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FIGURES

1. Purpose and Need

This section of the environmental impact statement (EIS) discusses the purpose of the proposed study and the need for improvements being considered in the Interstate 39/90/94 Corridor Study. Purpose and need factors identify existing problems and problems anticipated to occur in the future. The purpose and need for improvements in the I-39/90/94 study corridor shape the range of alternatives developed and evaluated, leading to the preferred alternative. The alternatives evaluation process determines the most appropriate solution(s) to identified and anticipated problems. The preferred alternative will be selected, in part, based on how well it satisfies the study's purpose and need. See Section 2 for a discussion of the alternatives considered and descriptions of the preferred alternatives.

1.1. Project Description

1.1.1. Location and Termini

The Wisconsin Department of Transportation (WisDOT) and the Federal Highway Administration (FHWA) are conducting the I-39/90/94 Corridor Study between US Highway (US) 12/18 in Madison and US 12/ Wisconsin State Highway (WIS) 16 in Wisconsin Dells. The study will also evaluate I-39 from its split with I-90/94 (I-39 I-90/94 Split Interchange) to Levee Road near Portage. Evaluation of the influence of the US 151/High Crossing Boulevard Interchanges extends the study corridor along US 151 to American Parkway/Nelson Road. A potential new interchange on I-94 at Milwaukee Street similarly extends the study corridor east along I-94. The study corridor is about 67 miles long and travels through Dane, Columbia, Sauk and Juneau counties, see Figure 1-1.

Consistent with FHWA regulations at 23 Code of Federal Regulations (CFR) 771.111(f), the study limits must connect logical termini and be of sufficient length to address environmental matters on a broad scope; have independent utility and will be a reasonable expenditure of funds even if no additional transportation improvements in the area are made; and does not restrict consideration of alternatives for other reasonably foreseeable transportation improvements, see further discussion in following sections.

Connects Logical Termini and Is of Sufficient Length

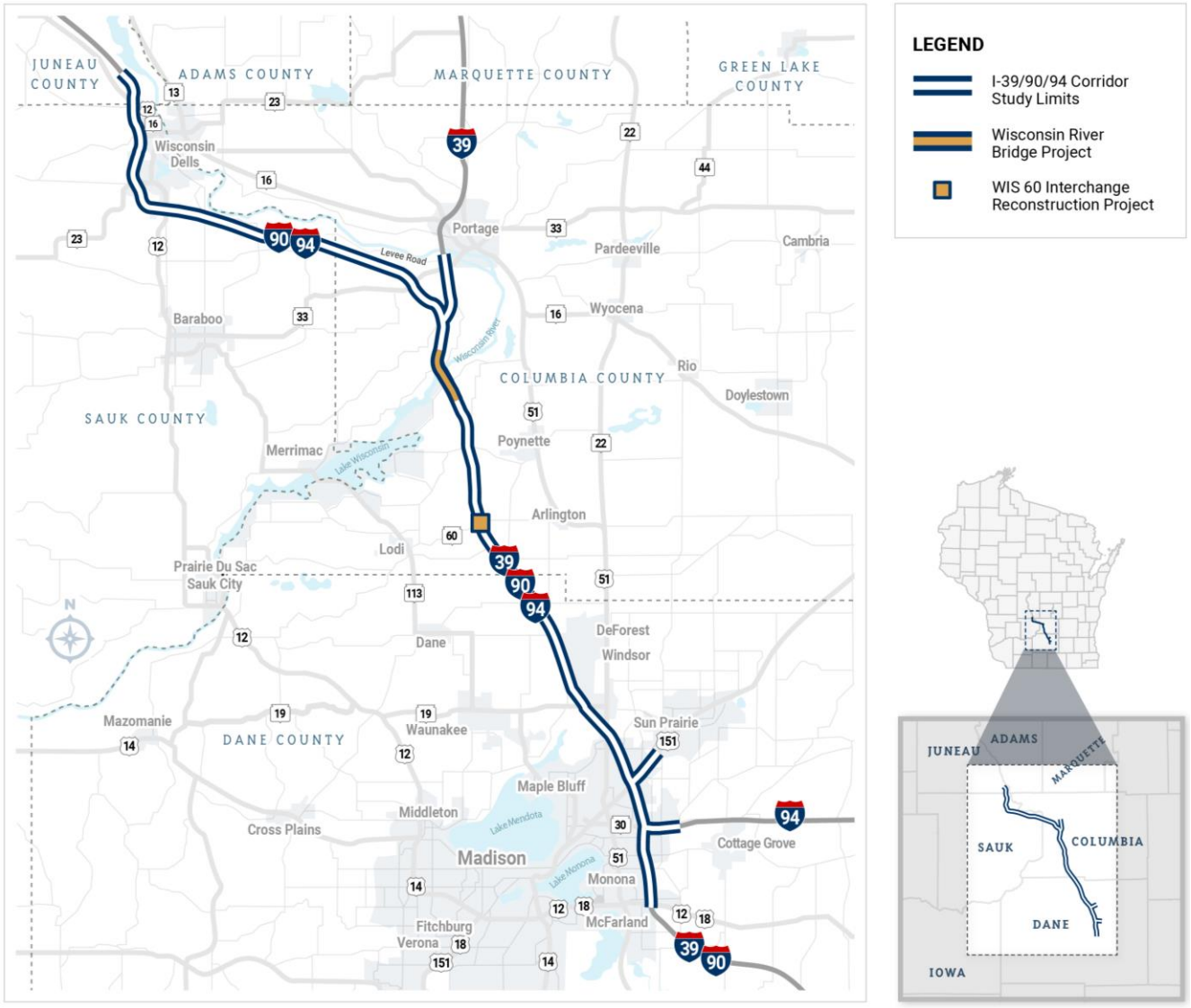
The southern terminus at the I-39/90 and US 12/18 Interchange in Madison is situated at a marked change in daily traffic (97,400 AADT north and 59,200 AADT south of the interchange).[1] The interchange serves major destinations to and from Madison during the weekday, as well as major destinations to and from points north of Madison reflecting recreational travel demand.[2] WisDOT also recently completed construction to modernize I-39/90 south of US 12/18, expanding the Interstate by a lane each direction and reconstructing 11 interchanges. During heaviest travel times, traffic congestion begins to decline north of the northern terminus at the I-90/94 and US 12/WIS 16 Interchange in Wisconsin Dells. In addition, I-90/94 north of the interchange has fewer travel demand and congestion issues compared to conditions south of the US 12/WIS 16 interchange. The I-39 northern terminus at Levee Road would address flood events impacting interstate operations between the I-39 I-90/94 Split

[1] *Wisconsin Department of Transportation. WisDOT Traffic Counts. TCMap: Wisconsin Department of Transportation Traffic Count Map*. https://wisdot.maps.arcgis.com/apps/webappviewer/index.html?id=2e12a4f051de4ea9bc865ec6393731f8 . Accessed 2022.

[2] *Wisconsin Department of Transportation. I-90 Madison to Tomah Needs Study Corridor Needs Report, I.D. 1010-11-00, I.D. 1014-10-01. January 2022.*

Interchange and the Wisconsin River. Based on the specific needs intended to be addressed by the study, see Section 1.4, the single southern and two northern termini are logical endpoints for improvements since they encompass the geographical extent of those needs. In addition, evaluating improvements along the 67-mile corridor in a single study rather than multiple smaller projects will lead to a more comprehensive understanding of the potential impacts and benefits of proposed improvements.

Figure 1-1: Study Corridor Geographic Location



Has Independent Utility and is a Reasonable Expenditure of Funds

This study will develop alternatives that independently address the identified transportation needs and will not require other projects to be built or other expenditures in order to address the needs. Section 1.6 includes additional details on other nearby projects that are independent of this study.

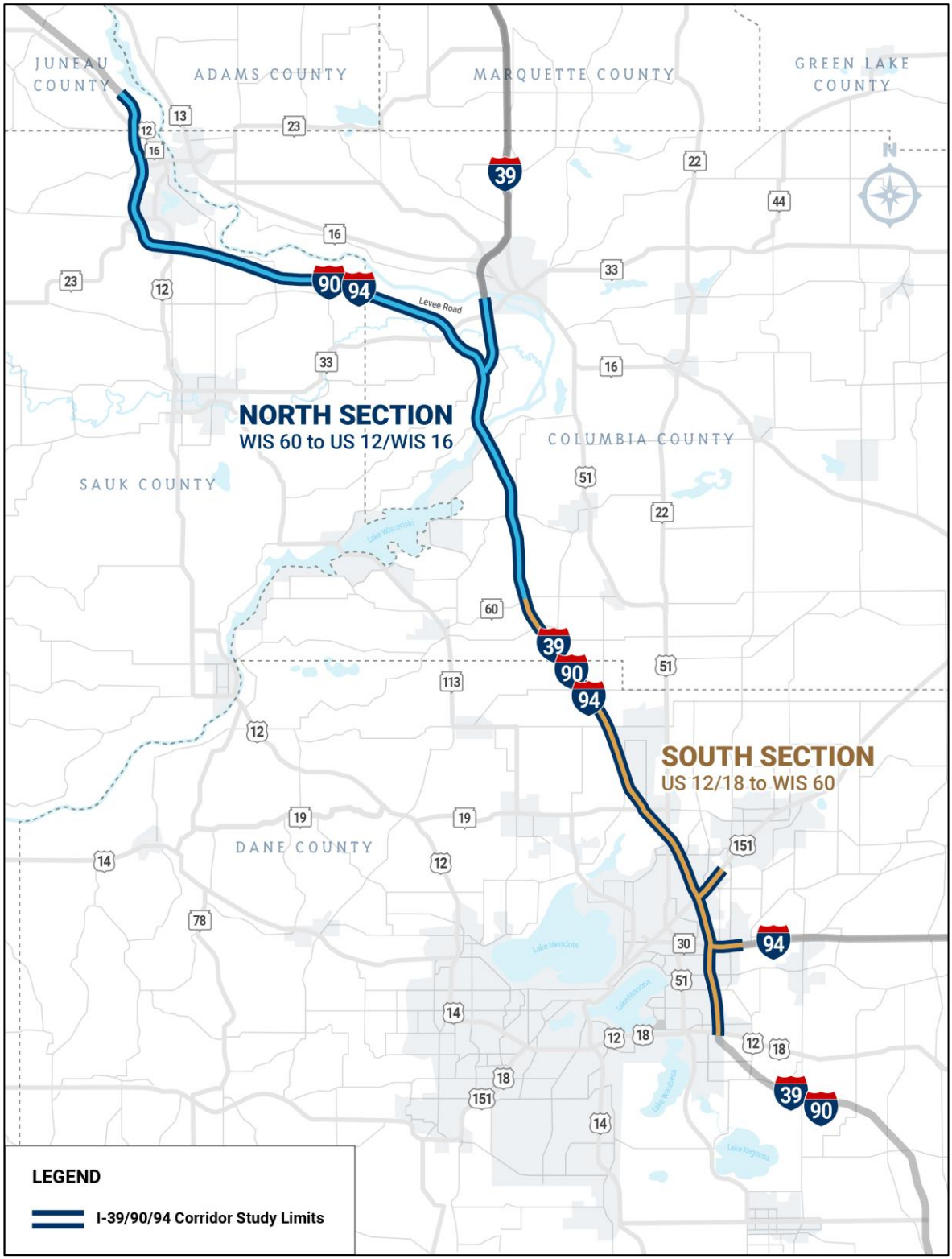
Any improvements in the I-39/90/94 study corridor would be constructed to match into the recently reconstructed interstate south of US 12/18. Since the US 12/WIS 16 interchange may be reconstructed as part of the preferred alternative, the study will evaluate I-90/94 north of US 12/WIS 16 to account for the impact of potential ramp extensions on existing railroad overpass bridges north of the interchange before matching into the existing cross section. Project alternatives will be developed in a manner that will not conflict with the development of alternatives for other projects, including the I-39/90/94 bridge replacement over the Wisconsin River and the WIS 60 interchange reconstruction project, both in Columbia County, see Section 1.6.

1.1.2. Freeway Characteristics

The study corridor is described by geographic locations to evaluate study purpose and need, see Figure 1-2:

- South Section: I-39/90/94 between US 12/18 and WIS 60
- North Section: I-39/90/94 between WIS 60 and US 12/WIS 16 and I-39 from the I-39 I-90/94 Split to Levee Road

Figure 1-2: Study Corridor North and South Sections



South Section

The South Section is 23 miles long. The corridor is a 6-lane divided freeway, which widens to eight lanes for 2.5 miles between the I-94/WIS 30 and US 151 interchanges. All locations along the South Section have 12-foot lane widths, 12-foot or greater paved shoulders along the median and 11-foot shoulders along the outside lane. The South Section contains seven interchanges:

- Three system interchanges: US 12/18, I-94/WIS 30 and US 151 (includes High Crossing Boulevard)
- Four service interchanges: US 51, WIS 19, County V and WIS 60

Spacing between interchanges is typically 2 to 4 miles, with 7 miles between County V and WIS 60. The south corridor contains 59 bridges and four box culverts.

What's the difference between a system interchange and a service interchange?

A ***system*** interchange connects two or more freeways, while a ***service*** interchange connects a freeway to arterial or collector roads. The US 12/18 Interchange is an example of a system interchange, while the US 51 Interchange is an example of a service interchange.

North Section

The North Section is characterized by two distinct subsections:

WIS 60 to I-39 I-90/94 Split Interchange and I-39 to Levee Road. North of WIS 60, the study corridor travels 11 miles to the I-39 I-90/94 Split Interchange and then continues 3 miles north on I-39 to Levee Road. I-39/90/94 is a 6-lane divided freeway, which narrows to 4 lanes for the 3 miles between the I-39 I-90/94 Split Interchange and Levee Road. This section of the study corridor has 12-foot lane widths with paved inside shoulder widths varying from 4 to 12 feet and outside shoulder widths varying from 4 to 11 feet.

This 11-mile section contains four interchanges:

- One system interchange: I-39/90/94/WIS 78 (the I-39 I-90/94 Split)
- One service interchange on I-39/90/94: County CS
- Two service interchanges on I-39: Cascade Mountain Road and WIS 33

There are 4 miles between WIS 60 and County CS, 7 miles between County CS and the I-39 I-90/94 Split Interchange, 0.50 miles from the I-39 I-90/94 Split Interchange to Cascade Mountain Road, and 2 miles between Cascade Mountain Road and WIS 33. The next interchange is beyond the study limits. There are 30 bridges and five box culverts.

I-39 I-90/94 Split Interchange to US 12/WIS 16. From the I-39 I-90/94 Split, the I-90/94 study corridor continues 25 miles to Dees Road, approximately 3,000 feet north of the US 12/WIS 16 interchange. This section has five service interchanges: WIS 33, US 12, WIS 23, WIS 13 and US 12/WIS 16. Spacing between interchanges is typically 2 miles, with 13 miles between WIS 33 and US 12.

I-90/94 is a 4-lane divided freeway for nearly the entire length; the highway narrows from three to two lanes in the westbound lanes 1 mile west of the I-39 I-90/94 Split Interchange and widens from two to three lanes eastbound at the I-39 I-90/94 Split Interchange. This section of the study corridor has 12-foot lane widths with paved inside shoulder widths varying from 4 to 12 feet, and outside shoulder widths varying from 4 to 11 feet. There are 24 bridges and one box culvert in this section.

What's the difference between a bridge and a box culvert?

The openings for a highway/stream crossing can be provided for by either culverts or bridges. A ***bridge*** is a structure having a span of more than 20 feet from face to face of abutments, while a ***culvert*** is typically embedded and surrounded by soil. A culvert may be made from a pipe, reinforced concrete or other material.

1.2. Project Background

1.2.1. Original Construction

I-90, starting in Seattle, Washington and ending in Boston, Massachusetts, was constructed in Wisconsin in the 1960s. I-94, also constructed in the 1960s, begins at its connection to I-90 in Billings, Montana, and ends in Port Huron, Michigan. I-39 extends from south to north between Bloomington-Normal, Illinois, and Wausau, Wisconsin. In 1992, FHWA commissioned I-39 in Wisconsin as running from the Illinois state line to WIS 29 in Wausau, Wisconsin. Interstate 39, within the study limits was constructed in 1995. It replaced US 51, which in the 1980s was one of the busiest 2-lane roads in the United States. Since original construction, starting in the 1970s, WisDOT has completed several pavement reconstruction, repair and overlay projects and bridge rehabilitation projects in efforts to maintain pavement and structures.[3]

1.2.2. Prior Studies

In 2014, WisDOT and FHWA began two EIS studies for the I-39/90/94 corridor in compliance with the National Environmental Policy Act (NEPA). The studies were: Madison to Portage (WisDOT Project ID: 1010-10-00) and Wisconsin Dells to Portage (WisDOT Project ID: 1014-10-00). In 2015, FHWA converted both projects to Tier 1 EIS's due to project complexity and funding limitations. The Tier 1 EIS's would have identified individual projects that could be implemented with project-specific environmental documents based on need and funding availability.

WisDOT and FHWA canceled both Tier 1 EIS's in Spring 2017 "due to recent and on-going reprioritization of major transportation projects." FHWA rescinded the Notices of Intent (NOI) to prepare EIS's for both projects on March 15, 2017. Because of ongoing needs along I-39/90/94, WisDOT subsequently prepared a Corridor Needs Report in January 2022, which summarized the existing and future conditions to be addressed in this corridor study.[4] The report findings are the basis for the study purpose and need.

[3] *Wisconsin Department of Transportation. I-90 Madison to Tomah Needs Study Appendix I - Existing Conditions Report. January 2022.*

[4] *See note 3 above*

1.3. Project Purpose

The purpose of the I-39/90/94 Corridor Study is to address existing and future traffic demands, safety issues, aging and outdated infrastructure and corridor resiliency.

1.4. Project Needs

The need for the transportation improvements in the I-39/90/94 study corridor is demonstrated through a combination of factors including the following elements:

- Traffic demands
- Safety needs
- Bridge condition
- Pavement condition
- Corridor resiliency

The remainder of Section 1.4 discusses these factors in more detail. The need for improvements sets the stage for developing and evaluating possible improvement alternatives.

1.4.1. Traffic Demands

Route Importance

I-39/90/94 is part of Wisconsin's "backbone system", a network of multi-lane highways connecting all major population and economic regions of the state.[5] The study corridor is also identified in the Wisconsin Electric Vehicle Infrastructure Plan as part of Wisconsin's designated Alternative Fuel Corridors because of its importance to serving traditionally underserved and rural portions of the state, as well as connecting tourism and recreation destinations.[6]

As a key freight route, 18% of truck freight in Wisconsin uses the study corridor and trucks make up at least 23% of all daily traffic. WisDOT's traffic counts indicates truck traffic on I-39/90/94 has not declined since the 2020 pandemic. Between 21% to 31% of the total interstate traffic volume consists of heavy vehicles.[7] Congestion and delay along freight routes increases product costs by reducing the efficiency of the shipping industry.

Both in-state and out-of-state tourists use I-39/90/94 to reach destinations such as the Wisconsin Dells area and northern Wisconsin, both of which are popular destinations and substantial economic generators for Wisconsin. The four counties in or near the study corridor, including Dane, Columbia, Sauk, and Juneau counties, accounted for over $4.5 billion total tourism business sales in 2022,[8] which is about 19% of the state's total tourism. As congestion

[5] *Wisconsin Department of Transportation. 2023-2032 Transportation Asset Management Plan. April 2023.*

[6] *Wisconsin Department of Transportation. Wisconsin Electric Vehicle Infrastructure Plan. Sept. 14, 2022.*

[7] *Wisconsin Department of Transportation. Traffic counts - Continuous count data. 2021. https://wisconsindot.gov/Pages/projects/data-plan/traf-counts/continuous.aspx.*

[8] *Wisconsin Department of Tourism. Travel Wisconsin Website, Economic Impact. County by County Spreadsheet (Total Tourism Impacts County by County) https://www.industry.travelwisconsin.com/research/economic-impact/. Accessed August 2023.*

increases, travel time will increase as well. Growth in the tourism industry depends upon more tourists visiting the area and the easier it is to travel to the destination, the more appealing the destination becomes.

The I-39/90/94 study corridor carries the highest traffic volumes around Madison with a mix of commuting and recreational traffic. Heavy weekday commuting traffic is primarily south of US 151 on the I-39/90/94 segment of the corridor between Madison and its southeast suburbs. Maintaining mobility along the corridor is also essential to supporting and growing the workforce in and around Madison and throughout the corridor. Heavy freight, tourism and commuting traffic in the study corridor impact traffic operations described in the next section.

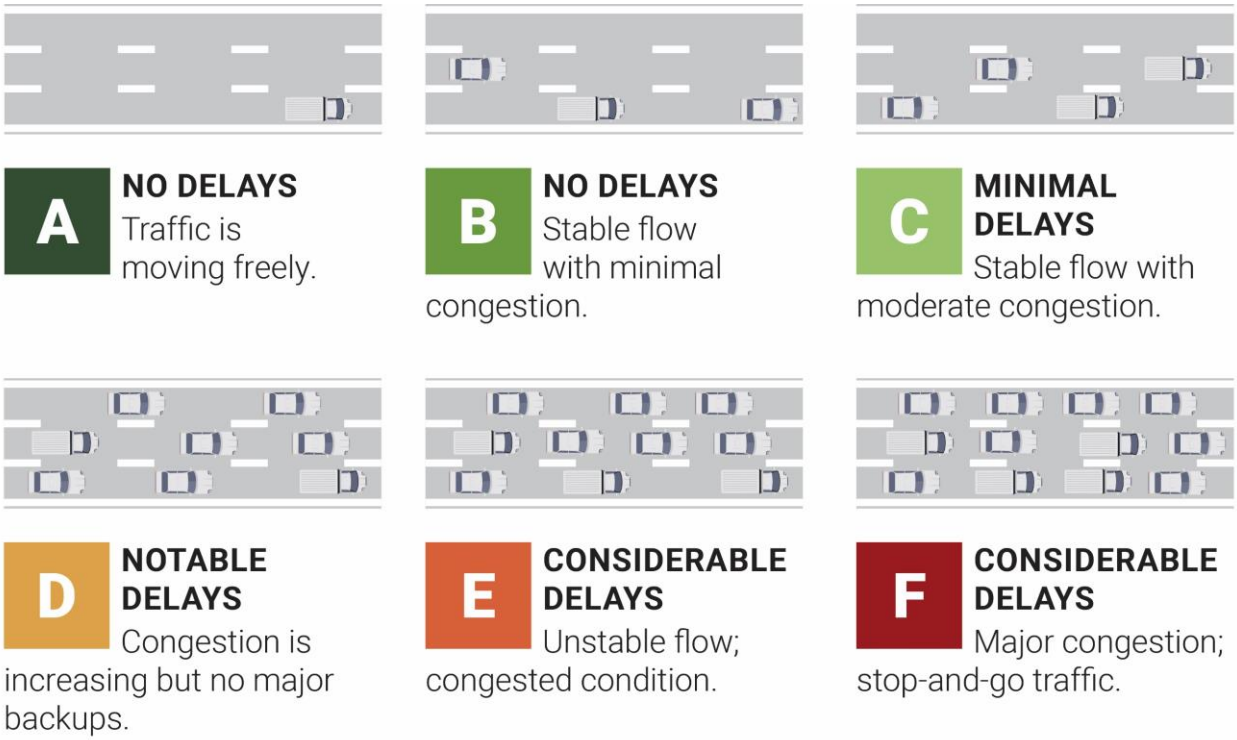
Traffic Operations

Roadways are typically designed to accommodate traffic volumes projected to occur 20 years in the future. For the I-39/90/94 Corridor Study, 2050 is the "design year", which is approximately 20 years from the year that improvement projects are typically opened to traffic. However, traffic volume is not the only factor that indicates how congested a roadway is, especially during heavy travel periods. Therefore, in addition to traffic volume, the term "Level of Service" (LOS) is used in this section. Level of service is the measure of a roadway's congestion using rankings ranging from A to F. Freeway LOS is based on the number of cars per hour per lane mile, with LOS A exhibiting free-flow traffic and LOS F exhibiting severe congestion that approaches gridlock.

Figure 1-3 illustrates the various levels of service. It is preferable that Interstates provide LOS C, but LOS D can be acceptable in urban areas, as reflected in policies for desirable LOS on freeways in WisDOT's Facilities Development Manual (FDM). When substantial portions of a freeway have a current or projected LOS that is more congested than desirable, WisDOT may consider improving the LOS preferably through incremental improvements or capacity expansion.[9] Sections of I-39/90/94 will operate at unacceptable levels of service within 10 years and most of the corridor will operate unacceptably by 2050 in the absence of improvements.

[9] *Wisconsin Department of Transportation. Facilities Development Manual. Chapter 11 Design Section 5 General Design Considerations. Nov. 17, 2020.*

Figure 1-3: Levels of Service (LOS) Measurements



In addition to commuter and freight traffic, recreational travel affects traffic operation patterns in the I-39/90/94 study corridor. During summer, the highest traffic volumes typically occur on Friday afternoons northbound and Sunday afternoons southbound. Figure 1-4 illustrates how travel patterns control peak periods. Peak period traffic is the period when the greatest volume of traffic occurs. Commonly called the rush hour, there are usually morning (AM) and evening (PM) peak hours. Reflecting unique summer recreational travel patterns in the I-39/90/94 study corridor, Friday and Sunday afternoons are also peak travel periods. The existing peak summer traffic volumes in Madison and Wisconsin Dells areas are already reaching average daily volumes projected in these areas by the year 2050.[10] Thus, the highest volumes currently experienced are expected to become the average traffic volumes in the future. As congestion increases, travel time reliability will decrease. The following sections discuss existing and future traffic demands.

[10] *See note 3 above*

How does WisDOT use traffic data to evaluate traffic operations?

The LOS analysis focuses on the existing or projected traffic along a highway during a particular peak hour. The amount of traffic occurring during this hour is called the Design Hour Volume (DHV). The DHV is one of the most important criteria used in the level of service evaluation. The selection of an appropriate hour for planning, design and operational purposes balances providing an adequate LOS for most hours of the year and providing economic efficiency.

WisDOT's policy is to use the 30th highest hour volume of the year as the Design Hour Volume for mainline freeways, mainline multilane highways, and rural two-lane facilities. The 30th-highest design hour may be used when the facility has a small number of hours in the year with higher volumes and has many hours that experience only a small reduction in volumes. However, in cases where traffic patterns are significantly different, other design hour volumes can be justified. For example, there may be circumstances where the 30th highest design hour is not realistic to use because of exceptionally high hourly volume peaking characteristics, as is the case for I-39/90/94 in Madison between US 12/18 and US 151.

WisDOT will use the 100th highest design hour on I-39/90/94 between US 12/18 and US 151. Selecting the 100th highest volume as the DHV for this high-volume segment, and the 30th highest volume for the remainder of the I-39/90/94 study corridor provides volume data that is consistent with higher observed volumes between US 12/18 and US 151 but minimizes the potential for LOS to drive towards financially cost prohibitive solutions.

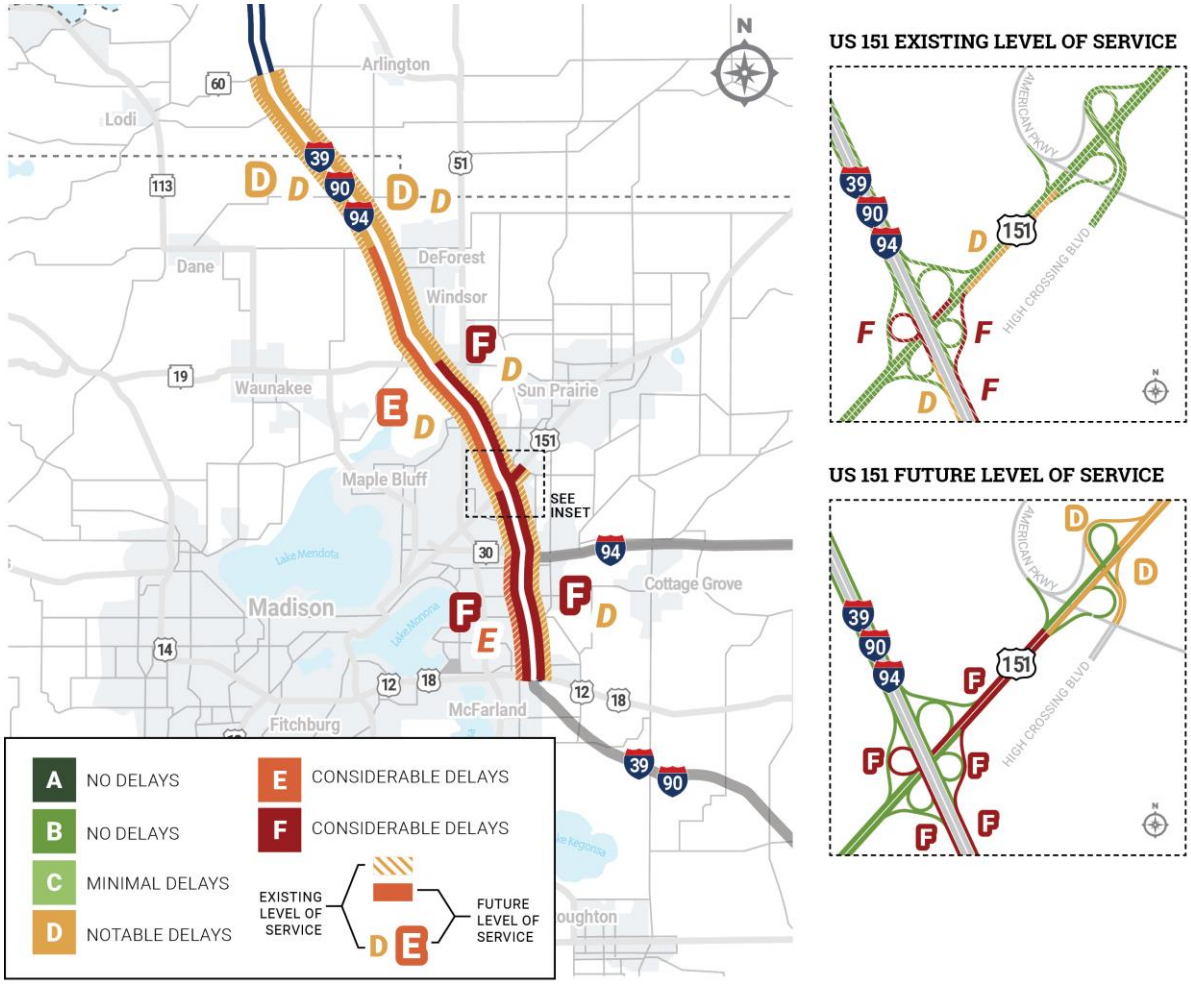
The COVID-19 pandemic decreased commuter traffic volumes on I-39/90/94. However, traffic counts show total corridor volumes now exceed pre-pandemic levels as increased truck volumes have offset the lagging volumes of commuter traffic. Total truck volumes along the study corridor increased 12% to 16% between 2019 and 2021, resulting in trucks representing a slightly higher portion of total traffic.

Figure 1-4: Travel Patterns during Peak Periods

South Section

The South Section currently experiences congestion at undesirable LOS E, see Figure 1-5. Existing traffic congestion occurs mainly in the Madison urban area on I-39/90/94 between US 12/18 and US 151. This area carries the highest traffic volumes in the study corridor, with a mix of commuting, recreational, and truck traffic.[11] Figure 1-5 shows increasing congestion in 2050, reaching undesirable LOS E and LOS F north of US 151 and LOS F between US 12/18 and US 151.

Figure 1-5: Existing and Future Freeway Level of Service – South Section



Congestion is most notable in the vicinity of the US 151 Interchange. US 151 functions as the main commuter route to and from the Sun Prairie area. Figure 1-5 shows existing ramps operating at LOS F. Congested ramps cause traffic queues on US 151 towards American Parkway and on northbound I-39/90/94. These conditions will only worsen in the future.

[11] *See note 3 above*

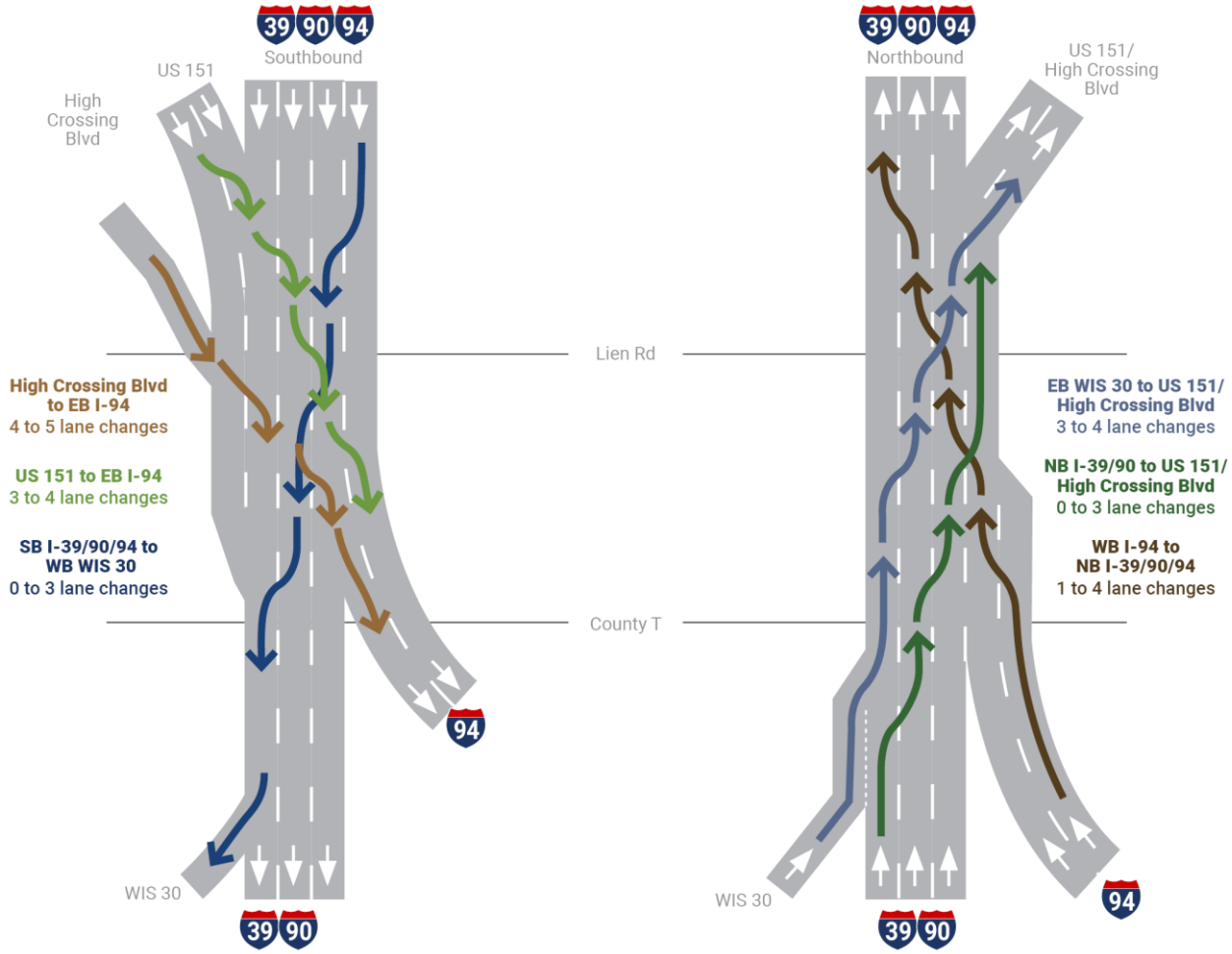
Congestion along I-39/90/94 and at the US 151 Interchange largely occurs because of overcapacity ramps and traffic weaves.

Overcapacity Ramps. Both the northbound I-39/90/94 to northbound US 151 ramp and the southbound US 151 to southbound I-39/90/94 ramp have existing and future traffic demands at or above capacity. These ramps have slow speeds and single-lane connections that have limited ability to accommodate high traffic volumes safely and efficiently.

Queues from the single-lane ramps can spill back onto the freeway mainline, creating unsafe speed differentials between ramp traffic and mainline traffic. Poor lane use at the northbound I-39/90/94 exit to the US 151/High Crossing Boulevard exit contributes to the congestion and backups on the mainline. The exit has two lanes, but the exit-only right lane feeds two high-volume ramps to northbound US 151 and High Crossing Boulevard while the shared left lane feeds the lower volume ramp to southbound US 151.

Northbound and Southbound Weaving. Traffic entering I-39/90/94 between the I-94/WIS 30 and US 151 interchanges experience weaving conflicts, where vehicles may have to make three or four lane changes under high traffic conditions, leading to traffic slowdowns and crashes, see Figure 1-6.

Figure 1-6: Weaving movements between the I-94/WIS 30 and US 151 Interchanges



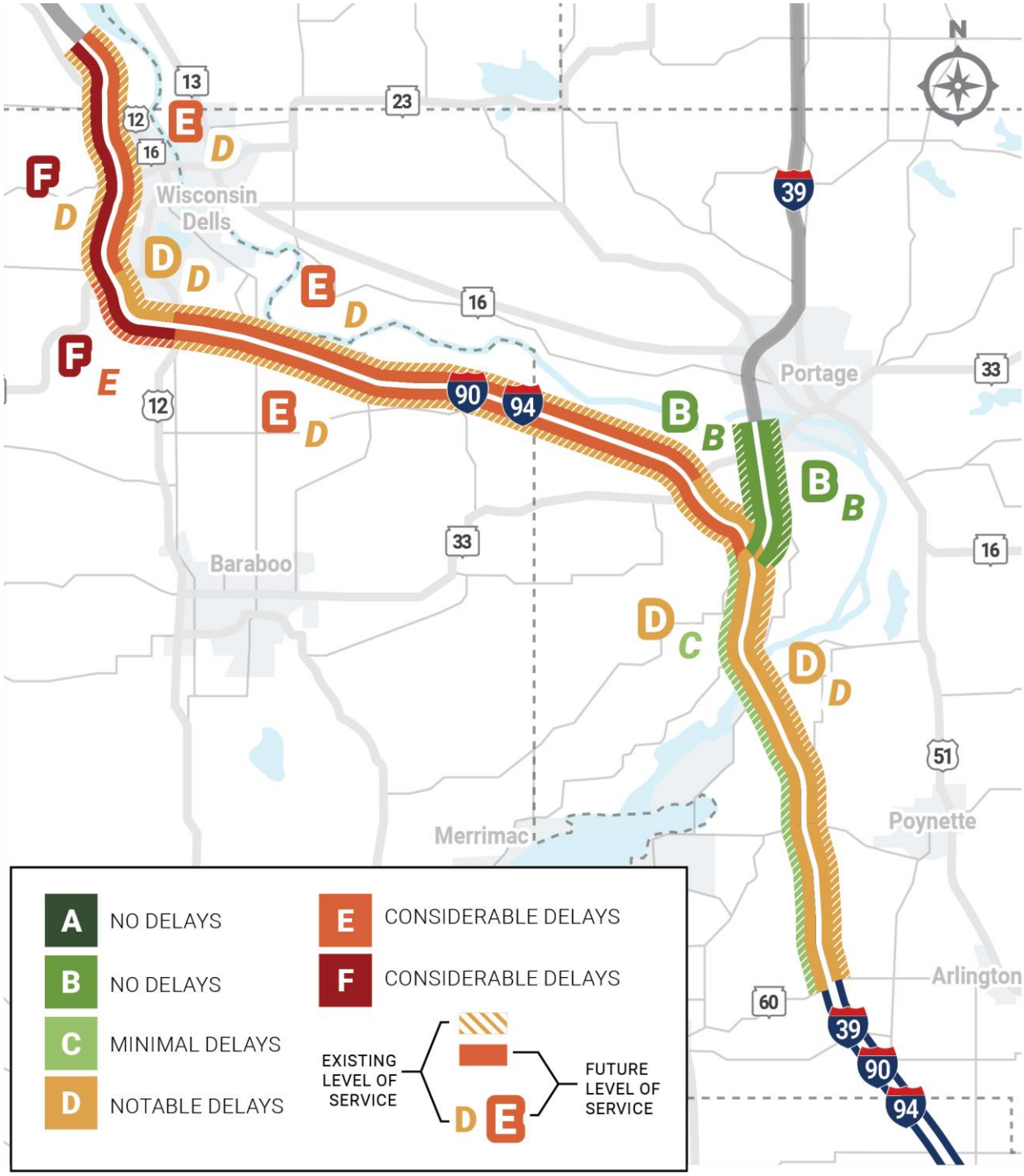
North Section

The North Section of I-39/90/94 is more rural but weekend summer traffic influences congestion. Wisconsin Dells is a popular tourist destination in the study corridor, and congestion occurs on Fridays and Sundays in the summer. Congestion will worsen as the Wisconsin Dells continues to grow in popularity.

Parts of the Interstate operate at an undesirable LOS D and LOS E now and will decrease to LOS E and LOS F by 2050, see Figure 1-7. Because the North Section is rural, the desirable LOS is C rather than D (for urban areas). Drivers anticipate having more delays in urban areas than in rural areas and therefore have a greater frustration with delays in rural areas.[12] Increasing congestion will add additional travel time to many tourist destinations.

[12] *See note 3 above*

Figure 1-7: Existing and Future Freeway Level of Service – North Section



1.4.2. Safety Needs

The location, frequency and severity of crashes are used to determine a highway's safety needs. WisDOT maintains a database of crashes that occur annually on the state highway system. This section describes the nature of crashes on the I-39/90/94 corridor sections and overall crash rates compared to the statewide average crash rates for similar highways. Crash data presented is based on total crashes occurring between 2017-2021, the most recent available data. Total crashes include those with fatalities; suspected serious, minor and possible injuries; and crashes with property damage only with no apparent injury. The data suggest that crashes tend to occur at the interchanges and congestion and geometric/design deficiencies contribute to the crashes.[13] Crashes often lead to secondary crashes where drivers approaching the resulting congestion backup at a high speed might not expect the slowed or stopped traffic and are not able to stop in time. Drivers are 70% more likely to be injured in a secondary crash compared to all other crashes. In fact, in 2019 88% of the secondary crashes in the study corridor occurred during congested travel periods, with about one half occurring on Sundays.[14]

South Section

The I-39/90/94 South Section crash rates exceeded the statewide average crash rate at interchanges. The US 151 Interchange has the highest crash rate in the study corridor with at least twice the statewide average, see Figure 1-8. During the PM peak periods, the ramp to northbound US 151 is over capacity with commuter traffic traveling between Madison and Sun Prairie. This backup onto the mainline freeway compromises safety because the queuing onto the mainline freeway mixes stopped vehicles with high-speed vehicles, resulting in rear-end crashes. Similarly, during the AM peak period, the loop ramp to southbound I-39/90/94 is over capacity with traffic traveling between Sun Prairie and Madison. The safety issues at US 151 are likely the result of congestion and geometry issues as illustrated in Figure 1-9.

[13] *See note 3 above*

[14] *See note 3 above*

Figure 1-8: I-39/90/94 2017-2021 Crash Rates US 12/18 to WIS 60

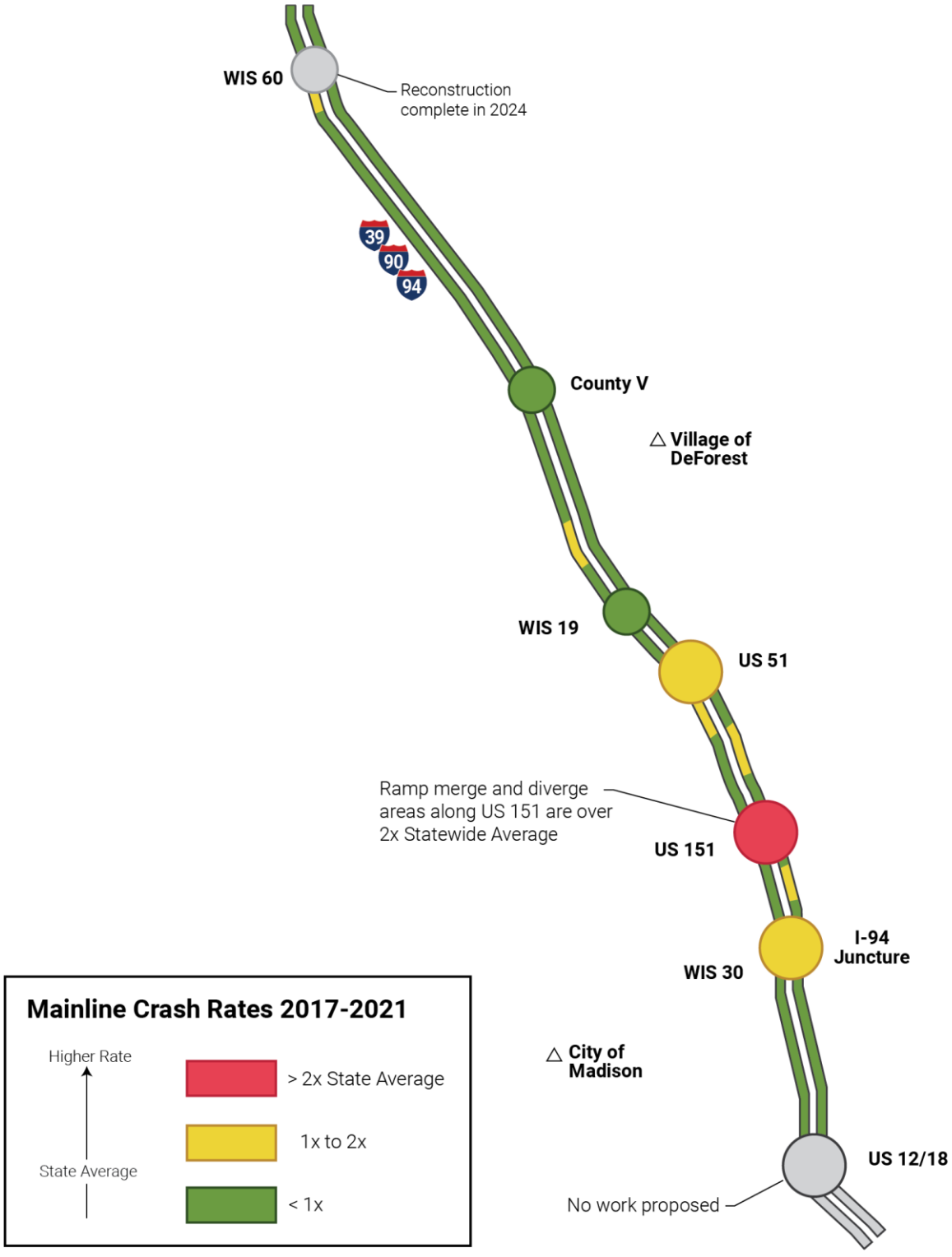


Figure 1-9: Design Deficiencies Contributing to High Crash Rates at the US 151 Interchange

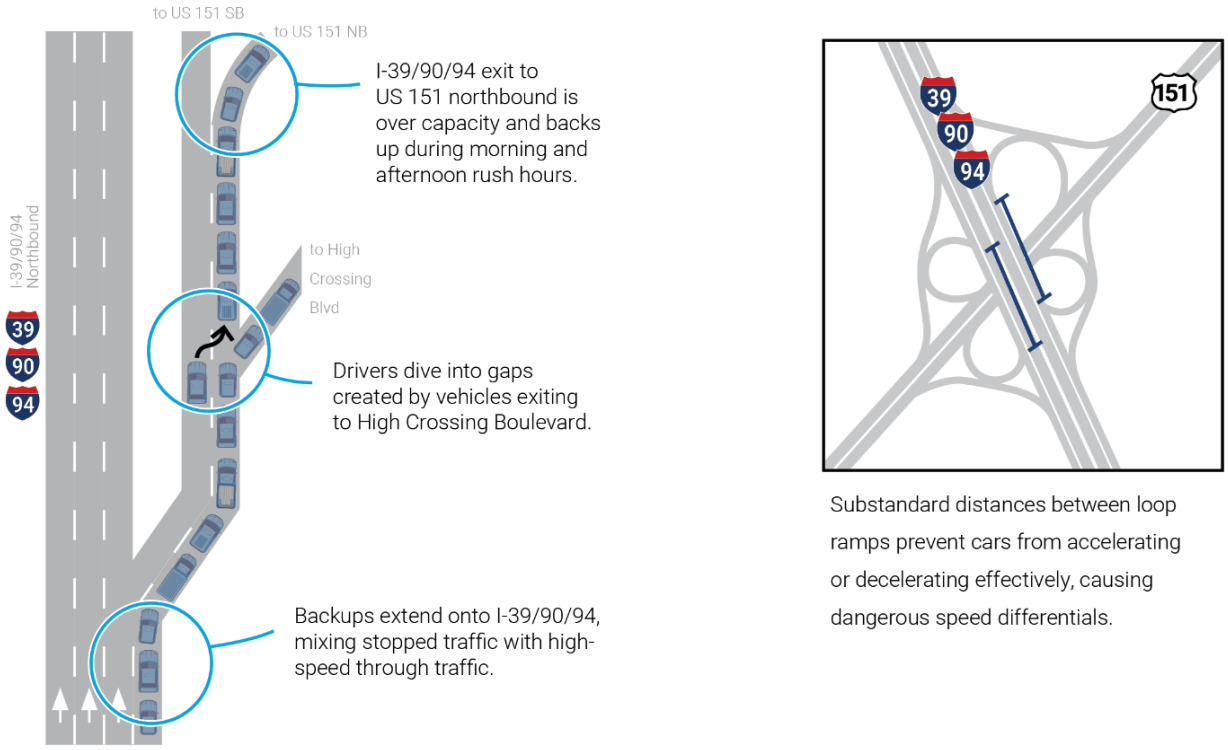
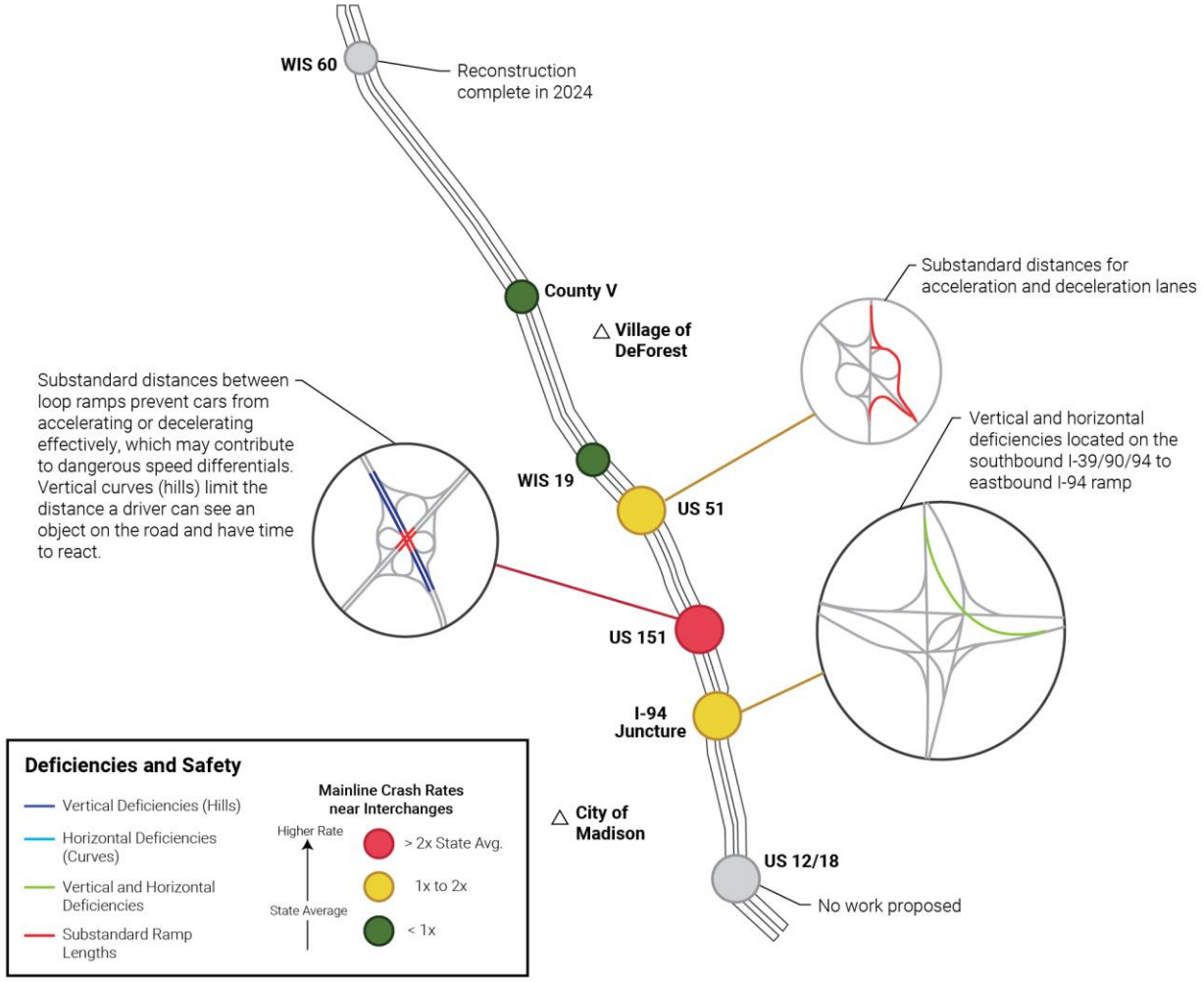


Figure 1-9 illustrates how there is inadequate distance between the loop ramps on each of the legs of the interchange. This deficiency prevents drivers from accelerating or decelerating effectively, causing dangerous speed differentials between the weaving movements as cars attempt to change lanes and speed to get between the loop ramps and the mainline. This results in sideswipe and rear-end crash types, which account for over 70% of the northbound crashes during weekday evening peak periods.

Figure 1-10 summarizes design deficiencies in the South Section that contribute to congestion and related safety issues. In addition to the deficiencies discussed above, vertical alignments (hills) do not meet WisDOT standards at the I-94/WIS 30, US 151 and WIS 19 interchanges and the side slopes do not meet the 6:1 slope standard. Steep vertical curves limit the distance a driver can see an object on the road and have time to react. Gentle 6:1 side slopes make it easier to regain control of a vehicle leaving the road, compared to steeper slide slopes. In addition to substandard ramp lengths at the US 151 Interchange, discussed above, other interchanges with substandard ramp design include US 51 and I-94/WIS 30.[15]

[15] *See note 3 above*

Figure 1-10: Design Deficiencies US 12/18 to WIS 60

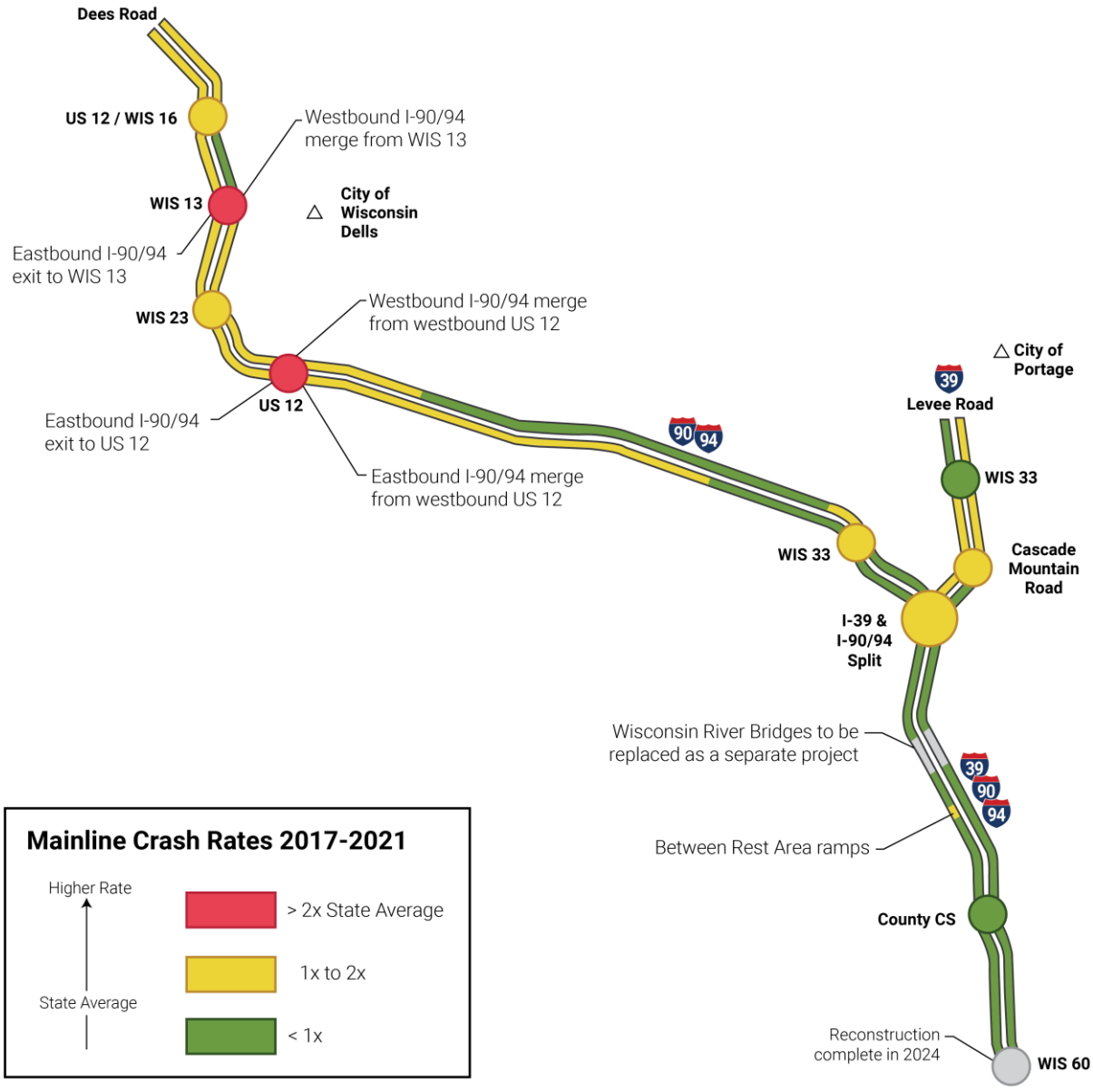


North Section

In the North Section of I-39/90/94, rear-end collisions are the most common crash type; crash rates along portions of the mainline are at or higher than the statewide average. As Figure 1-11 shows, much of the North Section study corridor has high mainline crash rates at interchanges.[16] Crash rates at two interchanges are twice the statewide average.

[16] *Note: WisDOT began reconstructing the WIS 60 interchange in 2022.*

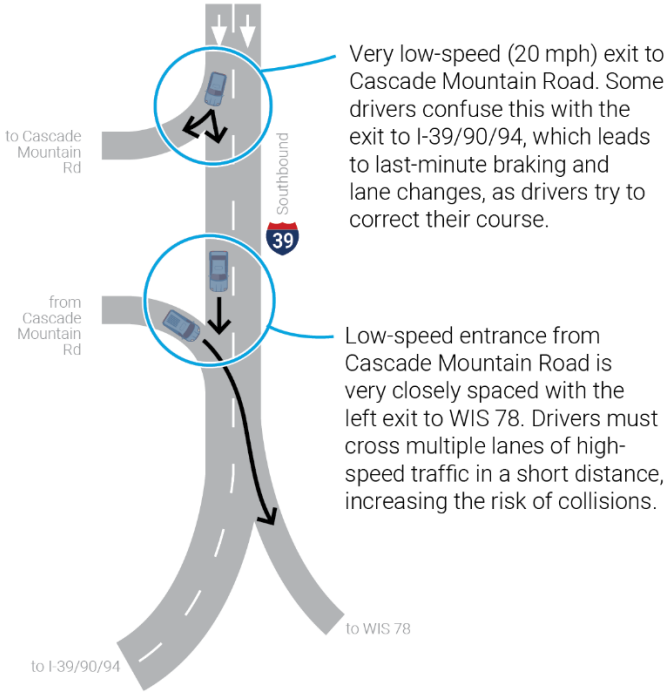
Figure 1-11: I-39/90/94 2017-2021 Crash Rates WIS 60 to US 12/WIS 16



On I-39 south of Cascade Mountain Road, there is not adequate space between the entrance ramp from Cascade Mountain Road and the exit ramps to both WIS 78 and I-39/90/94. These ramps are very close together, requiring vehicles to make lane changes in a short distance to take their desired routes. This, combined with the slow speeds required by the tight curve of the Cascade Mountain Road entrance ramp creates large speed differentials and many lane changes. Further, the signs for the exits to Cascade Mountain Road and I-90/94 are confusing and may contribute to crashes. Confused drivers take the Cascade Mountain Road exit at far higher speeds than what the ramp is designed for because they think they are exiting to I-90/94, see Figure 1-12.

Figure 1-12: Factors Contributing to High Crash Rates at Cascade Mountain Road

Advance signs for I-39/90/94 do not include Cascade Mountain Road.



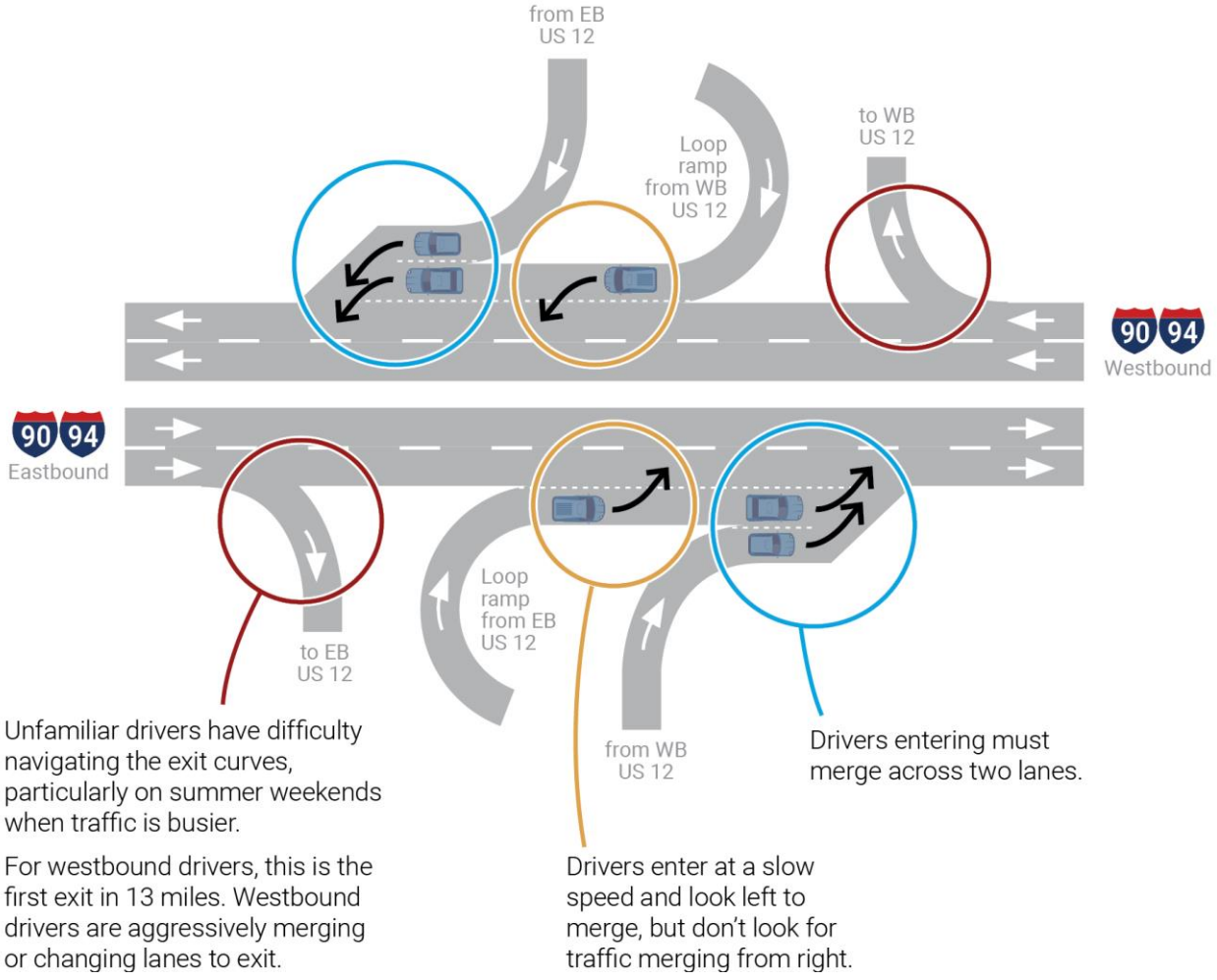
Moving northwest from the I-39 I-90/94 Split Interchange, the I-90/94 freeway and the interchanges near Wisconsin Dells all have safety issues. Just north of the I-39 I-90/94 Split Interchange, westbound I-90/94 drops from three to two lanes on a curve, contributing to sideswipe crashes.[17]

The crash rate along I-90/94 at the US 12 Interchange is also well above the statewide average.[18] The tight curve design at the US 12 to I-90/94 entrance ramps may contribute safety issues. Vehicles from two separate entrance ramps (one from eastbound US 12 and one from westbound US 12) must accelerate up to speed simultaneously while merging onto eastbound (or westbound) I-90/94 traffic. Drivers in one ramp must merge across two lanes, while watching for vehicles merging from the second ramp that are also merging onto I-90/94. This may contribute to sideswipe and multivehicle crashes, see Figure 1-13.

[17] *See note 3 above*

[18] *See note 3 above*

Figure 1-13: Factors Contributing to High Crash Rates at the US Highway 12 Interchange



Drivers on I-90/94 also have trouble navigating the exit ramps at US 12, particularly on busy summer weekends. The majority of crashes occur during the weekend when recreational traffic, unfamiliar drivers and aggressive driving make it difficult to navigate the tight ramp curves and slow ramp speeds as they exit I-90/94. For westbound drivers on I-90/94, US 12 is the first exit in 13 miles, causing some inattentive drivers to change lanes aggressively in order to exit. For the eastbound drivers on I-90/94, 75% of the crashes at the US 12 exit ramp happened during the Sunday afternoon peak, likely because of increased congestion and unfamiliar drivers.[19]

I-90/94 between WIS 23 and US 12 is on a curve, and this combined with a high volume of unfamiliar drivers during high congestion times contributes to high crash rates.[20] The Mirror Lake bridges have a crash rate 2.5 times the statewide average. The narrow bridge and narrow shoulders reduce space for drivers and contribute to higher

[19] *See note 3 above*

[20] *See note 3 above*

driver error and crash rates. Since 2011, three crashes have resulted in vehicles leaving the roadway and falling 100 feet into the lake below.[21]

The eastbound I-90/94 entrance ramp from WIS 23 has a short acceleration lane bordered by guardrail, which leaves little margin for error. Eastbound drivers must navigate the I-90/94 curve between WIS 23 and US 12 as well as the curve on the exit ramp.[22]

The I-90/94 eastbound exit to WIS 13 combines low speed with a narrow right shoulder. Vehicles cannot maneuver the curve at high speeds and crashes occur from vehicles leaving the road. This, plus a limited line of sight because trees block the drivers' view, creates difficult conditions for a driver to see a slow-moving vehicle in front of them.[23]

Interchange ramp design deficiencies, including ramp styles and vertical and horizontal curves can also impair driver safety. Eight interchanges in the North Section have taper-style ramps that have short merge distances into traffic lanes. The current design standard for ramps is to provide parallel style ramps. Parallel ramps allow vehicles more distance to get up to speed before entering traffic, or to slow down outside of active traffic lanes to exit the freeway, see Figure 1-14.[24]

Figure 1-14: Taper Style and Parallel Style Ramps

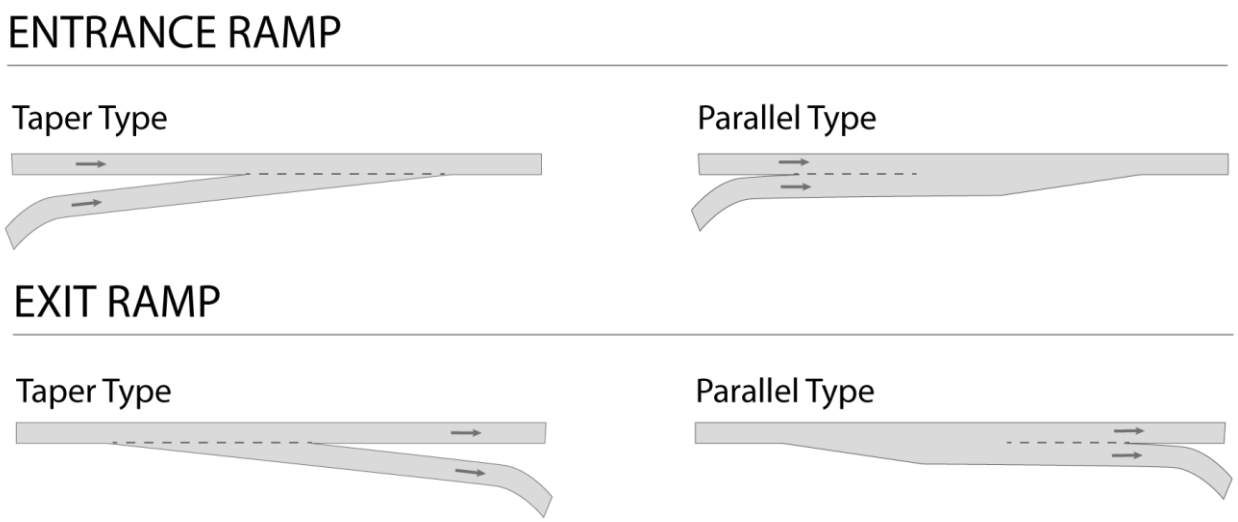


Figure 1-15 summarizes design deficiencies that may affect safety at interchanges between WIS 60 and Levee Road. Figure 1-16 summarizes design deficiencies at interchanges between the I-39 I-90/94 Split Interchange and

[21] *See note 3 above*

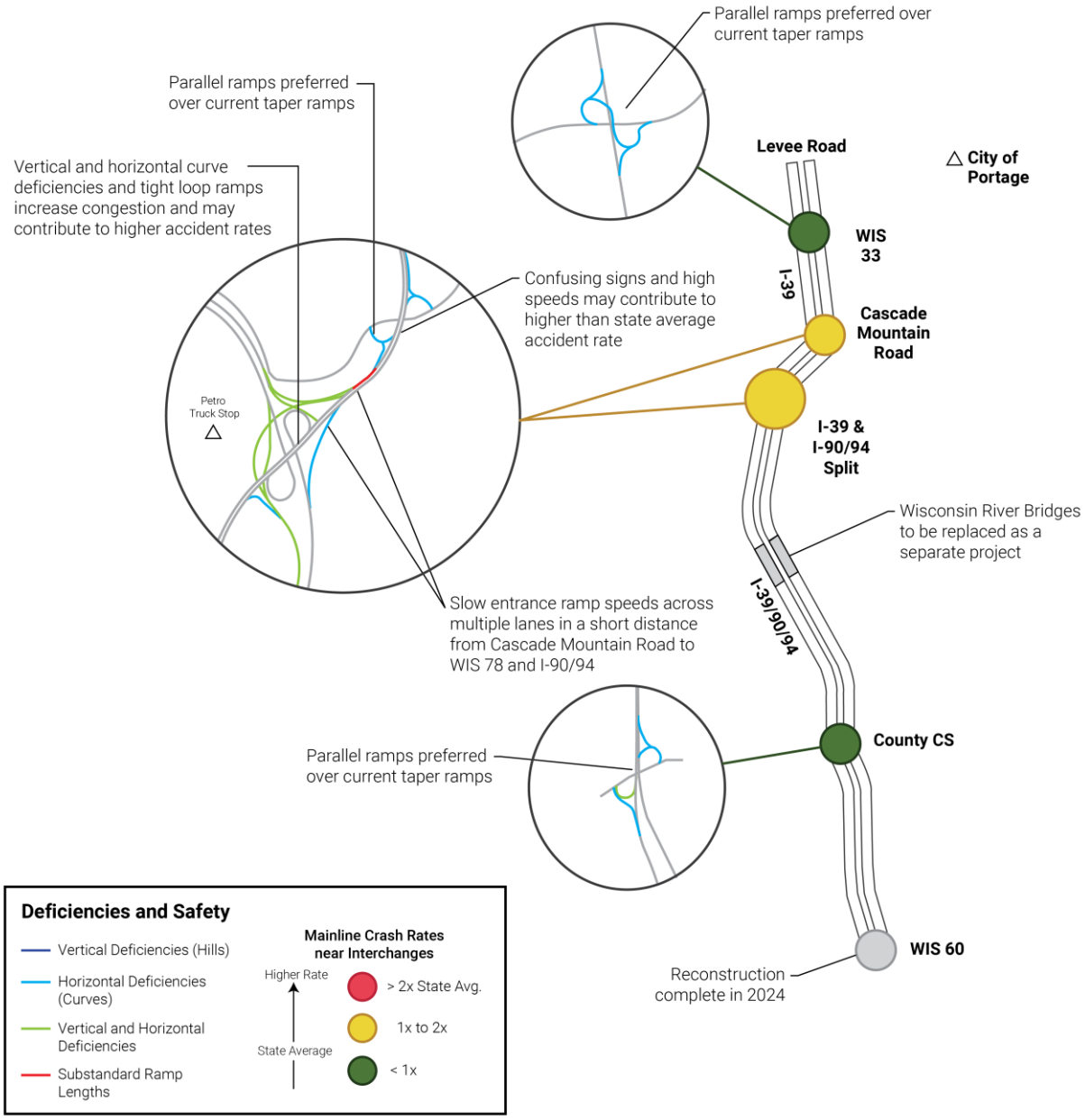
[22] *See note 3 above*

[23] *See note 3 above*

[24] *See note 3 above*

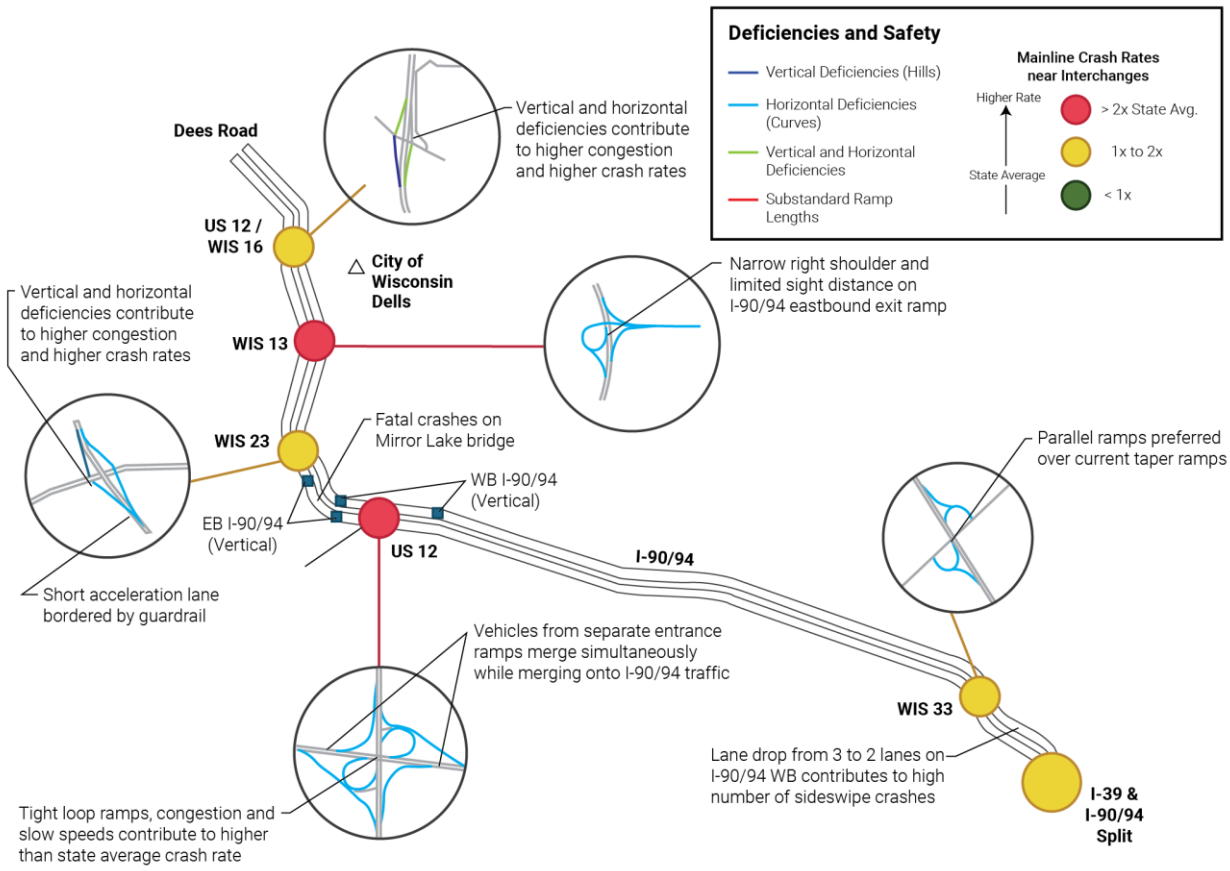
US 12/WIS 16. Improving the vertical and horizontal curves allows for a more efficient and safer driving experience.[25]

Figure 1-15: Design Deficiencies WIS 60 to Levee Road



[25] *See note 3 above*

Figure 1-16: Design Deficiencies I-39 I-90/94 Split to US 12/WIS 16



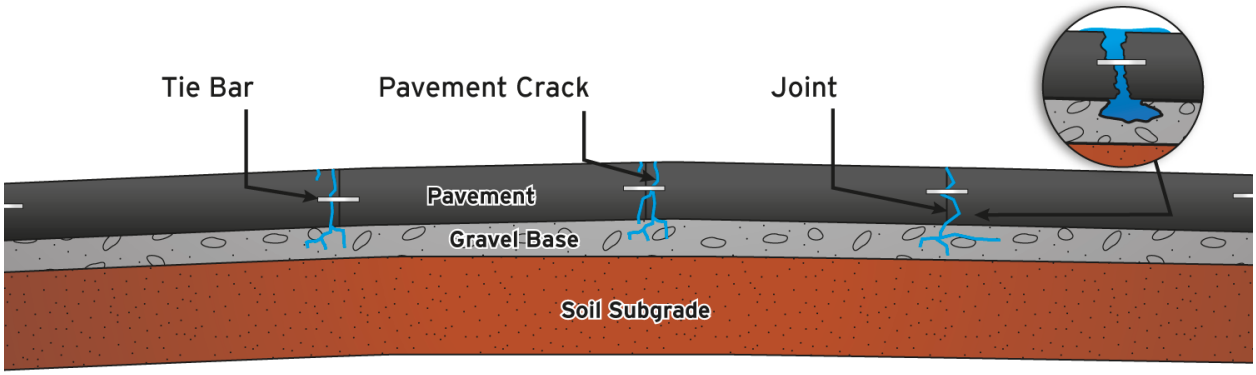
1.4.3. Pavement Condition

WisDOT measures pavement condition using a Pavement Condition Index, where a PCI rating of 55 or greater indicates the pavement is in fair to good condition. WisDOT's pavement performance goal is to have 90% of its backbone highway pavements rated fair or better.[26] By the year 2030, WisDOT projects that over 20% of pavement in the study corridor will be in poor or worse condition.

The base pavement throughout the study corridor is concrete. As concrete pavement ages, the top layer of concrete begins to wear and crack, which enables water to enter the pavement, see Figure 1-17. Water rusts the dowel bars and deteriorates the concrete creating cracks; both decrease the pavement's stability. The freeze and thaw cycle and heavy truck loads cause the cracks to widen, which further stresses and destabilizes the pavement. Transverse, longitudinal, fatigue, and edge cracking, and rutting or faulting are common on Midwest roadways.

[26] *Wisconsin Department of Transportation. MAPSS Performance Improvement Report. July 2023.*

Figure 1-17: Basic Pavement Components



Once the original pavement has deteriorated, repair work can be performed to extend the life of the pavement. Concrete repair is typically needed by year 25 of its life, then at year 33, and again at year 48. Eventually, full pavement replacement is more cost effective than more repair. Pavement maintenance projects in the I-39/90/94 study corridor, are anticipated in 24 of the next 30 years somewhere in the study corridor, which presents ongoing travel delay and congestion for daily commercial and recreational traffic.

Emergency pavement projects also occur outside of the estimated pavement maintenance schedule, which affects maintenance and construction schedules. The most recent example is the pavement section between County V and WIS 60 reconstructed in 2006. There is a one-mile section that has begun to exhibit symptoms of failing pavement, requiring a project in 2022 to repair cracked and failing concrete pavement joints. Instead of lasting the expected 25 years, the pavement only lasted 14 years.

1.4.4. Bridge Conditions

Although age is not a direct indicator of a bridge's needs, it is a gauge to assess the magnitude of potential future maintenance projects required. Within the I-39/90/94 study corridor there are 113 bridges,[27] of which 84 will be over 50 years old in the year 2030.[28] Further, many bridges do not meet current standards for bridge height or width clearances.

WisDOT uses a variety of bridge condition ratings, including FHWA's Structural Evaluation Appraisal Rating. The Structural Evaluation Appraisal Rating provides a detailed bridge evaluation based on the condition of the superstructure, substructure, deck and deck geometry. On the Structural Evaluation Appraisal Rating scale of 0 to 9, a value of 5 means the bridge is somewhat better than minimum adequacy to tolerate being left in place as-is, and a value of 4 means the bridge meets the minimum tolerable limits to be left in place as-is. The following sections discuss Structural Evaluation Appraisal Rating values of 5 or lower for the study corridor South and North

[27] *Structures include bridges and box-culverts longer than 20 feet.*

[28] *See note 3 above*

sections. Additional bridges in the study corridor, currently above a rating of 5, would likely decline to 5 or below in the coming years.[29]

South Section

Eight bridges, shown in Table 1-1, have a Structural Evaluation Appraisal Rating value of 5 or lower. WisDOT will need to replace each of the bridges in Table 1-1 in the late 2020s or 2030s. Others will need investments or improvements.

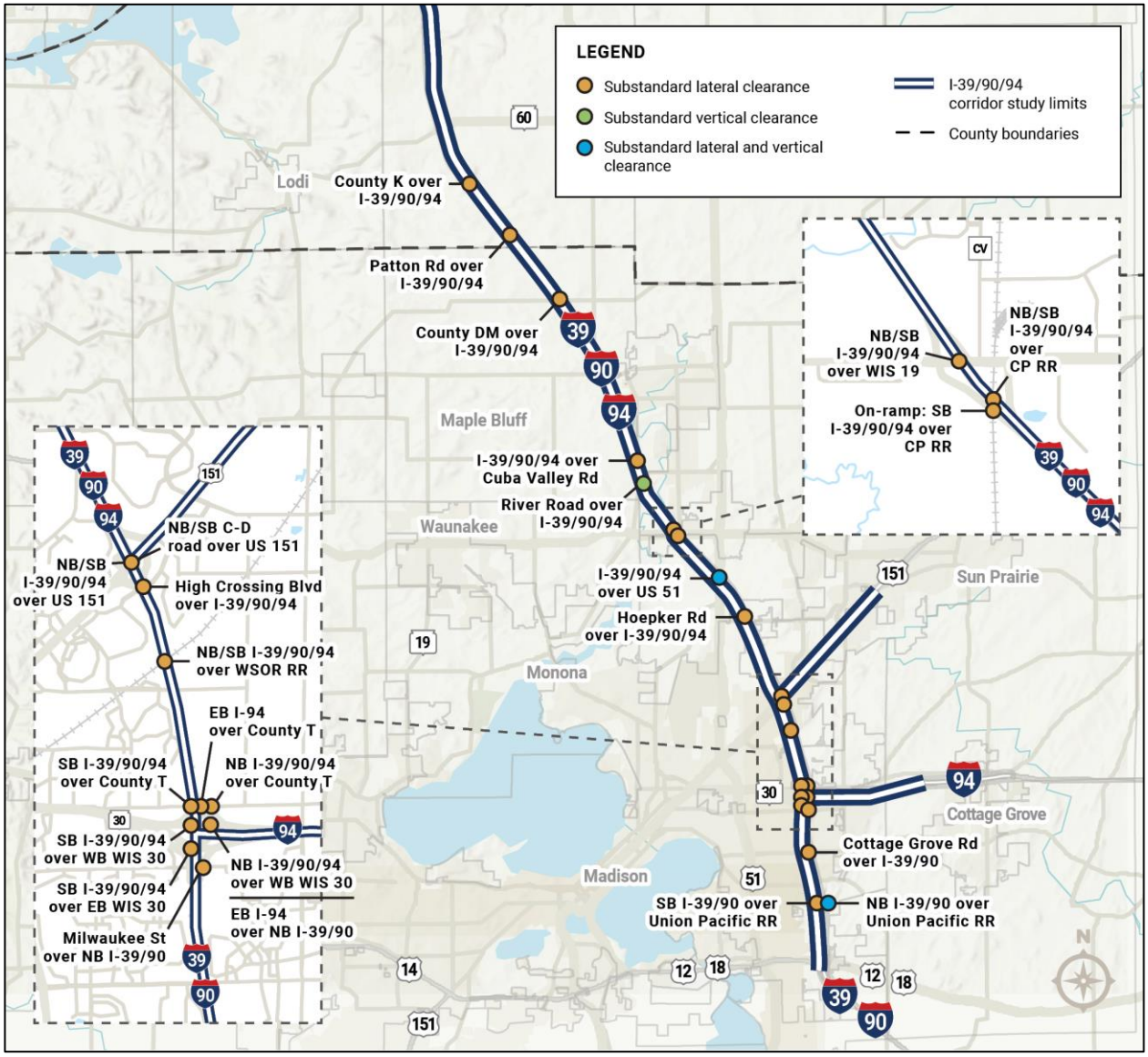
Table 1-1: South Section: Bridges with Structural Evaluation Appraisal Rating of 5 or Lower

Bridge Carrying	Over	Year Built	Structure Appraisal
County K	I-39/90/94	1961	5
Patton Road	I-39/90/94	1961	5
I-39/90/94 Southbound	Cuba Valley Road	1960	5
I-39/90/94 Northbound	Cuba Valley Road	1960	5
I-39/90/94 Northbound	WIS 19	1960	5
Hoepker Road	I-39/90/94	1960	4
I-39/90/94 Northbound	Wisconsin and Southern Railroad	1959	5
Cottage Grove Road/County BB	I-39/90	1961	5

[29] *U.S. Department of Transportation, Federal Highway Administration, Office of Engineering Bridge Division. Recording and Coding Guide for the Structural Inventory and Appraisal of the Nation's Bridges. Report No. FHA-PD-96-001. December 1995.*

Figure 1-18 summarizes bridges in the South Section that do not meet WisDOT's vertical or lateral clearance criteria.

Figure 1-18: South Section Bridges with Substandard Vertical and Lateral Clearances



Source: WisDOT

North Section

Twenty-two bridges, shown in Table 1-2, have a Structural Evaluation Appraisal Rating of 5 or lower. Some of these bridges are approaching the end of their useful life and will need to be replaced within the next 30 years. Others need investments or improvements.

Additionally, the I-90/94 bridges over Mirror Lake (see Figure 1-19), constructed in 1961, are "fracture critical".[30] Fracture critical means that failure of a steel girder could cause the bridge to collapse. Most highway bridges are designed so that the bridge will remain standing even if one of the girders fails. The Mirror Lake bridges are reaching the end of their useful life and will likely need to be replaced in the mid-2030s without substantial rehabilitation work.[31]

Figure 1-19: Mirror Lake Bridge Photos

[30] *American Association of State Highway and Transportation Officials (AASHTO). Proposed AASHTO Guide Specifications for Analysis an Identification of Fracture Critical Members and System Redundant Members. 2018.*

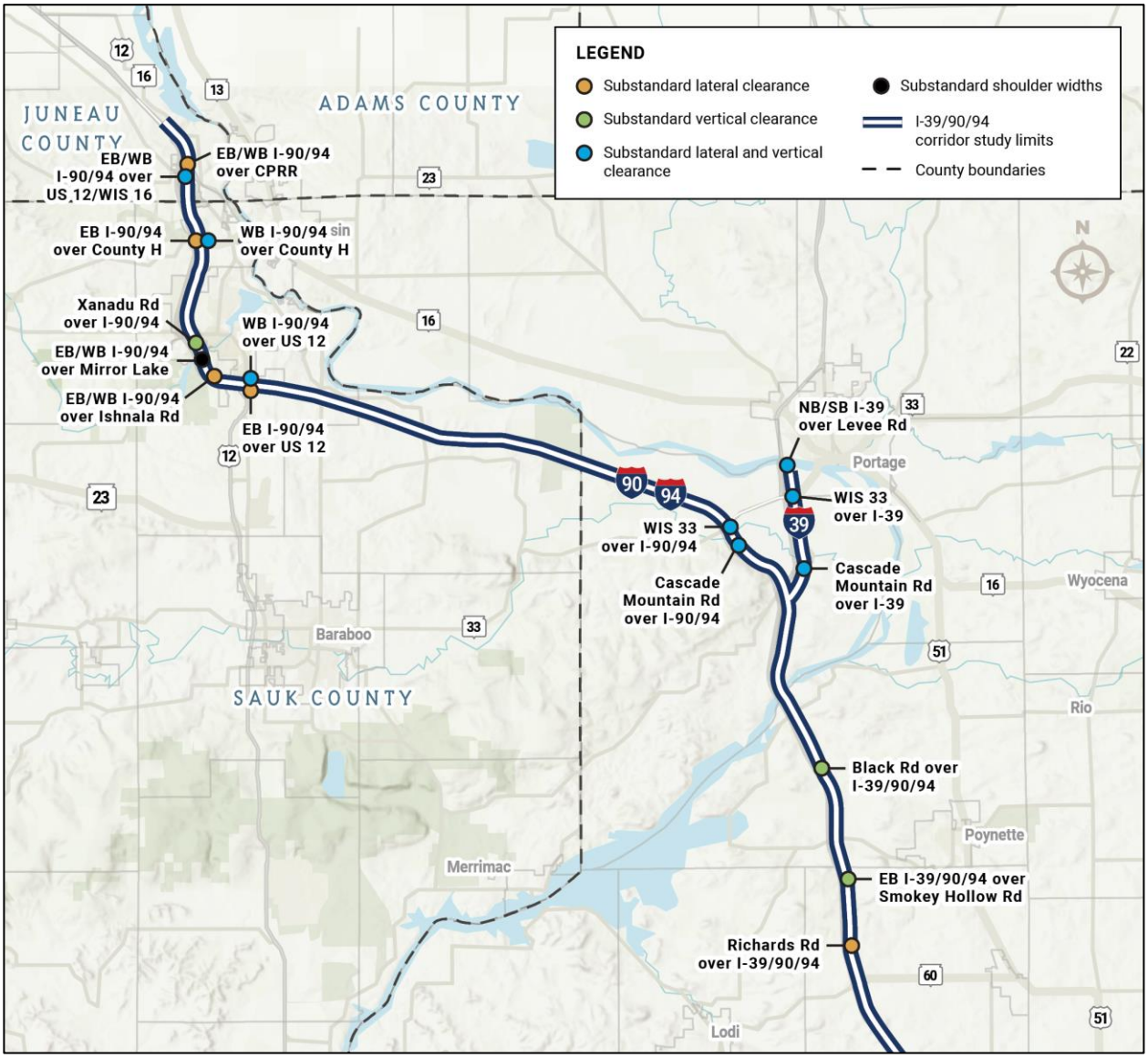
[31] *See note 3 above*

Figure 1-20 summarizes bridges in the North Section that do not meet WisDOT's vertical or lateral clearance criteria.

Table 1-2: North Section: Bridges with Structural Evaluation Appraisal Rating of 5 or Lower

Bridge Carrying	Over	Year Built	Structural Appraisal
Cascade Mountain Road	I-39	1963	5
Northbound I-39	Levee Road	1964	5
Richards Road	I-39/90/94	1961	4
Smokey Hollow Road	I-39/90/94	1984	5
Southbound I-39/90/94	Rowan Creek	1961	5
Northbound I-39/90/94	Rowan Creek	1961	5
Kent Road	I-39/90/94	1961	4
Cascade Mountain Road	I-90/94	1961	5
Westbound I-90/94	Baraboo River	2003	5
WIS 33	I-90/94	1961	5
Van Hoosen Road	I-90/94	1961	5
County T	I-90/94	1961	5
Gillem Road	I-90/94	1960	5
County A	I-90/94	1960	5
Westbound I-90/94	Ishnala Road	1961	5
Eastbound I-90/94	Mirror Lake	1961	5
Westbound I-90/94	Mirror Lake	1961	5
Xanadu Road	I-90/94	1961	4
Trout Road	I-90/94	1961	5
Eastbound I-90/94	WIS 13	1961	5
Eastbound I-90/94	Canadian Pacific Railway	1964	5
Westbound I-90/94	Canadian Pacific Railway	1964	5

Figure 1-20: North Section Bridges with Substandard Vertical and Lateral Clearances



Source: WisDOT

1.4.5. Corridor Resiliency

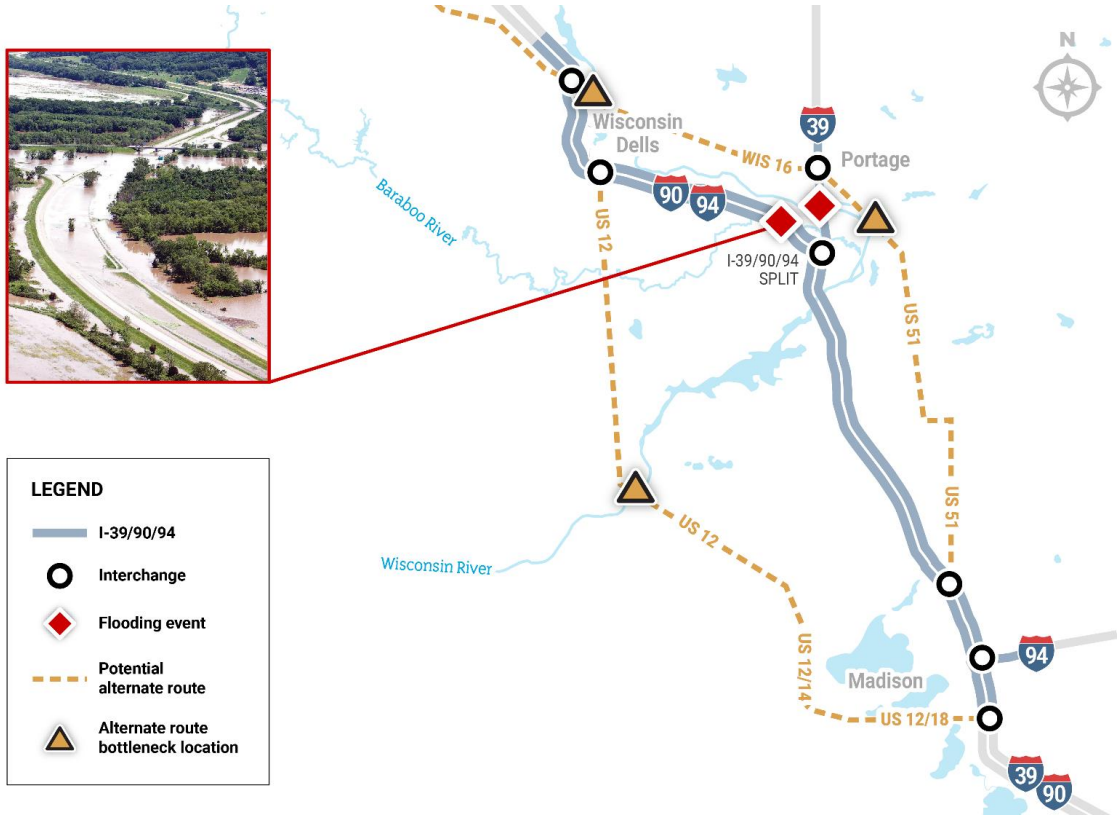
Flood events causing partial or full Interstate closures since 2008 have impacted vital connections for commerce and emergency services. Both I-39 and I-90/94 are in a low area as they cross the Baraboo and Wisconsin Rivers. The Baraboo River near the I-39 and I-90/94 Split Interchange flooded in 2008, closing both I-39 and I-90/94 for several days. The Baraboo River flooded again in 2018, which partially closed I-90/94. The Baraboo River flooding is problematic because it affects both I-90/94 and I-39, which has substantial impacts to both state and national commerce. Figure 1-21 illustrates locations of flood events.

During the 2008 closure, the alternate travel route added considerable indirection, using WIS 29 from Eau Claire to Green Bay and then I-43 from Green Bay to Milwaukee, a 66-mile-longer route and a 1-hour-and-10-minute travel

time increase. Other alternate routes to I-90/94 have geographic barriers that limit options to travel around or over and bottlenecks. From Madison to Wisconsin Dells, the Wisconsin River is a geographic barrier to alternate routes. The alternate routes also have bottlenecks in Sauk City, Portage, and Wisconsin Dells with traffic signals, lower speed limits and many intersections, see Figure 1-21.[32]

The risk of flooding may increase because of climate change. The Fourth National Climate Assessment predicts "increases in the severity and frequency of heavy precipitation events will affect inland infrastructure in every region, including access to roads, the viability of bridges, and the safety of pipelines."[33] The American Association of State Highway and Transportation Officials noted, "Future climate conditions, including increased precipitation and sea level rise, are anticipated to impact the structural performance, and therefore, the functionality of our transportation facilities. As such, the integration of climate considerations into the design of transportation facilities is an important step in ensuring that target levels of facility performance are met as climate conditions change."[34]

Figure 1-21: Corridor Flooding and Alternate Route Bottlenecks



[32] *See note 3 above*

[33] *U.S. Global Change Research Program (USGCRP). 2018: Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II [Reidmiller, D.R., C.W. Avery, D.R. Easterling, K.E. Kunkel, K.L.M. Lewis, T.K. Maycock, and B.C. Stewart (eds.)]. U.S. Global Change Research Program, Washington, DC, USA, 1515 pp. doi: 10.7930/NCA4. 2018.*

[34] *American Association of State Highway and Transportation Officials (AASHTO) Center for Environmental Excellence. Integration of Climate Change Projections in Hydrologic and Hydraulic Design in Transportation Projects. 2022.*

1.4.6. Other Considerations

The I-39/90/94 Corridor Study addresses needs on existing interchanges in the study corridor. In response to a request from the city of Madison, WisDOT will also evaluate potential new interchange access at Hoepker Road on I-39/90/94, and at a proposed extension of Milwaukee Street on I-94, located east of the I-94/WIS 30 Interchange, see Figure 1-22.[35]

The Sprecher Neighborhood Development Plan[36] and the City of Madison Comprehensive Plan[37] both recognize a potential new interchange at the Milwaukee Street extension. The Greater Madison Metropolitan Planning Organization's (MPO) regional plan, Connect Greater Madison 2050 Regional Transportation Plan, also includes both potential interchanges.[38] Study of both existing and potential new interchanges will consider effects on the roadway network near each existing and potential new interchange location, which may expand the study areas around interchanges.

Figure 1-22: Potential New Interchanges in Madison

[35] *Letter from WisDOT to City of Madison Director of Transportation, dated April 3, 2022, see Appendix B.*

[36] *City of Madison. Sprecher Neighborhood Development Plan Recommendations for Land Use and Development. January 1998 as amended.*

[37] *City of Madison. Planning Division. Comprehensive Plan – Part 1 People Powered Planning. https://plans.cityofmadison.com/comprehensive-plan-part-1. Accessed Nov. 28, 2022.*

[38] *Greater Madison Metropolitan Planning Organization. Connect Greater Madison 2050 Regional Transportation Plan: Executive Summary. May 2022.*

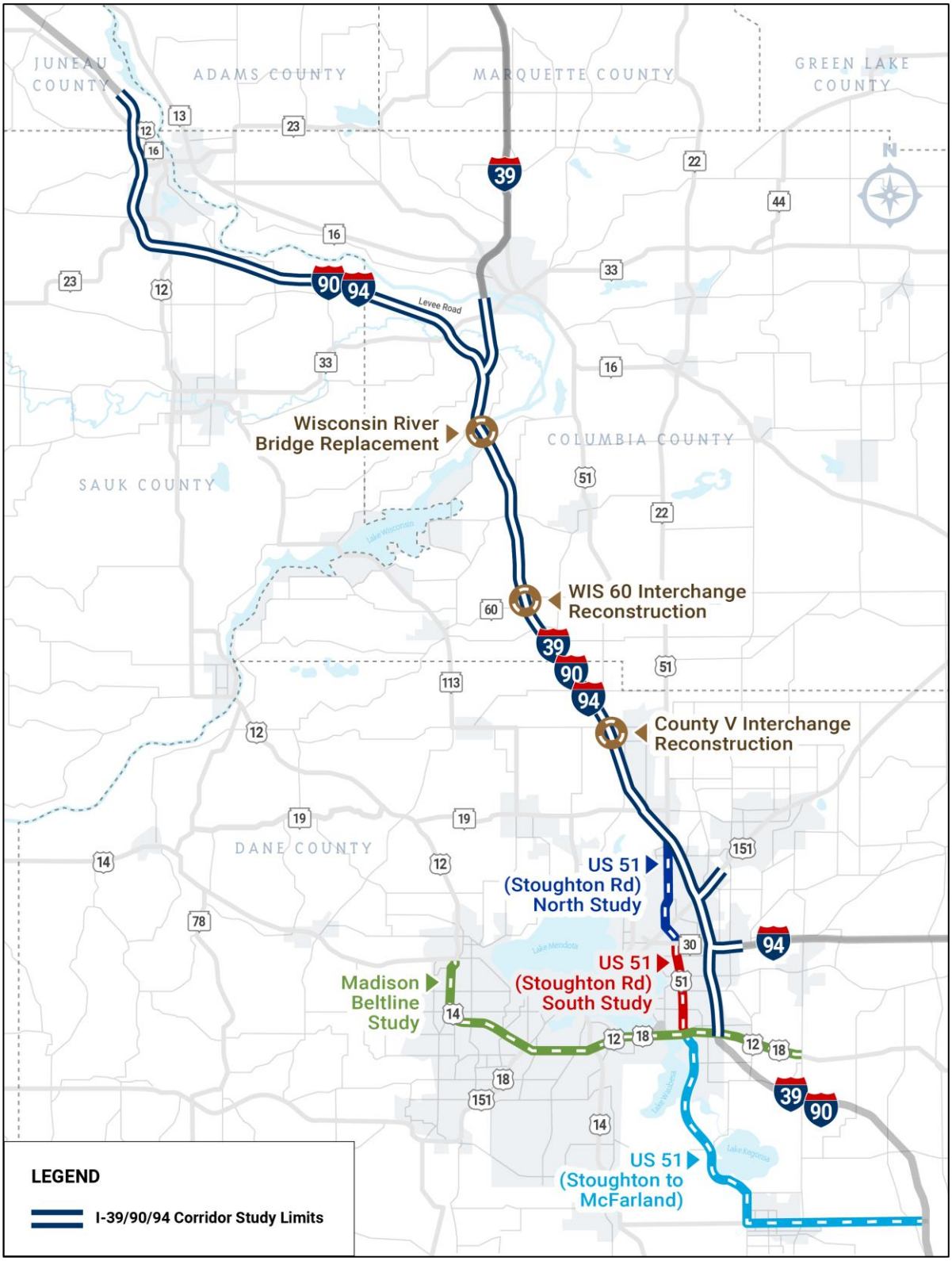
1.5. Local Government, Public and Agency Input

WisDOT presented the study purpose and need to business, local officials and advisory committees on Aug. 9 and 17, 2022 and at agency and public involvement meetings on Sept. 13 and 14, 2022. Comments on study needs focused on safety and addressing traffic diverting to local roads during Interstate backups. WisDOT presented a refined purpose and need to agencies on Jan. 30, 2023, to advisory committees on April 6, 2023 and at public involvement meetings on April 12 and 13, 2023. No additional comments were received on the purpose and need. WisDOT provided the draft purpose and need statement to Cooperating and Participating agencies on April 26, 2023. Agencies had no comments on the purpose and need. WisDOT completed agency concurrence on the purpose and need on Feb. 29, 2024 as part the formal coordination process for the EIS. WisDOT staff were available to discuss the purpose and need at public hearings held on July 29, 30 and August 1, 2024. Sections 5 and 6 provide detailed discussion of public involvement and stakeholder and agency coordination activities.

1.6. Relationship to Other Projects

Several other projects in and adjacent to the I-39/90/94 study corridor influence travel patterns, as well as what potential alternatives will be developed during the study. These studies may influence localized details of the I-39/90/94 study corridor alternatives to ensure compatibility and appropriate connections among the different projects, but they will not restrict the development or evaluation of the broad-scale project alternatives to address the I-39/90/94 study corridor needs. Likewise, I-39/90/94 study corridor alternatives will be developed so that they do not restrict consideration of alternatives for the other nearby projects. Figure 1-23 shows these other project locations in relation to the study corridor.

Figure 1-23: Other Project Locations in Relation to the Study Corridor



1.6.1. I-39/90/94 Bridge Replacement over the Wisconsin River

The I-39/90/94 bridges over the Wisconsin River in Columbia County were built in 1961, and they are nearing the end of their operational life and need replacement. The bridge replacement has independent utility; the bridges will be reconstructed to accommodate future potential improvements to I-39/90/94 evaluated during this study, thus not forcing or foreclosing future alternatives. Given the urgency to replace the bridges, WisDOT completed an Environmental Assessment/Finding of No Significant Impact in June 2021 and construction began in 2024. The project will replace both the eastbound and westbound interstate bridges over the Wisconsin River. In addition to replacing the bridges over the river, the project will also replace the County U and County V bridges over I-30/90/94 (immediately north and south of the river, respectively) to accommodate an alignment shift on the Interstate.[39]

1.6.2. WIS 60 Interchange Reconstruction

WisDOT is replacing the I-39/90/94 bridges over WIS 60 in Columbia County, reconfiguring the existing ramps as a diamond interchange with roundabouts at the ramp terminals. The bridges need replacement due to structural deterioration. The reconstruction project has independent utility; the interchange will be reconstructed to accommodate future potential improvements to I-39/90/94 evaluated during this study, thus not forcing or foreclosing future alternatives. Given the urgency to replace the bridge in the interchange, WisDOT completed an Environmental Report in June 2019. WIS 60 will be reconstructed from Sunset Drive to Pine Hollow Road. Construction began in late summer/fall 2022 and was completed in 2024.

1.6.3. County V Interchange Reconstruction

A private developer is proposing a large gas station and convenience store development along County V just west of the interchange. The development would generate substantial traffic demand and require improvements to the County V interchange. The developer is coordinating with WisDOT, Dane County, the village of DeForest and FHWA and would complete a separate environmental review, including an environmental document and permits, to privately fund the interchange reconstruction. The construction of this interchange could occur before any construction occurs on a I-39/90/94 project as analyzed as part of this EIS.

1.6.4. Madison Beltline Study

The Madison Beltline (US 12, 14, 18 and 151) study limits extend 19 miles from US 14 in Middleton to County N in Cottage Grove, in Dane County. WisDOT is conducting a planning-level analysis, also called a “planning and environmental linkages” study. The study will evaluate the effectiveness of possible solutions to the Beltline’s current and long-term needs, focused primarily on addressing existing safety, capacity, and geometric issues, but also meeting identified study objectives. The planning study will analyze changes or improvements to alternate travel modes, other area transportation corridors, and existing Beltline connections to the adjacent road network.

[39] *Wisconsin Department of Transportation. I-39/90/94 Bridge over Wisconsin River – Columbia County. https://wisconsindot.gov/Pages/projects/by-region/sw/i399094-bridge/default.aspx Accessed Sept. 7, 2023.*

The planning study will conclude with a description of strategies and how well they address existing and future needs. WisDOT will subsequently refine potential strategies in a formal environmental review process.[40]

1.6.5. US 51 (Stoughton to McFarland)

WisDOT is presently in the design and construction phase to reconstruct US 51 between I-39/90 to Voges Road through the city of Stoughton and the village of McFarland in Dane County. WisDOT will reconstruct the US 51 corridor on existing alignment between I-39/90 and Larson Beach Road in McFarland and replace the pavement from Larson Beach Road to a point south of the Terminal Drive/Voges Road intersection. A 1.4-mile section of US 51 on the west side of Stoughton will be expanded from 2 lanes to 4 lanes. Intersections will be improved. Bicycle accommodations will be provided when possible as well as alternative bike routes. Pedestrian facilities will be reconstructed and extended in urban areas. Construction is scheduled to begin in 2024 and end in 2030.[41]

1.6.6. US 51 (Stoughton Road) South Study

WisDOT began a study of US 51 between Voges Road and WIS 30 in the city of Madison in Dane County. The study will assess how to best accommodate traffic volumes with a focus on safety and access, with consideration or incorporation of the goals for the corridor outlined in the city of Madison's Stoughton Road Revitalization Plan.[42]

1.6.7. US 51 (Stoughton Road) North Study

WisDOT began a study of US 51 between WIS 30 and I-39/90/94 in the city of Madison and village of DeForest in Dane County. The study will assess how to best accommodate traffic volumes with a focus on safety issues that affect travel along US 51.[43]

1.7. Summary

The purpose of the I-39/90/94 Corridor Study is to address existing and future traffic demands, safety issues, aging and outdated infrastructure and corridor resiliency.

Portions of the Interstate currently operate at undesirable LOS during peak morning and evening commute times, as well as during peak Friday and Sunday afternoon recreational travel times. By 2050, WisDOT traffic projections expect congestion to decline to LOS D through F, on a scale of A through F, for a majority of the study corridor.

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[40] *Wisconsin Department of Transportation. Madison Beltline Study. https://wisconsindot.gov/Pages/projects/by-region/sw/madisonbeltline/default.aspx. Accessed Sept. 7, 2023.*

[41] *Wisconsin Department of Transportation. US 51 (Stoughton to McFarland) - Dane County Project Website. Wisconsin.Gov. https://wisconsindot.gov/Pages/projects/by-region/sw/us51-danecounty/default.aspx. Accessed June 19, 2023.*

[42] *Wisconsin Department of Transportation. US 51 (Stoughton Road) South Study Project Website. Wisconsin.Gov. https://wisconsindot.gov/Pages/projects/by-region/sw/us51-corridor/southstudy.aspx. Accessed June 19, 2023.*

[43] *Wisconsin Department of Transportation. US 51 (Stoughton Road) North Study. https://wisconsindot.gov/Pages/projects/by-region/sw/us51-corridor/northstudy.aspx. Accessed June 19, 2023.*

Crash rates are at or higher than the statewide average throughout the study corridor, particularly at interchanges. Deficiencies at interchanges contribute to congestion and high crash rates, most notably at the following interchanges:

- US 151/High Crossing Boulevard
- Cascade Mountain Road
- US 12

Pavement conditions are declining and WisDOT projects by 2030 over 20% of the pavement will be in poor or worse condition. Almost 75% of 113 bridges in the study corridor will be over 50 years old by 2030 and nearly 40 bridges do not meet current height and width clearance standards. Pavement and bridge projects may face substantial traffic control restrictions in order to minimize impacts to traffic. I-39 and I-90/94 are in the Baraboo and Wisconsin river floodplains where historic flooding has closed both interstates, making the Interstate less resilient to climate change.