 C-D	Freeway	79	F	41	E	-48%
I-270 C-D Merge from I-270 and Drop Lane	Merge	9	A	9	A	-1%	I-270 C-D Diverge to MD 189	Diverge	48	F	21	C	-56%
I-270 C-D Diverge to I-270	Diverge	14	B	14	B	0%	I-270 C-D	Freeway	113	F	46	F	-60%
I-270 C-D	Freeway	23	C	22	C	-5%	I-270 C-D Merge from MD 189	Merge	110	F	63	F	-43%
I-270 C-D Diverge to Shady Grove Rd	Diverge	19	B	18	B	-3%	I-270 C-D Diverge to I-270	Diverge	68	F	51	F	-24%
I-270 C-D	Freeway	5	A	5	A	0%	I-270 C-D	Freeway	40	E	27	D	-34%
I-270 C- D Merge from I-270 and EB Shady Grove Rd	Merge	9	A	9	A	0%	I-270 C-D Diverge to WB Montrose Rd	Diverge	26	C	15	B	-41%
I-270 C-D	Freeway	9	A	8	A	0%	I-270 C-D	Freeway	53	F	27	D	-50%
I-270 C-D Merge from WB Shady Grove Rd	Merge	10	B	11	B	1%	I-270 Weave between Montrose Rd Loops	Weave	61	F	34	D	-44%
I-270 C-D Diverge to I-270	Diverge	15	B	15	B	2%	I-270 C-D	Freeway	67	F	48	F	-29%
I-270 C-D	Freeway	14	B	14	B	0%	I-270 C-D Merge from EB Montrose Rd	Merge	54	F	42	F	-22%
I-270 C-D Diverge to I-370	Diverge	13	B	13	B	-1%	I-270 C-D	Freeway	59	F	53	F	-10%
I-270 C-D	Freeway	3	A	3	A	-1%							
I-270 Merge from I-370 EB	Merge	6	A	6	A	-1%							
I-270 C-D	Freeway	7	A	7	A	-1%							
I-270 C-D Weave from I-370 to I-270	Weave	16	B	16	B	0%							
I-270 C-D	Freeway	11	A	11	A	0%							
I-270 C-D Weave from I-270 to MD 117	Weave	16	B	16	B	-2%							

Table A.7: AM Peak -2015 Adaptive Ramp Metering- I-270 Local Vehicle Density

I-270 Northbound	Type	Existing		ARM		% Change	I-270 Souhbound	Type	Existing		ARM		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS	
I-270 C-D Diverge to MD 124	Diverge	11	B	14	B	26%							
I-270 C-D	Freeway	2	A	2	A	1%							
I-270 C-D Merge from EB MD 124	Merge	5	A	5	A	0%							
I-270 C-D Merge From WB MD 124	Merge	8	A	7	A	-1%							

Table A.8: AM Peak - 2015 Adaptive Ramp Metering- I-270 Vehicle Throughput

I-270 Northbound	Existing VISSIM Throughput	ARM VISSIM Throughput	% Change	I-270 Southbound	Existing VISSIM Throughput	ARM VISSIM Throughput	% Change
Between I-495 and MD 187	4495	4495	0%	North of I-70	2502	2502	0%
Between MD 187 on and off ramps	3999	3999	0%	Between I-70 on ramps	2857	2857	0%
Between Rockledge Blvd on and off ramps	3361	3361	0%	From I-70 interchange to MD-85	4925	4925	0%
Between Rockledge Dr and I-270 Spur	3094	3096	0%	Between MD-85 on and off ramps	2771	2771	0%
Between I-270 Spur and Montrose Rd	8311	8309	0%	Between MD-85 and MD-80	3221	3223	0%
Between Montrose Rd on and off ramps	4705	4707	0%	Between MD-80 on and off ramps	3185	3199	0%
Between Montrose Rd and MD 189	4376	4374	0%	Between MD-80 and Md-109	3861	3904	1%
Between MD 189 and MD 28	4381	4374	0%	Between MD-109 on and off ramps	3800	3825	1%
Between MD 28 on and off ramps	4677	4650	-1%	Between MD-109 and MD-121	4257	4259	0%
Between MD 28 and Shady Grove Rd	3378	3348	-1%	Between MD-121 on and off ramps	4043	4112	2%
Between Shady Grove Rd and I-370	2853	2825	-1%	Between MD-121 and MD-27	4694	4815	3%
Between I-370 on and off ramps	3129	3097	-1%	Between MD-27 on and off ramps	4342	4705	8%
Between I-370 and MD 117	4195	4166	-1%	Between MD-27 and MD-118	4665	5131	10%
Between MD 117 and MD 124	3275	3250	-1%	Between MD-118 on and off ramps	4480	4957	11%
Between MD-124 on and off ramps	3278	3250	-1%	Between MD-118 and Middlebrook Rd	5032	5507	9%
Between MD 124 and Middlebrook Rd	4082	4080	0%	Between Middlebrook Rd on and off ramps	5031	5485	9%
Between Middlebrook Rd on and off ramps	3784	3776	0%	Between Middlebrook Rd and MD-124	6737	7000	4%
Between Middlebrook Rd and MD 118	3344	3337	0%	Between MD-124 on and off ramps	5818	5923	2%
Between MD-118 on and off ramps	3008	2996	0%	Between MD-124 and MD-117	6930	7143	3%
Between MD 118 and MD 27	2831	2823	0%	Between MD-117 and I-370	8479	8641	2%
Between MD-27 on and off ramps	2232	2225	0%	Between I-370 on and off ramps	3024	3049	1%
Between MD 27 and MD 121	2515	2496	-1%	Between I-370 on ramp to Shady Grove Rd	4111	4438	8%
Between MD-121 on and off ramps	2211	2208	0%	Between Shady Grove Rd and MD 28	3568	3851	8%
Between MD 121 and MD 109	2420	2392	-1%	Between MD 28 on and off ramps	4420	4595	4%
Between MD-109 on and off ramps	2263	2231	-1%	Between MD 28 and MD 189	3950	4106	4%
Between MD 109 and MD 80	2363	2328	-1%	Between MD 189 and Montrose Rd	3941	4109	4%
Between MD-80 on and off ramps	2126	2100	-1%	Between Montrose Rd on and off ramps	4968	5143	4%
Between MD 80 and MD 85	2656	2624	-1%	Between Montose Rd and I-270 Spur	8098	8089	0%
Between MD-85 on and off ramps	2016	1997	-1%	Between I-270 Spur and Rockledge Blvd	3901	3911	0%
Between MD 85 and I-70	2858	2842	-1%	Between Rockledge Blvd on and off ramps	2845	2871	1%
North of I-70	1832	1816	-1%	Between MD 187 on and off ramps	2986	3015	1%
				Between MD 187 and I-495	3083	3103	1%
I-270 Spur Northbound				I-270 Spur Southbound			
Between I-495 and Democracy Blvd	5178	5173	0%	Between I-270 Split and HOV on ramp	4233	4157	-2%
Between Democracy Blvd on and off ramps	4035	4027	0%	Between HOV on ramp and Democracy Blvd	4165	4094	-2%
Between Democracy Blvd and I-270 Split	4304	4301	0%	Between Democracy Blvd on and off ramps	3636	3573	-2%
				Between Democracy Blvd and I-495	4140	4096	-1%

Table A.9: AM Peak -2015 Adaptive Ramp Metering- I-270 Local Vehicle Throughput

I-270 Local Northbound	Existing VISSIM Throughput	ARM VISSIM Throughput	% Change	I-270 Local Southbound	Existing VISSIM Throughput	ARM VISSIM Throughput	% Change
Between Montrose Rd EB off ramp and EB on ramp	2355	2352	0%	Between I-370 on ramp and I-270 off ramp	4068	4326	6%
Between Montrose Rd EB on ramp and WB off ramp	2567	2569	0%	Between I-270 off ramp and Shady Grove off ramp	2942	2946	0%
Between Montrose Rd WB off ramp and on ramp	2151	2153	0%	Between Shady Grove off ramp and Shady Grove WB on ramp	1759	1727	-2%
Between Montrose Rd WB on ramp and I-270 on ramp	3067	2949	-4%	Between Shady Grove WB and EB on ramps	2398	2333	-3%
Between I-270 on ramp and MD 189 off ramp	3387	3269	-3%	Between Shady Grove on ramp and I-270 on ramp	2797	2699	-4%
Between MD 189 ramps	2705	2609	-4%	Between I-270 on ramp and I-270 off ramp1	3423	3392	-1%
Between MD 189 off ramp and I-270 on ramp	3252	3155	-3%	Between I-270 off ramp1 and I-270 off ramp2	2902	2899	0%
Between I-270 on ramp and I-270 off ramp	3988	3890	-2%	Between I-270 off ramp2 and MD 28 off ramp	2031	2066	2%
Between I-270 off ramp and MD 28 EB off ramp	2948	2880	-2%	Between MD 28 off ramp and MD 28 WB on ramp	1466	1490	2%
Between MD 28 EB off ramp to MD 28 EB on ramp	2599	2536	-2%	Between MD 28 WB on ramp and MD 28 EB on ramp	1781	1771	-1%
Between MD 28 EB on ramp and MD 28 WB off ramp	2664	2603	-2%	Between MD 28 EB on ramp and I-270 on ramp	2841	2907	2%
Between MD 28 WB off ramp and MD 28 WB on ramp	1160	1133	-2%	Between I-270 on ramp and MD 189 off ramp	3310	3376	2%
Between MD 28 WB on ramp and I-270 on ramp	1631	1602	-2%	Between MD 189 on and off ramps	2671	2722	2%
Between I-270 on ramp and I-270 off ramp	2926	2901	-1%	Between MD 189 on ramp and I-270 off ramp	3800	3770	-1%
Between I-270 off ramp and Shady Grove off ramp	2518	2506	0%	Between I-270 off ramp and Montrose Rd off ramp	2573	2538	-1%
Between Shady Grove off ramp and I-270 on ramp	321	320	0%	Between Montrose Rd off ramp and Montrose Rd WB on ramp	2455	2408	-2%
Between I-270 on ramp and Shady Grove WB on ramp	1562	1552	-1%	Between Montrose Rd WB on ramp and EB off ramp	3375	3246	-4%
Between Shady Grove WB on ramp and I-270 off ramp	1887	1872	-1%	Between Montrose Rd EB off and on ramps	2652	2551	-4%
Between I-270 off ramp and I-370 off ramp	1609	1598	-1%	Between Montrose Rd EB off ramp and I-270	3384	3265	-4%
Between I-370 off ramp and I-370 EB on ramp	332	330	-1%				
Between I-370 EB and WB on ramps	826	824	0%				
Between I-370 WB on ramp and I-270 off ramp	2397	2396	0%				
Between I-270 off ramp and I-270 on ramp	1334	1333	0%				
Between I-270 on ramp and MD 117 off ramp	2251	2241	0%				
Between MD 117 off ramp and MD 124 off ramp	1034	1031	0%				
Between MD 124 off ramp and MD 124 EB on ramp	98	97	-1%				
Between MD 124 EB and WB on ramps	487	487	0%				
Between MD 124 on ramp I-270	815	833	2%				

Table A.10: AM Peak - 2015 Adaptive Ramp Metering- I-270 On Ramp Queue Length - Northbound

I-270 Northbound	Existing VISSIM Average Queue (feet)	ARM VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	ARM VISSIM Maximum Queue (feet)	% Change
Rockledge Dr on ramp	0	0	-	0	0	-
MD 189 C-D on ramp	0	0	-	0	0	-
MD 28 C-D on ramp	0	0	-	0	0	-
Shady Grove Rd C-D on ramp	0	0	-	0	0	-
I-370 C-D on ramp	0	0	-	0	0	-
MD 124 C-D on ramp	0	0	-	0	0	-
MD 118 on ramp	0	0	-	0	0	-
MD 27 EB on ramp	0	0	-	0	0	-
MD 27 WB on ramp	0	0	-	0	0	-
MD 121 on ramp	0	0	-	0	0	-
MD 109 on ramp	0	0	-	0	0	-
MD 80 on ramp	0	0	-	0	0	-
MD 85 on ramp	0	0	-	0	0	-
I-270 Spur Northbound	Existing VISSIM Average Queue (feet)	ARM VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	ARM VISSIM Maximum Queue (feet)	% Change
Democracy Blvd EB on ramp	0	0	-	0	0	-
Democracy Blvd WB on ramp	0	0	-	0	0	-
I-495 Northbound	Existing VISSIM Average Queue (feet)	ARM VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	ARM VISSIM Maximum Queue (feet)	% Change
Cabin John Pkwy on ramp	0	0	-	0	0	-
MD 190 on ramp	0	0	-	0	0	-
I-270 C-D Northbound	Existing VISSIM Average Queue (feet)	ARM VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	ARM VISSIM Maximum Queue (feet)	% Change
Montrose Rd EB on ramp	0	0	-	0	0	-
Montrose Rd WB on ramp	0	0	-	0	0	-
I-270 on ramp	0	0	-	0	0	-
MD 189 on ramp	0	0	-	0	5	-
I-270 on ramp	0	0	-	0	0	-
MD 28 EB on ramp	0	0	-100%	17	0	-100%
MD 28 WB on ramp	0	0	-	0	0	-
Shady Grove Rd EB on ramp	0	0	-	0	0	-
I-270 on ramp	0	0	-	0	0	-
Shady Grove Rd WB on ramp	0	0	-	0	0	-
I-370 EB on ramp	0	0	-	0	0	-
I-370 WB on ramp	0	0	-	0	0	-
I-270 on ramp	0	0	-	0	0	-
MD 124 EB on ramp	0	0	-	0	0	-
MD 124 WB on ramp	0	0	-	0	0	-

Table A.11: AM Peak - 2015 Adaptive Ramp Metering- I-270 Off Ramp Queue Length - Northbound

I-270 Northbound	Existing VISSIM Average Queue (feet)	ARM VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	ARM VISSIM Maximum Queue (feet)	% Change
MD 187 off ramp NB	56	44	-21%	347	362	4%
MD 187 off ramp SB	87	83	-5%	439	415	-6%
Rockledge Dr off ramp	4.64	4.75	2%	316	259	-18%
Tower Oaks Blvd off ramp	14.02	22.76	62%	165	174	5%
Montrose Rd off ramp EB	0	0	-	0	0	-
Montrose Rd off ramp WB	0	19	-	0	281	-
MD 189 off ramp WB	11	11	-3%	97	109	12%
MD 189 off ramp EB	1	2	90%	131	218	66%
MD 28 off ramp EB	48	43	-9%	296	256	-13%
MD 28 off ramp WB	1	0	-51%	119	62	-48%
Shady Grove Rd off ramp - Redland Blvd	0	0	-	0	0	-
Shady Grove Rd off ramp WB	191	184	-4%	620	642	3%
Shady Grove Rd off ramp EB	0	0	-	0	0	-
I-370 off ramp WB	0	0	-	0	0	-
I-370 off ramp EB	0	0	-	0	0	-
MD 117 off ramp	218	217	-1%	793	749	-6%
MD 124 off ramp	340	391	15%	957	974	2%
Watkins Mill Rd off ramp*			-			-
Middlebrook Rd EB off ramp	0	0	-	0	0	-
Middlebrook Rd WB off ramp	0	0	-	0	0	-
MD 118 WB off ramp - Seneca Meadows	0	0	-100%	19	0	-100%
MD 118 WB off ramp	0	0	-	0	0	-
MD 118 EB off ramp	0	0	-	0	0	-
MD 27 off ramp WB	5	5	-2%	83	81	-3%
MD 27 off ramp EB	0	0	-	0	0	-
MD 121 off ramp WB	0	0	-46%	37	32	-14%
MD 121 off ramp EB	0	0	-	0	0	-
MD 109 off ramp EB	3	2	-15%	97	82	-16%
MD 109 off ramp WB	0	0	-	0	0	-
MD 80 off ramp EB	5	5	0%	110	92	-16%
MD 80 off ramp WB	2	1	-48%	34	26	-22%
MD 85 NB off ramp	0	0	-	0	0	-
MD 85 SB off ramp	0	0	-31%	66	51	-22%
I-270 Spur Northbound	Existing VISSIM Average Queue (feet)	ARM VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	ARM VISSIM Maximum Queue (feet)	% Change
Clara Barton Pkwy off ramp EB	1	1	-1%	157	157	0%
Clara Barton Pkwy off ramp WB	0	0	-	0	0	-
MD 190 off ramp EB	0	0	-	0	0	-
MD 190 off ramp WB	0	0	-	0	0	-
Democracy Blvd off ramp WB	108	101	-7%	589	439	-25%
Democracy Blvd off ramp EB	16	14	-14%	149	126	-15%

* Ramp in Future Scenario

Table A.12: AM Peak -2015 Adaptive Ramp Metering - I-270 On Ramp Queue Length - Southbound

I-270 Southbound	Existing VISSIM Average Queue (feet)	ARM VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	ARM VISSIM Maximum Queue (feet)	% Change
MD 85 on ramp	0	0	-	0	46	-
MD 80 on ramp	575	288	-50%	2307	917	-60%
MD 109 on ramp	66.39	372.30	461%	841	1358	62%
MD 121 WB on ramp	8.05	0.00	-100%	263	0	-100%
MD 121 EB on ramp*			-			-
MD 27 WB on ramp	145	18	-87%	1297	650	-50%
MD 27 EB on ramp	1	0	-21%	89	54	-40%
MD 118 WB on ramp	0	0	-	0	0	-
MD 118 EB on ramp	0.015	0.000	-100%	9	0	-100%
Middlebrook Rd on ramp	161	0	-100%	1641	0	-100%
MD 124 WB on ramp	254	408	61%	2615	1997	-24%
MD 117 on ramp	94	0	-100%	1640	0	-100%
I-370 C-D on ramp	805	46	-94%	1861	372	-80%
Shady Grove Rd C-D on ramp North	2	0	-95%	160	22	-86%
Shady Grove Rd C-D on ramp South	68	11	-84%	927	384	-59%
MD 189 C-D on ramp	1393	618	-56%	3991	3634	-9%
Montrose Rd C-D on ramp	2	0	-85%	246	96	-61%
Rockledge Dr on ramp	0	0	-	0	0	-
MD 187 on ramp	0	0	-	0	0	-
I-270 Spur Southbound	Existing VISSIM Average Queue (feet)	ARM VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	ARM VISSIM Maximum Queue (feet)	% Change
Democracy Blvd on ramp	0	0	-	0	0	-
I-495 Southbound	Existing VISSIM Average Queue (feet)	ARM VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	ARM VISSIM Maximum Queue (feet)	% Change
I-270 Spur on ramp	260	0	-100%	1015	0	-100%
MD 190 on ramp	0	0	-	0	0	-
I-270 C-D Southbound	Existing VISSIM Average Queue (feet)	ARM VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	ARM VISSIM Maximum Queue (feet)	% Change
I-270 on ramp	2305	73	-97%	5053	523	-90%
I-370 on ramp	1241	16	-99%	2914	380	-87%
Shady Grove Rd WB on ramp	1	0	-100%	150	0	-100%
Shady Grove Rd EB on ramp	0	0	-100%	29	0	-100%
I-270 on ramp	0	0	-100%	39	0	-100%
MD 28 WB on ramp	6	0	-100%	121	0	-100%
MD 28 EB on ramp	3166	0	-100%	3877	0	-100%
I-270 on ramp	0	0	-100%	55	4	-93%
MD 189 on ramp	111	14	-87%	1104	457	-59%
Montrose Rd WB on ramp	8	0	-97%	440	54	-88%
Montrose Rd EB on ramp	0	1	61%	95	74	-22%

* Ramp in Future Scenario

Table A.13: AM Peak -2015 Adaptive Ramp Metering - I-270 Off Ramp Queue Length - Southbound

I-270 Southbound	Existing VISSIM Average Queue (feet)	ARM VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	ARM VISSIM Maximum Queue (feet)	% Change
MD 85 SB off ramp	0	0	-	0	0	-
MD 85 NB off ramp	0	0	-	0	0	-
MD 80 off ramp	0.41	10.32	2411%	69	298	329%
MD 109 off ramp WB	0.00	0.01	130%	7	16	127%
MD 109 off ramp EB	0	0	-	0	0	-
MD 121 off ramp EB	1	1	-9%	93	84	-10%
MD 121 off ramp WB	0	0	-	0	0	-
MD 27 off ramp EB	53	54	2%	279	252	-10%
MD 27 off ramp WB	45	0	-100%	289	0	-100%
MD 118 off ramp EB	31	30	-3%	161	151	-6%
MD 118 off ramp WB	0	0	-	0	0	-
Watkins Mill Rd off ramp*						
MD 124 off ramp EB	75	74	-2%	342	367	7%
MD 124 off ramp WB	18	12	-31%	405	337	-17%
I-370 off ramp WB	0	0	-	0	0	-
I-370 off ramp EB	0	0	-	0	0	-
Shady Grove Rd off ramp - Omega Drive	6	3	-51%	194	180	-7%
Shady Grove Rd off ramp	0	0	-	0	0	-
MD 28 off ramp	3	2	-10%	132	115	-13%
MD 189 off ramp EB	40	43	7%	296	286	-4%
MD 189 off ramp WB	0	0	-	0	0	-
Montrose Rd off ramp WB	0	0	-	0	0	-
Montrose Rd off ramp EB	0	0	-	0	0	-
Rockledge Dr off ramp	18	23	31%	261	373	43%
I-270 Spur Southbound	Existing VISSIM Average Queue (feet)	ARM VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	ARM VISSIM Maximum Queue (feet)	% Change
Democracy Blvd off ramp EB	51	53	4%	230	230	0%
Democracy Blvd off ramp WB	0	0	-	0	0	-
MD 190 off ramp WB	995	599	-40%	2271	2260	0%
MD 190 off ramp EB	0	0	-	0	0	-
Clara Barton Pkwy WB off ramp	0	0	-	0	0	-

* Ramp in Future Scenario

Table A.14: AM Peak - Existing - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
1- MD 85 at Sam's Club Drive											
1	NB	18.8	B	NB Left	103	76	57	282	E	33.3	C
				NB Through	312	24	57	282	C		
				NB Right	581	6	6	284	A		
	SB	42.4	D	SB Left	110	57	123	552	E		
				SB Through	535	41	123	552	D		
				SB Right	52	24	123	552	C		
	EB	44.4	D	EB Left	81	70	42	165	E		
				EB Through	47	81	42	165	F		
				EB Right	102	7	42	165	A		
	WB	50.7	D	WB Left	204	72	75	302	E		
				WB Through	12	61	75	302	E		
				WB Right	100	6	75	302	A		
2- MD 85 at I-270 NB on and off ramp											
2	NB	42.6	D	NB Left	560	43	155	745	D	28.8	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	14.6	B	SB Left	0	0	0	0	A		
				SB Through	547	15	36	483	B		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
3- MD 85 at I-270 SB on and off ramp											
3	NB	4.3	A	NB Left	0	0	0	0	A	10.2	B
				NB Through	812	4	12	316	A		
				NB Right	0	0	0	0	A		
	SB	41.3	D	SB Left	154	41	37	267	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
4- MD 85 at Crestwood Blvd											
4	NB	15.8	C	NB Left	10	57	34	262	E	19.8	B
				NB Through	585	15	34	262	B		
				NB U-Turn	0	0	0	0	A		
	SB	13.7	B	SB Left	57	68	23	146	E		
				SB Through	1657	14	55	477	B		
				SB Right	751	9	43	467	A		
	EB	49.1	D	EB Left	481	51	70	208	D		
				EB Through	19	62	70	208	E		
				EB Right	32	10	70	208	A		
	WB	43.1	D	WB Left	37	56	17	111	E		
				WB Through	15	59	17	111	E		
				WB Right	19	6	17	111	A		
5- MD 80 at I-270 NB on and ramp											
5	NB	-1.1	A	NB Left	3	0	0	0	A	16.1	B
				NB Through	2	0	0	0	A		
				NB Right	4	-2	0	0	A		
	SB	12.8	B	SB Left	183	15	12	115	B		
				SB Through	5	17	12	115	B		
				SB Right	52	4	1	16	A		
	EB	7.0	A	EB Left	38	8	6	165	A		
				EB Through	0	0	8	0	A		
				EB Right	7	4	13	196	A		
	WB	17.2	B	WB Left	31	13	1	48	B		
				WB Through	684	24	94	544	C		
				WB Right	504	8	6	182	A		
6- MD 80 at I-270 SB on and off ramp											
6	NB	4.1	A	NB Left	22	25	1	113	C	22.2	C
				NB Through	0	0	0	0	A		
				NB Right	262	2	1	113	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	23.0	C	EB Left	0	0	0	0	A		
				EB Through	241	22	26	226	C		
				EB Right	133	25	26	235	D		
	WB	47.1	E	WB Left	0	0	0	0	A		
				WB Through	194	47	126	641	E		
				WB Right	0	0	0	0	A		
7- MD 109 at I-270 NB on and off ramp											
7	NB			NB Left	0	0	0	0	A	2.5	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	8.3	A	SB Left	118	11	7	116	B		
				SB Through	0	0	0	0	A		
				SB Right	38	1	0	0	A		
	EB	3.2	A	EB Left	59	3	0	36	A		
				EB Through	0	0	0	0	A		
				EB Right	40	3	0	0	A		
	WB	0.4	A	WB Left	0	0	0	0	A		
				WB Through	462	0	0	54	A		
				WB Right	0	0	0	0	A		
8- MD 80 at I-270 SB on and off ramp											
8	NB	2.5	A	NB Left	15	10	1	65	B	3.5	A
				NB Through	0	0	0	0	A		
				NB Right	41	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	3.4	A	EB Left	0	0	0	0	A		
				EB Through	59	0	0	34	A		
				EB Right	70	6	1	34	A		
	WB	3.6	A	WB Left	393	3	8	292	A		
				WB Through	109	5	8	269	A		
				WB Right	0	0	0	0	A		
9- MD 121 at Gateway Center Dr											
9	NB	8.4	A	NB Left	95	11	13	147	B	20.7	C
				NB Through	279	12	13	147	B		
				NB Right	198	2	17	173	A		
	SB	16.8	C	SB Left	47	11	31	312	B		
				SB Through	577	17	41	312	B		
				SB Right	6	13	46	333	B		
	EB	33.6	D	EB Left	7	37	86	427	D		
				EB Through	88	44	93	427	D		
				EB Right	547	32	117	459	C		
	WB	30.3	D	WB Left	96	35	19	123	D		
				WB Through	12	33	19	123	C		
				WB Right	21	7	13	142	A		
10- MD 121 at I-270 NB on and off ramp											
10	NB	1.7	A	NB Left	40	10	2	86	A	0.7	A
				NB Through	0	0	0	0	A		
				NB Right	253	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.1	A	EB Left	0	0	0	0	A		
				EB Through	318	0	0	0	A		
				EB Right	49	0	0	0	A		
	WB	0.6	A	WB Left	151	2	1	87	A		
				WB Through	1070	0	0	58	A		
				WB Right	0	0	0	0	A		

Table A.14: AM Peak - Existing - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
11- MD 121 at I-270 SB on and off ramp											
11	NB			NB Left	0	0	0	0	A	1.3	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	7.7	A	SB Left	123	10	6	120	B		
				SB Through	0	0	0	0	A		
				SB Right	46	1	0	0	A		
	EB	0.4	A	EB Left	25	2	0	35	A		
				EB Through	0	0	0	0	A		
				EB Right	833	0	0	0	A		
	WB	0.1	A	WB Left	0	0	0	0	A		
WB Through				277	0	0	0	A			
WB Right				0	0	0	0	A			
12- MD 27 at Observation Dr											
12	NB	48.0	D	NB U-Turn	0	0	0	0	A	19.3	B
				NB Through	34	63	10	64	E		
				NB Right	12	7	10	64	A		
	SB	40.9	D	SB Left	75	52	23	142	D		
				SB Through	43	60	30	226	E		
				SB Right	157	30	52	263	C		
	EB	13.0	B	EB Left	149	30	29	290	C		
				EB Through	1202	11	31	291	B		
				EB Right	50	9	38	329	A		
	WB	20.1	C	WB Left	83	15	138	788	B		
WB Through				2047	21	138	788	C			
WB Right				94	10	138	788	A			
13- MD 27 at I-270 NB off ramp											
13	NB	30.7	C	NB Left	89	31	12	90	C	11.6	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.1	A	EB Left	0	0	0	0	A		
				EB Through	891	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	15.7	B	WB Left	0	0	0	0	A		
WB Through				2110	16	194	1341	B			
WB Right				0	0	0	0	A			
14- MD 27 at I-270 SB off ramp											
14	NB			NB Left	0	0	0	0	A	24.7	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	49.6	D	SB Left	376	50	64	293	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	9.0	A	EB Left	0	0	0	0	A		
				EB Through	657	9	12	192	A		
				EB Right	0	0	0	0	A		
	WB	25.5	C	WB Left	0	0	0	0	A		
WB Through				1263	25	195	645	C			
WB Right				0	0	0	0	A			
15- MD 27 at Crystal Rock Dr											
15	NB	17.8	B	NB Left	22	18	31	405	B	38.3	D
				NB Through	819	18	57	405	B		
				NB Right	72	16	60	418	B		
	SB	46.4	D	SB Left	407	69	356	1190	E		
				SB Through	1333	40	356	1190	D		
				SB Right	40	27	320	1184	C		
	EB	44.6	D	EB Left	177	49	47	169	D		
				EB Through	74	49	43	164	D		
				EB Right	60	27	44	196	C		
	WB	56.0	E	WB Left	8	63	85	273	E		
WB Through				21	302	85	273	F			
WB Right				104	6	85	273	A			
16- MD 118 at Seneca Meadows Pkwy											
16	NB	3.4	A	NB Left	123	10	1	70	A	5.5	A
				NB Through	727	3	4	119	A		
				NB Right	79	1	8	171	A		
	SB	3.7	A	SB Left	25	5	5	169	A		
				SB Through	808	4	8	169	A		
				SB Right	32	2	9	202	A		
	EB	16.9	B	EB Left	15	64	8	69	E		
				EB Through	6	59	8	69	E		
				EB Right	96	7	8	69	A		
	WB	44.2	D	WB Left	30	65	12	94	E		
WB Through				5	68	8	94	E			
WB Right				21	9	11	113	A			
17- MD 118 at I-270 NB on ramp											
17	NB			NB Left	0	0	0	0	A	11.1	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	33.0	C	EB Left	222	33	44	277	C		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	6.0	A	WB Left	0	0	0	0	A		
WB Through				155	1	0	4	A			
WB Right				778	7	16	276	A			
18- MD 118 at I-270 SB off ramp											
18	NB			NB Left	0	0	0	0	A	7.4	A
				NB Through	0	0.0	0	0	A		
				NB Right	0	0.0	0	0	A		
	SB	41.5	D	SB Left	193	41.5	34	164	D		
				SB Through	0	0.0	0	0	A		
				SB Right	0	0.0	0	0	A		
	EB	3.1	A	EB Left	0	0.0	0	0	A		
				EB Through	615	3.1	4	135	A		
				EB Right	0	0.0	0	0	A		
	WB	3.6	A	WB Left	0	0.0	0	0	A		
WB Through				1036	3.6	7	209	A			
WB Right				0	0.0	0	0	A			
19- MD 118 at Aircraft Dr											
19	NB	45.2	D	NB Left	7	70	8	75	E	18.1	B
				NB Through	12	80	8	75	F		
				NB Right	14	3	0	22	A		
	SB	60.7	E	SB Left	241	58	98	368	E		
				SB Through	41	66	98	368	E		
				SB Right	81	67	98	368	E		
	EB	10.4	B	EB Left	102	13	28	310	B		
				EB Through	932	10	28	310	B		
				EB Right	27	9	28	310	A		
	WB	11.5	B	WB Left	73	17	31	246	B		
WB Through				899	14	31	246	B			
WB Right				277	4	31	246	A			
20- Middlebrook Rd at Observation Dr											
20	NB			NB Left	0	0	0	0	A	16.1	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	18.7	B	SB Left	22	35	4	44	D		
				SB Through	0	0	0	0	A		
				SB Right	25	4	4	44	A		
	EB	14.2	B	EB Left	240	21	31	226	C		
				EB Through	865	12	31	226	B		
				EB Right	0	0	0	0	A		
	WB	17.7	B	WB Left	0	0	0	0	A		
WB Through				1072	19	69	381	B			
WB Right				215	13	92	431	B			

Table A.14: AM Peak - Existing - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
21- Middlebrook Rd at I-270 SB on ramp											
21	NB			NB Left	0	0	0	0	A	16.0	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	11.2	B	EB Left	0	0	0	0	A		
				EB Through	805	11	26	186	B		
				EB Right	0	0	0	0	A		
	WB	21.3	C	WB Left	743	21	64	867	C		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
22- Middlebrook Rd at Waring Station Rd											
22	NB	63.1	E	NB Left	147	52	145	449	D	25.3	C
				NB Through	6	52	145	449	D		
				NB Right	342	68	145	449	E		
	SB	21.9	C	SB Left	3	37	1	29	D		
				SB Through	0	0	1	29	A		
				SB Right	3	7	2	67	A		
	EB	18.2	B	EB Left	28	12	124	845	B		
				EB Through	1483	19	124	845	B		
				EB Right	76	10	124	845	A		
	WB	16.1	B	WB Left	78	20	28	213	C		
				WB Through	682	16	28	213	B		
				WB Right	35	4	28	213	A		
23- MD 124 at MD 355											
23	NB	50.5	D	NB Left	229	69	72	198	E	83.6	F
				NB Through	306	42	70	196	D		
				NB Right	37	2	0	0	A		
	SB	33.5	C	SB Left	49	86	121	406	F		
				SB Through	966	50	121	406	D		
				SB Right	619	3	34	375	A		
	EB	99.1	F	EB Left	615	255	1024	1207	F		
				EB Through	528	22	1024	1207	C		
				EB Right	582	5	921	1184	A		
	WB	122.0	F	WB Left	0	0	0	0	A		
				WB Through	1884	123	727	1112	F		
				WB Right	42	68	0	0	E		
24- MD 124 at I-270 SB on and off											
24	NB	65.0	F	NB Left	15	66	15	78	E	22.2	C
				NB Through	29	64	15	78	E		
				NB U-Turn	0	0	0	0	A		
	SB	27.6	C	SB Left	306	67	81	347	E		
				SB Through	4	87	81	347	F		
				SB Right	572	6	13	335	A		
	EB	15.7	B	EB Left	0	0	0	0	A		
				EB Through	904	16	41	321	B		
				EB Right	67	12	50	345	B		
	WB	22.0	C	WB Left	33	27	116	1390	C		
				WB Through	1193	22	116	1390	C		
				WB Right	0	0	0	0	A		
25- MD 117 at MD 124											
25	NB	42.7	D	NB Left	16	65	95	577	E	43.0	D
				NB Through	421	58	95	577	E		
				NB Right	407	26	61	641	C		
	SB	37.8	D	SB Left	181	47	126	605	D		
				SB Through	839	40	126	605	D		
				SB Right	95	2	0	0	A		
	EB	48.4	D	EB Left	80	108	175	722	F		
				EB Through	1383	45	174	723	D		
				EB Right	66	44	187	750	D		
	WB	40.7	D	WB Left	314	73	108	332	E		
				WB Through	480	27	108	332	C		
				WB Right	95	0	0	0	A		
26- MD 117 at Bureau Dr											
26	NB	52.3	D	NB Left	18	70	16	93	E	42.3	D
				NB Through	17	79	16	93	E		
				NB Right	25	21	16	93	C		
	SB	63.4	E	SB Left	191	70	80	297	E		
				SB Through	43	68	80	297	E		
				SB Right	28	13	80	297	B		
	EB	47.0	D	EB Left	28	36	314	962	D		
				EB Through	1928	47	322	962	D		
				EB Right	20	59	315	951	E		
	WB	31.8	C	WB Left	298	93	195	602	F		
				WB Through	852	19	195	603	B		
				WB Right	316	8	169	651	A		
27- MD 117 at I-270 SB off ramp											
27	NB			NB Left	0	0	0	0	A	8.0	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	1.8	A	EB Left	0	0	0	0	A		
				EB Through	799	2	1	180	A		
				EB Right	0	0	0	0	A		
	WB	24.0	C	WB Left	310	24	45	344	C		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
28- MD 117 at I-270 NB off ramp											
28	NB			NB Left	0	0	0	0	A	30.5	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	49.1	D	SB Left	307	54	230	811	D		
				SB Through	0	0	0	0	A		
				SB Right	915	48	236	813	D		
	EB	19.4	B	EB Left	10	111	80	888	F		
				EB Through	782	18	80	888	B		
				EB Right	0	0	0	0	A		
	WB	14.2	B	WB Left	0	0	0	0	A		
				WB Through	860	14	51	343	B		
				WB Right	9	5	55	373	A		
29- MD 117 at Perry Pkwy											
29	NB	42.5	D	NB Left	35	67	14	97	E	13.6	B
				NB Through	6	61	14	96	E		
				NB Right	31	11	23	117	B		
	SB	33.8	C	SB Left	91	72	37	167	E		
				SB Through	13	72	37	167	E		
				SB Right	124	2	37	167	A		
	EB	10.3	B	EB Left	119	69	42	237	E		
				EB Through	957	3	42	237	A		
				EB Right	9	1	29	221	A		
	WB	9.9	A	WB Left	5	87	20	261	F		
				WB Through	709	10	20	261	A		
				WB Right	104	5	20	261	A		
30- Shady Grove Rd at I-270 NB off ramp											
30	NB	9.5	A	NB Left	0	0	0	0	A	24.6	C
				NB Through	917	9	21	216	A		
				NB Right	0	0	0	0	A		
	SB	10.1	B	SB Left	0	0	0	0	A		
				SB Through	1284	10	31	344	B		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	56.8	E	WB Left	1008	57	201	631	E		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table A.14: AM Peak - Existing - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
31- Shady Grove Rd at I-270 SB off ramp											
31	NB	14.6	B	NB Left	0	0	0	0	A	21.0	C
				NB Through	920	15	41	379	B		
				NB Right	0	0	0	0	A		
	SB	11.4	B	SB Left	0	0	0	0	A		
				SB Through	1692	11	46	658	B		
				SB Right	0	0	0	0	A		
	EB	44.2	D	EB Left	313	37	42	360	D		
				EB Through	0	0	0	0	A		
				EB Right	642	48	102	463	D		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
32- MD 28 at I-270 SB off ramp											
32	NB			NB U-Turn	0	0	0	0	A	32.6	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	35.9	D	SB Left	456	44	72	304	D		
				SB Through	0	0	0	0	A		
				SB Right	108	3	0	59	A		
	EB	57.4	E	EB Left	0	0	0	0	A		
				EB Through	1050	87	1521	2131	F		
				EB Right	663	11	1050	2134	B		
	WB	9.1	A	WB Left	0	0	0	0	A		
				WB Through	1879	9	32	405	A		
				WB Right	0	0	0	0	A		
33- MD 28 at I-270 on and off ramps											
33	NB	34.9	C	NB Left	0	0	54	306	A	17.4	B
				NB Through	213	51	62	315	D		
				NB Right	139	11	62	315	B		
	SB	21.1	C	SB Left	25	60	19	169	E		
				SB Through	0	0	0	0	A		
				SB Right	260	17	19	169	B		
	EB	15.0	B	EB Left	224	28	46	333	C		
				EB Through	829	11	46	333	B		
				EB Right	0	0	0	0	A		
	WB	12.3	B	WB Left	22	11	41	286	B		
				WB Through	887	12	29	249	B		
				WB Right	0	0	0	0	A		
34- MD 189 at Great Falls Rd											
34	NB	40.7	D	NB Left	62	45	16	111	D	10.0	B
				NB Through	6	42	13	110	D		
				NB Right	8	8	15	121	A		
	SB	5.2	A	SB Left	66	46	20	162	D		
				SB Through	7	40	20	162	D		
				SB Right	601	0	0	0	A		
	EB	10.2	B	EB Left	325	16	14	215	B		
				EB Through	920	8	18	229	A		
				EB Right	13	6	26	265	A		
	WB	12.1	B	WB Left	3	21	16	184	C		
				WB Through	315	12	16	184	B		
				WB Right	10	9	27	218	A		
35- MD 189 at I-270 Ramps											
35	NB	50.5	D	NB Left	133	51	25	119	D	41.6	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	48.3	D	SB Left	184	48	54	316	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	23.2	C	EB Left	384	20	81	458	B		
				EB Through	529	26	81	458	C		
				EB Right	0	0	0	0	A		
	WB	59.1	E	WB Left	533	50	137	497	D		
				WB Through	284	76	137	497	E		
				WB Right	0	0	0	0	A		
36- MD 189 at Wootton Pkwy											
36	NB	43.1	D	NB Left	129	52	52	178	D	58.1	E
				NB Through	100	80	52	178	E		
				NB Right	151	12	52	178	B		
	SB	91.5	F	SB Left	385	105	294	792	F		
				SB Through	516	81	218	720	F		
				SB Right	0	0	0	0	A		
	EB	48.8	D	EB Left	132	75	214	884	E		
				EB Through	958	48	214	884	D		
				EB Right	95	23	214	884	C		
	WB	42.6	D	WB Left	423	62	108	314	E		
				WB Through	390	27	108	314	C		
				WB Right	58	5	108	314	A		
37- Montrose Rd at Tower Oaks Blvd											
37	NB			NB Left	0	0	0	0	A	26.1	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	106.3	F	SB Left	126	40	201	957	D		
				SB Through	0	0	0	0	A		
				SB Right	521	122	323	955	F		
	EB	7.9	A	EB Left	28	16	25	421	B		
				EB Through	1424	8	25	421	A		
				EB Right	0	0	0	0	A		
	WB	9.2	A	WB Left	0	0	0	0	A		
				WB Through	1443	9	26	286	A		
				WB Right	62	4	26	286	A		
38- Tower Oaks Blvd at I-270 off ramp											
38	NB	15.7	B	NB Left	475	16	25	187	B	14.8	B
				NB Through	12	17.0	19	179	B		
				NB Right	26	4.9	25	187	A		
	SB	0.1	A	SB Left	2	-0.2	0	16	A		
				SB Through	0	0.0	0	16	A		
				SB Right	2	0.5	0	0	A		
	EB	14.6	B	EB Left	7	11.4	39	282	B		
				EB Through	621	15.1	39	282	B		
				EB Right	91	11.5	32	272	B		
	WB	11.9	B	WB Left	0	0.0	4	71	A		
				WB Through	84	12.6	4	71	B		
				WB Right	7	4.2	0	0	A		
39- Montrose Rd at Tower Oaks Blvd											
39	NB	9.6	A	NB Left	26	45	21	127	D	61.8	E
				NB Through	188	30	21	127	C		
				NB Right	507	0	0	0	A		
	SB	38.9	D	SB Left	297	70	128	520	E		
				SB Through	605	26	127	519	C		
				SB Right	64	18	130	533	B		
	EB	144.4	F	EB Left	56	123	558	723	F		
				EB Through	816	146	559	724	F		
				EB Right	45	147	582	747	F		
	WB	39.8	D	WB Left	362	48	77	299	D		
				WB Through	231	46	77	299	D		
				WB Right	134	7	91	329	A		
40- Rockledge Blvd at I-270 NB on and off ramp											
40	NB			NB Left	0	0	0	0	A	16.0	B
				NB Through	85	32	30	146	C		
				NB Right	195	34	30	146	C		
	SB	2.3	A	SB Left	0	0	6	75	A		
				SB Through	986	2	6	75	A		
				SB Right	0	0	0	0	A		
	EB	24.3	C	EB Left	5	35	109	424	C		
				EB Through	501	50	109	424	D		
				EB Right	550	1	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table A.14: AM Peak - Existing - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
41- Rockledge Blvd at I-270 SB on and off ramps											
41	NB	2.6	A	NB Left	89	3	1	25	A	20.5	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	21.6	C	WB Left	986	23	98	664	C		
				WB Through	452	19	98	664	B		
				WB Right	0	0	0	0	A		
42- MD 187 at Tuckerman Ln											
42	NB	290.3	F	NB Left	184	172	1149	1512	F	195.3	F
				NB Through	1181	240	1149	1512	F		
				NB Right	143	859	1149	1512	F		
	SB	172.4	F	SB Left	60	147	2547	2696	F		
				SB Through	1511	171	2547	2696	F		
				SB Right	177	192	2547	2696	F		
	EB	65.2	E	EB Left	185	47	206	895	D		
				EB Through	548	73	207	896	E		
				EB Right	135	58	228	920	E		
	WB	203.3	F	WB Left	702	243	1957	2147	F		
				WB Through	354	165	1957	2147	F		
				WB Right	135	100	1957	2147	F		
43- MD 187 at I-270 NB on and off ramps											
43	NB	67.1	E	NB Left	153	90	240	435	F	44.4	D
				NB Through	1250	64	240	435	E		
				NB Right	0	0	0	0	A		
	SB	24.4	C	SB Left	0	0	0	0	A		
				SB Through	1718	24	91	590	C		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	64.9	E	WB Left	120	64	63	355	E		
				WB Through	10	75	63	355	E		
				WB Right	0	0	0	0	A		
44- MD 187 at I-270 NB on and off ramps											
44	NB	131.6	F	NB Left	0	0	0	0	A	62.8	E
				NB Through	1241	132	392	892	F		
				NB Right	0	0	0	0	A		
	SB	7.5	A	SB Left	193	56	63	268	E		
				SB Through	1641	2	63	268	A		
				SB Right	0	0	0	0	A		
	EB	91.6	F	EB Left	190	98	179	700	F		
				EB Through	0	0	179	700	A		
				EB Right	370	88	218	693	F		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
45- MD 187 at Rock Spring Dr											
45	NB	19.7	B	NB Left	192	61	84	380	E	22.2	C
				NB Through	1193	13	84	381	B		
				NB Right	6	16	104	414	B		
	SB	21.0	C	SB Left	12	25	104	666	C		
				SB Through	1837	23	104	666	C		
				SB Right	160	1	74	661	A		
	EB	38.3	D	EB Left	160	64	45	180	E		
				EB Through	22	54	45	180	D		
				EB Right	197	16	45	180	B		
	WB	4.8	A	WB Left	1	14	0	19	B		
				WB Through	8	6	0	19	A		
				WB Right	4	-1	0	0	A		
47-Democracy Blvd at I-270 NB off ramp											
47	NB	31.2	C	NB Left	212	31	26	165	C	14.0	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	13.5	B	EB Left	0	0	0	0	A		
				EB Through	1585	13	52	439	B		
				EB Right	0	0	0	0	A		
	WB	10.1	B	WB Left	0	0	0	0	A		
				WB Through	736	10	21	176	B		
				WB Right	0	0	0	0	A		
48- Democracy Blvd at I-270 SB on ramp											
48	NB			NB Left	0	0	0	0	A	6.3	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	5.0	A	EB Left	0	0	0	0	A		
				EB Through	1691	5	20	274	A		
				EB Right	0	0	0	0	A		
	WB	8.6	A	WB Left	210	37	30	188	D		
				WB Through	733	1	19	167	A		
				WB Right	0	0	0	0	A		
49- Democracy Blvd at I-270 SB off ramp											
49	NB			NB Left	0	0	0	0	A	12.4	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	33.1	C	SB Left	334	49	58	237	D		
				SB Through	0	0	0	0	A		
				SB Right	173	2	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	2.5	A	WB Left	0	0	0	0	A		
				WB Through	732	3	4	112	A		
				WB Right	323	2	0	103	A		
50- MD 190 at Burdette Rd											
50	NB	76.6	E	NB Left	19	69	12	111	E	11.8	B
				NB Through	3	74	12	111	E		
				NB Right	8	95	12	111	F		
	SB	33.2	C	SB Left	41	84	27	151	F		
				SB Through	13	84	27	151	F		
				SB Right	113	9	27	151	A		
	EB	9.6	A	EB Left	47	98	53	454	F		
				EB Through	1709	7	52	453	A		
				EB Right	15	5	42	477	A		
	WB	10.7	B	WB Left	0	87	45	661	F		
				WB Through	1437	11	46	662	B		
				WB Right	18	3	41	702	A		

Table A.14: AM Peak - Existing - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
51- MD 190 at I-270 NB on ramp											
51	NB			NB Left	0	0	0	0	A	37.1	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	81.7	F	EB Left	493	82	233	519	F		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	14.6	B	WB Left	0	0	0	0	A		
				WB Through	975	15	62	601	B		
				WB Right	0	0	0	0	A		
52- MD 190 at I-270 SB off ramp											
52	NB	78.7	E	NB Left	251	79	996	2228	E	14.3	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	2.9	A	EB Left	0	0	0	0	A		
				EB Through	864	3	6	140	A		
				EB Right	0	0	0	0	A		
	WB	4.8	A	WB Left	0	0	0	0	A		
				WB Through	675	5	6	147	A		
				WB Right	0	0	0	0	A		
53- MD 190 at Seven Locks Rd											
53	NB	66.4	E	NB Left	17	67	16	123	E	43.0	D
				NB Through	44	66	19	123	E		
				NB Right	0	0	0	0	A		
	SB	67.6	E	SB Left	581	67	199	696	E		
				SB Through	145	68	199	696	E		
				SB Right	13	73	198	696	E		
	EB	29.4	C	EB Left	18	25	93	480	C		
				EB Through	781	29	93	480	C		
				EB Right	32	30	93	480	C		
	WB	34.1	C	WB Left	121	113	109	329	F		
				WB Through	642	27	112	331	C		
				WB Right	159	1	2	57	A		
54- MD 124 at I-270 NB off ramp											
54	NB	84.3	F	NB Left	0	0	0	0	A	95.4	F
				NB Through	0	0	0	0	A		
				NB Right	920	84	345	963	F		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	107.9	F	EB Left	0	0	0	0	A		
				EB Through	813	108	473	1086	F		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
55- Democracy Blvd at I-270 NB off ramp											
55	NB	37.9	D	NB Left	0	0	0	0	A	16.9	B
				NB Through	0	0	0	0	A		
				NB Right	926	38	117	601	D		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	4.6	A	EB Left	0	0	0	0	A		
				EB Through	1586	5	18	88	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table A.15: AM Peak -2015 Adaptive Ramp Metering- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
1- MD 85 at Sam's Club Drive											
1	NB	19.1	B	NB Left	102	75	58	362	E	33.6	C
				NB Through	311	24	58	362	C		
				NB Right	579	7	6	258	A		
	SB	42.7	D	SB Left	111	59	125	567	E		
				SB Through	533	42	125	567	D		
				SB Right	52	20	125	567	C		
	EB	44.8	D	EB Left	81	70	43	148	E		
				EB Through	48	81	43	148	F		
				EB Right	102	8	43	148	A		
	WB	51.0	D	WB Left	207	72	74	306	E		
				WB Through	13	63	74	306	E		
				WB Right	100	6	74	306	A		
2- MD 85 at I-270 NB on and off ramp											
2	NB	40.9	D	NB Left	557	41	147	736	D	28.0	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	14.8	B	SB Left	0	0	0	0	A		
				SB Through	545	15	37	535	B		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
3- MD 85 at I-270 SB on and off ramp											
3	NB	4.4	A	NB Left	0	0	0	0	A	10.5	B
				NB Through	814	4	12	345	A		
				NB Right	0	0	0	0	A		
	SB	42.7	D	SB Left	154	43	39	253	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
4- MD 85 at Crestwood Blvd											
4	NB	16.0	C	NB Left	10	57	35	279	E	20.2	C
				NB Through	585	15	35	279	B		
				NB U-Turn	0	0	0	0	A		
	SB	14.4	B	SB Left	57	68	24	184	E		
				SB Through	1652	14	59	574	B		
				SB Right	750	11	50	564	B		
	EB	48.3	D	EB Left	483	50	68	226	D		
				EB Through	19	58	68	226	E		
				EB Right	32	11	68	226	B		
	WB	43.0	D	WB Left	37	56	17	111	E		
				WB Through	15	59	17	111	E		
				WB Right	19	6	17	111	A		
5- MD 80 at I-270 NB on and off ramp											
5	NB	-1.0	A	NB Left	3	2	0	0	A	12.6	B
				NB Through	1	0	0	0	A		
				NB Right	5	-3	0	0	A		
	SB	12.5	B	SB Left	181	15	12	98	B		
				SB Through	5	15	12	98	B		
				SB Right	51	3	0	13	A		
	EB	8.1	A	EB Left	38	9	7	133	A		
				EB Through	0	0	8	0	A		
				EB Right	7	5	14	163	A		
	WB	12.9	B	WB Left	31	14	0	46	B		
				WB Through	682	18	75	443	B		
				WB Right	502	5	0	0	A		
6- MD 80 at I-270 SB on and off ramp											
6	NB	7.9	A	NB Left	22	18	11	334	C	15.1	C
				NB Through	0	0	0	0	A		
				NB Right	263	7	11	334	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	19.9	C	EB Left	0	0	0	0	A		
				EB Through	241	21	23	202	C		
				EB Right	133	17	23	211	C		
	WB	16.3	C	WB Left	0	0	0	0	A		
				WB Through	192	16	47	285	C		
				WB Right	0	0	0	0	A		
7- MD 109 at I-270 NB on and off ramp											
7	NB			NB Left	0	0	0	0	A	2.4	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	7.9	A	SB Left	116	10	7	98	B		
				SB Through	0	0	0	0	A		
				SB Right	37	1	0	0	A		
	EB	3.2	A	EB Left	59	3	0	50	A		
				EB Through	0	0	0	0	A		
				EB Right	40	3	0	0	A		
	WB	0.5	A	WB Left	0	0	0	0	A		
				WB Through	462	0	0	23	A		
				WB Right	0	0	0	0	A		
8- MD 80 at I-270 SB on and off ramp											
8	NB	2.2	A	NB Left	15	10	1	61	A	11.6	B
				NB Through	0	0	0	0	A		
				NB Right	42	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	13.0	B	EB Left	0	0	0	0	A		
				EB Through	59	5	9	151	A		
				EB Right	70	20	9	155	C		
	WB	12.4	B	WB Left	392	13	41	462	B		
				WB Through	108	12	37	439	B		
				WB Right	0	0	0	0	A		
9- MD 121 at Gateway Center Dr											
9	NB	8.3	A	NB Left	95	13	13	123	B	48.6	D
				NB Through	278	11	13	123	B		
				NB Right	199	2	17	149	A		
	SB	28.7	D	SB Left	47	12	54	385	B		
				SB Through	573	30	70	385	C		
				SB Right	6	20	77	406	C		
	EB	132.8	F	EB Left	5	64	288	508	E		
				EB Through	62	125	291	508	F		
				EB Right	382	135	320	541	F		
	WB	31.1	D	WB Left	96	36	20	129	D		
				WB Through	12	37	20	128	D		
				WB Right	21	6	12	144	A		
10- MD 121 at I-270 NB on and off ramp											
10	NB	1.9	A	NB Left	40	11	2	91	B	36.1	E
				NB Through	0	0	0	0	A		
				NB Right	252	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.1	A	EB Left	0	0	0	0	A		
				EB Through	319	0	0	0	A		
				EB Right	49	0	0	0	A		
	WB	58.7	F	WB Left	135	8	250	1045	A		
				WB Through	890	66	490	1048	F		
				WB Right	0	0	0	0	A		

Table A.15: AM Peak -2015 Adaptive Ramp Metering- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
11- MD 121 at I-270 SB on and off ramp											
11	NB			NB Left	0	0	0	0	A	55.0	F
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	7.7	A	SB Left	124	10	6	110	B		
				SB Through	0	0	0	0	A		
				SB Right	47	1	0	0	A		
	EB	79.6	E	EB Left	25	2	0	34	A		
				EB Through	0	0	0	0	A		
				EB Right	674	82	572	892	F		
	WB	17.4	B	WB Left	0	0	0	0	A		
WB Through				242	17	0	0	C			
WB Right				0	0	0	0	A			
12- MD 27 at Observation Dr											
12	NB	45.3	D	NB U-Turn	0	0	0	0	A	48.3	D
				NB Through	34	59	10	64	E		
				NB Right	12	7	10	64	A		
	SB	49.3	D	SB Left	75	48	21	147	D		
				SB Through	43	55	39	241	E		
				SB Right	158	48	64	278	D		
	EB	16.6	B	EB Left	150	39	41	321	D		
				EB Through	1222	14	43	322	B		
				EB Right	49	13	50	360	B		
	WB	70.1	E	WB Left	78	47	442	838	D		
WB Through				1902	72	442	838	E			
WB Right				82	47	442	838	D			
13- MD 27 at I-270 NB off ramp											
13	NB	29.3	C	NB Left	90	29	12	88	C	32.2	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.1	A	EB Left	0	0	0	0	A		
				EB Through	915	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	47.4	D	WB Left	0	0	0	0	A		
WB Through				1964	47	1630	2466	D			
WB Right				0	0	0	0	A			
14- MD 27 at I-270 SB off ramp											
14	NB			NB Left	0	0	0	0	A	15.8	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	47.6	D	SB Left	400	48	66	265	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	9.3	A	EB Left	0	0	0	0	A		
				EB Through	657	9	12	196	A		
				EB Right	0	0	0	0	A		
	WB	8.7	A	WB Left	0	0	0	0	A		
WB Through				1189	9	22	369	A			
WB Right				0	0	0	0	A			
15- MD 27 at Crystal Rock Dr											
15	NB	17.7	B	NB Left	22	16	31	411	B	27.7	C
				NB Through	818	18	57	419	B		
				NB Right	72	17	60	432	B		
	SB	27.8	C	SB Left	400	53	139	816	D		
				SB Through	1318	21	139	816	C		
				SB Right	40	5	98	810	A		
	EB	44.2	D	EB Left	177	49	47	169	D		
				EB Through	73	50	43	164	D		
				EB Right	60	25	43	196	C		
	WB	56.0	E	WB Left	8	63	85	273	E		
WB Through				21	302	85	273	F			
WB Right				104	6	85	273	A			
16- MD 118 at Seneca Meadows Pkwy											
16	NB	3.3	A	NB Left	123	10	1	93	A	5.4	A
				NB Through	739	2	4	169	A		
				NB Right	81	1	8	222	A		
	SB	3.7	A	SB Left	25	5	5	174	A		
				SB Through	808	4	8	174	A		
				SB Right	32	2	9	203	A		
	EB	16.6	B	EB Left	15	62	8	69	E		
				EB Through	6	59	8	69	E		
				EB Right	96	7	8	69	A		
	WB	43.4	D	WB Left	30	64	12	94	E		
WB Through				5	69	8	93	E			
WB Right				21	9	11	113	A			
17- MD 118 at I-270 NB on ramp											
17	NB			NB Left	0	0	0	0	A	10.9	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	32.8	C	EB Left	222	33	44	278	C		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	5.7	A	WB Left	0	0	0	0	A		
WB Through				155	1	0	0	A			
WB Right				778	7	15	275	A			
18- MD 118 at I-270 SB off ramp											
18	NB			NB Left	0	0	0	0	A	7.5	A
				NB Through	0	0.0	0	0	A		
				NB Right	0	0.0	0	0	A		
	SB	37.9	D	SB Left	207	37.9	33	154	D		
				SB Through	0	0.0	0	0	A		
				SB Right	0	0.0	0	0	A		
	EB	3.4	A	EB Left	0	0.0	0	0	A		
				EB Through	615	3.4	4	147	A		
				EB Right	0	0.0	0	0	A		
	WB	3.8	A	WB Left	0	0.0	0	0	A		
WB Through				1033	3.8	7	190	A			
WB Right				0	0.0	0	0	A			
19- MD 118 at Aircraft Dr											
19	NB	45.2	D	NB Left	7	70	8	75	E	18.0	B
				NB Through	12	80	8	75	F		
				NB Right	14	3	0	22	A		
	SB	60.7	E	SB Left	241	58	98	368	E		
				SB Through	41	66	98	368	E		
				SB Right	81	67	98	368	E		
	EB	10.4	B	EB Left	102	13	28	310	B		
				EB Through	932	10	28	310	B		
				EB Right	27	9	28	310	A		
	WB	11.3	B	WB Left	72	18	31	238	B		
WB Through				909	13	31	238	B			
WB Right				277	4	31	238	A			
20- Middlebrook Rd at Observation Dr											
20	NB			NB Left	0	0	0	0	A	20.3	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	18.9	B	SB Left	22	35	4	43	D		
				SB Through	0	0	0	0	A		
				SB Right	25	5	4	43	A		
	EB	16.6	B	EB Left	208	23	30	262	C		
				EB Through	749	15	30	262	B		
				EB Right	0	0	0	0	A		
	WB	23.1	C	WB Left	0	0	0	0	A		
WB Through				1070	25	86	387	C			
WB Right				216	14	106	436	B			

Table A.15: AM Peak -2015 Adaptive Ramp Metering- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
21- Middlebrook Rd at I-270 SB on ramp											
21	NB			NB Left	0	0	0	0	A	77.2	E
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	17.7	B	EB Left	0	0	0	0	A		
				EB Through	662	18	36	228	B		
				EB Right	0	0	0	0	A		
	WB	131.6	F	WB Left	723	132	1471	2199	F		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
22- Middlebrook Rd at Waring Station Rd											
22	NB	327.0	F	NB Left	87	257	440	496	F	110.2	F
				NB Through	4	210	440	496	F		
				NB Right	204	359	440	496	F		
	SB	20.8	C	SB Left	3	35	1	29	D		
				SB Through	0	0	1	29	A		
				SB Right	3	6	2	67	A		
	EB	117.4	F	EB Left	26	34	1052	1301	C		
				EB Through	1283	119	1052	1301	F		
				EB Right	65	115	1052	1301	F		
	WB	17.6	B	WB Left	78	23	31	205	C		
				WB Through	679	18	31	205	B		
				WB Right	35	4	31	205	A		
23- MD 124 at MD 355											
23	NB	50.3	D	NB Left	230	69	72	197	E	84.2	F
				NB Through	306	42	70	195	D		
				NB Right	37	2	0	0	A		
	SB	33.2	C	SB Left	50	85	120	409	F		
				SB Through	966	50	120	409	D		
				SB Right	620	3	29	334	A		
	EB	101.9	F	EB Left	603	260	1041	1209	F		
				EB Through	520	25	1041	1209	C		
				EB Right	574	6	1013	1191	A		
	WB	121.8	F	WB Left	0	0	0	0	A		
				WB Through	1903	123	719	1121	F		
				WB Right	43	74	0	0	E		
24- MD 124 at I-270 SB on and off											
24	NB	64.7	F	NB Left	15	64	15	78	E	22.7	C
				NB Through	29	65	15	78	E		
				NB U-Turn	0	0	0	0	A		
	SB	26.8	C	SB Left	300	67	80	372	E		
				SB Through	3	65	80	372	E		
				SB Right	558	5	8	268	A		
	EB	16.3	B	EB Left	0	0	0	0	A		
				EB Through	900	17	44	356	B		
				EB Right	67	13	53	379	B		
	WB	23.4	C	WB Left	32	28	253	1708	C		
				WB Through	1224	23	253	1708	C		
				WB Right	0	0	0	0	A		
25- MD 117 at MD 124											
25	NB	167.0	F	NB Left	14	173	414	755	F	123.3	F
				NB Through	364	166	414	755	F		
				NB Right	333	168	436	745	F		
	SB	59.4	E	SB Left	172	120	207	694	F		
				SB Through	832	53	207	694	D		
				SB Right	93	8	0	0	A		
	EB	204.9	F	EB Left	73	254	709	861	F		
				EB Through	1211	203	710	862	F		
				EB Right	57	176	736	889	F		
	WB	44.0	D	WB Left	318	78	112	356	E		
				WB Through	473	30	112	356	C		
				WB Right	95	0	0	0	A		
26- MD 117 at Bureau Dr											
26	NB	56.3	E	NB Left	18	75	16	121	E	85.2	F
				NB Through	18	67	16	121	E		
				NB Right	25	35	16	121	C		
	SB	87.8	F	SB Left	191	96	107	332	F		
				SB Through	43	91	107	332	F		
				SB Right	28	27	107	332	C		
	EB	125.2	F	EB Left	23	94	709	1008	F		
				EB Through	1683	126	714	1007	F		
				EB Right	17	107	704	997	F		
	WB	38.7	D	WB Left	298	111	241	788	F		
				WB Through	849	24	242	789	C		
				WB Right	314	10	214	837	A		
27- MD 117 at I-270 SB off ramp											
27	NB			NB Left	0	0	0	0	A	19.6	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	8.8	A	EB Left	0	0	0	0	A		
				EB Through	701	9	6	283	A		
				EB Right	0	0	0	0	A		
	WB	43.7	E	WB Left	314	44	115	591	E		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
28- MD 117 at I-270 NB off ramp											
28	NB			NB Left	0	0	0	0	A	31.1	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	48.9	D	SB Left	307	56	229	766	E		
				SB Through	0	0	0	0	A		
				SB Right	914	47	235	768	D		
	EB	20.1	C	EB Left	8	114	69	838	F		
				EB Through	689	19	69	838	B		
				EB Right	0	0	0	0	A		
	WB	14.7	B	WB Left	0	0	0	0	A		
				WB Through	859	15	51	353	B		
				WB Right	9	7	57	383	A		
29- MD 117 at Perry Pkwy											
29	NB	43.5	D	NB Left	35	70	15	99	E	13.8	B
				NB Through	6	57	14	98	E		
				NB Right	31	11	24	118	B		
	SB	33.9	C	SB Left	91	73	37	167	E		
				SB Through	13	66	37	167	E		
				SB Right	124	2	37	167	A		
	EB	10.6	B	EB Left	110	69	40	262	E		
				EB Through	876	3	40	262	A		
				EB Right	8	3	27	247	A		
	WB	9.5	A	WB Left	5	103	19	239	F		
				WB Through	708	9	19	239	A		
				WB Right	104	5	19	239	A		
30- Shady Grove Rd at I-270 NB off ramp											
30	NB	8.5	A	NB Left	0	0	0	0	A	23.9	C
				NB Through	918	9	19	203	A		
				NB Right	0	0	0	0	A		
	SB	10.2	B	SB Left	0	0	0	0	A		
				SB Through	1284	10	31	344	B		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	55.4	E	WB Left	1005	55	193	653	E		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table A.15: AM Peak -2015 Adaptive Ramp Metering- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
31- Shady Grove Rd at I-270 SB off ramp											
31	NB	15.1	B	NB Left	0	0	0	0	A	20.8	C
				NB Through	920	15	42	356	B		
				NB Right	0	0	0	0	A		
	SB	11.0	B	SB Left	0	0	0	0	A		
				SB Through	1689	11	54	621	B		
				SB Right	0	0	0	0	A		
	EB	43.7	D	EB Left	313	39	44	273	D		
				EB Through	0	0	0	0	A		
				EB Right	644	46	98	449	D		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
32- MD 28 at I-270 SB off ramp											
32	NB			NB U-Turn	0	0	0	0	A	28.3	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	35.1	D	SB Left	463	43	71	288	D		
				SB Through	0	0	0	0	A		
				SB Right	111	3	0	61	A		
	EB	45.2	D	EB Left	0	0	0	0	A		
				EB Through	1129	68	1228	2133	E		
				EB Right	726	10	420	2124	B		
	WB	9.2	A	WB Left	0	0	0	0	A		
				WB Through	1841	9	31	413	A		
				WB Right	0	0	0	0	A		
33- MD 28 at I-270 on and off ramps											
33	NB	33.2	C	NB Left	0	0	48	267	A	17.2	B
				NB Through	206	48	57	276	D		
				NB Right	134	11	57	276	B		
	SB	19.9	B	SB Left	25	53	18	166	D		
				SB Through	0	0	0	0	A		
				SB Right	259	17	18	166	B		
	EB	16.2	B	EB Left	239	30	55	353	C		
				EB Through	884	13	55	353	B		
				EB Right	0	0	0	0	A		
	WB	11.6	B	WB Left	22	11	40	292	B		
				WB Through	890	12	28	255	B		
				WB Right	0	0	0	0	A		
34- MD 189 at Great Falls Rd											
34	NB	40.7	D	NB Left	62	45	16	111	D	10.2	B
				NB Through	6	42	13	110	D		
				NB Right	8	8	15	121	A		
	SB	5.1	A	SB Left	67	45	20	162	D		
				SB Through	7	40	20	162	D		
				SB Right	601	0	0	0	A		
	EB	10.6	B	EB Left	320	16	14	203	B		
				EB Through	910	9	18	215	A		
				EB Right	13	6	27	252	A		
	WB	12.2	B	WB Left	3	20	17	186	B		
				WB Through	315	12	17	185	B		
				WB Right	10	8	27	219	A		
35- MD 189 at I-270 Ramps											
35	NB	48.4	D	NB Left	129	48	25	131	D	39.7	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	48.1	D	SB Left	187	48	56	305	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	23.8	C	EB Left	383	21	86	446	C		
				EB Through	527	25	86	446	C		
				EB Right	0	0	0	0	A		
	WB	54.0	D	WB Left	535	47	123	322	D		
				WB Through	283	67	123	322	E		
				WB Right	0	0	0	0	A		
36- MD 189 at Wooton Pkwy											
36	NB	44.3	D	NB Left	129	52	52	180	D	58.9	E
				NB Through	101	83	52	180	F		
				NB Right	150	11	52	180	B		
	SB	97.8	F	SB Left	385	112	316	761	F		
				SB Through	517	87	252	748	F		
				SB Right	0	0	0	0	A		
	EB	45.4	D	EB Left	132	73	198	853	E		
				EB Through	961	44	198	853	D		
				EB Right	95	20	198	853	C		
	WB	43.4	D	WB Left	419	65	112	349	E		
				WB Through	387	26	112	349	C		
				WB Right	59	5	112	349	A		
37- Montrose Rd at Tower Oaks Blvd											
37	NB			NB Left	0	0	0	0	A	76.2	E
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	436.0	F	SB Left	82	72	1270	1408	E		
				SB Through	0	0	0	0	A		
				SB Right	334	525	1266	1403	F		
	EB	7.5	A	EB Left	26	24	23	311	C		
				EB Through	1402	7	23	311	A		
				EB Right	0	0	0	0	A		
	WB	41.9	D	WB Left	0	0	0	0	A		
				WB Through	1443	43	138	623	D		
				WB Right	62	11	138	623	B		
38- Tower Oaks Blvd at I-270 off ramp											
38	NB	25.1	C	NB Left	474	22	36	196	C	108.6	F
				NB Through	12	20.6	29	188	C		
				NB Right	26	91.0	36	196	F		
	SB	6.0	A	SB Left	1	17.2	0	18	B		
				SB Through	0	0.0	0	18	A		
				SB Right	2	0.4	0	0	A		
	EB	222.8	F	EB Left	2	81.1	393	464	F		
				EB Through	397	225.3	393	464	F		
				EB Right	55	209.6	384	455	F		
	WB	8.8	A	WB Left	0	0.0	3	60	A		
				WB Through	82	9.2	3	60	A		
				WB Right	6	3.8	0	0	A		
39- Montrose Rd at Tower Oaks Blvd											
39	NB	9.4	A	NB Left	26	44	21	130	D	61.0	E
				NB Through	188	29	21	130	C		
				NB Right	507	0	0	0	A		
	SB	36.5	D	SB Left	298	68	118	450	E		
				SB Through	607	24	117	449	C		
				SB Right	64	14	118	495	B		
	EB	144.1	F	EB Left	57	122	555	732	F		
				EB Through	810	146	557	732	F		
				EB Right	46	143	580	756	F		
	WB	39.3	D	WB Left	347	48	74	273	D		
				WB Through	219	45	74	273	D		
				WB Right	129	8	84	303	A		
40- Rockledge Blvd at I-270 NB on and off ramp											
40	NB			NB Left	0	0	0	0	A	16.2	B
				NB Through	84	31	29	147	C		
				NB Right	194	32	29	147	C		
	SB	2.5	A	SB Left	0	0	6	87	A		
				SB Through	991	2	6	87	A		
				SB Right	0	0	0	0	A		
	EB	25.0	C	EB Left	5	41	116	536	D		
				EB Through	495	51	116	536	D		
				EB Right	543	1	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table A.15: AM Peak -2015 Adaptive Ramp Metering- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS	
41- Rockledge Blvd at I-270 SB on and off ramps												
41	NB	2.6	A	NB Left	90	3	1	40	A	21.3	C	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	22.4	C		WB Left	992	23	102	651			C
					WB Through	453	21	102	651			C
					WB Right	0	0	0	0			A
42- MD 187 at Tuckerman Ln												
42	NB	269.6	F	NB Left	181	144	1032	1426	F	187.6	F	
				NB Through	1162	225	1032	1426	F			
				NB Right	138	808	1032	1426	F			
	SB	171.0	F		SB Left	58	146	2540	2702			F
					SB Through	1526	170	2540	2702			F
					SB Right	179	189	2540	2702			F
	EB	66.1	E		EB Left	185	47	212	927			D
					EB Through	548	74	214	928			E
					EB Right	135	60	234	952			E
	WB	198.5	F		WB Left	717	235	1952	2159			F
					WB Through	356	163	1952	2159			F
					WB Right	136	98	1952	2159			F
43- MD 187 at I-270 NB on and off ramps												
43	NB	60.4	E	NB Left	151	87	203	385	F	41.0	D	
				NB Through	1201	57	203	385	E			
				NB Right	0	0	0	0	A			
	SB	24.7	C		SB Left	0	0	0	0			A
					SB Through	1738	25	93	599			C
					SB Right	0	0	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	57.7	E		WB Left	119	58	51	370			E
					WB Through	10	56	51	370			E
					WB Right	0	0	0	0			A
44- MD 187 at I-270 NB on and off ramps												
44	NB	143.3	F	NB Left	0	0	0	0	A	65.1	E	
				NB Through	1185	143	426	836	F			
				NB Right	0	0	0	0	A			
	SB	6.9	A		SB Left	196	49	59	272			D
					SB Through	1659	2	59	272			A
					SB Right	0	0	0	0			A
	EB	92.5	F		EB Left	188	100	175	729			F
					EB Through	0	0	175	729			A
					EB Right	367	89	219	717			F
	WB				WB Left	0	0	0	0			A
					WB Through	0	0	0	0			A
					WB Right	0	0	0	0			A
45- MD 187 at Rock Spring Dr												
45	NB	25.2	C	NB Left	191	63	108	462	E	24.0	C	
				NB Through	1184	19	109	462	B			
				NB Right	6	13	130	495	B			
	SB	20.3	C		SB Left	13	27	101	696			C
					SB Through	1849	22	101	696			C
					SB Right	163	1	61	652			A
	EB	40.4	D		EB Left	159	68	46	178			E
					EB Through	22	54	46	178			D
					EB Right	197	16	46	178			B
	WB	5.0	A		WB Left	1	15	0	19			B
					WB Through	8	7	0	19			A
					WB Right	4	-1	0	0			A
47-Democracy Blvd at I-270 NB off ramp												
47	NB	27.3	C	NB Left	211	27	23	142	C	13.9	B	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB	13.7	B		EB Left	0	0	0	0			A
					EB Through	1582	14	53	448			B
					EB Right	0	0	0	0			A
	WB	10.4	B		WB Left	0	0	0	0			A
					WB Through	736	10	22	176			B
					WB Right	0	0	0	0			A
48- Democracy Blvd at I-270 SB on ramp												
48	NB			NB Left	0	0	0	0	A	6.3	A	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB	5.1	A		EB Left	0	0	0	0			A
					EB Through	1688	5	20	266			A
					EB Right	0	0	0	0			A
	WB	8.5	A		WB Left	210	36	30	188			D
					WB Through	732	1	19	167			A
					WB Right	0	0	0	0			A
49- Democracy Blvd at I-270 SB off ramp												
49	NB			NB Left	0	0	0	0	A	12.9	B	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB	35.0	D		SB Left	329	52	60	237			D
					SB Through	0	0	0	0			A
					SB Right	166	2	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	2.5	A		WB Left	0	0	0	0			A
					WB Through	731	3	4	115			A
					WB Right	323	2	0	109			A
50- MD 190 at Burdette Rd												
50	NB	76.6	E	NB Left	19	69	12	111	E	11.2	B	
				NB Through	3	74	12	111	E			
				NB Right	8	95	12	111	F			
	SB	33.4	C		SB Left	41	84	28	151			F
					SB Through	13	84	28	151			F
					SB Right	113	9	28	151			A
	EB	8.5	A		EB Left	47	97	47	367			F
					EB Through	1717	6	46	366			A
					EB Right	15	4	36	390			A
	WB	10.7	B		WB Left	0	87	43	641			F
					WB Through	1434	11	44	642			B
					WB Right	18	2	38	674			A

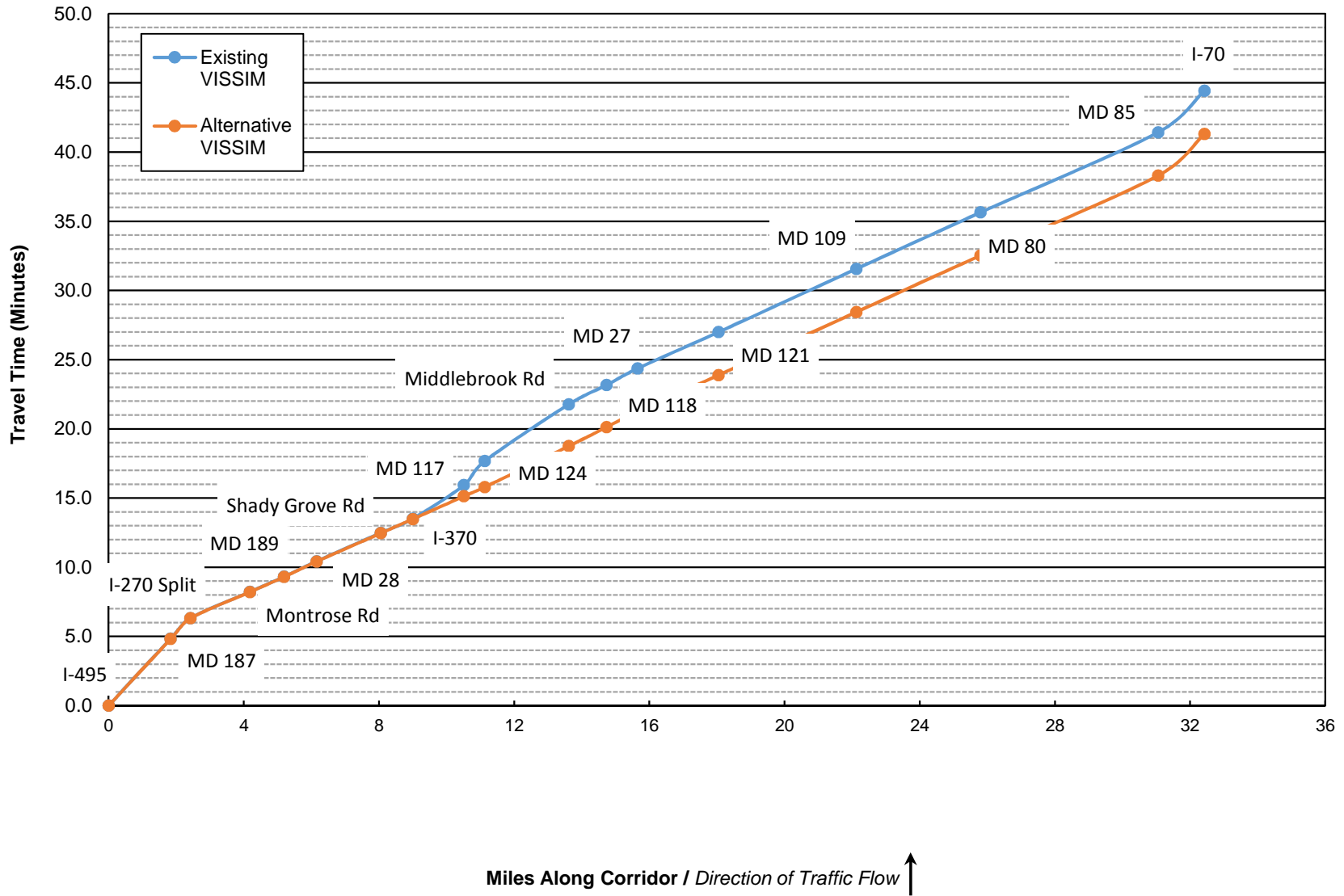
Table A.15: AM Peak -2015 Adaptive Ramp Metering- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
51- MD 190 at I-270 NB on ramp											
51	NB			NB Left	0	0	0	0	A	36.9	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	82.3	F	EB Left	491	82	233	538	F		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	14.1	B	WB Left	0	0	0	0	A		
				WB Through	975	14	59	618	B		
				WB Right	0	0	0	0	A		
52- MD 190 at I-270 SB off ramp											
52	NB	81.8	F	NB Left	252	82	601	2264	F	14.7	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	2.9	A	EB Left	0	0	0	0	A		
				EB Through	864	3	6	133	A		
				EB Right	0	0	0	0	A		
	WB	4.8	A	WB Left	0	0	0	0	A		
				WB Through	675	5	6	159	A		
				WB Right	0	0	0	0	A		
53- MD 190 at Seven Locks Rd											
53	NB	66.4	E	NB Left	17	67	16	123	E	43.4	D
				NB Through	44	66	19	123	E		
				NB Right	0	0	0	0	A		
	SB	67.6	E	SB Left	581	67	199	696	E		
				SB Through	145	68	199	696	E		
				SB Right	13	73	198	696	E		
	EB	29.4	C	EB Left	18	25	94	480	C		
				EB Through	781	29	94	480	C		
				EB Right	32	30	94	480	C		
	WB	35.2	D	WB Left	121	117	112	342	F		
				WB Through	644	28	114	345	C		
				WB Right	158	1	0	0	A		
54- MD 124 at I-270 NB off ramp											
54	NB	85.3	F	NB Left	0	0	0	0	A	98.3	F
				NB Through	0	0	0	0	A		
				NB Right	907	85	396	979	F		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	113.1	F	EB Left	0	0	0	0	A		
				EB Through	795	113	507	1042	F		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
55- Democracy Blvd at I-270 NB off ramp											
55	NB	36.2	D	NB Left	0	0	0	0	A	16.3	B
				NB Through	0	0	0	0	A		
				NB Right	926	36	110	452	D		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	4.6	A	EB Left	0	0	0	0	A		
				EB Through	1582	5	19	94	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

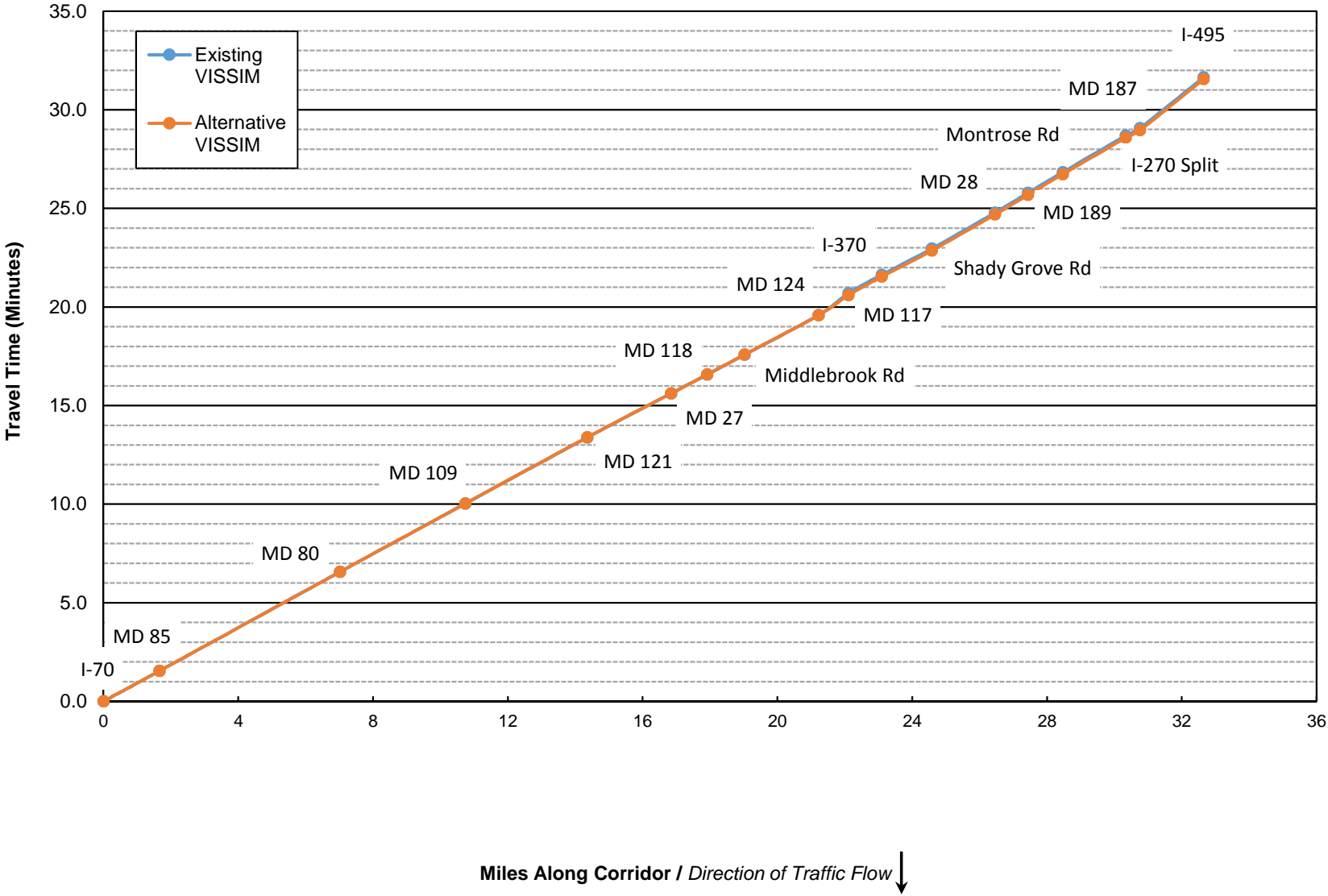
Table A.16: AM Peak -2015 Adaptive Ramp Metering - I-270 Vehicle Network Performance

	Existing	ARM	% Change
Total Delay	21,906,753	19,007,774	-13%
Average Delay per Vehicle	227	200	-12%
Total Travel Time	51,252,838	48,602,842	-5%
Vehicles (Arrived)	81,275	81,318	0%
Latent Demand	4,969	6,307	27%
Latent Delay	13,122,672	16,798,823	28%
Total Distance	467,210	470,752	1%
Average Speed	33	35	6%

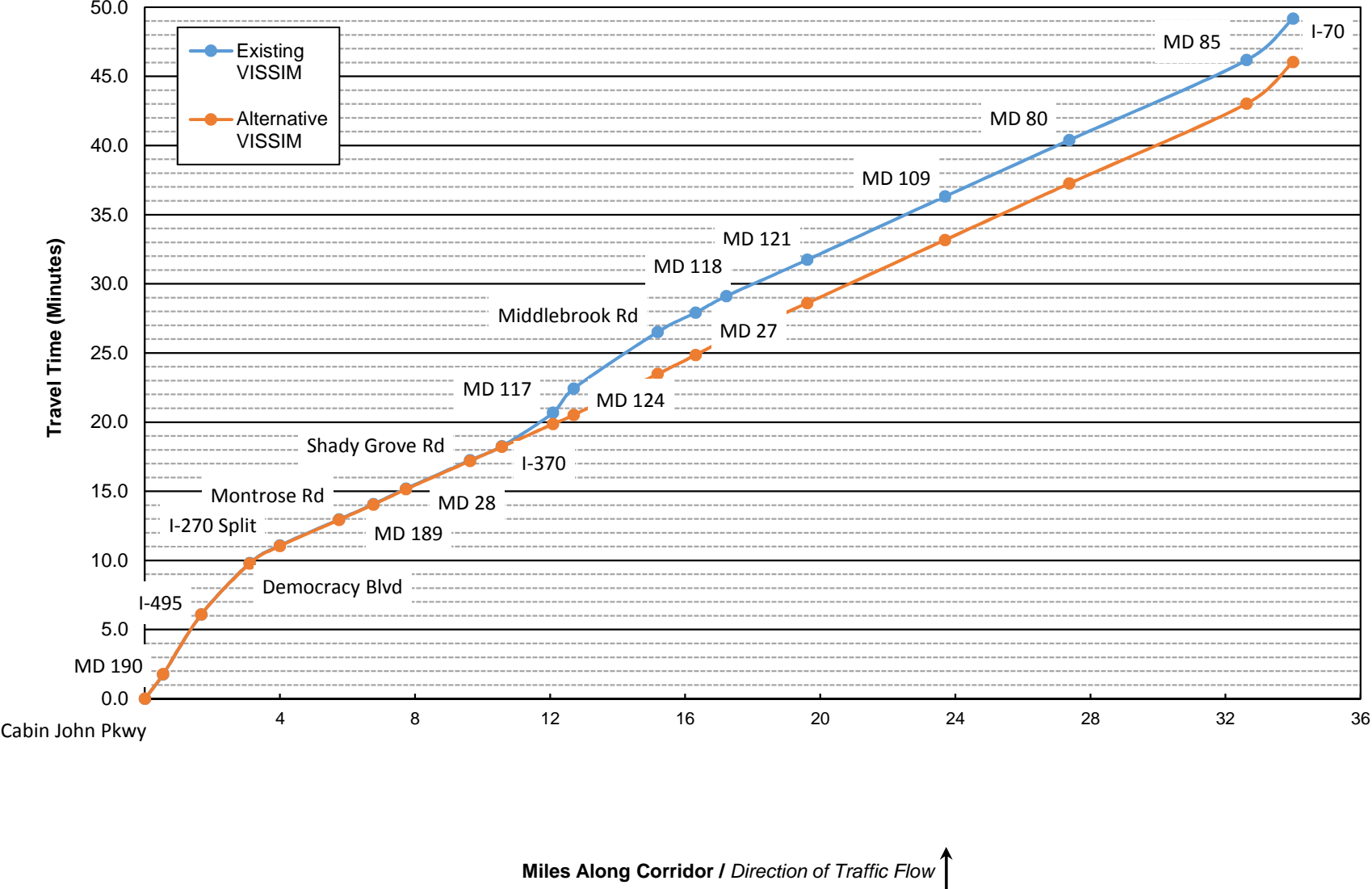
**Figure B.1: PM Peak - 2015 Adaptive Ramp Metering
I-270 Travel Time Graph - Northbound**



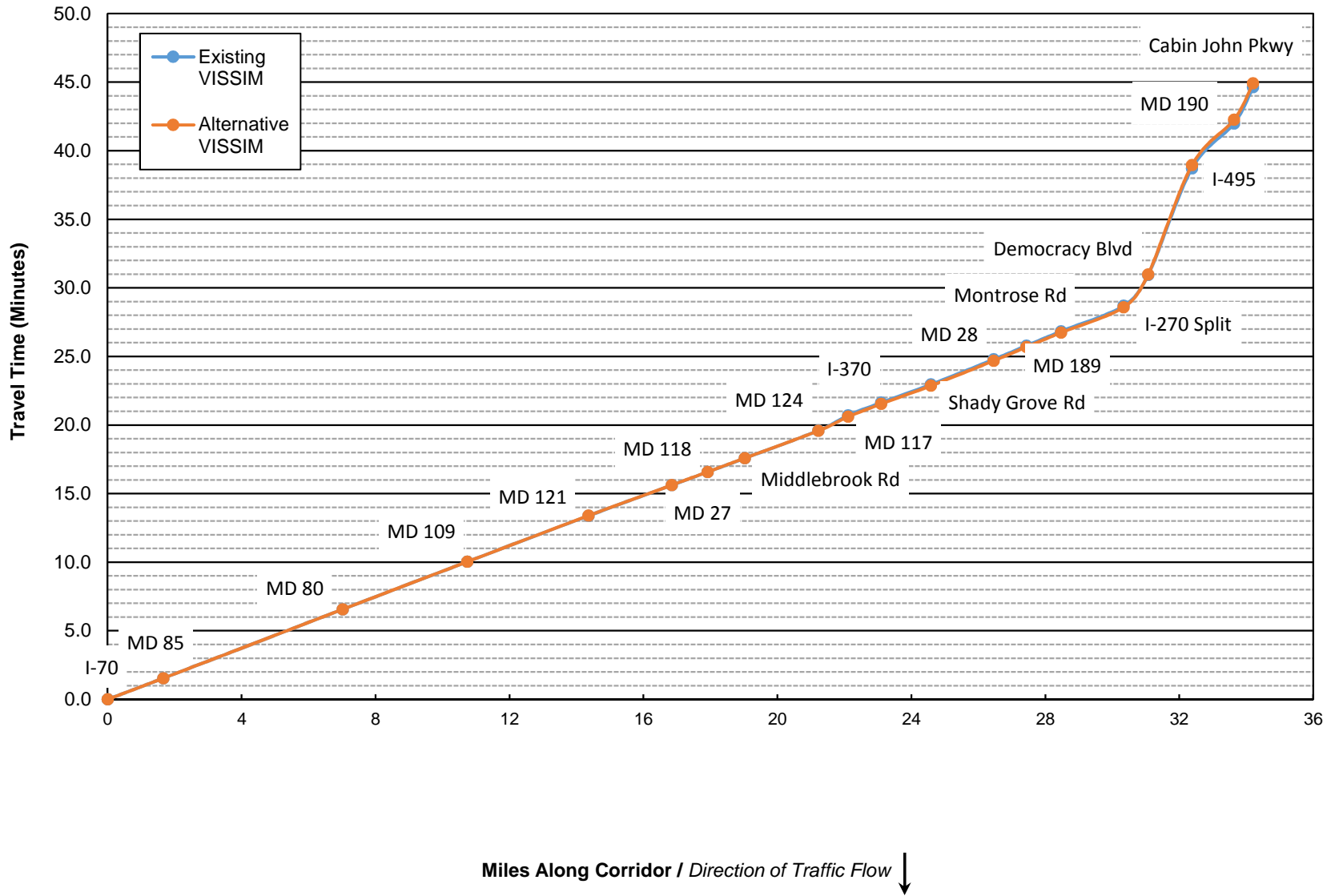
**Figure B.2: PM Peak - 2015 Adaptive Ramp Metering
I-270 Travel Time Graph - Southbound**



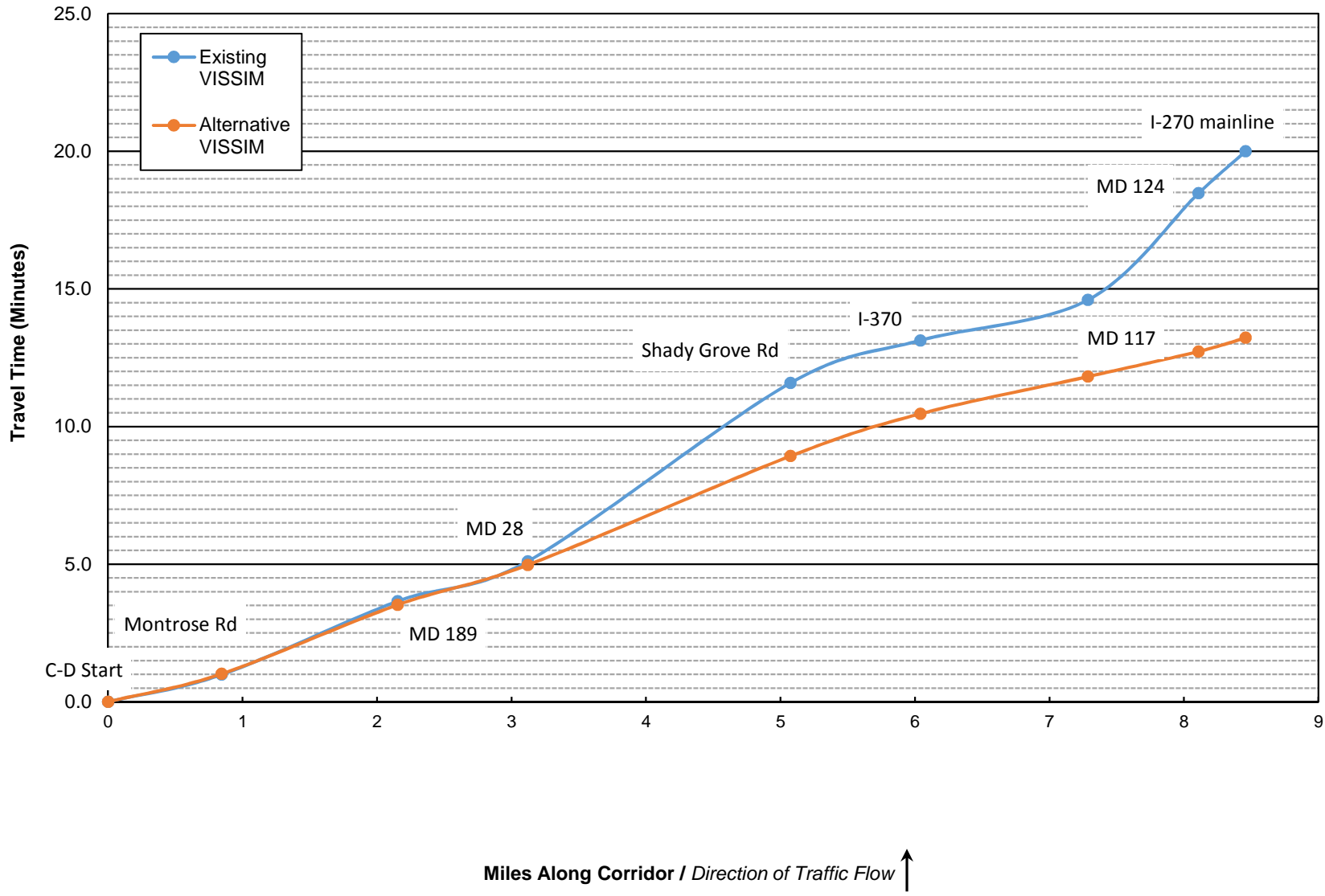
**Figure B.3: PM Peak - 2015 Adaptive Ramp Metering
I-270 Spur Travel Time Graph - Northbound**



**Figure B4: PM Peak - 2015 Adaptive Ramp Metering
I-270 Spur Travel Time Graph - Southbound**



**Figure B.5: PM Peak - 2015 Adaptive Ramp Metering
I-270 Local Travel Time Graph - Northbound**



**Figure B.6: PM Peak - 2015 Adaptive Ramp Metering
I-270 Local Travel Time Graph - Southbound**

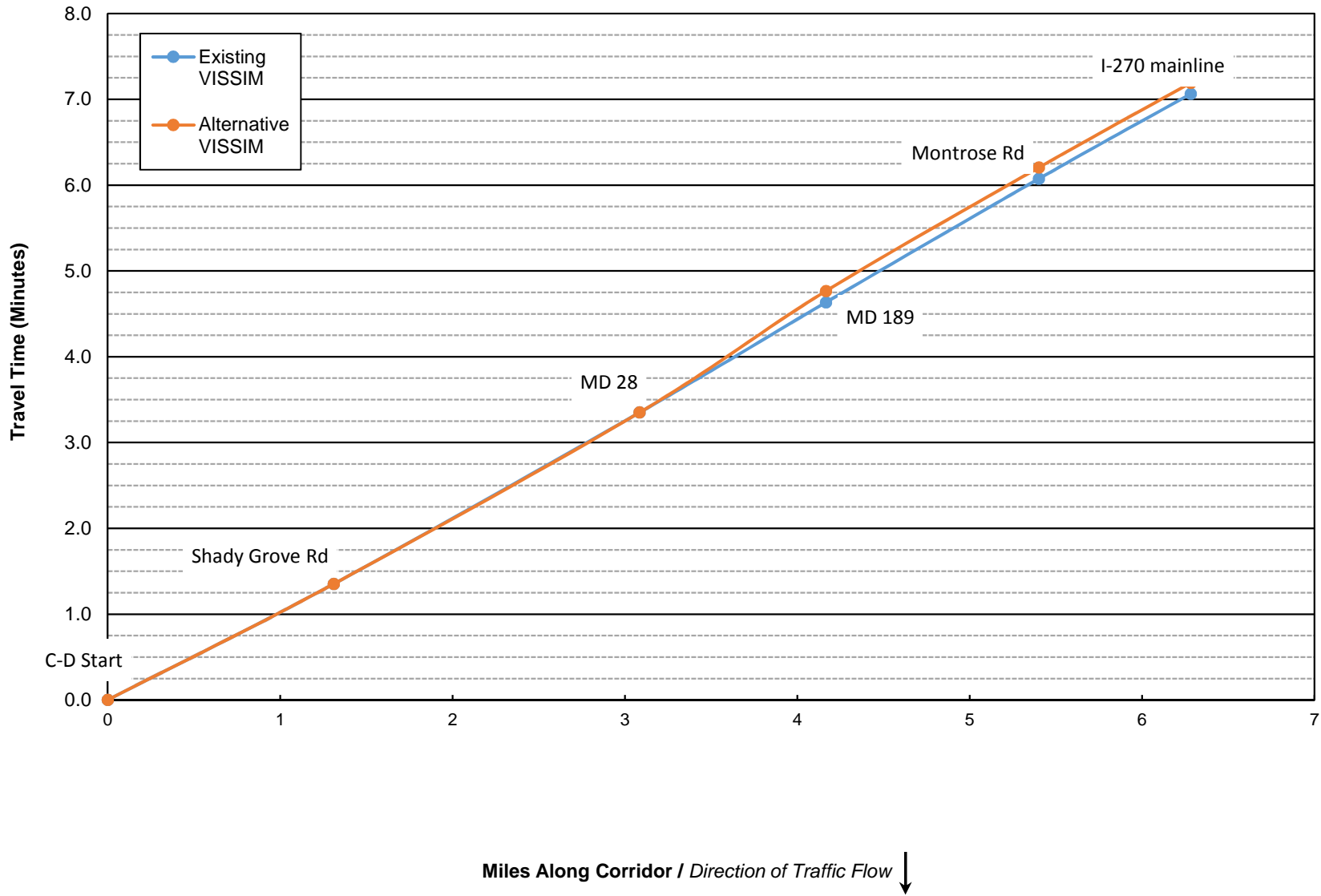


Table B.1: PM Peak -2015 Adaptive Ramp Metering- I-270 Vehicle Travel Time

I-270 Northbound	Segment Length (miles)	Existing VISSIM Travel Time (seconds)	ARM VISSIM Travel Time (seconds)	% Change	I-270 Southbound	Segment Length (miles)	Existing VISSIM Travel Time (seconds)	ARM VISSIM Travel Time (seconds)	% Change
From I-495 interchange					From I-70				
to MD 187	1.8	290.1	288.8	-0.5%	to MD 85	1.7	92.4	92.4	0.0%
to I-270 Split	0.6	89.3	90.0	0.7%	to MD 80	5.4	301.4	301.4	0.0%
to Montrose Rd	1.8	113.6	113.6	0.0%	to MD 109	3.7	207.9	208.1	0.1%
to MD 189	1.0	66.0	66.0	0.1%	to MD 121	3.6	201.4	201.6	0.1%
to MD 28	1.0	67.1	66.6	-0.8%	to MD 27	2.5	133.7	133.6	-0.1%
to Shady Grove Rd	1.9	123.3	122.9	-0.3%	to MD 118	1.1	57.6	57.7	0.0%
to I-370	0.9	61.3	61.0	-0.5%	to Middlebrook Rd	1.1	60.4	60.5	0.2%
to MD 117	1.5	145.0	99.2	-31.6%	to MD 124	2.2	120.9	119.6	-1.1%
to MD 124	0.6	104.3	39.3	-62.3%	to MD 117	0.9	66.4	61.1	-7.9%
to Middlebrook Rd	2.5	246.0	177.7	-27.8%	to I-370	1.0	55.8	55.9	0.2%
to MD 118	1.1	83.6	82.4	-1.4%	to Shady Grove Rd	1.5	79.7	79.7	0.0%
to MD 27	0.9	72.2	68.0	-5.7%	to MD 28	1.9	109.5	109.4	0.0%
to MD 121	2.4	157.6	157.4	-0.1%	to MD 189	1.0	60.1	60.0	-0.2%
to MD 109	4.1	274.2	273.5	-0.3%	to Montrose Rd	1.0	62.9	62.9	-0.1%
to MD 80	3.7	244.9	245.1	0.1%	to I-270 Split	1.9	111.5	111.2	-0.3%
to MD 85	5.3	346.9	346.4	-0.2%	to MD 187	0.4	22.8	22.9	0.3%
to I-70	1.4	180.2	180.2	0.0%	to I-495 interchange	1.9	154.8	154.9	0.1%
I-270 Total (miles/minutes)	32.4	44.4	41.3	-7.0%	I-270 Total (miles/minutes)	32.6	31.7	31.5	-0.3%
I-270 Spur Northbound					I-270 Spur Southbound				
From Cabin John Pkwy					From I-70				
to MD 190	0.5	105.6	106.4	0.8%	to I-270 Split	30.3	1,721.6	1,715.1	-0.4%
to I-495	1.1	259.8	259.3	-0.2%	to Democracy Blvd	0.7	135.0	143.9	6.6%
to Democracy Blvd	1.4	222.8	220.8	-0.9%	to I-495	1.3	466.2	478.2	2.6%
to I-270 Split	0.9	76.3	76.1	-0.3%	to MD 190	1.3	196.3	198.6	1.2%
to I-70	30.0	2,286.1	2,099.2	-8.2%	to Cabin John Pkwy	0.6	158.2	158.7	0.3%
I-270 Spur Total (miles/minutes)	34.0	49.2	46.0	-6.4%	I-270 Spur Total (miles/minutes)	34.2	44.6	44.9	0.6%

Table B.2: PM Peak -2015 Adaptive Ramp Metering- I-270 Local Vehicle Travel Time

I-270 Northbound	Segment Length (miles)	Existing VISSIM Travel Time (seconds)	ARM VISSIM Travel Time (seconds)	% Change	I-270 Southbound	RITIS Segment Number	Segment Length (miles)	Cumulative Length (miles)	Existing VISSIM Travel Time (seconds)	ARM VISSIM Travel Time (seconds)	% Change
From C-D start					From C-D start			0.0			
to Montrose Rd	0.8	59.3	61.0	2.9%	to Shady Grove	7001+7002	1.3	1.3	81.2	81.2	0.0%
to MD 189	1.3	159.8	150.3	-5.9%	to MD 28	7003+7004	1.8	3.1	119.8	119.8	0.0%
to MD 28	1.0	87.2	86.9	-0.3%	to MD 189	7005+7006	1.1	4.2	77.1	85.0	10.2%
to Shady Grove	2.0	388.8	237.4	-38.9%	to Montrose	7007+7008	1.2	5.4	86.4	86.4	-0.1%
to I-370	1.0	92.6	92.2	-0.4%	to I-270 mainline	7009+7010	0.9	6.3	59.4	59.3	-0.2%
to MD 117	1.2	88.2	81.0	-8.1%							
to MD 124	0.8	232.8	54.8	-76.5%							
to I-270 mainline	0.4	91.1	29.8	-67.2%							
I-270 Local Total (miles/minutes)	8.5	20.0	13.2	-33.9%	I-270 Local Total (miles/minutes)		6.3		7.1	7.2	1.8%

Table B.3: PM Peak -2015 Adaptive Ramp Metering- I-270 Vehicle Speed

I-270 Northbound	Segment Length (miles)	Existing VISSIM Speed (MPH)	ARM VISSIM Speed (MPH)	% Change	I-270 Southbound	Segment Length (miles)	Existing VISSIM Speed (MPH)	ARM VISSIM Speed (MPH)	% Change
From I-495 interchange					From I-70				
to MD 187	1.8	22.8	22.9	0.5%	to MD 85	1.7	64.8	64.8	0.0%
to I-270 Split	0.6	23.8	23.6	-0.7%	to MD 80	5.4	64.0	64.0	0.0%
to Montrose Rd	1.8	55.6	55.6	0.0%	to MD 109	3.7	64.4	64.4	-0.1%
to MD 189	1.0	55.3	55.3	-0.1%	to MD 121	3.6	64.7	64.7	-0.1%
to MD 28	1.0	51.8	52.1	0.8%	to MD 27	2.5	66.9	66.9	0.1%
to Shady Grove Rd	1.9	55.4	55.6	0.3%	to MD 118	1.1	67.0	67.0	0.0%
to I-370	0.9	55.5	55.8	0.5%	to Middlebrook Rd	1.1	66.2	66.1	-0.2%
to MD 117	1.5	37.6	55.0	46.2%	to MD 124	2.2	65.4	66.1	1.1%
to MD 124	0.6	21.1	56.1	165.3%	to MD 117	0.9	48.1	52.2	8.6%
to Middlebrook Rd	2.5	36.4	50.4	38.4%	to I-370	1.0	63.6	63.4	-0.2%
to MD 118	1.1	48.3	49.0	1.4%	to Shady Grove Rd	1.5	67.2	67.2	0.0%
to MD 27	0.9	45.7	48.5	6.1%	to MD 28	1.9	61.6	61.6	0.0%
to MD 121	2.4	54.7	54.8	0.1%	to MD 189	1.0	58.6	58.7	0.2%
to MD 109	4.1	53.5	53.7	0.3%	to Montrose Rd	1.0	59.1	59.1	0.1%
to MD 80	3.7	54.1	54.0	-0.1%	to I-270 Split	1.9	60.4	60.6	0.3%
to MD 85	5.3	54.5	54.6	0.2%	to MD 187	0.4	66.4	66.2	-0.3%
to I-70	1.4	27.4	27.4	0.0%	to I-495 interchange	1.9	44.0	43.9	-0.1%
I-270 Total (miles/minutes)	32.4	43.8	47.1	7.6%	I-270 Total (miles/minutes)	32.6	61.9	62.1	0.3%
I-270 Spur Northbound					I-270 Spur Southbound				
From Cabin John Pkwy					From I-70				
to MD 190	0.5	18.4	18.2	-0.8%	to I-270 Split	30.3	63.4	63.7	0.4%
to I-495	1.1	15.7	15.7	0.2%	to Democracy Blvd	0.7	19.5	18.3	-6.2%
to Democracy Blvd	1.4	23.2	23.4	0.9%	to I-495	1.3	10.1	9.9	-2.5%
to I-270 Split	0.9	42.1	42.2	0.3%	to MD 190	1.3	23.0	22.7	-1.2%
to I-70	30.0	47.2	51.5	8.9%	to Cabin John Pkwy	0.6	13.0	12.9	-0.3%
I-270 Spur Total (miles/minutes)	34.0	41.5	44.3	6.8%	I-270 Spur Total (miles/minutes)	34.2	46.0	45.7	-0.6%

Table B.4: PM Peak -2015 Adaptive Ramp Metering- I-270 Local Vehicle Speed

I-270 Northbound	Segment Length (miles)	Existing VISSIM Speed (MPH)	ARM VISSIM Speed (MPH)	% Change	I-270 Southbound	Segment Length (miles)	Existing VISSIM Speed (MPH)	ARM VISSIM Speed (MPH)	% Change
From C-D start					From C-D start				
to Montrose Rd	0.8	51.3	49.9	-2.8%	to Shady Grove	1.3	58.1	58.2	0.0%
to MD 189	1.3	29.4	31.3	6.3%	to MD 28	1.8	53.3	53.3	0.0%
to MD 28	1.0	40.0	40.1	0.3%	to MD 189	1.1	50.5	45.8	-9.3%
to Shady Grove	2.0	18.1	29.6	63.8%	to Montrose	1.2	51.4	51.5	0.1%
to I-370	1.0	37.5	37.7	0.4%	to I-270 mainline	0.9	53.5	53.6	0.2%
to MD 117	1.2	50.9	55.4	8.8%					
to MD 124	0.8	12.7	54.1	325.1%					
to I-270 mainline	0.4	13.8	42.2	205.2%					
I-270 Local Total (miles/minutes)	8.5	25.4	38.4	51.2%	I-270 Local Total (miles/minutes)	6.3	53.4	52.4	-1.8%

Table B.5: PM Peak -2015 Adaptive Ramp Metering- I-270 Vehicle Density

I-270 Northbound	Type	Existing		ARM		% Change	I-270 Southbound	Type	Existing		ARM		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS			
I-270	Freeway	47	F	47	F	-1%	I-270	Freeway	16	B	16	B	0%
I-270 Diverge to MD 187	Diverge	69	F	66	F	-5%	I-270 Merge from WB I-70	Merge	13	B	13	B	0%
I-270	Freeway	73	F	71	F	-3%	I-270	Freeway	19	C	19	C	0%
I-270 Diverge to Rockledge Rd	Diverge	69	F	66	F	-5%	I-270 Merge from EB I-70	Merge	14	B	14	B	0%
I-270	Freeway	82	F	82	F	0%	I-270	Freeway	18	C	18	C	0%
I-270 Weave from MD 187 to I-270 HOV	Weave	56	F	57	F	1%	I-270 Diverge to SB MD 85	Diverge	19	B	19	B	0%
I-270 Lane Drop	Merge	65	F	65	F	0%	I-270	Freeway	20	C	20	C	0%
I-270	Freeway	51	F	51	F	0%	I-270 Diverge to NB MD 85	Diverge	12	B	12	B	0%
I-270 Merge from I-270 Spur	Merge	37	E	37	E	0%	I-270	Freeway	16	B	16	B	0%
I-270 Weave from I-270 HOV to I-270 C-D	Weave	33	D	33	D	0%	I-270 Merge from MD 85	Merge	14	B	14	B	0%
I-270	Freeway	32	D	32	D	0%	I-270	Freeway	21	C	21	C	0%
I-270 Diverge to C-D (MD 189)	Diverge	37	E	37	E	0%	I-270 Diverge to MD 80	Diverge	13	B	14	B	1%
I-270	Freeway	32	D	32	D	0%	I-270	Freeway	17	B	17	B	1%
I-270 Diverge to C-D (MD 28)	Diverge	38	E	39	E	2%	I-270 Merge from MD 80	Merge	11	B	11	B	1%
I-270	Freeway	30	D	29	D	-2%	I-270	Freeway	20	C	20	C	0%
I-270 Merge from C-D (MD 189)	Merge	41	F	38	E	-9%	I-270 Diverge to MD 109	Diverge	10	B	10	A	-1%
I-270 Diverge to C-D (Shady Grove Rd)	Diverge	42	F	41	F	-3%	I-270	Freeway	19	C	19	C	0%
I-270	Freeway	30	D	29	D	-1%	I-270 Merge from MD 109	Merge	11	B	11	B	-2%
I-270 Weave from C-D (MD 28) to C-D (Shady Grove Rd)	Weave	32	D	32	D	-1%	I-270	Freeway	20	C	20	C	0%
I-270	Freeway	26	D	26	D	-1%	I-270 Diverge to SB Weigh Station	Diverge	10	B	10	A	-1%
I-270 Merge from C-D (Shady Grove Rd)	Merge	21	C	21	C	0%	I-270	Freeway	20	C	20	C	0%
I-270	Freeway	33	D	29	D	-11%	I-270 Merge from SB Weigh Station	Merge	10	B	10	A	-1%
I-270 Merge from C-D (I-370)	Merge	32	D	21	C	-36%	I-270	Freeway	19	C	19	C	0%
I-270 Diverge to C-D (MD 117)	Diverge	53	F	26	C	-50%	I-270 Diverge to MD 121	Diverge	7	A	7	A	-1%
I-270	Freeway	74	F	27	D	-64%	I-270	Freeway	12	B	12	B	0%
I-270 Merge from C-D (MD 124)	Merge	101	F	62	F	-39%	I-270 Merge from MD 121	Merge	9	A	9	A	-1%
I-270	Freeway	36	E	36	E	-2%	I-270	Freeway	14	B	14	B	0%
I-270 Diverge to EB Middlebrook Rd	Diverge	28	D	28	C	-1%	I-270 Diverge to MD 27	Diverge	10	A	10	A	0%
I-270	Freeway	34	D	33	D	-1%	I-270	Freeway	12	B	12	B	0%
I-270 Diverge to WB Middlebrook Rd	Diverge	30	D	30	D	-2%	I-270 Merge from WB MD 27	Merge	11	B	11	B	1%
I-270	Freeway	27	D	27	D	-2%	I-270	Freeway	15	B	15	B	0%
I-270 Diverge to EB MD 118	Diverge	24	C	23	C	-3%	I-270 Weave from EB MD 27 to MD 118	Weave	12	B	12	B	1%
I-270 Diverge to WB MD 118	Diverge	42	F	41	F	-2%	I-270	Freeway	14	B	14	B	0%
I-270	Freeway	33	D	32	D	-3%	I-270 Merge from WB MD 118	Merge	12	B	12	B	0%
I-270 Weave from MD 118 to MD 27	Weave	46	F	39	E	-15%	I-270	Freeway	17	B	17	B	0%
I-270	Freeway	26	D	26	C	-2%	I-270 Merge from EB MD 118	Merge	15	B	15	B	0%
I-270 Merge from EB MD 27	Merge	46	F	39	E	-15%	I-270	Freeway	20	C	20	C	0%
I-270	Freeway	26	C	25	C	-1%	I-270 Merge from Middlebrook Rd	Merge	21	C	21	C	0%
I-270 Merge from WB MD 27	Merge	20	C	20	C	1%	I-270	Freeway	21	C	21	C	0%
I-270	Freeway	27	D	27	D	-1%	I-270 Diverge to MD 124	Diverge	18	B	17	B	-8%
I-270 Diverge to MD 121	Diverge	21	C	20	C	-1%	I-270	Freeway	22	C	19	C	-15%

Table B.5: PM Peak -2015 Adaptive Ramp Metering- I-270 Vehicle Density

I-270 Northbound	Type	Existing		ARM		% Change	I-270 Southbound	Type	Existing		ARM		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS			
I-270	Freeway	22	C	22	C	-1%	I-270 Merge from WB MD 124	Merge	44	F	38	E	-14%
I-270 Merge from EB MD 121	Merge	16	B	17	B	0%	I-270	Freeway	21	C	21	C	0%
I-270 Lane Drop	Merge	27	C	26	C	-1%	I-270 Merge from MD 117	Merge	25	C	25	C	0%
I-270	Freeway	40	E	39	E	-1%	I-270	Freeway	21	C	21	C	1%
I-270 Diverge to NB Weigh Station	Diverge	17	B	17	B	-1%	I-270 Diverge to I-370	Diverge	19	B	19	B	1%
I-270	Freeway	35	D	35	D	-1%	I-270	Freeway	16	B	16	B	1%
I-270 Merge from NB Weight Station	Merge	17	B	17	B	-1%	I-270 Diverge to I-270 C-D	Diverge	13	B	13	B	0%
I-270	Freeway	36	E	35	E	-1%	I-270	Freeway	13	B	13	B	1%
I-270 Diverge to MD 109	Diverge	20	B	20	B	-1%	I-270 Merge from I-270 (I-370)	Merge	18	B	18	B	0%
I-270	Freeway	33	D	32	D	-1%	I-270 Diverge to I-270 C-D (Shady Grove Rd)	Diverge	22	C	22	C	0%
I-270 Merge from MD 109	Merge	17	B	17	B	1%	I-270	Freeway	17	B	17	B	0%
I-270	Freeway	34	D	34	D	-1%	I-270 Merge from I-270 C-D (Shady Grove Rd Northern)	Merge	16	B	16	B	-1%
I-270 Diverge to MD 80	Diverge	24	C	24	C	1%	I-270	Freeway	22	C	21	C	0%
I-270	Freeway	29	D	29	D	-1%	I-270 Merge from I-270 C-D (Shady Grove Rd Southern)	Merge	17	B	17	B	-1%
I-270 Merge from MD 80	Merge	16	B	17	B	2%	I-270 Diverge to I-270 C-D (MD 189)	Diverge	23	C	23	C	-1%
I-270	Freeway	33	D	33	D	-1%	I-270	Freeway	20	C	20	C	0%
I-270 Diverge to Scenic View	Diverge	17	B	17	B	1%	I-270 Merge from I-270 C-D (MD 189)	Merge	18	B	18	B	-2%
I-270	Freeway	33	D	33	D	0%	I-270	Freeway	24	C	24	C	-1%
I-270 Merge from Scenic View	Merge	17	B	17	B	0%	I-270 Merge from I-270 C-D	Merge	20	C	20	B	-2%
I-270	Freeway	33	D	33	D	-1%	I-270 Diverge to I-270 HOV Lane	Diverge	17	B	16	B	-3%
I-270 Diverge to NB MD 85	Diverge	19	B	18	B	-4%	I-270 Diverge to I-270 Spur	Diverge	33	D	33	D	2%
I-270	Freeway	32	D	31	D	-1%	I-270	Freeway	13	B	13	B	-1%
I-270 Diverge to SB MD 85	Diverge	18	B	18	B	-1%	I-270 Diverge to Rockledge Dr / MD 187	Diverge	9	A	9	A	2%
I-270	Freeway	28	D	28	D	-1%	I-270	Freeway	13	B	13	B	-1%
I-270 Weave from MD 85 to I-70	Weave	21	C	20	C	0%	I-270 Merge from Rockledge Dr	Merge	11	B	11	B	-2%
I-270	Freeway	59	F	59	F	-1%	I-270	Freeway	16	B	16	B	-1%
							I-270 Merge from Rockledge Dr / MD 187	Merge	14	B	13	B	-1%
							I-270	Freeway	35	D	35	D	-1%

Table B.6: PM Peak -2015 Adaptive Ramp Metering- I-270 Spur Vehicle Density

I-270 Spur Northbound	Type	Existing		ARM		% Change	I-270 Southbound	Type	Existing		ARM		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS			
I-270 Spur	Freeway	45	F	45	F	0%	I-270 Spur	Freeway	53	F	55	F	4%
I-270 Spur Merge from Clara Barton Parkway	Merge	51	F	53	F	3%	I-270 Spur Weave from I-270 HOV to Democracy Blvd	Weave	76	F	80	F	6%
I-270 Spur	Freeway	66	F	66	F	0%	I-270 Spur	Freeway	95	F	98	F	2%
I-270 Diverge to MD 190	Diverge	43	F	43	F	1%	I-270 Merge from Democracy Blvd	Merge	134	F	136	F	2%
I-270 Spur	Freeway	78	F	79	F	1%	I-270 Spur Lane Drop	Merge	131	F	134	F	3%
I-270 Spur Merge from Cabin John Parkway	Merge	95	F	96	F	1%	I-270 Spur	Freeway	123	F	124	F	1%
I-270 Spur Merge from MD 190	Merge	94	F	96	F	1%	I-270 Spur Merge from I-495	Merge	124	F	124	F	0%
I-270 Spur	Freeway	83	F	83	F	0%	I-270 Spur	Freeway	48	F	48	F	0%
I-270 Spur Diverge to I-495	Merge	65	F	65	F	1%	I-270 Spur Diverve to EB MD 190	Diverge	49	F	49	F	1%
I-270 Spur	Freeway	45	E	45	F	1%	I-270 Spur Diverve to Cabin John Pkwy	Diverge	66	F	67	F	1%
I-270 Spur Diverge to Democracy Blvd	Diverge	49	F	48	F	-1%	I-270 Spur	Freeway	93	F	93	F	0%
I-270 Spur	Freeway	58	F	57	F	-2%	I-270 Merge from MD 190	Merge	111	F	111	F	0%
I-270 Spur Merge from EB Democracy Blvd	Merge	98	F	96	F	-2%	I-270 Spur	Freeway	94	F	94	F	0%
I-270 Spur	Freeway	58	F	58	F	-1%	I-270 Diverge to WB Clara Barton Pkwy	Diverge	60	F	61	F	0%
I-270 Spur Merge from WB Democracy Blvd	Merge	65	F	65	F	0%	I-270 Spur	Freeway	83	F	83	F	0%
I-270 Spur	Freeway	39	E	39	E	0%	I-270 Merge from Clara Barton Pkwy	Merge	72	F	72	F	0%
I-270 Spur Merge from Westlake Terrace	Merge	31	D	31	D	0%							
I-270 Spur	Freeway	35	D	35	D	0%							

Table B.7: PM Peak -2015 Adaptive Ramp Metering- I-270 Local Vehicle Density

I-270 Northbound	Type	Existing		ARM		% Change	I-270 Southbound	Type	Existing		ARM		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS			
I-270 C-D	Freeway	29	D	29	D	0%	I-270 C-D	Freeway	8	A	8	A	1%
I-270 C-D Diverge to EB Montrose Rd	Diverge	20	B	20	B	0%	I-270 C-D Weave from I-370 EB to I-270	Weave	15	B	15	B	0%
I-270 C-D	Freeway	17	B	17	B	1%	I-270 C-D Diverge to Shady Grove Rd	Diverge	10	A	10	A	1%
I-270 C-D Weave between Montrose Rd Loop Ramps	Weave	12	A	13	B	8%	I-270 C-D	Freeway	7	A	7	A	0%
I-270 C-D	Freeway	20	C	23	C	12%	I-270 C-D Merge from WB Shady Grove Rd	Merge	9	A	9	A	-7%
I-270 C-D Merge from WB Montrose Rd	Merge	52	F	56	F	7%	I-270 C-D	Freeway	15	B	14	B	-5%
I-270 C-D	Freeway	51	F	53	F	4%	I-270 C-D Merge from EB Shady Grove Rd	Merge	11	B	11	B	-3%
I-270 C-D Merge from I-270	Merge	66	F	65	F	-2%	I-270 C-D	Freeway	21	C	20	C	-4%
I-270 C-D	Freeway	51	F	50	F	-3%	I-270 C-D Merge from I-270	Merge	25	C	23	C	-6%
I-270 C-D Diverge to MD 189	Diverge	31	D	30	D	-3%	I-270 C-D Diverge to I-270	Diverge	26	C	25	C	-3%
I-270 C-D	Freeway	67	F	56	F	-16%	I-270 C-D Diverge to I-270	Diverge	18	B	17	B	-2%
I-270 C-D Merge from MD 189	Merge	94	F	70	F	-26%	I-270 C-D	Freeway	16	B	16	B	-2%
I-270 C-D	Freeway	49	F	50	F	2%	I-270 C-D Diverge to MD 28	Diverge	12	B	11	B	-3%
I-270 C-D Weave between I-270 (to MD 28 from MD 189)	Weave	57	F	58	F	1%	I-270 C-D	Freeway	11	A	10	A	-3%
I-270 C-D	Freeway	48	F	47	F	-2%	I-270 C-D Merge from WB MD 28	Merge	13	B	12	B	-3%
I-270 C-D Diverge to MD 28	Diverge	20	B	20	B	0%	I-270 C-D	Freeway	13	B	14	B	5%
I-270 C-D	Freeway	31	D	31	D	0%	I-270 C-D Merge from EB MD 28	Merge	25	C	28	C	12%
I-270 C-D Weave between MD 28 Ramps	Weave	28	C	28	C	-1%	I-270 C-D	Freeway	29	D	34	D	15%
I-270 C-D	Freeway	18	C	18	C	-1%	I-270 C-D Merge from I-270	Merge	35	E	41	F	17%
I-270 C-D Merge from MD 28 WB	Merge	13	B	14	B	4%	I-270 C-D	Freeway	40	E	43	E	8%
I-270 C-D Merge from I-270 and Drop Lane	Merge	18	B	18	B	-1%	I-270 C-D Diverge to MD 189	Diverge	24	C	27	C	10%
I-270 C-D Diverge to I-270	Diverge	25	C	24	C	-5%	I-270 C-D	Freeway	25	C	25	C	-1%
I-270 C-D	Freeway	39	E	22	C	-44%	I-270 C-D Merge from MD 189	Merge	23	C	22	C	-4%
I-270 C-D Diverge to Shady Grove Rd	Diverge	14	B	13	B	-9%	I-270 C-D Diverge to I-270	Diverge	32	D	31	D	-4%
I-270 C-D	Freeway	111	F	46	F	-58%	I-270 C-D	Freeway	22	C	22	C	-3%
I-270 C-D Merge from I-270 and EB Shady Grove Rd	Merge	116	F	77	F	-33%	I-270 C-D Diverge to WB Montrose Rd	Diverge	16	B	16	B	-3%
I-270 C-D	Freeway	112	F	99	F	-12%	I-270 C-D	Freeway	20	C	19	C	-5%
I-270 C-D Merge from WB Shady Grove Rd	Merge	108	F	97	F	-10%	I-270 Weave between Montrose Rd Loops	Weave	35	D	30	C	-14%
I-270 C-D Diverge to I-270	Diverge	90	F	91	F	1%	I-270 C-D	Freeway	15	B	15	B	-2%
I-270 C-D	Freeway	60	F	60	F	1%	I-270 C-D Merge from EB Montrose Rd	Merge	9	A	9	A	0%
I-270 C-D Diverge to I-370	Diverge	28	C	28	D	2%	I-270 C-D	Freeway	18	B	17	B	-2%
I-270 C-D	Freeway	10	A	10	A	1%							
I-270 Merge from I-370 EB	Merge	11	B	10	B	-9%							
I-270 C-D	Freeway	19	C	17	B	-10%							
I-270 C-D Weave from I-370 to I-270	Weave	27	C	18	B	-34%							
I-270 C-D	Freeway	22	C	15	B	-34%							
I-270 C-D Weave from I-270 to MD 117	Weave	33	D	21	B	-37%							
I-270 C-D Diverge to MD 124	Diverge	39	E	20	B	-50%							
I-270 C-D	Freeway	55	F	8	A	-86%							
I-270 C-D Merge from EB MD 124	Merge	96	F	10	A	-90%							
I-270 C-D Merge From WB MD 124	Merge	81	F	17	B	-79%							

Table B.8: PM Peak -2015 Adaptive Ramp Metering- I-270 Vehicle Throughput

I-270 Northbound	Existing VISSIM Throughput	ARM VISSIM Throughput	% Change	Data Collection Measurement	I-270 Southbound	Existing VISSIM Throughput	ARM VISSIM Throughput	% Change
Between I-495 and MD 187	4350	4333	0%	100	North of I-70	1975	1975	0%
Between MD 187 on and off ramps	3888	3869	0%	102	Between I-70 on ramps	2287	2287	0%
Between Rockledge Blvd on and off ramps	3666	3640	-1%	105	From I-70 interchange to MD-85	3429	3429	0%
Between Rockledge Dr and I-270 Spur	3880	3874	0%	108	Between MD-85 on and off ramps	2006	2006	0%
Between I-270 Spur and Montrose Rd	8718	8713	0%	110	Between MD-85 and MD-80	2633	2632	0%
Between Montrose Rd on and off ramps	5750	5742	0%	112	Between MD-80 on and off ramps	2093	2093	0%
Between Montrose Rd and MD 189	5477	5468	0%	114	Between MD-80 and Md-109	2457	2460	0%
Between MD 189 and MD 28	5905	5890	0%	116	Between MD-109 on and off ramps	2395	2396	0%
Between MD 28 on and off ramps	6240	6171	-1%	118	Between MD-109 and MD-121	2521	2521	0%
Between MD 28 and Shady Grove Rd	5494	5427	-1%	120	Between MD-121 on and off ramps	2351	2351	0%
Between Shady Grove Rd and I-370	4789	4739	-1%	123	Between MD-121 and MD-27	2723	2726	0%
Between I-370 on and off ramps	4814	4813	0%	126	Between MD-27 on and off ramps	2890	2899	0%
Between I-370 and MD 117	6142	5784	-6%	129	Between MD-27 and MD-118	3164	3170	0%
Between MD 117 and MD 124	4713	4499	-5%	133	Between MD-118 on and off ramps	3197	3197	0%
Between MD-124 on and off ramps	4706	4585	-3%	136	Between MD-118 and Middlebrook Rd	3798	3798	0%
Between MD 124 and Middlebrook Rd	6115	6020	-2%	139	Between Middlebrook Rd on and off ramps	3796	3797	0%
Between Middlebrook Rd on and off ramps	5713	5637	-1%	142	Between Middlebrook Rd and MD-124	4826	4823	0%
Between Middlebrook Rd and MD 118	4798	4745	-1%	146	Between MD-124 on and off ramps	3765	3762	0%
Between MD-118 on and off ramps	4409	4353	-1%	150	Between MD-124 and MD-117	4938	4949	0%
Between MD 118 and MD 27	4456	4412	-1%	154	Between MD-117 and I-370	6461	6483	0%
Between MD-27 on and off ramps	2842	2818	-1%	159	Between I-370 on and off ramps	3327	3340	0%
Between MD 27 and MD 121	3330	3330	0%	163	Between I-370 on ramp to Shady Grove Rd	4663	4673	0%
Between MD-121 on and off ramps	2574	2574	0%	167	Between Shady Grove Rd and MD 28	4984	4967	0%
Between MD 121 and MD 109	3787	3763	-1%	171	Between MD 28 on and off ramps	5158	5131	-1%
Between MD-109 on and off ramps	3547	3509	-1%	175	Between MD 28 and MD 189	4536	4506	-1%
Between MD 109 and MD 80	3657	3613	-1%	179	Between MD 189 and Montrose Rd	4527	4508	0%
Between MD-80 on and off ramps	3096	3072	-1%	183	Between Montrose Rd on and off ramps	5414	5364	-1%
Between MD 80 and MD 85	3596	3576	-1%	187	Between Montrose Rd and I-270 Spur	7201	7125	-1%
Between MD-85 on and off ramps	3046	3018	-1%	193	Between I-270 Spur and Rockledge Blvd	3293	3249	-1%
Between MD 85 and I-70	4867	4837	-1%	197	Between Rockledge Blvd on and off ramps	2549	2527	-1%
North of I-70	2562	2537	-1%	200	Between MD 187 on and off ramps	3017	2992	-1%
				203	Between MD 187 and I-495	3372	3337	-1%
I-270 Spur Northbound					I-270 Spur Southbound			
Between I-495 and Democracy Blvd	4608	4612	0%	600	Between I-270 Split and HOV on ramp	3113	3100	0%
Between Democracy Blvd on and off ramps	4128	4142	0%	603	Between HOV on ramp and Democracy Blvd	2461	2416	-2%
Between Democracy Blvd and I-270 Split	4849	4850	0%	607	Between Democracy Blvd on and off ramps	1970	1941	-1%
				610	Between Democracy Blvd and I-495	2297	2271	-1%

Table B.9: PM Peak -2015 Adaptive Ramp Metering- I-270 Local Vehicle Throughput

I-270 Local Northbound	Existing VISSIM Throughput	ARM VISSIM Throughput	% Change	Data Collection Measurement	I-270 Local Southbound	Existing VISSIM Throughput	ARM VISSIM Throughput	% Change
Between Montrose Rd EB off ramp and and EB on ramp	1881	1882	0%	800	Between I-370 on ramp and I-270 off ramp	2740	2741	0%
Between Montrose Rd EB on ramp and WB off ramp	2172	2165	0%	804	Between I-270 off ramp and Shady Grove off ramp	1420	1421	0%
Between Montrose Rd WB off ramp and on ramp	1921	1905	-1%	807	Between Shady Grove off ramp and Shady Grove WB on ramp	764	765	0%
Between Montrose Rd WB on ramp and I-270 on ramp	3366	3344	-1%	809	Between Shady Grove WB and EB on ramps	1543	1467	-5%
Between I-270 on ramp and MD 189 off ramp	3611	3606	0%	811	Between Shady Grove on ramp and I-270 on ramp	2168	2092	-4%
Between MD 189 ramps	2908	2921	0%	813	Between I-270 on ramp and I-270 off ramp1	2660	2588	-3%
Between MD 189 off ramp and I-270 on ramp	3782	3707	-2%	815	Between I-270 off ramp1 and I-270 off ramp2	1854	1808	-2%
Between I-270 on ramp and I-270 off ramp	4472	4386	-2%	817	Between I-270 off ramp2 and MD 28 off ramp	1681	1639	-2%
Between I-270 off ramp and MD 28 EB off ramp	3481	3454	-1%	819	Between MD 28 off ramp and MD 28 WB on ramp	1149	1117	-3%
Between MD 28 EB off ramp to MD 28 EB on ramp	3133	3111	-1%	821	Between MD 28 WB on ramp and MD 28 EB on ramp	1401	1371	-2%
Between MD 28 EB on ramp and MD 28 WB off ramp	3262	3239	-1%	823	Between MD 28 EB on ramp and I-270 on ramp	2908	2847	-2%
Between MD 28 WB off ramp and MD 28 WB on ramp	2023	2003	-1%	825	Between I-270 on ramp and MD 189 off ramp	3530	3472	-2%
Between MD 28 WB on ramp and I-270 on ramp	2725	2706	-1%	827	Between MD 189 on and off ramps	2601	2563	-1%
Between I-270 on ramp and I-270 off ramp	3565	3547	-1%	829	Between MD 189 on ramp and I-270 off ramp	3166	3060	-3%
Between I-270 off ramp and Shady Grove off ramp	2136	2164	1%	831	Between I-270 off ramp and Montrose Rd off ramp	2280	2206	-3%
Between Shady Grove off ramp and I-270 on ramp	673	750	11%	833	Between Montrose Rd off ramp and Montrose Rd WB on ramp	2039	1978	-3%
Between I-270 on ramp and Shady Grove WB on ramp	3348	3458	3%	835	Between Montrose Rd WB on ramp and EB off ramp	2605	2543	-2%
Between Shady Grove WB on ramp and I-270 off ramp	4148	4168	0%	838	Between Montrose Rd EB off and on ramps	1525	1494	-2%
Between I-270 off ramp and I-370 off ramp	3663	3683	1%	840	Between Montrose Rd EB off ramp and I-270	1846	1809	-2%
Between I-370 off ramp and I-370 EB on ramp	1138	1144	1%					
Between I-370 EB and WB on ramps	2096	1891	-10%					
Between I-370 WB on ramp and I-270 off ramp	3687	2650	-28%					
Between I-270 off ramp and I-270 on ramp	2254	1587	-30%					
Between I-270 on ramp and MD 117 off ramp	3661	3077	-16%					
Between MD 117 off ramp and MD 124 off ramp	2448	2067	-16%					
Between MD 124 off ramp and MD 124 EB on ramp	479	416	-13%					
Between MD 124 EB and WB on ramps	943	943	0%					
Between MD 124 on ramp I-270	1427	1440	1%					

Table B.10: PM Peak -2015 Adaptive Ramp Metering- I-270 On Ramp Queue Length - Northbound

I-270 Northbound	Existing VISSIM Average Queue (feet)	ARM VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	ARM VISSIM Maximum Queue (feet)	% Change
Rockledge Dr on ramp	1	1	-12%	181	146	-19%
MD 189 C-D on ramp	0	0	-86%	33	13	-61%
MD 28 C-D on ramp	0	0	-	0	0	-
Shady Grove Rd C-D on ramp	0	0	-	0	0	-
I-370 C-D on ramp	2	0	-100%	233	0	-100%
MD 124 C-D on ramp	2459	6	-100%	3978	423	-89%
MD 118 on ramp	0	0	-48%	37	18	-52%
MD 27 EB on ramp	0	2	-	0	144	-
MD 27 WB on ramp	0	0	-	0	0	-
MD 121 on ramp	0	0	-	0	0	-
MD 109 on ramp	0	0	-	0	0	-
MD 80 on ramp	0	0	-	0	0	-
MD 85 on ramp	0	0	-	0	0	-
I-270 Spur Northbound	Existing VISSIM Average Queue (feet)	ARM VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	ARM VISSIM Maximum Queue (feet)	% Change
Democracy Blvd EB on ramp	0	0	-	0	11	-
Democracy Blvd WB on ramp	0	0	-	0	0	-
I-495 Northbound	Existing VISSIM Average Queue (feet)	ARM VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	ARM VISSIM Maximum Queue (feet)	% Change
Cabin John Pkwy on ramp	16	13	-22%	661	613	-7%
MD 190 on ramp	0	0	-	0	22	-
I-270 C-D Northbound	Existing VISSIM Average Queue (feet)	ARM VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	ARM VISSIM Maximum Queue (feet)	% Change
Montrose Rd EB on ramp	0	0	-	0	0	-
Montrose Rd WB on ramp	265	346	31%	1386	1845	33%
I-270 on ramp	0	0	-	0	0	-
MD 189 on ramp	15	0	-100%	555	0	-100%
I-270 on ramp	0	0	142%	23	69	205%
MD 28 EB on ramp	0	0	-	0	0	-
MD 28 WB on ramp	0	0	-	0	0	-
Shady Grove Rd EB on ramp	78	7	-91%	836	251	-70%
I-270 on ramp	178	67	-62%	1103	829	-25%
Shady Grove Rd WB on ramp	12	1	-91%	340	86	-75%
I-370 EB on ramp	0	4	-	0	202	-
I-370 WB on ramp	0	0	-	0	0	-
I-270 on ramp	12	0	-100%	658	0	-100%
MD 124 EB on ramp	257	0	-100%	1230	0	-100%
MD 124 WB on ramp	1	0	-100%	63	0	-100%

Table B.11: PM Peak -2015 Adaptive Ramp Metering- I-270 Off Ramp Queue Length - Northbound

I-270 Northbound	Existing VISSIM Average Queue (feet)	ARM VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	ARM VISSIM Maximum Queue (feet)	% Change
MD 187 off ramp NB	42	38	-7%	278	252	-9%
MD 187 off ramp SB	0	0	-	0	0	-
Rockledge Dr off ramp	1	1	-11%	73	60	-18%
Tower Oaks Blvd off ramp	32	33	3%	235	230	-2%
Montrose Rd off ramp EB	0	0	-	0	0	-
Montrose Rd off ramp WB	0	0	-	0	0	-
MD 189 off ramp WB	29	30	2%	168	165	-1%
MD 189 off ramp EB	1	219	20568%	122	1509	1139%
MD 28 off ramp EB	37	38	2%	231	228	-1%
MD 28 off ramp WB	0	0	-	0	55	-
Shady Grove Rd off ramp - Redland Blvd	0	0	-	0	0	-
Shady Grove Rd off ramp WB	49	49	1%	248	224	-10%
Shady Grove Rd off ramp EB	0	0	-	0	0	-
I-370 off ramp WB	0	0	-	0	0	-
I-370 off ramp EB	0	0	-	0	0	-
MD 117 off ramp	205	108	-47%	859	469	-45%
MD 124 off ramp	799	218	-1	2471	1001	-1
Watkins Mill Rd off ramp*			-			-
Middlebrook Rd EB off ramp	0	0	-	0	0	-
Middlebrook Rd WB off ramp	0	0	-	0	0	-
MD 118 WB off ramp - Seneca Meadows	0	0	-100%	20	0	-100%
MD 118 WB off ramp	0	0	-	0	0	-
MD 118 EB off ramp	0	0	-	0	0	-
MD 27 off ramp WB	56	56	0%	290	278	-4%
MD 27 off ramp EB	0	0	-	0	0	-
MD 121 off ramp WB	0	0	-	0	16	-
MD 121 off ramp EB	0	0	-	0	0	-
MD 109 off ramp EB	9	8	-14%	158	140	-12%
MD 109 off ramp WB	0	0	-	0	0	-
MD 80 off ramp EB	15	14	-2%	140	152	9%
MD 80 off ramp WB	0	0	-72%	11	12	4%
MD 85 NB off ramp	0	0	-	0	0	-
MD 85 SB off ramp	0	0	-43%	72	37	-49%
I-270 Spur Northbound	Existing VISSIM Average Queue (feet)	ARM VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	ARM VISSIM Maximum Queue (feet)	% Change
Clara Barton Pkwy off ramp EB	0	0	-	0	0	-
Clara Barton Pkwy off ramp WB	0	0	-	0	0	-
MD 190 off ramp EB	0	0	-	0	0	-
MD 190 off ramp WB	2	3	30%	287	304	6%
Democracy Blvd off ramp WB	42	40	-3%	188	181	-4%
Democracy Blvd off ramp EB	18	18	-2%	143	144	1%

* Ramp in Future Scenario

Table B.12: PM Peak -2015 Adaptive Ramp Metering- I-270 On Ramp Queue Length - Southbound

I-270 Southbound	Existing VISSIM Average Queue (feet)	ARM VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	ARM VISSIM Maximum Queue (feet)	% Change
MD 85 on ramp	0	0	-	0	0	-
MD 80 on ramp	0	0	-	0	0	-
MD 109 on ramp	0	0	-	0	0	-
MD 121 WB on ramp	0	0	-	0	0	-
MD 121 EB on ramp*			-			-
MD 27 WB on ramp	0	0	-	0	0	-
MD 27 EB on ramp	0	0	-	0	0	-
MD 118 WB on ramp	0	0	-	0	0	-
MD 118 EB on ramp	0	0	-	0	0	-
Middlebrook Rd on ramp	0	0	-	0	0	-
MD 124 WB on ramp	5	4	-15%	332	207	-38%
MD 117 on ramp	0	0	-	0	0	-
I-370 C-D on ramp	0	0	-	0	0	-
Shady Grove Rd C-D on ramp North	0	0	-	0	0	-
Shady Grove Rd C-D on ramp South	0	0	-	0	0	-
MD 189 C-D on ramp	0	0	-	0	0	-
Montrose Rd C-D on ramp	0	0	-	0	0	-
Rockledge Dr on ramp	0	0	-	0	0	-
MD 187 on ramp	0	0	-	0	0	-
I-270 Spur Southbound	Existing VISSIM Average Queue (feet)	ARM VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	ARM VISSIM Maximum Queue (feet)	% Change
Democracy Blvd on ramp	335	368	10%	1366	1315	-4%
I-495 Southbound	Existing VISSIM Average Queue (feet)	ARM VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	ARM VISSIM Maximum Queue (feet)	% Change
I-270 Spur on ramp	4212	4303	2%	5058	5061	0%
MD 190 on ramp	1	0	-92%	107	18	-83%
I-270 C-D Southbound	Existing VISSIM Average Queue (feet)	ARM VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	ARM VISSIM Maximum Queue (feet)	% Change
I-270 on ramp	0	0	-	0	0	-
I-370 on ramp	0	0	-	0	0	-
Shady Grove Rd WB on ramp	0	0	-	0	0	-
Shady Grove Rd EB on ramp	0	0	-	0	0	-
I-270 on ramp	0	0	-	0	0	-
MD 28 WB on ramp	0	0	282%	14	19	37%
MD 28 EB on ramp	2	81	3308%	219	992	353%
I-270 on ramp	0	0	-	0	0	-
MD 189 on ramp	0	0	-	0	0	-
Montrose Rd WB on ramp	1	0	-88%	107	36	-67%
Montrose Rd EB on ramp	0	0	-	0	0	-

* Ramp in Future Scenario

Table B.13: PM Peak -2015 Adaptive Ramp Metering- I-270 Off Ramp Queue Length - Southbound

I-270 Southbound	Existing VISSIM Average Queue (feet)	ARM VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	ARM VISSIM Maximum Queue (feet)	% Change
MD 85 SB off ramp	0	0	-	0	0	-
MD 85 NB off ramp	0	0	-65%	114	40	-65%
MD 80 off ramp	1	0	-75%	154	76	-51%
MD 109 off ramp WB	0	0	-25%	58	42	-26%
MD 109 off ramp EB	0	0	-	0	0	-
MD 121 off ramp EB	2	2	-4%	98	106	8%
MD 121 off ramp WB	0	0	-	0	0	-
MD 27 off ramp EB	23	22	-4%	149	128	-14%
MD 27 off ramp WB	0	0	-	0	0	-
MD 118 off ramp EB	19	19	0%	110	112	1%
MD 118 off ramp WB	0	0	-	0	0	-
Watkins Mill Rd off ramp*			-			-
MD 124 off ramp EB	310	142	-54%	1658	509	-69%
MD 124 off ramp WB	147	0	-100%	1129	72	-94%
I-370 off ramp WB	0	0	-	0	46	-
I-370 off ramp EB	0	0	-	0	0	-
Shady Grove Rd off ramp - Omega Drive	1	1	17%	42	61	47%
Shady Grove Rd off ramp	0	0	-	0	0	-
MD 28 off ramp	3	3	-10%	127	122	-4%
MD 189 off ramp EB	123	294	139%	849	1383	63%
MD 189 off ramp WB	0	0	-	0	0	-
Montrose Rd off ramp WB	0	0	-	0	0	-
Montrose Rd off ramp EB	0	1	-	0	120	-
Rockledge Dr off ramp	51	52	1%	295	326	10%
I-270 Spur Southbound	Existing VISSIM Average Queue (feet)	ARM VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	ARM VISSIM Maximum Queue (feet)	% Change
Democracy Blvd off ramp EB	24	23	-5%	157	145	-8%
Democracy Blvd off ramp WB	0	0	-	0	0	-
MD 190 off ramp WB	85	93	10%	826	958	16%
MD 190 off ramp EB	0	0	-	0	0	-
Clara Barton Pkwy WB off ramp	0	0	-	0	0	-

* Ramp in Future Scenario

Table B.14: PM Peak - Existing - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
1- MD 85 at Sam's Club Drive											
1	NB	28.2	C	NB Left	115	79	116	611	E	53.2	D
				NB Through	503	33	116	611	C		
				NB Right	824	18	55	634	B		
	SB	82.9	F	SB Left	142	77	401	1055	E		
				SB Through	875	84	401	1055	F		
				SB Right	67	87	401	1055	F		
	EB	33.5	C	EB Left	43	83	26	115	F		
				EB Through	20	91	26	115	F		
				EB Right	144	11	26	115	B		
	WB	63.9	E	WB Left	508	77	221	686	E		
				WB Through	27	67	221	686	E		
				WB Right	192	29	221	686	C		
2- MD 85 at I-270 NB on and off ramp											
2	NB	36.0	D	NB Left	977	36	187	908	D	32.7	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	27.9	C	SB Left	0	0	0	0	A		
				SB Through	671	28	100	634	C		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
3- MD 85 at I-270 SB on and off ramp											
3	NB	6.0	A	NB Left	0	0	0	0	A	9.4	A
				NB Through	1699	6	41	829	A		
				NB Right	0	0	0	0	A		
	SB	43.8	D	SB Left	170	44	46	320	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
4- MD 85 at Crestwood Blvd											
4	NB	33.3	D	NB Left	60	70	154	653	E	33.5	C
				NB Through	1255	32	154	654	C		
				NB U-Turn	0	0	0	0	A		
	SB	22.0	C	SB Left	91	80	45	208	E		
				SB Through	810	25	59	445	C		
				SB Right	796	12	45	436	B		
	EB	54.8	D	EB Left	802	57	133	610	E		
				EB Through	31	44	133	610	D		
				EB Right	22	0	133	610	A		
	WB	43.4	D	WB Left	36	75	39	162	E		
				WB Through	61	65	39	162	E		
				WB Right	81	13	39	162	B		
5- MD 80 at I-270 NB on and off ramp											
5	NB	-1.8	A	NB Left	1	0	0	0	A	8.6	A
				NB Through	2	0	0	0	A		
				NB Right	8	-3	0	0	A		
	SB	12.2	B	SB Left	385	15	21	145	B		
				SB Through	17	17	21	145	B		
				SB Right	122	2	0	0	A		
	EB	8.9	A	EB Left	70	9	13	171	A		
				EB Through	0	0	8	0	A		
				EB Right	6	5	24	202	A		
	WB	6.9	A	WB Left	16	10	0	40	B		
				WB Through	510	12	28	281	B		
				WB Right	482	1	0	0	A		
6- MD 80 at I-270 SB on and off ramp											
6	NB	2.3	A	NB Left	47	3	1	190	A	4.2	A
				NB Through	0	0	0	0	A		
				NB Right	491	2	1	190	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	5.0	A	EB Left	0	0	0	0	A		
				EB Through	271	5	2	61	A		
				EB Right	53	3	1	69	A		
	WB	6.6	A	WB Left	0	0	0	0	A		
				WB Through	316	7	1	89	A		
				WB Right	0	0	0	0	A		
7- MD 109 at I-270 NB on and off ramp											
7	NB			NB Left	0	0	0	0	A	5.3	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	10.2	B	SB Left	224	11	14	175	B		
				SB Through	0	0	0	0	A		
				SB Right	17	2	0	67	A		
	EB	2.2	A	EB Left	56	1	0	37	A		
				EB Through	0	0	0	0	A		
				EB Right	59	3	0	0	A		
	WB	0.3	A	WB Left	0	0	0	0	A		
				WB Through	160	0	0	0	A		
				WB Right	0	0	0	0	A		
8- MD 80 at I-270 SB on and off ramp											
8	NB	4.0	A	NB Left	44	7	2	115	A	1.6	A
				NB Through	0	0	0	0	A		
				NB Right	29	0	0	43	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.8	A	EB Left	0	0	0	0	A		
				EB Through	114	0	0	0	A		
				EB Right	24	4	0	0	A		
	WB	1.2	A	WB Left	98	1	0	42	A		
				WB Through	78	1	0	19	A		
				WB Right	0	0	0	0	A		
9- MD 121 at Gateway Center Dr											
9	NB	10.6	B	NB Left	471	13	31	242	B	17.0	B
				NB Through	638	10	31	242	A		
				NB Right	54	2	36	268	A		
	SB	17.8	C	SB Left	20	13	5	143	B		
				SB Through	169	19	14	163	B		
				SB Right	8	4	13	184	A		
	EB	16.6	C	EB Left	2	50	3	93	D		
				EB Through	19	51	11	170	D		
				EB Right	142	12	21	202	B		
	WB	34.8	D	WB Left	214	46	57	220	D		
				WB Through	56	41	57	219	D		
				WB Right	140	16	71	244	B		
10- MD 121 at I-270 NB on and off ramp											
10	NB	0.8	A	NB Left	25	9	1	67	A	0.6	A
				NB Through	0	0	0	0	A		
				NB Right	718	1	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.1	A	EB Left	0	0	0	0	A		
				EB Through	447	0	0	0	A		
				EB Right	58	0	0	0	A		
	WB	0.8	A	WB Left	100	3	1	73	A		
				WB Through	423	0	0	48	A		
				WB Right	0	0	0	0	A		

Table B.14: PM Peak - Existing - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
11- MD 121 at I-270 SB on and off ramp											
11	NB			NB Left	0	0	0	0	A	2.2	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	7.7	A	SB Left	136	10	8	125	A		
				SB Through	0	0	0	0	A		
				SB Right	36	0	0	0	A		
	EB	0.3	A	EB Left	29	1	0	23	A		
				EB Through	0	0	0	0	A		
				EB Right	349	0	0	0	A		
	WB	0.1	A	WB Left	0	0	0	0	A		
				WB Through	99	0	0	0	A		
				WB Right	0	0	0	0	A		
12- MD 27 at Observation Dr											
12	NB	40.1	D	NB U-Turn	0	0	0	0	A	22.2	C
				NB Through	73	57	19	86	E		
				NB Right	47	13	19	86	B		
	SB	39.7	D	SB Left	114	46	31	182	D		
				SB Through	41	62	35	244	E		
				SB Right	173	30	57	281	C		
	EB	16.8	B	EB Left	208	27	68	502	C		
				EB Through	2223	16	70	503	B		
				EB Right	106	15	82	541	B		
	WB	25.8	C	WB Left	31	22	123	627	C		
				WB Through	1503	26	123	627	C		
				WB Right	54	9	123	627	A		
13- MD 27 at I-270 NB off ramp											
13	NB	44.8	D	NB Left	390	45	63	297	D	8.1	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.1	A	EB Left	0	0	0	0	A		
				EB Through	1284	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	5.5	A	WB Left	0	0	0	0	A		
				WB Through	1582	6	41	680	A		
				WB Right	0	0	0	0	A		
14- MD 27 at I-270 SB off ramp											
14	NB			NB Left	0	0	0	0	A	5.4	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	52.2	D	SB Left	171	52	35	162	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	2.3	A	EB Left	0	0	0	0	A		
				EB Through	1351	2	4	149	A		
				EB Right	0	0	0	0	A		
	WB	2.7	A	WB Left	0	0	0	0	A		
				WB Through	1433	3	7	257	A		
				WB Right	0	0	0	0	A		
15- MD 27 at Crystal Rock Dr											
15	NB	22.6	C	NB Left	58	20	55	379	C	29.8	C
				NB Through	965	23	68	379	C		
				NB Right	43	20	72	391	B		
	SB	33.9	C	SB Left	140	57	185	770	E		
				SB Through	1310	35	185	770	D		
				SB Right	196	9	164	764	A		
	EB	43.0	D	EB Left	103	54	28	120	D		
				EB Through	37	46	25	115	D		
				EB Right	47	17	17	141	B		
	WB	27.6	C	WB Left	83	49	70	297	D		
				WB Through	102	43	70	297	D		
				WB Right	552	22	70	297	C		
16- MD 118 at Seneca Meadows Pkwy											
16	NB	4.0	A	NB Left	90	12	1	82	B	8.2	A
				NB Through	1174	3	7	154	A		
				NB Right	0	0	15	207	A		
	SB	6.5	A	SB Left	11	6	14	270	A		
				SB Through	1091	7	18	270	A		
				SB Right	9	3	21	302	A		
	EB	13.1	B	EB Left	18	55	12	130	E		
				EB Through	1	76	12	130	E		
				EB Right	275	10	12	130	B		
	WB	53.5	D	WB Left	93	64	37	199	E		
				WB Through	6	61	33	198	E		
				WB Right	25	13	42	218	B		
17- MD 118 at I-270 NB on ramp											
17	NB			NB Left	0	0	0	0	A	16.1	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	33.9	C	EB Left	435	34	90	501	C		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	10.8	B	WB Left	0	0	0	0	A		
				WB Through	246	2	1	116	A		
				WB Right	1216	13	46	480	B		
18- MD 118 at I-270 SB off ramp											
18	NB			NB Left	0	0	0	0	A	6.1	A
				NB Through	0	0.0	0	0	A		
				NB Right	0	0.0	0	0	A		
	SB	37.1	D	SB Left	129	37.1	22	114	D		
				SB Through	0	0.0	0	0	A		
				SB Right	0	0.0	0	0	A		
	EB	4.8	A	EB Left	0	0.0	0	0	A		
				EB Through	1182	4.8	10	322	A		
				EB Right	0	0.0	0	0	A		
	WB	4.5	A	WB Left	0	0.0	0	0	A		
				WB Through	1465	4.5	8	237	A		
				WB Right	0	0.0	0	0	A		
19- MD 118 at Aircraft Dr											
19	NB	24.0	C	NB Left	42	69	33	176	E	27.5	C
				NB Through	43	70	33	176	E		
				NB Right	196	4	3	77	A		
	SB	90.2	F	SB Left	381	90	221	577	F		
				SB Through	12	82	221	577	F		
				SB Right	97	91	221	577	F		
	EB	17.8	B	EB Left	98	22	60	395	C		
				EB Through	1215	17	60	395	B		
				EB Right	17	15	60	395	B		
	WB	17.6	B	WB Left	12	17	66	441	B		
				WB Through	1324	21	66	441	C		
				WB Right	351	5	66	441	A		
20- Middlebrook Rd at Observation Dr											
20	NB			NB Left	0	0	0	0	A	8.5	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	18.0	B	SB Left	96	35	18	131	D		
				SB Through	0	0	0	0	A		
				SB Right	179	9	18	131	A		
	EB	6.4	A	EB Left	15	9	17	155	A		
				EB Through	1180	6	17	155	A		
				EB Right	0	0	0	0	A		
	WB	8.4	A	WB Left	0	0	0	0	A		
				WB Through	1238	8	24	251	A		
				WB Right	12	6	39	300	A		

Table B.14: PM Peak - Existing - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
21- Middlebrook Rd at I-270 SB on ramp											
21	NB			NB Left	0	0	0	0	A	4.4	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	2.8	A	EB Left	0	0	0	0	A		
				EB Through	686	3	4	96	A		
				EB Right	0	0	0	0	A		
	WB	7.1	A	WB Left	429	7	4	194	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
22- Middlebrook Rd at Waring Station Rd											
22	NB	48.4	D	NB Left	156	45	75	316	D	12.5	B
				NB Through	0	0	75	316	A		
				NB Right	219	51	75	316	D		
	SB	30.6	C	SB Left	30	44	7	66	D		
				SB Through	2	37	7	66	D		
				SB Right	19	9	18	104	A		
	EB	7.3	A	EB Left	3	10	23	262	B		
				EB Through	1035	7	23	262	A		
				EB Right	160	7	23	262	A		
	WB	8.3	A	WB Left	242	20	33	332	C		
				WB Through	1650	7	33	332	A		
				WB Right	4	2	33	332	A		
23- MD 124 at MD 355											
23	NB	51.6	D	NB Left	507	63	186	529	E	63.0	E
				NB Through	942	46	183	527	D		
				NB Right	6	12	0	0	B		
	SB	30.7	C	SB Left	141	71	99	395	E		
				SB Through	554	53	99	395	D		
				SB Right	736	6	20	339	A		
	EB	42.4	D	EB Left	468	93	363	1176	F		
				EB Through	2720	41	363	1176	D		
				EB Right	575	7	160	1150	A		
	WB	153.9	F	WB Left	0	0	0	0	A		
				WB Through	1481	156	718	950	F		
				WB Right	65	101	0	0	F		
24- MD 124 at I-270 SB on and off											
24	NB	64.4	F	NB Left	55	65	23	98	E	40.8	D
				NB Through	23	64	23	98	E		
				NB U-Turn	0	0	0	0	A		
	SB	57.0	E	SB Left	572	94	316	1663	F		
				SB Through	10	80	316	1663	F		
				SB Right	452	9	141	1059	A		
	EB	43.4	D	EB Left	0	0	0	0	A		
				EB Through	1738	44	307	1098	D		
				EB Right	31	34	323	1121	C		
	WB	18.7	B	WB Left	4	66	77	588	E		
				WB Through	1046	19	77	588	B		
				WB Right	0	0	0	0	A		
25- MD 117 at MD 124											
25	NB	36.4	D	NB Left	45	63	116	666	E	40.6	D
				NB Through	545	54	116	666	D		
				NB Right	447	13	4	216	B		
	SB	32.8	C	SB Left	119	44	98	447	D		
				SB Through	762	37	98	447	D		
				SB Right	144	2	0	0	A		
	EB	46.1	D	EB Left	120	82	142	477	F		
				EB Through	1092	42	142	478	D		
				EB Right	43	39	149	506	D		
	WB	43.5	D	WB Left	402	70	280	1027	E		
				WB Through	1338	39	280	1027	D		
				WB Right	129	2	0	0	A		
26- MD 117 at Bureau Dr											
26	NB	45.7	D	NB Left	78	79	65	281	E	38.8	D
				NB Through	27	75	65	281	E		
				NB Right	260	33	65	281	C		
	SB	71.9	E	SB Left	274	83	109	351	F		
				SB Through	17	82	109	351	F		
				SB Right	65	21	109	351	C		
	EB	31.4	C	EB Left	41	80	156	829	F		
				EB Through	1593	30	157	829	C		
				EB Right	3	13	151	818	B		
	WB	37.7	D	WB Left	19	43	337	1058	D		
				WB Through	1703	40	337	1059	D		
				WB Right	292	26	368	1107	C		
27- MD 117 at I-270 SB off ramp											
27	NB			NB Left	0	0	0	0	A	13.3	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	4.6	A	EB Left	0	0	0	0	A		
				EB Through	896	5	10	466	A		
				EB Right	0	0	0	0	A		
	WB	39.8	E	WB Left	294	40	140	1068	E		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
28- MD 117 at I-270 NB off ramp											
28	NB			NB Left	0	0	0	0	A	30.5	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	52.1	D	SB Left	256	46	214	871	D		
				SB Through	0	0	0	0	A		
				SB Right	951	54	214	870	D		
	EB	27.6	C	EB Left	3	125	152	980	F		
				EB Through	897	27	152	980	C		
				EB Right	0	0	0	0	A		
	WB	13.3	B	WB Left	0	0	0	0	A		
				WB Through	1359	13	87	383	B		
				WB Right	0	0	87	383	A		
29- MD 117 at Perry Pkwy											
29	NB	42.6	D	NB Left	18	69	13	110	E	37.0	D
				NB Through	21	50	13	109	D		
				NB Right	23	15	21	129	B		
	SB	57.1	E	SB Left	194	85	89	332	F		
				SB Through	14	84	89	332	F		
				SB Right	112	6	89	332	A		
	EB	20.8	C	EB Left	240	69	84	355	E		
				EB Through	864	8	84	355	A		
				EB Right	32	6	69	339	A		
	WB	44.4	D	WB Left	36	105	245	752	F		
				WB Through	1228	46	245	752	D		
				WB Right	300	33	245	752	C		
30- Shady Grove Rd at I-270 NB off ramp											
30	NB	7.1	A	NB Left	0	0	0	0	A	13.8	B
				NB Through	1025	7	16	209	A		
				NB Right	0	0	0	0	A		
	SB	9.5	A	SB Left	0	0	0	0	A		
				SB Through	1280	9	41	481	A		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	52.9	D	WB Left	317	53	58	260	D		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table B.14: PM Peak - Existing - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
31- Shady Grove Rd at I-270 SB off ramp											
31	NB	6.8	A	NB Left	0	0	0	0	A	15.9	B
				NB Through	1463	7	28	378	A		
				NB Right	0	0	0	0	A		
	SB	5.5	A	SB Left	0	0	0	0	A		
				SB Through	817	5	8	156	A		
				SB Right	0	0	0	0	A		
	EB	57.5	E	EB Left	229	55	44	200	D		
				EB Through	0	0	0	0	A		
				EB Right	295	60	63	241	E		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
32- MD 28 at I-270 SB off ramp											
32	NB			NB U-Turn	0	0	0	0	A	8.0	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	36.5	D	SB Left	440	44	74	300	D		
				SB Through	0	0	0	0	A		
				SB Right	98	3	1	70	A		
	EB	2.7	A	EB Left	0	0	0	0	A		
				EB Through	1505	1	0	0	A		
				EB Right	830	6	14	245	A		
	WB	6.1	A	WB Left	0	0	0	0	A		
				WB Through	1693	6	18	227	A		
				WB Right	0	0	0	0	A		
33- MD 28 at I-270 on and off ramps											
33	NB	34.9	C	NB Left	0	0	43	241	A	21.5	C
				NB Through	208	47	51	250	D		
				NB Right	134	16	51	250	B		
	SB	33.6	C	SB Left	11	101	175	288	F		
				SB Through	0	0	0	0	A		
				SB Right	164	29	175	288	C		
	EB	12.7	B	EB Left	254	38	53	287	D		
				EB Through	885	5	53	287	A		
				EB Right	0	0	0	0	A		
	WB	24.1	C	WB Left	36	20	96	383	B		
				WB Through	1241	24	77	346	C		
				WB Right	0	0	0	0	A		
34- MD 189 at Great Falls Rd											
34	NB	38.6	D	NB Left	45	44	12	86	D	13.4	B
				NB Through	11	50	8	84	D		
				NB Right	12	10	8	94	A		
	SB	3.3	A	SB Left	14	51	7	73	D		
				SB Through	11	51	7	73	D		
				SB Right	401	0	0	0	A		
	EB	12.0	B	EB Left	425	24	38	464	C		
				EB Through	669	5	5	161	A		
				EB Right	58	4	9	198	A		
	WB	18.4	B	WB Left	11	18	48	405	B		
				WB Through	827	18	48	405	B		
				WB Right	14	17	63	439	B		
35- MD 189 at I-270 Ramps											
35	NB	46.1	D	NB Left	250	46	44	190	D	41.7	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	55.4	E	SB Left	350	55	139	869	E		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	27.5	C	EB Left	480	31	89	371	C		
				EB Through	367	23	89	371	C		
				EB Right	0	0	0	0	A		
	WB	48.9	D	WB Left	440	54	106	299	D		
				WB Through	417	43	106	299	D		
				WB Right	0	0	0	0	A		
36- MD 189 at Wootton Pkwy											
36	NB	45.1	D	NB Left	187	57	113	410	E	43.8	D
				NB Through	536	52	113	410	D		
				NB Right	174	10	113	410	B		
	SB	62.3	E	SB Left	247	79	151	606	E		
				SB Through	729	57	154	631	E		
				SB Right	0	0	0	0	A		
	EB	34.6	C	EB Left	118	71	101	438	E		
				EB Through	543	34	101	438	C		
				EB Right	160	10	101	438	B		
	WB	34.5	C	WB Left	160	71	123	603	E		
				WB Through	781	35	123	603	C		
				WB Right	317	15	123	603	B		
37- Montrose Rd at Tower Oaks Blvd											
37	NB	0.4	A	NB Left	0	0	0	0	A	16.2	B
				NB Through	0	0	0	0	A		
				NB Right	490	0	0	0	A		
	SB	71.2	E	SB Left	68	48	37	256	D		
				SB Through	0	0	0	0	A		
				SB Right	270	77	97	348	E		
	EB	6.1	A	EB Left	0	0	0	0	A		
				EB Through	1685	6	30	360	A		
				EB Right	0	0	0	0	A		
	WB	18.3	B	WB Left	69	35	30	360	C		
				WB Through	2563	18	105	727	B		
				WB Right	244	12	105	727	B		
38- Tower Oaks Blvd at I-270 off ramp											
38	NB	22.9	C	NB Left	650	23	46	257	C	17.4	B
				NB Through	0	0.0	39	249	A		
				NB Right	21	6.3	46	257	A		
	SB	15.4	B	SB Left	8	24.8	1	43	C		
				SB Through	0	0.0	1	43	A		
				SB Right	7	4.7	0	30	A		
	EB	11.1	B	EB Left	1	11.0	14	153	B		
				EB Through	310	11.6	14	153	B		
				EB Right	33	6.4	9	144	A		
	WB	12.7	B	WB Left	121	15.9	14	122	B		
				WB Through	192	10.8	14	122	B		
				WB Right	1	3.7	2	78	A		
39- Montrose Rd at Tower Oaks Blvd											
39	NB	17.3	B	NB Left	76	34	62	288	C	55.3	E
				NB Through	606	30	62	288	C		
				NB Right	572	1	0	0	A		
	SB	30.3	C	SB Left	193	62	61	206	E		
				SB Through	394	20	59	205	C		
				SB Right	105	11	54	250	B		
	EB	216.7	F	EB Left	81	178	517	714	F		
				EB Through	458	222	518	715	F		
				EB Right	32	240	542	739	F		
	WB	35.5	D	WB Left	565	44	110	402	D		
				WB Through	473	41	111	402	D		
				WB Right	330	13	130	433	B		
40- Rockledge Blvd at I-270 NB on and off ramp											
40	NB	124.2	F	NB Left	0	0	0	0	A	98.5	F
				NB Through	335	113	520	837	F		
				NB Right	854	129	520	837	F		
	SB	86.6	F	SB Left	0	0	86	220	A		
				SB Through	346	87	86	220	F		
				SB Right	0	0	0	0	A		
	EB	62.2	E	EB Left	5	127	169	458	F		
				EB Through	428	103	169	458	F		
				EB Right	297	2	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table B.14: PM Peak - Existing - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS	
41- Rockledge Blvd at I-270 SB on and off ramps												
41	NB	30.2	C	NB Left	341	30	76	261	C	49.5	D	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	54.7	D		WB Left	345	59	193	786			E
					WB Through	894	53	193	786			D
					WB Right	0	0	0	0			A
42- MD 187 at Tuckerman Ln												
42	NB	43.7	D	NB Left	198	21	316	1253	C	120.3	F	
				NB Through	2133	43	316	1253	D			
				NB Right	188	73	316	1253	E			
	SB	201.4	F		SB Left	185	168	2553	2702			F
					SB Through	1122	201	2553	2702			F
					SB Right	270	226	2553	2702			F
	EB	51.7	D		EB Left	238	52	94	407			D
					EB Through	409	54	95	408			D
					EB Right	103	43	113	432			D
	WB	215.4	F		WB Left	459	211	1918	2138			F
					WB Through	614	233	1918	2138			F
					WB Right	151	158	1918	2138			F
43- MD 187 at I-270 NB on and off ramps												
43	NB	14.8	B	NB Left	552	34	103	399	C	18.5	B	
				NB Through	2291	10	103	399	B			
				NB Right	0	0	0	0	A			
	SB	22.7	C		SB Left	0	0	0	0			A
					SB Through	1247	23	57	248			C
					SB Right	0	0	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	61.4	E		WB Left	65	60	50	290			E
					WB Through	65	63	50	290			E
					WB Right	0	0	0	0			A
44- MD 187 at I-270 NB on and off ramps												
44	NB	32.2	D	NB Left	0	0	0	0	A	33.3	C	
				NB Through	2211	32	103	485	C			
				NB Right	0	0	0	0	A			
	SB	20.4	C		SB Left	150	59	74	305			E
					SB Through	1163	15	74	305			B
					SB Right	0	0	0	0			A
	EB	57.1	E		EB Left	636	57	137	558			E
					EB Through	0	0	137	558			A
					EB Right	185	57	77	519			E
	WB				WB Left	0	0	0	0			A
					WB Through	0	0	0	0			A
					WB Right	0	0	0	0			A
45- MD 187 at Rock Spring Dr												
45	NB	16.8	B	NB Left	383	34	90	614	C	23.8	C	
				NB Through	2000	14	91	614	B			
				NB Right	14	12	111	647	B			
	SB	26.7	C		SB Left	20	47	82	400			D
					SB Through	1160	30	82	400			C
					SB Right	172	1	54	356			A
	EB	40.2	D		EB Left	396	59	98	362			E
					EB Through	37	63	98	362			E
					EB Right	375	18	98	362			B
	WB	11.6	B		WB Left	5	32	3	77			C
					WB Through	12	25	3	77			C
					WB Right	32	4	1	67			A
47-Democracy Blvd at I-270 NB off ramp												
47	NB	45.7	D	NB Left	152	46	29	159	D	3.0	A	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB	1.2	A		EB Left	0	0	0	0			A
					EB Through	1114	1	3	51			A
					EB Right	0	0	0	0			A
	WB	0.9	A		WB Left	0	0	0	0			A
					WB Through	2129	1	2	62			A
					WB Right	0	0	0	0			A
48- Democracy Blvd at I-270 SB on ramp												
48	NB			NB Left	0	0	0	0	A	6.3	A	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB	5.0	A		EB Left	0	0	0	0			A
					EB Through	1326	5	17	250			A
					EB Right	0	0	0	0			A
	WB	7.0	A		WB Left	531	24	39	287			C
					WB Through	1748	2	30	266			A
					WB Right	0	0	0	0			A
49- Democracy Blvd at I-270 SB off ramp												
49	NB			NB Left	0	0	0	0	A	7.4	A	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB	38.9	D		SB Left	159	53	31	164			D
					SB Through	0	0	0	0			A
					SB Right	60	2	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	3.8	A		WB Left	0	0	0	0			A
					WB Through	1748	4	16	274			A
					WB Right	168	3	12	305			A
50- MD 190 at Burdette Rd												
50	NB	72.8	E	NB Left	26	74	15	100	E	31.1	C	
				NB Through	4	84	15	100	F			
				NB Right	5	56	15	100	E			
	SB	32.1	C		SB Left	34	78	19	122			E
					SB Through	7	56	19	122			E
					SB Right	118	18	19	122			B
	EB	17.6	B		EB Left	122	85	82	513			F
					EB Through	1151	11	82	513			B
					EB Right	28	4	68	540			A
	WB	38.3	D		WB Left	11	113	334	1111			F
					WB Through	2146	38	334	1111			D
					WB Right	52	28	334	1111			C

Table B.14: PM Peak - Existing - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
51- MD 190 at I-270 NB on ramp											
51	NB			NB Left	0	0	0	0	A	16.9	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	70.2	E	EB Left	233	70	101	369	E		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	8.4	A	WB Left	0	0	0	0	A		
				WB Through	1464	8	42	713	A		
				WB Right	0	0	0	0	A		
52- MD 190 at I-270 SB off ramp											
52	NB	73.8	E	NB Left	222	74	89	830	E	12.4	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	2.9	A	EB Left	0	0	0	0	A		
				EB Through	840	3	6	143	A		
				EB Right	0	0	0	0	A		
	WB	9.1	A	WB Left	0	0	0	0	A		
				WB Through	1705	9	26	545	A		
				WB Right	0	0	0	0	A		
53- MD 190 at Seven Locks Rd											
53	NB	0.3	A	NB Left	21	1	0	0	A	24.7	C
				NB Through	243	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	55.7	E	SB Left	306	56	103	375	E		
				SB Through	180	56	103	375	E		
				SB Right	17	56	103	375	E		
	EB	27.1	C	EB Left	22	33	66	355	C		
				EB Through	664	27	66	355	C		
				EB Right	34	25	66	355	C		
	WB	19.0	B	WB Left	262	75	125	534	E		
				WB Through	935	15	125	534	B		
				WB Right	715	4	125	534	A		
54- MD 124 at I-270 NB off ramp											
54	NB	59.5	E	NB Left	0	0	0	0	A	64.0	E
				NB Through	0	0	0	0	A		
				NB Right	1911	59	802	2475	E		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	68.6	E	EB Left	0	0	0	0	A		
				EB Through	1874	69	579	1267	E		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
55- Democracy Blvd at I-270 NB off ramp											
55	NB	47.0	D	NB Left	0	0	0	0	A	11.5	B
				NB Through	0	0	0	0	A		
				NB Right	314	47	51	199	D		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	1.5	A	EB Left	0	0	0	0	A		
				EB Through	1113	2	4	65	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table B.15: PM Peak -2015 Adaptive Ramp Metering- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
1- MD 85 at Sam's Club Drive											
1	NB	28.0	C	NB Left	114	81	110	613	F	52.6	D
				NB Through	499	33	110	613	C		
				NB Right	823	17	52	612	B		
	SB	81.3	F	SB Left	143	79	394	1057	E		
				SB Through	876	81	394	1057	F		
				SB Right	67	88	394	1057	F		
	EB	33.3	C	EB Left	43	83	26	114	F		
				EB Through	20	91	26	114	F		
				EB Right	144	10	26	114	B		
	WB	63.7	E	WB Left	511	77	219	689	E		
				WB Through	28	65	219	689	E		
				WB Right	195	30	219	689	C		
2- MD 85 at I-270 NB on and off ramp											
2	NB	36.5	D	NB Left	973	37	194	856	D	32.1	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	25.7	C	SB Left	0	0	0	0	A		
				SB Through	675	26	87	640	C		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
3- MD 85 at I-270 SB on and off ramp											
3	NB	5.9	A	NB Left	0	0	0	0	A	9.4	A
				NB Through	1697	6	40	704	A		
				NB Right	0	0	0	0	A		
	SB	43.5	D	SB Left	173	43	46	332	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
4- MD 85 at Crestwood Blvd											
4	NB	33.2	D	NB Left	60	69	155	648	E	33.7	C
				NB Through	1255	31	154	648	C		
				NB U-Turn	0	0	0	0	A		
	SB	22.4	C	SB Left	90	80	45	210	F		
				SB Through	809	25	58	442	C		
				SB Right	798	13	43	434	B		
	EB	54.9	D	EB Left	801	57	132	602	E		
				EB Through	31	44	132	602	D		
				EB Right	22	0	132	602	A		
	WB	43.3	D	WB Left	36	74	39	162	E		
				WB Through	61	65	39	162	E		
				WB Right	81	13	39	162	B		
5- MD 80 at I-270 NB on and off ramp											
5	NB	-1.5	A	NB Left	1	0	0	9	A	8.5	A
				NB Through	1	0	0	9	A		
				NB Right	8	-2	0	9	A		
	SB	12.0	B	SB Left	379	15	21	157	B		
				SB Through	17	17	21	157	B		
				SB Right	119	2	0	0	A		
	EB	9.5	A	EB Left	70	10	14	184	A		
				EB Through	0	0	8	0	A		
				EB Right	6	5	24	215	A		
	WB	6.7	A	WB Left	16	10	0	40	B		
				WB Through	509	12	26	271	B		
				WB Right	482	1	0	0	A		
6- MD 80 at I-270 SB on and off ramp											
6	NB	1.9	A	NB Left	48	2	1	110	A	4.0	A
				NB Through	0	0	0	0	A		
				NB Right	492	2	1	110	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	5.0	A	EB Left	0	0	0	0	A		
				EB Through	272	5	2	86	A		
				EB Right	53	3	1	90	A		
	WB	6.4	A	WB Left	0	0	0	0	A		
				WB Through	315	6	1	107	A		
				WB Right	0	0	0	0	A		
7- MD 109 at I-270 NB on and off ramp											
7	NB			NB Left	0	0	0	0	A	5.1	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	9.8	A	SB Left	219	10	12	156	B		
				SB Through	0	0	0	0	A		
				SB Right	16	2	0	43	A		
	EB	2.2	A	EB Left	56	1	0	36	A		
				EB Through	0	0	0	0	A		
				EB Right	59	3	0	0	A		
	WB	0.3	A	WB Left	0	0	0	0	A		
				WB Through	160	0	0	0	A		
				WB Right	0	0	0	0	A		
8- MD 80 at I-270 SB on and off ramp											
8	NB	3.8	A	NB Left	43	7	2	81	A	1.5	A
				NB Through	0	0	0	0	A		
				NB Right	29	-1	0	12	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.8	A	EB Left	0	0	0	0	A		
				EB Through	114	0	0	0	A		
				EB Right	24	4	0	0	A		
	WB	1.2	A	WB Left	98	1	0	41	A		
				WB Through	78	1	0	18	A		
				WB Right	0	0	0	0	A		
9- MD 121 at Gateway Center Dr											
9	NB	10.9	B	NB Left	472	13	32	236	B	16.8	B
				NB Through	639	10	32	236	B		
				NB Right	54	2	38	262	A		
	SB	17.7	C	SB Left	20	10	5	125	A		
				SB Through	169	19	14	165	B		
				SB Right	8	10	13	179	A		
	EB	13.4	B	EB Left	2	48	3	116	D		
				EB Through	18	41	8	160	D		
				EB Right	141	9	17	193	A		
	WB	34.6	D	WB Left	211	46	56	215	D		
				WB Through	56	40	56	215	D		
				WB Right	140	16	70	239	B		
10- MD 121 at I-270 NB on and off ramp											
10	NB	0.8	A	NB Left	25	9	1	83	A	0.6	A
				NB Through	0	0	0	0	A		
				NB Right	715	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.1	A	EB Left	0	0	0	0	A		
				EB Through	447	0	0	0	A		
				EB Right	58	0	0	0	A		
	WB	0.9	A	WB Left	100	3	1	93	A		
				WB Through	422	0	0	65	A		
				WB Right	0	0	0	0	A		

Table B.15: PM Peak -2015 Adaptive Ramp Metering- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
11- MD 121 at I-270 SB on and off ramp											
11	NB			NB Left	0	0	0	0	A	2.2	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	7.8	A	SB Left	136	10	8	132	A		
				SB Through	0	0	0	0	A		
				SB Right	36	0	0	0	A		
	EB	0.3	A	EB Left	29	1	0	25	A		
				EB Through	0	0	0	0	A		
				EB Right	352	0	0	0	A		
	WB	0.1	A	WB Left	0	0	0	0	A		
WB Through				99	0	0	0	A			
WB Right				0	0	0	0	A			
12- MD 27 at Observation Dr											
12	NB	40.3	D	NB U-Turn	0	0	0	0	A	22.3	C
				NB Through	73	57	19	86	E		
				NB Right	47	14	19	86	B		
	SB	39.6	D	SB Left	114	46	31	182	D		
				SB Through	41	62	35	244	E		
				SB Right	173	30	57	281	C		
	EB	17.3	B	EB Left	208	30	71	499	C		
				EB Through	2206	16	73	500	B		
				EB Right	107	16	85	538	B		
	WB	25.2	C	WB Left	31	22	120	599	C		
WB Through				1503	26	120	599	C			
WB Right				54	8	120	599	A			
13- MD 27 at I-270 NB off ramp											
13	NB	45.8	D	NB Left	384	46	63	286	D	8.0	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.1	A	EB Left	0	0	0	0	A		
				EB Through	1284	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	5.3	A	WB Left	0	0	0	0	A		
WB Through				1581	5	39	635	A			
WB Right				0	0	0	0	A			
14- MD 27 at I-270 SB off ramp											
14	NB			NB Left	0	0	0	0	A	5.2	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	50.8	D	SB Left	171	51	34	142	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	2.2	A	EB Left	0	0	0	0	A		
				EB Through	1351	2	4	117	A		
				EB Right	0	0	0	0	A		
	WB	2.6	A	WB Left	0	0	0	0	A		
WB Through				1423	3	7	273	A			
WB Right				0	0	0	0	A			
15- MD 27 at Crystal Rock Dr											
15	NB	22.6	C	NB Left	58	20	55	397	C	30.1	C
				NB Through	966	23	68	397	C		
				NB Right	43	20	72	410	B		
	SB	34.5	C	SB Left	141	58	186	721	E		
				SB Through	1306	36	186	721	D		
				SB Right	197	9	167	715	A		
	EB	42.9	D	EB Left	103	54	28	120	D		
				EB Through	37	46	25	115	D		
				EB Right	47	17	17	141	B		
	WB	27.6	C	WB Left	83	49	70	297	D		
WB Through				102	43	70	297	D			
WB Right				552	22	70	297	C			
16- MD 118 at Seneca Meadows Pkwy											
16	NB	3.9	A	NB Left	91	11	1	70	B	8.0	A
				NB Through	1176	3	7	143	A		
				NB Right	0	0	14	196	A		
	SB	6.2	A	SB Left	11	6	12	280	A		
				SB Through	1091	6	16	280	A		
				SB Right	9	2	19	312	A		
	EB	13.2	B	EB Left	18	55	12	134	E		
				EB Through	1	76	12	134	E		
				EB Right	275	10	12	134	B		
	WB	53.5	D	WB Left	93	64	37	199	E		
WB Through				6	61	33	198	E			
WB Right				25	13	42	218	B			
17- MD 118 at I-270 NB on ramp											
17	NB			NB Left	0	0	0	0	A	16.3	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	34.9	C	EB Left	435	35	94	542	C		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	10.8	B	WB Left	0	0	0	0	A		
WB Through				246	2	0	41	A			
WB Right				1215	13	45	460	B			
18- MD 118 at I-270 SB off ramp											
18	NB			NB Left	0	0	0	0	A	6.1	A
				NB Through	0	0.0	0	0	A		
				NB Right	0	0.0	0	0	A		
	SB	36.8	D	SB Left	129	36.8	22	115	D		
				SB Through	0	0.0	0	0	A		
				SB Right	0	0.0	0	0	A		
	EB	4.5	A	EB Left	0	0.0	0	0	A		
				EB Through	1183	4.5	9	299	A		
				EB Right	0	0.0	0	0	A		
	WB	4.6	A	WB Left	0	0.0	0	0	A		
WB Through				1454	4.6	9	226	A			
WB Right				0	0.0	0	0	A			
19- MD 118 at Aircraft Dr											
19	NB	24.1	C	NB Left	42	68	33	176	E	28.4	C
				NB Through	43	70	33	176	E		
				NB Right	196	5	3	76	A		
	SB	93.7	F	SB Left	382	92	226	583	F		
				SB Through	12	93	226	583	F		
				SB Right	97	99	226	583	F		
	EB	17.8	B	EB Left	98	22	60	381	C		
				EB Through	1215	18	60	381	B		
				EB Right	17	16	60	381	B		
	WB	18.5	B	WB Left	13	21	71	566	C		
WB Through				1311	22	71	566	C			
WB Right				350	6	71	566	A			
20- Middlebrook Rd at Observation Dr											
20	NB			NB Left	0	0	0	0	A	8.6	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	18.0	B	SB Left	96	35	18	131	D		
				SB Through	0	0	0	0	A		
				SB Right	179	9	18	131	A		
	EB	6.4	A	EB Left	14	10	16	153	B		
				EB Through	1174	6	16	153	A		
				EB Right	0	0	0	0	A		
	WB	8.6	A	WB Left	0	0	0	0	A		
WB Through				1238	9	25	268	A			
WB Right				12	6	39	318	A			

Table B.15: PM Peak -2015 Adaptive Ramp Metering- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
21- Middlebrook Rd at I-270 SB on ramp											
21	NB			NB Left	0	0	0	0	A	4.4	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	2.7	A	EB Left	0	0	0	0	A		
				EB Through	685	3	4	98	A		
				EB Right	0	0	0	0	A		
	WB	7.1	A	WB Left	430	7	4	191	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
22- Middlebrook Rd at Waring Station Rd											
22	NB	48.2	D	NB Left	156	45	75	316	D	12.7	B
				NB Through	0	0	75	316	A		
				NB Right	219	51	75	316	D		
	SB	30.8	C	SB Left	30	45	7	66	D		
				SB Through	2	37	7	66	D		
				SB Right	19	8	19	104	A		
	EB	7.3	A	EB Left	3	11	23	262	B		
				EB Through	1035	7	23	262	A		
				EB Right	160	6	23	262	A		
	WB	8.6	A	WB Left	241	21	35	324	C		
				WB Through	1641	7	35	324	A		
				WB Right	3	2	35	324	A		
23- MD 124 at MD 355											
23	NB	51.6	D	NB Left	508	64	186	538	E	60.1	E
				NB Through	935	45	183	535	D		
				NB Right	6	9	0	0	A		
	SB	30.2	C	SB Left	144	69	95	401	E		
				SB Through	556	53	95	401	D		
				SB Right	735	5	21	316	A		
	EB	34.8	C	EB Left	441	76	232	1110	E		
				EB Through	2562	34	232	1110	C		
				EB Right	536	4	77	934	A		
	WB	154.1	F	WB Left	0	0	0	0	A		
				WB Through	1477	156	715	942	F		
				WB Right	64	103	0	0	F		
24- MD 124 at I-270 SB on and off											
24	NB	69.0	F	NB Left	53	69	25	105	E	29.6	C
				NB Through	23	69	25	105	E		
				NB U-Turn	0	0	0	0	A		
	SB	41.1	D	SB Left	581	70	148	514	E		
				SB Through	9	67	148	514	E		
				SB Right	453	4	0	15	A		
	EB	27.2	C	EB Left	0	0	0	0	A		
				EB Through	1798	27	180	1066	C		
				EB Right	32	24	192	1089	C		
	WB	19.6	B	WB Left	4	57	81	603	E		
				WB Through	1045	19	81	603	B		
				WB Right	0	0	0	0	A		
25- MD 117 at MD 124											
25	NB	35.5	D	NB Left	45	62	114	655	E	39.7	D
				NB Through	541	52	114	655	D		
				NB Right	446	12	5	275	B		
	SB	32.4	C	SB Left	119	41	97	451	D		
				SB Through	761	37	97	451	D		
				SB Right	144	2	0	0	A		
	EB	45.3	D	EB Left	121	83	140	493	F		
				EB Through	1085	41	139	495	D		
				EB Right	42	39	146	522	D		
	WB	42.3	D	WB Left	376	69	248	1001	E		
				WB Through	1253	38	248	1001	D		
				WB Right	121	1	0	0	A		
26- MD 117 at Bureau Dr											
26	NB	40.4	D	NB Left	77	74	57	258	E	37.8	D
				NB Through	27	70	57	258	E		
				NB Right	260	27	57	258	C		
	SB	70.0	E	SB Left	272	80	103	364	F		
				SB Through	18	83	103	364	F		
				SB Right	65	23	103	364	C		
	EB	31.7	C	EB Left	41	70	158	813	E		
				EB Through	1606	31	160	812	C		
				EB Right	3	22	153	802	C		
	WB	36.6	D	WB Left	18	35	295	1060	D		
				WB Through	1607	38	296	1061	D		
				WB Right	269	26	326	1110	C		
27- MD 117 at I-270 SB off ramp											
27	NB			NB Left	0	0	0	0	A	14.5	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	5.2	A	EB Left	0	0	0	0	A		
				EB Through	899	5	12	449	A		
				EB Right	0	0	0	0	A		
	WB	42.2	E	WB Left	300	42	124	896	E		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
28- MD 117 at I-270 NB off ramp											
28	NB			NB Left	0	0	0	0	A	23.7	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	36.0	D	SB Left	216	39	116	481	D		
				SB Through	0	0	0	0	A		
				SB Right	804	35	116	480	D		
	EB	28.7	C	EB Left	3	140	163	985	F		
				EB Through	897	28	163	985	C		
				EB Right	0	0	0	0	A		
	WB	11.4	B	WB Left	0	0	0	0	A		
				WB Through	1388	11	73	377	B		
				WB Right	0	0	73	377	A		
29- MD 117 at Perry Pkwy											
29	NB	42.1	D	NB Left	18	61	13	102	E	40.2	D
				NB Through	22	56	13	101	E		
				NB Right	24	15	22	122	B		
	SB	58.2	E	SB Left	199	85	89	333	F		
				SB Through	15	105	89	333	F		
				SB Right	112	5	89	333	A		
	EB	21.8	C	EB Left	235	72	83	349	E		
				EB Through	830	8	83	349	A		
				EB Right	32	7	68	336	A		
	WB	49.1	D	WB Left	37	107	280	741	F		
				WB Through	1257	50	280	741	D		
				WB Right	306	38	280	741	D		
30- Shady Grove Rd at I-270 NB off ramp											
30	NB	7.1	A	NB Left	0	0	0	0	A	39.9	D
				NB Through	1024	7	16	183	A		
				NB Right	0	0	0	0	A		
	SB	65.4	E	SB Left	0	0	0	0	A		
				SB Through	1162	65	354	806	E		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	52.5	D	WB Left	322	52	59	235	D		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table B.15: PM Peak -2015 Adaptive Ramp Metering- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
31- Shady Grove Rd at I-270 SB off ramp											
31	NB	6.6	A	NB Left	0	0	0	0	A	15.9	B
				NB Through	1463	7	27	434	A		
				NB Right	0	0	0	0	A		
	SB	5.4	A	SB Left	0	0	0	0	A		
				SB Through	778	5	7	148	A		
				SB Right	0	0	0	0	A		
	EB	57.5	E	EB Left	228	55	44	182	D		
				EB Through	0	0	0	0	A		
				EB Right	294	60	64	283	E		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
32- MD 28 at I-270 SB off ramp											
32	NB			NB U-Turn	0	0	0	0	A	8.5	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	37.4	D	SB Left	432	45	74	295	D		
				SB Through	0	0	0	0	A		
				SB Right	97	3	0	37	A		
	EB	3.5	A	EB Left	0	0	0	0	A		
				EB Through	1484	2	39	643	A		
				EB Right	828	6	53	826	A		
	WB	6.4	A	WB Left	0	0	0	0	A		
				WB Through	1686	6	19	222	A		
				WB Right	0	0	0	0	A		
33- MD 28 at I-270 on and off ramps											
33	NB	35.5	D	NB Left	0	0	44	239	A	21.7	C
				NB Through	210	48	52	248	D		
				NB Right	134	17	52	248	B		
	SB	34.8	C	SB Left	11	108	180	291	F		
				SB Through	0	0	0	0	A		
				SB Right	164	30	180	291	C		
	EB	12.7	B	EB Left	254	38	54	282	D		
				EB Through	879	5	54	282	A		
				EB Right	0	0	0	0	A		
	WB	24.3	C	WB Left	36	19	99	389	B		
				WB Through	1241	24	80	352	C		
				WB Right	0	0	0	0	A		
34- MD 189 at Great Falls Rd											
34	NB	46.0	D	NB Left	44	56	12	92	E	44.3	D
				NB Through	11	45	9	90	D		
				NB Right	12	11	10	101	B		
	SB	35.0	D	SB Left	12	52	28	189	D		
				SB Through	8	56	28	189	E		
				SB Right	317	34	88	263	C		
	EB	32.5	C	EB Left	398	61	356	1840	E		
				EB Through	646	16	14	252	B		
				EB Right	57	12	22	289	B		
	WB	66.0	E	WB Left	10	49	215	684	D		
				WB Through	714	66	214	684	E		
				WB Right	12	53	239	717	D		
35- MD 189 at I-270 Ramps											
35	NB	50.1	D	NB Left	250	50	45	187	D	60.4	E
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	70.1	E	SB Left	339	70	318	1402	E		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	33.9	C	EB Left	469	42	99	420	D		
				EB Through	366	23	99	420	C		
				EB Right	0	0	0	0	A		
	WB	90.1	F	WB Left	375	95	93	307	F		
				WB Through	346	84	93	307	F		
				WB Right	0	0	0	0	A		
36- MD 189 at Wooton Pkwy											
36	NB	45.5	D	NB Left	186	60	115	411	E	44.1	D
				NB Through	536	52	115	411	D		
				NB Right	174	10	115	411	B		
	SB	63.9	E	SB Left	247	83	159	643	F		
				SB Through	730	57	161	671	E		
				SB Right	0	0	0	0	A		
	EB	33.7	C	EB Left	118	71	98	442	E		
				EB Through	540	33	98	442	C		
				EB Right	160	10	98	442	B		
	WB	33.9	C	WB Left	151	73	111	560	E		
				WB Through	739	34	111	560	C		
				WB Right	298	15	111	560	B		
37- Montrose Rd at Tower Oaks Blvd											
37	NB	0.4	A	NB Left	0	0	0	0	A	15.9	B
				NB Through	0	0	0	0	A		
				NB Right	491	0	0	0	A		
	SB	55.6	E	SB Left	67	52	19	202	D		
				SB Through	0	0	0	0	A		
				SB Right	272	56	71	261	E		
	EB	6.0	A	EB Left	0	0	0	0	A		
				EB Through	1647	6	29	405	A		
				EB Right	0	0	0	0	A		
	WB	19.6	B	WB Left	68	35	29	405	C		
				WB Through	2564	20	115	708	B		
				WB Right	245	14	115	708	B		
38- Tower Oaks Blvd at I-270 off ramp											
38	NB	23.3	C	NB Left	652	24	47	251	C	17.5	B
				NB Through	0	0.0	40	243	A		
				NB Right	21	6.2	47	251	A		
	SB	16.0	B	SB Left	8	27.6	1	35	C		
				SB Through	0	0.0	1	34	A		
				SB Right	7	2.7	0	15	A		
	EB	11.1	B	EB Left	1	7.1	14	158	A		
				EB Through	309	11.6	14	158	B		
				EB Right	33	6.5	10	149	A		
	WB	12.2	B	WB Left	122	15.5	13	122	B		
				WB Through	191	10.2	13	123	B		
				WB Right	1	3.5	2	79	A		
39- Montrose Rd at Tower Oaks Blvd											
39	NB	17.6	B	NB Left	76	35	63	273	C	55.4	E
				NB Through	606	31	63	273	C		
				NB Right	572	1	0	0	A		
	SB	29.3	C	SB Left	193	59	58	196	E		
				SB Through	395	20	56	195	B		
				SB Right	105	11	54	226	B		
	EB	221.3	F	EB Left	80	182	537	725	F		
				EB Through	452	227	538	726	F		
				EB Right	32	244	562	749	F		
	WB	34.8	C	WB Left	565	43	108	408	D		
				WB Through	469	41	109	408	D		
				WB Right	330	12	128	438	B		
40- Rockledge Blvd at I-270 NB on and off ramp											
40	NB	127.5	F	NB Left	0	0	0	0	A	100.3	F
				NB Through	339	115	532	835	F		
				NB Right	861	132	532	835	F		
	SB	85.9	F	SB Left	0	0	88	230	A		
				SB Through	344	86	88	230	F		
				SB Right	0	0	0	0	A		
	EB	62.1	E	EB Left	5	104	168	488	F		
				EB Through	429	103	168	488	F		
				EB Right	292	2	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table B.15: PM Peak -2015 Adaptive Ramp Metering- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
41- Rockledge Blvd at I-270 SB on and off ramps											
41	NB	29.3	C	NB Left	343	29	73	270	C	49.7	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	55.3	E	WB Left	343	64	194	736	E		
				WB Through	888	52	194	736	D		
				WB Right	0	0	0	0	A		
42- MD 187 at Tuckerman Ln											
42	NB	45.7	D	NB Left	198	19	331	1151	B	121.7	F
				NB Through	2131	46	331	1151	D		
				NB Right	185	75	331	1151	E		
	SB	204.5	F	SB Left	181	177	2561	2693	F		
				SB Through	1112	203	2561	2693	F		
				SB Right	269	231	2561	2693	F		
	EB	51.7	D	EB Left	238	52	94	407	D		
				EB Through	409	54	95	408	D		
				EB Right	103	43	113	432	D		
	WB	214.9	F	WB Left	461	213	1910	2136	F		
				WB Through	613	231	1910	2136	F		
				WB Right	152	155	1910	2136	F		
43- MD 187 at I-270 NB on and off ramps											
43	NB	14.6	B	NB Left	551	30	102	395	C	18.7	B
				NB Through	2295	11	102	395	B		
				NB Right	0	0	0	0	A		
	SB	23.9	C	SB Left	0	0	0	0	A		
				SB Through	1241	24	60	245	C		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	58.5	E	WB Left	65	56	47	261	E		
				WB Through	65	61	47	261	E		
				WB Right	0	0	0	0	A		
44- MD 187 at I-270 NB on and off ramps											
44	NB	33.1	D	NB Left	0	0	0	0	A	34.0	C
				NB Through	2211	33	108	476	C		
				NB Right	0	0	0	0	A		
	SB	20.1	C	SB Left	147	60	73	308	E		
				SB Through	1158	15	73	308	B		
				SB Right	0	0	0	0	A		
	EB	58.8	E	EB Left	635	59	141	528	E		
				EB Through	0	0	141	528	A		
				EB Right	181	57	73	469	E		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
45- MD 187 at Rock Spring Dr											
45	NB	16.0	B	NB Left	383	35	87	592	C	23.2	C
				NB Through	2004	12	87	593	B		
				NB Right	14	10	107	626	A		
	SB	26.2	C	SB Left	20	41	81	369	D		
				SB Through	1155	30	81	369	C		
				SB Right	170	1	47	355	A		
	EB	40.4	D	EB Left	396	59	98	362	E		
				EB Through	37	64	98	362	E		
				EB Right	375	18	98	362	B		
	WB	11.7	B	WB Left	5	32	3	77	C		
				WB Through	12	25	3	77	C		
				WB Right	32	4	1	67	A		
47-Democracy Blvd at I-270 NB off ramp											
47	NB	46.8	D	NB Left	152	47	29	160	D	3.1	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	1.2	A	EB Left	0	0	0	0	A		
				EB Through	1108	1	3	48	A		
				EB Right	0	0	0	0	A		
	WB	0.9	A	WB Left	0	0	0	0	A		
				WB Through	2129	1	2	62	A		
				WB Right	0	0	0	0	A		
48- Democracy Blvd at I-270 SB on ramp											
48	NB			NB Left	0	0	0	0	A	6.2	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	5.0	A	EB Left	0	0	0	0	A		
				EB Through	1324	5	17	234	A		
				EB Right	0	0	0	0	A		
	WB	6.8	A	WB Left	534	23	38	282	C		
				WB Through	1748	2	30	261	A		
				WB Right	0	0	0	0	A		
49- Democracy Blvd at I-270 SB off ramp											
49	NB			NB Left	0	0	0	0	A	7.1	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	37.8	D	SB Left	153	51	30	152	D		
				SB Through	0	0	0	0	A		
				SB Right	58	2	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	3.7	A	WB Left	0	0	0	0	A		
				WB Through	1748	4	16	268	A		
				WB Right	170	4	10	192	A		
50- MD 190 at Burdette Rd											
50	NB	73.7	E	NB Left	26	76	15	100	E	31.2	C
				NB Through	4	84	15	100	F		
				NB Right	5	56	15	100	E		
	SB	31.7	C	SB Left	34	79	19	122	E		
				SB Through	7	56	19	122	E		
				SB Right	117	17	19	122	B		
	EB	20.2	C	EB Left	121	93	94	743	F		
				EB Through	1149	13	94	743	B		
				EB Right	27	5	85	770	A		
	WB	36.9	D	WB Left	11	117	329	1109	F		
				WB Through	2150	37	329	1109	D		
				WB Right	51	26	329	1109	C		

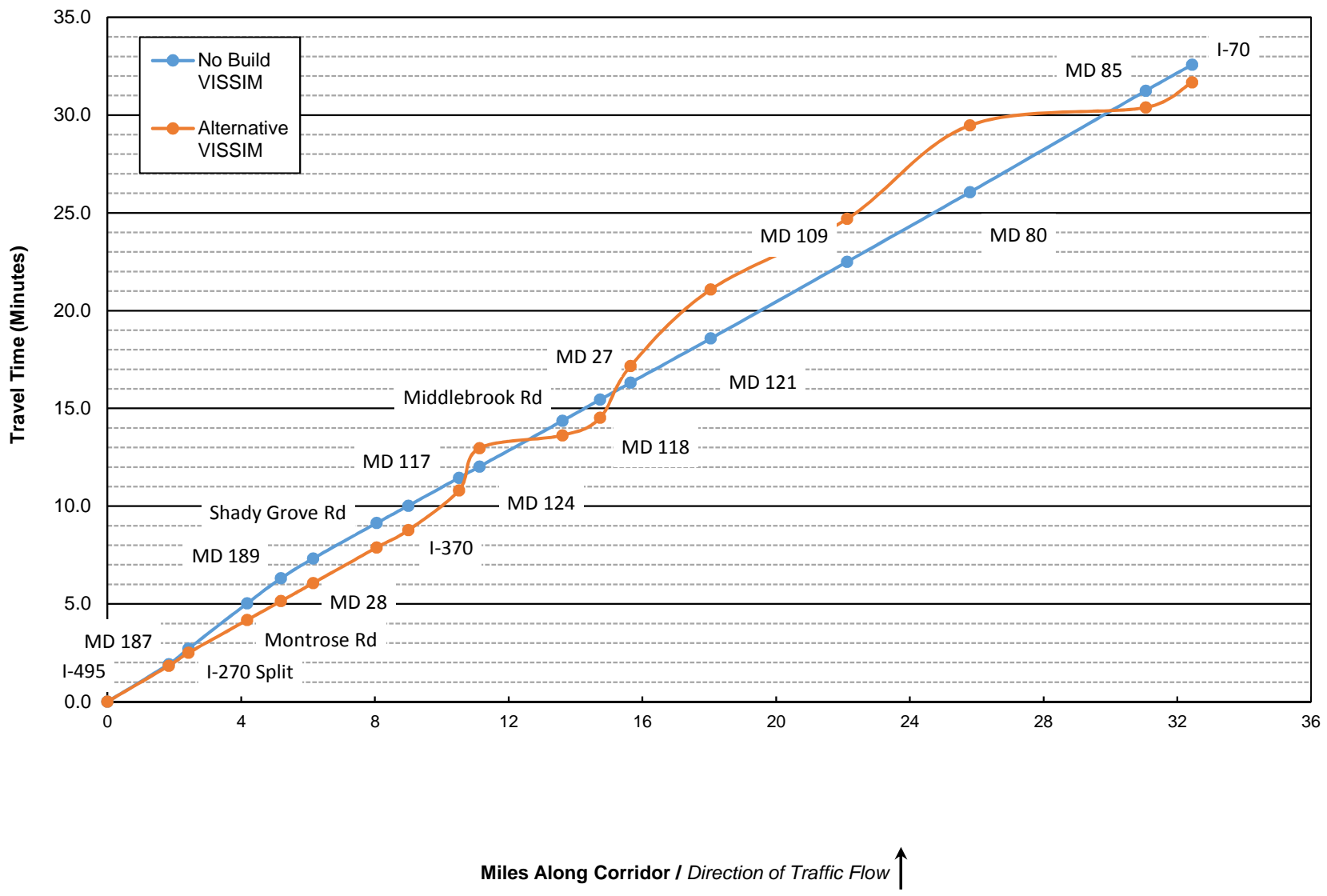
Table B.15: PM Peak -2015 Adaptive Ramp Metering- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
51- MD 190 at I-270 NB on ramp											
51	NB			NB Left	0	0	0	0	A	17.2	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	70.1	E	EB Left	234	70	102	374	E		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	8.8	A	WB Left	0	0	0	0	A		
WB Through				1466	9	49	801	A			
WB Right				0	0	0	0	A			
52- MD 190 at I-270 SB off ramp											
52	NB	75.1	E	NB Left	223	75	98	961	E	12.9	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	2.9	A	EB Left	0	0	0	0	A		
				EB Through	840	3	6	130	A		
				EB Right	0	0	0	0	A		
	WB	9.7	A	WB Left	0	0	0	0	A		
WB Through				1705	10	29	684	A			
WB Right				0	0	0	0	A			
53- MD 190 at Seven Locks Rd											
53	NB	0.4	A	NB Left	21	1	0	0	A	24.2	C
				NB Through	243	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	55.7	E	SB Left	305	56	103	375	E		
				SB Through	180	56	103	375	E		
				SB Right	17	56	103	375	E		
	EB	27.4	C	EB Left	22	33	66	348	C		
				EB Through	664	27	66	348	C		
				EB Right	34	25	66	348	C		
	WB	18.1	B	WB Left	265	72	118	462	E		
WB Through				940	14	118	462	B			
WB Right				717	4	118	462	A			
54- MD 124 at I-270 NB off ramp											
54	NB	36.7	D	NB Left	0	0	0	0	A	38.8	D
				NB Through	0	0	0	0	A		
				NB Right	1654	37	221	1004	D		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	40.7	D	EB Left	0	0	0	0	A		
				EB Through	1904	41	295	1198	D		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
WB Through				0	0	0	0	A			
WB Right				0	0	0	0	A			
55- Democracy Blvd at I-270 NB off ramp											
55	NB	46.3	D	NB Left	0	0	0	0	A	11.4	B
				NB Through	0	0	0	0	A		
				NB Right	315	46	49	192	D		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	1.5	A	EB Left	0	0	0	0	A		
				EB Through	1108	2	4	65	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
WB Through				0	0	0	0	A			
WB Right				0	0	0	0	A			

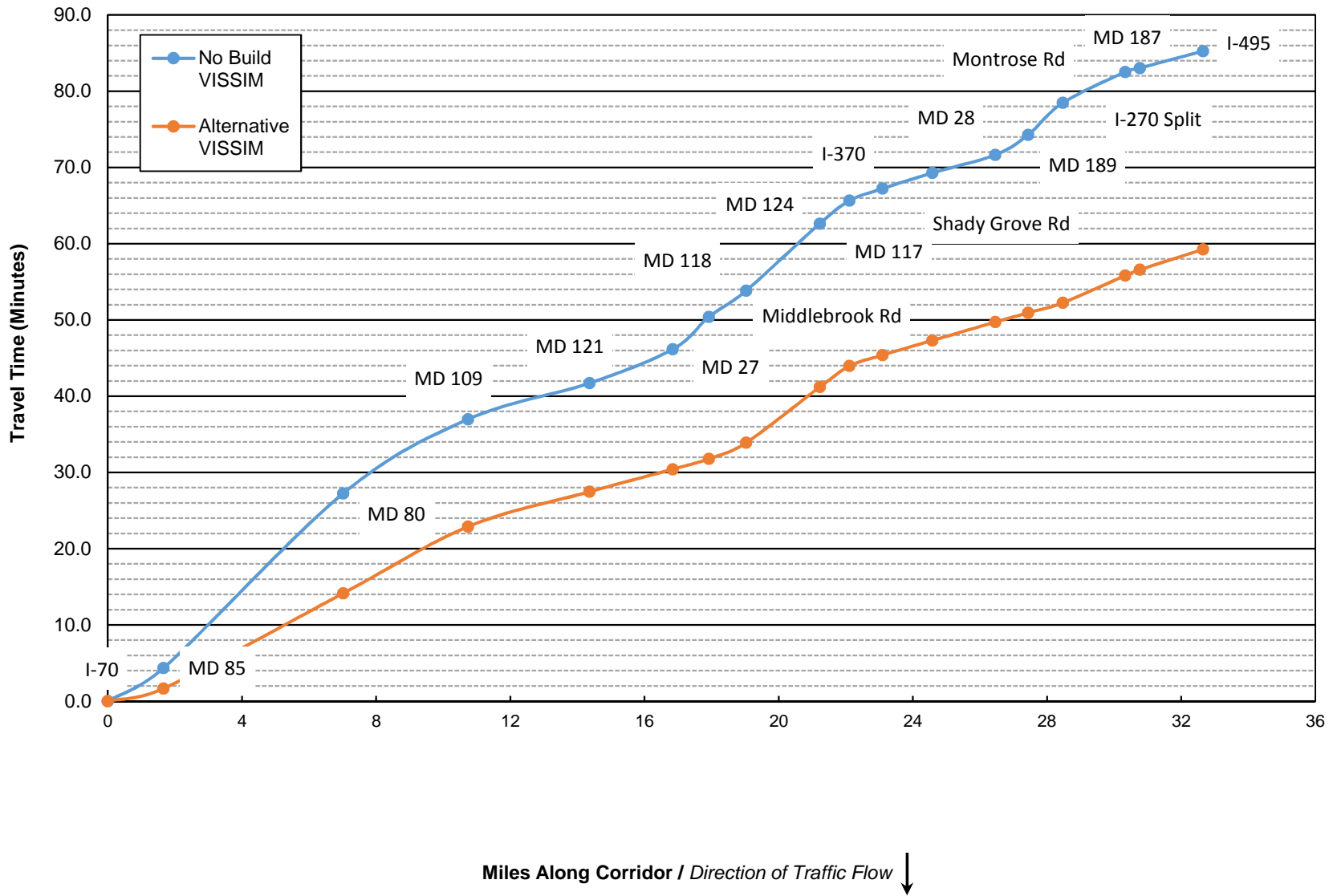
Table B.16: PM Peak -2015 Adaptive Ramp Metering- I-270 Vehicle Network Performance

	Existing	ARM	% Change
Total Delay	21,792,153	20,286,866	-7%
Average Delay per Vehicle	206	193	-6%
Total Travel Time	53,628,278	51,863,814	-3%
Vehicles (Arrived)	88,401	88,805	0%
Latent Demand	1,544	1,870	21%
Latent Delay	2,650,217	3,104,831	17%
Total Distance	484,473	480,554	-1%
Average Speed	33	33	3%

**Figure C.1: AM Peak - 2040 Adaptive Ramp Metering
I-270 Travel Time Graph - Northbound**



**Figure C.2: AM Peak - 2040 Adaptive Ramp Metering
I-270 Travel Time Graph - Southbound**



**Figure C.3: AM Peak - 2040 Adaptive Ramp Metering
I-270 Spur Travel Time Graph - Northbound**

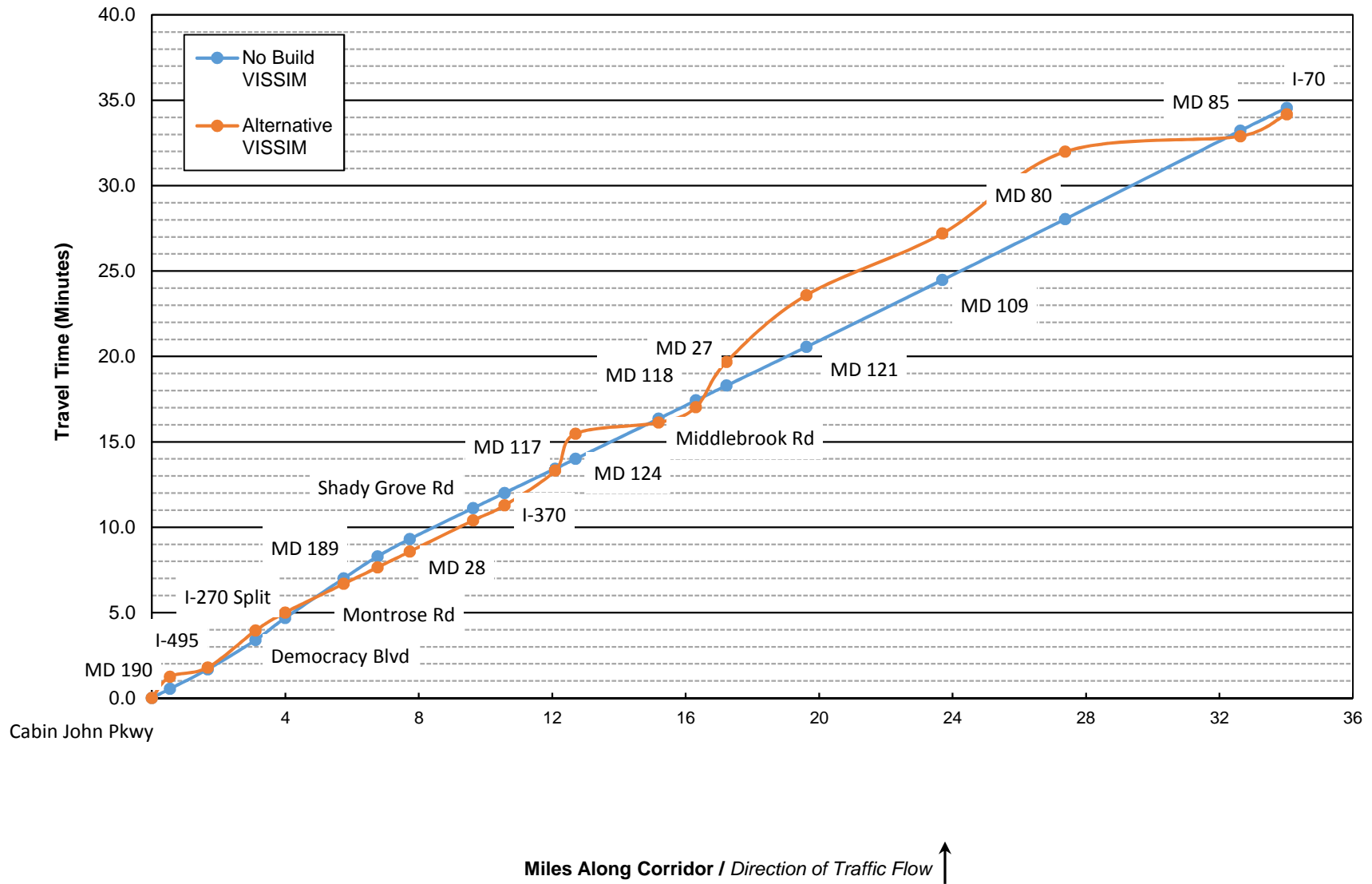
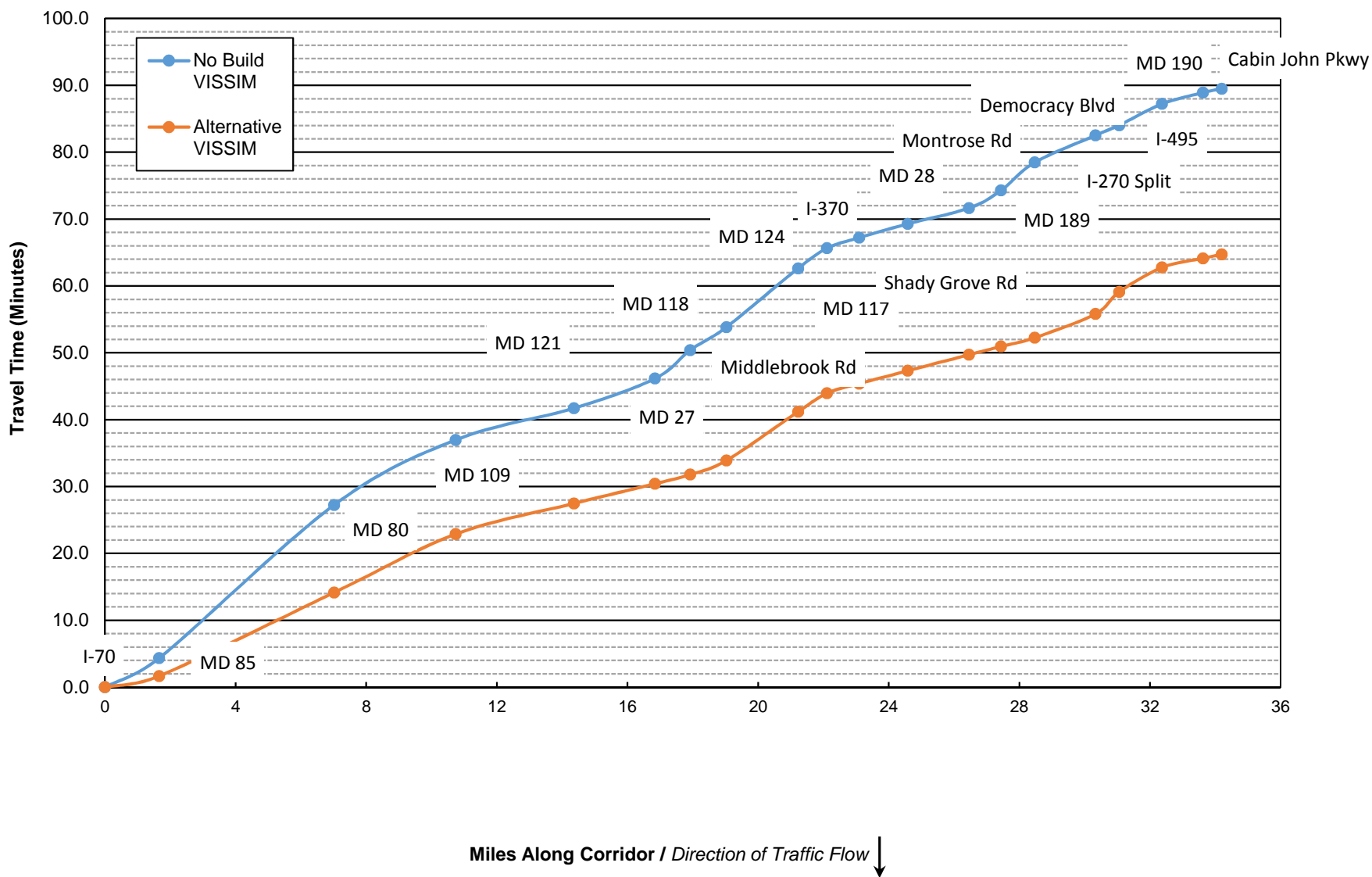
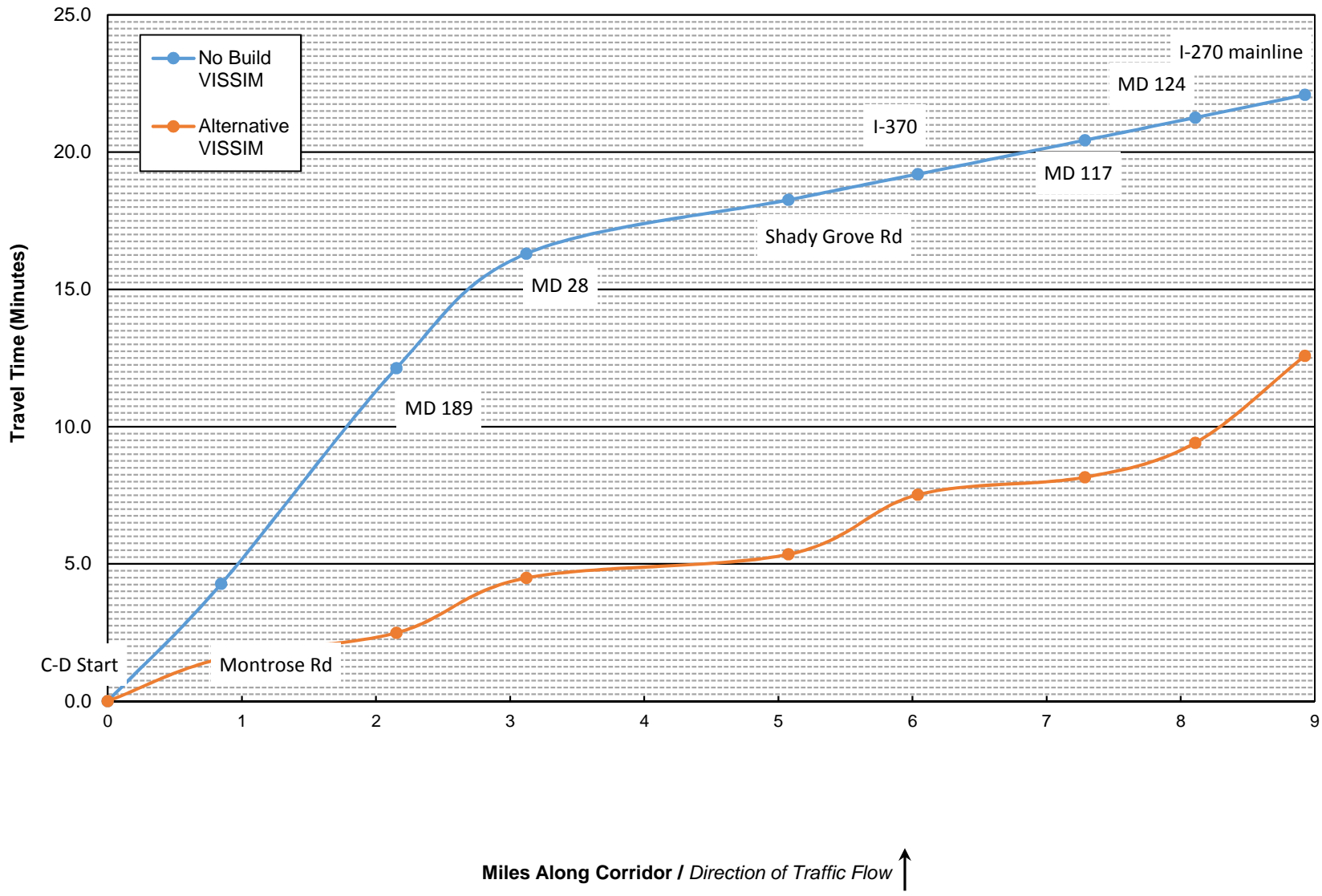


Figure C.4: AM Peak - 2040 Adaptive Ramp Metering I-270 Spur Travel Time Graph - Southbound



**Figure C.5: AM Peak - 2040 AdaptiveRamp Metering
I-270 Local Travel Time Graph - Northbound**



**Figure C.6: AM Peak - 2040 Adaptive Ramp Metering
I-270 Local Travel Time Graph - Southbound**

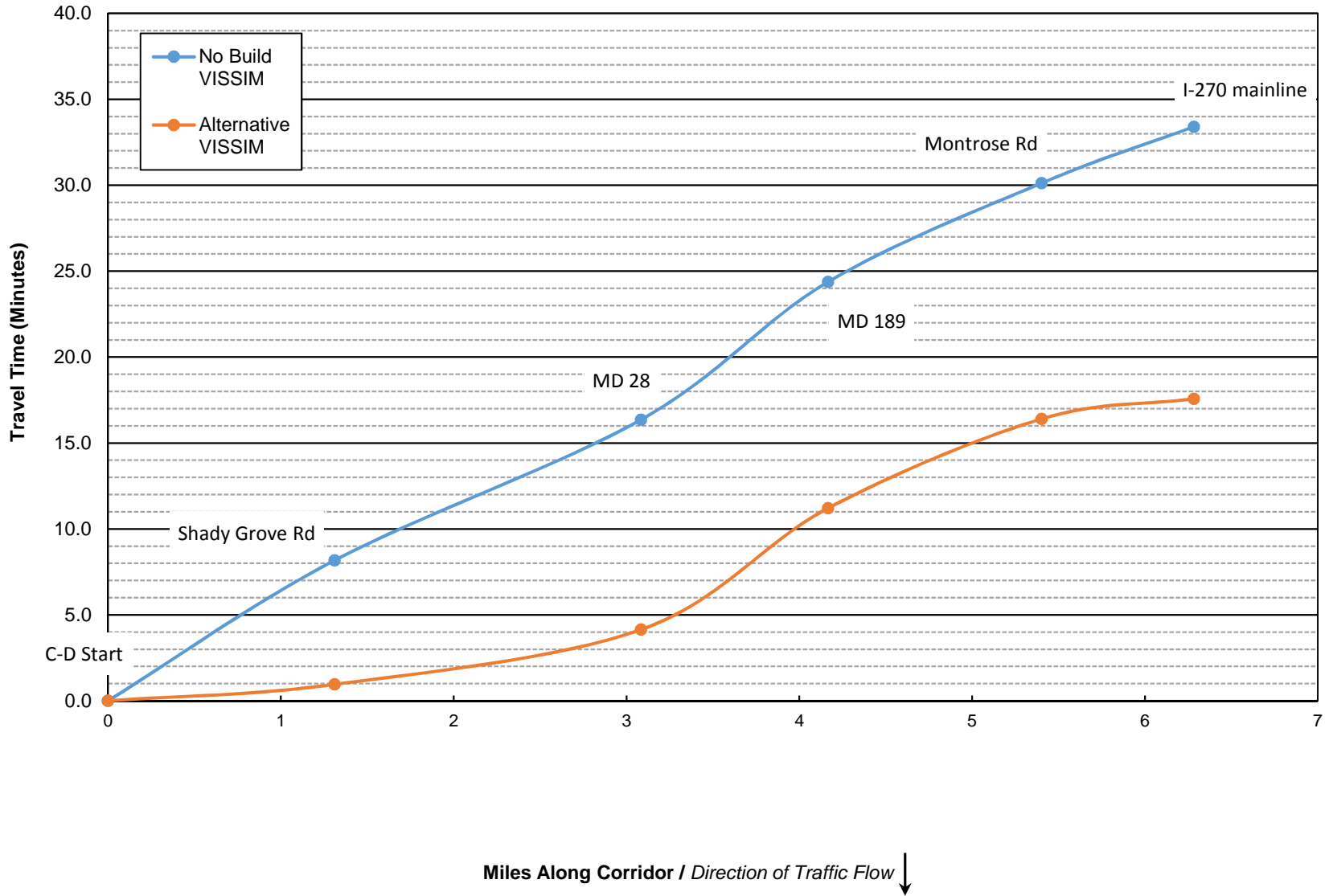


Table C.1: AM Peak - 2040 Adaptive Ramp Metering - I-270 Vehicle Travel Time

I-270 Northbound	No Build VISSIM Travel Time (seconds)	ARM VISSIM Travel Time (seconds)	% Change	I-270 Southbound	No Build VISSIM Travel Time (seconds)	ARM VISSIM Travel Time (seconds)	% Change
From I-495 interchange				From I-70			
to MD 187	115.1	110.2	-4%	to MD 85	260.9	99.9	-62%
to I-270 Split	47.5	39.6	-17%	to MD 80	1,374.0	749.0	-45%
to Montrose Rd	139.0	100.8	-27%	to MD 109	583.2	524.6	-10%
to MD 189	77.0	58.0	-25%	to MD 121	284.4	274.5	-3%
to MD 28	61.0	55.4	-9%	to MD 27	266.9	177.0	-34%
to Shady Grove Rd	108.7	109.2	0%	to MD 118	254.6	81.9	-68%
to I-370	53.0	53.1	0%	to Middlebrook Rd	206.2	126.3	-39%
to MD 117	85.5	122.2	43%	to MD 124	528.0	438.7	-17%
to MD 124	34.5	129.4	275%	to MD 117	180.6	165.6	-8%
to Middlebrook Rd	140.8	39.5	-72%	to I-370	94.3	85.9	-9%
to MD 118	64.7	53.9	-17%	to Shady Grove Rd	124.1	115.1	-7%
to MD 27	52.0	159.1	206%	to MD 28	141.9	144.8	2%
to MD 121	135.6	234.4	73%	to MD 189	157.8	73.5	-53%
to MD 109	235.2	216.7	-8%	to Montrose Rd	251.0	78.3	-69%
to MD 80	214.0	287.3	34%	to I-270 Split	243.1	213.3	-12%
to MD 85	310.9	54.6	-82%	to MD 187	30.7	46.5	51%
to I-70	80.1	77.3	-3%	to I-495 interchange	134.0	161.0	20%
I-270 Total (miles/minutes)	32.6	31.7	-3%	I-270 Total (miles/minutes)	85.3	59.3	-30%
I-270 Spur Northbound				I-270 Spur Southbound			
From Cabin John Pkwy				From I-70			
to MD 190	32.4	74.7	131%	to I-270 Split	4,951.1	3,348.5	-32%
to I-495	68.6	32.4	-53%	to Democracy Blvd	91.3	198.1	117%
to Democracy Blvd	102.7	129.6	26%	to I-495	191.0	219.2	15%
to I-270 Split	77.7	63.5	-18%	to MD 190	101.6	81.9	-19%
to I-70	1,792.1	1,750.8	-2%	to Cabin John Pkwy	35.1	35.2	0%
I-270 Spur Total (miles/minutes)	34.6	34.2	-1%	I-270 Spur Total (miles/minutes)	89.5	64.7	-28%

Table C.2: AM Peak - 2040 Adaptive Ramp Metering - I-270 Local Vehicle Travel Time

I-270 Northbound	No Build VISSIM Travel Time (seconds)	ARM VISSIM Travel Time (seconds)	% Change	I-270 Southbound	No Build VISSIM Travel Time (seconds)	ARM VISSIM Travel Time (seconds)	% Change
From C-D start				From C-D start			
to Montrose Rd	256.2	93.1	-64%	to Shady Grove	490.1	57.5	-88%
to MD 189	471.8	56.3	-88%	to MD 28	491.5	191.1	-61%
to MD 28	250.0	120.1	-52%	to MD 189	481.0	423.8	-12%
to Shady Grove	117.6	51.5	-56%	to Montrose	344.5	311.6	-10%
to I-370	56.5	130.4	131%	to I-270 mainline	197.1	70.5	-64%
to MD 117	74.0	38.2	-48%				
to MD 124	49.5	75.2	52%				
to I-270 mainline	49.7	190.2	283%				
I-270 Local Total (miles/minutes)	22.1	12.6	-43%	I-270 Local Total (miles/minutes)	33.4	17.6	-47%

Table C.3: AM Peak - 2040 Adaptive Ramp Metering - I-270 Vehicle Speed

I-270 Northbound	No Build VISSIM Speed (MPH)	ARM VISSIM Speed (MPH)	% Change	I-270 Southbound	No Build VISSIM Speed (MPH)	ARM VISSIM Speed (MPH)	% Change
From I-495 interchange				From I-70			
to MD 187	57.4	59.9	4%	to MD 85	22.9	59.9	161%
to I-270 Split	44.8	53.8	20%	to MD 80	14.0	25.7	83%
to Montrose Rd	45.4	62.6	38%	to MD 109	23.0	25.5	11%
to MD 189	47.4	63.0	33%	to MD 121	45.8	47.5	4%
to MD 28	56.9	62.7	10%	to MD 27	33.5	50.5	51%
to Shady Grove Rd	62.9	62.6	0%	to MD 118	15.2	47.1	211%
to I-370	64.1	64.0	0%	to Middlebrook Rd	19.4	31.7	63%
to MD 117	63.8	44.6	-30%	to MD 124	15.0	18.0	20%
to MD 124	64.0	17.0	-73%	to MD 117	17.7	19.3	9%
to Middlebrook Rd	63.6	226.8	257%	to I-370	37.6	41.3	10%
to MD 118	62.3	74.9	20%	to Shady Grove Rd	43.1	46.5	8%
to MD 27	63.4	20.7	-67%	to MD 28	47.6	46.6	-2%
to MD 121	63.6	36.8	-42%	to MD 189	22.3	47.9	115%
to MD 109	62.4	67.7	9%	to Montrose Rd	14.8	47.4	220%
to MD 80	61.9	46.1	-26%	to I-270 Split	27.5	31.4	14%
to MD 85	60.8	346.6	470%	to MD 187	51.0	33.7	-34%
to I-70	62.5	64.7	4%	to I-495 interchange	50.8	42.3	-17%
I-270 Total (miles/minutes)	59.8	61.5	3%	I-270 Total (miles/minutes)	23.0	33.1	44%
I-270 Spur Northbound				I-270 Spur Southbound			
From Cabin John Pkwy				From I-70			
to MD 190	59.9	26.0	-57%	to I-270 Split	22.1	32.6	48%
to I-495	59.5	126.0	112%	to Democracy Blvd	28.8	13.3	-54%
to Democracy Blvd	50.3	39.8	-21%	to I-495	24.7	21.5	-13%
to I-270 Split	41.3	50.6	22%	to MD 190	44.4	55.1	24%
to I-70	60.3	61.7	2%	to Cabin John Pkwy	58.5	58.3	0%
I-270 Spur Total (miles/minutes)	59.1	59.7	1%	I-270 Spur Total (miles/minutes)	22.9	31.7	38%

Table C.4: AM Peak - 2040 Adaptive Ramp Metering - I-270 Local Vehicle Speed

I-270 Northbound	No Build VISSIM Speed (MPH)	ARM VISSIM Speed (MPH)	% Change	I-270 Southbound	No Build VISSIM Speed (MPH)	ARM VISSIM Speed (MPH)	% Change
From C-D start				From C-D start			
to Montrose Rd	11.9	32.7	175%	to Shady Grove	9.6	82.1	753%
to MD 189	10.0	83.6	739%	to MD 28	13.0	33.4	157%
to MD 28	13.9	29.0	108%	to MD 189	8.1	9.2	13%
to Shady Grove	59.8	136.6	128%	to Montrose	12.9	14.3	11%
to I-370	61.5	26.7	-57%	to I-270 mainline	16.1	45.0	180%
to MD 117	60.6	117.3	94%				
to MD 124	59.8	39.4	-34%				
to I-270 mainline	59.3	15.5	-74%				
I-270 Local Total (miles/minutes)	24.2	42.6	76%	I-270 Local Total (miles/minutes)	11.3	21.5	90%

Table C.5: AM Peak - 2040 Adaptive Ramp Metering - I-270 Vehicle Density

I-270 Northbound	Type	No Build		ARM		% Change	I-270 Southbound	Type	No Build		ARM		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS			
I-270	Freeway	40	E	27	D	-31%	I-270	Freeway	45	F	22	C	-52%
I-270 Diverge to MD 187	Diverge	33	D	21	C	-36%	I-270 Merge from WB I-70	Merge	62	F	14	B	-77%
I-270	Freeway	45	F	24	C	-46%	I-270	Freeway	67	F	26	D	-61%
I-270 Diverge to Rockledge Rd	Diverge	35	D	21	C	-40%	I-270 Merge from EB I-70	Merge	57	F	22	C	-61%
I-270	Freeway	48	F	20	C	-58%	I-270	Freeway	67	F	32	D	-53%
I-270 Weave from MD 187 to I-270 HOV	Weave	30	D	12	B	-60%	I-270 Diverge to SB MD 85	Diverge	70	F	36	E	-48%
I-270 Lane Drop	Merge	47	F	16	B	-65%	I-270	Freeway	92	F	29	D	-68%
I-270	Freeway	64	F	30	D	-54%	I-270 Diverge to NB MD 85	Diverge	56	F	17	B	-70%
I-270 Merge from I-270 Spur	Merge	63	F	26	C	-60%	I-270	Freeway	119	F	24	C	-80%
I-270 Weave from I-270 HOV to I-270 C-D	Weave	49	F	23	C	-52%	I-270 Merge from MD 85	Merge	104	F	17	B	-84%
I-270	Freeway	38	E	25	C	-33%	I-270	Freeway	112	F	73	F	-35%
I-270 Diverge to C-D (MD 189)	Diverge	31	D	23	C	-25%	I-270 Diverge to MD 80	Diverge	61	F	55	F	-10%
I-270	Freeway	23	C	19	C	-16%	I-270	Freeway	108	F	99	F	-9%
I-270 Diverge to C-D (MD 28)	Diverge	50	F	21	C	-59%	I-270 Merge from MD 80	Merge	111	F	75	F	-32%
I-270	Freeway	14	B	16	B	13%	I-270	Freeway	75	F	70	F	-6%
I-270 Merge from C-D (MD 189)	Merge	14	B	19	B	39%	I-270 Diverge to MD 109	Diverge	41	F	37	E	-10%
I-270 Diverge to C-D (Shady Grove Rd)	Diverge	18	B	22	C	21%	I-270	Freeway	80	F	74	F	-7%
I-270	Freeway	12	B	16	B	29%	I-270 Merge from MD 109	Merge	87	F	58	F	-33%
I-270 Weave from C-D (MD 28) to C-D (Shady Grove Rd)	Weave	10	B	14	B	32%	I-270	Freeway	44	E	46	F	3%
I-270	Freeway	10	A	13	B	28%	I-270 Diverge to SB Weigh Station	Diverge	19	B	19	B	3%
I-270 Merge from C-D (Shady Grove Rd)	Merge	9	A	11	B	26%	I-270	Freeway	38	E	39	E	2%
I-270	Freeway	12	B	14	B	25%	I-270 Merge from SB Weigh Station	Merge	20	B	20	C	1%
I-270 Merge from C-D (I-370)	Merge	10	B	12	B	15%	I-270	Freeway	41	E	41	E	1%
I-270 Diverge to C-D (MD 117)	Diverge	16	B	28	D	76%	I-270 Diverge to MD 121	Diverge	20	B	18	B	-9%
I-270	Freeway	12	B	14	B	16%	I-270	Freeway	28	D	24	C	-16%
I-270 Merge from C-D (MD 124)	Merge	14	B	15	B	8%	I-270 Merge from WB MD 121	Merge	33	D	21	C	-37%
I-270	Freeway	16	B	18	C	12%	I-270	Freeway	43	E	31	D	-28%
I-270 Diverge to EB Middlebrook Rd	Diverge	10	B	12	B	10%	I-270 Merge from EB MD 121	Merge	37	E	26	C	-30%
I-270	Freeway	15	B	17	B	12%	I-270	Freeway	55	F	34	D	-38%
I-270 Diverge to WB Middlebrook Rd	Diverge	10	A	11	B	10%	I-270 Diverge to MD 27	Diverge	57	F	22	C	-61%
I-270	Freeway	13	B	15	B	12%	I-270	Freeway	81	F	24	C	-70%
I-270 Diverge to EB MD 118	Diverge	11	B	12	B	11%	I-270 Merge from WB MD 27	Merge	90	F	23	C	-74%
I-270 Diverge to WB MD 118	Diverge	15	B	16	B	11%	I-270	Freeway	82	F	34	D	-59%
I-270	Freeway	13	B	14	B	11%	I-270 Weave from EB MD 27 to MD 118	Weave	81	F	32	D	-61%
I-270 Weave from MD 118 to MD 27	Weave	13	B	14	B	7%	I-270	Freeway	91	F	51	F	-44%
I-270	Freeway	12	B	13	B	9%	I-270 Merge from WB MD 118	Merge	73	F	50	F	-32%
I-270 Merge from EB MD 27	Merge	13	B	14	B	7%	I-270	Freeway	85	F	67	F	-21%
I-270	Freeway	14	B	15	B	8%	I-270 Merge from EB MD 118	Merge	73	F	59	F	-18%
I-270 Merge from WB MD 27	Merge	11	B	11	B	5%	I-270	Freeway	70	F	50	F	-28%
I-270	Freeway	14	B	15	B	7%	I-270 Merge from Middlebrook Rd	Merge	113	F	68	F	-40%
I-270 Diverge to MD 121	Diverge	11	B	12	B	6%	I-270	Freeway	86	F	79	F	-8%

Table C.5: AM Peak - 2040 Adaptive Ramp Metering - I-270 Vehicle Density

I-270 Northbound	Type	No Build		ARM		% Change	I-270 Southbound	Type	No Build		ARM		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS	
I-270	Freeway	11	A	11	B	6%	I-270 Diverge to Watkins Mill Rd	Diverge	81	F	65	F	-20%
I-270 Merge from EB MD 121	Merge	10	A	10	A	0%	I-270	Freeway	124	F	109	F	-12%
I-270 Lane Drop	Merge	13	B	13	B	0%	I-270 Diverge to MD 124	Diverge	89	F	80	F	-10%
I-270	Freeway	19	C	20	C	4%	I-270	Freeway	133	F	130	F	-2%
I-270 Diverge to NB Weigh Station	Diverge	10	B	10	B	1%	I-270 Merge from Watkins Mill	Merge	158	F	154	F	-2%
I-270	Freeway	21	C	21	C	1%	I-270	Freeway	99	F	95	F	-4%
I-270 Merge from NB Weight Station	Merge	10	B	10	B	1%	I-270 Merge from WB MD 124	Merge	132	F	125	F	-5%
I-270	Freeway	21	C	21	C	1%	I-270	Freeway	53	F	50	F	-6%
I-270 Diverge to MD 109	Diverge	11	B	11	B	0%	I-270 Merge from MD 117	Merge	49	F	48	F	-2%
I-270	Freeway	19	C	19	C	1%	I-270	Freeway	48	F	43	E	-10%
I-270 Merge from MD 109	Merge	11	B	11	B	-1%	I-270 Diverge to I-370	Diverge	41	F	34	D	-17%
I-270	Freeway	21	C	20	C	-1%	I-270	Freeway	49	F	36	E	-27%
I-270 Diverge to MD 80	Diverge	12	B	12	B	-1%	I-270 Diverge to I-270 C-D	Diverge	96	F	28	D	-70%
I-270	Freeway	19	C	18	C	-1%	I-270	Freeway	20	C	23	C	16%
I-270 Merge from MD 80	Merge	14	B	13	B	-8%	I-270 Merge from I-270 (I-370)	Merge	20	C	21	C	2%
I-270	Freeway	24	C	23	C	-7%	I-270 Diverge to I-270 C-D (Shady Grove Rd)	Diverge	27	C	29	D	9%
I-270 Diverge to Scenic View	Diverge	12	B	12	B	-7%	I-270	Freeway	21	C	23	C	11%
I-270	Freeway	24	C	23	C	-7%	I-270 Merge from I-270 C-D (Shady Grove Rd Northern)	Merge	18	B	18	B	4%
I-270 Merge from Scenic View	Merge	12	B	11	B	-7%	I-270	Freeway	26	C	26	D	2%
I-270	Freeway	25	C	23	C	-7%	I-270 Merge from I-270 C-D (Shady Grove Rd Southern)	Merge	32	D	25	C	-22%
I-270 Diverge to NB MD 85	Diverge	14	B	13	B	-7%	I-270 Diverge to I-270 C-D (MD 189)	Diverge	46	F	33	D	-28%
I-270	Freeway	23	C	22	C	-8%	I-270	Freeway	82	F	27	D	-66%
I-270 Diverge to SB MD 85	Diverge	17	B	17	B	-5%	I-270 Merge from I-270 C-D (MD 189)	Merge	106	F	34	D	-68%
I-270	Freeway	19	C	18	B	-7%	I-270	Freeway	77	F	52	F	-33%
I-270 Weave from MD 85 to I-70	Weave	13	B	13	B	-5%	I-270 Merge from I-270 C-D	Merge	39	E	54	F	39%
I-270	Freeway	17	B	16	B	-5%	I-270 Diverge to I-270 HOV Lane	Diverge	19	B	26	C	37%
							I-270 Diverge to I-270 Spur	Diverge	37	E	64	F	75%
							I-270	Freeway	23	C	35	D	51%
							I-270 Diverge to Rockledge Dr / MD 187	Diverge	17	B	39	E	134%
							I-270	Freeway	23	C	24	C	5%
							I-270 Merge from Rockledge Dr	Merge	19	B	21	C	7%
							I-270	Freeway	24	C	27	D	11%
							I-270 Merge from Rockledge Dr / MD 187	Merge	22	C	24	C	8%
							I-270	Freeway	26	C	27	D	6%

Table C.6: AM Peak - 2040 Adaptive Ramp Metering - I-270 Spur Vehicle Density

I-270 Spur Northbound	Type	No Build		ARM		% Change	I-270 Southbound	Type	No Build		ARM		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS			
I-270 Spur	Freeway	57	F	57	F	0%	I-270 Spur	Freeway	49	F	111	F	129%
I-270 Spur Merge from Clara Barton Parkway	Merge	25	C	25	C	0%	I-270 Spur Weave from I-270 HOV to Democracy Blvd	Weave	60	F	88	F	45%
I-270 Spur	Freeway	39	E	39	E	0%	I-270 Spur	Freeway	54	F	68	F	25%
I-270 Diverge to MD 190	Diverge	28	D	28	D	0%	I-270 Merge from Democracy Blvd	Merge	30	D	34	D	12%
I-270 Spur	Freeway	34	D	34	D	0%	I-270 Spur Lane Drop	Merge	54	F	59	F	10%
I-270 Spur Merge from Cabin John Parkway	Merge	25	C	25	C	-3%	I-270 Spur	Freeway	75	F	80	F	6%
I-270 Spur Merge from MD 190	Merge	26	C	24	C	-6%	I-270 Spur Merge from I-495	Merge	37	E	32	D	-15%
I-270 Spur	Freeway	35	D	32	D	-9%	I-270 Spur	Freeway	45	F	32	D	-28%
I-270 Spur Diverge to I-495	Merge	38	E	35	D	-9%	I-270 Spur Diverve to EB MD 190	Diverge	56	F	42	F	-25%
I-270 Spur	Freeway	40	E	33	D	-16%	I-270 Spur Diverve to Cabin John Pkwy	Diverge	27	C	28	D	3%
I-270 Spur Diverge to Democracy Blvd	Diverge	33	D	27	C	-19%	I-270 Spur	Freeway	29	D	29	D	0%
I-270 Spur	Freeway	36	E	25	C	-31%	I-270 Merge from MD 190	Merge	26	C	26	C	1%
I-270 Spur Merge from EB Democracy Blvd	Merge	30	D	16	B	-48%	I-270 Spur	Freeway	34	D	34	D	0%
I-270 Spur	Freeway	39	E	24	C	-38%	I-270 Diverge to WB Clara Barton Pkwy	Diverge	23	C	23	C	1%
I-270 Spur Merge from WB Democracy Blvd	Merge	30	D	16	B	-46%	I-270 Spur	Freeway	33	D	34	D	1%
I-270 Spur	Freeway	43	E	25	C	-41%	I-270 Merge from Clara Barton Pkwy	Merge	30	D	30	D	0%
I-270 Spur Merge from Westlake Terrace	Merge	45	F	25	C	-45%							
I-270 Spur	Freeway	50	F	26	C	-49%							

Table C.7: AM Peak - 2040 Adaptive Ramp Metering - I-270 Local Vehicle Density

I-270 Northbound	Type	No Build		ARM		% Change	I-270 Southbound	Type	No Build		ARM		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS			
I-270 C-D	Freeway	84	F	36	E	-58%	I-270 C-D	Freeway	107	F	27	D	-75%
I-270 C-D Diverge to EB Montrose Rd	Diverge	48	F	23	C	-53%	I-270 C-D Weave from I-370 EB to I-270	Weave	110	F	19	B	-82%
I-270 C-D	Freeway	80	F	19	C	-76%	I-270 C-D Diverge to Shady Grove Rd	Diverge	115	F	20	B	-83%
I-270 C-D Weave between Montrose Rd Loop Ramps	Weave	69	F	13	B	-81%	I-270 C-D	Freeway	137	F	15	B	-89%
I-270 C-D	Freeway	84	F	18	C	-78%	I-270 C-D Merge from WB Shady Grove Rd	Merge	106	F	13	B	-88%
I-270 C-D Merge from WB Montrose Rd	Merge	89	F	25	C	-72%	I-270 C-D	Freeway	113	F	21	C	-81%
I-270 C-D	Freeway	98	F	31	D	-69%	I-270 C-D Merge from EB Shady Grove Rd	Merge	77	F	12	B	-85%
I-270 C-D Merge from I-270	Merge	86	F	18	B	-79%	I-270 C-D	Freeway	93	F	28	D	-70%
I-270 C-D	Freeway	104	F	31	D	-70%	I-270 C-D Merge from I-270	Merge	78	F	30	D	-61%
I-270 C-D Diverge to MD 189	Diverge	58	F	17	B	-70%	I-270 C-D Diverge to I-270	Diverge	56	F	38	E	-32%
I-270 C-D	Freeway	111	F	24	C	-78%	I-270 C-D Diverge to I-270	Diverge	64	F	30	D	-53%
I-270 C-D Merge from MD 189	Merge	101	F	18	B	-83%	I-270 C-D	Freeway	75	F	20	C	-73%
I-270 C-D	Freeway	114	F	32	D	-72%	I-270 C-D Diverge to MD 28	Diverge	62	F	12	B	-80%
I-270 C-D Weave between I-270 (to MD 28 from MD 189)	Weave	86	F	25	C	-71%	I-270 C-D	Freeway	128	F	21	C	-83%
I-270 C-D	Freeway	106	F	33	D	-69%	I-270 C-D Merge from WB MD 28	Merge	160	F	36	E	-78%
I-270 C-D Diverge to MD 28	Diverge	64	F	22	C	-65%	I-270 C-D	Freeway	132	F	71	F	-46%
I-270 C-D	Freeway	87	F	27	D	-69%	I-270 C-D Merge from EB MD 28	Merge	152	F	135	F	-11%
I-270 C-D Weave between MD 28 Ramps	Weave	109	F	34	D	-68%	I-270 C-D	Freeway	123	F	119	F	-3%
I-270 C-D	Freeway	7	A	10	A	60%	I-270 C-D Merge from I-270	Merge	84	F	82	F	-3%
I-270 C-D Merge from MD 28 WB	Merge	6	A	7	A	14%	I-270 C-D	Freeway	95	F	96	F	1%
I-270 C-D Merge from I-270 and Drop Lane	Merge	7	A	10	A	36%	I-270 C-D Diverge to MD 189	Diverge	60	F	61	F	2%
I-270 C-D Diverge to I-270	Diverge	12	B	14	B	25%	I-270 C-D	Freeway	117	F	124	F	6%
I-270 C-D	Freeway	19	C	26	C	32%	I-270 C-D Merge from MD 189	Merge	120	F	122	F	2%
I-270 C-D Diverge to Shady Grove Rd	Diverge	15	B	19	B	26%	I-270 C-D Diverge to I-270	Diverge	84	F	80	F	-5%
I-270 C-D	Freeway	5	A	6	A	24%	I-270 C-D	Freeway	92	F	95	F	4%
I-270 C-D Merge from I-270 and EB Shady Grove Rd	Merge	8	A	10	A	19%	I-270 C-D Diverge to WB Montrose Rd	Diverge	55	F	58	F	6%
I-270 C-D	Freeway	8	A	9	A	19%	I-270 C-D	Freeway	98	F	110	F	12%
I-270 C-D Merge from WB Shady Grove Rd	Merge	10	A	11	B	16%	I-270 Weave between Montrose Rd Loops	Weave	94	F	99	F	5%
I-270 C-D Diverge to I-270	Diverge	5	A	5	A	15%	I-270 C-D	Freeway	76	F	86	F	14%
I-270 C-D	Freeway	13	B	15	B	17%	I-270 C-D Merge from EB Montrose Rd	Merge	56	F	63	F	13%
I-270 C-D Diverge to I-370	Diverge	13	B	15	B	16%	I-270 C-D	Freeway	54	F	58	F	7%
I-270 C-D	Freeway	2	A	3	A	15%							
I-270 Merge from I-370 EB	Merge	7	A	8	A	3%							
I-270 C-D	Freeway	8	A	8	A	5%							
I-270 C-D Weave from I-370 to I-270	Weave	19	B	19	B	0%							
I-270 C-D	Freeway	14	B	23	C	71%							
I-270 C-D Weave from I-270 to MD 117	Weave	19	B	39	E	106%							
I-270 C-D Diverge to MD 124	Diverge	13	B	14	B	10%							
I-270 C-D	Freeway	13	B	14	B	8%							
I-270 C-D Merge from EB MD 124	Merge	12	B	12	B	6%							
I-270 C-D Merge From WB MD 124	Merge	12	B	13	B	8%							
I-270 C-D	Freeway	10	A	10	A	5%							

Table C.7: AM Peak - 2040 Adaptive Ramp Metering - I-270 Local Vehicle Density

I-270 Northbound	Type	No Build		ARM		% Change	I-270 Southbound	Type	No Build		ARM		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS	
I-270 C-D Merge from Watkins Mill	Merge	10	A	10	B	3%							

Table C.8: AM Peak - 2040 Adaptive Ramp Metering - I-270 Vehicle Throughput

I-270 Northbound	No-Build VISSIM Throughput	ARM VISSIM Throughput	Change %	I-270 Southbound	No-Build VISSIM Throughput	ARM VISSIM Throughput	Change %
Between I-495 and MD 187	4485	4861	8%	North of I-70	2514	2637	5%
Between MD 187 on and off ramps	3881	4320	11%	Between I-70 on ramps	2842	3038	7%
Between Rockledge Blvd on and off ramps	3138	3624	15%	From I-70 interchange to MD-85	4882	5380	10%
Between Rockledge Dr and I-270 Spur	2720	3297	21%	Between MD-85 on and off ramps	2530	2905	15%
Between I-270 Spur and Montrose Rd	7422	8830	19%	Between MD-85 and MD-80	3043	3354	10%
Between Montrose Rd on and off ramps	4321	5077	17%	Between MD-80 on and off ramps	2724	3024	11%
Between Montrose Rd and MD 189	4064	4745	17%	Between MD-80 and Md-109	3532	3695	5%
Between MD 189 and MD 28	4018	4745	18%	Between MD-109 on and off ramps	3430	3661	7%
Between MD 28 on and off ramps	4122	5143	25%	Between MD-109 and MD-121	4100	4238	3%
Between MD 28 and Shady Grove Rd	2980	3809	28%	Between MD-121 on and off ramps	3551	3719	5%
Between Shady Grove Rd and I-370	2552	3266	28%	Between MD-121 and MD-27	4802	5005	4%
Between I-370 on and off ramps	2849	3571	25%	Between MD-27 on and off ramps	4223	4664	10%
Between I-370 and MD 117	3979	4705	18%	Between MD-27 and MD-118	4688	5238	12%
Between MD 117 and MD 124	3010	3487	16%	Between MD-118 on and off ramps	4542	5026	11%
Between MD-124 on and off ramps	3023	3485	15%	Between MD-118 and Middlebrook Rd	5199	5688	9%
Between Watkins Mill Rd and Middlebrook Rd	3974	4465	12%	Between Middlebrook Rd on and off ramps	5197	5681	9%
Between Middlebrook Rd on and off ramps	3705	4132	12%	Between Middlebrook Rd and MD-124	6832	7126	4%
Between Middlebrook Rd and MD 118	3293	3669	11%	Between MD-124 on and off ramps	5415	5633	4%
Between MD-118 on and off ramps	2981	3314	11%	Between MD-124 and MD-117	6469	6809	5%
Between MD 118 and MD 27	2827	3081	9%	Between MD-117 and I-370	8146	8402	3%
Between MD-27 on and off ramps	2280	2488	9%	Between I-370 on and off ramps	2997	3007	0%
Between MD 27 and MD 121	2687	2877	7%	Between I-370 on ramp to Shady Grove Rd	3871	3743	-3%
Between MD-121 on and off ramps	1970	2099	7%	Between Shady Grove Rd and MD 28	3552	3451	-3%
Between MD 121 and MD 109	2497	2545	2%	Between MD 28 on and off ramps	4372	4255	-3%
Between MD-109 on and off ramps	2327	2359	1%	Between MD 28 and MD 189	3946	3813	-3%
Between MD 109 and MD 80	2487	2467	-1%	Between MD 189 and Montrose Rd	4070	3811	-6%
Between MD-80 on and off ramps	2222	2206	-1%	Between Montrose Rd on and off ramps	5046	4784	-5%
Between MD 80 and MD 85	2916	2722	-7%	Between Montrose Rd and I-270 Spur	8064	7950	-1%
Between MD-85 on and off ramps	2213	2056	-7%	Between I-270 Spur and Rockledge Blvd	3823	3735	-2%
Between MD 85 and I-70	3227	3064	-5%	Between Rockledge Blvd on and off ramps	2733	2660	-3%
North of I-70	2081	1979	-5%	Between MD 187 on and off ramps	2887	2859	-1%
				Between MD 187 and I-495	2902	2824	-3%
I-270 Spur Northbound				I-270 Spur Southbound			
Between I-495 and Democracy Blvd	5264	5468	4%	Between I-270 Split and HOV on ramp	4251	4062	-4%
Between Democracy Blvd on and off ramps	4077	4289	5%	Between HOV on ramp and Democracy Blvd	4186	4018	-4%
Between Democracy Blvd and I-270 Split	4219	4580	9%	Between Democracy Blvd on and off ramps	3670	3537	-4%
				Between Democracy Blvd and I-495	4194	4102	-2%

Table C.9: AM Peak -2040 Adaptive Ramp Metering- I-270 Local Vehicle Throughput

I-270 Local Northbound	No-Build VISSIM Throughput	ARM VISSIM Throughput	Change %	I-270 Local Southbound	No-Build VISSIM Throughput	ARM VISSIM Throughput	Change %
Between Montrose Rd EB off ramp and EB on ramp	1707	2367	39%	Between I-370 on ramp and I-270 off ramp	3627	3416	-6%
Between Montrose Rd EB on ramp and WB off ramp	1884	2612	39%	Between I-270 off ramp and Shady Grove off ramp	2767	2684	-3%
Between Montrose Rd WB off ramp and on ramp	1556	2193	41%	Between Shady Grove off ramp and Shady Grove WB on ramp	1593	1538	-3%
Between Montrose Rd WB on ramp and I-270 on ramp	2215	3309	49%	Between Shady Grove WB and EB on ramps	2225	2166	-3%
Between I-270 on ramp and MD 189 off ramp	2316	3648	58%	Between Shady Grove on ramp and I-270 on ramp	2594	2549	-2%
Between MD 189 ramps	1739	2943	69%	Between I-270 on ramp and I-270 off ramp1	3272	3193	-2%
Between MD 189 off ramp and I-270 on ramp	2036	3523	73%	Between I-270 off ramp1 and I-270 off ramp2	2767	2683	-3%
Between I-270 on ramp and I-270 off ramp	2547	4300	69%	Between I-270 off ramp2 and MD 28 off ramp	1961	1889	-4%
Between I-270 off ramp and MD 28 EB off ramp	1823	3109	71%	Between MD 28 off ramp and MD 28 WB on ramp	1428	1370	-4%
Between MD 28 EB off ramp to MD 28 EB on ramp	1585	2744	73%	Between MD 28 WB on ramp and MD 28 EB on ramp	1700	1653	-3%
Between MD 28 EB on ramp and MD 28 WB off ramp	1616	2794	73%	Between MD 28 EB on ramp and I-270 on ramp	2375	2462	4%
Between MD 28 WB off ramp and MD 28 WB on ramp	751	1253	67%	Between I-270 on ramp and MD 189 off ramp	2871	2886	1%
Between MD 28 WB on ramp and I-270 on ramp	1263	1772	40%	Between MD 189 on and off ramps	2353	2355	0%
Between I-270 on ramp and I-270 off ramp	2439	3103	27%	Between MD 189 on ramp and I-270 off ramp	3387	3520	4%
Between I-270 off ramp and Shady Grove off ramp	2131	2663	25%	Between I-270 off ramp and Montrose Rd off ramp	2357	2429	3%
Between Shady Grove off ramp and I-270 on ramp	322	400	24%	Between Montrose Rd off ramp and Montrose Rd WB on ramp	2251	2308	3%
Between I-270 on ramp and Shady Grove WB on ramp	1448	1723	19%	Between Montrose Rd WB on ramp and EB off ramp	2992	3331	11%
Between Shady Grove WB on ramp and I-270 off ramp	1788	2059	15%	Between Montrose Rd EB off and on ramps	2336	2633	13%
Between I-270 off ramp and I-370 off ramp	1515	1762	16%	Between Montrose Rd EB off ramp and I-270	3139	3418	9%
Between I-370 off ramp and I-370 EB on ramp	286	333	16%				
Between I-370 EB and WB on ramps	919	965	5%				
Between I-370 WB on ramp and I-270 off ramp	2785	2832	2%				
Between I-270 off ramp and I-270 on ramp	1670	1694	1%				
Between I-270 on ramp and MD 117 off ramp	2654	2884	9%				
Between MD 117 off ramp and MD 124 off ramp	1509	1634	8%				
Between MD 124 off ramp and MD 124 EB on ramp	789	851	8%				
Between MD 124 EB and WB on ramps	1183	1243	5%				
Between MD 124 on ramp I-270	573	600	5%				

Table C.10: AM Peak -2040 Adaptive Ramp Metering- I-270 On Ramp Queue Length - Northbound

I-270 Northbound	No Build VISSIM Average Queue (feet)	ARM VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	ARM VISSIM Maximum Queue (feet)	% Change
Rockledge Dr on ramp	67	0	-100%	421	0	-100%
MD 189 C-D on ramp	0	0	-	0	0	-
MD 28 C-D on ramp	0	0	-	0	0	-
Shady Grove Rd C-D on ramp	0	0	-	0	0	-
I-370 C-D on ramp	0	0	-	0	0	-
MD 124 C-D on ramp	0	0	-	0	0	-
MD 118 on ramp	0	0	-	0	0	-
MD 27 EB on ramp	0	0	-	0	0	-
MD 27 WB on ramp	0	0	-	0	0	-
MD 121 on ramp	0	0	-	0	0	-
MD 109 on ramp	0	0	-	0	0	-
MD 80 on ramp	0	0	-	0	0	-
MD 85 on ramp	0	0	-	0	0	-
I-270 Spur Northbound	No Build VISSIM Average Queue (feet)	ARM VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	ARM VISSIM Maximum Queue (feet)	% Change
Democracy Blvd EB on ramp	4	0	-100%	57	0	-100%
Democracy Blvd WB on ramp	0	0	-100%	5	0	-100%
I-495 Northbound	No Build VISSIM Average Queue (feet)	ARM VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	ARM VISSIM Maximum Queue (feet)	% Change
Cabin John Pkwy on ramp	0	0	-	0	0	-
MD 190 on ramp	0	0	-	0	0	-
I-270 C-D Northbound	No Build VISSIM Average Queue (feet)	ARM VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	ARM VISSIM Maximum Queue (feet)	% Change
Montrose Rd EB on ramp	436	0	-100%	1548	0	-100%
Montrose Rd WB on ramp	1047	0	-100%	2581	0	-100%
I-270 on ramp	409	0	-100%	1171	0	-100%
MD 189 on ramp	1304	0	-100%	2877	5	-100%
I-270 on ramp	1354	0	-100%	3378	10	-100%
MD 28 EB on ramp	3	0	-100%	55	0	-100%
MD 28 WB on ramp	0	0	-	0	0	-
Shady Grove Rd EB on ramp	0	0	-	0	0	-
I-270 on ramp	0	0	-	0	0	-
Shady Grove Rd WB on ramp	0	0	-	0	0	-
I-370 EB on ramp	0	0	-	0	0	-
I-370 WB on ramp	0	0	-	0	0	-
I-270 on ramp	0	318	279154%	29	538	1783%
MD 124 EB on ramp	0	0	-	0	0	-
MD 124 WB on ramp	0	0	-	0	0	-
Watkins Mill Rd on ramp	0	0	-100%	24	0	-100%

Table C.11: AM Peak -2040 Adaptive Ramp Metering- I-270 Off Ramp Queue Length - Northbound

I-270 Northbound	No Build VISSIM Average Queue (feet)	ARM VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	ARM VISSIM Maximum Queue (feet)	% Change
MD 187 off ramp NB	28	31	8%	242	239	-1%
MD 187 off ramp SB	0	0	-	0	0	-
Rockledge Dr off ramp	6	9	53%	359	415	16%
Tower Oaks Blvd off ramp	19	24	31%	179	173	-3%
Montrose Rd off ramp EB	0	0	-	0	0	-
Montrose Rd off ramp WB	0	0	-	0	9	-
MD 189 off ramp WB	8	12	53%	99	115	16%
MD 189 off ramp EB	60	5	-92%	1148	270	-76%
MD 28 off ramp EB	28	50	78%	227	303	33%
MD 28 off ramp WB	2636	0	-100%	5046	0	-100%
Shady Grove Rd off ramp - Redland Blvd	0	0	-	0	0	-
Shady Grove Rd off ramp WB	151	199	32%	605	693	15%
Shady Grove Rd off ramp EB	0	0	-	0	0	-
I-370 off ramp WB	0	0	-	0	0	-
I-370 off ramp EB	0	0	-	0	0	-
MD 117 off ramp	311	904	191%	1011	1828	81%
MD 124 off ramp	95	103	8%	453	480	6%
Watkins Mill Rd off ramp	78	80	3%	366	396	8%
Middlebrook Rd EB off ramp	0	0	-	0	0	-
Middlebrook Rd WB off ramp	0	0	-	0	0	-
MD 118 WB off ramp - Seneca Meadows	0	0	-	0	13	-
MD 118 WB off ramp	0	0	-	0	0	-
MD 118 EB off ramp	0	0	-	0	0	-
MD 27 off ramp WB	7	8	13%	81	88	9%
MD 27 off ramp EB	0	0	-	0	0	-
MD 121 off ramp WB	62	68	10%	250	260	4%
MD 121 off ramp EB	0	0	-	0	0	-
MD 109 off ramp EB	29	12	-57%	228	149	-34%
MD 109 off ramp WB	8	0	-98%	84	23	-72%
MD 80 off ramp EB	7	7	0%	102	105	2%
MD 80 off ramp WB	0	2	335%	26	66	148%
MD 85 NB off ramp	0	0	-	0	0	-
MD 85 SB off ramp	1	0	-30%	126	97	-23%
I-270 Spur Northbound	No Build VISSIM Average Queue (feet)	ARM VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	ARM VISSIM Maximum Queue (feet)	% Change
Clara Barton Pkwy off ramp EB	1	1	0%	214	214	0%
Clara Barton Pkwy off ramp WB	0	0	-	0	0	-
MD 190 off ramp EB	0	1	2531%	10	101	893%
MD 190 off ramp WB	0	0	-	0	13	-
Democracy Blvd off ramp WB	104	107	3%	563	526	-7%
Democracy Blvd off ramp EB	15	17	11%	143	126	-12%

Table C.12: AM Peak - 2040 Adaptive Ramp Metering- I-270 On Ramp Queue Length - Southbound

I-270 Southbound	No Build VISSIM Average Queue (feet)	ARM VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	ARM VISSIM Maximum Queue (feet)	% Change
MD 85 on ramp	41	0	-100%	528	0	-100%
MD 80 on ramp	1039	1529	47%	2688	1927	-28%
MD 109 on ramp	995	2086	110%	1914	2965	55%
MD 121 WB on ramp	135	0	-100%	972	0	-100%
MD 121 EB on ramp	0	0	-	0	0	-
MD 27 WB on ramp	552	0	-100%	2591	0	-100%
MD 27 EB on ramp	3	0	-100%	173	4	-98%
MD 118 WB on ramp	0	0	-	0	0	-
MD 118 EB on ramp	0	0	-100%	44	0	-100%
Middlebrook Rd on ramp	2842	366	-87%	4433	1770	-60%
Watkins Mill Rd on ramp	3066	3073	0%	3136	3161	1%
MD 124 WB on ramp	2789	1542	-45%	4158	3053	-27%
MD 117 on ramp	293	4145	1316%	1898	4388	131%
I-370 C-D on ramp	0	0	-	0	0	-
Shady Grove Rd C-D on ramp North	0	0	-	0	0	-
Shady Grove Rd C-D on ramp South	2	0	-100%	127	0	-100%
MD 189 C-D on ramp	1787	1	-100%	3610	182	-95%
Montrose Rd C-D on ramp	2	310	12983%	227	2024	792%
Rockledge Dr on ramp	0	0	-	0	0	-
MD 187 on ramp	0	0	-	0	0	-
I-270 Spur Southbound	No Build VISSIM Average Queue (feet)	ARM VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	ARM VISSIM Maximum Queue (feet)	% Change
Democracy Blvd on ramp	0	0	-	0	0	-
I-495 Southbound	No Build VISSIM Average Queue (feet)	ARM VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	ARM VISSIM Maximum Queue (feet)	% Change
I-270 Spur on ramp	147	0	-100%	1557	0	-100%
MD 190 on ramp	0	0	-	0	0	-
I-270 C-D Southbound	No Build VISSIM Average Queue (feet)	ARM VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	ARM VISSIM Maximum Queue (feet)	% Change
I-270 on ramp	2947	0	-100%	4900	0	-100%
I-370 on ramp	2511	0	-100%	2932	0	-100%
Shady Grove Rd WB on ramp	28	0	-100%	597	0	-100%
Shady Grove Rd EB on ramp	0	0	-100%	37	0	-100%
I-270 on ramp	0	0	-100%	42	0	-100%
MD 28 WB on ramp	1406	62	-96%	2299	486	-79%
MD 28 EB on ramp	3724	3205	-14%	3882	3873	0%
I-270 on ramp	1	0	-100%	74	0	-100%
MD 189 on ramp	3725	925	-75%	4200	2143	-49%
Montrose Rd WB on ramp	68	90	31%	926	691	-25%
Montrose Rd EB on ramp	0	2	586%	69	153	121%

Table C.13: AM Peak -2040 Adaptive Ramp Metering- I-270 Off Ramp Queue Length - Southbound

I-270 Southbound	No Build VISSIM Average Queue (feet)	ARM VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	ARM VISSIM Maximum Queue (feet)	% Change
MD 85 SB off ramp	297	17	-94%	1410	624	-56%
MD 85 NB off ramp	0	0	-73%	43	33	-22%
MD 80 off ramp	1	6	512%	99	142	44%
MD 109 off ramp WB	0	0	-96%	25	23	-9%
MD 109 off ramp EB	0	0	-	0	0	-
MD 121 off ramp EB	219	200	-9%	946	938	-1%
MD 121 off ramp WB	10	10	2%	519	383	-26%
MD 27 off ramp EB	50	53	7%	262	264	1%
MD 27 off ramp WB	881	38	-96%	3309	616	-81%
MD 118 off ramp EB	31	34	10%	160	163	2%
MD 118 off ramp WB	0	0	-	0	0	-
Watkins Mill Rd off ramp	2034	635	-69%	5055	2833	-44%
MD 124 off ramp EB	70	66	-6%	368	373	1%
MD 124 off ramp WB	19	21	11%	419	447	7%
I-370 off ramp WB	0	0	-	0	0	-
I-370 off ramp EB	0	0	-	0	0	-
Shady Grove Rd off ramp - Omega Drive	4	2	-49%	172	110	-36%
Shady Grove Rd off ramp	0	0	-	0	0	-
MD 28 off ramp	4	2	-51%	154	119	-23%
MD 189 off ramp EB	35	33	-7%	238	225	-6%
MD 189 off ramp WB	0	0	-	0	0	-
Montrose Rd off ramp WB	0	0	-	0	0	-
Montrose Rd off ramp EB	382	0	-100%	1566	0	-100%
Rockledge Dr off ramp	27	1396	5046%	343	2676	679%
I-270 Spur Southbound	No Build VISSIM Average Queue (feet)	ARM VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	ARM VISSIM Maximum Queue (feet)	% Change
Democracy Blvd off ramp EB	50	48	-3%	219	231	5%
Democracy Blvd off ramp WB	0	0	-	0	0	-
MD 190 off ramp WB	1389	531	-62%	3571	2923	-18%
MD 190 off ramp EB	0	3	-	0	159	-
Clara Barton Pkwy WB off ramp	0	0	-100%	5	0	-100%

Table C.14: AM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
1- MD 85 at Sam's Club Drive											
1	NB	23.0	C	NB Left	119	77	82	496	E	38.6	D
				NB Through	365	28	82	496	C		
				NB Right	664	11	22	438	B		
	SB	50.1	D	SB Left	137	63	174	771	E		
				SB Through	599	50	174	771	D		
				SB Right	68	26	174	771	C		
	EB	50.9	D	EB Left	105	78	56	182	E		
				EB Through	62	81	56	182	F		
				EB Right	113	9	56	182	A		
	WB	52.7	D	WB Left	230	77	90	355	E		
				WB Through	15	67	90	355	E		
				WB Right	126	7	90	355	A		
2- MD 85 at I-270 NB on and off ramp											
2	NB	52.1	D	NB Left	683	52	265	1136	D	36.3	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	18.8	B	SB Left	0	0	0	0	A		
				SB Through	611	19	56	562	B		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
3- MD 85 at I-270 SB on and off ramp											
3	NB	5.3	A	NB Left	0	0	0	0	A	10.2	B
				NB Through	1071	5	19	413	A		
				NB Right	0	0	0	0	A		
	SB	40.9	D	SB Left	172	41	43	440	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
4- MD 85 at Crestwood Blvd											
4	NB	19.4	C	NB Left	13	71	54	382	E	25.0	C
				NB Through	762	19	54	382	B		
				NB U-Turn	0	0	0	0	A		
	SB	18.8	B	SB Left	64	69	25	156	E		
				SB Through	1783	18	80	627	B		
				SB Right	808	16	68	617	B		
	EB	52.7	D	EB Left	621	54	91	276	D		
				EB Through	28	68	91	276	E		
				EB Right	42	17	91	276	B		
	WB	44.1	D	WB Left	52	53	21	137	D		
				WB Through	18	56	21	137	E		
				WB Right	19	9	21	137	A		
5- MD 80 at I-270 NB on and ramp											
5	NB	-1.0	A	NB Left	3	1	0	4	A	21.2	C
				NB Through	1	1	0	4	A		
				NB Right	5	-3	0	4	A		
	SB	13.0	B	SB Left	204	16	14	108	B		
				SB Through	6	20	14	108	B		
				SB Right	59	2	0	0	A		
	EB	11.3	B	EB Left	54	12	11	183	B		
				EB Through	0	0	8	0	A		
				EB Right	5	5	19	213	A		
	WB	23.1	C	WB Left	35	24	1	56	C		
				WB Through	879	31	182	786	C		
				WB Right	639	12	11	442	B		
6- MD 80 at I-270 SB on and off ramp											
6	NB	6.2	A	NB Left	24	37	2	134	E	31.6	D
				NB Through	0	0	0	0	A		
				NB Right	258	3	2	134	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	36.7	E	EB Left	0	0	0	0	A		
				EB Through	360	36	67	436	E		
				EB Right	161	38	68	446	E		
	WB	47.8	E	WB Left	0	0	0	0	A		
				WB Through	278	48	157	758	E		
				WB Right	0	0	0	0	A		
7- MD 109 at I-270 NB on and off ramp											
7	NB			NB Left	0	0	0	0	A	29.9	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	33.1	D	SB Left	143	37	37	244	E		
				SB Through	0	0	0	0	A		
				SB Right	47	20	17	177	C		
	EB	15.7	C	EB Left	88	11	5	149	B		
				EB Through	0	0	0	0	A		
				EB Right	63	22	0	0	C		
	WB	32.2	D	WB Left	0	0	0	0	A		
				WB Through	671	32	399	555	D		
				WB Right	0	0	0	0	A		
8- MD 80 at I-270 SB on and off ramp											
8	NB	9.3	A	NB Left	17	36	4	78	E	33.7	D
				NB Through	0	0	0	0	A		
				NB Right	48	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	50.0	E	EB Left	0	0	0	0	A		
				EB Through	92	34	58	270	D		
				EB Right	102	64	60	268	F		
	WB	31.6	D	WB Left	570	29	158	594	D		
				WB Through	156	39	152	571	E		
				WB Right	0	0	0	0	A		
9- MD 121 at Gateway Center Dr											
9	NB	17.8	C	NB Left	154	27	43	285	C	51.2	D
				NB Through	434	22	43	285	C		
				NB Right	327	8	52	311	A		
	SB	32.3	D	SB Left	55	22	113	555	C		
				SB Through	792	33	123	555	C		
				SB Right	8	26	131	576	C		
	EB	120.4	F	EB Left	8	97	421	525	F		
				EB Through	99	125	422	525	F		
				EB Right	646	120	452	557	F		
	WB	21.8	C	WB Left	137	25	18	147	C		
				WB Through	17	22	18	147	C		
				WB Right	28	6	16	171	A		
10- MD 121 at I-270 NB on and off ramp											
10	NB	28.3	D	NB Left	324	59	67	255	F	19.0	B
				NB Through	0	0	0	0	A		
				NB Right	402	3	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	11.5	B	EB Left	0	0	0	0	A		
				EB Through	513	18	32	325	C		
				EB Right	285	1	0	0	A		
	WB	18.6	C	WB Left	233	63	145	805	F		
				WB Through	1337	11	145	805	B		
				WB Right	0	0	0	0	A		

Table C.14: AM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
11- MD 121 at I-270 SB on and off ramp											
11	NB			NB Left	0	0	0	0	A	18.3	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	62.8	E	SB Left	218	94	225	953	F		
				SB Through	0	0	0	0	A		
				SB Right	304	40	8	439	E		
	EB	5.2	A	EB Left	0	0	0	0	A		
				EB Through	578	5	12	206	A		
				EB Right	0	0	0	0	A		
	WB	8.8	A	WB Left	0	0	0	0	A		
WB Through				642	18	61	438	C			
WB Right				1010	3	30	185	A			
12- MD 27 at Observation Dr											
12	NB	48.1	D	NB U-Turn	0	0	0	0	A	37.1	D
				NB Through	48	58	14	72	E		
				NB Right	12	7	14	72	A		
	SB	44.0	D	SB Left	91	52	29	192	D		
				SB Through	54	52	39	261	D		
				SB Right	178	38	64	298	D		
	EB	16.9	B	EB Left	151	40	40	324	D		
				EB Through	1217	14	42	325	B		
				EB Right	48	10	49	363	B		
	WB	48.1	D	WB Left	100	32	333	847	C		
WB Through				2130	50	333	847	D			
WB Right				109	30	333	847	C			
13- MD 27 at I-270 NB off ramp											
13	NB	35.6	D	NB Left	106	36	15	88	D	52.4	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.1	A	EB Left	0	0	0	0	A		
				EB Through	973	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	76.7	E	WB Left	0	0	0	0	A		
WB Through				2166	77	1092	2164	E			
WB Right				0	0	0	0	A			
14- MD 27 at I-270 SB off ramp											
14	NB			NB Left	0	0	0	0	A	70.6	E
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	49.4	D	SB Left	384	49	61	275	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	2.6	A	EB Left	0	0	0	0	A		
				EB Through	840	3	2	62	A		
				EB Right	0	0	0	0	A		
	WB	118.3	F	WB Left	0	0	0	0	A		
WB Through				1365	118	1106	1497	F			
WB Right				0	0	0	0	A			
15- MD 27 at Crystal Rock Dr											
15	NB	64.8	E	NB Left	30	38	296	736	D	92.0	F
				NB Through	1051	65	316	736	E		
				NB Right	92	70	327	748	E		
	SB	119.1	F	SB Left	514	118	1842	3792	F		
				SB Through	1620	121	1842	3792	F		
				SB Right	51	81	1836	3787	F		
	EB	44.2	D	EB Left	224	50	59	199	D		
				EB Through	97	43	55	194	D		
				EB Right	75	29	60	228	C		
	WB	46.8	D	WB Left	11	56	32	103	E		
WB Through				32	224	32	103	F			
WB Right				142	6	32	103	A			
16- MD 118 at Seneca Meadows Pkwy											
16	NB	3.6	A	NB Left	109	11	1	72	B	6.1	A
				NB Through	725	3	4	134	A		
				NB Right	60	1	9	187	A		
	SB	4.0	A	SB Left	31	4	7	238	A		
				SB Through	948	4	10	238	A		
				SB Right	41	2	12	271	A		
	EB	18.4	B	EB Left	20	65	10	77	E		
				EB Through	6	82	10	77	F		
				EB Right	115	7	10	77	A		
	WB	44.2	D	WB Left	35	71	16	102	E		
WB Through				6	55	11	101	D			
WB Right				27	7	14	111	A			
17- MD 118 at I-270 NB on ramp											
17	NB			NB Left	0	0	0	0	A	10.2	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	29.6	C	EB Left	274	30	31	194	C		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	5.4	A	WB Left	0	0	0	0	A		
WB Through				188	1	0	0	A			
WB Right				911	6	15	309	A			
18- MD 118 at I-270 SB off ramp											
18	NB			NB Left	0	0	0	0	A	7.5	A
				NB Through	0	0.0	0	0	A		
				NB Right	0	0.0	0	0	A		
	SB	38.1	D	SB Left	215	38.1	34	163	D		
				SB Through	0	0.0	0	0	A		
				SB Right	0	0.0	0	0	A		
	EB	3.7	A	EB Left	0	0.0	0	0	A		
				EB Through	631	3.7	5	194	A		
				EB Right	0	0.0	0	0	A		
	WB	4.1	A	WB Left	0	0.0	0	0	A		
WB Through				1214	4.1	9	173	A			
WB Right				0	0.0	0	0	A			
19- MD 118 at Aircraft Dr											
19	NB	46.2	D	NB Left	9	78	9	75	E	20.6	C
				NB Through	13	80	9	75	F		
				NB Right	17	3	0	24	A		
	SB	60.5	E	SB Left	267	55	112	418	E		
				SB Through	53	72	112	418	E		
				SB Right	96	68	112	418	E		
	EB	12.4	B	EB Left	132	16	37	329	B		
				EB Through	1019	12	37	329	B		
				EB Right	34	12	37	329	B		
	WB	15.1	B	WB Left	83	23	47	310	C		
WB Through				1046	17	47	310	B			
WB Right				324	6	47	310	A			
20- Middlebrook Rd at Observation Dr											
20	NB			NB Left	0	0	0	0	A	16.4	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	20.4	C	SB Left	26	36	5	63	D		
				SB Through	0	0	0	0	A		
				SB Right	27	5	5	63	A		
	EB	14.1	B	EB Left	231	21	29	249	C		
				EB Through	825	12	29	249	B		
				EB Right	0	0	0	0	A		
	WB	18.0	B	WB Left	0	0	0	0	A		
WB Through				1141	19	72	392	B			
WB Right				275	15	97	441	B			

Table C.14: AM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
21- Middlebrook Rd at I-270 SB on ramp											
21	NB			NB Left	0	0	0	0	A	19.5	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	13.7	B	EB Left	0	0	0	0	A		
				EB Through	763	14	31	203	B		
				EB Right	0	0	0	0	A		
	WB	25.4	C	WB Left	761	25	104	893	C		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
22- Middlebrook Rd at Waring Station Rd											
22	NB	179.6	F	NB Left	145	136	348	485	F	70.4	E
				NB Through	6	133	348	485	F		
				NB Right	268	204	348	485	F		
	SB	17.6	B	SB Left	3	39	1	29	D		
				SB Through	0	0	1	29	A		
				SB Right	5	5	2	67	A		
	EB	69.3	E	EB Left	31	21	645	1297	C		
				EB Through	1448	71	645	1297	E		
				EB Right	80	62	645	1297	E		
	WB	18.4	B	WB Left	80	23	33	237	C		
				WB Through	719	19	33	237	B		
				WB Right	41	4	33	237	A		
23- MD 124 at MD 355											
23	NB	52.9	D	NB Left	228	73	86	264	E	96.2	F
				NB Through	390	48	84	262	D		
				NB Right	54	3	0	0	A		
	SB	104.2	F	SB Left	64	166	490	804	F		
				SB Through	1188	124	490	804	F		
				SB Right	559	54	284	780	D		
	EB	54.5	D	EB Left	610	130	444	1095	F		
				EB Through	494	17	444	1095	B		
				EB Right	555	5	236	1008	A		
	WB	143.6	F	WB Left	0	0	0	0	A		
				WB Through	1717	146	760	1115	F		
				WB Right	52	73	0	0	E		
24- MD 124 at I-270 SB on and off											
24	NB	65.3	F	NB Left	16	62	18	95	E	29.3	C
				NB Through	37	67	18	95	E		
				NB U-Turn	0	0	0	0	A		
	SB	26.0	C	SB Left	285	65	77	373	E		
				SB Through	11	65	77	373	E		
				SB Right	588	6	14	350	A		
	EB	17.0	B	EB Left	0	0	0	0	A		
				EB Through	1037	17	50	409	B		
				EB Right	67	14	60	433	B		
	WB	41.6	D	WB Left	43	47	1679	2437	D		
				WB Through	1136	41	1679	2437	D		
				WB Right	0	0	0	0	A		
25- MD 117 at MD 124											
25	NB	49.7	D	NB Left	20	108	157	726	F	48.5	D
				NB Through	541	64	157	726	E		
				NB Right	433	30	76	717	C		
	SB	47.0	D	SB Left	181	69	221	826	E		
				SB Through	1072	48	221	826	D		
				SB Right	131	9	0	0	A		
	EB	54.0	D	EB Left	102	119	217	782	F		
				EB Through	1470	50	217	783	D		
				EB Right	82	47	229	811	D		
	WB	39.4	D	WB Left	319	70	103	304	E		
				WB Through	478	27	103	304	C		
				WB Right	99	0	0	0	A		
26- MD 117 at Bureau Dr											
26	NB	50.3	D	NB Left	25	64	19	125	E	41.1	D
				NB Through	24	65	19	125	E		
				NB Right	26	23	19	125	C		
	SB	174.5	F	SB Left	197	177	223	397	F		
				SB Through	55	190	223	397	F		
				SB Right	32	130	223	397	F		
	EB	36.8	D	EB Left	33	26	272	958	C		
				EB Through	2020	37	278	958	D		
				EB Right	29	43	271	948	D		
	WB	20.8	C	WB Left	299	67	134	543	E		
				WB Through	840	10	134	544	A		
				WB Right	314	6	100	582	A		
27- MD 117 at I-270 SB off ramp											
27	NB			NB Left	0	0	0	0	A	9.3	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	2.0	A	EB Left	0	0	0	0	A		
				EB Through	835	2	1	180	A		
				EB Right	0	0	0	0	A		
	WB	28.1	D	WB Left	328	28	59	453	D		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
28- MD 117 at I-270 NB off ramp											
28	NB			NB Left	0	0	0	0	A	34.5	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	60.5	E	SB Left	287	63	325	1037	E		
				SB Through	0	0	0	0	A		
				SB Right	871	60	329	1039	E		
	EB	19.2	B	EB Left	14	123	74	848	F		
				EB Through	821	17	74	848	B		
				EB Right	0	0	0	0	A		
	WB	15.6	B	WB Left	0	0	0	0	A		
				WB Through	909	16	60	360	B		
				WB Right	9	8	66	390	A		
29- MD 117 at Perry Pkwy											
29	NB	44.5	D	NB Left	36	76	17	120	E	15.9	B
				NB Through	7	58	17	119	E		
				NB Right	38	12	27	140	B		
	SB	48.7	D	SB Left	112	96	60	247	F		
				SB Through	14	102	60	247	F		
				SB Right	133	3	60	247	A		
	EB	10.6	B	EB Left	119	70	44	269	E		
				EB Through	975	3	44	269	A		
				EB Right	10	1	31	254	A		
	WB	10.4	B	WB Left	8	89	21	297	F		
				WB Through	747	10	21	297	B		
				WB Right	136	6	21	297	A		
30- Shady Grove Rd at I-270 NB off ramp											
30	NB	9.8	A	NB Left	0	0	0	0	A	22.3	C
				NB Through	959	10	22	267	A		
				NB Right	0	0	0	0	A		
	SB	10.4	B	SB Left	0	0	0	0	A		
				SB Through	1349	10	34	334	B		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	55.7	E	WB Left	846	56	160	616	E		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table C.14: AM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
31- Shady Grove Rd at I-270 SB off ramp											
31	NB	12.7	B	NB Left	0	0	0	0	A	19.9	B
				NB Through	1004	13	37	399	B		
				NB Right	0	0	0	0	A		
	SB	9.3	A	SB Left	0	0	0	0	A		
				SB Through	1565	9	32	563	A		
				SB Right	0	0	0	0	A		
	EB	47.4	D	EB Left	286	41	42	360	D		
				EB Through	0	0	0	0	A		
				EB Right	576	51	98	441	D		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
32- MD 28 at I-270 SB off ramp											
32	NB			NB U-Turn	0	0	0	0	A	67.9	E
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	35.7	D	SB Left	426	44	68	327	D		
				SB Through	0	0	0	0	A		
				SB Right	103	3	0	36	A		
	EB	131.7	F	EB Left	0	0	0	0	A		
				EB Through	683	200	1979	2136	F		
				EB Right	409	18	1925	2144	B		
	WB	25.4	C	WB Left	0	0	0	0	A		
				WB Through	1235	25	23	384	C		
				WB Right	0	0	0	0	A		
33- MD 28 at I-270 on and off ramps											
33	NB	36.5	D	NB Left	0	0	32	238	A	36.3	D
				NB Through	128	53	38	247	D		
				NB Right	80	10	38	247	A		
	SB	84.5	F	SB Left	26	102	128	357	F		
				SB Through	0	0	0	0	A		
				SB Right	273	83	128	357	F		
	EB	21.4	C	EB Left	177	45	57	407	D		
				EB Through	599	15	57	407	B		
				EB Right	0	0	0	0	A		
	WB	33.3	C	WB Left	26	37	101	391	D		
				WB Through	944	33	83	354	C		
				WB Right	0	0	0	0	A		
34- MD 189 at Great Falls Rd											
34	NB	37.3	D	NB Left	63	42	17	117	D	23.3	C
				NB Through	8	40	14	117	D		
				NB Right	10	8	16	128	A		
	SB	17.3	B	SB Left	63	45	19	229	D		
				SB Through	6	45	19	229	D		
				SB Right	478	13	54	147	B		
	EB	24.6	C	EB Left	227	55	111	1165	E		
				EB Through	680	15	17	199	B		
				EB Right	10	10	26	236	A		
	WB	26.4	C	WB Left	4	26	64	389	C		
				WB Through	311	27	63	388	C		
				WB Right	11	13	77	422	B		
35- MD 189 at I-270 Ramps											
35	NB	60.5	E	NB Left	88	61	18	121	E	79.7	E
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	55.9	E	SB Left	150	56	48	258	E		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	106.2	F	EB Left	284	138	627	1494	F		
				EB Through	436	85	627	1494	F		
				EB Right	0	0	0	0	A		
	WB	60.0	E	WB Left	457	53	107	429	D		
				WB Through	244	73	107	429	E		
				WB Right	0	0	0	0	A		
36- MD 189 at Wootton Pkwy											
36	NB	71.9	E	NB Left	161	48	85	311	D	117.9	F
				NB Through	125	95	85	311	F		
				NB Right	155	78	85	311	E		
	SB	142.8	F	SB Left	325	210	509	805	F		
				SB Through	593	106	482	792	F		
				SB Right	0	0	0	0	A		
	EB	162.3	F	EB Left	137	157	650	1047	F		
				EB Through	803	170	650	1047	F		
				EB Right	101	106	650	1047	F		
	WB	49.3	D	WB Left	346	69	104	353	E		
				WB Through	318	34	104	353	C		
				WB Right	47	6	104	353	A		
37- Montrose Rd at Tower Oaks Blvd											
37	NB			NB Left	0	0	0	0	A	104.5	F
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	235.8	F	SB Left	123	49	1098	1406	D		
				SB Through	0	0	0	0	A		
				SB Right	435	289	1123	1402	F		
	EB	25.5	C	EB Left	28	65	136	923	E		
				EB Through	1513	25	136	923	C		
				EB Right	0	0	0	0	A		
	WB	141.4	F	WB Left	0	0	0	0	A		
				WB Through	1255	145	491	850	F		
				WB Right	58	60	491	850	E		
38- Tower Oaks Blvd at I-270 off ramp											
38	NB	24.1	C	NB Left	385	22	30	200	C	78.2	E
				NB Through	8	22.5	25	192	C		
				NB Right	22	64.1	30	200	E		
	SB	0.6	A	SB Left	0	800.1	0	20	F		
				SB Through	0	0.0	0	20	A		
				SB Right	4	0.6	0	0	A		
	EB	122.8	F	EB Left	6	113.7	347	465	F		
				EB Through	558	122.3	347	465	F		
				EB Right	82	126.7	338	456	F		
	WB	9.5	A	WB Left	0	0.0	3	80	A		
				WB Through	81	9.9	3	80	A		
				WB Right	6	5.0	0	25	A		
39- Montrose Rd at Tower Oaks Blvd											
39	NB	17.9	B	NB Left	37	71	49	285	E	50.9	D
				NB Through	240	42	49	285	D		
				NB Right	555	4	12	151	A		
	SB	41.1	D	SB Left	334	54	163	619	D		
				SB Through	778	37	163	618	D		
				SB Right	78	29	124	658	C		
	EB	90.2	F	EB Left	76	74	416	718	E		
				EB Through	971	92	418	718	F		
				EB Right	62	89	439	742	F		
	WB	43.4	D	WB Left	300	52	68	290	D		
				WB Through	188	50	68	290	D		
				WB Right	109	7	77	321	A		
40- Rockledge Blvd at I-270 NB on and off ramp											
40	NB	34.1	C	NB Left	0	0	0	0	A	18.0	B
				NB Through	92	32	33	165	C		
				NB Right	216	35	33	165	C		
	SB	2.0	A	SB Left	0	0	4	61	A		
				SB Through	923	2	4	61	A		
				SB Right	0	0	0	0	A		
	EB	26.9	C	EB Left	7	48	126	506	D		
				EB Through	529	54	126	506	D		
				EB Right	563	1	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table C.14: AM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS	
41- Rockledge Blvd at I-270 SB on and off ramps												
41	NB	2.6	A	NB Left	97	3	5	72	A	20.4	C	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	21.7	C		WB Left	923	23	92	655			C
					WB Through	403	20	92	655			B
					WB Right	0	0	0	0			A
42- MD 187 at Tuckerman Ln												
42	NB	58.8	E	NB Left	230	25	265	793	C	153.0	F	
				NB Through	1468	55	265	793	D			
				NB Right	213	124	265	793	F			
	SB	224.9	F		SB Left	60	164	2605	2704			F
					SB Through	1204	225	2605	2704			F
					SB Right	162	247	2605	2704			F
	EB	186.0	F		EB Left	223	128	1864	1988			F
					EB Through	624	205	1865	1989			F
					EB Right	129	194	1889	2013			F
	WB	188.4	F		WB Left	721	229	1921	2147			F
					WB Through	393	152	1921	2147			F
					WB Right	159	92	1921	2147			F
43- MD 187 at I-270 NB on and off ramps												
43	NB	11.2	B	NB Left	163	76	57	257	E	19.1	B	
				NB Through	1541	4	57	257	A			
				NB Right	0	0	0	0	A			
	SB	25.4	C		SB Left	0	0	0	0			A
					SB Through	1529	25	81	553			C
					SB Right	0	0	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	49.5	D		WB Left	114	50	35	250			D
					WB Through	10	47	35	250			D
					WB Right	0	0	0	0			A
44- MD 187 at I-270 NB on and off ramps												
44	NB	23.9	C	NB Left	0	0	0	0	A	25.9	C	
				NB Through	1478	24	68	404	C			
				NB Right	0	0	0	0	A			
	SB	7.7	A		SB Left	178	49	58	295			D
					SB Through	1465	3	58	295			A
					SB Right	0	0	0	0			A
	EB	80.8	F		EB Left	228	58	187	740			E
					EB Through	0	0	187	740			A
					EB Right	371	95	232	784			F
	WB				WB Left	0	0	0	0			A
					WB Through	0	0	0	0			A
					WB Right	0	0	0	0			A
45- MD 187 at Rock Spring Dr												
45	NB	14.9	B	NB Left	255	57	68	257	E	20.8	C	
				NB Through	1383	7	69	258	A			
				NB Right	10	6	93	291	A			
	SB	21.9	C		SB Left	13	25	98	632			C
					SB Through	1668	24	98	632			C
					SB Right	144	1	63	619			A
	EB	37.9	D		EB Left	190	59	56	222			E
					EB Through	26	54	56	222			D
					EB Right	251	20	56	222			C
	WB	7.2	A		WB Left	1	7	1	29			A
					WB Through	9	11	1	29			B
					WB Right	5	0	0	7			A
47-Democracy Blvd at I-270 NB off ramp												
47	NB	29.7	C	NB Left	217	30	24	159	C	13.4	B	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB	12.7	B		EB Left	0	0	0	0			A
					EB Through	1654	13	50	446			B
					EB Right	0	0	0	0			A
	WB	10.4	B		WB Left	0	0	0	0			A
					WB Through	778	10	23	187			B
					WB Right	0	0	0	0			A
48- Democracy Blvd at I-270 SB on ramp												
48	NB			NB Left	0	0	0	0	A	6.6	A	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB	5.4	A		EB Left	0	0	0	0			A
					EB Through	1768	5	23	270			A
					EB Right	0	0	0	0			A
	WB	8.7	A		WB Left	223	37	31	173			D
					WB Through	771	1	21	152			A
					WB Right	0	0	0	0			A
49- Democracy Blvd at I-270 SB off ramp												
49	NB			NB Left	0	0	0	0	A	12.1	B	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB	32.9	C		SB Left	329	49	57	226			D
					SB Through	0	0	0	0			A
					SB Right	171	2	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	2.6	A		WB Left	0	0	0	0			A
					WB Through	770	3	4	133			A
					WB Right	334	2	1	163			A
50- MD 190 at Burdette Rd												
50	NB	73.2	E	NB Left	20	80	15	118	E	13.2	B	
				NB Through	4	59	15	118	E			
				NB Right	11	67	15	118	E			
	SB	34.4	C		SB Left	50	79	31	151			E
					SB Through	17	64	31	151			E
					SB Right	120	12	31	151			B
	EB	10.5	B		EB Left	53	93	61	561			F
					EB Through	1814	8	60	561			A
					EB Right	15	6	51	584			A
	WB	12.5	B		WB Left	1	106	61	828			F
					WB Through	1494	13	62	828			B
					WB Right	21	2	55	834			A

Table C.14: AM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
51- MD 190 at I-270 NB on ramp											
51	NB			NB Left	0	0	0	0	A	53.3	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	123.2	F	EB Left	531	123	347	715	F		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	15.9	B	WB Left	0	0	0	0	A		
				WB Through	994	16	76	747	B		
				WB Right	0	0	0	0	A		
52- MD 190 at I-270 SB off ramp											
52	NB	79.3	E	NB Left	258	79	1392	3574	E	14.2	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	2.9	A	EB Left	0	0	0	0	A		
				EB Through	982	3	6	151	A		
				EB Right	0	0	0	0	A		
	WB	5.7	A	WB Left	0	0	0	0	A		
				WB Through	667	6	8	160	A		
				WB Right	0	0	0	0	A		
53- MD 190 at Seven Locks Rd											
53	NB	68.2	E	NB Left	21	67	23	149	E	45.0	D
				NB Through	59	69	25	148	E		
				NB Right	0	0	0	0	A		
	SB	56.9	E	SB Left	624	56	184	777	E		
				SB Through	183	59	185	778	E		
				SB Right	18	54	184	777	D		
	EB	37.5	D	EB Left	24	30	135	584	C		
				EB Through	846	38	135	584	D		
				EB Right	42	42	135	584	D		
	WB	39.7	D	WB Left	119	127	125	418	F		
				WB Through	639	33	128	421	C		
				WB Right	157	1	4	127	A		
54- MD 124 at I-270 NB off ramp											
54	NB	40.6	D	NB Left	0	0	0	0	A	26.5	C
				NB Through	0	0	0	0	A		
				NB Right	723	41	100	459	D		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	15.6	B	EB Left	0	0	0	0	A		
				EB Through	933	16	37	359	B		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
55- Democracy Blvd at I-270 NB off ramp											
55	NB	37.1	D	NB Left	0	0	0	0	A	16.2	B
				NB Through	0	0	0	0	A		
				NB Right	928	37	113	575	D		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	4.5	A	EB Left	0	0	0	0	A		
				EB Through	1657	5	18	95	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
56- Watkins Mill Rd at I-270 SB off ramp/Parkview Ave											
56	NB	747.0	F	NB Left	46	222	668	726	F	174.0	F
				NB Through	0	0	0	0	A		
				NB Right	86	1028	668	726	F		
	SB	83.5	F	SB Left	552	113	2037	5048	F		
				SB Through	131	109	2037	5048	F		
				SB Right	447	39	2037	5048	D		
	EB	463.4	F	EB Left	0	0	0	0	A		
				EB Through	494	463	1163	1232	F		
				EB Right	2	599	1163	1232	F		
	WB	41.8	D	WB Left	116	87	120	459	F		
				WB Through	769	35	117	457	D		
				WB Right	0	0	0	0	A		
57- Watkins Mill Rd at I-270 NB on ramp											
57	NB	35.2	D	NB Left	386	51	92	383	D	70.0	E
				NB Through	0	0	0	0	A		
				NB Right	478	23	92	383	C		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	19.1	B	EB Left	190	61	49	301	E		
				EB Through	749	8	49	301	A		
				EB Right	0	0	0	0	A		
	WB	139.2	F	WB Left	0	0	0	0	A		
				WB Through	954	150	640	849	F		
				WB Right	174	78	640	849	E		
58- Watkins Mill Rd at I-270 SB on ramp											
58	NB			NB Left	0	0	0	0	A	60.7	E
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	73.4	E	EB Left	0	0	0	0	A		
				EB Through	938	30	483	620	C		
				EB Right	182	299	483	620	F		
	WB	50.0	D	WB Left	456	142	273	516	F		
				WB Through	883	2	273	516	A		
				WB Right	0	0	0	0	A		

Table C.15: AM Peak -2040 Adaptive Ramp Metering - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
1- MD 85 at Sam's Club Drive											
1	NB	21.9	C	NB Left	122	79	79	431	E	37.8	D
				NB Through	379	25	79	431	C		
				NB Right	696	10	25	442	B		
	SB	51.5	D	SB Left	136	65	175	772	E		
				SB Through	603	51	175	772	D		
				SB Right	68	31	175	772	C		
	EB	49.2	D	EB Left	107	76	55	181	E		
				EB Through	62	76	55	181	E		
				EB Right	113	9	55	181	A		
	WB	49.9	D	WB Left	233	72	85	349	E		
				WB Through	16	68	85	349	E		
				WB Right	127	7	85	349	A		
2- MD 85 at I-270 NB on and off ramp											
2	NB	53.2	D	NB Left	686	53	278	1258	D	36.9	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	18.6	B	SB Left	0	0	0	0	A		
				SB Through	612	19	52	592	B		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
3- MD 85 at I-270 SB on and off ramp											
3	NB	4.9	A	NB Left	0	0	0	0	A	9.9	A
				NB Through	1070	5	18	410	A		
				NB Right	0	0	0	0	A		
	SB	40.4	D	SB Left	174	40	61	910	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
4- MD 85 at Crestwood Blvd											
4	NB	19.3	C	NB Left	13	52	54	391	D	24.6	C
				NB Through	762	19	54	391	B		
				NB U-Turn	0	0	0	0	A		
	SB	18.4	B	SB Left	68	69	26	177	E		
				SB Through	1870	18	81	578	B		
				SB Right	845	16	70	568	B		
	EB	53.2	D	EB Left	620	55	92	290	D		
				EB Through	28	71	92	290	E		
				EB Right	42	18	92	290	B		
	WB	43.9	D	WB Left	52	53	21	132	D		
				WB Through	18	55	21	132	D		
				WB Right	19	9	21	132	A		
5- MD 80 at I-270 NB on and off ramp											
5	NB	4.1	A	NB Left	4	12	0	0	B	116.7	F
				NB Through	1	0	0	0	A		
				NB Right	4	-3	0	0	A		
	SB	13.4	B	SB Left	204	16	14	110	B		
				SB Through	6	16	14	110	B		
				SB Right	58	3	0	18	A		
	EB	19.4	B	EB Left	54	21	10	192	C		
				EB Through	0	0	8	0	A		
				EB Right	5	5	19	222	A		
	WB	146.4	F	WB Left	29	120	1	60	F		
				WB Through	662	180	805	941	F		
				WB Right	469	101	317	745	F		
6- MD 80 at I-270 SB on and off ramp											
6	NB	10.5	B	NB Left	25	73	7	181	F	60.5	F
				NB Through	0	0	0	0	A		
				NB Right	294	5	7	181	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	40.8	E	EB Left	0	0	0	0	A		
				EB Through	357	39	73	351	E		
				EB Right	159	45	74	360	E		
	WB	182.7	F	WB Left	0	0	0	0	A		
				WB Through	214	183	655	908	F		
				WB Right	0	0	0	0	A		
7- MD 109 at I-270 NB on and off ramp											
7	NB			NB Left	0	0	0	0	A	58.9	F
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	16.7	C	SB Left	145	21	21	166	C		
				SB Through	0	0	0	0	A		
				SB Right	48	3	1	87	A		
	EB	36.0	E	EB Left	58	9	2	147	A		
				EB Through	0	0	0	0	A		
				EB Right	60	62	0	0	F		
	WB	76.1	F	WB Left	0	0	0	0	A		
				WB Through	632	76	630	1538	F		
				WB Right	0	0	0	0	A		
8- MD 80 at I-270 SB on and off ramp											
8	NB	2.8	A	NB Left	17	12	1	77	B	136.7	F
				NB Through	0	0	0	0	A		
				NB Right	49	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	496.4	F	EB Left	0	0	0	0	A		
				EB Through	61	409	397	492	F		
				EB Right	49	605	400	489	F		
	WB	91.4	F	WB Left	531	91	574	911	F		
				WB Through	148	91	553	887	F		
				WB Right	0	0	0	0	A		
9- MD 121 at Gateway Center Dr											
9	NB	17.6	C	NB Left	150	30	42	271	C	113.3	F
				NB Through	430	22	42	271	C		
				NB Right	323	6	50	297	A		
	SB	163.4	F	SB Left	58	103	688	847	F		
				SB Through	827	167	689	847	F		
				SB Right	8	181	707	868	F		
	EB	250.3	F	EB Left	5	154	459	517	F		
				EB Through	54	227	459	517	F		
				EB Right	369	255	491	549	F		
	WB	21.1	C	WB Left	138	24	17	144	C		
				WB Through	17	21	18	144	C		
				WB Right	28	6	15	165	A		
10- MD 121 at I-270 NB on and off ramp											
10	NB	28.6	D	NB Left	347	60	74	266	F	45.7	D
				NB Through	0	0	0	0	A		
				NB Right	432	3	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	10.6	B	EB Left	0	0	0	0	A		
				EB Through	472	16	27	301	C		
				EB Right	245	0	0	0	A		
	WB	74.6	F	WB Left	191	76	542	1045	F		
				WB Through	1140	74	542	1045	F		
				WB Right	0	0	0	0	A		

Table C.15: AM Peak -2040 Adaptive Ramp Metering - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
11- MD 121 at I-270 SB on and off ramp											
11	NB			NB Left	0	0	0	0	A	43.3	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	60.0	E	SB Left	213	91	208	945	F		
				SB Through	0	0	0	0	A		
				SB Right	295	38	8	311	E		
	EB	15.0	B	EB Left	0	0	0	0	A		
				EB Through	501	15	10	214	C		
				EB Right	0	0	0	0	A		
	WB	47.0	D	WB Left	0	0	0	0	A		
WB Through				607	20	107	887	C			
WB Right				884	66	320	879	F			
12- MD 27 at Observation Dr											
12	NB	46.3	D	NB U-Turn	0	0	0	0	A	55.5	E
				NB Through	48	56	13	75	E		
				NB Right	12	7	13	75	A		
	SB	49.6	D	SB Left	92	49	27	177	D		
				SB Through	54	48	48	278	D		
				SB Right	180	50	75	315	D		
	EB	18.7	B	EB Left	155	43	47	306	D		
				EB Through	1245	16	48	307	B		
				EB Right	49	14	56	345	B		
	WB	80.7	F	WB Left	98	58	527	840	E		
WB Through				2020	83	527	840	F			
WB Right				99	57	527	840	E			
13- MD 27 at I-270 NB off ramp											
13	NB	34.0	C	NB Left	115	34	15	96	C	47.9	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.1	A	EB Left	0	0	0	0	A		
				EB Through	967	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	70.3	E	WB Left	0	0	0	0	A		
WB Through				2128	70	1644	2463	E			
WB Right				0	0	0	0	A			
14- MD 27 at I-270 SB off ramp											
14	NB			NB Left	0	0	0	0	A	51.5	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	47.6	D	SB Left	379	48	65	277	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	2.9	A	EB Left	0	0	0	0	A		
				EB Through	839	3	2	80	A		
				EB Right	0	0	0	0	A		
	WB	82.2	F	WB Left	0	0	0	0	A		
WB Through				1375	82	893	1399	F			
WB Right				0	0	0	0	A			
15- MD 27 at Crystal Rock Dr											
15	NB	62.0	E	NB Left	30	33	283	738	C	76.2	E
				NB Through	1048	62	305	738	E		
				NB Right	94	68	314	751	E		
	SB	92.1	F	SB Left	504	91	1072	1676	F		
				SB Through	1623	93	1072	1676	F		
				SB Right	48	55	1064	1670	E		
	EB	44.4	D	EB Left	224	50	59	201	D		
				EB Through	97	44	55	196	D		
				EB Right	76	28	60	230	C		
	WB	47.5	D	WB Left	11	56	34	103	E		
WB Through				31	234	34	103	F			
WB Right				142	6	34	103	A			
16- MD 118 at Seneca Meadows Pkwy											
16	NB	3.7	A	NB Left	118	10	1	64	B	6.1	A
				NB Through	763	3	5	139	A		
				NB Right	61	1	10	192	A		
	SB	4.0	A	SB Left	31	5	6	212	A		
				SB Through	948	4	10	212	A		
				SB Right	41	3	12	242	A		
	EB	18.4	B	EB Left	20	65	10	77	E		
				EB Through	6	82	10	77	F		
				EB Right	115	7	10	77	A		
	WB	44.8	D	WB Left	35	72	16	102	E		
WB Through				6	55	11	101	D			
WB Right				27	8	14	111	A			
17- MD 118 at I-270 NB on ramp											
17	NB			NB Left	0	0	0	0	A	10.3	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	29.4	C	EB Left	274	29	30	194	C		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	5.5	A	WB Left	0	0	0	0	A		
WB Through				188	1	0	0	A			
WB Right				911	6	16	295	A			
18- MD 118 at I-270 SB off ramp											
18	NB			NB Left	0	0	0	0	A	8.2	A
				NB Through	0	0.0	0	0	A		
				NB Right	0	0.0	0	0	A		
	SB	39.5	D	SB Left	230	39.5	37	166	D		
				SB Through	0	0.0	0	0	A		
				SB Right	0	0.0	0	0	A		
	EB	3.8	A	EB Left	0	0.0	0	0	A		
				EB Through	631	3.8	5	188	A		
				EB Right	0	0.0	0	0	A		
	WB	4.7	A	WB Left	0	0.0	0	0	A		
WB Through				1281	4.7	11	246	A			
WB Right				0	0.0	0	0	A			
19- MD 118 at Aircraft Dr											
19	NB	46.2	D	NB Left	9	78	9	75	E	20.5	C
				NB Through	13	80	9	75	F		
				NB Right	17	3	0	24	A		
	SB	60.4	E	SB Left	267	55	112	414	E		
				SB Through	53	72	112	414	E		
				SB Right	96	68	112	414	E		
	EB	12.3	B	EB Left	132	16	37	329	B		
				EB Through	1019	12	37	329	B		
				EB Right	34	12	37	329	B		
	WB	15.3	B	WB Left	87	25	49	289	C		
WB Through				1106	17	49	289	B			
WB Right				337	6	49	289	A			
20- Middlebrook Rd at Observation Dr											
20	NB			NB Left	0	0	0	0	A	48.2	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	21.2	C	SB Left	26	36	6	62	D		
				SB Through	0	0	0	0	A		
				SB Right	27	7	6	62	A		
	EB	17.6	B	EB Left	209	28	35	299	C		
				EB Through	752	15	35	299	B		
				EB Right	0	0	0	0	A		
	WB	71.1	E	WB Left	0	0	0	0	A		
WB Through				1089	78	296	508	E			
WB Right				262	41	322	558	D			

Table C.15: AM Peak -2040 Adaptive Ramp Metering - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
21- Middlebrook Rd at I-270 SB on ramp											
21	NB			NB Left	0	0	0	0	A	99.6	F
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	18.7	B	EB Left	0	0	0	0	A		
				EB Through	632	19	36	211	B		
				EB Right	0	0	0	0	A		
	WB	171.6	F	WB Left	711	172	2037	2387	F		
WB Through				0	0	0	0	A			
WB Right				0	0	0	0	A			
22- Middlebrook Rd at Waring Station Rd											
22	NB	332.5	F	NB Left	96	247	439	484	F	111.8	F
				NB Through	4	217	439	484	F		
				NB Right	192	378	439	484	F		
	SB	18.3	B	SB Left	3	38	1	29	D		
				SB Through	0	0	1	29	A		
				SB Right	5	6	2	67	A		
	EB	124.5	F	EB Left	29	37	1064	1307	D		
				EB Through	1229	126	1064	1307	F		
				EB Right	71	126	1064	1307	F		
	WB	17.1	B	WB Left	81	22	33	229	C		
WB Through				726	17	33	229	B			
WB Right				43	4	33	229	A			
23- MD 124 at MD 355											
23	NB	52.1	D	NB Left	228	69	86	253	E	88.4	F
				NB Through	390	49	84	251	D		
				NB Right	54	3	0	0	A		
	SB	95.1	F	SB Left	65	168	466	797	F		
				SB Through	1228	120	466	797	F		
				SB Right	578	35	271	775	C		
	EB	57.6	E	EB Left	620	138	507	1119	F		
				EB Through	511	18	507	1119	B		
				EB Right	569	5	287	1085	A		
	WB	121.7	F	WB Left	0	0	0	0	A		
WB Through				1870	123	726	1114	F			
WB Right				57	68	0	0	E			
24- MD 124 at I-270 SB on and off											
24	NB	65.1	F	NB Left	16	61	18	95	E	26.7	C
				NB Through	37	67	18	95	E		
				NB U-Turn	0	0	0	0	A		
	SB	25.5	C	SB Left	273	64	72	379	E		
				SB Through	11	66	72	379	E		
				SB Right	567	6	14	378	A		
	EB	17.6	B	EB Left	0	0	0	0	A		
				EB Through	1037	18	52	405	B		
				EB Right	67	14	62	429	B		
	WB	33.7	C	WB Left	47	36	825	2366	D		
WB Through				1231	34	825	2366	C			
WB Right				0	0	0	0	A			
25- MD 117 at MD 124											
25	NB	157.3	F	NB Left	18	202	413	763	F	107.7	F
				NB Through	511	159	413	763	F		
				NB Right	386	153	500	754	F		
	SB	57.5	E	SB Left	179	105	272	837	F		
				SB Through	1076	55	272	837	D		
				SB Right	130	15	0	0	B		
	EB	164.8	F	EB Left	98	211	644	861	F		
				EB Through	1309	163	645	862	F		
				EB Right	74	140	671	889	F		
	WB	42.7	D	WB Left	332	78	114	349	E		
WB Through				496	27	114	349	C			
WB Right				101	0	0	0	A			
26- MD 117 at Bureau Dr											
26	NB	57.9	E	NB Left	25	62	20	118	E	92.1	F
				NB Through	24	74	20	118	E		
				NB Right	26	39	20	118	D		
	SB	375.2	F	SB Left	176	372	397	460	F		
				SB Through	50	389	397	460	F		
				SB Right	30	370	397	460	F		
	EB	104.7	F	EB Left	30	75	662	996	E		
				EB Through	1815	106	674	996	F		
				EB Right	28	82	663	986	F		
	WB	30.6	C	WB Left	316	96	206	718	F		
WB Through				880	16	207	719	B			
WB Right				326	6	182	768	A			
27- MD 117 at I-270 SB off ramp											
27	NB			NB Left	0	0	0	0	A	22.4	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	10.4	B	EB Left	0	0	0	0	A		
				EB Through	748	10	6	340	B		
				EB Right	0	0	0	0	A		
	WB	49.4	E	WB Left	333	49	143	703	E		
WB Through				0	0	0	0	A			
WB Right				0	0	0	0	A			
28- MD 117 at I-270 NB off ramp											
28	NB			NB Left	0	0	0	0	A	44.2	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	76.1	E	SB Left	312	71	938	1841	E		
				SB Through	0	0	0	0	A		
				SB Right	934	78	943	1843	E		
	EB	22.5	C	EB Left	13	117	85	860	F		
				EB Through	734	21	85	860	C		
				EB Right	0	0	0	0	A		
	WB	18.7	B	WB Left	0	0	0	0	A		
WB Through				909	19	78	375	B			
WB Right				9	6	85	405	A			
29- MD 117 at Perry Pkwy											
29	NB	45.8	D	NB Left	36	79	18	125	E	17.8	B
				NB Through	7	63	17	124	E		
				NB Right	38	11	28	145	B		
	SB	48.7	D	SB Left	113	97	60	241	F		
				SB Through	13	96	60	241	F		
				SB Right	133	3	60	241	A		
	EB	10.5	B	EB Left	113	70	42	260	E		
				EB Through	923	3	42	260	A		
				EB Right	8	4	29	244	A		
	WB	14.9	B	WB Left	8	86	32	299	F		
WB Through				750	16	32	299	B			
WB Right				136	7	32	299	A			
30- Shady Grove Rd at I-270 NB off ramp											
30	NB	8.7	A	NB Left	0	0	0	0	A	24.7	C
				NB Through	948	9	19	232	A		
				NB Right	0	0	0	0	A		
	SB	10.8	B	SB Left	0	0	0	0	A		
				SB Through	1349	11	35	314	B		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	57.5	E	WB Left	1036	58	209	704	E		
WB Through				0	0	0	0	A			
WB Right				0	0	0	0	A			

Table C.15: AM Peak -2040 Adaptive Ramp Metering - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
31- Shady Grove Rd at I-270 SB off ramp											
31	NB	12.0	B	NB Left	0	0	0	0	A	18.4	B
				NB Through	1004	12	34	317	B		
				NB Right	0	0	0	0	A		
	SB	8.1	A	SB Left	0	0	0	0	A		
				SB Through	1755	8	41	653	A		
				SB Right	0	0	0	0	A		
	EB	47.6	D	EB Left	275	42	42	201	D		
				EB Through	0	0	0	0	A		
				EB Right	567	50	95	379	D		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
32- MD 28 at I-270 SB off ramp											
32	NB			NB U-Turn	0	0	0	0	A	39.3	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	35.6	D	SB Left	409	44	65	291	D		
				SB Through	0	0	0	0	A		
				SB Right	103	3	0	62	A		
	EB	0 *	F	EB Left	0	0	0	0	A		
				EB Through	848	132	1686	2131	F		
				EB Right	566	13	1095	2140	B		
	WB	8.3	A	WB Left	0	0	0	0	A		
				WB Through	1997	8	38	453	A		
				WB Right	0	0	0	0	A		
33- MD 28 at I-270 on and off ramps											
33	NB	34.8	C	NB Left	0	0	55	303	A	21.9	C
				NB Through	218	50	64	323	D		
				NB Right	143	11	64	323	B		
	SB	25.2	C	SB Left	31	59	30	224	E		
				SB Through	0	0	0	0	A		
				SB Right	317	22	30	224	C		
	EB	23.8	C	EB Left	218	45	71	522	D		
				EB Through	715	17	71	522	B		
				EB Right	0	0	0	0	A		
	WB	14.3	B	WB Left	26	15	51	319	B		
				WB Through	969	14	38	282	B		
				WB Right	0	0	0	0	A		
34- MD 189 at Great Falls Rd											
34	NB	38.1	D	NB Left	65	43	15	102	D	13.7	B
				NB Through	8	37	12	102	D		
				NB Right	10	5	14	113	A		
	SB	9.4	A	SB Left	84	44	32	199	D		
				SB Through	8	47	32	199	D		
				SB Right	625	4	13	99	A		
	EB	11.8	B	EB Left	332	18	17	214	B		
				EB Through	941	10	20	219	A		
				EB Right	14	8	29	255	A		
	WB	23.8	C	WB Left	5	15	42	304	B		
				WB Through	329	24	42	304	C		
				WB Right	11	11	54	338	B		
35- MD 189 at I-270 Ramps											
35	NB	50.6	D	NB Left	141	51	27	137	D	50.4	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	51.2	D	SB Left	152	51	45	245	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	24.9	C	EB Left	420	21	87	456	C		
				EB Through	569	28	87	456	C		
				EB Right	0	0	0	0	A		
	WB	79.7	E	WB Left	563	65	233	739	E		
				WB Through	295	108	233	739	F		
				WB Right	0	0	0	0	A		
36- MD 189 at Wooton Pkwy											
36	NB	40.8	D	NB Left	160	55	60	237	E	63.6	E
				NB Through	125	55	60	237	E		
				NB Right	159	15	60	237	B		
	SB	81.5	F	SB Left	480	91	363	793	F		
				SB Through	831	76	329	779	E		
				SB Right	0	0	0	0	A		
	EB	61.3	E	EB Left	166	82	287	968	F		
				EB Through	974	62	287	968	E		
				EB Right	125	32	287	968	C		
	WB	50.8	D	WB Left	394	68	115	367	E		
				WB Through	362	39	115	367	D		
				WB Right	54	7	115	367	A		
37- Montrose Rd at Tower Oaks Blvd											
37	NB			NB Left	0	0	0	0	A	79.6	E
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	200.6	F	SB Left	159	45	1100	1394	D		
				SB Through	0	0	0	0	A		
				SB Right	604	242	1095	1388	F		
	EB	25.3	C	EB Left	29	37	148	923	D		
				EB Through	1575	25	148	923	C		
				EB Right	0	0	0	0	A		
	WB	76.9	E	WB Left	0	0	0	0	A		
				WB Through	1757	79	401	851	E		
				WB Right	85	28	401	851	C		
38- Tower Oaks Blvd at I-270 off ramp											
38	NB	21.5	C	NB Left	538	22	37	194	C	61.1	E
				NB Through	10	21.1	31	186	C		
				NB Right	29	16.2	37	194	B		
	SB	0.7	A	SB Left	0	1.7	0	24	A		
				SB Through	0	0.0	0	24	A		
				SB Right	4	0.7	0	0	A		
	EB	94.7	F	EB Left	9	74.7	327	471	E		
				EB Through	739	95.7	327	471	F		
				EB Right	109	90.0	318	462	F		
	WB	10.8	B	WB Left	0	0.0	4	78	A		
				WB Through	106	11.3	4	78	B		
				WB Right	7	4.0	0	15	A		
39- Montrose Rd at Tower Oaks Blvd											
39	NB	16.7	B	NB Left	37	79	42	180	E	49.4	D
				NB Through	240	45	42	180	D		
				NB Right	560	0	0	0	A		
	SB	44.5	D	SB Left	333	55	181	628	E		
				SB Through	773	41	181	627	D		
				SB Right	77	34	136	666	C		
	EB	84.4	F	EB Left	77	74	392	719	E		
				EB Through	989	85	394	719	F		
				EB Right	63	87	411	740	F		
	WB	41.6	D	WB Left	403	51	90	292	D		
				WB Through	247	47	90	292	D		
				WB Right	147	8	105	322	A		
40- Rockledge Blvd at I-270 NB on and off ramp											
40	NB	34.9	C	NB Left	0	0	0	0	A	57.4	E
				NB Through	93	35	33	150	D		
				NB Right	216	35	33	150	C		
	SB	2.6	A	SB Left	0	0	7	80	A		
				SB Through	980	3	7	80	A		
				SB Right	0	0	0	0	A		
	EB	111.1	F	EB Left	6	327	1547	2810	F		
				EB Through	588	209	1547	2810	F		
				EB Right	538	1	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

* Queue on the on-ramp has impacted on the upstream intersection

Table C.15: AM Peak -2040 Adaptive Ramp Metering - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS	
41- Rockledge Blvd at I-270 SB on and off ramps												
41	NB	3.1	A	NB Left	98	3	1	39	A	22.3	C	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	23.6	C		WB Left	978	25	108	710			C
					WB Through	428	22	108	710			C
					WB Right	0	0	0	0			A
42- MD 187 at Tuckerman Ln												
42	NB	53.8	D	NB Left	232	22	244	692	C	150.1	F	
				NB Through	1475	51	244	692	D			
				NB Right	217	110	244	692	F			
	SB	220.7	F		SB Left	60	161	2601	2705			F
					SB Through	1226	220	2601	2705			F
					SB Right	164	248	2601	2705			F
	EB	186.4	F		EB Left	221	128	1872	1987			F
					EB Through	622	205	1873	1988			F
					EB Right	132	198	1897	2012			F
	WB	187.2	F		WB Left	721	226	1923	2151			F
					WB Through	397	154	1923	2151			F
					WB Right	157	94	1923	2151			F
43- MD 187 at I-270 NB on and off ramps												
43	NB	11.5	B	NB Left	165	82	59	244	F	18.9	B	
				NB Through	1525	4	59	244	A			
				NB Right	0	0	0	0	A			
	SB	24.5	C		SB Left	0	0	0	0			A
					SB Through	1540	24	79	553			C
					SB Right	0	0	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	48.2	D		WB Left	125	48	37	247			D
					WB Through	10	46	37	247			D
					WB Right	0	0	0	0			A
44- MD 187 at I-270 NB on and off ramps												
44	NB	23.2	C	NB Left	0	0	0	0	A	24.4	C	
				NB Through	1479	23	66	407	C			
				NB Right	0	0	0	0	A			
	SB	8.0	A		SB Left	180	51	59	271			D
					SB Through	1487	3	59	271			A
					SB Right	0	0	0	0			A
	EB	74.9	E		EB Left	213	59	168	689			E
					EB Through	0	0	168	689			A
					EB Right	358	84	200	677			F
	WB				WB Left	0	0	0	0			A
					WB Through	0	0	0	0			A
					WB Right	0	0	0	0			A
45- MD 187 at Rock Spring Dr												
45	NB	14.8	B	NB Left	255	57	68	264	E	20.7	C	
				NB Through	1383	7	69	264	A			
				NB Right	10	6	92	298	A			
	SB	21.7	C		SB Left	13	29	98	629			C
					SB Through	1687	23	98	629			C
					SB Right	146	1	62	623			A
	EB	37.7	D		EB Left	190	60	55	228			E
					EB Through	26	54	55	228			D
					EB Right	252	19	55	228			B
	WB	7.2	A		WB Left	1	7	1	29			A
					WB Through	9	11	1	29			B
					WB Right	5	0	0	7			A
47-Democracy Blvd at I-270 NB off ramp												
47	NB	30.8	C	NB Left	228	31	26	142	C	14.1	B	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB	13.4	B		EB Left	0	0	0	0			A
					EB Through	1640	13	53	463			B
					EB Right	0	0	0	0			A
	WB	10.8	B		WB Left	0	0	0	0			A
					WB Through	778	11	24	191			B
					WB Right	0	0	0	0			A
48- Democracy Blvd at I-270 SB on ramp												
48	NB			NB Left	0	0	0	0	A	6.4	A	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB	5.3	A		EB Left	0	0	0	0			A
					EB Through	1756	5	22	275			A
					EB Right	0	0	0	0			A
	WB	8.5	A		WB Left	222	36	31	173			D
					WB Through	781	1	20	152			A
					WB Right	0	0	0	0			A
49- Democracy Blvd at I-270 SB off ramp												
49	NB			NB Left	0	0	0	0	A	11.9	B	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB	33.7	C		SB Left	320	49	55	238			D
					SB Through	0	0	0	0			A
					SB Right	158	2	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	2.5	A		WB Left	0	0	0	0			A
					WB Through	780	3	4	121			A
					WB Right	335	2	1	139			A
50- MD 190 at Burdette Rd												
50	NB	73.3	E	NB Left	20	80	15	118	E	13.3	B	
				NB Through	4	59	15	118	E			
				NB Right	11	67	15	118	E			
	SB	34.6	C		SB Left	50	79	31	150			E
					SB Through	17	64	31	150			E
					SB Right	120	12	31	150			B
	EB	10.5	B		EB Left	52	94	61	605			F
					EB Through	1818	8	60	604			A
					EB Right	15	3	53	628			A
	WB	12.7	B		WB Left	1	106	62	840			F
					WB Through	1498	13	64	841			B
					WB Right	21	2	57	853			A

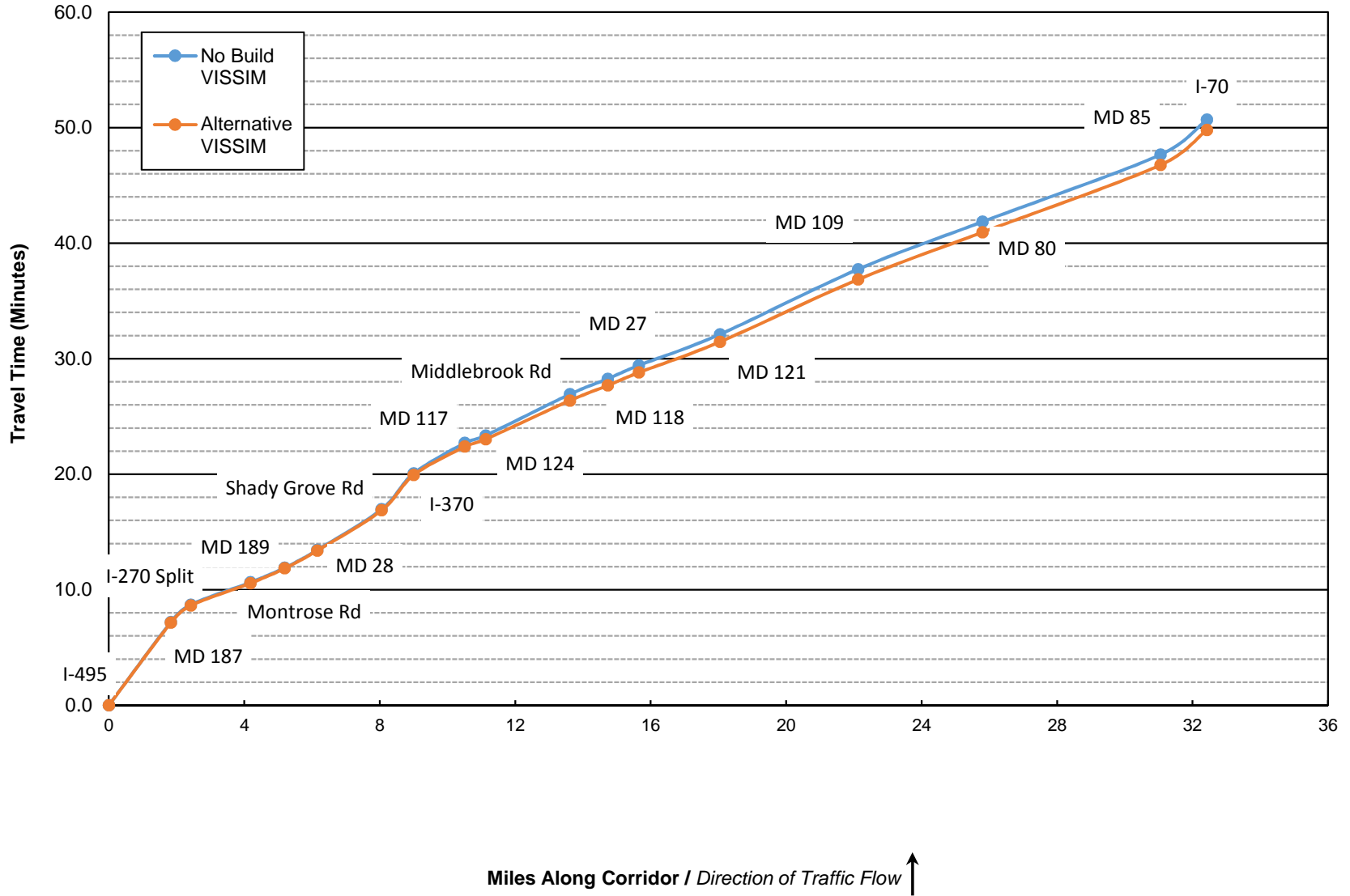
Table C.15: AM Peak -2040 Adaptive Ramp Metering - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
51- MD 190 at I-270 NB on ramp											
51	NB			NB Left	0	0	0	0	A	57.5	E
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	136.0	F	EB Left	526	136	384	691	F		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	16.0	B	WB Left	0	0	0	0	A		
				WB Through	994	16	76	735	B		
				WB Right	0	0	0	0	A		
52- MD 190 at I-270 SB off ramp											
52	NB	78.5	E	NB Left	256	79	535	2926	E	16.1	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	7.0	A	EB Left	0	0	0	0	A		
				EB Through	981	7	23	279	A		
				EB Right	0	0	0	0	A		
	WB	5.4	A	WB Left	0	0	0	0	A		
				WB Through	667	5	7	158	A		
				WB Right	0	0	0	0	A		
53- MD 190 at Seven Locks Rd											
53	NB	68.2	E	NB Left	21	67	23	149	E	44.4	D
				NB Through	59	69	25	148	E		
				NB Right	0	0	0	0	A		
	SB	56.8	E	SB Left	624	56	184	777	E		
				SB Through	183	59	185	778	E		
				SB Right	18	54	184	777	D		
	EB	37.5	D	EB Left	24	31	135	584	C		
				EB Through	846	38	135	584	D		
				EB Right	42	42	135	584	D		
	WB	38.0	D	WB Left	121	115	116	378	F		
				WB Through	637	33	119	380	C		
				WB Right	160	1	8	133	A		
54- MD 124 at I-270 NB off ramp											
54	NB	40.4	D	NB Left	0	0	0	0	A	28.8	C
				NB Through	0	0	0	0	A		
				NB Right	775	40	108	486	D		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	19.1	B	EB Left	0	0	0	0	A		
				EB Through	921	19	47	423	B		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
55- Democracy Blvd at I-270 NB off ramp											
55	NB	36.3	D	NB Left	0	0	0	0	A	16.3	B
				NB Through	0	0	0	0	A		
				NB Right	964	36	116	538	D		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	4.6	A	EB Left	0	0	0	0	A		
				EB Through	1641	5	18	95	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
56- Watkins Mill Rd at I-270 SB off ramp/Parkview Ave											
56	NB	703.8	F	NB Left	47	190	645	735	F	164.0	F
				NB Through	0	0	0	0	A		
				NB Right	79	1009	645	735	F		
	SB	75.7	E	SB Left	530	105	640	2837	F		
				SB Through	130	96	640	2837	F		
				SB Right	434	34	640	2837	C		
	EB	443.1	F	EB Left	0	0	0	0	A		
				EB Through	520	443	1149	1240	F		
				EB Right	3	398	1149	1240	F		
	WB	41.1	D	WB Left	126	83	122	478	F		
				WB Through	829	35	120	477	C		
				WB Right	0	0	0	0	A		
57- Watkins Mill Rd at I-270 NB on ramp											
57	NB	33.5	C	NB Left	414	45	93	413	D	66.0	E
				NB Through	0	0	0	0	A		
				NB Right	511	24	93	413	C		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	21.0	C	EB Left	192	66	54	306	E		
				EB Through	742	9	54	306	A		
				EB Right	0	0	0	0	A		
	WB	124.3	F	WB Left	0	0	0	0	A		
				WB Through	1045	133	612	865	F		
				WB Right	192	75	612	865	E		
58- Watkins Mill Rd at I-270 SB on ramp											
58	NB			NB Left	0	0	0	0	A	54.8	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	74.5	E	EB Left	0	0	0	0	A		
				EB Through	190	288	488	625	F		
				EB Right	928	31	488	625	C		
	WB	39.7	D	WB Left	955	2	228	509	A		
				WB Through	498	111	228	509	F		
				WB Right	0	0	0	0	A		

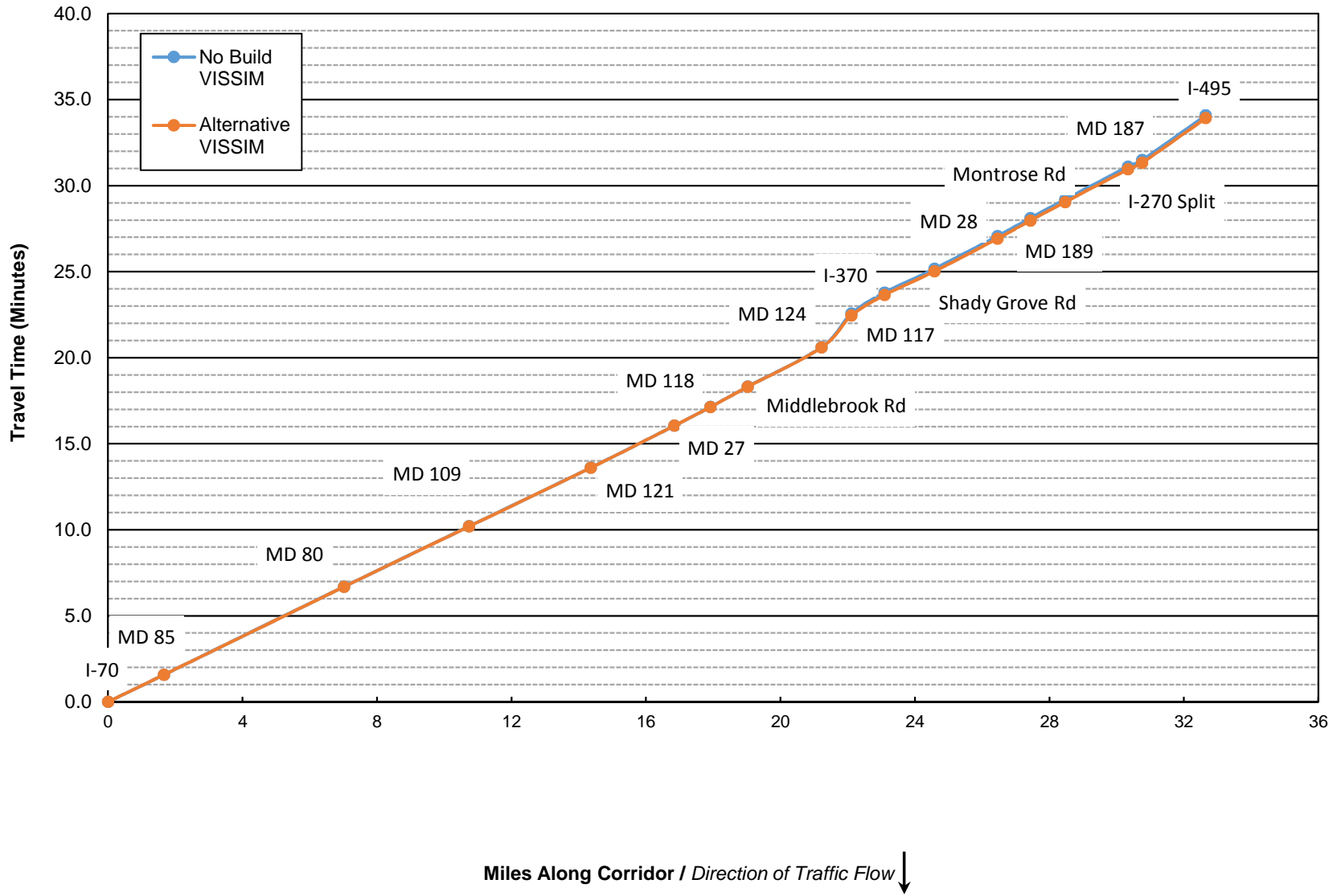
Table C.16: AM Peak - 2040 Adaptive Ramp Metering - I-270 Vehicle Network Performance

	No Build	ARM	% Change
Total Delay	35,032,576	24,961,667	-29%
Average Delay per Vehicle	326	233	-29%
Total Travel Time	64,317,886	55,856,620	-13%
Vehicles (Arrived)	87,894	91,423	4%
Latent Demand	44,530	46,296	4%
Latent Delay	120,600,723	129,765,371	8%
Total Distance	463,125	487,947	5%
Average Speed	26	31	21%

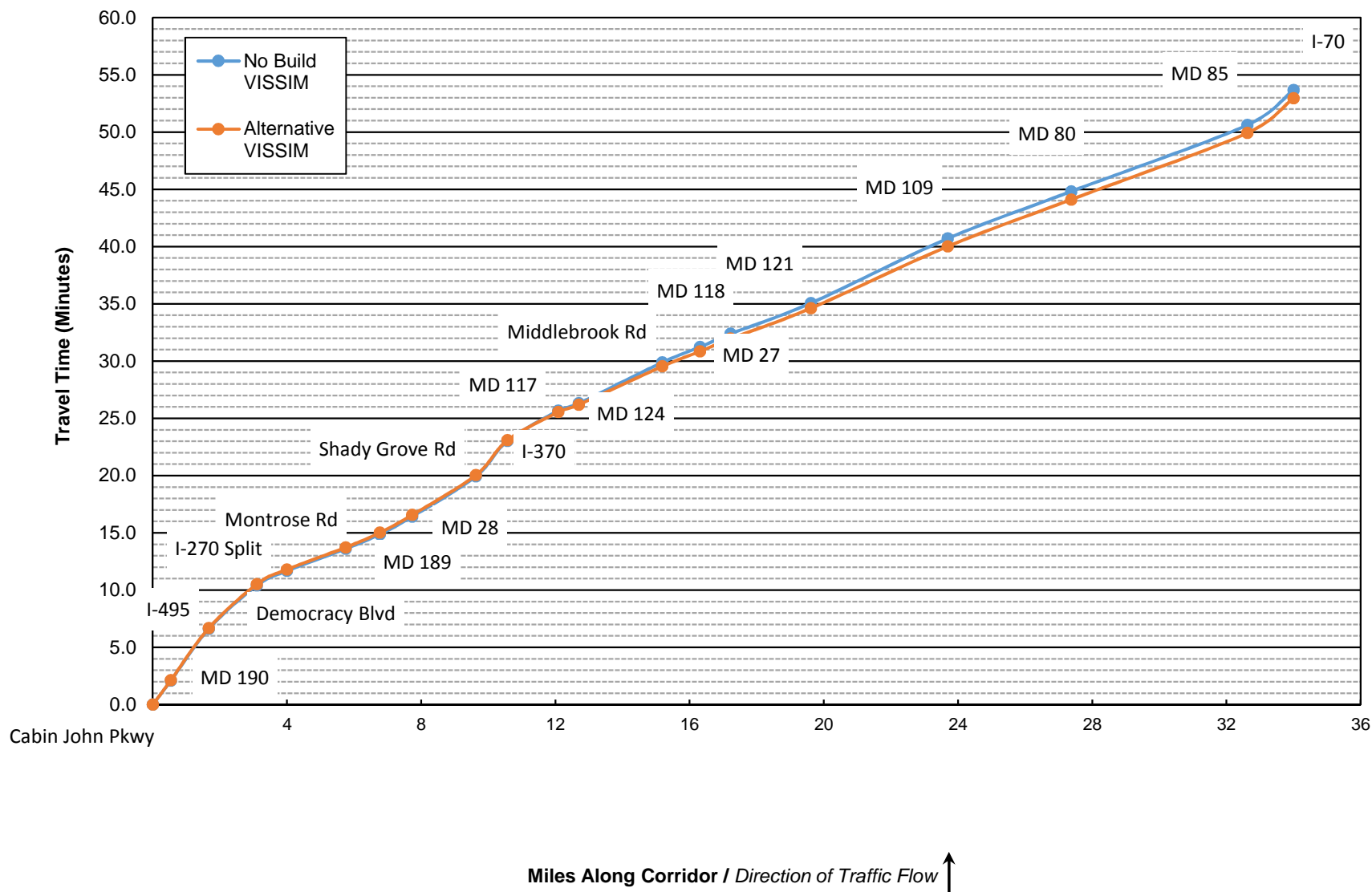
**Figure D.1: PM Peak - 2040 Adaptive Ramp Metering
I-270 Travel Time Graph - Northbound**



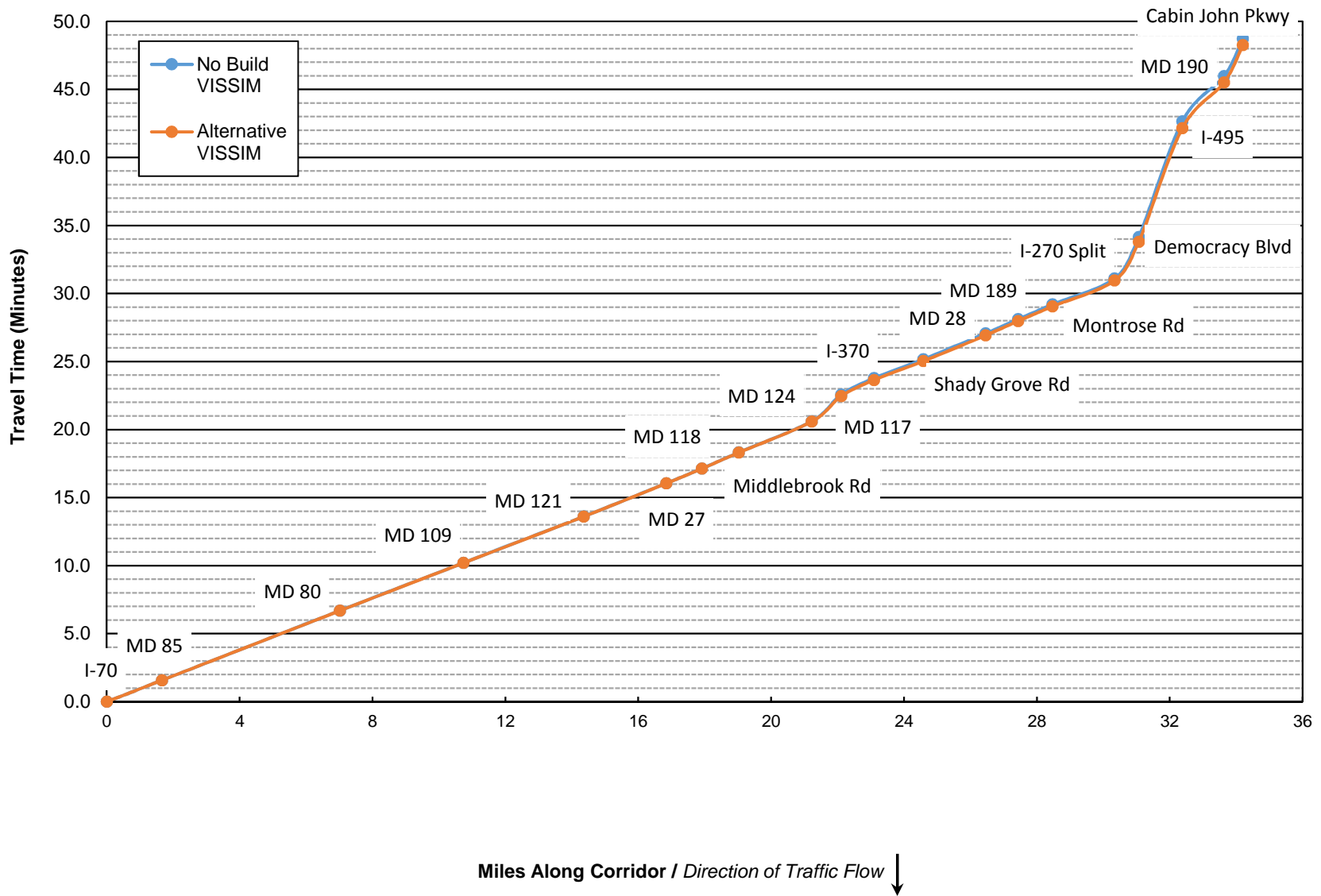
**Figure D.2: PM Peak - 2040 Adaptive Ramp Metering
I-270 Travel Time Graph - Southbound**



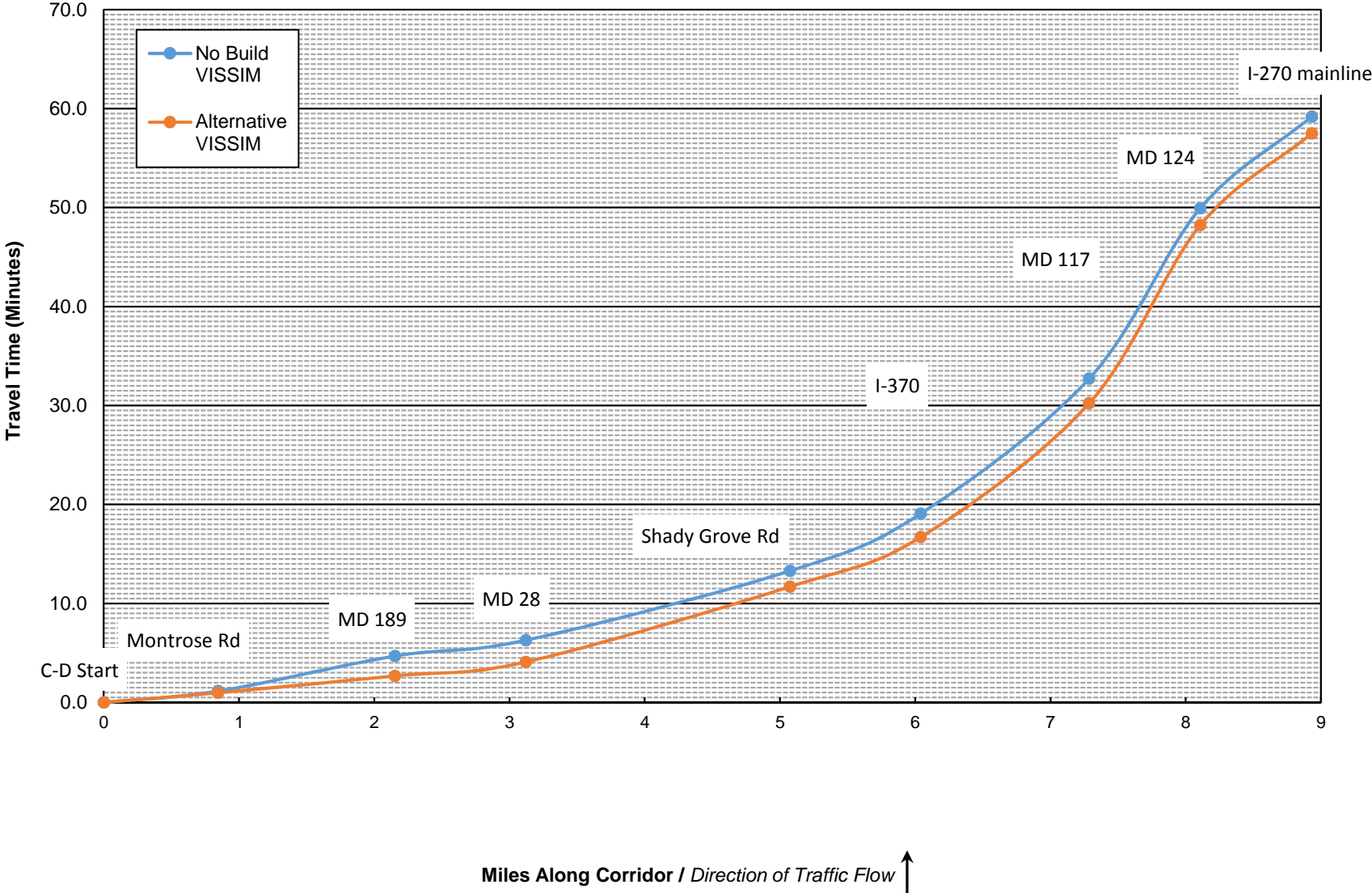
**Figure D.3: PM Peak - 2040 Adaptive Ramp Metering
I-270 Spur Travel Time Graph - Northbound**



**Figure D.4: PM Peak - 2040 Adaptive Ramp Metering
I-270 Spur Travel Time Graph - Southbound**



**Figure D.5: PM Peak - 2040 Adaptive Ramp Metering
I-270 Local Travel Time Graph - Northbound**



**Figure D.6: PM Peak - 2040 Adaptive Ramp Metering
I-270 Local Travel Time Graph - Southbound**

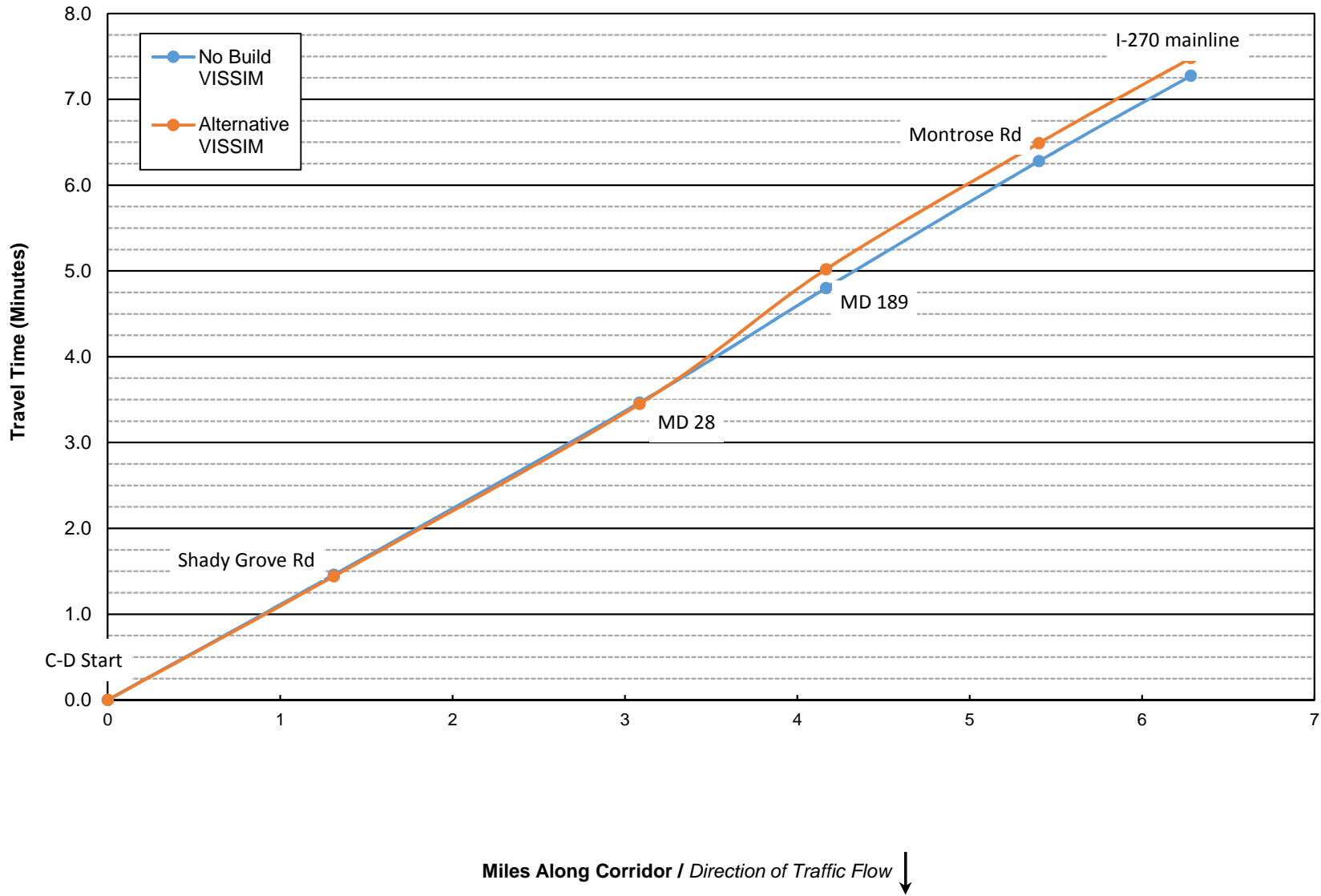


Table D.1: PM Peak - 2040 Adaptive Ramp Metering- I-270 Vehicle Travel Time

I-270 Northbound	Segment Length (miles)	No Build VISSIM Travel Time (seconds)	ARM VISSIM Travel Time (seconds)	% Change	I-270 Southbound	Segment Length (miles)	No Build VISSIM Travel Time (seconds)	ARM VISSIM Travel Time (seconds)	% Change
From I-495 interchange					From I-70				
to MD 187	1.8	432.3	428.6	-0.8%	to MD 85	1.7	94.6	94.6	0.0%
to I-270 Split	0.6	90.3	89.8	-0.6%	to MD 80	5.4	307.1	306.6	0.1%
to Montrose Rd	1.8	115.8	115.7	-0.1%	to MD 109	3.7	210.7	210.8	0.0%
to MD 189	1.0	76.0	77.2	1.5%	to MD 121	3.6	204.4	204.4	0.0%
to MD 28	1.0	92.5	92.6	0.1%	to MD 27	2.5	146.4	146.4	0.0%
to Shady Grove Rd	1.9	211.0	208.6	-1.1%	to MD 118	1.1	65.1	65.1	0.0%
to I-370	0.9	185.6	183.0	-1.4%	to Middlebrook Rd	1.1	71.2	70.7	0.7%
to MD 117	1.5	158.7	147.7	-6.9%	to MD 124	2.2	137.5	137.0	0.4%
to MD 124	0.6	38.8	38.8	0.1%	to MD 117	0.9	117.3	111.5	5.0%
to Middlebrook Rd	2.5	214.3	200.6	-6.4%	to I-370	1.0	72.5	71.5	1.4%
to MD 118	1.1	80.3	78.3	-2.6%	to Shady Grove Rd	1.5	83.4	83.1	0.4%
to MD 27	0.9	69.9	67.4	-3.5%	to MD 28	1.9	114.1	113.8	0.2%
to MD 121	2.4	161.1	159.1	-1.3%	to MD 189	1.0	62.7	62.7	0.0%
to MD 109	4.1	337.8	323.7	-4.2%	to Montrose Rd	1.0	64.8	64.6	0.2%
to MD 80	3.7	247.0	245.7	-0.5%	to I-270 Split	1.9	114.7	114.2	0.5%
to MD 85	5.3	348.1	348.8	0.2%	to MD 187	0.4	23.0	22.9	0.4%
to I-70	1.4	182.3	181.7	-0.4%	to I-495 interchange	1.9	155.6	155.4	0.2%
I-270 Total (miles/minutes)	32.4	50.7	49.8	-1.8%	I-270 Total (miles/minutes)	32.6	34.1	33.9	0.5%
I-270 Spur Northbound					I-270 Spur Southbound				
From Cabin John Pkwy					From I-70				
to MD 190	0.5	125.4	127.8	1.8%	to I-270 Split	30.3	1,866.3	1,856.9	-0.5%
to I-495	1.1	271.9	273.9	0.7%	to Democracy Blvd	0.7	183.2	171.4	-6.5%
to Democracy Blvd	1.4	226.8	229.8	1.4%	to I-495	1.3	509.9	501.0	-1.7%
to I-270 Split	0.9	76.4	76.6	0.3%	to MD 190	1.3	199.4	201.2	0.9%
to I-70	30.0	2,519.1	2,468.8	-2.0%	to Cabin John Pkwy	0.6	164.4	164.9	0.3%
I-270 Spur Total (miles/minutes)	34.0	53.7	52.9	-1.3%	I-270 Spur Total (miles/minutes)	34.2	48.7	48.3	-1.0%

Table D.2: PM Peak - 2040 Adaptive Ramp Metering- I-270 Local Vehicle Travel Time

I-270 Northbound	Segment Length (miles)	No Build VISSIM Travel Time (seconds)	ARM VISSIM Travel Time (seconds)	% Change	I-270 Southbound	Segment Length (miles)	No Build VISSIM Travel Time (seconds)	ARM VISSIM Travel Time (seconds)	% Change
From C-D start					From C-D start				
to Montrose Rd	0.8	68.8	58.6	-14.8%	to Shady Grove	1.3	87.5	86.5	-1.2%
to MD 189	1.3	212.1	102.4	-51.7%	to MD 28	1.8	120.3	120.5	0.2%
to MD 28	1.0	96.2	84.6	-12.1%	to MD 189	1.1	80.2	94.1	17.4%
to Shady Grove	2.0	420.6	456.3	8.5%	to Montrose	1.2	88.8	88.3	-0.5%
to I-370	1.0	346.7	300.7	-13.3%	to I-270 mainline	0.9	59.7	59.5	-0.4%
to MD 117	1.2	819.0	811.3	-0.9%					
to MD 124	0.8	1,033.2	1,079.9	4.5%					
to I-270 mainline	0.8	555.0	556.3	0.2%					
I-270 Local Total (miles/minutes)	8.9	59.2	57.5	-2.9%	I-270 Local Total (miles/minutes)	6.3	7.3	7.5	2.8%

Table D.3: PM Peak -2040 Adaptive Ramp Metering- I-270 Vehicle Speed

I-270 Northbound	Cumulative Length (miles)	No Build VISSIM Speed (MPH)	ARM VISSIM Speed (MPH)	% Change	I-270 Southbound	No Build VISSIM Speed (MPH)	ARM VISSIM Speed (MPH)	% Change	
From I-495 interchange	0.0				From I-70				
to MD 187	1.8	15.3	15.4	0.9%	to MD 85	63.3	63.3	0.0%	
to I-270 Split	2.4	23.6	23.7	0.6%	to MD 80	62.8	62.9	0.1%	
to Montrose Rd	4.2	54.5	54.6	0.1%	to MD 109	63.6	63.6	0.0%	
to MD 189	5.2	48.0	47.3	-1.5%	to MD 121	63.8	63.8	0.0%	
to MD 28	6.2	37.5	37.5	-0.1%	to MD 27	61.1	61.1	0.0%	
to Shady Grove Rd	8.1	32.4	32.8	1.2%	to MD 118	59.3	59.3	0.0%	
to I-370	9.0	18.3	18.6	1.4%	to Middlebrook Rd	56.2	56.6	0.7%	
to MD 117	10.5	34.4	36.9	7.4%	to MD 124	57.5	57.7	0.4%	
to MD 124	11.1	56.9	56.9	-0.1%	to MD 117	27.2	28.6	5.3%	
to Middlebrook Rd	13.6	41.8	44.6	6.8%	to I-370	48.9	49.6	1.4%	
to MD 118	14.7	50.2	51.6	2.6%	to Shady Grove Rd	64.2	64.5	0.4%	
to MD 27	15.7	47.2	48.9	3.6%	to MD 28	59.1	59.2	0.2%	
to MD 121	18.0	53.5	54.2	1.3%	to MD 189	56.2	56.2	0.0%	
to MD 109	22.1	43.5	45.3	4.4%	to Montrose Rd	57.4	57.5	0.2%	
to MD 80	25.8	53.6	53.9	0.5%	to I-270 Split	58.7	59.0	0.5%	
to MD 85	31.1	54.3	54.2	-0.2%	to MD 187	65.7	66.0	0.4%	
to I-70	32.4	27.1	27.2	0.4%	to I-495 interchange	43.7	43.8	0.2%	
I-270 Total (miles/minutes)		38.4	39.1	1.8%	I-270 Total (miles/minutes)	57.5	57.8	0.5%	
I-270 Spur Northbound					I-270 Spur Southbound				
From Cabin John Pkwy	0.0				From I-70				
to MD 190	0.5	15.5	15.2	-1.8%	to I-270 Split	58.5	58.8	0.5%	
to I-495	1.7	15.0	14.9	-0.7%	to Democracy Blvd	14.4	15.4	6.9%	
to Democracy Blvd	3.1	22.8	22.5	-1.3%	to I-495	9.3	9.4	1.8%	
to I-270 Split	4.0	42.0	41.9	-0.3%	to MD 190	22.6	22.4	-0.9%	
to I-70	34.0	42.9	43.7	2.0%	to Cabin John Pkwy	12.5	12.4	-0.3%	
I-270 Spur Total (miles/minutes)		38.0	38.5	1.3%	I-270 Spur Total (miles/minutes)	42.1	42.5	1.0%	

Table D.4: PM Peak -2040 Adaptive Ramp Metering- I-270 Local Vehicle Speed

I-270 Northbound	No Build VISSIM Speed (MPH)	ARM VISSIM Speed (MPH)	% Change	I-270 Southbound	No Build VISSIM Speed (MPH)	ARM VISSIM Speed (MPH)	% Change
From C-D start				From C-D start			
to Montrose Rd	44.2	51.9	17.4%	to Shady Grove	53.9	54.6	1.2%
to MD 189	22.2	46.0	107.2%	to MD 28	53.1	53.0	-0.2%
to MD 28	36.2	41.2	13.7%	to MD 189	48.6	41.4	-14.8%
to Shady Grove	16.7	15.4	-7.8%	to Montrose	50.1	50.4	0.5%
to I-370	10.0	11.6	15.3%	to I-270 mainline	53.2	53.4	0.4%
to MD 117	5.5	5.5	1.0%				
to MD 124	2.9	2.7	-4.3%				
to I-270 mainline	5.3	5.3	-0.2%				
I-270 Local Total (miles/minutes)	9.1	9.3	2.9%	I-270 Local Total (miles/minutes)	51.8	50.4	-2.8%

Table D.5: PM Peak - 2040 Adaptive Ramp Metering- I-270 Vehicle Density

I-270 Northbound	Type	No Build		ARM		% Change	I-270 Southbound	Type	No Build		ARM		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS			
I-270	Freeway	91	F	91	F	0%	I-270	Freeway	19	C	19	C	0%
I-270 Diverge to MD 187	Diverge	77	F	76	F	0%	I-270 Merge from WB I-70	Merge	17	B	17	B	0%
I-270	Freeway	84	F	84	F	-1%	I-270	Freeway	24	C	24	C	0%
I-270 Diverge to Rockledge Rd	Diverge	77	F	77	F	0%	I-270 Merge from EB I-70	Merge	16	B	16	B	0%
I-270	Freeway	85	F	85	F	0%	I-270	Freeway	22	C	22	C	0%
I-270 Weave from MD 187 to I-270 HOV	Weave	57	F	57	F	1%	I-270 Diverge to SB MD 85	Diverge	23	C	23	C	1%
I-270 Lane Drop	Merge	65	F	64	F	-1%	I-270	Freeway	24	C	24	C	0%
I-270	Freeway	51	F	51	F	1%	I-270 Diverge to NB MD 85	Diverge	15	B	15	B	0%
I-270 Merge from I-270 Spur	Merge	37	E	38	E	2%	I-270	Freeway	19	C	19	C	0%
I-270 Weave from I-270 HOV to I-270 C-D	Weave	34	D	33	D	-1%	I-270 Merge from MD 85	Merge	20	C	20	B	-1%
I-270	Freeway	34	D	33	D	-3%	I-270	Freeway	25	C	25	C	0%
I-270 Diverge to C-D (MD 189)	Diverge	46	F	43	F	-6%	I-270 Diverge to MD 80	Diverge	17	B	17	B	0%
I-270	Freeway	46	F	44	E	-4%	I-270	Freeway	20	C	20	C	1%
I-270 Diverge to C-D (MD 28)	Diverge	62	F	59	F	-3%	I-270 Merge from MD 80	Merge	14	B	14	B	-2%
I-270	Freeway	55	F	52	F	-4%	I-270	Freeway	23	C	23	C	0%
I-270 Merge from C-D (MD 189)	Merge	72	F	71	F	-2%	I-270 Diverge to MD 109	Diverge	12	B	12	B	1%
I-270 Diverge to C-D (Shady Grove Rd)	Diverge	77	F	75	F	-3%	I-270	Freeway	22	C	22	C	0%
I-270	Freeway	65	F	64	F	-2%	I-270 Merge from MD 109	Merge	13	B	14	B	3%
I-270 Weave from C-D (MD 28) to C-D (Shady Grove Rd)	Weave	90	F	89	F	-1%	I-270	Freeway	24	C	24	C	0%
I-270	Freeway	90	F	87	F	-3%	I-270 Diverge to SB Weigh Station	Diverge	12	B	12	B	1%
I-270 Merge from C-D (Shady Grove Rd)	Merge	124	F	124	F	1%	I-270	Freeway	24	C	24	C	0%
I-270	Freeway	88	F	88	F	-1%	I-270 Merge from SB Weigh Station	Merge	12	B	12	B	1%
I-270 Merge from C-D (I-370)	Merge	155	F	153	F	-1%	I-270	Freeway	23	C	23	C	0%
I-270 Diverge to C-D (MD 117)	Diverge	159	F	157	F	-2%	I-270 Diverge to MD 121	Diverge	9	A	9	A	0%
I-270	Freeway	21	C	19	C	-11%	I-270	Freeway	12	B	12	B	0%
I-270 Merge from C-D (MD 124)	Merge	47	F	46	F	-4%	I-270 Merge from WB MD 121	Merge	10	B	10	B	1%
I-270	Freeway	27	D	27	D	-1%	I-270	Freeway	15	B	15	B	0%
I-270 Diverge to EB Middlebrook Rd	Diverge	20	B	20	B	-1%	I-270 Merge from EB MD 121	Merge	13	B	13	B	0%
I-270	Freeway	25	C	25	C	-1%	I-270	Freeway	20	C	20	C	0%
I-270 Diverge to WB Middlebrook Rd	Diverge	20	C	20	B	-3%	I-270 Diverge to MD 27	Diverge	13	B	13	B	0%
I-270	Freeway	22	C	22	C	1%	I-270	Freeway	16	B	17	B	0%
I-270 Diverge to EB MD 118	Diverge	17	B	19	B	7%	I-270 Merge from WB MD 27	Merge	14	B	14	B	0%
I-270 Diverge to WB MD 118	Diverge	31	D	28	D	-8%	I-270	Freeway	20	C	20	C	0%
I-270	Freeway	27	D	26	C	-5%	I-270 Weave from EB MD 27 to MD 118	Weave	15	B	15	B	0%
I-270 Weave from MD 118 to MD 27	Weave	36	E	32	D	-11%	I-270	Freeway	19	C	19	C	0%
I-270	Freeway	25	C	25	C	-1%	I-270 Merge from WB MD 118	Merge	15	B	15	B	-2%
I-270 Merge from EB MD 27	Merge	36	E	32	D	-11%	I-270	Freeway	22	C	22	C	-1%
I-270	Freeway	26	C	25	C	-2%	I-270 Merge from EB MD 118	Merge	18	B	18	B	0%
I-270 Merge from WB MD 27	Merge	22	C	21	C	-3%	I-270	Freeway	28	D	28	D	-1%
I-270	Freeway	28	D	28	D	-1%	I-270 Merge from Middlebrook Rd	Merge	30	D	30	D	0%
I-270 Diverge to MD 121	Diverge	22	C	21	C	-1%	I-270 Diverge to Watkins Mill Rd	Diverge	24	C	24	C	1%

Table D.5: PM Peak - 2040 Adaptive Ramp Metering - I-270 Vehicle Density

I-270 Northbound	Type	No Build		ARM		% Change	I-270 Southbound	Type	No Build		ARM		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS			
I-270	Freeway	22	C	20	C	-10%	I-270	Freeway	19	C	19	C	0%
I-270 Merge from EB MD 121	Merge	35	E	30	D	-16%	I-270 Diverge to MD 124	Diverge	17	B	16	B	-2%
I-270 Lane Drop	Merge	78	F	67	F	-15%	I-270	Freeway	14	B	14	B	0%
I-270	Freeway	37	E	36	E	-3%	I-270 Merge from Watkins Mill	Merge	17	B	16	B	-2%
I-270 Diverge to NB Weigh Station	Diverge	18	B	18	B	0%	I-270	Freeway	58	F	56	F	-3%
I-270	Freeway	36	E	36	E	0%	I-270 Merge from WB MD 124	Merge	96	F	92	F	-4%
I-270 Merge from NB Weight Station	Merge	18	B	18	B	3%	I-270	Freeway	0	A	0	A	-
I-270	Freeway	38	E	37	E	0%	I-270 Merge from MD 117	Merge	39	E	40	E	2%
I-270 Diverge to MD 109	Diverge	22	C	22	C	-1%	I-270	Freeway	28	D	28	D	1%
I-270	Freeway	34	D	33	D	-1%	I-270 Diverge to I-370	Diverge	22	C	21	C	-1%
I-270 Merge from MD 109	Merge	19	B	19	B	0%	I-270	Freeway	18	B	18	B	-1%
I-270	Freeway	36	E	36	E	-1%	I-270 Diverge to I-270 C-D	Diverge	14	B	14	B	-1%
I-270 Diverge to MD 80	Diverge	27	C	26	C	-3%	I-270	Freeway	14	B	14	B	0%
I-270	Freeway	30	D	30	D	0%	I-270 Merge from I-270 (I-370)	Merge	21	C	21	C	0%
I-270 Merge from MD 80	Merge	18	B	18	B	2%	I-270 Diverge to I-270 C-D (Shady Grove Rd)	Diverge	23	C	23	C	0%
I-270	Freeway	36	E	36	E	0%	I-270	Freeway	19	C	19	C	0%
I-270 Diverge to Scenic View	Diverge	19	B	19	B	-1%	I-270 Merge from I-270 C-D (Shady Grove Rd Northern)	Merge	18	B	18	B	-1%
I-270	Freeway	36	E	36	E	0%	I-270	Freeway	23	C	23	C	0%
I-270 Merge from Scenic View	Merge	18	B	18	B	-1%	I-270 Merge from I-270 C-D (Shady Grove Rd Southern)	Merge	18	B	18	B	0%
I-270	Freeway	36	E	36	E	0%	I-270 Diverge to I-270 C-D (MD 189)	Diverge	25	C	25	C	0%
I-270 Diverge to NB MD 85	Diverge	20	C	20	C	2%	I-270	Freeway	21	C	21	C	0%
I-270	Freeway	34	D	34	D	0%	I-270 Merge from I-270 C-D (MD 189)	Merge	20	C	20	C	-1%
I-270 Diverge to SB MD 85	Diverge	20	C	20	C	0%	I-270	Freeway	26	C	26	C	0%
I-270	Freeway	30	D	30	D	0%	I-270 Merge from I-270 C-D	Merge	25	C	24	C	-6%
I-270 Weave from MD 85 to I-70	Weave	22	C	22	C	-1%	I-270 Diverge to I-270 HOV Lane	Diverge	17	B	17	B	-2%
I-270	Freeway	64	F	64	F	0%	I-270 Diverge to I-270 Spur	Diverge	38	E	36	E	-5%
							I-270	Freeway	13	B	13	B	-1%
							I-270 Diverge to Rockledge Dr / MD 187	Diverge	9	A	9	A	-2%
							I-270	Freeway	13	B	13	B	-1%
							I-270 Merge from Rockledge Dr	Merge	11	B	11	B	0%
							I-270	Freeway	16	B	16	B	0%
							I-270 Merge from Rockledge Dr / MD 187	Merge	14	B	14	B	0%
							I-270	Freeway	35	E	35	E	0%

Table D.6: PM Peak - 2040 Adaptive Ramp Metering- I-270 Spur Vehicle Density

I-270 Spur Northbound	Type	No Build		ARM		% Change	I-270 Southbound	Type	No Build		ARM		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS			
I-270 Spur	Freeway	62	F	63	F	1%	I-270 Spur	Freeway	72	F	67	F	-6%
I-270 Spur Merge from Clara Barton Parkway	Merge	64	F	64	F	0%	I-270 Spur Weave from I-270 HOV to Democracy Blvd	Weave	94	F	89	F	-5%
I-270 Spur	Freeway	78	F	78	F	1%	I-270 Spur	Freeway	108	F	105	F	-2%
I-270 Diverge to MD 190	Diverge	49	F	49	F	-1%	I-270 Merge from Democracy Blvd	Merge	152	F	146	F	-5%
I-270 Spur	Freeway	89	F	90	F	1%	I-270 Spur Lane Drop	Merge	144	F	140	F	-2%
I-270 Spur Merge from Cabin John Parkway	Merge	105	F	107	F	1%	I-270 Spur	Freeway	125	F	125	F	0%
I-270 Spur Merge from MD 190	Merge	97	F	97	F	0%	I-270 Spur Merge from I-495	Merge	124	F	124	F	0%
I-270 Spur	Freeway	84	F	84	F	0%	I-270 Spur	Freeway	49	F	49	F	1%
I-270 Spur Diverge to I-495	Merge	66	F	67	F	1%	I-270 Spur Diverve to EB MD 190	Diverge	50	F	50	F	1%
I-270 Spur	Freeway	45	F	46	F	2%	I-270 Spur Diverve to Cabin John Pkwy	Diverge	67	F	68	F	1%
I-270 Spur Diverge to Democracy Blvd	Diverge	50	F	51	F	2%	I-270 Spur	Freeway	95	F	95	F	0%
I-270 Spur	Freeway	58	F	59	F	1%	I-270 Merge from MD 190	Merge	120	F	119	F	-1%
I-270 Spur Merge from EB Democracy Blvd	Merge	97	F	98	F	1%	I-270 Spur	Freeway	93	F	94	F	0%
I-270 Spur	Freeway	58	F	58	F	1%	I-270 Diverge to WB Clara Barton Pkwy	Diverge	60	F	61	F	0%
I-270 Spur Merge from WB Democracy Blvd	Merge	65	F	66	F	1%	I-270 Spur	Freeway	83	F	83	F	0%
I-270 Spur	Freeway	39	E	38	E	-1%	I-270 Merge from Clara Barton Pkwy	Merge	77	F	77	F	0%
I-270 Spur Merge from Westlake Terrace	Merge	31	D	31	D	0%							
I-270 Spur	Freeway	34	D	34	D	0%							

Table D.7: PM Peak -2040 Adaptive Ramp Metering - I-270 Local Vehicle Density

I-270 Northbound	Type	No Build		ARM		% Change	I-270 Southbound	Type	No Build		ARM		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS	
I-270 C-D	Freeway	29	D	29	D	0%	I-270 C-D	Freeway	8	A	9	A	2%
I-270 C-D Diverge to EB Montrose Rd	Diverge	21	C	21	C	2%	I-270 C-D Weave from I-370 EB to I-270	Weave	23	B	23	B	-2%
I-270 C-D	Freeway	16	B	16	B	-2%	I-270 C-D Diverge to Shady Grove Rd	Diverge	11	B	11	B	1%
I-270 C-D Weave between Montrose Rd Loop Ramps	Weave	13	B	12	B	-8%	I-270 C-D	Freeway	8	A	8	A	1%
I-270 C-D	Freeway	28	D	17	B	-41%	I-270 C-D Merge from WB Shady Grove Rd	Merge	8	A	8	A	-3%
I-270 C-D Merge from WB Montrose Rd	Merge	83	F	23	C	-73%	I-270 C-D	Freeway	14	B	13	B	-2%
I-270 C-D	Freeway	67	F	33	D	-51%	I-270 C-D Merge from EB Shady Grove Rd	Merge	10	A	10	A	-1%
I-270 C-D Merge from I-270	Merge	42	F	17	B	-59%	I-270 C-D	Freeway	19	C	19	C	-1%
I-270 C-D	Freeway	65	F	37	E	-44%	I-270 C-D Merge from I-270	Merge	18	B	19	B	6%
I-270 C-D Diverge to MD 189	Diverge	43	F	23	C	-47%	I-270 C-D Diverge to I-270	Diverge	25	C	25	C	0%
I-270 C-D	Freeway	91	F	39	E	-57%	I-270 C-D Diverge to I-270	Diverge	17	B	17	B	0%
I-270 C-D Merge from MD 189	Merge	112	F	57	F	-49%	I-270 C-D	Freeway	16	B	16	B	0%
I-270 C-D	Freeway	62	F	54	F	-12%	I-270 C-D Diverge to MD 28	Diverge	11	B	11	B	1%
I-270 C-D Weave between I-270 (to MD 28 from MD 189)	Weave	63	F	57	F	-10%	I-270 C-D	Freeway	11	A	11	A	0%
I-270 C-D	Freeway	42	E	39	E	-8%	I-270 C-D Merge from WB MD 28	Merge	12	B	13	B	6%
I-270 C-D Diverge to MD 28	Diverge	18	B	18	B	2%	I-270 C-D	Freeway	14	B	14	B	0%
I-270 C-D	Freeway	28	D	28	D	-1%	I-270 C-D Merge from EB MD 28	Merge	26	C	36	E	41%
I-270 C-D Weave between MD 28 Ramps	Weave	28	C	26	C	-6%	I-270 C-D	Freeway	32	D	43	E	37%
I-270 C-D	Freeway	26	D	21	C	-22%	I-270 C-D Merge from I-270	Merge	20	B	30	D	53%
I-270 C-D Merge from MD 28 WB	Merge	28	C	27	C	-2%	I-270 C-D	Freeway	44	E	47	F	5%
I-270 C-D Merge from I-270 and Drop Lane	Merge	34	D	33	D	-2%	I-270 C-D Diverge to MD 189	Diverge	25	C	25	C	0%
I-270 C-D Diverge to I-270	Diverge	61	F	60	F	-3%	I-270 C-D	Freeway	27	D	27	D	0%
I-270 C-D	Freeway	48	F	51	F	7%	I-270 C-D Merge from MD 189	Merge	27	C	26	C	-4%
I-270 C-D Diverge to Shady Grove Rd	Diverge	14	B	14	B	-1%	I-270 C-D Diverge to I-270	Diverge	34	D	34	D	-1%
I-270 C-D	Freeway	130	F	133	F	2%	I-270 C-D	Freeway	24	C	23	C	-3%
I-270 C-D Merge from I-270 and EB Shady Grove Rd	Merge	140	F	143	F	2%	I-270 C-D Diverge to WB Montrose Rd	Diverge	18	B	17	B	-5%
I-270 C-D	Freeway	144	F	144	F	0%	I-270 C-D	Freeway	23	C	21	C	-8%
I-270 C-D Merge from WB Shady Grove Rd	Merge	146	F	142	F	-3%	I-270 Weave between Montrose Rd Loops	Weave	41	F	36	E	-12%
I-270 C-D Diverge to I-270	Diverge	113	F	114	F	1%	I-270 C-D	Freeway	15	B	14	B	-5%
I-270 C-D	Freeway	94	F	89	F	-5%	I-270 C-D Merge from EB Montrose Rd	Merge	9	A	9	A	-3%
I-270 C-D Diverge to I-370	Diverge	64	F	63	F	0%	I-270 C-D	Freeway	18	B	17	B	-4%
I-270 C-D	Freeway	120	F	114	F	-5%							
I-270 Merge from I-370 EB	Merge	129	F	125	F	-3%							
I-270 C-D	Freeway	139	F	137	F	-1%							
I-270 C-D Weave from I-370 to I-270	Weave	134	F	133	F	-1%							
I-270 C-D	Freeway	110	F	111	F	1%							
I-270 C-D Weave from I-270 to MD 117	Weave	114	F	109	F	-4%							
I-270 C-D Diverge to MD 124	Diverge	142	F	142	F	0%							
I-270 C-D	Freeway	178	F	181	F	2%							
I-270 C-D Merge from EB MD 124	Merge	168	F	171	F	2%							
I-270 C-D Merge From WB MD 124	Merge	154	F	155	F	1%							
I-270 C-D	Freeway	144	F	144	F	0%							
I-270 C-D Merge from Watkins Mill	Merge	133	F	141	F	6%							

Table D.8: PM Peak - 2040 Adaptive Ramp Metering- I-270 Vehicle Throughput

I-270 Northbound	No Build VISSIM Throughput	ARM VISSIM Throughput	% Change	I-270 Southbound	No Build VISSIM Throughput	ARM VISSIM Throughput	% Change
Between I-495 and MD 187	4113	4124	0%	North of I-70	2366	2366	0%
Between MD 187 on and off ramps	3710	3722	0%	Between I-70 on ramps	2703	2703	0%
Between Rockledge Blvd on and off ramps	3540	3552	0%	From I-70 interchange to MD-85	4047	4047	0%
Between Rockledge Dr and I-270 Spur	3873	3872	0%	Between MD-85 on and off ramps	2379	2379	0%
Between I-270 Spur and Montrose Rd	8718	8700	0%	Between MD-85 and MD-80	3075	3075	0%
Between Montrose Rd on and off ramps	5582	5641	1%	Between MD-80 on and off ramps	2415	2418	0%
Between Montrose Rd and MD 189	5102	5164	1%	Between MD-80 and Md-109	2866	2864	0%
Between MD 189 and MD 28	5078	5134	1%	Between MD-109 on and off ramps	2767	2764	0%
Between MD 28 on and off ramps	5014	5068	1%	Between MD-109 and MD-121	2935	2938	0%
Between MD 28 and Shady Grove Rd	4214	4243	1%	Between MD-121 on and off ramps	2413	2415	0%
Between Shady Grove Rd and I-370	3243	3289	1%	Between MD-121 and MD-27	3354	3359	0%
Between I-370 on and off ramps	2749	2797	2%	Between MD-27 on and off ramps	3458	3455	0%
Between I-370 and MD 117	2851	2844	0%	Between MD-27 and MD-118	3773	3765	0%
Between MD 117 and MD 124	2432	2380	-2%	Between MD-118 on and off ramps	3719	3710	0%
Between MD-124 on and off ramps	2547	2504	-2%	Between MD-118 and Middlebrook Rd	4384	4375	0%
Between Watkins Mill Rd and Middlebrook Rd	4564	4515	-1%	Between Middlebrook Rd on and off ramps	4382	4370	0%
Between Middlebrook Rd on and off ramps	4337	4299	-1%	Between Middlebrook Rd and MD-124	5462	5476	0%
Between Middlebrook Rd and MD 118	3776	3744	-1%	Between MD-124 on and off ramps	4179	4236	1%
Between MD-118 on and off ramps	3479	3454	-1%	Between MD-124 and MD-117	5347	5420	1%
Between MD 118 and MD 27	3770	3740	-1%	Between MD-117 and I-370	6905	6981	1%
Between MD-27 on and off ramps	2754	2739	-1%	Between I-370 on and off ramps	3456	3474	1%
Between MD 27 and MD 121	3428	3413	0%	Between I-370 on ramp to Shady Grove Rd	4990	5018	1%
Between MD-121 on and off ramps	2299	2294	0%	Between Shady Grove Rd and MD 28	5157	5189	1%
Between MD 121 and MD 109	3931	3915	0%	Between MD 28 on and off ramps	5327	5361	1%
Between MD-109 on and off ramps	3643	3627	0%	Between MD 28 and MD 189	4678	4699	0%
Between MD 109 and MD 80	3831	3818	0%	Between MD 189 and Montrose Rd	4678	4701	0%
Between MD-80 on and off ramps	3186	3188	0%	Between Montrose Rd on and off ramps	5599	5613	0%
Between MD 80 and MD 85	3875	3885	0%	Between Montrose Rd and I-270 Spur	7355	7323	0%
Between MD-85 on and off ramps	3257	3253	0%	Between I-270 Spur and Rockledge Blvd	3320	3305	0%
Between MD 85 and I-70	5239	5229	0%	Between Rockledge Blvd on and off ramps	2542	2534	0%
North of I-70	2739	2733	0%	Between MD 187 on and off ramps	3011	3008	0%
				Between MD 187 and I-495	3393	3389	0%
I-270 Spur Northbound				I-270 Spur Southbound			
Between I-495 and Democracy Blvd	4568	4554	0%	Between I-270 Split and HOV on ramp	3187	3188	0%
Between Democracy Blvd on and off ramps	4101	4095	0%	Between HOV on ramp and Democracy Blvd	2329	2350	1%
Between Democracy Blvd and I-270 Split	4833	4825	0%	Between Democracy Blvd on and off ramps	1856	1871	1%
				Between Democracy Blvd and I-495	2227	2233	0%

Table D.9: PM Peak - 2040 Adaptive Ramp Metering- I-270 Local Vehicle Throughput

I-270 Local Northbound	No Build VISSIM Throughput	ARM VISSIM Throughput	% Change	I-270 Local Southbound	No Build VISSIM Throughput	ARM VISSIM Throughput	% Change
Between Montrose Rd EB off ramp and EB on ramp	1766	1768	0%	Between I-370 on ramp and I-270 off ramp	3064	3074	0%
Between Montrose Rd EB on ramp and WB off ramp	2079	2090	1%	Between I-270 off ramp and Shady Grove off ramp	1525	1532	0%
Between Montrose Rd WB off ramp and on ramp	1811	1834	1%	Between Shady Grove off ramp and Shady Grove WB on ramp	811	817	1%
Between Montrose Rd WB on ramp and I-270 on ramp	3211	3136	-2%	Between Shady Grove WB and EB on ramps	1431	1401	-2%
Between I-270 on ramp and MD 189 off ramp	3392	3377	0%	Between Shady Grove on ramp and I-270 on ramp	1957	1939	-1%
Between MD 189 ramps	2697	2707	0%	Between I-270 on ramp and I-270 off ramp1	2571	2562	0%
Between MD 189 off ramp and I-270 on ramp	3503	3465	-1%	Between I-270 off ramp1 and I-270 off ramp2	1808	1803	0%
Between I-270 on ramp and I-270 off ramp	4032	3983	-1%	Between I-270 off ramp2 and MD 28 off ramp	1648	1645	0%
Between I-270 off ramp and MD 28 EB off ramp	3156	3133	-1%	Between MD 28 off ramp and MD 28 WB on ramp	1153	1151	0%
Between MD 28 EB off ramp to MD 28 EB on ramp	2855	2834	-1%	Between MD 28 WB on ramp and MD 28 EB on ramp	1423	1416	0%
Between MD 28 EB on ramp and MD 28 WB off ramp	2994	2970	-1%	Between MD 28 EB on ramp and I-270 on ramp	2987	2977	0%
Between MD 28 WB off ramp and MD 28 WB on ramp	1879	1873	0%	Between I-270 on ramp and MD 189 off ramp	3660	3651	0%
Between MD 28 WB on ramp and I-270 on ramp	2552	2548	0%	Between MD 189 on and off ramps	2740	2734	0%
Between I-270 on ramp and I-270 off ramp	3027	3016	0%	Between MD 189 on ramp and I-270 off ramp	3316	3284	-1%
Between I-270 off ramp and Shady Grove off ramp	1718	1719	0%	Between I-270 off ramp and Montrose Rd off ramp	2399	2379	-1%
Between Shady Grove off ramp and I-270 on ramp	468	480	3%	Between Montrose Rd off ramp and Montrose Rd WB on ramp	2155	2140	-1%
Between I-270 on ramp and Shady Grove WB on ramp	2182	2186	0%	Between Montrose Rd WB on ramp and EB off ramp	2705	2641	-2%
Between Shady Grove WB on ramp and I-270 off ramp	2671	2658	0%	Between Montrose Rd EB off and on ramps	1525	1467	-4%
Between I-270 off ramp and I-370 off ramp	2310	2324	1%	Between Montrose Rd EB off ramp and I-270	1845	1787	-3%
Between I-370 off ramp and I-370 EB on ramp	529	541	2%				
Between I-370 EB and WB on ramps	896	932	4%				
Between I-370 WB on ramp and I-270 off ramp	1577	1550	-2%				
Between I-270 off ramp and I-270 on ramp	1008	982	-3%				
Between I-270 on ramp and MD 117 off ramp	1386	1339	-3%				
Between MD 117 off ramp and MD 124 off ramp	920	879	-4%				
Between MD 124 off ramp and MD 124 EB on ramp	346	325	-6%				
Between MD 124 EB and WB on ramps	651	638	-2%				
Between MD 124 on ramp I-270	812	818	1%				

Table D.10: PM Peak - 2040 Adaptive Ramp Metering- I-270 On Ramp Queue Length - Northbound

I-270 Northbound	No Build VISSIM Average Queue (feet)	ARM VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	ARM VISSIM Maximum Queue (feet)	% Change
Rockledge Dr on ramp	1	1	51%	192	214	12%
MD 189 C-D on ramp	610	498	-18%	4780	4487	-6%
MD 28 C-D on ramp	994	917	-8%	4333	4294	-1%
Shady Grove Rd C-D on ramp	1762	1988	13%	4090	5040	23%
I-370 C-D on ramp	3386	3289	-3%	5049	5049	0%
MD 124 C-D on ramp	4875	4902	1%	5069	5073	0%
MD 118 on ramp	0	0	-100%	43	0	-100%
MD 27 EB on ramp	0	7	-	0	203	-
MD 27 WB on ramp	0	0	-	0	0	-
MD 121 on ramp	0	0	-	4	0	-100%
MD 109 on ramp	0	0	-	0	0	-
MD 80 on ramp	0	0	-	0	0	-
MD 85 on ramp	0	0	-	0	0	-
I-270 Spur Northbound	No Build VISSIM Average Queue (feet)	ARM VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	ARM VISSIM Maximum Queue (feet)	% Change
Democracy Blvd EB on ramp	0	0	-	9	4	-55%
Democracy Blvd WB on ramp	0	0	-	0	0	-
I-495 Northbound	No Build VISSIM Average Queue (feet)	ARM VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	ARM VISSIM Maximum Queue (feet)	% Change
Cabin John Pkwy on ramp	46	31	-32%	903	788	-13%
MD 190 on ramp	0	0	5%	48	102	112%
I-270 C-D Northbound	No Build VISSIM Average Queue (feet)	ARM VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	ARM VISSIM Maximum Queue (feet)	% Change
Montrose Rd EB on ramp	0	0	-	0	0	-
Montrose Rd WB on ramp	916	3	-100%	2556	261	-90%
I-270 on ramp	0	0	-	0	0	-
MD 189 on ramp	104	50	-52%	1084	1099	1%
I-270 on ramp	1	2	81%	109	98	-10%
MD 28 EB on ramp	0	0	-	0	0	-
MD 28 WB on ramp	38	9	-75%	652	169	-74%
Shady Grove Rd EB on ramp	1396	1544	11%	4077	4087	0%
I-270 on ramp	1555	250	-84%	5058	2441	-52%
Shady Grove Rd WB on ramp	739	676	-9%	1949	1955	0%
I-370 EB on ramp	1319	1207	-9%	2422	2459	2%
I-370 WB on ramp	1606	1655	3%	2548	2583	1%
I-270 on ramp	4357	4242	-3%	5055	5054	0%
MD 124 EB on ramp	1831	1908	4%	2796	2790	0%
MD 124 WB on ramp	98	104	6%	700	695	-1%
Watkins Mill Rd on ramp	2665	2103	-21%	3270	3258	0%

Table D.11: PM Peak - 2040 Adaptive Ramp Metering- I-270 Off Ramp Queue Length - Northbound

I-270 Northbound	No Build VISSIM Average Queue (feet)	ARM VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	ARM VISSIM Maximum Queue (feet)	% Change
MD 187 off ramp NB	39	36	-9%	309	266	-14%
MD 187 off ramp SB	0	0	-	0	0	-
Rockledge Dr off ramp	1	1	27%	88	83	-5%
Tower Oaks Blvd off ramp	37	37	2%	219	232	6%
Montrose Rd off ramp EB	0	0	-	0	0	-
Montrose Rd off ramp WB	0	0	-	0	0	-
MD 189 off ramp WB	26	26	0%	174	141	-19%
MD 189 off ramp EB	0	59	15144%	78	889	1034%
MD 28 off ramp EB	35	35	2%	215	199	-8%
MD 28 off ramp WB	0	0	-	0	0	-
Shady Grove Rd off ramp - Redland Blvd	0	0	-	0	0	-
Shady Grove Rd off ramp WB	40	41	3%	253	237	-6%
Shady Grove Rd off ramp EB	0	0	-	0	0	-
I-370 off ramp WB	8	11	38%	162	229	41%
I-370 off ramp EB	0	0	-	0	0	-
MD 117 off ramp	1835	1042	-43%	2770	2218	-20%
MD 124 off ramp	55	51	-7%	626	646	3%
Watkins Mill Rd off ramp	45	27	-41%	627	405	-35%
Middlebrook Rd EB off ramp	0	0	-	0	0	-
Middlebrook Rd WB off ramp	0	0	-	0	0	-
MD 118 WB off ramp - Seneca Meadows	0	0	-100%	8	0	-100%
MD 118 WB off ramp	0	0	-	0	0	-
MD 118 EB off ramp	0	0	-100%	16	0	-100%
MD 27 off ramp WB	44	47	8%	252	244	-3%
MD 27 off ramp EB	0	0	-	0	0	-
MD 121 off ramp WB	70	72	2%	314	288	-8%
MD 121 off ramp EB	2	0	-100%	94	0	-100%
MD 109 off ramp EB	26	22	-15%	251	207	-17%
MD 109 off ramp WB	0	0	-	0	0	-
MD 80 off ramp EB	21	20	-2%	233	179	-23%
MD 80 off ramp WB	0	0	40%	24	22	-8%
MD 85 NB off ramp	1	0	-89%	53	18	-67%
MD 85 SB off ramp	1	1	-46%	141	101	-28%
I-270 Spur Northbound	No Build VISSIM Average Queue (feet)	ARM VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	ARM VISSIM Maximum Queue (feet)	% Change
Clara Barton Pkwy off ramp EB	0	0	-	0	0	-
Clara Barton Pkwy off ramp WB	0	0	-	0	0	-
MD 190 off ramp EB	0	0	-	0	0	-
MD 190 off ramp WB	5	4	-21%	354	231	-35%
Democracy Blvd off ramp WB	41	42	2%	194	214	10%
Democracy Blvd off ramp EB	17	17	1%	120	130	8%

Table D.12: PM Peak-2040 Adaptive Ramp Metering- I-270 On Ramp Queue Length - Southbound

I-270 Southbound	No Build VISSIM Average Queue (feet)	ARM VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	ARM VISSIM Maximum Queue (feet)	% Change
MD 85 on ramp	0	0	-100%	12	0	-100%
MD 80 on ramp	0	0	-	0	0	-
MD 109 on ramp	0	0	-	0	0	-
MD 121 WB on ramp	0	0	-	0	0	-
MD 121 EB on ramp	0	0	-	0	0	-
MD 27 WB on ramp	0	0	-	0	0	-
MD 27 EB on ramp	0	0	-	0	0	-
MD 118 WB on ramp	0	0	-	0	0	-
MD 118 EB on ramp	0	0	-	0	0	-
Middlebrook Rd on ramp	0	0	-	0	0	-
Watkins Mill Rd on ramp	0	0	-	0	0	-
MD 124 WB on ramp	1368	1257	-8%	3492	3381	-3%
MD 117 on ramp	29	19	-34%	837	596	-29%
I-370 C-D on ramp	0	0	-	0	0	-
Shady Grove Rd C-D on ramp North	0	0	-	0	0	-
Shady Grove Rd C-D on ramp South	0	0	-	0	0	-
MD 189 C-D on ramp	0	0	-	0	0	-
Montrose Rd C-D on ramp	0	0	-	0	0	-
Rockledge Dr on ramp	0	0	-	0	0	-
MD 187 on ramp	0	0	-	0	0	-
I-270 Spur Southbound	No Build VISSIM Average Queue (feet)	ARM VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	ARM VISSIM Maximum Queue (feet)	% Change
Democracy Blvd on ramp	698	601	-14%	1919	1855	-3%
I-495 Southbound	No Build VISSIM Average Queue (feet)	ARM VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	ARM VISSIM Maximum Queue (feet)	% Change
I-270 Spur on ramp	4555	4472	-2%	5065	5066	0%
MD 190 on ramp	184	6	-96%	956	365	-62%
I-270 C-D Southbound	No Build VISSIM Average Queue (feet)	ARM VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	ARM VISSIM Maximum Queue (feet)	% Change
I-270 on ramp	0	0	-100%	10	0	-100%
I-370 on ramp	0	0	-19%	80	62	-22%
Shady Grove Rd WB on ramp	0	0	-	0	0	-
Shady Grove Rd EB on ramp	0	0	-	0	0	-
I-270 on ramp	0	0	-	0	0	-
MD 28 WB on ramp	0	0	-	0	19	-
MD 28 EB on ramp	0	124	29536%	63	974	1438%
I-270 on ramp	0	0	-	0	0	-
MD 189 on ramp	0	0	-	0	36	-
Montrose Rd WB on ramp	1	0	-90%	115	23	-80%
Montrose Rd EB on ramp	0	0	-	0	0	-

Table D.13: PM Peak - 2040 Adaptive Ramp Metering- I-270 Off Ramp Queue Length - Southbound

I-270 Southbound	No Build VISSIM Average Queue (feet)	ARM VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	ARM VISSIM Maximum Queue (feet)	% Change
MD 85 SB off ramp	22	57	163%	383	446	17%
MD 85 NB off ramp	17	22	35%	354	406	15%
MD 80 off ramp	2	2	50%	204	232	14%
MD 109 off ramp WB	1	0	-18%	88	92	5%
MD 109 off ramp EB	0	0	-	0	0	-
MD 121 off ramp EB	217	225	4%	970	956	-1%
MD 121 off ramp WB	0	0	-18%	137	75	-46%
MD 27 off ramp EB	22	23	4%	137	159	16%
MD 27 off ramp WB	1	0	-100%	65	0	-100%
MD 118 off ramp EB	24	23	-2%	142	146	3%
MD 118 off ramp WB	0	0	-100%	23	0	-100%
Watkins Mill Rd off ramp	103	113	10%	384	419	9%
MD 124 off ramp EB	185	180	-3%	731	867	19%
MD 124 off ramp WB	17	19	10%	445	462	4%
I-370 off ramp WB	147	36	-76%	725	500	-31%
I-370 off ramp EB	0	0	-	0	0	-
Shady Grove Rd off ramp - Omega Drive	1	0	-20%	52	52	1%
Shady Grove Rd off ramp	0	0	-	0	0	-
MD 28 off ramp	3	3	16%	149	145	-3%
MD 189 off ramp EB	108	132	22%	433	705	63%
MD 189 off ramp WB	0	0	-	0	0	-
Montrose Rd off ramp WB	0	0	-	0	0	-
Montrose Rd off ramp EB	4	4	6%	337	243	-28%
Rockledge Dr off ramp	155	168	8%	641	650	1%
I-270 Spur Southbound	No Build VISSIM Average Queue (feet)	ARM VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	ARM VISSIM Maximum Queue (feet)	% Change
Democracy Blvd off ramp EB	20	22	5%	136	172	26%
Democracy Blvd off ramp WB	0	0	-	0	0	-
MD 190 off ramp WB	80	94	17%	797	909	14%
MD 190 off ramp EB	0	0	-	0	0	-
Clara Barton Pkwy WB off ramp	0	0	500%	6	12	103%

Table D.14: PM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
1- MD 85 at Sam's Club Drive											
1	NB	60.8	E	NB Left	134	78	463	889	E	115.6	F
				NB Through	570	38	463	889	D		
				NB Right	935	72	443	912	E		
	SB	179.8	F	SB Left	153	131	1021	1231	F		
				SB Through	874	186	1021	1231	F		
				SB Right	74	209	1021	1231	F		
	EB	35.0	C	EB Left	55	84	32	144	F		
				EB Through	24	81	32	144	F		
				EB Right	169	13	32	144	B		
	WB	163.6	F	WB Left	561	181	536	762	F		
				WB Through	30	166	536	762	F		
				WB Right	224	119	536	762	F		
2- MD 85 at I-270 NB on and off ramp											
2	NB	58.5	E	NB Left	1136	58	700	1857	E	48.2	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	32.6	C	SB Left	0	0	0	0	A		
				SB Through	743	33	132	737	C		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
3- MD 85 at I-270 SB on and off ramp											
3	NB	17.3	B	NB Left	0	0	0	0	A	19.5	B
				NB Through	1975	17	181	1210	B		
				NB Right	0	0	0	0	A		
	SB	44.0	D	SB Left	173	44	74	582	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
4- MD 85 at Crestwood Blvd											
4	NB	68.0	F	NB Left	74	103	368	830	F	51.3	D
				NB Through	1450	66	367	830	E		
				NB U-Turn	0	0	0	0	A		
	SB	31.9	C	SB Left	105	83	53	246	F		
				SB Through	940	30	105	1039	C		
				SB Right	923	28	92	1030	C		
	EB	63.3	E	EB Left	949	66	196	744	E		
				EB Through	43	51	196	744	D		
				EB Right	28	1	196	744	A		
	WB	53.0	D	WB Left	44	78	60	230	E		
				WB Through	79	81	60	230	F		
				WB Right	94	18	60	230	B		
5- MD 80 at I-270 NB on and off ramp											
5	NB	-0.9	A	NB Left	1	9	0	4	A	11.5	B
				NB Through	2	0	0	4	A		
				NB Right	7	-3	0	4	A		
	SB	12.8	B	SB Left	479	16	27	238	B		
				SB Through	22	16	27	238	B		
				SB Right	149	3	0	0	A		
	EB	13.6	B	EB Left	97	14	24	208	B		
				EB Through	0	0	8	0	A		
				EB Right	5	10	37	239	B		
	WB	10.7	B	WB Left	15	14	0	38	B		
				WB Through	670	18	66	419	B		
				WB Right	612	2	0	0	A		
6- MD 80 at I-270 SB on and off ramp											
6	NB	3.4	A	NB Left	55	5	3	239	A	5.9	A
				NB Through	0	0	0	0	A		
				NB Right	605	3	3	239	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	7.1	A	EB Left	0	0	0	0	A		
				EB Through	382	8	4	111	A		
				EB Right	66	4	4	119	A		
	WB	8.4	A	WB Left	0	0	0	0	A		
				WB Through	446	8	3	163	A		
				WB Right	0	0	0	0	A		
7- MD 109 at I-270 NB on and off ramp											
7	NB			NB Left	0	0	0	0	A	7.9	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	15.2	C	SB Left	317	16	34	268	C		
				SB Through	0	0	0	0	A		
				SB Right	25	6	1	162	A		
	EB	2.5	A	EB Left	80	2	0	47	A		
				EB Through	0	0	0	0	A		
				EB Right	83	3	0	0	A		
	WB	0.4	A	WB Left	0	0	0	0	A		
				WB Through	222	0	0	0	A		
				WB Right	0	0	0	0	A		
8- MD 80 at I-270 SB on and off ramp											
8	NB	4.9	A	NB Left	63	8	3	120	A	1.8	A
				NB Through	0	0	0	0	A		
				NB Right	36	0	0	63	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.9	A	EB Left	0	0	0	0	A		
				EB Through	166	0	0	0	A		
				EB Right	34	4	0	0	A		
	WB	1.4	A	WB Left	137	1	0	58	A		
				WB Through	110	2	0	30	A		
				WB Right	0	0	0	0	A		
9- MD 121 at Gateway Center Dr											
9	NB	29.4	D	NB Left	590	33	112	604	C	47.0	D
				NB Through	795	28	112	604	C		
				NB Right	64	16	119	630	B		
	SB	22.6	C	SB Left	28	15	19	219	B		
				SB Through	300	24	31	223	C		
				SB Right	9	13	34	244	B		
	EB	14.9	B	EB Left	4	40	8	196	D		
				EB Through	24	41	15	229	D		
				EB Right	248	12	27	261	B		
	WB	117.1	F	WB Left	349	162	304	715	F		
				WB Through	75	73	304	714	E		
				WB Right	186	51	327	739	D		
10- MD 121 at I-270 NB on and off ramp											
10	NB	22.1	C	NB Left	372	59	77	320	F	18.1	B
				NB Through	0	0	0	0	A		
				NB Right	785	4	1	73	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	11.8	B	EB Left	0	0	0	0	A		
				EB Through	651	18	38	367	C		
				EB Right	336	1	0	0	A		
	WB	20.0	C	WB Left	219	60	86	412	F		
				WB Through	682	7	86	412	A		
				WB Right	0	0	0	0	A		

Table D.14: PM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
11- MD 121 at I-270 SB on and off ramp											
11	NB			NB Left	0	0	0	0	A	22.3	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	62.3	E	SB Left	271	85	226	977	F		
				SB Through	0	0	0	0	A		
				SB Right	254	39	0	49	E		
	EB	6.5	A	EB Left	0	0	0	0	A		
				EB Through	717	6	16	229	A		
				EB Right	0	0	0	0	A		
	WB	13.2	B	WB Left	0	0	0	0	A		
WB Through				520	27	46	382	D			
WB Right				538	0	0	0	A			
12- MD 27 at Observation Dr											
12	NB	37.7	D	NB U-Turn	0	0	0	0	A	24.8	C
				NB Through	94	55	22	98	E		
				NB Right	61	11	22	98	B		
	SB	41.3	D	SB Left	146	44	38	216	D		
				SB Through	57	62	43	250	E		
				SB Right	188	33	69	287	C		
	EB	18.6	B	EB Left	189	33	70	458	C		
				EB Through	2012	17	71	459	B		
				EB Right	97	16	84	497	B		
	WB	27.9	C	WB Left	41	24	149	731	C		
				WB Through	1695	29	149	731	C		
				WB Right	69	9	149	731	A		
13- MD 27 at I-270 NB off ramp											
13	NB	47.2	D	NB Left	303	47	52	260	D	6.5	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.1	A	EB Left	0	0	0	0	A		
				EB Through	1512	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	4.9	A	WB Left	0	0	0	0	A		
WB Through				1791	5	37	726	A			
WB Right				0	0	0	0	A			
14- MD 27 at I-270 SB off ramp											
14	NB			NB Left	0	0	0	0	A	5.2	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	50.1	D	SB Left	174	50	33	150	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	1.8	A	EB Left	0	0	0	0	A		
				EB Through	1677	2	4	89	A		
				EB Right	0	0	0	0	A		
	WB	3.7	A	WB Left	0	0	0	0	A		
WB Through				1541	4	12	384	A			
WB Right				0	0	0	0	A			
15- MD 27 at Crystal Rock Dr											
15	NB	31.1	C	NB Left	77	30	107	545	C	70.1	E
				NB Through	1196	31	116	545	C		
				NB Right	55	29	123	558	C		
	SB	56.5	E	SB Left	157	74	381	1298	E		
				SB Through	1468	58	381	1298	E		
				SB Right	225	33	368	1291	C		
	EB	40.4	D	EB Left	125	53	34	129	D		
				EB Through	49	36	30	124	D		
				EB Right	62	18	23	156	B		
	WB	163.8	F	WB Left	104	99	1056	1511	F		
				WB Through	127	110	1056	1511	F		
				WB Right	665	184	1056	1511	F		
16- MD 118 at Seneca Meadows Pkwy											
16	NB	4.9	A	NB Left	97	14	2	77	B	9.0	A
				NB Through	1309	4	11	182	A		
				NB Right	1	-1	19	235	A		
	SB	7.4	A	SB Left	15	8	19	307	A		
				SB Through	1226	7	22	307	A		
				SB Right	11	5	25	340	A		
	EB	14.0	B	EB Left	23	59	14	138	E		
				EB Through	0	65	14	138	E		
				EB Right	312	11	14	138	B		
	WB	53.8	D	WB Left	103	65	43	243	E		
				WB Through	7	69	39	242	E		
				WB Right	30	13	48	262	B		
17- MD 118 at I-270 NB on ramp											
17	NB			NB Left	0	0	0	0	A	13.8	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	26.5	C	EB Left	493	26	43	299	C		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	10.0	A	WB Left	0	0	0	0	A		
WB Through				283	2	1	139	A			
WB Right				1361	12	46	611	B			
18- MD 118 at I-270 SB off ramp											
18	NB			NB Left	0	0	0	0	A	7.1	A
				NB Through	0	0.0	0	0	A		
				NB Right	0	0.0	0	0	A		
	SB	37.7	D	SB Left	169	37.7	27	145	D		
				SB Through	0	0.0	0	0	A		
				SB Right	0	0.0	0	0	A		
	EB	5.5	A	EB Left	0	0.0	0	0	A		
				EB Through	1407	5.5	13	384	A		
				EB Right	0	0.0	0	0	A		
	WB	5.1	A	WB Left	0	0.0	0	0	A		
WB Through				1499	5.1	10	218	A			
WB Right				0	0.0	0	0	A			
19- MD 118 at Aircraft Dr											
19	NB	26.2	C	NB Left	53	72	43	241	E	43.0	D
				NB Through	53	70	43	241	E		
				NB Right	227	5	5	87	A		
	SB	165.9	F	SB Left	436	156	419	656	F		
				SB Through	14	205	419	656	F		
				SB Right	126	195	419	656	F		
	EB	22.6	C	EB Left	125	31	89	536	C		
				EB Through	1415	22	89	536	C		
				EB Right	21	20	89	536	B		
	WB	24.3	C	WB Left	15	30	107	749	C		
				WB Through	1399	28	107	749	C		
				WB Right	367	8	107	749	A		
20- Middlebrook Rd at Observation Dr											
20	NB			NB Left	0	0	0	0	A	9.0	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	20.5	C	SB Left	124	36	23	150	D		
				SB Through	0	0	0	0	A		
				SB Right	186	10	23	150	B		
	EB	6.0	A	EB Left	14	11	15	149	B		
				EB Through	1053	6	15	149	A		
				EB Right	0	0	0	0	A		
	WB	8.8	A	WB Left	0	0	0	0	A		
				WB Through	1313	9	27	253	A		
				WB Right	17	7	42	302	A		

Table D.14: PM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
21- Middlebrook Rd at I-270 SB on ramp											
21	NB			NB Left	0	0	0	0	A	4.6	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	2.7	A	EB Left	0	0	0	0	A		
				EB Through	742	3	4	110	A		
				EB Right	0	0	0	0	A		
	WB	7.8	A	WB Left	438	8	5	236	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
22- Middlebrook Rd at Waring Station Rd											
22	NB	48.4	D	NB Left	200	46	83	309	D	13.7	B
				NB Through	1	55	83	309	D		
				NB Right	236	50	83	309	D		
	SB	30.1	C	SB Left	32	47	8	72	D		
				SB Through	2	38	8	72	D		
				SB Right	24	7	19	110	A		
	EB	8.0	A	EB Left	4	11	28	285	B		
				EB Through	1125	8	28	285	A		
				EB Right	198	7	28	285	A		
	WB	8.6	A	WB Left	210	21	28	289	C		
				WB Through	1437	7	28	289	A		
				WB Right	3	3	28	289	A		
23- MD 124 at MD 355											
23	NB	130.8	F	NB Left	490	115	682	1082	F	78.6	E
				NB Through	1162	138	680	1079	F		
				NB Right	7	85	0	0	F		
	SB	44.6	D	SB Left	180	92	146	490	F		
				SB Through	698	66	146	490	E		
				SB Right	720	12	44	383	B		
	EB	27.2	C	EB Left	291	68	108	598	E		
				EB Through	1615	25	108	598	C		
				EB Right	338	3	28	551	A		
	WB	126.4	F	WB Left	0	0	0	0	A		
				WB Through	1645	129	683	946	F		
				WB Right	88	83	0	3	F		
24- MD 124 at I-270 SB on and off											
24	NB	95.9	F	NB Left	55	84	67	182	F	63.0	E
				NB Through	21	127	67	182	F		
				NB U-Turn	0	0	0	0	A		
	SB	55.4	E	SB Left	547	95	190	736	F		
				SB Through	8	98	190	736	F		
				SB Right	456	7	13	379	A		
	EB	101.1	F	EB Left	0	0	0	0	A		
				EB Through	1409	100	584	1113	F		
				EB Right	22	162	604	1137	F		
	WB	21.7	C	WB Left	5	78	653	2194	E		
				WB Through	1192	22	653	2194	C		
				WB Right	0	0	0	0	A		
25- MD 117 at MD 124											
25	NB	78.5	E	NB Left	54	158	328	743	F	50.1	D
				NB Through	686	93	328	743	F		
				NB Right	461	48	29	665	D		
	SB	37.8	D	SB Left	134	61	153	737	E		
				SB Through	969	41	153	737	D		
				SB Right	182	5	0	0	A		
	EB	44.9	D	EB Left	153	80	152	574	E		
				EB Through	1156	41	152	576	D		
				EB Right	57	37	156	603	D		
	WB	42.6	D	WB Left	315	71	205	1006	E		
				WB Through	1069	38	205	1006	D		
				WB Right	99	1	0	0	A		
26- MD 117 at Bureau Dr											
26	NB	50.3	D	NB Left	98	76	81	296	E	37.8	D
				NB Through	35	77	81	296	E		
				NB Right	272	38	81	296	D		
	SB	80.7	F	SB Left	284	95	132	405	F		
				SB Through	23	83	132	405	F		
				SB Right	83	32	132	405	C		
	EB	30.3	C	EB Left	52	54	165	806	D		
				EB Through	1683	30	166	806	C		
				EB Right	6	18	160	795	B		
	WB	31.9	C	WB Left	14	35	185	997	D		
				WB Through	1272	34	186	998	C		
				WB Right	213	19	211	1046	B		
27- MD 117 at I-270 SB off ramp											
27	NB			NB Left	0	0	0	0	A	12.8	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	3.7	A	EB Left	0	0	0	0	A		
				EB Through	944	4	6	464	A		
				EB Right	0	0	0	0	A		
	WB	40.7	E	WB Left	306	41	98	848	E		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
28- MD 117 at I-270 NB off ramp											
28	NB			NB Left	0	0	0	0	A	24.3	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	89.3	F	SB Left	97	91	1950	2779	F		
				SB Through	0	0	0	0	A		
				SB Right	374	89	1949	2779	F		
	EB	17.3	B	EB Left	3	120	90	983	F		
				EB Through	947	17	90	983	B		
				EB Right	0	0	0	0	A		
	WB	7.3	A	WB Left	0	0	0	0	A		
				WB Through	1403	7	52	390	A		
				WB Right	0	0	52	390	A		
29- MD 117 at Perry Pkwy											
29	NB	40.8	D	NB Left	19	59	17	125	E	49.4	D
				NB Through	26	59	17	124	E		
				NB Right	34	17	27	145	B		
	SB	162.4	F	SB Left	241	198	280	446	F		
				SB Through	21	220	280	446	F		
				SB Right	121	82	280	446	F		
	EB	21.1	C	EB Left	223	69	74	337	E		
				EB Through	778	8	74	337	A		
				EB Right	30	7	60	321	A		
	WB	41.4	D	WB Left	37	108	248	736	F		
				WB Through	1260	42	248	736	D		
				WB Right	382	33	248	736	C		
30- Shady Grove Rd at I-270 NB off ramp											
30	NB	7.6	A	NB Left	0	0	0	0	A	30.1	C
				NB Through	914	8	87	483	A		
				NB Right	0	0	0	0	A		
	SB	44.7	D	SB Left	0	0	0	0	A		
				SB Through	1013	45	163	681	D		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	51.6	D	WB Left	267	52	48	264	D		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table D.14: PM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
31- Shady Grove Rd at I-270 SB off ramp											
31	NB	31.3	C	NB Left	0	0	0	0	A	29.5	C
				NB Through	1229	31	435	1759	C		
				NB Right	0	0	0	0	A		
	SB	5.6	A	SB Left	0	0	0	0	A		
				SB Through	676	6	7	154	A		
				SB Right	0	0	0	0	A		
	EB	55.6	E	EB Left	232	54	43	211	D		
				EB Through	0	0	0	0	A		
				EB Right	304	57	62	297	E		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
32- MD 28 at I-270 SB off ramp											
32	NB			NB U-Turn	0	0	0	0	A	7.9	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	37.2	D	SB Left	406	46	71	322	D		
				SB Through	0	0	0	0	A		
				SB Right	97	3	0	28	A		
	EB	2.8	A	EB Left	0	0	0	0	A		
				EB Through	1560	1	0	0	A		
				EB Right	932	6	16	224	A		
	WB	6.7	A	WB Left	0	0	0	0	A		
				WB Through	1642	7	20	253	A		
				WB Right	0	0	0	0	A		
33- MD 28 at I-270 on and off ramps											
33	NB	36.9	D	NB Left	0	0	41	226	A	39.9	D
				NB Through	185	49	49	235	D		
				NB Right	123	18	49	235	B		
	SB	137.2	F	SB Left	14	160	361	412	F		
				SB Through	0	0	0	0	A		
				SB Right	219	136	361	412	F		
	EB	20.0	B	EB Left	283	61	94	334	E		
				EB Through	920	7	94	334	A		
				EB Right	0	0	0	0	A		
	WB	41.7	D	WB Left	40	37	168	432	D		
				WB Through	1279	42	144	396	D		
				WB Right	0	0	0	0	A		
34- MD 189 at Great Falls Rd											
34	NB	36.7	D	NB Left	43	45	12	90	D	13.2	B
				NB Through	14	48	9	90	D		
				NB Right	19	9	9	101	A		
	SB	3.4	A	SB Left	18	41	7	83	D		
				SB Through	13	48	7	83	D		
				SB Right	408	0	3	48	A		
	EB	11.6	B	EB Left	410	23	37	417	C		
				EB Through	644	5	6	200	A		
				EB Right	55	5	10	236	A		
	WB	18.0	B	WB Left	14	19	52	406	B		
				WB Through	842	18	51	406	B		
				WB Right	18	12	67	440	B		
35- MD 189 at I-270 Ramps											
35	NB	47.1	D	NB Left	225	47	41	196	D	42.5	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	54.4	D	SB Left	348	54	124	453	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	28.0	C	EB Left	479	32	91	341	C		
				EB Through	373	23	91	341	C		
				EB Right	0	0	0	0	A		
	WB	50.8	D	WB Left	443	54	111	336	D		
				WB Through	428	47	111	336	D		
				WB Right	0	0	0	0	A		
36- MD 189 at Wootton Pkwy											
36	NB	45.9	D	NB Left	238	57	142	506	E	52.4	D
				NB Through	694	51	142	506	D		
				NB Right	176	12	142	506	B		
	SB	82.8	F	SB Left	250	101	295	794	F		
				SB Through	926	78	312	780	E		
				SB Right	0	0	0	0	A		
	EB	38.7	D	EB Left	153	72	123	486	E		
				EB Through	552	38	123	486	D		
				EB Right	204	15	123	486	B		
	WB	39.5	D	WB Left	157	72	141	743	E		
				WB Through	775	41	141	743	D		
				WB Right	315	19	141	743	B		
37- Montrose Rd at Tower Oaks Blvd											
37	NB	0.4	A	NB Left	0	0	0	0	A	32.4	C
				NB Through	0	0	0	0	A		
				NB Right	537	0	0	0	A		
	SB	143.6	F	SB Left	87	49	213	902	D		
				SB Through	0	0	0	0	A		
				SB Right	305	171	269	899	F		
	EB	6.9	A	EB Left	0	0	0	0	A		
				EB Through	1868	7	39	520	A		
				EB Right	0	0	0	0	A		
	WB	40.0	D	WB Left	79	37	39	520	D		
				WB Through	2426	41	277	780	D		
				WB Right	261	30	277	780	C		
38- Tower Oaks Blvd at I-270 off ramp											
38	NB	23.3	C	NB Left	707	24	50	240	C	17.3	B
				NB Through	0	0.0	43	232	A		
				NB Right	26	7.0	50	240	A		
	SB	9.8	A	SB Left	8	18.4	1	39	B		
				SB Through	0	0.0	1	39	A		
				SB Right	9	2.2	0	23	A		
	EB	10.8	B	EB Left	1	11.5	16	177	B		
				EB Through	363	11.2	16	177	B		
				EB Right	37	7.0	11	167	A		
	WB	12.7	B	WB Left	139	16.3	16	145	B		
				WB Through	203	10.4	16	145	B		
				WB Right	3	3.4	3	100	A		
39- Montrose Rd at Tower Oaks Blvd											
39	NB	20.0	C	NB Left	97	42	83	387	D	45.0	D
				NB Through	773	32	83	387	C		
				NB Right	621	2	0	0	A		
	SB	32.1	C	SB Left	210	63	76	334	E		
				SB Through	506	23	74	333	C		
				SB Right	131	15	72	340	B		
	EB	133.4	F	EB Left	104	112	358	697	F		
				EB Through	518	136	360	698	F		
				EB Right	44	149	382	722	F		
	WB	36.9	D	WB Left	542	46	109	374	D		
				WB Through	456	42	110	374	D		
				WB Right	315	13	129	404	B		
40- Rockledge Blvd at I-270 NB on and off ramp											
40	NB	132.4	F	NB Left	0	0	0	0	A	112.4	F
				NB Through	335	121	557	836	F		
				NB Right	854	137	557	836	F		
	SB	85.9	F	SB Left	0	0	89	217	A		
				SB Through	352	86	89	217	F		
				SB Right	0	0	0	0	A		
	EB	93.5	F	EB Left	6	184	288	804	F		
				EB Through	459	148	288	804	F		
				EB Right	304	10	0	0	B		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table D.14: PM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS	
41- Rockledge Blvd at I-270 SB on and off ramps												
41	NB	30.3	C	NB Left	343	30	76	273	C	48.1	D	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	53.0	D		WB Left	355	59	195	867			E
					WB Through	890	51	195	867			D
					WB Right	0	0	0	0			A
42- MD 187 at Tuckerman Ln												
42	NB	66.6	E	NB Left	216	39	567	1282	D	128.7	F	
				NB Through	2309	68	567	1282	E			
				NB Right	200	76	567	1282	E			
	SB	187.6	F		SB Left	205	172	2555	2693			F
					SB Through	1151	185	2555	2693			F
					SB Right	306	209	2555	2693			F
	EB	112.4	F		EB Left	302	66	540	1403			E
					EB Through	534	136	541	1404			F
					EB Right	118	121	564	1428			F
	WB	195.5	F		WB Left	465	191	1941	2142			F
					WB Through	674	211	1941	2142			F
					WB Right	166	145	1941	2142			F
43- MD 187 at I-270 NB on and off ramps												
43	NB	16.8	B	NB Left	566	35	117	404	C	20.4	C	
				NB Through	2515	13	117	404	B			
				NB Right	0	0	0	0	A			
	SB	25.1	C		SB Left	0	0	0	0			A
					SB Through	1290	25	66	269			C
					SB Right	0	0	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	60.3	E		WB Left	59	60	47	317			E
					WB Through	67	60	47	317			E
					WB Right	0	0	0	0			A
44- MD 187 at I-270 NB on and off ramps												
44	NB	40.0	E	NB Left	0	0	0	0	A	36.9	D	
				NB Through	2426	40	155	739	D			
				NB Right	0	0	0	0	A			
	SB	18.1	B		SB Left	147	56	67	271			E
					SB Through	1203	13	67	271			B
					SB Right	0	0	0	0			A
	EB	58.2	E		EB Left	652	60	143	560			E
					EB Through	0	0	143	560			A
					EB Right	179	53	82	486			D
	WB				WB Left	0	0	0	0			A
					WB Through	0	0	0	0			A
					WB Right	0	0	0	0			A
45- MD 187 at Rock Spring Dr												
45	NB	20.6	C	NB Left	492	37	123	826	D	29.8	C	
				NB Through	2174	17	124	827	B			
				NB Right	18	14	145	860	B			
	SB	34.2	C		SB Left	21	62	111	472			E
					SB Through	1186	39	111	472			D
					SB Right	173	1	69	465			A
	EB	50.0	D		EB Left	431	60	146	519			E
					EB Through	50	68	146	519			E
					EB Right	484	39	146	519			D
	WB	17.1	B		WB Left	7	29	6	108			C
					WB Through	16	33	6	108			C
					WB Right	36	8	3	97			A
47-Democracy Blvd at I-270 NB off ramp												
47	NB	45.3	D	NB Left	154	45	28	136	D	3.0	A	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB	1.2	A		EB Left	0	0	0	0			A
					EB Through	1127	1	3	66			A
					EB Right	0	0	0	0			A
	WB	1.1	A		WB Left	0	0	0	0			A
					WB Through	2241	1	3	84			A
					WB Right	0	0	0	0			A
48- Democracy Blvd at I-270 SB on ramp												
48	NB			NB Left	0	0	0	0	A	8.4	A	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB	5.5	A		EB Left	0	0	0	0			A
					EB Through	1336	5	19	232			A
					EB Right	0	0	0	0			A
	WB	10.1	B		WB Left	543	35	59	404			D
					WB Through	1827	3	49	383			A
					WB Right	0	0	0	0			A
49- Democracy Blvd at I-270 SB off ramp												
49	NB			NB Left	0	0	0	0	A	8.8	A	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB	37.4	D		SB Left	154	51	28	143			D
					SB Through	0	0	0	0			A
					SB Right	59	2	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	5.8	A		WB Left	0	0	0	0			A
					WB Through	1827	4	19	305			A
					WB Right	156	29	116	746			C
50- MD 190 at Burdette Rd												
50	NB	76.4	E	NB Left	27	79	18	118	E	36.6	D	
				NB Through	7	69	18	118	E			
				NB Right	6	75	18	118	E			
	SB	37.5	D		SB Left	45	77	25	148			E
					SB Through	9	72	25	148			E
					SB Right	122	20	25	148			C
	EB	21.6	C		EB Left	138	99	113	625			F
					EB Through	1297	14	113	625			B
					EB Right	31	4	99	653			A
	WB	45.7	D		WB Left	13	114	390	1119			F
					WB Through	2161	46	390	1119			D
					WB Right	65	35	390	1119			C

Table D.14: PM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
51- MD 190 at I-270 NB on ramp											
51	NB			NB Left	0	0	0	0	A	17.6	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	65.7	E	EB Left	254	66	101	343	E		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	9.3	A	WB Left	0	0	0	0	A		
WB Through				1471	9	49	692	A			
WB Right				0	0	0	0	A			
52- MD 190 at I-270 SB off ramp											
52	NB	70.5	E	NB Left	225	70	84	800	E	12.3	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	3.6	A	EB Left	0	0	0	0	A		
				EB Through	1062	4	8	176	A		
				EB Right	0	0	0	0	A		
	WB	10.0	A	WB Left	0	0	0	0	A		
WB Through				1641	10	30	635	A			
WB Right				0	0	0	0	A			
53- MD 190 at Seven Locks Rd											
53	NB	0.5	A	NB Left	28	1	0	0	A	26.9	C
				NB Through	314	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	52.6	D	SB Left	364	52	120	414	D		
				SB Through	232	53	120	414	D		
				SB Right	20	50	120	414	D		
	EB	32.0	C	EB Left	27	30	95	436	C		
				EB Through	800	32	95	436	C		
				EB Right	45	32	95	436	C		
	WB	20.8	C	WB Left	255	75	124	491	E		
WB Through				914	18	124	491	B			
WB Right				693	5	124	491	A			
54- MD 124 at I-270 NB off ramp											
54	NB	31.3	C	NB Left	0	0	0	0	A	23.6	C
				NB Through	0	0	0	0	A		
				NB Right	556	31	56	630	C		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	21.1	C	EB Left	0	0	0	0	A		
				EB Through	1661	21	57	938	C		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
WB Through				0	0	0	0	A			
WB Right				0	0	0	0	A			
55- Democracy Blvd at I-270 NB off ramp											
55	NB	46.2	D	NB Left	0	0	0	0	A	11.2	B
				NB Through	0	0	0	0	A		
				NB Right	313	46	51	205	D		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	1.5	A	EB Left	0	0	0	0	A		
				EB Through	1128	2	4	59	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
WB Through				0	0	0	0	A			
WB Right				0	0	0	0	A			
56- Watkins Mill Rd at I-270 SB off ramp/Parkview Ave											
56	NB	71.3	E	NB Left	145	53	170	656	D	87.9	F
				NB Through	0	0	0	0	A		
				NB Right	342	79	170	656	E		
	SB	42.7	D	SB Left	410	63	107	388	E		
				SB Through	110	59	107	388	E		
				SB Right	441	20	107	388	C		
	EB	143.5	F	EB Left	0	0	0	0	A		
				EB Through	1216	144	961	1246	F		
				EB Right	4	136	961	1246	F		
	WB	41.9	D	WB Left	62	85	49	220	F		
WB Through				295	33	47	219	C			
WB Right				0	0	0	0	A			
57- Watkins Mill Rd at I-270 NB on ramp											
57	NB	40.5	D	NB Left	77	65	56	638	E	72.4	E
				NB Through	0	0	0	0	A		
				NB Right	193	31	56	638	C		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	26.1	C	EB Left	644	66	146	438	E		
				EB Through	1051	2	146	438	A		
				EB Right	0	0	0	0	A		
	WB	157.1	F	WB Left	0	0	0	0	A		
WB Through				684	122	651	866	F			
WB Right				343	227	651	866	F			
58- Watkins Mill Rd at I-270 SB on ramp											
58	NB			NB Left	0	0	0	0	A	16.5	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	17.2	B	EB Left	0	0	0	0	A		
				EB Through	1691	19	150	598	B		
				EB Right	286	8	150	598	A		
	WB	14.8	B	WB Left	409	27	46	464	C		
WB Through				352	1	46	464	A			
WB Right				0	0	0	0	A			

Table D.15: PM Peak - 2040 Adaptive Ramp Metering- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
1- MD 85 at Sam's Club Drive											
1	NB	64.6	E	NB Left	136	75	502	897	E	122.5	F
				NB Through	573	39	502	897	D		
				NB Right	930	79	487	920	E		
	SB	182.5	F	SB Left	153	136	1021	1231	F		
				SB Through	869	189	1021	1231	F		
				SB Right	73	205	1021	1231	F		
	EB	35.3	D	EB Left	55	84	32	144	F		
				EB Through	24	81	32	144	F		
				EB Right	169	13	32	144	B		
	WB	186.2	F	WB Left	546	204	583	760	F		
				WB Through	29	193	583	760	F		
				WB Right	221	142	583	760	F		
2- MD 85 at I-270 NB on and off ramp											
2	NB	57.6	E	NB Left	1127	58	707	1877	E	47.0	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	30.7	C	SB Left	0	0	0	0	A		
				SB Through	736	31	125	615	C		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
3- MD 85 at I-270 SB on and off ramp											
3	NB	16.3	B	NB Left	0	0	0	0	A	18.4	B
				NB Through	1959	16	155	1201	B		
				NB Right	0	0	0	0	A		
	SB	42.4	D	SB Left	172	42	109	747	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
4- MD 85 at Crestwood Blvd											
4	NB	51.5	F	NB Left	76	78	292	833	E	45.2	D
				NB Through	1448	50	292	833	D		
				NB U-Turn	0	0	0	0	A		
	SB	30.6	C	SB Left	105	79	50	285	E		
				SB Through	938	30	103	843	C		
				SB Right	920	26	87	834	C		
	EB	62.2	E	EB Left	950	65	193	731	E		
				EB Through	43	49	193	731	D		
				EB Right	28	0	193	731	A		
	WB	53.3	D	WB Left	43	78	60	231	E		
				WB Through	79	81	60	231	F		
				WB Right	94	18	60	231	B		
5- MD 80 at I-270 NB on and off ramp											
5	NB	-1.1	A	NB Left	2	0	0	0	A	11.7	B
				NB Through	3	0	0	0	A		
				NB Right	6	-2	0	0	A		
	SB	12.5	B	SB Left	479	15	26	185	B		
				SB Through	22	16	26	185	B		
				SB Right	149	3	0	0	A		
	EB	12.9	B	EB Left	97	13	24	217	B		
				EB Through	0	0	8	0	A		
				EB Right	5	7	36	247	A		
	WB	11.3	B	WB Left	15	12	0	35	B		
				WB Through	674	19	70	473	B		
				WB Right	612	3	0	7	A		
6- MD 80 at I-270 SB on and off ramp											
6	NB	3.4	A	NB Left	56	4	4	268	A	5.7	A
				NB Through	0	0	0	0	A		
				NB Right	608	3	4	268	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	6.9	A	EB Left	0	0	0	0	A		
				EB Through	382	7	4	104	A		
				EB Right	66	5	3	112	A		
	WB	7.9	A	WB Left	0	0	0	0	A		
				WB Through	447	8	3	158	A		
				WB Right	0	0	0	0	A		
7- MD 109 at I-270 NB on and off ramp											
7	NB			NB Left	0	0	0	0	A	7.4	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	14.2	B	SB Left	315	15	30	224	C		
				SB Through	0	0	0	0	A		
				SB Right	25	4	1	169	A		
	EB	2.5	A	EB Left	80	2	0	53	A		
				EB Through	0	0	0	0	A		
				EB Right	83	3	0	0	A		
	WB	0.4	A	WB Left	0	0	0	0	A		
				WB Through	222	0	0	0	A		
				WB Right	0	0	0	0	A		
8- MD 80 at I-270 SB on and off ramp											
8	NB	5.2	A	NB Left	63	8	3	126	A	1.9	A
				NB Through	0	0	0	0	A		
				NB Right	36	0	0	55	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.9	A	EB Left	0	0	0	0	A		
				EB Through	166	0	0	0	A		
				EB Right	34	4	0	0	A		
	WB	1.5	A	WB Left	137	1	0	60	A		
				WB Through	109	2	0	37	A		
				WB Right	0	0	0	0	A		
9- MD 121 at Gateway Center Dr											
9	NB	25.8	D	NB Left	587	31	97	538	C	45.6	D
				NB Through	801	23	97	538	C		
				NB Right	64	11	103	564	B		
	SB	21.4	C	SB Left	27	14	17	226	B		
				SB Through	304	22	29	226	C		
				SB Right	9	10	32	247	A		
	EB	15.2	C	EB Left	4	49	8	238	D		
				EB Through	24	37	16	257	D		
				EB Right	248	13	28	289	B		
	WB	120.3	F	WB Left	348	167	308	735	F		
				WB Through	74	78	308	735	E		
				WB Right	183	49	331	759	D		
10- MD 121 at I-270 NB on and off ramp											
10	NB	22.5	C	NB Left	373	61	78	294	F	18.3	B
				NB Through	0	0	0	0	A		
				NB Right	784	4	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	11.4	B	EB Left	0	0	0	0	A		
				EB Through	649	17	37	340	C		
				EB Right	335	0	0	0	A		
	WB	20.4	C	WB Left	218	62	90	442	F		
				WB Through	685	7	90	442	A		
				WB Right	0	0	0	0	A		

Table D.15: PM Peak - 2040 Adaptive Ramp Metering- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
11- MD 121 at I-270 SB on and off ramp											
11	NB			NB Left	0	0	0	0	A	22.4	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	63.1	E	SB Left	270	85	231	963	F		
				SB Through	0	0	0	0	A		
				SB Right	252	40	0	22	E		
	EB	6.4	A	EB Left	0	0	0	0	A		
				EB Through	717	6	16	202	A		
				EB Right	0	0	0	0	A		
	WB	13.1	B	WB Left	0	0	0	0	A		
WB Through				519	26	46	352	D			
WB Right				541	0	0	0	A			
12- MD 27 at Observation Dr											
12	NB	37.6	D	NB U-Turn	0	0	0	0	A	25.0	C
				NB Through	94	55	22	98	E		
				NB Right	61	11	22	98	B		
	SB	41.0	D	SB Left	146	44	38	216	D		
				SB Through	57	62	43	250	E		
				SB Right	188	32	68	287	C		
	EB	19.2	B	EB Left	190	32	74	526	C		
				EB Through	2013	18	76	527	B		
				EB Right	97	16	89	566	B		
	WB	27.8	C	WB Left	41	24	147	721	C		
WB Through				1695	29	147	721	C			
WB Right				69	8	147	721	A			
13- MD 27 at I-270 NB off ramp											
13	NB	49.4	D	NB Left	302	49	55	252	D	6.5	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.1	A	EB Left	0	0	0	0	A		
				EB Through	1515	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	4.7	A	WB Left	0	0	0	0	A		
WB Through				1790	5	35	661	A			
WB Right				0	0	0	0	A			
14- MD 27 at I-270 SB off ramp											
14	NB			NB Left	0	0	0	0	A	5.1	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	51.5	D	SB Left	175	51	34	173	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	1.9	A	EB Left	0	0	0	0	A		
				EB Through	1677	2	4	81	A		
				EB Right	0	0	0	0	A		
	WB	3.3	A	WB Left	0	0	0	0	A		
WB Through				1536	3	11	383	A			
WB Right				0	0	0	0	A			
15- MD 27 at Crystal Rock Dr											
15	NB	31.3	C	NB Left	77	30	109	559	C	67.8	E
				NB Through	1196	31	118	558	C		
				NB Right	55	30	124	571	C		
	SB	51.8	D	SB Left	157	73	333	1111	E		
				SB Through	1463	54	333	1111	D		
				SB Right	223	21	316	1105	C		
	EB	40.8	D	EB Left	125	54	35	131	D		
				EB Through	49	36	30	126	D		
				EB Right	62	18	23	160	B		
	WB	162.4	F	WB Left	104	94	1020	1491	F		
WB Through				126	106	1020	1491	F			
WB Right				664	184	1020	1491	F			
16- MD 118 at Seneca Meadows Pkwy											
16	NB	5.0	A	NB Left	97	14	2	68	B	9.1	A
				NB Through	1306	4	11	185	A		
				NB Right	1	-1	20	238	A		
	SB	7.4	A	SB Left	15	9	19	295	A		
				SB Through	1226	7	22	295	A		
				SB Right	11	5	25	327	A		
	EB	13.9	B	EB Left	23	59	14	134	E		
				EB Through	0	65	14	134	E		
				EB Right	312	11	14	134	B		
	WB	53.8	D	WB Left	103	65	43	243	E		
WB Through				7	69	39	242	E			
WB Right				30	13	48	262	B			
17- MD 118 at I-270 NB on ramp											
17	NB			NB Left	0	0	0	0	A	13.8	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	26.4	C	EB Left	491	26	44	354	C		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	10.0	A	WB Left	0	0	0	0	A		
WB Through				283	2	0	27	A			
WB Right				1363	12	46	527	B			
18- MD 118 at I-270 SB off ramp											
18	NB			NB Left	0	0	0	0	A	6.8	A
				NB Through	0	0.0	0	0	A		
				NB Right	0	0.0	0	0	A		
	SB	36.7	D	SB Left	169	36.7	26	149	D		
				SB Through	0	0.0	0	0	A		
				SB Right	0	0.0	0	0	A		
	EB	5.6	A	EB Left	0	0.0	0	0	A		
				EB Through	1409	5.6	14	409	A		
				EB Right	0	0.0	0	0	A		
	WB	4.6	A	WB Left	0	0.0	0	0	A		
WB Through				1500	4.6	10	228	A			
WB Right				0	0.0	0	0	A			
19- MD 118 at Aircraft Dr											
19	NB	26.3	C	NB Left	53	71	43	237	E	41.5	D
				NB Through	52	70	43	237	E		
				NB Right	227	6	5	94	A		
	SB	155.4	F	SB Left	436	144	399	644	F		
				SB Through	14	203	399	644	F		
				SB Right	127	190	399	644	F		
	EB	22.5	C	EB Left	125	31	89	545	C		
				EB Through	1415	22	89	545	C		
				EB Right	21	20	89	545	B		
	WB	24.1	C	WB Left	14	27	105	679	C		
WB Through				1398	28	105	679	C			
WB Right				365	8	105	679	A			
20- Middlebrook Rd at Observation Dr											
20	NB			NB Left	0	0	0	0	A	8.9	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	20.5	C	SB Left	125	36	23	150	D		
				SB Through	0	0	0	0	A		
				SB Right	186	10	23	150	B		
	EB	5.9	A	EB Left	14	8	14	150	A		
				EB Through	1054	6	14	150	A		
				EB Right	0	0	0	0	A		
	WB	8.5	A	WB Left	0	0	0	0	A		
WB Through				1313	9	26	271	A			
WB Right				17	7	41	320	A			

Table D.15: PM Peak - 2040 Adaptive Ramp Metering- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
21- Middlebrook Rd at I-270 SB on ramp											
21	NB			NB Left	0	0	0	0	A	4.5	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	2.5	A	EB Left	0	0	0	0	A		
				EB Through	742	2	4	104	A		
				EB Right	0	0	0	0	A		
	WB	7.9	A	WB Left	438	8	5	230	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
22- Middlebrook Rd at Waring Station Rd											
22	NB	48.4	D	NB Left	200	46	83	309	D	13.7	B
				NB Through	1	55	83	309	D		
				NB Right	236	50	83	309	D		
	SB	30.4	C	SB Left	32	47	8	72	D		
				SB Through	2	38	8	72	D		
				SB Right	24	7	20	110	A		
	EB	7.9	A	EB Left	4	12	27	283	B		
				EB Through	1125	8	27	283	A		
				EB Right	198	7	27	283	A		
	WB	8.4	A	WB Left	209	21	28	288	C		
				WB Through	1433	7	28	288	A		
				WB Right	3	5	28	288	A		
23- MD 124 at MD 355											
23	NB	136.1	F	NB Left	495	122	723	1090	F	81.3	F
				NB Through	1162	143	720	1087	F		
				NB Right	7	97	0	0	F		
	SB	46.2	D	SB Left	183	95	150	496	F		
				SB Through	701	67	150	496	E		
				SB Right	723	14	43	443	B		
	EB	27.6	C	EB Left	285	70	105	624	E		
				EB Through	1595	25	105	624	C		
				EB Right	330	3	31	532	A		
	WB	130.2	F	WB Left	0	0	0	0	A		
				WB Through	1626	132	686	946	F		
				WB Right	88	87	4	179	F		
24- MD 124 at I-270 SB on and off											
24	NB	82.8	F	NB Left	54	75	63	174	E	63.1	E
				NB Through	20	104	63	174	F		
				NB U-Turn	0	0	0	0	A		
	SB	53.7	D	SB Left	551	92	185	872	F		
				SB Through	8	110	185	872	F		
				SB Right	454	7	15	393	A		
	EB	103.9	F	EB Left	0	0	0	0	A		
				EB Through	1394	103	613	1107	F		
				EB Right	22	155	633	1130	F		
	WB	21.1	C	WB Left	5	62	598	2099	E		
				WB Through	1182	21	598	2099	C		
				WB Right	0	0	0	0	A		
25- MD 117 at MD 124											
25	NB	74.8	E	NB Left	56	147	308	744	F	49.8	D
				NB Through	681	90	308	744	F		
				NB Right	464	44	28	603	D		
	SB	37.9	D	SB Left	136	60	152	699	E		
				SB Through	968	41	152	699	D		
				SB Right	182	4	0	0	A		
	EB	45.7	D	EB Left	155	81	154	601	F		
				EB Through	1157	41	153	602	D		
				EB Right	57	38	158	629	D		
	WB	43.7	D	WB Left	314	72	204	1013	E		
				WB Through	1054	39	204	1013	D		
				WB Right	99	1	0	0	A		
26- MD 117 at Bureau Dr											
26	NB	46.3	D	NB Left	99	71	73	273	E	36.1	D
				NB Through	34	79	73	273	E		
				NB Right	271	33	73	273	C		
	SB	73.8	E	SB Left	284	86	122	376	F		
				SB Through	22	81	122	376	F		
				SB Right	83	28	122	376	C		
	EB	30.0	C	EB Left	52	52	164	863	D		
				EB Through	1695	29	166	863	C		
				EB Right	6	35	160	853	D		
	WB	30.7	C	WB Left	14	37	175	983	D		
				WB Through	1260	33	176	983	C		
				WB Right	210	18	202	1032	B		
27- MD 117 at I-270 SB off ramp											
27	NB			NB Left	0	0	0	0	A	12.2	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	3.2	A	EB Left	0	0	0	0	A		
				EB Through	951	3	4	354	A		
				EB Right	0	0	0	0	A		
	WB	40.6	E	WB Left	303	41	97	780	E		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
28- MD 117 at I-270 NB off ramp											
28	NB			NB Left	0	0	0	0	A	21.8	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	76.5	E	SB Left	97	77	1947	2557	E		
				SB Through	0	0	0	0	A		
				SB Right	364	76	1948	2556	E		
	EB	17.0	B	EB Left	4	83	81	971	F		
				EB Through	949	17	81	971	B		
				EB Right	0	0	0	0	A		
	WB	7.0	A	WB Left	0	0	0	0	A		
				WB Through	1396	7	48	387	A		
				WB Right	0	0	48	387	A		
29- MD 117 at Perry Pkwy											
29	NB	38.1	D	NB Left	19	55	15	122	D	48.5	D
				NB Through	26	52	15	122	D		
				NB Right	33	18	23	142	B		
	SB	158.6	F	SB Left	242	194	276	445	F		
				SB Through	21	216	276	445	F		
				SB Right	118	75	276	445	E		
	EB	21.0	C	EB Left	219	71	78	329	E		
				EB Through	779	7	78	330	A		
				EB Right	29	6	64	314	A		
	WB	40.7	D	WB Left	36	108	246	739	F		
				WB Through	1252	41	246	739	D		
				WB Right	380	32	246	739	C		
30- Shady Grove Rd at I-270 NB off ramp											
30	NB	7.2	A	NB Left	0	0	0	0	A	41.9	D
				NB Through	941	7	28	335	A		
				NB Right	0	0	0	0	A		
	SB	73.0	E	SB Left	0	0	0	0	A		
				SB Through	954	73	337	780	E		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	52.9	D	WB Left	267	53	49	248	D		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table D.15: PM Peak - 2040 Adaptive Ramp Metering- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
31- Shady Grove Rd at I-270 SB off ramp											
31	NB	15.6	B	NB Left	0	0	0	0	A	21.8	C
				NB Through	1262	16	380	1767	B		
				NB Right	0	0	0	0	A		
	SB	5.9	A	SB Left	0	0	0	0	A		
				SB Through	657	6	7	166	A		
				SB Right	0	0	0	0	A		
	EB	55.6	E	EB Left	233	55	45	183	E		
				EB Through	0	0	0	0	A		
				EB Right	307	56	61	254	E		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
32- MD 28 at I-270 SB off ramp											
32	NB			NB U-Turn	0	0	0	0	A	8.6	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	37.5	D	SB Left	406	46	71	318	D		
				SB Through	0	0	0	0	A		
				SB Right	95	3	0	38	A		
	EB	3.6	A	EB Left	0	0	0	0	A		
				EB Through	1560	2	30	512	A		
				EB Right	932	6	16	269	A		
	WB	7.3	A	WB Left	0	0	0	0	A		
				WB Through	1707	7	23	336	A		
				WB Right	0	0	0	0	A		
33- MD 28 at I-270 on and off ramps											
33	NB	38.1	D	NB Left	0	0	41	209	A	56.2	E
				NB Through	186	50	49	218	D		
				NB Right	123	21	49	218	C		
	SB	141.9	F	SB Left	20	169	351	422	F		
				SB Through	0	0	0	0	A		
				SB Right	286	140	351	422	F		
	EB	38.3	D	EB Left	276	131	183	379	F		
				EB Through	919	11	183	379	B		
				EB Right	0	0	0	0	A		
	WB	56.8	E	WB Left	41	51	224	429	D		
				WB Through	1279	57	199	392	E		
				WB Right	0	0	0	0	A		
34- MD 189 at Great Falls Rd											
34	NB	37.6	D	NB Left	43	48	11	87	D	30.5	C
				NB Through	14	46	9	86	D		
				NB Right	19	8	9	97	A		
	SB	21.7	C	SB Left	17	45	18	243	D		
				SB Through	13	46	18	243	D		
				SB Right	382	20	52	257	B		
	EB	24.9	C	EB Left	396	45	165	1310	D		
				EB Through	634	14	10	200	B		
				EB Right	54	9	17	236	A		
	WB	41.4	D	WB Left	14	31	133	678	C		
				WB Through	803	42	133	677	D		
				WB Right	17	33	154	711	C		
35- MD 189 at I-270 Ramps											
35	NB	49.2	D	NB Left	224	49	41	163	D	54.3	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	62.8	E	SB Left	345	63	148	725	E		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	30.5	C	EB Left	479	36	93	350	D		
				EB Through	373	23	93	350	C		
				EB Right	0	0	0	0	A		
	WB	76.8	E	WB Left	416	83	104	292	F		
				WB Through	403	70	104	292	E		
				WB Right	0	0	0	0	A		
36- MD 189 at Wootton Pkwy											
36	NB	46.2	D	NB Left	237	58	144	489	E	52.9	D
				NB Through	694	51	144	489	D		
				NB Right	176	12	144	489	B		
	SB	84.6	F	SB Left	251	107	297	789	F		
				SB Through	931	79	321	776	E		
				SB Right	0	0	0	0	A		
	EB	38.2	D	EB Left	152	72	120	456	E		
				EB Through	554	38	120	456	D		
				EB Right	205	15	120	456	B		
	WB	39.2	D	WB Left	155	74	133	678	E		
				WB Through	755	41	133	678	D		
				WB Right	306	18	133	678	B		
37- Montrose Rd at Tower Oaks Blvd											
37	NB	0.4	A	NB Left	0	0	0	0	A	50.7	D
				NB Through	0	0	0	0	A		
				NB Right	538	0	0	0	A		
	SB	362.2	F	SB Left	83	74	760	1248	E		
				SB Through	0	0	0	0	A		
				SB Right	267	452	795	1245	F		
	EB	7.4	A	EB Left	0	0	0	0	A		
				EB Through	1865	7	42	516	A		
				EB Right	0	0	0	0	A		
	WB	50.2	D	WB Left	77	35	42	516	C		
				WB Through	2215	52	319	776	D		
				WB Right	237	36	319	776	D		
38- Tower Oaks Blvd at I-270 off ramp											
38	NB	24.1	C	NB Left	705	24	51	254	C	25.4	C
				NB Through	0	0.0	44	246	A		
				NB Right	26	23.5	51	254	C		
	SB	17.1	B	SB Left	9	31.4	1	40	C		
				SB Through	0	0.0	1	39	A		
				SB Right	9	2.7	0	23	A		
	EB	37.4	D	EB Left	1	11.0	56	216	B		
				EB Through	357	37.5	56	216	D		
				EB Right	36	36.7	51	207	D		
	WB	13.9	B	WB Left	130	18.6	16	168	B		
				WB Through	184	10.6	16	168	B		
				WB Right	2	6.5	4	124	A		
39- Montrose Rd at Tower Oaks Blvd											
39	NB	19.3	B	NB Left	97	41	79	380	D	44.2	D
				NB Through	773	30	79	380	C		
				NB Right	621	2	0	0	A		
	SB	31.5	C	SB Left	211	63	74	329	E		
				SB Through	506	23	72	328	C		
				SB Right	131	15	69	279	B		
	EB	129.4	F	EB Left	103	110	345	678	F		
				EB Through	519	132	347	678	F		
				EB Right	44	141	369	702	F		
	WB	36.8	D	WB Left	507	46	102	410	D		
				WB Through	421	43	103	410	D		
				WB Right	290	13	122	441	B		
40- Rockledge Blvd at I-270 NB on and off ramp											
40	NB	138.5	F	NB Left	0	0	0	0	A	116.5	F
				NB Through	333	126	580	847	F		
				NB Right	848	143	580	847	F		
	SB	86.3	F	SB Left	0	0	88	224	A		
				SB Through	349	86	88	224	F		
				SB Right	0	0	0	0	A		
	EB	96.4	F	EB Left	6	184	299	813	F		
				EB Through	455	151	299	813	F		
				EB Right	299	12	0	0	B		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table D.15: PM Peak - 2040 Adaptive Ramp Metering- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS	
41- Rockledge Blvd at I-270 SB on and off ramps												
41	NB	32.8	C	NB Left	339	33	81	261	C	48.9	D	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	53.3	D		WB Left	351	58	192	722			E
					WB Through	891	51	192	722			D
					WB Right	0	0	0	0			A
42- MD 187 at Tuckerman Ln												
42	NB	74.3	E	NB Left	217	49	631	1323	D	132.1	F	
				NB Through	2288	76	631	1323	E			
				NB Right	201	80	631	1323	F			
	SB	187.9	F		SB Left	205	169	2556	2681			F
					SB Through	1145	185	2556	2681			F
					SB Right	304	210	2556	2681			F
	EB	113.9	F		EB Left	301	63	514	1368			E
					EB Through	533	139	515	1369			F
					EB Right	118	130	539	1393			F
	WB	194.6	F		WB Left	466	189	1933	2138			F
					WB Through	675	210	1933	2138			F
					WB Right	166	145	1933	2138			F
43- MD 187 at I-270 NB on and off ramps												
43	NB	19.2	B	NB Left	562	35	130	410	D	22.0	C	
				NB Through	2498	16	130	410	B			
				NB Right	0	0	0	0	A			
	SB	25.0	C		SB Left	0	0	0	0			A
					SB Through	1286	25	65	299			C
					SB Right	0	0	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	58.7	E		WB Left	60	58	44	274			E
					WB Through	68	59	44	274			E
					WB Right	0	0	0	0			A
44- MD 187 at I-270 NB on and off ramps												
44	NB	47.5	E	NB Left	0	0	0	0	A	43.2	D	
				NB Through	2416	48	205	933	D			
				NB Right	0	0	0	0	A			
	SB	18.9	B		SB Left	149	58	72	305			E
					SB Through	1199	14	72	305			B
					SB Right	0	0	0	0			A
	EB	70.7	E		EB Left	643	72	180	669			E
					EB Through	0	0	180	669			A
					EB Right	178	65	99	604			E
	WB				WB Left	0	0	0	0			A
					WB Through	0	0	0	0			A
					WB Right	0	0	0	0			A
45- MD 187 at Rock Spring Dr												
45	NB	20.3	C	NB Left	492	36	118	783	D	30.0	C	
				NB Through	2181	17	118	784	B			
				NB Right	18	13	139	817	B			
	SB	36.4	D		SB Left	21	59	119	588			E
					SB Through	1187	41	119	588			D
					SB Right	173	1	72	582			A
	EB	48.6	D		EB Left	431	60	141	511			E
					EB Through	50	64	141	511			E
					EB Right	484	37	141	511			D
	WB	17.1	B		WB Left	7	30	6	108			C
					WB Through	16	33	6	108			C
					WB Right	36	8	3	97			A
47- Democracy Blvd at I-270 NB off ramp												
47	NB	44.0	D	NB Left	152	44	28	146	D	2.9	A	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB	1.2	A		EB Left	0	0	0	0			A
					EB Through	1151	1	3	54			A
					EB Right	0	0	0	0			A
	WB	1.0	A		WB Left	0	0	0	0			A
					WB Through	2240	1	3	57			A
					WB Right	0	0	0	0			A
48- Democracy Blvd at I-270 SB on ramp												
48	NB			NB Left	0	0	0	0	A	8.1	A	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB	5.3	A		EB Left	0	0	0	0			A
					EB Through	1364	5	19	249			A
					EB Right	0	0	0	0			A
	WB	9.8	A		WB Left	553	33	55	351			C
					WB Through	1825	3	44	330			A
					WB Right	0	0	0	0			A
49- Democracy Blvd at I-270 SB off ramp												
49	NB			NB Left	0	0	0	0	A	8.2	A	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB	37.4	D		SB Left	153	51	29	179			D
					SB Through	0	0	0	0			A
					SB Right	59	3	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	5.1	A		WB Left	0	0	0	0			A
					WB Through	1825	4	19	288			A
					WB Right	160	20	80	685			B
50- MD 190 at Burdette Rd												
50	NB	76.5	E	NB Left	27	79	18	118	E	38.0	D	
				NB Through	7	69	18	118	E			
				NB Right	6	75	18	118	E			
	SB	35.9	D		SB Left	45	76	25	158			E
					SB Through	9	70	25	158			E
					SB Right	122	19	25	158			B
	EB	25.1	C		EB Left	137	107	135	710			F
					EB Through	1293	17	135	710			B
					EB Right	30	4	129	737			A
	WB	45.9	D		WB Left	13	117	396	1108			F
					WB Through	2146	46	396	1108			D
					WB Right	65	37	396	1108			D

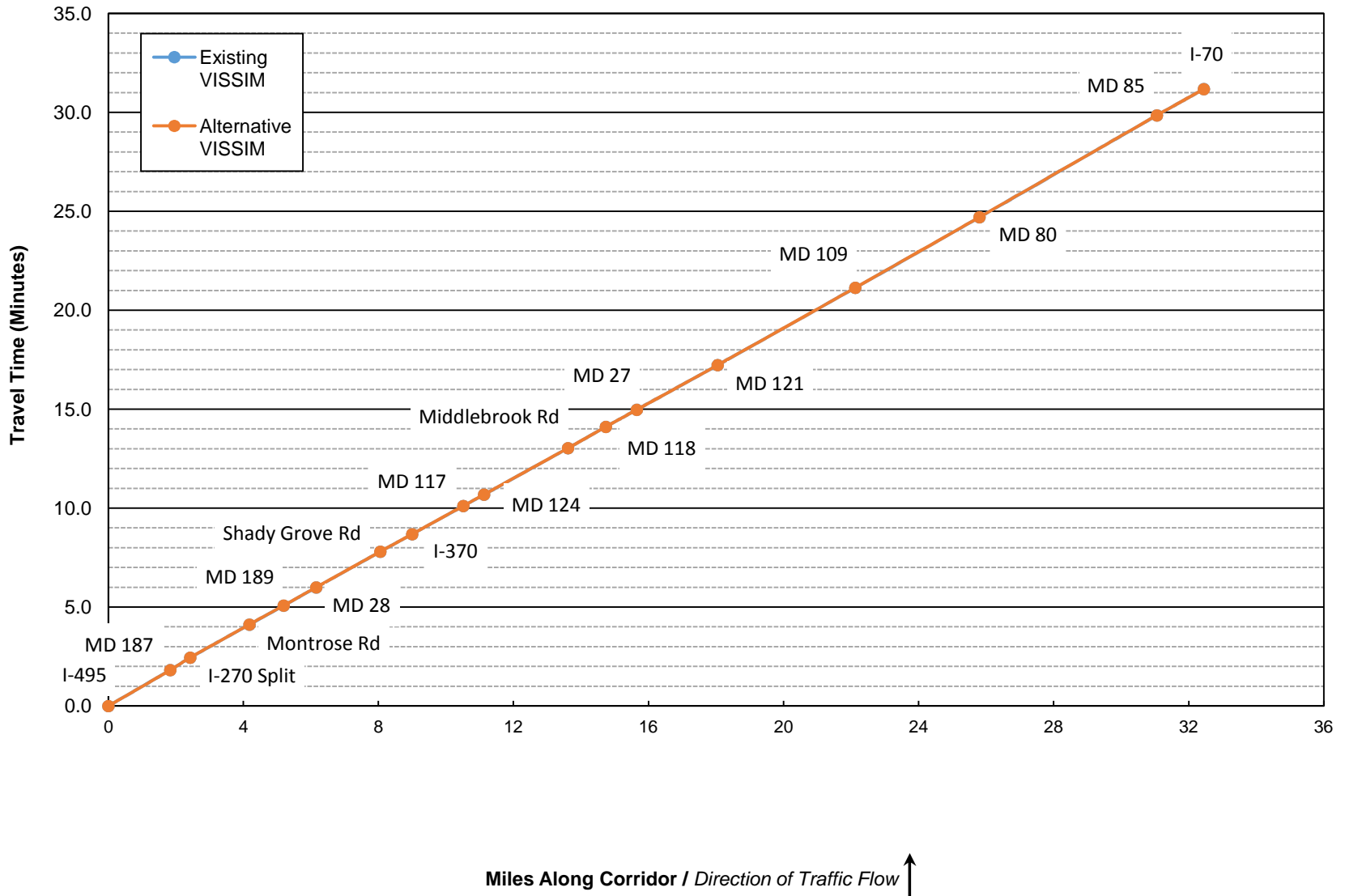
Table D.15: PM Peak - 2040 Adaptive Ramp Metering- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
51- MD 190 at I-270 NB on ramp											
51	NB			NB Left	0	0	0	0	A	17.8	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	66.1	E	EB Left	253	66	101	354	E		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	9.4	A	WB Left	0	0	0	0	A		
WB Through				1465	9	51	832	A			
WB Right				0	0	0	0	A			
52- MD 190 at I-270 SB off ramp											
52	NB	73.2	E	NB Left	230	73	98	913	E	12.8	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	3.5	A	EB Left	0	0	0	0	A		
				EB Through	1062	4	8	187	A		
				EB Right	0	0	0	0	A		
	WB	10.3	B	WB Left	0	0	0	0	A		
WB Through				1633	10	26	530	B			
WB Right				0	0	0	0	A			
53- MD 190 at Seven Locks Rd											
53	NB	0.5	A	NB Left	28	1	0	0	A	26.8	C
				NB Through	314	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	52.8	D	SB Left	364	53	120	414	D		
				SB Through	232	53	120	414	D		
				SB Right	20	52	120	414	D		
	EB	32.0	C	EB Left	27	29	95	437	C		
				EB Through	800	32	95	437	C		
				EB Right	45	32	95	437	C		
	WB	20.6	C	WB Left	255	75	123	506	E		
WB Through				908	17	123	506	B			
WB Right				693	5	123	506	A			
54- MD 124 at I-270 NB off ramp											
54	NB	30.3	C	NB Left	0	0	0	0	A	22.6	C
				NB Through	0	0	0	0	A		
				NB Right	537	30	52	649	C		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	20.1	C	EB Left	0	0	0	0	A		
				EB Through	1640	20	52	1002	C		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
WB Through				0	0	0	0	A			
WB Right				0	0	0	0	A			
55- Democracy Blvd at I-270 NB off ramp											
55	NB	48.5	D	NB Left	0	0	0	0	A	11.5	B
				NB Through	0	0	0	0	A		
				NB Right	313	48	51	225	D		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	1.5	A	EB Left	0	0	0	0	A		
				EB Through	1153	1	4	61	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
WB Through				0	0	0	0	A			
WB Right				0	0	0	0	A			
56- Watkins Mill Rd at I-270 SB off ramp/Parkview Ave											
56	NB	67.0	E	NB Left	145	51	152	619	D	87.3	F
				NB Through	0	0	0	0	A		
				NB Right	344	74	152	619	E		
	SB	44.4	D	SB Left	405	65	118	424	E		
				SB Through	110	61	118	424	E		
				SB Right	441	22	118	424	C		
	EB	143.1	F	EB Left	0	0	0	0	A		
				EB Through	1220	143	959	1251	F		
				EB Right	4	125	959	1251	F		
	WB	41.7	D	WB Left	67	92	57	228	F		
WB Through				315	31	54	226	C			
WB Right				0	0	0	0	A			
57- Watkins Mill Rd at I-270 NB on ramp											
57	NB	36.7	D	NB Left	72	71	37	416	E	65.0	E
				NB Through	0	0	0	0	A		
				NB Right	180	23	37	416	C		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	24.3	C	EB Left	642	61	135	451	E		
				EB Through	1052	2	135	451	A		
				EB Right	0	0	0	0	A		
	WB	131.4	F	WB Left	0	0	0	0	A		
WB Through				761	107	615	872	F			
WB Right				386	180	615	872	F			
58- Watkins Mill Rd at I-270 SB on ramp											
58	NB			NB Left	0	0	0	0	A	16.3	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	16.4	B	EB Left	0	0	0	0	A		
				EB Through	1686	18	149	596	B		
				EB Right	286	8	149	596	A		
	WB	15.9	B	WB Left	458	28	60	488	C		
WB Through				377	1	60	488	A			
WB Right				0	0	0	0	A			

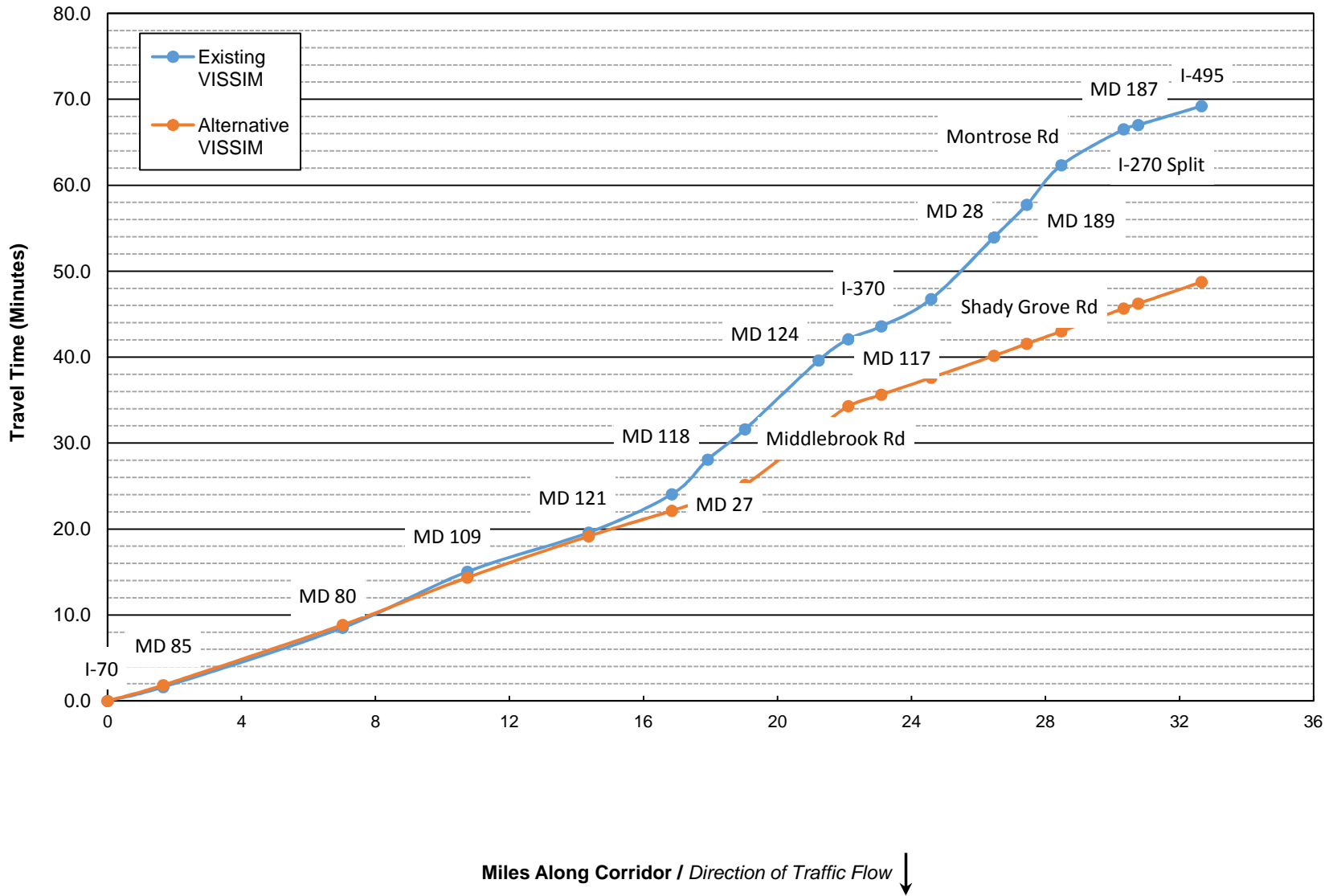
Table D.16: PM Peak - 2040 Adaptive Ramp Metering- I-270 Vehicle Network Performance

	No-Build	ARM	% Change
Total Delay	36,237,078	36,442,816	1%
Average Delay per Vehicle	307	309	1%
Total Travel Time	67,865,560	68,043,530	0%
Vehicles (Arrived)	95,124	94,948	0%
Latent Demand	8,861	9,170	3%
Latent Delay	13,484,325	14,252,737	6%
Total Distance	477,455	477,055	0%
Average Speed	25	25	0%

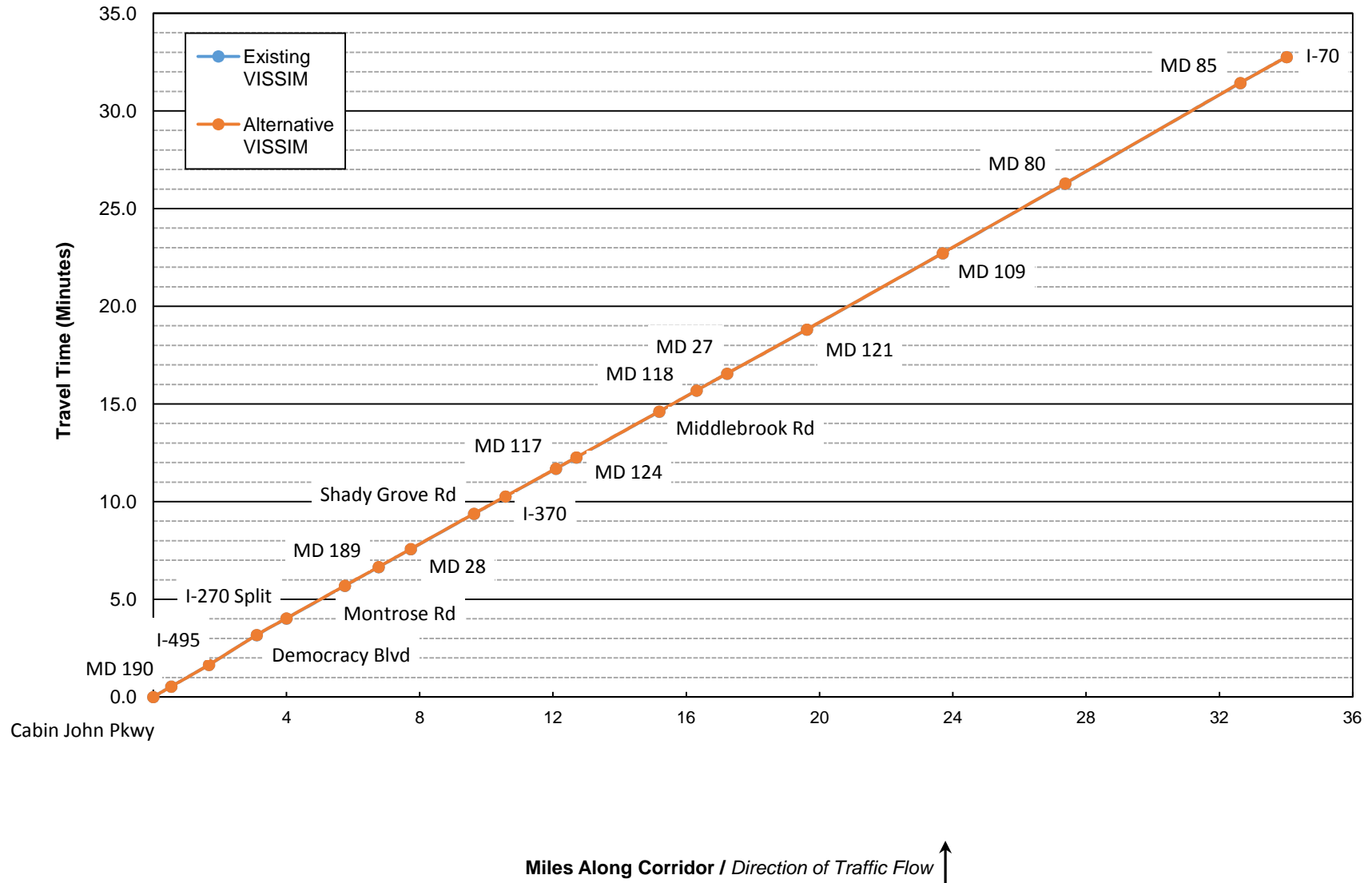
**Figure A.1: AM Peak - 2015 HSR+VSL+ARM
I-270 Travel Time Graph - Northbound**



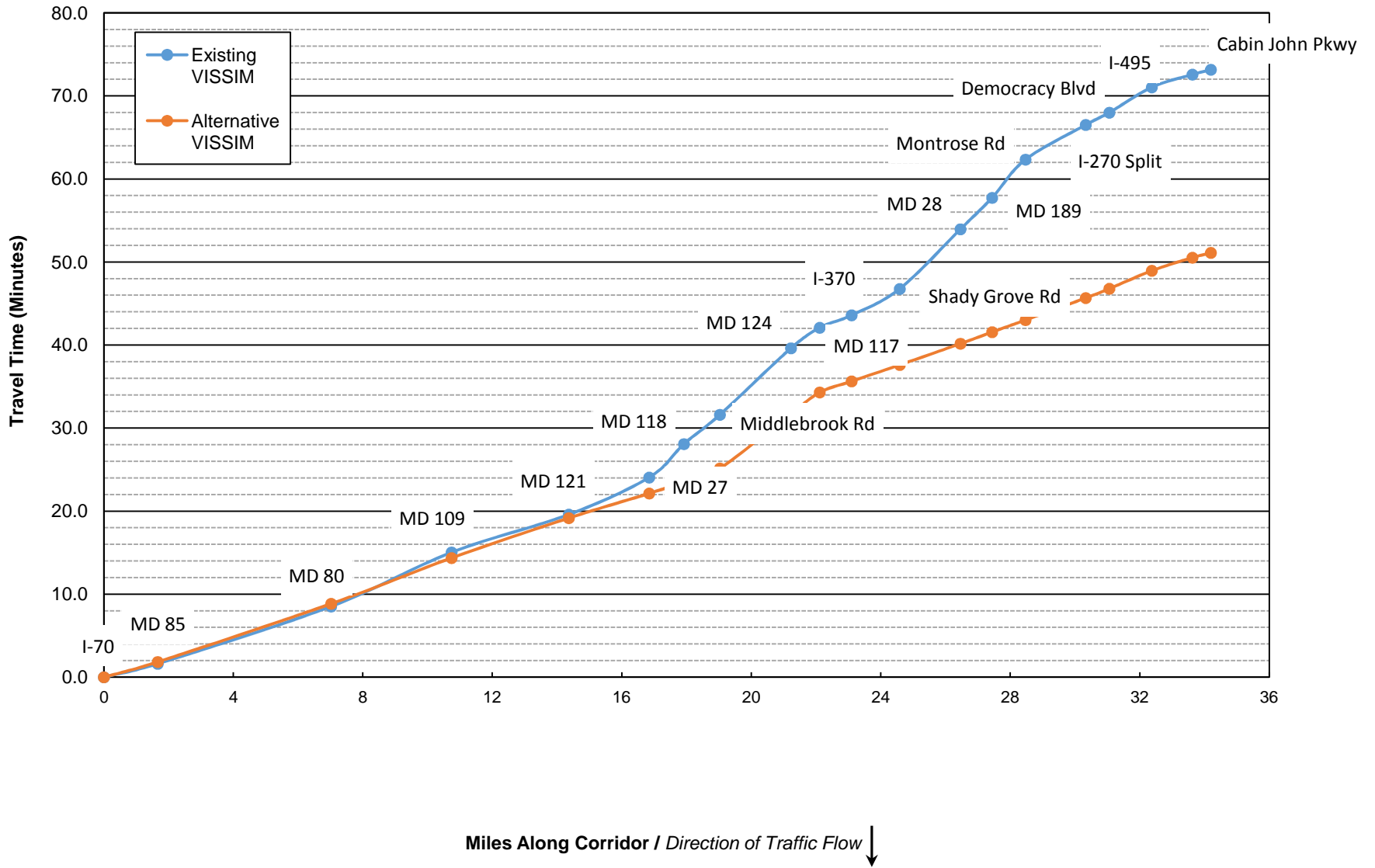
**Figure A.2: AM Peak - 2015 HSR+VSL+ARM
I-270 Travel Time Graph - Southbound**



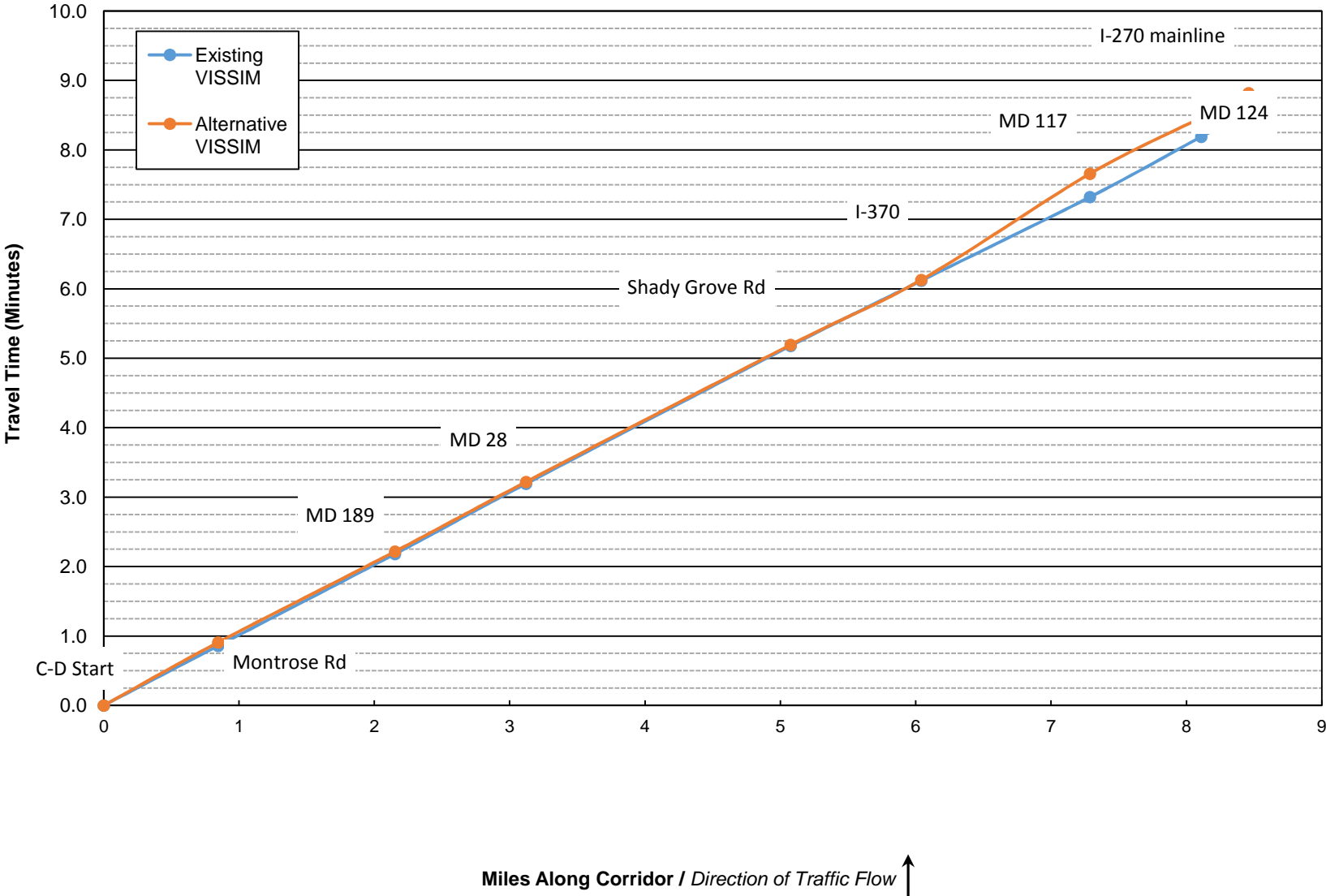
**Figure A.3: AM Peak - 2015 HSR+VSL+ARM
I-270 Spur Travel Time Graph - Northbound**



**Figure A.4: AM Peak - 2015 HSR+VSL+ARM
I-270 Spur Travel Time Graph - Southbound**



**Figure A.5: AM Peak - 2015 HSR+VSL+ARM
I-270 Local Travel Time Graph - Northbound**



**Figure A.6: AM Peak - 2015 HSR+VSL+ARM
I-270 Local Travel Time Graph - Southbound**

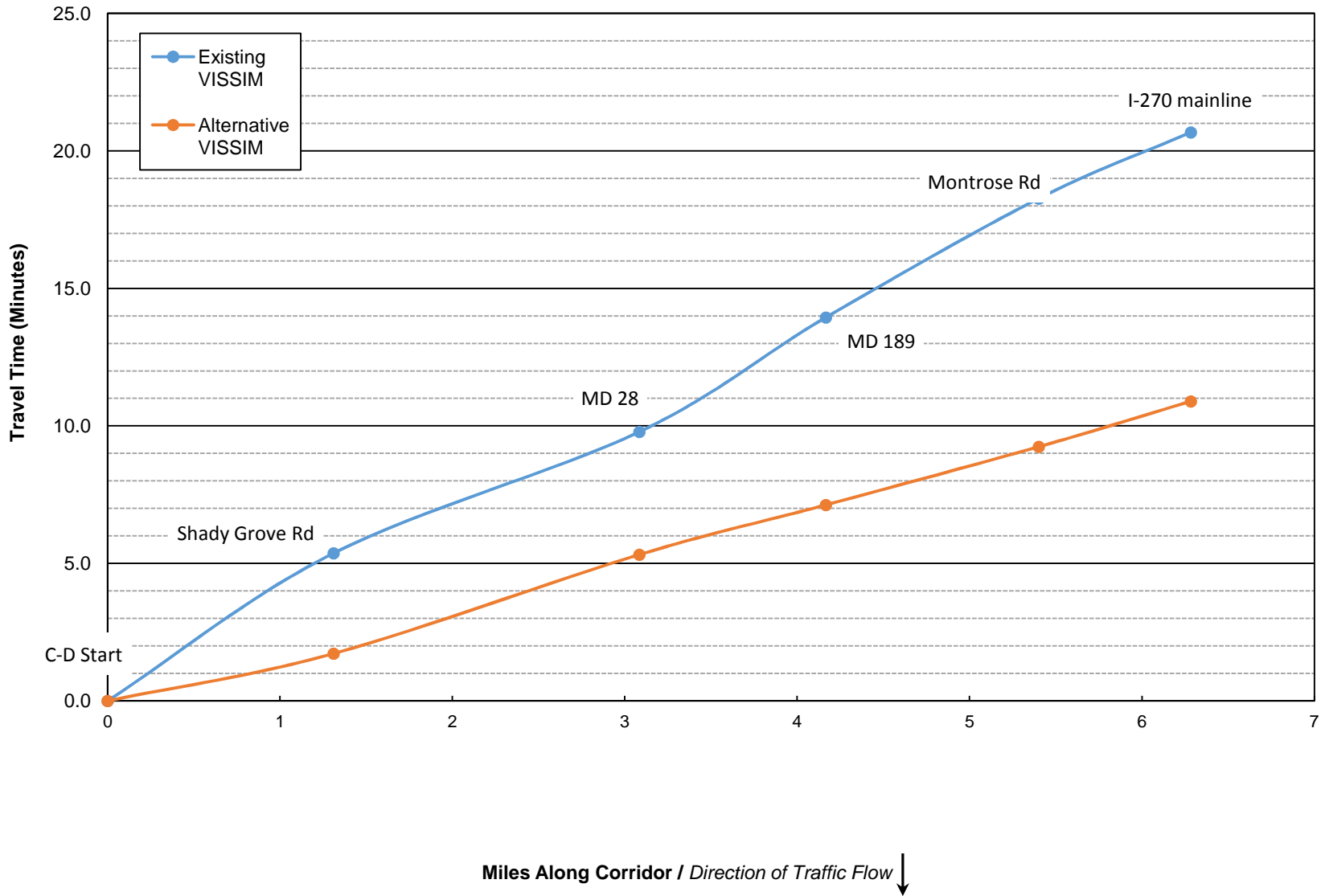


Table A.1: AM Peak -2015 HSR+VSL+ARM- I-270 Vehicle Travel Time

I-270 Northbound	Segment Length (miles)	Existing VISSIM Travel Time (seconds)	HSR+VSL+ARM VISSIM Travel Time (seconds)	% Change	I-270 Southbound	Segment Length (miles)	Existing VISSIM Travel Time (seconds)	HSR+VSL+ARM VISSIM Travel Time (seconds)	% Change
From I-495 interchange					From I-70				
to MD 187	1.8	109.0	108.9	0%	to MD 85	1.7	97.0	110.2	14%
to I-270 Split	0.6	37.5	37.9	1%	to MD 80	5.4	414.5	420.6	1%
to Montrose Rd	1.8	100.1	100.3	0%	to MD 109	3.7	390.6	330.4	-15%
to MD 189	1.0	57.6	57.7	0%	to MD 121	3.6	273.2	288.5	6%
to MD 28	1.0	55.1	55.1	0%	to MD 27	2.5	267.9	178.2	-33%
to Shady Grove Rd	1.9	108.4	108.3	0%	to MD 118	1.1	241.4	82.4	-66%
to I-370	0.9	53.0	53.0	0%	to Middlebrook Rd	1.1	211.7	98.5	-53%
to MD 117	1.5	85.5	85.5	0%	to MD 124	2.2	480.5	394.7	-18%
to MD 124	0.6	34.5	34.5	0%	to MD 117	0.9	148.4	154.5	4%
to Middlebrook Rd	2.5	140.9	140.9	0%	to I-370	1.0	90.2	80.0	-11%
to MD 118	1.1	64.8	64.5	0%	to Shady Grove Rd	1.5	190.3	118.5	-38%
to MD 27	0.9	51.8	51.8	0%	to MD 28	1.9	431.1	153.3	-64%
to MD 121	2.4	135.3	135.4	0%	to MD 189	1.0	227.1	83.7	-63%
to MD 109	4.1	234.5	234.5	0%	to Montrose Rd	1.0	276.2	87.1	-68%
to MD 80	3.7	213.8	214.0	0%	to I-270 Split	1.9	250.6	159.4	-36%
to MD 85	5.3	309.0	308.6	0%	to MD 187	0.4	30.0	34.4	15%
to I-70	1.4	79.9	79.7	0%	to I-495 interchange	1.9	131.8	150.4	14%
I-270 Total (miles/minutes)	32.4	31.2	31.2	0%	I-270 Total (miles/minutes)	32.7	69.2	48.7	-30%
I-270 Spur Northbound					I-270 Spur Southbound				
From Cabin John Pkwy					From I-70				
to MD 190	0.5	32.2	32.2	0%	to I-270 Split	30.3	3,990.6	2,739.8	-31%
to I-495	1.1	66.7	66.7	0%	to Democracy Blvd	0.7	88.4	67.5	-24%
to Democracy Blvd	1.4	91.2	91.6	0%	to I-495	1.3	183.1	129.8	-29%
to I-270 Split	0.9	51.0	51.1	0%	to MD 190	1.3	92.2	94.4	2%
to I-70	30.0	1,724.3	1,723.8	0%	to Cabin John Pkwy	0.6	35.0	34.8	-1%
I-270 Spur Total (miles/minutes)	34.0	32.8	32.8	0%	I-270 Spur Total (miles/minutes)	34.2	73.2	51.1	-30%

Table A.2: AM Peak -2015 HSR+VSL+ARM- I-270 Local Vehicle Travel Time

I-270 Northbound	Segment Length (miles)	Existing VISSIM Travel Time (seconds)	HSR+VSL+ARM VISSIM Travel Time (seconds)	% Change	I-270 Southbound	Segment Length (miles)	Existing VISSIM Travel Time (seconds)	HSR+VSL+ARM VISSIM Travel Time (seconds)	% Change
From C-D start					From C-D start				
to Montrose Rd	0.8	51.6	54.5	6%	to Shady Grove	1.3	322.1	103.2	-68%
to MD 189	1.3	79.3	78.5	-1%	to MD 28	1.8	264.8	215.8	-19%
to MD 28	1.0	60.7	60.1	-1%	to MD 189	1.1	249.5	108.4	-57%
to Shady Grove	2.0	119.1	118.5	-1%	to Montrose	1.2	259.4	126.9	-51%
to I-370	1.0	56.3	56.1	0%	to I-270 mainline	0.9	144.4	99.1	-31%
to MD 117	1.2	72.3	91.7	27%					
to MD 124	0.8	52.1	48.5	-7%					
to I-270 mainline	0.4	21.4	21.2	-1%					
I-270 Local Total (miles/minutes)	8.5	8.5	8.8	3%	I-270 Local Total (miles/minutes)	6.3	20.7	10.9	-47%

Table A.3: AM Peak -2015 HSR+VSL+ARM- I-270 Vehicle Speed

I-270 Northbound	Segment Length (miles)	Existing VISSIM Speed (MPH)	HSR+VSL+ARM VISSIM Speed (MPH)	% Change	I-270 Southbound	Segment Length (miles)	Existing VISSIM Speed (MPH)	HSR+VSL+ARM VISSIM Speed (MPH)	% Change
From I-495 interchange					From I-70				
to MD 187	1.8	60.5	60.6	0%	to MD 85	1.7	61.7	54.3	-12%
to I-270 Split	0.6	56.7	56.2	-1%	to MD 80	5.4	46.5	45.8	-1%
to Montrose Rd	1.8	63.0	63.0	0%	to MD 109	3.7	34.3	40.5	18%
to MD 189	1.0	63.3	63.3	0%	to MD 121	3.6	47.7	45.2	-5%
to MD 28	1.0	62.9	63.0	0%	to MD 27	2.5	33.4	50.2	50%
to Shady Grove Rd	1.9	63.0	63.1	0%	to MD 118	1.1	16.0	46.9	193%
to I-370	0.9	64.1	64.1	0%	to Middlebrook Rd	1.1	18.9	40.6	115%
to MD 117	1.5	63.8	63.8	0%	to MD 124	2.2	16.5	20.0	22%
to MD 124	0.6	63.9	64.0	0%	to MD 117	0.9	21.5	20.7	-4%
to Middlebrook Rd	2.5	63.6	63.5	0%	to I-370	1.0	39.3	44.3	13%
to MD 118	1.1	62.3	62.6	0%	to Shady Grove Rd	1.5	28.1	45.2	61%
to MD 27	0.9	63.6	63.6	0%	to MD 28	1.9	15.7	44.1	181%
to MD 121	2.4	63.7	63.7	0%	to MD 189	1.0	15.5	42.1	171%
to MD 109	4.1	62.6	62.6	0%	to Montrose Rd	1.0	13.5	42.7	217%
to MD 80	3.7	61.9	61.9	0%	to I-270 Split	1.9	26.7	42.0	57%
to MD 85	5.3	61.2	61.3	0%	to MD 187	0.4	52.3	45.6	-13%
to I-70	1.4	62.7	62.8	0%	to I-495 interchange	1.9	51.7	45.3	-12%
I-270 Total (miles/minutes)	32.4	62.4	62.4	0%	I-270 Total (miles/minutes)	32.7	28.3	40.2	42%
I-270 Spur Northbound					I-270 Spur Southbound				
From Cabin John Pkwy					From I-70				
to MD 190	0.5	60.3	60.3	0%	to I-270 Split	30.3	27.4	39.8	46%
to I-495	1.1	61.2	61.1	0%	to Democracy Blvd	0.7	29.8	39.0	31%
to Democracy Blvd	1.4	56.6	56.3	0%	to I-495	1.3	25.8	36.4	41%
to I-270 Split	0.9	62.9	62.9	0%	to MD 190	1.3	48.9	47.8	-2%
to I-70	30.0	62.7	62.7	0%	to Cabin John Pkwy	0.6	58.6	58.9	1%
I-270 Spur Total (miles/minutes)	34.0	62.3	62.3	0%	I-270 Spur Total (miles/minutes)	34.2	28.0	40.1	43%

Table A.4: AM Peak -2015 HSR+VSL+ARM- I-270 Local Vehicle Speed

I-270 Northbound	Segment Length (miles)	Existing VISSIM Speed (MPH)	HSR+VSL+ARM VISSIM Speed (MPH)	% Change	I-270 Southbound	Segment Length (miles)	Existing VISSIM Speed (MPH)	HSR+VSL+ARM VISSIM Speed (MPH)	% Change
From C-D start					From C-D start				
to Montrose Rd	0.8	59.0	55.8	-5%	to Shady Grove	1.3	14.6	45.7	212%
to MD 189	1.3	59.3	59.9	1%	to MD 28	1.8	24.1	29.6	23%
to MD 28	1.0	57.4	58.0	1%	to MD 189	1.1	15.6	35.9	130%
to Shady Grove	2.0	59.1	59.4	1%	to Montrose	1.2	17.1	35.0	104%
to I-370	1.0	61.7	62.0	0%	to I-270 mainline	0.9	22.0	32.0	46%
to MD 117	1.2	62.1	48.9	-21%					
to MD 124	0.8	56.8	61.1	8%					
to I-270 mainline	0.4	58.9	59.3	1%					
I-270 Local Total (miles/minutes)	8.5	59.4	57.6	-3%	I-270 Local Total (miles/minutes)	6.3	18.2	34.6	90%

Table A.5: AM Peak -2015 HSR+VSL+ARM- I-270 Vehicle Density

I-270 Northbound	Type	Existing		HSR+VSL+ARM		% Change	I-270 Southbound	Type	Existing		HSR+VSL+ARM		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS	
I-270	Freeway	25	C	25	C	0%	I-270	Freeway	20	C	20	C	0%
I-270 Diverge to MD 187	Diverge	19	B	19	B	0%	I-270 Merge from WB I-70	Merge	13	B	13	B	0%
I-270	Freeway	22	C	22	C	0%	I-270	Freeway	24	C	24	C	0%
I-270 Diverge to Rockledge Rd	Diverge	19	B	19	B	0%	I-270 Merge from EB I-70	Merge	20	B	20	B	0%
I-270	Freeway	19	C	19	C	0%	I-270	Freeway	28	D	35	D	26%
I-270 Weave from MD 187 to I-270 HOV	Weave	10	B	11	B	1%	I-270 Diverge to SB MD 85	Diverge	31	D	40	E	28%
I-270 Lane Drop	Merge	15	B	15	B	0%	I-270	Freeway	27	D	37	E	34%
I-270	Freeway	27	D	27	D	0%	I-270 Diverge to NB MD 85	Diverge	15	B	19	B	21%
I-270 Merge from I-270 Spur	Merge	24	C	24	C	0%	I-270	Freeway	23	C	27	D	22%
I-270 Weave from I-270 HOV to I-270 C-D	Weave	27	C	27	C	0%	I-270 Merge from MD 85	Merge	14	B	14	B	0%
I-270	Freeway	23	C	23	C	1%	I-270	Freeway	36	E	30	D	-17%
I-270 Diverge to C-D (MD 189)	Diverge	21	C	21	C	1%	I-270 Diverge to MD 80	Diverge	39	E	19	B	-50%
I-270	Freeway	18	B	18	B	0%	I-270	Freeway	75	F	36	E	-53%
I-270 Diverge to C-D (MD 28)	Diverge	19	B	19	B	1%	I-270 Merge from MD 80	Merge	85	F	21	C	-75%
I-270	Freeway	15	B	15	B	0%	I-270	Freeway	55	F	44	E	-20%
I-270 Merge from C-D (MD 189)	Merge	18	B	18	B	-2%	I-270 Diverge to MD 109	Diverge	33	D	23	C	-29%
I-270 Diverge to C-D (Shady Grove Rd)	Diverge	26	C	25	C	-3%	I-270	Freeway	66	F	47	F	-29%
I-270	Freeway	14	B	14	B	-1%	I-270 Merge from MD 109	Merge	55	F	28	D	-48%
I-270 Weave from C-D (MD 28) to C-D (Shady Grove Rd)	Weave	13	B	13	B	0%	I-270	Freeway	47	F	48	F	3%
I-270	Freeway	11	B	11	B	-1%	I-270 Diverge to SB Weigh Station	Diverge	19	B	22	C	15%
I-270 Merge from C-D (Shady Grove Rd)	Merge	10	B	10	A	-1%	I-270	Freeway	39	E	46	F	17%
I-270	Freeway	13	B	13	B	0%	I-270 Merge from SB Weigh Station	Merge	20	C	23	C	13%
I-270 Merge from C-D (I-370)	Merge	11	B	11	B	0%	I-270	Freeway	41	E	42	E	2%
I-270 Diverge to C-D (MD 117)	Diverge	16	B	17	B	0%	I-270 Diverge to MD 121	Diverge	20	C	19	B	-5%
I-270	Freeway	13	B	13	B	0%	I-270	Freeway	31	D	29	D	-7%
I-270 Merge from C-D (MD 124)	Merge	14	B	14	B	0%	I-270 Merge from MD 121	Merge	32	D	22	C	-30%
I-270	Freeway	17	B	17	B	0%	I-270	Freeway	53	F	21	C	-59%
I-270 Diverge to EB Middlebrook Rd	Diverge	11	B	11	B	0%	I-270 Diverge to MD 27	Diverge	55	F	22	C	-60%
I-270	Freeway	15	B	15	B	0%	I-270	Freeway	80	F	24	C	-70%
I-270 Diverge to WB Middlebrook Rd	Diverge	10	A	10	A	0%	I-270 Merge from WB MD 27	Merge	83	F	26	C	-69%
I-270	Freeway	14	B	14	B	0%	I-270	Freeway	78	F	35	E	-55%
I-270 Diverge to EB MD 118	Diverge	11	B	11	B	-4%	I-270 Weave from EB MD 27 to MD 118	Weave	76	F	28	C	-64%
I-270 Diverge to WB MD 118	Diverge	14	B	14	B	0%	I-270	Freeway	89	F	34	D	-61%
I-270	Freeway	13	B	13	B	0%	I-270 Merge from WB MD 118	Merge	70	F	26	C	-63%
I-270 Weave from MD 118 to MD 27	Weave	13	B	13	B	0%	I-270	Freeway	85	F	38	E	-56%
I-270	Freeway	12	B	12	B	0%	I-270 Merge from EB MD 118	Merge	70	F	29	D	-58%
I-270 Merge from EB MD 27	Merge	13	B	13	B	0%	I-270	Freeway	75	F	39	E	-48%
I-270	Freeway	13	B	13	B	0%	I-270 Merge from Middlebrook Rd	Merge	99	F	55	F	-45%
I-270 Merge from WB MD 27	Merge	10	A	10	A	0%	I-270	Freeway	107	F	86	F	-20%
I-270	Freeway	14	B	13	B	0%	I-270 Diverge to MD 124	Diverge	93	F	124	F	33%
I-270 Diverge to MD 121	Diverge	10	A	10	A	0%	I-270	Freeway	92	F	91	F	-1%

Table A.5: AM Peak -2015 HSR+VSL+ARM- I-270 Vehicle Density

I-270 Northbound	Type	Existing		HSR+VSL+ARM		% Change	I-270 Southbound	Type	Existing		HSR+VSL+ARM		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS			
I-270	Freeway	12	B	12	B	0%	I-270 Merge from WB MD 124	Merge	119	F	104	F	-13%
I-270 Merge from EB MD 121	Merge	9	A	9	A	-3%	I-270	Freeway	47	F	47	F	-1%
I-270 Lane Drop	Merge	13	B	12	B	-3%	I-270 Merge from MD 117	Merge	46	F	41	F	-12%
I-270	Freeway	18	C	18	C	-1%	I-270	Freeway	48	F	40	E	-17%
I-270 Diverge to NB Weigh Station	Diverge	10	A	10	A	-1%	I-270 Diverge to I-370	Diverge	43	F	35	D	-19%
I-270	Freeway	20	C	20	C	-1%	I-270	Freeway	51	F	37	E	-27%
I-270 Merge from NB Weight Station	Merge	10	B	10	A	-2%	I-270 Diverge to I-270 C-D	Diverge	81	F	28	C	-66%
I-270	Freeway	20	C	20	C	-1%	I-270	Freeway	36	E	24	C	-34%
I-270 Diverge to MD 109	Diverge	11	B	11	B	-2%	I-270 Merge from I-270 (I-370)	Merge	94	F	23	C	-76%
I-270	Freeway	19	C	18	C	-2%	I-270 Diverge to I-270 C-D (Shady Grove Rd)	Diverge	87	F	23	C	-73%
I-270 Merge from MD 109	Merge	10	B	10	A	-3%	I-270	Freeway	90	F	21	C	-76%
I-270	Freeway	20	C	19	C	-2%	I-270 Merge from I-270 C-D (Shady Grove Rd Northern)	Merge	102	F	25	C	-75%
I-270 Diverge to MD 80	Diverge	12	B	11	B	-1%	I-270	Freeway	86	F	27	D	-69%
I-270	Freeway	18	B	18	B	-1%	I-270 Merge from I-270 C-D (Shady Grove Rd Southern)	Merge	107	F	23	C	-78%
I-270 Merge from MD 80	Merge	12	B	12	B	-4%	I-270 Diverge to I-270 C-D (MD 189)	Diverge	89	F	32	D	-64%
I-270	Freeway	22	C	21	C	-4%	I-270	Freeway	100	F	19	C	-81%
I-270 Diverge to Scenic View	Diverge	11	B	11	B	-5%	I-270 Merge from I-270 C-D (MD 189)	Merge	123	F	18	B	-85%
I-270	Freeway	22	C	21	C	-4%	I-270	Freeway	83	F	27	D	-67%
I-270 Merge from Scenic View	Merge	11	B	11	B	-5%	I-270 Merge from I-270 C-D	Merge	41	F	34	D	-17%
I-270	Freeway	22	C	22	C	-4%	I-270 Diverge to I-270 HOV Lane	Diverge	21	C	25	C	18%
I-270 Diverge to NB MD 85	Diverge	12	B	12	B	-3%	I-270 Diverge to I-270 Spur	Diverge	40	E	35	E	-11%
I-270	Freeway	21	C	20	C	-3%	I-270	Freeway	24	C	25	C	8%
I-270 Diverge to SB MD 85	Diverge	16	B	15	B	-3%	I-270 Diverge to Rockledge Dr / MD 187	Diverge	16	B	17	B	1%
I-270	Freeway	17	B	17	B	-4%	I-270	Freeway	25	C	27	D	9%
I-270 Weave from MD 85 to I-70	Weave	11	B	11	B	-3%	I-270 Merge from Rockledge Dr	Merge	20	B	20	C	3%
I-270	Freeway	15	B	15	B	-2%	I-270	Freeway	25	C	28	D	9%
							I-270 Merge from Rockledge Dr / MD 187	Merge	22	C	23	C	3%
							I-270	Freeway	27	D	30	D	9%

Table A.6: AM Peak -2015 HSR+VSL+ARM- I-270 Spur Vehicle Density

I-270 Spur Northbound	Type	Existing		HSR+VSL+ARM		% Change	I-270 Southbound	Type	Existing		HSR+VSL+ARM		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS	
I-270 Spur	Freeway	34	D	34	D	0%	I-270 Spur	Freeway	48	F	34	D	-29%
I-270 Spur Merge from Clara Barton Parkway	Merge	24	C	24	C	0%	I-270 Spur Weave from I-270 HOV to Democracy Blvd	Weave	53	F	36	E	-31%
I-270 Spur	Freeway	37	E	37	E	0%	I-270 Spur	Freeway	52	F	34	D	-34%
I-270 Diverge to MD 190	Diverge	27	C	27	C	0%	I-270 Merge from Democracy Blvd	Merge	28	D	17	B	-39%
I-270 Spur	Freeway	32	D	32	D	0%	I-270 Spur Lane Drop	Merge	52	F	36	E	-30%
I-270 Spur Merge from Cabin John Parkway	Merge	23	C	23	C	0%	I-270 Spur	Freeway	72	F	47	F	-34%
I-270 Spur Merge from MD 190	Merge	23	C	23	C	0%	I-270 Spur Merge from I-495	Merge	37	E	38	E	3%
I-270 Spur	Freeway	30	D	30	D	0%	I-270 Spur	Freeway	39	E	39	E	0%
I-270 Spur Diverge to I-495	Merge	32	D	32	D	1%	I-270 Spur Diverve to EB MD 190	Diverge	46	F	48	F	4%
I-270 Spur	Freeway	31	D	31	D	0%	I-270 Spur Diverve to Cabin John Pkwy	Diverge	27	C	26	C	-3%
I-270 Spur Diverge to Democracy Blvd	Diverge	25	C	25	C	2%	I-270 Spur	Freeway	28	D	28	D	-2%
I-270 Spur	Freeway	23	C	24	C	1%	I-270 Merge from MD 190	Merge	25	C	25	C	-2%
I-270 Spur Merge from EB Democracy Blvd	Merge	15	B	15	B	0%	I-270 Spur	Freeway	33	D	33	D	-1%
I-270 Spur	Freeway	23	C	23	C	0%	I-270 Diverge to WB Clara Barton Pkwy	Diverge	22	C	22	C	-1%
I-270 Spur Merge from WB Democracy Blvd	Merge	15	B	15	B	0%	I-270 Spur	Freeway	32	D	32	D	-1%
I-270 Spur	Freeway	23	C	23	C	0%	I-270 Merge from Clara Barton Pkwy	Merge	28	D	28	D	-1%
I-270 Spur Merge from Westlake Terrace	Merge	23	C	23	C	0%							
I-270 Spur	Freeway	24	C	24	C	0%							

Table A.7: AM Peak -2015 HSR+VSL+ARM- I-270 Local Vehicle Density

I-270 Northbound	Type	Existing		HSR+VSL+ARM		% Change	I-270 Southbound	Type	Existing		HSR+VSL+ARM		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS	
I-270 C-D	Freeway	33	D	33	D	2%	I-270 C-D	Freeway	87	F	23	C	-74%
I-270 C-D Diverge to EB Montrose Rd	Diverge	21	C	21	C	0%	I-270 C-D Weave from I-370 EB to I-270	Weave	88	F	22	B	-75%
I-270 C-D	Freeway	19	C	19	C	0%	I-270 C-D Diverge to Shady Grove Rd	Diverge	53	F	15	B	-72%
I-270 C-D Weave between Montrose Rd Loop Ramps	Weave	13	B	13	B	-1%	I-270 C-D	Freeway	76	F	46	F	-39%
I-270 C-D	Freeway	18	B	18	B	0%	I-270 C-D Merge from WB Shady Grove Rd	Merge	62	F	40	F	-35%
I-270 C-D Merge from WB Montrose Rd	Merge	20	B	18	B	-9%	I-270 C-D	Freeway	75	F	67	F	-10%
I-270 C-D	Freeway	28	D	26	D	-5%	I-270 C-D Merge from EB Shady Grove Rd	Merge	53	F	46	F	-13%
I-270 C-D Merge from I-270	Merge	28	D	27	C	-4%	I-270 C-D	Freeway	68	F	32	D	-53%
I-270 C-D	Freeway	29	D	28	D	-4%	I-270 C-D Merge from I-270	Merge	75	F	24	C	-68%
I-270 C-D Diverge to MD 189	Diverge	16	B	15	B	-4%	I-270 C-D Diverge to I-270	Diverge	42	F	47	F	13%
I-270 C-D	Freeway	22	C	22	C	-3%	I-270 C-D Diverge to I-270	Diverge	29	D	39	E	34%
I-270 C-D Merge from MD 189	Merge	15	B	15	B	-3%	I-270 C-D	Freeway	20	C	26	D	29%
I-270 C-D	Freeway	29	D	28	D	-4%	I-270 C-D Diverge to MD 28	Diverge	13	B	17	B	31%
I-270 C-D Weave between I-270 (to MD 28 from MD 189)	Weave	28	C	26	C	-6%	I-270 C-D	Freeway	20	C	19	C	-5%
I-270 C-D	Freeway	30	D	29	D	-4%	I-270 C-D Merge from WB MD 28	Merge	36	E	12	B	-67%
I-270 C-D Diverge to MD 28	Diverge	21	C	21	C	-1%	I-270 C-D	Freeway	64	F	23	C	-65%
I-270 C-D	Freeway	26	C	25	C	-3%	I-270 C-D Merge from EB MD 28	Merge	134	F	24	C	-82%
I-270 C-D Weave between MD 28 Ramps	Weave	35	D	34	D	-3%	I-270 C-D	Freeway	109	F	41	E	-62%
I-270 C-D	Freeway	10	A	10	A	1%	I-270 C-D Merge from I-270	Merge	112	F	30	D	-73%
I-270 C-D Merge from MD 28 WB	Merge	7	A	7	A	0%	I-270 C-D	Freeway	79	F	27	D	-66%
I-270 C-D Merge from I-270 and Drop Lane	Merge	9	A	9	A	0%	I-270 C-D Diverge to MD 189	Diverge	48	F	26	C	-47%
I-270 C-D Diverge to I-270	Diverge	14	B	14	B	0%	I-270 C-D	Freeway	113	F	19	C	-83%
I-270 C-D	Freeway	23	C	23	C	-1%	I-270 C-D Merge from MD 189	Merge	110	F	23	C	-79%
I-270 C-D Diverge to Shady Grove Rd	Diverge	19	B	19	B	-1%	I-270 C-D Diverge to I-270	Diverge	68	F	34	D	-50%
I-270 C-D	Freeway	5	A	5	A	0%	I-270 C-D	Freeway	40	E	37	E	-10%
I-270 C- D Merge from I-270 and EB Shady Grove Rd	Merge	9	A	9	A	-1%	I-270 C-D Diverge to WB Montrose Rd	Diverge	26	C	19	B	-26%
I-270 C-D	Freeway	9	A	8	A	-1%	I-270 C-D	Freeway	53	F	34	D	-36%
I-270 C-D Merge from WB Shady Grove Rd	Merge	10	B	10	B	-1%	I-270 Weave between Montrose Rd Loops	Weave	61	F	26	C	-58%
I-270 C-D Diverge to I-270	Diverge	15	B	15	B	0%	I-270 C-D	Freeway	67	F	39	E	-42%
I-270 C-D	Freeway	14	B	13	B	-1%	I-270 C-D Merge from EB Montrose Rd	Merge	54	F	28	C	-49%
I-270 C-D Diverge to I-370	Diverge	13	B	13	B	-1%	I-270 C-D	Freeway	59	F	52	F	-11%
I-270 C-D	Freeway	3	A	3	A	0%							
I-270 Merge from I-370 EB	Merge	6	A	6	A	0%							
I-270 C-D	Freeway	7	A	7	A	0%							
I-270 C-D Weave from I-370 to I-270	Weave	16	B	16	B	0%							
I-270 C-D	Freeway	11	A	14	B	26%							
I-270 C-D Weave from I-270 to MD 117	Weave	16	B	34	D	107%							
I-270 C-D Diverge to MD 124	Diverge	11	B	9	A	-18%							
I-270 C-D	Freeway	2	A	2	A	2%							
I-270 C-D Merge from EB MD 124	Merge	5	A	5	A	1%							
I-270 C-D Merge From WB MD 124	Merge	8	A	8	A	-1%							

Table A.8: AM Peak -2015 HSR+VSL+ARM- I-270 Vehicle Throughput

I-270 Northbound	Existing VISSIM Throughput	HSR+VSL+ ARM VISSIM Throughput	% Change	I-270 Southbound	Existing VISSIM Throughput	HSR+VSL+ ARM VISSIM Throughput	% Change
Between I-495 and MD 187	4495	4495	0%	North of I-70	2502	2502	0%
Between MD 187 on and off ramps	3999	3999	0%	Between I-70 on ramps	2857	2857	0%
Between Rockledge Blvd on and off ramps	3361	3361	0%	From I-70 interchange to MD-85	4925	4918	0%
Between Rockledge Dr and I-270 Spur	3094	3091	0%	Between MD-85 on and off ramps	2771	2753	-1%
Between I-270 Spur and Montrose Rd	8311	8311	0%	Between MD-85 and MD-80	3221	1951	-39%
Between Montrose Rd on and off ramps	4705	4701	0%	Between MD-80 on and off ramps	3185	2891	-9%
Between Montrose Rd and MD 189	4376	4380	0%	Between MD-80 and Md-109	3861	3557	-8%
Between MD 189 and MD 28	4381	4375	0%	Between MD-109 on and off ramps	3800	3591	-6%
Between MD 28 on and off ramps	4677	4652	-1%	Between MD-109 and MD-121	4257	4052	-5%
Between MD 28 and Shady Grove Rd	3378	3349	-1%	Between MD-121 on and off ramps	4043	3892	-4%
Between Shady Grove Rd and I-370	2853	2825	-1%	Between MD-121 and MD-27	4694	4541	-3%
Between I-370 on and off ramps	3129	3108	-1%	Between MD-27 on and off ramps	4342	4529	4%
Between I-370 and MD 117	4195	4174	-1%	Between MD-27 and MD-118	4665	4994	7%
Between MD 117 and MD 124	3275	3251	-1%	Between MD-118 on and off ramps	4480	4855	8%
Between MD-124 on and off ramps	3278	3259	-1%	Between MD-118 and Middlebrook Rd	5032	5426	8%
Between MD 124 and Middlebrook Rd	4082	4083	0%	Between Middlebrook Rd on and off ramps	5031	5432	8%
Between Middlebrook Rd on and off ramps	3784	3780	0%	Between Middlebrook Rd and MD-124	6737	6888	2%
Between Middlebrook Rd and MD 118	3344	3347	0%	Between MD-124 on and off ramps	5818	5870	1%
Between MD-118 on and off ramps	3008	3004	0%	Between MD-124 and MD-117	6930	7079	2%
Between MD 118 and MD 27	2831	2832	0%	Between MD-117 and I-370	8479	8665	2%
Between MD-27 on and off ramps	2232	2230	0%	Between I-370 on and off ramps	3024	3048	1%
Between MD 27 and MD 121	2515	2505	0%	Between I-370 on ramp to Shady Grove Rd	4111	3048	-26%
Between MD-121 on and off ramps	2211	2210	0%	Between Shady Grove Rd and MD 28	3568	3070	-14%
Between MD 121 and MD 109	2420	2387	-1%	Between MD 28 on and off ramps	4420	3911	-12%
Between MD-109 on and off ramps	2263	2228	-2%	Between MD 28 and MD 189	3950	3459	-12%
Between MD 109 and MD 80	2363	2334	-1%	Between MD 189 and Montrose Rd	3941	3466	-12%
Between MD-80 on and off ramps	2126	2099	-1%	Between Montrose Rd on and off ramps	4968	4507	-9%
Between MD 80 and MD 85	2656	2553	-4%	Between Montose Rd and I-270 Spur	8098	7469	-8%
Between MD-85 on and off ramps	2016	1941	-4%	Between I-270 Spur and Rockledge Blvd	3901	3530	-10%
Between MD 85 and I-70	2858	2791	-2%	Between Rockledge Blvd on and off ramps	2845	2564	-10%
North of I-70	1832	1798	-2%	Between MD 187 on and off ramps	2986	2698	-10%
				Between MD 187 and I-495	3083	2913	-6%
I-270 Spur Northbound				I-270 Spur Southbound			
Between I-495 and Democracy Blvd	5178	5175	0%	Between I-270 Split and HOV on ramp	4233	3909	-8%
Between Democracy Blvd on and off ramps	4035	4026	0%	Between HOV on ramp and Democracy Blvd	4165	3885	-7%
Between Democracy Blvd and I-270 Split	4304	4293	0%	Between Democracy Blvd on and off ramps	3636	3399	-7%
				Between Democracy Blvd and I-495	4140	3914	-5%

Table A.9: AM Peak -2015 HSR+VSL+ARM- I-270 Local Vehicle Throughput

I-270 Local Northbound	Existing VISSIM Throughput	HSR+VSL+ARM VISSIM Throughput	% Change	I-270 Local Southbound	Existing VISSIM Throughput	HSR+VSL+ARM VISSIM Throughput	% Change
Between Montrose Rd EB off ramp and EB on ramp	2355	2349	0%	Between I-370 on ramp and I-270 off ramp	4068	3826	-6%
Between Montrose Rd EB on ramp and WB off ramp	2567	2564	0%	Between I-270 off ramp and Shady Grove off ramp	2942	3827	30%
Between Montrose Rd WB off ramp and on ramp	2151	2147	0%	Between Shady Grove off ramp and Shady Grove WB on ramp	1759	2610	48%
Between Montrose Rd WB on ramp and I-270 on ramp	3067	2959	-4%	Between Shady Grove WB and EB on ramps	2398	3233	35%
Between I-270 on ramp and MD 189 off ramp	3387	3272	-3%	Between Shady Grove on ramp and I-270 on ramp	2797	3579	28%
Between MD 189 ramps	2705	2616	-3%	Between I-270 on ramp and I-270 off ramp1	3423	4043	18%
Between MD 189 off ramp and I-270 on ramp	3252	3166	-3%	Between I-270 off ramp1 and I-270 off ramp2	2902	2642	-9%
Between I-270 on ramp and I-270 off ramp	3988	3893	-2%	Between I-270 off ramp2 and MD 28 off ramp	2031	1810	-11%
Between I-270 off ramp and MD 28 EB off ramp	2948	2886	-2%	Between MD 28 off ramp and MD 28 WB on ramp	1466	1303	-11%
Between MD 28 EB off ramp to MD 28 EB on ramp	2599	2542	-2%	Between MD 28 WB on ramp and MD 28 EB on ramp	1781	1586	-11%
Between MD 28 EB on ramp and MD 28 WB off ramp	2664	2624	-2%	Between MD 28 EB on ramp and I-270 on ramp	2841	2913	3%
Between MD 28 WB off ramp and MD 28 WB on ramp	1160	1153	-1%	Between I-270 on ramp and MD 189 off ramp	3310	3289	-1%
Between MD 28 WB on ramp and I-270 on ramp	1631	1621	-1%	Between MD 189 on and off ramps	2671	2671	0%
Between I-270 on ramp and I-270 off ramp	2926	2921	0%	Between MD 189 on ramp and I-270 off ramp	3800	2435	-36%
Between I-270 off ramp and Shady Grove off ramp	2518	2517	0%	Between I-270 off ramp and Montrose Rd off ramp	2573	2440	-5%
Between Shady Grove off ramp and I-270 on ramp	321	321	0%	Between Montrose Rd off ramp and Montrose Rd WB on ramp	2455	2307	-6%
Between I-270 on ramp and Shady Grove WB on ramp	1562	1556	0%	Between Montrose Rd WB on ramp and EB off ramp	3375	3157	-6%
Between Shady Grove WB on ramp and I-270 off ramp	1887	1874	-1%	Between Montrose Rd EB off and on ramps	2652	2483	-6%
Between I-270 off ramp and I-370 off ramp	1609	1600	-1%	Between Montrose Rd EB off ramp and I-270	3384	3189	-6%
Between I-370 off ramp and I-370 EB on ramp	332	331	0%				
Between I-370 EB and WB on ramps	826	825	0%				
Between I-370 WB on ramp and I-270 off ramp	2397	2397	0%				
Between I-270 off ramp and I-270 on ramp	1334	1333	0%				
Between I-270 on ramp and MD 117 off ramp	2251	2238	-1%				
Between MD 117 off ramp and MD 124 off ramp	1034	1034	0%				
Between MD 124 off ramp and MD 124 EB on ramp	98	99	1%				
Between MD 124 EB and WB on ramps	487	490	1%				
Between MD 124 on ramp I-270	815	833	2%				

Table A.10: AM Peak -2015 HSR+VSL+ARM- I-270 On Ramp Queue Length - Northbound

I-270 Northbound	Existing VISSIM Average Queue (feet)	HSR+VSL+ARM VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	PTG Existing VISSIM Maximum Queue (feet)	% Change
Rockledge Dr on ramp	0	0	-	0	0	-
MD 189 C-D on ramp	0	0	-	0	0	-
MD 28 C-D on ramp	0	0	-	0	0	-
Shady Grove Rd C-D on ramp	0	0	-	0	0	-
I-370 C-D on ramp	0	0	-	0	0	-
MD 124 C-D on ramp	0	0	-	0	0	-
MD 118 on ramp	0	0	-	0	0	-
MD 27 EB on ramp	0	0	-	0	0	-
MD 27 WB on ramp	0	0	-	0	0	-
MD 121 on ramp	0	0	-	0	0	-
MD 109 on ramp	0	0	-	0	0	-
MD 80 on ramp	0	0	-	0	0	-
MD 85 on ramp	0	0	-	0	0	-
I-270 Spur Northbound	Existing VISSIM Average Queue (feet)	HSR+VSL+ARM VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	PTG Existing VISSIM Maximum Queue (feet)	% Change
Democracy Blvd EB on ramp	0	0	-	0	0	-
Democracy Blvd WB on ramp	0	0	-	0	0	-
I-495 Northbound	Existing VISSIM Average Queue (feet)	HSR+VSL+ARM VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	PTG Existing VISSIM Maximum Queue (feet)	% Change
Cabin John Pkwy on ramp	0	0	-	0	0	-
MD 190 on ramp	0	0	-	0	0	-
I-270 C-D Northbound	Existing VISSIM Average Queue (feet)	HSR+VSL+ARM VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	PTG Existing VISSIM Maximum Queue (feet)	% Change
Montrose Rd EB on ramp	0	0	-	0	0	-
Montrose Rd WB on ramp	0	0	-	0	0	-
I-270 on ramp	0	0	-	0	0	-
MD 189 on ramp	0	0	-	0	0	-
I-270 on ramp	0	0	-	0	0	-
MD 28 EB on ramp	0	0	-100%	17	0	-100%
MD 28 WB on ramp	0	0	-	0	0	-
Shady Grove Rd EB on ramp	0	0	-	0	0	-
I-270 on ramp	0	0	-	0	0	-
Shady Grove Rd WB on ramp	0	0	-	0	0	-
I-370 EB on ramp	0	0	-	0	0	-
I-370 WB on ramp	0	19	-	0	218	-
I-270 on ramp	0	0	-	0	0	-
MD 124 EB on ramp	0	0	-	0	0	-
MD 124 WB on ramp	0	0	-	0	0	-

Table A.11: AM Peak -2015 HSR+VSL+ARM- I-270 Off Ramp Queue Length - Northbound

I-270 Northbound	Existing VISSIM Average Queue (feet)	HSR+VSL+ARM VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	PTG Existing VISSIM Maximum Queue (feet)	% Change
MD 187 off ramp NB	56	166	198%	347	447	29%
MD 187 off ramp SB	87	3	-97%	439	228	-48%
Rockledge Dr off ramp	4.64	22.39	382%	316	157	-50%
Tower Oaks Blvd off ramp	14.02	0.00	-100%	165	0	-100%
Montrose Rd off ramp EB	0	15	-	0	294	-
Montrose Rd off ramp WB	0	11	-	0	107	-
MD 189 off ramp WB	11	4	-68%	97	253	162%
MD 189 off ramp EB	1	47	3843%	131	296	126%
MD 28 off ramp EB	48	0	-100%	296	0	-100%
MD 28 off ramp WB	1	0	-100%	119	0	-100%
Shady Grove Rd off ramp - Redland Blvd	0	190	-	0	643	-
Shady Grove Rd off ramp WB	191	0	-100%	620	0	-100%
Shady Grove Rd off ramp EB	0	0	-	0	0	-
I-370 off ramp WB	0	0	-	0	0	-
I-370 off ramp EB	0	557	-	0	1214	-
MD 117 off ramp	218	185	-15%	793	658	-17%
MD 124 off ramp	340	0	-100%	957	0	-100%
Watkins Mill Rd off ramp*			-			-
Middlebrook Rd EB off ramp	0	0	-	0	0	-
Middlebrook Rd WB off ramp	0	0	-	0	0	-
MD 118 WB off ramp - Seneca Meadows	0	0	-100%	19	0	-100%
MD 118 WB off ramp	0	0	-	0	0	-
MD 118 EB off ramp	0	6	-	0	94	-
MD 27 off ramp WB	5	0	-100%	83	0	-100%
MD 27 off ramp EB	0	0	-	0	28	-
MD 121 off ramp WB	0	0	-100%	37	0	-100%
MD 121 off ramp EB	0	2	-	0	104	-
MD 109 off ramp EB	3	0	-100%	97	0	-100%
MD 109 off ramp WB	0	6	-	0	97	-
MD 80 off ramp EB	5	0	-94%	110	29	-74%
MD 80 off ramp WB	2	0	-100%	34	0	-100%
MD 85 NB off ramp	0	0	-	0	36	-
MD 85 SB off ramp	0	1	111%	66	157	138%
I-270 Spur Northbound	Existing VISSIM Average Queue (feet)	HSR+VSL+ARM VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	PTG Existing VISSIM Maximum Queue (feet)	% Change
Clara Barton Pkwy off ramp EB	1	0	-100%	157	0	-100%
Clara Barton Pkwy off ramp WB	0	0	-	0	14	-
MD 190 off ramp EB	0	0	-	0	0	-
MD 190 off ramp WB	0	107	-	0	521	-
Democracy Blvd off ramp WB	108	15	-86%	589	147	-75%
Democracy Blvd off ramp EB	16	15	-9%	149	123	-18%

* Ramp in Future Scenario

Table A.12: AM Peak -2015 HSR+VSL+ARM- I-270 On Ramp Queue Length - Southbound

I-270 Southbound	Existing VISSIM Average Queue (feet)	HSR+VSL+AR M VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	HSR VISSIM Maximum Queue (feet)	% Change
MD 85 on ramp	0	0	-	0	0	-
MD 80 on ramp	575	0	-100%	2307	0	-100%
MD 109 on ramp	66.39	121.66	83%	841	265	-69%
MD 121 WB on ramp	8.05	0.00	-100%	263	0	-100%
MD 121 EB on ramp*			-			-
MD 27 WB on ramp	145	0	-100%	1297	0	-100%
MD 27 EB on ramp	1	0	-100%	89	0	-100%
MD 118 WB on ramp	0	0	-	0	0	-
MD 118 EB on ramp	0.015	0.000	-100%	9	0	-100%
Middlebrook Rd on ramp	161	4099	2439%	1641	4194	156%
MD 124 WB on ramp	254	74	-71%	2615	707	-73%
MD 117 on ramp	94	0	-100%	1640	74	-95%
I-370 C-D on ramp	805	0	-100%	1861	0	-100%
Shady Grove Rd C-D on ramp North	2	0	-100%	160	0	-100%
Shady Grove Rd C-D on ramp South	68	0	-100%	927	0	-100%
MD 189 C-D on ramp	1393	0	-100%	3991	0	-100%
Montrose Rd C-D on ramp	2	0	-100%	246	0	-100%
Rockledge Dr on ramp	0	0	-	0	0	-
MD 187 on ramp	0	0	-	0	0	-
I-270 Spur Southbound	Existing VISSIM Average Queue (feet)	HSR+VSL+AR M VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	HSR VISSIM Maximum Queue (feet)	% Change
Democracy Blvd on ramp	0	381	-	0	1008	-
I-495 Southbound	Existing VISSIM Average Queue (feet)	HSR+VSL+AR M VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	HSR VISSIM Maximum Queue (feet)	% Change
I-270 Spur on ramp	260	0	-100%	1015	0	-100%
MD 190 on ramp	0	0	-	0	0	-
I-270 C-D Southbound	Existing VISSIM Average Queue (feet)	HSR+VSL+AR M VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	HSR VISSIM Maximum Queue (feet)	% Change
I-270 on ramp	2305	0	-100%	5053	0	-100%
I-370 on ramp	1241	0	-100%	2914	0	-100%
Shady Grove Rd WB on ramp	1	0	-100%	150	0	-100%
Shady Grove Rd EB on ramp	0	0	-100%	29	0	-100%
I-270 on ramp	0	0	-100%	39	0	-100%
MD 28 WB on ramp	6	0	-100%	121	0	-100%
MD 28 EB on ramp	3166	0	-100%	3877	0	-100%
I-270 on ramp	0	0	-100%	55	0	-100%
MD 189 on ramp	111	0	-100%	1104	0	-100%
Montrose Rd WB on ramp	8	0	-100%	440	0	-100%
Montrose Rd EB on ramp	0	0	-100%	95	0	-100%

* Ramp in Future Scenario

Table A.13: AM Peak -2015 HSR+VSL+ARM- I-270 Off Ramp Queue Length - Southbound

I-270 Southbound	Existing VISSIM Average Queue (feet)	HSR+VSL+ARM VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	HSR VISSIM Maximum Queue (feet)	% Change
MD 85 SB off ramp	0	0	-	0	0	-
MD 85 NB off ramp	0	1	-	0	85	-
MD 80 off ramp	0.41	0.10	-76%	69	22	-69%
MD 109 off ramp WB	0.00	0.00	-100%	7	0	-100%
MD 109 off ramp EB	0	1	-	0	79	-
MD 121 off ramp EB	1	0	-100%	93	0	-100%
MD 121 off ramp WB	0	53	-	0	235	-
MD 27 off ramp EB	53	0	-100%	279	0	-100%
MD 27 off ramp WB	45	33	-28%	289	146	-50%
MD 118 off ramp EB	31	0	-100%	161	0	-100%
MD 118 off ramp WB	0	75	-	0	428	-
Watkins Mill Rd off ramp*						
MD 124 off ramp EB	75	26	-65%	342	501	47%
MD 124 off ramp WB	18	0	-100%	405	0	-100%
I-370 off ramp WB	0	0	-	0	0	-
I-370 off ramp EB	0	3	-	0	117	-
Shady Grove Rd off ramp - Omega Drive	6	0	-100%	194	0	-100%
Shady Grove Rd off ramp	0	2	-	0	82	-
MD 28 off ramp	3	38	1379%	132	244	85%
MD 189 off ramp EB	40	0	-100%	296	0	-100%
MD 189 off ramp WB	0	0	-	0	0	-
Montrose Rd off ramp WB	0	0	-	0	0	-
Montrose Rd off ramp EB	0	8	-	0	170	-
Rockledge Dr off ramp	18	49	174%	261	223	-15%
I-270 Spur Southbound	Existing VISSIM Average Queue (feet)	HSR +VSL+ARM VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	HSR VISSIM Maximum Queue (feet)	% Change
Democracy Blvd off ramp EB	51	0	-100%	230	0	-100%
Democracy Blvd off ramp WB	0	911	-	0	2884	-
MD 190 off ramp WB	995	0	-100%	2271	0	-100%
MD 190 off ramp EB	0	0	-	0	7	-
Clara Barton Pkwy WB off ramp	0	132	-	0	466	-

* Ramp in Future Scenario

Table A.14: AM Peak - Existing - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
1- MD 85 at Sam's Club Drive											
1	NB	18.8	B	NB Left	103	76	57	282	E	33.3	C
				NB Through	312	24	57	282	C		
				NB Right	581	6	6	284	A		
	SB	42.4	D	SB Left	110	57	123	552	E		
				SB Through	535	41	123	552	D		
				SB Right	52	24	123	552	C		
	EB	44.4	D	EB Left	81	70	42	165	E		
				EB Through	47	81	42	165	F		
				EB Right	102	7	42	165	A		
	WB	50.7	D	WB Left	204	72	75	302	E		
				WB Through	12	61	75	302	E		
				WB Right	100	6	75	302	A		
2- MD 85 at I-270 NB on and off ramp											
2	NB	42.6	D	NB Left	560	43	155	745	D	28.8	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	14.6	B	SB Left	0	0	0	0	A		
				SB Through	547	15	36	483	B		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
3- MD 85 at I-270 SB on and off ramp											
3	NB	4.3	A	NB Left	0	0	0	0	A	10.2	B
				NB Through	812	4	12	316	A		
				NB Right	0	0	0	0	A		
	SB	41.3	D	SB Left	154	41	37	267	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
4- MD 85 at Crestwood Blvd											
4	NB	15.8	C	NB Left	10	57	34	262	E	19.8	B
				NB Through	585	15	34	262	B		
				NB U-Turn	0	0	0	0	A		
	SB	13.7	B	SB Left	57	68	23	146	E		
				SB Through	1657	14	55	477	B		
				SB Right	751	9	43	467	A		
	EB	49.1	D	EB Left	481	51	70	208	D		
				EB Through	19	62	70	208	E		
				EB Right	32	10	70	208	A		
	WB	43.1	D	WB Left	37	56	17	111	E		
				WB Through	15	59	17	111	E		
				WB Right	19	6	17	111	A		
5- MD 80 at I-270 NB on and ramp											
5	NB	-1.1	A	NB Left	3	0	0	0	A	16.1	B
				NB Through	2	0	0	0	A		
				NB Right	4	-2	0	0	A		
	SB	12.8	B	SB Left	183	15	12	115	B		
				SB Through	5	17	12	115	B		
				SB Right	52	4	1	16	A		
	EB	7.0	A	EB Left	38	8	6	165	A		
				EB Through	0	0	8	0	A		
				EB Right	7	4	13	196	A		
	WB	17.2	B	WB Left	31	13	1	48	B		
				WB Through	684	24	94	544	C		
				WB Right	504	8	6	182	A		
6- MD 80 at I-270 SB on and off ramp											
6	NB	4.1	A	NB Left	22	25	1	113	C	22.2	C
				NB Through	0	0	0	0	A		
				NB Right	262	2	1	113	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	23.0	C	EB Left	0	0	0	0	A		
				EB Through	241	22	26	226	C		
				EB Right	133	25	26	235	D		
	WB	47.1	E	WB Left	0	0	0	0	A		
				WB Through	194	47	126	641	E		
				WB Right	0	0	0	0	A		
7- MD 109 at I-270 NB on and off ramp											
7	NB			NB Left	0	0	0	0	A	2.5	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	8.3	A	SB Left	118	11	7	116	B		
				SB Through	0	0	0	0	A		
				SB Right	38	1	0	0	A		
	EB	3.2	A	EB Left	59	3	0	36	A		
				EB Through	0	0	0	0	A		
				EB Right	40	3	0	0	A		
	WB	0.4	A	WB Left	0	0	0	0	A		
				WB Through	462	0	0	54	A		
				WB Right	0	0	0	0	A		
8- MD 80 at I-270 SB on and off ramp											
8	NB	2.5	A	NB Left	15	10	1	65	B	3.5	A
				NB Through	0	0	0	0	A		
				NB Right	41	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	3.4	A	EB Left	0	0	0	0	A		
				EB Through	59	0	0	34	A		
				EB Right	70	6	1	34	A		
	WB	3.6	A	WB Left	393	3	8	292	A		
				WB Through	109	5	8	269	A		
				WB Right	0	0	0	0	A		
9- MD 121 at Gateway Center Dr											
9	NB	8.4	A	NB Left	95	11	13	147	B	20.7	C
				NB Through	279	12	13	147	B		
				NB Right	198	2	17	173	A		
	SB	16.8	C	SB Left	47	11	31	312	B		
				SB Through	577	17	41	312	B		
				SB Right	6	13	46	333	B		
	EB	33.6	D	EB Left	7	37	86	427	D		
				EB Through	88	44	93	427	D		
				EB Right	547	32	117	459	C		
	WB	30.3	D	WB Left	96	35	19	123	D		
				WB Through	12	33	19	123	C		
				WB Right	21	7	13	142	A		
10- MD 121 at I-270 NB on and off ramp											
10	NB	1.7	A	NB Left	40	10	2	86	A	0.7	A
				NB Through	0	0	0	0	A		
				NB Right	253	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.1	A	EB Left	0	0	0	0	A		
				EB Through	318	0	0	0	A		
				EB Right	49	0	0	0	A		
	WB	0.6	A	WB Left	151	2	1	87	A		
				WB Through	1070	0	0	58	A		
				WB Right	0	0	0	0	A		

Table A.14: AM Peak - Existing - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
11- MD 121 at I-270 SB on and off ramp											
11	NB			NB Left	0	0	0	0	A	1.3	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	7.7	A	SB Left	123	10	6	120	B		
				SB Through	0	0	0	0	A		
				SB Right	46	1	0	0	A		
	EB	0.4	A	EB Left	25	2	0	35	A		
				EB Through	0	0	0	0	A		
				EB Right	833	0	0	0	A		
	WB	0.1	A	WB Left	0	0	0	0	A		
WB Through				277	0	0	0	A			
WB Right				0	0	0	0	A			
12- MD 27 at Observation Dr											
12	NB	48.0	D	NB U-Turn	0	0	0	0	A	19.3	B
				NB Through	34	63	10	64	E		
				NB Right	12	7	10	64	A		
	SB	40.9	D	SB Left	75	52	23	142	D		
				SB Through	43	60	30	226	E		
				SB Right	157	30	52	263	C		
	EB	13.0	B	EB Left	149	30	29	290	C		
				EB Through	1202	11	31	291	B		
				EB Right	50	9	38	329	A		
	WB	20.1	C	WB Left	83	15	138	788	B		
WB Through				2047	21	138	788	C			
WB Right				94	10	138	788	A			
13- MD 27 at I-270 NB off ramp											
13	NB	30.7	C	NB Left	89	31	12	90	C	11.6	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.1	A	EB Left	0	0	0	0	A		
				EB Through	891	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	15.7	B	WB Left	0	0	0	0	A		
WB Through				2110	16	194	1341	B			
WB Right				0	0	0	0	A			
14- MD 27 at I-270 SB off ramp											
14	NB			NB Left	0	0	0	0	A	24.7	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	49.6	D	SB Left	376	50	64	293	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	9.0	A	EB Left	0	0	0	0	A		
				EB Through	657	9	12	192	A		
				EB Right	0	0	0	0	A		
	WB	25.5	C	WB Left	0	0	0	0	A		
WB Through				1263	25	195	645	C			
WB Right				0	0	0	0	A			
15- MD 27 at Crystal Rock Dr											
15	NB	17.8	B	NB Left	22	18	31	405	B	38.3	D
				NB Through	819	18	57	405	B		
				NB Right	72	16	60	418	B		
	SB	46.4	D	SB Left	407	69	356	1190	E		
				SB Through	1333	40	356	1190	D		
				SB Right	40	27	320	1184	C		
	EB	44.6	D	EB Left	177	49	47	169	D		
				EB Through	74	49	43	164	D		
				EB Right	60	27	44	196	C		
	WB	56.0	E	WB Left	8	63	85	273	E		
WB Through				21	302	85	273	F			
WB Right				104	6	85	273	A			
16- MD 118 at Seneca Meadows Pkwy											
16	NB	3.4	A	NB Left	123	10	1	70	A	5.5	A
				NB Through	727	3	4	119	A		
				NB Right	79	1	8	171	A		
	SB	3.7	A	SB Left	25	5	5	169	A		
				SB Through	808	4	8	169	A		
				SB Right	32	2	9	202	A		
	EB	16.9	B	EB Left	15	64	8	69	E		
				EB Through	6	59	8	69	E		
				EB Right	96	7	8	69	A		
	WB	44.2	D	WB Left	30	65	12	94	E		
WB Through				5	68	8	94	E			
WB Right				21	9	11	113	A			
17- MD 118 at I-270 NB on ramp											
17	NB			NB Left	0	0	0	0	A	11.1	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	33.0	C	EB Left	222	33	44	277	C		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	6.0	A	WB Left	0	0	0	0	A		
WB Through				155	1	0	4	A			
WB Right				778	7	16	276	A			
18- MD 118 at I-270 SB off ramp											
18	NB			NB Left	0	0	0	0	A	7.4	A
				NB Through	0	0.0	0	0	A		
				NB Right	0	0.0	0	0	A		
	SB	41.5	D	SB Left	193	41.5	34	164	D		
				SB Through	0	0.0	0	0	A		
				SB Right	0	0.0	0	0	A		
	EB	3.1	A	EB Left	0	0.0	0	0	A		
				EB Through	615	3.1	4	135	A		
				EB Right	0	0.0	0	0	A		
	WB	3.6	A	WB Left	0	0.0	0	0	A		
WB Through				1036	3.6	7	209	A			
WB Right				0	0.0	0	0	A			
19- MD 118 at Aircraft Dr											
19	NB	45.2	D	NB Left	7	70	8	75	E	18.1	B
				NB Through	12	80	8	75	F		
				NB Right	14	3	0	22	A		
	SB	60.7	E	SB Left	241	58	98	368	E		
				SB Through	41	66	98	368	E		
				SB Right	81	67	98	368	E		
	EB	10.4	B	EB Left	102	13	28	310	B		
				EB Through	932	10	28	310	B		
				EB Right	27	9	28	310	A		
	WB	11.5	B	WB Left	73	17	31	246	B		
WB Through				899	14	31	246	B			
WB Right				277	4	31	246	A			
20- Middlebrook Rd at Observation Dr											
20	NB			NB Left	0	0	0	0	A	16.1	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	18.7	B	SB Left	22	35	4	44	D		
				SB Through	0	0	0	0	A		
				SB Right	25	4	4	44	A		
	EB	14.2	B	EB Left	240	21	31	226	C		
				EB Through	865	12	31	226	B		
				EB Right	0	0	0	0	A		
	WB	17.7	B	WB Left	0	0	0	0	A		
WB Through				1072	19	69	381	B			
WB Right				215	13	92	431	B			

Table A.14: AM Peak - Existing - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
21- Middlebrook Rd at I-270 SB on ramp											
21	NB			NB Left	0	0	0	0	A	16.0	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	11.2	B	EB Left	0	0	0	0	A		
				EB Through	805	11	26	186	B		
				EB Right	0	0	0	0	A		
	WB	21.3	C	WB Left	743	21	64	867	C		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
22- Middlebrook Rd at Waring Station Rd											
22	NB	63.1	E	NB Left	147	52	145	449	D	25.3	C
				NB Through	6	52	145	449	D		
				NB Right	342	68	145	449	E		
	SB	21.9	C	SB Left	3	37	1	29	D		
				SB Through	0	0	1	29	A		
				SB Right	3	7	2	67	A		
	EB	18.2	B	EB Left	28	12	124	845	B		
				EB Through	1483	19	124	845	B		
				EB Right	76	10	124	845	A		
	WB	16.1	B	WB Left	78	20	28	213	C		
				WB Through	682	16	28	213	B		
				WB Right	35	4	28	213	A		
23- MD 124 at MD 355											
23	NB	50.5	D	NB Left	229	69	72	198	E	83.6	F
				NB Through	306	42	70	196	D		
				NB Right	37	2	0	0	A		
	SB	33.5	C	SB Left	49	86	121	406	F		
				SB Through	966	50	121	406	D		
				SB Right	619	3	34	375	A		
	EB	99.1	F	EB Left	615	255	1024	1207	F		
				EB Through	528	22	1024	1207	C		
				EB Right	582	5	921	1184	A		
	WB	122.0	F	WB Left	0	0	0	0	A		
				WB Through	1884	123	727	1112	F		
				WB Right	42	68	0	0	E		
24- MD 124 at I-270 SB on and off											
24	NB	65.0	F	NB Left	15	66	15	78	E	22.2	C
				NB Through	29	64	15	78	E		
				NB U-Turn	0	0	0	0	A		
	SB	27.6	C	SB Left	306	67	81	347	E		
				SB Through	4	87	81	347	F		
				SB Right	572	6	13	335	A		
	EB	15.7	B	EB Left	0	0	0	0	A		
				EB Through	904	16	41	321	B		
				EB Right	67	12	50	345	B		
	WB	22.0	C	WB Left	33	27	116	1390	C		
				WB Through	1193	22	116	1390	C		
				WB Right	0	0	0	0	A		
25- MD 117 at MD 124											
25	NB	42.7	D	NB Left	16	65	95	577	E	43.0	D
				NB Through	421	58	95	577	E		
				NB Right	407	26	61	641	C		
	SB	37.8	D	SB Left	181	47	126	605	D		
				SB Through	839	40	126	605	D		
				SB Right	95	2	0	0	A		
	EB	48.4	D	EB Left	80	108	175	722	F		
				EB Through	1383	45	174	723	D		
				EB Right	66	44	187	750	D		
	WB	40.7	D	WB Left	314	73	108	332	E		
				WB Through	480	27	108	332	C		
				WB Right	95	0	0	0	A		
26- MD 117 at Bureau Dr											
26	NB	52.3	D	NB Left	18	70	16	93	E	42.3	D
				NB Through	17	79	16	93	E		
				NB Right	25	21	16	93	C		
	SB	63.4	E	SB Left	191	70	80	297	E		
				SB Through	43	68	80	297	E		
				SB Right	28	13	80	297	B		
	EB	47.0	D	EB Left	28	36	314	962	D		
				EB Through	1928	47	322	962	D		
				EB Right	20	59	315	951	E		
	WB	31.8	C	WB Left	298	93	195	602	F		
				WB Through	852	19	195	603	B		
				WB Right	316	8	169	651	A		
27- MD 117 at I-270 SB off ramp											
27	NB			NB Left	0	0	0	0	A	8.0	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	1.8	A	EB Left	0	0	0	0	A		
				EB Through	799	2	1	180	A		
				EB Right	0	0	0	0	A		
	WB	24.0	C	WB Left	310	24	45	344	C		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
28- MD 117 at I-270 NB off ramp											
28	NB			NB Left	0	0	0	0	A	30.5	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	49.1	D	SB Left	307	54	230	811	D		
				SB Through	0	0	0	0	A		
				SB Right	915	48	236	813	D		
	EB	19.4	B	EB Left	10	111	80	888	F		
				EB Through	782	18	80	888	B		
				EB Right	0	0	0	0	A		
	WB	14.2	B	WB Left	0	0	0	0	A		
				WB Through	860	14	51	343	B		
				WB Right	9	5	55	373	A		
29- MD 117 at Perry Pkwy											
29	NB	42.5	D	NB Left	35	67	14	97	E	13.6	B
				NB Through	6	61	14	96	E		
				NB Right	31	11	23	117	B		
	SB	33.8	C	SB Left	91	72	37	167	E		
				SB Through	13	72	37	167	E		
				SB Right	124	2	37	167	A		
	EB	10.3	B	EB Left	119	69	42	237	E		
				EB Through	957	3	42	237	A		
				EB Right	9	1	29	221	A		
	WB	9.9	A	WB Left	5	87	20	261	F		
				WB Through	709	10	20	261	A		
				WB Right	104	5	20	261	A		
30- Shady Grove Rd at I-270 NB off ramp											
30	NB	9.5	A	NB Left	0	0	0	0	A	24.6	C
				NB Through	917	9	21	216	A		
				NB Right	0	0	0	0	A		
	SB	10.1	B	SB Left	0	0	0	0	A		
				SB Through	1284	10	31	344	B		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	56.8	E	WB Left	1008	57	201	631	E		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table A.14: AM Peak - Existing - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
31- Shady Grove Rd at I-270 SB off ramp											
31	NB	14.6	B	NB Left	0	0	0	0	A	21.0	C
				NB Through	920	15	41	379	B		
				NB Right	0	0	0	0	A		
	SB	11.4	B	SB Left	0	0	0	0	A		
				SB Through	1692	11	46	658	B		
				SB Right	0	0	0	0	A		
	EB	44.2	D	EB Left	313	37	42	360	D		
				EB Through	0	0	0	0	A		
				EB Right	642	48	102	463	D		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
32- MD 28 at I-270 SB off ramp											
32	NB			NB U-Turn	0	0	0	0	A	32.6	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	35.9	D	SB Left	456	44	72	304	D		
				SB Through	0	0	0	0	A		
				SB Right	108	3	0	59	A		
	EB	57.4	E	EB Left	0	0	0	0	A		
				EB Through	1050	87	1521	2131	F		
				EB Right	663	11	1050	2134	B		
	WB	9.1	A	WB Left	0	0	0	0	A		
				WB Through	1879	9	32	405	A		
				WB Right	0	0	0	0	A		
33- MD 28 at I-270 on and off ramps											
33	NB	34.9	C	NB Left	0	0	54	306	A	17.4	B
				NB Through	213	51	62	315	D		
				NB Right	139	11	62	315	B		
	SB	21.1	C	SB Left	25	60	19	169	E		
				SB Through	0	0	0	0	A		
				SB Right	260	17	19	169	B		
	EB	15.0	B	EB Left	224	28	46	333	C		
				EB Through	829	11	46	333	B		
				EB Right	0	0	0	0	A		
	WB	12.3	B	WB Left	22	11	41	286	B		
				WB Through	887	12	29	249	B		
				WB Right	0	0	0	0	A		
34- MD 189 at Great Falls Rd											
34	NB	40.7	D	NB Left	62	45	16	111	D	10.0	B
				NB Through	6	42	13	110	D		
				NB Right	8	8	15	121	A		
	SB	5.2	A	SB Left	66	46	20	162	D		
				SB Through	7	40	20	162	D		
				SB Right	601	0	0	0	A		
	EB	10.2	B	EB Left	325	16	14	215	B		
				EB Through	920	8	18	229	A		
				EB Right	13	6	26	265	A		
	WB	12.1	B	WB Left	3	21	16	184	C		
				WB Through	315	12	16	184	B		
				WB Right	10	9	27	218	A		
35- MD 189 at I-270 Ramps											
35	NB	50.5	D	NB Left	133	51	25	119	D	41.6	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	48.3	D	SB Left	184	48	54	316	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	23.2	C	EB Left	384	20	81	458	B		
				EB Through	529	26	81	458	C		
				EB Right	0	0	0	0	A		
	WB	59.1	E	WB Left	533	50	137	497	D		
				WB Through	284	76	137	497	E		
				WB Right	0	0	0	0	A		
36- MD 189 at Wooton Pkwy											
36	NB	43.1	D	NB Left	129	52	52	178	D	58.1	E
				NB Through	100	80	52	178	E		
				NB Right	151	12	52	178	B		
	SB	91.5	F	SB Left	385	105	294	792	F		
				SB Through	516	81	218	720	F		
				SB Right	0	0	0	0	A		
	EB	48.8	D	EB Left	132	75	214	884	E		
				EB Through	958	48	214	884	D		
				EB Right	95	23	214	884	C		
	WB	42.6	D	WB Left	423	62	108	314	E		
				WB Through	390	27	108	314	C		
				WB Right	58	5	108	314	A		
37- Montrose Rd at Tower Oaks Blvd											
37	NB			NB Left	0	0	0	0	A	26.1	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	106.3	F	SB Left	126	40	201	957	D		
				SB Through	0	0	0	0	A		
				SB Right	521	122	323	955	F		
	EB	7.9	A	EB Left	28	16	25	421	B		
				EB Through	1424	8	25	421	A		
				EB Right	0	0	0	0	A		
	WB	9.2	A	WB Left	0	0	0	0	A		
				WB Through	1443	9	26	286	A		
				WB Right	62	4	26	286	A		
38- Tower Oaks Blvd at I-270 off ramp											
38	NB	15.7	B	NB Left	475	16	25	187	B	14.8	B
				NB Through	12	17.0	19	179	B		
				NB Right	26	4.9	25	187	A		
	SB	0.1	A	SB Left	2	-0.2	0	16	A		
				SB Through	0	0.0	0	16	A		
				SB Right	2	0.5	0	0	A		
	EB	14.6	B	EB Left	7	11.4	39	282	B		
				EB Through	621	15.1	39	282	B		
				EB Right	91	11.5	32	272	B		
	WB	11.9	B	WB Left	0	0.0	4	71	A		
				WB Through	84	12.6	4	71	B		
				WB Right	7	4.2	0	0	A		
39- Montrose Rd at Tower Oaks Blvd											
39	NB	9.6	A	NB Left	26	45	21	127	D	61.8	E
				NB Through	188	30	21	127	C		
				NB Right	507	0	0	0	A		
	SB	38.9	D	SB Left	297	70	128	520	E		
				SB Through	605	26	127	519	C		
				SB Right	64	18	130	533	B		
	EB	144.4	F	EB Left	56	123	558	723	F		
				EB Through	816	146	559	724	F		
				EB Right	45	147	582	747	F		
	WB	39.8	D	WB Left	362	48	77	299	D		
				WB Through	231	46	77	299	D		
				WB Right	134	7	91	329	A		
40- Rockledge Blvd at I-270 NB on and off ramp											
40	NB			NB Left	0	0	0	0	A	16.0	B
				NB Through	85	32	30	146	C		
				NB Right	195	34	30	146	C		
	SB	2.3	A	SB Left	0	0	6	75	A		
				SB Through	986	2	6	75	A		
				SB Right	0	0	0	0	A		
	EB	24.3	C	EB Left	5	35	109	424	C		
				EB Through	501	50	109	424	D		
				EB Right	550	1	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table A.14: AM Peak - Existing - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
41- Rockledge Blvd at I-270 SB on and off ramps											
41	NB	2.6	A	NB Left	89	3	1	25	A	20.5	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	21.6	C	WB Left	986	23	98	664	C		
				WB Through	452	19	98	664	B		
				WB Right	0	0	0	0	A		
42- MD 187 at Tuckerman Ln											
42	NB	290.3	F	NB Left	184	172	1149	1512	F	195.3	F
				NB Through	1181	240	1149	1512	F		
				NB Right	143	859	1149	1512	F		
	SB	172.4	F	SB Left	60	147	2547	2696	F		
				SB Through	1511	171	2547	2696	F		
				SB Right	177	192	2547	2696	F		
	EB	65.2	E	EB Left	185	47	206	895	D		
				EB Through	548	73	207	896	E		
				EB Right	135	58	228	920	E		
	WB	203.3	F	WB Left	702	243	1957	2147	F		
				WB Through	354	165	1957	2147	F		
				WB Right	135	100	1957	2147	F		
43- MD 187 at I-270 NB on and off ramps											
43	NB	67.1	E	NB Left	153	90	240	435	F	44.4	D
				NB Through	1250	64	240	435	E		
				NB Right	0	0	0	0	A		
	SB	24.4	C	SB Left	0	0	0	0	A		
				SB Through	1718	24	91	590	C		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	64.9	E	WB Left	120	64	63	355	E		
				WB Through	10	75	63	355	E		
				WB Right	0	0	0	0	A		
44- MD 187 at I-270 NB on and off ramps											
44	NB	131.6	F	NB Left	0	0	0	0	A	62.8	E
				NB Through	1241	132	392	892	F		
				NB Right	0	0	0	0	A		
	SB	7.5	A	SB Left	193	56	63	268	E		
				SB Through	1641	2	63	268	A		
				SB Right	0	0	0	0	A		
	EB	91.6	F	EB Left	190	98	179	700	F		
				EB Through	0	0	179	700	A		
				EB Right	370	88	218	693	F		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
45- MD 187 at Rock Spring Dr											
45	NB	19.7	B	NB Left	192	61	84	380	E	22.2	C
				NB Through	1193	13	84	381	B		
				NB Right	6	16	104	414	B		
	SB	21.0	C	SB Left	12	25	104	666	C		
				SB Through	1837	23	104	666	C		
				SB Right	160	1	74	661	A		
	EB	38.3	D	EB Left	160	64	45	180	E		
				EB Through	22	54	45	180	D		
				EB Right	197	16	45	180	B		
	WB	4.8	A	WB Left	1	14	0	19	B		
				WB Through	8	6	0	19	A		
				WB Right	4	-1	0	0	A		
47-Democracy Blvd at I-270 NB off ramp											
47	NB	31.2	C	NB Left	212	31	26	165	C	14.0	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	13.5	B	EB Left	0	0	0	0	A		
				EB Through	1585	13	52	439	B		
				EB Right	0	0	0	0	A		
	WB	10.1	B	WB Left	0	0	0	0	A		
				WB Through	736	10	21	176	B		
				WB Right	0	0	0	0	A		
48- Democracy Blvd at I-270 SB on ramp											
48	NB			NB Left	0	0	0	0	A	6.3	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	5.0	A	EB Left	0	0	0	0	A		
				EB Through	1691	5	20	274	A		
				EB Right	0	0	0	0	A		
	WB	8.6	A	WB Left	210	37	30	188	D		
				WB Through	733	1	19	167	A		
				WB Right	0	0	0	0	A		
49- Democracy Blvd at I-270 SB off ramp											
49	NB			NB Left	0	0	0	0	A	12.4	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	33.1	C	SB Left	334	49	58	237	D		
				SB Through	0	0	0	0	A		
				SB Right	173	2	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	2.5	A	WB Left	0	0	0	0	A		
				WB Through	732	3	4	112	A		
				WB Right	323	2	0	103	A		
50- MD 190 at Burdette Rd											
50	NB	76.6	E	NB Left	19	69	12	111	E	11.8	B
				NB Through	3	74	12	111	E		
				NB Right	8	95	12	111	F		
	SB	33.2	C	SB Left	41	84	27	151	F		
				SB Through	13	84	27	151	F		
				SB Right	113	9	27	151	A		
	EB	9.6	A	EB Left	47	98	53	454	F		
				EB Through	1709	7	52	453	A		
				EB Right	15	5	42	477	A		
	WB	10.7	B	WB Left	0	87	45	661	F		
				WB Through	1437	11	46	662	B		
				WB Right	18	3	41	702	A		

Table A.14: AM Peak - Existing - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
51- MD 190 at I-270 NB on ramp											
51	NB			NB Left	0	0	0	0	A	37.1	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	81.7	F	EB Left	493	82	233	519	F		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	14.6	B	WB Left	0	0	0	0	A		
				WB Through	975	15	62	601	B		
				WB Right	0	0	0	0	A		
52- MD 190 at I-270 SB off ramp											
52	NB	78.7	E	NB Left	251	79	996	2228	E	14.3	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	2.9	A	EB Left	0	0	0	0	A		
				EB Through	864	3	6	140	A		
				EB Right	0	0	0	0	A		
	WB	4.8	A	WB Left	0	0	0	0	A		
				WB Through	675	5	6	147	A		
				WB Right	0	0	0	0	A		
53- MD 190 at Seven Locks Rd											
53	NB	66.4	E	NB Left	17	67	16	123	E	43.0	D
				NB Through	44	66	19	123	E		
				NB Right	0	0	0	0	A		
	SB	67.6	E	SB Left	581	67	199	696	E		
				SB Through	145	68	199	696	E		
				SB Right	13	73	198	696	E		
	EB	29.4	C	EB Left	18	25	93	480	C		
				EB Through	781	29	93	480	C		
				EB Right	32	30	93	480	C		
	WB	34.1	C	WB Left	121	113	109	329	F		
				WB Through	642	27	112	331	C		
				WB Right	159	1	2	57	A		
54- MD 124 at I-270 NB off ramp											
54	NB	84.3	F	NB Left	0	0	0	0	A	95.4	F
				NB Through	0	0	0	0	A		
				NB Right	920	84	345	963	F		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	107.9	F	EB Left	0	0	0	0	A		
				EB Through	813	108	473	1086	F		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
55- Democracy Blvd at I-270 NB off ramp											
55	NB	37.9	D	NB Left	0	0	0	0	A	16.9	B
				NB Through	0	0	0	0	A		
				NB Right	926	38	117	601	D		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	4.6	A	EB Left	0	0	0	0	A		
				EB Through	1586	5	18	88	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table A.15: AM Peak -2015 HSR+VSL+ARM- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
1- MD 85 at Sam's Club Drive											
1	NB	18.3	B	NB Left	102	76	58	273	E	33.1	C
				NB Through	310	23	58	273	C		
				NB Right	580	6	5	272	A		
	SB	42.3	D	SB Left	110	58	124	586	E		
				SB Through	535	41	124	586	D		
				SB Right	53	23	124	586	C		
	EB	44.9	D	EB Left	82	73	43	159	E		
				EB Through	47	77	43	159	E		
				EB Right	102	8	43	159	A		
	WB	50.4	D	WB Left	203	71	75	321	E		
				WB Through	12	68	75	321	E		
				WB Right	100	6	75	321	A		
2- MD 85 at I-270 NB on and off ramp											
2	NB	40.8	D	NB Left	560	41	145	791	D	28.3	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	15.5	B	SB Left	0	0	0	0	A		
				SB Through	544	15	39	491	B		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
3- MD 85 at I-270 SB on and off ramp											
3	NB	4.2	A	NB Left	0	0	0	0	A	10.0	A
				NB Through	811	4	12	398	A		
				NB Right	0	0	0	0	A		
	SB	40.2	D	SB Left	155	40	36	242	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
4- MD 85 at Crestwood Blvd											
4	NB	15.7	C	NB Left	10	61	34	269	E	19.8	B
				NB Through	585	15	34	269	B		
				NB U-Turn	0	0	0	0	A		
	SB	13.8	B	SB Left	57	70	23	151	E		
				SB Through	1650	14	57	608	B		
				SB Right	751	10	46	598	A		
	EB	49.2	D	EB Left	481	51	70	225	D		
				EB Through	19	61	70	225	E		
				EB Right	32	11	70	225	B		
	WB	43.1	D	WB Left	37	56	17	117	E		
				WB Through	15	59	17	117	E		
				WB Right	19	7	17	117	A		
5- MD 80 at I-270 NB on and ramp											
5	NB	-1.6	A	NB Left	3	0	0	0	A	7.0	A
				NB Through	1	0	0	0	A		
				NB Right	5	-3	0	0	A		
	SB	12.1	B	SB Left	183	15	11	104	B		
				SB Through	5	18	11	104	B		
				SB Right	52	2	0	0	A		
	EB	7.5	A	EB Left	38	8	7	132	A		
				EB Through	0	0	8	0	A		
				EB Right	7	3	14	163	A		
	WB	6.1	A	WB Left	31	8	0	52	A		
				WB Through	682	9	29	311	A		
				WB Right	503	1	0	0	A		
6- MD 80 at I-270 SB on and off ramp											
6	NB	4.1	A	NB Left	21	7	0	71	A	6.7	A
				NB Through	0	0	0	0	A		
				NB Right	251	4	0	71	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	8.1	A	EB Left	0	0	0	0	A		
				EB Through	240	9	7	122	A		
				EB Right	133	7	6	131	A		
	WB	7.5	A	WB Left	0	0	0	0	A		
				WB Through	193	7	2	205	A		
				WB Right	0	0	0	0	A		
7- MD 109 at I-270 NB on and off ramp											
7	NB			NB Left	0	0	0	0	A	2.4	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	8.1	A	SB Left	119	10	7	127	B		
				SB Through	0	0	0	0	A		
				SB Right	37	1	0	32	A		
	EB	3.3	A	EB Left	59	3	0	28	A		
				EB Through	0	0	0	0	A		
				EB Right	40	3	0	0	A		
	WB	0.3	A	WB Left	0	0	0	0	A		
				WB Through	462	0	0	0	A		
				WB Right	0	0	0	0	A		
8- MD 80 at I-270 SB on and off ramp											
8	NB	3.7	A	NB Left	15	12	1	80	B	2.1	A
				NB Through	0	0	0	0	A		
				NB Right	41	1	0	19	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	2.8	A	EB Left	0	0	0	0	A		
				EB Through	59	0	0	30	A		
				EB Right	70	5	0	30	A		
	WB	1.7	A	WB Left	393	1	0	113	A		
				WB Through	108	3	0	90	A		
				WB Right	0	0	0	0	A		
9- MD 121 at Gateway Center Dr											
9	NB	7.9	A	NB Left	95	11	13	133	B	20.1	C
				NB Through	279	11	13	133	B		
				NB Right	200	2	16	159	A		
	SB	15.4	C	SB Left	47	10	27	343	B		
				SB Through	579	16	38	343	B		
				SB Right	6	11	42	364	B		
	EB	33.1	D	EB Left	7	33	85	422	C		
				EB Through	88	44	90	422	D		
				EB Right	547	31	114	454	C		
	WB	32.6	D	WB Left	95	38	21	128	D		
				WB Through	12	34	21	128	C		
				WB Right	21	6	15	147	A		
10- MD 121 at I-270 NB on and off ramp											
10	NB	1.7	A	NB Left	40	10	2	86	B	0.7	A
				NB Through	0	0	0	0	A		
				NB Right	254	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.1	A	EB Left	0	0	0	0	A		
				EB Through	321	0	0	0	A		
				EB Right	49	0	0	0	A		
	WB	0.6	A	WB Left	151	2	1	88	A		
				WB Through	1071	0	0	60	A		
				WB Right	0	0	0	0	A		

Table A.15: AM Peak -2015 HSR+VSL+ARM- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
11- MD 121 at I-270 SB on and off ramp											
11	NB			NB Left	0	0	0	0	A	1.3	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	7.7	A	SB Left	125	10	6	113	B		
				SB Through	0	0	0	0	A		
				SB Right	48	1	0	0	A		
	EB	0.4	A	EB Left	25	2	0	37	A		
				EB Through	0	0	0	0	A		
				EB Right	834	0	0	0	A		
	WB	0.2	A	WB Left	0	0	0	0	A		
				WB Through	277	0	0	0	A		
				WB Right	0	0	0	0	A		
12- MD 27 at Observation Dr											
12	NB	48.0	D	NB U-Turn	0	0	0	0	A	19.8	B
				NB Through	34	63	10	64	E		
				NB Right	12	7	10	64	A		
	SB	40.8	D	SB Left	75	52	23	142	D		
				SB Through	43	59	29	226	E		
				SB Right	158	30	52	263	C		
	EB	13.3	B	EB Left	152	30	30	312	C		
				EB Through	1235	11	32	313	B		
				EB Right	49	11	40	351	B		
	WB	20.8	C	WB Left	83	15	142	791	B		
				WB Through	2045	22	142	791	C		
				WB Right	94	9	142	791	A		
13- MD 27 at I-270 NB off ramp											
13	NB	29.5	C	NB Left	90	30	13	103	C	8.1	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.1	A	EB Left	0	0	0	0	A		
				EB Through	927	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	10.6	B	WB Left	0	0	0	0	A		
				WB Through	2109	11	161	1219	B		
				WB Right	0	0	0	0	A		
14- MD 27 at I-270 SB off ramp											
14	NB			NB Left	0	0	0	0	A	17.6	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	47.7	D	SB Left	412	48	68	262	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	9.2	A	EB Left	0	0	0	0	A		
				EB Through	657	9	12	215	A		
				EB Right	0	0	0	0	A		
	WB	12.1	B	WB Left	0	0	0	0	A		
				WB Through	1255	12	52	562	B		
				WB Right	0	0	0	0	A		
15- MD 27 at Crystal Rock Dr											
15	NB	18.4	B	NB Left	22	19	34	417	B	42.6	D
				NB Through	820	18	60	419	B		
				NB Right	73	18	63	432	B		
	SB	53.5	D	SB Left	415	72	423	1418	E		
				SB Through	1365	49	423	1418	D		
				SB Right	41	23	390	1412	C		
	EB	44.5	D	EB Left	177	49	47	169	D		
				EB Through	73	50	43	164	D		
				EB Right	60	26	43	196	C		
	WB	56.0	E	WB Left	8	63	85	273	E		
				WB Through	21	302	85	273	F		
				WB Right	104	6	85	273	A		
16- MD 118 at Seneca Meadows Pkwy											
16	NB	3.3	A	NB Left	123	10	1	59	A	5.3	A
				NB Through	730	3	4	144	A		
				NB Right	79	1	8	197	A		
	SB	3.5	A	SB Left	25	5	4	178	A		
				SB Through	808	4	8	178	A		
				SB Right	32	2	9	206	A		
	EB	16.6	B	EB Left	15	62	8	69	E		
				EB Through	6	59	8	69	E		
				EB Right	96	7	8	69	A		
	WB	43.1	D	WB Left	30	63	12	94	E		
				WB Through	5	69	8	93	E		
				WB Right	21	9	11	113	A		
17- MD 118 at I-270 NB on ramp											
17	NB			NB Left	0	0	0	0	A	10.9	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	32.8	C	EB Left	222	33	44	278	C		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	5.7	A	WB Left	0	0	0	0	A		
				WB Through	155	1	0	5	A		
				WB Right	778	7	15	252	A		
18- MD 118 at I-270 SB off ramp											
18	NB			NB Left	0	0	0	0	A	7.3	A
				NB Through	0	0.0	0	0	A		
				NB Right	0	0.0	0	0	A		
	SB	38.3	D	SB Left	196	38.3	32	157	D		
				SB Through	0	0.0	0	0	A		
				SB Right	0	0.0	0	0	A		
	EB	3.1	A	EB Left	0	0.0	0	0	A		
				EB Through	615	3.1	4	145	A		
				EB Right	0	0.0	0	0	A		
	WB	4.0	A	WB Left	0	0.0	0	0	A		
				WB Through	1035	4.0	8	185	A		
				WB Right	0	0.0	0	0	A		
19- MD 118 at Aircraft Dr											
19	NB	45.3	D	NB Left	7	70	8	75	E	17.9	B
				NB Through	12	80	8	75	F		
				NB Right	14	3	0	22	A		
	SB	60.7	E	SB Left	241	58	98	368	E		
				SB Through	41	66	98	368	E		
				SB Right	81	67	98	368	E		
	EB	10.3	B	EB Left	102	12	28	310	B		
				EB Through	932	10	28	310	B		
				EB Right	27	9	28	310	A		
	WB	11.2	B	WB Left	72	19	30	251	B		
				WB Through	900	13	30	251	B		
				WB Right	273	4	30	251	A		
20- Middlebrook Rd at Observation Dr											
20	NB			NB Left	0	0	0	0	A	16.2	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	18.8	B	SB Left	22	35	4	43	D		
				SB Through	0	0	0	0	A		
				SB Right	25	4	4	43	A		
	EB	14.4	B	EB Left	240	21	31	250	C		
				EB Through	865	13	31	250	B		
				EB Right	0	0	0	0	A		
	WB	17.7	B	WB Left	0	0	0	0	A		
				WB Through	1072	19	68	382	B		
				WB Right	214	13	92	431	B		

Table A.15: AM Peak -2015 HSR+VSL+ARM- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
21- Middlebrook Rd at I-270 SB on ramp											
21	NB			NB Left	0	0	0	0	A	16.3	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	11.3	B	EB Left	0	0	0	0	A		
				EB Through	806	11	27	187	B		
				EB Right	0	0	0	0	A		
	WB	21.7	C	WB Left	743	22	75	904	C		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
22- Middlebrook Rd at Waring Station Rd											
22	NB	65.0	E	NB Left	147	52	150	452	D	26.0	C
				NB Through	6	53	150	452	D		
				NB Right	341	71	150	452	E		
	SB	21.6	C	SB Left	3	37	1	29	D		
				SB Through	0	0	1	29	A		
				SB Right	3	6	2	67	A		
	EB	18.9	B	EB Left	28	11	130	822	B		
				EB Through	1485	19	130	822	B		
				EB Right	76	11	130	822	B		
	WB	16.0	B	WB Left	78	19	28	201	B		
				WB Through	681	16	28	201	B		
				WB Right	35	4	28	201	A		
23- MD 124 at MD 355											
23	NB	50.6	D	NB Left	230	69	72	200	E	84.4	F
				NB Through	306	43	70	197	D		
				NB Right	37	2	0	0	A		
	SB	33.1	C	SB Left	49	86	120	415	F		
				SB Through	965	50	120	415	D		
				SB Right	619	3	29	348	A		
	EB	102.1	F	EB Left	612	261	1043	1206	F		
				EB Through	528	24	1043	1206	C		
				EB Right	581	5	1025	1188	A		
	WB	122.3	F	WB Left	0	0	0	0	A		
				WB Through	1881	123	724	1106	F		
				WB Right	43	74	0	0	E		
24- MD 124 at I-270 SB on and off											
24	NB	65.0	F	NB Left	15	66	15	78	E	20.6	C
				NB Through	29	64	15	78	E		
				NB U-Turn	0	0	0	0	A		
	SB	25.7	C	SB Left	303	61	75	419	E		
				SB Through	4	80	75	419	F		
				SB Right	561	6	12	418	A		
	EB	15.3	B	EB Left	0	0	0	0	A		
				EB Through	903	15	40	360	B		
				EB Right	67	13	49	384	B		
	WB	19.6	B	WB Left	33	25	80	687	C		
				WB Through	1205	19	80	687	B		
				WB Right	0	0	0	0	A		
25- MD 117 at MD 124											
25	NB	53.7	D	NB Left	16	80	129	674	E	44.8	D
				NB Through	420	70	129	674	E		
				NB Right	402	36	98	641	D		
	SB	37.5	D	SB Left	182	46	123	582	D		
				SB Through	842	40	123	582	D		
				SB Right	95	3	0	0	A		
	EB	48.0	D	EB Left	80	108	173	695	F		
				EB Through	1386	45	173	696	D		
				EB Right	66	43	182	723	D		
	WB	39.9	D	WB Left	318	72	105	333	E		
				WB Through	478	27	105	333	C		
				WB Right	95	0	0	0	A		
26- MD 117 at Bureau Dr											
26	NB	48.9	D	NB Left	18	67	14	96	E	43.0	D
				NB Through	17	68	14	96	E		
				NB Right	25	23	14	96	C		
	SB	62.1	E	SB Left	192	69	79	297	E		
				SB Through	44	65	79	297	E		
				SB Right	28	12	79	297	B		
	EB	47.2	D	EB Left	28	36	321	978	D		
				EB Through	1916	47	328	977	D		
				EB Right	20	53	320	967	D		
	WB	33.7	C	WB Left	300	96	202	673	F		
				WB Through	854	21	203	674	C		
				WB Right	315	9	181	722	A		
27- MD 117 at I-270 SB off ramp											
27	NB			NB Left	0	0	0	0	A	8.0	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	1.6	A	EB Left	0	0	0	0	A		
				EB Through	793	2	0	87	A		
				EB Right	0	0	0	0	A		
	WB	24.1	C	WB Left	314	24	47	336	C		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
28- MD 117 at I-270 NB off ramp											
28	NB			NB Left	0	0	0	0	A	29.5	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	46.8	D	SB Left	306	52	211	551	D		
				SB Through	0	0	0	0	A		
				SB Right	917	45	218	554	D		
	EB	19.7	B	EB Left	10	111	83	913	F		
				EB Through	781	19	83	913	B		
				EB Right	0	0	0	0	A		
	WB	14.2	B	WB Left	0	0	0	0	A		
				WB Through	860	14	51	346	B		
				WB Right	9	6	55	376	A		
29- MD 117 at Perry Pkwy											
29	NB	44.3	D	NB Left	35	70	15	97	E	13.7	B
				NB Through	6	62	14	96	E		
				NB Right	31	11	24	117	B		
	SB	32.7	C	SB Left	90	70	36	164	E		
				SB Through	13	67	36	164	E		
				SB Right	124	2	36	164	A		
	EB	10.5	B	EB Left	120	72	45	270	E		
				EB Through	954	3	45	270	A		
				EB Right	9	1	32	254	A		
	WB	9.9	A	WB Left	5	87	20	253	F		
				WB Through	709	10	20	253	B		
				WB Right	104	5	20	253	A		
30- Shady Grove Rd at I-270 NB off ramp											
30	NB	9.0	A	NB Left	0	0	0	0	A	24.3	C
				NB Through	916	9	20	223	A		
				NB Right	0	0	0	0	A		
	SB	10.1	B	SB Left	0	0	0	0	A		
				SB Through	1284	10	31	344	B		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	56.2	E	WB Left	1011	56	199	709	E		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table A.15: AM Peak -2015 HSR+VSL+ARM- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
31- Shady Grove Rd at I-270 SB off ramp											
31	NB	14.7	B	NB Left	0	0	0	0	A	21.4	C
				NB Through	920	15	42	383	B		
				NB Right	0	0	0	0	A		
	SB	11.0	B	SB Left	0	0	0	0	A		
				SB Through	1695	11	43	569	B		
				SB Right	0	0	0	0	A		
	EB	46.2	D	EB Left	312	39	43	300	D		
				EB Through	0	0	0	0	A		
				EB Right	651	50	107	434	D		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
32- MD 28 at I-270 SB off ramp											
32	NB			NB U-Turn	0	0	0	0	A	8.4	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	33.0	C	SB Left	403	41	62	260	D		
				SB Through	0	0	0	0	A		
				SB Right	98	1	0	58	A		
	EB	3.0	A	EB Left	0	0	0	0	A		
				EB Through	1422	1	0	0	A		
				EB Right	898	7	18	369	A		
	WB	8.6	A	WB Left	0	0	0	0	A		
				WB Through	1893	9	28	347	A		
				WB Right	0	0	0	0	A		
33- MD 28 at I-270 on and off ramps											
33	NB	34.7	C	NB Left	0	0	50	283	A	18.3	B
				NB Through	214	49	61	328	D		
				NB Right	140	12	61	328	B		
	SB	20.8	C	SB Left	25	57	19	160	E		
				SB Through	0	0	0	0	A		
				SB Right	260	17	19	160	B		
	EB	17.6	B	EB Left	258	33	65	452	C		
				EB Through	951	13	65	452	B		
				EB Right	0	0	0	0	A		
	WB	12.1	B	WB Left	22	11	40	282	B		
				WB Through	887	12	28	246	B		
				WB Right	0	0	0	0	A		
34- MD 189 at Great Falls Rd											
34	NB	40.8	D	NB Left	62	45	16	111	D	10.5	B
				NB Through	6	42	13	110	D		
				NB Right	8	8	15	121	A		
	SB	5.2	A	SB Left	66	46	20	162	D		
				SB Through	7	40	20	162	D		
				SB Right	601	0	0	0	A		
	EB	11.1	B	EB Left	325	16	13	217	B		
				EB Through	920	9	19	215	A		
				EB Right	13	8	28	251	A		
	WB	12.5	B	WB Left	3	19	17	177	B		
				WB Through	315	13	17	177	B		
				WB Right	10	7	28	211	A		
35- MD 189 at I-270 Ramps											
35	NB	47.9	D	NB Left	133	48	24	134	D	42.2	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	48.9	D	SB Left	181	49	55	270	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	24.5	C	EB Left	383	21	86	460	C		
				EB Through	530	27	86	460	C		
				EB Right	0	0	0	0	A		
	WB	59.6	E	WB Left	532	48	138	442	D		
				WB Through	280	81	138	442	F		
				WB Right	0	0	0	0	A		
36- MD 189 at Wooton Pkwy											
36	NB	43.0	D	NB Left	129	51	51	179	D	58.3	E
				NB Through	101	79	51	179	E		
				NB Right	151	12	51	179	B		
	SB	93.5	F	SB Left	388	107	298	747	F		
				SB Through	520	83	237	729	F		
				SB Right	0	0	0	0	A		
	EB	46.8	D	EB Left	132	71	201	841	E		
				EB Through	944	46	201	841	D		
				EB Right	95	21	201	841	C		
	WB	43.5	D	WB Left	423	63	111	357	E		
				WB Through	381	28	111	357	C		
				WB Right	57	5	111	357	A		
37- Montrose Rd at Tower Oaks Blvd											
37	NB			NB Left	0	0	0	0	A	25.3	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	101.7	F	SB Left	126	40	176	987	D		
				SB Through	0	0	0	0	A		
				SB Right	531	116	308	1072	F		
	EB	7.2	A	EB Left	27	14	23	297	B		
				EB Through	1401	7	23	297	A		
				EB Right	0	0	0	0	A		
	WB	9.2	A	WB Left	0	0	0	0	A		
				WB Through	1443	9	25	284	A		
				WB Right	62	4	25	284	A		
38- Tower Oaks Blvd at I-270 off ramp											
38	NB	15.5	B	NB Left	474	16	24	166	B	14.9	B
				NB Through	12	14.3	18	158	B		
				NB Right	26	4.6	24	166	A		
	SB	0.4	A	SB Left	2	-0.4	0	24	A		
				SB Through	0	0.0	0	23	A		
				SB Right	2	1.2	0	0	A		
	EB	14.9	B	EB Left	7	12.0	39	277	B		
				EB Through	622	15.4	39	277	B		
				EB Right	91	11.5	33	268	B		
	WB	11.5	B	WB Left	0	0.0	4	69	A		
				WB Through	83	12.2	4	69	B		
				WB Right	7	3.3	0	8	A		
39- Montrose Rd at Tower Oaks Blvd											
39	NB	9.6	A	NB Left	26	45	21	135	D	61.8	E
				NB Through	188	30	21	135	C		
				NB Right	507	0	0	0	A		
	SB	37.6	D	SB Left	296	67	122	514	E		
				SB Through	605	26	121	513	C		
				SB Right	64	17	118	547	B		
	EB	146.0	F	EB Left	56	126	556	737	F		
				EB Through	807	147	560	738	F		
				EB Right	45	146	583	762	F		
	WB	40.8	D	WB Left	362	49	79	264	D		
				WB Through	231	47	79	264	D		
				WB Right	134	7	92	294	A		
40- Rockledge Blvd at I-270 NB on and off ramp											
40	NB			NB Left	0	0	0	0	A	14.7	B
				NB Through	83	35	31	137	D		
				NB Right	193	35	31	137	D		
	SB	2.1	A	SB Left	0	0	5	61	A		
				SB Through	984	2	5	61	A		
				SB Right	0	0	0	0	A		
	EB	21.5	C	EB Left	4	36	88	369	D		
				EB Through	473	44	88	369	D		
				EB Right	518	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table A.15: AM Peak -2015 HSR+VSL+ARM- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS	
41- Rockledge Blvd at I-270 SB on and off ramps												
41	NB	2.2	A	NB Left	88	2	1	20	A	19.4	B	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	20.4		C	WB Left	984	21	90	603			C
					WB Through	448	19	90	603			B
					WB Right	0	0	0	0			A
42- MD 187 at Tuckerman Ln												
42	NB	300.4	F	NB Left	173	170	1089	1596	F	196.8	F	
				NB Through	1101	254	1089	1596	F			
				NB Right	150	792	1089	1596	F			
	SB	173.1	F	F	SB Left	60	142	2550	2702			F
					SB Through	1503	171	2550	2702			F
					SB Right	175	197	2550	2702			F
	EB	67.0	E	E	EB Left	185	47	218	956			D
					EB Through	548	75	219	957			E
					EB Right	135	62	240	981			E
	WB	202.3	F	F	WB Left	706	241	1956	2147			F
					WB Through	351	164	1956	2147			F
					WB Right	135	99	1956	2147			F
43- MD 187 at I-270 NB on and off ramps												
43	NB	64.2	E	NB Left	142	99	203	368	F	42.8	D	
				NB Through	1163	60	203	368	E			
				NB Right	0	0	0	0	A			
	SB	24.3	C	C	SB Left	0	0	0	0			A
					SB Through	1712	24	90	599			C
					SB Right	0	0	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	73.4	E	E	WB Left	119	74	116	586			E
					WB Through	9	67	116	586			E
					WB Right	0	0	0	0			A
44- MD 187 at I-270 NB on and off ramps												
44	NB	145.6	F	NB Left	0	0	0	0	A	66.0	E	
				NB Through	1146	146	365	845	F			
				NB Right	0	0	0	0	A			
	SB	7.7	A	A	SB Left	195	59	65	317			E
					SB Through	1638	2	65	317			A
					SB Right	0	0	0	0			A
	EB	95.6	F	F	EB Left	179	128	163	638			F
					EB Through	0	0	163	638			A
					EB Right	353	79	200	652			E
	WB				WB Left	0	0	0	0			A
					WB Through	0	0	0	0			A
					WB Right	0	0	0	0			A
45- MD 187 at Rock Spring Dr												
45	NB	44.4	D	NB Left	184	74	193	686	E	31.9	C	
				NB Through	1123	40	193	687	D			
				NB Right	6	36	215	720	D			
	SB	20.0	C	C	SB Left	13	23	99	701			C
					SB Through	1813	22	99	701			C
					SB Right	160	1	59	686			A
	EB	51.7	D	D	EB Left	158	87	56	209			F
					EB Through	22	67	56	209			E
					EB Right	196	22	56	209			C
	WB	5.5	A	A	WB Left	1	15	0	19			B
					WB Through	8	6	0	19			A
					WB Right	4	2	0	0			A
47-Democracy Blvd at I-270 NB off ramp												
47	NB	29.4	C	NB Left	210	29	24	139	C	13.9	B	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB	13.5	B	B	EB Left	0	0	0	0			A
					EB Through	1583	14	52	482			B
					EB Right	0	0	0	0			A
	WB	10.4	B	B	WB Left	0	0	0	0			A
					WB Through	736	10	22	176			B
					WB Right	0	0	0	0			A
48- Democracy Blvd at I-270 SB on ramp												
48	NB			NB Left	0	0	0	0	A	6.4	A	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB	5.2	A	A	EB Left	0	0	0	0			A
					EB Through	1688	5	20	269			A
					EB Right	0	0	0	0			A
	WB	8.5	A	A	WB Left	211	36	30	189			D
					WB Through	732	1	19	168			A
					WB Right	0	0	0	0			A
49- Democracy Blvd at I-270 SB off ramp												
49	NB			NB Left	0	0	0	0	A	12.2	B	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB	32.9	C	C	SB Left	328	49	57	213			D
					SB Through	0	0	0	0			A
					SB Right	165	1	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	2.5	A	A	WB Left	0	0	0	0			A
					WB Through	731	3	4	122			A
					WB Right	323	2	0	93			A
50- MD 190 at Burdette Rd												
50	NB	76.6	E	NB Left	19	69	12	111	E	11.5	B	
				NB Through	3	74	12	111	E			
				NB Right	8	95	12	111	F			
	SB	33.3	C	C	SB Left	41	84	28	151			F
					SB Through	13	84	28	151			F
					SB Right	113	9	28	151			A
	EB	9.3	A	A	EB Left	48	94	50	531			F
					EB Through	1718	7	49	531			A
					EB Right	15	4	41	554			A
	WB	10.5	B	B	WB Left	0	87	44	630			F
					WB Through	1435	11	45	630			B
					WB Right	18	2	39	670			A

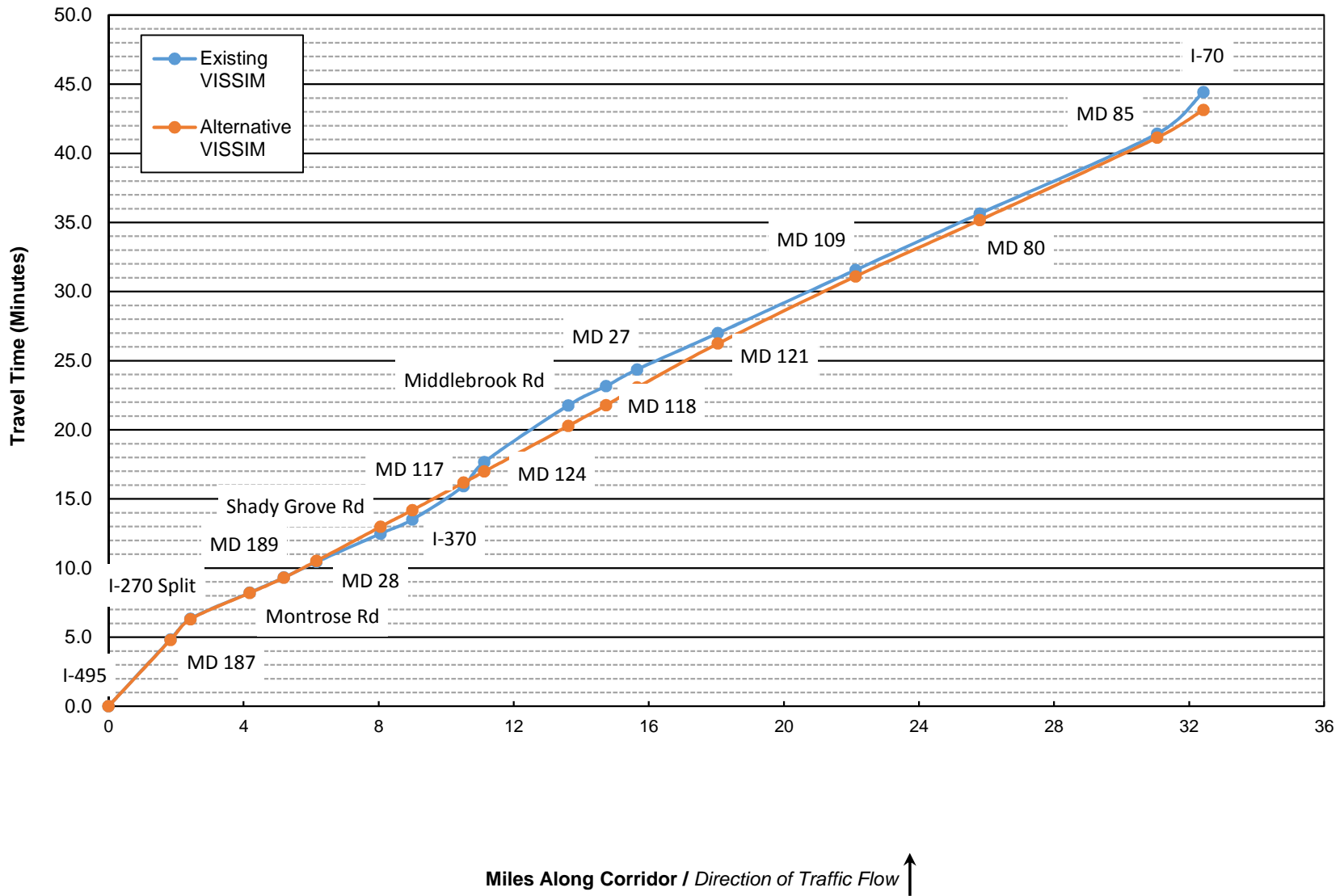
Table A.15: AM Peak -2015 HSR+VSL+ARM- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
51- MD 190 at I-270 NB on ramp											
51	NB			NB Left	0	0	0	0	A	36.9	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	81.8	F	EB Left	491	82	232	543	F		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	14.2	B	WB Left	0	0	0	0	A		
				WB Through	974	14	59	582	B		
				WB Right	0	0	0	0	A		
52- MD 190 at I-270 SB off ramp											
52	NB	79.4	E	NB Left	258	79	418	1714	E	14.7	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	3.0	A	EB Left	0	0	0	0	A		
				EB Through	864	3	6	141	A		
				EB Right	0	0	0	0	A		
	WB	4.8	A	WB Left	0	0	0	0	A		
				WB Through	675	5	6	157	A		
				WB Right	0	0	0	0	A		
53- MD 190 at Seven Locks Rd											
53	NB	66.4	E	NB Left	17	67	16	123	E	43.0	D
				NB Through	44	66	19	123	E		
				NB Right	0	0	0	0	A		
	SB	67.6	E	SB Left	581	67	199	696	E		
				SB Through	145	68	199	696	E		
				SB Right	13	73	198	696	E		
	EB	29.4	C	EB Left	18	24	94	480	C		
				EB Through	781	30	94	480	C		
				EB Right	32	30	94	480	C		
	WB	33.9	C	WB Left	122	108	106	335	F		
				WB Through	647	28	108	338	C		
				WB Right	159	1	0	11	A		
54- MD 124 at I-270 NB off ramp											
54	NB	64.3	E	NB Left	0	0	0	0	A	78.6	E
				NB Through	0	0	0	0	A		
				NB Right	922	64	237	743	E		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	95.1	F	EB Left	0	0	0	0	A		
				EB Through	803	95	392	960	F		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
55- Democracy Blvd at I-270 NB off ramp											
55	NB	36.8	D	NB Left	0	0	0	0	A	16.7	B
				NB Through	0	0	0	0	A		
				NB Right	927	37	111	529	D		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	4.9	A	EB Left	0	0	0	0	A		
				EB Through	1583	5	20	100	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

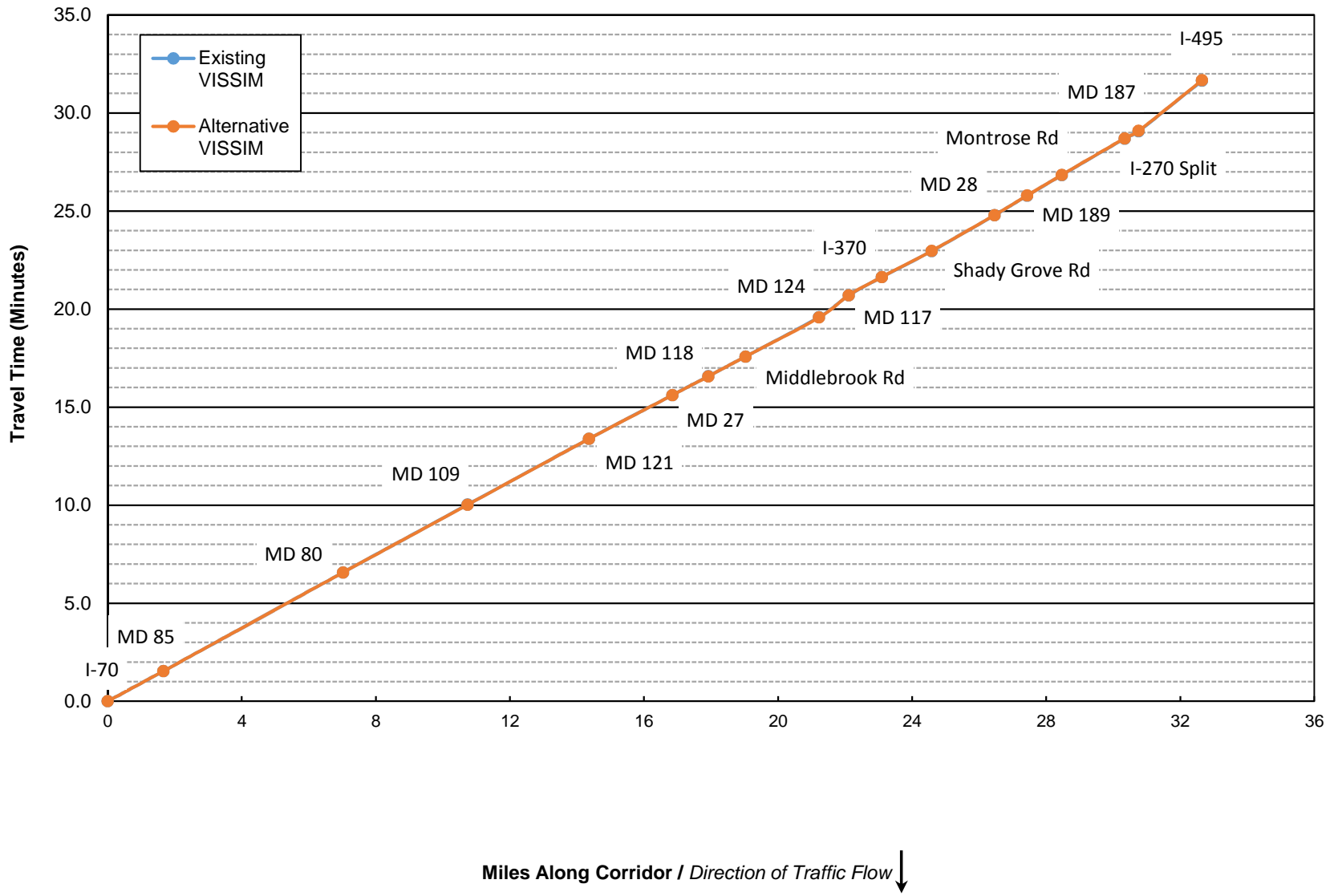
Table A.16: AM Peak -2015 HSR+VSL+ARM- I-270 Vehicle Network Performance

	Existing	HSR+VSL+AR M	% Change
Total Delay	21,906,753	13,755,977	-37%
Average Delay per Vehicle	227	147	-35%
Total Travel Time	51,252,838	45,154,520	-12%
Vehicles (Arrived)	81,275	80,986	0%
Latent Demand	4,969	7,898	59%
Latent Delay	13,122,672	21,485,516	64%
Total Distance	467,210	459,885	-2%
Average Speed	33	37	12%

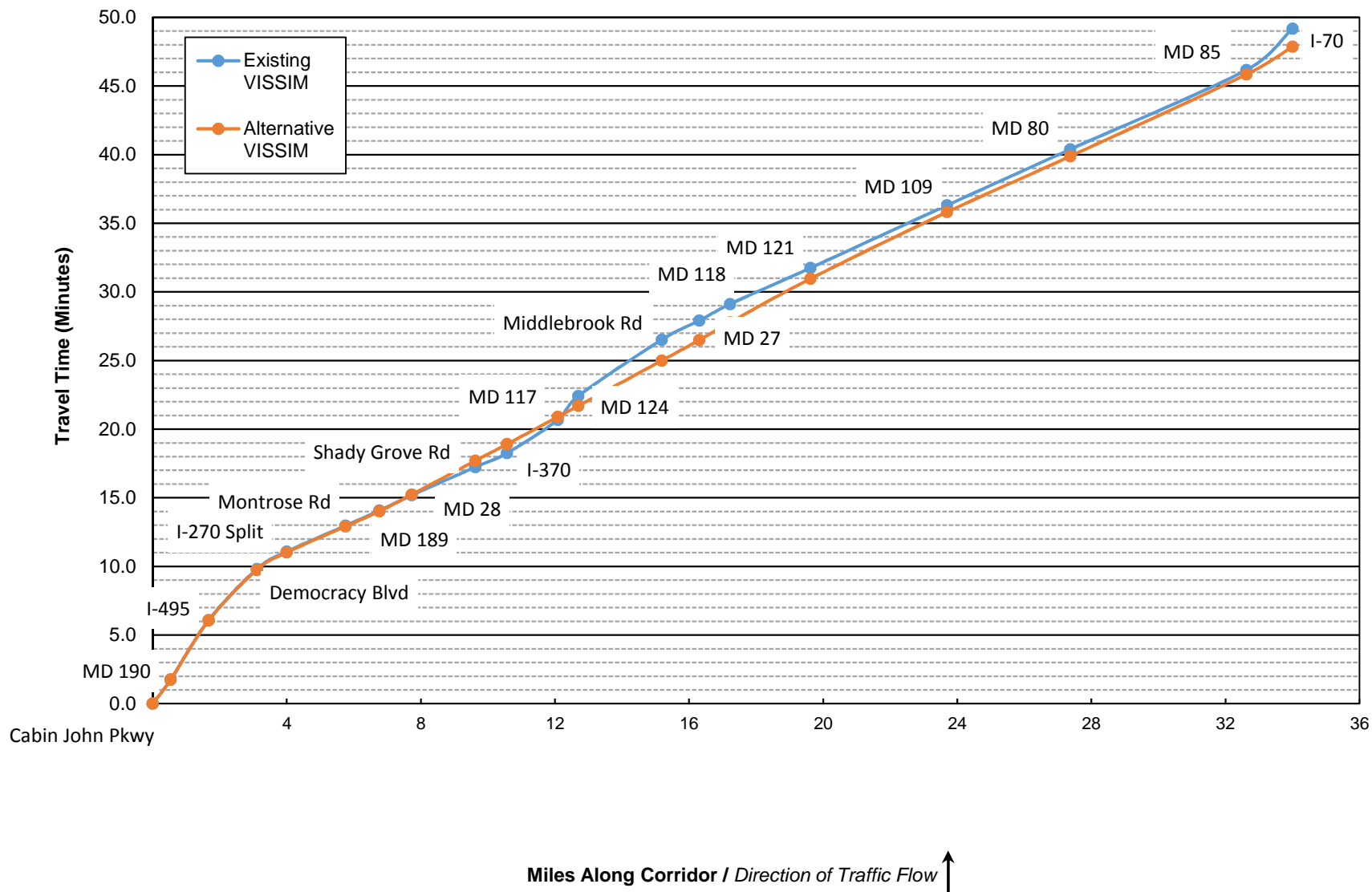
**Figure B.1: PM Peak - 2015 HSR + VSL + ARM Model
I-270 Travel Time Graph - Northbound**



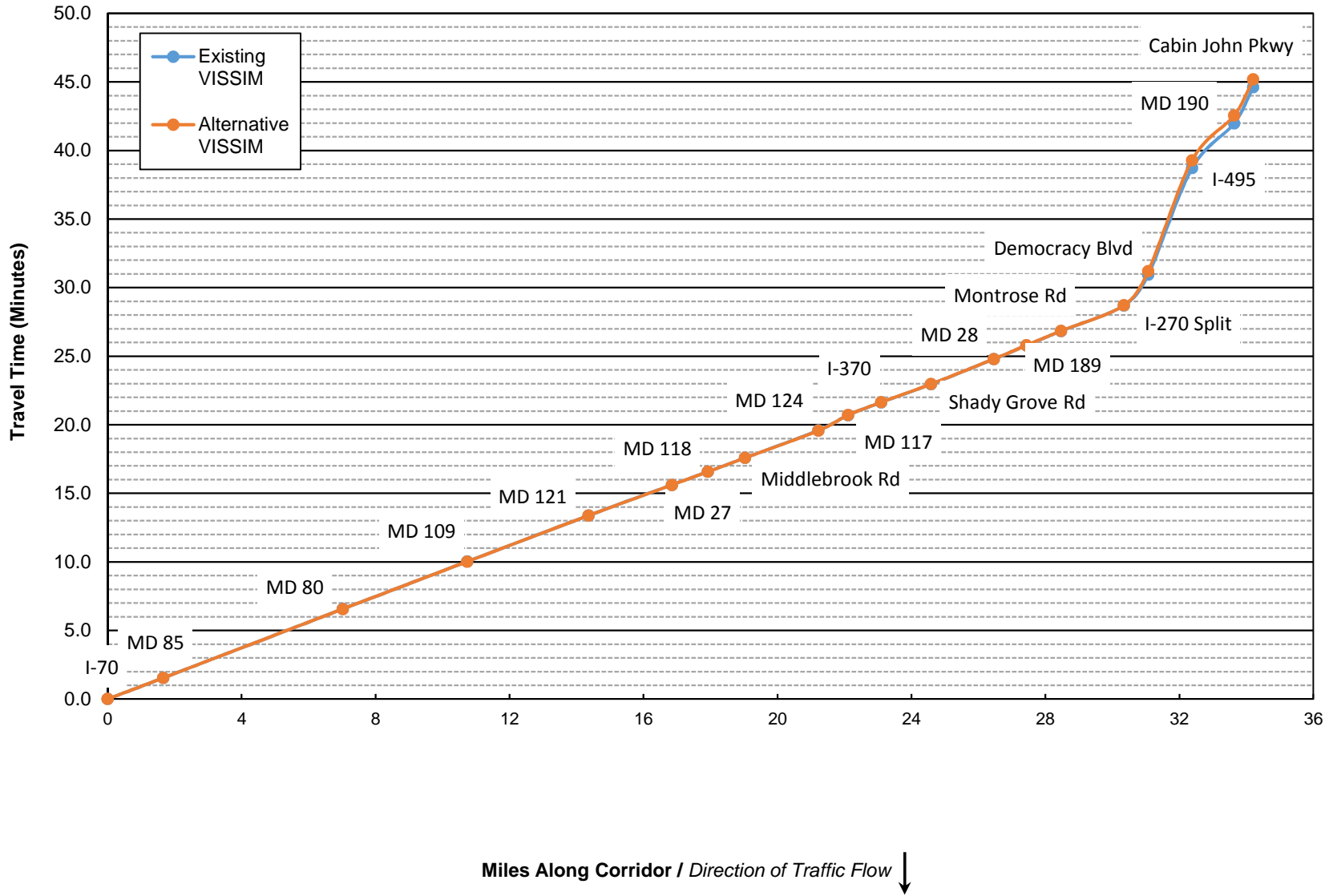
**Figure B.2: PM Peak - 2015 HSR + VSL + ARM Model
I-270 Travel Time Graph - Southbound**



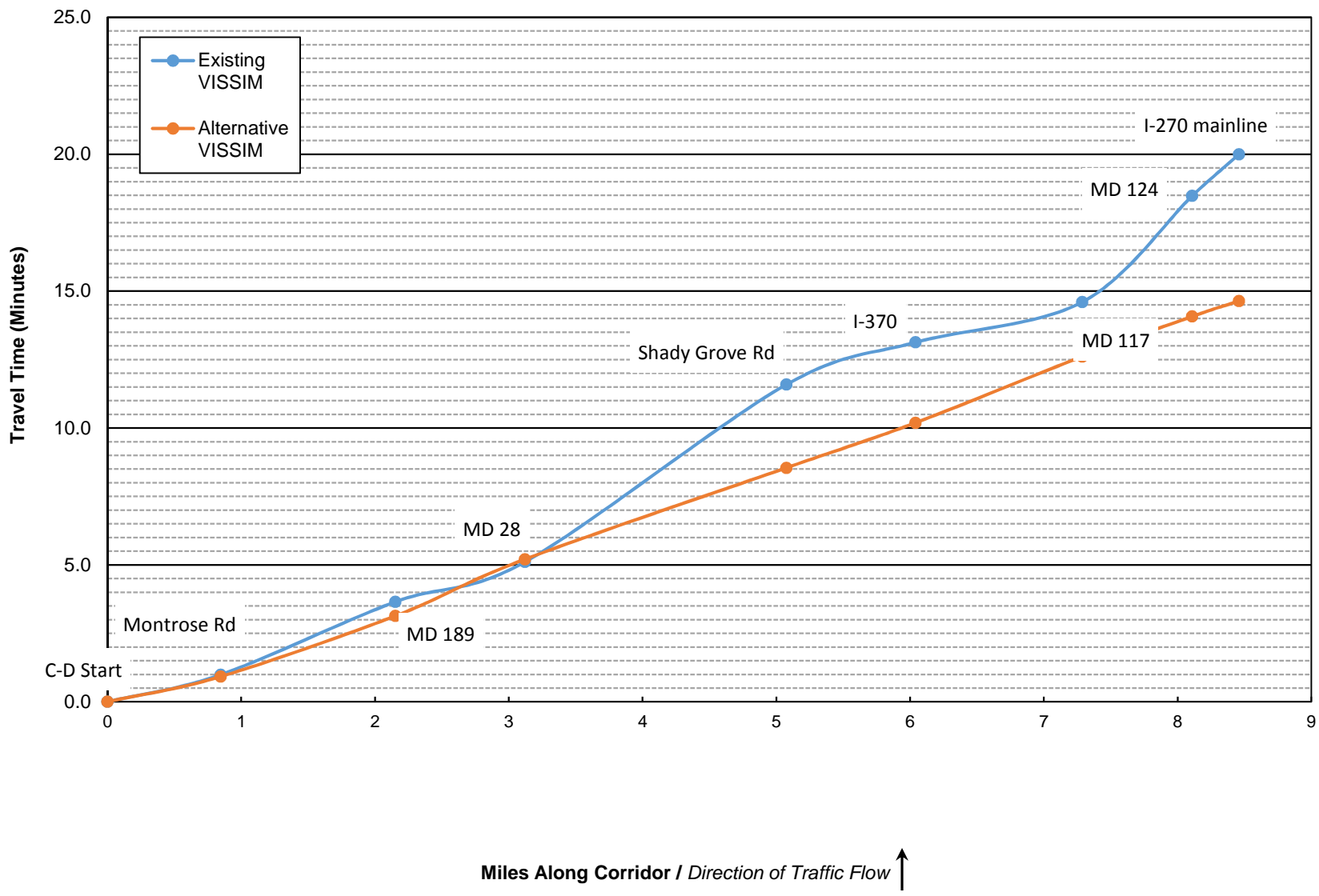
**Figure B.3: PM Peak - 2015 HSR + VSL + ARM Model
I-270 Spur Travel Time Graph - Northbound**



**Figure B4: PM Peak - 2015 HSR + VSL + ARM Model
I-270 Spur Travel Time Graph - Southbound**



**Figure B.5: PM Peak - 2015 HSR + VSL + ARM Model
I-270 Local Travel Time Graph - Northbound**



**Figure B.6: PM Peak - 2015 HSR + VSL + ARM Model
I-270 Local Travel Time Graph - Southbound**

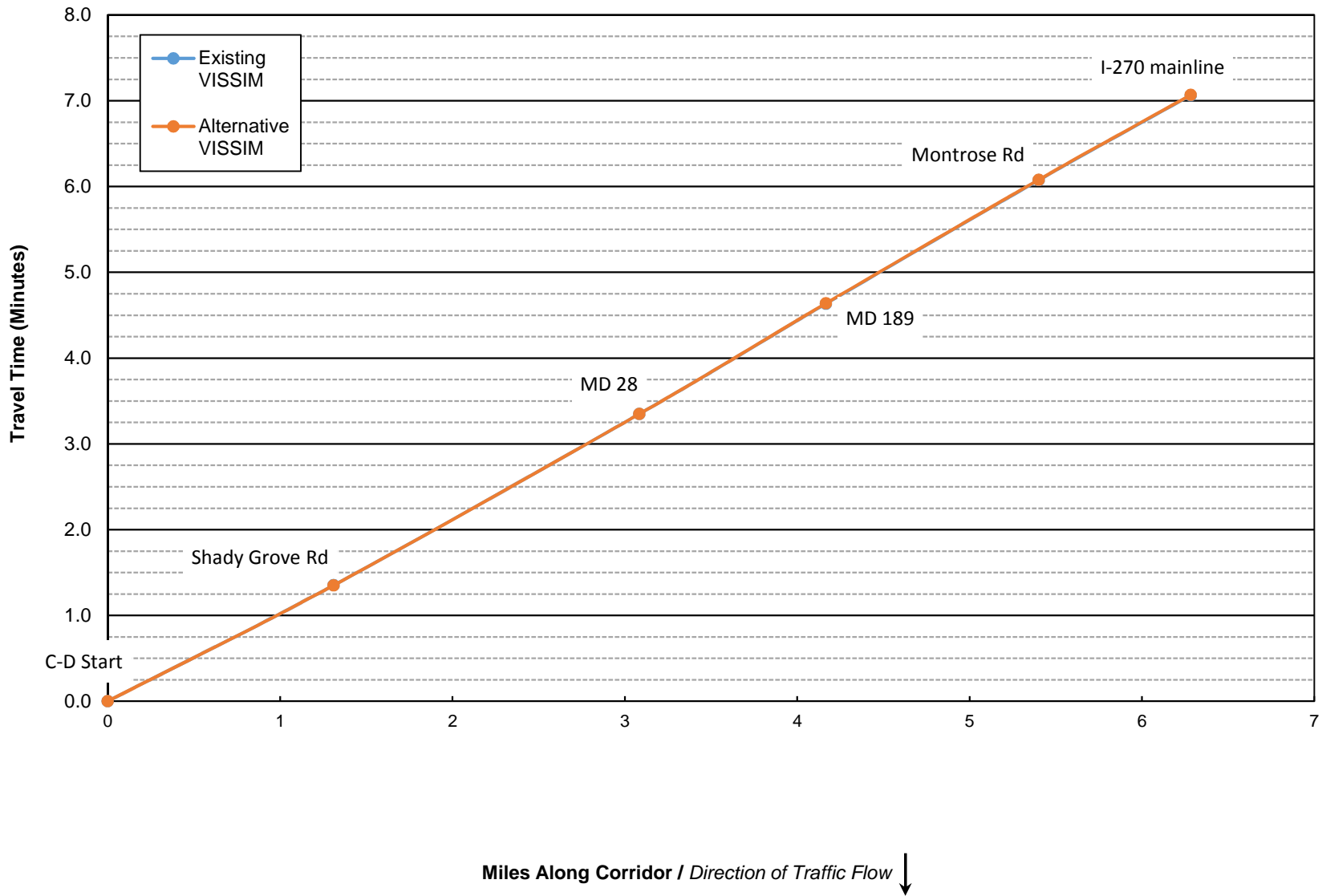


Table B.1: PM Peak - 2015 HSR + VSL + ARM Model - I-270 Vehicle Travel Time

I-270 Northbound	Segment Length (miles)	Existing VISSIM Travel Time (seconds)	HSR + VSL + ARM VISSIM Travel Time (seconds)	% Change	I-270 Southbound	Segment Length (miles)	Existing VISSIM Travel Time (seconds)	HSR + VSL + ARM VISSIM Travel Time (seconds)	% Change
From I-495 interchange					From I-70				
to MD 187	1.8	290.1	288.1	-0.7%	to MD 85	1.7	92.4	92.4	0.0%
to I-270 Split	0.6	89.3	90.0	0.7%	to MD 80	5.4	301.4	301.4	0.0%
to Montrose Rd	1.8	113.6	113.7	0.1%	to MD 109	3.7	207.9	207.6	-0.1%
to MD 189	1.0	66.0	66.1	0.3%	to MD 121	3.6	201.4	201.5	0.0%
to MD 28	1.0	67.1	73.0	8.8%	to MD 27	2.5	133.7	133.7	0.0%
to Shady Grove Rd	1.9	123.3	148.4	20.4%	to MD 118	1.1	57.6	57.7	0.0%
to I-370	0.9	61.3	72.2	17.8%	to Middlebrook Rd	1.1	60.4	60.6	0.3%
to MD 117	1.5	145.0	119.3	-17.8%	to MD 124	2.2	120.9	119.6	-1.1%
to MD 124	0.6	104.3	48.2	-53.8%	to MD 117	0.9	66.4	68.0	2.5%
to Middlebrook Rd	2.5	246.0	197.9	-19.6%	to I-370	1.0	55.8	56.0	0.3%
to MD 118	1.1	83.6	90.0	7.7%	to Shady Grove Rd	1.5	79.7	79.6	-0.1%
to MD 27	0.9	72.2	76.8	6.4%	to MD 28	1.9	109.5	109.6	0.1%
to MD 121	2.4	157.6	190.8	21.0%	to MD 189	1.0	60.1	60.1	0.0%
to MD 109	4.1	274.2	291.7	6.4%	to Montrose Rd	1.0	62.9	63.0	0.2%
to MD 80	3.7	244.9	244.2	-0.3%	to I-270 Split	1.9	111.5	111.7	0.2%
to MD 85	5.3	346.9	357.9	3.2%	to MD 187	0.4	22.8	22.9	0.5%
to I-70	1.4	180.2	120.4	-33.2%	to I-495 interchange	1.9	154.8	155.0	0.1%
I-270 Total (miles/minutes)	32.4	44.4	43.1	-2.9%	I-270 Total (miles/minutes)	32.6	31.7	31.7	0.1%
I-270 Spur Northbound					I-270 Spur Southbound				
From Cabin John Pkwy					From I-70				
to MD 190	0.5	105.6	105.4	-0.2%	to I-270 Split	30.3	1,721.6	1,722.4	0.0%
to I-495	1.1	259.8	258.3	-0.6%	to Democracy Blvd	0.7	135.0	149.4	10.7%
to Democracy Blvd	1.4	222.8	220.9	-0.9%	to I-495	1.3	466.2	485.5	4.1%
to I-270 Split	0.9	76.3	76.5	0.2%	to MD 190	1.3	196.3	196.1	-0.1%
to I-70	30.0	2,286.1	2,210.4	-3.3%	to Cabin John Pkwy	0.6	158.2	157.6	-0.4%
I-270 Spur Total (miles/minutes)	34.0	49.2	47.9	-2.7%	I-270 Spur Total (miles/minutes)	34.2	44.6	45.2	1.3%

Table B.2: PM Peak - 2015 HSR + VSL + ARM Model - I-270 Local Vehicle Travel Time

I-270 Northbound	Segment Length (miles)	Existing VISSIM Travel Time (seconds)	HSR + VSL + ARM VISSIM Travel Time (seconds)	% Change	I-270 Southbound	Segment Length (miles)	Existing VISSIM Travel Time (seconds)	HSR + VSL + ARM VISSIM Travel Time (seconds)	% Change
From C-D start					From C-D start				
to Montrose Rd	0.8	59.3	55.2	-6.9%	to Shady Grove	1.3	81.2	81.1	0.0%
to MD 189	1.3	159.8	133.0	-16.8%	to MD 28	1.8	119.8	119.9	0.0%
to MD 28	1.0	87.2	124.1	42.2%	to MD 189	1.1	77.1	77.3	0.3%
to Shady Grove	2.0	388.8	200.5	-48.4%	to Montrose	1.2	86.4	86.5	0.1%
to I-370	1.0	92.6	98.8	6.7%	to I-270 mainline	0.9	59.4	59.3	-0.1%
to MD 117	1.2	88.2	145.1	64.5%					
to MD 124	0.8	232.8	88.0	-62.2%					
to I-270 mainline	0.4	91.1	34.0	-62.7%					
I-270 Local Total (miles/minutes)	8.5	20.0	14.6	-26.8%	I-270 Local Total (miles/minutes)	6.3	7.1	7.1	0.1%

Table B.3: PM Peak - 2015 HSR + VSL + ARM Model - I-270 Vehicle Speed

I-270 Northbound	Segment Length (miles)	Existing VISSIM Speed (MPH)	HSR + VSL + ARM VISSIM Speed (MPH)	% Change	I-270 Southbound	Existing VISSIM Speed (MPH)	HSR + VSL + ARM VISSIM Speed (MPH)	% Change
From I-495 interchange					From I-70			
to MD 187	1.8	22.8	22.9	0.7%	to MD 85	64.8	64.8	0.0%
to I-270 Split	0.6	23.8	23.6	-0.7%	to MD 80	64.0	64.0	0.0%
to Montrose Rd	1.8	55.6	55.5	-0.1%	to MD 109	64.4	64.5	0.1%
to MD 189	1.0	55.3	55.2	-0.3%	to MD 121	64.7	64.7	0.0%
to MD 28	1.0	51.8	47.6	-8.1%	to MD 27	66.9	66.9	0.0%
to Shady Grove Rd	1.9	55.4	46.0	-16.9%	to MD 118	67.0	67.0	0.0%
to I-370	0.9	55.5	47.1	-15.1%	to Middlebrook Rd	66.2	66.0	-0.3%
to MD 117	1.5	37.6	45.7	21.6%	to MD 124	65.4	66.1	1.1%
to MD 124	0.6	21.1	45.8	116.6%	to MD 117	48.1	46.9	-2.5%
to Middlebrook Rd	2.5	36.4	45.3	24.3%	to I-370	63.6	63.4	-0.3%
to MD 118	1.1	48.3	44.8	-7.2%	to Shady Grove Rd	67.2	67.2	0.1%
to MD 27	0.9	45.7	42.9	-6.0%	to MD 28	61.6	61.6	-0.1%
to MD 121	2.4	54.7	45.2	-17.4%	to MD 189	58.6	58.6	0.0%
to MD 109	4.1	53.5	50.3	-6.0%	to Montrose Rd	59.1	59.0	-0.2%
to MD 80	3.7	54.1	54.2	0.3%	to I-270 Split	60.4	60.3	-0.2%
to MD 85	5.3	54.5	52.9	-3.1%	to MD 187	66.4	66.0	-0.5%
to I-70	1.4	27.4	41.0	49.7%	to I-495 interchange	44.0	43.9	-0.1%
I-270 Total (miles/minutes)	32.4	43.8	45.1	3.0%	I-270 Total (miles/minutes)	61.9	60.0	-100.0%
I-270 Spur Northbound					I-270 Spur Southbound			
From Cabin John Pkwy					From I-70			
to MD 190	0.5	18.4	18.4	0.2%	to I-270 Split	63.4	63.4	0.0%
to I-495	1.1	15.7	15.8	0.6%	to Democracy Blvd	19.5	17.6	-9.7%
to Democracy Blvd	1.4	23.2	23.4	0.9%	to I-495	10.1	9.7	-4.0%
to I-270 Split	0.9	42.1	42.0	-0.2%	to MD 190	23.0	23.0	0.1%
to I-70	30.0	47.2	48.9	3.4%	to Cabin John Pkwy	13.0	13.0	0.4%
I-270 Spur Total (miles/minutes)	34.0	41.5	42.6	2.8%	I-270 Spur Total (miles/minutes)	46.0	45.4	-1.2%

* Final = HSR + VSL + ARM + MODE

Table B.4: PM Peak - 2015 HSR + VSL + ARM Model - I-270 Local Vehicle Speed

I-270 Northbound	Existing VISSIM Speed (MPH)	HSR + VSL + ARM VISSIM Speed (MPH)	% Change	I-270 Southbound	Segment Length (miles)	Existing VISSIM Speed (MPH)	HSR + VSL + ARM VISSIM Speed (MPH)	% Change
From C-D start				From C-D start				
to Montrose Rd	51.3	55.1	7.4%	to Shady Grove	1.3	58.1	58.2	0.0%
to MD 189	29.4	35.4	20.2%	to MD 28	1.8	53.3	53.3	0.0%
to MD 28	40.0	28.1	-29.7%	to MD 189	1.1	50.5	50.4	-0.3%
to Shady Grove	18.1	35.1	94.0%	to Montrose	1.2	51.4	51.4	-0.1%
to I-370	37.5	35.2	-6.3%	to I-270 mainline	0.9	53.5	53.5	0.1%
to MD 117	50.9	30.9	-39.2%					
to MD 124	12.7	33.7	164.6%					
to I-270 mainline	13.8	37.1	168.0%					
I-270 Local Total (miles/minutes)	25.4	34.7	36.6%	I-270 Local Total (miles/minutes)	6.3	53.4	53.3	-0.1%

Table B.5: PM Peak - 2015 HSR + ARM + VSL Model - I-270 Vehicle Density

I-270 Northbound	Type	Existing		HSR + ARM + VSL			I-270 Southbound	Type	Existing		HSR + ARM + VSL		
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS	% Change			Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS	% Change
I-270	Freeway	47	F	47	F	0%	I-270	Freeway	16	B	16	B	0%
I-270 Diverge to MD 187	Diverge	60	F	58	F	-3%	I-270 Merge from WB I-70	Merge	13	B	13	B	0%
I-270	Freeway	73	F	70	F	-4%	I-270	Freeway	19	C	19	C	0%
I-270 Diverge to Rockledge Rd	Diverge	69	F	66	F	-4%	I-270 Merge from EB I-70	Merge	14	B	14	B	0%
I-270	Freeway	82	F	81	F	-1%	I-270	Freeway	18	C	18	C	0%
I-270 Weave from MD 187 to I-270 HOV	Weave	56	F	57	F	2%	I-270 Diverge to SB MD 85	Diverge	19	B	19	B	0%
I-270 Lane Drop	Merge	65	F	65	F	0%	I-270	Freeway	20	C	20	C	0%
I-270	Freeway	51	F	51	F	0%	I-270 Diverge to NB MD 85	Diverge	12	B	12	B	0%
I-270 Merge from I-270 Spur	Merge	37	E	37	E	0%	I-270	Freeway	16	B	16	B	0%
I-270 Weave from I-270 HOV to I-270 C-D	Weave	33	D	33	D	0%	I-270 Merge from MD 85	Merge	14	B	14	B	0%
I-270	Freeway	32	D	32	D	0%	I-270	Freeway	21	C	21	C	0%
I-270 Diverge to C-D (MD 189)	Diverge	37	E	37	E	1%	I-270 Diverge to MD 80	Diverge	13	B	14	B	1%
I-270	Freeway	32	D	32	D	0%	I-270	Freeway	17	B	17	B	0%
I-270 Diverge to C-D (MD 28)	Diverge	38	E	38	E	0%	I-270 Merge from MD 80	Merge	11	B	11	B	1%
I-270	Freeway	30	D	33	D	11%	I-270	Freeway	20	C	20	C	0%
I-270 Merge from C-D (MD 189)	Merge	41	F	50	F	20%	I-270 Diverge to MD 109	Diverge	10	B	10	A	-1%
I-270 Diverge to C-D (Shady Grove Rd)	Diverge	42	F	48	F	14%	I-270	Freeway	19	C	19	C	0%
I-270	Freeway	30	D	36	E	21%	I-270 Merge from MD 109	Merge	11	B	11	B	-1%
I-270 Weave from C-D (MD 28) to C-D (Shady Grove Rd)	Weave	32	D	40	F	26%	I-270	Freeway	20	C	20	C	0%
I-270	Freeway	26	D	31	D	19%	I-270 Diverge to SB Weigh Station	Diverge	10	B	10	A	-1%
I-270 Merge from C-D (Shady Grove Rd)	Merge	21	C	26	C	24%	I-270	Freeway	20	C	20	C	0%
I-270	Freeway	33	D	34	D	4%	I-270 Merge from SB Weigh Station	Merge	10	B	10	B	0%
I-270 Merge from C-D (I-370)	Merge	32	D	28	C	-14%	I-270	Freeway	19	C	19	C	0%
I-270 Diverge to C-D (MD 117)	Diverge	53	F	37	E	-30%	I-270 Diverge to MD 121	Diverge	7	A	7	A	-1%
I-270	Freeway	74	F	33	D	-55%	I-270	Freeway	12	B	12	B	0%
I-270 Merge from C-D (MD 124)	Merge	101	F	36	E	-65%	I-270 Merge from MD 121	Merge	9	A	9	A	-1%
I-270	Freeway	36	E	34	D	-7%	I-270	Freeway	14	B	14	B	0%
I-270 Diverge to EB Middlebrook Rd	Diverge	28	D	28	C	-1%	I-270 Diverge to MD 27	Diverge	10	A	9	A	0%
I-270	Freeway	34	D	31	D	-7%	I-270	Freeway	12	B	12	B	0%
I-270 Diverge to WB Middlebrook Rd	Diverge	30	D	26	C	-15%	I-270 Merge from WB MD 27	Merge	11	B	11	B	0%
I-270	Freeway	27	D	26	D	-4%	I-270	Freeway	15	B	15	B	0%
I-270 Diverge to EB MD 118	Diverge	24	C	22	C	-7%	I-270 Weave from EB MD 27 to MD 118	Weave	12	B	12	B	0%
I-270 Diverge to WB MD 118	Diverge	42	F	27	C	-35%	I-270	Freeway	14	B	14	B	0%
I-270	Freeway	33	D	27	D	-17%	I-270 Merge from WB MD 118	Merge	12	B	12	B	-1%
I-270 Weave from MD 118 to MD 27	Weave	46	F	33	D	-29%	I-270	Freeway	17	B	17	B	0%
I-270	Freeway	26	D	22	C	-16%	I-270 Merge from EB MD 118	Merge	15	B	15	B	0%
I-270 Merge from EB MD 27	Merge	46	F	33	D	-29%	I-270	Freeway	20	C	20	C	0%
I-270	Freeway	26	C	23	C	-9%	I-270 Merge from Middlebrook Rd	Merge	21	C	21	C	0%
I-270 Merge from WB MD 27	Merge	20	C	26	C	27%	I-270	Freeway	21	C	21	C	0%
I-270	Freeway	27	D	33	D	20%	I-270 Diverge to MD 124	Diverge	18	B	17	B	-7%
I-270 Diverge to MD 121	Diverge	21	C	25	C	21%	I-270	Freeway	22	C	23	C	4%

Table B.5: PM Peak - 2015 HSR + ARM + VSL Model - I-270 Vehicle Density

I-270 Northbound	Type	Existing		HSR + ARM + VSL		% Change	I-270 Southbound	Type	Existing		HSR + ARM + VSL		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS			
I-270	Freeway	22	C	27	D	20%	I-270 Merge from WB MD 124	Merge	44	F	47	F	6%
I-270 Merge from EB MD 121	Merge	16	B	20	C	24%	I-270	Freeway	21	C	20	C	-1%
I-270 Lane Drop	Merge	27	C	35	E	32%	I-270 Merge from MD 117	Merge	25	C	25	C	1%
I-270	Freeway	40	E	39	E	-2%	I-270	Freeway	21	C	21	C	0%
I-270 Diverge to NB Weigh Station	Diverge	17	B	17	B	-2%	I-270 Diverge to I-370	Diverge	19	B	18	B	-1%
I-270	Freeway	35	D	34	D	-2%	I-270	Freeway	16	B	16	B	0%
I-270 Merge from NB Weight Station	Merge	17	B	17	B	-2%	I-270 Diverge to I-270 C-D	Diverge	13	B	13	B	-1%
I-270	Freeway	36	E	35	D	-3%	I-270	Freeway	13	B	13	B	0%
I-270 Diverge to MD 109	Diverge	20	B	19	B	-4%	I-270 Merge from I-270 (I-370)	Merge	18	B	17	B	0%
I-270	Freeway	33	D	32	D	-2%	I-270 Diverge to I-270 C-D (Shady Grove Rd)	Diverge	22	C	21	C	0%
I-270 Merge from MD 109	Merge	17	B	17	B	-1%	I-270	Freeway	17	B	17	B	0%
I-270	Freeway	34	D	34	D	-2%	I-270 Merge from I-270 C-D (Shady Grove Rd Northern)	Merge	16	B	16	B	0%
I-270 Diverge to MD 80	Diverge	24	C	23	C	-2%	I-270	Freeway	22	C	22	C	0%
I-270	Freeway	29	D	28	D	-1%	I-270 Merge from I-270 C-D (Shady Grove Rd Southern)	Merge	17	B	17	B	1%
I-270 Merge from MD 80	Merge	16	B	16	B	1%	I-270 Diverge to I-270 C-D (MD 189)	Diverge	23	C	23	C	0%
I-270	Freeway	33	D	33	D	-2%	I-270	Freeway	20	C	20	C	0%
I-270 Diverge to Scenic View	Diverge	17	B	17	B	-1%	I-270 Merge from I-270 C-D (MD 189)	Merge	18	B	18	B	0%
I-270	Freeway	33	D	33	D	-2%	I-270	Freeway	24	C	24	C	0%
I-270 Merge from Scenic View	Merge	17	B	16	B	-2%	I-270 Merge from I-270 C-D	Merge	20	C	20	C	2%
I-270	Freeway	33	D	34	D	1%	I-270 Diverge to I-270 HOV Lane	Diverge	17	B	16	B	-2%
I-270 Diverge to NB MD 85	Diverge	19	B	21	C	12%	I-270 Diverge to I-270 Spur	Diverge	33	D	34	D	5%
I-270	Freeway	32	D	37	E	16%	I-270	Freeway	13	B	13	B	0%
I-270 Diverge to SB MD 85	Diverge	18	B	20	B	8%	I-270 Diverge to Rockledge Dr / MD 187	Diverge	9	A	9	A	2%
I-270	Freeway	28	D	33	D	20%	I-270	Freeway	13	B	13	B	0%
I-270 Weave from MD 85 to I-70	Weave	21	C	23	C	13%	I-270 Merge from Rockledge Dr	Merge	11	B	11	B	0%
I-270	Freeway	59	F	33	D	-44%	I-270	Freeway	16	B	16	B	-1%
							I-270 Merge from Rockledge Dr / MD 187	Merge	14	B	14	B	0%
							I-270	Freeway	35	D	35	D	0%

Table B.6: PM Peak - 2015 HSR + ARM + VSL Model - I-270 Spur Vehicle Density

I-270 Spur Northbound	Type	Existing		HSR + ARM + VSL		% Change	I-270 Southbound	Type	Existing		HSR + ARM + VSL		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS			
I-270 Spur	Freeway	45	F	46	F	1%	I-270 Spur	Freeway	53	F	58	F	10%
I-270 Spur Merge from Clara Barton Parkway	Merge	51	F	53	F	3%	I-270 Spur Weave from I-270 HOV to Democracy Blvd	Weave	76	F	81	F	7%
I-270 Spur	Freeway	66	F	66	F	1%	I-270 Spur	Freeway	95	F	99	F	4%
I-270 Diverge to MD 190	Diverge	43	F	42	F	-1%	I-270 Merge from Democracy Blvd	Merge	134	F	141	F	5%
I-270 Spur	Freeway	78	F	78	F	0%	I-270 Spur Lane Drop	Merge	131	F	138	F	5%
I-270 Spur Merge from Cabin John Parkway	Merge	95	F	94	F	-1%	I-270 Spur	Freeway	123	F	124	F	1%
I-270 Spur Merge from MD 190	Merge	94	F	94	F	0%	I-270 Spur Merge from I-495	Merge	124	F	124	F	0%
I-270 Spur	Freeway	83	F	83	F	0%	I-270 Spur	Freeway	48	F	48	F	0%
I-270 Spur Diverge to I-495	Merge	65	F	64	F	-1%	I-270 Spur Diverve to EB MD 190	Diverge	49	F	49	F	0%
I-270 Spur	Freeway	45	E	45	E	0%	I-270 Spur Diverve to Cabin John Pkwy	Diverge	66	F	66	F	-1%
I-270 Spur Diverge to Democracy Blvd	Diverge	49	F	48	F	0%	I-270 Spur	Freeway	93	F	93	F	0%
I-270 Spur	Freeway	58	F	58	F	-1%	I-270 Merge from MD 190	Merge	111	F	112	F	1%
I-270 Spur Merge from EB Democracy Blvd	Merge	98	F	96	F	-2%	I-270 Spur	Freeway	94	F	94	F	0%
I-270 Spur	Freeway	58	F	58	F	-1%	I-270 Diverge to WB Clara Barton Pkwy	Diverge	60	F	60	F	0%
I-270 Spur Merge from WB Democracy Blvd	Merge	65	F	65	F	0%	I-270 Spur	Freeway	83	F	83	F	0%
I-270 Spur	Freeway	39	E	39	E	0%	I-270 Merge from Clara Barton Pkwy	Merge	72	F	72	F	0%
I-270 Spur Merge from Westlake Terrace	Merge	31	D	32	D	2%							
I-270 Spur	Freeway	35	D	35	D	0%							

Table B.7: PM Peak - 2015 HSR + ARM + VSL Model - I-270 Local Vehicle Density

I-270 Northbound	Type	Existing		HSR + ARM + VSL		% Change	I-270 Southbound	Type	Existing		HSR + ARM + VSL		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS			
I-270 C-D	Freeway	29	D	29	D	0%	I-270 C-D	Freeway	8	A	8	A	0%
I-270 C-D Diverge to EB Montrose Rd	Diverge	20	B	20	C	2%	I-270 C-D Weave from I-370 EB to I-270	Weave	15	B	15	B	0%
I-270 C-D	Freeway	17	B	17	B	0%	I-270 C-D Diverge to Shady Grove Rd	Diverge	10	A	10	A	1%
I-270 C-D Weave between Montrose Rd Loop Ramps	Weave	12	A	12	B	2%	I-270 C-D	Freeway	7	A	7	A	0%
I-270 C-D	Freeway	20	C	18	B	-13%	I-270 C-D Merge from WB Shady Grove Rd	Merge	9	A	10	A	1%
I-270 C-D Merge from WB Montrose Rd	Merge	52	F	25	C	-52%	I-270 C-D	Freeway	15	B	15	B	0%
I-270 C-D	Freeway	51	F	22	C	-57%	I-270 C-D Merge from EB Shady Grove Rd	Merge	11	B	11	B	1%
I-270 C-D Merge from I-270	Merge	34	D	23	C	-31%	I-270 C-D	Freeway	21	C	21	C	0%
I-270 C-D	Freeway	51	F	45	E	-13%	I-270 C-D Merge from I-270	Merge	25	C	24	C	-2%
I-270 C-D Diverge to MD 189	Diverge	31	D	25	C	-21%	I-270 C-D Diverge to I-270	Diverge	26	C	26	C	0%
I-270 C-D	Freeway	67	F	50	F	-24%	I-270 C-D Diverge to I-270	Diverge	18	B	18	B	0%
I-270 C-D Merge from MD 189	Merge	94	F	52	F	-45%	I-270 C-D	Freeway	16	B	16	B	0%
I-270 C-D	Freeway	49	F	70	F	42%	I-270 C-D Diverge to MD 28	Diverge	12	B	12	B	0%
I-270 C-D Weave between I-270 (to MD 28 from MD 189)	Weave	44	F	52	F	18%	I-270 C-D	Freeway	11	A	11	A	0%
I-270 C-D	Freeway	48	F	62	F	29%	I-270 C-D Merge from WB MD 28	Merge	13	B	12	B	-2%
I-270 C-D Diverge to MD 28	Diverge	20	B	27	C	37%	I-270 C-D	Freeway	13	B	13	B	0%
I-270 C-D	Freeway	31	D	45	F	46%	I-270 C-D Merge from EB MD 28	Merge	25	C	26	C	6%
I-270 C-D Weave between MD 28 Ramps	Weave	28	C	30	C	5%	I-270 C-D	Freeway	29	D	30	D	0%
I-270 C-D	Freeway	18	C	28	D	50%	I-270 C-D Merge from I-270	Merge	35	E	35	D	-1%
I-270 C-D Merge from MD 28 WB	Merge	13	B	18	B	33%	I-270 C-D	Freeway	40	E	40	E	0%
I-270 C-D Merge from I-270 and Drop Lane	Merge	18	B	26	C	48%	I-270 C-D Diverge to MD 189	Diverge	24	C	24	C	0%
I-270 C-D Diverge to I-270	Diverge	23	C	34	D	49%	I-270 C-D	Freeway	25	C	26	C	1%
I-270 C-D	Freeway	39	E	31	D	-19%	I-270 C-D Merge from MD 189	Merge	23	C	23	C	-1%
I-270 C-D Diverge to Shady Grove Rd	Diverge	14	B	19	B	41%	I-270 C-D Diverge to I-270	Diverge	32	D	32	D	-2%
I-270 C-D	Freeway	111	F	22	C	-80%	I-270 C-D	Freeway	22	C	22	C	-1%
I-270 C- D Merge from I-270 and EB Shady Grove Rd	Merge	116	F	22	C	-81%	I-270 C-D Diverge to WB Montrose Rd	Diverge	16	B	16	B	-1%
I-270 C-D	Freeway	112	F	23	C	-79%	I-270 C-D	Freeway	20	C	20	C	-3%
I-270 C-D Merge from WB Shady Grove Rd	Merge	108	F	25	C	-77%	I-270 Weave between Montrose Rd Loops	Weave	35	D	31	C	-11%
I-270 C-D Diverge to I-270	Diverge	90	F	37	E	-59%	I-270 C-D	Freeway	15	B	15	B	-1%
I-270 C-D	Freeway	60	F	38	E	-37%	I-270 C-D Merge from EB Montrose Rd	Merge	9	A	9	A	0%
I-270 C-D Diverge to I-370	Diverge	28	C	45	F	63%	I-270 C-D	Freeway	18	B	17	B	-1%
I-270 C-D	Freeway	10	A	16	B	61%							
I-270 Merge from I-370 EB	Merge	11	B	18	B	64%							
I-270 C-D	Freeway	19	C	19	C	2%							
I-270 C-D Weave from I-370 to I-270	Weave	27	C	23	B	-17%							
I-270 C-D	Freeway	22	C	36	E	59%							
I-270 C-D Weave from I-270 to MD 117	Weave	33	D	44	F	33%							
I-270 C-D Diverge to MD 124	Diverge	39	E	37	E	-6%							
I-270 C-D	Freeway	55	F	13	B	-76%							
I-270 C-D Merge from EB MD 124	Merge	96	F	13	B	-87%							
I-270 C-D Merge From WB MD 124	Merge	81	F	9	A	-88%							

Table B.8: PM Peak -Final HSR+ VSL+ ARM - I-270 Vehicle Throughput

I-270 Northbound	Existing VISSIM Throughput	HSR+VSL+ ARM VISSIM Throughput	% Change	Data Collection Measurement	I-270 Southbound	Existing VISSIM Throughput	HSR+VSL+ ARM VISSIM Throughput	% Change
Between I-495 and MD 187	4350	4328	-1%	100	North of I-70	1975	1975	0%
Between MD 187 on and off ramps	3888	3867	-1%	102	Between I-70 on ramps	2287	2287	0%
Between Rockledge Blvd on and off ramps	3666	3642	-1%	105	From I-70 interchange to MD-85	3429	3429	0%
Between Rockledge Dr and I-270 Spur	3880	3866	0%	108	Between MD-85 on and off ramps	2006	2006	0%
Between I-270 Spur and Montrose Rd	8718	8704	0%	110	Between MD-85 and MD-80	2633	2633	0%
Between Montrose Rd on and off ramps	5750	5738	0%	112	Between MD-80 on and off ramps	2093	2096	0%
Between Montrose Rd and MD 189	5477	5467	0%	114	Between MD-80 and Md-109	2457	2456	0%
Between MD 189 and MD 28	5905	5896	0%	116	Between MD-109 on and off ramps	2395	2395	0%
Between MD 28 on and off ramps	6240	6158	-1%	118	Between MD-109 and MD-121	2521	2522	0%
Between MD 28 and Shady Grove Rd	5494	5407	-2%	120	Between MD-121 on and off ramps	2351	2353	0%
Between Shady Grove Rd and I-370	4789	4662	-3%	123	Between MD-121 and MD-27	2723	2726	0%
Between I-370 on and off ramps	4814	4745	-1%	126	Between MD-27 on and off ramps	2890	2896	0%
Between I-370 and MD 117	6142	5861	-5%	129	Between MD-27 and MD-118	3164	3163	0%
Between MD 117 and MD 124	4713	4630	-2%	133	Between MD-118 on and off ramps	3197	3195	0%
Between MD-124 on and off ramps	4706	4710	0%	136	Between MD-118 and Middlebrook Rd	3798	3803	0%
Between MD 124 and Middlebrook Rd	6115	6156	1%	139	Between Middlebrook Rd on and off ramps	3796	3803	0%
Between Middlebrook Rd on and off ramps	5713	5722	0%	142	Between Middlebrook Rd and MD-124	4826	4828	0%
Between Middlebrook Rd and MD 118	4798	3567	-26%	146	Between MD-124 on and off ramps	3765	3757	0%
Between MD-118 on and off ramps	4409	4411	0%	150	Between MD-124 and MD-117	4938	4918	0%
Between MD 118 and MD 27	4456	4446	0%	154	Between MD-117 and I-370	6461	6438	0%
Between MD-27 on and off ramps	2842	2845	0%	159	Between I-370 on and off ramps	3327	3331	0%
Between MD 27 and MD 121	3330	3326	0%	163	Between I-370 on ramp to Shady Grove Rd	4663	4667	0%
Between MD-121 on and off ramps	2574	2567	0%	167	Between Shady Grove Rd and MD 28	4984	4981	0%
Between MD 121 and MD 109	3787	3725	-2%	171	Between MD 28 on and off ramps	5158	5158	0%
Between MD-109 on and off ramps	3547	3474	-2%	175	Between MD 28 and MD 189	4536	4539	0%
Between MD 109 and MD 80	3657	3580	-2%	179	Between MD 189 and Montrose Rd	4527	4530	0%
Between MD-80 on and off ramps	3096	3049	-2%	183	Between Montrose Rd on and off ramps	5414	5409	0%
Between MD 80 and MD 85	3596	3541	-2%	187	Between Montrose Rd and I-270 Spur	7201	7173	0%
Between MD-85 on and off ramps	3046	2975	-2%	193	Between I-270 Spur and Rockledge Blvd	3293	3273	-1%
Between MD 85 and I-70	4867	4794	-1%	197	Between Rockledge Blvd on and off ramps	2549	2536	-1%
North of I-70	2562	2515	-2%	200	Between MD 187 on and off ramps	3017	3003	0%
				203	Between MD 187 and I-495	3372	3356	0%
I-270 Spur Northbound					I-270 Spur Southbound			
Between I-495 and Democracy Blvd	4608	4609	0%	600	Between I-270 Split and HOV on ramp	3113	3106	0%
Between Democracy Blvd on and off ramps	4128	4134	0%	603	Between HOV on ramp & Democracy Blvd	2461	2426	-1%
Between Democracy Blvd and I-270 Split	4849	4847	0%	607	Between Democracy Blvd on and off ramps	1970	1950	-1%
				610	Between Democracy Blvd and I-495	2297	2263	-1%

Table B.9: PM Peak - 2015 HSR+ VSL+ ARM Model- I-270 Local Vehicle Throughput

I-270 Local Northbound	Existing VISSIM Throughput	HSR+ VSL+ ARM VISSIM Throughput	% Change	Data Collection Measurement	I-270 Local Southbound	Existing VISSIM Throughput	HSR+ VSL+ ARM VISSIM Throughput	% Change
Between Montrose Rd EB off ramp and and EB on ramp	1881	1878	0%	800	Between I-370 on ramp and I-270 off ramp	2740	2739	0%
Between Montrose Rd EB on ramp and WB off ramp	2172	2168	0%	804	Between I-270 off ramp and Shady Grove off ramp	1420	1419	0%
Between Montrose Rd WB off ramp and on ramp	1921	1914	0%	807	Between Shady Grove off ramp and Shady Grove WB on ramp	764	764	0%
Between Montrose Rd WB on ramp and I-270 on ramp	3366	3302	-2%	809	Between Shady Grove WB and EB on ramps	1543	1544	0%
Between I-270 on ramp and MD 189 off ramp	3611	3579	-1%	811	Between Shady Grove on ramp and I-270 on ramp	2168	2169	0%
Between MD 189 ramps	2908	2899	0%	813	Between I-270 on ramp and I-270 off ramp1	2660	2662	0%
Between MD 189 off ramp and I-270 on ramp	3782	3687	-3%	815	Between I-270 off ramp1 and I-270 off ramp2	1854	1851	0%
Between I-270 on ramp and I-270 off ramp	4472	4364	-2%	817	Between I-270 off ramp2 and MD 28 off ramp	1681	1679	0%
Between I-270 off ramp and MD 28 EB off ramp	3481	3427	-2%	819	Between MD 28 off ramp and MD 28 WB on ramp	1149	1149	0%
Between MD 28 EB off ramp to MD 28 EB on ramp	3133	3080	-2%	821	Between MD 28 WB on ramp and MD 28 EB on ramp	1401	1397	0%
Between MD 28 EB on ramp and MD 28 WB off ramp	3262	3209	-2%	823	Between MD 28 EB on ramp and I-270 on ramp	2908	2900	0%
Between MD 28 WB off ramp and MD 28 WB on ramp	2023	1989	-2%	825	Between I-270 on ramp and MD 189 off ramp	3530	3537	0%
Between MD 28 WB on ramp and I-270 on ramp	2725	2652	-3%	827	Between MD 189 on and off ramps	2601	2606	0%
Between I-270 on ramp and I-270 off ramp	3565	3488	-2%	829	Between MD 189 on ramp and I-270 off ramp	3166	3117	-2%
Between I-270 off ramp and Shady Grove off ramp	2136	2128	0%	831	Between I-270 off ramp and Montrose Rd off ramp	2280	2249	-1%
Between Shady Grove off ramp and I-270 on ramp	673	747	11%	833	Between Montrose Rd off ramp and Montrose Rd WB on ramp	2039	2014	-1%
Between I-270 on ramp and Shady Grove WB on ramp	3348	2830	-15%	835	Between Montrose Rd WB on ramp and EB off ramp	2605	2577	-1%
Between Shady Grove WB on ramp and I-270 off ramp	4148	4283	3%	838	Between Montrose Rd EB off and on ramps	1525	1510	-1%
Between I-270 off ramp and I-370 off ramp	3663	2150	-41%	840	Between Montrose Rd EB off ramp and I-270	1846	1829	-1%
Between I-370 off ramp and I-370 EB on ramp	1138	1165	2%					
Between I-370 EB and WB on ramps	2096	1400	-33%					
Between I-370 WB on ramp and I-270 off ramp	3687	3322	-10%					
Between I-270 off ramp and I-270 on ramp	2254	2006	-11%					
Between I-270 on ramp and MD 117 off ramp	3661	3368	-8%					
Between MD 117 off ramp and MD 124 off ramp	2448	2254	-8%					
Between MD 124 off ramp and MD 124 EB on ramp	479	451	-6%					
Between MD 124 EB and WB on ramps	943	972	3%					
Between MD 124 on ramp I-270	1427	1480	4%					

Table B.10: PM Peak - 2015 HSR+VSL+ARM Model - I-270 On Ramp Queue Length - Northbound

I-270 Northbound	Existing VISSIM Average Queue (feet)	HSR+VSL+ ARM VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	HSR+VSL+ ARM VISSIM Maximum Queue (feet)	% Change
Rockledge Dr on ramp	1	1	26%	181	151	-16%
MD 189 C-D on ramp	0	0	521%	33	89	169%
MD 28 C-D on ramp	0	0	-	0	24	-
Shady Grove Rd C-D on ramp	0	0	-	0	0	-
I-370 C-D on ramp	2	37	1362%	233	549	136%
MD 124 C-D on ramp	2459	5	-100%	3978	343	-91%
MD 118 on ramp	0	0	-100%	37	0	-100%
MD 27 EB on ramp	0	3	-	0	142	-
MD 27 WB on ramp	0	0	-	0	0	-
MD 121 on ramp	0	0	-	0	0	-
MD 109 on ramp	0	0	-	0	0	-
MD 80 on ramp	0	0	-	0	0	-
MD 85 on ramp	0	0	-	0	0	-
I-270 Spur Northbound	Existing VISSIM Average Queue (feet)	HSR+VSL+ ARM VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	HSR+VSL+ ARM VISSIM Maximum Queue (feet)	% Change
Democracy Blvd EB on ramp	0	0	-	0	34	-
Democracy Blvd WB on ramp	0	0	-	0	0	-
I-495 Northbound	Existing VISSIM Average Queue (feet)	HSR+VSL+ ARM VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	HSR+VSL+ ARM VISSIM Maximum Queue (feet)	% Change
Cabin John Pkwy on ramp	16	11	-31%	661	550	-17%
MD 190 on ramp	0	0	-	0	35	-
I-270 C-D Northbound	Existing VISSIM Average Queue (feet)	HSR+VSL+ ARM VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	HSR+VSL+ ARM VISSIM Maximum Queue (feet)	% Change
Montrose Rd EB on ramp	0	0	-	0	0	-
Montrose Rd WB on ramp	265	27	-90%	1386	374	-73%
I-270 on ramp	0	0	-	0	0	-
MD 189 on ramp	15	0	-100%	555	0	-100%
I-270 on ramp	0	0	-38%	23	26	13%
MD 28 EB on ramp	0	0	-	0	0	-
MD 28 WB on ramp	0	0	-	0	0	-
Shady Grove Rd EB on ramp	78	0	-100%	836	0	-100%
I-270 on ramp	178	0	-100%	1103	0	-100%
Shady Grove Rd WB on ramp	12	0	-100%	340	0	-100%
I-370 EB on ramp	0	2	-	0	206	-
I-370 WB on ramp	0	826	-	0	1356	-
I-270 on ramp	12	217	1659%	658	1148	75%
MD 124 EB on ramp	257	0	-100%	1230	0	-100%
MD 124 WB on ramp	1	0	-100%	63	0	-100%

Table B.11: PM Peak - 2015 HSR+VSL+ARM Model - I-270 Off Ramp Queue Length - Northbound

I-270 Northbound	Existing VISSIM Average Queue (feet)	HSR+VSL+ ARM VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	HSR+VSL+ ARM VISSIM Maximum Queue (feet)	% Change
MD 187 off ramp NB	42	40	-4%	278	319	14%
MD 187 off ramp SB	0	0	-	0	0	-
Rockledge Dr off ramp	1	1	-10%	73	74	1%
Tower Oaks Blvd off ramp	32	32	0%	235	212	-10%
Montrose Rd off ramp EB	0	0	-	0	0	-
Montrose Rd off ramp WB	0	0	-	0	0	-
MD 189 off ramp WB	29	30	3%	168	161	-4%
MD 189 off ramp EB	1	26	2326%	122	514	322%
MD 28 off ramp EB	37	39	5%	231	239	4%
MD 28 off ramp WB	0	0	-	0	0	-
Shady Grove Rd off ramp - Redland Blvd	0	0	-	0	0	-
Shady Grove Rd off ramp WB	49	47	-4%	248	226	-9%
Shady Grove Rd off ramp EB	0	0	-	0	0	-
I-370 off ramp WB	0	0	-	0	0	-
I-370 off ramp EB	0	0	-	0	0	-
MD 117 off ramp	205	460	125%	859	1582	84%
MD 124 off ramp	799	503	-37%	2471	2108	-15%
Watkins Mill Rd off ramp*			-			-
Middlebrook Rd EB off ramp	0	0	-	0	0	-
Middlebrook Rd WB off ramp	0	0	-	0	0	-
MD 118 WB off ramp - Seneca Meadows	0	0	-100%	20	0	-100%
MD 118 WB off ramp	0	0	-	0	0	-
MD 118 EB off ramp	0	0	-	0	0	-
MD 27 off ramp WB	56	52	-6%	290	232	-20%
MD 27 off ramp EB	0	0	-	0	0	-
MD 121 off ramp WB	0	0	-	0	0	-
MD 121 off ramp EB	0	0	-	0	0	-
MD 109 off ramp EB	9	8	-8%	158	138	-13%
MD 109 off ramp WB	0	0	-	0	0	-
MD 80 off ramp EB	15	15	3%	140	147	5%
MD 80 off ramp WB	0	0	-44%	11	13	13%
MD 85 NB off ramp	0	0	-	0	0	-
MD 85 SB off ramp	0	0	71%	72	78	8%
I-270 Spur Northbound	Existing VISSIM Average Queue (feet)	HSR+VSL+ ARM VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	HSR+VSL+ ARM VISSIM Maximum Queue (feet)	% Change
Clara Barton Pkwy off ramp EB	0	0	-	0	0	-
Clara Barton Pkwy off ramp WB	0	0	-	0	0	-
MD 190 off ramp EB	0	0	-	0	0	-
MD 190 off ramp WB	2	2	17%	287	163	-43%
Democracy Blvd off ramp WB	42	43	3%	188	185	-1%
Democracy Blvd off ramp EB	18	17	-5%	143	118	-17%

* Ramp in Future Scenario

Table B.12: PM Peak - 2015 HSR+VSL+ARM Model - I-270 On Ramp Queue Length - Southbound

I-270 Southbound	Existing VISSIM Average Queue (feet)	HSR+VSL+ ARM VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	HSR+VSL+ ARM VISSIM Maximum Queue (feet)	% Change
MD 85 on ramp	0	0	-	0	0	-
MD 80 on ramp	0	0	-	0	0	-
MD 109 on ramp	0	0	-	0	0	-
MD 121 WB on ramp	0	0	-	0	0	-
MD 121 EB on ramp*			-			-
MD 27 WB on ramp	0	0	-	0	0	-
MD 27 EB on ramp	0	0	-	0	0	-
MD 118 WB on ramp	0	0	-	0	0	-
MD 118 EB on ramp	0	0	-	0	0	-
Middlebrook Rd on ramp	0	0	-	0	0	-
MD 124 WB on ramp	5	13	171%	332	496	50%
MD 117 on ramp	0	0	-	0	0	-
I-370 C-D on ramp	0	0	-	0	0	-
Shady Grove Rd C-D on ramp North	0	0	-	0	0	-
Shady Grove Rd C-D on ramp South	0	0	-	0	0	-
MD 189 C-D on ramp	0	0	-	0	0	-
Montrose Rd C-D on ramp	0	0	-	0	0	-
Rockledge Dr on ramp	0	0	-	0	0	-
MD 187 on ramp	0	0	-	0	0	-
I-270 Spur Southbound	Existing VISSIM Average Queue (feet)	HSR+VSL+ ARM VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	HSR+VSL+ ARM VISSIM Maximum Queue (feet)	% Change
Democracy Blvd on ramp	335	440	31%	1366	1525	12%
I-495 Southbound	Existing VISSIM Average Queue (feet)	HSR+VSL+ ARM VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	HSR+VSL+ ARM VISSIM Maximum Queue (feet)	% Change
I-270 Spur on ramp	4212	4365	4%	5058	5070	0%
MD 190 on ramp	1	3	196%	107	288	169%
I-270 C-D Southbound	Existing VISSIM Average Queue (feet)	HSR+VSL+ ARM VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	Final VISSIM Maximum Queue (feet)	% Change
I-270 on ramp	0	0	-	0	0	-
I-370 on ramp	0	0	-	0	0	-
Shady Grove Rd WB on ramp	0	0	-	0	0	-
Shady Grove Rd EB on ramp	0	0	-	0	0	-
I-270 on ramp	0	0	-	0	0	-
MD 28 WB on ramp	0	0	17%	14	14	5%
MD 28 EB on ramp	2	1	-63%	219	69	-68%
I-270 on ramp	0	0	-	0	0	-
MD 189 on ramp	0	0	-	0	14	-
Montrose Rd WB on ramp	1	0	-96%	107	14	-87%
Montrose Rd EB on ramp	0	0	-	0	0	-

* Ramp in Future Scenario

Table B.13: PM Peak -2015 HSR+VSL+ARM Model - I-270 Off Ramp Queue Length - Southbound

I-270 Southbound	Existing VISSIM Average Queue (feet)	HSR+VSL+ ARM VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	HSR+VSL+ ARM VISSIM Maximum Queue (feet)	% Change
MD 85 SB off ramp	0	0	-	0	0	-
MD 85 NB off ramp	0	0	-29%	114	94	-17%
MD 80 off ramp	1	0	-61%	154	82	-47%
MD 109 off ramp WB	0	0	5%	58	67	16%
MD 109 off ramp EB	0	0	-	0	0	-
MD 121 off ramp EB	2	2	-21%	98	99	2%
MD 121 off ramp WB	0	0	-	0	0	-
MD 27 off ramp EB	23	23	0%	149	131	-12%
MD 27 off ramp WB	0	0	-	0	0	-
MD 118 off ramp EB	19	18	-5%	110	125	14%
MD 118 off ramp WB	0	0	-	0	0	-
Watkins Mill Rd off ramp*			-			-
MD 124 off ramp EB	310	151	-51%	1658	738	-55%
MD 124 off ramp WB	147	4	-97%	1129	218	-81%
I-370 off ramp WB	0	0	-	0	0	-
I-370 off ramp EB	0	0	-	0	0	-
Shady Grove Rd off ramp - Omega Drive	1	0	-9%	42	52	26%
Shady Grove Rd off ramp	0	0	-	0	0	-
MD 28 off ramp	3	3	-7%	127	120	-5%
MD 189 off ramp EB	123	114	-8%	849	573	-33%
MD 189 off ramp WB	0	0	-	0	0	-
Montrose Rd off ramp WB	0	0	-	0	0	-
Montrose Rd off ramp EB	0	0	-	0	34	-
Rockledge Dr off ramp	51	57	11%	295	334	13%
I-270 Spur Southbound	Existing VISSIM Average Queue (feet)	HSR+VSL+ ARM VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	HSR+VSL+ ARM VISSIM Maximum Queue (feet)	% Change
Democracy Blvd off ramp EB	24	23	-6%	157	170	8%
Democracy Blvd off ramp WB	0	0	-	0	0	-
MD 190 off ramp WB	85	86	1%	826	881	7%
MD 190 off ramp EB	0	0	-	0	0	-
Clara Barton Pkwy WB off ramp	0	0	-	0	0	-

* Ramp in Future Scenario

Table B.14: PM Peak - Existing - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
1- MD 85 at Sam's Club Drive											
1	NB	28.2	C	NB Left	115	79	116	611	E	53.2	D
				NB Through	503	33	116	611	C		
				NB Right	824	18	55	634	B		
	SB	82.9	F	SB Left	142	77	401	1055	E		
				SB Through	875	84	401	1055	F		
				SB Right	67	87	401	1055	F		
	EB	33.5	C	EB Left	43	83	26	115	F		
				EB Through	20	91	26	115	F		
				EB Right	144	11	26	115	B		
	WB	63.9	E	WB Left	508	77	221	686	E		
				WB Through	27	67	221	686	E		
				WB Right	192	29	221	686	C		
2- MD 85 at I-270 NB on and off ramp											
2	NB	36.0	D	NB Left	977	36	187	908	D	32.7	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	27.9	C	SB Left	0	0	0	0	A		
				SB Through	671	28	100	634	C		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
3- MD 85 at I-270 SB on and off ramp											
3	NB	6.0	A	NB Left	0	0	0	0	A	9.4	A
				NB Through	1699	6	41	829	A		
				NB Right	0	0	0	0	A		
	SB	43.8	D	SB Left	170	44	46	320	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
4- MD 85 at Crestwood Blvd											
4	NB	33.3	D	NB Left	60	70	154	653	E	33.5	C
				NB Through	1255	32	154	654	C		
				NB U-Turn	0	0	0	0	A		
	SB	22.0	C	SB Left	91	80	45	208	E		
				SB Through	810	25	59	445	C		
				SB Right	796	12	45	436	B		
	EB	54.8	D	EB Left	802	57	133	610	E		
				EB Through	31	44	133	610	D		
				EB Right	22	0	133	610	A		
	WB	43.4	D	WB Left	36	75	39	162	E		
				WB Through	61	65	39	162	E		
				WB Right	81	13	39	162	B		
5- MD 80 at I-270 NB on and off ramp											
5	NB	-1.8	A	NB Left	1	0	0	0	A	8.6	A
				NB Through	2	0	0	0	A		
				NB Right	8	-3	0	0	A		
	SB	12.2	B	SB Left	385	15	21	145	B		
				SB Through	17	17	21	145	B		
				SB Right	122	2	0	0	A		
	EB	8.9	A	EB Left	70	9	13	171	A		
				EB Through	0	0	8	0	A		
				EB Right	6	5	24	202	A		
	WB	6.9	A	WB Left	16	10	0	40	B		
				WB Through	510	12	28	281	B		
				WB Right	482	1	0	0	A		
6- MD 80 at I-270 SB on and off ramp											
6	NB	2.3	A	NB Left	47	3	1	190	A	4.2	A
				NB Through	0	0	0	0	A		
				NB Right	491	2	1	190	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	5.0	A	EB Left	0	0	0	0	A		
				EB Through	271	5	2	61	A		
				EB Right	53	3	1	69	A		
	WB	6.6	A	WB Left	0	0	0	0	A		
				WB Through	316	7	1	89	A		
				WB Right	0	0	0	0	A		
7- MD 109 at I-270 NB on and off ramp											
7	NB			NB Left	0	0	0	0	A	5.3	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	10.2	B	SB Left	224	11	14	175	B		
				SB Through	0	0	0	0	A		
				SB Right	17	2	0	67	A		
	EB	2.2	A	EB Left	56	1	0	37	A		
				EB Through	0	0	0	0	A		
				EB Right	59	3	0	0	A		
	WB	0.3	A	WB Left	0	0	0	0	A		
				WB Through	160	0	0	0	A		
				WB Right	0	0	0	0	A		
8- MD 80 at I-270 SB on and off ramp											
8	NB	4.0	A	NB Left	44	7	2	115	A	1.6	A
				NB Through	0	0	0	0	A		
				NB Right	29	0	0	43	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.8	A	EB Left	0	0	0	0	A		
				EB Through	114	0	0	0	A		
				EB Right	24	4	0	0	A		
	WB	1.2	A	WB Left	98	1	0	42	A		
				WB Through	78	1	0	19	A		
				WB Right	0	0	0	0	A		
9- MD 121 at Gateway Center Dr											
9	NB	10.6	B	NB Left	471	13	31	242	B	17.0	B
				NB Through	638	10	31	242	A		
				NB Right	54	2	36	268	A		
	SB	17.8	C	SB Left	20	13	5	143	B		
				SB Through	169	19	14	163	B		
				SB Right	8	4	13	184	A		
	EB	16.6	C	EB Left	2	50	3	93	D		
				EB Through	19	51	11	170	D		
				EB Right	142	12	21	202	B		
	WB	34.8	D	WB Left	214	46	57	220	D		
				WB Through	56	41	57	219	D		
				WB Right	140	16	71	244	B		
10- MD 121 at I-270 NB on and off ramp											
10	NB	0.8	A	NB Left	25	9	1	67	A	0.6	A
				NB Through	0	0	0	0	A		
				NB Right	718	1	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.1	A	EB Left	0	0	0	0	A		
				EB Through	447	0	0	0	A		
				EB Right	58	0	0	0	A		
	WB	0.8	A	WB Left	100	3	1	73	A		
				WB Through	423	0	0	48	A		
				WB Right	0	0	0	0	A		

Table B.14: PM Peak - Existing - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
11- MD 121 at I-270 SB on and off ramp											
11	NB			NB Left	0	0	0	0	A	2.2	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	7.7	A	SB Left	136	10	8	125	A		
				SB Through	0	0	0	0	A		
				SB Right	36	0	0	0	A		
	EB	0.3	A	EB Left	29	1	0	23	A		
				EB Through	0	0	0	0	A		
				EB Right	349	0	0	0	A		
	WB	0.1	A	WB Left	0	0	0	0	A		
WB Through				99	0	0	0	A			
WB Right				0	0	0	0	A			
12- MD 27 at Observation Dr											
12	NB	40.1	D	NB U-Turn	0	0	0	0	A	22.2	C
				NB Through	73	57	19	86	E		
				NB Right	47	13	19	86	B		
	SB	39.7	D	SB Left	114	46	31	182	D		
				SB Through	41	62	35	244	E		
				SB Right	173	30	57	281	C		
	EB	16.8	B	EB Left	208	27	68	502	C		
				EB Through	2223	16	70	503	B		
				EB Right	106	15	82	541	B		
	WB	25.8	C	WB Left	31	22	123	627	C		
				WB Through	1503	26	123	627	C		
				WB Right	54	9	123	627	A		
13- MD 27 at I-270 NB off ramp											
13	NB	44.8	D	NB Left	390	45	63	297	D	8.1	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.1	A	EB Left	0	0	0	0	A		
				EB Through	1284	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	5.5	A	WB Left	0	0	0	0	A		
WB Through				1582	6	41	680	A			
WB Right				0	0	0	0	A			
14- MD 27 at I-270 SB off ramp											
14	NB			NB Left	0	0	0	0	A	5.4	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	52.2	D	SB Left	171	52	35	162	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	2.3	A	EB Left	0	0	0	0	A		
				EB Through	1351	2	4	149	A		
				EB Right	0	0	0	0	A		
	WB	2.7	A	WB Left	0	0	0	0	A		
WB Through				1433	3	7	257	A			
WB Right				0	0	0	0	A			
15- MD 27 at Crystal Rock Dr											
15	NB	22.6	C	NB Left	58	20	55	379	C	29.8	C
				NB Through	965	23	68	379	C		
				NB Right	43	20	72	391	B		
	SB	33.9	C	SB Left	140	57	185	770	E		
				SB Through	1310	35	185	770	D		
				SB Right	196	9	164	764	A		
	EB	43.0	D	EB Left	103	54	28	120	D		
				EB Through	37	46	25	115	D		
				EB Right	47	17	17	141	B		
	WB	27.6	C	WB Left	83	49	70	297	D		
				WB Through	102	43	70	297	D		
				WB Right	552	22	70	297	C		
16- MD 118 at Seneca Meadows Pkwy											
16	NB	4.0	A	NB Left	90	12	1	82	B	8.2	A
				NB Through	1174	3	7	154	A		
				NB Right	0	0	15	207	A		
	SB	6.5	A	SB Left	11	6	14	270	A		
				SB Through	1091	7	18	270	A		
				SB Right	9	3	21	302	A		
	EB	13.1	B	EB Left	18	55	12	130	E		
				EB Through	1	76	12	130	E		
				EB Right	275	10	12	130	B		
	WB	53.5	D	WB Left	93	64	37	199	E		
				WB Through	6	61	33	198	E		
				WB Right	25	13	42	218	B		
17- MD 118 at I-270 NB on ramp											
17	NB			NB Left	0	0	0	0	A	16.1	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	33.9	C	EB Left	435	34	90	501	C		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	10.8	B	WB Left	0	0	0	0	A		
WB Through				246	2	1	116	A			
WB Right				1216	13	46	480	B			
18- MD 118 at I-270 SB off ramp											
18	NB			NB Left	0	0	0	0	A	6.1	A
				NB Through	0	0.0	0	0	A		
				NB Right	0	0.0	0	0	A		
	SB	37.1	D	SB Left	129	37.1	22	114	D		
				SB Through	0	0.0	0	0	A		
				SB Right	0	0.0	0	0	A		
	EB	4.8	A	EB Left	0	0.0	0	0	A		
				EB Through	1182	4.8	10	322	A		
				EB Right	0	0.0	0	0	A		
	WB	4.5	A	WB Left	0	0.0	0	0	A		
WB Through				1465	4.5	8	237	A			
WB Right				0	0.0	0	0	A			
19- MD 118 at Aircraft Dr											
19	NB	24.0	C	NB Left	42	69	33	176	E	27.5	C
				NB Through	43	70	33	176	E		
				NB Right	196	4	3	77	A		
	SB	90.2	F	SB Left	381	90	221	577	F		
				SB Through	12	82	221	577	F		
				SB Right	97	91	221	577	F		
	EB	17.8	B	EB Left	98	22	60	395	C		
				EB Through	1215	17	60	395	B		
				EB Right	17	15	60	395	B		
	WB	17.6	B	WB Left	12	17	66	441	B		
				WB Through	1324	21	66	441	C		
				WB Right	351	5	66	441	A		
20- Middlebrook Rd at Observation Dr											
20	NB			NB Left	0	0	0	0	A	8.5	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	18.0	B	SB Left	96	35	18	131	D		
				SB Through	0	0	0	0	A		
				SB Right	179	9	18	131	A		
	EB	6.4	A	EB Left	15	9	17	155	A		
				EB Through	1180	6	17	155	A		
				EB Right	0	0	0	0	A		
	WB	8.4	A	WB Left	0	0	0	0	A		
				WB Through	1238	8	24	251	A		
				WB Right	12	6	39	300	A		

Table B.14: PM Peak - Existing - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
21- Middlebrook Rd at I-270 SB on ramp											
21	NB			NB Left	0	0	0	0	A	4.4	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	2.8	A	EB Left	0	0	0	0	A		
				EB Through	686	3	4	96	A		
				EB Right	0	0	0	0	A		
	WB	7.1	A	WB Left	429	7	4	194	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
22- Middlebrook Rd at Waring Station Rd											
22	NB	48.4	D	NB Left	156	45	75	316	D	12.5	B
				NB Through	0	0	75	316	A		
				NB Right	219	51	75	316	D		
	SB	30.6	C	SB Left	30	44	7	66	D		
				SB Through	2	37	7	66	D		
				SB Right	19	9	18	104	A		
	EB	7.3	A	EB Left	3	10	23	262	B		
				EB Through	1035	7	23	262	A		
				EB Right	160	7	23	262	A		
	WB	8.3	A	WB Left	242	20	33	332	C		
				WB Through	1650	7	33	332	A		
				WB Right	4	2	33	332	A		
23- MD 124 at MD 355											
23	NB	51.6	D	NB Left	507	63	186	529	E	63.0	E
				NB Through	942	46	183	527	D		
				NB Right	6	12	0	0	B		
	SB	30.7	C	SB Left	141	71	99	395	E		
				SB Through	554	53	99	395	D		
				SB Right	736	6	20	339	A		
	EB	42.4	D	EB Left	468	93	363	1176	F		
				EB Through	2720	41	363	1176	D		
				EB Right	575	7	160	1150	A		
	WB	153.9	F	WB Left	0	0	0	0	A		
				WB Through	1481	156	718	950	F		
				WB Right	65	101	0	0	F		
24- MD 124 at I-270 SB on and off											
24	NB	64.4	F	NB Left	55	65	23	98	E	40.8	D
				NB Through	23	64	23	98	E		
				NB U-Turn	0	0	0	0	A		
	SB	57.0	E	SB Left	572	94	316	1663	F		
				SB Through	10	80	316	1663	F		
				SB Right	452	9	141	1059	A		
	EB	43.4	D	EB Left	0	0	0	0	A		
				EB Through	1738	44	307	1098	D		
				EB Right	31	34	323	1121	C		
	WB	18.7	B	WB Left	4	66	77	588	E		
				WB Through	1046	19	77	588	B		
				WB Right	0	0	0	0	A		
25- MD 117 at MD 124											
25	NB	36.4	D	NB Left	45	63	116	666	E	40.6	D
				NB Through	545	54	116	666	D		
				NB Right	447	13	4	216	B		
	SB	32.8	C	SB Left	119	44	98	447	D		
				SB Through	762	37	98	447	D		
				SB Right	144	2	0	0	A		
	EB	46.1	D	EB Left	120	82	142	477	F		
				EB Through	1092	42	142	478	D		
				EB Right	43	39	149	506	D		
	WB	43.5	D	WB Left	402	70	280	1027	E		
				WB Through	1338	39	280	1027	D		
				WB Right	129	2	0	0	A		
26- MD 117 at Bureau Dr											
26	NB	45.7	D	NB Left	78	79	65	281	E	38.8	D
				NB Through	27	75	65	281	E		
				NB Right	260	33	65	281	C		
	SB	71.9	E	SB Left	274	83	109	351	F		
				SB Through	17	82	109	351	F		
				SB Right	65	21	109	351	C		
	EB	31.4	C	EB Left	41	80	156	829	F		
				EB Through	1593	30	157	829	C		
				EB Right	3	13	151	818	B		
	WB	37.7	D	WB Left	19	43	337	1058	D		
				WB Through	1703	40	337	1059	D		
				WB Right	292	26	368	1107	C		
27- MD 117 at I-270 SB off ramp											
27	NB			NB Left	0	0	0	0	A	13.3	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	4.6	A	EB Left	0	0	0	0	A		
				EB Through	896	5	10	466	A		
				EB Right	0	0	0	0	A		
	WB	39.8	E	WB Left	294	40	140	1068	E		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
28- MD 117 at I-270 NB off ramp											
28	NB			NB Left	0	0	0	0	A	30.5	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	52.1	D	SB Left	256	46	214	871	D		
				SB Through	0	0	0	0	A		
				SB Right	951	54	214	870	D		
	EB	27.6	C	EB Left	3	125	152	980	F		
				EB Through	897	27	152	980	C		
				EB Right	0	0	0	0	A		
	WB	13.3	B	WB Left	0	0	0	0	A		
				WB Through	1359	13	87	383	B		
				WB Right	0	0	87	383	A		
29- MD 117 at Perry Pkwy											
29	NB	42.6	D	NB Left	18	69	13	110	E	37.0	D
				NB Through	21	50	13	109	D		
				NB Right	23	15	21	129	B		
	SB	57.1	E	SB Left	194	85	89	332	F		
				SB Through	14	84	89	332	F		
				SB Right	112	6	89	332	A		
	EB	20.8	C	EB Left	240	69	84	355	E		
				EB Through	864	8	84	355	A		
				EB Right	32	6	69	339	A		
	WB	44.4	D	WB Left	36	105	245	752	F		
				WB Through	1228	46	245	752	D		
				WB Right	300	33	245	752	C		
30- Shady Grove Rd at I-270 NB off ramp											
30	NB	7.1	A	NB Left	0	0	0	0	A	13.8	B
				NB Through	1025	7	16	209	A		
				NB Right	0	0	0	0	A		
	SB	9.5	A	SB Left	0	0	0	0	A		
				SB Through	1280	9	41	481	A		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	52.9	D	WB Left	317	53	58	260	D		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table B.14: PM Peak - Existing - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
31- Shady Grove Rd at I-270 SB off ramp											
31	NB	6.8	A	NB Left	0	0	0	0	A	15.9	B
				NB Through	1463	7	28	378	A		
				NB Right	0	0	0	0	A		
	SB	5.5	A	SB Left	0	0	0	0	A		
				SB Through	817	5	8	156	A		
				SB Right	0	0	0	0	A		
	EB	57.5	E	EB Left	229	55	44	200	D		
				EB Through	0	0	0	0	A		
				EB Right	295	60	63	241	E		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
32- MD 28 at I-270 SB off ramp											
32	NB			NB U-Turn	0	0	0	0	A	8.0	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	36.5	D	SB Left	440	44	74	300	D		
				SB Through	0	0	0	0	A		
				SB Right	98	3	1	70	A		
	EB	2.7	A	EB Left	0	0	0	0	A		
				EB Through	1505	1	0	0	A		
				EB Right	830	6	14	245	A		
	WB	6.1	A	WB Left	0	0	0	0	A		
				WB Through	1693	6	18	227	A		
				WB Right	0	0	0	0	A		
33- MD 28 at I-270 on and off ramps											
33	NB	34.9	C	NB Left	0	0	43	241	A	21.5	C
				NB Through	208	47	51	250	D		
				NB Right	134	16	51	250	B		
	SB	33.6	C	SB Left	11	101	175	288	F		
				SB Through	0	0	0	0	A		
				SB Right	164	29	175	288	C		
	EB	12.7	B	EB Left	254	38	53	287	D		
				EB Through	885	5	53	287	A		
				EB Right	0	0	0	0	A		
	WB	24.1	C	WB Left	36	20	96	383	B		
				WB Through	1241	24	77	346	C		
				WB Right	0	0	0	0	A		
34- MD 189 at Great Falls Rd											
34	NB	38.6	D	NB Left	45	44	12	86	D	13.4	B
				NB Through	11	50	8	84	D		
				NB Right	12	10	8	94	A		
	SB	3.3	A	SB Left	14	51	7	73	D		
				SB Through	11	51	7	73	D		
				SB Right	401	0	0	0	A		
	EB	12.0	B	EB Left	425	24	38	464	C		
				EB Through	669	5	5	161	A		
				EB Right	58	4	9	198	A		
	WB	18.4	B	WB Left	11	18	48	405	B		
				WB Through	827	18	48	405	B		
				WB Right	14	17	63	439	B		
35- MD 189 at I-270 Ramps											
35	NB	46.1	D	NB Left	250	46	44	190	D	41.7	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	55.4	E	SB Left	350	55	139	869	E		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	27.5	C	EB Left	480	31	89	371	C		
				EB Through	367	23	89	371	C		
				EB Right	0	0	0	0	A		
	WB	48.9	D	WB Left	440	54	106	299	D		
				WB Through	417	43	106	299	D		
				WB Right	0	0	0	0	A		
36- MD 189 at Wootton Pkwy											
36	NB	45.1	D	NB Left	187	57	113	410	E	43.8	D
				NB Through	536	52	113	410	D		
				NB Right	174	10	113	410	B		
	SB	62.3	E	SB Left	247	79	151	606	E		
				SB Through	729	57	154	631	E		
				SB Right	0	0	0	0	A		
	EB	34.6	C	EB Left	118	71	101	438	E		
				EB Through	543	34	101	438	C		
				EB Right	160	10	101	438	B		
	WB	34.5	C	WB Left	160	71	123	603	E		
				WB Through	781	35	123	603	C		
				WB Right	317	15	123	603	B		
37- Montrose Rd at Tower Oaks Blvd											
37	NB	0.4	A	NB Left	0	0	0	0	A	16.2	B
				NB Through	0	0	0	0	A		
				NB Right	490	0	0	0	A		
	SB	71.2	E	SB Left	68	48	37	256	D		
				SB Through	0	0	0	0	A		
				SB Right	270	77	97	348	E		
	EB	6.1	A	EB Left	0	0	0	0	A		
				EB Through	1685	6	30	360	A		
				EB Right	0	0	0	0	A		
	WB	18.3	B	WB Left	69	35	30	360	C		
				WB Through	2563	18	105	727	B		
				WB Right	244	12	105	727	B		
38- Tower Oaks Blvd at I-270 off ramp											
38	NB	22.9	C	NB Left	650	23	46	257	C	17.4	B
				NB Through	0	0.0	39	249	A		
				NB Right	21	6.3	46	257	A		
	SB	15.4	B	SB Left	8	24.8	1	43	C		
				SB Through	0	0.0	1	43	A		
				SB Right	7	4.7	0	30	A		
	EB	11.1	B	EB Left	1	11.0	14	153	B		
				EB Through	310	11.6	14	153	B		
				EB Right	33	6.4	9	144	A		
	WB	12.7	B	WB Left	121	15.9	14	122	B		
				WB Through	192	10.8	14	122	B		
				WB Right	1	3.7	2	78	A		
39- Montrose Rd at Tower Oaks Blvd											
39	NB	17.3	B	NB Left	76	34	62	288	C	55.3	E
				NB Through	606	30	62	288	C		
				NB Right	572	1	0	0	A		
	SB	30.3	C	SB Left	193	62	61	206	E		
				SB Through	394	20	59	205	C		
				SB Right	105	11	54	250	B		
	EB	216.7	F	EB Left	81	178	517	714	F		
				EB Through	458	222	518	715	F		
				EB Right	32	240	542	739	F		
	WB	35.5	D	WB Left	565	44	110	402	D		
				WB Through	473	41	111	402	D		
				WB Right	330	13	130	433	B		
40- Rockledge Blvd at I-270 NB on and off ramp											
40	NB	124.2	F	NB Left	0	0	0	0	A	98.5	F
				NB Through	335	113	520	837	F		
				NB Right	854	129	520	837	F		
	SB	86.6	F	SB Left	0	0	86	220	A		
				SB Through	346	87	86	220	F		
				SB Right	0	0	0	0	A		
	EB	62.2	E	EB Left	5	127	169	458	F		
				EB Through	428	103	169	458	F		
				EB Right	297	2	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table B.14: PM Peak - Existing - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS	
41- Rockledge Blvd at I-270 SB on and off ramps												
41	NB	30.2	C	NB Left	341	30	76	261	C	49.5	D	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	54.7	D		WB Left	345	59	193	786			E
					WB Through	894	53	193	786			D
					WB Right	0	0	0	0			A
42- MD 187 at Tuckerman Ln												
42	NB	43.7	D	NB Left	198	21	316	1253	C	120.3	F	
				NB Through	2133	43	316	1253	D			
				NB Right	188	73	316	1253	E			
	SB	201.4	F		SB Left	185	168	2553	2702			F
					SB Through	1122	201	2553	2702			F
					SB Right	270	226	2553	2702			F
	EB	51.7	D		EB Left	238	52	94	407			D
					EB Through	409	54	95	408			D
					EB Right	103	43	113	432			D
	WB	215.4	F		WB Left	459	211	1918	2138			F
					WB Through	614	233	1918	2138			F
					WB Right	151	158	1918	2138			F
43- MD 187 at I-270 NB on and off ramps												
43	NB	14.8	B	NB Left	552	34	103	399	C	18.5	B	
				NB Through	2291	10	103	399	B			
				NB Right	0	0	0	0	A			
	SB	22.7	C		SB Left	0	0	0	0			A
					SB Through	1247	23	57	248			C
					SB Right	0	0	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	61.4	E		WB Left	65	60	50	290			E
					WB Through	65	63	50	290			E
					WB Right	0	0	0	0			A
44- MD 187 at I-270 NB on and off ramps												
44	NB	32.2	D	NB Left	0	0	0	0	A	33.3	C	
				NB Through	2211	32	103	485	C			
				NB Right	0	0	0	0	A			
	SB	20.4	C		SB Left	150	59	74	305			E
					SB Through	1163	15	74	305			B
					SB Right	0	0	0	0			A
	EB	57.1	E		EB Left	636	57	137	558			E
					EB Through	0	0	137	558			A
					EB Right	185	57	77	519			E
	WB				WB Left	0	0	0	0			A
					WB Through	0	0	0	0			A
					WB Right	0	0	0	0			A
45- MD 187 at Rock Spring Dr												
45	NB	16.8	B	NB Left	383	34	90	614	C	23.8	C	
				NB Through	2000	14	91	614	B			
				NB Right	14	12	111	647	B			
	SB	26.7	C		SB Left	20	47	82	400			D
					SB Through	1160	30	82	400			C
					SB Right	172	1	54	356			A
	EB	40.2	D		EB Left	396	59	98	362			E
					EB Through	37	63	98	362			E
					EB Right	375	18	98	362			B
	WB	11.6	B		WB Left	5	32	3	77			C
					WB Through	12	25	3	77			C
					WB Right	32	4	1	67			A
47-Democracy Blvd at I-270 NB off ramp												
47	NB	45.7	D	NB Left	152	46	29	159	D	3.0	A	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB	1.2	A		EB Left	0	0	0	0			A
					EB Through	1114	1	3	51			A
					EB Right	0	0	0	0			A
	WB	0.9	A		WB Left	0	0	0	0			A
					WB Through	2129	1	2	62			A
					WB Right	0	0	0	0			A
48- Democracy Blvd at I-270 SB on ramp												
48	NB			NB Left	0	0	0	0	A	6.3	A	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB	5.0	A		EB Left	0	0	0	0			A
					EB Through	1326	5	17	250			A
					EB Right	0	0	0	0			A
	WB	7.0	A		WB Left	531	24	39	287			C
					WB Through	1748	2	30	266			A
					WB Right	0	0	0	0			A
49- Democracy Blvd at I-270 SB off ramp												
49	NB			NB Left	0	0	0	0	A	7.4	A	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB	38.9	D		SB Left	159	53	31	164			D
					SB Through	0	0	0	0			A
					SB Right	60	2	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	3.8	A		WB Left	0	0	0	0			A
					WB Through	1748	4	16	274			A
					WB Right	168	3	12	305			A
50- MD 190 at Burdette Rd												
50	NB	72.8	E	NB Left	26	74	15	100	E	31.1	C	
				NB Through	4	84	15	100	F			
				NB Right	5	56	15	100	E			
	SB	32.1	C		SB Left	34	78	19	122			E
					SB Through	7	56	19	122			E
					SB Right	118	18	19	122			B
	EB	17.6	B		EB Left	122	85	82	513			F
					EB Through	1151	11	82	513			B
					EB Right	28	4	68	540			A
	WB	38.3	D		WB Left	11	113	334	1111			F
					WB Through	2146	38	334	1111			D
					WB Right	52	28	334	1111			C

Table B.14: PM Peak - Existing - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
51- MD 190 at I-270 NB on ramp											
51	NB			NB Left	0	0	0	0	A	16.9	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	70.2	E	EB Left	233	70	101	369	E		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	8.4	A	WB Left	0	0	0	0	A		
				WB Through	1464	8	42	713	A		
				WB Right	0	0	0	0	A		
52- MD 190 at I-270 SB off ramp											
52	NB	73.8	E	NB Left	222	74	89	830	E	12.4	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	2.9	A	EB Left	0	0	0	0	A		
				EB Through	840	3	6	143	A		
				EB Right	0	0	0	0	A		
	WB	9.1	A	WB Left	0	0	0	0	A		
				WB Through	1705	9	26	545	A		
				WB Right	0	0	0	0	A		
53- MD 190 at Seven Locks Rd											
53	NB	0.3	A	NB Left	21	1	0	0	A	24.7	C
				NB Through	243	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	55.7	E	SB Left	306	56	103	375	E		
				SB Through	180	56	103	375	E		
				SB Right	17	56	103	375	E		
	EB	27.1	C	EB Left	22	33	66	355	C		
				EB Through	664	27	66	355	C		
				EB Right	34	25	66	355	C		
	WB	19.0	B	WB Left	262	75	125	534	E		
				WB Through	935	15	125	534	B		
				WB Right	715	4	125	534	A		
54- MD 124 at I-270 NB off ramp											
54	NB	59.5	E	NB Left	0	0	0	0	A	64.0	E
				NB Through	0	0	0	0	A		
				NB Right	1911	59	802	2475	E		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	68.6	E	EB Left	0	0	0	0	A		
				EB Through	1874	69	579	1267	E		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
55- Democracy Blvd at I-270 NB off ramp											
55	NB	47.0	D	NB Left	0	0	0	0	A	11.5	B
				NB Through	0	0	0	0	A		
				NB Right	314	47	51	199	D		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	1.5	A	EB Left	0	0	0	0	A		
				EB Through	1113	2	4	65	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table B.15: PM Peak - 2015 HSR+ VSL+ ARM Model - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
1- MD 85 at Sam's Club Drive											
1	NB	25.3	C	NB Left	113	75	91	523	E	51.6	D
				NB Through	500	34	91	523	C		
				NB Right	825	13	36	546	B		
	SB	84.0	F	SB Left	143	80	411	1134	F		
				SB Through	876	84	411	1134	F		
				SB Right	66	86	411	1134	F		
	EB	33.7	C	EB Left	43	83	26	114	F		
				EB Through	20	91	26	114	F		
				EB Right	144	11	26	114	B		
	WB	60.2	E	WB Left	511	73	210	698	E		
				WB Through	28	62	210	698	E		
				WB Right	195	26	210	698	C		
2- MD 85 at I-270 NB on and off ramp											
2	NB	37.4	D	NB Left	972	37	198	935	D	32.6	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	25.8	C	SB Left	0	0	0	0	A		
				SB Through	676	26	89	678	C		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
3- MD 85 at I-270 SB on and off ramp											
3	NB	5.9	A	NB Left	0	0	0	0	A	9.4	A
				NB Through	1696	6	41	766	A		
				NB Right	0	0	0	0	A		
	SB	43.3	D	SB Left	173	43	46	327	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
4- MD 85 at Crestwood Blvd											
4	NB	33.3	D	NB Left	60	69	155	659	E	33.5	C
				NB Through	1255	32	154	659	C		
				NB U-Turn	0	0	0	0	A		
	SB	22.1	C	SB Left	91	77	44	215	E		
				SB Through	809	25	58	575	C		
				SB Right	796	13	45	567	B		
	EB	54.2	D	EB Left	801	56	131	604	E		
				EB Through	31	44	131	604	D		
				EB Right	22	0	131	604	A		
	WB	43.0	D	WB Left	35	73	39	162	E		
				WB Through	61	65	39	162	E		
				WB Right	81	13	39	162	B		
5- MD 80 at I-270 NB on and ramp											
5	NB	-2.2	A	NB Left	1	0	0	0	A	8.5	A
				NB Through	1	0	0	0	A		
				NB Right	7	-3	0	0	A		
	SB	12.4	B	SB Left	375	15	21	153	B		
				SB Through	17	14	21	153	B		
				SB Right	119	3	0	0	A		
	EB	10.1	B	EB Left	70	11	14	201	B		
				EB Through	0	0	8	0	A		
				EB Right	6	5	24	231	A		
	WB	6.5	A	WB Left	16	10	0	42	B		
				WB Through	509	11	26	279	B		
				WB Right	482	1	0	28	A		
6- MD 80 at I-270 SB on and off ramp											
6	NB	2.0	A	NB Left	48	2	1	118	A	4.1	A
				NB Through	0	0	0	0	A		
				NB Right	491	2	1	118	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	5.1	A	EB Left	0	0	0	0	A		
				EB Through	272	5	2	82	A		
				EB Right	53	3	1	88	A		
	WB	6.6	A	WB Left	0	0	0	0	A		
				WB Through	315	7	1	98	A		
				WB Right	0	0	0	0	A		
7- MD 109 at I-270 NB on and off ramp											
7	NB			NB Left	0	0	0	0	A	5.2	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	10.0	B	SB Left	219	11	13	154	B		
				SB Through	0	0	0	0	A		
				SB Right	17	2	0	39	A		
	EB	2.2	A	EB Left	56	1	0	36	A		
				EB Through	0	0	0	0	A		
				EB Right	59	3	0	0	A		
	WB	0.3	A	WB Left	0	0	0	0	A		
				WB Through	160	0	0	0	A		
				WB Right	0	0	0	0	A		
8- MD 80 at I-270 SB on and off ramp											
8	NB	3.9	A	NB Left	44	7	2	104	A	1.6	A
				NB Through	0	0	0	0	A		
				NB Right	29	0	0	30	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.8	A	EB Left	0	0	0	0	A		
				EB Through	114	0	0	0	A		
				EB Right	24	4	0	0	A		
	WB	1.2	A	WB Left	98	1	0	47	A		
				WB Through	78	1	0	25	A		
				WB Right	0	0	0	0	A		
9- MD 121 at Gateway Center Dr											
9	NB	10.6	B	NB Left	469	12	31	232	B	17.0	B
				NB Through	637	10	31	232	B		
				NB Right	55	1	37	258	A		
	SB	17.0	C	SB Left	20	12	4	114	B		
				SB Through	170	18	14	127	B		
				SB Right	8	7	12	142	A		
	EB	14.3	B	EB Left	2	50	3	109	D		
				EB Through	18	47	9	159	D		
				EB Right	142	10	18	191	A		
	WB	36.0	E	WB Left	214	48	58	211	D		
				WB Through	56	44	59	211	D		
				WB Right	139	15	72	235	B		
10- MD 121 at I-270 NB on and off ramp											
10	NB	0.6	A	NB Left	25	9	1	75	A	0.5	A
				NB Through	0	0	0	0	A		
				NB Right	715	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.1	A	EB Left	0	0	0	0	A		
				EB Through	447	0	0	0	A		
				EB Right	58	0	0	0	A		
	WB	0.7	A	WB Left	100	3	1	67	A		
				WB Through	426	0	0	30	A		
				WB Right	0	0	0	0	A		

Table B.15: PM Peak - 2015 HSR+ VSL+ ARM Model - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
11- MD 121 at I-270 SB on and off ramp											
11	NB			NB Left	0	0	0	0	A	2.0	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	7.2	A	SB Left	136	9	7	125	A		
				SB Through	0	0	0	0	A		
				SB Right	36	0	0	0	A		
	EB	0.3	A	EB Left	29	1	0	19	A		
				EB Through	0	0	0	0	A		
				EB Right	352	0	0	0	A		
	WB	0.1	A	WB Left	0	0	0	0	A		
				WB Through	99	0	0	0	A		
				WB Right	0	0	0	0	A		
12- MD 27 at Observation Dr											
12	NB	40.6	D	NB U-Turn	0	0	0	0	A	22.1	C
				NB Through	73	57	19	86	E		
				NB Right	47	15	19	86	B		
	SB	39.8	D	SB Left	114	46	31	182	D		
				SB Through	41	62	36	244	E		
				SB Right	173	30	58	281	C		
	EB	16.9	B	EB Left	210	27	68	462	C		
				EB Through	2220	16	70	463	B		
				EB Right	108	15	83	501	B		
	WB	25.4	C	WB Left	31	22	121	592	C		
				WB Through	1503	26	121	592	C		
				WB Right	54	8	121	592	A		
13- MD 27 at I-270 NB off ramp											
13	NB	41.5	D	NB Left	390	42	60	239	D	7.7	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.1	A	EB Left	0	0	0	0	A		
				EB Through	1283	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	5.4	A	WB Left	0	0	0	0	A		
				WB Through	1581	5	40	606	A		
				WB Right	0	0	0	0	A		
14- MD 27 at I-270 SB off ramp											
14	NB			NB Left	0	0	0	0	A	5.3	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	51.4	D	SB Left	170	51	35	145	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	2.2	A	EB Left	0	0	0	0	A		
				EB Through	1352	2	4	131	A		
				EB Right	0	0	0	0	A		
	WB	2.7	A	WB Left	0	0	0	0	A		
				WB Through	1429	3	8	282	A		
				WB Right	0	0	0	0	A		
15- MD 27 at Crystal Rock Dr											
15	NB	22.7	C	NB Left	58	20	55	379	C	29.8	C
				NB Through	968	23	68	379	C		
				NB Right	43	20	72	392	B		
	SB	33.9	C	SB Left	140	60	184	746	E		
				SB Through	1310	35	184	746	D		
				SB Right	198	8	165	740	A		
	EB	42.9	D	EB Left	103	54	28	120	D		
				EB Through	37	46	25	115	D		
				EB Right	47	17	17	141	B		
	WB	27.7	C	WB Left	83	49	70	297	D		
				WB Through	102	43	70	297	D		
				WB Right	552	22	70	297	C		
16- MD 118 at Seneca Meadows Pkwy											
16	NB	4.1	A	NB Left	91	13	2	69	B	8.3	A
				NB Through	1174	3	7	171	A		
				NB Right	0	0	15	224	A		
	SB	6.7	A	SB Left	11	6	15	294	A		
				SB Through	1091	7	19	294	A		
				SB Right	9	3	22	326	A		
	EB	13.1	B	EB Left	18	55	12	124	E		
				EB Through	1	76	12	124	E		
				EB Right	275	10	12	124	B		
	WB	53.5	D	WB Left	93	64	37	199	E		
				WB Through	6	61	33	198	E		
				WB Right	25	13	42	218	B		
17- MD 118 at I-270 NB on ramp											
17	NB			NB Left	0	0	0	0	A	16.3	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	34.2	C	EB Left	435	34	91	509	C		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	10.9	B	WB Left	0	0	0	0	A		
				WB Through	246	2	1	121	A		
				WB Right	1215	13	46	484	B		
18- MD 118 at I-270 SB off ramp											
18	NB			NB Left	0	0	0	0	A	5.9	A
				NB Through	0	0.0	0	0	A		
				NB Right	0	0.0	0	0	A		
	SB	36.3	D	SB Left	130	36.3	21	128	D		
				SB Through	0	0.0	0	0	A		
				SB Right	0	0.0	0	0	A		
	EB	4.7	A	EB Left	0	0.0	0	0	A		
				EB Through	1182	4.7	10	295	A		
				EB Right	0	0.0	0	0	A		
	WB	4.1	A	WB Left	0	0.0	0	0	A		
				WB Through	1465	4.1	8	185	A		
				WB Right	0	0.0	0	0	A		
19- MD 118 at Aircraft Dr											
19	NB	24.2	C	NB Left	42	68	33	176	E	28.0	C
				NB Through	43	71	33	176	E		
				NB Right	196	5	3	77	A		
	SB	93.9	F	SB Left	382	92	226	583	F		
				SB Through	12	93	226	583	F		
				SB Right	97	100	226	583	F		
	EB	17.4	B	EB Left	98	21	58	358	C		
				EB Through	1215	17	58	358	B		
				EB Right	17	15	58	358	B		
	WB	17.9	B	WB Left	13	17	69	516	B		
				WB Through	1320	21	69	516	C		
				WB Right	355	5	69	516	A		
20- Middlebrook Rd at Observation Dr											
20	NB			NB Left	0	0	0	0	A	8.5	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	18.0	B	SB Left	96	35	18	131	D		
				SB Through	0	0	0	0	A		
				SB Right	179	9	18	131	A		
	EB	6.3	A	EB Left	15	10	17	155	A		
				EB Through	1181	6	17	155	A		
				EB Right	0	0	0	0	A		
	WB	8.4	A	WB Left	0	0	0	0	A		
				WB Through	1238	8	24	248	A		
				WB Right	12	7	39	297	A		

Table B.15: PM Peak - 2015 HSR+ VSL+ ARM Model - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
21- Middlebrook Rd at I-270 SB on ramp											
21	NB			NB Left	0	0	0	0	A	4.4	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	2.7	A	EB Left	0	0	0	0	A		
				EB Through	685	3	4	92	A		
				EB Right	0	0	0	0	A		
	WB	7.2	A	WB Left	429	7	4	191	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
22- Middlebrook Rd at Waring Station Rd											
22	NB	48.4	D	NB Left	156	45	75	316	D	12.8	B
				NB Through	0	0	75	316	A		
				NB Right	219	51	75	316	D		
	SB	30.7	C	SB Left	30	44	7	66	D		
				SB Through	2	37	7	66	D		
				SB Right	19	9	18	104	A		
	EB	7.2	A	EB Left	3	12	22	262	B		
				EB Through	1035	7	22	262	A		
				EB Right	160	6	22	262	A		
	WB	8.8	A	WB Left	244	22	35	339	C		
				WB Through	1651	7	35	339	A		
				WB Right	4	2	35	339	A		
23- MD 124 at MD 355											
23	NB	50.9	D	NB Left	505	62	185	517	E	60.7	E
				NB Through	923	45	183	514	D		
				NB Right	6	10	0	0	B		
	SB	30.8	C	SB Left	141	72	99	366	E		
				SB Through	545	54	99	366	D		
				SB Right	734	6	26	352	A		
	EB	37.1	D	EB Left	458	84	283	1154	F		
				EB Through	2668	36	283	1154	D		
				EB Right	561	5	115	1127	A		
	WB	153.8	F	WB Left	0	0	0	0	A		
				WB Through	1480	156	712	945	F		
				WB Right	64	104	0	0	F		
24- MD 124 at I-270 SB on and off											
24	NB	66.4	F	NB Left	53	66	25	103	E	30.5	C
				NB Through	22	67	25	103	E		
				NB U-Turn	0	0	0	0	A		
	SB	41.8	D	SB Left	566	71	156	743	E		
				SB Through	9	57	156	743	E		
				SB Right	451	4	3	152	A		
	EB	30.0	C	EB Left	0	0	0	0	A		
				EB Through	1795	30	196	1067	C		
				EB Right	31	23	209	1090	C		
	WB	17.8	B	WB Left	4	70	73	642	E		
				WB Through	1048	18	73	642	B		
				WB Right	0	0	0	0	A		
25- MD 117 at MD 124											
25	NB	34.4	C	NB Left	45	58	110	633	E	41.5	D
				NB Through	544	51	110	633	D		
				NB Right	447	12	5	296	B		
	SB	32.5	C	SB Left	120	41	98	446	D		
				SB Through	761	37	98	446	D		
				SB Right	144	2	0	0	A		
	EB	46.2	D	EB Left	120	86	144	522	F		
				EB Through	1090	42	143	524	D		
				EB Right	42	41	151	551	D		
	WB	47.5	D	WB Left	380	69	290	1028	E		
				WB Through	1273	46	290	1028	D		
				WB Right	123	2	0	0	A		
26- MD 117 at Bureau Dr											
26	NB	42.0	D	NB Left	78	73	59	255	E	40.1	D
				NB Through	28	72	59	255	E		
				NB Right	260	30	59	255	C		
	SB	67.2	E	SB Left	275	78	99	341	E		
				SB Through	17	71	99	341	E		
				SB Right	65	20	99	341	B		
	EB	32.1	C	EB Left	42	75	160	836	E		
				EB Through	1601	31	162	836	C		
				EB Right	3	18	155	825	B		
	WB	41.5	D	WB Left	19	46	349	1070	D		
				WB Through	1628	43	350	1071	D		
				WB Right	277	30	383	1119	C		
27- MD 117 at I-270 SB off ramp											
27	NB			NB Left	0	0	0	0	A	15.0	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	5.0	A	EB Left	0	0	0	0	A		
				EB Through	904	5	11	420	A		
				EB Right	0	0	0	0	A		
	WB	46.5	E	WB Left	289	46	167	1075	E		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
28- MD 117 at I-270 NB off ramp											
28	NB			NB Left	0	0	0	0	A	32.1	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	56.1	E	SB Left	236	51	475	1591	D		
				SB Through	0	0	0	0	A		
				SB Right	872	58	476	1591	E		
	EB	29.1	C	EB Left	3	155	162	953	F		
				EB Through	901	29	162	953	C		
				EB Right	0	0	0	0	A		
	WB	14.3	B	WB Left	0	0	0	0	A		
				WB Through	1338	14	90	388	B		
				WB Right	0	0	90	388	A		
29- MD 117 at Perry Pkwy											
29	NB	40.2	D	NB Left	18	63	12	92	E	38.2	D
				NB Through	22	50	11	91	D		
				NB Right	23	13	20	112	B		
	SB	50.9	D	SB Left	197	75	77	317	E		
				SB Through	15	80	77	317	F		
				SB Right	112	4	77	317	A		
	EB	21.3	C	EB Left	237	71	84	352	E		
				EB Through	850	8	84	352	A		
				EB Right	31	5	70	336	A		
	WB	47.7	D	WB Left	36	118	254	745	F		
				WB Through	1206	49	254	745	D		
				WB Right	292	35	254	745	D		
30- Shady Grove Rd at I-270 NB off ramp											
30	NB	7.1	A	NB Left	0	0	0	0	A	13.8	B
				NB Through	1025	7	16	192	A		
				NB Right	0	0	0	0	A		
	SB	10.4	B	SB Left	0	0	0	0	A		
				SB Through	1280	10	41	493	B		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	49.9	D	WB Left	310	50	57	238	D		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table B.15: PM Peak - 2015 HSR+ VSL+ ARM Model - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
31- Shady Grove Rd at I-270 SB off ramp											
31	NB	6.7	A	NB Left	0	0	0	0	A	15.7	B
				NB Through	1463	7	26	409	A		
				NB Right	0	0	0	0	A		
	SB	5.3	A	SB Left	0	0	0	0	A		
				SB Through	809	5	8	148	A		
				SB Right	0	0	0	0	A		
	EB	57.2	E	EB Left	229	56	45	188	E		
				EB Through	0	0	0	0	A		
				EB Right	293	58	62	254	E		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
32- MD 28 at I-270 SB off ramp											
32	NB			NB U-Turn	0	0	0	0	A	8.3	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	36.8	D	SB Left	442	44	73	293	D		
				SB Through	0	0	0	0	A		
				SB Right	98	2	0	14	A		
	EB	2.7	A	EB Left	0	0	0	0	A		
				EB Through	1506	1	0	0	A		
				EB Right	829	6	14	229	A		
	WB	6.8	A	WB Left	0	0	0	0	A		
				WB Through	1669	7	20	225	A		
				WB Right	0	0	0	0	A		
33- MD 28 at I-270 on and off ramps											
33	NB	33.9	C	NB Left	0	0	45	250	A	24.3	C
				NB Through	209	47	53	259	D		
				NB Right	134	14	53	259	B		
	SB	42.6	D	SB Left	11	105	184	343	F		
				SB Through	0	0	0	0	A		
				SB Right	159	38	184	343	D		
	EB	13.2	B	EB Left	252	40	57	293	D		
				EB Through	885	5	57	293	A		
				EB Right	0	0	0	0	A		
	WB	29.3	C	WB Left	36	24	116	387	C		
				WB Through	1228	29	95	351	C		
				WB Right	0	0	0	0	A		
34- MD 189 at Great Falls Rd											
34	NB	43.3	D	NB Left	43	52	12	86	D	29.6	C
				NB Through	11	46	9	84	D		
				NB Right	12	10	10	95	A		
	SB	24.5	C	SB Left	12	49	19	170	D		
				SB Through	9	45	19	170	D		
				SB Right	333	23	62	257	C		
	EB	20.6	C	EB Left	411	40	129	995	D		
				EB Through	660	10	12	250	A		
				EB Right	57	8	19	287	A		
	WB	44.2	D	WB Left	10	33	145	683	C		
				WB Through	732	44	145	682	D		
				WB Right	13	41	166	716	D		
35- MD 189 at I-270 Ramps											
35	NB	46.6	D	NB Left	251	47	45	183	D	53.1	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	55.5	E	SB Left	348	55	130	593	E		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	32.6	C	EB Left	473	40	97	355	D		
				EB Through	367	23	97	355	C		
				EB Right	0	0	0	0	A		
	WB	77.4	E	WB Left	386	82	97	362	F		
				WB Through	359	72	97	362	E		
				WB Right	0	0	0	0	A		
36- MD 189 at Wooton Pkwy											
36	NB	44.5	D	NB Left	186	56	110	414	E	43.8	D
				NB Through	536	52	110	414	D		
				NB Right	174	10	110	414	B		
	SB	62.6	E	SB Left	248	80	151	606	E		
				SB Through	730	57	156	593	E		
				SB Right	0	0	0	0	A		
	EB	34.5	C	EB Left	118	71	100	414	E		
				EB Through	541	34	100	414	C		
				EB Right	159	10	100	414	B		
	WB	34.4	C	WB Left	155	70	118	575	E		
				WB Through	752	35	118	575	C		
				WB Right	302	15	118	575	B		
37- Montrose Rd at Tower Oaks Blvd											
37	NB	0.4	A	NB Left	0	0	0	0	A	13.2	B
				NB Through	0	0	0	0	A		
				NB Right	491	0	0	0	A		
	SB	46.7	D	SB Left	67	48	16	128	D		
				SB Through	0	0	0	0	A		
				SB Right	270	46	59	210	D		
	EB	6.1	A	EB Left	0	0	0	0	A		
				EB Through	1665	6	29	400	A		
				EB Right	0	0	0	0	A		
	WB	15.6	B	WB Left	69	35	29	400	D		
				WB Through	2575	16	84	719	B		
				WB Right	245	11	84	719	B		
38- Tower Oaks Blvd at I-270 off ramp											
38	NB	23.0	C	NB Left	652	24	46	234	C	17.4	B
				NB Through	0	0.0	39	226	A		
				NB Right	22	6.2	46	234	A		
	SB	13.6	B	SB Left	8	21.9	1	43	C		
				SB Through	0	0.0	1	43	A		
				SB Right	7	4.0	0	30	A		
	EB	11.0	B	EB Left	1	15.2	14	160	B		
				EB Through	311	11.5	14	159	B		
				EB Right	33	6.6	9	150	A		
	WB	12.5	B	WB Left	122	16.3	15	143	B		
				WB Through	192	10.1	15	143	B		
				WB Right	1	9.1	3	99	A		
39- Montrose Rd at Tower Oaks Blvd											
39	NB	17.1	B	NB Left	76	33	61	269	C	54.3	D
				NB Through	606	30	61	269	C		
				NB Right	572	1	0	0	A		
	SB	29.3	C	SB Left	192	59	58	182	E		
				SB Through	394	20	57	181	B		
				SB Right	105	11	55	225	B		
	EB	211.1	F	EB Left	80	174	512	721	F		
				EB Through	453	217	513	722	F		
				EB Right	31	225	537	746	F		
	WB	36.5	D	WB Left	569	45	114	415	D		
				WB Through	472	43	114	415	D		
				WB Right	329	12	135	445	B		
40- Rockledge Blvd at I-270 NB on and off ramp											
40	NB	121.9	F	NB Left	0	0	0	0	A	97.4	F
				NB Through	336	105	516	828	F		
				NB Right	858	128	516	828	F		
	SB	86.1	F	SB Left	0	0	86	216	A		
				SB Through	347	86	86	216	F		
				SB Right	0	0	0	0	A		
	EB	62.5	E	EB Left	5	119	171	496	F		
				EB Through	429	103	171	496	F		
				EB Right	294	2	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table B.15: PM Peak - 2015 HSR+ VSL+ ARM Model - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS	
41- Rockledge Blvd at I-270 SB on and off ramps												
41	NB	30.3	C	NB Left	340	30	71	278	C	49.1	D	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	54.3	D		WB Left	344	59	199	963			E
					WB Through	897	53	199	963			D
					WB Right	0	0	0	0			A
42- MD 187 at Tuckerman Ln												
42	NB	43.0	D	NB Left	197	18	308	1179	B	120.9	F	
				NB Through	2139	43	308	1179	D			
				NB Right	187	73	308	1179	E			
	SB	207.3	F		SB Left	181	170	2543	2701			F
					SB Through	1101	207	2543	2701			F
					SB Right	266	233	2543	2701			F
	EB	51.7	D		EB Left	238	52	94	407			D
					EB Through	409	54	95	408			D
					EB Right	103	43	113	432			D
	WB	214.4	F		WB Left	459	211	1910	2139			F
					WB Through	616	232	1910	2139			F
					WB Right	152	156	1910	2139			F
43- MD 187 at I-270 NB on and off ramps												
43	NB	14.1	B	NB Left	552	31	100	397	C	18.4	B	
				NB Through	2292	10	100	397	B			
				NB Right	0	0	0	0	A			
	SB	24.0	C		SB Left	0	0	0	0			A
					SB Through	1230	24	59	305			C
					SB Right	0	0	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	59.6	E		WB Left	65	58	48	330			E
					WB Through	64	61	48	330			E
					WB Right	0	0	0	0			A
44- MD 187 at I-270 NB on and off ramps												
44	NB	32.6	D	NB Left	0	0	0	0	A	33.5	C	
				NB Through	2209	33	105	468	C			
				NB Right	0	0	0	0	A			
	SB	20.1	C		SB Left	146	58	73	309			E
					SB Through	1147	15	73	309			B
					SB Right	0	0	0	0			A
	EB	57.3	E		EB Left	634	58	135	549			E
					EB Through	0	0	135	549			A
					EB Right	184	55	80	486			D
	WB				WB Left	0	0	0	0			A
					WB Through	0	0	0	0			A
					WB Right	0	0	0	0			A
45- MD 187 at Rock Spring Dr												
45	NB	16.3	B	NB Left	383	35	87	626	C	23.5	C	
				NB Through	2002	13	88	626	B			
				NB Right	14	12	108	659	B			
	SB	27.0	C		SB Left	20	47	82	394			D
					SB Through	1142	31	82	394			C
					SB Right	169	1	49	388			A
	EB	39.9	D		EB Left	396	58	97	367			E
					EB Through	38	64	97	367			E
					EB Right	375	18	97	367			B
	WB	11.6	B		WB Left	5	31	3	77			C
					WB Through	12	25	3	77			C
					WB Right	32	4	1	67			A
47-Democracy Blvd at I-270 NB off ramp												
47	NB	46.2	D	NB Left	152	46	29	134	D	3.0	A	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB	1.2	A		EB Left	0	0	0	0			A
					EB Through	1108	1	3	45			A
					EB Right	0	0	0	0			A
	WB	0.9	A		WB Left	0	0	0	0			A
					WB Through	2129	1	2	62			A
					WB Right	0	0	0	0			A
48- Democracy Blvd at I-270 SB on ramp												
48	NB			NB Left	0	0	0	0	A	6.2	A	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB	5.0	A		EB Left	0	0	0	0			A
					EB Through	1319	5	18	251			A
					EB Right	0	0	0	0			A
	WB	6.9	A		WB Left	531	23	39	282			C
					WB Through	1748	2	30	261			A
					WB Right	0	0	0	0			A
49- Democracy Blvd at I-270 SB off ramp												
49	NB			NB Left	0	0	0	0	A	7.4	A	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB	37.9	D		SB Left	155	51	31	177			D
					SB Through	0	0	0	0			A
					SB Right	58	3	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	4.0	A		WB Left	0	0	0	0			A
					WB Through	1748	4	16	270			A
					WB Right	163	7	26	380			A
50- MD 190 at Burdette Rd												
50	NB	73.7	E	NB Left	26	76	15	100	E	29.0	C	
				NB Through	4	84	15	100	F			
				NB Right	5	56	15	100	E			
	SB	30.9	C		SB Left	34	77	19	123			E
					SB Through	7	56	19	123			E
					SB Right	118	16	19	123			B
	EB	18.3	B		EB Left	119	91	84	520			F
					EB Through	1138	11	84	520			B
					EB Right	26	3	72	548			A
	WB	34.4	C		WB Left	11	114	308	1103			F
					WB Through	2157	34	308	1103			C
					WB Right	51	24	308	1103			C

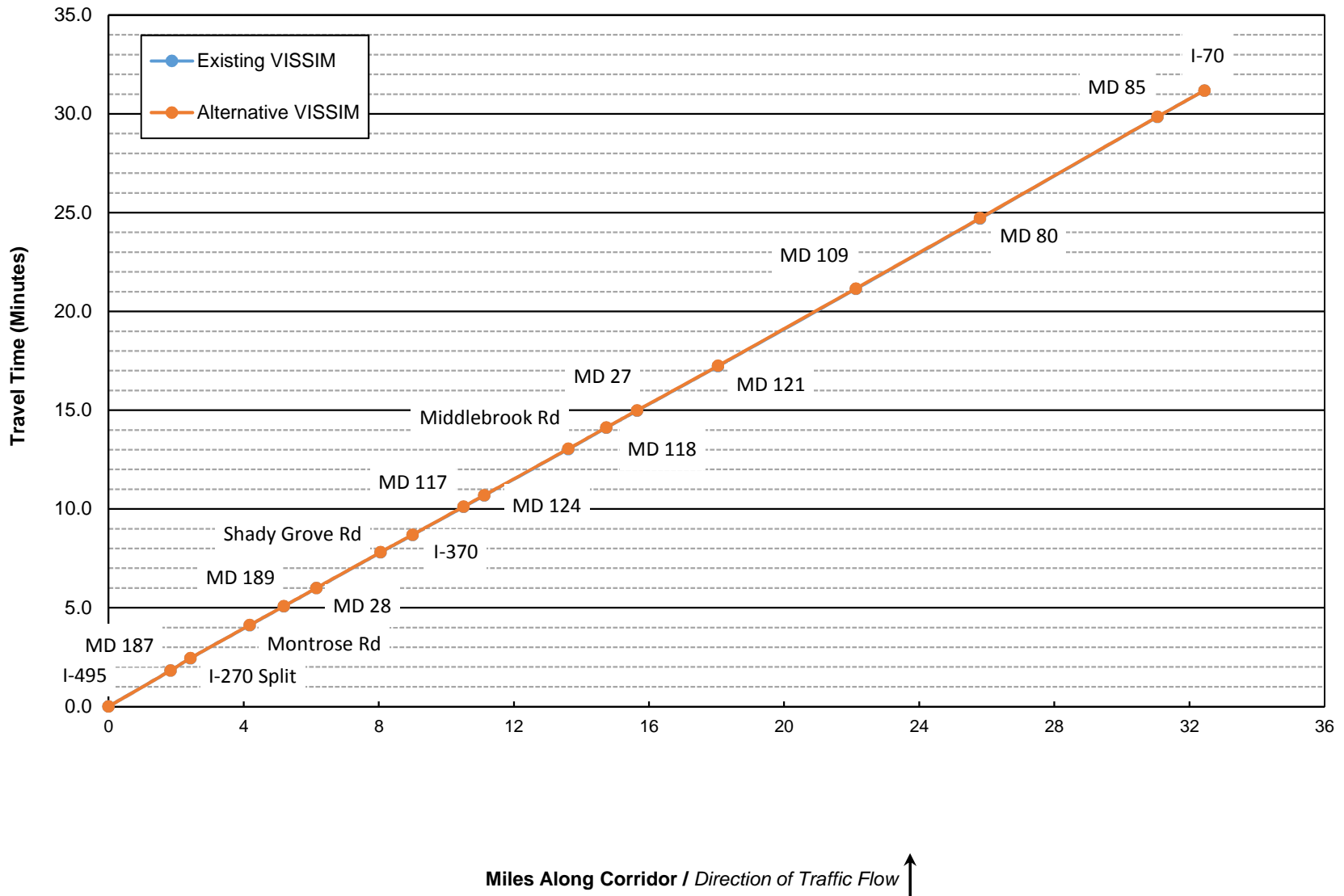
Table B.15: PM Peak - 2015 HSR+ VSL+ ARM Model - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
51- MD 190 at I-270 NB on ramp											
51	NB			NB Left	0	0	0	0	A	17.1	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	70.0	E	EB Left	234	70	102	348	E		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	8.6	A	WB Left	0	0	0	0	A		
				WB Through	1472	9	47	779	A		
				WB Right	0	0	0	0	A		
52- MD 190 at I-270 SB off ramp											
52	NB	70.9	E	NB Left	227	71	90	884	E	12.6	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	2.9	A	EB Left	0	0	0	0	A		
				EB Through	840	3	6	135	A		
				EB Right	0	0	0	0	A		
	WB	9.7	A	WB Left	0	0	0	0	A		
				WB Through	1709	10	27	569	A		
				WB Right	0	0	0	0	A		
53- MD 190 at Seven Locks Rd											
53	NB	0.4	A	NB Left	21	1	0	0	A	24.5	C
				NB Through	243	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	55.7	E	SB Left	306	56	103	372	E		
				SB Through	180	56	103	372	E		
				SB Right	17	56	103	372	E		
	EB	27.3	C	EB Left	22	33	66	345	C		
				EB Through	664	27	66	345	C		
				EB Right	34	25	66	345	C		
	WB	18.5	B	WB Left	265	75	124	563	E		
				WB Through	942	14	124	563	B		
				WB Right	721	4	124	563	A		
54- MD 124 at I-270 NB off ramp											
54	NB	48.1	D	NB Left	0	0	0	0	A	50.4	D
				NB Through	0	0	0	0	A		
				NB Right	1785	48	506	2111	D		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	52.5	D	EB Left	0	0	0	0	A		
				EB Through	1904	53	408	1245	D		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
55- Democracy Blvd at I-270 NB off ramp											
55	NB	47.2	D	NB Left	0	0	0	0	A	11.6	B
				NB Through	0	0	0	0	A		
				NB Right	314	47	52	196	D		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	1.5	A	EB Left	0	0	0	0	A		
				EB Through	1108	2	4	60	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table B.16: PM Peak - 2015 HSR+VSL+ARM Model - I-270 Vehicle Network Perfo

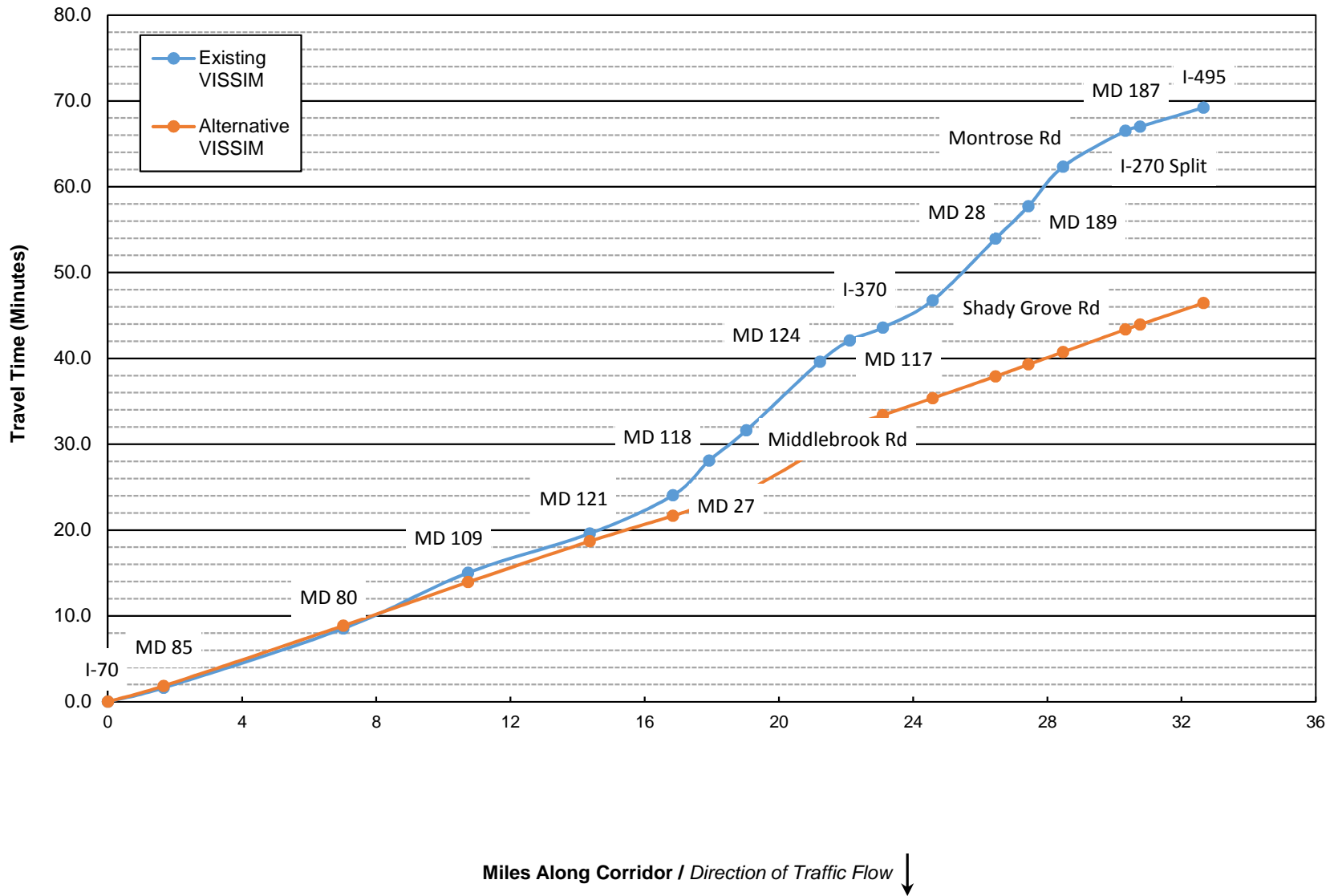
	Existing	HSR+VSL+ARM	% Change
Total Delay	21,792,153	19,812,593	-9%
Average Delay per Vehicle	206	188	-9%
Total Travel Time	53,628,278	53,021,757	-1%
Vehicles (Arrived)	88,401	88,533	0%
Latent Demand	1,544	1,718	11%
Latent Delay	2,650,217	2,844,531	7%
Total Distance	484,473	481,636	-1%
Average Speed	33	33	1%

**Figure A.1: AM Peak - 2015 Final Model
I-270 Travel Time Graph - Northbound**



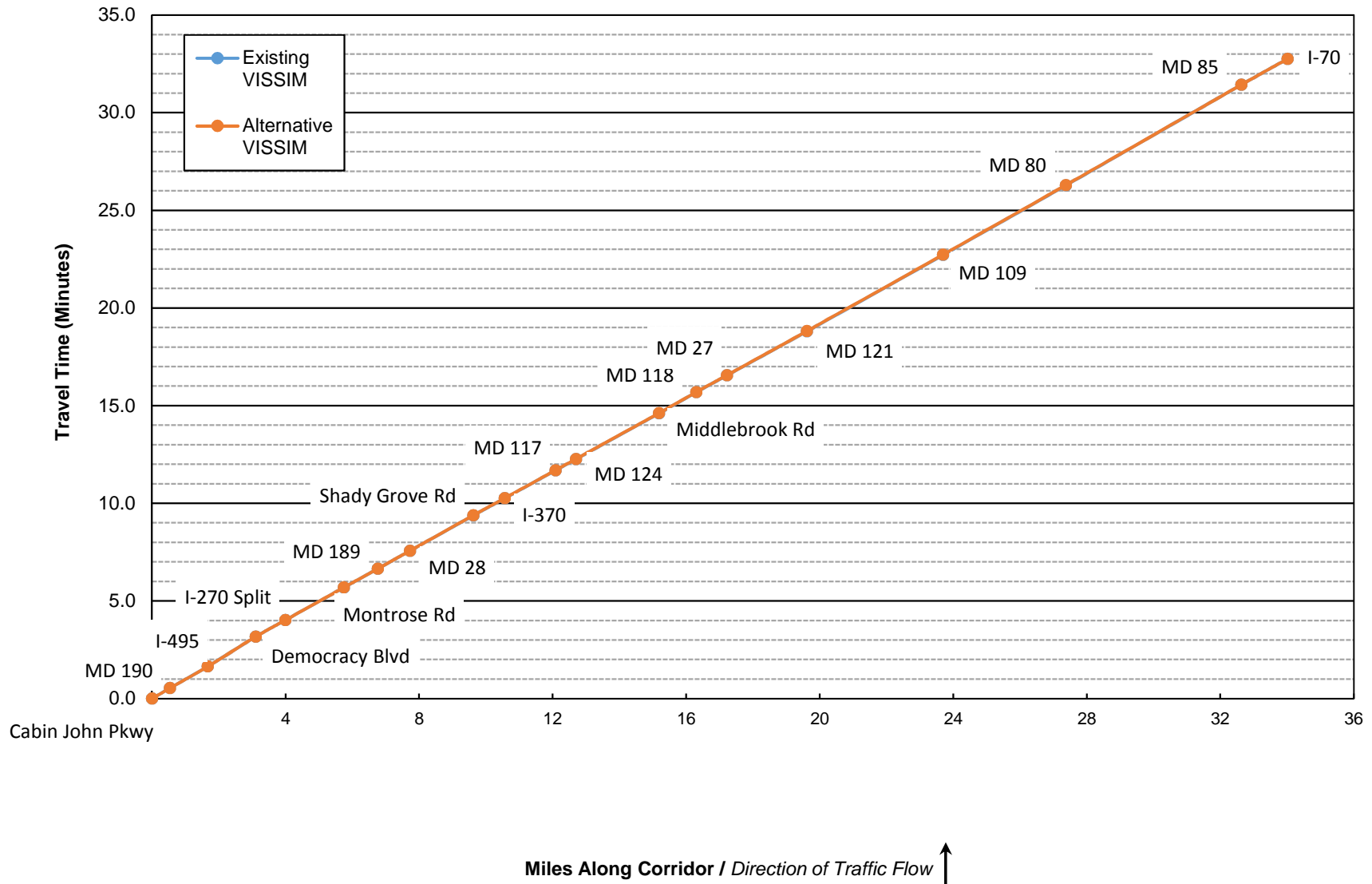
*FINAL = HSR + VSL + ARM + MODE

**Figure A.2: AM Peak - 2015 Final Model
I-270 Travel Time Graph - Southbound**



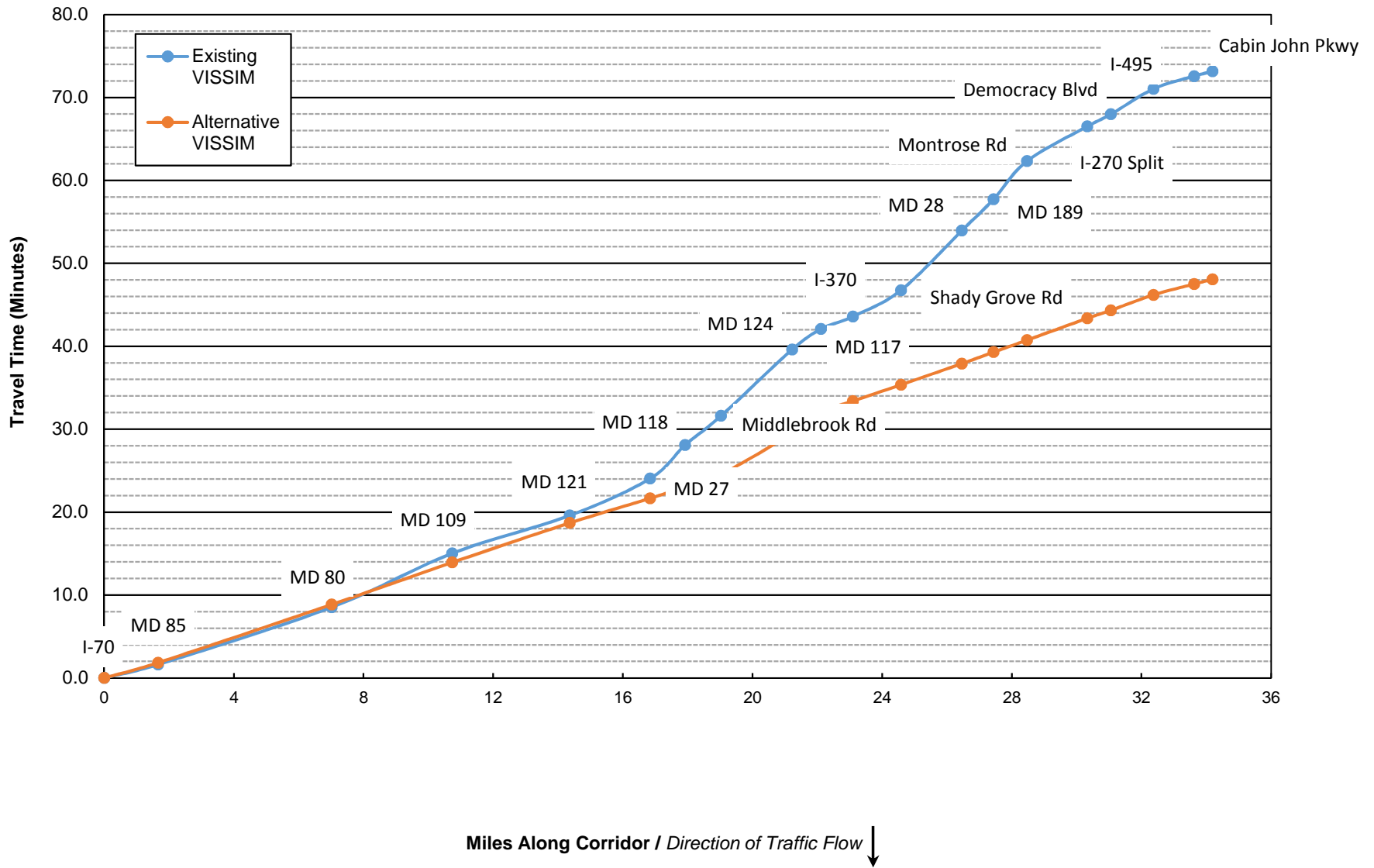
*FINAL = HSR + VSL + ARM + MODE

**Figure A.3: AM Peak - 2015 Final Model
I-270 Spur Travel Time Graph - Northbound**



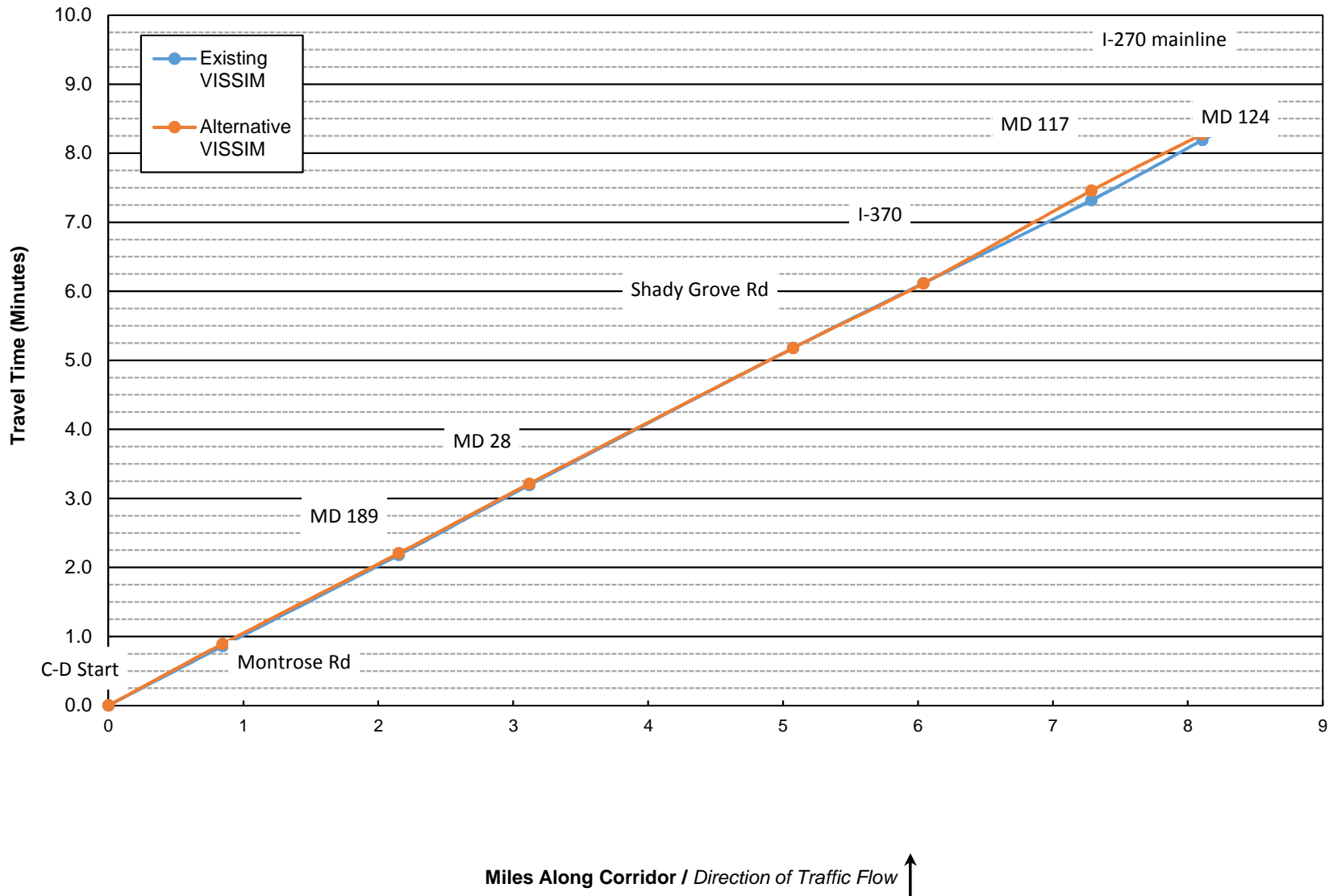
*FINAL = HSR + VSL + ARM + MODE

**Figure A.4: AM Peak - 2015 Final Model
I-270 Spur Travel Time Graph - Southbound**



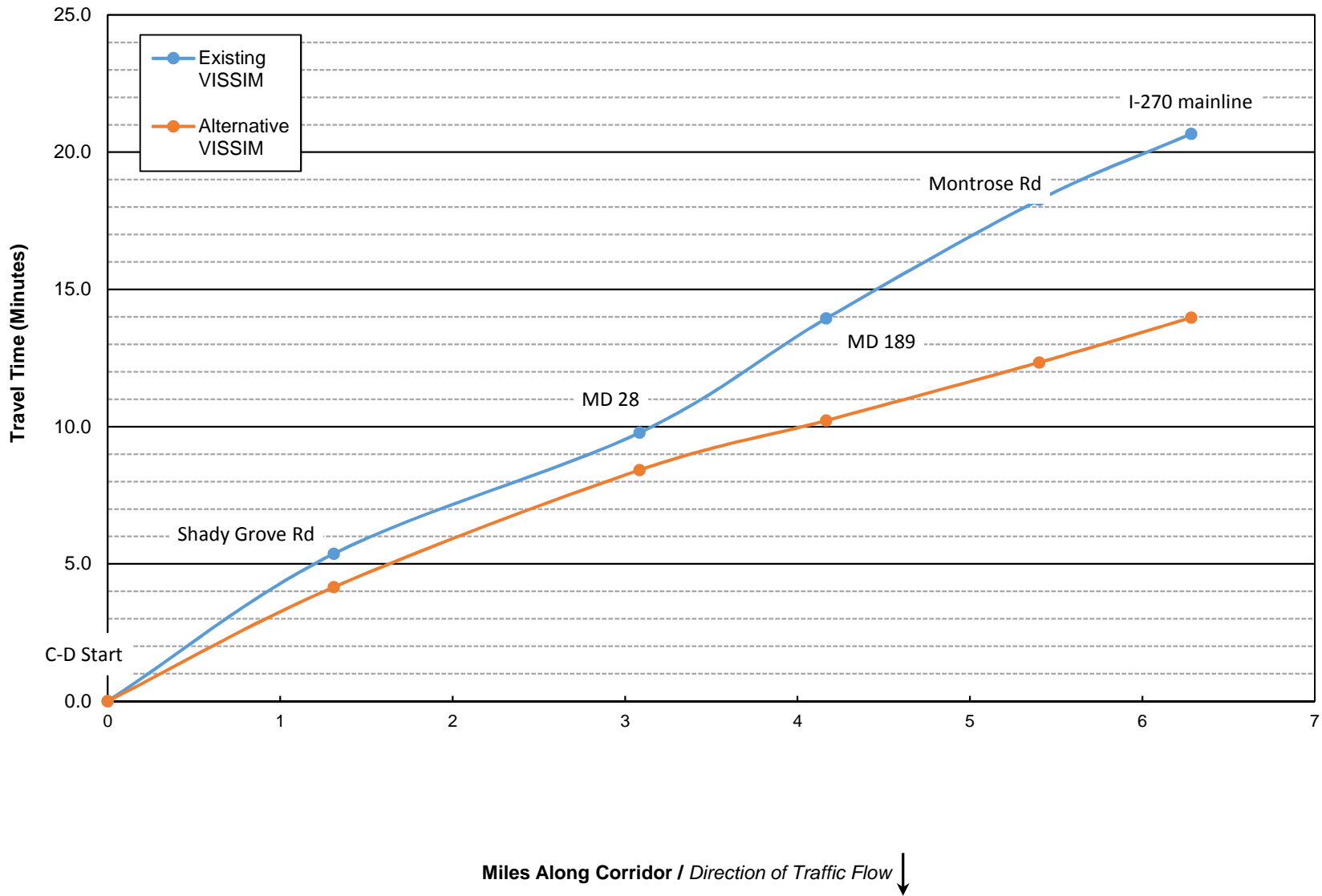
*FINAL = HSR + VSL + ARM + MODE

**Figure A.5: AM Peak - 2015 Final Model
I-270 Local Travel Time Graph - Northbound**



*FINAL = HSR + VSL + ARM + MODE

**Figure A.6: AM Peak - 2015 Final Model
I-270 Local Travel Time Graph - Southbound**



*FINAL = HSR + VSL + ARM + MODE

Table A.1: AM Peak -2015 Final Model - I-270 Vehicle Travel Time

I-270 Northbound	Segment Length (miles)	Existing VISSIM Travel Time (seconds)	Final VISSIM Travel Time (seconds)	% Change	I-270 Southbound	Segment Length (miles)	Existing VISSIM Travel Time (seconds)	Final VISSIM Travel Time (seconds)	% Change
From I-495 interchange					From I-70				
to MD 187	1.8	109.0	109.1	0%	to MD 85	1.7	97.0	110.4	14%
to I-270 Split	0.6	37.5	37.7	1%	to MD 80	5.4	414.5	421.1	2%
to Montrose Rd	1.8	100.1	100.3	0%	to MD 109	3.7	390.6	304.9	-22%
to MD 189	1.0	57.6	57.7	0%	to MD 121	3.6	273.2	285.1	4%
to MD 28	1.0	55.1	55.2	0%	to MD 27	2.5	267.9	178.1	-34%
to Shady Grove Rd	1.9	108.4	108.7	0%	to MD 118	1.1	241.4	82.2	-66%
to I-370	0.9	53.0	53.0	0%	to Middlebrook Rd	1.1	211.7	90.6	-57%
to MD 117	1.5	85.5	85.6	0%	to MD 124	2.2	480.5	298.7	-38%
to MD 124	0.6	34.5	34.5	0%	to MD 117	0.9	148.4	151.6	2%
to Middlebrook Rd	2.5	140.9	141.0	0%	to I-370	1.0	90.2	81.0	-10%
to MD 118	1.1	64.8	64.8	0%	to Shady Grove Rd	1.5	190.3	118.3	-38%
to MD 27	0.9	51.8	51.8	0%	to MD 28	1.9	431.1	152.7	-65%
to MD 121	2.4	135.3	135.4	0%	to MD 189	1.0	227.1	83.1	-63%
to MD 109	4.1	234.5	234.8	0%	to Montrose Rd	1.0	276.2	86.6	-69%
to MD 80	3.7	213.8	213.7	0%	to I-270 Split	1.9	250.6	157.8	-37%
to MD 85	5.3	309.0	308.1	0%	to MD 187	0.4	30.0	34.4	15%
to I-70	1.4	79.9	79.7	0%	to I-495 interchange	1.9	131.8	150.2	14%
I-270 Total (miles/minutes)	32.4	31.2	31.2	0%	I-270 Total (miles/minutes)	32.7	69.2	46.4	-33%
I-270 Spur Northbound					I-270 Spur Southbound				
From Cabin John Pkwy					From I-70				
to MD 190	0.5	32.2	32.2	0%	to I-270 Split	30.3	3,990.6	2,602.0	-35%
to I-495	1.1	66.7	66.6	0%	to Democracy Blvd	0.7	88.4	58.2	-34%
to Democracy Blvd	1.4	91.2	91.3	0%	to I-495	1.3	183.1	111.4	-39%
to I-270 Split	0.9	51.0	51.0	0%	to MD 190	1.3	92.2	78.4	-15%
to I-70	30.0	1,724.3	1,724.2	0%	to Cabin John Pkwy	0.6	35.0	34.8	-1%
I-270 Spur Total (miles/minutes)	34.0	32.8	32.8	0%	I-270 Spur Total (miles/minutes)	34.2	73.2	48.1	-34%

* Final = HSR + VSL + ARM + MODE

Table A.2: AM Peak -2015 Final Model - I-270 Local Vehicle Travel Time

I-270 Northbound	Segment Length (miles)	Existing VISSIM Travel Time (seconds)	Final VISSIM Travel Time (seconds)	% Change	I-270 Southbound	Segment Length (miles)	Existing VISSIM Travel Time (seconds)	Final VISSIM Travel Time (seconds)	% Change
From C-D start					From C-D start				
to Montrose Rd	0.8	51.6	53.5	4%	to Shady Grove	1.3	322.1	249.3	-23%
to MD 189	1.3	79.3	78.9	-1%	to MD 28	1.8	264.8	255.9	-3%
to MD 28	1.0	60.7	60.4	0%	to MD 189	1.1	249.5	108.3	-57%
to Shady Grove	2.0	119.1	117.9	-1%	to Montrose	1.2	259.4	126.9	-51%
to I-370	1.0	56.3	56.2	0%	to I-270 mainline	0.9	144.4	98.0	-32%
to MD 117	1.2	72.3	80.7	12%					
to MD 124	0.8	52.1	49.0	-6%					
to I-270 mainline	0.4	21.4	21.1	-1%					
I-270 Local Total (miles/minutes)	8.5	8.5	8.6	1%	I-270 Local Total (miles/minutes)	6.3	20.7	14.0	-32%

* Final = HSR + VSL + ARM + MODE

Table A.3: AM Peak -2015 Final Model - I-270 Vehicle Speed

I-270 Northbound	Segment Length (miles)	Existing VISSIM Speed (MPH)	Final VISSIM Travel Time (seconds)	% Change	I-270 Southbound	Segment Length (miles)	Existing VISSIM Speed (MPH)	Final VISSIM Speed (MPH)	% Change
From I-495 interchange					From I-70				
to MD 187	1.8	60.5	60.5	0%	to MD 85	1.7	61.7	54.2	-12%
to I-270 Split	0.6	56.7	56.4	-1%	to MD 80	5.4	46.5	45.8	-2%
to Montrose Rd	1.8	63.0	62.9	0%	to MD 109	3.7	34.3	43.9	28%
to MD 189	1.0	63.3	63.2	0%	to MD 121	3.6	47.7	45.7	-4%
to MD 28	1.0	62.9	62.9	0%	to MD 27	2.5	33.4	50.2	50%
to Shady Grove Rd	1.9	63.0	62.9	0%	to MD 118	1.1	16.0	47.0	194%
to I-370	0.9	64.1	64.1	0%	to Middlebrook Rd	1.1	18.9	44.2	134%
to MD 117	1.5	63.8	63.7	0%	to MD 124	2.2	16.5	26.5	61%
to MD 124	0.6	63.9	63.9	0%	to MD 117	0.9	21.5	21.1	-2%
to Middlebrook Rd	2.5	63.6	63.5	0%	to I-370	1.0	39.3	43.8	11%
to MD 118	1.1	62.3	62.3	0%	to Shady Grove Rd	1.5	28.1	45.2	61%
to MD 27	0.9	63.6	63.6	0%	to MD 28	1.9	15.7	44.2	182%
to MD 121	2.4	63.7	63.7	0%	to MD 189	1.0	15.5	42.4	173%
to MD 109	4.1	62.6	62.5	0%	to Montrose Rd	1.0	13.5	42.9	219%
to MD 80	3.7	61.9	62.0	0%	to I-270 Split	1.9	26.7	42.4	59%
to MD 85	5.3	61.2	61.4	0%	to MD 187	0.4	52.3	45.6	-13%
to I-70	1.4	62.7	62.8	0%	to I-495 interchange	1.9	51.7	45.3	-12%
I-270 Total (miles/minutes)	32.4	62.4	62.4	0%	I-270 Total (miles/minutes)	32.7	28.3	42.2	49%
I-270 Spur Northbound					I-270 Spur Southbound				
From Cabin John Pkwy					From I-70				
to MD 190	0.5	60.3	60.3	0%	to I-270 Split	30.3	27.4	42.0	53%
to I-495	1.1	61.2	61.2	0%	to Democracy Blvd	0.7	29.8	45.2	52%
to Democracy Blvd	1.4	56.6	56.5	0%	to I-495	1.3	25.8	42.4	64%
to I-270 Split	0.9	62.9	63.0	0%	to MD 190	1.3	48.9	57.6	18%
to I-70	30.0	62.7	62.7	0%	to Cabin John Pkwy	0.6	58.6	58.9	1%
I-270 Spur Total (miles/minutes)	34.0	62.3	62.3	0%	I-270 Spur Total (miles/minutes)	34.2	28.0	42.7	52%

* Final = HSR + VSL + ARM + MODE

Table A.4: AM Peak -2015 Final Model- I-270 Local Vehicle Speed

I-270 Northbound	Segment Length (miles)	Existing VISSIM Speed (MPH)	Final VISSIM Speed (MPH)	% Change	I-270 Southbound	Segment Length (miles)	Existing VISSIM Speed (MPH)	Final VISSIM Speed (MPH)	% Change
From C-D start					From C-D start				
to Montrose Rd	0.8	59.0	56.9	-4%	to Shady Grove	1.3	14.6	18.9	29%
to MD 189	1.3	59.3	59.6	1%	to MD 28	1.8	24.1	24.9	3%
to MD 28	1.0	57.4	57.7	0%	to MD 189	1.1	15.6	36.0	130%
to Shady Grove	2.0	59.1	59.7	1%	to Montrose	1.2	17.1	35.0	104%
to I-370	1.0	61.7	61.9	0%	to I-270 mainline	0.9	22.0	32.4	47%
to MD 117	1.2	62.1	55.6	-10%					
to MD 124	0.8	56.8	60.4	6%					
to I-270 mainline	0.4	58.9	59.8	1%					
I-270 Local Total (miles/minutes)	8.5	59.4	58.8	-1%	I-270 Local Total (miles/minutes)	6.3	18.2	27.0	48%

* Final = HSR + VSL + ARM + MODE

Table A.5: AM Peak -2015 Final Model- I-270 Vehicle Density

I-270 Northbound	Type	Existing		Final		% Change	I-270 Southbound	Type	Existing		Final		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS			
I-270	Freeway	25	C	25	C	0%	I-270	Freeway	20	C	21	C	4%
I-270 Diverge to MD 187	Diverge	19	B	19	B	0%	I-270 Merge from WB I-70	Merge	13	B	14	B	4%
I-270	Freeway	22	C	22	C	0%	I-270	Freeway	24	C	25	C	4%
I-270 Diverge to Rockledge Rd	Diverge	19	B	19	B	0%	I-270 Merge from EB I-70	Merge	20	B	20	B	2%
I-270	Freeway	19	C	19	C	0%	I-270	Freeway	28	D	36	E	29%
I-270 Weave from MD 187 to I-270 HOV	Weave	10	B	11	B	1%	I-270 Diverge to SB MD 85	Diverge	31	D	40	E	29%
I-270 Lane Drop	Merge	15	B	15	B	0%	I-270	Freeway	27	D	38	E	37%
I-270	Freeway	27	D	27	D	0%	I-270 Diverge to NB MD 85	Diverge	15	B	19	B	25%
I-270 Merge from I-270 Spur	Merge	24	C	24	C	0%	I-270	Freeway	23	C	28	D	25%
I-270 Weave from I-270 HOV to I-270 C-D	Weave	27	C	27	C	0%	I-270 Merge from MD 85	Merge	14	B	15	B	2%
I-270	Freeway	23	C	23	C	1%	I-270	Freeway	36	E	30	D	-16%
I-270 Diverge to C-D (MD 189)	Diverge	21	C	21	C	1%	I-270 Diverge to MD 80	Diverge	39	E	19	B	-52%
I-270	Freeway	18	B	18	B	0%	I-270	Freeway	75	F	34	D	-55%
I-270 Diverge to C-D (MD 28)	Diverge	19	B	19	B	1%	I-270 Merge from MD 80	Merge	85	F	21	C	-76%
I-270	Freeway	15	B	15	B	0%	I-270	Freeway	55	F	41	E	-25%
I-270 Merge from C-D (MD 189)	Merge	18	B	18	B	-1%	I-270 Diverge to MD 109	Diverge	33	D	21	C	-37%
I-270 Diverge to C-D (Shady Grove Rd)	Diverge	26	C	26	C	1%	I-270	Freeway	66	F	41	E	-38%
I-270	Freeway	14	B	14	B	0%	I-270 Merge from MD 109	Merge	55	F	25	C	-54%
I-270 Weave from C-D (MD 28) to C-D (Shady Grove Rd)	Weave	13	B	13	B	0%	I-270	Freeway	47	F	46	F	-1%
I-270	Freeway	11	B	11	B	-1%	I-270 Diverge to SB Weigh Station	Diverge	19	B	22	C	12%
I-270 Merge from C-D (Shady Grove Rd)	Merge	10	B	10	A	-1%	I-270	Freeway	39	E	45	E	14%
I-270	Freeway	13	B	13	B	-1%	I-270 Merge from SB Weigh Station	Merge	20	C	22	C	10%
I-270 Merge from C-D (I-370)	Merge	11	B	11	B	0%	I-270	Freeway	41	E	41	E	-1%
I-270 Diverge to C-D (MD 117)	Diverge	16	B	16	B	0%	I-270 Diverge to MD 121	Diverge	20	C	19	B	-8%
I-270	Freeway	13	B	13	B	-1%	I-270	Freeway	31	D	28	D	-9%
I-270 Merge from C-D (MD 124)	Merge	14	B	14	B	0%	I-270 Merge from MD 121	Merge	32	D	22	C	-32%
I-270	Freeway	17	B	17	B	0%	I-270	Freeway	53	F	21	C	-60%
I-270 Diverge to EB Middlebrook Rd	Diverge	11	B	11	B	0%	I-270 Diverge to MD 27	Diverge	55	F	21	C	-61%
I-270	Freeway	15	B	15	B	0%	I-270	Freeway	80	F	23	C	-71%
I-270 Diverge to WB Middlebrook Rd	Diverge	10	A	10	A	-1%	I-270 Merge from WB MD 27	Merge	83	F	25	C	-70%
I-270	Freeway	14	B	14	B	0%	I-270	Freeway	78	F	34	D	-56%
I-270 Diverge to EB MD 118	Diverge	11	B	11	B	-2%	I-270 Weave from EB MD 27 to MD 118	Weave	76	F	27	C	-65%
I-270 Diverge to WB MD 118	Diverge	14	B	15	B	1%	I-270	Freeway	89	F	33	D	-62%
I-270	Freeway	13	B	13	B	0%	I-270 Merge from WB MD 118	Merge	70	F	25	C	-64%
I-270 Weave from MD 118 to MD 27	Weave	13	B	13	B	0%	I-270	Freeway	85	F	37	E	-57%
I-270	Freeway	12	B	12	B	0%	I-270 Merge from EB MD 118	Merge	70	F	29	D	-59%
I-270 Merge from EB MD 27	Merge	13	B	13	B	0%	I-270	Freeway	75	F	30	D	-60%
I-270	Freeway	13	B	13	B	0%	I-270 Merge from Middlebrook Rd	Merge	99	F	38	E	-62%
I-270 Merge from WB MD 27	Merge	10	A	10	A	-1%	I-270	Freeway	107	F	56	F	-48%
I-270	Freeway	14	B	13	B	0%	I-270 Diverge to MD 124	Diverge	93	F	104	F	12%
I-270 Diverge to MD 121	Diverge	10	A	10	A	0%	I-270	Freeway	92	F	87	F	-5%

* Final = HSR + VSL + ARM + MODE

Table A.5: AM Peak -2015 Final Model- I-270 Vehicle Density

I-270 Northbound	Type	Existing		Final		% Change	I-270 Southbound	Type	Existing		Final		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS	
I-270	Freeway	12	B	12	B	0%	I-270 Merge from WB MD 124	Merge	119	F	102	F	-14%
I-270 Merge from EB MD 121	Merge	9	A	9	A	-3%	I-270	Freeway	47	F	47	F	-1%
I-270 Lane Drop	Merge	13	B	13	B	-2%	I-270 Merge from MD 117	Merge	46	F	42	F	-10%
I-270	Freeway	18	C	18	C	0%	I-270	Freeway	48	F	40	E	-16%
I-270 Diverge to NB Weigh Station	Diverge	10	A	10	A	-1%	I-270 Diverge to I-370	Diverge	43	F	35	E	-19%
I-270	Freeway	20	C	20	C	-1%	I-270	Freeway	51	F	36	E	-28%
I-270 Merge from NB Weight Station	Merge	10	B	10	A	-2%	I-270 Diverge to I-270 C-D	Diverge	81	F	28	D	-65%
I-270	Freeway	20	C	20	C	-1%	I-270	Freeway	36	E	23	C	-35%
I-270 Diverge to MD 109	Diverge	11	B	10	B	-2%	I-270 Merge from I-270 (I-370)	Merge	94	F	22	C	-76%
I-270	Freeway	19	C	18	C	-1%	I-270 Diverge to I-270 C-D (Shady Grove Rd)	Diverge	87	F	23	C	-74%
I-270 Merge from MD 109	Merge	10	B	10	A	-4%	I-270	Freeway	90	F	21	C	-77%
I-270	Freeway	20	C	19	C	-2%	I-270 Merge from I-270 C-D (Shady Grove Rd Northern)	Merge	102	F	26	C	-75%
I-270 Diverge to MD 80	Diverge	12	B	11	B	-2%	I-270	Freeway	86	F	26	D	-70%
I-270	Freeway	18	B	17	B	-2%	I-270 Merge from I-270 C-D (Shady Grove Rd Southern)	Merge	107	F	23	C	-78%
I-270 Merge from MD 80	Merge	12	B	12	B	-3%	I-270 Diverge to I-270 C-D (MD 189)	Diverge	89	F	32	D	-64%
I-270	Freeway	22	C	22	C	-2%	I-270	Freeway	100	F	19	C	-81%
I-270 Diverge to Scenic View	Diverge	11	B	11	B	-1%	I-270 Merge from I-270 C-D (MD 189)	Merge	123	F	18	B	-85%
I-270	Freeway	22	C	22	C	-1%	I-270	Freeway	83	F	27	D	-68%
I-270 Merge from Scenic View	Merge	11	B	11	B	-2%	I-270 Merge from I-270 C-D	Merge	41	F	33	D	-18%
I-270	Freeway	22	C	22	C	-2%	I-270 Diverge to I-270 HOV Lane	Diverge	21	C	23	C	10%
I-270 Diverge to NB MD 85	Diverge	12	B	12	B	-2%	I-270 Diverge to I-270 Spur	Diverge	40	E	34	D	-14%
I-270	Freeway	21	C	21	C	-1%	I-270	Freeway	24	C	25	C	6%
I-270 Diverge to SB MD 85	Diverge	16	B	15	B	-2%	I-270 Diverge to Rockledge Dr / MD 187	Diverge	16	B	16	B	0%
I-270	Freeway	17	B	17	B	-3%	I-270	Freeway	25	C	26	D	6%
I-270 Weave from MD 85 to I-70	Weave	11	B	11	B	-2%	I-270 Merge from Rockledge Dr	Merge	20	B	20	C	2%
I-270	Freeway	15	B	15	B	-1%	I-270	Freeway	25	C	27	D	6%
							I-270 Merge from Rockledge Dr / MD 187	Merge	22	C	23	C	2%
							I-270	Freeway	27	D	29	D	6%

* Final = HSR + VSL + ARM + MODE

Table A.6: AM Peak -2015 Final Model- I-270 Spur Vehicle Density

I-270 Spur Northbound	Type	Existing		Final		% Change	I-270 Southbound	Type	Existing		Final		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS			
I-270 Spur	Freeway	34	D	34	D	0%	I-270 Spur	Freeway	48	F	30	D	-38%
I-270 Spur Merge from Clara Barton Parkway	Merge	24	C	24	C	0%	I-270 Spur Weave from I-270 HOV to Democracy Blvd	Weave	53	F	31	D	-42%
I-270 Spur	Freeway	37	E	37	E	0%	I-270 Spur	Freeway	52	F	30	D	-43%
I-270 Diverge to MD 190	Diverge	27	C	27	C	0%	I-270 Merge from Democracy Blvd	Merge	28	D	15	B	-48%
I-270 Spur	Freeway	32	D	32	D	0%	I-270 Spur Lane Drop	Merge	52	F	32	D	-38%
I-270 Spur Merge from Cabin John Parkway	Merge	23	C	23	C	0%	I-270 Spur	Freeway	72	F	40	E	-44%
I-270 Spur Merge from MD 190	Merge	23	C	23	C	0%	I-270 Spur Merge from I-495	Merge	37	E	31	D	-18%
I-270 Spur	Freeway	30	D	30	D	0%	I-270 Spur	Freeway	39	E	30	D	-22%
I-270 Spur Diverge to I-495	Merge	32	D	32	D	0%	I-270 Spur Diverve to EB MD 190	Diverge	46	F	34	D	-25%
I-270 Spur	Freeway	31	D	31	D	0%	I-270 Spur Diverve to Cabin John Pkwy	Diverge	27	C	27	C	1%
I-270 Spur Diverge to Democracy Blvd	Diverge	25	C	24	C	-2%	I-270 Spur	Freeway	28	D	28	D	-1%
I-270 Spur	Freeway	23	C	23	C	0%	I-270 Merge from MD 190	Merge	25	C	25	C	-1%
I-270 Spur Merge from EB Democracy Blvd	Merge	15	B	14	B	0%	I-270 Spur	Freeway	33	D	33	D	0%
I-270 Spur	Freeway	23	C	23	C	0%	I-270 Diverge to WB Clara Barton Pkwy	Diverge	22	C	22	C	0%
I-270 Spur Merge from WB Democracy Blvd	Merge	15	B	15	B	0%	I-270 Spur	Freeway	32	D	32	D	0%
I-270 Spur	Freeway	23	C	23	C	0%	I-270 Merge from Clara Barton Pkwy	Merge	28	D	28	D	0%
I-270 Spur Merge from Westlake Terrace	Merge	23	C	23	C	0%							
I-270 Spur	Freeway	24	C	24	C	0%							

* Final = HSR + VSL + ARM + MODE

Table A.7: AM Peak -2015 Final Model- I-270 Local Vehicle Density

I-270 Northbound	Type	Existing		Final		% Change	I-270 Southbound	Type	Existing		Final		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS			
I-270 C-D	Freeway	33	D	33	D	2%	I-270 C-D	Freeway	87	F	31	D	-64%
I-270 C-D Diverge to EB Montrose Rd	Diverge	21	C	21	C	0%	I-270 C-D Weave from I-370 EB to I-270	Weave	88	F	132	F	50%
I-270 C-D	Freeway	19	C	19	C	-1%	I-270 C-D Diverge to Shady Grove Rd	Diverge	53	F	70	F	31%
I-270 C-D Weave between Montrose Rd Loop Ramps	Weave	13	B	13	B	0%	I-270 C-D	Freeway	76	F	96	F	25%
I-270 C-D	Freeway	18	B	18	B	0%	I-270 C-D Merge from WB Shady Grove Rd	Merge	62	F	70	F	14%
I-270 C-D Merge from WB Montrose Rd	Merge	20	B	19	B	-4%	I-270 C-D	Freeway	75	F	78	F	4%
I-270 C-D	Freeway	28	D	27	D	-4%	I-270 C-D Merge from EB Shady Grove Rd	Merge	53	F	51	F	-4%
I-270 C-D Merge from I-270	Merge	28	D	27	C	-4%	I-270 C-D	Freeway	68	F	34	D	-50%
I-270 C-D	Freeway	29	D	28	D	-3%	I-270 C-D Merge from I-270	Merge	75	F	25	C	-67%
I-270 C-D Diverge to MD 189	Diverge	16	B	15	B	-4%	I-270 C-D Diverge to I-270	Diverge	42	F	48	F	16%
I-270 C-D	Freeway	22	C	22	C	-3%	I-270 C-D Diverge to I-270	Diverge	29	D	39	E	34%
I-270 C-D Merge from MD 189	Merge	15	B	15	B	1%	I-270 C-D	Freeway	20	C	26	D	29%
I-270 C-D	Freeway	29	D	28	D	-3%	I-270 C-D Diverge to MD 28	Diverge	13	B	17	B	32%
I-270 C-D Weave between I-270 (to MD 28 from MD 189)	Weave	28	C	27	C	-5%	I-270 C-D	Freeway	20	C	19	C	-5%
I-270 C-D	Freeway	30	D	29	D	-2%	I-270 C-D Merge from WB MD 28	Merge	36	E	12	B	-68%
I-270 C-D Diverge to MD 28	Diverge	21	C	21	C	-1%	I-270 C-D	Freeway	64	F	23	C	-65%
I-270 C-D	Freeway	26	C	25	C	-2%	I-270 C-D Merge from EB MD 28	Merge	134	F	23	C	-83%
I-270 C-D Weave between MD 28 Ramps	Weave	35	D	35	D	2%	I-270 C-D	Freeway	109	F	41	E	-62%
I-270 C-D	Freeway	10	A	10	A	-1%	I-270 C-D Merge from I-270	Merge	112	F	30	D	-73%
I-270 C-D Merge from MD 28 WB	Merge	7	A	7	A	-1%	I-270 C-D	Freeway	79	F	27	D	-66%
I-270 C-D Merge from I-270 and Drop Lane	Merge	9	A	9	A	-1%	I-270 C-D Diverge to MD 189	Diverge	48	F	25	C	-48%
I-270 C-D Diverge to I-270	Diverge	14	B	14	B	0%	I-270 C-D	Freeway	113	F	19	C	-83%
I-270 C-D	Freeway	23	C	23	C	-3%	I-270 C-D Merge from MD 189	Merge	110	F	23	C	-79%
I-270 C-D Diverge to Shady Grove Rd	Diverge	19	B	18	B	-2%	I-270 C-D Diverge to I-270	Diverge	68	F	34	D	-50%
I-270 C-D	Freeway	5	A	5	A	0%	I-270 C-D	Freeway	40	E	36	E	-10%
I-270 C- D Merge from I-270 and EB Shady Grove Rd	Merge	9	A	9	A	-1%	I-270 C-D Diverge to WB Montrose Rd	Diverge	26	C	19	B	-26%
I-270 C-D	Freeway	9	A	8	A	-1%	I-270 C-D	Freeway	53	F	34	D	-36%
I-270 C-D Merge from WB Shady Grove Rd	Merge	10	B	10	B	-2%	I-270 Weave between Montrose Rd Loops	Weave	61	F	26	C	-56%
I-270 C-D Diverge to I-270	Diverge	15	B	15	B	-1%	I-270 C-D	Freeway	67	F	38	E	-43%
I-270 C-D	Freeway	14	B	13	B	-1%	I-270 C-D Merge from EB Montrose Rd	Merge	54	F	26	C	-52%
I-270 C-D Diverge to I-370	Diverge	13	B	13	B	-2%	I-270 C-D	Freeway	59	F	52	F	-12%
I-270 C-D	Freeway	3	A	3	A	0%							
I-270 Merge from I-370 EB	Merge	6	A	6	A	-1%							
I-270 C-D	Freeway	7	A	7	A	0%							
I-270 C-D Weave from I-370 to I-270	Weave	16	B	16	B	0%							
I-270 C-D	Freeway	11	A	12	B	12%							
I-270 C-D Weave from I-270 to MD 117	Weave	16	B	24	C	49%							
I-270 C-D Diverge to MD 124	Diverge	11	B	9	A	-17%							
I-270 C-D	Freeway	2	A	2	A	-1%							
I-270 C-D Merge from EB MD 124	Merge	5	A	5	A	0%							
I-270 C-D Merge From WB MD 124	Merge	8	A	7	A	-2%							

* Final = HSR + VSL + ARM + MODE

Table A.8: AM Peak -2015 Final Model - I-270 Vehicle Throughput

I-270 Northbound	Existing VISSIM Throughput	Final VISSIM Throughput	% Change	I-270 Southbound	Existing VISSIM Throughput	Final VISSIM Throughput	% Change
Between I-495 and MD 187	4495	4495	0%	North of I-70	2502	2606	4%
Between MD 187 on and off ramps	3999	3999	0%	Between I-70 on ramps	2857	2956	3%
Between Rockledge Blvd on and off ramps	3361	3361	0%	From I-70 interchange to MD-85	4925	5010	2%
Between Rockledge Dr and I-270 Spur	3094	3091	0%	Between MD-85 on and off ramps	2771	2817	2%
Between I-270 Spur and Montrose Rd	8311	8312	0%	Between MD-85 and MD-80	3221	1981	-38%
Between Montrose Rd on and off ramps	4705	4703	0%	Between MD-80 on and off ramps	3185	2894	-9%
Between Montrose Rd and MD 189	4376	4374	0%	Between MD-80 and Md-109	3861	3553	-8%
Between MD 189 and MD 28	4381	4378	0%	Between MD-109 on and off ramps	3800	3491	-8%
Between MD 28 on and off ramps	4677	4660	0%	Between MD-109 and MD-121	4257	3934	-8%
Between MD 28 and Shady Grove Rd	3378	3357	-1%	Between MD-121 on and off ramps	4043	3778	-7%
Between Shady Grove Rd and I-370	2853	2834	-1%	Between MD-121 and MD-27	4694	4431	-6%
Between I-370 on and off ramps	3129	3106	-1%	Between MD-27 on and off ramps	4342	4388	1%
Between I-370 and MD 117	4195	4170	-1%	Between MD-27 and MD-118	4665	4854	4%
Between MD 117 and MD 124	3275	3252	-1%	Between MD-118 on and off ramps	4480	4722	5%
Between MD-124 on and off ramps	3278	3249	-1%	Between MD-118 and Middlebrook Rd	5032	5285	5%
Between MD 124 and Middlebrook Rd	4082	4082	0%	Between Middlebrook Rd on and off ramps	5031	5276	5%
Between Middlebrook Rd on and off ramps	3784	3783	0%	Between Middlebrook Rd and MD-124	6737	6744	0%
Between Middlebrook Rd and MD 118	3344	3343	0%	Between MD-124 on and off ramps	5818	5817	0%
Between MD-118 on and off ramps	3008	3004	0%	Between MD-124 and MD-117	6930	7023	1%
Between MD 118 and MD 27	2831	2832	0%	Between MD-117 and I-370	8479	8604	1%
Between MD-27 on and off ramps	2232	2234	0%	Between I-370 on and off ramps	3024	3018	0%
Between MD 27 and MD 121	2515	2500	-1%	Between I-370 on ramp to Shady Grove Rd	4111	3025	-26%
Between MD-121 on and off ramps	2211	2209	0%	Between Shady Grove Rd and MD 28	3568	3042	-15%
Between MD 121 and MD 109	2420	2386	-1%	Between MD 28 on and off ramps	4420	3882	-12%
Between MD-109 on and off ramps	2263	2228	-2%	Between MD 28 and MD 189	3950	3423	-13%
Between MD 109 and MD 80	2363	2334	-1%	Between MD 189 and Montrose Rd	3941	3439	-13%
Between MD-80 on and off ramps	2126	2089	-2%	Between Montrose Rd on and off ramps	4968	4464	-10%
Between MD 80 and MD 85	2656	2625	-1%	Between Montrose Rd and I-270 Spur	8098	7456	-8%
Between MD-85 on and off ramps	2016	1988	-1%	Between I-270 Spur and Rockledge Blvd	3901	3513	-10%
Between MD 85 and I-70	2858	2832	-1%	Between Rockledge Blvd on and off ramps	2845	2547	-10%
North of I-70	1832	1817	-1%	Between MD 187 on and off ramps	2986	2683	-10%
				Between MD 187 and I-495	3083	2862	-7%
I-270 Spur Northbound				I-270 Spur Southbound			
Between I-495 and Democracy Blvd	5178	5184	0%	Between I-270 Split and HOV on ramp	4233	3942	-7%
Between Democracy Blvd on and off ramps	4035	4038	0%	Between HOV on ramp and Democracy Blvd	4165	3942	-5%
Between Democracy Blvd and I-270 Split	4304	4303	0%	Between Democracy Blvd on and off ramps	3636	3456	-5%
				Between Democracy Blvd and I-495	4140	3987	-4%

*FINAL = HSR + VSL + ARM + MODE

Table A.9: AM Peak -2015 Final Model - I-270 Local Vehicle Throughput

I-270 Local Northbound	Existing VISSIM Throughput	Final VISSIM Throughput	% Change	I-270 Local Southbound	Existing VISSIM Throughput	Final VISSIM Throughput	% Change
Between Montrose Rd EB off ramp and and EB on ramp	2355	2352	0%	Between I-370 on ramp and I-270 off ramp	4068	3884	-5%
Between Montrose Rd EB on ramp and WB off ramp	2567	2563	0%	Between I-270 off ramp and Shady Grove off ramp	2942	3872	32%
Between Montrose Rd WB off ramp and on ramp	2151	2147	0%	Between Shady Grove off ramp and Shady Grove WB on ramp	1759	2662	51%
Between Montrose Rd WB on ramp and I-270 on ramp	3067	2979	-3%	Between Shady Grove WB and EB on ramps	2398	3259	36%
Between I-270 on ramp and MD 189 off ramp	3387	3294	-3%	Between Shady Grove on ramp and I-270 on ramp	2797	3617	29%
Between MD 189 ramps	2705	2630	-3%	Between I-270 on ramp and I-270 off ramp1	3423	4090	19%
Between MD 189 off ramp and I-270 on ramp	3252	3177	-2%	Between I-270 off ramp1 and I-270 off ramp2	2902	2645	-9%
Between I-270 on ramp and I-270 off ramp	3988	3907	-2%	Between I-270 off ramp2 and MD 28 off ramp	2031	1815	-11%
Between I-270 off ramp and MD 28 EB off ramp	2948	2897	-2%	Between MD 28 off ramp and MD 28 WB on ramp	1466	1307	-11%
Between MD 28 EB off ramp to MD 28 EB on ramp	2599	2547	-2%	Between MD 28 WB on ramp and MD 28 EB on ramp	1781	1586	-11%
Between MD 28 EB on ramp and MD 28 WB off ramp	2664	2628	-1%	Between MD 28 EB on ramp and I-270 on ramp	2841	2890	2%
Between MD 28 WB off ramp and MD 28 WB on ramp	1160	1148	-1%	Between I-270 on ramp and MD 189 off ramp	3310	3274	-1%
Between MD 28 WB on ramp and I-270 on ramp	1631	1619	-1%	Between MD 189 on and off ramps	2671	2654	-1%
Between I-270 on ramp and I-270 off ramp	2926	2917	0%	Between MD 189 on ramp and I-270 off ramp	3800	2427	-36%
Between I-270 off ramp and Shady Grove off ramp	2518	2515	0%	Between I-270 off ramp and Montrose Rd off ramp	2573	2435	-5%
Between Shady Grove off ramp and I-270 on ramp	321	322	0%	Between Montrose Rd off ramp and Montrose Rd WB on ramp	2455	2301	-6%
Between I-270 on ramp and Shady Grove WB on ramp	1562	1555	0%	Between Montrose Rd WB on ramp and EB off ramp	3375	3148	-7%
Between Shady Grove WB on ramp and I-270 off ramp	1887	1868	-1%	Between Montrose Rd EB off and on ramps	2652	2483	-6%
Between I-270 off ramp and I-370 off ramp	1609	1597	-1%	Between Montrose Rd EB off ramp and I-270	3384	3194	-6%
Between I-370 off ramp and I-370 EB on ramp	332	331	0%				
Between I-370 EB and WB on ramps	826	826	0%				
Between I-370 WB on ramp and I-270 off ramp	2397	2398	0%				
Between I-270 off ramp and I-270 on ramp	1334	1332	0%				
Between I-270 on ramp and MD 117 off ramp	2251	2239	-1%				
Between MD 117 off ramp and MD 124 off ramp	1034	1032	0%				
Between MD 124 off ramp and MD 124 EB on ramp	98	99	1%				
Between MD 124 EB and WB on ramps	487	491	1%				
Between MD 124 on ramp I-270	815	832	2%				

*FINAL = HSR + VSL + ARM + MODE

Table A.10: AM Peak -2015 Final Model- I-270 On Ramp Queue Length - Northbound

I-270 Northbound	Existing VISSIM Average Queue (feet)	Final VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	Final VISSIM Maximum Queue (feet)	% Change
Rockledge Dr on ramp	0	0	-	0	0	-
MD 189 C-D on ramp	0	0	-	0	0	-
MD 28 C-D on ramp	0	0	-	0	0	-
Shady Grove Rd C-D on ramp	0	0	-	0	0	-
I-370 C-D on ramp	0	0	-	0	0	-
MD 124 C-D on ramp	0	0	-	0	0	-
MD 118 on ramp	0	0	-	0	0	-
MD 27 EB on ramp	0	0	-	0	0	-
MD 27 WB on ramp	0	0	-	0	0	-
MD 121 on ramp	0	0	-	0	0	-
MD 109 on ramp	0	0	-	0	0	-
MD 80 on ramp	0	0	-	0	0	-
MD 85 on ramp	0	0	-	0	0	-
I-270 Spur Northbound	Existing VISSIM Average Queue (feet)	Final VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	Final VISSIM Maximum Queue (feet)	% Change
Democracy Blvd EB on ramp	0	0	-	0	0	-
Democracy Blvd WB on ramp	0	0	-	0	0	-
I-495 Northbound	Existing VISSIM Average Queue (feet)	Final VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	Final VISSIM Maximum Queue (feet)	% Change
Cabin John Pkwy on ramp	0	0	-	0	0	-
MD 190 on ramp	0	0	-	0	0	-
I-270 C-D Northbound	Existing VISSIM Average Queue (feet)	Final VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	Final VISSIM Maximum Queue (feet)	% Change
Montrose Rd EB on ramp	0	0	-	0	0	-
Montrose Rd WB on ramp	0	0	-	0	0	-
I-270 on ramp	0	0	-	0	0	-
MD 189 on ramp	0	0	-	0	0	-
I-270 on ramp	0	0	-	0	0	-
MD 28 EB on ramp	0	0	-100%	17	0	-100%
MD 28 WB on ramp	0	0	-	0	0	-
Shady Grove Rd EB on ramp	0	0	-	0	0	-
I-270 on ramp	0	0	-	0	0	-
Shady Grove Rd WB on ramp	0	0	-	0	0	-
I-370 EB on ramp	0	0	-	0	0	-
I-370 WB on ramp	0	1	-	0	74	-
I-270 on ramp	0	0	-	0	0	-
MD 124 EB on ramp	0	0	-	0	0	-
MD 124 WB on ramp	0	0	-	0	0	-

*Final = HSR + VSL + ARM + MODE

Table A.11: AM Peak -2015 Final Model- I-270 Off Ramp Queue Length - Northbound

I-270 Northbound	Existing VISSIM Average Queue (feet)	Final VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	Final VISSIM Maximum Queue (feet)	% Change
MD 187 off ramp NB	56	55	0%	347	435	25%
MD 187 off ramp SB	87	88	1%	439	316	-28%
Rockledge Dr off ramp	5	4	-17%	316	247	-22%
Tower Oaks Blvd off ramp	14	21	46%	165	156	-6%
Montrose Rd off ramp EB	0	0	-	0	0	-
Montrose Rd off ramp WB	0	17	-	0	293	-
MD 189 off ramp WB	11	11	-3%	97	108	11%
MD 189 off ramp EB	1	4	230%	131	250	91%
MD 28 off ramp EB	48	45	-6%	296	272	-8%
MD 28 off ramp WB	1	0	-100%	119	0	-100%
Shady Grove Rd off ramp - Redland Blvd	0	0	-	0	0	-
Shady Grove Rd off ramp WB	191	186	-3%	620	600	-3%
Shady Grove Rd off ramp EB	0	0	-	0	0	-
I-370 off ramp WB	0	0	-	0	0	-
I-370 off ramp EB	0	0	-	0	0	-
MD 117 off ramp	218	414	90%	793	1130	42%
MD 124 off ramp	340	259	-24%	957	906	-5%
Watkins Mill Rd off ramp*			-			-
Middlebrook Rd EB off ramp	0	0	-	0	0	-
Middlebrook Rd WB off ramp	0	0	-	0	0	-
MD 118 WB off ramp - Seneca Meadows	0	0	-100%	19	0	-100%
MD 118 WB off ramp	0	0	-	0	0	-
MD 118 EB off ramp	0	0	-	0	0	-
MD 27 off ramp WB	5	6	6%	83	87	5%
MD 27 off ramp EB	0	0	-	0	0	-
MD 121 off ramp WB	0	0	-60%	37	28	-24%
MD 121 off ramp EB	0	0	-	0	0	-
MD 109 off ramp EB	3	2	-19%	97	103	6%
MD 109 off ramp WB	0	0	-	0	0	-
MD 80 off ramp EB	5	5	-3%	110	105	-4%
MD 80 off ramp WB	2	0	-99%	34	9	-73%
MD 85 NB off ramp	0	0	-	0	0	-
MD 85 SB off ramp	0	0	-62%	66	41	-38%
I-270 Spur Northbound	Existing VISSIM Average Queue (feet)	Final VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	Final VISSIM Maximum Queue (feet)	% Change
Clara Barton Pkwy off ramp EB	1	0	-100%	157	0	-100%
Clara Barton Pkwy off ramp WB	0	23	-	0	392	-
MD 190 off ramp EB	0	0	-	0	0	-
MD 190 off ramp WB	0	103	-	0	473	-
Democracy Blvd off ramp WB	108	15	-87%	589	124	-79%
Democracy Blvd off ramp EB	16	0	-100%	149	0	-100%

* Ramp in Future Scenario

* Final = HSR + VSL + ARM + MODE

Table A.12: AM Peak -2015 Final Model- I-270 On Ramp Queue Length - Southbound

I-270 Southbound	Existing VISSIM Average Queue (feet)	Final VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	Final VISSIM Maximum Queue (feet)	% Change
MD 85 on ramp	0	0	-	0	0	-
MD 80 on ramp	575	0	-100%	2307	0	-100%
MD 109 on ramp	66.39	0.00	-100%	841	0	-100%
MD 121 WB on ramp	8.05	0.00	-100%	263	0	-100%
MD 121 EB on ramp*			-			-
MD 27 WB on ramp	145	0	-100%	1297	0	-100%
MD 27 EB on ramp	1	0	-100%	89	0	-100%
MD 118 WB on ramp	0	0	-	0	0	-
MD 118 EB on ramp	0.015	0.000	-100%	9	0	-100%
Middlebrook Rd on ramp	161	4065	2417%	1641	4194	156%
MD 124 WB on ramp	254	3	-99%	2615	187	-93%
MD 117 on ramp	94	0	-100%	1640	107	-93%
I-370 C-D on ramp	805	0	-100%	1861	0	-100%
Shady Grove Rd C-D on ramp North	2	0	-100%	160	0	-100%
Shady Grove Rd C-D on ramp South	68	0	-100%	927	0	-100%
MD 189 C-D on ramp	1393	0	-100%	3991	0	-100%
Montrose Rd C-D on ramp	2	0	-100%	246	0	-100%
Rockledge Dr on ramp	0	0	-	0	0	-
MD 187 on ramp	0	0	-	0	0	-
I-270 Spur Southbound	Existing VISSIM Average Queue (feet)	Final VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	Final VISSIM Maximum Queue (feet)	% Change
Democracy Blvd on ramp	0	0	-	0	0	-
I-495 Southbound	Existing VISSIM Average Queue (feet)	Final VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	Final VISSIM Maximum Queue (feet)	% Change
I-270 Spur on ramp	260	0	-100%	1015	0	-100%
MD 190 on ramp	0	50	-	0	630	-
I-270 C-D Southbound	Existing VISSIM Average Queue (feet)	Final VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	Final VISSIM Maximum Queue (feet)	% Change
I-270 on ramp	2305	2471	7%	5053	2936	-42%
I-370 on ramp	1241	0	-100%	2914	0	-100%
Shady Grove Rd WB on ramp	1	0	-100%	150	0	-100%
Shady Grove Rd EB on ramp	0	0	-100%	29	0	-100%
I-270 on ramp	0	0	-100%	39	0	-100%
MD 28 WB on ramp	6	0	-100%	121	0	-100%
MD 28 EB on ramp	3166	0	-100%	3877	0	-100%
I-270 on ramp	0	0	-100%	55	0	-100%
MD 189 on ramp	111	0	-100%	1104	0	-100%
Montrose Rd WB on ramp	8	0	-100%	440	0	-100%
Montrose Rd EB on ramp	0	0	-100%	95	0	-100%

* Ramp in Future Scenario

* Final = HSR + VSL + ARM + MODE

Table A.13: AM Peak -2015 Final Model- I-270 Off Ramp Queue Length - Southbound

I-270 Southbound	Existing VISSIM Average Queue (feet)	Final VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	Final VISSIM Maximum Queue (feet)	% Change
MD 85 SB off ramp	0	0	-	0	0	-
MD 85 NB off ramp	0	0	-	0	9	-
MD 80 off ramp	0.41	0.00	-100%	69	0	-100%
MD 109 off ramp WB	0.00	0.00	-100%	7	0	-100%
MD 109 off ramp EB	0	1	-	0	78	-
MD 121 off ramp EB	1	0	-100%	93	0	-100%
MD 121 off ramp WB	0	50	-	0	235	-
MD 27 off ramp EB	53	2	-96%	279	165	-41%
MD 27 off ramp WB	45	32	-30%	289	157	-46%
MD 118 off ramp EB	31	0	-100%	161	0	-100%
MD 118 off ramp WB	0	72	-	0	407	-
Watkins Mill Rd off ramp*						
MD 124 off ramp EB	75	19	-75%	342	468	37%
MD 124 off ramp WB	18	0	-100%	405	0	-100%
I-370 off ramp WB	0	0	-	0	0	-
I-370 off ramp EB	0	4	-	0	160	-
Shady Grove Rd off ramp - Omega Drive	6	0	-100%	194	0	-100%
Shady Grove Rd off ramp	0	1	-	0	77	-
MD 28 off ramp	3	38	1364%	132	258	96%
MD 189 off ramp EB	40	0	-100%	296	0	-100%
MD 189 off ramp WB	0	0	-	0	0	-
Montrose Rd off ramp WB	0	0	-	0	0	-
Montrose Rd off ramp EB	0	9	-	0	226	-
Rockledge Dr off ramp	18	48	166%	261	224	-14%
I-270 Spur Southbound	Existing VISSIM Average Queue (feet)	Final VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	Final VISSIM Maximum Queue (feet)	% Change
Democracy Blvd off ramp EB	51	0	-100%	230	0	-100%
Democracy Blvd off ramp WB	0	281	-	0	2265	-
MD 190 off ramp WB	995	0	-100%	2271	0	-100%
MD 190 off ramp EB	0	0	-	0	0	-
Clara Barton Pkwy WB off ramp	0	55	-	0	435	-

* Ramp in Future Scenario

* Final = HSR + VSL + ARM + MODE

Table A.14: AM Peak - Existing - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
1- MD 85 at Sam's Club Drive											
1	NB	18.8	B	NB Left	103	76	57	282	E	33.3	C
				NB Through	312	24	57	282	C		
				NB Right	581	6	6	284	A		
	SB	42.4	D	SB Left	110	57	123	552	E		
				SB Through	535	41	123	552	D		
				SB Right	52	24	123	552	C		
	EB	44.4	D	EB Left	81	70	42	165	E		
				EB Through	47	81	42	165	F		
				EB Right	102	7	42	165	A		
	WB	50.7	D	WB Left	204	72	75	302	E		
				WB Through	12	61	75	302	E		
				WB Right	100	6	75	302	A		
2- MD 85 at I-270 NB on and off ramp											
2	NB	42.6	D	NB Left	560	43	155	745	D	28.8	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	14.6	B	SB Left	0	0	0	0	A		
				SB Through	547	15	36	483	B		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
3- MD 85 at I-270 SB on and off ramp											
3	NB	4.3	A	NB Left	0	0	0	0	A	10.2	B
				NB Through	812	4	12	316	A		
				NB Right	0	0	0	0	A		
	SB	41.3	D	SB Left	154	41	37	267	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
4- MD 85 at Crestwood Blvd											
4	NB	15.8	C	NB Left	10	57	34	262	E	19.8	B
				NB Through	585	15	34	262	B		
				NB U-Turn	0	0	0	0	A		
	SB	13.7	B	SB Left	57	68	23	146	E		
				SB Through	1657	14	55	477	B		
				SB Right	751	9	43	467	A		
	EB	49.1	D	EB Left	481	51	70	208	D		
				EB Through	19	62	70	208	E		
				EB Right	32	10	70	208	A		
	WB	43.1	D	WB Left	37	56	17	111	E		
				WB Through	15	59	17	111	E		
				WB Right	19	6	17	111	A		
5- MD 80 at I-270 NB on and ramp											
5	NB	-1.1	A	NB Left	3	0	0	0	A	16.1	B
				NB Through	2	0	0	0	A		
				NB Right	4	-2	0	0	A		
	SB	12.8	B	SB Left	183	15	12	115	B		
				SB Through	5	17	12	115	B		
				SB Right	52	4	1	16	A		
	EB	7.0	A	EB Left	38	8	6	165	A		
				EB Through	0	0	8	0	A		
				EB Right	7	4	13	196	A		
	WB	17.2	B	WB Left	31	13	1	48	B		
				WB Through	684	24	94	544	C		
				WB Right	504	8	6	182	A		
6- MD 80 at I-270 SB on and off ramp											
6	NB	4.1	A	NB Left	22	25	1	113	C	22.2	C
				NB Through	0	0	0	0	A		
				NB Right	262	2	1	113	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	23.0	C	EB Left	0	0	0	0	A		
				EB Through	241	22	26	226	C		
				EB Right	133	25	26	235	D		
	WB	47.1	E	WB Left	0	0	0	0	A		
				WB Through	194	47	126	641	E		
				WB Right	0	0	0	0	A		
7- MD 109 at I-270 NB on and off ramp											
7	NB			NB Left	0	0	0	0	A	2.5	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	8.3	A	SB Left	118	11	7	116	B		
				SB Through	0	0	0	0	A		
				SB Right	38	1	0	0	A		
	EB	3.2	A	EB Left	59	3	0	36	A		
				EB Through	0	0	0	0	A		
				EB Right	40	3	0	0	A		
	WB	0.4	A	WB Left	0	0	0	0	A		
				WB Through	462	0	0	54	A		
				WB Right	0	0	0	0	A		
8- MD 80 at I-270 SB on and off ramp											
8	NB	2.5	A	NB Left	15	10	1	65	B	3.5	A
				NB Through	0	0	0	0	A		
				NB Right	41	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	3.4	A	EB Left	0	0	0	0	A		
				EB Through	59	0	0	34	A		
				EB Right	70	6	1	34	A		
	WB	3.6	A	WB Left	393	3	8	292	A		
				WB Through	109	5	8	269	A		
				WB Right	0	0	0	0	A		
9- MD 121 at Gateway Center Dr											
9	NB	8.4	A	NB Left	95	11	13	147	B	20.7	C
				NB Through	279	12	13	147	B		
				NB Right	198	2	17	173	A		
	SB	16.8	C	SB Left	47	11	31	312	B		
				SB Through	577	17	41	312	B		
				SB Right	6	13	46	333	B		
	EB	33.6	D	EB Left	7	37	86	427	D		
				EB Through	88	44	93	427	D		
				EB Right	547	32	117	459	C		
	WB	30.3	D	WB Left	96	35	19	123	D		
				WB Through	12	33	19	123	C		
				WB Right	21	7	13	142	A		
10- MD 121 at I-270 NB on and off ramp											
10	NB	1.7	A	NB Left	40	10	2	86	A	0.7	A
				NB Through	0	0	0	0	A		
				NB Right	253	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.1	A	EB Left	0	0	0	0	A		
				EB Through	318	0	0	0	A		
				EB Right	49	0	0	0	A		
	WB	0.6	A	WB Left	151	2	1	87	A		
				WB Through	1070	0	0	58	A		
				WB Right	0	0	0	0	A		

Table A.14: AM Peak - Existing - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
11- MD 121 at I-270 SB on and off ramp											
11	NB			NB Left	0	0	0	0	A	1.3	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	7.7	A	SB Left	123	10	6	120	B		
				SB Through	0	0	0	0	A		
				SB Right	46	1	0	0	A		
	EB	0.4	A	EB Left	25	2	0	35	A		
				EB Through	0	0	0	0	A		
				EB Right	833	0	0	0	A		
	WB	0.1	A	WB Left	0	0	0	0	A		
WB Through				277	0	0	0	A			
WB Right				0	0	0	0	A			
12- MD 27 at Observation Dr											
12	NB	48.0	D	NB U-Turn	0	0	0	0	A	19.3	B
				NB Through	34	63	10	64	E		
				NB Right	12	7	10	64	A		
	SB	40.9	D	SB Left	75	52	23	142	D		
				SB Through	43	60	30	226	E		
				SB Right	157	30	52	263	C		
	EB	13.0	B	EB Left	149	30	29	290	C		
				EB Through	1202	11	31	291	B		
				EB Right	50	9	38	329	A		
	WB	20.1	C	WB Left	83	15	138	788	B		
WB Through				2047	21	138	788	C			
WB Right				94	10	138	788	A			
13- MD 27 at I-270 NB off ramp											
13	NB	30.7	C	NB Left	89	31	12	90	C	11.6	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.1	A	EB Left	0	0	0	0	A		
				EB Through	891	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	15.7	B	WB Left	0	0	0	0	A		
WB Through				2110	16	194	1341	B			
WB Right				0	0	0	0	A			
14- MD 27 at I-270 SB off ramp											
14	NB			NB Left	0	0	0	0	A	24.7	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	49.6	D	SB Left	376	50	64	293	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	9.0	A	EB Left	0	0	0	0	A		
				EB Through	657	9	12	192	A		
				EB Right	0	0	0	0	A		
	WB	25.5	C	WB Left	0	0	0	0	A		
WB Through				1263	25	195	645	C			
WB Right				0	0	0	0	A			
15- MD 27 at Crystal Rock Dr											
15	NB	17.8	B	NB Left	22	18	31	405	B	38.3	D
				NB Through	819	18	57	405	B		
				NB Right	72	16	60	418	B		
	SB	46.4	D	SB Left	407	69	356	1190	E		
				SB Through	1333	40	356	1190	D		
				SB Right	40	27	320	1184	C		
	EB	44.6	D	EB Left	177	49	47	169	D		
				EB Through	74	49	43	164	D		
				EB Right	60	27	44	196	C		
	WB	56.0	E	WB Left	8	63	85	273	E		
WB Through				21	302	85	273	F			
WB Right				104	6	85	273	A			
16- MD 118 at Seneca Meadows Pkwy											
16	NB	3.4	A	NB Left	123	10	1	70	A	5.5	A
				NB Through	727	3	4	119	A		
				NB Right	79	1	8	171	A		
	SB	3.7	A	SB Left	25	5	5	169	A		
				SB Through	808	4	8	169	A		
				SB Right	32	2	9	202	A		
	EB	16.9	B	EB Left	15	64	8	69	E		
				EB Through	6	59	8	69	E		
				EB Right	96	7	8	69	A		
	WB	44.2	D	WB Left	30	65	12	94	E		
WB Through				5	68	8	94	E			
WB Right				21	9	11	113	A			
17- MD 118 at I-270 NB on ramp											
17	NB			NB Left	0	0	0	0	A	11.1	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	33.0	C	EB Left	222	33	44	277	C		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	6.0	A	WB Left	0	0	0	0	A		
WB Through				155	1	0	4	A			
WB Right				778	7	16	276	A			
18- MD 118 at I-270 SB off ramp											
18	NB			NB Left	0	0	0	0	A	7.4	A
				NB Through	0	0.0	0	0	A		
				NB Right	0	0.0	0	0	A		
	SB	41.5	D	SB Left	193	41.5	34	164	D		
				SB Through	0	0.0	0	0	A		
				SB Right	0	0.0	0	0	A		
	EB	3.1	A	EB Left	0	0.0	0	0	A		
				EB Through	615	3.1	4	135	A		
				EB Right	0	0.0	0	0	A		
	WB	3.6	A	WB Left	0	0.0	0	0	A		
WB Through				1036	3.6	7	209	A			
WB Right				0	0.0	0	0	A			
19- MD 118 at Aircraft Dr											
19	NB	45.2	D	NB Left	7	70	8	75	E	18.1	B
				NB Through	12	80	8	75	F		
				NB Right	14	3	0	22	A		
	SB	60.7	E	SB Left	241	58	98	368	E		
				SB Through	41	66	98	368	E		
				SB Right	81	67	98	368	E		
	EB	10.4	B	EB Left	102	13	28	310	B		
				EB Through	932	10	28	310	B		
				EB Right	27	9	28	310	A		
	WB	11.5	B	WB Left	73	17	31	246	B		
WB Through				899	14	31	246	B			
WB Right				277	4	31	246	A			
20- Middlebrook Rd at Observation Dr											
20	NB			NB Left	0	0	0	0	A	16.1	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	18.7	B	SB Left	22	35	4	44	D		
				SB Through	0	0	0	0	A		
				SB Right	25	4	4	44	A		
	EB	14.2	B	EB Left	240	21	31	226	C		
				EB Through	865	12	31	226	B		
				EB Right	0	0	0	0	A		
	WB	17.7	B	WB Left	0	0	0	0	A		
WB Through				1072	19	69	381	B			
WB Right				215	13	92	431	B			

Table A.14: AM Peak - Existing - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
21- Middlebrook Rd at I-270 SB on ramp											
21	NB			NB Left	0	0	0	0	A	16.0	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	11.2	B	EB Left	0	0	0	0	A		
				EB Through	805	11	26	186	B		
				EB Right	0	0	0	0	A		
	WB	21.3	C	WB Left	743	21	64	867	C		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
22- Middlebrook Rd at Waring Station Rd											
22	NB	63.1	E	NB Left	147	52	145	449	D	25.3	C
				NB Through	6	52	145	449	D		
				NB Right	342	68	145	449	E		
	SB	21.9	C	SB Left	3	37	1	29	D		
				SB Through	0	0	1	29	A		
				SB Right	3	7	2	67	A		
	EB	18.2	B	EB Left	28	12	124	845	B		
				EB Through	1483	19	124	845	B		
				EB Right	76	10	124	845	A		
	WB	16.1	B	WB Left	78	20	28	213	C		
				WB Through	682	16	28	213	B		
				WB Right	35	4	28	213	A		
23- MD 124 at MD 355											
23	NB	50.5	D	NB Left	229	69	72	198	E	83.6	F
				NB Through	306	42	70	196	D		
				NB Right	37	2	0	0	A		
	SB	33.5	C	SB Left	49	86	121	406	F		
				SB Through	966	50	121	406	D		
				SB Right	619	3	34	375	A		
	EB	99.1	F	EB Left	615	255	1024	1207	F		
				EB Through	528	22	1024	1207	C		
				EB Right	582	5	921	1184	A		
	WB	122.0	F	WB Left	0	0	0	0	A		
				WB Through	1884	123	727	1112	F		
				WB Right	42	68	0	0	E		
24- MD 124 at I-270 SB on and off											
24	NB	65.0	F	NB Left	15	66	15	78	E	22.2	C
				NB Through	29	64	15	78	E		
				NB U-Turn	0	0	0	0	A		
	SB	27.6	C	SB Left	306	67	81	347	E		
				SB Through	4	87	81	347	F		
				SB Right	572	6	13	335	A		
	EB	15.7	B	EB Left	0	0	0	0	A		
				EB Through	904	16	41	321	B		
				EB Right	67	12	50	345	B		
	WB	22.0	C	WB Left	33	27	116	1390	C		
				WB Through	1193	22	116	1390	C		
				WB Right	0	0	0	0	A		
25- MD 117 at MD 124											
25	NB	42.7	D	NB Left	16	65	95	577	E	43.0	D
				NB Through	421	58	95	577	E		
				NB Right	407	26	61	641	C		
	SB	37.8	D	SB Left	181	47	126	605	D		
				SB Through	839	40	126	605	D		
				SB Right	95	2	0	0	A		
	EB	48.4	D	EB Left	80	108	175	722	F		
				EB Through	1383	45	174	723	D		
				EB Right	66	44	187	750	D		
	WB	40.7	D	WB Left	314	73	108	332	E		
				WB Through	480	27	108	332	C		
				WB Right	95	0	0	0	A		
26- MD 117 at Bureau Dr											
26	NB	52.3	D	NB Left	18	70	16	93	E	42.3	D
				NB Through	17	79	16	93	E		
				NB Right	25	21	16	93	C		
	SB	63.4	E	SB Left	191	70	80	297	E		
				SB Through	43	68	80	297	E		
				SB Right	28	13	80	297	B		
	EB	47.0	D	EB Left	28	36	314	962	D		
				EB Through	1928	47	322	962	D		
				EB Right	20	59	315	951	E		
	WB	31.8	C	WB Left	298	93	195	602	F		
				WB Through	852	19	195	603	B		
				WB Right	316	8	169	651	A		
27- MD 117 at I-270 SB off ramp											
27	NB			NB Left	0	0	0	0	A	8.0	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	1.8	A	EB Left	0	0	0	0	A		
				EB Through	799	2	1	180	A		
				EB Right	0	0	0	0	A		
	WB	24.0	C	WB Left	310	24	45	344	C		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
28- MD 117 at I-270 NB off ramp											
28	NB			NB Left	0	0	0	0	A	30.5	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	49.1	D	SB Left	307	54	230	811	D		
				SB Through	0	0	0	0	A		
				SB Right	915	48	236	813	D		
	EB	19.4	B	EB Left	10	111	80	888	F		
				EB Through	782	18	80	888	B		
				EB Right	0	0	0	0	A		
	WB	14.2	B	WB Left	0	0	0	0	A		
				WB Through	860	14	51	343	B		
				WB Right	9	5	55	373	A		
29- MD 117 at Perry Pkwy											
29	NB	42.5	D	NB Left	35	67	14	97	E	13.6	B
				NB Through	6	61	14	96	E		
				NB Right	31	11	23	117	B		
	SB	33.8	C	SB Left	91	72	37	167	E		
				SB Through	13	72	37	167	E		
				SB Right	124	2	37	167	A		
	EB	10.3	B	EB Left	119	69	42	237	E		
				EB Through	957	3	42	237	A		
				EB Right	9	1	29	221	A		
	WB	9.9	A	WB Left	5	87	20	261	F		
				WB Through	709	10	20	261	A		
				WB Right	104	5	20	261	A		
30- Shady Grove Rd at I-270 NB off ramp											
30	NB	9.5	A	NB Left	0	0	0	0	A	24.6	C
				NB Through	917	9	21	216	A		
				NB Right	0	0	0	0	A		
	SB	10.1	B	SB Left	0	0	0	0	A		
				SB Through	1284	10	31	344	B		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	56.8	E	WB Left	1008	57	201	631	E		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table A.14: AM Peak - Existing - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
31- Shady Grove Rd at I-270 SB off ramp											
31	NB	14.6	B	NB Left	0	0	0	0	A	21.0	C
				NB Through	920	15	41	379	B		
				NB Right	0	0	0	0	A		
	SB	11.4	B	SB Left	0	0	0	0	A		
				SB Through	1692	11	46	658	B		
				SB Right	0	0	0	0	A		
	EB	44.2	D	EB Left	313	37	42	360	D		
				EB Through	0	0	0	0	A		
				EB Right	642	48	102	463	D		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
32- MD 28 at I-270 SB off ramp											
32	NB			NB U-Turn	0	0	0	0	A	32.6	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	35.9	D	SB Left	456	44	72	304	D		
				SB Through	0	0	0	0	A		
				SB Right	108	3	0	59	A		
	EB	57.4	E	EB Left	0	0	0	0	A		
				EB Through	1050	87	1521	2131	F		
				EB Right	663	11	1050	2134	B		
	WB	9.1	A	WB Left	0	0	0	0	A		
				WB Through	1879	9	32	405	A		
				WB Right	0	0	0	0	A		
33- MD 28 at I-270 on and off ramps											
33	NB	34.9	C	NB Left	0	0	54	306	A	17.4	B
				NB Through	213	51	62	315	D		
				NB Right	139	11	62	315	B		
	SB	21.1	C	SB Left	25	60	19	169	E		
				SB Through	0	0	0	0	A		
				SB Right	260	17	19	169	B		
	EB	15.0	B	EB Left	224	28	46	333	C		
				EB Through	829	11	46	333	B		
				EB Right	0	0	0	0	A		
	WB	12.3	B	WB Left	22	11	41	286	B		
				WB Through	887	12	29	249	B		
				WB Right	0	0	0	0	A		
34- MD 189 at Great Falls Rd											
34	NB	40.7	D	NB Left	62	45	16	111	D	10.0	B
				NB Through	6	42	13	110	D		
				NB Right	8	8	15	121	A		
	SB	5.2	A	SB Left	66	46	20	162	D		
				SB Through	7	40	20	162	D		
				SB Right	601	0	0	0	A		
	EB	10.2	B	EB Left	325	16	14	215	B		
				EB Through	920	8	18	229	A		
				EB Right	13	6	26	265	A		
	WB	12.1	B	WB Left	3	21	16	184	C		
				WB Through	315	12	16	184	B		
				WB Right	10	9	27	218	A		
35- MD 189 at I-270 Ramps											
35	NB	50.5	D	NB Left	133	51	25	119	D	41.6	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	48.3	D	SB Left	184	48	54	316	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	23.2	C	EB Left	384	20	81	458	B		
				EB Through	529	26	81	458	C		
				EB Right	0	0	0	0	A		
	WB	59.1	E	WB Left	533	50	137	497	D		
				WB Through	284	76	137	497	E		
				WB Right	0	0	0	0	A		
36- MD 189 at Wootton Pkwy											
36	NB	43.1	D	NB Left	129	52	52	178	D	58.1	E
				NB Through	100	80	52	178	E		
				NB Right	151	12	52	178	B		
	SB	91.5	F	SB Left	385	105	294	792	F		
				SB Through	516	81	218	720	F		
				SB Right	0	0	0	0	A		
	EB	48.8	D	EB Left	132	75	214	884	E		
				EB Through	958	48	214	884	D		
				EB Right	95	23	214	884	C		
	WB	42.6	D	WB Left	423	62	108	314	E		
				WB Through	390	27	108	314	C		
				WB Right	58	5	108	314	A		
37- Montrose Rd at Tower Oaks Blvd											
37	NB			NB Left	0	0	0	0	A	26.1	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	106.3	F	SB Left	126	40	201	957	D		
				SB Through	0	0	0	0	A		
				SB Right	521	122	323	955	F		
	EB	7.9	A	EB Left	28	16	25	421	B		
				EB Through	1424	8	25	421	A		
				EB Right	0	0	0	0	A		
	WB	9.2	A	WB Left	0	0	0	0	A		
				WB Through	1443	9	26	286	A		
				WB Right	62	4	26	286	A		
38- Tower Oaks Blvd at I-270 off ramp											
38	NB	15.7	B	NB Left	475	16	25	187	B	14.8	B
				NB Through	12	17.0	19	179	B		
				NB Right	26	4.9	25	187	A		
	SB	0.1	A	SB Left	2	-0.2	0	16	A		
				SB Through	0	0.0	0	16	A		
				SB Right	2	0.5	0	0	A		
	EB	14.6	B	EB Left	7	11.4	39	282	B		
				EB Through	621	15.1	39	282	B		
				EB Right	91	11.5	32	272	B		
	WB	11.9	B	WB Left	0	0.0	4	71	A		
				WB Through	84	12.6	4	71	B		
				WB Right	7	4.2	0	0	A		
39- Montrose Rd at Tower Oaks Blvd											
39	NB	9.6	A	NB Left	26	45	21	127	D	61.8	E
				NB Through	188	30	21	127	C		
				NB Right	507	0	0	0	A		
	SB	38.9	D	SB Left	297	70	128	520	E		
				SB Through	605	26	127	519	C		
				SB Right	64	18	130	533	B		
	EB	144.4	F	EB Left	56	123	558	723	F		
				EB Through	816	146	559	724	F		
				EB Right	45	147	582	747	F		
	WB	39.8	D	WB Left	362	48	77	299	D		
				WB Through	231	46	77	299	D		
				WB Right	134	7	91	329	A		
40- Rockledge Blvd at I-270 NB on and off ramp											
40	NB			NB Left	0	0	0	0	A	16.0	B
				NB Through	85	32	30	146	C		
				NB Right	195	34	30	146	C		
	SB	2.3	A	SB Left	0	0	6	75	A		
				SB Through	986	2	6	75	A		
				SB Right	0	0	0	0	A		
	EB	24.3	C	EB Left	5	35	109	424	C		
				EB Through	501	50	109	424	D		
				EB Right	550	1	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table A.14: AM Peak - Existing - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
41- Rockledge Blvd at I-270 SB on and off ramps											
41	NB	2.6	A	NB Left	89	3	1	25	A	20.5	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	21.6	C	WB Left	986	23	98	664	C		
				WB Through	452	19	98	664	B		
				WB Right	0	0	0	0	A		
42- MD 187 at Tuckerman Ln											
42	NB	290.3	F	NB Left	184	172	1149	1512	F	195.3	F
				NB Through	1181	240	1149	1512	F		
				NB Right	143	859	1149	1512	F		
	SB	172.4	F	SB Left	60	147	2547	2696	F		
				SB Through	1511	171	2547	2696	F		
				SB Right	177	192	2547	2696	F		
	EB	65.2	E	EB Left	185	47	206	895	D		
				EB Through	548	73	207	896	E		
				EB Right	135	58	228	920	E		
	WB	203.3	F	WB Left	702	243	1957	2147	F		
				WB Through	354	165	1957	2147	F		
				WB Right	135	100	1957	2147	F		
43- MD 187 at I-270 NB on and off ramps											
43	NB	67.1	E	NB Left	153	90	240	435	F	44.4	D
				NB Through	1250	64	240	435	E		
				NB Right	0	0	0	0	A		
	SB	24.4	C	SB Left	0	0	0	0	A		
				SB Through	1718	24	91	590	C		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	64.9	E	WB Left	120	64	63	355	E		
				WB Through	10	75	63	355	E		
				WB Right	0	0	0	0	A		
44- MD 187 at I-270 NB on and off ramps											
44	NB	131.6	F	NB Left	0	0	0	0	A	62.8	E
				NB Through	1241	132	392	892	F		
				NB Right	0	0	0	0	A		
	SB	7.5	A	SB Left	193	56	63	268	E		
				SB Through	1641	2	63	268	A		
				SB Right	0	0	0	0	A		
	EB	91.6	F	EB Left	190	98	179	700	F		
				EB Through	0	0	179	700	A		
				EB Right	370	88	218	693	F		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
45- MD 187 at Rock Spring Dr											
45	NB	19.7	B	NB Left	192	61	84	380	E	22.2	C
				NB Through	1193	13	84	381	B		
				NB Right	6	16	104	414	B		
	SB	21.0	C	SB Left	12	25	104	666	C		
				SB Through	1837	23	104	666	C		
				SB Right	160	1	74	661	A		
	EB	38.3	D	EB Left	160	64	45	180	E		
				EB Through	22	54	45	180	D		
				EB Right	197	16	45	180	B		
	WB	4.8	A	WB Left	1	14	0	19	B		
				WB Through	8	6	0	19	A		
				WB Right	4	-1	0	0	A		
47-Democracy Blvd at I-270 NB off ramp											
47	NB	31.2	C	NB Left	212	31	26	165	C	14.0	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	13.5	B	EB Left	0	0	0	0	A		
				EB Through	1585	13	52	439	B		
				EB Right	0	0	0	0	A		
	WB	10.1	B	WB Left	0	0	0	0	A		
				WB Through	736	10	21	176	B		
				WB Right	0	0	0	0	A		
48- Democracy Blvd at I-270 SB on ramp											
48	NB			NB Left	0	0	0	0	A	6.3	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	5.0	A	EB Left	0	0	0	0	A		
				EB Through	1691	5	20	274	A		
				EB Right	0	0	0	0	A		
	WB	8.6	A	WB Left	210	37	30	188	D		
				WB Through	733	1	19	167	A		
				WB Right	0	0	0	0	A		
49- Democracy Blvd at I-270 SB off ramp											
49	NB			NB Left	0	0	0	0	A	12.4	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	33.1	C	SB Left	334	49	58	237	D		
				SB Through	0	0	0	0	A		
				SB Right	173	2	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	2.5	A	WB Left	0	0	0	0	A		
				WB Through	732	3	4	112	A		
				WB Right	323	2	0	103	A		
50- MD 190 at Burdette Rd											
50	NB	76.6	E	NB Left	19	69	12	111	E	11.8	B
				NB Through	3	74	12	111	E		
				NB Right	8	95	12	111	F		
	SB	33.2	C	SB Left	41	84	27	151	F		
				SB Through	13	84	27	151	F		
				SB Right	113	9	27	151	A		
	EB	9.6	A	EB Left	47	98	53	454	F		
				EB Through	1709	7	52	453	A		
				EB Right	15	5	42	477	A		
	WB	10.7	B	WB Left	0	87	45	661	F		
				WB Through	1437	11	46	662	B		
				WB Right	18	3	41	702	A		

Table A.14: AM Peak - Existing - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
51- MD 190 at I-270 NB on ramp											
51	NB			NB Left	0	0	0	0	A	37.1	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	81.7	F	EB Left	493	82	233	519	F		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	14.6	B	WB Left	0	0	0	0	A		
				WB Through	975	15	62	601	B		
				WB Right	0	0	0	0	A		
52- MD 190 at I-270 SB off ramp											
52	NB	78.7	E	NB Left	251	79	996	2228	E	14.3	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	2.9	A	EB Left	0	0	0	0	A		
				EB Through	864	3	6	140	A		
				EB Right	0	0	0	0	A		
	WB	4.8	A	WB Left	0	0	0	0	A		
				WB Through	675	5	6	147	A		
				WB Right	0	0	0	0	A		
53- MD 190 at Seven Locks Rd											
53	NB	66.4	E	NB Left	17	67	16	123	E	43.0	D
				NB Through	44	66	19	123	E		
				NB Right	0	0	0	0	A		
	SB	67.6	E	SB Left	581	67	199	696	E		
				SB Through	145	68	199	696	E		
				SB Right	13	73	198	696	E		
	EB	29.4	C	EB Left	18	25	93	480	C		
				EB Through	781	29	93	480	C		
				EB Right	32	30	93	480	C		
	WB	34.1	C	WB Left	121	113	109	329	F		
				WB Through	642	27	112	331	C		
				WB Right	159	1	2	57	A		
54- MD 124 at I-270 NB off ramp											
54	NB	84.3	F	NB Left	0	0	0	0	A	95.4	F
				NB Through	0	0	0	0	A		
				NB Right	920	84	345	963	F		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	107.9	F	EB Left	0	0	0	0	A		
				EB Through	813	108	473	1086	F		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
55- Democracy Blvd at I-270 NB off ramp											
55	NB	37.9	D	NB Left	0	0	0	0	A	16.9	B
				NB Through	0	0	0	0	A		
				NB Right	926	38	117	601	D		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	4.6	A	EB Left	0	0	0	0	A		
				EB Through	1586	5	18	88	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table A.15: AM Peak -2015 Final Model - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
1- MD 85 at Sam's Club Drive											
1	NB	19.3	B	NB Left	102	74	59	373	E	33.5	C
				NB Through	313	25	59	373	C		
				NB Right	582	7	8	286	A		
	SB	42.8	D	SB Left	110	58	127	621	E		
				SB Through	533	42	127	621	D		
				SB Right	52	22	127	621	C		
	EB	44.5	D	EB Left	80	71	43	142	E		
				EB Through	47	81	43	142	F		
				EB Right	102	7	43	142	A		
	WB	50.0	D	WB Left	209	70	74	334	E		
				WB Through	13	68	74	334	E		
				WB Right	100	6	74	334	A		
2- MD 85 at I-270 NB on and off ramp											
2	NB	38.9	D	NB Left	563	39	138	726	D	26.3	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	13.3	B	SB Left	0	0	0	0	A		
				SB Through	546	13	31	414	B		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
3- MD 85 at I-270 SB on and off ramp											
3	NB	4.4	A	NB Left	0	0	0	0	A	10.6	B
				NB Through	813	4	12	319	A		
				NB Right	0	0	0	0	A		
	SB	44.0	D	SB Left	153	44	40	245	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
4- MD 85 at Crestwood Blvd											
4	NB	16.0	C	NB Left	10	57	34	274	E	19.6	B
				NB Through	585	15	34	274	B		
				NB U-Turn	0	0	0	0	A		
	SB	13.5	B	SB Left	57	64	20	147	E		
				SB Through	1665	14	56	540	B		
				SB Right	755	9	45	530	A		
	EB	49.1	D	EB Left	482	51	70	218	D		
				EB Through	19	57	70	218	E		
				EB Right	32	12	70	218	B		
	WB	43.1	D	WB Left	37	56	16	116	E		
				WB Through	15	59	16	116	E		
				WB Right	19	7	16	116	A		
5- MD 80 at I-270 NB on and off ramp											
5	NB	-1.4	A	NB Left	4	0	0	0	A	6.5	A
				NB Through	1	0	0	0	A		
				NB Right	5	-3	0	0	A		
	SB	12.3	B	SB Left	180	15	11	111	B		
				SB Through	5	17	11	111	B		
				SB Right	51	2	0	0	A		
	EB	7.9	A	EB Left	38	9	6	111	A		
				EB Through	0	0	8	0	A		
				EB Right	7	4	13	142	A		
	WB	5.4	A	WB Left	31	7	0	47	A		
				WB Through	682	9	25	355	A		
				WB Right	502	1	0	0	A		
6- MD 80 at I-270 SB on and off ramp											
6	NB	2.1	A	NB Left	20	4	0	51	A	6.2	A
				NB Through	0	0	0	0	A		
				NB Right	242	2	0	51	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	7.7	A	EB Left	0	0	0	0	A		
				EB Through	242	8	6	119	A		
				EB Right	133	7	5	128	A		
	WB	8.9	A	WB Left	0	0	0	0	A		
				WB Through	193	9	2	196	A		
				WB Right	0	0	0	0	A		
7- MD 109 at I-270 NB on and off ramp											
7	NB			NB Left	0	0	0	0	A	2.3	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	7.6	A	SB Left	117	10	6	120	A		
				SB Through	0	0	0	0	A		
				SB Right	37	1	0	34	A		
	EB	3.4	A	EB Left	59	3	0	38	A		
				EB Through	0	0	0	0	A		
				EB Right	40	3	0	0	A		
	WB	0.3	A	WB Left	0	0	0	0	A		
				WB Through	462	0	0	0	A		
				WB Right	0	0	0	0	A		
8- MD 80 at I-270 SB on and off ramp											
8	NB	3.8	A	NB Left	14	12	1	68	B	2.4	A
				NB Through	0	0	0	0	A		
				NB Right	38	1	0	12	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	3.0	A	EB Left	0	0	0	0	A		
				EB Through	59	0	0	30	A		
				EB Right	70	5	0	30	A		
	WB	2.1	A	WB Left	393	2	2	142	A		
				WB Through	108	4	1	119	A		
				WB Right	0	0	0	0	A		
9- MD 121 at Gateway Center Dr											
9	NB	8.9	A	NB Left	95	13	14	148	B	59.7	E
				NB Through	276	12	14	148	B		
				NB Right	195	2	18	174	A		
	SB	40.0	E	SB Left	47	14	89	542	B		
				SB Through	569	42	108	542	D		
				SB Right	6	32	118	563	C		
	EB	170.8	F	EB Left	5	96	323	504	F		
				EB Through	55	139	326	504	F		
				EB Right	340	177	355	537	F		
	WB	33.1	D	WB Left	96	38	21	135	D		
				WB Through	12	36	22	135	D		
				WB Right	21	8	15	159	A		
10- MD 121 at I-270 NB on and off ramp											
10	NB	1.9	A	NB Left	40	11	2	84	B	43.2	E
				NB Through	0	0	0	0	A		
				NB Right	252	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.1	A	EB Left	0	0	0	0	A		
				EB Through	312	0	0	0	A		
				EB Right	49	0	0	0	A		
	WB	71.5	F	WB Left	127	9	333	1074	A		
				WB Through	852	81	577	1047	F		
				WB Right	0	0	0	0	A		

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Table A.15: AM Peak -2015 Final Model- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
11- MD 121 at I-270 SB on and off ramp											
11	NB			NB Left	0	0	0	0	A	62.4	F
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	7.2	A	SB Left	116	10	5	104	A		
				SB Through	0	0	0	0	A		
				SB Right	45	1	0	0	A		
	EB	90.6	F	EB Left	25	2	0	46	A		
				EB Through	0	0	0	0	A		
				EB Right	641	94	642	890	F		
	WB	19.4	B	WB Left	0	0	0	0	A		
WB Through				229	19	0	0	C			
WB Right				0	0	0	0	A			
12- MD 27 at Observation Dr											
12	NB	45.3	D	NB U-Turn	0	0	0	0	A	47.8	D
				NB Through	34	59	10	64	E		
				NB Right	12	7	10	64	A		
	SB	49.5	D	SB Left	75	47	21	147	D		
				SB Through	43	54	40	225	D		
				SB Right	156	49	65	262	D		
	EB	16.1	B	EB Left	149	40	38	309	D		
				EB Through	1200	13	40	310	B		
				EB Right	48	12	47	349	B		
	WB	68.8	E	WB Left	79	44	440	843	D		
WB Through				1925	71	440	843	E			
WB Right				83	46	440	843	D			
13- MD 27 at I-270 NB off ramp											
13	NB	31.1	C	NB Left	90	31	12	95	C	33.4	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.1	A	EB Left	0	0	0	0	A		
				EB Through	890	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	48.4	D	WB Left	0	0	0	0	A		
WB Through				1974	48	1685	2482	D			
WB Right				0	0	0	0	A			
14- MD 27 at I-270 SB off ramp											
14	NB			NB Left	0	0	0	0	A	15.5	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	46.4	D	SB Left	375	46	61	248	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	9.1	A	EB Left	0	0	0	0	A		
				EB Through	657	9	12	195	A		
				EB Right	0	0	0	0	A		
	WB	9.4	A	WB Left	0	0	0	0	A		
WB Through				1195	9	22	360	A			
WB Right				0	0	0	0	A			
15- MD 27 at Crystal Rock Dr											
15	NB	17.3	B	NB Left	22	20	29	374	B	36.3	D
				NB Through	820	17	55	382	B		
				NB Right	72	17	58	395	B		
	SB	43.3	D	SB Left	393	67	289	1411	E		
				SB Through	1306	37	289	1411	D		
				SB Right	40	22	254	1405	C		
	EB	44.2	D	EB Left	177	48	47	169	D		
				EB Through	73	50	43	164	D		
				EB Right	60	25	43	196	C		
	WB	56.0	E	WB Left	8	63	85	273	E		
WB Through				21	302	85	273	F			
WB Right				104	6	85	273	A			
16- MD 118 at Seneca Meadows Pkwy											
16	NB	3.3	A	NB Left	124	10	1	50	B	5.3	A
				NB Through	736	2	4	128	A		
				NB Right	80	1	8	182	A		
	SB	3.5	A	SB Left	25	5	4	158	A		
				SB Through	808	4	7	158	A		
				SB Right	32	2	9	187	A		
	EB	16.6	B	EB Left	15	62	8	69	E		
				EB Through	6	59	8	69	E		
				EB Right	96	7	8	69	A		
	WB	44.0	D	WB Left	30	65	12	94	E		
WB Through				5	69	8	94	E			
WB Right				21	9	11	113	A			
17- MD 118 at I-270 NB on ramp											
17	NB			NB Left	0	0	0	0	A	10.9	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	32.7	C	EB Left	222	33	44	277	C		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	5.7	A	WB Left	0	0	0	0	A		
WB Through				155	1	0	0	A			
WB Right				778	7	15	252	A			
18- MD 118 at I-270 SB off ramp											
18	NB			NB Left	0	0	0	0	A	7.8	A
				NB Through	0	0.0	0	0	A		
				NB Right	0	0.0	0	0	A		
	SB	39.3	D	SB Left	206	39.3	35	160	D		
				SB Through	0	0.0	0	0	A		
				SB Right	0	0.0	0	0	A		
	EB	3.3	A	EB Left	0	0.0	0	0	A		
				EB Through	615	3.3	4	120	A		
				EB Right	0	0.0	0	0	A		
	WB	4.2	A	WB Left	0	0.0	0	0	A		
WB Through				1035	4.2	8	184	A			
WB Right				0	0.0	0	0	A			
19- MD 118 at Aircraft Dr											
19	NB	45.2	D	NB Left	7	70	8	75	E	18.2	B
				NB Through	12	80	8	75	F		
				NB Right	14	3	0	22	A		
	SB	60.7	E	SB Left	241	58	98	368	E		
				SB Through	41	66	98	368	E		
				SB Right	81	67	98	368	E		
	EB	10.4	B	EB Left	102	13	28	310	B		
				EB Through	932	10	28	310	B		
				EB Right	27	9	28	310	A		
	WB	11.9	B	WB Left	73	21	32	254	C		
WB Through				904	14	32	254	B			
WB Right				277	4	32	254	A			
20- Middlebrook Rd at Observation Dr											
20	NB			NB Left	0	0	0	0	A	63.3	E
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	19.9	B	SB Left	22	35	4	49	D		
				SB Through	0	0	0	0	A		
				SB Right	24	6	4	49	A		
	EB	18.7	B	EB Left	205	30	37	281	C		
				EB Through	746	16	37	281	B		
				EB Right	0	0	0	0	A		
	WB	102.6	F	WB Left	0	0	0	0	A		
WB Through				942	112	369	506	F			
WB Right				190	55	408	555	E			

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Table A.15: AM Peak -2015 Final Model- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
21- Middlebrook Rd at I-270 SB on ramp											
21	NB			NB Left	0	0	0	0	A	114.9	F
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	17.7	B	EB Left	0	0	0	0	A		
				EB Through	656	18	35	228	B		
				EB Right	0	0	0	0	A		
	WB	212.3	F	WB Left	655	212	2178	2402	F		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
22- Middlebrook Rd at Waring Station Rd											
22	NB	332.7	F	NB Left	82	259	439	503	F	111.9	F
				NB Through	4	221	439	503	F		
				NB Right	203	365	439	503	F		
	SB	20.4	C	SB Left	3	35	1	29	C		
				SB Through	0	0	1	29	A		
				SB Right	3	6	2	67	A		
	EB	118.5	F	EB Left	26	34	1046	1305	C		
				EB Through	1275	120	1046	1305	F		
				EB Right	62	121	1046	1305	F		
	WB	15.9	B	WB Left	73	21	27	213	C		
				WB Through	648	16	27	213	B		
				WB Right	33	4	27	213	A		
23- MD 124 at MD 355											
23	NB	50.8	D	NB Left	230	70	73	211	E	82.8	F
				NB Through	306	42	71	209	D		
				NB Right	37	2	0	0	A		
	SB	33.2	C	SB Left	50	84	120	410	F		
				SB Through	965	50	120	410	D		
				SB Right	620	3	26	348	A		
	EB	95.7	F	EB Left	612	247	1001	1203	F		
				EB Through	527	22	1001	1203	C		
				EB Right	586	4	960	1185	A		
	WB	122.8	F	WB Left	0	0	0	0	A		
				WB Through	1887	124	722	1106	F		
				WB Right	42	79	0	0	E		
24- MD 124 at I-270 SB on and off											
24	NB	64.8	F	NB Left	15	67	15	86	E	21.1	C
				NB Through	29	64	15	86	E		
				NB U-Turn	0	0	0	0	A		
	SB	26.0	C	SB Left	301	63	77	412	E		
				SB Through	3	89	77	412	F		
				SB Right	567	6	14	398	A		
	EB	15.2	B	EB Left	0	0	0	0	A		
				EB Through	905	15	41	316	B		
				EB Right	68	13	50	340	B		
	WB	20.6	C	WB Left	32	24	112	1070	C		
				WB Through	1208	20	112	1070	C		
				WB Right	0	0	0	0	A		
25- MD 117 at MD 124											
25	NB	112.2	F	NB Left	14	107	283	697	F	90.0	F
				NB Through	391	122	283	697	F		
				NB Right	363	102	304	749	F		
	SB	52.2	D	SB Left	177	98	183	701	F		
				SB Through	844	48	183	701	D		
				SB Right	94	7	0	0	A		
	EB	131.1	F	EB Left	80	190	507	832	F		
				EB Through	1358	129	508	833	F		
				EB Right	64	107	530	860	F		
	WB	48.1	D	WB Left	311	87	121	391	F		
				WB Through	472	32	121	391	C		
				WB Right	94	0	0	0	A		
26- MD 117 at Bureau Dr											
26	NB	56.4	E	NB Left	18	75	17	108	E	71.6	E
				NB Through	17	80	17	108	F		
				NB Right	25	27	17	108	C		
	SB	75.9	E	SB Left	192	83	93	312	F		
				SB Through	44	82	93	312	F		
				SB Right	28	17	93	312	B		
	EB	97.4	F	EB Left	26	77	608	994	E		
				EB Through	1858	98	616	993	F		
				EB Right	19	82	606	983	F		
	WB	37.3	D	WB Left	288	109	235	762	F		
				WB Through	837	23	235	763	C		
				WB Right	311	8	203	811	A		
27- MD 117 at I-270 SB off ramp											
27	NB			NB Left	0	0	0	0	A	18.3	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	7.2	A	EB Left	0	0	0	0	A		
				EB Through	776	7	1	146	A		
				EB Right	0	0	0	0	A		
	WB	45.7	E	WB Left	314	46	126	790	E		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
28- MD 117 at I-270 NB off ramp											
28	NB			NB Left	0	0	0	0	A	34.4	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	57.3	E	SB Left	302	62	427	1147	E		
				SB Through	0	0	0	0	A		
				SB Right	904	56	432	1149	E		
	EB	20.3	C	EB Left	10	113	84	935	F		
				EB Through	763	19	84	935	B		
				EB Right	0	0	0	0	A		
	WB	15.2	B	WB Left	0	0	0	0	A		
				WB Through	859	15	52	331	B		
				WB Right	9	7	57	361	A		
29- MD 117 at Perry Pkwy											
29	NB	43.5	D	NB Left	35	70	14	97	E	13.7	B
				NB Through	6	59	14	96	E		
				NB Right	31	11	24	117	B		
	SB	34.0	C	SB Left	91	73	37	168	E		
				SB Through	13	68	37	168	E		
				SB Right	124	2	37	168	A		
	EB	10.5	B	EB Left	115	72	43	240	E		
				EB Through	935	3	42	240	A		
				EB Right	8	2	29	224	A		
	WB	9.5	A	WB Left	5	93	19	257	F		
				WB Through	708	10	19	257	A		
				WB Right	104	5	19	257	A		
30- Shady Grove Rd at I-270 NB off ramp											
30	NB	8.8	A	NB Left	0	0	0	0	A	24.3	C
				NB Through	904	9	19	217	A		
				NB Right	0	0	0	0	A		
	SB	10.2	B	SB Left	0	0	0	0	A		
				SB Through	1268	10	31	287	B		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	55.9	E	WB Left	1008	56	196	611	E		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

*FINAL = HSR + VSL + ARM + MODE

Table A.15: AM Peak -2015 Final Model- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
31- Shady Grove Rd at I-270 SB off ramp											
31	NB	13.9	B	NB Left	0	0	0	0	A	20.9	C
				NB Through	905	14	38	356	B		
				NB Right	0	0	0	0	A		
	SB	10.3	B	SB Left	0	0	0	0	A		
				SB Through	1684	10	38	546	B		
				SB Right	0	0	0	0	A		
	EB	46.2	D	EB Left	311	40	45	321	D		
				EB Through	0	0	0	0	A		
				EB Right	644	49	105	429	D		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
32- MD 28 at I-270 SB off ramp											
32	NB			NB U-Turn	0	0	0	0	A	12.0	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	32.7	C	SB Left	403	40	63	250	D		
				SB Through	0	0	0	0	A		
				SB Right	98	2	0	51	A		
	EB	10.0	B	EB Left	0	0	0	0	A		
				EB Through	1342	12	53	1043	B		
				EB Right	883	8	18	273	A		
	WB	8.8	A	WB Left	0	0	0	0	A		
				WB Through	1858	9	29	370	A		
				WB Right	0	0	0	0	A		
33- MD 28 at I-270 on and off ramps											
33	NB	33.8	C	NB Left	0	0	50	283	A	17.9	B
				NB Through	207	48	59	292	D		
				NB Right	136	13	59	292	B		
	SB	21.3	C	SB Left	25	61	19	180	E		
				SB Through	0	0	0	0	A		
				SB Right	259	17	19	180	B		
	EB	17.1	B	EB Left	259	31	61	387	C		
				EB Through	949	13	61	387	B		
				EB Right	0	0	0	0	A		
	WB	11.9	B	WB Left	22	11	40	286	B		
				WB Through	890	12	28	249	B		
				WB Right	0	0	0	0	A		
34- MD 189 at Great Falls Rd											
34	NB	41.2	D	NB Left	62	45	16	111	D	10.2	B
				NB Through	6	42	13	111	D		
				NB Right	8	7	15	121	A		
	SB	5.1	A	SB Left	67	45	19	134	D		
				SB Through	7	40	19	134	D		
				SB Right	601	0	0	0	A		
	EB	10.6	B	EB Left	318	16	14	242	B		
				EB Through	902	9	16	210	A		
				EB Right	13	6	25	246	A		
	WB	12.6	B	WB Left	3	17	17	193	B		
				WB Through	316	13	18	192	B		
				WB Right	10	8	28	226	A		
35- MD 189 at I-270 Ramps											
35	NB	49.5	D	NB Left	130	49	25	130	D	41.3	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	47.7	D	SB Left	173	48	51	278	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	23.4	C	EB Left	384	21	84	407	C		
				EB Through	527	25	84	407	C		
				EB Right	0	0	0	0	A		
	WB	58.6	E	WB Left	534	49	135	457	D		
				WB Through	282	77	135	457	E		
				WB Right	0	0	0	0	A		
36- MD 189 at Wooton Pkwy											
36	NB	42.0	D	NB Left	130	51	51	176	D	59.2	E
				NB Through	101	77	51	176	E		
				NB Right	151	11	51	176	B		
	SB	99.0	F	SB Left	387	115	323	744	F		
				SB Through	521	87	254	727	F		
				SB Right	0	0	0	0	A		
	EB	45.0	D	EB Left	131	72	194	770	E		
				EB Through	957	44	194	770	D		
				EB Right	95	19	194	770	B		
	WB	44.2	D	WB Left	411	65	111	332	E		
				WB Through	376	28	111	332	C		
				WB Right	57	5	111	332	A		
37- Montrose Rd at Tower Oaks Blvd											
37	NB			NB Left	0	0	0	0	A	63.9	E
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	326.0	F	SB Left	100	79	1115	1395	E		
				SB Through	0	0	0	0	A		
				SB Right	408	387	1125	1391	F		
	EB	7.3	A	EB Left	26	19	22	300	B		
				EB Through	1369	7	22	300	A		
				EB Right	0	0	0	0	A		
	WB	26.3	C	WB Left	0	0	0	0	A		
				WB Through	1385	27	74	486	C		
				WB Right	60	7	74	486	A		
38- Tower Oaks Blvd at I-270 off ramp											
38	NB	21.7	C	NB Left	474	20	33	177	C	81.0	F
				NB Through	12	23.2	26	169	C		
				NB Right	26	44.4	33	177	D		
	SB	9.8	A	SB Left	2	19.3	0	19	B		
				SB Through	0	0.0	0	18	A		
				SB Right	2	0.4	0	0	A		
	EB	146.5	F	EB Left	4	88.1	311	449	F		
				EB Through	487	148.3	311	449	F		
				EB Right	67	136.9	302	440	F		
	WB	10.5	B	WB Left	0	0.0	3	65	A		
				WB Through	79	11.1	3	65	B		
				WB Right	6	2.3	0	7	A		
39- Montrose Rd at Tower Oaks Blvd											
39	NB	9.4	A	NB Left	26	45	21	126	D	61.9	E
				NB Through	188	29	21	126	C		
				NB Right	507	0	0	0	A		
	SB	36.6	D	SB Left	294	67	121	485	E		
				SB Through	600	24	120	484	C		
				SB Right	63	14	124	530	B		
	EB	145.9	F	EB Left	57	122	559	726	F		
				EB Through	804	148	560	726	F		
				EB Right	45	146	583	750	F		
	WB	41.9	D	WB Left	351	51	80	293	D		
				WB Through	224	47	80	293	D		
				WB Right	130	8	91	324	A		
40- Rockledge Blvd at I-270 NB on and off ramp											
40	NB			NB Left	0	0	0	0	A	14.8	B
				NB Through	85	34	31	148	C		
				NB Right	195	35	31	148	C		
	SB	2.4	A	SB Left	0	0	6	81	A		
				SB Through	981	2	6	81	A		
				SB Right	0	0	0	0	A		
	EB	21.5	C	EB Left	4	35	90	388	C		
				EB Through	463	44	90	388	D		
				EB Right	507	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

*FINAL = HSR + VSL + ARM + MODE

Table A.15: AM Peak -2015 Final Model- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
41- Rockledge Blvd at I-270 SB on and off ramps											
41	NB	2.4	A	NB Left	89	2	1	29	A	19.9	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	21.0	C	WB Left	980	22	95	653	C		
				WB Through	443	19	95	653	B		
				WB Right	0	0	0	0	A		
42- MD 187 at Tuckerman Ln											
42	NB	291.4	F	NB Left	180	154	1093	1506	F	195.2	F
				NB Through	1131	240	1093	1506	F		
				NB Right	146	861	1093	1506	F		
	SB	173.7	F	SB Left	59	141	2544	2701	F		
				SB Through	1504	173	2544	2701	F		
				SB Right	174	193	2544	2701	F		
	EB	65.7	E	EB Left	185	47	211	920	D		
				EB Through	547	74	213	921	E		
				EB Right	135	60	233	945	E		
	WB	203.2	F	WB Left	709	242	1954	2150	F		
				WB Through	347	163	1954	2150	F		
				WB Right	133	100	1954	2150	F		
43- MD 187 at I-270 NB on and off ramps											
43	NB	62.7	E	NB Left	144	83	198	349	F	42.2	D
				NB Through	1179	60	198	349	E		
				NB Right	0	0	0	0	A		
	SB	24.5	C	SB Left	0	0	0	0	A		
				SB Through	1717	24	90	656	C		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	66.2	E	WB Left	120	66	63	442	E		
				WB Through	10	65	63	442	E		
				WB Right	0	0	0	0	A		
44- MD 187 at I-270 NB on and off ramps											
44	NB	142.3	F	NB Left	0	0	0	0	A	63.0	E
				NB Through	1150	142	345	789	F		
				NB Right	0	0	0	0	A		
	SB	7.7	A	SB Left	193	52	64	304	D		
				SB Through	1644	3	64	304	A		
				SB Right	0	0	0	0	A		
	EB	83.1	F	EB Left	177	93	145	660	F		
				EB Through	0	0	145	660	A		
				EB Right	346	78	178	664	E		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
45- MD 187 at Rock Spring Dr											
45	NB	65.8	E	NB Left	179	112	278	500	F	39.3	D
				NB Through	1119	59	279	500	E		
				NB Right	6	9	300	533	A		
	SB	19.8	B	SB Left	13	28	98	647	C		
				SB Through	1813	21	98	647	C		
				SB Right	159	0	60	641	A		
	EB	51.4	D	EB Left	155	86	55	213	F		
				EB Through	22	68	55	213	E		
				EB Right	196	22	55	213	C		
	WB	5.0	A	WB Left	1	14	0	19	B		
				WB Through	8	7	0	19	A		
				WB Right	4	-1	0	0	A		
47- Democracy Blvd at I-270 NB off ramp											
47	NB	29.1	C	NB Left	212	29	24	140	C	13.8	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	13.4	B	EB Left	0	0	0	0	A		
				EB Through	1574	13	51	445	B		
				EB Right	0	0	0	0	A		
	WB	10.3	B	WB Left	0	0	0	0	A		
				WB Through	736	10	22	176	B		
				WB Right	0	0	0	0	A		
48- Democracy Blvd at I-270 SB on ramp											
48	NB			NB Left	0	0	0	0	A	6.4	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	5.2	A	EB Left	0	0	0	0	A		
				EB Through	1678	5	20	275	A		
				EB Right	0	0	0	0	A		
	WB	8.6	A	WB Left	211	36	30	188	D		
				WB Through	733	1	19	167	A		
				WB Right	0	0	0	0	A		
49- Democracy Blvd at I-270 SB off ramp											
49	NB			NB Left	0	0	0	0	A	11.9	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	32.8	C	SB Left	321	48	55	231	D		
				SB Through	0	0	0	0	A		
				SB Right	159	1	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	2.4	A	WB Left	0	0	0	0	A		
				WB Through	732	3	4	116	A		
				WB Right	323	2	0	85	A		
50- MD 190 at Burdette Rd											
50	NB	76.6	E	NB Left	19	69	12	111	E	12.9	B
				NB Through	3	74	12	111	E		
				NB Right	8	95	12	111	F		
	SB	33.0	C	SB Left	41	84	28	151	F		
				SB Through	13	84	28	151	F		
				SB Right	113	9	28	151	A		
	EB	11.8	B	EB Left	49	97	85	846	F		
				EB Through	1746	9	85	846	A		
				EB Right	15	7	76	869	A		
	WB	10.6	B	WB Left	0	87	44	657	F		
				WB Through	1437	11	46	658	B		
				WB Right	18	3	41	698	A		

*FINAL = HSR + VSL + ARM + MODE

Table A.15: AM Peak -2015 Final Model- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
51- MD 190 at I-270 NB on ramp											
51	NB			NB Left	0	0	0	0	A	36.6	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	80.2	F	EB Left	495	80	231	540	F		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	14.4	B	WB Left	0	0	0	0	A		
WB Through				975	14	61	588	B			
WB Right				0	0	0	0	A			
52- MD 190 at I-270 SB off ramp											
52	NB	81.3	F	NB Left	255	81	285	2269	F	14.8	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	3.0	A	EB Left	0	0	0	0	A		
				EB Through	864	3	6	136	A		
				EB Right	0	0	0	0	A		
	WB	4.8	A	WB Left	0	0	0	0	A		
WB Through				675	5	6	153	A			
WB Right				0	0	0	0	A			
53- MD 190 at Seven Locks Rd											
53	NB	66.4	E	NB Left	17	67	16	123	E	42.6	D
				NB Through	44	66	19	123	E		
				NB Right	0	0	0	0	A		
	SB	67.6	E	SB Left	581	67	199	696	E		
				SB Through	145	68	199	696	E		
				SB Right	13	73	198	696	E		
	EB	29.3	C	EB Left	18	25	93	475	C		
				EB Through	781	29	93	475	C		
				EB Right	32	30	93	475	C		
	WB	33.1	C	WB Left	121	105	102	337	F		
WB Through				645	27	104	340	C			
WB Right				159	1	0	4	A			
54- MD 124 at I-270 NB off ramp											
54	NB	67.1	E	NB Left	0	0	0	0	A	74.9	E
				NB Through	0	0	0	0	A		
				NB Right	912	67	264	911	E		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	83.8	F	EB Left	0	0	0	0	A		
				EB Through	810	84	339	823	F		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
WB Through				0	0	0	0	A			
WB Right				0	0	0	0	A			
55- Democracy Blvd at I-270 NB off ramp											
55	NB	36.7	D	NB Left	0	0	0	0	A	16.6	B
				NB Through	0	0	0	0	A		
				NB Right	928	37	112	485	D		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	4.8	A	EB Left	0	0	0	0	A		
				EB Through	1573	5	19	93	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
WB Through				0	0	0	0	A			
WB Right				0	0	0	0	A			

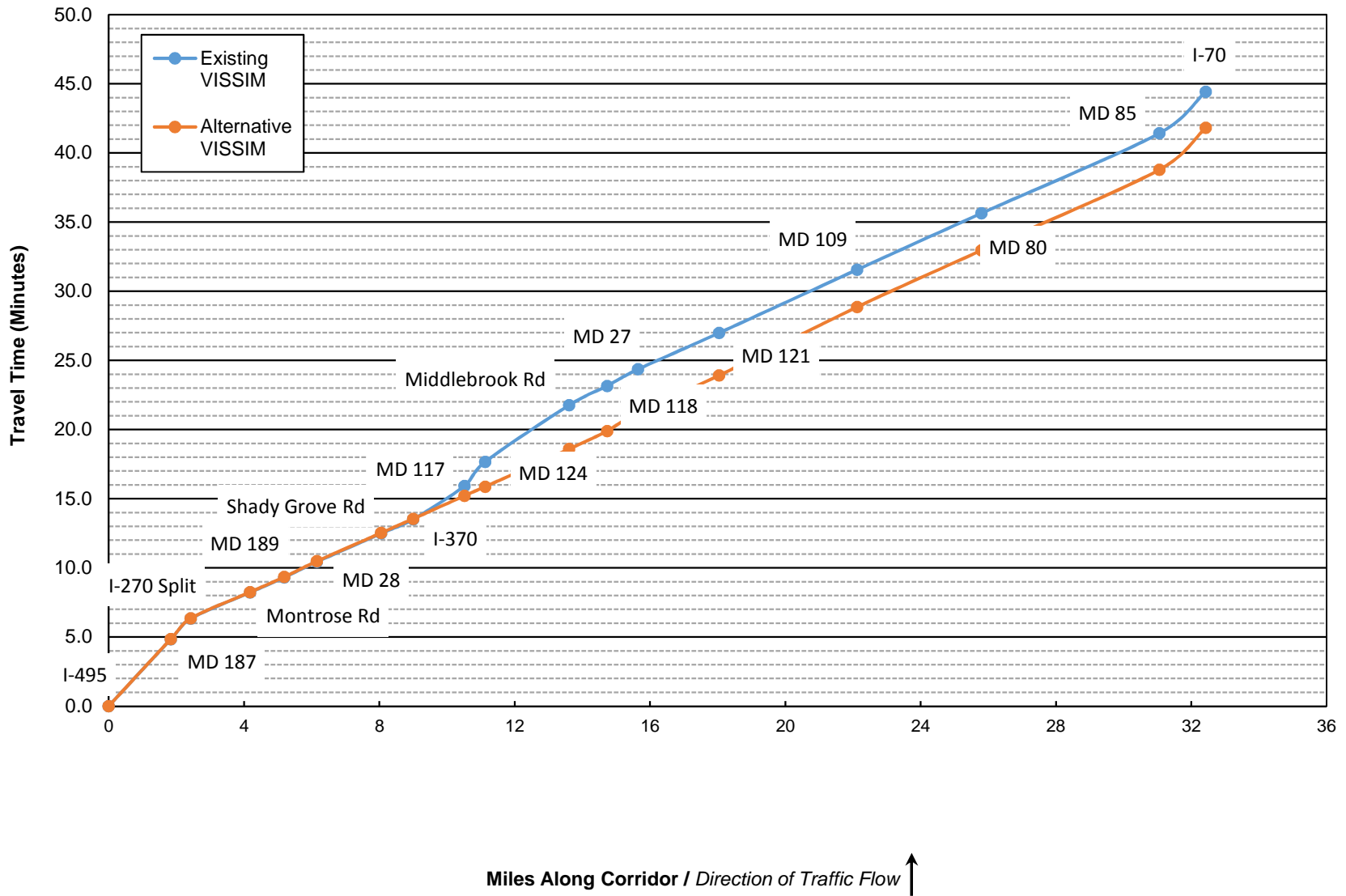
*FINAL = HSR + VSL + ARM + MODE

Table A.16: AM Peak -2015 Final Model- I-270 Vehicle Network Performance

	Existing	Final	% Change
Total Delay	21,906,753	12,905,430	-41%
Average Delay per Vehicle	227	138	-39%
Total Travel Time	51,252,838	44,202,804	-14%
Vehicles (Arrived)	81,275	81,186	0%
Latent Demand	4,969	6,670	34%
Latent Delay	13,122,672	17,409,171	33%
Total Distance	467,210	458,662	-2%
Average Speed	33	37	14%

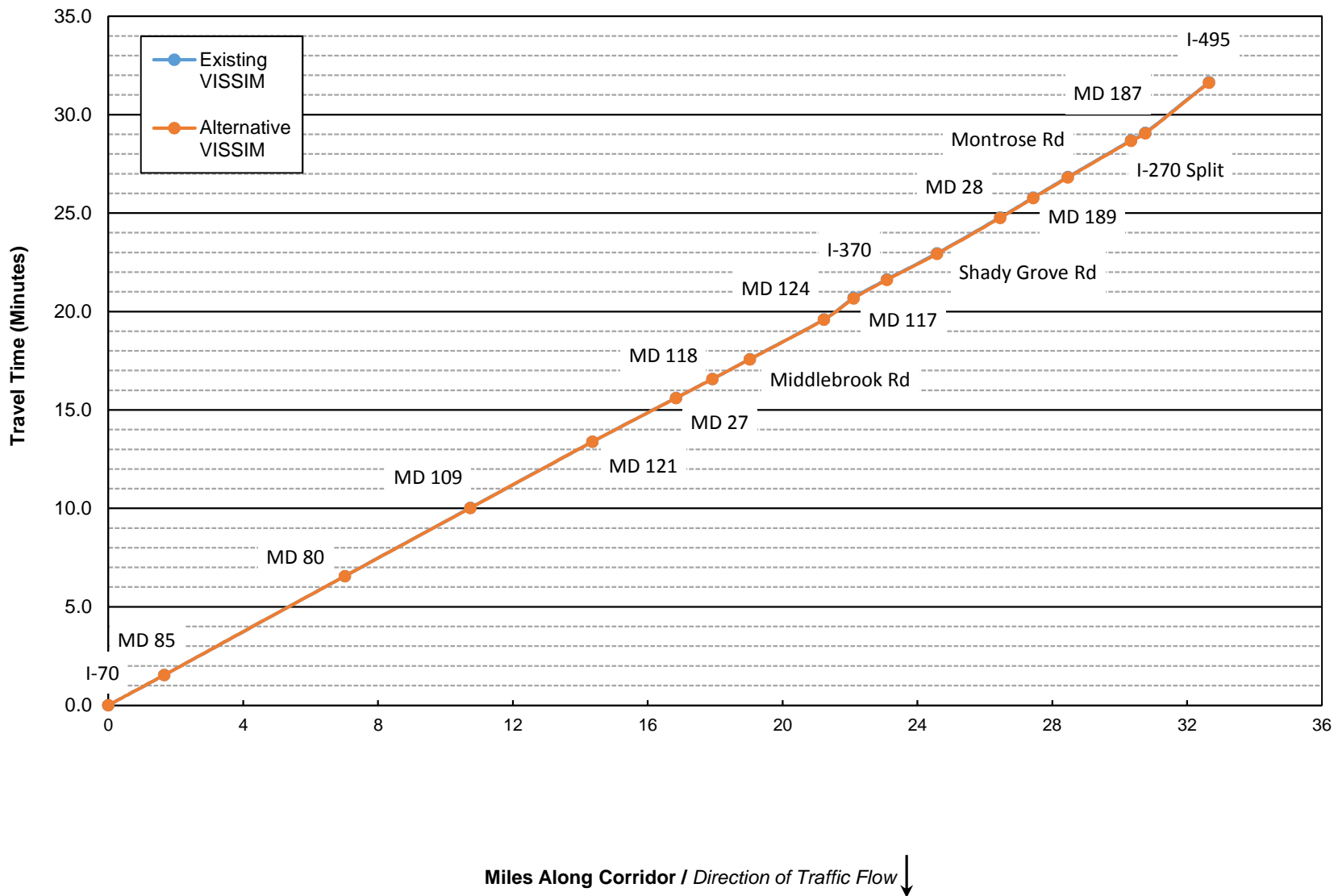
*FINAL = HSR+VSL+ARM+MODE

**Figure B.1: PM Peak - 2015 Final Model
I-270 Travel Time Graph - Northbound**



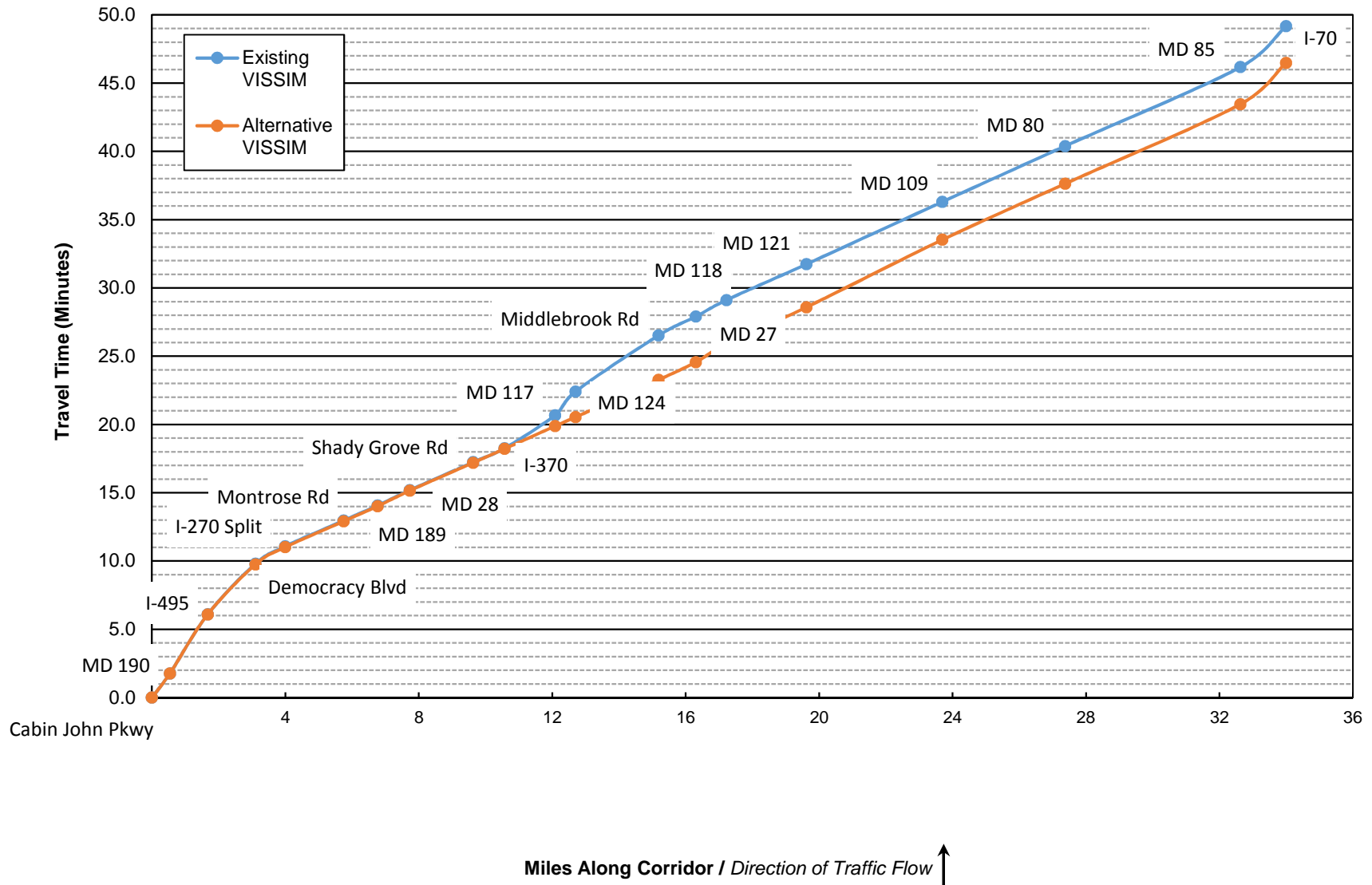
* Final = HSR + VSL + ARM + MODE

**Figure B.2: PM Peak - 2015 Final Model
I-270 Travel Time Graph - Southbound**



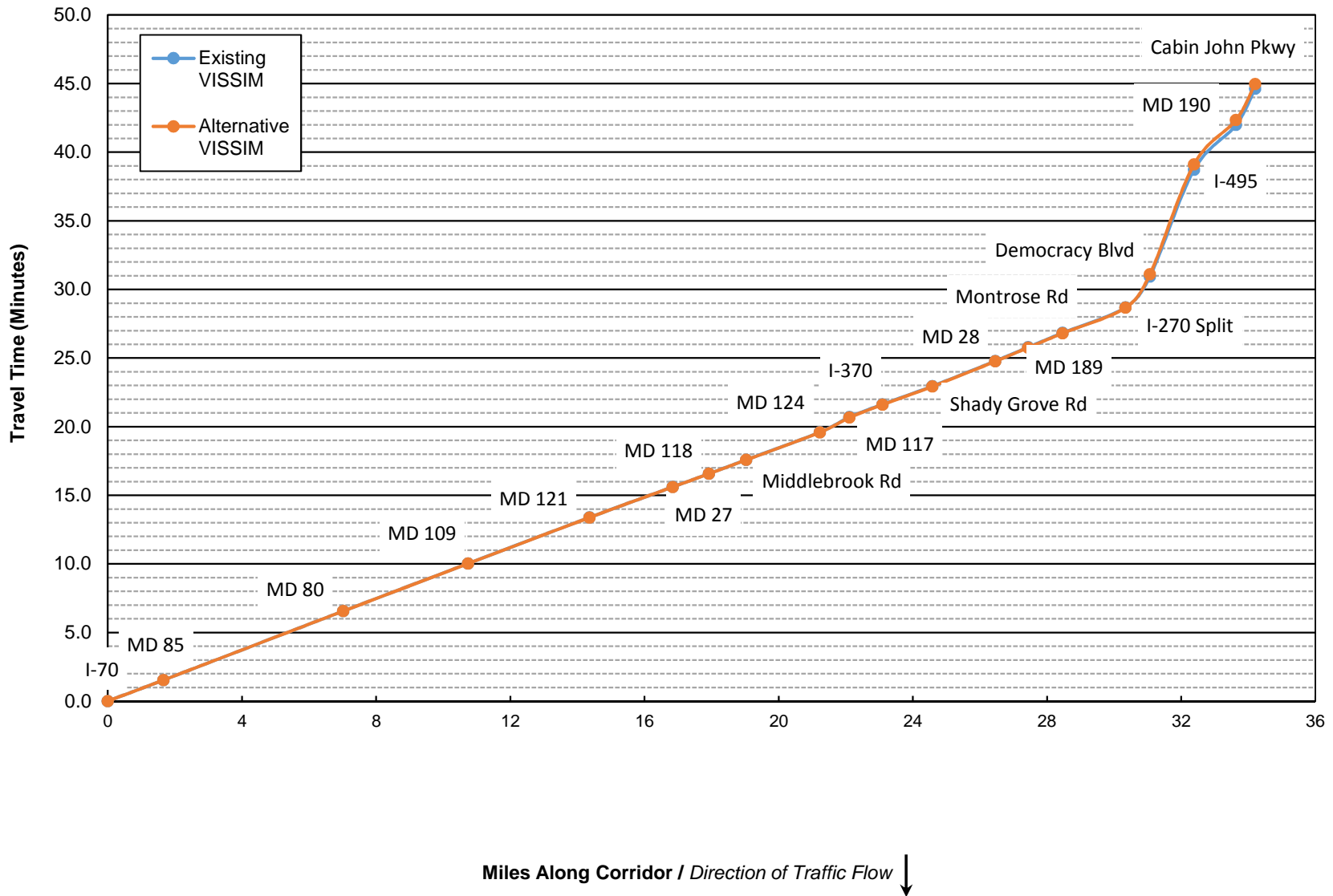
* Final = HSR + VSL + ARM + MODE

**Figure B.3: PM Peak - 2015 Final Model
I-270 Spur Travel Time Graph - Northbound**



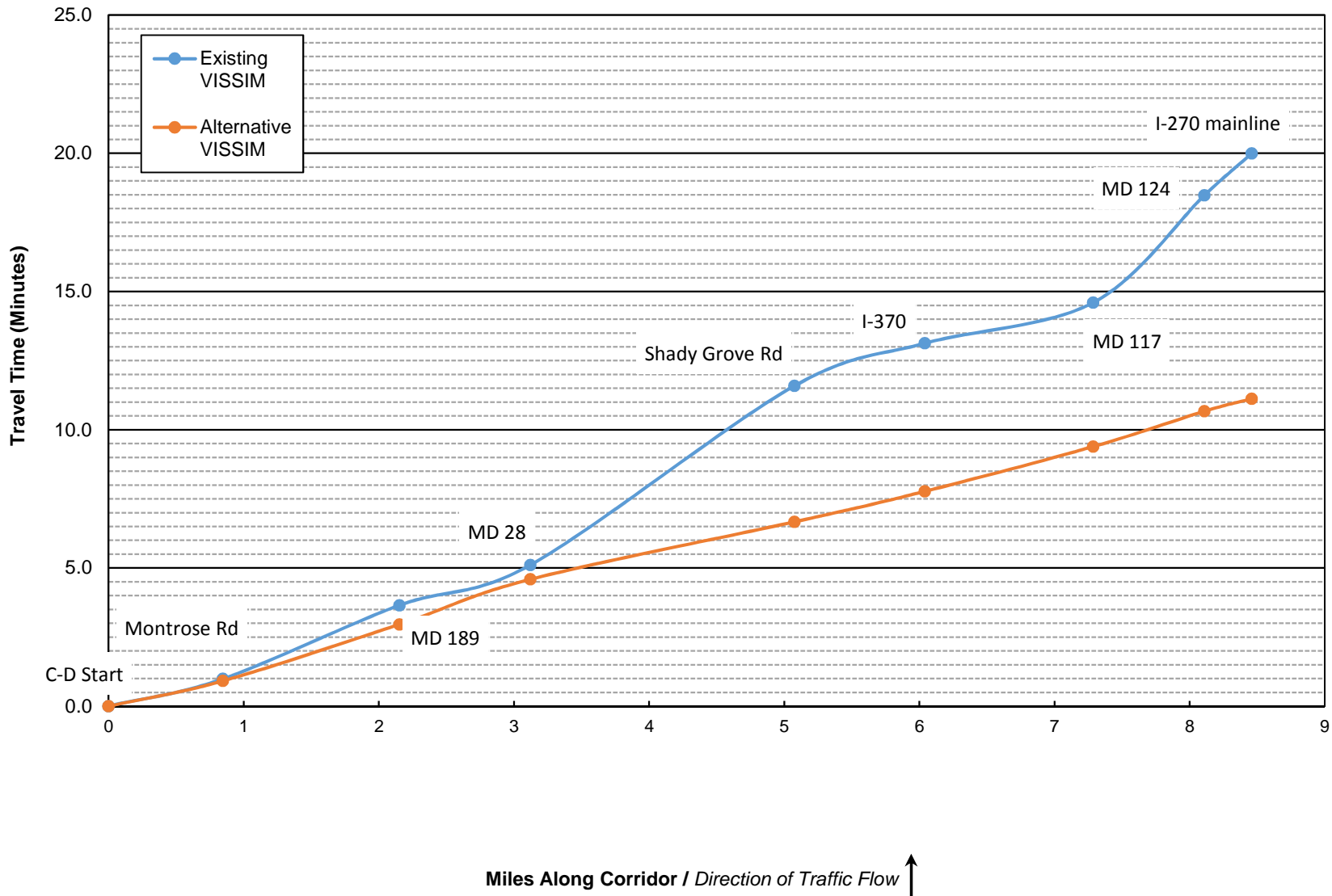
* Final = HSR + VSL + ARM + MODE

**Figure B4: PM Peak - 2015 Final Model
I-270 Spur Travel Time Graph - Southbound**



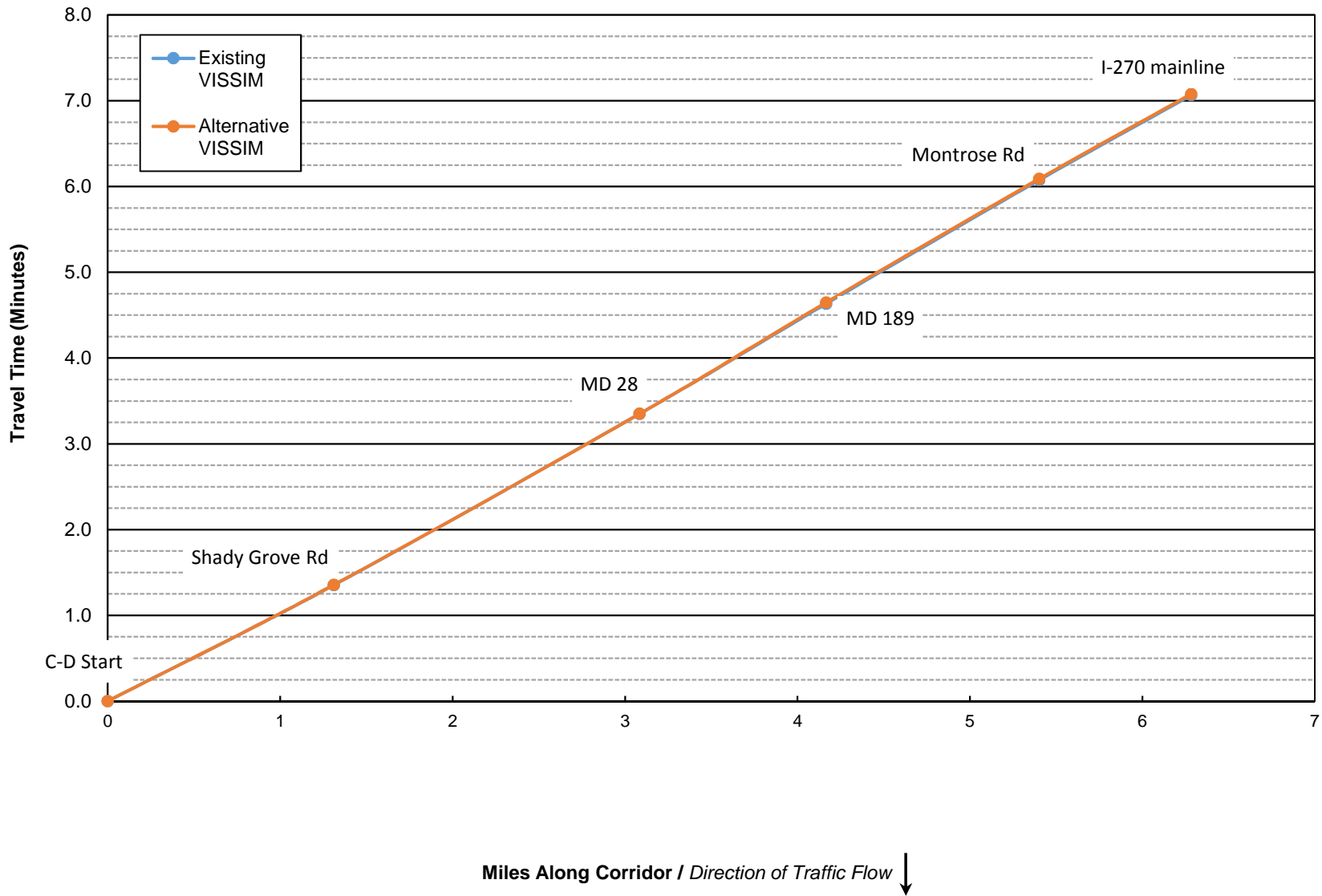
* Final = HSR + VSL + ARM + MODE

**Figure B.5: PM Peak - 2015 Final Model
I-270 Local Travel Time Graph - Northbound**



* Final = HSR + VSL + ARM + MODE

**Figure B.6: PM Peak - 2015 Final Model
I-270 Local Travel Time Graph - Southbound**



* Final = HSR + VSL + ARM + MODE

Table B.1: PM Peak - 2015 Final Model - I-270 Vehicle Travel Time

I-270 Northbound	Segment Length (miles)	Existing VISSIM Travel Time (seconds)	Final VISSIM Travel Time (seconds)	% Change	I-270 Southbound	Segment Length (miles)	Existing VISSIM Travel Time (seconds)	Final VISSIM Travel Time (seconds)	% Change
From I-495 interchange					From I-70				
to MD 187	1.8	290.1	291.2	0.4%	to MD 85	1.7	92.4	92.4	0.0%
to I-270 Split	0.6	89.3	89.5	0.1%	to MD 80	5.4	301.4	301.2	-0.1%
to Montrose Rd	1.8	113.6	114.0	0.4%	to MD 109	3.7	207.9	207.7	-0.1%
to MD 189	1.0	66.0	66.1	0.1%	to MD 121	3.6	201.4	201.5	0.1%
to MD 28	1.0	67.1	68.2	1.6%	to MD 27	2.5	133.7	133.6	-0.1%
to Shady Grove Rd	1.9	123.3	122.9	-0.3%	to MD 118	1.1	57.6	57.5	-0.2%
to I-370	0.9	61.3	61.1	-0.3%	to Middlebrook Rd	1.1	60.4	60.5	0.1%
to MD 117	1.5	145.0	99.8	-31.2%	to MD 124	2.2	120.9	120.5	-0.4%
to MD 124	0.6	104.3	39.6	-62.1%	to MD 117	0.9	66.4	65.0	-2.1%
to Middlebrook Rd	2.5	246.0	163.4	-33.6%	to I-370	1.0	55.8	56.2	0.7%
to MD 118	1.1	83.6	78.2	-6.4%	to Shady Grove Rd	1.5	79.7	79.7	0.0%
to MD 27	0.9	72.2	80.9	12.1%	to MD 28	1.9	109.5	109.6	0.1%
to MD 121	2.4	157.6	160.3	1.7%	to MD 189	1.0	60.1	60.1	0.0%
to MD 109	4.1	274.2	296.5	8.1%	to Montrose Rd	1.0	62.9	62.9	0.0%
to MD 80	3.7	244.9	246.2	0.5%	to I-270 Split	1.9	111.5	111.6	0.1%
to MD 85	5.3	346.9	349.4	0.7%	to MD 187	0.4	22.8	22.9	0.4%
to I-70	1.4	180.2	181.9	0.9%	to I-495 interchange	1.9	154.8	154.5	-0.2%
I-270 Total (miles/minutes)	32.4	44.4	41.8	-5.9%	I-270 Total (miles/minutes)	32.6	31.7	31.6	-0.1%
I-270 Spur Northbound					I-270 Spur Southbound				
From Cabin John Pkwy					From I-70				
to MD 190	0.5	105.6	105.6	0.0%	to I-270 Split	30.3	1,721.6	1,720.1	-0.1%
to I-495	1.1	259.8	259.6	-0.1%	to Democracy Blvd	0.7	135.0	146.1	8.2%
to Democracy Blvd	1.4	222.8	219.5	-1.5%	to I-495	1.3	466.2	480.4	3.0%
to I-270 Split	0.9	76.3	76.1	-0.3%	to MD 190	1.3	196.3	194.8	-0.8%
to I-70	30.0	2,286.1	2,128.4	-6.9%	to Cabin John Pkwy	0.6	158.2	156.9	-0.8%
I-270 Spur Total (miles/minutes)	34.0	49.2	46.5	-5.5%	I-270 Spur Total (miles/minutes)	34.2	44.6	45.0	0.8%

* Final = HSR + VSL + ARM + MODE

Table B.2: PM Peak - 2015 Final Model - I-270 Local Vehicle Travel Time

I-270 Northbound	Segment Length (miles)	Existing VISSIM Travel Time (seconds)	Final VISSIM Travel Time (seconds)	% Change	I-270 Southbound	Segment Length (miles)	Existing VISSIM Travel Time (seconds)	Final VISSIM Travel Time (seconds)	% Change
From C-D start					From C-D start				
to Montrose Rd	0.8	59.3	54.8	-7.6%	to Shady Grove	1.3	81.2	81.3	0.2%
to MD 189	1.3	159.8	122.7	-23.2%	to MD 28	1.8	119.8	119.7	-0.1%
to MD 28	1.0	87.2	97.8	12.1%	to MD 189	1.1	77.1	77.9	1.1%
to Shady Grove	2.0	388.8	124.7	-67.9%	to Montrose	1.2	86.4	86.4	0.0%
to I-370	1.0	92.6	66.2	-28.5%	to I-270 mainline	0.9	59.4	59.4	0.0%
to MD 117	1.2	88.2	97.3	10.3%					
to MD 124	0.8	232.8	76.6	-67.1%					
to I-270 mainline	0.4	91.1	27.0	-70.3%					
I-270 Local Total (miles/minutes)	8.5	20.0	11.1	-44.4%	I-270 Local Total (miles/minutes)	6.3	7.1	7.1	0.2%

* Final = HSR + VSL + ARM + MODE

Table B.3: PM Peak - 2015 Final Model - I-270 Vehicle Speed

I-270 Northbound	Segment Length (miles)	Existing VISSIM Speed (MPH)	Final VISSIM Speed (MPH)	% Change	I-270 Southbound	Existing VISSIM Speed (MPH)	Final VISSIM Speed (MPH)	% Change
From I-495 interchange					From I-70			
to MD 187	1.8	22.8	22.7	-0.4%	to MD 85	64.8	64.8	0.0%
to I-270 Split	0.6	23.8	23.8	-0.1%	to MD 80	64.0	64.0	0.1%
to Montrose Rd	1.8	55.6	55.4	-0.4%	to MD 109	64.4	64.5	0.1%
to MD 189	1.0	55.3	55.3	-0.1%	to MD 121	64.7	64.7	-0.1%
to MD 28	1.0	51.8	50.9	-1.6%	to MD 27	66.9	66.9	0.1%
to Shady Grove Rd	1.9	55.4	55.6	0.3%	to MD 118	67.0	67.1	0.2%
to I-370	0.9	55.5	55.6	0.3%	to Middlebrook Rd	66.2	66.2	-0.1%
to MD 117	1.5	37.6	54.6	45.3%	to MD 124	65.4	65.6	0.4%
to MD 124	0.6	21.1	55.7	163.6%	to MD 117	48.1	49.1	2.1%
to Middlebrook Rd	2.5	36.4	54.8	50.5%	to I-370	63.6	63.2	-0.7%
to MD 118	1.1	48.3	51.6	6.9%	to Shady Grove Rd	67.2	67.2	0.0%
to MD 27	0.9	45.7	40.7	-10.8%	to MD 28	61.6	61.5	-0.1%
to MD 121	2.4	54.7	53.8	-1.7%	to MD 189	58.6	58.6	0.0%
to MD 109	4.1	53.5	49.5	-7.5%	to Montrose Rd	59.1	59.0	0.0%
to MD 80	3.7	54.1	53.8	-0.5%	to I-270 Split	60.4	60.4	-0.1%
to MD 85	5.3	54.5	54.2	-0.7%	to MD 187	66.4	66.1	-0.4%
to I-70	1.4	27.4	27.1	-0.9%	to I-495 interchange	44.0	44.1	0.2%
I-270 Total (miles/minutes)	32.4	43.8	46.5	6.2%	I-270 Total (miles/minutes)	61.9	60.0	-100.0%
I-270 Spur Northbound					I-270 Spur Southbound			
From Cabin John Pkwy					From I-70			
to MD 190	0.5	18.4	18.4	0.0%	to I-270 Split	63.4	63.5	0.1%
to I-495	1.1	15.7	15.7	0.1%	to Democracy Blvd	19.5	18.0	-7.6%
to Democracy Blvd	1.4	23.2	23.5	1.5%	to I-495	10.1	9.8	-2.9%
to I-270 Split	0.9	42.1	42.2	0.3%	to MD 190	23.0	23.2	0.8%
to I-70	30.0	47.2	50.7	7.4%	to Cabin John Pkwy	13.0	13.1	0.8%
I-270 Spur Total (miles/minutes)	34.0	41.5	43.9	5.8%	I-270 Spur Total (miles/minutes)	46.0	45.6	-0.8%

* Final = HSR + VSL + ARM + MODE

Table B.4: PM Peak - 2015 Final Model - I-270 Local Vehicle Speed

I-270 Northbound	Existing VISSIM Speed (MPH)	Final VISSIM Speed (MPH)	% Change	I-270 Southbound	Segment Length (miles)	Existing VISSIM Speed (MPH)	Final VISSIM Speed (MPH)	% Change
From C-D start				From C-D start				
to Montrose Rd	51.3	55.5	8.2%	to Shady Grove	1.3	58.1	58.0	-0.2%
to MD 189	29.4	38.3	30.2%	to MD 28	1.8	53.3	53.3	0.1%
to MD 28	40.0	35.6	-10.8%	to MD 189	1.1	50.5	50.0	-1.1%
to Shady Grove	18.1	56.4	211.7%	to Montrose	1.2	51.4	51.5	0.0%
to I-370	37.5	52.5	39.9%	to I-270 mainline	0.9	53.5	53.5	0.0%
to MD 117	50.9	46.1	-9.4%					
to MD 124	12.7	38.6	203.8%					
to I-270 mainline	13.8	46.6	236.8%					
I-270 Local Total (miles/minutes)	25.4	45.6	79.8%	I-270 Local Total (miles/minutes)	6.3	53.4	53.3	-0.2%

* Final = HSR + VSL + ARM + MODE

Table B.5: PM Peak - 2015 Final Model - I-270 Vehicle Density

I-270 Northbound	Type	Existing		Final		% Change	I-270 Southbound	Type	Existing		Final		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS			
I-270	Freeway	47	F	48	F	2%	I-270	Freeway	16	B	16	B	0%
I-270 Diverge to MD 187	Diverge	60	F	59	F	-2%	I-270 Merge from WB I-70	Merge	13	B	13	B	0%
I-270	Freeway	73	F	72	F	-2%	I-270	Freeway	19	C	19	C	0%
I-270 Diverge to Rockledge Rd	Diverge	69	F	67	F	-3%	I-270 Merge from EB I-70	Merge	14	B	14	B	0%
I-270	Freeway	82	F	81	F	-1%	I-270	Freeway	18	C	18	C	0%
I-270 Weave from MD 187 to I-270 HOV	Weave	56	F	57	F	2%	I-270 Diverge to SB MD 85	Diverge	19	B	19	B	0%
I-270 Lane Drop	Merge	65	F	64	F	-2%	I-270	Freeway	20	C	20	C	0%
I-270	Freeway	51	F	51	F	0%	I-270 Diverge to NB MD 85	Diverge	12	B	12	B	0%
I-270 Merge from I-270 Spur	Merge	37	E	37	E	0%	I-270	Freeway	16	B	16	B	0%
I-270 Weave from I-270 HOV to I-270 C-D	Weave	33	D	33	D	0%	I-270 Merge from MD 85	Merge	14	B	14	B	0%
I-270	Freeway	32	D	32	D	0%	I-270	Freeway	21	C	21	C	0%
I-270 Diverge to C-D (MD 189)	Diverge	37	E	38	E	2%	I-270 Diverge to MD 80	Diverge	13	B	14	B	1%
I-270	Freeway	32	D	32	D	0%	I-270	Freeway	17	B	17	B	0%
I-270 Diverge to C-D (MD 28)	Diverge	38	E	38	E	-1%	I-270 Merge from MD 80	Merge	11	B	11	B	0%
I-270	Freeway	30	D	31	D	3%	I-270	Freeway	20	C	20	C	0%
I-270 Merge from C-D (MD 189)	Merge	41	F	45	F	9%	I-270 Diverge to MD 109	Diverge	10	B	10	B	0%
I-270 Diverge to C-D (Shady Grove Rd)	Diverge	42	F	42	F	0%	I-270	Freeway	19	C	19	C	0%
I-270	Freeway	30	D	29	D	0%	I-270 Merge from MD 109	Merge	11	B	11	B	0%
I-270 Weave from C-D (MD 28) to C-D (Shady Grove Rd)	Weave	32	D	32	D	0%	I-270	Freeway	20	C	20	C	0%
I-270	Freeway	26	D	26	D	0%	I-270 Diverge to SB Weigh Station	Diverge	10	B	10	B	0%
I-270 Merge from C-D (Shady Grove Rd)	Merge	21	C	21	C	2%	I-270	Freeway	20	C	20	C	1%
I-270	Freeway	33	D	30	D	-10%	I-270 Merge from SB Weigh Station	Merge	10	B	10	B	0%
I-270 Merge from C-D (I-370)	Merge	32	D	23	C	-29%	I-270	Freeway	19	C	19	C	0%
I-270 Diverge to C-D (MD 117)	Diverge	53	F	30	D	-44%	I-270 Diverge to MD 121	Diverge	7	A	7	A	0%
I-270	Freeway	74	F	29	D	-61%	I-270	Freeway	12	B	12	B	0%
I-270 Merge from C-D (MD 124)	Merge	101	F	30	D	-70%	I-270 Merge from MD 121	Merge	9	A	9	A	-1%
I-270	Freeway	36	E	29	D	-19%	I-270	Freeway	14	B	14	B	0%
I-270 Diverge to EB Middlebrook Rd	Diverge	28	D	25	C	-9%	I-270 Diverge to MD 27	Diverge	10	A	9	A	-1%
I-270	Freeway	34	D	28	D	-15%	I-270	Freeway	12	B	12	B	0%
I-270 Diverge to WB Middlebrook Rd	Diverge	30	D	27	C	-11%	I-270 Merge from WB MD 27	Merge	11	B	11	B	0%
I-270	Freeway	27	D	24	C	-14%	I-270	Freeway	15	B	15	B	0%
I-270 Diverge to EB MD 118	Diverge	24	C	20	C	-15%	I-270 Weave from EB MD 27 to MD 118	Weave	12	B	12	B	-1%
I-270 Diverge to WB MD 118	Diverge	42	F	26	C	-38%	I-270	Freeway	14	B	14	B	0%
I-270	Freeway	33	D	25	C	-25%	I-270 Merge from WB MD 118	Merge	12	B	12	B	-1%
I-270 Weave from MD 118 to MD 27	Weave	46	F	49	F	7%	I-270	Freeway	17	B	17	B	0%
I-270	Freeway	26	D	21	C	-21%	I-270 Merge from EB MD 118	Merge	15	B	15	B	0%
I-270 Merge from EB MD 27	Merge	46	F	49	F	7%	I-270	Freeway	20	C	20	C	0%
I-270	Freeway	26	C	23	C	-9%	I-270 Merge from Middlebrook Rd	Merge	21	C	21	C	0%
I-270 Merge from WB MD 27	Merge	20	C	24	C	21%	I-270	Freeway	21	C	21	C	0%
I-270	Freeway	27	D	29	D	7%	I-270 Diverge to MD 124	Diverge	18	B	18	B	-2%
I-270 Diverge to MD 121	Diverge	21	C	22	C	7%	I-270	Freeway	22	C	21	C	-6%

* Final = HSR + ARM + VSL + MODE

Table B.5: PM Peak - 2015 Final Model - I-270 Vehicle Density

I-270 Northbound	Type	Existing		Final		% Change	I-270 Southbound	Type	Existing		Final		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS			
I-270	Freeway	22	C	24	C	6%	I-270 Merge from WB MD 124	Merge	44	F	44	F	0%
I-270 Merge from EB MD 121	Merge	16	B	18	B	7%	I-270	Freeway	21	C	21	C	0%
I-270 Lane Drop	Merge	27	C	49	F	86%	I-270 Merge from MD 117	Merge	25	C	25	C	3%
I-270	Freeway	40	E	36	E	-9%	I-270	Freeway	21	C	21	C	0%
I-270 Diverge to NB Weigh Station	Diverge	17	B	18	B	5%	I-270 Diverge to I-370	Diverge	19	B	18	B	-1%
I-270	Freeway	35	D	37	E	5%	I-270	Freeway	16	B	16	B	0%
I-270 Merge from NB Weight Station	Merge	17	B	18	B	5%	I-270 Diverge to I-270 C-D	Diverge	13	B	13	B	0%
I-270	Freeway	36	E	38	E	5%	I-270	Freeway	13	B	13	B	0%
I-270 Diverge to MD 109	Diverge	20	B	21	C	5%	I-270 Merge from I-270 (I-370)	Merge	18	B	18	B	0%
I-270	Freeway	33	D	34	D	5%	I-270 Diverge to I-270 C-D (Shady Grove Rd)	Diverge	22	C	22	C	0%
I-270 Merge from MD 109	Merge	17	B	18	B	6%	I-270	Freeway	17	B	17	B	0%
I-270	Freeway	34	D	36	E	5%	I-270 Merge from I-270 C-D (Shady Grove Rd Northern)	Merge	16	B	16	B	1%
I-270 Diverge to MD 80	Diverge	24	C	25	C	3%	I-270	Freeway	22	C	22	C	0%
I-270	Freeway	29	D	30	D	5%	I-270 Merge from I-270 C-D (Shady Grove Rd Southern)	Merge	17	B	17	B	1%
I-270 Merge from MD 80	Merge	16	B	17	B	4%	I-270 Diverge to I-270 C-D (MD 189)	Diverge	23	C	23	C	0%
I-270	Freeway	33	D	35	D	4%	I-270	Freeway	20	C	20	C	0%
I-270 Diverge to Scenic View	Diverge	17	B	18	B	5%	I-270 Merge from I-270 C-D (MD 189)	Merge	18	B	19	B	1%
I-270	Freeway	33	D	35	D	4%	I-270	Freeway	24	C	24	C	1%
I-270 Merge from Scenic View	Merge	17	B	18	B	6%	I-270 Merge from I-270 C-D	Merge	20	C	20	C	1%
I-270	Freeway	33	D	35	D	4%	I-270 Diverge to I-270 HOV Lane	Diverge	17	B	16	B	-1%
I-270 Diverge to NB MD 85	Diverge	19	B	20	B	2%	I-270 Diverge to I-270 Spur	Diverge	33	D	35	D	6%
I-270	Freeway	32	D	33	D	5%	I-270	Freeway	13	B	13	B	0%
I-270 Diverge to SB MD 85	Diverge	18	B	19	B	4%	I-270 Diverge to Rockledge Dr / MD 187	Diverge	9	A	9	A	3%
I-270	Freeway	28	D	29	D	3%	I-270	Freeway	13	B	13	B	0%
I-270 Weave from MD 85 to I-70	Weave	21	C	21	C	2%	I-270 Merge from Rockledge Dr	Merge	11	B	12	B	1%
I-270	Freeway	59	F	61	F	4%	I-270	Freeway	16	B	16	B	0%
							I-270 Merge from Rockledge Dr / MD 187	Merge	14	B	14	B	0%
							I-270	Freeway	35	D	35	D	0%

* Final = HSR + ARM + VSL + MODE

Table B.6: PM Peak - 2015 Final Model - I-270 Spur Vehicle Density

I-270 Spur Northbound	Type	Existing		Final		% Change	I-270 Southbound	Type	Existing		Final		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS			
I-270 Spur	Freeway	45	F	45	F	-1%	I-270 Spur	Freeway	53	F	57	F	7%
I-270 Spur Merge from Clara Barton Parkway	Merge	51	F	52	F	2%	I-270 Spur Weave from I-270 HOV to Democracy Blvd	Weave	76	F	78	F	4%
I-270 Spur	Freeway	66	F	66	F	0%	I-270 Spur	Freeway	95	F	98	F	3%
I-270 Diverge to MD 190	Diverge	43	F	43	F	0%	I-270 Merge from Democracy Blvd	Merge	134	F	140	F	4%
I-270 Spur	Freeway	78	F	78	F	0%	I-270 Spur Lane Drop	Merge	131	F	136	F	4%
I-270 Spur Merge from Cabin John Parkway	Merge	95	F	97	F	2%	I-270 Spur	Freeway	123	F	124	F	1%
I-270 Spur Merge from MD 190	Merge	94	F	96	F	1%	I-270 Spur Merge from I-495	Merge	124	F	124	F	0%
I-270 Spur	Freeway	83	F	83	F	0%	I-270 Spur	Freeway	48	F	47	F	-2%
I-270 Spur Diverge to I-495	Merge	65	F	65	F	1%	I-270 Spur Diverve to EB MD 190	Diverge	49	F	49	F	0%
I-270 Spur	Freeway	45	E	44	E	-3%	I-270 Spur Diverve to Cabin John Pkwy	Diverge	66	F	66	F	0%
I-270 Spur Diverge to Democracy Blvd	Diverge	49	F	48	F	-1%	I-270 Spur	Freeway	93	F	93	F	0%
I-270 Spur	Freeway	58	F	57	F	-2%	I-270 Merge from MD 190	Merge	111	F	115	F	3%
I-270 Spur Merge from EB Democracy Blvd	Merge	98	F	97	F	-1%	I-270 Spur	Freeway	94	F	94	F	0%
I-270 Spur	Freeway	58	F	58	F	0%	I-270 Diverge to WB Clara Barton Pkwy	Diverge	60	F	61	F	0%
I-270 Spur Merge from WB Democracy Blvd	Merge	65	F	65	F	0%	I-270 Spur	Freeway	83	F	83	F	0%
I-270 Spur	Freeway	39	E	39	E	-1%	I-270 Merge from Clara Barton Pkwy	Merge	72	F	72	F	0%
I-270 Spur Merge from Westlake Terrace	Merge	31	D	31	D	0%							
I-270 Spur	Freeway	35	D	35	D	0%							

* Final = HSR + ARM + VSL + MODE

Table B.7: PM Peak - 2015 Final Model - I-270 Local Vehicle Density

I-270 Northbound	Type	Existing		Final		% Change	I-270 Southbound	Type	Existing		Final		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS			
I-270 C-D	Freeway	29	D	29	D	-1%	I-270 C-D	Freeway	8	A	8	A	1%
I-270 C-D Diverge to EB Montrose Rd	Diverge	20	B	20	B	-1%	I-270 C-D Weave from I-370 EB to I-270	Weave	15	B	15	B	1%
I-270 C-D	Freeway	17	B	17	B	0%	I-270 C-D Diverge to Shady Grove Rd	Diverge	10	A	10	A	0%
I-270 C-D Weave between Montrose Rd Loop Ramps	Weave	12	A	12	A	-2%	I-270 C-D	Freeway	7	A	7	A	0%
I-270 C-D	Freeway	20	C	17	B	-14%	I-270 C-D Merge from WB Shady Grove Rd	Merge	9	A	10	A	1%
I-270 C-D Merge from WB Montrose Rd	Merge	52	F	22	C	-59%	I-270 C-D	Freeway	15	B	15	B	0%
I-270 C-D	Freeway	51	F	24	C	-53%	I-270 C-D Merge from EB Shady Grove Rd	Merge	11	B	11	B	0%
I-270 C-D Merge from I-270	Merge	34	D	25	C	-25%	I-270 C-D	Freeway	21	C	21	C	0%
I-270 C-D	Freeway	51	F	41	E	-20%	I-270 C-D Merge from I-270	Merge	25	C	24	C	-3%
I-270 C-D Diverge to MD 189	Diverge	31	D	23	C	-27%	I-270 C-D Diverge to I-270	Diverge	26	C	26	C	0%
I-270 C-D	Freeway	67	F	45	E	-33%	I-270 C-D Diverge to I-270	Diverge	18	B	18	B	0%
I-270 C-D Merge from MD 189	Merge	94	F	60	F	-37%	I-270 C-D	Freeway	16	B	16	B	0%
I-270 C-D	Freeway	49	F	59	F	18%	I-270 C-D Diverge to MD 28	Diverge	12	B	12	B	1%
I-270 C-D Weave between I-270 (to MD 28 from MD 189)	Weave	44	F	48	F	10%	I-270 C-D	Freeway	11	A	11	A	0%
I-270 C-D	Freeway	48	F	50	F	4%	I-270 C-D Merge from WB MD 28	Merge	13	B	13	B	2%
I-270 C-D Diverge to MD 28	Diverge	20	B	20	C	1%	I-270 C-D	Freeway	13	B	13	B	0%
I-270 C-D	Freeway	31	D	31	D	1%	I-270 C-D Merge from EB MD 28	Merge	25	C	25	C	1%
I-270 C-D Weave between MD 28 Ramps	Weave	28	C	28	C	0%	I-270 C-D	Freeway	29	D	30	D	1%
I-270 C-D	Freeway	18	C	19	C	0%	I-270 C-D Merge from I-270	Merge	35	E	36	E	1%
I-270 C-D Merge from MD 28 WB	Merge	13	B	13	B	-1%	I-270 C-D	Freeway	40	E	41	E	2%
I-270 C-D Merge from I-270 and Drop Lane	Merge	18	B	18	B	-1%	I-270 C-D Diverge to MD 189	Diverge	24	C	26	C	5%
I-270 C-D Diverge to I-270	Diverge	23	C	22	C	-1%	I-270 C-D	Freeway	25	C	25	C	0%
I-270 C-D	Freeway	39	E	20	C	-49%	I-270 C-D Merge from MD 189	Merge	23	C	22	C	-4%
I-270 C-D Diverge to Shady Grove Rd	Diverge	14	B	13	B	-9%	I-270 C-D Diverge to I-270	Diverge	32	D	32	D	0%
I-270 C-D	Freeway	111	F	14	B	-87%	I-270 C-D	Freeway	22	C	22	C	0%
I-270 C- D Merge from I-270 and EB Shady Grove Rd	Merge	116	F	16	B	-86%	I-270 C-D Diverge to WB Montrose Rd	Diverge	16	B	16	B	0%
I-270 C-D	Freeway	112	F	16	B	-86%	I-270 C-D	Freeway	20	C	20	C	-1%
I-270 C-D Merge from WB Shady Grove Rd	Merge	108	F	16	B	-85%	I-270 Weave between Montrose Rd Loops	Weave	35	D	32	C	-8%
I-270 C-D Diverge to I-270	Diverge	90	F	30	D	-67%	I-270 C-D	Freeway	15	B	15	B	0%
I-270 C-D	Freeway	60	F	27	D	-54%	I-270 C-D Merge from EB Montrose Rd	Merge	9	A	9	A	1%
I-270 C-D Diverge to I-370	Diverge	28	C	31	D	14%	I-270 C-D	Freeway	18	B	18	B	0%
I-270 C-D	Freeway	10	A	10	A	5%							
I-270 Merge from I-370 EB	Merge	11	B	13	B	16%							
I-270 C-D	Freeway	19	C	11	B	-40%							
I-270 C-D Weave from I-370 to I-270	Weave	27	C	16	B	-40%							
I-270 C-D	Freeway	22	C	25	C	13%							
I-270 C-D Weave from I-270 to MD 117	Weave	33	D	42	F	28%							
I-270 C-D Diverge to MD 124	Diverge	39	E	43	F	10%							
I-270 C-D	Freeway	55	F	10	A	-82%							
I-270 C-D Merge from EB MD 124	Merge	96	F	10	A	-90%							
I-270 C-D Merge From WB MD 124	Merge	81	F	8	A	-91%							

* Final = HSR + ARM + VSL + MODE

Table B.8: PM Peak -Final Model - I-270 Vehicle Throughput

I-270 Northbound	Existing VISSIM Throughput	Final VISSIM Throughput	% Change	Data Collection Measurement	I-270 Southbound	Existing VISSIM Throughput	Final VISSIM Throughput	% Change
Between I-495 and MD 187	4350	4337	0%	100	North of I-70	1975	1975	0%
Between MD 187 on and off ramps	3888	3906	0%	102	Between I-70 on ramps	2287	2287	0%
Between Rockledge Blvd on and off ramps	3666	3672	0%	105	From I-70 interchange to MD-85	3429	3429	0%
Between Rockledge Dr and I-270 Spur	3880	3871	0%	108	Between MD-85 on and off ramps	2006	2006	0%
Between I-270 Spur and Montrose Rd	8718	8687	0%	110	Between MD-85 and MD-80	2633	2633	0%
Between Montrose Rd on and off ramps	5750	5735	0%	112	Between MD-80 on and off ramps	2093	2095	0%
Between Montrose Rd and MD 189	5477	5458	0%	114	Between MD-80 and MD-109	2457	2456	0%
Between MD 189 and MD 28	5905	5891	0%	116	Between MD-109 on and off ramps	2395	2397	0%
Between MD 28 on and off ramps	6240	6155	-1%	118	Between MD-109 and MD-121	2521	2516	0%
Between MD 28 and Shady Grove Rd	5494	5407	-2%	120	Between MD-121 on and off ramps	2351	2351	0%
Between Shady Grove Rd and I-370	4789	4629	-3%	123	Between MD-121 and MD-27	2723	2724	0%
Between I-370 on and off ramps	4814	4721	-2%	126	Between MD-27 on and off ramps	2890	2891	0%
Between I-370 and MD 117	6142	5903	-4%	129	Between MD-27 and MD-118	3164	3161	0%
Between MD 117 and MD 124	4713	4663	-1%	133	Between MD-118 on and off ramps	3197	3193	0%
Between MD-124 on and off ramps	4706	4742	1%	136	Between MD-118 and Middlebrook Rd	3798	3799	0%
Between MD 124 and Middlebrook Rd	6115	6184	1%	139	Between Middlebrook Rd on and off ramps	3796	3799	0%
Between Middlebrook Rd on and off ramps	5713	5765	1%	142	Between Middlebrook Rd and MD-124	4826	4824	0%
Between Middlebrook Rd and MD 118	4798	3584	-25%	146	Between MD-124 on and off ramps	3765	3767	0%
Between MD-118 on and off ramps	4409	4432	1%	150	Between MD-124 and MD-117	4938	4943	0%
Between MD 118 and MD 27	4456	4473	0%	154	Between MD-117 and I-370	6461	6465	0%
Between MD-27 on and off ramps	2842	2867	1%	159	Between I-370 on and off ramps	3327	3335	0%
Between MD 27 and MD 121	3330	3333	0%	163	Between I-370 on ramp to Shady Grove Rd	4663	4674	0%
Between MD-121 on and off ramps	2574	2573	0%	167	Between Shady Grove Rd and MD 28	4984	4986	0%
Between MD 121 and MD 109	3787	3698	-2%	171	Between MD 28 on and off ramps	5158	5164	0%
Between MD-109 on and off ramps	3547	3460	-2%	175	Between MD 28 and MD 189	4536	4539	0%
Between MD 109 and MD 80	3657	3554	-3%	179	Between MD 189 and Montrose Rd	4527	4524	0%
Between MD-80 on and off ramps	3096	3025	-2%	183	Between Montrose Rd on and off ramps	5414	5388	0%
Between MD 80 and MD 85	3596	3525	-2%	187	Between Montrose Rd and I-270 Spur	7201	7157	-1%
Between MD-85 on and off ramps	3046	2961	-3%	193	Between I-270 Spur and Rockledge Blvd	3293	3271	-1%
Between MD 85 and I-70	4867	4778	-2%	197	Between Rockledge Blvd on and off ramps	2549	2532	-1%
North of I-70	2562	2505	-2%	200	Between MD 187 on and off ramps	3017	3005	0%
				203	Between MD 187 and I-495	3372	3355	-1%
I-270 Spur Northbound					I-270 Spur Southbound			
Between I-495 and Democracy Blvd	4608	4602	0%	600	Between I-270 Split and HOV on ramp	3113	3101	0%
Between Democracy Blvd on and off ramps	4128	4130	0%	603	Between HOV on ramp & Democracy Blvd	2461	2433	-1%
Between Democracy Blvd and I-270 Split	4849	4841	0%	607	Between Democracy Blvd on and off ramps	1970	1944	-1%
				610	Between Democracy Blvd and I-495	2297	2261	-2%

* Final = HSR + VSL + ARM + MODE

Table B.9: PM Peak - 2015 Final Model- I-270 Local Vehicle Throughput

I-270 Local Northbound	Existing VISSIM Throughput	Final VISSIM Throughput	% Change	Data Collection Measurement	I-270 Local Southbound	Existing VISSIM Throughput	Final VISSIM Throughput	% Change
Between Montrose Rd EB off ramp and and EB on ramp	1881	1881	0%	800	Between I-370 on ramp and I-270 off ramp	2740	2742	0%
Between Montrose Rd EB on ramp and WB off ramp	2172	2174	0%	804	Between I-270 off ramp and Shady Grove off ramp	1420	1424	0%
Between Montrose Rd WB off ramp and on ramp	1921	1914	0%	807	Between Shady Grove off ramp and Shady Grove WB on ramp	764	768	1%
Between Montrose Rd WB on ramp and I-270 on ramp	3366	3293	-2%	809	Between Shady Grove WB and EB on ramps	1543	1529	-1%
Between I-270 on ramp and MD 189 off ramp	3611	3546	-2%	811	Between Shady Grove on ramp and I-270 on ramp	2168	2159	0%
Between MD 189 ramps	2908	2872	-1%	813	Between I-270 on ramp and I-270 off ramp1	2660	2648	0%
Between MD 189 off ramp and I-270 on ramp	3782	3653	-3%	815	Between I-270 off ramp1 and I-270 off ramp2	1854	1847	0%
Between I-270 on ramp and I-270 off ramp	4472	4340	-3%	817	Between I-270 off ramp2 and MD 28 off ramp	1681	1673	0%
Between I-270 off ramp and MD 28 EB off ramp	3481	3410	-2%	819	Between MD 28 off ramp and MD 28 WB on ramp	1149	1141	-1%
Between MD 28 EB off ramp to MD 28 EB on ramp	3133	3062	-2%	821	Between MD 28 WB on ramp and MD 28 EB on ramp	1401	1382	-1%
Between MD 28 EB on ramp and MD 28 WB off ramp	3262	3188	-2%	823	Between MD 28 EB on ramp and I-270 on ramp	2908	2861	-2%
Between MD 28 WB off ramp and MD 28 WB on ramp	2023	1974	-2%	825	Between I-270 on ramp and MD 189 off ramp	3530	3481	-1%
Between MD 28 WB on ramp and I-270 on ramp	2725	2610	-4%	827	Between MD 189 on and off ramps	2601	2565	-1%
Between I-270 on ramp and I-270 off ramp	3565	3441	-3%	829	Between MD 189 on ramp and I-270 off ramp	3166	3075	-3%
Between I-270 off ramp and Shady Grove off ramp	2136	2108	-1%	831	Between I-270 off ramp and Montrose Rd off ramp	2280	2217	-3%
Between Shady Grove off ramp and I-270 on ramp	673	743	10%	833	Between Montrose Rd off ramp and Montrose Rd WB on ramp	2039	1988	-3%
Between I-270 on ramp and Shady Grove WB on ramp	3348	2812	-16%	835	Between Montrose Rd WB on ramp and EB off ramp	2605	2551	-2%
Between Shady Grove WB on ramp and I-270 off ramp	4148	4254	3%	838	Between Montrose Rd EB off and on ramps	1525	1500	-2%
Between I-270 off ramp and I-370 off ramp	3663	2140	-42%	840	Between Montrose Rd EB off ramp and I-270	1846	1817	-2%
Between I-370 off ramp and I-370 EB on ramp	1138	1161	2%					
Between I-370 EB and WB on ramps	2096	1412	-33%					
Between I-370 WB on ramp and I-270 off ramp	3687	3390	-8%					
Between I-270 off ramp and I-270 on ramp	2254	2073	-8%					
Between I-270 on ramp and MD 117 off ramp	3661	3451	-6%					
Between MD 117 off ramp and MD 124 off ramp	2448	2300	-6%					
Between MD 124 off ramp and MD 124 EB on ramp	479	461	-4%					
Between MD 124 EB and WB on ramps	943	984	4%					
Between MD 124 on ramp I-270	1427	1491	4%					

* Final = HSR + VSL + ARM + MODE

Table B.10: PM Peak - 2015 Final Model - I-270 On Ramp Queue Length - Northbound

I-270 Northbound	Existing VISSIM Average Queue (feet)	Final VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	Final VISSIM Maximum Queue (feet)	% Change
Rockledge Dr on ramp	1	1	-20%	181	177	-2%
MD 189 C-D on ramp	0	0	-31%	33	27	-17%
MD 28 C-D on ramp	0	0	-	0	39	-
Shady Grove Rd C-D on ramp	0	0	-	0	0	-
I-370 C-D on ramp	2	0	-100%	233	0	-100%
MD 124 C-D on ramp	2459	8	-100%	3978	429	-89%
MD 118 on ramp	0	0	-100%	37	0	-100%
MD 27 EB on ramp	0	2	-	0	133	-
MD 27 WB on ramp	0	0	-	0	0	-
MD 121 on ramp	0	0	-	0	0	-
MD 109 on ramp	0	0	-	0	0	-
MD 80 on ramp	0	0	-	0	0	-
MD 85 on ramp	0	0	-	0	0	-
I-270 Spur Northbound	Existing VISSIM Average Queue (feet)	Final VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	Final VISSIM Maximum Queue (feet)	% Change
Democracy Blvd EB on ramp	0	0	-	0	5	-
Democracy Blvd WB on ramp	0	0	-	0	0	-
I-495 Northbound	Existing VISSIM Average Queue (feet)	Final VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	Final VISSIM Maximum Queue (feet)	% Change
Cabin John Pkwy on ramp	16	9	-47%	661	433	-35%
MD 190 on ramp	0	0	-	0	0	-
I-270 C-D Northbound	Existing VISSIM Average Queue (feet)	Final VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	Final VISSIM Maximum Queue (feet)	% Change
Montrose Rd EB on ramp	0	0	-	0	0	-
Montrose Rd WB on ramp	265	34	-87%	1386	555	-60%
I-270 on ramp	0	0	-	0	0	-
MD 189 on ramp	15	0	-100%	555	0	-100%
I-270 on ramp	0	0	-64%	23	25	10%
MD 28 EB on ramp	0	0	-	0	0	-
MD 28 WB on ramp	0	0	-	0	0	-
Shady Grove Rd EB on ramp	78	0	-100%	836	0	-100%
I-270 on ramp	178	0	-100%	1103	0	-100%
Shady Grove Rd WB on ramp	12	0	-100%	340	0	-100%
I-370 EB on ramp	0	2	-	0	210	-
I-370 WB on ramp	0	855	-	0	1407	-
I-270 on ramp	12	19	57%	658	527	-20%
MD 124 EB on ramp	257	0	-100%	1230	0	-100%
MD 124 WB on ramp	1	0	-100%	63	0	-100%

* Final = HSR + VSL + ARM + MODE

Table B.11: PM Peak - 2015 Final Model - I-270 Off Ramp Queue Length - Northbound

I-270 Northbound	Existing VISSIM Average Queue (feet)	Final VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	Final VISSIM Maximum Queue (feet)	% Change
MD 187 off ramp NB	42	37	-10%	278	330	18%
MD 187 off ramp SB	0	0	-	0	0	-
Rockledge Dr off ramp	1	1	-1%	73	60	-18%
Tower Oaks Blvd off ramp	32	33	2%	235	219	-7%
Montrose Rd off ramp EB	0	0	-	0	0	-
Montrose Rd off ramp WB	0	0	-	0	0	-
MD 189 off ramp WB	29	29	0%	168	192	14%
MD 189 off ramp EB	1	209	19604%	122	1403	1052%
MD 28 off ramp EB	37	39	5%	231	213	-8%
MD 28 off ramp WB	0	0	-	0	0	-
Shady Grove Rd off ramp - Redland Blvd	0	0	-	0	0	-
Shady Grove Rd off ramp WB	49	48	-2%	248	210	-15%
Shady Grove Rd off ramp EB	0	0	-	0	0	-
I-370 off ramp WB	0	2	-	0	153	-
I-370 off ramp EB	0	0	-	0	0	-
MD 117 off ramp	205	286	40%	859	1354	58%
MD 124 off ramp	799	546	-32%	2471	2183	-12%
Watkins Mill Rd off ramp*			-			-
Middlebrook Rd EB off ramp	0	0	-	0	0	-
Middlebrook Rd WB off ramp	0	0	-	0	0	-
MD 118 WB off ramp - Seneca Meadows	0	0	-100%	20	0	-100%
MD 118 WB off ramp	0	0	-	0	0	-
MD 118 EB off ramp	0	0	-	0	0	-
MD 27 off ramp WB	56	57	2%	290	233	-19%
MD 27 off ramp EB	0	0	-	0	0	-
MD 121 off ramp WB	0	0	-	0	7	-
MD 121 off ramp EB	0	0	-	0	0	-
MD 109 off ramp EB	9	8	-12%	158	136	-14%
MD 109 off ramp WB	0	0	-	0	0	-
MD 80 off ramp EB	15	15	4%	140	125	-11%
MD 80 off ramp WB	0	0	-72%	11	5	-53%
MD 85 NB off ramp	0	0	-	0	0	-
MD 85 SB off ramp	0	0	-35%	72	26	-64%
I-270 Spur Northbound	Existing VISSIM Average Queue (feet)	Final VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	Final VISSIM Maximum Queue (feet)	% Change
Clara Barton Pkwy off ramp EB	0	0	-	0	0	-
Clara Barton Pkwy off ramp WB	0	0	-	0	0	-
MD 190 off ramp EB	0	0	-	0	0	-
MD 190 off ramp WB	2	2	-4%	287	217	-25%
Democracy Blvd off ramp WB	42	42	1%	188	183	-3%
Democracy Blvd off ramp EB	18	18	-4%	143	113	-21%

* Ramp in Future Scenario

* Final = HSR + VSL + ARM + MODE

Table B.12: PM Peak - 2015 Final Model - I-270 On Ramp Queue Length - Southbound

I-270 Southbound	Existing VISSIM Average Queue (feet)	Final VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	Final VISSIM Maximum Queue (feet)	% Change
MD 85 on ramp	0	0	-	0	0	-
MD 80 on ramp	0	0	-	0	0	-
MD 109 on ramp	0	0	-	0	0	-
MD 121 WB on ramp	0	0	-	0	0	-
MD 121 EB on ramp*			-			-
MD 27 WB on ramp	0	0	-	0	0	-
MD 27 EB on ramp	0	0	-	0	0	-
MD 118 WB on ramp	0	0	-	0	0	-
MD 118 EB on ramp	0	0	-	0	0	-
Middlebrook Rd on ramp	0	0	-	0	0	-
MD 124 WB on ramp	5	8	53%	332	269	-19%
MD 117 on ramp	0	0	-	0	0	-
I-370 C-D on ramp	0	0	-	0	0	-
Shady Grove Rd C-D on ramp North	0	0	-	0	0	-
Shady Grove Rd C-D on ramp South	0	0	-	0	0	-
MD 189 C-D on ramp	0	0	-	0	0	-
Montrose Rd C-D on ramp	0	0	-	0	0	-
Rockledge Dr on ramp	0	0	-	0	0	-
MD 187 on ramp	0	0	-	0	0	-
I-270 Spur Southbound	Existing VISSIM Average Queue (feet)	Final VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	Final VISSIM Maximum Queue (feet)	% Change
Democracy Blvd on ramp	335	471	41%	1366	1574	15%
I-495 Southbound	Existing VISSIM Average Queue (feet)	Final VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	Final VISSIM Maximum Queue (feet)	% Change
I-270 Spur on ramp	4212	4300	2%	5058	5068	0%
MD 190 on ramp	1	0	-98%	107	16	-85%
I-270 C-D Southbound	Existing VISSIM Average Queue (feet)	Final VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	Final VISSIM Maximum Queue (feet)	% Change
I-270 on ramp	0	0	-	0	0	-
I-370 on ramp	0	0	-	0	0	-
Shady Grove Rd WB on ramp	0	0	-	0	0	-
Shady Grove Rd EB on ramp	0	0	-	0	0	-
I-270 on ramp	0	0	-	0	0	-
MD 28 WB on ramp	0	0	-100%	14	0	-100%
MD 28 EB on ramp	2	82	3342%	219	1231	462%
I-270 on ramp	0	0	-	0	0	-
MD 189 on ramp	0	0	-	0	0	-
Montrose Rd WB on ramp	1	0	-71%	107	40	-63%
Montrose Rd EB on ramp	0	0	-	0	0	-

* Ramp in Future Scenario

* Final = HSR + VSL + ARM + MODE

Table B.13: PM Peak -2015 Final Model - I-270 Off Ramp Queue Length - Southbound

I-270 Southbound	Existing VISSIM Average Queue (feet)	Final VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	Final VISSIM Maximum Queue (feet)	% Change
MD 85 SB off ramp	0	0	-	0	0	-
MD 85 NB off ramp	0	0	-34%	114	87	-23%
MD 80 off ramp	1	0	-67%	154	87	-43%
MD 109 off ramp WB	0	0	-10%	58	54	-6%
MD 109 off ramp EB	0	0	-	0	0	-
MD 121 off ramp EB	2	2	-8%	98	108	11%
MD 121 off ramp WB	0	0	-	0	0	-
MD 27 off ramp EB	23	21	-8%	149	153	3%
MD 27 off ramp WB	0	0	-	0	0	-
MD 118 off ramp EB	19	19	-1%	110	118	7%
MD 118 off ramp WB	0	0	-	0	0	-
Watkins Mill Rd off ramp*			-			-
MD 124 off ramp EB	310	184	-41%	1658	986	-41%
MD 124 off ramp WB	147	7	-95%	1129	355	-69%
I-370 off ramp WB	0	0	-	0	25	-
I-370 off ramp EB	0	0	-	0	0	-
Shady Grove Rd off ramp - Omega Drive	1	1	3%	42	55	33%
Shady Grove Rd off ramp	0	0	-	0	0	-
MD 28 off ramp	3	3	-3%	127	130	3%
MD 189 off ramp EB	123	263	113%	849	1266	49%
MD 189 off ramp WB	0	0	-	0	0	-
Montrose Rd off ramp WB	0	0	-	0	0	-
Montrose Rd off ramp EB	0	0	-	0	76	-
Rockledge Dr off ramp	51	59	14%	295	444	50%
I-270 Spur Southbound	Existing VISSIM Average Queue (feet)	Final VISSIM Average Queue (feet)	% Change	Existing VISSIM Maximum Queue (feet)	Final VISSIM Maximum Queue (feet)	% Change
Democracy Blvd off ramp EB	24	23	-3%	157	178	14%
Democracy Blvd off ramp WB	0	0	-	0	0	-
MD 190 off ramp WB	85	74	-13%	826	783	-5%
MD 190 off ramp EB	0	0	-	0	0	-
Clara Barton Pkwy WB off ramp	0	0	-	0	9	-

* Ramp in Future Scenario

* Final = HSR + VSL + ARM + MODE

Table B.14: PM Peak - Existing - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
1- MD 85 at Sam's Club Drive											
1	NB	28.2	C	NB Left	115	79	116	611	E	53.2	D
				NB Through	503	33	116	611	C		
				NB Right	824	18	55	634	B		
	SB	82.9	F	SB Left	142	77	401	1055	E		
				SB Through	875	84	401	1055	F		
				SB Right	67	87	401	1055	F		
	EB	33.5	C	EB Left	43	83	26	115	F		
				EB Through	20	91	26	115	F		
				EB Right	144	11	26	115	B		
	WB	63.9	E	WB Left	508	77	221	686	E		
				WB Through	27	67	221	686	E		
				WB Right	192	29	221	686	C		
2- MD 85 at I-270 NB on and off ramp											
2	NB	36.0	D	NB Left	977	36	187	908	D	32.7	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	27.9	C	SB Left	0	0	0	0	A		
				SB Through	671	28	100	634	C		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
3- MD 85 at I-270 SB on and off ramp											
3	NB	6.0	A	NB Left	0	0	0	0	A	9.4	A
				NB Through	1699	6	41	829	A		
				NB Right	0	0	0	0	A		
	SB	43.8	D	SB Left	170	44	46	320	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
4- MD 85 at Crestwood Blvd											
4	NB	33.3	D	NB Left	60	70	154	653	E	33.5	C
				NB Through	1255	32	154	654	C		
				NB U-Turn	0	0	0	0	A		
	SB	22.0	C	SB Left	91	80	45	208	E		
				SB Through	810	25	59	445	C		
				SB Right	796	12	45	436	B		
	EB	54.8	D	EB Left	802	57	133	610	E		
				EB Through	31	44	133	610	D		
				EB Right	22	0	133	610	A		
	WB	43.4	D	WB Left	36	75	39	162	E		
				WB Through	61	65	39	162	E		
				WB Right	81	13	39	162	B		
5- MD 80 at I-270 NB on and off ramp											
5	NB	-1.8	A	NB Left	1	0	0	0	A	8.6	A
				NB Through	2	0	0	0	A		
				NB Right	8	-3	0	0	A		
	SB	12.2	B	SB Left	385	15	21	145	B		
				SB Through	17	17	21	145	B		
				SB Right	122	2	0	0	A		
	EB	8.9	A	EB Left	70	9	13	171	A		
				EB Through	0	0	8	0	A		
				EB Right	6	5	24	202	A		
	WB	6.9	A	WB Left	16	10	0	40	B		
				WB Through	510	12	28	281	B		
				WB Right	482	1	0	0	A		
6- MD 80 at I-270 SB on and off ramp											
6	NB	2.3	A	NB Left	47	3	1	190	A	4.2	A
				NB Through	0	0	0	0	A		
				NB Right	491	2	1	190	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	5.0	A	EB Left	0	0	0	0	A		
				EB Through	271	5	2	61	A		
				EB Right	53	3	1	69	A		
	WB	6.6	A	WB Left	0	0	0	0	A		
				WB Through	316	7	1	89	A		
				WB Right	0	0	0	0	A		
7- MD 109 at I-270 NB on and off ramp											
7	NB			NB Left	0	0	0	0	A	5.3	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	10.2	B	SB Left	224	11	14	175	B		
				SB Through	0	0	0	0	A		
				SB Right	17	2	0	67	A		
	EB	2.2	A	EB Left	56	1	0	37	A		
				EB Through	0	0	0	0	A		
				EB Right	59	3	0	0	A		
	WB	0.3	A	WB Left	0	0	0	0	A		
				WB Through	160	0	0	0	A		
				WB Right	0	0	0	0	A		
8- MD 80 at I-270 SB on and off ramp											
8	NB	4.0	A	NB Left	44	7	2	115	A	1.6	A
				NB Through	0	0	0	0	A		
				NB Right	29	0	0	43	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.8	A	EB Left	0	0	0	0	A		
				EB Through	114	0	0	0	A		
				EB Right	24	4	0	0	A		
	WB	1.2	A	WB Left	98	1	0	42	A		
				WB Through	78	1	0	19	A		
				WB Right	0	0	0	0	A		
9- MD 121 at Gateway Center Dr											
9	NB	10.6	B	NB Left	471	13	31	242	B	17.0	B
				NB Through	638	10	31	242	A		
				NB Right	54	2	36	268	A		
	SB	17.8	C	SB Left	20	13	5	143	B		
				SB Through	169	19	14	163	B		
				SB Right	8	4	13	184	A		
	EB	16.6	C	EB Left	2	50	3	93	D		
				EB Through	19	51	11	170	D		
				EB Right	142	12	21	202	B		
	WB	34.8	D	WB Left	214	46	57	220	D		
				WB Through	56	41	57	219	D		
				WB Right	140	16	71	244	B		
10- MD 121 at I-270 NB on and off ramp											
10	NB	0.8	A	NB Left	25	9	1	67	A	0.6	A
				NB Through	0	0	0	0	A		
				NB Right	718	1	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.1	A	EB Left	0	0	0	0	A		
				EB Through	447	0	0	0	A		
				EB Right	58	0	0	0	A		
	WB	0.8	A	WB Left	100	3	1	73	A		
				WB Through	423	0	0	48	A		
				WB Right	0	0	0	0	A		

Table B.14: PM Peak - Existing - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
11- MD 121 at I-270 SB on and off ramp											
11	NB			NB Left	0	0	0	0	A	2.2	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	7.7	A	SB Left	136	10	8	125	A		
				SB Through	0	0	0	0	A		
				SB Right	36	0	0	0	A		
	EB	0.3	A	EB Left	29	1	0	23	A		
				EB Through	0	0	0	0	A		
				EB Right	349	0	0	0	A		
	WB	0.1	A	WB Left	0	0	0	0	A		
				WB Through	99	0	0	0	A		
				WB Right	0	0	0	0	A		
12- MD 27 at Observation Dr											
12	NB	40.1	D	NB U-Turn	0	0	0	0	A	22.2	C
				NB Through	73	57	19	86	E		
				NB Right	47	13	19	86	B		
	SB	39.7	D	SB Left	114	46	31	182	D		
				SB Through	41	62	35	244	E		
				SB Right	173	30	57	281	C		
	EB	16.8	B	EB Left	208	27	68	502	C		
				EB Through	2223	16	70	503	B		
				EB Right	106	15	82	541	B		
	WB	25.8	C	WB Left	31	22	123	627	C		
				WB Through	1503	26	123	627	C		
				WB Right	54	9	123	627	A		
13- MD 27 at I-270 NB off ramp											
13	NB	44.8	D	NB Left	390	45	63	297	D	8.1	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.1	A	EB Left	0	0	0	0	A		
				EB Through	1284	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	5.5	A	WB Left	0	0	0	0	A		
				WB Through	1582	6	41	680	A		
				WB Right	0	0	0	0	A		
14- MD 27 at I-270 SB off ramp											
14	NB			NB Left	0	0	0	0	A	5.4	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	52.2	D	SB Left	171	52	35	162	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	2.3	A	EB Left	0	0	0	0	A		
				EB Through	1351	2	4	149	A		
				EB Right	0	0	0	0	A		
	WB	2.7	A	WB Left	0	0	0	0	A		
				WB Through	1433	3	7	257	A		
				WB Right	0	0	0	0	A		
15- MD 27 at Crystal Rock Dr											
15	NB	22.6	C	NB Left	58	20	55	379	C	29.8	C
				NB Through	965	23	68	379	C		
				NB Right	43	20	72	391	B		
	SB	33.9	C	SB Left	140	57	185	770	E		
				SB Through	1310	35	185	770	D		
				SB Right	196	9	164	764	A		
	EB	43.0	D	EB Left	103	54	28	120	D		
				EB Through	37	46	25	115	D		
				EB Right	47	17	17	141	B		
	WB	27.6	C	WB Left	83	49	70	297	D		
				WB Through	102	43	70	297	D		
				WB Right	552	22	70	297	C		
16- MD 118 at Seneca Meadows Pkwy											
16	NB	4.0	A	NB Left	90	12	1	82	B	8.2	A
				NB Through	1174	3	7	154	A		
				NB Right	0	0	15	207	A		
	SB	6.5	A	SB Left	11	6	14	270	A		
				SB Through	1091	7	18	270	A		
				SB Right	9	3	21	302	A		
	EB	13.1	B	EB Left	18	55	12	130	E		
				EB Through	1	76	12	130	E		
				EB Right	275	10	12	130	B		
	WB	53.5	D	WB Left	93	64	37	199	E		
				WB Through	6	61	33	198	E		
				WB Right	25	13	42	218	B		
17- MD 118 at I-270 NB on ramp											
17	NB			NB Left	0	0	0	0	A	16.1	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	33.9	C	EB Left	435	34	90	501	C		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	10.8	B	WB Left	0	0	0	0	A		
				WB Through	246	2	1	116	A		
				WB Right	1216	13	46	480	B		
18- MD 118 at I-270 SB off ramp											
18	NB			NB Left	0	0	0	0	A	6.1	A
				NB Through	0	0.0	0	0	A		
				NB Right	0	0.0	0	0	A		
	SB	37.1	D	SB Left	129	37.1	22	114	D		
				SB Through	0	0.0	0	0	A		
				SB Right	0	0.0	0	0	A		
	EB	4.8	A	EB Left	0	0.0	0	0	A		
				EB Through	1182	4.8	10	322	A		
				EB Right	0	0.0	0	0	A		
	WB	4.5	A	WB Left	0	0.0	0	0	A		
				WB Through	1465	4.5	8	237	A		
				WB Right	0	0.0	0	0	A		
19- MD 118 at Aircraft Dr											
19	NB	24.0	C	NB Left	42	69	33	176	E	27.5	C
				NB Through	43	70	33	176	E		
				NB Right	196	4	3	77	A		
	SB	90.2	F	SB Left	381	90	221	577	F		
				SB Through	12	82	221	577	F		
				SB Right	97	91	221	577	F		
	EB	17.8	B	EB Left	98	22	60	395	C		
				EB Through	1215	17	60	395	B		
				EB Right	17	15	60	395	B		
	WB	17.6	B	WB Left	12	17	66	441	B		
				WB Through	1324	21	66	441	C		
				WB Right	351	5	66	441	A		
20- Middlebrook Rd at Observation Dr											
20	NB			NB Left	0	0	0	0	A	8.5	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	18.0	B	SB Left	96	35	18	131	D		
				SB Through	0	0	0	0	A		
				SB Right	179	9	18	131	A		
	EB	6.4	A	EB Left	15	9	17	155	A		
				EB Through	1180	6	17	155	A		
				EB Right	0	0	0	0	A		
	WB	8.4	A	WB Left	0	0	0	0	A		
				WB Through	1238	8	24	251	A		
				WB Right	12	6	39	300	A		

Table B.14: PM Peak - Existing - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
21- Middlebrook Rd at I-270 SB on ramp											
21	NB			NB Left	0	0	0	0	A	4.4	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	2.8	A	EB Left	0	0	0	0	A		
				EB Through	686	3	4	96	A		
				EB Right	0	0	0	0	A		
	WB	7.1	A	WB Left	429	7	4	194	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
22- Middlebrook Rd at Waring Station Rd											
22	NB	48.4	D	NB Left	156	45	75	316	D	12.5	B
				NB Through	0	0	75	316	A		
				NB Right	219	51	75	316	D		
	SB	30.6	C	SB Left	30	44	7	66	D		
				SB Through	2	37	7	66	D		
				SB Right	19	9	18	104	A		
	EB	7.3	A	EB Left	3	10	23	262	B		
				EB Through	1035	7	23	262	A		
				EB Right	160	7	23	262	A		
	WB	8.3	A	WB Left	242	20	33	332	C		
				WB Through	1650	7	33	332	A		
				WB Right	4	2	33	332	A		
23- MD 124 at MD 355											
23	NB	51.6	D	NB Left	507	63	186	529	E	63.0	E
				NB Through	942	46	183	527	D		
				NB Right	6	12	0	0	B		
	SB	30.7	C	SB Left	141	71	99	395	E		
				SB Through	554	53	99	395	D		
				SB Right	736	6	20	339	A		
	EB	42.4	D	EB Left	468	93	363	1176	F		
				EB Through	2720	41	363	1176	D		
				EB Right	575	7	160	1150	A		
	WB	153.9	F	WB Left	0	0	0	0	A		
				WB Through	1481	156	718	950	F		
				WB Right	65	101	0	0	F		
24- MD 124 at I-270 SB on and off											
24	NB	64.4	F	NB Left	55	65	23	98	E	40.8	D
				NB Through	23	64	23	98	E		
				NB U-Turn	0	0	0	0	A		
	SB	57.0	E	SB Left	572	94	316	1663	F		
				SB Through	10	80	316	1663	F		
				SB Right	452	9	141	1059	A		
	EB	43.4	D	EB Left	0	0	0	0	A		
				EB Through	1738	44	307	1098	D		
				EB Right	31	34	323	1121	C		
	WB	18.7	B	WB Left	4	66	77	588	E		
				WB Through	1046	19	77	588	B		
				WB Right	0	0	0	0	A		
25- MD 117 at MD 124											
25	NB	36.4	D	NB Left	45	63	116	666	E	40.6	D
				NB Through	545	54	116	666	D		
				NB Right	447	13	4	216	B		
	SB	32.8	C	SB Left	119	44	98	447	D		
				SB Through	762	37	98	447	D		
				SB Right	144	2	0	0	A		
	EB	46.1	D	EB Left	120	82	142	477	F		
				EB Through	1092	42	142	478	D		
				EB Right	43	39	149	506	D		
	WB	43.5	D	WB Left	402	70	280	1027	E		
				WB Through	1338	39	280	1027	D		
				WB Right	129	2	0	0	A		
26- MD 117 at Bureau Dr											
26	NB	45.7	D	NB Left	78	79	65	281	E	38.8	D
				NB Through	27	75	65	281	E		
				NB Right	260	33	65	281	C		
	SB	71.9	E	SB Left	274	83	109	351	F		
				SB Through	17	82	109	351	F		
				SB Right	65	21	109	351	C		
	EB	31.4	C	EB Left	41	80	156	829	F		
				EB Through	1593	30	157	829	C		
				EB Right	3	13	151	818	B		
	WB	37.7	D	WB Left	19	43	337	1058	D		
				WB Through	1703	40	337	1059	D		
				WB Right	292	26	368	1107	C		
27- MD 117 at I-270 SB off ramp											
27	NB			NB Left	0	0	0	0	A	13.3	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	4.6	A	EB Left	0	0	0	0	A		
				EB Through	896	5	10	466	A		
				EB Right	0	0	0	0	A		
	WB	39.8	E	WB Left	294	40	140	1068	E		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
28- MD 117 at I-270 NB off ramp											
28	NB			NB Left	0	0	0	0	A	30.5	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	52.1	D	SB Left	256	46	214	871	D		
				SB Through	0	0	0	0	A		
				SB Right	951	54	214	870	D		
	EB	27.6	C	EB Left	3	125	152	980	F		
				EB Through	897	27	152	980	C		
				EB Right	0	0	0	0	A		
	WB	13.3	B	WB Left	0	0	0	0	A		
				WB Through	1359	13	87	383	B		
				WB Right	0	0	87	383	A		
29- MD 117 at Perry Pkwy											
29	NB	42.6	D	NB Left	18	69	13	110	E	37.0	D
				NB Through	21	50	13	109	D		
				NB Right	23	15	21	129	B		
	SB	57.1	E	SB Left	194	85	89	332	F		
				SB Through	14	84	89	332	F		
				SB Right	112	6	89	332	A		
	EB	20.8	C	EB Left	240	69	84	355	E		
				EB Through	864	8	84	355	A		
				EB Right	32	6	69	339	A		
	WB	44.4	D	WB Left	36	105	245	752	F		
				WB Through	1228	46	245	752	D		
				WB Right	300	33	245	752	C		
30- Shady Grove Rd at I-270 NB off ramp											
30	NB	7.1	A	NB Left	0	0	0	0	A	13.8	B
				NB Through	1025	7	16	209	A		
				NB Right	0	0	0	0	A		
	SB	9.5	A	SB Left	0	0	0	0	A		
				SB Through	1280	9	41	481	A		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	52.9	D	WB Left	317	53	58	260	D		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table B.14: PM Peak - Existing - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
31- Shady Grove Rd at I-270 SB off ramp											
31	NB	6.8	A	NB Left	0	0	0	0	A	15.9	B
				NB Through	1463	7	28	378	A		
				NB Right	0	0	0	0	A		
	SB	5.5	A	SB Left	0	0	0	0	A		
				SB Through	817	5	8	156	A		
				SB Right	0	0	0	0	A		
	EB	57.5	E	EB Left	229	55	44	200	D		
				EB Through	0	0	0	0	A		
				EB Right	295	60	63	241	E		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
32- MD 28 at I-270 SB off ramp											
32	NB			NB U-Turn	0	0	0	0	A	8.0	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	36.5	D	SB Left	440	44	74	300	D		
				SB Through	0	0	0	0	A		
				SB Right	98	3	1	70	A		
	EB	2.7	A	EB Left	0	0	0	0	A		
				EB Through	1505	1	0	0	A		
				EB Right	830	6	14	245	A		
	WB	6.1	A	WB Left	0	0	0	0	A		
				WB Through	1693	6	18	227	A		
				WB Right	0	0	0	0	A		
33- MD 28 at I-270 on and off ramps											
33	NB	34.9	C	NB Left	0	0	43	241	A	21.5	C
				NB Through	208	47	51	250	D		
				NB Right	134	16	51	250	B		
	SB	33.6	C	SB Left	11	101	175	288	F		
				SB Through	0	0	0	0	A		
				SB Right	164	29	175	288	C		
	EB	12.7	B	EB Left	254	38	53	287	D		
				EB Through	885	5	53	287	A		
				EB Right	0	0	0	0	A		
	WB	24.1	C	WB Left	36	20	96	383	B		
				WB Through	1241	24	77	346	C		
				WB Right	0	0	0	0	A		
34- MD 189 at Great Falls Rd											
34	NB	38.6	D	NB Left	45	44	12	86	D	13.4	B
				NB Through	11	50	8	84	D		
				NB Right	12	10	8	94	A		
	SB	3.3	A	SB Left	14	51	7	73	D		
				SB Through	11	51	7	73	D		
				SB Right	401	0	0	0	A		
	EB	12.0	B	EB Left	425	24	38	464	C		
				EB Through	669	5	5	161	A		
				EB Right	58	4	9	198	A		
	WB	18.4	B	WB Left	11	18	48	405	B		
				WB Through	827	18	48	405	B		
				WB Right	14	17	63	439	B		
35- MD 189 at I-270 Ramps											
35	NB	46.1	D	NB Left	250	46	44	190	D	41.7	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	55.4	E	SB Left	350	55	139	869	E		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	27.5	C	EB Left	480	31	89	371	C		
				EB Through	367	23	89	371	C		
				EB Right	0	0	0	0	A		
	WB	48.9	D	WB Left	440	54	106	299	D		
				WB Through	417	43	106	299	D		
				WB Right	0	0	0	0	A		
36- MD 189 at Wootton Pkwy											
36	NB	45.1	D	NB Left	187	57	113	410	E	43.8	D
				NB Through	536	52	113	410	D		
				NB Right	174	10	113	410	B		
	SB	62.3	E	SB Left	247	79	151	606	E		
				SB Through	729	57	154	631	E		
				SB Right	0	0	0	0	A		
	EB	34.6	C	EB Left	118	71	101	438	E		
				EB Through	543	34	101	438	C		
				EB Right	160	10	101	438	B		
	WB	34.5	C	WB Left	160	71	123	603	E		
				WB Through	781	35	123	603	C		
				WB Right	317	15	123	603	B		
37- Montrose Rd at Tower Oaks Blvd											
37	NB	0.4	A	NB Left	0	0	0	0	A	16.2	B
				NB Through	0	0	0	0	A		
				NB Right	490	0	0	0	A		
	SB	71.2	E	SB Left	68	48	37	256	D		
				SB Through	0	0	0	0	A		
				SB Right	270	77	97	348	E		
	EB	6.1	A	EB Left	0	0	0	0	A		
				EB Through	1685	6	30	360	A		
				EB Right	0	0	0	0	A		
	WB	18.3	B	WB Left	69	35	30	360	C		
				WB Through	2563	18	105	727	B		
				WB Right	244	12	105	727	B		
38- Tower Oaks Blvd at I-270 off ramp											
38	NB	22.9	C	NB Left	650	23	46	257	C	17.4	B
				NB Through	0	0.0	39	249	A		
				NB Right	21	6.3	46	257	A		
	SB	15.4	B	SB Left	8	24.8	1	43	C		
				SB Through	0	0.0	1	43	A		
				SB Right	7	4.7	0	30	A		
	EB	11.1	B	EB Left	1	11.0	14	153	B		
				EB Through	310	11.6	14	153	B		
				EB Right	33	6.4	9	144	A		
	WB	12.7	B	WB Left	121	15.9	14	122	B		
				WB Through	192	10.8	14	122	B		
				WB Right	1	3.7	2	78	A		
39- Montrose Rd at Tower Oaks Blvd											
39	NB	17.3	B	NB Left	76	34	62	288	C	55.3	E
				NB Through	606	30	62	288	C		
				NB Right	572	1	0	0	A		
	SB	30.3	C	SB Left	193	62	61	206	E		
				SB Through	394	20	59	205	C		
				SB Right	105	11	54	250	B		
	EB	216.7	F	EB Left	81	178	517	714	F		
				EB Through	458	222	518	715	F		
				EB Right	32	240	542	739	F		
	WB	35.5	D	WB Left	565	44	110	402	D		
				WB Through	473	41	111	402	D		
				WB Right	330	13	130	433	B		
40- Rockledge Blvd at I-270 NB on and off ramp											
40	NB	124.2	F	NB Left	0	0	0	0	A	98.5	F
				NB Through	335	113	520	837	F		
				NB Right	854	129	520	837	F		
	SB	86.6	F	SB Left	0	0	86	220	A		
				SB Through	346	87	86	220	F		
				SB Right	0	0	0	0	A		
	EB	62.2	E	EB Left	5	127	169	458	F		
				EB Through	428	103	169	458	F		
				EB Right	297	2	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table B.14: PM Peak - Existing - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS	
41- Rockledge Blvd at I-270 SB on and off ramps												
41	NB	30.2	C	NB Left	341	30	76	261	C	49.5	D	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	54.7	D		WB Left	345	59	193	786			E
					WB Through	894	53	193	786			D
					WB Right	0	0	0	0			A
42- MD 187 at Tuckerman Ln												
42	NB	43.7	D	NB Left	198	21	316	1253	C	120.3	F	
				NB Through	2133	43	316	1253	D			
				NB Right	188	73	316	1253	E			
	SB	201.4	F		SB Left	185	168	2553	2702			F
					SB Through	1122	201	2553	2702			F
					SB Right	270	226	2553	2702			F
	EB	51.7	D		EB Left	238	52	94	407			D
					EB Through	409	54	95	408			D
					EB Right	103	43	113	432			D
	WB	215.4	F		WB Left	459	211	1918	2138			F
					WB Through	614	233	1918	2138			F
					WB Right	151	158	1918	2138			F
43- MD 187 at I-270 NB on and off ramps												
43	NB	14.8	B	NB Left	552	34	103	399	C	18.5	B	
				NB Through	2291	10	103	399	B			
				NB Right	0	0	0	0	A			
	SB	22.7	C		SB Left	0	0	0	0			A
					SB Through	1247	23	57	248			C
					SB Right	0	0	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	61.4	E		WB Left	65	60	50	290			E
					WB Through	65	63	50	290			E
					WB Right	0	0	0	0			A
44- MD 187 at I-270 NB on and off ramps												
44	NB	32.2	D	NB Left	0	0	0	0	A	33.3	C	
				NB Through	2211	32	103	485	C			
				NB Right	0	0	0	0	A			
	SB	20.4	C		SB Left	150	59	74	305			E
					SB Through	1163	15	74	305			B
					SB Right	0	0	0	0			A
	EB	57.1	E		EB Left	636	57	137	558			E
					EB Through	0	0	137	558			A
					EB Right	185	57	77	519			E
	WB				WB Left	0	0	0	0			A
					WB Through	0	0	0	0			A
					WB Right	0	0	0	0			A
45- MD 187 at Rock Spring Dr												
45	NB	16.8	B	NB Left	383	34	90	614	C	23.8	C	
				NB Through	2000	14	91	614	B			
				NB Right	14	12	111	647	B			
	SB	26.7	C		SB Left	20	47	82	400			D
					SB Through	1160	30	82	400			C
					SB Right	172	1	54	356			A
	EB	40.2	D		EB Left	396	59	98	362			E
					EB Through	37	63	98	362			E
					EB Right	375	18	98	362			B
	WB	11.6	B		WB Left	5	32	3	77			C
					WB Through	12	25	3	77			C
					WB Right	32	4	1	67			A
47-Democracy Blvd at I-270 NB off ramp												
47	NB	45.7	D	NB Left	152	46	29	159	D	3.0	A	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB	1.2	A		EB Left	0	0	0	0			A
					EB Through	1114	1	3	51			A
					EB Right	0	0	0	0			A
	WB	0.9	A		WB Left	0	0	0	0			A
					WB Through	2129	1	2	62			A
					WB Right	0	0	0	0			A
48- Democracy Blvd at I-270 SB on ramp												
48	NB			NB Left	0	0	0	0	A	6.3	A	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB	5.0	A		EB Left	0	0	0	0			A
					EB Through	1326	5	17	250			A
					EB Right	0	0	0	0			A
	WB	7.0	A		WB Left	531	24	39	287			C
					WB Through	1748	2	30	266			A
					WB Right	0	0	0	0			A
49- Democracy Blvd at I-270 SB off ramp												
49	NB			NB Left	0	0	0	0	A	7.4	A	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB	38.9	D		SB Left	159	53	31	164			D
					SB Through	0	0	0	0			A
					SB Right	60	2	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	3.8	A		WB Left	0	0	0	0			A
					WB Through	1748	4	16	274			A
					WB Right	168	3	12	305			A
50- MD 190 at Burdette Rd												
50	NB	72.8	E	NB Left	26	74	15	100	E	31.1	C	
				NB Through	4	84	15	100	F			
				NB Right	5	56	15	100	E			
	SB	32.1	C		SB Left	34	78	19	122			E
					SB Through	7	56	19	122			E
					SB Right	118	18	19	122			B
	EB	17.6	B		EB Left	122	85	82	513			F
					EB Through	1151	11	82	513			B
					EB Right	28	4	68	540			A
	WB	38.3	D		WB Left	11	113	334	1111			F
					WB Through	2146	38	334	1111			D
					WB Right	52	28	334	1111			C

Table B.14: PM Peak - Existing - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
51- MD 190 at I-270 NB on ramp											
51	NB			NB Left	0	0	0	0	A	16.9	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	70.2	E	EB Left	233	70	101	369	E		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	8.4	A	WB Left	0	0	0	0	A		
				WB Through	1464	8	42	713	A		
				WB Right	0	0	0	0	A		
52- MD 190 at I-270 SB off ramp											
52	NB	73.8	E	NB Left	222	74	89	830	E	12.4	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	2.9	A	EB Left	0	0	0	0	A		
				EB Through	840	3	6	143	A		
				EB Right	0	0	0	0	A		
	WB	9.1	A	WB Left	0	0	0	0	A		
				WB Through	1705	9	26	545	A		
				WB Right	0	0	0	0	A		
53- MD 190 at Seven Locks Rd											
53	NB	0.3	A	NB Left	21	1	0	0	A	24.7	C
				NB Through	243	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	55.7	E	SB Left	306	56	103	375	E		
				SB Through	180	56	103	375	E		
				SB Right	17	56	103	375	E		
	EB	27.1	C	EB Left	22	33	66	355	C		
				EB Through	664	27	66	355	C		
				EB Right	34	25	66	355	C		
	WB	19.0	B	WB Left	262	75	125	534	E		
				WB Through	935	15	125	534	B		
				WB Right	715	4	125	534	A		
54- MD 124 at I-270 NB off ramp											
54	NB	59.5	E	NB Left	0	0	0	0	A	64.0	E
				NB Through	0	0	0	0	A		
				NB Right	1911	59	802	2475	E		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	68.6	E	EB Left	0	0	0	0	A		
				EB Through	1874	69	579	1267	E		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
55- Democracy Blvd at I-270 NB off ramp											
55	NB	47.0	D	NB Left	0	0	0	0	A	11.5	B
				NB Through	0	0	0	0	A		
				NB Right	314	47	51	199	D		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	1.5	A	EB Left	0	0	0	0	A		
				EB Through	1113	2	4	65	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table B.15: PM Peak - 2015 Final Model - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
1- MD 85 at Sam's Club Drive											
1	NB	26.6	C	NB Left	114	86	103	586	F	50.7	D
				NB Through	501	32	103	586	C		
				NB Right	822	15	39	584	B		
	SB	76.8	E	SB Left	143	76	371	1011	E		
				SB Through	880	77	371	1011	E		
				SB Right	68	77	371	1011	E		
	EB	33.5	C	EB Left	43	83	27	116	F		
				EB Through	20	91	27	116	F		
				EB Right	144	11	27	116	B		
	WB	64.0	E	WB Left	508	77	222	701	E		
				WB Through	28	66	222	701	E		
				WB Right	193	29	222	701	C		
2- MD 85 at I-270 NB on and off ramp											
2	NB	37.8	D	NB Left	974	38	202	946	D	32.7	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	25.5	C	SB Left	0	0	0	0	A		
				SB Through	676	25	87	687	C		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
3- MD 85 at I-270 SB on and off ramp											
3	NB	6.1	A	NB Left	0	0	0	0	A	9.6	A
				NB Through	1699	6	44	876	A		
				NB Right	0	0	0	0	A		
	SB	44.4	D	SB Left	173	44	47	345	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
4- MD 85 at Crestwood Blvd											
4	NB	33.5	D	NB Left	60	70	154	659	E	33.6	C
				NB Through	1255	32	154	659	C		
				NB U-Turn	0	0	0	0	A		
	SB	22.1	C	SB Left	90	79	44	202	E		
				SB Through	807	25	58	529	C		
				SB Right	795	12	47	520	B		
	EB	54.3	D	EB Left	803	56	132	602	E		
				EB Through	31	44	132	602	D		
				EB Right	22	0	132	602	A		
	WB	43.2	D	WB Left	35	74	39	162	E		
				WB Through	61	65	39	162	E		
				WB Right	81	13	39	162	B		
5- MD 80 at I-270 NB on and ramp											
5	NB	-1.9	A	NB Left	1	0	0	4	A	8.5	A
				NB Through	2	0	0	4	A		
				NB Right	8	-3	0	4	A		
	SB	12.6	B	SB Left	373	16	21	130	B		
				SB Through	17	18	21	130	B		
				SB Right	118	3	0	0	A		
	EB	9.3	A	EB Left	70	10	14	183	A		
				EB Through	0	0	8	0	A		
				EB Right	6	5	24	213	A		
	WB	6.5	A	WB Left	16	10	0	41	A		
				WB Through	509	12	26	266	B		
				WB Right	482	1	0	0	A		
6- MD 80 at I-270 SB on and off ramp											
6	NB	2.2	A	NB Left	47	2	1	123	A	4.0	A
				NB Through	0	0	0	0	A		
				NB Right	491	2	1	123	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	4.9	A	EB Left	0	0	0	0	A		
				EB Through	272	5	2	64	A		
				EB Right	53	3	1	72	A		
	WB	6.2	A	WB Left	0	0	0	0	A		
				WB Through	313	6	1	95	A		
				WB Right	0	0	0	0	A		
7- MD 109 at I-270 NB on and off ramp											
7	NB			NB Left	0	0	0	0	A	5.2	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	10.0	A	SB Left	218	11	13	152	B		
				SB Through	0	0	0	0	A		
				SB Right	16	2	0	78	A		
	EB	2.2	A	EB Left	56	1	0	39	A		
				EB Through	0	0	0	0	A		
				EB Right	59	3	0	0	A		
	WB	0.2	A	WB Left	0	0	0	0	A		
				WB Through	160	0	0	0	A		
				WB Right	0	0	0	0	A		
8- MD 80 at I-270 SB on and off ramp											
8	NB	4.2	A	NB Left	44	7	2	103	A	1.6	A
				NB Through	0	0	0	0	A		
				NB Right	29	0	0	46	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.8	A	EB Left	0	0	0	0	A		
				EB Through	114	0	0	0	A		
				EB Right	24	4	0	0	A		
	WB	1.2	A	WB Left	98	1	0	41	A		
				WB Through	77	1	0	18	A		
				WB Right	0	0	0	0	A		
9- MD 121 at Gateway Center Dr											
9	NB	10.3	B	NB Left	466	13	30	229	B	16.6	B
				NB Through	636	9	30	229	A		
				NB Right	55	1	36	255	A		
	SB	16.8	C	SB Left	20	11	5	118	B		
				SB Through	169	18	14	141	B		
				SB Right	8	7	12	149	A		
	EB	13.1	B	EB Left	2	56	2	69	E		
				EB Through	18	40	8	143	D		
				EB Right	142	9	17	175	A		
	WB	35.6	E	WB Left	211	47	57	204	D		
				WB Through	57	40	58	204	D		
				WB Right	140	17	72	228	B		
10- MD 121 at I-270 NB on and off ramp											
10	NB	0.7	A	NB Left	25	10	1	77	A	0.6	A
				NB Through	0	0	0	0	A		
				NB Right	715	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.1	A	EB Left	0	0	0	0	A		
				EB Through	446	0	0	0	A		
				EB Right	58	0	0	0	A		
	WB	0.9	A	WB Left	99	3	1	89	A		
				WB Through	423	0	0	60	A		
				WB Right	0	0	0	0	A		

* Final = HSR + VSL + ARM + MODE

Table B.15: PM Peak - 2015 Final Model - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
11- MD 121 at I-270 SB on and off ramp											
11	NB			NB Left	0	0	0	0	A	2.2	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	7.5	A	SB Left	135	9	7	134	A		
				SB Through	0	0	0	0	A		
				SB Right	36	0	0	0	A		
	EB	0.3	A	EB Left	29	1	0	26	A		
				EB Through	0	0	0	0	A		
				EB Right	348	0	0	0	A		
	WB	0.1	A	WB Left	0	0	0	0	A		
				WB Through	98	0	0	0	A		
				WB Right	0	0	0	0	A		
12- MD 27 at Observation Dr											
12	NB	40.4	D	NB U-Turn	0	0	0	0	A	22.0	C
				NB Through	73	57	19	86	E		
				NB Right	47	14	19	86	B		
	SB	39.9	D	SB Left	114	46	31	182	D		
				SB Through	41	62	36	244	E		
				SB Right	173	30	58	281	C		
	EB	16.9	B	EB Left	208	28	69	498	C		
				EB Through	2226	16	71	499	B		
				EB Right	106	15	84	537	B		
	WB	25.1	C	WB Left	31	22	120	599	C		
				WB Through	1503	26	120	599	C		
				WB Right	54	7	120	599	A		
13- MD 27 at I-270 NB off ramp											
13	NB	43.6	D	NB Left	389	44	64	241	D	7.9	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.1	A	EB Left	0	0	0	0	A		
				EB Through	1284	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	5.5	A	WB Left	0	0	0	0	A		
				WB Through	1582	5	41	683	A		
				WB Right	0	0	0	0	A		
14- MD 27 at I-270 SB off ramp											
14	NB			NB Left	0	0	0	0	A	5.3	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	50.3	D	SB Left	171	50	33	166	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	2.3	A	EB Left	0	0	0	0	A		
				EB Through	1351	2	4	165	A		
				EB Right	0	0	0	0	A		
	WB	2.7	A	WB Left	0	0	0	0	A		
				WB Through	1430	3	8	288	A		
				WB Right	0	0	0	0	A		
15- MD 27 at Crystal Rock Dr											
15	NB	22.7	C	NB Left	58	20	55	387	B	29.6	C
				NB Through	966	23	68	386	C		
				NB Right	43	20	72	399	B		
	SB	33.4	C	SB Left	143	57	181	722	E		
				SB Through	1309	35	181	722	C		
				SB Right	198	9	163	716	A		
	EB	43.0	D	EB Left	103	54	28	120	D		
				EB Through	37	46	25	115	D		
				EB Right	47	17	17	141	B		
	WB	27.6	C	WB Left	83	49	69	297	D		
				WB Through	102	42	69	297	D		
				WB Right	552	22	69	297	C		
16- MD 118 at Seneca Meadows Pkwy											
16	NB	4.0	A	NB Left	91	13	2	80	B	8.2	A
				NB Through	1178	3	7	149	A		
				NB Right	0	0	14	203	A		
	SB	6.6	A	SB Left	11	7	14	260	A		
				SB Through	1091	7	18	260	A		
				SB Right	9	3	21	293	A		
	EB	13.1	B	EB Left	18	55	12	129	E		
				EB Through	1	76	12	129	E		
				EB Right	275	10	12	129	B		
	WB	53.6	D	WB Left	93	64	37	199	E		
				WB Through	6	61	33	198	E		
				WB Right	25	13	42	218	B		
17- MD 118 at I-270 NB on ramp											
17	NB			NB Left	0	0	0	0	A	16.2	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	33.4	C	EB Left	435	33	89	499	C		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	11.1	B	WB Left	0	0	0	0	A		
				WB Through	246	2	1	133	A		
				WB Right	1214	13	48	510	B		
18- MD 118 at I-270 SB off ramp											
18	NB			NB Left	0	0	0	0	A	5.8	A
				NB Through	0	0.0	0	0	A		
				NB Right	0	0.0	0	0	A		
	SB	37.0	D	SB Left	130	37.0	22	121	D		
				SB Through	0	0.0	0	0	A		
				SB Right	0	0.0	0	0	A		
	EB	4.4	A	EB Left	0	0.0	0	0	A		
				EB Through	1182	4.4	9	318	A		
				EB Right	0	0.0	0	0	A		
	WB	4.2	A	WB Left	0	0.0	0	0	A		
				WB Through	1467	4.2	8	189	A		
				WB Right	0	0.0	0	0	A		
19- MD 118 at Aircraft Dr											
19	NB	24.1	C	NB Left	42	68	34	176	E	28.2	C
				NB Through	43	71	34	176	E		
				NB Right	196	4	3	79	A		
	SB	93.9	F	SB Left	382	92	226	583	F		
				SB Through	12	93	226	583	F		
				SB Right	97	100	226	583	F		
	EB	17.9	B	EB Left	98	22	60	393	C		
				EB Through	1215	18	60	393	B		
				EB Right	17	16	60	393	B		
	WB	17.9	B	WB Left	13	24	68	427	C		
				WB Through	1324	21	68	427	C		
				WB Right	352	5	68	427	A		
20- Middlebrook Rd at Observation Dr											
20	NB			NB Left	0	0	0	0	A	8.5	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	18.0	B	SB Left	96	35	18	131	D		
				SB Through	0	0	0	0	A		
				SB Right	179	9	18	131	A		
	EB	6.4	A	EB Left	15	8	17	161	A		
				EB Through	1183	6	17	161	A		
				EB Right	0	0	0	0	A		
	WB	8.5	A	WB Left	0	0	0	0	A		
				WB Through	1238	8	24	243	A		
				WB Right	12	7	39	292	A		

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Table B.15: PM Peak - 2015 Final Model - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
21- Middlebrook Rd at I-270 SB on ramp											
21	NB			NB Left	0	0	0	0	A	4.4	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	2.7	A	EB Left	0	0	0	0	A		
				EB Through	685	3	4	105	A		
				EB Right	0	0	0	0	A		
				WB Left	429	7	4	189	A		
WB	7.1	A	WB Through	0	0	0	0	A			
			WB Right	0	0	0	0	A			
22- Middlebrook Rd at Waring Station Rd											
22	NB	48.2	D	NB Left	156	45	75	316	D	12.8	B
				NB Through	0	0	75	316	A		
				NB Right	219	51	75	316	D		
	SB	30.9	C	SB Left	30	45	7	66	D		
				SB Through	2	37	7	66	D		
				SB Right	19	8	19	104	A		
	EB	7.3	A	EB Left	3	13	23	261	B		
				EB Through	1035	7	23	261	A		
				EB Right	160	7	23	261	A		
				WB Left	243	22	36	352	C		
WB	8.8	A	WB Through	1658	7	36	352	A			
			WB Right	4	1	36	352	A			
23- MD 124 at MD 355											
23	NB	53.1	D	NB Left	505	64	191	519	E	61.2	E
				NB Through	938	47	188	517	D		
				NB Right	6	15	0	0	B		
	SB	31.1	C	SB Left	141	72	101	383	E		
				SB Through	550	54	101	383	D		
				SB Right	732	6	22	311	A		
	EB	37.8	D	EB Left	460	84	296	1175	F		
				EB Through	2671	37	296	1175	D		
				EB Right	563	5	124	1122	A		
				WB Left	0	0	0	0	A		
WB	152.1	F	WB Through	1491	154	715	949	F			
			WB Right	65	97	0	7	F			
24- MD 124 at I-270 SB on and off											
24	NB	66.0	F	NB Left	54	65	24	96	E	32.4	C
				NB Through	23	69	24	96	E		
				NB U-Turn	0	0	0	0	A		
	SB	48.4	D	SB Left	567	82	189	991	F		
				SB Through	9	58	189	991	E		
				SB Right	454	6	5	290	A		
	EB	30.2	C	EB Left	0	0	0	0	A		
				EB Through	1788	30	200	1079	C		
				EB Right	31	23	213	1102	C		
				WB Left	5	36	76	615	D		
WB	18.1	B	WB Through	1055	18	76	615	B			
			WB Right	0	0	0	0	A			
25- MD 117 at MD 124											
25	NB	34.9	C	NB Left	45	62	112	653	E	40.0	D
				NB Through	542	52	112	653	D		
				NB Right	446	12	3	175	B		
	SB	31.9	C	SB Left	120	40	97	464	D		
				SB Through	763	36	97	464	D		
				SB Right	144	2	0	0	A		
	EB	45.6	D	EB Left	120	81	141	482	F		
				EB Through	1093	42	140	484	D		
				EB Right	42	41	149	511	D		
				WB Left	386	68	269	1023	E		
WB	43.5	D	WB Through	1295	40	269	1023	D			
			WB Right	127	2	0	0	A			
26- MD 117 at Bureau Dr											
26	NB	43.3	D	NB Left	78	76	62	262	E	39.0	D
				NB Through	28	75	62	262	E		
				NB Right	260	30	62	262	C		
	SB	74.5	E	SB Left	273	85	113	370	F		
				SB Through	18	86	113	370	F		
				SB Right	65	26	113	370	C		
	EB	32.5	C	EB Left	41	75	160	824	E		
				EB Through	1608	31	162	824	C		
				EB Right	3	37	155	813	D		
				WB Left	18	39	320	1063	D		
WB	37.3	D	WB Through	1671	39	321	1064	D			
			WB Right	283	26	351	1112	C			
27- MD 117 at I-270 SB off ramp											
27	NB			NB Left	0	0	0	0	A	14.6	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	5.3	A	EB Left	0	0	0	0	A		
				EB Through	902	5	14	506	A		
				EB Right	0	0	0	0	A		
				WB Left	297	43	150	1059	E		
WB	42.8	E	WB Through	0	0	0	0	A			
			WB Right	0	0	0	0	A			
28- MD 117 at I-270 NB off ramp											
28	NB			NB Left	0	0	0	0	A	30.2	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	53.9	D	SB Left	239	50	296	1381	D		
				SB Through	0	0	0	0	A		
				SB Right	894	55	296	1380	D		
	EB	27.7	C	EB Left	3	115	160	984	F		
				EB Through	897	27	160	984	C		
				EB Right	0	0	0	0	A		
				WB Left	0	0	0	0	A		
WB	12.2	B	WB Through	1377	12	80	375	B			
			WB Right	0	0	80	375	A			
29- MD 117 at Perry Pkwy											
29	NB	45.1	D	NB Left	18	71	14	103	E	37.6	D
				NB Through	22	57	13	102	E		
				NB Right	24	15	22	123	B		
	SB	56.1	E	SB Left	196	83	87	330	F		
				SB Through	15	91	87	330	F		
				SB Right	113	5	87	330	A		
	EB	21.4	C	EB Left	238	72	84	356	E		
				EB Through	849	8	84	356	A		
				EB Right	32	6	69	340	A		
				WB Left	37	101	251	747	F		
WB	44.9	D	WB Through	1247	46	251	747	D			
			WB Right	304	34	251	747	C			
30- Shady Grove Rd at I-270 NB off ramp											
30	NB	7.1	A	NB Left	0	0	0	0	A	13.3	B
				NB Through	1024	7	16	198	A		
				NB Right	0	0	0	0	A		
	SB	9.2	A	SB Left	0	0	0	0	A		
				SB Through	1257	9	38	494	A		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
				WB Left	309	51	58	222	D		
WB	50.7	D	WB Through	0	0	0	0	A			
			WB Right	0	0	0	0	A			

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Table B.15: PM Peak - 2015 Final Model - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
31- Shady Grove Rd at I-270 SB off ramp											
31	NB	6.6	A	NB Left	0	0	0	0	A	15.9	B
				NB Through	1463	7	26	391	A		
				NB Right	0	0	0	0	A		
	SB	5.3	A	SB Left	0	0	0	0	A		
				SB Through	803	5	8	175	A		
				SB Right	0	0	0	0	A		
	EB	58.3	E	EB Left	229	58	48	199	E		
				EB Through	0	0	0	0	A		
				EB Right	295	59	63	233	E		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
32- MD 28 at I-270 SB off ramp											
32	NB			NB U-Turn	0	0	0	0	A	8.5	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	36.8	D	SB Left	438	44	75	303	D		
				SB Through	0	0	0	0	A		
				SB Right	98	3	0	24	A		
	EB	3.3	A	EB Left	0	0	0	0	A		
				EB Through	1493	2	34	542	A		
				EB Right	829	6	47	725	A		
	WB	6.6	A	WB Left	0	0	0	0	A		
				WB Through	1652	7	19	209	A		
				WB Right	0	0	0	0	A		
33- MD 28 at I-270 on and off ramps											
33	NB	34.7	C	NB Left	0	0	45	224	A	20.3	C
				NB Through	206	47	53	233	D		
				NB Right	133	15	53	233	B		
	SB	34.5	C	SB Left	11	108	183	320	F		
				SB Through	0	0	0	0	A		
				SB Right	160	29	183	320	C		
	EB	11.1	B	EB Left	255	32	43	255	C		
				EB Through	884	5	43	255	A		
				EB Right	0	0	0	0	A		
	WB	22.9	C	WB Left	36	19	90	384	B		
				WB Through	1171	23	72	347	C		
				WB Right	0	0	0	0	A		
34- MD 189 at Great Falls Rd											
34	NB	45.2	D	NB Left	44	55	12	90	D	32.8	C
				NB Through	11	46	9	88	D		
				NB Right	12	10	9	99	A		
	SB	21.5	C	SB Left	13	52	35	262	D		
				SB Through	9	51	35	262	D		
				SB Right	335	20	58	260	B		
	EB	25.9	C	EB Left	403	48	305	1776	D		
				EB Through	648	13	11	215	B		
				EB Right	55	15	17	252	B		
	WB	47.6	D	WB Left	10	42	162	611	D		
				WB Through	706	48	162	611	D		
				WB Right	12	39	183	645	D		
35- MD 189 at I-270 Ramps											
35	NB	48.7	D	NB Left	244	49	44	214	D	53.2	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	64.8	E	SB Left	340	65	292	1379	E		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	32.8	C	EB Left	473	38	90	369	D		
				EB Through	367	26	90	369	C		
				EB Right	0	0	0	0	A		
	WB	72.9	E	WB Left	379	78	94	331	E		
				WB Through	348	68	94	331	E		
				WB Right	0	0	0	0	A		
36- MD 189 at Wooton Pkwy											
36	NB	44.2	D	NB Left	187	56	110	411	E	43.4	D
				NB Through	535	51	110	411	D		
				NB Right	174	10	110	411	A		
	SB	61.6	E	SB Left	248	78	149	594	E		
				SB Through	729	56	154	586	E		
				SB Right	0	0	0	0	A		
	EB	34.7	C	EB Left	118	71	102	520	E		
				EB Through	540	34	102	520	C		
				EB Right	160	11	102	520	B		
	WB	33.7	C	WB Left	151	71	113	591	E		
				WB Through	736	34	113	591	C		
				WB Right	296	15	113	591	B		
37- Montrose Rd at Tower Oaks Blvd											
37	NB	0.3	A	NB Left	0	0	0	0	A	12.6	B
				NB Through	0	0	0	0	A		
				NB Right	493	0	0	0	A		
	SB	48.0	D	SB Left	68	54	18	153	D		
				SB Through	0	0	0	0	A		
				SB Right	270	47	57	217	D		
	EB	5.6	A	EB Left	0	0	0	0	A		
				EB Through	1654	6	26	390	A		
				EB Right	0	0	0	0	A		
	WB	14.5	B	WB Left	68	34	26	390	C		
				WB Through	2573	15	76	661	B		
				WB Right	245	10	76	661	A		
38- Tower Oaks Blvd at I-270 off ramp											
38	NB	23.3	C	NB Left	651	24	46	241	C	17.5	B
				NB Through	0	0.0	40	233	A		
				NB Right	22	6.4	46	241	A		
	SB	14.3	B	SB Left	8	24.5	1	39	C		
				SB Through	0	0.0	1	38	A		
				SB Right	7	2.7	0	22	A		
	EB	10.9	B	EB Left	1	7.3	14	174	A		
				EB Through	310	11.3	14	173	B		
				EB Right	33	6.5	9	164	A		
	WB	12.5	B	WB Left	122	16.3	14	123	B		
				WB Through	191	10.1	14	123	B		
				WB Right	1	4.1	2	79	A		
39- Montrose Rd at Tower Oaks Blvd											
39	NB	17.2	B	NB Left	76	33	62	278	C	55.6	E
				NB Through	606	30	62	278	C		
				NB Right	572	1	0	0	A		
	SB	29.0	C	SB Left	192	59	59	196	E		
				SB Through	394	19	57	195	B		
				SB Right	105	11	52	231	B		
	EB	221.0	F	EB Left	79	183	530	713	F		
				EB Through	452	226	531	714	F		
				EB Right	31	240	555	737	F		
	WB	36.4	D	WB Left	568	45	114	427	D		
				WB Through	472	43	115	427	D		
				WB Right	329	12	136	457	B		
40- Rockledge Blvd at I-270 NB on and off ramp											
40	NB	125.1	F	NB Left	0	0	0	0	A	99.3	F
				NB Through	340	114	524	835	F		
				NB Right	857	130	524	835	F		
	SB	86.5	F	SB Left	0	0	86	223	A		
				SB Through	344	87	86	223	F		
				SB Right	0	0	0	0	A		
	EB	62.6	E	EB Left	5	130	173	607	F		
				EB Through	425	104	173	607	F		
				EB Right	295	2	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

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Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS	
41- Rockledge Blvd at I-270 SB on and off ramps												
41	NB	29.2	C	NB Left	346	29	73	271	C	45.5	D	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	50.1	D		WB Left	343	54	175	681			D
					WB Through	890	49	175	681			D
					WB Right	0	0	0	0			A
42- MD 187 at Tuckerman Ln												
42	NB	45.2	D	NB Left	199	19	325	1231	B	122.0	F	
				NB Through	2134	45	325	1231	D			
				NB Right	185	74	325	1231	E			
	SB	208.3	F		SB Left	179	183	2555	2701			F
					SB Through	1096	207	2555	2701			F
					SB Right	269	233	2555	2701			F
	EB	51.7	D		EB Left	238	52	94	407			D
					EB Through	409	54	95	408			D
					EB Right	103	43	113	432			D
	WB	213.9	F		WB Left	461	210	1910	2137			F
					WB Through	614	231	1910	2137			F
					WB Right	153	157	1910	2137			F
43- MD 187 at I-270 NB on and off ramps												
43	NB	14.2	B	NB Left	552	31	100	395	C	18.3	B	
				NB Through	2294	10	100	395	B			
				NB Right	0	0	0	0	A			
	SB	23.8	C		SB Left	0	0	0	0			A
					SB Through	1230	24	59	230			C
					SB Right	0	0	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	55.9	E		WB Left	65	55	46	338			E
					WB Through	66	56	46	338			E
					WB Right	0	0	0	0			A
44- MD 187 at I-270 NB on and off ramps												
44	NB	32.7	D	NB Left	0	0	0	0	A	33.7	C	
				NB Through	2213	33	105	491	C			
				NB Right	0	0	0	0	A			
	SB	19.8	B		SB Left	147	59	72	287			E
					SB Through	1147	15	72	287			B
					SB Right	0	0	0	0			A
	EB	58.7	E		EB Left	632	59	141	550			E
					EB Through	0	0	141	550			A
					EB Right	183	58	85	509			E
	WB				WB Left	0	0	0	0			A
					WB Through	0	0	0	0			A
					WB Right	0	0	0	0			A
45- MD 187 at Rock Spring Dr												
45	NB	16.4	B	NB Left	383	35	89	629	C	23.5	C	
				NB Through	2000	13	89	630	B			
				NB Right	14	12	109	663	B			
	SB	26.7	C		SB Left	20	42	82	358			D
					SB Through	1144	30	82	358			C
					SB Right	169	1	53	350			A
	EB	40.1	D		EB Left	396	59	98	358			E
					EB Through	38	63	98	358			E
					EB Right	376	18	98	358			B
	WB	11.5	B		WB Left	5	31	3	77			C
					WB Through	12	24	3	77			C
					WB Right	32	4	1	67			A
47- Democracy Blvd at I-270 NB off ramp												
47	NB	45.7	D	NB Left	152	46	29	129	D	3.0	A	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB	1.2	A		EB Left	0	0	0	0			A
					EB Through	1099	1	3	48			A
					EB Right	0	0	0	0			A
	WB	1.0	A		WB Left	0	0	0	0			A
					WB Through	2129	1	3	62			A
					WB Right	0	0	0	0			A
48- Democracy Blvd at I-270 SB on ramp												
48	NB			NB Left	0	0	0	0	A	7.2	A	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB	5.2	A		EB Left	0	0	0	0			A
					EB Through	1307	5	18	248			A
					EB Right	0	0	0	0			A
	WB	8.3	A		WB Left	524	30	48	364			C
					WB Through	1748	2	39	344			A
					WB Right	0	0	0	0			A
49- Democracy Blvd at I-270 SB off ramp												
49	NB			NB Left	0	0	0	0	A	7.9	A	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB	38.9	D		SB Left	155	53	31	185			D
					SB Through	0	0	0	0			A
					SB Right	58	2	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	4.4	A		WB Left	0	0	0	0			A
					WB Through	1748	4	16	263			A
					WB Right	161	13	49	406			B
50- MD 190 at Burdette Rd												
50	NB	73.7	E	NB Left	26	76	15	100	E	29.2	C	
				NB Through	4	84	15	100	F			
				NB Right	5	56	15	100	E			
	SB	31.0	C		SB Left	34	79	19	121			E
					SB Through	7	56	19	121			E
					SB Right	118	16	19	121			B
	EB	17.5	B		EB Left	121	89	83	487			F
					EB Through	1141	10	83	487			B
					EB Right	27	4	66	514			A
	WB	35.2	D		WB Left	11	121	309	1107			F
					WB Through	2159	35	309	1107			D
					WB Right	51	24	309	1107			C

* Final = HSR + VSL + ARM + MODE

Table B.15: PM Peak - 2015 Final Model - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
51- MD 190 at I-270 NB on ramp											
51	NB			NB Left	0	0	0	0	A	17.0	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	70.6	E	EB Left	233	71	102	361	E		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	8.6	A	WB Left	0	0	0	0	A		
WB Through				1471	9	45	661	A			
WB Right				0	0	0	0	A			
52- MD 190 at I-270 SB off ramp											
52	NB	69.4	E	NB Left	221	69	78	786	E	12.4	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	2.9	A	EB Left	0	0	0	0	A		
				EB Through	840	3	6	138	A		
				EB Right	0	0	0	0	A		
	WB	9.8	A	WB Left	0	0	0	0	A		
WB Through				1714	10	24	449	A			
WB Right				0	0	0	0	A			
53- MD 190 at Seven Locks Rd											
53	NB	0.4	A	NB Left	21	1	0	0	A	25.0	C
				NB Through	243	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	55.7	E	SB Left	306	56	103	375	E		
				SB Through	180	56	103	375	E		
				SB Right	17	56	103	375	E		
	EB	27.2	C	EB Left	22	32	66	357	C		
				EB Through	664	27	66	357	C		
				EB Right	34	25	66	357	C		
	WB	19.5	B	WB Left	264	77	127	602	E		
WB Through				940	16	127	602	B			
WB Right				720	4	127	602	A			
54- MD 124 at I-270 NB off ramp											
54	NB	49.8	D	NB Left	0	0	0	0	A	53.0	D
				NB Through	0	0	0	0	A		
				NB Right	1810	50	548	2186	D		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	56.2	E	EB Left	0	0	0	0	A		
				EB Through	1897	56	446	1253	E		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
WB Through				0	0	0	0	A			
WB Right				0	0	0	0	A			
55- Democracy Blvd at I-270 NB off ramp											
55	NB	46.1	D	NB Left	0	0	0	0	A	11.5	B
				NB Through	0	0	0	0	A		
				NB Right	315	46	51	194	D		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	1.6	A	EB Left	0	0	0	0	A		
				EB Through	1099	2	4	66	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
WB Through				0	0	0	0	A			
WB Right				0	0	0	0	A			

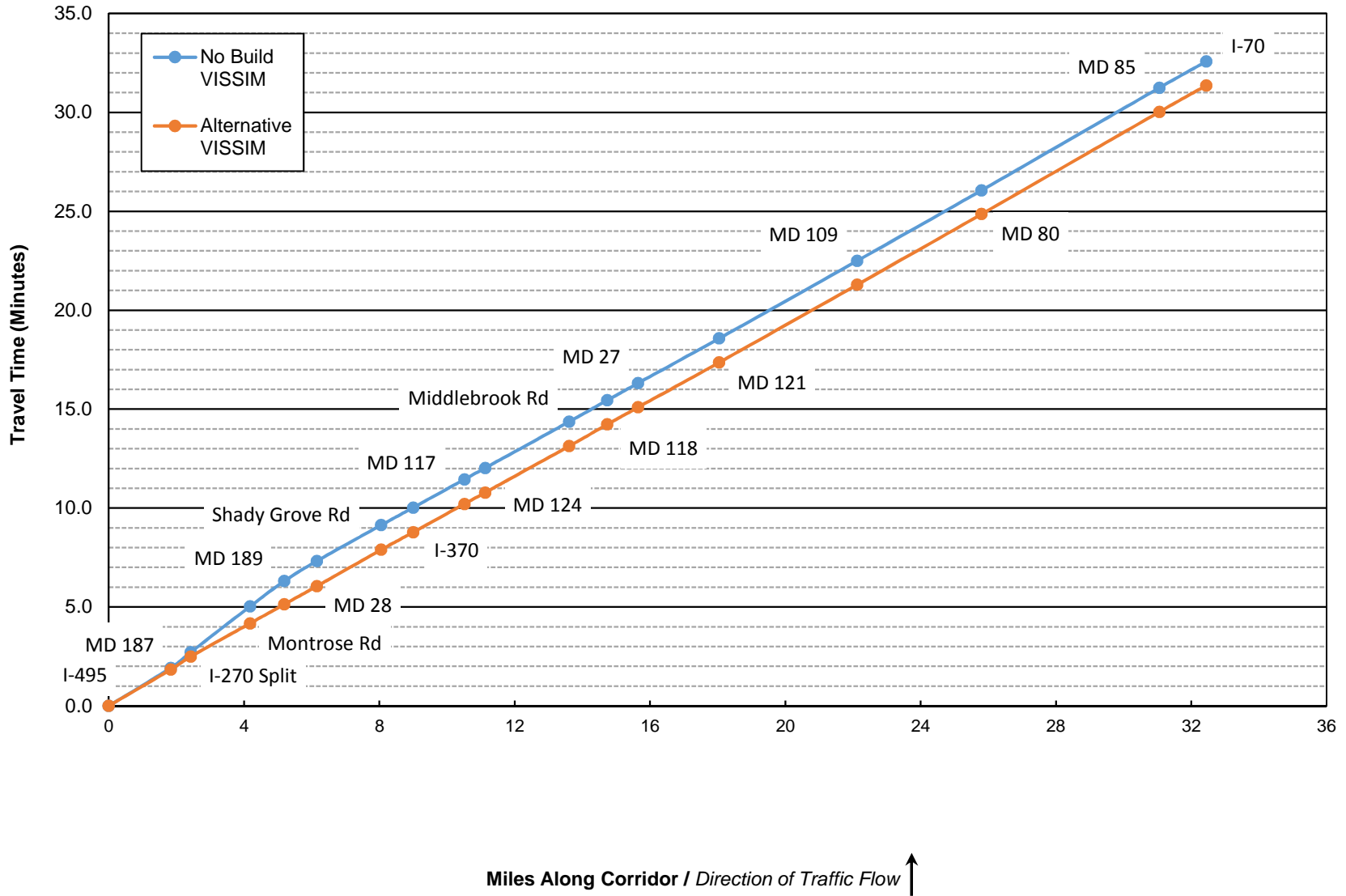
* Final = HSR + VSL + ARM + MODE

Table B.16: PM Peak - 2015 Final Model - I-270 Vehicle Network Performance

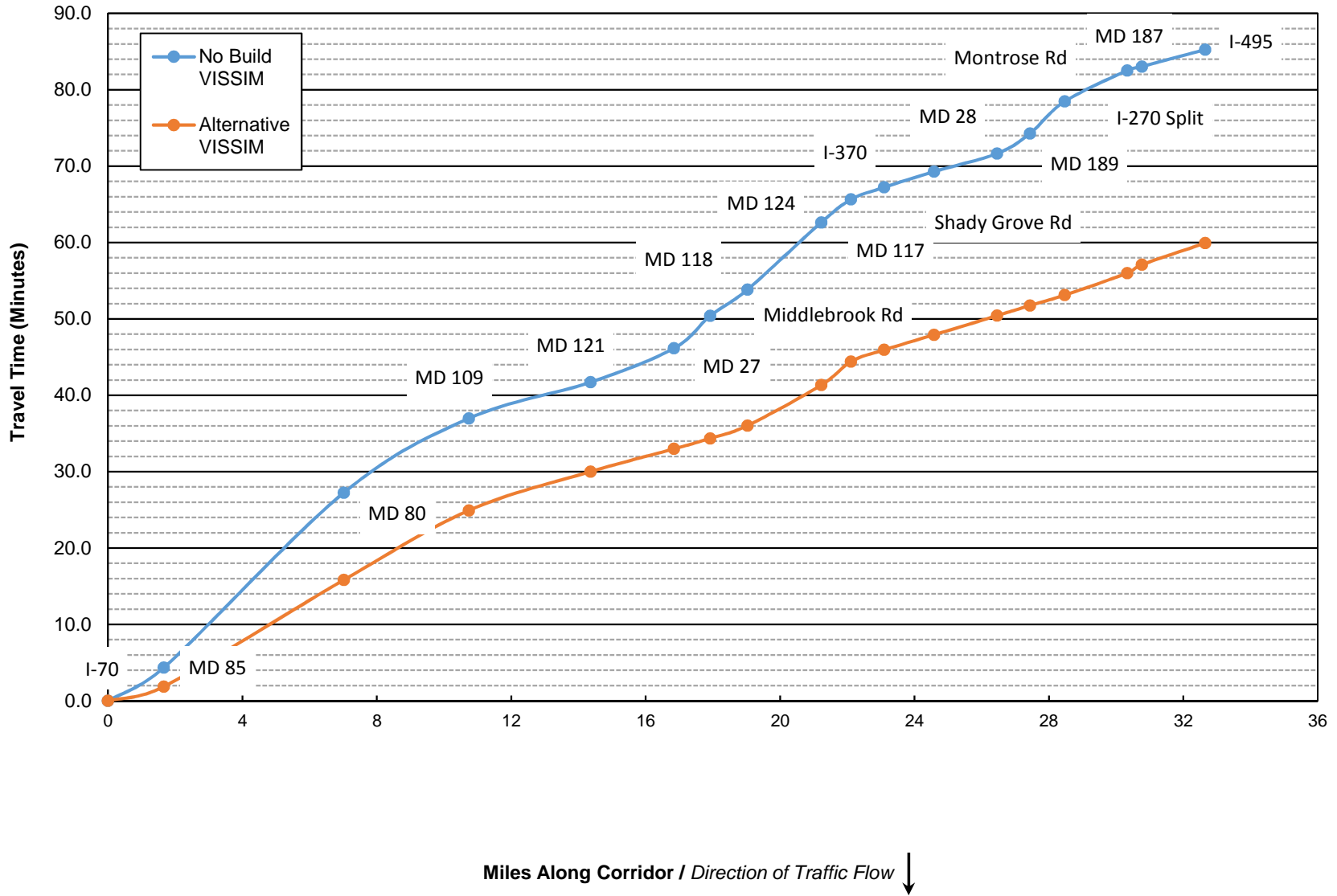
	Existing	Final	% Change
Total Delay	21,792,153	18,866,992	-13%
Average Delay per Vehicle	206	180	-13%
Total Travel Time	53,628,278	52,046,682	-3%
Vehicles (Arrived)	88,401	88,417	0%
Latent Demand	1,544	1,526	-1%
Latent Delay	2,650,217	2,714,907	2%
Total Distance	484,473	481,179	-1%
Average Speed	33	33	2%

*FINAL = HSR+VSL+ARM+MODE

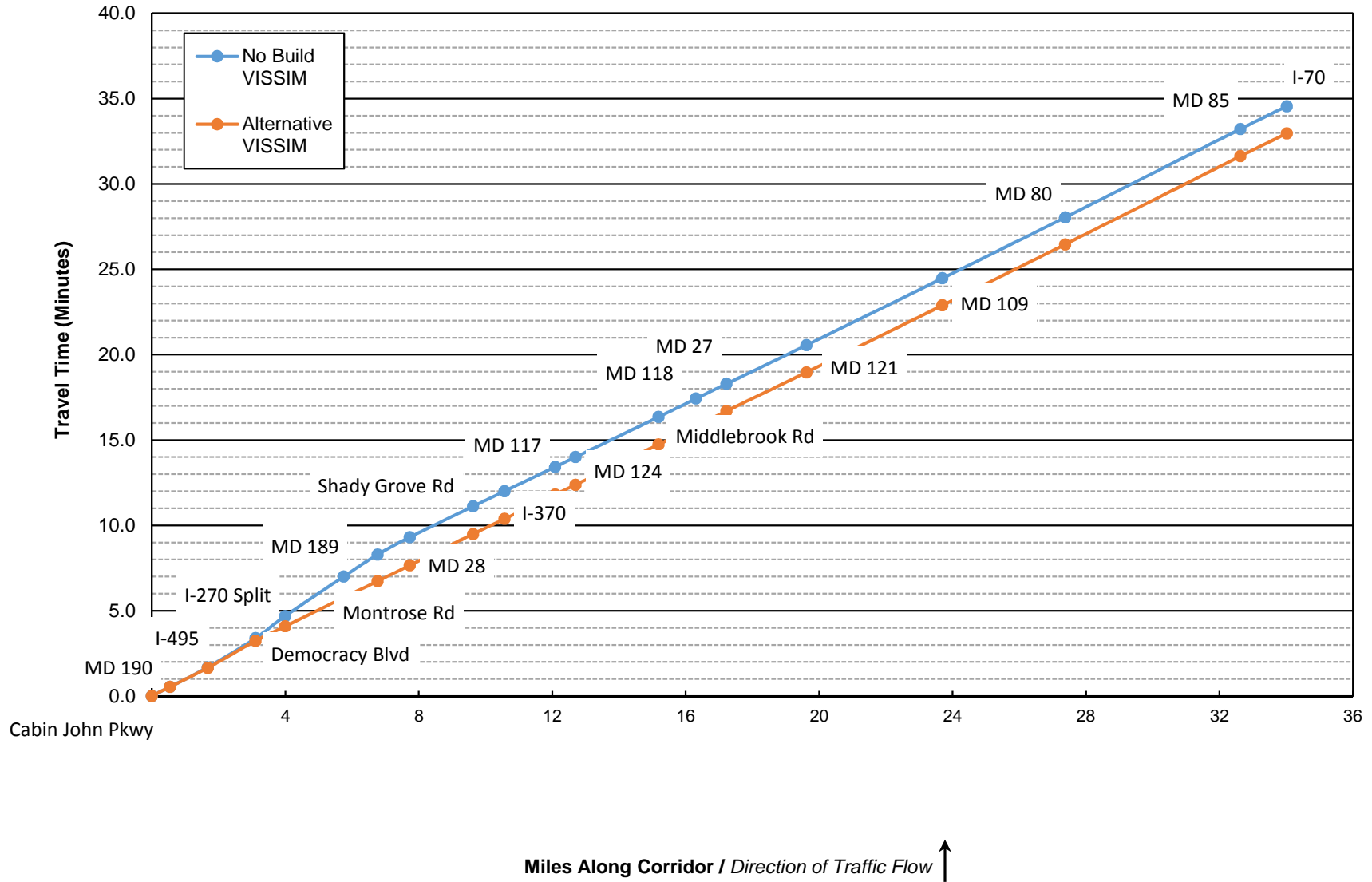
**Figure C.1: AM Peak - 2040 HSR + VSL + ARM
I-270 Travel Time Graph - Northbound**



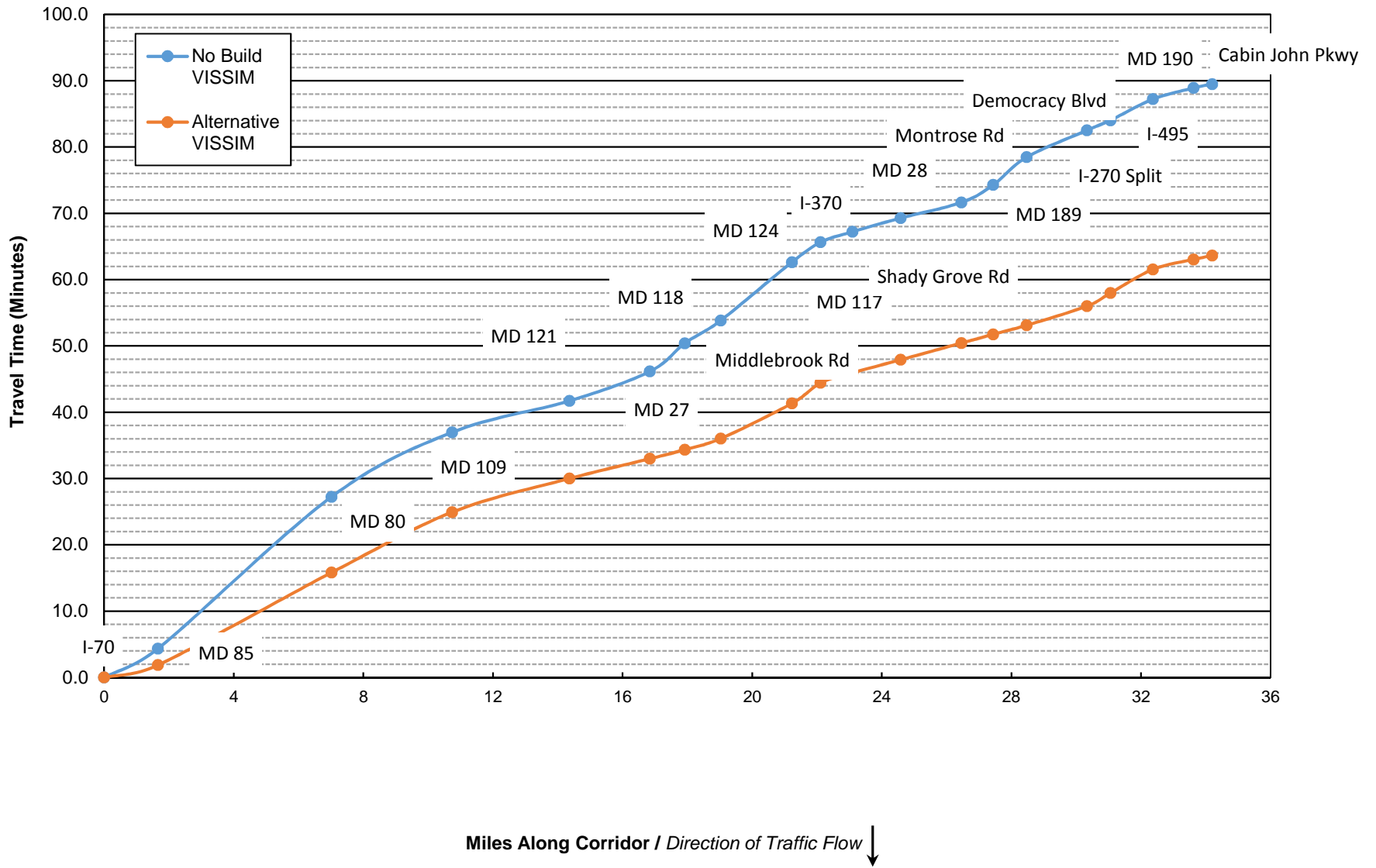
**Figure C.2: AM Peak - 2040 HSR + VSL + ARM
I-270 Travel Time Graph - Southbound**



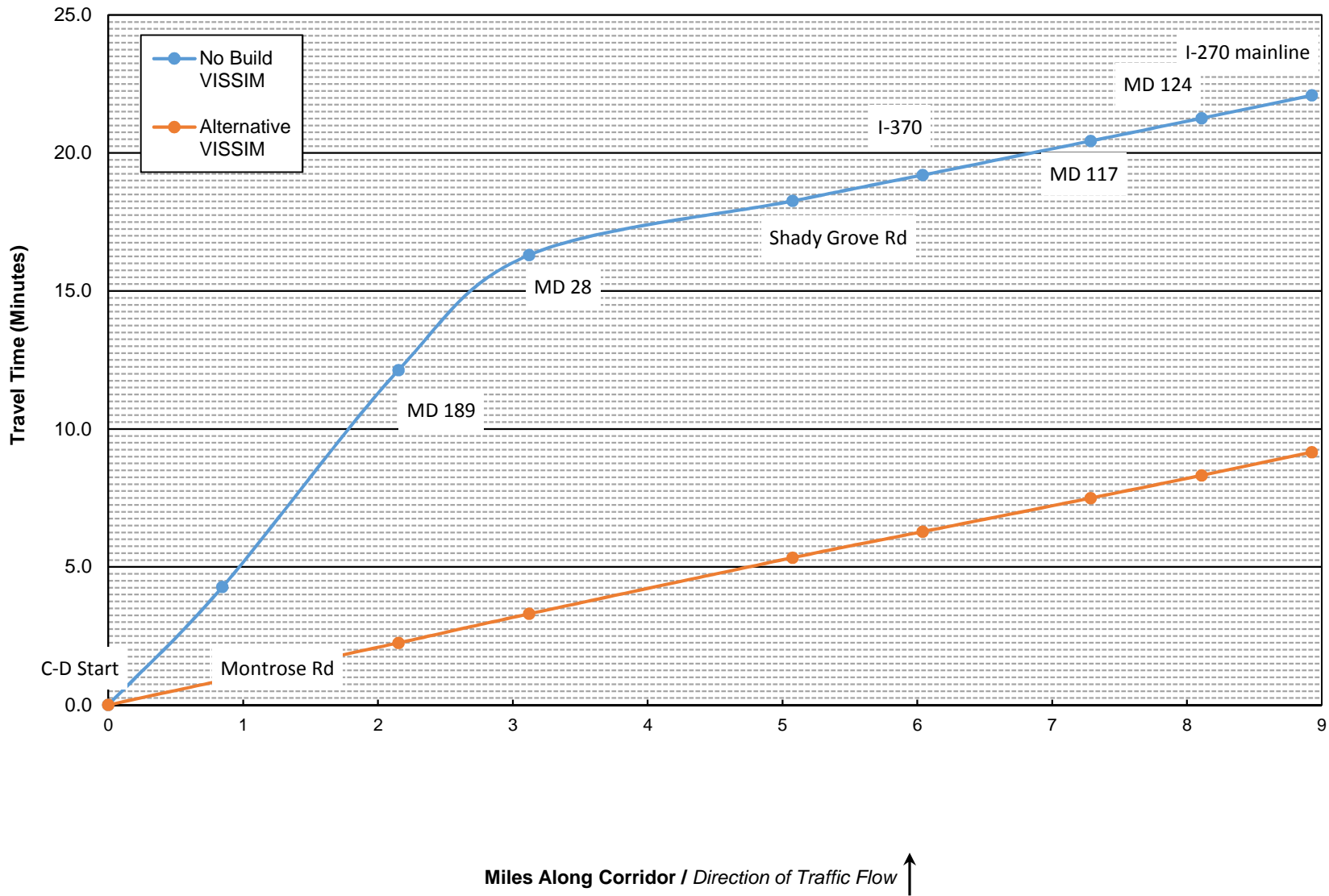
**Figure C.3: AM Peak - 2040 HSR + VSL + ARM
I-270 Spur Travel Time Graph - Northbound**



**Figure C.4: AM Peak - 2040 HSR + VSL + ARM
I-270 Spur Travel Time Graph - Southbound**



**Figure C.5: AM Peak - 2040 HSR + VSL + ARM
I-270 Local Travel Time Graph - Northbound**



**Figure C.6: AM Peak - 2040 HSR + VSL + ARM
I-270 Local Travel Time Graph - Southbound**

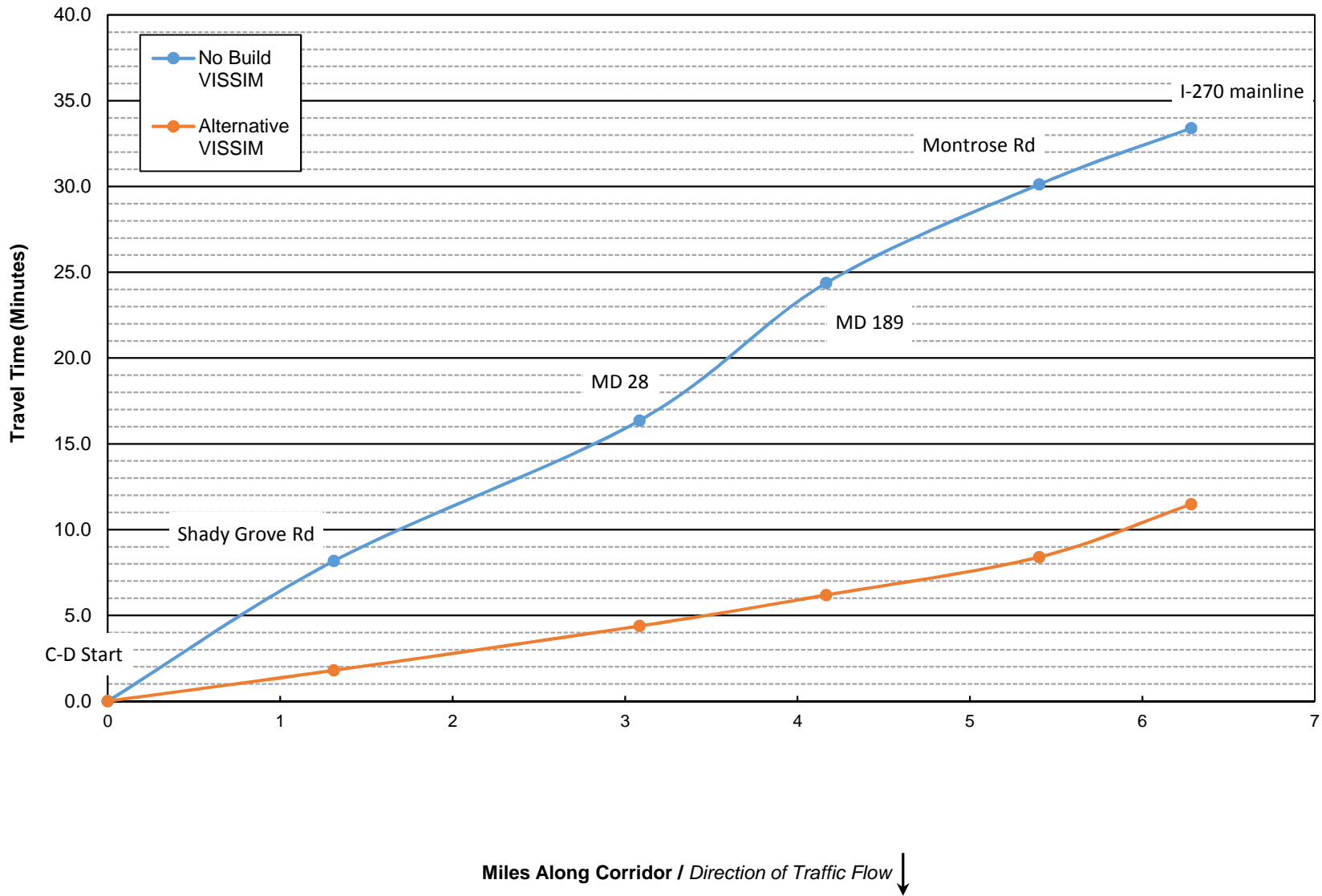


Table C.1: AM Peak -2040 HSR+VSL+ARM - I-270 Vehicle Travel Time

I-270 Northbound	Segment Length (miles)	No Build VISSIM Travel Time (seconds)	HSR+VSL+ ARM VISSIM Travel Time (seconds)	% Change	I-270 Southbound	Segment Length (miles)	No Build VISSIM Travel Time (seconds)	HSR+VSL+ ARM VISSIM Travel Time (seconds)	% Change
From I-495 interchange					From I-70				
to MD 187	1.8	115.1	110.1	-4%	to MD 85	1.7	260.9	111.9	-57%
to I-270 Split	0.6	47.5	39.2	-18%	to MD 80	5.4	1,374.0	837.7	-39%
to Montrose Rd	1.8	139.0	100.9	-27%	to MD 109	3.7	583.2	545.9	-6%
to MD 189	1.0	77.0	57.9	-25%	to MD 121	3.6	284.4	304.7	7%
to MD 28	1.0	61.0	55.3	-9%	to MD 27	2.5	266.9	178.7	-33%
to Shady Grove Rd	1.9	108.7	110.2	1%	to MD 118	1.1	254.6	82.7	-68%
to I-370	0.9	53.0	53.1	0%	to Middlebrook Rd	1.1	206.2	100.3	-51%
to MD 117	1.5	85.5	85.7	0%	to MD 124	2.2	528.0	318.2	-40%
to MD 124	0.6	34.5	34.5	0%	to MD 117	0.9	180.6	185.5	3%
to Middlebrook Rd	2.5	140.8	141.3	0%	to I-370	1.0	94.3	91.0	-4%
to MD 118	1.1	64.7	65.5	1%	to Shady Grove Rd	1.5	124.1	118.7	-4%
to MD 27	0.9	52.0	52.1	0%	to MD 28	1.9	141.9	150.9	6%
to MD 121	2.4	135.6	136.0	0%	to MD 189	1.0	157.8	79.3	-50%
to MD 109	4.1	235.2	235.4	0%	to Montrose Rd	1.0	251.0	81.5	-68%
to MD 80	3.7	214.0	214.5	0%	to I-270 Split	1.9	243.1	173.2	-29%
to MD 85	5.3	310.9	309.9	0%	to MD 187	0.4	30.7	65.6	113%
to I-70	1.4	80.1	80.3	0%	to I-495 interchange	1.9	134.0	170.6	27%
I-270 Total (miles/minutes)	32.4	32.6	31.4	-4%	I-270 Total (miles/minutes)	32.7	85.3	59.9	-30%
I-270 Spur Northbound					I-270 Spur Southbound				
From Cabin John Pkwy					From I-70				
to MD 190	0.5	32.4	32.4	0%	to I-270 Split	30.3	4,951.1	3,360.0	-32%
to I-495	1.1	68.6	66.8	-3%	to Democracy Blvd	0.7	91.3	118.7	30%
to Democracy Blvd	1.4	102.7	95.0	-8%	to I-495	1.3	191.0	214.7	12%
to I-270 Split	0.9	77.7	51.3	-34%	to MD 190	1.3	101.6	89.5	-12%
to I-70	30.0	1,792.1	1,732.5	-3%	to Cabin John Pkwy	0.6	35.1	35.0	0%
I-270 Spur Total (miles/minutes)	34.0	34.6	33.0	-5%	I-270 Spur Total (miles/minutes)	34.2	89.5	63.6	-29%

I-270 Spur Northbound	Segment Length (miles)	No Build VISSIM Travel Time (seconds)	HSR+VSL+ ARM VISSIM Travel Time (seconds)	% Change	I-270 Spur Southbound	Segment Length (miles)	No Build VISSIM Travel Time (seconds)	HSR+VSL+ ARM VISSIM Travel Time (seconds)	% Change
From Cabin John Pkwy					From I-70				
to MD 190	0.5	32.4	32.4	0%	to MD 85	1.7	260.9	111.9	-57%
to I-495	1.1	68.6	66.8	-3%	to MD 80	5.4	1,374.0	837.7	-39%
to Democracy Blvd	1.4	102.7	95.0	-8%	to MD 109	3.7	583.2	545.9	-6%
to I-270 Split	0.9	77.7	51.3	-34%	to MD 121	3.6	284.4	304.7	7%
to Montrose Rd	1.8	139.0	100.9	-27%	to MD 27	2.5	266.9	178.7	-33%
to MD 189	1.0	77.0	57.9	-25%	to MD 118	1.1	254.6	82.7	-68%
to MD 28	1.0	61.0	55.3	-9%	to Middlebrook Rd	1.1	206.2	100.3	-51%
to Shady Grove Rd	1.9	108.7	110.2	1%	to MD 124	2.2	528.0	318.2	-40%
to I-370	0.9	53.0	53.1	0%	to MD 117	0.9	180.6	185.5	3%
to MD 117	1.5	85.5	85.7	0%	to I-370	1.0	94.3	91.0	-4%
to MD 124	0.6	34.5	34.5	0%	to Shady Grove Rd	1.5	124.1	118.7	-4%
to Middlebrook Rd	2.5	140.8	141.3	0%	to MD 28	1.9	141.9	150.9	6%
to MD 118	1.1	64.7	65.5	1%	to MD 189	1.0	157.8	79.3	-50%
to MD 27	0.9	52.0	52.1	0%	to Montrose Rd	1.0	251.0	81.5	-68%
to MD 121	2.4	135.6	136.0	0%	to I-270 Split	1.9	243.1	173.2	-29%
to MD 109	4.1	235.2	235.4	0%	to Democracy Blvd	0.7	91.3	118.7	30%
to MD 80	3.7	214.0	214.5	0%	to I-495	1.3	191.0	214.7	12%
to MD 85	5.3	310.9	309.9	0%	to MD 190	1.3	101.6	89.5	-12%
to I-70	1.4	80.1	80.3	0%	to Cabin John Pkwy	0.6	35.1	35.0	0%
I-270 Spur Total (miles/minutes)	34.0	34.6	33.0	-5%	I-270 Spur Total (miles/minutes)	34.2	89.5	63.6	-29%

Table C.2: AM Peak -2040 HSR+VSL+ARM- I-270 Local Vehicle Travel Time

I-270 Northbound	Segment Length (miles)	No Build VISSIM Travel Time (seconds)	HSR+VSL+ ARM VISSIM Travel Time (seconds)	% Change	I-270 Southbound	Segment Length (miles)	No Build VISSIM Travel Time (seconds)	HSR+VSL+ ARM VISSIM Travel Time (seconds)	% Change
From C-D start					From C-D start				
to Montrose Rd	0.8	256.2	53.5	-79%	to Shady Grove	1.3	490.1	107.6	-78%
to MD 189	1.3	471.8	81.5	-83%	to MD 28	1.8	491.5	155.3	-68%
to MD 28	1.0	250.0	63.1	-75%	to MD 189	1.1	481.0	108.0	-78%
to Shady Grove	2.0	117.6	122.0	4%	to Montrose	1.2	344.5	133.0	-61%
to I-370	1.0	56.5	56.8	0%	to I-270 mainline	0.9	197.1	184.7	-6%
to MD 117	1.2	74.0	72.9	-1%					
to MD 124	0.8	49.5	49.4	0%					
to I-270 mainline	0.8	49.7	50.4	1%					
I-270 Local Total (miles/minutes)	8.9	22.1	9.2	-59%	I-270 Local Total (miles/minutes)	6.3	33.4	11.5	-66%

Table C.3: AM Peak -2040 HSR+VSL+ARM I-270 Vehicle Speed

I-270 Northbound	Segment Length (miles)	No Build VISSIM Speed (MPH)	HSR+VSL+ ARM VISSIM Speed (MPH)	% Change	I-270 Southbound	Segment Length (miles)	No Build VISSIM Speed (MPH)	HSR+VSL+ ARM VISSIM Speed (MPH)	% Change
From I-495 interchange					From I-70				
to MD 187	1.8	57.4	59.9	4%	to MD 85	1.7	22.9	53.5	133%
to I-270 Split	0.6	44.8	54.4	21%	to MD 80	5.4	14.0	23.0	64%
to Montrose Rd	1.8	45.4	62.6	38%	to MD 109	3.7	23.0	24.5	7%
to MD 189	1.0	47.4	63.0	33%	to MD 121	3.6	45.8	42.8	-7%
to MD 28	1.0	56.9	62.8	10%	to MD 27	2.5	33.5	50.0	49%
to Shady Grove Rd	1.9	62.9	62.0	-1%	to MD 118	1.1	15.2	46.7	208%
to I-370	0.9	64.1	64.0	0%	to Middlebrook Rd	1.1	19.4	39.9	106%
to MD 117	1.5	63.8	63.6	0%	to MD 124	2.2	15.0	24.9	66%
to MD 124	0.6	64.0	63.9	0%	to MD 117	0.9	17.7	17.2	-3%
to Middlebrook Rd	2.5	63.6	63.4	0%	to I-370	1.0	37.6	39.0	4%
to MD 118	1.1	62.3	61.6	-1%	to Shady Grove Rd	1.5	43.1	45.1	5%
to MD 27	0.9	63.4	63.2	0%	to MD 28	1.9	47.6	44.8	-6%
to MD 121	2.4	63.6	63.4	0%	to MD 189	1.0	22.3	44.4	99%
to MD 109	4.1	62.4	62.4	0%	to Montrose Rd	1.0	14.8	45.6	208%
to MD 80	3.7	61.9	61.7	0%	to I-270 Split	1.9	27.5	38.6	40%
to MD 85	5.3	60.8	61.1	0%	to MD 187	0.4	51.0	23.9	-53%
to I-70	1.4	62.5	62.3	0%	to I-495 interchange	1.9	50.8	39.9	-21%
I-270 Total (miles/minutes)	32.4	59.8	62.1	4%	I-270 Total (miles/minutes)	32.7	23.0	32.7	42%
I-270 Spur Northbound					I-270 Spur Southbound				
From Cabin John Pkwy					From I-70				
to MD 190	0.5	59.9	59.9	0%	to I-270 Split	30.3	22.1	32.5	47%
to I-495	1.1	59.5	61.0	3%	to Democracy Blvd	0.7	28.8	22.2	-23%
to Democracy Blvd	1.4	50.3	54.3	8%	to I-495	1.3	24.7	22.0	-11%
to I-270 Split	0.9	41.3	62.6	52%	to MD 190	1.3	44.4	50.4	14%
to I-70	30.0	60.3	62.4	3%	to Cabin John Pkwy	0.6	58.5	58.6	0%
I-270 Spur Total (miles/minutes)	34.0	59.1	61.9	5%	I-270 Spur Total (miles/minutes)	34.2	22.9	32.2	41%

Table C.4: AM Peak -2040 HSR+VSL+ARM- I-270 Local Vehicle Speed

I-270 Northbound	Segment Length (miles)	No Build VISSIM Speed (MPH)	HSR+VSL+ ARM VISSIM Speed (MPH)	% Change	I-270 Southbound	Segment Length (miles)	No Build VISSIM Speed (MPH)	HSR+VSL+ ARM VISSIM Speed (MPH)	% Change
From C-D start					From C-D start				
to Montrose Rd	0.8	11.9	56.9	379%	to Shady Grove	1.3	9.6	43.9	356%
to MD 189	1.3	10.0	57.8	479%	to MD 28	1.8	13.0	41.1	216%
to MD 28	1.0	13.9	55.2	296%	to MD 189	1.1	8.1	36.1	345%
to Shady Grove	2.0	59.8	57.7	-4%	to Montrose	1.2	12.9	33.4	159%
to I-370	1.0	61.5	61.2	0%	to I-270 mainline	0.9	16.1	17.2	7%
to MD 117	1.2	60.6	61.5	1%					
to MD 124	0.8	59.8	60.0	0%					
to I-270 mainline	0.8	59.3	58.4	-1%					
I-270 Local Total (miles/minutes)	8.9	24.2	58.5	141%	I-270 Local Total (miles/minutes)	6.3	11.3	32.8	191%

Table C.5: AM Peak -2040 HSR+VSL+ARM- I-270 Vehicle Density

I-270 Northbound	Type	No Build		HSR+VSL+ARM		% Change	I-270 Southbound	Type	No Build		HSR+VSL+ARM		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS	
I-270	Freeway	40	E	27	D	-31%	I-270	Freeway	45	F	22	C	-52%
I-270 Diverge to MD 187	Diverge	33	D	21	C	-36%	I-270 Merge from WB I-70	Merge	62	F	14	B	-77%
I-270	Freeway	45	F	24	C	-46%	I-270	Freeway	67	F	26	D	-61%
I-270 Diverge to Rockledge Rd	Diverge	35	D	21	C	-40%	I-270 Merge from EB I-70	Merge	57	F	22	C	-61%
I-270	Freeway	48	F	20	C	-58%	I-270	Freeway	67	F	39	E	-42%
I-270 Weave from MD 187 to I-270 HOV	Weave	30	D	12	B	-60%	I-270 Diverge to SB MD 85	Diverge	70	F	45	F	-36%
I-270 Lane Drop	Merge	47	F	16	B	-65%	I-270	Freeway	92	F	39	E	-57%
I-270	Freeway	64	F	29	D	-55%	I-270 Diverge to NB MD 85	Diverge	56	F	20	B	-65%
I-270 Merge from I-270 Spur	Merge	63	F	25	C	-60%	I-270	Freeway	119	F	21	C	-82%
I-270 Weave from I-270 HOV to I-270 C-D	Weave	68	F	29	D	-58%	I-270 Merge from MD 85	Merge	104	F	21	C	-80%
I-270	Freeway	38	E	25	C	-33%	I-270	Freeway	112	F	71	F	-36%
I-270 Diverge to C-D (MD 189)	Diverge	31	D	23	C	-26%	I-270 Diverge to MD 80	Diverge	61	F	55	F	-9%
I-270	Freeway	23	C	19	C	-16%	I-270	Freeway	108	F	100	F	-8%
I-270 Diverge to C-D (MD 28)	Diverge	50	F	21	C	-59%	I-270 Merge from MD 80	Merge	111	F	52	F	-53%
I-270	Freeway	14	B	16	B	13%	I-270	Freeway	75	F	71	F	-5%
I-270 Merge from C-D (MD 189)	Merge	14	B	19	B	37%	I-270 Diverge to MD 109	Diverge	41	F	38	E	-8%
I-270 Diverge to C-D (Shady Grove Rd)	Diverge	18	B	22	C	22%	I-270	Freeway	80	F	75	F	-6%
I-270	Freeway	12	B	16	B	31%	I-270 Merge from MD 109	Merge	87	F	57	F	-34%
I-270 Weave from C-D (MD 28) to C-D (Shady Grove Rd)	Weave	10	B	14	B	34%	I-270	Freeway	44	E	51	F	16%
I-270	Freeway	10	A	13	B	28%	I-270 Diverge to SB Weigh Station	Diverge	19	B	23	C	25%
I-270 Merge from C-D (Shady Grove Rd)	Merge	9	A	11	B	29%	I-270	Freeway	38	E	48	F	27%
I-270	Freeway	12	B	14	B	26%	I-270 Merge from SB Weigh Station	Merge	20	B	24	C	19%
I-270 Merge from C-D (I-370)	Merge	10	B	12	B	15%	I-270	Freeway	41	E	44	E	8%
I-270 Diverge to C-D (MD 117)	Diverge	16	B	19	B	17%	I-270 Diverge to MD 121	Diverge	20	B	20	C	3%
I-270	Freeway	12	B	14	B	16%	I-270	Freeway	28	D	28	D	-3%
I-270 Merge from C-D (MD 124)	Merge	14	B	17	B	16%	I-270 Merge from WB MD 121	Merge	33	D	22	C	-33%
I-270	Freeway	16	B	19	C	16%	I-270	Freeway	43	E	24	C	-45%
I-270 Diverge to EB Middlebrook Rd	Diverge	10	B	12	B	14%	I-270 Merge from EB MD 121	Merge	37	E	17	B	-55%
I-270	Freeway	15	B	17	B	16%	I-270	Freeway	55	F	25	C	-55%
I-270 Diverge to WB Middlebrook Rd	Diverge	10	A	11	B	15%	I-270 Diverge to MD 27	Diverge	57	F	24	C	-57%
I-270	Freeway	13	B	15	B	15%	I-270	Freeway	81	F	24	C	-70%
I-270 Diverge to EB MD 118	Diverge	11	B	13	B	19%	I-270 Merge from WB MD 27	Merge	90	F	26	C	-71%
I-270 Diverge to WB MD 118	Diverge	15	B	17	B	16%	I-270	Freeway	82	F	36	E	-56%
I-270	Freeway	13	B	15	B	15%	I-270 Weave from EB MD 27 to MD 118	Weave	81	F	29	D	-64%
I-270 Weave from MD 118 to MD 27	Weave	13	B	14	B	9%	I-270	Freeway	91	F	37	E	-59%
I-270	Freeway	12	B	14	B	12%	I-270 Merge from WB MD 118	Merge	73	F	29	D	-60%
I-270 Merge from EB MD 27	Merge	13	B	14	B	9%	I-270	Freeway	85	F	41	E	-52%
I-270	Freeway	14	B	15	B	10%	I-270 Merge from EB MD 118	Merge	73	F	33	D	-55%
I-270 Merge from WB MD 27	Merge	11	B	11	B	7%	I-270	Freeway	70	F	43	E	-38%
I-270	Freeway	14	B	16	B	9%	I-270 Merge from Middlebrook Rd	Merge	113	F	45	F	-60%
I-270 Diverge to MD 121	Diverge	11	B	12	B	9%	I-270	Freeway	86	F	48	F	-44%

Table C.5: AM Peak -2040 HSR+VSL+ARM- I-270 Vehicle Density

I-270 Northbound	Type	No Build		HSR+VSL+ARM		% Change	I-270 Southbound	Type	No Build		HSR+VSL+ARM		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS			
I-270	Freeway	11	A	12	B	9%	I-270 Diverge to Watkins Mill Rd	Diverge	81	F	38	E	-54%
I-270 Merge from EB MD 121	Merge	10	A	10	B	2%	I-270	Freeway	124	F	52	F	-58%
I-270 Lane Drop	Merge	13	B	14	B	4%	I-270 Diverge to MD 124	Diverge	89	F	31	D	-66%
I-270	Freeway	19	C	20	C	7%	I-270	Freeway	133	F	100	F	-25%
I-270 Diverge to NB Weigh Station	Diverge	10	B	11	B	5%	I-270 Merge from Watkins Mill	Merge	158	F	150	F	-5%
I-270	Freeway	21	C	22	C	4%	I-270	Freeway	99	F	110	F	11%
I-270 Merge from NB Weight Station	Merge	10	B	11	B	5%	I-270 Merge from WB MD 124	Merge	132	F	103	F	-22%
I-270	Freeway	21	C	22	C	4%	I-270	Freeway	53	F	52	F	-2%
I-270 Diverge to MD 109	Diverge	11	B	12	B	6%	I-270 Merge from MD 117	Merge	49	F	49	F	1%
I-270	Freeway	19	C	20	C	4%	I-270	Freeway	48	F	43	E	-10%
I-270 Merge from MD 109	Merge	11	B	11	B	0%	I-270 Diverge to I-370	Diverge	41	F	34	D	-18%
I-270	Freeway	21	C	21	C	2%	I-270	Freeway	49	F	37	E	-26%
I-270 Diverge to MD 80	Diverge	12	B	13	B	6%	I-270 Diverge to I-270 C-D	Diverge	96	F	28	C	-71%
I-270	Freeway	19	C	19	C	3%	I-270	Freeway	20	C	25	C	27%
I-270 Merge from MD 80	Merge	14	B	13	B	-7%	I-270 Merge from I-270 (I-370)	Merge	20	C	24	C	18%
I-270	Freeway	24	C	23	C	-6%	I-270 Diverge to I-270 C-D (Shady Grove Rd)	Diverge	27	C	25	C	-7%
I-270 Diverge to Scenic View	Diverge	12	B	12	B	-7%	I-270	Freeway	21	C	22	C	6%
I-270	Freeway	24	C	23	C	-6%	I-270 Merge from I-270 C-D (Shady Grove Rd Northern)	Merge	18	B	22	C	26%
I-270 Merge from Scenic View	Merge	12	B	12	B	-5%	I-270	Freeway	26	C	26	C	-1%
I-270	Freeway	25	C	23	C	-6%	I-270 Merge from I-270 C-D (Shady Grove Rd Southern)	Merge	32	D	25	C	-21%
I-270 Diverge to NB MD 85	Diverge	14	B	13	B	-6%	I-270 Diverge to I-270 C-D (MD 189)	Diverge	46	F	34	D	-27%
I-270	Freeway	23	C	22	C	-6%	I-270	Freeway	82	F	20	C	-76%
I-270 Diverge to SB MD 85	Diverge	17	B	17	B	-3%	I-270 Merge from I-270 C-D (MD 189)	Merge	106	F	21	C	-80%
I-270	Freeway	19	C	18	C	-6%	I-270	Freeway	77	F	29	D	-63%
I-270 Weave from MD 85 to I-70	Weave	13	B	13	B	-2%	I-270 Merge from I-270 C-D	Merge	39	E	42	F	8%
I-270	Freeway	17	B	16	B	-4%	I-270 Diverge to I-270 HOV Lane	Diverge	19	B	31	D	63%
							I-270 Diverge to I-270 Spur	Diverge	40	E	51	F	28%
							I-270	Freeway	23	C	48	F	108%
							I-270 Diverge to Rockledge Dr / MD 187	Diverge	17	B	48	F	187%
							I-270	Freeway	23	C	26	D	12%
							I-270 Merge from Rockledge Dr	Merge	19	B	22	C	10%
							I-270	Freeway	24	C	29	D	18%
							I-270 Merge from Rockledge Dr / MD 187	Merge	22	C	23	C	6%
							I-270	Freeway	26	C	30	D	14%

Table C.6: AM Peak -2040 HSR+VSL+ARM- I-270 Spur Vehicle Density

I-270 Spur Northbound	Type	No Build		HSR+VSL+ARM		% Change	I-270 Southbound	Type	No Build		HSR+VSL+ARM		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS			
I-270 Spur	Freeway	57	F	#VALUE!	####	#####	I-270 Spur	Freeway	49	F	61	F	25%
I-270 Spur Merge from Clara Barton Parkway	Merge	25	C			#####	I-270 Spur Weave from I-270 HOV to Democracy Blvd	Weave	60	F	72	F	19%
I-270 Spur	Freeway	39	E			#####	I-270 Spur	Freeway	54	F	65	F	20%
I-270 Diverge to MD 190	Diverge	28	D	28	D	0%	I-270 Merge from Democracy Blvd	Merge	30	D	34	D	11%
I-270 Spur	Freeway	34	D	34	D	0%	I-270 Spur Lane Drop	Merge	54	F	59	F	9%
I-270 Spur Merge from Cabin John Parkway	Merge	25	C			#####	I-270 Spur	Freeway	75	F	79	F	4%
I-270 Spur Merge from MD 190	Merge	26	C			#####	I-270 Spur Merge from I-495	Merge	37	E	33	D	-11%
I-270 Spur	Freeway	35	D			#####	I-270 Spur	Freeway	45	F	37	E	-18%
I-270 Spur Diverge to I-495	Merge	38	E	34	D	-9%	I-270 Spur Diverve to EB MD 190	Diverge	56	F			#####
I-270 Spur	Freeway	40	E	33	D	-16%	I-270 Spur Diverve to Cabin John Pkwy	Diverge	27	C			#####
I-270 Spur Diverge to Democracy Blvd	Diverge	33	D	29	D	-13%	I-270 Spur	Freeway	29	D			#####
I-270 Spur	Freeway	36	E	26	C	-29%	I-270 Merge from MD 190	Merge	26	C	26	C	0%
I-270 Spur Merge from EB Democracy Blvd	Merge	30	D	16	B	-48%	I-270 Spur	Freeway	34	D			#####
I-270 Spur	Freeway	39	E	24	C	-38%	I-270 Diverge to WB Clara Barton Pkwy	Diverge	23	C			#####
I-270 Spur Merge from WB Democracy Blvd	Merge	30	D	16	B	-46%	I-270 Spur	Freeway	33	D			#####
I-270 Spur	Freeway	43	E	25	C	-42%	I-270 Merge from Clara Barton Pkwy	Merge	30	D			#####
I-270 Spur Merge from Westlake Terrace	Merge	45	F	25	C	-45%							
I-270 Spur	Freeway	50	F	26	C	-49%							

Table C.7: AM Peak -2040 HSR+VSL+ARM - I-270 Local Vehicle Density

I-270 Northbound	Type	No Build		HSR+VSL+ARM		% Change	I-270 Southbound	Type	No Build		HSR+VSL+ARM		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS			
I-270 C-D	Freeway	84	F	36	E	-57%	I-270 C-D	Freeway	107	F	24	C	-78%
I-270 C-D Diverge to EB Montrose Rd	Diverge	48	F	23	C	-53%	I-270 C-D Weave from I-370 EB to I-270	Weave	128	F	24	B	-82%
I-270 C-D	Freeway	80	F	19	C	-76%	I-270 C-D Diverge to Shady Grove Rd	Diverge	115	F	18	B	-85%
I-270 C-D Weave between Montrose Rd Loop Ramps	Weave	69	F	13	B	-81%	I-270 C-D	Freeway	137	F	25	C	-82%
I-270 C-D	Freeway	84	F	18	C	-78%	I-270 C-D Merge from WB Shady Grove Rd	Merge	106	F	23	C	-78%
I-270 C-D Merge from WB Montrose Rd	Merge	89	F	26	C	-71%	I-270 C-D	Freeway	113	F	35	D	-69%
I-270 C-D	Freeway	98	F	31	D	-68%	I-270 C-D Merge from EB Shady Grove Rd	Merge	77	F	27	C	-65%
I-270 C-D Merge from I-270	Merge	96	F	32	D	-67%	I-270 C-D	Freeway	93	F	30	D	-68%
I-270 C-D	Freeway	104	F	32	D	-70%	I-270 C-D Merge from I-270	Merge	98	F	25	C	-75%
I-270 C-D Diverge to MD 189	Diverge	58	F	17	B	-70%	I-270 C-D Diverge to I-270	Diverge	56	F	36	E	-36%
I-270 C-D	Freeway	111	F	24	C	-78%	I-270 C-D Diverge to I-270	Diverge	64	F	36	E	-43%
I-270 C-D Merge from MD 189	Merge	101	F	19	B	-81%	I-270 C-D	Freeway	75	F	26	D	-65%
I-270 C-D	Freeway	114	F	32	D	-72%	I-270 C-D Diverge to MD 28	Diverge	62	F	17	B	-72%
I-270 C-D Weave between I-270 (to MD 28 from MD 189)	Weave	108	F	31	C	-71%	I-270 C-D	Freeway	128	F	19	C	-85%
I-270 C-D	Freeway	106	F	33	D	-69%	I-270 C-D Merge from WB MD 28	Merge	160	F	13	B	-92%
I-270 C-D Diverge to MD 28	Diverge	64	F	23	C	-64%	I-270 C-D	Freeway	132	F	23	C	-83%
I-270 C-D	Freeway	87	F	27	D	-68%	I-270 C-D Merge from EB MD 28	Merge	152	F	25	C	-84%
I-270 C-D Weave between MD 28 Ramps	Weave	109	F	38	E	-65%	I-270 C-D	Freeway	123	F	39	E	-68%
I-270 C-D	Freeway	7	A	11	A	66%	I-270 C-D Merge from I-270	Merge	124	F	29	D	-76%
I-270 C-D Merge from MD 28 WB	Merge	6	A	8	A	17%	I-270 C-D	Freeway	95	F	32	D	-66%
I-270 C-D Merge from I-270 and Drop Lane	Merge	7	A	10	A	39%	I-270 C-D Diverge to MD 189	Diverge	60	F	25	C	-58%
I-270 C-D Diverge to I-270	Diverge	12	B	16	B	34%	I-270 C-D	Freeway	117	F	16	B	-86%
I-270 C-D	Freeway	19	C	26	C	34%	I-270 C-D Merge from MD 189	Merge	120	F	23	C	-81%
I-270 C-D Diverge to Shady Grove Rd	Diverge	15	B	20	B	29%	I-270 C-D Diverge to I-270	Diverge	84	F	38	E	-55%
I-270 C-D	Freeway	5	A	6	A	25%	I-270 C-D	Freeway	92	F	58	F	-37%
I-270 C- D Merge from I-270 and EB Shady Grove Rd	Merge	8	A	10	A	19%	I-270 C-D Diverge to WB Montrose Rd	Diverge	55	F	36	E	-34%
I-270 C-D	Freeway	8	A	9	A	20%	I-270 C-D	Freeway	98	F	78	F	-21%
I-270 C-D Merge from WB Shady Grove Rd	Merge	10	A	12	B	20%	I-270 Weave between Montrose Rd Loops	Weave	94	F	83	F	-12%
I-270 C-D Diverge to I-270	Diverge	14	B	17	B	17%	I-270 C-D	Freeway	76	F	84	F	11%
I-270 C-D	Freeway	13	B	15	B	17%	I-270 C-D Merge from EB Montrose Rd	Merge	56	F	62	F	10%
I-270 C-D Diverge to I-370	Diverge	13	B	15	B	16%	I-270 C-D	Freeway	54	F	60	F	10%
I-270 C-D	Freeway	2	A	3	A	15%							
I-270 Merge from I-370 EB	Merge	7	A	8	A	3%							
I-270 C-D	Freeway	8	A	8	A	5%							
I-270 C-D Weave from I-370 to I-270	Weave	19	B	19	B	0%							
I-270 C-D	Freeway	14	B	14	B	2%							
I-270 C-D Weave from I-270 to MD 117	Weave	19	B	18	B	-7%							
I-270 C-D Diverge to MD 124	Diverge	13	B	14	B	9%							
I-270 C-D	Freeway	13	B	14	B	9%							
I-270 C-D Merge from EB MD 124	Merge	12	B	12	B	4%							
I-270 C-D Merge From WB MD 124	Merge	12	B	13	B	8%							
I-270 C-D	Freeway	10	A	10	A	6%							
I-270 C-D Merge from Watkins Mill	Merge	10	A	13	B	33%							

Table C.8: AM Peak - 2040 HSR+VSL+ARM- I-270 Vehicle Throughput

I-270 Northbound	No-Build VISSIM Throughput	HSR+VSL+ ARM VISSIM Throughput	Change %	I-270 Southbound	No-Build VISSIM Throughput	HSR+VSL+ ARM VISSIM Throughput	Change %
Between I-495 and MD 187	4485	4861	8%	North of I-70	2514	2637	5%
Between MD 187 on and off ramps	3881	4320	11%	Between I-70 on ramps	2842	3038	7%
Between Rockledge Blvd on and off ramps	3138	3624	15%	From I-70 interchange to MD-85	4882	5373	10%
Between Rockledge Dr and I-270 Spur	2720	3293	21%	Between MD-85 on and off ramps	2530	2888	14%
Between I-270 Spur and Montrose Rd	7422	8826	19%	Between MD-85 and MD-80	3043	3368	11%
Between Montrose Rd on and off ramps	4321	5076	17%	Between MD-80 on and off ramps	2724	3020	11%
Between Montrose Rd and MD 189	4064	4735	17%	Between MD-80 and Md-109	3532	3686	4%
Between MD 189 and MD 28	4018	4735	18%	Between MD-109 on and off ramps	3430	3627	6%
Between MD 28 on and off ramps	4122	5143	25%	Between MD-109 and MD-121	4100	4213	3%
Between MD 28 and Shady Grove Rd	2980	3816	28%	Between MD-121 on and off ramps	3551	3704	4%
Between Shady Grove Rd and I-370	2552	3284	29%	Between MD-121 and MD-27	4802	4954	3%
Between I-370 on and off ramps	2849	3588	26%	Between MD-27 on and off ramps	4223	4643	10%
Between I-370 and MD 117	3979	4718	19%	Between MD-27 and MD-118	4688	5250	12%
Between MD 117 and MD 124	3010	3496	16%	Between MD-118 on and off ramps	4542	5076	12%
Between MD-124 on and off ramps	3023	3496	16%	Between MD-118 and Middlebrook Rd	5199	5735	10%
Between Watkins Mill Rd and Middlebrook Rd	3974	4620	16%	Between Middlebrook Rd on and off ramps	5197	5713	10%
Between Middlebrook Rd on and off ramps	3705	4276	15%	Between Middlebrook Rd and MD-124	6832	7146	5%
Between Middlebrook Rd and MD 118	3293	3791	15%	Between MD-124 on and off ramps	5415	5768	7%
Between MD-118 on and off ramps	2981	3426	15%	Between MD-124 and MD-117	6469	6947	7%
Between MD 118 and MD 27	2827	3168	12%	Between MD-117 and I-370	8146	8651	6%
Between MD-27 on and off ramps	2280	2559	12%	Between I-370 on and off ramps	2997	3264	9%
Between MD 27 and MD 121	2687	2944	10%	Between I-370 on ramp to Shady Grove Rd	3871	3275	-15%
Between MD-121 on and off ramps	1970	2148	9%	Between Shady Grove Rd and MD 28	3552	3229	-9%
Between MD 121 and MD 109	2497	2607	4%	Between MD 28 on and off ramps	4372	4044	-8%
Between MD-109 on and off ramps	2327	2415	4%	Between MD 28 and MD 189	3946	3467	-12%
Between MD 109 and MD 80	2487	2539	2%	Between MD 189 and Montrose Rd	4070	3124	-23%
Between MD-80 on and off ramps	2222	2267	2%	Between Montrose Rd on and off ramps	5046	3765	-25%
Between MD 80 and MD 85	2916	2755	-6%	Between Montose Rd and I-270 Spur	8064	7728	-4%
Between MD-85 on and off ramps	2213	2091	-6%	Between I-270 Spur and Rockledge Blvd	3823	3606	-6%
Between MD 85 and I-70	3227	3093	-4%	Between Rockledge Blvd on and off ramps	2733	2546	-7%
North of I-70	2081	2003	-4%	Between MD 187 on and off ramps	2887	2754	-5%
				Between MD 187 and I-495	2902	2897	0%
I-270 Spur Northbound				I-270 Spur Southbound			
Between I-495 and Democracy Blvd	5264	5474	4%	Between I-270 Split and HOV on ramp	4251	4023	-5%
Between Democracy Blvd on and off ramps	4077	4285	5%	Between HOV on ramp and Democracy Blvd	4186	3994	-5%
Between Democracy Blvd and I-270 Split	4219	4565	8%	Between Democracy Blvd on and off ramps	3670	3514	-4%
				Between Democracy Blvd and I-495	4194	4083	-3%

Table C.9: AM Peak -2040 HSR+VSL+ARM- I-270 Local Vehicle Throughput

I-270 Local Northbound	No-Build VISSIM Throughput	HSR+VSL+ ARM VISSIM Throughput	Change %	I-270 Local Southbound	No-Build VISSIM Throughput	HSR+VSL+ ARM VISSIM Throughput	Change %
Between Montrose Rd EB off ramp and EB on ramp	1707	2366	39%	Between I-370 on ramp and I-270 off ramp	3627	3500	-4%
Between Montrose Rd EB on ramp and WB off ramp	1884	2613	39%	Between I-270 off ramp and Shady Grove off ramp	2767	2695	-3%
Between Montrose Rd WB off ramp and on ramp	1556	2196	41%	Between Shady Grove off ramp and Shady Grove WB on ramp	1593	2319	46%
Between Montrose Rd WB on ramp and I-270 on ramp	2215	3317	50%	Between Shady Grove WB and EB on ramps	2225	2983	34%
Between I-270 on ramp and MD 189 off ramp	2316	3645	57%	Between Shady Grove on ramp and I-270 on ramp	2594	3361	30%
Between MD 189 ramps	1739	2943	69%	Between I-270 on ramp and I-270 off ramp1	3272	3936	20%
Between MD 189 off ramp and I-270 on ramp	2036	3533	74%	Between I-270 off ramp1 and I-270 off ramp2	2767	2649	-4%
Between I-270 on ramp and I-270 off ramp	2547	4311	69%	Between I-270 off ramp2 and MD 28 off ramp	1961	1822	-7%
Between I-270 off ramp and MD 28 EB off ramp	1823	3119	71%	Between MD 28 off ramp and MD 28 WB on ramp	1428	1329	-7%
Between MD 28 EB off ramp to MD 28 EB on ramp	1585	2750	74%	Between MD 28 WB on ramp and MD 28 EB on ramp	1700	1629	-4%
Between MD 28 EB on ramp and MD 28 WB off ramp	1616	2820	75%	Between MD 28 EB on ramp and I-270 on ramp	2375	2790	17%
Between MD 28 WB off ramp and MD 28 WB on ramp	751	1279	70%	Between I-270 on ramp and MD 189 off ramp	2871	2564	-11%
Between MD 28 WB on ramp and I-270 on ramp	1263	1799	42%	Between MD 189 on and off ramps	2353	1385	-41%
Between I-270 on ramp and I-270 off ramp	2439	3133	28%	Between MD 189 on ramp and I-270 off ramp	3387	2342	-31%
Between I-270 off ramp and Shady Grove off ramp	2131	2683	26%	Between I-270 off ramp and Montrose Rd off ramp	2357	2420	3%
Between Shady Grove off ramp and I-270 on ramp	322	402	25%	Between Montrose Rd off ramp and Montrose Rd WB on ramp	2251	2274	1%
Between I-270 on ramp and Shady Grove WB on ramp	1448	1726	19%	Between Montrose Rd WB on ramp and EB off ramp	2992	3301	10%
Between Shady Grove WB on ramp and I-270 off ramp	1788	2067	16%	Between Montrose Rd EB off and on ramps	2336	2602	11%
Between I-270 off ramp and I-370 off ramp	1515	1770	17%	Between Montrose Rd EB off ramp and I-270	3139	3353	7%
Between I-370 off ramp and I-370 EB on ramp	286	334	17%				
Between I-370 EB and WB on ramps	919	967	5%				
Between I-370 WB on ramp and I-270 off ramp	2785	2834	2%				
Between I-270 off ramp and I-270 on ramp	1670	1698	2%				
Between I-270 on ramp and MD 117 off ramp	2654	2920	10%				
Between MD 117 off ramp and MD 124 off ramp	1509	1651	9%				
Between MD 124 off ramp and MD 124 EB on ramp	789	861	9%				
Between MD 124 EB and WB on ramps	1183	1253	6%				
Between MD 124 on ramp I-270	573	610	6%				

Table C.10: AM Peak - 2040 HSR+VSL+ARM - I-270 On Ramp Queue Length - Northbound

I-270 Northbound	No Build VISSIM Average Queue (feet)	HSR+VSL+ ARM VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	HSR+VSL+ ARM VISSIM Maximum Queue (feet)	% Change
Rockledge Dr on ramp	67	0	-100%	421	0	-100%
MD 189 C-D on ramp	0	0	-	0	0	-
MD 28 C-D on ramp	0	0	-	0	0	-
Shady Grove Rd C-D on ramp	0	0	-	0	0	-
I-370 C-D on ramp	0	0	-	0	0	-
MD 124 C-D on ramp	0	0	-	0	0	-
MD 118 on ramp	0	0	-	0	0	-
MD 27 EB on ramp	0	0	-	0	0	-
MD 27 WB on ramp	0	0	-	0	0	-
MD 121 on ramp	0	0	-	0	0	-
MD 109 on ramp	0	0	-	0	0	-
MD 80 on ramp	0	0	-	0	0	-
MD 85 on ramp	0	0	-	0	0	-
I-270 Spur Northbound	No Build VISSIM Average Queue (feet)	HSR+VSL+ ARM VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	HSR+VSL+ ARM VISSIM Maximum Queue (feet)	% Change
Democracy Blvd EB on ramp	4	0	-100%	57	0	-100%
Democracy Blvd WB on ramp	0	0	-100%	5	0	-100%
I-495 Northbound	No Build VISSIM Average Queue (feet)	HSR+VSL+ ARM VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	HSR+VSL+ ARM VISSIM Maximum Queue (feet)	% Change
Cabin John Pkwy on ramp	0	0	-	0	0	-
MD 190 on ramp	0	0	-	0	0	-
I-270 C-D Northbound	No Build VISSIM Average Queue (feet)	HSR+VSL+ ARM VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	HSR+VSL+ ARM VISSIM Maximum Queue (feet)	% Change
Montrose Rd EB on ramp	436	2	-99%	1548	254	-84%
Montrose Rd WB on ramp	1047	0	-100%	2581	0	-100%
I-270 on ramp	409	0	-100%	1171	6	-99%
MD 189 on ramp	1304	0	-100%	2877	0	-100%
I-270 on ramp	1354	0	-100%	3378	0	-100%
MD 28 EB on ramp	3	0	-100%	55	0	-100%
MD 28 WB on ramp	0	0	-	0	0	-
Shady Grove Rd EB on ramp	0	0	-	0	0	-
I-270 on ramp	0	0	-	0	0	-
Shady Grove Rd WB on ramp	0	0	-	0	0	-
I-370 EB on ramp	0	0	-	0	0	-
I-370 WB on ramp	0	0	-	0	0	-
I-270 on ramp	0	0	-100%	29	0	-100%
MD 124 EB on ramp	0	0	-	0	0	-
MD 124 WB on ramp	0	6	-	0	386	-
Watkins Mill Rd on ramp	0	2560	2577694%	24	3079	12813%

Table C.11: AM Peak - 2040 HSR+VSL+ARM- I-270 Off Ramp Queue Length - Northbound

I-270 Northbound	No Build VISSIM Average Queue (feet)	HSR+VSL+ ARM VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	HSR+VSL+ ARM VISSIM Maximum Queue (feet)	% Change
MD 187 off ramp NB	28	0	-100%	242	0	-100%
MD 187 off ramp SB	0	7	-	0	352	-
Rockledge Dr off ramp	6	22	304%	359	164	-54%
Tower Oaks Blvd off ramp	19	0	-100%	179	0	-100%
Montrose Rd off ramp EB	0	0	-	0	11	-
Montrose Rd off ramp WB	0	11	-	0	120	-
MD 189 off ramp WB	8	4	-54%	99	282	184%
MD 189 off ramp EB	60	55	-8%	1148	313	-73%
MD 28 off ramp EB	28	0	-100%	227	0	-100%
MD 28 off ramp WB	2636	0	-100%	5046	0	-100%
Shady Grove Rd off ramp - Redland Blvd	0	211	-	0	807	-
Shady Grove Rd off ramp WB	151	0	-100%	605	0	-100%
Shady Grove Rd off ramp EB	0	0	-	0	0	-
I-370 off ramp WB	0	0	-	0	0	-
I-370 off ramp EB	0	256	-	0	805	-
MD 117 off ramp	311	105	-66%	1011	408	-60%
MD 124 off ramp	95	0	-100%	453	0	-100%
Watkins Mill Rd off ramp	78	0	-100%	366	31	-92%
Middlebrook Rd EB off ramp	0	0	-	0	0	-
Middlebrook Rd WB off ramp	0	0	-	0	21	-
MD 118 WB off ramp - Seneca Meadows	0	0	-	0	0	-
MD 118 WB off ramp	0	0	-	0	0	-
MD 118 EB off ramp	0	8	-	0	98	-
MD 27 off ramp WB	7	0	-100%	81	0	-100%
MD 27 off ramp EB	0	64	-	0	256	-
MD 121 off ramp WB	62	0	-100%	250	0	-100%
MD 121 off ramp EB	0	14	-	0	209	-
MD 109 off ramp EB	29	0	-100%	228	6	-97%
MD 109 off ramp WB	8	7	-13%	84	131	56%
MD 80 off ramp EB	7	1	-85%	102	51	-50%
MD 80 off ramp WB	0	0	-100%	26	0	-100%
MD 85 NB off ramp	0	1	-	0	119	-
MD 85 SB off ramp	1	1	102%	126	214	70%
I-270 Spur Northbound	No Build VISSIM Average Queue (feet)	HSR+VSL+ ARM VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	HSR+VSL+ ARM VISSIM Maximum Queue (feet)	% Change
Clara Barton Pkwy off ramp EB	1	0	-100%	214	0	-100%
Clara Barton Pkwy off ramp WB	0	14	-	0	587	-
MD 190 off ramp EB	0	0	-100%	10	0	-100%
MD 190 off ramp WB	0	113	-	0	650	-
Democracy Blvd off ramp WB	104	18	-83%	563	150	-73%
Democracy Blvd off ramp EB	15	0	-100%	143	0	-100%

Table C.12: AM Peak - 2040 HSR+VSL+ARM- I-270 On Ramp Queue Length - Southbound

I-270 Southbound	No Build VISSIM Average Queue (feet)	HSR+VSL+ ARM VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	HSR+VSL+ ARM VISSIM Maximum Queue (feet)	% Change
MD 85 on ramp	41	0	-100%	528	0	-100%
MD 80 on ramp	1039	0	-100%	2688	0	-100%
MD 109 on ramp	995	1703	71%	1914	2841	48%
MD 121 WB on ramp	135	0	-100%	972	0	-100%
MD 121 EB on ramp	0	217	-	0	1332	-
MD 27 WB on ramp	552	0	-100%	2591	0	-100%
MD 27 EB on ramp	3	0	-100%	173	0	-100%
MD 118 WB on ramp	0	0	-	0	0	-
MD 118 EB on ramp	0	0	-100%	44	0	-100%
Middlebrook Rd on ramp	2842	0	-100%	4433	0	-100%
Watkins Mill Rd on ramp	3066	3063	0%	3136	3143	0%
MD 124 WB on ramp	2789	9	-100%	4158	358	-91%
MD 117 on ramp	293	1540	426%	1898	2913	53%
I-370 C-D on ramp	0	0	-	0	0	-
Shady Grove Rd C-D on ramp North	0	0	-	0	0	-
Shady Grove Rd C-D on ramp South	2	0	-100%	127	0	-100%
MD 189 C-D on ramp	1787	512	-71%	3610	1020	-72%
Montrose Rd C-D on ramp	2	0	-100%	227	0	-100%
Rockledge Dr on ramp	0	0	-	0	0	-
MD 187 on ramp	0	0	-	0	0	-
I-270 Spur Southbound	No Build VISSIM Average Queue (feet)	HSR+VSL+ ARM VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	HSR+VSL+ ARM VISSIM Maximum Queue (feet)	% Change
Democracy Blvd on ramp	0	80	-	0	1003	-
I-495 Southbound	No Build VISSIM Average Queue (feet)	HSR+VSL+ ARM VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	HSR+VSL+ ARM VISSIM Maximum Queue (feet)	% Change
I-270 Spur on ramp	147	0	-100%	1557	0	-100%
MD 190 on ramp	0	0	-	0	0	-
I-270 C-D Southbound	No Build VISSIM Average Queue (feet)	HSR+VSL+ ARM VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	HSR+VSL+ ARM VISSIM Maximum Queue (feet)	% Change
I-270 on ramp	2947	0	-100%	4900	0	-100%
I-370 on ramp	2511	0	-100%	2932	0	-100%
Shady Grove Rd WB on ramp	28	0	-100%	597	0	-100%
Shady Grove Rd EB on ramp	0	0	-100%	37	0	-100%
I-270 on ramp	0	0	-100%	42	0	-100%
MD 28 WB on ramp	1406	0	-100%	2299	0	-100%
MD 28 EB on ramp	3724	0	-100%	3882	0	-100%
I-270 on ramp	1	5	715%	74	136	83%
MD 189 on ramp	3725	560	-85%	4200	1118	-73%
Montrose Rd WB on ramp	68	1	-99%	926	79	-92%
Montrose Rd EB on ramp	0	0	-100%	69	0	-100%

Table C.13: AM Peak -2040 HSR+VSL+ARM- I-270 Off Ramp Queue Length - Southbound

I-270 Southbound	No Build VISSIM Average Queue (feet)	HSR+VSL+ ARM VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	HSR+VSL+ ARM VISSIM Maximum Queue (feet)	% Change
MD 85 SB off ramp	297	0	-100%	1410	7	-99%
MD 85 NB off ramp	0	1	495%	43	111	158%
MD 80 off ramp	1	0	-99%	99	10	-90%
MD 109 off ramp WB	0	0	-100%	25	0	-100%
MD 109 off ramp EB	0	193	-	0	911	-
MD 121 off ramp EB	219	22	-90%	946	354	-63%
MD 121 off ramp WB	10	51	414%	519	237	-54%
MD 27 off ramp EB	50	18	-64%	262	312	19%
MD 27 off ramp WB	881	35	-96%	3309	150	-95%
MD 118 off ramp EB	31	0	-100%	160	0	-100%
MD 118 off ramp WB	0	63	-	0	286	-
Watkins Mill Rd off ramp	2034	89	-96%	5055	381	-92%
MD 124 off ramp EB	70	11	-85%	368	291	-21%
MD 124 off ramp WB	19	0	-100%	419	0	-100%
I-370 off ramp WB	0	0	-	0	0	-
I-370 off ramp EB	0	2	-	0	119	-
Shady Grove Rd off ramp - Omega Drive	4	0	-100%	172	0	-100%
Shady Grove Rd off ramp	0	1	-	0	63	-
MD 28 off ramp	4	56	1262%	154	270	75%
MD 189 off ramp EB	35	0	-100%	238	0	-100%
MD 189 off ramp WB	0	0	-	0	0	-
Montrose Rd off ramp WB	0	0	-	0	0	-
Montrose Rd off ramp EB	382	1690	342%	1566	2514	61%
Rockledge Dr off ramp	27	49	80%	343	207	-40%
I-270 Spur Southbound	No Build VISSIM Average Queue (feet)	HSR+VSL+ ARM VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	HSR+VSL+ ARM VISSIM Maximum Queue (feet)	% Change
Democracy Blvd off ramp EB	50	0	-100%	219	0	-100%
Democracy Blvd off ramp WB	0	742	-	0	2598	-
MD 190 off ramp WB	1389	0	-100%	3571	19	-99%
MD 190 off ramp EB	0	0	-	0	0	-
Clara Barton Pkwy WB off ramp	0	31	1065479%	5	249	4621%

Table C.14: AM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
1- MD 85 at Sam's Club Drive											
1	NB	23.0	C	NB Left	119	77	82	496	E	38.6	D
				NB Through	365	28	82	496	C		
				NB Right	664	11	22	438	B		
	SB	50.1	D	SB Left	137	63	174	771	E		
				SB Through	599	50	174	771	D		
				SB Right	68	26	174	771	C		
	EB	50.9	D	EB Left	105	78	56	182	E		
				EB Through	62	81	56	182	F		
				EB Right	113	9	56	182	A		
	WB	52.7	D	WB Left	230	77	90	355	E		
				WB Through	15	67	90	355	E		
				WB Right	126	7	90	355	A		
2- MD 85 at I-270 NB on and off ramp											
2	NB	52.1	D	NB Left	683	52	265	1136	D	36.3	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	18.8	B	SB Left	0	0	0	0	A		
				SB Through	611	19	56	562	B		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
3- MD 85 at I-270 SB on and off ramp											
3	NB	5.3	A	NB Left	0	0	0	0	A	10.2	B
				NB Through	1071	5	19	413	A		
				NB Right	0	0	0	0	A		
	SB	40.9	D	SB Left	172	41	43	440	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
4- MD 85 at Crestwood Blvd											
4	NB	19.4	C	NB Left	13	71	54	382	E	25.0	C
				NB Through	762	19	54	382	B		
				NB U-Turn	0	0	0	0	A		
	SB	18.8	B	SB Left	64	69	25	156	E		
				SB Through	1783	18	80	627	B		
				SB Right	808	16	68	617	B		
	EB	52.7	D	EB Left	621	54	91	276	D		
				EB Through	28	68	91	276	E		
				EB Right	42	17	91	276	B		
	WB	44.1	D	WB Left	52	53	21	137	D		
				WB Through	18	56	21	137	E		
				WB Right	19	9	21	137	A		
5- MD 80 at I-270 NB on and ramp											
5	NB	-1.0	A	NB Left	3	1	0	4	A	21.2	C
				NB Through	1	1	0	4	A		
				NB Right	5	-3	0	4	A		
	SB	13.0	B	SB Left	204	16	14	108	B		
				SB Through	6	20	14	108	B		
				SB Right	59	2	0	0	A		
	EB	11.3	B	EB Left	54	12	11	183	B		
				EB Through	0	0	8	0	A		
				EB Right	5	5	19	213	A		
	WB	23.1	C	WB Left	35	24	1	56	C		
				WB Through	879	31	182	786	C		
				WB Right	639	12	11	442	B		
6- MD 80 at I-270 SB on and off ramp											
6	NB	6.2	A	NB Left	24	37	2	134	E	31.6	D
				NB Through	0	0	0	0	A		
				NB Right	258	3	2	134	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	36.7	E	EB Left	0	0	0	0	A		
				EB Through	360	36	67	436	E		
				EB Right	161	38	68	446	E		
	WB	47.8	E	WB Left	0	0	0	0	A		
				WB Through	278	48	157	758	E		
				WB Right	0	0	0	0	A		
7- MD 109 at I-270 NB on and off ramp											
7	NB			NB Left	0	0	0	0	A	29.9	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	33.1	D	SB Left	143	37	37	244	E		
				SB Through	0	0	0	0	A		
				SB Right	47	20	17	177	C		
	EB	15.7	C	EB Left	88	11	5	149	B		
				EB Through	0	0	0	0	A		
				EB Right	63	22	0	0	C		
	WB	32.2	D	WB Left	0	0	0	0	A		
				WB Through	671	32	399	555	D		
				WB Right	0	0	0	0	A		
8- MD 80 at I-270 SB on and off ramp											
8	NB	9.3	A	NB Left	17	36	4	78	E	33.7	D
				NB Through	0	0	0	0	A		
				NB Right	48	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	50.0	E	EB Left	0	0	0	0	A		
				EB Through	92	34	58	270	D		
				EB Right	102	64	60	268	F		
	WB	31.6	D	WB Left	570	29	158	594	D		
				WB Through	156	39	152	571	E		
				WB Right	0	0	0	0	A		
9- MD 121 at Gateway Center Dr											
9	NB	17.8	C	NB Left	154	27	43	285	C	51.2	D
				NB Through	434	22	43	285	C		
				NB Right	327	8	52	311	A		
	SB	32.3	D	SB Left	55	22	113	555	C		
				SB Through	792	33	123	555	C		
				SB Right	8	26	131	576	C		
	EB	120.4	F	EB Left	8	97	421	525	F		
				EB Through	99	125	422	525	F		
				EB Right	646	120	452	557	F		
	WB	21.8	C	WB Left	137	25	18	147	C		
				WB Through	17	22	18	147	C		
				WB Right	28	6	16	171	A		
10- MD 121 at I-270 NB on and off ramp											
10	NB	28.3	D	NB Left	324	59	67	255	F	19.0	B
				NB Through	0	0	0	0	A		
				NB Right	402	3	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	11.5	B	EB Left	0	0	0	0	A		
				EB Through	513	18	32	325	C		
				EB Right	285	1	0	0	A		
	WB	18.6	C	WB Left	233	63	145	805	F		
				WB Through	1337	11	145	805	B		
				WB Right	0	0	0	0	A		

Table C.14: AM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
11- MD 121 at I-270 SB on and off ramp											
11	NB			NB Left	0	0	0	0	A	18.3	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	62.8	E	SB Left	218	94	225	953	F		
				SB Through	0	0	0	0	A		
				SB Right	304	40	8	439	E		
	EB	5.2	A	EB Left	0	0	0	0	A		
				EB Through	578	5	12	206	A		
				EB Right	0	0	0	0	A		
	WB	8.8	A	WB Left	0	0	0	0	A		
WB Through				642	18	61	438	C			
WB Right				1010	3	30	185	A			
12- MD 27 at Observation Dr											
12	NB	48.1	D	NB U-Turn	0	0	0	0	A	37.1	D
				NB Through	48	58	14	72	E		
				NB Right	12	7	14	72	A		
	SB	44.0	D	SB Left	91	52	29	192	D		
				SB Through	54	52	39	261	D		
				SB Right	178	38	64	298	D		
	EB	16.9	B	EB Left	151	40	40	324	D		
				EB Through	1217	14	42	325	B		
				EB Right	48	10	49	363	B		
	WB	48.1	D	WB Left	100	32	333	847	C		
WB Through				2130	50	333	847	D			
WB Right				109	30	333	847	C			
13- MD 27 at I-270 NB off ramp											
13	NB	35.6	D	NB Left	106	36	15	88	D	52.4	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.1	A	EB Left	0	0	0	0	A		
				EB Through	973	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	76.7	E	WB Left	0	0	0	0	A		
WB Through				2166	77	1092	2164	E			
WB Right				0	0	0	0	A			
14- MD 27 at I-270 SB off ramp											
14	NB			NB Left	0	0	0	0	A	70.6	E
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	49.4	D	SB Left	384	49	61	275	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	2.6	A	EB Left	0	0	0	0	A		
				EB Through	840	3	2	62	A		
				EB Right	0	0	0	0	A		
	WB	118.3	F	WB Left	0	0	0	0	A		
WB Through				1365	118	1106	1497	F			
WB Right				0	0	0	0	A			
15- MD 27 at Crystal Rock Dr											
15	NB	64.8	E	NB Left	30	38	296	736	D	92.0	F
				NB Through	1051	65	316	736	E		
				NB Right	92	70	327	748	E		
	SB	119.1	F	SB Left	514	118	1842	3792	F		
				SB Through	1620	121	1842	3792	F		
				SB Right	51	81	1836	3787	F		
	EB	44.2	D	EB Left	224	50	59	199	D		
				EB Through	97	43	55	194	D		
				EB Right	75	29	60	228	C		
	WB	46.8	D	WB Left	11	56	32	103	E		
WB Through				32	224	32	103	F			
WB Right				142	6	32	103	A			
16- MD 118 at Seneca Meadows Pkwy											
16	NB	3.6	A	NB Left	109	11	1	72	B	6.1	A
				NB Through	725	3	4	134	A		
				NB Right	60	1	9	187	A		
	SB	4.0	A	SB Left	31	4	7	238	A		
				SB Through	948	4	10	238	A		
				SB Right	41	2	12	271	A		
	EB	18.4	B	EB Left	20	65	10	77	E		
				EB Through	6	82	10	77	F		
				EB Right	115	7	10	77	A		
	WB	44.2	D	WB Left	35	71	16	102	E		
WB Through				6	55	11	101	D			
WB Right				27	7	14	111	A			
17- MD 118 at I-270 NB on ramp											
17	NB			NB Left	0	0	0	0	A	10.2	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	29.6	C	EB Left	274	30	31	194	C		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	5.4	A	WB Left	0	0	0	0	A		
WB Through				188	1	0	0	A			
WB Right				911	6	15	309	A			
18- MD 118 at I-270 SB off ramp											
18	NB			NB Left	0	0	0	0	A	7.5	A
				NB Through	0	0.0	0	0	A		
				NB Right	0	0.0	0	0	A		
	SB	38.1	D	SB Left	215	38.1	34	163	D		
				SB Through	0	0.0	0	0	A		
				SB Right	0	0.0	0	0	A		
	EB	3.7	A	EB Left	0	0.0	0	0	A		
				EB Through	631	3.7	5	194	A		
				EB Right	0	0.0	0	0	A		
	WB	4.1	A	WB Left	0	0.0	0	0	A		
WB Through				1214	4.1	9	173	A			
WB Right				0	0.0	0	0	A			
19- MD 118 at Aircraft Dr											
19	NB	46.2	D	NB Left	9	78	9	75	E	20.6	C
				NB Through	13	80	9	75	F		
				NB Right	17	3	0	24	A		
	SB	60.5	E	SB Left	267	55	112	418	E		
				SB Through	53	72	112	418	E		
				SB Right	96	68	112	418	E		
	EB	12.4	B	EB Left	132	16	37	329	B		
				EB Through	1019	12	37	329	B		
				EB Right	34	12	37	329	B		
	WB	15.1	B	WB Left	83	23	47	310	C		
WB Through				1046	17	47	310	B			
WB Right				324	6	47	310	A			
20- Middlebrook Rd at Observation Dr											
20	NB			NB Left	0	0	0	0	A	16.4	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	20.4	C	SB Left	26	36	5	63	D		
				SB Through	0	0	0	0	A		
				SB Right	27	5	5	63	A		
	EB	14.1	B	EB Left	231	21	29	249	C		
				EB Through	825	12	29	249	B		
				EB Right	0	0	0	0	A		
	WB	18.0	B	WB Left	0	0	0	0	A		
WB Through				1141	19	72	392	B			
WB Right				275	15	97	441	B			

Table C.14: AM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
21- Middlebrook Rd at I-270 SB on ramp											
21	NB			NB Left	0	0	0	0	A	19.5	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	13.7	B	EB Left	0	0	0	0	A		
				EB Through	763	14	31	203	B		
				EB Right	0	0	0	0	A		
	WB	25.4	C	WB Left	761	25	104	893	C		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
22- Middlebrook Rd at Waring Station Rd											
22	NB	179.6	F	NB Left	145	136	348	485	F	70.4	E
				NB Through	6	133	348	485	F		
				NB Right	268	204	348	485	F		
	SB	17.6	B	SB Left	3	39	1	29	D		
				SB Through	0	0	1	29	A		
				SB Right	5	5	2	67	A		
	EB	69.3	E	EB Left	31	21	645	1297	C		
				EB Through	1448	71	645	1297	E		
				EB Right	80	62	645	1297	E		
	WB	18.4	B	WB Left	80	23	33	237	C		
				WB Through	719	19	33	237	B		
				WB Right	41	4	33	237	A		
23- MD 124 at MD 355											
23	NB	52.9	D	NB Left	228	73	86	264	E	96.2	F
				NB Through	390	48	84	262	D		
				NB Right	54	3	0	0	A		
	SB	104.2	F	SB Left	64	166	490	804	F		
				SB Through	1188	124	490	804	F		
				SB Right	559	54	284	780	D		
	EB	54.5	D	EB Left	610	130	444	1095	F		
				EB Through	494	17	444	1095	B		
				EB Right	555	5	236	1008	A		
	WB	143.6	F	WB Left	0	0	0	0	A		
				WB Through	1717	146	760	1115	F		
				WB Right	52	73	0	0	E		
24- MD 124 at I-270 SB on and off											
24	NB	65.3	F	NB Left	16	62	18	95	E	29.3	C
				NB Through	37	67	18	95	E		
				NB U-Turn	0	0	0	0	A		
	SB	26.0	C	SB Left	285	65	77	373	E		
				SB Through	11	65	77	373	E		
				SB Right	588	6	14	350	A		
	EB	17.0	B	EB Left	0	0	0	0	A		
				EB Through	1037	17	50	409	B		
				EB Right	67	14	60	433	B		
	WB	41.6	D	WB Left	43	47	1679	2437	D		
				WB Through	1136	41	1679	2437	D		
				WB Right	0	0	0	0	A		
25- MD 117 at MD 124											
25	NB	49.7	D	NB Left	20	108	157	726	F	48.5	D
				NB Through	541	64	157	726	E		
				NB Right	433	30	76	717	C		
	SB	47.0	D	SB Left	181	69	221	826	E		
				SB Through	1072	48	221	826	D		
				SB Right	131	9	0	0	A		
	EB	54.0	D	EB Left	102	119	217	782	F		
				EB Through	1470	50	217	783	D		
				EB Right	82	47	229	811	D		
	WB	39.4	D	WB Left	319	70	103	304	E		
				WB Through	478	27	103	304	C		
				WB Right	99	0	0	0	A		
26- MD 117 at Bureau Dr											
26	NB	50.3	D	NB Left	25	64	19	125	E	41.1	D
				NB Through	24	65	19	125	E		
				NB Right	26	23	19	125	C		
	SB	174.5	F	SB Left	197	177	223	397	F		
				SB Through	55	190	223	397	F		
				SB Right	32	130	223	397	F		
	EB	36.8	D	EB Left	33	26	272	958	C		
				EB Through	2020	37	278	958	D		
				EB Right	29	43	271	948	D		
	WB	20.8	C	WB Left	299	67	134	543	E		
				WB Through	840	10	134	544	A		
				WB Right	314	6	100	582	A		
27- MD 117 at I-270 SB off ramp											
27	NB			NB Left	0	0	0	0	A	9.3	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	2.0	A	EB Left	0	0	0	0	A		
				EB Through	835	2	1	180	A		
				EB Right	0	0	0	0	A		
	WB	28.1	D	WB Left	328	28	59	453	D		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
28- MD 117 at I-270 NB off ramp											
28	NB			NB Left	0	0	0	0	A	34.5	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	60.5	E	SB Left	287	63	325	1037	E		
				SB Through	0	0	0	0	A		
				SB Right	871	60	329	1039	E		
	EB	19.2	B	EB Left	14	123	74	848	F		
				EB Through	821	17	74	848	B		
				EB Right	0	0	0	0	A		
	WB	15.6	B	WB Left	0	0	0	0	A		
				WB Through	909	16	60	360	B		
				WB Right	9	8	66	390	A		
29- MD 117 at Perry Pkwy											
29	NB	44.5	D	NB Left	36	76	17	120	E	15.9	B
				NB Through	7	58	17	119	E		
				NB Right	38	12	27	140	B		
	SB	48.7	D	SB Left	112	96	60	247	F		
				SB Through	14	102	60	247	F		
				SB Right	133	3	60	247	A		
	EB	10.6	B	EB Left	119	70	44	269	E		
				EB Through	975	3	44	269	A		
				EB Right	10	1	31	254	A		
	WB	10.4	B	WB Left	8	89	21	297	F		
				WB Through	747	10	21	297	B		
				WB Right	136	6	21	297	A		
30- Shady Grove Rd at I-270 NB off ramp											
30	NB	9.8	A	NB Left	0	0	0	0	A	22.3	C
				NB Through	959	10	22	267	A		
				NB Right	0	0	0	0	A		
	SB	10.4	B	SB Left	0	0	0	0	A		
				SB Through	1349	10	34	334	B		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	55.7	E	WB Left	846	56	160	616	E		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table C.14: AM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
31- Shady Grove Rd at I-270 SB off ramp											
31	NB	12.7	B	NB Left	0	0	0	0	A	19.9	B
				NB Through	1004	13	37	399	B		
				NB Right	0	0	0	0	A		
	SB	9.3	A	SB Left	0	0	0	0	A		
				SB Through	1565	9	32	563	A		
				SB Right	0	0	0	0	A		
	EB	47.4	D	EB Left	286	41	42	360	D		
				EB Through	0	0	0	0	A		
				EB Right	576	51	98	441	D		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
32- MD 28 at I-270 SB off ramp											
32	NB			NB U-Turn	0	0	0	0	A	67.9	E
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	35.7	D	SB Left	426	44	68	327	D		
				SB Through	0	0	0	0	A		
				SB Right	103	3	0	36	A		
	EB	131.7	F	EB Left	0	0	0	0	A		
				EB Through	683	200	1979	2136	F		
				EB Right	409	18	1925	2144	B		
	WB	25.4	C	WB Left	0	0	0	0	A		
				WB Through	1235	25	23	384	C		
				WB Right	0	0	0	0	A		
33- MD 28 at I-270 on and off ramps											
33	NB	36.5	D	NB Left	0	0	32	238	A	36.3	D
				NB Through	128	53	38	247	D		
				NB Right	80	10	38	247	A		
	SB	84.5	F	SB Left	26	102	128	357	F		
				SB Through	0	0	0	0	A		
				SB Right	273	83	128	357	F		
	EB	21.4	C	EB Left	177	45	57	407	D		
				EB Through	599	15	57	407	B		
				EB Right	0	0	0	0	A		
	WB	33.3	C	WB Left	26	37	101	391	D		
				WB Through	944	33	83	354	C		
				WB Right	0	0	0	0	A		
34- MD 189 at Great Falls Rd											
34	NB	37.3	D	NB Left	63	42	17	117	D	23.3	C
				NB Through	8	40	14	117	D		
				NB Right	10	8	16	128	A		
	SB	17.3	B	SB Left	63	45	19	229	D		
				SB Through	6	45	19	229	D		
				SB Right	478	13	54	147	B		
	EB	24.6	C	EB Left	227	55	111	1165	E		
				EB Through	680	15	17	199	B		
				EB Right	10	10	26	236	A		
	WB	26.4	C	WB Left	4	26	64	389	C		
				WB Through	311	27	63	388	C		
				WB Right	11	13	77	422	B		
35- MD 189 at I-270 Ramps											
35	NB	60.5	E	NB Left	88	61	18	121	E	79.7	E
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	55.9	E	SB Left	150	56	48	258	E		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	106.2	F	EB Left	284	138	627	1494	F		
				EB Through	436	85	627	1494	F		
				EB Right	0	0	0	0	A		
	WB	60.0	E	WB Left	457	53	107	429	D		
				WB Through	244	73	107	429	E		
				WB Right	0	0	0	0	A		
36- MD 189 at Wootton Pkwy											
36	NB	71.9	E	NB Left	161	48	85	311	D	117.9	F
				NB Through	125	95	85	311	F		
				NB Right	155	78	85	311	E		
	SB	142.8	F	SB Left	325	210	509	805	F		
				SB Through	593	106	482	792	F		
				SB Right	0	0	0	0	A		
	EB	162.3	F	EB Left	137	157	650	1047	F		
				EB Through	803	170	650	1047	F		
				EB Right	101	106	650	1047	F		
	WB	49.3	D	WB Left	346	69	104	353	E		
				WB Through	318	34	104	353	C		
				WB Right	47	6	104	353	A		
37- Montrose Rd at Tower Oaks Blvd											
37	NB			NB Left	0	0	0	0	A	104.5	F
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	235.8	F	SB Left	123	49	1098	1406	D		
				SB Through	0	0	0	0	A		
				SB Right	435	289	1123	1402	F		
	EB	25.5	C	EB Left	28	65	136	923	E		
				EB Through	1513	25	136	923	C		
				EB Right	0	0	0	0	A		
	WB	141.4	F	WB Left	0	0	0	0	A		
				WB Through	1255	145	491	850	F		
				WB Right	58	60	491	850	E		
38- Tower Oaks Blvd at I-270 off ramp											
38	NB	24.1	C	NB Left	385	22	30	200	C	78.2	E
				NB Through	8	22.5	25	192	C		
				NB Right	22	64.1	30	200	E		
	SB	0.6	A	SB Left	0	800.1	0	20	F		
				SB Through	0	0.0	0	20	A		
				SB Right	4	0.6	0	0	A		
	EB	122.8	F	EB Left	6	113.7	347	465	F		
				EB Through	558	122.3	347	465	F		
				EB Right	82	126.7	338	456	F		
	WB	9.5	A	WB Left	0	0.0	3	80	A		
				WB Through	81	9.9	3	80	A		
				WB Right	6	5.0	0	25	A		
39- Montrose Rd at Tower Oaks Blvd											
39	NB	17.9	B	NB Left	37	71	49	285	E	50.9	D
				NB Through	240	42	49	285	D		
				NB Right	555	4	12	151	A		
	SB	41.1	D	SB Left	334	54	163	619	D		
				SB Through	778	37	163	618	D		
				SB Right	78	29	124	658	C		
	EB	90.2	F	EB Left	76	74	416	718	E		
				EB Through	971	92	418	718	F		
				EB Right	62	89	439	742	F		
	WB	43.4	D	WB Left	300	52	68	290	D		
				WB Through	188	50	68	290	D		
				WB Right	109	7	77	321	A		
40- Rockledge Blvd at I-270 NB on and off ramp											
40	NB	34.1	C	NB Left	0	0	0	0	A	18.0	B
				NB Through	92	32	33	165	C		
				NB Right	216	35	33	165	C		
	SB	2.0	A	SB Left	0	0	4	61	A		
				SB Through	923	2	4	61	A		
				SB Right	0	0	0	0	A		
	EB	26.9	C	EB Left	7	48	126	506	D		
				EB Through	529	54	126	506	D		
				EB Right	563	1	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table C.14: AM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS	
41- Rockledge Blvd at I-270 SB on and off ramps												
41	NB	2.6	A	NB Left	97	3	5	72	A	20.4	C	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	21.7	C		WB Left	923	23	92	655			C
					WB Through	403	20	92	655			B
					WB Right	0	0	0	0			A
42- MD 187 at Tuckerman Ln												
42	NB	58.8	E	NB Left	230	25	265	793	C	153.0	F	
				NB Through	1468	55	265	793	D			
				NB Right	213	124	265	793	F			
	SB	224.9	F		SB Left	60	164	2605	2704			F
					SB Through	1204	225	2605	2704			F
					SB Right	162	247	2605	2704			F
	EB	186.0	F		EB Left	223	128	1864	1988			F
					EB Through	624	205	1865	1989			F
					EB Right	129	194	1889	2013			F
	WB	188.4	F		WB Left	721	229	1921	2147			F
					WB Through	393	152	1921	2147			F
					WB Right	159	92	1921	2147			F
43- MD 187 at I-270 NB on and off ramps												
43	NB	11.2	B	NB Left	163	76	57	257	E	19.1	B	
				NB Through	1541	4	57	257	A			
				NB Right	0	0	0	0	A			
	SB	25.4	C		SB Left	0	0	0	0			A
					SB Through	1529	25	81	553			C
					SB Right	0	0	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	49.5	D		WB Left	114	50	35	250			D
					WB Through	10	47	35	250			D
					WB Right	0	0	0	0			A
44- MD 187 at I-270 NB on and off ramps												
44	NB	23.9	C	NB Left	0	0	0	0	A	25.9	C	
				NB Through	1478	24	68	404	C			
				NB Right	0	0	0	0	A			
	SB	7.7	A		SB Left	178	49	58	295			D
					SB Through	1465	3	58	295			A
					SB Right	0	0	0	0			A
	EB	80.8	F		EB Left	228	58	187	740			E
					EB Through	0	0	187	740			A
					EB Right	371	95	232	784			F
	WB				WB Left	0	0	0	0			A
					WB Through	0	0	0	0			A
					WB Right	0	0	0	0			A
45- MD 187 at Rock Spring Dr												
45	NB	14.9	B	NB Left	255	57	68	257	E	20.8	C	
				NB Through	1383	7	69	258	A			
				NB Right	10	6	93	291	A			
	SB	21.9	C		SB Left	13	25	98	632			C
					SB Through	1668	24	98	632			C
					SB Right	144	1	63	619			A
	EB	37.9	D		EB Left	190	59	56	222			E
					EB Through	26	54	56	222			D
					EB Right	251	20	56	222			C
	WB	7.2	A		WB Left	1	7	1	29			A
					WB Through	9	11	1	29			B
					WB Right	5	0	0	7			A
47-Democracy Blvd at I-270 NB off ramp												
47	NB	29.7	C	NB Left	217	30	24	159	C	13.4	B	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB	12.7	B		EB Left	0	0	0	0			A
					EB Through	1654	13	50	446			B
					EB Right	0	0	0	0			A
	WB	10.4	B		WB Left	0	0	0	0			A
					WB Through	778	10	23	187			B
					WB Right	0	0	0	0			A
48- Democracy Blvd at I-270 SB on ramp												
48	NB			NB Left	0	0	0	0	A	6.6	A	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB	5.4	A		EB Left	0	0	0	0			A
					EB Through	1768	5	23	270			A
					EB Right	0	0	0	0			A
	WB	8.7	A		WB Left	223	37	31	173			D
					WB Through	771	1	21	152			A
					WB Right	0	0	0	0			A
49- Democracy Blvd at I-270 SB off ramp												
49	NB			NB Left	0	0	0	0	A	12.1	B	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB	32.9	C		SB Left	329	49	57	226			D
					SB Through	0	0	0	0			A
					SB Right	171	2	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	2.6	A		WB Left	0	0	0	0			A
					WB Through	770	3	4	133			A
					WB Right	334	2	1	163			A
50- MD 190 at Burdette Rd												
50	NB	73.2	E	NB Left	20	80	15	118	E	13.2	B	
				NB Through	4	59	15	118	E			
				NB Right	11	67	15	118	E			
	SB	34.4	C		SB Left	50	79	31	151			E
					SB Through	17	64	31	151			E
					SB Right	120	12	31	151			B
	EB	10.5	B		EB Left	53	93	61	561			F
					EB Through	1814	8	60	561			A
					EB Right	15	6	51	584			A
	WB	12.5	B		WB Left	1	106	61	828			F
					WB Through	1494	13	62	828			B
					WB Right	21	2	55	834			A

Table C.14: AM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
51- MD 190 at I-270 NB on ramp											
51	NB			NB Left	0	0	0	0	A	53.3	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	123.2	F	EB Left	531	123	347	715	F		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	15.9	B	WB Left	0	0	0	0	A		
				WB Through	994	16	76	747	B		
				WB Right	0	0	0	0	A		
52- MD 190 at I-270 SB off ramp											
52	NB	79.3	E	NB Left	258	79	1392	3574	E	14.2	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	2.9	A	EB Left	0	0	0	0	A		
				EB Through	982	3	6	151	A		
				EB Right	0	0	0	0	A		
	WB	5.7	A	WB Left	0	0	0	0	A		
				WB Through	667	6	8	160	A		
				WB Right	0	0	0	0	A		
53- MD 190 at Seven Locks Rd											
53	NB	68.2	E	NB Left	21	67	23	149	E	45.0	D
				NB Through	59	69	25	148	E		
				NB Right	0	0	0	0	A		
	SB	56.9	E	SB Left	624	56	184	777	E		
				SB Through	183	59	185	778	E		
				SB Right	18	54	184	777	D		
	EB	37.5	D	EB Left	24	30	135	584	C		
				EB Through	846	38	135	584	D		
				EB Right	42	42	135	584	D		
	WB	39.7	D	WB Left	119	127	125	418	F		
				WB Through	639	33	128	421	C		
				WB Right	157	1	4	127	A		
54- MD 124 at I-270 NB off ramp											
54	NB	40.6	D	NB Left	0	0	0	0	A	26.5	C
				NB Through	0	0	0	0	A		
				NB Right	723	41	100	459	D		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	15.6	B	EB Left	0	0	0	0	A		
				EB Through	933	16	37	359	B		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
55- Democracy Blvd at I-270 NB off ramp											
55	NB	37.1	D	NB Left	0	0	0	0	A	16.2	B
				NB Through	0	0	0	0	A		
				NB Right	928	37	113	575	D		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	4.5	A	EB Left	0	0	0	0	A		
				EB Through	1657	5	18	95	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
56- Watkins Mill Rd at I-270 SB off ramp/Parkview Ave											
56	NB	747.0	F	NB Left	46	222	668	726	F	174.0	F
				NB Through	0	0	0	0	A		
				NB Right	86	1028	668	726	F		
	SB	83.5	F	SB Left	552	113	2037	5048	F		
				SB Through	131	109	2037	5048	F		
				SB Right	447	39	2037	5048	D		
	EB	463.4	F	EB Left	0	0	0	0	A		
				EB Through	494	463	1163	1232	F		
				EB Right	2	599	1163	1232	F		
	WB	41.8	D	WB Left	116	87	120	459	F		
				WB Through	769	35	117	457	D		
				WB Right	0	0	0	0	A		
57- Watkins Mill Rd at I-270 NB on ramp											
57	NB	35.2	D	NB Left	386	51	92	383	D	70.0	E
				NB Through	0	0	0	0	A		
				NB Right	478	23	92	383	C		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	19.1	B	EB Left	190	61	49	301	E		
				EB Through	749	8	49	301	A		
				EB Right	0	0	0	0	A		
	WB	139.2	F	WB Left	0	0	0	0	A		
				WB Through	954	150	640	849	F		
				WB Right	174	78	640	849	E		
58- Watkins Mill Rd at I-270 SB on ramp											
58	NB			NB Left	0	0	0	0	A	60.7	E
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	73.4	E	EB Left	0	0	0	0	A		
				EB Through	938	30	483	620	C		
				EB Right	182	299	483	620	F		
	WB	50.0	D	WB Left	456	142	273	516	F		
				WB Through	883	2	273	516	A		
				WB Right	0	0	0	0	A		

Table C.15: AM Peak -2040 HSR+VSL+ARM- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
1- MD 85 at Sam's Club Drive											
1	NB	21.4	C	NB Left	125	76	77	394	E	37.4	D
				NB Through	384	26	77	394	C		
				NB Right	698	9	18	353	A		
	SB	50.3	D	SB Left	138	64	174	747	E		
				SB Through	595	50	174	747	D		
				SB Right	68	27	174	747	C		
	EB	50.3	D	EB Left	104	77	55	177	E		
				EB Through	62	81	55	177	F		
				EB Right	113	9	55	177	A		
	WB	52.1	D	WB Left	233	76	89	320	E		
				WB Through	16	69	89	320	E		
				WB Right	126	7	89	320	A		
2- MD 85 at I-270 NB on and off ramp											
2	NB	51.0	D	NB Left	681	51	257	1130	D	35.6	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	18.5	B	SB Left	0	0	0	0	A		
				SB Through	613	19	55	593	B		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
3- MD 85 at I-270 SB on and off ramp											
3	NB	5.1	A	NB Left	0	0	0	0	A	10.3	B
				NB Through	1071	5	18	465	A		
				NB Right	0	0	0	0	A		
	SB	42.4	D	SB Left	173	42	44	272	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
4- MD 85 at Crestwood Blvd											
4	NB	19.3	C	NB Left	13	52	54	403	D	25.0	C
				NB Through	762	19	54	403	B		
				NB U-Turn	0	0	0	0	A		
	SB	18.8	B	SB Left	68	68	26	163	E		
				SB Through	1871	18	83	637	B		
				SB Right	844	16	73	640	B		
	EB	53.8	D	EB Left	622	55	94	291	E		
				EB Through	28	78	94	291	E		
				EB Right	42	17	94	291	B		
	WB	43.9	D	WB Left	52	53	21	132	D		
				WB Through	18	55	21	132	E		
				WB Right	19	8	21	132	A		
5- MD 80 at I-270 NB on and ramp											
5	NB	2.6	A	NB Left	4	9	0	0	A	122.9	F
				NB Through	2	0	0	0	A		
				NB Right	4	-3	0	0	A		
	SB	12.1	B	SB Left	209	15	13	137	B		
				SB Through	6	15	13	137	B		
				SB Right	61	2	0	0	A		
	EB	18.8	B	EB Left	54	20	10	212	C		
				EB Through	0	0	8	0	A		
				EB Right	5	5	19	242	A		
	WB	156.8	F	WB Left	26	133	0	53	F		
				WB Through	638	193	816	944	F		
				WB Right	452	107	30	372	F		
6- MD 80 at I-270 SB on and off ramp											
6	NB	7.3	A	NB Left	25	60	2	146	F	59.1	F
				NB Through	0	0	0	0	A		
				NB Right	292	3	2	146	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	34.0	D	EB Left	0	0	0	0	A		
				EB Through	362	33	55	348	D		
				EB Right	162	36	56	357	E		
	WB	198.1	F	WB Left	0	0	0	0	A		
				WB Through	213	198	663	902	F		
				WB Right	0	0	0	0	A		
7- MD 109 at I-270 NB on and off ramp											
7	NB			NB Left	0	0	0	0	A	34.5	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	17.6	C	SB Left	149	22	22	225	C		
				SB Through	0	0	0	0	A		
				SB Right	49	5	2	179	A		
	EB	23.2	C	EB Left	61	11	3	191	B		
				EB Through	0	0	0	0	A		
				EB Right	62	35	0	9	D		
	WB	41.8	E	WB Left	0	0	0	0	A		
				WB Through	647	42	332	1147	E		
				WB Right	0	0	0	0	A		
8- MD 80 at I-270 SB on and off ramp											
8	NB	4.4	A	NB Left	17	15	2	89	B	116.2	F
				NB Through	0	0	0	0	A		
				NB Right	47	1	0	18	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	421.3	F	EB Left	0	0	0	0	A		
				EB Through	64	345	386	494	F		
				EB Right	49	521	384	491	F		
	WB	77.0	F	WB Left	546	77	472	905	F		
				WB Through	152	77	452	882	F		
				WB Right	0	0	0	0	A		
9- MD 121 at Gateway Center Dr											
9	NB	19.0	C	NB Left	160	30	46	313	C	107.8	F
				NB Through	448	24	46	313	C		
				NB Right	335	7	57	339	A		
	SB	155.6	F	SB Left	53	91	634	847	F		
				SB Through	764	160	637	847	F		
				SB Right	8	187	657	868	F		
	EB	260.3	F	EB Left	5	140	461	522	F		
				EB Through	51	236	462	522	F		
				EB Right	337	266	494	554	F		
	WB	22.8	C	WB Left	138	26	18	153	C		
				WB Through	17	21	18	153	C		
				WB Right	28	6	15	157	A		
10- MD 121 at I-270 NB on and off ramp											
10	NB	27.3	D	NB Left	354	57	70	261	F	47.1	D
				NB Through	0	0	0	0	A		
				NB Right	445	3	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	9.7	A	EB Left	0	0	0	0	A		
				EB Through	498	15	27	289	B		
				EB Right	274	1	0	0	A		
	WB	83.1	F	WB Left	182	80	608	1057	F		
				WB Through	1061	84	608	1057	F		
				WB Right	0	0	0	0	A		

Table C.15: AM Peak -2040 HSR+VSL+ARM- Intersection Delay and Level of Service

11- MD 121 at I-270 SB on and off ramp											
11	NB	57.0	E	NB Left	0	0	0	0	A	44.0	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	11.8	B	SB Left	212	88	200	917	F		
				SB Through	0	0	0	0	A		
				SB Right	294	34	20	272	D		
	EB	52.1	D	EB Left	0	0	0	0	A		
				EB Through	559	12	11	230	B		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	605	20	259	900	C		
				WB Right	807	76	429	876	F		
12- MD 27 at Observation Dr											
12	NB	45.1	D	NB U-Turn	0	0	0	0	A	53.5	D
				NB Through	48	55	13	72	D		
				NB Right	12	6	13	72	A		
	SB	49.6	D	SB Left	92	48	27	183	D		
				SB Through	54	50	48	276	D		
				SB Right	180	51	75	313	D		
	EB	18.8	B	EB Left	158	42	46	300	D		
				EB Through	1259	16	48	301	B		
				EB Right	50	13	57	339	B		
	WB	77.2	E	WB Left	98	55	514	844	E		
				WB Through	2021	79	514	844	E		
				WB Right	99	54	514	844	D		
13- MD 27 at I-270 NB off ramp											
13	NB	30.7	C	NB Left	117	31	16	105	C	31.7	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	0.1	A	SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	46.4	D	EB Left	0	0	0	0	A		
				EB Through	970	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	2098	46	1618	2471	D		
				WB Right	0	0	0	0	A		
14- MD 27 at I-270 SB off ramp											
14	NB	47.1	D	NB Left	0	0	0	0	A	34.7	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	2.7	A	SB Left	383	47	63	251	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	51.0	D	EB Left	0	0	0	0	A		
				EB Through	836	3	1	67	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	1347	51	533	1380	D		
				WB Right	0	0	0	0	A		
15- MD 27 at Crystal Rock Dr											
15	NB	59.4	E	NB Left	30	34	269	750	C	70.1	E
				NB Through	1041	60	293	750	E		
				NB Right	92	66	304	763	E		
	SB	82.7	F	SB Left	509	81	870	1447	F		
				SB Through	1606	84	870	1447	F		
				SB Right	47	48	861	1441	D		
	EB	43.8	D	EB Left	224	50	59	197	D		
				EB Through	97	43	55	192	D		
				EB Right	76	27	60	226	C		
	WB	46.8	D	WB Left	11	56	32	103	E		
				WB Through	32	224	32	103	F		
				WB Right	142	6	32	103	A		
16- MD 118 at Seneca Meadows Pkwy											
16	NB	3.8	A	NB Left	123	11	1	70	B	6.1	A
				NB Through	770	3	5	159	A		
				NB Right	63	1	9	212	A		
	SB	4.0	A	SB Left	31	4	7	223	A		
				SB Through	948	4	10	224	A		
				SB Right	41	3	12	256	A		
	EB	18.4	B	EB Left	20	65	10	77	E		
				EB Through	6	82	10	77	F		
				EB Right	115	7	10	77	A		
	WB	44.8	D	WB Left	35	72	16	102	E		
				WB Through	6	55	11	101	D		
				WB Right	27	8	14	111	A		
17- MD 118 at I-270 NB on ramp											
17	NB	29.4	C	NB Left	0	0	0	0	A	10.2	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	5.4	A	SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB			EB Left	274	29	30	195	C		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	188	1	0	0	A		
				WB Right	911	6	15	250	A		
18- MD 118 at I-270 SB off ramp											
18	NB	38.8	D	NB Left	0	0	0	0	A	8.1	A
				NB Through	0	0.0	0	0	A		
				NB Right	0	0.0	0	0	A		
	SB	3.8	A	SB Left	229	38.8	38	154	D		
				SB Through	0	0.0	0	0	A		
				SB Right	0	0.0	0	0	A		
	EB	4.8	A	EB Left	0	0.0	0	0	A		
				EB Through	631	3.8	5	190	A		
				EB Right	0	0.0	0	0	A		
	WB			WB Left	0	0.0	0	0	A		
				WB Through	1306	4.8	11	239	A		
				WB Right	0	0.0	0	0	A		
19- MD 118 at Aircraft Dr											
19	NB	46.1	D	NB Left	9	78	9	75	E	20.5	C
				NB Through	13	80	9	75	F		
				NB Right	17	3	0	23	A		
	SB	60.5	E	SB Left	267	55	112	418	E		
				SB Through	53	72	112	418	E		
				SB Right	96	68	112	418	E		
	EB	12.3	B	EB Left	132	16	37	329	B		
				EB Through	1019	12	37	329	B		
				EB Right	34	12	37	329	B		
	WB	15.5	B	WB Left	89	24	50	370	C		
				WB Through	1129	18	50	370	B		
				WB Right	345	7	50	370	A		
20- Middlebrook Rd at Observation Dr											
20	NB	21.4	C	NB Left	0	0	0	0	A	68.4	E
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	18.0	B	SB Left	26	36	5	68	D		
				SB Through	0	0	0	0	A		
				SB Right	27	7	5	68	A		
	EB	111.0	F	EB Left	212	29	36	280	C		
				EB Through	757	15	36	280	B		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	971	123	422	519	F		
				WB Right	234	61	465	568	E		

Table C.15: AM Peak -2040 HSR+VSL+ARM- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
21- Middlebrook Rd at I-270 SB on ramp											
21	NB			NB Left	0	0	0	0	A	117.4	F
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	18.2	B	EB Left	0	0	0	0	A		
				EB Through	630	18	35	216	B		
				EB Right	0	0	0	0	A		
	WB	213.8	F	WB Left	648	214	2191	2394	F		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
22- Middlebrook Rd at Waring Station Rd											
22	NB	358.8	F	NB Left	86	274	441	509	F	113.4	F
				NB Through	4	249	441	509	F		
				NB Right	183	401	441	509	F		
	SB	17.8	B	SB Left	3	38	1	29	D		
				SB Through	0	0	1	29	A		
				SB Right	5	6	2	67	A		
	EB	124.7	F	EB Left	29	32	1062	1307	C		
				EB Through	1250	127	1062	1307	F		
				EB Right	71	128	1062	1307	F		
	WB	15.6	B	WB Left	83	22	29	226	C		
				WB Through	710	15	29	226	B		
				WB Right	40	4	29	226	A		
23- MD 124 at MD 355											
23	NB	51.7	D	NB Left	227	68	86	261	E	79.9	E
				NB Through	390	49	84	258	D		
				NB Right	54	3	0	0	A		
	SB	75.0	E	SB Left	67	153	360	790	F		
				SB Through	1236	99	360	790	F		
				SB Right	588	17	147	762	B		
	EB	56.5	E	EB Left	630	136	487	1059	F		
				EB Through	521	18	487	1059	B		
				EB Right	573	5	330	1029	A		
	WB	114.2	F	WB Left	0	0	0	0	A		
				WB Through	1936	116	711	1108	F		
				WB Right	60	66	0	0	E		
24- MD 124 at I-270 SB on and off											
24	NB	65.0	F	NB Left	16	61	18	95	E	20.7	C
				NB Through	37	67	18	95	E		
				NB U-Turn	0	0	0	0	A		
	SB	22.9	C	SB Left	283	61	70	292	E		
				SB Through	11	64	70	292	E		
				SB Right	577	4	6	221	A		
	EB	17.2	B	EB Left	0	0	0	0	A		
				EB Through	1036	17	52	438	B		
				EB Right	67	14	62	462	B		
	WB	20.3	C	WB Left	51	26	93	820	C		
				WB Through	1265	20	93	820	C		
				WB Right	0	0	0	0	A		
25- MD 117 at MD 124											
25	NB	58.1	E	NB Left	20	128	197	704	F	49.9	D
				NB Through	548	73	197	704	E		
				NB Right	431	36	84	586	D		
	SB	46.8	D	SB Left	182	71	221	829	E		
				SB Through	1072	47	221	829	D		
				SB Right	131	10	0	0	A		
	EB	53.0	D	EB Left	101	119	214	788	F		
				EB Through	1476	49	213	789	D		
				EB Right	81	45	223	816	D		
	WB	40.2	D	WB Left	334	71	109	341	E		
				WB Through	506	28	109	341	C		
				WB Right	105	0	0	0	A		
26- MD 117 at Bureau Dr											
26	NB	52.5	D	NB Left	24	73	22	133	E	44.2	D
				NB Through	24	71	22	133	E		
				NB Right	26	16	22	133	B		
	SB	219.8	F	SB Left	192	221	267	424	F		
				SB Through	54	230	267	424	F		
				SB Right	31	194	267	424	F		
	EB	39.6	D	EB Left	33	36	236	919	D		
				EB Through	2008	40	240	919	D		
				EB Right	29	31	233	908	C		
	WB	18.4	B	WB Left	320	58	117	421	E		
				WB Through	893	9	118	422	A		
				WB Right	331	5	87	470	A		
27- MD 117 at I-270 SB off ramp											
27	NB			NB Left	0	0	0	0	A	13.6	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	5.1	A	EB Left	0	0	0	0	A		
				EB Through	824	5	1	107	A		
				EB Right	0	0	0	0	A		
	WB	35.0	E	WB Left	328	35	77	567	E		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
28- MD 117 at I-270 NB off ramp											
28	NB			NB Left	0	0	0	0	A	35.4	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	55.8	E	SB Left	321	53	270	822	D		
				SB Through	0	0	0	0	A		
				SB Right	955	57	275	824	E		
	EB	23.8	C	EB Left	15	120	105	927	F		
				EB Through	807	22	105	927	C		
				EB Right	0	0	0	0	A		
	WB	17.4	B	WB Left	0	0	0	0	A		
				WB Through	909	17	68	363	B		
				WB Right	9	6	74	393	A		
29- MD 117 at Perry Pkwy											
29	NB	45.7	D	NB Left	36	77	18	120	E	16.4	B
				NB Through	7	63	17	119	E		
				NB Right	38	12	28	140	B		
	SB	51.4	D	SB Left	112	102	64	246	F		
				SB Through	14	101	64	246	F		
				SB Right	133	3	64	246	A		
	EB	10.1	B	EB Left	123	67	43	263	E		
				EB Through	994	3	44	263	A		
				EB Right	10	2	30	248	A		
	WB	11.4	B	WB Left	8	83	22	264	F		
				WB Through	748	12	22	264	B		
				WB Right	136	6	22	264	A		
30- Shady Grove Rd at I-270 NB off ramp											
30	NB	8.6	A	NB Left	0	0	0	0	A	25.2	C
				NB Through	954	9	19	231	A		
				NB Right	0	0	0	0	A		
	SB	10.5	B	SB Left	0	0	0	0	A		
				SB Through	1350	11	34	328	B		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	59.3	E	WB Left	1043	59	221	819	E		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table C.15: AM Peak -2040 HSR+VSL+ARM- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
31- Shady Grove Rd at I-270 SB off ramp											
31	NB	13.1	B	NB Left	0	0	0	0	A	18.9	B
				NB Through	1004	13	38	359	B		
				NB Right	0	0	0	0	A		
	SB	9.2	A	SB Left	0	0	0	0	A		
				SB Through	1762	9	35	566	A		
				SB Right	0	0	0	0	A		
	EB	45.4	D	EB Left	281	40	40	209	D		
				EB Through	0	0	0	0	A		
				EB Right	576	48	92	388	D		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
32- MD 28 at I-270 SB off ramp											
32	NB			NB U-Turn	0	0	0	0	A	26.2	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	32.3	C	SB Left	391	40	60	236	D		
				SB Through	0	0	0	0	A		
				SB Right	98	2	0	43	A		
	EB	43.4	D	EB Left	0	0	0	0	A		
				EB Through	1165	65	1149	2119	E		
				EB Right	766	10	698	2113	A		
	WB	8.2	A	WB Left	0	0	0	0	A		
				WB Through	2007	8	38	454	A		
				WB Right	0	0	0	0	A		
33- MD 28 at I-270 on and off ramps											
33	NB	36.8	D	NB Left	0	0	61	324	A	21.8	C
				NB Through	218	53	70	333	D		
				NB Right	145	12	70	333	B		
	SB	25.7	C	SB Left	29	59	31	238	E		
				SB Through	0	0	0	0	A		
				SB Right	317	23	31	238	C		
	EB	22.4	C	EB Left	259	44	78	392	D		
				EB Through	837	16	78	392	B		
				EB Right	0	0	0	0	A		
	WB	14.2	B	WB Left	26	14	50	327	B		
				WB Through	969	14	36	290	B		
				WB Right	0	0	0	0	A		
34- MD 189 at Great Falls Rd											
34	NB	37.8	D	NB Left	65	42	15	107	D	11.1	B
				NB Through	8	42	12	107	D		
				NB Right	10	6	13	117	A		
	SB	6.2	A	SB Left	83	44	25	224	D		
				SB Through	8	48	25	224	D		
				SB Right	619	1	0	0	A		
	EB	11.3	B	EB Left	340	17	17	240	B		
				EB Through	971	9	19	227	A		
				EB Right	13	8	28	263	A		
	WB	13.6	B	WB Left	5	14	20	188	B		
				WB Through	328	14	20	188	B		
				WB Right	11	9	32	222	A		
35- MD 189 at I-270 Ramps											
35	NB	45.4	D	NB Left	142	45	25	142	D	41.4	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	50.6	D	SB Left	218	51	70	290	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	24.7	C	EB Left	425	22	96	437	C		
				EB Through	575	27	96	437	C		
				EB Right	0	0	0	0	A		
	WB	58.1	E	WB Left	553	49	135	343	D		
				WB Through	289	75	135	343	E		
				WB Right	0	0	0	0	A		
36- MD 189 at Wootton Pkwy											
36	NB	38.9	D	NB Left	160	53	57	227	D	62.8	E
				NB Through	124	55	57	227	D		
				NB Right	159	12	57	227	B		
	SB	80.1	F	SB Left	486	86	358	798	F		
				SB Through	836	77	327	785	E		
				SB Right	0	0	0	0	A		
	EB	60.8	E	EB Left	168	81	284	961	F		
				EB Through	985	61	284	961	E		
				EB Right	126	32	284	961	C		
	WB	51.3	D	WB Left	416	69	124	322	E		
				WB Through	387	39	124	322	D		
				WB Right	59	6	124	322	A		
37- Montrose Rd at Tower Oaks Blvd											
37	NB			NB Left	0	0	0	0	A	74.2	E
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	180.0	F	SB Left	163	40	910	1387	D		
				SB Through	0	0	0	0	A		
				SB Right	623	217	943	1383	F		
	EB	25.3	C	EB Left	29	40	147	951	D		
				EB Through	1573	25	147	951	C		
				EB Right	0	0	0	0	A		
	WB	71.6	E	WB Left	0	0	0	0	A		
				WB Through	1753	74	359	842	E		
				WB Right	85	24	359	842	C		
38- Tower Oaks Blvd at I-270 off ramp											
38	NB	20.3	C	NB Left	537	21	35	186	C	39.8	D
				NB Through	10	21.6	28	178	C		
				NB Right	28	15.4	35	186	B		
	SB	0.8	A	SB Left	0	37.7	0	23	D		
				SB Through	0	0.0	0	23	A		
				SB Right	4	0.8	0	0	A		
	EB	56.8	E	EB Left	8	39.0	190	426	D		
				EB Through	752	57.3	190	426	E		
				EB Right	110	54.8	182	416	D		
	WB	9.6	A	WB Left	0	0.0	4	73	A		
				WB Through	106	10.0	4	73	B		
				WB Right	8	3.2	0	11	A		
39- Montrose Rd at Tower Oaks Blvd											
39	NB	16.9	B	NB Left	37	80	42	186	E	51.6	D
				NB Through	240	45	42	186	D		
				NB Right	560	0	0	0	A		
	SB	44.2	D	SB Left	334	56	178	627	E		
				SB Through	774	40	177	626	D		
				SB Right	77	33	139	664	C		
	EB	92.7	F	EB Left	76	81	434	727	F		
				EB Through	979	94	437	728	F		
				EB Right	62	91	458	752	F		
	WB	41.7	D	WB Left	404	51	88	293	D		
				WB Through	252	47	88	293	D		
				WB Right	146	8	104	323	A		
40- Rockledge Blvd at I-270 NB on and off ramp											
40	NB	32.6	C	NB Left	0	0	0	0	A	46.2	D
				NB Through	93	34	31	158	C		
				NB Right	215	32	31	158	C		
	SB	2.3	A	SB Left	0	0	6	65	A		
				SB Through	983	2	6	65	A		
				SB Right	0	0	0	0	A		
	EB	88.3	F	EB Left	6	246	1811	2611	F		
				EB Through	585	167	1811	2611	F		
				EB Right	533	1	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table C.15: AM Peak -2040 HSR+VSL+ARM- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS	
41- Rockledge Blvd at I-270 SB on and off ramps												
41	NB	2.9	A	NB Left	99	3	1	36	A	20.4	C	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	21.6	C		WB Left	983	22	96	663			C
					WB Through	431	20	96	663			C
					WB Right	0	0	0	0			A
42- MD 187 at Tuckerman Ln												
42	NB	54.6	D	NB Left	231	22	252	693	C	149.7	F	
				NB Through	1475	50	252	693	D			
				NB Right	218	117	252	693	F			
	SB	218.9	F		SB Left	60	162	2597	2706			F
					SB Through	1242	218	2597	2706			F
					SB Right	165	243	2597	2706			F
	EB	186.3	F		EB Left	220	131	1869	1988			F
					EB Through	633	204	1870	1989			F
					EB Right	130	192	1894	2013			F
	WB	185.1	F		WB Left	731	223	1910	2148			F
					WB Through	398	152	1910	2148			F
					WB Right	158	94	1910	2148			F
43- MD 187 at I-270 NB on and off ramps												
43	NB	11.0	B	NB Left	164	82	59	292	F	19.0	B	
				NB Through	1530	3	59	292	A			
				NB Right	0	0	0	0	A			
	SB	25.1	C		SB Left	0	0	0	0			A
					SB Through	1556	25	85	577			C
					SB Right	0	0	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	49.1	D		WB Left	124	50	38	257			D
					WB Through	10	42	38	257			D
					WB Right	0	0	0	0			A
44- MD 187 at I-270 NB on and off ramps												
44	NB	23.3	C	NB Left	0	0	0	0	A	23.2	C	
				NB Through	1479	23	66	402	C			
				NB Right	0	0	0	0	A			
	SB	7.0	A		SB Left	182	45	53	260			D
					SB Through	1498	2	53	260			A
					SB Right	0	0	0	0			A
	EB	71.1	E		EB Left	217	57	158	667			E
					EB Through	0	0	158	667			A
					EB Right	351	80	183	665			E
	WB				WB Left	0	0	0	0			A
					WB Through	0	0	0	0			A
					WB Right	0	0	0	0			A
45- MD 187 at Rock Spring Dr												
45	NB	14.8	B	NB Left	255	57	68	243	E	20.8	C	
				NB Through	1383	7	69	244	A			
				NB Right	10	6	92	277	A			
	SB	22.1	C		SB Left	13	30	101	636			C
					SB Through	1694	24	101	636			C
					SB Right	147	1	62	619			A
	EB	37.5	D		EB Left	190	60	55	214			E
					EB Through	26	55	55	214			E
					EB Right	251	19	55	214			B
	WB	7.2	A		WB Left	1	7	1	29			A
					WB Through	9	11	1	29			B
					WB Right	5	0	0	7			A
47-Democracy Blvd at I-270 NB off ramp												
47	NB	30.6	C	NB Left	228	31	27	166	C	14.3	B	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB	13.7	B		EB Left	0	0	0	0			A
					EB Through	1642	14	54	492			B
					EB Right	0	0	0	0			A
	WB	10.9	B		WB Left	0	0	0	0			A
					WB Through	778	11	24	191			B
					WB Right	0	0	0	0			A
48- Democracy Blvd at I-270 SB on ramp												
48	NB			NB Left	0	0	0	0	A	6.4	A	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB	5.2	A		EB Left	0	0	0	0			A
					EB Through	1754	5	21	273			A
					EB Right	0	0	0	0			A
	WB	8.4	A		WB Left	222	36	31	173			D
					WB Through	781	1	20	152			A
					WB Right	0	0	0	0			A
49- Democracy Blvd at I-270 SB off ramp												
49	NB			NB Left	0	0	0	0	A	11.8	B	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB	33.7	C		SB Left	318	50	56	214			D
					SB Through	0	0	0	0			A
					SB Right	158	1	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	2.5	A		WB Left	0	0	0	0			A
					WB Through	781	3	4	125			A
					WB Right	334	2	1	158			A
50- MD 190 at Burdette Rd												
50	NB	73.3	E	NB Left	20	80	15	118	E	14.8	B	
				NB Through	4	59	15	118	E			
				NB Right	11	67	15	118	E			
	SB	34.3	C		SB Left	50	78	31	150			E
					SB Through	17	64	31	150			E
					SB Right	120	12	31	150			B
	EB	13.6	B		EB Left	52	101	93	1122			F
					EB Through	1819	11	93	1121			B
					EB Right	15	9	86	1145			A
	WB	12.5	B		WB Left	1	106	63	845			F
					WB Through	1495	13	64	845			B
					WB Right	21	1	57	863			A

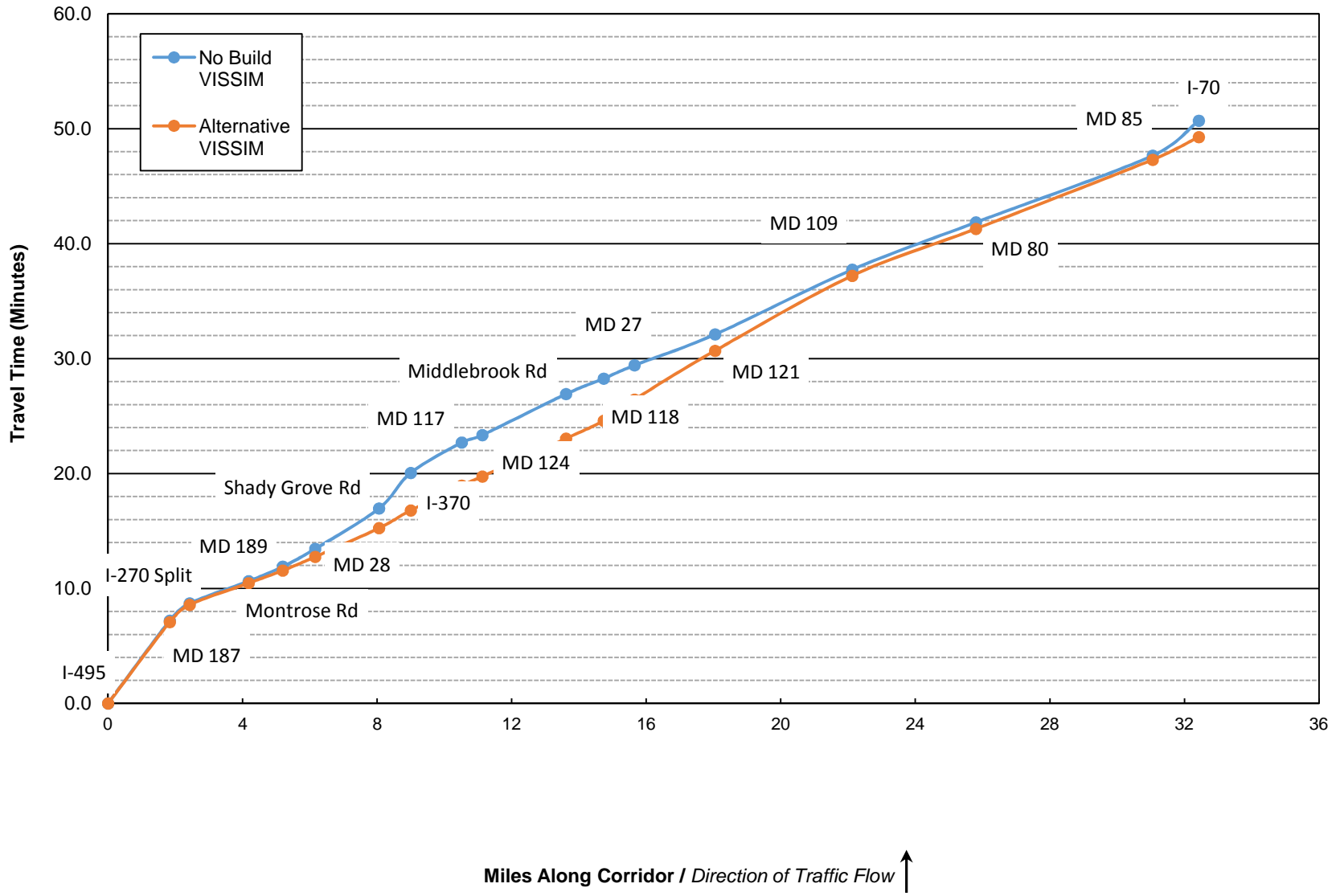
Table C.15: AM Peak -2040 HSR+VSL+ARM- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
51- MD 190 at I-270 NB on ramp											
51	NB			NB Left	0	0	0	0	A	54.4	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	126.6	F	EB Left	525	127	364	704	F		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	16.3	B	WB Left	0	0	0	0	A		
				WB Through	995	16	78	740	B		
				WB Right	0	0	0	0	A		
52- MD 190 at I-270 SB off ramp											
52	NB	78.4	E	NB Left	255	78	746	2601	E	16.2	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	7.5	A	EB Left	0	0	0	0	A		
				EB Through	981	8	27	315	A		
				EB Right	0	0	0	0	A		
	WB	5.2	A	WB Left	0	0	0	0	A		
				WB Through	668	5	7	174	A		
				WB Right	0	0	0	0	A		
53- MD 190 at Seven Locks Rd											
53	NB	68.2	E	NB Left	21	67	23	149	E	43.7	D
				NB Through	59	69	25	148	E		
				NB Right	0	0	0	0	A		
	SB	56.9	E	SB Left	624	56	184	769	E		
				SB Through	183	59	185	770	E		
				SB Right	18	55	184	769	D		
	EB	37.6	D	EB Left	24	30	135	584	C		
				EB Through	846	38	135	584	D		
				EB Right	42	42	135	584	D		
	WB	35.7	D	WB Left	120	101	107	355	F		
				WB Through	636	32	110	357	C		
				WB Right	158	1	4	89	A		
54- MD 124 at I-270 NB off ramp											
54	NB	40.6	D	NB Left	0	0	0	0	A	27.9	C
				NB Through	0	0	0	0	A		
				NB Right	794	41	111	414	D		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	17.2	B	EB Left	0	0	0	0	A		
				EB Through	933	17	39	348	B		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
55- Democracy Blvd at I-270 NB off ramp											
55	NB	37.5	D	NB Left	0	0	0	0	A	16.8	B
				NB Through	0	0	0	0	A		
				NB Right	967	38	122	662	D		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	4.7	A	EB Left	0	0	0	0	A		
				EB Through	1643	5	19	102	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
56- Watkins Mill Rd at I-270 SB off ramp/Parkview Ave											
56	NB	249.9	F	NB Left	76	93	334	576	F	108.8	F
				NB Through	0	0	0	0	A		
				NB Right	131	341	334	576	F		
	SB	56.7	E	SB Left	526	79	222	1337	E		
				SB Through	129	71	222	1337	E		
				SB Right	440	26	222	1337	C		
	EB	215.5	F	EB Left	0	0	0	0	A		
				EB Through	860	216	894	1174	F		
				EB Right	5	182	894	1174	F		
	WB	44.4	D	WB Left	131	89	141	480	F		
				WB Through	871	38	138	479	D		
				WB Right	0	0	0	0	A		
57- Watkins Mill Rd at I-270 NB on ramp											
57	NB	34.0	C	NB Left	419	45	102	398	D	62.4	E
				NB Through	0	0	0	0	A		
				NB Right	517	26	102	398	C		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	25.2	C	EB Left	316	72	87	344	E		
				EB Through	868	8	87	344	A		
				EB Right	0	0	0	0	A		
	WB	115.6	F	WB Left	0	0	0	0	A		
				WB Through	1126	123	589	857	F		
				WB Right	202	77	589	857	E		
58- Watkins Mill Rd at I-270 SB on ramp											
58	NB			NB Left	0	0	0	0	A	30.9	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	45.3	D	EB Left	0	0	0	0	A		
				EB Through	330	136	354	609	F		
				EB Right	1176	20	354	609	B		
	WB	16.7	B	WB Left	1000	3	91	488	A		
				WB Through	537	43	91	488	D		
				WB Right	0	0	0	0	A		

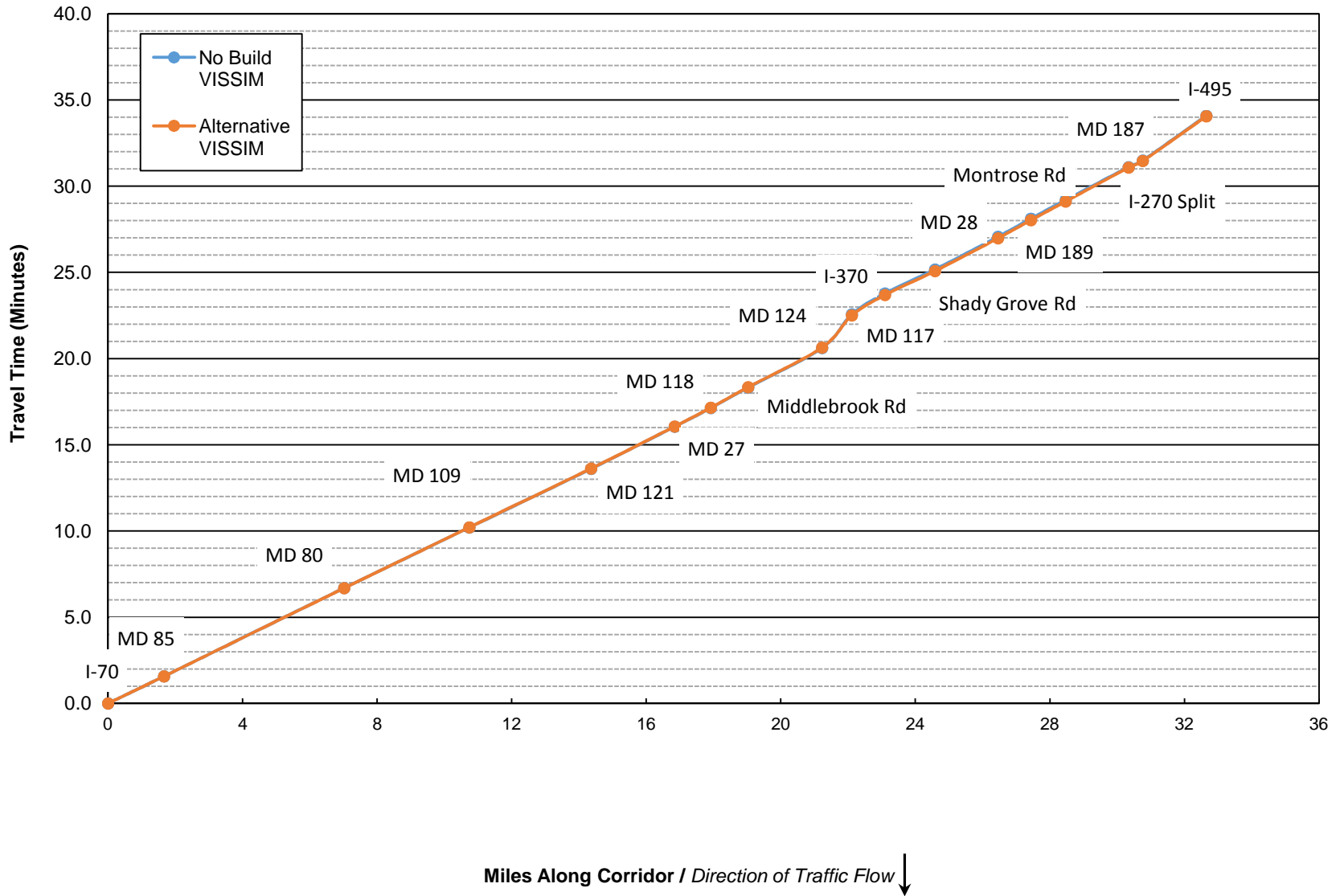
Table C.16: AM Peak -2040 HSR+VSL+ARM- I-270 Vehicle Network Performance

	No Build	HSR+VSL+ARM- Alternative	% Change
Total Delay	35,032,576	19,376,211	-45%
Average Delay per Vehicle	326	180	-45%
Total Travel Time	64,317,886	52,679,474	-18%
Vehicles (Arrived)	87,894	92,848	6%
Latent Demand	44,530	44,511	0%
Latent Delay	120,600,723	125,623,611	4%
Total Distance	463,125	490,310	6%
Average Speed	26	34	29%

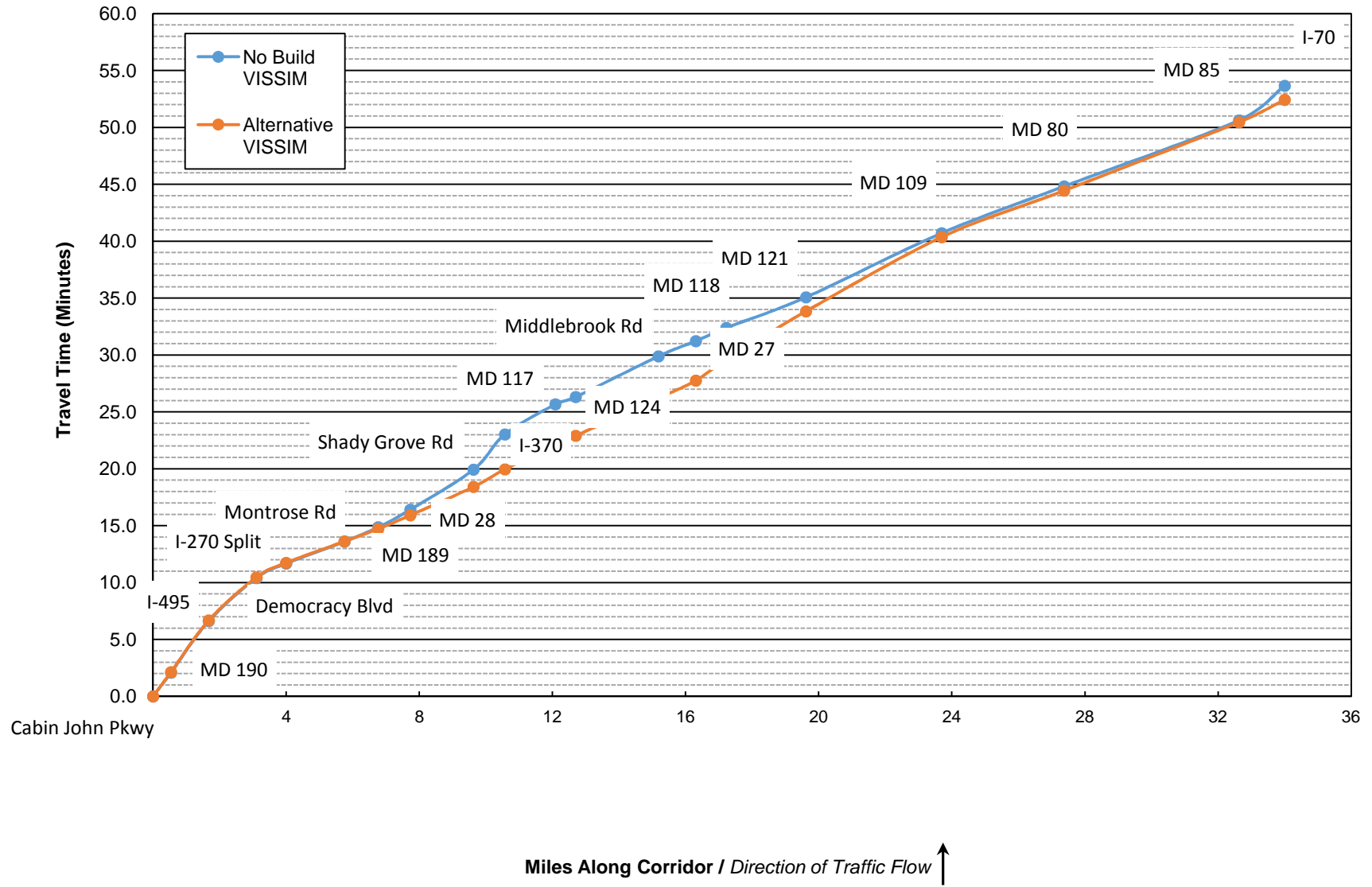
**Figure D.1: PM Peak - 2040 HSR + VSL + ARM
I-270 Travel Time Graph - Northbound**



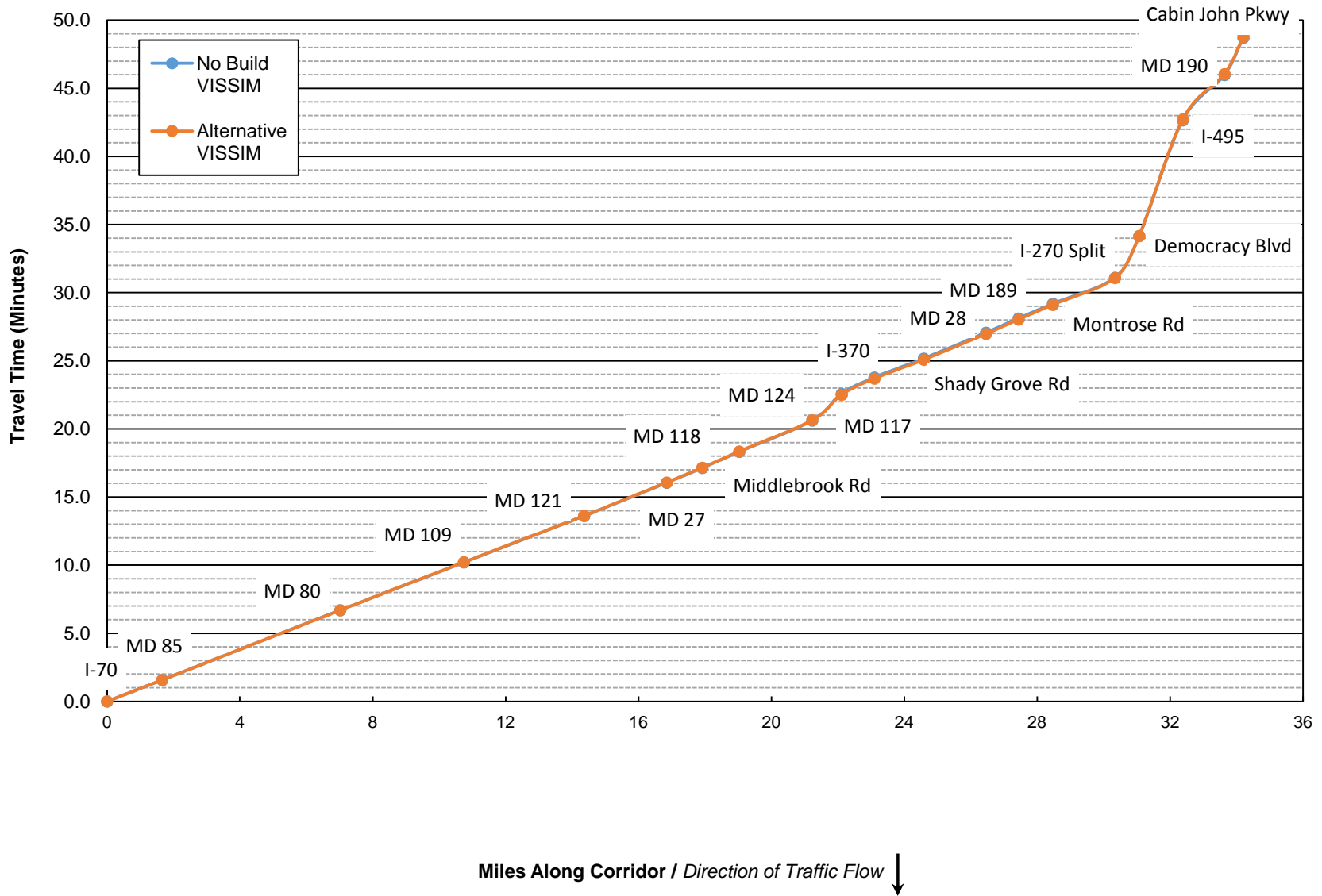
**Figure D.2: PM Peak - 2040 HSR + VSL + ARM
I-270 Travel Time Graph - Southbound**



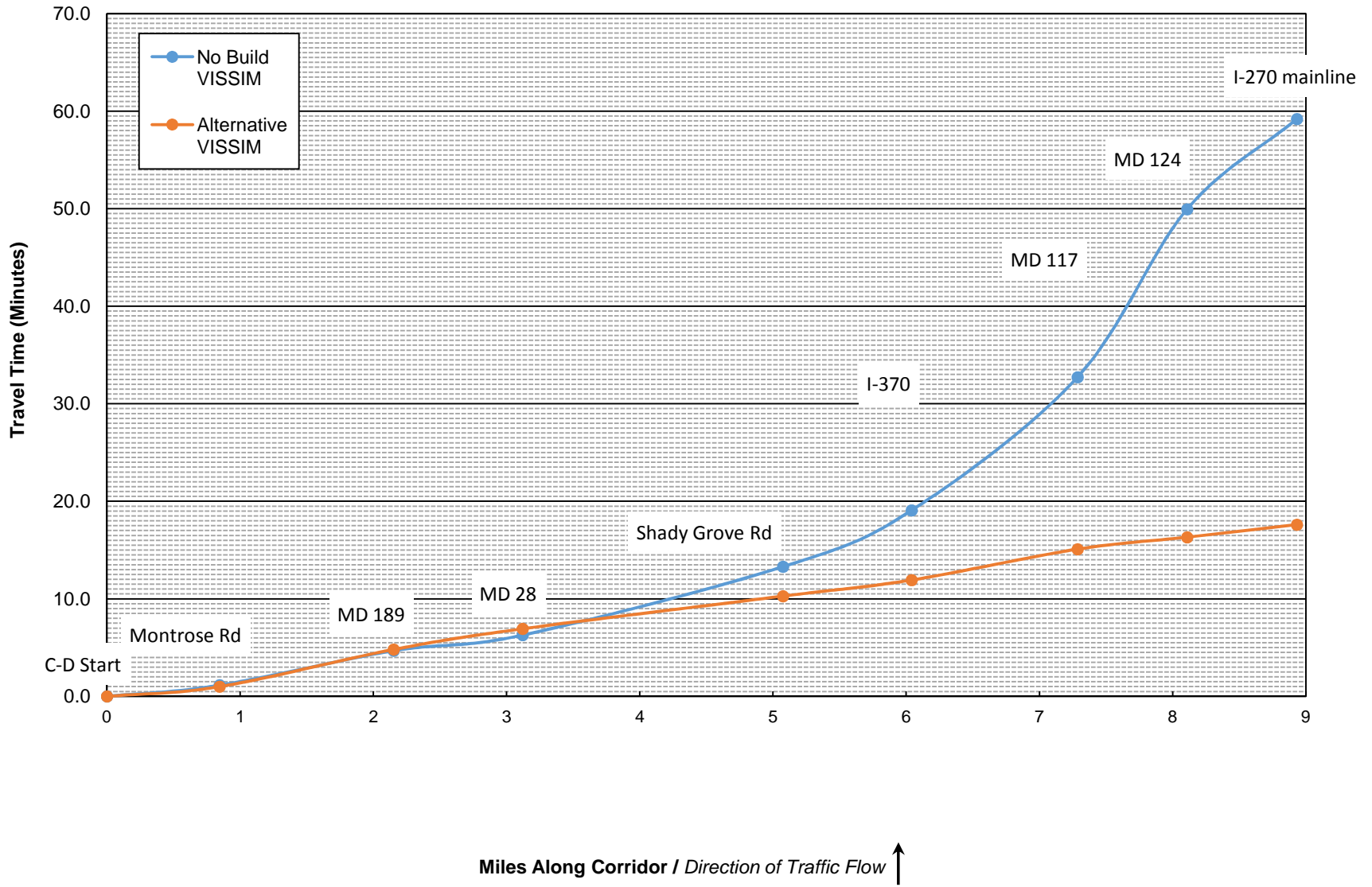
**Figure D.3: PM Peak - 2040 HSR + VSL + ARM
I-270 Spur Travel Time Graph - Northbound**



**Figure D.4: PM Peak - 2040 HSR + VSL + ARM
I-270 Spur Travel Time Graph - Southbound**



**Figure D.5: PM Peak -2040 HSR + VSL + ARM
I-270 Local Travel Time Graph - Northbound**



**Figure D.6: PM Peak - 2040 HSR + VSL + ARM
I-270 Local Travel Time Graph - Southbound**

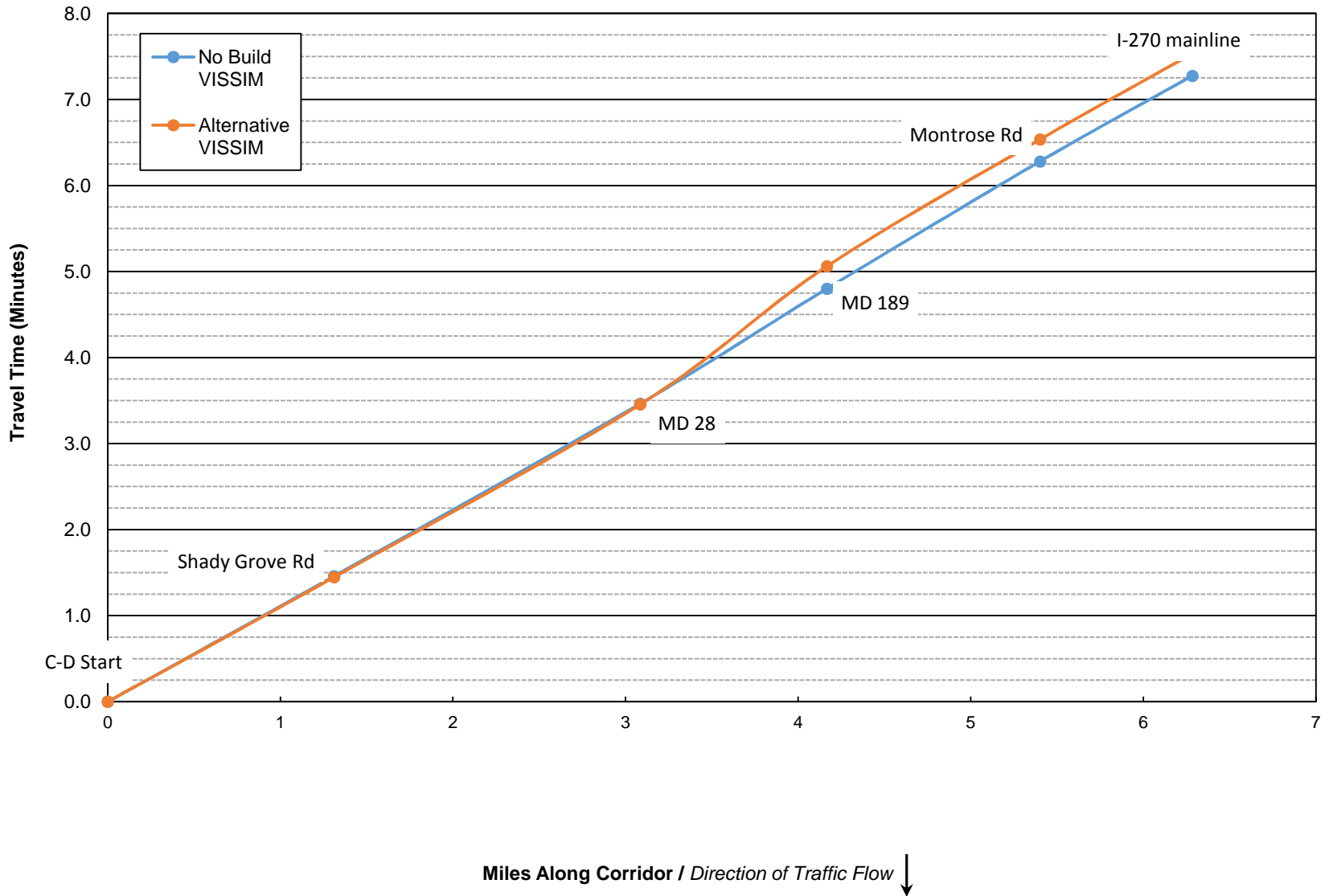


Table D.1: PM Peak 2040 HSR + VSL + ARM - I-270 Vehicle Travel Time

I-270 Northbound	Segment Length (miles)	No Build VISSIM Travel Time (seconds)	HSR+VSL+ ARM VISSIM Travel Time (seconds)	% Change	I-270 Southbound	Segment Length (miles)	No Build VISSIM Travel Time (seconds)	HSR+VSL+ ARM VISSIM Travel Time (seconds)	% Change
From I-495 interchange					From I-70				
to MD 187	1.8	432.3	424.6	-1.8%	to MD 85	1.7	94.6	94.6	0.0%
to I-270 Split	0.6	90.3	90.1	-0.2%	to MD 80	5.4	307.1	306.9	0.0%
to Montrose Rd	1.8	115.8	113.2	-2.2%	to MD 109	3.7	210.7	211.3	-0.3%
to MD 189	1.0	76.0	65.8	-13.4%	to MD 121	3.6	204.4	204.7	-0.2%
to MD 28	1.0	92.5	71.7	-22.5%	to MD 27	2.5	146.4	146.4	0.0%
to Shady Grove Rd	1.9	211.0	149.8	-29.0%	to MD 118	1.1	65.1	65.4	-0.4%
to I-370	0.9	185.6	92.2	-50.3%	to Middlebrook Rd	1.1	71.2	71.3	-0.2%
to MD 117	1.5	158.7	129.6	-18.3%	to MD 124	2.2	137.5	137.9	-0.2%
to MD 124	0.6	38.8	47.4	22.3%	to MD 117	0.9	117.3	111.9	4.7%
to Middlebrook Rd	2.5	214.3	198.1	-7.6%	to I-370	1.0	72.5	71.1	1.9%
to MD 118	1.1	80.3	93.2	15.9%	to Shady Grove Rd	1.5	83.4	83.1	0.3%
to MD 27	0.9	69.9	110.2	57.6%	to MD 28	1.9	114.1	114.1	-0.1%
to MD 121	2.4	161.1	254.8	58.1%	to MD 189	1.0	62.7	63.0	-0.6%
to MD 109	4.1	337.8	391.4	15.9%	to Montrose Rd	1.0	64.8	65.0	-0.3%
to MD 80	3.7	247.0	245.1	-0.7%	to I-270 Split	1.9	114.7	118.1	-2.9%
to MD 85	5.3	348.1	360.6	3.6%	to MD 187	0.4	23.0	23.1	-0.1%
to I-70	1.4	182.3	118.5	-35.0%	to I-495 interchange	1.9	155.6	155.6	0.0%
I-270 Total (miles/minutes)	32.4	50.7	49.3	-2.8%	I-270 Total (miles/minutes)	32.6	34.1	34.1	0.1%
I-270 Spur Northbound					I-270 Spur Southbound				
From Cabin John Pkwy					From I-70				
to MD 190	0.5	125.4	128.0	2.0%	to I-270 Split	30.3	1,866.3	1,864.9	-0.1%
to I-495	1.1	271.9	272.9	0.4%	to Democracy Blvd	0.7	183.2	185.4	1.2%
to Democracy Blvd	1.4	226.8	227.0	0.1%	to I-495	1.3	509.9	513.3	0.7%
to I-270 Split	0.9	76.4	76.4	0.0%	to MD 190	1.3	199.4	199.3	0.0%
to I-70	30.0	2,519.1	2,441.6	-3.1%	to Cabin John Pkwy	0.6	164.4	163.6	-0.5%
I-270 Spur Total (miles/minutes)	34.0	53.7	52.4	-2.3%	I-270 Spur Total (miles/minutes)	34.2	48.7	48.8	0.1%

Table D.2: PM Peak - 2040 HSR + VSL + ARM - I-270 Local Vehicle Travel Time

I-270 Northbound	Segment Length (miles)	No Build VISSIM Travel Time (seconds)	HSR+VSL+ ARM VISSIM Travel Time (seconds)	% Change	I-270 Southbound	Segment Length (miles)	No Build VISSIM Travel Time (seconds)	HSR+VSL+ ARM VISSIM Travel Time (seconds)	% Change
From C-D start					From C-D start				
to Montrose Rd	0.8	68.8	60.0	-12.8%	to Shady Grove	1.3	87.5	86.8	-0.8%
to MD 189	1.3	212.1	228.4	7.7%	to MD 28	1.8	120.3	120.5	0.2%
to MD 28	1.0	96.2	127.2	32.3%	to MD 189	1.1	80.2	96.3	20.1%
to Shady Grove	2.0	420.6	200.7	-52.3%	to Montrose	1.2	88.8	88.5	-0.3%
to I-370	1.0	346.7	99.1	-71.4%	to I-270 mainline	0.9	59.7	59.8	0.2%
to MD 117	1.2	819.0	189.6	-76.8%					
to MD 124	0.8	1,033.2	73.6	-92.9%					
to I-270 mainline	0.8	555.0	77.5	-86.0%					
I-270 Local Total (miles/minutes)	8.9	59.2	17.6	-70.3%	I-270 Local Total (miles/minutes)	6.3	7.3	7.5	3.6%

Table D.3: PM Peak - 2040 HSR + VSL + ARM - I-270 Vehicle Speed

I-270 Northbound	Segment Length (miles)	No Build VISSIM Speed (MPH)	HSR+VSL+ ARM VISSIM Speed (MPH)	% Change	I-270 Southbound	Segment Length (miles)	No Build VISSIM Speed (MPH)	HSR+VSL+ ARM VISSIM Speed (MPH)	% Change
From I-495 interchange					From I-70				
to MD 187	1.8	15.3	15.5	1.8%	to MD 85	1.7	63.3	63.3	0.0%
to I-270 Split	0.6	23.6	23.6	0.2%	to MD 80	5.4	62.8	62.8	0.0%
to Montrose Rd	1.8	54.5	55.7	2.3%	to MD 109	3.7	63.6	63.4	-0.3%
to MD 189	1.0	48.0	55.4	15.5%	to MD 121	3.6	63.8	63.7	-0.2%
to MD 28	1.0	37.5	48.4	29.0%	to MD 27	2.5	61.1	61.1	0.0%
to Shady Grove Rd	1.9	32.4	45.6	40.9%	to MD 118	1.1	59.3	59.1	-0.4%
to I-370	0.9	18.3	36.8	101.2%	to Middlebrook Rd	1.1	56.2	56.1	-0.2%
to MD 117	1.5	34.4	42.1	22.4%	to MD 124	2.2	57.5	57.4	-0.2%
to MD 124	0.6	56.9	46.5	-18.2%	to MD 117	0.9	27.2	28.5	4.9%
to Middlebrook Rd	2.5	41.8	45.2	8.2%	to I-370	1.0	48.9	49.9	2.0%
to MD 118	1.1	50.2	43.3	-13.8%	to Shady Grove Rd	1.5	64.2	64.4	0.3%
to MD 27	0.9	47.2	29.9	-36.6%	to MD 28	1.9	59.1	59.1	-0.1%
to MD 121	2.4	53.5	33.8	-36.7%	to MD 189	1.0	56.2	55.8	-0.6%
to MD 109	4.1	43.5	37.5	-13.7%	to Montrose Rd	1.0	57.4	57.2	-0.3%
to MD 80	3.7	53.6	54.0	0.7%	to I-270 Split	1.9	58.7	57.1	-2.9%
to MD 85	5.3	54.3	52.5	-3.5%	to MD 187	0.4	65.7	65.6	-0.1%
to I-70	1.4	27.1	41.7	53.9%	to I-495 interchange	1.9	43.7	43.7	0.0%
I-270 Total (miles/minutes)	32.4	38.4	39.5	2.9%	I-270 Total (miles/minutes)	32.6	57.5	57.5	0.1%
I-270 Spur Northbound					I-270 Spur Southbound				
From Cabin John Pkwy					From I-70				
to MD 190	0.5	15.5	15.2	-2.0%	to I-270 Split	30.3	58.5	58.6	0.1%
to I-495	1.1	15.0	14.9	-0.4%	to Democracy Blvd	0.7	14.4	14.2	-1.2%
to Democracy Blvd	1.4	22.8	22.7	-0.1%	to I-495	1.3	9.3	9.2	-0.7%
to I-270 Split	0.9	42.0	42.0	0.0%	to MD 190	1.3	22.6	22.7	0.0%
to I-70	30.0	42.9	44.2	3.2%	to Cabin John Pkwy	0.6	12.5	12.5	0.5%
I-270 Spur Total (miles/minutes)	34.0	38.0	38.9	2.3%	I-270 Spur Total (miles/minutes)	34.2	42.1	42.1	-0.1%

Table D.4: PM Peak -2040 HSR + VSL + ARM - I-270 Local Vehicle Speed

I-270 Northbound	No Build VISSIM Speed (MPH)	HSR+VSL+ ARM VISSIM Speed (MPH)	% Change	I-270 Southbound	No Build VISSIM Speed (MPH)	HSR+VSL+ ARM VISSIM Speed (MPH)	% Change
From C-D start				From C-D start			
to Montrose Rd	44.2	50.7	14.7%	to Shady Grove	53.9	54.3	0.8%
to MD 189	22.2	20.6	-7.1%	to MD 28	53.1	53.0	-0.2%
to MD 28	36.2	27.4	-24.4%	to MD 189	48.6	40.4	-16.8%
to Shady Grove	16.7	35.1	109.6%	to Montrose	50.1	50.2	0.3%
to I-370	10.0	35.1	249.9%	to I-270 mainline	53.2	53.1	-0.2%
to MD 117	5.5	23.7	331.9%				
to MD 124	2.9	40.2	1303.8%				
to I-270 mainline	5.3	38.3	615.9%				
I-270 Local Total (miles/minutes)	9.1	30.5	236.3%	I-270 Local Total (miles/minutes)	51.8	50.0	-3.4%

Table D.5: PM Peak -2040 HSR + VSL + ARM- I-270 Vehicle Density

I-270 Northbound	Type	No Build		HSR+VSL+ARM		% Change	I-270 Southbound	Type	No Build		HSR+VSL+ARM		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS	
I-270	Freeway	91	F	89	F	-2%	I-270	Freeway	19	C	19	C	0%
I-270 Diverge to MD 187	Diverge	77	F	76	F	0%	I-270 Merge from WB I-70	Merge	17	B	17	B	0%
I-270	Freeway	84	F	84	F	0%	I-270	Freeway	24	C	24	C	0%
I-270 Diverge to Rockledge Rd	Diverge	77	F	78	F	1%	I-270 Merge from EB I-70	Merge	16	B	16	B	0%
I-270	Freeway	85	F	85	F	0%	I-270	Freeway	22	C	22	C	0%
I-270 Weave from MD 187 to I-270 HOV	Weave	57	F	57	F	1%	I-270 Diverge to SB MD 85	Diverge	23	C	23	C	0%
I-270 Lane Drop	Merge	65	F	64	F	0%	I-270	Freeway	24	C	24	C	0%
I-270	Freeway	51	F	51	F	1%	I-270 Diverge to NB MD 85	Diverge	15	B	14	B	0%
I-270 Merge from I-270 Spur	Merge	37	E	37	E	0%	I-270	Freeway	19	C	19	C	0%
I-270 Weave from I-270 HOV to I-270 C-D	Weave	34	D	33	D	-3%	I-270 Merge from MD 85	Merge	20	C	21	C	2%
I-270	Freeway	34	D	32	D	-7%	I-270	Freeway	25	C	25	C	0%
I-270 Diverge to C-D (MD 189)	Diverge	46	F	37	E	-20%	I-270 Diverge to MD 80	Diverge	17	B	17	B	1%
I-270	Freeway	46	F	32	D	-31%	I-270	Freeway	20	C	20	C	1%
I-270 Diverge to C-D (MD 28)	Diverge	62	F	38	E	-38%	I-270 Merge from MD 80	Merge	14	B	14	B	0%
I-270	Freeway	55	F	31	D	-43%	I-270	Freeway	23	C	23	C	0%
I-270 Merge from C-D (MD 189)	Merge	72	F	46	F	-36%	I-270 Diverge to MD 109	Diverge	12	B	12	B	1%
I-270 Diverge to C-D (Shady Grove Rd)	Diverge	77	F	48	F	-37%	I-270	Freeway	22	C	22	C	1%
I-270	Freeway	65	F	35	E	-46%	I-270 Merge from MD 109	Merge	13	B	14	B	2%
I-270 Weave from C-D (MD 28) to C-D (Shady Grove Rd)	Weave	90	F	41	F	-54%	I-270	Freeway	24	C	24	C	0%
I-270	Freeway	90	F	37	E	-59%	I-270 Diverge to SB Weigh Station	Diverge	12	B	12	B	1%
I-270 Merge from C-D (Shady Grove Rd)	Merge	124	F	44	F	-64%	I-270	Freeway	24	C	24	C	0%
I-270	Freeway	88	F	47	F	-46%	I-270 Merge from SB Weigh Station	Merge	12	B	12	B	1%
I-270 Merge from C-D (I-370)	Merge	155	F	50	F	-68%	I-270	Freeway	23	C	23	C	0%
I-270 Diverge to C-D (MD 117)	Diverge	159	F	61	F	-62%	I-270 Diverge to MD 121	Diverge	9	A	9	A	0%
I-270	Freeway	21	C	31	D	45%	I-270	Freeway	12	B	12	B	0%
I-270 Merge from C-D (MD 124)	Merge	47	F	33	D	-29%	I-270 Merge from WB MD 121	Merge	10	B	10	B	0%
I-270	Freeway	27	D	37	E	36%	I-270	Freeway	15	B	15	B	0%
I-270 Diverge to EB Middlebrook Rd	Diverge	20	B	30	D	52%	I-270 Merge from EB MD 121	Merge	13	B	13	B	0%
I-270	Freeway	25	C	35	E	42%	I-270	Freeway	20	C	20	C	0%
I-270 Diverge to WB Middlebrook Rd	Diverge	20	C	30	D	48%	I-270 Diverge to MD 27	Diverge	13	B	13	B	0%
I-270	Freeway	22	C	29	D	35%	I-270	Freeway	16	B	17	B	0%
I-270 Diverge to EB MD 118	Diverge	17	B	27	C	53%	I-270 Merge from WB MD 27	Merge	14	B	14	B	1%
I-270 Diverge to WB MD 118	Diverge	31	D	33	D	8%	I-270	Freeway	20	C	20	C	0%
I-270	Freeway	27	D	31	D	14%	I-270 Weave from EB MD 27 to MD 118	Weave	15	B	15	B	0%
I-270 Weave from MD 118 to MD 27	Weave	36	E	40	E	10%	I-270	Freeway	19	C	19	C	0%
I-270	Freeway	25	C	32	D	28%	I-270 Merge from WB MD 118	Merge	15	B	15	B	-1%
I-270 Merge from EB MD 27	Merge	36	E	40	E	10%	I-270	Freeway	22	C	22	C	0%
I-270	Freeway	26	C	78	F	207%	I-270 Merge from EB MD 118	Merge	18	B	19	B	2%
I-270 Merge from WB MD 27	Merge	22	C	38	E	76%	I-270	Freeway	28	D	28	D	0%
I-270	Freeway	28	D	50	F	78%	I-270 Merge from Middlebrook Rd	Merge	30	D	30	D	0%
I-270 Diverge to MD 121	Diverge	22	C	48	F	119%	I-270 Diverge to Watkins Mill Rd	Diverge	24	C	24	C	1%

Table D.5: PM Peak -2040 HSR + VSL + ARM- I-270 Vehicle Density

I-270 Northbound	Type	No Build		HSR+VSL+ARM		% Change	I-270 Southbound	Type	No Build		HSR+VSL+ARM		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS			
I-270	Freeway	22	C	56	F	152%	I-270	Freeway	19	C	19	C	0%
I-270 Merge from EB MD 121	Merge	35	E	87	F	146%	I-270 Diverge to MD 124	Diverge	17	B	17	B	-1%
I-270 Lane Drop	Merge	78	F	113	F	44%	I-270	Freeway	14	B	14	B	0%
I-270	Freeway	37	E	44	E	18%	I-270 Merge from Watkins Mill	Merge	17	B	17	B	-1%
I-270 Diverge to NB Weigh Station	Diverge	18	B	19	B	3%	I-270	Freeway	58	F	56	F	-3%
I-270	Freeway	36	E	37	E	3%	I-270 Merge from WB MD 124	Merge	96	F	91	F	-5%
I-270 Merge from NB Weight Station	Merge	18	B	19	B	4%	I-270	Freeway	0	A	0	A	#DIV/0!
I-270	Freeway	38	E	39	E	3%	I-270 Merge from MD 117	Merge	39	E	39	E	-1%
I-270 Diverge to MD 109	Diverge	22	C	22	C	2%	I-270	Freeway	28	D	28	D	2%
I-270	Freeway	34	D	34	D	2%	I-270 Diverge to I-370	Diverge	22	C	22	C	0%
I-270 Merge from MD 109	Merge	19	B	20	B	7%	I-270	Freeway	18	B	18	B	0%
I-270	Freeway	36	E	36	E	0%	I-270 Diverge to I-270 C-D	Diverge	14	B	14	B	-1%
I-270 Diverge to MD 80	Diverge	27	C	26	C	-4%	I-270	Freeway	14	B	14	B	0%
I-270	Freeway	30	D	30	D	-1%	I-270 Merge from I-270 (I-370)	Merge	21	C	20	C	-1%
I-270 Merge from MD 80	Merge	18	B	18	B	1%	I-270 Diverge to I-270 C-D (Shady Grove Rd)	Diverge	23	C	23	C	0%
I-270	Freeway	36	E	36	E	0%	I-270	Freeway	19	C	19	C	0%
I-270 Diverge to Scenic View	Diverge	19	B	18	B	-1%	I-270 Merge from I-270 C-D (Shady Grove Rd Northern)	Merge	18	B	19	B	4%
I-270	Freeway	36	E	36	E	-1%	I-270	Freeway	23	C	24	C	3%
I-270 Merge from Scenic View	Merge	18	B	18	B	-1%	I-270 Merge from I-270 C-D (Shady Grove Rd Southern)	Merge	18	B	19	B	4%
I-270	Freeway	36	E	37	E	2%	I-270 Diverge to I-270 C-D (MD 189)	Diverge	25	C	26	C	4%
I-270 Diverge to NB MD 85	Diverge	20	C	24	C	18%	I-270	Freeway	21	C	22	C	3%
I-270	Freeway	34	D	41	E	18%	I-270 Merge from I-270 C-D (MD 189)	Merge	20	C	21	C	2%
I-270 Diverge to SB MD 85	Diverge	20	C	21	C	5%	I-270	Freeway	26	C	26	D	2%
I-270	Freeway	30	D	36	E	21%	I-270 Merge from I-270 C-D	Merge	25	C	30	D	19%
I-270 Weave from MD 85 to I-70	Weave	22	C	25	C	13%	I-270 Diverge to I-270 HOV Lane	Diverge	17	B	19	B	7%
I-270	Freeway	64	F	34	D	-48%	I-270 Diverge to I-270 Spur	Diverge	38	E	41	F	8%
							I-270	Freeway	13	B	13	B	1%
							I-270 Diverge to Rockledge Dr / MD 187	Diverge	9	A	9	A	-3%
							I-270	Freeway	13	B	13	B	1%
							I-270 Merge from Rockledge Dr	Merge	11	B	11	B	1%
							I-270	Freeway	16	B	16	B	1%
							I-270 Merge from Rockledge Dr / MD 187	Merge	14	B	14	B	0%
							I-270	Freeway	35	E	35	E	0%

Table D.6: PM Peak -2040 HSR + VSL + ARM- I-270 Spur Vehicle Density

I-270 Spur Northbound	Type	No Build		HSR+VSL+ARM		% Change	I-270 Southbound	Type	No Build		HSR+VSL+ARM		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS			
I-270 Spur	Freeway	62	F	63	F	2%	I-270 Spur	Freeway	72	F	73	F	1%
I-270 Spur Merge from Clara Barton Parkway	Merge	64	F	64	F	0%	I-270 Spur Weave from I-270 HOV to Democracy Blvd	Weave	94	F	93	F	-1%
I-270 Spur	Freeway	78	F	79	F	1%	I-270 Spur	Freeway	108	F	109	F	1%
I-270 Diverge to MD 190	Diverge	49	F	49	F	-1%	I-270 Merge from Democracy Blvd	Merge	152	F	153	F	0%
I-270 Spur	Freeway	89	F	90	F	1%	I-270 Spur Lane Drop	Merge	144	F	144	F	0%
I-270 Spur Merge from Cabin John Parkway	Merge	105	F	106	F	0%	I-270 Spur	Freeway	125	F	126	F	1%
I-270 Spur Merge from MD 190	Merge	97	F	97	F	0%	I-270 Spur Merge from I-495	Merge	124	F	125	F	0%
I-270 Spur	Freeway	84	F	84	F	0%	I-270 Spur	Freeway	49	F	49	F	0%
I-270 Spur Diverge to I-495	Merge	66	F	64	F	-3%	I-270 Spur Diverve to EB MD 190	Diverge	50	F	49	F	-1%
I-270 Spur	Freeway	45	F	46	F	1%	I-270 Spur Diverve to Cabin John Pkwy	Diverge	67	F	67	F	0%
I-270 Spur Diverge to Democracy Blvd	Diverge	50	F	49	F	-2%	I-270 Spur	Freeway	95	F	95	F	-1%
I-270 Spur	Freeway	58	F	59	F	1%	I-270 Merge from MD 190	Merge	120	F	114	F	-5%
I-270 Spur Merge from EB Democracy Blvd	Merge	97	F	100	F	3%	I-270 Spur	Freeway	93	F	94	F	0%
I-270 Spur	Freeway	58	F	58	F	0%	I-270 Diverge to WB Clara Barton Pkwy	Diverge	60	F	60	F	0%
I-270 Spur Merge from WB Democracy Blvd	Merge	65	F	65	F	0%	I-270 Spur	Freeway	83	F	83	F	0%
I-270 Spur	Freeway	39	E	38	E	-1%	I-270 Merge from Clara Barton Pkwy	Merge	77	F	76	F	0%
I-270 Spur Merge from Westlake Terrace	Merge	31	D	31	D	0%							
I-270 Spur	Freeway	34	D	34	D	0%							

Table D.7: PM Peak -2040 HSR + VSL + ARM- I-270 Local Vehicle Density

I-270 Northbound	Type	No Build		HSR+VSL+ARM		% Change	I-270 Southbound	Type	No Build		HSR+VSL+ARM		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS	
I-270 C-D	Freeway	29	D	29	D	0%	I-270 C-D	Freeway	8	A	9	A	1%
I-270 C-D Diverge to EB Montrose Rd	Diverge	21	C	21	C	-1%	I-270 C-D Weave from I-370 EB to I-270	Weave	23	B	24	B	1%
I-270 C-D	Freeway	16	B	16	B	-2%	I-270 C-D Diverge to Shady Grove Rd	Diverge	11	B	11	B	0%
I-270 C-D Weave between Montrose Rd Loop Ramps	Weave	13	B	12	A	-9%	I-270 C-D	Freeway	8	A	8	A	1%
I-270 C-D	Freeway	28	D	20	C	-31%	I-270 C-D Merge from WB Shady Grove Rd	Merge	8	A	10	B	21%
I-270 C-D Merge from WB Montrose Rd	Merge	83	F	65	F	-21%	I-270 C-D	Freeway	14	B	16	B	14%
I-270 C-D	Freeway	67	F	75	F	13%	I-270 C-D Merge from EB Shady Grove Rd	Merge	10	A	12	B	19%
I-270 C-D Merge from I-270	Merge	42	F	69	F	62%	I-270 C-D	Freeway	19	C	22	C	17%
I-270 C-D	Freeway	65	F	67	F	3%	I-270 C-D Merge from I-270	Merge	18	B	21	C	17%
I-270 C-D Diverge to MD 189	Diverge	43	F	36	E	-16%	I-270 C-D Diverge to I-270	Diverge	25	C	29	D	13%
I-270 C-D	Freeway	91	F	63	F	-30%	I-270 C-D Diverge to I-270	Diverge	17	B	19	B	11%
I-270 C-D Merge from MD 189	Merge	112	F	56	F	-50%	I-270 C-D	Freeway	16	B	18	B	10%
I-270 C-D	Freeway	62	F	69	F	12%	I-270 C-D Diverge to MD 28	Diverge	11	B	12	B	12%
I-270 C-D Weave between I-270 (to MD 28 from MD 189)	Weave	63	F	56	F	-12%	I-270 C-D	Freeway	11	A	12	B	10%
I-270 C-D	Freeway	42	E	62	F	47%	I-270 C-D Merge from WB MD 28	Merge	12	B	14	B	10%
I-270 C-D Diverge to MD 28	Diverge	18	B	27	C	50%	I-270 C-D	Freeway	14	B	15	B	8%
I-270 C-D	Freeway	28	D	45	F	60%	I-270 C-D Merge from EB MD 28	Merge	26	C	38	E	48%
I-270 C-D Weave between MD 28 Ramps	Weave	28	C	30	C	8%	I-270 C-D	Freeway	32	D	49	F	53%
I-270 C-D	Freeway	26	D	28	D	7%	I-270 C-D Merge from I-270	Merge	20	B	30	D	54%
I-270 C-D Merge from MD 28 WB	Merge	28	C	18	B	-33%	I-270 C-D	Freeway	44	E	47	F	7%
I-270 C-D Merge from I-270 and Drop Lane	Merge	34	D	27	C	-20%	I-270 C-D Diverge to MD 189	Diverge	25	C	26	C	3%
I-270 C-D Diverge to I-270	Diverge	61	F	35	E	-43%	I-270 C-D	Freeway	27	D	28	D	2%
I-270 C-D	Freeway	48	F	31	D	-35%	I-270 C-D Merge from MD 189	Merge	27	C	26	C	-2%
I-270 C-D Diverge to Shady Grove Rd	Diverge	14	B	19	B	39%	I-270 C-D Diverge to I-270	Diverge	34	D	34	D	0%
I-270 C-D	Freeway	130	F	22	C	-83%	I-270 C-D	Freeway	24	C	24	C	-1%
I-270 C- D Merge from I-270 and EB Shady Grove Rd	Merge	140	F	22	C	-84%	I-270 C-D Diverge to WB Montrose Rd	Diverge	18	B	17	B	-3%
I-270 C-D	Freeway	144	F	23	C	-84%	I-270 C-D	Freeway	23	C	22	C	-5%
I-270 C-D Merge from WB Shady Grove Rd	Merge	146	F	26	C	-83%	I-270 Weave between Montrose Rd Loops	Weave	41	F	40	F	-2%
I-270 C-D Diverge to I-270	Diverge	113	F	37	E	-67%	I-270 C-D	Freeway	15	B	15	B	3%
I-270 C-D	Freeway	94	F	38	E	-60%	I-270 C-D Merge from EB Montrose Rd	Merge	9	A	9	A	1%
I-270 C-D Diverge to I-370	Diverge	64	F	47	F	-27%	I-270 C-D	Freeway	18	B	18	B	2%
I-270 C-D	Freeway	120	F	14	B	-89%							
I-270 Merge from I-370 EB	Merge	129	F	21	C	-84%							
I-270 C-D	Freeway	139	F	21	C	-85%							
I-270 C-D Weave from I-370 to I-270	Weave	134	F	25	C	-81%							
I-270 C-D	Freeway	110	F	55	F	-50%							
I-270 C-D Weave from I-270 to MD 117	Weave	114	F	75	F	-34%							
I-270 C-D Diverge to MD 124	Diverge	142	F	31	D	-78%							
I-270 C-D	Freeway	178	F	27	D	-85%							
I-270 C-D Merge from EB MD 124	Merge	168	F	24	C	-86%							
I-270 C-D Merge From WB MD 124	Merge	154	F	21	C	-86%							
I-270 C-D	Freeway	144	F	39	E	-73%							

Table D.7: PM Peak -2040 HSR + VSL + ARM- I-270 Local Vehicle Density

I-270 Northbound	Type	No Build		HSR+VSL+ARM		% Change	I-270 Souhbound	Type	No Build		HSR+VSL+ARM		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS	
I-270 C-D Merge from Watkins Mill	Merge	133	F	35	D	-74%							

Table D.8: PM Peak -2040 HSR + VSL + ARM- I-270 Vehicle Throughput

I-270 Northbound	No Build VISSIM Throughput	HSR+VSL+ ARM VISSIM Throughput	% Change	I-270 Southbound	No Build VISSIM Throughput	HSR+VSL+ ARM VISSIM Throughput	% Change
Between I-495 and MD 187	4113	4151	1%	North of I-70	2366	2366	0%
Between MD 187 on and off ramps	3710	3724	0%	Between I-70 on ramps	2703	2703	0%
Between Rockledge Blvd on and off ramps	3540	3556	0%	From I-70 interchange to MD-85	4047	4047	0%
Between Rockledge Dr and I-270 Spur	3873	3870	0%	Between MD-85 on and off ramps	2379	2379	0%
Between I-270 Spur and Montrose Rd	8718	8716	0%	Between MD-85 and MD-80	3075	3073	0%
Between Montrose Rd on and off ramps	5582	5756	3%	Between MD-80 on and off ramps	2415	2419	0%
Between Montrose Rd and MD 189	5102	5478	7%	Between MD-80 and Md-109	2866	2871	0%
Between MD 189 and MD 28	5078	5848	15%	Between MD-109 on and off ramps	2767	2766	0%
Between MD 28 on and off ramps	5014	6124	22%	Between MD-109 and MD-121	2935	2936	0%
Between MD 28 and Shady Grove Rd	4214	5383	28%	Between MD-121 on and off ramps	2413	2414	0%
Between Shady Grove Rd and I-370	3243	4727	46%	Between MD-121 and MD-27	3354	3351	0%
Between I-370 on and off ramps	2749	4703	71%	Between MD-27 on and off ramps	3458	3455	0%
Between I-370 and MD 117	2851	5946	109%	Between MD-27 and MD-118	3773	3764	0%
Between MD 117 and MD 124	2432	4507	85%	Between MD-118 on and off ramps	3719	3715	0%
Between MD-124 on and off ramps	2547	4593	80%	Between MD-118 and Middlebrook Rd	4384	4380	0%
Between Watkins Mill Rd and Middlebrook Rd	4564	6699	47%	Between Middlebrook Rd on and off ramps	4382	4384	0%
Between Middlebrook Rd on and off ramps	4337	6264	44%	Between Middlebrook Rd and MD-124	5462	5465	0%
Between Middlebrook Rd and MD 118	3776	4127	9%	Between MD-124 on and off ramps	4179	4194	0%
Between MD-118 on and off ramps	3479	5005	44%	Between MD-124 and MD-117	5347	5372	0%
Between MD 118 and MD 27	3770	5034	34%	Between MD-117 and I-370	6905	6938	0%
Between MD-27 on and off ramps	2754	3613	31%	Between I-370 on and off ramps	3456	3458	0%
Between MD 27 and MD 121	3428	4007	17%	Between I-370 on ramp to Shady Grove Rd	4990	5009	0%
Between MD-121 on and off ramps	2299	2632	14%	Between Shady Grove Rd and MD 28	5157	5283	2%
Between MD 121 and MD 109	3931	4064	3%	Between MD 28 on and off ramps	5327	5485	3%
Between MD-109 on and off ramps	3643	3713	2%	Between MD 28 and MD 189	4678	4798	3%
Between MD 109 and MD 80	3831	3876	1%	Between MD 189 and Montrose Rd	4678	4796	3%
Between MD-80 on and off ramps	3186	3196	0%	Between Montrose Rd on and off ramps	5599	5708	2%
Between MD 80 and MD 85	3875	3861	0%	Between Montrose Rd and I-270 Spur	7355	7371	0%
Between MD-85 on and off ramps	3257	3200	-2%	Between I-270 Spur and Rockledge Blvd	3320	3352	1%
Between MD 85 and I-70	5239	5178	-1%	Between Rockledge Blvd on and off ramps	2542	2566	1%
North of I-70	2739	2711	-1%	Between MD 187 on and off ramps	3011	3028	1%
				Between MD 187 and I-495	3393	3406	0%
I-270 Spur Northbound				I-270 Spur Southbound			
Between I-495 and Democracy Blvd	4568	4577	0%	Between I-270 Split and HOV on ramp	3187	3170	-1%
Between Democracy Blvd on and off ramps	4101	4099	0%	Between HOV on ramp and Democracy Blvd	2329	2319	0%
Between Democracy Blvd and I-270 Split	4833	4828	0%	Between Democracy Blvd on and off ramps	1856	1839	-1%
				Between Democracy Blvd and I-495	2227	2190	-2%

Table D.9: PM Peak -2040 HSR + VSL + ARM- I-270 Local Vehicle Throughput

I-270 Local Northbound	No Build VISSIM Throughput	HSR+VSL+ ARM VISSIM Throughput	% Change	I-270 Local Southbound	No Build VISSIM Throughput	HSR+VSL+ ARM VISSIM Throughput	% Change
Between Montrose Rd EB off ramp and EB on ramp	1766	1775	1%	Between I-370 on ramp and I-270 off ramp	3064	3060	0%
Between Montrose Rd EB on ramp and WB off ramp	2079	2097	1%	Between I-270 off ramp and Shady Grove off ramp	1525	1528	0%
Between Montrose Rd WB off ramp and on ramp	1811	1838	1%	Between Shady Grove off ramp and Shady Grove WB on ramp	811	816	1%
Between Montrose Rd WB on ramp and I-270 on ramp	3211	3324	4%	Between Shady Grove WB and EB on ramps	1431	1633	14%
Between I-270 on ramp and MD 189 off ramp	3392	3538	4%	Between Shady Grove on ramp and I-270 on ramp	1957	2285	17%
Between MD 189 ramps	2697	2871	6%	Between I-270 on ramp and I-270 off ramp1	2571	2887	12%
Between MD 189 off ramp and I-270 on ramp	3503	3688	5%	Between I-270 off ramp1 and I-270 off ramp2	1808	1999	11%
Between I-270 on ramp and I-270 off ramp	4032	4364	8%	Between I-270 off ramp2 and MD 28 off ramp	1648	1810	10%
Between I-270 off ramp and MD 28 EB off ramp	3156	3423	8%	Between MD 28 off ramp and MD 28 WB on ramp	1153	1262	9%
Between MD 28 EB off ramp to MD 28 EB on ramp	2855	3083	8%	Between MD 28 WB on ramp and MD 28 EB on ramp	1423	1520	7%
Between MD 28 EB on ramp and MD 28 WB off ramp	2994	3214	7%	Between MD 28 EB on ramp and I-270 on ramp	2987	3053	2%
Between MD 28 WB off ramp and MD 28 WB on ramp	1879	2023	8%	Between I-270 on ramp and MD 189 off ramp	3660	3727	2%
Between MD 28 WB on ramp and I-270 on ramp	2552	2698	6%	Between MD 189 on and off ramps	2740	2792	2%
Between I-270 on ramp and I-270 off ramp	3027	3533	17%	Between MD 189 on ramp and I-270 off ramp	3316	3319	0%
Between I-270 off ramp and Shady Grove off ramp	1718	2117	23%	Between I-270 off ramp and Montrose Rd off ramp	2399	2406	0%
Between Shady Grove off ramp and I-270 on ramp	468	746	59%	Between Montrose Rd off ramp and Montrose Rd WB on ramp	2155	2161	0%
Between I-270 on ramp and Shady Grove WB on ramp	2182	3466	59%	Between Montrose Rd WB on ramp and EB off ramp	2705	2746	2%
Between Shady Grove WB on ramp and I-270 off ramp	2671	4289	61%	Between Montrose Rd EB off and on ramps	1525	1566	3%
Between I-270 off ramp and I-370 off ramp	2310	3752	62%	Between Montrose Rd EB off ramp and I-270	1845	1888	2%
Between I-370 off ramp and I-370 EB on ramp	529	999	89%				
Between I-370 EB and WB on ramps	896	2151	140%				
Between I-370 WB on ramp and I-270 off ramp	1577	3727	136%				
Between I-270 off ramp and I-270 on ramp	1008	2264	125%				
Between I-270 on ramp and MD 117 off ramp	1386	3736	170%				
Between MD 117 off ramp and MD 124 off ramp	920	2630	186%				
Between MD 124 off ramp and MD 124 EB on ramp	346	1114	222%				
Between MD 124 EB and WB on ramps	651	1629	150%				
Between MD 124 on ramp I-270	812	1165	43%				

Table D.10: PM Peak -2040 HSR + VSL + ARM- I-270 On Ramp Queue Length - Northbound

I-270 Northbound	No Build VISSIM Average Queue (feet)	HSR+VSL+ ARM VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	HSR+VSL+ ARM VISSIM Maximum Queue (feet)	% Change
Rockledge Dr on ramp	1	1	9%	192	192	0%
MD 189 C-D on ramp	610	0	-100%	4780	0	-100%
MD 28 C-D on ramp	994	1	-100%	4333	213	-95%
Shady Grove Rd C-D on ramp	1762	0	-100%	4090	55	-99%
I-370 C-D on ramp	3386	191	-94%	5049	1465	-71%
MD 124 C-D on ramp	4875	0	-100%	5069	11	-100%
MD 118 on ramp	0	0	-100%	43	0	-100%
MD 27 EB on ramp	0	0	-	0	0	-
MD 27 WB on ramp	0	131	-	0	562	-
MD 121 on ramp	0	0	-	4	0	-100%
MD 109 on ramp	0	0	-	0	0	-
MD 80 on ramp	0	0	-	0	0	-
MD 85 on ramp	0	0	-	0	12	-
I-270 Spur Northbound	No Build VISSIM Average Queue (feet)	HSR+VSL+ ARM VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	HSR+VSL+ ARM VISSIM Maximum Queue (feet)	% Change
Democracy Blvd EB on ramp	0	0	-	9	0	-100%
Democracy Blvd WB on ramp	0	32	-	0	844	-
I-495 Northbound	No Build VISSIM Average Queue (feet)	HSR+VSL+ ARM VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	HSR+VSL+ ARM VISSIM Maximum Queue (feet)	% Change
Cabin John Pkwy on ramp	46	1	-99%	903	115	-87%
MD 190 on ramp	0	0	-100%	48	0	-100%
I-270 C-D Northbound	No Build VISSIM Average Queue (feet)	HSR+VSL+ ARM VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	HSR+VSL+ ARM VISSIM Maximum Queue (feet)	% Change
Montrose Rd EB on ramp	0	471	-	0	2295	-
Montrose Rd WB on ramp	916	0	-100%	2556	0	-100%
I-270 on ramp	0	0	-	0	0	-
MD 189 on ramp	104	0	-100%	1084	85	-92%
I-270 on ramp	1	0	-100%	109	0	-100%
MD 28 EB on ramp	0	0	-	0	0	-
MD 28 WB on ramp	38	0	-100%	652	0	-100%
Shady Grove Rd EB on ramp	1396	0	-100%	4077	0	-100%
I-270 on ramp	1555	0	-100%	5058	0	-100%
Shady Grove Rd WB on ramp	739	7	-99%	1949	255	-87%
I-370 EB on ramp	1319	1971	49%	2422	2118	-13%
I-370 WB on ramp	1606	2297	43%	2548	5028	97%
I-270 on ramp	4357	2	-100%	5055	71	-99%
MD 124 EB on ramp	1831	1	-100%	2796	78	-97%
MD 124 WB on ramp	98	2	-98%	700	162	-77%
Watkins Mill Rd on ramp	2665	0	-100%	3270	0	-100%

Table D.11: PM Peak -2040 HSR + VSL + ARM- I-270 Off Ramp Queue Length - Northbound

I-270 Northbound	No Build VISSIM Average Queue (feet)	HSR+VSL+ ARM VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	HSR+VSL+ ARM VISSIM Maximum Queue (feet)	% Change
MD 187 off ramp NB	39	0	-100%	309	3	-99%
MD 187 off ramp SB	0	1	-	0	91	-
Rockledge Dr off ramp	1	36	4031%	88	252	188%
Tower Oaks Blvd off ramp	37	0	-100%	219	0	-100%
Montrose Rd off ramp EB	0	0	-	0	0	-
Montrose Rd off ramp WB	0	26	-	0	160	-
MD 189 off ramp WB	26	553	2012%	174	2090	1101%
MD 189 off ramp EB	0	35	8877%	78	196	150%
MD 28 off ramp EB	35	0	-100%	215	0	-100%
MD 28 off ramp WB	0	0	-	0	0	-
Shady Grove Rd off ramp - Redland Blvd	0	48	-	0	253	-
Shady Grove Rd off ramp WB	40	0	-100%	253	0	-100%
Shady Grove Rd off ramp EB	0	53	-	0	828	-
I-370 off ramp WB	8	0	-100%	162	0	-100%
I-370 off ramp EB	0	2623	-	0	4873	-
MD 117 off ramp	1835	212	-88%	2770	1049	-62%
MD 124 off ramp	55	0	-100%	626	0	-100%
Watkins Mill Rd off ramp	45	5	-89%	627	363	-42%
Middlebrook Rd EB off ramp	0	0	-	0	0	-
Middlebrook Rd WB off ramp	0	0	-	0	24	-
MD 118 WB off ramp - Seneca Meadows	0	0	-50%	8	10	24%
MD 118 WB off ramp	0	0	-	0	0	-
MD 118 EB off ramp	0	56	140425%	16	259	1475%
MD 27 off ramp WB	44	0	-100%	252	0	-100%
MD 27 off ramp EB	0	79	-	0	319	-
MD 121 off ramp WB	70	0	-100%	314	0	-100%
MD 121 off ramp EB	2	25	1097%	94	243	159%
MD 109 off ramp EB	26	0	-100%	251	0	-100%
MD 109 off ramp WB	0	22	-	0	193	-
MD 80 off ramp EB	21	0	-100%	233	19	-92%
MD 80 off ramp WB	0	0	360%	24	18	-23%
MD 85 NB off ramp	1	0	-75%	53	79	51%
MD 85 SB off ramp	1	0	-100%	141	0	-100%
I-270 Spur Northbound	No Build VISSIM Average Queue (feet)	HSR+VSL+ ARM VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	HSR+VSL+ ARM VISSIM Maximum Queue (feet)	% Change
Clara Barton Pkwy off ramp EB	0	0	-	0	0	-
Clara Barton Pkwy off ramp WB	0	0	-	0	0	-
MD 190 off ramp EB	0	6	-	0	426	-
MD 190 off ramp WB	5	45	838%	354	219	-38%
Democracy Blvd off ramp WB	41	17	-59%	194	136	-30%
Democracy Blvd off ramp EB	17	0	-100%	120	0	-100%

Table D.12: PM Peak -2040 HSR + VSL + ARM- I-270 On Ramp Queue Length - Southbound

I-270 Southbound	No Build VISSIM Average Queue (feet)	HSR+VSL+ ARM VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	HSR+VSL+ ARM VISSIM Maximum Queue (feet)	% Change
MD 85 on ramp	0	0	133%	12	39	228%
MD 80 on ramp	0	0	-	0	0	-
MD 109 on ramp	0	0	-	0	0	-
MD 121 WB on ramp	0	0	-	0	0	-
MD 121 EB on ramp	0	109	-	0	398	-
MD 27 WB on ramp	0	0	-	0	0	-
MD 27 EB on ramp	0	0	-	0	0	-
MD 118 WB on ramp	0	0	-	0	0	-
MD 118 EB on ramp	0	0	-	0	0	-
Middlebrook Rd on ramp	0	0	-	0	0	-
Watkins Mill Rd on ramp	0	0	-	0	0	-
MD 124 WB on ramp	1368	564	-59%	3492	2016	-42%
MD 117 on ramp	29	7	-77%	837	504	-40%
I-370 C-D on ramp	0	0	-	0	0	-
Shady Grove Rd C-D on ramp North	0	0	-	0	0	-
Shady Grove Rd C-D on ramp South	0	0	-	0	0	-
MD 189 C-D on ramp	0	0	-	0	0	-
Montrose Rd C-D on ramp	0	0	-	0	0	-
Rockledge Dr on ramp	0	0	-	0	0	-
MD 187 on ramp	0	0	-	0	0	-
I-270 Spur Southbound	No Build VISSIM Average Queue (feet)	HSR+VSL+ ARM VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	HSR+VSL+ ARM VISSIM Maximum Queue (feet)	% Change
Democracy Blvd on ramp	698	650	-7%	1919	1878	-2%
I-495 Southbound	No Build VISSIM Average Queue (feet)	HSR+VSL+ ARM VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	HSR+VSL+ ARM VISSIM Maximum Queue (feet)	% Change
I-270 Spur on ramp	4555	4571	0%	5065	5073	0%
MD 190 on ramp	184	9	-95%	956	433	-55%
I-270 C-D Southbound	No Build VISSIM Average Queue (feet)	HSR+VSL+ ARM VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	HSR+VSL+ ARM VISSIM Maximum Queue (feet)	% Change
I-270 on ramp	0	0	-100%	10	0	-100%
I-370 on ramp	0	0	-55%	80	58	-27%
Shady Grove Rd WB on ramp	0	0	-	0	0	-
Shady Grove Rd EB on ramp	0	0	-	0	0	-
I-270 on ramp	0	0	-	0	0	-
MD 28 WB on ramp	0	0	-	0	6	-
MD 28 EB on ramp	0	295	70052%	63	1185	1771%
I-270 on ramp	0	0	-	0	0	-
MD 189 on ramp	0	0	-	0	0	-
Montrose Rd WB on ramp	1	1	-54%	115	118	2%
Montrose Rd EB on ramp	0	0	-	0	0	-

Table D.13: PM Peak -2040 HSR + VSL + ARM- I-270 Off Ramp Queue Length - Southbound

I-270 Southbound	No Build VISSIM Average Queue (feet)	HSR+VSL+ ARM VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	HSR+VSL+ ARM VISSIM Maximum Queue (feet)	% Change
MD 85 SB off ramp	22	5	-75%	383	229	-40%
MD 85 NB off ramp	17	1	-91%	354	177	-50%
MD 80 off ramp	2	0	-75%	204	66	-68%
MD 109 off ramp WB	1	0	-100%	88	0	-100%
MD 109 off ramp EB	0	371	-	0	1061	-
MD 121 off ramp EB	217	7	-97%	970	141	-85%
MD 121 off ramp WB	0	22	5458%	137	145	6%
MD 27 off ramp EB	22	0	-100%	137	0	-100%
MD 27 off ramp WB	1	24	2483%	65	143	120%
MD 118 off ramp EB	24	0	-100%	142	0	-100%
MD 118 off ramp WB	0	125	416633%	23	483	2039%
Watkins Mill Rd off ramp	103	1002	875%	384	3014	686%
MD 124 off ramp EB	185	9	-95%	731	326	-55%
MD 124 off ramp WB	17	454	2598%	445	2277	412%
I-370 off ramp WB	147	0	-100%	725	0	-100%
I-370 off ramp EB	0	1	-	0	67	-
Shady Grove Rd off ramp - Omega Drive	1	0	-100%	52	0	-100%
Shady Grove Rd off ramp	0	4	-	0	153	-
MD 28 off ramp	3	105	3724%	149	518	247%
MD 189 off ramp EB	108	0	-100%	433	0	-100%
MD 189 off ramp WB	0	0	-	0	0	-
Montrose Rd off ramp WB	0	2	-	0	320	-
Montrose Rd off ramp EB	4	149	3713%	337	593	76%
Rockledge Dr off ramp	155	24	-85%	641	177	-72%
I-270 Spur Southbound	No Build VISSIM Average Queue (feet)	HSR+VSL+ ARM VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	HSR+VSL+ ARM VISSIM Maximum Queue (feet)	% Change
Democracy Blvd off ramp EB	20	0	-100%	136	0	-100%
Democracy Blvd off ramp WB	0	90	-	0	792	-
MD 190 off ramp WB	80	0	-100%	797	0	-100%
MD 190 off ramp EB	0	0	-	0	11	-
Clara Barton Pkwy WB off ramp	0	37	368600%	6	274	4473%

Table D.14: PM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
1- MD 85 at Sam's Club Drive											
1	NB	60.8	E	NB Left	134	78	463	889	E	115.6	F
				NB Through	570	38	463	889	D		
				NB Right	935	72	443	912	E		
	SB	179.8	F	SB Left	153	131	1021	1231	F		
				SB Through	874	186	1021	1231	F		
				SB Right	74	209	1021	1231	F		
	EB	35.0	C	EB Left	55	84	32	144	F		
				EB Through	24	81	32	144	F		
				EB Right	169	13	32	144	B		
	WB	163.6	F	WB Left	561	181	536	762	F		
				WB Through	30	166	536	762	F		
				WB Right	224	119	536	762	F		
2- MD 85 at I-270 NB on and off ramp											
2	NB	58.5	E	NB Left	1136	58	700	1857	E	48.2	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	32.6	C	SB Left	0	0	0	0	A		
				SB Through	743	33	132	737	C		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
3- MD 85 at I-270 SB on and off ramp											
3	NB	17.3	B	NB Left	0	0	0	0	A	19.5	B
				NB Through	1975	17	181	1210	B		
				NB Right	0	0	0	0	A		
	SB	44.0	D	SB Left	173	44	74	582	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
4- MD 85 at Crestwood Blvd											
4	NB	68.0	F	NB Left	74	103	368	830	F	51.3	D
				NB Through	1450	66	367	830	E		
				NB U-Turn	0	0	0	0	A		
	SB	31.9	C	SB Left	105	83	53	246	F		
				SB Through	940	30	105	1039	C		
				SB Right	923	28	92	1030	C		
	EB	63.3	E	EB Left	949	66	196	744	E		
				EB Through	43	51	196	744	D		
				EB Right	28	1	196	744	A		
	WB	53.0	D	WB Left	44	78	60	230	E		
				WB Through	79	81	60	230	F		
				WB Right	94	18	60	230	B		
5- MD 80 at I-270 NB on and off ramp											
5	NB	-0.9	A	NB Left	1	9	0	4	A	11.5	B
				NB Through	2	0	0	4	A		
				NB Right	7	-3	0	4	A		
	SB	12.8	B	SB Left	479	16	27	238	B		
				SB Through	22	16	27	238	B		
				SB Right	149	3	0	0	A		
	EB	13.6	B	EB Left	97	14	24	208	B		
				EB Through	0	0	8	0	A		
				EB Right	5	10	37	239	B		
	WB	10.7	B	WB Left	15	14	0	38	B		
				WB Through	670	18	66	419	B		
				WB Right	612	2	0	0	A		
6- MD 80 at I-270 SB on and off ramp											
6	NB	3.4	A	NB Left	55	5	3	239	A	5.9	A
				NB Through	0	0	0	0	A		
				NB Right	605	3	3	239	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	7.1	A	EB Left	0	0	0	0	A		
				EB Through	382	8	4	111	A		
				EB Right	66	4	4	119	A		
	WB	8.4	A	WB Left	0	0	0	0	A		
				WB Through	446	8	3	163	A		
				WB Right	0	0	0	0	A		
7- MD 109 at I-270 NB on and off ramp											
7	NB			NB Left	0	0	0	0	A	7.9	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	15.2	C	SB Left	317	16	34	268	C		
				SB Through	0	0	0	0	A		
				SB Right	25	6	1	162	A		
	EB	2.5	A	EB Left	80	2	0	47	A		
				EB Through	0	0	0	0	A		
				EB Right	83	3	0	0	A		
	WB	0.4	A	WB Left	0	0	0	0	A		
				WB Through	222	0	0	0	A		
				WB Right	0	0	0	0	A		
8- MD 80 at I-270 SB on and off ramp											
8	NB	4.9	A	NB Left	63	8	3	120	A	1.8	A
				NB Through	0	0	0	0	A		
				NB Right	36	0	0	63	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.9	A	EB Left	0	0	0	0	A		
				EB Through	166	0	0	0	A		
				EB Right	34	4	0	0	A		
	WB	1.4	A	WB Left	137	1	0	58	A		
				WB Through	110	2	0	30	A		
				WB Right	0	0	0	0	A		
9- MD 121 at Gateway Center Dr											
9	NB	29.4	D	NB Left	590	33	112	604	C	47.0	D
				NB Through	795	28	112	604	C		
				NB Right	64	16	119	630	B		
	SB	22.6	C	SB Left	28	15	19	219	B		
				SB Through	300	24	31	223	C		
				SB Right	9	13	34	244	B		
	EB	14.9	B	EB Left	4	40	8	196	D		
				EB Through	24	41	15	229	D		
				EB Right	248	12	27	261	B		
	WB	117.1	F	WB Left	349	162	304	715	F		
				WB Through	75	73	304	714	E		
				WB Right	186	51	327	739	D		
10- MD 121 at I-270 NB on and off ramp											
10	NB	22.1	C	NB Left	372	59	77	320	F	18.1	B
				NB Through	0	0	0	0	A		
				NB Right	785	4	1	73	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	11.8	B	EB Left	0	0	0	0	A		
				EB Through	651	18	38	367	C		
				EB Right	336	1	0	0	A		
	WB	20.0	C	WB Left	219	60	86	412	F		
				WB Through	682	7	86	412	A		
				WB Right	0	0	0	0	A		

Table D.14: PM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
11- MD 121 at I-270 SB on and off ramp											
11	NB			NB Left	0	0	0	0	A	22.3	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	62.3	E	SB Left	271	85	226	977	F		
				SB Through	0	0	0	0	A		
				SB Right	254	39	0	49	E		
	EB	6.5	A	EB Left	0	0	0	0	A		
				EB Through	717	6	16	229	A		
				EB Right	0	0	0	0	A		
	WB	13.2	B	WB Left	0	0	0	0	A		
				WB Through	520	27	46	382	D		
				WB Right	538	0	0	0	A		
12- MD 27 at Observation Dr											
12	NB	37.7	D	NB U-Turn	0	0	0	0	A	24.8	C
				NB Through	94	55	22	98	E		
				NB Right	61	11	22	98	B		
	SB	41.3	D	SB Left	146	44	38	216	D		
				SB Through	57	62	43	250	E		
				SB Right	188	33	69	287	C		
	EB	18.6	B	EB Left	189	33	70	458	C		
				EB Through	2012	17	71	459	B		
				EB Right	97	16	84	497	B		
	WB	27.9	C	WB Left	41	24	149	731	C		
				WB Through	1695	29	149	731	C		
				WB Right	69	9	149	731	A		
13- MD 27 at I-270 NB off ramp											
13	NB	47.2	D	NB Left	303	47	52	260	D	6.5	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.1	A	EB Left	0	0	0	0	A		
				EB Through	1512	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	4.9	A	WB Left	0	0	0	0	A		
				WB Through	1791	5	37	726	A		
				WB Right	0	0	0	0	A		
14- MD 27 at I-270 SB off ramp											
14	NB			NB Left	0	0	0	0	A	5.2	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	50.1	D	SB Left	174	50	33	150	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	1.8	A	EB Left	0	0	0	0	A		
				EB Through	1677	2	4	89	A		
				EB Right	0	0	0	0	A		
	WB	3.7	A	WB Left	0	0	0	0	A		
				WB Through	1541	4	12	384	A		
				WB Right	0	0	0	0	A		
15- MD 27 at Crystal Rock Dr											
15	NB	31.1	C	NB Left	77	30	107	545	C	70.1	E
				NB Through	1196	31	116	545	C		
				NB Right	55	29	123	558	C		
	SB	56.5	E	SB Left	157	74	381	1298	E		
				SB Through	1468	58	381	1298	E		
				SB Right	225	33	368	1291	C		
	EB	40.4	D	EB Left	125	53	34	129	D		
				EB Through	49	36	30	124	D		
				EB Right	62	18	23	156	B		
	WB	163.8	F	WB Left	104	99	1056	1511	F		
				WB Through	127	110	1056	1511	F		
				WB Right	665	184	1056	1511	F		
16- MD 118 at Seneca Meadows Pkwy											
16	NB	4.9	A	NB Left	97	14	2	77	B	9.0	A
				NB Through	1309	4	11	182	A		
				NB Right	1	-1	19	235	A		
	SB	7.4	A	SB Left	15	8	19	307	A		
				SB Through	1226	7	22	307	A		
				SB Right	11	5	25	340	A		
	EB	14.0	B	EB Left	23	59	14	138	E		
				EB Through	0	65	14	138	E		
				EB Right	312	11	14	138	B		
	WB	53.8	D	WB Left	103	65	43	243	E		
				WB Through	7	69	39	242	E		
				WB Right	30	13	48	262	B		
17- MD 118 at I-270 NB on ramp											
17	NB			NB Left	0	0	0	0	A	13.8	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	26.5	C	EB Left	493	26	43	299	C		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	10.0	A	WB Left	0	0	0	0	A		
				WB Through	283	2	1	139	A		
				WB Right	1361	12	46	611	B		
18- MD 118 at I-270 SB off ramp											
18	NB			NB Left	0	0	0	0	A	7.1	A
				NB Through	0	0.0	0	0	A		
				NB Right	0	0.0	0	0	A		
	SB	37.7	D	SB Left	169	37.7	27	145	D		
				SB Through	0	0.0	0	0	A		
				SB Right	0	0.0	0	0	A		
	EB	5.5	A	EB Left	0	0.0	0	0	A		
				EB Through	1407	5.5	13	384	A		
				EB Right	0	0.0	0	0	A		
	WB	5.1	A	WB Left	0	0.0	0	0	A		
				WB Through	1499	5.1	10	218	A		
				WB Right	0	0.0	0	0	A		
19- MD 118 at Aircraft Dr											
19	NB	26.2	C	NB Left	53	72	43	241	E	43.0	D
				NB Through	53	70	43	241	E		
				NB Right	227	5	5	87	A		
	SB	165.9	F	SB Left	436	156	419	656	F		
				SB Through	14	205	419	656	F		
				SB Right	126	195	419	656	F		
	EB	22.6	C	EB Left	125	31	89	536	C		
				EB Through	1415	22	89	536	C		
				EB Right	21	20	89	536	B		
	WB	24.3	C	WB Left	15	30	107	749	C		
				WB Through	1399	28	107	749	C		
				WB Right	367	8	107	749	A		
20- Middlebrook Rd at Observation Dr											
20	NB			NB Left	0	0	0	0	A	9.0	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	20.5	C	SB Left	124	36	23	150	D		
				SB Through	0	0	0	0	A		
				SB Right	186	10	23	150	B		
	EB	6.0	A	EB Left	14	11	15	149	B		
				EB Through	1053	6	15	149	A		
				EB Right	0	0	0	0	A		
	WB	8.8	A	WB Left	0	0	0	0	A		
				WB Through	1313	9	27	253	A		
				WB Right	17	7	42	302	A		

Table D.14: PM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
21- Middlebrook Rd at I-270 SB on ramp											
21	NB			NB Left	0	0	0	0	A	4.6	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	2.7	A	EB Left	0	0	0	0	A		
				EB Through	742	3	4	110	A		
				EB Right	0	0	0	0	A		
	WB	7.8	A	WB Left	438	8	5	236	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
22- Middlebrook Rd at Waring Station Rd											
22	NB	48.4	D	NB Left	200	46	83	309	D	13.7	B
				NB Through	1	55	83	309	D		
				NB Right	236	50	83	309	D		
	SB	30.1	C	SB Left	32	47	8	72	D		
				SB Through	2	38	8	72	D		
				SB Right	24	7	19	110	A		
	EB	8.0	A	EB Left	4	11	28	285	B		
				EB Through	1125	8	28	285	A		
				EB Right	198	7	28	285	A		
	WB	8.6	A	WB Left	210	21	28	289	C		
				WB Through	1437	7	28	289	A		
				WB Right	3	3	28	289	A		
23- MD 124 at MD 355											
23	NB	130.8	F	NB Left	490	115	682	1082	F	78.6	E
				NB Through	1162	138	680	1079	F		
				NB Right	7	85	0	0	F		
	SB	44.6	D	SB Left	180	92	146	490	F		
				SB Through	698	66	146	490	E		
				SB Right	720	12	44	383	B		
	EB	27.2	C	EB Left	291	68	108	598	E		
				EB Through	1615	25	108	598	C		
				EB Right	338	3	28	551	A		
	WB	126.4	F	WB Left	0	0	0	0	A		
				WB Through	1645	129	683	946	F		
				WB Right	88	83	0	3	F		
24- MD 124 at I-270 SB on and off											
24	NB	95.9	F	NB Left	55	84	67	182	F	63.0	E
				NB Through	21	127	67	182	F		
				NB U-Turn	0	0	0	0	A		
	SB	55.4	E	SB Left	547	95	190	736	F		
				SB Through	8	98	190	736	F		
				SB Right	456	7	13	379	A		
	EB	101.1	F	EB Left	0	0	0	0	A		
				EB Through	1409	100	584	1113	F		
				EB Right	22	162	604	1137	F		
	WB	21.7	C	WB Left	5	78	653	2194	E		
				WB Through	1192	22	653	2194	C		
				WB Right	0	0	0	0	A		
25- MD 117 at MD 124											
25	NB	78.5	E	NB Left	54	158	328	743	F	50.1	D
				NB Through	686	93	328	743	F		
				NB Right	461	48	29	665	D		
	SB	37.8	D	SB Left	134	61	153	737	E		
				SB Through	969	41	153	737	D		
				SB Right	182	5	0	0	A		
	EB	44.9	D	EB Left	153	80	152	574	E		
				EB Through	1156	41	152	576	D		
				EB Right	57	37	156	603	D		
	WB	42.6	D	WB Left	315	71	205	1006	E		
				WB Through	1069	38	205	1006	D		
				WB Right	99	1	0	0	A		
26- MD 117 at Bureau Dr											
26	NB	50.3	D	NB Left	98	76	81	296	E	37.8	D
				NB Through	35	77	81	296	E		
				NB Right	272	38	81	296	D		
	SB	80.7	F	SB Left	284	95	132	405	F		
				SB Through	23	83	132	405	F		
				SB Right	83	32	132	405	C		
	EB	30.3	C	EB Left	52	54	165	806	D		
				EB Through	1683	30	166	806	C		
				EB Right	6	18	160	795	B		
	WB	31.9	C	WB Left	14	35	185	997	D		
				WB Through	1272	34	186	998	C		
				WB Right	213	19	211	1046	B		
27- MD 117 at I-270 SB off ramp											
27	NB			NB Left	0	0	0	0	A	12.8	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	3.7	A	EB Left	0	0	0	0	A		
				EB Through	944	4	6	464	A		
				EB Right	0	0	0	0	A		
	WB	40.7	E	WB Left	306	41	98	848	E		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
28- MD 117 at I-270 NB off ramp											
28	NB			NB Left	0	0	0	0	A	24.3	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	89.3	F	SB Left	97	91	1950	2779	F		
				SB Through	0	0	0	0	A		
				SB Right	374	89	1949	2779	F		
	EB	17.3	B	EB Left	3	120	90	983	F		
				EB Through	947	17	90	983	B		
				EB Right	0	0	0	0	A		
	WB	7.3	A	WB Left	0	0	0	0	A		
				WB Through	1403	7	52	390	A		
				WB Right	0	0	52	390	A		
29- MD 117 at Perry Pkwy											
29	NB	40.8	D	NB Left	19	59	17	125	E	49.4	D
				NB Through	26	59	17	124	E		
				NB Right	34	17	27	145	B		
	SB	162.4	F	SB Left	241	198	280	446	F		
				SB Through	21	220	280	446	F		
				SB Right	121	82	280	446	F		
	EB	21.1	C	EB Left	223	69	74	337	E		
				EB Through	778	8	74	337	A		
				EB Right	30	7	60	321	A		
	WB	41.4	D	WB Left	37	108	248	736	F		
				WB Through	1260	42	248	736	D		
				WB Right	382	33	248	736	C		
30- Shady Grove Rd at I-270 NB off ramp											
30	NB	7.6	A	NB Left	0	0	0	0	A	30.1	C
				NB Through	914	8	87	483	A		
				NB Right	0	0	0	0	A		
	SB	44.7	D	SB Left	0	0	0	0	A		
				SB Through	1013	45	163	681	D		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	51.6	D	WB Left	267	52	48	264	D		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table D.14: PM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
31- Shady Grove Rd at I-270 SB off ramp											
31	NB	31.3	C	NB Left	0	0	0	0	A	29.5	C
				NB Through	1229	31	435	1759	C		
				NB Right	0	0	0	0	A		
	SB	5.6	A	SB Left	0	0	0	0	A		
				SB Through	676	6	7	154	A		
				SB Right	0	0	0	0	A		
	EB	55.6	E	EB Left	232	54	43	211	D		
				EB Through	0	0	0	0	A		
				EB Right	304	57	62	297	E		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
32- MD 28 at I-270 SB off ramp											
32	NB			NB U-Turn	0	0	0	0	A	7.9	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	37.2	D	SB Left	406	46	71	322	D		
				SB Through	0	0	0	0	A		
				SB Right	97	3	0	28	A		
	EB	2.8	A	EB Left	0	0	0	0	A		
				EB Through	1560	1	0	0	A		
				EB Right	932	6	16	224	A		
	WB	6.7	A	WB Left	0	0	0	0	A		
				WB Through	1642	7	20	253	A		
				WB Right	0	0	0	0	A		
33- MD 28 at I-270 on and off ramps											
33	NB	36.9	D	NB Left	0	0	41	226	A	39.9	D
				NB Through	185	49	49	235	D		
				NB Right	123	18	49	235	B		
	SB	137.2	F	SB Left	14	160	361	412	F		
				SB Through	0	0	0	0	A		
				SB Right	219	136	361	412	F		
	EB	20.0	B	EB Left	283	61	94	334	E		
				EB Through	920	7	94	334	A		
				EB Right	0	0	0	0	A		
	WB	41.7	D	WB Left	40	37	168	432	D		
				WB Through	1279	42	144	396	D		
				WB Right	0	0	0	0	A		
34- MD 189 at Great Falls Rd											
34	NB	36.7	D	NB Left	43	45	12	90	D	13.2	B
				NB Through	14	48	9	90	D		
				NB Right	19	9	9	101	A		
	SB	3.4	A	SB Left	18	41	7	83	D		
				SB Through	13	48	7	83	D		
				SB Right	408	0	3	48	A		
	EB	11.6	B	EB Left	410	23	37	417	C		
				EB Through	644	5	6	200	A		
				EB Right	55	5	10	236	A		
	WB	18.0	B	WB Left	14	19	52	406	B		
				WB Through	842	18	51	406	B		
				WB Right	18	12	67	440	B		
35- MD 189 at I-270 Ramps											
35	NB	47.1	D	NB Left	225	47	41	196	D	42.5	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	54.4	D	SB Left	348	54	124	453	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	28.0	C	EB Left	479	32	91	341	C		
				EB Through	373	23	91	341	C		
				EB Right	0	0	0	0	A		
	WB	50.8	D	WB Left	443	54	111	336	D		
				WB Through	428	47	111	336	D		
				WB Right	0	0	0	0	A		
36- MD 189 at Wootton Pkwy											
36	NB	45.9	D	NB Left	238	57	142	506	E	52.4	D
				NB Through	694	51	142	506	D		
				NB Right	176	12	142	506	B		
	SB	82.8	F	SB Left	250	101	295	794	F		
				SB Through	926	78	312	780	E		
				SB Right	0	0	0	0	A		
	EB	38.7	D	EB Left	153	72	123	486	E		
				EB Through	552	38	123	486	D		
				EB Right	204	15	123	486	B		
	WB	39.5	D	WB Left	157	72	141	743	E		
				WB Through	775	41	141	743	D		
				WB Right	315	19	141	743	B		
37- Montrose Rd at Tower Oaks Blvd											
37	NB	0.4	A	NB Left	0	0	0	0	A	32.4	C
				NB Through	0	0	0	0	A		
				NB Right	537	0	0	0	A		
	SB	143.6	F	SB Left	87	49	213	902	D		
				SB Through	0	0	0	0	A		
				SB Right	305	171	269	899	F		
	EB	6.9	A	EB Left	0	0	0	0	A		
				EB Through	1868	7	39	520	A		
				EB Right	0	0	0	0	A		
	WB	40.0	D	WB Left	79	37	39	520	D		
				WB Through	2426	41	277	780	D		
				WB Right	261	30	277	780	C		
38- Tower Oaks Blvd at I-270 off ramp											
38	NB	23.3	C	NB Left	707	24	50	240	C	17.3	B
				NB Through	0	0.0	43	232	A		
				NB Right	26	7.0	50	240	A		
	SB	9.8	A	SB Left	8	18.4	1	39	B		
				SB Through	0	0.0	1	39	A		
				SB Right	9	2.2	0	23	A		
	EB	10.8	B	EB Left	1	11.5	16	177	B		
				EB Through	363	11.2	16	177	B		
				EB Right	37	7.0	11	167	A		
	WB	12.7	B	WB Left	139	16.3	16	145	B		
				WB Through	203	10.4	16	145	B		
				WB Right	3	3.4	3	100	A		
39- Montrose Rd at Tower Oaks Blvd											
39	NB	20.0	C	NB Left	97	42	83	387	D	45.0	D
				NB Through	773	32	83	387	C		
				NB Right	621	2	0	0	A		
	SB	32.1	C	SB Left	210	63	76	334	E		
				SB Through	506	23	74	333	C		
				SB Right	131	15	72	340	B		
	EB	133.4	F	EB Left	104	112	358	697	F		
				EB Through	518	136	360	698	F		
				EB Right	44	149	382	722	F		
	WB	36.9	D	WB Left	542	46	109	374	D		
				WB Through	456	42	110	374	D		
				WB Right	315	13	129	404	B		
40- Rockledge Blvd at I-270 NB on and off ramp											
40	NB	132.4	F	NB Left	0	0	0	0	A	112.4	F
				NB Through	335	121	557	836	F		
				NB Right	854	137	557	836	F		
	SB	85.9	F	SB Left	0	0	89	217	A		
				SB Through	352	86	89	217	F		
				SB Right	0	0	0	0	A		
	EB	93.5	F	EB Left	6	184	288	804	F		
				EB Through	459	148	288	804	F		
				EB Right	304	10	0	0	B		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table D.14: PM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS	
41- Rockledge Blvd at I-270 SB on and off ramps												
41	NB	30.3	C	NB Left	343	30	76	273	C	48.1	D	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	53.0	D		WB Left	355	59	195	867			E
					WB Through	890	51	195	867			D
					WB Right	0	0	0	0			A
42- MD 187 at Tuckerman Ln												
42	NB	66.6	E	NB Left	216	39	567	1282	D	128.7	F	
				NB Through	2309	68	567	1282	E			
				NB Right	200	76	567	1282	E			
	SB	187.6	F		SB Left	205	172	2555	2693			F
					SB Through	1151	185	2555	2693			F
					SB Right	306	209	2555	2693			F
	EB	112.4	F		EB Left	302	66	540	1403			E
					EB Through	534	136	541	1404			F
					EB Right	118	121	564	1428			F
	WB	195.5	F		WB Left	465	191	1941	2142			F
					WB Through	674	211	1941	2142			F
					WB Right	166	145	1941	2142			F
43- MD 187 at I-270 NB on and off ramps												
43	NB	16.8	B	NB Left	566	35	117	404	C	20.4	C	
				NB Through	2515	13	117	404	B			
				NB Right	0	0	0	0	A			
	SB	25.1	C		SB Left	0	0	0	0			A
					SB Through	1290	25	66	269			C
					SB Right	0	0	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	60.3	E		WB Left	59	60	47	317			E
					WB Through	67	60	47	317			E
					WB Right	0	0	0	0			A
44- MD 187 at I-270 NB on and off ramps												
44	NB	40.0	E	NB Left	0	0	0	0	A	36.9	D	
				NB Through	2426	40	155	739	D			
				NB Right	0	0	0	0	A			
	SB	18.1	B		SB Left	147	56	67	271			E
					SB Through	1203	13	67	271			B
					SB Right	0	0	0	0			A
	EB	58.2	E		EB Left	652	60	143	560			E
					EB Through	0	0	143	560			A
					EB Right	179	53	82	486			D
	WB				WB Left	0	0	0	0			A
					WB Through	0	0	0	0			A
					WB Right	0	0	0	0			A
45- MD 187 at Rock Spring Dr												
45	NB	20.6	C	NB Left	492	37	123	826	D	29.8	C	
				NB Through	2174	17	124	827	B			
				NB Right	18	14	145	860	B			
	SB	34.2	C		SB Left	21	62	111	472			E
					SB Through	1186	39	111	472			D
					SB Right	173	1	69	465			A
	EB	50.0	D		EB Left	431	60	146	519			E
					EB Through	50	68	146	519			E
					EB Right	484	39	146	519			D
	WB	17.1	B		WB Left	7	29	6	108			C
					WB Through	16	33	6	108			C
					WB Right	36	8	3	97			A
47-Democracy Blvd at I-270 NB off ramp												
47	NB	45.3	D	NB Left	154	45	28	136	D	3.0	A	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB	1.2	A		EB Left	0	0	0	0			A
					EB Through	1127	1	3	66			A
					EB Right	0	0	0	0			A
	WB	1.1	A		WB Left	0	0	0	0			A
					WB Through	2241	1	3	84			A
					WB Right	0	0	0	0			A
48- Democracy Blvd at I-270 SB on ramp												
48	NB			NB Left	0	0	0	0	A	8.4	A	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB	5.5	A		EB Left	0	0	0	0			A
					EB Through	1336	5	19	232			A
					EB Right	0	0	0	0			A
	WB	10.1	B		WB Left	543	35	59	404			D
					WB Through	1827	3	49	383			A
					WB Right	0	0	0	0			A
49- Democracy Blvd at I-270 SB off ramp												
49	NB			NB Left	0	0	0	0	A	8.8	A	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB	37.4	D		SB Left	154	51	28	143			D
					SB Through	0	0	0	0			A
					SB Right	59	2	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	5.8	A		WB Left	0	0	0	0			A
					WB Through	1827	4	19	305			A
					WB Right	156	29	116	746			C
50- MD 190 at Burdette Rd												
50	NB	76.4	E	NB Left	27	79	18	118	E	36.6	D	
				NB Through	7	69	18	118	E			
				NB Right	6	75	18	118	E			
	SB	37.5	D		SB Left	45	77	25	148			E
					SB Through	9	72	25	148			E
					SB Right	122	20	25	148			C
	EB	21.6	C		EB Left	138	99	113	625			F
					EB Through	1297	14	113	625			B
					EB Right	31	4	99	653			A
	WB	45.7	D		WB Left	13	114	390	1119			F
					WB Through	2161	46	390	1119			D
					WB Right	65	35	390	1119			C

Table D.14: PM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
51- MD 190 at I-270 NB on ramp											
51	NB			NB Left	0	0	0	0	A	17.6	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	65.7	E	EB Left	254	66	101	343	E		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	9.3	A	WB Left	0	0	0	0	A		
				WB Through	1471	9	49	692	A		
				WB Right	0	0	0	0	A		
52- MD 190 at I-270 SB off ramp											
52	NB	70.5	E	NB Left	225	70	84	800	E	12.3	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	3.6	A	EB Left	0	0	0	0	A		
				EB Through	1062	4	8	176	A		
				EB Right	0	0	0	0	A		
	WB	10.0	A	WB Left	0	0	0	0	A		
				WB Through	1641	10	30	635	A		
				WB Right	0	0	0	0	A		
53- MD 190 at Seven Locks Rd											
53	NB	0.5	A	NB Left	28	1	0	0	A	26.9	C
				NB Through	314	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	52.6	D	SB Left	364	52	120	414	D		
				SB Through	232	53	120	414	D		
				SB Right	20	50	120	414	D		
	EB	32.0	C	EB Left	27	30	95	436	C		
				EB Through	800	32	95	436	C		
				EB Right	45	32	95	436	C		
	WB	20.8	C	WB Left	255	75	124	491	E		
				WB Through	914	18	124	491	B		
				WB Right	693	5	124	491	A		
54- MD 124 at I-270 NB off ramp											
54	NB	31.3	C	NB Left	0	0	0	0	A	23.6	C
				NB Through	0	0	0	0	A		
				NB Right	556	31	56	630	C		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	21.1	C	EB Left	0	0	0	0	A		
				EB Through	1661	21	57	938	C		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
55- Democracy Blvd at I-270 NB off ramp											
55	NB	46.2	D	NB Left	0	0	0	0	A	11.2	B
				NB Through	0	0	0	0	A		
				NB Right	313	46	51	205	D		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	1.5	A	EB Left	0	0	0	0	A		
				EB Through	1128	2	4	59	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
56- Watkins Mill Rd at I-270 SB off ramp/Parkview Ave											
56	NB	71.3	E	NB Left	145	53	170	656	D	87.9	F
				NB Through	0	0	0	0	A		
				NB Right	342	79	170	656	E		
	SB	42.7	D	SB Left	410	63	107	388	E		
				SB Through	110	59	107	388	E		
				SB Right	441	20	107	388	C		
	EB	143.5	F	EB Left	0	0	0	0	A		
				EB Through	1216	144	961	1246	F		
				EB Right	4	136	961	1246	F		
	WB	41.9	D	WB Left	62	85	49	220	F		
				WB Through	295	33	47	219	C		
				WB Right	0	0	0	0	A		
57- Watkins Mill Rd at I-270 NB on ramp											
57	NB	40.5	D	NB Left	77	65	56	638	E	72.4	E
				NB Through	0	0	0	0	A		
				NB Right	193	31	56	638	C		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	26.1	C	EB Left	644	66	146	438	E		
				EB Through	1051	2	146	438	A		
				EB Right	0	0	0	0	A		
	WB	157.1	F	WB Left	0	0	0	0	A		
				WB Through	684	122	651	866	F		
				WB Right	343	227	651	866	F		
58- Watkins Mill Rd at I-270 SB on ramp											
58	NB			NB Left	0	0	0	0	A	16.5	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	17.2	B	EB Left	0	0	0	0	A		
				EB Through	1691	19	150	598	B		
				EB Right	286	8	150	598	A		
	WB	14.8	B	WB Left	409	27	46	464	C		
				WB Through	352	1	46	464	A		
				WB Right	0	0	0	0	A		

Table D.15: PM Peak -2040 HSR +VSL + ARM- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
1- MD 85 at Sam's Club Drive											
1	NB	63.2	E	NB Left	136	75	497	910	E	117.7	F
				NB Through	577	38	497	910	D		
				NB Right	930	77	469	934	E		
	SB	184.6	F	SB Left	152	133	1035	1238	F		
				SB Through	868	191	1035	1238	F		
				SB Right	71	213	1035	1238	F		
	EB	35.1	D	EB Left	55	85	32	151	F		
				EB Through	24	81	32	151	F		
				EB Right	168	12	32	151	B		
	WB	162.4	F	WB Left	569	179	540	750	F		
				WB Through	30	166	540	750	F		
				WB Right	230	120	540	750	F		
2- MD 85 at I-270 NB on and off ramp											
2	NB	59.3	E	NB Left	1130	59	685	1747	E	48.0	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	30.9	C	SB Left	0	0	0	0	A		
				SB Through	746	31	128	686	C		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
3- MD 85 at I-270 SB on and off ramp											
3	NB	16.4	B	NB Left	0	0	0	0	A	18.6	B
				NB Through	1970	16	160	1182	B		
				NB Right	0	0	0	0	A		
	SB	43.2	D	SB Left	175	43	50	490	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
4- MD 85 at Crestwood Blvd											
4	NB	51.4	F	NB Left	76	76	299	840	E	45.9	D
				NB Through	1459	50	299	840	D		
				NB U-Turn	0	0	0	0	A		
	SB	31.2	C	SB Left	105	81	52	237	F		
				SB Through	938	30	94	856	C		
				SB Right	927	27	79	790	C		
	EB	64.7	E	EB Left	948	67	208	750	E		
				EB Through	43	50	208	750	D		
				EB Right	28	1	208	750	A		
	WB	52.8	D	WB Left	44	77	60	229	E		
				WB Through	78	81	60	229	F		
				WB Right	94	18	60	229	B		
5- MD 80 at I-270 NB on and off ramp											
5	NB	-1.2	A	NB Left	2	0	0	7	A	12.0	B
				NB Through	1	0	0	7	A		
				NB Right	7	-2	0	7	A		
	SB	13.4	B	SB Left	478	16	28	198	B		
				SB Through	22	19	28	198	B		
				SB Right	149	3	0	0	A		
	EB	13.8	B	EB Left	97	14	24	231	B		
				EB Through	0	0	8	0	A		
				EB Right	5	7	37	262	A		
	WB	11.2	B	WB Left	15	15	0	45	B		
				WB Through	672	19	70	523	B		
				WB Right	613	3	0	35	A		
6- MD 80 at I-270 SB on and off ramp											
6	NB	3.6	A	NB Left	55	7	3	212	A	6.3	A
				NB Through	0	0	0	0	A		
				NB Right	607	3	3	212	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	7.2	A	EB Left	0	0	0	0	A		
				EB Through	381	8	4	101	A		
				EB Right	66	5	4	109	A		
	WB	9.5	A	WB Left	0	0	0	0	A		
				WB Through	447	10	3	143	A		
				WB Right	0	0	0	0	A		
7- MD 109 at I-270 NB on and off ramp											
7	NB			NB Left	0	0	0	0	A	7.9	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	15.3	C	SB Left	321	16	34	260	C		
				SB Through	0	0	0	0	A		
				SB Right	25	5	0	148	A		
	EB	2.5	A	EB Left	80	2	0	51	A		
				EB Through	0	0	0	0	A		
				EB Right	83	3	0	0	A		
	WB	0.4	A	WB Left	0	0	0	0	A		
				WB Through	222	0	0	0	A		
				WB Right	0	0	0	0	A		
8- MD 80 at I-270 SB on and off ramp											
8	NB	5.0	A	NB Left	64	8	3	101	A	1.9	A
				NB Through	0	0	0	0	A		
				NB Right	37	0	0	39	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.9	A	EB Left	0	0	0	0	A		
				EB Through	166	0	0	0	A		
				EB Right	34	4	0	0	A		
	WB	1.5	A	WB Left	137	1	0	55	A		
				WB Through	109	2	0	27	A		
				WB Right	0	0	0	0	A		
9- MD 121 at Gateway Center Dr											
9	NB	29.2	D	NB Left	634	34	123	629	C	44.9	D
				NB Through	864	27	123	629	C		
				NB Right	71	12	130	654	B		
	SB	21.6	C	SB Left	27	18	19	225	B		
				SB Through	302	22	29	225	C		
				SB Right	9	12	31	246	B		
	EB	15.7	C	EB Left	4	43	8	194	D		
				EB Through	24	41	16	242	D		
				EB Right	248	13	29	274	B		
	WB	111.5	F	WB Left	347	155	284	699	F		
				WB Through	76	68	283	699	E		
				WB Right	186	48	306	723	D		
10- MD 121 at I-270 NB on and off ramp											
10	NB	21.4	C	NB Left	425	59	85	326	F	19.3	B
				NB Through	0	0	0	0	A		
				NB Right	910	4	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	15.1	C	EB Left	0	0	0	0	A		
				EB Through	651	20	44	409	C		
				EB Right	336	6	9	248	A		
	WB	21.0	C	WB Left	219	62	90	414	F		
				WB Through	679	8	90	414	A		
				WB Right	0	0	0	0	A		

Table D.15: PM Peak -2040 HSR +VSL + ARM- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
11- MD 121 at I-270 SB on and off ramp											
11	NB			NB Left	0	0	0	0	A	30.5	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	97.8	F	SB Left	272	121	378	1067	F		
				SB Through	0	0	0	0	A		
				SB Right	255	73	5	102	F		
	EB	6.4	A	EB Left	0	0	0	0	A		
				EB Through	717	6	16	209	A		
				EB Right	0	0	0	0	A		
	WB	14.1	B	WB Left	0	0	0	0	A		
WB Through				568	27	52	399	D			
WB Right				537	0	0	0	A			
12- MD 27 at Observation Dr											
12	NB	38.5	D	NB U-Turn	0	0	0	0	A	25.7	C
				NB Through	94	55	22	98	E		
				NB Right	61	12	22	98	B		
	SB	41.0	D	SB Left	146	44	38	216	D		
				SB Through	57	62	43	250	E		
				SB Right	188	32	68	287	C		
	EB	19.7	B	EB Left	210	32	83	535	C		
				EB Through	2244	19	85	536	B		
				EB Right	107	17	99	574	B		
	WB	30.0	C	WB Left	41	26	161	759	C		
WB Through				1695	31	161	759	C			
WB Right				69	11	161	759	B			
13- MD 27 at I-270 NB off ramp											
13	NB	45.2	D	NB Left	387	45	64	267	D	7.7	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.1	A	EB Left	0	0	0	0	A		
				EB Through	1515	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	6.1	A	WB Left	0	0	0	0	A		
WB Through				1789	6	54	786	A			
WB Right				0	0	0	0	A			
14- MD 27 at I-270 SB off ramp											
14	NB			NB Left	0	0	0	0	A	5.0	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	48.7	D	SB Left	175	49	34	158	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	1.9	A	EB Left	0	0	0	0	A		
				EB Through	1678	2	4	98	A		
				EB Right	0	0	0	0	A		
	WB	3.5	A	WB Left	0	0	0	0	A		
WB Through				1622	3	11	342	A			
WB Right				0	0	0	0	A			
15- MD 27 at Crystal Rock Dr											
15	NB	31.5	C	NB Left	77	32	109	566	C	71.2	E
				NB Through	1196	32	118	565	C		
				NB Right	55	30	124	578	C		
	SB	62.3	E	SB Left	164	80	456	1508	F		
				SB Through	1524	64	456	1508	E		
				SB Right	232	36	442	1502	D		
	EB	40.7	D	EB Left	125	54	35	128	D		
				EB Through	49	36	30	123	D		
				EB Right	62	19	24	157	B		
	WB	157.1	F	WB Left	104	91	999	1482	F		
WB Through				127	103	999	1482	F			
WB Right				666	178	999	1482	F			
16- MD 118 at Seneca Meadows Pkwy											
16	NB	5.6	A	NB Left	110	15	2	93	B	9.4	A
				NB Through	1417	5	13	245	A		
				NB Right	1	0	22	298	A		
	SB	7.8	A	SB Left	15	9	20	313	A		
				SB Through	1226	8	23	313	A		
				SB Right	11	5	28	345	A		
	EB	14.0	B	EB Left	23	58	14	134	E		
				EB Through	0	65	14	134	E		
				EB Right	312	11	14	134	B		
	WB	53.9	D	WB Left	103	65	43	243	E		
WB Through				7	69	39	242	E			
WB Right				30	13	48	262	B			
17- MD 118 at I-270 NB on ramp											
17	NB			NB Left	0	0	0	0	A	13.4	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	26.2	C	EB Left	491	26	43	279	C		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	9.5	A	WB Left	0	0	0	0	A		
WB Through				284	2	0	20	A			
WB Right				1364	11	43	523	B			
18- MD 118 at I-270 SB off ramp											
18	NB			NB Left	0	0	0	0	A	7.4	A
				NB Through	0	0.0	0	0	A		
				NB Right	0	0.0	0	0	A		
	SB	37.2	D	SB Left	168	37.2	27	146	D		
				SB Through	0	0.0	0	0	A		
				SB Right	0	0.0	0	0	A		
	EB	6.1	A	EB Left	0	0.0	0	0	A		
				EB Through	1407	6.1	15	472	A		
				EB Right	0	0.0	0	0	A		
	WB	5.6	A	WB Left	0	0.0	0	0	A		
WB Through				1715	5.6	13	256	A			
WB Right				0	0.0	0	0	A			
19- MD 118 at Aircraft Dr											
19	NB	26.0	C	NB Left	53	71	42	230	E	43.1	D
				NB Through	52	69	42	230	E		
				NB Right	228	6	5	102	A		
	SB	171.4	F	SB Left	434	160	432	654	F		
				SB Through	14	218	432	654	F		
				SB Right	125	205	432	654	F		
	EB	22.7	C	EB Left	125	34	90	526	C		
				EB Through	1415	22	90	526	C		
				EB Right	20	19	90	526	B		
	WB	25.0	C	WB Left	16	29	119	784	C		
WB Through				1562	29	119	784	C			
WB Right				411	9	119	784	A			
20- Middlebrook Rd at Observation Dr											
20	NB			NB Left	0	0	0	0	A	8.9	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	20.5	C	SB Left	125	36	23	150	D		
				SB Through	0	0	0	0	A		
				SB Right	186	10	23	150	B		
	EB	6.2	A	EB Left	15	13	17	171	B		
				EB Through	1184	6	17	171	A		
				EB Right	0	0	0	0	A		
	WB	8.6	A	WB Left	0	0	0	0	A		
WB Through				1313	9	26	260	A			
WB Right				17	6	41	309	A			

Table D.15: PM Peak -2040 HSR +VSL + ARM- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
21- Middlebrook Rd at I-270 SB on ramp											
21	NB			NB Left	0	0	0	0	A	4.6	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	2.6	A	EB Left	0	0	0	0	A		
				EB Through	742	3	4	106	A		
				EB Right	0	0	0	0	A		
	WB	8.0	A	WB Left	438	8	5	241	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
22- Middlebrook Rd at Waring Station Rd											
22	NB	48.4	D	NB Left	200	46	83	309	D	13.7	B
				NB Through	1	55	83	309	D		
				NB Right	236	50	83	309	D		
	SB	31.0	C	SB Left	32	47	8	72	D		
				SB Through	2	38	8	72	D		
				SB Right	24	8	20	110	A		
	EB	8.0	A	EB Left	4	12	27	282	B		
				EB Through	1125	8	27	282	A		
				EB Right	198	8	27	282	A		
	WB	9.2	A	WB Left	243	24	36	303	C		
				WB Through	1649	7	36	303	A		
				WB Right	3	2	36	303	A		
23- MD 124 at MD 355											
23	NB	145.6	F	NB Left	487	125	764	1145	F	76.1	E
				NB Through	1140	155	762	1142	F		
				NB Right	7	99	0	0	F		
	SB	47.2	D	SB Left	181	96	154	501	F		
				SB Through	698	70	154	501	E		
				SB Right	718	13	45	415	B		
	EB	29.6	C	EB Left	447	74	189	787	E		
				EB Through	2566	27	189	787	C		
				EB Right	532	3	86	676	A		
	WB	133.5	F	WB Left	0	0	0	0	A		
				WB Through	1602	136	693	942	F		
				WB Right	88	91	5	185	F		
24- MD 124 at I-270 SB on and off											
24	NB	57.5	F	NB Left	52	57	21	106	E	28.7	C
				NB Through	21	60	21	106	E		
				NB U-Turn	0	0	0	0	A		
	SB	38.9	D	SB Left	558	66	130	489	E		
				SB Through	8	66	130	489	E		
				SB Right	453	5	7	256	A		
	EB	27.0	C	EB Left	0	0	0	0	A		
				EB Through	1889	27	194	1079	C		
				EB Right	36	28	207	1103	C		
	WB	20.9	C	WB Left	5	47	246	1046	D		
				WB Through	1158	21	246	1046	C		
				WB Right	0	0	0	0	A		
25- MD 117 at MD 124											
25	NB	78.2	E	NB Left	55	153	326	748	F	51.2	D
				NB Through	678	93	326	748	F		
				NB Right	461	48	38	684	D		
	SB	38.9	D	SB Left	136	64	157	645	E		
				SB Through	965	42	157	645	D		
				SB Right	182	5	0	0	A		
	EB	48.2	D	EB Left	152	82	165	614	F		
				EB Through	1162	44	164	615	D		
				EB Right	58	40	172	643	D		
	WB	44.6	D	WB Left	388	73	281	1039	E		
				WB Through	1316	40	281	1039	D		
				WB Right	127	2	0	0	A		
26- MD 117 at Bureau Dr											
26	NB	49.8	D	NB Left	100	78	80	284	E	42.3	D
				NB Through	35	77	80	284	E		
				NB Right	271	36	80	284	D		
	SB	86.6	F	SB Left	286	100	138	409	F		
				SB Through	22	91	138	409	F		
				SB Right	83	40	138	409	D		
	EB	33.5	C	EB Left	50	83	184	880	F		
				EB Through	1678	32	185	880	C		
				EB Right	5	17	178	869	B		
	WB	39.6	D	WB Left	19	40	336	1064	D		
				WB Through	1625	42	336	1065	D		
				WB Right	279	27	368	1113	C		
27- MD 117 at I-270 SB off ramp											
27	NB			NB Left	0	0	0	0	A	13.3	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	3.6	A	EB Left	0	0	0	0	A		
				EB Through	940	4	7	544	A		
				EB Right	0	0	0	0	A		
	WB	43.7	E	WB Left	303	44	136	1071	E		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
28- MD 117 at I-270 NB off ramp											
28	NB			NB Left	0	0	0	0	A	57.4	E
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	151.3	F	SB Left	238	140	3091	5061	F		
				SB Through	0	0	0	0	A		
				SB Right	858	154	3090	5060	F		
	EB	18.5	B	EB Left	3	121	89	958	F		
				EB Through	940	18	89	958	B		
				EB Right	0	0	0	0	A		
	WB	9.3	A	WB Left	0	0	0	0	A		
				WB Through	1379	9	60	374	A		
				WB Right	0	0	60	374	A		
29- MD 117 at Perry Pkwy											
29	NB	38.2	D	NB Left	19	57	15	122	E	48.8	D
				NB Through	26	53	15	121	D		
				NB Right	33	16	23	141	B		
	SB	153.1	F	SB Left	238	189	270	450	F		
				SB Through	20	203	270	450	F		
				SB Right	118	72	270	450	E		
	EB	21.2	C	EB Left	247	68	88	359	E		
				EB Through	879	8	88	363	A		
				EB Right	33	8	74	347	A		
	WB	44.9	D	WB Left	37	114	269	742	F		
				WB Through	1244	46	269	742	D		
				WB Right	380	35	269	742	D		
30- Shady Grove Rd at I-270 NB off ramp											
30	NB	6.7	A	NB Left	0	0	0	0	A	24.1	C
				NB Through	1060	7	16	175	A		
				NB Right	0	0	0	0	A		
	SB	31.4	C	SB Left	0	0	0	0	A		
				SB Through	1353	31	185	881	C		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	51.2	D	WB Left	314	51	58	264	D		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table D.15: PM Peak -2040 HSR +VSL + ARM- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
31- Shady Grove Rd at I-270 SB off ramp											
31	NB	7.1	A	NB Left	0	0	0	0	A	15.9	B
				NB Through	1529	7	31	445	A		
				NB Right	0	0	0	0	A		
	SB	5.6	A	SB Left	0	0	0	0	A		
				SB Through	852	6	9	174	A		
				SB Right	0	0	0	0	A		
	EB	57.1	E	EB Left	232	56	46	180	E		
				EB Through	0	0	0	0	A		
				EB Right	305	58	65	268	E		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
32- MD 28 at I-270 SB off ramp											
32	NB			NB U-Turn	0	0	0	0	A	9.5	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	37.8	D	SB Left	444	46	79	326	D		
				SB Through	0	0	0	0	A		
				SB Right	104	3	0	31	A		
	EB	4.8	A	EB Left	0	0	0	0	A		
				EB Through	1552	4	138	648	A		
				EB Right	930	6	121	844	A		
	WB	7.4	A	WB Left	0	0	0	0	A		
				WB Through	1731	7	23	318	A		
				WB Right	0	0	0	0	A		
33- MD 28 at I-270 on and off ramps											
33	NB	34.8	C	NB Left	0	0	41	207	A	48.9	D
				NB Through	201	47	50	216	D		
				NB Right	134	17	50	216	B		
	SB	142.2	F	SB Left	17	167	358	417	F		
				SB Through	0	0	0	0	A		
				SB Right	246	141	358	417	F		
	EB	27.7	C	EB Left	280	91	148	465	F		
				EB Through	946	9	148	465	A		
				EB Right	0	0	0	0	A		
	WB	53.8	D	WB Left	40	47	213	428	D		
				WB Through	1247	54	187	391	D		
				WB Right	0	0	0	0	A		
34- MD 189 at Great Falls Rd											
34	NB	39.4	D	NB Left	43	52	11	87	D	48.0	D
				NB Through	14	43	9	86	D		
				NB Right	19	8	9	97	A		
	SB	38.3	D	SB Left	17	50	34	264	D		
				SB Through	12	43	34	264	D		
				SB Right	367	38	93	272	D		
	EB	36.7	D	EB Left	407	67	596	2360	E		
				EB Through	649	19	99	1181	B		
				EB Right	56	17	107	1208	B		
	WB	68.9	E	WB Left	13	55	222	673	E		
				WB Through	792	69	222	672	E		
				WB Right	16	64	247	706	E		
35- MD 189 at I-270 Ramps											
35	NB	54.0	D	NB Left	233	54	40	182	D	57.9	E
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	53.4	D	SB Left	351	53	121	538	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	29.9	C	EB Left	483	35	90	368	D		
				EB Through	374	23	90	368	C		
				EB Right	0	0	0	0	A		
	WB	91.3	F	WB Left	403	96	103	295	F		
				WB Through	393	86	103	295	F		
				WB Right	0	0	0	0	A		
36- MD 189 at Wootton Pkwy											
36	NB	45.8	D	NB Left	237	58	142	506	E	53.6	D
				NB Through	694	50	142	506	D		
				NB Right	176	12	142	506	B		
	SB	86.4	F	SB Left	251	107	306	797	F		
				SB Through	931	81	332	786	F		
				SB Right	0	0	0	0	A		
	EB	39.0	D	EB Left	152	72	125	468	E		
				EB Through	550	39	125	468	D		
				EB Right	205	15	125	468	B		
	WB	39.6	D	WB Left	155	70	136	656	E		
				WB Through	755	42	136	656	D		
				WB Right	306	18	136	656	B		
37- Montrose Rd at Tower Oaks Blvd											
37	NB	0.4	A	NB Left	0	0	0	0	A	24.2	C
				NB Through	0	0	0	0	A		
				NB Right	539	0	0	0	A		
	SB	68.3	E	SB Left	87	52	44	410	D		
				SB Through	0	0	0	0	A		
				SB Right	308	73	107	452	E		
	EB	7.2	A	EB Left	0	0	0	0	A		
				EB Through	1868	7	42	443	A		
				EB Right	0	0	0	0	A		
	WB	33.3	C	WB Left	79	43	42	443	D		
				WB Through	2629	34	219	773	C		
				WB Right	284	24	219	773	C		
38- Tower Oaks Blvd at I-270 off ramp											
38	NB	23.2	C	NB Left	706	24	50	274	C	17.4	B
				NB Through	0	0.0	43	266	A		
				NB Right	26	7.0	50	274	A		
	SB	8.2	A	SB Left	9	13.7	1	36	B		
				SB Through	0	0.0	1	36	A		
				SB Right	9	2.7	0	17	A		
	EB	10.9	B	EB Left	1	15.5	17	200	B		
				EB Through	363	11.2	17	199	B		
				EB Right	37	8.0	12	190	A		
	WB	13.4	B	WB Left	149	16.9	17	156	B		
				WB Through	213	11.1	17	156	B		
				WB Right	3	10.3	4	112	B		
39- Montrose Rd at Tower Oaks Blvd											
39	NB	20.4	C	NB Left	97	43	84	384	D	42.9	D
				NB Through	773	32	84	384	C		
				NB Right	621	2	0	0	A		
	SB	32.5	C	SB Left	210	64	75	330	E		
				SB Through	506	24	74	329	C		
				SB Right	131	15	71	318	B		
	EB	117.8	F	EB Left	104	98	313	654	F		
				EB Through	522	121	315	655	F		
				EB Right	44	124	337	678	F		
	WB	37.3	D	WB Left	574	46	117	387	D		
				WB Through	478	43	117	387	D		
				WB Right	331	14	138	418	B		
40- Rockledge Blvd at I-270 NB on and off ramp											
40	NB	139.8	F	NB Left	0	0	0	0	A	115.2	F
				NB Through	332	124	586	835	F		
				NB Right	844	146	586	835	F		
	SB	85.5	F	SB Left	0	0	89	234	A		
				SB Through	356	85	89	234	F		
				SB Right	0	0	0	0	A		
	EB	91.4	F	EB Left	6	146	281	755	F		
				EB Through	461	145	281	755	F		
				EB Right	304	9	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table D.15: PM Peak -2040 HSR +VSL + ARM- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS	
41- Rockledge Blvd at I-270 SB on and off ramps												
41	NB	31.6	C	NB Left	339	32	74	265	C	51.3	D	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	56.6	E		WB Left	355	63	220	908			E
					WB Through	888	54	220	908			D
					WB Right	0	0	0	0			A
42- MD 187 at Tuckerman Ln												
42	NB	79.4	E	NB Left	208	54	686	1329	D	136.9	F	
				NB Through	2290	81	686	1329	F			
				NB Right	200	81	686	1329	F			
	SB	192.3	F		SB Left	204	168	2564	2695			F
					SB Through	1129	190	2564	2695			F
					SB Right	304	216	2564	2695			F
	EB	124.1	F		EB Left	300	72	603	1433			E
					EB Through	529	151	604	1434			F
					EB Right	117	139	627	1458			F
	WB	195.5	F		WB Left	469	186	1942	2143			F
					WB Through	672	213	1942	2143			F
					WB Right	165	150	1942	2143			F
43- MD 187 at I-270 NB on and off ramps												
43	NB	20.0	B	NB Left	564	36	132	416	D	22.7	C	
				NB Through	2497	16	132	416	B			
				NB Right	0	0	0	0	A			
	SB	25.5	C		SB Left	0	0	0	0			A
					SB Through	1277	26	68	271			C
					SB Right	0	0	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	59.6	E		WB Left	61	60	45	282			E
					WB Through	67	59	45	282			E
					WB Right	0	0	0	0			A
44- MD 187 at I-270 NB on and off ramps												
44	NB	49.7	E	NB Left	0	0	0	0	A	46.1	D	
				NB Through	2412	50	224	751	D			
				NB Right	0	0	0	0	A			
	SB	19.4	B		SB Left	147	63	72	282			E
					SB Through	1192	14	72	282			B
					SB Right	0	0	0	0			A
	EB	78.3	E		EB Left	649	80	206	741			F
					EB Through	0	0	206	741			A
					EB Right	179	72	102	678			E
	WB				WB Left	0	0	0	0			A
					WB Through	0	0	0	0			A
					WB Right	0	0	0	0			A
45- MD 187 at Rock Spring Dr												
45	NB	22.4	C	NB Left	492	38	140	805	D	30.5	C	
				NB Through	2181	19	140	806	B			
				NB Right	18	14	162	839	B			
	SB	33.5	C		SB Left	20	62	107	468			E
					SB Through	1173	38	107	468			D
					SB Right	172	1	65	461			A
	EB	49.6	D		EB Left	431	60	144	478			E
					EB Through	50	68	144	478			E
					EB Right	485	38	144	478			D
	WB	16.7	B		WB Left	7	28	5	108			C
					WB Through	16	32	5	108			C
					WB Right	36	8	3	97			A
47-Democracy Blvd at I-270 NB off ramp												
47	NB	44.2	D	NB Left	154	44	28	152	D	2.9	A	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB	1.2	A		EB Left	0	0	0	0			A
					EB Through	1119	1	3	59			A
					EB Right	0	0	0	0			A
	WB	1.0	A		WB Left	0	0	0	0			A
					WB Through	2242	1	3	53			A
					WB Right	0	0	0	0			A
48- Democracy Blvd at I-270 SB on ramp												
48	NB			NB Left	0	0	0	0	A	7.9	A	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB	5.5	A		EB Left	0	0	0	0			A
					EB Through	1328	5	20	252			A
					EB Right	0	0	0	0			A
	WB	9.3	A		WB Left	544	32	54	338			C
					WB Through	1828	3	43	317			A
					WB Right	0	0	0	0			A
49- Democracy Blvd at I-270 SB off ramp												
49	NB			NB Left	0	0	0	0	A	9.1	A	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB	39.8	D		SB Left	153	54	31	184			D
					SB Through	0	0	0	0			A
					SB Right	58	3	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	5.8	A		WB Left	0	0	0	0			A
					WB Through	1828	4	19	302			A
					WB Right	159	30	108	668			C
50- MD 190 at Burdette Rd												
50	NB	77.1	E	NB Left	27	79	18	118	E	36.6	D	
				NB Through	7	72	18	118	E			
				NB Right	6	75	18	118	E			
	SB	36.0	D		SB Left	44	78	25	158			E
					SB Through	9	69	25	158			E
					SB Right	122	18	25	158			B
	EB	22.2	C		EB Left	139	104	118	724			F
					EB Through	1302	14	118	724			B
					EB Right	31	5	108	751			A
	WB	45.4	D		WB Left	13	124	390	1113			F
					WB Through	2163	45	390	1113			D
					WB Right	65	35	390	1113			C

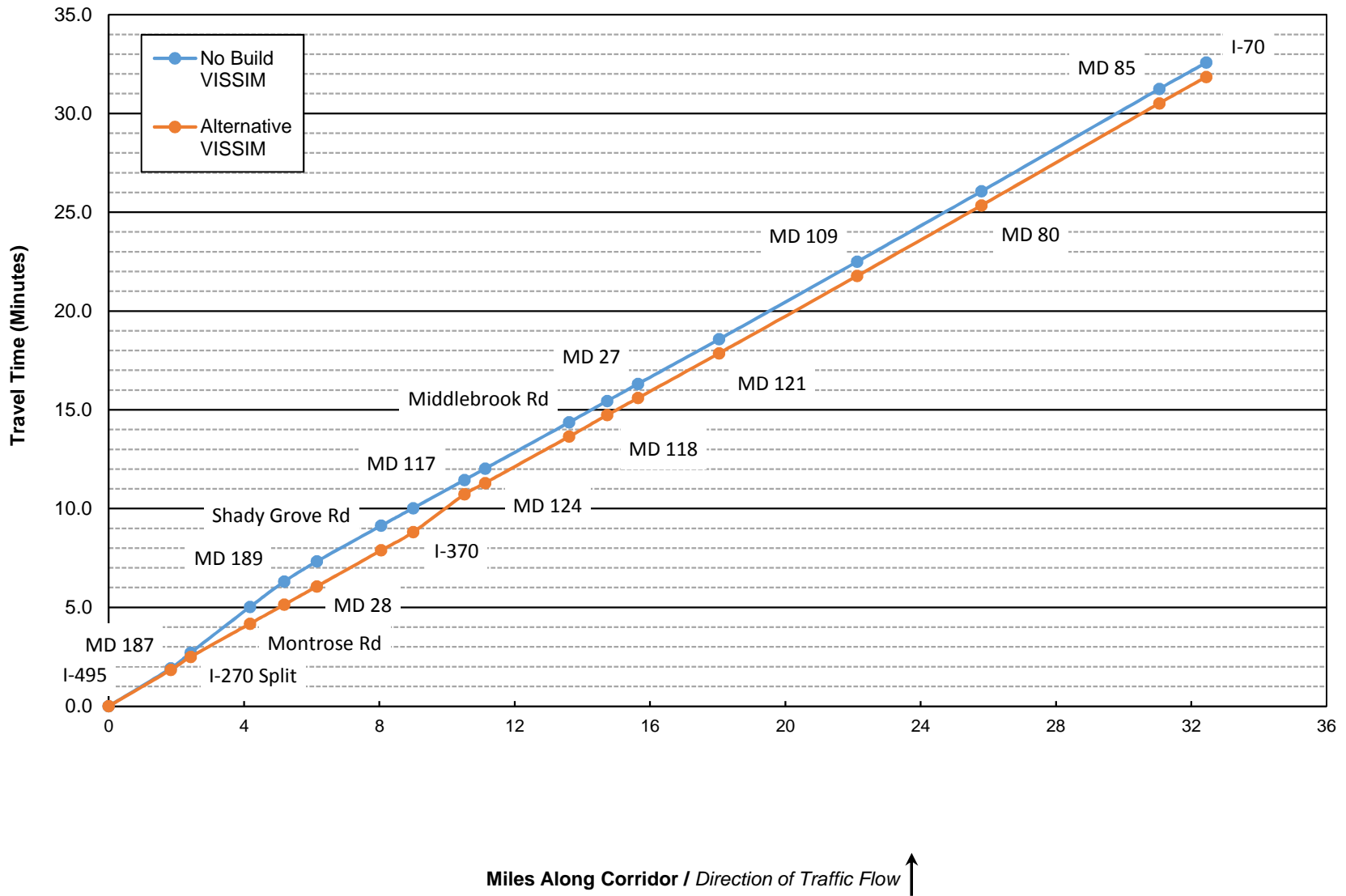
Table D.15: PM Peak -2040 HSR +VSL + ARM- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
51- MD 190 at I-270 NB on ramp											
51	NB			NB Left	0	0	0	0	A	18.1	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	67.2	E	EB Left	253	67	104	365	E		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	9.7	A	WB Left	0	0	0	0	A		
				WB Through	1475	10	51	780	A		
				WB Right	0	0	0	0	A		
52- MD 190 at I-270 SB off ramp											
52	NB	73.9	E	NB Left	229	74	95	795	E	12.7	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	3.7	A	EB Left	0	0	0	0	A		
				EB Through	1062	4	9	200	A		
				EB Right	0	0	0	0	A		
	WB	10.0	B	WB Left	0	0	0	0	A		
				WB Through	1637	10	25	432	B		
				WB Right	0	0	0	0	A		
53- MD 190 at Seven Locks Rd											
53	NB	0.5	A	NB Left	28	1	0	0	A	26.8	C
				NB Through	314	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	52.7	D	SB Left	364	52	120	414	D		
				SB Through	232	53	120	414	D		
				SB Right	20	52	120	414	D		
	EB	31.8	C	EB Left	27	29	95	442	C		
				EB Through	800	32	95	442	C		
				EB Right	45	32	95	442	C		
	WB	20.7	C	WB Left	257	76	126	452	E		
				WB Through	908	17	126	452	B		
				WB Right	693	5	126	452	A		
54- MD 124 at I-270 NB off ramp											
54	NB	36.7	D	NB Left	0	0	0	0	A	37.5	D
				NB Through	0	0	0	0	A		
				NB Right	1521	37	214	1052	D		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	38.2	D	EB Left	0	0	0	0	A		
				EB Through	2004	38	288	1216	D		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
55- Democracy Blvd at I-270 NB off ramp											
55	NB	48.2	D	NB Left	0	0	0	0	A	11.8	B
				NB Through	0	0	0	0	A		
				NB Right	316	48	53	230	D		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	1.5	A	EB Left	0	0	0	0	A		
				EB Through	1120	1	4	60	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
56- Watkins Mill Rd at I-270 SB off ramp/Parkview Ave											
56	NB	125.7	F	NB Left	140	60	359	704	E	107.7	F
				NB Through	0	0	0	0	A		
				NB Right	323	154	359	704	F		
	SB	46.2	D	SB Left	405	68	114	403	E		
				SB Through	110	60	114	403	E		
				SB Right	444	23	114	403	C		
	EB	189.8	F	EB Left	0	0	0	0	A		
				EB Through	1001	190	1030	1252	F		
				EB Right	3	138	1030	1252	F		
	WB	51.3	D	WB Left	95	89	89	319	F		
				WB Through	470	44	87	317	D		
				WB Right	0	0	0	0	A		
57- Watkins Mill Rd at I-270 NB on ramp											
57	NB	104.6	F	NB Left	243	63	1013	3025	E	84.5	F
				NB Through	0	0	0	0	A		
				NB Right	613	121	1013	3025	F		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	45.1	D	EB Left	530	106	262	445	F		
				EB Through	951	11	262	445	B		
				EB Right	0	0	0	0	A		
	WB	118.2	F	WB Left	0	0	0	0	A		
				WB Through	794	136	615	863	F		
				WB Right	422	84	615	863	F		
58- Watkins Mill Rd at I-270 SB on ramp											
58	NB			NB Left	0	0	0	0	A	25.4	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	32.7	C	EB Left	0	0	0	0	A		
				EB Through	1485	36	273	602	D		
				EB Right	244	12	273	602	B		
	WB	13.2	B	WB Left	476	28	59	475	C		
				WB Through	560	1	59	475	A		
				WB Right	0	0	0	0	A		

Table D.16: PM Peak- 2040 HSR+VSL+ARM- I-270 Vehicle Network Performance

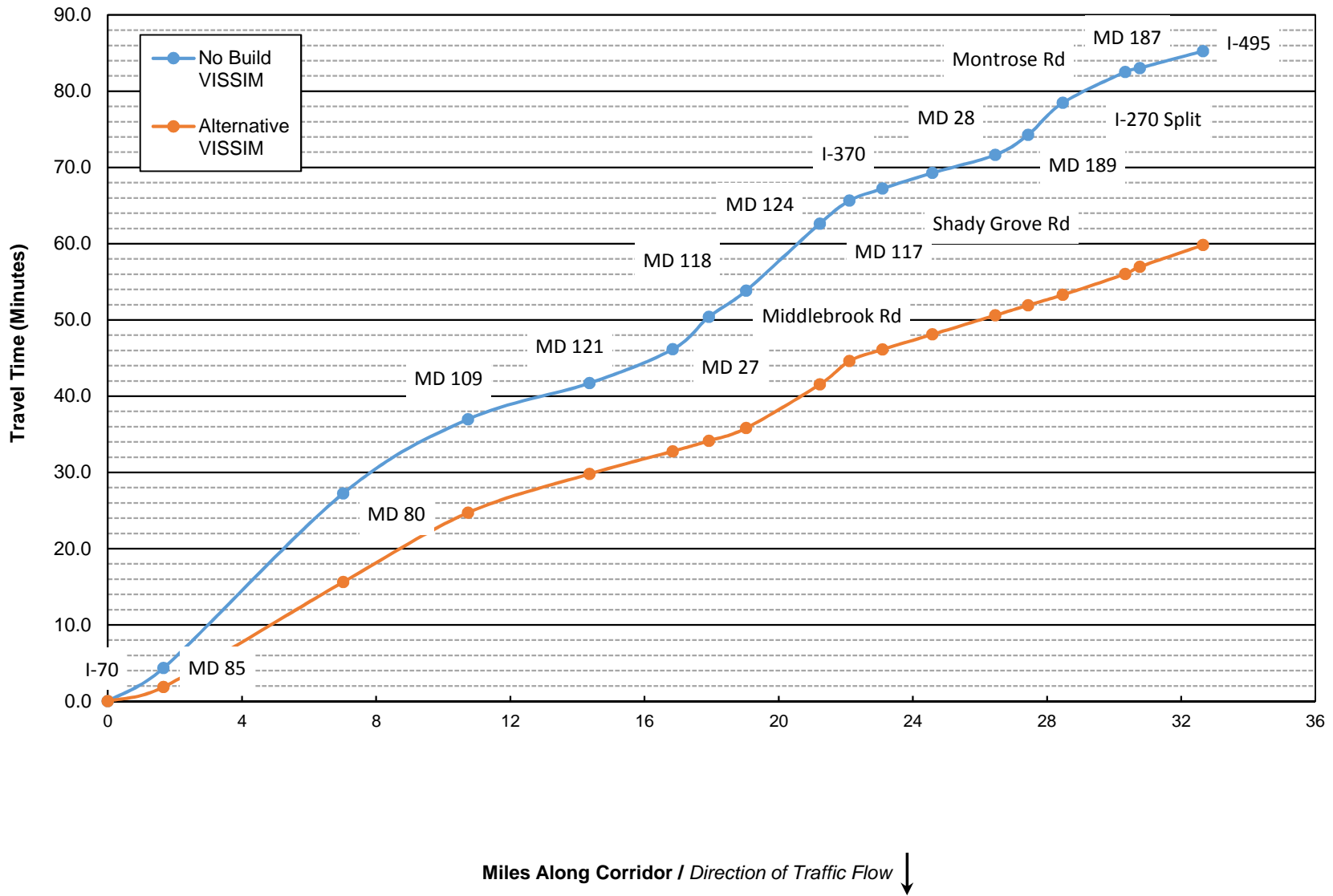
	No Build	HSR+VSL+ARM	% Change
Total Delay	36,237,078	29,258,237	-19%
Average Delay per Vehicle	307	243	-21%
Total Travel Time	67,865,560	64,421,662	-5%
Vehicles (Arrived)	95,124	100,230	5%
Latent Demand	8,861	6,231	-30%
Latent Delay	13,484,325	10,791,035	-20%
Total Distance	477,455	511,732	7%
Average Speed	25	29	13%

**Figure C.1: AM Peak - 2040 Final Model
I-270 Travel Time Graph - Northbound**



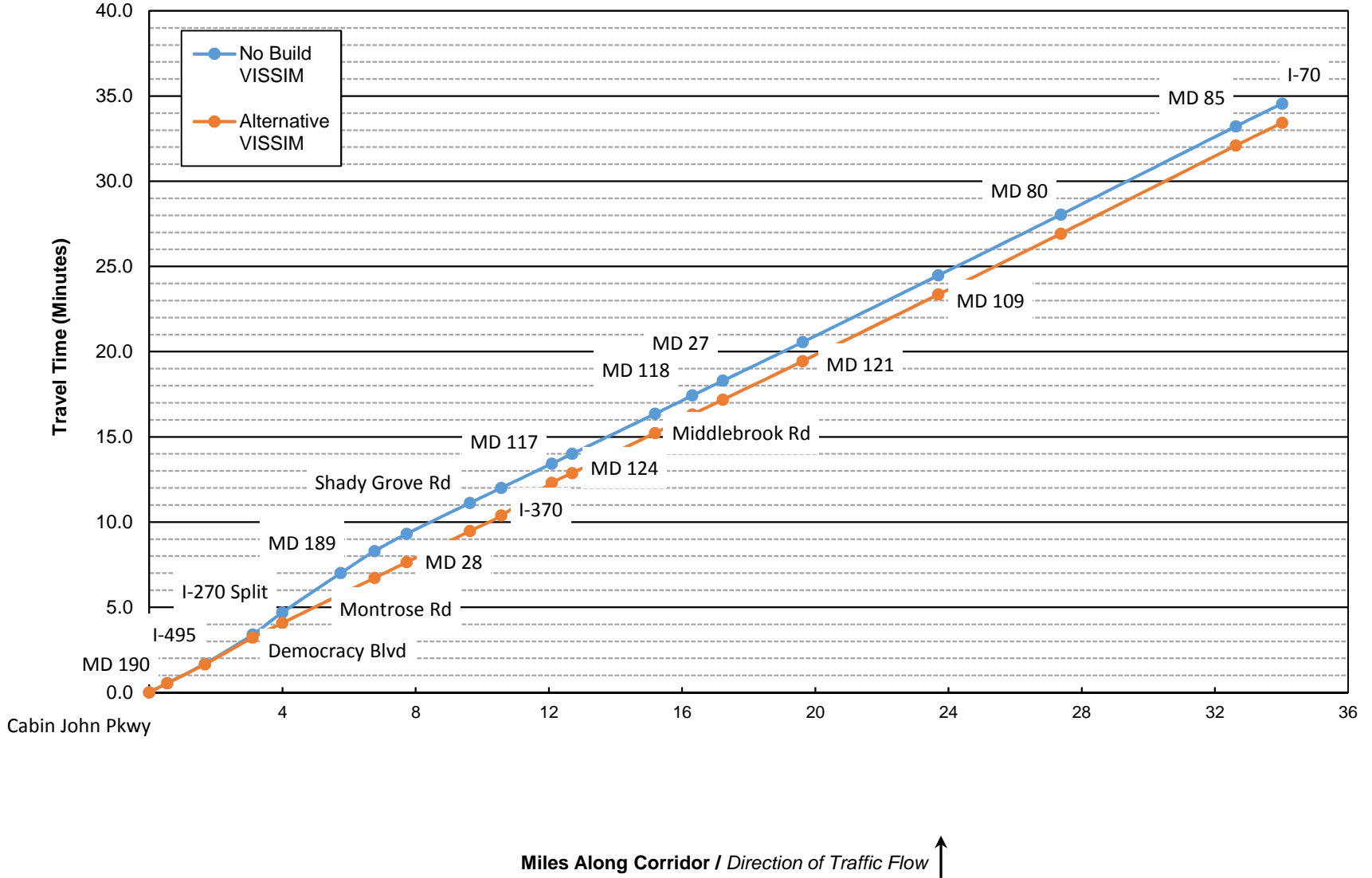
* Final = HSR + VSL + ARM + DDI

**Figure C.2: AM Peak - 2040 Final Model
I-270 Travel Time Graph - Southbound**



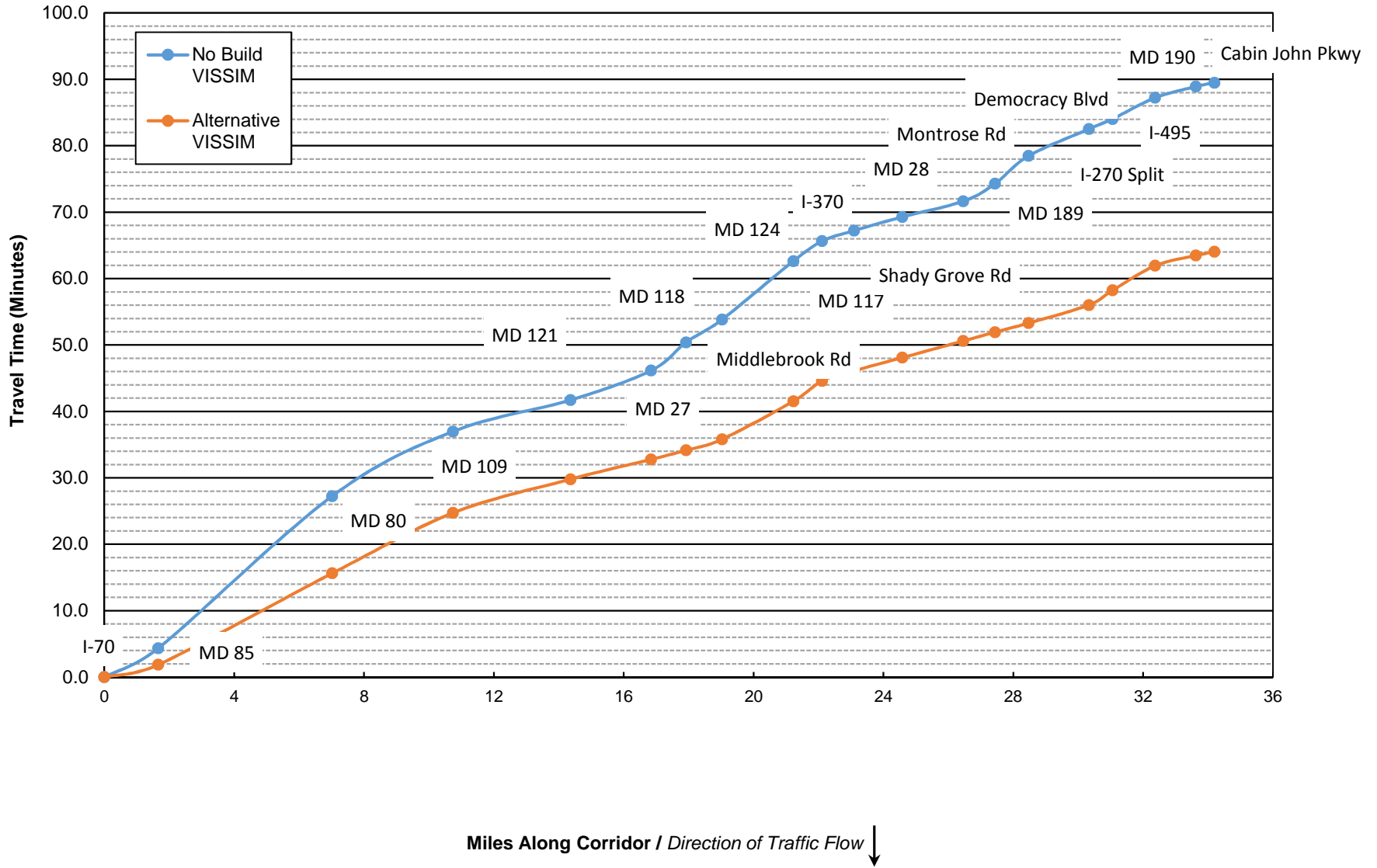
* Final = HSR + VSL + ARM + DDI

**Figure C.3: AM Peak - 2040 Final Model
I-270 Spur Travel Time Graph - Northbound**



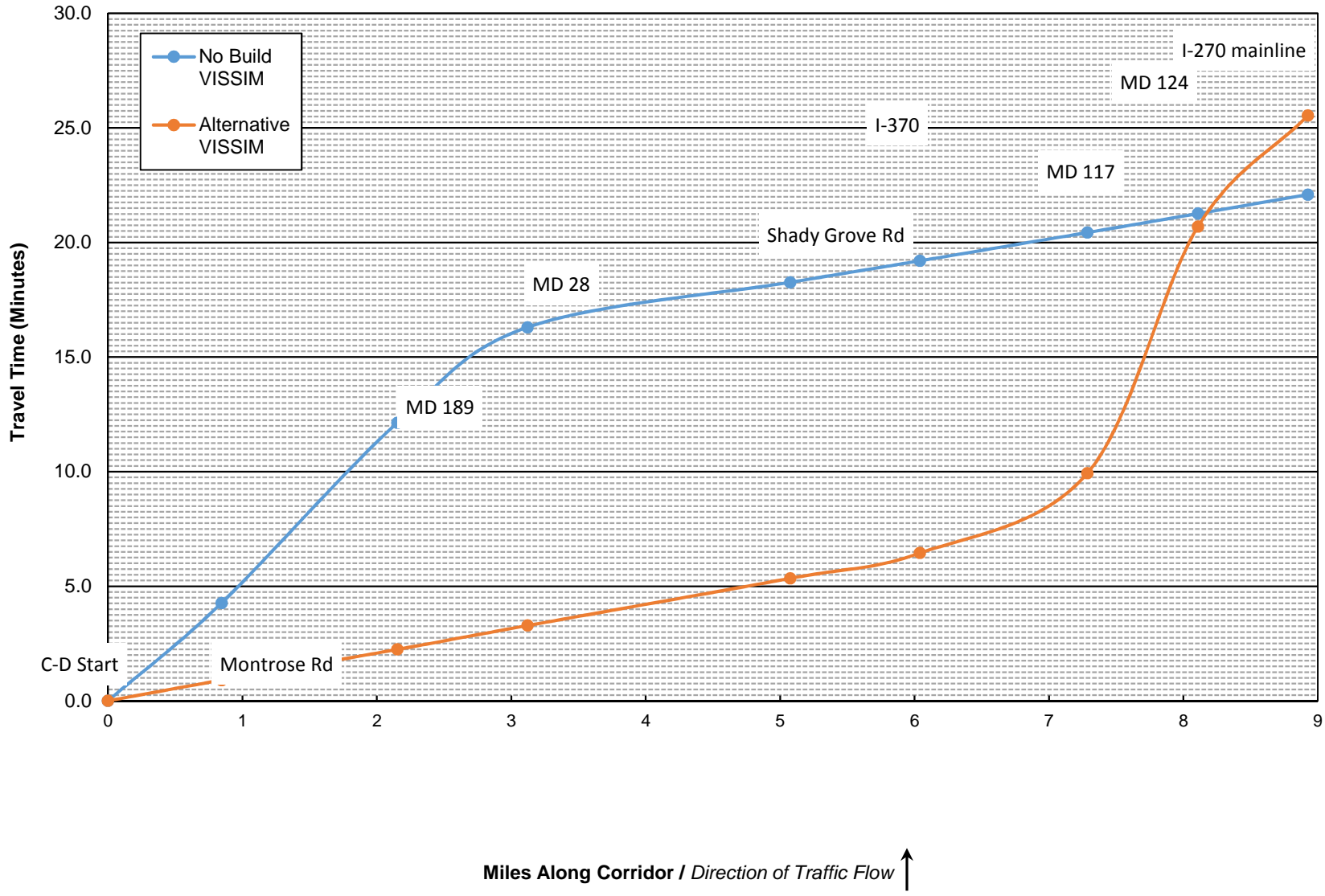
* Final = HSR + VSL + ARM + DDI

**Figure C.4: AM Peak - 2040 Final Model
I-270 Spur Travel Time Graph - Southbound**



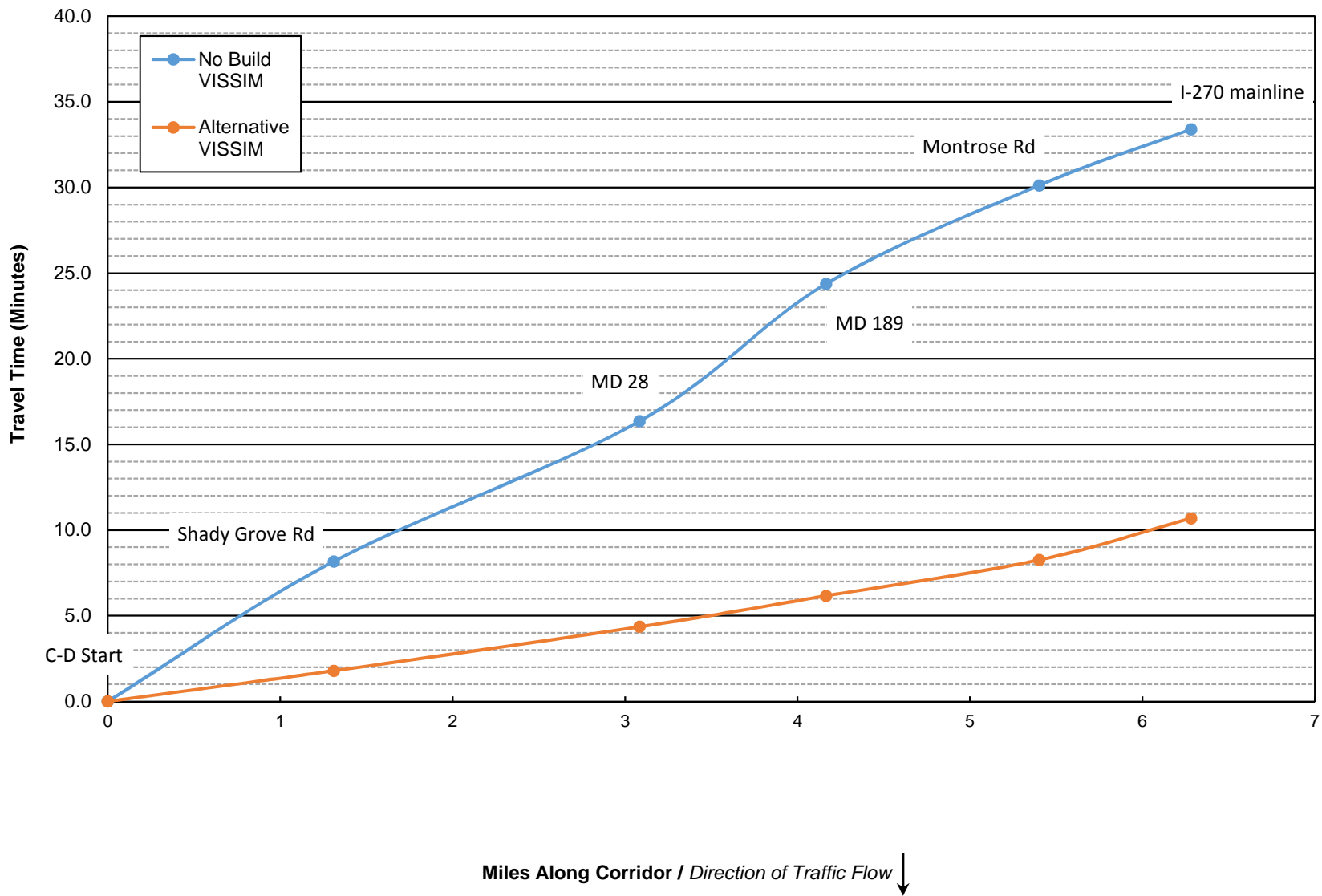
* Final = HSR + VSL + ARM + DDI

**Figure C.5: AM Peak - 2040 Final Model
I-270 Local Travel Time Graph - Northbound**



* Final = HSR + VSL + ARM + DDI

**Figure C.6: AM Peak - 2040 Final Model
I-270 Local Travel Time Graph - Southbound**



* Final = HSR + VSL + ARM + DDI

Table C.1: AM Peak -2040 Final Model - I-270 Vehicle Travel Time

I-270 Northbound	Segment Length (miles)	No Build VISSIM Travel Time (seconds)	Final VISSIM Travel Time (seconds)	% Change	I-270 Southbound	Segment Length (miles)	No Build VISSIM Travel Time (seconds)	Final VISSIM Travel Time (seconds)	% Change
From I-495 interchange					From I-70				
to MD 187	1.8	115.1	110.2	-4%	to MD 85	1.7	260.9	111.9	-57%
to I-270 Split	0.6	47.5	39.6	-17%	to MD 80	5.4	1,374.0	825.5	-40%
to Montrose Rd	1.8	139.0	100.7	-28%	to MD 109	3.7	583.2	545.5	-6%
to MD 189	1.0	77.0	57.8	-25%	to MD 121	3.6	284.4	304.7	7%
to MD 28	1.0	61.0	55.4	-9%	to MD 27	2.5	266.9	178.8	-33%
to Shady Grove Rd	1.9	108.7	109.6	1%	to MD 118	1.1	254.6	82.5	-68%
to I-370	0.9	53.0	55.1	4%	to Middlebrook Rd	1.1	206.2	99.6	-52%
to MD 117	1.5	85.5	114.8	34%	to MD 124	2.2	528.0	343.8	-35%
to MD 124	0.6	34.5	34.5	0%	to MD 117	0.9	180.6	184.3	2%
to Middlebrook Rd	2.5	140.8	141.1	0%	to I-370	1.0	94.3	90.4	-4%
to MD 118	1.1	64.7	65.3	1%	to Shady Grove Rd	1.5	124.1	118.8	-4%
to MD 27	0.9	52.0	51.9	0%	to MD 28	1.9	141.9	150.9	6%
to MD 121	2.4	135.6	135.7	0%	to MD 189	1.0	157.8	79.3	-50%
to MD 109	4.1	235.2	234.9	0%	to Montrose Rd	1.0	251.0	81.5	-68%
to MD 80	3.7	214.0	214.2	0%	to I-270 Split	1.9	243.1	163.6	-33%
to MD 85	5.3	310.9	310.1	0%	to MD 187	0.4	30.7	56.8	85%
to I-70	1.4	80.1	80.2	0%	to I-495 interchange	1.9	134.0	171.6	28%
I-270 Total (miles/minutes)	32.4	32.6	31.9	-2%	I-270 Total (miles/minutes)	32.7	85.3	59.8	-30%
I-270 Spur Northbound					I-270 Spur Southbound				
From Cabin John Pkwy					From I-70				
to MD 190	0.5	32.4	32.4	0%	to I-270 Split	30.3	4,951.1	3,361.1	-32%
to I-495	1.1	68.6	66.8	-3%	to Democracy Blvd	0.7	91.3	132.9	46%
to Democracy Blvd	1.4	102.7	94.1	-8%	to I-495	1.3	191.0	222.6	17%
to I-270 Split	0.9	77.7	51.2	-34%	to MD 190	1.3	101.6	91.4	-10%
to I-70	30.0	1,792.1	1,761.2	-2%	to Cabin John Pkwy	0.6	35.1	35.0	0%
I-270 Spur Total (miles/minutes)	34.0	34.6	33.4	-3%	I-270 Spur Total (miles/minutes)	34.2	89.5	64.1	-28%

* Final = HSR + VSL + ARM + DDI

Table C.2: AM Peak -2040 Final Model - I-270 Local Vehicle Travel Time

I-270 Northbound	Segment Length (miles)	No Build VISSIM Travel Time (seconds)	Final VISSIM Travel Time (seconds)	% Change	I-270 Southbound	Segment Length (miles)	No Build VISSIM Travel Time (seconds)	Final VISSIM Travel Time (seconds)	% Change
From C-D start					From C-D start				
to Montrose Rd	0.8	256.2	54.1	-79%	to Shady Grove	1.3	490.1	107.5	-78%
to MD 189	1.3	471.8	80.4	-83%	to MD 28	1.8	491.5	153.9	-69%
to MD 28	1.0	250.0	62.6	-75%	to MD 189	1.1	481.0	108.2	-77%
to Shady Grove	2.0	117.6	123.5	5%	to Montrose	1.2	344.5	125.7	-64%
to I-370	1.0	56.5	66.5	18%	to I-270 mainline	0.9	197.1	146.0	-26%
to MD 117	1.2	74.0	209.1	182%					
to MD 124	0.8	49.5	645.7	1204%					
to I-270 mainline	0.8	49.7	290.7	485%					
I-270 Local Total (miles/minutes)	8.9	22.1	25.5	16%	I-270 Local Total (miles/minutes)	6.3	33.4	10.7	-68%

* Final = HSR + VSL + ARM + DDI

Table C.3: AM Peak -2040 Final Model - I-270 Vehicle Speed

I-270 Northbound	Segment Length (miles)	No Build VISSIM Speed (MPH)	Final VISSIM Speed (MPH)	% Change	I-270 Southbound	Segment Length (miles)	No Build VISSIM Speed (MPH)	Final VISSIM Speed (MPH)	% Change
From I-495 interchange					From I-70				
to MD 187	1.8	57.4	59.9	4%	to MD 85	1.7	22.9	53.5	133%
to I-270 Split	0.6	44.8	53.7	20%	to MD 80	5.4	14.0	23.4	66%
to Montrose Rd	1.8	45.4	62.7	38%	to MD 109	3.7	23.0	24.6	7%
to MD 189	1.0	47.4	63.1	33%	to MD 121	3.6	45.8	42.8	-7%
to MD 28	1.0	56.9	62.7	10%	to MD 27	2.5	33.5	50.0	49%
to Shady Grove Rd	1.9	62.9	62.4	-1%	to MD 118	1.1	15.2	46.8	209%
to I-370	0.9	64.1	61.7	-4%	to Middlebrook Rd	1.1	19.4	40.2	107%
to MD 117	1.5	63.8	47.5	-25%	to MD 124	2.2	15.0	23.0	54%
to MD 124	0.6	64.0	63.9	0%	to MD 117	0.9	17.7	17.3	-2%
to Middlebrook Rd	2.5	63.6	63.5	0%	to I-370	1.0	37.6	39.2	4%
to MD 118	1.1	62.3	61.8	-1%	to Shady Grove Rd	1.5	43.1	45.1	5%
to MD 27	0.9	63.4	63.5	0%	to MD 28	1.9	47.6	44.8	-6%
to MD 121	2.4	63.6	63.5	0%	to MD 189	1.0	22.3	44.4	99%
to MD 109	4.1	62.4	62.5	0%	to Montrose Rd	1.0	14.8	45.6	208%
to MD 80	3.7	61.9	61.8	0%	to I-270 Split	1.9	27.5	40.9	49%
to MD 85	5.3	60.8	61.0	0%	to MD 187	0.4	51.0	27.6	-46%
to I-70	1.4	62.5	62.4	0%	to I-495 interchange	1.9	50.8	39.7	-22%
I-270 Total (miles/minutes)	32.4	59.8	61.1	2%	I-270 Total (miles/minutes)	32.7	23.0	32.7	43%
I-270 Spur Northbound					I-270 Spur Southbound				
From Cabin John Pkwy					From I-70				
to MD 190	0.5	59.9	59.9	0%	to I-270 Split	30.3	22.1	32.5	47%
to I-495	1.1	59.5	61.0	3%	to Democracy Blvd	0.7	28.8	19.8	-31%
to Democracy Blvd	1.4	50.3	54.9	9%	to I-495	1.3	24.7	21.2	-14%
to I-270 Split	0.9	41.3	62.7	52%	to MD 190	1.3	44.4	49.4	11%
to I-70	30.0	60.3	61.4	2%	to Cabin John Pkwy	0.6	58.5	58.7	0%
I-270 Spur Total (miles/minutes)	34.0	59.1	61.1	3%	I-270 Spur Total (miles/minutes)	34.2	22.9	32.0	40%

* Final = HSR + VSL + ARM + DDI

Table C.4: AM Peak -2040 Final Model - I-270 Local Vehicle Speed

I-270 Northbound	Segment Length (miles)	No Build VISSIM Speed (MPH)	Final VISSIM Speed (MPH)	% Change	I-270 Southbound	Segment Length (miles)	No Build VISSIM Speed (MPH)	Final VISSIM Speed (MPH)	% Change
From C-D start					From C-D start				
to Montrose Rd	0.8	11.9	56.2	373%	to Shady Grove	1.3	9.6	43.9	356%
to MD 189	1.3	10.0	58.5	487%	to MD 28	1.8	13.0	41.5	219%
to MD 28	1.0	13.9	55.7	300%	to MD 189	1.1	8.1	36.0	344%
to Shady Grove	2.0	59.8	57.0	-5%	to Montrose	1.2	12.9	35.4	174%
to I-370	1.0	61.5	52.3	-15%	to I-270 mainline	0.9	16.1	21.7	35%
to MD 117	1.2	60.6	21.5	-65%					
to MD 124	0.8	59.8	4.6	-92%					
to I-270 mainline	0.8	59.3	10.1	-83%					
I-270 Local Total (miles/minutes)	8.9	24.2	21.0	-14%	I-270 Local Total (miles/minutes)	6.3	11.3	35.3	212%

* Final = HSR + VSL + ARM + DDI

Table C.5: AM Peak -2040 Final Model - I-270 Vehicle Density

I-270 Northbound	Type	No Build		Final		% Change	I-270 Southbound	Type	No Build		Final		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS	
I-270	Freeway	40	E	27	D	-31%	I-270	Freeway	45	F	22	C	-52%
I-270 Diverge to MD 187	Diverge	33	D	21	C	-36%	I-270 Merge from WB I-70	Merge	62	F	14	B	-77%
I-270	Freeway	45	F	24	C	-46%	I-270	Freeway	67	F	26	D	-61%
I-270 Diverge to Rockledge Rd	Diverge	35	D	21	C	-40%	I-270 Merge from EB I-70	Merge	57	F	22	C	-61%
I-270	Freeway	48	F	20	C	-58%	I-270	Freeway	67	F	39	E	-42%
I-270 Weave from MD 187 to I-270 HOV	Weave	30	D	12	B	-59%	I-270 Diverge to SB MD 85	Diverge	70	F	45	F	-36%
I-270 Lane Drop	Merge	47	F	17	B	-65%	I-270	Freeway	92	F	39	E	-57%
I-270	Freeway	64	F	29	D	-54%	I-270 Diverge to NB MD 85	Diverge	56	F	20	B	-65%
I-270 Merge from I-270 Spur	Merge	63	F	25	C	-60%	I-270	Freeway	119	F	21	C	-82%
I-270 Weave from I-270 HOV to I-270 C-D	Weave	68	F	29	D	-58%	I-270 Merge from MD 85	Merge	104	F	21	C	-80%
I-270	Freeway	38	E	25	C	-33%	I-270	Freeway	112	F	70	F	-37%
I-270 Diverge to C-D (MD 189)	Diverge	31	D	23	C	-26%	I-270 Diverge to MD 80	Diverge	61	F	55	F	-10%
I-270	Freeway	23	C	19	C	-16%	I-270	Freeway	108	F	99	F	-8%
I-270 Diverge to C-D (MD 28)	Diverge	50	F	21	C	-59%	I-270 Merge from MD 80	Merge	111	F	52	F	-53%
I-270	Freeway	14	B	16	B	13%	I-270	Freeway	75	F	71	F	-5%
I-270 Merge from C-D (MD 189)	Merge	14	B	19	B	37%	I-270 Diverge to MD 109	Diverge	41	F	38	E	-7%
I-270 Diverge to C-D (Shady Grove Rd)	Diverge	18	B	22	C	21%	I-270	Freeway	80	F	76	F	-5%
I-270	Freeway	12	B	16	B	29%	I-270 Merge from MD 109	Merge	87	F	56	F	-36%
I-270 Weave from C-D (MD 28) to C-D (Shady Grove Rd)	Weave	10	B	14	B	35%	I-270	Freeway	44	E	51	F	16%
I-270	Freeway	10	A	20	C	95%	I-270 Diverge to SB Weigh Station	Diverge	19	B	23	C	25%
I-270 Merge from C-D (Shady Grove Rd)	Merge	9	A	22	C	159%	I-270	Freeway	38	E	48	F	27%
I-270	Freeway	12	B	43	E	273%	I-270 Merge from SB Weigh Station	Merge	20	B	24	C	19%
I-270 Merge from C-D (I-370)	Merge	10	B	66	F	544%	I-270	Freeway	41	E	44	E	8%
I-270 Diverge to C-D (MD 117)	Diverge	16	B	94	F	482%	I-270 Diverge to MD 121	Diverge	20	B	20	C	3%
I-270	Freeway	12	B	10	A	-15%	I-270	Freeway	28	D	27	D	-4%
I-270 Merge from C-D (MD 124)	Merge	14	B	13	B	-10%	I-270 Merge from WB MD 121	Merge	33	D	22	C	-33%
I-270	Freeway	16	B	15	B	-8%	I-270	Freeway	43	E	24	C	-45%
I-270 Diverge to EB Middlebrook Rd	Diverge	10	B	10	A	-9%	I-270 Merge from EB MD 121	Merge	37	E	17	B	-54%
I-270	Freeway	15	B	14	B	-7%	I-270	Freeway	55	F	25	C	-55%
I-270 Diverge to WB Middlebrook Rd	Diverge	10	A	9	A	-7%	I-270 Diverge to MD 27	Diverge	57	F	25	C	-57%
I-270	Freeway	13	B	12	B	-7%	I-270	Freeway	81	F	25	C	-70%
I-270 Diverge to EB MD 118	Diverge	11	B	10	B	-7%	I-270 Merge from WB MD 27	Merge	90	F	26	C	-71%
I-270 Diverge to WB MD 118	Diverge	15	B	14	B	-8%	I-270	Freeway	82	F	36	E	-56%
I-270	Freeway	13	B	12	B	-6%	I-270 Weave from EB MD 27 to MD 118	Weave	81	F	29	D	-64%
I-270 Weave from MD 118 to MD 27	Weave	13	B	12	B	-5%	I-270	Freeway	91	F	36	E	-60%
I-270	Freeway	12	B	12	B	-5%	I-270 Merge from WB MD 118	Merge	73	F	28	D	-61%
I-270 Merge from EB MD 27	Merge	13	B	12	B	-5%	I-270	Freeway	85	F	41	E	-52%
I-270	Freeway	14	B	13	B	-4%	I-270 Merge from EB MD 118	Merge	73	F	33	D	-55%
I-270 Merge from WB MD 27	Merge	11	B	10	B	-3%	I-270	Freeway	70	F	44	E	-38%
I-270	Freeway	14	B	14	B	-4%	I-270 Merge from Middlebrook Rd	Merge	113	F	44	F	-61%
I-270 Diverge to MD 121	Diverge	11	B	11	B	-3%	I-270	Freeway	86	F	48	F	-44%

* Final = HSR + VSL + ARM + DDI

Table C.5: AM Peak -2040 Final Model - I-270 Vehicle Density

I-270 Northbound	Type	No Build		Final		% Change	I-270 Southbound	Type	No Build		Final		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS	
I-270	Freeway	11	A	10	A	-4%	I-270 Diverge to Watkins Mill Rd	Diverge	81	F	39	E	-52%
I-270 Merge from EB MD 121	Merge	10	A	9	A	-5%	I-270	Freeway	124	F	64	F	-48%
I-270 Lane Drop	Merge	13	B	13	B	-5%	I-270 Diverge to MD 124	Diverge	89	F	40	E	-56%
I-270	Freeway	19	C	18	B	-6%	I-270	Freeway	133	F	113	F	-15%
I-270 Diverge to NB Weigh Station	Diverge	10	B	10	A	-4%	I-270 Merge from Watkins Mill	Merge	158	F	153	F	-3%
I-270	Freeway	21	C	20	C	-4%	I-270	Freeway	99	F	110	F	12%
I-270 Merge from NB Weight Station	Merge	10	B	10	A	-4%	I-270 Merge from WB MD 124	Merge	132	F	104	F	-21%
I-270	Freeway	21	C	20	C	-4%	I-270	Freeway	53	F	51	F	-3%
I-270 Diverge to MD 109	Diverge	11	B	11	B	-4%	I-270 Merge from MD 117	Merge	49	F	49	F	0%
I-270	Freeway	19	C	18	C	-4%	I-270	Freeway	48	F	44	E	-9%
I-270 Merge from MD 109	Merge	11	B	10	B	-5%	I-270 Diverge to I-370	Diverge	41	F	34	D	-17%
I-270	Freeway	21	C	20	C	-4%	I-270	Freeway	49	F	37	E	-25%
I-270 Diverge to MD 80	Diverge	12	B	12	B	-4%	I-270 Diverge to I-270 C-D	Diverge	96	F	28	C	-71%
I-270	Freeway	19	C	18	B	-4%	I-270	Freeway	20	C	25	C	28%
I-270 Merge from MD 80	Merge	14	B	12	B	-10%	I-270 Merge from I-270 (I-370)	Merge	20	C	24	C	19%
I-270	Freeway	24	C	22	C	-9%	I-270 Diverge to I-270 C-D (Shady Grove Rd)	Diverge	27	C	25	C	-7%
I-270 Diverge to Scenic View	Diverge	12	B	11	B	-11%	I-270	Freeway	21	C	22	C	6%
I-270	Freeway	24	C	22	C	-9%	I-270 Merge from I-270 C-D (Shady Grove Rd Northern)	Merge	18	B	22	C	26%
I-270 Merge from Scenic View	Merge	12	B	11	B	-9%	I-270	Freeway	26	C	26	C	0%
I-270	Freeway	25	C	22	C	-9%	I-270 Merge from I-270 C-D (Shady Grove Rd Southern)	Merge	32	D	25	C	-20%
I-270 Diverge to NB MD 85	Diverge	14	B	13	B	-7%	I-270 Diverge to I-270 C-D (MD 189)	Diverge	46	F	34	D	-27%
I-270	Freeway	23	C	21	C	-9%	I-270	Freeway	82	F	20	C	-76%
I-270 Diverge to SB MD 85	Diverge	17	B	16	B	-10%	I-270 Merge from I-270 C-D (MD 189)	Merge	106	F	21	C	-80%
I-270	Freeway	19	C	17	B	-10%	I-270	Freeway	77	F	29	D	-63%
I-270 Weave from MD 85 to I-70	Weave	13	B	13	B	-4%	I-270 Merge from I-270 C-D	Merge	39	E	39	E	0%
I-270	Freeway	17	B	16	B	-6%	I-270 Diverge to I-270 HOV Lane	Diverge	19	B	27	C	46%
							I-270 Diverge to I-270 Spur	Diverge	40	E	50	F	26%
							I-270	Freeway	23	C	41	E	77%
							I-270 Diverge to Rockledge Dr / MD 187	Diverge	17	B	42	F	147%
							I-270	Freeway	23	C	26	C	10%
							I-270 Merge from Rockledge Dr	Merge	19	B	21	C	7%
							I-270	Freeway	24	C	28	D	16%
							I-270 Merge from Rockledge Dr / MD 187	Merge	22	C	23	C	5%
							I-270	Freeway	26	C	29	D	13%

* Final = HSR + VSL + ARM + DDI

Table C.6: AM Peak -2040 Final Model - I-270 Spur Vehicle Density

I-270 Spur Northbound	Type	No Build		Final			I-270 Southbound	Type	No Build		Final		
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS	% Change			Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS	% Change
I-270 Spur	Freeway	57	F	57	F	0%	I-270 Spur	Freeway	49	F	66	F	37%
I-270 Spur Merge from Clara Barton Parkway	Merge	25	C	25	C	0%	I-270 Spur Weave from I-270 HOV to Democracy Blvd	Weave	60	F	82	F	35%
I-270 Spur	Freeway	39	E	39	E	0%	I-270 Spur	Freeway	54	F	68	F	25%
I-270 Diverge to MD 190	Diverge	28	D	28	D	0%	I-270 Merge from Democracy Blvd	Merge	30	D	34	D	13%
I-270 Spur	Freeway	34	D	34	D	0%	I-270 Spur Lane Drop	Merge	54	F	60	F	12%
I-270 Spur Merge from Cabin John Parkway	Merge	25	C	25	C	-3%	I-270 Spur	Freeway	75	F	81	F	7%
I-270 Spur Merge from MD 190	Merge	26	C	24	C	-6%	I-270 Spur Merge from I-495	Merge	37	E	37	E	-1%
I-270 Spur	Freeway	35	D	32	D	-9%	I-270 Spur	Freeway	45	F	39	E	-14%
I-270 Spur Diverge to I-495	Merge	38	E	35	D	-8%	I-270 Spur Diverve to EB MD 190	Diverge	56	F	48	F	-14%
I-270 Spur	Freeway	40	E	33	D	-17%	I-270 Spur Diverve to Cabin John Pkwy	Diverge	27	C	27	C	-1%
I-270 Spur Diverge to Democracy Blvd	Diverge	33	D	27	C	-17%	I-270 Spur	Freeway	29	D	29	D	-1%
I-270 Spur	Freeway	36	E	26	C	-30%	I-270 Merge from MD 190	Merge	26	C	26	C	0%
I-270 Spur Merge from EB Democracy Blvd	Merge	30	D	16	B	-48%	I-270 Spur	Freeway	34	D	34	D	-1%
I-270 Spur	Freeway	39	E	24	C	-39%	I-270 Diverge to WB Clara Barton Pkwy	Diverge	23	C	23	C	0%
I-270 Spur Merge from WB Democracy Blvd	Merge	30	D	16	B	-46%	I-270 Spur	Freeway	33	D	33	D	0%
I-270 Spur	Freeway	43	E	25	C	-42%	I-270 Merge from Clara Barton Pkwy	Merge	30	D	30	D	0%
I-270 Spur Merge from Westlake Terrace	Merge	45	F	25	C	-45%							
I-270 Spur	Freeway	50	F	26	C	-49%							

* Final = HSR + VSL + ARM + DDI

Table C.7: AM Peak -2040 Final Model - I-270 Local Vehicle Density

I-270 Northbound	Type	No Build		Final		% Change	I-270 Southbound	Type	No Build		Final		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS	
I-270 C-D	Freeway	84	F	36	E	-57%	I-270 C-D	Freeway	107	F	24	C	-78%
I-270 C-D Diverge to EB Montrose Rd	Diverge	48	F	23	C	-53%	I-270 C-D Weave from I-370 EB to I-270	Weave	128	F	24	B	-81%
I-270 C-D	Freeway	80	F	19	C	-76%	I-270 C-D Diverge to Shady Grove Rd	Diverge	115	F	18	B	-85%
I-270 C-D Weave between Montrose Rd Loop Ramps	Weave	69	F	13	B	-81%	I-270 C-D	Freeway	137	F	25	C	-82%
I-270 C-D	Freeway	84	F	18	C	-78%	I-270 C-D Merge from WB Shady Grove Rd	Merge	106	F	23	C	-78%
I-270 C-D Merge from WB Montrose Rd	Merge	89	F	25	C	-72%	I-270 C-D	Freeway	113	F	35	D	-69%
I-270 C-D	Freeway	98	F	31	D	-69%	I-270 C-D Merge from EB Shady Grove Rd	Merge	77	F	26	C	-66%
I-270 C-D Merge from I-270	Merge	96	F	30	D	-68%	I-270 C-D	Freeway	93	F	30	D	-68%
I-270 C-D	Freeway	104	F	31	D	-70%	I-270 C-D Merge from I-270	Merge	98	F	25	C	-75%
I-270 C-D Diverge to MD 189	Diverge	58	F	17	B	-71%	I-270 C-D Diverge to I-270	Diverge	56	F	36	E	-36%
I-270 C-D	Freeway	111	F	24	C	-78%	I-270 C-D Diverge to I-270	Diverge	64	F	36	E	-43%
I-270 C-D Merge from MD 189	Merge	101	F	19	B	-81%	I-270 C-D	Freeway	75	F	27	D	-65%
I-270 C-D	Freeway	114	F	32	D	-72%	I-270 C-D Diverge to MD 28	Diverge	62	F	17	B	-72%
I-270 C-D Weave between I-270 (to MD 28 from MD 189)	Weave	108	F	31	C	-71%	I-270 C-D	Freeway	128	F	19	C	-85%
I-270 C-D	Freeway	106	F	32	D	-69%	I-270 C-D Merge from WB MD 28	Merge	160	F	13	B	-92%
I-270 C-D Diverge to MD 28	Diverge	64	F	22	C	-65%	I-270 C-D	Freeway	132	F	23	C	-83%
I-270 C-D	Freeway	87	F	27	D	-69%	I-270 C-D Merge from EB MD 28	Merge	152	F	25	C	-83%
I-270 C-D Weave between MD 28 Ramps	Weave	109	F	37	E	-66%	I-270 C-D	Freeway	123	F	40	E	-68%
I-270 C-D	Freeway	7	A	11	A	64%	I-270 C-D Merge from I-270	Merge	124	F	30	D	-76%
I-270 C-D Merge from MD 28 WB	Merge	6	A	7	A	15%	I-270 C-D	Freeway	95	F	32	D	-66%
I-270 C-D Merge from I-270 and Drop Lane	Merge	7	A	10	A	37%	I-270 C-D Diverge to MD 189	Diverge	60	F	25	C	-58%
I-270 C-D Diverge to I-270	Diverge	12	B	16	B	33%	I-270 C-D	Freeway	117	F	16	B	-86%
I-270 C-D	Freeway	19	C	26	D	37%	I-270 C-D Merge from MD 189	Merge	120	F	21	C	-83%
I-270 C-D Diverge to Shady Grove Rd	Diverge	15	B	20	C	31%	I-270 C-D Diverge to I-270	Diverge	84	F	36	E	-58%
I-270 C-D	Freeway	5	A	7	A	25%	I-270 C-D	Freeway	92	F	50	F	-46%
I-270 C-D Merge from I-270 and EB Shady Grove Rd	Merge	8	A	10	A	17%	I-270 C-D Diverge to WB Montrose Rd	Diverge	55	F	29	D	-47%
I-270 C-D	Freeway	8	A	9	A	19%	I-270 C-D	Freeway	98	F	53	F	-46%
I-270 C-D Merge from WB Shady Grove Rd	Merge	10	A	12	B	18%	I-270 Weave between Montrose Rd Loops	Weave	94	F	57	F	-39%
I-270 C-D Diverge to I-270	Diverge	14	B	18	B	25%	I-270 C-D	Freeway	76	F	70	F	-7%
I-270 C-D	Freeway	13	B	15	B	18%	I-270 C-D Merge from EB Montrose Rd	Merge	56	F	56	F	0%
I-270 C-D Diverge to I-370	Diverge	13	B	16	B	24%	I-270 C-D	Freeway	54	F	58	F	7%
I-270 C-D	Freeway	2	A	6	A	176%							
I-270 Merge from I-370 EB	Merge	7	A	27	C	263%							
I-270 C-D	Freeway	8	A	30	D	294%							
I-270 C-D Weave from I-370 to I-270	Weave	19	B	54	F	186%							
I-270 C-D	Freeway	14	B	36	E	161%							
I-270 C-D Weave from I-270 to MD 117	Weave	19	B	55	F	190%							
I-270 C-D Diverge to MD 124	Diverge	13	B	107	F	729%							
I-270 C-D	Freeway	13	B	140	F	955%							
I-270 C-D Merge from EB MD 124	Merge	12	B	130	F	1010%							
I-270 C-D Merge From WB MD 124	Merge	12	B	140	F	1021%							
I-270 C-D	Freeway	10	A	9	A	-6%							
I-270 C-D Merge from Watkins Mill	Merge	10	A	12	B	18%							

* Final = HSR + VSL + ARM + DDI

Table C.8: AM Peak - 2040 Final Model - I-270 Vehicle Throughput

I-270 Northbound	No-Build VISSIM Throughput	Final VISSIM Throughput	Change %	I-270 Southbound	No-Build VISSIM Throughput	Final VISSIM Throughput	Change %
Between I-495 and MD 187	4485	4861	8%	North of I-70	2514	2637	5%
Between MD 187 on and off ramps	3881	4320	11%	Between I-70 on ramps	2842	3038	7%
Between Rockledge Blvd on and off ramps	3138	3624	15%	From I-70 interchange to MD-85	4882	5373	10%
Between Rockledge Dr and I-270 Spur	2720	3293	21%	Between MD-85 on and off ramps	2530	2888	14%
Between I-270 Spur and Montrose Rd	7422	8817	19%	Between MD-85 and MD-80	3043	3370	11%
Between Montrose Rd on and off ramps	4321	5078	18%	Between MD-80 on and off ramps	2724	3029	11%
Between Montrose Rd and MD 189	4064	4734	16%	Between MD-80 and Md-109	3532	3691	5%
Between MD 189 and MD 28	4018	4736	18%	Between MD-109 on and off ramps	3430	3628	6%
Between MD 28 on and off ramps	4122	5128	24%	Between MD-109 and MD-121	4100	4205	3%
Between MD 28 and Shady Grove Rd	2980	3807	28%	Between MD-121 on and off ramps	3551	3685	4%
Between Shady Grove Rd and I-370	2552	3215	26%	Between MD-121 and MD-27	4802	4955	3%
Between I-370 on and off ramps	2849	3247	14%	Between MD-27 on and off ramps	4223	4642	10%
Between I-370 and MD 117	3979	3590	-10%	Between MD-27 and MD-118	4688	5250	12%
Between MD 117 and MD 124	3010	2549	-15%	Between MD-118 on and off ramps	4542	5087	12%
Between MD-124 on and off ramps	3023	2570	-15%	Between MD-118 and Middlebrook Rd	5199	5775	11%
Between Watkins Mill Rd & Middlebrook Rd	3974	3660	-8%	Between Middlebrook Rd on and off ramps	5197	5757	11%
Between Middlebrook Rd on and off ramps	3705	3441	-7%	Between Middlebrook Rd and MD-124	6832	7174	5%
Between Middlebrook Rd and MD 118	3293	3069	-7%	Between MD-124 on and off ramps	5415	5771	7%
Between MD-118 on and off ramps	2981	2781	-7%	Between MD-124 and MD-117	6469	6988	8%
Between MD 118 and MD 27	2827	2679	-5%	Between MD-117 and I-370	8146	8703	7%
Between MD-27 on and off ramps	2280	2169	-5%	Between I-370 on and off ramps	2997	3291	10%
Between MD 27 and MD 121	2687	2584	-4%	Between I-370 on ramp to Shady Grove Rd	3871	3297	-15%
Between MD-121 on and off ramps	1970	1900	-4%	Between Shady Grove Rd and MD 28	3552	3246	-9%
Between MD 121 and MD 109	2497	2386	-4%	Between MD 28 on and off ramps	4372	4050	-7%
Between MD-109 on and off ramps	2327	2237	-4%	Between MD 28 and MD 189	3946	3466	-12%
Between MD 109 and MD 80	2487	2379	-4%	Between MD 189 and Montrose Rd	4070	3124	-23%
Between MD-80 on and off ramps	2222	2140	-4%	Between Montrose Rd on and off ramps	5046	3777	-25%
Between MD 80 and MD 85	2916	2657	-9%	Between Montrose Rd and I-270 Spur	8064	7697	-5%
Between MD-85 on and off ramps	2213	2025	-8%	Between I-270 Spur and Rockledge Blvd	3823	3596	-6%
Between MD 85 and I-70	3227	3035	-6%	Between Rockledge Blvd on and off ramps	2733	2523	-8%
North of I-70	2081	1966	-6%	Between MD 187 on and off ramps	2887	2719	-6%
				Between MD 187 and I-495	2902	2876	-1%
I-270 Spur Northbound				I-270 Spur Southbound			
Between I-495 and Democracy Blvd	5264	5474	4%	Between I-270 Split and HOV on ramp	4251	4015	-6%
Between Democracy Blvd on and off ramps	4077	4286	5%	Between HOV on ramp & Democracy Blvd	4186	3991	-5%
Between Democracy Blvd and I-270 Split	4219	4565	8%	Between Democracy Blvd on & off ramps	3670	3511	-4%
				Between Democracy Blvd and I-495	4194	4068	-3%

* Final = HSR + VSL + ARM + DDI

Table C.9: AM Peak -2040 Final Model - I-270 Local Vehicle Throughput

I-270 Local Northbound	No-Build VISSIM Throughput	Final VISSIM Throughput	Change %	I-270 Local Southbound	No-Build VISSIM Throughput	Final VISSIM Throughput	Change %
Between Montrose Rd EB off ramp and EB on ramp	1707	2367	39%	Between I-370 on ramp and I-270 off ramp	3627	3502	-3%
Between Montrose Rd EB on ramp and WB off ramp	1884	2615	39%	Between I-270 off ramp and Shady Grove off ramp	2767	2698	-2%
Between Montrose Rd WB off ramp and on ramp	1556	2198	41%	Between Shady Grove off ramp and Shady Grove WB on ramp	1593	2325	46%
Between Montrose Rd WB on ramp and I-270 on ramp	2215	3302	49%	Between Shady Grove WB and EB on ramps	2225	2986	34%
Between I-270 on ramp and MD 189 off ramp	2316	3633	57%	Between Shady Grove on ramp and I-270 on ramp	2594	3372	30%
Between MD 189 ramps	1739	2934	69%	Between I-270 on ramp and I-270 off ramp1	3272	3947	21%
Between MD 189 off ramp and I-270 on ramp	2036	3515	73%	Between I-270 off ramp1 and I-270 off ramp2	2767	2656	-4%
Between I-270 on ramp and I-270 off ramp	2547	4292	69%	Between I-270 off ramp2 and MD 28 off ramp	1961	1829	-7%
Between I-270 off ramp and MD 28 EB off ramp	1823	3102	70%	Between MD 28 off ramp and MD 28 WB on ramp	1428	1336	-6%
Between MD 28 EB off ramp to MD 28 EB on ramp	1585	2741	73%	Between MD 28 WB on ramp and MD 28 EB on ramp	1700	1632	-4%
Between MD 28 EB on ramp and MD 28 WB off ramp	1616	2811	74%	Between MD 28 EB on ramp and I-270 on ramp	2375	2802	18%
Between MD 28 WB off ramp and MD 28 WB on ramp	751	1273	70%	Between I-270 on ramp and MD 189 off ramp	2871	2574	-10%
Between MD 28 WB on ramp and I-270 on ramp	1263	1795	42%	Between MD 189 on and off ramps	2353	1390	-41%
Between I-270 on ramp and I-270 off ramp	2439	3129	28%	Between MD 189 on ramp and I-270 off ramp	3387	2360	-30%
Between I-270 off ramp and Shady Grove off ramp	2131	2681	26%	Between I-270 off ramp and Montrose Rd off ramp	2357	2459	4%
Between Shady Grove off ramp and I-270 on ramp	322	401	25%	Between Montrose Rd off ramp and Montrose Rd WB on ramp	2251	2309	3%
Between I-270 on ramp and Shady Grove WB on ramp	1448	1708	18%	Between Montrose Rd WB on ramp and EB off ramp	2992	3316	11%
Between Shady Grove WB on ramp and I-270 off ramp	1788	2046	14%	Between Montrose Rd EB off and on ramps	2336	2612	12%
Between I-270 off ramp and I-370 off ramp	1515	1750	16%	Between Montrose Rd EB off ramp and I-270	3139	3368	7%
Between I-370 off ramp and I-370 EB on ramp	286	326	14%				
Between I-370 EB and WB on ramps	919	875	-5%				
Between I-370 WB on ramp and I-270 off ramp	2785	2354	-15%				
Between I-270 off ramp and I-270 on ramp	1670	1351	-19%				
Between I-270 on ramp and MD 117 off ramp	2654	1992	-25%				
Between MD 117 off ramp and MD 124 off ramp	1509	998	-34%				
Between MD 124 off ramp and MD 124 EB on ramp	789	457	-42%				
Between MD 124 EB and WB on ramps	1183	744	-37%				
Between MD 124 on ramp I-270	573	497	-13%				

* Final = HSR + VSL + ARM + DDI

Table C.10: AM Peak - 2040 Final Model - I-270 On Ramp Queue Length - Northbound

I-270 Northbound	No Build VISSIM Average Queue (feet)	Final VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	Final VISSIM Maximum Queue (feet)	% Change
Rockledge Dr on ramp	67	0	-100%	421	0	-100%
MD 189 C-D on ramp	0	0	-	0	0	-
MD 28 C-D on ramp	0	35	-	0	359	-
Shady Grove Rd C-D on ramp	0	756	-	0	3211	-
I-370 C-D on ramp	0	0	-	0	0	-
MD 124 C-D on ramp	0	0	-	0	0	-
MD 118 on ramp	0	0	-	0	0	-
MD 27 EB on ramp	0	0	-	0	0	-
MD 27 WB on ramp	0	0	-	0	0	-
MD 121 on ramp	0	0	-	0	0	-
MD 109 on ramp	0	0	-	0	0	-
MD 80 on ramp	0	0	-	0	0	-
MD 85 on ramp	0	0	-	0	0	-
I-270 Spur Northbound	No Build VISSIM Average Queue (feet)	Final VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	Final VISSIM Maximum Queue (feet)	% Change
Democracy Blvd EB on ramp	4	0	-100%	57	0	-100%
Democracy Blvd WB on ramp	0	0	-100%	5	0	-100%
I-495 Northbound	No Build VISSIM Average Queue (feet)	Final VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	Final VISSIM Maximum Queue (feet)	% Change
Cabin John Pkwy on ramp	0	0	-	0	0	-
MD 190 on ramp	0	0	-	0	0	-
I-270 C-D Northbound	No Build VISSIM Average Queue (feet)	Final VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	Final VISSIM Maximum Queue (feet)	% Change
Montrose Rd EB on ramp	436	2	-100%	1548	209	-87%
Montrose Rd WB on ramp	1047	0	-100%	2581	0	-100%
I-270 on ramp	409	0	-100%	1171	0	-100%
MD 189 on ramp	1304	0	-100%	2877	0	-100%
I-270 on ramp	1354	0	-100%	3378	7	-100%
MD 28 EB on ramp	3	0	-100%	55	0	-100%
MD 28 WB on ramp	0	0	-	0	0	-
Shady Grove Rd EB on ramp	0	0	-	0	0	-
I-270 on ramp	0	0	-	0	0	-
Shady Grove Rd WB on ramp	0	120	-	0	749	-
I-370 EB on ramp	0	378	-	0	2025	-
I-370 WB on ramp	0	1923	-	0	4756	-
I-270 on ramp	0	560	491558%	29	1998	6898%
MD 124 EB on ramp	0	187	-	0	813	-
MD 124 WB on ramp	0	2	-	0	220	-
Watkins Mill Rd on ramp	0	2340	2356194%	24	2730	11348%

* Final = HSR + VSL + ARM + DDI

Table C.11: AM Peak - 2040 Final Model- I-270 Off Ramp Queue Length - Northbound

I-270 Northbound	No Build VISSIM Average Queue (feet)	Final VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	Final VISSIM Maximum Queue (feet)	% Change
MD 187 off ramp NB	28	0	-100%	242	0	-100%
MD 187 off ramp SB	0	8	-	0	353	-
Rockledge Dr off ramp	6	26	364%	359	185	-49%
Tower Oaks Blvd off ramp	19	0	-100%	179	0	-100%
Montrose Rd off ramp EB	0	0	-	0	10	-
Montrose Rd off ramp WB	0	11	-	0	104	-
MD 189 off ramp WB	8	3	-64%	99	208	110%
MD 189 off ramp EB	60	51	-15%	1148	301	-74%
MD 28 off ramp EB	28	0	-100%	227	0	-100%
MD 28 off ramp WB	2636	0	-100%	5046	0	-100%
Shady Grove Rd off ramp - Redland Blvd	0	208	-	0	722	-
Shady Grove Rd off ramp WB	151	0	-100%	605	0	-100%
Shady Grove Rd off ramp EB	0	0	-	0	0	-
I-370 off ramp WB	0	0	-	0	0	-
I-370 off ramp EB	0	777	-	0	2324	-
MD 117 off ramp	311	56	-82%	1011	376	-63%
MD 124 off ramp	95	0	-100%	453	0	-100%
Watkins Mill Rd off ramp	78	0	-100%	366	0	-100%
Middlebrook Rd EB off ramp	0	0	-	0	0	-
Middlebrook Rd WB off ramp	0	0	-	0	17	-
MD 118 WB off ramp - Seneca Meadows	0	0	-	0	0	-
MD 118 WB off ramp	0	0	-	0	0	-
MD 118 EB off ramp	0	6	-	0	97	-
MD 27 off ramp WB	7	0	-100%	81	0	-100%
MD 27 off ramp EB	0	59	-	0	235	-
MD 121 off ramp WB	62	0	-100%	250	0	-100%
MD 121 off ramp EB	0	11	-	0	175	-
MD 109 off ramp EB	29	0	-100%	228	5	-98%
MD 109 off ramp WB	8	7	-13%	84	115	37%
MD 80 off ramp EB	7	1	-87%	102	43	-58%
MD 80 off ramp WB	0	0	-100%	26	0	-100%
MD 85 NB off ramp	0	0	-	0	83	-
MD 85 SB off ramp	1	1	102%	126	214	70%
I-270 Spur Northbound	No Build VISSIM Average Queue (feet)	Final VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	Final VISSIM Maximum Queue (feet)	% Change
Clara Barton Pkwy off ramp EB	1	0	-100%	214	0	-100%
Clara Barton Pkwy off ramp WB	0	0	-	0	55	-
MD 190 off ramp EB	0	0	-100%	10	0	-100%
MD 190 off ramp WB	0	109	-	0	582	-
Democracy Blvd off ramp WB	104	17	-83%	563	141	-75%
Democracy Blvd off ramp EB	15	0	-100%	143	0	-100%

* Final = HSR + VSL + ARM + DDI

Table C.12: AM Peak - 2040 Final Model- I-270 On Ramp Queue Length - Southbound

I-270 Southbound	No Build VISSIM Average Queue (feet)	Final VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	Final VISSIM Maximum Queue (feet)	% Change
MD 85 on ramp	41	0	-100%	528	0	-100%
MD 80 on ramp	1039	0	-100%	2688	0	-100%
MD 109 on ramp	995	1710	72%	1914	2882	51%
MD 121 WB on ramp	135	0	-100%	972	0	-100%
MD 121 EB on ramp	0	0	-	0	0	-
MD 27 WB on ramp	552	0	-100%	2591	0	-100%
MD 27 EB on ramp	3	0	-100%	173	0	-100%
MD 118 WB on ramp	0	0	-	0	0	-
MD 118 EB on ramp	0	0	-100%	44	0	-100%
Middlebrook Rd on ramp	2842	0	-100%	4433	0	-100%
Watkins Mill Rd on ramp	3066	2340	-24%	3136	2730	-13%
MD 124 WB on ramp	2789	29	-99%	4158	712	-83%
MD 117 on ramp	293	1540	426%	1898	2727	44%
I-370 C-D on ramp	0	0	-	0	0	-
Shady Grove Rd C-D on ramp North	0	0	-	0	0	-
Shady Grove Rd C-D on ramp South	2	0	-100%	127	0	-100%
MD 189 C-D on ramp	1787	0	-100%	3610	0	-100%
Montrose Rd C-D on ramp	2	121	5009%	227	1004	343%
Rockledge Dr on ramp	0	0	-	0	0	-
MD 187 on ramp	0	0	-	0	0	-
I-270 Spur Southbound	No Build VISSIM Average Queue (feet)	Final VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	Final VISSIM Maximum Queue (feet)	% Change
Democracy Blvd on ramp	0	0	-	0	0	-
I-495 Southbound	No Build VISSIM Average Queue (feet)	Final VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	Final VISSIM Maximum Queue (feet)	% Change
I-270 Spur on ramp	147	270	83%	1557	1005	-35%
MD 190 on ramp	0	0	-	0	0	-
I-270 C-D Southbound	No Build VISSIM Average Queue (feet)	Final VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	Final VISSIM Maximum Queue (feet)	% Change
I-270 on ramp	2947	0	-100%	4900	0	-100%
I-370 on ramp	2511	0	-100%	2932	0	-100%
Shady Grove Rd WB on ramp	28	0	-100%	597	0	-100%
Shady Grove Rd EB on ramp	0	0	-100%	37	0	-100%
I-270 on ramp	0	0	-100%	42	0	-100%
MD 28 WB on ramp	1406	0	-100%	2299	0	-100%
MD 28 EB on ramp	3724	0	-100%	3882	0	-100%
I-270 on ramp	1	0	-100%	74	0	-100%
MD 189 on ramp	3725	0	-100%	4200	0	-100%
Montrose Rd WB on ramp	68	266	291%	926	1103	19%
Montrose Rd EB on ramp	0	0	-100%	69	0	-100%

* Final = HSR + VSL + ARM + DDI

Table C.13: AM Peak - 2040 Final Model - I-270 Off Ramp Queue Length - Southbound

I-270 Southbound	No Build VISSIM Average Queue (feet)	Final VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	Final VISSIM Maximum Queue (feet)	% Change
MD 85 SB off ramp	297	0	-100%	1410	28	-98%
MD 85 NB off ramp	0	2	1420%	43	185	330%
MD 80 off ramp	1	0	-99%	99	14	-86%
MD 109 off ramp WB	0	0	-100%	25	0	-100%
MD 109 off ramp EB	0	135	-	0	770	-
MD 121 off ramp EB	219	1	-100%	946	154	-84%
MD 121 off ramp WB	10	55	446%	519	246	-53%
MD 27 off ramp EB	50	57	14%	262	782	199%
MD 27 off ramp WB	881	34	-96%	3309	159	-95%
MD 118 off ramp EB	31	0	-100%	160	0	-100%
MD 118 off ramp WB	0	61	-	0	307	-
Watkins Mill Rd off ramp	2034	3865	90%	5055	5059	0%
MD 124 off ramp EB	70	10	-86%	368	352	-4%
MD 124 off ramp WB	19	0	-100%	419	0	-100%
I-370 off ramp WB	0	0	-	0	0	-
I-370 off ramp EB	0	3	-	0	166	-
Shady Grove Rd off ramp - Omega Drive	4	0	-100%	172	0	-100%
Shady Grove Rd off ramp	0	1	-	0	81	-
MD 28 off ramp	4	55	1250%	154	302	96%
MD 189 off ramp EB	35	0	-100%	238	0	-100%
MD 189 off ramp WB	0	0	-	0	0	-
Montrose Rd off ramp WB	0	0	-	0	53	-
Montrose Rd off ramp EB	382	1368	258%	1566	2101	34%
Rockledge Dr off ramp	27	48	77%	343	265	-23%
I-270 Spur Southbound	No Build VISSIM Average Queue (feet)	Final VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	Final VISSIM Maximum Queue (feet)	% Change
Democracy Blvd off ramp EB	50	0	-100%	219	0	-100%
Democracy Blvd off ramp WB	0	716	-	0	3096	-
MD 190 off ramp WB	1389	0	-100%	3571	0	-100%
MD 190 off ramp EB	0	0	-	0	0	-
Clara Barton Pkwy WB off ramp	0	32	1084847%	5	225	4149%

* Final = HSR + VSL + ARM + DDI

Table C.14: AM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
1- MD 85 at Sam's Club Drive											
1	NB	23.0	C	NB Left	119	77	82	496	E	38.6	D
				NB Through	365	28	82	496	C		
				NB Right	664	11	22	438	B		
	SB	50.1	D	SB Left	137	63	174	771	E		
				SB Through	599	50	174	771	D		
				SB Right	68	26	174	771	C		
	EB	50.9	D	EB Left	105	78	56	182	E		
				EB Through	62	81	56	182	F		
				EB Right	113	9	56	182	A		
	WB	52.7	D	WB Left	230	77	90	355	E		
				WB Through	15	67	90	355	E		
				WB Right	126	7	90	355	A		
2- MD 85 at I-270 NB on and off ramp											
2	NB	52.1	D	NB Left	683	52	265	1136	D	36.3	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	18.8	B	SB Left	0	0	0	0	A		
				SB Through	611	19	56	562	B		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
3- MD 85 at I-270 SB on and off ramp											
3	NB	5.3	A	NB Left	0	0	0	0	A	10.2	B
				NB Through	1071	5	19	413	A		
				NB Right	0	0	0	0	A		
	SB	40.9	D	SB Left	172	41	43	440	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
4- MD 85 at Crestwood Blvd											
4	NB	19.4	C	NB Left	13	71	54	382	E	25.0	C
				NB Through	762	19	54	382	B		
				NB U-Turn	0	0	0	0	A		
	SB	18.8	B	SB Left	64	69	25	156	E		
				SB Through	1783	18	80	627	B		
				SB Right	808	16	68	617	B		
	EB	52.7	D	EB Left	621	54	91	276	D		
				EB Through	28	68	91	276	E		
				EB Right	42	17	91	276	B		
	WB	44.1	D	WB Left	52	53	21	137	D		
				WB Through	18	56	21	137	E		
				WB Right	19	9	21	137	A		
5- MD 80 at I-270 NB on and ramp											
5	NB	-1.0	A	NB Left	3	1	0	4	A	21.2	C
				NB Through	1	1	0	4	A		
				NB Right	5	-3	0	4	A		
	SB	13.0	B	SB Left	204	16	14	108	B		
				SB Through	6	20	14	108	B		
				SB Right	59	2	0	0	A		
	EB	11.3	B	EB Left	54	12	11	183	B		
				EB Through	0	0	8	0	A		
				EB Right	5	5	19	213	A		
	WB	23.1	C	WB Left	35	24	1	56	C		
				WB Through	879	31	182	786	C		
				WB Right	639	12	11	442	B		
6- MD 80 at I-270 SB on and off ramp											
6	NB	6.2	A	NB Left	24	37	2	134	E	31.6	D
				NB Through	0	0	0	0	A		
				NB Right	258	3	2	134	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	36.7	E	EB Left	0	0	0	0	A		
				EB Through	360	36	67	436	E		
				EB Right	161	38	68	446	E		
	WB	47.8	E	WB Left	0	0	0	0	A		
				WB Through	278	48	157	758	E		
				WB Right	0	0	0	0	A		
7- MD 109 at I-270 NB on and off ramp											
7	NB			NB Left	0	0	0	0	A	29.9	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	33.1	D	SB Left	143	37	37	244	E		
				SB Through	0	0	0	0	A		
				SB Right	47	20	17	177	C		
	EB	15.7	C	EB Left	88	11	5	149	B		
				EB Through	0	0	0	0	A		
				EB Right	63	22	0	0	C		
	WB	32.2	D	WB Left	0	0	0	0	A		
				WB Through	671	32	399	555	D		
				WB Right	0	0	0	0	A		
8- MD 80 at I-270 SB on and off ramp											
8	NB	9.3	A	NB Left	17	36	4	78	E	33.7	D
				NB Through	0	0	0	0	A		
				NB Right	48	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	50.0	E	EB Left	0	0	0	0	A		
				EB Through	92	34	58	270	D		
				EB Right	102	64	60	268	F		
	WB	31.6	D	WB Left	570	29	158	594	D		
				WB Through	156	39	152	571	E		
				WB Right	0	0	0	0	A		
9- MD 121 at Gateway Center Dr											
9	NB	17.8	C	NB Left	154	27	43	285	C	51.2	D
				NB Through	434	22	43	285	C		
				NB Right	327	8	52	311	A		
	SB	32.3	D	SB Left	55	22	113	555	C		
				SB Through	792	33	123	555	C		
				SB Right	8	26	131	576	C		
	EB	120.4	F	EB Left	8	97	421	525	F		
				EB Through	99	125	422	525	F		
				EB Right	646	120	452	557	F		
	WB	21.8	C	WB Left	137	25	18	147	C		
				WB Through	17	22	18	147	C		
				WB Right	28	6	16	171	A		
10- MD 121 at I-270 NB on and off ramp											
10	NB	28.3	D	NB Left	324	59	67	255	F	19.0	B
				NB Through	0	0	0	0	A		
				NB Right	402	3	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	11.5	B	EB Left	0	0	0	0	A		
				EB Through	513	18	32	325	C		
				EB Right	285	1	0	0	A		
	WB	18.6	C	WB Left	233	63	145	805	F		
				WB Through	1337	11	145	805	B		
				WB Right	0	0	0	0	A		

Table C.14: AM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
11- MD 121 at I-270 SB on and off ramp											
11	NB			NB Left	0	0	0	0	A	18.3	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	62.8	E	SB Left	218	94	225	953	F		
				SB Through	0	0	0	0	A		
				SB Right	304	40	8	439	E		
	EB	5.2	A	EB Left	0	0	0	0	A		
				EB Through	578	5	12	206	A		
				EB Right	0	0	0	0	A		
	WB	8.8	A	WB Left	0	0	0	0	A		
WB Through				642	18	61	438	C			
WB Right				1010	3	30	185	A			
12- MD 27 at Observation Dr											
12	NB	48.1	D	NB U-Turn	0	0	0	0	A	37.1	D
				NB Through	48	58	14	72	E		
				NB Right	12	7	14	72	A		
	SB	44.0	D	SB Left	91	52	29	192	D		
				SB Through	54	52	39	261	D		
				SB Right	178	38	64	298	D		
	EB	16.9	B	EB Left	151	40	40	324	D		
				EB Through	1217	14	42	325	B		
				EB Right	48	10	49	363	B		
	WB	48.1	D	WB Left	100	32	333	847	C		
WB Through				2130	50	333	847	D			
WB Right				109	30	333	847	C			
13- MD 27 at I-270 NB off ramp											
13	NB	35.6	D	NB Left	106	36	15	88	D	52.4	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.1	A	EB Left	0	0	0	0	A		
				EB Through	973	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	76.7	E	WB Left	0	0	0	0	A		
WB Through				2166	77	1092	2164	E			
WB Right				0	0	0	0	A			
14- MD 27 at I-270 SB off ramp											
14	NB			NB Left	0	0	0	0	A	70.6	E
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	49.4	D	SB Left	384	49	61	275	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	2.6	A	EB Left	0	0	0	0	A		
				EB Through	840	3	2	62	A		
				EB Right	0	0	0	0	A		
	WB	118.3	F	WB Left	0	0	0	0	A		
WB Through				1365	118	1106	1497	F			
WB Right				0	0	0	0	A			
15- MD 27 at Crystal Rock Dr											
15	NB	64.8	E	NB Left	30	38	296	736	D	92.0	F
				NB Through	1051	65	316	736	E		
				NB Right	92	70	327	748	E		
	SB	119.1	F	SB Left	514	118	1842	3792	F		
				SB Through	1620	121	1842	3792	F		
				SB Right	51	81	1836	3787	F		
	EB	44.2	D	EB Left	224	50	59	199	D		
				EB Through	97	43	55	194	D		
				EB Right	75	29	60	228	C		
	WB	46.8	D	WB Left	11	56	32	103	E		
WB Through				32	224	32	103	F			
WB Right				142	6	32	103	A			
16- MD 118 at Seneca Meadows Pkwy											
16	NB	3.6	A	NB Left	109	11	1	72	B	6.1	A
				NB Through	725	3	4	134	A		
				NB Right	60	1	9	187	A		
	SB	4.0	A	SB Left	31	4	7	238	A		
				SB Through	948	4	10	238	A		
				SB Right	41	2	12	271	A		
	EB	18.4	B	EB Left	20	65	10	77	E		
				EB Through	6	82	10	77	F		
				EB Right	115	7	10	77	A		
	WB	44.2	D	WB Left	35	71	16	102	E		
WB Through				6	55	11	101	D			
WB Right				27	7	14	111	A			
17- MD 118 at I-270 NB on ramp											
17	NB			NB Left	0	0	0	0	A	10.2	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	29.6	C	EB Left	274	30	31	194	C		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	5.4	A	WB Left	0	0	0	0	A		
WB Through				188	1	0	0	A			
WB Right				911	6	15	309	A			
18- MD 118 at I-270 SB off ramp											
18	NB			NB Left	0	0	0	0	A	7.5	A
				NB Through	0	0.0	0	0	A		
				NB Right	0	0.0	0	0	A		
	SB	38.1	D	SB Left	215	38.1	34	163	D		
				SB Through	0	0.0	0	0	A		
				SB Right	0	0.0	0	0	A		
	EB	3.7	A	EB Left	0	0.0	0	0	A		
				EB Through	631	3.7	5	194	A		
				EB Right	0	0.0	0	0	A		
	WB	4.1	A	WB Left	0	0.0	0	0	A		
WB Through				1214	4.1	9	173	A			
WB Right				0	0.0	0	0	A			
19- MD 118 at Aircraft Dr											
19	NB	46.2	D	NB Left	9	78	9	75	E	20.6	C
				NB Through	13	80	9	75	F		
				NB Right	17	3	0	24	A		
	SB	60.5	E	SB Left	267	55	112	418	E		
				SB Through	53	72	112	418	E		
				SB Right	96	68	112	418	E		
	EB	12.4	B	EB Left	132	16	37	329	B		
				EB Through	1019	12	37	329	B		
				EB Right	34	12	37	329	B		
	WB	15.1	B	WB Left	83	23	47	310	C		
WB Through				1046	17	47	310	B			
WB Right				324	6	47	310	A			
20- Middlebrook Rd at Observation Dr											
20	NB			NB Left	0	0	0	0	A	16.4	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	20.4	C	SB Left	26	36	5	63	D		
				SB Through	0	0	0	0	A		
				SB Right	27	5	5	63	A		
	EB	14.1	B	EB Left	231	21	29	249	C		
				EB Through	825	12	29	249	B		
				EB Right	0	0	0	0	A		
	WB	18.0	B	WB Left	0	0	0	0	A		
WB Through				1141	19	72	392	B			
WB Right				275	15	97	441	B			

Table C.14: AM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
21- Middlebrook Rd at I-270 SB on ramp											
21	NB			NB Left	0	0	0	0	A	19.5	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	13.7	B	EB Left	0	0	0	0	A		
				EB Through	763	14	31	203	B		
				EB Right	0	0	0	0	A		
	WB	25.4	C	WB Left	761	25	104	893	C		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
22- Middlebrook Rd at Waring Station Rd											
22	NB	179.6	F	NB Left	145	136	348	485	F	70.4	E
				NB Through	6	133	348	485	F		
				NB Right	268	204	348	485	F		
	SB	17.6	B	SB Left	3	39	1	29	D		
				SB Through	0	0	1	29	A		
				SB Right	5	5	2	67	A		
	EB	69.3	E	EB Left	31	21	645	1297	C		
				EB Through	1448	71	645	1297	E		
				EB Right	80	62	645	1297	E		
	WB	18.4	B	WB Left	80	23	33	237	C		
				WB Through	719	19	33	237	B		
				WB Right	41	4	33	237	A		
23- MD 124 at MD 355											
23	NB	52.9	D	NB Left	228	73	86	264	E	96.2	F
				NB Through	390	48	84	262	D		
				NB Right	54	3	0	0	A		
	SB	104.2	F	SB Left	64	166	490	804	F		
				SB Through	1188	124	490	804	F		
				SB Right	559	54	284	780	D		
	EB	54.5	D	EB Left	610	130	444	1095	F		
				EB Through	494	17	444	1095	B		
				EB Right	555	5	236	1008	A		
	WB	143.6	F	WB Left	0	0	0	0	A		
				WB Through	1717	146	760	1115	F		
				WB Right	52	73	0	0	E		
24- MD 124 at I-270 SB on and off											
24	NB	65.3	F	NB Left	16	62	18	95	E	29.3	C
				NB Through	37	67	18	95	E		
				NB U-Turn	0	0	0	0	A		
	SB	26.0	C	SB Left	285	65	77	373	E		
				SB Through	11	65	77	373	E		
				SB Right	588	6	14	350	A		
	EB	17.0	B	EB Left	0	0	0	0	A		
				EB Through	1037	17	50	409	B		
				EB Right	67	14	60	433	B		
	WB	41.6	D	WB Left	43	47	1679	2437	D		
				WB Through	1136	41	1679	2437	D		
				WB Right	0	0	0	0	A		
25- MD 117 at MD 124											
25	NB	49.7	D	NB Left	20	108	157	726	F	48.5	D
				NB Through	541	64	157	726	E		
				NB Right	433	30	76	717	C		
	SB	47.0	D	SB Left	181	69	221	826	E		
				SB Through	1072	48	221	826	D		
				SB Right	131	9	0	0	A		
	EB	54.0	D	EB Left	102	119	217	782	F		
				EB Through	1470	50	217	783	D		
				EB Right	82	47	229	811	D		
	WB	39.4	D	WB Left	319	70	103	304	E		
				WB Through	478	27	103	304	C		
				WB Right	99	0	0	0	A		
26- MD 117 at Bureau Dr											
26	NB	50.3	D	NB Left	25	64	19	125	E	41.1	D
				NB Through	24	65	19	125	E		
				NB Right	26	23	19	125	C		
	SB	174.5	F	SB Left	197	177	223	397	F		
				SB Through	55	190	223	397	F		
				SB Right	32	130	223	397	F		
	EB	36.8	D	EB Left	33	26	272	958	C		
				EB Through	2020	37	278	958	D		
				EB Right	29	43	271	948	D		
	WB	20.8	C	WB Left	299	67	134	543	E		
				WB Through	840	10	134	544	A		
				WB Right	314	6	100	582	A		
27- MD 117 at I-270 SB off ramp											
27	NB			NB Left	0	0	0	0	A	9.3	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	2.0	A	EB Left	0	0	0	0	A		
				EB Through	835	2	1	180	A		
				EB Right	0	0	0	0	A		
	WB	28.1	D	WB Left	328	28	59	453	D		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
28- MD 117 at I-270 NB off ramp											
28	NB			NB Left	0	0	0	0	A	34.5	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	60.5	E	SB Left	287	63	325	1037	E		
				SB Through	0	0	0	0	A		
				SB Right	871	60	329	1039	E		
	EB	19.2	B	EB Left	14	123	74	848	F		
				EB Through	821	17	74	848	B		
				EB Right	0	0	0	0	A		
	WB	15.6	B	WB Left	0	0	0	0	A		
				WB Through	909	16	60	360	B		
				WB Right	9	8	66	390	A		
29- MD 117 at Perry Pkwy											
29	NB	44.5	D	NB Left	36	76	17	120	E	15.9	B
				NB Through	7	58	17	119	E		
				NB Right	38	12	27	140	B		
	SB	48.7	D	SB Left	112	96	60	247	F		
				SB Through	14	102	60	247	F		
				SB Right	133	3	60	247	A		
	EB	10.6	B	EB Left	119	70	44	269	E		
				EB Through	975	3	44	269	A		
				EB Right	10	1	31	254	A		
	WB	10.4	B	WB Left	8	89	21	297	F		
				WB Through	747	10	21	297	B		
				WB Right	136	6	21	297	A		
30- Shady Grove Rd at I-270 NB off ramp											
30	NB	9.8	A	NB Left	0	0	0	0	A	22.3	C
				NB Through	959	10	22	267	A		
				NB Right	0	0	0	0	A		
	SB	10.4	B	SB Left	0	0	0	0	A		
				SB Through	1349	10	34	334	B		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	55.7	E	WB Left	846	56	160	616	E		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table C.14: AM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
31- Shady Grove Rd at I-270 SB off ramp											
31	NB	12.7	B	NB Left	0	0	0	0	A	19.9	B
				NB Through	1004	13	37	399	B		
				NB Right	0	0	0	0	A		
	SB	9.3	A	SB Left	0	0	0	0	A		
				SB Through	1565	9	32	563	A		
				SB Right	0	0	0	0	A		
	EB	47.4	D	EB Left	286	41	42	360	D		
				EB Through	0	0	0	0	A		
				EB Right	576	51	98	441	D		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
32- MD 28 at I-270 SB off ramp											
32	NB			NB U-Turn	0	0	0	0	A	67.9	E
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	35.7	D	SB Left	426	44	68	327	D		
				SB Through	0	0	0	0	A		
				SB Right	103	3	0	36	A		
	EB	131.7	F	EB Left	0	0	0	0	A		
				EB Through	683	200	1979	2136	F		
				EB Right	409	18	1925	2144	B		
	WB	25.4	C	WB Left	0	0	0	0	A		
				WB Through	1235	25	23	384	C		
				WB Right	0	0	0	0	A		
33- MD 28 at I-270 on and off ramps											
33	NB	36.5	D	NB Left	0	0	32	238	A	36.3	D
				NB Through	128	53	38	247	D		
				NB Right	80	10	38	247	A		
	SB	84.5	F	SB Left	26	102	128	357	F		
				SB Through	0	0	0	0	A		
				SB Right	273	83	128	357	F		
	EB	21.4	C	EB Left	177	45	57	407	D		
				EB Through	599	15	57	407	B		
				EB Right	0	0	0	0	A		
	WB	33.3	C	WB Left	26	37	101	391	D		
				WB Through	944	33	83	354	C		
				WB Right	0	0	0	0	A		
34- MD 189 at Great Falls Rd											
34	NB	37.3	D	NB Left	63	42	17	117	D	23.3	C
				NB Through	8	40	14	117	D		
				NB Right	10	8	16	128	A		
	SB	17.3	B	SB Left	63	45	19	229	D		
				SB Through	6	45	19	229	D		
				SB Right	478	13	54	147	B		
	EB	24.6	C	EB Left	227	55	111	1165	E		
				EB Through	680	15	17	199	B		
				EB Right	10	10	26	236	A		
	WB	26.4	C	WB Left	4	26	64	389	C		
				WB Through	311	27	63	388	C		
				WB Right	11	13	77	422	B		
35- MD 189 at I-270 Ramps											
35	NB	60.5	E	NB Left	88	61	18	121	E	79.7	E
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	55.9	E	SB Left	150	56	48	258	E		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	106.2	F	EB Left	284	138	627	1494	F		
				EB Through	436	85	627	1494	F		
				EB Right	0	0	0	0	A		
	WB	60.0	E	WB Left	457	53	107	429	D		
				WB Through	244	73	107	429	E		
				WB Right	0	0	0	0	A		
36- MD 189 at Wootton Pkwy											
36	NB	71.9	E	NB Left	161	48	85	311	D	117.9	F
				NB Through	125	95	85	311	F		
				NB Right	155	78	85	311	E		
	SB	142.8	F	SB Left	325	210	509	805	F		
				SB Through	593	106	482	792	F		
				SB Right	0	0	0	0	A		
	EB	162.3	F	EB Left	137	157	650	1047	F		
				EB Through	803	170	650	1047	F		
				EB Right	101	106	650	1047	F		
	WB	49.3	D	WB Left	346	69	104	353	E		
				WB Through	318	34	104	353	C		
				WB Right	47	6	104	353	A		
37- Montrose Rd at Tower Oaks Blvd											
37	NB			NB Left	0	0	0	0	A	104.5	F
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	235.8	F	SB Left	123	49	1098	1406	D		
				SB Through	0	0	0	0	A		
				SB Right	435	289	1123	1402	F		
	EB	25.5	C	EB Left	28	65	136	923	E		
				EB Through	1513	25	136	923	C		
				EB Right	0	0	0	0	A		
	WB	141.4	F	WB Left	0	0	0	0	A		
				WB Through	1255	145	491	850	F		
				WB Right	58	60	491	850	E		
38- Tower Oaks Blvd at I-270 off ramp											
38	NB	24.1	C	NB Left	385	22	30	200	C	78.2	E
				NB Through	8	22.5	25	192	C		
				NB Right	22	64.1	30	200	E		
	SB	0.6	A	SB Left	0	800.1	0	20	F		
				SB Through	0	0.0	0	20	A		
				SB Right	4	0.6	0	0	A		
	EB	122.8	F	EB Left	6	113.7	347	465	F		
				EB Through	558	122.3	347	465	F		
				EB Right	82	126.7	338	456	F		
	WB	9.5	A	WB Left	0	0.0	3	80	A		
				WB Through	81	9.9	3	80	A		
				WB Right	6	5.0	0	25	A		
39- Montrose Rd at Tower Oaks Blvd											
39	NB	17.9	B	NB Left	37	71	49	285	E	50.9	D
				NB Through	240	42	49	285	D		
				NB Right	555	4	12	151	A		
	SB	41.1	D	SB Left	334	54	163	619	D		
				SB Through	778	37	163	618	D		
				SB Right	78	29	124	658	C		
	EB	90.2	F	EB Left	76	74	416	718	E		
				EB Through	971	92	418	718	F		
				EB Right	62	89	439	742	F		
	WB	43.4	D	WB Left	300	52	68	290	D		
				WB Through	188	50	68	290	D		
				WB Right	109	7	77	321	A		
40- Rockledge Blvd at I-270 NB on and off ramp											
40	NB	34.1	C	NB Left	0	0	0	0	A	18.0	B
				NB Through	92	32	33	165	C		
				NB Right	216	35	33	165	C		
	SB	2.0	A	SB Left	0	0	4	61	A		
				SB Through	923	2	4	61	A		
				SB Right	0	0	0	0	A		
	EB	26.9	C	EB Left	7	48	126	506	D		
				EB Through	529	54	126	506	D		
				EB Right	563	1	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table C.14: AM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS	
41- Rockledge Blvd at I-270 SB on and off ramps												
41	NB	2.6	A	NB Left	97	3	5	72	A	20.4	C	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	21.7	C		WB Left	923	23	92	655			C
					WB Through	403	20	92	655			B
					WB Right	0	0	0	0			A
42- MD 187 at Tuckerman Ln												
42	NB	58.8	E	NB Left	230	25	265	793	C	153.0	F	
				NB Through	1468	55	265	793	D			
				NB Right	213	124	265	793	F			
	SB	224.9	F		SB Left	60	164	2605	2704			F
					SB Through	1204	225	2605	2704			F
					SB Right	162	247	2605	2704			F
	EB	186.0	F		EB Left	223	128	1864	1988			F
					EB Through	624	205	1865	1989			F
					EB Right	129	194	1889	2013			F
	WB	188.4	F		WB Left	721	229	1921	2147			F
					WB Through	393	152	1921	2147			F
					WB Right	159	92	1921	2147			F
43- MD 187 at I-270 NB on and off ramps												
43	NB	11.2	B	NB Left	163	76	57	257	E	19.1	B	
				NB Through	1541	4	57	257	A			
				NB Right	0	0	0	0	A			
	SB	25.4	C		SB Left	0	0	0	0			A
					SB Through	1529	25	81	553			C
					SB Right	0	0	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	49.5	D		WB Left	114	50	35	250			D
					WB Through	10	47	35	250			D
					WB Right	0	0	0	0			A
44- MD 187 at I-270 NB on and off ramps												
44	NB	23.9	C	NB Left	0	0	0	0	A	25.9	C	
				NB Through	1478	24	68	404	C			
				NB Right	0	0	0	0	A			
	SB	7.7	A		SB Left	178	49	58	295			D
					SB Through	1465	3	58	295			A
					SB Right	0	0	0	0			A
	EB	80.8	F		EB Left	228	58	187	740			E
					EB Through	0	0	187	740			A
					EB Right	371	95	232	784			F
	WB				WB Left	0	0	0	0			A
					WB Through	0	0	0	0			A
					WB Right	0	0	0	0			A
45- MD 187 at Rock Spring Dr												
45	NB	14.9	B	NB Left	255	57	68	257	E	20.8	C	
				NB Through	1383	7	69	258	A			
				NB Right	10	6	93	291	A			
	SB	21.9	C		SB Left	13	25	98	632			C
					SB Through	1668	24	98	632			C
					SB Right	144	1	63	619			A
	EB	37.9	D		EB Left	190	59	56	222			E
					EB Through	26	54	56	222			D
					EB Right	251	20	56	222			C
	WB	7.2	A		WB Left	1	7	1	29			A
					WB Through	9	11	1	29			B
					WB Right	5	0	0	7			A
47-Democracy Blvd at I-270 NB off ramp												
47	NB	29.7	C	NB Left	217	30	24	159	C	13.4	B	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB	12.7	B		EB Left	0	0	0	0			A
					EB Through	1654	13	50	446			B
					EB Right	0	0	0	0			A
	WB	10.4	B		WB Left	0	0	0	0			A
					WB Through	778	10	23	187			B
					WB Right	0	0	0	0			A
48- Democracy Blvd at I-270 SB on ramp												
48	NB			NB Left	0	0	0	0	A	6.6	A	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB	5.4	A		EB Left	0	0	0	0			A
					EB Through	1768	5	23	270			A
					EB Right	0	0	0	0			A
	WB	8.7	A		WB Left	223	37	31	173			D
					WB Through	771	1	21	152			A
					WB Right	0	0	0	0			A
49- Democracy Blvd at I-270 SB off ramp												
49	NB			NB Left	0	0	0	0	A	12.1	B	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB	32.9	C		SB Left	329	49	57	226			D
					SB Through	0	0	0	0			A
					SB Right	171	2	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	2.6	A		WB Left	0	0	0	0			A
					WB Through	770	3	4	133			A
					WB Right	334	2	1	163			A
50- MD 190 at Burdette Rd												
50	NB	73.2	E	NB Left	20	80	15	118	E	13.2	B	
				NB Through	4	59	15	118	E			
				NB Right	11	67	15	118	E			
	SB	34.4	C		SB Left	50	79	31	151			E
					SB Through	17	64	31	151			E
					SB Right	120	12	31	151			B
	EB	10.5	B		EB Left	53	93	61	561			F
					EB Through	1814	8	60	561			A
					EB Right	15	6	51	584			A
	WB	12.5	B		WB Left	1	106	61	828			F
					WB Through	1494	13	62	828			B
					WB Right	21	2	55	834			A

Table C.14: AM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
51- MD 190 at I-270 NB on ramp											
51	NB			NB Left	0	0	0	0	A	53.3	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	123.2	F	EB Left	531	123	347	715	F		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	15.9	B	WB Left	0	0	0	0	A		
				WB Through	994	16	76	747	B		
				WB Right	0	0	0	0	A		
52- MD 190 at I-270 SB off ramp											
52	NB	79.3	E	NB Left	258	79	1392	3574	E	14.2	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	2.9	A	EB Left	0	0	0	0	A		
				EB Through	982	3	6	151	A		
				EB Right	0	0	0	0	A		
	WB	5.7	A	WB Left	0	0	0	0	A		
				WB Through	667	6	8	160	A		
				WB Right	0	0	0	0	A		
53- MD 190 at Seven Locks Rd											
53	NB	68.2	E	NB Left	21	67	23	149	E	45.0	D
				NB Through	59	69	25	148	E		
				NB Right	0	0	0	0	A		
	SB	56.9	E	SB Left	624	56	184	777	E		
				SB Through	183	59	185	778	E		
				SB Right	18	54	184	777	D		
	EB	37.5	D	EB Left	24	30	135	584	C		
				EB Through	846	38	135	584	D		
				EB Right	42	42	135	584	D		
	WB	39.7	D	WB Left	119	127	125	418	F		
				WB Through	639	33	128	421	C		
				WB Right	157	1	4	127	A		
54- MD 124 at I-270 NB off ramp											
54	NB	40.6	D	NB Left	0	0	0	0	A	26.5	C
				NB Through	0	0	0	0	A		
				NB Right	723	41	100	459	D		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	15.6	B	EB Left	0	0	0	0	A		
				EB Through	933	16	37	359	B		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
55- Democracy Blvd at I-270 NB off ramp											
55	NB	37.1	D	NB Left	0	0	0	0	A	16.2	B
				NB Through	0	0	0	0	A		
				NB Right	928	37	113	575	D		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	4.5	A	EB Left	0	0	0	0	A		
				EB Through	1657	5	18	95	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
56- Watkins Mill Rd at I-270 SB off ramp/Parkview Ave											
56	NB	747.0	F	NB Left	46	222	668	726	F	174.0	F
				NB Through	0	0	0	0	A		
				NB Right	86	1028	668	726	F		
	SB	83.5	F	SB Left	552	113	2037	5048	F		
				SB Through	131	109	2037	5048	F		
				SB Right	447	39	2037	5048	D		
	EB	463.4	F	EB Left	0	0	0	0	A		
				EB Through	494	463	1163	1232	F		
				EB Right	2	599	1163	1232	F		
	WB	41.8	D	WB Left	116	87	120	459	F		
				WB Through	769	35	117	457	D		
				WB Right	0	0	0	0	A		
57- Watkins Mill Rd at I-270 NB on ramp											
57	NB	35.2	D	NB Left	386	51	92	383	D	70.0	E
				NB Through	0	0	0	0	A		
				NB Right	478	23	92	383	C		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	19.1	B	EB Left	190	61	49	301	E		
				EB Through	749	8	49	301	A		
				EB Right	0	0	0	0	A		
	WB	139.2	F	WB Left	0	0	0	0	A		
				WB Through	954	150	640	849	F		
				WB Right	174	78	640	849	E		
58- Watkins Mill Rd at I-270 SB on ramp											
58	NB			NB Left	0	0	0	0	A	60.7	E
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	73.4	E	EB Left	0	0	0	0	A		
				EB Through	938	30	483	620	C		
				EB Right	182	299	483	620	F		
	WB	50.0	D	WB Left	456	142	273	516	F		
				WB Through	883	2	273	516	A		
				WB Right	0	0	0	0	A		

Table C.15: AM Peak -2040 Final Model - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
1- MD 85 at Sam's Club Drive											
1	NB	21.0	C	NB Left	122	75	75	405	E	37.1	D
				NB Through	375	25	75	405	C		
				NB Right	690	9	18	322	A		
	SB	50.1	D	SB Left	137	65	171	731	E		
				SB Through	598	49	171	731	D		
				SB Right	68	28	171	731	C		
	EB	49.3	D	EB Left	106	76	54	192	E		
				EB Through	62	76	54	192	E		
				EB Right	113	9	54	192	A		
	WB	51.2	D	WB Left	231	74	88	346	E		
				WB Through	16	73	88	346	E		
				WB Right	126	7	88	346	A		
2- MD 85 at I-270 NB on and off ramp											
2	NB	49.4	D	NB Left	681	49	245	1138	D	34.9	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	18.8	B	SB Left	0	0	0	0	A		
				SB Through	610	19	52	593	B		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
3- MD 85 at I-270 SB on and off ramp											
3	NB	5.3	A	NB Left	0	0	0	0	A	10.8	B
				NB Through	1068	5	19	406	A		
				NB Right	0	0	0	0	A		
	SB	45.0	D	SB Left	174	45	50	521	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
4- MD 85 at Crestwood Blvd											
4	NB	19.3	C	NB Left	13	51	54	408	D	24.5	C
				NB Through	762	19	54	408	B		
				NB U-Turn	0	0	0	0	A		
	SB	18.4	B	SB Left	67	69	28	181	E		
				SB Through	1868	18	85	709	B		
				SB Right	843	15	72	699	B		
	EB	52.2	D	EB Left	623	54	91	286	D		
				EB Through	28	67	91	286	E		
				EB Right	42	16	91	286	B		
	WB	44.0	D	WB Left	52	53	21	134	D		
				WB Through	18	55	21	134	E		
				WB Right	19	9	21	134	A		
5- MD 80 at I-270 NB on and off ramp											
5	NB	6.2	A	NB Left	4	16	0	5	B	120.4	F
				NB Through	1	0	0	5	A		
				NB Right	4	-2	0	5	A		
	SB	12.9	B	SB Left	199	16	14	120	B		
				SB Through	5	18	14	120	B		
				SB Right	58	2	0	0	A		
	EB	19.8	B	EB Left	55	21	11	175	C		
				EB Through	0	0	8	0	A		
				EB Right	5	6	19	205	A		
	WB	151.8	F	WB Left	27	122	1	58	F		
				WB Through	638	188	810	939	F		
				WB Right	455	103	109	377	F		
6- MD 80 at I-270 SB on and off ramp											
6	NB	7.9	A	NB Left	26	59	3	220	F	55.5	F
				NB Through	0	0	0	0	A		
				NB Right	293	3	3	220	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	32.0	D	EB Left	0	0	0	0	A		
				EB Through	358	30	51	281	D		
				EB Right	161	37	52	290	E		
	WB	187.2	F	WB Left	0	0	0	0	A		
				WB Through	208	187	662	892	F		
				WB Right	0	0	0	0	A		
7- MD 109 at I-270 NB on and off ramp											
7	NB			NB Left	0	0	0	0	A	31.5	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	16.7	C	SB Left	137	21	19	191	C		
				SB Through	0	0	0	0	A		
				SB Right	45	2	0	88	A		
	EB	19.6	C	EB Left	66	9	3	203	A		
				EB Through	0	0	0	0	A		
				EB Right	61	31	0	6	D		
	WB	38.1	E	WB Left	0	0	0	0	A		
				WB Through	642	38	256	1317	E		
				WB Right	0	0	0	0	A		
8- MD 80 at I-270 SB on and off ramp											
8	NB	4.0	A	NB Left	17	14	1	72	B	123.4	F
				NB Through	0	0	0	0	A		
				NB Right	50	1	0	14	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	433.8	F	EB Left	0	0	0	0	A		
				EB Through	69	356	416	493	F		
				EB Right	53	535	416	490	F		
	WB	79.8	F	WB Left	538	81	491	910	F		
				WB Through	147	77	471	887	F		
				WB Right	0	0	0	0	A		
9- MD 121 at Gateway Center Dr											
9	NB	17.9	C	NB Left	150	28	41	295	C	110.6	F
				NB Through	429	23	41	295	C		
				NB Right	319	7	52	321	A		
	SB	161.3	F	SB Left	54	101	663	835	F		
				SB Through	765	165	665	836	F		
				SB Right	8	174	686	856	F		
	EB	252.4	F	EB Left	5	159	461	517	F		
				EB Through	52	227	461	517	F		
				EB Right	347	258	494	550	F		
	WB	22.4	C	WB Left	137	26	18	134	C		
				WB Through	17	22	19	133	C		
				WB Right	28	5	15	154	A		
10- MD 121 at I-270 NB on and off ramp											
10	NB	28.5	D	NB Left	315	60	67	240	F	47.1	D
				NB Through	0	0	0	0	A		
				NB Right	394	3	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	9.0	A	EB Left	0	0	0	0	A		
				EB Through	503	14	25	277	B		
				EB Right	278	0	0	0	A		
	WB	81.6	F	WB Left	182	79	602	1051	F		
				WB Through	1065	82	602	1051	F		
				WB Right	0	0	0	0	A		

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Table C.15: AM Peak -2040 Final Model - Intersection Delay and Level of Service

11- MD 121 at I-270 SB on and off ramp											
11	NB	42.2	D	NB Left	0	0	0	0	A	40.6	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	10.3	B	SB Left	210	72	146	778	F		
				SB Through	0	0	0	0	A		
				SB Right	292	21	0	79	C		
	EB	52.4	D	EB Left	0	0	0	0	A		
				EB Through	567	10	11	221	B		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	572	20	228	902	C		
				WB Right	808	76	432	889	F		
12- MD 27 at Observation Dr											
12	NB	45.8	D	NB U-Turn	0	0	0	0	A	55.6	E
				NB Through	48	56	13	71	E		
				NB Right	12	6	13	71	A		
	SB	50.2	D	SB Left	92	48	27	187	D		
				SB Through	54	48	52	281	D		
				SB Right	178	52	79	318	D		
	EB	19.8	B	EB Left	149	45	46	308	D		
				EB Through	1198	17	48	309	B		
				EB Right	46	11	56	347	B		
	WB	79.3	E	WB Left	97	56	517	847	E		
				WB Through	2014	82	517	847	F		
				WB Right	100	56	517	847	E		
13- MD 27 at I-270 NB off ramp											
13	NB	29.2	C	NB Left	102	29	13	105	C	31.3	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	0.1	A	SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	45.8	D	EB Left	0	0	0	0	A		
				EB Through	968	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	2098	46	1623	2476	D		
				WB Right	0	0	0	0	A		
14- MD 27 at I-270 SB off ramp											
14	NB	48.9	D	NB Left	0	0	0	0	A	20.9	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	3.0	A	SB Left	382	49	66	260	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	24.0	C	EB Left	0	0	0	0	A		
				EB Through	835	3	2	64	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	1337	24	179	853	C		
				WB Right	0	0	0	0	A		
15- MD 27 at Crystal Rock Dr											
15	NB	61.4	E	NB Left	30	34	278	723	C	71.1	E
				NB Through	1040	62	304	723	E		
				NB Right	91	67	315	736	E		
	SB	83.2	F	SB Left	493	82	836	1759	F		
				SB Through	1561	85	836	1759	F		
				SB Right	48	48	827	1753	D		
	EB	43.9	D	EB Left	224	50	58	202	D		
				EB Through	97	43	55	197	D		
				EB Right	76	27	59	227	C		
	WB	53.1	D	WB Left	11	56	36	112	E		
				WB Through	32	261	36	112	F		
				WB Right	142	6	36	112	A		
16- MD 118 at Seneca Meadows Pkwy											
16	NB	3.7	A	NB Left	103	12	1	87	B	6.1	A
				NB Through	726	3	4	136	A		
				NB Right	60	1	9	189	A		
	SB	3.9	A	SB Left	31	4	6	221	A		
				SB Through	948	4	10	221	A		
				SB Right	41	3	12	254	A		
	EB	18.5	B	EB Left	20	65	10	77	E		
				EB Through	6	82	10	77	F		
				EB Right	115	7	10	77	A		
	WB	44.7	D	WB Left	35	72	16	102	E		
				WB Through	6	55	11	101	D		
				WB Right	27	8	14	111	A		
17- MD 118 at I-270 NB on ramp											
17	NB	29.1	C	NB Left	0	0	0	0	A	10.1	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	5.4	A	SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB			EB Left	274	29	30	195	C		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	188	1	0	0	A		
				WB Right	911	6	15	253	A		
18- MD 118 at I-270 SB off ramp											
18	NB	38.0	D	NB Left	0	0.0	0	0	A	8.0	A
				NB Through	0	0.0	0	0	A		
				NB Right	0	0.0	0	0	A		
	SB	4.0	A	SB Left	230	38.0	37	163	D		
				SB Through	0	0.0	0	0	A		
				SB Right	0	0.0	0	0	A		
	EB	4.3	A	EB Left	0	0.0	0	0	A		
				EB Through	631	4.0	6	196	A		
				EB Right	0	0.0	0	0	A		
	WB			WB Left	0	0.0	0	0	A		
				WB Through	1181	4.3	9	238	A		
				WB Right	0	0.0	0	0	A		
19- MD 118 at Aircraft Dr											
19	NB	46.2	D	NB Left	9	78	9	75	E	20.8	C
				NB Through	13	80	9	75	F		
				NB Right	17	3	0	24	A		
	SB	60.5	E	SB Left	267	55	112	418	E		
				SB Through	53	72	112	418	E		
				SB Right	96	68	112	418	E		
	EB	12.4	B	EB Left	132	16	37	334	B		
				EB Through	1019	12	37	334	B		
				EB Right	34	12	37	334	B		
	WB	15.7	B	WB Left	84	25	47	342	C		
				WB Through	1038	18	47	342	B		
				WB Right	317	7	47	342	A		
20- Middlebrook Rd at Observation Dr											
20	NB	21.4	C	NB Left	0	0	0	0	A	68.6	E
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	18.4	B	SB Left	26	36	6	68	D		
				SB Through	0	0	0	0	A		
				SB Right	27	7	6	68	A		
	EB	107.9	F	EB Left	193	27	33	254	C		
				EB Through	705	16	33	254	B		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	979	119	414	511	F		
				WB Right	232	60	455	561	E		

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Table C.15: AM Peak -2040 Final Model - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
21- Middlebrook Rd at I-270 SB on ramp											
21	NB			NB Left	0	0	0	0	A	118.3	F
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	16.9	B	EB Left	0	0	0	0	A		
				EB Through	625	17	33	181	B		
				EB Right	0	0	0	0	A		
	WB	216.2	F	WB Left	648	216	2200	2397	F		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
22- Middlebrook Rd at Waring Station Rd											
22	NB	323.6	F	NB Left	96	242	438	495	F	117.0	F
				NB Through	5	262	438	495	F		
				NB Right	196	365	438	495	F		
	SB	18.1	B	SB Left	3	39	1	29	D		
				SB Through	0	0	1	29	A		
				SB Right	5	6	2	67	A		
	EB	128.8	F	EB Left	28	36	1077	1310	D		
				EB Through	1219	131	1077	1310	F		
				EB Right	69	131	1077	1310	F		
	WB	15.9	B	WB Left	75	23	27	203	C		
				WB Through	641	16	27	203	B		
				WB Right	36	4	27	203	A		
23- MD 124 at MD 355											
23	NB	52.1	D	NB Left	228	69	87	252	E	79.7	E
				NB Through	390	49	84	250	D		
				NB Right	54	3	0	0	A		
	SB	90.1	F	SB Left	67	163	448	787	F		
				SB Through	1240	117	448	787	F		
				SB Right	590	26	194	770	C		
	EB	39.8	D	EB Left	519	90	205	944	F		
				EB Through	409	17	205	944	B		
				EB Right	463	4	52	729	A		
	WB	105.9	F	WB Left	0	0	0	0	A		
				WB Through	2016	107	688	1115	F		
				WB Right	62	63	0	0	E		
24- MD 124 at I-270 SB on and off											
24	NB	64.7	F	NB Left	16	60	19	99	E	26.7	C
				NB Through	37	67	19	99	E		
				NB U-Turn	0	0	0	0	A		
	SB	22.8	C	SB Left	280	61	67	312	E		
				SB Through	11	52	67	312	D		
				SB Right	579	4	6	283	A		
	EB	35.9	D	EB Left	0	0	0	0	A		
				EB Through	971	37	129	674	D		
				EB Right	60	21	141	697	C		
	WB	20.7	C	WB Left	52	27	99	850	C		
				WB Through	1300	20	99	850	C		
				WB Right	0	0	0	0	A		
25- MD 117 at MD 124											
25	NB	61.8	E	NB Left	20	107	206	691	F	51.2	D
				NB Through	554	76	206	691	E		
				NB Right	432	42	110	629	D		
	SB	43.9	D	SB Left	184	67	201	787	E		
				SB Through	1090	44	201	787	D		
				SB Right	131	8	0	0	A		
	EB	56.5	E	EB Left	99	118	227	751	F		
				EB Through	1447	53	227	752	D		
				EB Right	81	51	237	779	D		
	WB	40.4	D	WB Left	290	71	97	352	E		
				WB Through	438	28	97	352	C		
				WB Right	87	0	0	0	A		
26- MD 117 at Bureau Dr											
26	NB	48.9	D	NB Left	24	70	19	118	E	44.7	D
				NB Through	24	61	19	118	E		
				NB Right	25	16	19	118	B		
	SB	217.1	F	SB Left	187	221	262	420	F		
				SB Through	53	228	262	420	F		
				SB Right	32	178	262	420	F		
	EB	39.3	D	EB Left	33	34	237	944	C		
				EB Through	2020	39	240	944	D		
				EB Right	29	36	233	934	D		
	WB	17.4	B	WB Left	276	54	93	430	D		
				WB Through	760	9	93	431	A		
				WB Right	283	5	68	479	A		
27- MD 117 at I-270 SB off ramp											
27	NB			NB Left	0	0	0	0	A	15.6	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	5.3	A	EB Left	0	0	0	0	A		
				EB Through	827	5	2	119	A		
				EB Right	0	0	0	0	A		
	WB	41.8	E	WB Left	328	42	99	516	E		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
28- MD 117 at I-270 NB off ramp											
28	NB			NB Left	0	0	0	0	A	30.7	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	54.8	D	SB Left	229	59	834	2337	E		
				SB Through	0	0	0	0	A		
				SB Right	717	54	837	2339	D		
	EB	22.3	C	EB Left	14	115	103	860	F		
				EB Through	811	21	103	860	C		
				EB Right	0	0	0	0	A		
	WB	13.5	B	WB Left	0	0	0	0	A		
				WB Through	910	14	51	367	B		
				WB Right	9	5	56	397	A		
29- MD 117 at Perry Pkwy											
29	NB	44.6	D	NB Left	37	74	17	125	E	17.0	B
				NB Through	7	63	17	124	E		
				NB Right	39	13	28	145	B		
	SB	56.6	E	SB Left	113	112	69	251	F		
				SB Through	14	121	69	251	F		
				SB Right	133	3	69	251	A		
	EB	10.7	B	EB Left	112	71	43	293	E		
				EB Through	918	3	43	293	A		
				EB Right	8	3	30	277	A		
	WB	10.1	B	WB Left	8	83	21	282	F		
				WB Through	749	10	21	282	B		
				WB Right	136	6	21	282	A		
30- Shady Grove Rd at I-270 NB off ramp											
30	NB	8.5	A	NB Left	0	0	0	0	A	25.0	C
				NB Through	956	8	19	242	A		
				NB Right	0	0	0	0	A		
	SB	10.4	B	SB Left	0	0	0	0	A		
				SB Through	1350	10	34	327	B		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	59.0	E	WB Left	1040	59	218	733	E		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

* Final = HSR + VSL + ARM + DDI

Table C.15: AM Peak -2040 Final Model - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
31- Shady Grove Rd at I-270 SB off ramp											
31	NB	13.2	B	NB Left	0	0	0	0	A	19.2	B
				NB Through	1004	13	38	375	B		
				NB Right	0	0	0	0	A		
	SB	9.1	A	SB Left	0	0	0	0	A		
				SB Through	1759	9	34	598	A		
				SB Right	0	0	0	0	A		
	EB	46.7	D	EB Left	283	42	40	232	D		
				EB Through	0	0	0	0	A		
				EB Right	578	49	95	435	D		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
32- MD 28 at I-270 SB off ramp											
32	NB			NB U-Turn	0	0	0	0	A	25.3	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	33.8	C	SB Left	390	42	64	254	D		
				SB Through	0	0	0	0	A		
				SB Right	98	2	0	52	A		
	EB	40.9	D	EB Left	0	0	0	0	A		
				EB Through	1175	62	982	2108	E		
				EB Right	774	10	304	1741	A		
	WB	8.1	A	WB Left	0	0	0	0	A		
				WB Through	1998	8	36	426	A		
				WB Right	0	0	0	0	A		
33- MD 28 at I-270 on and off ramps											
33	NB	35.5	D	NB Left	0	0	56	312	A	22.3	C
				NB Through	217	51	66	321	D		
				NB Right	142	11	66	321	B		
	SB	25.2	C	SB Left	30	56	30	227	E		
				SB Through	0	0	0	0	A		
				SB Right	317	22	30	227	C		
	EB	24.8	C	EB Left	257	48	88	402	D		
				EB Through	842	18	88	402	B		
				EB Right	0	0	0	0	A		
	WB	13.7	B	WB Left	26	13	48	313	B		
				WB Through	967	14	35	276	B		
				WB Right	0	0	0	0	A		
34- MD 189 at Great Falls Rd											
34	NB	37.9	D	NB Left	65	42	15	107	D	11.0	B
				NB Through	8	42	12	107	D		
				NB Right	10	6	14	118	A		
	SB	6.1	A	SB Left	83	43	24	199	D		
				SB Through	8	48	24	199	D		
				SB Right	619	1	0	0	A		
	EB	11.2	B	EB Left	341	17	16	203	B		
				EB Through	963	9	18	211	A		
				EB Right	14	6	28	247	A		
	WB	13.7	B	WB Left	5	17	20	194	B		
				WB Through	328	14	20	193	B		
				WB Right	11	9	32	227	A		
35- MD 189 at I-270 Ramps											
35	NB	46.1	D	NB Left	141	46	24	126	D	40.6	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	50.7	D	SB Left	219	51	70	322	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	23.9	C	EB Left	423	22	92	419	C		
				EB Through	571	25	92	419	C		
				EB Right	0	0	0	0	A		
	WB	56.8	E	WB Left	552	48	131	391	D		
				WB Through	289	73	131	391	E		
				WB Right	0	0	0	0	A		
36- MD 189 at Wooton Pkwy											
36	NB	40.5	D	NB Left	161	56	60	239	E	63.0	E
				NB Through	125	57	60	239	E		
				NB Right	159	12	60	239	B		
	SB	83.0	F	SB Left	477	92	365	808	F		
				SB Through	824	78	331	795	E		
				SB Right	0	0	0	0	A		
	EB	57.2	E	EB Left	167	79	262	916	E		
				EB Through	987	57	262	916	E		
				EB Right	127	30	262	916	C		
	WB	53.1	D	WB Left	411	73	129	315	E		
				WB Through	384	39	129	315	D		
				WB Right	59	6	129	315	A		
37- Montrose Rd at Tower Oaks Blvd											
37	NB			NB Left	0	0	0	0	A	83.1	F
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	209.6	F	SB Left	154	49	1114	1390	D		
				SB Through	0	0	0	0	A		
				SB Right	586	252	1117	1386	F		
	EB	25.6	C	EB Left	29	38	150	1014	D		
				EB Through	1587	25	150	1014	C		
				EB Right	0	0	0	0	A		
	WB	82.7	F	WB Left	0	0	0	0	A		
				WB Through	1758	85	444	857	F		
				WB Right	85	31	444	857	C		
38- Tower Oaks Blvd at I-270 off ramp											
38	NB	22.4	C	NB Left	537	22	39	206	C	64.4	E
				NB Through	10	22.8	32	198	C		
				NB Right	29	26.9	39	206	C		
	SB	0.5	A	SB Left	0	28.6	0	25	C		
				SB Through	0	0.0	0	25	A		
				SB Right	4	0.5	0	0	A		
	EB	101.5	F	EB Left	8	78.1	342	468	E		
				EB Through	720	102.5	342	468	F		
				EB Right	104	96.0	333	458	F		
	WB	8.6	A	WB Left	0	0.0	3	74	A		
				WB Through	107	8.9	3	75	A		
				WB Right	7	4.0	0	0	A		
39- Montrose Rd at Tower Oaks Blvd											
39	NB	16.6	B	NB Left	37	74	41	180	E	49.2	D
				NB Through	240	45	41	180	D		
				NB Right	560	0	0	0	A		
	SB	44.8	D	SB Left	334	56	181	621	E		
				SB Through	773	41	181	620	D		
				SB Right	77	33	120	662	C		
	EB	82.4	F	EB Left	79	73	385	720	E		
				EB Through	991	83	387	721	F		
				EB Right	64	83	406	744	F		
	WB	42.7	D	WB Left	401	53	90	308	D		
				WB Through	250	47	90	308	D		
				WB Right	145	7	106	338	A		
40- Rockledge Blvd at I-270 NB on and off ramp											
40	NB	33.9	C	NB Left	0	0	0	0	A	51.0	D
				NB Through	93	34	33	157	C		
				NB Right	214	34	33	157	C		
	SB	2.2	A	SB Left	0	0	5	71	A		
				SB Through	981	2	5	71	A		
				SB Right	0	0	0	0	A		
	EB	98.9	F	EB Left	6	283	1510	2228	F		
				EB Through	580	186	1510	2228	F		
				EB Right	522	1	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

* Final = HSR + VSL + ARM + DDI

Table C.15: AM Peak -2040 Final Model - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
41- Rockledge Blvd at I-270 SB on and off ramps											
41	NB	2.8	A	NB Left	99	3	1	25	A	21.3	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	22.5	C	WB Left	980	23	101	652	C		
				WB Through	430	21	101	652	C		
				WB Right	0	0	0	0	A		
42- MD 187 at Tuckerman Ln											
42	NB	56.9	E	NB Left	231	24	260	779	C	152.0	F
				NB Through	1470	53	260	779	D		
				NB Right	216	116	260	779	F		
	SB	223.7	F	SB Left	60	160	2603	2700	F		
				SB Through	1212	223	2603	2700	F		
				SB Right	161	250	2603	2700	F		
	EB	186.6	F	EB Left	222	128	1863	1983	F		
				EB Through	620	207	1865	1984	F		
				EB Right	128	191	1888	2008	F		
	WB	187.8	F	WB Left	722	228	1914	2154	F		
				WB Through	399	153	1914	2154	F		
				WB Right	158	93	1914	2154	F		
43- MD 187 at I-270 NB on and off ramps											
43	NB	11.6	B	NB Left	163	90	64	195	F	18.8	B
				NB Through	1523	3	64	195	A		
				NB Right	0	0	0	0	A		
	SB	24.0	C	SB Left	0	0	0	0	A		
				SB Through	1530	24	77	542	C		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	49.9	D	WB Left	124	50	39	232	D		
				WB Through	11	48	39	232	D		
				WB Right	0	0	0	0	A		
44- MD 187 at I-270 NB on and off ramps											
44	NB	23.2	C	NB Left	0	0	0	0	A	23.6	C
				NB Through	1478	23	67	428	C		
				NB Right	0	0	0	0	A		
	SB	7.8	A	SB Left	178	54	60	285	D		
				SB Through	1470	2	60	285	A		
				SB Right	0	0	0	0	A		
	EB	70.2	E	EB Left	212	58	145	685	E		
				EB Through	0	0	145	685	A		
				EB Right	354	78	175	696	E		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
45- MD 187 at Rock Spring Dr											
45	NB	14.8	B	NB Left	255	57	68	266	E	20.5	C
				NB Through	1382	7	69	266	A		
				NB Right	10	6	92	299	A		
	SB	21.3	C	SB Left	13	29	96	613	C		
				SB Through	1665	23	96	613	C		
				SB Right	143	1	64	608	A		
	EB	37.4	D	EB Left	190	59	55	232	E		
				EB Through	26	55	55	232	E		
				EB Right	251	19	55	232	B		
	WB	7.3	A	WB Left	1	8	1	29	A		
				WB Through	9	11	1	29	B		
				WB Right	5	0	0	7	A		
47-Democracy Blvd at I-270 NB off ramp											
47	NB	31.7	C	NB Left	228	32	28	156	C	14.3	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	13.6	B	EB Left	0	0	0	0	A		
				EB Through	1644	14	54	453	B		
				EB Right	0	0	0	0	A		
	WB	10.9	B	WB Left	0	0	0	0	A		
				WB Through	778	11	24	190	B		
				WB Right	0	0	0	0	A		
48- Democracy Blvd at I-270 SB on ramp											
48	NB			NB Left	0	0	0	0	A	6.4	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	5.3	A	EB Left	0	0	0	0	A		
				EB Through	1756	5	22	277	A		
				EB Right	0	0	0	0	A		
	WB	8.5	A	WB Left	223	36	31	173	D		
				WB Through	781	1	20	152	A		
				WB Right	0	0	0	0	A		
49- Democracy Blvd at I-270 SB off ramp											
49	NB			NB Left	0	0	0	0	A	11.7	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	33.2	C	SB Left	318	49	55	272	D		
				SB Through	0	0	0	0	A		
				SB Right	157	2	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	2.5	A	WB Left	0	0	0	0	A		
				WB Through	782	3	4	130	A		
				WB Right	334	2	0	105	A		
50- MD 190 at Burdette Rd											
50	NB	73.2	E	NB Left	20	80	15	118	E	13.8	B
				NB Through	4	59	15	118	E		
				NB Right	11	67	15	118	E		
	SB	34.6	C	SB Left	50	79	31	151	E		
				SB Through	17	64	31	151	E		
				SB Right	120	12	31	151	B		
	EB	11.6	B	EB Left	52	96	66	607	F		
				EB Through	1807	9	65	606	A		
				EB Right	14	4	58	630	A		
	WB	12.5	B	WB Left	1	106	62	828	F		
				WB Through	1498	13	63	829	B		
				WB Right	21	2	55	846	A		

* Final = HSR + VSL + ARM + DDI

Table C.15: AM Peak -2040 Final Model - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
51- MD 190 at I-270 NB on ramp											
51	NB			NB Left	0	0	0	0	A	57.9	E
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	135.1	F	EB Left	535	135	381	730	F		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	16.3	B	WB Left	0	0	0	0	A		
WB Through				994	16	77	750	B			
WB Right				0	0	0	0	A			
52- MD 190 at I-270 SB off ramp											
52	NB	81.2	F	NB Left	256	81	719	3099	F	14.7	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	3.8	A	EB Left	0	0	0	0	A		
				EB Through	983	4	9	180	A		
				EB Right	0	0	0	0	A		
	WB	5.3	A	WB Left	0	0	0	0	A		
WB Through				667	5	7	161	A			
WB Right				0	0	0	0	A			
53- MD 190 at Seven Locks Rd											
53	NB	68.2	E	NB Left	21	67	23	149	E	44.1	D
				NB Through	59	69	25	148	E		
				NB Right	0	0	0	0	A		
	SB	56.8	E	SB Left	624	56	184	769	E		
				SB Through	183	59	184	770	E		
				SB Right	18	54	183	769	D		
	EB	37.6	D	EB Left	24	32	135	584	C		
				EB Through	846	38	135	584	D		
				EB Right	42	42	135	584	D		
	WB	36.9	D	WB Left	121	110	112	360	F		
WB Through				638	32	115	362	C			
WB Right				159	1	2	147	A			
54- MD 124 at I-270 NB off ramp											
54	NB	37.7	D	NB Left	0	0	0	0	A	21.8	C
				NB Through	0	0	0	0	A		
				NB Right	481	38	60	381	D		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	13.2	B	EB Left	0	0	0	0	A		
				EB Through	895	13	21	354	B		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
WB Through				0	0	0	0	A			
WB Right				0	0	0	0	A			
55- Democracy Blvd at I-270 NB off ramp											
55	NB	37.0	D	NB Left	0	0	0	0	A	16.6	B
				NB Through	0	0	0	0	A		
				NB Right	964	37	119	594	D		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	4.6	A	EB Left	0	0	0	0	A		
				EB Through	1644	5	18	92	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
WB Through				0	0	0	0	A			
WB Right				0	0	0	0	A			
56- Watkins Mill Rd at I-270 SB off ramp/Parkview Ave											
56	NB	#VALUE!	#VALUE!	NB Left	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
				NB Through	0	0	0	0	A		
				NB Right	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!		
	SB	43.9	D	SB Left	125	94	135	477	F		
				SB Through	1050	38	75	452	D		
				SB Right	5	1	75	452	A		
	EB	#VALUE!	#VALUE!	EB Left	0	0	0	0	A		
				EB Through	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!		
				EB Right	1180	43	105	541	D		
	WB	#VALUE!	#VALUE!	WB Left	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!		
WB Through				#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!			
WB Right				0	0	0	0	A			
57- Watkins Mill Rd at I-270 NB on ramp											
57	NB	12.1	B	NB Left	946	16	42	266	B	36.7	D
				NB Through	0	0	0	0	A		
				NB Right	354	3	1	110	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	34.3	C	EB Left	743	27	424	679	C		
				EB Through	387	49	98	289	D		
				EB Right	0	0	0	0	A		
	WB	41.7	D	WB Left	0	0	0	0	A		
WB Through				6080	48	566	5059	D			
WB Right				872	0	0	0	A			
58- Watkins Mill Rd at I-270 SB on ramp											
58	NB			NB Left	0	0	0	0	A	23.8	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	21.4	C	EB Left	0	0	0	0	A		
				EB Through	756	23	128	338	C		
				EB Right	543	20	65	450	B		
	WB	24.5	C	WB Left	4371	24	149	679	C		
WB Through				0	0	0	0	A			
WB Right				0	0	0	0	A			

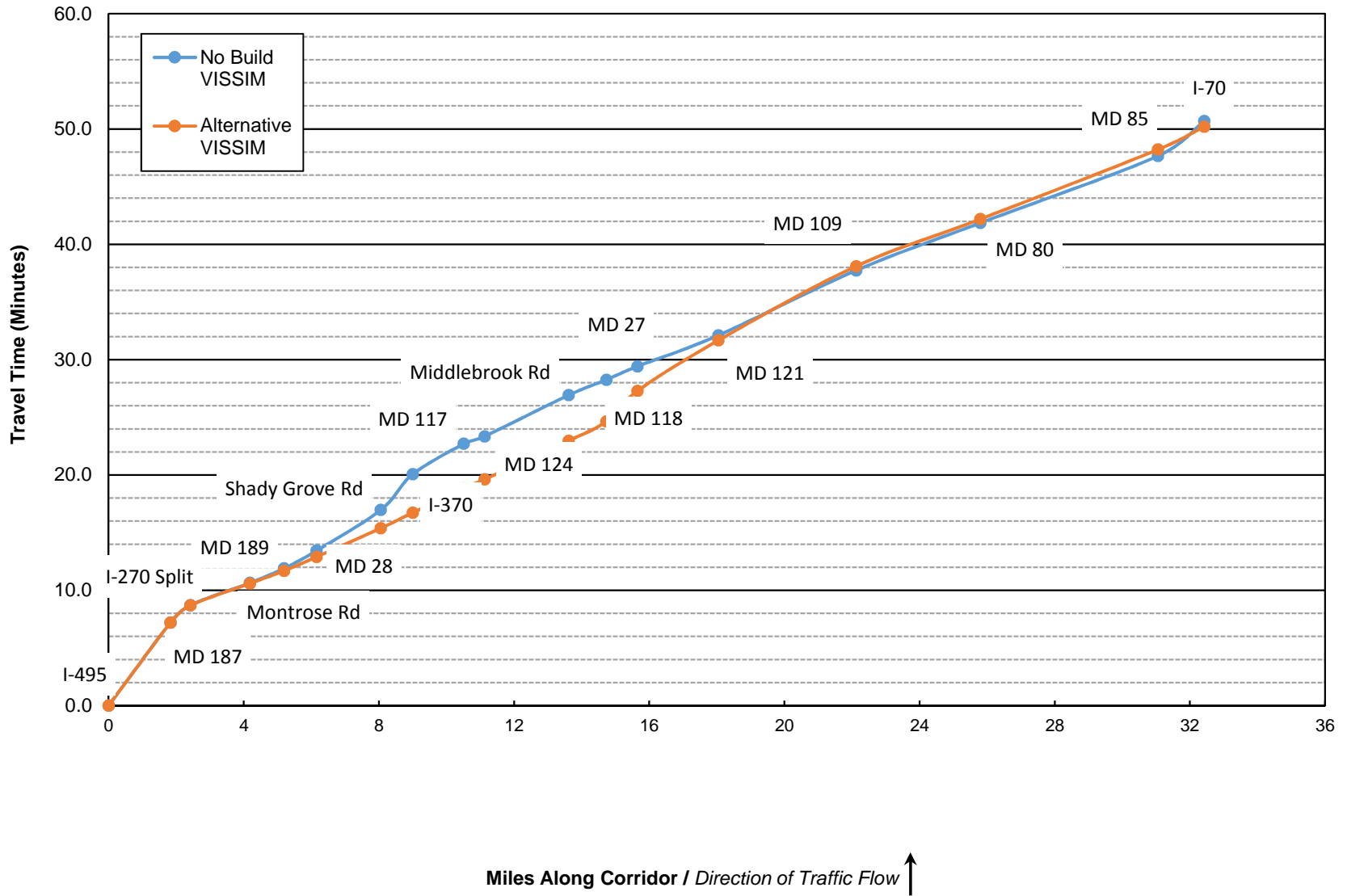
* Final = HSR + VSL + ARM + DDI

Table C.16: AM Peak -2040 Final Model- I-270 Vehicle Network Performance

	No Build	Final	% Change
Total Delay	35,032,576	21,624,724	-38%
Average Delay per Vehicle	326	201	-38%
Total Travel Time	64,317,886	54,280,006	-16%
Vehicles (Arrived)	87,894	91,128	4%
Latent Demand	44,530	44,443	0%
Latent Delay	120,600,723	124,821,632	3%
Total Distance	463,125	479,180	3%
Average Speed	26	32	22%

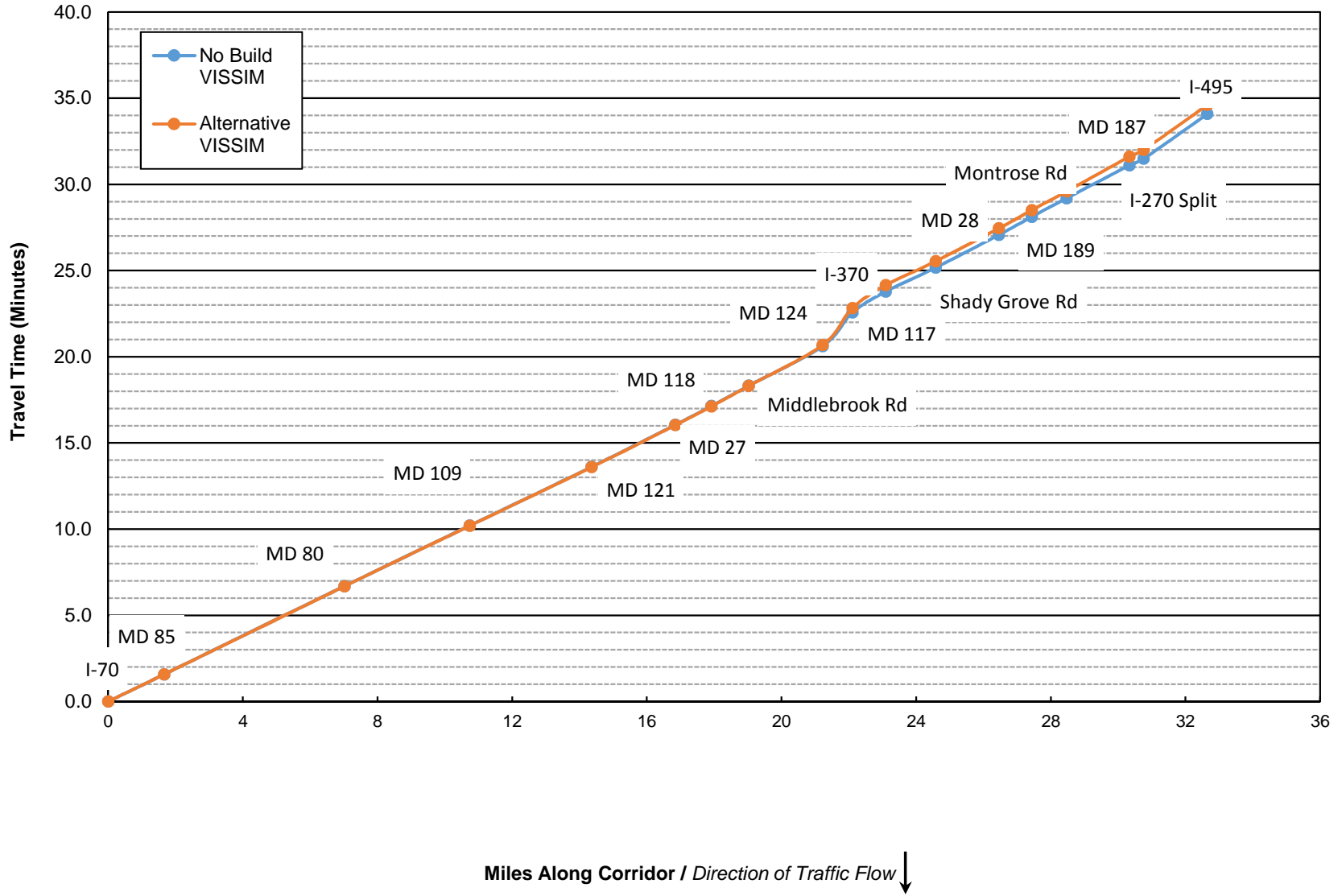
*FINAL = HSR+VSL+ARM+DDI

**Figure D.1: PM Peak - 2040 Final Model
I-270 Travel Time Graph - Northbound**



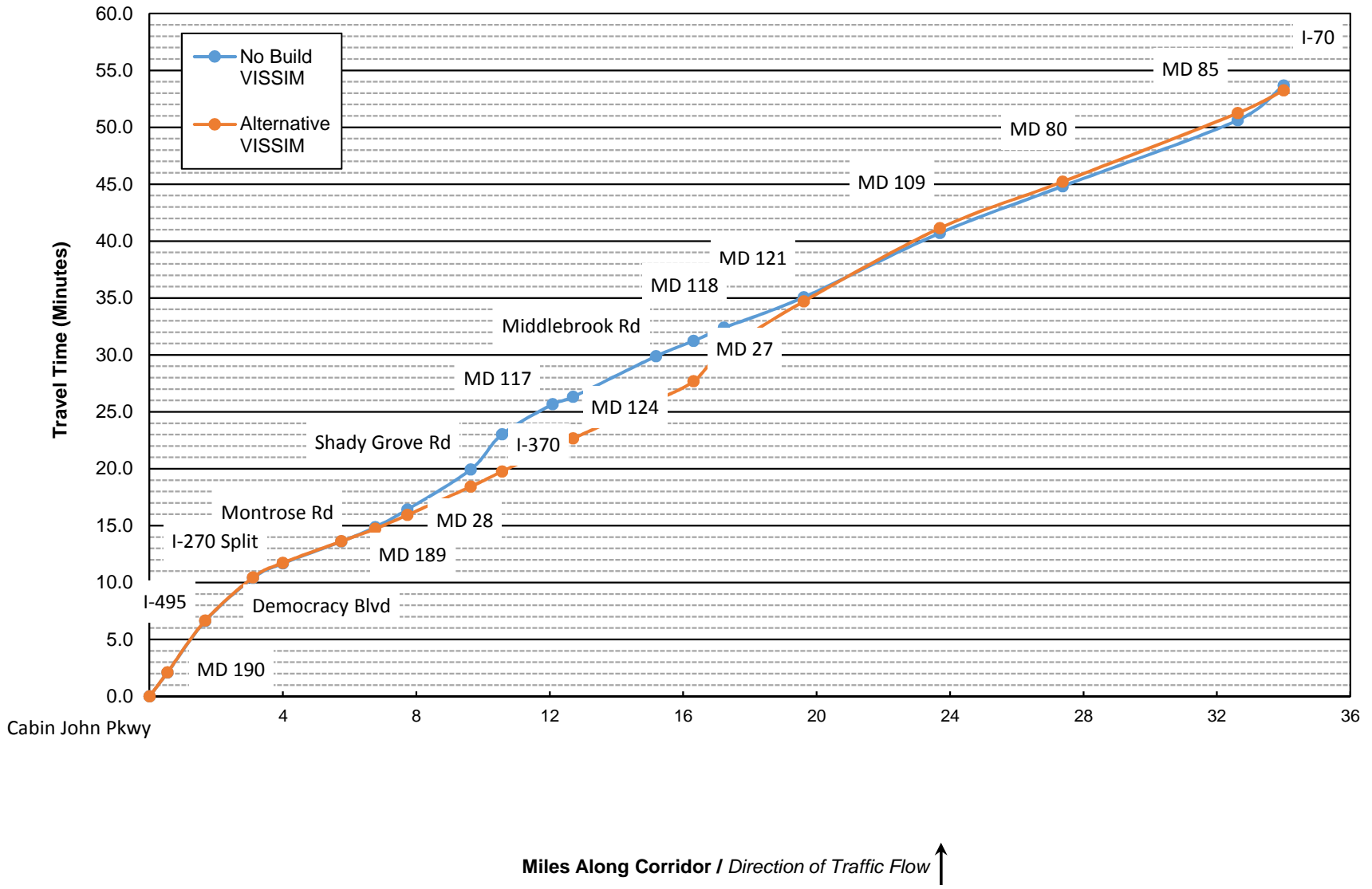
* Final = HSR + VSL + ARM + DDI

**Figure D.2: PM Peak - 2040 Final Model
I-270 Travel Time Graph - Southbound**



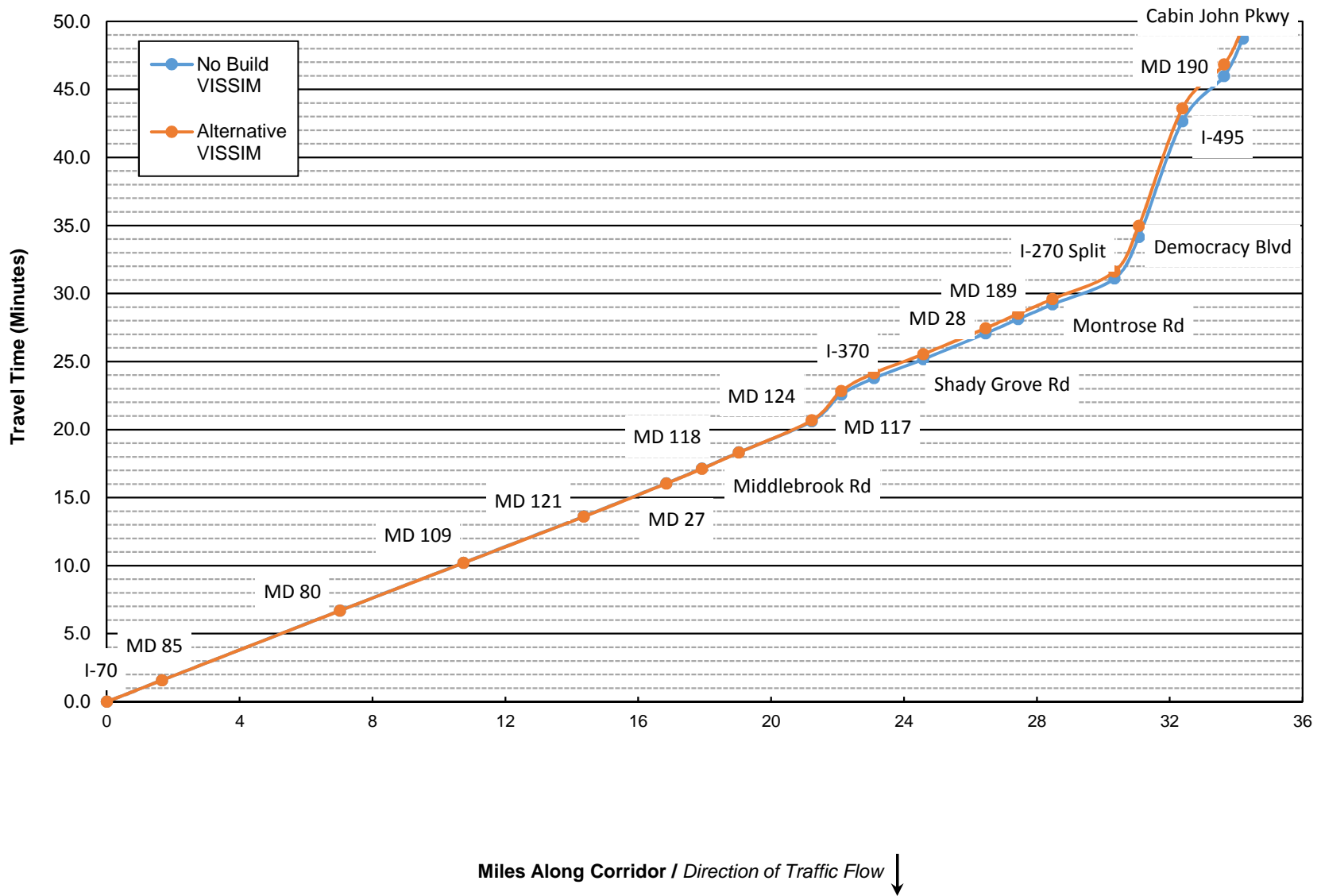
* Final = HSR + VSL + ARM + DDI

**Figure D.3: PM Peak - 2040 Final Model
I-270 Spur Travel Time Graph - Northbound**



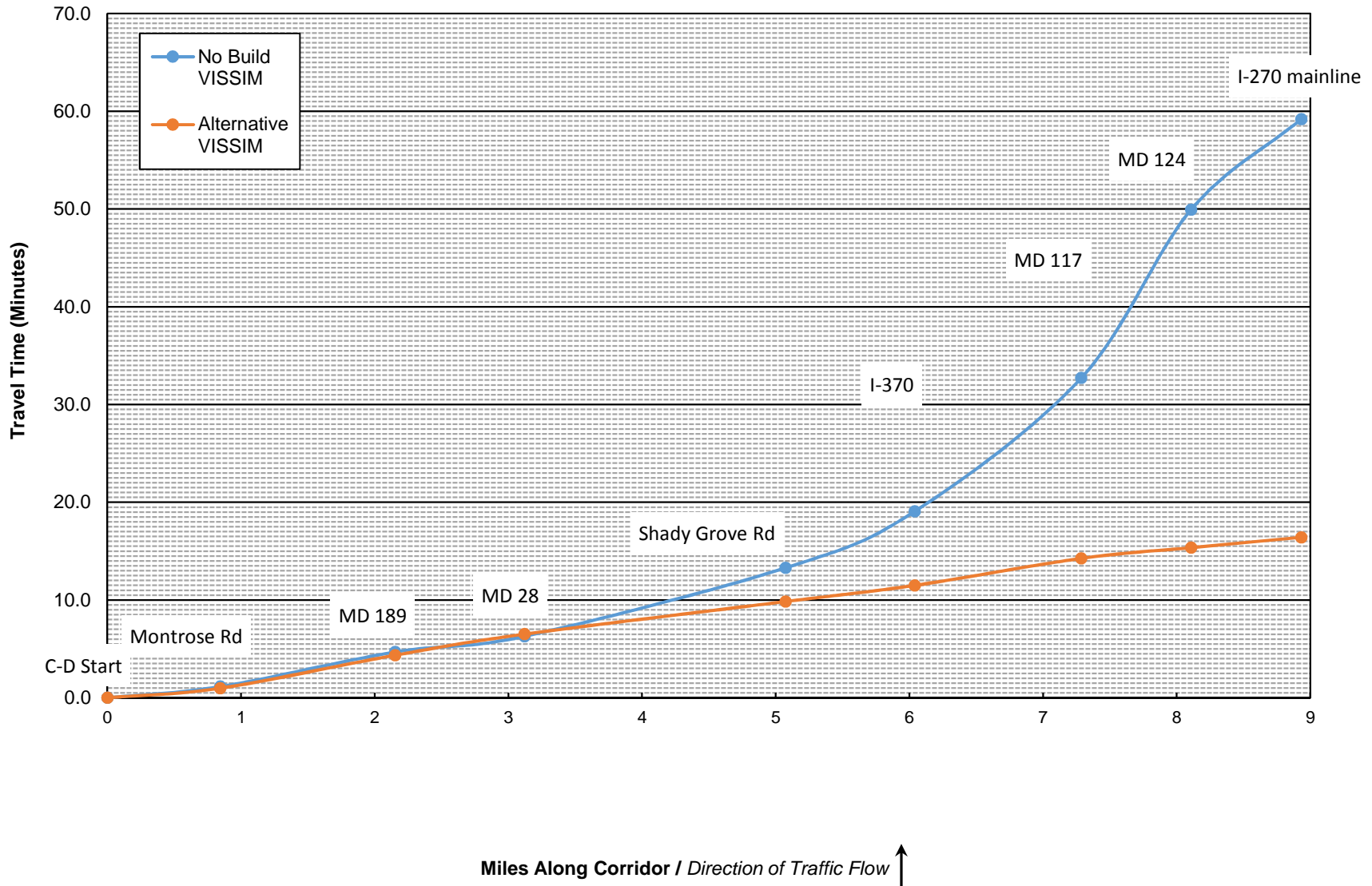
* Final = HSR + VSL + ARM + DDI

**Figure D.4: PM Peak - 2040 Final Model
I-270 Spur Travel Time Graph - Southbound**



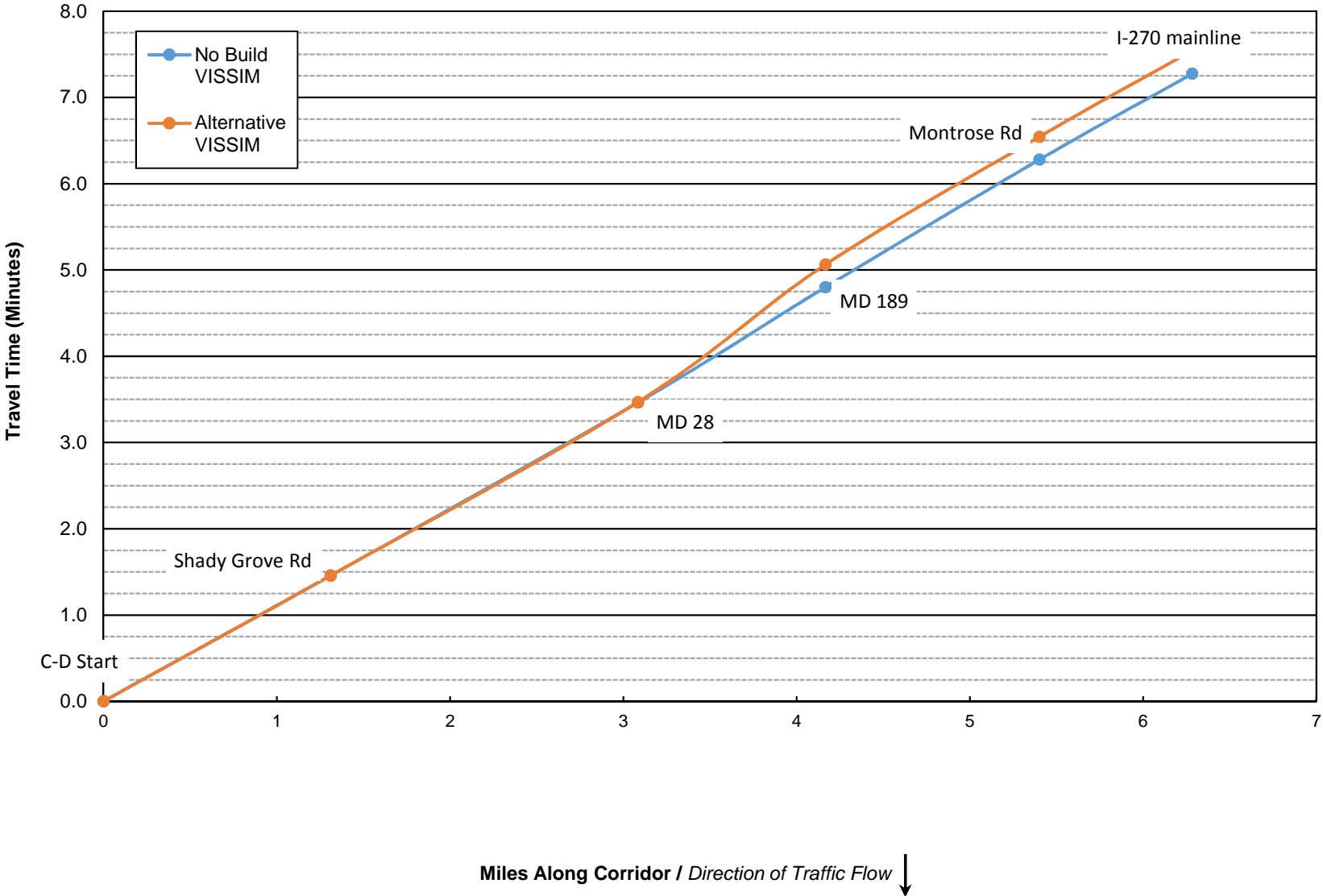
* Final = HSR + VSL + ARM + DDI

**Figure D.5: PM Peak -2040 Final Model
I-270 Local Travel Time Graph - Northbound**



* Final = HSR + VSL + ARM + DDI

**Figure D.6: PM Peak - 2040 Final Model
I-270 Local Travel Time Graph - Southbound**



* Final = HSR + VSL + ARM + DDI

Table D.1: PM Peak 2040 Final Model - I-270 Vehicle Travel Time

I-270 Northbound	Segment Length (miles)	No Build VISSIM Travel Time (seconds)	Final VISSIM Travel Time (seconds)	% Change	I-270 Southbound	Segment Length (miles)	No Build VISSIM Travel Time (seconds)	Final VISSIM Travel Time (seconds)	% Change
From I-495 interchange					From I-70				
to MD 187	1.8	432.3	431.7	-0.1%	to MD 85	1.7	94.6	94.6	0.0%
to I-270 Split	0.6	90.3	89.7	-0.6%	to MD 80	5.4	307.1	306.7	0.1%
to Montrose Rd	1.8	115.8	113.8	-1.8%	to MD 109	3.7	210.7	210.6	0.0%
to MD 189	1.0	76.0	66.1	-13.0%	to MD 121	3.6	204.4	204.0	0.2%
to MD 28	1.0	92.5	72.7	-21.4%	to MD 27	2.5	146.4	146.1	0.2%
to Shady Grove Rd	1.9	211.0	149.3	-29.2%	to MD 118	1.1	65.1	65.2	-0.1%
to I-370	0.9	185.6	80.4	-56.7%	to Middlebrook Rd	1.1	71.2	71.4	-0.4%
to MD 117	1.5	158.7	126.2	-20.5%	to MD 124	2.2	137.5	142.4	-3.5%
to MD 124	0.6	38.8	47.5	22.6%	to MD 117	0.9	117.3	128.6	-9.6%
to Middlebrook Rd	2.5	214.3	200.5	-6.4%	to I-370	1.0	72.5	79.2	-9.2%
to MD 118	1.1	80.3	100.7	25.4%	to Shady Grove Rd	1.5	83.4	83.7	-0.4%
to MD 27	0.9	69.9	158.3	126.5%	to MD 28	1.9	114.1	114.4	-0.3%
to MD 121	2.4	161.1	263.4	63.5%	to MD 189	1.0	62.7	63.4	-1.1%
to MD 109	4.1	337.8	385.7	14.2%	to Montrose Rd	1.0	64.8	65.0	-0.4%
to MD 80	3.7	247.0	245.0	-0.8%	to I-270 Split	1.9	114.7	121.3	-5.8%
to MD 85	5.3	348.1	361.9	4.0%	to MD 187	0.4	23.0	23.2	-0.8%
to I-70	1.4	182.3	118.9	-34.8%	to I-495 interchange	1.9	155.6	156.8	-0.7%
I-270 Total (miles/minutes)	32.4	50.7	50.2	-1.0%	I-270 Total (miles/minutes)	32.6	34.1	34.6	-1.5%
I-270 Spur Northbound					I-270 Spur Southbound				
From Cabin John Pkwy					From I-70				
to MD 190	0.5	125.4	126.7	1.0%	to I-270 Split	30.3	1,866.3	1,896.6	1.6%
to I-495	1.1	271.9	272.6	0.3%	to Democracy Blvd	0.7	183.2	201.4	9.9%
to Democracy Blvd	1.4	226.8	227.9	0.5%	to I-495	1.3	509.9	517.8	1.6%
to I-270 Split	0.9	76.4	76.2	-0.2%	to MD 190	1.3	199.4	194.0	-2.7%
to I-70	30.0	2,519.1	2,490.4	-1.1%	to Cabin John Pkwy	0.6	164.4	160.5	-2.4%
I-270 Spur Total (miles/minutes)	34.0	53.7	53.2	-0.8%	I-270 Spur Total (miles/minutes)	34.2	48.7	49.5	1.6%

* Final = HSR + VSL + ARM + DDI

Table D.2: PM Peak - 2040 Final Model - I-270 Local Vehicle Travel Time

I-270 Northbound	Segment Length (miles)	No Build VISSIM Travel Time (seconds)	Final VISSIM Travel Time (seconds)	% Change	I-270 Southbound	Segment Length (miles)	No Build VISSIM Travel Time (seconds)	Final VISSIM Travel Time (seconds)	% Change
From C-D start					From C-D start				
to Montrose Rd	0.8	68.8	58.9	-14.4%	to Shady Grove	1.3	87.5	87.4	-0.1%
to MD 189	1.3	212.1	202.4	-4.6%	to MD 28	1.8	120.3	120.7	0.3%
to MD 28	1.0	96.2	129.1	34.2%	to MD 189	1.1	80.2	95.6	19.3%
to Shady Grove	2.0	420.6	200.5	-52.3%	to Montrose	1.2	88.8	88.9	0.2%
to I-370	1.0	346.7	98.9	-71.5%	to I-270 mainline	0.9	59.7	60.0	0.4%
to MD 117	1.2	819.0	165.7	-79.8%					
to MD 124	0.8	1,033.2	66.0	-93.6%					
to I-270 mainline	0.8	555.0	63.1	-88.6%					
I-270 Local Total (miles/minutes)	8.9	59.2	16.4	-72.3%	I-270 Local Total (miles/minutes)	6.3	7.3	7.5	3.7%

* Final = HSR + VSL + ARM + DDI

Table D.3: PM Peak - 2040 Final Model - I-270 Vehicle Speed

I-270 Northbound	Segment Length (miles)	No Build VISSIM Speed (MPH)	Final VISSIM Speed (MPH)	% Change	I-270 Southbound	Segment Length (miles)	No Build VISSIM Speed (MPH)	Final VISSIM Speed (MPH)	% Change
From I-495 interchange					From I-70				
to MD 187	1.8	15.3	15.3	0.1%	to MD 85	1.7	63.3	63.3	0.0%
to I-270 Split	0.6	23.6	23.7	0.6%	to MD 80	5.4	62.8	62.9	0.1%
to Montrose Rd	1.8	54.5	55.5	1.8%	to MD 109	3.7	63.6	63.6	0.0%
to MD 189	1.0	48.0	55.2	15.0%	to MD 121	3.6	63.8	63.9	0.2%
to MD 28	1.0	37.5	47.8	27.3%	to MD 27	2.5	61.1	61.2	0.2%
to Shady Grove Rd	1.9	32.4	45.8	41.3%	to MD 118	1.1	59.3	59.2	-0.1%
to I-370	0.9	18.3	42.3	130.9%	to Middlebrook Rd	1.1	56.2	56.0	-0.4%
to MD 117	1.5	34.4	43.2	25.8%	to MD 124	2.2	57.5	55.5	-3.4%
to MD 124	0.6	56.9	46.4	-18.4%	to MD 117	0.9	27.2	24.8	-8.8%
to Middlebrook Rd	2.5	41.8	44.7	6.8%	to I-370	1.0	48.9	44.8	-8.4%
to MD 118	1.1	50.2	40.1	-20.3%	to Shady Grove Rd	1.5	64.2	64.0	-0.4%
to MD 27	0.9	47.2	20.8	-55.8%	to MD 28	1.9	59.1	59.0	-0.3%
to MD 121	2.4	53.5	32.7	-38.8%	to MD 189	1.0	56.2	55.5	-1.1%
to MD 109	4.1	43.5	38.1	-12.4%	to Montrose Rd	1.0	57.4	57.1	-0.4%
to MD 80	3.7	53.6	54.0	0.8%	to I-270 Split	1.9	58.7	55.5	-5.5%
to MD 85	5.3	54.3	52.3	-3.8%	to MD 187	0.4	65.7	65.2	-0.8%
to I-70	1.4	27.1	41.5	53.3%	to I-495 interchange	1.9	43.7	43.4	-0.7%
I-270 Total (miles/minutes)	32.4	38.4	38.8	1.0%	I-270 Total (miles/minutes)	32.6	57.5	56.6	-1.5%
I-270 Spur Northbound					I-270 Spur Southbound				
From Cabin John Pkwy					From I-70				
to MD 190	0.5	15.5	15.3	-1.0%	to I-270 Split	30.3	58.5	57.6	-1.6%
to I-495	1.1	15.0	15.0	-0.3%	to Democracy Blvd	0.7	14.4	13.1	-9.0%
to Democracy Blvd	1.4	22.8	22.6	-0.5%	to I-495	1.3	9.3	9.1	-1.5%
to I-270 Split	0.9	42.0	42.1	0.2%	to MD 190	1.3	22.6	23.3	2.8%
to I-70	30.0	42.9	43.4	1.2%	to Cabin John Pkwy	0.6	12.5	12.8	2.5%
I-270 Spur Total (miles/minutes)	34.0	38.0	38.3	0.8%	I-270 Spur Total (miles/minutes)	34.2	42.1	41.5	-1.6%

* Final = HSR + VSL + ARM + DDI

Table D.4: PM Peak -2040 Final Model - I-270 Local Vehicle Speed

I-270 Northbound	No Build VISSIM Speed (MPH)	Final VISSIM Speed (MPH)	% Change	I-270 Southbound	No Build VISSIM Speed (MPH)	Final VISSIM Speed (MPH)	% Change
From C-D start				From C-D start			
to Montrose Rd	44.2	51.7	16.8%	to Shady Grove	53.9	54.0	0.1%
to MD 189	22.2	23.2	4.8%	to MD 28	53.1	52.9	-0.3%
to MD 28	36.2	27.0	-25.5%	to MD 189	48.6	40.7	-16.1%
to Shady Grove	16.7	35.1	109.8%	to Montrose	50.1	50.0	-0.2%
to I-370	10.0	35.1	250.4%	to I-270 mainline	53.2	53.0	-0.4%
to MD 117	5.5	27.1	394.2%				
to MD 124	2.9	44.9	1466.2%				
to I-270 mainline	5.3	47.0	779.9%				
I-270 Local Total (miles/minutes)	9.1	32.7	260.7%	I-270 Local Total (miles/minutes)	51.8	50.0	-3.6%

* Final = HSR + VSL + ARM + DDI

Table D.5: PM Peak -2040 Final Model - I-270 Vehicle Density

I-270 Northbound	Type	No Build		Final		% Change	I-270 Southbound	Type	No Build		Final		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS	
I-270	Freeway	91	F	92	F	1%	I-270	Freeway	19	C	19	C	0%
I-270 Diverge to MD 187	Diverge	77	F	77	F	0%	I-270 Merge from WB I-70	Merge	17	B	17	B	0%
I-270	Freeway	84	F	86	F	2%	I-270	Freeway	24	C	24	C	0%
I-270 Diverge to Rockledge Rd	Diverge	77	F	78	F	1%	I-270 Merge from EB I-70	Merge	16	B	16	B	0%
I-270	Freeway	85	F	85	F	0%	I-270	Freeway	22	C	22	C	0%
I-270 Weave from MD 187 to I-270 HOV	Weave	57	F	57	F	0%	I-270 Diverge to SB MD 85	Diverge	23	C	23	C	0%
I-270 Lane Drop	Merge	65	F	64	F	0%	I-270	Freeway	24	C	24	C	0%
I-270	Freeway	51	F	51	F	0%	I-270 Diverge to NB MD 85	Diverge	15	B	15	B	0%
I-270 Merge from I-270 Spur	Merge	37	E	37	E	0%	I-270	Freeway	19	C	19	C	0%
I-270 Weave from I-270 HOV to I-270 C-D	Weave	34	D	33	D	-3%	I-270 Merge from MD 85	Merge	20	C	20	C	1%
I-270	Freeway	34	D	32	D	-7%	I-270	Freeway	25	C	25	C	0%
I-270 Diverge to C-D (MD 189)	Diverge	46	F	38	E	-18%	I-270 Diverge to MD 80	Diverge	17	B	16	B	-1%
I-270	Freeway	46	F	32	D	-30%	I-270	Freeway	20	C	20	C	0%
I-270 Diverge to C-D (MD 28)	Diverge	62	F	38	E	-38%	I-270 Merge from MD 80	Merge	14	B	14	B	-1%
I-270	Freeway	55	F	32	D	-42%	I-270	Freeway	23	C	23	C	0%
I-270 Merge from C-D (MD 189)	Merge	72	F	49	F	-33%	I-270 Diverge to MD 109	Diverge	12	B	12	B	1%
I-270 Diverge to C-D (Shady Grove Rd)	Diverge	77	F	48	F	-37%	I-270	Freeway	22	C	22	C	0%
I-270	Freeway	65	F	35	E	-46%	I-270 Merge from MD 109	Merge	13	B	14	B	3%
I-270 Weave from C-D (MD 28) to C-D (Shady Grove Rd)	Weave	90	F	41	F	-54%	I-270	Freeway	24	C	24	C	0%
I-270	Freeway	90	F	32	D	-64%	I-270 Diverge to SB Weigh Station	Diverge	12	B	12	B	1%
I-270 Merge from C-D (Shady Grove Rd)	Merge	124	F	34	D	-73%	I-270	Freeway	24	C	24	C	-1%
I-270	Freeway	88	F	43	E	-52%	I-270 Merge from SB Weigh Station	Merge	12	B	12	B	0%
I-270 Merge from C-D (I-370)	Merge	155	F	42	F	-73%	I-270	Freeway	23	C	22	C	0%
I-270 Diverge to C-D (MD 117)	Diverge	159	F	54	F	-66%	I-270 Diverge to MD 121	Diverge	9	A	9	A	1%
I-270	Freeway	21	C	32	D	47%	I-270	Freeway	12	B	12	B	0%
I-270 Merge from C-D (MD 124)	Merge	47	F	42	F	-12%	I-270 Merge from WB MD 121	Merge	10	B	10	B	0%
I-270	Freeway	27	D	39	E	47%	I-270	Freeway	15	B	15	B	0%
I-270 Diverge to EB Middlebrook Rd	Diverge	20	B	34	D	68%	I-270 Merge from EB MD 121	Merge	13	B	13	B	0%
I-270	Freeway	25	C	38	E	54%	I-270	Freeway	20	C	20	C	0%
I-270 Diverge to WB Middlebrook Rd	Diverge	20	C	33	D	62%	I-270 Diverge to MD 27	Diverge	13	B	13	B	0%
I-270	Freeway	22	C	32	D	46%	I-270	Freeway	16	B	17	B	0%
I-270 Diverge to EB MD 118	Diverge	17	B	31	D	78%	I-270 Merge from WB MD 27	Merge	14	B	14	B	2%
I-270 Diverge to WB MD 118	Diverge	31	D	40	E	29%	I-270	Freeway	20	C	20	C	0%
I-270	Freeway	27	D	37	E	38%	I-270 Weave from EB MD 27 to MD 118	Weave	15	B	15	B	0%
I-270 Weave from MD 118 to MD 27	Weave	36	E	56	F	56%	I-270	Freeway	19	C	19	C	0%
I-270	Freeway	25	C	60	F	141%	I-270 Merge from WB MD 118	Merge	15	B	15	B	-1%
I-270 Merge from EB MD 27	Merge	36	E	56	F	56%	I-270	Freeway	22	C	22	C	0%
I-270	Freeway	26	C	88	F	245%	I-270 Merge from EB MD 118	Merge	18	B	19	B	2%
I-270 Merge from WB MD 27	Merge	22	C	39	E	79%	I-270	Freeway	28	D	28	D	0%
I-270	Freeway	28	D	52	F	87%	I-270 Merge from Middlebrook Rd	Merge	30	D	31	D	1%
I-270 Diverge to MD 121	Diverge	22	C	48	F	121%	I-270 Diverge to Watkins Mill Rd	Diverge	24	C	24	C	2%

* Final = HSR + VSL + ARM + DDI

Table D.5: PM Peak -2040 Final Model - I-270 Vehicle Density

I-270 Northbound	Type	No Build		Final		% Change	I-270 Southbound	Type	No Build		Final		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS	
I-270	Freeway	22	C	56	F	150%	I-270	Freeway	19	C	20	C	1%
I-270 Merge from EB MD 121	Merge	35	E	86	F	142%	I-270 Diverge to MD 124	Diverge	17	B	17	B	0%
I-270 Lane Drop	Merge	78	F	108	F	38%	I-270	Freeway	14	B	15	B	1%
I-270	Freeway	37	E	47	F	25%	I-270 Merge from Watkins Mill	Merge	17	B	17	B	0%
I-270 Diverge to NB Weigh Station	Diverge	18	B	19	B	3%	I-270	Freeway	58	F	64	F	12%
I-270	Freeway	36	E	37	E	3%	I-270 Merge from WB MD 124	Merge	96	F	101	F	6%
I-270 Merge from NB Weight Station	Merge	18	B	19	B	4%	I-270	Freeway	0	A	0	A	#DIV/0!
I-270	Freeway	38	E	39	E	3%	I-270 Merge from MD 117	Merge	39	E	45	F	16%
I-270 Diverge to MD 109	Diverge	22	C	23	C	3%	I-270	Freeway	28	D	30	D	8%
I-270	Freeway	34	D	35	D	3%	I-270 Diverge to I-370	Diverge	22	C	24	C	10%
I-270 Merge from MD 109	Merge	19	B	20	C	9%	I-270	Freeway	18	B	19	C	4%
I-270	Freeway	36	E	36	E	1%	I-270 Diverge to I-270 C-D	Diverge	14	B	14	B	3%
I-270 Diverge to MD 80	Diverge	27	C	26	C	-5%	I-270	Freeway	14	B	14	B	4%
I-270	Freeway	30	D	30	D	0%	I-270 Merge from I-270 (I-370)	Merge	21	C	21	C	2%
I-270 Merge from MD 80	Merge	18	B	18	B	0%	I-270 Diverge to I-270 C-D (Shady Grove Rd)	Diverge	23	C	24	C	3%
I-270	Freeway	36	E	36	E	0%	I-270	Freeway	19	C	19	C	3%
I-270 Diverge to Scenic View	Diverge	19	B	19	B	1%	I-270 Merge from I-270 C-D (Shady Grove Rd Northern)	Merge	18	B	19	B	6%
I-270	Freeway	36	E	36	E	0%	I-270	Freeway	23	C	24	C	5%
I-270 Merge from Scenic View	Merge	18	B	18	B	-1%	I-270 Merge from I-270 C-D (Shady Grove Rd Southern)	Merge	18	B	19	B	6%
I-270	Freeway	36	E	37	E	3%	I-270 Diverge to I-270 C-D (MD 189)	Diverge	25	C	27	C	6%
I-270 Diverge to NB MD 85	Diverge	20	C	24	C	18%	I-270	Freeway	21	C	22	C	5%
I-270	Freeway	34	D	41	E	19%	I-270 Merge from I-270 C-D (MD 189)	Merge	20	C	21	C	4%
I-270 Diverge to SB MD 85	Diverge	20	C	22	C	8%	I-270	Freeway	26	C	27	D	4%
I-270	Freeway	30	D	36	E	21%	I-270 Merge from I-270 C-D	Merge	25	C	35	E	40%
I-270 Weave from MD 85 to I-70	Weave	22	C	25	C	13%	I-270 Diverge to I-270 HOV Lane	Diverge	17	B	19	B	9%
I-270	Freeway	64	F	34	D	-47%	I-270 Diverge to I-270 Spur	Diverge	38	E	46	F	20%
							I-270	Freeway	13	B	13	B	2%
							I-270 Diverge to Rockledge Dr / MD 187	Diverge	9	A	9	A	2%
							I-270	Freeway	13	B	13	B	2%
							I-270 Merge from Rockledge Dr	Merge	11	B	12	B	2%
							I-270	Freeway	16	B	16	B	2%
							I-270 Merge from Rockledge Dr / MD 187	Merge	14	B	14	B	1%
							I-270	Freeway	35	E	36	E	2%

* Final = HSR + VSL + ARM + DDI

Table D.6: PM Peak -2040 Final Model - I-270 Spur Vehicle Density

I-270 Spur Northbound	Type	No Build		Final		% Change	I-270 Southbound	Type	No Build		Final		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS			
I-270 Spur	Freeway	62	F	62	F	0%	I-270 Spur	Freeway	72	F	79	F	10%
I-270 Spur Merge from Clara Barton Parkway	Merge	64	F			#####	I-270 Spur Weave from I-270 HOV to Democracy Blvd	Weave	94	F	99	F	6%
I-270 Spur	Freeway	78	F			#####	I-270 Spur	Freeway	108	F	112	F	4%
I-270 Diverge to MD 190	Diverge	49	F	49	F	-1%	I-270 Merge from Democracy Blvd	Merge	152	F	154	F	1%
I-270 Spur	Freeway	89	F	89	F	1%	I-270 Spur Lane Drop	Merge	144	F	144	F	0%
I-270 Spur Merge from Cabin John Parkway	Merge	105	F	105	F	0%	I-270 Spur	Freeway	125	F	125	F	0%
I-270 Spur Merge from MD 190	Merge	97	F	97	F	0%	I-270 Spur Merge from I-495	Merge	124	F	124	F	0%
I-270 Spur	Freeway	84	F	84	F	0%	I-270 Spur	Freeway	49	F	47	F	-2%
I-270 Spur Diverge to I-495	Merge	66	F	67	F	0%	I-270 Spur Diverge to EB MD 190	Diverge	50	F	48	F	-4%
I-270 Spur	Freeway	45	F	46	F	1%	I-270 Spur Diverge to Cabin John Pkwy	Diverge	67	F	66	F	-2%
I-270 Spur Diverge to Democracy Blvd	Diverge	50	F	49	F	-1%	I-270 Spur	Freeway	95	F	93	F	-2%
I-270 Spur	Freeway	58	F	59	F	1%	I-270 Merge from MD 190	Merge	120	F	122	F	2%
I-270 Spur Merge from EB Democracy Blvd	Merge	97	F	98	F	1%	I-270 Spur	Freeway	93	F			#####
I-270 Spur	Freeway	58	F	58	F	0%	I-270 Diverge to WB Clara Barton Pkwy	Diverge	60	F			#####
I-270 Spur Merge from WB Democracy Blvd	Merge	65	F	65	F	0%	I-270 Spur	Freeway	83	F			#####
I-270 Spur	Freeway	39	E	38	E	0%	I-270 Merge from Clara Barton Pkwy	Merge	77	F			#####
I-270 Spur Merge from Westlake Terrace	Merge	31	D	31	D	0%							
I-270 Spur	Freeway	34	D	34	D	0%							

* Final = HSR + VSL + ARM + DDI

Table D.7: PM Peak -2040 Final Model - I-270 Local Vehicle Density

I-270 Northbound	Type	No Build		Final		% Change	I-270 Southbound	Type	No Build		Final		% Change
		Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS				Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS	
I-270 C-D	Freeway	29	D	29	D	0%	I-270 C-D	Freeway	8	A	9	A	3%
I-270 C-D Diverge to EB Montrose Rd	Diverge	21	C	21	C	1%	I-270 C-D Weave from I-370 EB to I-270	Weave	23	B	23	B	0%
I-270 C-D	Freeway	16	B	16	B	-2%	I-270 C-D Diverge to Shady Grove Rd	Diverge	11	B	11	B	2%
I-270 C-D Weave between Montrose Rd Loop Ramps	Weave	13	B	12	B	-8%	I-270 C-D	Freeway	8	A	8	A	2%
I-270 C-D	Freeway	28	D	19	C	-32%	I-270 C-D Merge from WB Shady Grove Rd	Merge	8	A	10	B	23%
I-270 C-D Merge from WB Montrose Rd	Merge	83	F	51	F	-39%	I-270 C-D	Freeway	14	B	16	B	15%
I-270 C-D	Freeway	67	F	59	F	-12%	I-270 C-D Merge from EB Shady Grove Rd	Merge	10	A	12	B	20%
I-270 C-D Merge from I-270	Merge	42	F	57	F	34%	I-270 C-D	Freeway	19	C	22	C	18%
I-270 C-D	Freeway	65	F	61	F	-7%	I-270 C-D Merge from I-270	Merge	18	B	22	C	20%
I-270 C-D Diverge to MD 189	Diverge	43	F	31	D	-28%	I-270 C-D Diverge to I-270	Diverge	25	C	29	D	15%
I-270 C-D	Freeway	91	F	62	F	-32%	I-270 C-D Diverge to I-270	Diverge	17	B	19	B	13%
I-270 C-D Merge from MD 189	Merge	112	F	58	F	-48%	I-270 C-D	Freeway	16	B	18	B	12%
I-270 C-D	Freeway	62	F	71	F	14%	I-270 C-D Diverge to MD 28	Diverge	11	B	12	B	12%
I-270 C-D Weave between I-270 (to MD 28 from MD 189)	Weave	63	F	57	F	-10%	I-270 C-D	Freeway	11	A	12	B	12%
I-270 C-D	Freeway	42	E	62	F	48%	I-270 C-D Merge from WB MD 28	Merge	12	B	14	B	15%
I-270 C-D Diverge to MD 28	Diverge	18	B	27	C	50%	I-270 C-D	Freeway	14	B	15	B	9%
I-270 C-D	Freeway	28	D	46	F	61%	I-270 C-D Merge from EB MD 28	Merge	26	C	38	E	48%
I-270 C-D Weave between MD 28 Ramps	Weave	28	C	30	C	9%	I-270 C-D	Freeway	32	D	47	F	47%
I-270 C-D	Freeway	26	D	28	D	8%	I-270 C-D Merge from I-270	Merge	20	B	30	D	56%
I-270 C-D Merge from MD 28 WB	Merge	28	C	18	B	-33%	I-270 C-D	Freeway	44	E	49	F	10%
I-270 C-D Merge from I-270 and Drop Lane	Merge	34	D	27	C	-20%	I-270 C-D Diverge to MD 189	Diverge	25	C	27	C	6%
I-270 C-D Diverge to I-270	Diverge	61	F	35	E	-43%	I-270 C-D	Freeway	27	D	28	D	4%
I-270 C-D	Freeway	48	F	31	D	-35%	I-270 C-D Merge from MD 189	Merge	27	C	28	C	3%
I-270 C-D Diverge to Shady Grove Rd	Diverge	14	B	19	B	39%	I-270 C-D Diverge to I-270	Diverge	34	D	35	D	1%
I-270 C-D	Freeway	130	F	22	C	-83%	I-270 C-D	Freeway	24	C	24	C	0%
I-270 C-D Merge from I-270 and EB Shady Grove Rd	Merge	140	F	22	C	-84%	I-270 C-D Diverge to WB Montrose Rd	Diverge	18	B	17	B	-2%
I-270 C-D	Freeway	144	F	23	C	-84%	I-270 C-D	Freeway	23	C	22	C	-5%
I-270 C-D Merge from WB Shady Grove Rd	Merge	146	F	25	C	-83%	I-270 Weave between Montrose Rd Loops	Weave	41	F	41	F	-1%
I-270 C-D Diverge to I-270	Diverge	113	F	37	E	-67%	I-270 C-D	Freeway	15	B	16	B	5%
I-270 C-D	Freeway	94	F	38	E	-60%	I-270 C-D Merge from EB Montrose Rd	Merge	9	A	9	A	3%
I-270 C-D Diverge to I-370	Diverge	64	F	46	F	-27%	I-270 C-D	Freeway	18	B	18	C	4%
I-270 C-D	Freeway	120	F	14	B	-89%							
I-270 Merge from I-370 EB	Merge	129	F	20	C	-84%							
I-270 C-D	Freeway	139	F	21	C	-85%							
I-270 C-D Weave from I-370 to I-270	Weave	134	F	25	C	-81%							
I-270 C-D	Freeway	110	F	47	F	-57%							
I-270 C-D Weave from I-270 to MD 117	Weave	114	F	62	F	-46%							
I-270 C-D Diverge to MD 124	Diverge	142	F	31	D	-78%							
I-270 C-D	Freeway	178	F	26	C	-86%							
I-270 C-D Merge from EB MD 124	Merge	168	F	18	B	-89%							
I-270 C-D Merge From WB MD 124	Merge	154	F	11	B	-93%							
I-270 C-D	Freeway	144	F	43	E	-70%							
I-270 C-D Merge from Watkins Mill	Merge	133	F	36	E	-73%							

* Final = HSR + VSL + ARM + DDI

Table D.8: PM Peak -2040 Final Model - I-270 Vehicle Throughput

I-270 Northbound	No Build VISSIM Throughput	Final VISSIM Throughput	% Change	I-270 Southbound	No Build VISSIM Throughput	Final VISSIM Throughput	% Change
Between I-495 and MD 187	4113	4135	1%	North of I-70	2366	2366	0%
Between MD 187 on and off ramps	3710	3724	0%	Between I-70 on ramps	2703	2703	0%
Between Rockledge Blvd on and off ramps	3540	3547	0%	From I-70 interchange to MD-85	4047	4047	0%
Between Rockledge Dr and I-270 Spur	3873	3868	0%	Between MD-85 on and off ramps	2379	2379	0%
Between I-270 Spur and Montrose Rd	8718	8712	0%	Between MD-85 and MD-80	3075	3072	0%
Between Montrose Rd on and off ramps	5582	5750	3%	Between MD-80 on and off ramps	2415	2412	0%
Between Montrose Rd and MD 189	5102	5469	7%	Between MD-80 and Md-109	2866	2866	0%
Between MD 189 and MD 28	5078	5852	15%	Between MD-109 on and off ramps	2767	2764	0%
Between MD 28 on and off ramps	5014	6128	22%	Between MD-109 and MD-121	2935	2929	0%
Between MD 28 and Shady Grove Rd	4214	5395	28%	Between MD-121 on and off ramps	2413	2413	0%
Between Shady Grove Rd and I-370	3243	4746	46%	Between MD-121 and MD-27	3354	3351	0%
Between I-370 on and off ramps	2749	4771	74%	Between MD-27 on and off ramps	3458	3457	0%
Between I-370 and MD 117	2851	6048	112%	Between MD-27 and MD-118	3773	3764	0%
Between MD 117 and MD 124	2432	4563	88%	Between MD-118 on and off ramps	3719	3710	0%
Between MD-124 on and off ramps	2547	4643	82%	Between MD-118 and Middlebrook Rd	4384	4388	0%
Between Watkins Mill Rd and Middlebrook Rd	4564	7158	57%	Between Middlebrook Rd on and off ramps	4382	4381	0%
Between Middlebrook Rd on and off ramps	4337	6678	54%	Between Middlebrook Rd and MD-124	5462	5476	0%
Between MD 28 and Shady Grove Rd	3776	4401	17%	Between MD-124 on and off ramps	4179	4464	7%
Between MD-118 on and off ramps	3479	5341	54%	Between MD-124 and MD-117	5347	5588	5%
Between MD 118 and MD 27	3770	5230	39%	Between MD-117 and I-370	6905	7126	3%
Between MD-27 on and off ramps	2754	3680	34%	Between I-370 on and off ramps	3456	3561	3%
Between MD 27 and MD 121	3428	4009	17%	Between I-370 on ramp to Shady Grove Rd	4990	5120	3%
Between MD-121 on and off ramps	2299	2652	15%	Between Shady Grove Rd and MD 28	5157	5394	5%
Between MD 121 and MD 109	3931	4074	4%	Between MD 28 on and off ramps	5327	5594	5%
Between MD-109 on and off ramps	3643	3730	2%	Between MD 28 and MD 189	4678	4902	5%
Between MD 109 and MD 80	3831	3873	1%	Between MD 189 and Montrose Rd	4678	4889	5%
Between MD-80 on and off ramps	3186	3210	1%	Between Montrose Rd on and off ramps	5599	5816	4%
Between MD 80 and MD 85	3875	3886	0%	Between Montose Rd and I-270 Spur	7355	7393	1%
Between MD-85 on and off ramps	3257	3219	-1%	Between I-270 Spur and Rockledge Blvd	3320	3367	1%
Between MD 85 and I-70	5239	5191	-1%	Between Rockledge Blvd on and off ramps	2542	2584	2%
North of I-70	2739	2729	0%	Between MD 187 on and off ramps	3011	3058	2%
				Between MD 187 and I-495	3393	3431	1%
I-270 Spur Northbound				I-270 Spur Southbound			
Between I-495 and Democracy Blvd	4568	4566	0%	Between I-270 Split and HOV on ramp	3187	3167	-1%
Between Democracy Blvd on and off ramps	4101	4091	0%	Between HOV on ramp and Democracy Blvd	2329	2318	0%
Between Democracy Blvd and I-270 Split	4833	4836	0%	Between Democracy Blvd on and off ramps	1856	1842	-1%
				Between Democracy Blvd and I-495	2227	2222	0%

* Final = HSR + VSL + ARM + DDI

Table D.9: PM Peak -2040 Final Model - I-270 Local Vehicle Throughput

I-270 Local Northbound	No Build VISSIM Throughput	Final VISSIM Throughput	% Change	I-270 Local Southbound	No Build VISSIM Throughput	Final VISSIM Throughput	% Change
Between Montrose Rd EB off ramp and EB on ramp	1766	1767	0%	Between I-370 on ramp and I-270 off ramp	3064	3094	1%
Between Montrose Rd EB on ramp and WB off ramp	2079	2089	0%	Between I-270 off ramp and Shady Grove off ramp	1525	1558	2%
Between Montrose Rd WB off ramp and on ramp	1811	1833	1%	Between Shady Grove off ramp and Shady Grove WB on ramp	811	831	2%
Between Montrose Rd WB on ramp and I-270 on ramp	3211	3351	4%	Between Shady Grove WB and EB on ramps	1431	1646	15%
Between I-270 on ramp and MD 189 off ramp	3392	3578	5%	Between Shady Grove on ramp and I-270 on ramp	1957	2298	17%
Between MD 189 ramps	2697	2904	8%	Between I-270 on ramp and I-270 off ramp1	2571	2921	14%
Between MD 189 off ramp and I-270 on ramp	3503	3724	6%	Between I-270 off ramp1 and I-270 off ramp2	1808	2024	12%
Between I-270 on ramp and I-270 off ramp	4032	4408	9%	Between I-270 off ramp2 and MD 28 off ramp	1648	1832	11%
Between I-270 off ramp and MD 28 EB off ramp	3156	3456	10%	Between MD 28 off ramp and MD 28 WB on ramp	1153	1279	11%
Between MD 28 EB off ramp to MD 28 EB on ramp	2855	3110	9%	Between MD 28 WB on ramp and MD 28 EB on ramp	1423	1536	8%
Between MD 28 EB on ramp and MD 28 WB off ramp	2994	3240	8%	Between MD 28 EB on ramp and I-270 on ramp	2987	3079	3%
Between MD 28 WB off ramp and MD 28 WB on ramp	1879	2039	9%	Between I-270 on ramp and MD 189 off ramp	3660	3772	3%
Between MD 28 WB on ramp and I-270 on ramp	2552	2725	7%	Between MD 189 on and off ramps	2740	2819	3%
Between I-270 on ramp and I-270 off ramp	3027	3550	17%	Between MD 189 on ramp and I-270 off ramp	3316	3359	1%
Between I-270 off ramp and Shady Grove off ramp	1718	2118	23%	Between I-270 off ramp and Montrose Rd off ramp	2399	2428	1%
Between Shady Grove off ramp and I-270 on ramp	468	751	60%	Between Montrose Rd off ramp and Montrose Rd WB on ramp	2155	2182	1%
Between I-270 on ramp and Shady Grove WB on ramp	2182	3465	59%	Between Montrose Rd WB on ramp and EB off ramp	2705	2779	3%
Between Shady Grove WB on ramp and I-270 off ramp	2671	4291	61%	Between Montrose Rd EB off and on ramps	1525	1588	4%
Between I-270 off ramp and I-370 off ramp	2310	3750	62%	Between Montrose Rd EB off ramp and I-270	1845	1909	3%
Between I-370 off ramp and I-370 EB on ramp	529	997	88%				
Between I-370 EB and WB on ramps	896	2126	137%				
Between I-370 WB on ramp and I-270 off ramp	1577	3728	136%				
Between I-270 off ramp and I-270 on ramp	1008	2283	126%				
Between I-270 on ramp and MD 117 off ramp	1386	3827	176%				
Between MD 117 off ramp and MD 124 off ramp	920	2702	194%				
Between MD 124 off ramp and MD 124 EB on ramp	346	1145	231%				
Between MD 124 EB and WB on ramps	651	1663	155%				
Between MD 124 on ramp I-270	812	1177	45%				

* Final = HSR + VSL + ARM + DDI

Table D.10: PM Peak -2040 Final Model - I-270 On Ramp Queue Length - Northbound

I-270 Northbound	No Build VISSIM Average Queue (feet)	Final VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	Final VISSIM Maximum Queue (feet)	% Change
Rockledge Dr on ramp	1	1	62%	192	177	-8%
MD 189 C-D on ramp	610	0	-100%	4780	20	-100%
MD 28 C-D on ramp	994	0	-100%	4333	10	-100%
Shady Grove Rd C-D on ramp	1762	0	-100%	4090	70	-98%
I-370 C-D on ramp	3386	96	-97%	5049	962	-81%
MD 124 C-D on ramp	4875	0	-100%	5069	36	-99%
MD 118 on ramp	0	0	79%	43	32	-25%
MD 27 EB on ramp	0	0	-	0	0	-
MD 27 WB on ramp	0	113	-	0	800	-
MD 121 on ramp	0	0	-	4	0	-100%
MD 109 on ramp	0	0	-	0	0	-
MD 80 on ramp	0	0	-	0	0	-
MD 85 on ramp	0	0	-	0	7	-
I-270 Spur Northbound	No Build VISSIM Average Queue (feet)	Final VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	Final VISSIM Maximum Queue (feet)	% Change
Democracy Blvd EB on ramp	0	0	-	9	0	-100%
Democracy Blvd WB on ramp	0	19	-	0	595	-
I-495 Northbound	No Build VISSIM Average Queue (feet)	Final VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	Final VISSIM Maximum Queue (feet)	% Change
Cabin John Pkwy on ramp	46	0	-100%	903	16	-98%
MD 190 on ramp	0	0	-100%	48	0	-100%
I-270 C-D Northbound	No Build VISSIM Average Queue (feet)	Final VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	Final VISSIM Maximum Queue (feet)	% Change
Montrose Rd EB on ramp	0	265	-	0	1710	-
Montrose Rd WB on ramp	916	0	-100%	2556	0	-100%
I-270 on ramp	0	0	-	0	0	-
MD 189 on ramp	104	0	-100%	1084	24	-98%
I-270 on ramp	1	0	-100%	109	0	-100%
MD 28 EB on ramp	0	0	-	0	0	-
MD 28 WB on ramp	38	0	-100%	652	0	-100%
Shady Grove Rd EB on ramp	1396	0	-100%	4077	0	-100%
I-270 on ramp	1555	0	-100%	5058	0	-100%
Shady Grove Rd WB on ramp	739	21	-97%	1949	318	-84%
I-370 EB on ramp	1319	1944	47%	2422	2122	-12%
I-370 WB on ramp	1606	1630	1%	2548	4672	83%
I-270 on ramp	4357	0	-100%	5055	0	-100%
MD 124 EB on ramp	1831	0	-100%	2796	0	-100%
MD 124 WB on ramp	98	1	-99%	700	107	-85%
Watkins Mill Rd on ramp	2665	87	-97%	3270	501	-85%

* Final = HSR + VSL + ARM + DDI

Table D.11: PM Peak -2040 Final Model - I-270 Off Ramp Queue Length - Northbound

I-270 Northbound	No Build VISSIM Average Queue (feet)	Final VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	Final VISSIM Maximum Queue (feet)	% Change
MD 187 off ramp NB	39	0	-100%	309	0	-100%
MD 187 off ramp SB	0	1	-	0	85	-
Rockledge Dr off ramp	1	37	4099%	88	239	173%
Tower Oaks Blvd off ramp	37	0	-100%	219	0	-100%
Montrose Rd off ramp EB	0	0	-	0	0	-
Montrose Rd off ramp WB	0	28	-	0	156	-
MD 189 off ramp WB	26	364	1290%	174	2158	1141%
MD 189 off ramp EB	0	38	9579%	78	227	189%
MD 28 off ramp EB	35	0	-100%	215	0	-100%
MD 28 off ramp WB	0	0	-	0	0	-
Shady Grove Rd off ramp - Redland Blvd	0	48	-	0	220	-
Shady Grove Rd off ramp WB	40	0	-100%	253	0	-100%
Shady Grove Rd off ramp EB	0	59	-	0	685	-
I-370 off ramp WB	8	0	-100%	162	0	-100%
I-370 off ramp EB	0	2033	-	0	5003	-
MD 117 off ramp	1835	211	-89%	2770	1026	-63%
MD 124 off ramp	55	0	-100%	626	0	-100%
Watkins Mill Rd off ramp	45	17	-62%	627	364	-42%
Middlebrook Rd EB off ramp	0	0	-	0	0	-
Middlebrook Rd WB off ramp	0	0	-	0	14	-
MD 118 WB off ramp - Seneca Meadows	0	0	-100%	8	0	-100%
MD 118 WB off ramp	0	0	-	0	0	-
MD 118 EB off ramp	0	59	148275%	16	280	1598%
MD 27 off ramp WB	44	0	-100%	252	0	-100%
MD 27 off ramp EB	0	88	-	0	548	-
MD 121 off ramp WB	70	13	-82%	314	332	6%
MD 121 off ramp EB	2	24	1020%	94	226	141%
MD 109 off ramp EB	26	0	-100%	251	0	-100%
MD 109 off ramp WB	0	21	-	0	179	-
MD 80 off ramp EB	21	0	-99%	233	35	-85%
MD 80 off ramp WB	0	0	180%	24	34	42%
MD 85 NB off ramp	1	1	-48%	53	91	73%
MD 85 SB off ramp	1	0	-100%	141	0	-100%
I-270 Spur Northbound	No Build VISSIM Average Queue (feet)	Final VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	Final VISSIM Maximum Queue (feet)	% Change
Clara Barton Pkwy off ramp EB	0	0	-	0	0	-
Clara Barton Pkwy off ramp WB	0	0	-	0	4	-
MD 190 off ramp EB	0	5	-	0	270	-
MD 190 off ramp WB	5	42	788%	354	194	-45%
Democracy Blvd off ramp WB	41	18	-57%	194	130	-33%
Democracy Blvd off ramp EB	17	0	-100%	120	0	-100%

* Final = HSR + VSL + ARM + DDI

Table D.12: PM Peak -2040 Final Model - I-270 On Ramp Queue Length - Southbound

I-270 Southbound	No Build VISSIM Average Queue (feet)	Final VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	Final VISSIM Maximum Queue (feet)	% Change
MD 85 on ramp	0	0	-100%	12	0	-100%
MD 80 on ramp	0	0	-	0	0	-
MD 109 on ramp	0	0	-	0	0	-
MD 121 WB on ramp	0	0	-	0	0	-
MD 121 EB on ramp	0	0	-	0	0	-
MD 27 WB on ramp	0	0	-	0	0	-
MD 27 EB on ramp	0	0	-	0	0	-
MD 118 WB on ramp	0	0	-	0	0	-
MD 118 EB on ramp	0	0	-	0	0	-
Middlebrook Rd on ramp	0	0	-	0	0	-
Watkins Mill Rd on ramp	0	0	-	0	0	-
MD 124 WB on ramp	1368	1111	-19%	3492	3497	0%
MD 117 on ramp	29	92	220%	837	1590	90%
I-370 C-D on ramp	0	0	-	0	0	-
Shady Grove Rd C-D on ramp North	0	0	-	0	0	-
Shady Grove Rd C-D on ramp South	0	0	-	0	0	-
MD 189 C-D on ramp	0	0	-	0	0	-
Montrose Rd C-D on ramp	0	0	-	0	35	-
Rockledge Dr on ramp	0	0	-	0	0	-
MD 187 on ramp	0	0	-	0	0	-
I-270 Spur Southbound	No Build VISSIM Average Queue (feet)	Final VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	Final VISSIM Maximum Queue (feet)	% Change
Democracy Blvd on ramp	698	565	-19%	1919	1679	-13%
I-495 Southbound	No Build VISSIM Average Queue (feet)	Final VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	Final VISSIM Maximum Queue (feet)	% Change
I-270 Spur on ramp	4555	4614	1%	5065	5064	0%
MD 190 on ramp	184	70	-62%	956	903	-6%
I-270 C-D Southbound	No Build VISSIM Average Queue (feet)	Final VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	Final VISSIM Maximum Queue (feet)	% Change
I-270 on ramp	0	0	-100%	10	0	-100%
I-370 on ramp	0	0	-100%	80	0	-100%
Shady Grove Rd WB on ramp	0	0	-	0	0	-
Shady Grove Rd EB on ramp	0	0	-	0	0	-
I-270 on ramp	0	0	-	0	0	-
MD 28 WB on ramp	0	0	-	0	17	-
MD 28 EB on ramp	0	314	74655%	63	1136	1693%
I-270 on ramp	0	0	-	0	0	-
MD 189 on ramp	0	0	-	0	39	-
Montrose Rd WB on ramp	1	1	-44%	115	128	11%
Montrose Rd EB on ramp	0	0	-	0	0	-

* Final = HSR + VSL + ARM + DDI

Table D.13: PM Peak -2040 Final Model - I-270 Off Ramp Queue Length - Southbound

I-270 Southbound	No Build VISSIM Average Queue (feet)	Final VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	Final VISSIM Maximum Queue (feet)	% Change
MD 85 SB off ramp	22	15	-29%	383	334	-13%
MD 85 NB off ramp	17	1	-93%	354	147	-59%
MD 80 off ramp	2	0	-77%	204	66	-68%
MD 109 off ramp WB	1	0	-100%	88	0	-100%
MD 109 off ramp EB	0	211	-	0	954	-
MD 121 off ramp EB	217	0	-100%	970	82	-92%
MD 121 off ramp WB	0	22	5418%	137	142	4%
MD 27 off ramp EB	22	0	-100%	137	0	-100%
MD 27 off ramp WB	1	22	2293%	65	131	101%
MD 118 off ramp EB	24	0	-99%	142	47	-67%
MD 118 off ramp WB	0	133	443567%	23	471	1985%
Watkins Mill Rd off ramp	103	3	-97%	384	106	-72%
MD 124 off ramp EB	185	12	-93%	731	327	-55%
MD 124 off ramp WB	17	347	1962%	445	2084	369%
I-370 off ramp WB	147	0	-100%	725	0	-100%
I-370 off ramp EB	0	0	-	0	48	-
Shady Grove Rd off ramp - Omega Drive	1	0	-100%	52	0	-100%
Shady Grove Rd off ramp	0	3	-	0	119	-
MD 28 off ramp	3	116	4126%	149	493	231%
MD 189 off ramp EB	108	0	-100%	433	0	-100%
MD 189 off ramp WB	0	0	-	0	0	-
Montrose Rd off ramp WB	0	8	-	0	520	-
Montrose Rd off ramp EB	4	250	6287%	337	669	99%
Rockledge Dr off ramp	155	23	-85%	641	156	-76%
I-270 Spur Southbound	No Build VISSIM Average Queue (feet)	Final VISSIM Average Queue (feet)	% Change	No Build VISSIM Maximum Queue (feet)	Final VISSIM Maximum Queue (feet)	% Change
Democracy Blvd off ramp EB	20	0	-100%	136	0	-100%
Democracy Blvd off ramp WB	0	87	-	0	771	-
MD 190 off ramp WB	80	1	-99%	797	60	-92%
MD 190 off ramp EB	0	0	-	0	0	-
Clara Barton Pkwy WB off ramp	0	34	344100%	6	321	5257%

* Final = HSR + VSL + ARM + DDI

Table D.14: PM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
1- MD 85 at Sam's Club Drive											
1	NB	60.8	E	NB Left	134	78	463	889	E	115.6	F
				NB Through	570	38	463	889	D		
				NB Right	935	72	443	912	E		
	SB	179.8	F	SB Left	153	131	1021	1231	F		
				SB Through	874	186	1021	1231	F		
				SB Right	74	209	1021	1231	F		
	EB	35.0	C	EB Left	55	84	32	144	F		
				EB Through	24	81	32	144	F		
				EB Right	169	13	32	144	B		
	WB	163.6	F	WB Left	561	181	536	762	F		
				WB Through	30	166	536	762	F		
				WB Right	224	119	536	762	F		
2- MD 85 at I-270 NB on and off ramp											
2	NB	58.5	E	NB Left	1136	58	700	1857	E	48.2	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	32.6	C	SB Left	0	0	0	0	A		
				SB Through	743	33	132	737	C		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
3- MD 85 at I-270 SB on and off ramp											
3	NB	17.3	B	NB Left	0	0	0	0	A	19.5	B
				NB Through	1975	17	181	1210	B		
				NB Right	0	0	0	0	A		
	SB	44.0	D	SB Left	173	44	74	582	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
4- MD 85 at Crestwood Blvd											
4	NB	68.0	F	NB Left	74	103	368	830	F	51.3	D
				NB Through	1450	66	367	830	E		
				NB U-Turn	0	0	0	0	A		
	SB	31.9	C	SB Left	105	83	53	246	F		
				SB Through	940	30	105	1039	C		
				SB Right	923	28	92	1030	C		
	EB	63.3	E	EB Left	949	66	196	744	E		
				EB Through	43	51	196	744	D		
				EB Right	28	1	196	744	A		
	WB	53.0	D	WB Left	44	78	60	230	E		
				WB Through	79	81	60	230	F		
				WB Right	94	18	60	230	B		
5- MD 80 at I-270 NB on and off ramp											
5	NB	-0.9	A	NB Left	1	9	0	4	A	11.5	B
				NB Through	2	0	0	4	A		
				NB Right	7	-3	0	4	A		
	SB	12.8	B	SB Left	479	16	27	238	B		
				SB Through	22	16	27	238	B		
				SB Right	149	3	0	0	A		
	EB	13.6	B	EB Left	97	14	24	208	B		
				EB Through	0	0	8	0	A		
				EB Right	5	10	37	239	B		
	WB	10.7	B	WB Left	15	14	0	38	B		
				WB Through	670	18	66	419	B		
				WB Right	612	2	0	0	A		
6- MD 80 at I-270 SB on and off ramp											
6	NB	3.4	A	NB Left	55	5	3	239	A	5.9	A
				NB Through	0	0	0	0	A		
				NB Right	605	3	3	239	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	7.1	A	EB Left	0	0	0	0	A		
				EB Through	382	8	4	111	A		
				EB Right	66	4	4	119	A		
	WB	8.4	A	WB Left	0	0	0	0	A		
				WB Through	446	8	3	163	A		
				WB Right	0	0	0	0	A		
7- MD 109 at I-270 NB on and off ramp											
7	NB			NB Left	0	0	0	0	A	7.9	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	15.2	C	SB Left	317	16	34	268	C		
				SB Through	0	0	0	0	A		
				SB Right	25	6	1	162	A		
	EB	2.5	A	EB Left	80	2	0	47	A		
				EB Through	0	0	0	0	A		
				EB Right	83	3	0	0	A		
	WB	0.4	A	WB Left	0	0	0	0	A		
				WB Through	222	0	0	0	A		
				WB Right	0	0	0	0	A		
8- MD 80 at I-270 SB on and off ramp											
8	NB	4.9	A	NB Left	63	8	3	120	A	1.8	A
				NB Through	0	0	0	0	A		
				NB Right	36	0	0	63	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.9	A	EB Left	0	0	0	0	A		
				EB Through	166	0	0	0	A		
				EB Right	34	4	0	0	A		
	WB	1.4	A	WB Left	137	1	0	58	A		
				WB Through	110	2	0	30	A		
				WB Right	0	0	0	0	A		
9- MD 121 at Gateway Center Dr											
9	NB	29.4	D	NB Left	590	33	112	604	C	47.0	D
				NB Through	795	28	112	604	C		
				NB Right	64	16	119	630	B		
	SB	22.6	C	SB Left	28	15	19	219	B		
				SB Through	300	24	31	223	C		
				SB Right	9	13	34	244	B		
	EB	14.9	B	EB Left	4	40	8	196	D		
				EB Through	24	41	15	229	D		
				EB Right	248	12	27	261	B		
	WB	117.1	F	WB Left	349	162	304	715	F		
				WB Through	75	73	304	714	E		
				WB Right	186	51	327	739	D		
10- MD 121 at I-270 NB on and off ramp											
10	NB	22.1	C	NB Left	372	59	77	320	F	18.1	B
				NB Through	0	0	0	0	A		
				NB Right	785	4	1	73	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	11.8	B	EB Left	0	0	0	0	A		
				EB Through	651	18	38	367	C		
				EB Right	336	1	0	0	A		
	WB	20.0	C	WB Left	219	60	86	412	F		
				WB Through	682	7	86	412	A		
				WB Right	0	0	0	0	A		

Table D.14: PM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
11- MD 121 at I-270 SB on and off ramp											
11	NB			NB Left	0	0	0	0	A	22.3	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	62.3	E	SB Left	271	85	226	977	F		
				SB Through	0	0	0	0	A		
				SB Right	254	39	0	49	E		
	EB	6.5	A	EB Left	0	0	0	0	A		
				EB Through	717	6	16	229	A		
				EB Right	0	0	0	0	A		
	WB	13.2	B	WB Left	0	0	0	0	A		
WB Through				520	27	46	382	D			
WB Right				538	0	0	0	A			
12- MD 27 at Observation Dr											
12	NB	37.7	D	NB U-Turn	0	0	0	0	A	24.8	C
				NB Through	94	55	22	98	E		
				NB Right	61	11	22	98	B		
	SB	41.3	D	SB Left	146	44	38	216	D		
				SB Through	57	62	43	250	E		
				SB Right	188	33	69	287	C		
	EB	18.6	B	EB Left	189	33	70	458	C		
				EB Through	2012	17	71	459	B		
				EB Right	97	16	84	497	B		
	WB	27.9	C	WB Left	41	24	149	731	C		
				WB Through	1695	29	149	731	C		
				WB Right	69	9	149	731	A		
13- MD 27 at I-270 NB off ramp											
13	NB	47.2	D	NB Left	303	47	52	260	D	6.5	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.1	A	EB Left	0	0	0	0	A		
				EB Through	1512	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	4.9	A	WB Left	0	0	0	0	A		
WB Through				1791	5	37	726	A			
WB Right				0	0	0	0	A			
14- MD 27 at I-270 SB off ramp											
14	NB			NB Left	0	0	0	0	A	5.2	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	50.1	D	SB Left	174	50	33	150	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	1.8	A	EB Left	0	0	0	0	A		
				EB Through	1677	2	4	89	A		
				EB Right	0	0	0	0	A		
	WB	3.7	A	WB Left	0	0	0	0	A		
WB Through				1541	4	12	384	A			
WB Right				0	0	0	0	A			
15- MD 27 at Crystal Rock Dr											
15	NB	31.1	C	NB Left	77	30	107	545	C	70.1	E
				NB Through	1196	31	116	545	C		
				NB Right	55	29	123	558	C		
	SB	56.5	E	SB Left	157	74	381	1298	E		
				SB Through	1468	58	381	1298	E		
				SB Right	225	33	368	1291	C		
	EB	40.4	D	EB Left	125	53	34	129	D		
				EB Through	49	36	30	124	D		
				EB Right	62	18	23	156	B		
	WB	163.8	F	WB Left	104	99	1056	1511	F		
				WB Through	127	110	1056	1511	F		
				WB Right	665	184	1056	1511	F		
16- MD 118 at Seneca Meadows Pkwy											
16	NB	4.9	A	NB Left	97	14	2	77	B	9.0	A
				NB Through	1309	4	11	182	A		
				NB Right	1	-1	19	235	A		
	SB	7.4	A	SB Left	15	8	19	307	A		
				SB Through	1226	7	22	307	A		
				SB Right	11	5	25	340	A		
	EB	14.0	B	EB Left	23	59	14	138	E		
				EB Through	0	65	14	138	E		
				EB Right	312	11	14	138	B		
	WB	53.8	D	WB Left	103	65	43	243	E		
				WB Through	7	69	39	242	E		
				WB Right	30	13	48	262	B		
17- MD 118 at I-270 NB on ramp											
17	NB			NB Left	0	0	0	0	A	13.8	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	26.5	C	EB Left	493	26	43	299	C		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	10.0	A	WB Left	0	0	0	0	A		
WB Through				283	2	1	139	A			
WB Right				1361	12	46	611	B			
18- MD 118 at I-270 SB off ramp											
18	NB			NB Left	0	0	0	0	A	7.1	A
				NB Through	0	0.0	0	0	A		
				NB Right	0	0.0	0	0	A		
	SB	37.7	D	SB Left	169	37.7	27	145	D		
				SB Through	0	0.0	0	0	A		
				SB Right	0	0.0	0	0	A		
	EB	5.5	A	EB Left	0	0.0	0	0	A		
				EB Through	1407	5.5	13	384	A		
				EB Right	0	0.0	0	0	A		
	WB	5.1	A	WB Left	0	0.0	0	0	A		
WB Through				1499	5.1	10	218	A			
WB Right				0	0.0	0	0	A			
19- MD 118 at Aircraft Dr											
19	NB	26.2	C	NB Left	53	72	43	241	E	43.0	D
				NB Through	53	70	43	241	E		
				NB Right	227	5	5	87	A		
	SB	165.9	F	SB Left	436	156	419	656	F		
				SB Through	14	205	419	656	F		
				SB Right	126	195	419	656	F		
	EB	22.6	C	EB Left	125	31	89	536	C		
				EB Through	1415	22	89	536	C		
				EB Right	21	20	89	536	B		
	WB	24.3	C	WB Left	15	30	107	749	C		
				WB Through	1399	28	107	749	C		
				WB Right	367	8	107	749	A		
20- Middlebrook Rd at Observation Dr											
20	NB			NB Left	0	0	0	0	A	9.0	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	20.5	C	SB Left	124	36	23	150	D		
				SB Through	0	0	0	0	A		
				SB Right	186	10	23	150	B		
	EB	6.0	A	EB Left	14	11	15	149	B		
				EB Through	1053	6	15	149	A		
				EB Right	0	0	0	0	A		
	WB	8.8	A	WB Left	0	0	0	0	A		
				WB Through	1313	9	27	253	A		
				WB Right	17	7	42	302	A		

Table D.14: PM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
21- Middlebrook Rd at I-270 SB on ramp											
21	NB			NB Left	0	0	0	0	A	4.6	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	2.7	A	EB Left	0	0	0	0	A		
				EB Through	742	3	4	110	A		
				EB Right	0	0	0	0	A		
	WB	7.8	A	WB Left	438	8	5	236	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
22- Middlebrook Rd at Waring Station Rd											
22	NB	48.4	D	NB Left	200	46	83	309	D	13.7	B
				NB Through	1	55	83	309	D		
				NB Right	236	50	83	309	D		
	SB	30.1	C	SB Left	32	47	8	72	D		
				SB Through	2	38	8	72	D		
				SB Right	24	7	19	110	A		
	EB	8.0	A	EB Left	4	11	28	285	B		
				EB Through	1125	8	28	285	A		
				EB Right	198	7	28	285	A		
	WB	8.6	A	WB Left	210	21	28	289	C		
				WB Through	1437	7	28	289	A		
				WB Right	3	3	28	289	A		
23- MD 124 at MD 355											
23	NB	130.8	F	NB Left	490	115	682	1082	F	78.6	E
				NB Through	1162	138	680	1079	F		
				NB Right	7	85	0	0	F		
	SB	44.6	D	SB Left	180	92	146	490	F		
				SB Through	698	66	146	490	E		
				SB Right	720	12	44	383	B		
	EB	27.2	C	EB Left	291	68	108	598	E		
				EB Through	1615	25	108	598	C		
				EB Right	338	3	28	551	A		
	WB	126.4	F	WB Left	0	0	0	0	A		
				WB Through	1645	129	683	946	F		
				WB Right	88	83	0	3	F		
24- MD 124 at I-270 SB on and off											
24	NB	95.9	F	NB Left	55	84	67	182	F	63.0	E
				NB Through	21	127	67	182	F		
				NB U-Turn	0	0	0	0	A		
	SB	55.4	E	SB Left	547	95	190	736	F		
				SB Through	8	98	190	736	F		
				SB Right	456	7	13	379	A		
	EB	101.1	F	EB Left	0	0	0	0	A		
				EB Through	1409	100	584	1113	F		
				EB Right	22	162	604	1137	F		
	WB	21.7	C	WB Left	5	78	653	2194	E		
				WB Through	1192	22	653	2194	C		
				WB Right	0	0	0	0	A		
25- MD 117 at MD 124											
25	NB	78.5	E	NB Left	54	158	328	743	F	50.1	D
				NB Through	686	93	328	743	F		
				NB Right	461	48	29	665	D		
	SB	37.8	D	SB Left	134	61	153	737	E		
				SB Through	969	41	153	737	D		
				SB Right	182	5	0	0	A		
	EB	44.9	D	EB Left	153	80	152	574	E		
				EB Through	1156	41	152	576	D		
				EB Right	57	37	156	603	D		
	WB	42.6	D	WB Left	315	71	205	1006	E		
				WB Through	1069	38	205	1006	D		
				WB Right	99	1	0	0	A		
26- MD 117 at Bureau Dr											
26	NB	50.3	D	NB Left	98	76	81	296	E	37.8	D
				NB Through	35	77	81	296	E		
				NB Right	272	38	81	296	D		
	SB	80.7	F	SB Left	284	95	132	405	F		
				SB Through	23	83	132	405	F		
				SB Right	83	32	132	405	C		
	EB	30.3	C	EB Left	52	54	165	806	D		
				EB Through	1683	30	166	806	C		
				EB Right	6	18	160	795	B		
	WB	31.9	C	WB Left	14	35	185	997	D		
				WB Through	1272	34	186	998	C		
				WB Right	213	19	211	1046	B		
27- MD 117 at I-270 SB off ramp											
27	NB			NB Left	0	0	0	0	A	12.8	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	3.7	A	EB Left	0	0	0	0	A		
				EB Through	944	4	6	464	A		
				EB Right	0	0	0	0	A		
	WB	40.7	E	WB Left	306	41	98	848	E		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
28- MD 117 at I-270 NB off ramp											
28	NB			NB Left	0	0	0	0	A	24.3	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	89.3	F	SB Left	97	91	1950	2779	F		
				SB Through	0	0	0	0	A		
				SB Right	374	89	1949	2779	F		
	EB	17.3	B	EB Left	3	120	90	983	F		
				EB Through	947	17	90	983	B		
				EB Right	0	0	0	0	A		
	WB	7.3	A	WB Left	0	0	0	0	A		
				WB Through	1403	7	52	390	A		
				WB Right	0	0	52	390	A		
29- MD 117 at Perry Pkwy											
29	NB	40.8	D	NB Left	19	59	17	125	E	49.4	D
				NB Through	26	59	17	124	E		
				NB Right	34	17	27	145	B		
	SB	162.4	F	SB Left	241	198	280	446	F		
				SB Through	21	220	280	446	F		
				SB Right	121	82	280	446	F		
	EB	21.1	C	EB Left	223	69	74	337	E		
				EB Through	778	8	74	337	A		
				EB Right	30	7	60	321	A		
	WB	41.4	D	WB Left	37	108	248	736	F		
				WB Through	1260	42	248	736	D		
				WB Right	382	33	248	736	C		
30- Shady Grove Rd at I-270 NB off ramp											
30	NB	7.6	A	NB Left	0	0	0	0	A	30.1	C
				NB Through	914	8	87	483	A		
				NB Right	0	0	0	0	A		
	SB	44.7	D	SB Left	0	0	0	0	A		
				SB Through	1013	45	163	681	D		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	51.6	D	WB Left	267	52	48	264	D		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table D.14: PM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
31- Shady Grove Rd at I-270 SB off ramp											
31	NB	31.3	C	NB Left	0	0	0	0	A	29.5	C
				NB Through	1229	31	435	1759	C		
				NB Right	0	0	0	0	A		
	SB	5.6	A	SB Left	0	0	0	0	A		
				SB Through	676	6	7	154	A		
				SB Right	0	0	0	0	A		
	EB	55.6	E	EB Left	232	54	43	211	D		
				EB Through	0	0	0	0	A		
				EB Right	304	57	62	297	E		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
32- MD 28 at I-270 SB off ramp											
32	NB			NB U-Turn	0	0	0	0	A	7.9	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	37.2	D	SB Left	406	46	71	322	D		
				SB Through	0	0	0	0	A		
				SB Right	97	3	0	28	A		
	EB	2.8	A	EB Left	0	0	0	0	A		
				EB Through	1560	1	0	0	A		
				EB Right	932	6	16	224	A		
	WB	6.7	A	WB Left	0	0	0	0	A		
				WB Through	1642	7	20	253	A		
				WB Right	0	0	0	0	A		
33- MD 28 at I-270 on and off ramps											
33	NB	36.9	D	NB Left	0	0	41	226	A	39.9	D
				NB Through	185	49	49	235	D		
				NB Right	123	18	49	235	B		
	SB	137.2	F	SB Left	14	160	361	412	F		
				SB Through	0	0	0	0	A		
				SB Right	219	136	361	412	F		
	EB	20.0	B	EB Left	283	61	94	334	E		
				EB Through	920	7	94	334	A		
				EB Right	0	0	0	0	A		
	WB	41.7	D	WB Left	40	37	168	432	D		
				WB Through	1279	42	144	396	D		
				WB Right	0	0	0	0	A		
34- MD 189 at Great Falls Rd											
34	NB	36.7	D	NB Left	43	45	12	90	D	13.2	B
				NB Through	14	48	9	90	D		
				NB Right	19	9	9	101	A		
	SB	3.4	A	SB Left	18	41	7	83	D		
				SB Through	13	48	7	83	D		
				SB Right	408	0	3	48	A		
	EB	11.6	B	EB Left	410	23	37	417	C		
				EB Through	644	5	6	200	A		
				EB Right	55	5	10	236	A		
	WB	18.0	B	WB Left	14	19	52	406	B		
				WB Through	842	18	51	406	B		
				WB Right	18	12	67	440	B		
35- MD 189 at I-270 Ramps											
35	NB	47.1	D	NB Left	225	47	41	196	D	42.5	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	54.4	D	SB Left	348	54	124	453	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	28.0	C	EB Left	479	32	91	341	C		
				EB Through	373	23	91	341	C		
				EB Right	0	0	0	0	A		
	WB	50.8	D	WB Left	443	54	111	336	D		
				WB Through	428	47	111	336	D		
				WB Right	0	0	0	0	A		
36- MD 189 at Wootton Pkwy											
36	NB	45.9	D	NB Left	238	57	142	506	E	52.4	D
				NB Through	694	51	142	506	D		
				NB Right	176	12	142	506	B		
	SB	82.8	F	SB Left	250	101	295	794	F		
				SB Through	926	78	312	780	E		
				SB Right	0	0	0	0	A		
	EB	38.7	D	EB Left	153	72	123	486	E		
				EB Through	552	38	123	486	D		
				EB Right	204	15	123	486	B		
	WB	39.5	D	WB Left	157	72	141	743	E		
				WB Through	775	41	141	743	D		
				WB Right	315	19	141	743	B		
37- Montrose Rd at Tower Oaks Blvd											
37	NB	0.4	A	NB Left	0	0	0	0	A	32.4	C
				NB Through	0	0	0	0	A		
				NB Right	537	0	0	0	A		
	SB	143.6	F	SB Left	87	49	213	902	D		
				SB Through	0	0	0	0	A		
				SB Right	305	171	269	899	F		
	EB	6.9	A	EB Left	0	0	0	0	A		
				EB Through	1868	7	39	520	A		
				EB Right	0	0	0	0	A		
	WB	40.0	D	WB Left	79	37	39	520	D		
				WB Through	2426	41	277	780	D		
				WB Right	261	30	277	780	C		
38- Tower Oaks Blvd at I-270 off ramp											
38	NB	23.3	C	NB Left	707	24	50	240	C	17.3	B
				NB Through	0	0.0	43	232	A		
				NB Right	26	7.0	50	240	A		
	SB	9.8	A	SB Left	8	18.4	1	39	B		
				SB Through	0	0.0	1	39	A		
				SB Right	9	2.2	0	23	A		
	EB	10.8	B	EB Left	1	11.5	16	177	B		
				EB Through	363	11.2	16	177	B		
				EB Right	37	7.0	11	167	A		
	WB	12.7	B	WB Left	139	16.3	16	145	B		
				WB Through	203	10.4	16	145	B		
				WB Right	3	3.4	3	100	A		
39- Montrose Rd at Tower Oaks Blvd											
39	NB	20.0	C	NB Left	97	42	83	387	D	45.0	D
				NB Through	773	32	83	387	C		
				NB Right	621	2	0	0	A		
	SB	32.1	C	SB Left	210	63	76	334	E		
				SB Through	506	23	74	333	C		
				SB Right	131	15	72	340	B		
	EB	133.4	F	EB Left	104	112	358	697	F		
				EB Through	518	136	360	698	F		
				EB Right	44	149	382	722	F		
	WB	36.9	D	WB Left	542	46	109	374	D		
				WB Through	456	42	110	374	D		
				WB Right	315	13	129	404	B		
40- Rockledge Blvd at I-270 NB on and off ramp											
40	NB	132.4	F	NB Left	0	0	0	0	A	112.4	F
				NB Through	335	121	557	836	F		
				NB Right	854	137	557	836	F		
	SB	85.9	F	SB Left	0	0	89	217	A		
				SB Through	352	86	89	217	F		
				SB Right	0	0	0	0	A		
	EB	93.5	F	EB Left	6	184	288	804	F		
				EB Through	459	148	288	804	F		
				EB Right	304	10	0	0	B		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

Table D.14: PM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS	
41- Rockledge Blvd at I-270 SB on and off ramps												
41	NB	30.3	C	NB Left	343	30	76	273	C	48.1	D	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	53.0	D		WB Left	355	59	195	867			E
					WB Through	890	51	195	867			D
					WB Right	0	0	0	0			A
42- MD 187 at Tuckerman Ln												
42	NB	66.6	E	NB Left	216	39	567	1282	D	128.7	F	
				NB Through	2309	68	567	1282	E			
				NB Right	200	76	567	1282	E			
	SB	187.6	F		SB Left	205	172	2555	2693			F
					SB Through	1151	185	2555	2693			F
					SB Right	306	209	2555	2693			F
	EB	112.4	F		EB Left	302	66	540	1403			E
					EB Through	534	136	541	1404			F
					EB Right	118	121	564	1428			F
	WB	195.5	F		WB Left	465	191	1941	2142			F
					WB Through	674	211	1941	2142			F
					WB Right	166	145	1941	2142			F
43- MD 187 at I-270 NB on and off ramps												
43	NB	16.8	B	NB Left	566	35	117	404	C	20.4	C	
				NB Through	2515	13	117	404	B			
				NB Right	0	0	0	0	A			
	SB	25.1	C		SB Left	0	0	0	0			A
					SB Through	1290	25	66	269			C
					SB Right	0	0	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	60.3	E		WB Left	59	60	47	317			E
					WB Through	67	60	47	317			E
					WB Right	0	0	0	0			A
44- MD 187 at I-270 NB on and off ramps												
44	NB	40.0	E	NB Left	0	0	0	0	A	36.9	D	
				NB Through	2426	40	155	739	D			
				NB Right	0	0	0	0	A			
	SB	18.1	B		SB Left	147	56	67	271			E
					SB Through	1203	13	67	271			B
					SB Right	0	0	0	0			A
	EB	58.2	E		EB Left	652	60	143	560			E
					EB Through	0	0	143	560			A
					EB Right	179	53	82	486			D
	WB				WB Left	0	0	0	0			A
					WB Through	0	0	0	0			A
					WB Right	0	0	0	0			A
45- MD 187 at Rock Spring Dr												
45	NB	20.6	C	NB Left	492	37	123	826	D	29.8	C	
				NB Through	2174	17	124	827	B			
				NB Right	18	14	145	860	B			
	SB	34.2	C		SB Left	21	62	111	472			E
					SB Through	1186	39	111	472			D
					SB Right	173	1	69	465			A
	EB	50.0	D		EB Left	431	60	146	519			E
					EB Through	50	68	146	519			E
					EB Right	484	39	146	519			D
	WB	17.1	B		WB Left	7	29	6	108			C
					WB Through	16	33	6	108			C
					WB Right	36	8	3	97			A
47-Democracy Blvd at I-270 NB off ramp												
47	NB	45.3	D	NB Left	154	45	28	136	D	3.0	A	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB	1.2	A		EB Left	0	0	0	0			A
					EB Through	1127	1	3	66			A
					EB Right	0	0	0	0			A
	WB	1.1	A		WB Left	0	0	0	0			A
					WB Through	2241	1	3	84			A
					WB Right	0	0	0	0			A
48- Democracy Blvd at I-270 SB on ramp												
48	NB			NB Left	0	0	0	0	A	8.4	A	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB				SB Left	0	0	0	0			A
					SB Through	0	0	0	0			A
					SB Right	0	0	0	0			A
	EB	5.5	A		EB Left	0	0	0	0			A
					EB Through	1336	5	19	232			A
					EB Right	0	0	0	0			A
	WB	10.1	B		WB Left	543	35	59	404			D
					WB Through	1827	3	49	383			A
					WB Right	0	0	0	0			A
49- Democracy Blvd at I-270 SB off ramp												
49	NB			NB Left	0	0	0	0	A	8.8	A	
				NB Through	0	0	0	0	A			
				NB Right	0	0	0	0	A			
	SB	37.4	D		SB Left	154	51	28	143			D
					SB Through	0	0	0	0			A
					SB Right	59	2	0	0			A
	EB				EB Left	0	0	0	0			A
					EB Through	0	0	0	0			A
					EB Right	0	0	0	0			A
	WB	5.8	A		WB Left	0	0	0	0			A
					WB Through	1827	4	19	305			A
					WB Right	156	29	116	746			C
50- MD 190 at Burdette Rd												
50	NB	76.4	E	NB Left	27	79	18	118	E	36.6	D	
				NB Through	7	69	18	118	E			
				NB Right	6	75	18	118	E			
	SB	37.5	D		SB Left	45	77	25	148			E
					SB Through	9	72	25	148			E
					SB Right	122	20	25	148			C
	EB	21.6	C		EB Left	138	99	113	625			F
					EB Through	1297	14	113	625			B
					EB Right	31	4	99	653			A
	WB	45.7	D		WB Left	13	114	390	1119			F
					WB Through	2161	46	390	1119			D
					WB Right	65	35	390	1119			C

Table D.14: PM Peak - No Build - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
51- MD 190 at I-270 NB on ramp											
51	NB			NB Left	0	0	0	0	A	17.6	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	65.7	E	EB Left	254	66	101	343	E		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	9.3	A	WB Left	0	0	0	0	A		
WB Through				1471	9	49	692	A			
WB Right				0	0	0	0	A			
52- MD 190 at I-270 SB off ramp											
52	NB	70.5	E	NB Left	225	70	84	800	E	12.3	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	3.6	A	EB Left	0	0	0	0	A		
				EB Through	1062	4	8	176	A		
				EB Right	0	0	0	0	A		
	WB	10.0	A	WB Left	0	0	0	0	A		
WB Through				1641	10	30	635	A			
WB Right				0	0	0	0	A			
53- MD 190 at Seven Locks Rd											
53	NB	0.5	A	NB Left	28	1	0	0	A	26.9	C
				NB Through	314	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	52.6	D	SB Left	364	52	120	414	D		
				SB Through	232	53	120	414	D		
				SB Right	20	50	120	414	D		
	EB	32.0	C	EB Left	27	30	95	436	C		
				EB Through	800	32	95	436	C		
				EB Right	45	32	95	436	C		
	WB	20.8	C	WB Left	255	75	124	491	E		
WB Through				914	18	124	491	B			
WB Right				693	5	124	491	A			
54- MD 124 at I-270 NB off ramp											
54	NB	31.3	C	NB Left	0	0	0	0	A	23.6	C
				NB Through	0	0	0	0	A		
				NB Right	556	31	56	630	C		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	21.1	C	EB Left	0	0	0	0	A		
				EB Through	1661	21	57	938	C		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
WB Through				0	0	0	0	A			
WB Right				0	0	0	0	A			
55- Democracy Blvd at I-270 NB off ramp											
55	NB	46.2	D	NB Left	0	0	0	0	A	11.2	B
				NB Through	0	0	0	0	A		
				NB Right	313	46	51	205	D		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	1.5	A	EB Left	0	0	0	0	A		
				EB Through	1128	2	4	59	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
WB Through				0	0	0	0	A			
WB Right				0	0	0	0	A			
56- Watkins Mill Rd at I-270 SB off ramp/Parkview Ave											
56	NB	71.3	E	NB Left	145	53	170	656	D	87.9	F
				NB Through	0	0	0	0	A		
				NB Right	342	79	170	656	E		
	SB	42.7	D	SB Left	410	63	107	388	E		
				SB Through	110	59	107	388	E		
				SB Right	441	20	107	388	C		
	EB	143.5	F	EB Left	0	0	0	0	A		
				EB Through	1216	144	961	1246	F		
				EB Right	4	136	961	1246	F		
	WB	41.9	D	WB Left	62	85	49	220	F		
WB Through				295	33	47	219	C			
WB Right				0	0	0	0	A			
57- Watkins Mill Rd at I-270 NB on ramp											
57	NB	40.5	D	NB Left	77	65	56	638	E	72.4	E
				NB Through	0	0	0	0	A		
				NB Right	193	31	56	638	C		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	26.1	C	EB Left	644	66	146	438	E		
				EB Through	1051	2	146	438	A		
				EB Right	0	0	0	0	A		
	WB	157.1	F	WB Left	0	0	0	0	A		
WB Through				684	122	651	866	F			
WB Right				343	227	651	866	F			
58- Watkins Mill Rd at I-270 SB on ramp											
58	NB			NB Left	0	0	0	0	A	16.5	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	17.2	B	EB Left	0	0	0	0	A		
				EB Through	1691	19	150	598	B		
				EB Right	286	8	150	598	A		
	WB	14.8	B	WB Left	409	27	46	464	C		
WB Through				352	1	46	464	A			
WB Right				0	0	0	0	A			

Table D.15: PM Peak -2040 Final Model - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
1- MD 85 at Sam's Club Drive											
1	NB	65.9	E	NB Left	134	74	508	896	E	122.2	F
				NB Through	572	40	508	896	D		
				NB Right	929	81	493	919	F		
	SB	179.1	F	SB Left	154	132	1014	1232	F		
				SB Through	868	185	1014	1232	F		
				SB Right	73	206	1014	1232	F		
	EB	34.6	C	EB Left	55	83	31	146	F		
				EB Through	24	81	31	146	F		
				EB Right	169	12	31	146	B		
	WB	186.3	F	WB Left	554	203	584	767	F		
				WB Through	30	197	584	767	F		
				WB Right	220	142	584	767	F		
2- MD 85 at I-270 NB on and off ramp											
2	NB	57.1	E	NB Left	1134	57	677	1853	E	46.4	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	29.9	C	SB Left	0	0	0	0	A		
				SB Through	738	30	122	748	C		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
3- MD 85 at I-270 SB on and off ramp											
3	NB	17.1	B	NB Left	0	0	0	0	A	19.2	B
				NB Through	1970	17	172	1239	B		
				NB Right	0	0	0	0	A		
	SB	42.4	D	SB Left	173	42	46	357	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
4- MD 85 at Crestwood Blvd											
4	NB	47.2	E	NB Left	77	73	275	821	E	44.6	D
				NB Through	1458	46	275	821	D		
				NB U-Turn	0	0	0	0	A		
	SB	31.8	C	SB Left	105	77	49	218	E		
				SB Through	937	30	110	920	C		
				SB Right	925	28	95	912	C		
	EB	63.9	E	EB Left	946	66	200	737	E		
				EB Through	43	51	200	737	D		
				EB Right	28	1	200	737	A		
	WB	52.4	D	WB Left	43	74	59	238	E		
				WB Through	80	81	59	238	F		
				WB Right	94	18	59	238	B		
5- MD 80 at I-270 NB on and off ramp											
5	NB	-1.1	A	NB Left	2	0	0	4	A	11.4	B
				NB Through	2	0	0	4	A		
				NB Right	5	-2	0	4	A		
	SB	12.8	B	SB Left	480	16	27	185	B		
				SB Through	22	14	27	185	B		
				SB Right	150	3	0	0	A		
	EB	13.1	B	EB Left	97	14	24	239	B		
				EB Through	0	0	8	0	A		
				EB Right	5	5	37	270	A		
	WB	10.7	B	WB Left	15	14	0	39	B		
				WB Through	673	18	66	450	B		
				WB Right	612	2	0	46	A		
6- MD 80 at I-270 SB on and off ramp											
6	NB	3.3	A	NB Left	56	3	3	182	A	5.7	A
				NB Through	0	0	0	0	A		
				NB Right	607	3	3	182	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	6.9	A	EB Left	0	0	0	0	A		
				EB Through	382	7	4	109	A		
				EB Right	66	5	3	119	A		
	WB	8.0	A	WB Left	0	0	0	0	A		
				WB Through	447	8	3	141	A		
				WB Right	0	0	0	0	A		
7- MD 109 at I-270 NB on and off ramp											
7	NB			NB Left	0	0	0	0	A	7.8	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	15.0	C	SB Left	322	16	32	242	C		
				SB Through	0	0	0	0	A		
				SB Right	25	5	0	140	A		
	EB	2.5	A	EB Left	80	2	0	49	A		
				EB Through	0	0	0	0	A		
				EB Right	83	3	0	0	A		
	WB	0.4	A	WB Left	0	0	0	0	A		
				WB Through	222	0	0	0	A		
				WB Right	0	0	0	0	A		
8- MD 80 at I-270 SB on and off ramp											
8	NB	4.7	A	NB Left	63	8	3	109	A	1.9	A
				NB Through	0	0	0	0	A		
				NB Right	36	0	0	59	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.9	A	EB Left	0	0	0	0	A		
				EB Through	166	0	0	0	A		
				EB Right	34	4	0	0	A		
	WB	1.5	A	WB Left	137	1	0	58	A		
				WB Through	109	2	0	29	A		
				WB Right	0	0	0	0	A		
9- MD 121 at Gateway Center Dr											
9	NB	32.4	D	NB Left	636	36	141	615	D	53.1	D
				NB Through	870	31	141	615	C		
				NB Right	70	14	150	641	B		
	SB	22.0	C	SB Left	27	14	19	224	B		
				SB Through	301	23	30	224	C		
				SB Right	9	10	33	245	B		
	EB	15.6	C	EB Left	4	44	10	238	D		
				EB Through	24	41	16	246	D		
				EB Right	248	13	29	278	B		
	WB	141.2	F	WB Left	345	192	353	768	F		
				WB Through	76	94	353	767	F		
				WB Right	184	65	377	792	E		
10- MD 121 at I-270 NB on and off ramp											
10	NB	22.0	C	NB Left	429	59	94	554	F	19.3	B
				NB Through	0	0	0	0	A		
				NB Right	917	5	11	311	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	13.8	B	EB Left	0	0	0	0	A		
				EB Through	651	19	41	372	C		
				EB Right	336	4	4	212	A		
	WB	21.4	C	WB Left	218	62	91	460	F		
				WB Through	678	8	91	460	A		
				WB Right	0	0	0	0	A		

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Table D.15: PM Peak -2040 Final Model - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
11- MD 121 at I-270 SB on and off ramp											
11	NB			NB Left	0	0	0	0	A	22.8	C
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	63.2	E	SB Left	272	85	229	961	F		
				SB Through	0	0	0	0	A		
				SB Right	254	40	0	4	E		
	EB	6.3	A	EB Left	0	0	0	0	A		
				EB Through	717	6	16	213	A		
				EB Right	0	0	0	0	A		
	WB	14.2	B	WB Left	0	0	0	0	A		
WB Through				570	27	51	376	D			
WB Right				536	0	0	0	A			
12- MD 27 at Observation Dr											
12	NB	38.5	D	NB U-Turn	0	0	0	0	A	25.6	C
				NB Through	94	55	22	98	D		
				NB Right	61	14	22	98	B		
	SB	41.1	D	SB Left	146	44	38	216	D		
				SB Through	57	62	43	250	E		
				SB Right	188	33	68	287	C		
	EB	19.7	B	EB Left	213	35	86	511	D		
				EB Through	2274	18	88	512	B		
				EB Right	107	15	99	550	B		
	WB	29.6	C	WB Left	41	28	158	753	C		
WB Through				1695	30	158	753	C			
WB Right				69	9	158	753	A			
13- MD 27 at I-270 NB off ramp											
13	NB	45.9	D	NB Left	402	46	67	287	D	7.8	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	0.1	A	EB Left	0	0	0	0	A		
				EB Through	1516	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	5.7	A	WB Left	0	0	0	0	A		
WB Through				1791	6	48	725	A			
WB Right				0	0	0	0	A			
14- MD 27 at I-270 SB off ramp											
14	NB			NB Left	0	0	0	0	A	5.0	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	49.6	D	SB Left	175	50	33	155	D		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	1.9	A	EB Left	0	0	0	0	A		
				EB Through	1677	2	4	80	A		
				EB Right	0	0	0	0	A		
	WB	3.5	A	WB Left	0	0	0	0	A		
WB Through				1637	4	11	349	A			
WB Right				0	0	0	0	A			
15- MD 27 at Crystal Rock Dr											
15	NB	31.5	C	NB Left	77	32	109	534	C	70.0	E
				NB Through	1196	32	117	534	C		
				NB Right	55	29	123	547	C		
	SB	58.0	E	SB Left	166	76	406	1315	E		
				SB Through	1543	60	406	1315	E		
				SB Right	236	31	390	1309	C		
	EB	40.9	D	EB Left	125	54	35	132	D		
				EB Through	49	36	30	127	D		
				EB Right	62	19	23	160	B		
	WB	161.2	F	WB Left	104	91	1024	1517	F		
WB Through				126	103	1024	1517	F			
WB Right				665	183	1024	1517	F			
16- MD 118 at Seneca Meadows Pkwy											
16	NB	5.4	A	NB Left	114	14	2	95	B	9.3	A
				NB Through	1442	5	13	225	A		
				NB Right	1	2	22	278	A		
	SB	8.0	A	SB Left	16	10	22	313	A		
				SB Through	1226	8	24	313	A		
				SB Right	11	6	29	346	A		
	EB	13.9	B	EB Left	23	58	14	128	E		
				EB Through	0	65	14	128	E		
				EB Right	312	11	14	128	B		
	WB	53.9	D	WB Left	103	65	43	243	E		
WB Through				7	69	39	242	E			
WB Right				30	13	48	262	B			
17- MD 118 at I-270 NB on ramp											
17	NB			NB Left	0	0	0	0	A	13.9	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	26.5	C	EB Left	494	26	43	355	C		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	10.1	B	WB Left	0	0	0	0	A		
WB Through				284	2	0	14	A			
WB Right				1362	12	48	561	B			
18- MD 118 at I-270 SB off ramp											
18	NB			NB Left	0	0	0	0	A	7.5	A
				NB Through	0	0.0	0	0	A		
				NB Right	0	0.0	0	0	A		
	SB	34.6	C	SB Left	168	34.6	25	134	C		
				SB Through	0	0.0	0	0	A		
				SB Right	0	0.0	0	0	A		
	EB	5.5	A	EB Left	0	0.0	0	0	A		
				EB Through	1411	5.5	13	407	A		
				EB Right	0	0.0	0	0	A		
	WB	6.5	A	WB Left	0	0.0	0	0	A		
WB Through				1763	6.5	15	308	A			
WB Right				0	0.0	0	0	A			
19- MD 118 at Aircraft Dr											
19	NB	26.5	C	NB Left	53	71	43	237	E	42.9	D
				NB Through	53	69	43	237	E		
				NB Right	227	6	5	107	A		
	SB	158.9	F	SB Left	441	146	407	658	F		
				SB Through	14	218	407	658	F		
				SB Right	128	197	407	658	F		
	EB	23.6	C	EB Left	125	38	94	577	D		
				EB Through	1415	22	94	577	C		
				EB Right	21	20	94	577	B		
	WB	27.2	C	WB Left	17	29	144	902	C		
WB Through				1606	32	144	902	C			
WB Right				418	10	144	902	B			
20- Middlebrook Rd at Observation Dr											
20	NB			NB Left	0	0	0	0	A	9.0	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	20.6	C	SB Left	125	36	23	150	D		
				SB Through	0	0	0	0	A		
				SB Right	186	10	23	150	B		
	EB	6.4	A	EB Left	16	10	17	173	B		
				EB Through	1215	6	17	173	A		
				EB Right	0	0	0	0	A		
	WB	8.8	A	WB Left	0	0	0	0	A		
WB Through				1313	9	27	286	A			
WB Right				17	7	42	336	A			

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Table D.15: PM Peak -2040 Final Model - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
21- Middlebrook Rd at I-270 SB on ramp											
21	NB			NB Left	0	0	0	0	A	4.6	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	2.6	A	EB Left	0	0	0	0	A		
				EB Through	742	3	4	103	A		
				EB Right	0	0	0	0	A		
	WB	7.9	A	WB Left	438	8	5	230	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
22- Middlebrook Rd at Waring Station Rd											
22	NB	48.4	D	NB Left	200	46	83	309	D	14.0	B
				NB Through	1	55	83	309	D		
				NB Right	236	50	83	309	D		
	SB	30.4	C	SB Left	32	47	8	72	D		
				SB Through	2	38	8	72	D		
				SB Right	24	8	19	110	A		
	EB	8.2	A	EB Left	4	14	28	319	B		
				EB Through	1125	8	28	319	A		
				EB Right	198	8	28	319	A		
	WB	9.7	A	WB Left	249	25	42	327	C		
				WB Through	1694	7	42	327	A		
				WB Right	3	2	42	327	A		
23- MD 124 at MD 355											
23	NB	155.5	F	NB Left	471	137	808	1145	F	78.1	E
				NB Through	1116	164	805	1142	F		
				NB Right	7	109	0	0	F		
	SB	45.8	D	SB Left	180	93	150	508	F		
				SB Through	698	66	150	508	E		
				SB Right	718	14	42	442	B		
	EB	29.9	C	EB Left	446	74	191	870	E		
				EB Through	2591	28	191	870	C		
				EB Right	534	3	67	791	A		
	WB	139.4	F	WB Left	0	0	0	0	A		
				WB Through	1551	142	693	943	F		
				WB Right	83	94	0	9	F		
24- MD 124 at I-270 SB on and off											
24	NB	62.7	F	NB Left	52	63	23	109	E	28.9	C
				NB Through	21	61	23	109	E		
				NB U-Turn	0	0	0	0	A		
	SB	41.2	D	SB Left	557	70	138	476	E		
				SB Through	8	63	138	476	E		
				SB Right	456	5	9	268	A		
	EB	26.2	C	EB Left	0	0	0	0	A		
				EB Through	1875	26	185	1050	C		
				EB Right	36	27	197	1074	C		
	WB	20.4	C	WB Left	5	57	489	2043	E		
				WB Through	1133	20	489	2043	C		
				WB Right	0	0	0	0	A		
25- MD 117 at MD 124											
25	NB	74.9	E	NB Left	55	159	312	748	F	50.9	D
				NB Through	684	89	312	748	F		
				NB Right	465	44	26	684	D		
	SB	39.2	D	SB Left	135	66	160	668	E		
				SB Through	963	42	160	668	D		
				SB Right	182	5	0	0	A		
	EB	48.5	D	EB Left	152	82	166	602	F		
				EB Through	1163	45	166	603	D		
				EB Right	57	40	173	630	D		
	WB	45.0	D	WB Left	397	72	285	1023	E		
				WB Through	1326	41	285	1023	D		
				WB Right	128	1	0	0	A		
26- MD 117 at Bureau Dr											
26	NB	49.9	D	NB Left	98	78	80	282	E	40.3	D
				NB Through	35	81	80	282	F		
				NB Right	271	36	80	282	D		
	SB	89.4	F	SB Left	285	103	147	395	F		
				SB Through	22	95	147	395	F		
				SB Right	83	40	147	395	D		
	EB	31.2	C	EB Left	50	74	166	853	E		
				EB Through	1693	30	167	853	C		
				EB Right	6	20	160	843	B		
	WB	36.7	D	WB Left	18	38	301	1057	D		
				WB Through	1653	39	302	1058	D		
				WB Right	280	25	332	1106	C		
27- MD 117 at I-270 SB off ramp											
27	NB			NB Left	0	0	0	0	A	11.4	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	3.3	A	EB Left	0	0	0	0	A		
				EB Through	944	3	3	283	A		
				EB Right	0	0	0	0	A		
	WB	36.9	E	WB Left	301	37	102	980	E		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
28- MD 117 at I-270 NB off ramp											
28	NB			NB Left	0	0	0	0	A	53.4	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	138.8	F	SB Left	248	131	2371	5039	F		
				SB Through	0	0	0	0	A		
				SB Right	878	141	2370	5038	F		
	EB	17.1	B	EB Left	4	101	74	915	F		
				EB Through	945	17	74	915	B		
				EB Right	0	0	0	0	A		
	WB	8.3	A	WB Left	0	0	0	0	A		
				WB Through	1368	8	52	378	A		
				WB Right	0	0	52	378	A		
29- MD 117 at Perry Pkwy											
29	NB	37.6	D	NB Left	18	59	15	123	E	45.3	D
				NB Through	26	52	15	122	D		
				NB Right	34	16	24	143	B		
	SB	154.3	F	SB Left	239	191	266	446	F		
				SB Through	20	199	266	446	F		
				SB Right	118	72	266	446	E		
	EB	21.3	C	EB Left	249	71	90	366	E		
				EB Through	891	8	90	366	A		
				EB Right	33	7	76	350	A		
	WB	37.8	D	WB Left	36	105	218	747	F		
				WB Through	1228	38	218	747	D		
				WB Right	376	29	218	747	C		
30- Shady Grove Rd at I-270 NB off ramp											
30	NB	6.6	A	NB Left	0	0	0	0	A	24.3	C
				NB Through	1064	7	16	188	A		
				NB Right	0	0	0	0	A		
	SB	32.2	C	SB Left	0	0	0	0	A		
				SB Through	1351	32	196	826	C		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	49.9	D	WB Left	316	50	58	232	D		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

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Table D.15: PM Peak -2040 Final Model- Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
31- Shady Grove Rd at I-270 SB off ramp											
31	NB	7.3	A	NB Left	0	0	0	0	A	15.6	B
				NB Through	1529	7	32	385	A		
				NB Right	0	0	0	0	A		
	SB	5.6	A	SB Left	0	0	0	0	A		
				SB Through	851	6	9	186	A		
				SB Right	0	0	0	0	A		
	EB	54.9	D	EB Left	236	53	44	196	D		
				EB Through	0	0	0	0	A		
				EB Right	308	57	62	264	E		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
32- MD 28 at I-270 SB off ramp											
32	NB			NB U-Turn	0	0	0	0	A	9.7	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	37.3	D	SB Left	449	46	77	291	D		
				SB Through	0	0	0	0	A		
				SB Right	106	3	0	26	A		
	EB	5.2	A	EB Left	0	0	0	0	A		
				EB Through	1549	4	156	669	A		
				EB Right	928	6	16	248	A		
	WB	7.3	A	WB Left	0	0	0	0	A		
				WB Through	1775	7	23	246	A		
				WB Right	0	0	0	0	A		
33- MD 28 at I-270 on and off ramps											
33	NB	35.3	D	NB Left	0	0	44	237	A	55.1	E
				NB Through	203	47	52	246	D		
				NB Right	136	18	52	246	B		
	SB	146.9	F	SB Left	19	166	352	422	F		
				SB Through	0	0	0	0	A		
				SB Right	276	146	352	422	F		
	EB	38.8	D	EB Left	279	140	213	533	F		
				EB Through	951	9	213	533	A		
				EB Right	0	0	0	0	A		
	WB	54.9	D	WB Left	39	48	219	436	D		
				WB Through	1268	55	191	399	E		
				WB Right	0	0	0	0	A		
34- MD 189 at Great Falls Rd											
34	NB	41.0	D	NB Left	43	54	12	87	D	45.3	D
				NB Through	14	45	9	86	D		
				NB Right	19	8	10	97	A		
	SB	33.6	C	SB Left	17	50	41	265	D		
				SB Through	12	44	41	265	D		
				SB Right	376	33	81	271	C		
	EB	32.3	C	EB Left	420	63	360	2409	E		
				EB Through	663	15	16	374	B		
				EB Right	56	12	24	411	B		
	WB	69.6	E	WB Left	13	55	225	692	E		
				WB Through	794	70	225	692	E		
				WB Right	16	56	250	726	E		
35- MD 189 at I-270 Ramps											
35	NB	48.3	D	NB Left	238	48	43	178	D	57.7	E
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	57.5	E	SB Left	356	57	132	513	E		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	30.4	C	EB Left	483	35	91	350	D		
				EB Through	374	24	91	350	C		
				EB Right	0	0	0	0	A		
	WB	89.7	F	WB Left	408	94	103	287	F		
				WB Through	396	85	103	287	F		
				WB Right	0	0	0	0	A		
36- MD 189 at Wooton Pkwy											
36	NB	46.5	D	NB Left	238	59	145	490	E	52.6	D
				NB Through	694	51	145	490	D		
				NB Right	176	12	145	490	B		
	SB	83.7	F	SB Left	250	105	298	801	F		
				SB Through	930	78	316	789	E		
				SB Right	0	0	0	0	A		
	EB	39.2	D	EB Left	152	71	127	500	E		
				EB Through	555	39	127	500	D		
				EB Right	205	15	127	500	B		
	WB	38.2	D	WB Left	156	69	137	745	E		
				WB Through	760	40	137	745	D		
				WB Right	310	18	137	745	B		
37- Montrose Rd at Tower Oaks Blvd											
37	NB	0.3	A	NB Left	0	0	0	0	A	25.1	C
				NB Through	0	0	0	0	A		
				NB Right	537	0	0	0	A		
	SB	82.5	F	SB Left	87	49	34	336	D		
				SB Through	0	0	0	0	A		
				SB Right	308	92	128	391	F		
	EB	7.3	A	EB Left	0	0	0	0	A		
				EB Through	1885	7	42	467	A		
				EB Right	0	0	0	0	A		
	WB	33.1	C	WB Left	79	44	42	467	D		
				WB Through	2665	34	221	773	C		
				WB Right	286	24	221	773	C		
38- Tower Oaks Blvd at I-270 off ramp											
38	NB	23.3	C	NB Left	708	24	51	261	C	17.2	B
				NB Through	0	0.0	44	253	A		
				NB Right	27	7.3	51	261	A		
	SB	10.0	A	SB Left	9	17.2	1	39	B		
				SB Through	0	0.0	1	39	A		
				SB Right	9	2.8	0	23	A		
	EB	10.6	B	EB Left	1	12.6	16	180	B		
				EB Through	363	11.0	16	180	B		
				EB Right	37	6.6	11	171	A		
	WB	12.4	B	WB Left	150	15.7	16	147	B		
				WB Through	214	10.3	16	147	B		
				WB Right	3	2.4	3	103	A		
39- Montrose Rd at Tower Oaks Blvd											
39	NB	20.4	C	NB Left	97	41	84	384	D	44.2	D
				NB Through	773	32	84	384	C		
				NB Right	621	2	0	0	A		
	SB	33.2	C	SB Left	211	66	76	317	E		
				SB Through	506	24	75	316	C		
				SB Right	131	15	74	343	B		
	EB	123.0	F	EB Left	105	105	329	672	F		
				EB Through	525	126	331	673	F		
				EB Right	44	129	353	696	F		
	WB	38.1	D	WB Left	575	47	121	453	D		
				WB Through	479	43	121	453	D		
				WB Right	332	15	142	484	B		
40- Rockledge Blvd at I-270 NB on and off ramp											
40	NB	137.0	F	NB Left	0	0	0	0	A	122.9	F
				NB Through	339	126	578	838	F		
				NB Right	862	141	578	838	F		
	SB	86.3	F	SB Left	0	0	89	231	A		
				SB Through	349	86	89	231	F		
				SB Right	0	0	0	0	A		
	EB	117.4	F	EB Left	6	207	386	831	F		
				EB Through	456	179	386	831	F		
				EB Right	306	24	0	0	C		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

* Final = HSR + VSL + ARM + DDI

Table D.15: PM Peak -2040 Final Model - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
41- Rockledge Blvd at I-270 SB on and off ramps											
41	NB	30.2	C	NB Left	346	30	78	266	C	48.0	D
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	53.0	D	WB Left	355	58	195	862	E		
				WB Through	882	51	195	862	D		
				WB Right	0	0	0	0	A		
42- MD 187 at Tuckerman Ln											
42	NB	73.3	E	NB Left	217	49	632	1325	D	135.7	F
				NB Through	2293	75	632	1325	E		
				NB Right	200	82	632	1325	F		
	SB	192.2	F	SB Left	201	179	2564	2698	F		
				SB Through	1133	188	2564	2698	F		
				SB Right	303	216	2564	2698	F		
	EB	133.3	F	EB Left	302	73	653	1421	E		
				EB Through	532	164	654	1422	F		
				EB Right	117	150	677	1446	F		
	WB	196.7	F	WB Left	460	190	1942	2152	F		
				WB Through	669	213	1942	2152	F		
				WB Right	166	147	1942	2152	F		
43- MD 187 at I-270 NB on and off ramps											
43	NB	18.1	B	NB Left	565	33	122	423	C	21.2	C
				NB Through	2508	15	122	423	B		
				NB Right	0	0	0	0	A		
	SB	25.2	C	SB Left	0	0	0	0	A		
				SB Through	1274	25	66	283	C		
				SB Right	0	0	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	55.4	E	WB Left	61	52	42	329	D		
				WB Through	67	59	42	329	E		
				WB Right	0	0	0	0	A		
44- MD 187 at I-270 NB on and off ramps											
44	NB	42.6	E	NB Left	0	0	0	0	A	40.8	D
				NB Through	2417	43	173	691	D		
				NB Right	0	0	0	0	A		
	SB	19.0	B	SB Left	147	57	71	300	E		
				SB Through	1189	14	71	300	B		
				SB Right	0	0	0	0	A		
	EB	70.6	E	EB Left	653	72	182	667	E		
				EB Through	0	0	182	667	A		
				EB Right	182	67	99	597	E		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
45- MD 187 at Rock Spring Dr											
45	NB	19.7	B	NB Left	492	36	117	802	D	28.3	C
				NB Through	2187	16	117	803	B		
				NB Right	18	13	138	836	B		
	SB	32.7	C	SB Left	21	58	105	464	E		
				SB Through	1175	37	105	464	D		
				SB Right	172	1	73	451	A		
	EB	47.0	D	EB Left	432	59	135	489	E		
				EB Through	50	62	135	489	E		
				EB Right	484	35	135	489	D		
	WB	16.8	B	WB Left	7	30	6	108	C		
				WB Through	16	32	6	108	C		
				WB Right	36	8	3	97	A		
47-Democracy Blvd at I-270 NB off ramp											
47	NB	46.3	D	NB Left	153	46	29	146	D	3.0	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	1.2	A	EB Left	0	0	0	0	A		
				EB Through	1152	1	3	60	A		
				EB Right	0	0	0	0	A		
	WB	1.0	A	WB Left	0	0	0	0	A		
				WB Through	2240	1	3	53	A		
				WB Right	0	0	0	0	A		
48- Democracy Blvd at I-270 SB on ramp											
48	NB			NB Left	0	0	0	0	A	7.3	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	5.2	A	EB Left	0	0	0	0	A		
				EB Through	1373	5	19	239	A		
				EB Right	0	0	0	0	A		
	WB	8.5	A	WB Left	551	28	48	312	C		
				WB Through	1826	3	39	292	A		
				WB Right	0	0	0	0	A		
49- Democracy Blvd at I-270 SB off ramp											
49	NB			NB Left	0	0	0	0	A	7.9	A
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB	37.8	D	SB Left	152	51	29	163	D		
				SB Through	0	0	0	0	A		
				SB Right	59	3	0	0	A		
	EB			EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	4.7	A	WB Left	0	0	0	0	A		
				WB Through	1826	4	18	294	A		
				WB Right	168	17	58	434	B		
50- MD 190 at Burdette Rd											
50	NB	76.4	E	NB Left	27	79	18	118	E	39.7	D
				NB Through	7	69	18	118	E		
				NB Right	6	75	18	118	E		
	SB	36.1	D	SB Left	44	78	25	142	E		
				SB Through	9	70	25	142	E		
				SB Right	122	19	25	142	B		
	EB	28.0	C	EB Left	139	106	158	787	F		
				EB Through	1299	20	158	787	C		
				EB Right	30	8	151	814	A		
	WB	47.2	D	WB Left	13	120	416	1113	F		
				WB Through	2121	47	416	1113	D		
				WB Right	64	41	416	1113	D		

* Final = HSR + VSL + ARM + DDI

Table D.15: PM Peak -2040 Final Model - Intersection Delay and Level of Service

Intersection	Approach	Approach Delay	Approach LOS	Movement	Volume	Delay	Ave. Queue	Max Queue	LOS	Intersection Delay	Intersection LOS
51- MD 190 at I-270 NB on ramp											
51	NB			NB Left	0	0	0	0	A	18.3	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	65.9	E	EB Left	253	66	120	471	E		
				EB Through	0	0	0	0	A		
				EB Right	0	0	0	0	A		
	WB	10.0	B	WB Left	0	0	0	0	A		
				WB Through	1447	10	54	770	B		
				WB Right	0	0	0	0	A		
52- MD 190 at I-270 SB off ramp											
52	NB	73.9	E	NB Left	228	74	91	774	E	13.3	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	3.6	A	EB Left	0	0	0	0	A		
				EB Through	1062	4	8	186	A		
				EB Right	0	0	0	0	A		
	WB	11.0	B	WB Left	0	0	0	0	A		
				WB Through	1621	11	23	417	B		
				WB Right	0	0	0	0	A		
53- MD 190 at Seven Locks Rd											
53	NB	0.5	A	NB Left	28	1	0	0	A	26.9	C
				NB Through	314	1	0	0	A		
				NB Right	0	0	0	0	A		
	SB	52.8	D	SB Left	364	53	120	414	D		
				SB Through	232	53	120	414	D		
				SB Right	20	50	120	414	D		
	EB	31.6	C	EB Left	27	29	94	437	C		
				EB Through	800	32	94	437	C		
				EB Right	45	32	94	437	C		
	WB	20.9	C	WB Left	253	74	123	511	E		
				WB Through	903	18	123	511	B		
				WB Right	687	5	123	511	A		
54- MD 124 at I-270 NB off ramp											
54	NB	35.4	D	NB Left	0	0	0	0	A	37.5	D
				NB Through	0	0	0	0	A		
				NB Right	1558	35	213	1029	D		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	39.2	D	EB Left	0	0	0	0	A		
				EB Through	1992	39	299	1227	D		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
55- Democracy Blvd at I-270 NB off ramp											
55	NB	46.4	D	NB Left	0	0	0	0	A	11.1	B
				NB Through	0	0	0	0	A		
				NB Right	315	46	51	204	D		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	1.5	A	EB Left	0	0	0	0	A		
				EB Through	1152	1	4	60	A		
				EB Right	0	0	0	0	A		
	WB			WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		
56- Watkins Mill Rd at I-270 SB off ramp/Parkview Ave											
56	NB	#VALUE!	#VALUE!	NB Left	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
				NB Through	0	0	0	0	A		
				NB Right	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!		
	SB	40.8	D	SB Left	335	77	115	374	E		
				SB Through	1382	32	108	527	C		
				SB Right	4	2	108	527	A		
	EB	#VALUE!	#VALUE!	EB Left	0	0	0	0	A		
				EB Through	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!		
				EB Right	1720	41	111	527	D		
	WB	#VALUE!	#VALUE!	WB Left	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!		
				WB Through	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!		
				WB Right	0	0	0	0	A		
57- Watkins Mill Rd at I-270 NB on ramp											
57	NB	12.4	B	NB Left	4496	14	27	505	B	12.7	B
				NB Through	0	0	0	0	A		
				NB Right	1026	4	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	16.9	B	EB Left	405	21	35	313	C		
				EB Through	1403	16	163	314	B		
				EB Right	0	0	0	0	A		
	WB	8.7	A	WB Left	0	0	0	0	A		
				WB Through	723	14	37	353	B		
				WB Right	681	3	9	204	A		
58- Watkins Mill Rd at I-270 SB on ramp											
58	NB			NB Left	0	0	0	0	A	10.3	B
				NB Through	0	0	0	0	A		
				NB Right	0	0	0	0	A		
	SB			SB Left	0	0	0	0	A		
				SB Through	0	0	0	0	A		
				SB Right	0	0	0	0	A		
	EB	10.3	B	EB Left	0	0	0	0	A		
				EB Through	0	0	0	0	A		
				EB Right	5100	10	35	399	B		
	WB	#DIV/0!	#DIV/0!	WB Left	0	0	0	0	A		
				WB Through	0	0	0	0	A		
				WB Right	0	0	0	0	A		

* Final = HSR + VSL + ARM + DDI

Table D.16: PM Peak- 2040 Final Model- I-270 Vehicle Network Performance

	No Build	Final	% Change
Total Delay	36,237,078	29,010,420	-20%
Average Delay per Vehicle	307	239	-22%
Total Travel Time	67,865,560	64,476,166	-5%
Vehicles (Arrived)	95,124	101,095	6%
Latent Demand	8,861	5,010	-43%
Latent Delay	13,484,325	8,320,170	-38%
Total Distance	477,455	515,823	8%
Average Speed	25	29	14%

*FINAL = HSR+VSL+ARM+DDI



ATTACHMENT 1: PARSONS IS 270 SUMMARY OF FIELD INFRASTRUCTURE



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 Monday, January 09, 2017 AT 03:34 PM

TABLE C.16: AM PEAK - 2040 HSR+VSL+ARM - I-270 VEHICLE NETWORK PERFORMANCE

	NO BUILD	FINAL	% CHANGE
TOTAL DELAY	35,032,576	19,376,211	REDUCE BY 45%
AVERAGE DELAY PER VEHICLE	326	180	REDUCE BY 56%
TOTAL TRAVEL TIME	64,317,886	52,679,474	REDUCE BY 18%
VEHICLES (ARRIVED)	87,894	92,848	INCREASE BY 6%
LATENT DEMAND	44,530	44,511	INCREASE BY 0%
LATENT DELAY	120,600,723	125,623,611	INCREASE BY 4%
TOTAL DISTANCE	463,125	490,310	INCREASE BY 6%
AVERAGE SPEED	26	34	INCREASE BY 29%

TABLE D.16: PM PEAK - 2040 HSR+VSL+ARM - I-270 VEHICLE NETWORK PERFORMANCE

	NO BUILD	FINAL	% CHANGE
TOTAL DELAY	36,237,078	29,258,237	REDUCE BY 19%
AVERAGE DELAY PER VEHICLE	307	243	REDUCE BY 21%
TOTAL TRAVEL TIME	67,865,560	64,421,662	REDUCE BY 5%
VEHICLES (ARRIVED)	95,124	100,230	INCREASE BY 5%
LATENT DEMAND	8,861	6,231	REDUCE BY 30%
LATENT DELAY	13,484,325	10,791,035	REDUCE BY 20%
TOTAL DISTANCE	477,455	511,732	INCREASE BY 7%
AVERAGE SPEED	25	29	INCREASE BY 13%

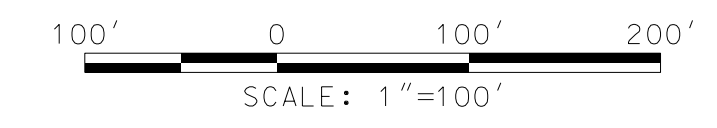
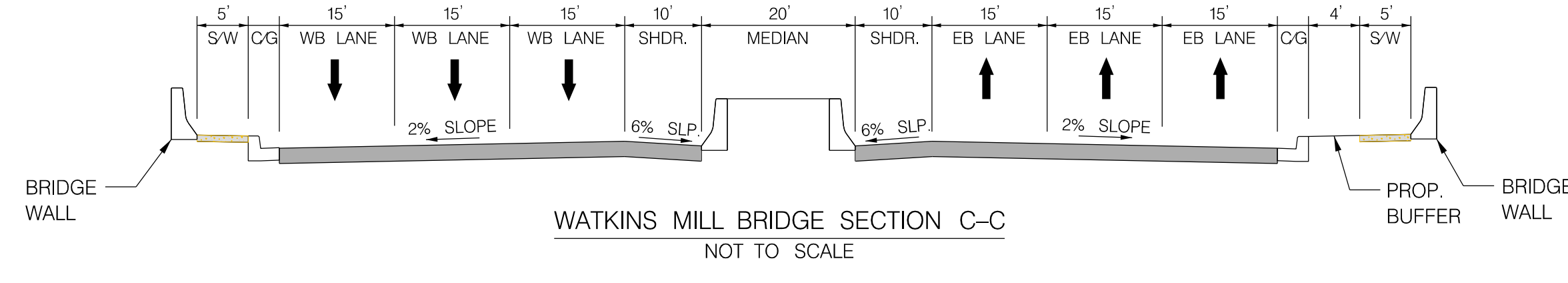
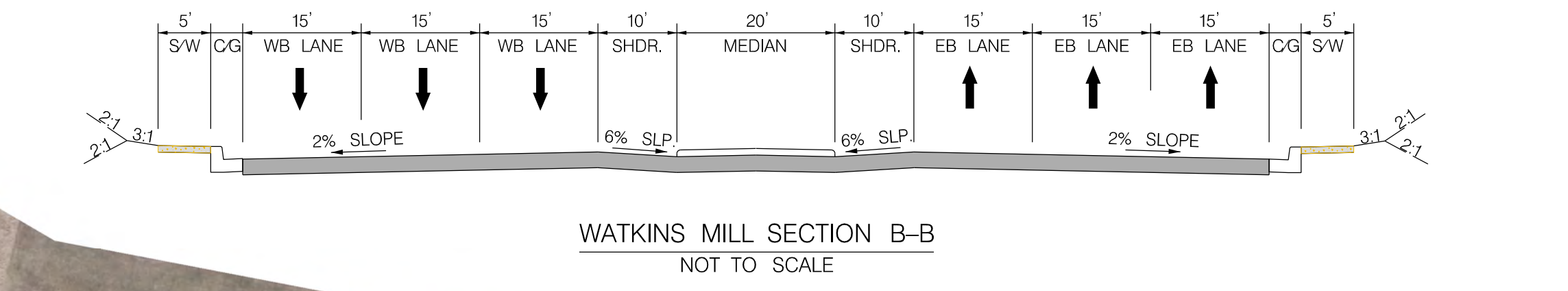
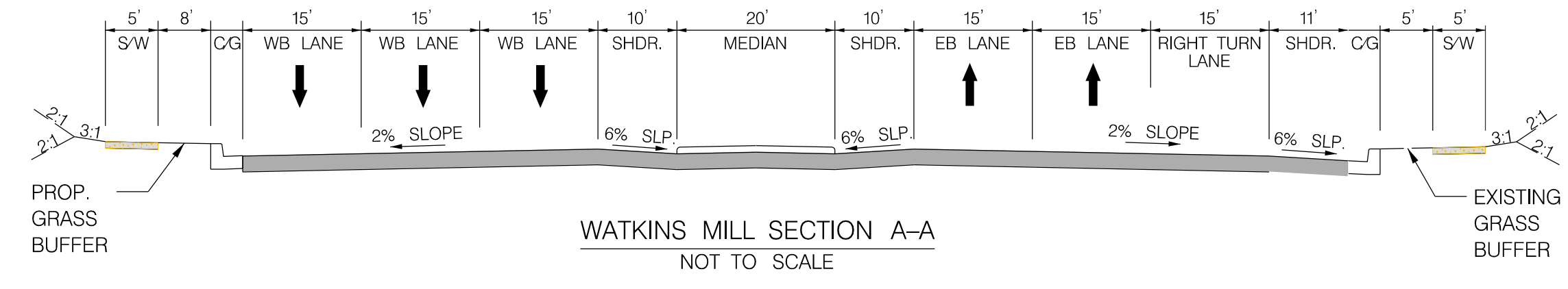
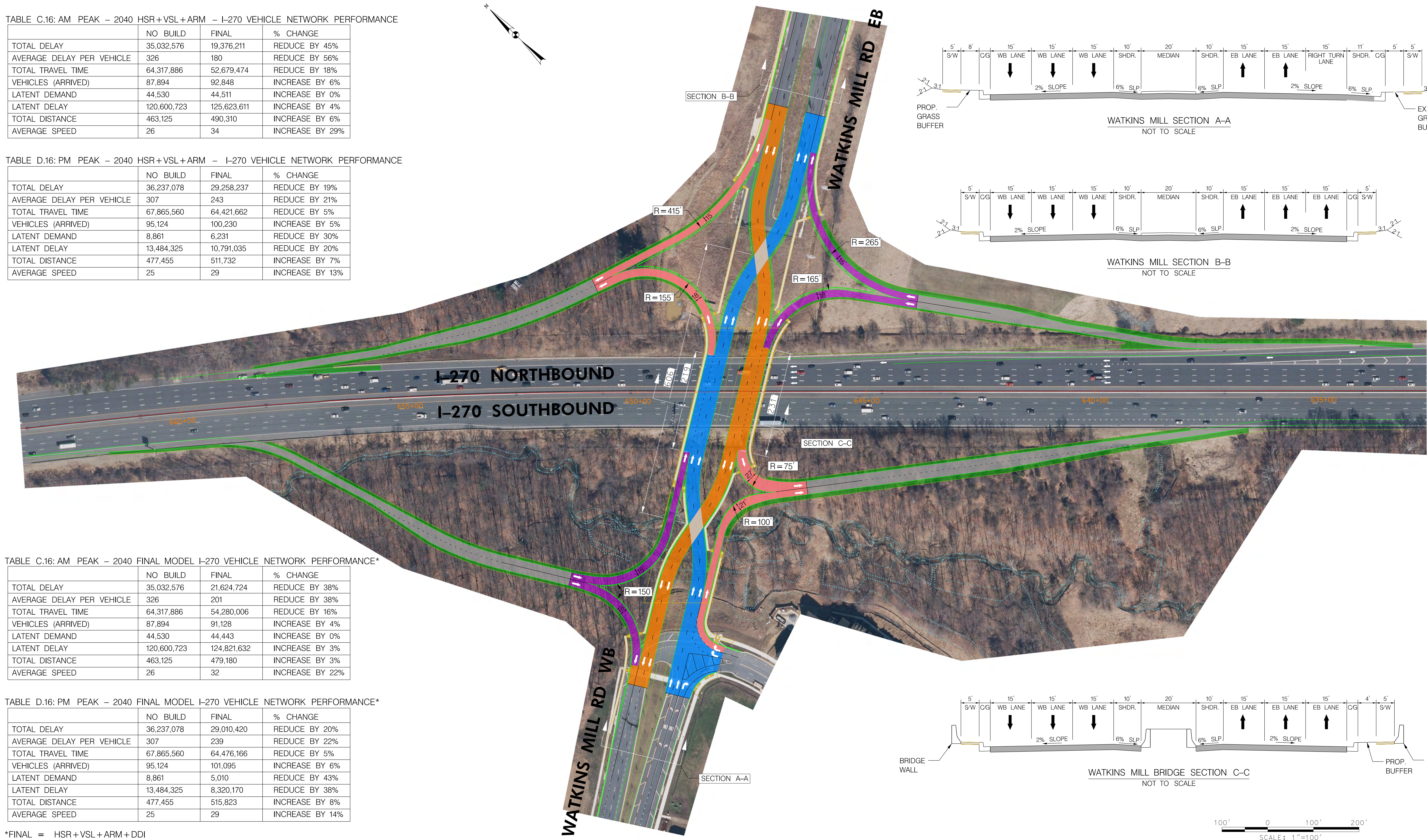
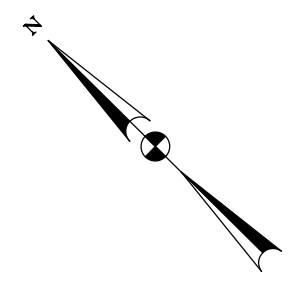
TABLE C.16: AM PEAK - 2040 FINAL MODEL I-270 VEHICLE NETWORK PERFORMANCE*

	NO BUILD	FINAL	% CHANGE
TOTAL DELAY	35,032,576	21,624,724	REDUCE BY 38%
AVERAGE DELAY PER VEHICLE	326	201	REDUCE BY 38%
TOTAL TRAVEL TIME	64,317,886	54,280,006	REDUCE BY 16%
VEHICLES (ARRIVED)	87,894	91,128	INCREASE BY 4%
LATENT DEMAND	44,530	44,443	INCREASE BY 0%
LATENT DELAY	120,600,723	124,821,632	INCREASE BY 3%
TOTAL DISTANCE	463,125	479,180	INCREASE BY 3%
AVERAGE SPEED	26	32	INCREASE BY 22%

TABLE D.16: PM PEAK - 2040 FINAL MODEL I-270 VEHICLE NETWORK PERFORMANCE*

	NO BUILD	FINAL	% CHANGE
TOTAL DELAY	36,237,078	29,010,420	REDUCE BY 20%
AVERAGE DELAY PER VEHICLE	307	239	REDUCE BY 22%
TOTAL TRAVEL TIME	67,865,560	64,476,166	REDUCE BY 5%
VEHICLES (ARRIVED)	95,124	101,095	INCREASE BY 6%
LATENT DEMAND	8,861	5,010	REDUCE BY 43%
LATENT DELAY	13,484,325	8,320,170	REDUCE BY 38%
TOTAL DISTANCE	477,455	515,823	INCREASE BY 8%
AVERAGE SPEED	25	29	INCREASE BY 14%

*FINAL = HSR + VSL + ARM + DDI



LEGEND

- | | | | | | |
|--------------------|--|------------------------|--|-------------------|--|
| EASTBOUND MOVEMENT | | RAMP ONTO WATKINS MILL | | PROPOSED SIDEWALK | |
| WESTBOUND MOVEMENT | | RAMP OFF WATKINS MILL | | | |
| NEW PAVEMENT | | PROPOSED SHOULDER | | | |

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

APPR CHECK DRAWN DESIGN	I-270 INTERCHANGE IMPROVEMENT PRELIMINARY ENGINEERING		CONTRACT NO. PROPOSAL
	WATKINS MILL INTERCHANGE		DRAWING NO.
	DATE: 11/15/16	SCALE: 1" = 100'	SHEET NO. OF 66

7 Appendix

iv. Supporting Information

Communication Network for ITS Equipment

Parsons proposes a communication network architecture for ITS with two sub-networks:

- Backbone high speed network and
- Distribution network.

The backbone network provides a high-speed redundant network interconnects to the Montgomery County Traffic Management Center (MC TMC) and Layer 3 switches at each interchange arranged in dual fiber optic rings architecture to provide link aggregations and redundancies. The local distribution networks that will connect to local ITS equipment through Layer 2 Hardened Field Ethernet Switches forming local sub-ring networks that connect to the closest Layer 3 switches.

From the IS 270 and IS 495 interchange near Wildwood Hills, Washington to the IS 270 and IS 70 interchange at Fredrick, the project limit spans about 32 miles and 14 interchanges.

Parsons proposes to build a new state-of-the-art fiber optic network connecting all these ITS devices bringing the network to the Montgomery County Traffic Management Center (MC TMC), Statewide Operation Center (SOC) and other required agencies. The solution is a redundant fault tolerant ring topology using a 10 Gbps backbone with a local one (1) Gbps fiber distribution system utilizing Layer 2 Gbps Hardened Field Switches.

Figure 1, on the following page, shows a block diagram of the overall ITS communication network.

Backbone Network

Dual fiber connection backbone network rings are created using the four existing dark fibers running along the west side of IS 270.

Layer 3 network switches (The Layer 3 switches will be Alcatel-Lucent 6855, Cisco IE5000 or models with equivalent features) will be installed at each of the 14 interchanges to provide connectivity as nodes and access points to the distributive networks. The Layer 3 switches will be placed in staggered formation per interchanges along the duct bank. The Backbone Network will be providing 10 Gbps of bandwidth and terminates at the Montgomery County Traffic Management Center.

The Montgomery County Traffic Management Center as situated at the middle of the IS 270 project limits. This MC TMC is also connected to the SHA FiberNet, NetworkMaryland and CHART fiber optical network with direct connection to the Statewide Operation Center (SOC). This MC TMC would serve as an ideal termination point for the new communication network for IS 270. The connection to the MC TMC will be made through existing dark fiber optic cables on IS 270.

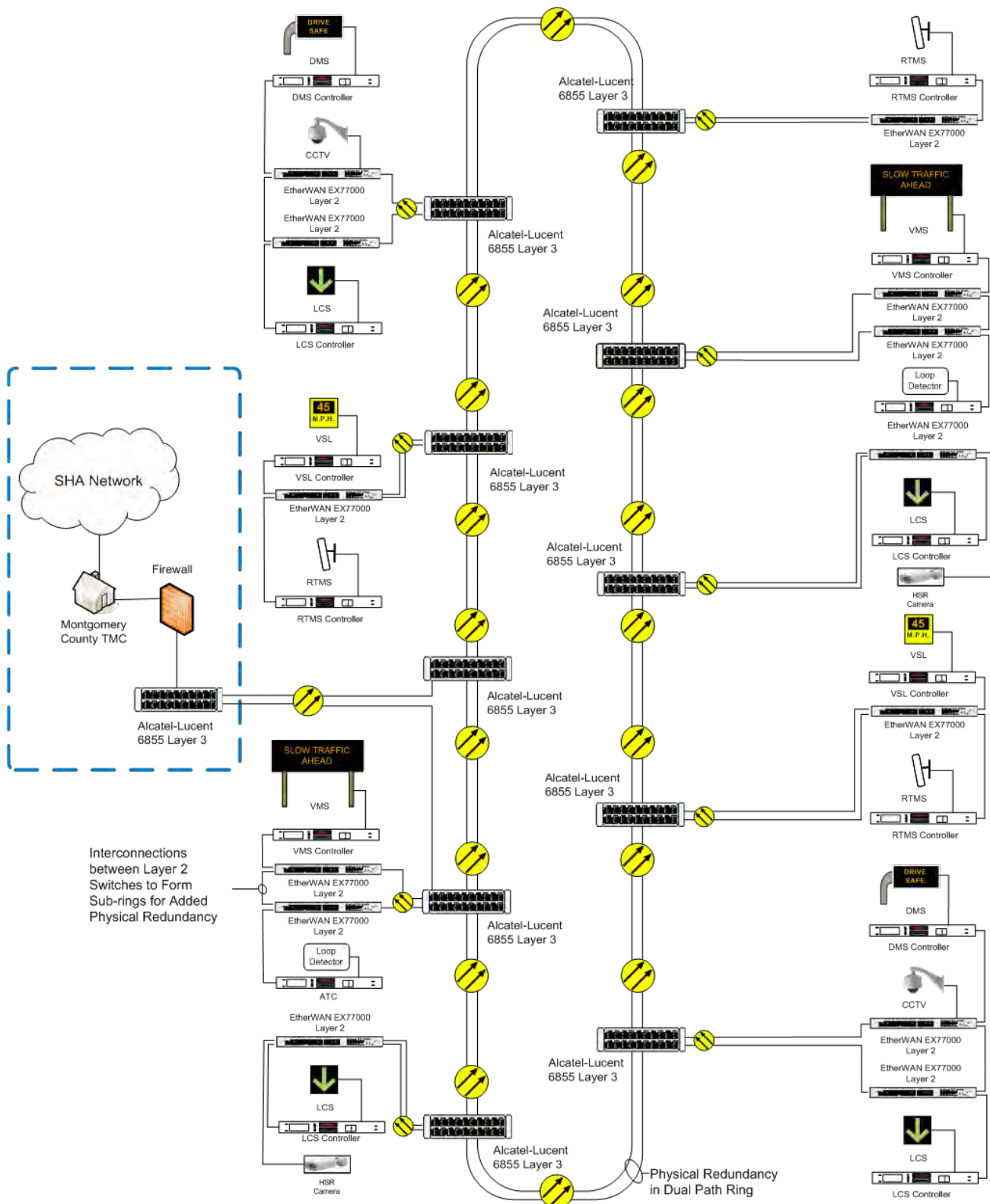
Firewall (Cisco 5500 Series or model with equivalent features) will also be installed at the MCTMC to provide added security TMC from any traffic coming from the field to prevent unauthorized access to SHA network through the ITS communication network.

Distributive Network

The distributive network brings network connectivity from the backbone ring to the ITS devices such as:

- Closed-circuit Television (CCTV)
- Dynamic Message Signs (DMS)/Variable Message Sign (VMS)
- Roadside Traffic Microwave Sensor (RTMS)
- Hard Shoulder Running (HSR) Camera

Figure 1 High Level Conceptual Network Block Diagram



(Note: Equipment model shown and quantities are for illustration purpose only. Actual equipment model and connection will vary according to actual condition in detail design phase.)

- Lane Control Sign (LCS) over shoulder lanes
- Variable Speed Limit (VSL) Signs
- Advance Traffic Controller (ATC)/Ramp Metering Controllers

Parsons estimated there will be approximate 430 new ITS devices. The new ITS devices along IS 270 will be connected to approximately 160 local rugged Layer 2 field network switches (Etherwan Ex7000 or similar) on 1 Gbps bandwidth local distributive fiber network. The Distributive Network will bring the connections to the nearest Layer 3 Switch and carry data backs to the TMC.

Fiber Cable Plan Infrastructure and Other Equipment

The four existing single-mode fibers would form the backbone ring with an additional new 72 strands of single-mode fiber trunk cable inside 4" HDPE pipes to be installed for this project to connect network equipment along the IS 270 mainline.

24 single-mode fiber strand trunk cables for the distributive network will be provisioned for the connection between the Layer 3 switches and Layer 2 switches off the mainline and ITS equipment to Layer 2 switches.

Since the backbone ring would be spliced less frequently compared to the trunk cable for the distributive network, the distributive network and backbone network are allocated on separate trunk cables to reduce the chance of backbone network service interruptions caused by accidental damage through careless excavations and splicing work during device installations and maintenance.

The backbone fiber optic trunk cables would be running on the west side of IS 270 in a duct bank. This duct bank can also be shared by distributive network on the west side of IS 270. For equipment located at the median or east side of IS 270, conduits will be installed

through either bore holes underground, or inside conduits that hang between bridge beams using conduit supports attached to beams.

To protect the network infrastructure, fiber splicing pedestals will be strategically located along the highway and near the weather proof NEMA cabinets which house the network equipment and provide power to the switches and nearby ITS equipment.

Network Architecture

Ring network topology is a widely used network topology among transportation and other industrial applications. By utilizing Spanning Tree Protocol (STP) and Rapid Spanning Tree Protocol (RSTP), a ring topology network can have the following benefits:

- Simple to manage
- Easy to expand to add more nodes
- Allows link aggregation as data traffic can travel in both directions
- Fast failure convergence time (< 50ms, depends on ring size and equipment)

Having more than one ring stacked on each other, provides a backup redundant path, and link aggregation can be achieved by sharing the traffic load over more than one physical connection.

The Backbone Network will be in the form of a dual ring architecture for the above benefits.

For the distributive network, the Layer 2 switches can be arranged and connected in ring formations forming local sub-rings with terminations to the Layer 3 switches. If there is only one Layer 2 switch connected to the Layer 3 switch, the ring would be a simple 2 path connections between the Layer 2 and Layer 3 switches preventing connection lost due to single interface failure. When multiple Layer 2 switches are connected in the path forming a ring of network switches, the arrangement would be dependent on the

conduit and equipment layout which would be defined in detail design phase.

Utilizing Multiple Spanning Tree Protocol (MSTP) or Cisco's Per-VLAN Spanning Tree (PVST), PVST+ and Rapid PVST+ on either the Ring or Mesh network, the network can handle a more sophisticated networking scheme, such separating the networks in to individual Virtual Local Area Network (VLAN) serving different agencies, departments, or simply grouping different ITS equipment onto different virtual networks for ease of managements.

In the detail design stage, Parsons will survey and design the physical layout of network equipment based on the ITS equipment placement, and choose the most adequate network design, connection methodology, network equipment, and conduit and cable arrangements according to the needs and constraints in this project.