Interstate 270

INNOVATIVE CONGESTION MANAGEMENT PROJECT

T E C H N I C A L P R O P O S A L

MDOT/STATE HIGHWAY ADMINISTRATION
CONTRACT NO. MO0695172

JANUARY 19TH 2017

Kiewit AECOM

IS-270 LOOKING SOUTHBOUND

Interstate 270 INNOVATIVE CONGESTION MANAGEMENT PROJECT
TECHNICAL PROPOSAL

TABLE OF CONTENTS

2. MOBILITY

2. MOBILITY

2.i Mobility Improvements

When this project was announced by the Administration with the progressive design build model, our team was eager to participate in this procurement, mainly due to our strength as a innovative design and construction team. The Kiewit/AECOM team has spent over a year developing a solution that exceeds the Administration's goals for this project, including providing mobility improvements for $100 M, that would cost billions in traditional capacity improvements.

For our comprehensive solution, the Kiewit/AECOM Team utilized several Proposed Technical Concept (PTC) improvements along IS-270, hereby referred to as "the Project", to alleviate recurring traffic congestion which will improve travel time, increase vehicle throughput and reduce traffic densities in the most congested segments. The Project will improve mobility, reduce crashes by as much as 6.3% , require minimal operational and maintenance activities and allow for adaptability for future technologies. Utilizing Hard Shoulder Running (HSR) as our base concept, we are improving the corridor for the daily IS-270 commuters. The Project is consistent with the Administration's objective of delivering projects using Practical Design. The Project also meets the Purpose and Need and results in a low complexity construction phase. The Project efficiently uses the $100M budget for the project goals and minimize or eliminate cost for: right-of-way, utility relocations, existing structures and environmental impacts. In summary, the project achieves the following:

- Commuters will save an average of 26 minutes on their round trip that currently takes 118 minutes, resulting in 22% daily travel time savings. Motorists who convert from SOV to HOV will save 50 minutes. This includes:
  - Save an average of 20 minute (27% reduction) travel time for IS-270 Southbound which currently takes 73 minutes (average travel speed improves from 28 mph to 38 mph) from I-70 to I-495.
  - Save an average of 6 minutes (12% reduction) travel time for IS-270 Northbound which currently takes 49 minutes (average travel speed improves from 41 mph to 47 mph) from I-495 to I-70.
- 9,270 southbound vehicles and 9,535 northbound vehicles will benefit from the travel time savings during AM and PM peak hours respectively.
- The 2016 traffic models confirm IS-270 southbound AM commute experiences the highest congestion, compared to higher existing travel speeds and better travel times in the northbound PM peak hour. As a result, the Project yields congestion relief that is more pronounced in the 2016 model for southbound. However, the model predicts in 2040 the northbound PM peak will have larger savings, as compared to southbound AM peak as traffic volumes grow.
- The level of service (LOS) improved from F to D or better in 10% of segments during peak hours.
- Density (passenger car per mile per lane) reduced on 63% and 60% of the corridor segments during AM & PM peak hour, respectively.
- Vehicle throughput increased on 43% and 39% of the corridor segments during AM & PM peak hour, respectively.
- Additional Closed Circuit Television (CCTV) cameras and Dynamic Message Signs (DMS) will inform motorist in advance of incidents.
- Advanced Stage Origin-Destination (O-D) Data will be collected and provided to the Administration, which will allow for better planning along the IS-270 corridor.

The project includes mobility solutions which fall under three categories (Median Managed Lanes on HSR, Local Congestion Relief and Technology Solutions), as described below and illustrated in the two following Project Summary Pages

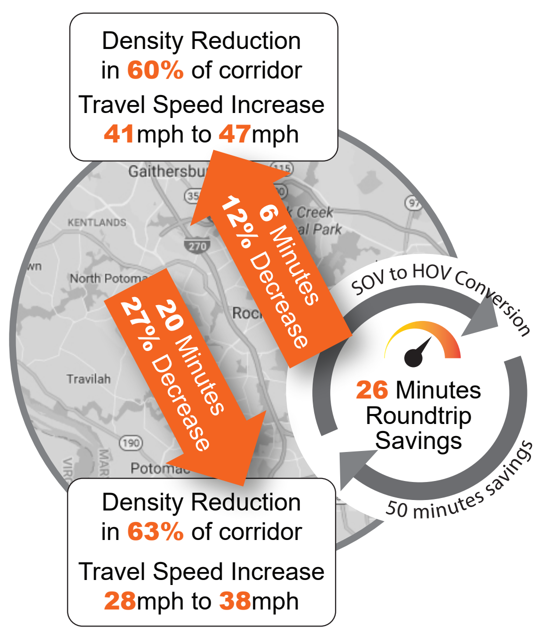
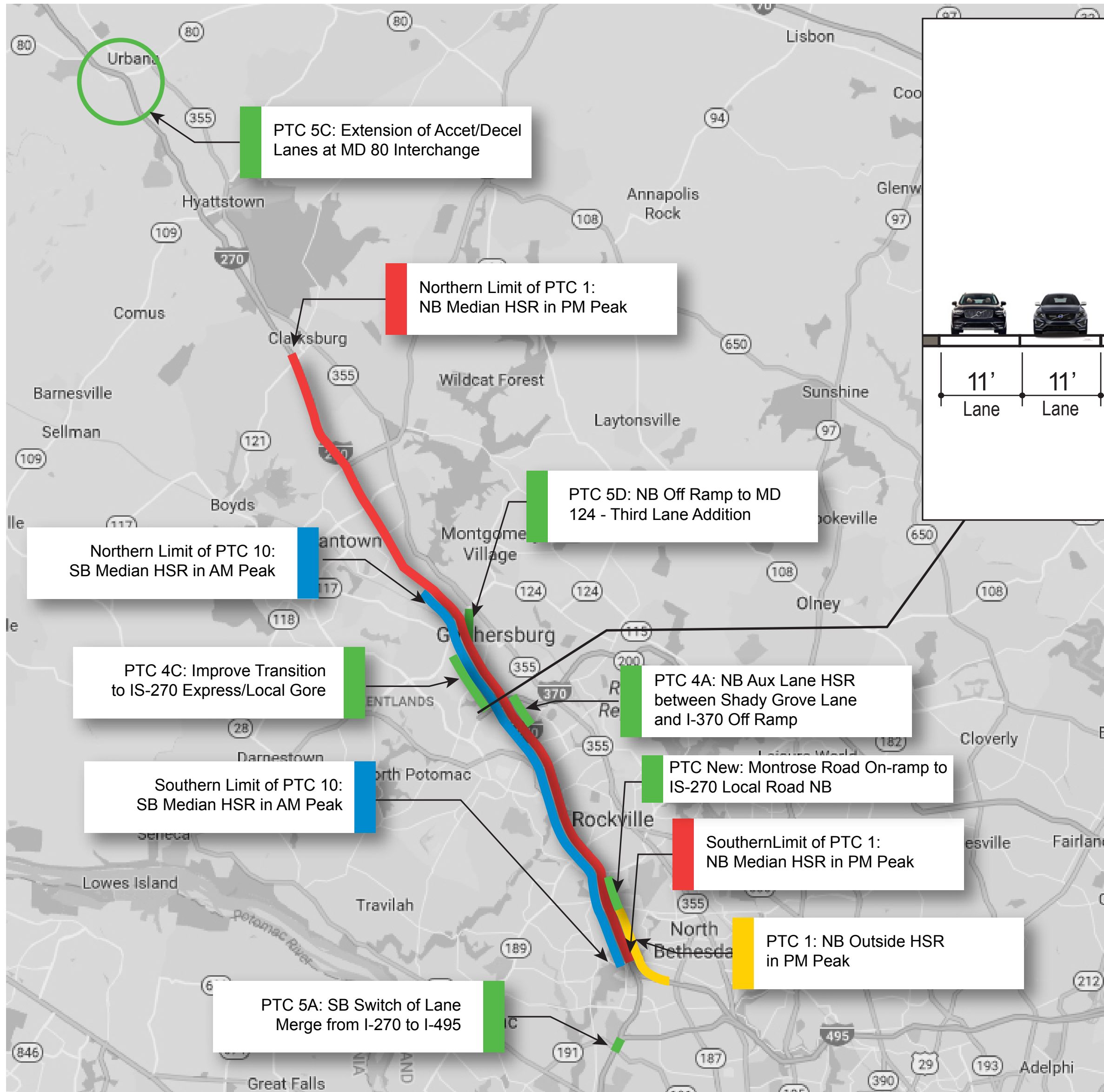
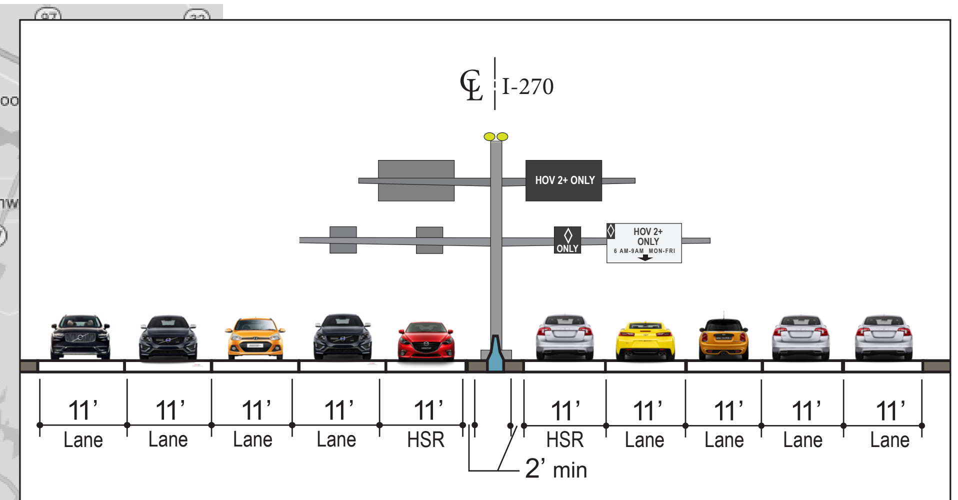


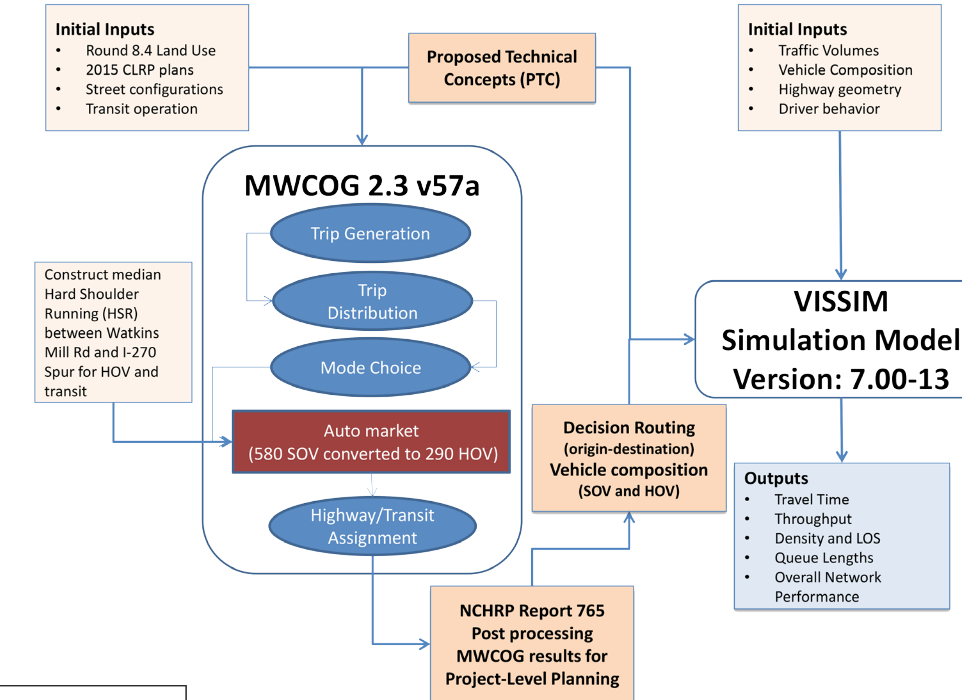
Figure 2.1 2016 congestion relief summary

Figure 2.2 Kiewit/AECOM improves to the I-270 corridor





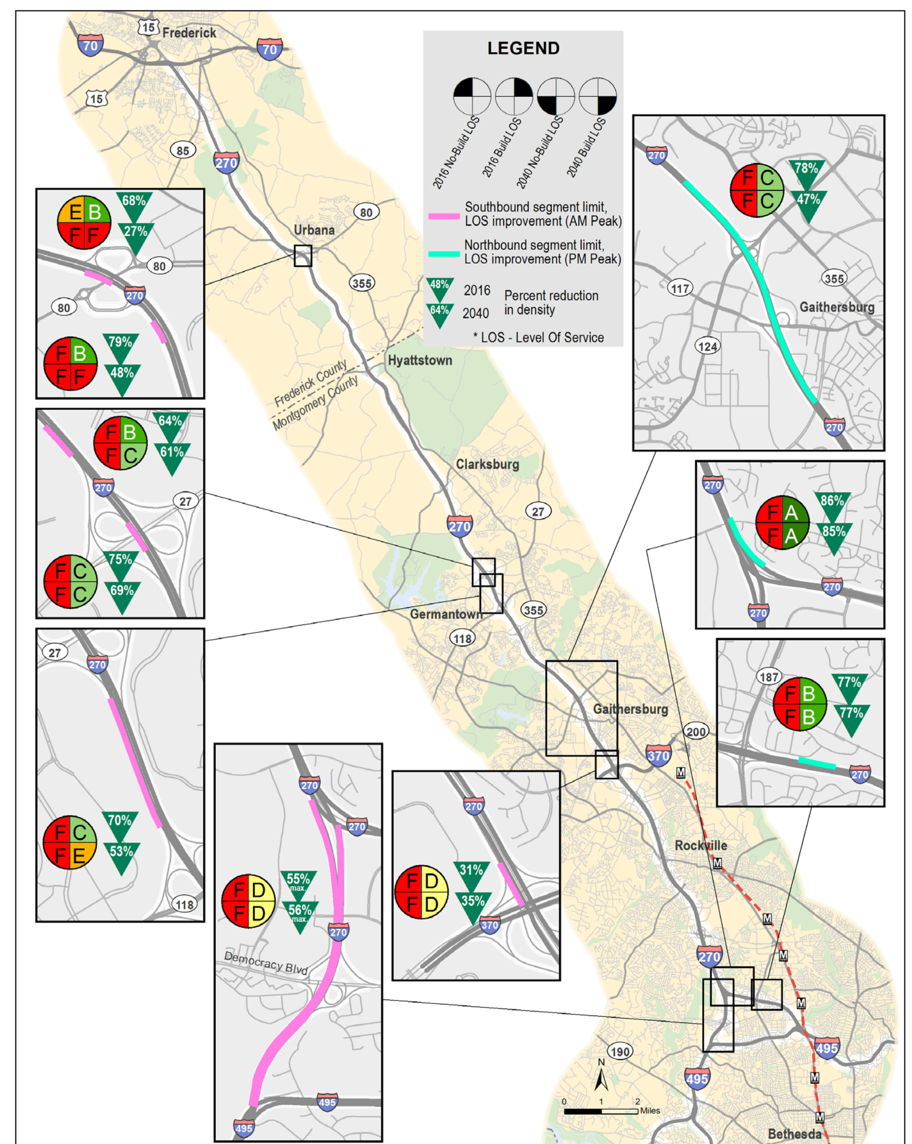
Typical section looking southbound



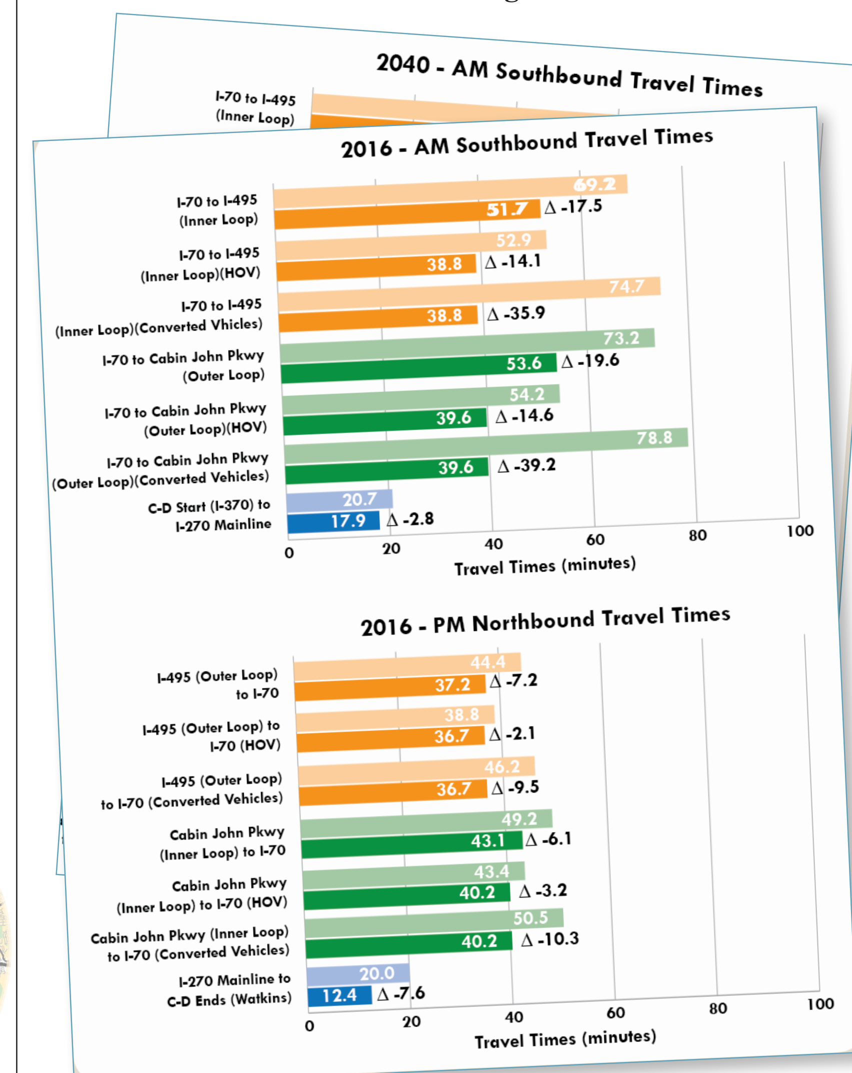
MWCOG Modeling Process

1	Managed Lane on HSR operating as HOV 2+	PTC 1: NB Median HSR in PM Peak PTC 1: NB Outside HSR in PM Peak PTC 10: SB Median HSR in AM Peak	See Typical Sections on Figure 2.5
2	Targetting Specific Local Relief Areas of Severe Congestion	PTC 4A: NB Aux Lane HSR between Shady Grove Lane and I-370 Off Ramp PTC 4C: Improve Transition to IS-270 Express/Local Gore PTC 5A: SB Switch of Lane Merge from I-270 to I-495 PTC 5C: Extension of Accel/Decel Lanes at MD 80 Interchange PTC 5D: NB Off Ramp to MD 124 - Third Lane Addition PTC NEW: Montrose Road on-ramp to IS-270 Local Road NB	
3	Technology Solutions and additional systems	PTC 6: ITS devices, DMS, Lane Use Controls PTC 7: Ultra-Thin Bonded Wearing Course (UTBWC) as surface treatment PTC 8: Advanced Stage O-D Data & connected vehicle infrastructure (CORRIDOR GUIDE NOT ON MAP)	

Overview of Kiewit/AECOM's master solution

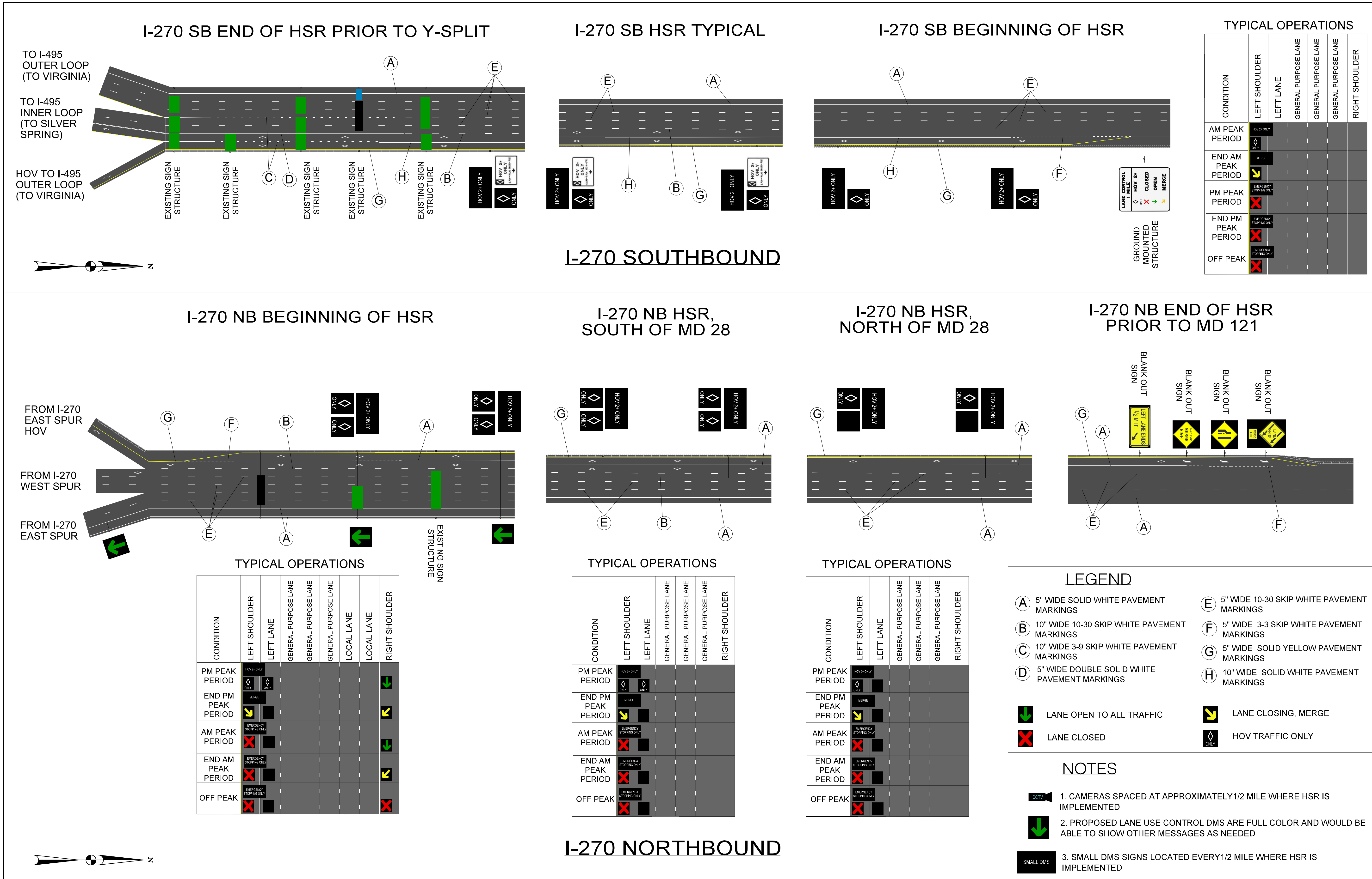


Level of service improvements



Travel time savings

Figure 2.3 Pavement markings, signing and HSR lane designations



2.i.a. Median Managed Lane on HSR

Managed Lane on HSR Description:

The Kiewit/AECOM Team proposes to design and construct Managed Lane facilities along IS-270's existing median shoulders in both directions using HSR. HSR is the temporary operation of paved shoulders as running lanes during peak traffic flow times to alleviate congestion and temporarily increase highway capacity without major infrastructure reconstruction.

A Managed Lane includes operational strategies that are proactively implemented and managed in response to changing traffic conditions. This type of facility incorporates a high degree of operational flexibility, so that the purpose can change to respond to future growth and needs. The managed lanes on the median HSR will operate as a High Occupancy Vehicle Lane for 2 or more people (HOV 2+) during the peak periods. The Administration can adapt the role of the managed lane to future needs and possibly change to a HOV 3+ lane use designation, general purpose lane, or as a test lane facility for automated and connected vehicles during off peak hours.

The existing southbound IS-270 HOV lane extends from Muddy Branch Road to the Capital Beltway (I-495). We are not proposing to change or laterally shift the existing southbound HOV lane's functional limits. Kiewit/AECOM proposes constructing the new Managed Lane on HSR from Watkins Mill Road to Tuckerman Lane.

The existing northbound IS-270 HOV 2+ lane extends from the Capital Beltway to MD 121 (Clarksburg Road). The Kiewit/AECOM Team proposes constructing the Managed Lane on HSR within the current limits of the existing northbound IS-270 HOV lane, and shifting the existing HOV lane to the HSR from MD 28 (W. Montgomery Ave) to MD 121. We will prepare an equivalency study for FHWA approval. Figure 2.12 depicts the NB HOV limits.

The Kiewit/AECOM Team determined that additional capacity is the only way to address congestion. Our team focused on adding capacity to relieve congestion along the most problematic IS-270 bottlenecks, between the Y-Split and MD 121. The median HSR lanes will only serve passenger vehicles and buses and have signage to restrict all commercial vehicle and truck use, which reduces ESALs and allows for minimal pavement patching.

Value Statement for Managed Lane on HSR Operating as HOV2+:

The Managed Lane on HSR will have the following values to the Administration:

Value of Additional Capacity: Adding Capacity will reduce travel time, increase throughput, reduce recurring congestion and reduce densities.

Value of Providing Reliable Traffic Flow: The proposed Managed Lanes on HSR operating as HOV 2+ will reduce traffic congestion on general purpose lanes and existing HOV lanes resulting in travel time reduction and reducing the possibility and frequency of traffic incidents in the corridor. The combination of these two impacts will improve travel time reliability.

Value of Defining Lanes to be Flexible Managed Lanes: Implementing a Managed Lane facility will allow the Administration to have flexibility to adapt to future traffic congestion and emerging technologies. Potential future eligibility for the managed lane include continued HOV use, general purpose, connected vehicles, hybrid/electric vehicles and autonomous vehicles. In addition, the Administration can use the managed lane to submit for technology grants and use the lane for pilot programs to test out emerging technologies.

Value of Encouraging Ridesharing (HOV Usage): Commuters who convert from SOV to HOV have 43 minutes of travel time reduction and improved travel time reliability. These benefits encourage drivers of SOV to switch mode to HOV which improves travel time and reliability for the whole corridor. Additional signage along IS-270 will remind commuters daily to consider ridesharing.

Value of Sizing the Additional Managed Lane Facility and HOV Limits: Kiewit/AECOM has defined the limits of the Managed Lane facility and HOV within the budget by analyzing data from the VISSIM model, Metropolitan Washington Council of Government (MWCOG) model, INRIX and other data from our subconsultant Michael Pack, Director of the University of Maryland's CATT Lab. Michael Pack is committed to work with the team and collaborate to analyze traffic data from multiple sources along the corridor. Michael has access to multiple data sources and our team has traffic engineering and modeling experts that evaluated the VISSIM model, MWCOG model and real-time travel information (INRIX). In addition, Amir Shahpar (AECOM) has worked in the National Capital region, advising the Transportation Planning Board (TPB) with strategies designed to improve the performance of MWCOG v2.3 travel demand model. He applied the model to projects such as WMATA Regional Transit System Plan (RTSP) and the Maryland Avenue SW Transportation Study. The capabilities of our modeling experts combined with the real-time traffic data provide the Administration with the unique ability to evaluate and adapt to changes resulting from the project.

Value of Kiewit/AECOM's Understanding of the MWCOG Model: Providing additional capacity for a specific mode of transportation similar to what is proposed in PTC 1 and 10 (HOV lane on HSR) will impact transportation mode shares i.e SOV, HOV and transit. Unlike VISSIM, travel demand forecasting models are designed to capture these types of impacts. The Kiewit/AECOM Team has extensive knowledge of the MWCOG travel demand forecasting model which includes the IS-270 corridor. Kiewit/AECOM used the latest version of this 4 step travel demand model (2.3 v57a) with Round 8.4 land use data, and 2015 CLRP plans and modified the highway network to include the new HOV lanes on HSR for SB and NB directions as well as dedicating the SB median HSR as an Express HOV. The MWCOG model was fully run (4-feedback loops) to perform "Before and After" studies and capture potential shift between transportation modes (SOV to HOV conversion). Rather than using the raw model results, the Kiewit/AECOM team followed the methodology recommended by TRB's National Cooperative Highway Research Program (NCHRP) *Report 765: Analytical Travel Forecasting Approaches for Project-Level Planning and Design*. We post-processed the raw model results by applying the estimated travel patterns on the observed counts.

Value of a New SB HOV Express: The analysis showed the SB Managed HOV Lane on HSR is fully utilized during the AM peak period by HOV vehicles having origins north of Watkins Mill Rd and destinations beyond IS-270 Split. The added HOV capacity also resulted in mode shift from SOV to HOV, and congestion relief on parallel facilities (MD-355, 185, and 97). The new HOV user origins shows the origin location of those 580 SOVs that were converted to 290 HOV with a conversion rate of 2 to 1. The majority of the mode shift occurs around the I-370 interchange, very close to the northern limits of the new SB express HOV lane, and the rest of the shift happens near the IS-70 interchange. This conversion resulted in 8% traffic reduction on IS-270. The overall vehicle occupancy ratio of the corridor stayed at 1.4 person per vehicle, which is conservative. Kiewit/AECOM's VISSIM model did not include any shift of mode choice from auto to transit, which is a conservative assumption of our model.

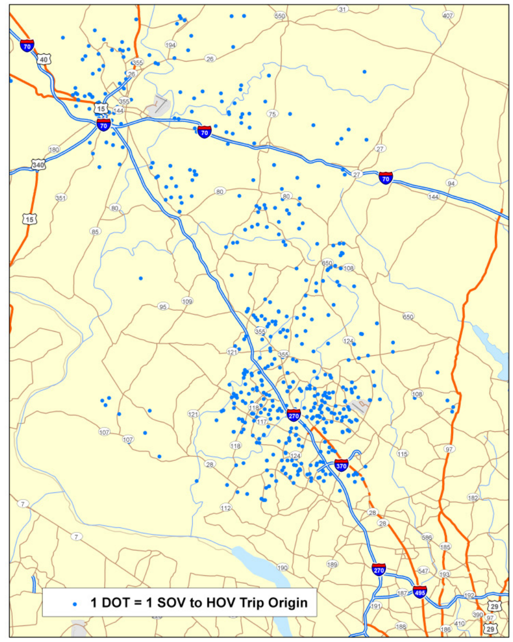


Figure 2.4 New HOV user origins

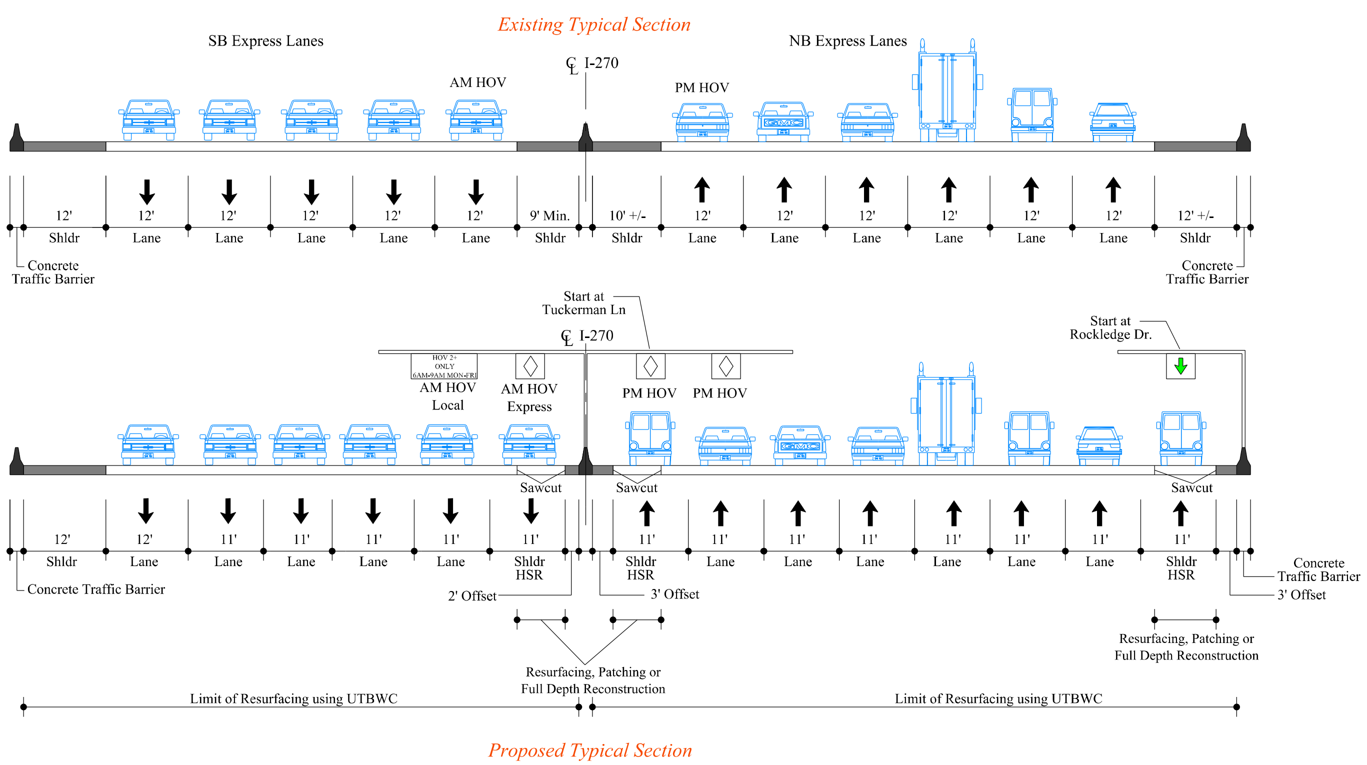
The VISSIM traffic analysis indicates that SB IS-270 commuters save 19.6 minutes from I-70 interchange to Cabin John Parkway and 17.5 minutes from I-70 to I-495 interchange, refer to Figures 2.14 and 2.15 for 2016 and 2040 IS-270 Corridor Travel Times. The majority of travel time savings in the SB direction is observed at the segments immediately north of Watkins Mill Rd interchange. The new Managed Lane on HSR accommodates 1,350 long-distance HOV users and results in additional capacity in the existing HOV lane and the general purpose lanes. The southbound HOV users will save approximately 14 minutes of travel time depending on their destination.

Value of HOV Capacity to Transit: Transit service is more attractive to riders when transit is reliable and has higher travel speeds compared to SOV commuters. The proposed Managed Lanes has the potential to reduce the IS-270 traffic congestion even more when some SOV drivers start using transit. The potential impact of SOV to transit conversion has not been included in the VISSIM model. We will coordinate the Project with the Maryland Transit Administration (MTA) and other commuter bus service providers to encourage transit use along the corridor.

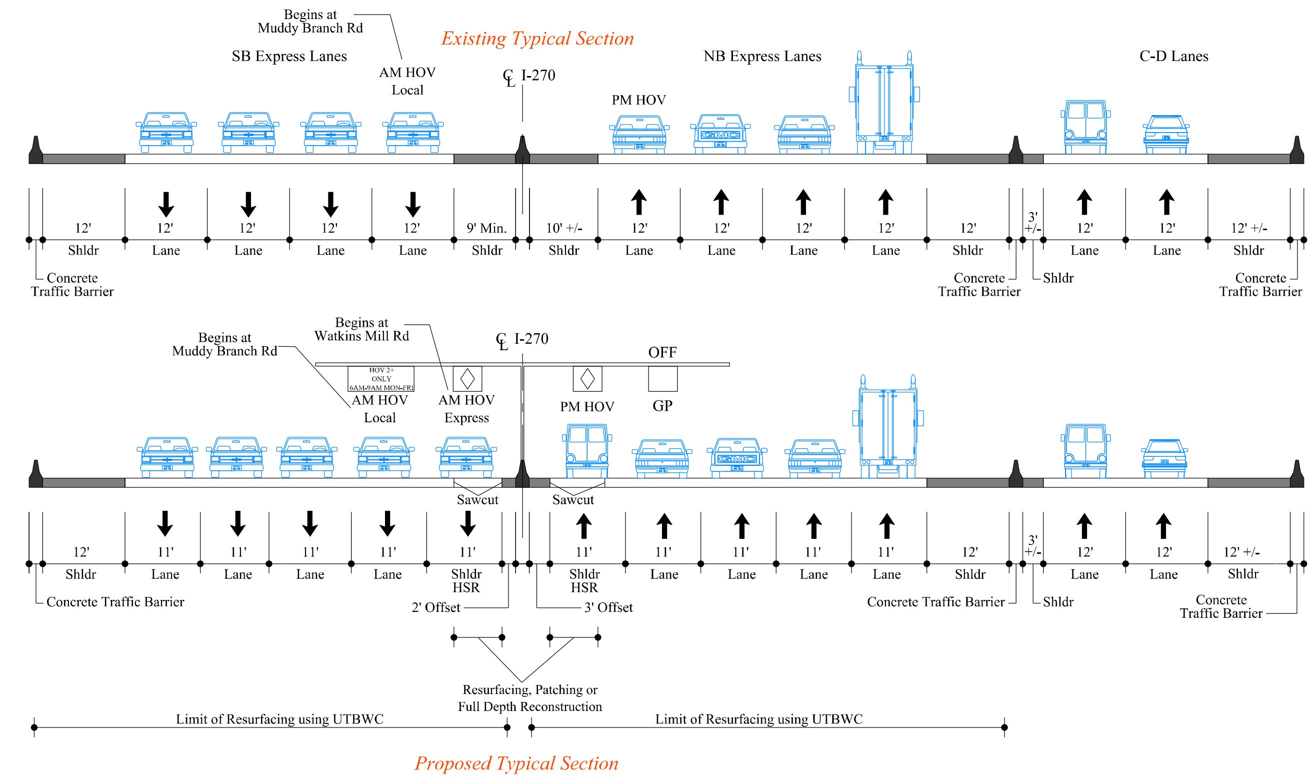
Value of Sizing the HOV Network Based on Observed Demand: The limits of the Managed Lanes on HSR were determined based on analysis of observed HOV demand. The existing IS-270 HOV network is at capacity during the northbound PM peak hour, as evident by the volumes where the spurs from

Figure 2.5 Managed lanes on HSR operating as HOV 2+ - Roadway Typical Sections

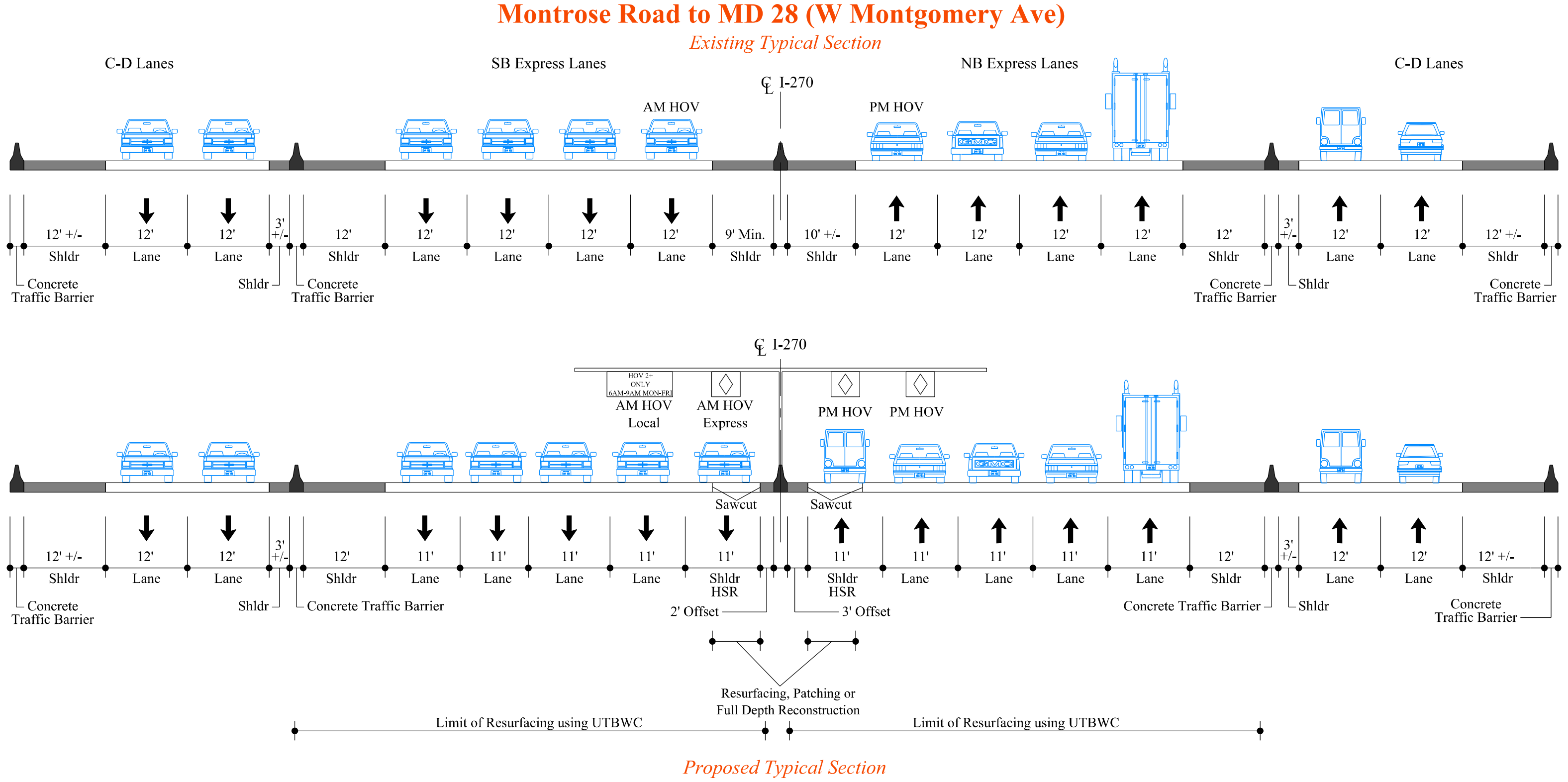
Typical Section A-A
South of Montrose Road



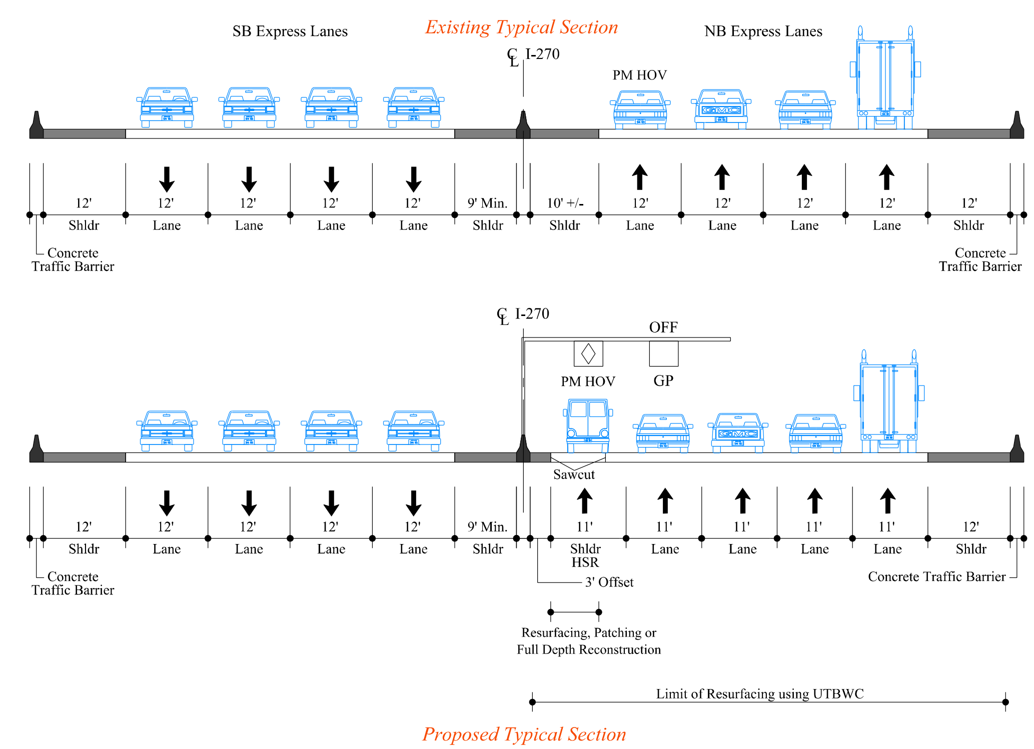
Typical Section C-C
MD 28 (W Montgomery Ave) to Watkins Mill Rd



Typical Section B-B
Montrose Road to MD 28 (W Montgomery Ave)



Typical Section D-D
Watkins Mill Rd to MD 121 (Clarksburg Road)



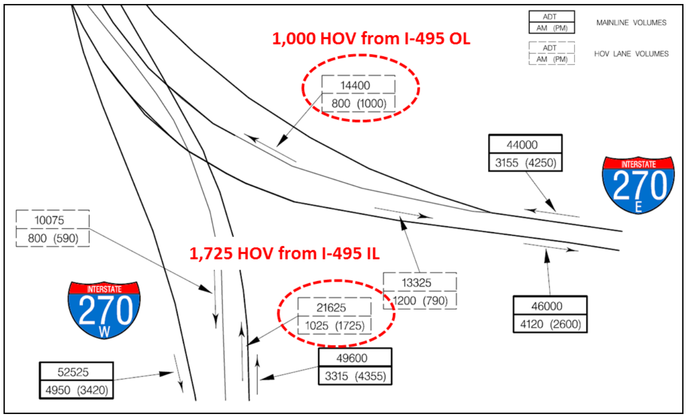


Figure 2.6 NB HOV demand exceeds one lane of capacity

I-495 connect south of Tuckerman Lane. A second HOV lane for the commuting tour, morning and evening trips, is logically justified due to the higher volumes recorded in the northbound direction than in the southbound direction and further supports adding capacity for IS-270 southbound HOV commuters. IS-270 northbound has two northbound HOV lanes from the IS-270 spurs from I-495 (Capital Beltway) during PM peak hours. Based on the observed 2016 traffic counts on IS-270 northbound, there are 2,725 HOV vehicles arriving at one existing HOV lane during PM peak hour, which does not have enough capacity to serve this demand. Therefore, the extra HOV vehicles have to merge to the already congested general purpose lanes causing a bottleneck. It is expected that the additional HOV lane on HSR will resolve this bottleneck. The inability to meet the HOV demand contributes to the severe congestion within this segment of roadway. It is logical to infer that these same evening HOVs commute in the IS-270 corridor in the AM. Therefore there is additional HOV demand for the southbound AM peak hours.

The existing HOV lane is underutilized north of MD 28 based on the observed 2016 counts while the general purpose lanes are functioning at or above capacity. This observation is the main reason behind the Kiewit/AECOM Team proposal of converting the existing northbound HOV lane to a general purpose lane providing much needed capacity and subsequently congestion relief from MD 28 and beyond which also impacts the upstream traffic flow. From a HOV lane equivalency perspective, the commuter will have two NB HOV lanes up to MD 28, and one HOV on HSR lane up to MD 121 (existing HOV terminus), which is an improvement compared to existing conditions. Furthermore, since we are providing a managed lane, the HOV on HSR limits are adaptable and can be extended to the north as the commuters adjust and HOV volumes increase.

The VISSIM analysis results in approximately 7.2 (16%) minutes of travel time saving using the northbound express lanes during PM peak hour in 2016. The VISSIM model also shows 7.6 (38%) minutes travel time reduction for travelers using the CD roads during PM peak hour in 2016.

As expected, the majority of travel time saving is observed at IS-270 split where extra HOV capacity provided by the HSR lane alleviates congestion. The impact of relieved congestion at IS-270 split cascades to upstream segments and provides a smoother flow on both Inner-Loop and Outer-Loop. On the CD roads, most of the travel time saving is achieved between MD 28 and Shady Grove Rd. and is attributed to the new northbound auxiliary lane proposed at the downstream segment, refer to "Target IS-270 CD Road NB to I-370 EB" in Section 2.i.b below. The addition of third lane on the off-ramp to MD 124 is another contributing factor to travel time savings on the local road of almost 3 minutes.

2.i.b. Targeting Specific Local Congestion Relief Areas of Severe Congestion:

The Kiewit/AECOM Team initiated their analysis by evaluating the VISSIM model for the IS-270 corridor and locating areas of severe congestion. We compared our findings with the incident records to validate our targeted approach. Our review of the model identified 25 severe bottleneck locations. The Kiewit/AECOM Team developed the following localized congestion relief solutions.

Target IS-270 NB Where Spurs Converge:

Kiewit/AECOM Team proposes to add capacity on the right northbound shoulder, through the use of HSR in concert with the median HSR, between Rockledge Dr. and Montrose Rd, as shown in Figure 2.5. IS-270 NB has severe congestion due to: the converging and blending of traffic from the two spurs; the insufficient HOV capacity; and the decision point for the IS-270 Express/Local gore. Adding capacity on both sides (median and right shoulders) will improve this bottleneck. A detailed description of the benefits to this location is included in PTC 1, see appendix, shown in Figure 2.2.

Value of added Capacity to both sides where IS-270 Spurs connect: This segment of IS-270 northbound involves a lot of blending of traffic streams which causes congestion and motorists need to make decisions: choose CD/express lanes, stay in HOV lane or abandon and exit to Montrose Rd. Adding capacity will allow motorist to make their decision and stay on their course. Refer to Figure 2.2.

Target IS-270 SB Spur to I-495 OL: Kiewit/AECOM Team proposes to restripe the roadway to switch the merge from IS-270 left/fast lane to I-495 right/slow lane. The current lane configuration joins three lanes from IS-270 and three lanes from I-495 OL interchange into five lanes on I-495 OL. This is a Practical Design solution for two reasons. First, IS-270 (5,435 AM|4,315 PM vph) southbound carries a higher volume of traffic than I-495 OL (4,480 AM|3,635 PM vph) during the peak hours. Second, providing the lane merge along the I-495 right/slow lane is consistent with driver expectations. This improvement would provide three continuous lanes from IS-270 southbound Western Spur and is expected to increase traffic flow in the IS-270 southbound / I-495 OL merge area. A detailed description of the benefits to this location is included in PTC 5A, see appendix, and depicted in Figure 2.7.

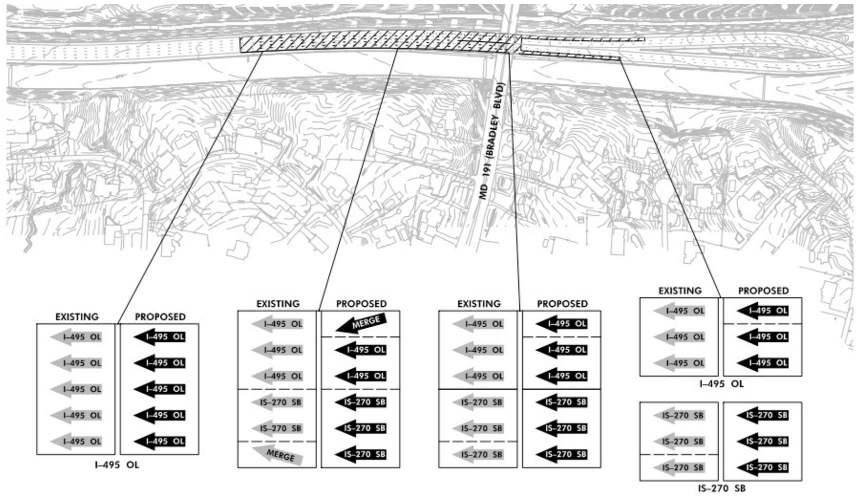


Figure 2.7 IS-270 Spur to I-495 OL

Value of Accommodating Highest Volume Interstate and Meeting Driver Expectations: This is low-cost Practical Design solution that provides priority to the interstate that has the highest volumes of traffic (IS-270) and is consistent with driver expectations of a lane merge along the right/slow lane.

Target IS-270 CD Road NB onto IS-370 EB: Kiewit/AECOM Team proposes connecting the Shady Grove on-ramp onto IS-270 CD road with the I-370 eastbound exit ramp along IS-270 NB CD Road. This solution converts the existing shoulder of a CD road into an auxiliary lane. A detailed description of the benefits to this location is included in PTC 4A, see appendix, Figure 2.8.

Value of Improving Traffic Flow onto I-370: This low-cost Practical Design solution will relieve congestion at this segment and improve the flow of traffic along the CD roadway and onto I-370 EB.

Target IS-270/MD 80 Interchange: Kiewit/AECOM Team proposes to implement a Traditional Capacity Improvements by restriping IS-270/MD80 Interchange to lengthen acceleration/deceleration lanes and reduce queuing lengths. The acceleration and deceleration lanes will be restriped without widening the existing pavement by using the existing shoulders to provide additional length.

The acceleration and deceleration lanes would be lengthened to meet AASHTO. Ramp 1 will increase the existing acceleration length by over 200', however, it will be shorter than the recommended length. A detailed description of the benefits to this location is included in PTC 5C, see appendix.

Value of Low-Cost Restriping of Speed Change Lanes: This is low-cost Practical Design solution that will improve the flow of traffic for each of the interchange ramps via restriping to add length to speed change lanes.

Target Montrose Road on-ramp to IS-270 local Road NB: Kiewit/AECOM Team proposes lengthening the Montrose Rd. on-ramp to IS-270 CD NB road from 400 to 800 feet to provide vehicles using this ramp with more distance to merge, improving ramp operation.

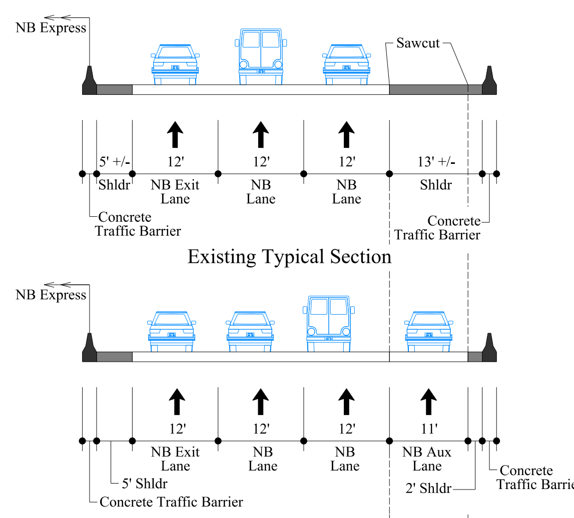


Figure 2.8 NB onto I-370 EB
New Auxiliary lane to I-370 EB

Value of Low-Cost Restriping of On-Ramp: This low-cost Practical Design solution will improve the flow of traffic via restriping and pavement reconstruction to add length to the acceleration lane. This will significantly improve latent demand access to IS-270 generated from the all other project improvements.

Target IS-270 NB Off-Ramp to MD 124 EB:

The exit ramp is two lanes wide, while MD 124 EB has three through lanes. We propose minor widening of the IS-270 NB offramp to MD 124 from two to three lanes to provide additional storage and throughput during the green signal phase. The ramp widening will require full depth pavement. The Synchro results for the PM peak hour are summarized below.

		2016 PM Volumes		2040 PM Volumes	
		No Build Conditions	Build Conditions	No Build Conditions	Build Conditions
NBR	Delay	349.2	177.7	278.6	124.8
	LOS	F	F	F	F
EBT	Delay	60.7	60.7	71.6	12.6
	LOS	E	E	E	E

No change in delay for the through movement along MD 124 is expected. The delay for the ramp is a fraction of what it is today. Refer to PTC 5D for the VISSIM and Synchro analyses, including the AM peak hour, see appendix.

Value of Increasing Throughput at the Signal: This is low-cost Practical Design solution which will allow for greater throughput and improved signal operations. The ramp will be widened to three lanes, which adds queueing length and matches the number of lanes the ramp connects with along MD124.

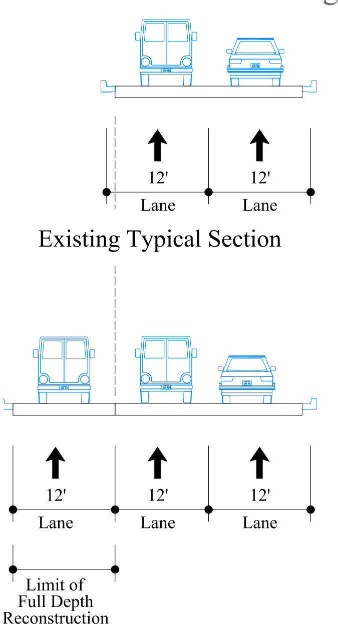


Figure 2.9 New third lane to increase capacity at MD 124 signal

Target IS-270 SB Approaching the IS-270 Express/CD Gore:

Kiewit/AECOM Team proposes restriping SB IS-270 from MD 117 (West Diamond Ave) to IS-370. This improvement is in conjunction with the IS-270 SB Managed Lane on HSR. We propose to restripe and adjust the overhead signage to support an additional mile of a fifth mainline lane. IS-270 transitions from four lanes to six lanes abruptly as approach the IS-270 Express/CD gore, and this will smooth the traffic flow approaching this decision point. A detailed description of the benefits of this location is included in PTC 4C, see appendix and is depicted in Figure 2.9.

Value of Improving Transition Length Approaching Express/Local Gore Point: This is a low-cost Practical Design solution looks to adjust pavement markings and signage to better align motorist into the lanes which feed into the Express or CD road prior to the gore point. The intent is to improve signing and marking along with the length of the 5th lane during the transition from 4 lanes to 6 lanes (4 Express and two CD lanes).

2.i.c. Technology Solutions: Advanced O-D Data Collection and Additional Systems/CCTV & DMS

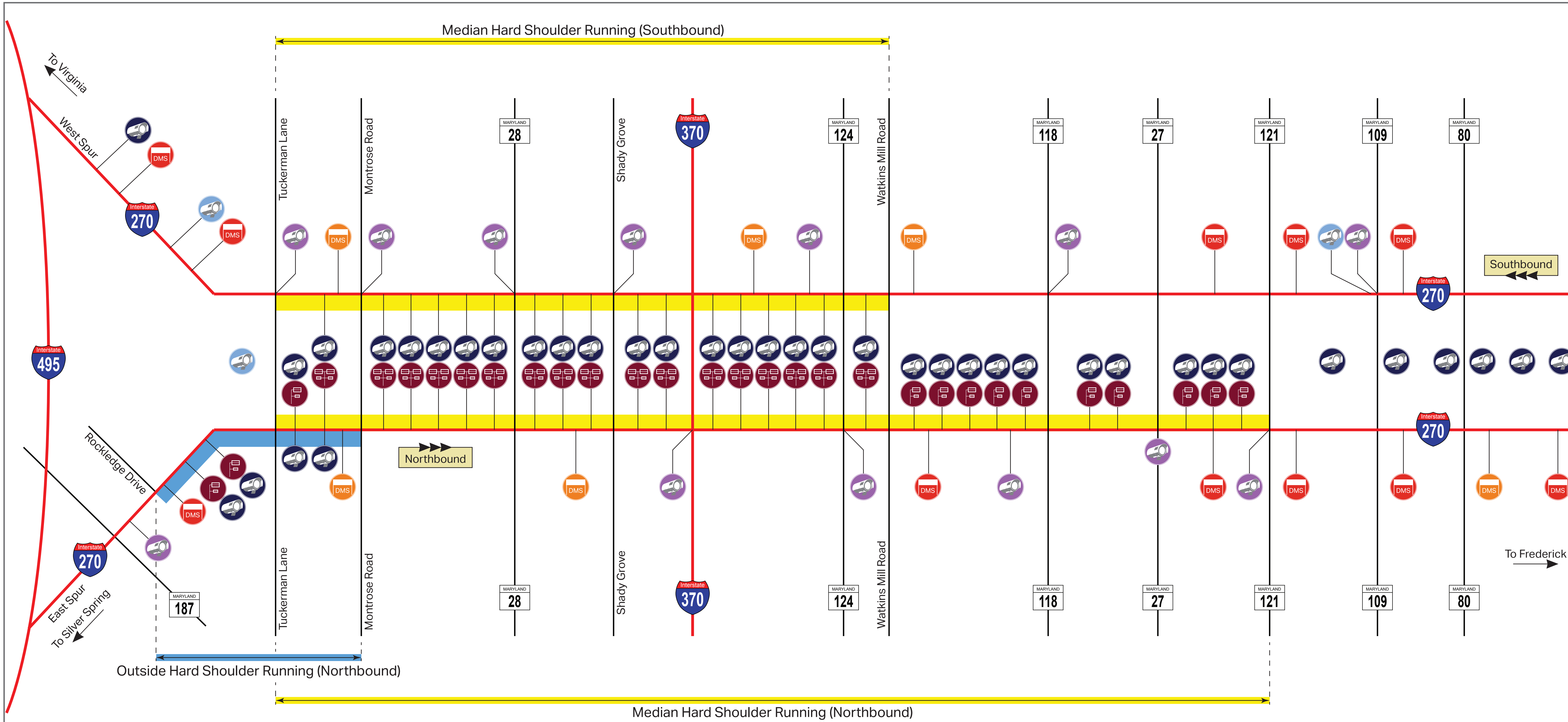
Technology Solution - Advanced O-D Data Collection:

Figure 2.10 BlueTOAD Spectra Unit

The Kiewit/AECOM team proposes to install BlueTOAD advanced traffic monitoring system at 25 locations. We propose to co-locate WiFi/Bluetooth/DSRC equipment along with current microwave vehicle detection units along the corridor. This technology will equip the Administration with traffic data which can be used to maintain and calibrate the VISSIM model during the construction phase and position the Administration to adapt to changes in travel patterns resulting from the Project.

By implementing this technology, the Administration will be capable of enhancing the current corridor planning model, evaluating any potential solution compared to real-time data, creating the capability of utilizing the adjacent arterials more effectively and providing an additional method to determine real-time roadway operations, including potential incidents and roadway surface traction. Therefore, the implementation of the technology will improve mobility, travel time reliability, safety and operability throughout the corridor. A detailed description of the benefits is included in PTC 8, see appendix.

Figure 2.11 Lane Control System / CCTV / DMS / BlueTOAD



Legend

- Lane Control System
- Existing Dynamic Message Sign (DMS)
- Proposed Dynamic Message Sign (DMS)
- Existing CHART CCTV Camera
- Existing Montgomery County CCTV Camera
- Proposed CCTV Camera

ITS Device	Quantity
New Full Size DMS	11
New CCTV	7
CCTV for HSR	32
Lane Control System	30
BlueTOAD Traffic Monitoring	25

- BlueTOAD advanced traffic monitoring system to be installed at 25 locations. WiFi / Bluetooth / DSRC equipment to be co-located with existing microwave vehicle detection units, or to be installed on existing structures.
- Additional information provided in PTC 8 Advanced Stage O-D Data & Connected Vehicles Infrastructure.

Not to Scale
Note: Not All Interchanges Shown

Value of O-D Data and Knowing How Motorists React to Project: This technology will work in collaboration with existing data being collected currently to provide the Administration with the ability to see how motorist react to the Project, and adapt. This is a low-cost innovative solution that will allow the Administration to begin developing real time traffic management strategies.

Technology Solution - Additional CCTV Cameras and DMS Beyond Managed Lanes Requirements: In existing conditions, CHART and Montgomery County have 16 CCTV cameras and 6 DMS along the corridor, mostly located in Montgomery County. Kiewit/AECOM Team proposes to install 7 additional CCTV Cameras and 11 additional DMS devices, beyond those required for the Managed Lanes on HSR. The managed lanes will have a lane control systems (LCS), CCTV cameras and DMS to support their operation. The deployment of additional CCTV and DMS along the entire IS-270 corridor will enhance CHART's ability to surveil the corridor, provide information to reduce recurring congestion, and enhance motorist information.

The proposed devices will be similar to the devices currently installed by CHART in terms of manufacturer and model. The proposed CCTV cameras will communicate with CHART via leased T-1 lines and the proposed DMS will communicate with CHART via cellular modems.

This approach will allow for quicker verification and response to incidents. It will also provide motorists with live traffic information, and allow them to choose alternate travel routes. The ITS field devices will be designed, constructed and tested in accordance with current CHART procedures, and will be turned over to CHART for use upon acceptance. No additional integration will be required beyond the normal practices of adding devices to the CHART program. A detailed description of the benefits of the additional devices are included in PTC 6, see appendix.

Value of Additional CCTV and DMS devices: These devices beyond the LCS and will improve communication to motorist and enhance the incident management program to improve safety and relieve both recurring and non-recurring congestion.

Technology Solution – Innovative UTBWC Surface Treatment:
Kiewit/AECOM Team proposes Ultra-Thin Bonded Wearing Course (UTBWC) as an innovative alternative surface treatment. It will be applied across all lanes and shoulders of IS-270 that need to be re-striped, without grinding the existing pavement before final lane markings are placed. Refer to PTC 7, see appendix.

Value of UTBWC Surface Treatment: UTBWC offers a cost effective solution as a surface treatment/ wearing course by providing: durable waterproof seal to existing surface micro cracks from oxidation; Restored and improved skid resistance; reduced user delays with quick, one-pass construction, allowing almost immediate reopening to traffic; Retainability to curb and concrete barrier reveals and clearances under bridges and overpasses due to need for minimal grinding; quick and safe construction joints following end-of-day work with very minimal drop-offs between lanes; reduced back spray and improved visibility in wet weather and reduced tire noise.

2.i.d.Traffic Analysis Results

The Kiewit/AECOM team used the VISSIM model to conduct traffic microsimulation analysis during peak hours. The Administration provided the observed 2016 traffic counts, and forecasted 2040 traffic volumes for traffic analysis. The proposed improvements for the NB & SB directions were analyzed during the PM peak hour and AM peak hour respectively. The goal was to fully capture the impact of the project on the peak direction of travel. The analysis results are reported in the same format as of no-build condition using the same tables and graphs provided by the Administration. The no-build tables and graphs do not include values pertaining to HOV operation. Therefore, HOV related values were added to each table and graph to provide a comprehensive picture.

The impact of "induced demand" was not taken into account as part of this analysis. However, the team acknowledges that the additional capacity provided by the Project will gradually attract traffic (mainly HOV vehicles) to the corridor from parallel facilities.

Northbound Model: Traffic analyses were performed for 2016 and 2040 scenarios with the assumption that two northbound HOV lanes from IS-270 split to MD 28 will be provided. One of the lanes is the existing HOV lane and the other one is the new HOV lane that operates on HSR. The current traffic condition indicates that a portion of the HOV traffic destined from Inner-loop, Outer-loop and Westlake Terrace choose to avoid HOV lanes once they arrive at IS-270 split due to the high demand and insufficient capacity on HOV lane at this segment. Provision of a second HOV lane that starts at this location allows this unserved HOV demand to continue traveling on HOV lane and save travel time. The

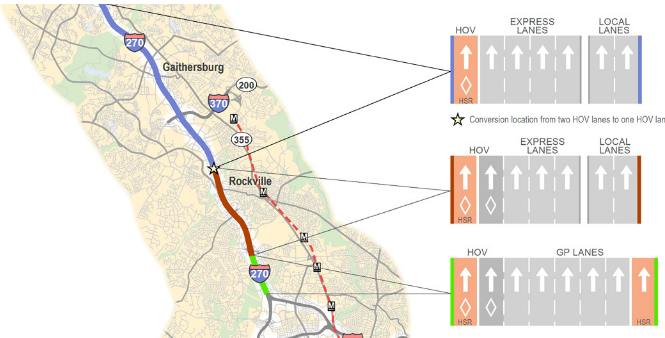


Figure 2.12 NB HOV lane to general purpose lane conversion point

additional capacity created by removing this unserved HOV demand from general purpose lanes is expected to provide significant operational improvement at IS-270 split, one of the major bottlenecks of the corridor along NB IS-270. Kiewit/AECOM Team's proposal for the HOV lanes beyond MD 28 is to continue the HOV lane operating on the HSR all the way to MD 121 (Clarksburg Road), but converting the existing HOV lane into a general purpose lane to increase corridor capacity for vehicles using the general purpose lanes. The location of the HOV to GP lane conversion (MD 28) was determined based on the observed HOV traffic demand provided by SHA. Based on the 2016 counts there are 1060 HOV vehicles on the exiting HOV lane beyond MD 28 which is less than one lane capacity. Figure 2.12 illustrates the location of HOV to GP lane conversion.

In addition to the HOV lane configuration and limits, the following Local Congestion Relief areas (section 2.i.b) were included in the NB PM peak hour VISSIM model:

1. Constructing right-side HSR from Rockledge Drive to Montrose Road.
2. Extension of WB Montrose Rd on-ramp to NB CD Rd.
3. Constructing the NB auxiliary lane on the CD road between Shady Grove interchange westbound on-ramp and the off-ramp to I-370 interchange.
4. Constructing of a third lane on the off-ramp to Maryland 124 interchange.
5. Extension of deceleration and acceleration lanes leading to and from the off and on ramps connecting to MD 80.

HOV traffic destination information was obtained from the MWCOG travel demand model. We assumed HOV traffic that have destinations north of Montrose Rd (80 percent of HOV vehicles) will use the HOV lanes, for the VISSIM model input. We assumed in the VISSIM model that the remaining 20 percent of HOVs will shift into the general purpose lanes of IS-270 because they logically would not be exiting at Montrose Rd. The Montrose off ramp is less than 1.4 mile away from where IS-270 converges, so it is reasonable to assume these HOVs would stay in the general purpose lanes and not cross multiple lanes and exit.

In additional to the lane use assumption described above, SOV traffic volume was assumed to reduce by 580 vehicles per hour and HOV traffic to increase by 290 vehicles per hour (conversion rate of 2:1) as per MWCOG model estimation. The justification for this conversion is explained in the "Value of a New Southbound HOV Express" section. Vehicles that shift from SOV to HOV in the morning, will do the same in the evening.

The travel time savings obtained by these improvements during 2016 and 2040 scenarios are shown on Figures 2.14, 2.15, and 2.18.

Southbound Model: Traffic analysis using VISSIM microsimulation model was performed for 2015 and 2040 scenarios with additional HOV express lane starting from north of Watkins Mill interchange to the IS-270 split. The HOV Express is modeled and assumed to operate as an uninterrupted facility where the entry and exit access will be at northern and southern termini respectively. The existing SB HOV lane limits are unchanged. The following Local Congestion Relief areas (Section2.i.b) were included in the VISSIM model to analyze SB operation during AM peak hour:

1. Extension of speed change lanes at the IS-270/ MD 80 interchange.
2. Restripe the SB IS-270 Spur left lane at I-495 merge to continue in the SB direction

SB HOV traffic destination information was obtained from the MWCOG travel demand model. It was determined that 69% of HOV traffic traveling on IS-270 north of Watkins Mill Rd have destinations south of IS-270. This traffic is assumed to use the express HOV lane during the AM peak hour. Additionally, 580 vehicles were reduced from the general purpose lanes according to SOV to HOV conversion calculation performed based on the results of the travel demand model. MWCOG travel demand model provides information with regards to the origin points of the SOV users that will be converted to HOV. Considering the origin points of the new HOV users, 290 additional HOVs were added to the network from the I-70 and I-370 interchanges. Figure 2.13 illustrates the SOV reduction and HOV addition applied to the SB VISSIM model used to analyze AM peak hour traffic conditions.

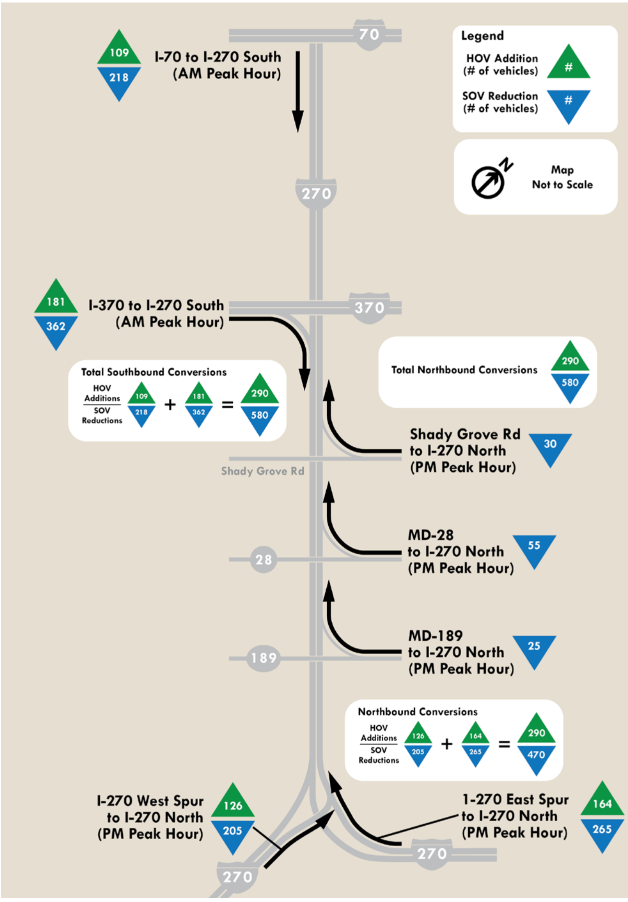


Figure 2.13: SOV reduction/HOV addition applied to the VISSIM model

Reduction in Recurring Congestion – Travel Time:

The results of the traffic analysis performed to analyze the impact of the project on the NB direction suggests that IS-270 travelers will save approximately 7 minutes on average throughout the corridor during PM peak hour in 2016. The travel time savings for users destined from Inner-Loop and Outer-Loop are 6.1 and 7.2 minutes respectively. The CD road travel time decreased by 7.6 minutes.

The majority of travel time saving is observed at the IS-270 split, suggesting alleviated congestion as a result of increased HOV capacity at this segment. The impact of relieved congestion at IS-270 split cascades to upstream segments and provides a smoother flow on both Inner- and Outer-Loop. On the CD road, most of the travel time savings are achieved between MD 28 and Shady Grove Rd, and are attributed to the NB auxiliary lane at the downstream segment. The addition of the third lane on the off-ramp to MD 124 is another contributing factor to travel time saving on the local road making up for almost 3 minutes. NB HOV users will save about 2.7 minutes on average throughout the corridor.

On the SB direction, IS-270 travelers destined to the Outer-loop will save 19.6 minutes from I-70 interchange to Cabin John Parkway. Travel time savings for SB commuters using the Inner-loop is 17.5 minutes from I-70 to I-495 interchange.

The majority of travel time saving in the SB direction is observed at the segments immediately north of Watkins Mill Rd. The new HOV Express introduced at this location allows for 1350 long-distance HOV users to travel on this new facility and results in additional capacity in the general purpose traffic lanes. All the travel time savings achieved on the Inner-loop segment are attributed to the flow improvement proposed by PTC 5A that reduces merging conflicts for IS-270 traffic.

The SB HOV users will save approximately 14 minutes of travel time depending on their destination on either the Inner-or Outer-loops. Figure 2.14 & 2.15 compare no-build and build travel times for 2016 and 2040 scenarios.

Reduction in Recurring Congestion – Vehicle Throughput:

Overall throughput increased throughout the corridor in the 2016 and 2040 scenarios. The throughput summary tables included in the appendix report the throughput changes by segment. The original tables provided by the Administration do not include throughput values for HOV lanes. As a result, the throughput value for some of the segments has decreased due to the SOV to HOV conversion assumptions. To address this issue, throughput values for HOV lanes were added to the tables to provide a realistic comparison. Despite the SOV to HOV conversion assumption which resulted in fewer vehicles traveling on general purpose lanes, the positive impact of the proposed improvements are observed in form of increased throughput at some of the previously identified bottlenecks and the locations where the improvements were applied.

Reduction in Recurring Congestion – Density:

Density reduction and level of service improvement was observed at most of the segments throughout the corridor as a result of the project in the 2016 and 2040 scenarios. The impact of the project is more pronounced at or near the segments where the mitigations where applied, but the improved flow resulted due to eliminating bottlenecks is observed by reduced density and better LOS at the majority of the segments. Density increase is also observed at some of the segments, but it usually coincides with increased throughput at the same or upstream segments. This is expected since, by eliminating different bottlenecks along the corridor, more cars are able to arrive at these segments in a given period of time.

Figure 2.14: No-build and Build travel time in 2016

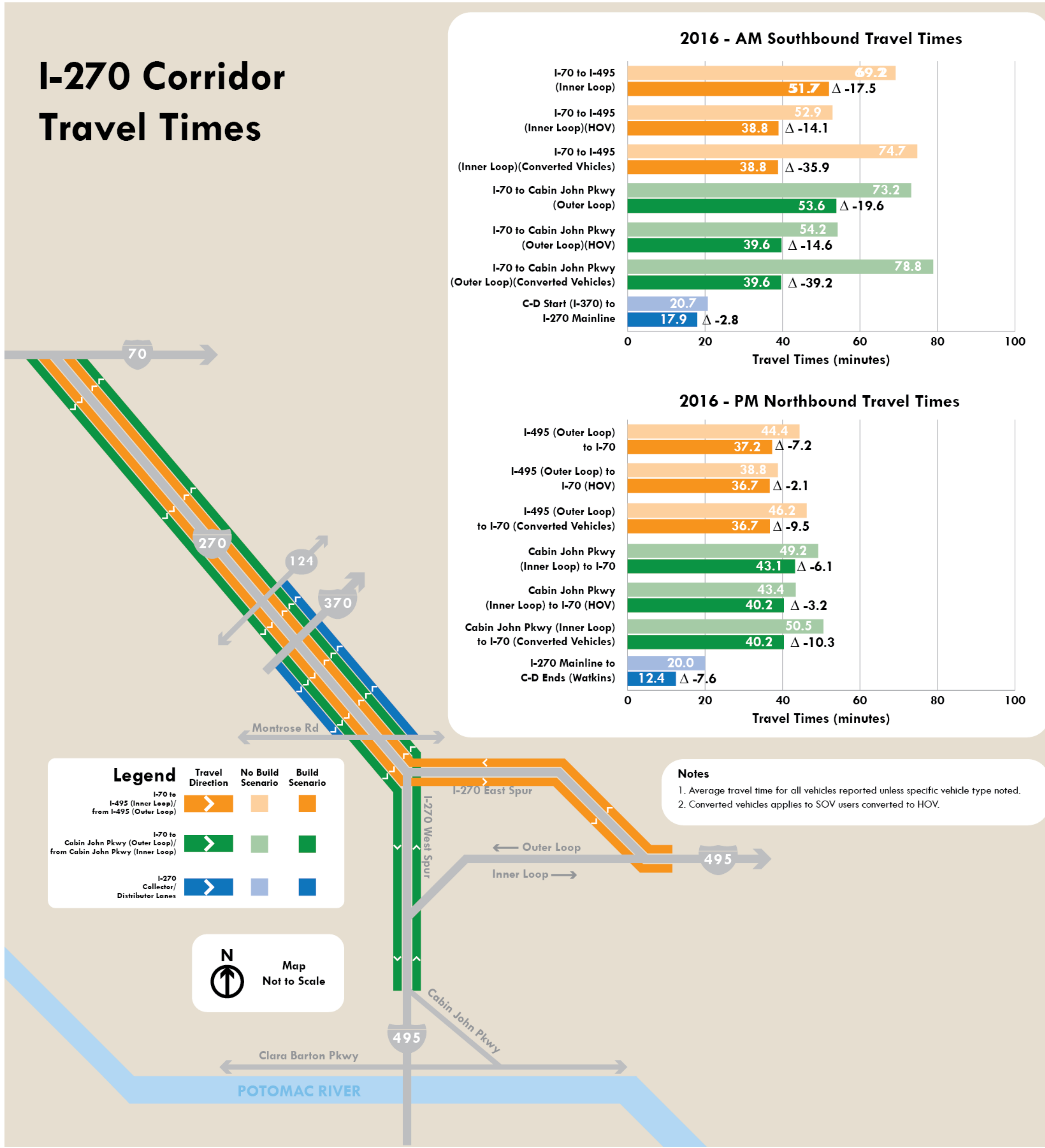


Figure 2.15: No-build and Build travel time in 2040

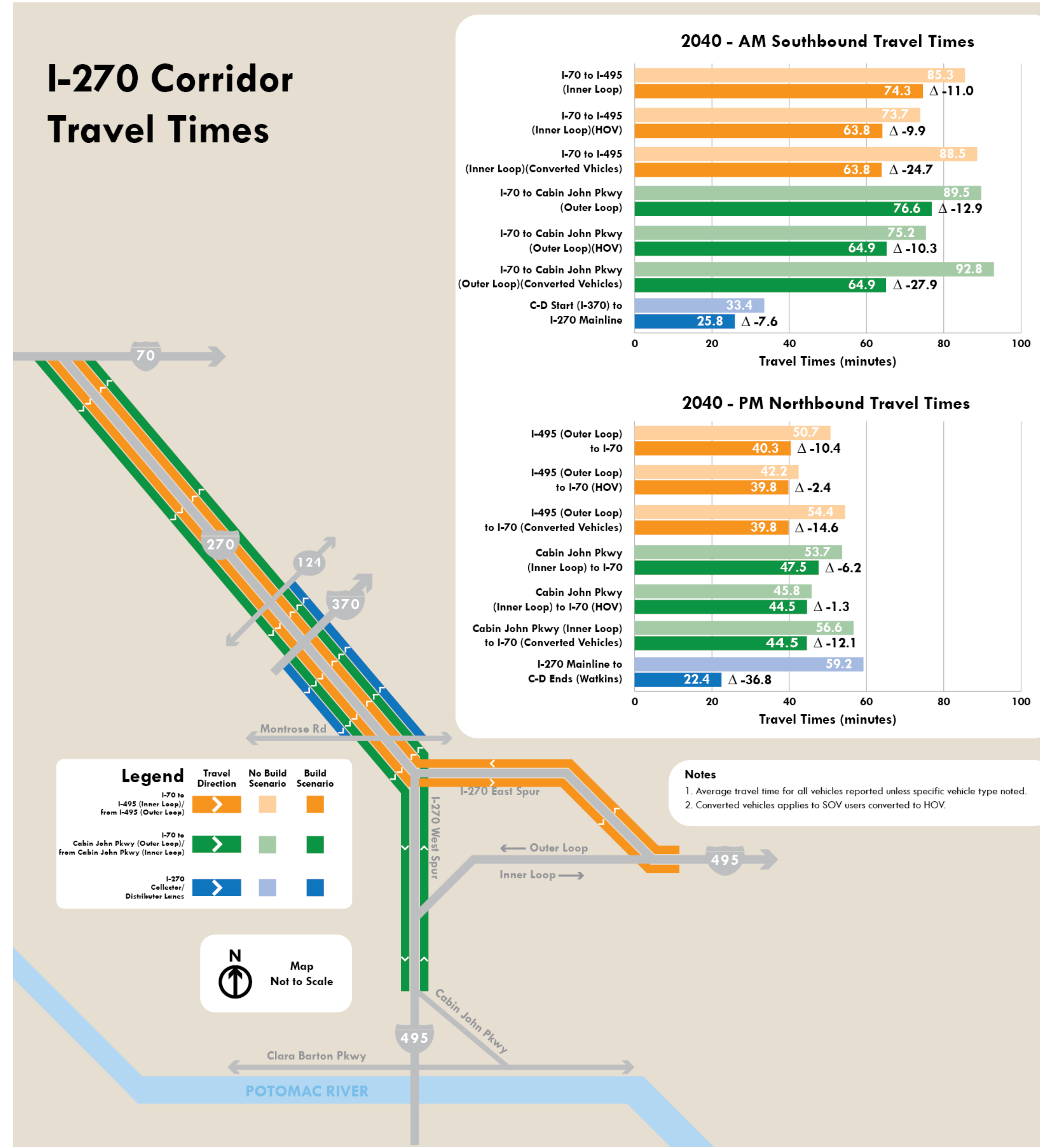


Figure 2.16 Density and Level of Service Improvements

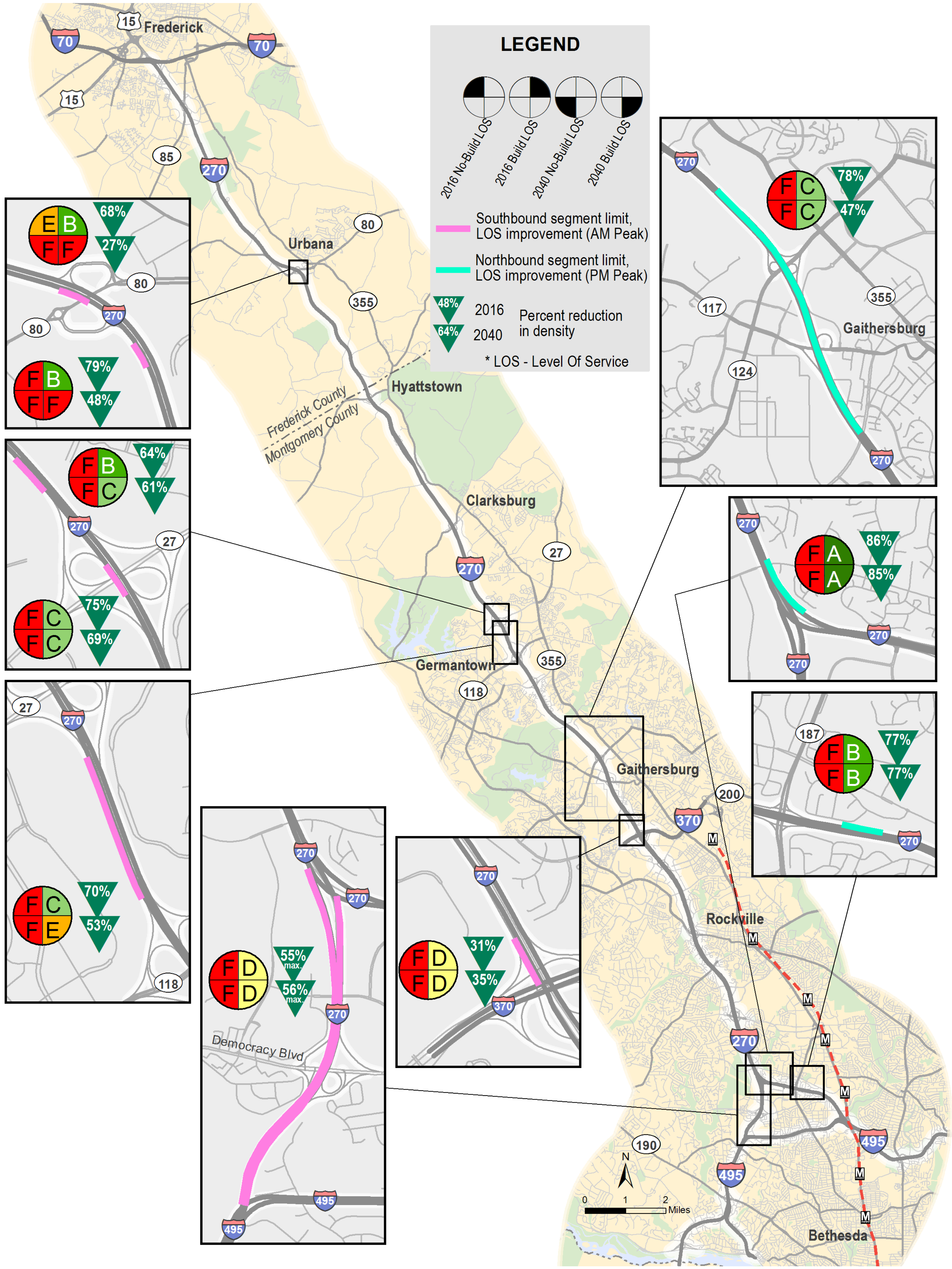


Figure 2.17 Vehicle throughput Improvements

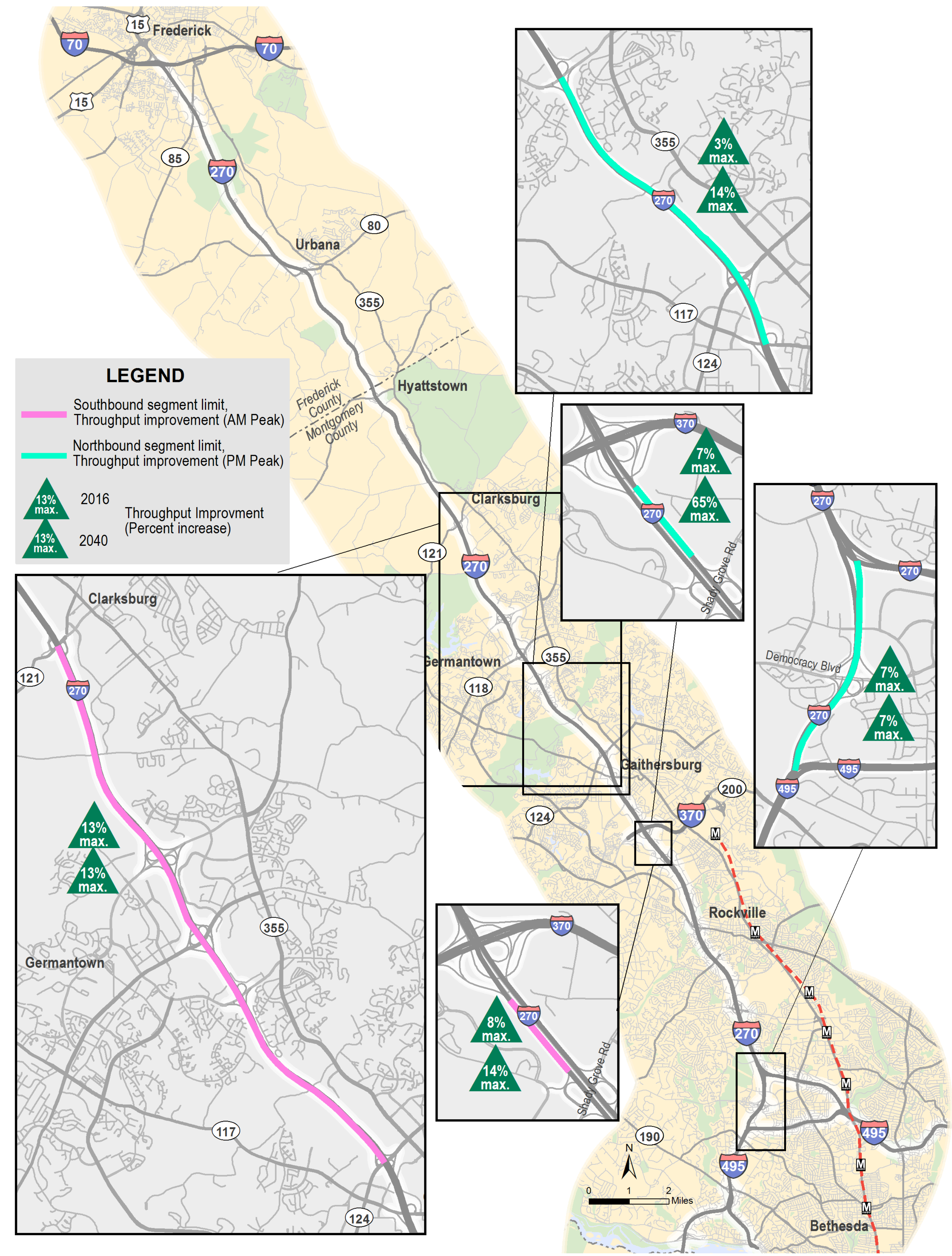
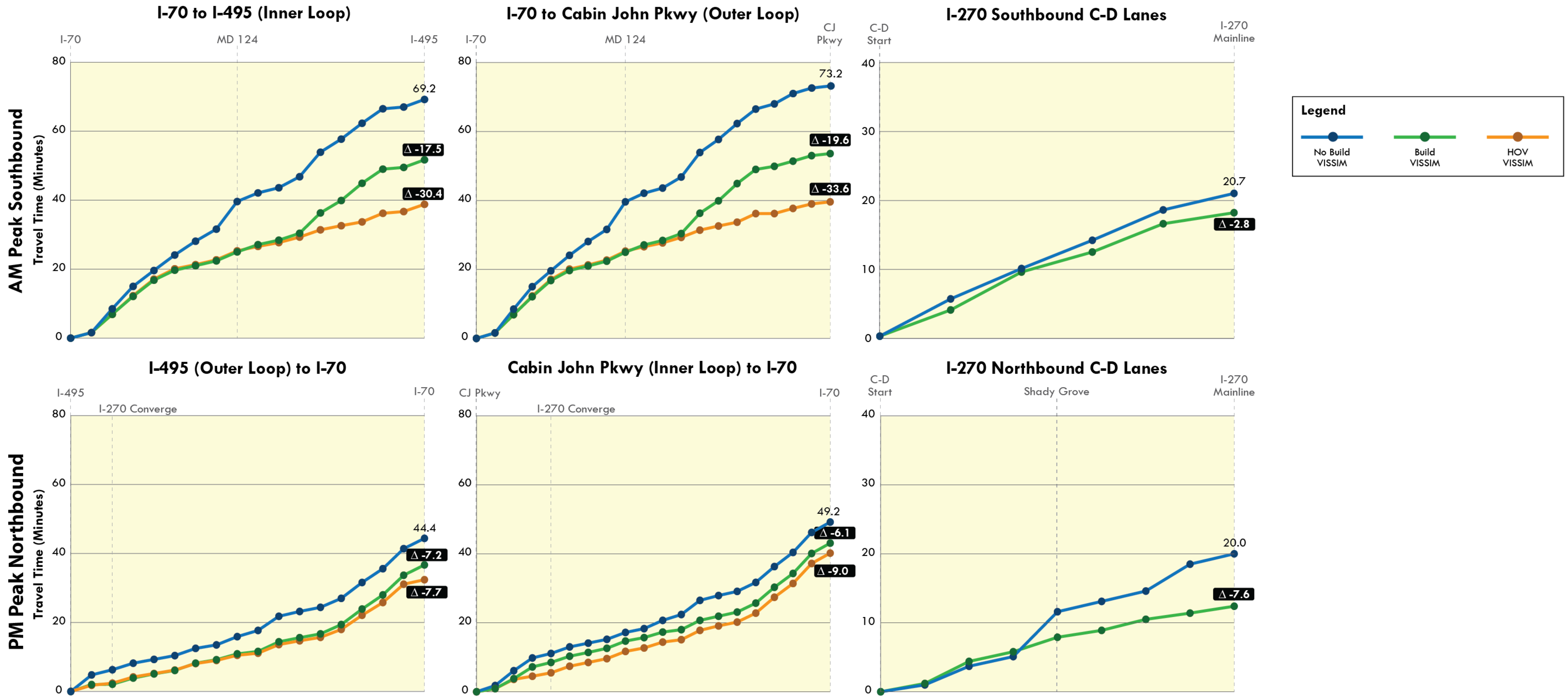


Figure 2.18 I-270 Corridor Peach Travel Times (2016)



Note: For all graphs, average travel time for all vehicles reported unless specific vehicle type noted.

Table 2.1: I-270 Vehicle Network Performance - AM Peak Hour

	2016 No Build	2016 Build	% Change	2040 No Build	2040 Build	% Change
Total Delay (sec.)	21,906,753	14,562,468	-34%	35,032,576	25,663,805	-27%
Average Delay per Vehicle (sec.)	227	153	-33%	326	235	-28%
Total Travel Time (sec.)	51,252,838	44,560,506	-13%	64,317,886	56,784,362	-12%
Vehicles (Arrived)	81,275	82,754	2%	87,894	92,787	6%
Latent Demand	4,969	4,305	-13%	44,530	41,717	-6%
Latent Delay (sec.)	13,122,672	11,728,745	-11%	120,600,723	116,673,147	-3%
Total Distance (mi.)	467,210	476,632	2%	463,125	492,650	6%
Average Speed (mph)	33	39	17%	26	31	20%

Table 2.2: I-270 Vehicle Network Performance - PM Peak Hour

	2016 No Build	2016 Build	% Change	2040 No Build	2040 Build	% Change
Total Delay (sec.)	21,792,153	15,965,330	-27%	36,237,078	25,486,332	-30%
Average Delay per Vehicle (sec.)	206	153	-26%	307	214	-30%
Total Travel Time (sec.)	53,628,278	48,319,981	-10%	67,865,560	59,670,766	-12%
Vehicles (Arrived)	88,401	89,792	2%	95,124	100,618	6%
Latent Demand	1,544	2,336	51%	8,861	6,635	-25%
Latent Delay (sec.)	2,650,217	3,468,590	31%	13,484,325	11,606,317	-14%
Total Distance (mi.)	484,473	493,212	2%	477,455	518,219	9%
Average Speed (mph)	33	37	13%	25	31	23%

Figure 2.16 illustrates the density and level of service improvement along NB and SB IS-270.

The information presented for each direction pertains to peak travel times for that direction: AM peak hour for NB and PM peak hour for SB.

Reduction in Recurring Congestion – Intersection Operations:

The Kiewit/AECOM project improvements are mainly focused on the IS-270 mainline. Lane configuration and signal timing was unchanged for all but one intersection included in the VISSIM model. The IS-270 off-ramp to MD 124 is proposed to be widened as part of the project for the NB direction. The proposed change increases ramp approach capacity and helps with CD road flow at upstream segments. Detailed intersection capacity analysis using Synchro performed suggests that, using existing volumes during the PM peak, delay and level of service for the ramp changes from 349 seconds (LOS F) to 177 seconds (LOS F) as a result of this change. Refer to VISSIM model results, see appendix.

Additionally, the SOV to HOV conversion resulted from providing more HOV capacity on IS-270 will provides additional capacity at intersections adjacent to the corridor as for each new HOV vehicle, two SOV vehicles will be reduced from the network. Furthermore, in the long run, the improved HOV network will attract more HOV users to the corridor which reduces the demand and alleviates congestion on parallel arterials and intersections.

Reduction in Recurring Congestion – Queues and Vehicle Network Performance:

Table 2.1, shown on Figure 2.18, summarizes network performance for the SB IS-270 AM peak hour for the 2016 and 2040 scenarios. Total delay experienced by users on the network is reduced by 34% in 2016 and 27% in 2040 compared to existing/no-build condition, and the average delay per vehicle on the network is reduced by 33% in 2016 and 28% in 2040. The average speed of the vehicles on the network increases by 17% (20% in 2040) and the total travel time reduced by 13% (12% in 2040), suggesting a smoother traffic flow on the network.

The 13% (6% in 2040) reduction in latent demand indicates that the network is able to process and serve more vehicles during the AM peak hour in both 2016 and 2040 scenarios.

Table 2.2, shown on Figure 2.18, summarizes network performance for the PM peak hour with the 2016 and 2040 traffic numbers. Similar to the AM peak hour, total delay, average delay per vehicle, and total travel time reduced compared to existing/no-build condition, suggesting a smoother flow throughout the network. Consistent with travel time reduction, the average speed of the vehicles on the network increases by 13% in 2016 and 23% in 2040, compared to AM peak hour. The results suggest that latent demand has increased during PM peak hour in 2016 scenario. Therefore, investigation of the VISSIM model was performed to identify the root cause(s). The review of the VISSIM model received from the Administration suggests that most of the latent demand increase in 2016 is attributed to the I-495 entry point. As the VISSIM model was developed to study the traffic operation on IS-270, only small portions of the I-495 were included in the model upstream of the merge point with the IS-270 SB spur. The improved traffic flow in the SB direction of IS-270 resulting from the proposed improvements introduces higher delay to I-495 traffic, but the model is not representative of the I-495 traffic operation. The review of existing/No-Build VISSIM results suggest that the portion of I-495 included in the model is operating under level of service (LOS) F with densities around 83 (pc/mi/ln), and will operate with densities around 132 (pc/mi/ln) in the Build condition. The improved flow on the IS-270 Spur SB traffic as well as the lane drop shift from the left-side to the right-side at the IS-270 Spur and I-495 merge point would require I-495 traffic to slow down at this segment. In existing/No-Build conditions, IS-270 traffic has to merge due to the left-side lane drop, but the review of traffic volumes indicates that the traffic volumes on IS-270 approaching this merge point is notably higher that the I-495 traffic volumes during both AM and PM peak hours, and thus justifies the proposed change to make the approach with lower traffic volumes to merge. Similar phenomenon is observed for 2040 scenario, but the magnitude of the improvements is so significant that the overall "latent demand" and "latent delay" are decreased by 25% and 14% respectively.

Queue lengths are unchanged or decreased from no-build condition at the majority of the ramps throughout the project. Queue length increase are also observed at some locations, mainly due to the improved flow on the mainline. At off-ramps, better flow on the mainline allows for more car to get off the corridor and arrive the downstream signal. At on-ramps, vehicles need to wait longer to find acceptable gap within the improved mainline flow.

2.i.e Proposed Technology Improvements to Support the Project:

Technology Solution – Lane Control System (LCS):

Kiewit/AECOM propose to install a LCS that is highly compatible with and will effectively be integrated into the CHART operations. The LCS will be a standalone system to configure and control the new DMS and be an extension of the existing CHART ATMS. The lane controls will be supported on either butterfly or cantilever sign structures, and be spaced every 1/2 mile. In the SB direction, there will be one dynamic lane control panel over the proposed Express HOV lane and one static sign over the existing HOV lane. In the NB direction, there will be two panels over the HOV on HSR and the existing HOV lane. The lane controls will be mounted on a T-shaped structure supported at the median as shown in the proposal cover. No additional signs can be added to this proposed structure.

Design Exceptions, nonstandard practices, and Lane Equivalency Studies:

The HSR method will result in reduced travel lane and shoulder widths, to offset the narrow width of the existing shoulders in certain locations. A design exception will be submitted for proposed lanes and shoulders that are less than 12' in width.

The Kiewit/AECOM Team will prepare lane equivalency studies for FHWA approval. From a HOV lane equivalency perspective, we are maintaining the length of the existing HOVs in both directions. The existing HOVs consist of 12' wide lanes and shoulders that vary 9' to 12' in width in both directions. In the proposed conditions, the 2 HOV lanes are 11' wide with shoulders varying 2'-3' in width. As a result of the additional HOV lanes in both directions, the HOV commuter travel time has improved as shown in Figures 2.14 and 2.15. The HOV commuters will have two NB HOV lanes up to MD 28, and then one HOV on HSR lane up to MD 121 (existing HOV terminus), which is an improvement compared to existing conditions. The HOV commuters will have two SB HOV lanes between Muddy Branch Rd and the Y-split. The typical sections shown in Figure 2.5 depict the proposed work, and the roll plans showing the proposed improvements are included in the appendix.

Adjustments to Median Shoulder Cross Slope and Median Barrier:

The Kiewit/AECOM Team proposes adjusting the cross slopes of the existing median shoulders using wedge and level to meet the required super elevation and normal rate. Refer to PTC 1 for existing and proposed crown discussion. In the areas where shoulder cross slope adjustment is necessary, the existing median barrier will be either rehabilitated to have the required reveal at gutter, modified to have a sloped face, demolished and reconstructed in part, or replaced in its entirety. The existing concrete median barrier is less than 42" in height. The team is proposing 42" barrier in the sections where the median barrier needs to be replaced, but not replacing the existing median barrier that is not impacted by the change in the shoulder cross slope. Since the traffic will run closer to the barrier compared to the existing conditions, the approach angle is reduced, lowering the risk of cars rolling over upon impact. The median openings within the limits of the Project will remain. The existing attenuators will be replaced only in areas where the median barrier will need to be reconstructed.

Drainage Design:

Kiewit/AECOM Team will prepare a detailed hydraulic analysis during the post award phase to evaluate the spread during rain events and add inlets to reduce the spread. The maximum allowable spread identified for the northbound and southbound HSR lanes will be 6' (the sum of the width of the proposed 2' shoulder and 4' of the proposed 11' HSR lane). Because no additional impervious is proposed for this project, it is assumed that the hydraulic capacity of pipes and the storage provided at outfalls is sufficient. The team will perform an inlet capacity evaluation to determine if additional inlets are required. The team is not replacing existing inlets.

Storm Water Management (SWM):

Within the proposed construction limits, there are three different watersheds. Due to the existing storm drain system, retaining walls, barriers and the urban nature of the surround area, the potential for environment site design (ESD) treatments is limited. Suitable locations for proposed ESD and SWM retrofits were identified within the 3 watersheds along the I-270 corridor. Within all of the watersheds, there is enough opportunity to provide SWM management with ESD facilities and retrofitting existing SWM ponds.

The most northern watershed is Seneca Creek which ranges from North of MD 117 past the northern project limits. Within this watershed, there is approximately 17,000 LF of grass median that could be converted to bio-swales from North of MD 118 to Clarksburg Road. To achieve SWM in this watershed, 10 bio-swales that are 200' in length, would provide 0.73 acres of treatment.

The Potomac River MO County watershed ranges from Great Falls Road to North of Muddy Branch Road. None of the existing ponds were determined as feasible to be retrofitted. Three potential locations for new SWM facilities were found, which are inside SHA ROW, but could require modifying existing or new storm drain pipes.

The most southern watershed is Cabin John Creek and ranges from Old Georgetown Road to Great Falls Road. Two existing ponds were identified to be within SHA ROW and built before 2000, and can be retrofitted to meet current standards.

The Kiewit/AECOM team will submit the SWM and E&S packages to the appropriate permitting agencies and receive approvals for the Concept, Site Development and Final Stages of the project.

Geotechnical/Pavement Design:

The shoulder pavement composition will be strengthened using resurfacing, a full depth patch or full depth reconstruction where necessary. Shoulder sections that only require an overlay or full depth patch will not result in any disturbance of the existing soil. The team will request the permitting agency to consider the pavement patch as maintenance, which would not require stormwater quality management. If stormwater quality management is still required, the team will submit packages for approval as described in the SWM section. The limits of full depth will be sawcut prior to pavement removal, to avoid impact to the adjacent pavement composition. The team has evaluated the existing pavement sections within the Project limits, and will limit the full depth patching to non-traffic bearing pavement sections only. Refer to the appendix for detailed pavement analysis.

Right of Way (ROW):

The additional capacity is provided within the existing pavement footprint. Additional ROW is unlikely, but may be required to accommodate signage, utilities, drainage outfalls, stormwater and erosion and sediment control facilities. The Kiewit/AECOM team will coordinate with the Administration for any ROW needs and prepare ROW plats, if needed.

Existing Utilities:

The Kiewit/AECOM team will perform subsurface utility investigation, and supplement the utility designation file as necessary. The team will provide test hole information to confirm the depth of each utility in areas where potential conflicts with proposed improvements are identified. Due to the proposed improvements being contained within the existing roadway footprint, the Kiewit/AECOM team does not anticipate major utility relocations. The team will develop a utility conflict matrix to track potential conflicts between proposed improvements and existing utilities and adjust the design whenever possible to minimize or completely avoid impact.

Maintenance of Traffic:

The Maintenance of Traffic (MOT) will consist of restriping the existing NB and SB express lanes to 11’ wide, to accommodate the width of the temporary concrete traffic barrier. The existing outside shoulder will remain as-is, to avoid shoulder pavement reconstruction. We will set temporary barrier walls on NB and SB travel lanes parallel to each other to create a greater workspace in the median and allow for concurrent NB and SB construction. All express lanes will be maintained throughout construction. Lighting will not be maintained during construction. The majority of the work will be contained within the existing median shoulders.

2.ii More Predictable Commuter Trip

The Proposed Project will provide commuters a more predictable commuter trip since travel time and density will decrease, refer to the IS-270 Corridor Travel Time exhibits in section 2.i.d. In addition to the additional capacity provided by the Managed Lane on HSR and Local Congestion Relief Areas, the Kiewit/AECOM Team is proposing innovative technologies to further improve commuter predictability. Kiewit/AECOM Team propose to implement a new technology that uses Bluetooth technology, as described in Section 2.i.c above. BlueTOAD advanced traffic monitoring system will be installed at 25 locations. These WiFi/Bluetooth/DSRC devices will be co-located with existing microwave vehicle detection units, or will be installed on existing structures. No new supports are anticipated, as the devices are small and location selection is fairly flexible. Additional information provided in PTC 8 Advanced Stage O-D Data & Connected Vehicles Infrastructure. The proposed advanced data collection will allow the Administration to monitor changes in travel patterns, mode choice (SOV vs HOV), and path selection. It will also provide the Administration with a powerful tool to increase its adaptability by performing a smart “Before and After” study to fully understand the impact of additional capacity provided by the managed lane on HSR. Although not a requirement of the RFP, the additional capacity can be monitored to evaluate HOV demand (induced demand), reduction of SOVs from the corridor and use of the existing HOV lane, as well as HSR lane. Depending on the results of such study, the Administration might consider the following, which are not included in our proposal but allow for IS-270 to adapt in the future: changing HOV on HSR from 2+ to 3+ ridership; extend HOV lanes in both directions of IS-270 further north to I-70, extend onto IS-495 and adding ramp meters at interchange ramps with HOV bypass lanes. The Kiewit/AECOM Team will monitor travel patterns using the advancesd O-D data until construction is substantially complete and will recommend future projects for others to implement at that time.

Through the implementation of Advanced State O-D Data & Connected Vehicles Infrastructure, CHART will be able to better understand current operational conditions along the corridor based on the real-time O-D data provided. From this, operational strategies, such as alternative route options, can be disseminated to motorists via DMS, 511, and Google/ Waze. The information collected will also provide key data for true Integrated Corridor Management (ICM) applications, in which CHART can implement traffic signal changes along feeder arterials to IS-270, as well as balance freeway and arterial traffic. Lastly, conservative estimates show approximately 84 Million is spent in annual user delay cost on I-270. This is based on Probe Data Analytics Suite for 2015.

In addition to the dynamic lane use control signs, additional CCTV coverage and additional DMS will be installed within the limits of the proposed improvements, in order to verify the HSR lane is clear of disabled vehicles before opening and also to confirm incidents, at which time CHART will close the HSR for first responder access. All new CCTV and DMS devices will be similar to the devices currently being installed by CHART, in terms of manufacturer and model. New CCTV will communicate with CHART via leased T-1 lines, and new DMS will communicate with CHART via cellular modems. The new lane control system will communicate with CHART using cellular modems.

Improved Commuter Trip for Transit Buses

With improved travel time, transit along IS-270 will provide a faster and more predictable commute, which will attract additional riders and remove more automobiles from IS-270. Currently, transit buses access the Rock Spring Business Park in Bethesda using the Westlake Terrace Interchange exit from IS-270 southbound, which provides direct HOV-only access to this local road. This interchange was designed to accommodate transit and does not need upgrading, so the Administration will gain additional value from this existing asset.

The existing IS-270 southbound morning commute from I-70 to Rock Spring Business Park has an average travel speed of 27 mph, much slower when compared to to the evening northbound commute of 47mph. The Kiewit/AECOM team proposes a southbound HOV express lane which will result in travel speeds of 50 mph and will improve the average speed between I-70 and the I-270 split to 38 mph.

Additional HOV capacity and the southbound HOV express will improve predictability hence making the express bus services in the IS-270 corridor more competitive with the automobile and thus increasing transit ridership. For detailed information on bus routes, Refer to PTC 10, see appendix.

2.iii Performance Life Analysis of Project

The Kiewit/AECOM team developed a methodology to estimate the performance life of the Project. It was determined that the performance life varies in different segments and directions of the corridor. It takes longer for a segment which experiences significant improvement to lose its gain due to traffic increase, and takes less for a segment with minor improvement.

The results showed that it will take 15 years for the congestion levels between IS-70 and IS-370 to return to pre-construction levels. Other segments along IS-270 corridor will have varying performance life based on a 2040 VISSIM model provided.

Our methodology for calculating the performance life these two segments assumes the travel time improvements dissipate as traffic volume increases. Our methodology to calculate the performance life for different segments is.

1. Estimate traffic growth rate between 2016 and 2040 based on traffic volumes for the No Build scenario.
2. Estimate the relationship between traffic volume and travel time increase between 2016 and 2040 for the No Build scenario of VISSIM model.
3. Calculate travel time saving resulted by implementing the Project in 2016.
4. Estimate traffic volume increase required to wipe the travel time saving calculated in Step 3 based on the rate estimated in Step 2.
5. Calculate the time it will take the 2016 traffic volume to increase to the level estimated in Step 4 using the growth rate estimated in Step 1.