VISSIM Modeling Guidance

This document outlines standard practice methodologies for VISSIM related microsimulation operational analysis on Maryland Roadways.

Maryland Department of Transportation
State Highway Administration
Office of Planning and Preliminary Engineering
Travel Forecasting and Analysis Division

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Purpose

The purpose of this document is to outline standard modeling techniques of a typical transportation operational analysis using VISSIM microsimulation modeling software and to provide guidance on specific details of VISSIM modeling for the Maryland Department of Transportation State Highway Administration (MDOT SHA), Travel Forecasting and Analysis Division (TFAD).

Methodologies outlined in this Standard Operating Procedure (SOP) must be followed when submitting operational capacity analyses to TFAD for all projects using VISSIM microsimulation analysis. This document is not a tutorial for VISSIM; rather it provides guidance on specific concerns previously noted by the TFAD staff. Engineers applying these methodologies should already be familiar with the latest VISSIM software package, currently at version 8.0 (as of 9/01/2016). Version 9.0 has been released by PTV and will shortly be added to TFAD's suite of software.

Users should also be familiar with the latest Highway Capacity Manual (HCM), Maryland Manual on Uniform Traffic Control Devices (MD MUTCD), and general transportation vernacular to ensure accurate engineering judgment during the modeling process.

Quality Review and Schedule

All VISSIM modeling will be created with a set schedule in place for (1) the existing year calibrated models, (2) the future year no build calibrated models, and (3) the future year build conditions models. Each additional Build condition, or alternative, requires additional schedule consideration.

A minimum of one week must be taken into consideration for TFAD staff to review and confirm the VISSIM models are acceptable **at each stage of the modeling effort** (i.e. a minimum of three review periods with additional review periods if more than one Build condition is modeled).

Additional time may be required and must be discussed with the TFAD staff to ensure project schedule adherence. TFAD staff will review the models for accuracy per the provided checklist at the end of this document.

Modeling Techniques

Vehicle Inputs

Vehicle inputs must reflect current vehicular composition and speeds using existing vehicle traffic counts and travel data. At a minimum, Vehicle Inputs will take into consideration automobiles and trucks as two separate vehicle classes (exception: routes with no truck access). Additional breakdown of vehicle classes are appropriate if data is available (i.e. motorcycles, medium trucks vs. heavy trucks etc).

For all project studies multiple Vehicle Input types must be created for all roadways entering the project area. For example, side streets with no trucks might use 100% automobiles, whereas mainline streets might use 90% automobiles and 10% trucks.

If the project is a transit oriented study, bus volumes shall **not** be included in the Vehicle Input. Bus "volumes" will be input as Public Transit (PT) frequencies. If the study allows for a mix of known and unknown transit, the modeler can consider the unknown bus volume as a Vehicle Input and the known bus "volume" as a PT frequency.

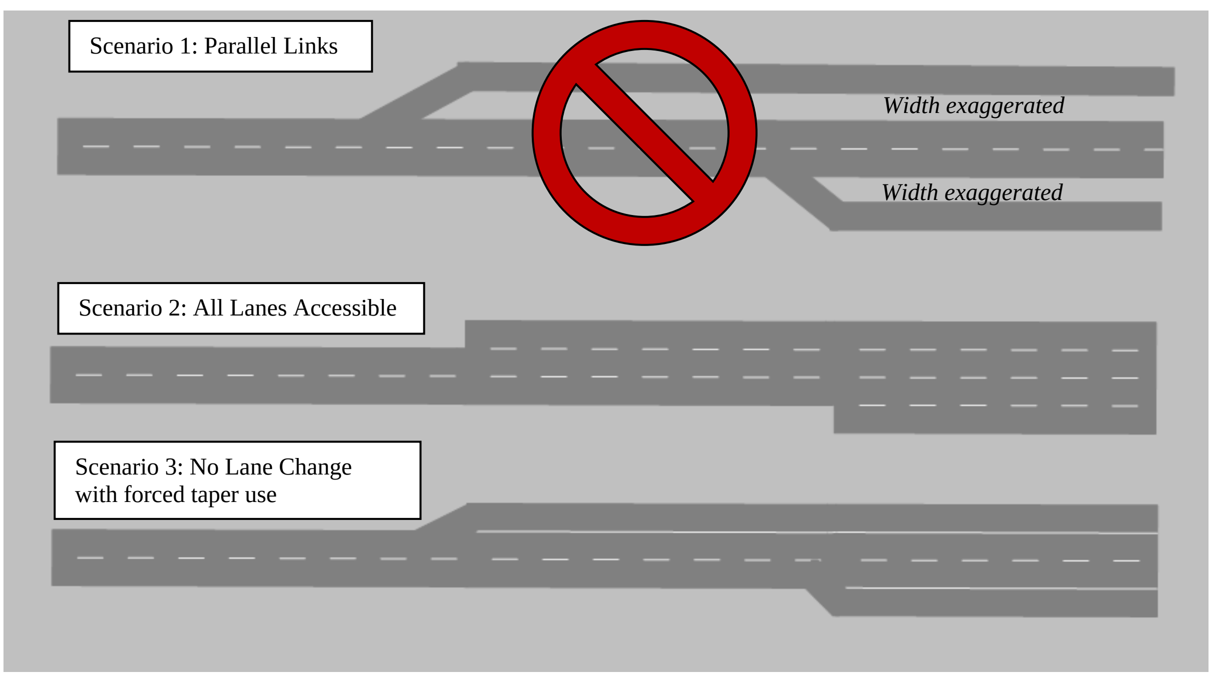
Note that using PT will affect your traffic count and must be taken into consideration carefully. Traffic volumes need to be reduced based on the known number of buses passing through the corridor in a given hour.

Links and Connectors

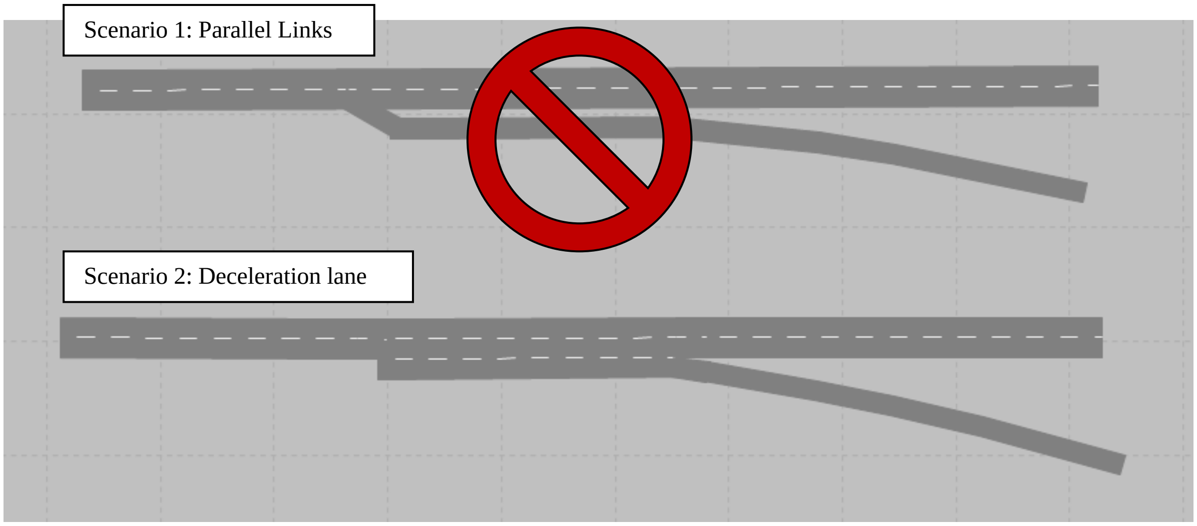
Network links shall be modeled per existing lane geometry. Currently, SHA projects GIS aerial imagery to NAD 83 whereas the VISSIM 8.0 imagery is projected to WSG 1984. VISSIM 8.0 imagery is considered acceptable for model development.

Note that **Google or Bing** imagery (from Google Maps/Earth or Bing Maps for example) may not be accepted as a background image for large project areas due to scaling problems noted in past projects. Ensure scaling is accurate throughout the entire corridor if you use these images. Internal to SHA, engineers should use GIS imagery files.

Segments of roadway with turning bays shall be modeled as links with all lanes accessible, rather than multiple parallel links (Scenario 1) each associated to a turning movement, as shown below, unless the existing conditions include a physical barrier between turn lanes. TFAD recognizes this approach differs from the PTV modeling technique. However, this approach allows users to then model forced lane use (with the use of no lane change options) through connectors if necessary (Scenario 3) or allow vehicles to merge smoothly into the turning bay (Scenario 2). Generally, this approach works best for longer turning bays, but for consistency, all models should use the "one link-all lanes" approach and adapt as needed.



Merges and diverges with acceleration and deceleration lanes shall be modeled similarly (one link-all lanes), one link with the acceleration or deceleration lane included as part of the mainline link, as shown below, unless the existing conditions include a physical barrier between the mainline and the ramp lanes (ex. Collector-Distributor lane).



In general, parallel link modeling is not an accepted methodology for TFAD operational analysis using VISSIM software unless specific roadway geometry prohibits movement along the lane (ex. solid barriers), ramp design allows for single on/off access from the freeway (ex. tapered diverge/merge), or the modeler can provide field data to show that all drivers merge/diverge using the taper only. There may be case by case exceptions, but the modeler should consider the above one link-all lanes approach unless the conditions suggest otherwise.

All connectors should be short and should not significantly overlap over the two links it connects.

Driver Behavior Parameters

Modelers are encouraged to develop driver behavior models in addition to the default VISSIM driver behavior models. Each corridor is unique and driver behavior models should reflect these patterns.

Driver behavior models shall not be altered when a VISSIM model is supplied and confirmed calibrated, unless specified otherwise. All alternatives analysis may alter driver behavior where improvements are implemented, but not where improvements are not implemented.

Pedestrian Models

TFAD currently models pedestrians as a Vehicle Input instead of using the pedestrian module. If the modeler expects more than 30 pedestrians within the model, then the above Vehicle Input method must be used due to software limitations. Pedestrians should always be modeled where appropriate, unless specified otherwise.

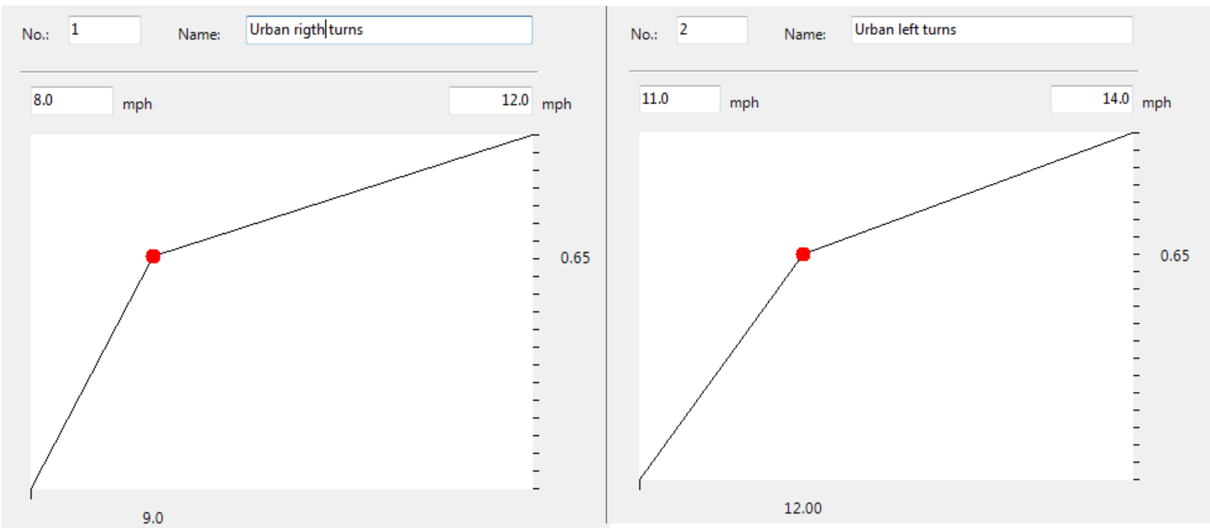
Transit

For all Transit, bus alighting and boarding should be considered in addition to bus travel times, schedules, capacity (vehicle types), all stop locations, etc. TFAD currently models an on street bus stop as 50 feet to 100 feet depending on urban density. An alternative to boarding/alighting data is to use dwell time information, though this must be supported with field verified information.

Speeds

Turning Speeds

Turning speeds for intersection movements, or tight left/right turning vehicles, should be modeled using the speed distributions provided below. These speeds differ from the Synchro defaults and are based on MDOT SHA data.



Speed reduction zones should be placed at the sharpest point on the curve of the link or connector. The speed reduction zones for turning movements should be short, usually within 5-15 feet depending on the curve length. Excessively long reduced speed zones will reduce the turning movement volume capacity and should only be used if the turning movement excessively reduces vehicle throughput.

Wide left turning movements or free right movements where vehicles can travel faster are especially susceptible to this condition and can be modeled with higher turning speed distributions with longer speed reduction zones (e.g. 5-30 feet at 25mph), if appropriate.

Speed reduction zones for ramps, specifically loop ramps, shall use a distribution of the ramp caution speed limit, usually within the 30-45 mph range. These can span the entire ramp (ex. tight loops) or only the sharpest curve of the ramp (ex. slip ramps) depending on field data.

All speed distributions above may be replaced with field based data, which must be documented.

Mainline Speeds

Mainline desired speeds should be modeled as a distribution of existing speeds along the corridor, **not** as the posted speed limit. Vehicles modeled in VISSIM must reflect existing conditions as accurately as possible. Scenario analysis may be performed after the base calibration in complete; however, existing conditions must be reflected in the models.

When first opening a VISSIM model, care should be taken when converting from KPH to MPH (i.e. when converting from metric to imperial). Do not switch to imperial units and keep the speed as-is; this will result in unrealistic speed distributions.

Currently, TFAD uses the default VISSIM Maximum Acceleration and Deceleration distributions. Make note should these be altered in the modeling effort.

Conflict Areas and Priority Rules

Conflict areas should be modeled for all conflicting movements that might occur. Specifically, permissive left turns, right-turn-on-red, and pedestrian conflicts. Not all movements must be coded, but those occurring in the field and specifically under congested conditions where an intersection might spillback should be coded.

Note that conflict zones work most efficiently for non congested locations and tight conflict areas. For wide turns, congested networks, and other complex facilities, priority rules may be more appropriate to allow for smoother traffic flow.

Signals

Signal timings shall use RBC NEMA phasing standards or VAP for complex/innovative signals. All signal timings must use MDOT SHA, County, or City timing sheets. New signals must meet MDOT SHA standard practice and the RBC timing sheet must be supplied to TFAD for review.

Permissive left turn signal heads should be coded as an “Overlap” with parent phases as the through and left movement combined. This movement should not be coded through the “Or signal group” option in the Signal Head tool, but instead through the Signal Controller, which would then assign the Overlap phase in the Signal Head.

Right Turn On Red (RTOR) conditions must be coded into the networks where vehicles are permitted to turn if the signal is red. To code RTOR, use the stop sign tool and under the “RTOR” tab, select the “Only on Red” option for the appropriate Signal Controller and Signal Group. The stop sign should be positioned on the link/connector performing the right turn while a signal head for the through movement should still be coded in on the through link.

Caution*:* Import of Synchro files into VISSIM can lead to multiple errors and should be done with caution. Always confirm Synchro timings with actual controller timing sheets when possible – TFAD staff is trained in reviewing signal controller timing sheets and will request corrections to signal timings if they do not match the controller outputs.

Routing

Static Routing

TFAD currently uses Static Routing for most VISSIM simulation models. This requires a balanced network of traffic volumes to input in the VISSIM model that must be approved by TFAD. Routes should start at the farthest point from a “split” or volume change location to ensure the most distance for vehicles to make a decision.

Caution is advised for interchange locations where routing might cause “loop” conditions where a vehicle will be removed from the highway only to return in the opposing direction. To avoid these conditions, push highway traffic at interchanges through the following intersections rather than stopping a route right after the end of the ramp movement, as shown below.

Route end points **must** be on the same link as the following route’s start point.

Breakdown of truck routes versus automobile routes, or route combinations will be left at the discretion of the modeler. However, methodologies are expected to be submitted to TFAD for review.

Dynamic Routing

Dynamic routing shall be discussed on a case by case basis with the TFAD staff as this requires an additional macroscopic modeling effort.

Calibration

Two calibration metrics are required of all VISSIM models submitted to TFAD:

- Travel time and/or speed
- Vehicle throughput

Additionally, engineering judgment will be required for locations with existing queues and overall network operations. All calibration must consider the following:

- Seeding time must allow a car to travel from one end of the network to the other; customary simulation seeding times span from 900 seconds (15 minutes) to 1,800 seconds (30 minutes). Longer seeding times should be considered for excessively large networks or high congestion.
- A minimum of 5 simulation runs must be completed before average outputs of all runs can be used for analysis. Additional runs may be necessary, up to 15 runs or by showing convergence of the model.

Calibration of the network using travel times or speed must report short segment data in addition to overall corridor travel time/speed. TFAD requires a ± 10 percent travel time variation for small segments (no more than 1 mile long) and ± 5 percent travel time variation over the entire corridor analyzed. Exceptions permitted on a case by case basis with justification.

For a facility spanning more than 1 mile, it is recommended to break the facility into segments based on obvious breakpoints (ex. between signalized intersections, or at ramps). These new smaller segments would then be calibrated at ± 10 percent variation with an overall corridor calibration of ± 5 percent.

To calibrate to travel times or speeds, floating car runs or collected speed data may be used (ex. RITIS.org probe data). This may result in two separate data sets: one from floating car runs, and one from an outside source. Do **not** mix the calibration of travel times from floating car runs with speeds collected from an outside source. Two options are available if multiple data sets are available:

1. Average the speed data with the travel time runs into one data set (i.e. convert speeds into travel time runs or vice versa and calibrate the VISSIM outputs to the average of the two),
2. Use only one data set, either travel time runs from the floating car runs, or the speed data from an outside source, and keep the other data source for validation.

The volume calibrations should not exceed 10% of the **count traffic volume** and/or GEH<5.

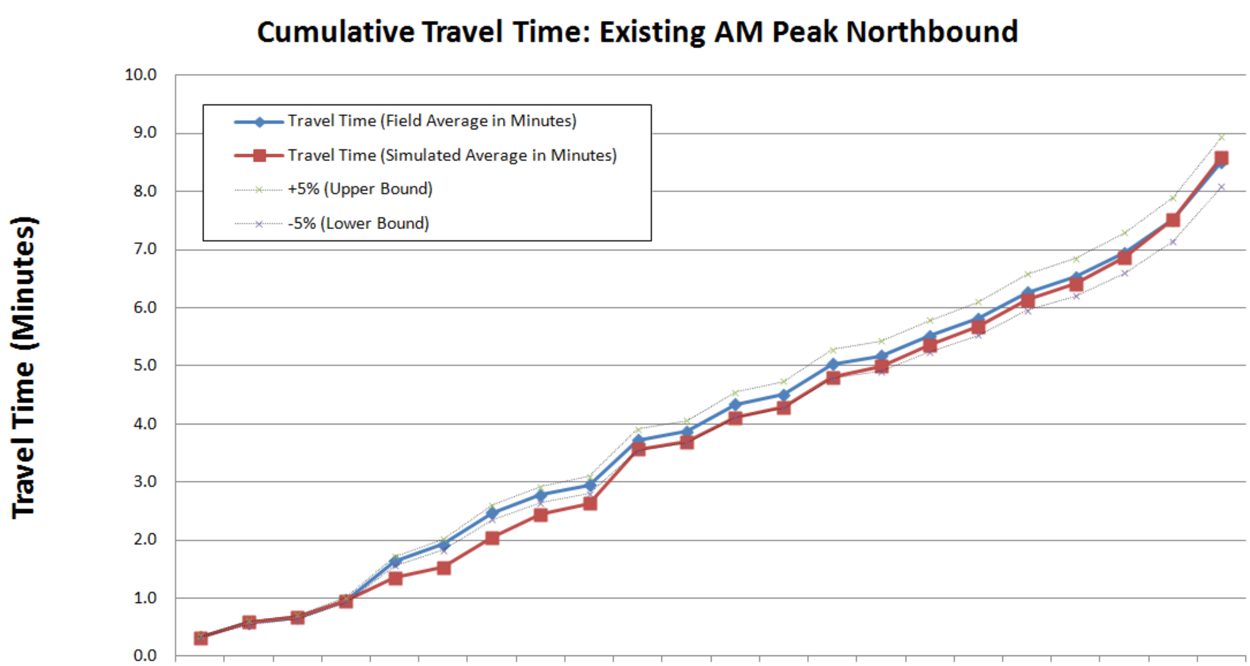
Caution: A frequent error noted is the use of the balanced traffic volume network for calibration of a VISSIM model. This is an incorrect calibration method. Calibration should not be made using the demand volume (i.e. the balanced volume network), rather they should meet the throughput measured in the field (i.e. raw data count).

Calibration sheets are required for review and must be presented with the start of stage (2) of the VISSIM schedule (See Quality Review and Schedule). Example calibration tables are provided below.

Segment	Table 1: Volume Calibration						
	1.Demand Volume (vehicles)	2.Count Volume (vehicles)	3.Simulated Volume (vehicles)	4.Difference (% of 2&3)	5.Difference <10%?	6. GEH	7.GEH <5?
Corridor							
A-B	2,765	2,620	2,628	0%	Yes	0.2	Yes
B-C	4,050	3,500	4,086	-17%	No	9.5	No

Travel Segments	Distance (miles)	Table 2: Travel Time Calibration					
		Speeds (MPH)		Travel Times (sec)		Difference	
		Field (mph)	Simulated (mph)	Field (sec)	Simulated (sec)	Difference (sec)	Difference (%)
Corridor	**2**	**51**	**56.3**	**141.2**	**128.5**	**12.7**	**10%**
A-B	**1**	60	59.7	**60**	**60.3**	**0.3**	**1%**
B-C	**1**	30	52.8	**120**	**68.2**	**-51.8**	**-43%**

Calibration threshold not met.



Measures of Effectiveness

Outputs of the VISSIM models requested for project studies include (as appropriate):

- Travel times and speeds for each corridor segment and associated cross streets,
- Average and Maximum Queue lengths on each approach
- Node delays for intersection level of service (LOS)
- Diverge, merge, and weave density outputs for LOS
- Network performance measures of effectiveness (MOEs)
    - Network Overall Delays
    - Network Overall Travel Times
    - Latent Vehicles ("vehicles denied entry")

Tables clearly labeling all results must be submitted to TFAD for review and will be included in the final report.

Travel Times & Speed

Travel time collection points should span the same distances and locations as the floating car runs. For example, if a segment in the floating car run extends 524 feet, the travel time collection point should be equal or almost equal to 524 feet. Alternatively, if the modeler wishes to extend or reduce that distance, an appropriate travel time needs to be calculated for the new distance.

Speeds may be calculated from the travel time collection points.

Transit oriented studies must include transit travel times separate from automobile travel times (ex. bus/tram/light-rail).

Queues

Maximum and average queue lengths should be collected at the stop bar locations for signalized intersections or stop signs. Queues occurring on freeways should be measured from the start of the queue by observing the simulation and determining the start point. Networks should be modeled such that the maximum queue length measurements are encompassed by the network and queues do not extend past the end of the link.

VISSIM may provide 95^{th} percentile queues in future updates – until such a tool is available maximum and average queues will still be required.

Intersection Levels of Service (Nodes)

Intersection delays should be collected via the Node tool to determine Level of Service (LOS). Different modeling techniques may be used – each edge of the node may sit solely at the stop bars for each approach resulting in a small node, or each edge of the node may sit outside of the farthest turning bay resulting in wider nodes.

Measuring delay per vehicle should consider the HCM categories for LOS grade. Node delays at unsignalized versus signalized intersections are different and must be evaluated correctly.

Node “start of delay segment” should consider the length of the queues at that node. Alternatively, this may be zeroed out if the edges of nodes from nearby intersections are bordering the node (i.e. back to back node systems).

Once data is collected from the VISSIM model, total intersection delays should be translated from the latest Highway Capacity Manual (HCM) to a letter grade LOS.

Diverge, Merge, and Weave Levels of Service

Diverge, merge, and weave lane density outputs must be collected for all freeway analyses and converted to a level or service letter grade based on the latest HCM.

For all studies the link(s) on which the merge, diverge, or weave occurs must be evaluated for density output. Note that the modeler should use HGV and auto densities to translate to a LOS, and must not solely translate the VISSIM “All Vehicle” density to a LOS grade. TFAD allows for the use of a 2.5 factor to convert HGV density to passenger car per mile per lane (pcpmpl), which is added to the auto density, and then converted to a LOS grade per the HCM breakdowns. Similar to intersection LOS categories, freeway segments have different breakdowns for weaves, diverges and merges, which must be considered when reporting LOS.

Delays at the diverge/merge/weave may be considered in addition to the density; however, a delay estimation using node or travel times may not be translated to a LOS using HCM delay tables.

Benefit Cost Analysis

Benefit cost analysis (BCA) may be considered for VISSIM models that consider Build scenarios. Each Build scenario would include a change in the network, resulting in changes to vehicular delay.

TFAD’s current approach is to determine the delay variation at the location of the Build change using either travel time segments or nodes. Due to the software limitations, some node systems may be too large to encompass an entire interchange, for example, and thus travel times may be used.

TFAD does not currently use network wide delay as a means for BCA due to scale of projects; however, this MOE may be considered for very small networks (independent intersections, single interchange etc) and is needed for the Network Performance Measures, below.

Network Performance Measures of Effectiveness (MOEs)

Network wide MOEs should be collected for the following:

- System wide average delay (seconds per vehicle)
- Averaged stopped delay (seconds per vehicle)
- Vehicles denied entry (Delay Latent)

Additional MOEs that might be considered:

- Average number of stops
- Average speed (miles per hour)
- Total travel time (seconds per vehicle)
- Total vehicle-miles (miles)

Deliverables

The required deliverables of a VISSIM modeling effort to MDOT SHA's TFAD include:

- All VISSIM models and associated VISSIM files (ex. RBC and VAP files), for each stage of the schedule (see Quality Review and Schedule)
- Calibration tables (see Calibration)
- A Calibration and Methodologies Memorandum,
- MOEs of final (i.e. not the base model) VISSIM networks (see Measures of Effectiveness)
- Full technical memorandum with all results.

-end-

For questions regarding this report please contact Ms. Carole Delion via email at cdelion@sha.state.md.us or Ms. Lisa Shemer, Assistant Division Chief, Data Services Engineering Division.

VISSIM Model Review Checklist

Project Name:

Reviewer Name:

Reviewer Response:

☐ Model approved for use – Date:________________

☐ Model must be revised – see Action Required items

Return to Reviewer by:________________

How to use this checklist:

Reviewers should use this checklist to confirm VISSIM microsimulation models are acceptable for use in operational result submittals. All models must follow the Maryland Department of Transportation State Highway Administration (MDOT SHA) Travel Forecasting and Analysis Division (TFAD) VISSIM Modeling Guidance. The below is a checklist to ensure all VISSIM modeling conditions are acceptable to MDOT SHA; however, this checklist is not the only method of approving or rejecting a VISSIM model. Engineering judgment is still the final decision tool in the approval or rejection of VISSIM models.

If an item below does not meet the guidance, or if the reviewer feels the model is not appropriate, do not check off the item in question. Instead, check off the "Action Required" box and comment on the changes required. If an item is not applicable to the model, simply check off "Not Applicable". Items that do not have the "Not Applicable" option require all checklist actions be completed. Once the review is complete, please check off the appropriate Reviewer Response, above, to notify the model's acceptance for operational results submittal.

For any questions please contact Carole Delion at cdelion@sha.state.md.us or Ms. Lisa Shemer, Assistant Division Chief, Travel Forecasting and Analysis Division at lshemer@sha.state.md.us.

BASE DATA

Desired Speed Distributions: speeds should reflect the speeds in the corridor.

☐ Vehicle desired speed distributions reflect actual speeds, not speed limits, on the corridor for all mainline and all cross streets for entering vehicles or vehicles changing roadway classification/speed zones

☐ Vehicle desired speed distributions reflect actual turning speeds for urban right/left turns, as well as ramp speeds, wide rights/lefts or any other condition applicable to this corridor

☐ *Action Required:*____

Vehicle Composition: percent of cars, trucks, etc for entering vehicles.

☐ All vehicle compositions used in the network reflect the mode splits of that entering volume, specifically truck percentages

☐ *Action Required:*____

Driver Behavior

☐ Driver behavior used is reflective of the area modeled

☐ *Action Required:*____

NETWORK PARAMETERS

Links reflect expected lane geometry: All links should reflect the correct geometric designs expected for that scenario (example: existing conditions).

☐ Links are to-scale: use aerial or design imagery and spot check lengths of several long segments. Do not use small segments – add segments together to create the total length of a known segment
☐ Curves follow the existing or proposed designs
☐ Tapers are the correct lengths
☐ Connectors all reflect the correct lane distribution connection from one link to the next
☐ Appropriate lane use by vehicle types are assigned correctly – ex. no trucks in left lane are taken into consideration
☐ *Action Required:*____

Desired Speed Decisions

☐ Desired speed decisions are located at all locations in the network where vehicles must change their speeds to meet new speed behavior zones. This includes locations where the speed limit changes, roadway classifications change (example freeway to arterial), or anywhere vehicles are expected to change their speeds for long periods of time. This should not be applied for short segments (i.e. reduced speed areas), though it can be if reduced speed areas are not used
☐ *Action Required:*____

Reduced speed area

☐ Reduced speed areas are placed in all locations where vehicles must temporarily reduce their speeds to realistically perform turns. This includes left/right turns, ramp loops and sharp movements where a vehicle would realistically reduce its speed to perform the movement
☐ *Action Required:*____

Conflict areas

☐ Not applicable
☐ Conflict areas were modeled where vehicles conflict with other movements, throughout the entire network. Not all conflict areas must be coded, but left/right movement conflicts with through movements must be coded, as noted in the VISSIM guidance
☐ *Action Required:*____

Priority Rules

☐ Not applicable
☐ Not always necessary, but if vehicles are not performing conflicts properly, these must be coded in. If they are coded, the simulation must show the vehicles are performing the movement realistically
☐ *Action Required:*____

Vehicle Inputs

☐ Correct inputs have correct vehicle compositions
☐ *Action Required:*____

Vehicle Routes: Static

☐ Positioned to allow the most distance to make decisions
☐ Positioned to end on the same link as the next route begins unless it is an exit link
☐ Reflect all possible movements in the network
☐ Routes at interchanges do not loop back into the opposing direction (see DSED Standard)
☐ Routes are dynamic (Origin Destination tables must be approved)
☐ *Action Required:*____

MULTIMODAL

Public Transport Stops

☐ Not applicable
☐ Positioned at the correct stop location
☐ 50feet in length or more – if less justification should be provided
☐ Reflect the correct dwell time or load time for passengers
☐ *Action Required:*____

Public Transport Lines

☐ Not applicable
☐ Lines reflect the bus routes from known public transit agencies, or proposed transit
☐ Lines use either a distribution or calculation for alighting time
☐ Departure offset reflects the time it would take a bus to actually reach its first stop
☐ Stops are activated for the line they serve
☐ *Action Required:*____

Pedestrian and Bicycle Facilities

☐ Not applicable
☐ Pedestrian and Bicycle inputs are modeled as vehicle inputs, not through the pedestrian module (SHA does not have the license for high pedestrian module to be effective)
☐ Pedestrian and Bicycle walkways and crosswalks are in their correct location
☐ Pedestrian and Bicycle speeds are appropriate
☐ *Action Required:*____

CONTROL DEVICES

Stop signs

☐ Not applicable
☐ Reflects realistic stop/dwell times, as recorded in the field. Otherwise defaults can be used. ☐ Stop signs are coded where Right Turn On Red (RTOR) occur
☐ *Action Required:*____

Signal heads

☐ Not applicable
☐ All signal heads are at the appropriate stop bar location
☐ All signal heads represent the correct signal controller and signal phase
☐ *Action Required:*____

Signal Controllers

☐ Not applicable
☐ Signal is coded using NEMA (Ring Barrier) or VAP for special signals
☐ Signal phasing reflect the correct signal phase from timing sheets or proposed signals
☐ Signal timings reflect the correct signal timing from timing sheets or proposed signals
☐ All inputs of the signal controller reflect the actual signal timing sheets or proposed signals (ex. max recalls, pedestrian recalls, etc)
☐ Correctly coded as "Free" or the pattern number it is attempting to replicate
☐ Ring barrier sequence is correctly coded and barrier separated
☐ Overlaps are correctly coded for permissive lefts, or right turn overlaps, or any phase that "overlaps" (occurs at the same time as another)
☐ Detectors reflect correct detector names
☐ *Action Required:*____

Detectors

☐ Not applicable
☐ Detector port numbers are correct
☐ Detector Signal Controller (SC) is correct
☐ Detector lengths and positioning are correct (see signal plan locator tool to confirm)
☐ *Action Required:*____

RESULT COLLECTION TOOLS

Nodes: used in the development of intersection delays, among other reporting measures

☐ Node covers the entire intersection of interest
☐ Node checked off as "use for evaluation" if reporting for that node
☐ *Action Required:*____

Data Collection Points: used in the collection of volumes, spot speeds, and queues

☐ Located where data can be validated against existing data or at a location where data wishes to be collected under build scenarios
☐ *Action Required:*____

Data Collection Measurements: used to combine the above Data Collection Points

☐ The measurement groups reflect the correct grouping of Data Collection Points
☐ *Action Required:*____

Vehicle Travel Times: used for the collection of segment based travel time information along a corridor.

☐ Start and end points create a path vehicles can travel on (careful where connectors overlap with links)
☐ Start and end locations match existing field collected travel time or match the distance needed for reporting purposes
☐ The vehicle type recorded is reflective of the correct vehicle type from the existing field travel times (i.e. cars for cars, buses for buses etc) or of the vehicle type needed for reporting purposes
☐ *Action Required:*____

Simulation Parameters

☐ Period time reflects a seeding time and minimum one hour for peak period analysis
☐ Simulation resolution is at 7 or more (ideally at 10)
☐ Number of runs is at 5 or more for reporting purposes
☐ *Action Required:*____

CALIBRATION

☐ Calibration tables were submitted – if no tables submitted skip to action required.
☐ Calibration takes into account both travel times and traffic throughput
☐ Calibration of total corridor travel time (end to end) has an error of 5% or less
☐ Calibration of segmented travel time has an error of 10% or less [*exception:* 30 second or less for errors with higher than 10% variation]
*Justification of acceptance of higher errors:*____
____
☐ Calibration of traffic throughput compares the VISSIM throughput at the correct location
☐ Calibration of traffic throughput compares the VISSIM throughput to the appropriate traffic volume. The balanced volume network can be used for uncongested corridors, whereas field counts should be used for congested corridors
☐ *Action Required:*____

MISCELLANEOUS

Provide additional comments not noted in the above checklist