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MEMORANDUM

DATE: January 6, 2021
TO: Maggie Bergeron
CC: Julie Fulgham, Jay Keen
FROM: Jim Harvey, Peter Barrilleaux
RE: Victoria TMP – Future Conditions Analysis

Introduction

The following memorandum details the methods and findings from the Victoria Thoroughfare Master Plan (TMP) future conditions analysis. The project team used the Victoria Travel Demand Model (TDM) to perform a deficiencies analysis of the Victoria roadway system using an updated Existing plus Committed (E+C) network. Network outputs are based on the 2045 (future growth) demographic scenario. The analysis demonstrates the anticipated performance of the transportation system in 2045 under a no-action scenario. This scenario is intended to serve as a baseline for comparison of transportation system performance between the existing thoroughfare system and the alignments and roadway cross-section recommendations provided in the latter stages of the TMP.

Methods

The future conditions analysis is based on traffic forecasts provided by the TDM. The metrics provided by the TDM can be used to calculate various measures of congestion, travel demand, and travel behavior that inform the evaluation of potential deficiencies on the roadway network.

The 2045 TDM results show where congestion is expected to exist in the future along the E+C roadway network assuming no roadway improvements are made by 2045. The 2045 TDM results are also used in analyzing the potential impacts of future transportation improvements through scenario analysis and the comparison of performance measures over time.

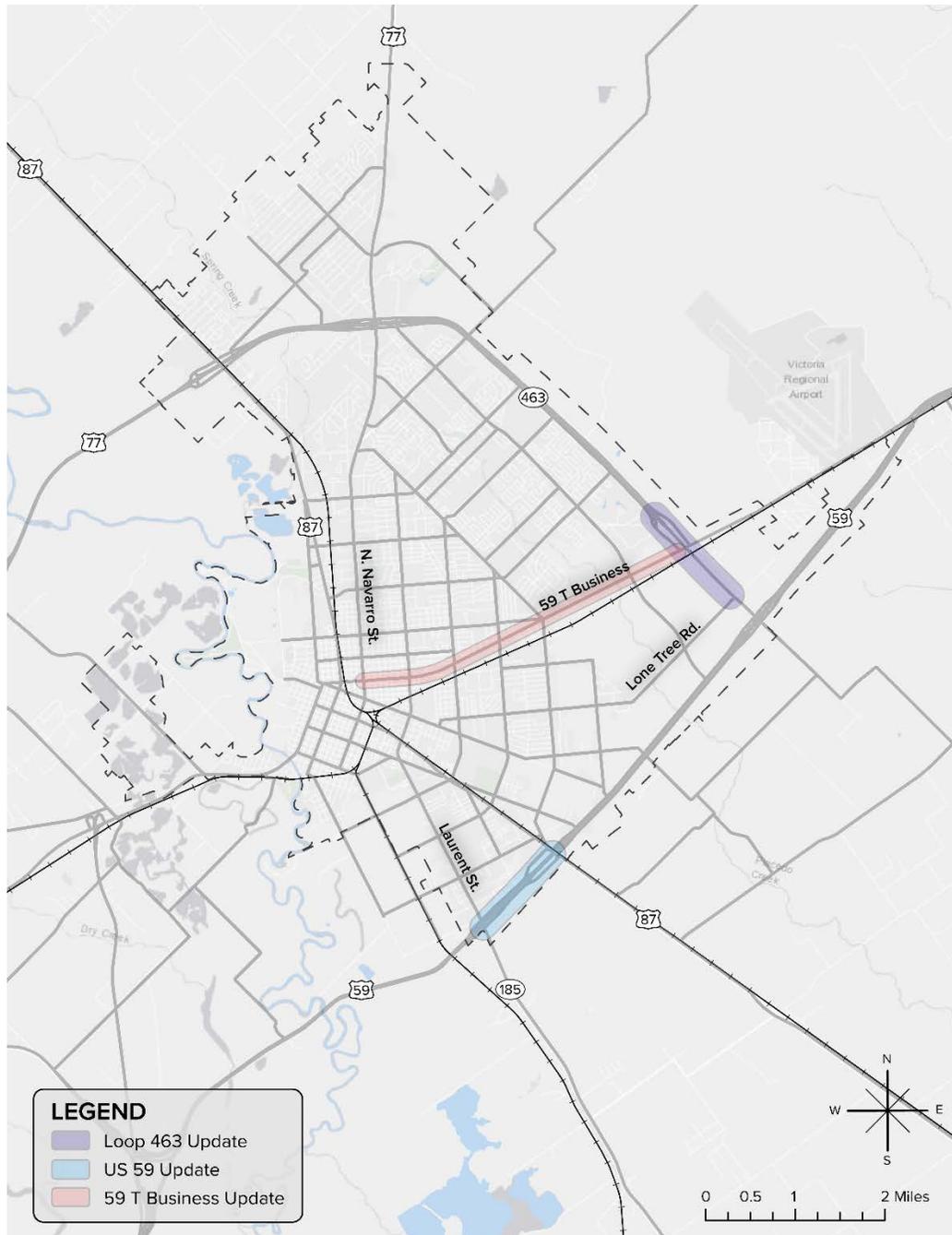
These E+C projects are currently programmed projects or projects with enough investment in planning or design to reasonably expect that they will be constructed within the next few years. Running the model with only E+C projects is an exercise to illuminate where major operational deficiencies could arise with no additional improvements and allows us to measure the benefits of projects proposed for implementation through the TMP process.

To ensure the most accurate roadway network, the project team updated the 2018 E+C network used for the Victoria 2045 Metropolitan Transportation Plan conducted in 2019 by adjusting segment attributes to reflect projects currently underway or programmed to be constructed in the short-term future. Network updates are listed in **Table 1** and displayed in **Figure 1** below.

Table 1: E+C Network Updates

Roadway	From	To	Attribute Edits
Loop 463	1.3 mi N. of BU 59T	Lone Tree Rd.	Increase to 4 lanes, update ramps
US 59	SH 185/Laurent St.	US 87/Port Lavaca Dr.	Reverse ramps, add turnarounds
BU 59T	N. Navarro St.	Zac Lentz Pkwy.	Add Median

Figure 1: E+C Network Updates



TDM Outputs

Travel demand forecasting quantifies the existing and future interaction between supply and demand on the transportation system. The supply of transportation is represented by the characteristics of the roadway network (e.g., roadway classification, roadway capacity, etc.), while the demand for transportation is created by the separation and intensity of urban activities. The service characteristics of the roadway and land use forecasts are direct inputs to the TDM.

The TDM output produces a defined roadway network for the Victoria area with reported congestion measures that help quantify system deficiencies at the segment and regional level to gain full perspective of the existing roadway system's performance. Measures used in this analysis are defined as follows:

- *Vehicle Miles Traveled (VMT)* – The amount of cumulative roadway miles traveled by vehicles within a specified segment.
 - This measure provides a sense of the overall level of vehicular traffic in the region and on individual roadways.
- *Vehicle Hours Traveled (VHT)* – Cumulative travel time (in hours) of all vehicles traveling within a specified segment.
 - This measure provides insight into the quality of service that the region's roadways provide, and feeds into other delay measures.
- *Vehicle Hours of Delay* – This represents excess hours spent in traffic due to congestion on the roadway network.
 - This measure indicates the amount of extra time it takes travelers to reach their destination under congested conditions compared to how long it would take under free-flow conditions.
- *Travel Time Index (TTI)* – The ratio of a) travel time during peak travel periods (congested time) to b) the time required to make the same trip at free-flow speeds.
 - For example, a TTI of 1.2 indicates that a 10-minute free flow trip would take 12 minutes during peak congestion times.¹

These measures were quantified to visualize updated forecast year outputs for a no-action scenario, creating a baseline condition to compare to TMP scenarios.

Segment level analysis was also conducted to visualize congestion level-of-service (LOS) on the Victoria roadway network. LOS is an indicator of congestion on a scale from A to F, where A represents free flow traffic and F represents severe congestion. LOS was derived from Victoria TDM volume to capacity (V/C) ratios. The following ranges were used to generate roadway segment LOS values, and are based on TxDOT's Transportation Planning and Programming (TPP) division resources:

- LOS A: Less than 0.33
- LOS B: 0.33 to 0.55
- LOS C: 0.55 to 0.75
- LOS D: 0.75 to 0.90
- LOS E: 0.90 to 1.00
- LOS F: Greater than 1.00

The Victoria TDM reports LOS on each network link for a typical weekday.

¹ Source: <https://www.bts.dot.gov/bts/bts/content/travel-time-index>

Future Deficiencies & Regional Roadway System Performance

Figure 2 and **Figure 3** display 2045 congestion levels based on the updated E+C network, represented by LOS. Roadway segments displayed by shades of red (LOS E and F) represent areas forecast to experience severe congestion by 2045. These areas of severe congestion represent roughly 2% of the entire roadway network.

These figures indicate high levels of congestion projected along highways and thoroughfares extending from the City of Victoria and connecting with outlying destinations, such as Nursery to the north and McFaddin to the southwest. Congestion is also projected to increase along arterial roadways in and near the City of Victoria. The most noticeable congestion is estimated to occur along the roadway segments listed in **Table 2**.

Table 2: Regional Congestion Segments

Roadway	From	To
US 77	US 59 Junction	SH 239
Nursery Dr.	Cottonwood Dr.	US 77
US 77	FM 236	Bob White Dr.
FM 236	Weber Rd.	US 77
US 59 (Houston Hwy)	Loop 463	Midway Rd. N.
N. Moody St./E. Rio Grande St.	W. Goodwin Ave.	N. Main St.
N. Navarro St.	E. Colorado St.	E. Larkspur St.
Sam Houston Dr.	Evergreen Ln.	N. Ben Wilson St.
S. Moody St.	Wolfram St.	W. Water St.
US 87	Mockingbird Ln.	US 77

Figure 2: Victoria MAB Roadway Congestion - 2045 LOS

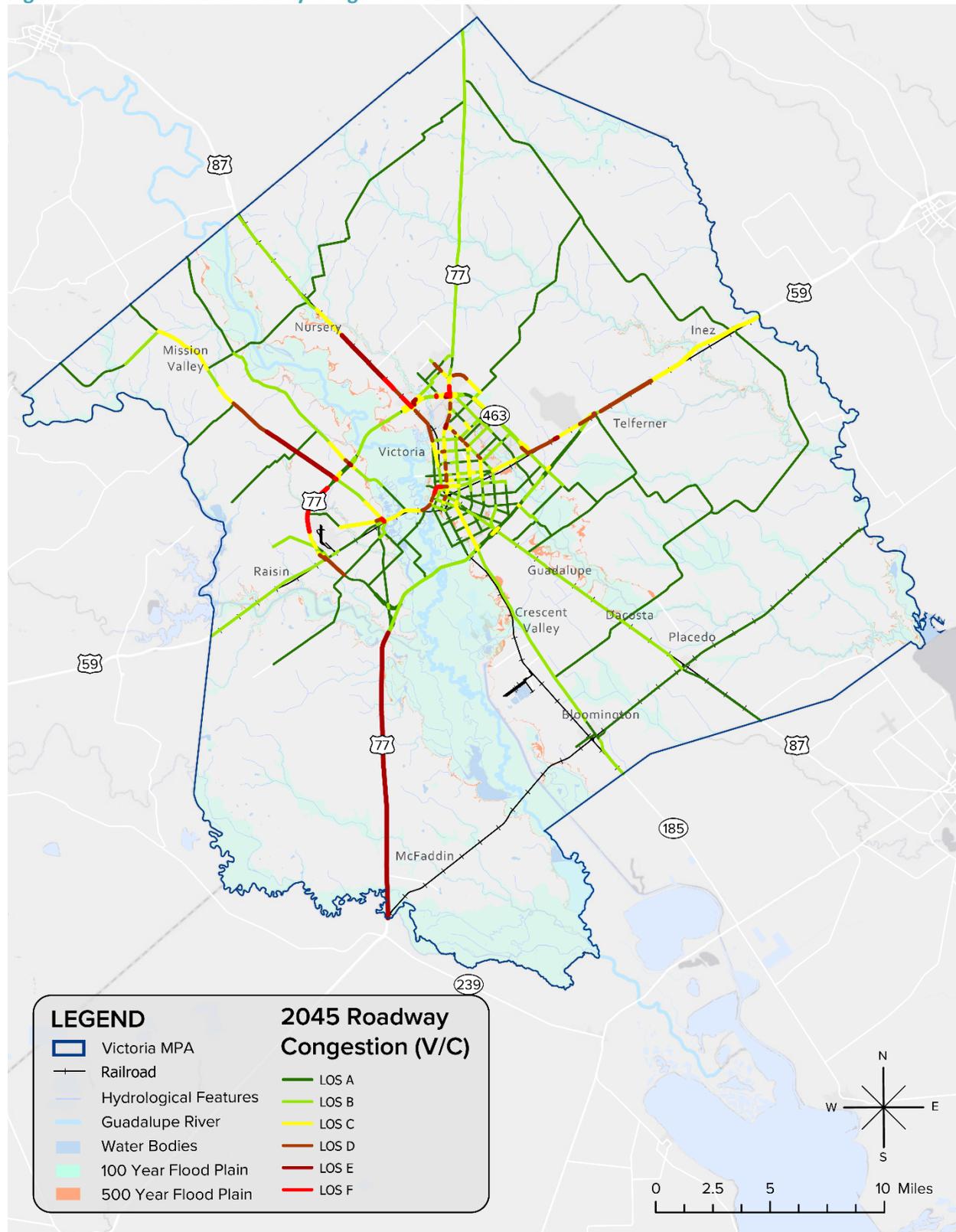


Figure 3: City of Victoria Congestion - 2045 LOS

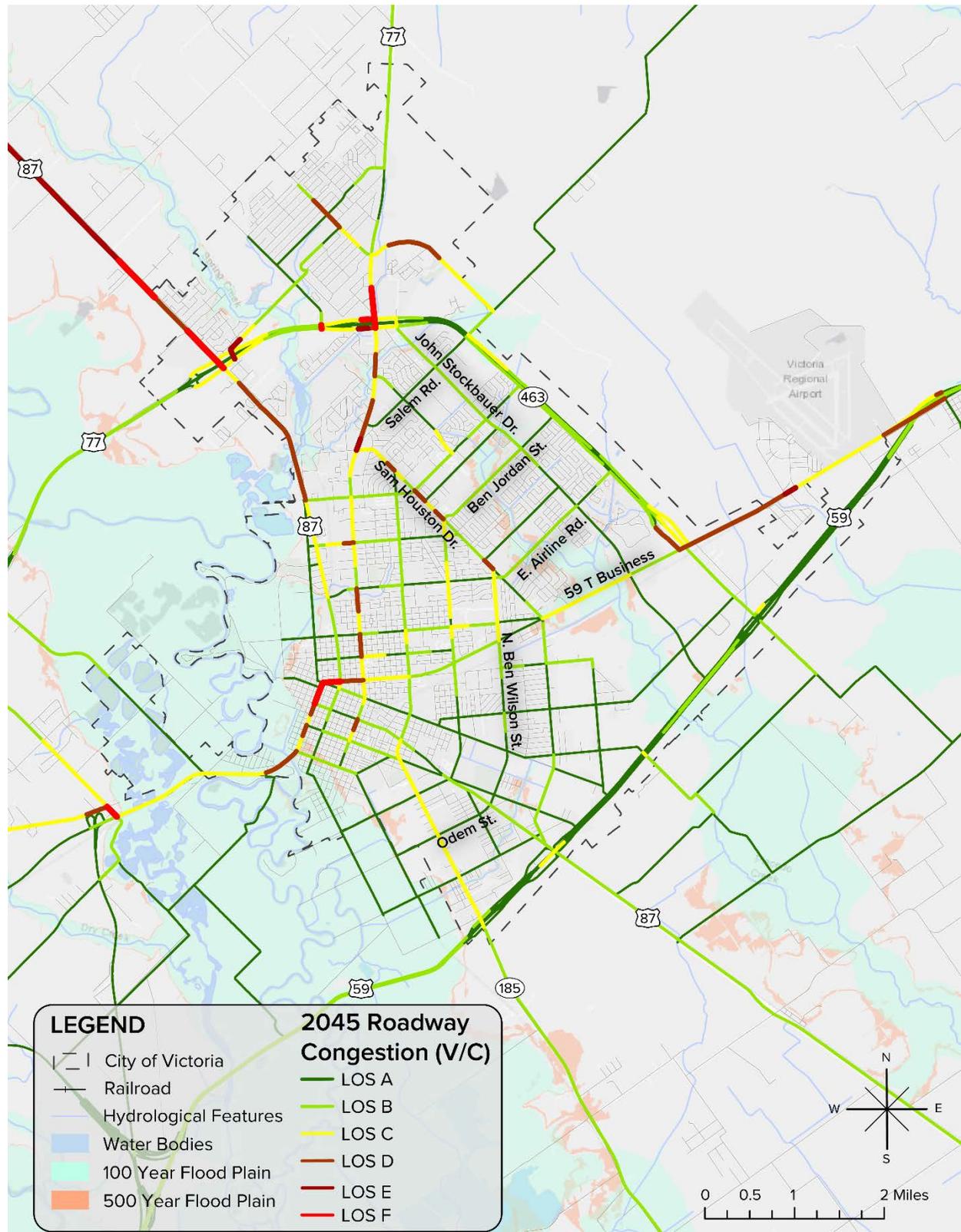


Table 3 presents a comparison of regional performance measures between the updated 2045 no-action scenario and the 2012 existing conditions scenario derived from the Metropolitan Transportation Plan needs analysis. This table quantifies the anticipated changes in traffic and congestion over time in the Victoria Metropolitan Area Boundary (MAB), and provides a baseline for evaluating other TDM scenarios that reflect the addition of transportation projects recommended in the Victoria TMP.

Table 3: Regional Traffic & Congestion Performance Measures; 2012 & 2045

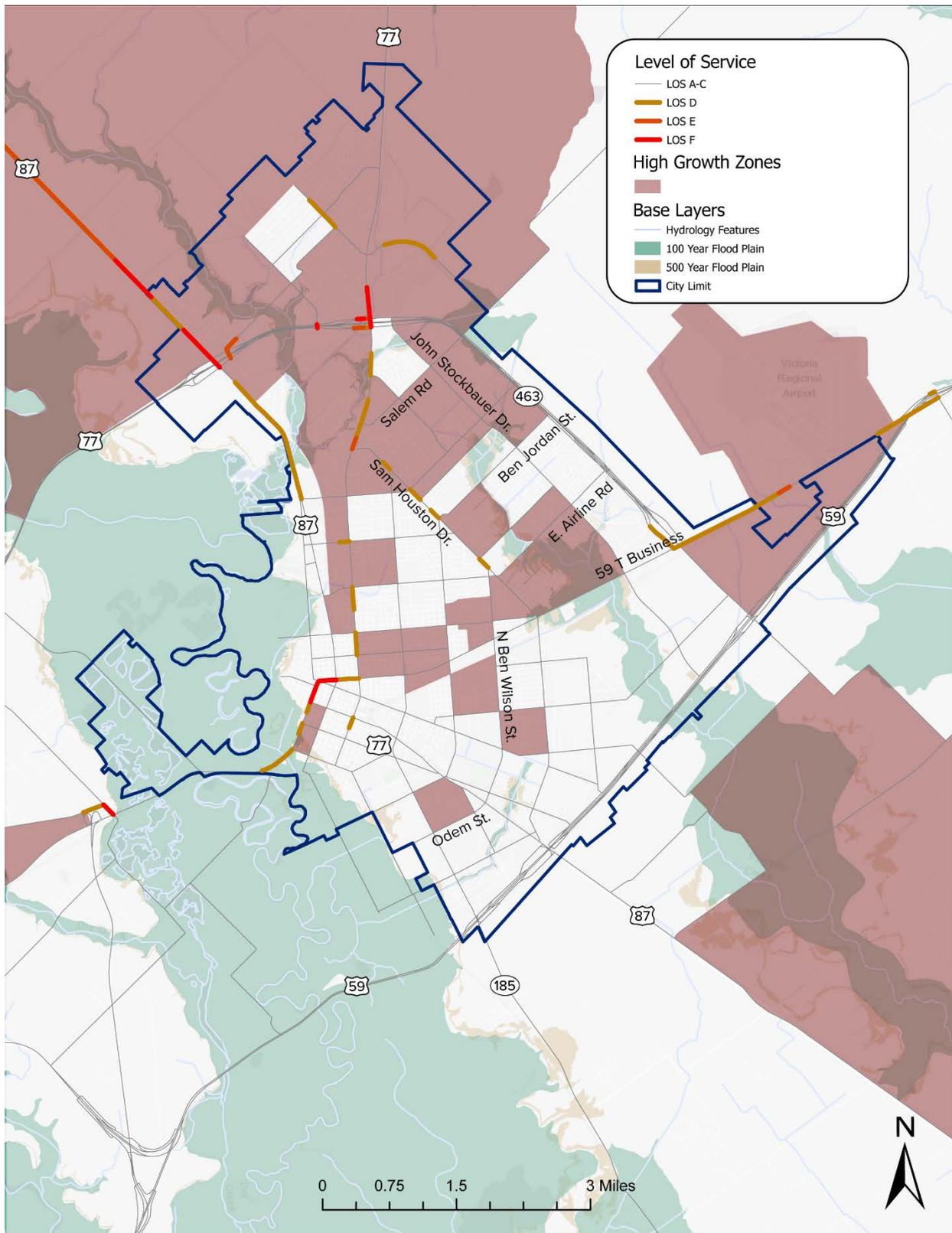
	2012 – Existing Conditions			2045 – Future No-Build			% Change for Totals
	<i>Interstate</i>	<i>Arterials</i>	<i>Total</i>	<i>Interstate</i>	<i>Arterials</i>	<i>Total</i>	
Daily VMT	713,209	1,766,448	2,479,657	734,377	2,196,354	2,930,730	18%
Daily VHT	13,029	48,062	61,091	12,958	61,079	74,037	21%
Annual Weekday Vehicle Hours of Delay	105,935	230,575	336,510	99,880	655,880	755,760	125%
Weighted Avg. TTI	1.03	1.02	1.02	1.02	0.85	1.04	2%

Regional performance measures for the updated 2045 no-action scenario (**Table 3**) are nearly identical to similar measures resultant from the Metropolitan Transportation Plan needs assessment. Accordingly, results show that the 2045 no-action transportation system is expected to experience increases for all traffic and congestion measures if no future improvements are made to the Victoria roadway system. The most substantial increase is estimated for annual weekday vehicle hours of delay (125% increase). These measures will help inform TMP recommendations moving forward in the planning process; potential recommendations and ensuing model runs will show the extent of relief additional throughfares/improvements to existing throughfares may have on network deficiencies.

Figure 4 similarly uses the updated 2045 E+C no-build model run. However, this figure only displays roadway segments with projected LOS D – F to highlight areas projected to experience severe congestion. These segments were then overlaid with high employment and population growth zones (TAZs with highest growth from 2012 to 2045) to show the relationship between land use and transportation and to illustrate where there may be potential gaps in the Victoria roadway network.

Accordingly, the TMP process will consider alignments and recommendations that will help improve regional traffic and congestion performance measures, as well as remedy roadway segments projected to experience severe congestion and/or in close proximity to high growth employment and population areas.

Figure 4: Victoria Roadway Congestion & Projected Population/Employment Growth - 2045



Key Takeaways

Key takeaways from the Victoria TMP future conditions analysis are summarized below:

- The project team updated the 2018 E+C network used in the Victoria MTP. Three roadways were edited to provide the most up-to-date roadway network to run a 2045 future growth scenario.
- Several roadway segments are projected to experience severe congestion by 2045, occurring throughout the City/MAB. These roadways will represent areas of focus in the TMP process.
- Updated 2018 E+C regional traffic and congestion performance measures are consistent with and confirm the results obtained from the previous analysis conducted during the Metropolitan Transportation Plan. All measures show increases over the forecast horizon; these measures will be used as a baseline for evaluating TMP scenarios.
- Segments with LOS values of D through F were identified and mapped; these represent roadways projected to experience or be on the verge of severe congestion. The identified roadway segments were overlaid with high growth employment and population zones. Roadways with identified poor LOS and those near high growth zones will be used to inform the upcoming gaps analysis and recommendations sub-tasks.



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RE: Victoria TMP Gap Analysis Memorandum

Introduction

The project team performed a gap analysis based on results from the Task 1 Needs Assessment to identify deficiencies in the Victoria thoroughfare network. The identification of deficient areas, or gaps in the thoroughfare network, generated suggestions for additions and modifications to the network that will ultimately inform the development of the conceptual thoroughfare network. Stakeholder and public engagement feedback will be considered concurrently when developing the conceptual network. The following sections detail the methods and key findings from the gap analysis.

Methods

Two types of transportation system modeling were used to conduct the gap analysis – forecasting traffic demand using the Victoria MPO Travel Demand Model (TDM) and projecting traffic conditions using TransModeler.

Travel Demand Model

The existing plus committed (E+C) roadway network, updated to include committed projects as of 2020, was used to run a no-build future growth scenario (2045) to evaluate the level of service (LOS) and mobility improvements achieved by the existing thoroughfare network. Serving as the first step in identifying gaps in the thoroughfare network, the TDM output provided a high-level snapshot of future demand in Victoria assuming no network improvements were made beyond the projects coded in the E+C network. This allowed the project team to identify general areas of concern and helped inform the TransModeler analysis.

Please refer to the Future Conditions Analysis memorandum for detailed information on the TDM modeling process and findings.

TransModeler

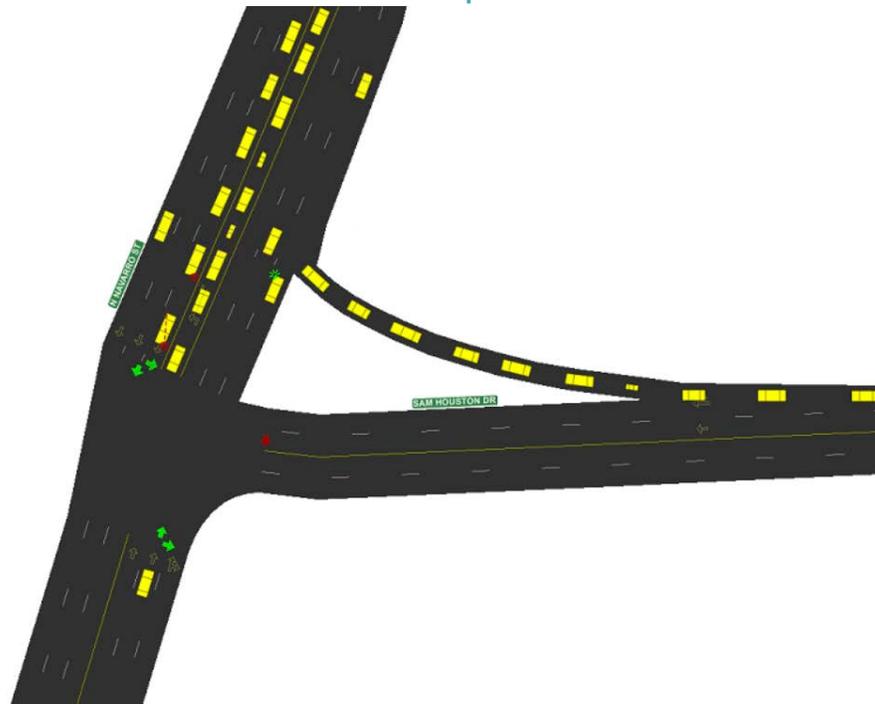
TransModeler is a traffic simulation package suitable for all network sizes that simulates car, truck, and transit traffic patterns. The package integrated seamlessly with TransCAD and GIS software to visualize and evaluate the benefits of future transportation scenarios.

The gap analysis of the Victoria roadway network using TransModeler was based on a thorough analysis of projected 2045 traffic on area roadways. The methods included:

- Acquired E+C roadway alignments and traffic analysis zones (TAZs) used in the Victoria MPO TDM.
- Developed a PM peak origin and destination (O-D) trip matrix using the TDM output. The O-D matrix determined total daily volumes and a K-factor representing local TxDOT permanent count station locations.¹
- Developed a simulation network of Victoria's transportation system using TransModeler Version 6.0™ in conjunction with the PM peak O-D trip matrix to model projected no-build (2045) traffic conditions on the roadway network.
- Analyzed future no-build (2045) conditions using TransModeler to compile roadway segment travel times and delay.
- Backchecked simulation network with TDM LOS results to verify the TransModeler simulation loaded vehicles onto the network appropriately.
- Reviewed projected roadway congestion and deficiencies by evaluating segment delay using 2010 Highway Capacity Manual (HCM) delay thresholds for LOS metrics.

Figure 1 illustrates an example of an intersection, Sam Houston Dr and Navarro St, with a congested southbound approach simulated in TransModeler.

Figure 1: TransModeler Intersection Simulation Example – Sam Houston Dr & Navarro St



Identification of Gaps

Outputs displaying failing or deficient segments were considered gaps for this analysis. Accordingly, TDM segments displaying continuous or intermittent failing LOS grades (D - F) and TransModeler segments flagged as high delay were recorded as gaps in the Victoria roadway network.

¹ The O-D trip matrix used TAZ centroids to define its origin and destinations. These O-D trips were loaded onto the network by centroid connectors, which link the centroid to the roadway segments. This was used to define access point for trips to and from the TAZ.

Key Findings

The following section details key findings from the dual modeling approach with the TDM and TransModeler results, highlighting gaps in Victoria’s thoroughfare network that will inform TMP alignment considerations. Tables and maps are provided to detail segment limits, reasons for failures, and to visualize where gaps are present. It must be noted that the “Segment Number” column provided in the tables is not representative of ranking but serves to help the reader match table information with the accompanying maps.

TDM Outputs

Table 1 displays roadway segments from the TDM analysis containing failing LOS grades (D - F). These segments represent potential gaps in the Victoria thoroughfare network and should inform alignment considerations (i.e., roadway modification, new alignments, etc.).

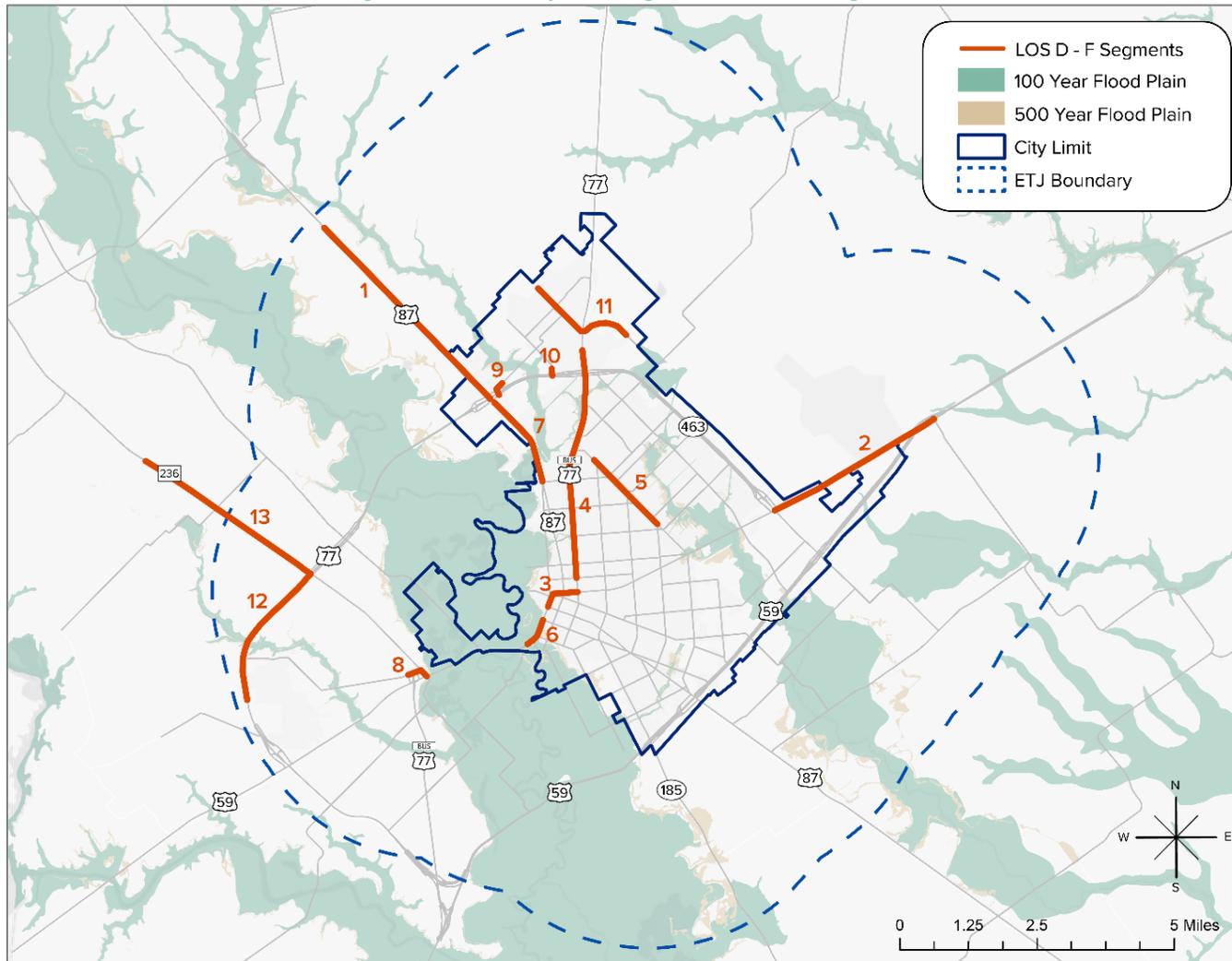
Table 1: TDM Outputs - Segments with Failing LOS

Roadway	Segment Number	From	To
US 87	1	Cottonwood Dr	US 77
US 59T*	2	Loop 463	Midway Rd N
N Moody St/E Rio Grande St (Five Points)	3	W Goodwin Ave	N Navarro St
N Navarro St*	4	E Colorado St	E Larkspur St
Sam Houston Dr*	5	Evergreen Ln	N Ben Wilson St
S Moody St	6	Wolfram St	E Juan Linn St
US 87	7	Mockingbird Ln	US 77
FM 236/Old Goliad Rd	8	US 59T	US 77 BUS Exit Ramp
Briggs Blvd	9	Woodway Dr	Zac Lentz Pkwy
Mallette Dr	10	Holy Family Catholic Church	Zac Lentz Pkwy
Glasgow St/Placido Benavides*	11	Bianchi Dr	Ethel Lee Tracy Park
US 77 (NW Zac Lentz Pkwy)	12	FM 236	Bob White Rd
FM 236	13	Weber Rd	US 77

*Represents segments with intermittent congestion

Figure 2 below provides a map of roadways with failing LOS labeled by their segment numbers for reference.

Figure 2: TDM Outputs - Segments with Failing LOS





TransModeler Outputs

Table 2 outlines the roadway segments with the highest delay as shown in TransModeler and compares this to whether the segment shows a passing (A - C) or failing (D - F) LOS grade in the TDM output. This allowed the project team to find any disparities between TDM and TransModeler outputs regarding network gaps to help further inform alignment considerations.

Roadway segments included in the table represent those that are anticipated to operate at a failing LOS in the no-build scenario (2045). Intersections observed in the simulation that potentially play a role in the anticipated congestion were noted as observed reasons for failure. It must be noted that the “TDM Results” column displays whether the segment had a passing or failing LOS output from the TDM analysis.

Many failing roadway segments are due to congestion at nearby interchanges and intersections and include the following:

- Zac Lentz Pkwy and US 77 N interchange,
- Zac Lentz Pkwy and US 87/Nursery Dr interchange,
- Zac Lentz Pkwy and N John Stockbauer Dr interchange,
- Miori Ln and Sam Houston Dr,
- Sam Houston Dr and Ben Jordan St,
- Zac Lentz Pkwy and Navarro St,
- Sam Houston Dr and Navarro St,
- Airline Rd and Sam Houston Dr,
- Zac Lentz Pkwy and US 59T, and
- Red River St and Sam Houston St.

This is reflective of heavy conflicting traffic flows entering and exiting the City’s urban core and downtown area. New or improved roadway alignments providing routes to and from the City center are expected to improve these future conditions. **Figure 3** displays gaps with segment numbers labeled for reference.

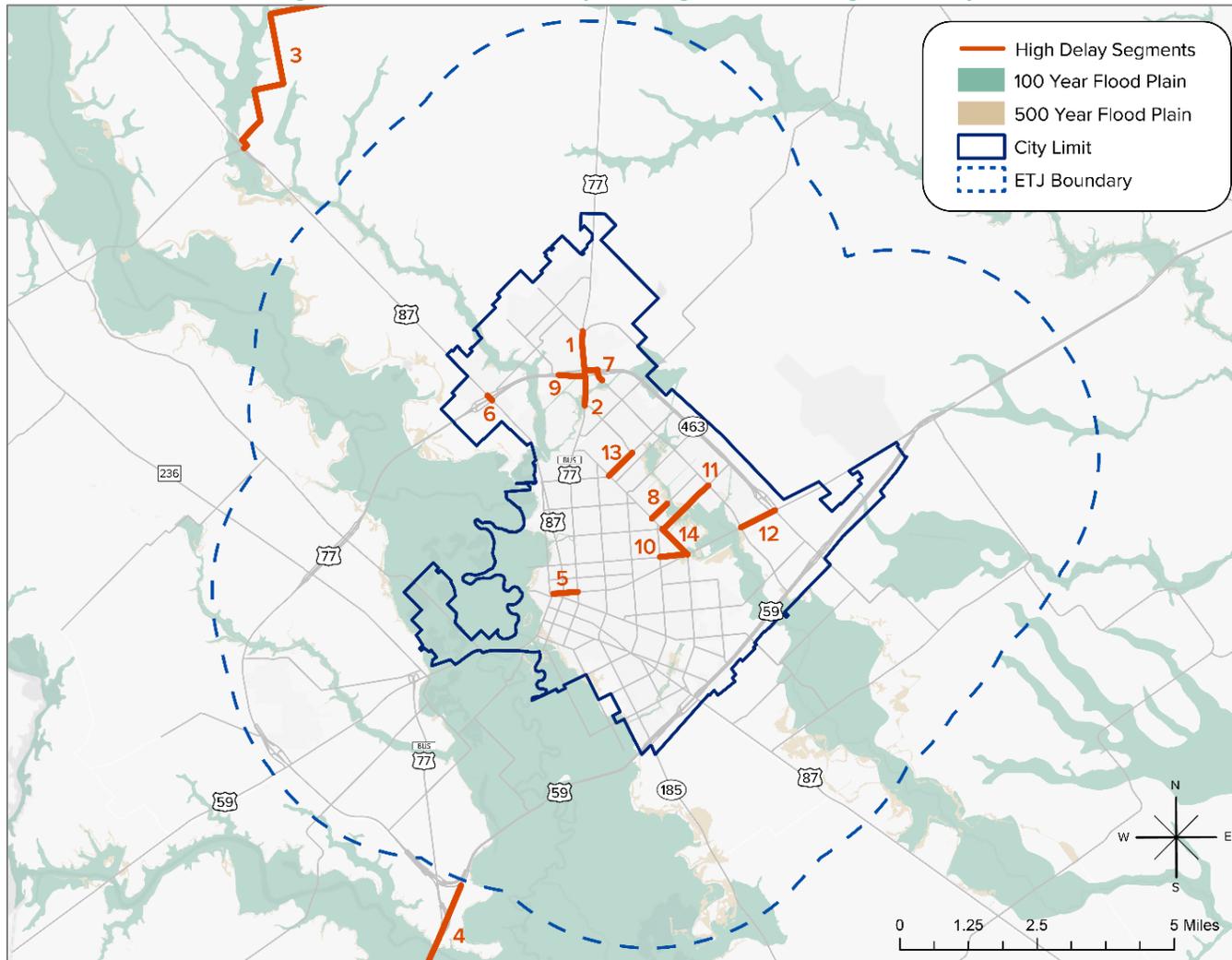
Table 2: TransModeler Outputs - Segments with Highest Delay

Roadway	Segment Number	Limits	TDM Results	Observed Reason for Failure
US 77 N	1	Glasgow St to Zac Lentz Pkwy	Passing *	Interchange at Zac Lentz Pkwy severely congested for the northbound, southbound, and eastbound approaches
Navarro St	2	N of Sam Houston Dr to Zac Lentz Pkwy	Failing	Heavy congestion caused by the intersection of Sam Houston Dr and Navarro St
Nursery Rd	3	NE of US 87 to W of US HWY 77	Failing	Potential alignment issues, recommended improvements will require additional verification once future models are developed
US 77 S	4	S of US 59 to end of network	Failing	Potential alignment issues, recommended improvements will require additional verification once future models are developed
E Rio Grande St	5	US 87/Main St to US 77/N Navarro St	Failing	Congestion along corridor, potential signal timing coordination could be recommended
US 87	6	Zac Lentz Pkwy NBFR to W of Zac Lentz Pkwy SBFR	Failing	Interchange at Zac Lentz Pkwy severely congested for northbound and southbound approaches
N John Stockbauer Dr	7	N Navarro St to Zac Lentz Pkwy	Passing	Interchange at Zac Lentz Pkwy severely congested for northbound and southbound approaches
Miori Ln	8	Sam Houston Dr to Stadium Dr	Passing	Severe congestion at intersection of Sam Houston Dr with Ben Jordan St.
Zac Lentz Pkwy	9	Off ramp leading up to Navarro St	Failing	Interchange at Zac Lentz Pkwy severely congested for the northbound, southbound, and eastbound approaches
Red River St	10	N Ben Wilson St to Sam Houston Dr	Passing	Severe congestion on minor street approach due to TWSC** and high volumes on major street approaches
E Airline Rd	11	Sam Houston Dr to John Stockbauer Dr	Passing *	Severe congestion at intersection with Sam Houston Dr
US 59T	12	John Stockbauer Dr to Zac Lentz Pkwy	Failing	Severe congestion at interchange with Zac Lentz Pkwy
E Mockingbird Ln	13	Sam Houston to Guy Grant Rd	Passing *	Severe congestion at intersection of John Stockbauer Dr and US 59T creating delay on E Mockingbird Ln
Sam Houston Dr	14	E Airline Rd to Houston Hwy	Passing	Potential alignment issues, recommended improvements will require additional verification once future models are developed

* TDM results show adjacent segments failing

**Two-Way Stop Control

Figure 3: TransModeler Outputs - Segments with Highest Delay

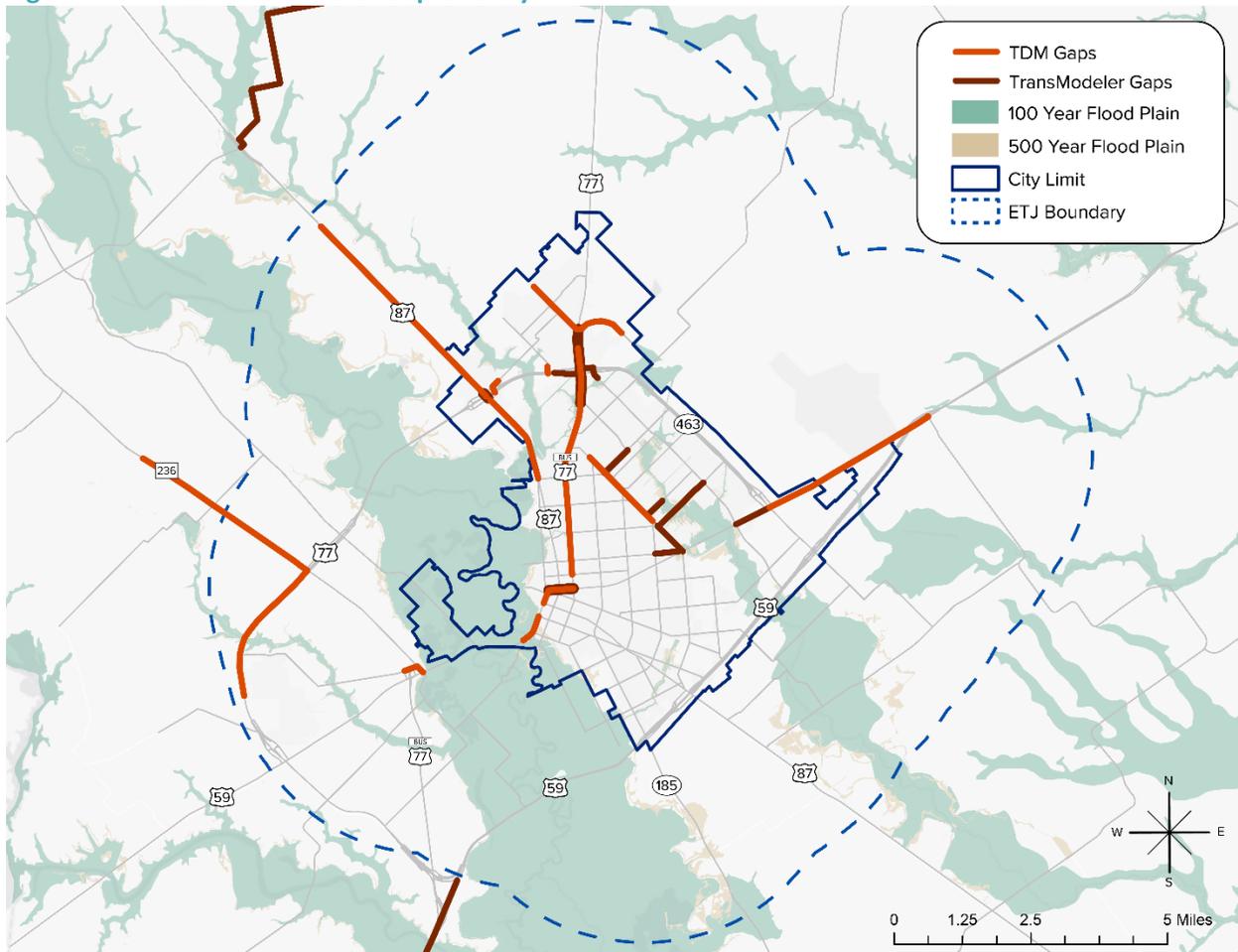


TDM & TransModeler Gap Overlay

Figure 4 displays an overlay of network gaps determined by TDM and TransModeler outputs. While disparities in gap locations exist between the models, several roadway segments are shown as gaps by both outputs (e.g., Navarro St, US 59T, and US 87). The overlay also displays network gaps from both models adjacent to one another (e.g., Sam Houston Dr and Mockingbird Ln).

Roadway segments shown as gaps from both modeling efforts should be strongly considered during TMP alignment selection. Areas where adjacent gaps occur suggest potential spillover traffic from major thoroughfares as well as issues with street design and signalization. These areas should also be considered due to the potential interrelatedness of their failing conditions.

Figure 4: TDM & TransModeler Gap Overlay



Conclusion & Next Steps

The Victoria TMP gap analysis used two levels of transportation system modeling to identify deficiencies in the thoroughfare network. Analysis of the Victoria MPO TDM provided a high-level look at potential deficiencies based on LOS measures. The TDM network was then used as an input for the TransModeler traffic simulation which produced a more defined look at deficiencies within the network based on traffic delay. Between the two modeling efforts, the following key findings were obtained:

- Model outputs display overlap in network gaps, specifically along major corridors (e.g., Navarro, Sam Houston Dr, US 59T) and intersections (e.g., Zac Lentz/US 87, Zac Lentz/Navarro, Five Points).
- Disparities in identified gaps between model outputs display deficiencies in areas adjacent to one another. For example, TDM outputs display failing segments along Sam Houston Dr while TransModeler outputs display gaps along minor arterials feeding into Sam Houston Dr (e.g., Airline Rd, Mockingbird Ln, Red River St). This suggests potential spillover traffic from major thoroughfares as well as issues with street design and signalization.
- Gaps identified by both models tend to be located near established commercial and residential developments, or near developable land/zones categorized as high growth areas.

Gap analysis findings should serve as a base for discussion between the project team, city leadership, and planning partners to inform alignment considerations. Further to this, the technical findings obtained from this analysis should be used concurrently with the technical results of the needs analysis and qualitative findings from public involvement events (e.g., stakeholder meetings, visioning, technical committee meetings) to finalize additions and modifications to the Victoria thoroughfare network.