WIS 19 SAFETY AND OPERATIONS STUDY

Final Report

April 2016

WISCONSIN DEPARTMENT OF TRANSPORTATION

SRF Consulting Group, Inc.

Table of Contents

Figures

Tables

Exhibits

Appendix

Appendix A: Coordination

- PIM Meeting Minutes
- LOM Meeting Minutes
- Stakeholder and Interest Group Meeting Minutes
- Agency/Local Officials Notification List
- WDNR Meeting Minutes
- WIS 19 Spring 2015 Newsletter
- WIS 19 Winter 2015 Newsletter

Appendix B: Existing Corridor Characteristics

- Existing Access Inventory
- Bike and Pedestrian Accommodations
- Corridor School District Boundaries
- Typical Cross Section Locations
- Corridor Curve Evaluation
- Encroachments Map and Table
- Encroachment Pictures and Descriptions
- Structures Map and Table
- Intersection Sight Distance

Appendix C: Operational Characteristics

- Count Data
- Forecasts
- LOS/Capacity Analysis
- MV4000s
- 2012 Statewide Average Crash Rate memo

Appendix D: Land Use and Community Character

- Land Use Maps and Comp Plans
- Agricultural Survey Results

Appendix E: Environmental Scan

- Potential Section 4(f) Resources
- Potential Section 6(f) Resources
- Environmental Resources Map
- Rivers, Lakes and Streams Map
- WDNR Waterway Areas of Special Natural Resource Interest (ASNRI)
- Archaeology and Architecture History Literature Review for the WIS 19 Corridor Study
- Environmental Screen

Appendix F: Other Non-Referenced Maps

Appendix G: Improvements

- Improved LOS synchro runs
- Concept cadd files
- Concept cost estimates

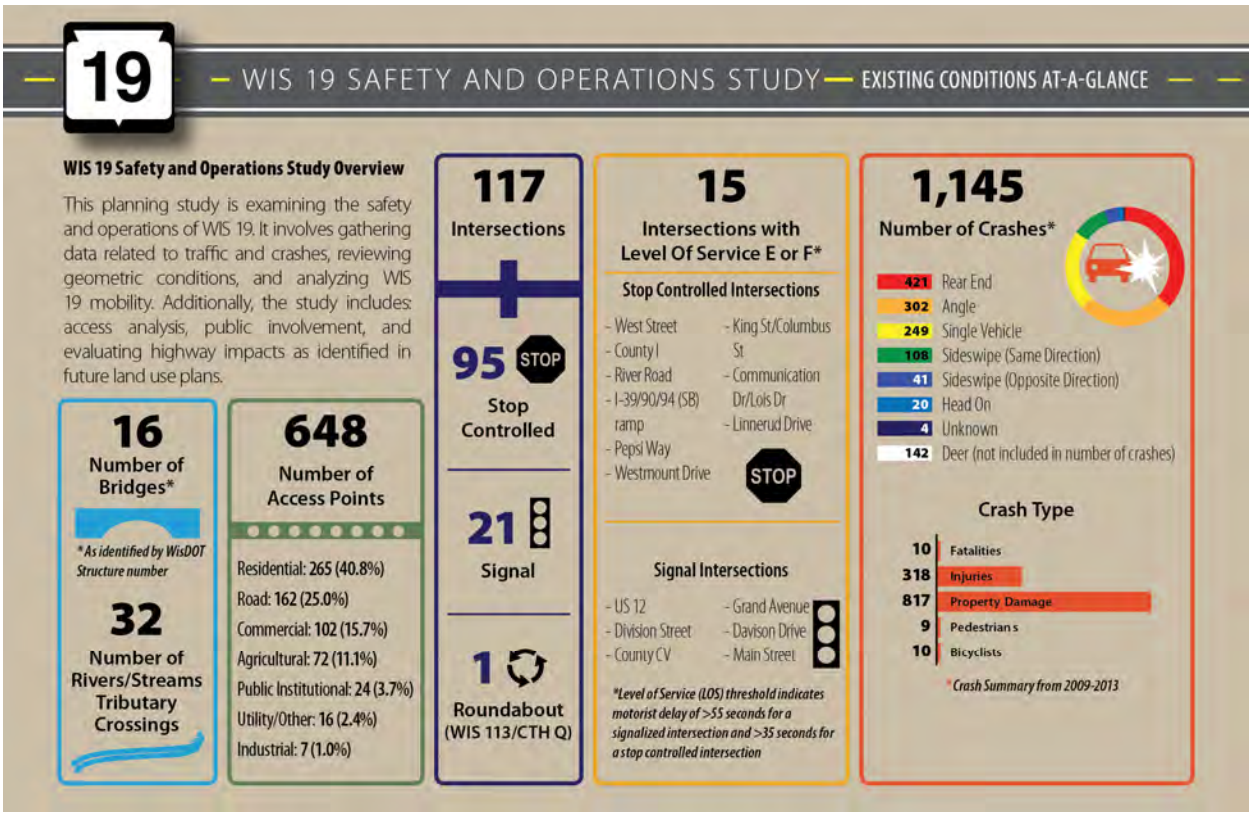
1 Introduction

The WIS 19 Safety and Operations Study was initiated by the Wisconsin Department of Transportation (WisDOT). The purpose of the study is to develop strategies and recommendations that will preserve the safety and efficiency of the existing highway. The study will evaluate several vital components including existing roadway conditions, access, environmental and socioeconomic resources, infrastructure, existing and future land use, safety, operations, existing and projected traffic volumes, and bicycle and pedestrian accommodations.

There is no design or construction funds allocated to this WIS 19 Safety and Operations Study. The study and report will identify operational deficiencies and document corridor needs.

The WIS 19 study limits are from US 12 in the town of Springfield, to WIS 89 in the city of Waterloo, a distance of approximately 30.5 miles. The limits travel through six municipalities, five townships, and two counties, refer to Exhibit 1: Location Map. Figure 1 gives the reader a high level overview of existing conditions within the study corridor.

Figure 1: Study Overview At-A-Glance



1.1 Existing Conditions Summary and Recommendations

The study has yielded twelve (12) primary points of summary.

1. The study limits are diverse and traffic flow throughout is not describable by one theme. The entire corridor is a commuter route, but with many cross roads, it is not highly directional throughout. The corridor can generally be described as rural high speed, semi-urban moderate speed, and urban low speed with connected routes.
2. Understanding traffic characteristics in the study area is constrained by the lack of origin-destination data. Traffic volume data generally supports that Waunakee, I-39/90/94, and Sun Prairie are destinations but the study team does not have the data to precisely distinguish regional versus local traffic.
3. In 2014 the existing typical section (2 lanes) is over-capacity from Division Street in Waunakee to I-39/90/94, a major commuting section of WIS 19. Over-capacity conditions are not easily mitigated with preservation improvements.
4. In Year 2050[1], the existing typical section will be over-capacity (~15,200 vehicles/day (vpd) on 2-lanes):
   - from WIS 113/Downtown Waunakee to I-39/90/94
   - from US 51 to Broadway Drive on the west side of Sun Prairie
   - from WIS 19/Main Street to County N in Sun Prairie

   Improvements at intersections will extend mobility and safety for a limited duration but will not fix overcapacity highway sections in the long term. Limiting factors for capacity improvements on existing roadway sections include:

   - Parking, homes, businesses in downtown Waunakee from WIS 113 to Division Street
   - Parking, businesses from WIS 19/Main Street to County N in Sun Prairie
5. Many intersections have level of service and delay conditions that are appropriate for preservation-improvement recommendations. Those locations within the "at/over-capacity" sections detailed previously will continue to suffer delay and level of service values that are less than acceptable even given preservation-style improvements (refer to Item #8 in this list for typical examples of "preservation-style" improvements).
6. Only one location exists with critical safety failures, the set of horizontal curves near Walter Drive in the town of Westport that is anticipated to be improved in the near future[2]. No other locations or sections exist that have 'critical' safety failures or extremely

[1] Year 2050 is the selected design year for this study. Typical long-range preservation studies assume a 30 year design horizon, which would place the design year in about 2045 for this study. For consistency with other regional long-range studies, the design year was assumed a few years later to 2050.

[2] Highway Safety Improvement Plan project as identified on Exhibit 4.

high concern relative to other highways but several spot locations have crash rates and severities that are appropriate for improvement recommendations.

7. WIS 19 is becoming a "barrier" within urban fringe/suburban areas. Pedestrian movements are especially segregated at WIS 19 due to traffic volume, speed, and lack of facilities.
8. There are many opportunities for preservation-style improvements in the study limits and the primary type of improvements recommended in this study include:
    - Addition of left turn and right turn lanes
    - Addition of traffic signals or roundabouts
    - Addition of pedestrian facilities (sidewalks, crosswalks, pedestrian signal phases, beacons)
    - Addition of signalized systems and optimization of signal timing and phasing
    - Combining or removing driveways near intersections and where appropriate in other areas
    - Reconstruction of intersections, typical sections, and curve geometry to meet current standards, improve safety, and preserve passing ability
    - Installation of bike facilities and shoulders
9. Public comments have focused on expansion, including the North Mendota Parkway, location of programmed improvements and hastening the Transportation Improvement Program (TIP), five-year improvement schedule. In general the public and local officials want larger improvements and quicker construction.
10. Several high sensitivity natural corridors commence near WIS 19 and drain to Lake Mendota, making them particularly sensitive and constraining:
    - Headwaters of Yahara River
    - Headwaters of Token Creek
    - Sixmile Creek
11. Access to WIS 19 is variable given its diverse nature. Rural, suburban, and urban access densities are very typical. Jurisdiction of WIS 19 through Sun Prairie, designated as Connecting Highway, should change the focus and intensity and style of access recommendations in the final plan.
12. Transit is almost non-existent in the study area. Transit feasibility should be considered in greater detail in future studies.

1.2 Corridor Issues

Sections of WIS 19 within the study area are rapidly changing from agriculture and low density to high density residential, commercial, and industrial uses. As land develops and traffic volumes continue to grow, the WIS 19 corridor will need improvements to remain safe and efficient. Over the past several years, traffic volumes near or over-capacity, long

queueing and delays, and an increasing number of crashes have triggered this detailed analysis of the corridor. Refer to Exhibit 2 for Average Annual Daily Traffic (AADT). Substandard curve conditions, intersection site distance, access points, structures, bicycle and pedestrian facilities and existing environmental features along the corridor will also be discussed. Potential strategies that will be investigated in the final Corridor Management Plan include but are not limited to:

- Intersection improvements
- Access management recommendations
- Geometric improvements
- Signing and pavement marking
- Traffic signal and roundabout recommendations
- Bicycle and pedestrian accommodations/crossing locations

WIS 19 is unique in that it has urban and rural sections, changing speed limits, wide range of traffic volumes, areas of congestion and delay, and intersections and sections with high incidences of crashes. All of these factors will be discussed in detail in this report.

1.3 Study Team

SRF Consulting Group, Inc. was selected by WisDOT to conduct the WIS 19 Safety and Operations Study. MSA Professional Services, Inc., KL Engineering, Revelation, LLC, Saga Environmental and Engineering, Inc., and The 106 Group Ltd., were also vital contributors to this 22-month study.

1.4 Corridor Importance

WIS 19 is a critical state highway that provides a direct route around the north side of Madison from US 14 near Mazomanie east to WIS 16 in the city of Watertown, a distance of

approximately 60 miles.[3] The roadway follows a 2-lane cross section for the entire length of the highway with the exception of urban multi-lane arterials between the following termini (Refer to Exhibit 5 for a typical section map):

- Raemisch Road/Schumacher Road to WIS 113 South/County I – (1.1 miles)
- I-39/90/94 to approximately ½ mile east of US 51 – (1.75 miles)
- Broadway Drive to Bird Street – (0.85 miles)

The study limits are diverse and the traffic flow throughout the corridor is not describable by one theme. The entire corridor is a commuter route; however, with all of the major cross roads, the highway is not universally directional. Some of the corridor is a rural high speed commuter route with 55 mph posted speeds and AADT as high as 15,800 just west of Walter Drive; some are semi-urban moderate speed (30-45 mph) with AADT as high as 14,500 west of Portage Road, while other sections are urban low speed with 25 mph posted speeds and AADT as high as 19,900 just west of Bird Street in Sun Prairie. Refer to Appendix 2 for a map of daily traffic volumes (AADT).

WIS 19 is identified as a designated long truck route according to the Wisconsin Long Truck Operators Map – Designated Long Truck Route Maps identified in Trans 276.07. [4] WIS 19 carries between 5 and 11 percent trucks (Average Annual Daily Traffic Trucks) within the study limits.

1.5 Relation to Other Projects, Studies, and Plans

At the time of this report, several ongoing studies within the project area and within the WisDOT SW Region are occurring. Refer to Exhibit 3: Current WisDOT Studies for a map of WisDOT sponsored studies.

1.5.1 5-Year Transportation Improvement Plan

The Transportation Improvement Program (TIP), is a coordinated listing of short-term transportation improvement projects anticipated to be undertaken in the next five-year period.[5] Projects that are listed in this program include transit, pedestrian, bicycle, parking, along with street and roadways, and must be included in the TIP in order to be eligible to receive federal funding. The Madison Area Transportation Planning Board as part of the Madison Metropolitan Planning Organization (MPO) updates the TIP on an annual basis. The federally designated MPO Area only includes the portions of WIS 19 within Dane County, and does not encompass the entire WIS 19 Corridor.

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[3] http://www.wisconsinhighways.org/listings/WiscHwys10-19.html#STH-019

[4] WisDOT Southwest Region Long Truck Route Map (March 2015)

http://wisconsindot.gov/Documents/dmv/shared/ltr-sw.pdf

[5] http://madisonareampo.org/planning/improvementprogram.cfm

The TIP is a coordinated listing of projects based upon capital improvement programs and dollars. The TIP allocates funding to projects based upon need and the time frames provided are a 'best estimate' at the time of TIP development. The TIP can be amended after it is adopted and projects can be added, deleted, advanced, or delayed depending on availability of federal or local funds, or another projects need.

The 2015-2019 TIP for the Madison Metropolitan Area and Dane County identify several improvements in the next five years. Refer to Exhibit 4 for an Anticipated Projects map of all upcoming construction projects.

1.5.2 Connections 2030 Planning

Connections 2030 is the long-range transportation plan for the state. This plan addresses all forms of transportation over a 20-year planning horizon: highways, local roads, air, water, rail, bicycle, pedestrian and transit. WisDOT officially adopted Connections 2030 in October 2009. Refer to Appendix A for information related to Connections 2030.

Connections 2030 identifies WIS 19 within the Madison Metropolitan Planning Area. The Madison Metropolitan Planning Area consists of the city of Madison and the Madison Urbanized Area, including all or portions of the 27 contiguous villages, cities, and towns that are or are likely to become urbanized within a 20-year planning period. The Madison Metropolitan Planning Board identified short-term (listed as 2008-2013), mid-term (2014-2019), and long-term (2020-2030) activities within the planning area. Activities pertaining to WIS 19 include:

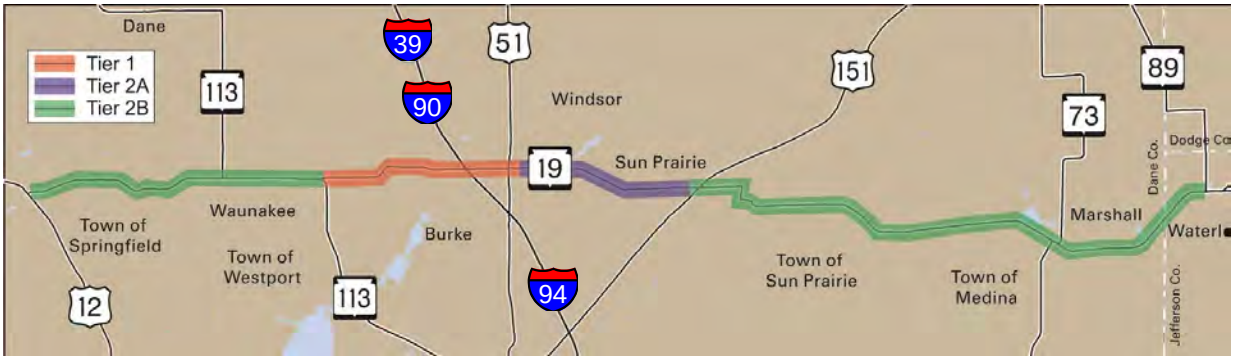
- Short-term – Prepare corridor plan from WIS 113 in Waunakee to US 151 in Sun Prairie. (COMPLETED 2009)
- Mid-term – Reconstruct from Klein Drive to Division Street in Waunakee and add bike lanes if supported by environmental document. (COMPLETED 2014)
- Long-term – Construct candidate expressway upgrades and/or convert to freeway from WIS 113 to US 151 if supported by environmental document.

1.5.3 Statewide Access Management Plan

The State Access Management Plan (SAMP) was adopted as part of the Connections 2030 statewide long-range multimodal transportation plan in October 2009, and defines the vision and policy for appropriate access on the Wisconsin state trunk highway system. The plan separates the state highway network into five tiers (Tiers 1, 2A, 2B, 3, and 4) based on a particular roadway's importance to the overall system. . WisDOT has an array of access management tools available to address the department's access management goals. Many of these tools are reserved for special situations outside the project development process, while others are more universally applicable and of high value for implementation as part of an improvement project.

- The Statewide Access Management Plan identifies WIS 19 as follows (refer to Figure 2):
- Section from US 12 to Waunakee – Tier 2B, where the goal is to maximize interregional traffic movement that is not high volume. This type of roadway would have at-grade public intersections, removal of access if alternatives exist or widely spaced access if no reasonable alternative exists, and left turn bypass or turn lanes constructed to maintain safety.
- Section from Waunakee to US 51 – Tier 1, where the goal is to maximize interstate/statewide traffic movement and there is a plan in place for ultimate removal of all private access.
- Section from US 51 to US 151 – Tier 2A, where the goal is to maximize high volume interregional traffic movement. This type of roadway would have at-grade public road intersections, with interchanges at higher volume routes.
- Section from US 151 eastward – Tier 2B, where the goal is to maximize interregional traffic movement that is not high volume. This type of roadway would have at-grade public intersections, removal of access if alternatives exist or widely spaced access if no reasonable alternative exists, and left turn bypass or turn lanes constructed to maintain safety.

Figure 2: WisDOT Statewide Access Management Plan Tiers



1.5.4 WIS 19/113 Access Plan

The WIS 19/113 Access Plan (Division Street, Waunakee to US 151, Sun Prairie, Project ID: 6085-03-00, 2009) aimed at reducing conflicts along the WIS 19/113 corridor between and within Waunakee and Sun Prairie, west of US 151. The plan recommend measures to minimize congestion and conflicts along the corridor, making the roadway more manageable until the roadway is reconstructed in the future.

1.5.5 North Mendota Parkway

The North Mendota Parkway study (conducted by Dane County) is intended to explore a range of alternative land use and transportation scenarios for the area north of Lake

Mendota.[6] The North Mendota Parkway Alternatives Study recommends that a "North Mendota E-Way" is developed between US 12 and I-39/90/94, Lake Mendota and WIS 19 to preserve potential open space system sites. The Plan also recommends that the Parkway contain a route that would connect from I-39/90/94 at WIS 19 westerly along WIS 19 corridor to WIS 113 at Waunakee; southerly along WIS 113 corridor to County M at Westport; westerly along County M corridor to selected new alignment connecting to a free flow interchange with US 12.

1.5.6 I-39/90/94 Interstate Study

WisDOT has begun a multi-year study to analyze a 35-mile stretch of I-39/90/94 from Madison to Portage (Project ID: 6085-03-00). Construction funding and schedule will be addressed upon completion of the study. The study corridor limits are from US 12/18 in Madison (Beltline Interchange) north to WIS 78 near Portage.

In addition to the Interstate roadway, this study also includes reviewing and assessing potential improvements to several intersecting routes which influence traffic operations on I-39/90/94, one of which is the I-39/90/94, US 51, and WIS 19 triangle in DeForest.

1.5.7 US 51 - Stoughton Road Corridor Study

This is an environmental impact statement (EIS) study that is examining long-term alternatives to address the safety and congestion issues along US 51/Stoughton Road, between Terminal Drive in McFarland and WIS 19 (Project ID: 5410-05-00). It will also develop alternatives to address the gaps in bicycle and pedestrian facilities along the corridor.

US 51 is classified as a Connections 2030 backbone highway and is also part of the National Highway System. Backbone routes provide links to the State's economic centers and should meet maximum design standards for service, mobility, and safety.

The long-term plan for the I-39/90/94 study will not be determined by that time by the time the US 51 Stoughton Road study is complete. In order not to preclude design options that may be developed as part of the I-39/90/94 study, WisDOT will defer selection of a Preferred Alternative for Stoughton Road in the I-39/90/94 to WIS 19 area to the interstate study.

1.5.8 US 12 Freeway Conversion Study

WisDOT is conducting a planning study of the US 12 corridor located between the Parmenter Street interchange north of Middleton to WIS 19 West in the town of Springfield (Project ID: 5300-05-00). This 6.1 mile corridor of US 12 is part of Wisconsin's National Highway System (NHS). This corridor provides a parallel route from the Madison metro

[6] North Mendota Parkway History and Issues – Dane Country Regional Planning Commission Meeting – Aug. 23, 2001, http://danedocs.countyofdane.com/webdocs/PDF/execCommittees/8_23_01rpcpresentation.pdf

area to I-39/90/94 and to the major tourism destination areas in the state and region and to Wisconsin Dells.

The purpose of this study is to conceptualize the conversion of US 12 from the city of Middleton to WIS 19 West into a freeway, taking into account impacts on existing and future land uses, as well as access to the local transportation network. The study will develop strategies and recommendations that integrate land use and transportation systems, so that US 12 operates well into the future. This will allow both WisDOT and the local communities involved to adequately plan for future land use and local transportation network needs.

1.5.9 Madison Beltline Planning and Environmental Linkages (PEL) Study

The Madison Beltline (US 12) PEL Study (US 14 to County N, Project ID: 5304-02-01) is a planning-level development and analysis of the effectiveness of all possible solutions to the Madison Beltline's current and long-term future needs; in particular, determining to what extent possible solutions would address the existing safety, capacity and geometric issues and meet identified study objectives. The study corridor of the Madison Beltline begins at the US 12/14 (University Avenue) interchange in the city of Middleton and extends approximately 20 miles south and east to the US 12/18 and County N interchange in the town of Cottage Grove.

In addition to improvements to and across the Beltline itself, changes or improvements to alternate modes of travel, other area transportation corridors, and existing Beltline connections to the adjacent road network are expected to be analyzed.

This PEL study included conceptual investigation of several highway alternatives that traverse the WIS 19 study area between US 12 and I-39/90/94.

1.5.10 US 51 (Reardon Road to County V)

US 51, from just north of WIS 19 to Grinde Road, was expanded from a 2-lane highway to a four-lane highway (Reardon Road to County V, Project ID: 6020-02-00).

Access to US 51 is now only allowed at interchanges. Two full diamond interchanges located at Windsor Road and North Street/County V were included in the project's design. Construction was completed in 2014.

1.6 Study Input

1.6.1 Local Officials Meeting #1

Local government officials were invited to participate in project discussions and provide input throughout the planning process. Two Local Official Meetings (LOM) were held in Sun Prairie on February 12th and Waunakee on February 17, 2015 to discuss existing conditions along the corridor.

Twenty-two officials attended the meeting in Sun Prairie representing; cities, villages and towns within the study limits, city councils, police, fire, and EMS departments, and WDNR.

Twenty-four officials attend the meeting in Waunakee representing; State Senators office, Dane County Board and County highway department, cities, villages and towns within the study limits. Local officials were invited to review the project website.

Primary themes from the local officials meetings included (Refer to Appendix A for meeting minutes):

- There was some confusion as to why the study did not investigate mainline WIS 19 expansion from 2-lanes to 4-lanes
- The study may need updates as municipalities rapidly grow
- There was questions of why the study did not consider the North Mendota Parkway project and that coordination with the North Mendota Parkway project was desired
- Mainline WIS 19 traffic reroutes to local roads due to lack of mainline capacity
- Poor intersection operations and geometry cause vehicle rerouting and improper lane usage to avoid delay
- Areas of development are anticipated and may require additional access points along WIS 19 or may lead to increased volumes at existing, low-volume intersections
- Poor pavement conditions cause drainage issues and large trucks to drive close to the centerline to avoid edge line pavement failure
- The lack of passing opportunities in addition to passing zones located near or on hills lead to driver frustration and safety issues
- Speeding issues exist near rural to urban transition areas
- Several locations exist where motorists use the shoulder or turn lanes as bypass lanes

1.6.2 Public Involvement Meeting #1

Several opportunities for public input were offered during the data collection phase of the project. A Public Involvement Meeting (PIM) was held on February 25, 2015 at the Prairie View Middle School in Sun Prairie. A second PIM followed on March 11, 2015 at Waunakee Middle School. Over 2,100 households located within 1/4-mile of WIS 19 were sent project material and invitations to attend one of the PIMs and participate in project discussions. A newsletter, (which included a link to the project website[7]) was provided to all those in attendance.

[7] http://wisconsindot.gov/Pages/projects/by-region/sw/191289/default.aspx

The Sun Prairie meeting had 47 attendees signed in. Maps were on display and WisDOT and project team staff was available to answer any questions in a one-hour open house format. A half-hour WisDOT led PowerPoint presentation and question and answer session followed. Thirty-five written comments were recorded.

The Waunakee meeting had 30 attendees signed in. The meeting format was the same, with an open house followed by a presentation and question and answer session. Twenty-four written comments were recorded.

Primary themes from the public involvement meetings included (Refer to Appendix A for meeting minutes):

- Truck traffic should be limited through residential and tight urban areas
- Speeding issues exist near rural to urban transition areas
- Horizontal curves along WIS 19 are causing safety concerns especially near intersections
- Bypass lanes are desired in high speed rural areas in order to avoid rear-end crashes at intersections
- The condition of the existing pavement in several areas appears that it cannot wait for the planned improvement projects

1.6.3 Local Officials Meeting #2

Local government officials were invited to participate in a second set of Local Officials Meetings during the recommendations phase of the project. Two LOMs were held; in Sun Prairie on December 2, 2015 and Waunakee on December 3, 2015.

Sixteen officials attended the meeting in Sun Prairie representing; Dane and Jefferson County, cities, villages and towns within the study limits, highway departments, city councils, and police, fire, and EMS departments.

Seven officials attend the meeting in Waunakee representing; the Town of Westport, Village of Waunakee, and the Dane County Board.

Primary themes from the local officials meetings included (Refer to Appendix A for meeting minutes):

- Concerns regarding traffic volumes above the 2-lane threshold
- Speeds through various segments of the corridor
- Questions on implementing access recommendations
- General comments on location specific access recommendations
- Local road volume concerns as land use develops

- Questions regarding roundabout maintenance and plantings
- Schumacher Park access and special event traffic
- Discussion regarding North Mendota Parkway feasibility
- Intersection operations in various locations including: Hellenbrand Road, River Road, Grand Avenue, Linnerud Drive, and Musket Ridge Drive
- Pavement condition between US 12 and Waunakee

1.6.4 Public Involvement Meeting #2

The general public was invited to participate in a second set of Public Involvement Meetings during the recommendations phase of the project. Two PIMs were held; in Sun Prairie on December 9, 2015 and Waunakee on December 10, 2015.

The Sun Prairie meeting had 30 attendees signed in and twenty-five written comments were recorded.

The Waunakee meeting had 20 attendees signed in and one written comment was recorded along with a number of mailed comments before and after the meeting date. Refer to Appendix A for meeting minutes and specific comments.

Primary themes from the public involvement meetings included (Refer to Appendix A for meeting minutes):

- Concerns regarding traffic volumes above the 2-lane threshold
- Speeds through various segments of the corridor
- Questions on implementing access recommendations
- General comments on location specific access recommendations
- Schumacher Park access and special event traffic
- Concern for traffic volumes and backups near Hogan Road
- Safety of Walter Drive and River Road intersection
- Concern for additional roundabouts along the corridor
- Traffic noise
- Access and type of control at Revere Trails location
- Pavement condition between US 12 and Waunakee

1.6.5 Stakeholder and Interest Group Input

Individual meetings were held in May and June 2015 with municipalities along the corridor.

- Village of Marshall – May 12

- Village of Windsor – May 13
- Town of Sun Prairie – May 14
- City of Sun Prairie – May 19
- Village of DeForest – May 20
- Dane County – May 21
- Town of Burke – May 27
- Village of Waunakee – June 8
- Town of Westport – June 8 (joint meeting with Waunakee)
- Town of Springfield – June 10
- Town of Medina – June 18
- City of Waterloo – August 25

These meetings allowed for small group interaction between local officials and project staff. Refer to Section 1.6.1, Local Officials Meeting #1 for a bullet list of primary issues received during all local officials and municipal meetings. Refer to Appendix A for meeting minutes that detail all individual meetings.

1.6.6 State and Federal Agency Input

Approximately seventy initial project notification packages were sent to various organizations in December 2014 (see Agency/Local Official Notification List).

A meeting was held with Wisconsin Department of Natural Resources (WDNR) on January 14, 2015 to gather data and discuss environmental factors within 1/4-mile of the corridor. Rivers, streams, tributaries, threatened and endangered species, and potential Section 4(f)/6(f) properties were discussed. The WDNR provided a follow up email that included resources and concerns on a wider study area (up to a mile and some cases beyond). Refer to Appendix A for WDNR meeting minutes and the Chapter 5 Environmental Scan for further information.

2 Existing Corridor Characteristics

This chapter focuses on the physical attributes of the WIS 19 corridor and includes access, bike and pedestrian facilities, parking, railroads, typical roadway sections and curves, intersections, encroachments, and bridges and culverts. Refer to Appendix B for data and mapping related to this section.

2.1 Access Management Background

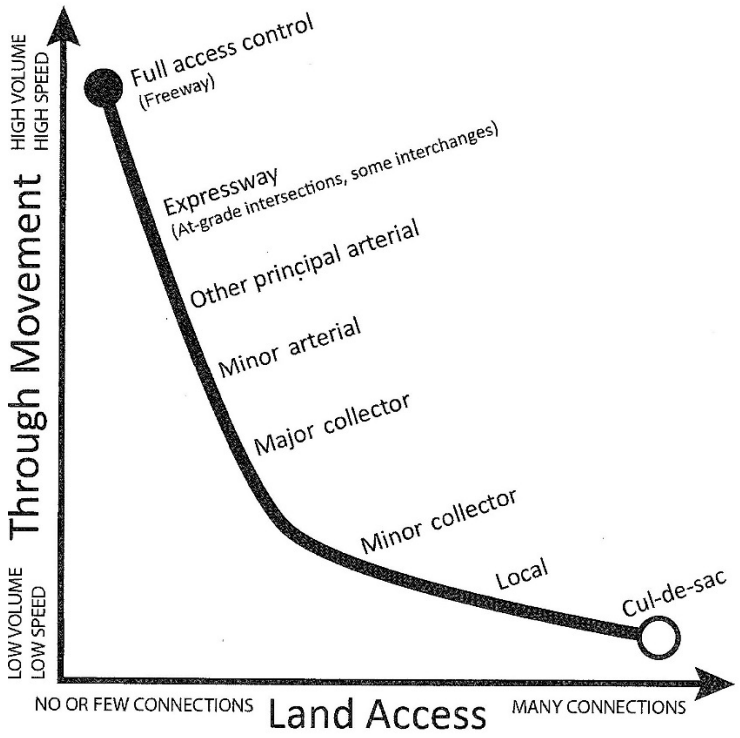
Access management is the systematic control of the location, spacing, design, and operation of driveways, median openings, interchanges, and street connections to a roadway. The purpose of access management is to provide vehicular access to land development in a manner that preserves the safety and efficiency of the transportation system.[8] Control of access to roadways, both in terms of cross-street spacing and driveway placement, is a critical means of preserving or enhancing the efficient operation of the roadway system. By controlling access, it is possible to improve safety by reducing vehicle turning conflicts.

2.1.1 Access Points and Mobility Relationship

Access management is used to preserve the public investment in the roadway system and to provide direction to developers and property owners. Successful access management provides a balance between the public interest (mobility) and the interests of property owners (access). High volume roadways such as freeways and principal arterial routes are expected to provide a high level of mobility with less access. Conversely, lower volume roadways such as local streets, are intended to serve access needs with less focus on mobility. Figure 3 illustrates the relationship between access and mobility. Access management is particularly important along arterial roadways such as WIS 19 that are expected to provide a high level of safe and efficient mobility.

[8] WisDOT Facilities Development Manual (FDM) 7-1-1 Access Control – Purpose and Benefits – 7/28/11

Figure 3: Access/Mobility Relationship[9]



2.1.2 Access Points and Crash Relationship

Several national studies have documented a strong relationship between the number of access points per mile and crash rates. The following summarizes findings developed from each study:

- A study published by the Transportation Research Board (TRB) in 2007 developed a general crash rate based on access density. This crash rate was developed from the analysis of 37,500 arterial roadway crashes nationwide and compared to the number of access points per mile. The study indicated that crash rates increased by roughly 30 percent when access points increased from 10 to 20 access points per mile.[10]
- A 2000 study produced by the National Cooperative Highway Research Program (NCHRP) suggested crash rates generally increase by the square root of the change in access density, up to about 40 access points per mile. In this case, an increase from 10 to 20 access points per mile would translate into about a 41 percent increase in crash rate. [11]

[9] Transportation Research Board, Access Management Manual (2014), Exhibit 1-1, pg. 4

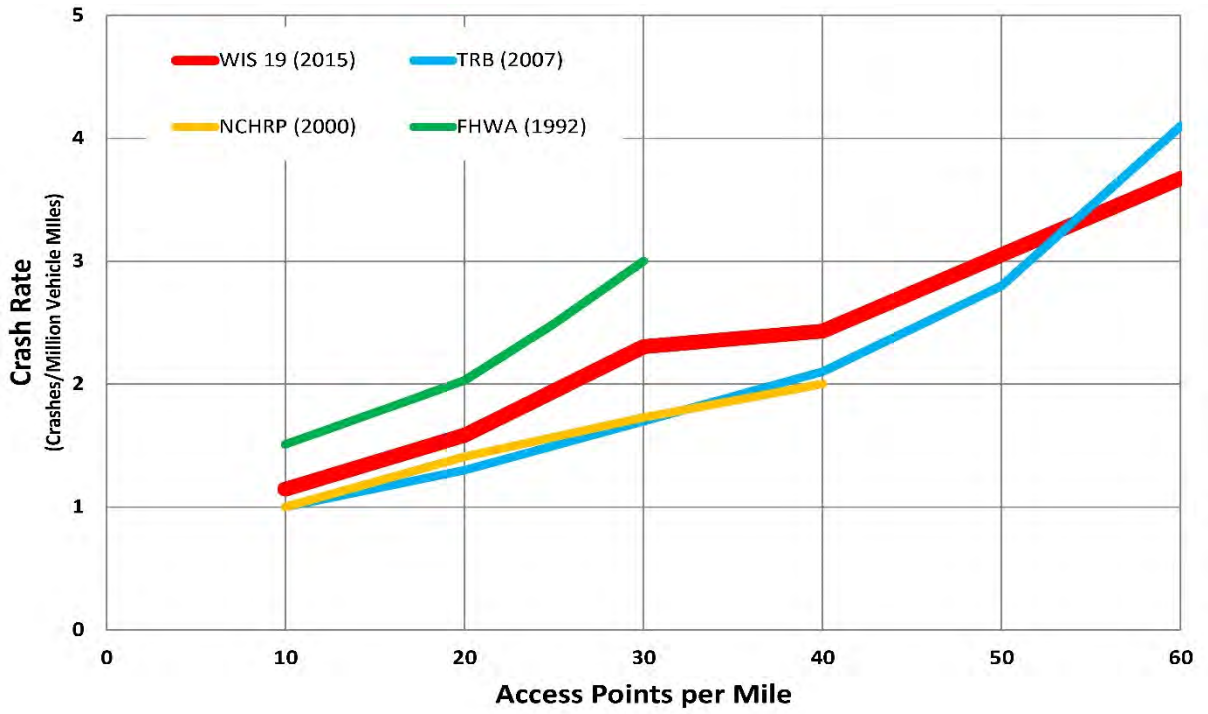
[10] Transportation Research Board, Access Management Manual (2014) – Exhibit 2-1, pg. 26

[11] Levinson, H.S., and J.S. Gluck. Access Spacing and Safety: Recent Research Results. 4th National Access Management Conference, Portland, Oregon, TRB, National Research Council, Washington, D.C., August 2000.

- A study by the Federal Highway Administration (FHWA) in 1992 compared crash rates and access points per mile. At that time, an access density of ten per mile had a crash rate of 1.51 crashes per million vehicle-miles (MVM) while an access density of twenty per mile had a crash rate of 2.03 crashes per MVM. [12]

A crash rate based on access density for the WIS 19 corridor was developed to evaluate how the WIS 19 corridor compares to the previously-mentioned studies. This was performed by determining the crash rate and access density of one-mile segments along the study corridor and plotting them graphically. Figure 4 shows the crash and access relationship of all sections along WIS 19 and compares it to national studies that determined a crash rate based on access density. This comparison indicates that WIS 19 falls within the range of these studies and crash rates increase along WIS 19 as access density increases, similar to what was observed in previous studies.

Figure 4: WIS 19 Access/Crash Rate Comparison versus National Studies



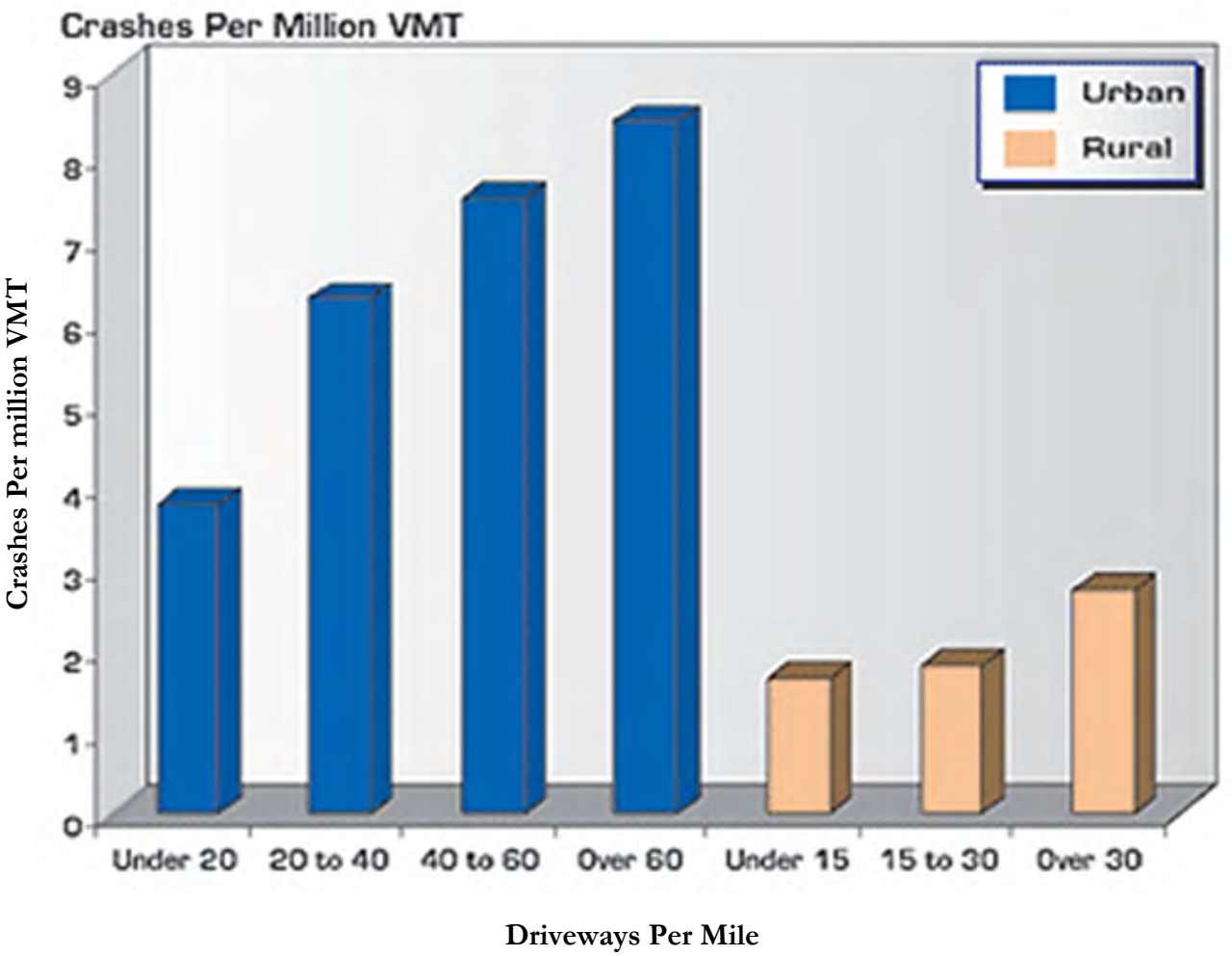
2.1.3 Access in Urban and Rural Areas

An overabundance of driveways along a roadway also increases the rate of car crashes. An examination of crash data in seven states indicated a strong linear relationship between the number of crashes and the number of driveways. Rural areas had a similar, but less strong relationship.[13] Refer to Figure 5 for graphical results of this study.

[12] FHWA Publication number FHWA-RD-91-044, (Nov 1992), Two-Lane Highways in Minnesota

[13] FHWA – Benefits of Access Management – Driveway Spacing Brochure, 2011

Figure 5: Crash Rate and Driveway Density Comparison



VMT – Vehicle Miles Traveled.
Source: http://ops.fhwa.dot.gov/access_mgmt/docs/benefits_am_trifold.pdf

2.1.4 WisDOT FDM Guidelines and Recommendations

Section 84.25 of the Wisconsin Statutes, the Controlled Access Highway law, authorizes WisDOT to allow the number of access points it deems appropriate, providing that all parcels are given reasonable access. Highways included in Tiers 1, 2A, 2B of the State Access Management Plan are the top priority of WisDOT for access control.[14] This type of access control is best used to "freeze" the existing access and control any future changes in access.

A Guideline for New Access Points (WisDOT FDM 7-5-1) is provided in Table 1. This guideline shows the goal for access and traffic movement and the recommended types of new access allowed. Refer to Figure 2 on page 7 for the Tiers along the WIS 19 corridor.

[14] FDM 7-15-1, Section 1.2 Application Criteria

Table 1: WisDOT Guidelines for New Access Points per Facilities Development Manual

Goal for Access and Traffic Movement	Type of New Access Allowed
Tier 1 - Maximize Interstate/Statewide Traffic Movement - Generally reserved for C2020 Backbone and Connector routes. - High percentage designed/planned for expressway or freeway standards.	- Safely spaced at constructed or planned grade-separated locations. - Locked/gated driveways for emergency vehicles. - Plan in place for ultimate removal of all private access.
Tier 2A - Maximize Interregional Traffic Movement – High Volume - High percentage is C2020 Backbone and Connector routes, but also includes a number of other routes. - Most are constructed/planned for 4-lane capacity. Expressway standards are highly desirable.	- At-grade public road intersections, with interchanges at higher volume routes. - Locked/gated driveways for emergency vehicles. - No at-grade intersections within 1 mile of interchange entrance ramps. - See FDM 11-5-5 for spacing.
Tier 2B – Maximize Interregional Traffic Movement – Other - High volume 2-lane principal arterials. - Volumes warrant passing lanes, but may not have 4-lane warrants within next 15-20 years - High truck Volumes denoting commercial/economic value. - Connect multiple urban areas across state.	- At-grade public road intersections. - Widely spaced lower volume residential, commercial, and field entrances may be allowed if no reasonable alternative or opportunity to obtain such access exists, and a long term plan is in place for removing existing access as opportunities arise. - Bypass or turn lanes may be required to maintain safety. - See FDM 11-5-5 for spacing.
Tier 4 – Balance Traffic Movement and Property Access - Lower volume, primarily rural 2-lane highways.	- All types, provided they meet operational and safety standards

WisDOT access spacing guidelines were reviewed to determine where access along WIS 19 exceeds best practices, and if spacing was a contributing factor to rear end collisions, traffic queues, or areas of public concern. WisDOT defines access management as the process of designing, planning and maintaining appropriate access point spacing along the State Trunk Highway system. The goals of WisDOT for access management include protecting the safety, capacity, traffic flow and public investment in the State Trunk Highway system, while providing property access with minimal conflicts. In order to achieve these goals, WisDOT employs a number of access management tools which include the following:

- Statutory control of highway access
- Purchase of access rights
- Driveway permitting
- Land use/access management plans
- Traffic impact analysis
- Joint access easement agreements
- Official mapping and freeways or expressway designations

- Early review of local rezoning and site plan development
- Input into local zoning ordinances and land use plans

Successful access management should provide a balance between the interests of highway users and property owners, while preserving the public investment in the highway and promoting good land use decisions. As such, access management policies should accommodate landowners' use of their property while providing an acceptable level of mobility. Therefore, the intent of access management is not to limit or reduce access below a point that is reasonable to serve the needs of property owners.

WisDOT has developed an access management policy that establishes access spacing and design guidelines for intersecting highway and local road access points, including private driveways. These guidelines are intended to be used as a tool in relating access to facility type, functional type, and traffic volumes of both the route under study and intersecting routes and driveways. These access spacing guidelines are generally not appropriate for highly developed urban areas due to the unique characteristics of roadways in urban areas. When developing access management guidelines for urban areas, other factors such as existing development and street spacing should be considered. Table 2 shows the minimum recommended spacing between access points along rural arterials, as found in the WisDOT Facilities Development Manual (FDM), Chapter 11-5-5, Attachment 1.[15] As a minor arterial, the WisDOT Access Spacing Guidelines call for a higher degree of access spacing on WIS 19, shown as shaded portions in Table 2.

Table 2: WisDOT Access Spacing Guidelines

Intersecting Highway		Rural Arterial Under Study			
Type	Design Year ADT	Principal Arterial	Minor Arterial ADT		
			>5,000	1,000-5,000	<1,000
Minor Arterial	>5,000	2 miles	2 miles	1 mile	1 mile
	3,000-5,000	1 mile	1 mile	1 mile	2,000 feet
	<3,000	1 mile	2,000 feet	2,000 feet	2,000 feet
Major Collector	--	1 mile	2,000 feet	2,000 feet	2,000 feet
Minor Collector	--	2,000 feet	2,000 feet	2,000 feet	1,000 feet
Local	--	2,000 feet	2,000 feet	2,000 feet	2,000 feet
Private	>100	1,000 feet	1,000 feet	1,000 feet	1,000 feet
	<100	1,000 feet	1,000 feet	500 feet	500 feet

ADT – Average daily traffic; measured in vehicles per day

Access spacing guidelines for urban arterials are not provided in the FDM. Per the FDM, "Urban areas are unique such as existing development and street spacing usually require varying degrees of access"

[15] FDM 7-5 Attachment 1.1 Access Management System Plan

The main function of arterials, however, is to facilitate high levels of traveler mobility. According to the State Access Management Plan[16], WIS 19 is listed as a Tier 2B roadway within the Guideline for New Access Points, which aims to maximize interregional traffic movement. The guideline for spacing between all access points as illustrated in Table 2 is two miles for desirable conditions and a minimum spacing of 500 feet[17].

2.1.5 Access Spacing

Appropriate driveway spacing presents another access management issue as large numbers of driveways increase the potential conflicts on the roadway. Fewer driveways spaced further apart allow for more orderly merging of traffic and present fewer challenges for drivers.

The congestion impacts of reduced driveways are fairly clear. It is very difficult for a major arterial or highway to maintain high free flow speeds with numerous access points that add slow-moving vehicles to the traffic stream. A research synthesis found that roadway speeds were reduced an average of 2.5 miles per hour for every 10 access points per mile, up to a maximum of a 10 miles per hour reduction (at 40 access points per mile). This infers that with higher numbers of access points along a given section of roadway, congestion will increase substantially.

Figure 6: Access Management Sample Picture

[16] FDM 7-5 Attachment 1.1 Access Management System Plan

[17] FDM 11-5 Attachment 5.1 Access Spacing Guidelines

Figure 6 is a photo showing an example of poor access management. The driveway lacks a definitive entrance and exit point and is located within a signalized intersection. The driveway also combines a residential and a commercial use, and another access point is within close proximity (within fifty feet). In addition, one access drive serves as the north leg of the WIS 19 and WIS 73 South intersection while the second access drive is within the intersection influence area. Areas like this should be investigated for potential removal, consolidation, relocation, or cross access as land use changes/develops.

2.2 Access Inventory

An access inventory was performed as part of the study to identify and categorize all access points along the corridor (refer to Figure 7 for a summary graphic). The study team documented each access point along the corridor using a hand-held GPS camera. At each location, a picture was taken at each access point to WIS 19. The GPS software automatically produced attribute information, including a date stamp, X, Y, and Z location coordinates, and a Google aerial and street view location exhibit, refer to Figure 8. The geocoded data was then assigned into one of seven access types listed below corresponding to its current land use function:

- Residential
- Commercial
- Industrial
- Public / Institutional
- Agricultural
- Utility / Other
- Road

Figure 7: Access Inventory Summary

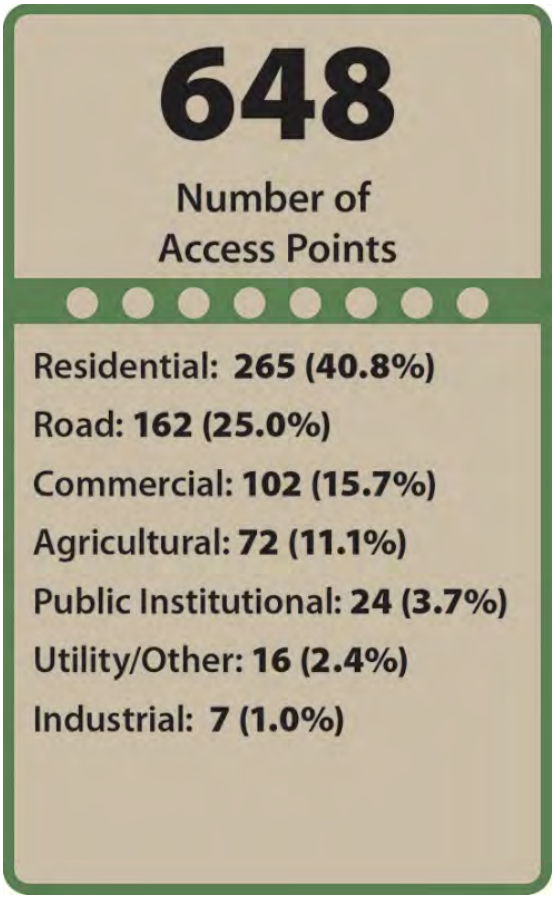
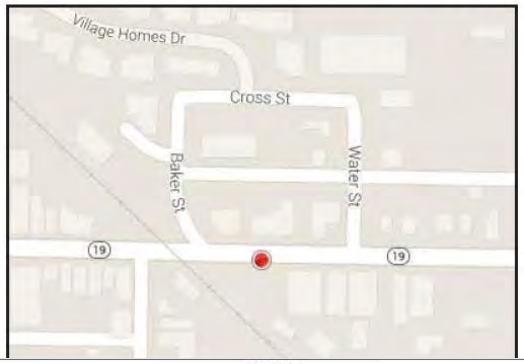


Figure 8: Access Inventory Data Collected for Each Access Point

RIMG0240.JPG

Title:



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Title	
Subject	
Comment	
Description	
Unknown	
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Longitude	W 89° 27' 14.67"
Time Stamp	10:27:56 AM
Date Stamp	8/12/2014
Elevation	928 ft
Photo Direction	236° SW
Make	RICOH
Model	G700 SE
Access Type	C

The WIS 19 corridor has a total of 648 access points. Over 40 percent (265) of the access drives are residential. Residential access is predominant throughout the corridor. Almost all residential properties have a single access point to their parcel.

Public entrances (roads), account for 25 percent (162) of all access onto WIS 19.

Eleven percent (72) of the access points within the corridor are agricultural uses. The use and frequency of these access points is dependent on growing and harvesting seasons. During non-peak times and winter months, the driveways are infrequently used.

Individual access points locations and their corresponding existing land uses are shown in the Existing Access Inventory maps in Appendix B.

2.3 Access Points per Mile along WIS 19

Individual access points along the WIS 19 corridor were evaluated on a mile to mile basis against three main factors. Each section considered WisDOT Access Control Tiers, (see section 1.5.3), WisDOT Functional Classification by roadway section, and a consideration of if the road is in an urban or rural section. Refer to Table 3 for an access summary table.

This analysis indicated the density of access along WIS 19 is very inconsistent. This is expected given the varying land uses throughout the corridor. Urban areas account for approximately five miles along the corridor and average 67 access points per mile within these areas. Rural areas account for approximately 25 miles and average 12 rural access points per mile.

Urban areas identified within the corridor with high access densities included:

- Village of Waunakee - between Century Avenue and Division Street
- City of Sun Prairie – between Bird Street and Main Street
- Village of Marshall – between Motl Street and Box Elder Road
- City of Waterloo – between Canal Road to WIS 89

Table 3: WIS 19 Access Points Per Mile (West to East)

Mile Marker	Description	Access Points	Access Control Tier	Roadway Classification
0-1	US 12 to 1800 feet W of Barman Road	20	T2B	Minor Arterial
1-2	1800 feet W of Barman Road to 1300 feet E of Kuehn Road	15	T2B	Minor Arterial
2-3	1300 feet E of Kuehn Road 250 feet E of Poelma Drive	8	T2B	Minor Arterial
3-4	250 feet E of Poelma Drive to 1050 feet E of Hellenbrand Road	12	T2B	Minor Arterial
4-5	1050 feet E of Hellenbrand Road to 30 feet E of O'Malley Street	20	T2B	Minor Arterial/Principal Arterial
5-6	30 feet E of O'Malley Street to 950 W of Schumacher Road/Raemisch Road	62	T2B	Principal Arterial
6-7	950 W of Schumacher Road/Raemisch Road to 350 feet E of Hogan Road	7	T2B	Principal Arterial
7-8	350 feet E of Hogan Road to 2925 feet E of County I	10	T1/ T2B	Minor Arterial/Principal Arterial
8-9	2925 feet E of County I to 1450 feet E of Walter Drive	7	T1	Minor Arterial
9-10	1450 feet E of Walter Drive to 650 feet E of River Road	8	T1	Minor Arterial
10-11	650 feet E of River Road to County CV/Lake Road	11	T1	Minor Arterial/Principal Arterial
11-12	County CV/Lake Road to US 51 Northbound Ramps	13	T1	Principal Arterial
12-13	US 51 Northbound Ramps to 1875 feet W of Steven Drive	16	T1/T2A	Principal Arterial
13-14	1875 feet W of Steven Drive to 375 feet E of Fox Run	22	T2A	Principal Arterial
14-15	375 feet E of Fox Run to 250 feet E of Oxford Place	9	T2A	Principal Arterial

Table 4: WIS 19 Access Points Per Mile (West to East, continued)

Mile Marker	Description	Access Points	Access Control Tier	Roadway Classification
15-16	250 feet E of Oxford Place to 200 feet W of Eddington Drive	9	T2A	Principal Arterial
16-17	200 feet W of Eddington Drive to 150 feet W of Bird Street	25	T2A/T2B	Principal Arterial
17-18	150 feet W of Bird Street to 150 feet S of Angell Street	117	T2B	Principal Arterial
18-19	150 feet S of Angell Street to 825 feet E of Musket Ridge Drive	34	T2B	Principal Arterial
19-20	825 feet E of Musket Ridge Drive to 525 feet E of Blaska Drive	8	T2B	Minor Arterial/Principal Arterial
20-21	525 feet E of Blaska Drive to 3550 feet W of Twin Lane Road	17	T2B	Minor Arterial
21-22	3550 feet W of Twin Lane Road to 1050 feet W of Tennant Road	13	T2B	Minor Arterial
22-23	1050 feet W of Tennant Road to 2325 feet E of Prospector Lane	17	T2B	Minor Arterial
23-24	2325 feet E of Prospector Lane to 1900 feet W of Schappe Road	21	T2B	Minor Arterial
24-25	1900 feet W of Schappe Road to 350 feet E of Lochinvars Trail	18	T2B	Minor Arterial
25-26	350 feet E of Lochinvars Trail to 100 feet W of Deerfield Road	32	T2B	Minor Arterial
26-27	100 feet W of Deerfield Road to 150 feet E of Koch Drive	37	T2B	Minor Arterial
27-28	150 feet E of Koch Drive to to 950 feet E of Cherry Lane	6	T2B	Minor Arterial
28-29	950 feet E of Cherry Lane to 1850 feet SW of Knowlton Street	4	T2B	Minor Arterial
29-30	1850 feet SW of Knowlton Street to 350 feet E of Minnetonka Way	24	T2B	Minor Arterial
30-End	350 feet E of Minnetonka Way to WIS 89	26	T2B	Minor Arterial

2.4 Bicycle / Pedestrian Facilities

The primary intent of evaluating the existing pedestrian and bicycle facilities was to locate sections of the corridor that have disconnected networks within the municipal limits. Areas outside the municipal limits were also assessed to provide an inclusive summary of the existing facilities.

It was determined that a majority of the corridor within each municipality provided off-street pedestrian facilities (sidewalks) and/or shared-use paths adjacent to the corridor. Many urban areas also provided wide auxiliary lanes to accommodate a bicycle lane.

2.4.1 Methodology

The evaluation of the existing pedestrian and bicycle facilities used available as-built plans and aerial GIS imagery. The evaluation began by reviewing as-built plans. Two sections of WIS 19 did not have as-built plans on file for review. Those sections include and can be seen in the Corridor Curve Evaluation map in Appendix B:

- WIS 19 from the village of Waunakee at Division Street to the village of Windsor at the Canadian Pacific Railroad
- WIS 19 from the town of Medina at Box Elder Road to the city of Waterloo at the Dane County and Jefferson County border

Aerial imagery and Dane County GIS data were then used as a supplement to the as-built plans to determine approximate widths and locations of the existing facilities where this information was unavailable in as-built plans. Aerial imagery was also used to document where off-street shared-use paths or sidewalks were disconnected. Shoulder widths, auxiliary lane widths, presence of on-street marked bike lanes were also documented.

Data was reviewed per the FDM criteria to determine acceptable shoulder widths for bicycle accommodations. Sections with paved shoulder widths greater than 5-feet meet the design criteria for a design class A2 highway[18] and can accommodate bicycles, according to the Facilities Development Manual (FDM) Chapter 11 (11-14, Attachment 1.5). Paved shoulder widths less than 5-feet do not meet the design criteria and were documented as such in Appendix B.

The auxiliary lanes are defined by FDM as "the portion of roadway adjoining the traveled way to through-traffic movement." For discussion purposes, auxiliary lanes specifically include on-street marked bike lanes or combined parking and/or bike lanes in urban sections. The location of the sections with either of these forms of auxiliary lanes were also noted.

2.4.2 Findings

As a result of the pedestrian and bicycle facility evaluation, six categories were used to distinguish the existing facilities along the corridor:

1. Paved Shoulder 5-feet or Greater

[18] WisDOT FDM 11-15 Attachment 1.1 describes design criteria for rural state trunk highways. Daily traffic volume is the prime indicator of design class. WIS 19 is classified as an A2 highway within the entire two-lane rural study limits.

2. Paved Shoulder Less than 5-feet
3. On-Street Marked Bike Lane
4. Wide Parking Lane, No Marked Bike Lane
5. Discontinued Sidewalk Facilities (municipal limits only)
6. Shared-use Path

The Bike and Pedestrian Accommodations map in Appendix B displays the location and side of road where each of these facilities lie along the WIS 19 study area. Refer to Table 5 for details of facilities along the highway.

A majority of the facilities within the municipal limits provide additional sidewalks and/or shared-use paths adjacent to the roadway. Typically, marked/identified pedestrian or bicycle accommodations are not provided adjacent to the rural cross sections (Typical Sections #1, #3, and #4 on Figure 9 and located on Exhibit 5) outside of the municipal limits of the study corridor. However, a shared-use path exists on the south side of WIS 19 along a rural section (Typical Section #1) in Sun Prairie between Heatherstone Drive and Grand Avenue. Between Grand Avenue to west of Broadway Avenue, a shared-use path exists along the north and south sides of WIS 19.

A substantial amount of the rural sections accommodate bicyclists with the 5-feet or greater paved shoulder. These shoulders are specifically marked as a bike lane only in the city of Waterloo due to the high bicycle volumes in the area.

One discontinued sidewalk facility exists in Sun Prairie between Pony Lane and A Street, (US 151 interchange) north of WIS 19. The discontinued facility does not provide an efficient route for residents to travel between the surrounding neighborhoods and the local institutions (i.e. schools) north of WIS 19.

Table 5: Bike Accommodation Table

WIS 19 Section	Accommodations
US 12 to Holiday Drive	Less than 5' Paved Shoulders
Holiday Drive to Division Street	On-Street Marked Bike Lane, Width Varies
Division Street to WIS 113/County I	Greater than 5' Paved Shoulders
WIS 113/County I to Bird Street	Less than 5' Paved Shoulders, Greater than 5' Paved Shoulders from I-39/90/94 to US 51^
Bird Street to Musket Ridge Drive	Wide Parking Lane, No Marked Bike Lane, Less than 5' Shoulders
Musket Ridge Drive to Town Hall Drive	Less than 5' Paved Shoulders
Town Hall Drive to Lothe Road/School Street	Greater than 5' Paved Shoulders
Lothe Road/School Street to WIS 73/Hubbell Street	On-Street Marked Bike Lane
WIS 73/Hubbell Street to Knowlton Street	Greater than 5' Paved Shoulders

WIS 19 Section	Accommodations
Knowlton Street to Jackson Street	On-Street Marked Bike Lane
Jackson Street to WIS 89	Less than 5' Shoulders

^ 5-foot shoulders and a small portion of roadway will be constructed between WIS 113 and River Road as part of the 2018 roundabout project at WIS 19/113/County I

2.5 Parking

In rural portions of the WIS 19 corridor (areas outside of municipal limits), signed parking areas are not located anywhere along WIS 19. In urban areas (village of Waunakee, city of Sun Prairie, village of Marshall) on street parking is allowed in designated areas, mainly the downtown areas of these municipalities. Refer to Appendix B for a map of parking areas along WIS 19.

In the Village Waunakee, there is designated on street parking on both sides of East Main Street (WIS 19), from O'Malley Street to Water Street. Additional on street parking is also designated from just west of Cross Street to the Sixmile Creek Bridge, located just west of the Division Street intersection.

In the city of Sun Prairie, on street parking is available along Windsor Street (WIS 19) from just east of the WIS 19/North Bird Street intersection through the Windsor Street (WIS 19) intersection with County N. Just south of this intersection, in downtown Sun Prairie, on street parking is designated from Angell Street through Dewey Street. The parking in downtown Sun Prairie is limited to two hours.

In the village of Marshall, on street parking is available in the downtown area, generally from County T to just east of the WIS 73 North intersection. Parking in downtown village of Marshall is generally limited to 2 hours, with a small section of 1 hour only parking.

2.6 Railroads

The Canadian Pacific Railway (CP), and Wisconsin and Southern Railroad (WSOR) have rail lines running through the study area. The CP railway crosses WIS 19 at one location (between I-39/90/94 and CTH CV. WSOR has two lines crossing WIS 19, a total of three times, one in the village of Waunakee (between South Avenue and Baker Street), one in the city of Sun Prairie (between Linnerud Drive and CTH N), and one in the city of Waterloo (between Palmer Street and Canal Road).

WSOR is considered a Class II operator, and its tracks provide freight linkages for rural and urban communities throughout southern Wisconsin. Refer to Exhibit 2 for an overview map that shows the railroad lines.

One line runs north-south through the village of Waunakee, with an at-grade crossing in downtown Waunakee, between South Street and Baker Street. The second line runs east to

west, with an at-grade crossing in the city of Sun Prairie, between Linnerud Street and County N.

The second line runs adjacent to US 14 from the village of Lone Rock to the town of Mazomanie. This line connects freight services between the harbor facilities in Prairie du Chien and Madison. Approximately three trains per week transport coal, lumber, fertilizer, ammonia, ethanol, plastics, corn and grain.

The Canadian Pacific Rail System operates a portion of a rail line running from Madison through DeForest. This line runs north to south and crosses the WIS 19 corridor just east of the WIS 19 and I-39/90/94 interchange, between Lake Road (County CV) and the northbound I-39/90/94 off-ramp.

2.7 School Districts

The WIS 19 corridor crosses the following six public school districts:

- Middleton-Cross Plains
- Waunakee Community
- Deforest Area
- Sun Prairie Area
- Marshall
- Waterloo

School district boundaries can be found in the Corridor School District Boundaries map in Appendix F.

Each of these school districts offers bus services. Generally, bus services are offered to elementary age students living one mile or greater from the closest elementary school, and middle and high school students living 1.75 miles or greater from the closest middle or high school. School buses for all districts travel and/or cross WIS 19.

2.8 Typical Sections

The examination of the existing typical cross sections throughout the corridor focused on providing information about the following:

1. Number of Lanes
2. Rural or Urban (mountable or non-mountable curb if necessary)
3. Shoulder Widths and Types
4. On-Street Parking and/or Bike Lanes

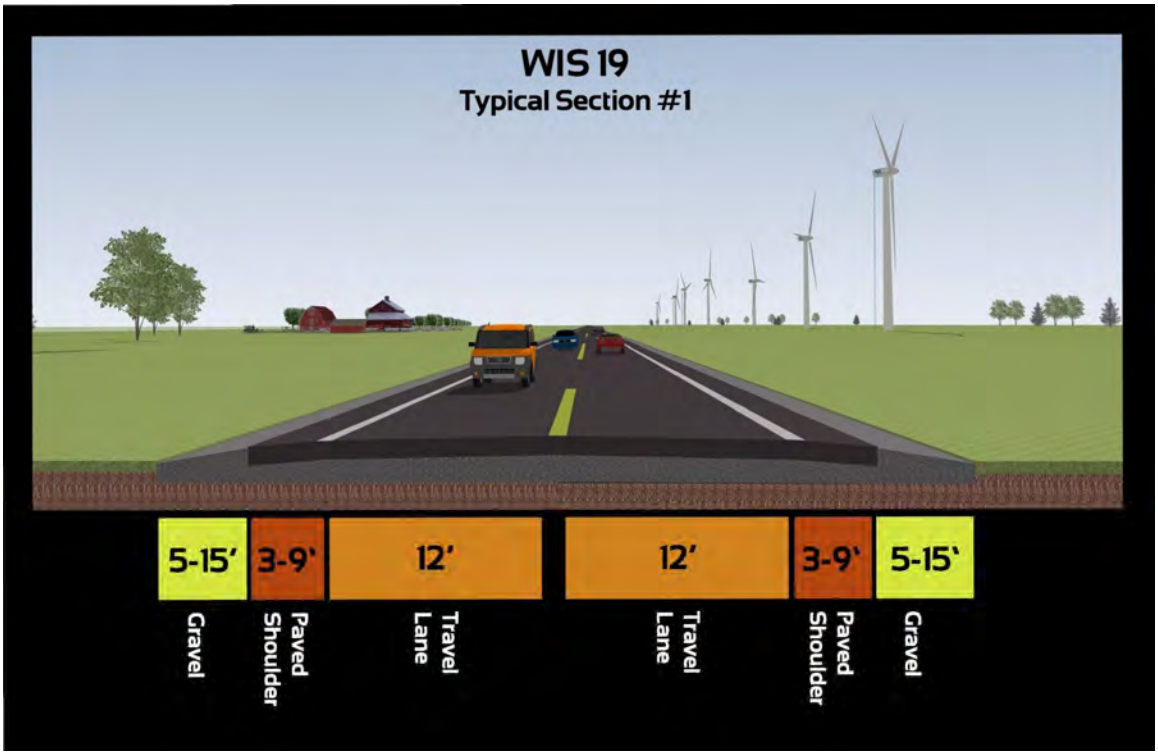
5. Divided or Undivided
6. Terrace Width
7. Sidewalk Width
8. Shared-Use Path Width

The purpose of the cross section evaluation was to provide information about the existing widths of the roadway and its on-street or off-street facilities. Ultimately, eight typical cross sections were found to best represent the existing roadway characteristics of the WIS 19 study corridor. These cross sections are illustrated in Exhibit 5, Typical Cross Sections Locations map.

The majority of the study corridor is characterized as a 2-lane rural roadway between the municipalities (Typical Section #1, illustrated in Figure 8). Through the residential/downtown areas, the rural cross-sections transition into a 2-lane urban roadway. The typical 2-lane urban roadway includes wide parking and/or bike lanes, terraces, and sidewalks on both sides (Typical Section #2, illustrated in Figure 8). The remaining six typical sections deviate from these two primary sections.

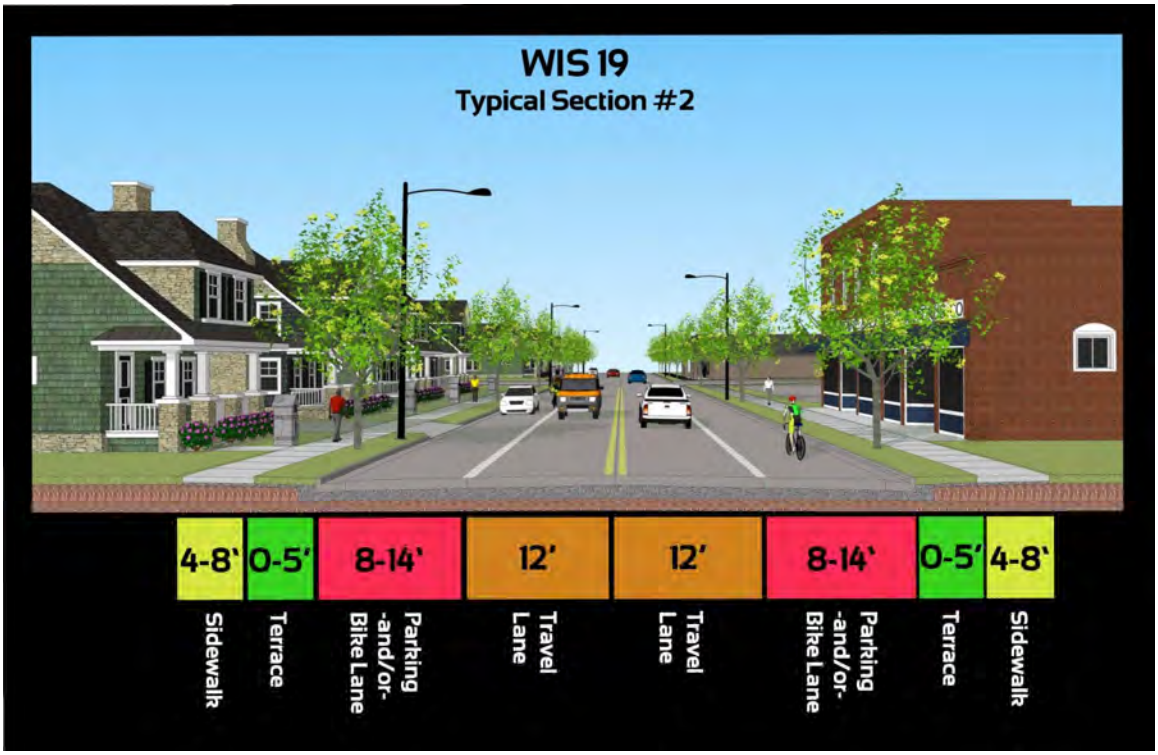
Figure 9: Typical Cross Sections

1. Rural 2-lane without continuous[19] adequate bike facilities



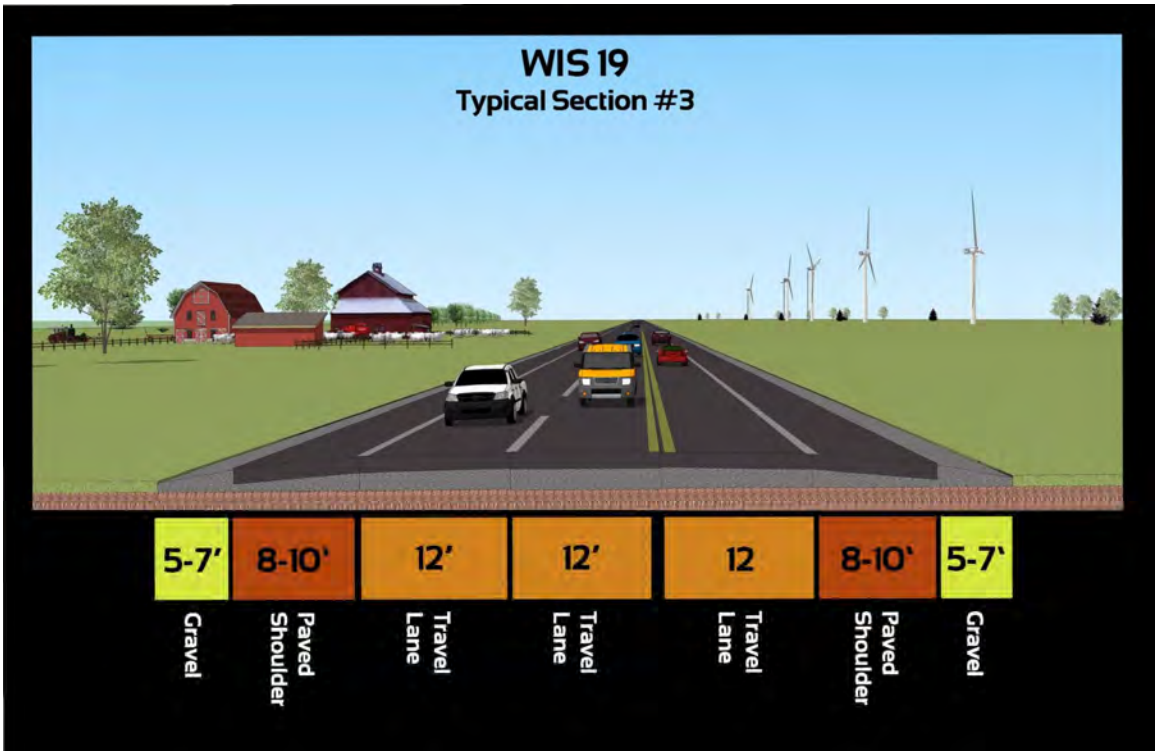
[19] Within these sections the paved shoulder ranges from 3 to 9 feet. Where less than 5 feet this condition is considered less than desirable for biking on the paved shoulder.

2. Urban 2-lane with sidewalks[20] and bike/parking facilities

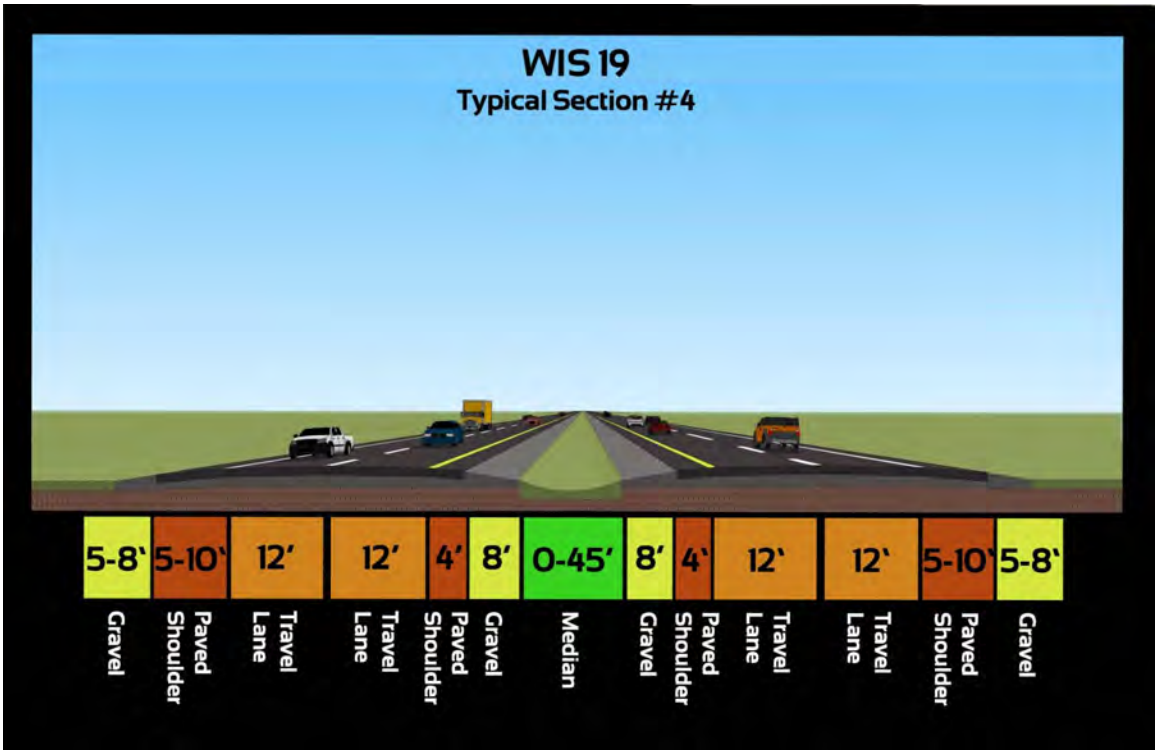


[20] Locations exist where sidewalk is immediately adjacent to roadway curb and gutter and those sections denoted as zero width terrace. Graphic shows terrace space to denote the primary condition where some grass or paved terrace exists.

3. Rural 3-lane with desirable bike facilities

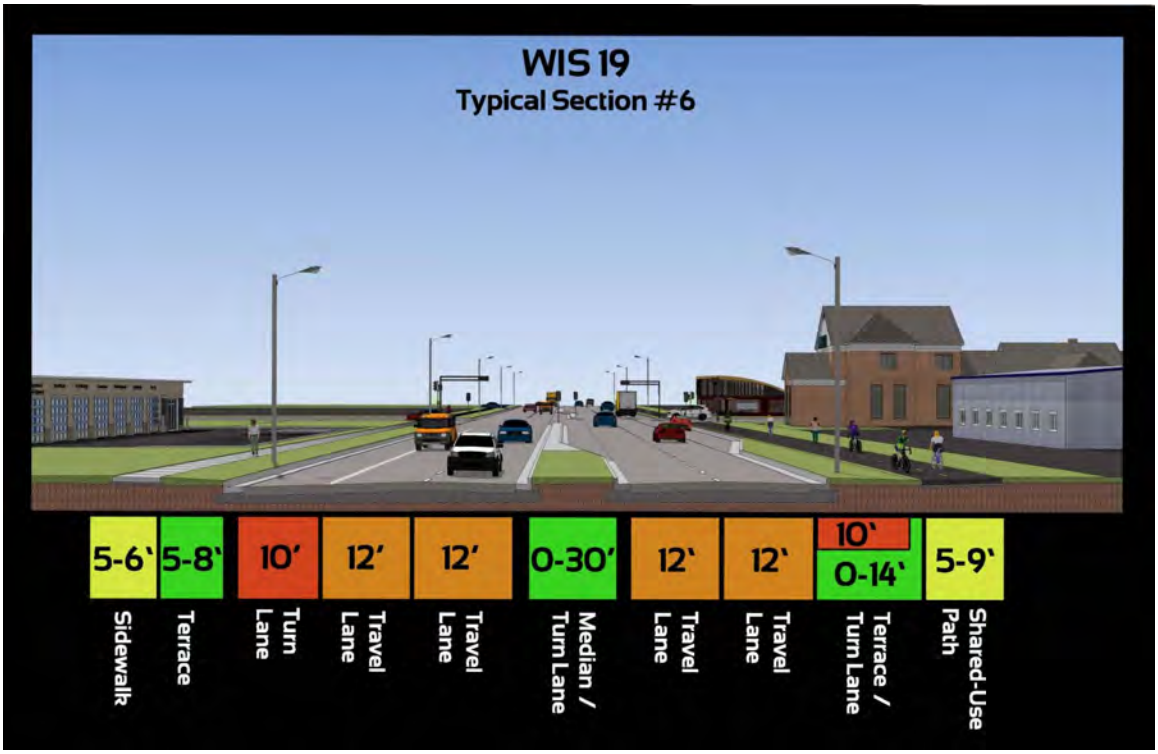


4. Rural 4-lane divided with adequate bike facilities

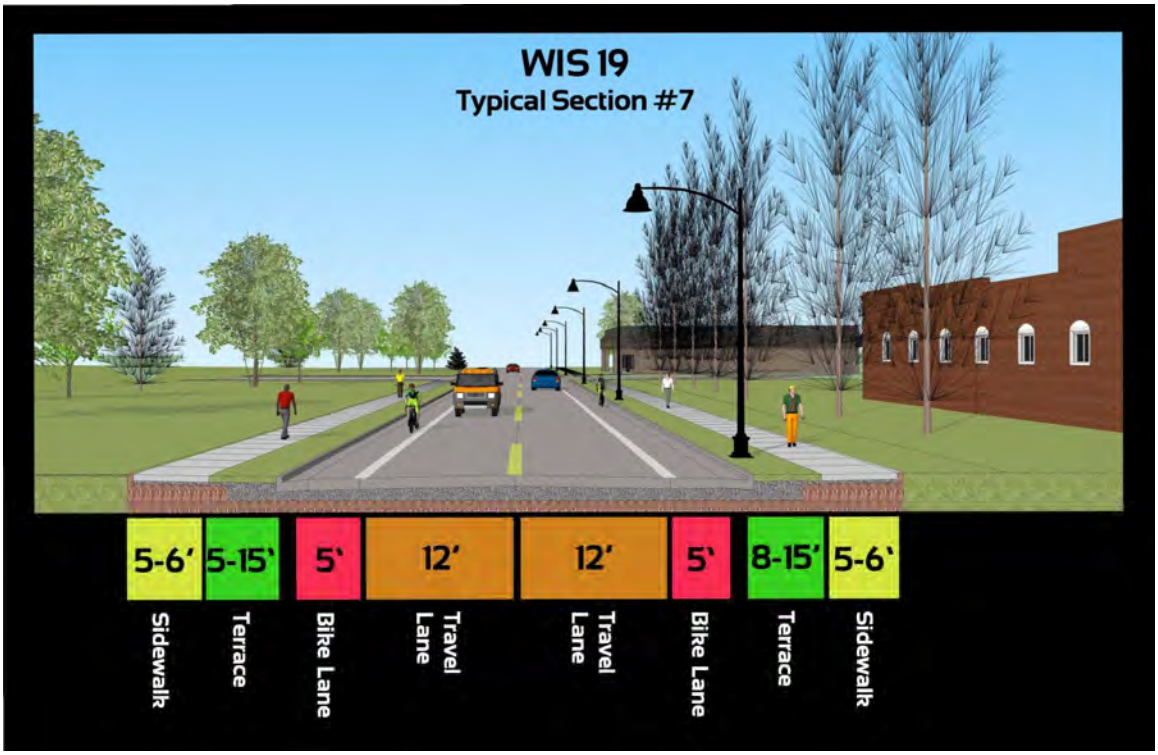


5. Urban 4-lane with sidewalk and/or shared use path

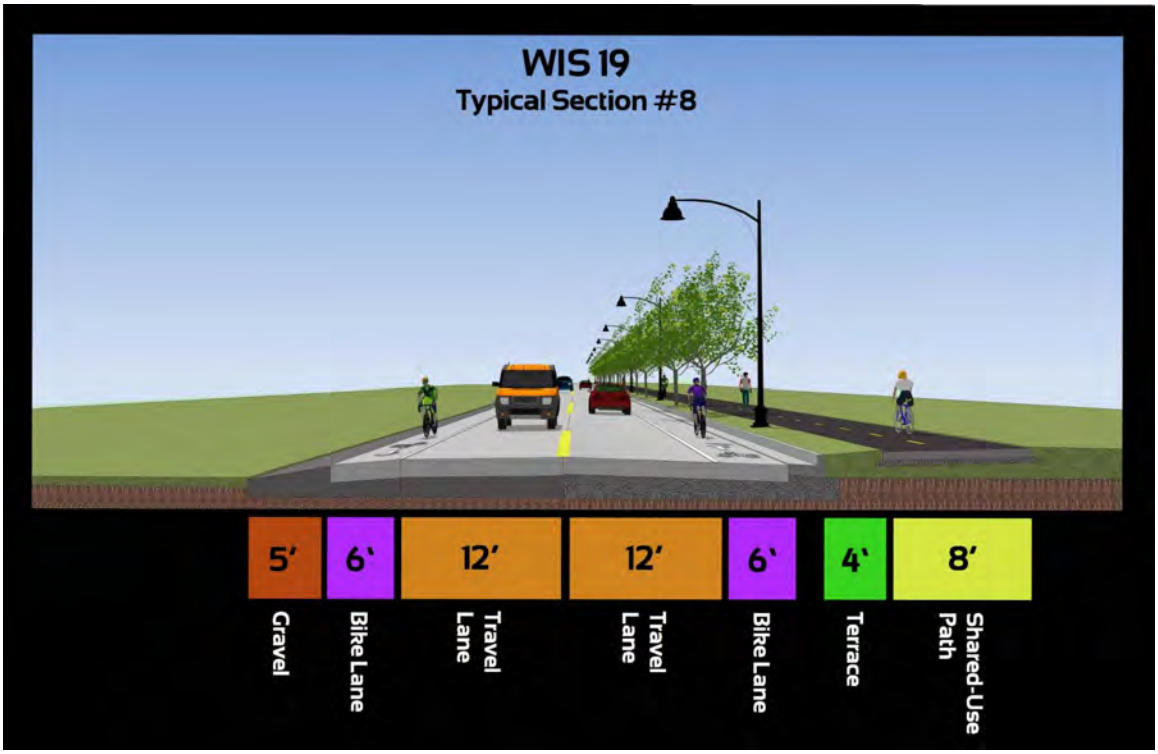
6. Urban 4 lane divided with sidewalk and/or shared use path



7. Urban 2-lane with sidewalks and bike facilities



8. Urban/rural 2-lane with one-side shared use path



2.8.1 Methodology

A review of aerial imagery and Dane County GIS data provided a majority of the information used to determine the existing cross section features. Review of as-built plans supplemented this aerial inventory where additional detail or information was needed. Due to the length of the corridor, the analysis initially yielded a substantial amount of cross sections. To minimize the typical sections, the most common characteristics shared between the cross sections were evaluated. These common features included sidewalk, curb and gutter, number of lanes, shoulders, wide auxiliary lanes, and turn lanes.

Ultimately, eight typical sections were documented to represent the features of the corridor. The analysis maintained record of the width variations for shoulders, auxiliary lanes, medians, terraces, and sidewalks/shared-use paths.

It was also documented if each typical section contained nominal characteristics that deviated from the typical, which did not warrant an additional typical section. An example of one of these characteristics is the presence of turn bays and medians at several rural intersections.

A detailed inventory of the varying characteristics and their respective locations along the corridor can be referenced in Appendix B. Table 6 supplements Exhibit 5, Typical Cross Sections Locations, by specifying, for example, the presence auxiliary lanes (bypass lane, turn lane, shared parking and/or bike lane, etc.) or when shoulder widths noticeably change within the same typical section.

Finally, to validate the location and descriptions of the typical sections, the information was checked with the Bike and Pedestrian Accommodations map in Appendix B to ensure the details and locations match.

2.8.2 Findings

The WIS 19 study corridor has many prominent and unique cross section features, which were ultimately categorized into eight typical sections. Table 6 summarizes the characteristics of each typical section and the corresponding notes distinguishing if changes to the cross sections occur. These notes were important to maintain the low amount of typical sections without disregarding variations to the cross sections.

Table 6: Existing Typical Sections

Typical Section # (A)	Urban/Rural	No. of Lanes	Lane Width (ft.)	Shoulder Width		Aux. Lane	Median (ft.)	Terrace (ft.)	Sidewalk (ft.)	Shared-Use Path (ft.)
				Paved (ft.)	Gravel (ft.)					
1	Undivided, Rural (B)	2	12	3-9	5-15		(C)			(D)
2	Undivided, Urban (E)	2	12			8-14 ft. parking and/or bike lane		0-5		
3	Undivided, Rural	3	12	8-10	5-7		(C)			
4	Divided, Rural (F)	4	12	5-10	5-8		0-45			
5	Undivided, Urban	4	11-12					4-18		5-8 (south only)
6	Divided, Urban, Right and Left Turn Lanes (F)	4	12			10 ft. turn lane	0-30	0-14		5-8 (south only)
7	Undivided, Urban	2	12			5 ft. bike lane		5-15		
8	Undivided, Rural to North, Urban to South	2	12	6 (rural side only)	5 (rural side only)	6 ft. bike lane		4		

(A) Refer Appendix B for a map of these Typical Cross Section Locations and Layouts

(B) Minimum 5 ft. paved shoulder not met on portions of section

(C) Narrow medians provided for turn bays at some rural intersections

(D) 11 ft. shared-use path to south and/or north of WIS 19 (not typical)

(E) Guardrail along portions of paved shoulder edge

(F) Bridge/Underpass on portions of section

(G) Paved shoulder typically marked for bike lane

A majority of the corridor is classified as Typical Section #1, a rural 2-lane roadway. Within the municipal limits, Typical Section #2 best represents the cross sections, including the wide outside lane for a bike and/or parking lane. The other six cross sections collectively summarize the rest of the cross section along the corridor, including the presence of four-lane rural sections, wide medians, and substantial intersections or interchanges.

All cross sections provide a minimum 11-ft. wide travel lane. Some sections have paved shoulders that meet the 5-ft. minimum design criteria for bicycle accommodations but many do not. Refer to Appendix B for a Bike and Pedestrian Accommodations map. Most municipalities provide an average 5-ft. terrace between the travel lanes and sidewalk, with the

exception being the section between Angell Street and Dewey Street in Sun Prairie. As mentioned, a detailed inventory of cross section characteristics along the corridor, organized by location, is provided in Appendix B.

The typical roadway section is over-capacity (more vehicle traffic that the facility can efficiently handle) in several areas along the WIS 19 corridor. Today, the section from Division Street in the village of Waunakee to I-39/90/94 is above capacity (approximately 15,200 vehicles per day[21] at a planning level analysis). In year 2050, three locations are identified as above capacity:

- WIS 113 north in downtown Waunakee to I-39/90/94
- US 51 to Broadway Drive on the near west side of the city of Sun Prairie
- WIS 19/Main Street to County N in Sun Prairie

2.9 Horizontal Curves

The following is an overview of horizontal geometry along WIS 19. The majority of this information is derived from as-built plans, aerial imagery, and field visits. Details include existing speed limits, curve radii, current design standards, and other relevant transportation guidelines.

2.9.1 Methodology

Two sections of WIS 19 did not have as-built plans on file for review. Those sections include and can be seen in the Corridor Curve Evaluation map in Appendix B:

- WIS 19 from the village of Waunakee at Division Street to the village of Windsor at the Canadian Pacific Railroad
- WIS 19 from the town of Medina at Box Elder Road to the city of Waterloo at the Dane County and Jefferson County border

Aerial imagery and Dane County GIS data were used to determine an approximate horizontal geometry for the two sections mentioned above. All other alignment data utilized as-built alignments which were inputted into AutoCAD Civil3D. Data was reviewed per the Facilities Development Manual (FDM) Chapter 11, Section 10 (Exhibit 5.1) and the American Association of State Highway Transportation Officials (AASHTO) Geometric Design of Highway and Streets Manual (2004) guidelines, to determine acceptable horizontal geometry. Posted speed, design speed, superelevation, and each curve radius was reviewed to determine if the current geometry meets design standards.

[21] https://trust.dot.state.wi.us/roadrunner/

2.9.2 Findings

A curve deficiency has been defined as any curve that not does meet the current design speed for the existing superelevation and curve radius in the field. Under those conditions, of the 23 horizontal curves, seven do not meet current roadway design standards, see Table 7 below.

Table 7: Horizontal Curves (table presents all curves)

Curve # (1)	Approx. Curve Location	Curve Radius (ft.)	Posted Speed (mph)	Existing Super-elevation	Posted Speed Minimum Radius (ft.)	Design Speed (2) Minimum Radius (ft.)	Meets Min. Radius for Design Speed
1	US 12 to Darlin Road	1,206	55	4.0%	1,190	1,500	No
2	West of Lodi-Springfield Road	1,273	55	8.0%(3)	960	1,200	Yes
3	West of Barman Road	2,865	55	5.1%	1,820	2,230	Yes
4	East of Kuhn Road	1,348	55	7.8% (3)	1,140	1,410	No
5	West of Wipperfurth Road	1,206	55	8.0% (3)	960	1,200	Yes
6	East of Wipperfurth Road	1,348	55	7.5% (3)	1,275	1,580	No
7	East of Kinsley Road	1,432	55	7.8% (3)	1,140	1,410	Yes
8	West of Hellenbrand Road	1,637	55	7.4% (3)	1,320	1,630	Yes
9	East of Hellenbrand Road	1,637	55	7.4% (3)	1,320	1,630	Yes
10	Walter Drive	1,430	55	5.9%	1,230	1,530	No
11	Walter Drive	1,430	55	5.9%	1,230	1,530	No
12	West of River Road	3,810	55	3.6%	1,880	2,350	Yes
13	East of River Road	3,480	55	4.0%	1,190	1,500	Yes
14	Brandywood Trail	1,273	45	5.9%	749	965	Yes
15	Charlotte's Way	1,273	45	8.0% (3)	587	758	Yes
16	Dewey Street/Linnerud Drive	287	25	3.0%	433	681	No
17	Grove Street	764	25	3.0%	433	681	Yes
18	East of CTY VV	2,864	55	4.5%	2,300	2,800	Yes
19	West of Twin Lane Road	1,763	55	5.6%	1,470	1,830	No
20	East of Lochinvars Trail	1,348	45	5.9%	749	965	Yes
21	Box Elder Road	2,500	55	4.9% (4)	1,970	2,410	Yes
22	East of Cherry Lane	2,800	55	4.5% (4)	2,300	2,800	Yes
23	Minnetonka Way	478	25	8.0% (3)	134	214	Yes

Legend

Meets both posted and design speed minimum radii

Meets posted speed but not design speed minimum radius

Does not meet posted or design speed minimum radius

(1) Refer to Appendix B, Corridor Curve Evaluation, for a map of deficient curve locations
(2) Design speed is 5 mph over the posted speed limit
(3) eMAX 8.0 percent values from AASHTO's Geometric Design of Highways and Streets, 2004
(4) Plans do not show curve superelevation (4.9 percent and 4.5 percent assumed based off existing radius and design speed)

Eight horizontal curves required a review of the 2004 AASHTO Geometric Design of Highways and Streets to evaluate superelevation rates greater than 7 percent[22]. Of these eight curves, only two curves do not meet criteria for design speed minimum radius.

A majority of the rural, high speed, horizontal curves within the corridor study area meet current design standards for the design speed of the roadway. However, six curves only meet the current posted speed limits (5 mph less than design speed) for the geometric radius and superelevation. The urban, low speed sections of WIS 19 are generally straight and flat; one exception is near the intersection of Dewey Street/Linnerud Drive within the city of Sun Prairie. The substandard horizontal curve is the only curve within the corridor that does not meet current roadway standards for the posted or design speed. The intersection is also discussed later in the report as having poor intersection operations, limited intersection sight distance, and a crash history.

2.10 Vertical Curves

The following section presents an overview of vertical geometry along WIS 19 from the Town or Springfield through the city of Waterloo. The majority of this information is derived from as-built plans, Dane County LIDAR data, and field visits. Details include existing speed limits, K-values, and curve types.

2.10.1 Methodology

Similar to the horizontal curves, as-built plans were provided by the WisDOT and two sections of WIS 19 did not have as-built plans on file for review. Those sections include and can be seen in Vertical Curve map in Appendix B:

- WIS 19 from the village of Waunakee at Division Street to the village of Windsor at the Canadian Pacific Railroad
- WIS 19 from the town of Medina at Box Elder Road to the city of Waterloo at the Dane County and Jefferson County border

Dane County LIDAR data was used to determine an approximate vertical profile for the two sections mentioned above. All other profile data utilized as-built profiles which were inputted into AutoCAD Civil3D. Data was reviewed per the FDM Chapter 11-10-5 (Attachments 3 and 4), based on the AASHTO Geometric Design of Highway and Streets Manual (2004) guidelines, to determine acceptable profile grades and sight distance. Posted speed, design speed, and corresponding K-values were reviewed to determine if the current profile meets design standards.

[22] WisDOT FDM does not list superelevation information beyond 6 percent because in areas with frequent ice and snow conditions, 6 percent is a desirable maximum superelevation condition.

2.10.2 Findings

A curve deficiency has been defined as any curve that not does meet the k-value for the given design speed. Under those conditions, of the 180 vertical curves, six do not meet current roadway design standards, see Table 8.

Table 8: Deficient Vertical Curves (table presents only deficient curves)

Curve # (1)	Station (3)	Location	Municipality	Vertical Curve Type	Posted Speed (mph)	Posted Speed K Value	Design Speed (2) K Value	Curve K Value	Recommended Speed for Measured K Value (if Less than Posted)
1	16+70	Darlin Drive	Springfield	Sag	55	115	136	53	40
2	22+50	Lodi-Springfield Road	Springfield	Crest	55	114	151	80	45
3	59+50	Barman Road	Springfield	Sag	55	115	136	122	55
4	123+25	Wipperfurth Road	Springfield	Sag	55	115	136	67	45
5	1266+00	County TT	Medina	Sag	55	115	136	129	55
6	1565+10	Canal Road	Waterloo	Sag	40	64	79	52	40

Legend

Meets posted speed but not design speed minimum K-value

Does not meet posted or design speed minimum K-values

(1) Refer to Corridor Curve Evaluation Appendix B for a map of deficient curve locations and a list of existing vertical curves

(2) Design speed is 5mph over the posted speed limit

(3) Stations can be referenced in Exhibit 9

The urban areas of WIS 19 consist generally of a flat roadway profile that therefore does not have any deficient vertical curves. However, in a few of the rural areas of the town of Springfield, Marshall, town of Medina, and Waterloo there are spot locations where the design speed and/or posted speed do not meet the geometric criteria for a safe highway.

2.11 Intersections

The following section presents an overview of the existing geometry for the at-grade intersections along the WIS 19 study corridor. This report chapter is divided into two sections, Intersection Angles and Intersection Types. The information from each section is based on as-built data and aerial imagery measurements and observations.

2.11.1 Intersection Angles

The intersection angles were documented for each at-grade intersection along the WIS 19 study corridor. A total of 13 intersections do not meet criteria for new and/or

reconstruction projects. These intersections can be used to compare against crash rates and locations to identify any potential geometric problems related to the crash history.

Methodology

Using the as-built data that was entered into AutoCAD Civil 3D and dimensioning tools, the angles were measured at each intersection for each applicable quadrant. These angles were documented (in degrees) and compared to the angle criteria for existing intersections according to FDM Chapter 11, Section 25, 2.8.3.1. Depending on the existing conditions, the angles were noted if they 1) met the angle criteria for existing intersection on new or reconstruction projects, 2) met the minimum angle criteria for existing intersection on 3R projects, or 3) did not meet minimum angle criteria.

Findings

Of the 128 intersections evaluated, 13 intersections were determined to be deficient per FDM criteria. Refer to Table 9 for a list of these deficient intersections or quadrants along the study corridor. Refer to Appendix B for the location of these intersections. The intersection with WIS 113 is subject for a near-future reconstruction project.

Table 9: Intersection Angles (table only lists intersections with deficiencies)

Intersection with WIS 19	Intersection Angles (degrees)			
	NE	NW	SE	SW
Barman Road	112	68	-	-
Baker Street	117	63	-	-
WIS 113	157	23	23	157
Grove Street/County N	111	58	83	108
US 151 Off-Ramp SWB	53	127	-	-
US 151 On-Ramp SWB	-	-	115	65
US 151 Off-Ramp NEB	-	-	125	55
US 151 On-Ramp NEB	59	121	-	-
Twin Lane Road	104	73	76	107
Schappe Road	-	-	124	56
Box Elder Road	-	-	55	125
Koch Drive	114	66	-	-
Palmer Street	48	132	-	-

Legend

Meets minimum angle criteria for existing intersection on 3R projects
Does not meet minimum angle criteria

2.11.2 Intersection Types

The intersection types were documented for each rural at-grade intersection along the WIS 19 study corridor that corresponded to a speed limit of 45 mph or greater. These higher speed intersections were studied because substandard geometric conditions at these intersections generally have higher severity crashes than lower speed intersections. Therefore geometric deficiencies that could relate to crash history are considered a higher priority at higher speed intersections. Existing intersection control was also documented. Twenty-one intersections do not meet the criteria provided in the FDM for adequate turn lane length.

Methodology

The intersection types were evaluated based on the information provided by the FDM's Standard Detail Drawing (S.D.D.) 9A1- a & b, At-Grade Side Road Intersections (FDM 11-25) and Attachment 1.1 in Chapter 11-25. Only intersections found to be in a 45 mph or greater speed zone were evaluated. Based on the criteria, each intersection was categorized into one of the six (6) types of rural-at grade intersections: A1, A2, B1, B2, C, and D.

Next, each intersection was evaluated to determine if the existing conditions meet desired intersection type geometry. For intersections on a 2-lane segment of WIS 19, AADT data on the mainline (WIS 19) and estimated AADT values for the side roads were used to determine the necessary intersection type. For intersections on a four lane divided segment of WIS 19, posted speed limits and AADT information were used to determine the necessary intersection type. Attachment 1.1 in Chapter 11-25 of the FDM summarizes these selection criteria. Once the desired intersection types were determined, the existing intersection types were compared to the desired geometry. Intersections not meeting the criteria for the intersection type are noted in Table 8.

The side of the road that the intersections exist and the intersection control (signalized or stop controlled) are also documented in Table 10. Refer to Appendix B for the location of these intersections. Some rural side roads contained varying intersection types depending on the side of road analyzed, which are noted in the table below.

Findings

Approximately 56 rural at-grade intersections were evaluated along the WIS 19 study corridor. Of these intersections, 12 intersections may need intersection type upgrades based on new development, AADT, or posted speed. Some intersections are recommended to maintain the intersection type but lengthen the storage length to meet FDM criteria. Table 10 provides a summary of the findings, including the side of road the intersection type was analyzed and the existing intersection control. At the intersection of WIS 113/CTH I, the intersection was found Not-Applicable (N/A) due to future roundabout construction.

Table 10: At-Grade Intersection Types and Control

Intersection with WIS 19	Side of Road	Current Intersection Type	Recommended Intersection Type	Intersection Control
USH 12	Both	B2		Signalized
Darlin Drive	North	B2		Stop Controlled
Lodi Springfield Road	North	D	B2	Stop Controlled
Barman Road	North	D		Stop Controlled
Kuehn Road	North	D		Stop Controlled
Wipperfurth Road	North	D	B2	Stop Controlled
Poelma Drive	North	D		Stop Controlled
Kingsley Road	South	D	B2	Stop Controlled
Hellenbrand Road	North	D	B1	Stop Controlled
Hogan Road	South	A2		Stop Controlled
Hogan Road	North	C		Stop Controlled
113/CTH I	South	N/A		Stop Controlled
Walter Drive	North	C		Stop Controlled
River Road	Both	A2		Stop Controlled
Liuna Way	South	B2		Stop Controlled
Liuna Way	South	B2		Stop Controlled
I-39 Off Ramp (NB)	South	D		Signalized
Pepsi Way	Both	B2		Stop Controlled
Blanchar's Crossing	North	B2		Stop Controlled
N Town Road	North	B2		Stop Controlled
Williamsburg Way	South	B2		Stop Controlled
Steven Drive	South	D	A2	Stop Controlled
Portage Road	Both	A2		Signalized
Brandywood Trail	North	D	B1	Stop Controlled
Fox Run	South	D	B2	Stop Controlled
Heatherstone Drive	Both	B1		Stop Controlled
Westmount Drive	South	D		Stop Controlled
Westmount Drive	North	B1		Stop Controlled
Charlottes Way	North	B1	B1 – extend taper length to WisDOT standards	Stop Controlled
Oxford Road	South	B2		Stop Controlled
CTH C/Grand Avenue	Both	B2		Signalized
Ironwood Drive	South	A2		Stop Controlled
Town Hall Drive	Both	B2		Stop Controlled
Keller Drive	South	B2		Stop Controlled

Intersection with WIS 19	Side of Road	Current Intersection Type	Recommended Intersection Type	Intersection Control
Skala Road	North	C		Stop Controlled
Blaska Drive	South	B2		Stop Controlled
Co Rd VV	Both	B2		Stop Controlled
Twin Lane Road	Both	B2		Stop Controlled
Tennant Road	South	C		Stop Controlled
Wagon Lane	South	B2		Stop Controlled
Prospector Lane	South	B2		Stop Controlled
Weidemann Drive	North	C		Stop Controlled
Co Rd TT	South	B2		Stop Controlled
Co Rd TT	North	B1		Stop Controlled
Schappe Road	South	C		Stop Controlled
Lochinvars Trail	South	B2		Stop Controlled
Box Elder Road	South	C	B1	Stop Controlled
Industrial Drive	North	D	A2	Stop Controlled
Karem Drive	North	C		Stop Controlled
Koch Drive	North	C		Stop Controlled
Cherry Lane	Both	C	B2	Stop Controlled
Abrecht Drive	North	C		Stop Controlled
Waterloo Road	South	C		Stop Controlled
McKay Way	South	B2	A2	Stop Controlled
Palmer Street	North	D		
Shaded rows denote intersection types not meeting FDM standards				

2.11.3 Intersection Sight Distance

Four intersections were evaluated for intersection sight distance along the WIS 19 study corridor. The intersections of Town Hall Drive, County VV, and County TT (both South and North) were evaluated due to crash history, location in a high speed/rural zone, and no programmed projects for future improvements.

Methodology

Intersection sight distance (ISD) was measured at the four locations in Section 2.11.3 using GIS data, aerial imagery, and AutoCAD Civil 3D measuring tools. ISD was analyzed only at locations with safety concerns identified through crash data or by public/local official feedback. Safety concerns were defined as intersections that had at least one crash per million entering vehicles or had more than one crash per year with 50 percent or more crashes involving injuries or fatalities.

From the provided list of concerning intersections, each intersection had to meet three criteria to be analyzed for ISD. The intersections had to be in 1) a location with a posted speed limit of 55 mph, 2) within a rural corridor, and 3) have no future project improvement plan. Two intersections remained for ISD evaluation from the original list of hazardous intersections. In addition to these two intersections, it was noted from local official feedback that County TT (South) poses sight distance concerns due to the proximity of the designated land use near the intersection (a cemetery) and the combination of a landscaping berm and sag curve east of the intersection. County TT consists of two T-intersections with WIS 19, and both intersections were evaluated.

A field visit was scheduled to take photos at the concerning intersections to document the existing sight distance in each direction. Since County TT was added to the list for ISD evaluation after the sight visit was conducted, Google Street View imagery was used to similarly document the existing sight distance in each direction. To simulate a stopped passenger vehicle turning onto WIS 19 from the minor road, photos were taken pointing in each direction at an approximate eye height of 3.5 ft. and 14.5 ft. back from the edge of the mainline turn lane.

Using the intersection sight distance requirements presented in the FDM Chapter 11 (Section 10, Table 5.2), each of the three intersections were evaluated based on the respective intersection control case and mainline design speed (mph). The findings are documented below in Table 11.

Findings

Figure 10 through Figure 15 are photos that show the approximate sight distance of a passenger vehicle looking in each direction from the north and south approaches. Each "Looking Left" photo corresponds to the ISD for right turning vehicles onto WIS 19, and vice versa. Refer to Exhibit 9L and 9N for aerial photos of these intersections.

Figure 10 and Figure 11 show the intersection of Town Hall Drive, which is located on a relative flat grade with no surrounding horizontal curves to impact the sight distance in either direction. For northbound left turning vehicles, one deciduous tree may impact the sight distance and cause drivers to stop further past the existing stop bar. Both northbound and southbound directions provide adequate sight distance for left and right turning vehicles.

Figure 10: Northbound Town Hall Road

Figure 11: Southbound Town Hall Road

Figure 12 and Figure 13 show the intersection of County VV. County VV is also located on a relatively flat grade, but lies on a horizontal curve. All sight distances meet the minimum FDM criteria; however, the sight distance for left turning vehicles marginally meets the

665 ft. criteria with the existing sight distance being approximately 750 ft. Looking right, one can see the impacted sight distance caused due to the horizontal geometry near the intersection. Figure 13 shows the flat grade, providing a safe sight distance for roadway users.

Figure 12: Northbound County VV

Figure 13: Southbound at County VV

Figure 14 and Figure 15 show the intersection of County TT. As mentioned, this intersection does not a history of crashes but was further investigated due to the adjacent cemetery, berm, and proximity to a vertical curve at the northbound intersection. County TT consists of two T-intersections with WIS 19, located approximately ¼ mile apart. Although the northbound intersection posed the most concern, both intersections were evaluated for ISD. It was found that the northbound left turning vehicles are not provided the proper sight distance. The existing sight distance of approximately 480 ft. does not meet the required minimum 665 ft. to make a safe left turn. The sight distance for the three other turning movements at County TT meet the minimum sight distance requirements per the FDM.

Figure 14: Northbound County TT

Figure 15: Southbound County TT

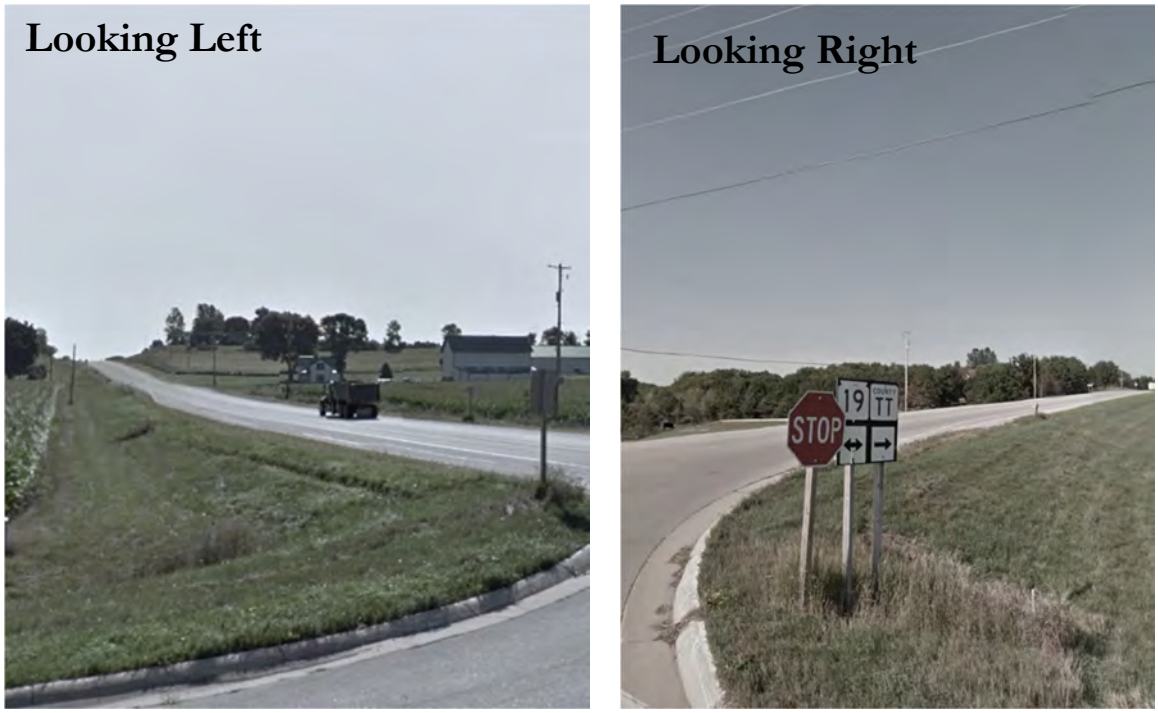


Table 11 shows a summary of the findings after ISD analysis for both north and south approaches at each intersection. Refer to Appendix B for a plan view of each of the three intersections and the respective intersection sight distance measurements.

Table 11: Intersection Sight Distance

Intersection with WIS 19	Design Speed (mph)	Minimum Left Turn ISD (ft.)	Approximate Existing Left Turn ISD (ft.) (if less than minimum)	Minimum Right Turn ISD (ft.)	Approximate Existing Right Turn ISD (ft.) (if less than minimum)
Town Hall Drive (NB)	60	665		575	
Town Hall Drive (SB)	60	665		575	
County VV (NB)	60	665	750	575	
County VV (SB)	60	665		575	
County TT (NB)	60	665	480	575	
County TT (SB)	60	665	Met	575	

Legend

Meets minimum ISD

Marginally meets minimum ISD

Does not meet minimum ISD

Of the four intersections evaluated, County TT South did not meet the minimum intersection sight distance requirements per FDM for left turning vehicles onto WIS 19. Due to the horizontal curve at the intersection of County VV, the northbound left turning intersection sight distance marginally met the minimum criteria. The remaining intersections proved to meet the FDM criteria for left and right turning vehicles from the side roads onto WIS 19.

2.12 Encroachments

The following section presents an overview of the encroachments along the WIS 19 study corridor. The majority of this information was provided by field visits, aerial imagery, and GIS data. Details include encroachment type, description, and station location.

The existing encroachments were documented by identifying any object located partially or entirely within the highway right of way along WIS 19.

2.12.1 Methodology

An encroachment scan was completed for the entire corridor to identify visually potential encroachments within the roadway's right of way. Field visits were performed to initially determine the location and types of encroachments along the study corridor. To determine whether objects were encroaching on the WIS 19 right of way, field indicators such as WisDOT right of way marker stakes and sidewalks were utilized.

Using 'Collector for ArcGIS' application, photos of the encroachments were taken with an iPad in the field. The application allowed the photos to be saved on a map of the corridor at the location of the specific encroachment. Four different types of encroachments were identified:

- Landscaping
- Detached Commercial Signage
- Building Encroachment
- Other

Descriptions were given to each encroachment to further understand the magnitude and detail of the encroachment. A majority of the addresses of building structure encroachments are documented in Table 12.

2.12.2 Findings

A total of 104 encroachments were found along the study corridor on WIS 19. A list of the encroachments and their station location is provided below in Table 12. Refer to Appendix B for a map and photographs of the encroachments. Photographs of the encroachments are included in Appendix B. Refer to Exhibit 9 for corridor stationing to locate these encroachments.

A majority of the encroachments were classified as building encroachments, which included any awnings or building structure crossing the roadway's right of way. These occurred especially often within the downtown areas of the municipal limits. Other encroachments were documented along the rural sections of the corridor such as landscaping or detached commercial signage encroachments.

Table 12: Existing Encroachments along WIS 19

Encroachment #	Station	Location on WIS 19	Type	Description
1	6+00	N	Landscaping	Trees
2	6+25	S	Landscaping	Trees
3	18+50	N	Landscaping	Retaining Wall
4	39+50	N	Landscaping	Driveway and Fence Posts
5	52+15	N	Landscaping	Trash Can Platform
6	58+80	N	Other	Survey Markers
7	178+50	N	Landscaping	Fencing
8	180+50	N	Landscaping	Retaining Wall
9	186+00	N	Landscaping	Signs and Stone Pillars
10	194+50	N	Landscaping	Farm Buildings and Fencing
11	203+75	N	Other	Farm Buildings and Fencing

Encroachment #	Station	Location on WIS 19	Type	Description
12	208+25	N	Landscaping	Garden with Wooden Edging
13	230+00	N	Other	DNR Box
14	234+40	S	Detached Commercial Signage	Waunakee Welcome Sign
15	339+50	N	Detached Commercial Signage	Schumacher Farms Sign
16	366+00	N	Detached Commercial Signage	Intercon Sign
17	553+20	N	Other	Solar Panel
18	690+00 to 693+00	S	Landscaping	Retaining Wall 3941
19	713+60	S	Other	Building Encroachment (Paddle Inn)
20	717+25	S	Detached Commercial Signage	Token Center
21	882+60	S	Other	Memorial Plaque
22	894+70	S	Detached Commercial Signage	Sun Prairie Sign
23	904+80 to 907+20	S	Landscaping	Retaining Wall (625 Windsor St.)
24	911+50	N	Landscaping	Retaining Wall (536 Windsor St.)
25	923+30	N	Other	Steps and Railing (306 Windsor St.)
26	941+70 to 943+00	N	Other	Retaining Wall (211 Bristol St.)
27	943+60	S	Landscaping	Fencing (188 Bristol St.)
28	944+00	N	Landscaping	Fencing (183 Bristol St.)
29	949+70	S	Building Encroachment	Apostolic Church (126 Bristol St.)
30	950+50	S	Building Encroachment	Frontier (117 Bristol St.)
31	953+40	N	Building Encroachment	Window and doorway awnings (100 Main St.)
32	953+40	S	Building Encroachment	Awning, Steps, Pillar (101 Main St.)
33	953+60	N	Building Encroachment	Awnings (100 Main St.)
34	953+80	N	Building Encroachment	Steps, Sign, Building Overhand

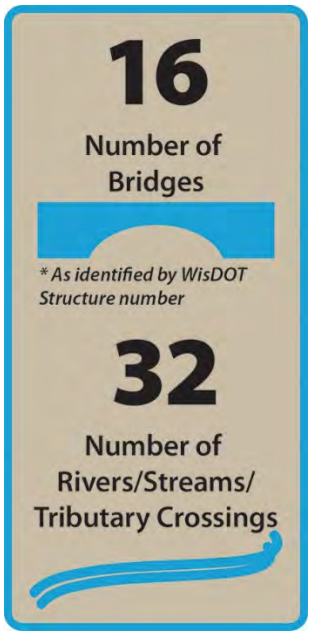
Encroachment #	Station	Location on WIS 19	Type	Description
35	953+95	S	Building Encroachment	Awnings (109 Main St.)
36	954+20	S	Detached Commercial Signage	Sign and Roof (115 Main St.)
37	954+15	N	Building Encroachment	Awning, Steps (116 Main St.)
38	954+80	N	Detached Commercial Signage	Detached Sign (120 Main St.)
39	955+05	S	Building Encroachment	Awnings, Sign
40	955+80	S	Building Encroachment	Awning
41	956+30	S	Building Encroachment	Awning (205 Main St.)
42	956+90	S	Building Encroachment	Awning, Window
43	957+40	S	Building Encroachment	Awning (219 Main St.)
44	957+90	S	Building Encroachment	Awning (233 Main St.)
45	958+30	S	Building Encroachment	Attached Sign (235/237 Main St.)
46	957+00 to 958+50	N	Landscaping	Short Retaining Wall and Plants (228 Main St.)
47	958+60	S	Building Encroachment	Awnings and Lights (239 Main St.)
48	958+70	S	Building Encroachment	Awning and Lights (238 Main St.)
49	959+10	S	Building Encroachment	Awning
50	959+30	N	Building Encroachment	Awning, Attached sign (Prairie Flowers)
51	960+00 to 961+20	N	Landscaping	Concrete Planters (Plaza)
52	960+80 to 962+40	N	Building Encroachment	Retaining Wall (Police Department)
53	962+20 to 963+70	S	Building Encroachment	Awnings (351 Main St.)
54	963+00	S	Building Encroachment	Attached Sign (295 Main St.)

Encroachment #	Station	Location on WIS 19	Type	Description
55	973+90	N	Detached Commercial Signage	Detached Sign (McDonald's)
56	986+80	N	Detached Commercial Signage	Detached Sign (East Bay Condo)
57	1191+00	S	Landscaping	Fencing
58	1192+40	N	Landscaping	Fencing
59	1346+00	N	Other	Retaining Wall
60	1360+50	S	Landscaping	Fencing (Kwik Trip)
61	1359+50	N	Landscaping	Brick wall, lights, sign posts
62	1368+10	S	Landscaping	Fencing, Pillars, Plants
63	1370+80	S	Detached Commercial Signage	Detached Sign (215 Main St.)
64	1371+50	S	Building Encroachment	Steps, Ramp, Railing, Flag Pole
65	1371+71	N	Landscaping	Retaining Wall
66	1372+60	N	Building Encroachment	Steps, Railing (132 Main St.)
67	1373+75	N	Building Encroachment	Steps
68	1374+25	N	Detached Commercial Signage	Detached Sign (110 Main St.)
69	1374+20	S	Building Encroachment	Attached Sign, Stairs, Balcony (111 Main St.)
70	1375+30	S	Building Encroachment	Awning, Attached Sign (104 Main St.)
71	1376+50	S	Building Encroachment	Attached Sign (120 Main St.)
72	1376+20	N	Landscaping	Retaining Wall
73	1377+00	S	Building Encroachment	Steps, Railing (124 Main St.)
74	1377+50	S	Other	Flag Pole (128 Main St.)
75	1377+20	N	Detached Commercial Signage	Detached Sign (131-133 Main St.)
76	1378+00	N	Building Encroachment	Steps, Railing, Attached Sign (Marshall Pub)
77	1378+50	N	Building Encroachment	Steps, Railing

Encroachment #	Station	Location on WIS 19	Type	Description
78	1379+00	S	Detached Commercial Signage	Detached Sign
79	1379+50	N	Building Encroachment	Steps, Railing (159-161 Main St.)
80	1380+40	N	Building Encroachment	Steps, Railing (203-205 Main St.)
81	1381+30	S	Landscaping	Retaining Wall (214 Main St.)
82	1382+20	N	Building Encroachment	Steps (221 Main St.)
83	1382+70	S	Detached Commercial Signage	Detached sign (238 Main St.)
84	1383+50	N	Other	Retaining Wall (233 Main St.t)
85	1396+60	S	Detached Commercial Signage	Medina Cemetery Sign
86	1394+80	S	Detached Commercial Signage	Marshall Welcome Sign
87	1525+60	N	Detached Commercial Signage	Detached Sign (The Dock)
88	1582+00 to 1586+50	N	Landscaping	Retaining Wall (Waterloo Tech Center)
89	1591+40	S	Building Encroachment	Steps (422 Madison St.)
90	1594+00	S	Building Encroachment	Steps and Railing (Waterloo United Methodist Church)
91	1595+80	N	Building Encroachment	Detached Sign, Light Post (BP Gas Station)
92	1596+80	S	Detached Commercial Signage	Building Overhang, Detached Sign
93	1597+40	S	Landscaping/Other	Steps, Ramp, Bike Rack, Landscaping (210 Madison Street)
94	1597+50	N	Other	US Post Office, Mailbox
95	1599+00	N	Building Encroachment	Awning, Attached Sign, Satellite Dish
96	1600+00	N	Building Encroachment	Step (151 Madison St.)
97	1600+50	N	Building Encroachment	Steps (141 Madison St.)
98	1600+75	N	Building Encroachment	Steps (139 Madison St.)

Encroachment #	Station	Location on WIS 19	Type	Description
99	1601+00	N	Building Encroachment	Columns, Awning (125 Madison St.)
100	1601+60	S	Building Encroachment	Awning (120 Madison St.)
101	1602+00	S	Building Encroachment	Step (112 Madison St.)
102	1602+60	N	Building Encroachment	Fire Escape (103 Monroe St.)
103	1603+50	S	Building Encroachment	Stairs, Tower (100 Madison St.)
104	1604+00	N	Landscaping	Retaining Wall, Landscaping (117 Madison St.)

2.13 Bridges / Culverts



The Federal Highway Administration (FHWA) through Moving Ahead for Progress in the 21st Century (MAP-21) provides guidance to municipalities, counties, and other state agencies for the inspection of bridges and ancillary structures. An inspection report includes roadway geometry, capacity, hydraulic classification, span, and other key structural elements. A structure is not limited to roadway or waterway bridges; also included in this section are culverts, sign structures, and monotube traffic signal poles.

2.13.1 Methodology

The WisDOT Highway Structures Information (HSI) website was used to gather inspection reports for every structure along the corridor that has been assigned a structure number by WisDOT Bureau of Structures.

As defined in the Wisconsin State Legislatures Chapter Trans 213, a bridge is determined to be deficient when a sufficiency rating of 80 or less has been identified by a certified bridge inspector. A bridge may be made eligible for rehabilitation with a rating of 80 or less. An engineering study must also be completed to determine if rehabilitation would be cost effective, extend the life of the structure and would correct deficiencies. When a structure reaches a sufficiency rating of less than 50, the bridge may be eligible for replacement. Bridges are also determined to be deficient when the structure becomes functionally obsolete such as the width of the structure is too narrow. Figure 16 is a photo of the Yahara River structure, a bridge that is currently under consideration for replacement.

Figure 16: Structure B-13-861 over the Yahara River

Cross culverts and box culverts that run perpendicular to roadways do not receive a sufficiency rating like bridges. Cross culverts are inspected on length, depth, and type of material. For this section, culverts with structure numbers were identified and the total length of structure was noted, if recorded in the inspection report.

Similarly, sign structures and monotube traffic signals are assigned structure numbers when the vertical pole is attached to a large underground concrete base. Sign structures are not breakaway, meaning they are not crash worthy and must be located outside of the lateral clearance limits. For this section, poles with structure numbers were identified and the vertical clearance under the roadway was noted. The Manual of Uniform Traffic Control Devices (MUTCD) indicates that the mounting height of a sign, light fixture, or sign bridge shall provide not less than 17 feet over the entire roadway width.

2.13.2 Findings

Of the 16 bridge structures located on WIS 19, eight are within the thresholds of rehabilitation or reconstruction, two of which are programmed for improvement within the next three years as seen in Table 13. The existing roadway width of the structures is adequate based on the two travel lanes needed on WIS 19 at this time.

One grade separated railroad bridge (operated by Wisconsin and Southern Railroad) currently crosses WIS 19 within the city of Waterloo (B-28-341), refer to Figure 17. Very little crossing information or structure condition is available to review. The roadway width

appears to accommodate two lanes of traffic, wide outside shoulders/bike lanes, and sidewalk on one side of the roadway. No clearance or other warning signs are posted within the area to restrict traffic movements for vehicles traveling on WIS 19. Additional coordination with the railroad will be necessary if any improvements under the railroad are anticipated.

Figure 17: Structure B-28-341 under Chicago, Milwaukee, Saint Paul, and Pacific (CMSTPP) Railroad

Table 13: Bridge Structures

Structure No.	General Location	Sufficiency Rating	Roadway Width (ft.)	Type of Structure	Year Built	Other Work
B-13-188	WIS 19 over Sixmile Creek	77.1	48	Concrete Box Culvert	1960	
B-13-861	WIS 19 over Yahara River	59.3	44	Concrete Haunched Slab	1958	1976 – Widen Structure
B-13-091	I-39/90/94 EB over WIS 19	77.1	56	Steel Deck Girder	1960	1984 – Overlay
B-13-092	I-39/90/94 WB over WIS 19	78.6	56	Steel Deck Girder	1960	1984 – Overlay
B-13-292	US 51 SB over WIS 19	88.0	40	Prestressed Concrete Deck Girder	1971	2004 – New Deck
B-13-291	US 51 NB over WIS 19	99.3	40	Prestressed Concrete Deck Girder	1971	1986 – Overlay
B-13-609	WIS 19 over Token Creek	92.7	44	Prestressed Concrete Inverted T Girder	2013	
B-13-608	WIS 19 over Token Creek	92.7	44	Prestressed Concrete Inverted T Girder	2013	
B-13-271	US 151 SB over WIS 19	90.0	40	Steel Deck Girder	1969	19870 – Overlay
B-13-270	US 151 NB over WIS 19	81.1	40	Steel Deck Girder	1969	1989 – Overlay (Programmed for Overlay in 2017)
B-13-345	WIS 19 over Br Maunesha River	89.9	40	Flat Slab Concrete	1981	
B-28-341	CMSTPP Railroad over WIS 19 (W Madison Street)	N/A	N/A	Steed Thru Girder/Fl Sys	1938	Railroad Bridge
B-28-072	WIS 19 (W Madison Street) over Maunesha River	96.9	36	Steel Deck Girder	1989	
B-28-466	WIS 19 (W Madison Street) over Maunesha River	74.7	40	Concrete T Girder	1938	1981 – Overlay (Replacement in 2018)
B-28-104	WIS 19 (W Madison Street) over Maunesha River	80.5	44	Prestressed Concrete Box Girder	2001	
B-28-077	WIS 19 (W Madison Street) over Maunesha River	78.9	45	Prestressed Concrete Deck Girder	1993	

Legend

Structure not eligible for replacement or rehabilitation

Sufficiency rating approaching threshold for rehabilitation eligibility

Sufficiency rating indicating eligibility for rehabilitation

Sufficiency rating indicating eligibility for replacement

While there are many cross culverts along WIS 19, twelve culvert structures have been assigned structure numbers with the project limits. No deficiencies or concerns exist with the culverts as shown in Table 14.

Table 14: Culvert Structures

Structure No.	Nearest Roadway Crossing	Municipality	Roadway Width (ft.)	Type of Structure	Year Built	Other Work
C-13-110	Barman Road	Springfield	48	Concrete Box Culvert	1960	
C-13-109	Dorn Drive	Waunakee	44	Concrete Box Culvert	1931	1992 – Lengthen Structure
C-13-2028	Raemisch Road	Waunakee	-	Precast Concrete Pipe Culvert	2012	
C-13-090	US 39/90/94 SB Off Ramp	DeForest	-	Concrete Box Culvert	1971	
C-13-091	US 39/90/94 NB Off Ramp	DeForest	-	Concrete Box Culvert	1970	
C-13-2052	Williamsburg Way	Burke	-	Precast Concrete Box Culvert	1990	
C-13-2051	Charlottes Way	Burke	-	Precast Concrete Box Culvert	1990	
C-13-097	Dewey Street/Linnerud Drive	Sun Prairie	-	Precast Concrete Box Culvert	1977	
C-13-3004	Twin Lake Road	Sun Prairie	-	Galv Steel Box Culvert	1980	
C-13-1306	Twin Lake Road	Sun Prairie	44	Galv Steel Box Culvert	1938	1992 – Lengthen Structure
C-13-2013	Wagon Lane	Sun Prairie	-	Precast Concrete Culvert	2014	
C-13-129	County TT	Marshall	44	Concrete Box Culvert	2002	

Of the eight sign structures located on WIS 19, four are reaching the acceptable vertical clearance of 17 feet while one does not meet MUTCD vertical clearance standards.

Table 15: Sign Structures

Structure No.	General Location	Vertical Clearance (ft.)	Type of Structure	Year Built	Notes:
S-13-434	WIS 113/County Q	18.9	Cantilever Mast Arm (24')	2014	Lane Designation Sign
S-13-433	WIS 113/County Q	19.3	Cantilever Mast Arm (24')	2014	Lane Designation Sign
S-13-254	I-39/90/94 Interchange	20.8	4 Chord Cantilever Truss (27.3'"	2008	Lane Designation Sign
S-13-253	I-39/90/94 Interchange	22.0	4 Chord Full Span (54')	2008	Lane Designation Sign Bridge
S-13-975-0004	US 51 Interchange	17.7	Cantilever Mast Arm (42')	2013	Monotube
S-13-975-0001	US 51 Interchange	16.8	Cantilever Mast Arm (42')	2013	Monotube
S-13-975-0002	US 51 Interchange	17.3	Cantilever Mast Arm (42')	2013	Monotube
S-13-975-0003	US 51 Interchange	17.4	Cantilever Mast Arm (42')	2013	Monotube

Legend

Structure meets MUTCD vertical clearance standards

Structure near the threshold of MUTCD vertical clearance standards

Structure does not meet MUTCD vertical clearance standards

3 Operational Characteristics

The WIS 19 study investigated operational characteristics including traffic volume, traffic capacity and level-of-service, and safety conditions.

3.1 Volume

Three basic types of traffic volume data is applicable to the WIS 19 study:

- Tube counts and Automatic Traffic Recorder (ATR) counts
- Manual intersection turning movement counts
- Traffic forecasts

Refer to the following Exhibits while reviewing this report section:

- Exhibit 1 for a Study Location map
- Exhibit 2 for Average Annual Daily Traffic volume map
- Exhibit 6A-E for Existing Volumes Turning Movements

3.1.1 Tube and ATR Counts

Tube counts and Automatic Traffic Recorder (ATR) counts on highway sections record daily traffic volumes crossing a location.

Methodology

Traffic volume counts were collected by WisDOT between 2004 and 2013 for the corridor study to understand historical traffic patterns along the WIS 19 corridor. Most counts, especially those along WIS 19, were collected in 2012. One ATR station exists west of I-39/90/94. Refer to Appendix D for traffic count data.

Findings

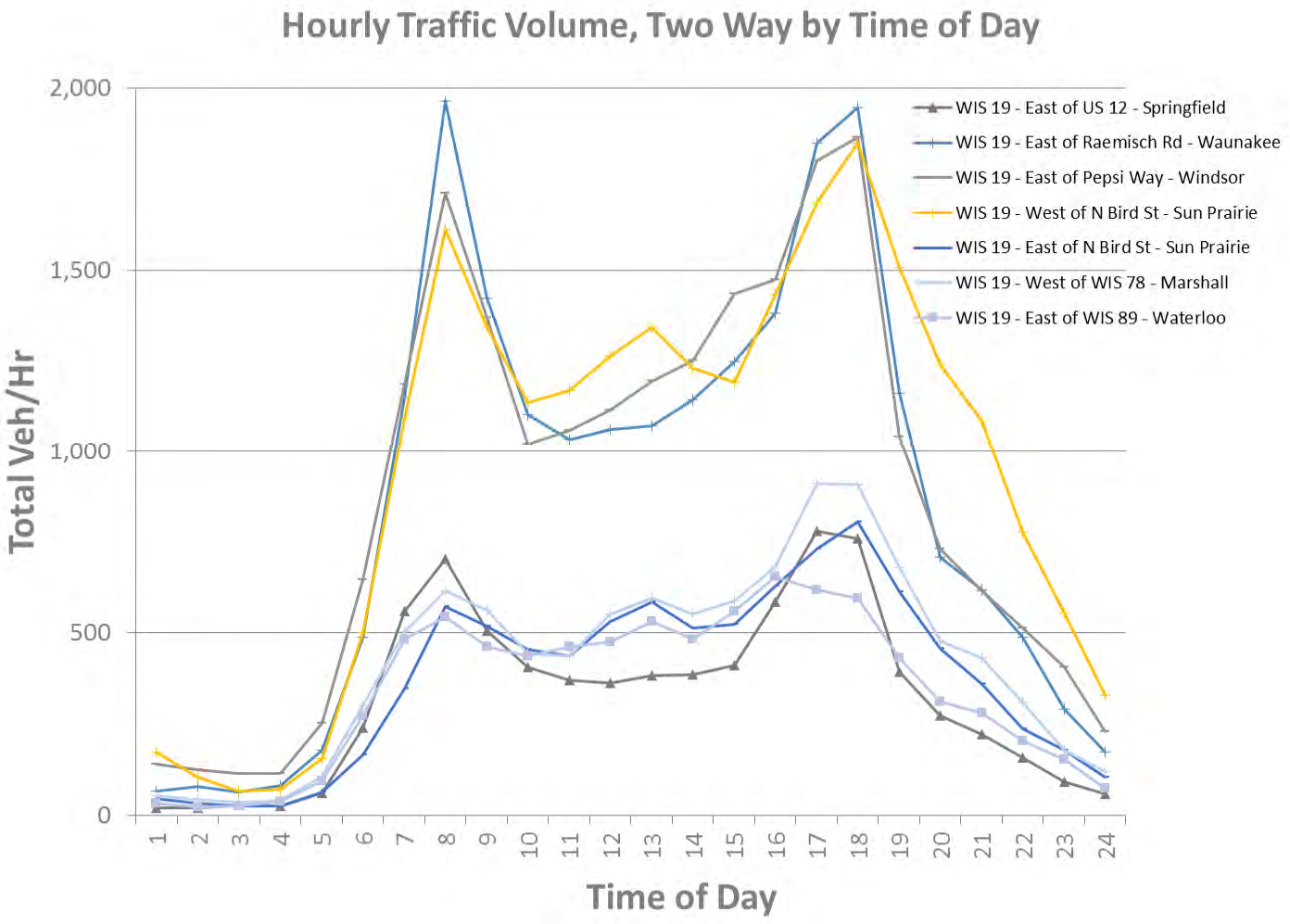
The study team completed a comprehensive research of traffic flow conditions within the corridor. Fully describing volume conditions require individual discussion of findings related to:

- Hourly
- Geographical
- Seasonal
- Directional
- Historical

Hourly

Traffic volumes in the study corridor generally indicate commuter peaking. Figure 18 shows a time-of-day chart illustrating hourly traffic volumes at several locations along WIS 19 from US 12 to Waterloo. These counts were obtained via the WisDOT traffic database for Year 2012, the most recent traffic data collection date. It is important to note from this chart the morning and evening peak trends that exist throughout the corridor. A few locations, particularly within the urban areas of Waunakee and Sun Prairie have small "lunch time" peaks during the middle of the day. Details associated with this chart, such as specific count location for each data point, can be found in Appendix C.

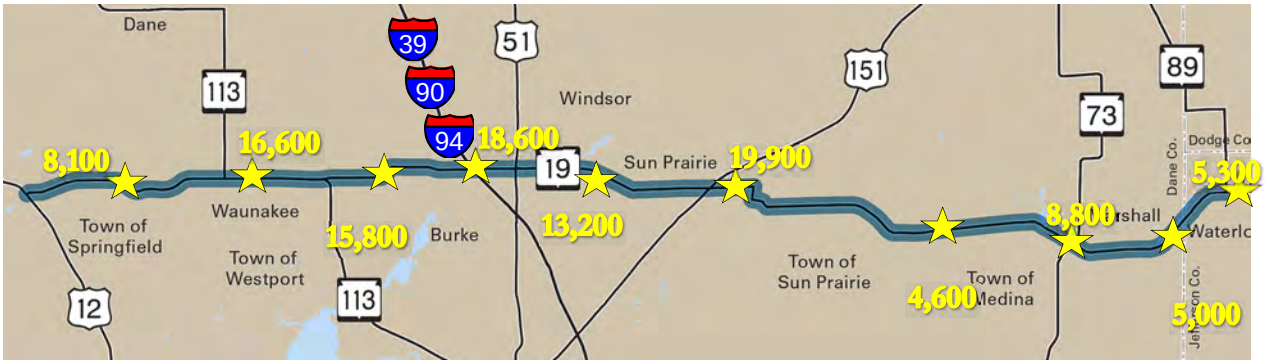
Figure 18: Time of Day Chart



Geographical

Traffic volumes along the corridor range from 4,600 vehicles per day (vpd) west of Marshall to 19,900 vpd near Davis Street in Sun Prairie. Figure 19 illustrate the daily traffic volumes throughout the study corridor.

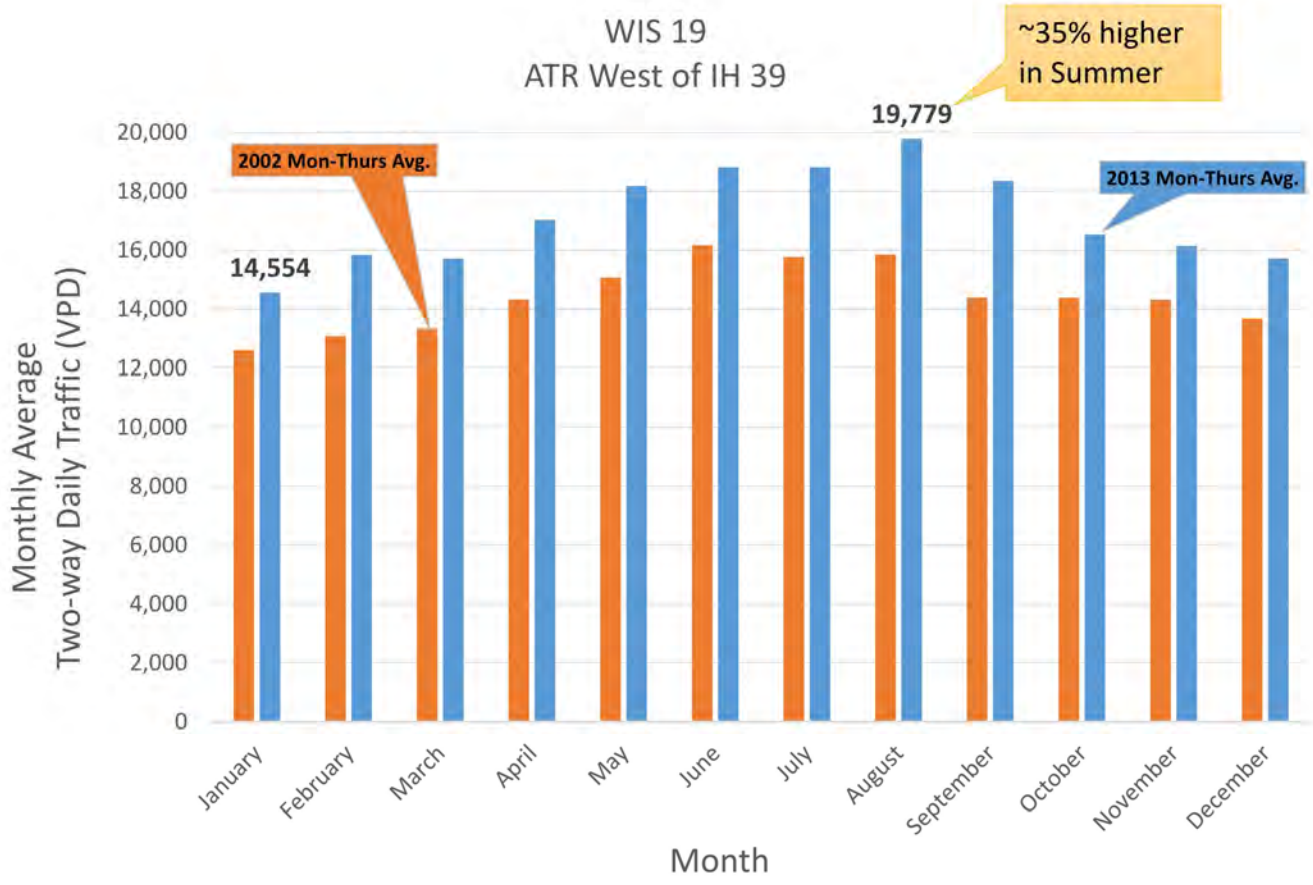
Figure 19: AADT Map by location



Seasonal

WIS 19 is not necessarily recognized as a recreational corridor, but given its proximity to I-39/90/94, a highly recreational corridor, WIS 19 does exhibit moderate seasonal fluctuations. Figure 20 illustrates the monthly two-way volume throughout the year at the ATR station west of I-39/90/94. Note the daily traffic in August (19,779 vpd) is 35 percent higher than the daily traffic in January (14,554 vpd).

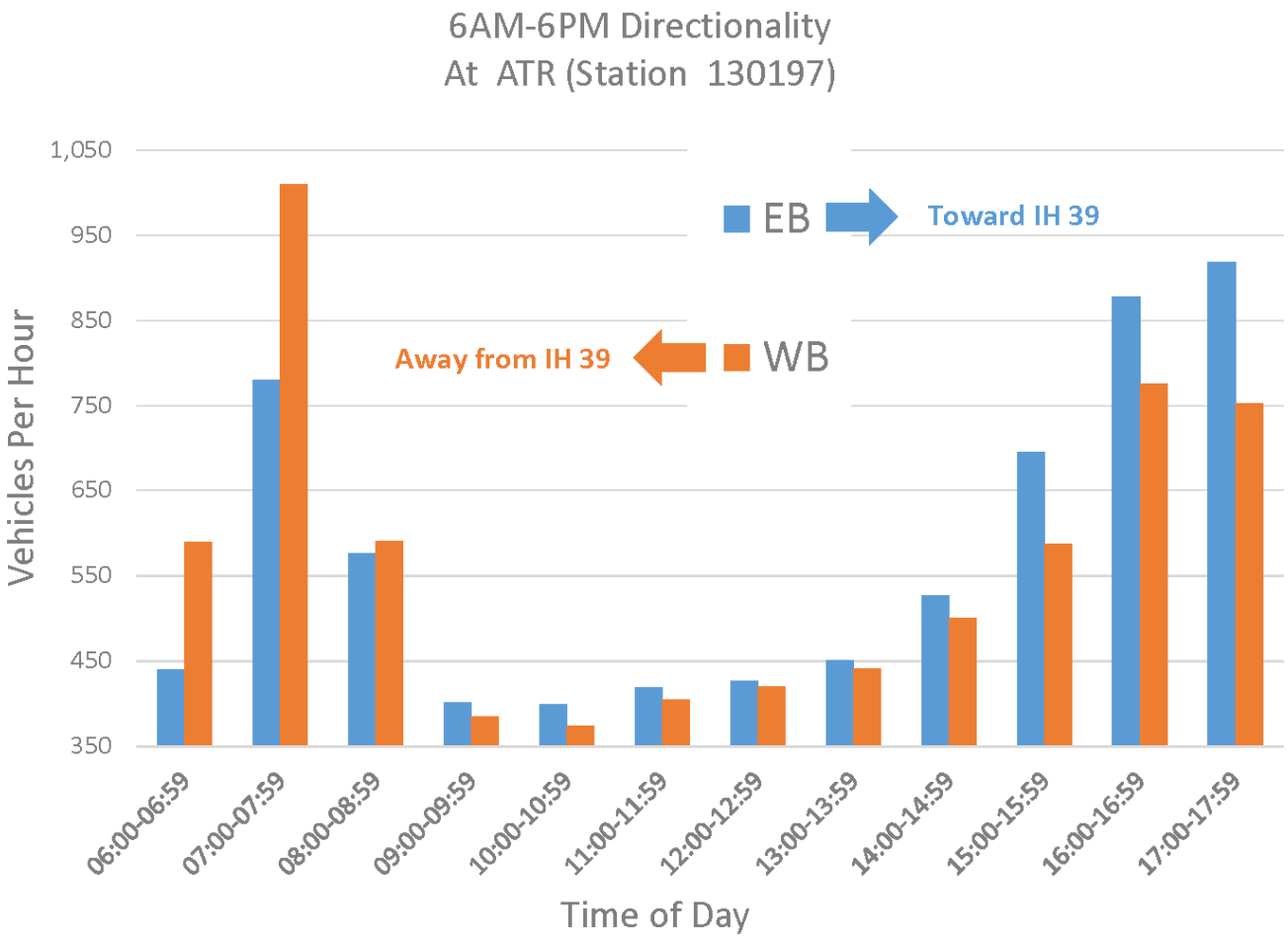
Figure 20: Volume Seasonal Variance



Directional

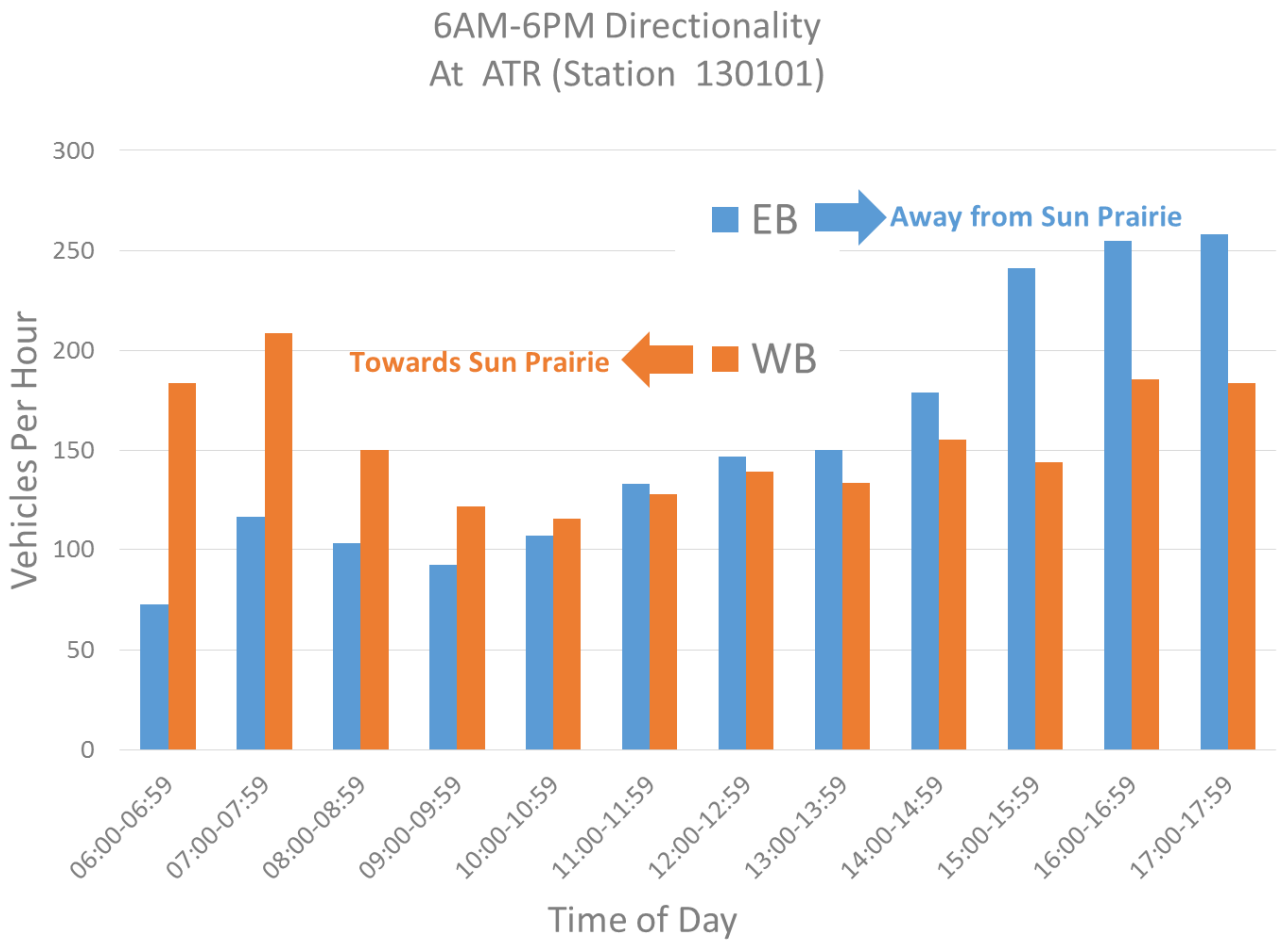
WIS 19 is a commuting highway and therefore has distinct directionality during the peak hours of the day. Directionality changes throughout the corridor, where the highway near Waunakee has different origins, destinations, and route choices, than those areas near Waterloo. Figure 21 illustrates the directionality of WIS 19 just west of I-39/90/94. Note the commuter flow in the morning is more heavily destined westbound and the commuter flow is slightly more heavily destined eastbound in the afternoon.

Figure 21: Volume Directionality West of I- 39/90/94



Another example of directionality is for a count location between the city of Sun Prairie and the village of Marshall on WIS 19. Figure 22 illustrates the morning commuter flow being more heavily destined westbound and the afternoon commuter flow is slightly more heavily destined eastbound.

Figure 22: Volume Directionality between Sun Prairie and Marshall



The final example of directionality is for a count location between I-39/90/94 and US 51 on WIS 19. Figure 23 illustrates two important points. One point is in the morning the traffic flow is very heavily destined westbound and in the afternoon the traffic flow for eastbound traffic drastically increases over the morning eastbound traffic levels. The other point is that the demand of I-39/90/94 overpowers commuter traffic patterns as westbound traffic has a greater magnitude of traffic during each hour of the 6AM to 6PM time frame.

Figure 23: Volume Directionality between I-39/90/94 and US 51

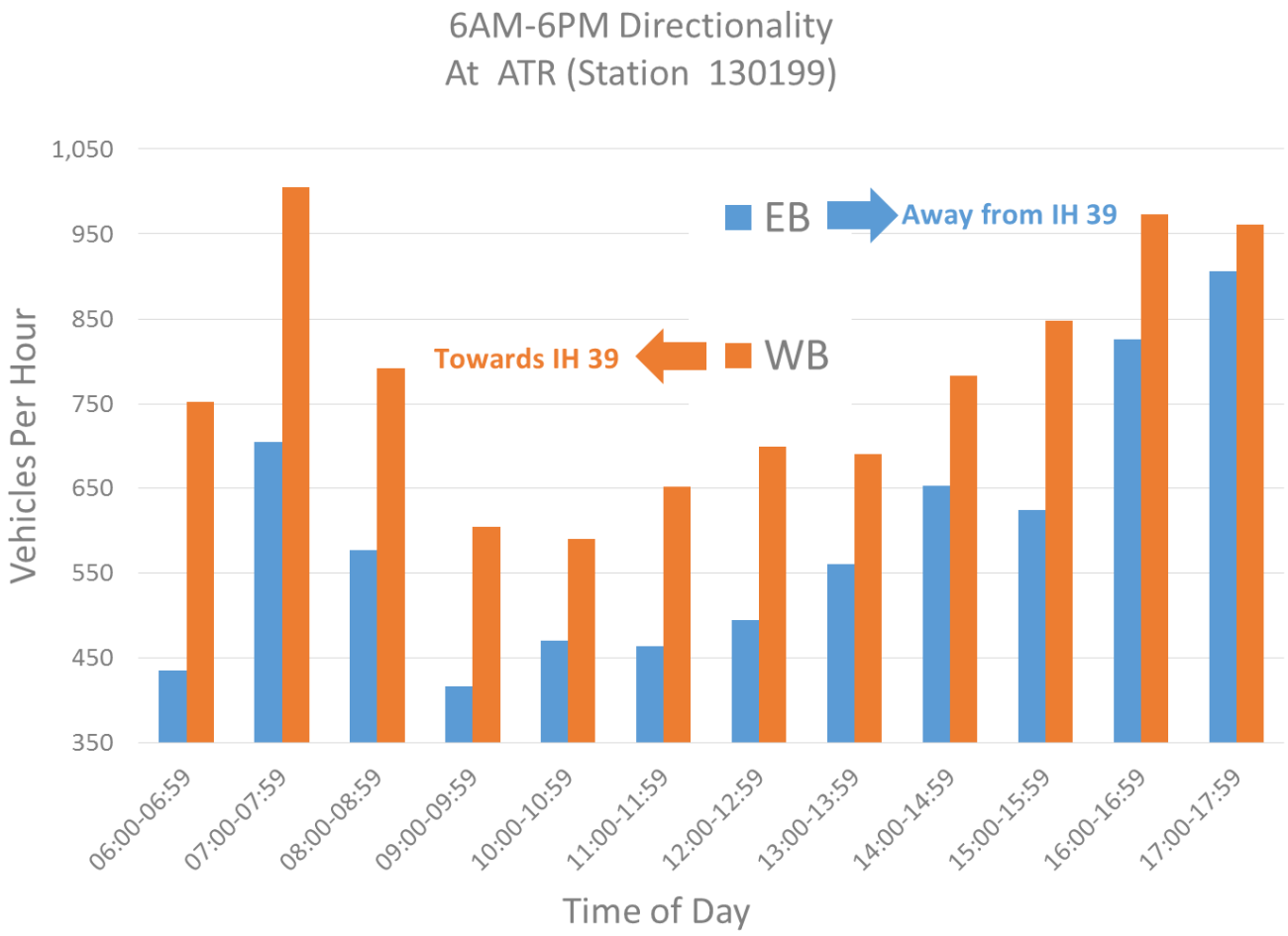
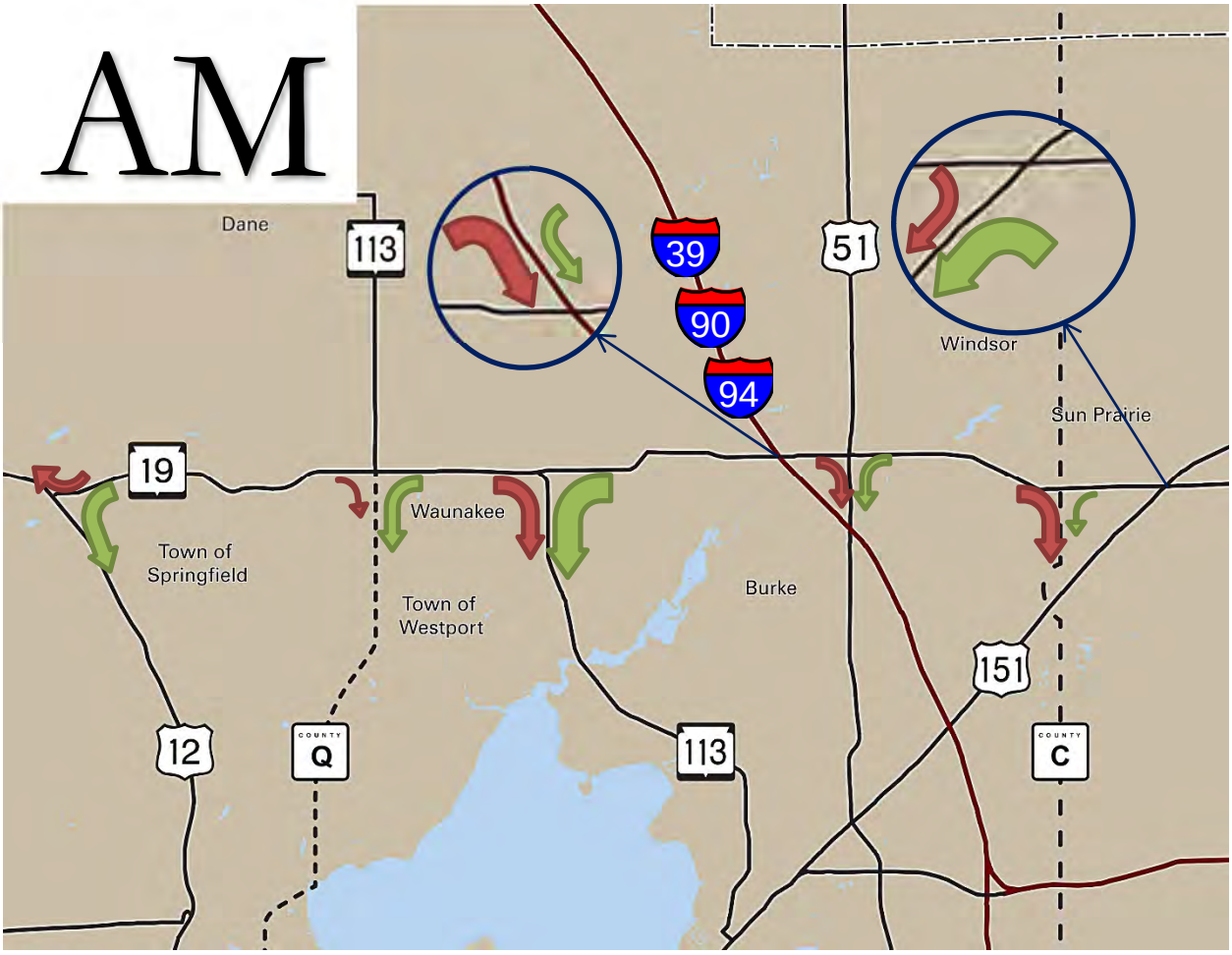


Figure 24 and Figure 25 present graphical overviews of morning and afternoon peak commuting hour traffic flows. Larger flows are indicated with larger arrows and therefore provide an approximation of the origins and destinations in the corridor.

During the morning (AM) peak, motorists are most heavily destined for the greater Madison area via US 12, WIS 113, I-39/90/94, and US 151. The section of WIS 19 between

Waunakee and I-39/90/94 is non-directionally weighted and contains heavy commuter flow in both east and west directions.

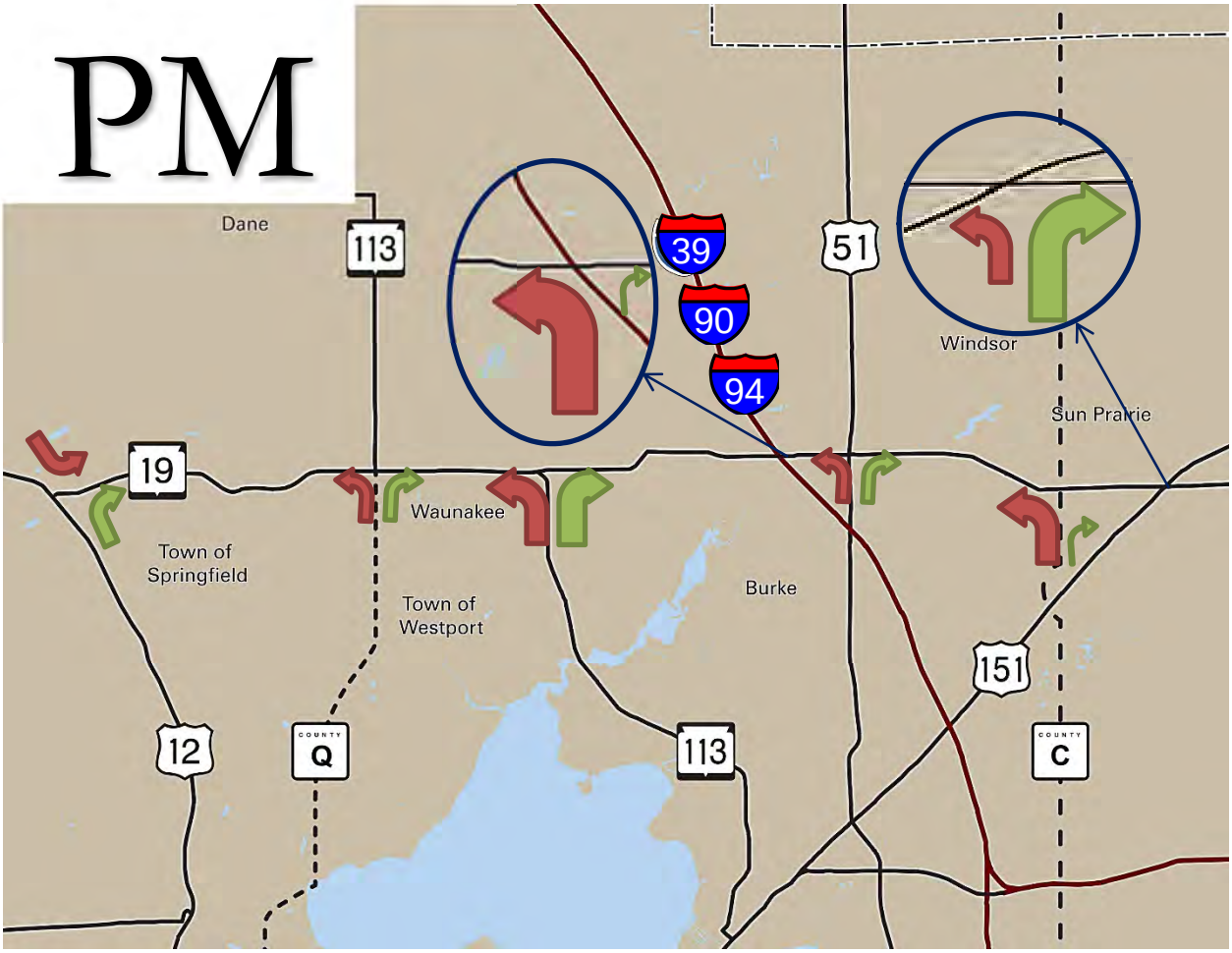
Figure 24: Morning Peak Hour Flow Illustration



Green arrows denote westbound movements and red arrows denote eastbound movements. The size of the arrows approximate the relative size of each movement.

During the afternoon (PM) peak, motorists are most heavily returning from the Madison area via WIS 113, I-39/90/94, and US 151. Similar to the morning commute, the section of WIS 19 between Waunakee and I-39/90/94 is non-directionally weighted and contains heavy commuter flow in both east and west directions.

Figure 25: Afternoon Peak Hour Flow Illustration

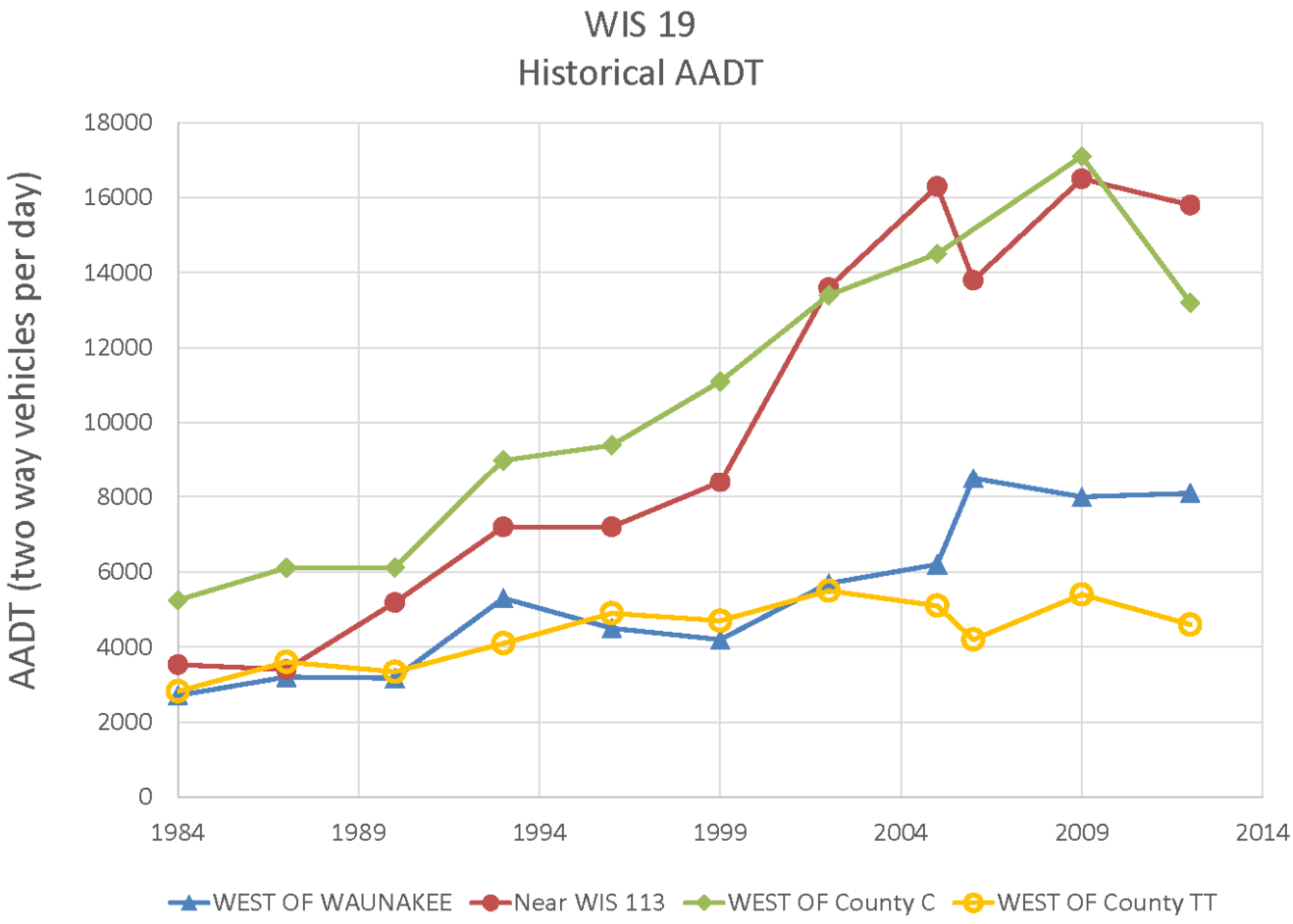


Green arrows denote westbound movements and red arrows denote eastbound movements. The size of the arrows approximate the relative size of each movement.

Historical

Traffic volumes have grown in a predictable manner and modest manner over the last 30 years as illustrated on Figure 26.

Figure 26: Historic AADT Growth



3.1.2 Turning Movement Counts

A turning movement count quantifies vehicle and pedestrian movements at a given location, particularly at intersections. Unlike tube counts and ATR counts, turning movement counts are typically performed during the AM peak and PM peak periods instead of all day. The AM count was from 6 AM to 9 AM while the PM count was from 3 PM to 6 PM to correspond to the peak periods identified in Figure 18. This is done to capture the traffic patterns during the heaviest usage of the roadway.

Methodology

The turning movement counts were performed between the dates of April 16, 2014 and May 8, 2014 between 6 AM to 9 AM (AM peak period) and 3 PM to 6 PM (PM peak

period). Locations of the counts are based on the functional classification of the roadway along the length of the WIS 19 study area. A total of 45 intersections were identified. The identified intersections, listed from west to east, and the associated count dates are listed in Table 16. Exhibit 6 illustrates the location of each intersection.

Table 16: Turning Movement Count Information

#	Intersection	Date Counted		# (cont.)	Intersection (cont.)	Date Counted (cont.)
1	US 12	April 17, 2014		24	Broadway Drive	May 1, 2014
2	Lodi Springfield Road	April 17, 2014		25	Communications Drive/ Lois Drive	May 1, 2014
3	Holiday Drive	April 16, 2014		26	US 151 Southbound Ramps	May 1, 2014
4	County Q/Century Avenue	April 16, 2014		27	US 151 Northbound Ramps	May 1, 2014
5	West Street	April 16, 2014		28	Davison Drive	May 1, 2014
6	South Street	April 16, 2014		29	Bird Street	May 1, 2014
7	Madison Street	April 16, 2014		30	Bristol Street	May 6, 2014
8	Division Street	April 16, 2014		31	Main Street	May 6, 2014
9	Schumacher Road/ Raemisch Road	April 17, 2014		32	King Street/ Columbus Street	May 6, 2014
10	Hogan Road	April 17, 2014		33	Market Street/ Church Street	May 6, 2014
11	WIS 113/County I	April 17, 2014		34	Linnerud Drive/Dewey Street	May 6, 2014
12	River Road	April 22, 2014		35	County N/Grove Street	May 6t, 2014
13	I-39/90/94 Southbound Ramps	April 22, 2014		36	Town Hall Drive	April 30, 2014
14	I-39/90/94 Northbound Ramps	April 22, 2014		37	County VV	May 1, 2014
15	County CV/Lake Road	April 22, 2014		38	County TT (South leg)	May 1, 2014
16	Pepsi Way	April 23, 2014		39	County TT (North leg)	May 1, 2014
17	North Town Road	April 23, 2014		40	County T/Madison Street	May 6, 2014
18	US 51 Southbound Ramps	April 23, 2014		41	WIS 73/Deerfield Road	May 6, 2014
19	US 51 Northbound Ramps	April 23, 2014		42	WIS 73/Hubbell Street	May 6, 2014
20	Portage Road	April 23, 2014		43	Knowlton Street	May 8, 2014
21	Westmount Drive	April 23, 2014		44	Jackson Street	May 8, 2014
22	County C/Grand Avenue	April 30, 2014		45	WIS 89	May 8, 2014
23	N Thompson Road	April 30, 2014				

Source: Study team counted with Miovision video. Video files exist for all counts.

Video equipment was setup at 45 intersections along WIS 19 to record traffic data during the AM and PM weekday peak periods. These recorded video files were later post-processed by either Miovision technical staff who utilize proprietary software or by project staff who utilize enhanced speed video playback. The output from the post-processing is available in either Microsoft Excel or PDF format and is provided in Appendix C.

Findings

Peak Hour Volumes

Turning movement counts for the AM peak and PM peak for each intersection was performed. Table 17 presents a ranked list of the heaviest volume intersections in the study corridor. Urban intersections tend to have more traffic than their rural counterparts due to the higher density of business and residential areas, especially with side street through movements. Volumes of adjacent intersections were typically of the same magnitude with the exception of major routes with heavy through traffic. Turning movement count worksheets can be found in Appendix C, and Table 18 shows existing peak hour truck percentages along the corridor.

Table 17: Intersections Ranked by Entering Volume

Intersection	AM Peak	Total Entering Volume	PM Peak	Total Entering Volume
US 12	7:00	2557	4:30	2715
County CV/Lake Road	7:00	2480	4:30	2687
County C/Grand Avenue	7:00	2286	4:30	2872
IH 39 Southbound Ramps	7:00	2502	4:30	2444
US 151 Southbound Ramps	7:15	2451	4:30	2380
US 151 Northbound Ramps	7:15	2130	4:30	2605
Bird Street	7:15	2278	4:30	2311
River Road	7:00	2264	4:30	2280
Davison Drive	7:15	2130	4:30	2356
IH 39 Northbound On Ramp	7:00	2153	4:30	2324

Note: Blue shading represents magnitude of the value in the table cell

Table 18: Truck Percentage along WIS 19

Intersection	AM Peak	Truck % WIS 19 only	PM Peak	Truck % WIS 19 only
US 12	7:00	7.5%	4:30	4.1%
Lodi Springfield Road	7:00	7.0%	4:30	3.4%
Holiday Drive	7:00	8.1%	4:30	3.4%
County Q/Centruy Avenue	7:00	7.1%	4:30	3.3%
West Street	7:00	6.3%	4:30	3.8%
South Street	7:00	6.9%	4:30	3.5%
Madison Street	7:00	5.8%	4:30	3.6%
Division Street	7:00	5.4%	4:30	3.2%
Schumacher Road/Raemisch Road	7:00	4.7%	4:30	3.6%
Hogan Road	7:00	5.3%	4:30	3.8%
WIS 113	7:00	3.0%	4:30	2.9%
County I	7:00	5.3%	4:30	4.9%
River Road	7:00	5.2%	4:30	3.2%
IH 39 Southbound Ramps	7:00	5.7%	4:30	3.8%
IH 39 Northbound On Ramp	7:00	5.0%	4:30	3.4%
County CV/Lake Road	7:00	5.0%	4:30	3.1%
IH 39 Northbound Off Ramp	7:00	5.6%	4:30	3.1%
Pepsi Way	7:00	5.4%	4:30	4.0%
North Town Road	7:00	3.9%	4:30	3.3%
US 51 Southbound	7:00	4.6%	4:30	2.8%
US 51 Northbound	7:00	4.3%	4:30	1.5%
Portage Road	7:00	4.5%	4:30	1.5%

Note: Blue shading represents magnitude of the value in the table cell

Table 18: Truck Percentage along WIS 19 (continued)

Intersection	AM Peak	Truck % WIS 19 only	PM Peak	Truck % WIS 19 only
Westmount Drive	7:00	4.9%	4:30	1.5%
County C/Grand Avenue	7:00	3.8%	4:30	0.9%
N Thompson Road	7:15	4.0%	4:30	1.5%
Broadway Drive	7:15	3.6%	4:30	0.9%
Communications Drive/Lois Drive	7:15	3.0%	4:30	0.9%
US 151 Southbound Ramps	7:15	2.1%	4:30	0.5%
US 151 Northbound Ramps	7:15	2.4%	4:30	1.0%
Davison Drive	7:15	1.9%	4:30	0.6%
Bird Street	7:15	3.2%	4:30	0.3%
Bristol Street	7:15	4.7%	4:30	1.3%
Main Street	7:15	4.4%	4:30	1.9%
King Street/Columbus Street	7:15	4.6%	4:30	2.1%
Market Street/Church Street	7:15	4.4%	4:30	2.1%
Linnerud Drive/Dewey Street	7:15	4.3%	4:30	1.4%
County N/Grove Street	7:15	4.5%	4:30	1.3%
Town Hall Drive	7:00	4.3%	4:30	1.4%
County VV	7:00	2.9%	4:30	0.4%
County TT (South leg)	7:00	3.2%	4:30	0.2%
County TT (North leg)	7:00	3.6%	4:30	0.2%
County T/Madison Street	7:00	2.6%	4:30	1.8%
WIS 73/Deerfield Road	7:00	2.8%	4:30	3.1%
WIS 73/Hubbell Street	7:00	4.7%	4:30	3.8%
Knowlton Street	7:00	5.1%	4:30	0.8%
Jackson Street	7:00	4.6%	4:30	1.6%
WIS 89	7:00	5.6%	4:30	1.6%

Note: Blue shading represents magnitude of the value in the table cell

Length of peaks

The length of peak used for analysis is a standard hour-long peak made up of four consecutive 15-minute periods. An analysis of how long the peaking periods last was conducted on adjacent 15-minute periods. If an adjacent period was within 10 percent of the start or end volume of the peak hour, it was considered as part of the extended peak period.

Sixteen intersections with the highest volumes were analyzed in both the AM and PM time periods. For the AM period, over 60 percent of the intersections did not contain substantial volumes outside of the peak period and the remaining intersections had only one 15-minute peak extension period. The PM period contained many more extended peak periods as shown in Table 19.

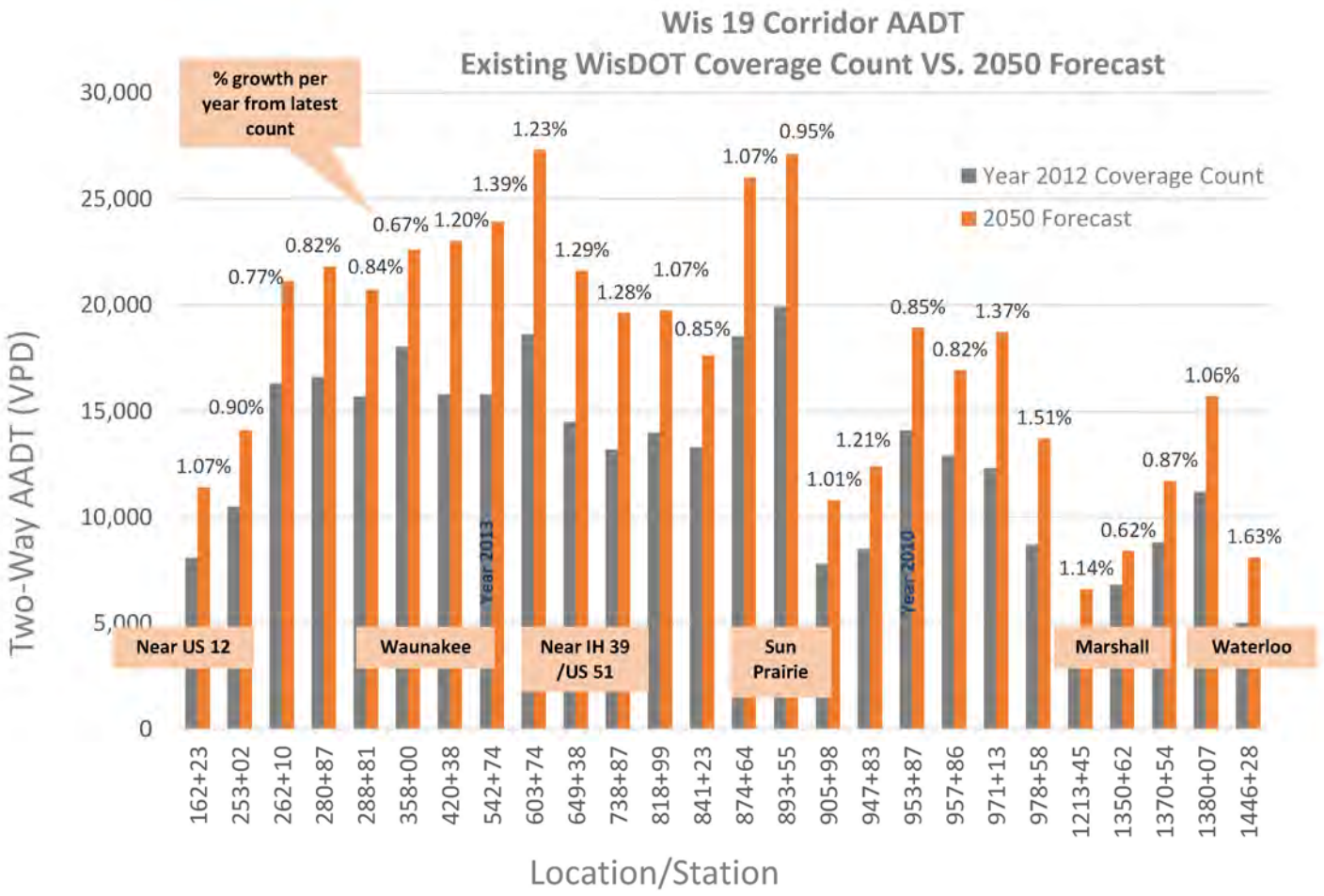
Table 19: Length of Peak "Hour" at Intersections

Intersection	Time of full PM Peak	Length of Peak (hrs.)
Bird Street	3:15-6:00	2.75
County Q/Century Avenue	3:45-5:45	2
US 12	3:45-5:30	1.75
I-39/90/94 Southbound Ramps	4:15-5:45	1.5
I-39/90/94 Northbound Off Ramp	4:15-5:45	1.5
Davison Drive	4:30-6:00	1.5
County C/Grand Avenue	4:15-5:30	1.25
County CV/Lake Road	4:15-5:30	1.25
US 151 Southbound Ramps	4:30-5:45	1.25
I-39/90/94 Northbound On Ramp	4:15-5:30	1.25
Schumacher Road/Raemisch Road	4:30-5:45	1.25
Communications Drive/Lois Drive	4:30-5:45	1.25
US 151 Northbound Ramps	4:30-5:30	1
River Road	4:30-5:30	1
Hogan Road	4:30-5:30	1
Broadway Drive	4:30-5:30	1

3.1.3 Traffic Forecasts

The daily travel demand volume forecasts were developed for the study corridor by WisDOT for the existing network roadway system plus any already programmed/funded geometric and operational modifications. Daily traffic growth is anticipated to range from about 0.5 to 1.5 percent per year as detailed in Figure 27. These values are consistent with the historical growth observed and illustrated on Figure 26.

Figure 27: Forecast Growth Rate by Location



3.2 Capacity and Operational Quality

Operational analysis uses a combination of tools and methodologies to assist in the determination and description of the quality of traffic operations, or "Level of Service" (LOS) of a roadway or transportation facility. The study team conducted operational analysis along WIS 19 to determine travel and operational deficiencies within the study limits.

Refer to the following Exhibits while reviewing this report section:

- Exhibit 1 for a Study Location map
- Exhibit 6 for a series of Turning Movement Count maps
- Exhibit 8 for a Traffic Operations Overview map

3.2.1 Methodology

This section provides a methodology overview for operational analysis within the WIS 19 Study. Operational analysis ranges from high-level estimates to finely tuned and validated

traffic-modeling intended for final signal timings and geometric design requirements. This document describes the methodology for analyzing and describing "operational quality" within the study by concentrating on two components of analysis: Intersection Analysis and Highway Section Analysis.

Intersection Analysis

Motorists along WIS 19 will travel through many intersections with other major roadways within the entire length of the study limits. The purpose of the intersection analysis is to determine the overall quality of operations at each of these major intersections and to identify the need for improvements.

The goal of the intersection analysis is to determine meaningful measures of operational quality at these intersections and determine how each intersection contributes to the overall quality of traffic operations on WIS 19 within the sections (refer to Figure 28 for the study section definitions).

There are over 120 cross streets that intersect WIS 19 within the study limits. Only a few of these intersections in the corridor have existing real or perceived traffic operational problems. These problems are often due to the interaction between the side street traffic and high WIS 19 traffic volumes during the morning and afternoon peak commuting hours. Operational quality is quantified and described in terms of seconds of Control Delay as determined using Highway Capacity Manual (HCM) Methodologies. Refer to the attached map of the study corridor illustrating the intersections included in the operational analysis.

Table 20 summarizes all intersection operational methodologies.

Table 20: Intersection Analysis Methodologies

Facility Type	Analysis Methodology[1,4]
Default methodology	Synchro software to produce HCM 2010 traffic operations output
Roundabouts	SIDRA software to produce SIDRA traffic operations output
Interchange termini[2]	Synchro software to produce HCM 2000 traffic operations output (HCM 2000 methodologies allow analysis of single-controller situations)
Coordinated systems[3]	Synchro software to produce HCM 2010 traffic operations output compared to SimTraffic software output

1 Each intersection analyzed during weekday morning and afternoon peak hour for base year and study horizon year 2050 for no-build conditions. Improved/Build conditions will be analyzed for year 2050 traffic conditions only. Level of service quantified by seconds of delay and both alpha (A–F) and numeric (0–6+) values. V/C and 95th percentile queues reported as necessary to reflect critical conditions.

2 "Single controller" type situations include the interchange ramps of US 51 and US 151.

3 Coordinated systems include: County CV to I-39/90/94 NB off ramp terminal (WisDOT system).

4 Locations with non-standard geometry in which HCM 2000 or 2010 methodologies are not applicable will use SimTraffic micro-simulation modeling to estimate operational conditions. As of the writing of this report, this note only applies to the Bristol Street and County N intersection with WIS 19 in Sun Prairie.

All methodologies described above use HCM 2010 Level of Service (LOS) criteria to determine ultimate reported LOS. Table 21 and Table 22 describe the relationship between delay and LOS used for this study.

Table 21: HCM 2010 Signalized LOS Criteria

Control Delay (s/veh)	LOS by Volume-to-Capacity Ratio*	
	< 1.0	>1.0
<10	A	F
>10-20	B	F
>20-35	C	F
>35-55	D	F
>55-80	E	F
>80	F	F

Note: *For approach-based and intersection-wide assessments, LOS is defined solely by control delay.

Source: Highway Capacity Manual 2010

Table 22: HCM 2010 Stop Controlled Intersection LOS Criteria

Control Delay (s/veh)	LOS by Volume-to-Capacity Ratio	
	≤ 1.0	>1.0
<10	A	F
>10-15	B	F
>15-25	C	F
>25-35	D	F
>35-50	E	F
>50	F	F

Note: The LOS criteria apply to each lane on a given approach and to each approach on the minor street. LOS is not calculated for major-street approaches or for the intersection as a whole.

Source: Highway Capacity Manual 2010

HCM outputs from the traffic operations software, Synchro, were developed for intersection analysis of the WIS 19 corridor. These outputs include LOS, delay, and queue length. It should be noted that HCM delay (and, subsequently, LOS) determination is based on empirical formulas using traffic characteristic inputs. This methodology provides a good estimate of LOS and delay for under-capacity (below LOS E/F) situations; however, for movements or approaches that operate above-capacity (LOS F), HCM methodologies can report delays and queues that overestimate traffic conditions at a particular location. While the LOS F determination is still applicable for analysis purposes, the magnitude of delays and queues for LOS F movements may not be realistic.

All methodologies described above use Highway Capacity Manual (HCM) 2010 Level of Service (LOS) criteria to determine ultimate reported LOS. Table 21 and describe the relationship between delay and LOS used for this study.

Highway Section Analysis

Motorists traveling WIS 19 in the study limits will encounter differing operational conditions depending on location within the corridor. The purpose of the section analysis is to determine the overall operational quality along these sections of WIS 19.

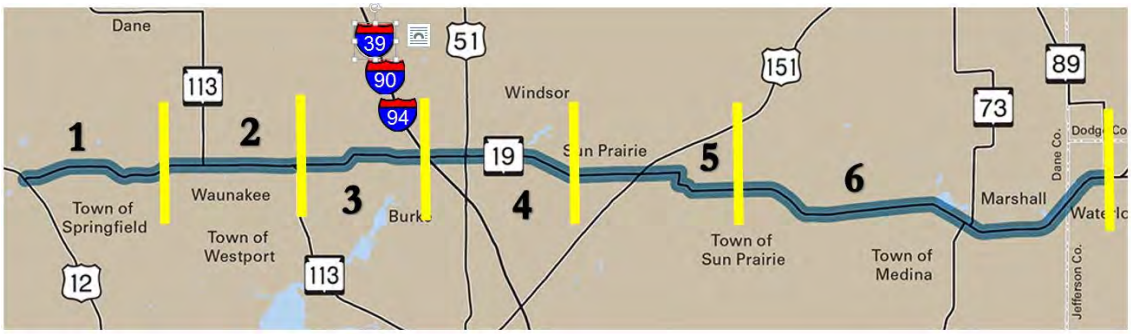
The study team "sectioned" the 30.5-mile WIS 19 corridor into six distinct limits for operational analysis at the section level. Each of these sections was chosen because of its unique geometric or traffic volume conditions compared to adjacent sections.

Refer to Figure 28 and Exhibit 8, Traffic Operations Overview map for an illustration of these operational sections.

1. US 12 to Sixmile Creek - 4.3 miles
2. Sixmile Creek to County I (village of Waunakee) – 3.1 miles
3. County I to I-39/90/94 – 3.2 miles

4. I-39/90/94 to County C – 4.5 miles
5. County C to County VV (city of Sun Prairie) – 5.4 miles
6. County VV to WIS 89 (includes village of Marshall and city of Waterloo) – 9.9 miles

Figure 28: Section Definitions



In the predominantly rural sections of WIS 19 that have one lane in each direction, the applicable descriptors for operational quality are Average Travel Speed (ATS) and Percent Time Spent Following (PTSF). Both of these are determined within the HCM 2010 2-lane Highways methodologies.

Average Travel Speed is how fast on average a motorist is able to travel from one end of the section to the other. PTSF is a good indicator of frustration of the motorist. If a motorist on a long stretch of highway has few opportunities to pass a slow moving vehicle because of either topographic constraints like sight restricted hills and curves or because there is too much opposing traffic to pass, this highway section would be described as having a very high PTSF.

In the predominantly urban areas of Waunakee and Sun Prairie, a more complex condition exists to fully describe the "operational quality" of the section. The motorist can sense their own quality of operation by experiencing compounding sources of delay. These sources primarily include:

- Signalized/roundabout intersection delay
- Unsignalized intersection friction
- Reduced speed limit to urban requirements
- Parking maneuver frictions
- Pedestrian and bike conflict
- Driveway and private access friction

HCM 2010 Urban Street Segment methodologies apply sophisticated analysis that incorporates many of these delay conditions, but within a planning level analysis this

methodology is overly complex, time consuming, and results in excess and unnecessary precision.

A more simplistic but useful analysis is appropriate, and we recommend the urbanized areas of the corridor use Average Travel Speed (ATS), computed by summing travel time at ideal-condition posted speeds with added travel time encountered through signalized and roundabout intersection delay during the weekday morning and afternoon peak hours. This metric "simplifies" the final output and is appropriate, explainable, and justifiable to a public and agency audience.

To further clarify, the analyst applies peak hour signalized and roundabout intersection delay at the controlled intersections and adds the time it takes to drive the section at ideal conditions at posted speed limits to calculate a theoretical average travel speed across each operational section. This travel speed (or travel time) can be compared directly to the average travel speed (or travel time) that would exist without controlled intersection delay. This metric allows the public and stakeholders to understand the ramifications of intersection control for motorists traveling through the entire section. It needs to be understood this methodology assumes no contribution to delay or operational-quality degradation from parking, driveways, minor stop-controlled side street intersections, or pedestrians.

Table 23 summarizes all sectional operational methodologies.

Table 23: Section Analysis Methodologies

Section #	Termini	Predominant Section Type	Analysis Methodology[1]
1	US 12 to Sixmile Creek	Rural	HCM Two Lane Highways[2]
2	Sixmile Creek to County I (village of Waunakee)	Urban	Average travel speed in section
3	County I to I-39/90/94	Rural	HCM Two Lane Highways[2]
4	I-39/90/94 to County C I-39/90/94 to US 51 US 51 to County C	 Urban Rural	 Average travel speed in section HCM Two Lane Highways[2]
5	County C to County VV (city of Sun Prairie)	Urban	Average travel speed in section
6	County VV to WIS 89 (includes village of Marshall and city of Waterloo)	Rural	HCM Two Lane Highways[2]

1. Each operational section analyzed during weekday morning and afternoon peak hour for base year and study horizon year 2050 for no-build conditions. Improved/Build conditions will be analyzed for year 2050 traffic conditions only.

2. Length weighted averages of variable inputs such as shoulder width and volumes. Level of service quantified by percent time spent following, average travel speed, and alpha (A–F) values.

All methodologies described use HCM 2010 LOS criteria to determine ultimate reported LOS. Table 24 describes the relationship between Average Travel Speed, Percent Time Spent Following, Highway Class, and LOS, used for this study.

Table 24: HCM 2010 Sectional LOS Criteria

LOS	Class I Highways		Class II Highways	Class III Highways
	ATS (mi/h)	PTSF (%)	PTSF (%)	PTSF (%)
A	>55	≤35	≤40	>91.7
B	>50-55	>35-50	>40-55	>83.3-91.7
C	>45-50	>50-65	>55-70	>75.0-83.3
D	>40-45	>65-80	>70-85	>66.7-75.0
E	≤40	>80	>85	≤66.7

Source: Highway Capacity Manual 2010

3.2.2 Findings

Figure 29: Intersection Operations At-A-Glance

Operational concerns exist throughout the corridor. Measures of operational quality will further degrade in the future without improvements.

Primary concern is related to operational failures at intersections along the corridor. At signalized intersections these operational failures result in long traffic queues, increased travel times, and route-change encouragement onto less appropriate roads. Figure 29 gives the reader a snapshot of the intersection conditions.

Of secondary concern is the operational challenges of roadway sections as a whole. While much of the operational concern is due to delay and congestion at intersections, another noteworthy concern is the inability to pass vehicles when desired. This condition leads to lower average travel speeds than are desired. Table 25 through Table 31 detail the intersection operations for year 2014 and Table 32 through Table 38 detail intersection operations for year 2050.

Intersection

Sixteen intersections are currently exhibiting traffic delays that qualify as LOS E or F (unacceptable operations as defined by the FDM) and another 15 will reach LOS E or F before year 2050 without improvements. By year 2050 there will be 31 intersections exhibiting LOS E or F with long delay and queueing concerns without improvements.

Highway Capacity methodologies are limited when analyzing traffic operations for near or over-capacity intersections. HCM 2010 procedures are accurate for analyzing traffic operations for isolated intersections experiencing moderate to low congestion (Source: Highway Capacity Manual 2010, Chapter 10). HCM 2010 procedures are based on calculations and only take a static snapshot of an intersection at a specific time and location. When intersections reach capacity (volume/capacity > 1), HCM 2010 will provide delay values that do not account for vehicle rerouting, peak shifting, and alternate routing that is common on commuter roadways. For WIS 19 it is logical to assume any calculated delay exceeding about 180 seconds (3 min) would not accurately reflect field conditions as vehicles would begin to find more efficient routes before they accept long delays in this area.

Table 25: 2014 Operational Analysis (1 of 7 tables) Refer to Table 31 for legend

Intersection	Traffic Control	Time Period	MOE	Overall	Eastbound LT	Eastbound TH	Eastbound RT	Westbound LT	Westbound TH	Westbound RT	Northbound LT	Northbound TH	Northbound RT	Southbound LT	Southbound TH	Southbound RT
US 12		AM	Volume	F	2	13	3	338	6	188	2	374	44	236	1348	3
			Delay (s)			30	29		1839	38	56	18	16	40	15	8
			LOS			C	C		F	D	E	B	B	D	B	A
		PM	Volume	D	4	3	0	81	8	323	1	1345	225	220	501	4
			Delay (s)			35	0		37	155	67	26	17	46	8	7
			LOS			D	A		D	F	E	C	B	D	A	A
Lodi - Springfield Road	STOP	AM	Volume	A	3	278	18	0	437	3	11	2	0	16	9	48
			Delay (s)			0			0			21			16	
			LOS			A			A			C			C	
		PM	Volume	A	33	398	7	1	365	16	13	8	1	9	1	12
			Delay (s)			8			8			21			16	
			LOS			A			A			C			C	
Holiday Drive		AM	Volume	Under Construction												
			Delay (s)													
			LOS													
		PM	Volume													
			Delay (s)													
			LOS													
WIS 113 North / County Q		AM	Volume	Under Construction												
			Delay (s)													
			LOS													
		PM	Volume													
			Delay (s)													
			LOS													
West Street	STOP	AM	Volume	A	6	621	30	57	666	4	1	3	32	5	6	13
			Delay (s)			0			1			18			34	
			LOS			A			A			C			D	
		PM	Volume	A	15	612	9	11	818	16	2	3	20	10	4	8
			Delay (s)			9			9			19			40	
			LOS			A			A			C			E	
South Street	STOP	AM	Volume	A		609	68	3	776		1		70			
			Delay (s)			0			0			16				
			LOS			A			A			C				
		PM	Volume	A		615	27	60	858		7		76			
			Delay (s)			0			9			18				
			LOS			A			A			C				
Madison Street		AM	Volume	B	38	563	31	40	551	24	60	40	60	46	113	173
			Delay (s)		9	13		9	13		34	27		28		29
			LOS		A	B		A	B		C	C		C		C
		PM	Volume	B	66	543	30	30	749	45	88	46	31	33	33	71
			Delay (s)		9	9		6	14		35	30		30		30
			LOS		A	A		A	B		D	C		C		C
Division Street		AM	Volume	F	1	634	29	232	626	40	28	30	211	107	84	4
			Delay (s)			10	6	30	11		86		47	1346	35	
			LOS			B	A	C	B		F		D	F	C	
		PM	Volume	D	5	545	59	147	767	79	78	57	200	38	25	8
			Delay (s)			26	18	20	25		401		27	83	23	
			LOS			C	B	C	C		F		C	F	C	

Table 26: 2014 Operational Analysis (2 of 7 tables) Refer to Table 31 for legend

Intersection	Traffic Control	Time Period	MOE	Overall	Eastbound LT	Eastbound TH	Eastbound RT	Westbound LT	Westbound TH	Westbound RT	Northbound LT	Northbound TH	Northbound RT	Southbound LT	Southbound TH	Southbound RT
Raemisch Road / Schumacher Road		AM	Volume		22	755	116	134	794	19	52	12	41	97	72	42
			Delay (s)	C	17	14	12	11	26	9	31		30		38	
			LOS		B	B	B	B	C	A	C		C		D	
		PM	Volume		39	736	98	70	828	112	166	65	151	23	16	10
			Delay (s)	C	21	16	13	12	36	13	39		31		31	
			LOS		C	B	B	B	D	B	D		C		C	
Hogan Road	STOP	AM	Volume		0	843	43	111	930	0	17	0	95	1	0	0
			Delay (s)	A		0		11	0		24		13		28	
			LOS			A		B	A		C		B		D	
		PM	Volume		0	899	51	90	971	0	39	0	102	9	0	0
			Delay (s)	A		0		11	0		25		13		28	
			LOS			A		B	A		D		B		D	
WIS 113 South (West Intersection)^^	STOP	AM	Volume			639										
			Delay (s)	C		19										
			LOS			C										
		PM	Volume			745										
			Delay (s)	D		29										
			LOS			D										
WIS 113 South (East Intersection)^^	STOP	AM	Volume												412	
			Delay (s)	A											9	
			LOS												A	
		PM	Volume												166	
			Delay (s)	A											8	
			LOS												A	
County I	STOP	AM	Volume		21	610	1	373	751	4	0	15	156	2	38	84
			Delay (s)	D	10	0		12	0	0	0		18	1268		18
			LOS		A	A		B	A	A	A		C	F		C
		PM	Volume		50	695	0	148	731	2	0	53	354	5	18	39
			Delay (s)	F	10	0		10	0	0	214		42	3891		15
			LOS		A	A		B	A	A	F		E	F		C
River Road	STOP	AM	Volume		35	742	5	136	1007	23	3	7	99	42	18	147
			Delay (s)	F	11	0	0	11	0	0	810		18	1886		40
			LOS		B	A	A	B	A	A	F		C	F		E
		PM	Volume		112	891	6	88	852	72	0	17	169	21	9	43
			Delay (s)	F	11	0	0	11	0	0	282		32	3880		18
			LOS		B	A	A	B	A	A	F		D	F		C
I-39/90/94 SB Exit Ramp	STOP	AM	Volume			875			1132					165		75
			Delay (s)	B		0			0					141		16
			LOS			A			A					F		C
		PM	Volume			1102			957					141		41
			Delay (s)	A		0			0					73		13
			LOS			A			A					F		B
I-39/90/94 SB Entrance Ramp^^	No Control	AM	Volume			652	391	255	1153							
			Delay (s)	A		1	2	17	1							
			LOS			A	A	C	A							
		PM	Volume			983	263	203	974							
			Delay (s)	A		1	1	17	1							
			LOS			A	A	C	A							

Table 27: 2014 Operational Analysis (3 of 7 tables) Refer to Table 31 for legend

Intersection	Traffic Control	Time Period	MOE	Overall	Eastbound LT	Eastbound TH	Eastbound RT	Westbound LT	Westbound TH	Westbound RT	Northbound LT	Northbound TH	Northbound RT	Southbound LT	Southbound TH	Southbound RT
I-39/90/94 NB Entrance Ramp^^	No Control	AM	Volume	A	34	622			1402	119						
			Delay (s)		21	1			2	1						
			LOS		C	A			A	A						
		PM	Volume	A	64	931			1172	184						
			Delay (s)		14	1			2	1						
			LOS		B	A			A	A						
County CV		AM	Volume	C	69	543			1080	189				172		427
			Delay (s)		27	6			5	3				21		168
			LOS		C	A			A	A				C		F
		PM	Volume	B	154	762			1098	319				108		246
			Delay (s)		32	6			8	5				21		39
			LOS		C	A			A	A				C		D
I-39/90/94 NB Exit Ramp		AM	Volume	A		715			890		379		89			
			Delay (s)			1			6		25		23			
			LOS			A			A		C		C			
		PM	Volume	A		870			821		596		74			
			Delay (s)			1			8		24		18			
			LOS			A			A		C		B			
Pepsi Way	STOP	AM	Volume	A	9	608	140	85	782	18	106	3	85	7	4	2
			Delay (s)		10	0	0	10	0	0	32		12		25	12
			LOS		B	A	A	A	A	A	D		B		C	B
		PM	Volume	A	10	797	83	74	643	6	161	5	145	13	6	17
			Delay (s)		9	0	0	10	0	0	45		14		24	11
			LOS		A	A	A	B	A	A	E		B		C	B
North Towne Road	STOP	AM	Volume	A	41	659			899	33				23		8
			Delay (s)		11	0			0	0				24		14
			LOS		B	A			A	A				C		B
		PM	Volume	A	17	938			662	12				54		33
			Delay (s)		9	0			0	0				17		11
			LOS		A	A			A	A				C		B
US 51 SB Ramps ^		AM	Volume	B		532	150	167	795					118		131
			Delay (s)			17	16	3	1					28		25
			LOS			B	B	A	A					C		C
		PM	Volume	A		859	133	77	632					102		42
			Delay (s)			10	11	8	3					31		27
			LOS			B	B	A	A					C		C
US 51 NB Ramps^		AM	Volume	A	47	603			861	128	101		55			
			Delay (s)		6	3			11	11	32		27			
			LOS		A	A			B	B	C		C			
		PM	Volume	B	121	840			555	141	154		174			
			Delay (s)		1	1			16	15	27		24			
			LOS		A	A			B	B	C		C			
Portage Road		AM	Volume	B	24	482	132	47	760	20	104	25	31	21	83	140
			Delay (s)		27	12	9	17	19	8	37		30	31		36
			LOS		C	B	A	B	B	A	D		C	C		D
		PM	Volume	B	83	856	88	37	535	32	107	82	64	24	38	43
			Delay (s)		17	20	8	29	11	7	38		30	36		35
			LOS		B	C	A	C	B	A	D		C	D		D

Table 28: 2014 Operational Analysis (4 of 7 tables) Refer to Table 31 for legend

Intersection	Traffic Control	Time Period	MOE	Overall	Eastbound LT	Eastbound TH	Eastbound RT	Westbound LT	Westbound TH	Westbound RT	Northbound LT	Northbound TH	Northbound RT	Southbound LT	Southbound TH	Southbound RT
Westmount Drive	STOP	AM	Volume	A	7	523	17	94	711	5	43	3	291	8	3	25
			Delay (s)		9		0	9		0	120		22		59	
			LOS		A		A	A		A	F		C		F	
		PM	Volume	A	7	878	39	197	583	5	13	2	143	3	1	14
			Delay (s)		9		0	12		0	160		24		55	
			LOS		A		A	B		A	F		C		F	
County C / Grand Avenue		AM	Volume	D	70	465	266	72	505	58	174	163	29	57	299	128
			Delay (s)		19	32	25	19	35	19	121	27	26	44	54	32
			LOS		B	C	C	B	D	B	F	C	C	D	D	C
		PM	Volume	E	100	643	281	97	441	36	287	373	142	65	311	96
			Delay (s)		24	57	31	33	35	23	173	35	35	73	69	44
			LOS		C	E	C	C	D	C	F	D	D	E	E	D
Thompson Road		AM	Volume	C	33	478	79	74	528	47	85	71	36	87	219	78
			Delay (s)		16	27	18	15	25	16	28	36	36	26	49	35
			LOS		B	C	B	B	C	B	C	D	D	C	D	D
		PM	Volume	C	120	640	70	31	494	55	83	147	39	70	98	57
			Delay (s)		15	28	14	16	25	16	29	41	37	28	38	37
			LOS		B	C	B	B	C	B	C	D	D	C	D	D
Broadway Drive		AM	Volume	B	28	662	16	24	650	132	10	14	135	351	9	37
			Delay (s)			12			12		12	13		27	12	
			LOS			B			B		B	B		C	B	
		PM	Volume	A	31	778	20	48	603	271	30	20	65	179	10	36
			Delay (s)			7			8		15	15		19	14	
			LOS			A			A		B	B		B	B	
Communications Drive / Lois Drive	STOP	AM	Volume	A	62	1063	5	34	751	81	0	0	5	23	0	55
			Delay (s)			10		11	0		0	13		130	12	
			LOS			B		B	A		A	B		F	B	
		PM	Volume	A	15	998	3	24	861	48	0	0	45	52	0	68
			Delay (s)			10		11	0		0	13		149	13	
			LOS			B		B			A	B		F	B	
US 151 SB Ramps^		AM	Volume	C		780	310	440	650					50	5	220
			Delay (s)			25	19	24	18					28		28
			LOS			C	B	C	B					C		C
		PM	Volume	C		925	170	275	715					75	1	215
			Delay (s)			27	18	25	11					24		24
			LOS			C	B	C	B					C		C
US 151 NB Ramps^		AM	Volume	C	185	650			985	55	105	1	155			
			Delay (s)		14	14			32	17	29		27			
			LOS		B	B			C	B	C		C			
		PM	Volume	C	235	760			710	70	280	1	545			
			Delay (s)		11	16			23	17	29		31			
			LOS		B	B			C	B	C		C			
Davison Drive		AM	Volume	F	90	575	140	120	740	95	175	25	70	55	25	25
			Delay (s)		18	23	21	17	25	20	1144		23	197		22
			LOS		B	C	C	B	C	B	F		C	F		C
		PM	Volume	F	100	855	305	120	500	40	170	40	105	65	25	30
			Delay (s)		16	26	25	19	22	19	1069		23	235		22
			LOS		B	C	C	B	C	B	F		C	F		C

Table 29: 2014 Operational Analysis (5 of 7 tables) Refer to Table 31 for legend

Intersection	Traffic Control	Time Period	MOE	Overall	Eastbound LT	Eastbound TH	Eastbound RT	Westbound LT	Westbound TH	Westbound RT	Northbound LT	Northbound TH	Northbound RT	Southbound LT	Southbound TH	Southbound RT
Bird Street		AM	Volume	C	190	265	255	35	430	50	140	135	40	80	280	385
			Delay (s)		14	16	0	12	23	0	24	26	0	24	35	0
			LOS		B	B	A	B	C	A	C	C	A	C	C	A
		PM	Volume	B	430	460	190	30	270	75	140	200	40	55	170	255
			Delay (s)		12	14	0	12	17	0	27	32	0	29	36	0
			LOS		B	B	A	B	B	A	C	C	A	C	D	A
County N (Bristol Street)^^	STOP	AM	Volume	A	65		280				250	195			245	150
			Delay (s)		16		13				2				15	8
			LOS		C		B				A				B	A
		PM	Volume	B	120		355				275	220			180	85
			Delay (s)		21		19				3				15	9
			LOS		C		C				A				C	A
Main Street		AM	Volume	F	45	340	60	10	445	290	30	60	5	280	120	35
			Delay (s)		13		10	13		12	23		11	1468		11
			LOS		B		A	B		B	C		B	F		B
		PM	Volume	F	50	505	60	10	400	240	45	130	20	300	80	60
			Delay (s)		14		9	12		11	29		11	1176		12
			LOS		B		A	B		B	C		B	F		B
King Street / Columbus Street	STOP	AM	Volume	A	60	555	10	15	650	25	5	5	5	5	5	90
			Delay (s)		10			9			46			22		
			LOS		A			A			E			C		
		PM	Volume	A	60	750	20	5	575	35	5	1	15	10	1	55
			Delay (s)		9			10			29			24		
			LOS		A			A			D			C		
Market Street / Church Street		AM	Volume	B	15	530	15	10	630	95	45	50	15	145	65	15
			Delay (s)		10			14			19			22		
			LOS		A			B			B			C		
		PM	Volume	B	25	670	50	10	525	60	60	40	30	130	40	30
			Delay (s)		11			9			20			21		
			LOS		B			A			B			C		
Linnerud Drive / Dewey Street	STOP	AM	Volume	C	40	630	10	40	695	45	5	5	35	35	5	65
			Delay (s)		10		0	9		0	37			210		
			LOS		A		A	A		A	E			F		
		PM	Volume	A	65	755	15	50	595	30	5	5	90	10	5	45
			Delay (s)		9		0	10		0	30			50		
			LOS		A		A	A		A	D			E		
County N (Grove Street)		AM	Volume	B	70	175	440	190	415	30	300	30	25	10	45	60
			Delay (s)		13	16	18	13	17		29	19		25	30	
			LOS		B	B	B	B	B		C	B		C	C	
		PM	Volume	B	95	485	260	70	345	5	240	40	85	20	20	90
			Delay (s)		11	16	11	12	16		20	21		23	28	
			LOS		B	B	B	B	B		B	C		C	C	
Town Hall Drive	STOP	AM	Volume	A	15	130	15	20	275	5	20	5	5	10	65	80
			Delay (s)		8		0	8		0	17			15		
			LOS		A		A	A		A	C			B		
		PM	Volume	A	70	320	25	5	220	15	20	35	25	5	5	45
			Delay (s)		8		0	8		0	17			12		
			LOS		A		A	A		A	C			B		

Table 30: 2014 Operational Analysis (6 of 7 tables) Refer to Table 31 for legend

Intersection	Traffic Control	Time Period	MOE	Overall	Eastbound LT	Eastbound TH	Eastbound RT	Westbound LT	Westbound TH	Westbound RT	Northbound LT	Northbound TH	Northbound RT	Southbound LT	Southbound TH	Southbound RT
County VV	STOP	AM	Volume	A	15	130	5	5	265	40	10	5	5	15	15	20
			Delay (s)			8	0		8	0		13			13	
			LOS			A	A		A	A		B			B	
		PM	Volume	A	20	310	10	1	185	10	5	10	5	20	10	25
			Delay (s)			8	0		8	0		13			13	
			LOS			A	A		A	A		B			B	
County TT South	STOP	AM	Volume	A		145	5	45	275		5		10			
			Delay (s)			0	0	8	0			11				
			LOS			A	A	A	A			B				
		PM	Volume	A		310	5	10	200		5		40			
			Delay (s)			0	0	8	0			11				
			LOS			A	A	A	A			B				
County TT North	STOP	AM	Volume	A	20	135			255	5				20		55
			Delay (s)		8	0			0	0					11	
			LOS		A	A			A	A					B	
		PM	Volume	A	60	290			190	10				5		20
			Delay (s)		8	0			0	0					11	
			LOS		A	A			A	A					B	
County T	STOP	AM	Volume	A	1	155	25	280	275	5	5	5	80	1	5	1
			Delay (s)			8	0		8	0		14			30	
			LOS			A	A		A	A		B			D	
		PM	Volume	A	15	370	15	100	335	15	10	5	155	5	1	5
			Delay (s)			8	0		9	0		16			24	
			LOS			A	A		A	A		C			C	
WIS 73 South/ Deerfield Road		AM	Volume	B	1	190	45	245	530	1	25	1	130	1	1	1
			Delay (s)			4	4		11			26			21	
			LOS			A	A		B			C			C	
		PM	Volume	B	1	495	40	125	380	1	55	1	230	1	1	1
			Delay (s)			8	6		12			23			17	
			LOS			A	A		B			C			B	
WIS 73 North/ Hubbell Street	STOP	AM	Volume	A	105	210			400	10				5		375
			Delay (s)			9				0					25	
			LOS			A				A					C	
		PM	Volume	A	360	355			275	20				10		220
			Delay (s)			9				0					19	
			LOS			A				A					C	
McKay Way	STOP	AM	Volume	A		145	45	255	5		45		5			
			Delay (s)			0	0		8			19				
			LOS			A	A		A			C				
		PM	Volume	A		285	45	185	15		85		5			
			Delay (s)			0	0		9			22				
			LOS			A	A		A			C				
Jackson Street	STOP	AM	Volume	A	1	150	15	45	220	5	5	1	40	5	1	5
			Delay (s)			8			8			11			15	
			LOS			A			A			B			C	
		PM	Volume	A	1	300	15	45	190	5	15	1	60	1	1	1
			Delay (s)			8			8			12			14	
			LOS			A			A			B			B	

Table 31: 2014 Operational Analysis (7 of 7 tables)

Intersection	Traffic Control	Time Period	MOE	Overall	Eastbound LT	Eastbound TH	Eastbound RT	Westbound LT	Westbound TH	Westbound RT	Northbound LT	Northbound TH	Northbound RT	Southbound LT	Southbound TH	Southbound RT
WIS 89 North / Monroe Street	STOP	AM	Volume	C	100	90	5	5	165	135	5	5	5	105	5	150
			Delay (s)		16		9		22			11		13		12
			LOS		C		A		C			B		B		B
		PM	Volume	C	130	240	5	10	140	105	5	5	10	125	5	90
			Delay (s)		19		8		13			10		12		10
			LOS		C		A		B			B		B		A

MOE : Measure of Effectiveness

Volume measured in vehicles per hour

LOS : Level of Service

Stop-sign and traffic signal intersections were evaluated using HCM 2010 methods

Roundabouts were evaluated using HCM 2010 module from SIDRA

Intersections with "^" were evaluated using HCM 2000 methods

Interserctions with "^^" were evaluated using Synchro 8 / SimTraffic 8 methods

Intersections shaded in orange denotes a change in traffic control while the study was performed; results reflect updated traffic control

: HCS Delay (s) exceeds 180sec, Delay (s) may not be accurate

D : Lane group and / or intersection experiences LOS D

E : Lane group and / or intersection experiences LOS E

F : Lane group and / or intersection experiences LOS F

Table 32: 2050 Operational Analysis (1 of 7 tables, west to east reading down)

Intersection	Traffic Control	Time Period	MOE	Overall	Eastbound			Westbound			Northbound			Southbound		
					LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
US 12*		AM	Volume	F	5	20	5	460	10	260	5	505	60	330	1820	5
			Delay (s)		34		33	2930		100	53	23	19	54	29	8
			LOS		C		C	F		F	D	C	B	D	C	A
		PM	Volume	F	5	5	5	110	10	450	5	1815	310	305	675	5
			Delay (s)		39		37	489		391	57	119	21	51	9	7
			LOS		D		D	F		F	E	F	C	D	A	A
Lodi - Springfield Road		AM	Volume	A	5	390	25	5	610	5	15	5	5	20	10	55
			Delay (s)		9			8			34			26		
			LOS		A			A			D			D		
		PM	Volume	A	35	555	10	5	505	20	20	10	5	10	5	15
			Delay (s)		9			9			35			24		
			LOS		A			A			E			C		
Holiday Drive		AM	Volume	B	55	475	5	25	425	115	5	30	75	95	25	145
			Delay (s)		13	8		10	9		20			23		
			LOS		B	A		B	A		C			C		
		PM	Volume	B	60	445	10	35	535	220	15	25	60	115	60	65
			Delay (s)		19	6		9	12		26			29		
			LOS		B	A		A	B		C			C		
WIS 113 North / County Q		AM	Volume	F	75	480	100	310	450	65	130	240	120	260	625	60
			Delay (s)		54			20			14			123		
			LOS		F			C			B			F		
		PM	Volume	F	260	410	65	270	590	125	180	580	170	170	365	85
			Delay (s)		25			142			86			20		
			LOS		D			F			F			C		
West Street		AM	Volume	A	5	795	30	60	850	5	5	5	35	5	5	15
			Delay (s)		10			10			44			61		
			LOS		B			B			E			F		
		PM	Volume	A	15	780	10	10	1040	15	5	5	20	10	5	10
			Delay (s)		11			10			43			82		
			LOS		B			B			E			F		
South Street		AM	Volume	A		785	90	5	985		5	0	95			
			Delay (s)			0		10			29					
			LOS			A		B			D					
		PM	Volume	A		785	30	85	1100		10	0	100			
			Delay (s)			0		10			34					
			LOS			A		B			D					
Madison Street*		AM	Volume	C	45	740	35	45	730	30	65	40	65	55	120	215
			Delay (s)		16	28		15	32		32	25		26		28
			LOS		B	C		B	C		C	C		C		C
		PM	Volume	C	80	715	35	35	985	55	100	50	35	40	35	85
			Delay (s)		19	14		9	49		34	28		29		28
			LOS		B	B		A	D		C	C		C		C
Division Street		AM	Volume	F	5	795	60	310	785	40	60	50	285	105	130	5
			Delay (s)		13	6		181	14		433		101	2155	38	
			LOS		B	A		F	B		F		F	F	D	
		PM	Volume	F	5	680	100	200	955	85	135	85	270	40	35	10
			Delay (s)		45		18	57	40		1421		38	158	30	
			LOS		D		B	E	D		F		D	F	C	

Table 33: 2050 Operational Analysis (2 of 7 tables, west to east reading down)

Intersection	Traffic Control	Time Period	MOE	Overall	Eastbound LT	Eastbound TH	Eastbound RT	Westbound LT	Westbound TH	Westbound RT	Northbound LT	Northbound TH	Northbound RT	Southbound LT	Southbound TH	Southbound RT
Raemisch Road / Schumacher Road*		AM	Volume	D	25	960	125	150	1000	20	55	10	45	115	70	45
			Delay (s)		21	18	13	14	103	10		28	27		34	
			LOS		C	B	B	B	F	B		C	C		C	
		PM	Volume	E	45	940	105	75	1055	130	180	65	165	25	15	10
			Delay (s)		25	18	14	14	120	14		37	30		31	
			LOS		C	B	B	B	F	B		D	C		C	
Hogan Road	STOP	AM	Volume	A	5	1070	45	125	1155	5	20	5	105	5	5	5
			Delay (s)			12		13	0			40	16		38	
			LOS			B		B	A			E	C		E	
		PM	Volume	A	5	1135	55	105	1210	5	40	5	115	5	5	5
			Delay (s)			12		13	0			43	16		34	
			LOS			B		B	A			E	C		D	
WIS 113 South (West Intersection)^^	STOP	AM	Volume	Reconfigured and Removed												
			Delay (s)													
			LOS													
		PM	Volume													
			Delay (s)													
			LOS													
WIS 113 South (East Intersection)^^	STOP	AM	Volume	Reconfigured and Removed												
			Delay (s)													
			LOS													
		PM	Volume													
			Delay (s)													
			LOS													
County I ^^^		AM	Volume		40	660	400	430	685	70	190	45	310	30	125	95
			Delay (s)	10.2		13.1			14.2			8.1			16.8	
			LOS	B		B			B			A			C	
		PM	Volume		65	720	260	285	715	60	415	90	495	50	40	45
			Delay (s)	11.9		10.2			21.2			12.3			14.0	
			LOS	B		B			C			B			B	
River Road	STOP	AM	Volume	F	40	1055	5	150	1460	50	5	5	105	105	20	195
			Delay (s)		15	0	0	13	0	0		0	34	11049		377
			LOS		C	A	A	B	A	A		A	D	F		F
		PM	Volume	A	140	1305	5	95	1200	150	5	15	185	50	10	55
			Delay (s)		15	0	0	15	0	0		0	184	0		31
			LOS		C	A	A	C	A	A		A	F	A		D
I-39/90/94 SB Ramps^		AM	Volume	B	0	920	655	435	1550	0	0	0	0	250	0	115
			Delay (s)			30	13	25	8					32		23
			LOS			C	B	C	A					C		C
		PM	Volume	B	0	1400	445	345	1315	0	0	0	0	215	0	60
			Delay (s)			33	8	25	3					48		26
			LOS			C	A	C	A					D		C

Table 34: 2050 Operational Analysis (3 of 7 tables, west to east reading down)

Intersection	Traffic Control	Time Period	MOE	Overall	Eastbound LT	Eastbound TH	Eastbound RT	Westbound LT	Westbound TH	Westbound RT	Northbound LT	Northbound TH	Northbound RT	Southbound LT	Southbound TH	Southbound RT
I-39/90/94 NB Entrance Ramp^^	No Control	AM	Volume	A	50	870	0	0	1985	180	0	0	0	0	0	0
			Delay (s)		144	4			8	4						
			LOS		F	A			A	A						
		PM	Volume	A	95	1305	0	0	1660	275	0	0	0	0	0	0
			Delay (s)		107	4			5	5						
			LOS		F	A			A	A						
County CV^		AM	Volume	C	85	795	0	0	1615	255	0	0	0	240	0	545
			Delay (s)		6	5			34	15				33		36
			LOS		A	A			C	B				C		D
		PM	Volume	C	185	1120	0	0	1635	440	0	0	0	155	0	310
			Delay (s)		30	7			26	27				30		23
			LOS		C	A			C	C				C		C
I-39/90/94 NB Exit Ramp^		AM	Volume	B	0	945	0	0	1120	0	690	0	160	0	0	0
			Delay (s)			8			19		16		14			
			LOS			A			B		B		B			
		PM	Volume	B	0	1135	0	0	1020	0	1045	0	155	0	0	0
			Delay (s)			9			19		22		14			
			LOS			A			B		C		B			
Pepsi Way		AM	Volume	C	10	785	250	150	1030	20	190	5	150	10	5	5
			Delay (s)		25	26	19	34	31	12	28		18		16	16
			LOS		C	C	B	C	C	B	C		B		B	B
		PM	Volume	C	10	1045	150	130	835	5	285	10	250	15	10	20
			Delay (s)		34	26	16	45	17	12	28		25		34	34
			LOS		C	C	B	D	B	B	C		C		C	C
North Towne Road	STOP	AM	Volume	A	50	905	0	0	1215	65	0	0	0	40	0	10
			Delay (s)		13	0			0	0				43		17
			LOS		B	A			A	A				E		C
		PM	Volume	A	20	1270	0	0	910	25	0	0	0	95	0	40
			Delay (s)		10	0			0	0				29		13
			LOS		B	A			A	A				D		B
US 51 SB Ramps ^*		AM	Volume	B	0	735	230	265	1100	0	0	0	0	185	0	195
			Delay (s)			19	15	9	1					32		29
			LOS			B	B	A	A					C		C
		PM	Volume	B	0	1200	205	125	880	0	0	0	0	160	0	60
			Delay (s)			16	13	16	2					33		27
			LOS			B	B	B	A					C		C
US 51 NB Ramps^*		AM	Volume	B	65	855	0	0	1215	170	150	0	80	0	0	0
			Delay (s)		9	2			22	14	32		26			
			LOS		A	A			C	B	C		C			
		PM	Volume	B	165	1190	0	0	780	190	230	0	250	0	0	0
			Delay (s)		6	1			19	15	33		32			
			LOS		A	A			B	B	C		C			
Portage Road		AM	Volume	F	30	710	180	100	1115	40	150	50	70	45	170	200
			Delay (s)		47	27	12	52	160	11	53		34	48		58
			LOS		D	C	B	D	F	B	D		C	D		E
		PM	Volume	F	115	1265	125	80	785	65	145	155	130	50	75	60
			Delay (s)		45	183	10	131	23	10	80		33	42		37
			LOS		D	F	B	F	C	B	F		C	D		D

Table 35: 2050 Operational Analysis (4 of 7 tables, west to east reading down)

Intersection	Traffic Control	Time Period	MOE	Overall	Eastbound LT	Eastbound TH	Eastbound RT	Westbound LT	Westbound TH	Westbound RT	Northbound LT	Northbound TH	Northbound RT	Southbound LT	Southbound TH	Southbound RT
Westmount Drive		AM	Volume	D	5	855	15	95	1080	10	45	5	340	15	5	25
			Delay (s)		55	51	12	44	53	8	31	45		50	29	
			LOS		E	D	B	D	D	A	C	D		D	C	
		PM	Volume	F	5	1385	40	210	895	5	15	5	160	5	5	15
			Delay (s)		13	211	8	26	8	3	28		34	34	27	
			LOS		B	F	A	C	A	A	C	C		C	C	
County C / Grand Avenue		AM	Volume	F	190	645	335	70	785	80	225	205	30	80	380	350
			Delay (s)		48	60	27	24	183	22	278	30	29	50	118	156
			LOS		D	E	C	C	F	C	F	C	C	D	F	F
		PM	Volume	F	240	920	325	95	630	65	330	530	140	115	440	225
			Delay (s)		62	208	34	42	137	33	274	40	37	159	161	54
			LOS		E	F	C	D	F	C	F	D	D	F	F	D
Thompson Road		AM	Volume	E	45	625	145	115	680	55	150	115	55	100	355	105
			Delay (s)		21	43	20	22	44	17	34	40	39	29	168	39
			LOS		C	D	C	C	D	B	C	D	D	C	F	D
		PM	Volume	E	165	845	125	50	640	65	145	240	60	85	160	80
			Delay (s)		23	104	19	23	45	19	31	64	38	30	41	38
			LOS		C	F	B	C	D	B	C	E	D	C	D	D
Broadway Drive		AM	Volume	E	35	865	30	45	865	180	20	25	245	480	15	50
			Delay (s)		30	50		35	40	16	56		286	125	34	
			LOS		C	D		C	D	B	E		F	F	C	
		PM	Volume	D	40	1035	35	90	790	370	50	35	125	250	20	45
			Delay (s)		13	47		52	16	10	50		65	158	39	
			LOS		B	D		D	B	B	D		E	F	D	
Communications Drive / Lois Drive	STOP	AM	Volume	D	85	1470	10	55	1025	115	5	5	10	35	5	75
			Delay (s)			13		15	0		892	244		1772	90	
			LOS			B		C	A		F	F		F	F	
		PM	Volume	F	20	1370	5	40	1180	70	5	5	75	75	5	95
			Delay (s)			12		13	0		503	55		2830	60	
			LOS			B		B			F	F		F	F	
US 151 SB Ramps^*		AM	Volume	D		1040	505	620	860					65	5	315
			Delay (s)			67	26	69	10					31	33	
			LOS			E	C	E	A					C	C	
		PM	Volume	E		1240	295	385	955					95	1	320
			Delay (s)			78	21	187	26					20	22	
			LOS			E	C	F	C					C	C	
US 151 NB Ramps^*		AM	Volume	C	235	855			1315	70	170	1	260			
			Delay (s)		39	30			24	11	35		29			
			LOS		D	C			C	B	C		C			
		PM	Volume	E	305	975			930	95	455	1	880			
			Delay (s)		27	25			35	19	36		228			
			LOS		C	C			C	B	D		F			
Davison Drive*		AM	Volume	F	95	840	155	125	1075	100	185	25	70	60	25	25
			Delay (s)		18	22	18	16	25	17	1421		30	304		29
			LOS		B	C	B	B	C	B	F		C	F		C
		PM	Volume	F	110	1245	330	120	750	45	185	40	105	65	25	35
			Delay (s)		13	24	19	20	19	15	1461		32	291		30
			LOS		B	C	B	C	B	B	F		C	F		C

Table 36: 2050 Operational Analysis (5 of 7 tables, west to east reading down)

Intersection	Traffic Control	Time Period	MOE	Overall	Eastbound LT	Eastbound TH	Eastbound RT	Westbound LT	Westbound TH	Westbound RT	Northbound LT	Northbound TH	Northbound RT	Southbound LT	Southbound TH	Southbound RT
Bird Street*		AM	Volume		285	370	310	40	580	75	160	160	50	115	340	570
			Delay (s)	C	37	18	0	14	35	0	54	33	0	27	49	0
			LOS		D	B	A	B	D	A	D	C	A	C	D	A
		PM	Volume		630	630	220	35	370	105	170	245	45	80	205	370
			Delay (s)	D	97	21	0	15	21	0	26	33	0	28	37	0
			LOS		F	C	A	B	C	A	C	C	A	C	D	A
County N (Bristol Street)^^	STOP	AM	Volume		65		430				360	225			315	150
			Delay (s)	F	99		94				3				80	64
			LOS		F		F				A				F	E
		PM	Volume		125		540				410	270			220	100
			Delay (s)	C	37		36				3				34	20
			LOS		D		D				A				C	C
Main Street*		AM	Volume		100	405	60	10	550	405	30	65	10	415	125	80
			Delay (s)	D	38	17		19		16	15		13	126	18	
			LOS		D	B		B		B	B		B	F	B	
		PM	Volume		105	625	60	10	485	360	45	140	25	430	85	120
			Delay (s)	C	27	21		14		13	15		13	63	16	
			LOS		C	C		B		B	B		B	E	B	
King Street / Columbus Street	STOP	AM	Volume		75	715	10	20	855	30	5	5	10	5	5	115
			Delay (s)	A		11			10			124			51	
			LOS			B			A			F			F	
		PM	Volume		75	975	25	5	755	45	10	5	20	15	5	70
			Delay (s)	A		10			11			140			121	
			LOS			B			B			F			F	
Market Street / Church Street*		AM	Volume		15	685	20	65	840	145	50	60	105	200	90	15
			Delay (s)	F		21			163			19			28	
			LOS			C			F			B			C	
		PM	Volume		25	895	75	65	690	95	70	60	130	180	65	30
			Delay (s)	D		42			48			20			23	
			LOS			F			F			C			C	
Linnerud Drive / Dewey Street	STOP	AM	Volume		40	950	10	45	1030	50	5	5	40	45	5	65
			Delay (s)	F		12	0		11	0		501			3779	
			LOS			B	A		B	A		F			F	
		PM	Volume		65	1150	15	55	870	40	5	5	100	15	5	45
			Delay (s)	F		10	0		12	0		275			1586	
			LOS			B	A		B	A		F			F	
County N (Grove Street)*		AM	Volume		75	270	675	305	630	35	460	35	40	10	50	65
			Delay (s)	F	13	16	59	29	20		20	163		21	31	
			LOS		B	B	F	C	B		B	F		C	C	
		PM	Volume		100	740	400	115	525	10	380	45	135	25	25	95
			Delay (s)	C	13	16	59	29	20		163	21		25	31	
			LOS		B	B	E	C	B		F	C		C	C	
Town Hall Drive	STOP	AM	Volume		20	200	30	40	420	5	35	10	15	15	110	105
			Delay (s)	B	9		0	8		0	44			38		
			LOS		A		A	A		A	E			E		
		PM	Volume		95	485	40	5	335	20	35	65	50	10	15	65
			Delay (s)	A	8		0	8		0	53			20		
			LOS		A		A	A		A	F			C		

Table 37: 2050 Operational Analysis (6 of 7 tables, west to east reading down)

Intersection	Traffic Control	Time Period	MOE	Overall	Eastbound LT	Eastbound TH	Eastbound RT	Westbound LT	Westbound TH	Westbound RT	Northbound LT	Northbound TH	Northbound RT	Southbound LT	Southbound TH	Southbound RT
County VV	STOP	AM	Volume	A	20	175	5	5	365	65	15	10	10	30	20	30
			Delay (s)		8		0	8		0		16			17	
			LOS		A		A	A		A		C			C	
		PM	Volume	A	25	425	10	1	260	20	5	15	5	40	15	30
			Delay (s)		8		0	8		0		17			18	
			LOS		A		A	A		A		C			C	
County TT South	STOP	AM	Volume	A		205	10	70	375		5		20			
			Delay (s)			0	0	8	0			11				
			LOS			A	A	A	A			B				
		PM	Volume	A		430	10	20	280		5		65			
			Delay (s)			0	0	8	0			12				
			LOS			A	A	A	A			B				
County TT North	STOP	AM	Volume	A	30	195			315	10				25		75
			Delay (s)		8	0			0	0					12	
			LOS		A	A			A	A					B	
		PM	Volume	A	85	390			255	10				5		30
			Delay (s)		8	0			0	0					12	
			LOS		A	A			A	A					B	
County T	STOP	AM	Volume	A	5	190	35	390	340	5	5	5	115	5	5	5
			Delay (s)		8		0	9		0		19			66	
			LOS		A		A	A		A		C			F	
		PM	Volume	A	15	465	15	145	420	20	10	5	225	10	5	5
			Delay (s)		8		0	9		0		25			67	
			LOS		A		A	A		A		C			F	
WIS 73 South/ Deerfield Road		AM	Volume	F	1	255	55	350	700	1	30	1	185	1	1	1
			Delay (s)		5		5		150			34			26	
			LOS		A		A		F			C			C	
		PM	Volume	F	1	655	50	185	500	1	65	1	335	1	1	1
			Delay (s)		13		7		213			67			24	
			LOS		B		A		F			E			C	
WIS 73 North/ Hubbell Street	STOP	AM	Volume	F	120	305			565	65				45		525
			Delay (s)		10				0						323	
			LOS		A				A						F	
		PM	Volume	F	480	520			375	100				50		300
			Delay (s)		12				0						2020	
			LOS		B				A						F	
McKay Way	STOP	AM	Volume	A		220	75	20	390		80		15			
			Delay (s)			0	0	8				18				
			LOS			A	A	A				C				
		PM	Volume	A		440	70	35	275		155		15			
			Delay (s)			0	0	9				35				
			LOS			A	A	A				D				
Jackson Street	STOP	AM	Volume	A	1	245	15	60	345	5	5	1	50	1	1	1
			Delay (s)		8				8			12			19	
			LOS		A				A			B			C	
		PM	Volume	A	1	485	15	55	300	5	15	1	75	1	1	1
			Delay (s)		8				9			16			19	
			LOS		A				A			C			C	

Table 38: 2050 Operational Analysis (7 of 7 tables, west to east reading down)

Intersection	Traffic Control	Time Period	MOE	Overall	Eastbound LT	Eastbound TH	Eastbound RT	Westbound LT	Westbound TH	Westbound RT	Northbound LT	Northbound TH	Northbound RT	Southbound LT	Southbound TH	Southbound RT
WIS 89 North / Monroe Street	STOP	AM	Volume	E	160	140	5	5	255	155	5	5	5	115	5	160
			Delay (s)		35		9		65			12			15	15
			LOS		D		A		F			B			C	B
		PM	Volume	E	200	360	10	15	210	110	5	10	10	130	5	150
			Delay (s)		63		8		21			12			14	12
			LOS		F		A		C			B			B	B

MOE : Measure of Effectiveness

Volume measured in vehicles per hour

LOS : Level of Service

Stop-sign and traffic signal intersections were evaluated using HCM 2010 methods

Roundabouts were evaluated using HCM 2010 module from SIDRA

Intersections with "^" were evaluated using HCM 2000 methods

Interserctions with "^^" were evaluated using Synchro 8 / SimTraffic 8 methods

The intersection with "^^^" contains Year 2035 analysis results from the WisDOT Proj 0656-43-04 STH 19 and STH 113 Intersection ICE

Interserctions with "*" were evaluated with adjusted green timings, while maintaining existing cycle lengths

Intersections shaded in orange denotes a change in traffic control while the study was performed; results reflect updated traffic control

: HCS Delay (s) exceeds 180sec, Delay (s) may not be accurate

D : Lane group and / or intersection experiences LOS D

E : Lane group and / or intersection experiences LOS E

F : Lane group and / or intersection experiences LOS F

Highway Section

Three rural study sections exhibit undesirable level of service as indicated in Table 39. Of these only the section from County I to I-39/90/94 east of Waunakee exhibits level of service failure in year 2050.

Table 39: Rural Highway section LOS

Study Section	Location	Peak Hour 2014 AM PSTF (%)	Peak Hour 2014 AM PFFS (%)	Peak Hour 2014 AM LOS	Peak Hour 2014 PM PSTF (%)	Peak Hour 2014 PM PFFS (%)	Peak Hour 2014 PM LOS	Peak Hour 2050 No-build AM PSTF (%)	Peak Hour 2050 No-build AM PFFS (%)	Peak Hour 2050 No-build AM LOS	Peak Hour 2050 No-build PM PSTF (%)	Peak Hour 2050 No-build PM PFFS (%)	Peak Hour 2050 No-build PM LOS	Highway Classification
1	**US 12 to Six Mile Creek**													I
	Eastbound	54	85	C	68	84	D	65	81	C	76	81	D	
	Westbound	72	83	D	65	84	C	82	79	E	72	81	D	
3	**CTH I to IH 39/90/94**													I
	Eastbound	82	70	E	89	70	E	91	58	F	96	59	E	
	Westbound	92	70	E	85	71	E	99	58	F	93	59	E	
4b	**US 51 to CTH C**													III
	Eastbound	70	74	D	87	71	D	87	57	E	94	57	E	
	Westbound	84	73	D	72	72	D	94	57	E	87	57	E	
6	**CTH VV to WIS 89**													III
	Eastbound	38	89	B	64	87	B	45	87	B	68	84	B	
	Westbound	60	88	B	45	88	B	68	86	B	52	86	B	

PFFS: Percent of Free Flow Speed.

The only study section that raises substantial concern is the failure in Section 3 in the future. This indicates an unacceptable combination of percent time spent following and average travel speed though the section is very short. Those sections with LOS D and E are undesirable but within preservation studies of this nature failing LOS is often used as the threshold for when long term improvements should be considered.

Highway Capacity Manual (HCM) methodologies provide empirical analysis on how traffic operates with available passing opportunities (as described for WIS 19 in Table 39), but does not necessarily take into consideration the spacing or frequency of passing opportunities. For example, in section six from the western limits of the village of Marshall to County VV, there is approximately half of the roadway that is marked for passing in each direction. This passing area is divided into six locations eastbound and seven locations westbound. These passing zones typically range from approximately 1/5 of a mile to 1/3 of a mile in length with the exception of a two-thirds of a mile long passing zone in each direction near Prospector Lane. These shorter passing zones cause difficulty passing when passing maneuvers may take up to a quarter mile to complete without the consideration of interference from oncoming traffic.

The team used travel time analysis to illustrate current and future conditions along the urban or multi-lane sections of the study. Figure 30, Figure 31, and Figure 32 illustrate the existing

and forecasted 2050 travel time during the commuting peak hours in the three urban areas of the corridor.

Findings from the travel time exercise shows the commuting time through the Sun Prairie urban area of Section 5 (County C to County VV, approximately 5 miles) will raise from approximately 13-14 minutes today to around 17-21 minutes in the future with no improvements. This added travel time through the Sun Prairie area will likely encourage motorists to find other routes during peak hours.

Figure 30: Urban Highway Section Travel Time (Section 2)

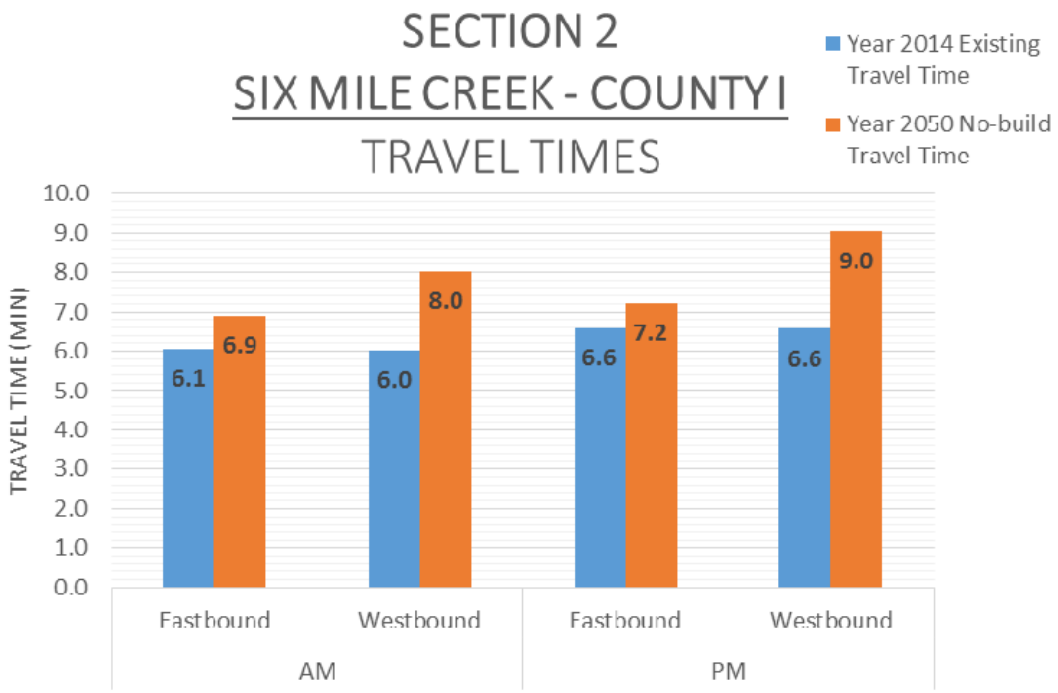


Figure 31: Urban Highway Section Travel Time (Section 4A)

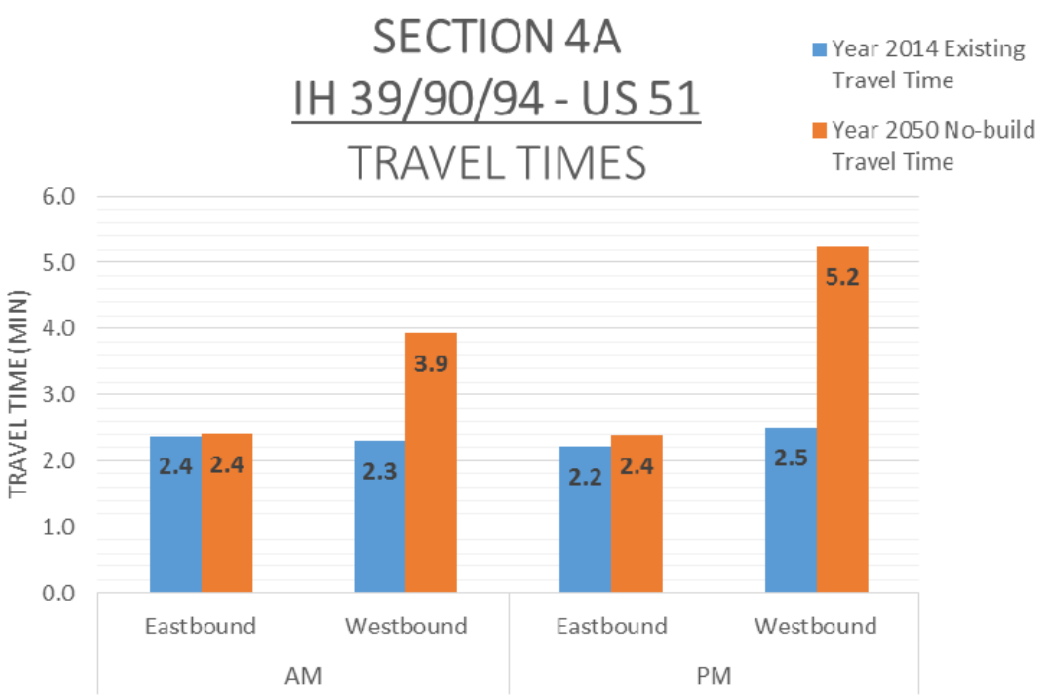
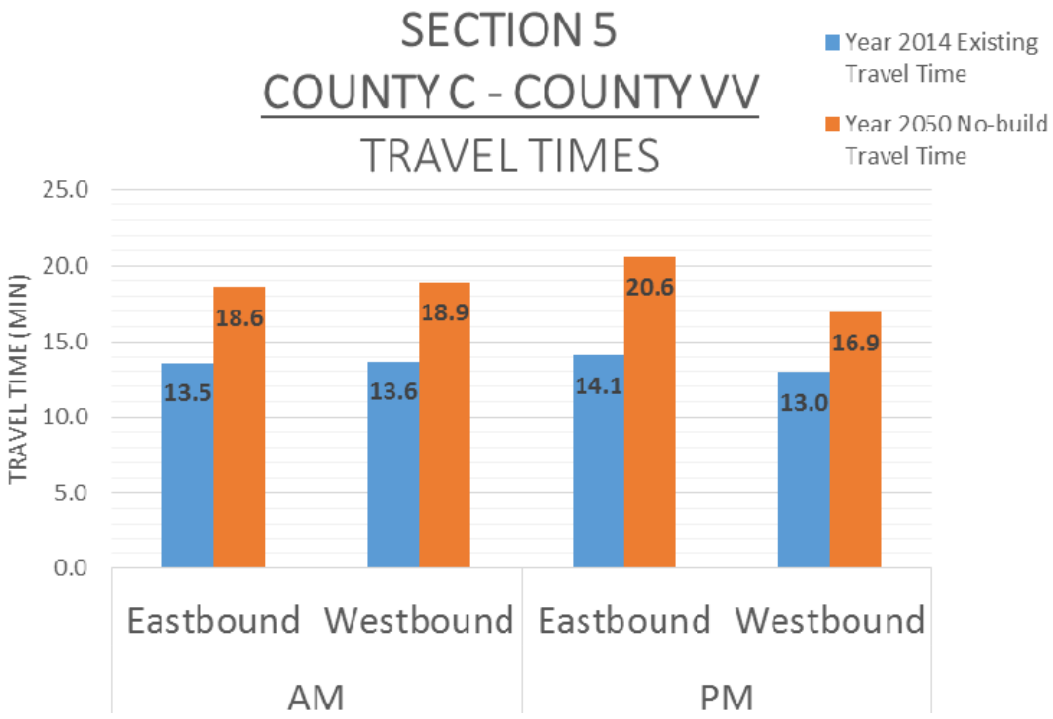


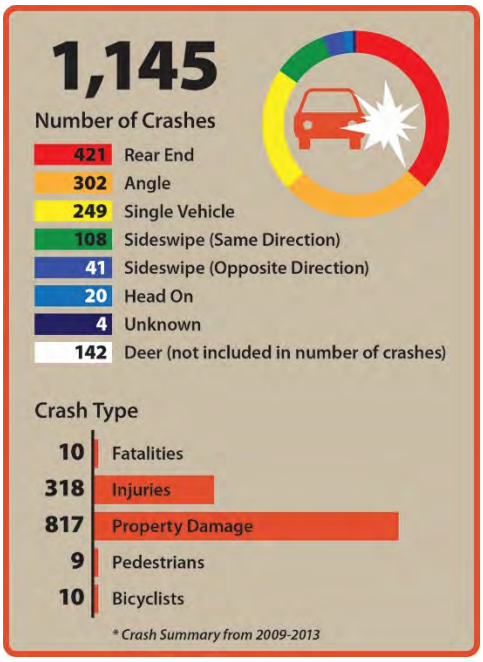
Figure 32: Urban Highway Section Travel Time (Section 5)



3.3 Traffic Safety

The purpose of the safety analysis is to identify crash history locations and determine the most likely contributors to those crash patterns. Areas of potential safety concern that do not currently exhibit a crash history will also be identified.

Figure 33: Safety At-a-Glance



The study team analyzed crash data was from 2009 to 2013. Refer to Exhibit 1 for a Study Location map, Exhibit 7 for a Safety Overview map, and Exhibit 9A-HH for a series of maps showing all crash history.

3.3.1 Methodology

The study team generally followed this process to identify safety concerns:

1. Reviewed state database of all reported crashes within study area.

2. Analyzed contributing data (geometric, traffic volume, crash details, etc.) to the crash history.

3. Summarized deficiencies and causes potentially contributing to crash locations.

The safety process identified crash spot locations, mostly at intersections, along WIS 19. Data reviewed for each of these spot locations included:

- Traffic volume
- Design drawings
- As-built data
- Traffic signal drawings
- University of Wisconsin Traffic Operations and Safety (UW-TOPS) Lab Portal crash data
- MV4000 crash reports
- Speed zone installations
- Public comments

3.3.2 Findings

Refer to Exhibit 7 for a Safety Overview Map and Appendix C for materials related to the safety analysis. Table 40 presents an overview of corridor crash statistics.

Crash Rates

Crash rates vary throughout the study corridor. Crash rates along four of the six operational study sections are greater than the statewide average crash rate for their similar peer group facilities, which generally indicates WIS 19 has more crashes than its peer highways across the state. Table 40 presents crash rate computations for the study sections.

Table 40: Highway Section Crash Details

WIS 19 Crash Details[1]								Statewide Crash Rates for Comparison[2]	
						WIS 19 Crash Rates[2,3]			
Operational Section	From	To	Section Length (Miles)	AADT (veh/day)	Total Crashes	Total	All Injury + Fatal	Total	All Injury + Fatal
1	US 12	Six Mile Creek	4.1	7,350	55	**100.0**	**36.4**	71.0	27.6
2	Six Mile Creek	County I	3.4	15,420	244	**255.0**	**72.1**	144.7	45.1
3[4]	County I	IH 39/90/94	3.5	15,800	64	63.4	18.8	75.0	27.0
4	IH 39/90/94	County C	4.2	15,433	235	**198.7**	**48.2**	63.0	21.9
5	County C	County VV	5.3	13,000	400	318.1	96.2	423.0	142.2
6	County VV	STH 89	10	6,514	147	**123.7**	**35.3**	86.3	30.9
Total	-	-	30.5	-	1145				

1. Crash analysis includes years 2009-2013

2. Crash rates are crashes per 100 million vehicle miles traveled. Statewide crash rates are length-weight averaged over multiple Highway Peer Groups for appropriate comparision.

3. Highlighted study crash rates are above statewide average for Highway Peer Group

4. Section 3 appears to have a "low" crash compared to the statewide average peer group. This seems attributed to the low number of contributing access points (peer group typically would have more influential access points contributing crashes) and atypically high volume compared to the peer group. Additionally, two "spot" crash locations, the curve set near Walter Drive and the River Road intersection account for 70% of the section's crash total.

Fatalities

There were 10 fatalities along WIS 19 from 2009 to 2013 and an additional fatality occurring at WIS 19 and River Road in 2014. Refer to Exhibit 7 for a safety overview exhibit that shows all fatal crash locations. Key statistics related to the fatal crashes include:

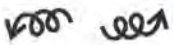
- Fatalities were a mix of intersection related and non-intersection related crashes
- Four fatalities occurred in dark conditions
- Horizontal and vertical curves were a factor in two of the crashes
- Two fatalities were head on collisions, four were angle collisions, and the remaining four were categorized as single vehicle

- One of the angle collision crashes involved a bicyclist at US 12 and the other at Town Hall Drive in Sun Prairie involved a motorcycle
- Three fatalities may have had weather conditions as a contributing factor
- Half of the fatal crashes involved someone who was intoxicated or under the influence of drugs

Crash Locations and Patterns

As shown on Table 41 through Table 46, there are over 50 locations within the study corridor that had crash clusters between 2009 and 2013. This table presents primary crash patterns, severity, crash rates, and possible contributing factors for all locations. Of particular note are those locations with over 50 percent injury/fatality crashes and those with a crash rate of greater than 1.0. Refer to Table 46 for table notes that apply to all spot crash detail tables.

Table 41: Spot Crash Details

Intersection or Spot or Grouping	Primary Patterns[1]	Spot Crash Data[2]			Rate Range[4]		Notes
		Total # Crashes	Inj/ Fatal	% Injury or Fatality	Low	High	
US 12		23	4	17%	0.74	1.91	Project ID 1010-02-04 proposes freeway conversion. High volume and long queues may contribute.
Lodi Springfield Road		4	2	50%	0.32	0.33	Lack of intersection awareness may contribute.
Curve west of Wipperfurth		7	3	43%	n/a		Curve geometry may contribute.
Holiday Drive		15	4	27%	0.73	0.78	Project ID 5290-01-72 constructed signals and will likely mitigate this historical crash pattern.
Klein Drive		7	4	57%	0.36	0.37	Project ID 5290-01-72 reconstructed roadway and may mitigate historical crashes.
Century Ave (CTH Q/ WIS 113 N)		28	6	21%	0.69	0.94	Project ID 5290-01-72 reconstructed roadway and may mitigate historical crashes.
Between CTH Q and Madison Street	Rear ends related to access 	44	12	27%	n/a		Project ID 5290-01-72 reconstructed roadway and may mitigate historical crashes.
Madison Street		6	2	33%	0.18	0.20	Project ID 5290-01-72 reconstructed roadway and may mitigate historical crashes.
Between Madison Street and Division Street	Rear ends related to access 	8	2	25%	n/a		Project ID 5290-01-72 reconstructed roadway and may mitigate historical crashes.
Division Street		9	2	22%	0.28	0.31	High turning volume and tight geometry may contribute.

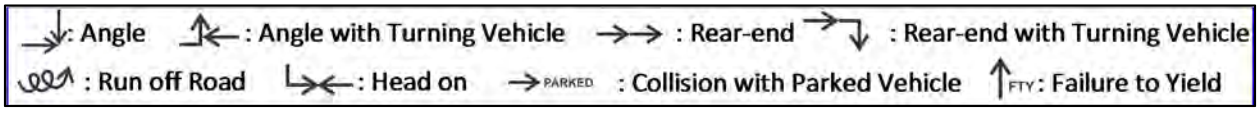
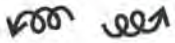
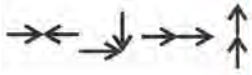
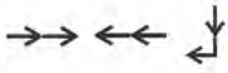


Table 42: Spot Crash Details (continued)

Intersection or Spot or Grouping	Primary Patterns[1]	Spot Crash Data[2]			Rate Range[4]		Notes
		Total # Crashes	Inj/ Fatal	% Injury or Fatality	Low	High	
Schumacher Road /Raemisch Road		15	5	33%	0.45	0.46	Grade, speed, and long queues may contribute.
Near Hogan Road		12	4	33%	n/a		Lack of wwareness of typical section change and intersection may contribute.
WIS 113		14	7	50%	0.33	0.43	Project ID 5290-02-00 HSIP project in planning and will likely mitigate these crash patterns.
CTH I		28	7	25%	0.89	0.97	Project ID 5290-02-00 HSIP project in design and will likely mitigate these crash patterns.
Curve set at Walter Drive		27	10	37%	n/a		Project ID 5290-02-60 HSIP project in design and may mitigate these crash patterns.
River Road		19	5	26%	0.62	0.66	This intersection was improved as part of an HSIP project in the last 15 years. High speed and poor LOS for River Road motorist encourage risky maneuvers.
Liuna Way	 Unexpected U-Turns	5	2	40%	0.17	0.17	Lack of awareness of U-turning maneuvers.
I-39/90/94 Interchange		49	12	24%	n/a		Crashes are included for both ramp terminals to this interchange. Complex and confusing cluster of intersections likely contributes.
CTH CV / Lake Road		44	7	16%	1.09	1.30	Complex and confusing cluster of intersections likely contributes.

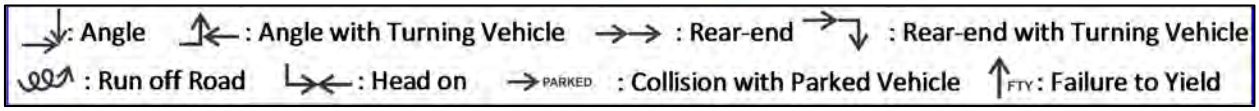
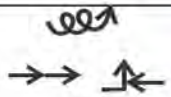


Table 43: Spot Crash Details (continued)

Intersection or Spot or Grouping	Primary Patterns[1]	Spot Crash Data[2]			Rate Range[4]		Notes
		Total # Crashes	Inj/ Fatal	% Injury or Fatality	Low	High	
Pepsi Way		23	10	43%	0.67	0.68	Project ID 3700-10-13 installed signals and will likely mitigate this historical crash pattern.
US 51 Interchange		18	3	17%	n/a		Recent additdion of signals is likely mitigating this historical crash pattern.
Between US 51 and Steven Drive	Urban access related 	23	6	26%	n/a		High volume, speed, and access conditions may contribute.
Portage Road		13	0	0%	0.45	0.49	High volume and queues may contribute.
Westmount Drive		7	3	43%	0.29	0.29	Project ID 6085-02-02 proposes signals and will likely mitigate this historical crash pattern.
CTH C / Grand Avenue		31	12	39%	0.85	1.21	High volume and queues may contribute.
Thompson Road		23	8	35%	0.77	0.90	High volume and queues may contribute.
Between Thompson and Broadway		12	4	33%	n/a		Typical section change may contribute.
Between Broadway and US 151		26	4	15%	n/a		Narrow section of 4-lane undivided may contribute due to lack of awareness of turning motorists.
Broadway Drive		37	16	43%	0.95	1.10	Project ID 6085-02-03 HSIP project in design and may mitigate these crash patterns.

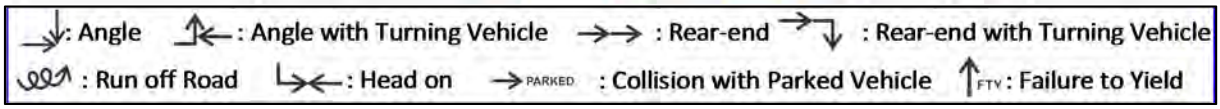
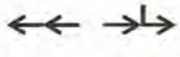
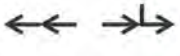
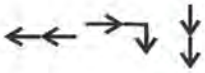


Table 44: Spot Crash Details (continued)

Intersection or Spot or Grouping	Primary Patterns[1]	Spot Crash Data[2]			Rate Range[4]		Notes
		Total # Crashes	Inj/ Fatal	% Injury or Fatality	Low	High	
US 151 Interchange		36	14	39%	n/a		High volume and queues may contribute.
Davison Drive		24	8	33%	0.66	0.66	High volume and queues may contribute.
Bird Street		32	6	19%	0.66	0.88	High volume and queues may contribute.
Between Bird Street and Bristol Street		20	9	45%	n/a		High volume, parking, visibility concerns may contribute.
Bristol Street / CTH N		12	0	0%	0.62	0.84	Unconventional 2-way stop control may contribute.
Bristol Street / Main St		20	2	10%	0.81	1.29	High volume and queues may contribute.
King Street		11	3	27%	0.42	0.43	Lack of awareness of intersection may contribute.
Church Street / Market Street		16	4	25%	0.62	0.68	Lack of awareness of intersection may contribute.
Linnerud Drive / Dewey Street		7	2	29%	0.28	0.31	Lack of awareness of intersection may contribute.
CTH N South/Grove Street		11	3	27%	0.40	0.49	Intersection at top of grade may contribute.

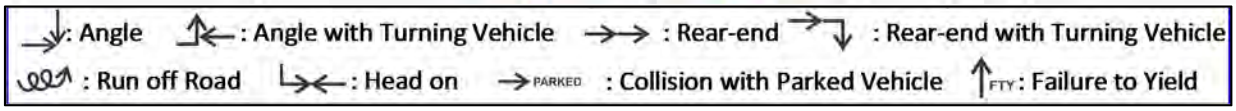


Table 45: Spot Crash Details (continued)

Intersection or Spot or Grouping	Primary Patterns[1]	Spot Crash Data[2]			Rate Range[4]		Notes
		Total # Crashes	Inj/ Fatal	% Injury or Fatality	Low	High	
Town Hall Drive		8	5	63%	0.50	0.50	Lack of awareness of intersection may contribute.
CTH VV		3	2	67%	0.19	0.19	Lack of awareness of intersection may contribute.
Curve at CTH VV		5	0	0%	n/a		Lack of awareness of curve may contribute.
Curve at Twin Lane Road		19	7	37%	n/a		Lack of awareness of curve may contribute.
Between Tennant Road and Prospector Lane		8	3	38%	n/a		Cluster of unancitipated access points may contribute.
CTH TT (Northbound)		5	2	40%	0.31	0.31	Lack of awareness of intersection may contribute.
Curve east of Lochinvars Trail		6	2	33%	n/a		Lack of awareness of curve may contribute.
WIS 73 SB/ Deerfield Road		7	3	43%	0.29	0.34	Lack of awareness of signalized intersection may contribute.
WIS 73 NB/ Hubbell Street		7	0	0%	0.28	0.34	Unancitipated left turning motorists may contribute.
Curve east of Box Elder Road		8	3	38%	n/a		Lack of awareness of curve may contribute.

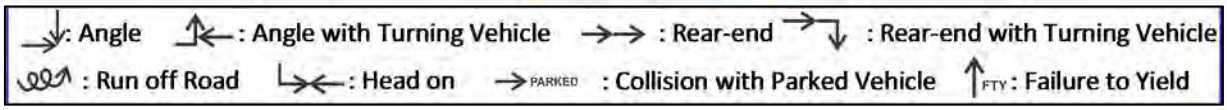
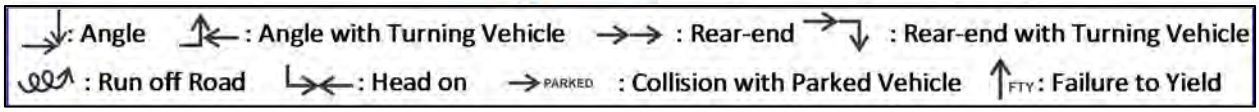


Table 46: Spot Crash Details (continued)

Intersection or Spot or Grouping	Primary Patterns[1]	Spot Crash Data[2]			Rate Range[4]		Notes
		Total # Crashes	Inj/ Fatal	% Injury or Fatality	Low	High	
WIS 89 / Monroe Street	Urban access related	9	0	0%	0.49	0.67	Lack of awareness of signalized intersection may contribute.



Notes

1. These are the most recognizable and predominant patterns but many other manners of crash exist. Blanks denote no discernable pattern.

2. These are the total crashes and severity indicators from 2009-2013.

3. Most recent AADT from the WisDOT coverage count program. If AADT is N/A, 300 vehicles per day is used for computations.

4. Rate is crashes per million entering vehicles for intersection locations. Low and high range is based on estimated range of entering vehicles. Low range includes mainline AADT only and high range includes mainline AADT plus 1/2 of the sidestreet AADT volume. Those crash rates greater than 1.0 are **bold red.**

As illustrated in the crash details tables, many locations throughout the study corridor have high incidences of crashes and specific crash patterns. Additional details related to certain safety areas are provided below.

Urban Areas

WIS 19 through Waunakee, Sun Prairie, Marshall, and Waterloo have many intersections, access driveways, pedestrian conflict areas, and parking that overall impact the safety of the highway. The relatively complex urban driving conditions, combined with relatively high commuting traffic volumes contribute to a large amount of conflict points and a relatively high frequency of crashes in all urban areas.

A lack of motorist-awareness of conflict points is contributing to the crash condition. Frequent parking, access driveway, and side street turning maneuvers all contribute to the frequency of crashes. No single location or maneuver is overwhelmingly contributing to this frequency.

There are three primary concerns contributing to the crash frequency in downtown urban areas.

1. High volume left turns through standing queues
2. Inadequate sight distance for side street motorists
3. Awareness of conflicts

Figure 34 shows a typical "downtown" condition (this example in Waunakee) where traffic queues build near access points to a commercial business. In this case motorists are tempted to turn across a standing queue to gain access to the gas station on the corner of Madison Street. This contributes to angle crashes.

Figure 35 illustrates the frequent challenge of a side street motorist trying to cross or enter WIS 19 from an urban area. This photo is in downtown Waunakee at Fish Street. Motorists are forced to 'inch forward' until they are nearly in the WIS 19 traffic before they can see if the right of way is clear. During peak hours this is difficult and often motorists will take risky chances with little visibility. Table 47 lists the urban intersections most likely to have this condition.

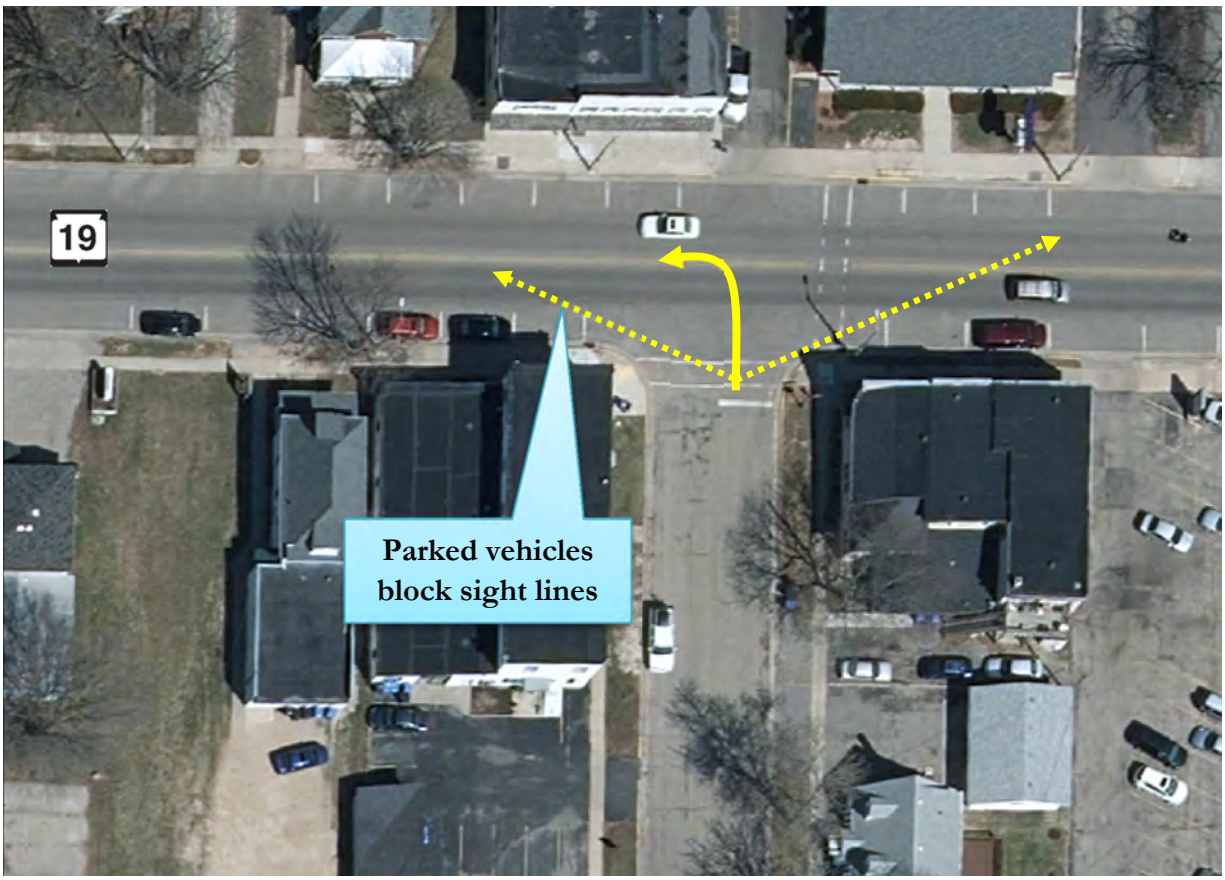
Table 47: Urban area intersections with stop control and sight challenges

Waunakee	Sun Prairie	Marshall	Waterloo
Fish Street	Angell Street	South Pardee Street	WIS 89/Monroe Street
Water Street	Cannery Square	Beebe Street	
Baker Street	Vine Street		
	Dewey Street		

Conflict awareness simply means in a conflict-rich environment, like those in downtown areas, motorist awareness and care needs to increase to ensure safe travel. Visual distraction is often the key element reducing motorists' awareness of conflicts. There are competing signage, lighting, buildings, pedestrians, landscaping, events, and destinations. All of these increase the complexity and required driver skill and contribute to higher crash frequency in these areas.

Figure 34: Left turn through standing queue

Figure 35: Left turn with challenging visibility



Pedestrian Safety

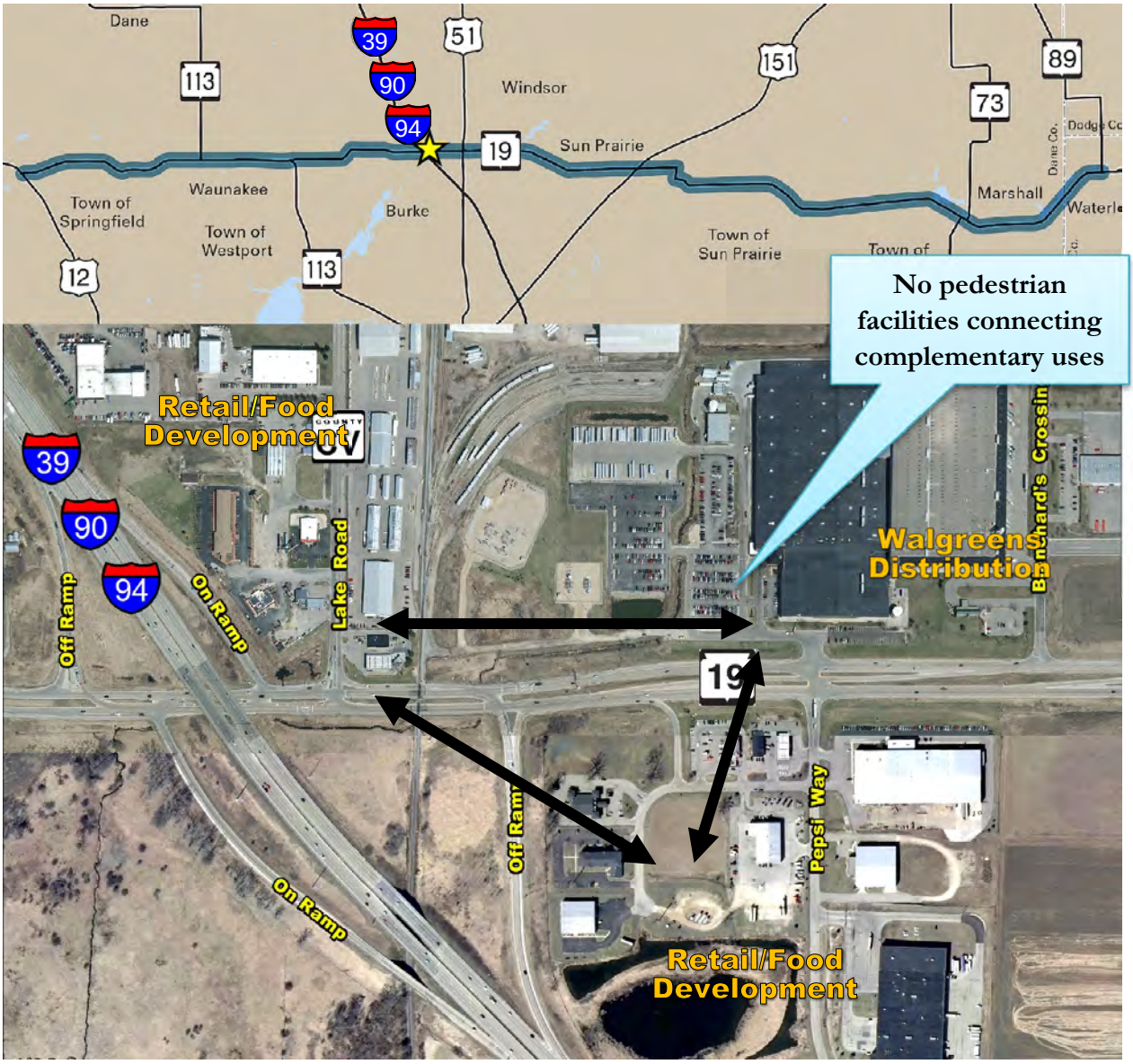
Pedestrian movements exist in all four urban areas of the study corridor including Waunakee, Sun Prairie, Marshall, and Waterloo. Throughout the corridor there have been 20 crashes involving pedestrians or bicyclists, all of which have been inside one of these municipal areas.

There are several areas in the study corridor that offer potential for pedestrian crossings that do not currently have adequate facilities to support those movements:

4. County CV to Pepsi Way corridor. This area has complementary land uses along and across WIS 19. Walgreens distribution, fast food restaurants, and retail gas station locations lead to pedestrian cross-traffic. No sidewalks or designated pedestrian crossing locations exist for these movements as illustrated on Figure 36.

5. County C/Grand Avenue on the west side of Sun Prairie. This area has residential and office property on the north side of WIS 19 and commercial property on the south side. These two complementary land uses do not have crossing facilities at the intersection. Refer to Figure 41 for details of the pedestrian facilities at this intersection.

Figure 36: County CV/Pepsi Way Development Area



Intersections / Roadways

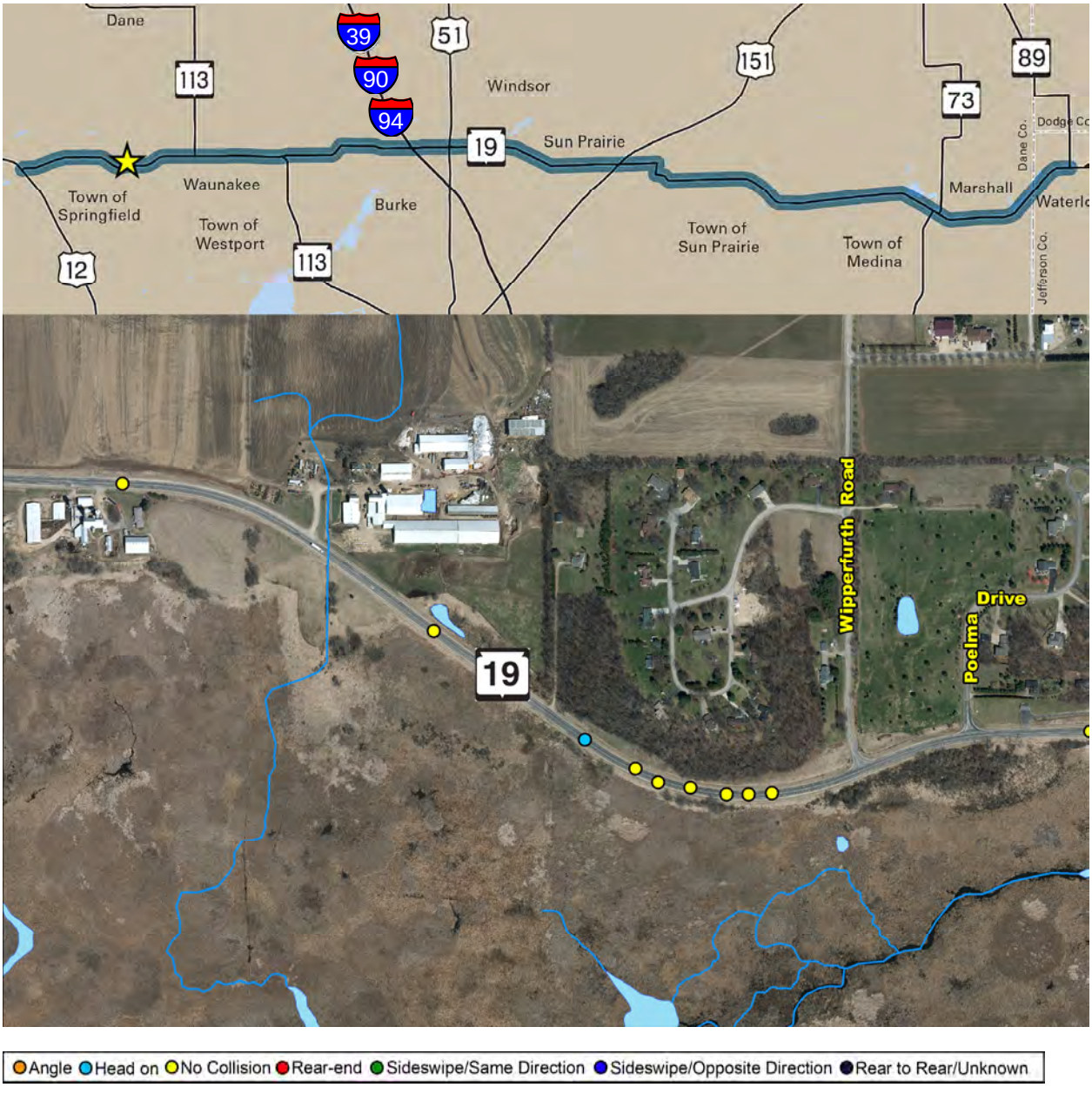
US 12 Intersection

US 12 is a high-volume high-speed commuting highway. Long vehicle queues develop during the peak hours on the WIS 19 approach to this signalized intersection and queue-failure is common. These failed queues increase the likelihood of rear end crashes because of the high number of unexpected stops and slowdowns that are created by a queue of dissipating vehicles.

Curve near Wipperfurth Road

The horizontal curve near Wipperfurth Road experiences a small cluster of crashes that represent motorists' failure to negotiate the curve. The curve has sufficient advanced warning signage and is not deficient for horizontal geometric standards but the crash history may indicate a lack of awareness of the curve. Figure 37 is a map showing the curve area. Each dot represents a reported crash location between 2009 and 2013. Refer to Exhibit 9 for a series of detailed maps of all crashes on the study corridor.

Figure 37: Wipperfurth Road Curve Area



WIS 113/County I Intersection

This intersection has historical safety concerns and is anticipated to be reconstructed as a roundabout in 2018 under project ID 5290-02-00.

Curves near Walter Drive

The set of horizontal curves near Walter Drive have led to numerous severe crashes. Both curves have deficient curve radius that likely contribute to the crashes and neither curve has advanced warning. Separate WisDOT Project ID 5290-02-06 is in progress to address the historical safety concern of these curves. Figure 38 is a map of the crash area with dots representing vehicle crashes between 2009 and 2013.

Figure 38: Walter Road Curve Concerns

I-39/90/94 Interchange/County CV area

The section of WIS 19 near I-39/90/94 and County CV is challenging for many reasons. Figure 39 is a map of this area showing the close spacing and multiple decision points. The following conditions all contribute to the crash history at the interchange area:

1. The southbound ramps are not aligned. Driver expectation has on and off ramp terminals in the same location. When ramp terminals are offset like this, driver awareness of potential conflicts reduces.

2. The southbound ramp terminal intersection, currently a stop control intersection on the ramp, is a high volume commuting intersection that has relatively long queues and high delay that likely contribute to motorist frustration and willingness to accept dangerously small gaps in traffic to enter WIS 19.

3. The ramp intersections and County CV combine to create 5 intersections within about 1600 feet. Closely spaced intersections, especially mixing interchange ramps with local roads, may cause motorist confusion and cause erratic and unexpected maneuvers. The short spacing between intersections also causes weaving concerns.

4. Lack of visible signal heads. The County CV and I-39/90/94 northbound ramp intersection both have mast arm signal heads that hang over the departures of the intersections, but given the failure-to-yield crash patterns and confusing cluster of intersections and railroad conflicts, lack of awareness of these signals appears relatively common. This lack of intersection awareness is a likely contributor to the failure-to-yield crashes.

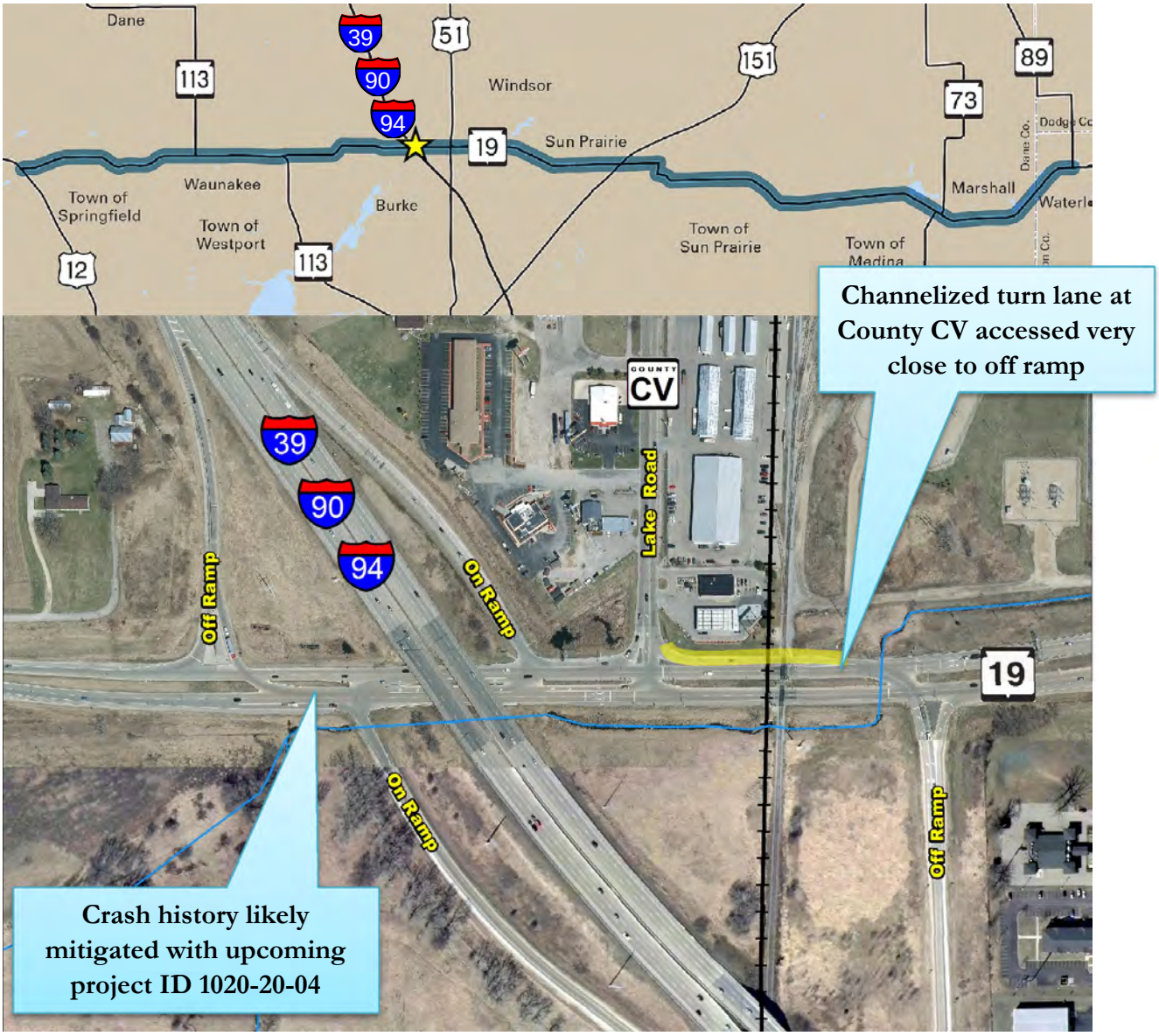
5. Location of the railroad crossing. The railroad crosses at grade through this cluster of intersections. Crossings occur at this location 1-2 times a day.

6. Westbound right turn channelized lane at County CV is accessed immediately west of the I-39/90/94 northbound off ramp. Left turning vehicles making the turn off the ramp (dual lefts) have little decision distance to get into that lane to make the turn onto County CV and often make that turn inappropriately from the "through" lane on WIS 19 after missing this turn lane bay.

Note: WisDOT is in-progress with the I-39/90/94 Study from Madison to Portage and the WIS 19 interchange area, including County CV, is within that study area. That study is investigating large scale conceptual improvements to this interchange area.[23]

[23] http://wisconsindot.gov/Pages/projects/by-region/sw/399094/default.aspx

Figure 39: I-39/90/94 Interchange Area



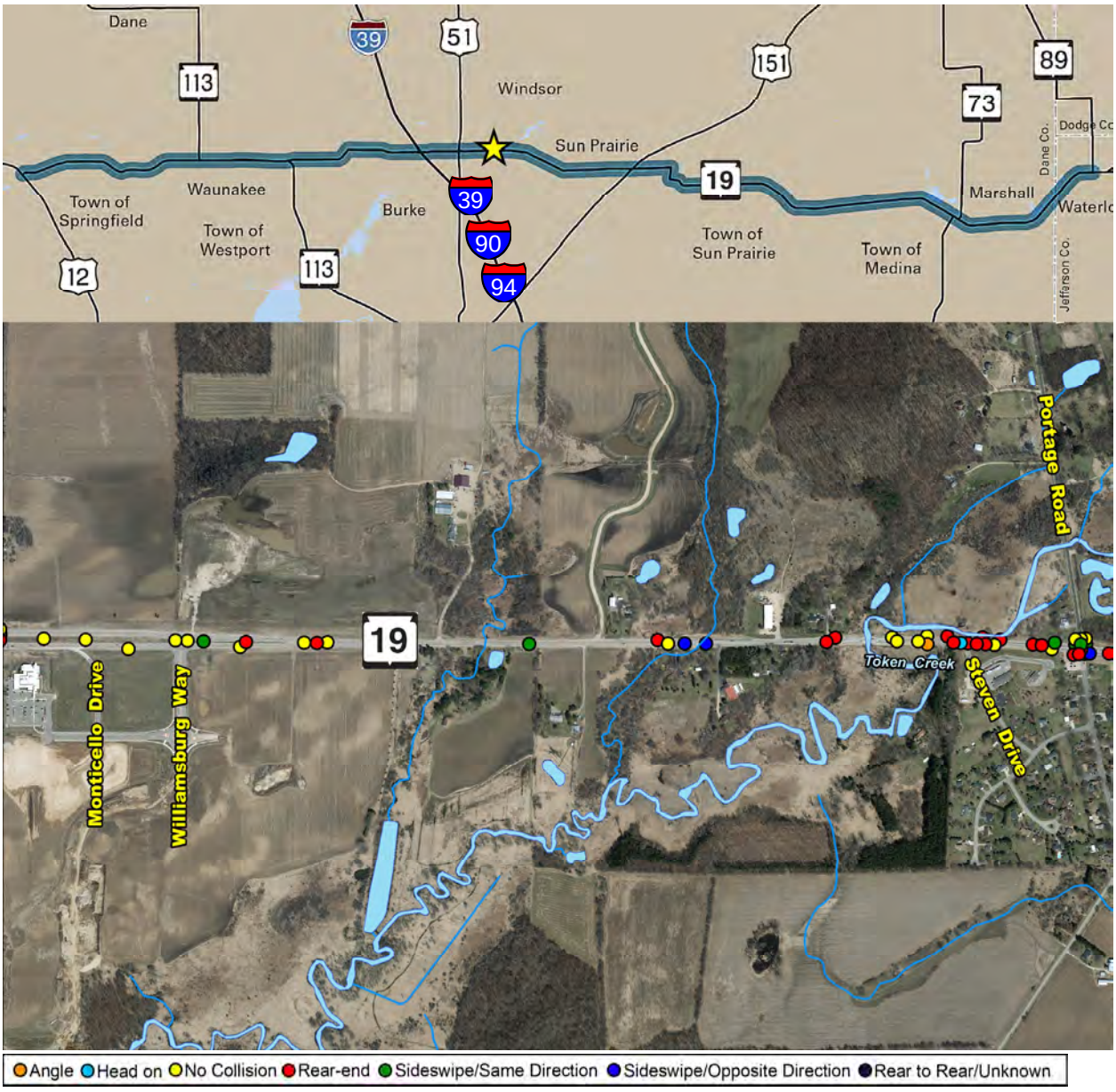
Section of highway between US 51 and Portage Road

This section of highway contains two river crossings and the 4-lane to 2-lane transition. Figure 40 is a map of this area with dots representing crashes between 2009 and 2013.

Highway transition areas typically have crash history similar to this area, primarily due to inattentive driving and the slight complexity of the 2-lane to 4-lane transition area.

The crashes at the east end of this figure near Steven Drive are related to traffic queues at Portage Road and potentially unexpected turns at Steven Drive.

Figure 40: US 51 to Portage Road Section



Westmount Drive

The primary safety concern at this intersection and cause of much of the crash history is the lack of dedicated left turn lanes on WIS 19. This intersection provides pseudo-bypass lanes for through travelers to bypass left turning motorists. While this is effective most of the

time, crash history at the intersection illustrate that these following motorists periodically are unaware of a stopped-turning-left vehicle in front of them and crash. Without requiring the turning vehicle to physically exit the through lane, this periodic crash condition exists.

WisDOT project ID 6085-02-02 is likely to install traffic signals and intersection improvements at this intersection in the near future. Much of the safety concern at this intersection will be mitigated by this project.

Grand Avenue/County C

This intersection does not have pedestrian crossing signal phases for crossing WIS 19.

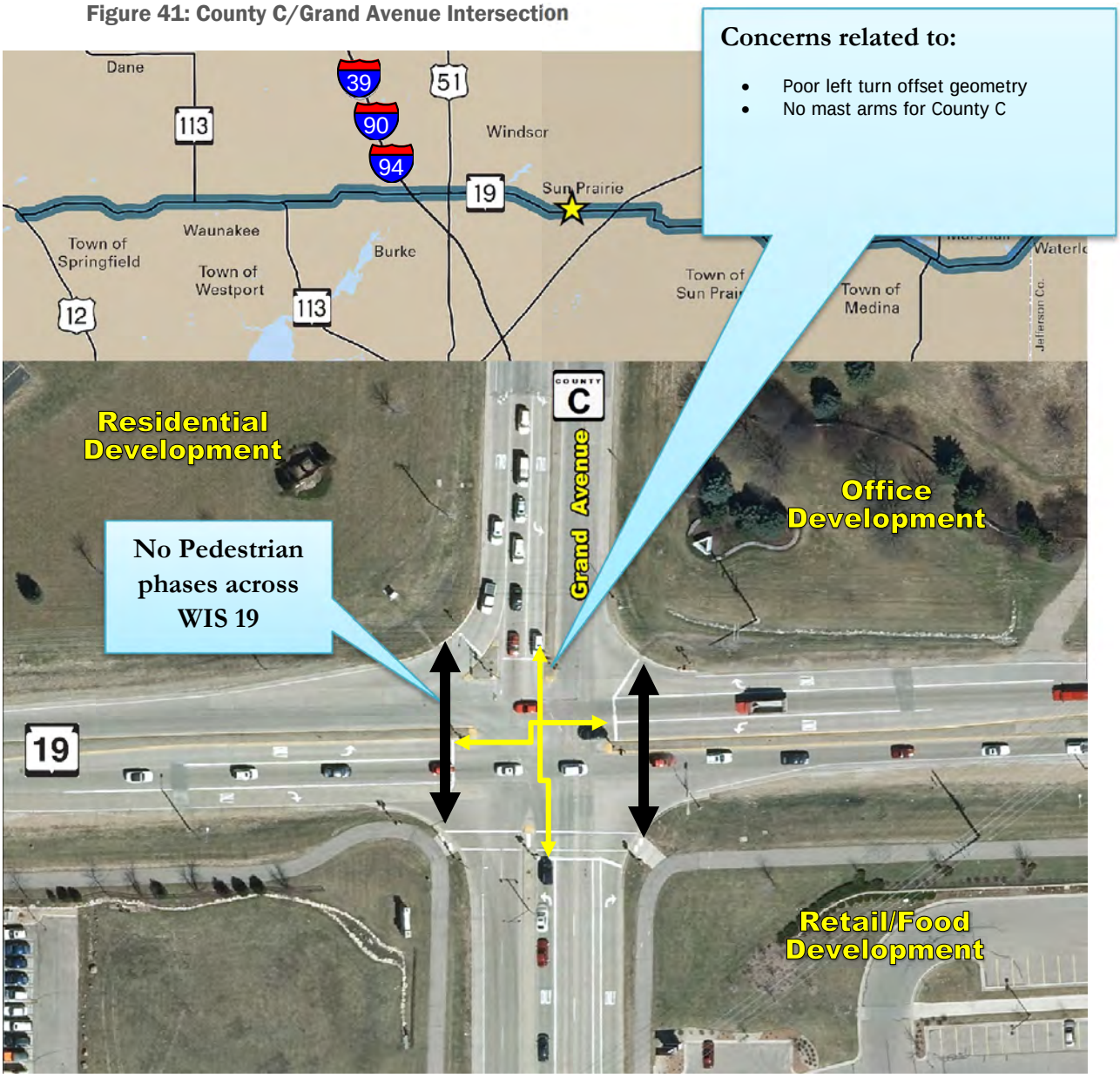
Three primary safety concerns exist at this intersection:

1. Opposing left turn lanes. Opposing left turn lanes on WIS 19 are negatively offset. This dramatically decreases the visibility for left turning vehicles and typically raises the crash frequency of these failed permissive left turn maneuvers.

2. Lack of visible signal heads. This intersection does not have mast arms or other signal equipment that hangs over the departures of the intersection for the County C approaches. This lack of intersection awareness is a likely contributor to the failure-to-yield crashes.

3. Peak hour queues. The intersection develops long vehicle queues during the peak hours and periodically queue-failures occur. These failed queues increase the likelihood of rear end crashes because of unexpected stops and slowdowns when a green phase is anticipated to last.

Figure 41: County C/Grand Avenue Intersection



Broadway Drive Intersection

Crash patterns at this intersection indicate failure to recognize stopped-left-turning vehicles. The intersection does not have WIS 19 left turn lanes and all turns are facilitated with a shared lane, either shared through-left or shared through-right. These shared lanes, especially the shared through-left, appear to result in frequent rear end crashes. Separate WisDOT Project ID 6085-02-03 is in progress to address this historical intersection safety concern.

US 151 Interchange

Crash patterns at this interchange suggest inconsistent signal phasing compared to most other regional interchanges. The most typical application is TTI-style phasing, indicating phasing that guarantees a green phase at the "second" of the two intersections a motorist

travels through at an interchange ramp pair. This interchange does not currently have TTI phasing and signal phasing at the downstream ramp intersection may not meet driver expectation. Figure 42 and Figure 43 show a frequent crash type at this interchange, most likely resulting from signal timing, interrupted queue dissipation, and queuing between the terminals.

Figure 42: US 151 Interchange Area

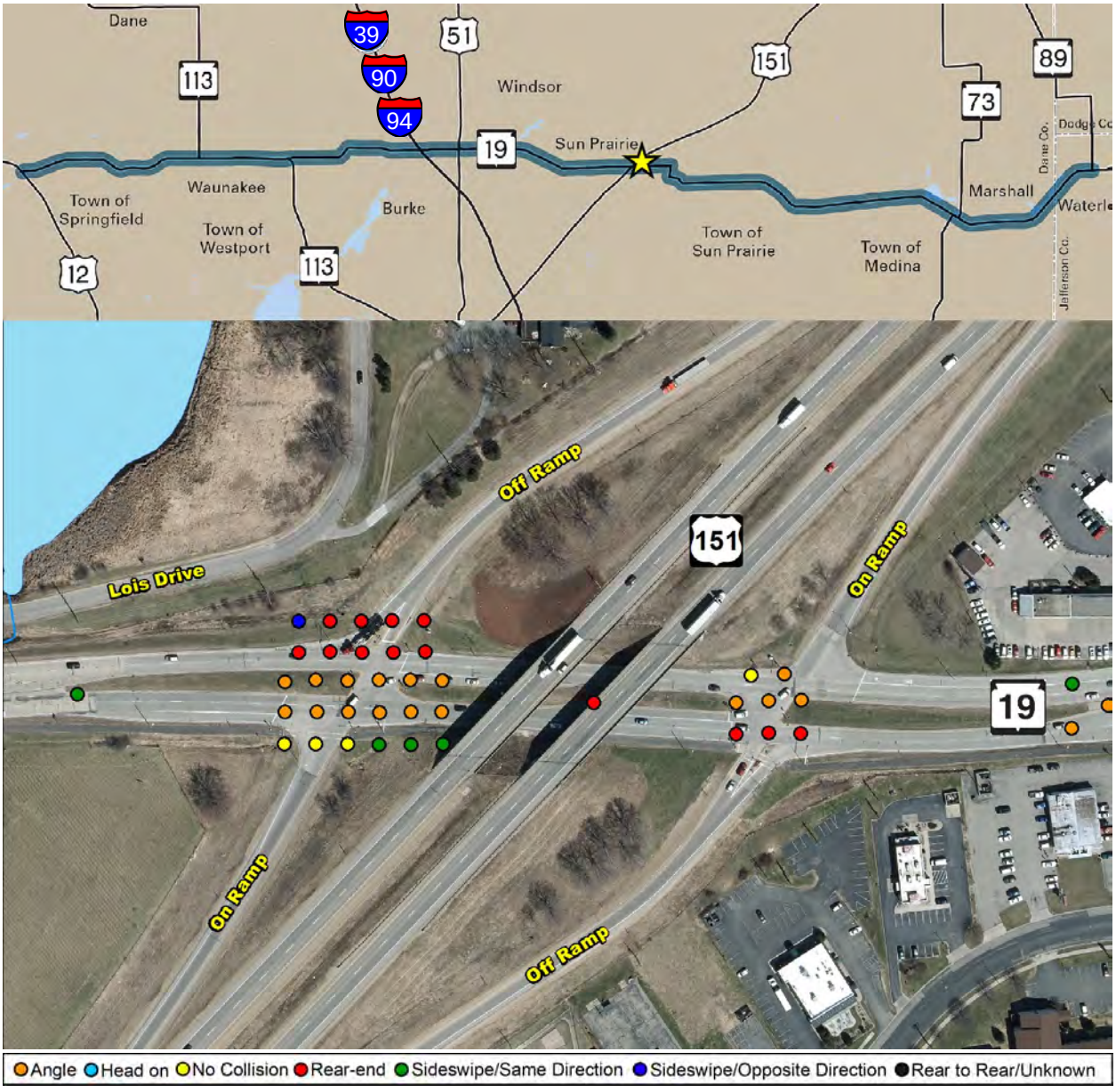
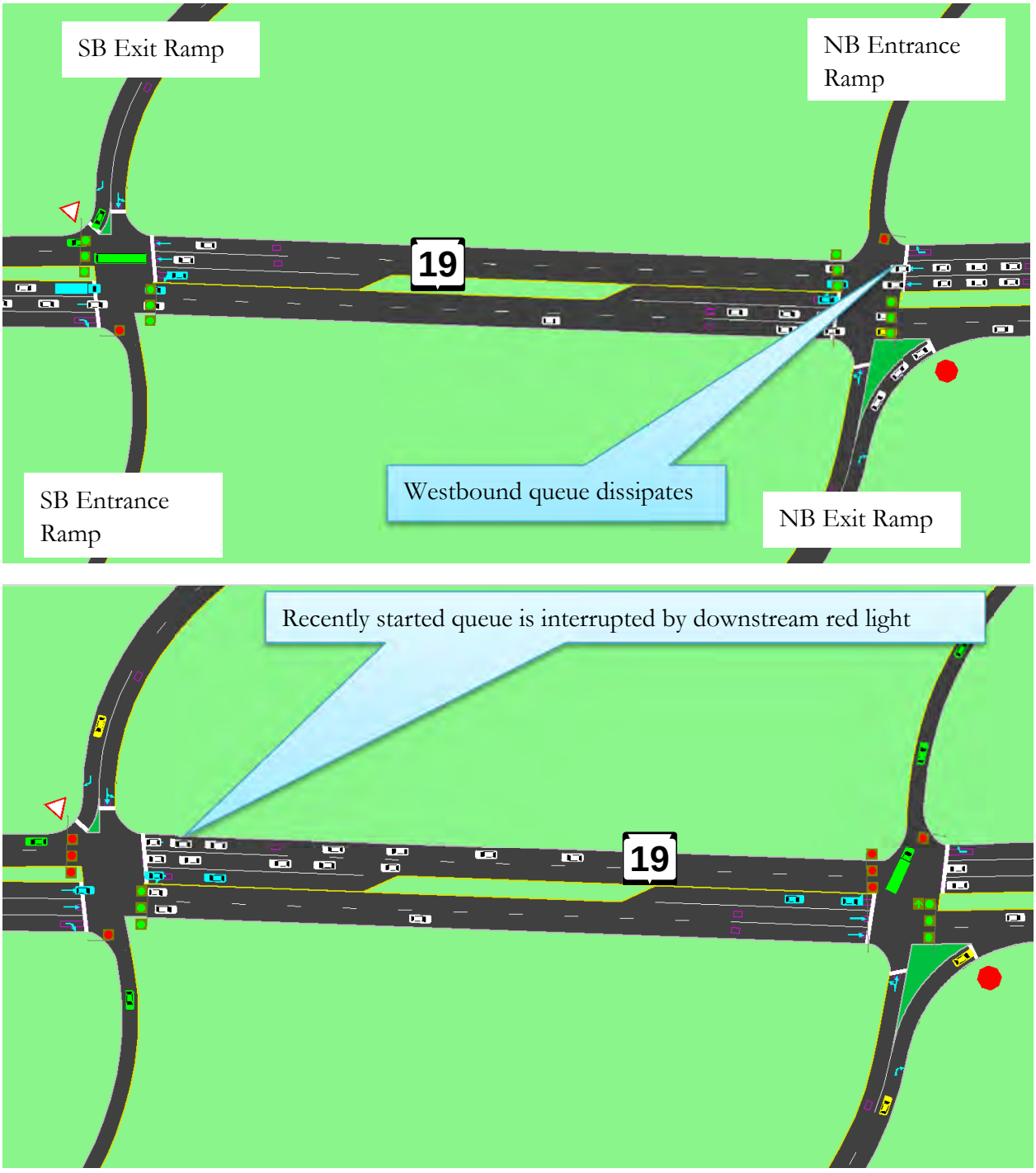


Figure 43: US 151 Queue Interruption



Bristol Street/Main Street

This downtown intersection represents typical concerns for any urban downtown condition. Limited visibility of conflicts due to buildings and parking cause many of the crashes. Two primary safety problems exist at this intersection:

1. Lack of visible signal heads. This intersection does not have mast arms or other signal equipment that hangs over the departures of the intersection. In a visual-rich environment like downtown Sun Prairie, the signal displays get overlooked. This likely contributes to the rear end crash history at the intersection. Figure 44 is a photo of this approach, note the difficulty seeing signal heads approaching the intersection.

2. Lack of left turn lanes. All left turn maneuvers occur in a shared through lane. This condition inevitably leads to rear end collisions from drivers unaware the vehicle in front of them is slowing to turn left.

Figure 44: Signal Head Visibility Approaching Main Street/Bristol Street

Town Hall Drive

Town Hall Drive suffers from being the 'urban fringe' intersection. This intersection is just east of the real transition from urban to rural high-speed. Intersections in this location are often subject to higher frequency of crashes due to a lack of awareness from motorists when transitioning from slower speed urban to higher speed rural areas.

The intersection has sufficient design standards.

County VV

This intersection has a low crash frequency but since it is a high-speed condition many of the crashes that have occurred resulted in injuries. The intersection has sufficient design standards but most likely the intersection, located on a curve, is unexpected by some motorists.

Curve near Twin Lane Road

Twin Lane Road intersections WIS 19 on a curve. This curve and intersection area has a history of injury crashes. The curve is not deficient for horizontal geometric standards but the crash history may indicate a lack of awareness of the curve. No advanced warning of the curve or intersection with Twin Lane Road exists.

Figure 45: Twin Lane Road curve area

Curve East of Lochinvars Trail

This curve area has a history of injury crashes. The curve is not deficient for horizontal geometric standards but the crash history may indicate a lack of awareness of the curve.

Figure 46: Lochinvars Trail Curve Area

Box Elder Road Curve Area

This curve area has a history of injury crashes. The curve is not deficient for horizontal geometric standards but the crash history may indicate a lack of awareness of the curve. Weather is a contributing factor to the crashes.

Figure 47: Box Elder Road Curve Area

4 Land Use and Community Character

The following section presents an overview of planning policies for each local government along WIS 19 within the study area. Sections 4.1-4.15 focus on land use and Section 4.16 addresses bike and pedestrian plan coordination. The majority of this information is derived from each community's locally adopted comprehensive land use plan. Although some planning documents such as park and open space plans and farmland preservation plans are referenced as standalone documents in this section, typically these plans are amended into, and consistent with comprehensive plans. Summary details include existing land use, zoning regulations, future land use, and other relevant transportation policies. The plans that were referenced are shown in Table 48 below.

Refer to Appendix D for municipal comprehensive plans, land use maps, and "Planned Growth Area" maps of the DeForest, Sun Prairie, and Waunakee areas.

Table 48: Existing Planning Documents for Local Governments along WIS 19 [24] [25]

Jurisdiction	Plan Category				Plan (Date)
	Comprehensive Plan (CP)	Zoning (Z)	Bicycle/ Pedestrian (B/P)	Miscellaneous (M)	
Town of Springfield	X		X	X	CP: Springfield CP[26] (Adopted 2002, as amended 2007)
					B/P: Bicycle Map (2014)
					M: Springfield/C. of Middleton Intergovernmental Agreement (2004)
Town of Westport	X		X		CP: Westport CP (2004)
					B/P: Bicycle Map (2014)
Village of Windsor	X		X		CP: Windsor CP (Adopted 2005, as amended 2011)
					B/P: Bicycle Map (2014)
Town of Burke	X		X		CP: Burke CP (2013)
					B/P: Bicycle Map (2014)
Town of Sun Prairie	X	X			CP: T. of Sun Prairie (Adopted 2003, as amended 2011)
					Z: Zoning Map (2011)
					B/P: Bicycle Map (2014)
	X	X	X		CP: Medina CP (2008)

[24] If plans were amended, only the most recent amendment date is noted in Table 48.
[25] Zoning Maps for the Towns of Springfield, Westport, Windsor and Burke were viewed online at https://dcimapapps.countyofdane.com/dcmapviewer/
[26] An update of this plan is currently under development by the Town. As of date of this report it was yet to be adopted.

Jurisdiction	Plan Category				Plan (Date)
	Comprehensive Plan (CP)	Zoning (Z)	Bicycle/ Pedestrian (B/P)	Miscellaneous (M)	
Town of Medina					Z: Zoning Map (2010)
					B/P: Bicycle Map (2014)
Village of Waunakee	X	X	X	X	CP: Waunakee CP (Adopted 2003, as amended 2007), Waunakee Westport Joint Planning Area CP (Adopted 2003, as amended 2011)
					Z: Zoning Code and Map, Extraterritorial Zoning Map (2010)
					B/P: Waunakee Westport Bicycle and Pedestrian Plan (2005)
					M: Waunakee Westport Boundary Stipulation (Adopted 1996, as amended 1998) Comprehensive Park and Open Space Plan (2009)
Village of DeForest	X	X		X	CP: DeForest CP (Adopted 2015)
					Z: Zoning Map (2013), Zoning Code (2014)
					M: DeForest/Burke/C. Sun Prairie/C. Madison Cooperative Plan (2007), DeForest/Windsor Cooperative Plan (2010), DeForest/Windsor/C. Sun Prairie Cooperative Plan (2012), North Yahara Future Urban Development Area Planning [FUDA Study] (2012), Safe Routes to School Plan, Park and Open Space Plan (2015)
Village of Marshall	X	X		X	CP: Marshall CP (Adopted 2002, as amended 2011)
					Z: Zoning Map (2010), Zoning Ordinance, Extraterritorial Zoning Plan (2010), Extraterritorial Zoning Ordinance (2011)
					M: Comprehensive Outdoor Recreation Plan (2013)
City of Sun Prairie	X	X	X	X	CP: C. of Sun Prairie CP (2009)
					Z: Zoning Map (2014), Zoning Ordinance, Extraterritorial Zoning Map with Windsor (2014), Sun Prairie-Windsor Extraterritorial Zoning Ordinance
					B/P: Bicycle Routes Map (2013)
					M: Business District Revitalization Plan (2001), Westside Neighborhood

Jurisdiction	Plan Category				Plan (Date)
	Comprehensive Plan (CP)	Zoning (Z)	Bicycle/ Pedestrian (B/P)	Miscellaneous (M)	
					Plan (Adopted 2003, as amended 2006), Downtown Plan Phase II (2004), Safe Routes to School Plan (2008), Parks and Open Space Plan (2009)
Dane County	X	X		X	CP: Dane County CP (2007)
					Z: Zoning Code and Zoning Maps
					M: North Mendota Parkway Alternative Study (2003), Snowmobile Map (2011), Environmental and Resource Protection Corridors Map (2012), Farmland Preservation Plan (2012), Parks and Open Space Plan (2012)
Madison Area MPO			X	X	B/P: Bicycle Transportation Plan (2015)
					M: Regional Transportation Plan 2035 (2012), Transportation Improvement Program (2015), WIS 19/113 Access Study Preservation, Population 2035
CARPC				X	M: Environmental Corridors, Urban Service Area and Limited Service Area Maps
City of Waterloo	X	X		X	CP: Waterloo CP (2008)
					Z: Zoning Code, Zoning Map
					M: Comprehensive Outdoor Recreation Plan (2011)
Jefferson County	X	X		X	CP: Jefferson County CP (2012)
					Z: Zoning Code, Zoning Maps
					B/P: Bicycle Plan (2010), Bicycle Map (2012)
					M: Agricultural Preservation Plan (2012), Snowmobile Map (2012), Parks, Recreation and Open Space Plan (2013)

4.1 Madison Area Metropolitan Planning Organization (MPO)

The Madison Area MPO has several active plan and program documents. These documents include Regional Transportation Plan 2035, Transportation Improvement Program, Bicycle Transportation Plan[27], WIS 19/113 Access Study Presentation and Population 2035.

[27] Discussed in Section 4.16

The MPO's long range plan, Regional Transportation Plan 2035, map shows WIS 19 as a congested arterial roadway (from Waunakee to the city of Sun Prairie). To improve conditions on the roadway, the Transportation Improvement Program (TIP), (which includes programmed projects over the next 5-year period), lists several projects along WIS 19 including: improvements at Broadway Drive Intersection, bridge replacement and expanded roadway at River Road to I-39/90/94, reconstruction/reconfiguration or intersection of WIS 19, 113, and County I, and resurfacing from WIS 78 to US 12. The TIP only includes projects that will be constructed within the new four years.

4.2 Capital Area Regional Planning Commission (CARPC)

CARPC serves as the regional planning entity for the Dane County region, consistent with §66.0309, Wis. Stats. As the regional planning entity, CARPC is responsible for preparing and adopting a master plan for the physical development of the region with consideration to the impact land use has on water quality.

CARPC has several maps which are relevant to the planning area; Environmental Corridors, Urban Service Area, and Limited Service Area Maps.

These maps list several important features which are relevant to WIS 19; public lands, wetlands, and 100 year floodplains. There is existing public land adjacent to WIS 19 near County C, at the intersection of WIS 19 and Schumacher Road, between WIS 19 and Easy Street; wetland and 100 year flood plan at the intersection of WIS 19 and Portage Road, near WIS 19 and Cherry Lane, the intersection of WIS 19 and WIS 73, along WIS 19 in Waunakee, and along WIS 19/Main Street in Marshall; and wetland between WIS 19 and County T.

4.3 Dane County

Dane County has many active plan documents and maps. In addition to a Comprehensive Plan, the County has a Planned Land Use Map, an Environmental and Resource Protection Corridors Map, Farmland Preservation Plan, Zoning Code/Map, Parks and Open Space Plan, Snowmobile Map, and North Mendota Parkway Alternatives Study.

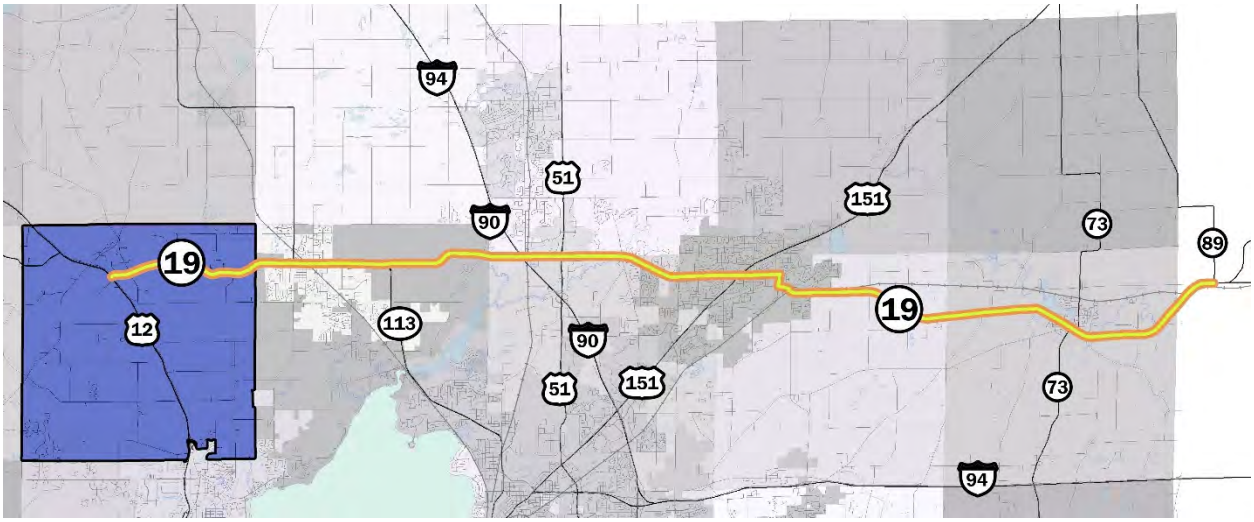
According to the County's Future Land Use Plan and Farmland Preservation Plan, the portion of WIS 19 that passes through Dane County is either in agricultural preservation, agricultural transition, or resource protection corridor, excluding land that is considered within village and city planning areas. This is consistent with the County Zoning as most of the land surrounding WIS 19 is zoned agricultural. It is likely most of this land will continue to be agricultural in the future.

4.4 Jefferson County

Jefferson County has several active plan documents and maps. In addition to the Comprehensive Plan there is a Zoning Code/Map, Parks, Recreation and Open Space Plan, Agricultural Preservation Plan, and Bicycle Plan and Map[28].

Nearly all of the property adjacent to WIS 19 within the project corridor in Jefferson County that is under the County's zoning ordinance is zoned agricultural and is planned as Farmland Preservation Area.

4.5 Town of Springfield



The town of Springfield has several active planning documents. In addition to its Comprehensive Plan, the town has an Intergovernmental Agreement with the city of Middleton, is included in Dane County's Bicycle Map[29], and is under jurisdiction of Dane County's Rural Zoning Ordinances.

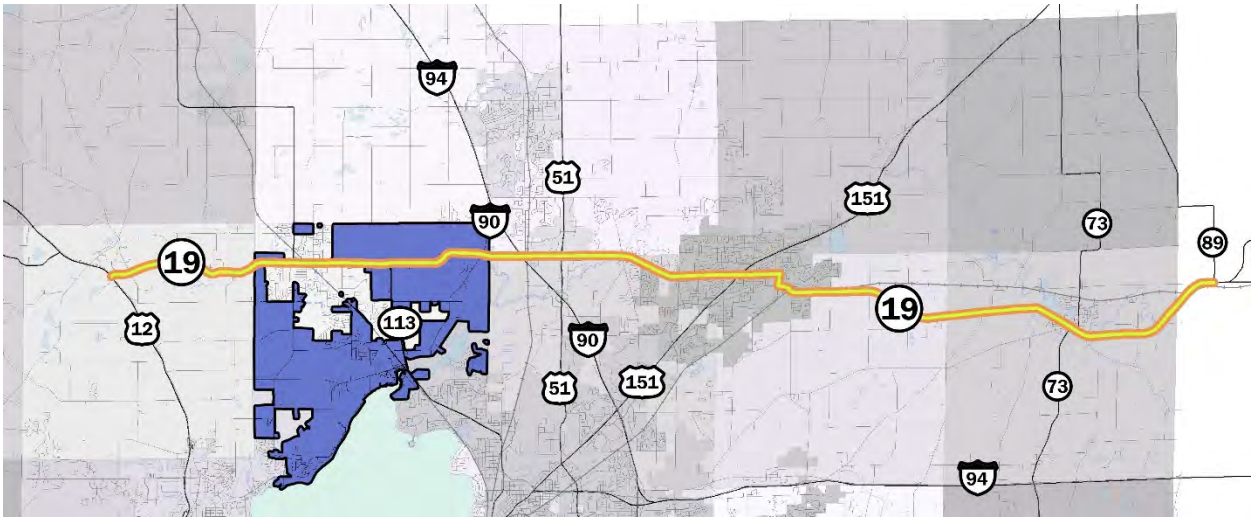
The center of activity in the town of Springfield is a community called Springfield Corners which is located at the intersection of US 12, County P and WIS 19. The Comprehensive Plan recommends preserving this area as the town's center which is reflected in the planned land use map. The majority of properties adjacent to WIS 19 are either planned for Agricultural Preservation District or Conservancy District (identified as the Waunakee Marsh State Wildlife Area), though there are several pockets of Agricultural Transition District and Rural Development District along WIS 19. The Comprehensive Plan for Springfield denotes the WIS 19 and Lodi-Springfield Road intersection as a growth edge to the east and south of Springfield which is consistent with the zoning map.

[28] Discussed in Section 4.16

[29] Discussed in Section 4.16

The Springfield Comprehensive Plan expresses the community's concern with the increasing amount of traffic on WIS 19 through Waunakee and suggests that if WIS 19 were enlarged for safety and volume concerns, it could negatively impact the rural character of the town. To minimize impacts on landowners and the farming community, the Comprehensive Plan recommends a required minimum setback for all buildings, parking, signs and other improvements of at least 50 feet along WIS 19 right of way. The Springfield Comprehensive Plan also recommends working with WisDOT, Waunakee, and Westport to address issues associated with increasing traffic on WIS 19.

4.6 Town of Westport



The town of Westport has a Comprehensive Plan, and is included in the Dane County Bicycle Map[30]. The town is under jurisdiction of the Dane County Rural Zoning Ordinances.

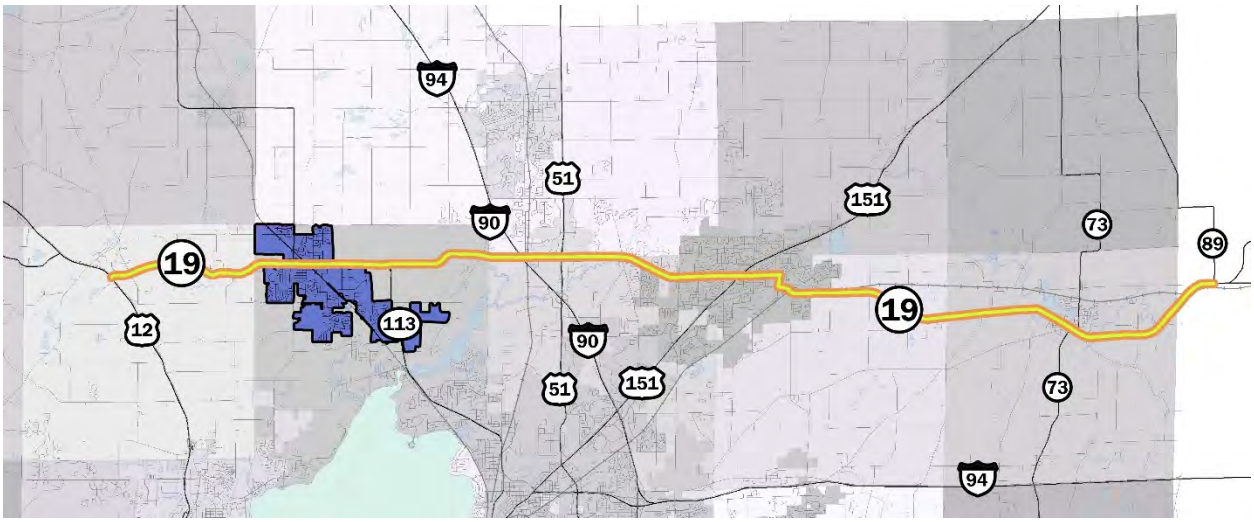
The Transportation Element of the Comprehensive Plan recommends the town work with WisDOT to upgrade the intersection of WIS 19, WIS 113 and County I to improve the overall safety of the area. A majority of property along WIS 19 is proposed to be used for agriculture. There is property at the WIS 19/WIS 113 intersections that is proposed to be used for a future business park and also land for a potential school site. Today these sites still appear to be used primarily for farmland, though a business park at one or both of the recommended sites may become an attractive option when improvements are made to WIS 19.

The town of Westport Comprehensive Plan desires a focus on multimodal transportation and encourages the development of alternative transportation throughout the community to reduce demand on its existing roadways. This includes supporting the development of a

[30] Discussed in Section 4.16

North Mendota Parkway to carry regional traffic away from neighborhoods and environmentally sensitive areas.

4.7 Village of Waunakee



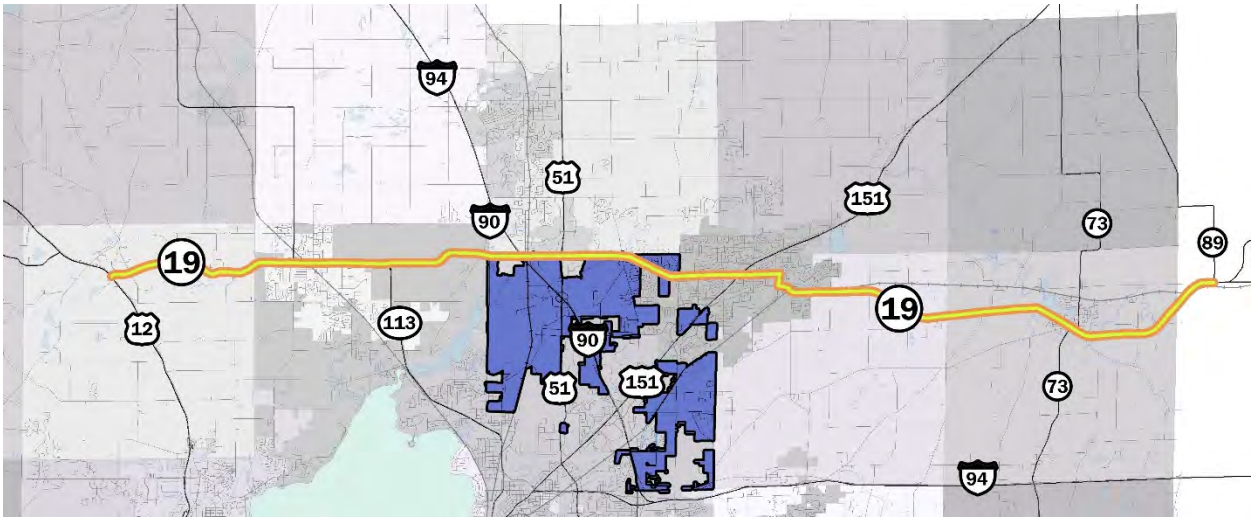
The village of Waunakee has a number of active plan documents, maps and reports. Along with the Comprehensive Plan there is a Zoning Code/Map, Extraterritorial Zoning Map, and Comprehensive Park and Open Space Plan. The village also worked with the town of Westport to develop a boundary agreement, Joint Planning Area Comprehensive Plan, and Bicycle and Pedestrian Plan[31].

WIS 19 is Main Street for Waunakee, which runs through Downtown Waunakee. Since WIS 19 is the only east-west through street in Waunakee, it carries a great amount of local as well as through-traffic, and suffers from poor traffic movement and congestion. Planned land use along WIS 19 is a mix of Business Park, community residential, rural preservation and central business district. This is consistent with zoning along WIS 19 which includes residential, commercial district, conservancy district and industrial.

The business park for the village, Waunakee Business Park, has frontage on WIS 19 on the east side of the community. Waunakee plans to expand the Business Park, especially if there are improvements made where WIS 19 intersects WIS 113. The Village wishes to promote the intersection near WIS 19/113 as an "economic development zone" for new nonretail business and light industrial development. In 2003 the village joined with the town of Westport to create a Joint Planning Area Comprehensive Plan which also reiterates the goal of an "economic development zone" near WIS 19/113. Current zoning is consistent with this planned use.

[31] Discussed in Section 4.16

4.8 Town of Burke

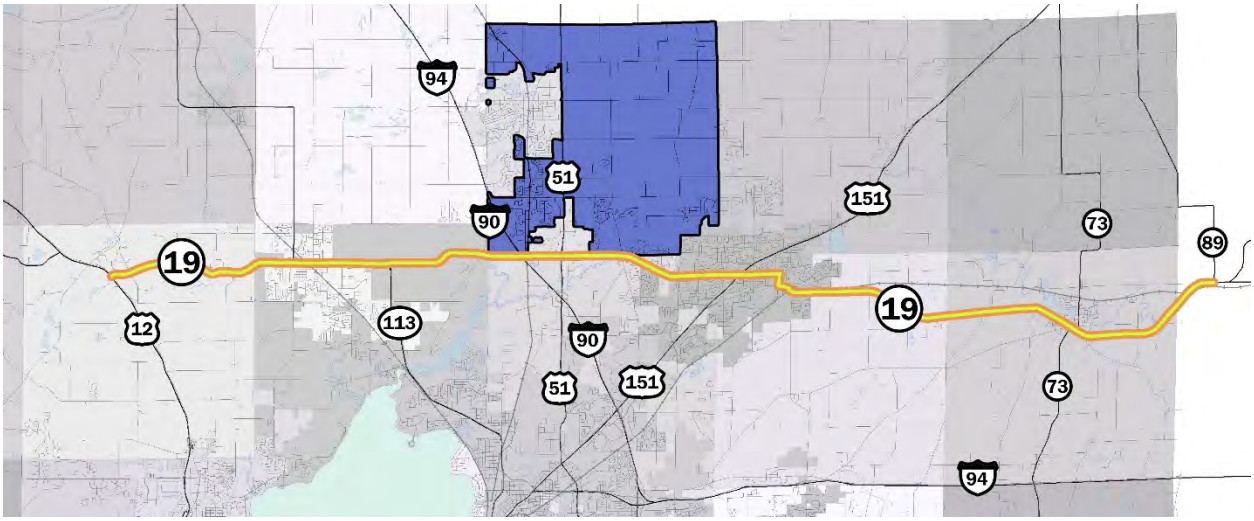


The town of Burke has a Comprehensive Plan and is included in the Dane County Bicycle Map[32]. The town is under jurisdiction of the Dane County Rural Zoning Ordinances.

The town is bordered on the north by WIS 19. The properties adjacent to WIS 19, between US 51 and I-39/90/94 are planned for Commercial Retail and Services and Industrial/Business, though currently they are zoned agricultural. It is likely that once sufficient growth and infrastructure are in place to support this development, the area will be upzoned for business development. The land to the east of US 51 and adjacent to WIS 19 is primarily planned for agriculture and rural residential. This is consistent with the existing zoning which is primarily agricultural, with single family residences as an allowed use. Since a majority of the town is zoned agricultural, most properties would require a zoning change for substantial development to occur. The town does not envision long-term agricultural preservation in any part of the town; in the future Burke will be absorbed into the village of DeForest and the cities of Madison and Sun Prairie.

[32] Discussed in Section 4.16

4.9 Village of Windsor



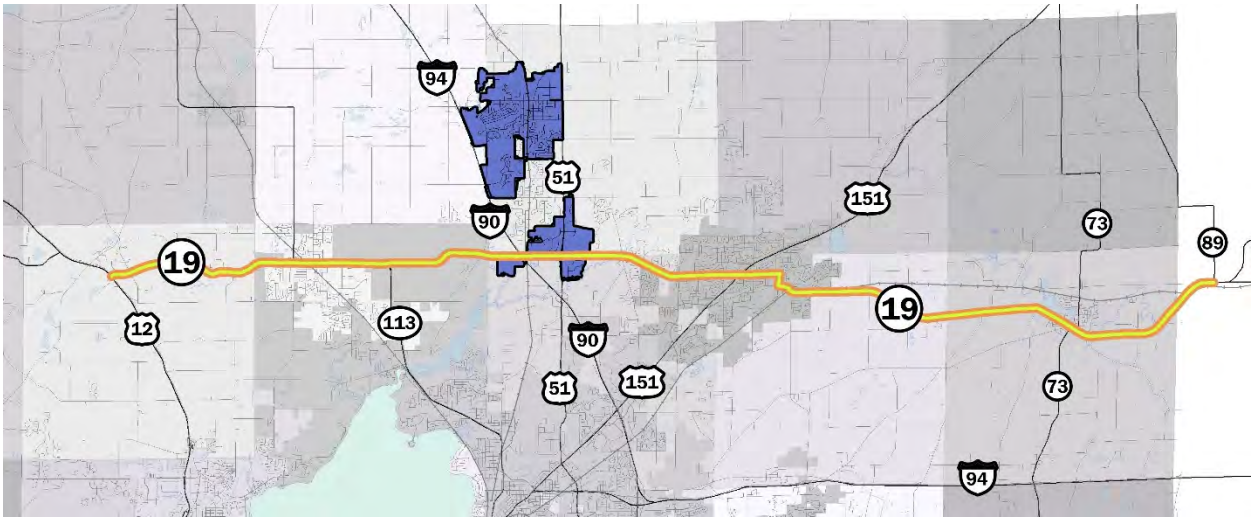
The village of Windsor has a Comprehensive Plan, is included in the Dane County Bicycle Map[33], and is under jurisdiction of Dane County's Rural Zoning Ordinances. The village of Windsor became and incorporated village in November 2015.

WIS 19 bounds the village of Windsor on the south side. A majority of the land adjacent to WIS 19 is planned for agricultural use. Most of the land which is zoned "exclusive agriculture" south of Windsor Road and north of WIS 19 is planned to be developed within the next 20 years. The exception to this is the land that is directly to the east of I-39/90/94 which is planned for regional commercial and will be annexed to the village of DeForest upon development. The current zoning on this land also promotes commercial use. Property in this location is desirable for distribution centers and is currently home to a number of national firms. The land that is to the west of I-39/90/94 is zoned as agricultural land though it is planned for regional commercial. In the future it is possible that the zoning could be amended to allow for more intensive uses if this portion of the Comprehensive Plan is carried out. One of the goals in the village of Windsor Comprehensive Plan is to expand regional commercial opportunities around the I-39/90/94 and WIS 19 intersection. If WIS 19 were improved this could expand the existing commercial area.

Since the Comprehensive Plan for the village of Windsor was adopted, a majority of the land adjacent to WIS 19 and near I-39/90/94 has been annexed to DeForest as was planned. The village of DeForest Comprehensive Plan also desires to expand its industrial/business park south of WIS 19 to I-39/90/94. Each year DeForest annexes more land in this area based on their need for additional commercial space.

[33] Discussed in Section 4.16

4.10 Village of DeForest



The village of DeForest has a number of active plan documents, maps and reports. The Village has a Comprehensive Plan, Future Urban Development Area Study, Safe Routes to School Plan, Park and Open Space Plan, Zoning Code/Map, as well as several boundary agreements with nearby communities.

Most property in DeForest near WIS 19 is planned for commercial, industrial/business park and planned mixed use. This is consistent with zoning which is industrial, planned unit development and business district. There is some property adjacent to WIS 19 and US 51 that is zoned agricultural and will likely be upzoned to accommodate future development.

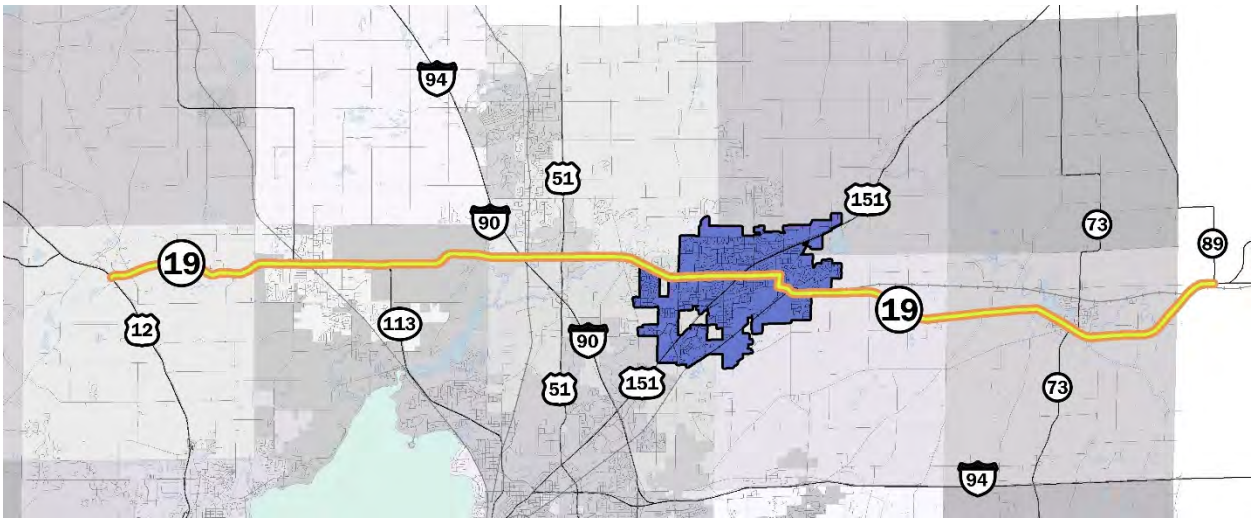
The intersection of US 51 and WIS 19 is one of the primary entryways into DeForest which makes development of this corridor particularly important to the village. The Comprehensive Plan for the village of DeForest envisions a land use mix surrounding this intersection that is open to regional commercial opportunities. With the development of two medical clinics and a group living facility nearby, the village sees potential for developing a "wellness district" in this area.

The village has several business parks which are adjacent to WIS 19. North Towne Corporate Park is a private industrial park that spans the village of DeForest and village of Windsor. The business park is home to warehousing and distribution facilities. It has additional land that is slated for regional commercial development. North Towne Trails Commercial Park is north of WIS 19 and east of US 51 and has sites available for office, retail, restaurant, hotels and other commercial services. Savannah Brooks is south of WIS 19 and east of US 51. These sites are planned for mixed use with commercial uses closest to the highways. Meriter located a healthcare clinic in Savannah Brooks in 2010.

To the east of US 51, beyond the suggested commercial development, there is a designated Stewardship area and some existing developed land; minimal growth is planned in this area. The Comprehensive Plan for the village of DeForest also shows that to the north of WIS 19

and west of I-39/90/94 future land use is commercial and mixed use. To the south of this side of I-39/90/94 there is a Stewardship Area which is not recommended for development.

4.11 City of Sun Prairie



The city of Sun Prairie has numerous active plan documents and maps. These include a Comprehensive Plan, Zoning Code/Map, Westside Neighborhood Plan, Business District Revitalization Plan, Downtown Plan Phase II, Safe Routes to School Plan[34], Parks and Open Space Plan, Bicycle Routes Map[35], and an Extraterritorial Zoning Ordinance and Map with the village of Windsor.

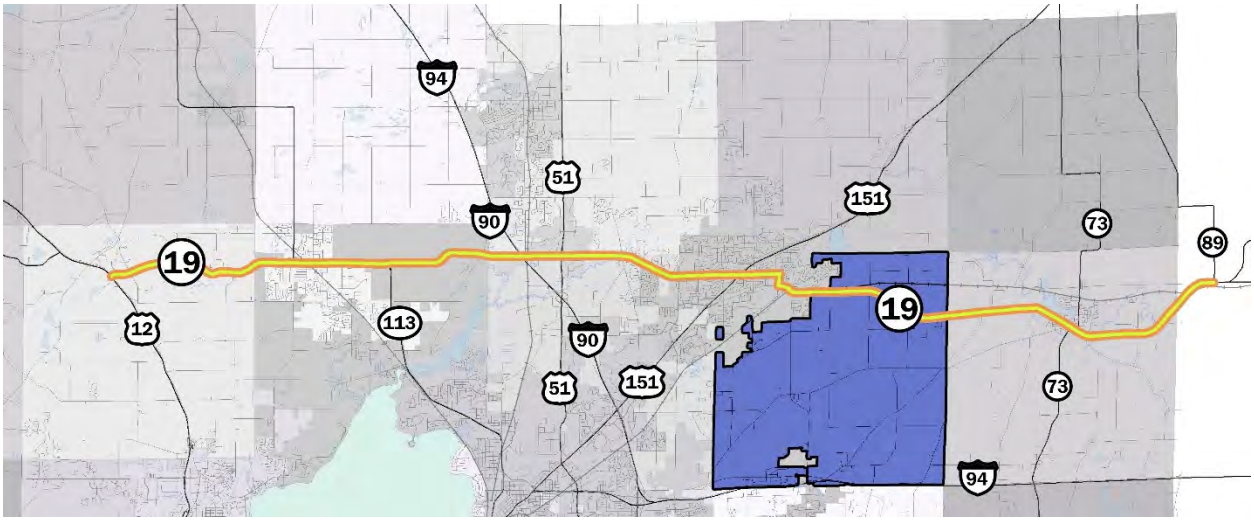
There is a mix of desired future uses along WIS 19, also the Main Street for the city of Sun Prairie, including residential, mixed use, and commercial. This is consistent with the Sun Prairie zoning map where most properties are zoned as residential, planned development, and commercial. High quality development along WIS 19 is important to Sun Prairie as it one of the key entry corridors into the community. The City does anticipate that it will continue growing in the future. Outside of city limits to the east, Sun Prairie has designated this area as a future neighborhood planning area. This is consistent with the existing zoning map.

The city wishes to target economic development efforts to the US 151/WIS 19 area, including the retail commercial district east of the interchange, as well as the vacant land and buildings in the Communications Drive area west of the interchange. This "Windsor Street Interchange" area is considered an important redevelopment area in the city. The existing zoning map is consistent with the City Comprehensive Plan; this area is a mix of suburban office, urban commercial, residential and is in a business district overlay.

[34] Discussed in Section 4.16

[35] Discussed in Section 4.16

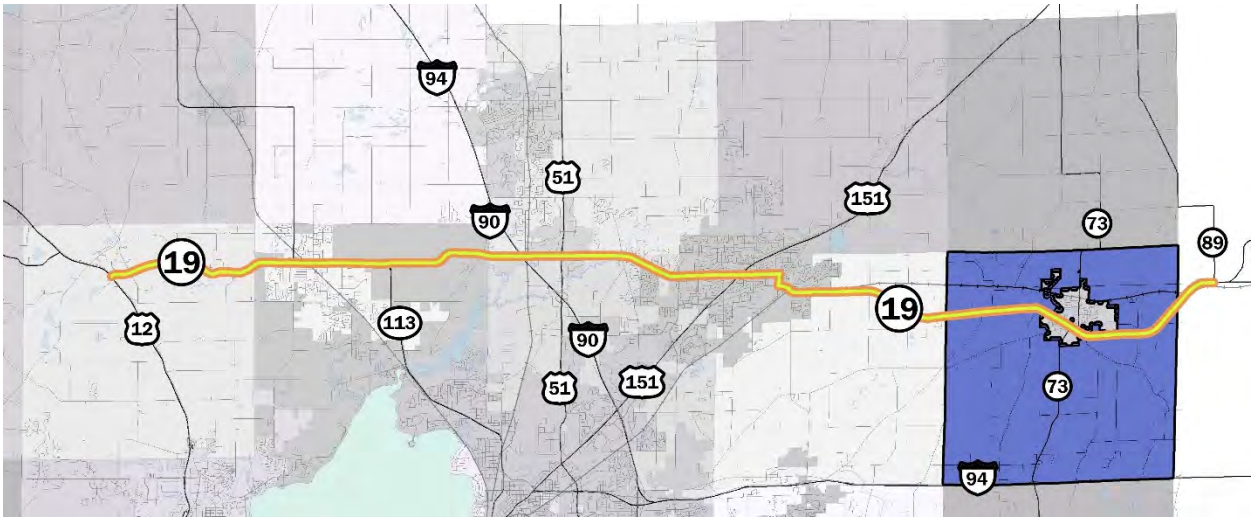
4.12 Town of Sun Prairie



The town of Sun Prairie has a Comprehensive Plan, is included in the Dane County Bicycle Map, and is under jurisdiction of the Dane County Rural Zoning Ordinances.

The future land use map shows primarily agriculture and open space with some single family residential scattered along the portion of WIS 19 that runs through the town of Sun Prairie. Zoning code is consistent with planned use; a majority of the land along WIS 19 is zoned agricultural district with several residential districts and rural residential districts. There are very few commercially zoned properties within a quarter mile of this section of WIS 19.

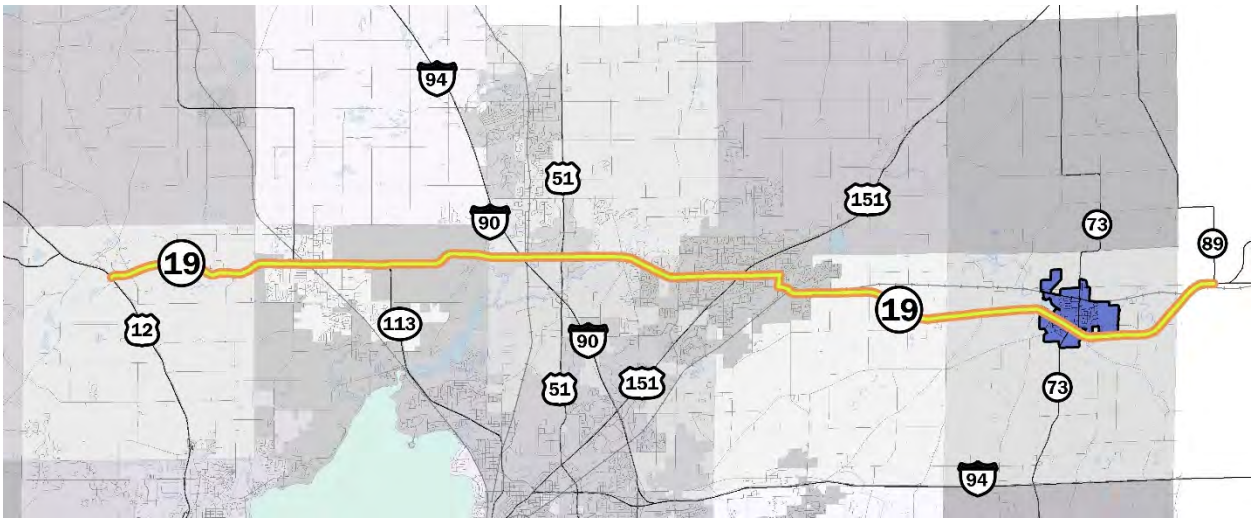
4.13 Town of Medina



The town of Medina has a Comprehensive Plan, is included in the Dane County Bicycle Map[36], and is under jurisdiction of the Dane County Rural Zoning Ordinances.

A majority of the properties along WIS 19 are planned for agriculture though there are several open space, woodland and single family sites. This planned use is compatible with the existing zoning map of Dane County which has these properties zoned as agricultural and rural homes/residential districts. The Town designated all properties near WIS 19 as either part of an agricultural or environmental protection area, making intensive development unlikely.

4.14 Village of Marshall



The village of Marshall has several active plan documents, maps and reports. The village has a Comprehensive Plan, Zoning Code/Map, Comprehensive Outdoor Recreation Plan and Extraterritorial Zoning Ordinance and Plan.

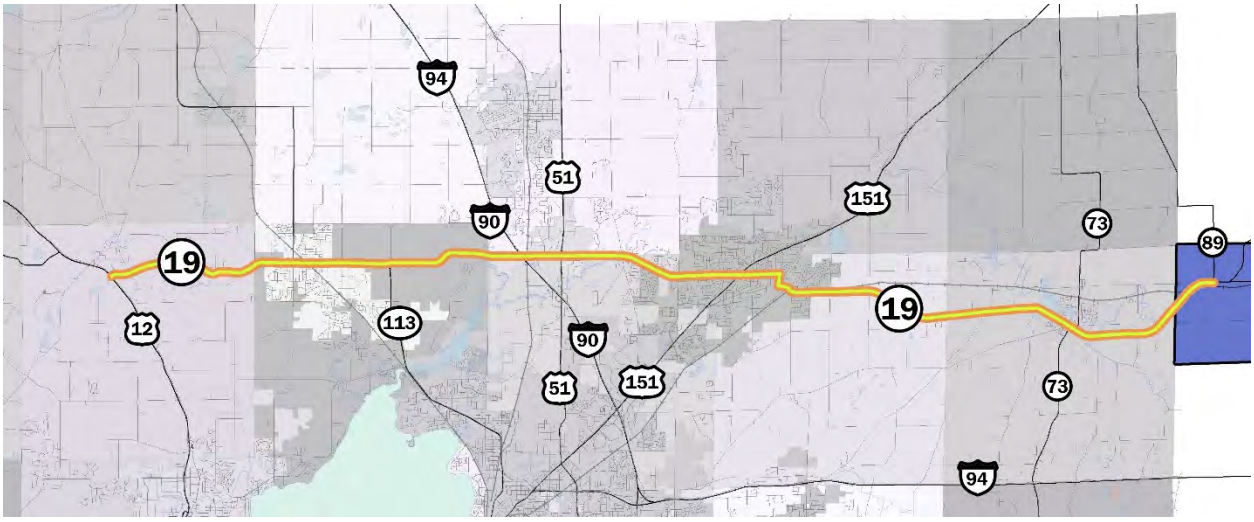
WIS 19 runs east-west through the village of Marshall and is also Main Street for the village. The Comprehensive Plan for the village of Marshall notes that WIS 19/Main Street is the most hazardous roadway in the village and has seen an increase in traffic over the last few years. To make WIS 19 safer, the village would like to see two travel lanes and parking on both sides of WIS 19 within Marshall.

The village has designated its downtown as a revitalization area – focused primarily on aesthetic upgrades rather than changes in land use. The village desires redevelopment to be focused on retail and professional service development and for commercial use to be increase by one-fifth. Future land use along WIS 19 includes downtown mixed use, residential, commercial, and industrial. The only current zoning that does not appear consistent with the future land use plan is on the south side of WIS 19 along Deerfield Road.

[36] Discussed in Section 4.16

The future land use desired for this area is industrial and new neighborhood but the existing zoning is primarily urban agriculture. This zoning is not necessarily inconsistent with the Comprehensive Plan; this area could be upzoned in the future to accommodate development.

4.15 City of Waterloo



The city of Waterloo has a couple of active plan documents. In addition to the Comprehensive Plan there is a Zoning Code/Map and Comprehensive Outdoor Recreation Plan.

WIS 19 is the primary east-west arterial for the city, which has created some aesthetic as well as safety issues for Waterloo. Because of these issues, the Comprehensive Plan designates WIS 19 as a road that requires improvements and needs a trail/bike route. The Plan also recommends that the City upgrade the aesthetic quality of the WIS 19 corridor by continuing to install streetscape improvements. To facilitate traffic flow and development, the plan suggests McKay Way connect WIS 19 near the western edge of the city to WIS 89 on the eastern edge.

Land uses along WIS 19 are generally commercial, office, residential or industrial. The existing zoning map is consistent with the desired land use, though there are some issues with land use conflicts along WIS 19 where single-family residential neighborhoods abut industrial properties. The City desires to reduce these conflicts in the future, so it is possible zoning or future land use may be modified.

Waterloo in the future would like to attract and retain businesses that capitalize on their regional position. The Comprehensive Plan for the city of Waterloo recognizes several sites along WIS 19 which are planned for redevelopment and also an industrial park the City would like to expand. One policy the city is using to attract/retain regional businesses is to

support mixed-use development projects that integrate non-residential and residential uses, both in the downtown and in other scattered places throughout the community, particularly along the WIS 19 corridor. The city would also like to ensure all new development matches the existing character of the community – particularly along WIS 19.

4.16 Bike and Pedestrian Plan Coordination

Dane County has a Bicycle Map (2015) which is "designed to assist bicyclists in identifying the safest, most enjoyable routes between origins and destinations." Currently, the only portion of WIS 19 on the map that has been identified as "suitable for biking" is the portion to the east of the village of Marshall. The remainder of WIS 19, located in Dane County, included on the map is considered "least suitable for biking".

The Madison MPO Bicycle Transportation Plan (2015) lists WIS 19 between Canal Road and Waterloo, WIS 78 to US 12, and Waunakee to West County Line as roadway sections that have the greatest needs for added or widened paved shoulders in the County. If these sections are improved it is possible that the roadway's ratings for bicycle/motor vehicle shared use could improve.

The Jefferson County Bike Plan Map shows WIS 19 as planned for a shared-use path for bikes. The Bike Plan recommends that where paved shoulders do not exist in the city of Waterloo, they should be provided, from west to east city limits. From Marshall, through Watertown and into Waukesha (namely in the Glacial Heritage Area Study Area) there is also a proposed trail that runs along WIS 19.

Many of the communities within the study area also have their own plans and recently completed projects which address bicycle and pedestrian elements. These plans and projects include:

- The Comprehensive Plan for Springfield, which shows a desire to improve bicycle routes within the community and recommends WIS 19, between US 12 and Waunakee, have paved shoulders to accommodate bicycle traffic.
- The Waunakee Westport Bicycle and Pedestrian Plan, which recommends on-street bike lanes along the entire stretch of WIS 19 within the village of Waunakee. Bicycle lanes already exist on WIS 19 between Division and WIS 113. The plan also suggests widening the paved shoulders of WIS 19 when it is reconstructed and installing traffic signals, pedestrian signals, and an enhanced crosswalk at the intersection of WIS 113/19 and Hogan Road.
- The village of DeForest Comprehensive Outdoor Recreation Plan envisions planned bicycle trails along WIS 19, which would connect to existing and planned north and south bound bicycle trails. Currently there are existing bicycle trails north of WIS 19 on North Towne Rd. and south of WIS 19 on Williamsburg Way.

- The Comprehensive Plan for the town of Burke, which is supportive of developing bicycle paths within the community and proposed a bike path along WIS 19.
- The town of Westport Comprehensive Plan, which mentions accommodating bicycles and pedestrians through the creation of safe bicycle routes which can serve the greater community.
- At the time the village of Windsor Comprehensive Plan was written, there were no dedicated bike lanes in Windsor, though the Town has planned for a DeForest-Windsor Bikeway Connection which would be a multi-season shared-use path. The Plan does not mention a bike trail along WIS 19.
- Several of the city of Sun Prairie Plans (Westside Neighborhood Plan, Comprehensive Plan, the Intergovernmental Agreement and Safe Routes to School Plan), mention upgrades are needed on WIS 19. The plans recommend that WIS 19 be widened to accommodate neighborhood and regional traffic and that lead pedestrian signals are added to the intersections of WIS 19 and Thompson Drive as well at County C. A bicycle route is also recommended so that the existing route/path along WIS 19 that runs through Sun Prairie is fully connected.
- In the town of Sun Prairie, WIS 19 was reconstructed in 2002 to widen the shoulders with the intent of better accommodating bicyclists and farm machinery.

5 Environmental Scan

An environmental resource scan was completed and compiled to identify major natural and cultural resources adjacent to the WIS 19 corridor. The environmental review was conducted to determine if any environmental limitations or concerns exist along the corridor. The report focuses on the existing environmental conditions of lands within a quarter-mile radius of the corridor. Five searches and surveys were conducted and include the following: a basic literature search and windshield survey for known lands protected under Section 4(f) of the Department of Transportation Act of 1966; a literature search for known lands protected under Section 6(f) of the United States Land and Water Conservation Fund Act (LWCF), of 1965; a basic literature search for known archaeological and historical resources; a literature search to locate any potential hazardous materials or contaminated sites; and a literature search for known wetlands.

In addition to the information above, other environmental features were collected and documented. An inventory of rivers, lakes, streams, agricultural operations, threatened and endangered species, ground water wells, springs, and cemeteries is discussed in this chapter.

Refer to Appendix E for maps and data related to the environmental scan.

5.1 Section 4(f) Properties

Section 4(f) law (49 USC 303) from the U.S. Department of Transportation (USDOT) states that "the proposed transportation use of any land from a significant publicly owned public park, recreation area, wildlife and waterfowl refuge, or public or private historic site that is on or eligible for the National Register of Historic Places (NRHP), be avoided, if avoidance is feasible and prudent, before any U.S. DOT funding or approvals can be granted.

Section 4(f) applies only to the actions of agencies within the U.S. Department of Transportation, including the Federal Highway Administration (FHWA). While other agencies may have an interest in Section 4(f), the FHWA is responsible for Section 4(f) applicability determinations, evaluations, findings, and overall compliance for transportation projects.

Section 4(f) requires consideration of:

- Parks and recreational areas of national, state, or local significance that are both publicly owned and open to the public
- Publicly owned wildlife and waterfowl refuges of national, state, or local significance that are open to the public to the extent that public access does not interfere with the primary purpose of the refuge

- Historic sites of national, state, or local significance in public or private ownership regardless of whether they are open to the public (See 23 U.S.C. § 138(a) and 49 U.S.C. § 303(a))

Potential Section 4(f) resources in the WIS 19 corridor project area were identified on a map in Appendix E.

5.1.1 Local Parks

Seventeen local (municipal) parks and two county parks are located within ½ mile of the WIS 19 Corridor.

Of the seventeen local parks, four are located in the village of Waunakee, twelve in the city of Sun Prairie, and one in the village of Marshall.

County Parks

County parks located within ½ mile of the WIS 19 Corridor include:

- Token Creek County Park: Token Creek County Park is located approximately ½ mile south of WIS 19, on US 51. The 427-acre park is best known for its five shelter facilities and ample open space for large group picnics and outings. Recreational facilities include five volleyball courts, equestrian trails, miles of hiking and cross country ski trails, a 27-hole disc golf course and a 43-unit campground, plus a group camp area. Special facilities accommodate people with disabilities such as a fishing pier, two playgrounds and an elevated boardwalk through a sedge meadow marsh. It also offers winter access to Dane County's 274 miles of snowmobile trails.
- Riley Deppe County Park: Riley-Deppe Park is located just west of the village of Marshall on the north side of WIS 19. Riley-Deppe Park fronts on a millpond formed by the impoundment of the Maunesha River. The 34-acre park offers quiet areas for picnics or shoreline fishing. Facilities include a shallow boat launch, picnic shelter, and play equipment.

Village of Waunakee Parks

Local parks located in the village of Waunakee include:

- Ripp Park / Ripp Recreation Area: Ripp Park is the Village's largest community park with a total area of 84.9 acres. The park has numerous ball diamonds and playfields, and is actively used for organized athletic events. Ripp Park's 28 youth soccer fields are heavily used for youth soccer leagues and the park is considered the "home field" for most tournament competitions.
- The southern 6.4 acres of Ripp Park functions as the neighborhood park for Westview Meadows neighborhood. The northern 28.5 acres are wetlands and are managed as conservancy land.

- McWatty Park: McWatty Park is a 3.6-acre neighborhood park adjoining the north side of Sixmile Creek at the east end of the historic downtown business district. Facilities include playground equipment, basketball court, and open play areas.
- Village Park: Village Park is a 12.6-acre community park, and Waunakee's premier central park. Village Park is one of Waunakee's most heavily used parks. Facilities include a baseball field, batting cages, basketball courts, picnic shelter with restrooms, a gazebo, paved pathways, bridges, and playground equipment.
- Reeve Park: Reeve Park is a 0.6-acre plaza on E. Main Street that includes the former railroad depot and public parking in the historic downtown. The former railroad depot building is currently leased to the Waunakee Area Chamber of Commerce.

City of Sun Prairie Parks

Local parks located in the city of Sun Prairie include:

- Wyndham Hills Park: Wyndham Hills is a 17.7-acre community park, located on the west side of Sun Prairie, adjacent (south) of WIS 19, between N. Heatherstone Drive and N. Westmount Drive. Facilities include multiple play structures, play fields, park shelter, and bike paths.
- Oakridge Park: Oakridge Park is a 2.2-acre neighborhood park located on Michigan Avenue, a few blocks south of WIS 19, and a few blocks west of US 151. Facilities include swings, play structures, and a lighted ice skating rink.
- Evergreen Park: Evergreen Park is a 1.1-acre neighborhood park located on Pennsylvania Avenue, two blocks south of WIS 19 (Windsor Street). Facilities include a playground, picnic tables, and a basketball court.
- Renstone Park: Renstone Park is a 4.7-acre community park located on Steven Street, about ¼ mile north of WIS 19 (Windsor Street) and ½ mile west of US 151. Facilities include multiple play structures, picnic shelters, softball diamonds, play fields, hockey/ice skating, and restroom facilities.
- Davison Park: Davison Park is a 2.1-acre neighborhood park located on Davison Drive, two blocks south of WIS 19 (Windsor Street), and ¼ mile east of US 151. Facilities include a playground and picnic tables.
- Birkinbine Park: Birkinbine Park is a 2-acre neighborhood park located on Union State, two blocks north of WIS 19 (Windsor Street), and ¼ mile east of County N/Bristol Street. Facilities include a playground, picnic tables, softball diamond, and a basketball court.
- Wetmore Park: Wetmore Park is a 10.4-acre community park located on North Street, one blocks north of WIS 19 (Windsor Street), and just east of

County N/Bristol Street. Facilities include multiple play structures, picnic shelters, softball diamonds, play fields, hockey/ice skating, and restroom facilities.

- Blankenheim Park: Blankenheim Park is a 0.6-acre pocket park located on Blankenheim Lane, a block north of WIS 19 (Main Street). Facilities include a playground and picnic tables.
- Angell Park: Angell Park is a 55.9-acre semi-private park located on Park Street, two blocks south of WIS 19 (Main Street).

  This park is owned and managed by the Sun Prairie Volunteer Fire Department. Included in this park are picnic tables, one picnic shelter, a horseshoe court, one baseball field, sanitary facilities, drinking water, wooded area, and ample parking areas.

  Angell Park hosts the annual Sweet Com Festival in August of each year. In 2008, a community built playground named Fireman's Park was constructed for use by the entire community.

  The main feature of the park is its midget auto race track. Although this facility is not open for public recreational use at all times, it does serve as an important entertainment source for many people. Complementary to the track is a large pavilion and bleachers for spectators.
- Glacier Crossing Park: Glacier Crossing Park is a 2-acre neighborhood park located on Granite Way, two blocks south of WIS 19 (Main Street). Facilities include a playground, basketball court, and picnic shelters.
- Uplands Park: Uplands Park is a 2.8-acre neighborhood park located on Sweet Grass Drive, adjacent to the south side of WIS 19 (Main Street), near the eastern edge of Sun Prairie. Facilities include a playground, picnic tables, and hiking trails.
- Carriage Hills Estate Park: Carriage Hills Estate Park is a 20.2-acre community park located on N. Musket Ridge Drive, ¼ mile north of WIS 19 (Main Street), near the eastern edge of Sun Prairie. Facilities include multiple play structures, picnic shelters, softball diamonds, play fields, sledding hill, hiking trails, volleyball, and restroom facilities.

Village of Marshall Parks

Local parks located in the village of Marshall include:

- Fireman's Park: Firemen's Park is an 11.5-acre community park located in the central part of the village of Marshall, off of West Park Drive, two blocks north of WIS 19. The park is adjacent to the Maunesha River Mill Pond.

  The park offers a lighted baseball diamond, an outdoor stage with bleachers, basketball and grass volleyball courts, a children's playground, an open picnic

shelter, enclosed picnic pavilion, a canoe launch, and a handicap accessible fishing pier.
The park also hosts the annual Fireman's Festival for the village in June

5.1.2 Publicly Owned Recreation, Wildlife and Waterfowl Areas

Eight publicly owned recreation, wildlife, and/or waterfowl areas are located within ½ mile of the WIS 19 Corridor.

Waunakee Marsh Wildlife Area

The Waunakee Marsh State Wildlife Management Area is a 470-acre property consisting of approximately 40 acres of hardwood upland forest, 25 acres of upland warm season grassland and 400 acres of marsh dominated by cattail with some areas of sedge meadow. The Waunakee Wildlife Area is located adjacent to WIS 19, near the west terminus of the WIS 19 corridor. The area is located south of WIS 19 and east of Lodi-Springfield Road. The area has direct access off of WIS 19. The Waunakee Wildlife Area was established in 1958 with the intent to protect the extensive wetlands associated with the upper reach of Sixmile Creek and its springheads and to provide for public hunting. Sixmile Creek flows east through the Waunakee Marsh to the village of Waunakee, and then south, emptying into Lake Mendota. The marsh is owned and managed by the Wisconsin Department of Natural Resources as a conservancy area.

Schumacher Farm (Schumacher Farms-Raemisch Acquisition)

Schumacher Farm is a 117.8-acre natural resource area located on the north side of WIS 19 adjacent to the village of Waunakee. The park includes a historic farmstead, demonstration gardens, prairie restoration, and natural trails.

The Schumacher Farms-Raemisch Acquisition was an 80-acre WDNR Stewardship Grant Acquisition between Schumacher Road and County I, northeast of the village of Waunakee, approximately 1.5 miles north of the WIS 19 Corridor. If any takings of these parcels are required in the future, it should be known that land needed would be calculated and would need to be added into the WDNR banking system.

Empire Prairies Wildlife Area

Empire Prairies is a State Natural Area unit, located southeast of the WIS 113/WIS 19 intersection, east of Waunakee, west of River Road. Empire Prairies is a dry prairie remnant. There is access north from Bong Road but it is about 0.5 miles south of WIS 19. A portion of this property was purchased using the federal LWCF Fund program.

Cherokee Marsh Fishery Area

Cherokee Marsh is an approximately 1000-acre publicly-owned conservancy area and wetland complex located along the Yahara River. The area is owned and maintained jointly by Dane County, the Wisconsin Department of Natural Resources, and the city of Madison. While maintained primarily as a conservancy area, there are extensive recreational trails and other passive recreation facilities within the Cherokee Marsh area. A portion of the parkland adjacent to WIS 113 is managed as a dog park.

Cherokee Marsh represents a gradient of habitat types including, open water, wetland vegetation, hardwood forest and warm season grass fields. The Cherokee Marsh Fishery Area is managed to protect fish spawning and wetland habitat. The Yahara River empties into the Cherokee Marsh, and eventually Lake Mendota. The river is an Area of Special Natural Resource Interest (ASNRI).

The area represents critical spawning and nursery habitat for northern pike and gamefish that use the marsh to complete their life cycles. The complex is an extension of the overall Lake Mendota system and provides flood relief and nutrient and sediment settling services to the downstream waterbodies.

The Cherokee Marsh Fishery Area is located in Westport Township and overlaps into Burke Township in Dane County. The northern boundary of the Cherokee Marsh Fishery Area is located generally ¼ mile south of the WIS 19 corridor, between River Road and I-39/90/94.

Road access is from River Road, off WIS 113 on Madison's north side. Water access is from the confluence of the marsh with Lake Mendota or from the School Road launch in the Cherokee park on the property's east shore.

Natural Heritage Foundation Token Creek-Pedersen Acquisition

WDNR Stewardship Grants were used for the Natural Heritage Foundation Token Creek-Pedersen Acquisition – approximately 20 acres (located on the north side of WIS 19 between US 51 and Portage Road).

Token Creek Conservancy (Yngsdahl Property Acquisition)

The Token Creek Conservancy is roughly 190 acres of publicly owned land located in the village of Windsor along Token Creek. Token Creek is the primary contributor of water to the Yahara River and consequentially is the largest contributor to the water of Madison's Lake Mendota. In 1999, over a million dollars was raised to remove an old dam and mill pond to free up the stream and springs of the Token Creek. The environmental benefits of this project were tremendous and the Token Creek now supports trout, with cold clean water flowing into Lake Mendota.

WDNR Stewardship Grants were used for the Yngsdahl Property Acquisition portion of this recreation area; approximately 25 acres located on the north side of WIS 19, immediately west of Portage Road.

Patrick Marsh (Brazee Lake)

Patrick Marsh is a wetland restoration that was initiated by WisDOT in 1988, in cooperation with WDNR, US Fish and Wildlife Service (USFWS), US Army Corps of Engineers (USACE), and the US Environmental Protection Agency (EPA). The restoration was completed for compensation for wetland loss as a result of a US 151 project. The 225 acre site was purchased by WisDOT in 1991 then donated to WDNR. The restoration produced 160 acres of wetland, 120 acres more wetland than what was needed for mitigation related to the US 151 project. The surplus acres became the WisDOT Patrick Marsh wetland bank site, which was a prototype for the WisDOT wetland mitigation banking system which was formally established July 1993. Natural Heritage Land Trust has acquired an additional 80 acres south of the original 225 acres expanding the total site to 305 acres. Currently Patrick Marsh is utilized as a passive recreation area. Patrick Marsh is adjacent to US 151, approximately one-mile north of the WIS 19 corridor.

Deansville Wildlife Area

The Deansville Wildlife Area is a large wildlife area and wetland complex. This area is a WDNR property approximately 1.5 miles north of WIS 19 between the city of Sun Prairie and the village of Marshall. The WDNR owns 1,459 acres and four miles of frontage on the Maunesha River. The area is primarily used as a hunting area. A portion of this property was purchased using the federal LWCF Fund program.

5.1.3 Historic Sites of National, State, or Local Significance

Historic sites of national, state, or local significance in public or private ownership are considered potential Section 4(f) resources. An archaeological archival and literature research was performed for the WIS 19 corridor (see chapter 5.3). Within the ¼ mile study area, four properties are listed on the NRHP, and three properties are determined eligible for listing. See chapter 5.3 for more information on historic sites in the WIS 19 corridor.

5.2 Section 6(f) Properties

A natural resource meeting was held with WDNR to discuss potential environmental factors within the WIS 19 corridor. Three potential Section 6(f) resources were identified by WDNR along the WIS 19 Corridor. Portions of these properties were purchased using the federal Land and Water Conservation Fund (LWCF) program.

Section 6(f) lands are often also Section 4(f) lands. Potential Section 6(f) properties near the WIS 19 corridor are identified below and described in more detail in this report's preceding

Section 4(f) properties chapter (chapter 5.1). Potential Section 6(f) properties are shown on a map in Appendix E.

Potential Section 6(f) properties include:

- Empire Prairies Wildlife Area
- Patrick Marsh (Brazee Lake)
- Deansville Wildlife Area

5.3 Archaeological, Architecture, and Historic Surveys

An archaeological archival and literature research was performed in December 2014 and consisted of identifying all previously reported archaeological sites, burial sites, and cemeteries within a quarter-mile of the corridor. The archaeological investigations were conducted to fulfill WIS Stats 44.40, WIS Stats 157.70, and Section 106 of the National Historic Preservation Act of 1966 (PL 89-65), as amended and 36 CFR Part 800. It should be known that if there are any future construction activities within the project area, a WisDOT Southwest Region Environmental Coordinator and WisDOT Bureau of Technical Services, Environmental Process and Documentation Section Cultural Resource Team (BTS-EPDS-CRT) should be involved to establish an area of potential effect (APE). A Phase I archaeological survey and a history survey would likely be needed.

Information from the Wisconsin State Historic Preservation Office (SHPO), Wisconsin Historic Preservation Database (WHPD), was used to identify any known archaeological and historical sites previously conducted within the study review.

5.3.1 Archaeological Findings

Research indicated that 33 archaeological surveys have been conducted within the quarter-mile study area. Two human burial sites, or cemeteries, protected under Wisconsin Statute 157.70 and one additional site has been determined eligible for listing in the National Register of Historic Places (NRHP). A table of archaeological findings is located in Appendix E.

5.3.2 Architecture/History Findings

Research indicated that 196 architectural history properties have been previously inventoried within the quarter-mile study area. Four properties are listed in the NRHP, and three properties are determined eligible for listing. Refer to Table 49 for architectural findings.

Table 49: Architectural Findings

AHI No.	Historic Name	Construction Date	Location	Municipality	NRHP Status
5988	Sun Prairie Water Tower	1899	Columbus St.	Sun Prairie	Listed
5998	Dr. Charles Giles Crosse House	1902	133 W. Main St.	Sun Prairie	Listed
6032	Waunakee Train Depot	1896	100 E. Main St.	Waunakee	Listed
127548	Fuhremann Canning Company Factory	1912	151 Market St.	Sun Prairie	Listed
6040	Noyes-Brausen Hotel	1879	101 E Main St.	Waunakee	Potentially Eligible
6048	Thomas O'Malley House	N/A	317 W Main St.	Waunakee	Potentially Eligible
6013	William Henry Birkinbine House	1904	306 Windsor St.	Sun Prairie	Potentially Eligible
	Waterloo Downtown Historic District			Waterloo	Six Potential Contributing Resources

5.4 Hazardous Substances and Underground Storage Tanks (USTs)

Federal and state environmental databases were searched for potentially contaminated hazardous substances within the project area. A total of 299 sites were identified. Refer to Appendix E for the complete EDR report. Sites were generally clustered around the developed municipalities of Waunakee, Sun Prairie, Marshall, and Waterloo.

Many of the sites identified are former gas stations or other leaking underground storage tanks (USTs) sites where the investigation and cleanup work has been completed and WDNR determined that no unacceptable risk to human health or the environment would be posed by leaving the documented levels or residual contamination in the ground.

Many properties were identified as having the potential for unknown or documented residual hazardous substance contamination that would require special handling considerations if there was to be construction activity in the future. The nature and extent of contamination in many of these sites has been documented and activity and use limitations are in place for review within WDNR files.

5.5 Wetlands

For this study, wetland delineations were not conducted. Wetland boundaries were not determined based on regulatory wetland delineation methods. Information in this section is meant to provide an estimate of wetland acreage and type that may be located within the study area.

A wetland is defined as an area where water is at, near, or above the land surface long enough to be capable of supporting aquatic or hydrophytic vegetation, and which has soils indicative of wet conditions (§. 23.32(1) Wis. Stats). Approximately fifteen percent of the surface area of Wisconsin is considered to be wetlands. In Dane County, approximately 6.7 percent of the surface area is classified as wetlands whereas 16.6 percent of the surface area in Jefferson County falls into that category.

Potential wetlands and areas of hydric soils were identified using the Wisconsin Wetland Inventory (WWI) and National Cooperative Soil Survey (NCSS) data from the U.S. Department of Agriculture (USDA), and the Natural Resources Conservation Service (NRCS).

According to Wisconsin Wetland Inventory (WWI), there are 156 unique wetlands encompassing approximately 1,081 acres of wetlands within the ¼ mile study area. A detailed listing of wetland types, subclasses and acreages can be found in Table 50.

Table 50: Wetland Data

Wetland Type	WWI Subclass and Modifiers	WisDOT Wetland Types	Approximate Size (in acres)
Emergent/wet meadow	E1H, E1K(a,f), E2H(g), E2K(g)	RPE, RPE(D)	697.9
Forested, Emergent/wet meadow	T3/E1K(g), T3/E2K(g)	RPF(D)	55.8
Open Water	W0H(x), W0L		107.7
Forested	T3K	RPF	133.6
Scrub/shrub, Emergent/wet meadow	S3/E1K(a), S3/E2K(g), S3/E2H	SS, RPE(D)	22.7
Forested, Scrub/shrub	T3/S3K	RPF	55.2
Emergent/wet meadow, Open Water	E2/W0H(x)	BOG	8

When developing a wetland mitigation strategy, it is often advantageous to identify high quality wetlands, or wetlands of local or regional significance to target for minimal disturbance. Wetlands with the notations of "a", "f", and "g" in particular can be considered to be of lesser quality due to their status as disturbed wetlands. Wetlands without these notations, and wetlands adjacent to tributary streams, rivers, or other important waterways that may be considered important natural resources for ecological corridors and recreational opportunities they provide, are the highest value and priority to maintain.

Wetlands that are considered high importance in protecting the surface water bodies are located:

1. West of Waunakee within the Waunakee Marsh State Fishery Area
2. Adjacent to the Yahara River and Token Creek
3. On either side of the junction of I-39/90/94 and WIS 19

4. Along Sixmile Creek near Waunakee

5. Near Maunesha River and the Maunesha Flowage near Marshall and Waterloo

5.6 Rivers / Lakes / Streams

There are several water resources near the WIS 19 corridor with the Yahara River, Sixmile Creek, Token Creek, Koshkonong Creek, and the Maunesha River being the primary resources. The WIS 19 corridor also traverses numerous additional small tributary creeks and streams. As shown on the rivers, lakes, and streams map in Appendix E, the WIS 19 corridor passes through or is adjacent to the following four watersheds:

- Sixmile and Pheasant Branch Creeks Watershed
- Yahara River and Lake Mendota Watershed
- Upper Koshkonong Creek Watershed
- Maunesha River Watershed

Sixmile Creek, tributaries to Sixmile Creek, the Yahara River, Token Creek, Koshkonong Creek, and the Maunesha River are all designated as Areas of Special Natural Resource Interests (ASNRI) by the Wisconsin Department of Natural Resources (WDNR). This classification is given to water sources with characteristics that provide key functions to habitat or ecosystems within their watershed.

See Appendix E for a WDNR Waterway Areas of Special Natural Resource Interest (ANSRI) showing waters near the WIS 19 Corridor.

A breakdown of the existing water resources in the project corridor is shown below, and can be found in the Rivers, Lakes, and Streams map in Appendix E.

5.6.1 Sixmile and Pheasant Branch Creeks Watershed (US 12 to Village of Waunakee)

The Sixmile and Pheasant Branch Creeks Watershed is located in north central Dane County. Agriculture is the predominant land use in the Sixmile and Pheasant Branch Creeks Watershed covering 56 percent of the area. This watershed has a medium susceptibility for groundwater contamination based on WDNR groundwater susceptibility mapping.

The 119-square-mile Sixmile and Pheasant Branch Creek Watershed was one of the first Nonpoint Source Pollution Priority Watershed Projects undertaken by WDNR and has once again been chosen as a project in the Lake Mendota Priority Watershed Project. Despite work over the past ten years to reduce polluted runoff in the Lake Mendota watershed(s), sources of polluted runoff continue to be the largest threat to this lake. Simultaneously, Lake Mendota is a contributor to nutrient loading in the downstream Yahara chain-of-lakes. A number of stormwater and erosion control projects are underway in individual municipalities, as well. The Sixmile and Pheasant Branch Creeks Watershed is listed as a high

priority overall for nonpoint source (NPS) pollution due to its listing as a high priority for groundwater and stream NPS pollution.

5.6.2 Sixmile Creek

Sixmile Creek is the primary water resource in the watershed that is impacted by the WIS 19 Corridor. The creek originates in Section 2 of Springfield Township (T8N, R8E) and flows east to Waunakee and south to the north end of Lake Mendota. Within the WIS 19 Corridor, the creek runs parallel to WIS 19 west of the village of Waunakee, crossing WIS 19 at two separate locations within the Village. The creek then continues south from the Village before emptying into Lake Mendota. The creek is an Area of Special Natural Resource Interest (ASNRI).

Sixmile Creek contributes 12 miles of Exceptional Resource Waters to the watershed. The watershed once encompassed plentiful wetlands, but many of these areas have been drained, filled, or altered for the development of more cropland. Two major remaining wetlands are the Waunakee Marsh in the northwestern part of the watershed and the marshes near the creek's mouth on Lake Mendota).

The Waunakee Marsh State Wildlife Management Area is located south of WIS 19 and east of Lodi-Springfield Road. The area was established to protect extensive wetlands associated with Sixmile Creek and its springheads. Sixmile Creek meanders through the wildlife area, and is fed by known springs with the wildlife area.

Channel alterations in the upper reaches of the creek and sewage effluent contribute to the high sediment load. Much of the creek bottom is heavily silted. Sixmile Creek supports a diverse forage and warm water game fishery and offers abundant spawning areas for fish from Lake Mendota. Although the creek has a past history of fish kills near Waunakee (caused by waste discharge from a canning factory with a defective land irrigation disposal system), there are no other known point sources of pollution on the creek and water quality is good.

5.6.3 Yahara River and Lake Mendota Watershed (Village of Waunakee to City of Sun Prairie)

The Yahara River and Lake Mendota Watershed is located in north central Dane County, with a small portion extending into southern Columbia County. The 85-square mile watershed has a medium susceptibility for groundwater contamination based on WDNR groundwater susceptibility mapping. Increased urban development on the west side of Sun Prairie extending to Token Creek has raised concern about decreased groundwater recharge and altered base flow in Token Creek, a Class III trout stream. Land use in the watershed is a mixture of urban, suburban, and agricultural land. Urban areas include DeForest, Windsor-Lake Windsor, the north side of the city of Madison, and a portion of the city of Sun Prairie. Principal streams are the Yahara River and Token Creek. Lake Mendota is the major lake in the watershed. Large portions of wetlands in the watershed have been drained for agriculture or filled for development. Cherokee Marsh is the last large wetland complex in the

watershed. Smaller wetland complexes exist, as well as many prior converted wetland areas. In spring, numerous ephemeral ponds are extensively used by migratory waterfowl. Drainage tiles and ponds and intense (sub) urban and rural development threaten or have already destroyed many of these water features.

The Yahara River and Token Creek are the primary water resources in the watershed that are impacted by the WIS 19 Corridor.

5.6.4 Yahara River

The Yahara River is a cold water resource and trout stream. The river originates in the marshy areas of Columbia County and flows as a small meandering creek through extensively farmed land to where it empties into the 2,000-plus acre Cherokee Marsh, and eventually Lake Mendota. Within the WIS 19 Corridor, the river flows north to south, crossing WIS 19 just west of I-39/90/94, southwest of the village of Deforest. The river then continues south from the Village before emptying into Lake Mendota. The river is an Area of Special Natural Resource Interest (ASNRI).

The Yahara River serves as relatively short connecting channel between lakes in this watershed. Wetlands along this headwater stretch have been extensively drained, while small feeder streams have been straightened. The loss of wetlands combined with heavy agriculture in this reach have resulted in large sediment and nutrient loads and loss of valuable fish habitat. Heavy fertilizer use, poor animal waste management practices, and silage holding problems have reduced the river's water quality. Due to the river's large loadings of nutrients and sediments, the river plays a role in Lake Mendota's poor water quality. Despite these loadings, the stream exhibits fair water quality and supports a good warm water sport fishery, as far upstream as DeForest. Development in DeForest and Windsor threatens water quality, in-stream habitat and fisheries of the Yahara River if adequate erosion control measures and post-development stormwater management are not established and maintained.

5.6.5 Token Creek

Token Creek originates in Section 24 - (T9N, R10E) and empties into the Yahara River north of Lake Mendota. Token Creek is a spring-fed Class III trout stream that is a primary tributary to the Yahara River. The creek is one of the best trout streams in Dane County. The creek is an Area of Special Natural Resource Interest (ASNRI). Within the WIS 19 Corridor, the Creek and its tributary streams flow northeast to southwest, crossing WIS 19 just east of US 51. The Creek then empties into the Yahara River and the Cherokee Marsh.

This spring-fed Class III trout stream is the primary tributary to the Yahara River, providing base flow for the Yahara River and Lake Mendota. The stream passes through residential (7 percent), agricultural (73 percent) and wetland areas (4 percent). Intense agricultural practices contribute sediment and nutrients to the stream and small impoundments in upstream areas warm the water, decreasing its suitability for trout management and contribute to excessive

rooted aquatic plant production, and periods of low dissolved oxygen and turbidity. Water quality is quite good considering the developmental pressures affecting the area, such as residential subdivisions and a major highway interchange. However, agricultural runoff has caused heavy silting problems. The creek flows through part of Cherokee Marsh which provides habitat for wildlife and waterfowl.

There have been several restoration projects to remove sediment north of Token Creek near the Yngsdahl Property (approximately 25 acres located on the north side of WIS 19, immediately west of Portage Road.) A tributary west of Token Creek, near the Natural Heritage Foundation / Token Creek-Pederson Acquisition, is a sensitive fish spawning area. Any future roadwork of this culvert would require WDNR coordination.

Runoff from the three major highways that cross the stream and the US 51 interchange and truck stops located adjacent to it likely affects water quality. Urban development in Sun Prairie and the towns of Windsor, Burke, and Bristol, have and will continue to generate additional stormwater runoff bringing with it sediment and other pollutants.

5.6.6 Upper Koshkonong Creek Watershed (City of Sun Prairie)

The Upper Koshkonong Creek Watershed is located in eastern Dane County. The creek drains 107 square miles including: a large portion of eastern Dane County, the communities of Sun Prairie, Cottage Grove, and Deerfield, a number of small subdivisions, and a glacial drumlin-marsh area. Land use is primarily agricultural and a large percentage of original wetlands have been drained for this purpose. This wetland loss, coupled with stream ditching and widespread use of field tiles, allows nutrient and sediment loads to reach surface waters in this and downstream watersheds.

This watershed is experiencing rapid population growth in the city and town of Sun Prairie and the village and town of Deerfield. This watershed has a medium susceptibility for groundwater contamination based on WDNR groundwater susceptibility mapping.

Upper Koshkonong Creek is the primary water resource in the watershed that is impacted by the WIS 19 Corridor.

5.6.7 Upper Koshkonong Creek

Upper Koshkonong Creek originates on the east edge of the city of Sun Prairie. Within the WIS 19 Corridor, the Creek and its tributary streams flow northeast to southwest. Koshkonong Creek is channeled under WIS 19 at the WIS 19 crossing of the Wisconsin and Southern Railroad, crossing WIS 19 in the city of Sun Prairie. The Creek then continues to the southeast and eventually empties into Lake Koshkonong. The river is an Area of Special Natural Resource Interest (ASNRI).

This large stream drains lands of the drumlin-marsh area in Dane and Jefferson counties and is a tributary to the Rock River system entering at Lake Koshkonong. Small plots of wetlands, totaling several thousand acres, adjoin the stream. Mud Creek is a major tributary

and Rockdale Millpond is a major impoundment. Much of Upper Koshkonong creek's headwaters are ditched and straightened, and many portions are now clogged with debris. This river exhibits natural limiting conditions as well, such as a flat gradient, low base flow, warm temperatures, and high inputs of sediment and nutrients from the fertile watershed. Agricultural land use, urban development and hydrologic modifications result in sluggish flows, river stretches clogged with debris, and overall poor water quality. Most of its tributary streams have also been ditched and are also clogged with debris. The creek's substrate consists of thick silt, probably washed from nearby farm fields, and sludge from the Sun Prairie wastewater treatment plant lying over gravel.

5.6.8 Maunesha River Watershed (City of Sun Prairie to City of Waterloo)

The Maunesha River Watershed is located in Dane, Dodge and Jefferson counties. Agriculture is the dominant land use and polluted agricultural runoff is thought to be the primary water quality concern. The watershed has two state wildlife areas, the Waterloo Wildlife Area and the Deansville Marsh Wildlife Area. The draining of land for agriculture over the last 150 years has reduced the quality and extent of wetlands in the watershed.

There are three impoundments on the Maunesha River: one at Marshall, one just above Waterloo and one in Waterloo. These impoundments experience water quality problems similar to other impoundments in southern Wisconsin; turbidity, siltation and heavy aquatic weed growth. There are four wastewater dischargers in the watershed, Marshall and Waterloo and two industrial facilities.

The Maunesha River is the primary water resource in the watershed that is impacted by the WIS 19 Corridor.

5.6.9 Maunesha River

This large stream drains parts of Columbia, Dane, Jefferson, and Dodge Counties, and empties into the Crawfish River in Dodge County. Within the WIS 19 Corridor, the River and its tributary streams flow northwest to southeast, originating north of WIS 19, between the city of Sun Prairie and the village of Marshall. An impoundment on the River creates a large pond in the village of Marshall. WIS 19 crosses over the Maunesha River on the eastern edge of the village of Marshall, after it empties from the pond. Much of the watershed in Dane County is ditched and drained wetland. A large percentage is in cropland and soil loss is high. Deansville Marsh is a large, slightly disturbed wetland adjoining the river. Impoundments are found above the Villages of Marshall and Waterloo (Jefferson County). Siltation and agricultural runoff are problems above the Marshall Millpond but water quality is generally good.

The river is an Area of Special Natural Resource Interest (ASNRI) and is listed as an impaired waterway, meaning it does not support full use by humans, wildlife, or fish, and is shown that one or more of the pollutant criteria are not met. There is a listed plant and

several listed communities. Below the village of Marshall, water quality is poor. Over a dozen fish species are present in the river.

5.7 Agricultural Surveys

As of June 1, 2015 the agricultural survey is still underway. Partial findings are described in this section and Appendix E has maps and surveys of the effort thus far.

According to Dane County Farmland Preservation Plan, and Agricultural Statistics compiled by UWEX, there were 3,331 farm operations in Dane County in 2010 totaling over 535,000 acres of land. The average size farm now stands at 161 acres countywide, down from 172 acres eight years ago. Seventy percent of the total land area in Dane County is for agriculture uses. Fifteen different crops are produced in Dane County, led by corn (187,700 acres), soybean (80,500 acres), alfalfa (74,400 acres), and wheat (14,800 acres). Dane County continues to lead the state in total market value of agricultural products, and ranks in the top two percent nationwide.

An Agriculture Survey was developed and sent to local farm operators in April 2015, to gain a better understanding of agricultural travel patterns, traffic operations, and access needs along WIS 19. The survey included eleven questions regarding the type of farm (dairy, cattle, crops, etc.), the size of farm, and usage of WIS 19 for moving equipment and accessing fields. The survey was distributed to 66 farm operations that had land holdings of 15 acres or larger with direct access to or land abutting WIS 19.

Twenty-two agricultural surveys were returned. Their responses are compiled in Appendix E. Findings from the survey include:

- Of the 23 returned surveys, farm sizes range from 7 to 4,000 acres in size. Nineteen of the returned surveys (83 percent) indicated farms smaller than 250 acres. Eleven of the returned surveys (48 percent) indicated farms smaller than 125 acres.
- 14 survey respondents (61 percent) identified as a crops/produce farm; seven respondents (30 percent) identified as a dairy/cattle farm; four respondents (17 percent) identified as a horse/hobby farm. One respondent identified as a pork/poultry farm and one respondent identified as a nursery.
- Eight of the survey respondents indicated their farms are divided by WIS 19. Based on the survey responses, during planting/harvesting season, heavy equipment crosses WIS 19 approximately 18 times per day, per farming operation.

5.8 Threatened and Endangered Species

According to WDNR data, there is the potential for rare terrestrial and aquatic species and/or community occurrences along the WIS 19 Corridor. A higher probability of finding rare or special aquatic species within the project corridor exists because of the numerous water resources indicated (navigable waterways, floodplains and wetlands) along WIS 19. As

with all threatened or endangered species, exact locations of their presence are protected and should not be distributed for public consumption. Typically terrestrial species habitats are located adjacent to water resources for food sources. Due to the varying topography and drainage patterns of Dane County, there are secluded habitat sections where terrestrial species can reside. Due to the habitat changes along WIS 19 over the last 60 to 70 years, such as the conversion of agricultural land to residential, it is probable the amount of rare terrestrial sightings identified are obsolete. Further coordination and investigation with state agencies will be needed when project plans are more defined.

The Natural Heritage Inventory (NHI) databases, show records of several rare terrestrial and aquatic species and/or community occurrences along the WIS 19 Corridor. Established in 1985 by the Wisconsin legislature, Wisconsin's Natural Heritage Inventory program (NHI) is part of an international network of inventory programs. The program is responsible for maintaining data on the locations and status of rare species, natural communities and natural features throughout the state. Species and natural communities tracked by the Wisconsin NHI Program can be found on the NHI Working List.

The Cherokee Marsh Area and associated wetlands have a few threatened and endangered animal and plant species (a listed bird, two listed species of bat, and three listed plants. Cherokee Marsh is the largest wetland in Dane County. The marsh is located just upstream from Lake Mendota, along the Yahara River and Token Creek, south of the WIS 19 Corridor. The Marsh Area also has several communities (which are not protected by the endangered species act), but are listed because they are good examples of rare or sensitive plant communities or features. The Cherokee Marsh has seen a lot of wetland restoration. The wetlands hold and filter nutrients eventually draining into Lake Mendota.

The Waunakee Marsh State Wildlife Management Area is located south of WIS 19 and east of Lodi-Springfield Road. The 470-acre property contains approximately 40 acres of upland forest and 25 acres of upland warm season grassland, and 400+ acres of marsh (mostly cattail and sedge meadow). The area has direct access off of WIS 19. The area was established to protect extensive wetlands associated with Sixmile Creek and its springheads. The area contains at least one endangered reptile.

A federally listed plant species has been identified in the wetlands surrounding Token Creek, near the WIS 19 Corridor.

Upstream of the Maunesha River Millpond, north of WIS 19, there is a listed plant and several listed communities. There is also a listed community south of WIS 19, along a tributary to the millpond.

Empire Prairie is a State Natural Area unit, located southeast of the WIS 113/WIS 19 intersection, east of Waunakee, west of River Road. Empire Prairie is a high quality dry prairie remnant. This area contains one plant, two insects, and one snake shown on the Wisconsin State NHI list.

5.9 Groundwater Wells

The Wisconsin High-Capacity Well Network database indicated 62 high-capacity wells within the public lands survey sections that comprise the corridor study area. Most of the wells appear to be utilized for irrigation purposes.

5.10 Springs

No natural springs were identified within the project area in any of the databases searched. Small, unnamed springs may be present and should be investigated in the future if construction activities occur.

5.11 Cemeteries

There are three cemeteries located within a 1/4 mile of WIS 19.

- Deansville Cemetery is located on the south side of WIS 19 at the intersection of County TT in the town of Medina It has 112 interments.
- Saint Mary's Cemetery is located on the north side of WIS 19, one block up on Karem Drive in the village of Marshall. It has 661 interments.
- Medina Cemetery is located next to Little Amerricka, on the south side of WIS 19 at the intersection of Box Elder Road in the town of Medina. It has 1,893 interments.

6 Preservation Plan and Recommendations

Chapters 1 through 5 of this report provided details of the existing conditions within the WIS 19 study corridor that included operational deficiencies and safety concerns. This Chapter will document the type and locations of scheduled and recommended improvements to the WIS 19 corridor to help preserve the safety and mobility of the corridor and to mitigate operational and safety concerns with corridor preservation projects.

6.1 Improvement Types

Safety and mobility deficiencies contribute to declining operational and safety conditions along WIS 19. Improvements are necessary to preserve the safety and mobility of the highway for as long as possible.

This preservation plan incorporates near term WisDOT scheduled and recommended improvements to preserve safety and mobility along WIS 19. Four types of improvements are described in this chapter:

- Scheduled Improvements (within the Six Year Program and independent of this study)
- Unscheduled Improvements (not in the Six Year Program identified in this study)
- Access Management Improvements (identified in this study)
- Recommendations from other studies (continuing beyond this study)

6.1.1 Scheduled Improvements (Six Year Program)

The Six Year Highway Improvement Program refers to the near term upcoming State of Wisconsin projects that are scheduled for construction between 2016 and 2021. All improvements listed in this program were studied independently of this preservation study.

Project categories scheduled for construction in the six year program within the WIS 19 study limits include:

- Extension of a four lane section
- Mill and overlay projects
- Intersection reconstruction with roundabout installation
- Intersection reconstruction with traffic signal installation
- Bridge replacement
- Bridge deck overlay
- Intersection lane layout reconfiguration without change to controls
- Shoulder reconstruction, skid/friction overlay, and rumble strip addition

Refer to Exhibit 4 for a map of specific upcoming highway construction projects and the currently scheduled year of construction. This exhibit is an illustration of the Six Year Program along the WIS 19 corridor.

6.1.2 Other Recommended Improvements (Not in the Six Year Program)

The Six Year Highway Improvement Program projects will mitigate some of the operational and safety concerns and deficiencies identified in the WIS 19 corridor, however, many additional improvements are proposed to mitigate additional concerns. The following are the general types of preservation improvements that have been specifically identified within this study:

- Intersection reconstruction with roundabout installation
- Intersection reconstruction with traffic signal installation
- Intersection lane layout reconfiguration
- Improved stop sign controlled intersections
- Intersection median installation
- Intersection left turn lane additions
- Passing lane installation
- Intersection geometry
- Improved pedestrian and bike facilities

6.1.3 Access Management Improvements

Access Management is the coordinated planning, regulation, and design of access between roadways and land development.[37] The main goal with access management programs is to align transportation plans, access policies, and design standards with the desired function of each roadway in the transportation network. Access management strives to limit the number of traffic conflicts that occur at any given location and minimize speed changes and limit the speed differential between turning vehicles.

Traffic volumes and crashes continue to rise along WIS 19 as land use develops adjacent to the corridor. Without proper access management, the function and character of WIS 19 can deteriorate rapidly, jeopardizing the investment.

Every landowner has a right to reasonable access which is a right of access to a public roadway from a parcel in which he or she owns. Any property owner that is landlocked as a result of a new access control would be granted alternate access to a roadway or compensated should acquisition be needed.[38] Eminent domain may be applied where

[37] FDM 7-15-1, Section 1.2 Application Criteria

[38] FDM 11-5-5

necessary to achieve controlled access highways and may acquire all or part of the access rights to properties that abut the roadway.

Whenever possible, joint access agreements should be considered to reduce conflict points on busy streets. A joint or shared driveway is when two or more adjacent owners share a driveway for ingress/egress. Joint access can be built into private real estate titles through easements.

As a general recommendation in urban areas, properties with less than 60 feet of frontage along and arterial roadway should not have individual driveways. This can be an especially helpful guide in downtown areas that have numerous commercial driveways.

Driveway spacing and driveway density are important considerations in managing access. When driveways are spaced too close together or there are too many driveways in an area, traffic accident rates often increase and traffic speeds slow.

A detailed investigation of access locations was performed and potential solutions to reduce conflict points were developed. For this study, access management considerations included a wide array of elements including:

- Current AADTs
- Five-year crash rates, severity, and contributing conditions (weather, time of day)
- Existing speed limits
- Existing spacing of driveways and roadways and their proximity to each other
- Existing spacing from interchange ramps
- Existing spacing of median openings
- Existing intersection control type (stop control, traffic signal, roundabout)
- Existing site distance (vertical and horizontal)
- Considerations from existing and future land use and adopted comprehensive plans

A series of maps with access recommendations have been created for the WIS 19 corridor (refer to Exhibit 12 – Access Management Plan). These recommendations are not priority based, and can be implemented at any time and any location when land use changes occur, or funds become available. Access changes can, and will most likely occur as part of other roadway maintenance or Highway Safety Improvement Program (HSIP) projects.

Notations are displayed in Exhibit 12 describing each recommendation. Access recommendations include but are not limited to:

- Consolidating driveways
- Relocating driveways
    - New frontage roads

    - Existing roads
    - Back alleyways
    - Existing driveway
    - New driveway location
    - Upon redevelopment of parcel or when land use changes
    - If a safety or operational concern is present

- Removal of driveways
- Consideration of intersection or median adjustments
    - Proposed traffic signals
    - Proposed roundabouts
    - Right-in/right-out/left-in
    - Right-in/right-out
    - Call outs from other projects - (Programmed Studies)

Methodology and Access Criteria

Existing public and private access points were studied along the entire 30.5 mile corridor. A total of 648 access points currently exist on the WIS 19 corridor. Existing access spacing standards as defined in Wisconsin Facilities Development Manual (FDM Chapter 7-5-1) have been reviewed and each access driveway was evaluated alongside several criteria including:

- Tiers - Tier 1, 2A/2B, and Tier 4 – Refer to Table 1 below for explanations
- WisDOT FDM Interchange Influence Areas
- WisDOT FDM Allowable Access Spacing using Functional Classification of Roadways
- Parcels with multiple access points

When an existing access point does not meet the spacing recommendations as identified in WisDOT's State Access Management Plan (SAMP), it is often because no reasonable alternative access exists. A set of guidance criteria has been established in the FDM, however, the guidance recommends, first and foremost, that all access decisions balance current needs with safety risks. Therefore, not all access points with one or more of the criteria above will necessarily lead to a recommendation.

Tiers

As discussed in Chapter 2, highways included in Tiers 1, 2A, 2B of the State Access Management Plan are WisDOT's top priority for access control. Administrative access control should be used where there is a priority for access control but there is no project with general right-of-way acquisition in the Six Year Improvement Program, and where

abutting lands may be expected to change from agricultural and low density residential use to a more traffic-intensive use. This type of access control is best used when it is not necessary to eliminate driveways, but simply to freeze the existing access and control any future changes in access. [39]

Wisconsin Stats. 84.25 allows the number of access points it deems appropriate, providing all parcels are given reasonable access. Under this statute, access control is typically frozen at the time of implementation, and best used as a way to cap the existing access. From there, strict permitting and control of any future changes in access should be adhered to. This is especially important on WIS 19 since existing access is double the statewide average (21.2 access points per mile) corridor-wide.

If any new access points on WIS 19 are considered, a set of WisDOT guidelines have been established (refer to Table 1: WisDOT Guidelines for New Access Points per Facilities Development Manual on page 18 of this report) and will be evaluated on a case by case basis.

Table 51 shows existing access points by Tier and their general location along WIS 19.

Table 51: Access Points on WIS 19 by Tier

Map Section	Access Points by Tier				General Location (West to East)
	Tier 1	Tier 2A/2B	Tier 4	Total Driveways by Segment	
A	-	18	-	18	US 12 Springfield
B	-	13	-	13	↓
C	-	8	-	8	
D	-	8	-	8	
E	-	8	-	8	
F	-	9	-	9	
G	-	71	-	71	Downtown Waunakee
H	-	9	-	9	↓
I	1	4	-	5	
J	8	-	-	8	
K	9	-	-	9	
L	9	-	-	9	

[39] FDM 7-15-1, Section 1.2 Application Criteria

Map Section	Access Points by Tier				General Location (West to East)
	Tier 1	Tier 2A/2B	Tier 4	Total Driveways by Segment	
M	12	-	-	12	Interstate 39/90/94
N	13	-	-	13	
O	2	9	-	13	
P	-	21	-	21	
Q	-	8	-	8	
R	-	6	2	8	
S	-	-	19	19	
T	-	-	63	63	
U	-	-	73	73	Downtown Sun Prairie
V	-	14	6	20	
W	-	8	-	8	
X	-	16	-	16	
Y	-	13	-	13	
Z	-	14	-	14	
AA	-	20	-	20	
BB	-	15	-	15	
CC	-	8	5	13	
DD	-	13	46	59	Village of Marshall
EE	-	6	-	6	
FF	-	7	-	7	
GG	-	1	4	5	
HH	-	-	47	47	City of Waterloo
Total by Tier	54	327	265	648	

Interchange Influence Areas

The WisDOT FDM 11-5 Attachment 5.2 defines Access Control for a Typical Interchange. It defines a 1,320 foot desirable distance for a crossroad (one-quarter mile). Within one-quarter mile of an interchange, it is vitally important to limit access, if not eliminate access completely. Without proper access management and spacing, too many turning or slow moving vehicles could crowd the street system. The need for roundabouts or signals to move traffic increase, which in turn, can cause a delay either on the crossroad, or interchange ramp. To preserve the intended function of the interchange, adequate geometry at ramp termini and appropriate access control along crossroads are essential.

All access within one-quarter mile of an interchange ramp was evaluated. Recommendations were made where possible to consolidate or remove access once land uses develop. WIS 19 intersects interstate and US highways at three locations. Their locations, corresponding maps

panels, and access points not meeting desirable spacing requirements are called out in orange hatching (refer to Exhibit 12 – Access Management Plan). They include:

- Interstate 39/90/94 (Panel M and N) – 11 access points
- US 51 (Panel N and O) – 8 access points
- US 151 (Panels S and T) – 19 access points

Allowable Access Spacing

The WIS 19 Corridor has a majority of its access points not meeting WisDOT's FDM Access Spacing Guidelines (WisDOT FDM Chapter 11-5, Attachment 5.1). WIS 19 is a principal arterial carrying more than 5,000 vehicles per day. Therefore, the recommended minimum spacing between WIS 19 and private and/or local roads is 1,000 feet. As WIS 19 intersects with higher functionally classified roadways (major collectors, minor arterials, etc.), that minimum distance increases.

Areas where the intersection/driveway spacing meets FDM guidelines are shown in green hatching (refer to Exhibit 12 – Access Management Plan).

6.1.4 Other Studies

Unrelated to this WIS 19 study but overlapping in geography are several other roadway studies. These studies may have recommendations beyond the scope of this WIS 19 safety and operations study. Refer to pages 8 and 9 of this report for information on these adjacent studies and locations to find more information related to their scope and schedule.

6.2 Findings and Recommendations

6.2.1 Unscheduled Improvements (Not in the Six Year Program)

Refer to Exhibit 10 for an Improvement Overview map locating the primary scheduled and recommended improvements within the study limits. Refer to Exhibit 11 for Conceptual Drawings of specific intersection improvement strategies. Refer to Table 52: Intersection Improvements Table (Table spans 18 pages) for details of all recommended intersection improvements within the WIS 19 corridor. This table contains many improvement recommendations beyond those illustrated on Exhibit 10 and Exhibit 11.

Table 52: Intersection Improvements Table (Table spans 18 pages)

WIS 19 Intersection	Municipality	Exhibit 9 Station	Current Control	WIS 19 Intersection Deficiency (Year 2050 No-build Conditions)								Overlapping 6-year Program Project	Unscheduled Improvement Strategies	Exhibit 11 Concept Drawing Provided
				Operational Concern	Left Turn Phase Considered	WIS 19 Left Turn Lane Considered	Signal warrant potentially met in 2050	Pedestrian crosswalk absent	Long queues projected	Crash pattern identified	Rural Intersection geometric deficiency			
US 12	T Springfield	0+00		●		Exist	Exist	N/A	●	+				
				✓					✓	✓			NB and SB lane control heads for US 12 movements	
				✓					✓	✓			Dual WB LT lanes and add WB LT signal phase	
				✓					✓	✓			Capacity improvement study (US 12 Freeway Conversion Study)	
Lodi - Springfield Road	T Springfield	26+20		o		●		N/A			●	Mill and Overlay 5290-01-74		
						✓							Enhanced advance warning signage for intersection along WIS 19	
											✓		WisDOT Type B2 standards (existing D)	
				✓		✓							EB and WB offset LT lanes with raised median for two-stage crossing	✓
				✓									Capacity improvement study (US 12 Freeway Conversion Study)	

Legend

- ● Indicates a deficiency that is forecasted to exist in year 2050 at the particular intersection
- o LOS E/F is achieved for an approach / movement, but the volume during the peak hour is less than 50 vehicles
- # Indicates high crash severity in addition to a crash pattern
- + Indicates high crash rate in addition to a crash pattern
- ✓ Listed improvement strategy will partially address the deficiency
- N/A Intersection not included in the traffic analysis or not appropriate for pedestrian crossing
- Exist Warrant or consideration has already been addressed or is currently in-place

WIS 19 Intersection	Municipality	Exhibit 9 Station	Current Control	WIS 19 Intersection Deficiency (Year 2050 No-build Conditions)								Overlapping 6-year Program Project	Unscheduled Improvement Strategies	Exhibit 11 Concept Drawing Provided
				Operational Concern	Left Turn Phase Considered	WIS 19 Left Turn Lane Considered	Signal warrant potentially met in 2050	Pedestrian crosswalk absent	Long queues projected	Crash pattern identified	Rural Intersection geometric deficiency			
Wipperfurth Rd	T Springfield	150+67	STOP	N/A				N/A			●	Mill and Overlay 5290-01-74		
											✓		WisDOT Type B2 standards (existing D)	
Kingsley Road	T Springfield	171+91	STOP	N/A				N/A			●			
											✓		Extension of right-turn lanes to WisDOT Type B2 standards (existing D)	
Hellenbrand Road	T Springfield	200+60	STOP	N/A				N/A			●			
											✓		WisDOT Type B1 standards (existing D)	
WIS 113 North / County Q	V Waunakee	259+74		●		●	Exist Roundabout		●		N/A			
				✓					✓				Review and modification of approach lane assignments	
				✓					✓				Extension of two-lane departure lanes from roundabout	
West Street	V Waunakee	268+36	STOP	O		●					N/A			
						✓							Delineation of EB and WB offset LT lanes by restricting parking	

Legend

- ● Indicates a deficiency that is forecasted to exist in year 2050 at the particular intersection
- O LOS E/F is achieved for an approach / movement, but the volume during the peak hour is less than 50 vehicles
- # Indicates high crash severity in addition to a crash pattern
- + Indicates high crash rate in addition to a crash pattern
- ✓ Listed improvement strategy will partially address the deficiency
- N/A Intersection not included in the traffic analysis or not appropriate for pedestrian crossing
- Exist Warrant or consideration has already been addressed or is currently in-place

WIS 19 Intersection	Municipality	Exhibit 9 Station	Current Control	WIS 19 Intersection Deficiency (Year 2050 No-build Conditions)								Overlapping 6-year Program Project	Unscheduled Improvement Strategies	Exhibit 11 Concept Drawing Provided
				Operational Concern	Left Turn Phase Considered	WIS 19 Left Turn Lane Considered	Signal warrant potentially met in 2050	Pedestrian crosswalk absent	Long queues projected	Crash pattern identified	Rural Intersection geometric deficiency			
Division Street	V Waunakee	299+69		●		Exist	Exist		●		N/A			
				✓					✓				Turn lanes and LT phases on all approaches. NB RT overlap phasings and optimize signal timings	✓
				✓					✓				Roundabout shifted NE to minimize impacts	✓
				✓					✓				WIS 19 capacity improvement study	
Raemisch Road / Schumacher Road	T Westport	326+30		●	Exist	Exist	Exist	●	●	●	N/A			
								✓					Pedestrian phase for WIS 19 crossing movement	
				✓					✓	✓			Roundabout	
				✓					✓	✓			WIS 19 capacity improvement study	

Legend

- ● Indicates a deficiency that is forecasted to exist in year 2050 at the particular intersection
- o LOS E/F is achieved for an approach / movement, but the volume during the peak hour is less than 50 vehicles
- # Indicates high crash severity in addition to a crash pattern
- + Indicates high crash rate in addition to a crash pattern
- ✓ Listed improvement strategy will partially address the deficiency
- N/A Intersection not included in the traffic analysis or not appropriate for pedestrian crossing
- Exist Warrant or consideration has already been addressed or is currently in-place

WIS 19 Intersection	Municipality	Exhibit 9 Station	Current Control	WIS 19 Intersection Deficiency (Year 2050 No-build Conditions)								Overlapping 6-year Program Project	Unscheduled Improvement Strategies	Exhibit 11 Concept Drawing Provided
				Operational Concern	Left Turn Phase Considered	WIS 19 Left Turn Lane Considered	Signal warrant potentially met in 2050	Pedestrian crosswalk absent	Long queues projected	Crash pattern identified	Rural Intersection geometric deficiency			
Hogan Road	T Westport	366+25	STOP	o		Exist WB only	●	N/A	●	●	N/A			
										✓			Enhanced advance warning signage along WIS 19	
				✓					✓				Restriction of median to allow WB LT only	
				✓		✓	✓		✓	✓			Roundabout	✓
				✓					✓	✓			WIS 19 capacity improvement study	
WIS 113 South / County I	T Westport	393+41	STOP	Programmed roundabout reconstruction in 2018								Convert to roundabout intersection control		
Quarry Entrance	T Westport	420+77	STOP								●			
											✓		Coordination with property owner to construct EB auxiliary/climbing lane for NB RT heavy vehicles exiting the quarry	
Dane County Shooting Range Entrance	T Westport	439+98	STOP								●			
											✓		Coordination with property owner to construct EB LT bypass lane	

Legend

- ● Indicates a deficiency that is forecasted to exist in year 2050 at the particular intersection
- o LOS E/F is achieved for an approach / movement, but the volume during the peak hour is less than 50 vehicles
- # Indicates high crash severity in addition to a crash pattern
- + Indicates high crash rate in addition to a crash pattern
- ✓ Listed improvement strategy will partially address the deficiency
- N/A Intersection not included in the traffic analysis or not appropriate for pedestrian crossing
- Exist Warrant or consideration has already been addressed or is currently in-place

WIS 19 Intersection	Municipality	Exhibit 9 Station	Current Control	WIS 19 Intersection Deficiency (Year 2050 No-build Conditions)								Overlapping 6-year Program Project	Unscheduled Improvement Strategies	Exhibit 11 Concept Drawing Provided
				Operational Concern	Left Turn Phase Considered	WIS 19 Left Turn Lane Considered	Signal warrant potentially met in 2050	Pedestrian crosswalk absent	Long queues projected	Crash pattern identified	Rural Intersection geometric deficiency			
River Road	T Westport	522+05	STOP	●	●	Exist	●	N/A	●	●		Expand WIS 19 to 4 lanes; upgrade intersection control		
										✓			Enhanced advance warning signage along WIS 19	
				✓	✓		✓		✓	✓			Roundabout	✓
				✓	✓		✓		✓	✓			Traffic Signal	✓
				✓	✓				✓	✓			WIS 19 capacity improvement study	
I-39/90/94 SB Exit Ramp	V DeForest	572+17	STOP		●	Exist	●	N/A	●	●	N/A	Upgrade intersection control to traffic signals		
										✓			Enhanced advance warning signage along WB WIS 19	
					✓		✓		✓	✓			Coordination of new traffic signal (ID 1020-20-04) with adjacent traffic signals and optimization of timings	

Legend

- ● Indicates a deficiency that is forecasted to exist in year 2050 at the particular intersection
- o LOS E/F is achieved for an approach / movement, but the volume during the peak hour is less than 50 vehicles
- # Indicates high crash severity in addition to a crash pattern
- + Indicates high crash rate in addition to a crash pattern
- ✓ Listed improvement strategy will partially address the deficiency
- N/A Intersection not included in the traffic analysis or not appropriate for pedestrian crossing
- Exist Warrant or consideration has already been addressed or is currently in-place

WIS 19 Intersection	Municipality	Exhibit 9 Station	Current Control	WIS 19 Intersection Deficiency (Year 2050 No-build Conditions)								Overlapping 6-year Program Project	Unscheduled Improvement Strategies	Exhibit 11 Concept Drawing Provided
				Operational Concern	Left Turn Phase Considered	WIS 19 Left Turn Lane Considered	Signal warrant potentially met in 2050	Pedestrian crosswalk absent	Long queues projected	Crash pattern identified	Rural Intersection geometric deficiency			
I-39/90/94 NB Entrance Ramp	V DeForest	578+88	NONE	●		Exist	N/A	●	●	●	N/A			
				✓					✓	✓			Adjustment of signal timing at County CV to allow dedicated gaps for EB LT movement	
County CV	V DeForest	581+68			Exist	Exist	Exist	●	●	●	N/A			
										✓			Lane control signal heads along WIS 19	
								✓					Sidewalk system and crosswalks to adjacent developments	
I-39/90/94 NB Exit Ramp	V DeForest	588+21			N/A	N/A	Exist	●	●	●	N/A			
										✓			Lane control signal heads along WIS 19	
										✓			Custom signage to NB ramp for advance warning of County CV lane assignment	
								✓					Sidewalk system and crosswalks to adjacent developments	

Legend

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- o LOS E/F is achieved for an approach / movement, but the volume during the peak hour is less than 50 vehicles
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WIS 19 Intersection	Municipality	Exhibit 9 Station	Current Control	WIS 19 Intersection Deficiency (Year 2050 No-build Conditions)								Overlapping 6-year Program Project	Unscheduled Improvement Strategies	Exhibit 11 Concept Drawing Provided
				Operational Concern	Left Turn Phase Considered	WIS 19 Left Turn Lane Considered	Signal warrant potentially met in 2050	Pedestrian crosswalk absent	Long queues projected	Crash pattern identified	Rural Intersection geometric deficiency			
Pepsi Way	V DeForest	599+81	STOP		●	Exist	●	●	●	●	●	Upgrade intersection control		
					✓		✓	✓	✓	✓			Traffic signal and investigation of potential benefit of placing into existing system and optimize timings	
											✓		Extension of WBRT storage length to match WisDOT Type A2 standards	
								✓					Sidewalk system and crosswalks to adjacent developments	
North Towne Road	V DeForest	614+94	STOP	o		Exist EB only	●	●			N/A			
				✓			✓						Traffic signal and investigation potential benefit of placing into existing system and optimize timings	
								✓					Sidewalk system and crosswalks to adjacent developments as development occurs	

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WIS 19 Intersection	Municipality	Exhibit 9 Station	Current Control	WIS 19 Intersection Deficiency (Year 2050 No-build Conditions)								Overlapping 6-year Program Project	Unscheduled Improvement Strategies	Exhibit 11 Concept Drawing Provided
				Operational Concern	Left Turn Phase Considered	WIS 19 Left Turn Lane Considered	Signal warrant potentially met in 2050	Pedestrian crosswalk absent	Long queues projected	Crash pattern identified	Rural Intersection geometric deficiency			
US 51 SB Ramps	V DeForest	627+86			Exist	Exist	Exist	●			●			
								✓					Sidewalk system and crosswalks to adjacent developments as development occurs	
											✓		Raising of monotube mast arms to meet MUTCD vertical clearance standards	
US 51 NB Ramps	V DeForest	634+18			Exist	Exist	Exist	●			●			
								✓					Sidewalk system and crosswalks to adjacent developments as development occurs	
											✓		Raising of monotube mast arms to meet MUTCD vertical clearance standards	
Williamsburg Way	V DeForest	647+75		N/A			●							
							✓						Analysis as development occurs	

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WIS 19 Intersection	Municipality	Exhibit 9 Station	Current Control	WIS 19 Intersection Deficiency (Year 2050 No-build Conditions)								Overlapping 6-year Program Project	Unscheduled Improvement Strategies	Exhibit 11 Concept Drawing Provided
				Operational Concern	Left Turn Phase Considered	WIS 19 Left Turn Lane Considered	Signal warrant potentially met in 2050	Pedestrian crosswalk absent	Long queues projected	Crash pattern identified	Rural Intersection geometric deficiency			
Portage Road	T Burke	714+12		●	●	Exist	Exist	N/A	●	●				
				✓	✓				✓	✓			NB and SB LT turn lanes and adjustment of signal phasing as appropriate	✓
				✓					✓	✓			Roundabout	
				✓					✓	✓			WIS 19 capacity improvement study	
Fox Run	T Burke	735+92		N/A				N/A			●			
											✓		Extension of right-turn lanes to WisDOT Type B2 standards (existing D)	
Westmount Drive	T Burke	763+17		●	●	●	●	●	●	●		Upgrade intersection control		
				✓	✓	✓	✓	✓	✓	✓			Traffic Signal	✓
				✓		✓		✓	✓	✓			Roundabout	✓
				✓					✓	✓			WIS 19 capacity improvement study	

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WIS 19 Intersection	Municipality	Exhibit 9 Station	Current Control	WIS 19 Intersection Deficiency (Year 2050 No-build Conditions)								Overlapping 6-year Program Project	Unscheduled Improvement Strategies	Exhibit 11 Concept Drawing Provided
				Operational Concern	Left Turn Phase Considered	WIS 19 Left Turn Lane Considered	Signal warrant potentially met in 2050	Pedestrian crosswalk absent	Long queues projected	Crash pattern identified	Rural Intersection geometric deficiency			
County C/ Grand Avenue	C Sun Prairie	797+72		●	Exist	Exist	Exist	●	●	●		County Project: reconstruct north leg and add pedestrian crossing for WIS 19		
				✓					✓	✓			EB and WB offset LT lanes	✓
				✓					✓	✓			Conversion of SB RT to a TH and construct SB RT lane	
								✓					Sidewalk system and crosswalks to adjacent developments	
				✓					✓	✓			WIS 19 capacity improvement study	
Thompson Road	C Sun Prairie	824+43		●	Exist	Exist	Exist		●	●	N/A			
				✓					✓	✓			WIS 19 capacity improvement study	
Broadway Drive	C Sun Prairie	859+00		●	●	●	Exist		●	●	N/A	Reconstruct intersection with signal improvements		
				✓	✓	✓			✓	✓			Reconstruction of EB and WB approaches to consist of a LT, TH, and shared TH/RT lanes. Restriping of NB approach as shared TH/LT and exclusive RT. Addition of LT phases as appropriate	✓
				✓					✓	✓			WIS 19 capacity improvement study	

Legend

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				Operational Concern	Left Turn Phase Considered	WIS 19 Left Turn Lane Considered	Signal warrant potentially met in 2050	Pedestrian crosswalk absent	Long queues projected	Crash pattern identified	Rural Intersection geometric deficiency			
Lois Drive / Com. Drive	C Sun Prairie	871+40	STOP	●		●	●		●		N/A			
				✓					✓				Adjustment of adjacent signal system to provide gaps at this intersection	
US 151 SB Ramps	C Sun Prairie	877+92		●	Exist	Exist	Exist	●		●	N/A			
								✓					Sidewalk system and crosswalks to adjacent development	
				✓						✓			Diamond interchange phasing and investigation of potential benefit of placing into signal system with all signals from US 151 to Bird Street	

Legend

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				Operational Concern	Left Turn Phase Considered	WIS 19 Left Turn Lane Considered	Signal warrant potentially met in 2050	Pedestrian crosswalk absent	Long queues projected	Crash pattern identified	Rural Intersection geometric deficiency			
US 151 NB Ramps	C Sun Prairie	883+30		●	Exist	Exist	Exist	●		●	N/A			
								✓					Sidewalk system and crosswalks to adjacent development	
				✓						✓			Dual LT and dual RT lanes. Diamond interchange phasing and investigation of potential benefit of placing into signal system with all signals from US 151 to Bird Street	
Davison Drive	C Sun Prairie	891+13		●	Exist	Exist	Exist		●	●	N/A			
				✓					✓	✓			NB and SB LT lanes and implementation of LT phasing. Investigation of potential benefit to placing into signal system with all signals from US 151 to Bird Street	

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WIS 19 Intersection	Municipality	Exhibit 9 Station	Current Control	WIS 19 Intersection Deficiency (Year 2050 No-build Conditions)								Overlapping 6-year Program Project	Unscheduled Improvement Strategies	Exhibit 11 Concept Drawing Provided
				Operational Concern	Left Turn Phase Considered	WIS 19 Left Turn Lane Considered	Signal warrant potentially met in 2050	Pedestrian crosswalk absent	Long queues projected	Crash pattern identified	Rural Intersection geometric deficiency			
Bird Street	C Sun Prairie	899+80		●	Exist	Exist	Exist		●	●	N/A			
				✓					✓	✓			Investigation of potential benefit to placing into signal system with all signals from US 151 to Bird Street	
				✓					✓	✓			Roundabout	
				✓					✓	✓			EB and WB offset LT lanes	
County N /Bristol Street	C Sun Prairie	936+14	 EB/SB Only	●		Exist	●		●	●	N/A			
										✓			Advance warning signage of intersection	
				✓			✓		✓	✓			Traffic Signal	
				✓			✓		✓	✓			Roundabout	✓

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WIS 19 Intersection	Municipality	Exhibit 9 Station	Current Control	WIS 19 Intersection Deficiency (Year 2050 No-build Conditions)								Overlapping 6-year Program Project	Unscheduled Improvement Strategies	Exhibit 11 Concept Drawing Provided
				Operational Concern	Left Turn Phase Considered	WIS 19 Left Turn Lane Considered	Signal warrant potentially met in 2050	Pedestrian crosswalk absent	Long queues projected	Crash pattern identified	Rural Intersection geometric deficiency			
Main Street	C Sun Prairie	952+76		●	●	●	Exist		●	●	N/A			
										✓			Overhead mast arm signal heads	
				✓	✓	✓			✓	✓			Removal of parking spot on WB WIS 19 between Bristol St and Columbus St in order to increase RT storage	
				✓	✓	✓			✓	✓			Delineation of additional turn lanes by considering the removal of parking if delay and safety concerns present themselves	
				✓	✓	✓			✓	✓			EB and SB LT phasing and coordination with Market Street	
Market Street/Church Street	C Sun Prairie	959+60		●	●	●	Exist			●	N/A			
										✓			Overhead mast arm signal heads	

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WIS 19 Intersection	Municipality	Exhibit 9 Station	Current Control	WIS 19 Intersection Deficiency (Year 2050 No-build Conditions)								Overlapping 6-year Program Project	Unscheduled Improvement Strategies	Exhibit 11 Concept Drawing Provided
				Operational Concern	Left Turn Phase Considered	WIS 19 Left Turn Lane Considered	Signal warrant potentially met in 2050	Pedestrian crosswalk absent	Long queues projected	Crash pattern identified	Rural Intersection geometric deficiency			
Linnerud Drive/Dewey Street	C Sun Prairie	966+31	STOP	●		●	●		●	●	N/A			
				✓			✓		✓	✓			Traffic Signal	
Town Hall Drive	T Sun Prairie	1027+25	STOP	●		●	●	N/A		#	●			
				✓		✓				✓	✓		EB and WB offset LT lanes with raised median for two-stage crossing	
				✓		✓	✓			✓			Traffic Signal	✓
				✓		✓	✓			✓			Roundabout	✓
County VV	T Sun Prairie	1080+61	STOP			●		N/A		#	●			
										✓	✓		Improvement of intersection sight distance for NB LT	
						✓				✓	✓		EB and WB offset LT lanes with raised median for two-stage crossing	

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WIS 19 Intersection	Municipality	Exhibit 9 Station	Current Control	WIS 19 Intersection Deficiency (Year 2050 No-build Conditions)								Overlapping 6-year Program Project	Unscheduled Improvement Strategies	Exhibit 11 Concept Drawing Provided
				Operational Concern	Left Turn Phase Considered	WIS 19 Left Turn Lane Considered	Signal warrant potentially met in 2050	Pedestrian crosswalk absent	Long queues projected	Crash pattern identified	Rural Intersection geometric deficiency			
Twin Lane Road	T Sun Prairie	1145+00	STOP	N/A				N/A		●	●			
										✓			Advance warning signage of intersection	
										✓	✓		Intersection skewed. Reconstruction to WisDOT standards	
County TT North	V Marshall	1260+40	STOP			●		N/A		●				
										✓			Advance warning signage of intersection	
Schappe Road	V Marshall	1287+25	STOP	N/A				N/A			●			
											✓		Intersection skewed. Reconstruction to WisDOT standards	
County T	V Marshall	1368+71	STOP	o		●	●							
				✓		✓							Delineation of EB and WB offset LT lanes by considering the removal of parking if delay and safety concerns present themselves	

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WIS 19 Intersection	Municipality	Exhibit 9 Station	Current Control	WIS 19 Intersection Deficiency (Year 2050 No-build Conditions)								Overlapping 6-year Program Project	Unscheduled Improvement Strategies	Exhibit 11 Concept Drawing Provided
				Operational Concern	Left Turn Phase Considered	WIS 19 Left Turn Lane Considered	Signal warrant potentially met in 2050	Pedestrian crosswalk absent	Long queues projected	Crash pattern identified	Rural Intersection geometric deficiency			
WIS 73 South /Deerfield Road	V Marshall	1374+77		●	●	●	Exist		●	●				
				✓	✓	✓			✓	✓			Delineation of WB LT lane by removing parking and adding WB LT signal phase	✓
WIS 73 North /Hubbell Street	V Marshall	1383+95	STOP	●		●	●	●	●	●				
								✓					Pedestrian crossing	
				✓		✓	✓	✓	✓	✓			Traffic signal and investigation of potential benefit to placing into existing system and optimize timings	✓
Box Elder Road	V Marshall	1397+20	STOP	N/A							●			
											✓		WisDOT Type B1 standards (existing C)	
Industrial Drive	V Marshall	1404+00	STOP	N/A							●			
											✓		WisDOT Type A2 standards (existing D)	

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WIS 19 Intersection	Municipality	Exhibit 9 Station	Current Control	WIS 19 Intersection Deficiency (Year 2050 No-build Conditions)								Overlapping 6-year Program Project	Unscheduled Improvement Strategies	Exhibit 11 Concept Drawing Provided
				Operational Concern	Left Turn Phase Considered	WIS 19 Left Turn Lane Considered	Signal warrant potentially met in 2050	Pedestrian crosswalk absent	Long queues projected	Crash pattern identified	Rural Intersection geometric deficiency			
Cherry Lane	V Marshall	1470+31	STOP	N/A							●			
											✓		WisDOT Type B2 standards (existing C)	
McKay Way	C Waterloo	1550+21	STOP			●					●	Resurface 3050-02-72		
											✓		Extension of taper length to meet WisDOT Intersection Type A2 standards	
						✓							WB bypass lane	
Jackson Street	C Waterloo	1596+94	STOP			●								
						✓							Delineation of EB and WB offset LT lanes by considering the removal of parking if delay and safety concerns present themselves	
WIS 89 North /Monroe Street	C Waterloo	1602+88	STOP	●		●	●		●					
				✓		✓	✓		✓				Traffic Signal	

Legend

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Refer to Table 53: Section Improvements Table (Table spans next 6 pages) for details of all recommended highway section improvements within the WIS 19 corridor. This table contains many improvement recommendations beyond those illustrated on Exhibit 10 and Exhibit 11.

Table 53: Section Improvements Table (Table spans next 6 pages)

WIS 19 Section Subsection	Station	Roadway Feature	WIS 19 Highway Section Deficiency (Year 2050 No-build Conditions): Section Operational Concern for Year 2050	Crash Association	Speed concerns from public	Curve deficiency	Structure deficiency	Lack of Bike Shoulders	Overlapping 6-year Program Projects	Unscheduled Improvement Strategies
US 12 - Six Mile Creek										
US 12 - Six Mile Creek	0+00 - 230+21		●					●	Mill and Overlay 5290-01-74	
								✓		Widening of shoulder width to minimum 5 feet to accommodate bicycles
			✓							Passing zone review and implementation of improvements to increase passing ability
US 12 - Darlin Road	0+00 - 7+68	Horiz Curve				●				
						✓				Reconstruction of curve to WisDOT standards
West of Lodi-Springfield Road	7+68 - 26+20	2 Vert Curves				●				
						✓				Reconstruction of curves to WisDOT standards
West of Barman Road	70+34	Vert Curve				●				
						✓				Reconstruction of curve to WisDOT standards
East of Kuehn Road	92+50	Horiz Curve				●				
						✓				Reconstruction of curve to WisDOT standards
West of Wipperfurth Road	150+67	Horiz/Vert Curve		●		●				
				✓		✓				High friction pavement treatment
				✓		✓				Reconstruction of curve to WisDOT standards
East of Wipperfurth Road	150+67	Horiz Curve				●				
						✓				Reconstruction of curve to WisDOT standards
Six Mile Creek Bridge	230+21	Structure					●			
							✓			Rehabilitation of structure

● Indicates a deficiency that is forecasted to exist in year 2050 within the designated WIS 19 section

✓ Indicates the listed improvement strategy is likely to provide a level of correction for the deficiency listed

WIS 19 Section / Subsection	Station	Roadway Feature	WIS 19 Highway Section Deficiency (Year 2050 No-build Conditions): Section Operational Concern for Year 2050	Crash Association	Speed concerns from public	Curve deficiency	Structure deficiency	Lack of Bike Shoulders	Overlapping 6-year Program Projects	Unscheduled Improvement Strategies
Six Mile Creek - County I										
Six Mile Creek - County I	230+21 - 393+41		●							
			✓							Implementation of intersection improvements
Six Mile Creek - Holiday Drive	230+21 - 249+74							●		
								✓		Widening of shoulder width to minimum 5 feet to accommodate bicycles
Approaches to WIS 113 / County Q Roundabout	259+74				●					
					✓					Roundabout approach speed study
Fish Street - Water Street	273+04 - 282+45	Parking		●						
				✓						Removal of parking within intersection clear sight triangles

● Indicates a deficiency that is forecasted to exist in year 2050 within the designated WIS 19 section

✓ Indicates the listed improvement strategy is likely to provide a level of correction for the deficiency listed

WIS 19 Section / Subsection	Station	Roadway Feature	WIS 19 Highway Section Deficiency (Year 2050 No-build Conditions): Section Operational Concern for Year 2050	Crash Association	Speed concerns from public	Curve deficiency	Structure deficiency	Lack of Bike Shoulders	Overlapping 6-year Program Projects	Unscheduled Improvement Strategies
County I - I-39/90/94										
County I - I-39/90/94	393+41 - 577+37		●					●		
								✓		Widening of shoulder width to minimum 5 feet to accommodate bicycles
			✓							Implementation of intersection improvements
			✓							Capacity improvement study
East and West of Walter Drive	461+00	Horiz Curves		●		●			Curve and shoulder improvements 5290-02-60	
				✓		✓				Install high friction pavement treatment
				✓		✓				Reconstruction of curve to WisDOT standards
Yahara River Bridge	531+82	Structure					●		Expansion Reconstruction 5290-00-02	
							✓			Replace Structure
I-39/90/94 Bridges	572+17 - 588+21	Structures					●		Bridge deck replacement and SB ramp terminal signalization 1020-20-04	
							✓			Rehabilitate freeway structures

● Indicates a deficiency that is forecasted to exist in year 2050 within the designated WIS 19 section

✓ Indicates the listed improvement strategy is likely to provide a level of correction for the deficiency listed

WIS 19 Section / Subsection	Station	Roadway Feature	WIS 19 Highway Section Deficiency (Year 2050 No-build Conditions): Section Operational Concern for Year 2050	Crash Association	Speed concerns from public	Curve deficiency	Structure deficiency	Lack of Bike Shoulders	Overlapping 6-year Program Projects	Unscheduled Improvement Strategies
I-39/90/94 - County C/Grand Ave										
I-39/90/94 - County C/Grand Ave	577+37 - 797+72		●					●		
								✓		Widening of shoulder width to minimum 5 feet to accommodate bicycles
			✓							Implementation of intersection improvements
			✓							Capacity improvement study
I-39/90/94 - US 51	588+21 - 634+18		●							
			✓							Implementation of intersection improvements
			✓							Optimization of signal system as new signals are added
Williamsburg Way - Portage Road	647+76 - 714+12		●	●						
			✓	✓						Access management plan recommendations, See Access Management Plan Exhibit Panel O through P

● Indicates a deficiency that is forecasted to exist in year 2050 within the designated WIS 19 section

✓ Indicates the listed improvement strategy is likely to provide a level of correction for the deficiency listed

WIS 19 Section / Subsection	Station	Roadway Feature	WIS 19 Highway Section Deficiency (Year 2050 No-build Conditions)						Overlapping 6-year Program Projects	Unscheduled Improvement Strategies
			Section Operational Concern for Year 2050	Crash Association	Speed concerns from public	Curve deficiency	Structure deficiency	Lack of Bike Shoulders		
County C/Grand Ave - County VV										
County C/Grand Ave - County VV	797+72 - 1080+61		●							
			✓							Access management plan recommendations, See Access Management Plan Exhibit Panel R through X
			✓							Implementation of intersection improvements
County C/Grand Ave - US 151	797+72 - 877+92		●							
			✓							Capacity improvement study
County C/Grand Ave - Bird Street	797+72 - 899+80							●		
								✓		Widening of shoulder width to minimum 5 feet to accommodate bicycles
Bird Street - Bristol Street/County N	899+80 - 936+14			●						
				✓						Restriction of parking within intersection clear sight triangles
				✓						Access management plan recommendations, See Access Management Plan Exhibit Panel T through U
Bristol Street/Main Street - County N/Grove Street	952+76 - 975+25			●						
				✓						Access management plan recommendations, See Access Management Plan Exhibit Panel U through V
Linnerud Drive/ Dewey Street	966+31	Horiz Curve		●						
				✓						Access management plan recommendations, See Access Management Plan Exhibit Panel U
County N/Grove Street - Town Hall Drive	975+25 - 1027+25				●			●		
					✓					Speed study
								✓		Widening of shoulder width to minimum 5 feet to accommodate bicycles
Town Hall Drive - Lochinvars Trail	1027+25 - 1317+50		●							
			✓							EB and WB passing lanes

● Indicates a deficiency that is forecasted to exist in year 2050 within the designated WIS 19 section

✓ Indicates the listed improvement strategy is likely to provide a level of correction for the deficiency listed

WIS 19 Section / Subsection	Station	Roadway Feature	WIS 19 Highway Section Deficiency (Year 2050 No-build Conditions)						Overlapping 6-year Program Projects	Unscheduled Improvement Strategies
			Section Operational Concern for Year 2050	Crash Association	Speed concerns from public	Curve deficiency	Structure deficiency	Lack of Bike Shoulders		
County VV - WIS 89										
East and West of Twin Lane Road	1145+00	Horiz Curve		●		●				
				✓						Advance warning signing or indicators
				✓						Speed limit curve warning
				✓						High friction pavement treatment
				✓		✓				Reconstruction of curve to WisDOT standards
East of Lochinvars Trail	1317+50	Horiz Curve		●						
				✓						Advance warning signing or indicators
				✓						Speed limit curve warning
				✓						High friction pavement treatment
Lochinvars Trail - School Street	1317+50 - 1354+20				●					
					✓					Speed study
Box Elder Road - Karem Drive	1397+20 - 1410+38				●					
					✓					Speed study
School Street - WIS 73 North	1354+20 - 1383+95			●						
				✓						Removal of parking within intersection clear sight triangles
East of County TT	1247+20	Vert Curve				●				
						✓				Reconstruction of curve to WisDOT standards
West of Canal Road	1567+75	Vert Curve				●			Resurface 3050-02-72	
						✓				Reduction of speed limit approaching curve
						✓				Reconstruction of curve to WisDOT standards

- ● Indicates a deficiency that is forecasted to exist in year 2050 within the designated WIS 19 section
- ✓ Indicates the listed improvement strategy is likely to provide a level of correction for the deficiency listed

6.2.2 Access Management Improvements

Tiers

Roughly half, (327 of the 648) access points are classified within Tiers 2A/2B, where the primary goal of the roadway is to move interregional traffic. Tiers 2A/2B are shown as solid yellow lines (refer to Exhibit 12 – Access Management Plan).

Forty-one percent of the access along WIS 19 are Tier 4 access, where the goal is to balance traffic movement and property access. These areas are primarily located in downtown sections with lower speed limits, typically 25 mph, and in areas with higher driveway densities (central business district and/or residential areas on the fringes of it). Table 51: Access Points on WIS 19 by Tier, shows the relationship between the general location and the Tier assigned by WisDOT for each of the corridor segments. Tier 4 areas are shown as solid green lines (refer to Exhibit 12 – Access Management Plan).

Approximately eight percent of the access points fall within Tier 1, where the goal is to maximize interstate and statewide traffic. Tier 1 areas are the most restrictive, and are shown as solid red lines (refer to Exhibit 12 – Access Management Plan). Ideally, access in these areas would be minimal, and limited to locked or gated driveways for agricultural and emergency vehicles, and grade separated locations. However, for this study, recommendations are not to eliminate and relocate driveways strictly for Tier 1 purposes.

Interchange Influence Areas

A total of 38 access points (six percent), are non-compliant with the FDM Interchange Influence Area criteria (WisDOT FDM Chapter 11-5, Attachment 5.2). Of the 38 access points, 24 are public roads or private roads (including interchange ramps). Seven driveways are residential, three are commercial, three are utility/other, and one is an agricultural drive.

Only one of the 24 roads (A Street), should be considered for closure and consolidation due to the very close proximity to the northbound US 151 ramp. All of the other roads will have no changes, but should be periodically evaluated if safety or operations concerns develop, or land use changes.

All of the other fourteen residential, commercial, utility/other, and agricultural access points located within the Interchange Influence Areas have recommendations to remove and/or relocate, if/when project funding is available.

Allowable Access Spacing

There are 565 of the 648 access points (87.2 percent), within the WIS 19 Corridor that do not meet WisDOT's FDM Access Spacing Guidelines (WisDOT FDM Chapter 11-5, Attachment 1) as identified in Table 54. The top three access types that do not meet FDM standards are residential driveways (228), roads (161), and commercial driveways (94).

Table 54 shows all of the access point types by location that do not meet the FDM Access Spacing Guidelines.

Table 54: Access Points along WIS 19 Not Meeting FDM Access Spacing Guidelines (1,000 feet spacing)

	Access Points Not Meeting FDM Access Spacing Guidelines by Type - (Access Points Not Meeting Guidelines by Section)								
Map Section	Access Type								
	Residential	Commercial	Industrial	Public/ Institutional	Agricultural	Roadway	Utility	Driveways not meeting Guidelines	Total Driveways by Segment
A	7	-	1	3	1	5	-	17/18	18
B	4	-	-	2	1	1	1	9/13	13
C	3	-	-	-	-	1	-	4/8	8
D	4	-	-	-	-	3	-	7/8	8
E	4	-	-	-	1	1	-	6/8	8
F	3	1	-	-	-	3	-	7/9	9
G	21	28	-	3	-	15	4	71/71	71
H	1	-	-	-	-	5	-	6/9	9
I	-	2	-	2	1	-	-	5/5	5
J	-	-	-	-	-	2	-	2/8	8
K	2				1	1		4/9	9
L	3	-	-	-	1	3	-	7/9	9
M	1	-	-	-	2	6	3	12/12	12
N	1	-	-	-	2	10	-	13/13	13
O	-	-	1	-	-	1	-	2/13	11
P	5	6	-	-	1	5	-	17/21	21
Q	1	-	-	-	2	5	-	8/8	8
R	-	-	-	-	1	6	1	8/8	8
S	8	1	-	-	-	10	-	19/19	19
T	48	3	-	-	-	12	-	63/63	63
U	48	9	-	3	-	13	-	73/73	73
V	5	1	-	-	1	8	5	20/20	20
W	3	-	-	-	-	5	-	8/8	8
X	5	2	-	-	1	2	-	10/16	16
Y	1	-	-	-	1	2	-	4/13	13
Z	3	-	-	-	6	3	-	12/14	14
AA	5	-	1	-	7	2	-	15/20	20
BB	3	-	-	-	1	1	-	5/15	15
CC	6	-	-	1	2	3	-	12/13	13

Map Section	Access Points Not Meeting FDM Access Spacing Guidelines by Type - (Access Points Not Meeting Guidelines by Section)								
	Access Type								
	Residential	Commercial	Industrial	Public/ Institutional	Agricultural	Roadway	Utility	Driveways not meeting Guidelines	Total Driveways by Segment
DD	21	18	-	6	1	13	-	59/59	59
EE	-	-	-	-	1	3	-	4/6	6
FF	1	-	-		3	3	-	7/7	7
GG	1	-	-	-	-	1	-	2/5	5
HH	10	23	2	1	3	7	1	47/47	47
Total by Access Type	**228**	**94**	**5**	**21**	**41**	**161**	**15**	**565**	**648**

^ For driveways displayed on multiple maps, information is tabulated from the first map it appears in.

^^ Access spacing guidelines assume US 12/WIS 19 intersection as a starting point.

Properties with Multiple Access Points

A total of fifty-eight (58) properties along the corridor have multiple access driveways. For properties that contain multiple access points, an evaluation was conducted to determine whether there are opportunities to eliminate multiple access points located on WIS 19.

Forty-four (44) of the 58 properties having more than one access drive have opportunities for consolidation. The locations and specific properties that have a recommendation can be found in Table 55 below. In some cases, properties such as banks and restaurants with drive through lanes and gas stations, have better parking lot circulation with multiple access, and therefore, are not a recommendation for consolidation.

Urban Segments

Approximately 60 percent (139 of the 228) residential access points do not meet the desired spacing distance within urban segments. A similar finding was observed for commercial access points as 73 percent (69 of the 94) are within urban segments.

Areas where access points met WisDOT FDM Access Spacing Guidelines are located primarily around agricultural areas and undeveloped parcels.

Access Management Plan Detailed Recommendations

A full comprehensive list of all access recommendations are provided below (refer to Table 55). All of these access recommendations are illustrated on Exhibit 12, a multi-page Access Management Plan. A total of 149 access points have recommended adjustments. Sixty-seven of these access points are residential, forty-seven are commercial, eighteen agricultural, ten road, four utility/other, and three public as shown on the pie chart below.

Figure 48: Access Recommendations (by access type)

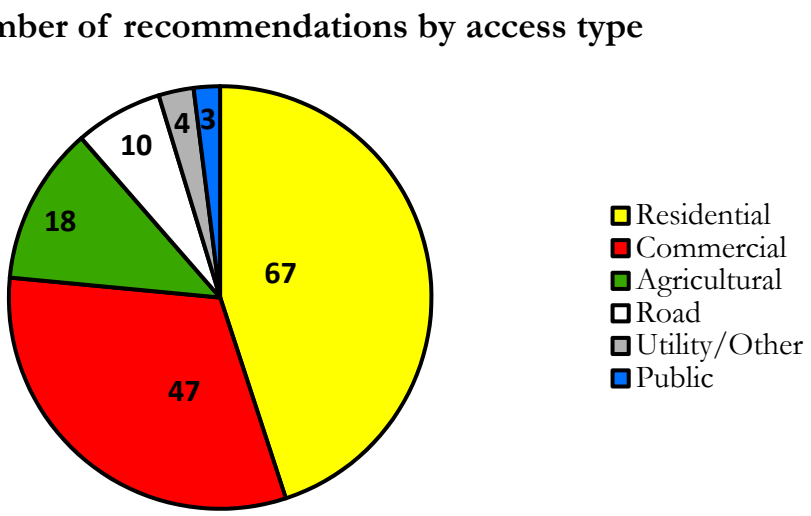

Table 55: All Access Recommendations for WIS 19

MAP #	Access Point #	Access Type	Interchange Influence	Access Point not meeting FDM Access Spacing Guidelines (1000 ft.)	Properties with Multiple Access Points	Recommended Adjustments
A	637-639, 641	Residential		✓		Provide new connection via driveway 640
B	628-630	Residential		✓		Remove driveways and provide new connection via driveway 630 or Barman Road
	633-634	Residential				Remove driveways and provide new connection via driveway 632
C	9,11	Residential		✓		Remove driveways and provide new connection via driveway 10
	12	Agricultural			✓	Remove driveway
D	615-618	Residential		✓		Remove driveways and provide new connection to align with Kingsley Road
E	612-614	Residential		✓		Remove driveways and provide new connection to align with Kingsley Road
G	597-598	Residential		✓	✓	Remove driveways and provide connection via Fairview Circle
	589-592	Residential		✓	✓	Remove driveways and provide connection via Fairview Circle
	588	Commercial		✓	✓	Remove driveways and provide connection via Fairview Circle
	29,31	Commercial		✓	✓	Remove driveways and provide connection via back alleyway
	33-35	Commercial		✓	✓	Remove driveways and provide connection via back alleyway
	585-586	Commercial		✓	✓	Remove driveways and provide connection via driveways 584 and 587
	579-581	Commercial		✓	✓	Remove driveways and provide connection via back alleyway
	575-576	Commercial, Utility		✓	✓	Remove driveways and provide connection via back alleyway

MAP #	Access Point #	Access Type	Interchange Influence	Access Point not meeting FDM Access Spacing Guidelines (1000 ft.)	Properties with Multiple Access Points	Recommended Adjustments
	44	Commercial		✓	✓	Remove driveway
H	559, 561	Public, Residential			✓	Remove driveways and provide connection via driveway 560
I	56	Agricultural		✓		Relocate if land use develops
	557	Commercial		✓		
K	550	Residential		✓		Remove driveways and provide connection via frontage road to Walter Road
	551	Agricultural		✓	✓	
	63	Residential		✓		Relocate driveway to line up with Walter Road
	547	Agricultural			✓	Remove driveway
L	544	Residential		✓	✓	Remove driveway
M	69,541	Agricultural		✓		Remove driveway when land use develops per Village of DeForest plans
	70	Utility	✓	✓	✓	Remove driveway as access is provided on LIUNA Way
	540	Residential	✓	✓		Remove driveway when land use develops or if Operation/Safety concerns present themselves
N	77	Agricultural		✓	✓	Remove driveway when land use develops per Village of DeForest plans
	78	Residential	✓	✓		Remove driveway when land use develops per Village of DeForest plans
	530	Agricultural	✓	✓		Remove driveway when land use develops
O	526	Residential				Remove driveway and provide connection to Revere Trails access
	90	Commercial			✓	Remove driveway
P	95	Commercial		✓	✓	Remove driveway
	97-98,100	Commercial, Residential		✓	✓	Remove driveways and provide connection via driveway 99
	520,522	Commercial, Residential		✓		Remove driveways and provide connection via driveway 521

MAP #	Access Point #	Access Type	Interchange Influence	Access Point not meeting FDM Access Spacing Guidelines (1000 ft.)	Properties with Multiple Access Points	Recommended Adjustments
	101,519	Agricultural, Road		✓		Consider Right-in/Right out/Left-in as land use develops or future operations/safety concerns are found
	103,518	Road, Residential		✓		Consider Right-in/Right out/Left-in as land use develops or future operations/safety concerns are found
Q	104,517	Road		✓		Consider Right-in/Right out/Left-in as land use develops or future operations/safety concerns are found
	514	Residential		✓	✓	Remove driveway
R	511	Agricultural		✓	✓	Remove driveway upon redevelopment
	510	Utility/Other		✓	✓	Remove driveway upon redevelopment
S	501-502,504	Residential	✓	✓		Remove driveways and provide connection via driveway 503
	500	Residential	✓	✓	✓	Remove driveway
	497-498	Residential	✓	✓		Remove driveways and provide connection via Pony Lane
T	493	Road	✓	✓		Remove access
	118	Commercial	✓	✓	✓	Remove driveway
	490-491	Commercial	✓	✓		Remove driveway and consolidate
	487	Residential		✓		Remove driveway and provide connection via Bird Street
U	176,432	Commercial		✓	✓	Remove driveway
	427	Commercial		✓	✓	Remove driveway and provide connection via Vine Street
	180	Road		✓		Consider Closure of Linnerud Drive due to substandard design operations and safety concerns

MAP #	Access Point #	Access Type	Interchange Influence	Access Point not meeting FDM Access Spacing Guidelines (1000 ft.)	Properties with Multiple Access Points	Recommended Adjustments
V	182	Road		✓		Remove driveway
	420	Commercial		✓	✓	Remove driveway
	419	Utility/Other		✓	✓	Remove driveway
	190	Residential		✓		Relocate or remove driveway when land use develops
	191	Agricultural		✓		Remove driveway when land use develops
W	194	Road		✓		Consider removing access if safety/operations concerns develop
	196	Residential		✓	✓	Remove driveway
X	405	Commercial		✓	✓	Remove driveway
	407-410	Residential		✓		Remove driveways and provide connection via frontage road to County VV or driveway 411
Y	400	Residential				Remove driveway
	402	Agricultural				
	398	Residential		✓	✓	Remove driveway and provide connection via Twin Lane Road
Z	212	Road		✓		Consider removing access if Operation/Safety concerns present themselves
	390	Agricultural		✓	✓	Remove driveway
AA	384-385	Agricultural, Residential		✓	✓	Remove driveway and provide connection via Weidemann Drive
	381-382	Agricultural, Residential		✓	✓	Remove driveways
BB	375	Agricultural			✓	Remove driveways
	229	Residential		✓		Remove driveway and provide connection via Schappe Road
CC	368	Residential		✓	✓	Remove driveway

MAP #	Access Point #	Access Type	Interchange Influence	Access Point not meeting FDM Access Spacing Guidelines (1000 ft.)	Properties with Multiple Access Points	Recommended Adjustments
	363-364	Residential		✓	✓	Remove driveway and provide connection via Waters Edge Court
DD	358-359	Residential, Commercial		✓	✓	Remove driveways
	356-357	Commercial		✓	✓	Remove driveways
	346-347	Commercial		✓	✓	Remove driveways
	247-257	Various		✓		Remove driveway and provide connection via back alleyway
	331-333	Residential		✓	✓	Remove driveways
	329	Public		✓	✓	Remove driveway
EE	326	Road		✓		Consider removing access if Operation/Safety concerns present themselves
FF	322	Residential		✓		Remove driveway and provide connection via Cherry Lane
HH	274-279	Various		✓	✓	Remove/consolidate to one or two driveways upon redevelopment
	282	Residential		✓		Consolidate driveway
	310	Commercial		✓	✓	Remove driveway
	297-298, 300-302	Commercial		✓		Consolidate driveways with 299

6.3 Projected improvements LOS

Based on forecasted year 2050 no-build traffic volumes, some of the intersections along WIS 19 are anticipated to experience operational deficiencies during the weekday AM and PM peak hours (Refer to page 92 through 98 for a series of tables depicting year 2050 no-build peak hour LOS/Delay results for comparison). To mitigate this condition, as well as other geometric and operational deficiencies at deficient intersections, several intersection improvement alternatives were developed and analyzed to determine their effectiveness. Refer to Table 56 for peak hour LOS/Delay results for each analyzed intersection improvement alternative under future-year 2050 traffic volumes. This table demonstrates how the improvements in this study will positively affect the LOS at each location. LOS results are only available for those improvements identified in Table 52 that would improve LOS.

Some locations, despite potential intersection improvements, are still expected to experience unacceptable LOS (LOS E or F).

Table 56: Analyzed Project Improvements Table (Year 2050) (Table spans 5 pages)

Intersection	Improvement Strategy	Traffic Control	Time Period	MOE	Overall	Eastbound LT	Eastbound TH	Eastbound RT	Westbound LT	Westbound TH	Westbound RT	Northbound LT	Northbound TH	Northbound RT	Southbound LT	Southbound TH	Southbound RT
US 12*	Dual WB LT lanes and add WB LT signal phase		AM	Volume	E	5	20	5	460	10	260	5	505	60	330	1820	5
				Delay (s)			42	41		137	37	52	27	23	55	86	11
				LOS			D	D		F	D	D	C	C	E	F	B
			PM	Volume	F	5	5	5	110	10	450	5	1815	310	305	675	5
				Delay (s)			39	39		43	172	53	163	21	172	12	9
				LOS			D	D		D	F	D	F	C	F	B	A
Lodi - Springfield Road	EB and WB offset LT lanes with raised median for two-stage crossing		AM	Volume	A	5	390	25	5	610	5	15	5	5	20	10	55
				Delay (s)		9	0		8	0			17			17	
				LOS			A			A			C			C	
			PM	Volume	A	35	555	10	5	505	20	20	10	5	10	5	15
				Delay (s)		9	0		9	0			17			15	
				LOS			A			A			C			C	
WIS 113 North / County Q	Review and modification of approach lane assignments		AM	Volume	D	75	480	100	310	450	65	130	240	120	260	625	60
				Delay (s)			51	27		14	10		14	11		67	28
				LOS			F	D		B	B		B	B		F	D
			PM	Volume	E	260	410	65	270	590	125	180	580	170	170	365	85
				Delay (s)			21	14		125	46		52	24		24	16
				LOS			C	B		F	E		F	C		C	C
Division Street	Turn lanes and LT phases on all approaches. NB RT overlap phasings and optimize signal timings		AM	Volume	C	5	795	60	310	785	40	60	50	285	105	130	5
				Delay (s)		16	44	12	79	9	4	45	36	33	45	39	34
				LOS		B	D	B	E	A	A	D	D	C	D	D	C
			PM	Volume	B	5	680	100	200	955	85	135	85	270	40	35	10
				Delay (s)		24	21	11	16	16	6	29	24	23	32	31	30
				LOS		C	C	B	B	B	A	C	C	C	C	C	C
	Roundabout shifted NE to minimize impacts		AM	Volume	B	5	795	60	310	785	40	60	50	285	105	130	5
				Delay (s)			20	13		12	9		9	16		19	
				LOS			C	B		B	A		A	C		C	
			PM	Volume	B	5	680	100	200	955	85	135	85	270	40	35	10
				Delay (s)			10	8		18	11		9	11		12	
				LOS			B	A		C	B		A	B		B	
Raemisch Road / Schumacher Road*	Roundabout		AM	Volume	B	25	960	125	150	1000	20	55	10	45	115	70	45
				Delay (s)			13			12			14	12		16	
				LOS			B			B			B	B		C	
			PM	Volume	B	45	940	105	75	1055	130	180	65	165	25	15	10
				Delay (s)			10			17			16	12		10	
				LOS			A			C			C	B		B	
Hogan Road	Roundabout		AM	Volume	B	5	1070	45	125	1155	5	20	5	105	5	5	5
				Delay (s)			11			11			11			9	
				LOS			B			B			B			A	
			PM	Volume	B	5	1135	55	105	1210	5	40	5	115	5	5	5
				Delay (s)			11			11			14			9	
				LOS			B			B			B			A	

MOE : Measure of Effectiveness

Volume measured in vehicles per hour

LOS : Level of Service

Stop-sign and traffic signal intersections were evaluated using HCM 2010 methods

Roundabouts were evaluated using HCM 2010 module from SIDRA

Intersections with "^" were evaluated using HCM 2000 methods

Interserctions with "^^" were evaluated using Synchro 8 / SimTraffic 8 methods

The intersection with "^^^" contains Year 2035 analysis results from the WisDOT Proj 0656-43-04 STH 19 and STH 113 Intersection ICE

Interserctions with "*" were evaluated with adjusted green timings, while maintaining existing cycle lengths

Intersections shaded in orange denotes a change in traffic control while the study was performed; results reflect updated traffic control

: HCS Delay (s) exceeds 180sec, Delay (s) may not be accurate

D : Lane group and / or intersection experiences LOS D

E : Lane group and / or intersection experiences LOS E

F : Lane group and / or intersection experiences LOS F

Intersection	Improvement Strategy	Traffic Control	Time Period	MOE	Overall	Eastbound LT	Eastbound TH	Eastbound RT	Westbound LT	Westbound TH	Westbound RT	Northbound LT	Northbound TH	Northbound RT	Southbound LT	Southbound TH	Southbound RT
River Road	Traffic Signal		AM	Volume	C	40	1055	5	150	1460	50	5	5	105	105	20	195
				Delay (s)		15	16	9	13	22	9	22	26		31	22	32
				LOS		B	B	A	B	C	A	C	C		C	C	C
			PM	Volume	B	140	1305	5	95	1200	150	5	15	185	50	10	55
				Delay (s)		12	12	7	11	12	8	26	54		44	26	29
				LOS		B	B	A	B	B	A	C	D		D	C	C
	Roundabout		AM	Volume	C	40	1055	5	150	1460	50	5	5	105	105	20	195
				Delay (s)			14			26	13		13			21	26
				LOS			B			D	B		B			C	D
			PM	Volume	C	140	1305	5	95	1200	150	5	15	185	50	10	55
				Delay (s)			16			23	13		28			11	10
				LOS			C			C	B		D			B	A
I-39/90/94 SB Ramps^	Coordination of new traffic signal (ID 1020-20-04) with adjacent traffic signals and optimization of timings		AM	Volume	C	0	920	655	435	1550	0				250	0	115
				Delay (s)			23	0	31	25					35		0
				LOS			C	A	C	C					D		A
			PM	Volume	C	0	1400	445	345	1315	0				215	0	60
				Delay (s)			43	22	37	21					51		0
				LOS			D	C	D	C					D		A
Pepsi Way	Traffic signal and investigation of potential benefit of placing into existing system and optimize timings		AM	Volume	C	10	785	250	150	1030	20	190	5	150	10	5	5
				Delay (s)		25	26	19	34	31	12	28	18		16		16
				LOS		C	C	B	C	C	B	C	B		B		B
			PM	Volume	C	10	1045	150	130	835	5	285	10	250	15	10	20
				Delay (s)		31	39	17	35	18	13	24	21		31		31
				LOS		C	D	B	D	B	B	C	C		C		C
North Towne Road	Traffic signal and investigation potential benefit of placing into existing system and optimize timings		AM	Volume	A	50	905	0	0	1215	65				40	0	10
				Delay (s)		6	3			9	0				27		25
				LOS		A	A			A	A				C		C
			PM	Volume	A	20	1270	0	0	910	25				95	0	40
				Delay (s)		6	5			4	0				17		16
				LOS		B	A			A	A				B		B
Portage Road	NB and SB LT turn lanes and adjustment of signal phasing as appropriate		AM	Volume	C	30	710	180	100	1115	40	150	50	70	45	170	200
				Delay (s)		48	22	11	15	39	6	60	29	30	31	32	36
				LOS		D	C	B	B	D	A	E	C	C	C	C	D
			PM	Volume	C	115	1265	125	80	785	65	145	155	130	50	75	60
				Delay (s)		9	24	4	61	12	6	54	42	42	46	38	38
				LOS		A	C	A	E	B	A	D	D	D	D	D	D
	Roundabout		AM	Volume	B	30	710	180	100	1115	40	150	50	70	45	170	200
				Delay (s)			12	12		18	11		9	8		23	22
				LOS			B	B		C	B		A	A		C	C
			PM	Volume	C	115	1265	125	80	785	65	145	155	130	50	75	60
				Delay (s)			29	14		15	11		31	22		10	8
				LOS			D	B		C	B		D	C		A	A

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The intersection with "^^^" contains Year 2035 analysis results from the WisDOT Proj 0656-43-04 STH 19 and STH 113 Intersection ICE

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: HCS Delay (s) exceeds 180sec, Delay (s) may not be accurate

D : Lane group and / or intersection experiences LOS D

E : Lane group and / or intersection experiences LOS E

F : Lane group and / or intersection experiences LOS F

Intersection	Improvement Strategy	Traffic Control	Time Period	MOE	Overall	Eastbound LT	Eastbound TH	Eastbound RT	Westbound LT	Westbound TH	Westbound RT	Northbound LT	Northbound TH	Northbound RT	Southbound LT	Southbound TH	Southbound RT
Westmount Drive	Traffic Signal		AM	Volume	D	5	855	15	95	1080	10	45	5	340	15	5	25
				Delay (s)		44	45	9	27	39	6	29	79		46	27	
				LOS		D	D	A	C	D	A	C	E		D	C	
			PM	Volume	F	5	1385	40	210	895	5	15	5	160	5	5	15
				Delay (s)		12	189	8	40	8	3	30	37		37	30	
				LOS		B	F	A	D	A	A	C	D		D	C	
	Roundabout		AM	Volume	B	5	855	15	95	1080	10	45	5	340	15	5	25
				Delay (s)		9		7	11		8		25			9	
				LOS		A		A	B		A		C			A	
			PM	Volume	C	5	1385	40	210	895	5	15	5	160	5	5	15
				Delay (s)		25		13	9		7		20			8	
				LOS		D		B	A		A		C			A	
County C / Grand Avenue	Conversion of SB RT to a TH and construct SB RT lane		AM	Volume	E	190	645	335	70	785	80	225	205	30	80	380	350
				Delay (s)		62	27	18	17	56	16	163	39	38	35	63	115
				LOS		E	C	B	B	E	B	F	D	D	D	E	F
			PM	Volume	E	240	920	325	95	630	65	330	530	140	115	440	225
				Delay (s)		54	97	22	42	38	19	236	53	43	48	69	45
				LOS		D	F	C	D	D	B	F	D	D	D	E	D
Broadway Drive	Reconstruction of EB and WB approaches to consist of a LT, TH, and shared TH/RT lanes. Restriping of NB approach as shared TH/LT and exclusive RT. Addition of LT phases as appropriate		AM	Volume	C	35	865	30	45	865	180	20	25	245	480	15	50
				Delay (s)		20	28		19	37		31		41	32	15	
				LOS		C	C		B	D		C		D	C	B	
			PM	Volume	C	40	1035	35	90	790	370	50	35	125	250	20	45
				Delay (s)		13	26		13	33		23		19	22	14	
				LOS		B	C		B	C		C		B	C	B	
US 151 SB Ramps^*	Diamond interchange phasing and investigation of potential benefit of placing into signal system with all signals from US 151 to Bird Street		AM	Volume	D		1040	505	620	860					65	5	315
				Delay (s)			43	28	76	1					39		56
				LOS			D	C	E	A					D		E
			PM	Volume	C		1240	295	385	955					95	1	320
				Delay (s)			23	16	34	1					7		69
				LOS			C	B	C	A					A		E
US 151 NB Ramps^*	Dual LT and dual RT lanes. Diamond interchange phasing and investigation of potential benefit of placing into signal system with all signals from US 151 to Bird Street		AM	Volume	C	235	855			1315	70	170	1	260			
				Delay (s)		30	3			30	15	46		27			
				LOS		C	A			C	B	D		C			
			PM	Volume	F	305	975			930	95	455	1	880			
				Delay (s)		33	11			45	27	86		267			
				LOS		C	B			D	C	F		F			
Davison Drive*	NB and SB LT lanes and implementation of LT phasing. Investigation of potential benefit to placing into signal system with all signals from US 151 to Bird Street		AM	Volume	C	95	840	155	125	1075	100	185	25	70	60	25	25
				Delay (s)		14	1	1	9	34	22	54		39	52		51
				LOS		B	A	A	A	C	C	D		D	D		D
			PM	Volume	B	110	1245	330	120	750	45	185	40	105	65	25	35
				Delay (s)		9	18	14	15	15	11	33		29	38		38
				LOS		A	B	B	B	B	B	C		C	D		D

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D : Lane group and / or intersection experiences LOS D

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F : Lane group and / or intersection experiences LOS F

Intersection	Improvement Strategy	Traffic Control	Time Period	MOE	Overall	Eastbound LT	Eastbound TH	Eastbound RT	Westbound LT	Westbound TH	Westbound RT	Northbound LT	Northbound TH	Northbound RT	Southbound LT	Southbound TH	Southbound RT
Bird Street*	Investigation of potential benefit to placing into signal system with all signals from US 151 to Bird Street		AM	Volume	D	285	370	310	40	580	75	160	160	50	115	340	570
				Delay (s)		53	36	0	19	40	0	45	35	0	33	54	0
				LOS		D	D	A	B	D	A	D	D	A	C	D	A
			PM	Volume	D	630	630	220	35	370	105	170	245	45	80	205	370
				Delay (s)		39	32	0	21	35	0	41	54	0	32	53	0
				LOS		D	C	A	C	D	A	D	D	A	C	D	A
	Roundabout		AM	Volume	B	285	370	310	40	580	75	160	160	50	115	340	570
				Delay (s)		9		7	11		8	25			9		
				LOS		A		A	B		A	C			A		
			PM	Volume	C	630	630	220	35	370	105	170	245	45	80	205	370
				Delay (s)		25		13	10		7	20			8		
				LOS		D		B	A		A	C			A		
County N (Bristol Street)^^	Traffic Signal		AM	Volume	C	65		430				360	225			315	150
				Delay (s)		17		15				27	7			33	22
				LOS		B		B				C	A			C	C
			PM	Volume	B	125		540				410	270			220	100
				Delay (s)		16		22				19	9			19	17
				LOS		B		C				B	A			B	B
	Roundabout		AM	Volume	B	65		430				360	225			315	150
				Delay (s)		13						11				13	
				LOS		B						B				B	
			PM	Volume	B	125		540				410	270			220	100
				Delay (s)		15						13				9	
				LOS		C						B				A	
Main Street*	EB and SB LT phasing and coordination with Market Street		AM	Volume	C	100	405	60	10	550	405	30	65	10	415	125	80
				Delay (s)		37	24		31	8		34	29		49	20	
				LOS		D	C		C	A		C	C		D	B	
			PM	Volume	C	105	625	60	10	485	360	45	140	25	430	85	120
				Delay (s)		21	33		19	8		34	28		33	17	
				LOS		C	C		B	A		C	C		C	B	
Linnerud Drive / Dewey Street	Traffic Signal		AM	Volume	B	40	950	10	45	1030	50	5	5	40	45	5	65
				Delay (s)		5	16		21	20		32			32		34
				LOS		A	B		C	C		C			C		C
			PM	Volume	A	65	1150	15	55	870	40	5	5	100	15	5	45
				Delay (s)		1	7		2	4		37			33		34
				LOS		A	A		A	A		D			C		C

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Intersection	Improvement Strategy	Traffic Control	Time Period	MOE	Overall	Eastbound LT	Eastbound TH	Eastbound RT	Westbound LT	Westbound TH	Westbound RT	Northbound LT	Northbound TH	Northbound RT	Southbound LT	Southbound TH	Southbound RT
Town Hall Drive	Traffic Signal		AM	Volume	B	20	200	30	40	420	5	35	10	15	15	110	105
				Delay (s)		14	9		10	11			10			13	
				LOS		B	A		B	B			B			B	
			PM	Volume	A	95	485	40	5	335	20	35	65	50	10	15	65
				Delay (s)		6	6		7	5			24			22	
				LOS		A	A		A	A			C			C	
	Roundabout		AM	Volume	A	20	200	30	40	420	5	35	10	15	15	110	105
				Delay (s)			6			10			5			8	
				LOS			A			B			A			A	
			PM	Volume	A	95	485	40	5	335	20	35	65	50	10	15	65
				Delay (s)			10			2			0			0	
				LOS			A			A			A			A	
WIS 73 South/ Deerfield Road	Delineation of WB LT lane by removing parking and adding WB LT signal phase		AM	Volume	B	1	255	55	350	700	1	30	1	185	1	1	1
				Delay (s)		12		11	17	9			20			15	
				LOS		B		B	B	A			C			B	
			PM	Volume	C	1	655	50	185	500	1	65	1	335	1	1	1
				Delay (s)		33		15	32	12			48			21	
				LOS		C		B	C	B			D			C	
WIS 73 North/ Hubbell Street	Traffic signal and investigation of potential benefit to placing into existing system and optimize timings		AM	Volume	D	120	305			565	65				45		525
				Delay (s)		20	10			34					19		54
				LOS		C	B			C					B		D
			PM	Volume	C	480	520			375	100				50		300
				Delay (s)		54	9			46					29		17
				LOS		D	A			D					C		B
WIS 89 North / Monroe Street	Traffic Signal		AM	Volume	B	160	140	5	5	255	155	5	5	5	115	5	160
				Delay (s)		19	9			16			12			14	16
				LOS		B	A			B			B			B	B
			PM	Volume	B	200	360	10	15	210	110	5	10	10	130	5	150
				Delay (s)		14	14			14			8			9	9
				LOS		B	B			B			A			A	A

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6.4 Concept Cost Estimates

Conceptual cost estimates were prepared for each of the primary concepts as depicted on Exhibit 11.

Construction costs are derived from roadway items and construction items.

- Roadway items include a unit cost of any existing removals, the pavement structure (asphalt or concrete and base aggregate), concrete curb and gutter, concrete sidewalk and the traffic signal equipment (if applicable).
- Roadway items also include 5% of the roadway items for drainage, 2% of the roadway items for erosion control, 2% of the roadway items for permanent signing, 1% of the roadway items for pavement marking, 5% of the roadway items for construction staging, and a per unit cost for lighting (if applicable).
- Construction items include a lump sum cost for mobilization, 15% of the total roadway costs for contingency and 10% of the total roadway costs for delivery.

Real Estate costs are derived from property acquisition and relocation cost (if applicable).

- Property acquisition is based on land needed for the right-of-way for the new project.
- The relocation cost is based on 2 times the relocated properties total value.

Table 57 presents conceptual cost estimates. Refer to Appendix G for more detailed cost breakdown for these estimates.

Table 57: Conceptual Cost Estimates

Alternative	Location	Improvement Concept	Construction Cost	Real Estate Cost	Total Alternative Cost
2A	Lodi-Springfield Road	Stop Controlled – Median Installation	$745,449	$0	$745,449
3A	Division Street	Reconstructed Traffic Signal	$725,133	$8,117	$733,250
3B	Division Street	Roundabout	$632,585	$455,501	$1,088,086
4	Raemisch / Schumacher Road	Roundabout	$779,977	$17,189	$797,166
5A	Hogan Road	Traffic Signal	$405,002	$0	$405,002
5B	Hogan Road	Roundabout	$992,057	$0	$992,057
7A	River Road	Reconstructed Traffic Signal	$1,666,857	$35,096	$1,701,953
7B	River Road	Roundabout	$986,663	$457,814	$1,444,477
8A	Portage Road	Reconstructed Traffic Signal	$479,101	$411,260	$890,361
8B	Portage Road	Roundabout	$1,087,328	$526,111	$1,613,439

Alternative	Location	Improvement Concept	Construction Cost	Real Estate Cost	Total Alternative Cost
9A	Westmount Drive	Reconstructed Traffic Signal	$1,189,916	$12,644	$1,202,560
9B	Westmount Drive	Roundabout	$871,037	$50,468	$921,505
10	County C / Grand Avenue	Offset Left-Turn Lane	$552,942	$0	$552,942
11	Broadway Drive	Reconstructed Traffic Signal	$400,849	$0	$400,849
12A	Town Hall Drive	Traffic Signal	$929,256	$0	$929,256
12B	Town Hall Drive	Roundabout	$924,991	$5,444	$930,435
13	WIS 73 South	Lane Reconfiguration	$325,985	$0	$325,985
14	WIS 73 North	Traffic Signal	$318,605	$0	$318,605
Passing Lane/Mile			$425,760	$0	$425,760