APPENDIX E

Year 2018 Existing WisDOT Model Review

MICROSIMULATION PEER REVIEW REPORT

Wisconsin Department of Transportation
DT2291   3/2018

	1st Review	2nd Review	3rd Review
Date Reviewed (m/d/yyyy):	3/22/2019	4/26/2019	5/23/2019
Reviewed By:	BMR	BMR	BMR
Model Completion/Revision Date(m/d/yyyy):	3/18/2019	5/10/2019	5/21/2019

Reviewer, please email completed form to:

To: Project Manager & Region Contact
CC: DOT Traffic Analysis & Modeling
Subject: DT2291 for Project ID; Traffic Model Name

CONTACT INFORMATION

	Lead Reviewer	**Lead Analyst**	**Region Contact**
Name (First, MI, Last)	Ben Rouleau	Jason Kessler	Bryan Lipke
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TRAFFIC MODEL DESCRIPTION

Project ID(s)	Project Name/Description	Region:	Highway(s)
1130-48-00	I-41 Traffic Analysis	NE	I-41

Traffic Model Name/Description	Analysis Scenario/Alternative	Analysis Year(s)
I-41 Vissim	Existing Conditions	2018

Analysis Time Period (s)

☒ Weekday AM Peak   Hours: 7-8
☐ Weekday Midday Peak   Hours:
☒ Weekday PM Peak   Hours: 4:15-5:15
☐ Fri Peak   Hours:
☐ Sat Peak   Hours:
☐ Sun Peak   Hours:
☐ Other: Hours:

Analysis Tool(s) Utilized

☐ SimTraffic- Version: ☐ Paramics - Version: ☒ Vissim - Version: 10   ☐ Other: - Version:

SCOPE AND EXTENT OF PEER REVIEW

Purpose & Scope of Review

Provide an independent peer review of the I-41 Vissim models

Description/Limit of Model

I-41 south of CTH BB (Outagmie) to north of CTH S (Brown). Ramp terminals modeled, no adjacent intersections.

Configuration Settings

Number of Zones:	Number of Time Steps:	Speed Memory:	Assignment Type:
25	10	N/A	OD Matrix

Mean Target Headway:	Mean Reaction Time	Matrix Structure	Vehicle Classifications/Splits
N/A	N/A	See Zone Map	See Model Validation Report

Seed Values Used for Calibration:	199, 409, 619, 829, 1039, 1249, 1459
Seed Values Used for Review:	17, 19, 514229
Other:	

Were any changes to the model made by the review team? If yes, please describe.

No.

MICROSIMULATION PEER REVIEW REPORT *(continued)*

Wisconsin Department of Transportation   DT2291

DIRECTIONS

This form is applicable for the review of all microsimulation traffic models, regardless of the traffic software program utilized to develop the traffic model. However, this form focuses on the SimTraffic, Paramics and Vissim microsimulation software packages.

When noting problems or concerns, identify the severity of the issue and the revisions recommended using the following scale: Minor, Moderate, or Major. Check the appropriate box associated with each review (the blue box for the 1st review, the green box for the 2nd review and the purple box for the 3rd review).

If more than one review of the traffic model is required, use different color text to distinguish the comments associated with each review (e.g., comments from the 1st review should be in blue text, comments from the 2nd review should be in green text, and comments from the 3rd review should be in purple text). Provide any supporting tables, screenshots, or additional images in a separate attachment to this form.

OBSERVATIONS, MODEL FEATURES AND CHARACTERISTICS

<table>
<tr>
<td rowspan="2">Geometrics /Traffic Control</td>
<td><i>Network Coding</i></td>
<td colspan="2"><i>Network Coding establishes the horizontal and vertical geometry of the network. It also includes the appropriate use of settings such as link free-flow speed.</i>

• <i>For SimTraffic, this is coded within the Synchro module and includes placement and interconnection of nodes and links, number of lanes, lane widths, lane configurations, roadway curvature, storage lengths, and other intersection and network geometry.</i>
• <i>For Paramics this includes placement and interconnection of nodes, links and link categories, curb points, curves, turn lanes, merge points, stop bars, signposts, and other network infrastructure.</i>
• <i>For VISSIM this includes the placement and interconnection of links, connectors, desired speed decisions, reduced speed areas, conflict areas, and priority rules.</i></td>
</tr>
<tr>
<td>As a whole, network coding is:

☐ ☐ ☒ Acceptable
☐ ☒ ☐ Conditionally Acceptable</td>
<td>Observations/Comments:

1st Review</td>
<td>Analyst Response

1st Review</td>
</tr>
</table>

⊠ ☐ ☐   Unacceptable

Extent of Revisions Required:

What is the purpose of Connector 10153 and Link 148? Recommend removal.

Need conflict areas at merges onto on-ramps at BB/Prospect, 125, 15, 47, Freedom, CTH S, etc. - check to make sure everywhere has a conflict area (coded correctly) that needs one

Off-ramp thru movements are currently allowed only at the interchanges with roundabouts. While this does create routing issues, recommend including the off-ramp thru movement at all interchanges where it's possible. This would reflect the field conditions fully.

There is inconsistency in the way the taper-style ramps are coded. The SB off-ramp to BB/Prospect is a taper style (though a longer taper, to be sure), but is coded as a full lane. Other taper style off-ramps are coded as connectors coming off without an added lane. Recommend coding all consistently, with a full lane starting from where the taper is 6' wide.

The I-41 SB to WIS 441 SB ramp should not be coded as a connector coming off - it is a parallel ramp.

Overall, try to keep connectors short and minimize overlap between the links and connectors.

While the weigh station isn't coded, and likely doesn't need to be, the relevant portions of links 119 and 122 and con. 10119 should be coded as 3 lanes to reflect the fact that an additional lane does exist there and is marked as an exit only lane to U.

Reduced speed areas are needed in several locations:
- roundabout approaches, specifically for the bypass lanes
- turn lanes at S and U interchanges

Document the logic used on where desired speed decisions are placed on both on- and off-ramps. As a note, the location differs from the standard for CTH S NB and SB off vs. other off-ramps.

For reduced speed areas for right and left turns, consider using the recommended values in the Attachment 6.1 of TEOpS 16-20. Additionally, considering using the left turn values for wider right turns, and potentially even the right turn values for a sharp left turn like for the NBL at BB/Prospect. Document any places where coding differs from the standard.

2nd Review

Link 148 and Connector 10153 were at the location of the initial southern end of the model, but it was later decided during the model building process that it should extend further south to where it is now. These links were supposed to be deleted.

The conflict areas at the merges onto the on ramps were added.

The off ramp thru movements were added into the model.

Off-ramp coding has been updated to be consistent across all interchanges. All off ramps were coded with a full lane starting where the taper is 6 feet wide.

The I-41 SB to WIS 441 SB ramp was coded as a parallel ramp instead of a connector.

Connectors will be reviewed to minimize overlap and be shortened in the near future during the calibration process.

The third lane was coded on I-41 NB and was included as an exit only lane to CTH U.

Reduced speed areas were added to the roundabout approaches and to the turn lanes at CTH S and CTH U interchanges.

Ramp desired speed decisions were placed based on the following logic. Along off ramps, a 55 mph transitional desired speed decision was placed shortly after the painted gore, generally before the off ramp's curve begins, and a second desired speed decision was placed equal to the cross street's posted speed limit generally located before the single lane off ramp opens up into turn lanes. Along on ramps, a 62 mph transitional desired speed decision was placed at the start of the ramp shortly after the merge of the left and right turns from the cross street. A second desired speed decision equal to the posted speed of the I-41 mainline is generally located after the final curve of the on ramp ends, allowing vehicles to accelerate to mainline speed along the final straight segment of the on ramp.

Reduced spead areas for right and left turns were updated to the recommended values in Attachment 6.1 of the TEOpS 16-20. Left turns were already coded at 15 mph. Right turns were updated to 12 mph.

2nd Review

	All geometric changes were made. *For the 100 km/h desired speed distribution, the upper bound should be capped at 77 MPH, as the freeway speed is - not a major concern, though, since vehicles don't tend to reach that speed on the ramps.* *For the reduced speed areas, the upper and lower bounds don't exactly match the recommended settings in TEOpS, but they are acceptable.* *For some of the diverges, check the lane change distance for the connectors (e.g., 10498) - some late lane changes were observed that disrupted mainline traffic unrealistically. Consider a rule-based or field signage-based system of setting lane change distances for the connectors before diverges. This would likely still be needed even with potential adjustments to the diverge coding.* *For 15 and 96 east of the interchange (where there is significant PM congestion), the links should be extended beyond the maximum extent of the queueing. Any intersections that are present on the extended link to the east of the NB ramp terminals do not have to be added (per previous discussions), but the link should extend far enough that all of the queueing is present within the model during the existing conditions. This will likely be a bigger problem during the No-Build (and possibly Build) model process, but can be addressed further then. Check for any other situations where queues spill outside of the model and lengthen links accordingly.*	*The 100 km/h desired speed distribution's upper bound speed was changed to 77 mph.* *The lane change distance was increased to 1500 feet for the taper-style connectors, but late changes still occurred. However, checking the 'per lane' box next to the lane change distance attribute on the off ramp connector at the ramp gore seems to significantly reduce late lane changes.* *WIS 15 and WIS 96, east of I-41, were extended out to Lynndale Drive to allow for more queuing space.*

☐ ☐ ☒ No Revisions Required

☐ ☒ ☐ Minor Revisions Required

☒ ☐ ☐ Moderate Revisions Required

☐ ☐ ☐ Major Revisions Required

3rd Review	3rd Review
The geometric changes are satisfactory.	

Intersection Traffic Control & Ramp Metering	*Intersection Controls are devices that regulate traffic flow at intersections, such as signals, roundabouts, and stop-controlled intersections. Elements of the signals may include the controller type, detector placement, signal heads, signal groups, and/or coordination between signals. Ramp meters control the rate of entry to a freeway. Comments on signal and ramp meter timing plans may be included in this section.*	
As a whole, intersection controls are:	**Observations/Comments:**	**Analyst Response**

☐ ☐ ☐ Acceptable

☐ ☒ ☒ Conditionally Acceptable

1st Review	1st Review
	Model timings were reviewed and updated.

☒ ☐ ☐   Unacceptable

Extent of Revisions Required:

Model timings do not appear to reflect field timings. Contact Matt Talcott to get plans if needed. Only one RTOR coded - need to add in at all signals and approaches where permitted. Signal timing at BB/Prospect - EBL always green? Check timing here. With the white line underneath the bridge at BB/Prospect, should the SBL turn into the right lane instead of the left (con. 10458)? The leftmost RT lane on connector 10422 (NBR) at WIS 125 should go to the leftmost thru lane, with the rightmost RT lane going to the first two lanes. Same for SBR at the same interchange. Check all locations with dual turn lanes that lane assignments match the field. On link 349, the right turn lane is shorter in the field. Where appropriate, set signal heads to arrows (left or right turn). 2nd Review	ROTR coding at all signals where permitted were included. Signal timing at CTH BB/Prospect's eastbound left turn was reviewed and it appears that according to our understanding of the signal plan that the EBL can be permitted when the WBT has the green light, therefore EBL traffic would have either a green arrow or permitted green ball for the entire cycle. The southbound left turn traffic at CTH BB/Prospect was updated to flow into the right lane instead of the left lane. The coding of the dual right turn lanes from both WIS 125 off ramps was updated to connect to the proper downstream lanes. Other ramp terminals were confirmed. The right turn lane on link 349 was shortened to match what is in the field. Signal heads were set to arrows where appropriate. 2nd Review

☐ ☐ ☐   No Revisions Required

See below for comments from Matt Talcott on the signal plans:

1   Please added NB or SB in the signal controller name (Wisconsin, Ballard, Richmond)

2   Should one signal on each side of interchanges be added so there is more of a platoon affect?

3   "41 & N

Phasing and Overlaps is incorrect

""offset"" should be zero

""Reduce After"" should be 30 for phase 1 & 5

Signal isn't in coord so that section should be blank

Detection is incorrect

"

4   "41 & Ballard SB

""Basic Timings"" Max 1 are incorrect.

""Basic Timings""Vehicle recall is only ""Min"" on Phase 2 & 6

No ped times included

In Coord Phase 4 is on Max recall

"

5   "41 & Ballard NB

""Basic Timings"" Max 1 are incorrect.

""Basic Timings""Vehicle recall is only ""Min"" on Phase 2 & 6

No ped times included

""Basic Timings"" Min gap should be blank

In Coord Phase 4 is on Max recall"

6   "41 SB & Richmond

Offset is incorrect

""Max green mode"" should be Maxinhibit

""Basic Timings"" Max 1 are incorrect.

""Basic Timings"" no vehicle recall only ped recall

No ped times included

""Basic Timings"" Min gap should be blank"

7   "41 NB & Richmond

Offset is incorrect

""Max green mode"" should be Maxinhibit

""Basic Timings"" Max 1 are incorrect.

""Basic Timings"" no vehicle recall only ped recall

No ped times included

""Basic Timings"" Min gap should be blank"

8   "41 NB & 15

""Max green mode"" should be Maxinhibit

""Basic Timings"" Max 1 are incorrect.

""Basic Timings"" Min gap should be blank"

9   "41 NB & 15

""Max green mode"" should be Maxinhibit

""Basic Timings"" Max 1 are incorrect.

""Basic Timings"" Min gap should be blank"

1.NB and SB have been added to the Wisconsin, Ballard and Richmond signals.

2/ Based on discussions with WisDOT, the signals on either side of the interchanges do not need to be added.

3. 41 & N

The interchange intersections were changed to uncoordinated and offset was set to zero. The Reduce After for phases 1 & 5 was set to 30. The "pattern 1" section was not deleted, because if any of the values were deleted the visual phasing plan in the rbc file would be deleted. The phasings were not changed because the phase movements as currently set-up accurately represent the phasings in VISSIM, and furthermore if the phase coding would be modified to exactly match how they are represented in the signal plan, Synchro shows conflicts errors.

4 and 5. 41 & Ballard SB & 41 and Ballard NB

These signals are coordinated (Pattern 1) therefore the Max 1 timings are not used, so the Max 1 timings in "Basic Timings" were not updated. The recall under "Basic Timings" was changed to "Min" in Phases 2 & 6. The Phase 4 recall was changed to "Max" in the cooridation section. No peds are modeled, therefore no ped times were included in the model. Min gaps in "Basic Timings" were deleted at the NB intersection.

6 and 7. 41 SB & Richmond and 41 NB & Richmond

The offset was not changed, because when the timings are imported from Synchro into the VISSIM the offset number changes due to what the reference phases are and where the reference phases are situated within the phasings in VISSIM. Max green mode was changed to Maxinhibit. These signals are coordinated (Pattern 1), therefore the Max 1 timings are not used, so the Max 1 timings in "Basic Timings" were not updated. "Basic Timings" recalls were switched to ped recall. There are no peds modeled, therefore no ped times are included in the model. The "Basic Timings" min gaps were deleted.

8 and 9. 41 NB & 15 and 41SB & 15

The Max green mode was changed to Maxinhibit. These signals are coordinated (Pattern 1), therefore the Max 1 timings are not used, so the Max 1 timings in "Basic Timings" were not updated. The "Basic Timings" min gaps were deleted.

10 and 11. 41 SB & 96 and 41 NB & 96

The offset was not changed, because when the timings are imported from Synchro into the VISSIM the offset number changes due to what the reference phases are and where the reference phases are situated within the phasings in VISSIM. Max green

10   "41 SB & 96
Offset is incorrect
""Max green mode"" should be Maxinhibit
""Basic Timings"" Max 1 are incorrect.
No ped times included
""Basic Timings"" Min gap should be blank"
11   "41 NB & 96
Offset is incorrect
""Max green mode"" should be Maxinhibit
""Basic Timings"" Max 1 are incorrect.
No ped times included
""Basic Timings"" Min gap should be blank"
12   "41 & 125
""Basic Timings"" Max 1 are incorrect.
""Basic Timings"" No max recalls
Please put overlaps in order A-H = 7-14
""offset"" should be zero"
13   "41 SB & NB on & BB
""Basic Timings"" no dual entry
Signal is not in coord so patterns should be blank
Signal only uses Max 1, not Max 2.
Max 1 is incorrect
Missing overlap C and D"
14   "41 NB & BB
""Basic Timings"" no dual entry
""Basic Timings"" Min gap should be blank
Signal is not in coord so patterns should be blank
Signal only uses Max 1, not Max 2.
Max 1 is incorrect
No ped phases (Phase 102 and 106)
Cycle length is incorrect"
15   "During simulation, I noticed cars making last second
lane changes to turn left at intercahnges and causing
back ups."

#2 above was discussed and will be mitigated via
documentation in the report rather than additional coding.

#15 can be adjusted by revising awareness distances on the
relevant connectors.

All previously noted adjustments are acceptable.

3rd Review

mode was changed to Maxinhibit. These signals are
coordinated (Pattern 1) therefore the Max 1 timings
are not used, so the Max 1 timings in "Basic Timings"
were not updated. There are no peds modeled,
therefore no ped times are included in the model. The
"Basic Timings" min gaps were deleted.

12. 41 & 125
These signals are coordinated (Pattern 1) therefore
the Max 1 timings are not used, so the Max 1 timings
in "Basic Timings" were not updated. The max recalls
in "Basic Timings" were removed. The overlaps were
re-ordered from #7 to #14 in order to represent
overlaps A to H
13 and 14. 41 SB/NB on & BB and 41 NB off & BB
Dual entries were removed from "Basic Timings". The
min gaps were removed from "Basic Timings" and
the ped phases were removed from the 41 NB & BB
intersection. The timings were updated to reflect Max
1 timings and cycle length, instead of Max 2. The
signal was changed to uncoordinated, however the
pattern data was not deleted because if any of the
pattern 1 data would be removed the signal timings
would be deleted. Overlaps were re-ordered from #7
to #10 to represent overlaps A to D.
15. The lane change awareness at intersections is
generally coded to a 1/4 mile (1,320 feet) distance.
This distance is usually back to nearly the end of the
model. Therefore, the late lane changes are due more
to congested conditions rather than not having
enough awareness distance.

3rd Review

☐ ☒ ☒ Minor Revisions Required
☒ ☐ ☐ Moderate Revisions Required

☐ ☐ ☐ Major Revisions Required	Most of the changes look good. At 41 & Prospect, it looks like red and yellow clearance times are still being subtracted from "Max 1". This interchange is in free and doesn't use "splits" that are referenced in the other signals that are in coordination along the model	

<table>
<tr><td rowspan="15">Geometrics /Traffic Control</td><td>Closures, Restrictions, & Incidents</td><td colspan="2">Closures represent links or lanes that are temporarily or permanently closed to traffic. Restrictions represent links or lanes that are temporarily or permanently closed to specific types of vehicles (such as lanes designated for High Occupancy Vehicles or lanes restricting truck use). Incidents include simulated vehicle break-downs, etc.
• This feature is <u>not</u> applicable for SimTraffic</td></tr>
<tr><td>As a whole closures, restrictions & incidents are:</td><td>Observations/Comments:</td><td>Analyst Response</td></tr>
<tr><td>☒ ☒ ☒ Acceptable
☐ ☐ ☐ Conditionally Acceptable
☐ ☐ ☐ Unacceptable</td><td>1st Review
Some routes closed to prevent unrealistic movements.</td><td>1st Review
Agreed.</td></tr>
<tr><td>Extent of Revisions Required:
☒ ☒ ☒ No Revisions Required
☐ ☐ ☐ Minor Revisions Required
☐ ☐ ☐ Moderate Revisions Required
☐ ☐ ☐ Major Revisions Required</td><td>2nd Review
No further route closures added with the additional thrus at off-ramps, but no unrealistic behavior observed.
3rd Review</td><td>2nd Review

3rd Review</td></tr>
<tr><td>Entrance Ramps</td><td colspan="2">Driver behavior and lane utilization approaching entrance ramps should be reviewed in this section.
• For SimTraffic, modifications to the default mandatory distance and positioning distance settings should be reviewed.
• For Paramics, modifications to default ramp headway, minimum ramp time, and ramp aware distance should be reviewed. The minimum ramp time setting specifies how long a driver will stay on the parallel entrance ramp before beginning to look for a gap to merge onto the freeway.
• For VISSIM, the effective merging area defined by the positions of the links and connectors should be reviewed.</td></tr>
<tr><td>As a whole, the vehicle behavior approaching entrance ramps is:</td><td>Observations/Comments:</td><td>Analyst Response</td></tr>
<tr><td>☐ ☐ ☒ Acceptable
☐ ☒ ☐ Conditionally Acceptable
☒ ☐ ☐ Unacceptable</td><td>1st Review
It looks like all of the entrance ramp merge area lengths correspond with the length out to the end of the taper. This does not reflect the usable length of the merge area. Recommend coding the merge as a full lane to where the taper is 6' wide.</td><td>1st Review
Entrance lane ramps were coded as a full lane out to where the taper is 6 feet wide.</td></tr>
<tr><td>Extent of Revisions Required:

☐ ☐ ☒ No Revisions Required

☐ ☒ ☐ Minor Revisions Required
☒ ☐ ☐ Moderate Revisions Required
☐ ☐ ☐ Major Revisions Required</td><td>2nd Review
Upon further evaluation, coding a full lane to 6' for merges resulted in unrealistic behavior that could be mitigated by coding using an alternate methodology that also better matched field marking conditions. This methodology should be used for merges. While diverges also experience unrealistic behavior with the 6' coding, they are less critical to the model results. If the level of effort is manageable, they should be coded the same way as the merges (alternative methodology), but this is not critical.
3rd Review
Changes to merges and diverges result in much more realistic behavior.</td><td>2nd Review
Merge and diverges were updated to remove the coding of a full lane to 6 feet and instead included the alternate "taper" coding method for the merge and diverge segments.

3rd Review</td></tr>
<tr><td>Lane Use Parameters</td><td colspan="2">Lane use parameters control the amount and/or destination of the traffic using each lane. A typical application of these parameters is to pre-position vehicles in advance of a fork in the road</td></tr>
</table>

As a whole, lane use parameters are:			Observations/Comments:	Analyst Response
☐ ☐ ☒		Acceptable	1st Review	1st Review
☒ ☒ ☐		Conditionally Acceptable	With the placeholder volumes, there are some late lane changes to get into left lanes at interchanges. Make sure to calibrate the lane change distance on connectors as needed with the real volumes to make conditions representative of the field.	Lane change distances along connectors will be adjusted, where necessary, during the calibration process.
☐ ☐ ☐		Unacceptable		
Extent of Revisions Required:			2nd Review	2nd Review
			Lane use appears generally reasonable. It is possible that there is a data issue resulting in comparisons against field data that do not look good, but the lane use in the model seems to be acceptable regardless of the quantitative results.	
☒ ☒ ☒		No Revisions Required		
☐ ☐ ☐		Minor Revisions Required	3rd Review	3rd Review
☐ ☐ ☐		Moderate Revisions Required	Lane use is acceptable.	
☐ ☐ ☐		Major Revisions Required		

Traffic/Global	***Zone Structure/Vehicle Inputs***	*Zone structure and vehicle inputs define where and how traffic is loaded into the network.* • *For SimTraffic, the intersection turning movement volumes from the Synchro module determine how the traffic is loaded into the network. If volumes are imbalanced in the Synchro network, SimTraffic will assume a traffic source or sink between nodes (such as driveways). Reviewer should note imbalances that may not be realistic or representative of the network.* • *For Paramics, zone structure relates to the placement of the zones representing the locations where traffic enters or leaves the network. Observations related to sectors and zone connectors should be included in this section. If the microsimulation model zones are derived from a travel demand model, reviewers should use this section to note any issues related to the consistency of the Paramics input data with respect to the travel demand model data.* • *For VISSIM, vehicle inputs control where traffic is loaded into the network and how much is loaded. Reviewer should use this section to note any issues related to the consistency of input data related to the sources.*

As a whole, zone structure and vehicle inputs are:			Observations/Comments:	Analyst Response
☒ ☐ ☐		Acceptable	1st Review	1st Review
☐ ☒ ☒		Conditionally Acceptable	Parking lots used with OD matrix. Everything looks good. Make sure to include a zone map with the official submittal.	Noted.
☐ ☐ ☐		Unacceptable		
Extent of Revisions Required:			2nd Review	2nd Review
			Zone map provided. Zone structure looks good.	***OD matrix was updated by adjusting the 15 minute profile.***
			For several of the arterials that see signficant congestion in the PM (15, 96), the WBT movement volumes are over 100 vph short of targets (due to the queue dynamics), mainly driven my shortfalls in the middle of the analysis period. Consider adjusting the OD matrix to move demand forward in the analysis hour. Assuming it is congested in the field, the volume profile observed in the turning movement count may not reflect the demand, but rather the realized volumes. Additionally, calibration is probably needed to reflect more aggressive driver behavior on these arterials given the congestion. Fine turning to better match observed volumes on these congested arterials would be ideal.	
☒ ☐ ☒		No Revisions Required		
☐ ☒ ☐		Minor Revisions Required	3rd Review	3rd Review

☐ ☑ ☐ Moderate Revisions Required ☐ ☑ ☐ Major Revisions Required	The PM WBT movement modeled volumes for WIS 15 and 96 are still significantly low - it does not look like any adjustments were made to these areas. These are not currently critical, and there will likely have to be unconstrained versions of the models for future conditions due to issues with the arterials getting traffic onto the mainline in general (not just at these locations). For reference, Strand had done some calibration of the Wiedemann 74 model (arterial) for the WIS 125 models.	

O-D Matrices, Demand Profiles, & Time Periods	*Origin-Destination (O-D) matrices contain the network demand patterns (number of trips between each pair of zones). Time Periods and Demand Profiles control the timing of the release of the trips into the network. In some cases multiple matrices are used (for example separate matrices for cars and heavy trucks). The reviewer should evaluate the source of the demand profile and time period selection.* • *For SimTraffic, network-wide O-D Matrices and demand profiles are not applicable. The intersection turning movement volumes, rather than network-wide O-D matrices, determines the origin and destination of the traffic. The Link O-D volumes setting can be modified within Synchro to model the weaving interaction between 2 adjacent intersections (such as zeroing out an off-ramp left-turn to on-ramp left-turn movement at a diamond interchange). Volume adjustment factors, rather than demand profiles, dictate the percentage of peak hour traffic to load into the network for each analysis period. Thus the intersection turning movement volumes, Link O-D volumes, volume adjustment factors (such as growth factor and PHF adjust settings), and the time and duration of the seeding (i.e., warm-up period) and recording (i.e., analysis period) periods should be reviewed.*

As a whole, O-D matrices, demand profiles, & time periods are:	Observations/Comments:	Analyst Response
☒ ☐ ☐ Acceptable ☐ ☒ ☐ Conditionally Acceptable ☐ ☐ ☐ Unacceptable Extent of Revisions Required: ☒ ☐ ☐ No Revisions Required ☐ ☒ ☐ Minor Revisions Required ☐ ☐ ☐ Moderate Revisions Required ☐ ☐ ☐ Major Revisions Required	1ˢᵗ Review OD matrix is currently a placeholder. 2ⁿᵈ Review ***As the calibration report shows, 15-minute profiles seemed to have some "overhang" from the previous 15 minute period, especially in the center of the model. This was attributable to the distance they had to travel from some zones to the central part of the model. Additionally, there was some discontinuity observed between the warm-up and analysis hours. Revise the OD matrix and profiles to remove the issue with 15 minute profiles related to distance and the discontinuities between all hours.*** 3ʳᵈ Review OD matrices were revised per the comment above - targets held the same. Results on the mainline look better, specifically for the SB in the AM and PM.	1ˢᵗ Review The OD matrices have been updated now. 2ⁿᵈ Review ***OD matrix 15 minute profile was adjusted to represent a typical bell curve of the peaking volume.*** 3ʳᵈ Review

Core Simulation Parameters	*Core simulation parameters affect fundamental aspects of vehicle behavior in the network, such as driver aggressiveness and the willingness to merge into small gaps. Modifications to default software values should be reviewed.* • *For SimTraffic, examples of core simulation parameters to review include driver and vehicle characteristics and behaviors.* • *For Paramics, examples of core simulation parameters to review include mean target headway, mean target reaction time, perturbation, global routing cost coefficients, driver familiarity, time steps, speed memory, allowing heavy vehicles to use all lanes, and matrix tuning.* • *For VISSIM, examples of core simulation parameters to review include Driving Behaviors, Simulation Resolution, and Speed Distributions.*	

Traffic/Global

As a whole, core simulation parameters are:	Observations/Comments:	Analyst Response

☐ ☐ ☒ Acceptable
 ☒ ☒ ☐ Conditionally Acceptable
 	
 ☐ ☒ ☐ Unacceptable
	1st Review
	 Driver behaviors are defaults.
	
	 Desired speed distributions - not hugely impactful to the mainline results but:
	 - consider using something other than the 60 km/hr default for the 35 MPH speed limit - maybe 32 to 42? Right now it doesn't actually contain the speed limit itself.
	 - it looks like STH 15 is posted at 45 MPH in the vicinity of the interchange. Use a different speed distribution (42 to 52?) there unless speeds are truly in the 52-55 range. The 70 km/hr default is used at WIS 55, which is also posted at 45 (unless the speed changed with the RABs, which it shouldn't have). Be consistent for the same speeds (unless field data dictates otherwise)
	 - the 85 km/hr is too low and narrow for 55 MPH speed limits. Consider using 52 to 62.
	 - WIS 441 is posted at 65 MPH - use a lower speed distribution accordingly?
	 - for reduced speed areas on long, tight ramps, document why the selected distribution is used
		1st Review
		 Additional driver behaviors have been added, for segment types. Behaviors will continue to be added and refined as needed for calibration.
		 Desired speed distributions were updated.
		  - 55 km/hr (35 mph) range was coded as 32 to 42 mph
		  - 60 km/hr (40 mph) range was coded as 38 to 48 mph.
		  - 70 km/hr (45 mph) range was coded as 43 to 53 mph.
		  - 80 km/hr (50 mph) range was coded as 48 to 58 mph.
		  - 85 km/hr (55 mph) range was coded as 52 to 62 mph.
		 STH 15 is posted at 50 mph west of the interchange and at 45 mph east of the interchange (see attached Google StreetView images below). The model includes WIS 15 coded at 80 km/hr (50 mph) west of the interchange and at 70 km/hr (45 mph) east of the interchange to match the posted speed limit signs.
		 WIS 441 was coded as 105 km/hr (65 mph). Its range was coded as 62 to 72 mph.
		  Reduced speed for long, tight ramps at 441 interchange were estimated to account for the curvature.

Extent of Revisions Required: ☐ ☐ ☒ No Revisions Required ☒ ☒ ☐ Minor Revisions Required ☐ ☐ ☐ Moderate Revisions Required	**2nd Review** ***Significant calibration was completed, with multiple distinct driver behaviors developed across the models. The waiting time before diffusion seems like it could have been set to the recommended value without issue, but 360 is acceptable. The adjustments to the safety distance reduction are logical. The general rationale seems acceptable for the changes to the maximum speed difference for the weave and merge driver behaviors, but the adjustments may be necessary due to the results of coding the merges as a full lane to where it is 6' wide (as recommended) - it is possible that these areas can be recalibrated with the changes to the merge coding. The same logic applies for the headway adjustments - it is possible that these can be reduced given the revised coding.*** **3rd Review**	**2nd Review** ***After updating the merge and diverge coding, driver behavior adjustments were switched back to default levels to test whether or not they were still needed for calibration purposes. It was determined that most of the driver behavior attributes could be kept at default levels because of the impact of the updated merge and diverge coding. However, driver behavior headways were increased from the 0.9s default to 1.0s for freeways, to 1.3s for merge/diverge/weave segments, and to 1.1s for the I-41 SB CTH E/441 area to decrease corridor speeds towards the goal of achieving better calibration with observed speed and travel time. In addition, all merge segments included an adjustment of the safety distance reduction factor from 0.60 to 0.40 and an adjustment of the maximum speed difference (mph) from 6.71 to 8.71 to aid merging movements.*** **3rd Review**

☐ ☐ ☐ Major Revisions Required	The revised merge/diverge coding resulted in less significant parameter adjustment being needed. Everything looks good - especially headways.	

Routing Parameters/ Vehicle Routes	*Routing parameters or vehicle routes influence the way vehicles travel through the network. If coded improperly, these controls can cause unrealistic or erratic routing.* • *This feature is* **not** *applicable for SimTraffic. However, interaction between intersections can be checked as noted with the Link O-D feature in the O-D Matrices, Demand Profiles, & Time Periods section.* • *For Paramics, routing parameters (such as cost factors, turn penalties, modification of the link type hierarchy, and waypoints) override the default routing behavior and profoundly influence the route choice in the network. They are occasionally used to increase or decrease the traffic volume on specific links.* • *For VISSIM, vehicle routes and vehicle routing decisions control the flow of traffic from the entrance points through the network. They can be coded using either actual vehicle flows or percentages.*

As a whole, traffic routing parameters are:	**Observations/Comments:**	**Analyst Response**
☒ ☒ ☒ Acceptable ☐ ☐ ☐ Conditionally Acceptable ☐ ☐ ☐ Unacceptable Extent of Revisions Required: ☐ ☒ ☒ No Revisions Required ☒ ☐ ☐ Minor Revisions Required ☐ ☐ ☐ Moderate Revisions Required ☐ ☐ ☐ Major Revisions Required	1ˢᵗ Review Vehicle routing is currently a placeholder. Make sure the routing is frozen upon submittal with real volumes. 2ⁿᵈ Review ***Routing is acceptable.*** 3ʳᵈ Review	1ˢᵗ Review The routing has been frozen. 2ⁿᵈ Review 3ʳᵈ Review

Vehicle Types & Proportions	*The proportion of vehicles (such as trucks, buses, and High Occupancy Vehicles) influences the overall performance of each part of the network. Vehicle lengths (such as heavy truck lengths) should be reviewed.*

	As a whole, vehicle types & proportions are:	**Observations/Comments:**	**Analyst Response**
Traffic/Global	☐ ☒ ☒ Acceptable ☒ ☐ ☐ Conditionally Acceptable ☐ ☐ ☐ Unacceptable Extent of Revisions Required: ☐ ☒ ☒ No Revisions Required ☒ ☐ ☐ Minor Revisions Required ☐ ☐ ☐ Moderate Revisions Required ☐ ☐ ☐ Major Revisions Required	1ˢᵗ Review Vehicle proportions are currently a placeholder. Toyota Camry and Plymouth Voyager models not available. Recommend putting all vehicle models used in a separate folder alongside the model files and reference them from there. 2ⁿᵈ Review ***HV percentages are reasonable. Vehicle models are acceptable.*** 3ʳᵈ Review	1ˢᵗ Review A separate folder has been created alongside the VISSIM model that includes all of the vehicle models, including the Toyota Camry and Plymouth Voyager. The VISSIM model references the vehicle models in this separate folder. 2ⁿᵈ Review 3ʳᵈ Review

Stuck/Stalled Vehicles	This section should be used to note any problems with stuck or stalled vehicles (including intermittent problems). These are vehicles that unexpectedly slow or stop partway through their route (which can cause backups that do not exist in the field). • For Paramics, this section should also be used for comments on the use of blockage removal tools, if used. • For SimTraffic, this section should be used to comment on if short links may be resulting in stuck or stalled vehicles within the network.

As a whole, stuck/stalled vehicle occurrence is :	Observations/Comments:	Analyst Response
⊠ ⊠ ⊠ Acceptable ☐ ☐ ☐ Conditionally Acceptable ☐ ☐ ☐ Unacceptable Extent of Revisions Required: ⊠ ⊠ ⊠ No Revisions Required ☐ ☐ ☐ Minor Revisions Required ☐ ☐ ☐ Moderate Revisions Required ☐ ☐ ☐ Major Revisions Required	1st Review None observed. 2nd Review ***None observed that are not anticipated to be addressed.*** 3rd Review	1st Review 2nd Review 3rd Review

Special Features	Special features include site- or study-specific items such as the use of detectors, car parks, variable message signs, special purpose lanes, speed harmonization, public transit routes, toll lanes, toll plazas, pedestrian modeling, special graphics, Application Programming Interfaces (APIs), etc • At present, SimTraffic will not model bus stops, bus routes, bus and carpool lanes, light rail, on-street parking, or short term event; thus, the use of special features is typically not applicable in SimTraffic.

As a whole, use of special features is :	Observations/Comments:	Analyst Response
⊠ ⊠ ⊠ Acceptable ☐ ☐ ☐ Conditionally Acceptable ☐ ☐ ☐ Unacceptable Extent of Revisions Required: ⊠ ⊠ ⊠ No Revisions Required ☐ ☐ ☐ Minor Revisions Required ☐ ☐ ☐ Moderate Revisions Required ☐ ☐ ☐ Major Revisions Required	1st Review None used. 2nd Review ***None used.*** 3rd Review	1st Review 2nd Review 3rd Review

	Consistency with Related Traffic Models	Modeling studies often involve a series of related models (base model, future no-build, and build alternatives, different times of day, etc.). To assure the integrity of the study as a whole, these models must be consistent.
Traffic/Global	As a whole, model consistency is :	Observations/Comments:	Analyst Response
	⊠ ⊠ ⊠ Acceptable ☐ ☐ ☐ Conditionally Acceptable ☐ ☐ ☐ Unacceptable Extent of Revisions Required: ⊠ ⊠ ⊠ No Revisions Required ☐ ☐ ☐ Minor Revisions Required ☐ ☐ ☐ Moderate Revisions Required	1st Review AM and PM models are consistent in coding. 2nd Review ***Consistency in coding as expected - some differences in driving behavior currently due to calibration, but this may go away with revised coding.*** 3rd Review	1st Review 2nd Review 3rd Review

			Major Revisions Required		

Calibration/Validation			*Calibration refers to the process where the analyst adjusts selected parameters within the traffic model (e.g., global and local headway and reaction times, driver aggressiveness, etc.) in order to get the traffic model to reproduce conditions observed in the field. Validation refers to the process where the analyst checks the traffic model outputs against field measured data including traffic volumes, travel speeds, travel times, intersection queuing and trip-making patterns (e.g., weaving volumes). The reviewer should spot-check the traffic model outputs and compare them to the results documented in the calibration/validation report. If the reviewer cannot produce similar outputs, it may indicate an issue with the traffic model's calibration.*		

Calibration/Validation/Documentation (sidebar label)

As a whole, model calibration is :	**Observations/Comments:**	**Analyst Response**
☒ ☐ ☐ Acceptable ☐ ☒ ☒ Conditionally Acceptable ☐ ☐ ☐ Unacceptable Extent of Revisions Required: ☒ ☐ ☒ No Revisions Required ☐ ☒ ☐ Minor Revisions Required ☐ ☐ ☐ Moderate Revisions Required ☐ ☐ ☐ Major Revisions Required	1st Review Volumes are placeholders. Consider the need for any calibration against any secondary MOEs. 2nd Review ***See discussion above. Validation acceptable, but amount of calibration should be reduced if revised coding reduces unrealistic behavior, especially at merges.*** 3rd Review Calibration and validation are acceptable. As a note, the Diverge driving behavior appears to be the same as the Weave driving behavior, and the Freeway (441) and Freeway (E) behaviors are also now the same. Theoretically these could be renamed and combined? One item to note is that, in the PM, the NB off-ramp to CTH N/Freedom Road likes to back up in the second half of the analysis hour. Specifically, the left turn lane gets enough of a queue that it means both LTs and RTs get stuck. Just noting this, as it was observed.	1st Review Lane utilization will be incorporated for calibration as a secondary MOE. 2nd Review ***Calibration was improved with the updated merge and diverge coding even with removing most of the driving behavior adjustments.*** 3rd Review

Documentation	*Proper documentation of modeling methods and assumptions establishes accountability and facilitates efficient revision, updating, and follow-up. Review team should verify that proper documentation has been provided.*	

As a whole, model documentation is :	**Observations/Comments:**	**Analyst Response**
☐ ☒ ☒ Acceptable ☒ ☐ ☐ Conditionally Acceptable ☐ ☐ ☐ Unacceptable Extent of Revisions Required: ☐ ☒ ☒ No Revisions Required ☒ ☐ ☐ Minor Revisions Required ☐ ☐ ☐ Moderate Revisions Required ☐ ☐ ☐ Major Revisions Required	1st Review Calculate RMSPE by direction for each run for each 15 minute period (TEOpS 16-20-8.3.1, 8.3.2, 8.3.3). Make sure to provide documentation of any adjustments to model parameters or other decisions made in the course of calibrating the models. 2nd Review ***Documentation is acceptable for the models.*** 3rd Review	1st Review RMSPE will be calculated for each run for each 15 minute period. 2nd Review 3rd Review

MICROSIMULATION PEER REVIEW REPORT *(continued)*

Wisconsin Department of Transportation   DT2291

SUMMARY OF REVIEW

Overall Traffic Model	As a whole, the traffic model is :	Summary of the review team's findings and recommendations
	☐ ☐ ☒ Acceptable ☐ ☒ ☐ Conditionally Acceptable ☒ ☐ ☐ Unacceptable Extent of Revisions Required: ☐ ☐ ☒ No Revisions Required ☐ ☒ ☐ Minor Revisions Required ☒ ☐ ☐ Moderate Revisions Required ☐ ☐ ☐ Major Revisions Required	1st Review Some changes needed to the geometry and other areas of the models. The most impactful to mainline model results is how the merge and diverge segments are modeled. 2nd Review ***Overall, the models are looking good. Some adjustments to merge and diverge coding are needed, as well as some tweaks to the signals and elsewhere, but overall they are close.*** 3rd Review The models reasonably replicate current operations in the corridor and are acceptable. There are a couple of things that could/should be adjusted, but they are not critical.

REVIEWER'S CONCULSION (Check One)

☐ ☐ ☒   *It is the opinion of the review team that the model as reviewed and tested is an accurate and reasonable representation of the traffic conditions in the study area for the analysis year, time period, and scenario/alternative indicated in the title block of this document.*

☒ ☒ ☐   *It is the opinion of the review team that the model as reviewed and tested requires correction of* <u>several smaller</u> *errors before it can be regarded as a reasonable representation of the traffic conditions in the study area for the analysis year, time period, and scenario/alternative indicated in the title block of this document. (Indicate number and severity of errors: Minor, Moderate, or Major).*

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