U.S. Department of Transportation
Federal Highway Administration

South Dakota Division

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November 13, 2017

In Reply Refer To:
HDA-SD

Mr. Steve Gramm, P.E.
Planning Engineer
South Dakota Department of Transportation
700 East Broadway Avenue
Pierre, SD 57501-3110

Subject: Interchange Modification Justification Report (IMJR); I-29, Exit 77 (41st Street);
IM 0293, PCN 03RA, Minnehaha County

Dear Mr. Gramm:

The Federal Highway Administration has completed our review of your November 7, 2017 submittal requesting approval of an access modification to Interstate 29 at Exit 77 (41st Street) in Minnehaha County.

Based on an engineering and operational review of the justification report, we hereby find the proposed modifications acceptable. Final approval of the IMJR will be granted upon satisfactory completion of the environmental process and the determination that the selected alternative results in no major design changes. Once the environmental document is approved, Federal funds can then be used for final design, purchasing right-of-way, and/or construction activities for the project.

If you have any questions, please feel free to call Mark Hoines at 605-776-1010.

Sincerely,

R. Kirk Fredrichs
South Dakota Division Administrator

E-Copies: Mike Behm, SDDOT, Planning and Engineering
Mark Leiferman, SDDOT, Project Development
Mark Hoines, FHWA
Mark Clausen, FHWA
Brett Hestdalen, FHWA

I-29 Exit 77 (41st St.) Interchange Modification Justification Report

Project PL 0100(84) , PCN 05MH

Project IM 0293(106)77P, PCN 03RA

Sioux Falls, SD

October 19, 2017

Interchange Modification Justification Report

I-29 Exit 77 (41st St.)

Project PL 0100(84), PCN 05MH

Project IM 0293(106)77P, PCN 03RA

Sioux Falls, South Dakota
October 19, 2017

Prepared for:

South Dakota Department of Transportation
Office of Project Development
700 East Broadway Avenue
Pierre, South Dakota 57501-2586

Prepared by:

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Abbreviations

AASHTO	American Association of State Highway Transportation Officials
CATEX	Categorical Exclusion
CMF	Crash Modification Factor
CRM	Critical Rate Method
FHWA	Federal Highway Administration
HCS	Highway Capacity Software
HOT	High Occupancy Transit
HOV	High Occupancy Vehicle
HSM	Highway Safety Manual
IMJR	Interchange Modification Justification Report
LOS	Level of Service
MRM	Mileage Reference Marker
MPO	Metropolitan Planning Organization
MSA	Metropolitan Statistical Area
SDDOT	South Dakota Department of Transportation
STIP	Statewide Transportation Improvement Program
TAZ	Traffic Analysis Zone
TIP	Transportation Improvement Program

EXECUTIVE SUMMARY

This Interchange Modification Justification Report (IMJR) report provides technical analysis related to proposed changes to the existing 41st Street interchange (Exit 77) on Interstate 29 in Sioux Falls, SD.

The proposed action is a reconfiguration of the existing 41st Street interchange on Interstate 29 in Sioux Falls, SD. The action is proposed to bring the existing interchange up to current design standards and provide appropriate operational capacity for future traffic demand. No adverse impacts to the Interstate highway system are forecast due to the proposed change.

The Federal policy considerations and requirements have been addressed in the Recommendations section of this report and summary responses to the eight requirements are provided below.

The proposed change is a reconfiguration of an existing interchange and improvements to the existing crossroad facility. The changes will correct current interchange and crossroad design deficiencies including short access spacing to an adjacent intersection, low peak hour ramp terminal level of service, and low peak hour crossroad level of service. The proposed change does not result in any new access points on the Interstate Highway System.

The concept alternatives involve changes to the geometric design of an existing interchange and changes to the crossroad arterial street to satisfy current design standards and meet the transportation needs in the study area. Mass transit reaches a limited market in South Dakota and HOV facilities are currently not in use because they have not been shown to be economically feasible. Neither mass transit nor HOV facilities will correct design deficiencies or provide sufficient relief to future travel demand within the study planning horizon.

The operational and safety analysis contained in this study shows that the proposed build alternatives are not expected to adversely affect the safety or efficiency of the Interstate system. The build alternatives are also expected to improve access management on the crossroad in the vicinity of the interchange.

The conceptual signing plan for the diverging diamond interchange alternative is shown in **Appendix 11**.

The proposed access is a reconfiguration of an existing interchange with full access to an arterial city street and includes all movements. The conceptual drawings have been prepared using current standards and further design using current standards is anticipated and will receive additional reviews throughout the next steps of the design.

The proposal is the result of land use and transportation plans prepared within the MPO process, including the Sioux Falls MPO Long Range Transportation Plan. The 2017-2020 STIP includes this Project in the Developmental STIP portion in the 2021-2023 funding and construction years.

Analysis techniques included evaluation of operational capacity using Highway Capacity Manual 2010 techniques via HCS 2010. Highway Safety Manual techniques were used to the extent possible in this report. Other techniques and reference materials are detailed in a Methods and Assumptions document prepared for this study and signed by City of Sioux Falls, South Dakota Department of Transportation, and Federal Highway Administration participants in July, 2014 and modified as necessary throughout the study. The Methods and Assumptions document is included in the **Appendix 2**.

1. INTRODUCTION

1.1 Background

SDDOT, the City of Sioux Falls, the Sioux Falls Metropolitan Planning Organization, and the Federal Highway Administration have conducted a study to evaluate the design, operations, policy and funding implications of modifying the 41st Street interchange (Exit 77) on I-29 in Sioux Falls, SD. The existing interchange serves an urban arterial corridor that has carried the largest traffic volumes in the state of South Dakota, including a significant amount of commuting traffic. This Interchange Modification Justification Report is being prepared in conjunction with applicable environmental reviews and analyses, and will provide traffic analysis for the selection of a preferred alternative.

1.2 Purpose

The *2010 Decennial Interstate Corridor Study* identified the I-29 Exit 77 interchange as a top priority project needing near-term improvement. The study cited safety concerns, geometric deficiencies at the interchange, and low peak hour level of service and recommended a DDI interchange as the most feasible interchange improvement alternative.

The *I-29 Exit 77 (41st Street) Crossroad Corridor Study (2012)* analyzed the interchange area and the crossroad arterial street in more detail and recommended a package of arterial street improvements and conversion of the interchange to a DDI configuration. The study again cited safety concerns, geometric deficiencies and level of service in determining the need for interchange improvements.

This study continues the previous planning work and provides the necessary analysis for consideration by SDDOT and FHWA.

1.3 Project Location

The subject interchange is at mileage reference marker 77 on Interstate 29, in southwest Sioux Falls, SD. This location is within the Sioux Falls MPO and also within the developed Sioux Falls urban area. The adjacent interchanges on I-29 are 26th Street (Exit 78) and the I-229 system interchange (Exit 75). Interchange spacing is approximately .85 miles to 26th Street from the subject interchange and about 1.78 miles to Interstate 229.

There are several local roadways in the vicinity of the interchange. The crossroad, 41st Street, is a five-lane urban street west of the interchange and a seven-lane urban street east of the interchange. 41st Street is intersected by Marion Road approximately ½ mile west of I-29. Two collector roadways, Valley View Drive/Holbrook Avenue and Terry Avenue intersect 41st Street approximately 1 mile and ¼ mile west of I-29, respectively. Madelyn Lane/Gateway Boulevard and Meadow Avenue are the closest intersecting local streets west of I-29 at 800' and 400', respectively from the I-29 southbound ramp terminal. The nearest intersection on 41st Street east of I-29 is Carolyn Avenue, approximately 230' east of the I-29 northbound ramp terminal. Empire Place, Shirley Avenue and Louise Avenue intersect 41st Street approximately 0.18 mile, 0.29, and 0.46 miles east of I-29, respectively. All these intersecting streets are controlled by traffic signals except the 41st/Carolyn intersection, which is controlled by a stop sign on the

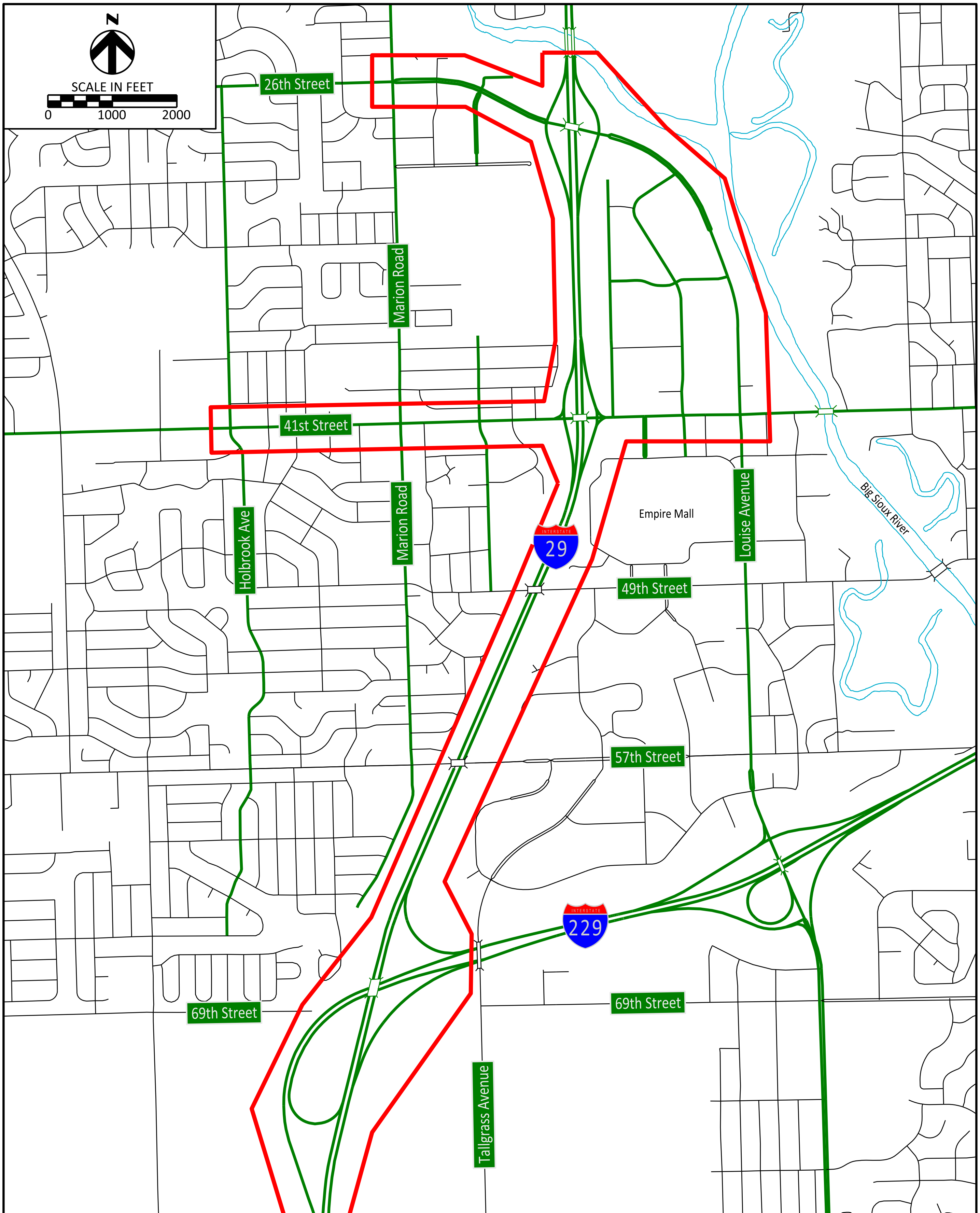
Carolyn Avenue approach. Improvements within the study area, including projects undertaken by the City of Sioux Falls, are planned to provide additional capacity along 41st Street. A solution to congestion issues in the interchange area, however, may require modification of the interchange itself.

Other local streets intersect I-29 at the adjacent 26th Street interchange or lie within the street network in the vicinity of the subject interchange. The study area, therefore, has been defined as Interstate 29, from MRM 75 to MRM 79, including Exits 75, 77, and 78, 41st Street from Valley View Road/Holbrook Avenue to just west of Louise Avenue, and portions of 26th that are part of the local street network served by the subject interchange and the adjoining interchanges. The study area is shown in **Figure 1**.

1.4 Logical Termini

- West limits – Marion Road was determined to be the westerly logical termini for the interchange study. This is mainly due to the need to widen 41st Street to 3 through lanes in each direction from I-29 to Marion Road to accommodate future traffic volumes. Widening of the Marion Road/41st Street intersection is necessary to add turn lanes for adequate intersection capacity.
- East limits – The City intends to expand the Shirley Avenue/41st Street intersection and realign the extension of Shirley Avenue south of 41st Street. This will become the main entrance and exit to the Empire Mall from 41st Street. The relocation of Sioux Falls Ford dealership along the south side of 41st Street west of Shirley Avenue allows for widening of 41st Street and adding raised medians and a right turn lane. Property is not feasibly available east of Shirley Avenue for expansion of 41st Street. Therefore, Shirley Avenue is a reasonable east logical terminus for this project.
- 41st Street/Louise Avenue intersection – Although existing and future LOS at this intersection is below acceptable criteria for peak traffic periods, existing developments adjacent to the intersection limit the feasible opportunities for improvement of the intersection. Therefore, this intersection is not within in the logical termini for the I-29 Exit 77 (41st Street) interchange study. Traffic impacts at the 41st Street/Louise Avenue intersection resulting from capacity improvements at the I-29 Exit 77 (41st Street) interchange and along 41st Street have been closely evaluated in the traffic assessment. Potential improvement options for the 41st Street/Louise Avenue intersection are included in a separate, subsequent Louise Avenue corridor project between 34th Street and 49th Street.
- Marion Road limits – Marion Road has been upgraded to 2 through lanes in each direction from 39th Street to the north. Therefore, the north logical terminus for Marion Road begins at 39th Street. Widening of Marin Road extends through the 41st Street intersection so that 2 through lanes and dual left turn lanes are provided for needed capacity. The south logical terminus for Marion Road is the distance needed to transition to the existing 3 lane section. Allowance is made for the potential future expansion of Marion Road to a 5 lane section south of 41st Street.

  For further background on the logical termini for the project, see the Purpose and Need Memo included in Appendix 1.



Drawn By: B.Miller
Date: 6/30/16
Chked By: J.Unruh
Date: 6/30/16
Revision:

Study Area

I-29 Exit 77 (41st Street) Interchange Modification Study
Sioux Falls, SD

Figure
1

2. METHODOLOGY

Preparation of this report included the following work tasks:

- Data gathering
- Review previous Interstate studies and coordinate with preparation of the environmental studies, including feasible alternatives and the recommended alternative.
- Determine existing and future operational characteristics of Interstate and local street facilities.
- Prepare a deliverable report.

Traffic forecasts were prepared using output from the regional travel demand model maintained by the City of Sioux Falls and the Sioux Falls MPO. Traffic operations were analyzed using the Highway Capacity Manual techniques using HCS 2010 software modules and Highway Safety Manual techniques.

This IMJR document is organized in accordance with section 2.5.2 of FHWA's *Interstate System Access Information Guide,* August 2010.

Additional details on methodology can be found in the Methods and Assumptions agreement prepared for this project and included in the **Appendix 2**.

3. EXISTING CONDITIONS

3.1 Demographics

The Sioux Falls metropolitan area enjoys a robust economy and sustained population growth. During the period 1980 – 2000 the population grew at a steady rate of between 2% and 3% per year. Even in the face of the recent recession, the population continued to grow at an annual rate of 1%-2% per year and the 2010 Census shows the city with a population of 153,888, while the Metropolitan Statistical Area (MSA) had a population of 228,261 and the market area had a population of 1,043,450. (Market area is a term used in economics and human geography describing the area surrounding a central place, from which people are attracted to use the place's goods or services.)

Generally, employment for the Sioux Falls area has grown at approximately the same rate as the population and unemployment is currently near 2% in Sioux Falls, compared with a statewide rate of 2.7%, regional rate of 3.0%, and a national unemployment rate of 5.0%.

3.2 Existing Land Use

The study area is comprised mainly of commercial uses ranging from big-box retail to light industrial with a smaller presence of single family and multifamily residential uses. The study area Traffic Analysis Zones (TAZ's) currently reflect the existing population and employment inputs. The future-year TAZ's show gradual infill of uses similar to those currently existing in the study area.

The future land use plan for Sioux Falls shows continued development of the existing land uses for this portion of the urban area.

3.3 Existing Roadway Network

As previously identified, the existing major roadways within the study area include:

- Interstate 29 – expanded to three lanes in each direction during this study, with auxiliary lanes between interchanges north of 41st Street
- 41st Street – 5-lane urban arterial roadway west of I-29 that transitions to a 7-lane urban roadway east of I-29
- 26th Street – 4-lane divided urban arterial roadway
- Marion Road – 5-lane urban arterial roadway north of 41st Street and 3-lane urban arterial south of 41st Street
- Louise Avenue – 5-lane urban arterial roadway
- Valley View Drive/Holbrook Avenue – 2-lane urban collector roadway
- Terry Avenue – 2-lane urban collector roadway
- Lorraine Drive – 4-lane divided urban collector roadway
- Carolyn Avenue – 2-lane urban local roadway
- West Empire Place – 4-lane divided private roadway
- Shirley Avenue – 3-lane urban collector roadway
- 34th Street – 2-lane urban collector roadway
- 38th Street – 2-lane urban local roadway

3.4 Alternative Travel Modes

Travel within the study area is primarily by automobile. Pedestrian activity is relatively high along the 41st Street corridor with City counts showing a peak range of 55 to 128 pedestrians per day at various locations for the years from 2003 to 2010. Pedestrian counts were also taken in March 2016 in conjunction with the traffic counts. Due to the time of year, the number of pedestrians was not as high as the previous peak levels from the City's 2003 to 2010 data. However, there were still a significant number of pedestrians along the corridor. One reason for the relatively high pedestrian use within the corridor is that the area west of I-29 contains multiple disadvantaged, handicapped, and assisted living facilities which generate pedestrians going to the Empire Mall and other commercial areas. The regional recreational trail system runs along the Skunk Creek/Big Sioux River channel on the north and east boundaries of the study area. The area is currently served by municipal transit routes 10 and 11, operating on portions of 41st Street, Marion Road, Shirley Avenue, and Louise Avenue. Buses operate on 30 minute headways during peak demand.

3.5 Interchanges

Interchanges within the study area include:

- I-29/I-229 (Exit 75) – this system interchange is currently a trumpet configuration.
- I-29/41st Street (Exit 77) – the subject interchange is a diamond configuration. Both ramp termini are controlled by traffic signals.
- I-29/26th Street (Exit 78) – this service interchange is currently a diamond configuration with both ramp termini controlled by traffic signals.

Aerial photos of the existing interchanges have been included in the **Appendix 12**.

3.6 Existing Data

New peak hour weekday and Saturday turning movement counts were gathered from March 9 to 13, 2016 for study area analysis intersections. Additional arterial roadway study data were available from the participating agencies, including traffic counts, crash data, and raw travel demand model output. The available data was supplemented with Interstate system counts, vehicle classifications, and traffic observations. The data is recent and of high quality.

3.7 Operational Performance

Operation performance of highways is evaluated in terms of the quality of service, which describes how well a transportation facility operates from the traveler's perspective. Quality of service is usually measured with "Level of Service", a letter grade similar to those used in school. Level of service A refers to uncongested traffic conditions, with levels of service B through E describing increasingly more congested conditions and level of service F describing the highest congestion or saturation. Level of service is determined in different ways for different roadway facilities, with Interstate highway facilities evaluated in terms of vehicle density, urban intersections evaluated in terms of vehicle delay, and other facilities evaluated using other measures of roadway dynamics. All quality of service is determined using techniques developed for the Highway Capacity Manual (HCM), published by the Transportation Research Board.

The existing study area roadways were evaluated using the HCM methodologies for Interstate highways and urban streets. SDDOT has established a minimum level of service standard of “C” for interstate facilities, including ramp terminal intersections. The City of Sioux Falls has established a minimum level of service standard of “D” for arterial signalized intersections. Interstate 29 operates at acceptable levels of service under existing conditions. The arterial street system, however, experiences peak hour congestion at the following locations:

- 26th Street/Marion Rd. (AM peak)
- 26th Street/I-29 SB (Saturday peak)
- 26th Street/I-29 NB (AM peak)
- 41st Street/Louise Ave. (AM, PM, and Saturday peaks)

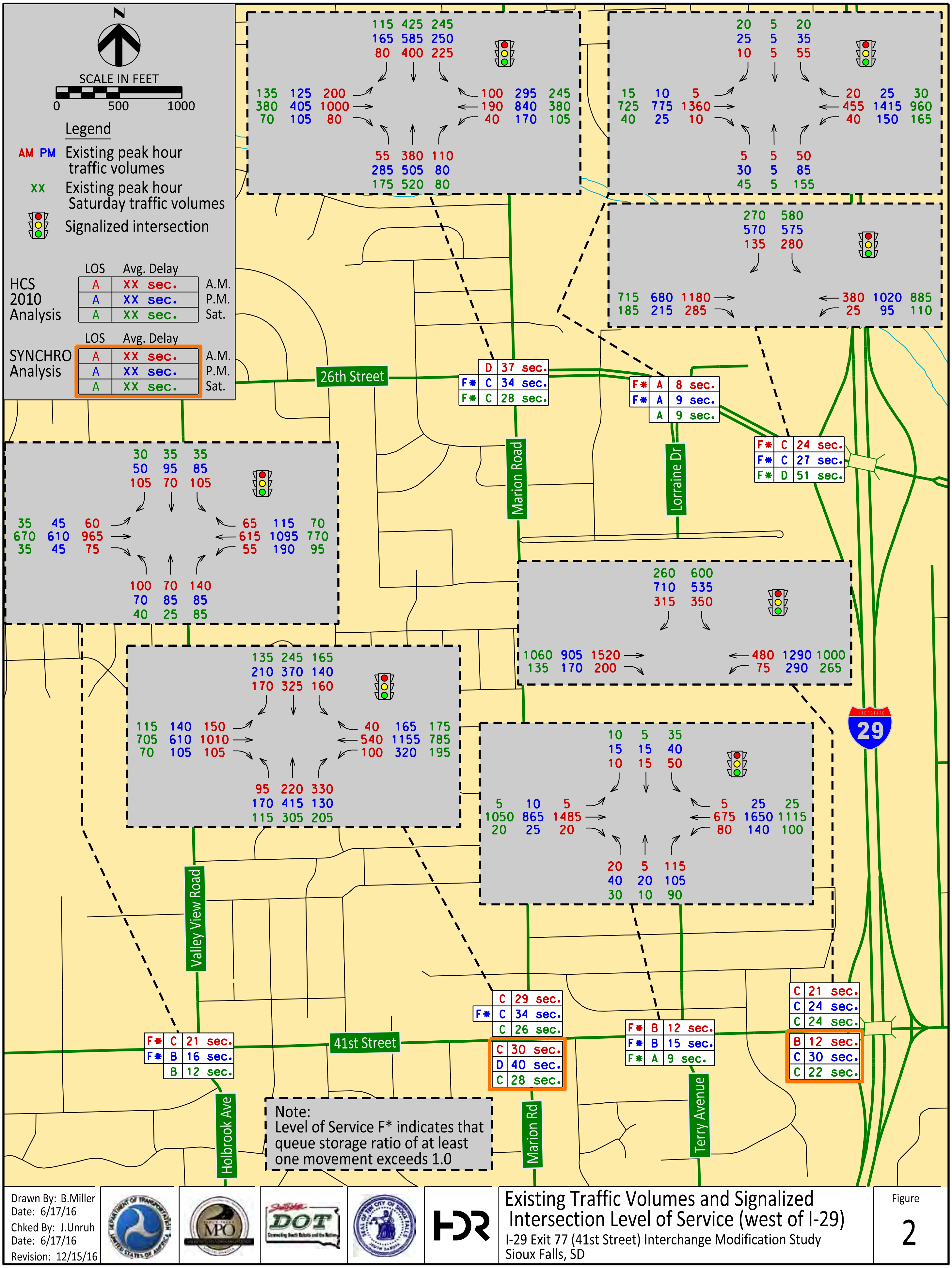
Certain movements experienced low levels of service or queues that exceeded the length of the available storage during particular peak hours. The eastbound left turn at 41st Street/I-29 NB is an example of this characteristic, with the left turn queue extending through the 41st Street/I-29 SB intersection during the AM peak.

Multimodal level of service varies widely throughout the 26th Street and 41st Street corridors. The lowest levels of service are related to locations with the absence of specific facilities for pedestrians and bicyclists in these corridors.

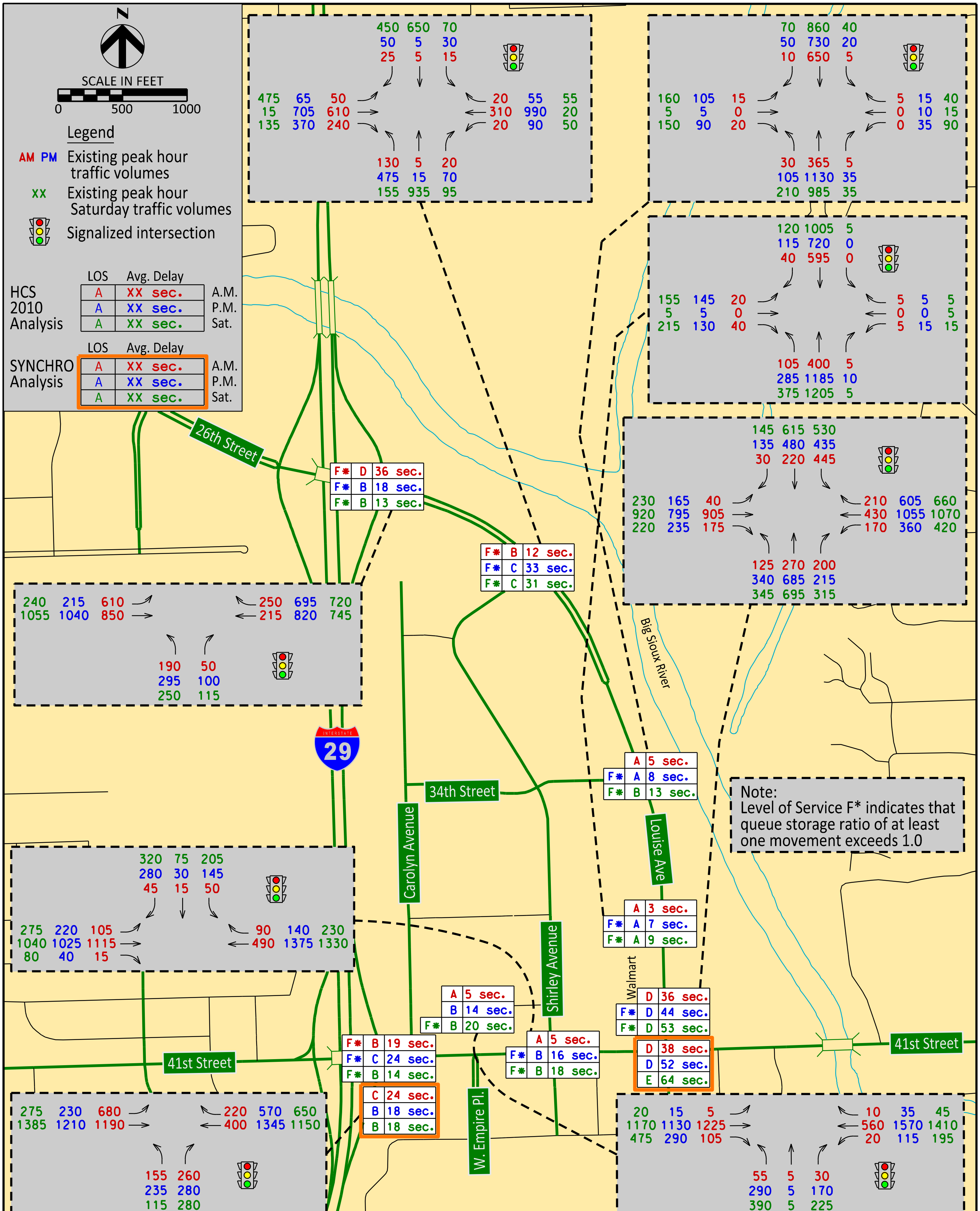
There are several stop-controlled intersections in the study area that are anticipated to play a role in future improvement alternatives. Those intersections are listed below along with peak hour stopped-approach level of service information:

- 38th Street/Carolyn Avenue: currently an uncontrolled intersection – no level of service analysis available.
- 38th Street/Shirley Avenue: AM-B, PM-D, SAT-D
- 41st Street/Carolyn Avenue: AM-C, PM-F, SAT-F

Daily traffic volumes in the study area are shown in **Figures 2 and 3**. Peak hour traffic volumes and levels of service are summarized in **Figures 2 through 5**. Supporting analysis printouts are provided in the **Appendix 3**.



Existing Traffic Volumes and Signalized Intersection Level of Service (west of I-29)
I-29 Exit 77 (41st Street) Interchange Modification Study
Sioux Falls, SD



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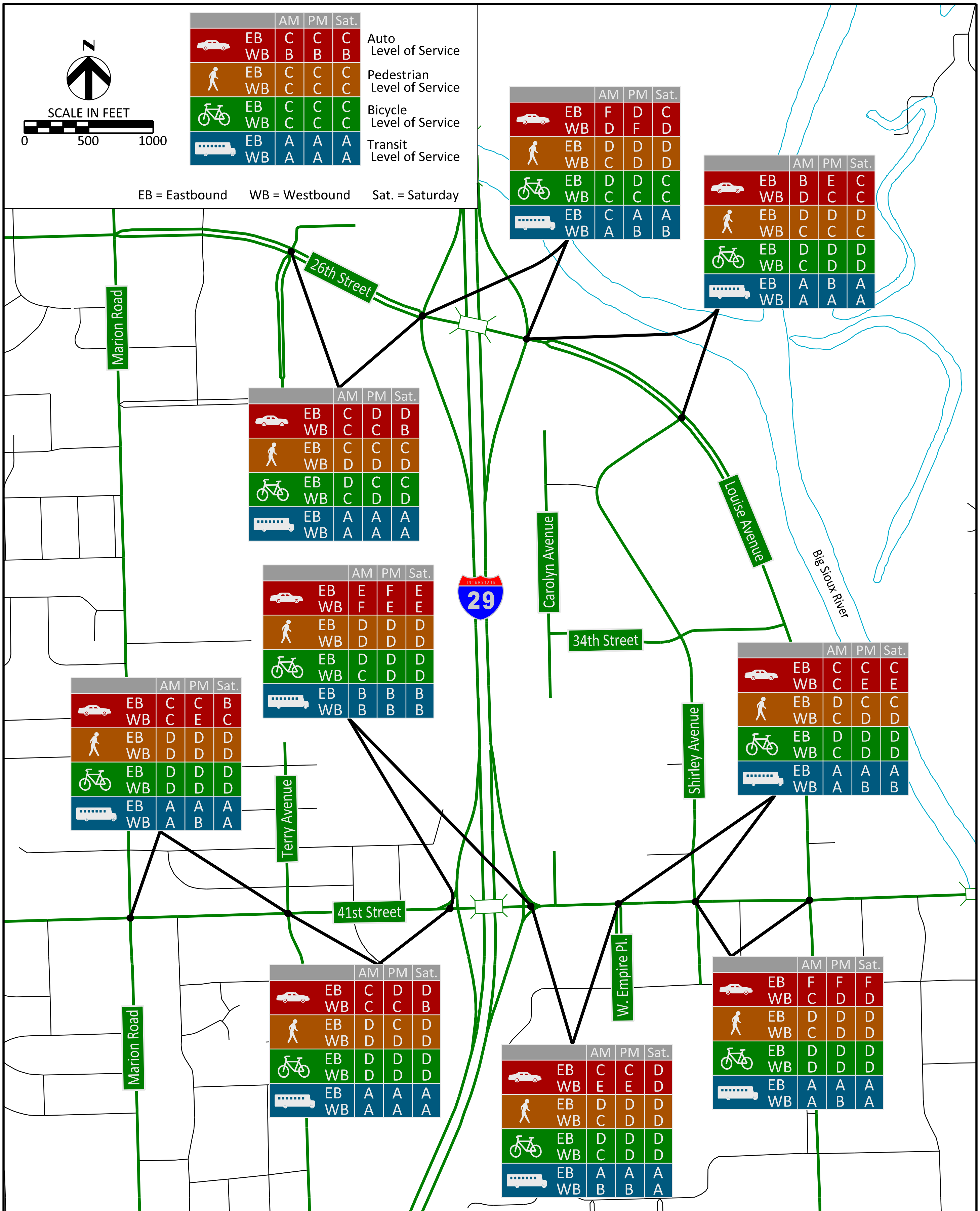
Chked By: J.Unruh
Date: 6/17/16
Revision: 12/15/16

Existing Traffic Volumes and Signalized Intersection Level of Service (east of I-29)

I-29 Exit 77 (41st Street) Interchange Modification Study
Sioux Falls, SD

Figure
3



Mode	Dir	AM	PM	Sat.
Auto	EB	C	C	C
	WB	B	B	B
Pedestrian	EB	C	C	C
	WB	C	C	C
Bicycle	EB	C	C	C
	WB	C	C	C
Transit	EB	A	A	A
	WB	A	A	A

Mode	Dir	AM	PM	Sat.
Auto	EB	F	D	C
	WB	D	F	D
Pedestrian	EB	D	D	D
	WB	C	D	D
Bicycle	EB	D	D	C
	WB	C	C	C
Transit	EB	C	A	A
	WB	A	B	B

Mode	Dir	AM	PM	Sat.
Auto	EB	B	E	C
	WB	D	C	C
Pedestrian	EB	D	D	D
	WB	C	C	C
Bicycle	EB	D	D	D
	WB	C	D	D
Transit	EB	A	B	A
	WB	A	A	A

Mode	Dir	AM	PM	Sat.
Auto	EB	C	D	D
	WB	C	C	B
Pedestrian	EB	C	C	C
	WB	D	D	D
Bicycle	EB	D	C	C
	WB	C	D	D
Transit	EB	A	A	A
	WB	A	A	A

Mode	Dir	AM	PM	Sat.
Auto	EB	E	F	E
	WB	F	E	E
Pedestrian	EB	D	D	D
	WB	D	D	D
Bicycle	EB	D	D	D
	WB	C	D	D
Transit	EB	B	B	B
	WB	B	B	B

Mode	Dir	AM	PM	Sat.
Auto	EB	C	C	B
	WB	C	E	C
Pedestrian	EB	D	D	D
	WB	D	D	D
Bicycle	EB	D	D	D
	WB	D	D	D
Transit	EB	A	A	A
	WB	A	B	A

Mode	Dir	AM	PM	Sat.
Auto	EB	C	C	C
	WB	C	E	E
Pedestrian	EB	D	C	C
	WB	C	D	D
Bicycle	EB	D	D	D
	WB	C	D	D
Transit	EB	A	A	A
	WB	A	B	B

Mode	Dir	AM	PM	Sat.
Auto	EB	C	D	D
	WB	C	C	B
Pedestrian	EB	D	C	D
	WB	D	D	D
Bicycle	EB	D	D	D
	WB	D	D	D
Transit	EB	A	A	A
	WB	A	A	A

Mode	Dir	AM	PM	Sat.
Auto	EB	C	C	D
	WB	E	E	D
Pedestrian	EB	D	D	D
	WB	C	D	D
Bicycle	EB	D	D	D
	WB	C	D	D
Transit	EB	A	A	A
	WB	B	B	A

Mode	Dir	AM	PM	Sat.
Auto	EB	F	F	F
	WB	C	D	D
Pedestrian	EB	D	D	D
	WB	C	D	D
Bicycle	EB	D	D	D
	WB	D	D	D
Transit	EB	A	A	A
	WB	A	B	A

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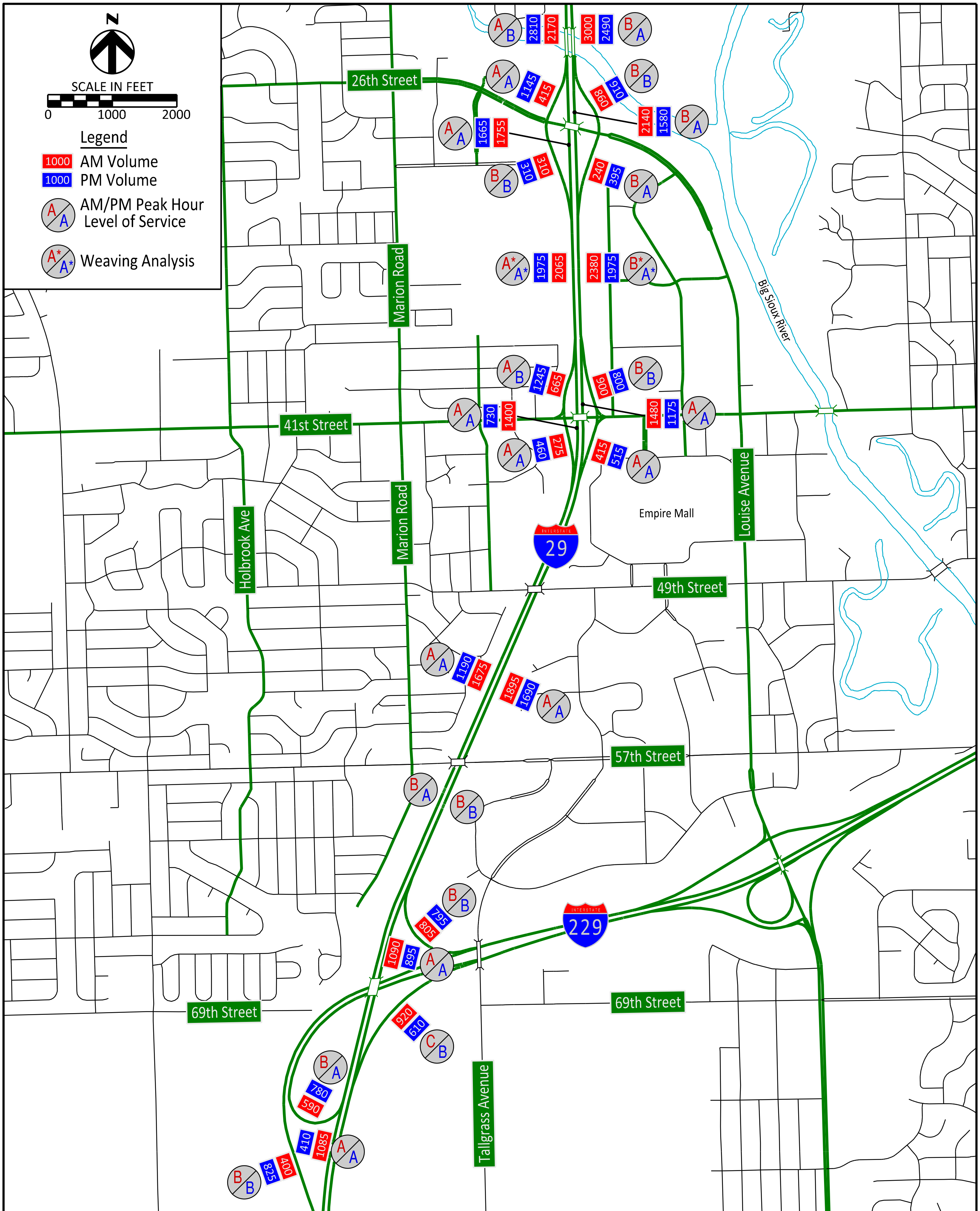
Existing Multimodal Peak Hour Level of Service

I-29 Exit 77 (41st Street) Interchange Modification Study
Sioux Falls, SD

Figure 4



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Existing Peak Hour Balanced Traffic Volumes and I-29 Level of Service
I-29 Exit 77 (41st Street) Interchange Modification Study
Sioux Falls, SD

Figure 5

3.8 Existing Safety Conditions

An analysis of existing safety conditions was conducted, based on crash records provided by SDDOT. The analysis was conducted using the Critical Rate Method, as described in the Highway Safety Manual (HSM), published by the American Association of State Highway and Transportation Officials (AASHTO).

Highway Safety Manual definition:

- *Critical Rate Method (CRM) – a method in which the observed crash rate at each site is compared to a calculated critical crash rate that is unique to each site.*

Crash data for the years 2010 through 2015 were provided by SDDOT and reviewed to identify any existing crash concentrations/crash trends and develop potential crash mitigation measures. Analyses were conducted for the following roadway facilities:

- Arterial street intersections
- Arterial street segments
- Interstate mainline segments
- Interstate ramp segments

Critical crash rates were calculated for each segment or intersection and used to identify portions of the study area that displayed crash rates higher than the critical rate. Each of the above-critical locations is discussed in subsequent sections of this memorandum.

<u>Segment and Intersection Crash Rates:</u>

The study area was divided into segments representing:

- Arterial street intersections (Figures 6, 7, Table 1)
- Arterial street segments (Figures 8, 9, Table 2)
- Interstate mainline segments (Figure 10, Table 3)
- Interstate ramp segments (Figure 11, Table 4)

Mainline and ramp sections were each analyzed separately to allow calculation of representative crash rates and critical rates for each type of Interstate feature. Rate calculations included other Interstate highway sections in the Sioux Falls urban area, resulting in more robust statistical representation of crash rates.

The arterial street intersections named in the M&A document were grouped for calculation of crash rates and critical rates.

Details of the crash records for each segment and intersection are contained in the **Appendix 4**.

Segment and Intersection Critical Crash Rates:

Critical crash rates were calculated based on the statistical populations in each spreadsheet, using the methods shown in the Highway Safety Manual (American Association of State Highway and Transportation Officials (AASHTO), 2010). Those segments and intersections that lay outside the critical rates are shown in red coloration in the last column of each spreadsheet. All the segments and intersections that lay within the critical rate are shown in green.

Crash Trends:

Review of the crash summaries for each Interstate and arterial street section revealed a few crash trends:

- Slightly elevated incidence of single vehicle crashes on the Interstate during inclement weather.
- Rear-end crashes at arterial intersections with the highest levels of congestion.
- Angle crashes at driveways in the arterial street segments near 41st Street/Louise Ave.
- Rear-end crashes on 41st Street in the arterial street segments bounding the Interstate 29 interchange.

Potential Mitigation Measures:

The general crash trends identified above suggest several potential strategies for reducing crash rates within the study area:

- Consider ITS-related means of communicating slippery roadway conditions to drivers and continue aggressive winter maintenance.
- Addition of high-friction surface courses on bridges, curves and weaving areas may help reduce crashes that occur during inclement weather. A section of high-friction surfacing has been installed on I-229 and may provide useful guidance about employing this technique for safety enhancement.
- Additional access management measures on 41st Street and Louise Avenue, particularly near the 41st/Louise intersection.
- Reconfiguration of the 41st Street interchange on I-29 to reduce 41st Street queues and enhance 41st Street traffic flow.

Each of the arterial intersections and Interstate segments that were identified as having crash rates outside of the critical rates are discussed in the following points.

Arterial Intersections:

- 41st Street/Marion Road – 53% of the crashes at this intersection involved rear-end incidents, while 37% involved angle incidents. Peak hour queues and congestion may be leading to increased crash rates.
- 41st Street/I-29 SB – 78% of the crashes at this intersection involved rear-end incidents, while 17% involved angle incidents. Peak hour queues and congestion may be leading to increased crash rates.

- 41st Street/I-29 NB – 53% of the crashes at this intersection involved rear-end incidents, while 40% involved angle incidents. Peak hour queues and congestion may be leading to increased crash rates.
- 41st Street/Shirley Avenue – 63% of the crashes at this intersection involved angle incidents, while 31% involved rear-end incidents. The intersection configuration and offset of Shirley Avenue may be leading to increased crash rates. Peak hour queues and congestion may also play a role in crash incidence.
- 41st Street/Louise Avenue – 54% of the crashes at this intersection involved rear-end incidents, while 37% involved angle incidents. Peak hour queues and congestion may be leading to increased crash rates.

Arterial Street Segments:

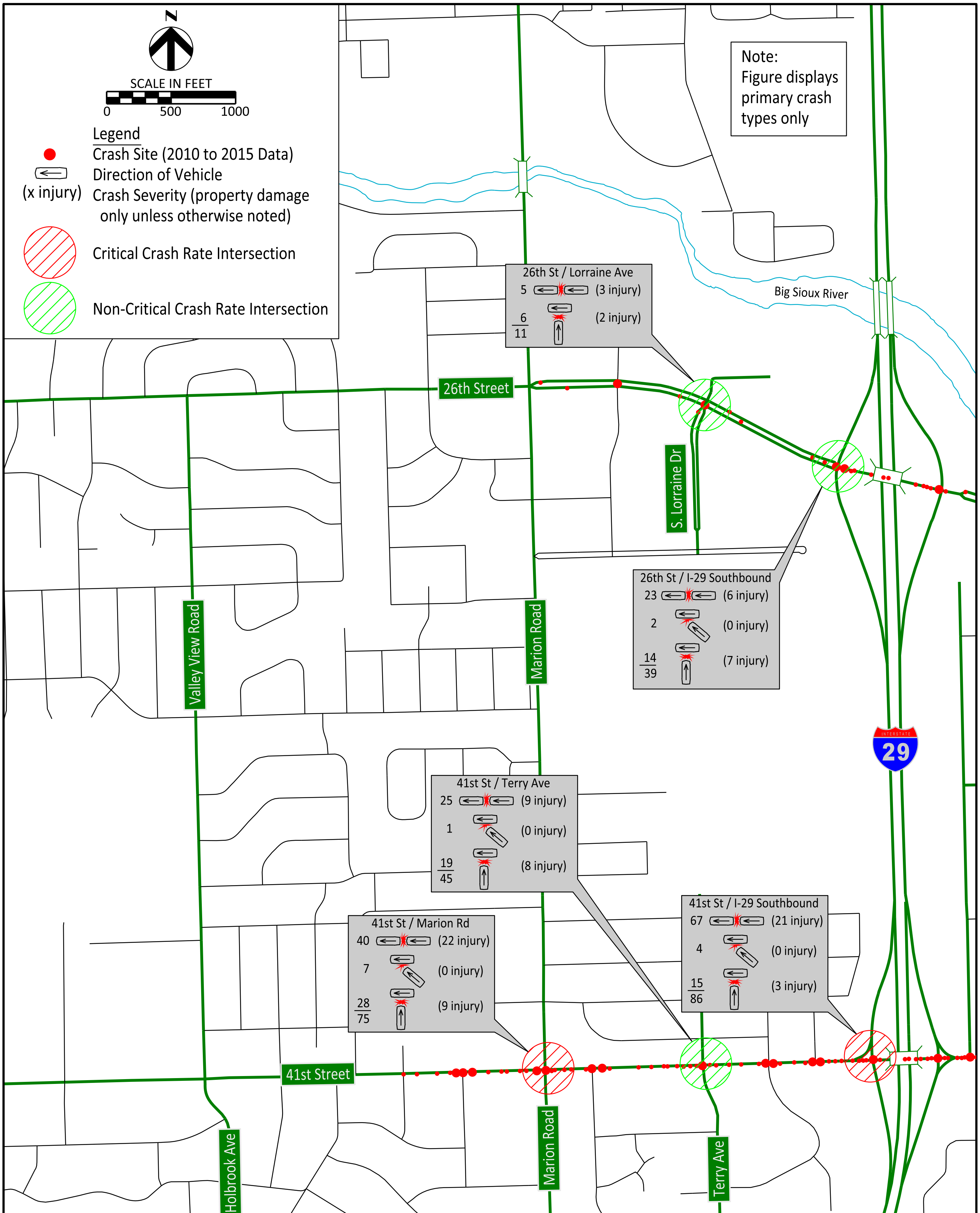
- Louise Avenue – Wal-Mart driveway to 41st Street – angle crashes at driveways appear to be leading to higher-than-normal crash rates. Queues from the adjacent intersections frequently back up into this segment making driveway maneuvers difficult.
- 41st Street – Terry Avenue to I-29 SB – peak hour queues from the I-29 interchange result in a high rate of rear-end crashes.
- 41st Street – I-29 NB to West Empire Place – peak hour queues from the I-29 interchange result in a high rate of rear-end crashes.
- 41st Street – Shirley Avenue to Louise Avenue – angle crashes at driveways and rear-end crashes appear to be leading to higher-than-normal crash rates. Queues from the adjacent intersections frequently back up into this segment making driveway maneuvers difficult and creating unexpected encounters with the back of the queue.

Interstate Segments:

- I-29 NB, 41st Street to 26th Street – single vehicle crashes with fixed objects appear to be leading to an elevated crash rate in this segment.
- I-29 NB, 26th Street off ramp to 26th Street on ramp – single vehicle crashes with fixed objects during slippery roadway conditions represent the predominant crash type.

Interstate Ramps:

No critical Interstate ramp segments were identified.



Drawn By: B.Miller
Date: 6/17/16
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Date: 6/17/16
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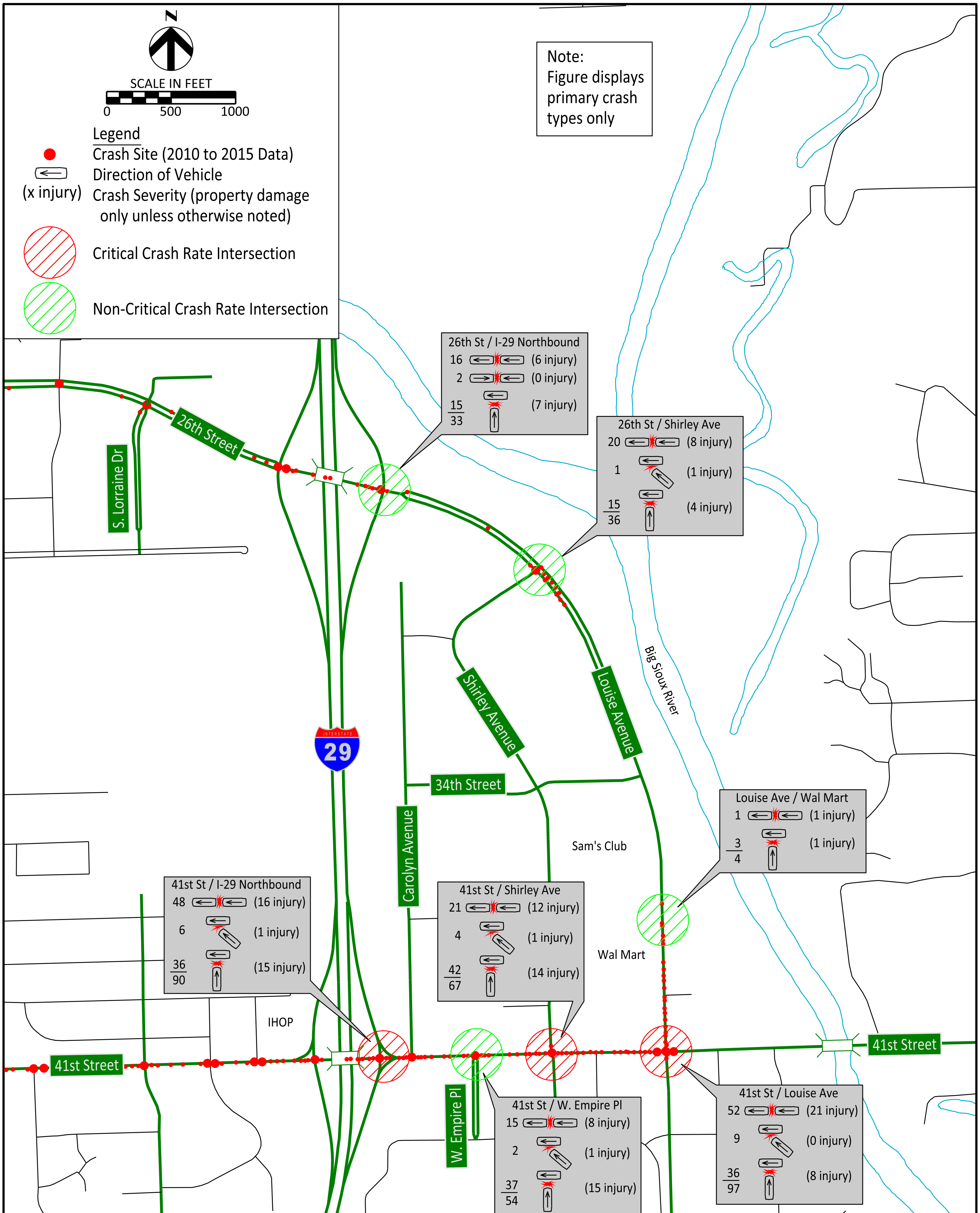
Signalized Intersection Crash Analysis Summary
Years 2010-2015 (west of I-29) (see Table 1)
I-29 Exit 77 (41st Street) Interchange Modification Study
Sioux Falls, SD

Figure
6



Drawn By: B.Miller
Date: 6/24/16
Chked By: J.Unruh
Date: 6/24/16
Revision: 9/6/16

Signalized Intersection Crash Analysis Summary
Years 2010-2015 (east of I-29) (see Table 1)
I-29 Exit 77 (41st Street) Interchange Modification Study
Sioux Falls, SD

Figure 7

TABLE 1 - SIGNALIZED INTERSECTION CRASH RATES (2010-2015)

I-29/41ST ST. IMJR

INTERSECTION	NUMBER CRASHES	DAILY VOLUME	MEV[1]	CRASH RATE	*TEV*R* [2]	CRITICAL RATE	DIFFERENCE
2: 26TH/LORRAINE	12	24400	44.53	0.27	6575.34	0.93	-0.66
3: 26TH/I-29 SB	42	27500	50.19	0.84	23013.70	0.92	-0.08
4: 26TH/I-29 NB	33	31200	56.94	0.58	18082.19	0.91	-0.33
5: 26TH/SHIRLEY	36	30500	55.66	0.65	19726.03	0.91	-0.26
9: LOUISE/WAL-MART	4	31100	56.76	0.07	2191.78	0.91	-0.84
11: 41ST/MARION	77	40500	73.91	1.04	42191.78	0.88	**0.16**
12: 41ST/TERRY	45	32300	58.95	0.76	24657.53	0.90	-0.14
13: 41ST/I-29 SB	91	38400	70.08	1.30	49863.01	0.89	**0.41**
14: 41ST/I-29 NB	95	37500	68.44	1.39	52054.79	0.89	**0.50**
16: 41ST/W. EMPIRE	56	38300	69.90	0.80	30684.93	0.89	-0.09
17: 41ST/SHIRLEY	67	36100	65.88	1.02	36712.33	0.89	**0.12**
18: 41ST/LOUISE	101	61700	112.60	0.90	55342.47	0.85	**0.05**
COLUMN TOTAL		1676220			1196027.40		
WEIGHTED AVERAGE RATE				0.71			

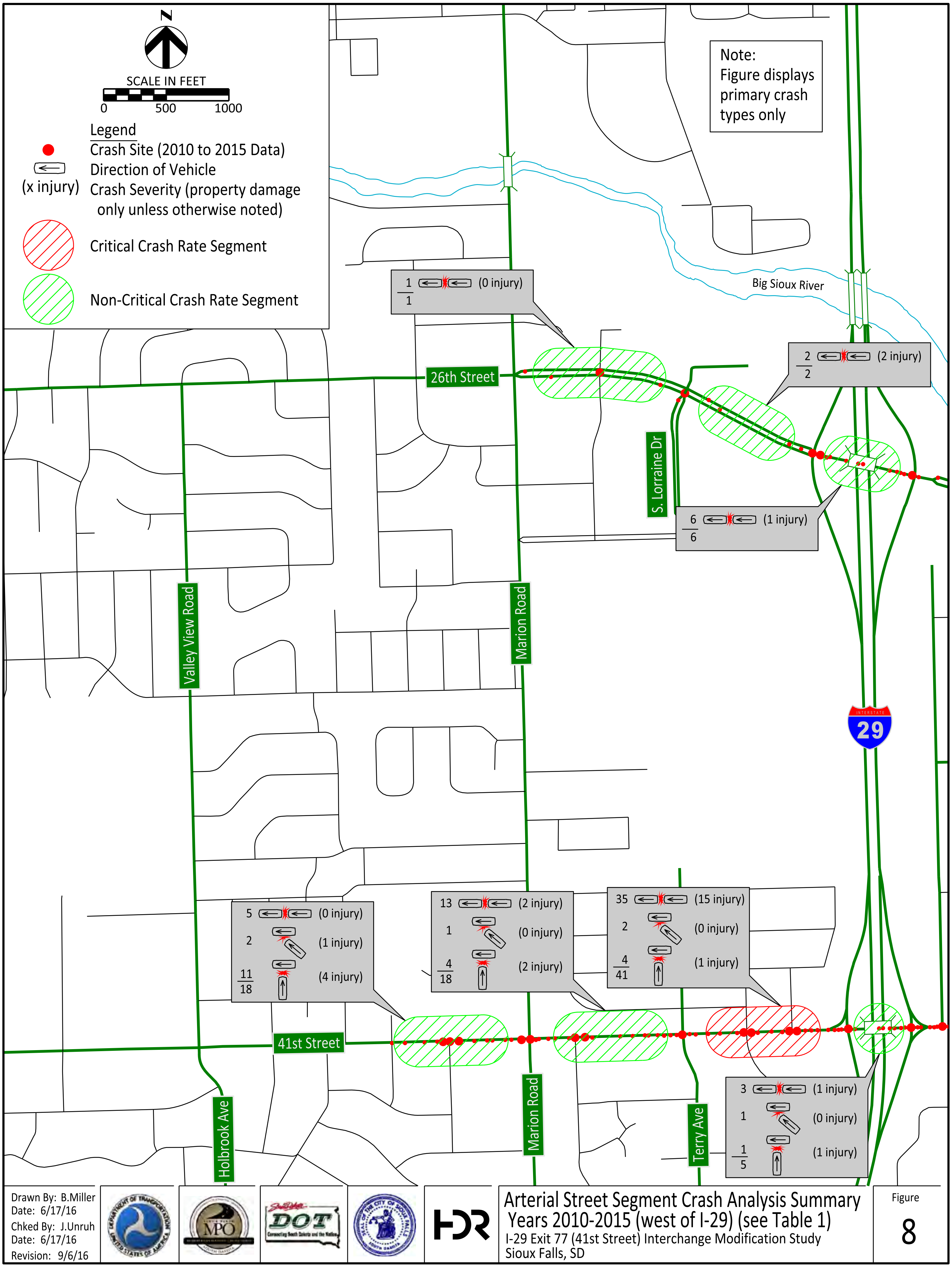
[1]MEV = MILLION ENTERING VEHICLES

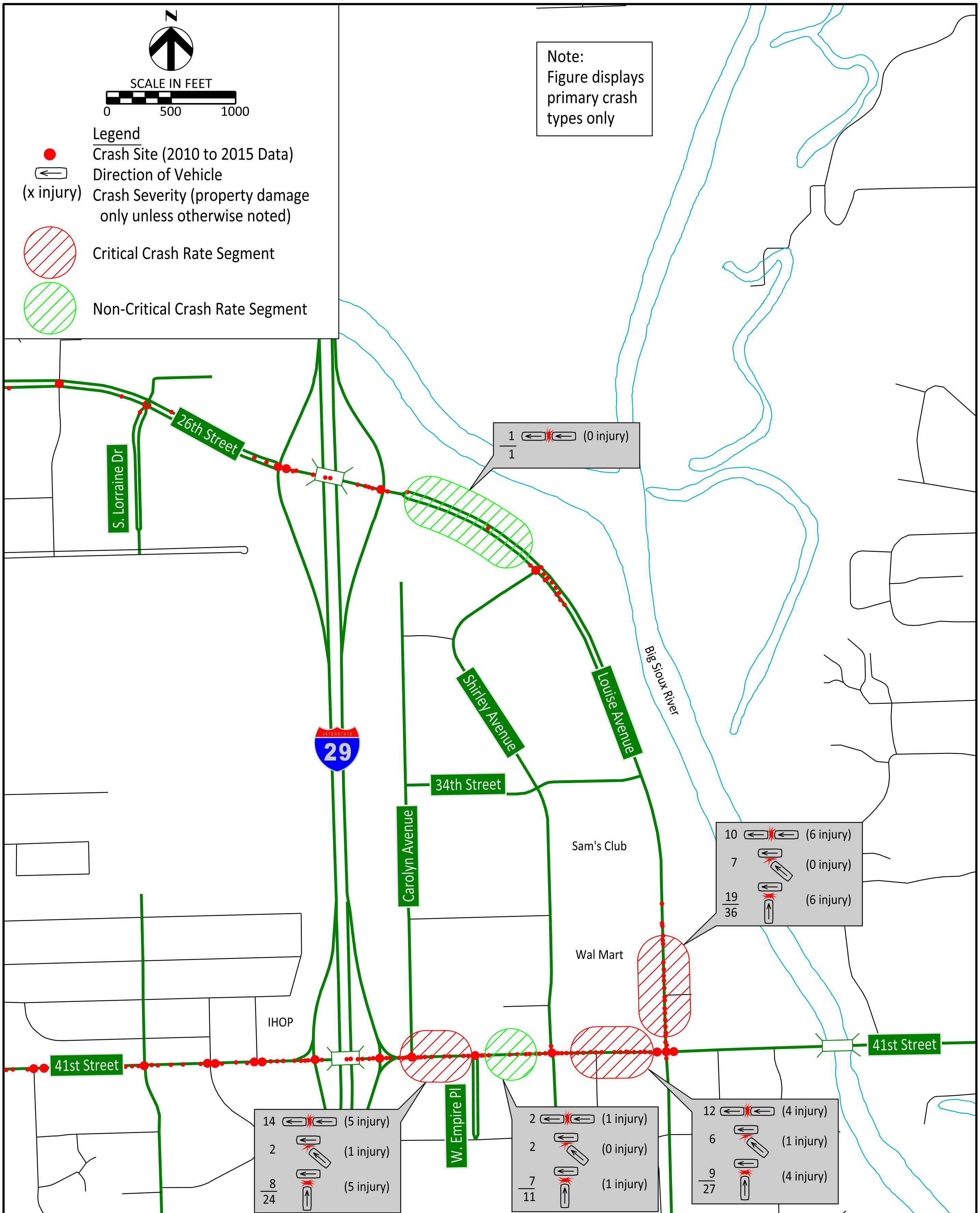
[2]TEV*R = TOTAL ENTERING VEHICLES TIMES CRASH RATE

SOURCE: HIGHWAY SAFETY MANUAL, FIRST EDITION, 2010, AASHTO

NOTE: CRITICAL RATE STATISTICS ARE BASED ON A LARGE SAMPLE OF SIGNALIZED ARTERIAL INTERSECTIONS IN SIOUX FALLS

NOTE: THE RED AND GREEN HIGHLIGHTS PROVIDE A QUICK VISUAL INDICATION OF WHICH INTERSECTIONS HAVE A CRASH RATE OUTSIDE OF THE STATISTICAL CRITICAL RATE. THE RED INTERSECTIONS ARE CONSIDERED OUTSIDE THE CRITICAL IMPROVEMENTS), WHILE THE GREEN SEGMENTS ARE INSIDE THE CRITICAL RATE. THIS CRASH ANALYSIS IS BEING PERFORMED AS PART OF THE IMJR PROCESS, A PLANNING PROCESS FOR FUTURE POTENTIAL INTERCHANGE PROJECTS. THE HIGHWAY SAFETY MANUAL (HSM) IS BEING USED AS A REFERENCE FOR PROPER PLANNING OF THE ROADWAY FEATURES THAT MAY BE ASSOCIATED WITH POTENTIAL INTERCHANGE IMPROVEMENTS. PROVIDING A COMPLETE EXPLANATION OF THE CRITICAL RATE METHOD WOULD REQUIRE RESTATEMENT OF A LARGE PORTION OF THE


N
SCALE IN FEET
0 500 1000
Legend
Crash Site (2010 to 2015 Data)
Direction of Vehicle
(x injury) Crash Severity (property damage only unless otherwise noted)
Critical Crash Rate Segment
Non-Critical Crash Rate Segment
Note:
Figure displays primary crash types only
Big Sioux River
26th Street
S. Lorraine Dr
Valley View Road
Marion Road
41st Street
Holbrook Ave
Terry Ave
29
1 (0 injury)
1
2 (2 injury)
2
6 (1 injury)
6
5 (0 injury)
2 (1 injury)
11 (4 injury)
18
13 (2 injury)
1 (0 injury)
4 (2 injury)
18
35 (15 injury)
2 (0 injury)
4 (1 injury)
41
3 (1 injury)
1 (0 injury)
1 (1 injury)
5
Drawn By: B.Miller
Date: 6/17/16
Chked By: J.Unruh
Date: 6/17/16
Revision: 9/6/16
Arterial Street Segment Crash Analysis Summary
Years 2010-2015 (west of I-29) (see Table 1)
I-29 Exit 77 (41st Street) Interchange Modification Study
Sioux Falls, SD
Figure
8



Drawn By: B.Miller
Date: 6/24/16
Chked By: J.Unruh
Date: 6/24/16
Revision: 9/6/16

HDR

Arterial Street Segment Crash Analysis Summary
Years 2010-2015 (east of I-29) (see Table 1)
I-29 Exit 77 (41st Street) Interchange Modification Study
Sioux Falls, SD

Figure
9

TABLE 2 - ARTERIAL SEGMENT CRASH RATES (2010-2015)

I-29/41ST ST. IMJR

SEGMENT	NUMBER CRASHES	SEGMENT LENGTH	DAILY VOLUME	MVMT[1]	CRASH RATE	*TEV*R* [2]	CRITICAL RATE	DIFFERENCE
1: 26TH ST., MARION TO LORRAINE	2	0.104	22,000	4.18	0.48	10537.41	4.72	-4.24
2: 26TH ST., LORRAINE TO I-29 SB	4	0.160	24,200	7.07	0.57	13698.63	4.34	-3.77
3: 26TH ST., I-29 SB TO I-29 NB	6	0.095	23,300	4.04	1.49	34607.07	4.75	-3.26
4: 26TH ST., I-29 NB TO SHIRLEY	2	0.206	24,100	9.06	0.22	5319.86	4.19	-3.97
6: LOUISE AVE., WAL-MART TO 41ST	37	0.113	26,700	5.51	6.72	179415.69	4.50	**2.22**
7: 41ST ST., VALLEY VIEW TO MARION	21	0.222	20,900	8.47	2.48	51832.65	4.23	-1.75
8: 41ST ST., MARION TO TERRY	18	0.175	26,500	8.46	2.13	56360.08	4.23	-2.10
9: 41ST ST., TERRY TO I-29 SB	43	0.182	30,300	10.06	4.27	129459.58	4.14	**0.13**
10: 41ST ST., I-29 SB TO I-29 NB	7	0.053	26,900	2.60	2.69	72370.12	5.17	-2.48
11: 41ST ST., I-29 NB TO W. EMPIRE	26	0.081	26,800	3.96	6.56	175883.65	4.76	**1.80**
12: 41ST ST., W. EMPIRE TO SHIRLEY	12	0.058	30,400	3.22	3.73	113367.97	4.95	-1.22
13: 41ST ST., SHIRLEY TO LOUISE	29	0.111	29,300	5.94	4.89	143156.86	4.45	**0.43**
COLUMN TOTALS			311400			986009.56		
WEIGHTED AVERAGE RATE					3.17			

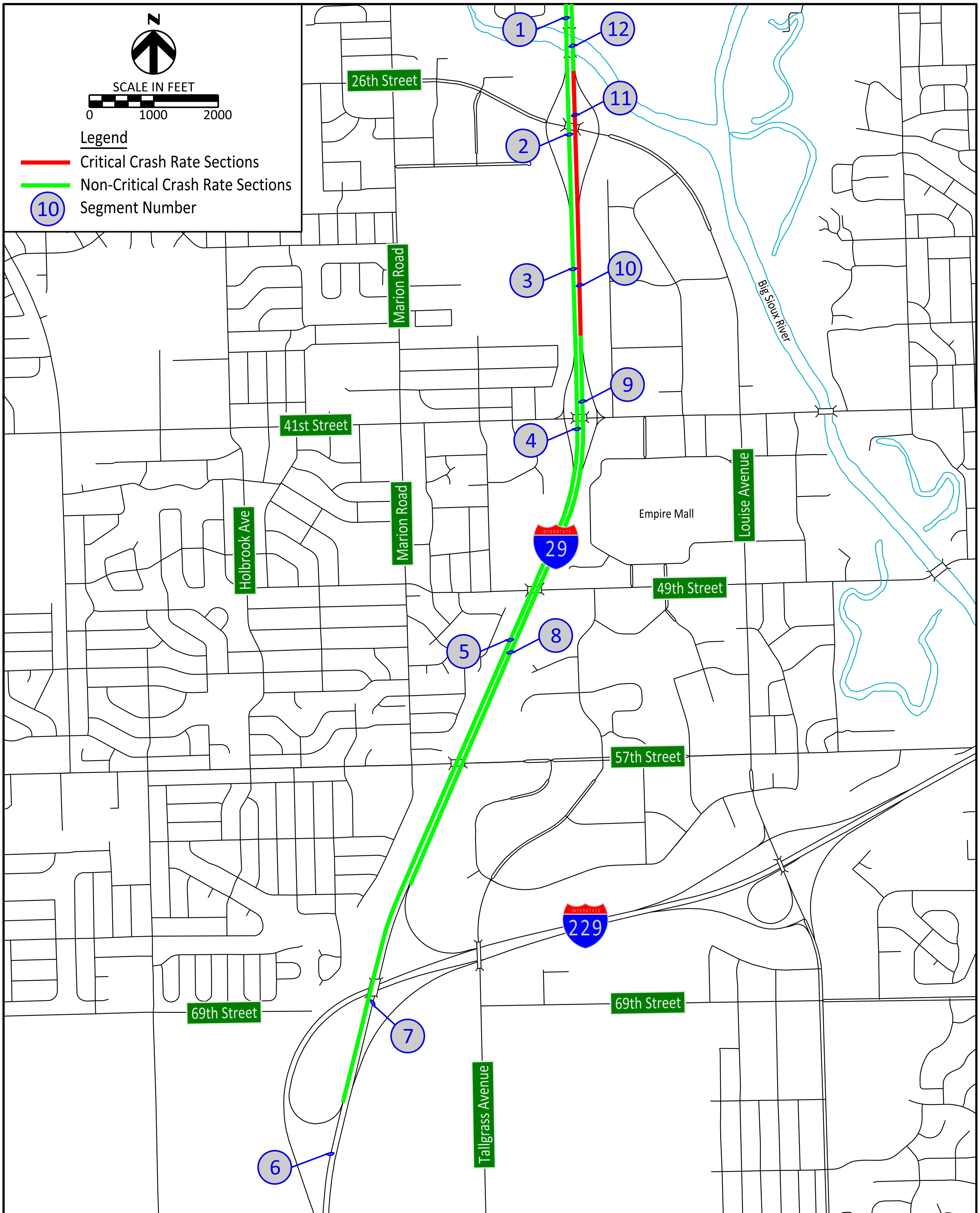
[1]MVMT=MILLION VEHICLE MILES TRAVELED

[2]TEV*R = TOTAL ENTERING VEHICLES PER DAY, TIMES OBSERVED CRASH RATE

SOURCE: HIGHWAY SAFETY MANUAL, FIRST EDITION, 2010, AASHTO

NOTE: CRITICAL RATE STATISTICS ARE BASED ON A LARGE SAMPLE OF ARTERIAL SEGMENTS IN SIOUX FALLS

NOTE: THE RED AND GREEN HIGHLIGHTS PROVIDE A QUICK VISUAL INDICATION OF WHICH SEGMENTS HAVE A CRASH RATE OUTSIDE OF THE STATISTICAL POSSIBLY REQUIRING ATTENTION AND SAFETY IMPROVEMENTS) WHILE THE GREEN SEGMENTS ARE INSIDE THE CRITICAL RATE. THE CRASH ANALYSIS IS BEING PERFORMED AS PART OF THE IMJR PROCESS, A PLANNING PROCESS FOR FUTURE POTENTIAL INTERCHANGE PROJECTS. THE HIGHWAY SAFETY MANUAL IS BEING USED AS A REFERENCE FOR PROPER PLANNING OF THE ROADWAY FEATURES THAT MAY BE ASSOCIATED WITH POTENTIAL INTERCHANGE IMPROVEMENTS. PROVIDING A COMPLETE EXPLANATION OF THE CRITICAL RATE METHOD WOULD REQUIRE RESTATEMENT OF LARGE PORTIONS OF THE HIGHWAY SAFETY MANUAL IN THIS DOCUMENT. INSTEAD, THE HSM IS INCLUDED BY REFERENCE.



Drawn By: B.Miller
Date: 7/5/16
Chked By: J.Unruh
Date: 7/5/16
Revision:

Interstate Segments for Crash Analysis
(see Table 3)
I-29 Exit 77 (41st Street) Interchange Modification Study
Sioux Falls, SD

Figure
10

TABLE 3 - INTERSTATE SEGMENT CRASH RATES (2010-2015)

I-29/41ST ST. IMJR

TRAVEL DIRECTION	SEGMENT	NUMBER CRASHES	SEGMENT LENGTH	DAILY VOLUME	MVMT[1]	CRASH RATE	*TEV*R* [2]	CRITICAL RATE	DIFFERENCE
SB	1: I-29, 12TH ST TO 26TH ST	22	0.589	31200	33.54	0.66	20466.54	1.23	-0.58
SB	2: I-29, 26TH ST TO 26TH ST	15	0.462	18500	15.60	0.96	17790.43	1.38	-0.42
SB	3: I-29, 26TH ST TO 41ST ST	15	0.330	21900	13.19	1.14	24906.60	1.42	-0.28
SB	4: I-29, 41ST ST TO 41ST ST	6	0.481	8100	7.11	0.84	6835.08	1.61	-0.77
SB	5: I-29, 41ST ST TO I-229	49	1.910	21200	73.90	0.66	14057.23	1.13	-0.47
SB	6: I-29, I-229 TO I-229	8	0.472	12500	10.77	0.74	9287.21	1.47	-0.73
NB	7: I-29, I-229 TO I-229	19	0.638	12400	14.44	1.32	16318.12	1.40	-0.08
NB	8: I-29, I-229 TO 41ST	23	1.270	21200	49.14	0.47	9923.42	1.18	-0.71
NB	9: I-29, 41ST TO 41ST	5	0.521	13100	12.46	0.40	5258.59	1.43	-1.03
NB	10: I-29, 41ST TO 26TH	20	0.248	21900	9.91	2.02	44189.13	1.50	**0.52**
NB	11: I-29, 26TH TO 26TH	25	0.440	17600	14.13	1.77	31133.25	1.40	**0.37**
NB	12: I-29, 26TH TO 12TH	17	0.669	27700	33.82	0.50	13923.87	1.23	-0.73
COLUMN TOTALS				227300			214089.46		
WEIGHTED AVERAGE RATE						0.94			

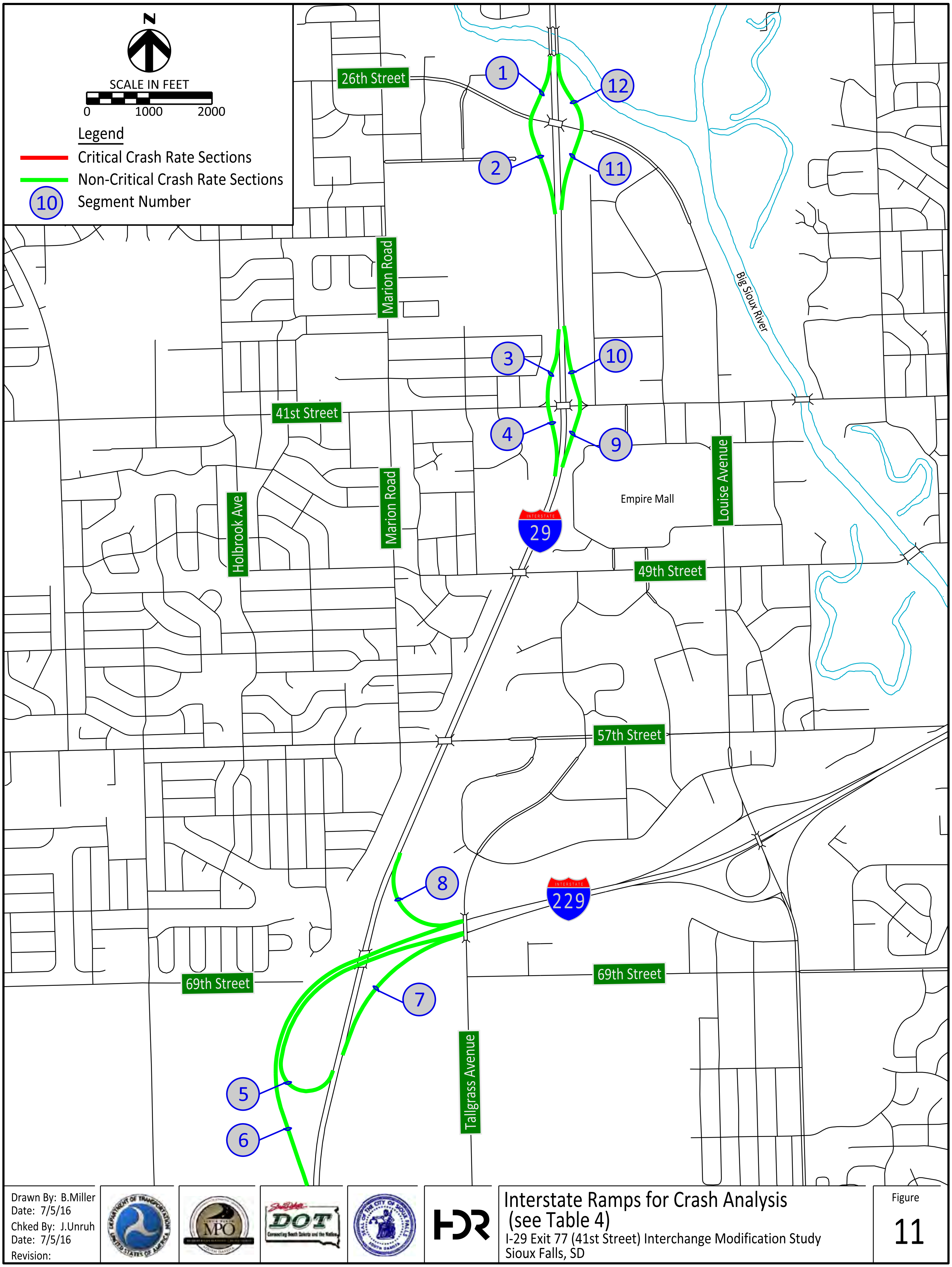
[1]MVMT=MILLION VEHICLE MILES TRAVELED

[2]TEV*R = TOTAL ENTERING VEHICLES PER DAY, TIMES OBSERVED CRASH RATE

SOURCE: HIGHWAY SAFETY MANUAL, FIRST EDITION, 2010, AASHTO

NOTE: CRITICAL RATE STATISTICS ARE BASED ON A LARGE SAMPLE OF INTERSTATE SEGMENTS IN SIOUX FALLS

NOTE: THE RED AND GREEN HIGHLIGHTS PROVIDE A QUICK VISUAL INDICATION OF WHICH SEGMENTS HAVE A CRASH RATE OUTSIDE OF THE STATISTICAL POSSIBLY REQUIRING ATTENTION AND SAFETY IMPROVEMENTS) WHILE THE GREEN SEGMENTS ARE INSIDE THE CRITICAL RATE. THE CRASH ANALYSIS IS BEING PERFORMED AS PART OF THE IMJR PROCESS, A PLANNING PROCESS FOR FUTURE POTENTIAL INTERCHANGE PROJECTS. THE HIGHWAY SAFETY MANUAL IS BEING USED AS A REFERENCE FOR PROPER PLANNING OF THE ROADWAY FEATURES THAT MAY BE ASSOCIATED WITH POTENTIAL INTERCHANGE IMPROVEMENTS. PROVIDING A COMPLETE EXPLANATION OF THE CRITICAL RATE METHOD WOULD REQUIRE RESTATEMENT OF LARGE PORTIONS OF THE HIGHWAY SAFETY MANUAL IN THIS DOCUMENT. INSTEAD, THE HSM IS INCLUDED BY REFERENCE.



N
SCALE IN FEET
0
1000
2000
Legend
Critical Crash Rate Sections
Non-Critical Crash Rate Sections
10
Segment Number
26th Street
41st Street
49th Street
57th Street
69th Street
69th Street
Marion Road
Marion Road
Holbrook Ave
Louise Avenue
Tallgrass Avenue
Big Sioux River
Empire Mall
29
229
1
2
3
4
5
6
7
8
9
10
11
12
Drawn By: B.Miller
Date: 7/5/16
Chked By: J.Unruh
Date: 7/5/16
Revision:
Interstate Ramps for Crash Analysis
(see Table 4)
I-29 Exit 77 (41st Street) Interchange Modification Study
Sioux Falls, SD
Figure
11

TABLE 4 - INTERSTATE RAMP CRASH RATES (2010-2015)

I-29/41ST ST. IMJR

TRAVEL DIRECTION	SEGMENT	NUMBER CRASHES	SEGMENT LENGTH	DAILY VOLUME	MVMT[1]	CRASH RATE	*TEV*R* [2]	CRITICAL RATE	DIFFERENCE
SB	1 - 26TH STREET OFF RAMP	5	0.188	12700	4.36	1.15	11067.72	3.13	-1.99
SB	2 - 26TH STREET ON RAMP	1	0.265	3400	1.64	0.61	5590.71	4.01	-3.40
SB	3 - 41ST STREET OFF RAMP	7	0.27	13800	6.80	1.03	13405.62	2.87	-1.84
SB	4 - 41ST STREET ON RAMP	2	0.186	5100	1.73	1.16	4414.55	3.95	-2.79
SB	5 - I-229 OFF RAMP	12	0.979	8700	15.54	0.77	11269.45	2.54	-1.76
SB	6 - I-229 ON RAMP	19	1.26	9200	21.16	0.90	10243.67	2.44	-1.55
NB	7 - I-229 OFF RAMP	4	0.554	6800	6.88	0.58	11687.74	2.87	-2.29
NB	8 - I-229 ON RAMP	5	0.376	8800	6.04	0.83	10627.87	2.94	-2.11
NB	9 - 41ST STREET OFF RAMP	2	0.185	5700	1.92	1.04	5484.72	3.83	-2.79
NB	10 - 41ST STREET ON RAMP	3	0.339	8900	5.51	0.54	16335.08	2.99	-2.44
NB	11 - 26TH STREET OFF RAMP	1	0.209	4400	1.68	0.60	7384.39	3.98	-3.39
NB	12 - 26TH STREET ON RAMP	2	0.265	10100	4.88	0.41	24667.29	3.06	-2.65
	COLUMN TOTAL			195590			376535.73		
	WEIGHTED AVERAGE RATE					1.93			

[1]MVMT = MILLION VEHICLE MILES TRAVELED

[2]TEV*R = TOTAL ENTERING VEHICLES TIMES CRASH RATE

SOURCE: HIGHWAY SAFETY MANUAL, FIRST EDITION, 2010, AASHTO

NOTE: CRITICAL RATE STATISTICS ARE BASED ON A LARGE SAMPLE OF INTERSTATE RAMPS IN SIOUX FALLS

NOTE: THE RED AND GREEN HIGHLIGHTS PROVIDE A QUICK VISUAL INDICATION OF WHICH SEGMENTS HAVE A CRASH RATE OUTSIDE OF THE STATISTICAL CRITICAL RATE. THE RED SEGMENTS ARE CONSIDERED OUTSIDE THE CRITICAL RATE (HAVING A CRASH RATE OUTSIDE THE NORMAL RANGE AND POSSIBLY REQUIRING ATTENTION AND SAFETY IMPROVEMENTS) WHILE THE GREEN SEGMENTS ARE INSIDE THE CRITICAL RATE. THE CRASH ANALYSIS IS BEING PERFORMED AS PART OF THE IMJR PROCESS, A PLANNING PROCESS FOR FUTURE POTENTIAL INTERCHANGE PROJECTS. THE HIGHWAY SAFETY MANUAL IS BEING USED AS A REFERENCE FOR PROPER PLANNING OF THE ROADWAY FEATURES THAT MAY BE ASSOCIATED WITH POTENTIAL INTERCHANGE IMPROVEMENTS. PROVIDING A COMPLETE EXPLANATION OF THE CRITICAL RATE METHOD WOULD REQUIRE RESTATEMENT OF LARGE PORTIONS OF THE HIGHWAY SAFETY MANUAL IN THIS DOCUMENT. INSTEAD, THE HSM IS INCLUDED BY REFERENCE.

3.9 Existing Environmental Constraints

The environmental studies and analyses completed during this Interchange Modification Justification Report preparation were used to refine, screen and eliminate alternatives based, in part, on environmental impacts identified.

4. PROJECT NEED

The environmental evaluation process has formulated a purpose and need statement for this project, included in **Appendix 1**. Previous studies, including the 2010 Decennial Interstate Corridor Study and the I-29 Exit 77 (41st Street) Crossroad Corridor Study, have identified the need to improve the Exit 77 interchange to address safety concerns, correct geometric deficiencies, and improve low peak hour levels of service.

5. ALTERNATIVES

Previous studies have identified improvements on the 41st Street crossroad to provide adequate roadway capacity and improve safety. The following improvement concepts were developed to address the interchange area needs:

- No-Build Concept Option
- Local Improvements Only (previously identified improvements on the 41st Street crossroad, no change to interchange configuration)
- Single point interchange (includes previously identified crossroad improvements)
- Diverging diamond interchange (DDI) (includes previously identified crossroad improvements)

The Single-Point and Diverging Diamond interchange concepts are shown in the following pages. The Concept Options were evaluated in a Technical Memorandum. The memo, including the concept options, is included in **Appendix 8**.

Drawn By: B.Miller Date: 8/30/2016 Chked By: J.Unruh Date: 8/30/2016 Revision: 2/1/2017	DOT		HDR	Single Point Interchange Alternative 41st Street Corridor Environmental Assessment — Sioux Falls, SD	Figure I-1

Drawn By: B.Miller
Date: 8/30/2016
Chked By: J.Unruh
Date: 8/30/2016
Revision: 8/21/2017

Diverging Diamond Interchange Alternative

41st Street Corridor Environmental Assessment

Sioux Falls, SD

Figure
I-2

6. FUTURE YEAR TRAFFIC

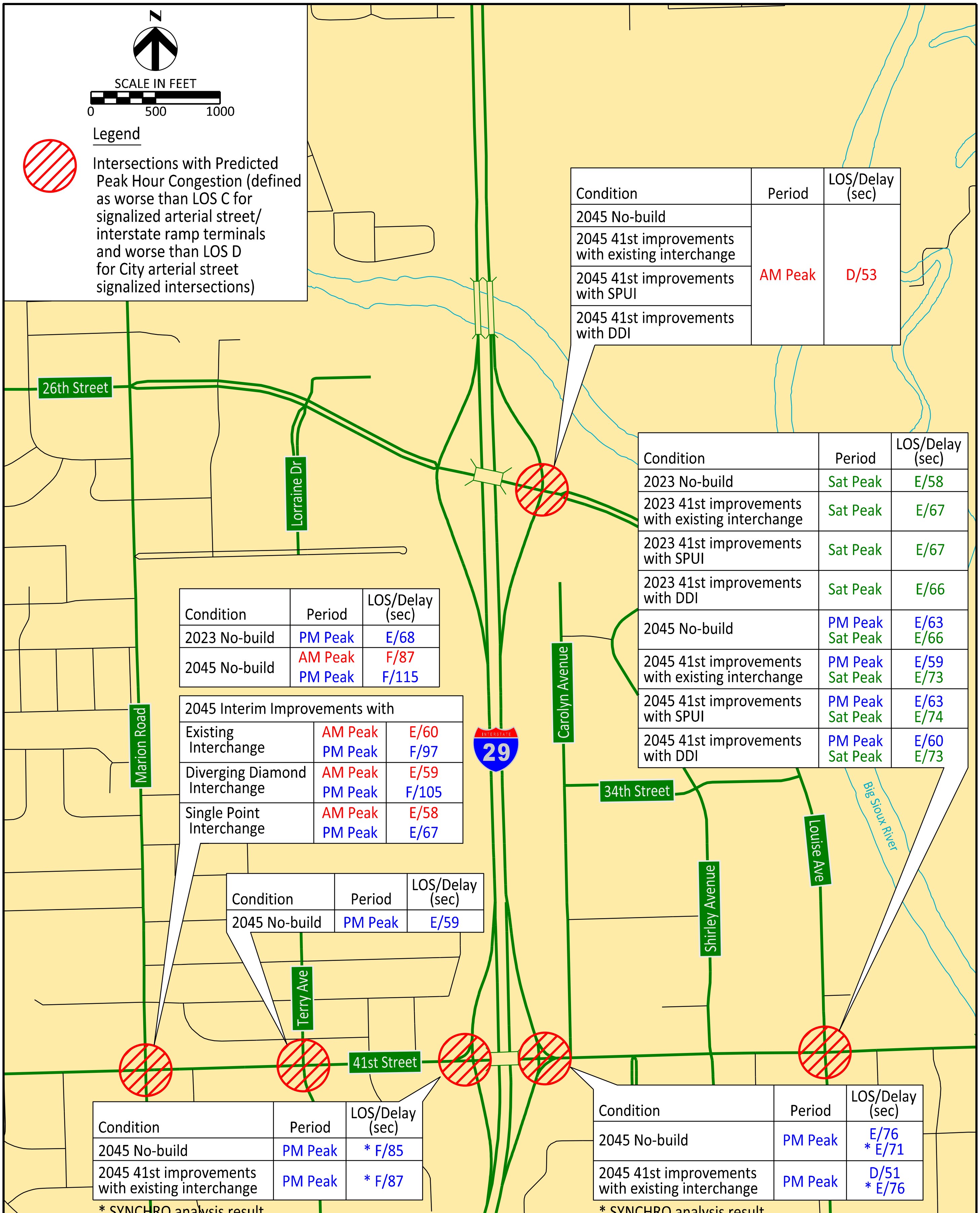
Traffic forecasts for the study area were prepared using the regional travel demand model maintained by the City of Sioux Falls and the Sioux Falls MPO. The model horizon year is 2045 and is based on local land use plans. Forecasts for the proposed 2023 construction completion year were also produced. Future year traffic demand reflects planned improvements. Peak hour traffic volumes and levels of service for the four scenarios are shown in **Figures 12 through 43.** Level of service output sheets from HCS 2010 are included in the **Appendix 5**.

The 2023 operational analysis revealed the following findings:

- Many intersections experienced peak hour conditions where the queue storage ratio of at least one movement exceeds 1.0 – defined as level of service F*
- The 41st St./Marion Rd. intersection experiences level of service E during the PM peak hour under no-build conditions.
- The 41st St./I-29 NB ramp terminal experiences level of service F during the AM peak hour under the local improvements only alternative.
- Both interchange alternatives provide good level of service at AM, PM and Saturday peak hours.
- All Interstate mainline sections, weaving sections and ramps operate at level of service C or better.

The 2045 operational analysis revealed the following findings:

- Many intersections experienced peak hour conditions where the queue storage ratio of at least one movement exceeds 1.0 – defined as level of service F*
- The 41st St./Marion Rd. intersection experiences level of service F during the AM and PM peak hours under no-build conditions.
- The 41st St./Terry Ave. intersection experiences level of service E during the PM peak hour under no-build conditions.
- The 41st St./I-29 NB ramp terminal experiences level of service E during the PM peak hour under no-build conditions and level of service F during the PM peak hour with the local improvements only alternative.
- Both interchange alternatives provide good level of service at AM, PM and Saturday peak hours.
- All Interstate mainline sections, weaving sections and ramps operate at level of service C or better.



Condition	Period	LOS/Delay (sec)
2045 No-build	AM Peak	D/53
2045 41st improvements with existing interchange		
2045 41st improvements with SPUI		
2045 41st improvements with DDI		

Condition	Period	LOS/Delay (sec)
2023 No-build	Sat Peak	E/58
2023 41st improvements with existing interchange	Sat Peak	E/67
2023 41st improvements with SPUI	Sat Peak	E/67
2023 41st improvements with DDI	Sat Peak	E/66
2045 No-build	PM Peak Sat Peak	E/63 E/66
2045 41st improvements with existing interchange	PM Peak Sat Peak	E/59 E/73
2045 41st improvements with SPUI	PM Peak Sat Peak	E/63 E/74
2045 41st improvements with DDI	PM Peak Sat Peak	E/60 E/73

Condition	Period	LOS/Delay (sec)
2023 No-build	PM Peak	E/68
2045 No-build	AM Peak PM Peak	F/87 F/115

2045 Interim Improvements with		
Existing Interchange	AM Peak PM Peak	E/60 F/97
Diverging Diamond Interchange	AM Peak PM Peak	E/59 F/105
Single Point Interchange	AM Peak PM Peak	E/58 E/67

Condition	Period	LOS/Delay (sec)
2045 No-build	PM Peak	E/59

Condition	Period	LOS/Delay (sec)
2045 No-build	PM Peak	* F/85
2045 41st improvements with existing interchange	PM Peak	* F/87

* SYNCHRO analysis result

Condition	Period	LOS/Delay (sec)
2045 No-build	PM Peak	E/76 * E/71
2045 41st improvements with existing interchange	PM Peak	D/51 * E/76

* SYNCHRO analysis result

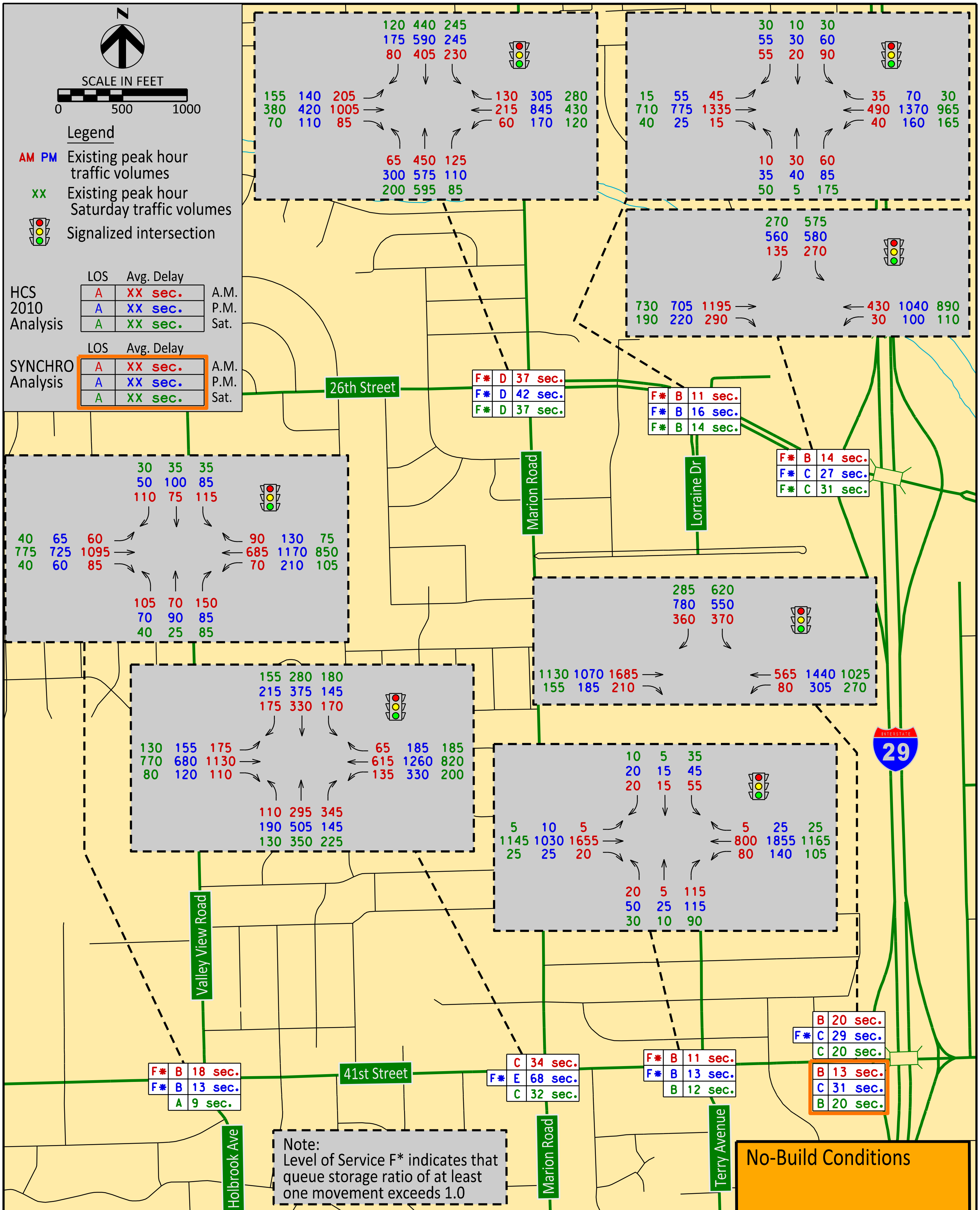
Drawn By: B.Miller
Date: 1/3/17
Chked By: J.Unruh
Date: 1/3/17
Revision: 2/7/17

FDR

Summary of Signalized Intersections with Predicted Peak Hour Low LOS (Yrs 2023 & 2045)

I-29 Exit 77 (41st Street) Interchange Modification Study
Sioux Falls, SD

Figure
12a

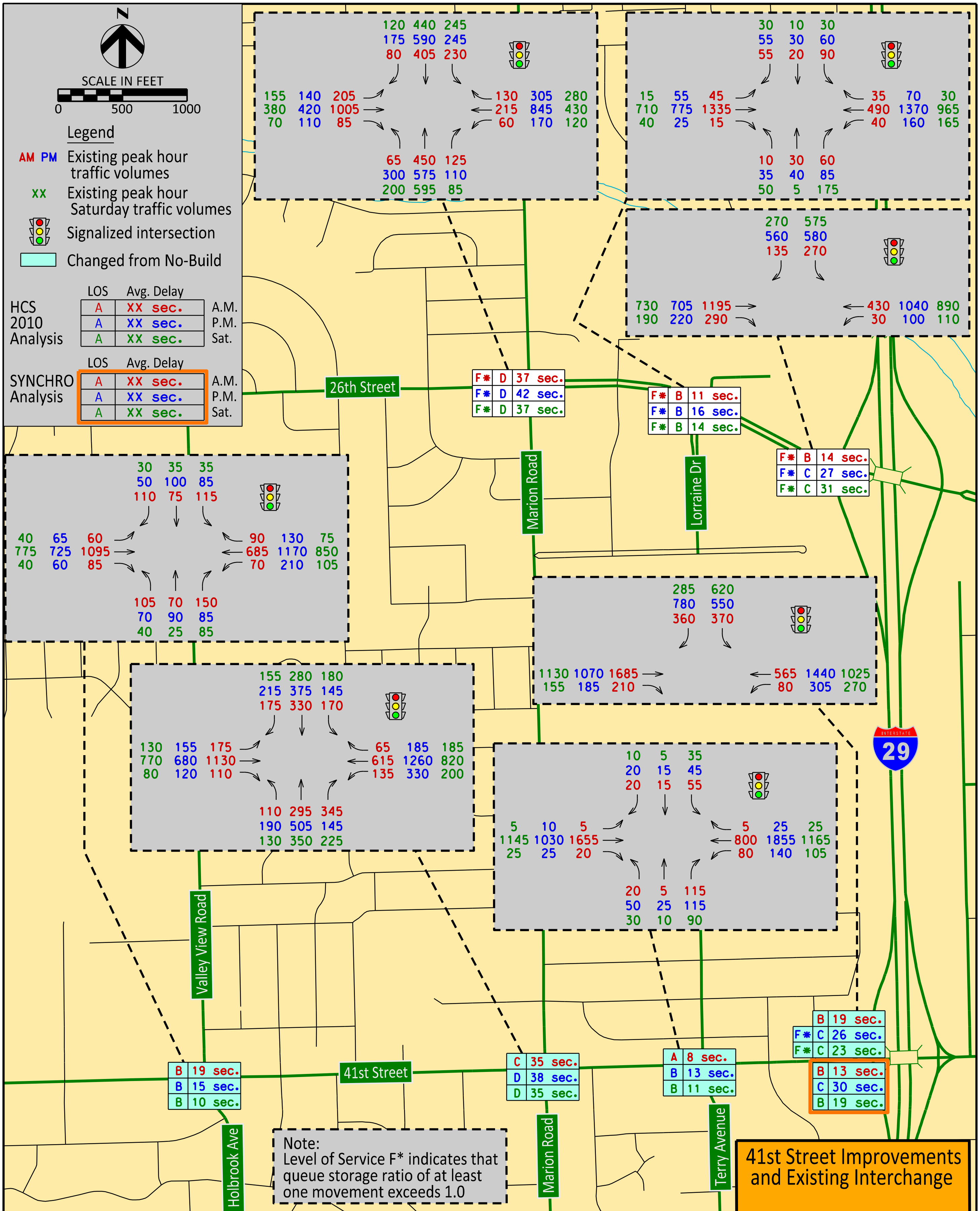


Drawn By: B.Miller
Date: 10/31/16
Chked By: J.Unruh
Date: 10/31/16
Revision: 12/15/16

Year 2023 Traffic Volumes and Signalized Intersection Level of Service (west of I-29)

I-29 Exit 77 (41st Street) Interchange Modification Study
Sioux Falls, SD

Figure 12

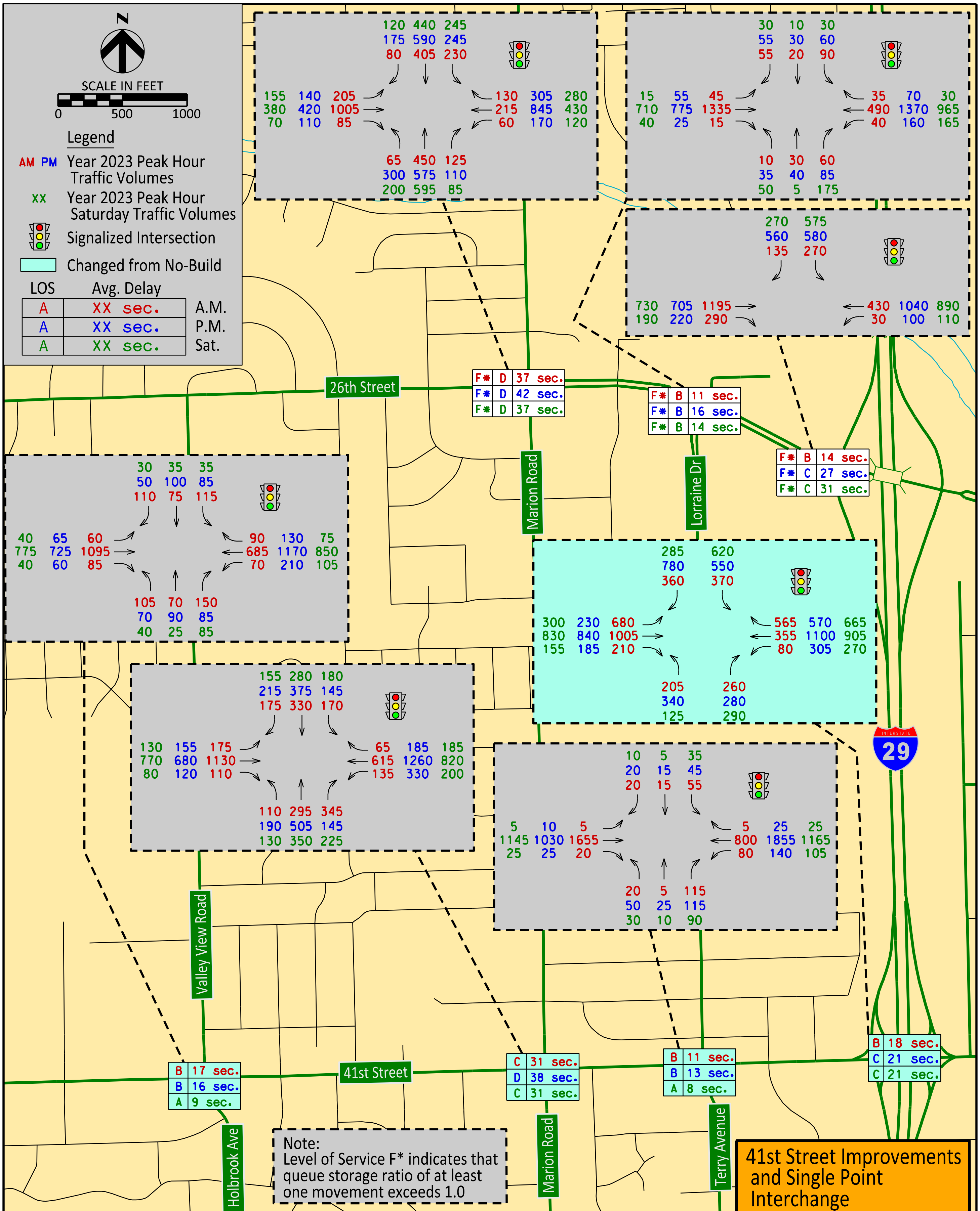


Drawn By: B.Miller
Date: 10/31/16
Chked By: J.Unruh
Date: 10/31/16
Revision: 1/25/17

Year 2023 Traffic Volumes and Signalized Intersection Level of Service (west of I-29)

I-29 Exit 77 (41st Street) Interchange Modification Study
Sioux Falls, SD

Figure 13

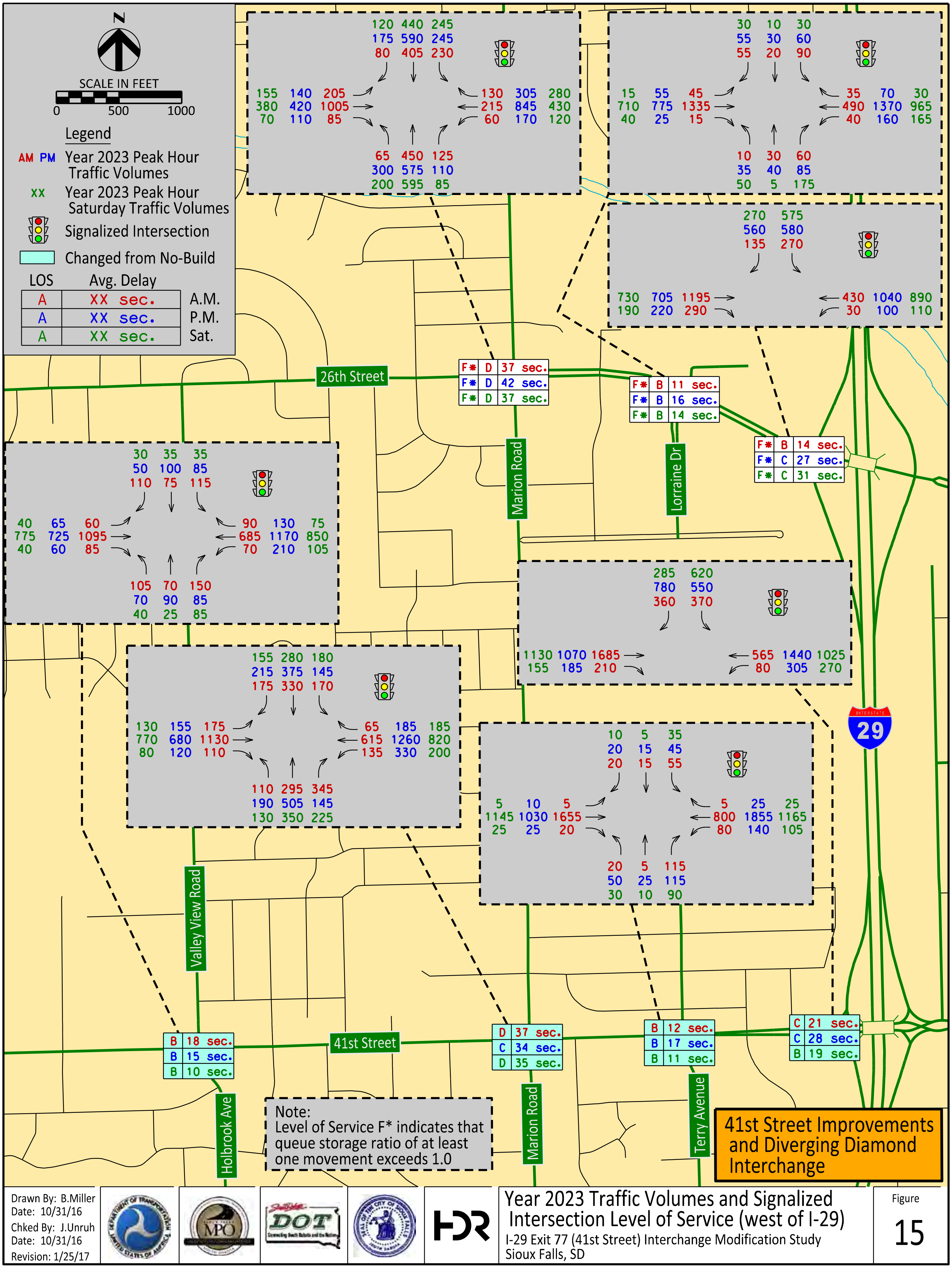


Drawn By: B.Miller
Date: 10/31/16
Chked By: J.Unruh
Date: 10/31/16
Revision: 1/25/17

Year 2023 Traffic Volumes and Signalized Intersection Level of Service (west of I-29)

I-29 Exit 77 (41st Street) Interchange Modification Study
Sioux Falls, SD

Figure
14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SCALE IN FEET
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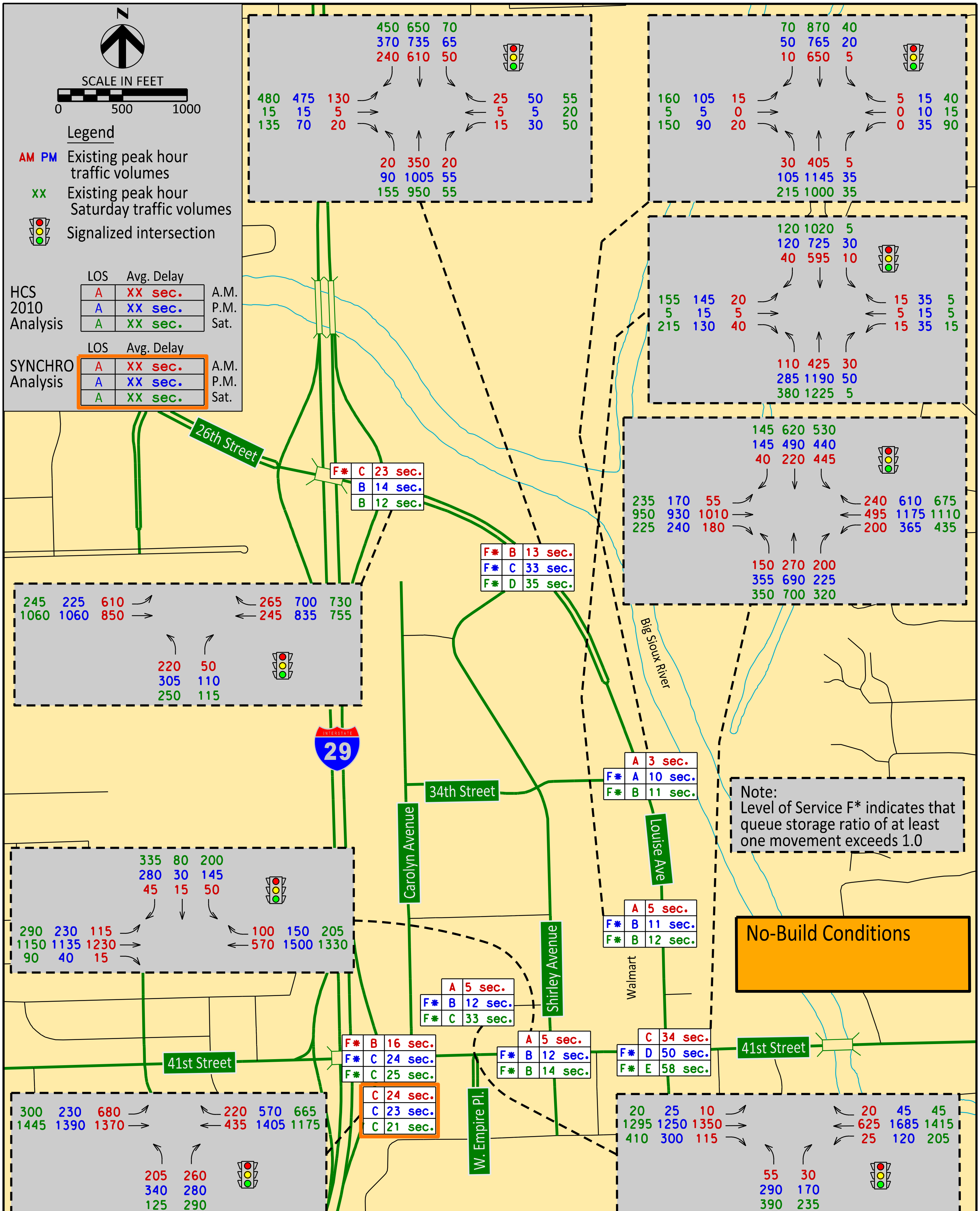
Legend
AM PM Year 2023 Peak Hour Traffic Volumes
XX Year 2023 Peak Hour Saturday Traffic Volumes
Signalized Intersection
Changed from No-Build
LOS Avg. Delay
A XX sec. A.M.
A XX sec. P.M.
A XX sec. Sat.
120 440 245
175 590 245
80 405 230
155 140 205
380 420 1005
70 110 85
130 305 280
215 845 430
60 170 120
65 450 125
300 575 110
200 595 85
30 10 30
55 30 60
55 20 90
15 55 45
710 775 1335
40 25 15
35 70 30
490 1370 965
40 160 165
10 30 60
35 40 85
50 5 175
270 575
560 580
135 270
730 705 1195
190 220 290
430 1040 890
30 100 110
26th Street
F* D 37 sec.
F* D 42 sec.
F* D 37 sec.
F* B 11 sec.
F* B 16 sec.
F* B 14 sec.
F* B 14 sec.
F* C 27 sec.
F* C 31 sec.
Marion Road
Lorraine Dr
30 35 35
50 100 85
110 75 115
40 65 60
775 725 1095
40 60 85
90 130 75
685 1170 850
70 210 105
105 70 150
70 90 85
40 25 85
285 620
780 550
360 370
1130 1070 1685
155 185 210
565 1440 1025
80 305 270
155 280 180
215 375 145
175 330 170
130 155 175
770 680 1130
80 120 110
65 185 185
615 1260 820
135 330 200
110 295 345
190 505 145
130 350 225
10 5 35
20 15 45
20 15 55
5 10 5
1145 1030 1655
25 25 20
5 25 25
800 1855 1165
80 140 105
20 5 115
50 25 115
30 10 90
29
Valley View Road
41st Street
B 18 sec.
B 15 sec.
B 10 sec.
D 37 sec.
C 34 sec.
D 35 sec.
B 12 sec.
B 17 sec.
B 11 sec.
C 21 sec.
C 28 sec.
B 19 sec.
Holbrook Ave
Marion Road
Terry Avenue
Note:
Level of Service F* indicates that queue storage ratio of at least one movement exceeds 1.0
41st Street Improvements and Diverging Diamond Interchange
Drawn By: B.Miller
Date: 10/31/16
Chked By: J.Unruh
Date: 10/31/16
Revision: 1/25/17
Year 2023 Traffic Volumes and Signalized Intersection Level of Service (west of I-29)
I-29 Exit 77 (41st Street) Interchange Modification Study
Sioux Falls, SD
Figure
15

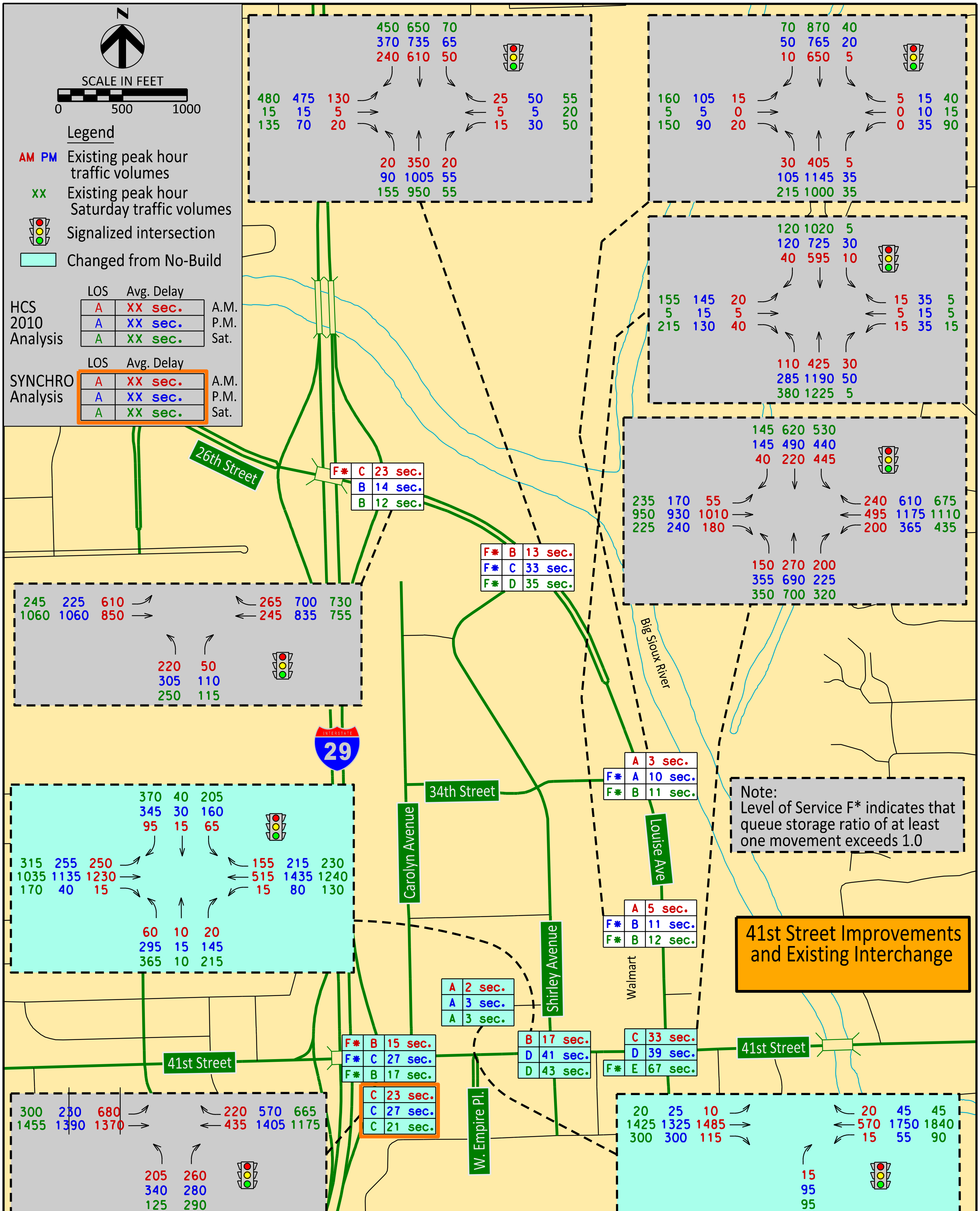


Drawn By: B.Miller
Date: 10/31/16
Chked By: J.Unruh
Date: 10/31/16
Revision: 12/15/16

Year 2023 Traffic Volumes and Signalized Intersection Level of Service (east of I-29)

I-29 Exit 77 (41st Street) Interchange Modification Study
Sioux Falls, SD

Figure
16

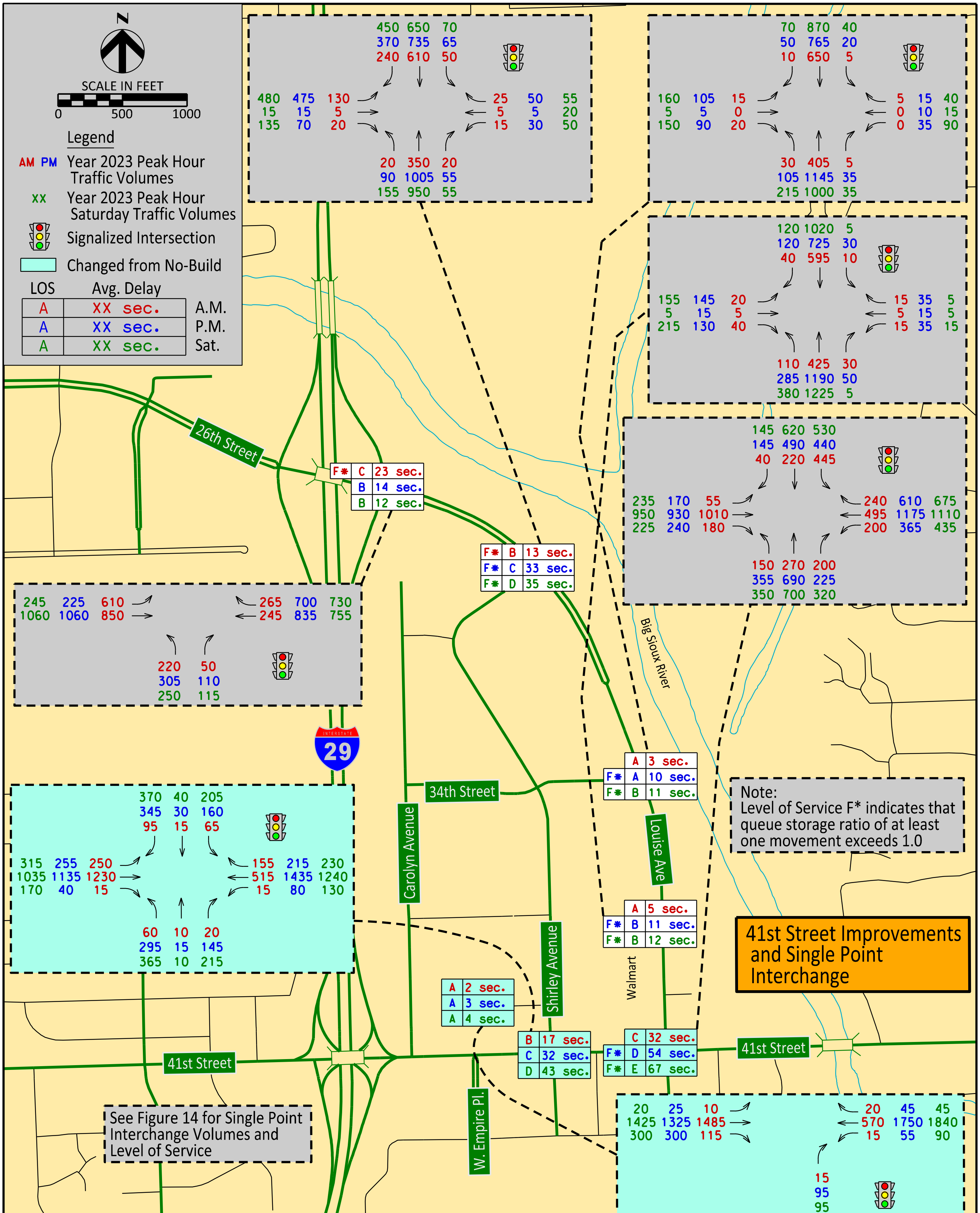


Drawn By: B.Miller
Date: 10/31/16
Chked By: J.Unruh
Date: 10/31/16
Revision: 2/7/17

Year 2023 Traffic Volumes and Signalized Intersection Level of Service (east of I-29)

I-29 Exit 77 (41st Street) Interchange Modification Study
Sioux Falls, SD

Figure
17



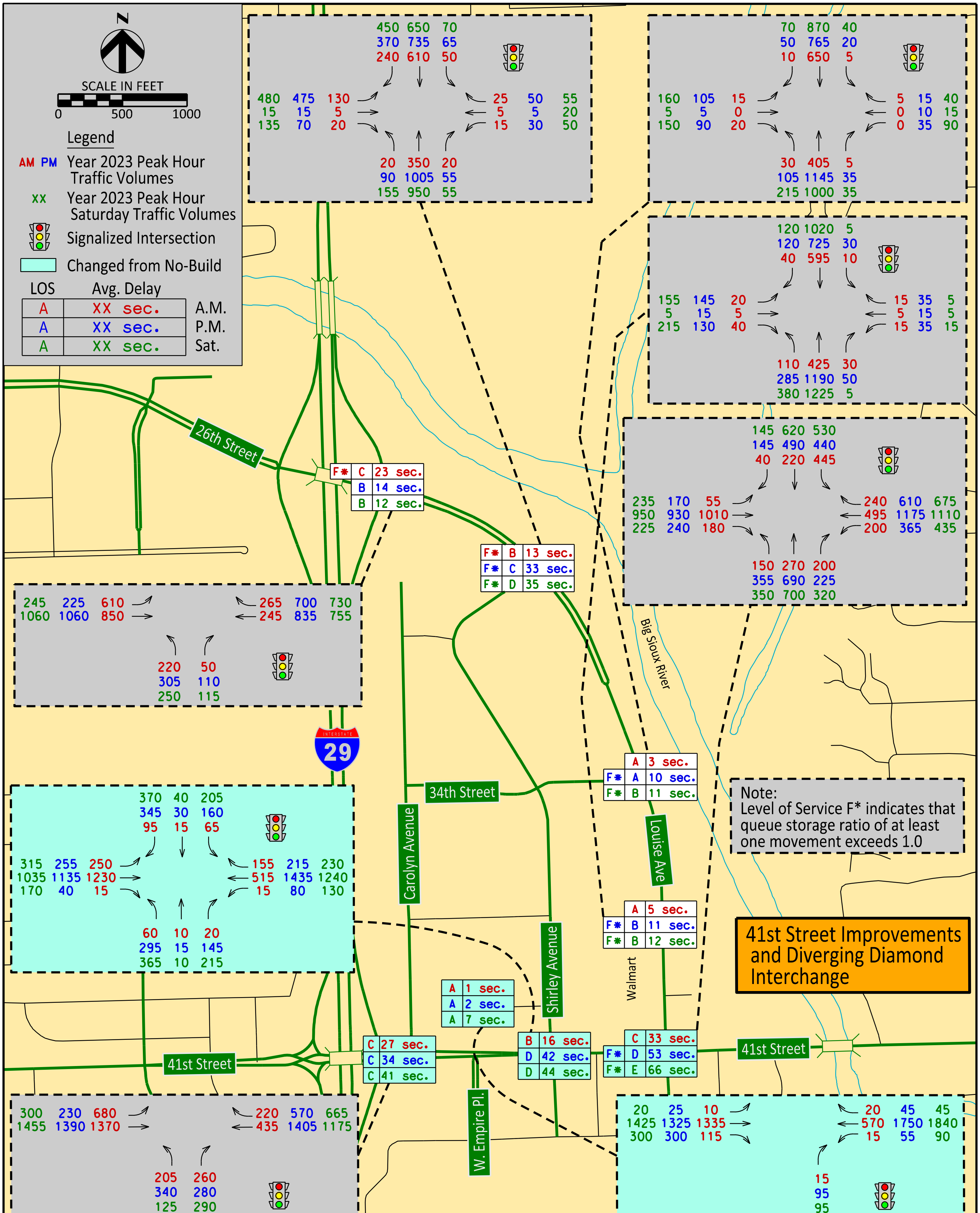
Drawn By: B.Miller
Date: 10/31/16
Chked By: J.Unruh
Date: 10/31/16
Revision: 2/7/17

HDR

Year 2023 Traffic Volumes and Signalized Intersection Level of Service (east of I-29)

I-29 Exit 77 (41st Street) Interchange Modification Study
Sioux Falls, SD

Figure
18



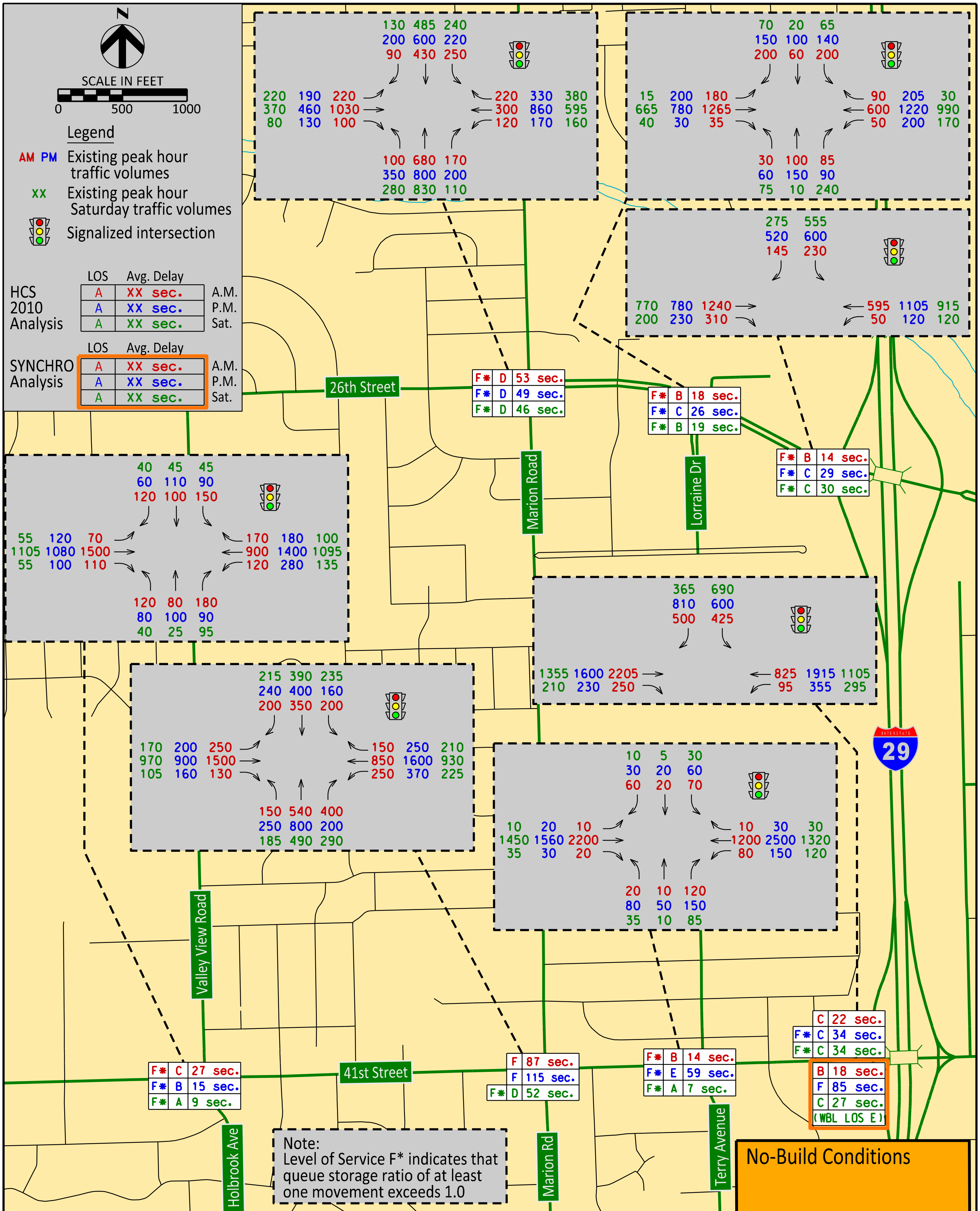
Drawn By: B.Miller
Date: 10/31/16
Chked By: J.Unruh
Date: 10/31/16
Revision: 2/7/17

HDR

Year 2023 Traffic Volumes and Signalized Intersection Level of Service (east of I-29)

I-29 Exit 77 (41st Street) Interchange Modification Study
Sioux Falls, SD

Figure
19

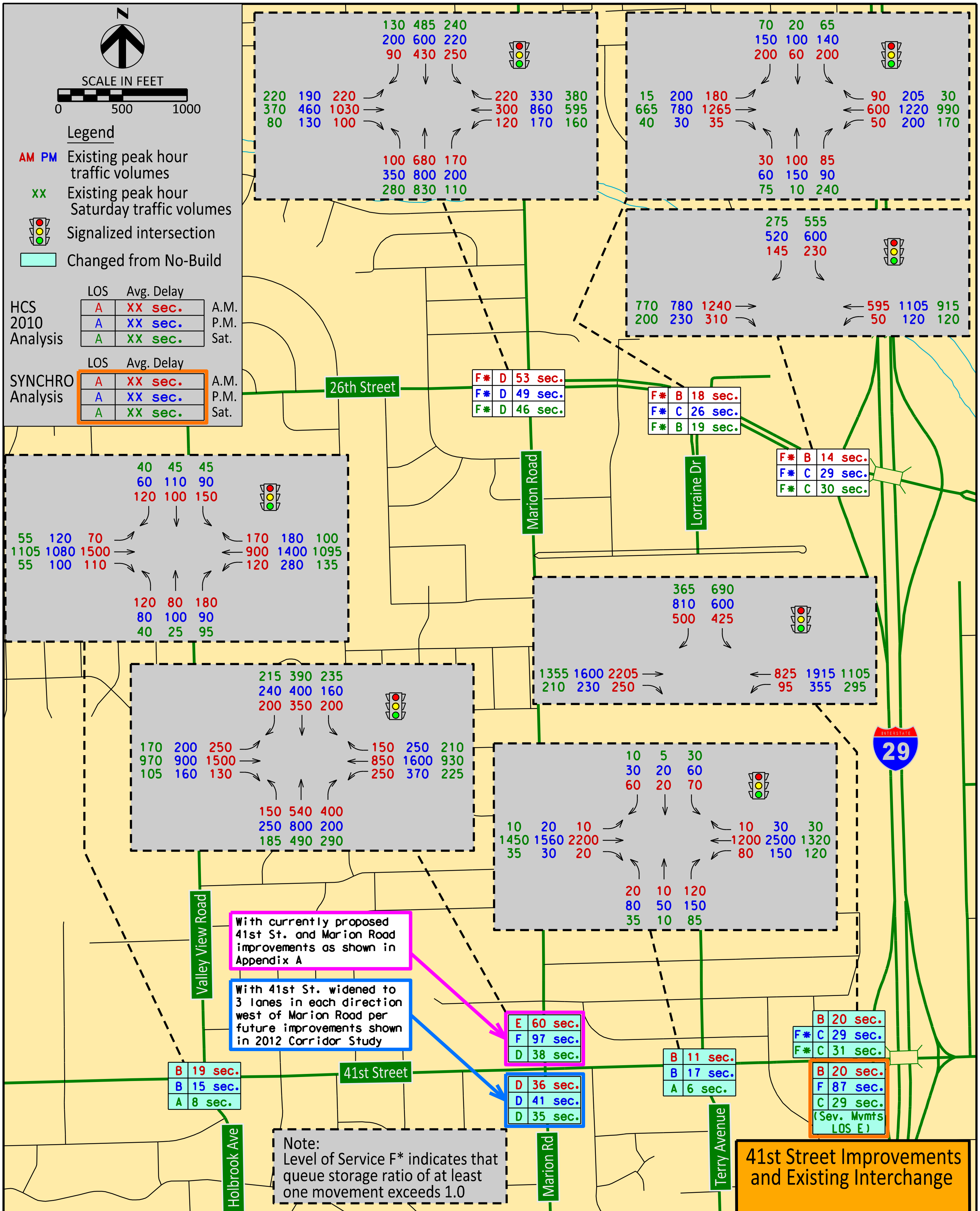


Drawn By: B.Miller
Date: 10/31/16
Chked By: J.Unruh
Date: 10/31/16
Revision: 12/15/16

Year 2045 Traffic Volumes and Signalized Intersection Level of Service (west of I-29)

I-29 Exit 77 (41st Street) Interchange Modification Study
Sioux Falls, SD

Figure
20

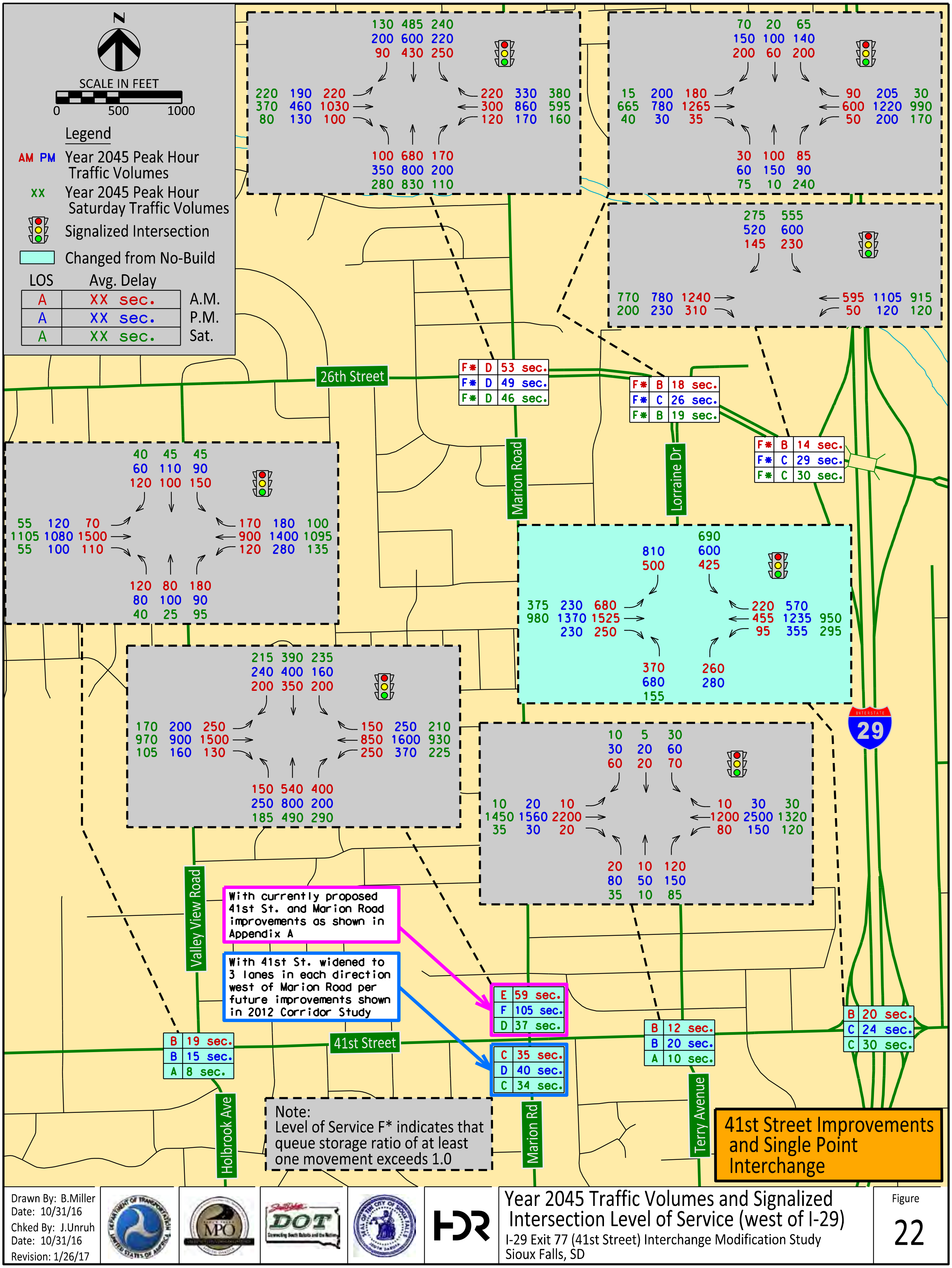


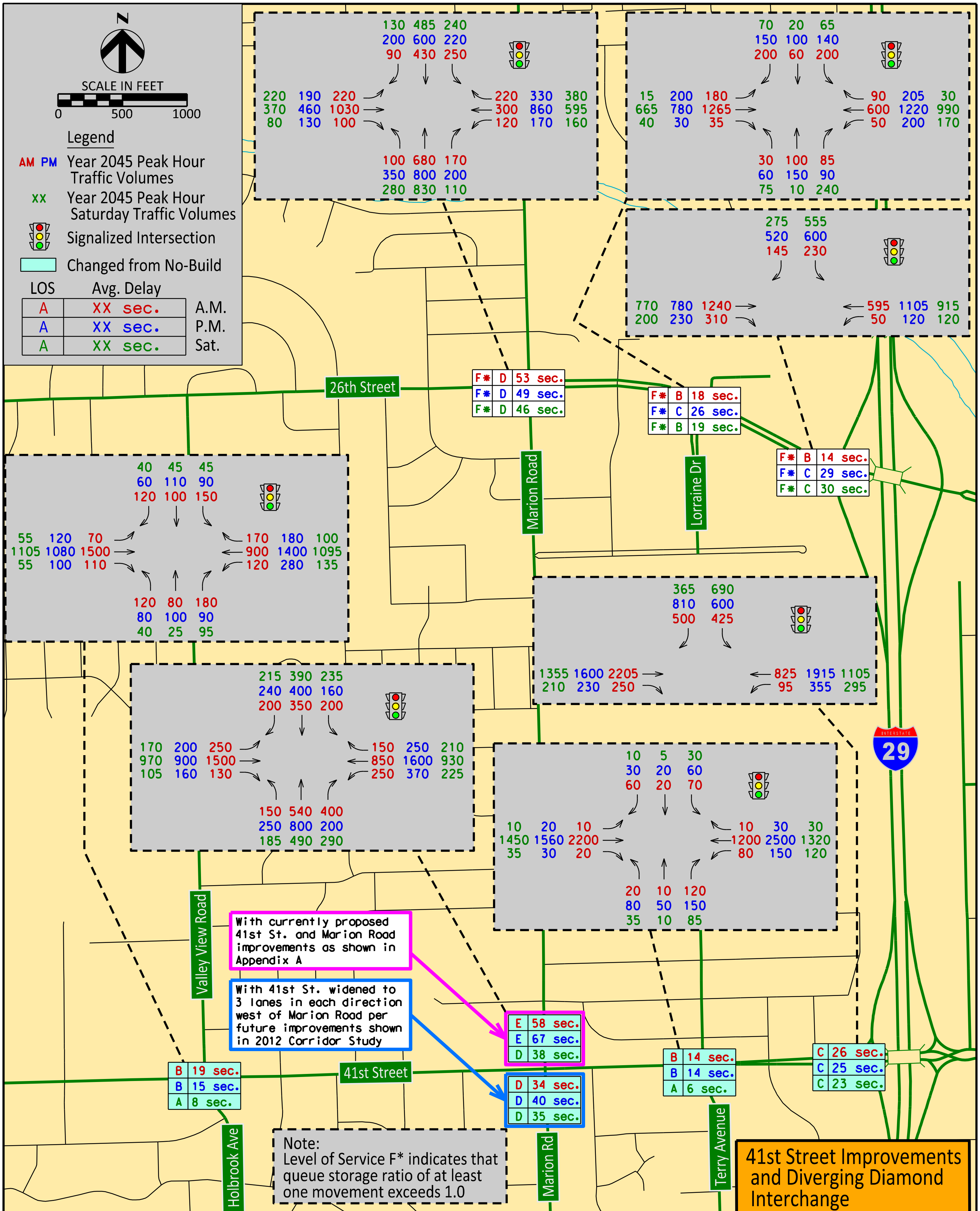
Drawn By: B.Miller
Date: 10/31/16
Chked By: J.Unruh
Date: 10/31/16
Revision: 1/26/17

Year 2045 Traffic Volumes and Signalized Intersection Level of Service (west of I-29)

I-29 Exit 77 (41st Street) Interchange Modification Study
Sioux Falls, SD

Figure 21


N
SCALE IN FEET
0 500 1000
Legend
AM PM Year 2045 Peak Hour Traffic Volumes
XX Year 2045 Peak Hour Saturday Traffic Volumes
Signalized Intersection
Changed from No-Build
LOS Avg. Delay
A XX sec. A.M.
A XX sec. P.M.
A XX sec. Sat.
26th Street
F* D 53 sec.
F* D 49 sec.
F* D 46 sec.
F* B 18 sec.
F* C 26 sec.
F* B 19 sec.
F* B 14 sec.
F* C 29 sec.
F* C 30 sec.
Marion Road
Lorraine Dr
Valley View Road
With currently proposed 41st St. and Marion Road improvements as shown in Appendix A
With 41st St. widened to 3 lanes in each direction west of Marion Road per future improvements shown in 2012 Corridor Study
E 59 sec.
F 105 sec.
D 37 sec.
C 35 sec.
D 40 sec.
C 34 sec.
B 19 sec.
B 15 sec.
A 8 sec.
41st Street
B 12 sec.
B 20 sec.
A 10 sec.
B 20 sec.
C 24 sec.
C 30 sec.
Holbrook Ave
Marion Rd
Terry Avenue
29
Note:
Level of Service F* indicates that queue storage ratio of at least one movement exceeds 1.0
41st Street Improvements and Single Point Interchange
Drawn By: B.Miller
Date: 10/31/16
Chked By: J.Unruh
Date: 10/31/16
Revision: 1/26/17
Year 2045 Traffic Volumes and Signalized Intersection Level of Service (west of I-29)
I-29 Exit 77 (41st Street) Interchange Modification Study
Sioux Falls, SD
Figure
22

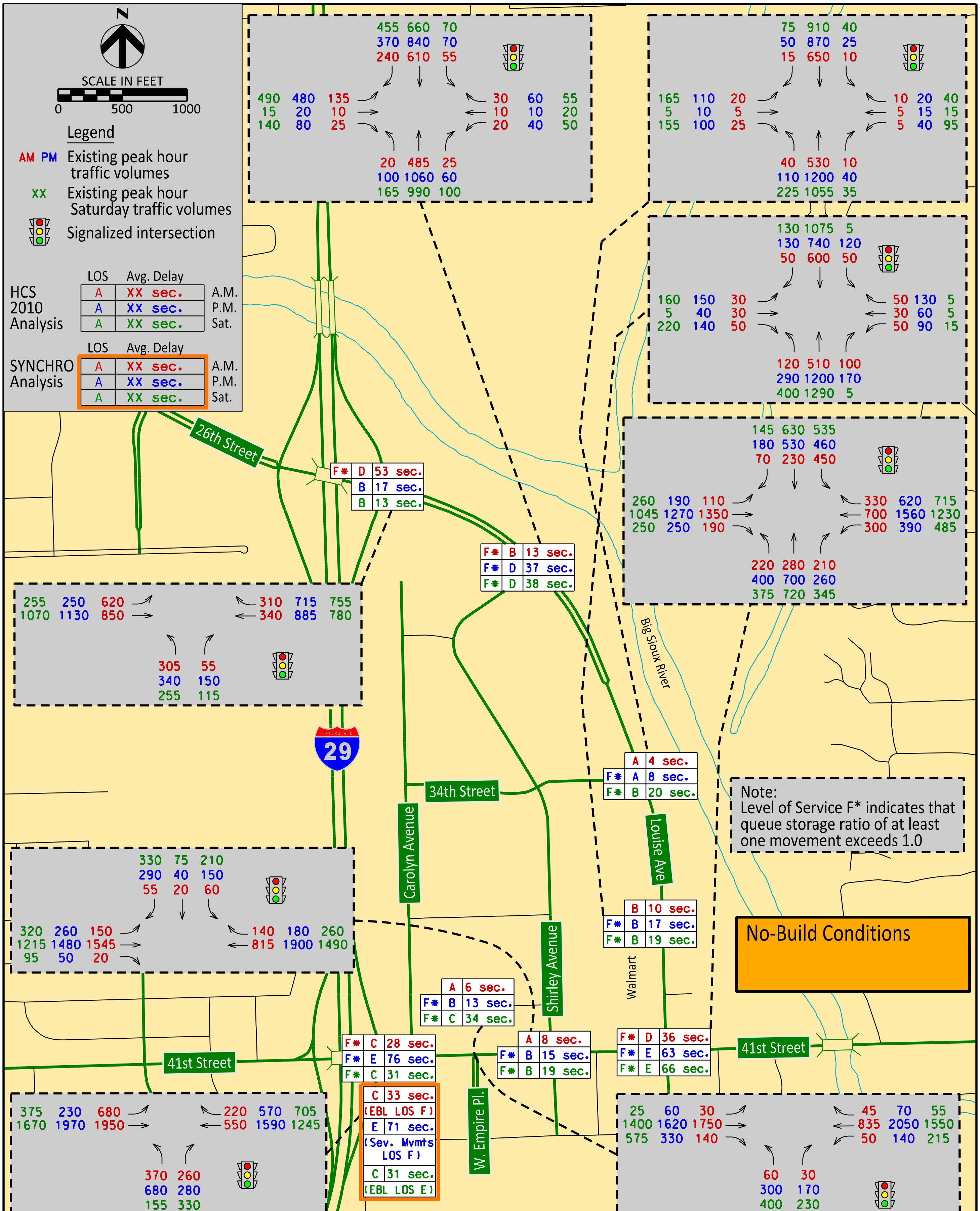


Drawn By: B.Miller
Date: 10/31/16
Chked By: J.Unruh
Date: 10/31/16
Revision: 1/26/17

Year 2045 Traffic Volumes and Signalized Intersection Level of Service (west of I-29)

I-29 Exit 77 (41st Street) Interchange Modification Study
Sioux Falls, SD

Figure
23



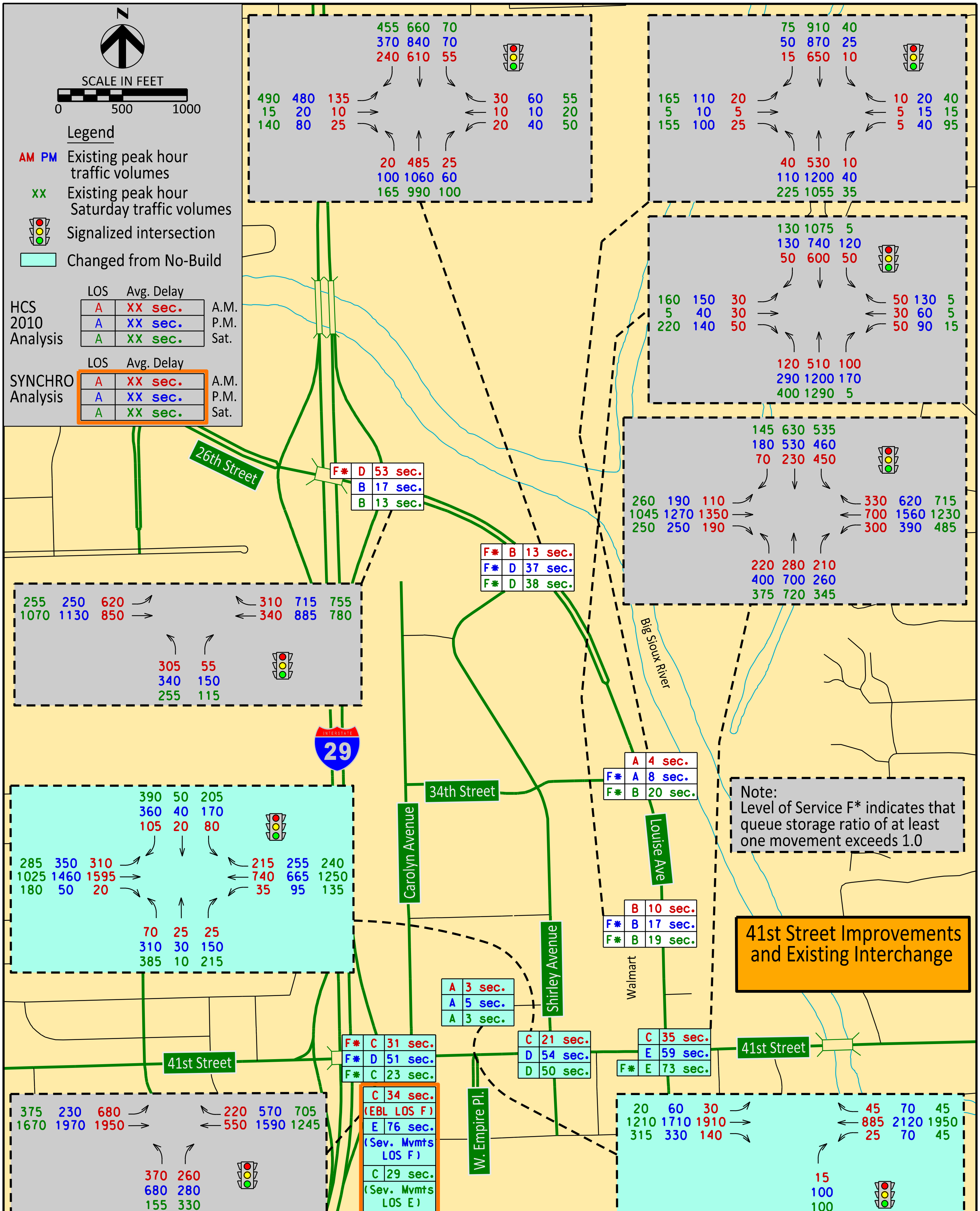
Drawn By: B.Miller
Date: 10/31/16
Chked By: J.Unruh
Date: 10/31/16
Revision: 12/15/16

FDR

Year 2045 Traffic Volumes and Signalized Intersection Level of Service (east of I-29)

I-29 Exit 77 (41st Street) Interchange Modification Study
Sioux Falls, SD

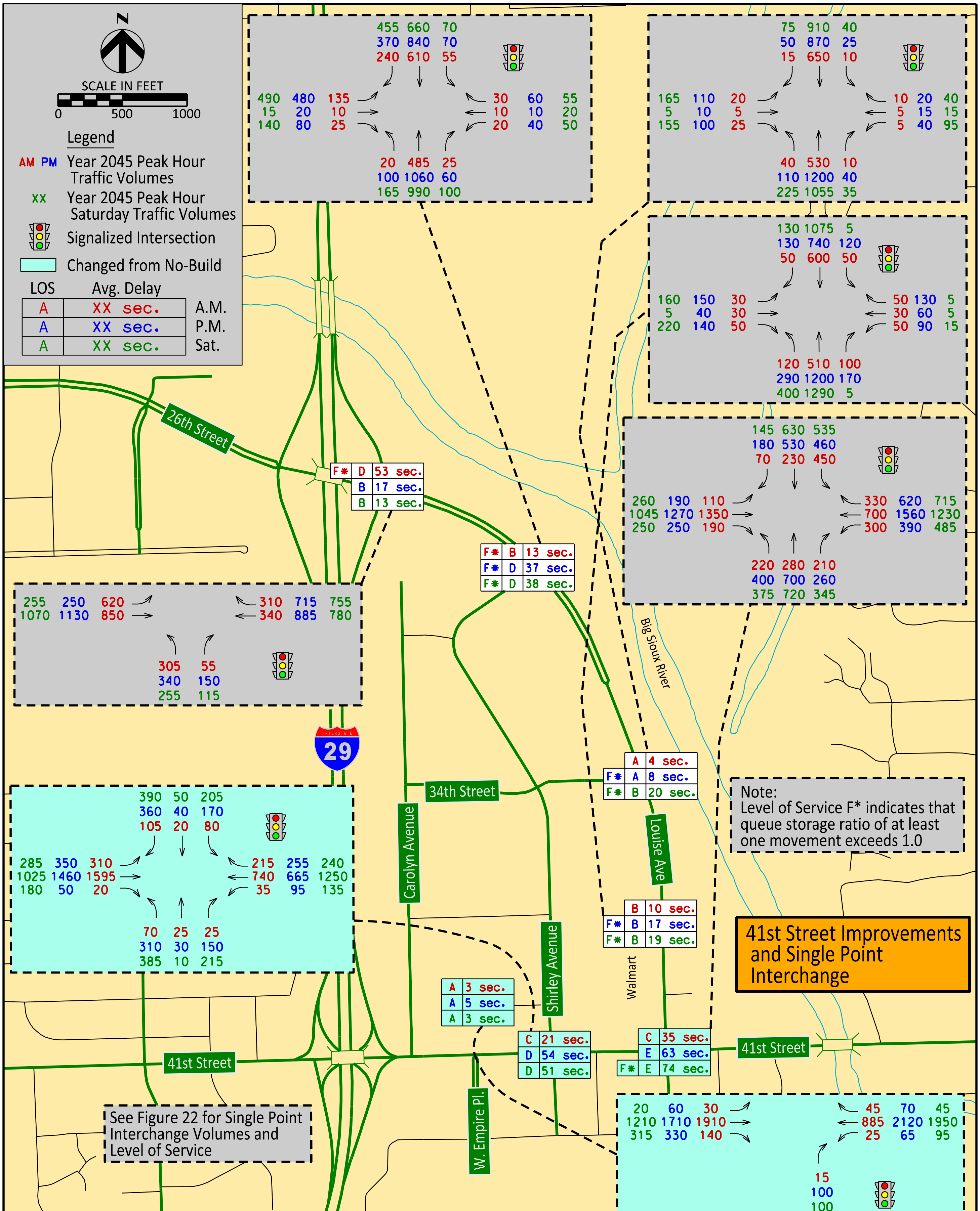
Figure
24



Drawn By: B.Miller
Date: 10/31/16
Chked By: J.Unruh
Date: 10/31/16
Revision: 2/7/17

Year 2045 Traffic Volumes and Signalized Intersection Level of Service (east of I-29)
I-29 Exit 77 (41st Street) Interchange Modification Study
Sioux Falls, SD

Figure 25

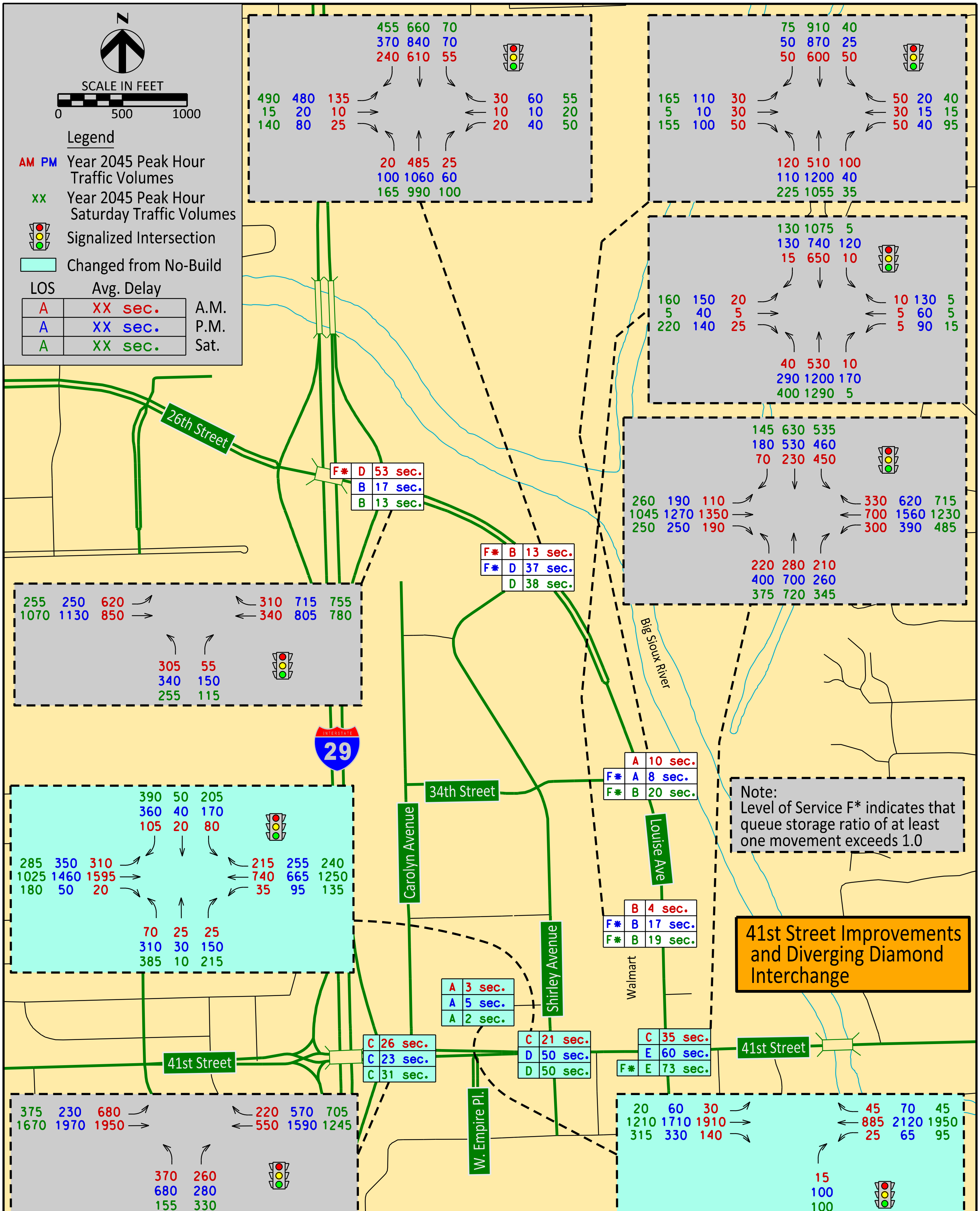


Drawn By: B.Miller
Date: 10/31/16
Chked By: J.Unruh
Date: 10/31/16
Revision: 2/7/17

Year 2045 Traffic Volumes and Signalized Intersection Level of Service (east of I-29)

I-29 Exit 77 (41st Street) Interchange Modification Study
Sioux Falls, SD

Figure 26

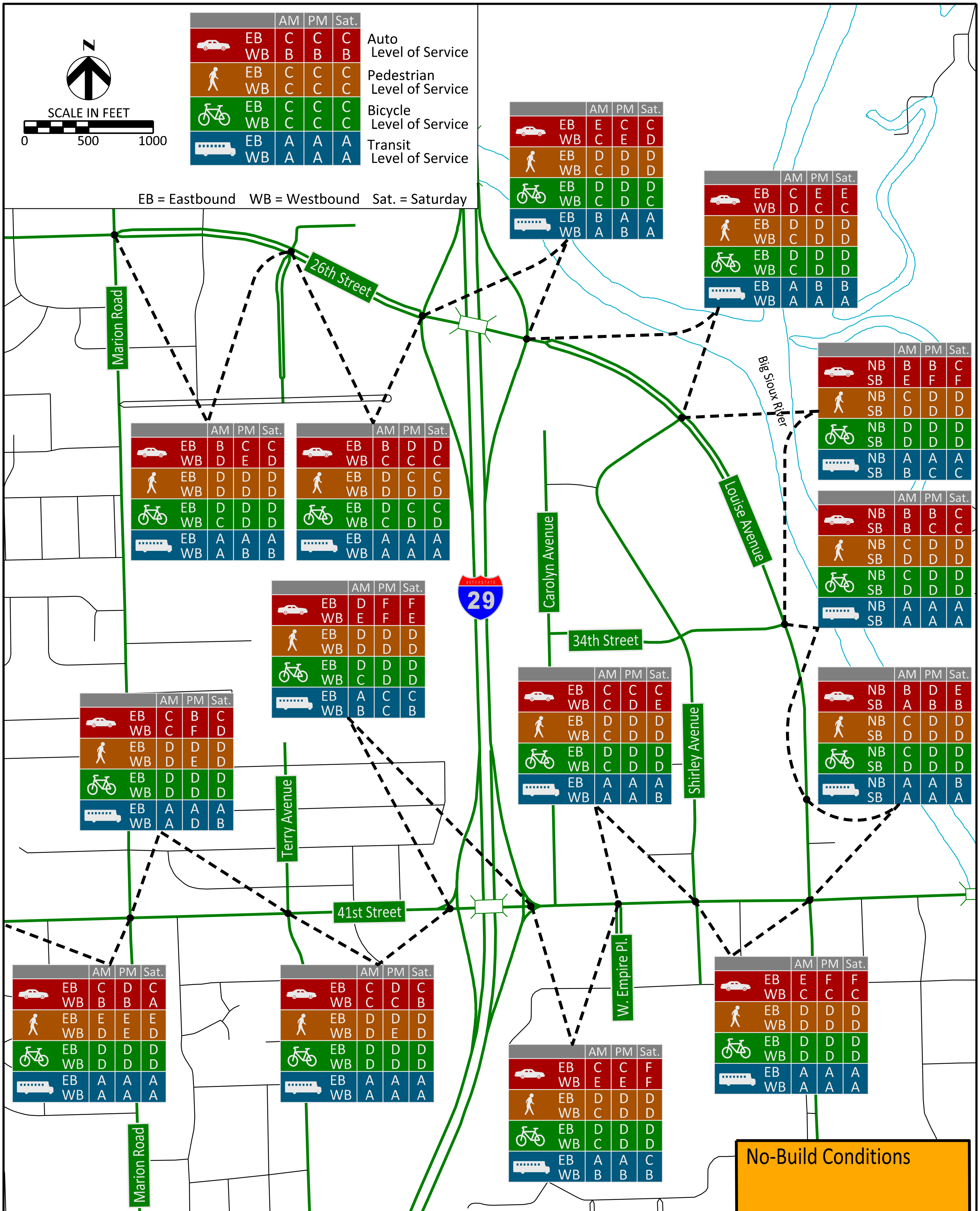


Drawn By: B.Miller
Date: 10/31/16
Chked By: J.Unruh
Date: 10/31/16
Revision: 2/7/17

Year 2045 Traffic Volumes and Signalized Intersection Level of Service (east of I-29)

I-29 Exit 77 (41st Street) Interchange Modification Study
Sioux Falls, SD

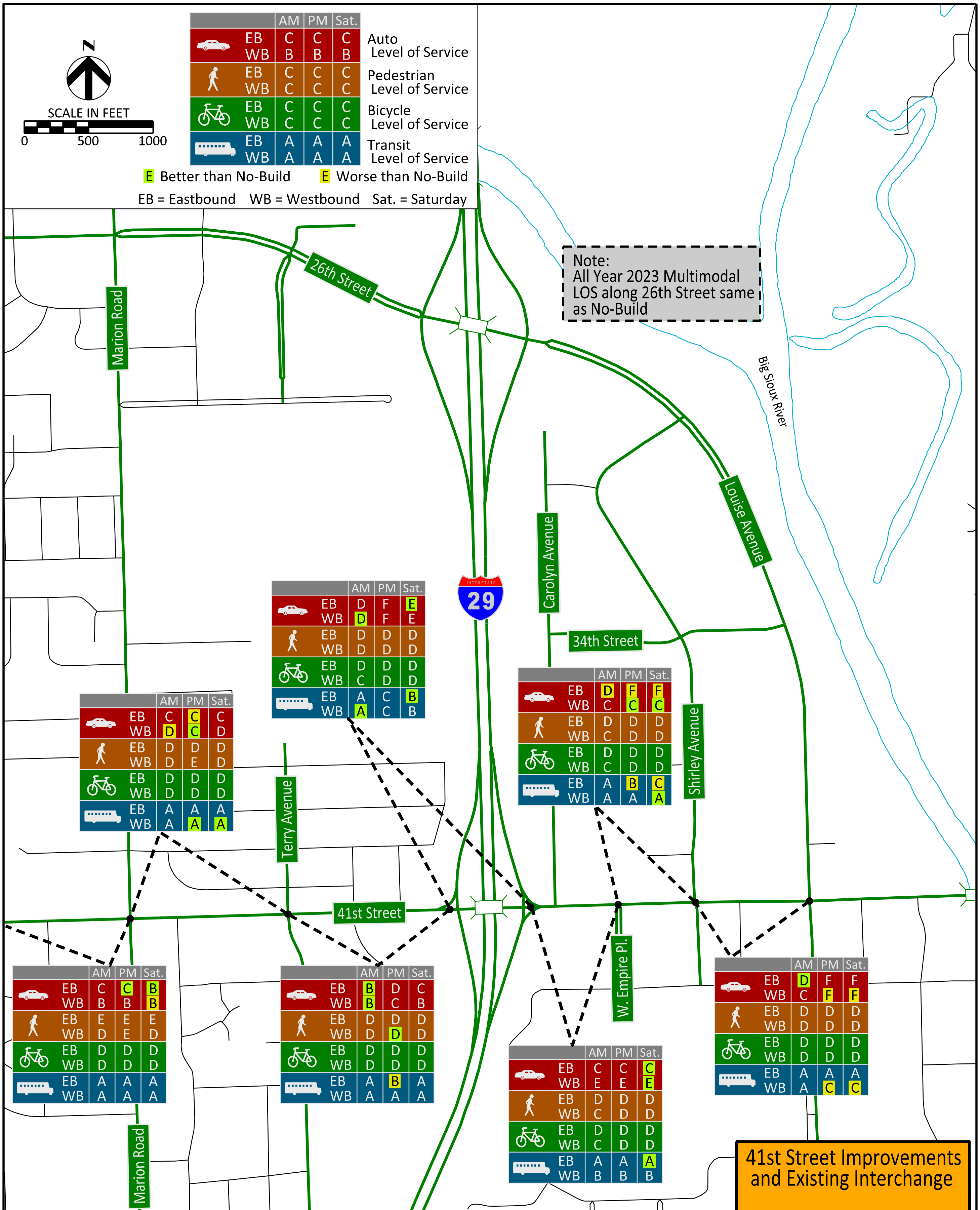
Figure 27



Drawn By: B.Miller
Date: 10/31/16
Chked By: J.Unruh
Date: 10/31/16
Revision:

Year 2023 Multimodal Peak Hour Level of Service
I-29 Exit 77 (41st Street) Interchange Modification Study
Sioux Falls, SD

Figure 28

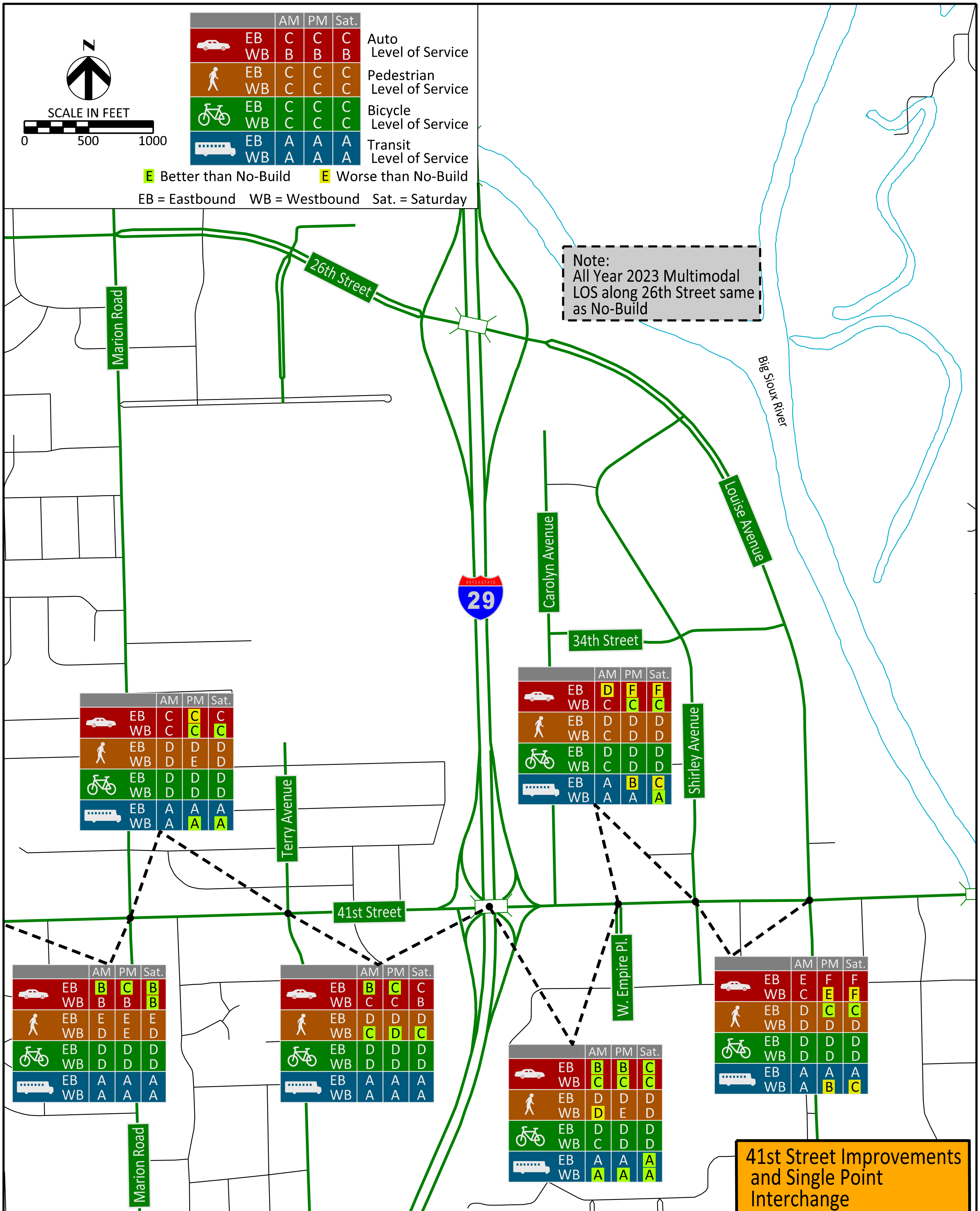


Drawn By: B.Miller
Date: 10/31/16
Chked By: J.Unruh
Date: 10/31/16
Revision: 1/20/17

Year 2023 Multimodal Peak Hour Level of Service

I-29 Exit 77 (41st Street) Interchange Modification Study
Sioux Falls, SD

Figure 29



Legend

		AM	PM	Sat.
Auto	EB	C	C	C
	WB	B	B	B
Pedestrian	EB	C	C	C
	WB	C	C	C
Bicycle	EB	C	C	C
	WB	C	C	C
Transit	EB	A	A	A
	WB	A	A	A

		AM	PM	Sat.
Auto	EB	C	C	C
	WB	C	C	C
Pedestrian	EB	D	D	D
	WB	D	E	D
Bicycle	EB	D	D	D
	WB	D	D	D
Transit	EB	A	A	A
	WB	A	A	A

		AM	PM	Sat.
Auto	EB	D	F	F
	WB	C	C	C
Pedestrian	EB	D	D	D
	WB	C	D	D
Bicycle	EB	D	D	D
	WB	C	D	D
Transit	EB	A	B	C
	WB	A	A	A

		AM	PM	Sat.
Auto	EB	B	C	B
	WB	B	B	B
Pedestrian	EB	E	E	E
	WB	D	E	D
Bicycle	EB	D	D	D
	WB	D	D	D
Transit	EB	A	A	A
	WB	A	A	A

		AM	PM	Sat.
Auto	EB	B	C	C
	WB	C	C	B
Pedestrian	EB	D	D	D
	WB	C	D	C
Bicycle	EB	D	D	D
	WB	D	D	D
Transit	EB	A	A	A
	WB	A	A	A

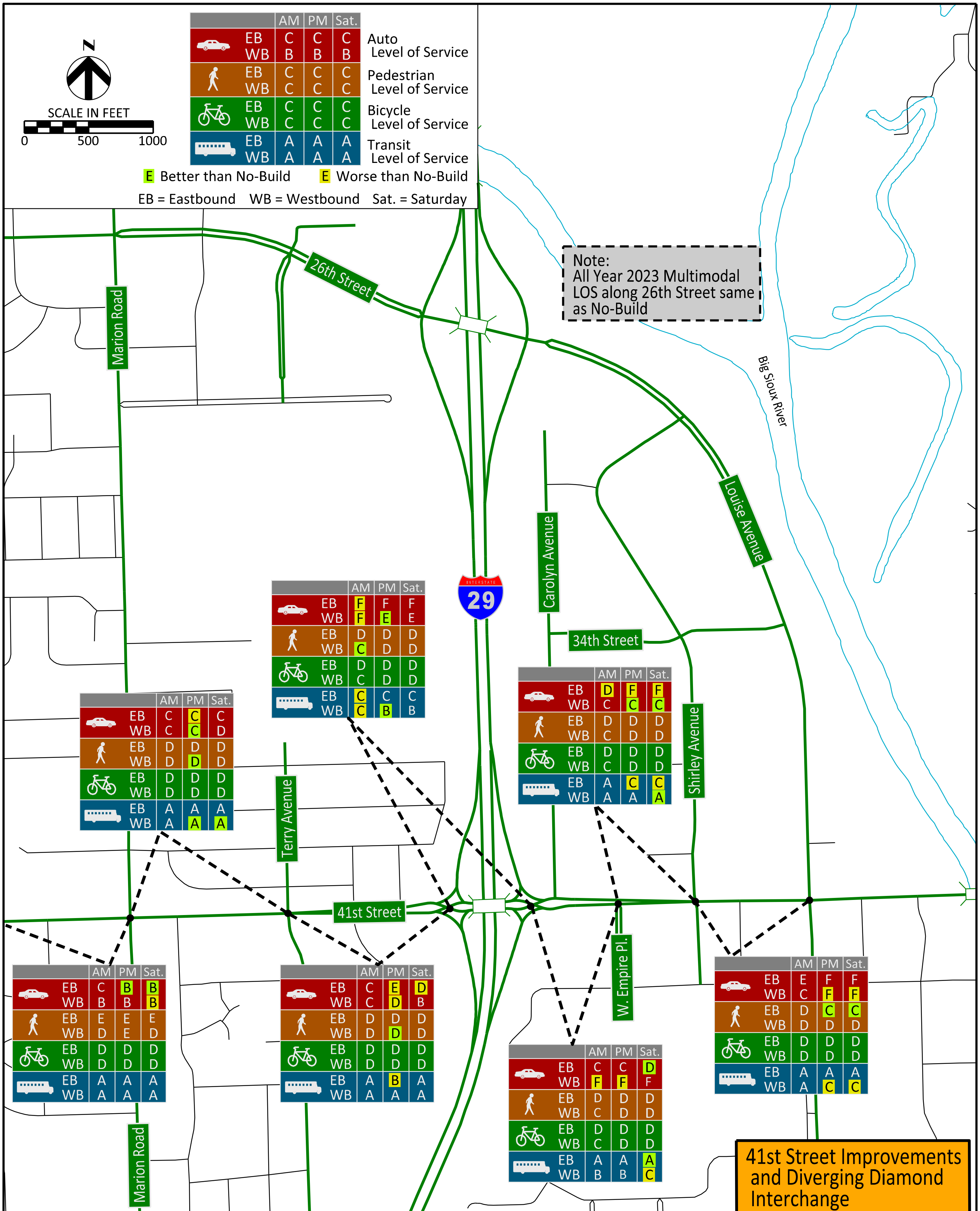
		AM	PM	Sat.
Auto	EB	B	B	C
	WB	C	C	C
Pedestrian	EB	D	D	D
	WB	D	E	D
Bicycle	EB	D	D	D
	WB	C	D	D
Transit	EB	A	A	A
	WB	A	A	A

		AM	PM	Sat.
Auto	EB	E	F	F
	WB	C	E	F
Pedestrian	EB	D	C	C
	WB	D	D	D
Bicycle	EB	D	D	D
	WB	D	D	D
Transit	EB	A	A	A
	WB	A	B	C

Drawn By: B.Miller
Date: 10/31/16
Chked By: J.Unruh
Date: 10/31/16
Revision: 1/20/17

Year 2023 Multimodal Peak Hour Level of Service
I-29 Exit 77 (41st Street) Interchange Modification Study
Sioux Falls, SD

Figure 30



		AM	PM	Sat.
Auto	EB	C	C	C
	WB	B	B	B
Pedestrian	EB	C	C	C
	WB	C	C	C
Bicycle	EB	C	C	C
	WB	C	C	C
Transit	EB	A	A	A
	WB	A	A	A

		AM	PM	Sat.
Auto	EB	F	F	F
	WB	F	E	E
Pedestrian	EB	D	D	D
	WB	C	D	D
Bicycle	EB	D	D	D
	WB	C	D	D
Transit	EB	C	C	C
	WB	C	B	B

		AM	PM	Sat.
Auto	EB	D	F	F
	WB	C	C	C
Pedestrian	EB	D	D	D
	WB	C	D	D
Bicycle	EB	D	D	D
	WB	C	D	D
Transit	EB	A	C	C
	WB	A	A	A

		AM	PM	Sat.
Auto	EB	C	C	C
	WB	C	C	D
Pedestrian	EB	D	D	D
	WB	D	D	D
Bicycle	EB	D	D	D
	WB	D	D	D
Transit	EB	A	A	A
	WB	A	A	A

		AM	PM	Sat.
Auto	EB	C	B	B
	WB	B	B	B
Pedestrian	EB	E	E	E
	WB	D	E	D
Bicycle	EB	D	D	D
	WB	D	D	D
Transit	EB	A	A	A
	WB	A	A	A

		AM	PM	Sat.
Auto	EB	C	E	D
	WB	C	D	B
Pedestrian	EB	D	D	D
	WB	D	D	D
Bicycle	EB	D	D	D
	WB	D	D	D
Transit	EB	A	B	A
	WB	A	A	A

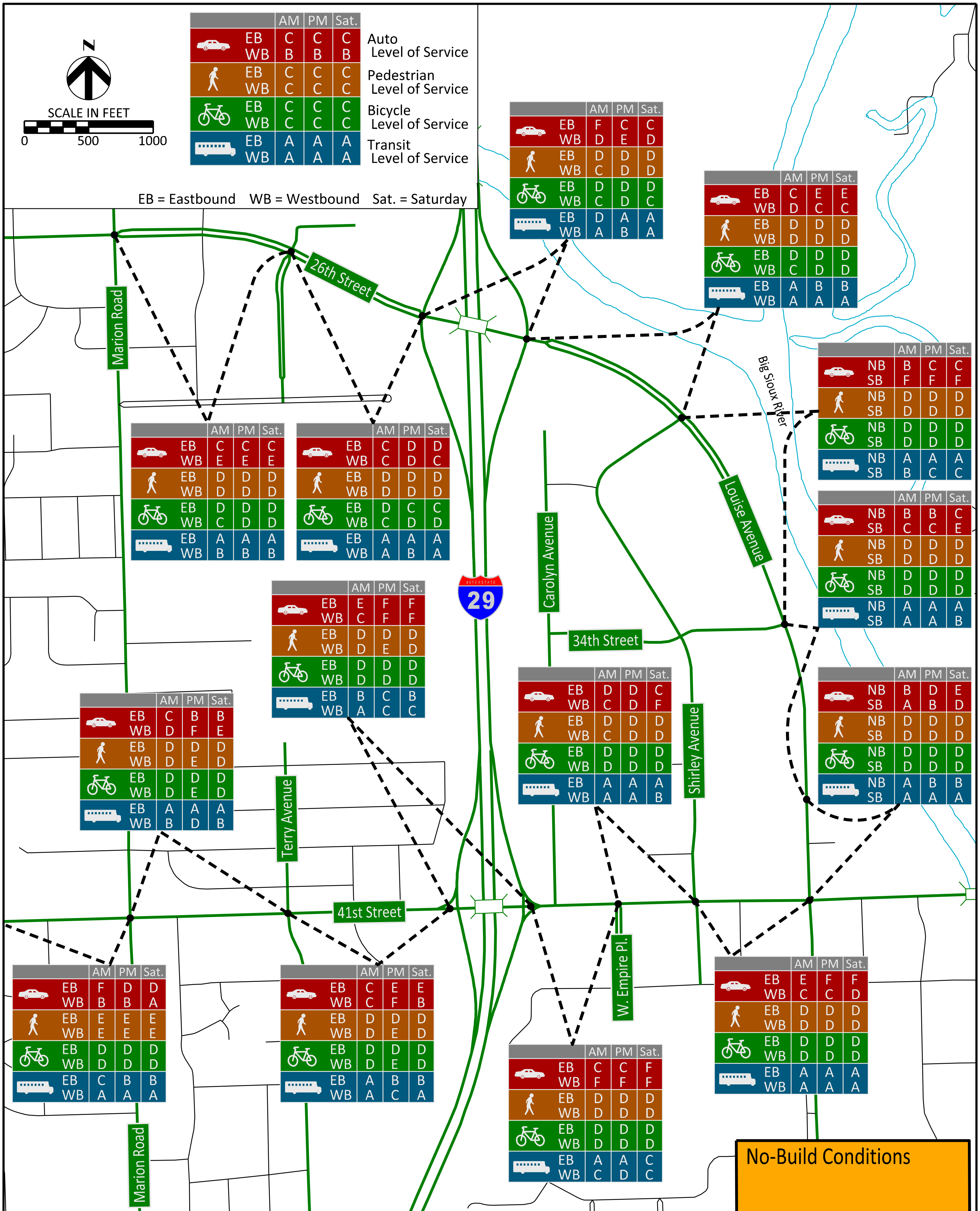
		AM	PM	Sat.
Auto	EB	C	C	D
	WB	F	F	F
Pedestrian	EB	D	D	D
	WB	C	D	D
Bicycle	EB	D	D	D
	WB	C	D	D
Transit	EB	A	A	A
	WB	B	B	C

		AM	PM	Sat.
Auto	EB	E	F	F
	WB	C	F	F
Pedestrian	EB	D	C	C
	WB	D	D	D
Bicycle	EB	D	D	D
	WB	D	D	D
Transit	EB	A	A	A
	WB	A	C	C

Drawn By: B.Miller
Date: 10/31/16
Chked By: J.Unruh
Date: 10/31/16
Revision: 1/20/17

Year 2023 Multimodal Peak Hour Level of Service
I-29 Exit 77 (41st Street) Interchange Modification Study
Sioux Falls, SD

Figure 31

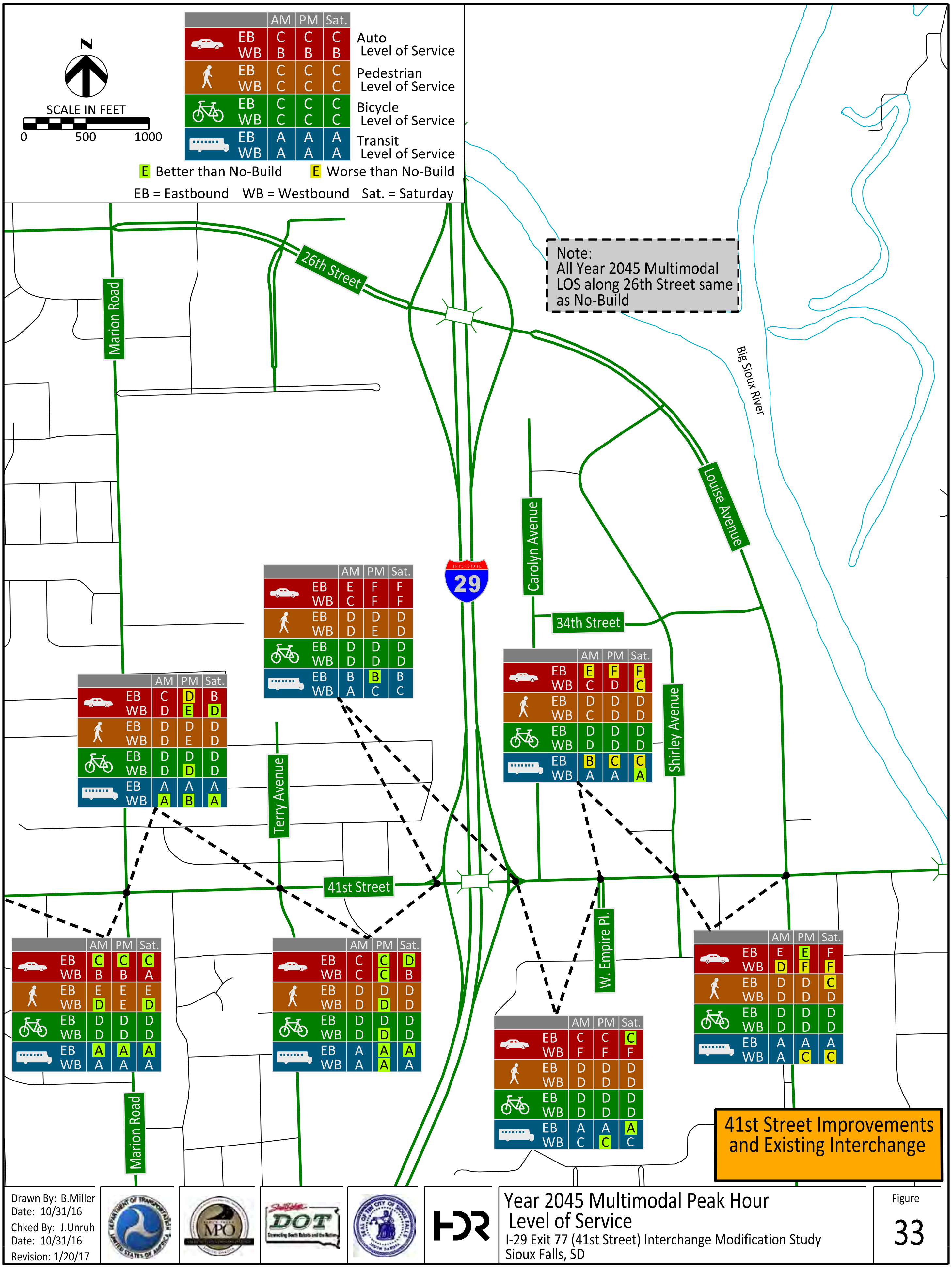


Drawn By: B.Miller
Date: 10/31/16
Chked By: J.Unruh
Date: 10/31/16
Revision: 12/7/16

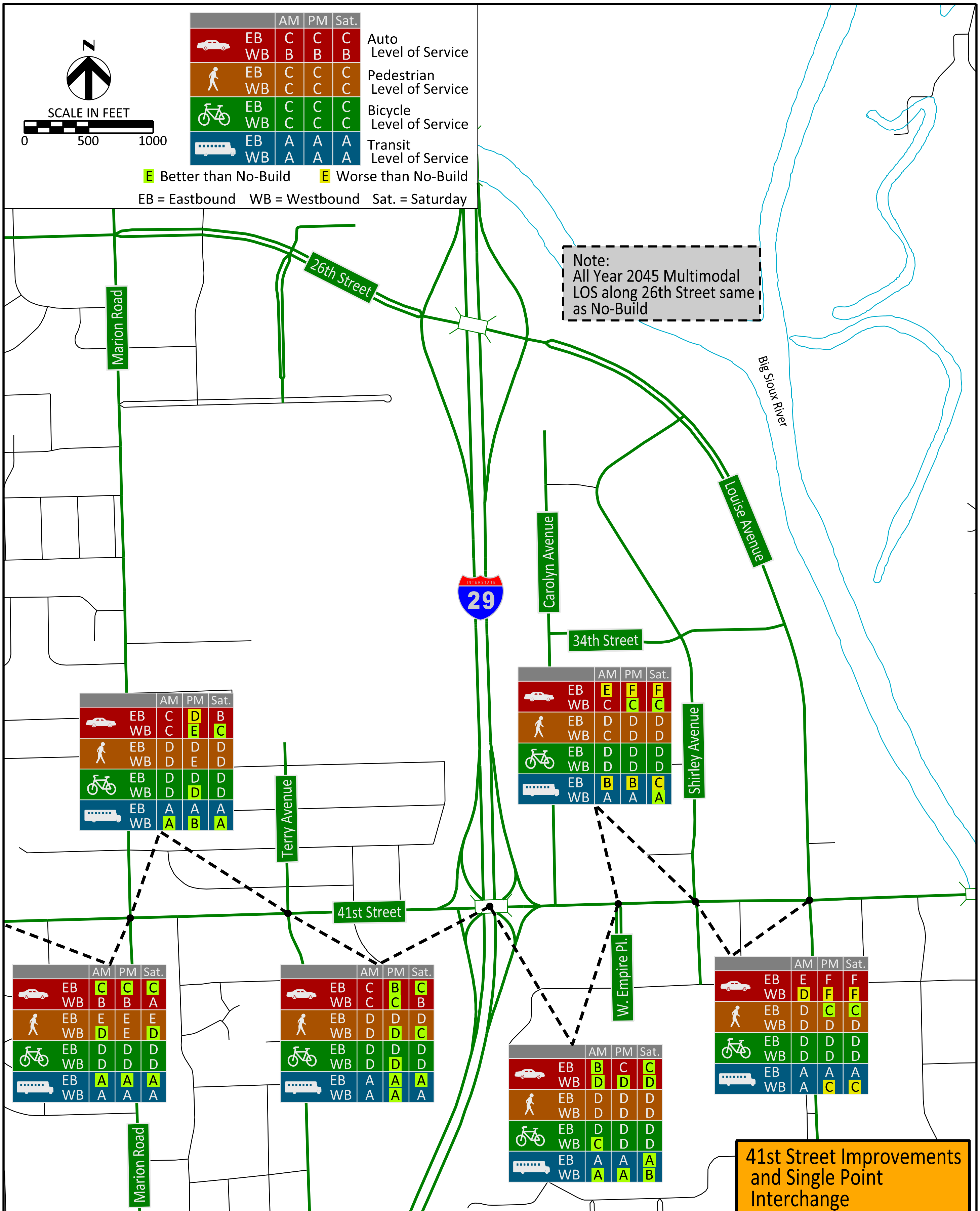
Year 2045 Multimodal Peak Hour Level of Service

I-29 Exit 77 (41st Street) Interchange Modification Study
Sioux Falls, SD

Figure
32



N
SCALE IN FEET
0 500 1000
AM PM Sat.
EB C C C
WB B B B
Auto Level of Service
EB C C C
WB C C C
Pedestrian Level of Service
EB C C C
WB C C C
Bicycle Level of Service
EB A A A
WB A A A
Transit Level of Service
E Better than No-Build
E Worse than No-Build
EB = Eastbound WB = Westbound Sat. = Saturday
26th Street
Note: All Year 2045 Multimodal LOS along 26th Street same as No-Build
Big Sioux River
Marion Road
Louise Avenue
Carolyn Avenue
INTERSTATE 29
34th Street
Shirley Avenue
Terry Avenue
41st Street
W. Empire Pl.
AM PM Sat.
EB E F F
WB C F F
EB D D D
WB D E D
EB D D D
WB D D D
EB B B B
WB A C C
AM PM Sat.
EB C D B
WB D E D
EB D D D
WB D E D
EB D D D
WB D D D
EB A A A
WB A B A
AM PM Sat.
EB E F F
WB C D C
EB D D D
WB C D D
EB D D D
WB D D D
EB B C C
WB A A A
AM PM Sat.
EB C C C
WB B B A
EB E E E
WB D E D
EB D D D
WB D D D
EB A A A
WB A A A
AM PM Sat.
EB C C D
WB C C B
EB D D D
WB D D D
EB D D D
WB D D D
EB A A A
WB A A A
AM PM Sat.
EB C C C
WB F F F
EB D D D
WB D D D
EB D D D
WB D D D
EB A A A
WB C C C
AM PM Sat.
EB E E F
WB D F F
EB D D C
WB D D D
EB D D D
WB D D D
EB A A A
WB A C C
41st Street Improvements and Existing Interchange
Drawn By: B.Miller
Date: 10/31/16
Chked By: J.Unruh
Date: 10/31/16
Revision: 1/20/17
MPO
DOT
HDR
Year 2045 Multimodal Peak Hour Level of Service
I-29 Exit 77 (41st Street) Interchange Modification Study
Sioux Falls, SD
Figure
33

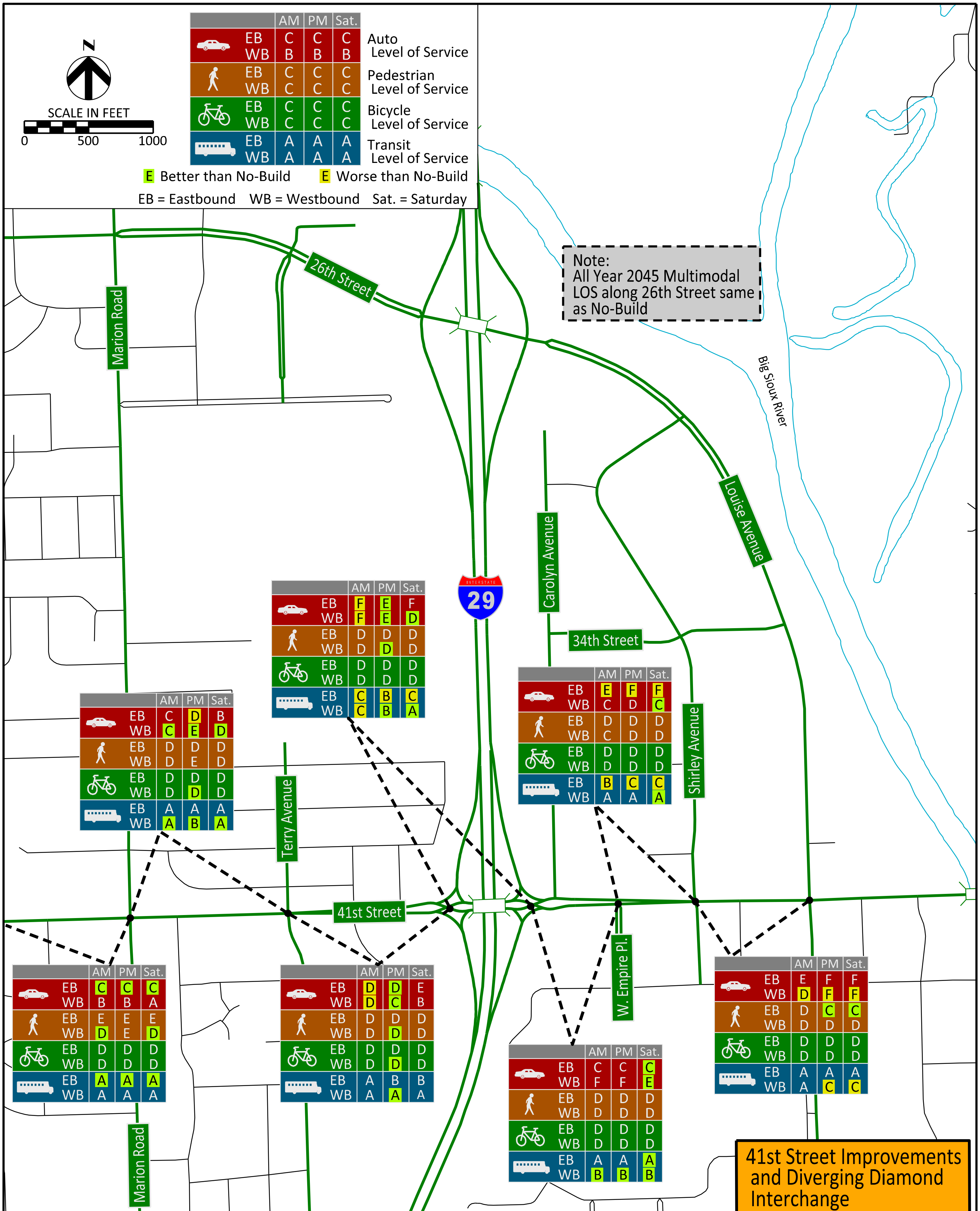


Drawn By: B.Miller
Date: 10/31/16
Chked By: J.Unruh
Date: 10/31/16
Revision: 1/20/17

Year 2045 Multimodal Peak Hour Level of Service

I-29 Exit 77 (41st Street) Interchange Modification Study
Sioux Falls, SD

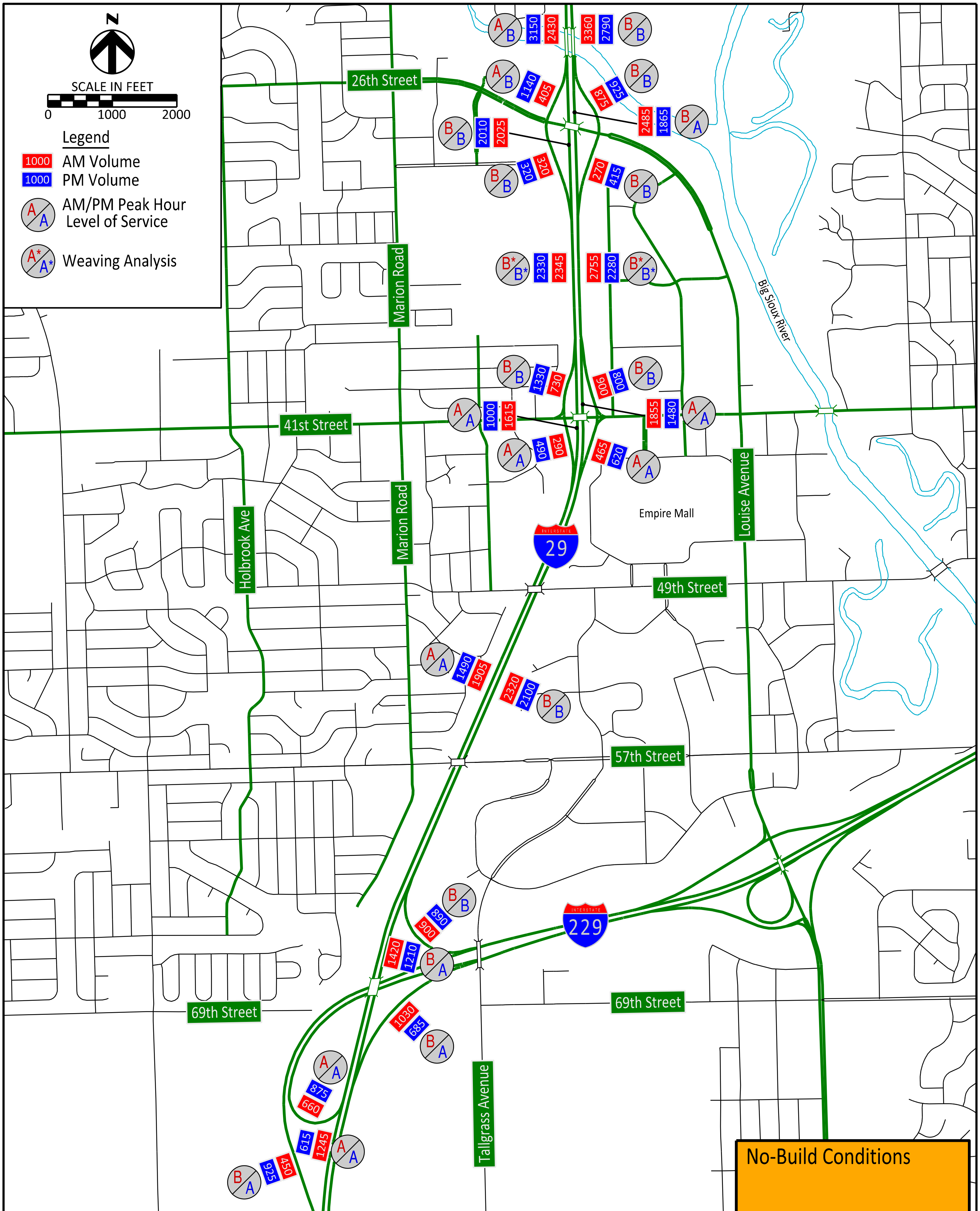
Figure 34



Drawn By: B.Miller
Date: 10/31/16
Chked By: J.Unruh
Date: 10/31/16
Revision: 1/20/17

Year 2045 Multimodal Peak Hour Level of Service
I-29 Exit 77 (41st Street) Interchange Modification Study
Sioux Falls, SD

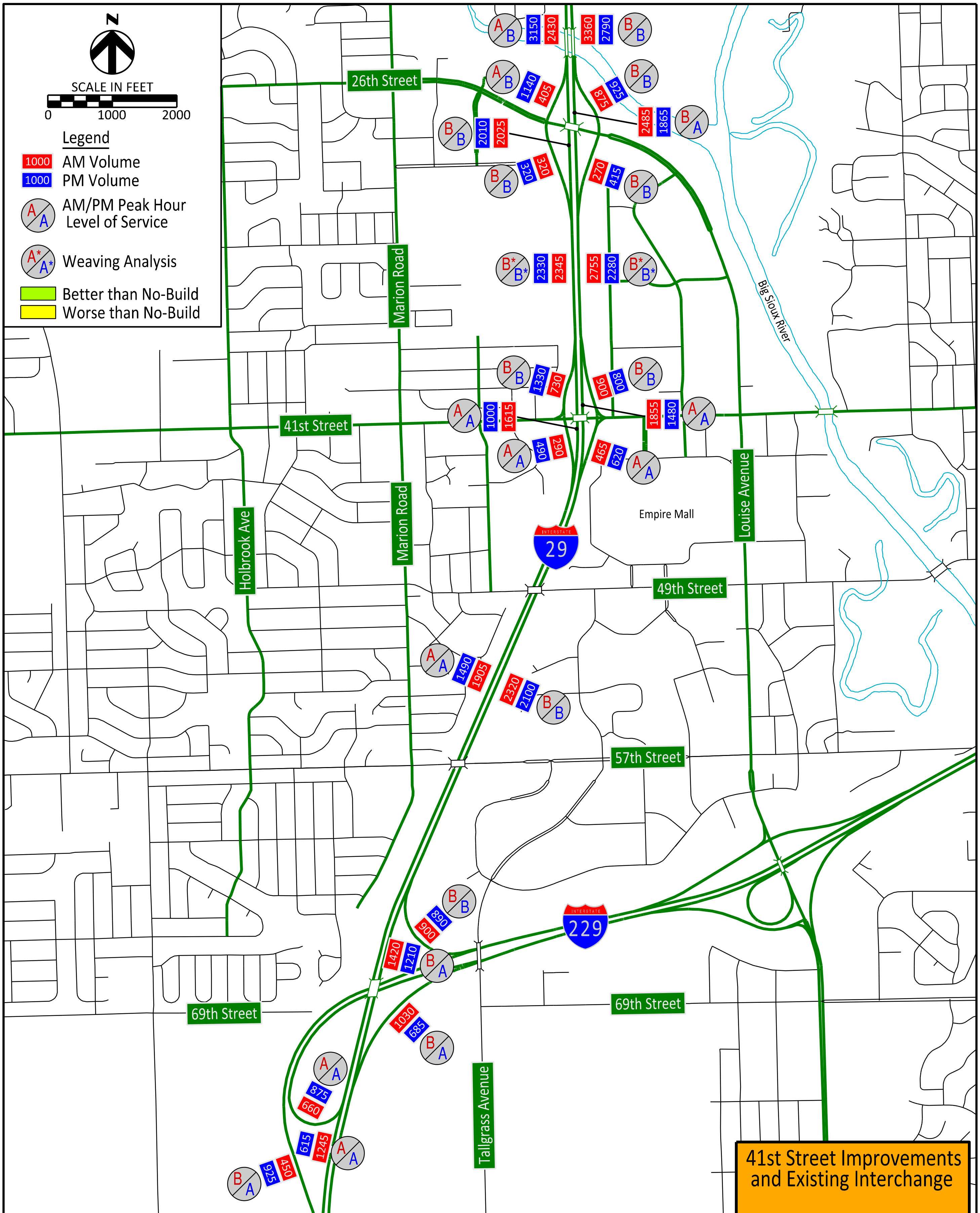
Figure 35



Drawn By: B.Miller
Date: 9/14/16
Chked By: J.Unruh
Date: 9/14/16
Revision:

Year 2023 Peak Hour Balanced Traffic Volumes and I-29 Level of Service
I-29 Exit 77 (41st Street) Interchange Modification Study
Sioux Falls, SD

Figure 36

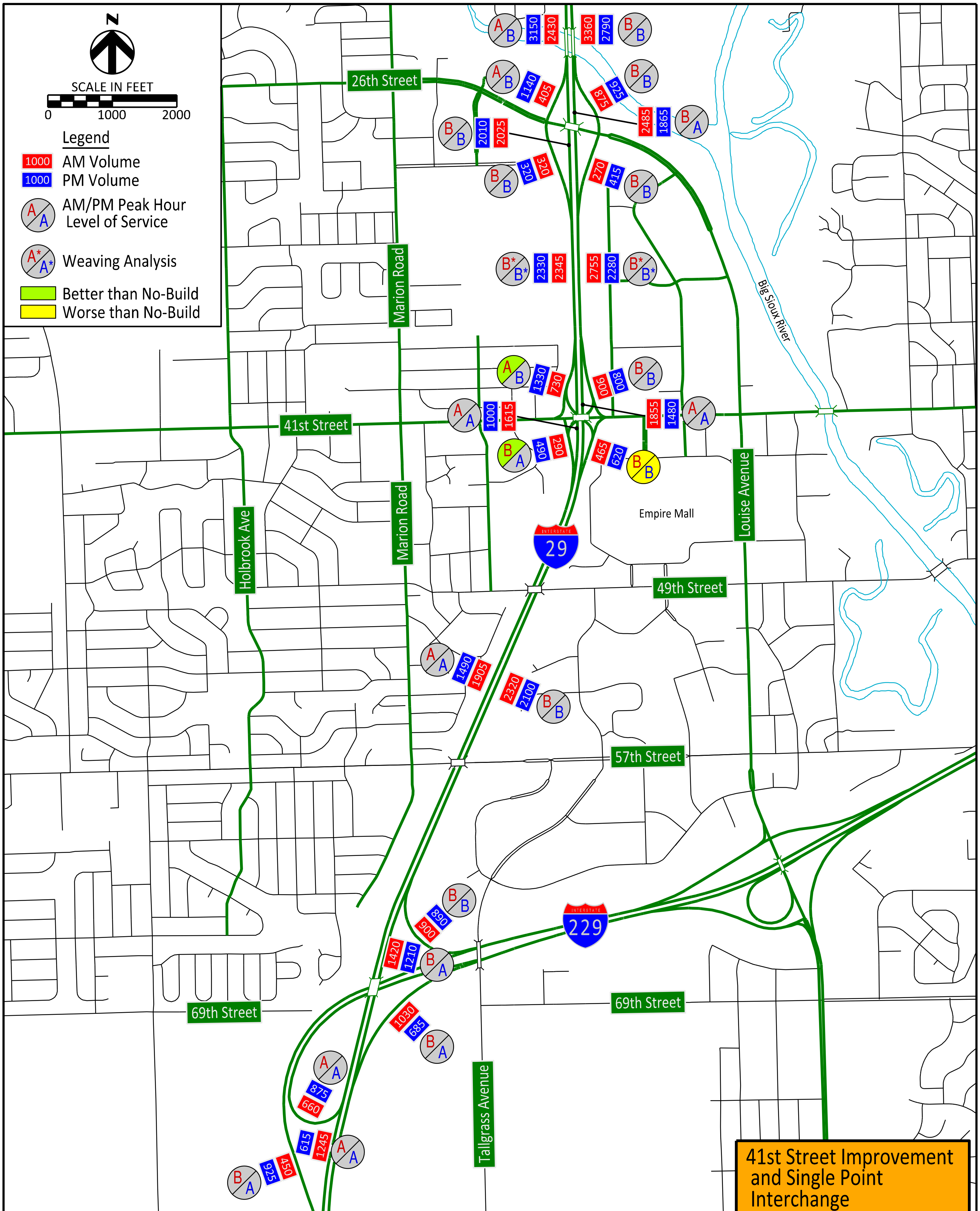


Drawn By: B.Miller
Date: 9/14/16
Chked By: J.Unruh
Date: 9/14/16
Revision: 1/20/17

Year 2023 Peak Hour Balanced Traffic Volumes and I-29 Level of Service

I-29 Exit 77 (41st Street) Interchange Modification Study
Sioux Falls, SD

Figure 37

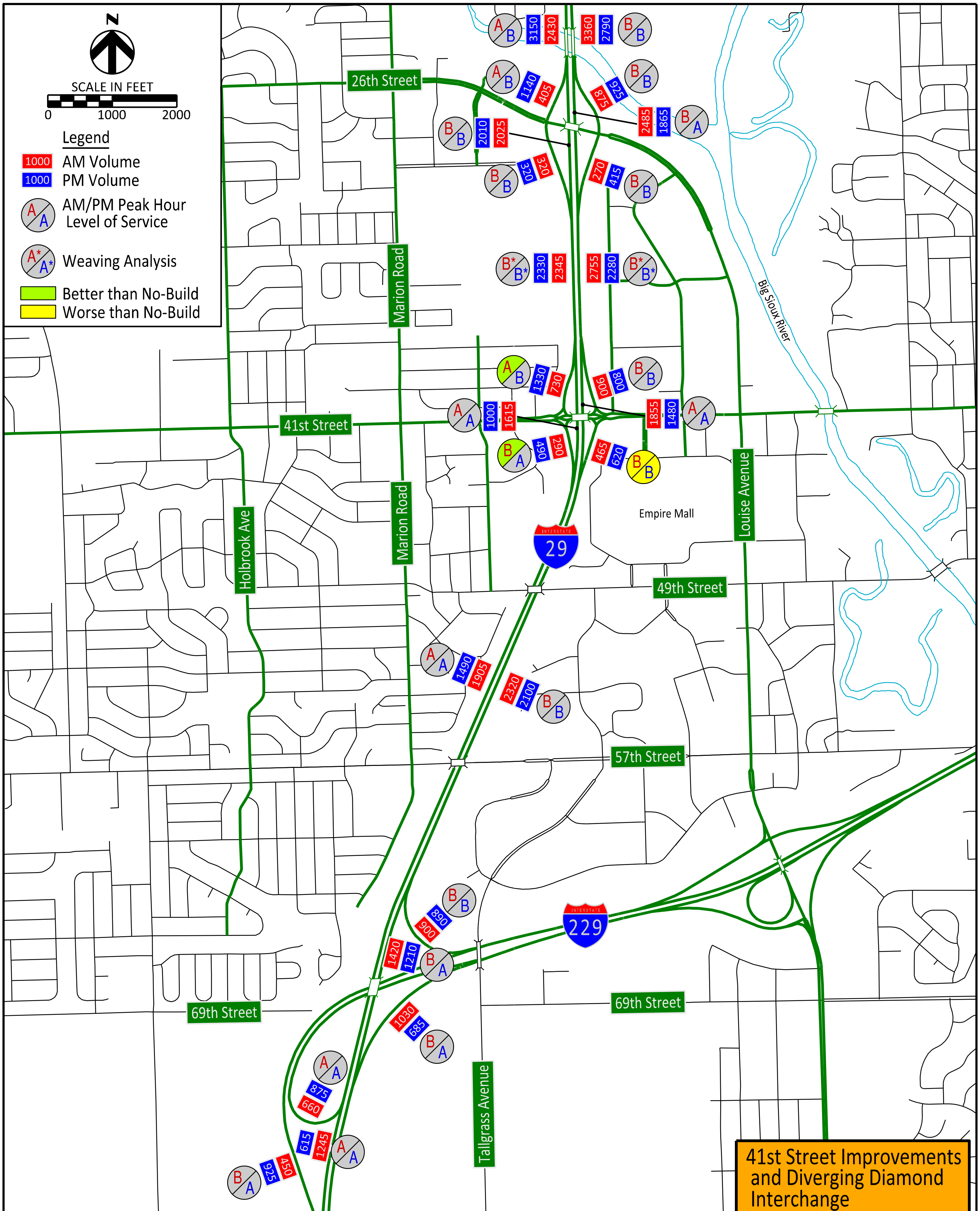


Drawn By: B.Miller
Date: 9/14/16
Chked By: J.Unruh
Date: 9/14/16
Revision: 1/20/17

Year 2023 Peak Hour Balanced Traffic Volumes and I-29 Level of Service

I-29 Exit 77 (41st Street) Interchange Modification Study
Sioux Falls, SD

Figure
38

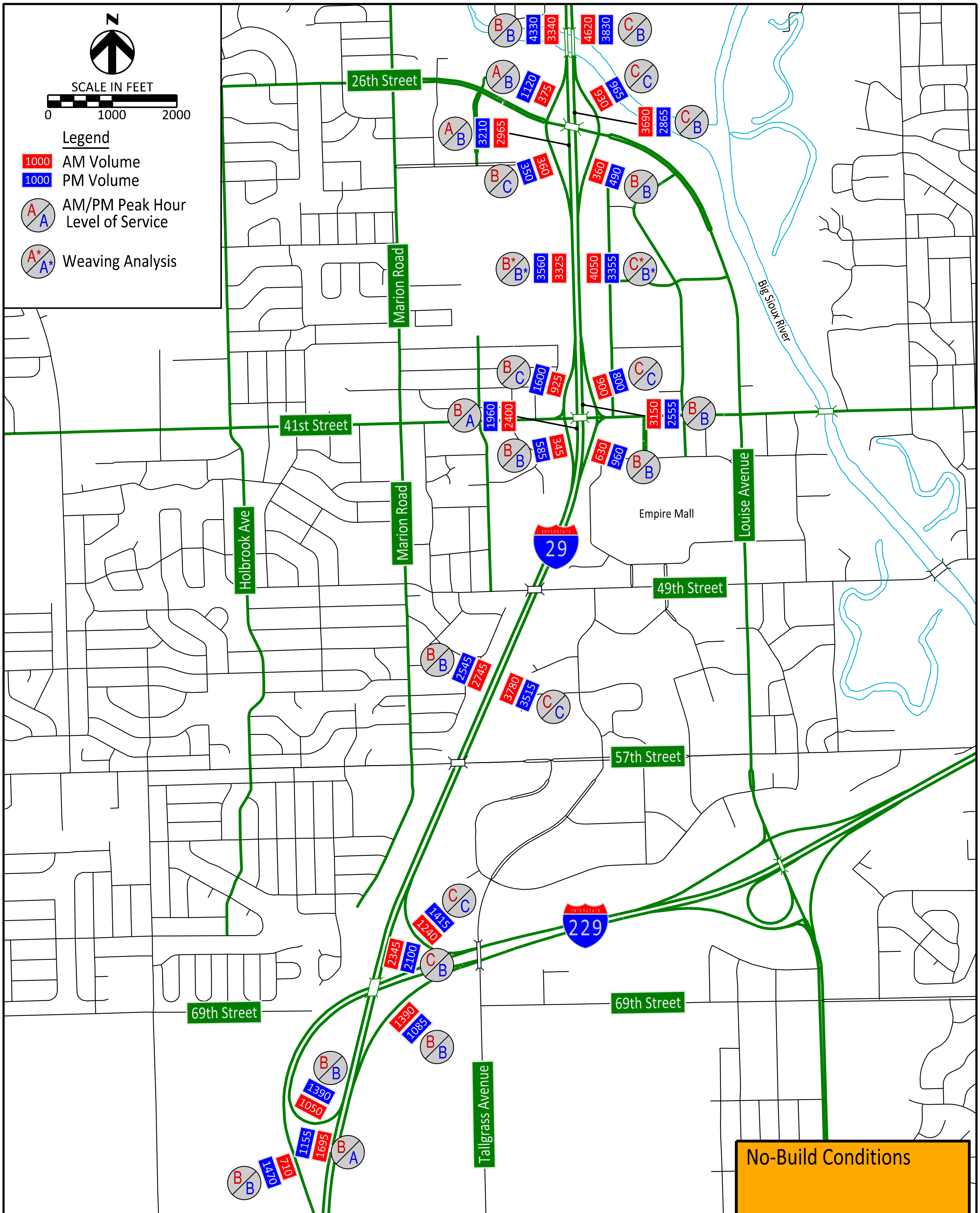


Drawn By: B.Miller
Date: 9/14/16
Chked By: J.Unruh
Date: 9/14/16
Revision: 1/20/17

Year 2023 Peak Hour Balanced Traffic Volumes and I-29 Level of Service

I-29 Exit 77 (41st Street) Interchange Modification Study
Sioux Falls, SD

Figure
39



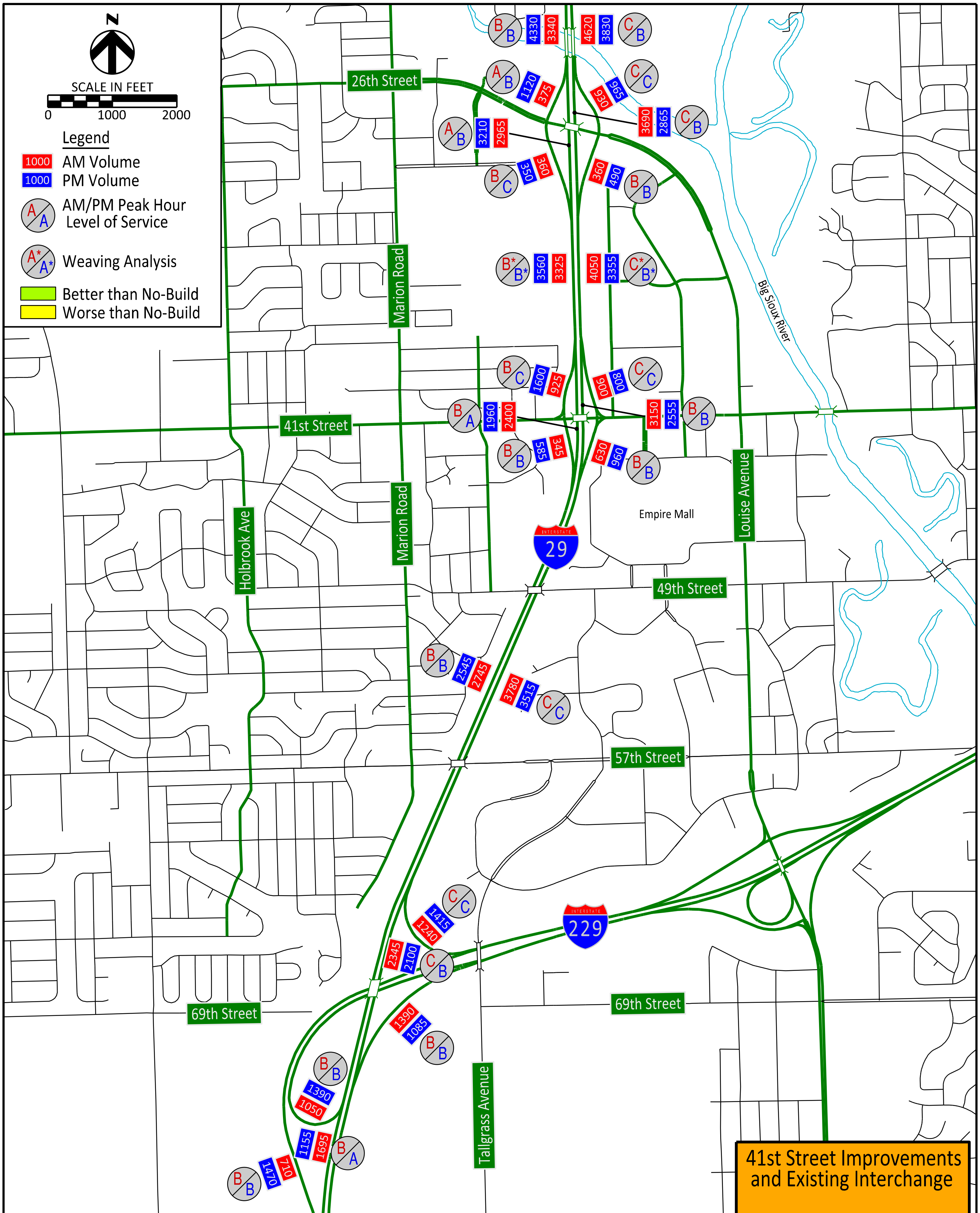
Drawn By: B.Miller
Date: 9/14/16
Chked By: J.Unruh
Date: 9/14/16
Revision:

HDR

Year 2045 Peak Hour Balanced Traffic Volumes and I-29 Level of Service

I-29 Exit 77 (41st Street) Interchange Modification Study
Sioux Falls, SD

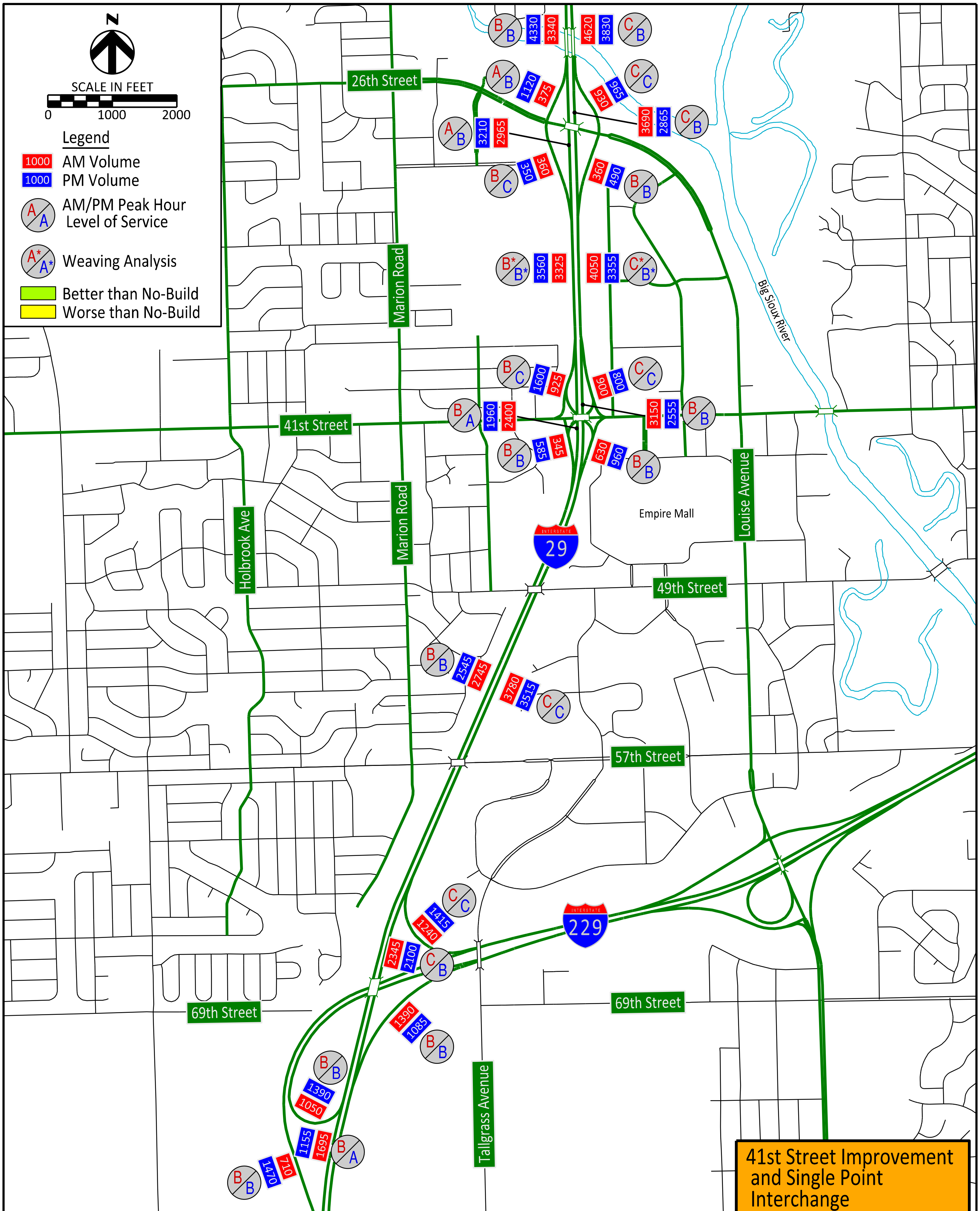
Figure
40



Drawn By: B.Miller
Date: 9/14/16
Chked By: J.Unruh
Date: 9/14/16
Revision:

Year 2045 Peak Hour Balanced Traffic Volumes and I-29 Level of Service
I-29 Exit 77 (41st Street) Interchange Modification Study
Sioux Falls, SD

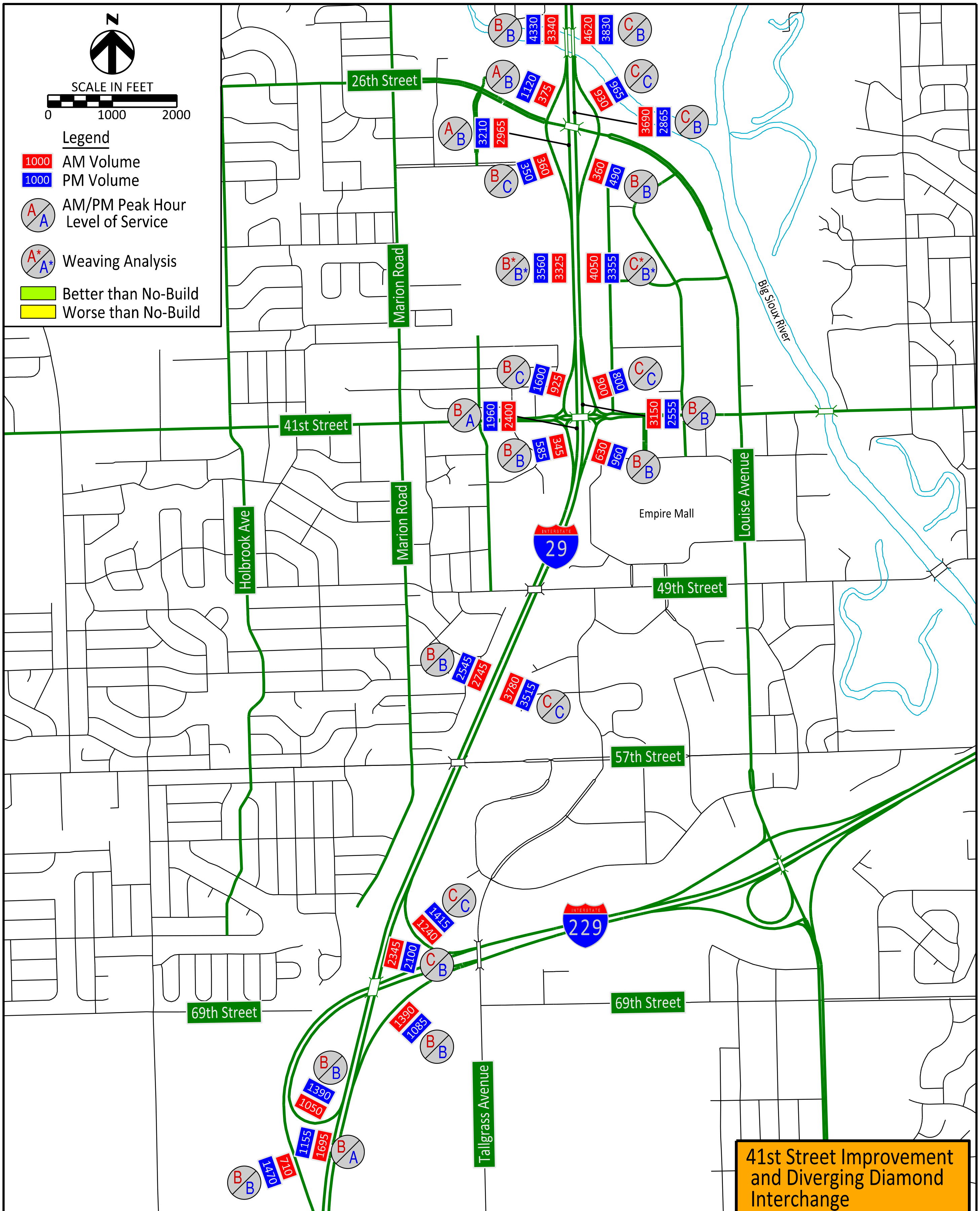
Figure
41



Drawn By: B.Miller
Date: 9/14/16
Chked By: J.Unruh
Date: 9/14/16
Revision:

Year 2045 Peak Hour Balanced Traffic Volumes and I-29 Level of Service
I-29 Exit 77 (41st Street) Interchange Modification Study
Sioux Falls, SD

Figure
42



Drawn By: B.Miller
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Year 2045 Peak Hour Balanced Traffic Volumes and I-29 Level of Service

I-29 Exit 77 (41st Street) Interchange Modification Study
Sioux Falls, SD

Figure 43

7. ALTERNATIVES ANALYSIS

The interchange improvement scenarios were analyzed and compared to determine which may be most suitable for meeting the project need. The areas of analysis and comparison are discussed in the following sections.

7.1 Conformance with Transportation Plans

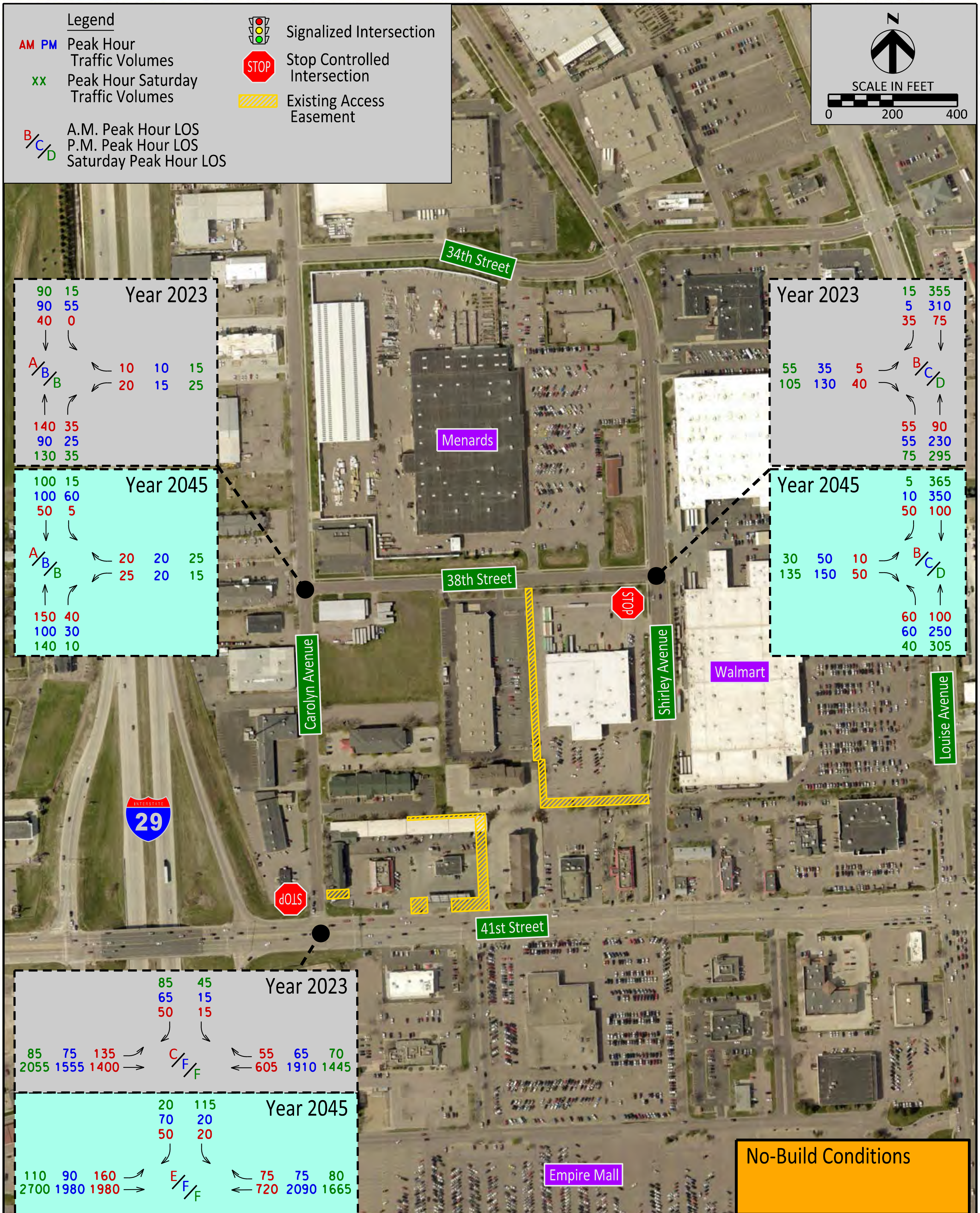
Local (MPO and City) and State transportation plans, including the Sioux Falls MPO Long Range Transportation Plan have identified a need for an improved interchange at I-29/41st Street that meets design standards, improves safety, and provides adequate capacity to serve future travel demand. Both the single point and DDI alternatives satisfy the existing transportation planning considerations.

7.2 Compliance with Policies and Engineering Standards

Each of the interchange build options has used the latest guidance from AASHTO and FHWA and final design of any of the options may be accomplished without conflict with geometric design standards.

Access management was examined at adjacent local street intersections and commercial driveways. SDDOT design standards call for access spacing of at least 100' from the Interstate highway right-of-way line at ramp termini when rebuilding an existing urban interchange, but further recommend extending the control of access to meet the access spacing requirements established by South Dakota Administrative Rule 70:09. The Administrative Rules call for unsignalized access spacing of 100' to 660' and minimum signalized access spacing of 1320', depending on the classification of the arterial street (41st Street is not within SDDOT jurisdiction and is not currently classified in the State system). City of Sioux Falls design standards call for ¼ mile full access spacing on arterial roadways like 41st Street, but list spacing of unsignalized partial access as "varies". Other guidelines and research recommends signalized intersections no closer than ¼ mile from interchange ramp termini, but allow unsignalized partial access at spacing less than ¼ mile. Several alternatives were examined for improvements on 41st Street as part of the *I-29 Exit 77 (41st St.) Crossroad Corridor Study.* Those alternatives each addressed retrofitting the accesses along 41st Street to improve access management. That study recommended alternatives that include a center median on 41st Street and the closure of the 41st Street/Carolyn Avenue intersection.

The 41st Street/Carolyn Avenue intersection was further evaluated in a Technical Memorandum as part of this study. That evaluation determined that the only feasible alternative for the intersection is to close access to Carolyn Avenue at 41st Street because of its proximity to the I-29 interchange. Carolyn Avenue would be provided with a cul-de-sac for local traffic and local traffic would also be rerouted via 38th Street and Shirley Avenue to reach 41st Street. The analysis is summarized in **Figures 44** and **45** and in the Technical Memorandum, reproduced in the **Appendix 5**.



Drawn By: B.Miller
Date: 10/26/16
Chked By: J.Unruh
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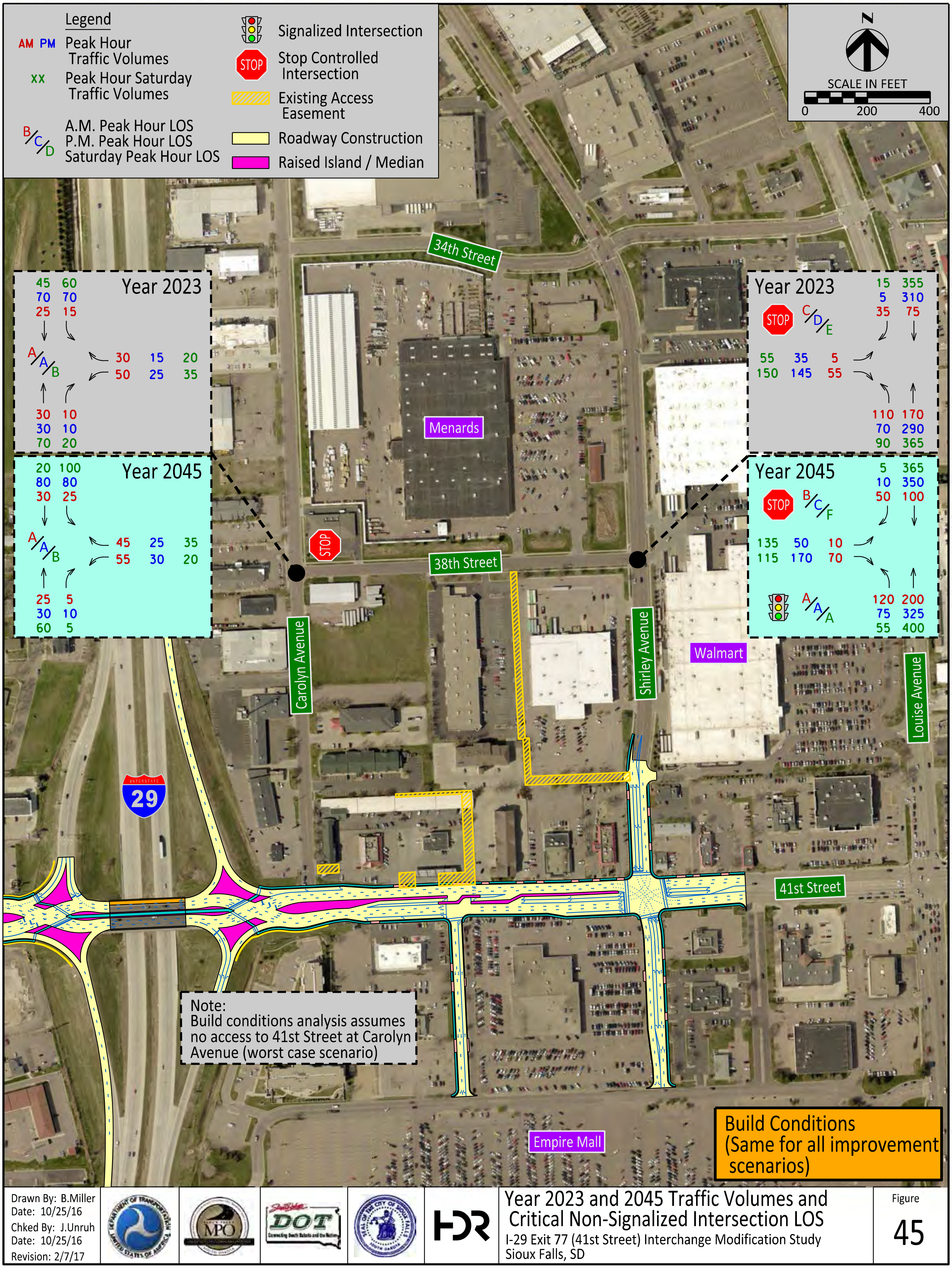
Revision: 1/25/17

Year 2023 and 2045 Traffic Volumes and Critical Non-Signalized Intersection LOS

I-29 Exit 77 (41st Street) Interchange Modification Study
Sioux Falls, SD

Figure
44


Legend
AM PM Peak Hour Traffic Volumes
xx Peak Hour Saturday Traffic Volumes
B/C/D A.M. Peak Hour LOS P.M. Peak Hour LOS Saturday Peak Hour LOS
Signalized Intersection
STOP Stop Controlled Intersection
Existing Access Easement
Roadway Construction
Raised Island / Median
N
SCALE IN FEET
0 200 400
34th Street
38th Street
41st Street
Carolyn Avenue
Shirley Avenue
Louise Avenue
Menards
Walmart
Empire Mall
29
Year 2023
45 60
70 70
25 15
A/A/B
30 15 20
50 25 35
30 10
30 10
70 20
Year 2045
20 100
80 80
30 25
A/A/B
45 25 35
55 30 20
25 5
30 10
60 5
Year 2023
15 355
5 310
35 75
STOP C/D/E
55 35 5
150 145 55
110 170
70 290
90 365
Year 2045
5 365
10 350
50 100
STOP B/C/F
135 50 10
115 170 70
A/A/A
120 200
75 325
55 400
Note:
Build conditions analysis assumes no access to 41st Street at Carolyn Avenue (worst case scenario)
Build Conditions (Same for all improvement scenarios)
Drawn By: B.Miller
Date: 10/25/16
Chked By: J.Unruh
Date: 10/25/16
Revision: 2/7/17
Year 2023 and 2045 Traffic Volumes and Critical Non-Signalized Intersection LOS
I-29 Exit 77 (41st Street) Interchange Modification Study
Sioux Falls, SD
Figure
45

7.3 Environmental Impacts

The proposed interchange scenarios have been thoroughly considered in the environmental analysis process, and a preferred alternative will be selected based on the study findings. Reconfiguration of the Exit 77 interchange to a single-point or DDI interchange may require small additional pieces of right of way along 41st Street. Sound walls currently exist along I-29 within the study area and sound impacts of interchange reconfiguration will be studied as part of the environmental documentation.

7.4 Safety

A predictive analysis of the alternatives was conducted and the technical memo documenting that analysis is included in the **Appendix 6**. The predictive analysis indicates that both the single-point and DDI interchange configurations will provide better safety than the existing diamond configuration. The DDI alternative also shows lower crash frequency when compared to the single-point alternative. Therefore, the DDI alternative is predicted to provide the best safety performance of the alternatives considered.

7.5 Operational Performance

The operations of the alternative scenarios were evaluated using appropriate level of service techniques. Performance was analyzed for forecast traffic conditions with each of the alternatives. Results of the operational analyses are shown in **Figures 12 through 43.**

The analysis indicates that the single-point and DDI alternatives result in acceptable level of service on the Interstate system and the arterial street system. The no-build and local improvements only alternatives show sub-standard levels of service at the interchange ramp terminals.

7.6 Evaluation of Alternatives

A Technical Memorandum was prepared which compares the Single-Point and DDI interchange alternatives. That comparison determined that the DDI alternative provides the best technical solution for the transportation needs at the I-29 exit 77 interchange. A preferred alternative will be determined through the environmental process. The Technical Memorandum is reproduced in the **Appendix 8**.

7.7 Coordination

The 41st Street corridor, including its interchange at Interstate 29, has been the subject of agency coordination and public involvement as part of the corridor planning process, including public meetings. The potential corridor improvements have also been the subject of review and coordination through the regular meetings of the MPO committees.

8. FUNDING PLAN

The 2017-2020 Statewide Transportation Improvements Program (STIP) does not contain a project for reconstruction of the I-29/41st Street interchange. The interchange reconstruction project is in the SDDOT's developmental program between 2021 and 2024. Current SDDOT budget estimates for interchange improvements are shown below.

Table 5 - Anticipated Funding Allocation Breakdown

Project Number	State Funding Category	Federal Funding Category	Federal Funds ($ million)	State Funds ($ million)	City Funds ($ million)	Total Funds ($ million)
IM 0293(106)77 P PCN03RA	Interstate	National Highway Performance	$17.6	$2.4		$20.0
P1400(16) P PCN 05NF	Local Urban Systems	Surface Transportation Block Grant	$5.2		$13.7	$18.9
		Total	$22.8	$2.4	$13.7	$38.9

Note: As funding is fluid, category breakdown may be different at time of project authorization.

As the project is anticipated to be let to contract in Federal fiscal year 2023 or beyond, the inflated cost for the overall project is $43.4 million.

9. RECOMMENDATIONS

The technical analysis contained in this Interchange Modification Justification Report has found that the diverging diamond interchange alternative provides the best technical solution for transportation needs in the study area. The single point interchange alternative also provides operations and safety improvements over the planned improvements to the local street system. The preferred option is being selected as part of the completion of the environmental review process.

The eight considerations and requirements for Interstate access are addressed below:

1) The need being addressed by the request cannot be adequately satisfied by existing interchanges to the Interstate, and/or local roads and streets in the corridor can neither provide the desired access, nor can they be reasonably improved (such as access control along surface streets, improving traffic control, modifying ramp terminals and intersections, adding turn bays or lengthening storage) to satisfactorily accommodate the design-year traffic demands.

   The proposed change is a reconfiguration of an existing interchange and improvements to the existing crossroad facility. The changes will correct current interchange and crossroad design deficiencies. Based on the analysis of various alternatives, improvements on the crossroad (41st Street) alone and/or modifications to the existing interchange configuration will not improve traffic conditions adequately to meet applicable criteria. Improvements to 41st Street (such as intersection improvements east of I-29 and added through lanes west of I-29) are being planned by the City of Sioux Falls. The proposed change does not result in any new access points on the Interstate Highway System.

2) The need being addressed by the request cannot be adequately satisfied by reasonable transportation system management (such as ramp metering, mass transit, and HOV facilities), geometric design, and alternative improvements to the Interstate with the proposed change(s) in access.

   The concept alternatives involve changes to the geometric design of an existing interchange and changes to the crossroad arterial street to satisfy current design standards and meet the transportation needs in the study area. Mass transit reaches a limited market in South Dakota and HOV facilities are currently not in use because they have not been shown to be economically feasible. Neither mass transit or HOV facilities will correct design deficiencies or provide sufficient relief to future travel demand within the study planning horizon.

3) An operational and safety analysis has concluded that the proposed change in access does not have a significant adverse impact on the safety and operation of the Interstate facility (which includes mainline lanes, existing, new, or modified ramps, ramp intersections with crossroad) or on the local street network based on both the current and the planned future traffic projections. The analysis shall, particularly in urbanized areas, include at least the first adjacent existing or proposed interchange on either side of the proposed change in access, shall be included in this analysis to the extent necessary to fully evaluate the safety and operational impacts that the proposed change

in access and other transportation improvements may have on the local street network. Requests for a proposed change in access must include a description and assessment of the impacts and ability of the proposed changes to safely and efficiently collect, distribute and accommodate traffic on the Interstate facility, ramps, intersection of ramps with crossroad, and local street network. Each request must also include a conceptual plan of the type and location of the signs proposed to support each design alternative.

The operational and safety analysis contained in this study shows that the proposed build scenarios are not expected to adversely affect the safety or efficiency of the Interstate system. All build alternatives are also expected to improve access management on the crossroad in the vicinity of the interchange.

*The conceptual signing plan for the DDI alternative is shown in the **Appendix 11**.*

Figure 46 illustrates these features of the Diverging Diamond Interchange:

- *existing and proposed control of access limits*
- *existing and proposed right-of-way limits*
- *distances to adjacent access points*

4) The proposed access connects to a public road only and will provide for all traffic movements. Less than “full interchanges” may be considered on a case-by-case basis for applications requiring special access for managed lanes (e.g., transit, HOVs, HOT lanes) or park and ride lots. The proposed access will be designed to meet or exceed current standards.

   The proposed access is a reconfiguration of an existing interchange with full access to an arterial city street and includes all movements. The conceptual drawings have been prepared using current standards and further design using current standards is anticipated. Additional refinement will take place during the environmental and design phases of the project.

5) The proposal considers and is consistent with local and regional land use and transportation plans. Prior to receiving final approval, all requests for new or revised access must be included in an adopted Metropolitan Transportation Plan, in the adopted Statewide or Metropolitan Transportation Improvement Program (STIP or TIP), and the Congestion Management Process within transportation management areas, as appropriate, and as specified.

   The proposal is the result of land use and transportation plans prepared within the MPO process, including the Sioux Falls MPO Long Range Transportation Plan. The 2017-2020 STIP includes this Project in the Developmental STIP portion in the 2021-2013 funding and construction years.

6) In corridors where the potential exists for future multiple interchange additions, a comprehensive corridor or network study must accompany all requests for new or revised access with recommendations that address all of the proposed and desired access changes within the context of a longer-range system or network plan.

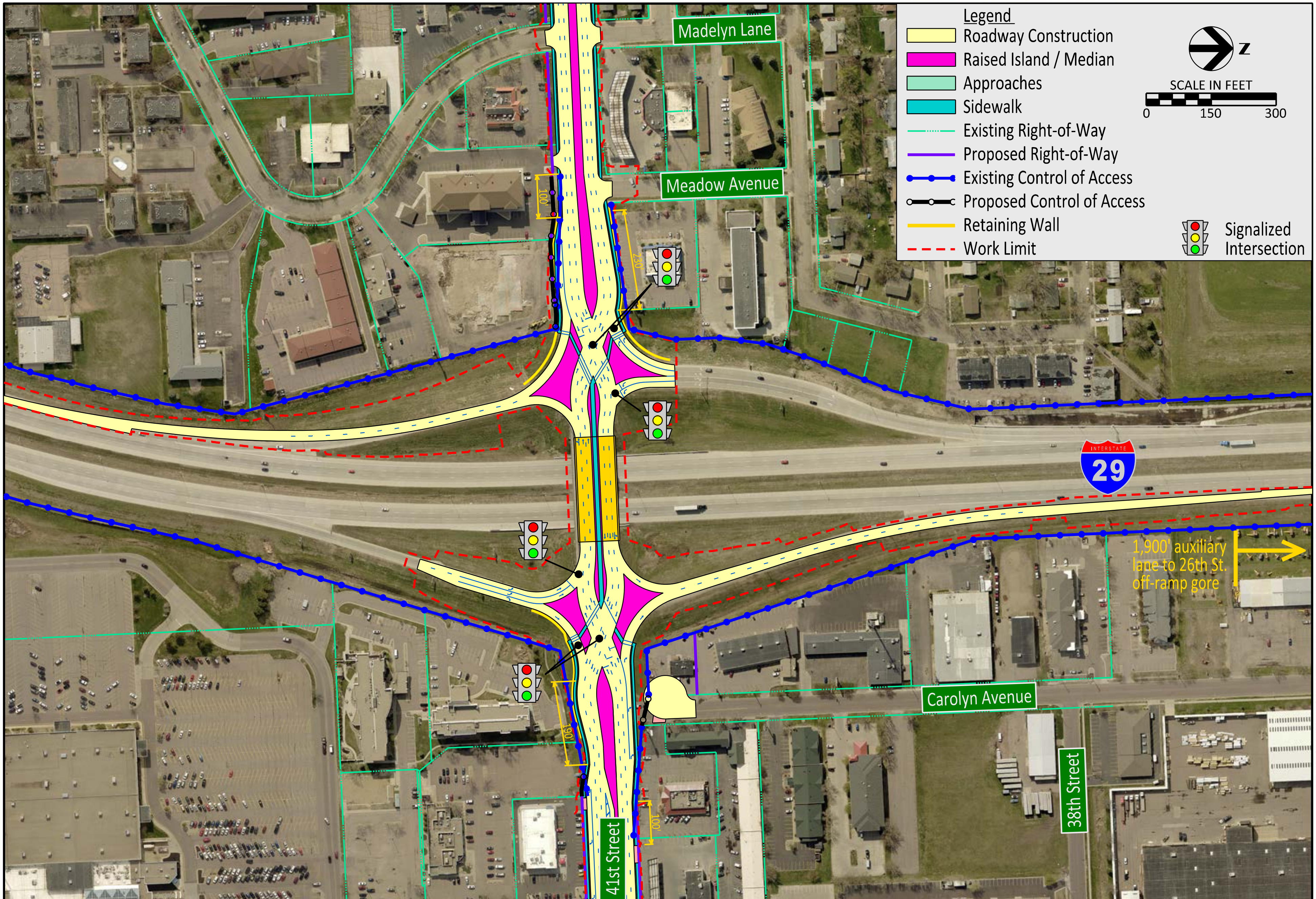
   SDDOT has prepared a study of the Interstate Highway System in South Dakota and this IMJR to address Interstate access needs. No additional interchanges are anticipated within the study area.

7) When a new or revised access point is due to a new, expanded, or substantial change in current or planned future development or land use, requests must demonstrate appropriate coordination has occurred between the development and any proposed transportation system improvements. The request must describe the commitments agreed upon to assure adequate collection and dispersion of the traffic resulting from the development with the adjoining local street network and Interstate access point.

   The revised access point is due to geometric deficiencies in the existing interchange and general regional growth. The proposed change is not related to a particular development or land use change.

8) The proposal can be expected to be included as an alternative in the required environmental evaluation, review and processing. The proposal should include supporting information and current status of environmental processing.

   The alternatives developed in this IMJR will serve as the technical basis for the environmental review process. The environmental studies are expected to be completed in time to allow construction in the 2021 to 2023 timeframe.



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Date: 7/12/2017
Revision:

Control of Access and Right-of-Way for Diverging Diamond Interchange

41st Street Corridor Interchange Study

Sioux Falls, SD

Figure

46

APPENDIX

1 – Purpose and Need Memo

2 – Methods and Assumptions Document

3 – Technical Memo 1: Existing Traffic Conditions

4 – Technical Memo 2: Existing Conditions Crash Analysis

5 – Technical Memo 3: Future Traffic Conditions

6 – Technical Memo 4: Predictive Crash Analysis

7 – Technical Memo 5: Carolyn Avenue Alternatives Evaluation

8 – Technical Memo 6: Interchange Alternatives Evaluation

9 – Technical Memo 7: 41st St. West of I-29 Alternatives Evaluation

10 – Technical Memo 8: 41st St. East of I-29 Alternatives Evaluation

11 – Concept Signing Plan

12 – Interchange Area Air Photos