

Technical Memorandum

To: Jerome Adams, MnDOT

From: Andi Moffatt, WSB
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Date: January 3, 2019

Re: Purpose and Need
I-94 UBOL Resurfacing Maple Grove to Rogers and Brockton Interchange
S.P. 2780-97 (I-94 Resurfacing)
S.P. 229-010-001 (Brockton Interchange)

The purpose of this technical memorandum is to document the purpose and needs of the I-94 Unbonded Overlay (UBOL) Resurfacing from Maple Grove to Rogers and the Brockton Interchange (the project). The project is located along I-94 between the cities of Rogers, Dayton, and Maple Grove as shown on **Figures 1-3**.

The project will address poor pavement condition along 9.6 miles of I-94 between the I-494/I-694 interchange in Maple Grove to TH 101 in Rogers, Minnesota. The project also includes the construction of a new interchange to the east of Brockton Lane in the City of Dayton. The project will also address mobility in both the westbound and eastbound directions of I-94 from TH 610 to TH 101. Other portions of the project will address poor pavement and lack of truck parking capacity at the Elm Creek Rest Area in Maple Grove, addressing ADA compliance within the MnDOT right of way, addressing deficient stormwater management systems, and addressing the lack of a commercial vehicle enforcement lane along this portion of I-94.

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A. BACKGROUND

I-94 is a regionally-important transportation corridor. It is designated by MnDOT as a high-priority interregional corridor (IRC) facility that carries substantial volumes of commercial, commuter, and recreational traffic. As part of the interstate system, I-94 is a high-speed, access-controlled freeway that carries the highest level of importance with respect to serving long-distance through trips. I-94 connects the Minneapolis-St. Paul metropolitan area with portions of central and western Minnesota, continuing to North Dakota and Montana to the west. To the east of the Twin Cities, I-94 provides a long-distance connection to other major metropolitan areas including Milwaukee, Chicago, and Detroit. Within the project area, I-94 is a six-lane freeway facility that is aligned diagonally from northwest to southeast, passing through the cities of Rogers, Dayton, and Maple Grove (see **Figures 1–3**). Based on the 2017 MnDOT Traffic Volume Program data¹, existing traffic volumes (annual average daily traffic) along I-94 in the project area range from 97,000 to 117,000, making it one of the busiest roadways in the region.

The project area has also seen substantial growth and development in recent years, and additional growth is anticipated over the next few decades. This growth has resulted in additional demand for access to I-94 along this corridor. **Figure 4** shows all five interchanges within the project area. Currently, full local access to I-94 within the project area is limited to three locations:

- TH 101 full local access interchange in Rogers
- CSAH 30/Maple Grove Parkway full access interchange in Maple Grove
- CSAH 109/Weaver Lake Road full access interchange in Maple Grove

In addition to its importance to commuters and residents in the project area, I-94 is an important part of the freight transportation network, providing a critical link for commerce to move goods between communities and regions. I-94 is designated as part of the National Highway System and the National Highway Freight Network as part of the Primary Freight Highway System. I-94 is commonly used for the transport of agricultural products as well as mining and construction materials (gravel, sand, steel, granite, etc.), natural resource products (lumber, etc.), and manufactured goods as the Twin Cities is home to several major manufacturers. The importance of this corridor for freight is further demonstrated by the high number and proportion of heavy commercial vehicles along the corridor, which can lead to accelerated deterioration of pavement condition. According to MnDOT 2017 Traffic Volume Program 2017 data¹, the annual average daily traffic for heavy commercial vehicles ranges from 10,000 to 11,000 within the project area, equating to a relatively high heavy commercial vehicle percentage of 9-10 percent.

¹ Source: Minnesota Department of Transportation. *2017 Publication Traffic Volumes Metro Street Series – 4F*. 2017. Accessed: 25 September 2018. Available from: <http://www.dot.state.mn.us/traffic/data/maps/indexmaps/2017/4F.pdf>.

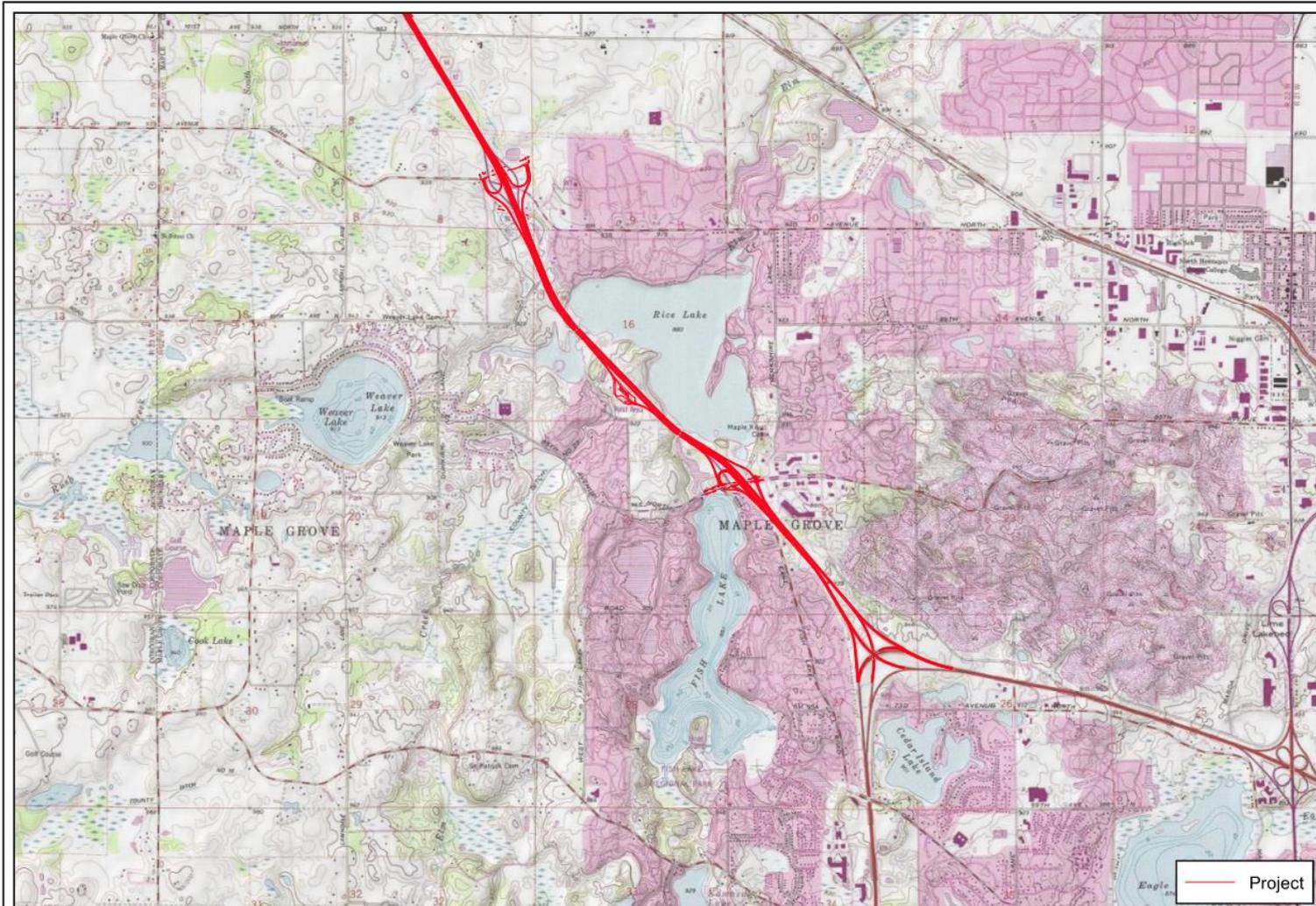
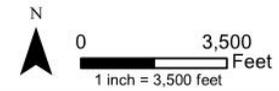


Figure 2A - USGS Project Location Map
I-94 UBOL Resurfacing Maple Grove to Rogers and Brockton Interchange
 S.P. 2780-97
 MnDOT and City of Dayton, Minnesota



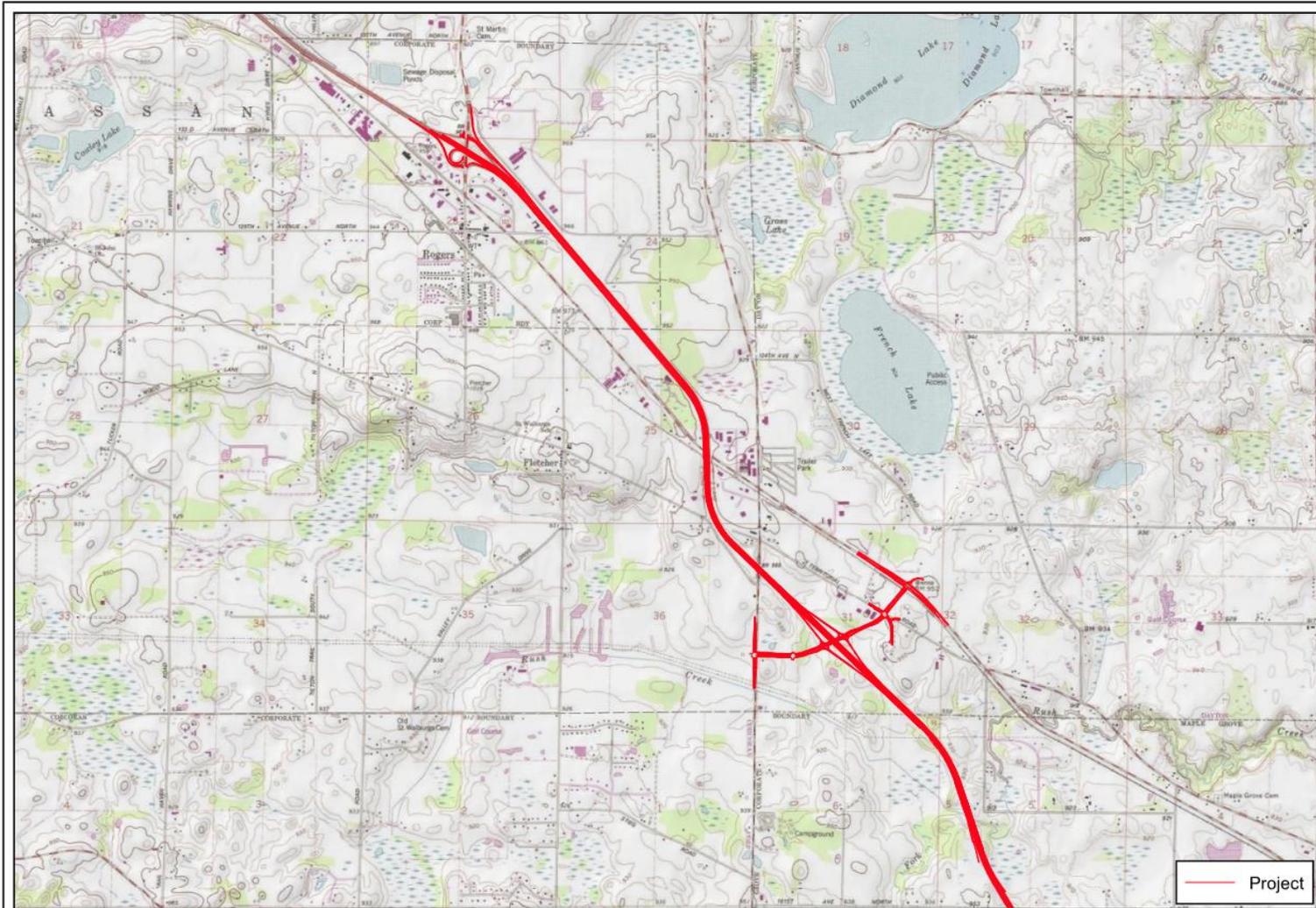
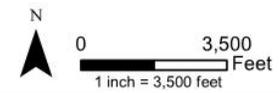
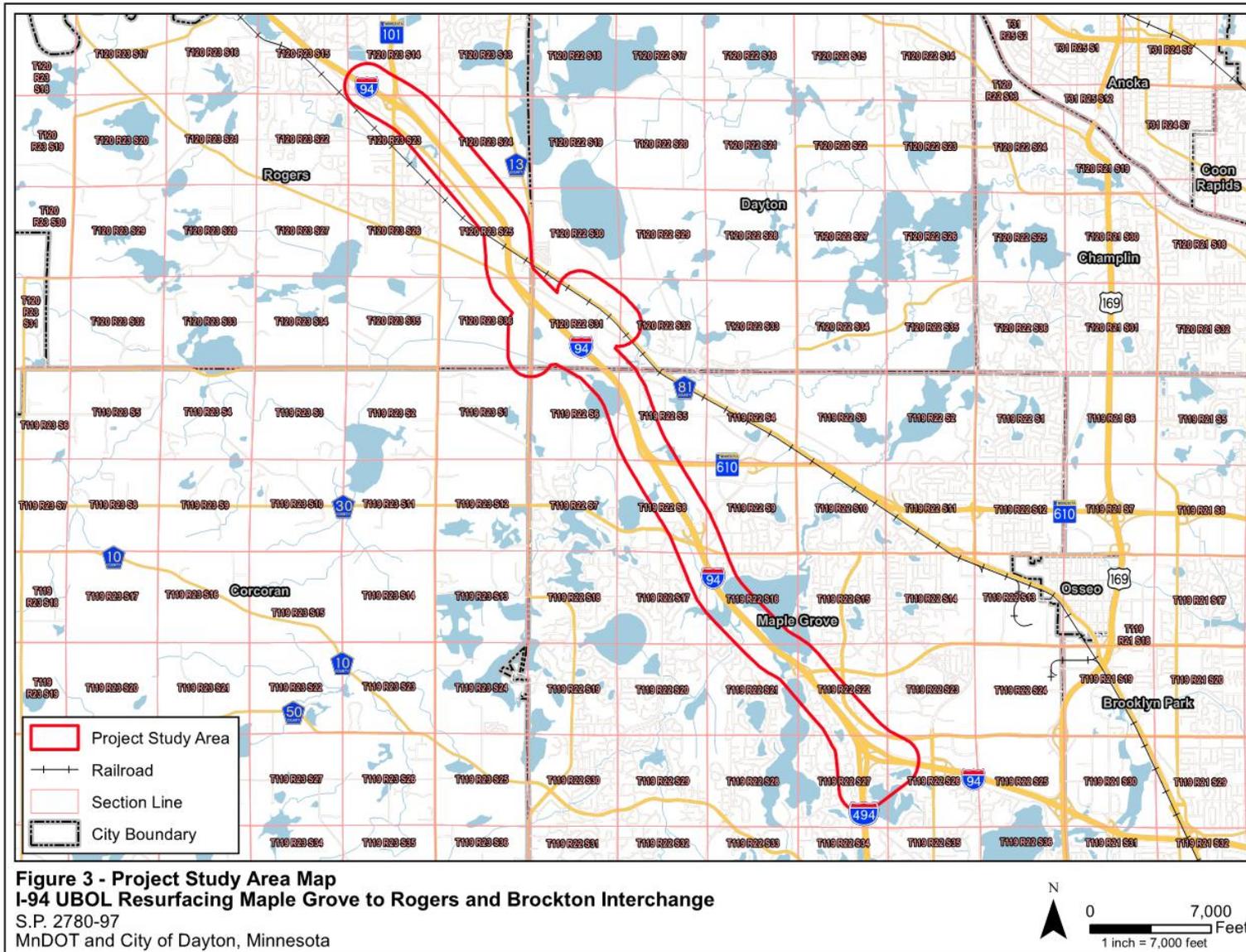
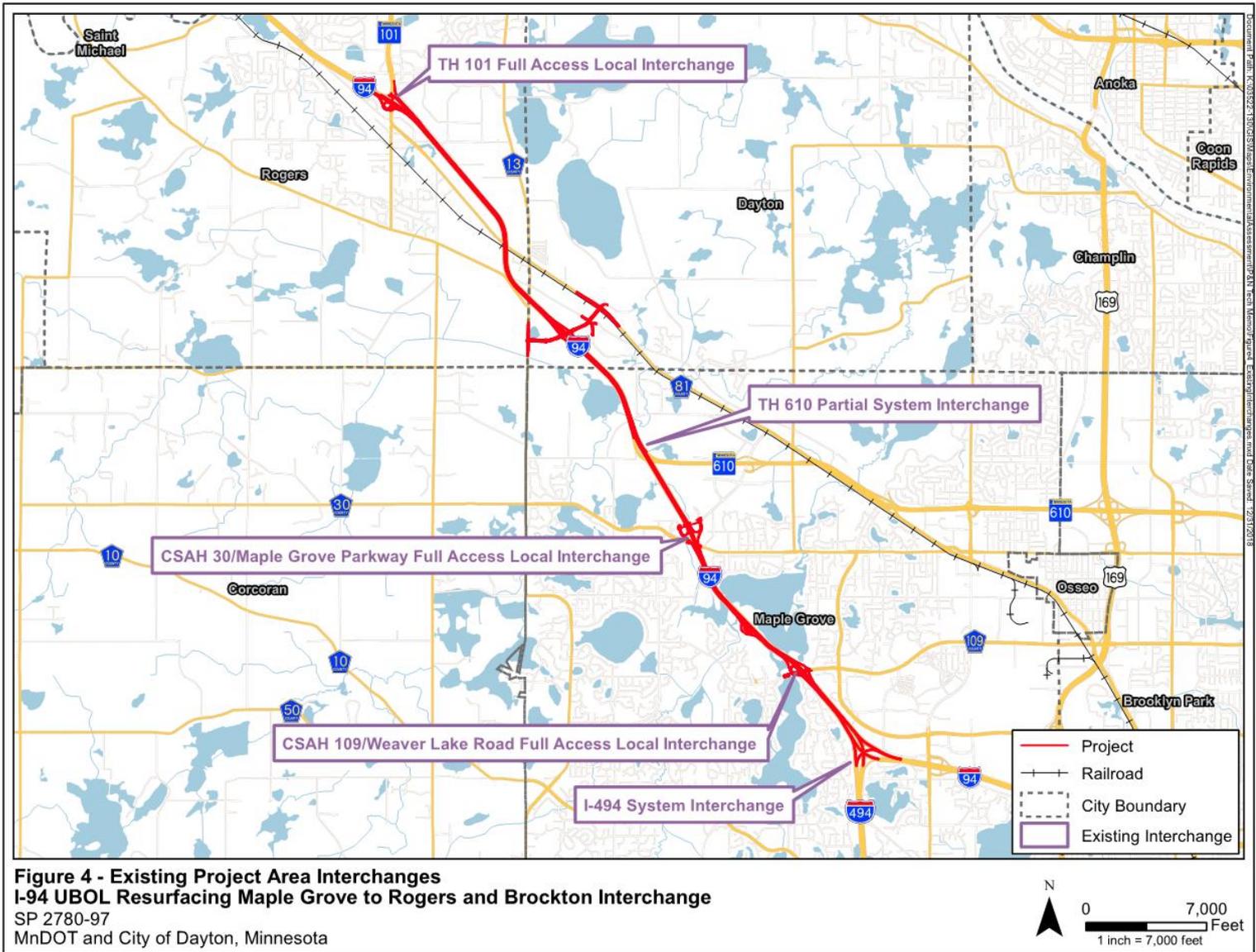


Figure 2B - USGS Project Location Map
I-94 UBOL Resurfacing Maple Grove to Rogers and Brockton Interchange
 S.P. 2780-97
 MnDOT and City of Dayton, Minnesota







B. WHAT ARE THE NEEDS FOR THE PROPOSED ACTION?

The Project Need identifies transportation problems that currently exist or are reasonably expected to occur within the project area. The Project Need section discusses the transportation problems which led to the initiation of the project (“primary needs”). In addition, opportunities to address other transportation problems or system improvements within the project area that may be addressed concurrently are also discussed (“secondary needs”).

The discussion below provides an analysis of the project needs, their applicability to the project, and whether they were determined to be primary needs, secondary needs, or determined not to be a need.

PRIMARY NEEDS

The primary needs are those needs that led to the initiation of the project. Based on an analysis of the project area, the primary needs include:

- Pavement condition along I-94
- Vehicle mobility in the I-94 corridor between TH 610 and TH 101
- Vehicle mobility to I-94 between Maple Grove Parkway and TH 101
- Infrastructure deficiencies in the drainage system along I-94

1. Pavement condition – The pavement condition is poor along the project corridor

The concrete pavement along the project section of I-94 was constructed in 1973. Since then, several maintenance and rehabilitation projects have been completed to keep the pavement in acceptable condition. In the early 1980s, a pavement improvement project consisting of smoothing the concrete surface, minor concrete pavement rehabilitation, and spot bituminous overlays was completed to improve the ride, correct sagging areas, and prolong the remaining service life of the roadway. In the 1990s, edge drains were installed. In 2003, a bituminous shoulder replacement was completed along the entire length of the project area with additional maintenance in 2005. In 2010, a major concrete paving rehabilitation and diamond grind on the pavement surface was completed along with correcting mainline sag areas. The cycle of continued repair and maintenance over the past several years extended the life of the pavement, but after 46 years these repairs are only providing short term, temporary improvements and is not addressing the overall underlying issue that the pavement is in poor condition, it will continue to deteriorate, and has reached the end of its functional life.

In addition to continued pavement maintenance within the project area, there have been pavement improvement projects immediately east and west of the current project location. In 2016, MnDOT completed a pavement repair and reconstruction project on I-494 between I-394 and the I-94/I-494/I-694 interchange. The northern end of that project is the eastern limit of the I-94 UBOL resurfacing project. In 2015, MnDOT completed the rehabilitation of I-94 between TH 101 Rogers and TH 241 in St. Michael. This project resulted in pavement resurfacing via an unbonded overlay. The eastern end of that project is the western limit of the I-94 UBOL resurfacing project. The current section of I-94 between the I-494/I-694 interchange and TH 101 is 46 years old and is in poor condition compared to its adjacent segments.

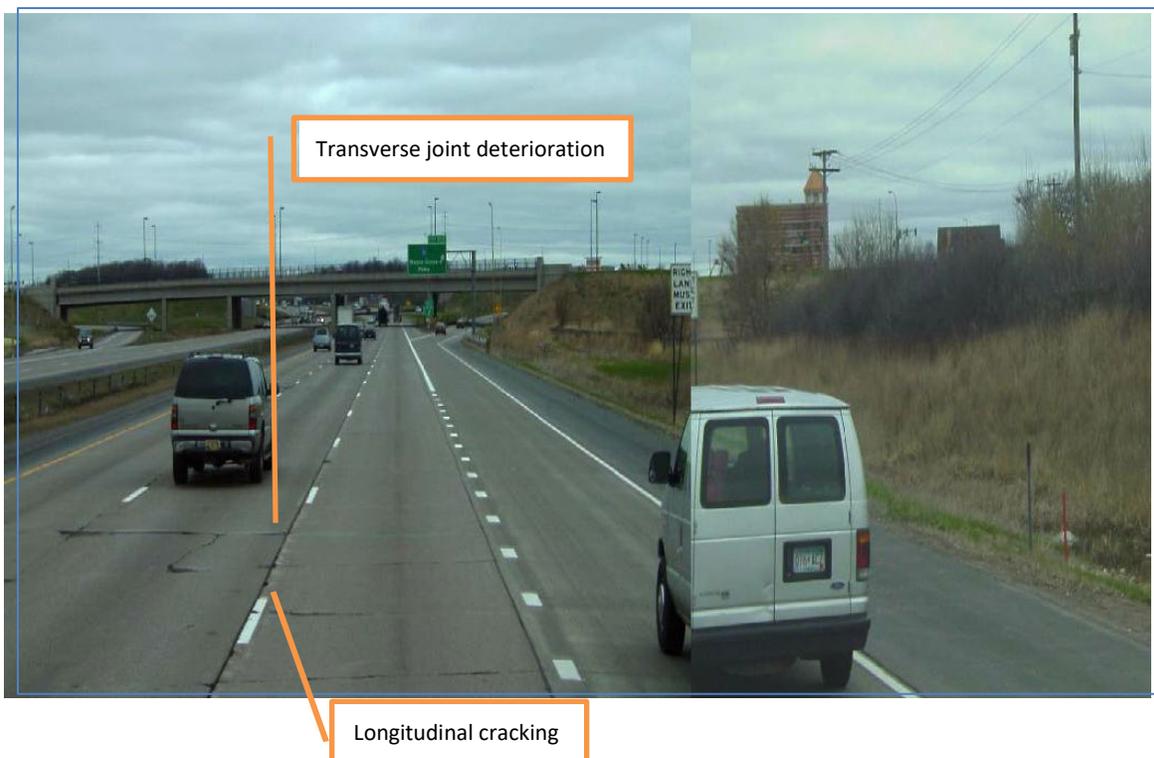
There is a need to restore the pavement condition within the project area to improve smoothness (ride) and the pavement’s structure for safety, maintenance, longevity, and to meet MnDOT’s Pavement Performance Targets. Federal regulations require state departments of transportation to develop performance measures to measure progress toward goals and guide investment on the state’s highway system. MnDOT has developed Pavement Performance Targets to assess the physical condition of its roadway system, determine how it is maintaining the roadway infrastructure, and plan for pavement improvements. On a systemwide level, there is a need to meet MnDOT’s Pavement Performance Targets. For the interstate system, MnDOT’s targets are for 70 percent or more of the roadway miles to be in “good” condition based on Ride Quality Index (RQI) (MnDOT’s measure of pavement roughness on a scale of 0.0 to 5.0) and for 2 percent or less of the roadway miles to be in “poor” condition based on RQI. **Table 1** shows the RQI categories and ranges.

Table 1. RQI Categories and Ranges²

Numerical Rating	Verbal Rating
4.1 - 5.0	Very Good
3.1 – 4.0	Good
2.1 – 3.0	Fair
1.1 – 2.0	Poor
0.0 – 1.0	Very Poor

As discussed, the section of I-94 within the project area was originally constructed in 1973 and has required numerous maintenance projects to address faulted joints and to install edge drains. The most recent pavement rehabilitation project was a major concrete paving rehabilitation (CPR) and diamond grind in 2010. Prior to this project, MnDOT Metro Materials projected that, without adding structural capacity to the roadway as part of this project, the improvement to RQI would not last beyond nine years. **Figure 5** shows the condition of the roadway prior to the 2010 CPR. Severe deterioration of the transverse joints is evident, as well as significant transverse and longitudinal cracking in the concrete panels. During the 2010 CPR, every transverse joint in the concrete pavement was repaired, as well as multiple mid-panel cracks and shattered slabs. During construction, the contractor constantly struggled with shallow groundwater as they removed the deteriorated concrete and prepared the grade for new patches. In addition, ultra-high early strength concrete was used in the patches, which sets and cures rapidly allowing for earlier opening to traffic but is also less durable than traditional concrete.

Figure 5: 2009 Videolog Image of Concrete Condition



² Source: Minnesota Department of Transportation. *An Overview of Mn/DOT's Pavement Condition Rating Procedures and Indices*. September 2015. Accessed: 11 October 2018. Available from: http://www.dot.state.mn.us/materials/pvmtmgmtdocs/Rating_Overview_State_2015V.pdf.

The resulting ride quality after the 2010 CPR and diamond grinding project improved to an RQI of 3.6. This put I-94 in the project area in the “good” category, but not as high as would be expected after a major improvement project. Since then, the pavement has continued to deteriorate. New transverse joint failures have materialized, and severe longitudinal joint deterioration has occurred. The joints between adjacent concrete lanes have widened creating potholes, and the bituminous shoulder has sunk, cracked, and developed severe potholes. **Figures 6 and 7** show the current condition of the roadway including the deterioration along the longitudinal joints and additional cracked panels.

Figure 6: 2017 Videolog Image of Concrete Joint Condition

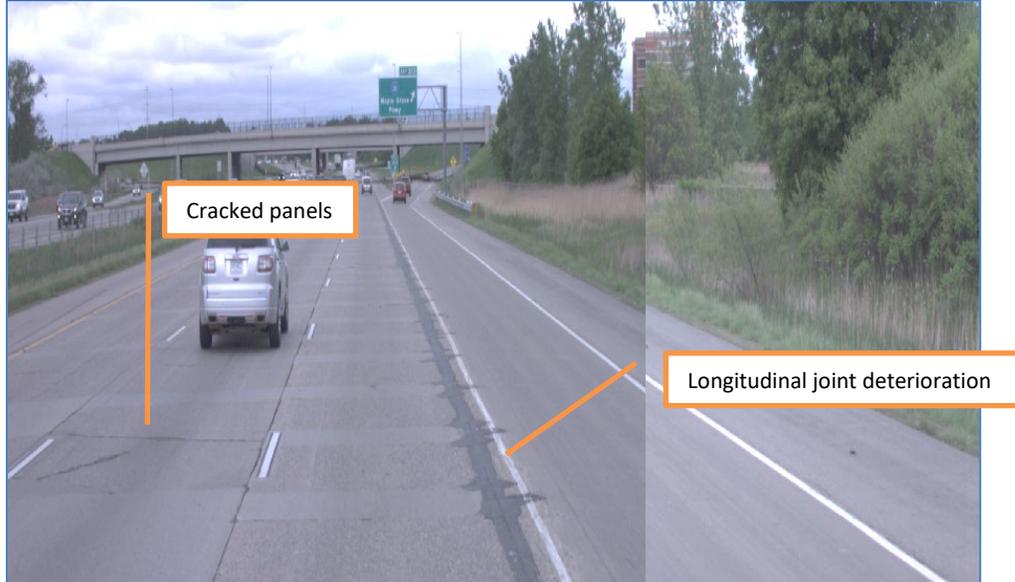


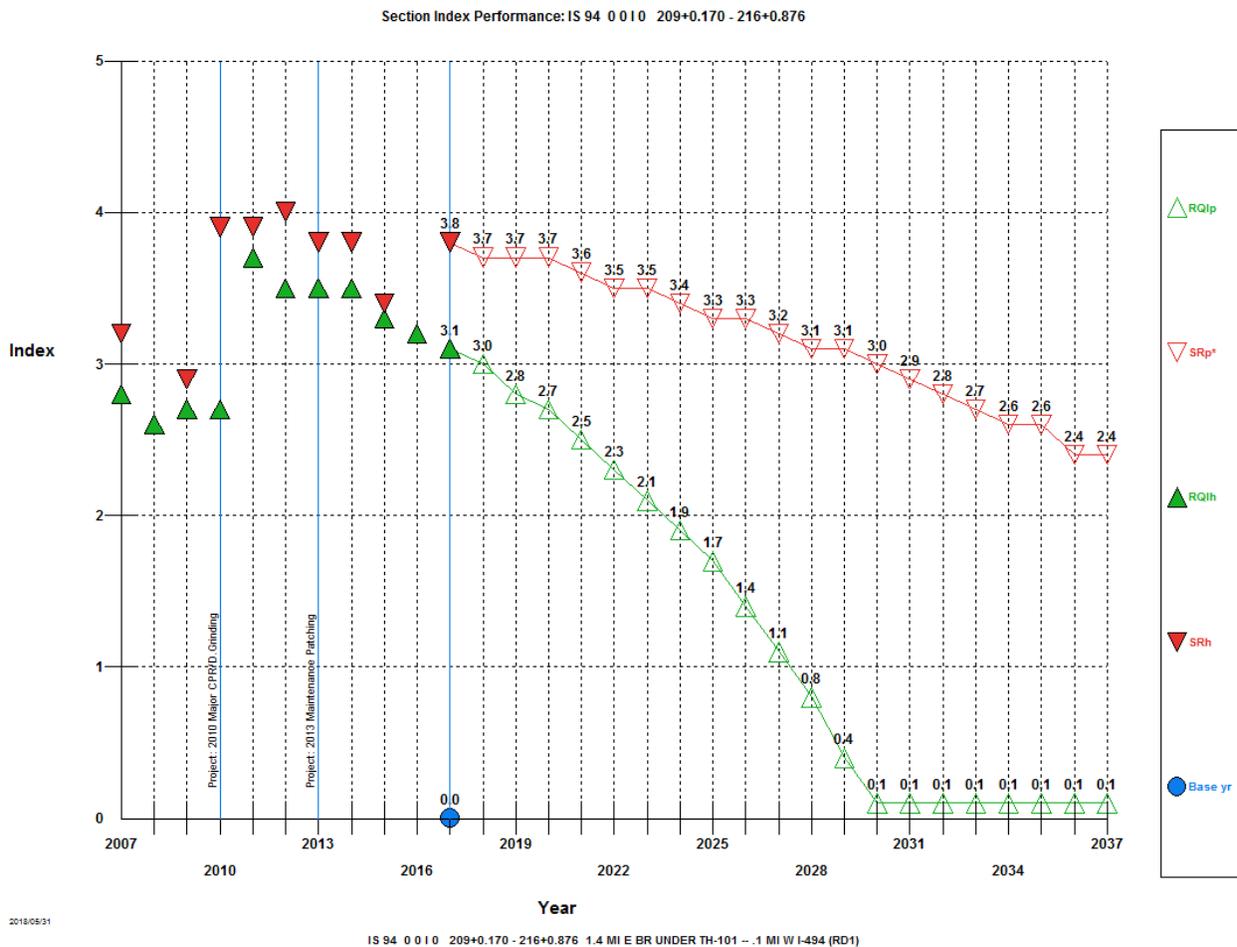
Figure 7: Current Bituminous Shoulder Condition



Figure 8 shows the Highway Pavement Management Application (HPMA) plot of current and future pavement condition on I-94 in the project area. The green triangles show RQI and the red triangles show Surface Rating (SR), a measure of MnDOT uses to quantify pavement distress. SR is based on visible defects on the pavement surface, which are symptoms indicating some type of problem or phenomenon of pavement deterioration such as cracks, patches, and ruts. SR ranges from 0.0 to 4.0, with a higher SR indicating better condition. A road in need of major rehabilitation or reconstruction will generally have an SR near or below 2.5.

The RQI has been steadily declining over the last three years, and that decline will accelerate in the years ahead. This year the RQI is projected to drop from “good” into “fair” condition and will drop into “poor” condition in six years. By 2026, the RQI will be at 1.4, which is unacceptable. The SR is also projected to steadily decline, though not as quickly as RQI.

Figure 8: HMPA Pavement Performance Plot in the I-94 Project Area³



The discussion above provides details about the rehabilitation history and pavement condition of this I-94 segment. Key points are as follows:

- Resurfacing projects have occurred immediately east and west of the proposed I-94 UBOL resurfacing project making it an older, deteriorating section in between two newer and improved sections.

³ Source: Clyne, Tim. Memorandum to Jerome Adams. "SP 2780-97 I-94 from Rogers to Maple Grove Discussion of Pavement Condition." Minnesota Department of Transportation. June 1, 2018.

- Rehabilitation projects have been frequent since initial construction of this section of I-94.
- Multiple diamond grinding efforts have reduced the structural integrity of the pavement by reducing concrete thickness.
- Pavement condition continues to deteriorate, and the pace of deterioration is accelerating.
- Maintenance crews are expending significant time, efforts, and resources to patch potholes and maintain the surface in an acceptable condition.
- HPMA projections indicate that the pavement condition will be in very poor condition by 2026.

Pavement condition and long term repair was identified as a primary need of the project.

2. Vehicle Mobility - The Interstate Access Request for the TH 610 connection to I-94 needs to be addressed

As part of the TH 610 Interstate Access Request (IAR) between MnDOT and the Federal Highway Administration (FHWA), MnDOT agreed to annually monitor operations at the I-94/TH 610 junction and evaluate the impacts of the TH 610 partial interchange on congestion. Three performance criteria were developed to determine whether additional mitigation strategies would be necessary to address operational issues.⁴ The IAR stated that when all three performance criteria were met, MnDOT would take steps to construct additional capacity on westbound I-94 west of TH 610. The IAR also indicated that when/if a future interchange near Brockton Lane was constructed, additional capacity on eastbound and westbound I-94 should be constructed between the Brockton interchange and the ramps to and from TH 610.

The performance criteria from the IAR are described below:

Performance Criterion 1 – Congestion on westbound I-94 immediately upstream of the TH 610 on ramp

The first performance criterion from the TH 610 IAR is met if over two hours of congestion per day immediately upstream of the merge point area are identified in MnDOT's Annual Congestion Report. Based on a review of the 2017 MnDOT Congestion Report (described below), it was determined that westbound I-94 immediately upstream of TH 610 is congested for two to three hours during the PM peak period and that the TH 610 merge is the cause of this congestion. This criterion has been met as described below.

Metropolitan Freeway System 2016 and 2017 Congestion Reports^{5, 6}

MnDOT prepares the *Metropolitan Freeway System Congestion Report* each year. This report documents recurring congestion on segments of the Twin Cities freeway system. Congestion is defined as traffic flowing at speeds less than or equal to 45 miles per hour (mph) and does not include delays that may occur at speeds greater than 45 mph. Congestion data is collected by detectors in roadways and field observations by MnDOT staff. Traffic data from the month of October is used for the congestion reports as this month generally reflects normal patterns of traffic.

The reports include freeway maps which display color coding corresponding to a certain number of hours of recurring congestion during the morning and afternoon. The maps in the congestion reports use a range of color coding to indicate the level of congestion; no color represents no recurring congestion while gradually moving to a dark red color that represents multiple hours of

⁴ Source: Federal Highway Administration, prepared for MnDOT. *Interstate Access Request at Interstate 94 (I-94) and TH 610, Hennepin County, MN*. May 2014. Appendix G: MnDOT Performance Based Criteria Submittal.

⁵ Source: Minnesota Department of Transportation, Metro District Office of Operations and Maintenance, Regional Transportation Management Center. *Metropolitan Freeway System 2016 Congestion Report*. May 2017.

⁶ Source: Minnesota Department of Transportation, Metro District Office of Operations and Maintenance, Regional Transportation Management Center. *Metropolitan Freeway System 2017 Congestion Report*. May 2018.

recurring congestion. Both the 2016 and the 2017 congestion reports are shown due to the interchange with TH 610 being completed in 2016.

2016

In the AM peak period (5:00 a.m. to 10:00 a.m.) congestion in the project area is eastbound. There are one to two hours of congestion from approximately TH 101 to Maple Grove Parkway, and two to three hours of congestion east to the eastern limits of the project.

In the PM peak period (2:00 p.m. to 7:00 p.m.) congestion in the project area is westbound. There are up to two hours of congestion in the area between approximately TH 101 and CSAH 81.

2017

In 2017, the AM peak period congestion was similar to 2016. There are from less than one to two hours of congestion from approximately TH 101 the eastern limits of the project.

In 2017, with the addition of the TH 610 partial interchange, the PM peak period congestion worsened in the project area in the westbound direction. There are up to three hours of congestion. The congestion is first experienced by motorists as far east as the junction between I-94 and I-494/I-694 and continues to beyond the point where traffic from TH 610 enters I-94.

Based on this analysis, Performance Criteria 1 of the TH 610 IAR is met, as there are over two hours of congestion indicated immediately upstream of the merge point for westbound I-94 and TH 610. The comparison between 2016 and 2017 further indicates that the TH 610 merge is the cause for congestion at this location.

The evening peak period maps from the 2016 and 2017 *Metropolitan Freeway System Congestion Reports* are included in **Figures 9** and **10**.

Figure 9: 2016 Metro Freeway Congestion (PM)⁵

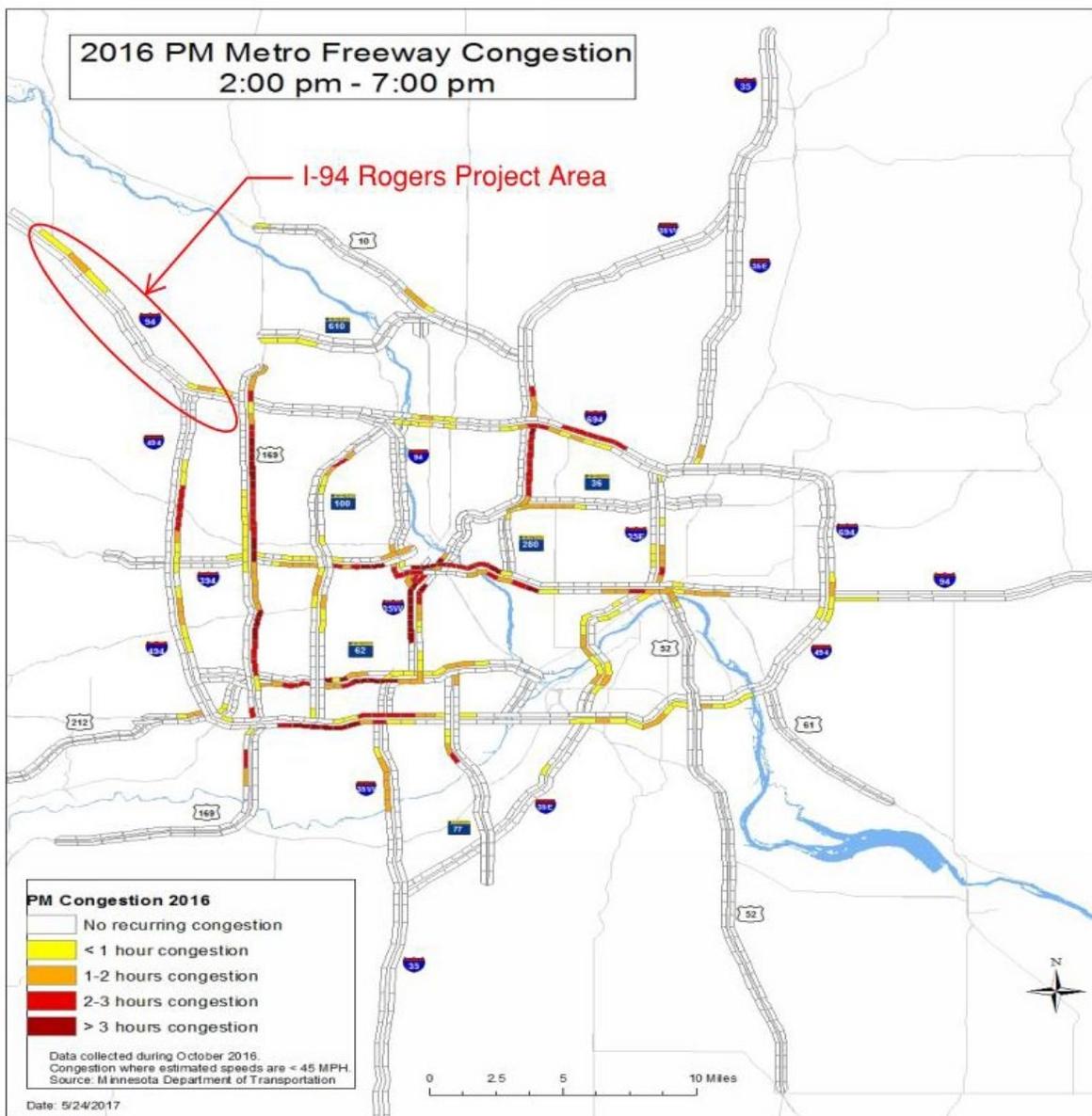
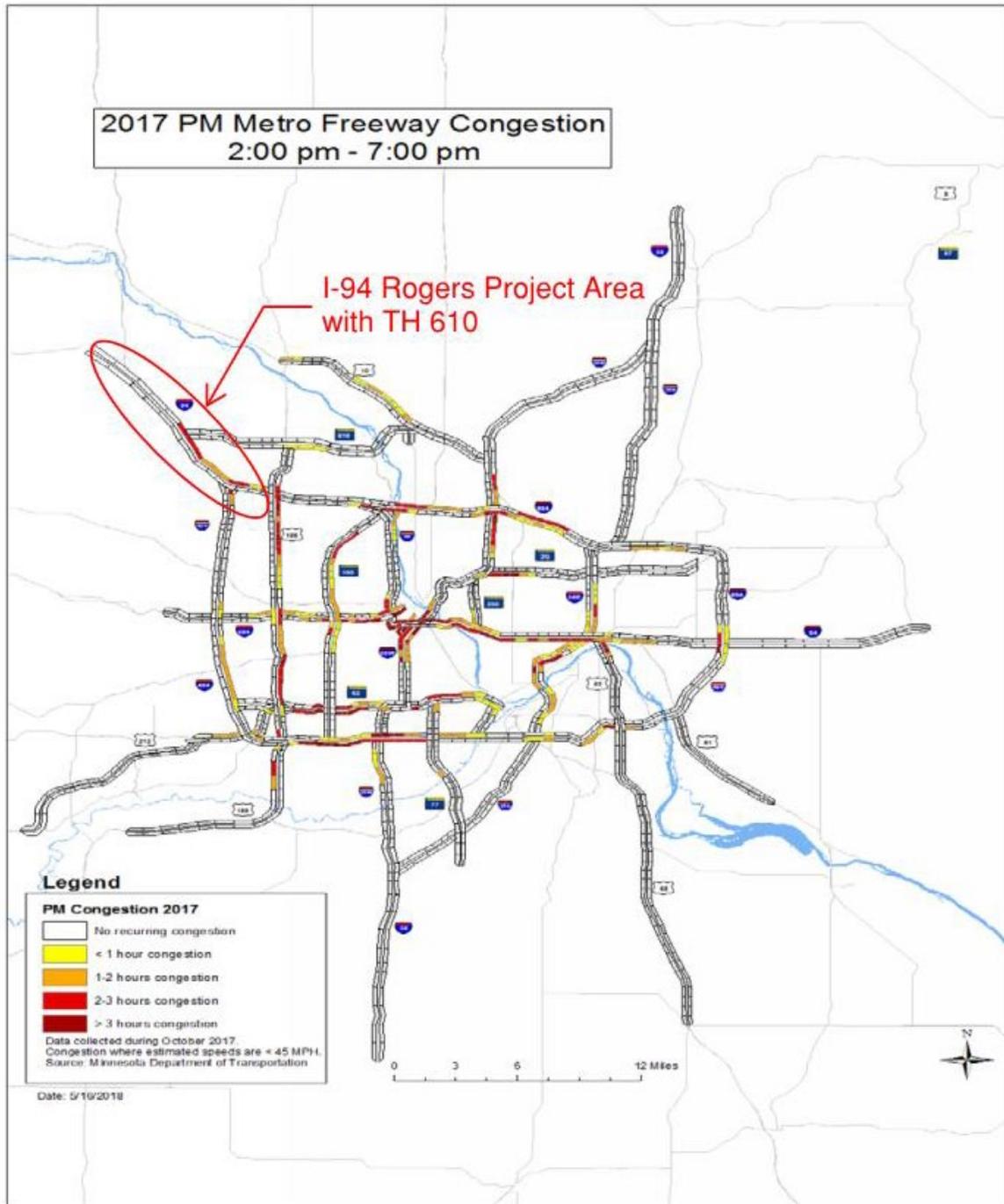


Figure 10: 2017 Metro Freeway Congestion (PM)⁶



Performance Criterion 2 – Travel time for westbound I-94 between Maple Grove Parkway and TH 101 exceeds pre-TH 610 conditions by 30 percent

The second performance criterion from the TH 610 IAR is related to travel time. The IAR states that this performance criterion is met if travel time on westbound I-94 between Maple Grove Parkway and TH 101 exceeds pre-TH 610 conditions by 30 percent (based on a comparison of loop detector data during the PM peak hour for weekdays in the month of October). In 2015, the average travel time for this segment was 8.1 minutes during the PM peak hour. In 2017, the average travel time increased to 9.6 minutes, an increase of 19.2 percent. While this analysis does not indicate that the 30 percent threshold was met, it does suggest that westbound I-94 travel times during the PM peak hour have increased since the opening of TH 610.

Performance Criterion 3 – Cost effectiveness of the capacity improvement

The third criterion from the TH 610 IAR is related to the cost effectiveness of adding capacity. If the cost effectiveness of adding capacity results in a return period of less than 20 years, MnDOT will pursue measures to mitigate the congestion caused by the TH 610 merge. MnDOT completed a cost benefit analysis that shows the present value of adding an additional westbound lane between TH 610 and TH 101 is just under \$50,000,000 while the construction and right of way costs would be just under \$4,000,000. Based on this analysis the return period would be less than 20 years and the criteria would be met.

Finally, the TH 610 IAR stated that when/if a future interchange near Brockton Lane was constructed, additional capacity on eastbound and westbound I-94 could be constructed between the Brockton interchange and the ramps to TH 610. The future interchange near Brockton Lane is planned to be constructed in 2020/2021, and therefore additional capacity between the interchange and TH 610 is needed.

Based on this analysis, vehicle mobility related to meeting the IAR for the TH 610 connection to I-94 was identified as a primary need.

3. Vehicle Mobility – There is poor local mobility to I-94 between Maple Grove Parkway and TH 101

There is no local access along I-94 between Maple Grove Parkway and TH 101. As shown in **Figure 4**, current access to I-94 within the project area is limited to five locations. Of these, only three provide local access as noted:

- TH 101 interchange in Rogers (local access)
- TH 610 partial interchange in Maple Grove
- CSAH 30/Maple Grove Parkway interchange in Maple Grove (local access)
- CSAH 109/Weaver Lake Road interchange in Maple Grove (local access)
- I-494 interchange in Maple Grove

This lack of local access results in longer regional trips since the traveling public in many areas must travel farther (up to three miles out of their way) to gain access to the regional transportation system. This increases the systemwide vehicle miles of travel, vehicle hours of travel, energy use and vehicle emissions. See **Figure 12** for example routes for users located between the existing interchanges. As this region continues to urbanize, it is expected that volumes along these arterial routes will continue to increase, creating additional demand for users that currently rely on them to access I-94. As this area develops, the problem will get worse and congestion will increase at the other access points to the regional system, especially at the TH 101 and I-94 interchange and the Maple Grove Parkway and I-94 interchange.

The lack of efficient access to I-94 between Maple Grove Parkway and TH 101 is documented in the *Northwest Hennepin County I-94 Sub-Area Transportation Study*⁷ (I-94 Sub-Area Study). This I-94 Sub-Area Study was a planning effort led by the cities of Rogers and Dayton and Hassan Township (Hassan Township and the City of Rogers are now one community). The I-94 Sub-Area Study was coordinated with MnDOT, the FHWA, Hennepin County, and other communities in the area.

At the time of the study, there were six miles between the interchanges at Maple Grove Parkway and TH 101. Since that time, a partial interchange at TH 610 was constructed and became operational in 2016. However, TH 610 is a regional facility with the nearest local access at the Maple Grove Parkway interchange. As northwest Hennepin County continues to urbanize, the current spacing of interchanges on I-94 is inadequate to support the future planned growth in the regional area. If new access is not provided, capacity enhancements to arterials and interchanges at TH 101, Maple Grove Parkway, and TH 610 would be needed⁸. For example, the TH 101 and I-94 interchange is already experiencing congestion. Planned growth in the project area is expected to overload existing interchange ramps at TH 101 and Maple Grove Parkway, further exacerbating delays at these interchanges.

This lack of local access to I-94 is also an issue for freight transportation and the regional business community. I-94 is an important part of the freight transportation network, providing a critical link for commerce to move goods between communities and regions. As previously stated, I-94 is part of the Primary Freight Highway System. Near the project area, there are several industrial businesses between Maple Grove Parkway and TH 101 including FedEx, Clam, Ruan, King Solutions, and Cemstone. In the existing conditions, the trucks and delivery vehicles carrying freight to and from these businesses access I-94 either from TH 101 or Maple Grove Parkway, causing additional systemwide vehicle miles of travel, vehicle hours of travel, energy use, and vehicle emissions. This lack of local connection to the major freight transportation network impacts the commerce within the area.

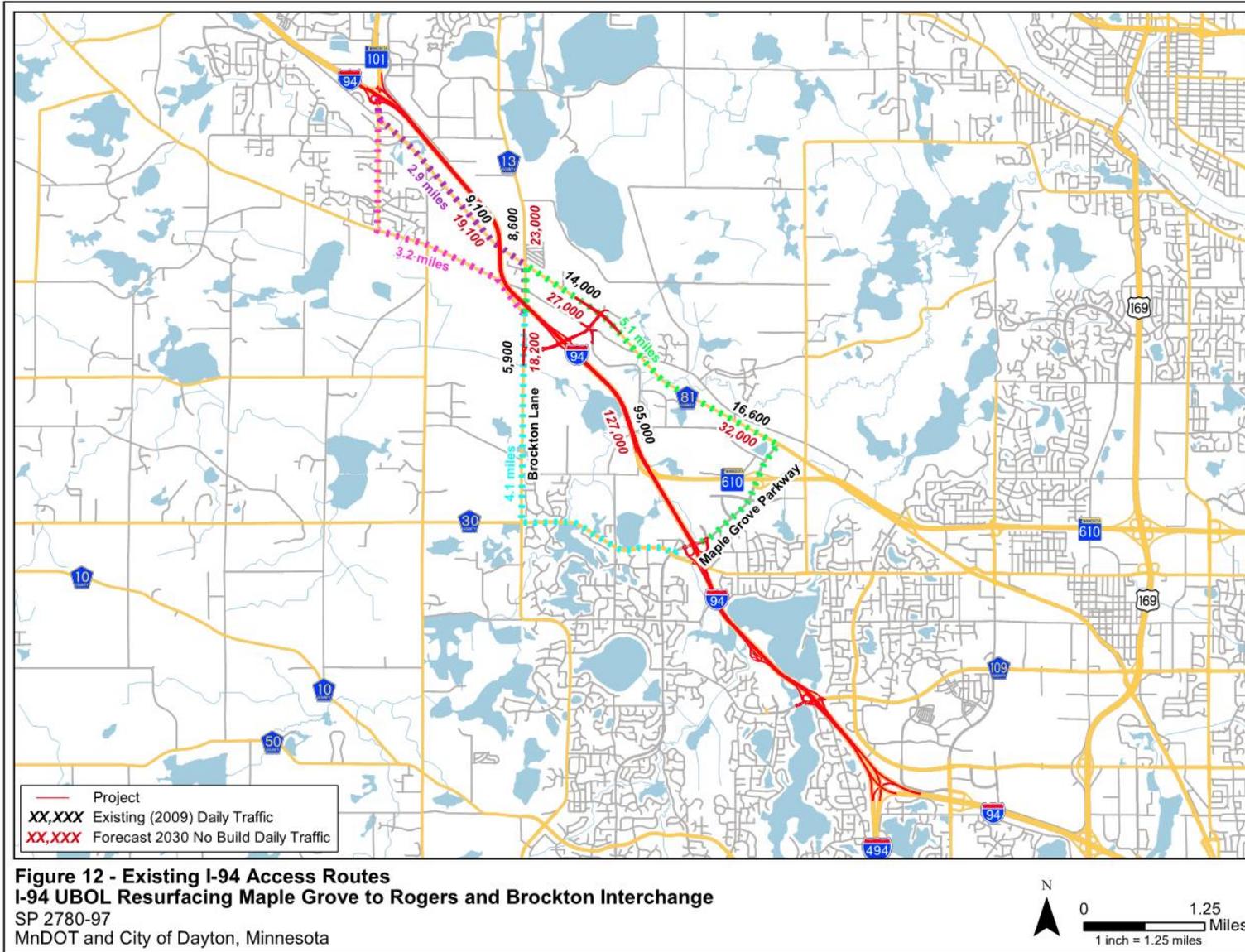
In 2012, as part of the past studies identifying this lack of local access to I-94, the Interchange Review Committee (which included MnDOT, Metropolitan Council, and FHWA) approved the planned interchange at I-94 near Brockton Lane and indicated it was consistent with the qualifying criteria of the Metropolitan Council's Transportation Policy Plan⁹. This letter is included in **Exhibit A**.

Based on a review of the existing condition, local vehicle mobility to I-94 was identified as a primary need.

⁷ Source: Hennepin County. *Northwest Hennepin County I-94 Sub-Area Transportation Study*. 2008.

⁸ Source: City of Dayton. *I-94/Brockton Lane Interchange Environmental Assessment Worksheet*. August 2012. Appendix C, Purpose and Need Framework.

⁹ Source: Interchange Review Committee. Communication to Samantha Orduno. November 7, 2012.



4. Infrastructure condition – The drainage infrastructure has reached its suitable life and is under capacity

The current stormwater management system along I-94 primarily consists of centerline culverts and median drains. As a part of the project, cleaning and video inspection of all the drainage infrastructure for I-94 was completed. The video inspections are being reviewed to rank the stormwater assets according to MnDOT's HydInfra condition rating system. HydInfra is MnDOT's hydraulic infrastructure information application used to manage inventory, inspection, and maintenance activities for storm drainage features. The assets are given ratings based on the worst defect found. All deteriorated, rusted, cracked, misaligned, or spalled pipes should be replaced with the project. Assets that do not need repair based on the inspections and have adequate hydraulic capacity will remain.

The median drains have reached their maximum life and are deteriorating. Most of the median drains were installed in 1972 and/or some median drains are corrugated metal pipes which have a shorter life span than reinforced concrete pipe. Additionally, many of the median drains were lined in 2009 which reduced the capacity of the culverts. This reduced capacity has caused water to drain more slowly from the median, resulting in poor subgrade conditions.

Portions of the interchanges along the project corridor that are urban section and have storm sewer will be replaced as needed based on condition rating and the proposed design. The interchanges were reconstructed within the last 20 years and therefore the storm sewer should be in a better condition than the main line I-94 stormwater management system.

Based on the results of the condition ratings and reduced pipe capacity, the infrastructure condition of the drainage system was identified as a primary need of the project.

SECONDARY NEEDS

Secondary needs are opportunities to address other transportation problems or system improvements within the project area that can be addressed concurrently with the project. These include any common project need as well as those unique to the project area. Three secondary needs were identified for the project:

- Infrastructure deficiencies in the pavement condition and capacity at the Elm Creek Rest Area
- Geometric deficiencies in meeting ADA design standards within the project area's right of way
- Lack of commercial vehicle enforcement area

The following sections discuss the project's secondary needs.

1. Infrastructure Conditions – There are poor pavement conditions and lack of capacity at the Elm Creek Rest Area

The Elm Creek Rest Area is located within the project corridor on the south side of I-94 near Elm Creek and Rice Lake in Maple Grove.

a. Pavement Condition

MnDOT assessed the vehicular pavements at the Elm Creek Rest Area in February 2018 using the PASER method developed by the University of Wisconsin-Madison Transportation Information Center, which includes a condition rating scale from 1 (Failed) to 5 (Excellent). Based on the 2018 assessment, the overall rating was a 2 which equates to a quality rating of Poor. This assessment was verified by an independent visual observation in 2018, which revealed pavement deterioration at several areas of the rest area, particularly mixed-use car and semi-truck parking areas and the driving lane adjacent to these areas. The pavements in these areas exhibited

severe joint spalling and deterioration, severe cracking, and standing water along the curb due to poor drainage. See **Exhibit B - Maple Grove Rest Area Pavement Investigation**, for further details including pavement photos.

b. Truck Capacity

Based on information from the 2010 *Minnesota Truck Parking Study*¹⁰, the Elm Creek Rest Area is the state's most congested public rest area in terms of truck parking. This rest area ranked first in the state in percent of days over capacity with 65.2 percent of days at or over capacity.

Based on this information, addressing the poor pavement condition and lack of truck capacity has been determined to be a secondary need.

2. Geometric Deficiencies – Pedestrian curb ramps and sidewalks do not meet ADA standards within the project right of way

In 2008 MnDOT implemented a policy to install Accessible Pedestrian Signals (APS) at all new signals at eligible locations and at any eligible intersection where an existing traffic signal has aged to the point of needing replacement. Pedestrian curb ramps and sidewalks have also been inventoried for ADA compliance within the project area. MnDOT's policy is to correct non-ADA compliant curb ramps and sidewalks located within their right of way during routine construction activities. ADA-related deficiencies related to APS, curb ramps, and sidewalks have been documented at several crossings within the project, including Weaver Lake Road, 93rd Avenue, Maple Grove Parkway, 105th Avenue N, CSAH 81, TH 101, and the Elm Creek Rest Area.

Addressing the existing curb ramps and sidewalks that do not meet ADA standards within the project area was determined to be a secondary need.

3. Commercial Vehicle Inspection Site – There is a lack of commercial vehicle enforcement areas along this portion of I-94

In 2017, the heavy commercial vehicle traffic ranged from 10,000 to 11,000 vehicles per day based on annual average daily traffic. Enforcement of heavy commercial vehicles to confirm they are within their weight limit is important to maintain the structural integrity of the roadways and ensure safe operation of the vehicle. Weigh stations are set up along commercial truck corridors to verify that trucks are operating with their weight limits.

In 2018, MnDOT and the Minnesota State Patrol developed the *Minnesota Weight Enforcement Investment Plan*¹¹ as part of a 10-year Weight Enforcement Investment Plan (WEIP). Needs identified during this planning process included the need for additional enforcement pull-off areas. I-94 between TH 610 and TH 101 was identified as a high-priority area for improving vehicle enforcement operations.

¹⁰ Source: Minnesota Department of Transportation. *Minnesota Truck Parking Study (Phase 2)*. 2010-34TS. November 2010. Accessed 25 September 2018. Available from: <https://www.lrrb.org/media/reports/201034TS.pdf>.

¹¹ Source: Lakeside Engineers. *Needs Assessment: Minnesota Weight Enforcement Investment Plan*. Minnesota Department of Transportation and Minnesota State Patrol. June 15, 2018.

Areas Analyzed but Determined Not to be a Project Need

1. Vehicle Safety

Safety is a common concern on highly-travelled interstate corridors. Crash data along the project corridor from January 2013 to March 2018 was reviewed to determine the number and type of crashes that are most frequently taking place along I-94 within the study area. Crash data was reviewed in two time periods. The 2013–2015 and 2016–2018 crashes were reviewed separately due to MnDOT’s adoption of a different set of crash data and due to the opening of the TH 610 partial interchange in 2016. Additionally, crash data was reviewed for the entire project corridor (with averaged AADTs) and for individual segments (where AADTs were different). **Table 2** summarizes the crash rates for these segments.

Table 2: Segment Crash Rates

Location	Number of Crashes	Daily Entering Vehicles	Crash Rate*			Severity Rate	
			Calculated	Average**	Critical***	Calculated	Average**
2013-2015 Data							
TH 101 to Maple Grove Pkwy.	401	100,00	0.61	0.90	0.96	0.81	1.19
Maple Grove Pkwy. to Weaver Lake Rd.	243	118,000	0.88	0.90	1.00	1.13	1.19
Weaver Lake Rd. to I-494	98	116,000	0.62	0.90	1.03	0.75	1.19
Entire Corridor	742	106,250	0.68	0.90	0.95	0.88	1.19
2016-2018 Data							
TH 101 to Maple Grove Pkwy.	332	100,000	0.69	0.90	0.97	0.88	1.19
Maple Grove Pkwy. to Weaver Lake Rd.	177	118,000	0.87	0.90	1.01	1.14	1.19
Weaver Lake Rd. to I-494	97	116,000	0.83	0.90	1.05	1.01	1.19
Entire Corridor	606	106,250	0.75	0.90	0.96	0.97	1.19

* Segment crash rates are expressed in crashes per million entering vehicles per mile.

** Average for urban freeway segments using MnDOT 2015 Green Sheets.

*** Critical crash rates are expressed in crashes per million entering vehicles with 0.95 confidence level.

None of the individual segments exhibit an existing crash rate that surpasses the average or critical crash rate for urban freeway segments, but the Maple Grove Parkway to Weaver Lake Road Parkway approaches the average crash rate of 0.90, with a 2013-2015 crash rate of 0.88 and a 2016-2018 crash rate of 0.87. This segment also approaches the average severity rate of 1.19, with a 2013-2015 severity rate of 1.13 and a 2016-2018 severity rate of 1.14.

Crash Type

Within the study area, a total of 883 crashes were recorded along mainline I-94 between January 2016 and March 2018, including junction crashes. Of these, 455 crashes (52 percent) were recorded as “Front to Rear” crashes, indicating that motorists failed to brake in time to stop from colliding with another braking vehicle. These are the types of crashes that are most closely related to congestion and the “shock waves” described above, when traffic streams are required to brake from higher speeds. In this regard, the need to address congestion is related to a need to address safety concerns associated with inconsistent travel speeds. A similar pattern is apparent when looking at segment crashes alone. Of the 742 segment crashes in the corridor that occurred between 2013 and 2015, 361 were rear end crashes (49 percent). Of the segment 606 segment crashes occurring between 2016 and 2018, 321 were rear end crashes (53 percent).

Crash Severity

Based on a review of crash data along the project corridor, two fatal crashes have been recorded between 2013 and March 2018, along with five incapacitating injury crashes. Detailed crash severity data is shown in **Table 3**.

Table 3: Segment Crash Severity

	Fatal	Incapacitating Injury	Non-Incapacitating Injury	Possible Injury	Property Damage Only	Total
2013-2015 Data						
<i>Crashes</i>	1	3	35	135	568	742
<i>Percent</i>	0.1	0.4	4.7	18.2	76.5	100
2016-2018 Data						
<i>Crashes</i>	1	2	36	89	478	606
<i>Percent</i>	0.2	0.3	5.9	14.7	78.9	100

Overall, the crash and severity rates experienced along I-94 within the project corridor are not worse than other, similar urban freeway segments. While safety was reviewed as a potential need, based on the analysis, it is not a need within this corridor.

Additional Considerations

1. Project Timing:

The timing for the project is an important consideration because other projects along the I-94 corridor are planned to be implemented over the next five years. Consideration should be given to combining as many improvements into a project as practical to avoid multiple traffic disruptions to the traveling public. At the very least, the construction schedules of various projects should be coordinated to minimize traffic impacts during construction.

Specifically, there are planned to be two other projects along the I-94 corridor west of the project area. The I-94 St. Michael (TH 241) to Albertville (County Road 19) and the I-94 Monticello to Clearwater projects will be undergoing construction within a similar timeline. These two projects, along with this I-94 UBOL Maple Grove to Rogers project will coordinate on project communication and maintenance of traffic.

Route Consistency/System Continuity

As part of the regional freeway network, there are several other planned or programmed projects that may affect how the I-94 facility is used within the project area. These projects are anticipated to result in increased traffic along TH 101 and I-94 within the project area. There are three specific projects that are expected to affect the project area:

- I-94 from TH 241 in St. Michael to west of Wright County Road 19 in Albertville
- Highway 169 Redefine
- TH 252 Freeway Conversion

a. I-94 from TH 241 in St. Michael to west of Wright County Road 19 in Albertville

MnDOT has identified a future project to improve I-94 from TH 241 in St. Michael (approximately 2.7 miles west of the project area) to just west of Wright County Road 19 in Albertville. As shown in **Figure 13**, this project includes pavement reconstruction, an additional lane on eastbound I-94 from County Road (CR) 13 to TH 241 and on westbound I-94 from CR 37 to TH 241, bridge reconstruction, a new eastbound access to I-94 between CR 19 and CR 37, a new access loop ramp from westbound I-94 to southbound TH 241, and drainage improvements along the corridor. The project is intended to improve the capacity of the interstate by adding a third lane in each direction and making interchange improvements at TH 241, CR 37, and CR 19. By providing additional capacity through this area, additional pressure will be placed on the bottlenecks and congested areas that are present within the project area.

Figure 13: Planned I-94 Improvement Project from Albertville to St. Michael¹²



¹² Source: Minnesota Department of Transportation. "Interstate 94-St. Michael to Albertville." <http://www.dot.state.mn.us/d3/i94/h241to19/index.html>. (accessed: October 11, 2018).

b. Highway 169 Redefine

The second project is the Highway 169 Redefine, which is a planned freeway conversion along TH 169 in Elk River. This proposed project will construct new interchanges at Main Street and School Street, 193rd Avenue, and a partial interchange at 197th Avenue (see **Figure 14**). By converting this segment of TH 169 from an expressway to a freeway, additional capacity will be provided along TH 169, which provides a north-south connection to TH 101 approximately six miles north of the project area. Therefore, this project is also anticipated to result in increased traffic along TH 101 and I-94 within the project area.

Figure 14: Planned Highway 169 Redefine Project in Elk River¹³

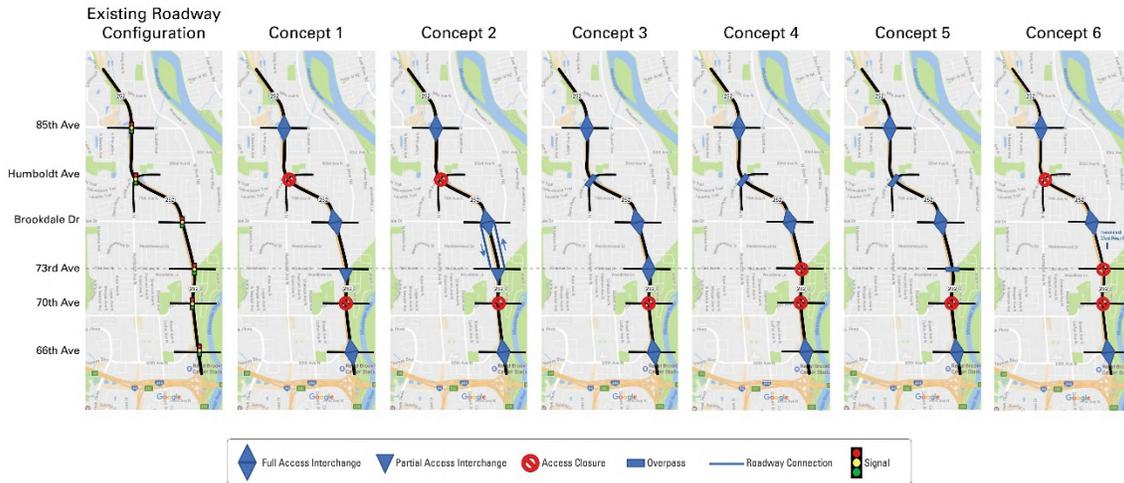


¹³ Source: Minnesota Department of Transportation. "Highway 169 in Elk River." <http://www.dot.state.mn.us/corridorsofcommerce/pdf/2018/169%20one%20pager.pdf>. (accessed: October 11, 2018).

c. TH 252/I-94 Environmental Review

MnDOT has studied TH 252 for a potential freeway conversion from TH 610 and I-694 in the cities of Brooklyn Center and Brooklyn Park. Several concepts for the locations of interchanges and overpasses are being considered as part of this project (see Figure 15). Additionally, an environmental review will be completed for a larger study area between TH 610 in Brooklyn Park to 4th Street North in Minneapolis. This study will consider alternatives for TH 252 and for I-94 between TH 252 and Dowling Avenue.

Figure 15: TH 252 Freeway Conversion Study in Brooklyn Center and Brooklyn Park¹⁴



Each of these projects is anticipated to increase capacity along the regional freeway network in proximity to the project area, which will directly influence the volume of traffic using the I-94 corridor. The project area will need to accommodate these other projects to maintain its role in the regional freeway system.

3. Known Needs that the Project Will Not Address

Traffic Growth Trends

As indicated by **Table 4**, traffic along the corridor has grown steadily over the past 20 years. The realigned and extended TH 610—including the partial interchange at I-94—opened in 2016. This new connection, in addition to the growth in traffic based on regional development and growth, has led to an increase in traffic using the I-94 corridor in both eastbound and westbound directions (with congestion issues primarily occurring in the eastbound direction during AM peak hours and in the westbound direction during PM peak hours).

¹⁴ Source: SRF. *TH 252 Conversion Study: Public Engagement Summary*. Accessed at: <http://www.dot.state.mn.us/metro/projects/hwy252study/pdf/th252engagementsummary.pdf>. (accessed date: October 11, 2018).

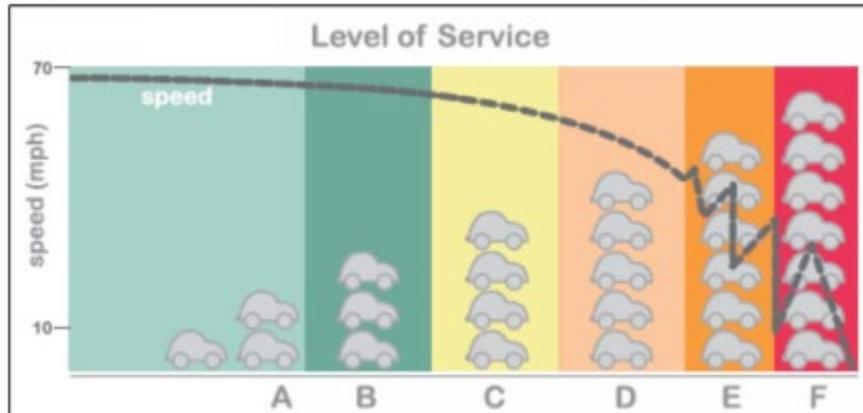
Table 4: Historical MnDOT Official AADT along I-94 in the Project Area

Year	Traffic Count Location		
	East of TH 101	South of CSAH 30	West of I-494
1998	69,000	83,000	97,000
2000	77,000	91,000	105,000
2002	79,000	92,000	100,000
2004	89,000	95,000	104,000
2006	93,000	115,000	114,000
2008	95,000	112,000	114,000
2010	91,000	112,000	114,000
2012	96,000	116,000	115,000
2014	94,000	114,000	119,000
2016	100,000	118,000	116,000

Operational Traffic Analysis (Existing Conditions)

Another method to measure congestion and mobility along I-94 is by roadway Level of Service (LOS). LOS is a grading system of A-F used to approximate congestion levels on roadway segments and at intersections. The LOS for freeway segments is based on vehicle density, as measured in vehicles per lane per hour. **Figure 11** illustrates the relationship of LOS A-F in terms of density of vehicles (cars, buses, freight) on the freeway. Vehicle speeds on the freeway can be maintained at higher densities (i.e., LOS C and D); however, as the density increases to LOS E and F, the freeway approaches capacity, speeds start to fluctuate, and traffic breaks down.

Figure 11: Freeway Traffic Flow Characteristics by Level of Service



This analysis evaluated existing traffic volumes from the MnDOT traffic volume detectors and INRIX data provided existing speeds in the project area. INRIX is a software company that provides road traffic information and analytics. This data was used to create a CORSIM model for the corridor that was calibrated to the existing conditions. **Table 5** shows the levels of service in the corridor based on the CORSIM model for the corridor.

Table 5: Existing Level of Service Analysis

I-94 Segment - Existing Conditions		AM		PM	
From	To	I-94 EB	I-94 WB	I-94 EB	I-94 WB
TH 241	TH 101	E	A	B	B
TH 101	TH 610	D	B	B	D
TH 610	Maple Grove Parkway	E	B	B	F
Maple Grove Parkway	Weaver Lake Road	F	B	B	F
Weaver Lake Road	I-494/I-694 interchange	F	B	C	F
I-494/I-684 interchange	Hemlock Lane	D	C	D	F

As shown in **Table 5**, during the AM peak hour, I-94 eastbound operates at LOS F between Maple Grove Parkway and the I-494/I-694 interchange. During the PM peak hour, I-94 westbound operates at LOS F between Hemlock Lane and TH 610.

Future Demographic Growth

Traffic conditions are anticipated to worsen in the future as additional growth planned along the I-94 corridor and in areas to the northwest of the Twin Cities comes to fruition. Based on demographic data from the Metropolitan Council, the three communities in the project area (Rogers, Dayton, and Maple Grove) are expected to add population, households, and jobs between 2014 and 2040. See **Table 6** for a summary of these demographic forecasts.

Table 6: Metropolitan Council Demographic Forecasts¹⁵

	2014 (estimate)	2020	2030	2040	Total Increase (2014 to 2040)
Rogers					
Population	12,230	14,200	18,400	22,800	10,570
Households	4,050	5,000	6,700	8,500	4,450
Employment	8,117	11,400	13,100	14,800	6,683
Dayton					
Population	4,957	5,900	7,900	10,400	5,443
Households	1,709	2,200	3,200	4,400	2,691
Employment	1,008	2,000	2,490	3,000	1,992
Maple Grove					
Population	64,448	70,900	80,500	89,700	25,252
Households	24,209	26,600	29,900	33,100	8,891
Employment	33,565	38,400	42,600	47,000	13,435

Based on these forecasts, these three communities are projected to add more than 41,000 in population and more than 16,000 households between 2014 and 2040. Additionally, job growth is expected to increase by more than 22,000 jobs. While not all this growth will translate directly into additional traffic along I-94, the freeway's role as a regional transportation facility indicates that volumes will continue to grow as demands on the roadway network increase in the area.

¹⁵ Source: Metropolitan Council. System Statement data. 2015. <https://metrocouncil.org/Communities/Planning/Local-Planning-Assistance/System-Statements.aspx>

The Metropolitan Council's 2040 Travel Demand model was used to develop 2040 No-Build Traffic Forecasts for the corridor for an average weekday and for the AM and PM peak periods. These forecasts are documented in the Traffic Forecast Memorandum prepared by HNTB dated September 7, 2018¹⁶. A 2040 No-Build CORSIM model was created with the 2040 forecast AM and PM peak period traffic to determine what the expected traffic operations would be in the corridor assuming no improvements. **Table 7** shows the CORSIM traffic operations analysis results for the 2040 No Build I-94 project area during the AM and PM peak hours.

Table 7: Future 2040 No Build Level of Service Analysis

I-94 Segment - 2040 No Build Conditions		AM				PM			
From	To	I-94 EB	Volume EB (vph)	I-94 WB	Volume WB (vph)	I-94 EB	Volume EB (vph)	I-94 WB	Volume WB (vph)
TH 241	TH 101	F	4975	B	2100	B	2750	C	4950
TH 101	TH 610	E	6275	B	3125	B	3700	E	6300
TH 610	Maple Grove Parkway	F	4575	B	2500	B	3050	F	4300
Maple Grove Parkway	Weaver Lake Road	F	5475	B	3350	C	4325	F	5300
Weaver Lake Road	I-494/I-694 interchange	F	6125	B	3700	C	5025	F	5300
I-494/I-684 interchange	Hemlock Lane	D	5775	C	5200	E	6800	F	4750

As noted, there are known mobility issues between I-494/I-694 and TH 610. **Table 5** shows that during the AM peak hour, I-94 eastbound operates at LOS F between Maple Grove Parkway and the I-494/I-694 interchange. During the PM peak hour, I-94 westbound operates at LOS F between Hemlock Lane and TH 610. The future no build in **Table 7** shows these areas of congestion becoming worse.

MnDOT and the Metropolitan Council are completing a system interchange study of 52 system interchanges in Minnesota. The I-494/I-694 interchange is one of the system interchanges being studied. Therefore, there is an unknown outcome regarding the priority of the interchanges and unknown outcome on what the suggested improvements would be.

There is also the future TH 610 extension. TH 610 is currently a partial interchange and while construction of the full interchange is not yet identified in any regional plans, there is local support for the full interchange and this creates additional uncertainty on improvements to address mobility between I-494/I-694 and TH 610.

Finally, the project area is a MnPASS Tier 3 corridor. Tier 3 is the lowest priority for MnPASS lanes and therefore construction of managed lanes would not be considered until the end of the 20-year plan.

While the data suggests that addressing the vehicle congestion between the I-494/I-694 interchange and TH 610 is a need in this segment of the project area, there is uncertainty as to the outcomes of ongoing studies and future improvements addressing the congestion between I-494/I-694 and TH 610. Therefore, addressing congestion between I-494/I-694 will not be addressed with this project.

C. WHAT IS THE PURPOSE OF THE PROPOSED ACTION?

¹⁶ Source: 2040 Traffic Forecast Memorandum prepared by HNTB September 7, 2018

The purpose of the project is to improve the ride quality and restore the pavement structure of I-94 between the I-494/I-694 interchange in Maple Grove and TH 101 in Rogers, improve mobility between TH 610 in Maple Grove and TH 101 in Rogers consistent with the performance criteria identified in the *TH 610 Interstate Access Request*, and provide vehicle mobility to I-94 between Maple Grove Parkway and TH 101 to improve transportation system connectivity and to accommodate planned regional growth in the area.

In addition, the purpose of the project is to address drainage deficiencies along I-94 in the project area, address ADA deficiencies within the MnDOT right of way, address the need to improve commercial vehicle enforcement operations, and improve the pavement and truck capacity at the Elm Creek Rest Area.

Exhibit A
Interchange Review Committee Approval of Brockton Interchange



Minnesota Department of Transportation

Metropolitan District

1500 West County Road B-2
Roseville, MN 55113

November 7, 2012

Samantha Orduno
City Administrator, City of Dayton
12260 South Diamond Lake Road
Dayton, MN 55327

This letter is to serve as your notification that the Interchange Review Committee has determined that the planned interchange project at I-94 and Brockton appears to be consistent with the qualifying criteria found in Appendix E of the Council's Transportation Policy Plan.

As the project layout and design progresses, please work with MnDOT and the Met Council to assure the technical and design criteria of Appendix E continue to be met and that the appropriate steps are taken to complete the Metropolitan Council's Controlled Access Approval and FHWA's Interstate Access Request (IAR) when needed.

We appreciate your efforts to work with the Interchange Review Committee in our effort to understand this project and to design a review process that can be consistently applied to all interchange projects.

Sincerely



Interchange Coordinator

CC:

Mark Hanson, City of Dayton
Steve Stahmer, City of Rogers
Tom Johnson, Hennepin County
Nnaemeka Ezekwemba, FHWA
Connie Kozlak, Metropolitan Council
Ramankutty Kannankutty, MnDOT
Tony Fischer, MnDOT
Cyrus Knutson, MnDOT

An Equal Opportunity Employer



Exhibit B
Maple Grove Rest Area Pavement Investigation



Memorandum

To: Tony Heppelmann
From: Andrea Blanchette
Date: April 30, 2018
Re: Maple Grove Rest Area Pavement Investigation
WSB Project No. 3522-130

WSB & Associates, Inc. (WSB) was tasked with performing a visual observation of the pavement conditions at the rest area in Maple Grove. Since MnDOT does not rate or collect data on the pavement condition of these rest stops, WSB performed a site visit on April 26, 2018 and documented the condition of the paved areas based on a visual review of the paved areas. Please note, no measurements or distresses/pavement ratings were obtained during this site visit. A summary of the findings is included in this memo along with a map (**Figure 1**) breaking down the areas of the pavement that were investigated. Photos of the areas investigated are included in **Appendix A**.

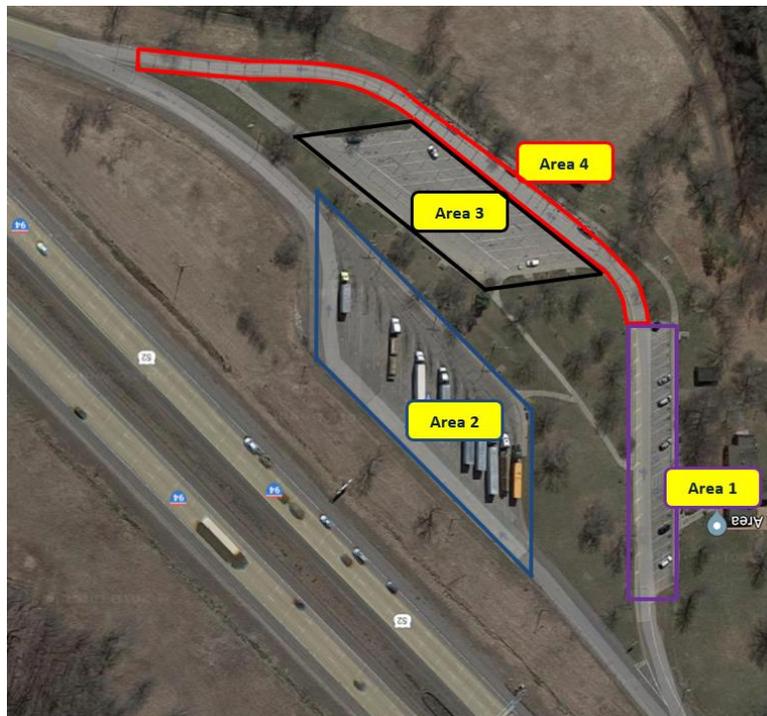


Figure 1 – Areas of pavement evaluated at the Rest Area in Maple Grove

Area 1

Area 1 included the on ramp to the rest area, the car parking stalls in front of the Visitor Center, the driving lane in front of the Visitor Center, and the sidewalk around the Visitor Center. As can be seen in the photos, the sidewalk is brand new and no distresses were noted. It is believed that this concrete was placed in 2017. It is worth noting that it does not appear that all the concrete curb was replaced at this time, only part of the curb looked new. Of the remainder of the parking areas in this rest stop, Area 1 was in the best condition. As can be seen in the photos, there were areas of moderate to severe spalling at the joints. There were also areas of severe longitudinal cracking. It appeared that a few slabs had already been replaced in this area likely due to more severe repairs being needed in the past. A few of the slabs contained areas of popouts likely caused by weathering of the aggregate.

Area 2

Area 2 included the semi-truck parking stalls. If we were to prioritize the four areas evaluated, this was the second best. That does not mean that severe distresses were not identified. There was faulting from half an inch to an inch in places. It is our belief that these are undoweled concrete slabs, which due to the heavy parked semi-truck traffic can explain some of the distresses noted. It would be recommended to replace these slabs with doweled concrete pavement, designed to withstand the semi-truck traffic and standing point loads these trucks put on the pavement as they park overnight. In addition to the faulting, there were areas of severe spalling and joint deterioration. The driving lane in this area appeared to have been previously overlaid with bituminous. This has since deteriorated and is breaking up into chunks of pavement. The fact that this driving lane has already been overlaid indicates that this is likely the worst of Area 2. The overlay is likely masking some of the other issues that were present before it was overlaid. There was a sidewalk that connects Area 2 and Area 3. The sidewalk was in good condition, minimal distresses noted.

Area 3

Area 3 included the mixed-use car and semi-truck parking stalls past the Visitor Center. This was tied for the worst of the four areas along with the driving lane adjacent to these parking stalls (Area 4). As can be seen in the photo, every slab in this area had severe joint spalling and deterioration, some were wide enough to fit a shoe (as seen in the photos). The widespread joint failure leads to a very low ride quality index in this area as each bump can be felt as you drive around. Due to the severe distresses present and the widespread poor condition of the pavement, it would be recommended that this area be completely reconstructed.

Area 4

Area 4 included the driving lane adjacent to the mixed-use car and semi-truck parking stalls. This area was tied with Area 3 as the worst pavement condition at the rest area. It appeared that at one point there had been an attempt to fix this area with a bituminous overlay. This overlay has since deteriorated past the point of repair. There was severe cracking present. The curb along this driving lane was in poor condition and there was standing water along the curb due to poor drainage. It would be recommended to completely reconstruct this area including replacement of the curb and addressing the drainage issue to drain the water off the pavement.

Appendix

Rest Area Photos

Area 1: Parking Stalls at Visitor Center, On Ramp and Visitor Center Sidewalk





Area 2: Truck Parking Lot





Area 3: Mixed Use Car and Truck Parking Lot



Area 4: Driving Lane for Cars

