



South Dakota Decennial Interstate Corridor Study

PHASE ONE REPORT

March 2010



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SOUTH DAKOTA DOT DECENNIAL INTERSTATE CORRIDOR STUDY

Phase 1 Report

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EXECUTIVE SUMMARY

Introduction

The South Dakota Department of Transportation (SDDOT) retained Felsburg Holt & Ullevig to conduct an analysis of the Interstate system. The study is focused on:

- ▶ Ensuring a mainline Level of Service (LOS) of C or better throughout the Interstate System,
- ▶ Ensuring an interchange LOS of D or better for all interchanges throughout the Interstate System, and
- ▶ Identification of areas not in compliance with current Interstate design standards.

The study will be conducted in three phases. This report documents Phase 1, which is an assessment of the entire Interstate System looking at geometry, safety and traffic operations. Phase 1 will identify a combination of 15 existing and future interchange locations to be analyzed further in Phase 2. Phase 2 will include the development of detailed geometric layouts of these interchanges, and a review of the projected traffic operations associated with the interchange design. Phase 3 will provide a prioritized plan for implementing the improvements. **Figure S-1** illustrates the progression of 3 phases.

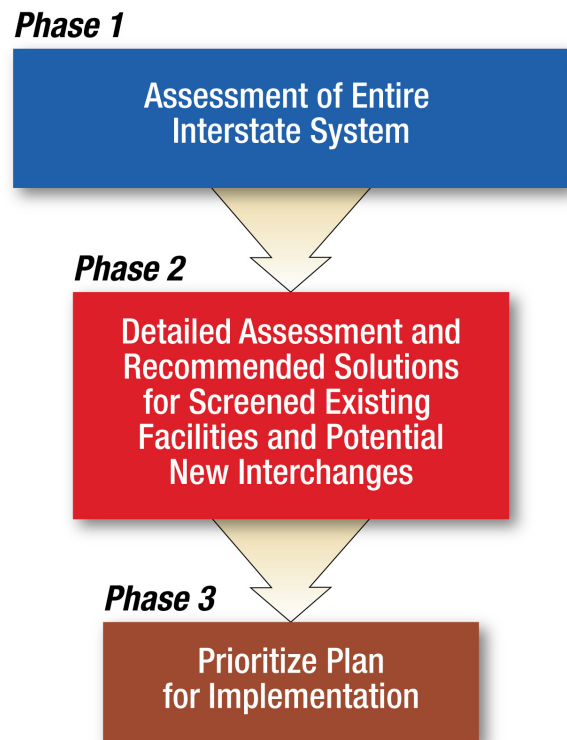
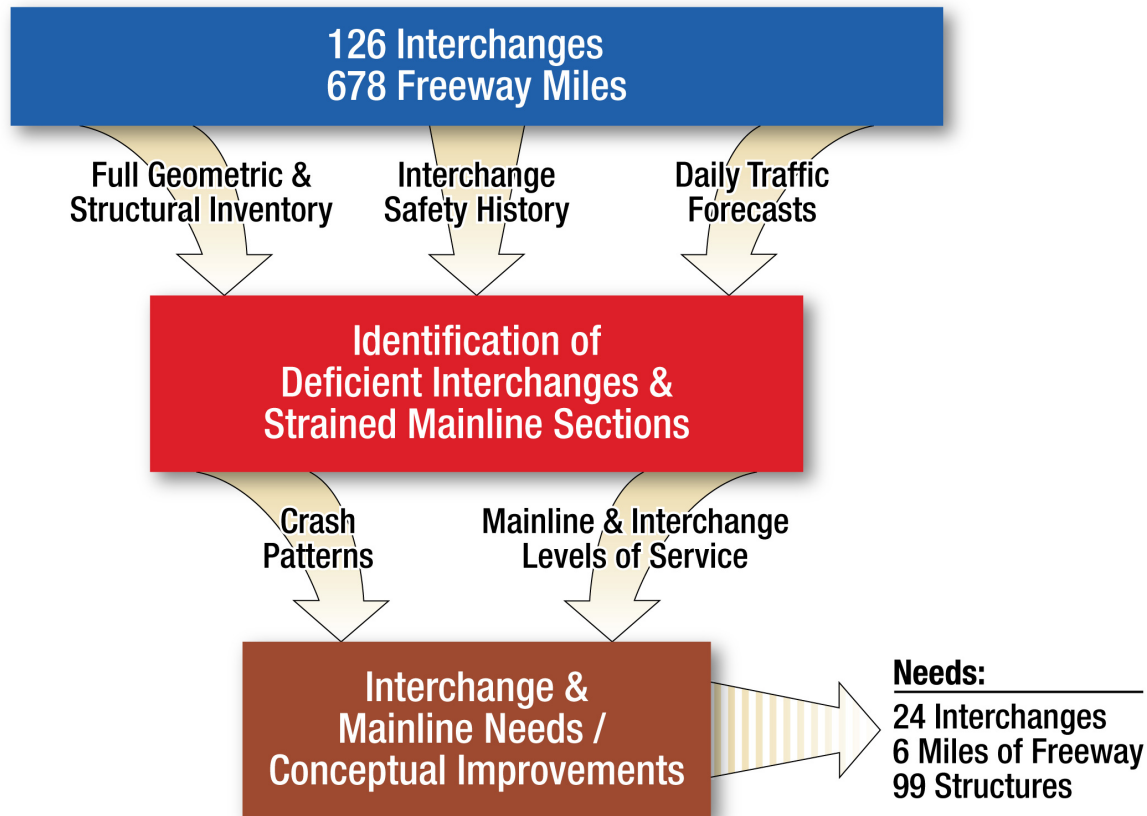


Figure S-1 Phased Study Overview

Figure S-2 depicts the Phase 1 contents detailed in this report. The Phase 1 evaluation includes all 678 centerline miles of Interstate mainline in South Dakota and 126 of the 152 total existing interchanges. A statewide inventory was performed to document geometric conditions, traffic safety and Average Daily Traffic (ADT) forecasts. This inventory led to the identification of a shortened list of deficient interchanges, structures and interstate segments. A detailed review of collision patterns and completion of Level of Service (LOS) analyses revealed a need for improvements at 32 interchanges, widening of 6 miles of Interstate triggered by traffic growth and replacement of 99 Structurally deficient or Functionally obsolete Interstate system bridges. The project team developed improvement concepts for the interchanges and provided preliminary cost estimates for interchange improvements, mainline widening and structure replacements.



Figure S-2 Phase 1 Flow Diagram



Phase 1 Findings

Geometric

The existing geometric features of the interstate mainline throughout the state and the 126 selected interchanges were reviewed to determine if they meet current design criteria. These design features included such items as the travel lane width, shoulder widths, design speed, degree of curve, clear zone, inslope, superelevation, bridge width, vertical clearance, vertical curves and grades. At the interchanges, the analysis also included cross road features such as stopping sight distance, ramp intersection sight distance and access control. Desirable values for these roadway elements were based on the *South Dakota Department of Transportation Roadway Design Manual* and *A Policy on Geometric Design of Highways and Streets*, published by AASHTO.

Mainline

The interstate mainline segments along I-90, I-190, I-29 and I-229 identified above were reviewed using information available on the as-built plans from when the interstate was originally constructed, reconstructed or otherwise improved.



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Tables summarizing the mainline geometric analysis are included in the **Appendix**. This review of existing geometric features on the mainline indicated that the most common substandard geometric element based on new construction standards along the interstate is the inslope. Another common finding is having a clear zone less than the desirable 30'. The longitudinal grade along interstate segments was reviewed and determined to have minimal consequence to the interstate system. Therefore, the longitudinal grade is not reported in this study.

The deficiencies identified typically do not warrant immediate correction, but should be reviewed at the time of pavement replacement or other major improvement projects on the interstate mainline.

Interchanges

The review of existing geometrics for the 126 interchanges selected for this Phase 1 analysis was conducted through a combination of measurements taken in the field, site observations and a review of the design plans provided by SDDOT. This evaluation process identified several design elements that do not meet current design criteria. The most common substandard geometric element was associated with the width provided for the ramp right shoulder. Ramp inslopes were also found to be substandard. These deficiencies do not warrant immediate correction, and can be reviewed at the time of pavement replacement along the ramps. The design features that do not meet the desirable design criteria are summarized in the tables provided in the **Appendix** along with detailed geometric checklists for selected interchanges. Additional discussion about the geometric deficiencies at specific interchanges is provided for those interchanges where safety issues have been identified through the crash analysis or concepts have been developed to address operations.

Structural Conditions

Several bridges along and crossing the Interstate System are currently classified as structurally deficient or functionally obsolete according to their National Bridge Inspection Standards (NBIS) rating. A statement of probable costs was prepared for the removal and reconstruction of these bridges along the study corridors. Structurally deficient bridges are assigned a high priority for reconstruction. Functionally obsolete bridges that demonstrate deficient vertical clearance should be considered a higher priority than correcting inadequate bridge widths when there is no crash history related to the inadequate width. A total of 95 structures (93 bridges, 2 tunnels) were identified in this analysis, with a total construction cost estimate of \$80.7 Million. More detailed information regarding the location and size of each structure are provided in the **Appendix**.

Safety

A shortened list of 19 interchanges was designated as high crash locations based on their 3-year crash history relative to the other interchanges. The 19 locations include the highest 10 crash rate interchanges and additional locations that experienced more than double the average crash rate. **Table S-1** lists these 19 locations.



Table S-1 19 High Crash Interchange Locations

Interchange	Number of Crashes by Severity July 2006 to July 2009				Crash Rate 3-Year (Wtd. Acc/MEV)
	Fatal	Injury	PDO	Total	
I-29 Exit 1	0	5	23	28	0.92
I-29 Exit 77	0	71	103	174	3.72
I-29 Exit 132	1	3	23	27	1.45
I-29 Exit 201	1	4	6	11	4.22
I-90 Exit 12	0	4	24	28	1.48
I-90 Exit 23	0	5	23	28	2.36
I-90 Exit 30	0	12	28	40	2.34
I-90 Exit 40	1	8	23	32	3.40
I-90 Exit 55	1	12	18	31	1.39
I-90 Exit 59	0	31	54	85	2.49
I-90 Exit 172	1	0	4	5	2.47
I-90 Exit 235	1	2	2	5	2.45
I-90 Exit 332	0	11	32	43	2.15
I-90 Exit 390	0	5	24	29	2.36
I-229 Exit 2	0	21	42	63	2.03
I-229 Exit 3	0	25	53	78	1.64
I-229 Exit 4	0	23	49	72	2.02
I-229 Exit 5	0	35	68	103	3.25
I-229 Exit 7	0	10	36	46	1.21
Statewide Average Interchange	0.11	3.57	9.68	13.36	0.94

Additional data were gathered to further evaluate these locations, resulting in a refined assessment of actual collision patterns and problems at each interchange. Most of the interchanges demonstrated no identifiable collision pattern, but several of the urban interchanges showed elevated numbers of rear end and approach turn collisions.

Traffic Forecasts / Operations

Mainline

Year 2008 mainline daily traffic counts conducted were available in the 2009 Highway Needs and Project Analysis Report (SDDOT, 2009), also known as the Needs Book. The counts provide average annual daily traffic volume (AADT) levels throughout the interstate system, including I-90, I-190, I-29 and I-229. The SDDOT supplied the project team with 20-year growth factors for urban and rural portions of each County in South Dakota. These growth factors, used to develop future mainline Interstate traffic forecasts, varied from 16 percent (0.7 percent per year) to 62 percent (2.6 percent per year) growth. Year 2030 forecasts for I-29 and I-229 in the Sioux Falls area reach 70,000 - 80,000 vpd. The **Appendix** provides a summary of all interstate segments with growth rates and AADT forecasts.



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Mainline Level of Service (LOS) analyses of current and future conditions were performed based on averaged traffic parameters. It was found that most mainline sections would operate acceptably (LOS C or better) through the Year 2030. Several mainline sections of I-29 and I-229 within Sioux Falls demonstrate a need for future widening.

Interchange

Middle crossroad traffic counts conducted between the Year 2001 and 2007 at each study interchange were provided by SDDOT. Forecasts were developed using localized interchange growth rates gathered from a variety of sources. There are 4 quasi-government agencies that include counties through which interstates pass and three Metropolitan Planning Organizations (MPOs). These agencies provided travel demand model information, population growth and land use forecasts. Population growth between the Year 2000 and 2008 is documented by County in the most recent U.S. Census (www.census.gov). This information was used to develop traffic forecasts for the more rural Interstate sections.

To focus study resources on potential operational problem areas throughout the State, the project team screened out the lower-traffic volume interchanges to reach a list of interchanges where conditions could reach substandard Levels of Service (LOS) currently or in the future. For the purposes of this study, substandard interchange operations occur when and where the ramp terminal intersection LOS reaches LOS D or worse and/or freeway and ramp operations reach LOS C or worse. Based on results from the 2000 Interstate Corridor Study and discussion with the Study Advisory Team, interchanges where the daily crossroad traffic volume between the ramp termini (“middle ADT”) exceeds 5,000 Vehicles Per Day (vpd) were designated as candidates for operational evaluation.

Operational analyses were performed for both AM and PM peak hour traffic conditions for each of the 34 candidate interchanges, with the exception of a few where only design hour information was available. Ten of the thirty-four interchanges demonstrated satisfactory operations through the Year 2030, while the majority required improvements to operate acceptably in the future. Improvements have been identified in the form of additional turn lanes, traffic control changes or modified acceleration/deceleration lanes at ramp junctions. Options for interchange reconstruction were also evaluated.

Improvement Concepts

Upon considering geometric, safety and operational deficiencies, a total of 32 interchanges and approximately 6 miles of mainline interstate were identified as locations where improvements would be needed to meet the goals identified in this Study:

- ▶ Ensuring a mainline Level of Service (LOS) of C or better throughout the Interstate System,
- ▶ Ensuring an interchange LOS of D or better for all interchanges throughout the Interstate System, and
- ▶ Identification of areas not in compliance with current Interstate design standards.



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A statement of probable construction costs was developed for each interchange improvement identified in Phase 1 as well as freeway widening projects. **Tables S-2** through **S-4** summarizes those probable construction costs by SDDOT Region. The costs shown are based on conceptual design for budgetary purposes. The cost estimate calculations are provided in the **Appendix**.

Table S-2 Rapid City Region - Summary of Probable Construction Costs

Interchange	Proposed Improvement	Probable Construction Cost
Interstate 90		
Exit 12	Add turn lane – widen bridge	\$50,000
	Signalize north intersection	\$125,000
Exit 17	Diamond	\$4.6 Million
	Single-Point	\$18.6 Million
Exit 30	Realign mainline I-90	\$19.8 Million
Exit 46	Reconstructed Diamond	\$8.7 Million
Exit 48	Single-Point	\$12.0 Million
	Relocated Diamond	\$8.1 Million
Exit 55	Bridge widening	\$4.2 Million
Exit 59	Diamond	\$7.2 Million
	Single-Point	\$14.5 Million
Exit 63	Diamond	\$8.7 Million
	Flyover	\$13.2 Million
Interstate 190		
Exit 1	2-lane roundabout	\$3.2 Million
	1-lane roundabout	\$1.3 Million
	Signal	\$1.6 Million



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Table S-3 Mitchell Region - Summary of Probable Construction Costs

Interchange	Proposed Improvement	Probable Construction Cost
Interstate 29		
I-29 Widening	Additional travel lane in each direction: Exit 75-77 and Exit 78-79	\$56 Million ¹
Exit 1	Add turn lane & Signals	\$410,000
Exit 2	Signal/relocate Fr. Rd.	\$860,000
	Roundabout/relocate Fr. Rd.	\$700,000
Exit 26	Reconstruct NB Ramps/signal	\$1.3 Million
Exit 47	Add turn lanes & Signals	\$470,000
	Add roundabouts	\$560,000
Exit 77	Single-Point	\$9.9 Million
	Diverging Diamond/exist bridge	\$2.5 Million
	Diverging Diamond w/new bridge	\$11.5 Million
Interstate 90		
Exit 330	Add turn lanes & Signals	\$470,000
Exit 406	Reconstruct Crossroad/add Signals	\$5.9 Million
	Single-Point	\$9.3 Million
Interstate 229		
I-229 Freeway Widening	Additional travel lane in each direction: I-29 to Exit 5, two more lanes Exit 5 to Exit 6	\$72 Million ¹
Exit 2	Add turn lane & re-stripe	\$60,000
	Single-Point	\$12.6 Million
Exit 4	Add turn lanes	\$240,000
Exit 5	Offset Single-Point	\$8.8 Million
Exit 7	Crossroad & Ramp Improvement/add Signal	\$1.2 Million
Exit 9	Add turn lanes & Signal	\$350,000

¹ Assumed conceptual estimated cost of Interstate widening is \$4 Million per mile per lane. This assumption is based on cost estimates developed for freeway widening projects in the 2004 *Interstate 90 Black Hawk – Sturgis Corridor Preservation Study* (Felsburg Holt & Ullevig). Estimated costs did not include Right-of-way. Actual costs would vary widely based on local conditions.

Table S-4 Aberdeen Region - Summary of Probable Construction Costs

Interchange	Proposed Improvement	Probable Construction Cost
Interstate 29		
Exit 132	Add turn lanes & Signals	\$470,000
Exit 177	Add turn lane & Signal	\$240,000



1.0 INTRODUCTION

The South Dakota Department of Transportation (SDDOT) retained Felsburg Holt & Ullevig to conduct an analysis of the Interstate system. The study is focused on:

- ▶ Ensuring a mainline Level of Service (LOS) of C or better throughout the Interstate System,
- ▶ Ensuring an interchange LOS of D or better for all interchanges throughout the Interstate System, and
- ▶ Identification of areas not in compliance with current Interstate design standards.

1.1 Phase 1 Study Description

The study will be conducted in three phases. Phase 1, summarized in this report, includes a review of the roadway geometrics, crash history, and traffic operations. A screening process utilizes these categories to identify a shortened list of interchanges in need of improvements and / or reconstruction. Conceptual alternative sketches of these potential changes are included.

The result of Phase 1 will be a combination of 15 existing and future interchange locations to be analyzed further in Phase 2. Phase 2 will include the development of detailed geometric layouts of these interchanges, and a review of the projected traffic operations associated with the interchange design. Access management in the vicinity of the interchange will also be considered during Phase 2. The next phase will also include an assessment of the impact of those alternatives on the operating conditions of the mainline and connecting arterial streets. Phase 3 will provide a prioritized plan for implementing the improvements.

1.2 2000 SDDOT Interstate Corridor Study

This effort represents an expansion over the First Edition of the study, which was completed in the Year 2000. The Phase 1 portion of that First Edition studied a grouping of 60 existing and 4 proposed interchanges and 148 miles of mainline freeway segments along Interstates 90, 29, and 229. The Phase 2 portion of the study provided a more detailed look at 22

Phase 1

Assessment of Entire Interstate System

Phase 2

Detailed Assessment and Recommended Solutions for Screened Existing Facilities and Potential New Interchanges

Phase 3

Prioritize Plan for Implementation



existing interchanges and 4 new interchanges. The Phase 2 study consisted of the development of detailed geometric layouts of these interchanges, and a review of the projected traffic operations associated with the interchange design. Recommended improvements included such items as the number of lanes required, intersection channelization and traffic control improvements. A capacity analysis to determine the level of service on the mainline, ramps and connecting arterials was also conducted.

1.3 *Improvements Constructed since Previous Study*

The inclusion of an interchange in the Phase 2 report did not automatically indicate that it was a high priority location for reconstruction. The report provided guidance and information to SDDOT and local governments for developing those priorities. Since the time of the 2000 Interstate Corridor Study, several existing interchanges have been reconstructed and three new interchanges have been added to the interstate system. These interchanges are listed below:

Reconstructed Interchanges

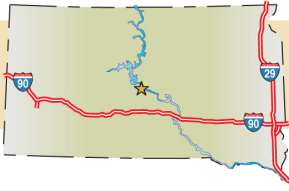
- ▶ I-90 Exit 32 – Junction Avenue, Sturgis (2006)
- ▶ I-90 Exit 51 – Black Hawk Road, Black Hawk (2009)
- ▶ I-90 Exit 57 – I-190 (2000)
- ▶ I-90 Exit 58 – Haines Ave. (2000)
- ▶ I-90 Exit 60 – East North Street, Rapid City (2006)
- ▶ I-90 Exit 61 – Elk Vale Road, Rapid City (2007)
- ▶ I-90 Exit 66 – Ellsworth Road, Ellsworth AFB (removed) (2003)
- ▶ I-29 Exit 73 – County Road 106, Tea (2005)
- ▶ I-29 Exit 79 – 12th Street, Sioux Falls (2007)
- ▶ I-29 Exit 81 – Russell Street/Maple Street, Sioux Falls (2003-4)
- ▶ I-29 Exit 83 – SD 38 (60th Street), Sioux Falls (2003-4)

New Interchanges

- ▶ I-90 Exit 8 – McGuigan Road, Spearfish (2002)
- ▶ I-90 Exit 67 – Main Gate Road/Liberty Blvd., Box Elder/Ellsworth AFB (2002)
- ▶ I-29 Exit 80 – Madison Street, Sioux Falls (2004)
- ▶ I-29 Exit 82 – Benson Road, Sioux Falls (2003-4)

1.4 *Recent Interchange Studies*

Since the completion of the 2000 Interstate Corridor Study, a number of existing and proposed interchange locations have been studied in greater detail. Many of these led to the ultimate construction of new or reconfigured interchanges identified in the previous section and are not



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included with this list. Other locations have much more recent or even current studies underway as a part of the planning and design process associated with future interstate access modifications. Since these detailed studies have been conducted or are underway, these existing and potential new interchange locations were not included in this Phase 1 or Phase 2 analysis. Recent interchange studies include the following:

Recent Interchange Studies

- ▶ I-29/I-229 and I-90/I-229 Interchange Improvements – January 2008
- ▶ Environmental Assessment for I-90/I-229 Interchange – September 2008
- ▶ I-29 Corridor Study: Exit 73 (Tea Exit) to Exit 77 (41st Street Exit) – Ongoing
- ▶ Interstate 29/85th Street Interchange Justification Report - Ongoing
- ▶ I-90 at Marion Road, Interchange Justification Study – March 2006
- ▶ I-90/I-29 Interchange Justification Study – March 2006
- ▶ I-90 Exit 399 (Cliff Ave.) Interchange Modification Justification Study – Ongoing
- ▶ I-299 and Minnesota Avenue Interchange Justification Report (by City of Sioux Falls) – February 2007
- ▶ I-90 Blackhawk – Sturgis Corridor Preservation Study – December 2004
- ▶ I-90 Environmental Assessment (Exit 40 to Exit 51) – September 2008
- ▶ US14A Corridor Study - Ongoing
- ▶ I-190 Corridor Study: Silver Street - Ongoing

1.5 Phase 1 Study Content

The Interstate in South Dakota is shown by region and Mileage Reference Marker (MRM) as follows:

<u>SDDOT Region</u>	<u>Interstate</u>	<u>Boundaries</u>
Rapid City	I-90	MRM 0.00 to MRM 130.30
	I-190	MRM 0.00 to MRM 2.03
Pierre	I-90	MRM 130.30 to MRM 251.00
	I-90	MRM 251.00 to MRM 412.52
Mitchell	I-29	MRM 0.00 to MRM 124.00
	I-229	MRM 0.00 to MRM 10.83
Aberdeen	I-29	MRM 124.00 to MRM 252.65



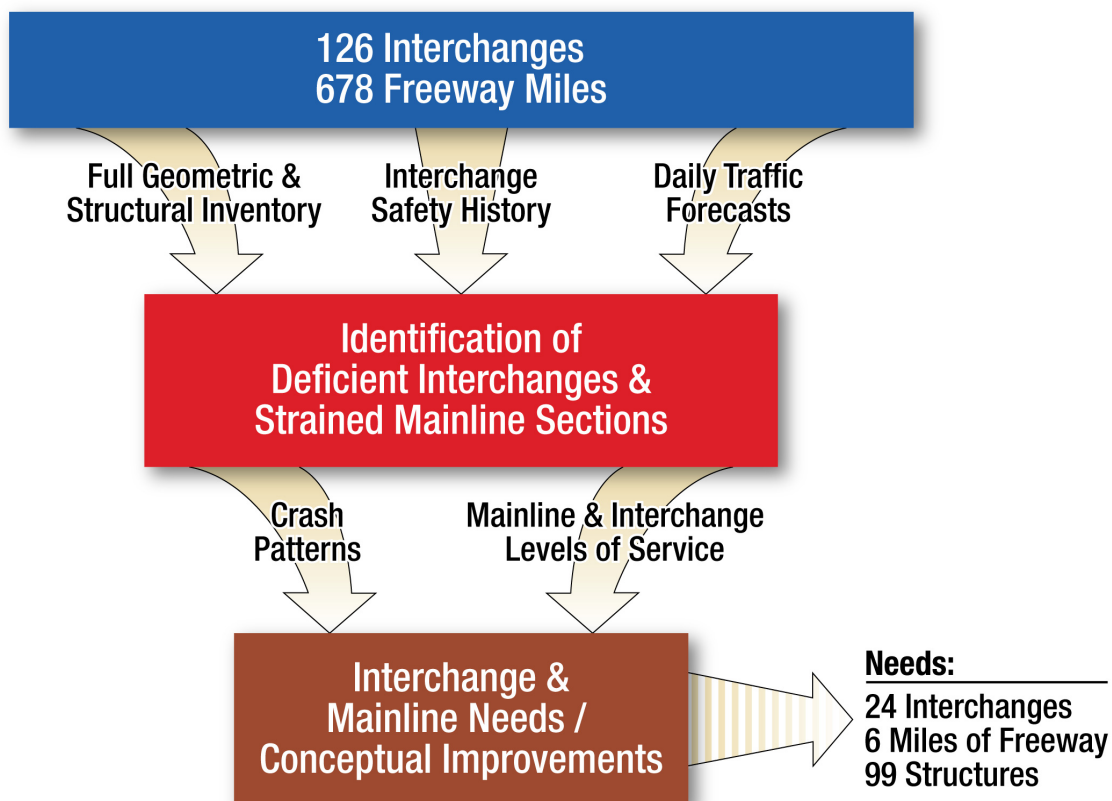
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This report is organized into the following sections:

- ▶ **Section 2.0:** Identification of Deficiencies
- ▶ **Section 3.0:** Analyses of Deficient Interchanges
- ▶ **Section 4.0:** Summary of Interstate Improvements

As shown in the following graphic, the Phase 1 evaluation includes all 678 centerline miles of Interstate mainline in South Dakota and 126 of the 152 total existing interchanges. A statewide inventory was performed to document geometric conditions, traffic safety and Average Daily Traffic (ADT) forecasts.



This inventory led to the identification of a shortened list of deficient interchanges, structures and interstate segments. A detailed review of collision patterns and completion of Level of Service (LOS) analyses revealed a need for improvements at 24 interchanges, widening of 6 miles of Interstate and replacement of 23 structurally deficient bridges. There are 78 functionally obsolete bridges on the interstate system, 30 due to substandard vertical clearance and 48 due to other reasons, typically the width of the shoulders provided on the bridge.



2.0 IDENTIFICATION OF DEFICIENCIES

2.1 Geometrics and Structures

2.1.1 Geometric Condition Measures

The existing geometric features of the interstate mainline throughout the state and the 126 selected interchanges were reviewed to determine if they meet current design criteria. These design features included such items as the travel lane width, shoulder widths, design speed, degree of curve, clear zone, inslope, superelevation, bridge width, vertical clearance, vertical curves and grades. At the interchanges, the analysis also included cross road features such as stopping sight distance, ramp intersection sight distance, vertical curvature through the interchange area, and access control. Desirable values for these roadway elements were based on the *South Dakota Department of Transportation Roadway Design Manual* and *A Policy on Geometric Design of Highways and Streets*, published by AASHTO.

2.1.2 Interstate Mainline Geometric Conditions

The interstate mainline segments along I-90, I-190, I-29 and I-229 identified above were reviewed using information available on the as-built plans from when the interstate was originally constructed, reconstructed or otherwise improved. Some segments of mainline have been reconstructed since the previous study was conducted in the year 2000. It was assumed that these segments meet current design standards and as such were not included in this review.

The majority of the interstate system in South Dakota consists of two lanes in each direction, with the exception of the segments located in the urban area of Sioux Falls. Three lanes of travel are provided on I-29, from 41st Street (Exit 77) through the 60th Street (Exit 83) interchange. A fourth auxiliary lane is also provided in each direction between the interchange ramps. North of the 60th Street interchange, three lanes are provided in each direction to the I-90 systems interchange (Exit 84).

On I-229, the interstate mainline provides two lanes of travel in each direction, with auxiliary lanes provided between interchanges. The auxiliary lanes begin at the Louise Avenue interchange (Exit 1) and extend to the interchange with Benson Road (Exit 9) with a gap in auxiliary lanes between Exits 5 and 6. The section of I-29, between the Dakota Dunes Boulevard (Exit 1) and River Drive (Exit 2) also consists of two lanes of travel in each direction with auxiliary lanes provided between the interchange ramps.

Tables summarizing the mainline geometric analysis are included in the **Appendix**. The mainline analysis was generally grouped into the same segments as shown in the design plans since many of the design features were consistently applied within those segments. This review of existing geometric features on the mainline indicated that the most common geometric element that does not meet standards for new construction on the interstate is the inslope. Typically, it ranges from a slope of 3:1 to 5:1, versus the desirable slope of 6:1. Another common element is having a clear zone less than the desirable 30'. As can be seen in the



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summary tables in the Appendix, often this geometric element can be found along several continuous segments of the interstate, likely corresponding with the design criteria at the time of construction.

The longitudinal grade along interstate segments was reviewed and determined to have minimal consequence to the interstate system. Therefore, the longitudinal grade is not reported in this study.

Only a few segments were identified containing grades in excess of the desirable levels of 3.0% for level terrain and 4.0% for rolling terrain. On I-90, the only segment exceeding these values is from mile markers 263 and 265, which is located immediately east of the Missouri River bridge near Chamberlain. The maximum grade on this segment is 5.5%. On I-29, between mile markers 208 and 225 north of Summit, the maximum grade present is 4.3%.

Several of the interstate segments on I-90 in the Black Hills region, one segment of I-229 in the Sioux Falls area, and one segment of I-29 near North Sioux City, contain horizontal curves that exceed a desirable $2^{\circ} 15'$ curve. These curves range in size from $2^{\circ} 30'$ to $4^{\circ} 00'$.

The geometric elements identified above typically do not warrant immediate correction, but should be reviewed at the time of pavement replacement or other major improvement projects on the interstate mainline.

The most notable geometric feature on the interstate mainline that does not meet current new construction standards are bridges with substandard widths. In many cases, these bridges are only 30' wide. Ninety-nine bridges are classified as structurally deficient or functionally obsolete.. These bridges are discussed in more detail in Section 2.1.4.

2.1.3 Interchange Geometric Conditions

The review of existing geometrics for the 126 interchanges selected for this Phase 1 analysis was conducted through a combination of measurements taken in the field, site observations and a review of the design plans provided by SDDOT. This evaluation process identified several design elements that do not meet current design criteria. By far, the most common substandard geometric element was associated with the width provided for the right shoulder. Many locations have a right shoulder width ranging from 1' to 7.5', compared to the minimum design criteria of 8'. Several interchange ramps were also noted with lane widths less than 15' and left shoulder widths less than 2'.

Many of the inslopes on the ramps were typically constructed at a slope of 4:1, which is within the acceptable range of allowable slopes, however, it does not meet the current design criteria of 6:1. This geometric element does not warrant immediate correction, and can be reviewed at the time of pavement replacement along the ramps.

Compliance with the remainder of the geometric features varied from interchange to interchange. The design features that do not meet the desirable design criteria are summarized in the tables provided in the **Appendix** along with detailed geometric checklists for selected



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interchanges. Additional discussion about the geometric deficiencies at specific interchanges is provided for those interchanges where safety issues have been identified through the crash analysis or concepts have been developed to address operations.

2.1.4 Structural Conditions

Several bridges along and crossing the Interstate System are currently classified as functionally obsolete or structurally deficient according to their NBIS rating. It is a high priority for the SDDOT to replace all Structurally deficient bridges. The replacement of Functionally obsolete bridges is considered based on the specific reason for the Functional Obsolescence. Correcting inadequate vertical clearances should be considered a higher priority than widening bridges of inadequate shoulder width when there is no crash history related to the inadequate width.

A statement of probable costs was prepared for the removal and reconstruction of three categories of bridges along the study corridors; 1) Structurally deficient bridges, 2) Functionally obsolete bridges that demonstrate deficient height clearances, and 3) Functionally obsolete bridges for other reasons (i.e. substandard width). The quantities and costs shown in **Tables 2.1 through 2.3** are based on conceptual design of the structures and do not include earthwork, mobilization, traffic control, concrete approach slab, or other incidental roadway costs. Bridges that have a structure width of 38' were not included in these cost estimates unless they were identified as functionally obsolete or structurally deficient. A total of 95 bridges and tunnels were identified in this analysis, with a total construction cost estimate of \$80.7 Million. The breakdown of bridges with various roadway segments is shown in the following tables. More detailed information regarding the location and size of each structure is provided in the **Appendix**.

Table 2.1 Interstate System Structurally Deficient Bridge Replacement Costs

Region	Interstate	Boundaries	Number of Bridges	Construction Cost
Rapid City	I-90	MRM 0.00 to MRM 130.30	3	\$1.8 Million
Pierre	I-90	MRM 130.30 to MRM 251.00	5	\$5.7 Million
Mitchell	I-90	MRM 251.00 to MRM 412.52	4	\$3.8 Million
	I-29	MRM 0.00 to MRM 124.00	2	\$4.0 Million
	I-229	MRM 0.00 to MRM 10.83	1	\$1.3 Million
Aberdeen	I-29	MRM 124.00 to MRM 252.65	4	\$3.6 Million



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Table 2.2 Interstate System Low Clearance Functionally Obsolete Bridge Replacement Costs

Region	Interstate	Boundaries	Number of Bridges	Construction Cost
Rapid City	I-90	MRM 0.00 to MRM 130.30	3	\$0.69 Million
	I-190	MRM 0.00 to MRM 2.03	2	\$3.5 Million
Pierre	I-90	MRM 130.30 to MRM 251.00	4	\$1.4 Million
Mitchell	I-90	MRM 251.00 to MRM 412.52	13	\$10.6 Million
	I-29	MRM 0.00 to MRM 124.00	4	\$1.4 Million
	I-229	MRM 0.00 to MRM 10.83	2	\$1.6 Million
Aberdeen	I-29	MRM 124.00 to MRM 252.65	2	\$2.0 Million

Table 2.3 Interstate System Other Functionally Obsolete Bridge Replacement Costs

Region	Interstate	Boundaries	Number of Bridges	Construction Cost
Rapid City	I-90	MRM 0.00 to MRM 130.30	18	\$11.9 Million
Mitchell	I-90	MRM 251.00 to MRM 412.52	10	\$7.2 Million
	I-29	MRM 0.00 to MRM 124.00	12	\$8.7 Million
	I-229	MRM 0.00 to MRM 10.83	1 bridge, 1 tunnel	\$4.0 Million
Aberdeen	I-29	MRM 124.00 to MRM 252.65	6 bridge, 1 tunnel	\$7.4 Million



2.2 Traffic Safety

The project team completed a crash analysis of each of the existing 126 interchanges included in this Phase 1 study. Crash information was compiled for the three year period between July 2006 and July 2009. The South Dakota Department of Transportation (SDDOT) provided historical crash information in its Geographic Information Systems (GIS) database. Traffic volume data were also provided by the SDDOT for the calculation of crash rates for each interchange.

The crash rate analysis methodology was first developed for the SDDOT Interstate Corridor Study completed in the Year 2000. The methodology is used to calculate a crash rate per million vehicle trips entering the interchange, similar to the measure typically used to calculate a surface street intersection crash rate. The number of collisions are weighted according to their severity and totaled for the three year time period, then divided by the total number of vehicle-trips entering the interchange area.

Crash data were provided in the form of three years of information for each interchange coded by location into the South Dakota Geographic Information System (GIS) database. The data provided a categorization of fatal, injury, and property damage traffic crashes occurring within the interchange area during the time period. A point rating system of 12 points for a fatal crash, 3 points for an injury crash, and 1 point for a property damage only crash was applied to the data. Based on this point system, a 3-year weighted crash sum was established for each interchange. Because of this weighting system, the occurrence of a fatal crash can significantly increase the crash rate, particularly at lower-traffic interchanges. I-29 Exit 201 at Twin Brooks is an example of this influence.

To determine the total number of vehicle-trips associated with a typical interchange, a rectangular cordon line was drawn around the perimeter, extending to 300 feet beyond each ramp terminal intersection and extending along the interstate to just beyond each ramp gore point. The total traffic entering the cordon area was compiled as the sum of the mainline entering volumes, the middle crossroad ADT, and one-half of the total ramp traffic. Traffic volumes were provided by SDDOT Staff. The sum of traffic was calculated to a total number of Millions of Entering Vehicles (MEV) for the three year time period.

By dividing the weighted crash sum by the MEV value, a crash rate was calculated for each interchange. The crash rate calculations are summarized in the **Appendix**. The study interchanges are ranked according to crash rate. As shown, the top crash rate was found at the I-29 / Twin Brooks interchange (Exit 201) followed by the I-29 / 41st Street interchange (Exit 77) in Sioux Falls.

A shortened list of 19 interchanges was designated as high crash locations based on their history relative to the other interchanges. The 19 locations include the highest 10 crash rate interchanges and additional locations that experienced more than double the average crash rate. **Table 2.4** lists these 19 locations.



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Table 2.4 19 High Crash Interchange Locations

Interchange	Rank by Weighted Crash Rate	Number of Crashes by Severity July 2006 to July 2009				Weighted 3-year Accidents	Crash Rate 3-Year (Wtd. Acc/MEV)
		Fatal	Injury	PDO	Total		
I-29 Exit 1	50	0	5	23	28	38	0.92
I-29 Exit 77	2	0	71	103	174	316	3.72
I-29 Exit 132	27	1	3	23	27	44	1.45
I-29 Exit 201	1	1	4	6	11	30	4.22
I-90 Exit 12	25	0	4	24	28	36	1.48
I-90 Exit 23	8	0	5	23	28	39	2.36
I-90 Exit 30	10	0	12	28	40	64	2.34
I-90 Exit 40	3	1	8	23	32	59	3.40
I-90 Exit 55	30	1	12	18	31	66	1.39
I-90 Exit 59	5	0	31	54	85	147	2.49
I-90 Exit 172	6	1	0	4	5	16	2.47
I-90 Exit 235	7	1	2	2	5	20	2.45
I-90 Exit 332	11	0	11	32	43	65	2.15
I-90 Exit 390	9	0	5	24	29	44	2.36
I-229 Exit 2	13	0	21	42	63	105	2.03
I-229 Exit 3	22	0	25	53	78	128	1.64
I-229 Exit 4	14	0	23	49	72	118	2.02
I-229 Exit 5	4	0	35	68	103	173	3.25
I-229 Exit 7	36	0	10	36	46	66	1.21
Statewide Average Interchange		0.11	3.57	9.68	13.36	21.73	0.94

Additional data were gathered to further evaluate these locations, resulting in a refined assessment of actual collision patterns and problems at each interchange. **Table 2.5** summarizes these assessments.



Table 2.5 Summary of Interchange Safety Evaluations

Interchange	Collision Patterns
I-29 Exit 1	No identifiable pattern
I-29 Exit 77	High number of congestion-related collisions, including rear-ends and approach-turn type collisions
I-29 Exit 132	There was one fatal crash but there does not appear to be a correctable pattern
I-29 Exit 201	There was one fatal crash but there does not appear to be a correctable pattern
I-90 Exit 12	No identifiable pattern
I-90 Exit 23	No identifiable pattern
I-90 Exit 30	Overturning crashes are occurring on I-90 in poor roadway conditions
I-90 Exit 40	Of the more severe crashes, 75% were related to poor roadway conditions
I-90 Exit 55	There was one fatal crash but there does not appear to be an identifiable pattern
I-90 Exit 59	High number of congestion-related collisions, including rear-ends and approach-turn type collisions
I-90 Exit 172	There was one fatal crash but there does not appear to be an identifiable pattern
I-90 Exit 235	There was one fatal crash but there does not appear to be an identifiable pattern
I-90 Exit 332	No identifiable pattern
I-90 Exit 390	No identifiable pattern
I-229 Exit 2	High number of rear ends, typical for signalized urban interchange
I-229 Exit 3	High number of rear ends, typical for signalized urban interchange
I-229 Exit 4	High number of rear ends, typical for signalized urban interchange
I-229 Exit 5	High number of rear ends and congestion-related collisions, pattern of highway sign hits during poor roadway conditions
I-229 Exit 7	No identifiable pattern



2.3 Traffic Forecasts

Traffic counts taken since the 2000 Interstate Corridor Study were provided from various sources. As the year of study initiation, 2009 was chosen as the base forecast year. The Years 2020 and 2030 were designated as future forecast time horizons.

2.3.1 Mainline Traffic Forecasts

Year 2008 mainline traffic counts conducted were available in the 2009 Highway Needs and Project Analysis Report (SDDOT, 2009), also known as the Needs Book. The counts provide average annual daily traffic volume (AADT) levels throughout the interstate system, including I-90, I-190, I-29 and I-229. The SDDOT supplied the project team with 20-year growth factors for urban and rural portions of each County in South Dakota. These growth factors, used to develop future mainline Interstate traffic forecasts, varied from 16 percent (0.7 percent per year) to 62 percent (2.6 percent per year) growth. Year 2030 forecasts for I-29 and I-229 in the Sioux Falls area reach 70,000 - 80,000 vpd. The **Appendix** provides a summary of all interstate segments with growth rates and AADT forecasts.

2.3.2 Interchange Traffic Forecasts

Middle crossroad traffic counts conducted between the Year 2001 and 2007 at each study interchange were provided by the South Dakota Department of Transportation (SDDOT). Forecasts were developed using localized interchange growth rates gathered from a variety of sources. There are 4 quasi-government agencies that include counties through which interstates pass and three Metropolitan Planning Organizations (MPOs). These agencies provided travel demand model information, population growth and land use forecasts. Population growth between the Year 2000 and 2008 is documented by County in the most recent U.S. Census (www.census.gov). This information was used to develop traffic forecasts for the more rural Interstate sections.

To focus study resources on potential operational problem areas throughout the State, the project team screened out the lower-traffic volume interchanges to reach a list of interchanges where conditions could reach substandard Levels of Service (LOS) currently or in the future. For the purposes of this study, substandard interchange operations occur when and where the ramp terminal intersection LOS reaches LOS D or worse and/or freeway and ramp operations reach LOS C or worse. Based on results from the 2000 Interstate Corridor Study and discussion with the Study Advisory Team, interchanges where the daily crossroad traffic volume between the ramp termini ("middle ADT") exceeds 5,000 Vehicles Per Day (vpd) were designated as candidates for operational evaluation.

Table 2.6 depicts the interchanges that, in 2009, exceeded the 5,000 vpd threshold or are projected to exceed 5,000 vpd by the Year 2030. As shown in **Table 2.6**, a total of 34 interchanges need to be analyzed operationally based on this screening approach. Of these, 21 exceed 5,000 vpd between the ramp terminal intersections based on Year 2009 traffic estimates.



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Table 2.6 Interchanges for Operational Analyses

Interstate	Exit #	Location	Projected Year of Exceeding Threshold
29	1	Dakota Dunes	2009
29	2	North Sioux City	2009
29	26	Vermillion/Yankton	2009
29	47	Beresford/Irene	2009
29	62	Canton	2030
29	71	Harrisburg/Tea	2030
29	77	4 ¹ st Street	2009
29	86	Renner/Crooks	2030
29	98	Dell Rapids	2030
29	132	Brookings	2009
29	133	Brookings/Huron	2030
29	177	Watertown	2009
29	207	Summit/Aberdeen	2020
29	232	Sisseton	2020
229	2	Western Ave	2009
229	3	Minnesota Ave	2009
229	4	Cliff Ave	2009
229	5	26 th Street	2009
229	7	Rice Street	2009
229	9	Benson Road	2009
90	12	Jackson Blvd	2020
90	17	Lead/Deadwood	2030
90	30	Lazelle Street	2009
90	46	Elk Creek Road	2030
90	48	Stage Stop Canyon	2020
90	55	Deadwood Ave	2009
90	59	LaCrosse Street	2009
90	63	Box Elder/EAFB	2009
90	330	Mitchell/Huron	2009
90	332	Mitchell/Parkston	2009
90	387	Hartford	2030
90	390	Hartford	2009
90	406	Brandon/Corson	2009
190	1	Silver Street	2009

For those interchanges exceeding 5,000 vpd middle ADT, peak hour turning movement traffic forecasts were developed based on the growth rates for each interchange. These peak hour forecasts are included in the **Appendix**.



2.4 Traffic Operations

2.4.1 Methodology

Analysis of traffic operations in the study area utilized methods documented in the Highway Capacity Manual (HCM), Transportation Research Board (TRB), 2000 Edition. The result of such an analysis is a LOS rating, which is a qualitative assessment of the traffic flow for a given roadway facility. Level of Service is described by a letter designation ranging from “A” to “F”, with LOS A representing essentially uninterrupted flow, and LOS F representing a breakdown of traffic flow with excessive congestion and delay. For analysis of a signalized intersection, a LOS rating is calculated for an intersection as a whole. Level of Service analysis of an unsignalized intersection yields a LOS rating for each critical vehicle movement. A LOS rating may also be calculated for mainline, merge, diverge, or weaving sections along a major freeway using Highway Capacity Software. The Synchro software analysis package and methodology was utilized to calculate LOS ratings for ramp terminal intersections throughout the Interstate system.

The SDDOT seeks to provide LOS C or better operating conditions along mainline sections and LOS D or better conditions at interchange ramp terminal intersections.

The traffic parameters shown in **Table 2.7** were used as the basis for the operational analyses of freeway sections and ramp terminal intersections. Traffic parameters were selected based on collected data.

Table 2.7 Traffic Parameters for Operational Analyses

Traffic Parameter	I-190	I-29		I-229	I-90		Ramp Terminal Intersections
		MRM 71-127	Other		MRM 2-67, 406-410	MRM 67-406	
Peak Hour Percentage of AADT	12%	10%	10%	12%	10%	10%	N/A
Peak Hour Directional Distribution	70%	65%	65%	70%	65%	65%	N/A
% Heavy Vehicles	10%	15%	25%	10%	15%	25%	10%
Peak Hour Factor	0.9	0.9	0.9	0.9	0.9	0.9	0.92
Free-Flow Speed ¹	55	75	75	65	75	75	n/a
Terrain/Area Type	Level	Level	Level	Level	Level	Level	Non-CBD
Cycle Length	n/a	n/a	n/a	n/a	n/a	n/a	Varies

¹ Interstate sections posted at 65 Miles Per Hour (mph) include: I-29 MRM 0-4.64 & 75.17 – 86.40; I-90 MRM 57.76-67.15 & 396.52-402.55



2.4.2 Mainline Interstate Traffic Operations

Mainline Interstate operations were analyzed for 2009, 2020 and 2030 using the growth rates and assumptions previously discussed. The project team found that the entirety of the South Dakota Interstate system operated at LOS C or better in Year 2009. Sections of I-29 and I-229 within the City of Sioux Falls are expected to reach the substandard LOS D by the Year 2020 and LOS F conditions by the Year 2030. Interstate segments through Rapid City are expected to operate at LOS C or better through the Year 2030. Many rural sections are projected to operate at LOS B or better through the Year 2030. The **Appendix** provides LOS results for mainline Interstates.

The findings of this study indicate that sections of Interstates 29 and 229 through the Sioux Falls area may require widening as early as 2020 to provide acceptable LOS. Changing growth patterns or significant new developments could place capacity pressure on other portions of the South Dakota interstate mainline.

Table 2.8 outlines the performance of substandard mainline segments into the future.

Table 2.8 Mainline Capacity Needs

Interstate	Section	Level of Service		
		2009	2020	2030
29	Exit 71 to Exit 78	B	C	D
229	Exit 1 to Exit 2	B	C	D
	Exit 2 to Exit 4	C	D	F
	Exit 4 to Exit 5	B	D	E
	Exit 5 to Exit 6	C	E	F
	Exit 6 to Exit 9	B	C	D

2.4.3 Interchange Traffic Operations

The **Appendix** provides the results for operational analyses of each of the 34 interchanges analyzed. Freeway merge and diverge sections were analyzed along with ramp terminal intersections. As expected, substandard operations occur at many of the 34 interchanges, and improvements are needed to restore acceptable LOS. Improvements range from the addition of turn lanes at ramp terminal intersections to reconstructed interchanges. **Table 2.9** highlights operational issues at each interchange and proposed measures to address these issues.



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Table 2.9 Interchange Capacity Needs

Interstate	Exit #	Operational Issue(s)	Year of Occurrence	Proposed Solution(s)
29	1	I	2020	S,T
29	2	I	2020	S
29	26	I	2020	S,T*
29	47	I	2020	S,T
29	62	OK	N/A	N
29	71	R	2030	A,D
29	77	I,R	Now	A*,D* (or reconstruction)
29	86	OK	N/A	N
29	98	OK	N/A	N
29	132	I	Now	S*,T
29	133	OK	N/A	N
29	177	I	2030	S,T
29	207	OK	N/A	N
29	232	OK	N/A	N
229	2	I,R	Now	T,A,D
229	3	I,R	Now	T,A,D
229	4	I,R	2030	T,A,D
229	5	I	Now	T
229	7	I	Now	S*,T*
229	9	I	Now	S,T
90	12	I	2030	T
90	17	I	2020	S,T (or reconstruction)
90	30	OK	N/A	N ¹
90	46	I	2030	S (or reconstruction)
90	48	I	2020	S (or reconstruction)
90	55	I	2020	S,T
90	59	I	Now	T (or reconstruction)
90	63	OK	N/A	New Diamond Interchange
90	330	I	2020	S,T
90	332	OK	N/A	N
90	387	OK	N/A	N
90	406	I	2020	S
190	1	non-standard	N/A	Reconstruction
Operational Issue Codes: I= Substandard ramp terminal intersection operations R= Substandard ramp junction (merge and/or diverge) operations OK= Acceptable Interchange Operations to Year 2030			Improvement Codes: S= Signalize ramp terminal intersection(s) T= Add intersection turn lanes to ramp terminal intersection(s) A= Add or modify acceleration lanes for on-ramp(s) D= Add or modify deceleration lane(s) for off ramp(s) N= No Improvements	
= Improvements already let or programmed to corresponding coded improvement type. For example, T means that improvements are in process to construct intersection turn lanes. 1= No operational imprvmts. are identified, but safety imprvmts. are currently underway at I-90 Exit 30				



3.0 ANALYSES OF DEFICIENT INTERCHANGES

The Geometric, Safety and Capacity analyses described in Section 2 resulted in the identification of 32 interchanges in need of improvement along the South Dakota Interstate System. **Table 3.1** lists these interchanges and the issues contributing to their need. There are no interchanges included in this list based exclusively on geometric deficiencies. It is assumed that geometric deficiencies have been captured in the analysis of crash history.

Table 3.1 Interchange Needs

SDDOT Region	Interstate	Exit #	Issues
Rapid City	90	12	Safety, Capacity
	90	17	Capacity
	90	23	Safety
	90	30	Safety
	90	40	Safety
	90	46	Capacity
	90	48	Capacity
	90	55	Capacity, Safety
	90	59	Capacity, Safety
	90	63	Capacity
	190	1	Capacity, Geometrics
Pierre	90	172	Safety
	90	235	Safety
Mitchell	29	1	Safety, Capacity
	29	2	Capacity
	29	26	Capacity
	29	47	Capacity
	29	71	Capacity
	29	77	Safety, Capacity
	229	2	Safety, Capacity
	229	3	Safety, Capacity
	229	4	Safety, Capacity
	229	5	Safety, Capacity
	229	7	Safety, Capacity
	229	9	Capacity
	90	330	Capacity
	90	332	Safety
	90	390	Safety
90	406	Capacity	
Aberdeen	29	132	Safety, Capacity
	29	177	Capacity
	29	201	Safety



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Organized by SDDOT Region, the interchange descriptions in Sections 3.1 through 3.4 provide additional information about the needs at each location including geometric, safety, and operational deficiencies. Improvements needed to address these deficiencies have been developed, and the Appendix includes conceptual drawings and cost estimates. Geometric checklists, traffic forecast and Level of Service details.

3.1 Rapid City Region

I-90 Exit 12 (Jackson Blvd)

Of the 28 total crashes during the 3-year study period, the highest occurring crash types at this interchange were 12 animal-vehicle collisions (AVCs) and 6 guardrail crashes. The majority (10 of 12) of the AVCs occurred at night in dry roadway conditions. All of the guardrail crashes occurred during icy or snowy roadway conditions with the majority (4 of 6) occurring during daylight. However, no recommendations have been made at this interchange with regard to crash experience since this interchange has an average severity rate and does not demonstrate a crash pattern in need of correction.

The geometric evaluation identified that the grade on the westbound on-ramp of 6.0% exceeds the maximum amount of 5.0%. In addition, the sag vertical curve on that ramp only provides 276' of stopping sight distance, which is considerably less than the 425' desirable length. Field observations also indicated that the sight distance for eastbound vehicles at the off-ramp intersection may be substandard. Based on information received from SDDOT Staff, unauthorized parking often occurs in the vicinity of the north ramp terminal intersection. As an initial measure, a "No parking" sign may be considered for installation here. Any reconstruction efforts at Exit 12 should also consider the presence of a culvert under I-90 northwest of the interchange. This culvert is currently used by pedestrians navigating the area.

This interchange is located in Spearfish. The ramp terminal intersections are unsignalized and all of the stop controlled movements currently operate at LOS B or better. In addition, both ramp terminals are expected to operate at LOS D or better through the Year 2020. However, by the Year 2030, it is expected that the stop controlled approach at the westbound ramp terminal will operate at LOS F with the current lane geometry. The construction of a second left turn lane on the westbound off-ramp would improve the operations at this ramp terminal to LOS D. An all-way STOP intersection would not improve operations, but signalization of this intersection would improve conditions to LOS A.

I-90 Exit 17 (US Highway 85 to Lead-Deadwood)

This interchange is located just east of Spearfish. The ramp terminal intersections are currently unsignalized and all of the stop controlled movements operate at LOS C or better. A new development named Elkhorn Ridge is being constructed in the vicinity of this interchange. As this development is constructed and nears build-out, traffic volumes at this interchange are expected to dramatically increase. Due to this increase, both ramp terminals are expected to operate at LOS F by the Year 2020 with the existing lane geometry and traffic control. In order to improve this condition, there are two options. In the first option, both ramp terminals will need to be signalized by the Year 2020 and new left and right turn lanes will need to be constructed at both ramp terminals. The addition of these new turn lanes will likely require the existing



bridges over I-90 to either be widened or reconstructed. If these improvements are constructed, the ramp terminal intersections are expected to operate at LOS B or better. In the second option, a Single-Point Urban Interchange is proposed to take the place of the existing diamond interchange. If this alternative is constructed, the ramp terminal intersection would operate at LOS B by the Year 2030.

I-90 Exit 23 (Laurel Street - Whitewood)

This interchange ranks 8th of the 126 interchanges evaluated in this study based on weighted crash rate. Of the 28 total crashes during the 3-year study period, the highest occurring crash types at this interchange were 14 AVCs and 5 rear-end crashes. The majority (10 of 14) of the wild animal crashes occurred at night in dry roadway conditions. The majority (4 of 5) of the rear-end crashes occurred during wet, icy or snowy roadway conditions. No recommendations have been made at this interchange with regard to crash experience since this interchange has an average severity rate and does not demonstrate a crash pattern in need of correction.

Geometric deficiencies at this interchange include the ramp intersection sight distance for both off-ramps. Field observations indicate that less than 425' is provided at both intersections.

I-90 Exit 30 (US Highway 14A - Sturgis)

This interchange ranks 10th of the 126 interchanges evaluated in this study based on weighted crash rate. Of the 40 total crashes during the 3-year study period, the highest occurring crash types at this interchange were 9 angle crashes and 5 overturning crashes. All of the angle crashes occurred in the vicinity of the I-90 ramp terminal intersections. All of the overturning crashes occurred in icy / slushy roadway conditions. Several of these crashes occurred along a curved portion of mainline I-90 through the interchange area. In light of this, consideration could be given to realignment of I-90 to soften the curve radii. The number and pattern of crashes at this interchange is not particularly problematic but to help reduce the number of angle type crashes at this interchange consideration could be given to changing the signal phasing to provide protected-only left turns or changing to the clearance interval length.

The geometric evaluation identified several features that do not meet current design standards at this interchange. The westbound off-ramp has a downgrade of 7.5%, which is considerably higher than the 5.0% desirable. This off-ramp also has a substandard vertical curve, with a k value of 46, resulting in a stopping sight distance of 317'. The eastbound on-ramp also has some geometric deficiencies, including a superelevation rate of 7.75%, which is higher than the 6.0% desirable amount, and a minimum radius of 553', which is less than the 833' desirable radius. To the northeast along Lazelle Street, an adjacent intersection is located on 170' from the westbound off-ramp intersection.

This interchange is located in Sturgis. Both ramp terminal intersections are currently signalized and operate at LOS B or better. Even with the growth in traffic in the future both ramp termini are expected to continue to operate at LOS B or better at least to the Year 2030. However, due to the number of roll over crashes at this interchange, a concept has been developed that reduces the horizontal curvature on I-90.



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It should be noted that a project is currently underway to reconstruct the I-90 bridges to soften the horizontal curvature of the mainline freeway. Many of the geometric and safety concerns listed here are being addressed by this project.

I-90 Exit 40 (Tilford Road - Tilford)

This interchange ranks 3rd of the 126 interchanges evaluated in this study based on weighted crash rate. Of the 32 total crashes during the 3-year study period, the highest occurring crash types at this interchange were 8 guardrail crashes, 7 AVCs and 4 angle crashes. The majority of the guardrail crashes (6 of 8) occurred in icy or snowy conditions. All of the AVCs occurred in dry conditions with most occurring at night. The majority of the angle crashes occurred in icy or snowy conditions with most occurring during the day. The one fatal crash at this interchange was an angle crash that occurred during the day in dry condition. Of the more severe crashes at this interchange, guardrail and angle, 75 percent happened in snowy or icy roadway conditions. A review of snow removal procedures at this location is recommended to determine if something needs to be done to improve roadway conditions during the winter.

The geometric evaluation of this interchange identified that the sag vertical curve on the crossroad immediately north of the bridge (not the crest curve across the bridge) is substandard, with a k value of 60 and a resulting stopping sight distance of 288', compared to the 425' desirable stopping sight distance. The intersection west of the westbound off-ramp intersection is located approximately 250' from the ramps, which is less than the 300' desirable access spacing.

I-90 Exit 44 (Deerview Road - Piedmont)

As noted on page A-4 of the Appendix, the eastbound and westbound I-90 interchange bridges over Deerview Road are functionally obsolete (low clearance) and structurally deficient, respectively. Mainline I-90 structures west of this interchange demonstrate similar conditions. In addition, SDDOT staff expressed concern regarding a fatal crash that occurred in 2008 along eastbound mainline I-90 north of the interchange. Reduced pavement skid resistance may have contributed to the crash. Pavement condition should be addressed when the structures are replaced.

I-90 Exit 46 (Elk Creek Road - Piedmont)

The most distinctive feature of this interchange is its severe crest vertical curve overpass and close accesses. Crash histories do not indicate a safety problem associated with the current design. Growing traffic, though, would trigger the need for bridge reconstruction and signalization to provide acceptable ramp terminal intersection operations by the Year 2030. A realigned diamond interchange was proposed in the 2004 *Interstate 90 Black Hawk-Sturgis Corridor Preservation Study* (Felsburg Holt & Ullevig) and would operate acceptably with a 3-lane bridge and channelized ramp approaches to intersections.

I-90 Exit 48 (Stage Stop Canyon Rd. - Piedmont)

This interchange is located northwest of Rapid City, serving a growing urban edge. Substandard operations are projected to occur at the east ramp terminal intersection by the Year 2020 and the west ramp terminal by the Year 2030, requiring signalization of both intersections and



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widening of the westbound off ramp intersection approach. Substandard access spacing adjacent to the interchange hastens the need for improvements. A single-point interchange option was recommended in the *Interstate 90 Black Hawk – Sturgis Corridor Preservation Study* and demonstrates LOS B intersection operations by the Year 2030.

I-90 Exit 55 (Deadwood Avenue - Rapid City)

Of the 31 total crashes during the 3-year study period, the highest occurring crash types at this interchange were 7 angle crashes, 6 rear-end crashes and 4 overturn crashes. The majority of the angle crashes occurred in dry daylight conditions. All of the rear-end crashes occurred during the day with most occurring in dry conditions. The majority of the overturn crashes (3 of 4) occurred in dry conditions with a 50-50 split between day and night. The one fatal crash at this interchange was an overturn crash that occurred during the day in dry conditions. However, no recommendations have been made at this interchange with regard to crash experience since the data for this interchange does not demonstrate a crash pattern in need of correction and this interchange does not have one of the higher crash rates within the state.

The downgrade for the westbound on-ramp contains a maximum grade of 5.6%, which is above the desirable rate of 5.0%. In addition, both the westbound on-ramp and off-ramp provide a sag vertical curve k value below the minimum range, resulting in substandard stopping sight distance. The crest vertical curve on the crossroad also contains a k value below the minimum range. There is a full movement truck stop access located approximately 330 feet south of the interchange. This distance meets minimum spacing criteria but does not meet the desired spacing distance of 660 feet. SDDOT staff has noted operational problems created by this close spacing.

The Deadwood Avenue interchange serves the west edge of Rapid City, and traffic operations at the ramp terminal intersections are shown to deteriorate to LOS E/F by the year 2030. The south ramp terminal, currently unsignalized with a temporary signal during peak motorcycle rally season, would need to be signalized and widened to provide acceptable operations. Deadwood Avenue across I-90 would need to be widened to 4 lanes, necessitating a significant bridge widening project. Movements at the adjacent south truck stop access should be limited to right turns only with a raised 'pork chop' style island to improve traffic safety and operations.

I-90 Exit 59 (LaCrosse Street - Rapid City)

This interchange ranks 5th of the 126 interchanges evaluated in this study based on weighted crash rate. Of the 85 total crashes during the 3-year study period, the highest occurring crash types at this interchange were 43 rear-end crashes and 31 angle crashes. It is likely that the high number of rear-end crashes is related to congestion in the vicinity of the interchange so there may be little that can be done to reduce the occurrence of this crash type. However, there may be an opportunity to reduce the number of angle type crashes at this interchange, especially if they are related to approach turn type crashes where permitted left turners pull out in front of oncoming traffic or broadside crashes where one vehicle is running the red light and striking a vehicle. Both of these crash types can be reduced with changes to the signal phasing (i.e. protected lefts) or changes to the clearance interval length.



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The downgrade for the westbound on-ramp contains a maximum grade of 5.6%, which is above the desirable rate of 5.0%. The sag vertical curve on the westbound off-ramp contains a k value below the minimum range, as well as stopping sight distance of 262', compared to the 425' minimum desired.

This interchange is located at a focal point of activity in Rapid City, straining the capacity of the current diamond interchange. The signalized ramp terminal intersections currently operate at LOS D and E during the PM peak period and are expected to worsen with future growth. Additional turn lanes at the ramp terminal intersections and widening of the LaCrosse Street bridge would improve substandard traffic operations. Providing a free eastbound to southbound right turn movement would substantially improve traffic operations though this action would require widening of LaCrosse Street south of the interchange. A Single-Point Urban Interchange would operate at LOS A/C by the Year 2030 and would serve to increase distance to adjacent accesses along LaCrosse Street. A diverging diamond concept will be investigated for Exit 59 in Phase 2 of the Decennial Interstate Corridor Study.

I-90 Exit 63 (US Highway 14-16 - Box Elder)

This interchange is located just east of Rapid City near the Town of Box Elder. Both ramp terminal intersections are currently unsignalized and all of the stop controlled movements operate at LOS B or better. Even with the growth in traffic in the future, both ramp termini are expected to operate at LOS C or better through the Year 2030. However, since this interchange in currently only a partial diamond, there is a desire to construct a full diamond interchange at this location. Two full diamond interchange concepts have been developed for this location. If a full diamond is constructed here, the ramp terminal intersections are expected to continue to operate at LOS C or better through the Year 2030.

I-190 Exit 1 (Silver Street - Rapid City)

This interchange is located in Rapid City. The layout of this interchange is an unconventional split diamond with ramps coming on and off of I-190 at various locations. In addition, the northbound ramp terminal intersection currently has 5 legs. Currently, all stop controlled approaches at the two ramp terminal intersections on Silver and North Streets operate at LOS A. With the growth in traffic in the future, these two intersections are expected to operate at LOS B or better through at least the Year 2030. However, due to the unconventional layout of the existing interchange and northbound ramp terminal intersection there is a desire to standardize the layout of the interchange. Three concepts have been developed in order to do this. The first alternative replaces the existing 5 legged stop controlled northbound ramp terminal with a 5 legged roundabout. This proposed roundabout is expected to operate at LOS A or better in the Year 2030. The second alternative removes the grade separation of I-190 with Silver and North Streets and in its place constructs a signalized intersection. This alternative would remove the majority of the existing ramps and with the proposed lane geometry is expected to operate at LOS C in the Year 2030. The third alternative also removes the grade separation of I-190 with Silver and North Streets but in its place constructs a two lane 5 legged roundabout. This alternative would also remove the majority of the existing ramps and is expected to operate at LOS A in the Year 2030.



3.2 *Pierre Region*

I-90 Exit 172 (Stamford Road - Stamford)

This interchange ranks 6th based on weighted crash rate. Even with a low total number of crashes, this interchange is in the top ten due to the one fatal crash that occurred during the study period. The highest occurring crash type at this interchange was overturn crashes, one of which was fatal. The fatal crash occurred during the day in icy conditions. No recommendations have been made at this interchange with regard to crash experience since the data for this interchange does not demonstrate a crash pattern in need of correction. There are so few crashes and the majority of the rates are below the averages for the entire state.

The geometric evaluation determined that the sag vertical curve on the crossroad has k value of 19, which is well below the minimum desirable amount. An adjacent intersection is located approximately 120' to the north of the westbound ramp intersection.

I-90 Exit 235 (SD Highway 273 - Kennebec)

Based on weighted crash rate, this interchange ranks 7th of the 126 interchanges evaluated in this study. This interchange ranks in the top ten due to the more severe crashes that occurred during the study period. Of the 5 total crashes during the 3-year study period, the highest occurring crash types at this interchange were 3 overturn crashes, of which one was fatal. The fatal crash occurred during the night in icy conditions. No recommendations have been made at this interchange with regard to crash experience since the data for this interchange do not demonstrate a crash pattern in need of correction.

An existing driveway is located approximately 235' north of the westbound ramp intersection, which is closer than the 300' minimum desirable distance.

3.3 *Mitchell Region*

I-29 Exit 1 (Dakota Dunes Boulevard - Sioux City)

Of the 28 total crashes during the 3-year study period, the highest occurring crash types at this interchange were 13 animal-vehicle collisions (AVCs) and 5 angle crashes. The majority (10 of 13) of the wild animal crashes occurred at night in dry roadway conditions. The majority (3 of 5) of the angle crashes occurred during the day in dry roadway conditions. However, no recommendations have been made at this interchange with regard to crash experience since this interchange is near the average weighted crash rate and does not demonstrate a crash pattern in need of correction.

The primary substandard geometric element at this interchange is the minimum radius of the loop ramps located in the northwest and southeast quadrants of the interchange. The 330' radius provided on these loop ramps is less than the 883' desirable radius, although the smaller radius does not appear to contribute to the high number of crashes at this interchange.

This interchange is currently a Parclo A. The unsignalized southbound ramp terminal intersection is expected to operate at LOS F in the AM peak period by 2020. The signalized northbound ramp terminal intersection is expected to operate at LOS E and F during the AM



and PM peak periods by 2030. The addition of a second northbound right turn lane at the northbound ramp terminal intersection is recommended. Traffic signalization is also recommended at the southbound ramp terminal intersection and at the intersection of Dakota Dunes Boulevard with Sioux Point Road.

The NB off-ramp diverge is expected to operate at LOS F in the AM peak period by 2020. It is recommended that an additional lane be added to the NB off-ramp.

I-29 Exit 2 (SD Highway 105 River Drive - North Sioux City)

This diamond interchange has a traffic signal at the northbound ramp terminal and the southbound ramp terminal is unsignalized. The southbound ramp terminal is expected to operate at LOS F in both the AM and PM peak periods by 2030. Signalization and the addition of a southbound right-turn lane would improve traffic operations. Another improvement option would be conversion to one-lane roundabouts at both the northbound and southbound ramp terminals.

I-29 Exit 26 (SD Highway 50 - Vermillion/Yankton)

The existing diamond interchange is unsignalized and the northbound ramp terminal intersection is expected to operate at LOS F by 2030. SDDOT has plans to improve the intersection to add eastbound and northbound left turn lanes. By 2020, traffic signalization is recommended at the northbound ramp terminal intersection.

I-29 Exit 47 (SD Highway 46 - Beresford/Irene)

This existing diamond interchange is unsignalized at both ramp terminals. Both the northbound and southbound ramp terminal intersections are expected to operate at LOS E or F in both peak periods by 2020. Signalization and the addition of northbound and southbound left-turn lanes would improve traffic operations. Another improvement option would be conversion to one-lane roundabouts at both the northbound and southbound ramp terminals.

I-29 Exit 71 (SD Highway 110 - Harrisburg/Tea)

This existing diamond interchange is unsignalized at both ramp terminals. The SB off-ramp diverge and SB on-ramp merge are expected to operate at LOS D in the PM peak period by 2030. It is recommended that the deceleration lane be extended to a minimum of 800' for the SB off-ramp, and the acceleration lane be lengthened to a minimum of 800' for the SB on-ramp.

I-29 Exit 77 (41st Street - Sioux Falls)

This interchange ranks 2nd of the 126 interchanges evaluated in this study in weighted crash rate, primarily due to the high number of total crashes that occurred at this interchange. Between 2006 and 2009. Of the 174 total crashes during the 3-year study period, the most frequent crash types at this interchange were 95 rear-end crashes and 56 angle crashes. It is likely that the high number of rear-end crashes is related to congestion on I-29 and the off-ramps. An alternative interchange configuration may help reduce the occurrence of rear-end crashes. There may also be an opportunity to reduce the number of angle type crashes at this interchange, especially if they are related to approach turn type crashes where permitted left turners pull out in front of oncoming traffic or broadside crashes where one vehicle is running



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the red light and striking a vehicle. Both of these crash types can be reduced with changes to the signal phasing (i.e. protected lefts) or changes to the clearance interval length.

There are a few geometric deficiencies at this interchange that may contribute to some of the crash types experienced. The southbound on-ramp taper rate is only 29:1, compared to the minimum rate of 50:1. This ramp also provides substandard stopping sight distance, although it is associated with a sag vertical curve. The adjacent intersections are also located close to the interchange ramps. To the east, South Carolyn Avenue is approximately 200' away, which is closer than the minimum of 300' identified as acceptable and 600' desirable. To the west, South Meadow Avenue is located a little further away at approximately 400', but is still relatively close given the volume of traffic on 41st Street.

The 41st Street interchange is a signalized diamond and currently operates at LOS E in the AM peak period and LOS F in the PM peak at both ramp terminals. By 2020 and 2030, operations are expected to be LOS F. The limited ROW and close spacing of adjacent intersections and driveways present a number of operational and safety problems along the 41st Street corridor. Lane additions to the existing diamond would not be sufficient to improve operations to LOS D. The limited ROW at the interchange prevents the addition of loop ramps at the interchange. Two improvement concepts have been developed for the interchange; a Single Point Urban Interchange, and a Diverging Diamond.

At this interchange the NB off-ramp diverge, and NB and SB on-ramp merges are expected to operate at a LOS D or worse by 2020. By 2030 the SB on-ramp is expected to operate at LOS F. It is recommended that an additional lane be added on the mainline for the SB off-ramp, SB on-ramp and NB on-ramp. Also, an additional lane is recommended for the SB on-ramp. For the NB off-ramp it is recommended that the deceleration lane be extended to a minimum of 1275'.

I-229 Exit 2 (Western Avenue - Sioux Falls)

Of the 63 total crashes during the 3-year study period, the highest occurring crash types at this interchange were 32 rear-end crashes and 12 angle crashes. It is likely that the high number of these crash types is related to congestion in the vicinity of the interchange and the off-ramps. The total number of each of these types is not particularly unusual for an interchange located within an urban area. Therefore, no recommendations are made for safety improvements at this interchange.

A variety of geometric deficiencies were identified at this interchange, mostly dealing with substandard k values and stopping sight distance for sag vertical curves. Every ramp at the interchange had values below the minimum desired levels. The crossroad to the north also has a substandard k value and stopping sight distance for the sag vertical curve. It was also observed that the sight distance provided at the ramp intersections is below the 425' acceptable distance.

The Western Avenue interchange is a signalized diamond and currently operates at LOS F at both ramp terminals in the PM peak period. By 2020 the westbound ramp terminal is also expected to operate at LOS F in the AM peak period. The addition of turn lanes at both of the ramp terminal intersections and the addition of a third southbound through lane at the



northbound ramp terminal is recommended to improve traffic operations. Another improvement option would be conversion to a Single Point Urban Interchange.

The EB on-ramp merge is expected to operate at LOS D in the AM peak period by 2030. It is recommended that an additional EB and WB lane be added to the mainline, creating three basic lanes through the system.

I-229 Exit 3 (Minnesota Avenue - Sioux Falls)

Of the 78 total crashes during the 3-year study period, the highest occurring crash types at this interchange were 35 rear-end crashes and 18 angle crashes. It is likely that the high number of these crash types is related to congestion in the vicinity of the interchange and the off-ramps. In addition, the total number of each of these types is not particularly unusual for an interchange located within an urban area. Therefore, no recommendations are made for safety improvements at this interchange.

Deficient geometric conditions at this interchange include a low k value of 76 for the westbound on-ramp. Adjacent access points on both sides of the interchange are located within the 300' minimum spacing. Only 160' is provided on the north side of the interchange, and 200' is provided on the south side.

The Minnesota Avenue interchange is a signalized diamond and is expected to operate at LOS E or F at both ramp terminals by 2020. By 2030 both of the ramp terminal intersections are expected to operate at LOS F in both peak periods. In 2007, an Interchange Justification Report was completed for this interchange. The study recommended the construction of a northbound to westbound loop ramp in the northeast quadrant of the interchange. In order to accommodate the loop ramp, the westbound off ramp would also be relocated approximately 300' further north. This westbound off-ramp would also align with a proposed extension of 49th Street, from Western Avenue to Minnesota Avenue. The southbound to westbound on-ramp would also be reconstructed to provide more distance on the mainline from the new loop ramp. This proposed concept was estimated to cost \$5.6 million.

The EB on-ramp merge is expected to operate at LOS D in the PM peak period by 2030. The WB on-ramp merge and WB off-ramp diverge are expected to operate at LOS D and F in the AM peak periods by 2030. It is recommended that an additional EB and WB lane be added to the mainline, creating three basic lanes in both directions.

I-229 Exit 4 (Cliff Avenue - Sioux Falls)

Of the 72 total crashes during the 3-year study period, the highest occurring crash types at this interchange were 31 rear-end crashes and 13 angle crashes. It is likely that the high number of these crash types is related to congestion in the vicinity of the interchange and the off-ramps. In addition, the total number of each of these types is not particularly unusual for an interchange located within an urban area. Therefore, no recommendations are made for safety improvements at this interchange.



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The intersections adjacent to the interchange ramps are located approximately 200' north and 150' south of the ramp intersections.

The Cliff Avenue interchange is a modified signalized diamond with the westbound off-ramp terminal forming an intersection via a direct connection with 41st Street. The westbound on-ramp is located to the south of the 41st Street / westbound off-ramp intersection and is unsignalized. The 41st Street / westbound off-ramp intersection is expected to operate at LOS E in the PM peak period by 2030. The addition of an eastbound left-turn lane and another westbound right-turn lane at the 41st Street / westbound off-ramp intersection is recommended to improve traffic operations.

The EB on-ramp merge is expected to operate at LOS D in the PM peak period by 2030. The WB on-ramp merge is expected to operate at LOS D in the AM peak periods by 2030. It is recommended that an additional EB and WB lane be added to the mainline, creating three basic lanes in both directions.

I-229 Exit 5 (26th Street - Sioux Falls)

This interchange ranks 4th of the 126 interchanges evaluated in this study based on weighted crash rate. Of the 103 total crashes during the 3-year study period, the highest occurring crash types at this interchange were 51 rear-end crashes, 18 angle crashes and 7 highway traffic sign post crashes. It is likely that the high number of rear-end and angle crash types are related to congestion in the vicinity of the interchange and the off-ramps. In addition, the total number of each of these types is not particularly unusual for an interchange located within an urban area. A pattern emerges from the data related to the highway traffic sign post crashes since the majority of these crashes occurred in poor roadway conditions on the northbound I-229 on-ramp. In order to reduce the number of this crash type, the highway traffic sign should be relocated or warning signs should be placed on the ramp to encourage motorists to slow down during slick conditions.

A number of the geometrics at this interchange are substandard, associated with the unconventional configuration. The 26th Street to northbound I-229 on-ramp provides a curve with a radius of 205', which is below the desirable radius of 231' for a loop ramp. The configuration of the southbound off and on-ramps also provide substandard radii, although they do intersect perpendicularly with South Yeager Road. The k values for the southbound on-ramp are also below the desirable levels. Stopping sight distance for the southbound on and off-ramps are both below the distance required for 50 mph design. A driveway is located only 260' east of the northbound on and off-ramp intersection with 26th Street.

The 26th Street interchange is a signalized folded diamond for the northbound ramps and provides unconventional access to South Yeager Road for the southbound ramps. The northbound ramp terminal intersection currently operates at LOS E in the AM peak period and the southbound ramp intersection currently operates at LOS E in the PM peak period. By 2020, all of the ramp terminal Intersections are expected to operate at LOS E or F in both the AM and PM peak periods. The addition of turn lanes at the ramp terminal intersections and the intersection of 26th Street with Yeager Road is recommended to improve traffic operations. The City has proposed the construction of a folded diamond interchange for the southbound ramps,



which would also include the removal of Yeager Street. The cross section of 26th Street, through the interchange area would also be widened to provide left turn lanes at the ramp intersections.

Another improvement option would be conversion to an offset Single Point Urban Interchange, which would also address the substandard loop ramp geometrics for the northbound on-ramp and permit Yeager Street to remain in service.

I-229 Exit 7 (Rice Street - Sioux Falls)

Of the 46 total crashes during the 3-year study period, the most frequent crash types at this interchange were 9 guardrail crashes, 7 AVCs and 7 angle crashes. It is likely that the high number of these crash types is related to congestion or slick road conditions in the vicinity of the interchange so there may be little that can be done to reduce the occurrence of these crash types. In addition, the total number of each of these types is not particularly unusual for an interchange located within an urban area. No recommendations are made for safety improvements at this interchange.

The Rice Street interchange is a folded diamond. The southbound ramp terminal intersection is unsignalized and currently operates at LOS F in the PM peak period. By 2020, both of the ramp terminal intersections are expected to operate at LOS E or F in both the AM and PM peak periods. SDDOT has designed a new signal for the southbound ramp terminal with additional turn lanes. At the signalized northbound ramp terminal intersection, other additional turn lanes are recommended.

I-229 Exit 9 (Benson Road - Sioux Falls)

The Benson Road diamond interchange has a traffic signal at the northbound ramp terminal and the southbound ramp terminal is unsignalized. The southbound ramp terminal currently operates at LOS F. By 2030, both of the ramp terminal intersections are expected to operate at LOS F in both the AM and PM peak periods. At the southbound ramp terminal intersection, signalization and the addition of turn lanes would improve traffic operations. At the northbound ramp terminal, the addition of an exclusive northbound right turn lane is recommended by 2030.

I-90 Exit 330 (Ohlman Street (I-90B) - Mitchell/Huron)

The existing diamond interchange is unsignalized. By 2030 in the PM peak hour, the eastbound ramp terminal intersection is expected to operate at LOS E and the westbound ramp terminal is expected to operate at LOS F. Signalization at both of the ramp terminal intersections and the addition of a westbound left-turn lane is recommended to improve traffic operations.

I-90 Exit 332 (SD Highway 37 - Mitchell / Parkston)

Of the 43 total crashes during the 3-year study period, the highest occurring crash types at this interchange were 16 angle crashes and 15 rear-end crashes. The majority of the angle and rear-end crashes occurred in dry daylight conditions and are likely due to high traffic volumes. It is possible that the number of angle crashes could be reduced by changing the phasing (i.e. protected-only left turns) or lengthening the clearance intervals at the ramp terminals. The crash



experience is not particularly problematic given the low number of total crashes and the relatively minor severity of most of the crashes.

I-90 Exit 390 (SD Highway 38 - Hartford)

Based on weighted crash rate, this interchange ranks 9th of the study interchanges. Of the 29 total crashes during the 3-year study period, the highest occurring crash types at this interchange were 6 guardrail crashes and 5 sideswipe-same direction crashes. Half of the guardrail crashes occurred in snowy / icy roadway conditions with most occurring during the day. Nearly all of the sideswipe-same direction crashes occurred during the day in dry conditions. However, no recommendations have been made at this interchange with regard to crash experience since the data for this interchange do not demonstrate a crash pattern in need of correction.

The geometric evaluation identified that the stopping sight distance of 407' for the eastbound on-ramp is slightly below the minimum value of 425'. It is unlikely that this minor reduction in sight distance has contributed to the crash history at this interchange.

I-90 Exit 406 (SD Highway 11 - Brandon/Corson)

The existing diamond interchange is unsignalized and only provides a two-lane bridge with no left-turn lanes. By 2030 the eastbound ramp terminal is expected to operate at LOS F in both peak periods and the westbound ramp terminal intersection is expected to operate at LOS F in the AM peak period. Signalization at both of the ramp terminal intersections and the addition of left-turn lanes on each approach is recommended to improve traffic operations. Another improvement option would be conversion to a Single Point Urban Interchange.

3.4 Aberdeen Region

I-29 Exit 132 (US Highway 14 - Brookings)

Of the 27 total crashes during the 3-year study period, the highest occurring crash types at this interchange were 7 angle crashes and 6 rear-end crashes. The one fatal crash at this interchange was an angle crash that occurred during the day on a wet surface. However, no recommendations have been made at this interchange with regard to crash experience since this interchange has a relatively low weighted crash rate and there is no correctable pattern evident based on a review of the crash data.

This existing diamond interchange is unsignalized at both ramp terminals. US 14 has a four-lane divided cross section in this location with exclusive eastbound and westbound left-turn lanes. Both the northbound and southbound ramp terminal intersections currently operate at LOS E or F in both peak periods. By 2020 and 2030, operations are expected to be LOS F. Signalization at both of the ramp terminal intersections and the addition of northbound and southbound left-turn lanes is recommended to improve traffic operations.

Information provided by SDDOT Staff indicates that the ramp terminal intersections are planned for signalization by the Year 2010.



I-29 Exit 177 (US Highway 212 - Watertown)

This existing diamond interchange is unsignalized at both ramp terminals. US 212 has a four-lane divided cross section in this location with exclusive eastbound and westbound left-turn lanes. The northbound ramp terminal intersection is expected to operate at LOS F in the PM peak periods by 2020. Signalization and the addition of a northbound left-turn lane would improve traffic operations at the northbound ramp terminal intersection.

I-29 Exit 201 (SD Highway 8 - Twin Brooks)

This interchange ranks 1st of the 126 interchanges evaluated in this study based on weighted crash rate, primarily due to the high number of severe crashes occurring at this interchange and the relatively low traffic volume. Of the 11 total crashes during the 3-year study period, the highest occurring crash types at this interchange were 4 bridge rail / guardrail crashes and 2 angle crashes. Half of the bridge / guard rail crashes occurred in icy conditions while the other half occurred in dry conditions and 3 of the 4 occurred either in dark or dawn lighting conditions. The one fatal crash at this interchange was an angle crash that occurred during the day on a wet roadway surface. However, no safety enhancement recommendations are made at this interchange since there are a low number of crashes so there is no correctable pattern evident based on a review of the crash data.



4.0 SUMMARY OF INTERSTATE IMPROVEMENTS

As discussed in the Introduction, the focus of this study is to:

- ▶ Ensure a mainline Level of Service (LOS) of C or better throughout the Interstate System,
- ▶ Ensure an interchange LOS of D or better for all interchanges throughout the Interstate System, and
- ▶ Identify areas not in compliance with current Interstate design standards.

The evaluation of geometric, safety and operational conditions throughout the South Dakota Interstate system resulted in a list of mainline freeway sections and interchanges where improvements are needed to reach compliance with the study goals. This section provides that list and conceptualizes the improvements needed.

4.1 *List of Mainline Interstate Improvements*

As discussed in Section 2.4.2, a number of mainline Interstate segments would need to be widened in the future to accommodate traffic growth. It is recommended that Interstate 29 between Exit 75 and Exit 79 be widened from 4 to 6 lanes. Widening is also recommended along I-229 between I-29 and Exit 6. **Table 4.1** outlines the recommended mainline widening efforts through the Year 2030.

Table 4.1 Recommended Interstate Widening Projects

Interstate	Section	Level of Service		
		Current Lanes	Widen to	Year
29	Exit 71 to Exit 77	4	6	2030
	Exit 77 to Exit 78	6	8	2030
229	Exit 1 to Exit 2	6	8	2030
	Exit 2 to Exit 3	6	8	2020
	Exit 3 to Exit 4	6	8	2020
	Exit 4 to Exit 5	6	8	2020
	Exit 5 to Exit 6	4	6	2020
	Exit 5 to Exit 6	6	8	2030
	Exit 6 to Exit 9	6	8	2030



4.2 List of Interchange Improvements

Table 4.2 List of Deficient Interchanges and Improvement Alternatives

Interstate	Exit	Proposed Solution(s)
29	1	Signalize southbound off-ramp terminal and Sioux Point Road Intersection
29	2	Add turn lanes
29	26	Either signalize southbound ramp terminal and provide additional turn lanes or construct a roundabout
29	47	Signalize northbound ramp terminal and provide additional turn lanes
29	71	No capacity improvements identified
29	77	Single Point w/ triple lefts or Diverging Diamond
29	132	Signalize ramp terminals and provide additional turn lanes
29	177	Signalize northbound ramp terminal and provide additional turn lanes
29	201	No safety improvements identified
90	12	Widen westbound off-ramp to accommodate second left turn lane
90	17	Either signalize ramp terminals and provide additional turn lanes or construct a Single-Point Urban Interchange
90	23	No safety improvements identified
90	30	No capacity improvements, realign mainline I-90
90	40	No physical improvements, enhance snow removal
90	46	Reconstruct realigned diamond interchange east of existing and signalize terminals
90	48	Reconstruct diamond with signalization; consider single-point option
90	55	Permanently signalize south ramp terminal and widen bridge to accommodate turn lanes at intersections
90	59	Widen bridge and ramps to improve operations; consider reconstructing interchange as a Single-Point Urban Interchange
90	63	New Diamond Interchange per Box Elder Transportation Plan
90	172	No safety improvements identified
90	235	No safety improvements identified
90	330	Signalize both ramp terminals and add turn lanes to improve operations
90	332	No improvements identified
90	390	No improvements identified
90	406	Widen bridge and ramps to improve operations; consider reconstructing interchange as a Single-Point Urban Interchange
190	1	In order to bring this interchange closer to standard, options include roundabouts or an at grade signalized intersection that removes the need for an interchange
229	2	Widen bridge and ramps to improve operations; consider reconstructing interchange as a Single-Point Urban Interchange
229	3	Widen Minnesota Ave and Ramps to improve operations; consider reconstructing interchange as a Single-Point Urban Interchange
229	4	Provide additional turn lanes to improve operations
229	5	Consider reconstructing interchange as an offset Single-Point Urban Interchange
229	7	Signalize the west ramp terminal adding turn lanes, reconstruct east terminal to provide additional capacity
229	9	Signalize the west ramp terminal and add turn lanes to improve operations



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Interchanges demonstrating substandard geometric, safety, and operating characteristics were identified in the previous sections. **Table 4.2** provides a listing of these 32 interchanges demonstrating safety or operational issues. Based on the evaluations in Section 3.1, the 32 interchanges listed in were reduced to 24 interchanges where improvements are recommended.

Preliminary design concepts have been prepared for each of the interchange improvements listed in **Table 4.2**. These concepts, shown in the **Appendix**, provide solutions to geometric, operational, and safety issues. Multiple alternatives are provided at several of the interchanges.

A statement of probable construction costs was developed for each interchange improvement identified in Phase 1 as well as freeway widening projects. **Tables 4.3** through **4.5** summarize those probable construction costs. The costs shown are based on conceptual design for budgetary purposes. The cost estimate calculations are provided in the **Appendix**.

Table 4.3 Rapid City Region - Summary of Probable Construction Costs

Interchange	Proposed Improvement	Probable Construction Cost
Interstate 90		
Exit 12	Add turn lane-widen bridge	\$50,000
	Signalize north intersection	\$125,000
Exit 17	Diamond	\$4.6 Million
	Single-Point	\$18.6 Million
Exit 30	Realign mainline I-90	\$19.8 Million
Exit 46	Reconstructed Diamond	\$8.7 Million
Exit 48	Single-Point	\$12.0 Million
	Relocated Diamond	\$8.1 Million
Exit 55	Bridge widening	\$4.2 Million
Exit 59	Diamond	\$7.2 Million
	Single-Point	\$14.5 Million
Exit 63	Diamond	\$8.7 Million
	Flyover	\$13.2 Million
Interstate 190		
Exit 1	2-lane roundabout	\$3.2 Million
	1-lane roundabout	\$1.3 Million
	Signal	\$1.6 Million



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Table 4.4 Mitchell Region - Summary of Probable Construction Costs

Interchange	Proposed Improvement	Probable Construction Cost
Interstate 29		
I-29 Widening	Additional travel lane in each direction: Exit 75-77 and Exit 78-79	\$56 Million ¹
Exit 1	Add turn lane & Signals	\$410,000
Exit 2	Signal/relocate Fr. Rd.	\$860,000
	Roundabout/relocate Fr. Rd.	\$700,000
Exit 26	Reconstruct NB Ramps/signal	\$1.3 Million
Exit 47	Add turn lanes & Signals	\$470,000
	Add roundabouts	\$560,000
Exit 77	Single-Point	\$9.9 Million
	Diverging Diamond/exist bridge	\$2.5 Million
	Diverging Diamond w/new bridge	\$11.5 Million
Interstate 90		
Exit 330	Add turn lanes & Signals	\$470,000
Exit 406	Reconstruct Crossroad/add Signals	\$5.9 Million
	Single-Point	\$9.3 Million
Interstate 229		
I-229 Freeway Widening	Additional travel lane in each direction: I-29 to Exit 5, two more lanes Exit 5 to Exit 6	\$72 Million ¹
Exit 2	Add turn lane & re-stripe	\$60,000
	Single-Point	\$12.6 Million
Exit 4	Add turn lanes	\$240,000
Exit 5	Offset Single-Point	\$8.8 Million
Exit 7	Crossroad & Ramp Improvement/add Signal	\$1.2 Million
Exit 9	Add turn lanes & Signal	\$350,000

¹ Assumed conceptual estimated cost of Interstate widening is \$4 Million per mile per lane. This assumption is based on cost estimates developed for freeway widening projects in the 2004 *Interstate 90 Black Hawk – Sturgis Corridor Preservation Study* (Felsburg Holt & Ullevig). Estimated costs did not include Right-of-way. Actual costs would vary widely based on local conditions.

Table 4.5 Aberdeen Region - Summary of Probable Construction Costs

Interchange	Proposed Improvement	Probable Construction Cost
Interstate 29		
Exit 132	Add turn lanes & Signals	\$470,000
Exit 177	Add turn lane & Signal	\$240,000



APPENDIX

Contents by SDDOT Region:

Rapid City Region: pp. A-3 through A-96

Pierre Region: pp. A-97 through A-106

Mitchell Region: pp. A-107 through A-276

Aberdeen Region: pp. A-277 through A-313

Summary table of mainline Interstate performance, including:

- ▶ Mainline geometrics
- ▶ Year 2009, 2020 and 2030 daily volumes and Levels of Service (LOS)
- ▶ Summary of structurally deficient and functionally obsolete Bridges

Summary table of interchange performance, including:

- ▶ Interchange geometrics
- ▶ Crash Information
- ▶ Year 2009, 2020 and 2030 Interchange LOS (where analyzed)

Detailed information for deficient interchanges only, including:

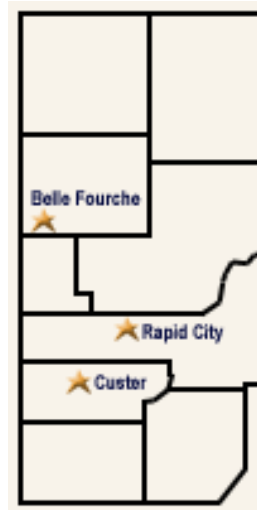
- ▶ Concept(s) drawn for improvements
- ▶ Conceptual Cost Estimate(s)
- ▶ Geometric checklist
- ▶ Year 2009, 2020 and 2030 peak hour volumes and LOS

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South Dakota Decennial Interstate Corridor Study

PHASE ONE REPORT



RAPID CITY REGION

Interstate 90, MRM 0.00 to MRM 130.30

Interstate 190, MRM 0.00 to MRM 2.03

Total Interchanges: 38

Studied Interchanges: 28

<u>Deficient Interchanges (10):</u>	<u>Page</u>
I-90 Exit 12	A-9
I-90 Exit 17	A-17
I-90 Exit 30	A-27
I-90 Exit 40	A-35
I-90 Exit 46	A-37
I-90 Exit 48	A-45
I-90 Exit 55	A-55
I-90 Exit 59	A-63
I-90 Exit 63	A-73
I-190 Exit 1	A-83

**Summary of Mainline Segment Geometric Performance
Rapid City Region**

	Lane Width (12 ft min.)	Right Shldr. Width (10 ft min.)	Left Shldr. Width (4 ft min.)	Design Speed (65 mph min.)	Max. Degree of Curve (2° 15' max.)	Clear Zone (30 ft min.)	Inslope (6:1 min.)	Superelevation Rate (6% max.)	Paved Section Width (38 ft min.)	Bridge Section Width (38 ft min./40 ft des.)	Vertical Clearance (16 ft min.)	Maximum Grade (3% level/4% rolling)	Minimum Grade (0.3% min/0.5 des.)
I-90													
MP 0-10	12	10	4	70	2° 00'	> 30	6:1	5.7	38	40	n/a	2.06	0.33%
MP 10-14	12	10	4	65	3° 00'	3:1	6:1	6.0%	38	38	16' 0"	3.00%	0.30%
MP 14-20	12	10	4	70	1° 30'	> 30	6:1	5.0%	38	38	16' 6"	1.94%	0.20%
MP 20-28	12	10	4	75	2° 00'	> 30	5:1	6.0%	38	38	17' 0"	3.39%	0.40%
MP 28-38	12	10	4	65	2° 30'	> 30	5:1	5.6%	38	40	16' 7"	3.72%	0.00%
MP 38-44	12	10	4		1° 00'	> 30	6:1		38	n/a	17' 4"	3.63%	0.38%
MP 44-53	12	10	4	75	2° 00'	3:1	6:1	6.0%	38	n/a	15' 10"	4.00%	0.00%
MP 53-64	12	10	6	65	2° 30'	> 30	5:1	6.9%	40	30	16' 5"	4.00%	0.00%
MP 64-69	12	10	4	75	2° 00'	> 30	5:1	6.0%	38	30	16' 6"	2.43%	0.20%
MP 76-95	12	10	6	65	1° 30'	> 30	5:1	4.2%	40	30	17' 2"	2.99%	0.00%
MP 95-102	12	10	4	65	2° 00'	> 30	5:1	5.0%	38	30	18' 0"	4.00%	0.00%
MP 102-112	12	10	4	75	2° 15'	> 30	6:1	6.0%	38	38	16' 0"	4.89%	0.13%
MP 112-125	12	10	4	70	2° 06'	> 30	6:1	5.7%	38	40	17' 1"	2.44%	0.00%
MP 125-133	12	10	4		2° 00'	> 30	6:1		38	n/a	15' 9"	3.06%	0.26%
I-190													
MP 0-1													
MP 1-2													

LEGEND:

- Existing Value does not meet standard criteria
- Mainline section recently reconstructed

**Summary of Mainline Segments, Traffic Volumes and Levels of Service
Rapid City Region**

I-90 Exits:	Current Lanes	Existing		2020		2030	
		AADT	LOS	AADT	LOS	AADT	LOS
0 to 2	4	5,670	A	7,427	A	9,300	A
2 to 8	4	5,690	A	7,108	A	8,556	A
8 to 10	4	8,400	A	10,493	A	12,631	A
10 to 12	4	8,820	A	11,018	A	13,263	A
12 to 14	4	17,720	A	22,136	B	26,646	B
14 to 17	4	13,380	A	17,525	A	21,945	A
17 to 23	4	11,590	A	15,181	A	19,009	A
23 to 30	4	11,590	A	14,364	A	17,177	A
30 to 32	4	8,930	A	11,068	A	13,235	A
32 to 34	4	16,320	A	18,051	A	19,634	A
34 to 37	4	16,320	A	18,051	A	19,634	A
37 to 40	4	15,290	A	16,912	A	18,395	A
40 to 44	4	15,250	A	16,868	A	18,346	A
44 to 46	4	18,150	A	22,495	B	26,900	B
46 to 48	4	19,940	A	24,713	B	29,553	B
48 to 51	4	20,350	A	25,221	B	30,160	B
51 to 55	4	22,200	B	27,825	B	33,586	B
55 to 57	4	28,740	B	32,302	B	35,606	C
57 to 58	4	32,380	B	36,393	C	40,115	C
58 to 59	4	30,880	B	34,707	B	38,257	C
59 to 60	4	26,570	B	29,863	B	32,917	C
60 to 61	4	25,940	B	29,155	B	32,137	C
61 to 63	4	22,670	B	28,414	B	34,297	C
63 to 67	4	16,850	A	21,119	A	25,492	B
67 to 78	4	8,950	A	11,218	A	13,540	A
78 to 84	4	7,380	A	9,250	A	11,165	A
84 to 88	4	7,150	A	8,962	A	10,817	A
88 to 90	4	7,180	A	8,999	A	10,863	A
90 to 98	4	7,290	A	9,137	A	11,029	A
98 to 101	4	7,450	A	9,338	A	11,271	A
101 to 107	4	7,400	A	9,275	A	11,195	A
107 to 109	4	7,500	A	9,400	A	11,347	A
109 to 110	4	7,080	A	8,874	A	10,711	A
110 to 112	4	7,290	A	9,137	A	11,029	A
112 to 116	4	7,400	A	9,275	A	11,195	A
116 to 121	4	6,020	A	7,545	A	9,108	A
121 to 127	4	5,240	A	5,518	A	5,761	A
127 to 131	4	5,420	A	5,708	A	5,959	A
I-190 Exits:							
I-90 to 1	4	17,670	B	19,860	B	21,891	C

Structurally Deficient and Functionally Obsolete Mainline Structure Summary - Rapid City Region

I-90 MRM 0 to 130.3	Number of Bridges	Length	Existing Deck Out-to-Out Width	Existing Area	Unit Price	Removal Cost	Proposed Deck Clear Roadway Width	Proposed Area	Unit Price	Bridge Cost
Highway 34 at MRM 30.28 (Functionally Obsolete-NARROW)	2	182	34	12,485	\$9	\$112,367	40	14,560	\$100	\$1,456,000
I-90 / BH National Cemetery Road at MRM 34.81 (EB - Functionally Obsolete)	1	119	44	5,272	\$9	\$47,445	40	4,760	\$100	\$476,000
Elk Creek at MRM 42.81 (WB - Functionally Obsolete/EB - Structurally Deficient)	2	140	34	9,604	\$9	\$86,436	40	11,200	\$100	\$1,120,000
Little Elk Creek at MRM 44.10 (WB - Functionally Obsolete/EB - Structurally Deficient)	2	129	34	8,849	\$9	\$79,645	40	10,320	\$100	\$1,032,000
WB I-90 over Deerview Road at MRM 44.66 (Structurally Deficient)	1	160	34	5,488	\$9	\$49,392	40	6,400	\$100	\$640,000
EB I-90 over Deerview Road at MRM 44.66 (Functionally Obsolete-LOW CLEARANCE)	1	160	34	5,440	\$9	\$48,960	40	6,400	\$100	\$640,000
I-90 over North Maple Avenue at MRM 58.80 (Functionally Obsolete)	2	119	44	10,543	\$9	\$94,891	40	9,520	\$100	\$952,000
Eastbound I-90 over DM&E Spur MRM 65.76 (Functionally Obsolete-NARROW)	2	162	35	11,264	\$9	\$101,373	40	12,984	\$100	\$1,298,400
I-90 over 151st Ave at MRM 68.15 (Functionally Obsolete-NARROW)	2	164	34	11,250	\$9	\$101,254	40	13,120	\$100	\$1,312,000
I-90 over 169th Ave at MRM 86.23 (Functionally Obsolete-NARROW)	2	164	34	11,250	\$9	\$101,254	40	13,120	\$100	\$1,312,000
I-90 over 173rd Ave at MRM 90.25 (Functionally Obsolete-NARROW)	2	158	34	10,639	\$9	\$97,549	40	12,640	\$100	\$1,264,000
I-90 WB over 175th Ave at MRM 92.23 (Functionally Obsolete)	1	86	44	3,810	\$9	\$34,288	40	3,440	\$100	\$344,000
I-90 over Bull Creek at MRM 101.4 (Functionally Obsolete-NARROW)	2	189	34	12,931	\$9	\$116,380	40	15,080	\$100	\$1,508,000
1-190 MRM 0 to 2.03										
Silver Street at MRM 0.43 NB (Functionally Obsolete-LOW CLEARANCE)	1	394	34	13,514	\$9	\$121,628	40	15,760	\$100	\$1,576,000
Silver Street at MRM 0.43 SB (Functionally Obsolete-LOW CLEARANCE)	1	421	34	14,440	\$9	\$129,963	40	16,840	\$100	\$1,684,000

RAPID CITY REGION

I-90	Location	Geometric Performance														Crashes, 2006-2009						2009/2020/2030 Level of Service										
		Max. Superelevation Rates (6%)	Min. Radius (833 ft)	Max. Degree of Curve (Standard - 6° 53' / Loop - 24° 48')	Clear Zone (30 ft)	Max. Grade on Ramp (5%)	Min. Lane Width (15 ft)	Min. Right Shldr. Width (8 ft)	Min. Left Shldr. Width (2 ft)	Inslope (6:1)	Min. Off-Ramp Taper (20:1)	Min. On Ramp Taper (50:1)	Min. Ramp K Values (84/96)	Min. Ramp Stopping Sight Distance (425 ft)	Min. Ramp Intersection Sight Distance (425 ft)	Min. Cross Road k Values (84/96)	Min. Cross Road Sight Distance (425 ft)	Max. Cross Road Grade (7%)	Min. Control of Access (300 ft min./660 ft des.)	Fatalities	Injury	PDO	Total	Wgtd. Total	Wgtd. Rate	State Rank by Rate	EB / NB Diverge	EB / NB Merge	WB / SB Diverge	WB / SB Merge	EB / NB Ramp Terminal	WB / SB Ramp Terminal
Exit 2	McNenny Fish Hatchery	4.2%	1910'	3° 00'	> 30'	3.4%	14.0'	2.0'	2.0'	6:1	40	61	213	898	> 425	n/a	>425	2.2%	250'	0	1	9	10	12	1.80	15	Not evaluated due to interchange screening method					
Exit 12	Jackson Blvd.	5.4%	1910'	3° 00'	> 30'	6.0%	15.0'	2.0'	2.0'	6:1	30	52	52	276	sub	120	520	6.0%	360'	0	4	24	28	36	1.48	25	A/A/A	B/B/B	A/B/B	A/A/A	b/b/c	b/b/f
Exit 17	Lead/Deadwood	5.9%	955'	6°	> 30'	5.0%	13.0'	3.0'	2.0'	6:1	40	61	93	490	> 425	500	1039	4.5%	200'	0	4	13	17	25	1.31	34	B/B/C	A/B/B	A/A/B	A/B/B	a/ff/f	c/ff
Exit 23	Whitewood	5.0%	1910'	3° 00'	> 30'	4.1%	12.0'	2.0'	0.0'	4:1	39	61	104	479	sub	40	238	2.8%	500'	0	5	24	29	39	2.36	8	Not evaluated due to interchange screening method					
Exit 30	Lazelle Street	7.7%	573'	10°	> 30'	7.5%	15.0'	2.0'	2.0'	4:1	40	50	46	317	> 425	107	497	3.4%	171'	0	12	28	40	64	2.34	10	A/A/B	B/B/B	A/A/A	A/A/A	B/B/B	A/A/B
Exit 34	BH National Cemetery	3.5%	2865'	2°	> 30'	3.4%	13.0'	3.0'	2.0'	4:1	39	60	100	509	sub	17	188	6.0%	80'	1	2	17	20	35	1.77	18	Not evaluated due to interchange screening method					
Exit 37	Pleasant Valley Road	5.0%	1432'	4°	> 30'	5.6%	13.0'	4.0'	3.0'	4:1	36	58	70	331	sub	25	178	6.3%	> 660'	0	8	8	16	32	1.76	19						
Exit 40	Tilford Road	4.2%	1910'	3° 00'	> 30'	2.1%	15.0'	4.0'	3.0'	4:1	40	61	198	> 425	> 425	60	288	6.0%	250'	1	8	23	32	59	3.40	3						
Exit 44	Piedmont	3.8%	310'		< 30"		15.0'	3.0'	2.0'	3:1	17	21	40	318	> 425	27	165	7.9%	50'	1	4	12	16	24	1.78	16						
Exit 46	Elk Creek Road		310'		< 30"		15.0'	4.0'	2.0'	3:1	17	21		sub						0	5	15	20	30	1.17	39	B/B/B	B/B/B	B/B/C	B/B/B	b/b/e	b/c/f
Exit 48	Stage Stop Canyon Rd.		310'		< 30"	3.9%	15.0'	3.0'	3.0'	3:1	17	21	110	412		59	393	3.03	80'	0	5	14	19	29	1.02	46	B/B/C	B/B/C	B/C/D	B/B/C	b/c/c	c/ff
Exit 55	Deadwood Avenue	2.0%		n/a	> 30'	5.6%	12.0'	8.0'	2.0'	4:1			46	246	> 425	56	460	3.8%	330'	1	12	18	31	66	1.39	30	B/B/B	B/C/C	B/C/D	B/B/C	f/ff/f	B/C/E
Exit 59	LaCrosse Street	2.0%		n/a	> 30'	5.6%	15.0'	2.0'	2.0'	4:1			49	262	> 425			6.0%	250'	0	31	54	85	147	2.49	4	B/C/C	B/B/C	B/B/B	B/B/B	E/E/E	D/D/E
Exit 63	Box Elder/Ellsworth AFB Commercial	5.0%	955'	6°	< 30"	4.0%	15.0'	2.0'	2.0'	6:1		58	93	414	n/a	n/a	n/a	n/a	n/a	1	9	15	25	54	1.33	33	B/B/B	-/-	-/-	B/B/B	b/b/c	b/b/b
Exit 78	New Underwood		1432'		< 30"	4.8%	13.0'	2.0'	2.0'	4:1	29	29	61	310	sub	114	514	5.5%	> 660'	0	3	4	7	13	1.22	36	Not evaluated due to interchange screening method					
Exit 84	167th Avenue		1432'		< 30"	4.0%	13.0'	2.0'	1.0'	4:1	29	29	65	318	> 425	89	400	4.0%	> 660'	0	0	1	1	1	0.12	119						
Exit 88	171st Avenue	5.0%	1763'	3° 15'	< 30"	2.6%	15.0'	1.0'	2.0'	4:1	29	29	113	486	> 425	140	550	4.0%	> 660'	0	0	6	6	6	0.76	60						
Exit 90	173rd Avenue		1432'		< 30"	4.9%	15.0'	1.0'	1.0'	4:1	29	29	106	628	> 425	82	655	2.3%	> 660'	0	0	3	3	3	0.37	99						
Exit 98	Wasta	6.0%	409'	14°	> 30'	3.7%	15.0'	5.0'	3.0'	4:1	41	51	54	447	> 425	111	1017	0.9%	> 660'	0	2	6	8	12	1.36	32						
Exit 101	Jensen Road	6.0%	409'	14°	> 30'	3.4%	17.0'	3.0'	4.0'	4:1	41	62	149	788	> 425	177	470	6.0%	> 660'	0	0	4	4	4	0.49	85						
Exit 107	Cedar Butte Road	6.0%	819'	7°	> 30'	4.1%	15.0'	3.0'	2.0'	6:1	40	61	98	439	> 425	167	603	4.0%	> 660'	0	1	2	3	5	0.60	74						
Exit 109	Wall	4.4%	1910'	3° 00'	> 30'	2.4%	15.0'	4.0'	2.0'	6:1	40	61	149	449	> 425	125	399	3.0%	250'	0	3	6	9	15	1.53	23						
Exit 110	Wall / Badlands Loop	5.9%	955'	6°	> 30'	2.4%	15.0'	4.0'	2.0'	6:1	40	56	90	443	> 425	46	350	3.2%	250'	1	1	4	6	19	1.39	29						
Exit 112	Philip/Pierre	6.0%	200'	28.65°	> 30'	2.6%	12.0'	4.0'	2.0'	6:1	40	61	294	597	n/a	n/a	n/a	n/a	n/a	0	1	3	4	6	0.64	68						
Exit 116	239th Street	5.0%	1910'	3° 00'	> 30'	3.7%	15.0'	4.0'	3.0'	6:1	40	61	149	603	> 425	268	1793	2.5%	> 660'	0	0	1	1	1	0.13	118						
Exit 121	Big Foot Road	6.0%	1910'	3° 00'	> 30'	2.6%	16.0'	3.0'	1.0'	6:1	40	61	149	579	> 425	225	811	2.3%	> 660'	0	0	2	2	2	0.32	102						
Exit 127	County Road 23A	5.4%	1910'	3° 00'	> 30'	2.8%	15.0'	3.0'	3.0'	6:1	40	60	138	539	> 425	240	1267	3.0%	> 660'	0	0	2	2	2	0.34	101						
I-190																																
Exit 1	North Street/Silver Street																			0	2	11	13	17	0.49	83	N/A	A/B/B	A/A/B	N/A	a/b/b	a/b/b

Legend

Existing value does not meet standard criteria
Information not available or easily discernable from plans

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I-90 EXIT 12 JACKSON BOULEVARD



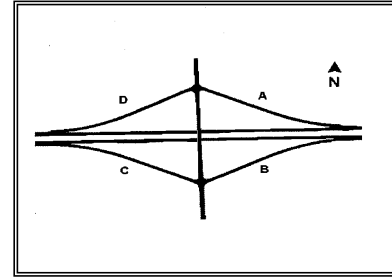
Figure 1
I-90 Exit 12 - W Jackson Boulevard, Spearfish
Additional Turning Lane

**Probable Construction Costs
Exit 12 - Added Left Turn Lane**

<i>Item Description</i>	<i>Quantity</i>	<i>Unit</i>	<i>Unit Cost</i>	<i>Total Cost</i>
Mobilization	1	LUMP SUM	\$153,000.00	\$153,000
Traffic Control	1	LUMP SUM	\$305,000.00	\$305,000
Clearing	1	LUMP SUM	\$61,000.00	\$61,000
Removal of Concrete Pavement	-	SQ. YD.	\$3.88	\$0
Removal of Asphalt Pavement	-	SQ. YD.	\$7.39	\$0
Remove Bridge	3,072	SQ. FT.	\$9.00	\$27,648
Borrow, Unclassified Excavation	564	CU. YD.	\$5.30	\$2,991
Base Course	249	TON	\$10.64	\$2,653
Asphalt Composite	249	TON	\$80.91	\$20,177
PCC Pavement 11" (mainline)	-	SQ. YD.	\$33.12	\$0
PCC Pavement 8" (ramps)	-	SQ. YD.	\$43.40	\$0
Concrete Approach Slab	6,400	SQ. YD.	\$188.34	\$1,205,389
Bridges	17,920	SQ. FT.	\$100.00	\$1,792,000
Guard Rail	0	LF	\$100.00	\$0
Permanent Signing/Markings	1	LUMP SUM	\$90,000.00	\$90,000
Traffic Signal	0	EACH	\$125,000.00	\$0
Roadway Lighting	1	LUMP SUM	\$60,000.00	\$60,000
Drainage (18" RCP)	30	LF	\$24.53	<u>\$736</u>
Subtotal				\$3,720,000
Contingencies	25%			<u>\$930,000</u>
Total Probable Construction Costs				\$4,650,000
Engineering, Administration	15%			\$697,500
Total Project Costs				\$5,350,000

INTERCHANGE GEOMETRICS CHECKLIST
SDDOT Interstate Corridor Study

Interstate: I-90
Interchange: Exit 12 (Jackson Blvd.)
Analyst: BDW
Date: 8/26/2009

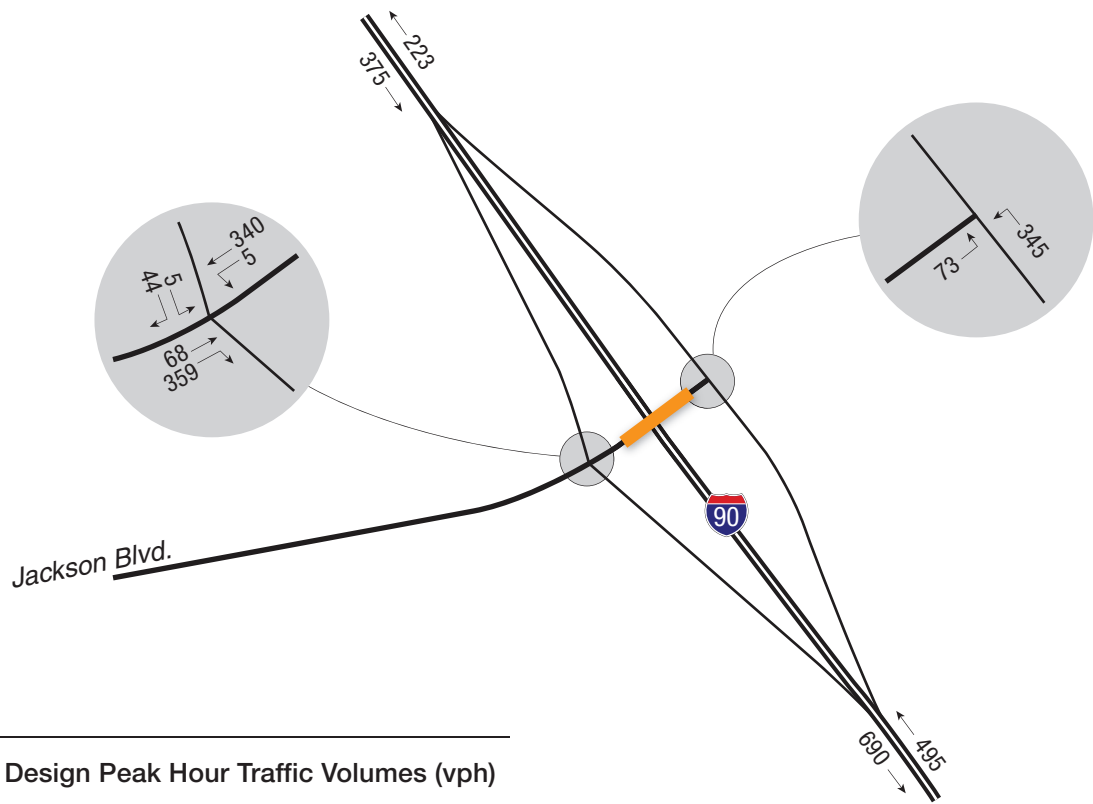


Interchange Geometry	Criteria	A	B	C	D	Achieved?
Interchange Type (Diamond, Full/Partial Cloverleaf, Trumpet etc.)	Diamond					
Design Speed	50 mph**					
Number of Lanes						
Right Turn Storage Length						
Left Turn Storage Length						
Superelevation (e max)	6%	4.9%	5.4%	4.2%	4.2%	
Minimum Horizontal Radius for e max of 6% (50 mph / 30 mph)	833 / 231 feet	1910'	1910'	1910'	1910'	
Maximum Degree of Curvature (50 mph / 30 mph)	6° 53' / 24° 48'	3°	3°	3°	3°	
Minimum Clear Zone From the Edge of Travel Lane	30 feet	> 30	> 30	> 30	> 30	
Maximum Grade on Ramp (Ascending)	+3% to +5%	0.9%	3.3%	5.0%	n/a	
Maximum Grade on Ramp (Descending)	-3% to -5%	-3.3%	n/a	n/a	-6.0%	Supports Impr.
Minimum Lane Width						
With Auxiliary Lanes	12 feet					
As Single Lane	15 feet (19 for loops)	15	15	15	15	
Shoulder Width						
Right Shoulder	8 feet (4 for loops)	4	2	2	4	Supports Impr.
Left Shoulder	2 feet	2	2	2	2	
Inslope	6:1	6:1	6:1	6:1	6:1	
Minimum Off-Ramp Taper Rate	20:1	38	n/a	30	n/a	
Minimum On-Ramp Taper Rate	50:1	n/a	61	n/a	52	
Ramp Features						
K-Value Ranges						
Minimum for a Crest Vertical Curve (50 mph / 30 mph)	84 / 19	n/a	n/a	n/a	n/a	
Minimum for a Sag Vertical Curve (50 mph / 30 mph)	96 / 37	132	214	174	52	Supports Impr.
Minimum Stopping Sight Distance (50 mph / 30 mph)	425 / 200 feet	626'	990'	1200'	276'	Supports Impr.
Cross Road Features						
K-Value Ranges						
Minimum for a Crest Vertical Curve (50 mph / 30 mph)	84 / 19		125			
Minimum for a Sag Vertical Curve (50 mph / 30 mph)	96 / 37		120			
Minimum Stopping Sight Distance (50 mph / 30 mph)	425 / 200 feet		520'			
Ramp Intersection Sight Distance (ISD) (50 mph / 30 mph)***	425 / 200 feet	ok	n/a	substandard	n/a	
Maximum Longitudinal Grade - Rolling Terrain (Urban Arterial)	7%		6.0%			
Minimum Longitudinal Grade (Min. / Des.)	0.3% / 0.5%		2.0%			
Minimum Control of Access from Interchange Ramps (Min. / Des.)	300 / 660 feet		360			Supports Impr.

** Loop ramp design speed = 30 mph
 ***Substandard Intersection Sight Distance locations could not be determined from the interchange plans. Substandard locations, therefore, are intersections that demonstrate sight distance limitations based on a general field evaluation or the presence of a substandard k-value or Stopping Sight Distance along the crossroad approaching the intersection.

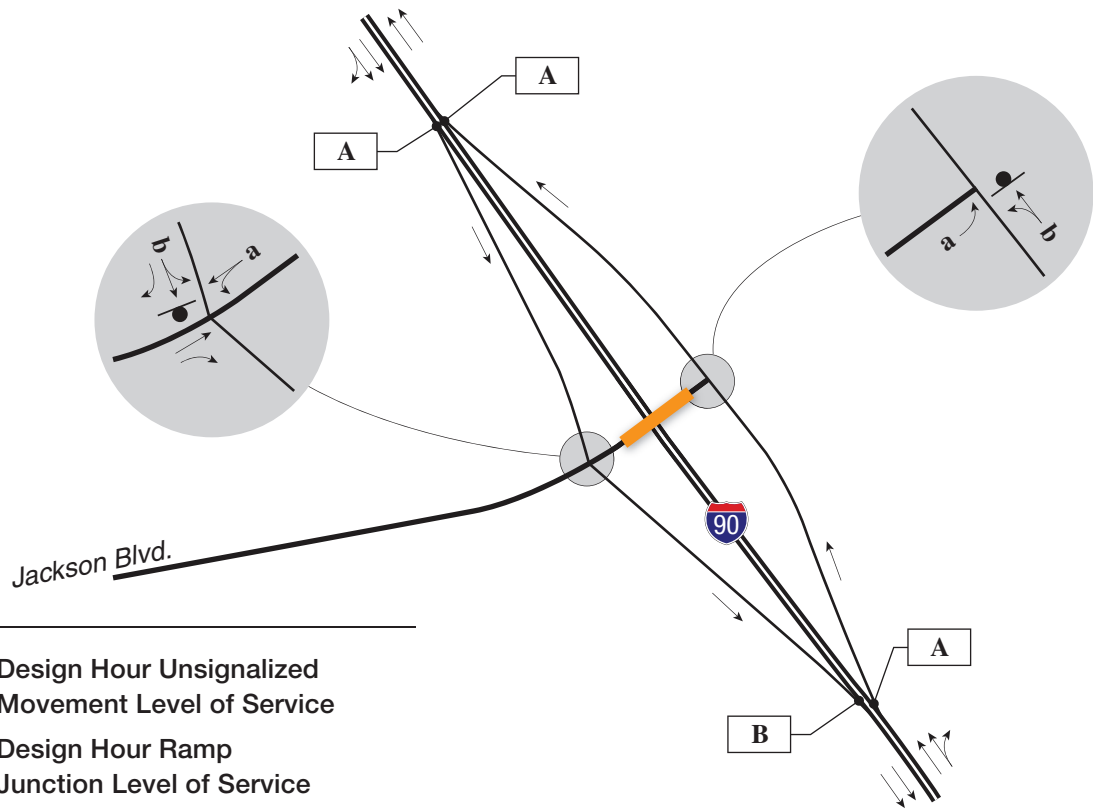
Comments

Bridge K value tight. Ramp A and C sight distance substandard



LEGEND

XXX = Design Peak Hour Traffic Volumes (vph)

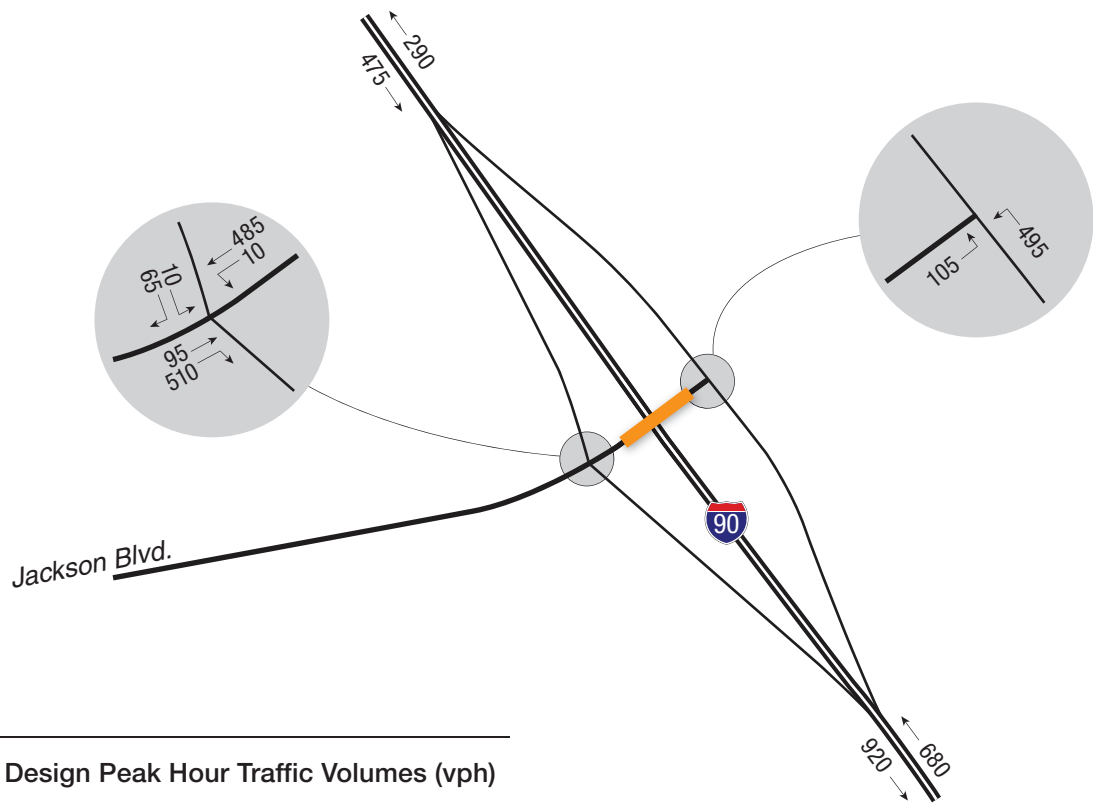


LEGEND

- x = Design Hour Unsignalized Movement Level of Service
- X = Design Hour Ramp Junction Level of Service
- = Stop Sign
- ↔ = Travel Lanes

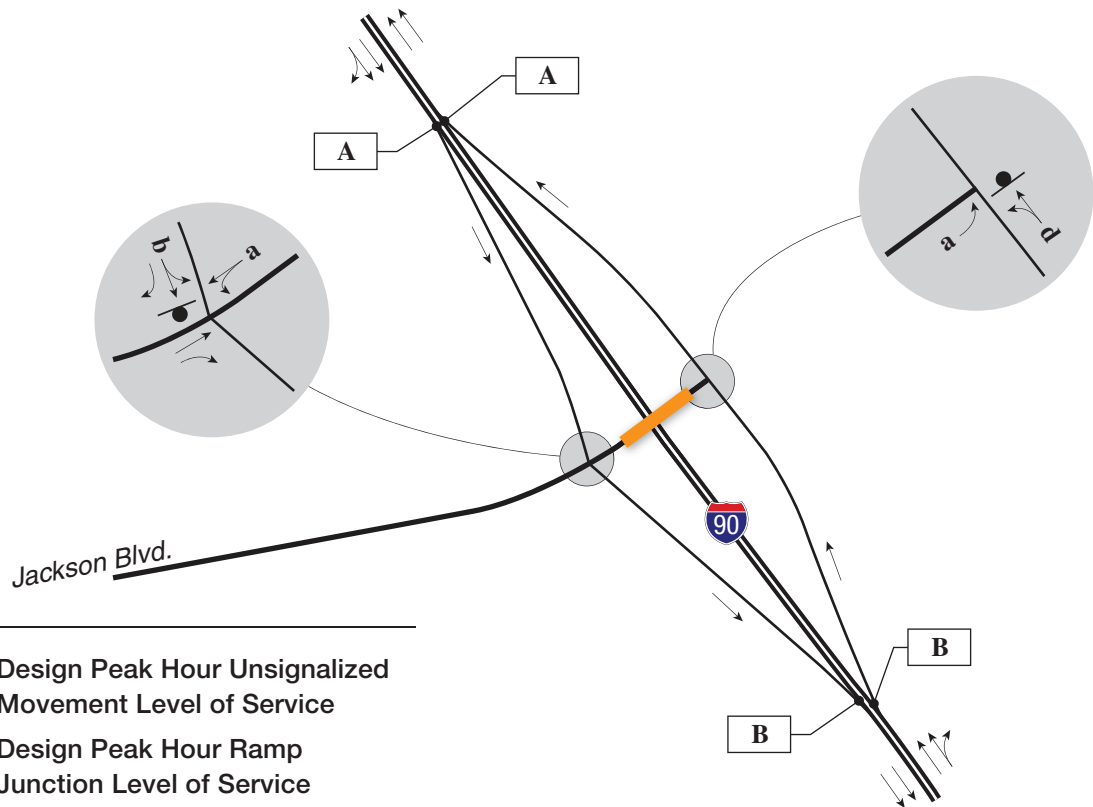
Interstate 90 Exit 12
Traffic Conditions Year 2009

NORTH



LEGEND

XXX = Design Peak Hour Traffic Volumes (vph)



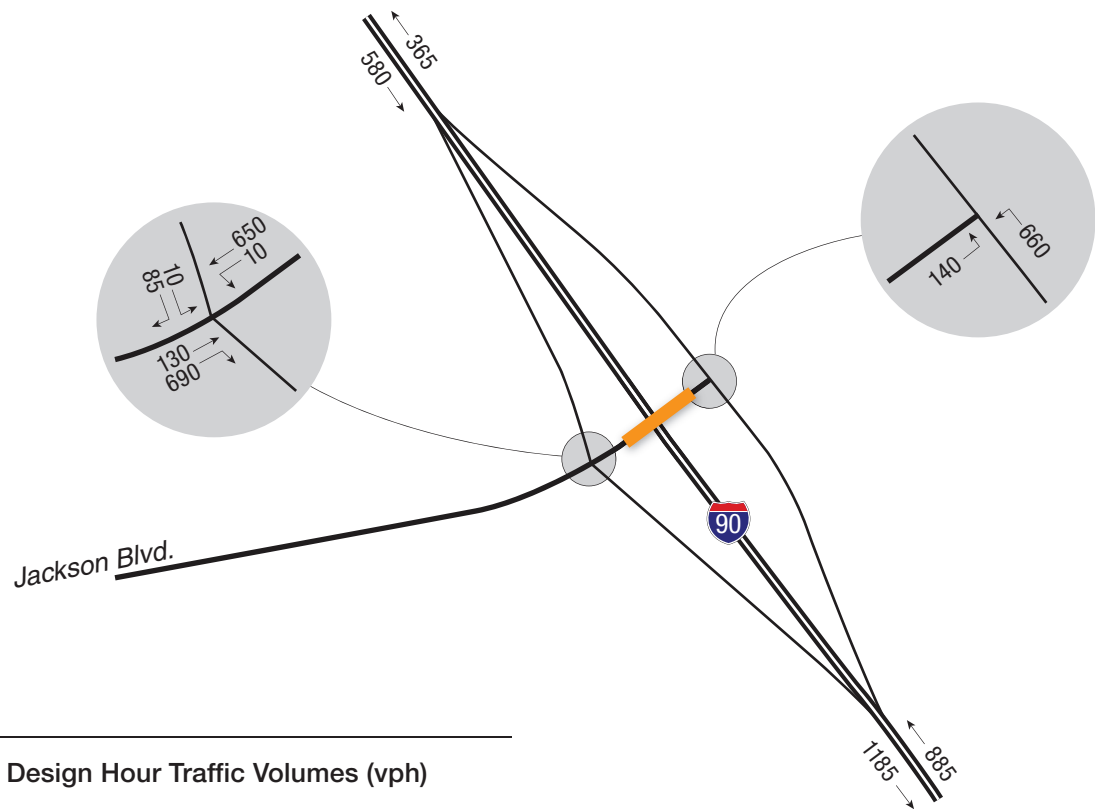
LEGEND

- x = Design Peak Hour Unsignalized Movement Level of Service
- X = Design Peak Hour Ramp Junction Level of Service
- = Stop Sign
- ↔ = Travel Lanes

Interstate 90 Exit 12
Traffic Conditions Year 2020

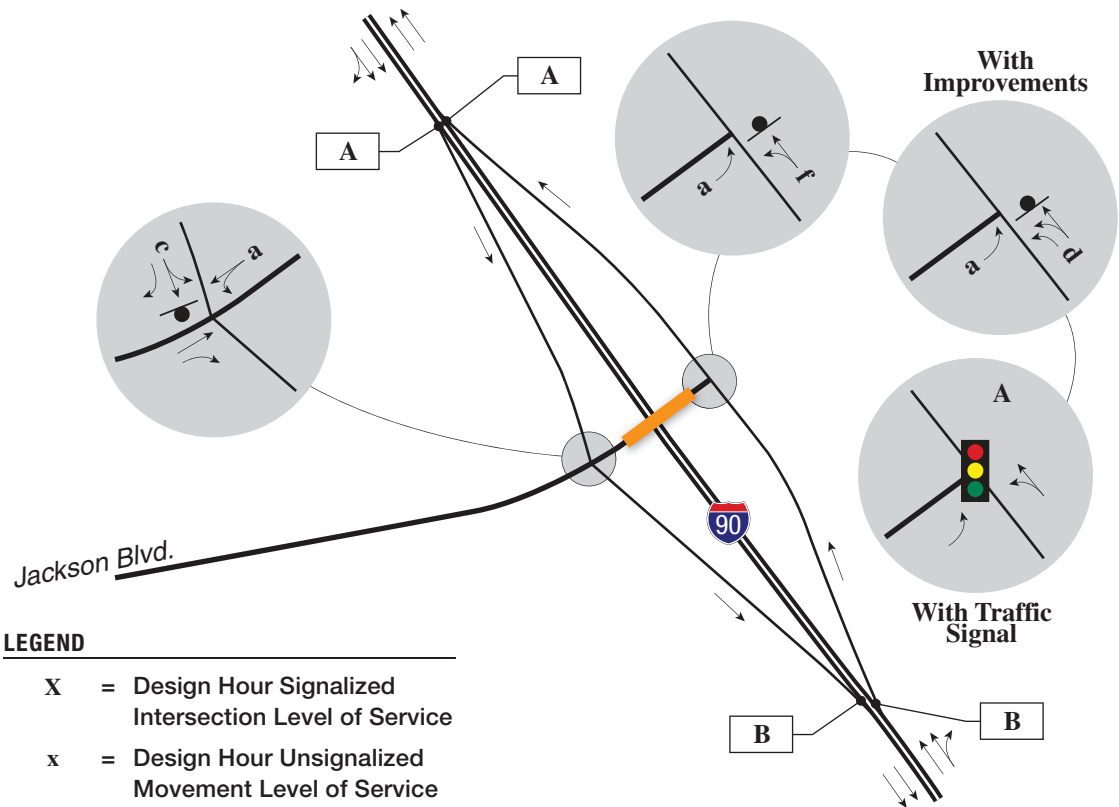
NORTH







LEGEND

XXX = Design Hour Traffic Volumes (vph)



LEGEND

- X = Design Hour Signalized Intersection Level of Service
- x = Design Hour Unsignalized Movement Level of Service
- X = Design Hour Ramp Junction Level of Service
-  = Traffic Signal
-  = Travel Lanes

Interstate 90 Exit 12
Traffic Conditions Year 2030

NORTH

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I-90 EXIT 17 LEAD / DEADWOOD

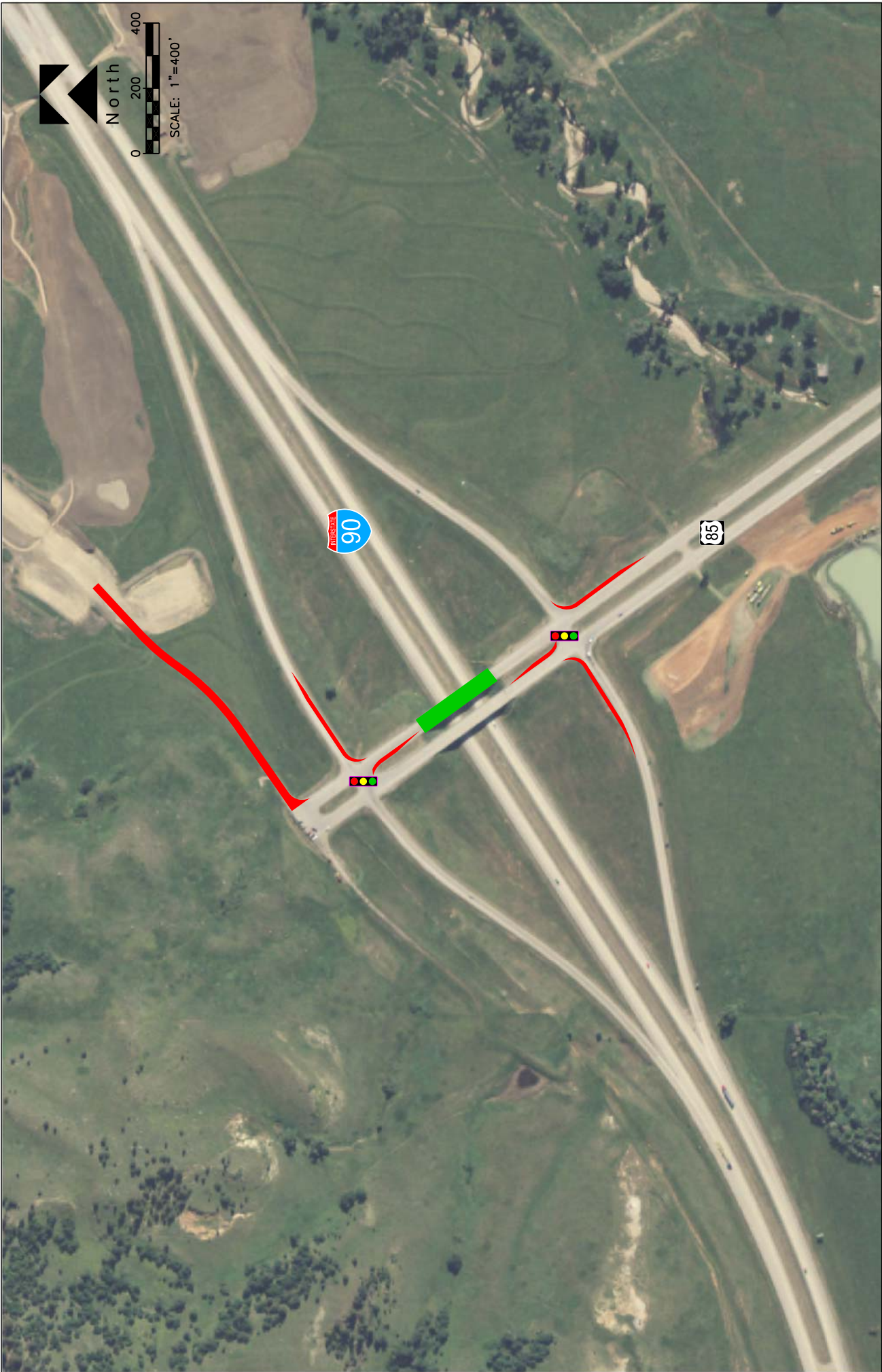


Figure 1
 I-90 Exit 17 - Lead/Deadwood
 New Turn Lanes & Signals

**Probable Construction Costs
Exit 17 - Turning Lanes**

<i>Item Description</i>	<i>Quantity</i>	<i>Unit</i>	<i>Unit Cost</i>	<i>Total Cost</i>
Mobilization	1	LUMP SUM	\$122,000.00	\$122,000
Traffic Control	1	LUMP SUM	\$243,000.00	\$243,000
Clearing	1	LUMP SUM	\$49,000.00	\$49,000
Removal of Concrete Pavement	-	SQ. YD.	\$3.88	\$0
Removal of Asphalt Pavement	-	SQ. YD.	\$7.39	\$0
Remove Bridge	9,864	SQ. FT.	\$9.00	\$88,776
Borrow, Unclassified Excavation	5,092	CU. YD.	\$5.30	\$26,996
Base Course	943	TON	\$10.64	\$10,029
Asphalt Composite	2,512	TON	\$80.91	\$203,252
PCC Pavement 11" (mainline)	-	SQ. YD.	\$33.12	\$0
PCC Pavement 8" (ramps)	-	SQ. YD.	\$43.40	\$0
Concrete Approach Slab	3,600	SQ. YD.	\$188.34	\$678,031
Bridges	14,248	SQ. FT.	\$100.00	\$1,424,800
Guard Rail	0	LF	\$100.00	\$0
Permanent Signing/Markings	1	LUMP SUM	\$70,000.00	\$70,000
Traffic Signal	2	EACH	\$125,000.00	\$250,000
Roadway Lighting	1	LUMP SUM	\$50,000.00	\$50,000
Drainage (18" RCP)	60	LF	\$24.53	<u>\$1,472</u>
Subtotal				\$3,220,000
Contingencies	25%			<u>\$805,000</u>
Total Probable Construction Costs				\$4,030,000
Engineering, Administration	15%			\$604,500
Total Project Costs				\$4,630,000

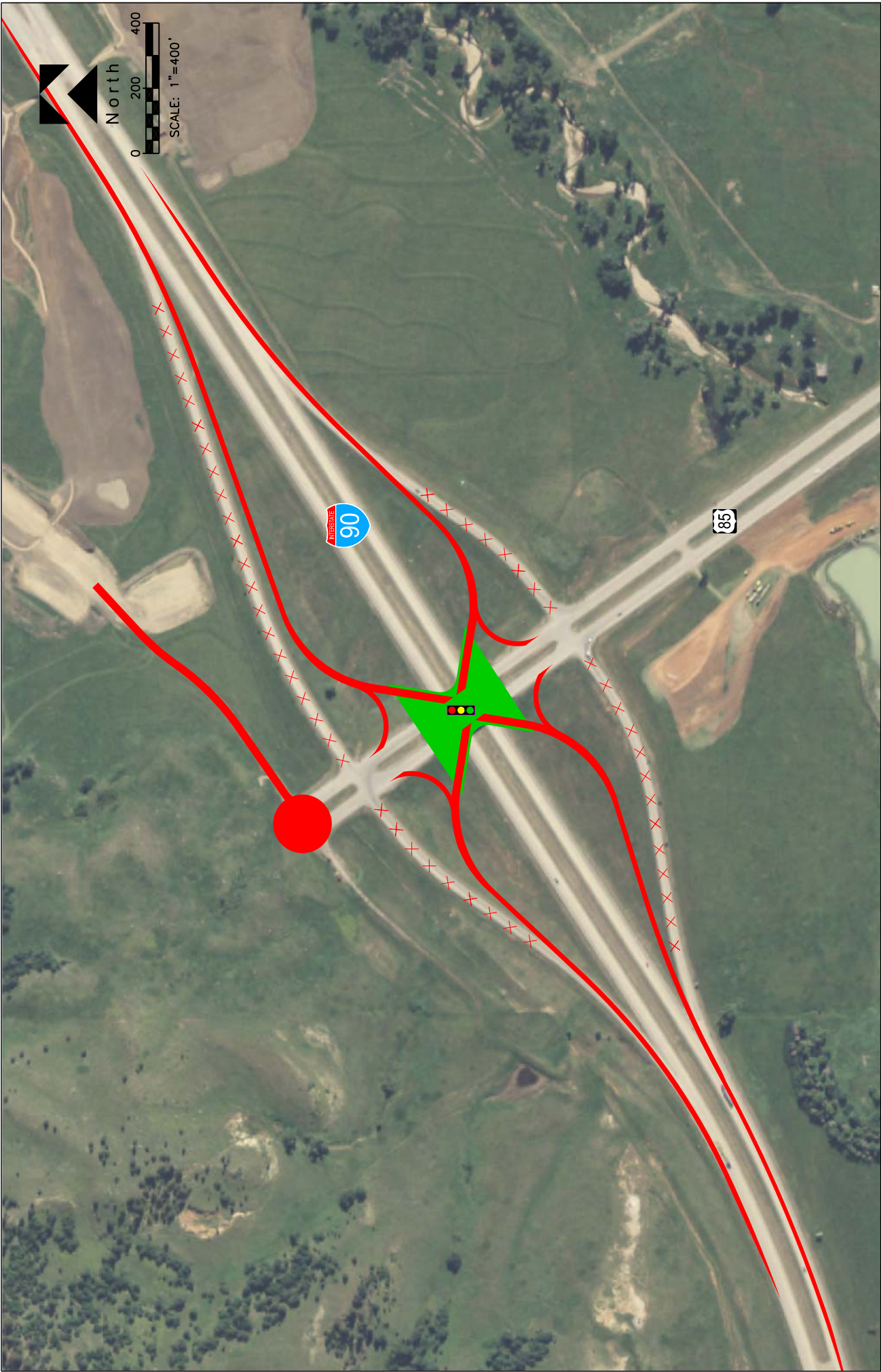


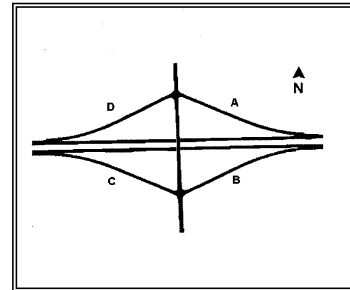
Figure 2
 I-90 Exit 17 - Lead/Deadwood
 Single Point Interchange

**Probable Construction Costs
Exit 17 - Single Point Interchange**

<i>Item Description</i>	<i>Quantity</i>	<i>Unit</i>	<i>Unit Cost</i>	<i>Total Cost</i>
Mobilization	1	LUMP SUM	\$502,000.00	\$502,000
Traffic Control	1	LUMP SUM	\$1,003,000.00	\$1,003,000
Clearing	1	LUMP SUM	\$201,000.00	\$201,000
Removal of Concrete Pavement	10,892	SQ. YD.	\$3.88	\$42,292
Removal of Asphalt Pavement	7,261	SQ. YD.	\$7.39	\$53,674
Remove Bridge	11,712	SQ. FT.	\$9.00	\$105,408
Borrow, Unclassified Excavation	69,591	CU. YD.	\$5.30	\$368,973
Base Course	13,200	TON	\$10.64	\$140,409
Asphalt Composite	13,772	TON	\$80.91	\$1,114,218
PCC Pavement 11" (mainline)	-	SQ. YD.	\$33.12	\$0
PCC Pavement 8" (ramps)	-	SQ. YD.	\$43.40	\$0
Concrete Approach Slab	3,600	SQ. YD.	\$188.34	\$678,031
Bridges	75,249	SQ. FT.	\$100.00	\$7,524,900
Guard Rail	0	LF	\$100.00	\$0
Roundabout (Single Lane)	1	EACH	\$600,000.00	\$600,000
Permanent Signing/Markings	1	LUMP SUM	\$300,000.00	\$300,000
Traffic Signal	1	EACH	\$125,000.00	\$125,000
Roadway Lighting	1	LUMP SUM	\$200,000.00	\$200,000
Drainage (18" RCP)	180	LF	\$24.53	<u>\$4,415</u>
Subtotal				\$12,960,000
Contingencies	25%			<u>\$3,240,000</u>
Total Probable Construction Costs				\$16,200,000
Engineering, Administration	15%			\$2,430,000
Total Project Costs				\$18,630,000

INTERCHANGE GEOMETRICS CHECKLIST
SDDOT Interstate Corridor Study

Interstate: I-90
Interchange: Exit 17 (Lead/Deadwood)
Analyst: BDW
Date: 8/26/2009



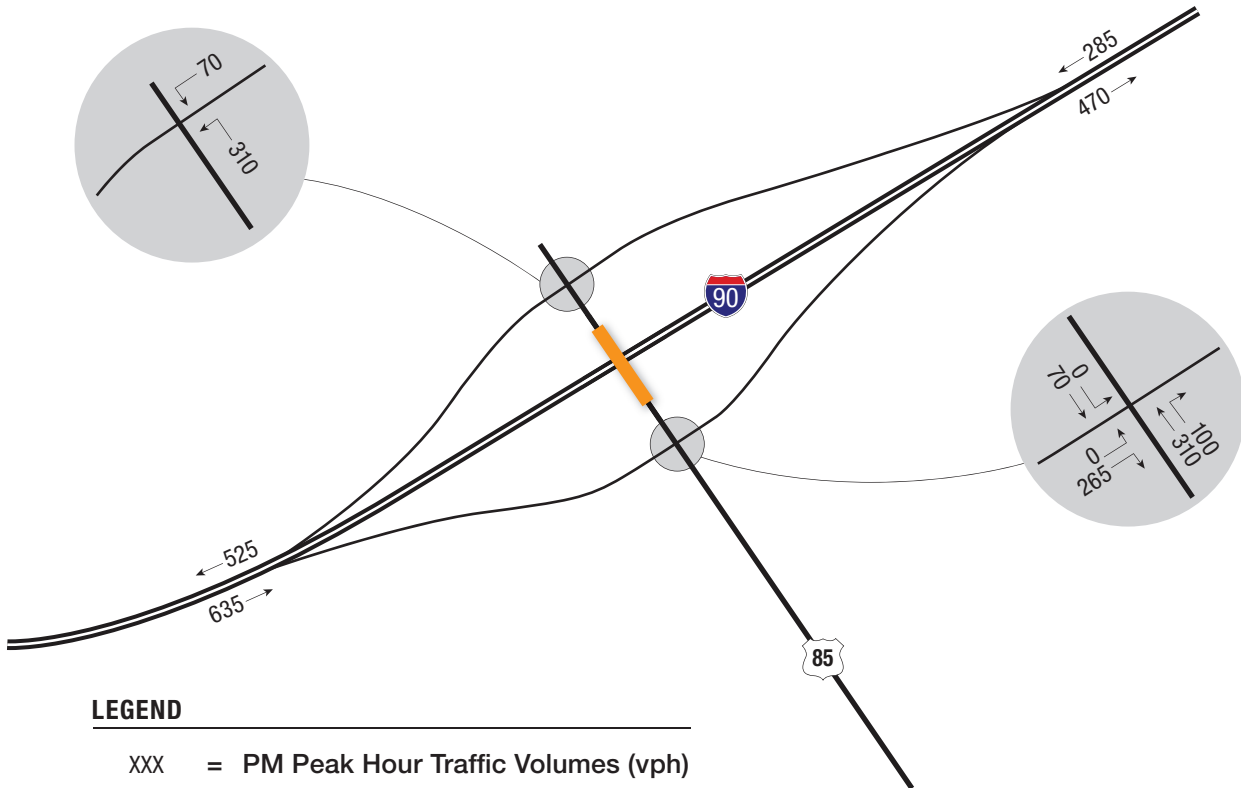
Interchange Geometry	Criteria	A	B	C	D	Achieved?
Interchange Type (Diamond, Full/Partial Cloverleaf, Trumpet etc.)	Diamond					-----
Design Speed	50 mph**					
Number of Lanes						
Right Turn Storage Length						
Left Turn Storage Length						
Superelevation (e max)	6%	4.4%	5.9%	5.9%	5.9%	
Minimum Horizontal Radius for e max of 6% (50 mph / 30 mph)	833 / 231 feet	1910'	1910'	955'	955'	
Maximum Degree of Curvature (50 mph / 30 mph)	6° 53' / 24° 48'	3°	3°	6°	6°	
Minimum Clear Zone From the Edge of Travel Lane	30 feet	> 30	> 30	> 30	> 30	
Maximum Grade on Ramp (Ascending)	+3% to +5%	5.00%	n/a	0.56%	0.62%	
Maximum Grade on Ramp (Descending)	-3% to -5%	n/a	5.00%	-1.72%	-3.03%	
Minimum Lane Width						
With Auxiliary Lanes	12 feet					
As Single Lane	15 feet (19 for loops)	13	13	15	15	Supports Impr.
Shoulder Width						
Right Shoulder	8 feet (4 for loops)	4	4	3	4	Supports Impr.
Left Shoulder	2 feet	2	2	3	2	
Inslope	6:1	6:1	6:1	6:1	6:1	
Minimum Off-Ramp Taper Rate	20:1	40	n/a		n/a	
Minimum On-Ramp Taper Rate	50:1	n/a	61	n/a		
Ramp Features						
K-Value Ranges						
Minimum for a Crest Vertical Curve (50 mph / 30 mph)	84 / 19	n/a	n/a	n/a	n/a	
Minimum for a Sag Vertical Curve (50 mph / 30 mph)	96 / 37	93	209	263	110	
Minimum Stopping Sight Distance (50 mph / 30 mph)	425 / 200 feet	1800	1243	1662	490	
Cross Road Features						
K-Value Ranges						
Minimum for a Crest Vertical Curve (50 mph / 30 mph)	84 / 19		500			
Minimum for a Sag Vertical Curve (50 mph / 30 mph)	96 / 37		n/a			
Minimum Stopping Sight Distance (50 mph / 30 mph)	425 / 200 feet		1039			
Ramp Intersection Sight Distance (ISD) (50 mph / 30 mph)***	425 / 200 feet	ok	n/a	ok	n/a	
Maximum Longitudinal Grade - Rolling Terrain (Urban Arterial)	7%		4.5%			
Minimum Longitudinal Grade (Min. / Des.)	0.3% / 0.5%		1.5%			
Minimum Control of Access from Interchange Ramps (Min. / Des.)	300 / 660 feet		200'			Supports Impr.

** Loop ramp design speed = 30 mph

***Substandard Intersection Sight Distance locations could not be determined from the interchange plans. Substandard locations, therefore, are intersections that demonstrate sight distance limitations based on a general field evaluation or the presence of a substandard k-value or Stopping Sight Distance along the crossroad approaching the intersection.

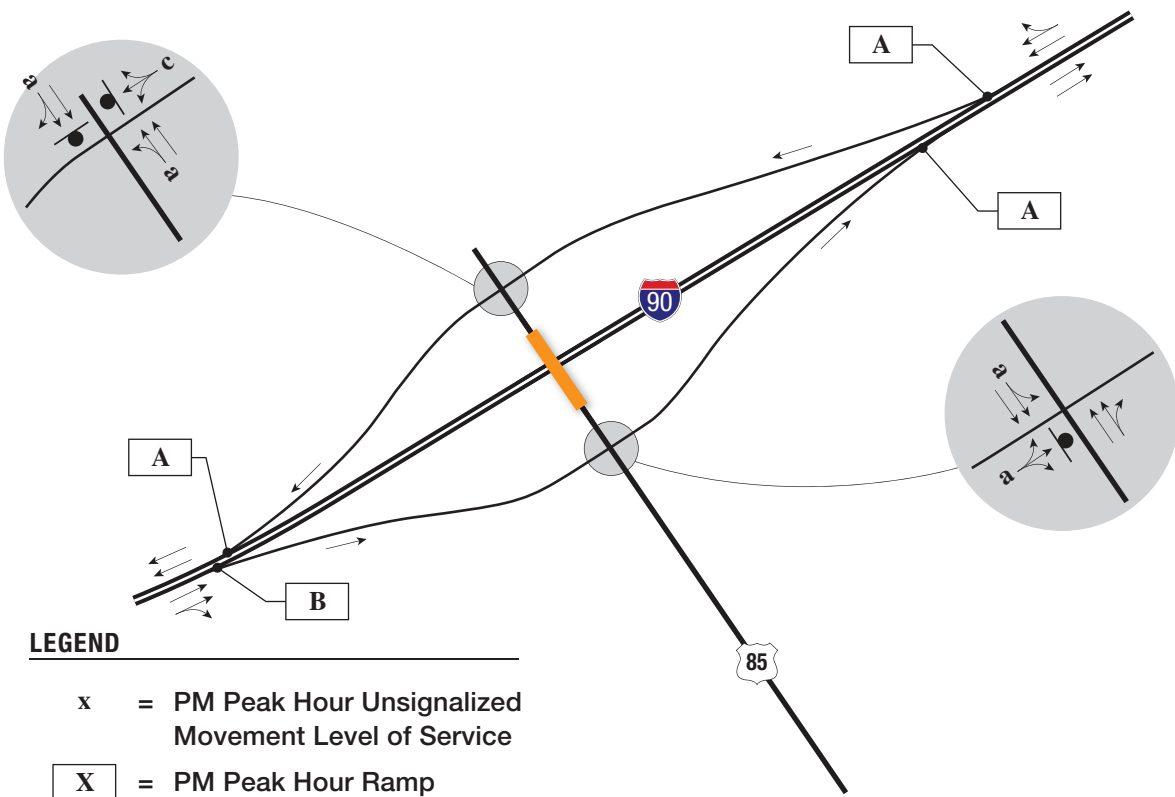
Comments

Divided highway makes sight distance less critical (2 stage turns). Future development in vicinity - Elhorn Ridge



LEGEND

XXX = PM Peak Hour Traffic Volumes (vph)



LEGEND

x = PM Peak Hour Unsignalized Movement Level of Service

X = PM Peak Hour Ramp Junction Level of Service

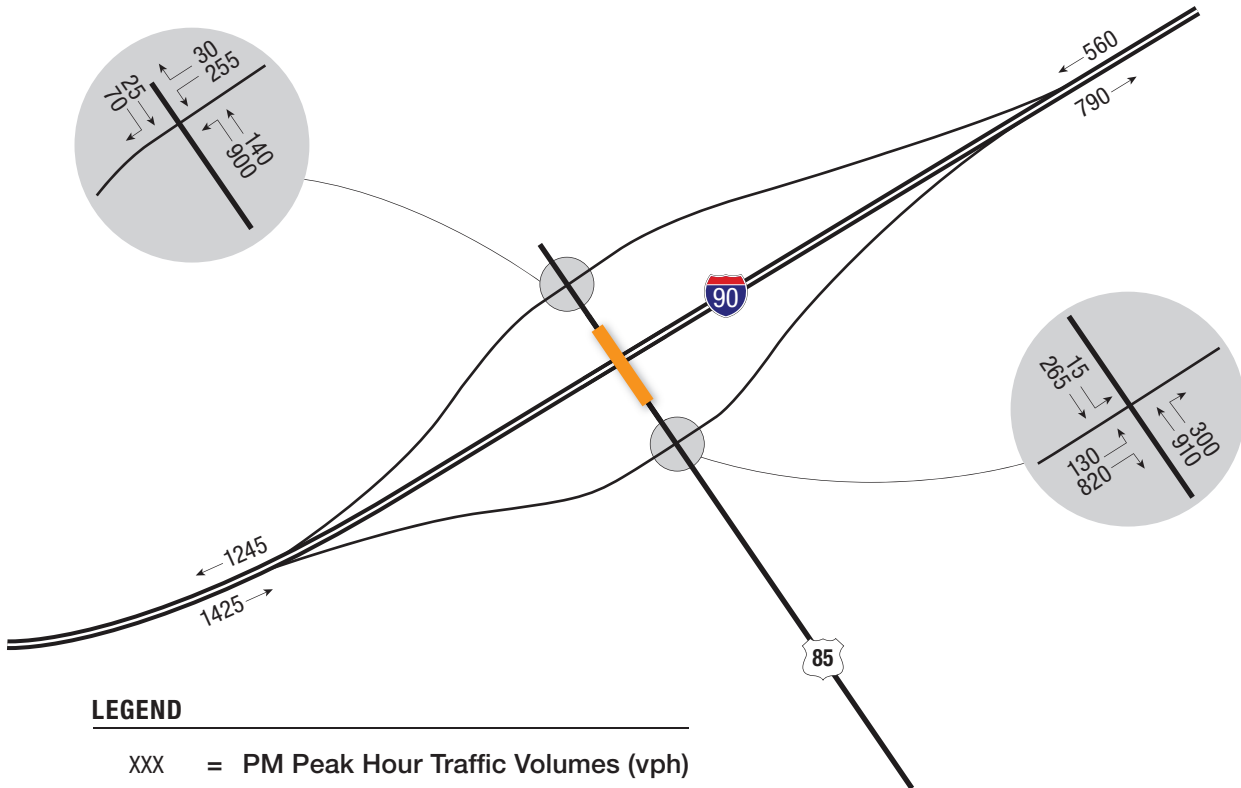
● = Stop Sign

→ = Travel Lanes

Interstate 90 Exit 17
Traffic Conditions Year 2009

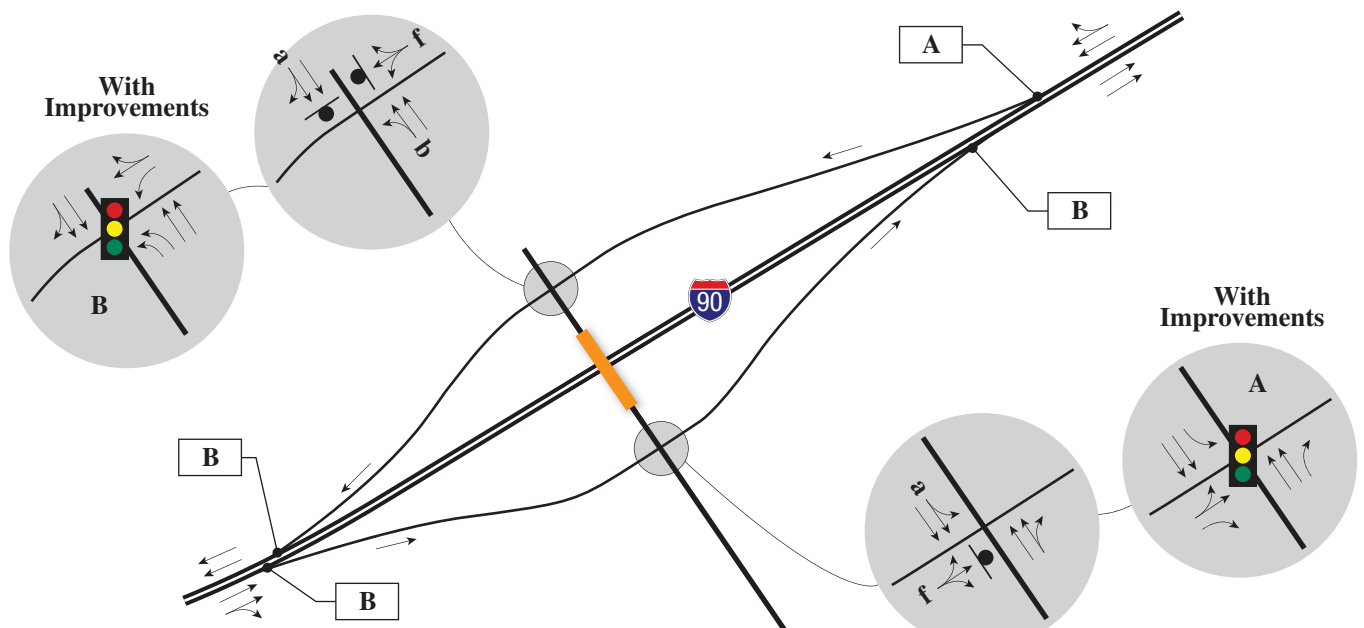
NORTH





LEGEND

XXX = PM Peak Hour Traffic Volumes (vph)



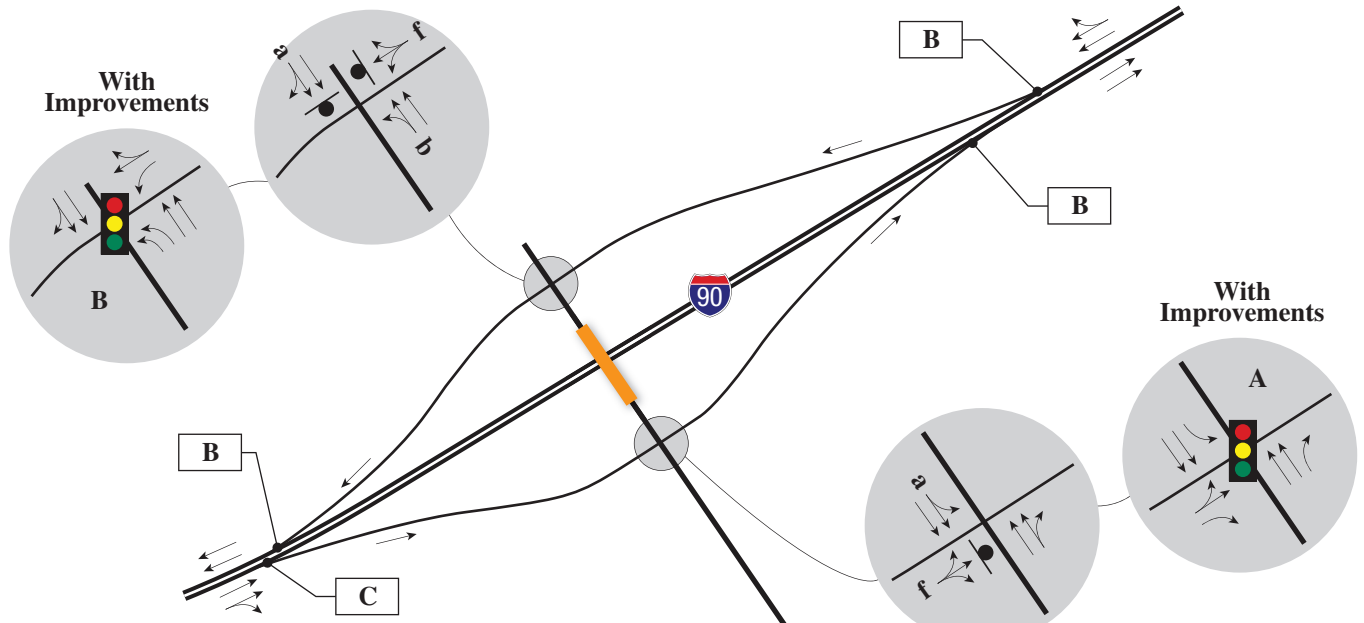
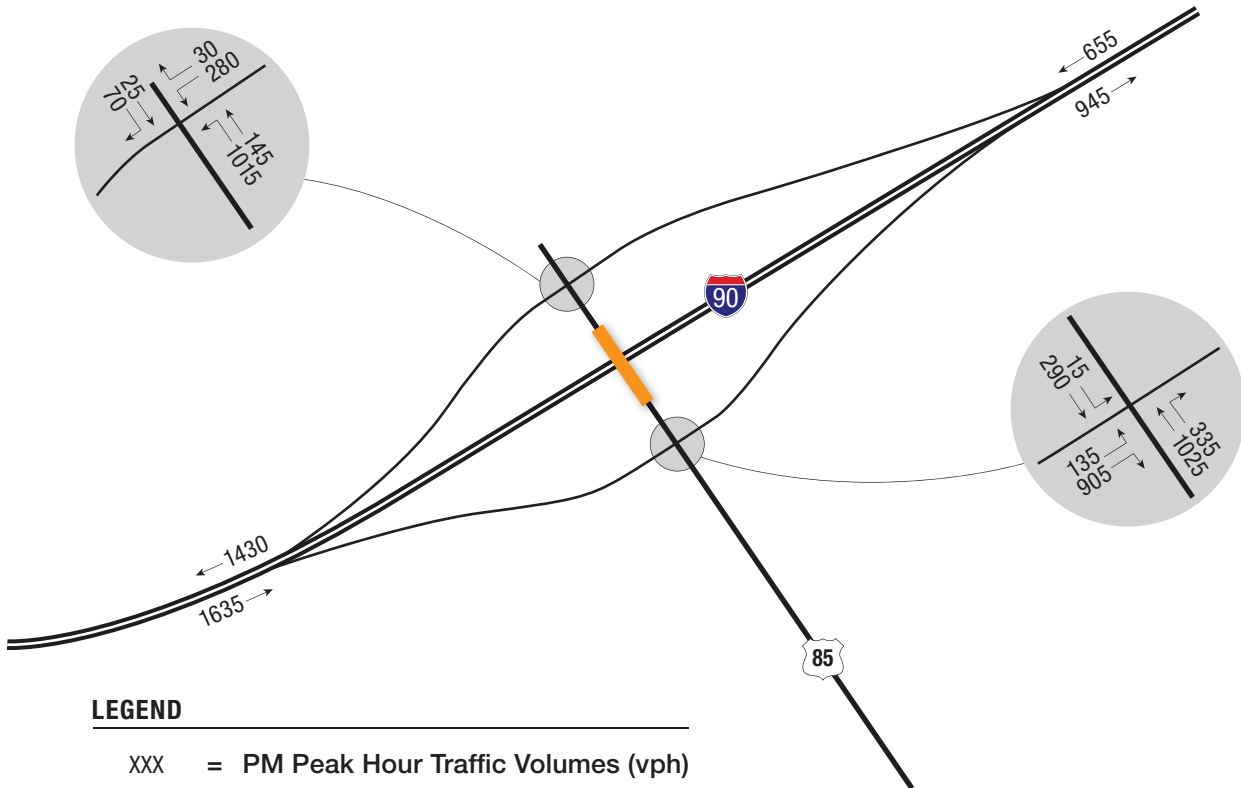
LEGEND

- X = PM Peak Hour Signalized Intersection Level of Service
- x = PM Peak Hour Unsignalized Movement Level of Service
- X = PM Peak Hour Ramp Junction Level of Service
- [Traffic Signal Icon] = Traffic Signal
- [Travel Lane Icon] = Travel Lanes

Interstate 90 Exit 17
Traffic Conditions Year 2020

NORTH

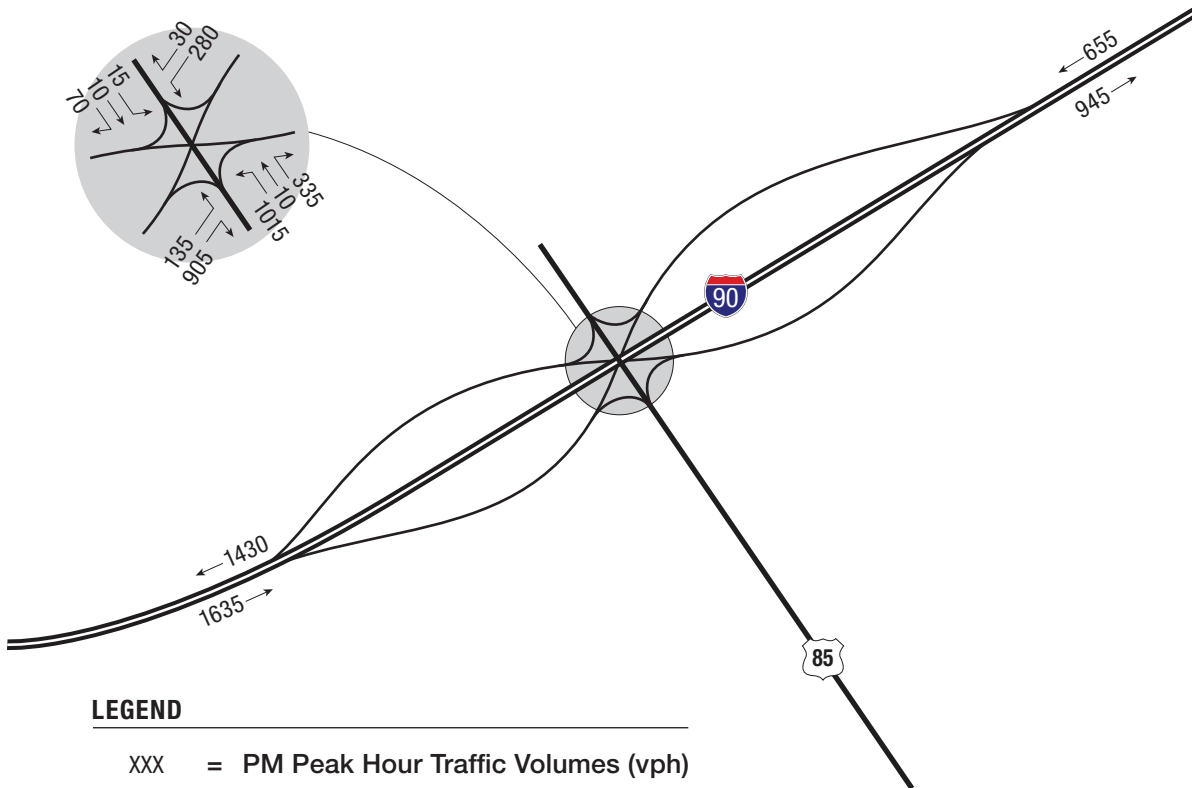




- LEGEND**
- X = PM Peak Hour Signalized Intersection Level of Service
 - x = PM Peak Hour Unsignalized Movement Level of Service
 - X = PM Peak Hour Ramp Junction Level of Service
 - 🚦 = Traffic Signal
 - ↔ = Travel Lanes

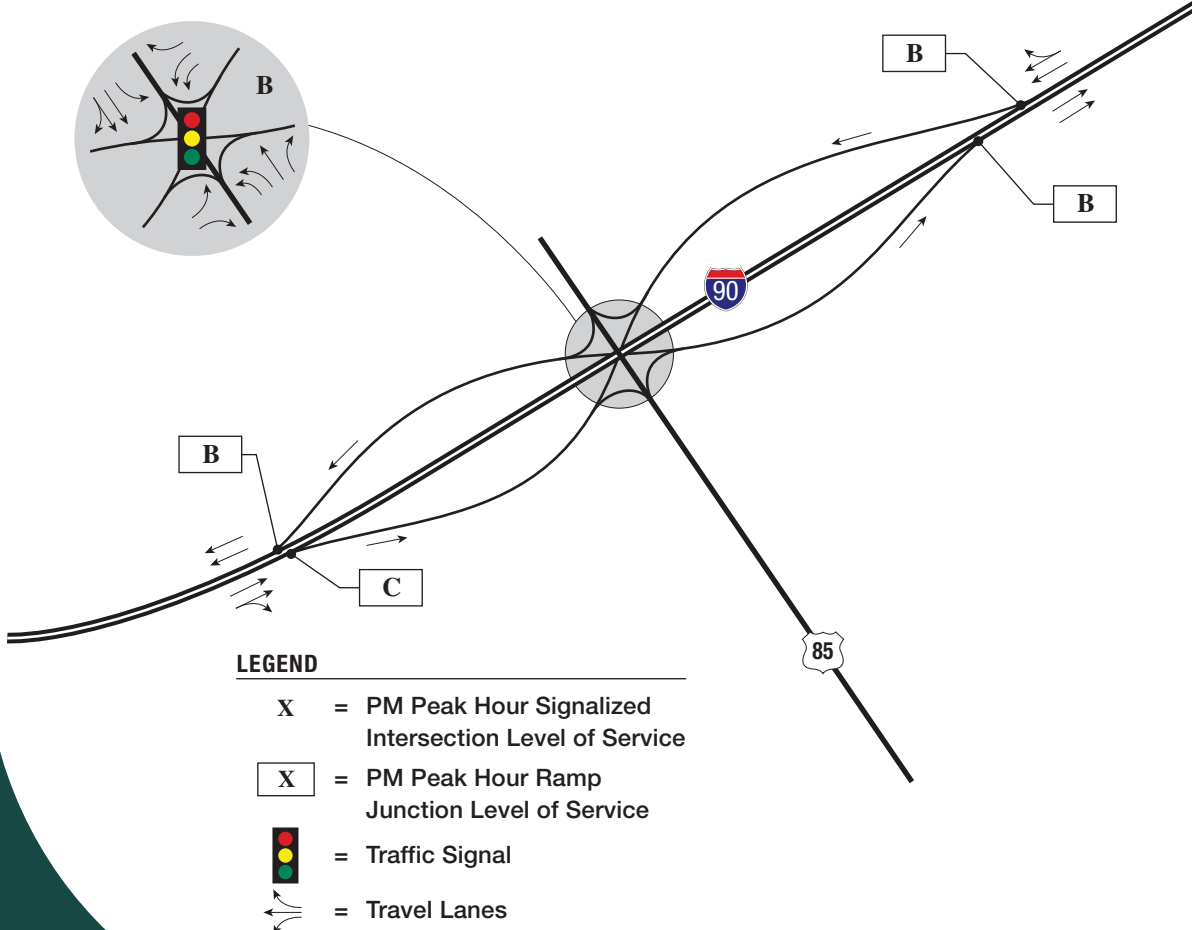
Interstate 90 Exit 17
 Traffic Conditions Year 2030





LEGEND

XXX = PM Peak Hour Traffic Volumes (vph)



LEGEND

- X = PM Peak Hour Signalized Intersection Level of Service
- X = PM Peak Hour Ramp Junction Level of Service
- [Traffic Signal Icon] = Traffic Signal
- [Travel Lane Icon] = Travel Lanes

Interstate 90 Exit 17 Alternative
Traffic Conditions Year 2030

NORTH





I-90 EXIT 30 LAZELLE STREET



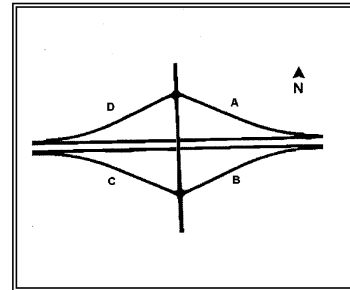
Figure 1
 I-90 Exit 30 - Lazelle Street, Sturgis
 Mainline Realignment and Ramps

**Probable Construction Costs
Exit 30 - Diamond Interchange**

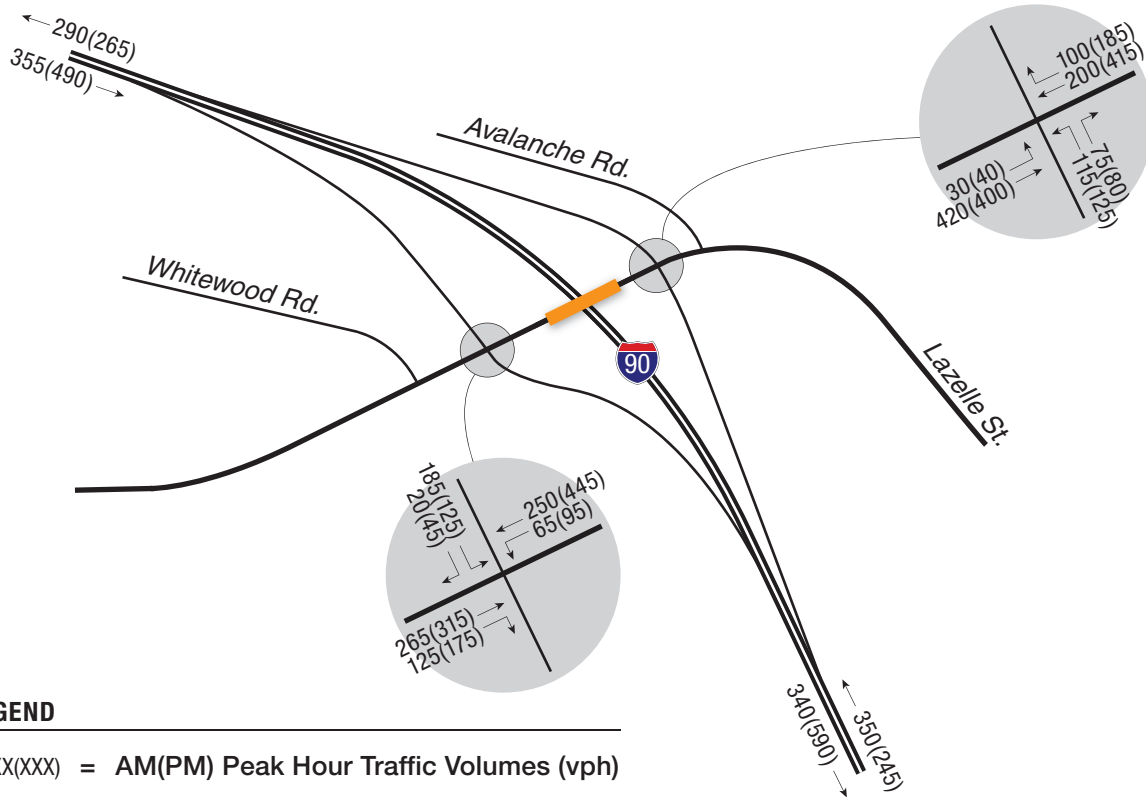
<i>Item Description</i>	<i>Quantity</i>	<i>Unit</i>	<i>Unit Cost</i>	<i>Total Cost</i>
Mobilization	1	LUMP SUM	\$565,000.00	\$565,000
Traffic Control	1	LUMP SUM	\$1,130,000.00	\$1,130,000
Clearing	1	LUMP SUM	\$226,000.00	\$226,000
Removal of Concrete Pavement	2,942	SQ. YD.	\$3.88	\$11,422
Removal of Asphalt Pavement	35,793	SQ. YD.	\$7.39	\$264,583
Remove Bridge	39,936	SQ. FT.	\$9.00	\$359,424
Borrow, Unclassified Excavation	47,198	CU. YD.	\$5.30	\$250,245
Base Course	4,200	TON	\$10.64	\$44,671
Asphalt Composite	-	TON	\$80.91	\$0
PCC Pavement 11" (mainline)	16,916	SQ. YD.	\$33.12	\$560,275
PCC Pavement 8" (ramps)	9,194	SQ. YD.	\$43.40	\$398,993
Concrete Approach Slab	18,600	SQ. YD.	\$188.34	\$3,503,161
Bridges	59,042	SQ. FT.	\$100.00	\$5,904,200
Guard Rail	0	LF	\$100.00	\$0
Permanent Signing/Markings	1	LUMP SUM	\$340,000.00	\$340,000
Traffic Signal	0	EACH	\$125,000.00	\$0
Roadway Lighting	1	LUMP SUM	\$230,000.00	\$230,000
Drainage (18" RCP)	90	LF	\$24.53	<u>\$2,208</u>
Subtotal				\$13,790,000
Contingencies	25%			<u>\$3,447,500</u>
Total Probable Construction Costs				\$17,240,000
Engineering, Administration	15%			\$2,586,000
Total Project Costs				\$19,830,000

INTERCHANGE GEOMETRICS CHECKLIST
SDDOT Interstate Corridor Study

Interstate: I-90
Interchange: 30 (Lazelle St.)
Analyst: BDW
Date: 8/26/2009

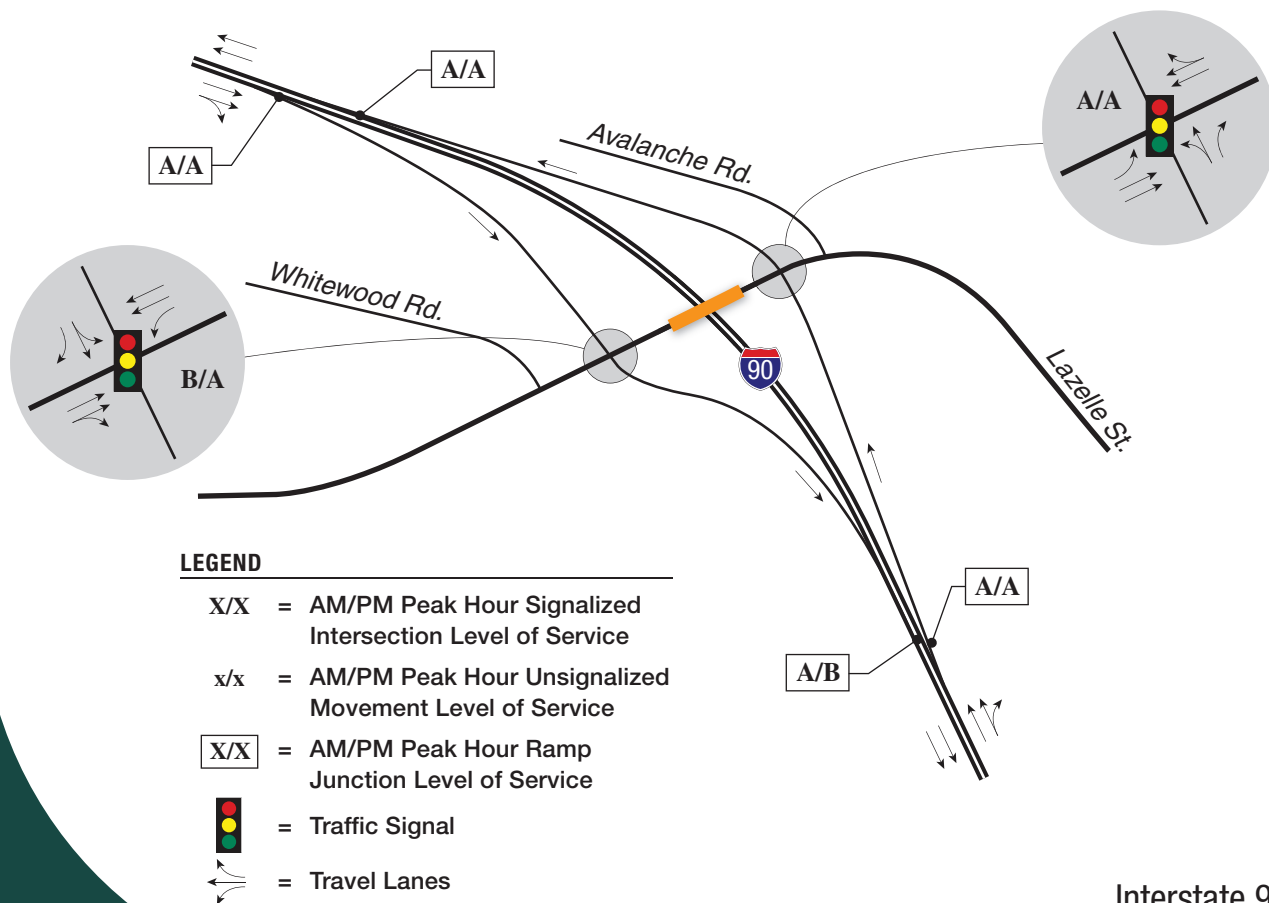


Interchange Geometry	Criteria	A	B	C	D	Achieved?
Interchange Type (Diamond, Full/Partial Cloverleaf, Trumpet etc.)	Diamond					-----
Design Speed	50 mph**					
Number of Lanes						
Right Turn Storage Length						
Left Turn Storage Length						
Superelevation (e max)	6%	2.08%	7.70%	5.00%	2.08%	Supports Impr.
Minimum Horizontal Radius for e max of 6% (50 mph / 30 mph)	833 / 231 feet	1910'	573'	1910'	5730'	Supports Impr.
Maximum Degree of Curvature (50 mph / 30 mph)	6° 53' / 24° 48'	3°	10°	3°	1°	Supports Impr.
Minimum Clear Zone From the Edge of Travel Lane	30 feet	> 30	> 30	> 30	> 30	
Maximum Grade on Ramp (Ascending)	+3% to +5%	0.74%	3.83%	2.00%	4.05%	
Maximum Grade on Ramp (Descending)	-3% to -5%	-7.47%	-3.12%	-2.68%	-1.66%	Supports Impr.
Minimum Lane Width						
With Auxiliary Lanes	12 feet					
As Single Lane	15 feet (19 for loops)	21	21	15	18	
Shoulder Width						
Right Shoulder	8 feet (4 for loops)	2	2	6	3	Supports Impr.
Left Shoulder	2 feet	2	2	2	2	
Inslope	6:1	4:1	4:1	4:1	4:1	Supports Impr.
Minimum Off-Ramp Taper Rate	20:1	55	n/a	40	n/a	
Minimum On-Ramp Taper Rate	50:1	n/a	50	n/a	58	
Ramp Features						
K-Value Ranges						
Minimum for a Crest Vertical Curve (50 mph / 30 mph)	84 / 19	46	184	279	99	Supports Impr.
Minimum for a Sag Vertical Curve (50 mph / 30 mph)	96 / 37	n/a	n/a	n/a	n/a	
Minimum Stopping Sight Distance (50 mph / 30 mph)	425 / 200 feet	317	696	953	466	Supports Impr.
Cross Road Features						
K-Value Ranges						
Minimum for a Crest Vertical Curve (50 mph / 30 mph)	84 / 19	119				
Minimum for a Sag Vertical Curve (50 mph / 30 mph)	96 / 37	107				
Minimum Stopping Sight Distance (50 mph / 30 mph)	425 / 200 feet	497				
Ramp Intersection Sight Distance (ISD) (50 mph / 30 mph)***	425 / 200 feet	ok	n/a	ok	n/a	
Maximum Longitudinal Grade - Rolling Terrain (Urban Arterial)	7%	3.37%				
Minimum Longitudinal Grade (Min. / Des.)	0.3% / 0.5%	0.00%				
Minimum Control of Access from Interchange Ramps (Min. / Des.)	300 / 660 feet	171'				Supports Impr.
** Loop ramp design speed = 30 mph						
***Substandard Intersection Sight Distance locations could not be determined from the interchange plans. Substandard locations, therefore, are intersections that demonstrate sight distance limitations based on a general field evaluation or the presence of a substandard k-value or Stopping Sight Distance along the crossroad approaching the intersection.						
Comments						
Recent work on ramps so inslopes should be improved						



LEGEND

XXX(XXX) = AM(PM) Peak Hour Traffic Volumes (vph)



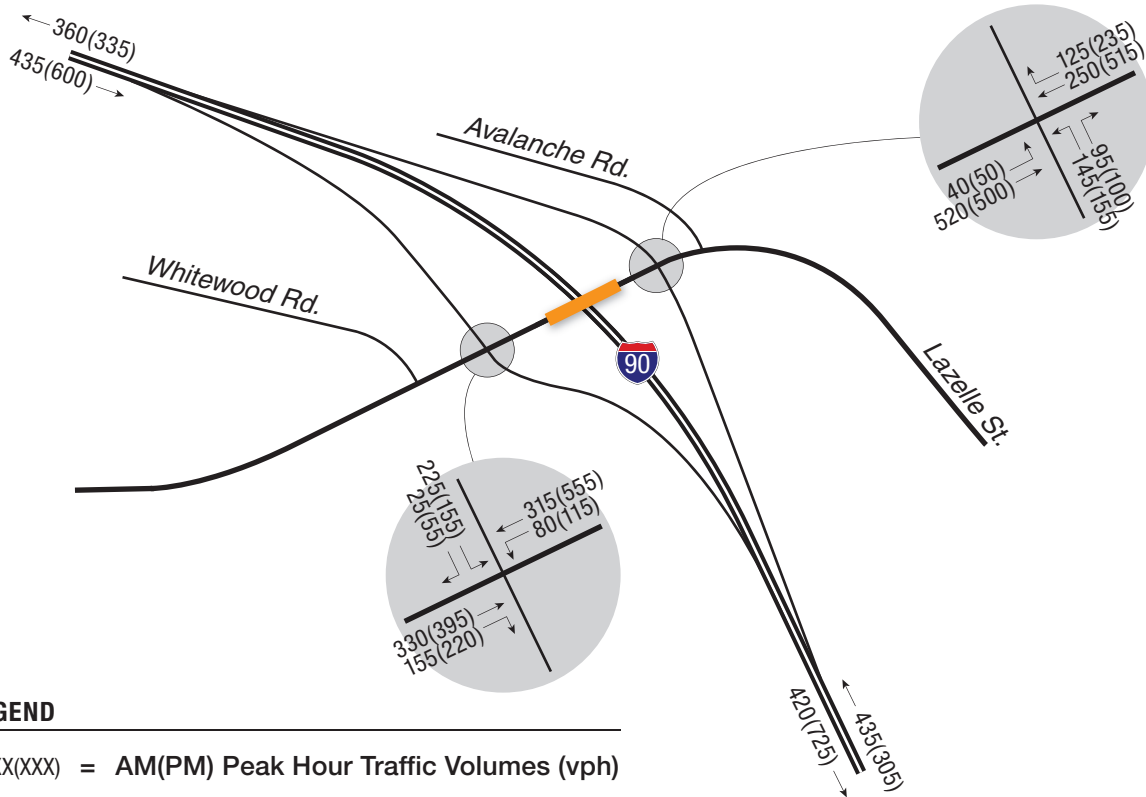
LEGEND

- X/X = AM/PM Peak Hour Signalized Intersection Level of Service
- x/x = AM/PM Peak Hour Unsignalized Movement Level of Service
- X/X = AM/PM Peak Hour Ramp Junction Level of Service
- = Traffic Signal
- = Travel Lanes

Interstate 90 Exit 30
Traffic Conditions Year 2009

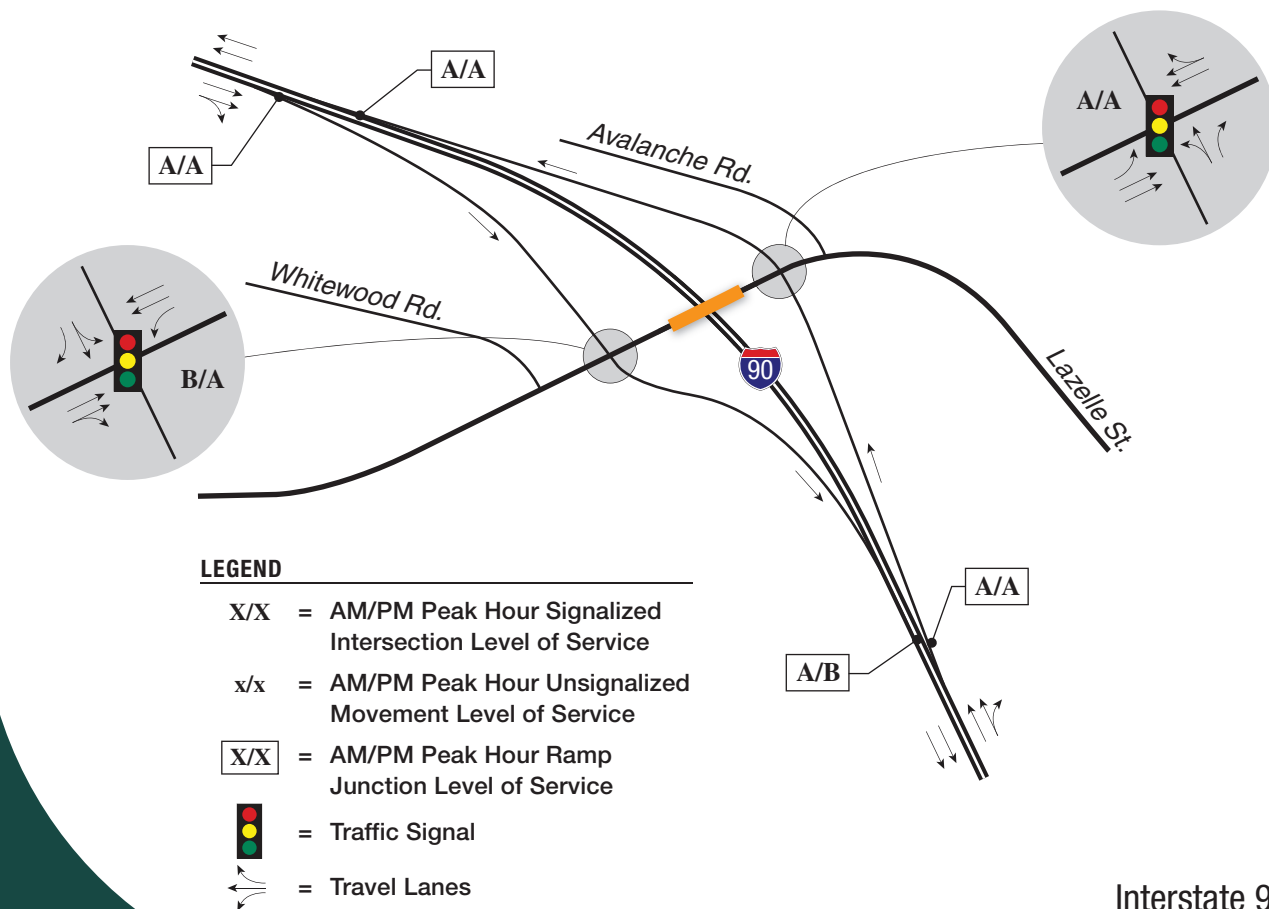
NORTH





LEGEND

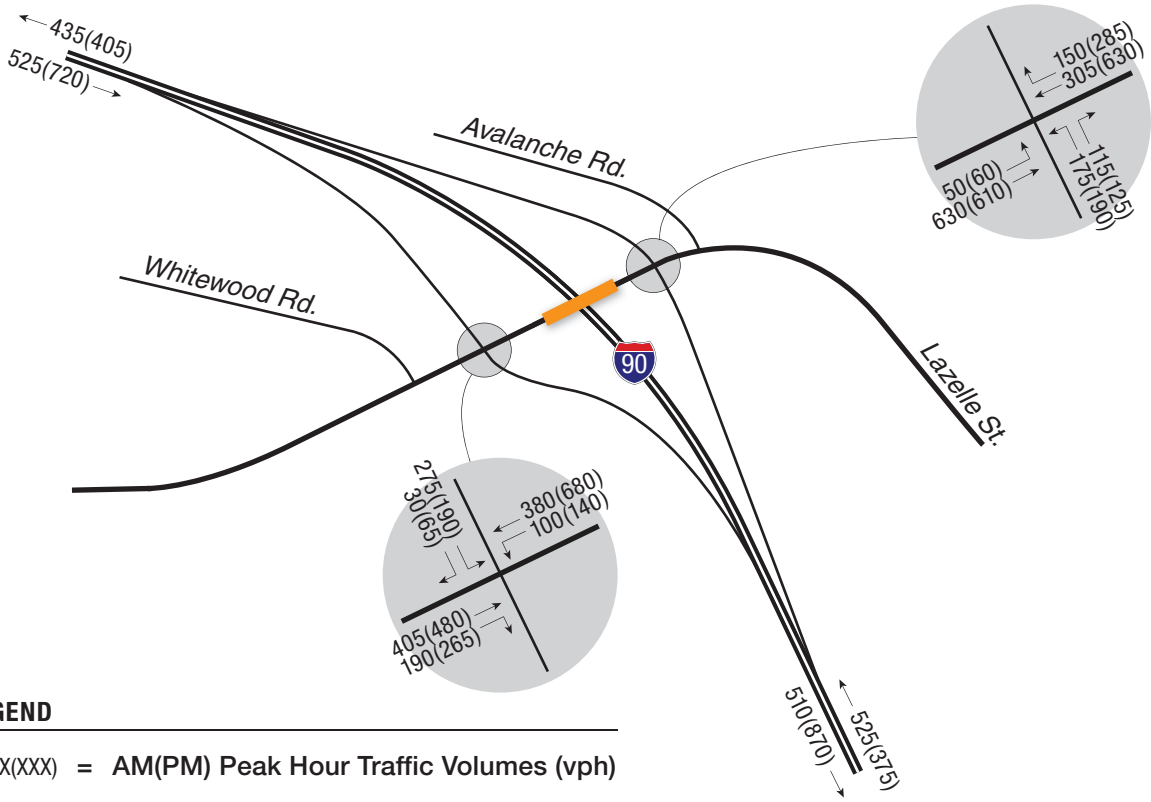
xxx(xxx) = AM(PM) Peak Hour Traffic Volumes (vph)



Interstate 90 Exit 30
Traffic Conditions Year 2020

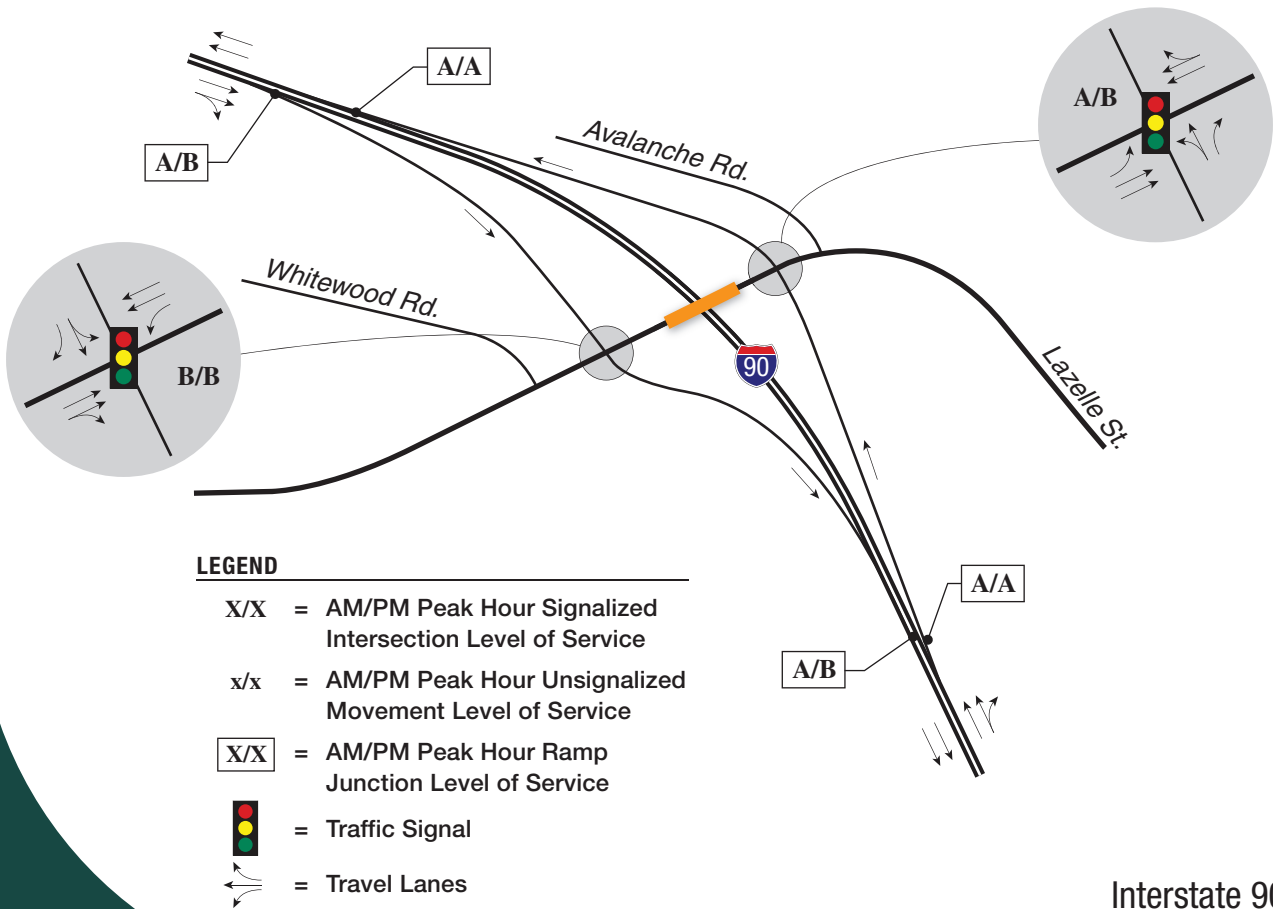
NORTH





LEGEND

xxx(xxx) = AM(PM) Peak Hour Traffic Volumes (vph)



LEGEND

- X/X = AM/PM Peak Hour Signalized Intersection Level of Service
- x/x = AM/PM Peak Hour Unsignalized Movement Level of Service
- X/X = AM/PM Peak Hour Ramp Junction Level of Service
- = Traffic Signal
- = Travel Lanes

Interstate 90 Exit 30
Traffic Conditions Year 2030

NORTH



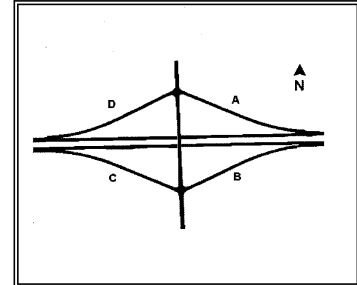
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I-90 EXIT 40 TILFORD ROAD

INTERCHANGE GEOMETRICS CHECKLIST
SDDOT Interstate Corridor Study

Interstate: I-90
Interchange: Exit 40 (Tilford Road)
Analyst: RDG
Date: 8/13/2009



Interchange Geometry	Criteria	A	B	C	D	Achieved?
Interchange Type (Diamond, Full/Partial Cloverleaf, Trumpet etc.)	Diamond					-----
Design Speed	50 mph**					
Number of Lanes						
Right Turn Storage Length						
Left Turn Storage Length						
Superelevation (e max)	6%	4.2%	3.0%	4.2%	3.0%	
Minimum Horizontal Radius for e max of 6% (50 mph / 30 mph)	833 / 231 feet	1910'	1910'	1910'	1910'	
Maximum Degree of Curvature (50 mph / 30 mph)	6° 53' / 24° 48'	3°	3°	3°	3°	
Minimum Clear Zone From the Edge of Travel Lane	30 feet	> 30	> 30	> 30	> 30	
Maximum Grade on Ramp (Ascending)	+3% to +5%	1.49%	n/a	1.20%	n/a	
Maximum Grade on Ramp (Descending)	-3% to -5%	n/a	-2.12%	n/a	-0.16%	
Minimum Lane Width						
With Auxiliary Lanes	12 feet					
As Single Lane	15 feet (19 for loops)	15	15	15	15	
Shoulder Width						
Right Shoulder	8 feet (4 for loops)	4	4	5	5	Suports Impr.
Left Shoulder	2 feet	4	3	3	3	
Inslope	6:1	4:1	4:1	4:1	4:1	Suports Impr.
Minimum Off-Ramp Taper Rate	20:1	41	n/a	40	n/a	
Minimum On-Ramp Taper Rate	50:1	n/a	62	n/a	61	
Ramp Features						
K-Value Ranges						
Minimum for a Crest Vertical Curve (50 mph / 30 mph)	84 / 19	n/a	n/a	n/a	n/a	
Minimum for a Sag Vertical Curve (50 mph / 30 mph)	96 / 37	198	280	200	1827	
Minimum Stopping Sight Distance (50 mph / 30 mph)	425 / 200 feet	>425	>425	>425	>425	
Cross Road Features						
K-Value Ranges						
Minimum for a Crest Vertical Curve (50 mph / 30 mph)	84 / 19		92			
Minimum for a Sag Vertical Curve (50 mph / 30 mph)	96 / 37		60			Suports Impr.
Minimum Stopping Sight Distance (50 mph / 30 mph)	425 / 200 feet		288			Suports Impr.
Ramp Intersection Sight Distance (ISD) (50 mph / 30 mph)***	425 / 200 feet	ok	n/a	ok	n/a	
Maximum Longitudinal Grade - Rolling Terrain (Urban Arterial)	7%		6.0%			
Minimum Longitudinal Grade (Min. / Des.)	0.3% / 0.5%				2.7%	
Minimum Control of Access from Interchange Ramps (Min. / Des.)	300 / 660 feet		250'			Suports Impr.

** Loop ramp design speed = 30 mph

***Substandard Intersection Sight Distance locations could not be determined from the interchange plans. Substandard locations, therefore, are intersections that demonstrate sight distance limitations based on a general field evaluation or the presence of a substandard k-value or Stopping Sight Distance along the crossroad approaching the intersection.

Comments

Cross road K value appears substandard. Inslopes substandard as well?



I-90 EXIT 46 ELK CREEK ROAD



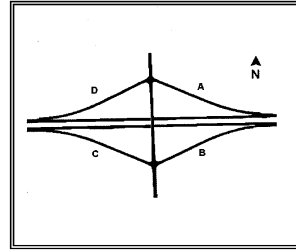
Figure 1
 I-90 Exit 46 - Elk Creek Road, Piedmont
 Relocated Diamond Interchange

Probable Construction Costs
Exit 46 - Relocated Diamond Interchange

<i>Item Description</i>	<i>Quantity</i>	<i>Unit</i>	<i>Unit Cost</i>	<i>Total Cost</i>
Mobilization	1	LUMP SUM	\$247,000.00	\$247,000
Traffic Control	1	LUMP SUM	\$494,000.00	\$494,000
Clearing	1	LUMP SUM	\$99,000.00	\$99,000
Removal of Concrete Pavement	5,967	SQ. YD.	\$3.88	\$23,169
Removal of Asphalt Pavement	9,572	SQ. YD.	\$7.39	\$70,760
Remove Bridge	6,360	SQ. FT.	\$9.00	\$57,240
Borrow, Unclassified Excavation	289,249	CU. YD.	\$5.30	\$1,533,597
Base Course	12,119	TON	\$10.64	\$128,911
Asphalt Composite	15,899	TON	\$80.91	\$1,286,322
PCC Pavement 11" (mainline)	-	SQ. YD.	\$33.12	\$0
PCC Pavement 8" (ramps)	-	SQ. YD.	\$43.40	\$0
Concrete Approach Slab	3,600	SQ. YD.	\$188.34	\$678,031
Bridges	11,544	SQ. FT.	\$100.00	\$1,154,400
Guard Rail	0	LF	\$100.00	\$0
Permanent Signing/Markings	1	LUMP SUM	\$150,000.00	\$150,000
Traffic Signal	0	EACH	\$125,000.00	\$0
Roadway Lighting	1	LUMP SUM	\$100,000.00	\$100,000
Drainage (18" RCP)	150	LF	\$24.53	<u>\$3,680</u>
Subtotal				\$6,030,000
Contingencies	25%			<u>\$1,507,500</u>
Total Probable Construction Costs				\$7,540,000
Engineering, Administration	15%			\$1,131,000
Total Project Costs				\$8,670,000

INTERCHANGE GEOMETRICS CHECKLIST
SDDOT Interstate Corridor Study

Interstate: I-90
Interchange: Exit 46 (Elk Creek Road)
Analyst: RDG
Date: 8/13/2009

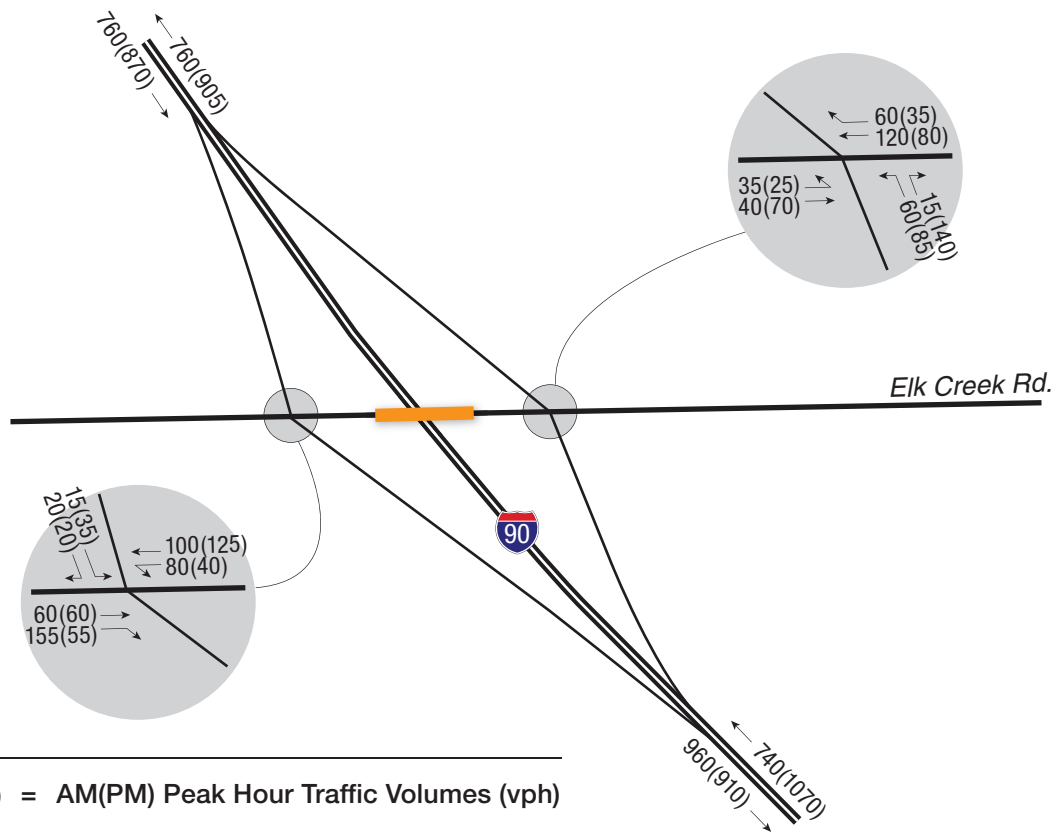


Interchange Geometry	Criteria	A	B	C	D	Achieved?
Interchange Type (Diamond, Full/Partial Cloverleaf, Trumpet etc.)	Diamond					-----
Design Speed	50 mph**					
Number of Lanes						
Right Turn Storage Length						
Left Turn Storage Length						
Superelevation (e max)	6%					
Minimum Horizontal Radius for e max of 6% (50 mph / 30 mph)	833 / 231 feet	310'	310'	310'	310'	Supports Impr.
Maximum Degree of Curvature (50 mph / 30 mph)	6° 53' / 24° 48'					
Minimum Clear Zone From the Edge of Travel Lane	30 feet	3:1	3:1	3:1	3:1	Supports Impr.
Maximum Grade on Ramp (Ascending)	+3% to +5%	1.00%	1.48%	1.18%	1.13%	
Maximum Grade on Ramp (Descending)	-3% to -5%	-3.00%	-0.45%	-1.00%	-3.42%	
Minimum Lane Width						
With Auxiliary Lanes	12 feet					
As Single Lane	15 feet (19 for loops)	15	15	15	15	
Shoulder Width						
Right Shoulder	8 feet (4 for loops)	5	4	5	5	
Left Shoulder	2 feet	2	2	2	2	
Inslope	6:1	3:1	3:1	3:1	3:1	Supports Impr.
Minimum Off-Ramp Taper Rate	20:1	17	n/a	17	n/a	
Minimum On-Ramp Taper Rate	50:1	n/a	21	n/a	21	
Ramp Features						
K-Value Ranges						
Minimum for a Crest Vertical Curve (50 mph / 30 mph)	84 / 19					
Minimum for a Sag Vertical Curve (50 mph / 30 mph)	96 / 37					
Minimum Stopping Sight Distance (50 mph / 30 mph)	425 / 200 feet					
Cross Road Features						
K-Value Ranges						
Minimum for a Crest Vertical Curve (50 mph / 30 mph)	84 / 19					
Minimum for a Sag Vertical Curve (50 mph / 30 mph)	96 / 37					
Minimum Stopping Sight Distance (50 mph / 30 mph)	425 / 200 feet					
Ramp Intersection Sight Distance (ISD) (50 mph / 30 mph)***	425 / 200 feet	substandard	n/a	substandard	n/a	
Maximum Longitudinal Grade - Rolling Terrain (Urban Arterial)	7%	4.4%				
Minimum Longitudinal Grade (Min. / Des.)	0.3% / 0.5%					
Minimum Control of Access from Interchange Ramps (Min. / Des.)	300 / 660 feet					

** Loop ramp design speed = 30 mph
 ***Substandard Intersection Sight Distance locations could not be determined from the interchange plans. Substandard locations, therefore, are intersections that demonstrate sight distance limitations based on a general field evaluation or the presence of a substandard k-value or Stopping Sight Distance along the crossroad approaching the intersection.

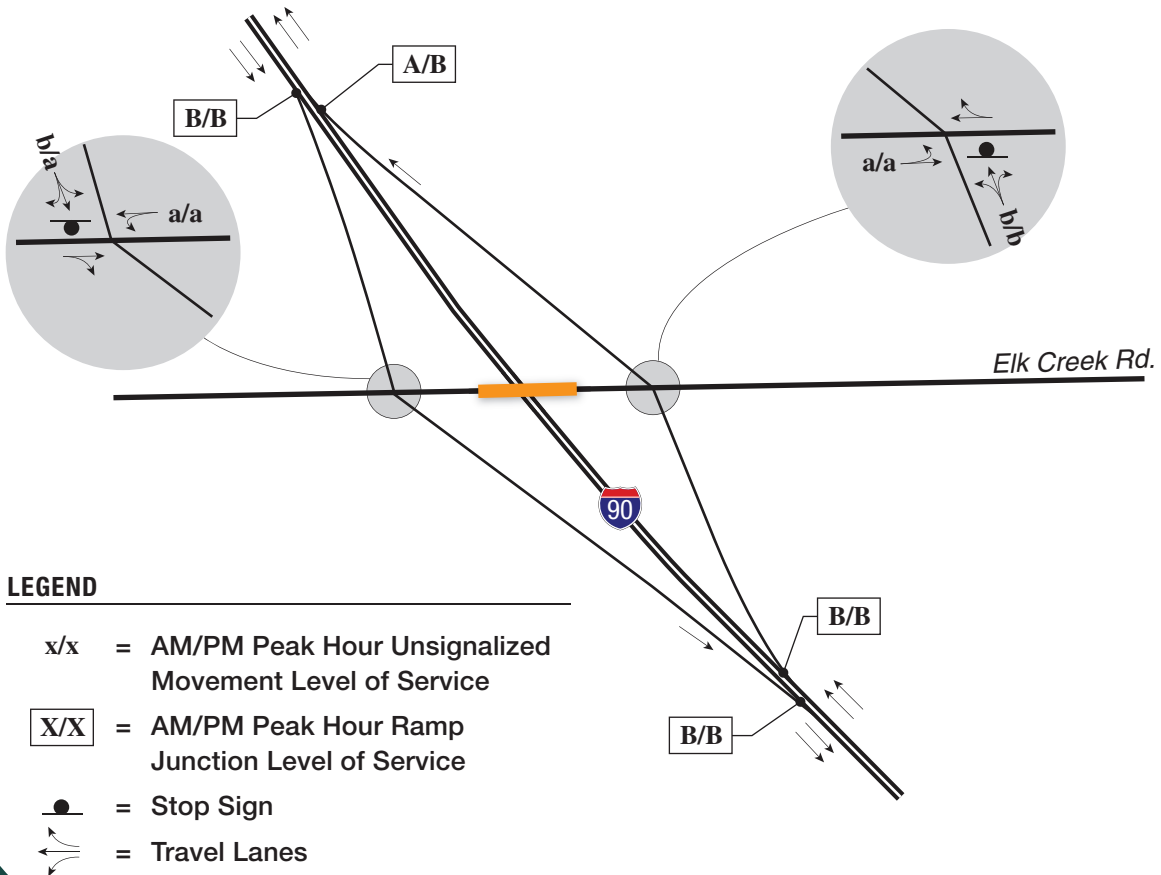
Comments

Very sharp curve on bridge over interstate...site distance from ramps poor.



LEGEND

xxx(xxx) = AM(PM) Peak Hour Traffic Volumes (vph)



LEGEND

x/x = AM/PM Peak Hour Unsignalized Movement Level of Service

X/X = AM/PM Peak Hour Ramp Junction Level of Service

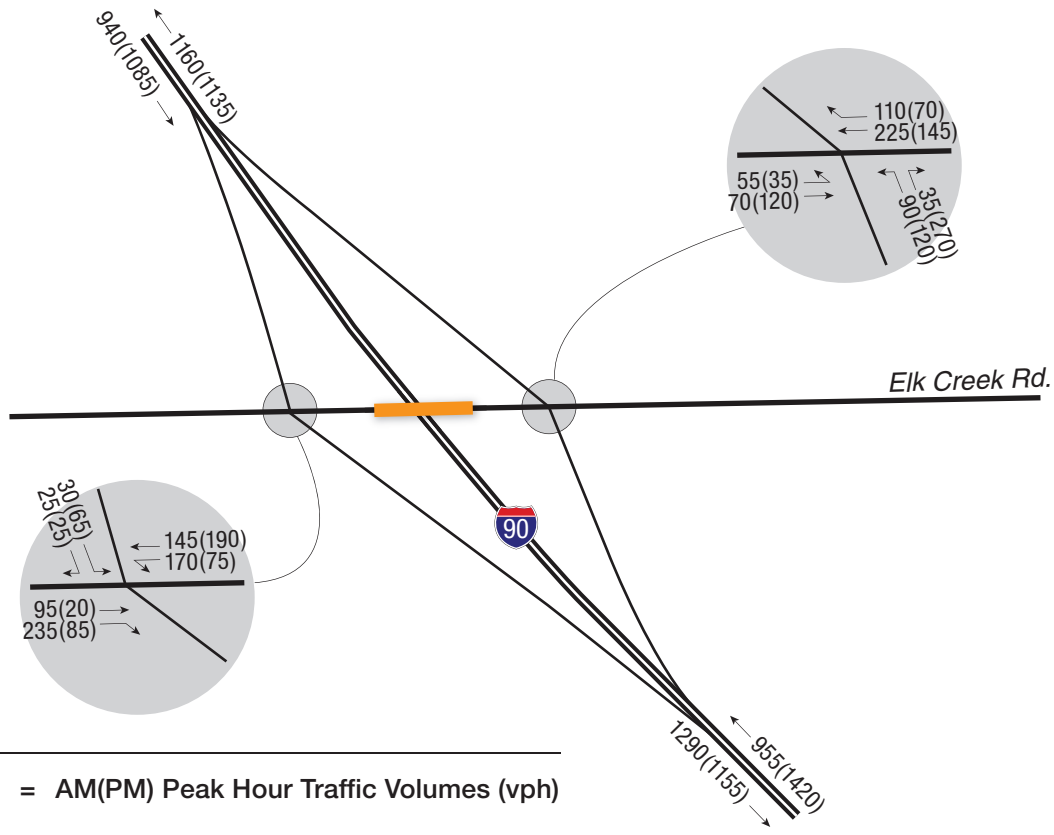
● = Stop Sign

↔ = Travel Lanes

Interstate 90 Exit 46
Traffic Conditions Year 2009

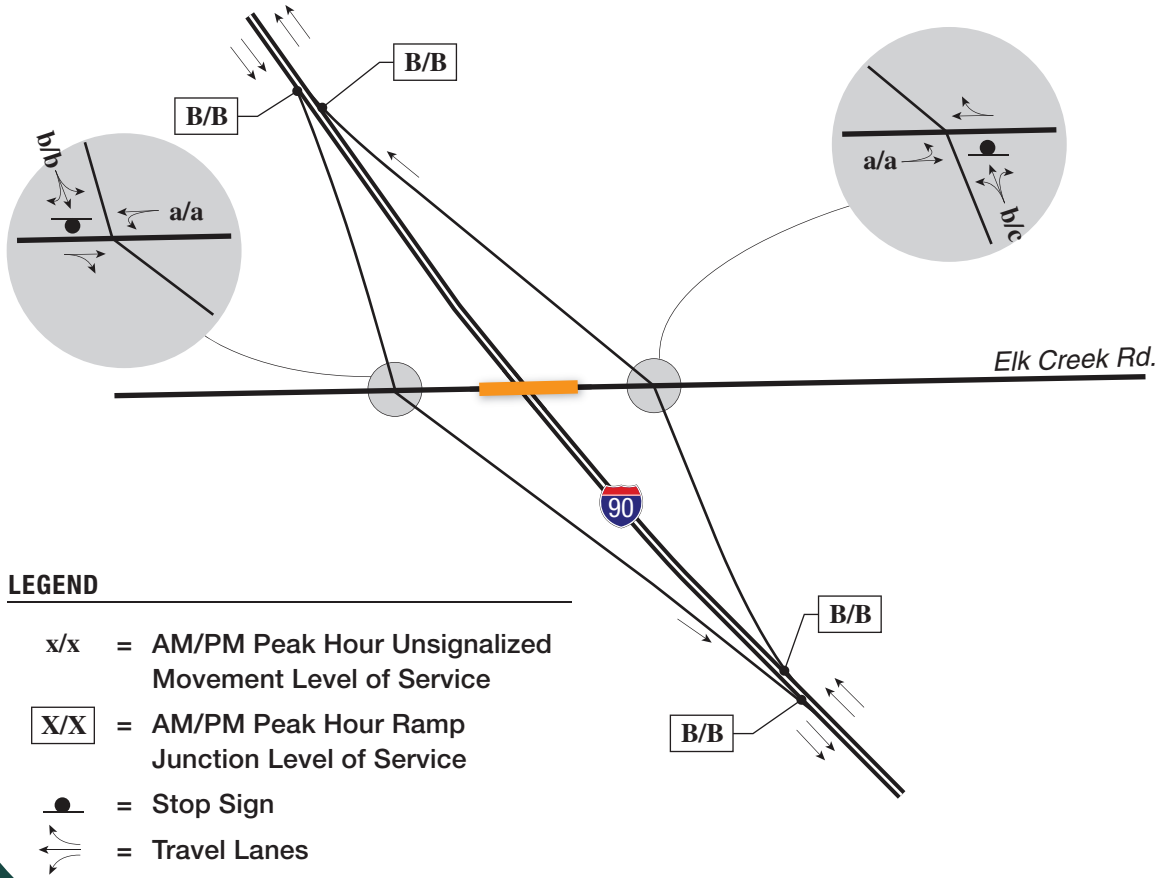
NORTH





LEGEND

xxx(xxx) = AM(PM) Peak Hour Traffic Volumes (vph)



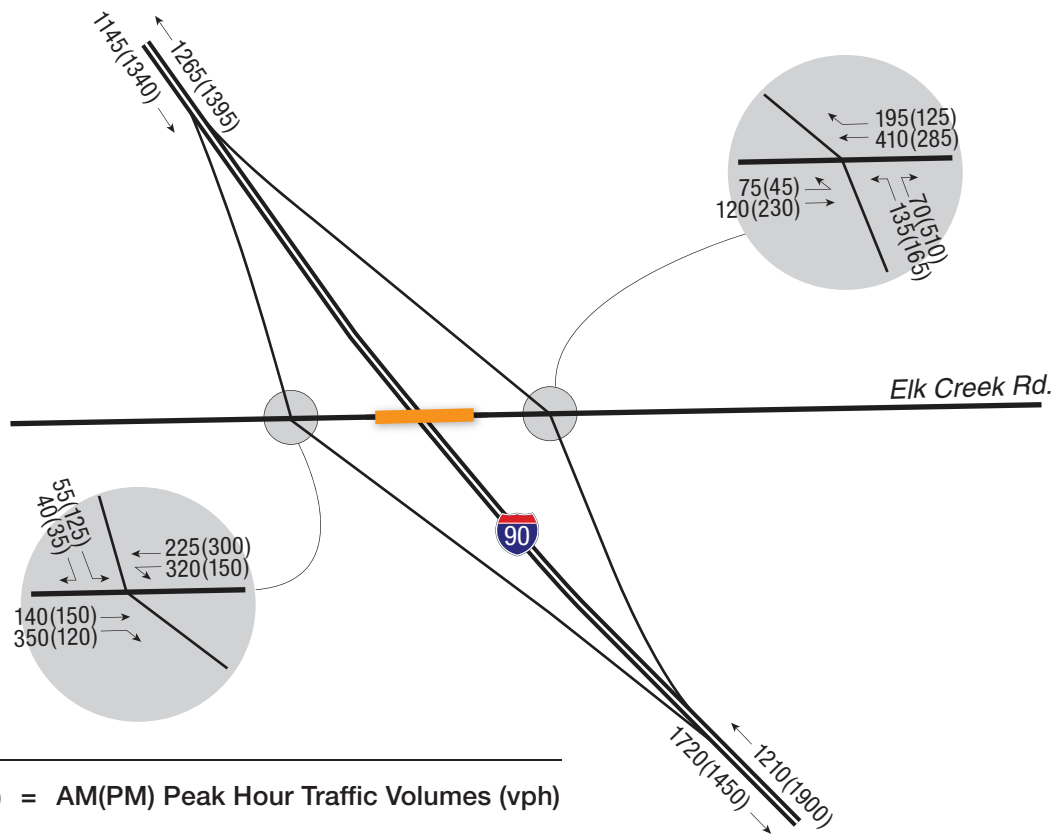
LEGEND

- x/x = AM/PM Peak Hour Unsignalized Movement Level of Service
- X/X = AM/PM Peak Hour Ramp Junction Level of Service
- = Stop Sign
- ↔ = Travel Lanes

Interstate 90 Exit 46
Traffic Conditions Year 2020

NORTH

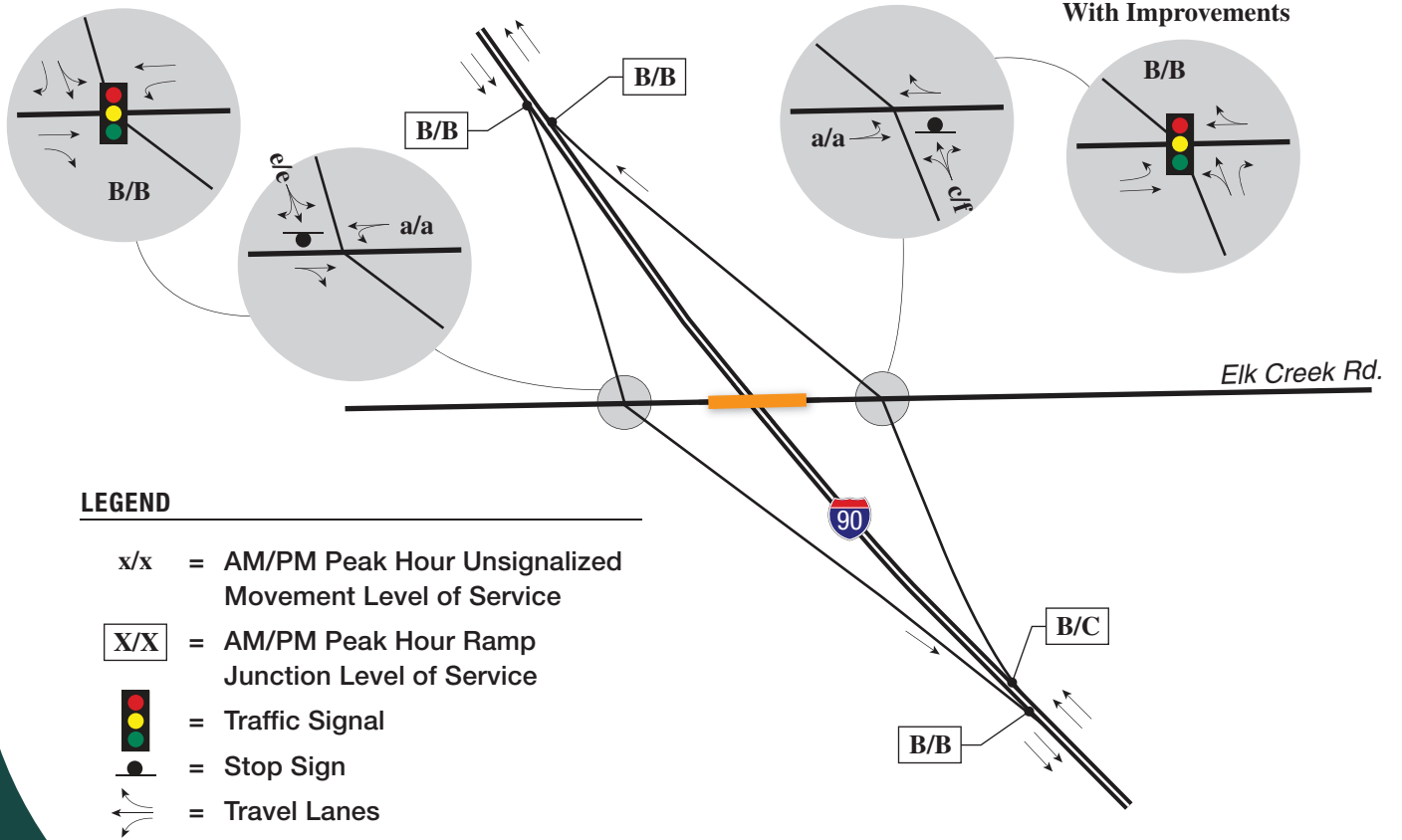




LEGEND

xxx(xxx) = AM(PM) Peak Hour Traffic Volumes (vph)

With Improvements



LEGEND

- x/x = AM/PM Peak Hour Unsignalized Movement Level of Service
- X/X = AM/PM Peak Hour Ramp Junction Level of Service
- = Traffic Signal
- = Stop Sign
- = Travel Lanes

Interstate 90 Exit 46
Traffic Conditions Year 2030

NORTH



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I-90 EXIT 48 STAGE STOP CANYON ROAD



Figure 1
 I-90 Exit 48 - Stage Stop Road, Piedmont
 Relocated Diamond Interchange

**Probable Construction Costs
Exit 48 - Relocated Diamond**

<i>Item Description</i>	<i>Quantity</i>	<i>Unit</i>	<i>Unit Cost</i>	<i>Total Cost</i>
Mobilization	1	LUMP SUM	\$229,000.00	\$229,000
Traffic Control	1	LUMP SUM	\$459,000.00	\$459,000
Clearing	1	LUMP SUM	\$92,000.00	\$92,000
Removal of Concrete Pavement	8,010	SQ. YD.	\$3.88	\$31,103
Removal of Asphalt Pavement	12,375	SQ. YD.	\$7.39	\$91,474
Remove Bridge	11,196	SQ. FT.	\$9.00	\$100,764
Borrow, Unclassified Excavation	49,585	CU. YD.	\$5.30	\$262,898
Base Course	9,405	TON	\$10.64	\$100,044
Asphalt Composite	16,095	TON	\$80.91	\$1,302,175
PCC Pavement 11" (mainline)	-	SQ. YD.	\$33.12	\$0
PCC Pavement 8" (ramps)	-	SQ. YD.	\$43.40	\$0
Concrete Approach Slab	5,600	SQ. YD.	\$188.34	\$1,054,715
Bridges	16,416	SQ. FT.	\$100.00	\$1,641,600
Guard Rail	0	LF	\$100.00	\$0
Permanent Signing/Markings	1	LUMP SUM	\$140,000.00	\$140,000
Traffic Signal	0	EACH	\$125,000.00	\$0
Roadway Lighting	1	LUMP SUM	\$90,000.00	\$90,000
Drainage (18" RCP)	120	LF	\$24.53	<u>\$2,944</u>
Subtotal				\$5,600,000
Contingencies	25%			<u>\$1,400,000</u>
Total Probable Construction Costs				\$7,000,000
Engineering, Administration	15%			\$1,050,000
Total Project Costs				\$8,050,000

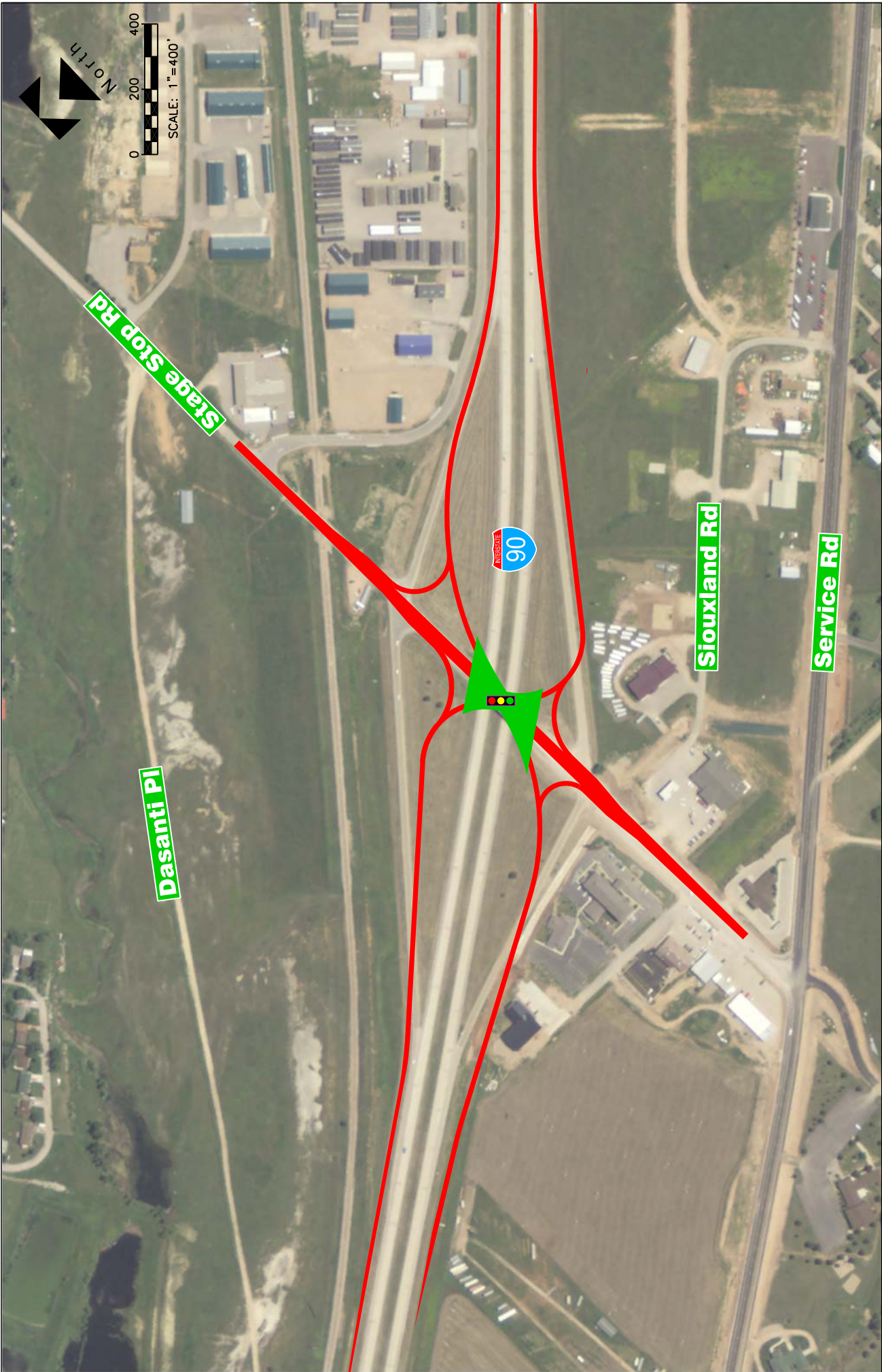


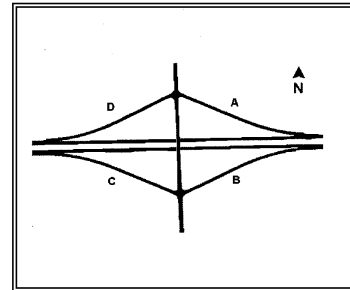
Figure 2
 I-90 Exit 48 - Stage Stop Road, Piedmont
 Single Point Interchange

**Probable Construction Costs
Exit 48 - Single Point Interchange**

<i>Item Description</i>	<i>Quantity</i>	<i>Unit</i>	<i>Unit Cost</i>	<i>Total Cost</i>
Mobilization	1	LUMP SUM	\$336,000.00	\$336,000
Traffic Control	1	LUMP SUM	\$671,000.00	\$671,000
Clearing	1	LUMP SUM	\$134,000.00	\$134,000
Removal of Concrete Pavement	15,522	SQ. YD.	\$3.88	\$60,271
Removal of Asphalt Pavement	17,948	SQ. YD.	\$7.39	\$132,670
Remove Bridge	9,864	SQ. FT.	\$9.00	\$88,776
Borrow, Unclassified Excavation	62,294	CU. YD.	\$5.30	\$330,281
Base Course	11,816	TON	\$10.64	\$125,685
Asphalt Composite	15,287	TON	\$80.91	\$1,236,808
PCC Pavement 11" (mainline)	-	SQ. YD.	\$33.12	\$0
PCC Pavement 8" (ramps)	-	SQ. YD.	\$43.40	\$0
Concrete Approach Slab	7,200	SQ. YD.	\$188.34	\$1,356,062
Bridges	33,784	SQ. FT.	\$100.00	\$3,378,400
Guard Rail	0	LF	\$100.00	\$0
Permanent Signing/Markings	1	LUMP SUM	\$200,000.00	\$200,000
Traffic Signal	1	EACH	\$125,000.00	\$125,000
Roadway Lighting	1	LUMP SUM	\$130,000.00	\$130,000
Drainage (18" RCP)	120	LF	\$24.53	<u>\$2,944</u>
Subtotal				\$8,310,000
Contingencies	25%			<u>\$2,077,500</u>
Total Probable Construction Costs				\$10,390,000
Engineering, Administration	15%			\$1,558,500
Total Project Costs				\$11,950,000

INTERCHANGE GEOMETRICS CHECKLIST
SDDOT Interstate Corridor Study

Interstate: I-90
Interchange: Exit 48 (Stage Stop Canyon Rd)
Analyst: RDG
Date: 8/13/2009



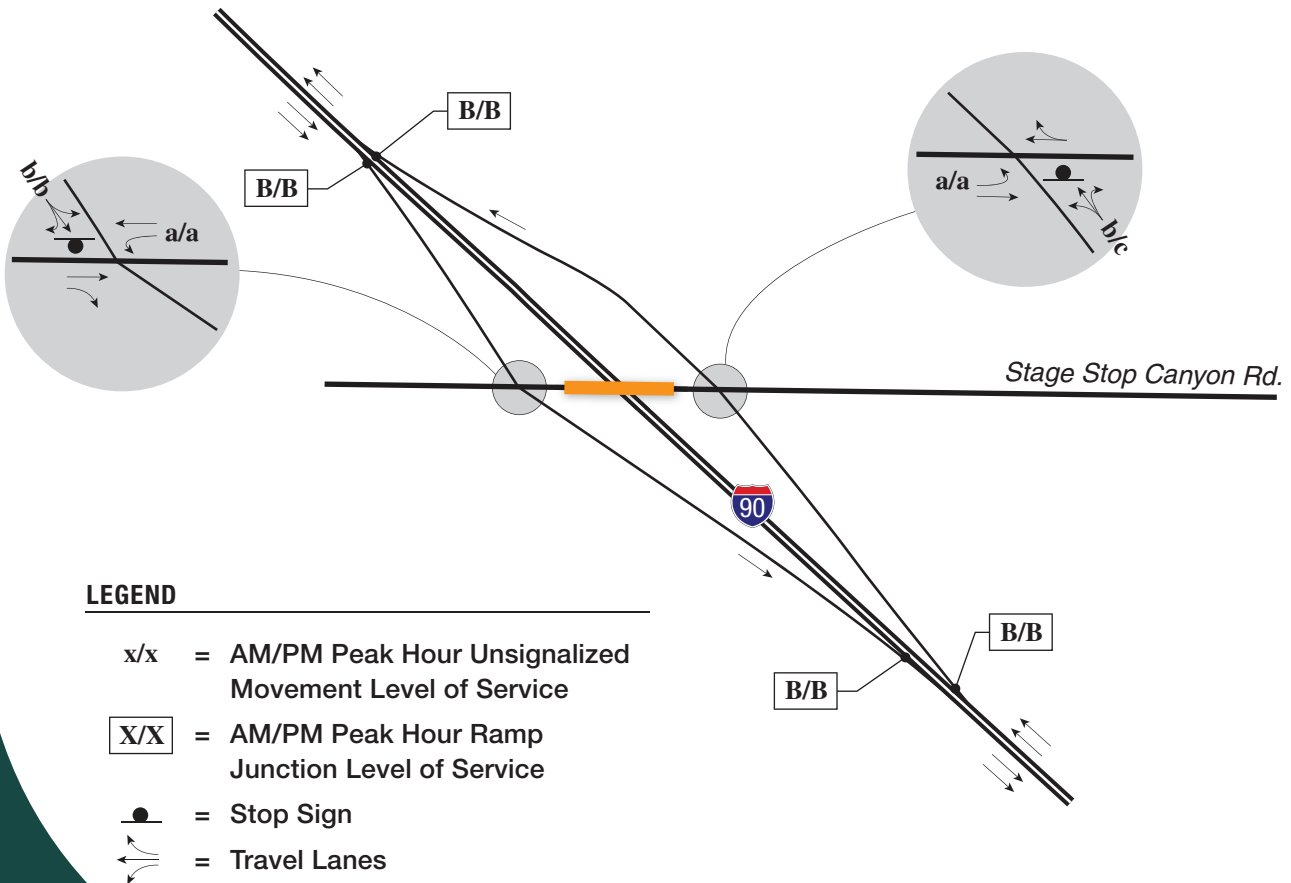
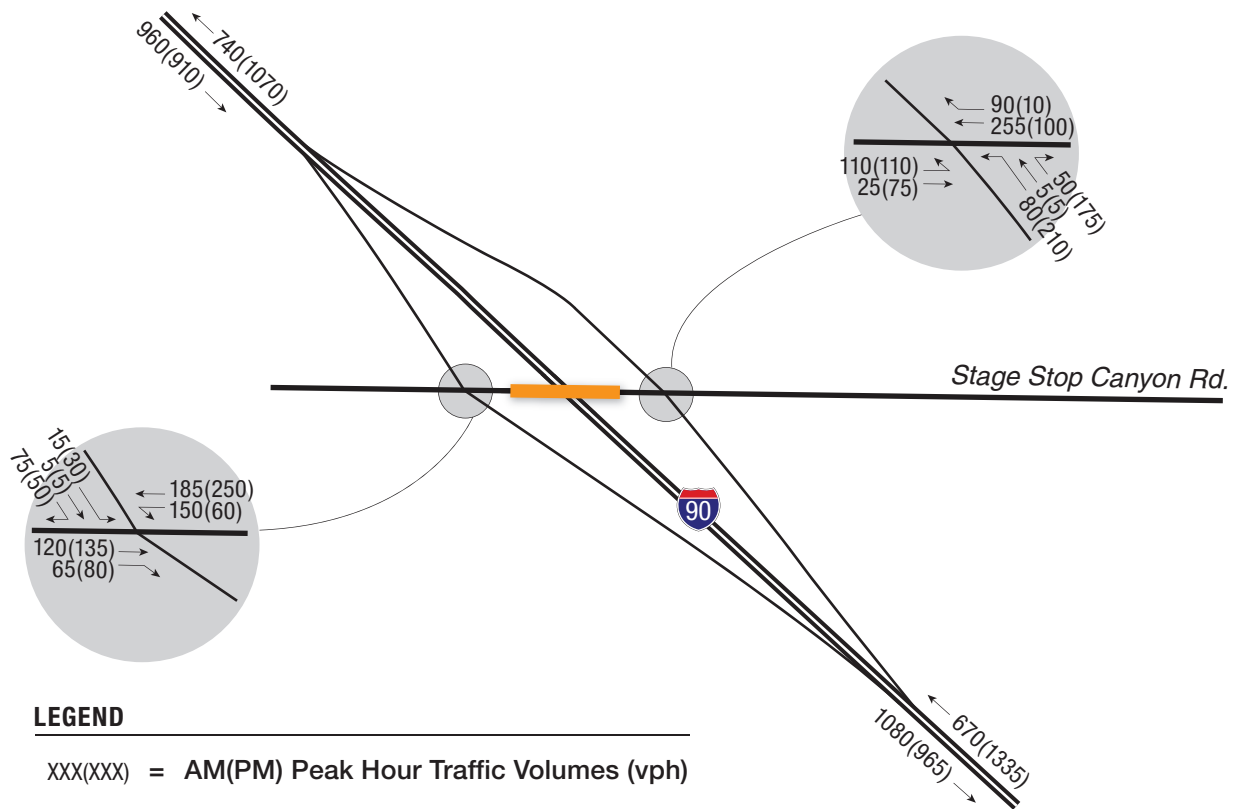
Interchange Geometry	Criteria	A	B	C	D	Achieved?
Interchange Type (Diamond, Full/Partial Cloverleaf, Trumpet etc.)	Diamond					-----
Design Speed	50 mph**					
Number of Lanes						
Right Turn Storage Length						
Left Turn Storage Length						
Superelevation (e max)	6%					
Minimum Horizontal Radius for e max of 6% (50 mph / 30 mph)	833 / 231 feet	310'	310'	310'	310'	Supports Impr.
Maximum Degree of Curvature (50 mph / 30 mph)	6° 53' / 24° 48'					
Minimum Clear Zone From the Edge of Travel Lane	30 feet	3:1	3:1	3:1	3:1	Supports Impr.
Maximum Grade on Ramp (Ascending)	+3% to +5%	0.34%	2.46%	2.13%	n/a	
Maximum Grade on Ramp (Descending)	-3% to -5%	-2.73%	-2.45%	-0.28%	-3.90%	
Minimum Lane Width						
With Auxiliary Lanes	12 feet					
As Single Lane	15 feet (19 for loops)	15	15	15	15	
Shoulder Width						
Right Shoulder	8 feet (4 for loops)	3	4	5	3	
Left Shoulder	2 feet	3	3	4	4	
Inslope	6:1	3:1	3:1	3:1	3:1	Supports Impr.
Minimum Off-Ramp Taper Rate	20:1	17	n/a	17	n/a	Supports Impr.
Minimum On-Ramp Taper Rate	50:1	n/a	21	n/a	21	Supports Impr.
Ramp Features						
K-Value Ranges						
Minimum for a Crest Vertical Curve (50 mph / 30 mph)	84 / 19	n/a	n/a	235	n/a	
Minimum for a Sag Vertical Curve (50 mph / 30 mph)	96 / 37	110	n/a	n/a	130	
Minimum Stopping Sight Distance (50 mph / 30 mph)	425 / 200 feet	698'	> 425	1,369'	412'	Supports Impr.
Cross Road Features						
K-Value Ranges						
Minimum for a Crest Vertical Curve (50 mph / 30 mph)	84 / 19		59			Supports Impr.
Minimum for a Sag Vertical Curve (50 mph / 30 mph)	96 / 37		66			Supports Impr.
Minimum Stopping Sight Distance (50 mph / 30 mph)	425 / 200 feet		393'			Supports Impr.
Ramp Intersection Sight Distance (ISD) (50 mph / 30 mph)***	425 / 200 feet		n/a		n/a	
Maximum Longitudinal Grade - Rolling Terrain (Urban Arterial)	7%		3.0%			
Minimum Longitudinal Grade (Min. / Des.)	0.3% / 0.5%		0.0%			Supports Impr.
Minimum Control of Access from Interchange Ramps (Min. / Des.)	300 / 660 feet		> 660			

** Loop ramp design speed = 30 mph

***Substandard Intersection Sight Distance locations could not be determined from the interchange plans. Substandard locations, therefore, are intersections that demonstrate sight distance limitations based on a general field evaluation or the presence of a substandard k-value or Stopping Sight Distance along the crossroad approaching the intersection.

Comments

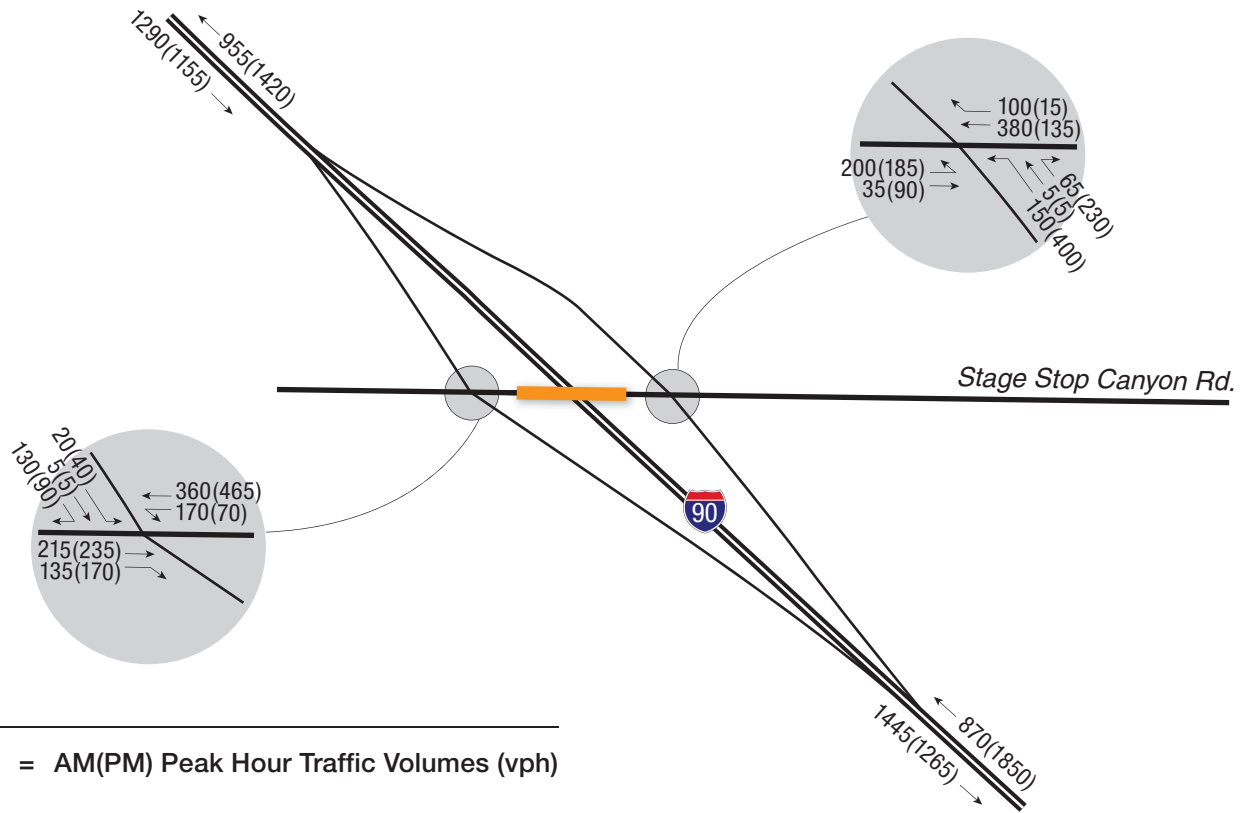
Inslopes poor?



Interstate 90 Exit 48
Traffic Conditions Year 2009

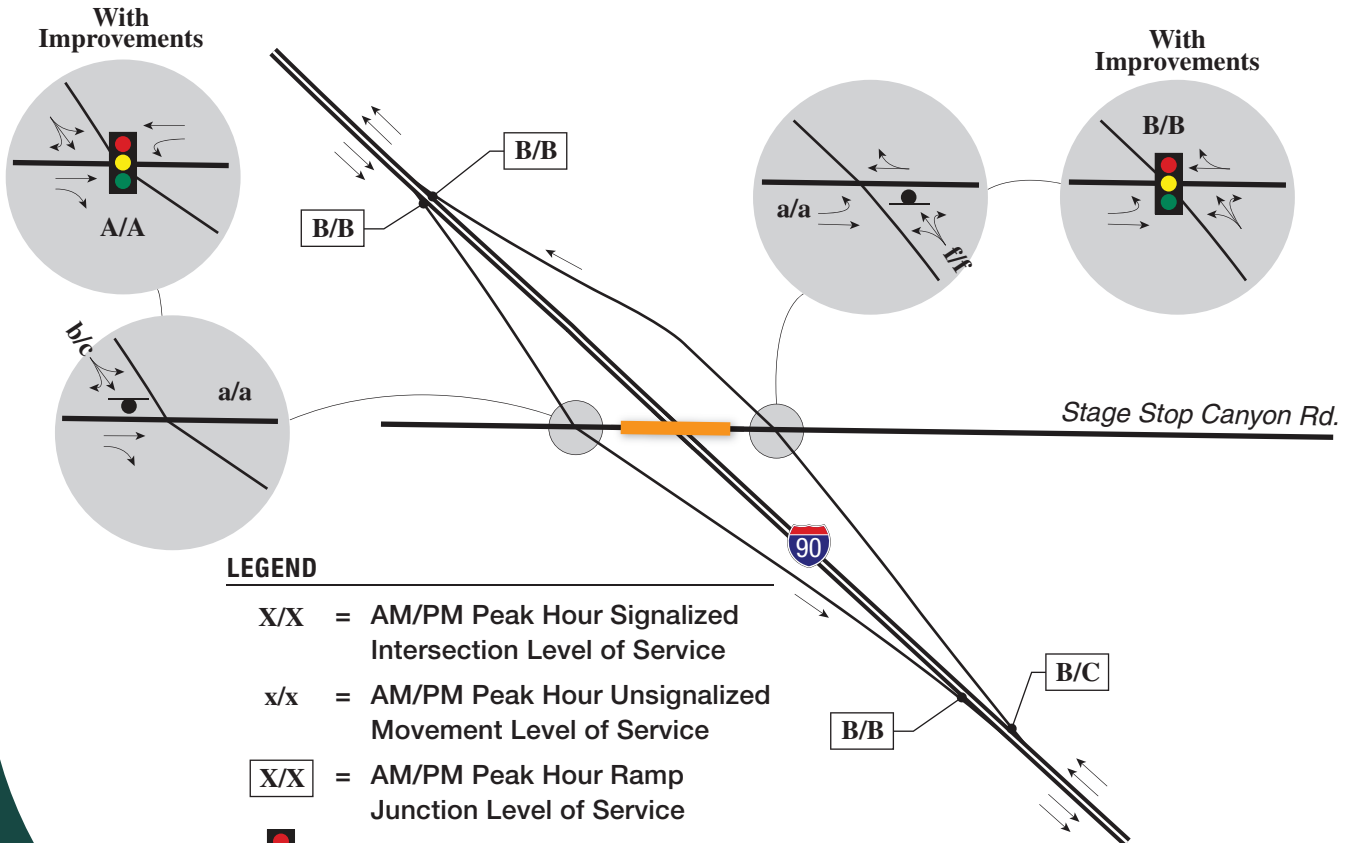
NORTH





LEGEND

XXX(XXX) = AM(PM) Peak Hour Traffic Volumes (vph)



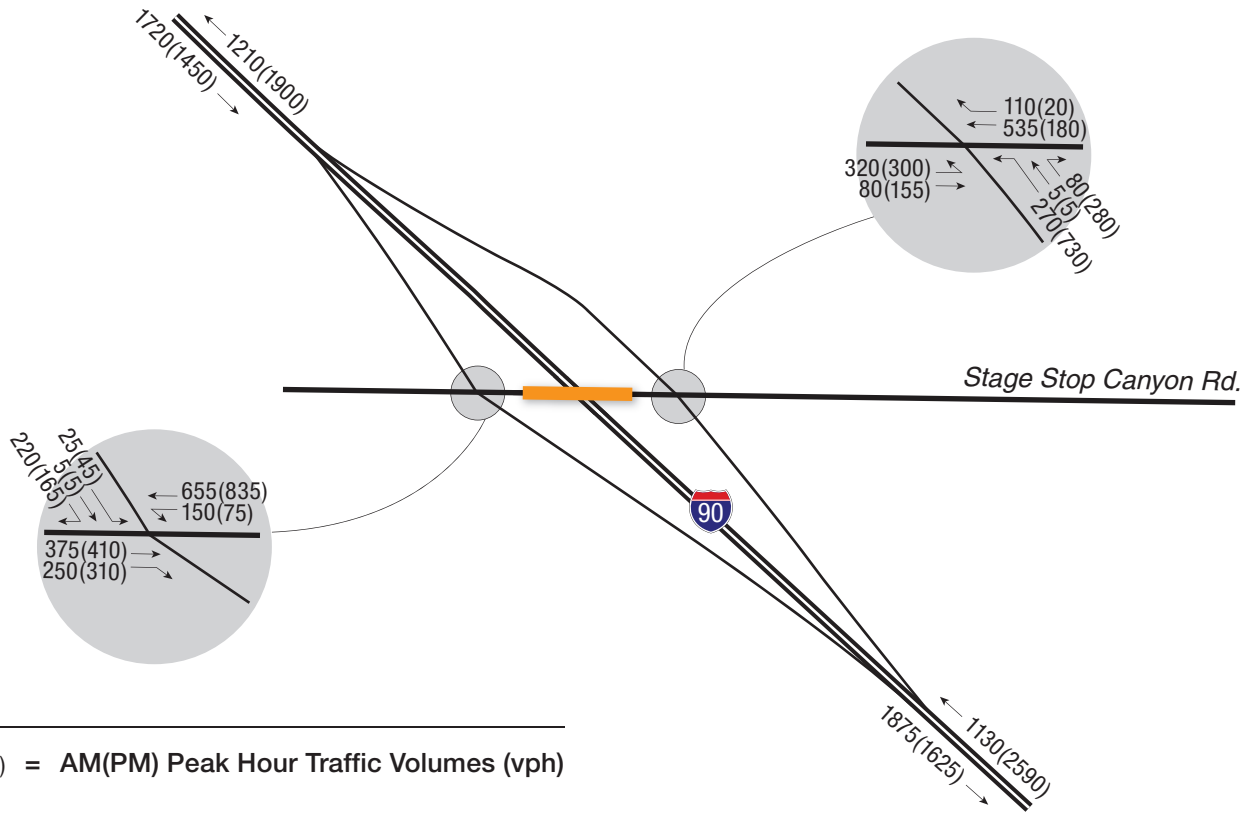
LEGEND

- X/X = AM/PM Peak Hour Signalized Intersection Level of Service
- x/x = AM/PM Peak Hour Unsignalized Movement Level of Service
- X/X = AM/PM Peak Hour Ramp Junction Level of Service
- = Traffic Signal
- = Stop Sign
- = Travel Lanes

Interstate 90 Exit 48
Traffic Conditions Year 2020

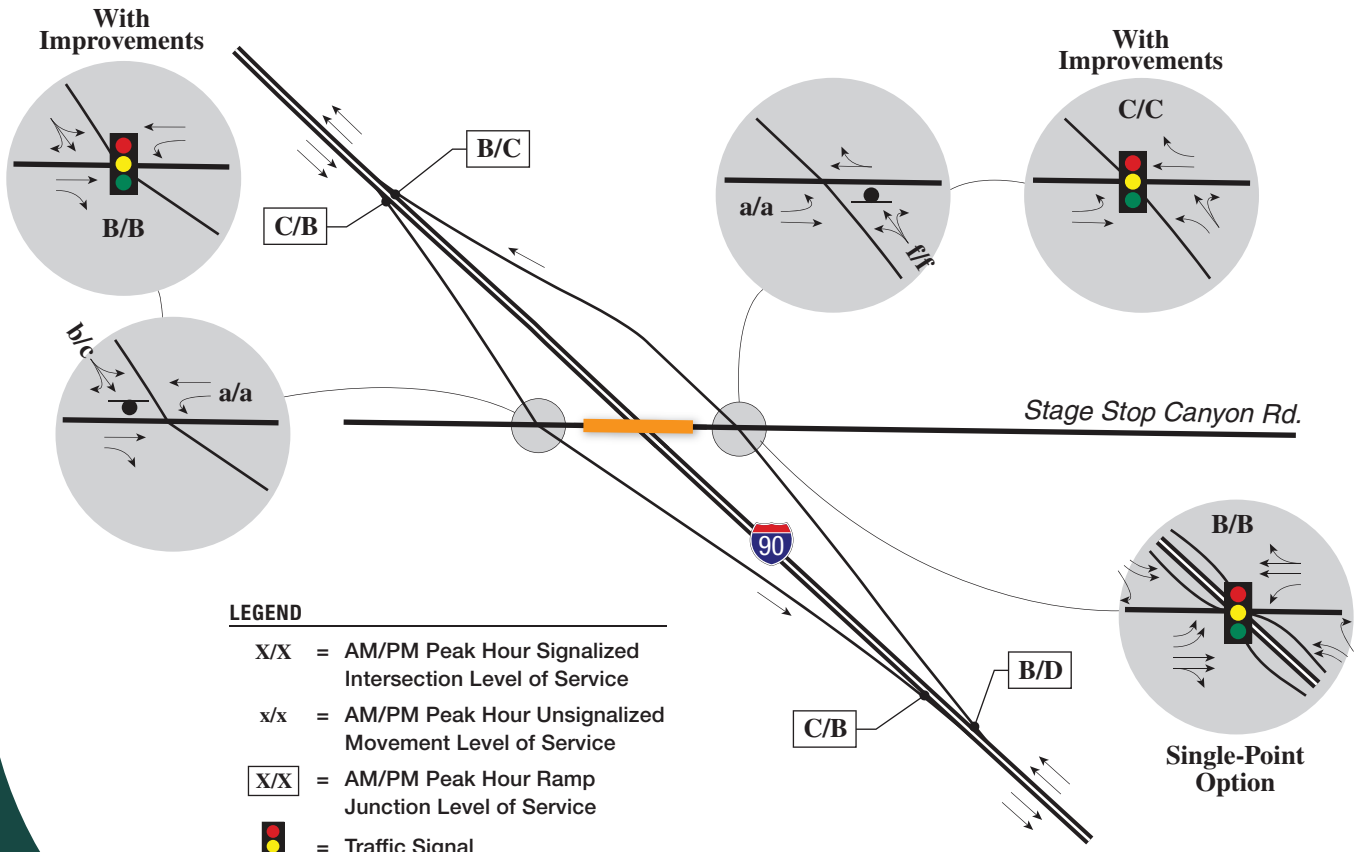
NORTH





LEGEND

XXX(XXX) = AM(PM) Peak Hour Traffic Volumes (vph)



LEGEND

- X/X = AM/PM Peak Hour Signalized Intersection Level of Service
- x/x = AM/PM Peak Hour Unsignalized Movement Level of Service
- X/X = AM/PM Peak Hour Ramp Junction Level of Service
- = Traffic Signal
- = Stop Sign
- = Travel Lanes

Interstate 90 Exit 48
Traffic Conditions Year 2030

NORTH



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I-90 EXIT 55 DEADWOOD AVENUE



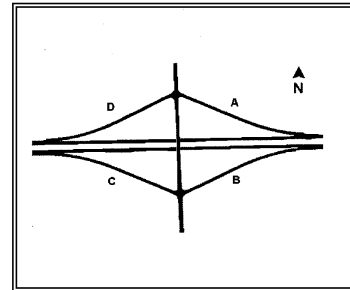
Figure 1
 I-90 Exit 55 - Deadwood Avenue, Rapid City
 Bridge Widening

**Probable Construction Costs
Exit 55 - Bridge Widening & Turn Lanes**

<i>Item Description</i>	<i>Quantity</i>	<i>Unit</i>	<i>Unit Cost</i>	<i>Total Cost</i>
Mobilization	1	LUMP SUM	\$126,000.00	\$126,000
Traffic Control	1	LUMP SUM	\$252,000.00	\$252,000
Clearing	1	LUMP SUM	\$50,000.00	\$50,000
Removal of Concrete Pavement	-	SQ. YD.	\$3.88	\$0
Removal of Asphalt Pavement	-	SQ. YD.	\$7.39	\$0
Remove Bridge	-	SQ. FT.	\$9.00	\$0
Borrow, Unclassified Excavation	2,086	CU. YD.	\$5.30	\$11,062
Base Course	1,317	TON	\$10.64	\$14,014
Asphalt Composite	1,317	TON	\$80.91	\$106,590
PCC Pavement 11" (mainline)	-	SQ. YD.	\$33.12	\$0
PCC Pavement 8" (ramps)	5,208	SQ. YD.	\$43.40	\$226,001
Concrete Approach Slab	3,600	SQ. YD.	\$188.34	\$678,031
Bridges	14,828	SQ. FT.	\$100.00	\$1,482,800
Guard Rail	0	LF	\$100.00	\$0
Permanent Signing/Markings	1	LUMP SUM	\$80,000.00	\$80,000
Traffic Signal	0	EACH	\$125,000.00	\$0
Roadway Lighting	1	LUMP SUM	\$50,000.00	\$50,000
Drainage (18" RCP)	90	LF	\$24.53	<u>\$2,208</u>
Subtotal				\$3,080,000
Contingencies	25%			<u>\$770,000</u>
Total Probable Construction Costs				\$3,850,000
Engineering, Administration	15%			\$577,500
Total Project Costs				\$4,430,000

INTERCHANGE GEOMETRICS CHECKLIST
SDDOT Interstate Corridor Study

Interstate: I-90
Interchange: Exit 55
Analyst: RDG
Date: 8/13/2009

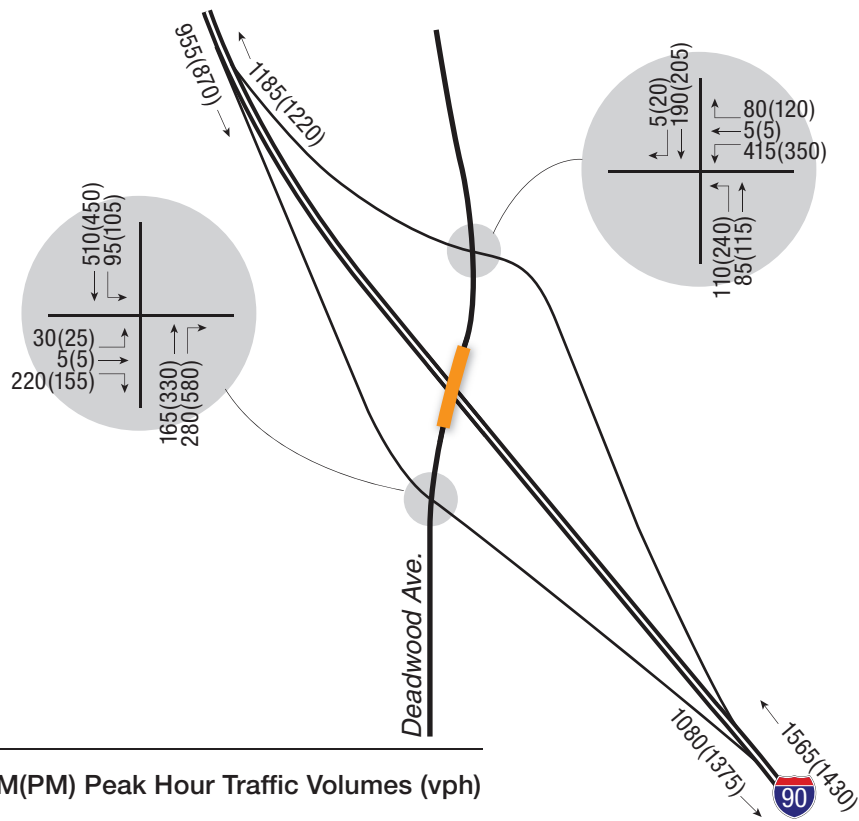


Interchange Geometry	Criteria	A	B	C	D	Achieved?
Interchange Type (Diamond, Full/Partial Cloverleaf, Trumpet etc.)	Diamond					-----
Design Speed	50 mph**					
Number of Lanes						
Right Turn Storage Length						
Left Turn Storage Length						
Superelevation (e max)	6%	2%	2%	2%	2%	
Minimum Horizontal Radius for e max of 6% (50 mph / 30 mph)	833 / 231 feet	-	-	-	-	
Maximum Degree of Curvature (50 mph / 30 mph)	6° 53' / 24° 48'	-	-	-	-	
Minimum Clear Zone From the Edge of Travel Lane	30 feet	> 30	> 30	> 30	> 30	
Maximum Grade on Ramp (Ascending)	+3% to +5%	4.95%	n/a	1.82%	3.00%	
Maximum Grade on Ramp (Descending)	-3% to -5%	n/a	-5.58%	-3.00%	n/a	Supports Impr.
Minimum Lane Width						
With Auxiliary Lanes	12 feet	18-20	18	12	18	Supports Impr.
As Single Lane	15 feet (19 for loops)					
Shoulder Width						
Right Shoulder	8 feet (4 for loops)	8	8	8	8	
Left Shoulder	2 feet	2	2	2	2	
Inslope	6:1	4:1	4:1	4:1	4:1	Supports Impr.
Minimum Off-Ramp Taper Rate	20:1					
Minimum On-Ramp Taper Rate	50:1					
Ramp Features						
K-Value Ranges						
Minimum for a Crest Vertical Curve (50 mph / 30 mph)	84 / 19	n/a	n/a	n/a	n/a	
Minimum for a Sag Vertical Curve (50 mph / 30 mph)	96 / 37	76	46	135	141	
Minimum Stopping Sight Distance (50 mph / 30 mph)	425 / 200 feet	360'	246'	576'	711'	
Cross Road Features						
K-Value Ranges						
Minimum for a Crest Vertical Curve (50 mph / 30 mph)	84 / 19		56			Supports Impr.
Minimum for a Sag Vertical Curve (50 mph / 30 mph)	96 / 37		106			
Minimum Stopping Sight Distance (50 mph / 30 mph)	425 / 200 feet		460			
Ramp Intersection Sight Distance (ISD) (50 mph / 30 mph)***	425 / 200 feet	ok	n/a	ok	n/a	
Maximum Longitudinal Grade - Rolling Terrain (Urban Arterial)	7%		3.8%			
Minimum Longitudinal Grade (Min. / Des.)	0.3% / 0.5%		0.0%			
Minimum Control of Access from Interchange Ramps (Min. / Des.)	300 / 660 feet		750'			

** Loop ramp design speed = 30 mph
 ***Substandard Intersection Sight Distance locations could not be determined from the interchange plans. Substandard locations, therefore, are intersections that demonstrate sight distance limitations based on a general field evaluation or the presence of a substandard k-value or Stopping Sight Distance along the crossroad approaching the intersection.

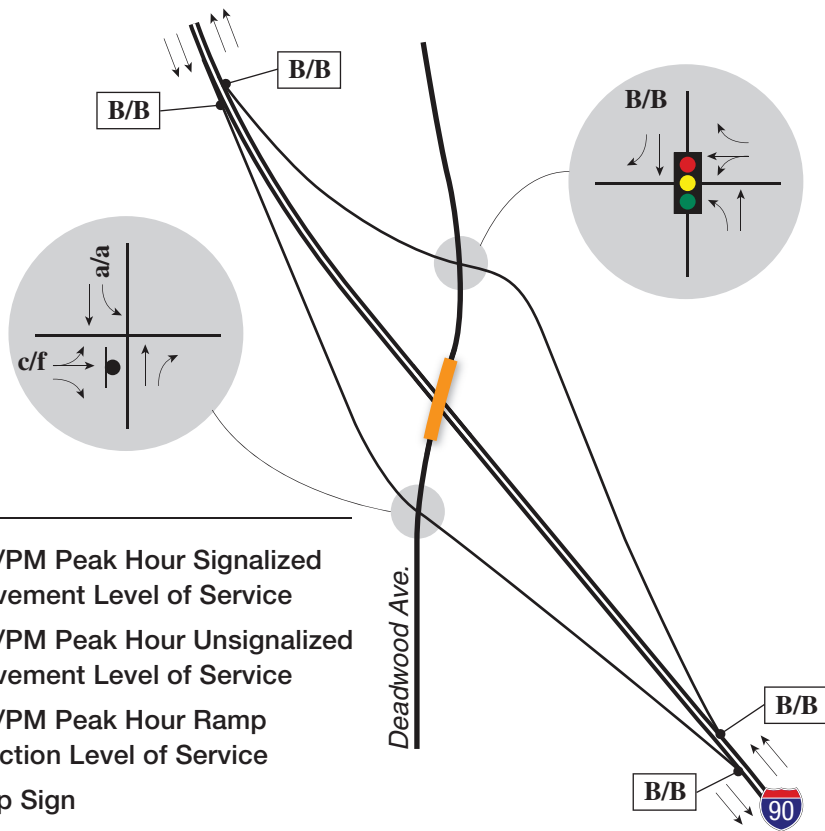
Comments

A lot of truck traffic. Thru-left and right turn lanes for off ramps.



LEGEND

xxx(xxx) = AM(PM) Peak Hour Traffic Volumes (vph)

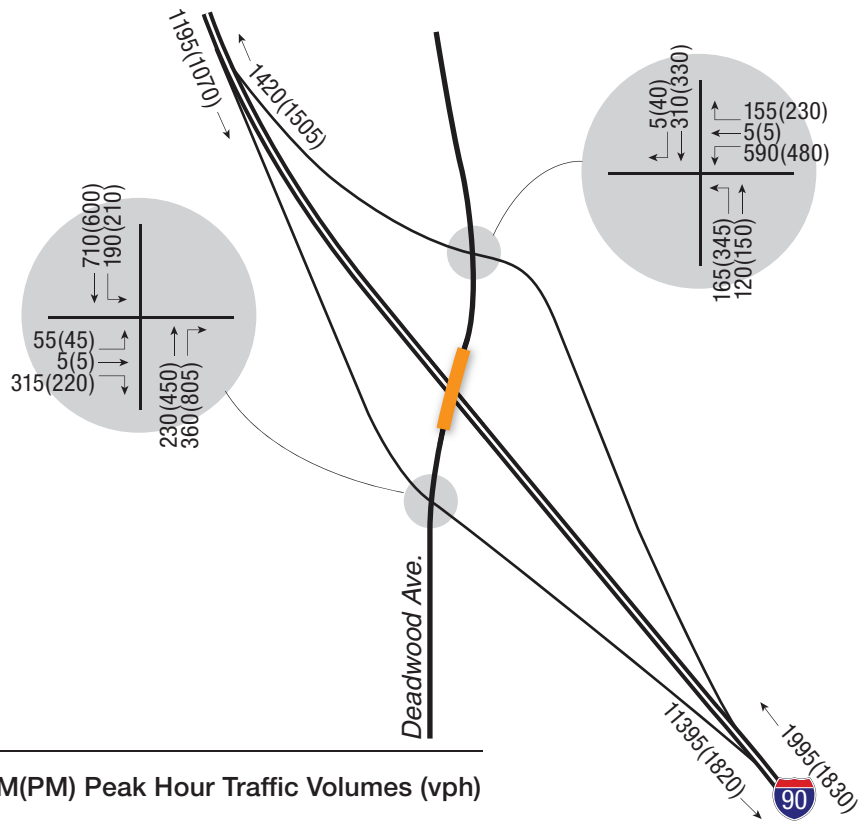


LEGEND

- X/X = AM/PM Peak Hour Signalized Movement Level of Service
- x/x = AM/PM Peak Hour Unsignalized Movement Level of Service
- X/X = AM/PM Peak Hour Ramp Junction Level of Service
- = Stop Sign
- ⬆️⬇️⬆️ = Traffic Signal
- ↔️ = Travel Lanes

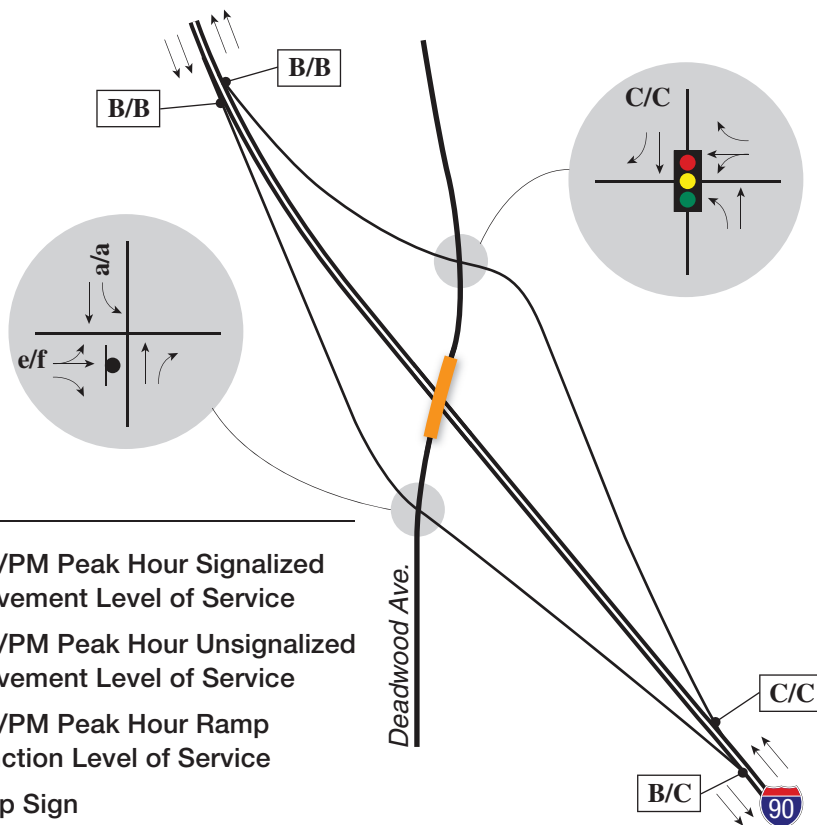
Interstate 90 Exit 55
Traffic Conditions Year 2009

NORTH



LEGEND

xxx(xxx) = AM(PM) Peak Hour Traffic Volumes (vph)



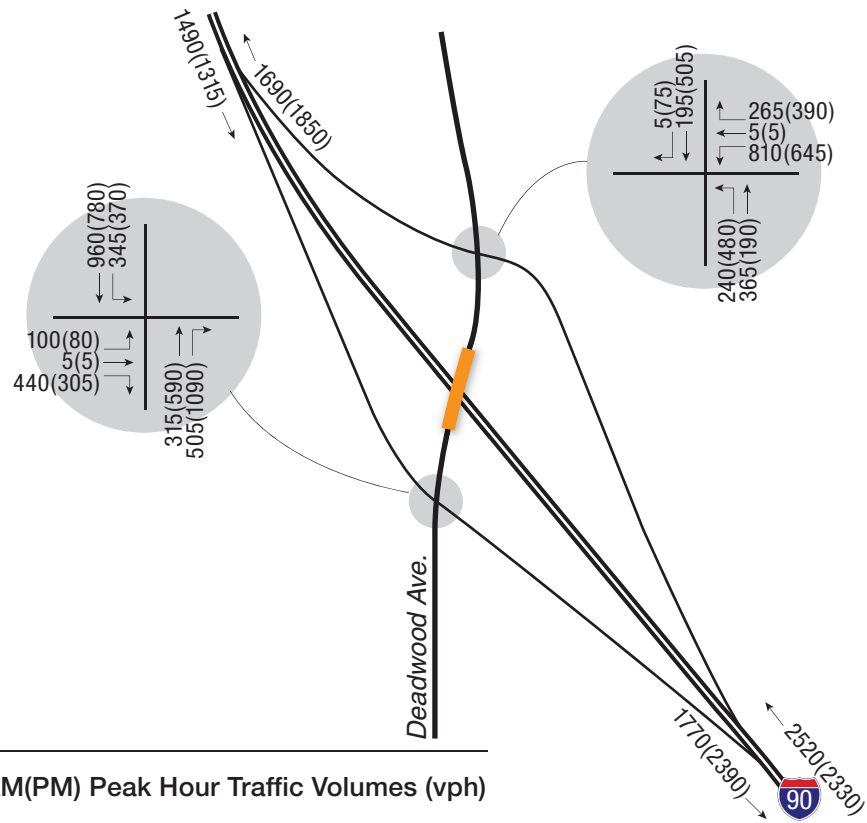
LEGEND

- X/X = AM/PM Peak Hour Signalized Movement Level of Service
- x/x = AM/PM Peak Hour Unsignalized Movement Level of Service
- X/X = AM/PM Peak Hour Ramp Junction Level of Service
- = Stop Sign
- 🚦 = Traffic Signal
- ↔ = Travel Lanes

Interstate 90 Exit 55
Traffic Conditions Year 2020

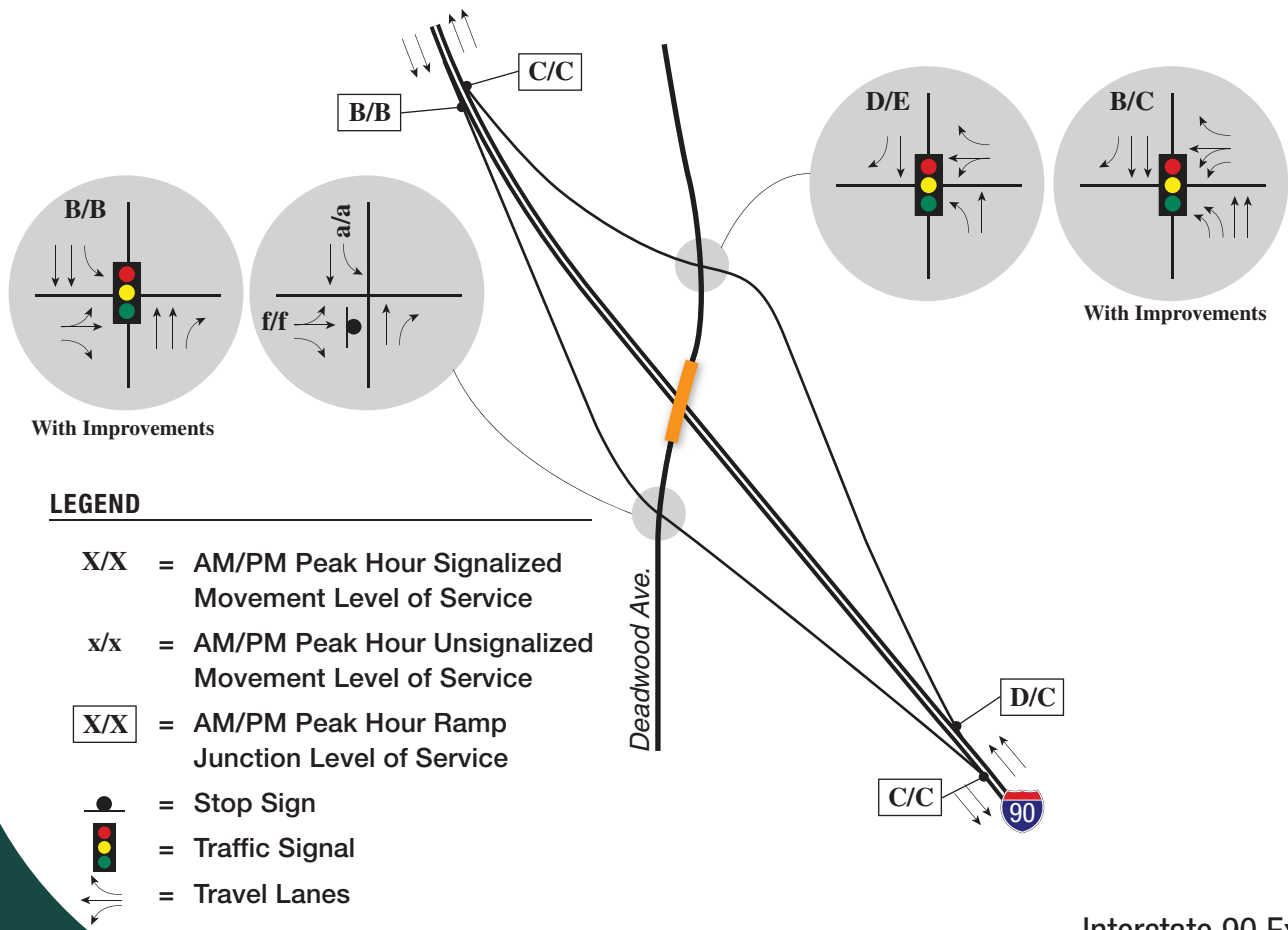
NORTH





LEGEND

xxx(XXX) = AM(PM) Peak Hour Traffic Volumes (vph)



LEGEND

- X/X = AM/PM Peak Hour Signalized Movement Level of Service
- x/x = AM/PM Peak Hour Unsignalized Movement Level of Service
- X/X = AM/PM Peak Hour Ramp Junction Level of Service
- = Stop Sign
- 🚦 = Traffic Signal
- ↔ = Travel Lanes

Interstate 90 Exit 55
Traffic Conditions Year 2030

NORTH

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I-90 EXIT 59 LACROSSE STREET



Figure 1
I-90 Exit 59 - LaCrosse Street, Rapid City
Bridge Widening & Lane Improvements

**Probable Construction Costs
Exit 59 - New Bridge & Turn Lanes**

<i>Item Description</i>	<i>Quantity</i>	<i>Unit</i>	<i>Unit Cost</i>	<i>Total Cost</i>
Mobilization	1	LUMP SUM	\$204,000.00	\$204,000
Traffic Control	1	LUMP SUM	\$409,000.00	\$409,000
Clearing	1	LUMP SUM	\$82,000.00	\$82,000
Removal of Concrete Pavement	-	SQ. YD.	\$3.88	\$0
Removal of Asphalt Pavement	-	SQ. YD.	\$7.39	\$0
Remove Bridge	6,360	SQ. FT.	\$9.00	\$57,240
Borrow, Unclassified Excavation	850	CU. YD.	\$5.30	\$4,508
Base Course	671	TON	\$10.64	\$7,139
Asphalt Composite	-	TON	\$80.91	\$0
PCC Pavement 11" (mainline)	-	SQ. YD.	\$33.12	\$0
PCC Pavement 8" (ramps)	2,193	SQ. YD.	\$43.40	\$95,185
Concrete Approach Slab	8,000	SQ. YD.	\$188.34	\$1,506,736
Bridges	24,160	SQ. FT.	\$100.00	\$2,416,000
Guard Rail	0	LF	\$100.00	\$0
Permanent Signing/Markings	1	LUMP SUM	\$120,000.00	\$120,000
Traffic Signal	0	EACH	\$125,000.00	\$0
Roadway Lighting	1	LUMP SUM	\$80,000.00	\$80,000
Drainage (18" RCP)	30	LF	\$24.53	<u>\$736</u>
Subtotal				\$4,980,000
Contingencies	25%			<u>\$1,245,000</u>
Total Probable Construction Costs				\$6,230,000
Engineering, Administration	15%			\$934,500
Total Project Costs				\$7,160,000

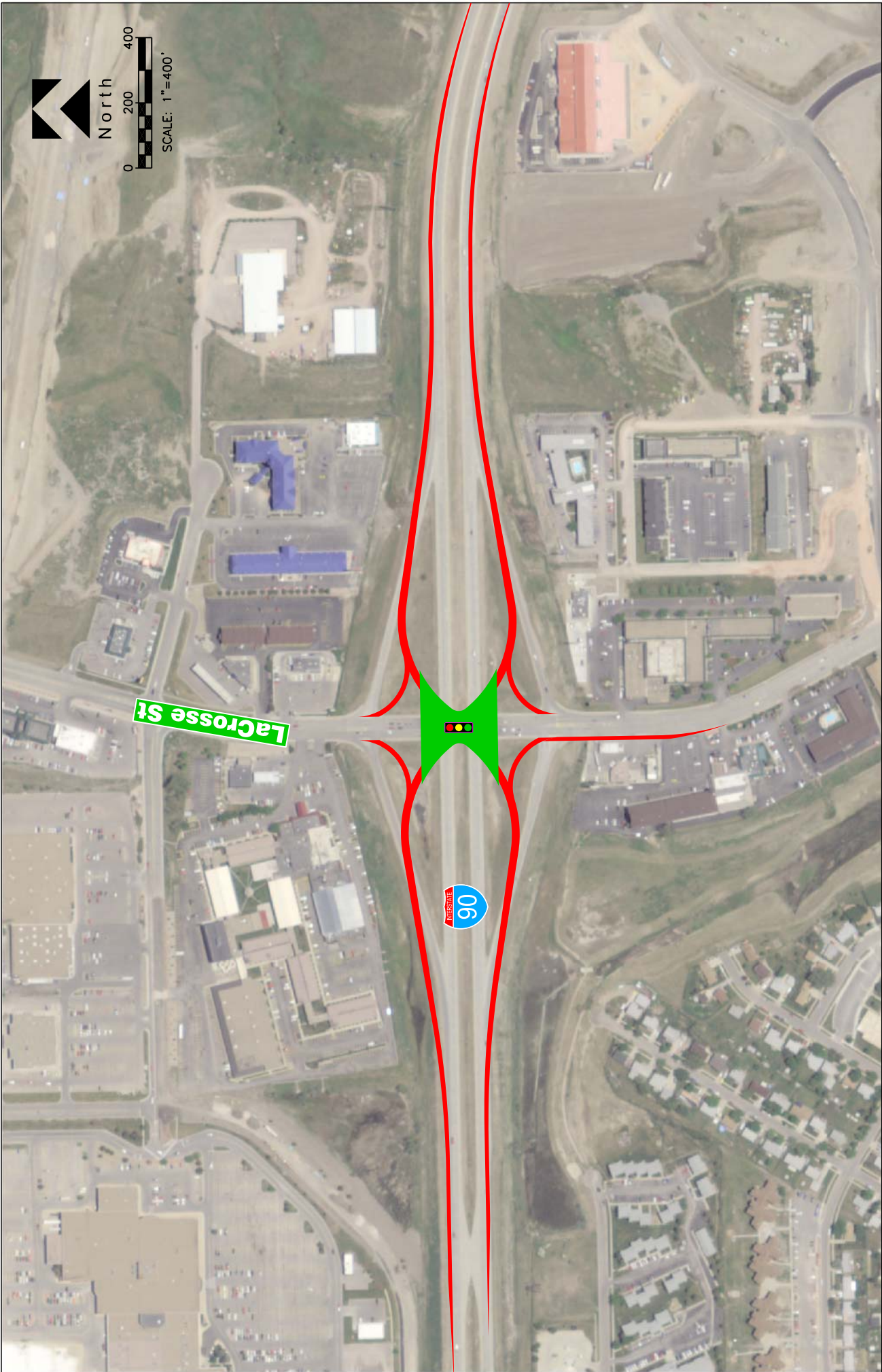


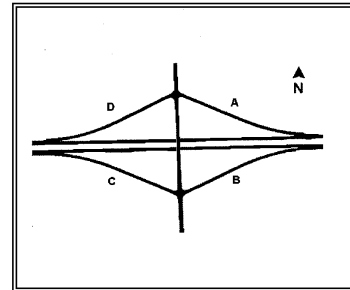
Figure 2
I-90 Exit 59 - LaCrosse Street, Rapid City
Single Point Interchange

**Probable Construction Costs
Exit 59 - Single Point Interchange**

<i>Item Description</i>	<i>Quantity</i>	<i>Unit</i>	<i>Unit Cost</i>	<i>Total Cost</i>
Mobilization	1	LUMP SUM	\$408,000.00	\$408,000
Traffic Control	1	LUMP SUM	\$817,000.00	\$817,000
Clearing	1	LUMP SUM	\$163,000.00	\$163,000
Removal of Concrete Pavement	6,105	SQ. YD.	\$3.88	\$23,706
Removal of Asphalt Pavement	4,070	SQ. YD.	\$7.39	\$30,085
Remove Bridge	24,500	SQ. FT.	\$9.00	\$220,500
Borrow, Unclassified Excavation	65,558	CU. YD.	\$5.30	\$347,587
Base Course	12,435	TON	\$10.64	\$132,271
Asphalt Composite	-	TON	\$80.91	\$0
PCC Pavement 11" (mainline)	-	SQ. YD.	\$33.12	\$0
PCC Pavement 8" (ramps)	28,001	SQ. YD.	\$43.40	\$1,215,103
Concrete Approach Slab	8,400	SQ. YD.	\$188.34	\$1,582,073
Bridges	46,149	SQ. FT.	\$100.00	\$4,614,900
Guard Rail	0	LF	\$100.00	\$0
Permanent Signing/Markings	1	LUMP SUM	\$250,000.00	\$250,000
Traffic Signal	1	EACH	\$125,000.00	\$125,000
Roadway Lighting	1	LUMP SUM	\$160,000.00	\$160,000
Drainage (18" RCP)	150	LF	\$24.53	<u>\$3,680</u>
Subtotal				\$10,090,000
Contingencies	25%			<u>\$2,522,500</u>
Total Probable Construction Costs				\$12,610,000
Engineering, Administration	15%			\$1,891,500
Total Project Costs				\$14,500,000

INTERCHANGE GEOMETRICS CHECKLIST
SDDOT Interstate Corridor Study

Interstate: I-90
Interchange: Exit 59 (Lacrosse St)
Analyst: RDG
Date: 8/13/2009



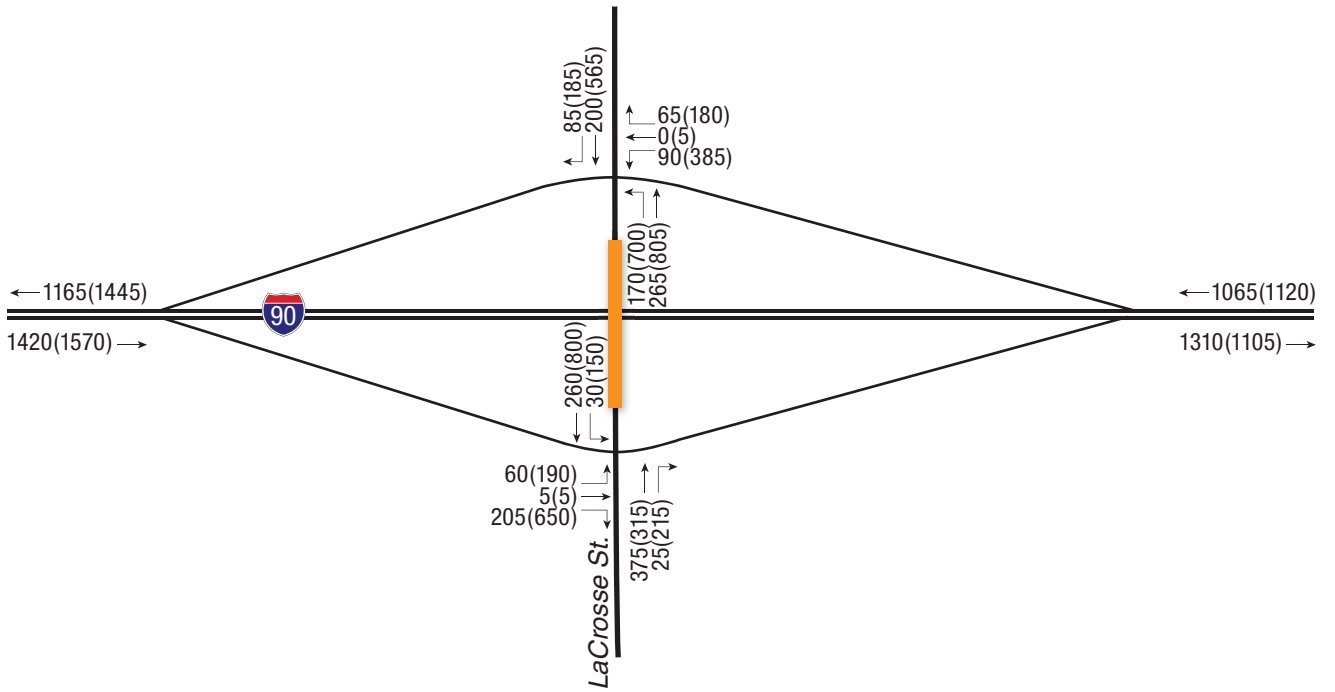
Interchange Geometry	Criteria	A	B	C	D	Achieved?
Interchange Type (Diamond, Full/Partial Cloverleaf, Trumpet etc.)	Diamond					-----
Design Speed	50 mph**					
Number of Lanes						
Right Turn Storage Length						
Left Turn Storage Length						
Superelevation (e max)	6%	2%	2%	2%	2%	
Minimum Horizontal Radius for e max of 6% (50 mph / 30 mph)	833 / 231 feet	-	-	-	-	
Maximum Degree of Curvature (50 mph / 30 mph)	6° 53' / 24° 48'	-	-	-	-	
Minimum Clear Zone From the Edge of Travel Lane	30 feet	> 30	> 30	> 30	> 30	
Maximum Grade on Ramp (Ascending)	+3% to +5%	3.13%	n/a	3.00%	1.07%	
Maximum Grade on Ramp (Descending)	-3% to -5%	n/a	-5.58%	-1.07%	-2.00%	Supports Impr.
Minimum Lane Width						
With Auxiliary Lanes	12 feet	18	15	18	15	
As Single Lane	15 feet (19 for loops)					
Shoulder Width						
Right Shoulder	8 feet (4 for loops)	2	3	3	5	Supports Impr.
Left Shoulder	2 feet	2	2	3	2	
Inslope	6:1	4:1	4:1	4:1	4:1	Supports Impr.
Minimum Off-Ramp Taper Rate	20:1					
Minimum On-Ramp Taper Rate	50:1					
Ramp Features						
K-Value Ranges						
Minimum for a Crest Vertical Curve (50 mph / 30 mph)	84 / 19	n/a	n/a	n/a	n/a	
Minimum for a Sag Vertical Curve (50 mph / 30 mph)	96 / 137		85	49	188	Supports Impr.
Minimum Stopping Sight Distance (50 mph / 30 mph)	425 / 200 feet		713	262	>425	
Cross Road Features						
K-Value Ranges						
Minimum for a Crest Vertical Curve (50 mph / 30 mph)	84 / 19					
Minimum for a Sag Vertical Curve (50 mph / 30 mph)	96 / 137					
Minimum Stopping Sight Distance (50 mph / 30 mph)	425 / 200 feet					
Ramp Intersection Sight Distance (ISD) (50 mph / 30 mph)***	425 / 200 feet	ok	n/a	ok	n/a	
Maximum Longitudinal Grade - Rolling Terrain (Urban Arterial)	7%	6.0%				
Minimum Longitudinal Grade (Min. / Des.)	0.3% / 0.5%					
Minimum Control of Access from Interchange Ramps (Min. / Des.)	300 / 660 feet	250'				Supports Impr.

** Loop ramp design speed = 30 mph

***Substandard Intersection Sight Distance locations could not be determined from the interchange plans. Substandard locations, therefore, are intersections that demonstrate sight distance limitations based on a general field evaluation or the presence of a substandard k-value or Stopping Sight Distance along the crossroad approaching the intersection.

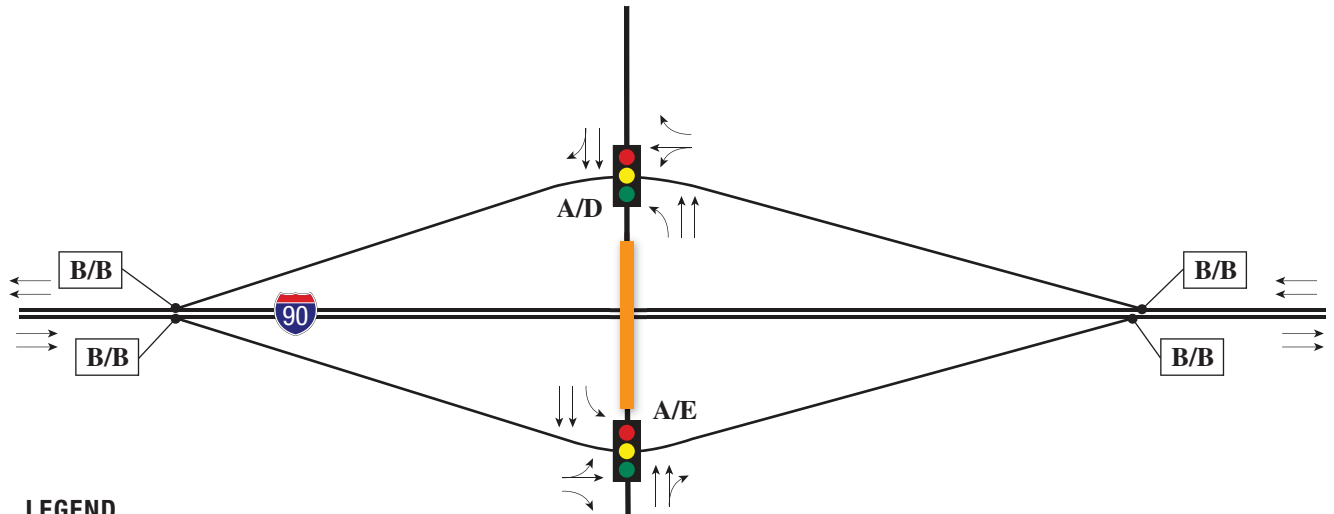
Comments

Busy interchange. It appears no recent changes have been made.



LEGEND

XXX(XXX) = AM(PM) Peak Hour Traffic Volumes (vph)



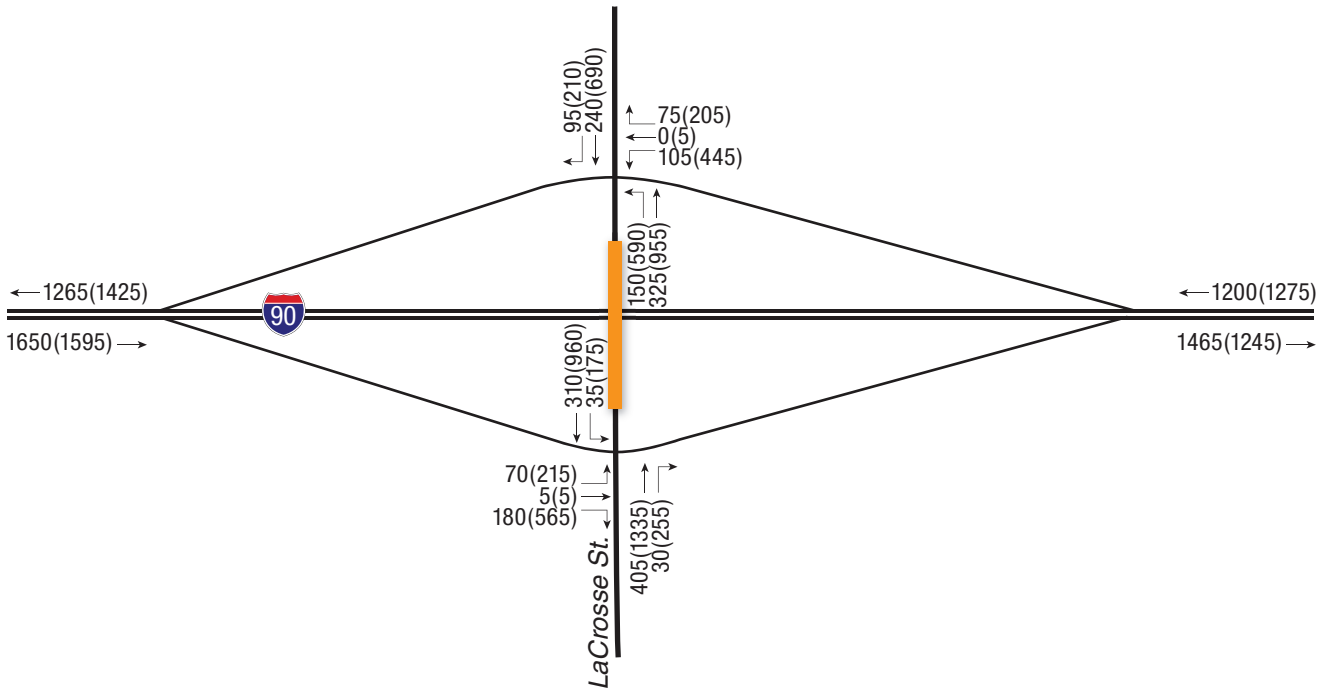
LEGEND

- X/X = AM/PM Peak Hour Signalized Movement Level of Service
- x/x = AM/PM Peak Hour Unsignalized Movement Level of Service
- X/X = AM/PM Peak Hour Ramp Junction Level of Service
- [Traffic Signal Icon] = Traffic Signal
- [Travel Lane Icon] = Travel Lanes

Interstate 90 Exit 59
Traffic Conditions Year 2009

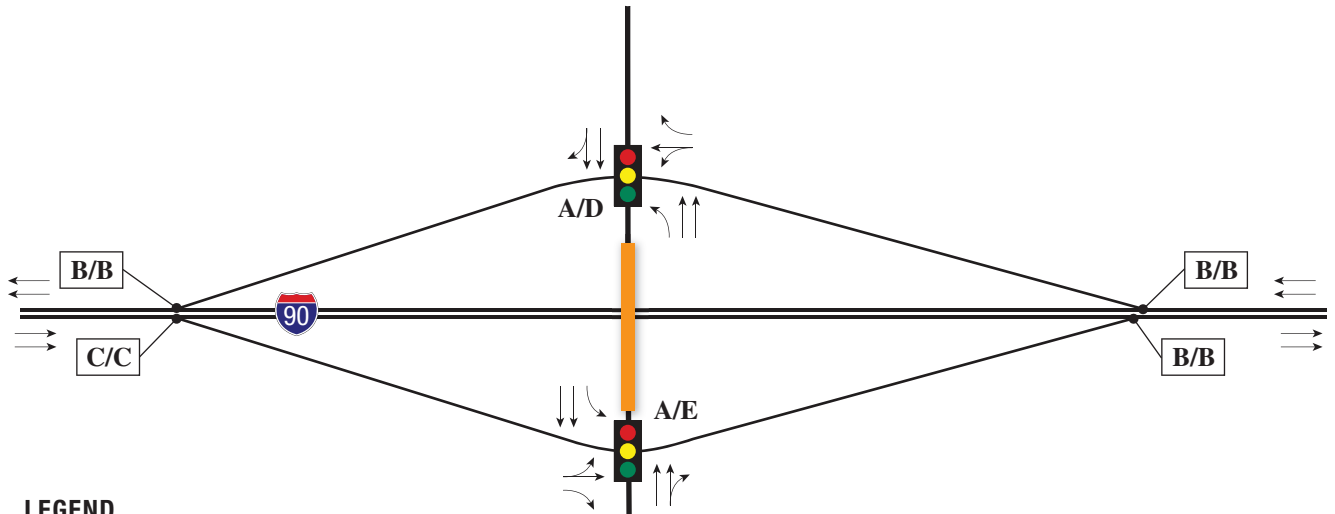
NORTH





LEGEND

XXX(XXX) = AM(PM) Peak Hour Traffic Volumes (vph)



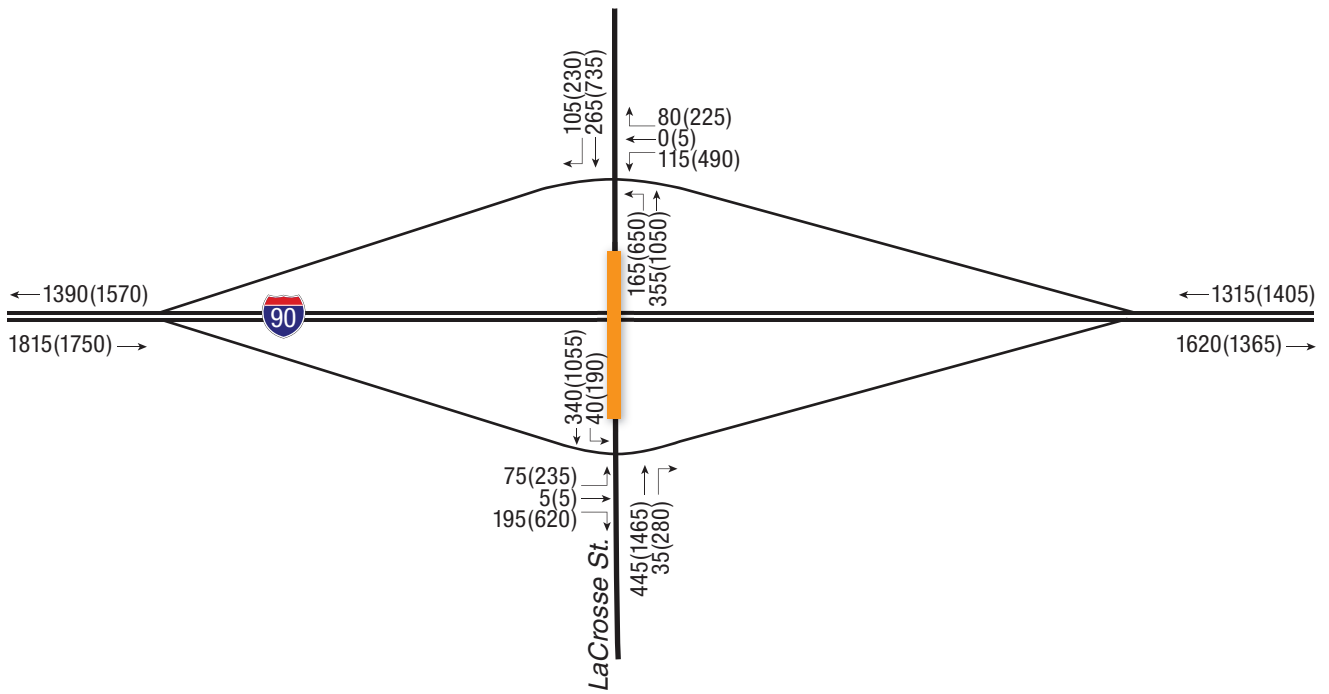
LEGEND

- X/X = AM/PM Peak Hour Signalized Movement Level of Service
- x/x = AM/PM Peak Hour Unsignalized Movement Level of Service
- X/X = AM/PM Peak Hour Ramp Junction Level of Service
- = Traffic Signal
- = Travel Lanes

Interstate 90 Exit 59
Traffic Conditions Year 2020

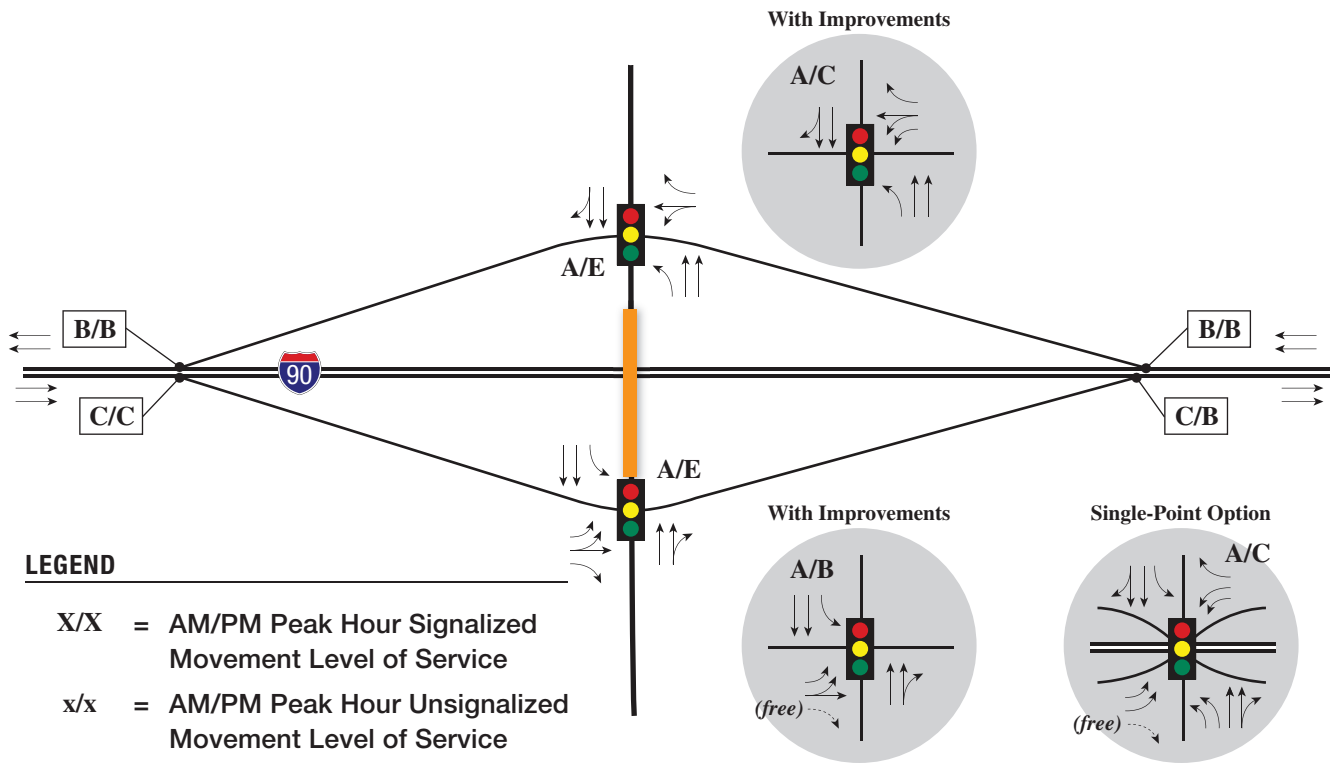
NORTH





LEGEND

XXX(XXX) = AM(PM) Peak Hour Traffic Volumes (vph)



LEGEND

- X/X = AM/PM Peak Hour Signalized Movement Level of Service
- x/x = AM/PM Peak Hour Unsignalized Movement Level of Service
- X/X = AM/PM Peak Hour Ramp Junction Level of Service
- Traffic Signal Icon = Traffic Signal
- Travel Lane Icon = Travel Lanes

Interstate 90 Exit 59
Traffic Conditions Year 2030

NORTH



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I-90 EXIT 63 BOX ELDER / ELLSWORTH AFB



Figure 1
 I-90 Exit 63 - Box Elder/Ellsworth AFB
 Diamond Interchange

**Probable Construction Costs
Exit 63 - New Diamond**

<i>Item Description</i>	<i>Quantity</i>	<i>Unit</i>	<i>Unit Cost</i>	<i>Total Cost</i>
Mobilization	1	LUMP SUM	\$248,000.00	\$248,000
Traffic Control	1	LUMP SUM	\$496,000.00	\$496,000
Clearing	1	LUMP SUM	\$99,000.00	\$99,000
Removal of Concrete Pavement	-	SQ. YD.	\$3.88	\$0
Removal of Asphalt Pavement	5,372	SQ. YD.	\$7.39	\$39,710
Remove Bridge	6,360	SQ. FT.	\$9.00	\$57,240
Borrow, Unclassified Excavation	298,727	CU. YD.	\$5.30	\$1,583,853
Base Course	9,297	TON	\$10.64	\$98,896
Asphalt Composite	11,751	TON	\$80.91	\$950,720
PCC Pavement 11" (mainline)	-	SQ. YD.	\$33.12	\$0
PCC Pavement 8" (ramps)	-	SQ. YD.	\$43.40	\$0
Concrete Approach Slab	3,600	SQ. YD.	\$188.34	\$678,031
Bridges	15,496	SQ. FT.	\$100.00	\$1,549,600
Guard Rail	0	LF	\$100.00	\$0
Permanent Signing/Markings	1	LUMP SUM	\$150,000.00	\$150,000
Traffic Signal	0	EACH	\$125,000.00	\$0
Roadway Lighting	1	LUMP SUM	\$100,000.00	\$100,000
Drainage (18" RCP)	240	LF	\$24.53	<u>\$5,887</u>
Subtotal				\$6,060,000
Contingencies	25%			<u>\$1,515,000</u>
Total Probable Construction Costs				\$7,580,000
Engineering, Administration	15%			\$1,137,000
Total Project Costs				\$8,720,000

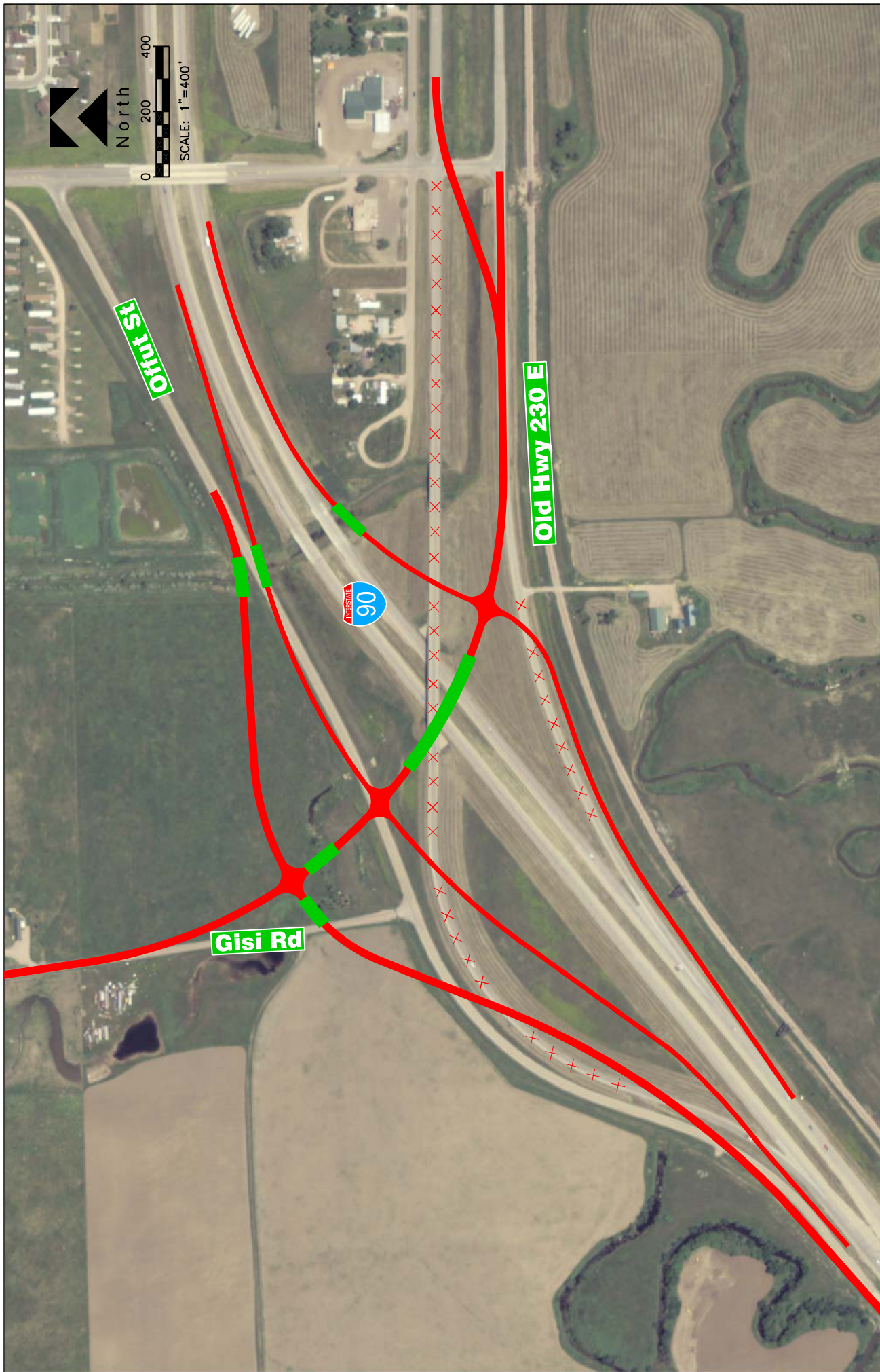


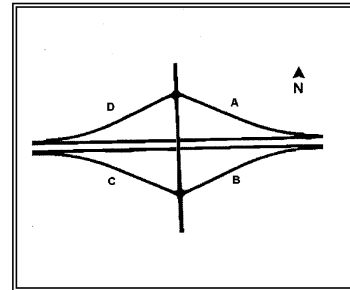
Figure 2
 I-90 Exit 63 - Box Elder/Ellsworth AFB
 Modified Diamond Interchange

**Probable Construction Costs
Exit 63 - Flyover**

<i>Item Description</i>	<i>Quantity</i>	<i>Unit</i>	<i>Unit Cost</i>	<i>Total Cost</i>
Mobilization	1	LUMP SUM	\$377,000.00	\$377,000
Traffic Control	1	LUMP SUM	\$754,000.00	\$754,000
Clearing	1	LUMP SUM	\$151,000.00	\$151,000
Removal of Concrete Pavement	-	SQ. YD.	\$3.88	\$0
Removal of Asphalt Pavement	27,680	SQ. YD.	\$7.39	\$204,611
Remove Bridge	13,400	SQ. FT.	\$9.00	\$120,600
Borrow, Unclassified Excavation	213,484	CU. YD.	\$5.30	\$1,131,895
Base Course	8,945	TON	\$10.64	\$95,145
Asphalt Composite	18,854	TON	\$80.91	\$1,525,410
PCC Pavement 11" (mainline)	-	SQ. YD.	\$33.12	\$0
PCC Pavement 8" (ramps)	-	SQ. YD.	\$43.40	\$0
Concrete Approach Slab	2,400	SQ. YD.	\$188.34	\$452,021
Bridges	40,040	SQ. FT.	\$100.00	\$4,004,000
Guard Rail	0	LF	\$100.00	\$0
Permanent Signing/Markings	1	LUMP SUM	\$230,000.00	\$230,000
Traffic Signal	0	EACH	\$125,000.00	\$0
Roadway Lighting	1	LUMP SUM	\$150,000.00	\$150,000
Drainage (18" RCP)	240	LF	\$24.53	<u>\$5,887</u>
Subtotal				\$9,200,000
Contingencies	25%			<u>\$2,300,000</u>
Total Probable Construction Costs				\$11,500,000
Engineering, Administration	15%			\$1,725,000
Total Project Costs				\$13,230,000

INTERCHANGE GEOMETRICS CHECKLIST
SDDOT Interstate Corridor Study

Interstate: I-90
Interchange: Exit 63 (Dusters corner)
Analyst: RDG
Date: 8/13/2009



Interchange Geometry	Criteria	A	B	C	D	Achieved?
Interchange Type (Diamond, Full/Partial Cloverleaf, Trumpet etc.)	Diamond					-----
Design Speed	50 mph**					
Number of Lanes		-	-			
Right Turn Storage Length		-	-			
Left Turn Storage Length		-	-			
Superelevation (e max)	6%	-	-	4.0%	5.0%	
Minimum Horizontal Radius for e max of 6% (50 mph / 30 mph)	833 / 231 feet	-	-	2589'	955'	
Maximum Degree of Curvature (50 mph / 30 mph)	6° 53' / 24° 48'	-	-	2° 12'	6°	
Minimum Clear Zone From the Edge of Travel Lane	30 feet	-	-	3:1	3:1	
Maximum Grade on Ramp (Ascending)	+3% to +5%	-	-	n/a	4.00%	
Maximum Grade on Ramp (Descending)	-3% to -5%	-	-	-0.67%	-4.00%	
Minimum Lane Width						
With Auxiliary Lanes	12 feet	-	-			
As Single Lane	15 feet (19 for loops)	-	-	15	15-18	
Shoulder Width						
Right Shoulder	8 feet (4 for loops)	-	-	8	2 to 8	Supports Impr.
Left Shoulder	2 feet	-	-	8	2 to 8	Supports Impr.
Inslope	6:1	-	-	6:1	6:1	
Minimum Off-Ramp Taper Rate	20:1	-	-	n/a	n/a	
Minimum On-Ramp Taper Rate	50:1	-	-	n/a	58	
Ramp Features						
K-Value Ranges						
Minimum for a Crest Vertical Curve (50 mph / 30 mph)	84 / 19	-	-	n/a	n/a	
Minimum for a Sag Vertical Curve (50 mph / 30 mph)	96 / 137	-	-	563	93	Supports Impr.
Minimum Stopping Sight Distance (50 mph / 30 mph)	425 / 200 feet	-	-	>425	414'	Supports Impr.
Cross Road Features						
K-Value Ranges						
Minimum for a Crest Vertical Curve (50 mph / 30 mph)	84 / 19	-	-			
Minimum for a Sag Vertical Curve (50 mph / 30 mph)	96 / 137	-	-			
Minimum Stopping Sight Distance (50 mph / 30 mph)	425 / 200 feet	-	-			
Ramp Intersection Sight Distance (ISD) (50 mph / 30 mph)***	425 / 200 feet	-	-			
Maximum Longitudinal Grade - Rolling Terrain (Urban Arterial)	7%	-	-			
Minimum Longitudinal Grade (Min. / Des.)	0.3% / 0.5%	-	-			
Minimum Control of Access from Interchange Ramps (Min. / Des.)	300 / 660 feet	-	-			

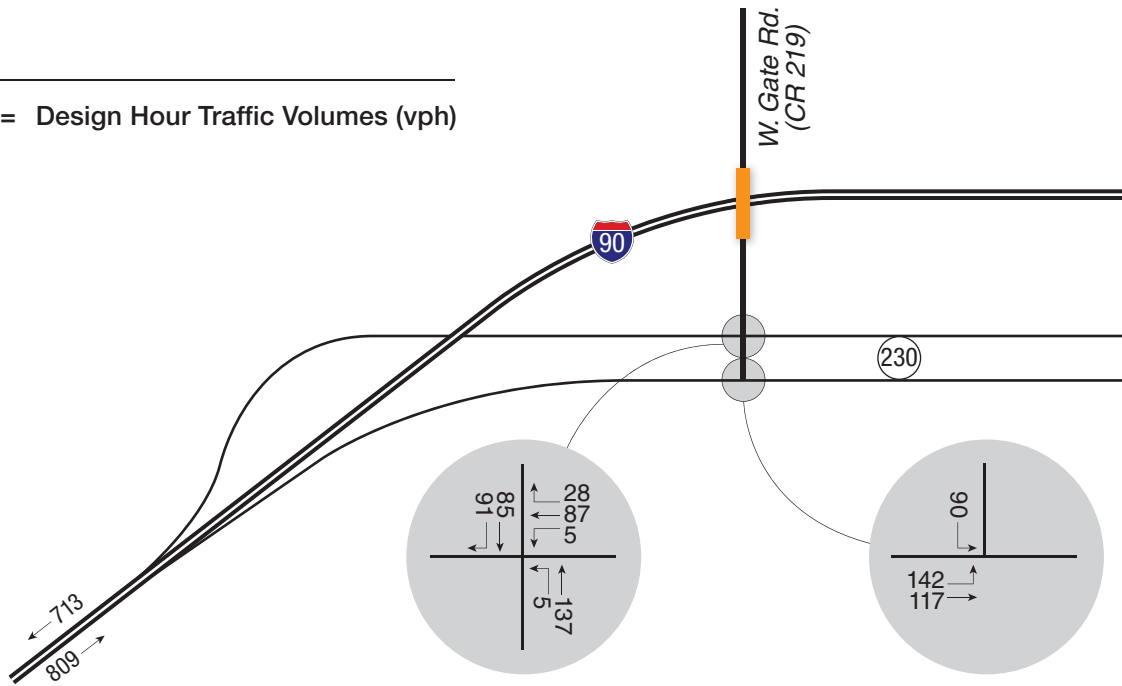
** Loop ramp design speed = 30 mph

***Substandard Intersection Sight Distance locations could not be determined from the interchange plans. Substandard locations, therefore, are intersections that demonstrate sight distance limitations based on a general field evaluation or the presence of a substandard k-value or Stopping Sight Distance along the crossroad approaching the intersection.

Comments

LEGEND

XXX = Design Hour Traffic Volumes (vph)



LEGEND

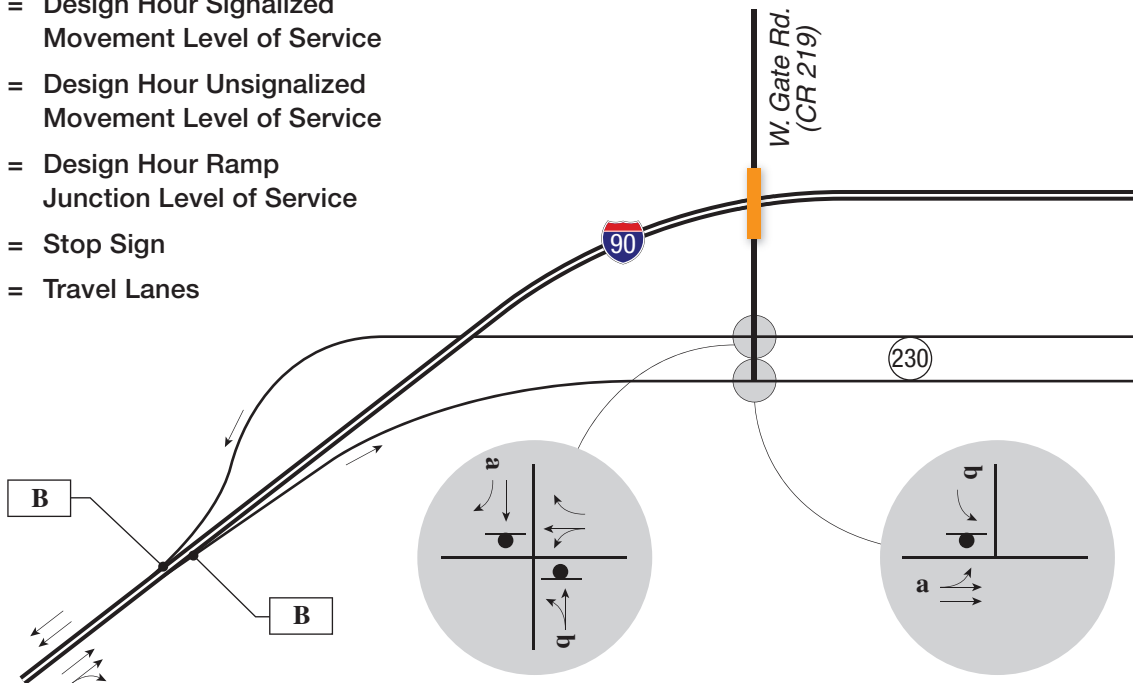
X = Design Hour Signalized Movement Level of Service

x = Design Hour Unsignalized Movement Level of Service

X = Design Hour Ramp Junction Level of Service

● = Stop Sign

↔ = Travel Lanes

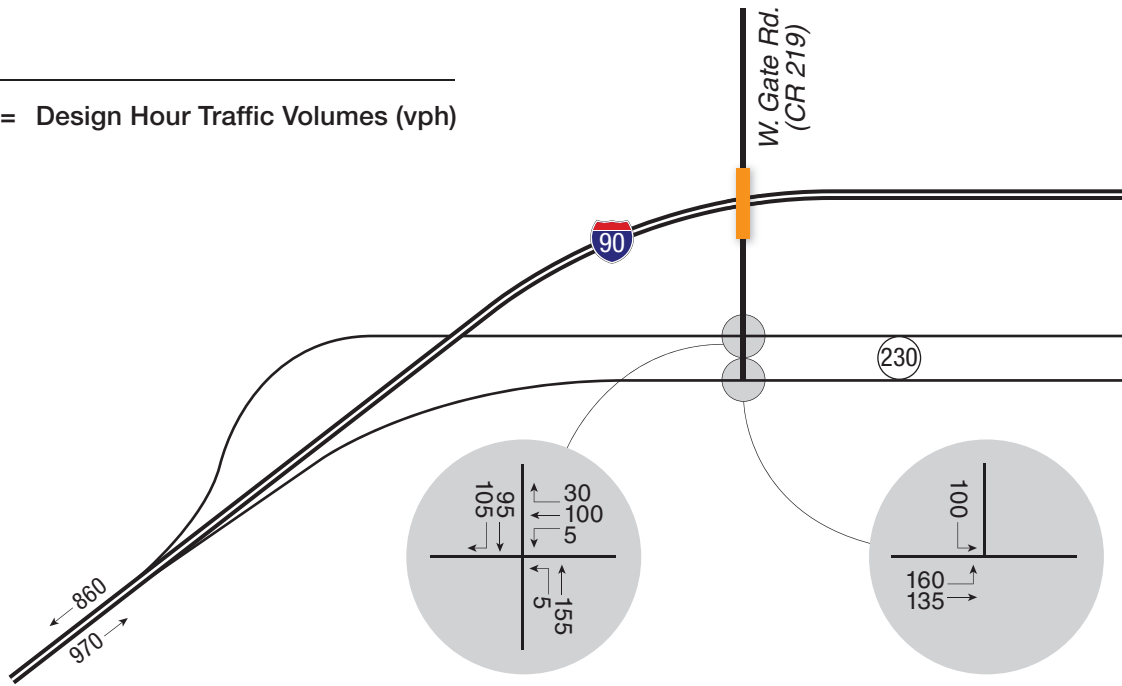


Interstate 90 Exit 63
Traffic Conditions Year 2009

NORTH

LEGEND

XXX = Design Hour Traffic Volumes (vph)



LEGEND

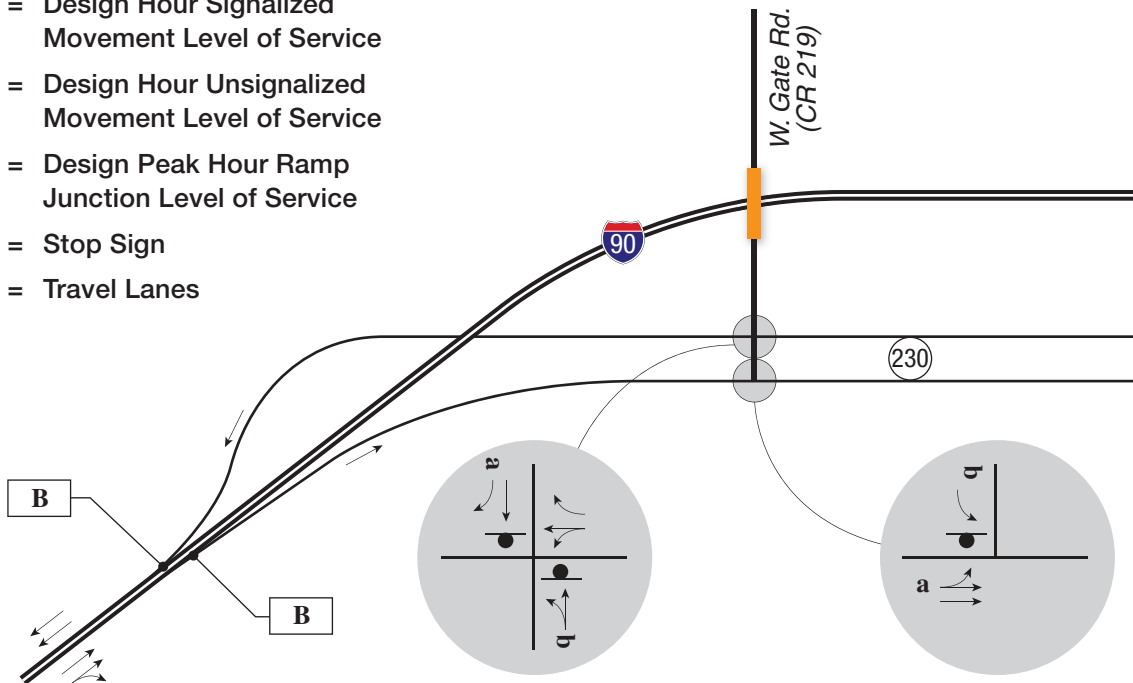
X = Design Hour Signalized Movement Level of Service

x = Design Hour Unsignalized Movement Level of Service

X = Design Peak Hour Ramp Junction Level of Service

● = Stop Sign

↔ = Travel Lanes

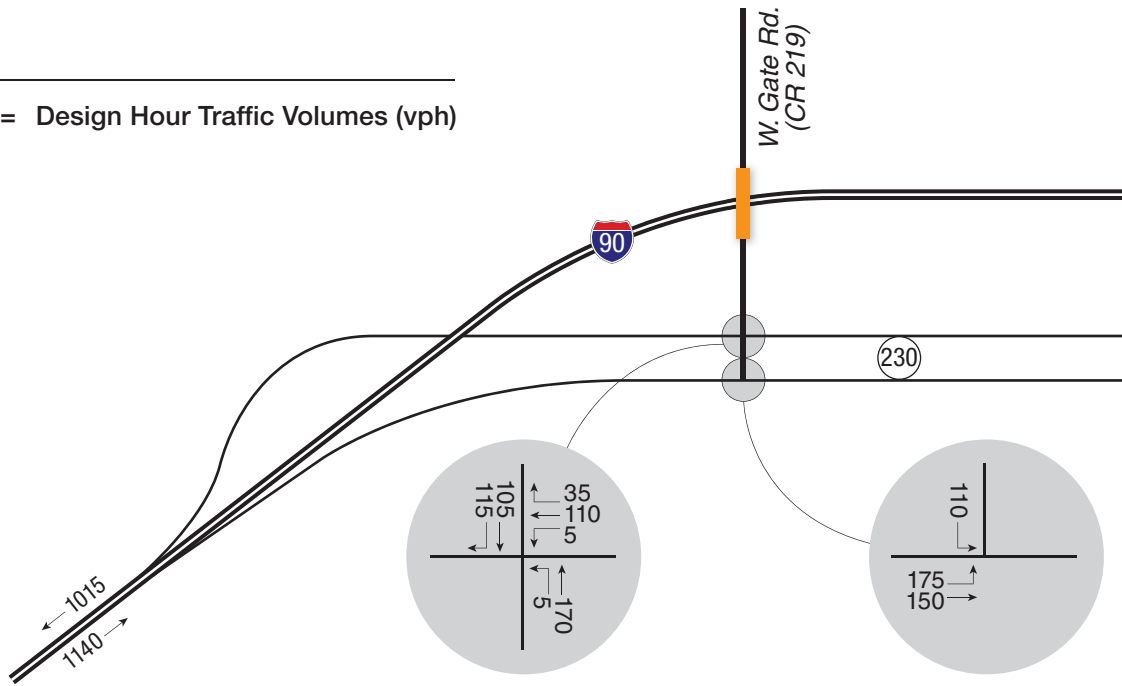


Interstate 90 Exit 63
Traffic Conditions Year 2020

NORTH

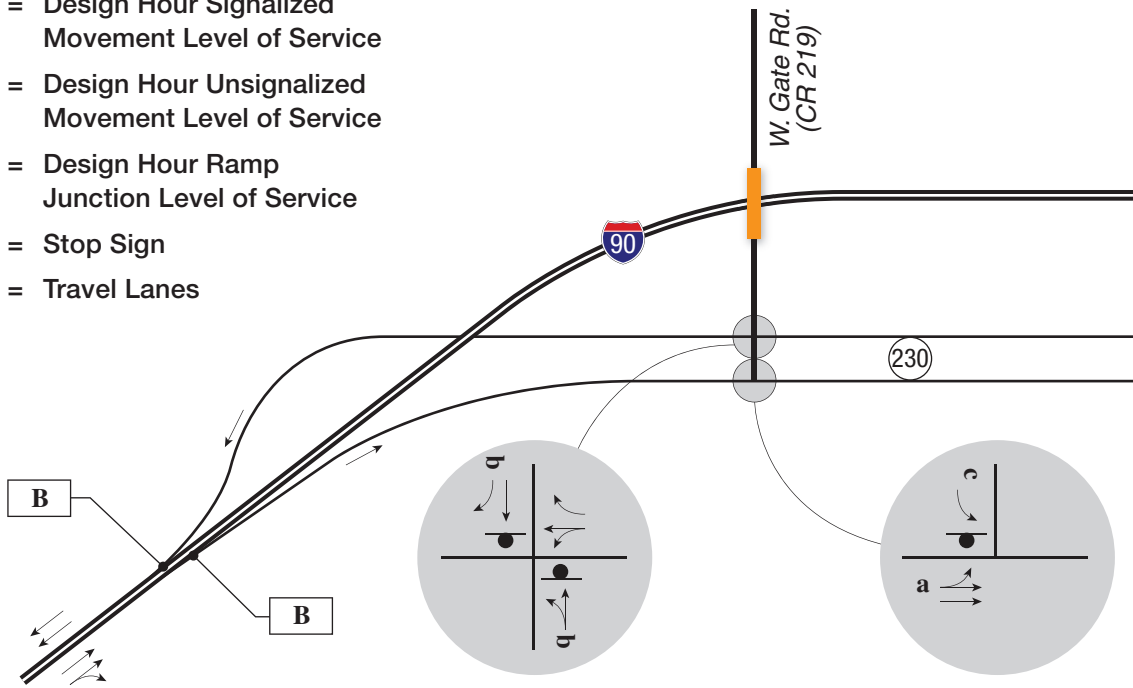
LEGEND

XXX = Design Hour Traffic Volumes (vph)



LEGEND

- X = Design Hour Signalized Movement Level of Service
- x = Design Hour Unsignalized Movement Level of Service
- X = Design Hour Ramp Junction Level of Service
- = Stop Sign
- ↔ = Travel Lanes



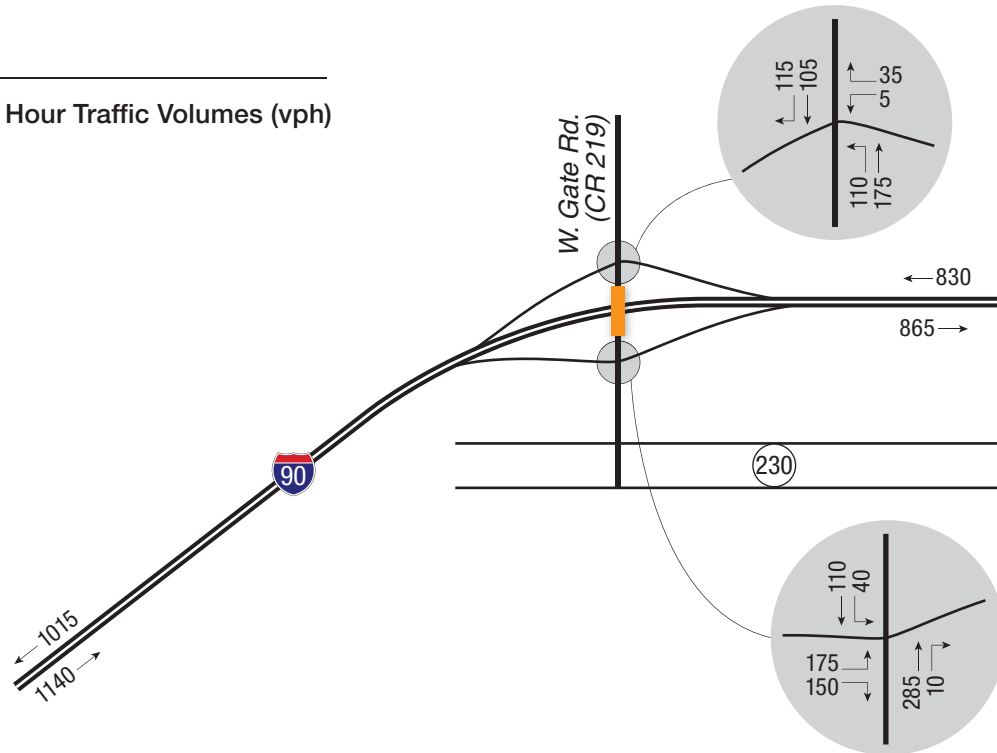
Interstate 90 Exit 63
Traffic Conditions Year 2030

NORTH



LEGEND

XXX = Design Hour Traffic Volumes (vph)

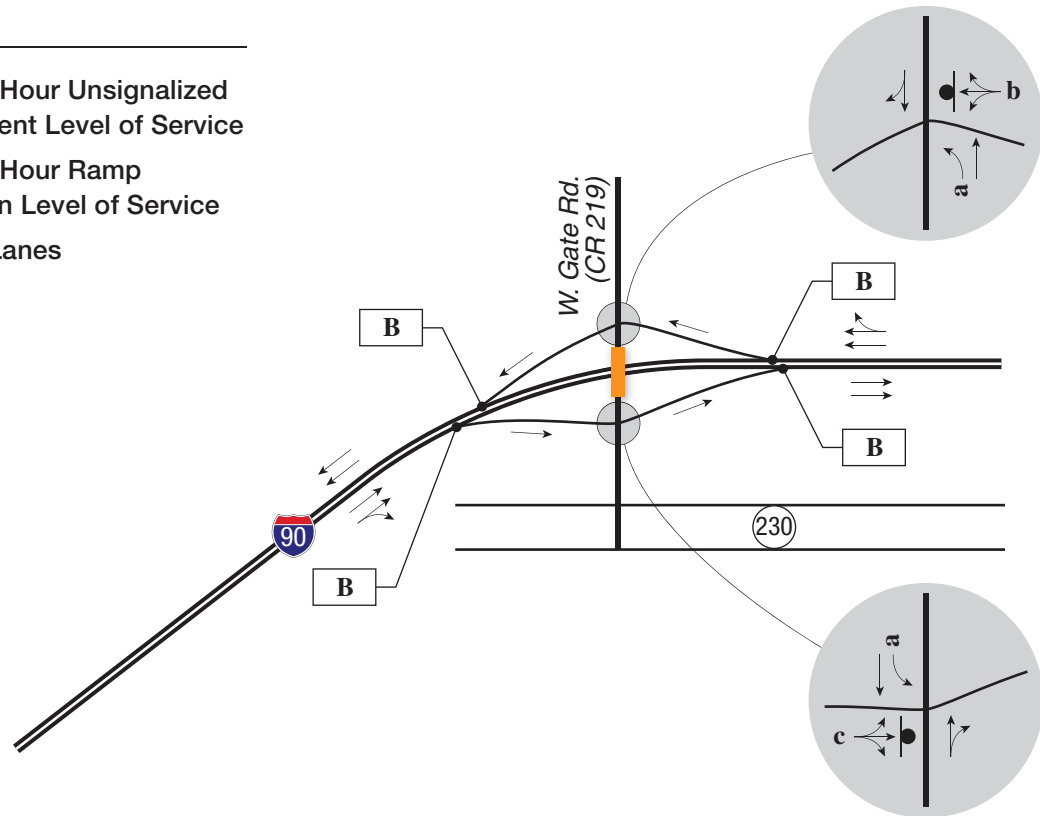


LEGEND

x = Design Hour Unsignalized Movement Level of Service

X = Design Hour Ramp Junction Level of Service

↔ = Travel Lanes



Interstate 90 Exit 63 Alternative
Traffic Conditions Year 2030

NORTH





I-190 EXIT 1 NORTH STREET / SILVER STREET



Figure 1
I-190 Exit 1 - North Street/Silver Street, Rapid City
Roundabout

**Probable Construction Costs
Exit 1 - Roundabout**

<i>Item Description</i>	<i>Quantity</i>	<i>Unit</i>	<i>Unit Cost</i>	<i>Total Cost</i>
Mobilization	1	LUMP SUM	\$13,000.00	\$13,000
Traffic Control	1	LUMP SUM	\$27,000.00	\$27,000
Clearing	1	LUMP SUM	\$5,000.00	\$5,000
Removal of Concrete Pavement	-	SQ. YD.	\$3.88	\$0
Removal of Asphalt Pavement	21,760	SQ. YD.	\$7.39	\$160,850
Remove Bridge	-	SQ. FT.	\$9.00	\$0
Borrow, Unclassified Excavation	5,217	CU. YD.	\$5.30	\$27,662
Base Course	-	TON	\$10.64	\$0
Asphalt Composite	950	TON	\$80.91	\$76,863
PCC Pavement 11" (mainline)	-	SQ. YD.	\$33.12	\$0
PCC Pavement 8" (ramps)	-	SQ. YD.	\$43.40	\$0
Concrete Approach Slab	-	SQ. YD.	\$188.34	\$0
Bridges	-	SQ. FT.	\$100.00	\$0
Guard Rail	0	LF	\$100.00	\$0
Roundabout (Single Lane)	1	EACH	\$600,000.00	\$600,000
Permanent Signing/Markings	1	LUMP SUM	\$10,000.00	\$10,000
Traffic Signal	0	EACH	\$125,000.00	\$0
Roadway Lighting	1	LUMP SUM	\$10,000.00	\$10,000
Drainage (18" RCP)	120	LF	\$24.53	<u>\$2,944</u>
Subtotal				\$930,000
Contingencies	25%			<u>\$232,500</u>
Total Probable Construction Costs				\$1,160,000
Engineering, Administration	15%			\$174,000
Total Project Costs				\$1,330,000



Figure 2
 I-190 Exit 1 - North Street/Silver Street, Rapid City
 Signalized Intersection

**Probable Construction Costs
Exit 1 - Signal & Bridge Removal**

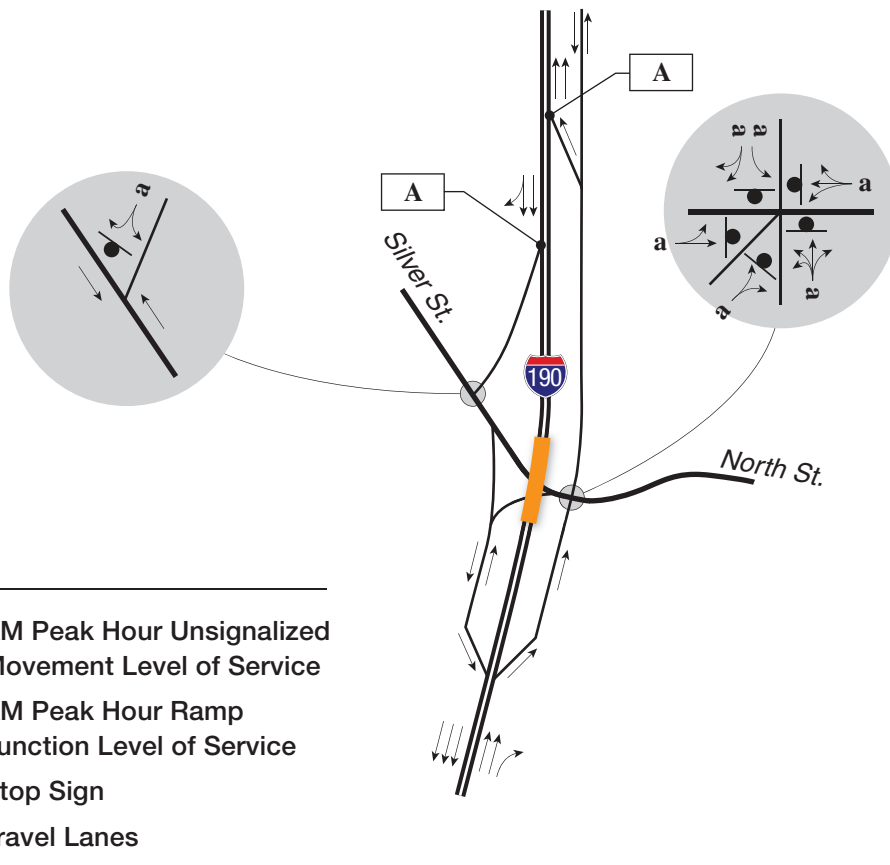
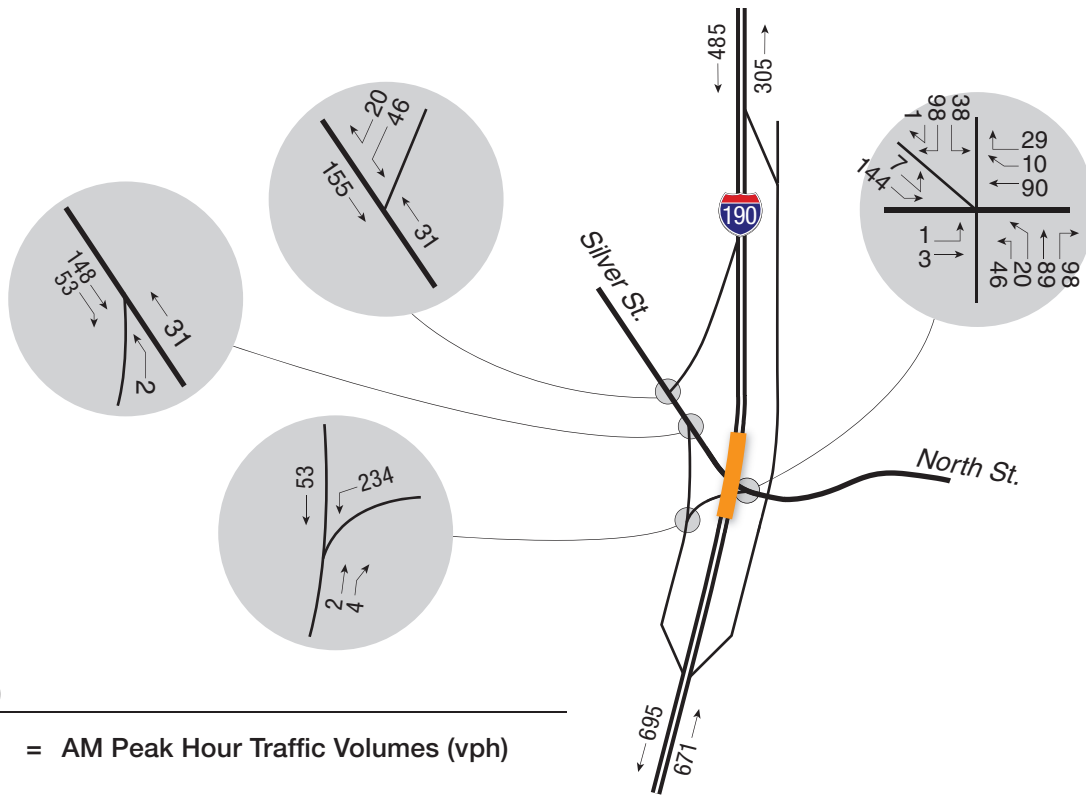
<i>Item Description</i>	<i>Quantity</i>	<i>Unit</i>	<i>Unit Cost</i>	<i>Total Cost</i>
Mobilization	1	LUMP SUM	\$36,000.00	\$36,000
Traffic Control	1	LUMP SUM	\$72,000.00	\$72,000
Clearing	1	LUMP SUM	\$14,000.00	\$14,000
Removal of Concrete Pavement	6,127	SQ. YD.	\$3.88	\$23,790
Removal of Asphalt Pavement	9,679	SQ. YD.	\$7.39	\$71,548
Remove Bridge	21,600	SQ. FT.	\$9.00	\$194,400
Borrow, Unclassified Excavation	5,719	CU. YD.	\$5.30	\$30,322
Base Course	-	TON	\$10.64	\$0
Asphalt Composite	2,049	TON	\$80.91	\$165,797
PCC Pavement 11" (mainline)	7,080	SQ. YD.	\$33.12	\$234,497
PCC Pavement 8" (ramps)		SQ. YD.	\$43.40	\$0
Concrete Approach Slab	-	SQ. YD.	\$188.34	\$0
Bridges	-	SQ. FT.	\$100.00	\$0
Guard Rail	0	LF	\$100.00	\$0
Permanent Signing/Markings	1	LUMP SUM	\$20,000.00	\$20,000
Traffic Signal	2	EACH	\$125,000.00	\$250,000
Roadway Lighting	1	LUMP SUM	\$10,000.00	\$10,000
Drainage (18" RCP)	120	LF	\$24.53	<u>\$2,944</u>
Subtotal				\$1,130,000
Contingencies	25%			<u>\$282,500</u>
Total Probable Construction Costs				\$1,410,000
Engineering, Administration	15%			\$211,500
Total Project Costs				\$1,620,000



Figure 3
 I-190 Exit 1 - North Street/Silver Street, Rapid City
 Two-Lane Roundabout Intersection

**Probable Construction Costs
Exit 1 - Two Lane Roundabout**

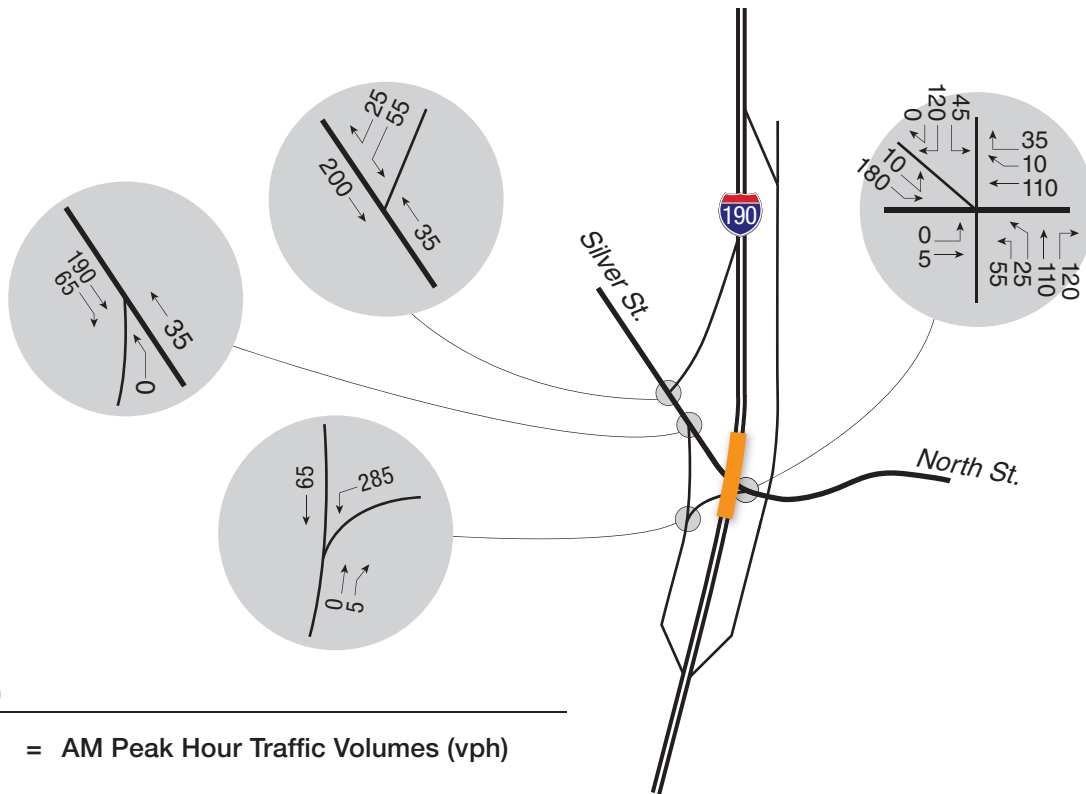
<i>Item Description</i>	<i>Quantity</i>	<i>Unit</i>	<i>Unit Cost</i>	<i>Total Cost</i>
Mobilization	1	LUMP SUM	\$23,000.00	\$23,000
Traffic Control	1	LUMP SUM	\$47,000.00	\$47,000
Clearing	1	LUMP SUM	\$9,000.00	\$9,000
Removal of Concrete Pavement	6,127	SQ. YD.	\$3.88	\$23,790
Removal of Asphalt Pavement	4,938	SQ. YD.	\$7.39	\$36,500
Remove Bridge	21,600	SQ. FT.	\$9.00	\$194,400
Borrow, Unclassified Excavation	17,239	CU. YD.	\$5.30	\$91,404
Base Course	-	TON	\$10.64	\$0
Asphalt Composite	1,473	TON	\$80.91	\$119,138
PCC Pavement 11" (mainline)	-	SQ. YD.	\$33.12	\$0
PCC Pavement 8" (ramps)	-	SQ. YD.	\$43.40	\$0
Concrete Approach Slab	-	SQ. YD.	\$188.34	\$0
Bridges	-	SQ. FT.	\$100.00	\$0
Guard Rail	0	LF	\$100.00	\$0
Roundabout (2 Lane)	1	EACH	\$1,500,000.00	\$1,500,000
Permanent Signing/Markings	1	LUMP SUM	\$10,000.00	\$10,000
Traffic Signal	1	EACH	\$125,000.00	\$125,000
Roadway Lighting	1	LUMP SUM	\$10,000.00	\$10,000
Drainage (18" RCP)	120	LF	\$24.53	<u>\$2,944</u>
Subtotal				\$2,190,000
Contingencies	25%			<u>\$547,500</u>
Total Probable Construction Costs				\$2,740,000
Engineering, Administration	15%			\$411,000
Total Project Costs				\$3,150,000



Interstate 190 Exit 1
Traffic Conditions Year 2009

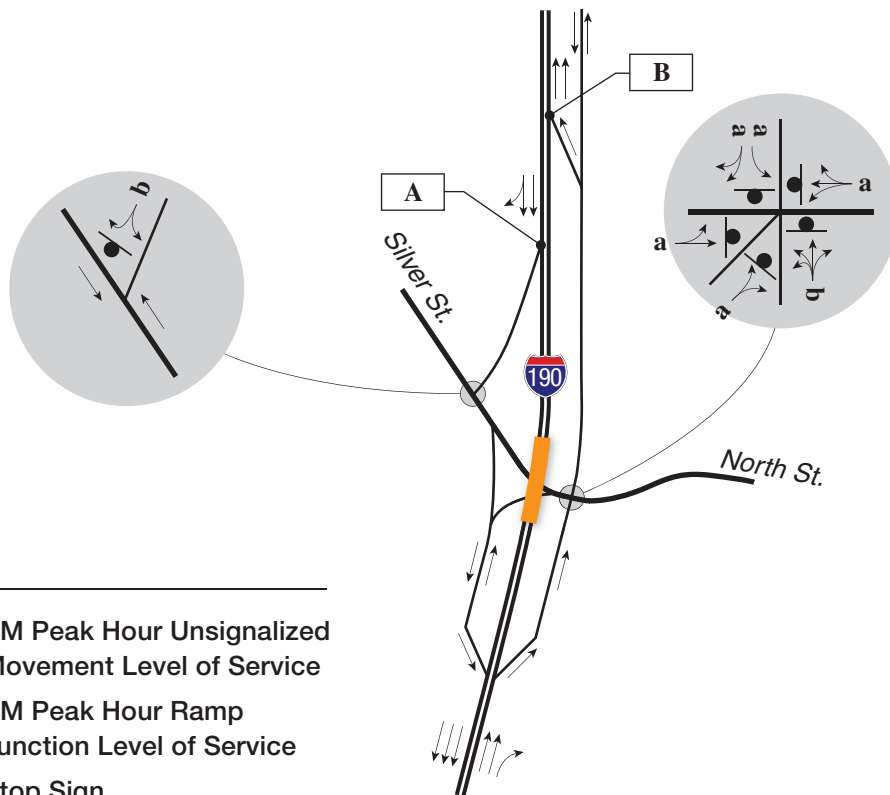
NORTH





LEGEND

XXX = AM Peak Hour Traffic Volumes (vph)

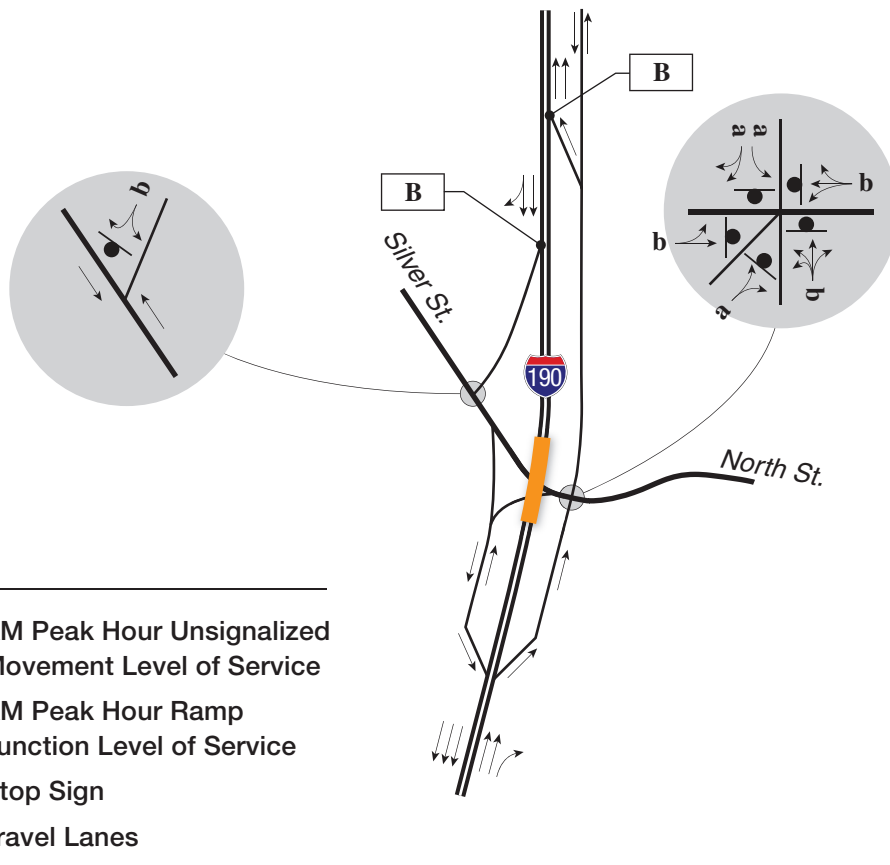
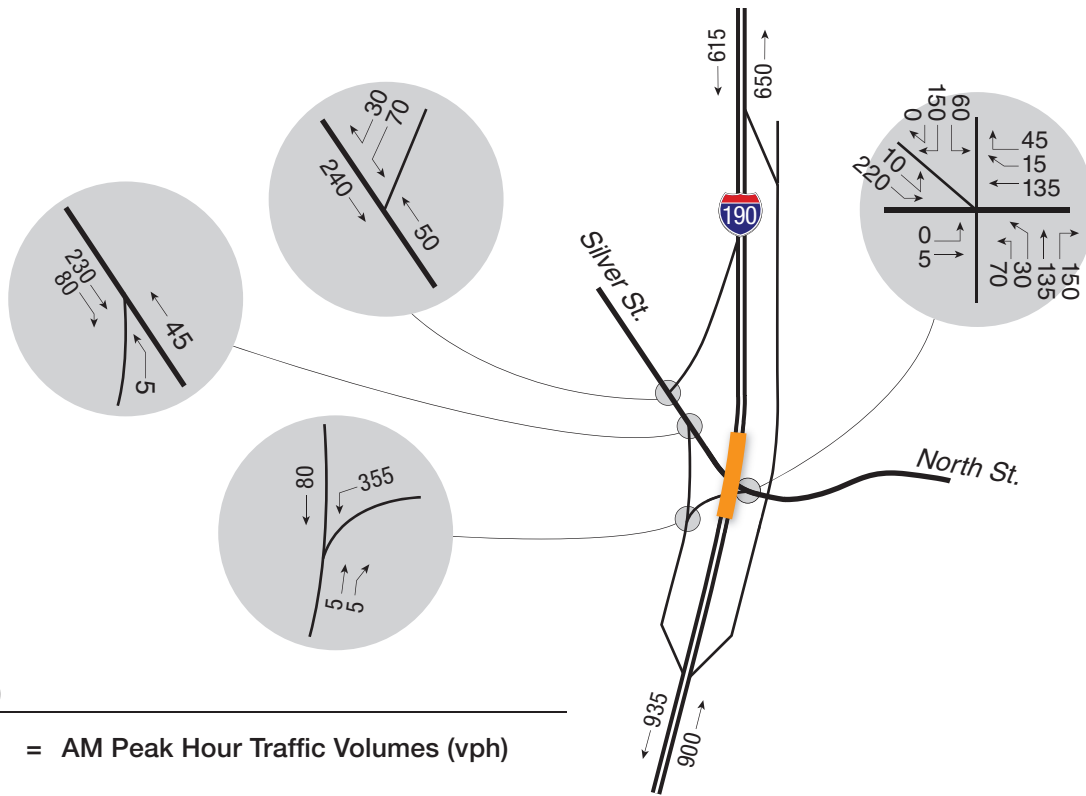


LEGEND

- x = AM Peak Hour Unsignalized Movement Level of Service
- X = AM Peak Hour Ramp Junction Level of Service
- = Stop Sign
- ↔ = Travel Lanes

Interstate 190 Exit 1
Traffic Conditions Year 2020

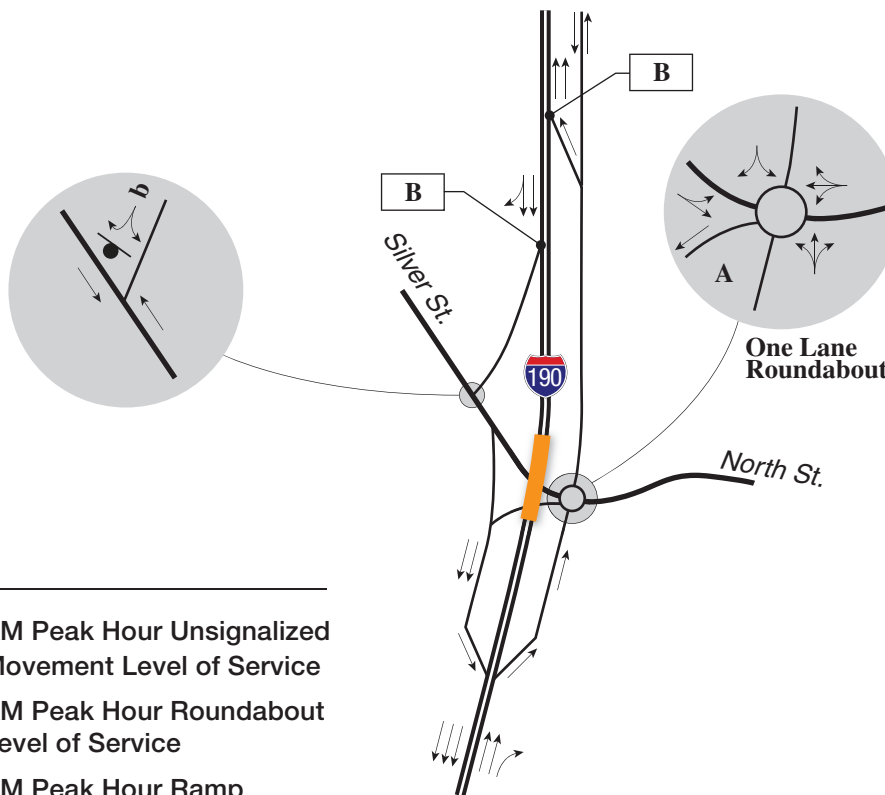
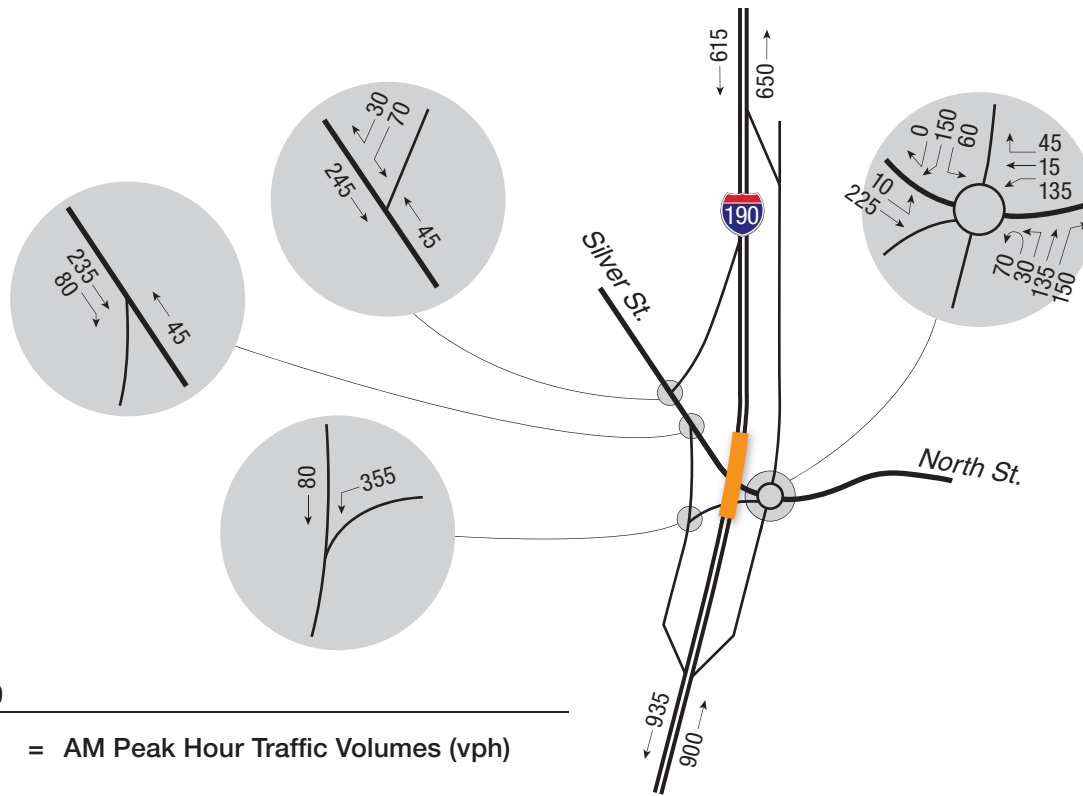
NORTH



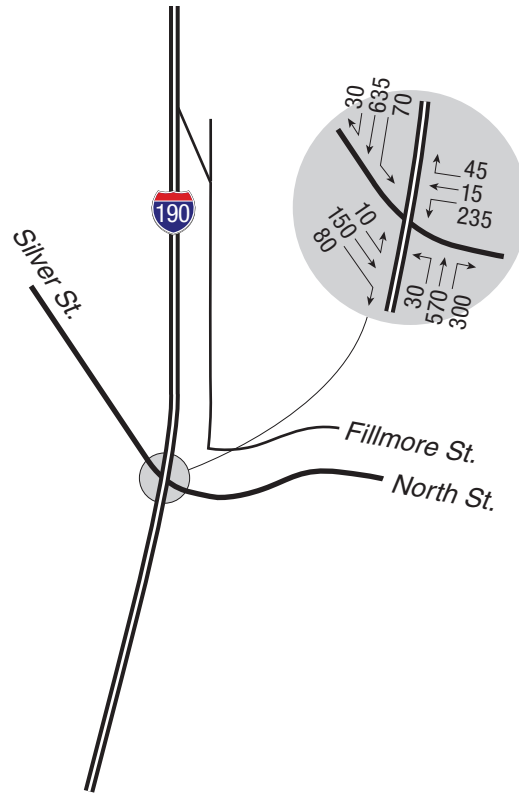
Interstate 190 Exit 1
Traffic Conditions Year 2030

NORTH



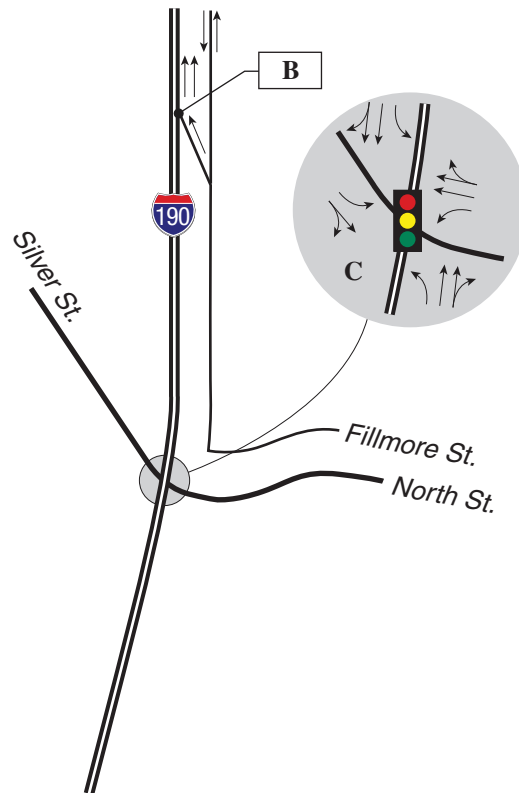


Interstate 190 Exit 1 - Alternative 1
Traffic Conditions Year 2030



LEGEND

XXX = AM Peak Hour Traffic Volumes (vph)



LEGEND

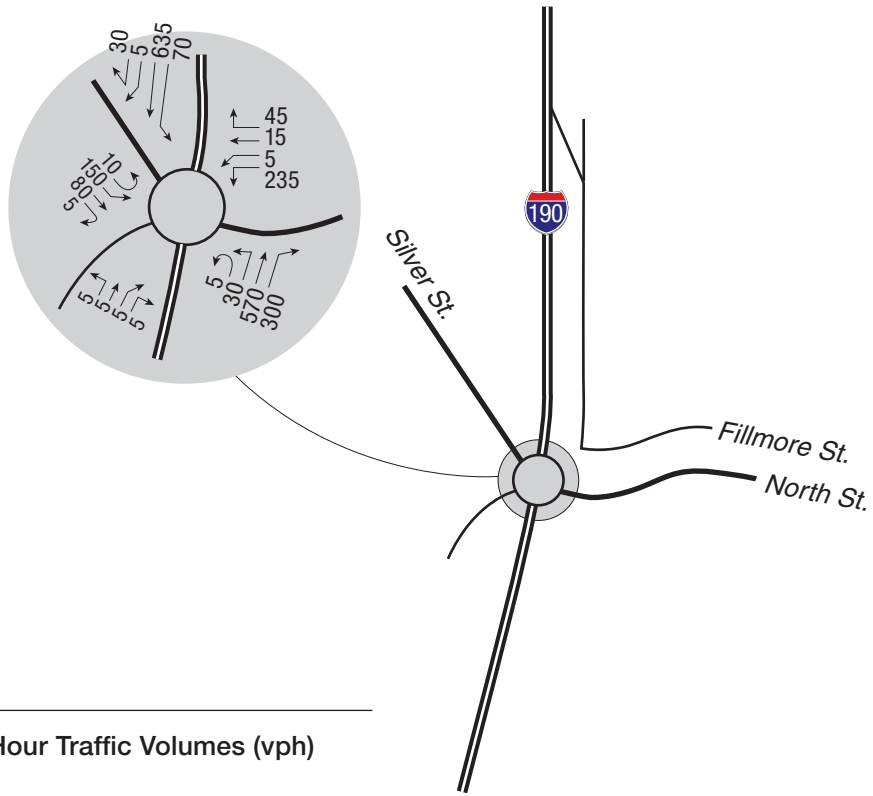
X = AM Peak Hour Signalized Intersection Level of Service

X = AM Peak Hour Ramp Junction Level of Service

 = Traffic Signal

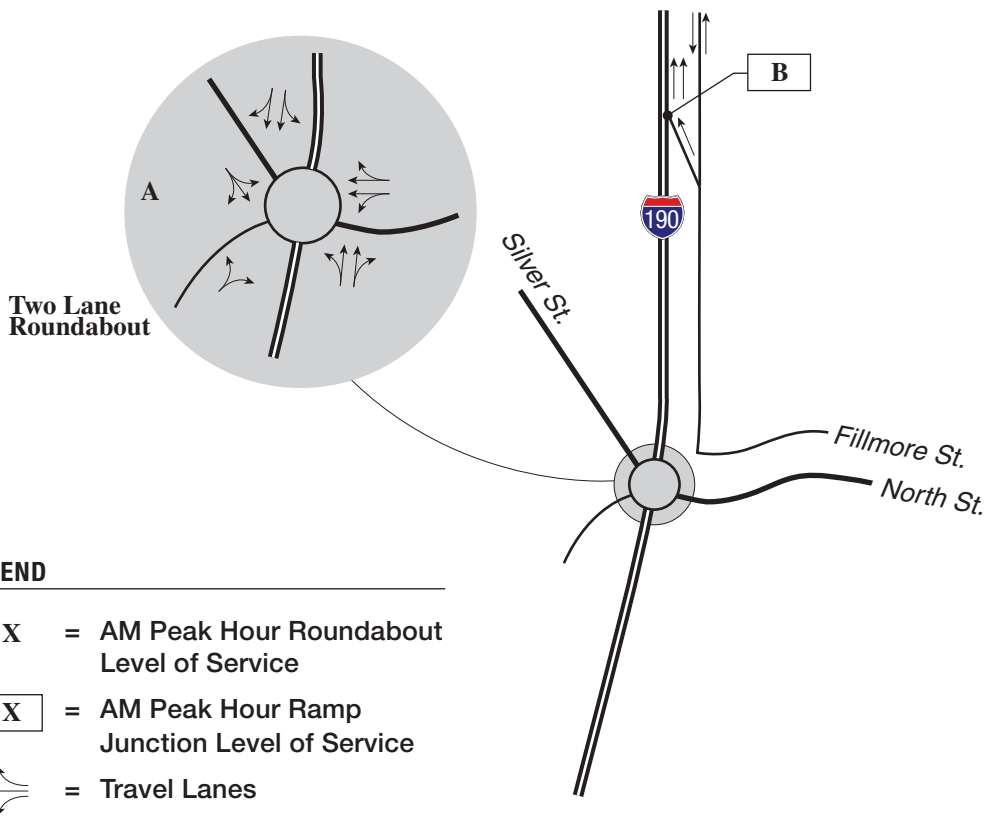
 = Travel Lanes

Interstate 190 Exit 1 - Alternative 2
Traffic Conditions Year 2030



LEGEND

XXX = AM Peak Hour Traffic Volumes (vph)



LEGEND

X = AM Peak Hour Roundabout Level of Service

[X] = AM Peak Hour Ramp Junction Level of Service

↗ ↘ ↙ ↚ = Travel Lanes

Interstate 190 Exit 1 - Alternative 3
Traffic Conditions Year 2030

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South Dakota Decennial Interstate Corridor Study

PHASE ONE REPORT



PIERRE REGION

Interstate 90, MRM 130.0 to MRM 251.00

Total Interchanges: 22

Studied Interchanges: 22

<u>Deficient Interchanges (2):</u>	<u>Page</u>
I-90 Exit 172	A-103
I-90 Exit 235	A-105

**Summary of Mainline Segment Geometric Performance
Pierre Region**

I-90	Lane Width (12 ft min.)	Right Shldr. Width (10 ft min.)	Left Shldr. Width (4 ft min.)	Design Speed (65 mph min.)	Max. Degree of Curve (2° 15' max.)	Clear Zone (30 ft min.)	Inslope (6:1 min.)	Superelevation Rate (6% max.)	Paved Section Width (38 ft min.)	Bridge Section Width (38 ft min./40 ft des.)	Vertical Clearance (16 ft min.)	Maximum Grade (3% level/4% rolling)
MP 142-149	12	10	4		1° 00'	3:1	5:1		38	n/a	n/a	3.00%
MP 149-159	12	10	4		0° 45'	3:1	5:1		38	38	16' 7"	1.71%
MP 159-165	12	10	4	70	1° 00'	3:1	5:1	3.7%	38	38	n/a	2.92%
MP 165-174	12	10	4	65	0° 45'	3:1	5:1	2.7%	38	38	n/a	2.83%
MP 174-182	12	10	4	70	1° 00'	> 30	6:1	3.7%	38	38	16' 5"	3.00%
MP 182-189	12	10	4	75	0° 45'	> 30	6:1	3.0%	38	38	n/a	3.00%
MP 189-198	12	10	4	70	1° 00'	> 30	6:1	3.7%	38	n/a	15' 6"	3.00%
MP 198-206	12	10	4	65	n/a	> 30	6:1	n/a	38	38	n/a	2.21%
MP 206-213	12	10	4		0° 06'	> 30	6:1		38	38	17' 2"	3.00%
MP 213-219	12	10	4	70	1° 00'	> 30	6:1	3.7%	38	38	n/a	3.00%
MP 219-227	12	10	4	70	1° 00'	> 30	6:1	3.7%	38	38	n/a	2.13%
MP 227-236	12	10	4	75	0° 45'	> 30	6:1	3.0%	38	38	n/a	2.75%
MP 236-243	12	10	4		0° 45'	> 30	6:1		38	38	n/a	3.00%
MP 243-251	12	10	4	65	1° 00'	> 30	6:1	3.1%	38	38	n/a	1.24%

LEGEND:

Existing Value does not meet standard criteria
Mainline section recently reconstructed

**Summary of Mainline Segments, Traffic Volumes and Levels of Service
Pierre Region**

I-90 Exits:	Current Lanes	Existing		2020		2030	
		AADT	LOS	AADT	LOS	AADT	LOS
131 to 143	4	5,920	A	6,234	A	6,509	A
143 to 150	4	6,170	A	6,497	A	6,784	A
150 to 152	4	6,220	A	6,550	A	6,838	A
152 to 163	4	6,070	A	6,392	A	6,674	A
163 to 170	4	5,920	A	6,234	A	6,509	A
170 to 172	4	5,990	A	6,308	A	6,586	A
172 to 177	4	5,680	A	5,697	A	5,711	A
177 to 183	4	5,990	A	6,008	A	6,023	A
183 to 191	4	5,980	A	5,998	A	6,013	A
191 to 192	4	6,110	A	6,128	A	6,144	A
192 to 201	4	6,550	A	6,570	A	6,586	A
201 to 208	4	5,250	A	5,266	A	5,279	A
208 to 212	4	5,260	A	5,367	A	5,457	A
212 to 214	4	6,260	A	6,387	A	6,495	A
214 to 220	4	6,120	A	6,244	A	6,349	A
220 to 225	4	5,960	A	6,081	A	6,183	A
225 to 226	4	6,260	A	6,387	A	6,495	A
226 to 235	4	6,470	A	6,601	A	6,712	A
235 to 241	4	6,010	A	6,132	A	6,235	A
241 to 248	4	6,180	A	6,305	A	6,412	A
248 to 251	4	6,630	A	6,764	A	6,878	A

Structurally Deficient and Functionally Obsolete Mainline Structure Summary- Pierre Region

I-90 MRM 130.3 to 251	Number of Bridges	Length	Existing Deck Out-to-Out Width	Existing Area	Unit Price	Removal Cost	Proposed Deck Clear Roadway Width	Proposed Area	Unit Price	Bridge Cost
Cactus Flat Interchange (Exit 131) over I-90 at MRM 131.27 (Structurally Deficient)	1	307	47	14,342	\$9	\$129,074	40	12,284	\$100	\$1,228,400
I-90 over Brave Bull Road at MRM 164.43 (Functionally Obsolete-LOW CLEARANCE)	2	80	41	6,512	\$9	\$58,608	40	6,400	\$100	\$640,000
256th Ave over I-90 at MRM 177.48 (Structurally Deficient)	2	304	31	18,938	\$9	\$170,446	32	19,424	\$100	\$1,942,400
SD 248 (Murdo Exit 191) over I-90 at MRM 191.15 (Structurally Deficient)	1	432	39	16,707	\$9	\$150,361	32	13,814	\$100	\$1,381,440
I-90 over 242nd St at MRM 194.81 (Functionally Obsolete-LOW CLEARANCE)	2	80	41	6,512	\$9	\$58,608	40	6,400	\$100	\$640,000
I-90 WB over 300th Ave (Exit 220) at MRM 220.31 (Structurally Deficient)	1	158	41	6,443	\$9	\$57,985	40	6,332	\$100	\$633,200

PIERRE REGION

I-90	Location	Geometric Performance																Crashes, 2006-2009						2009/2020/2030 Level of Service									
		Max. Superelevation Rates (6%)	Min. Radius (833 ft)	Max. Degree of Curve (Standard - 6° 53' / Loop - 24° 48')	Clear Zone (30 ft)	Max. Grade on Ramp (5%)	Min. Lane Width (15 ft)	Min. Right Shldr. Width (8 ft)	Min. Left Shldr. Width (2 ft)	Inslope (6:1)	Min. Off-Ramp Taper (20:1)	Min. On Ramp Taper (50:1)	Min. Ramp K Values (84/96)	Min. Ramp Stopping Sight Distance (425 ft)	Min. Ramp Intersection Sight Distance (425 ft)	Min. Cross Road k Values (84/96)	Min. Cross Road Sight Distance (425 ft)	Max. Cross Road Grade (7%)	Min. Control of Access (300 ft min./660 ft des.)	Fatalities	Injury	PDO	Total	Wgtd. Total	Wgtd. Rate	State Rank by Rate	EB / NB Diverge	EB / NB Merge	WB / SB Diverge	WB / SB Merge	EB / NB Ramp Terminal	WB / SB Ramp Terminal	
Exit 131	Cactus Flat/Badlands Loop					15.0'	1.0'	2.0'												0	0	3	3	3	0.39	97	Not evaluated due to interchange screening method						
Exit 143	Philip	4.4%	1910'	3° 00'	< 30"	3.2%	15.0'	2.0'	2.0'	4:1	40	60	143	666	> 425	365	879	1.1%	228'	0	0	5	5	5	0.70	65							
Exit 150	Kadoka	3.0%	1910'	3° 00'	> 30'	3.4%	18.0'	2.0'	2.0'	5:1	40	61	163	975	> 425	78	819	2.9%	354'	0	1	1	2	4	0.43	94							
Exit 152	Kadoka	3.0%	1910'	3° 00'	> 30'	2.0%	19.0'	2.0'	1.0'	5:1	40	61	134	561	> 425	n/a	n/a	0.4%	467'	0	0	0	0	0	0.00	124							
Exit 163	Belvidere	5.0%	1910'	3° 00'	> 30'	2.5%	15.0'	0.0'	1.0'	5:1	40	61	159	729	> 425	696	1339	0.9%	250'	0	1	5	6	8	1.13	41							
Exit 170	Midland	4.2%	1910'	3° 00'	> 30'	3.4%	14.0'	1.0'	1.0'	5:1	40	61	242	799	> 425	n/a	n/a	n/a	270'	0	1	5	6	8	1.05	43							
Exit 172	Midland	4.2%	1910'	3° 00'	> 30'	3.5%	15.0'	1.0'	1.0'	5:1	32	60	127	528	> 425	19	538	4.1%	120'	1	0	4	5	16	2.47	5							
Exit 177	Stanford Rd	5.4%	1910'	3° 00'	> 30'	4.3%	16.0'	2.0'	3.0'	6:1	42	63	134	574					470'	0	1	1	2	4	0.62	72							
Exit 183	Okaton	4.4%	1910'	3° 00'	> 30'	2.4%	17.0'	3.0'	3.0'	6:1	40	61	80	439	> 425	69	366	7.3%	180'	0	0	2	2	2	0.29	105							
Exit 191	Murdo	4.6%	1910'	3° 00'	> 30'	3.4%	18.0'	2.0'	2.0'	6:1	40	61	148	775	sub	163	592	3.9%	> 660'	0	0	2	2	2	0.27	108							
Exit 192	Murdo/White River	4.4%	1910'	3° 00'	> 30'	4.2%	19.0'	2.0'	3.0'	6:1	40	61	94	420	> 425	286	819	3.7%	250'	0	0	5	5	5	0.38	98							
Exit 201	Draper	5.0%	1910'	3° 00'	> 30'	2.9%	16.0'	3.0'	3.0'	6:1	40	61	112	503	> 425	n/a	n/a	1.3%	334'	0	1	3	4	6	0.87	55							
Exit 208:	286th Ave	4.4%	1910'	3° 00'	> 30'	3.4%	15.0'	3.0'	4.0'	6:1			150	568		294	797	3.7%	> 660'	0	0	0	0	0	0.00	125							
Exit 212	Pierre/Ft. Pierre	5.6%	1910'	3° 00'	> 30'	4.2%	15.0'	3.0'	3.0'	6:1	40	61	131	576	> 425	591	> 425	1.5%	> 660'	0	1	3	4	6	0.63	71							
Exit 214	Vivian	4.4%	1910'	3° 00'	> 30'	4.5%	19.0'	3.0'	2.0'	6:1	40	61	111	489	> 425	197	791	5.5%	400'	0	1	7	8	10	1.45	26							
Exit 220	300th Ave	5.0%	1910'	3° 00'	> 30'	4.1%	17.0'	2.0'	3.0'	6:1	40	61	98	464	> 425	93	598	6.0%	190'	0	0	3	3	3	0.44	91							
Exit 225	Presho	5.0%	1910'	3° 00'	> 30'	4.4%	18.0'	3.0'	2.0'	6:1	40	61	134	537	> 425	383	14215	2.1%	450'	0	0	2	2	2	0.27	107							
Exit 226	Presho/Winner			3° 00'	> 30'		19.0'	2.0'	2.0'	6:1	40	61			> 425				250'	0	1	1	2	4	0.49	84							
Exit 235	Kennebec	5.0%	1910'	3° 00'	> 30'	4.7%	14.0'	5.0'	3.0'	6:1	40	61	90	442	> 425	112	500	5.4%	235'	1	2	2	5	20	2.45	6							
Exit 241	Lyman		1910'	3° 00'	> 30'		17.0'	3.0'	2.0'	6:1	40	61			> 425	529	> 425	0.7%	> 660'	0	1	2	3	5	0.73	62							
Exit 248	Reliance/Lower Brule	4.2%	1910'	3° 00'	> 30'	3.0%	15.0'	3.0'	2.0'	6:1					> 425	299	1246	2.1%		0	0	4	4	4	0.48	86							
Exit 251	Gregory/Winner	4.2%		3° 00'	> 30'	2.9%	15.0'	3.0'	4.0'	6:1	40	58	77	427	> 425	n/a	n/a	0.7%	250'	0	0	3	3	3	0.31	103							

Legend

Existing value does not meet standard criteria
Information not available or easily discernable from plans

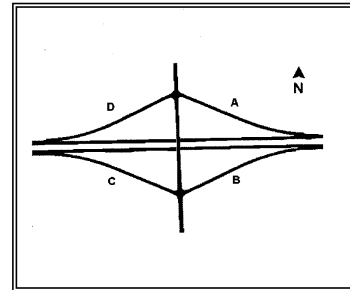
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I-90 EXIT 172 STAMFORD

INTERCHANGE GEOMETRICS CHECKLIST
SDDOT Interstate Corridor Study

Interstate: I-90
Interchange: Exit 172
Analyst: BDW
Date: 8/28/2009



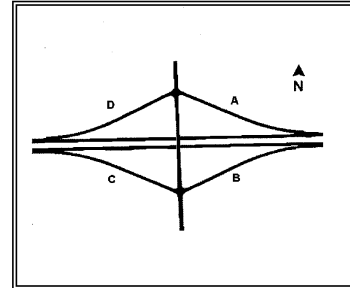
Interchange Geometry	Criteria	A	B	C	D	Achieved?
Interchange Type (Diamond, Full/Partial Cloverleaf, Trumpet etc.)	Diamond					-----
Design Speed	50 mph**					
Number of Lanes						
Right Turn Storage Length						
Left Turn Storage Length						
Superelevation (e max)	6%	4.2%	4.2%	4.2%	4.2%	
Minimum Horizontal Radius for e max of 6% (50 mph / 30 mph)	833 / 231 feet	1910'	1910'	1910'	1910'	
Maximum Degree of Curvature (50 mph / 30 mph)	6° 53' / 24° 48'	3°	3°	3°	3°	
Minimum Clear Zone From the Edge of Travel Lane	30 feet	> 30	> 30	> 30	> 30	
Maximum Grade on Ramp (Ascending)	+3% to +5%	1.26%	1.00%	1.86%	2.28%	
Maximum Grade on Ramp (Descending)	-3% to -5%	-3.48%	-1.63%	-0.28%	-2.20%	
Minimum Lane Width						
With Auxiliary Lanes	12 feet					
As Single Lane	15 feet (19 for loops)	15	17	17	17	
Shoulder Width						
Right Shoulder	8 feet (4 for loops)	1	1	2	4	Supports Impr.
Left Shoulder	2 feet	1	2	2	4	Supports Impr.
Inslope	6:1	5:1	5:1	5:1	5:1	Supports Impr.
Minimum Off-Ramp Taper Rate	20:1	32	n/a	42	n/a	
Minimum On-Ramp Taper Rate	50:1	n/a	87	n/a	60	
Ramp Features						
K-Value Ranges						
Minimum for a Crest Vertical Curve (50 mph / 30 mph)	84 / 19	127	190	280	179	
Minimum for a Sag Vertical Curve (50 mph / 30 mph)	96 / 37	n/a	n/a	n/a	n/a	
Minimum Stopping Sight Distance (50 mph / 30 mph)	425 / 200 feet	528	659	803	641	
Cross Road Features						
K-Value Ranges						
Minimum for a Crest Vertical Curve (50 mph / 30 mph)	84 / 19		134			
Minimum for a Sag Vertical Curve (50 mph / 30 mph)	96 / 37		19			Supports Impr.
Minimum Stopping Sight Distance (50 mph / 30 mph)	425 / 200 feet		538			
Ramp Intersection Sight Distance (ISD) (50 mph / 30 mph)***	425 / 200 feet	ok	n/a	ok	n/a	
Maximum Longitudinal Grade - Rolling Terrain (Urban Arterial)	7%		4.1%			
Minimum Longitudinal Grade (Min. / Des.)	0.3% / 0.5%		0.9%			
Minimum Control of Access from Interchange Ramps (Min. / Des.)	300 / 660 feet		120'			Supports Impr.
** Loop ramp design speed = 30 mph						
***Substandard Intersection Sight Distance locations could not be determined from the interchange plans. Substandard locations, therefore, are intersections that demonstrate sight distance limitations based on a general field evaluation or the presence of a substandard k-value or Stopping Sight Distance along the crossroad approaching the intersection.						
Comments						
Paved shoulders have steep slope						
Inslopes a little steep						
Sight distance not good from stop bars on off ramps but ok if pull forward						



I-90 EXIT 235 KENNEBEC

INTERCHANGE GEOMETRICS CHECKLIST
SDDOT Interstate Corridor Study

Interstate: I-90
Interchange: Exit 235 (Kennebec)
Analyst: BDW
Date: 8/31/2009



Interchange Geometry	Criteria	A	B	C	D	Achieved?
Interchange Type (Diamond, Full/Partial Cloverleaf, Trumpet etc.)	Diamond					-----
Design Speed	50 mph**					
Number of Lanes						
Right Turn Storage Length						
Left Turn Storage Length						
Superelevation (e max)	6%	5.0%	3.0%	5.0%	3.0%	
Minimum Horizontal Radius for e max of 6% (50 mph / 30 mph)	833 / 231 feet	1910'	1910'	1910'	1910'	
Maximum Degree of Curvature (50 mph / 30 mph)	6° 53' / 24° 48'	3°	3°	3°	3°	
Minimum Clear Zone From the Edge of Travel Lane	30 feet	> 30	> 30	> 30	> 30	
Maximum Grade on Ramp (Ascending)	+3% to +5%	0.65%	n/a	n/a	4.74%	
Maximum Grade on Ramp (Descending)	-3% to -5%	-1.78%	-1.31%	-1.68%	n/a	
Minimum Lane Width						
With Auxiliary Lanes	12 feet					
As Single Lane	15 feet (19 for loops)	14	16	15	14	Supports Impr.
Shoulder Width						
Right Shoulder	8 feet (4 for loops)	6	6	6	5	Supports Impr.
Left Shoulder	2 feet	4	3	4	4	
Inslope	6:1	6:1	6:1	6:1	6:1	
Minimum Off-Ramp Taper Rate	20:1	40	n/a	40	n/a	
Minimum On-Ramp Taper Rate	50:1	n/a	61	n/a	61	
Ramp Features						
K-Value Ranges						
Minimum for a Crest Vertical Curve (50 mph / 30 mph)	84 / 19	206	382	332	90	
Minimum for a Sag Vertical Curve (50 mph / 30 mph)	96 / 37	n/a	n/a	n/a	n/a	
Minimum Stopping Sight Distance (50 mph / 30 mph)	425 / 200 feet	645	954	967	442	
Cross Road Features						
K-Value Ranges						
Minimum for a Crest Vertical Curve (50 mph / 30 mph)	84 / 19		132			
Minimum for a Sag Vertical Curve (50 mph / 30 mph)	96 / 37		112			
Minimum Stopping Sight Distance (50 mph / 30 mph)	425 / 200 feet		500			
Ramp Intersection Sight Distance (ISD) (50 mph / 30 mph)***	425 / 200 feet	ok	n/a	ok	n/a	
Maximum Longitudinal Grade - Rolling Terrain (Urban Arterial)	7%		5.4%			
Minimum Longitudinal Grade (Min. / Des.)	0.3% / 0.5%		0.0%			
Minimum Control of Access from Interchange Ramps (Min. / Des.)	300 / 660 feet		235'			Supports Impr.

** Loop ramp design speed = 30 mph

***Substandard Intersection Sight Distance locations could not be determined from the interchange plans. Substandard locations, therefore, are intersections that demonstrate sight distance limitations based on a general field evaluation or the presence of a substandard k-value or Stopping Sight Distance along the crossroad approaching the intersection.

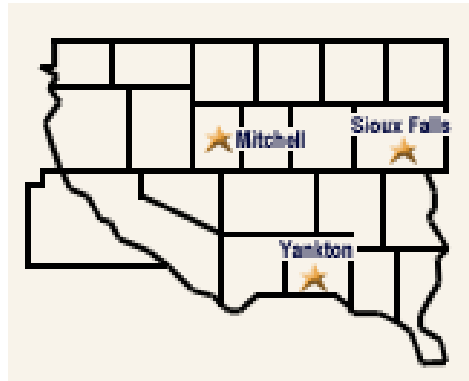
Comments

On cross road, guard rail ends are buried in ground. This is probably a substandard design for end treatment.



South Dakota Decennial Interstate Corridor Study

PHASE ONE REPORT



MITCHELL REGION

Interstate 90, MRM 251.00 to MRM 412.52

Interstate 29, MRM 0.00 to MRM 124.00

Interstate 229, MRM 0.00 to MRM 10.83

Total Interchanges: 74

Studied Interchanges: 58

Deficient Interchanges (20):

<u>Interchange</u>	<u>Page</u>	<u>Interchange</u>	<u>Page</u>
I-29 Exit 1	A-117	I-229 Exit 3	A-201
I-29 Exit 2	A-125	I-229 Exit 4	A-207
I-29 Exit 26	A-135	I-229 Exit 5	A-215
I-29 Exit 47	A-143	I-229 Exit 7	A-223
I-29 Exit 62	A-153	I-229 Exit 9	A-233
I-29 Exit 71	A-159	I-90 Exit 330	A-245
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I-29 Exit 86	A-179	I-90 Exit 387	A-259
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**Summary of Mainline Segment Geometric Performance
Mitchell Region**

	Lane Width (12 ft min.)	Right Shldr. Width (10 ft min.)	Left Shldr. Width (4 ft min.)	Design Speed (65 mph min.)	Max. Degree of Curve (2° 15' max.)	Clear Zone (30 ft min.)	Inslope (6:1 min.)	Superelevation Rate (6% max.)	Paved Section Width (38 ft min.)	Bridge Section Width (38 ft min./40 ft des.)	Vertical Clearance (16 ft min.)	Maximum Grade (3% level/4% rolling)
I-90												
MP 251-263	12	10	4	70	1° 30'	> 30	6:1	5.00%	38	38	n/a	3.95%
MP 263-265	12	10	4	75	1° 00'	> 30	6:1	3.70%	38	26	15' 11"	5.50%
MP 265-272	12	10	4	70	1° 00'	> 30	4:1	2.80%	38	-	16' 2"	1.98%
MP 272-284	12	10	4	70	1° 00'	> 30	5:1	2.80%	38	30	16' 10"	2.80%
MP 284-292	12	10	4	70	0° 14'	< 30	3:1	-	38	38	15' 11"	1.59%
MP 292-297	12	10	4	70	1° 00'	> 30	4:1	2.80%	38	38	15' 11"	1.59%
MP 297-306												
MP 306-316												
MP 316-325	12	10	4	70	0° 10'	< 30	< 6:1	-	38	-	16' 0"	1.20%
MP 325-334	12	10	4	70	0° 30'	< 30	3:1	-	38	30	16' 10"	2.54%
MP 334-344	12	10	4	70	0° 45'	> 30	4:1	-	38	38	16' 9"	2.15%
MP 344-352	12	10	4	70	< 2° 15'	> 30	4:1	-	38	38	16' 4"	2.10%
MP 352-362	12	10	4	70	< 2° 15'	< 30	3:1	-	38	-	17' 1"	<3%
MP 362-369	12	10	4	70	< 2° 15'	< 30	3:1	4.00%	38	30	16' 0"	1.68%
MP 369-377	12	10	4	70	0° 06'	< 30	3:1	-	38	30	15' 9"	3.00%
MP 377-389	12	10	4	70	1° 30'	< 30	3:1	-	38	30	15' 11"	2.98%
MP 389-395	12	10	4	70	0° 30'	< 30	3:1	-	38	30	16' 3"	3.00%
MP 395-399												
MP 399-407	12	10	6	70	1° 00'	> 30	4:1	2.40%	40	30	15' 2"	2.36%
MP 407-MIN	12	10	6	70	0° 28'	> 30	4:1	1.04%	40	30	16' 8"	3.00%
I-29												
MP 0-2	12	10	6	70	3° 00'	> 30	4:1	n/a	40	30	16' 2"	1.40%
MP 2-4	12	10	6	70	1° 00'	> 30	4:1	n/a	41	41	n/a	2.00%
MP 4-9	12	8	4	70	1° 00'	> 30	4:1	n/a	38	n/a	16' 2"	0.25%
MP 9-15	12	8	4	70	1° 30'	> 30	4:1	n/a	38	n/a	n/a	0.80%
MP 15-18	12	10	4	65	1° 30'	> 30	4:1	n/a	38	n/a	16' 7"	0.67%
MP 18-26	12	10	6	70	1° 30'	> 30	4:1	n/a	40'	40	n/a	3.00%
MP 26-31	13	10	6	70	1° 30'	> 30	4:1	n/a	42	42	16' 0"	1.38%
MP 31-38	12	10	6	70	0° 03'	> 30	4:1	n/a	40	n/a	n/a	3.00%
MP 38-42												
MP 42-47												
MP 47-50	12	10	6	70	1° 43'	> 30	4:1	n/a	40	n/a	17' 0"	2.68%
MP 50-53	12	10	6	70	0° 15'	> 30	4:1	n/a	40	n/a	n/a	0.81%
MP 53-56	12	10	6	70	0° 00'	> 30	4:1	n/a	40	n/a	18' 1"	0.52%
MP 56-59	12	10	6	70	0° 01'	> 30	4:1	n/a	40	40	n/a	0.52%
MP 59-62	12	10	6	70	0° 00'	> 30	4:1	n/a	40	40	15' 8"	0.60%
MP 62-64	12	10	6	70	0° 00'	> 30	4:1	n/a	40	n/a	n/a	0.59%

**Summary of Mainline Segment Geometric Performance
Mitchell Region**

	Lane Width (12 ft min.)	Right Shldr. Width (10 ft min.)	Left Shldr. Width (4 ft min.)	Design Speed (65 mph min.)	Max. Degree of Curve (2° 15' max.)	Clear Zone (30 ft min.)	Inslope (6:1 min.)	Superelevation Rate (6% max.)	Paved Section Width (38 ft min.)	Bridge Section Width (38 ft min./40 ft des.)	Vertical Clearance (16 ft min.)	Maximum Grade (3% level/4% rolling)
MP 64-68	12	10	6	70	0° 00'	> 30	4:1	n/a	40	30	16' 4"	3.00%
MP 68-71	12	10	6	70	0° 30'	> 30	4:1	2.00%	40	n/a	n/a	1.14%
MP 71-73	12	10	6	70	1° 00'	> 30	4:1	2.80%	40	n/a	16' 5"	1.79%
MP 73-75	12	10	6	70	0° 30'	> 30	4:1	2.08%	40	n/a	n/a	1.12%
MP 75-77	12	10	6	70	1° 30'	> 30	4:1	4.20%	40	30	16' 3"	3.00%
MP 77-78	12	10	6	70	0° 00'	> 30	4:1	n/a	40	n/a	n/a	< 3.00%
MP 78-79												
MP 79-80												
MP 80-81												
MP 81-82												
MP 82-83												
MP 83-84												
MP 84-86												
MP 86-94	12	10	4	70	1° 00'	> 30	4:1	2.80%	38	38	n/a	2.83%
MP 94-98	12	10	4	70	0° 10'	> 30	4:1	n/a	38	38	15' 9"	2.96%
MP 98-104	12	10	4	70	1° 00'	> 30	4:1	n/a	38	38	n/a	2.60%
MP 104-109	12	10	4	70	0° 12'	> 30	4:1	n/a	38	30	16' 3"	2.99%
MP 109-114	12	10	4	70	0° 00'	> 30	4:1	n/a	38	n/a	n/a	0.42%
MP 114-121	12	10	4	70	0° 06'	> 30	4:1	n/a	38	38	16' 11"	1.54%
I-229												
MP 1-2	12	10	6	70	1° 00'	> 30	6:1	-	40	30'	16' 5"	2.77%
MP 2-3	12	10	6	70	0° 00'	> 30	6:0	-	40	-	16' 3"	0.18%
MP 3-4	12	10	6	70	1° 00'	> 30	6:1	3.30%	40	-	17' 2"	2.73%
MP 4-5	12	10	6	70	3° 00'	> 30	6:1	6.00%	52	-	17' 4"	2.80%
MP 5-6	12	10	6	70	4° 00'	> 30	6:1	6.00%	40	-	16' 1"	2.68%
MP 6-7	12	10	4	70	0° 30'	> 30	6:1	-	50	-	16' 3"	3.00%
MP 7-9	12	10	4	70	0° 30'	> 30	6:1	1.04%	50	-	17' 6"	3.00%
MP 9-10												

LEGEND:

Existing Value does not meet standard criteria
Mainline section recently reconstructed

**Summary of Mainline Segments, Traffic Volumes and Levels of Service
Mitchell Region**

I-29 Exits:	Current Lanes	Existing		2020		2030	
		AADT	LOS	AADT	LOS	AADT	LOS
0 to 1	4	28,820	B	33733	C	38462	C
1 to 2	6	19,930	A	23328	B	26598	B
2 to 4	4	14,550	A	17031	A	19418	B
4 to 9	4	12,280	A	14374	A	16388	A
9 to 15	4	10,290	A	12044	A	13733	A
15 to 18	4	10,600	A	12407	A	14146	A
18 to 26	4	10,200	A	11939	A	13612	A
26 to 31	4	11,370	A	13308	A	15174	A
31 to 38	4	11,970	A	14011	A	15975	A
38 to 42	4	11,730	A	13730	A	15654	A
42 to 47	4	11,650	A	13636	A	15548	A
47 to 50	4	14,790	A	16524	A	18124	A
50 to 53	4	14,960	A	16714	A	18333	A
53 to 56	4	15,520	A	17340	A	19019	A
56 to 59	4	17,060	A	19061	A	20906	B
59 to 62	4	17,890	A	19988	A	21923	B
62 to 64	4	18,150	A	20279	A	22242	B
64 to 68	4	18,230	A	20368	B	22340	B
68 to 71	4	22,410	B	27960	B	33622	B
71 to 73	4	31,670	B	39514	C	47515	D
73 to 75	4	31,560	B	39377	C	47350	D
75 to 77	4	32,180	B	43648	C	56270	D
77 to 78	6	39,640	B	53767	C	69315	D
78 to 79	8	47,480	B	64401	C	83024	C
79 to 80	8	40,400	B	54797	B	70644	C
80 to 81	8	36,990	B	50172	B	64681	B
81 to 82	8	34,360	B	46605	B	60082	B
82 to 83	8	31,980	B	43377	B	55921	B
83 to 84	8	27,560	A	37382	A	48192	B
84 to 86	4	18,340	A	23429	B	28732	B
86 to 94	4	16,690	A	21321	A	26147	B
94 to 98	4	16,500	A	21078	A	25850	B
98 to 104	4	13,750	A	15720	A	17575	A
104 to 109	4	13,080	A	14954	A	16719	A
109 to 114	4	12,550	A	14348	A	16041	A
114 to 121	4	12,660	A	14474	A	16182	A
121 to 127	4	12,240	A	13463	A	14575	A

**Summary of Mainline Segments, Traffic Volumes and Levels of Service
Mitchell Region**

I-90 Exits:	Current Lanes	Existing		2020		2030	
		AADT	LOS	AADT	LOS	AADT	LOS
251 to 260	4	7,230	A	7,377	A	7,501	A
260 to 263	4	7,630	A	8,017	A	8,355	A
263 to 265	4	7,640	A	8,028	A	8,366	A
265 to 272	4	7,650	A	8,038	A	8,377	A
272 to 284	4	7,270	A	7,639	A	7,961	A
284 to 289	4	7,480	A	7,860	A	8,191	A
289 to 296	4	6,810	A	6,992	A	7,148	A
296 to 308	4	7,530	A	7,732	A	7,904	A
308 to 310	4	8,180	A	8,399	A	8,586	A
310 to 319	4	8,630	A	8,922	A	9,173	A
319 to 325	4	8,850	A	9,149	A	9,406	A
325 to 330	4	9,090	A	9,247	A	9,380	A
330 to 332	4	9,090	A	9,247	A	9,380	A
332 to 335	4	9,090	A	9,101	A	9,110	A
335 to 344	4	9,120	A	9,131	A	9,140	A
344 to 350	4	9,300	A	9,311	A	9,320	A
350 to 353	4	9,310	A	9,954	A	10,525	A
353 to 357	4	9,130	A	9,762	A	10,322	A
357 to 364	4	9,680	A	10,350	A	10,944	A
364 to 368	4	9,630	A	10,297	A	10,887	A
368 to 374	4	9,840	A	10,521	A	11,125	A
374 to 379	4	10,480	A	13,388	A	16,419	A
379 to 387	4	11,180	A	15,164	A	19,550	A
387 to 390	4	12,070	A	16,371	A	21,106	B
390 to 396	4	13,480	A	18,284	A	23,571	B
396 to 399	4	18,270	A	24,781	B	31,947	C
399 to 400	4	20,710	A	28,090	B	36,214	C
400 to 402	4	21,080	B	28,592	B	36,861	C
402 to 406	4	18,260	A	23,326	B	28,607	B
406 to 410	4	14,020	A	17,910	A	21,964	B
I-229 Exits:							
0 to 1	4	24,100	A	30,069	B	36,158	C
1 to 2	6	35,190	B	47,731	C	61,534	D
2 to 3	6	41,840	C	56,751	D	73,162	F
3 to 4	6	44,030	C	59,721	D	76,992	F
4 to 5	6	40,400	B	54,797	D	70,644	E
5 to 6	4	34,330	C	46,564	E	60,030	F
6 to 7	6	32,040	B	43,458	C	56,026	D
7 to 9	6	30,160	B	40,908	C	52,738	D

Structurally Deficient and Functionally Obsolete Mainline Structure Summary - Mitchell Region

I-90 MRM 251 to 412.52	Number of Bridges	Length	Existing Deck Out-to-Out Width	Existing Area	Unit Price	Removal Cost	Proposed Deck Clear Roadway Width	Proposed Area	Unit Price	Bridge Cost
I-90 over I-90 EF at MRM 253.9 (Functionally Obsolete-LOW CLEARANCE)	2	87	41	7,041	\$9	\$63,370	40	6,920	\$100	\$692,000
I-90 over Big Creek I-90 WF at MRM 258.37 (Functionally Obsolete-LOW CLEARANCE)	2	197	41	16,020	\$9	\$144,176	40	15,744	\$100	\$1,574,400
White Lake Interchange (Exit 296) over I-90 at MRM 296.68 (Structurally Deficient)	1	254	32	8,204	\$9	\$73,838	32	8,128	\$100	\$812,800
Plankinton Interchange (Exit 308) over I-90 at MRM 308.26 (Structurally Deficient)	1	268	32	8,666	\$9	\$77,995	36	9,659	\$100	\$965,880
Mt Vernon Interchange (Exit 319) over I-90 at MRM 319.43 (Structurally Deficient)	1	254	32	8,204	\$9	\$73,838	36	9,144	\$100	\$914,400
South Rowley Street at MRM 331.43 (Functionally Obsolete-LOW CLEARANCE)	2	119	41	9,687	\$9	\$87,179	40	9,520	\$100	\$952,000
435th Ave (Exit 357) over I-90 at MRM 357.99 (Structurally Deficient)	1	254	32	8,204	\$9	\$73,838	32	8,128	\$100	\$812,800
I-90 over West Fork Vermillion River at MRM 363.48 (Functionally Obsolete-NARROW)	2	152	34	10,393	\$9	\$93,536	40	12,120	\$100	\$1,212,000
I-90 over East Fork Vermillion River at MRM 374.95 (Functionally Obsolete-NARROW)	2	152	34	10,393	\$9	\$93,536	40	12,120	\$100	\$1,212,000
I-90 over SD 19 (Exit 379) at MRM 379.66 (Functionally Obsolete-NARROW)	2	189	35	13,130	\$9	\$118,174	40	15,136	\$100	\$1,513,600
Twin Structures at MRM 389.89 (Functionally Obsolete-NARROW)	2	163	34	11,182	\$9	\$100,636	40	13,040	\$100	\$1,304,000
County Road at MRM 392.47 (Functionally Obsolete-NARROW)	2	164	34	11,250	\$9	\$101,254	40	13,120	\$100	\$1,312,000
Big Sioux River at MRM 397.86 (Functionally Obsolete-LOW CLEARANCE)	2	336	43	28,694	\$9	\$258,250	40	26,880	\$100	\$2,688,000
SD 115 (Cliff Avenue) at MRM 399.56 (Functionally Obsolete-NARROW)	2	182	34	12,485	\$9	\$112,367	40	14,560	\$100	\$1,456,000
478th Ave over I-90 at MRM 402.55 (Functionally Obsolete-LOW CLEARANCE)	1	254	34	8,712	\$9	\$78,410	40	10,160	\$100	\$1,016,000
Burlington Northern RR at MRM 406.12 (Functionally Obsolete-NARROW)	2	184	34	12,622	\$9	\$113,602	40	14,720	\$100	\$1,472,000

Mitchell Region (continued)

I-29 MRM 0 to 124	Number of Bridges	Length	Existing Deck Out-to-Out Width	Existing Area	Unit Price	Removal Cost	Proposed Deck Clear Roadway Width	Proposed Area	Unit Price	Bridge Cost
River Drive at MRM 2.48 (Functionally Obsolete)	2	126	43	10,760	\$9	\$96,844	40	10,080	\$100	\$1,008,000
Westshore Dr over I-29 at MRM 4.35 (Functionally Obsolete-NARROW)	1	293	34	10,060	\$9	\$90,542	40	11,732	\$100	\$1,173,200
484th Ave over I-29 at MRM 5.88 (Functionally Obsolete-NARROW)	1	365	34	12,530	\$9	\$112,768	32	11,690	\$100	\$1,168,960
I-29 over SD owned RR at MRM 18.49 (Functionally Obsolete)	2	185	46	17,112	\$9	\$154,012	52	19,219	\$100	\$1,921,920
WB US 18 over I-29 (Exit 62) at MRM 62.37 (Functionally Obsolete)	1	293	34	10,060	\$9	\$90,542	36	10,559	\$100	\$1,055,880
281st St over I-29 at MRM 63.34 (Structurally Deficient)	1	254	28	7,112	\$9	\$64,008	32	8,128	\$100	\$812,800
Twin Structures over Creek at MRM 67.13 (Functionally Obsolete-NARROW)	2	192	34	13,171	\$9	\$118,541	40	15,360	\$100	\$1,536,000
248th St over I-29 at MRM 96.48 (Structurally Deficient)	1	254	32	8,204	\$9	\$73,838	32	8,128	\$100	\$812,800
SD 115 over I-29 (Exit 98) at MRM 98.48 (Functionally Obsolete)	1	254	32	8,204	\$9	\$73,838	40	10,160	\$100	\$1,016,000
I-29 over Bachelor Creek at MRM 106.02 (Functionally Obsolete-NARROW)	2	152	34	10,413	\$9	\$93,721	40	12,144	\$100	\$1,214,400
I-29 over 233rd St at MRM 111.84 (Functionally Obsolete-LOW CLEARANCE)	2	80	41	6,512	\$9	\$58,608	40	6,400	\$100	\$640,000
I-29 over 232nd St at MRM 112.83 (Functionally Obsolete-LOW CLEARANCE)	2	80	41	6,512	\$9	\$58,608	40	6,400	\$100	\$640,000
I-229 MRM 0 to 10.83										
Cliff Avenue at MRM 4.16 (Functionally Obsolete-LOW CLEARANCE)	2	183	35	12,714	\$9	\$114,427	40	14,656	\$100	\$1,465,600
I-229 over 57th Street at MRM 1.66 TUNNEL - (Functionally Obsolete-NARROW)	1	415	85	35,068	\$15	\$526,013	85	35,068	\$100	\$3,506,750
60th St over I-229 at MRM 10.47 (Structurally Deficient)	1	238	34	8,167	\$9	\$73,501	52	12,381	\$100	\$1,238,120

MITCHELL REGION

		Geometric Performance																	Crashes, 2006-2009						2009/2020/2030 Level of Service							
Location		Max. Superelevation Rates (6%)	Min. Radius (833 ft)	Max. Degree of Curve (Standard - 6° 53' / Loop - 24° 48')	Clear Zone (30 ft)	Max. Grade on Ramp (5%)	Min. Lane Width (15 ft)	Min. Right Shldr. Width (8 ft)	Min. Left Shldr. Width (2 ft)	Inslope (6:1)	Min. Off-Ramp Taper (20:1)	Min. On Ramp Taper (50:1)	Min. Ramp K Values (84/96)	Min. Ramp Stopping Sight Distance (425 ft)	Min. Ramp Intersection Sight Distance (425 ft)	Min. Cross Road k Values (84/96)	Min. Cross Road Sight Distance (425 ft)	Max. Cross Road Grade (7%)	Min. Control of Access (300 ft min./660 ft des.)	Fatalities	Injury	PDO	Total	Wgtd. Total	Wgtd. Rate	State Rank by Rate	EB / NB Diverge	EB / NB Merge	WB / SB Diverge	WB / SB Merge	EB / NB Ramp Terminal	WB / SB Ramp Terminal
I-29																																
Exit 1	Dakota Dunes	4.0%	330'	6° 21'	> 30'	4.00%	20.5'	2.5'	2.0'	6:1	25	50	110	493'	> 425	217	964'	3.0%	489'	0	5	23	28	38	0.92	50	B/F/F	A/B/B	B/B/B	A/A/A	C/C/F	c/f/f
	Loop Ramps																										N/A	A/A/B	N/A	B/B/B	N/A	
Exit 2	North Sioux City	-	1432'	4° 00'	< 30'	2.70%	18.5'	1.5'	1.5'	3:1	35	62	74	446'	> 425	73	649'	0.9%	70'	0	5	12	17	27	0.78	58	A/A/A	B/B/B	A/B/B	A/A/B	B/B/B	c/d/f
Exit 4	McCook Lake	-	955'	6° 00'	< 30'	3.17%	18.5'	1.5'	2.0'	3:1	41	62	105	488'	265'	45	356'	4.0%	300'	0	2	10	12	16	0.78	59	Not evaluated due to interchange screening method					
Exit 9	Jefferson	-	955'	6° 00'	< 30'	3.51%	19.5'	1.0'	1.0'	3:1	41	62	74	350'	sub	75	356'	4.0%	530'	0	1	3	4	6	0.41	95	Not evaluated due to interchange screening method					
Exit 15	Elk Point	-	1432'	4° 00'	< 30'	2.99%	18.5'	2.0'	1.5'	3:1	27	29	72	349'	sub	74	348'	4.1%	300'	0	0	0	0	0	0.00	126	Not evaluated due to interchange screening method					
Exit 26	Vermillion/Yankton	-	955'	6° 00'	< 30'	3.77%	19.0'	2.0'	2.5'	3:1	28	29	59	299'	sub	67	400'	4.0%	570'	0	2	12	14	18	0.69	66	A/A/A	A/A/A	A/A/A	A/A/A	c/d/f	b/b/c
Exit 31	Spink/Akron	6.0%	1910'	3° 00'	< 30'	1.54%	17.5'	2.5'	3.0'	3:1	42	63	124	1345'	> 425	115	521'	3.2%	> 660'	0	0	10	10	10	0.72	63	Not evaluated due to interchange screening method					
Exit 38	Volin	6.0%	1910'	3° 00'	< 30'	1.75%	18.0'	3.0'	3.0'	3:1	42	63	122	758'	sub	82	421'	4.0%	> 660'	0	0	8	8	8	0.59	75	Not evaluated due to interchange screening method					
Exit 42	Alcester/Wakonda	6.0%	1910'	3° 00'	< 30'	2.67%	18.0'	3.0'	3.0'	3:1	42	63	54	290'	> 425	99	500'	3.2%	> 660'	0	1	4	5	7	0.51	80	Not evaluated due to interchange screening method					
Exit 47	Beresford/Irene	6.2%	1432'	4° 00'	< 30'	3.77%	15.0'	6.5'	1.0'	3:1	42	63	90	439'	sub	81	386'	3.1%	410'	0	0	3	3	3	0.12	120	A/A/B	A/A/A	A/B/B	A/A/A	b/e/f	c/f/f
Exit 50	Centerville/Hudson	6.2%	1432'	4° 00'	< 30'	3.77%	15.5'	3.5'	2.5'	3:1	42	63	50	368'	sub	72	337'	4.3%	330'	0	0	1	1	1	0.06	123	Not evaluated due to interchange screening method					
Exit 53	Viborg	6.2%	1432'	4° 00'	< 30'	2.72%	14.0'	4.5'	4.0'	3:1	42	63	64	333'	sub	73	347'	5.0%	380'	0	2	2	4	8	0.46	87	Not evaluated due to interchange screening method					
Exit 56	Fairview	6.2%	1432'	4° 00'	< 30'	1.11%	13.0'	3.0'	2.5'	3:1	29	42	182	1699'	sub	63	305'	4.0%	350'	0	3	2	5	11	0.60	73	Not evaluated due to interchange screening method					
Exit 59	Davis	6.2%	1432'	4° 00'	< 30'	3.42%	14.0'	3.5'	2.0'	3:1	29	42	106	577'	sub	84	406'	1.0%	406'	1	1	4	6	19	0.91	51	Not evaluated due to interchange screening method					
Exit 62	Canton	8.0%	955'	6° 00'	> 30'	3.60%	16.5'	3.5'	2.5'	4:1	28	29	77	375'	> 425	100	561'	3.0%	550'	0	2	10	12	16	0.64	69	B/B/B	B/B/B	B/B/B	B/B/B	b/b/b	b/b/c
Exit 64	Worthing/ Lennox	-	1432'	4° 00'	> 30'	2.97%	18.0'	1.5'	3.0'	4:1	29	29	59	330'	> 425	98	434'	3.0%	420'	0	4	10	14	22	0.96	48	Not evaluated due to interchange screening method					
Exit 68	Lennox/Parker	-	1432'	4° 00'	> 30'	4.08%	15.5'	3.5'	2.5'	4:1	29	29	71	336'	sub	75	356'	4.0%	330'	0	4	10	14	22	0.83	56	Not evaluated due to interchange screening method					
Exit 71	Harrisburg/Tea	-	955'	6° 00'	> 30'	3.24%	15.5'	3.0'	2.0'	4:1	29	29	79	538'	sub	76	414'	4.0%	150'	0	1	7	8	10	0.29	104	B/B/C	B/B/C	C/D/D	C/C/D	b/b/b	b/b/c
Exit 77	41st Street	-	955'	6° 00'	> 30'	4.00%	16.5'	4.5'	2.0'	4:1	23	29	80	367'	> 425	100	444'	4.0%	200'	0	71	103	174	316	3.72	2	C/E/F	C/D/F	C/E/F	D/F/F	F/F/F	F/F/F
Exit 86	Renner/Crooks	5.0%	1910'	3° 00'	< 30'	4.61%	15.0'	4.0'	1.0'	4:1	41	62	117	547'	> 425	141	551'	4.2%	250'	1	2	11	14	29	1.14	40	B/B/B	A/B/B	B/B/B	B/B/B	b/b/c	b/b/c
Exit 94	Baltic	4.2%	1910'	3° 00'	> 30'	2.46%	15.0'	3.5'	2.5'	4:1	40	61	53	337'	> 425	173	611'	5.1%	380'	0	3	9	12	18	0.89	53	Not evaluated due to interchange screening method					
Exit 98	Dell Rapids	5.0%	1910'	3° 00'	> 30'	4.10%	15.5'	3.0'	3.0'	4:1	40	61	90	537'	> 425	220	689'	3.7%	250'	0	4	8	12	20	0.89	54	A/B/B	A/B/B	A/A/B	A/B/B	b/b/c	b/c/c
Exit 104	Trent	5.0%	1910'	3° 00'	> 30'	2.97%	15.0'	4.5'	2.0'	4:1	40	61	101	514'	sub	170	637'	2.1%	> 660'	0	0	4	4	4	0.26	109	Not evaluated due to interchange screening method					
Exit 109	Madison/Colman	5.0%	1910'	3° 00'	> 30'	3.20%	18.0'	3.0'	2.0'	4:1	40	61	118	534'	> 425	180	725'	2.7%	660'	0	4	7	11	19	0.91	52	Not evaluated due to interchange screening method					
Exit 114	Flandreau	4.2%	1910'	3° 00'	> 30'	4.00%	18.0'	3.0'	3.0'	4:1	40	61	89	470'	> 425	143	596'	3.0%	610'	0	1	6	7	9	0.54	78	Not evaluated due to interchange screening method					
Exit 121	Nunda/Ward	5.0%	1910'	3° 00'	> 30'	2.66%	18.0'	3.0'	3.0'	4:1	40	61	139	640'	> 425	167	625'	2.5%	330'	0	1	13	14	16	1.05	44	Not evaluated due to interchange screening method					

MITCHELL REGION

Location	Geometric Performance															Crashes, 2006-2009						2009/2020/2030 Level of Service										
	Max. Superelevation Rates (6%)	Min. Radius (833 ft)	Max. Degree of Curve (Standard - 6° 53' / Loop - 24° 48')	Clear Zone (30 ft)	Max. Grade on Ramp (5%)	Min. Lane Width (15 ft)	Min. Right Shldr. Width (8 ft)	Min. Left Shldr. Width (2 ft)	Inslope (6:1)	Min. Off-Ramp Taper (20:1)	Min. On Ramp Taper (50:1)	Min. Ramp K Values (84/96)	Min. Ramp Stopping Sight Distance (425 ft)	Min. Ramp Intersection Sight Distance (425 ft)	Min. Cross Road k Values (84/96)	Min. Cross Road Sight Distance (425 ft)	Max. Cross Road Grade (7%)	Min. Control of Access (300 ft min./660 ft des.)	Fatalities	Injury	PDO	Total	Wgtd. Total	Wgtd. Rate	State Rank by Rate	EB / NB Diverge	EB / NB Merge	WB / SB Diverge	WB / SB Merge	EB / NB Ramp Terminal	WB / SB Ramp Terminal	
I-90																																
Exit 260	Oacoma/Chamberlain	-	1910'	3° 00'	> 30"	4.4%	16.5'	3.0'	4.0'	6:1	42	63	118	505'	sub	28	349'	4.8%	220'	0	0	1	1	1	0.07	122	Not evaluated due to interchange screening method					
Exit 263	Chamberlain	6.0%	236'	24° 17'	> 30"	4.0%	16.5'	1.5'	0.0'	6:1	39	> 50	42	303'	> 425	1721	> 425'	0.7%	0'	0	2	2	4	8	0.74	61						
Exit 265	Chamberlain	4.2%	1910'	3° 00'	> 30"	2.4%	15.0'	4.5'	3.5'	4:1	40	61	91	588'	> 425	138	600'	3.0%	150'	0	0	6	6	6	0.46	90						
Exit 272	Pukwana	-	1910'	3° 00'	> 30"	3.4%	15.0'	6.5'	2.0'	4:1	40	61	96	493'	> 425	258	899'	3.0%	> 300'	0	0	2	2	2	0.22	112						
Exit 284	Kimball	3.5%	2865'	2° 00'	> 30"	2.9%	13.5'	5.0'	2.0'	4:1	39	58	115	550'	> 425	568	> 425'	1.0%	200'	0	0	5	5	5	0.46	89						
Exit 289	Platte	5.0%	1910'	3° 00'	> 30"	1.7%	14.0'	5.5'	3.5'	4:1	40	61	131	805'	> 425	108	471'	3.0%	> 300'	0	1	4	5	7	0.81	57						
Exit 296	White Lake	4.2%	1910'	3° 00'	> 30"	1.7%	13.0'	7.0'	4.5'	4:1	40	61	196	856'	> 425	167	600'	3.0%	120'	0	1	2	3	5	0.54	77						
Exit 308	Plankinton	4.2%	1910'	3° 00'	< 30"	1.3%	18.0'	3.0'	3.0'	3:1	40	61	144	1483'	sub	74	345'	4.0%	400'	0	0	1	1	1	0.09	121						
Exit 310	Stickney/Aberdeen	4.2%	1910'	3° 00'	< 30"	1.6%	14.0'	6.5'	4.0'	3:1	40	61	139	1092'	> 425	175	747'	3.0%	400'	0	0	2	2	2	0.15	117						
Exit 319	Mount Vernon	4.2%	1910'	3° 00'	< 30"	1.7%	14.0'	7.5'	3.0'	3:1	40	61	213	819'	> 425	167	600'	3.0%	250'	0	0	3	3	3	0.25	110						
Exit 325	Betts Road	4.0%	1910'	3° 00'	< 30"	2.9%	14.5'	6.5'	3.0'	3:1	40	61	104	560'	> 425	115	495'	3.8%	> 300'	0	1	2	3	5	0.46	88						
Exit 330	Mitchell/Huron	5.0%	1910'	3° 00'	> 30"	2.3%	18.0'	4.0'	4.0'	4:1	40	61	176	830'	> 425	175	754'	3.0%	420'	0	2	4	6	10	0.50	82	A/A/A	A/A/A	A/A/A	A/A/A	c/d/f	c/d/e
Exit 332	Mitchell/Parkston	6.0%	1910'	5° 00'	> 30"	4.3%	12.0'	4.0'	2.5'	4:1	40	60	134	539'	> 425	418	949'	2.6%	400'	0	11	32	43	65	2.15	11	A/A/A	A/A/A	A/A/A	A/A/A	A/A/A	A/A/A
Exit 335	Riverside Road	4.0%	1910'	3° 00'	> 30"	2.3%	18.0'	4.5'	4.0'	4:1	40	55	104	560'	> 425	225	960'	1.4%	350'	0	1	3	4	6	0.51	81						
Exit 344	Alexandria	4.0%	1910'	3° 00'	> 30"	2.2%	14.0'	6.5'	2.5'	4:1	40	53	224	1118'	> 425	253	749'	2.5%	300'	0	0	5	5	5	0.40	96						
Exit 350	Emery/Farmer	4.0%	1910'	3° 00'	> 30"	2.0%	14.0'	7.5'	2.5'	4:1	40	61	212	913'	> 425	262	754'	2.0%	300'	0	2	6	8	12	1.11	42						
Exit 353	Spencer/Emery	5.0%	1910'	3° 00'	> 30"	2.2%	14.5'	5.0'	3.0'	4:1	41	61	125	861'	> 425	115	665'	2.6%	300'	0	0	2	2	2	0.17	114						
Exit 357	Bridgewater	5.0%	1910'	3° 00'	> 30"	2.7%	14.0'	5.0'	2.5'	4:1	41	61	128	599'	> 425	120	434'	4.0%	400'	0	2	5	7	11	1.03	45	Not evaluated due to interchange screening method					
Exit 364	Salem/Yankton	5.0%	1910'	3° 00'	> 30"	3.8%	15.0'	6.5'	3.5'	4:1	40	61	128	600'	> 425	132	759'	3.0%	300'	0	1	7	8	10	0.71	64						
Exit 368	Canistota	5.0%	1910'	3° 00'	> 30"	3.0%	14.5'	7.5'	3.5'	4:1	39	61	179	754'	> 425	105	569'	3.8%	> 300'	0	5	5	10	20	1.77	17						
Exit 374	Montrose	-	1910'	3° 00'	> 30"	2.0%	14.5'	4.5'	3.5'	4:1	40	61	169	802'	sub	83	376'	3.7%	300'	0	4	6	10	18	1.50	24						
Exit 379	Humboldt/Madison	4.2%	1910'	3° 00'	> 30"	2.2%	14.0'	5.5'	1.5'	4:1	39	61	131	820'	> 425	202	807'	3.1%	200'	0	8	9	17	33	2.15	12						
Exit 387	Hartford	4.2%	1910'	3° 00'	> 30"	1.5%	14.0'	5.0'	1.0'	4:1	38	61	191	2820'	> 425	150	569'	4.0%	300'	0	1	3	4	6	0.34	100	A/A/A	A/A/A	A/A/B	A/A/B	a/b/b	b/b/b
Exit 390	Hartford	6.0%	252'	22° 34'	> 30"	3.5%	14.5'	4.5'	2.0'	3:1	41	61	77	407'	-	-	-	-	400'	0	7	23	30	44	2.36	9	Not evaluated due to interchange screening method					
Exit 406	Brandon/Corson	6.0%	1432'	4° 00'	< 30"	6.0%	15.0'	4.5'	1.5'	3:1	27	29	96	427'	> 425	249	871'	1.1%	400'	1	3	12	16	33	1.02	47	A/B/B	A/B/B	A/A/A	A/B/B	c/e/f	c/d/f
Exit 410	Valley Springs/Garretson	-	1432'	4° 00'	> 30"	4.6%	15.5'	2.0'	2.5'	4:1	27	29	67	321'	sub	100	465'	4.9%	> 300'	0	0	7	7	7	0.44	92	Not evaluated due to interchange screening method					
I-229																																
Exit 2	Western Avenue	-	716'	8° 00'	> 30"	4.35%	25.5'	1.5'	1.5'	4:1	-	-	61	289'	sub	74	344'	3.6%	350'	0	21	42	63	105	1.39	31	B/B/C	B/B/C	B/C/C	A/B/C	F/F/F	F/F/F
Exit 3	Minnesota Avenue	5.6%	1637'	3° 30'	> 30"	2.90%	17.5'	3.0'	1.5'	4:1	-	-	76	506'	-	-	-	-	160'	0	25	53	78	128	1.54	22	B/B/C	B/C/C	B/C/C	B/C/C	D/F/F	D/E/F
Exit 4	Cliff Avenue	6.0%	1848'	3° 06'	> 30"	3.29%	12.0'	3.5'	1.5'	3:1	-	-	87	508'	-	-	-	-	150'	0	23	49	72	118	1.97	13	B/C/C	B/B/C	B/B/C	B/C/C	B/C/C	C/C/E
Exit 5	26th Street	5.6%	205'	28° 00'	> 30"	3.57%	19.0'	1.5'	0.0'	6:1	-	-	30	257'	-	-	-	-	260'	0	35	68	103	173	2.41	7	B/B/C	B/C/C	B/C/C	B/B/C	E/F/F	f/f/f
Exit 7	Rice Street	6.0%	160'	35° 48'	> 30"	3.57%	15.0'	3.0'	2.5'	4:1	-	-	30	257'	-	-	-	-	350'	0	10	36	46	66	1.22	37	B/B/C	B/B/C	A/B/B	B/B/C	C/E/F	f/f/f
Exit 9	Benson Road	4.0%	2291'	2° 30'	> 30"	3.25%	15.0'	1.0'	0.0'	6:1	20	50	101	446'	ok	224	859'	0.8%	>300'	0	6	14	20	32	0.69	67	B/B/C	A/A/A	B/B/B	A/B/B	B/C/F	f/f/f

Legend
Existing value does not meet standard criteria
Information not available or easily discernable from plans

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I-29 EXIT 1 DAKOTA DUNES



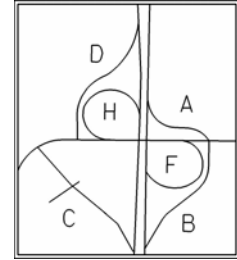
Figure 1
I-29 Exit 1 - Dakota Dunes
Lane Addition and Signalization Improvements

Probable Construction Costs
I-29 Exit 1 - Lane Addition and Signalization Improvements

<i>Item Description</i>	<i>Quantity</i>	<i>Unit</i>	<i>Unit Cost</i>	<i>Total Cost</i>
Mobilization	1	LUMP SUM	\$2,000.00	\$2,000
Traffic Control	1	LUMP SUM	\$3,000.00	\$3,000
Clearing	1	LUMP SUM	\$1,000.00	\$1,000
Removal of Concrete Pavement	-	SQ. YD.	\$3.88	\$0
Removal of Asphalt Pavement	-	SQ. YD.	\$7.39	\$0
Remove Bridge	-	SQ. FT.	\$9.00	\$0
Borrow, Unclassified Excavation	1,343	CU. YD.	\$5.30	\$7,120
Base Course	213	TON	\$10.64	\$2,267
Asphalt Composite		TON	\$80.91	\$0
PCC Pavement 11" (mainline)	-	SQ. YD.	\$33.12	\$0
PCC Pavement 8" (ramps)	467	SQ. YD.	\$43.40	\$20,251
Concrete Approach Slab	-	SQ. YD.	\$188.34	\$0
Bridges	-	SQ. FT.	\$100.00	\$0
Guard Rail	0	LF	\$100.00	\$0
Permanent Signing/Markings	1	LUMP SUM	\$0.00	\$0
Traffic Signal	2	EACH	\$125,000.00	\$250,000
Roadway Lighting	1	LUMP SUM	\$0.00	\$0
Drainage (18" RCP)	30	LF	\$24.53	<u>\$736</u>
Subtotal				\$290,000
Contingencies	25%			<u>\$72,500</u>
Total Probable Construction Costs				\$360,000
Engineering, Administration	15%			\$54,000
Total Project Costs				\$410,000

INTERCHANGE GEOMETRICS CHECKLIST
SDDOT Interstate Corridor Study

Interstate: I-29
Interchange: Exit 1
Analyst: BLM
Date: 1/20/2010



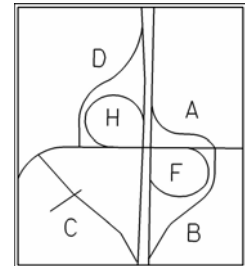
Interchange Geometry	Criteria	A	B	C	D	Achieved?
Interchange Type (Diamond, Full/Partial Cloverleaf, Trumpet etc.)	Partial Cloverleaf					-----
Design Speed	50 mph**					
Number of Lanes		1	2	1	2	
Right Turn Storage Length		-	-	-	300'	
Left Turn Storage Length		-	-	-	-	
Superelevation (e max)	6%	4.00%	4.00%	4.00%	4.00%	Acceptable
Minimum Horizontal Radius for e max of 6% (50 mph / 30 mph)	833 / 231 feet	330'	600'	900'	600'	Supports Impr.
Maximum Degree of Curvature (50 mph / 30 mph)	6° 53' / 24° 48'	17° 21'	9° 32'	6° 21'	9° 32'	Supports Impr.
Minimum Clear Zone From the Edge of Travel Lane	30 feet	>30'	>30'	>30'	>30'	Acceptable
Maximum Grade on Ramp (Ascending)	+3% to +5%	4.00%	0.98%	0.16%	0.71%	Acceptable
Maximum Grade on Ramp (Descending)	-3% to -5%	-3.63%	-	-1.30%	-	Acceptable
Minimum Lane Width						
With Auxiliary Lanes	12 feet	-	26		32	Acceptable
As Single Lane	15 feet (19 for loops)	22	-	24.5		Acceptable
Shoulder Width						
Right Shoulder	8 feet (4 for loops)	3.5	2.5	4'	3	Supports Impr.
Left Shoulder	2 feet	3.5	7	2'	2	Acceptable
Inslope	6:1	6:1	6:1	6:1	6:1	Acceptable
Minimum Off-Ramp Taper Rate	20:1	-	25:1	-	20:1	Acceptable
Minimum On-Ramp Taper Rate	50:1	50:1	-	50:1	-	Acceptable
Ramp Features						
K-Value Ranges						
Minimum for a Crest Vertical Curve (50 mph / 30 mph)	84 / 19		307	137	422	Acceptable
Minimum for a Sag Vertical Curve (50 mph / 30 mph)	96 / 37	110	504	111	563	Acceptable
Minimum Stopping Sight Distance (50 mph / 30 mph)	425 / 200 feet	493'	1253'	839'	1,670'	Acceptable
Cross Road Features						
K-Value Ranges						
Minimum for a Crest Vertical Curve (50 mph / 30 mph)	84 / 19	East		West		
		217		217		Acceptable
Minimum for a Sag Vertical Curve (50 mph / 30 mph)	96 / 37	246		246		Acceptable
Minimum Stopping Sight Distance (50 mph / 30 mph)	425 / 200 feet	964'		964'		Acceptable
Ramp Intersection Sight Distance (50 mph / 30 mph)***	425 / 200 feet	ok		ok		Acceptable
Maximum Longitudinal Grade - Rolling Terrain (Urban Arterial)	7%	3.0%		3.0%		Acceptable
Minimum Longitudinal Grade (Min. / Des.)	0.3% / 0.5%	0.25%		0.25%		Acceptable
Minimum Control of Access from Interchange Ramps (Min. / Des.)	300 / 660 feet	510'		489'		Acceptable

** Loop ramp design speed = 30 mph
 ***Substandard Intersection Sight Distance locations could not be determined from the interchange plans. Substandard locations, therefore, are intersections that demonstrate sight distance limitations based on a general field evaluation or the presence of a substandard k-value or Stopping Sight Distance along the crossroad approaching the intersection

Comments

INTERCHANGE GEOMETRICS CHECKLIST
SDDOT Interstate Corridor Study

Interstate: I-29
Interchange: Exit 1
Analyst: BLM
Date: 1/20/2010



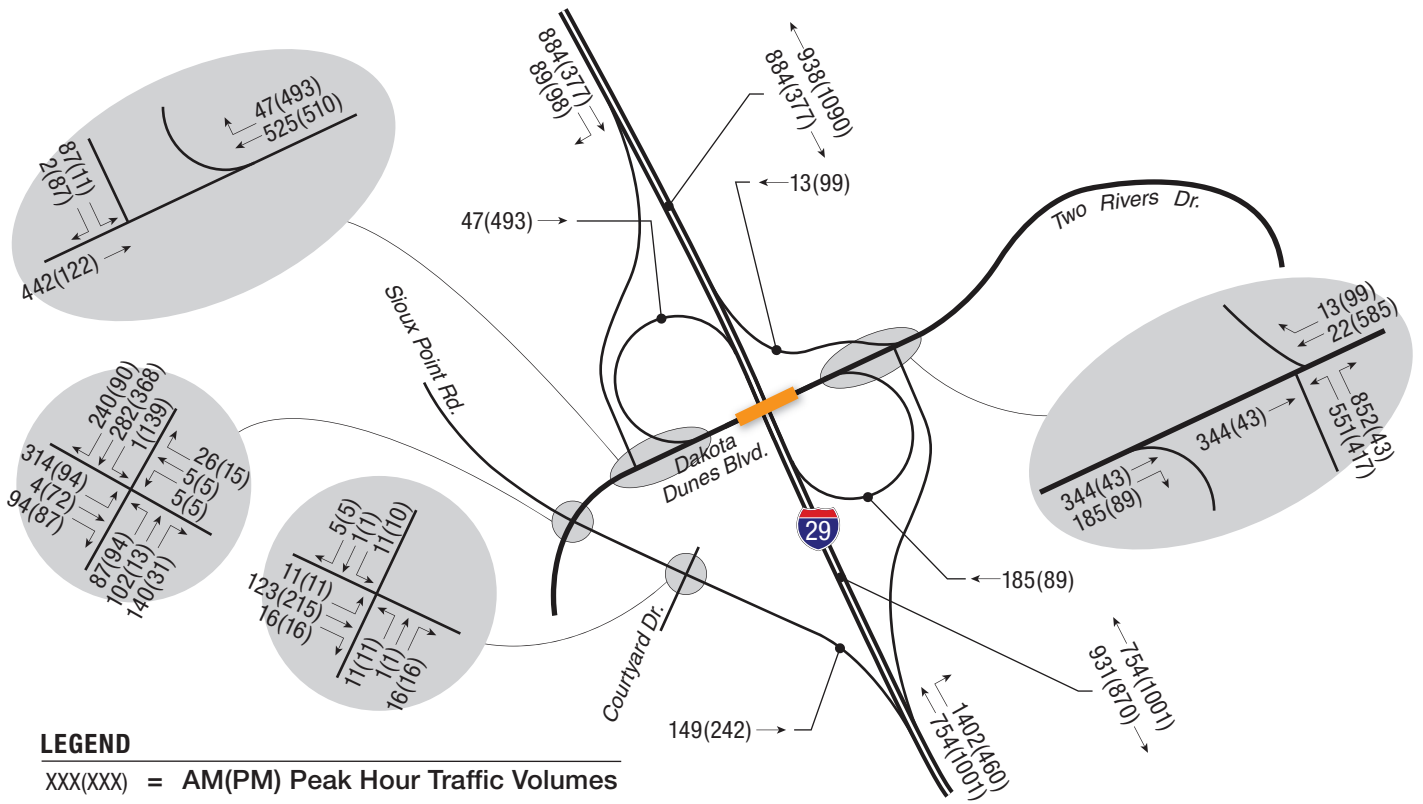
Interchange Geometry	Criteria	F	H		Achieved?
Interchange Type (Diamond, Full/Partial Cloverleaf, Trumpet etc.)	Partial Cloverleaf				-----
Design Speed	50 mph**				
Number of Lanes		1	1		
Right Turn Storage Length		-	-		
Left Turn Storage Length		-	-		
Superelevation (e max)	6%	4.00%	4.00%		Acceptable
Minimum Horizontal Radius for e max of 6% (50 mph / 30 mph)	833 / 231 feet	330'	330'		Acceptable
Maximum Degree of Curvature (50 mph / 30 mph)	6° 53' / 24° 48'	17° 21'	17° 21'		Acceptable
Minimum Clear Zone From the Edge of Travel Lane	30 feet	>30'	>30'		Acceptable
Maximum Grade on Ramp (Ascending)	+3% to +5%	-	-		
Maximum Grade on Ramp (Descending)	-3% to -5%	-3.25%	-3.25%		Acceptable
Minimum Lane Width					
With Auxiliary Lanes	12 feet	-	-		
As Single Lane	15 feet (19 for loops)	21.5	20.5		Acceptable
Shoulder Width					
Right Shoulder	8 feet (4 for loops)	5	3.5		Acceptable
Left Shoulder	2 feet	4'	4'		Acceptable
Inslope	6:1	6:1	6:1		Acceptable
Minimum Off-Ramp Taper Rate	20:1	-	-		
Minimum On-Ramp Taper Rate	50:1	Aux.	50:1		Acceptable
Ramp Features					
K-Value Ranges					
Minimum for a Crest Vertical Curve (50 mph / 30 mph)	84 / 19	-	-		
Minimum for a Sag Vertical Curve (50 mph / 30 mph)	96 / 137	290	290		Acceptable
Minimum Stopping Sight Distance (50 mph / 30 mph)	425 / 200 feet	2566'	2566'		Acceptable
Cross Road Features					
K-Value Ranges					
Minimum for a Crest Vertical Curve (50 mph / 30 mph)	84 / 19				
Minimum for a Sag Vertical Curve (50 mph / 30 mph)	96 / 137				
Minimum Stopping Sight Distance (50 mph / 30 mph)	425 / 200 feet				
Ramp Intersection Sight Distance (50 mph / 30 mph)***	425 / 200 feet				
Maximum Longitudinal Grade - Rolling Terrain (Urban Arterial)	7%				
Minimum Longitudinal Grade (Min. / Des.)	0.3% / 0.5%				
Minimum Control of Access from Interchange Ramps (Min. / Des.)	300 / 660 feet				

** Loop ramp design speed = 30 mph

***Substandard Intersection Sight Distance locations could not be determined from the interchange plans. Substandard locations, therefore, are intersections that demonstrate sight distance limitations based on a general field evaluation or the presence of a substandard k-value or Stopping Sight Distance along the crossroad approaching the intersection.

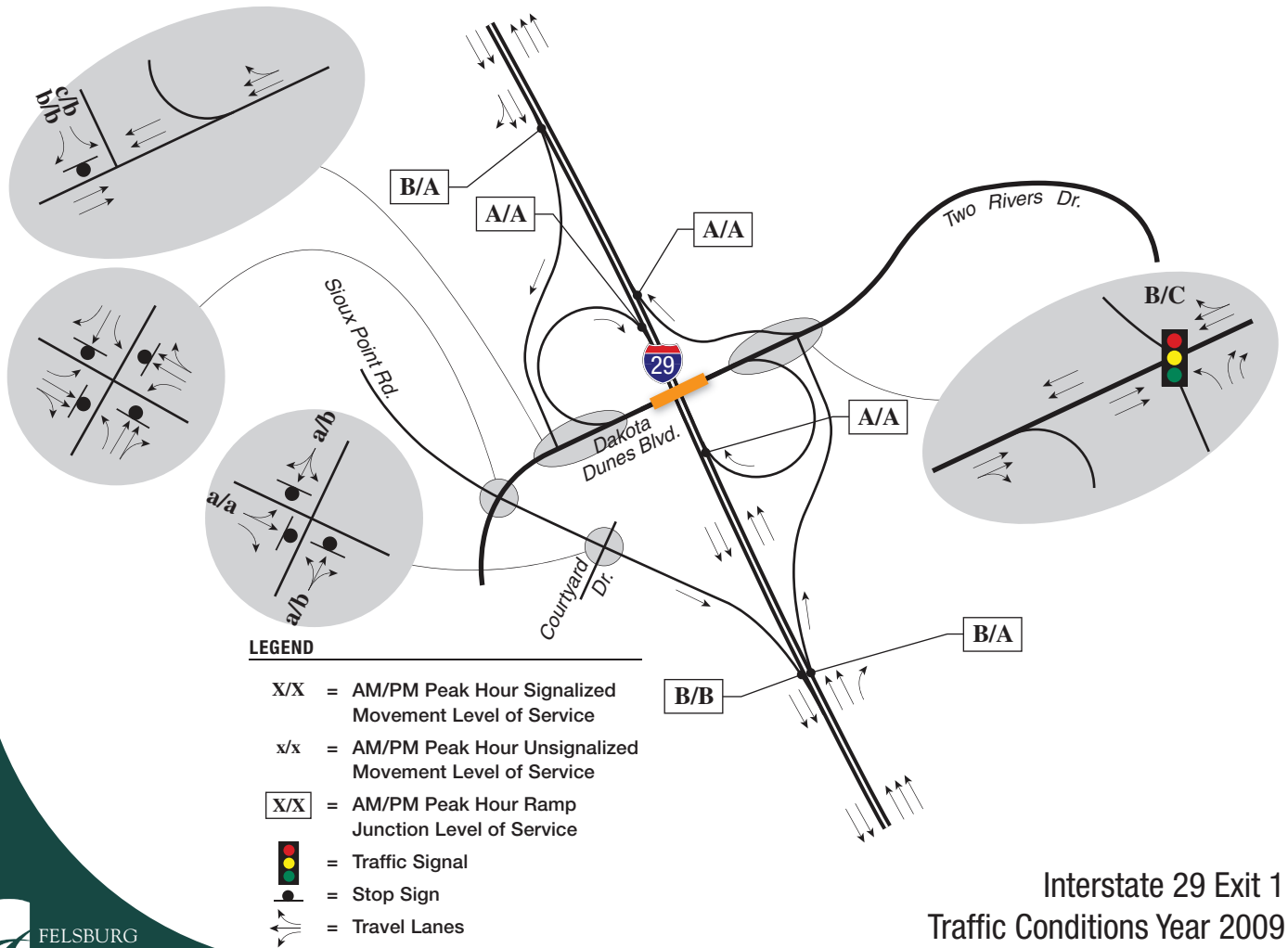
Comments

F Taper onto Auxillary Lane



LEGEND

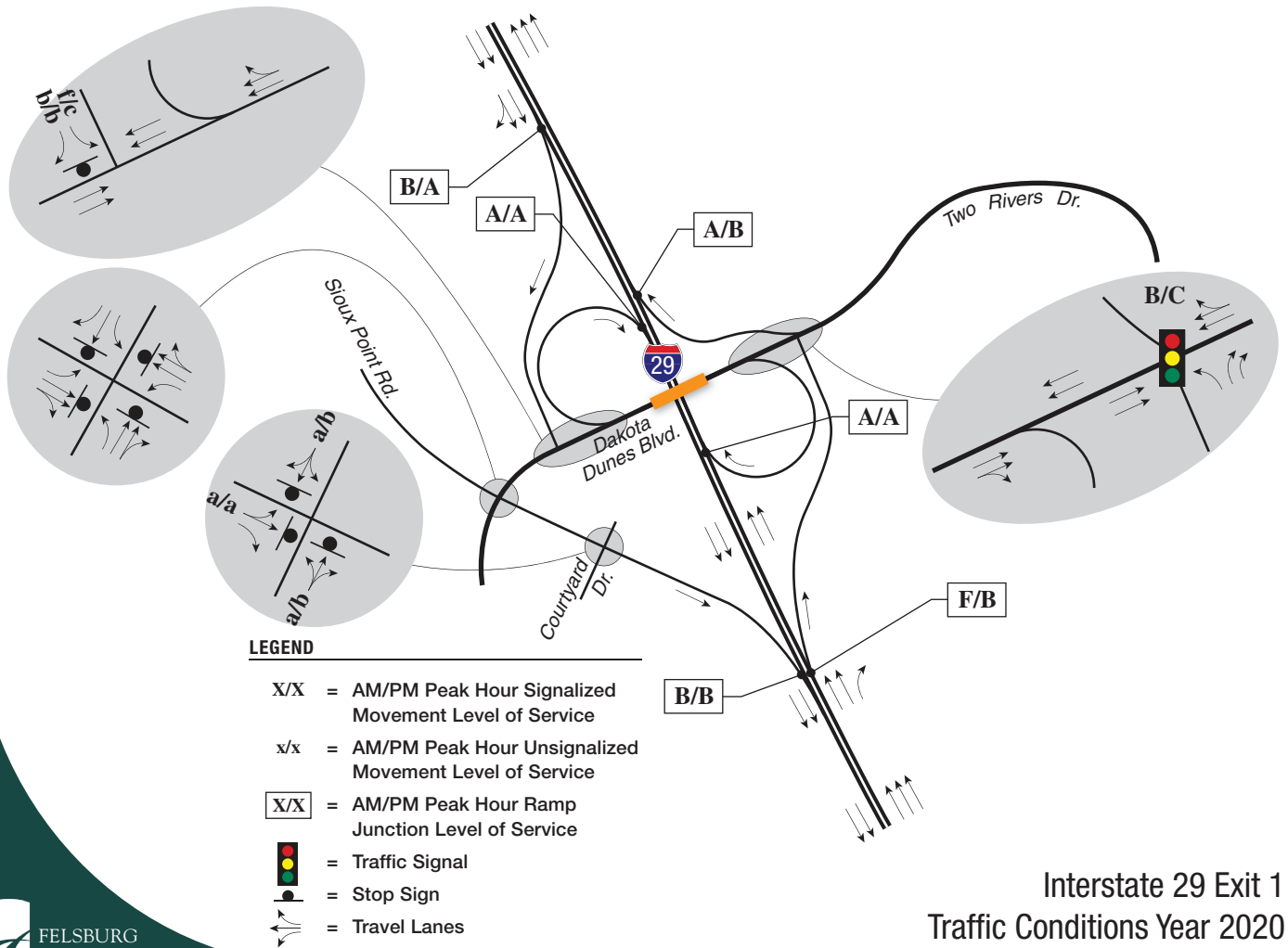
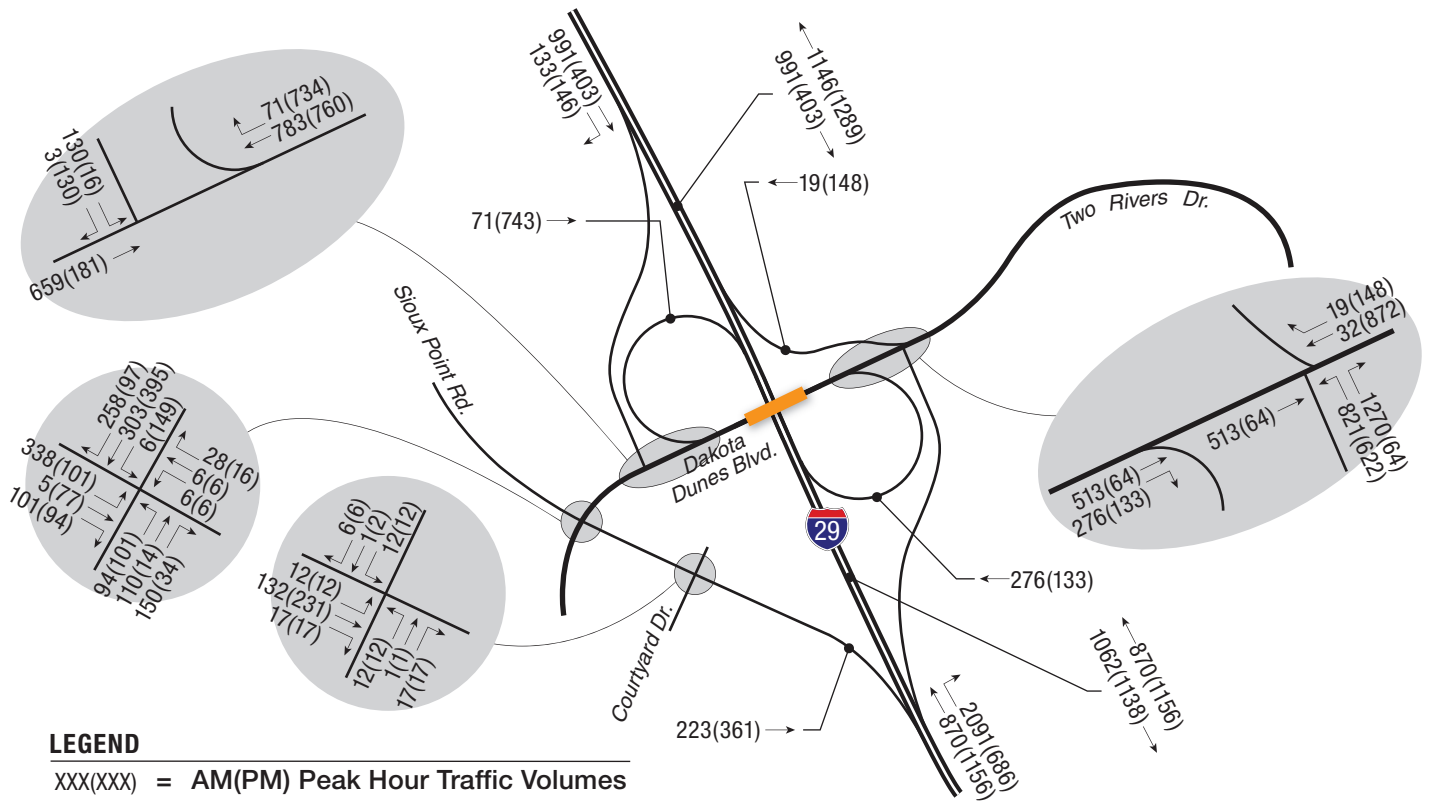
XXX(XXX) = AM(PM) Peak Hour Traffic Volumes



Interstate 29 Exit 1
 Traffic Conditions Year 2009

NORTH

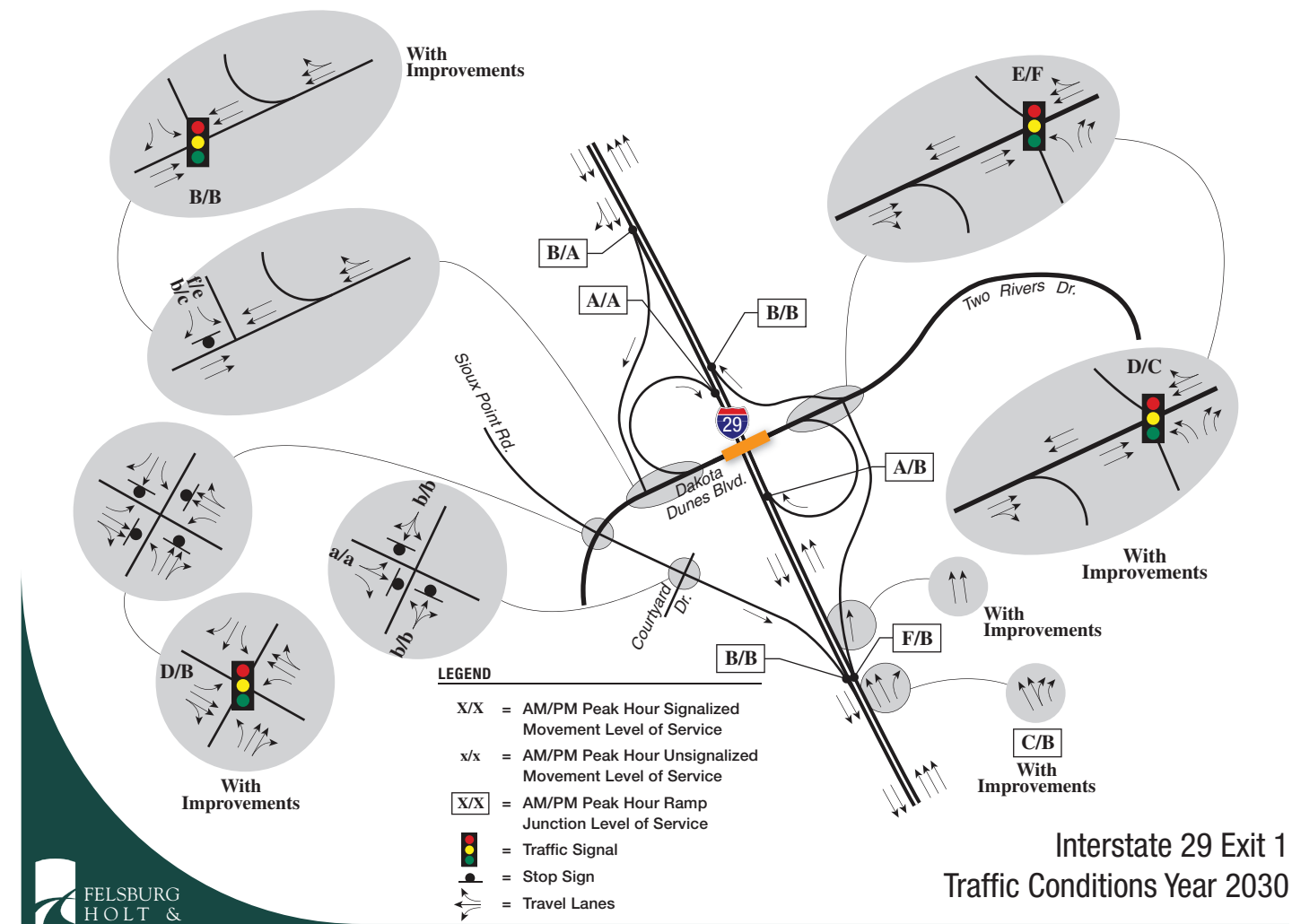
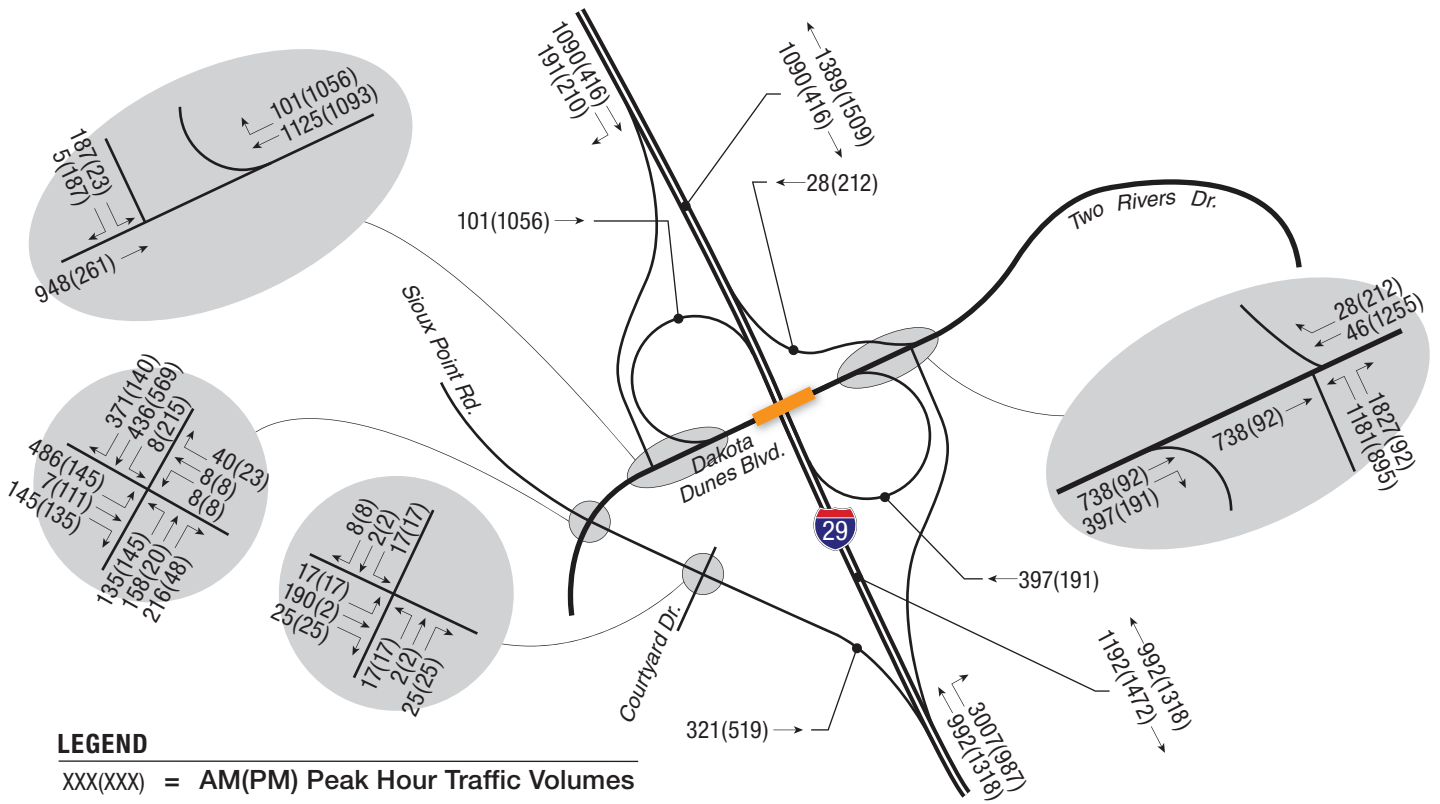




Interstate 29 Exit 1
 Traffic Conditions Year 2020

NORTH





Interstate 29 Exit 1
 Traffic Conditions Year 2030

NORTH





I-29 EXIT 2 NORTH SIOUX CITY

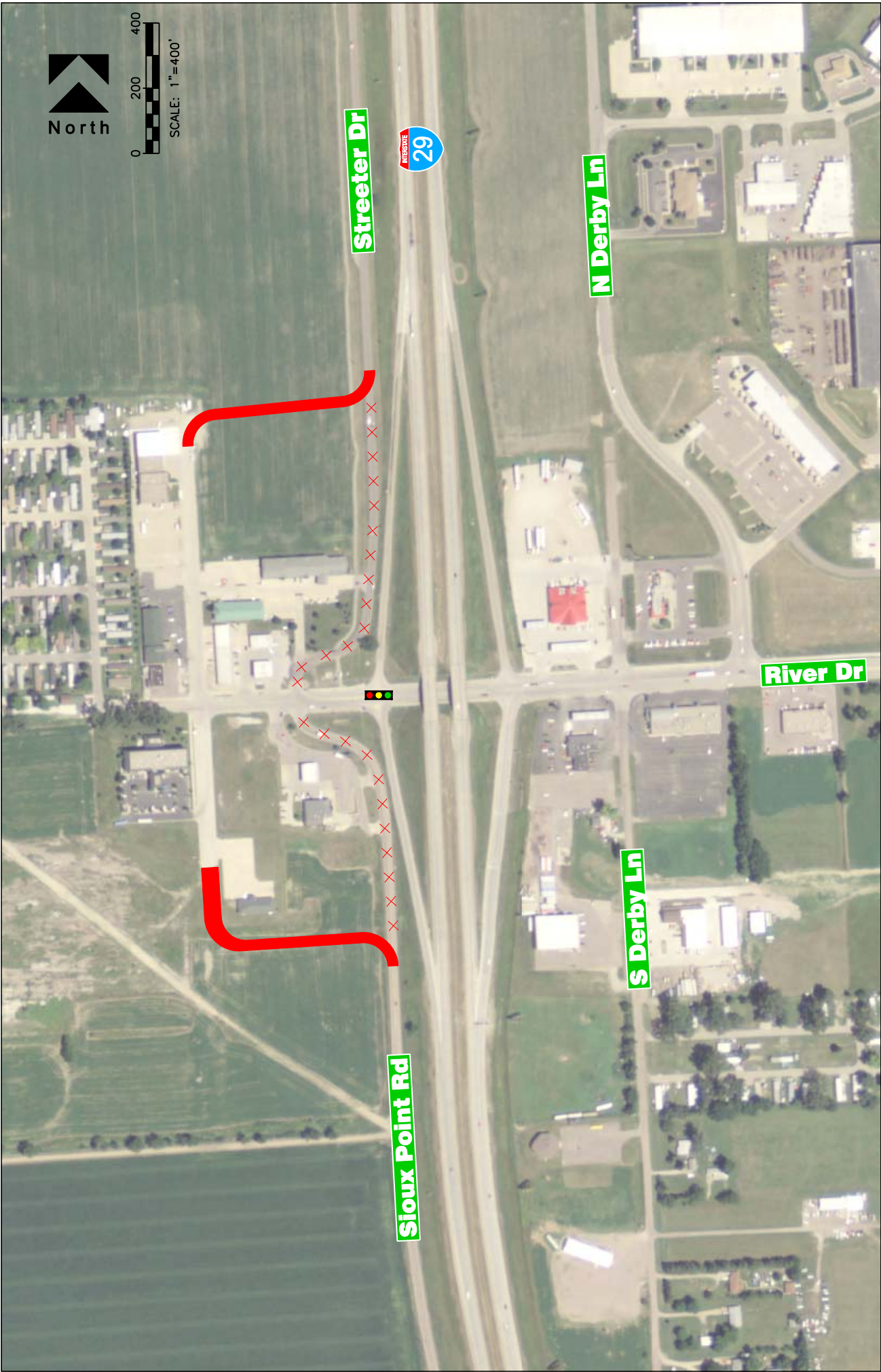


Figure 1
I-29 Exit 2 - North Sioux City
Signalization and Access Improvements

Probable Construction Costs
I-29 Exit 2 - Signalization and Access Improvements

<i>Item Description</i>	<i>Quantity</i>	<i>Unit</i>	<i>Unit Cost</i>	<i>Total Cost</i>
Mobilization	1	LUMP SUM	\$19,000.00	\$19,000
Traffic Control	1	LUMP SUM	\$39,000.00	\$39,000
Clearing	1	LUMP SUM	\$8,000.00	\$8,000
Removal of Concrete Pavement	-	SQ. YD.	\$3.88	\$0
Removal of Asphalt Pavement	5,640	SQ. YD.	\$7.39	\$41,691
Remove Bridge	-	SQ. FT.	\$9.00	\$0
Borrow, Unclassified Excavation	15,143	CU. YD.	\$5.30	\$80,287
Base Course	681	TON	\$10.64	\$7,239
Asphalt Composite		TON	\$80.91	\$0
PCC Pavement 8" (frontage rd)	5,960	SQ. YD.	\$43.40	\$258,634
PCC Pavement 8" (ramps)		SQ. YD.	\$43.40	\$0
Concrete Approach Slab	-	SQ. YD.	\$188.34	\$0
Bridges	-	SQ. FT.	\$100.00	\$0
Guard Rail	0	LF	\$100.00	\$0
Permanent Signing/Markings	1	LUMP SUM	\$10,000.00	\$10,000
Traffic Signal	1	EACH	\$125,000.00	\$125,000
Roadway Lighting	1	LUMP SUM	\$10,000.00	\$10,000
Drainage (18" RCP)	30	LF	\$24.53	<u>\$736</u>
Subtotal				\$600,000
Contingencies	25%			<u>\$150,000</u>
Total Probable Construction Costs				\$750,000
Engineering, Administration	15%			\$112,500
Total Project Costs				\$860,000

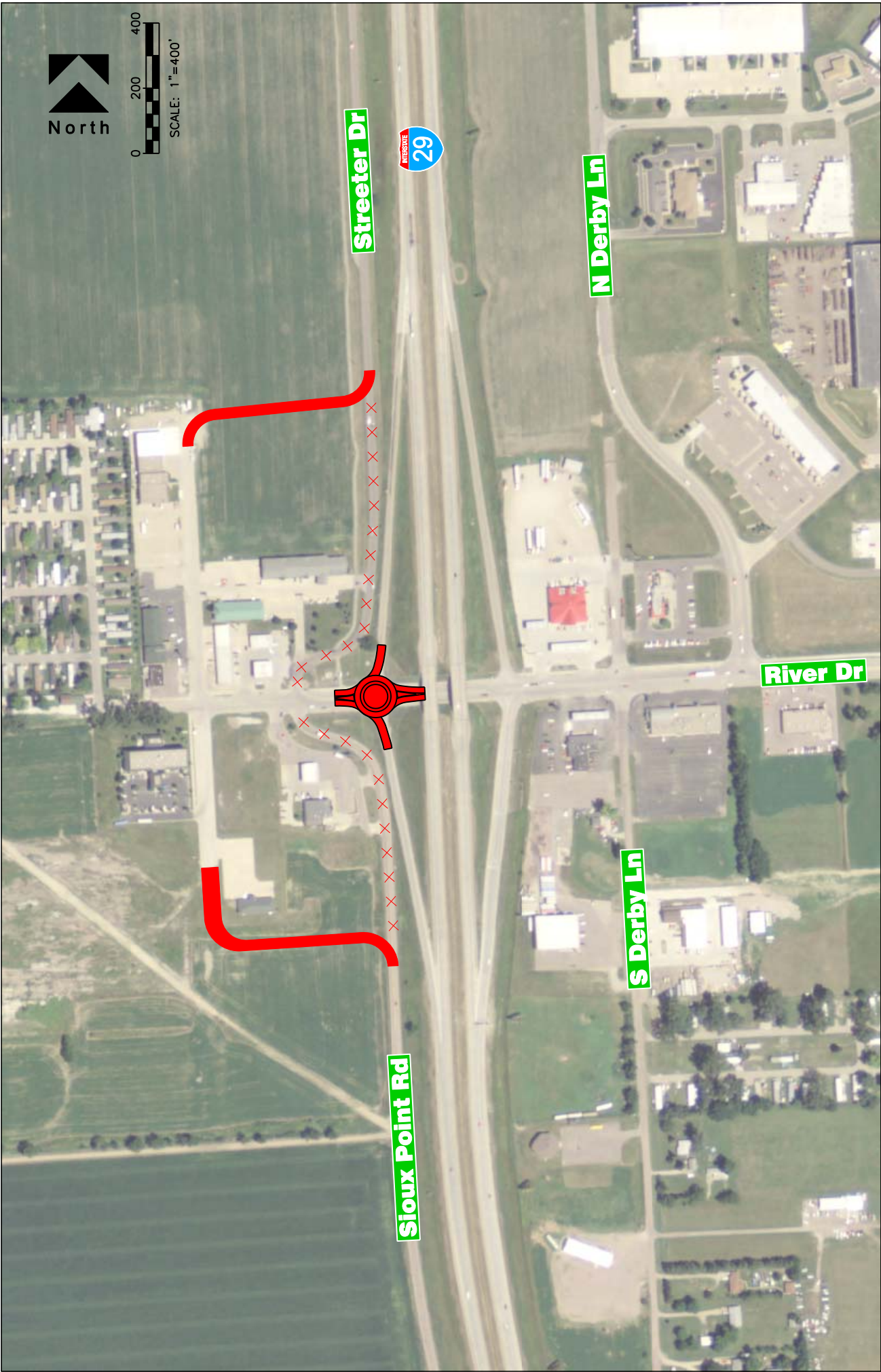


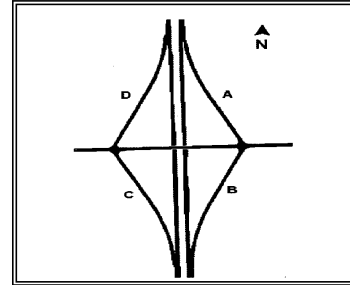
Figure 2
I-29 Exit 2 - North Sioux City
Roundabout and Access Improvements

Probable Construction Costs
I-29 Exit 2 - Roundabout and Access Improvements

<i>Item Description</i>	<i>Quantity</i>	<i>Unit</i>	<i>Unit Cost</i>	<i>Total Cost</i>
Mobilization	1	LUMP SUM	\$20,000.00	\$20,000
Traffic Control	1	LUMP SUM	\$40,000.00	\$40,000
Clearing	1	LUMP SUM	\$8,000.00	\$8,000
Removal of Concrete Pavement	333	SQ. YD.	\$3.88	\$1,294
Removal of Asphalt Pavement	5,862	SQ. YD.	\$7.39	\$43,334
Remove Bridge	-	SQ. FT.	\$9.00	\$0
Borrow, Unclassified Excavation	18,310	CU. YD.	\$5.30	\$97,079
Base Course	808	TON	\$10.64	\$8,599
Asphalt Composite		TON	\$80.91	\$0
PCC Pavement 8" (cross street)	7,447	SQ. YD.	\$33.12	\$246,641
PCC Pavement 8" (ramps)		SQ. YD.	\$43.40	\$0
Concrete Approach Slab	-	SQ. YD.	\$188.34	\$0
Bridges	-	SQ. FT.	\$100.00	\$0
Guard Rail	0	LF	\$100.00	\$0
Permanent Signing/Markings	1	LUMP SUM	\$10,000.00	\$10,000
Traffic Signal	0	EACH	\$125,000.00	\$0
Roadway Lighting	1	LUMP SUM	\$10,000.00	\$10,000
Drainage (18" RCP)	180	LF	\$24.53	<u>\$4,415</u>
Subtotal				\$490,000
Contingencies	25%			<u>\$122,500</u>
Total Probable Construction Costs				\$610,000
Engineering, Administration	15%			\$91,500
Total Project Costs				\$700,000

INTERCHANGE GEOMETRICS CHECKLIST
SDDOT Interstate Corridor Study

Interstate: I-29
Interchange: Exit 2
Analyst: JLB
Date: 1/20/2010



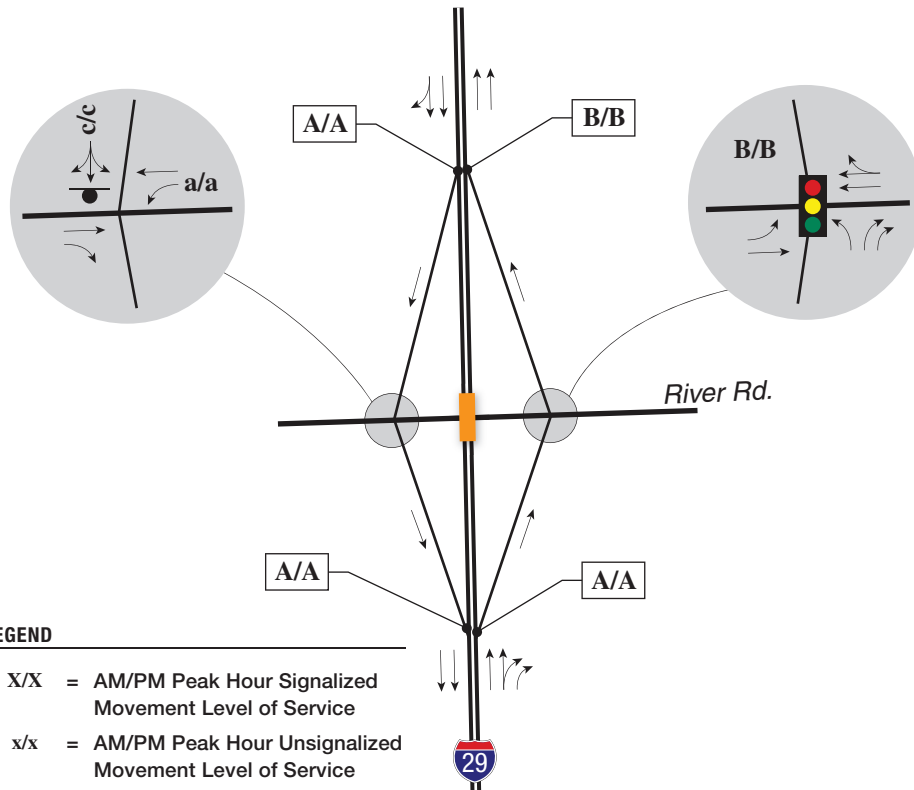
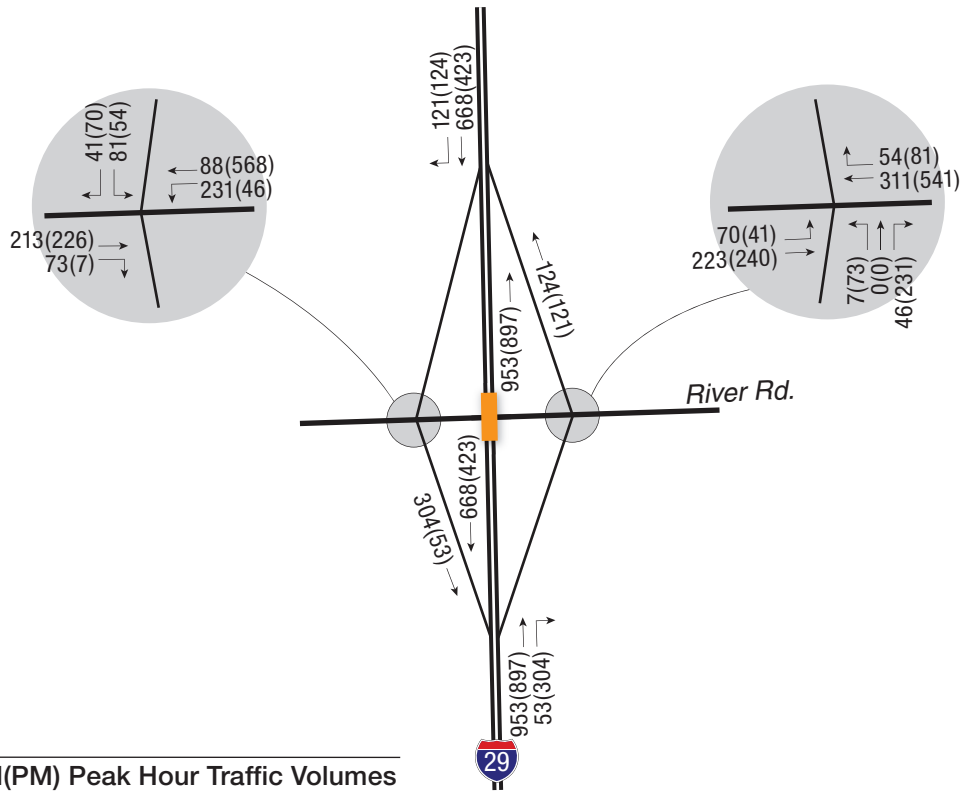
Interchange Geometry	Criteria	A	B	C	D	Achieved?
Interchange Type (Diamond, Full/Partial Cloverleaf, Trumpet etc.)	Diamond					-----
Design Speed	50 mph**					
Number of Lanes		1	3	1	1	
Right Turn Storage Length		-	-	-	-	
Left Turn Storage Length		-	150	-	-	
Superelevation (e max)	6%	-	-	-	-	
Minimum Horizontal Radius for e max of 6% (50 mph / 30 mph)	833 / 231 feet	1432'	1432'	1432'	1432'	Acceptable
Maximum Degree of Curvature (50 mph / 30 mph)	6° 53' / 24° 48'	4° 00'	4° 00'	4° 00'	4° 00'	Acceptable
Minimum Clear Zone From the Edge of Travel Lane	30 feet	>30'	>30'	>30'	>30'	Supports Impr.
Maximum Grade on Ramp (Ascending)	+3% to +5%	0.47%	2.08%	2.11%	-	Acceptable
Maximum Grade on Ramp (Descending)	-3% to -5%		-2.70%	-2.09%	-0.89%	Acceptable
Minimum Lane Width						
With Auxiliary Lanes	12 feet		37.0'			Acceptable
As Single Lane	15 feet (19 for loops)	19.5'		18.5'	19.0'	Acceptable
Shoulder Width						
Right Shoulder	8 feet (4 for loops)	1.5'	4.0'	3.0'	2.5'	Supports Impr.
Left Shoulder	2 feet	2.5'	5.0'	2.5'	1.5'	Supports Impr.
Inslope	6:1	3:1	3:1	3:1	3:1	Supports Impr.
Minimum Off-Ramp Taper Rate	20:1	-	35:1	-	40:1	Acceptable
Minimum On-Ramp Taper Rate	50:1	62:1	-	70:1	-	Acceptable
Ramp Features						
K-Value Ranges						
Minimum for a Crest Vertical Curve (50 mph / 30 mph)	84 / 19	531	92	95	112	Acceptable
Minimum for a Sag Vertical Curve (50 mph / 30 mph)	96 / 37	425	74	95	112	Acceptable
Minimum Stopping Sight Distance (50 mph / 30 mph)	425 / 200 feet	2962'	446'	457'	1262'	Acceptable
Cross Road Features						
K-Value Ranges		To East		To West		
Minimum for a Crest Vertical Curve (50 mph / 30 mph)	84 / 19	-		-		
Minimum for a Sag Vertical Curve (50 mph / 30 mph)	96 / 37	73		73		Supports Impr.
Minimum Stopping Sight Distance (50 mph / 30 mph)	425 / 200 feet	649'		649'		Acceptable
Ramp Intersection Sight Distance (50 mph / 30 mph)***	425 / 200 feet	ok		ok		Acceptable
Maximum Longitudinal Grade - Rolling Terrain (Urban Arterial)	7%	0.90%		0.90%		Acceptable
Minimum Longitudinal Grade (Min. / Des.)	0.3% / 0.5%	0.00%		0.00%		Supports Impr.
Minimum Control of Access from Interchange Ramps (Min. / Des.)	300 / 660 feet	70'		220'		Supports Impr.

** Loop ramp design speed = 30 mph




***Substandard Intersection Sight Distance locations could not be determined from the interchange plans. Substandard locations, therefore, are intersections that demonstrate sight distance limitations based on a general field evaluation or the presence of a substandard k-value or Stopping Sight Distance along the crossroad approaching the intersection.

Comments

Auxillary lane exits on to ramp B and becomes right turn lane. Mainline lane has option to exit which becomes a right turn lane.
 Clear Zone meets 30' criteria but slopes are non recoverable within this distance
 East ramp terminals are signalized

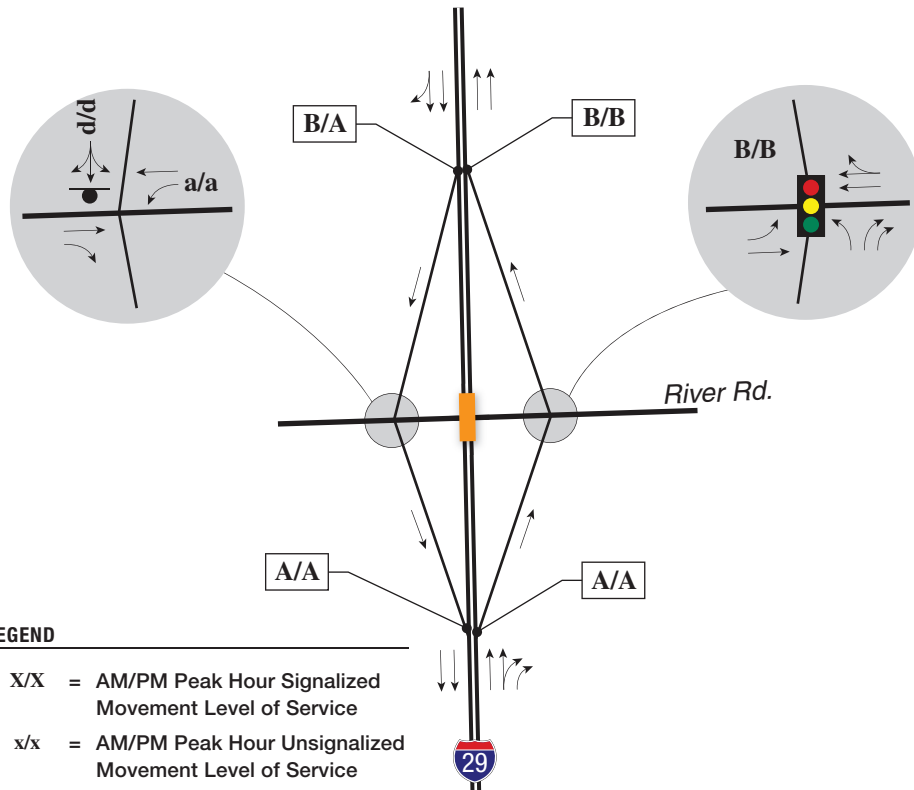
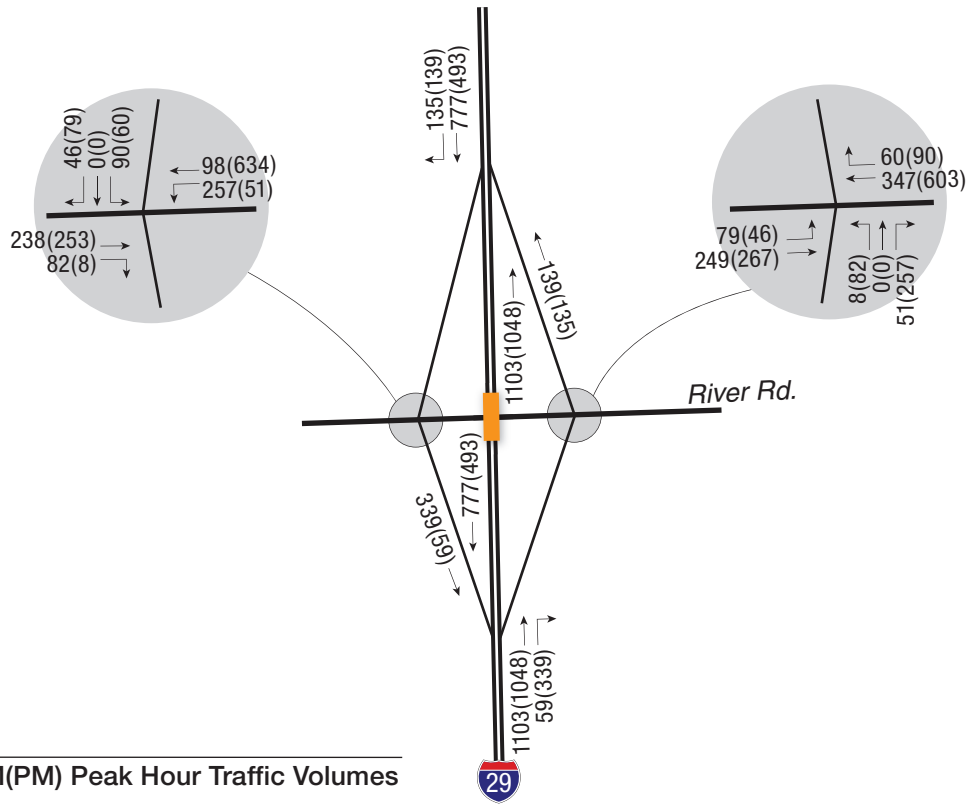


LEGEND

- X/X = AM/PM Peak Hour Signalized Movement Level of Service
- x/x = AM/PM Peak Hour Unsignalized Movement Level of Service
- X/X = AM/PM Peak Hour Ramp Junction Level of Service
-  = Traffic Signal
-  = Stop Sign
-  = Travel Lanes

Interstate 29 Exit 2
Traffic Conditions Year 2009

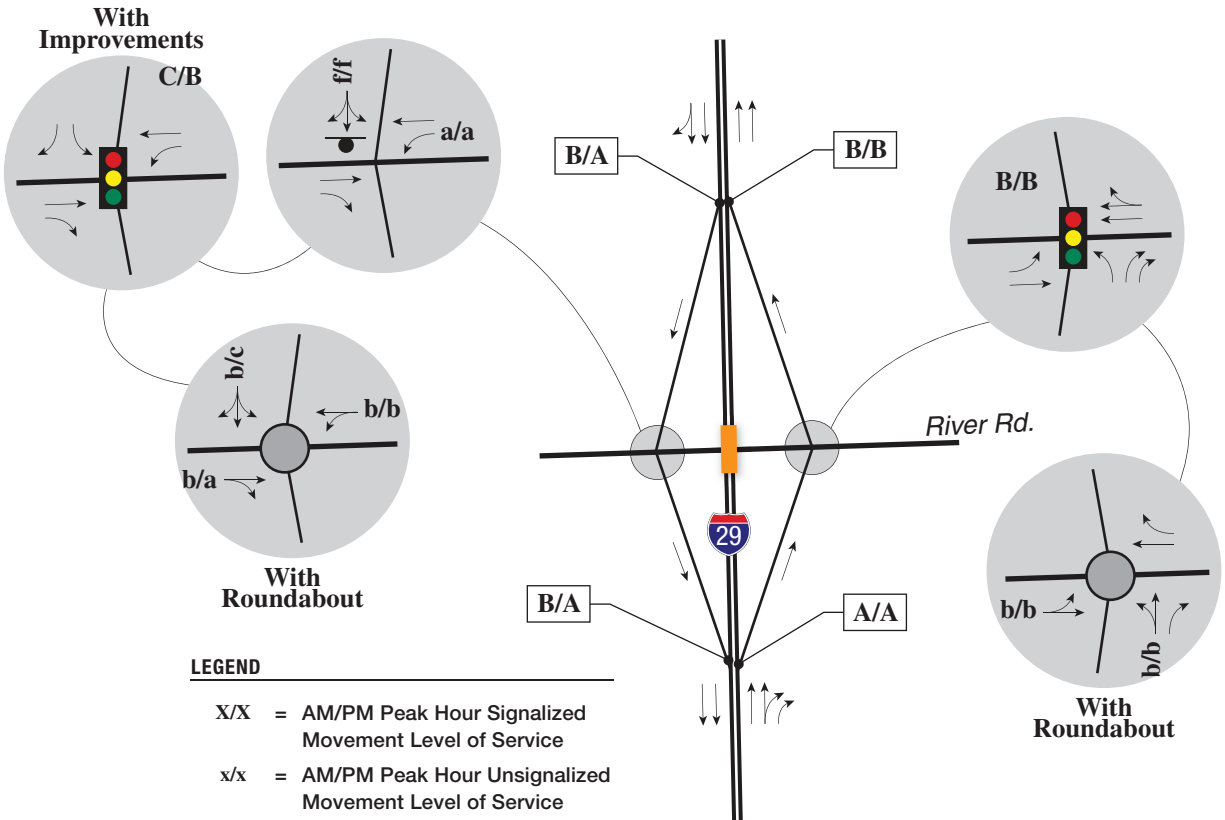
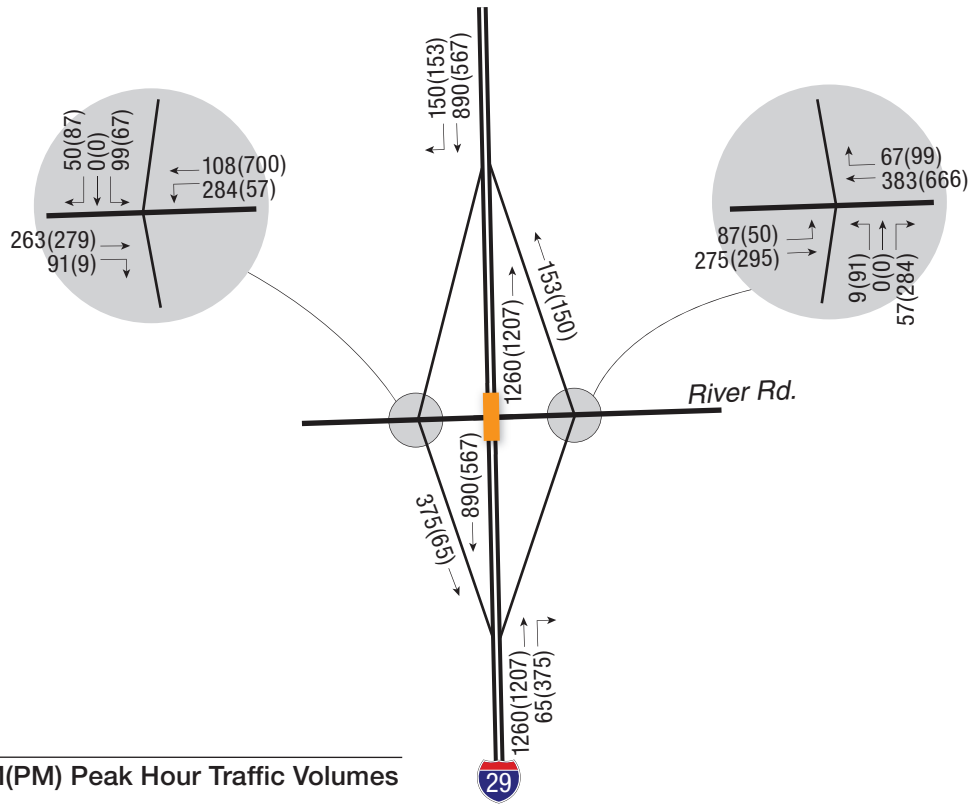
NORTH



Interstate 29 Exit 2
 Traffic Conditions Year 2020

NORTH





Interstate 29 Exit 2
 Traffic Conditions Year 2030

NORTH



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I-29 EXIT 26 VERMILLION/YANKTON

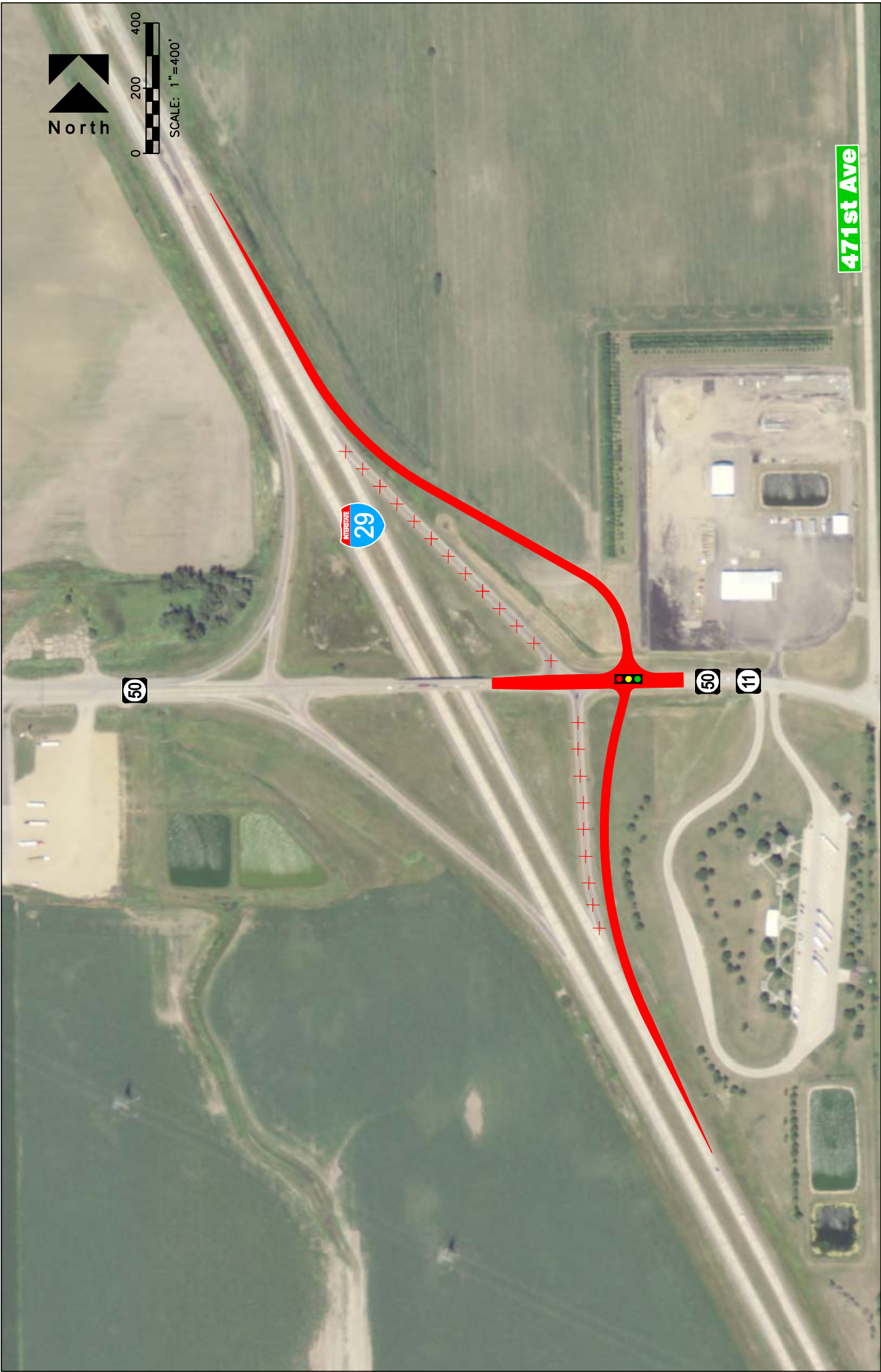


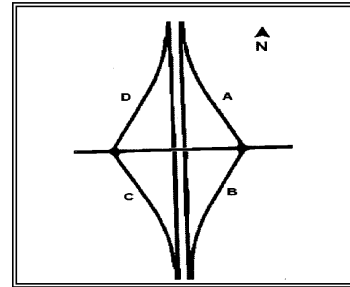
Figure 1
I-29 Exit 26 - Vermillion/Yankton
Signalization And Ramp Improvements

Probable Construction Costs
I-29 Exit 26 - Signalization and Ramp Improvements

<i>Item Description</i>	<i>Quantity</i>	<i>Unit</i>	<i>Unit Cost</i>	<i>Total Cost</i>
Mobilization	1	LUMP SUM	\$32,000.00	\$32,000
Traffic Control	1	LUMP SUM	\$65,000.00	\$65,000
Clearing	1	LUMP SUM	\$13,000.00	\$13,000
Removal of Concrete Pavement		SQ. YD.	\$3.88	\$0
Removal of Asphalt Pavement	7,684	SQ. YD.	\$7.39	\$56,803
Remove Bridge	-	SQ. FT.	\$9.00	\$0
Borrow, Unclassified Excavation	29,960	CU. YD.	\$5.30	\$158,850
Base Course	3,740	TON	\$10.64	\$39,785
Asphalt Composite	4,818	TON	\$80.91	\$389,817
PCC Pavement 11" (mainline)	-	SQ. YD.	\$33.12	\$0
PCC Pavement 8" (ramps)	-	SQ. YD.	\$43.40	\$0
Concrete Approach Slab	-	SQ. YD.	\$188.34	\$0
Bridges	-	SQ. FT.	\$100.00	\$0
Guard Rail	0	LF	\$100.00	\$0
Permanent Signing/Markings	1	LUMP SUM	\$20,000.00	\$20,000
Traffic Signal	1	EACH	\$125,000.00	\$125,000
Roadway Lighting	1	LUMP SUM	\$10,000.00	\$10,000
Drainage (18" RCP)	90	LF	\$24.53	<u>\$2,208</u>
Subtotal				\$910,000
Contingencies	25%			<u>\$227,500</u>
Total Probable Construction Costs				\$1,140,000
Engineering, Administration	15%			\$171,000
Total Project Costs				\$1,310,000

INTERCHANGE GEOMETRICS CHECKLIST
SDDOT Interstate Corridor Study

Interstate: I-29
Interchange: Exit 26
Analyst: JLB
Date: 1/20/2010



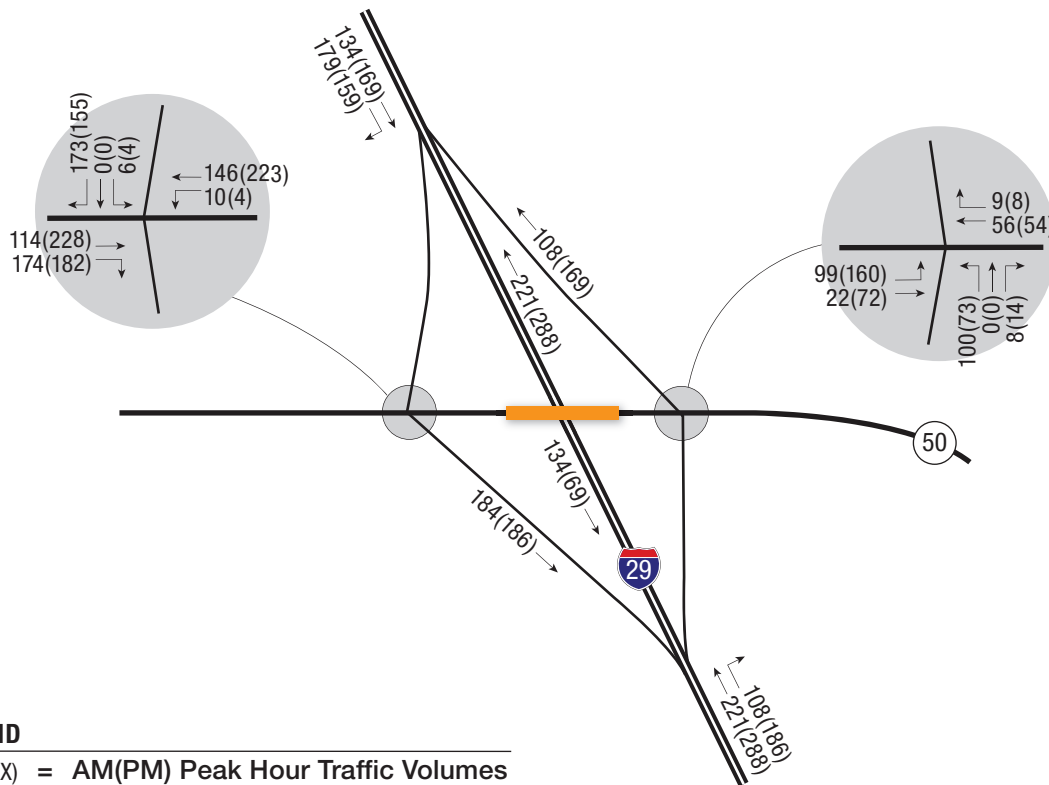
Interchange Geometry	Criteria	A	B	C	D	Achieved?
Interchange Type (Diamond, Full/Partial Cloverleaf, Trumpet etc.)	Diamond					-----
Design Speed	50 mph**					
Number of Lanes		1	1	1	1	
Right Turn Storage Length		-	-	-	-	
Left Turn Storage Length		-	-	-	-	
Superelevation (e max)	6%	-	-	-	-	
Minimum Horizontal Radius for e max of 6% (50 mph / 30 mph)	833 / 231 feet	955'	955'	955'	955'	Acceptable
Maximum Degree of Curvature (50 mph / 30 mph)	6° 53' / 24° 48'	6° 00'	6° 00'	6° 00'	6° 00'	Acceptable
Minimum Clear Zone From the Edge of Travel Lane	30 feet	<30'	<30'	<30'	<30'	Acceptable
Maximum Grade on Ramp (Ascending)	+3% to +5%		3.77%		2.14%	Acceptable
Maximum Grade on Ramp (Descending)	-3% to -5%	-2.10%		-2.01%		Acceptable
Minimum Lane Width						
With Auxiliary Lanes	12 feet					
As Single Lane	15 feet (19 for loops)	20.0'	19.0'	26.0'	22.0'	Acceptable
Shoulder Width						
Right Shoulder	8 feet (4 for loops)	4.5'	7.0'	5.5'	2.0'	Supports Impr.
Left Shoulder	2 feet	2.5'	3.0'	2.5'	3.0'	Acceptable
Inslope	6:1	3:1	3:1	3:1	3:1	Supports Impr.
Minimum Off-Ramp Taper Rate	20:1	-	28:1	-	28:1	Acceptable
Minimum On-Ramp Taper Rate	50:1	29:1	-	30:1	-	Supports Impr.
Ramp Features						
K-Value Ranges						
Minimum for a Crest Vertical Curve (50 mph / 30 mph)	84 / 19	-	59	-	-	Supports Impr.
Minimum for a Sag Vertical Curve (50 mph / 30 mph)	96 / 37	175	55	90	68	Supports Impr.
Minimum Stopping Sight Distance (50 mph / 30 mph)	425 / 200 feet	1219'	299'	913'	419'	Supports Impr.
Cross Road Features						
K-Value Ranges			To West	To East		
Minimum for a Crest Vertical Curve (50 mph / 30 mph)	84 / 19		185	185		Acceptable
Minimum for a Sag Vertical Curve (50 mph / 30 mph)	96 / 37		110	67		Supports Impr.
Minimum Stopping Sight Distance (50 mph / 30 mph)	425 / 200 feet		478'	400'		Supports Impr.
Ramp Intersection Sight Distance (50 mph / 30 mph)***	425 / 200 feet		ok	substandard		Supports Impr.
Maximum Longitudinal Grade - Rolling Terrain (Urban Arterial)	7%		3.60%	4.00%		Acceptable
Minimum Longitudinal Grade (Min. / Des.)	0.3% / 0.5%		1.00%	1.00%		Acceptable
Minimum Control of Access from Interchange Ramps (Min. / Des.)	300 / 660 feet		570'	570'		Acceptable

** Loop ramp design speed = 30 mph

***Substandard Intersection Sight Distance locations could not be determined from the interchange plans. Substandard locations, therefore, are intersections that demonstrate sight distance limitations based on a general field evaluation or the presence of a substandard k-value or Stopping Sight Distance along the crossroad approaching the intersection.

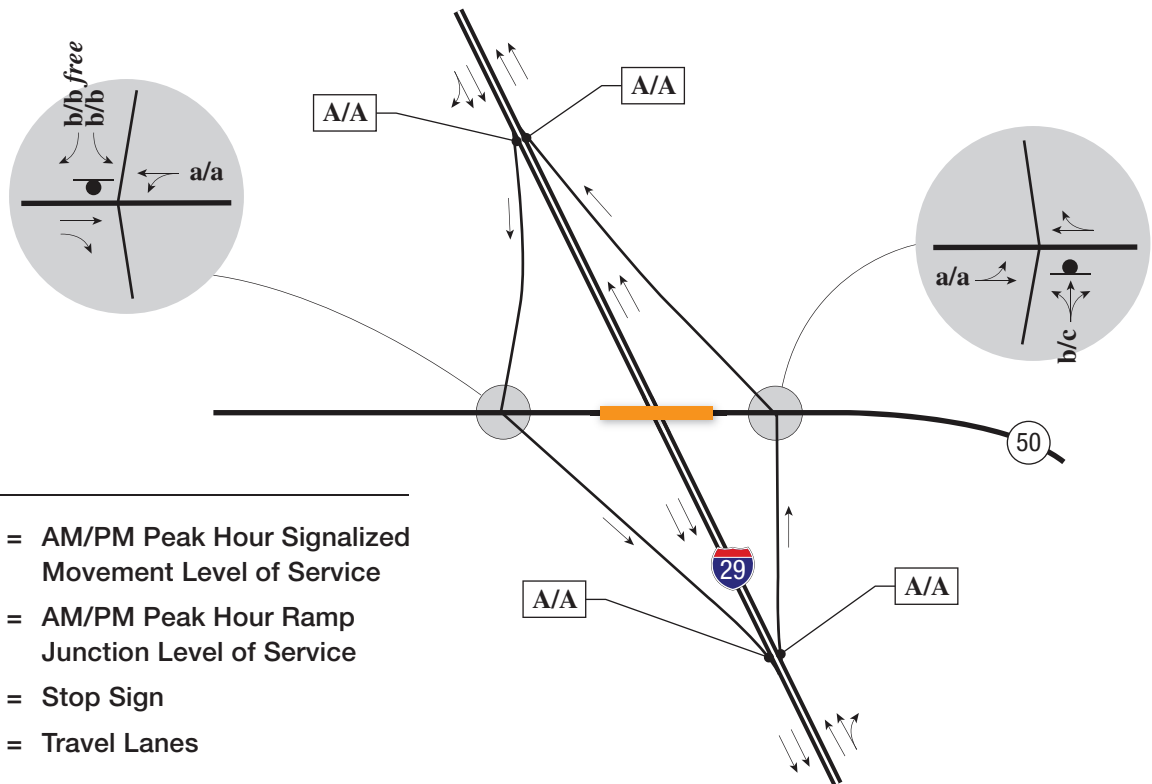
Comments

No superelevation in plans
Clear Zone meets 30' criteria but slopes are non recoverable within this distance
Ramp sight distance is limited by bridge rail.



LEGEND

XXX(XXX) = AM(PM) Peak Hour Traffic Volumes



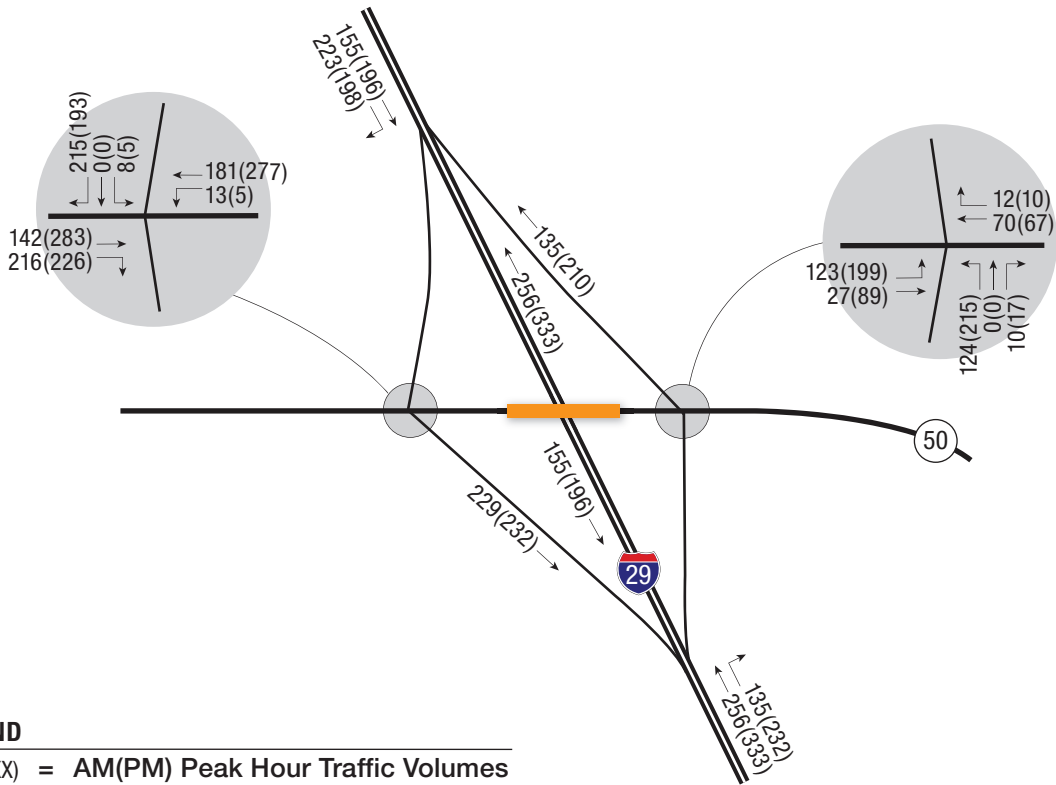
LEGEND

- X/X = AM/PM Peak Hour Signalized Movement Level of Service
- X/X = AM/PM Peak Hour Ramp Junction Level of Service
- = Stop Sign
- ↔ = Travel Lanes

Interstate 29 Exit 26
Traffic Conditions Year 2009

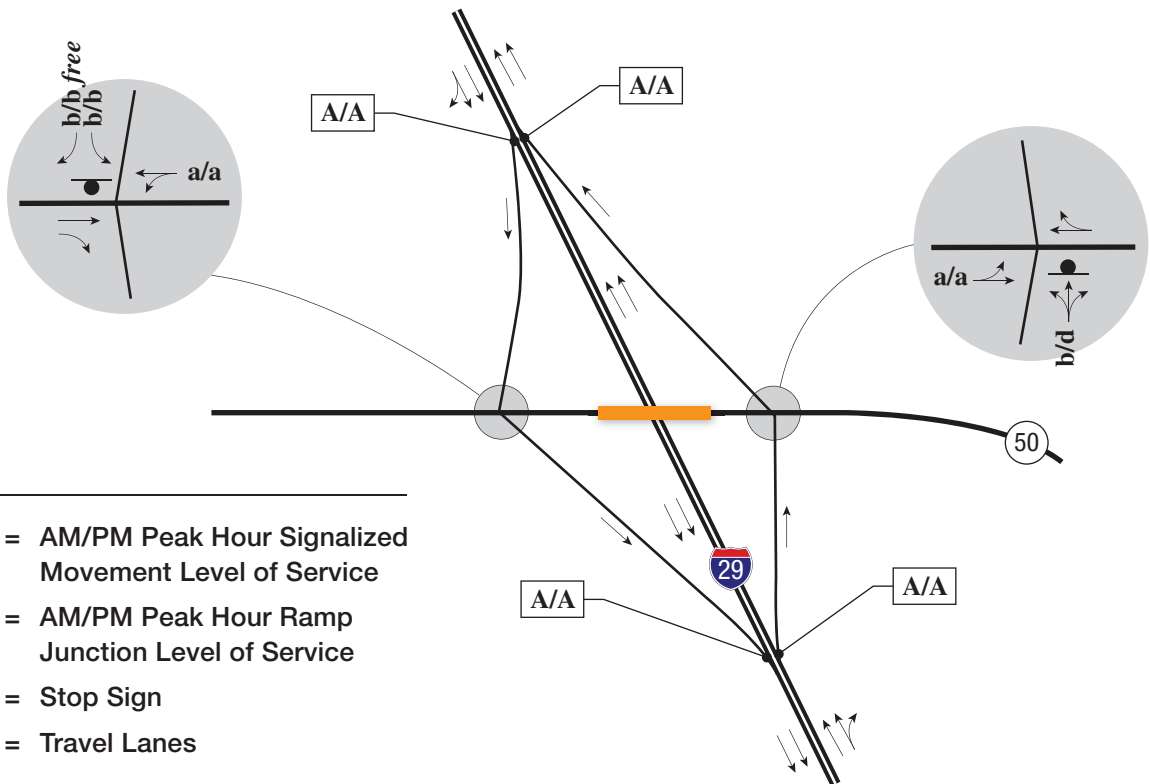
NORTH





LEGEND

XXX(XXX) = AM(PM) Peak Hour Traffic Volumes

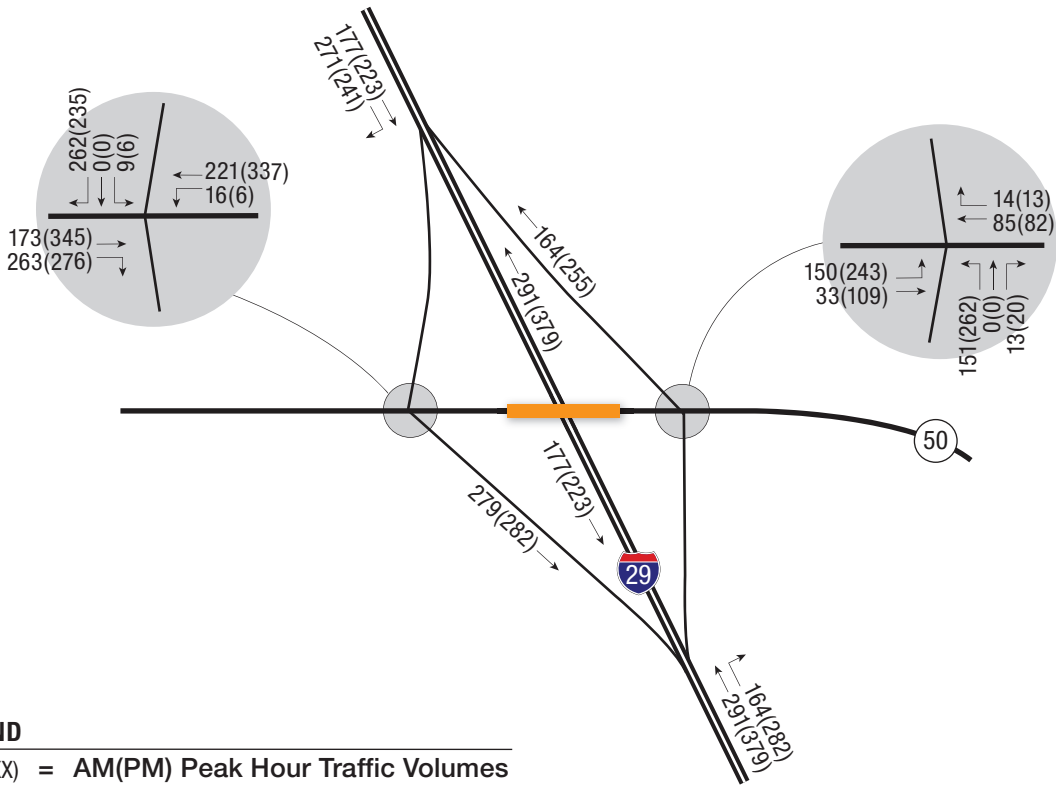


LEGEND

- X/X = AM/PM Peak Hour Signalized Movement Level of Service
- X/X = AM/PM Peak Hour Ramp Junction Level of Service
- = Stop Sign
- ↔ = Travel Lanes

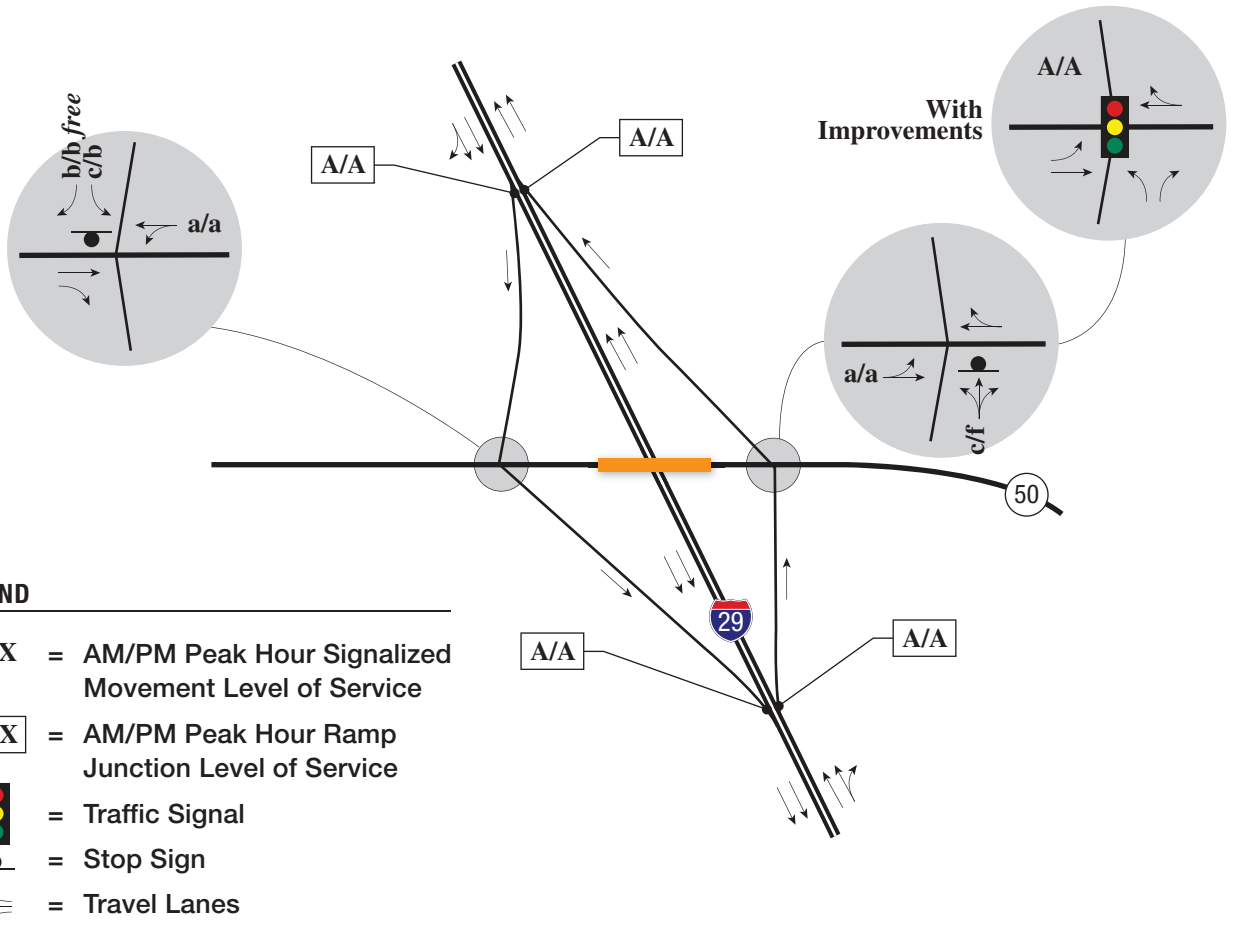
Interstate 29 Exit 26
Traffic Conditions Year 2020

NORTH



LEGEND

XXX(XXX) = AM(PM) Peak Hour Traffic Volumes



LEGEND

X/X = AM/PM Peak Hour Signalized Movement Level of Service

X/X = AM/PM Peak Hour Ramp Junction Level of Service

= Traffic Signal

= Stop Sign

= Travel Lanes

Interstate 29 Exit 26
Traffic Conditions Year 2030



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I-29 EXIT 47 BERESFORD/IRENE



Figure 1
I-29 Exit 47 - Beresford/Irene
Lane Addition and Signalization Improvements

Probable Construction Costs
I-29 Exit 47 - Lane Addition and Signalization Improvements

<i>Item Description</i>	<i>Quantity</i>	<i>Unit</i>	<i>Unit Cost</i>	<i>Total Cost</i>
Mobilization	1	LUMP SUM	\$3,000.00	\$3,000
Traffic Control	1	LUMP SUM	\$7,000.00	\$7,000
Clearing	1	LUMP SUM	\$1,000.00	\$1,000
Removal of Concrete Pavement	-	SQ. YD.	\$3.88	\$0
Removal of Asphalt Pavement	-	SQ. YD.	\$7.39	\$0
Remove Bridge	-	SQ. FT.	\$9.00	\$0
Borrow, Unclassified Excavation	1,206	CU. YD.	\$5.30	\$6,392
Base Course	571	TON	\$10.64	\$6,073
Asphalt Composite		TON	\$80.91	\$0
PCC Pavement 11" (mainline)	-	SQ. YD.	\$33.12	\$0
PCC Pavement 8" (ramps)	1,250	SQ. YD.	\$43.40	\$54,244
Concrete Approach Slab	-	SQ. YD.	\$188.34	\$0
Bridges	-	SQ. FT.	\$100.00	\$0
Guard Rail	0	LF	\$100.00	\$0
Permanent Signing/Markings	1	LUMP SUM	\$0.00	\$0
Traffic Signal	2	EACH	\$125,000.00	\$250,000
Roadway Lighting	1	LUMP SUM	\$0.00	\$0
Drainage (18" RCP)	60	LF	\$24.53	<u>\$1,472</u>
Subtotal				\$330,000
Contingencies	25%			<u>\$82,500</u>
Total Probable Construction Costs				\$410,000
Engineering, Administration	15%			\$61,500
Total Project Costs				\$470,000



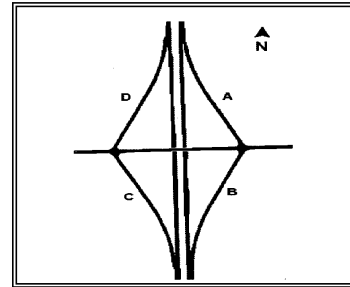
Figure 2
I-29 Exit 47 - Beresford/Irene
Roundabout Improvements

Probable Construction Costs
I-29 Exit 47 - Roundabout Improvements

<i>Item Description</i>	<i>Quantity</i>	<i>Unit</i>	<i>Unit Cost</i>	<i>Total Cost</i>
Mobilization	1	LUMP SUM	\$16,000.00	\$16,000
Traffic Control	1	LUMP SUM	\$32,000.00	\$32,000
Clearing	1	LUMP SUM	\$6,000.00	\$6,000
Removal of Concrete Pavement	5,716	SQ. YD.	\$3.88	\$22,196
Removal of Asphalt Pavement		SQ. YD.	\$7.39	\$0
Remove Bridge	-	SQ. FT.	\$9.00	\$0
Borrow, Unclassified Excavation	2,258	CU. YD.	\$5.30	\$11,974
Base Course	1,070	TON	\$10.64	\$11,377
Asphalt Composite		TON	\$80.91	\$0
PCC Pavement 8" (cross street)	4,944	SQ. YD.	\$43.40	\$214,564
PCC Pavement 8" (ramps)	1,250	SQ. YD.	\$43.40	\$54,244
Concrete Approach Slab	-	SQ. YD.	\$188.34	\$0
Bridges	-	SQ. FT.	\$100.00	\$0
Guard Rail	0	LF	\$100.00	\$0
Permanent Signing/Markings	1	LUMP SUM	\$10,000.00	\$10,000
Traffic Signal	0	EACH	\$125,000.00	\$0
Roadway Lighting	1	LUMP SUM	\$10,000.00	\$10,000
Drainage (18" RCP)	80	LF	\$24.53	<u>\$1,962</u>
Subtotal				\$390,000
Contingencies	25%			<u>\$97,500</u>
Total Probable Construction Costs				\$490,000
Engineering, Administration	15%			\$73,500
Total Project Costs				\$560,000

INTERCHANGE GEOMETRICS CHECKLIST
SDDOT Interstate Corridor Study

Interstate: I-29
Interchange: Exit 47
Analyst: JLB
Date: 1/20/2010



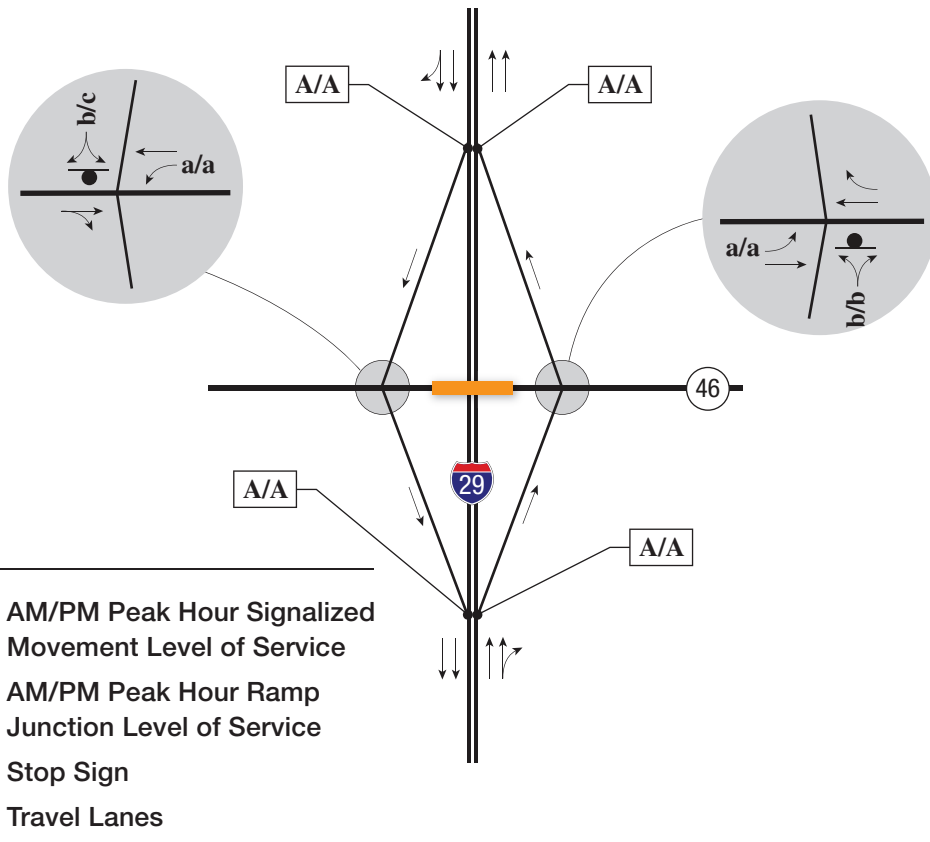
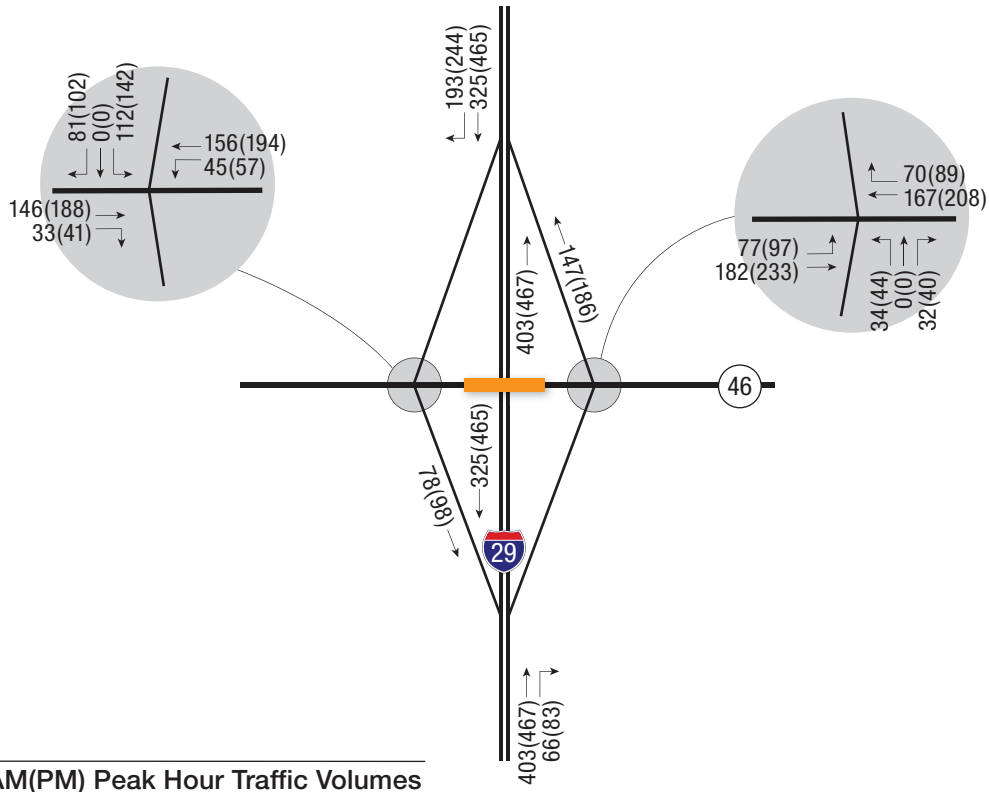
Interchange Geometry	Criteria	A	B	C	D	Achieved?
Interchange Type (Diamond, Full/Partial Cloverleaf, Trumpet etc.)	Diamond					-----
Design Speed	50 mph**					
Number of Lanes		1	1	1	1	
Right Turn Storage Length		-	-	-	-	
Left Turn Storage Length		-	-	-	-	
Superelevation (e max)	6%	6.20%	6.20%	6.20%	6.20%	Acceptable
Minimum Horizontal Radius for e max of 6% (50 mph / 30 mph)	833 / 231 feet	1432'	1432'	1432'	1432'	Acceptable
Maximum Degree of Curvature (50 mph / 30 mph)	6° 53' / 24° 48'	4° 00'	4° 00'	4° 00'	4° 00'	Acceptable
Minimum Clear Zone From the Edge of Travel Lane	30 feet	<30'	<30'	<30'	<30'	Supports Impr.
Maximum Grade on Ramp (Ascending)	+3% to +5%	-	2.99%	-	3.77%	Acceptable
Maximum Grade on Ramp (Descending)	-3% to -5%	-3.74%	-	-2.97%	-	Acceptable
Minimum Lane Width						
With Auxiliary Lanes	12 feet					
As Single Lane	15 feet (19 for loops)	16.0'	16.0'	16.0'	15.0'	Acceptable
Shoulder Width						
Right Shoulder	8 feet (4 for loops)	6.5'	7.5'	7.0'	8.0'	Supports Impr.
Left Shoulder	2 feet	2.5'	1.0'	2.5'	2.0'	Supports Impr.
Inslope	6:1	3:1	3:1	3:1	3:1	Supports Impr.
Minimum Off-Ramp Taper Rate	20:1	-	42:1	-	42:1	Acceptable
Minimum On-Ramp Taper Rate	50:1	63:1	-	63:1	-	Acceptable
Ramp Features						
K-Value Ranges						
Minimum for a Crest Vertical Curve (50 mph / 30 mph)	84 / 19	90	136	138	89	Acceptable
Minimum for a Sag Vertical Curve (50 mph / 30 mph)	96 / 37	122	90	90	122	Supports Impr.
Minimum Stopping Sight Distance (50 mph / 30 mph)	425 / 200 feet	586'	439'	440'	580'	Acceptable
Cross Road Features						
K-Value Ranges						
Minimum for a Crest Vertical Curve (50 mph / 30 mph)	84 / 19	To West		To East		
Minimum for a Sag Vertical Curve (50 mph / 30 mph)	96 / 37	150		150		Acceptable
Minimum Stopping Sight Distance (50 mph / 30 mph)	425 / 200 feet	569'		386'		Supports Impr.
Ramp Intersection Sight Distance (50 mph / 30 mph)***	425 / 200 feet	OK		Sub		Supports Impr.
Maximum Longitudinal Grade - Rolling Terrain (Urban Arterial)	7%	3.14%		3.14%		Acceptable
Minimum Longitudinal Grade (Min. / Des.)	0.3% / 0.5%	1.33%		0.57%		Acceptable
Minimum Control of Access from Interchange Ramps (Min. / Des.)	300 / 660 feet	>660'		410'		Acceptable

** Loop ramp design speed = 30 mph

***Substandard Intersection Sight Distance locations could not be determined from the interchange plans. Substandard locations, therefore, are intersections that demonstrate sight distance limitations based on a general field evaluation or the presence of a substandard k-value or Stopping Sight Distance along the crossroad approaching the intersection.

Comments

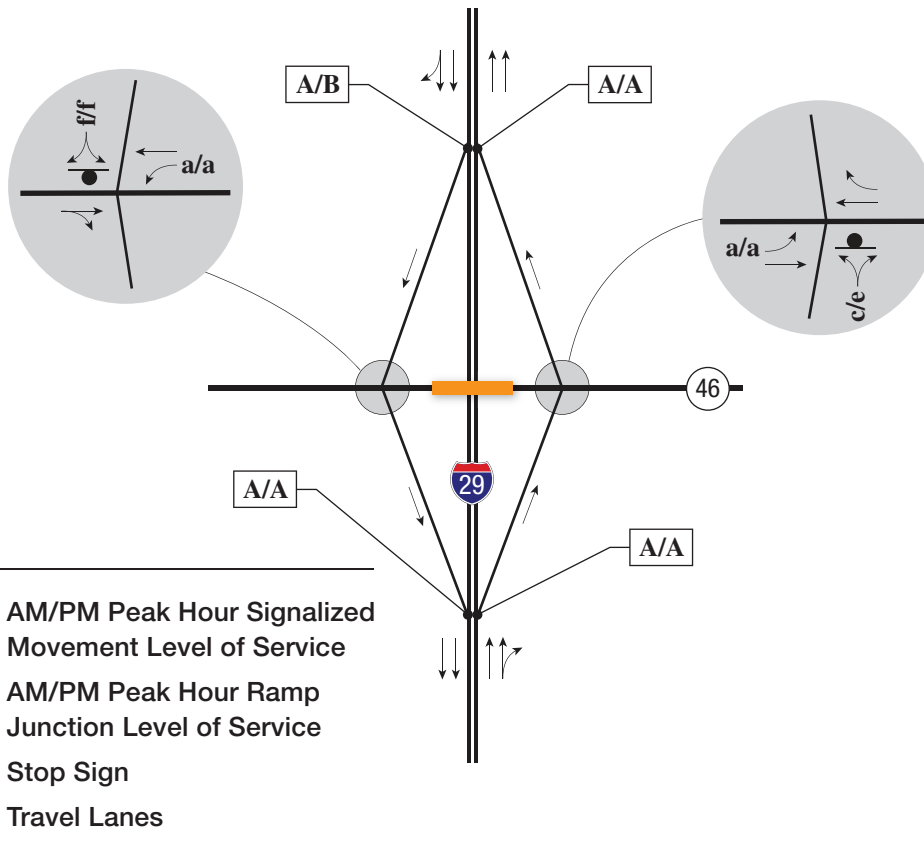
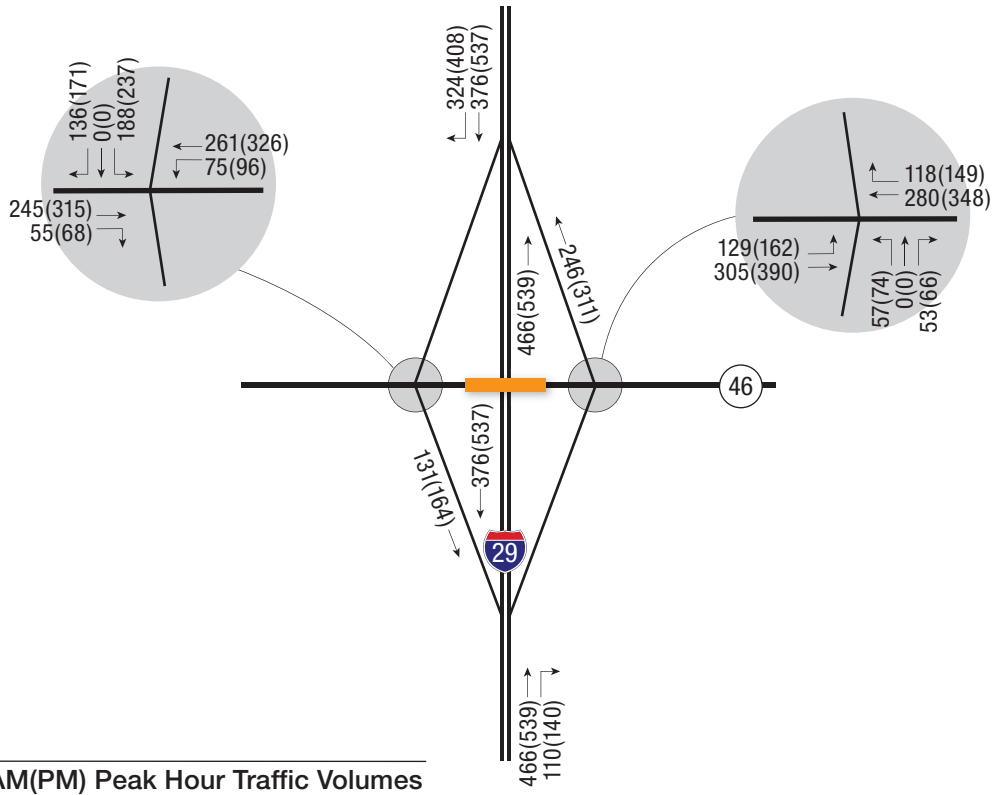
Plans show a curve not a taper so the taper is an estimate



Interstate 29 Exit 47
 Traffic Conditions Year 2009

NORTH

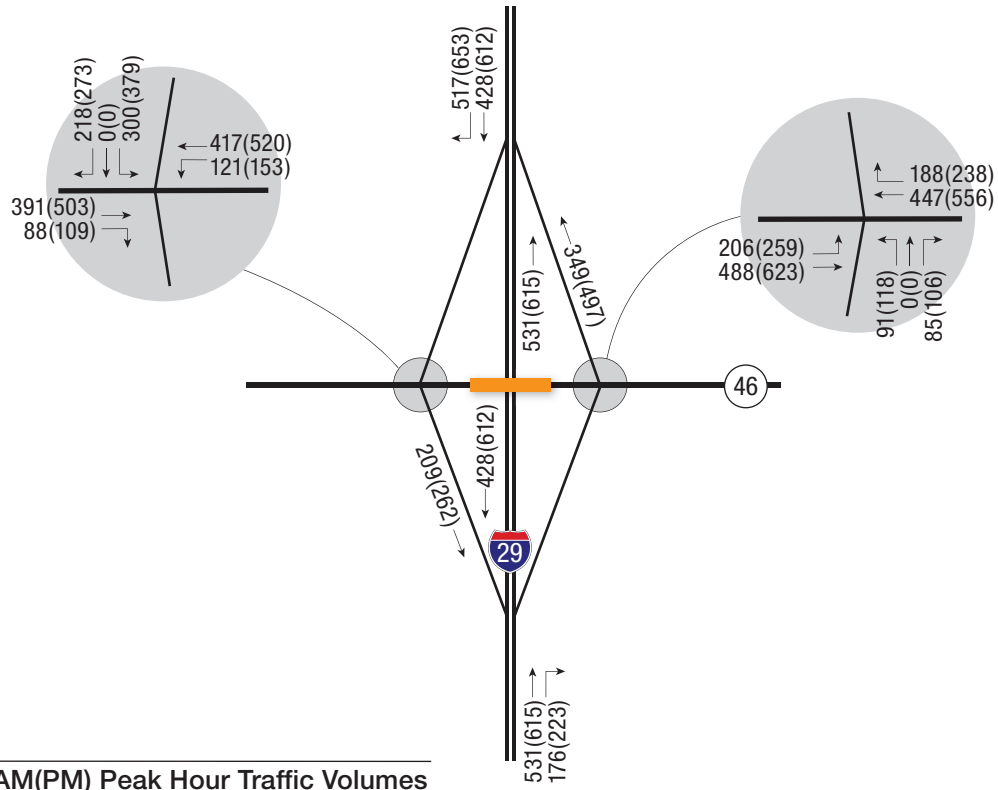




Interstate 29 Exit 47
 Traffic Conditions Year 2020

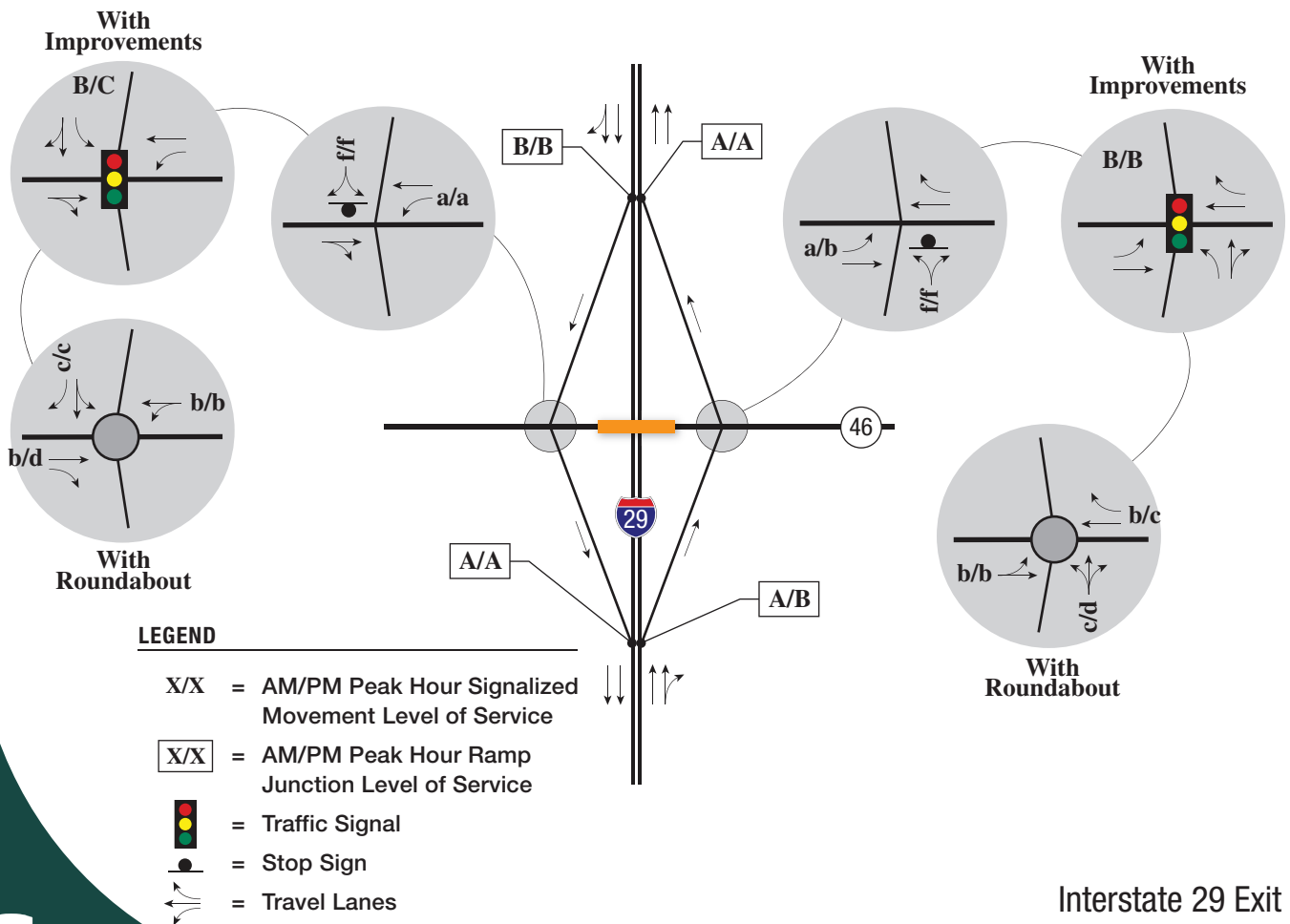
NORTH





LEGEND

XXX(XXX) = AM(PM) Peak Hour Traffic Volumes



Interstate 29 Exit 47
 Traffic Conditions Year 2030

NORTH



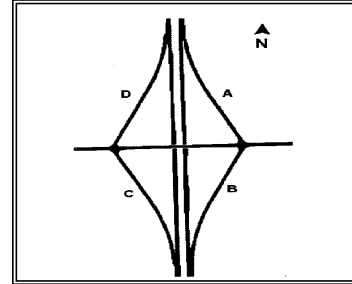
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I-29 EXIT 62 CANTON

INTERCHANGE GEOMETRICS CHECKLIST
SDDOT Interstate Corridor Study

Interstate: I-29
Interchange: Exit 62
Analyst: BLM
Date: 1/20/2010

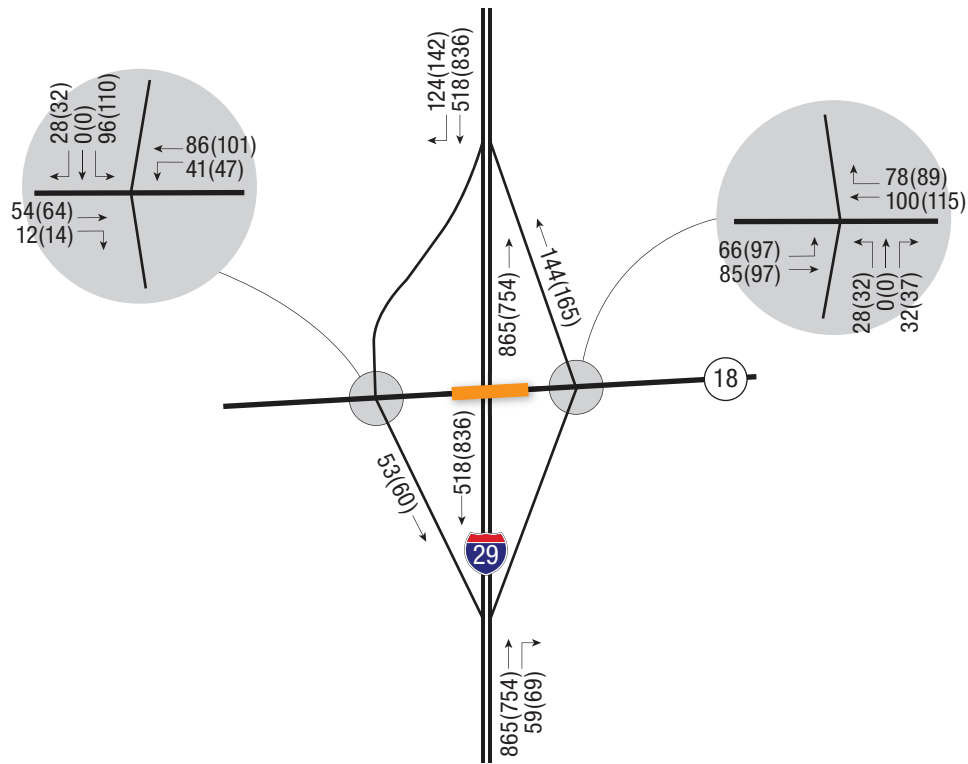


Interchange Geometry	Criteria	A	B	C	D	Achieved?
Interchange Type (Diamond, Full/Partial Cloverleaf, Trumpet etc.)	Diamond					-----
Design Speed	50 mph**					
Number of Lanes		1	1	1	1	
Right Turn Storage Length		-	-	-	-	
Left Turn Storage Length		-	-	-	-	
Superelevation (e max)	6%	-	7.6%	-	8.0%	Supports Impr.
Minimum Horizontal Radius for e max of 6% (50 mph / 30 mph)	833 / 231 feet	955'	955'	955'	955'	Acceptable
Maximum Degree of Curvature (50 mph / 30 mph)	6° 53' / 24° 48'	6° 00'	6° 00'	6° 00'	6° 00'	Acceptable
Minimum Clear Zone From the Edge of Travel Lane	30 feet	>30'	>30'	>30'	>30'	Acceptable
Maximum Grade on Ramp (Ascending)	+3% to +5%	-	3.60%	-	3.33%	Acceptable
Maximum Grade on Ramp (Descending)	-3% to -5%	-1.60%	-	-2.73%	-	Acceptable
Minimum Lane Width						
With Auxiliary Lanes	12 feet	-	-	-	-	
As Single Lane	15 feet (19 for loops)	17.0'	17.5'	16.5'	18.5'	Acceptable
Shoulder Width						
Right Shoulder	8 feet (4 for loops)	3.5'	6.0'	4.0'	5.0'	Supports Impr.
Left Shoulder	2 feet	3.0'	6.0'	2.5'	2.5'	Acceptable
Inslope	6:1	4:1	4:1	4:1	4:1	Supports Impr.
Minimum Off-Ramp Taper Rate	20:1	-	28:1	-	28:1	Acceptable
Minimum On-Ramp Taper Rate	50:1	29:1	-	29:1	-	Supports Impr.
Ramp Features						
K-Value Ranges						
Minimum for a Crest Vertical Curve (50 mph / 30 mph)	84 / 19	256	101	140	100	Acceptable
Minimum for a Sag Vertical Curve (50 mph / 30 mph)	96 / 37	98	77	98	82	Supports Impr.
Minimum Stopping Sight Distance (50 mph / 30 mph)	425 / 200 feet	366'	375'	461'	371'	Supports Impr.
Cross Road Features						
K-Value Ranges						
Minimum for a Crest Vertical Curve (50 mph / 30 mph)	84 / 19	East		West		
Minimum for a Sag Vertical Curve (50 mph / 30 mph)	96 / 37	150		150		Acceptable
Minimum Stopping Sight Distance (50 mph / 30 mph)	425 / 200 feet	561'		561'		Acceptable
Ramp Intersection Sight Distance (50 mph / 30 mph)***	425 / 200 feet	ok		ok		Acceptable
Maximum Longitudinal Grade - Rolling Terrain (Urban Arterial)	7%	3.00%		3.00%		Acceptable
Minimum Longitudinal Grade (Min. / Des.)	0.3% / 0.5%	0.00%		0.30%		Supports Impr.
Minimum Control of Access from Interchange Ramps (Min. / Des.)	300 / 660 feet	550'		>660'		Acceptable

** Loop ramp design speed = 30 mph

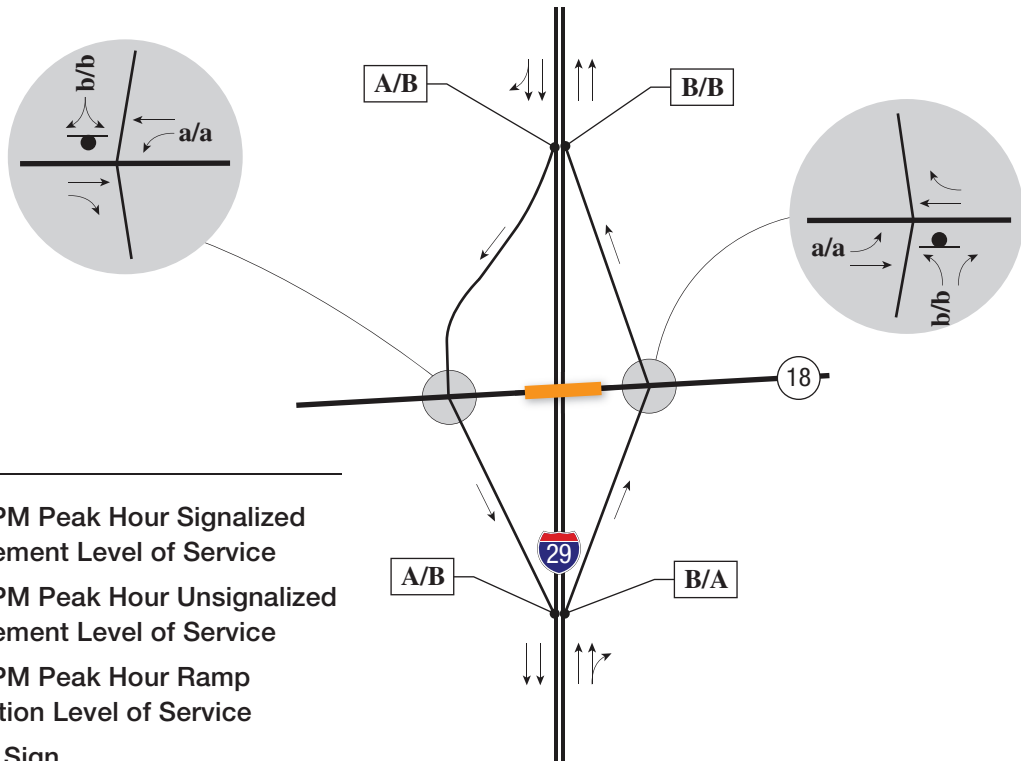
***Substandard Intersection Sight Distance locations could not be determined from the interchange plans. Substandard locations, therefore, are intersections that demonstrate sight distance limitations based on a general field evaluation or the presence of a substandard k-value or Stopping Sight Distance along the crossroad approaching the intersection.

Comments



LEGEND

XXX(XXX) = AM(PM) Peak Hour Traffic Volumes



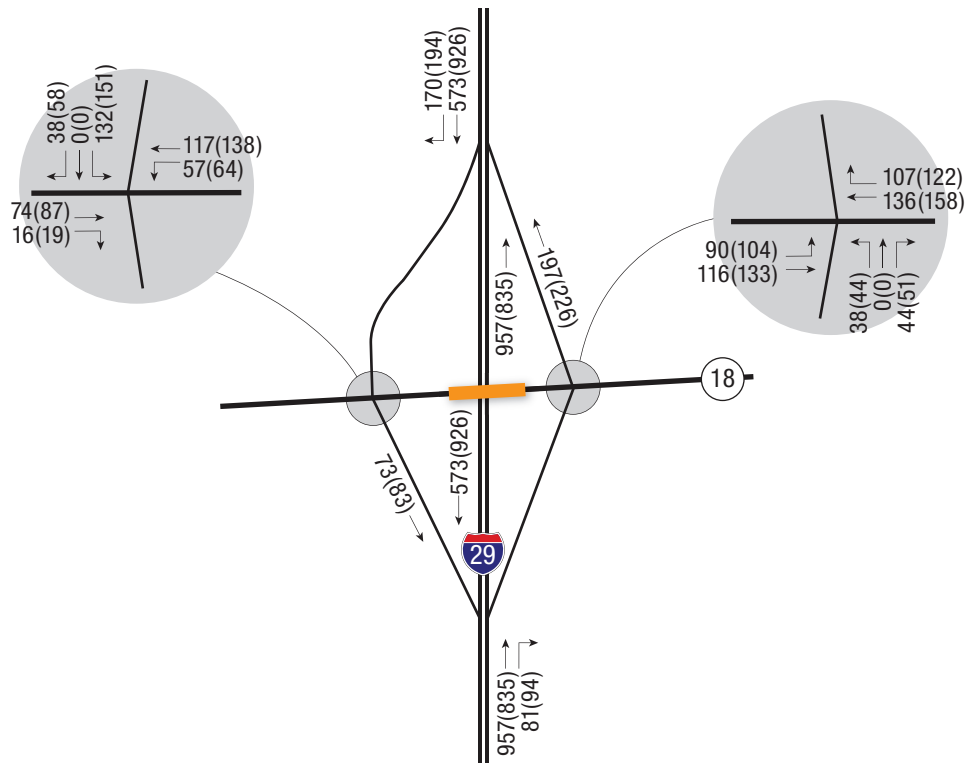
LEGEND

- X/X = AM/PM Peak Hour Signalized Movement Level of Service
- x/x = AM/PM Peak Hour Unsignalized Movement Level of Service
- X/X = AM/PM Peak Hour Ramp Junction Level of Service
- = Stop Sign
- ↔ = Travel Lanes

Interstate 29 Exit 62
Traffic Conditions Year 2009

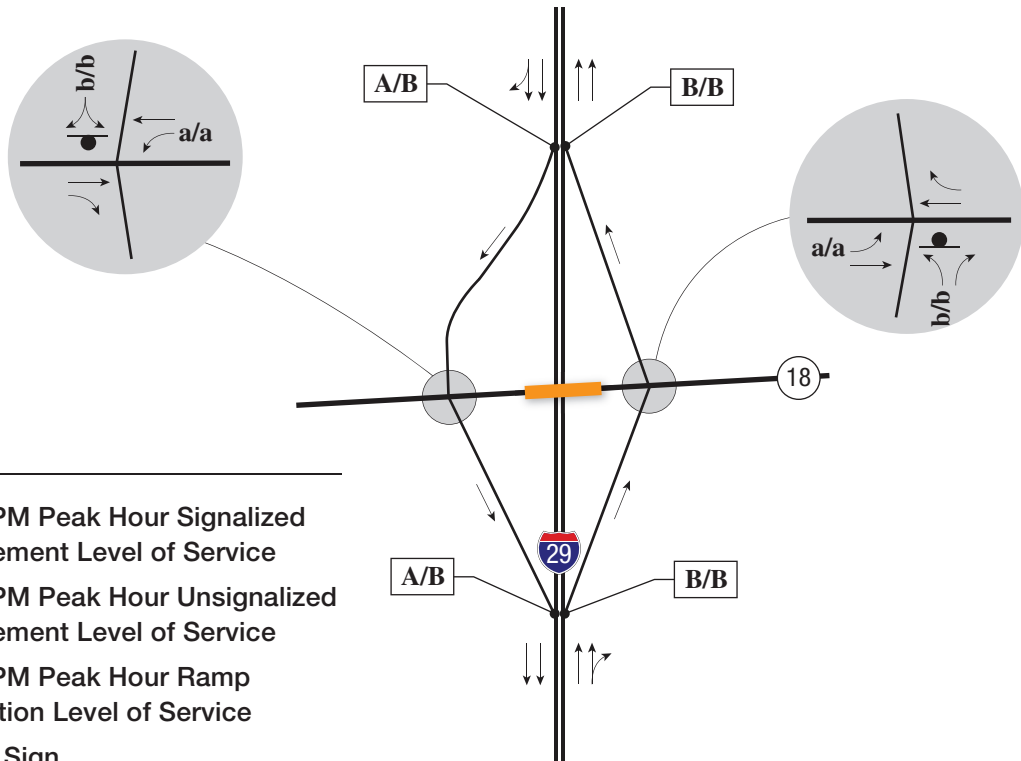
NORTH





LEGEND

XXX(XXX) = AM(PM) Peak Hour Traffic Volumes



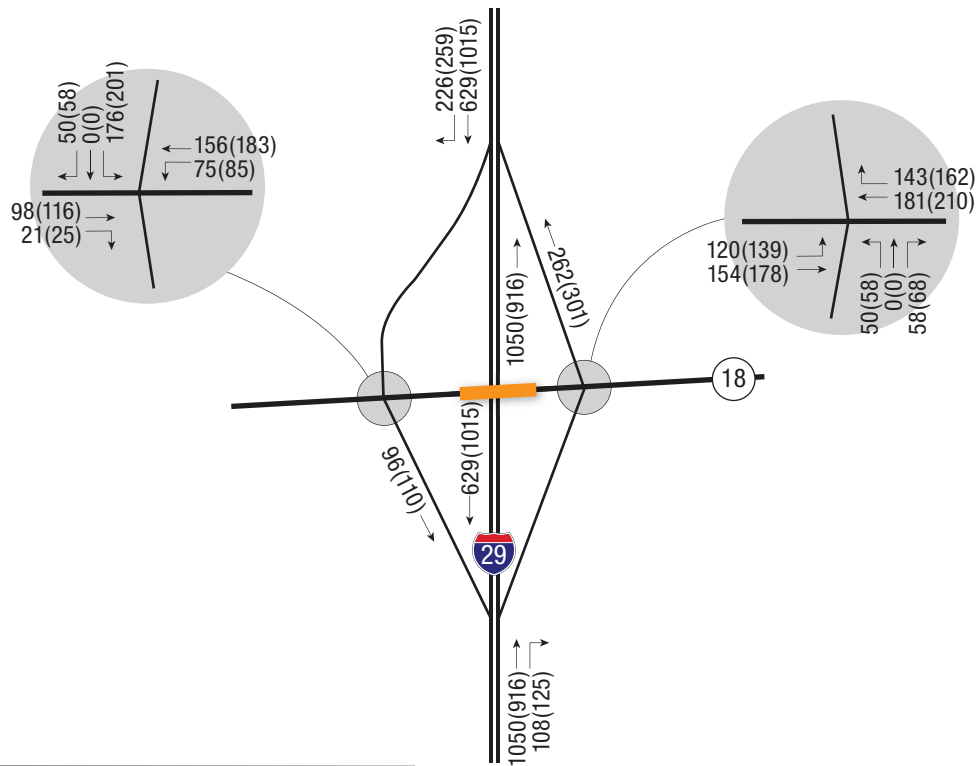
LEGEND

- X/X = AM/PM Peak Hour Signalized Movement Level of Service
- x/x = AM/PM Peak Hour Unsignalized Movement Level of Service
- X/X = AM/PM Peak Hour Ramp Junction Level of Service
- = Stop Sign
- ↔ = Travel Lanes

Interstate 29 Exit 62
Traffic Conditions Year 2020

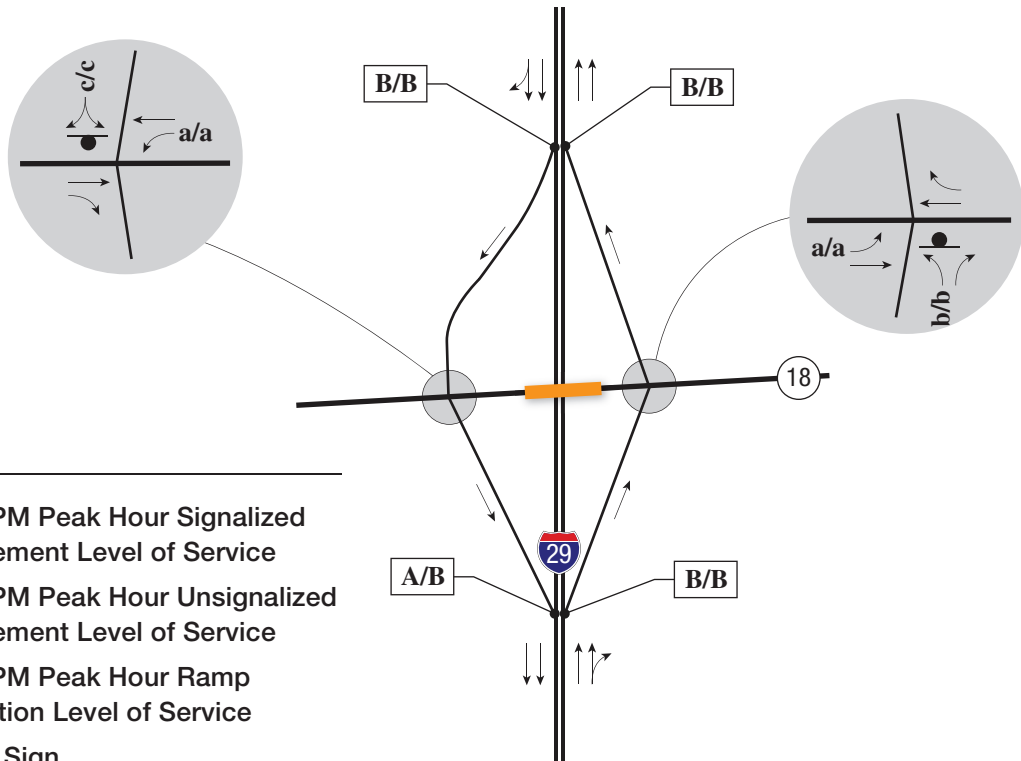
NORTH





LEGEND

XXX(XXX) = AM(PM) Peak Hour Traffic Volumes



LEGEND

- X/X = AM/PM Peak Hour Signalized Movement Level of Service
- x/x = AM/PM Peak Hour Unsignalized Movement Level of Service
- X/X = AM/PM Peak Hour Ramp Junction Level of Service
- = Stop Sign
- ↔ = Travel Lanes

Interstate 29 Exit 62
Traffic Conditions Year 2030

NORTH



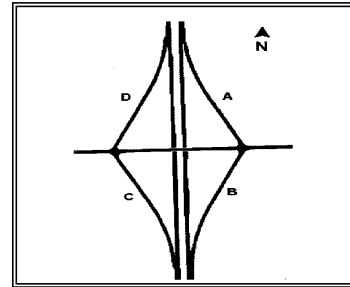
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I-29 EXIT 71 HARRISBURG/TEA

INTERCHANGE GEOMETRICS CHECKLIST
SDDOT Interstate Corridor Study

Interstate: I-29
Interchange: Exit 71
Analyst: JLB
Date: 1/20/2010

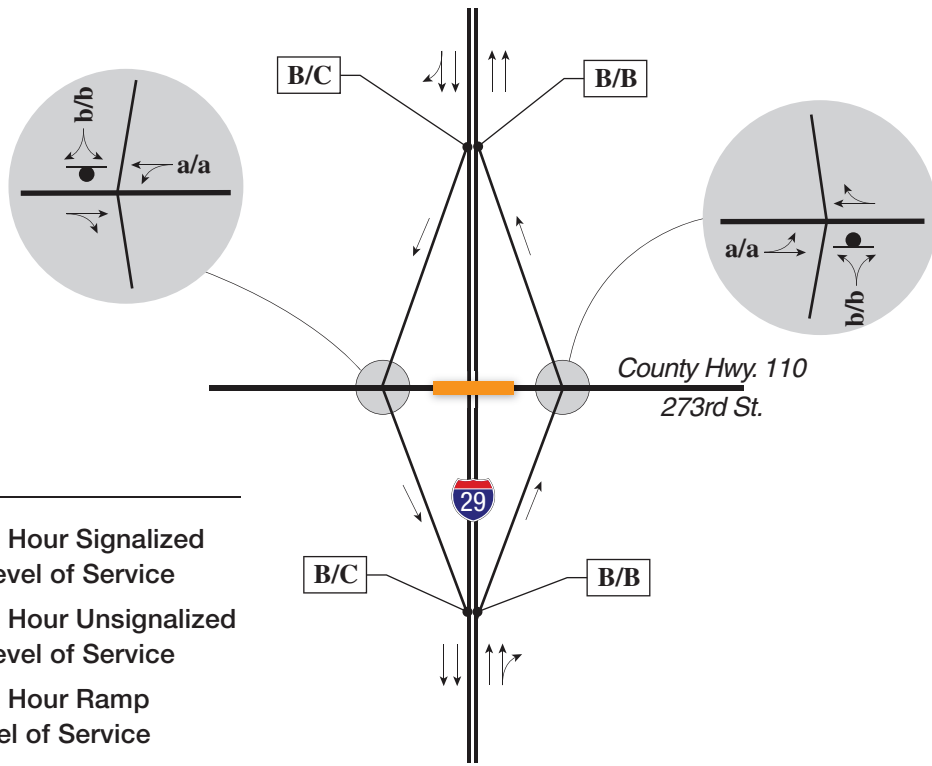
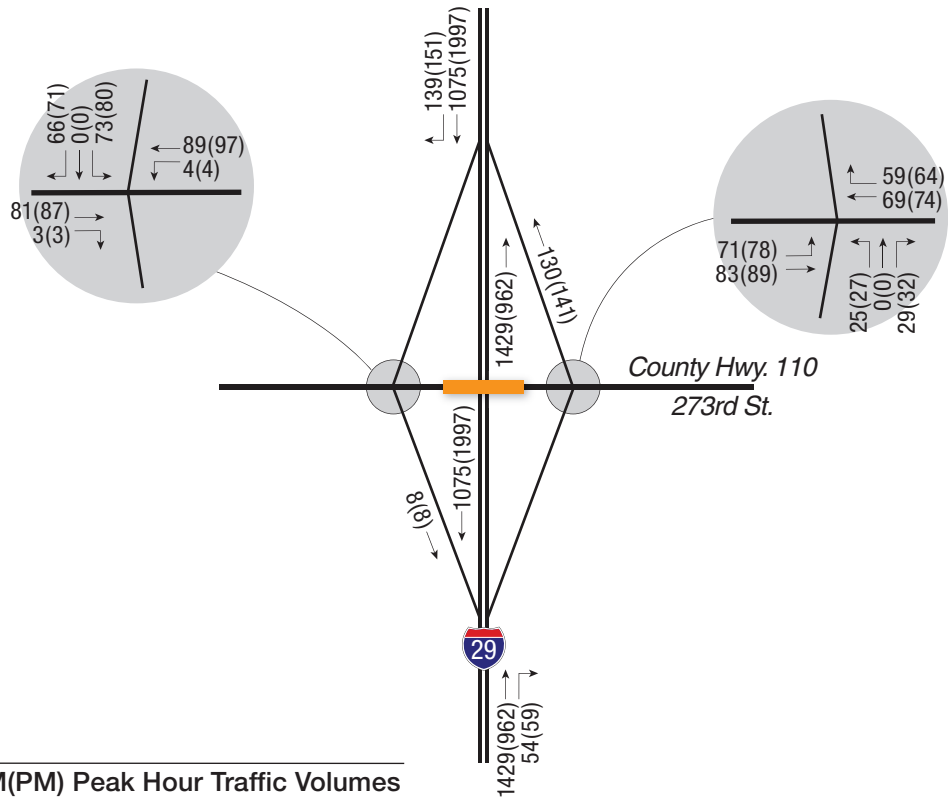


Interchange Geometry	Criteria	A	B	C	D	Achieved?
Interchange Type (Diamond, Full/Partial Cloverleaf, Trumpet etc.)	Diamond					-----
Design Speed	50 mph**					
Number of Lanes		1	1	1	1	
Right Turn Storage Length		-	-	-	-	
Left Turn Storage Length		-	-	-	-	
Superelevation (e max)	6%	-	-	-	-	
Minimum Horizontal Radius for e max of 6% (50 mph / 30 mph)	833 / 231 feet	1432'	955'	955'	1432'	Acceptable
Maximum Degree of Curvature (50 mph / 30 mph)	6° 53' / 24° 48'	4° 00'	6° 00'	6° 00'	4° 00'	Acceptable
Minimum Clear Zone From the Edge of Travel Lane	30 feet	>30'	>30'	>30'	>30'	Acceptable
Maximum Grade on Ramp (Ascending)	+3% to +5%	-	2.17%	-	1.57%	Acceptable
Maximum Grade on Ramp (Descending)	-3% to -5%	-1.26%	-	-3.24%	-	Acceptable
Minimum Lane Width						
With Auxiliary Lanes	12 feet					
As Single Lane	15 feet (19 for loops)	17.5'	17.0'	15.5'	18.0'	Acceptable
Shoulder Width						
Right Shoulder	8 feet (4 for loops)	3.0'	3.5'	4.0'	3.0'	Supports Impr.
Left Shoulder	2 feet	3.5'	2.5'	4.0'	2.0'	Acceptable
Inslope	6:1	4:1	4:1	4:1	4:1	Supports Impr.
Minimum Off-Ramp Taper Rate	20:1	-	29:1	-	29:1	Acceptable
Minimum On-Ramp Taper Rate	50:1	29:1	-	29:1	-	Supports Impr.
Ramp Features						
K-Value Ranges						
Minimum for a Crest Vertical Curve (50 mph / 30 mph)	84 / 19	-	230	197	-	Acceptable
Minimum for a Sag Vertical Curve (50 mph / 30 mph)	96 / 37	156	79	102	99	Supports Impr.
Minimum Stopping Sight Distance (50 mph / 30 mph)	425 / 200 feet	>425'	583'	538'	1459'	Acceptable
Cross Road Features						
K-Value Ranges						
Minimum for a Crest Vertical Curve (50 mph / 30 mph)	84 / 19	To West		To East		
Minimum for a Sag Vertical Curve (50 mph / 30 mph)	96 / 37	76		101		Supports Impr.
Minimum Stopping Sight Distance (50 mph / 30 mph)	425 / 200 feet	414'		415'		Supports Impr.
Ramp Intersection Sight Distance (50 mph / 30 mph)***	425 / 200 feet	substandard		substandard		Supports Impr.
Maximum Longitudinal Grade - Rolling Terrain (Urban Arterial)	7%	4.00%		4.00%		Acceptable
Minimum Longitudinal Grade (Min. / Des.)	0.3% / 0.5%	0.86%		0.34%		Acceptable
Minimum Control of Access from Interchange Ramps (Min. / Des.)	300 / 660 feet	150'		460'		Supports Impr.

** Loop ramp design speed = 30 mph

***Substandard Intersection Sight Distance locations could not be determined from the interchange plans. Substandard locations, therefore, are intersections that demonstrate sight distance limitations based on a general field evaluation or the presence of a substandard k-value or Stopping Sight Distance along the crossroad approaching the intersection.

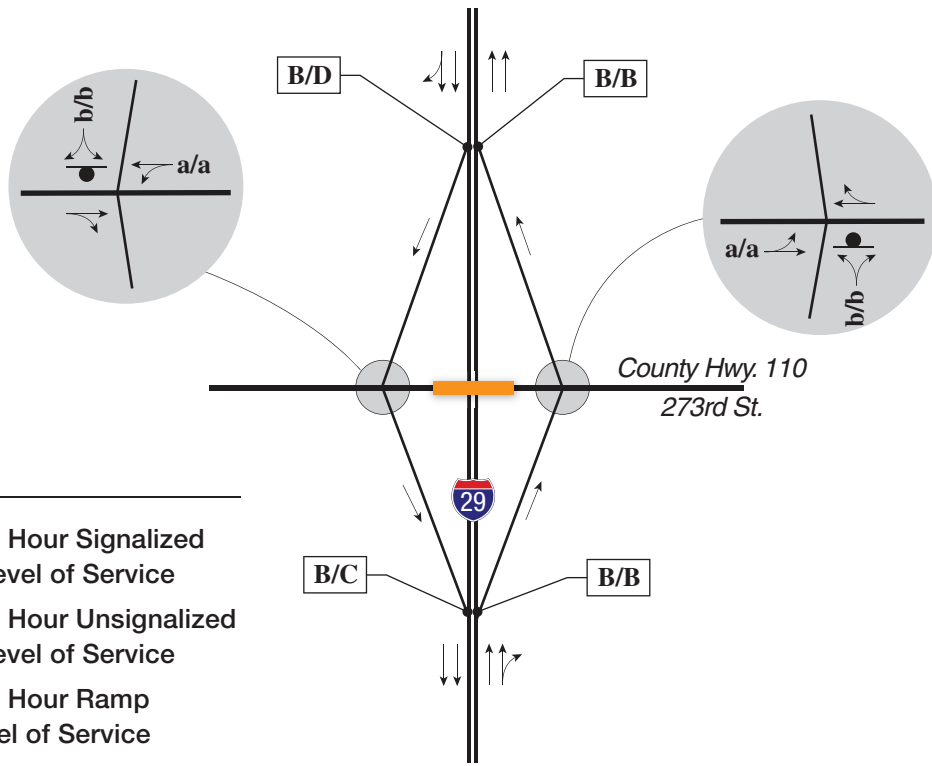
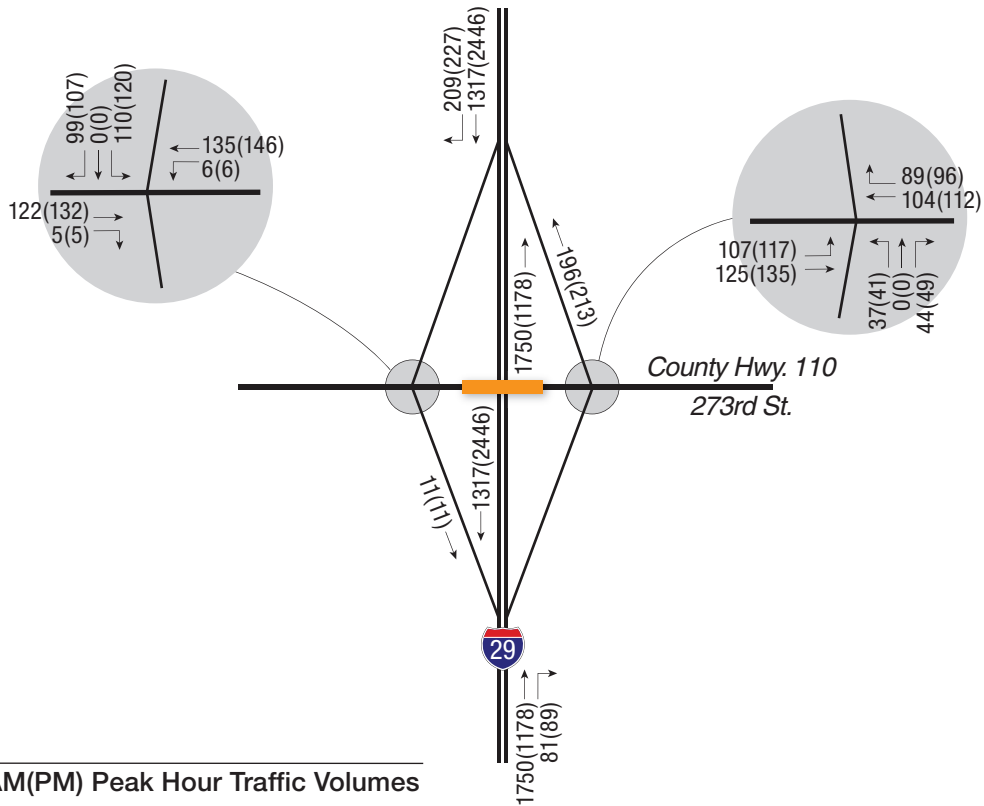
Comments



Interstate 29 Exit 71
 Traffic Conditions Year 2009

NORTH

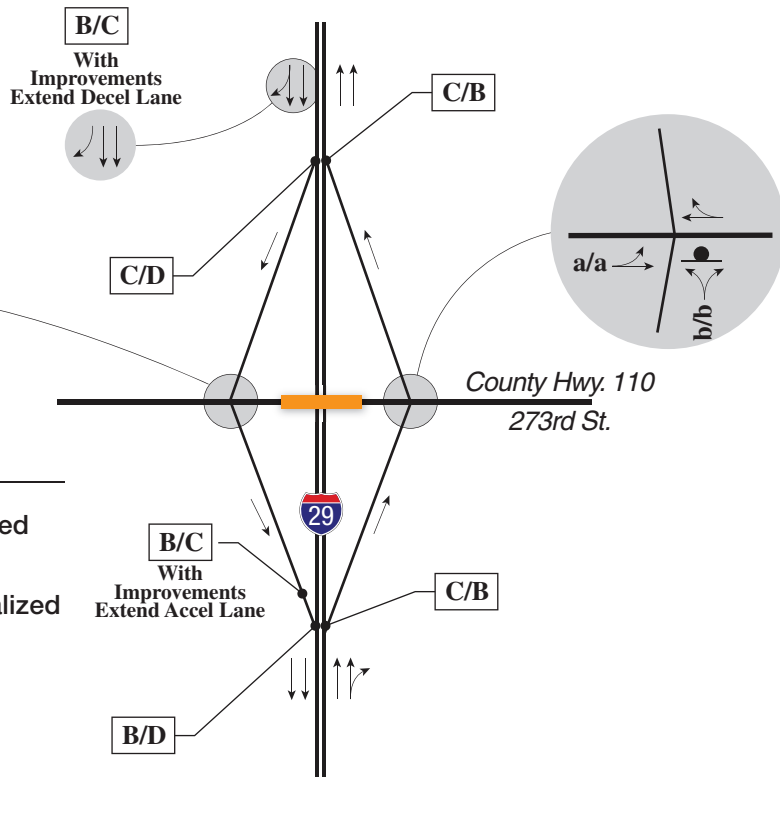
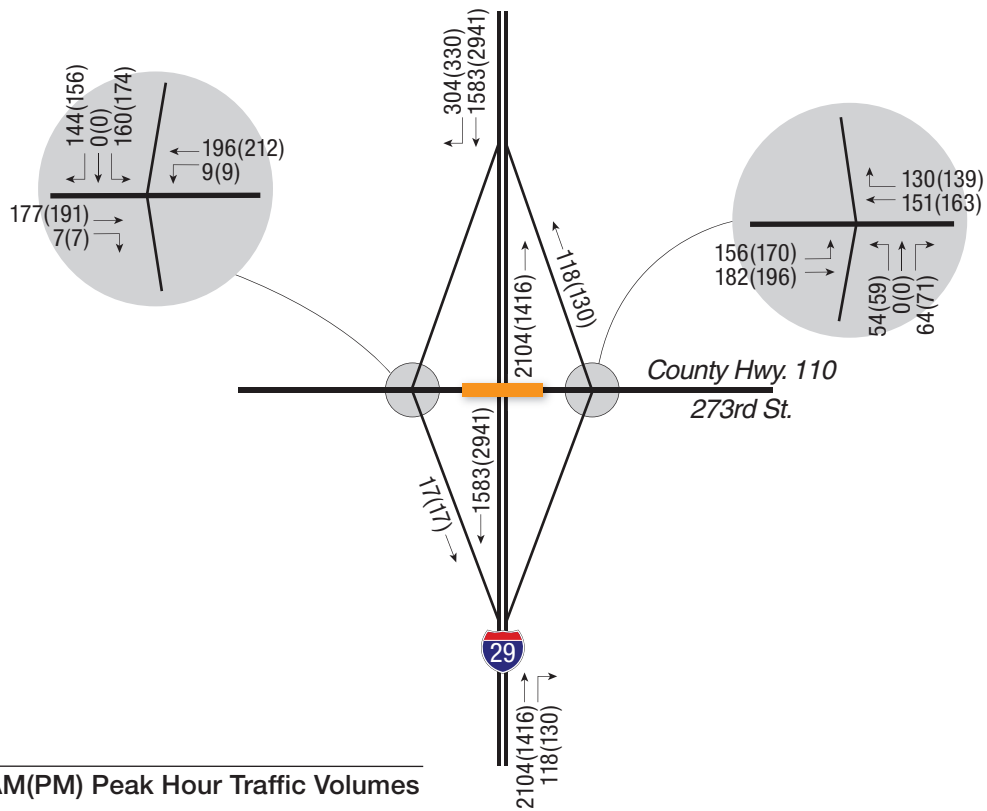




Interstate 29 Exit 71
 Traffic Conditions Year 2020

NORTH





Interstate 29 Exit 71
 Traffic Conditions Year 2030

NORTH

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I-29 EXIT 77 41ST STREET

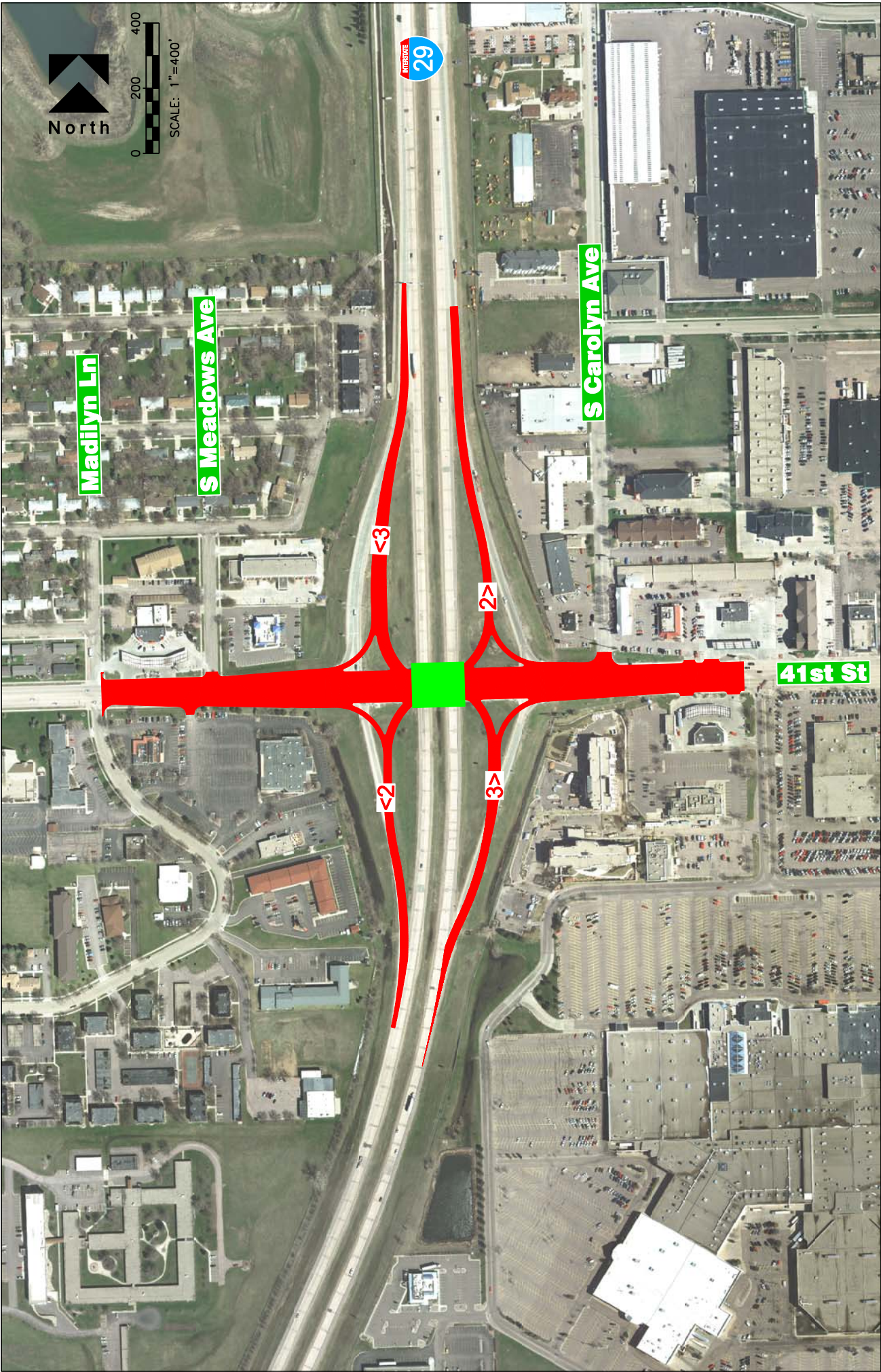


Figure 1
I-29 Exit 77 - 41st Street
Single Point Urban Interchange

CONCEPTUAL



South Dakota Decennial Interstate Corridor Study

Probable Construction Costs
I-29 Exit 77 - Single Point Urban Interchange

<i>Item Description</i>	<i>Quantity</i>	<i>Unit</i>	<i>Unit Cost</i>	<i>Total Cost</i>
Mobilization	1	LUMP SUM	\$275,000.00	\$275,000
Traffic Control	1	LUMP SUM	\$549,000.00	\$549,000
Clearing	1	LUMP SUM	\$110,000.00	\$110,000
Removal of Concrete Pavement	22,318	SQ. YD.	\$3.88	\$86,662
Removal of Asphalt Pavement		SQ. YD.	\$7.39	\$0
Remove Bridge	21,960	SQ. FT.	\$9.00	\$197,640
Borrow, Unclassified Excavation	16,039	CU. YD.	\$5.30	\$85,038
Base Course	6,177	TON	\$10.64	\$65,708
Asphalt Composite		TON	\$80.91	\$0
PCC Pavement 8" (cross street)	14,793	SQ. YD.	\$33.12	\$489,970
PCC Pavement 8" (ramps)	12,069	SQ. YD.	\$43.40	\$523,754
Concrete Approach Slab	10,000	SQ. YD.	\$188.34	\$1,883,420
Bridges	20,672	SQ. FT.	\$100.00	\$2,067,200
Guard Rail	900	LF	\$100.00	\$90,000
Permanent Signing/Markings	1	LUMP SUM	\$160,000.00	\$160,000
Traffic Signal	1	EACH	\$175,000.00	\$175,000
Roadway Lighting	1	LUMP SUM	\$110,000.00	\$110,000
Drainage (18" RCP)	180	LF	\$24.53	<u>\$4,415</u>
Subtotal				\$6,870,000
Contingencies	25%			<u>\$1,717,500</u>
Total Probable Construction Costs				\$8,590,000
Engineering, Administration	15%			\$1,288,500
Total Project Costs				\$9,880,000

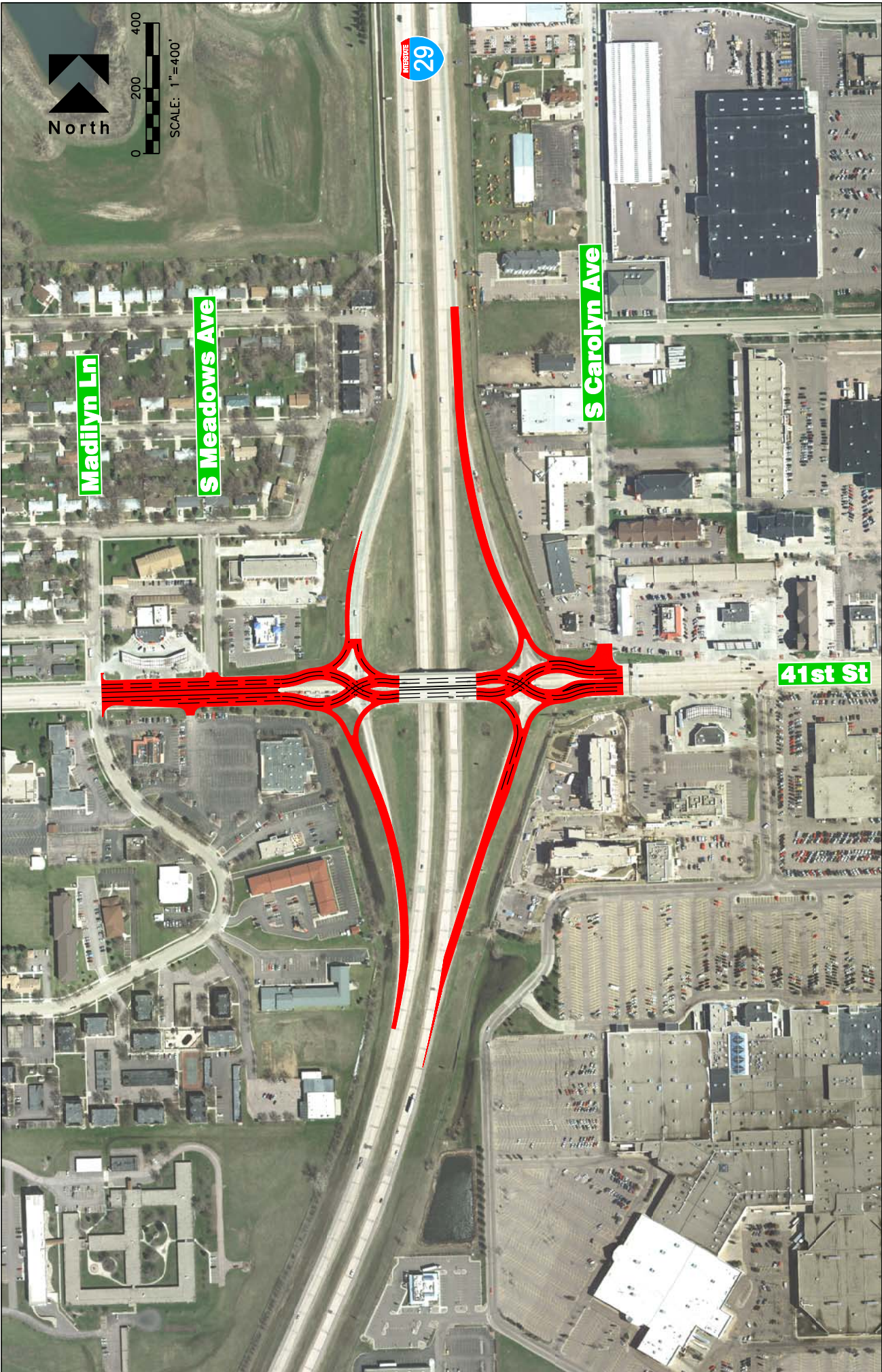


Figure 2
I-29 Exit 77 - 41st Street
Diverging Diamond Interchange

Probable Construction Costs
I-29 Exit 77 - Diverging Diamond Interchange

<i>Item Description</i>	<i>Quantity</i>	<i>Unit</i>	<i>Unit Cost</i>	<i>Total Cost</i>
Mobilization	1	LUMP SUM	\$61,000.00	\$61,000
Traffic Control	1	LUMP SUM	\$123,000.00	\$123,000
Clearing	1	LUMP SUM	\$25,000.00	\$25,000
Removal of Concrete Pavement	15,943	SQ. YD.	\$3.88	\$61,906
Removal of Asphalt Pavement		SQ. YD.	\$7.39	\$0
Remove Bridge	-	SQ. FT.	\$9.00	\$0
Borrow, Unclassified Excavation	13,963	CU. YD.	\$5.30	\$74,032
Base Course	5,787	TON	\$10.64	\$61,557
Asphalt Composite		TON	\$80.91	\$0
PCC Pavement 8" (cross street)	13,396	SQ. YD.	\$33.12	\$443,674
PCC Pavement 8" (ramps)	11,300	SQ. YD.	\$43.40	\$490,364
Concrete Approach Slab	-	SQ. YD.	\$188.34	\$0
Bridges	-	SQ. FT.	\$100.00	\$0
Guard Rail	900	LF	\$100.00	\$90,000
Permanent Signing/Markings	1	LUMP SUM	\$40,000.00	\$40,000
Traffic Signal	2	EACH	\$125,000.00	\$250,000
Roadway Lighting	1	LUMP SUM	\$20,000.00	\$20,000
Drainage (18" RCP)	180	LF	\$24.53	<u>\$4,415</u>
Subtotal				\$1,740,000
Contingencies	25%			<u>\$435,000</u>
Total Probable Construction Costs				\$2,180,000
Engineering, Administration	15%			\$327,000
Total Project Costs				\$2,510,000

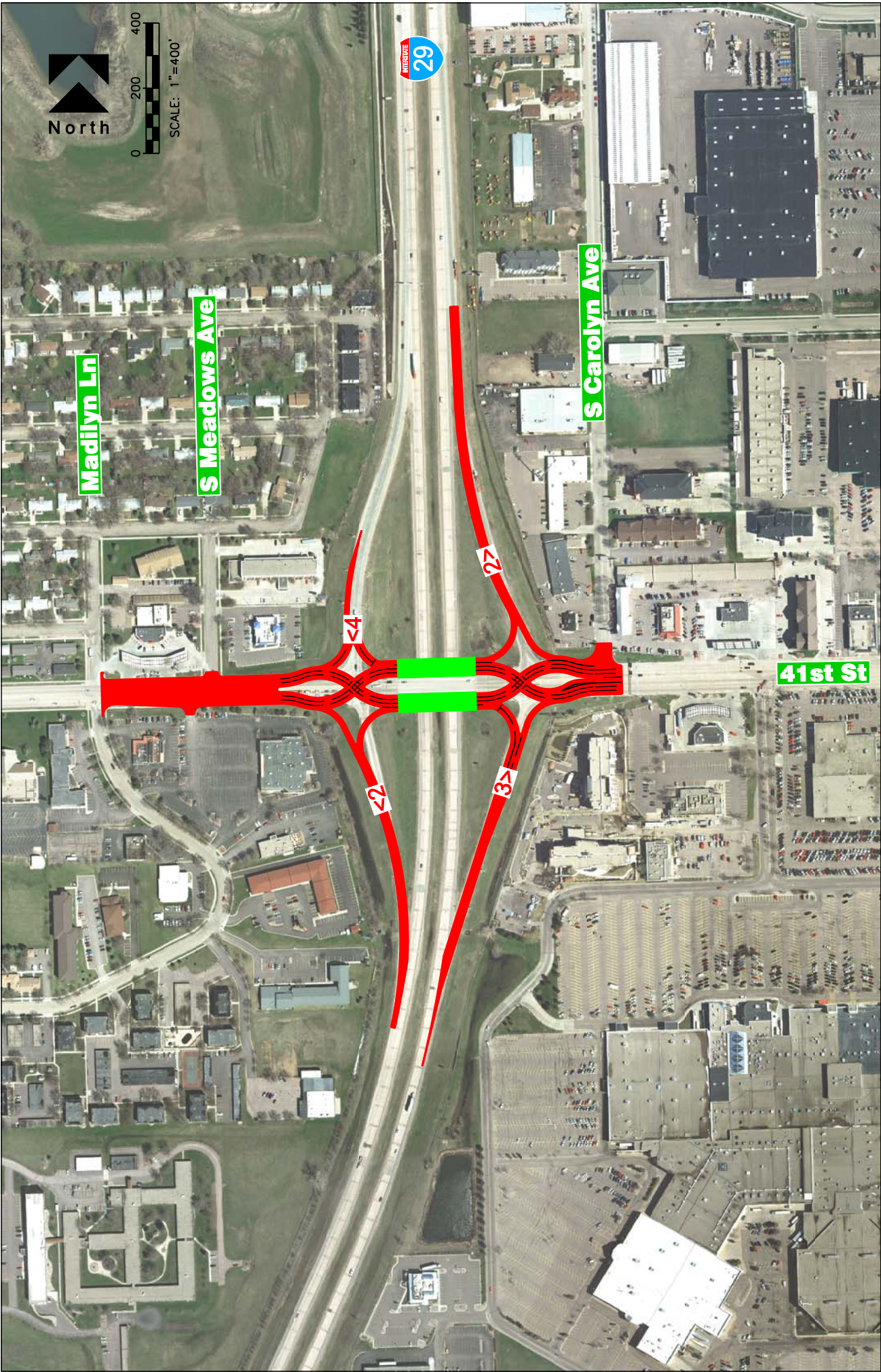


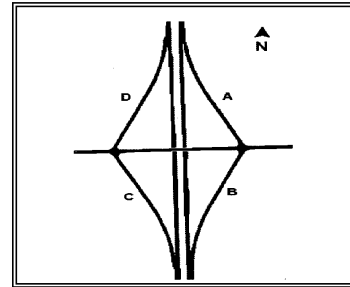
Figure 3
I-29 Exit 77 - 41st Street
Diverging Diamond Interchange

Probable Construction Costs
I-29 Exit 77 - Diverging Diamond Interchange

<i>Item Description</i>	<i>Quantity</i>	<i>Unit</i>	<i>Unit Cost</i>	<i>Total Cost</i>
Mobilization	1	LUMP SUM	\$319,000.00	\$319,000
Traffic Control	1	LUMP SUM	\$637,000.00	\$637,000
Clearing	1	LUMP SUM	\$127,000.00	\$127,000
Removal of Concrete Pavement	16,153	SQ. YD.	\$3.88	\$62,721
Removal of Asphalt Pavement		SQ. YD.	\$7.39	\$0
Remove Bridge	23,040	SQ. FT.	\$9.00	\$207,360
Borrow, Unclassified Excavation	13,963	CU. YD.	\$5.30	\$74,032
Base Course	5,741	TON	\$10.64	\$61,071
Asphalt Composite		TON	\$80.91	\$0
PCC Pavement 8" (cross street)	12,418	SQ. YD.	\$33.12	\$411,289
PCC Pavement 8" (ramps)	11,300	SQ. YD.	\$43.40	\$490,364
Concrete Approach Slab	11,600	SQ. YD.	\$188.34	\$2,184,767
Bridges	27,840	SQ. FT.	\$100.00	\$2,784,000
Guard Rail	900	LF	\$100.00	\$90,000
Permanent Signing/Markings	1	LUMP SUM	\$190,000.00	\$190,000
Traffic Signal	2	EACH	\$125,000.00	\$250,000
Roadway Lighting	1	LUMP SUM	\$130,000.00	\$130,000
Drainage (18" RCP)	180	LF	\$24.53	<u>\$4,415</u>
Subtotal				\$8,020,000
Contingencies	25%			<u>\$2,005,000</u>
Total Probable Construction Costs				\$10,030,000
Engineering, Administration	15%			\$1,504,500
Total Project Costs				\$11,530,000

INTERCHANGE GEOMETRICS CHECKLIST
SDDOT Interstate Corridor Study

Interstate: I-29
Interchange: Exit 77
Analyst: JLB
Date: 1/20/2010



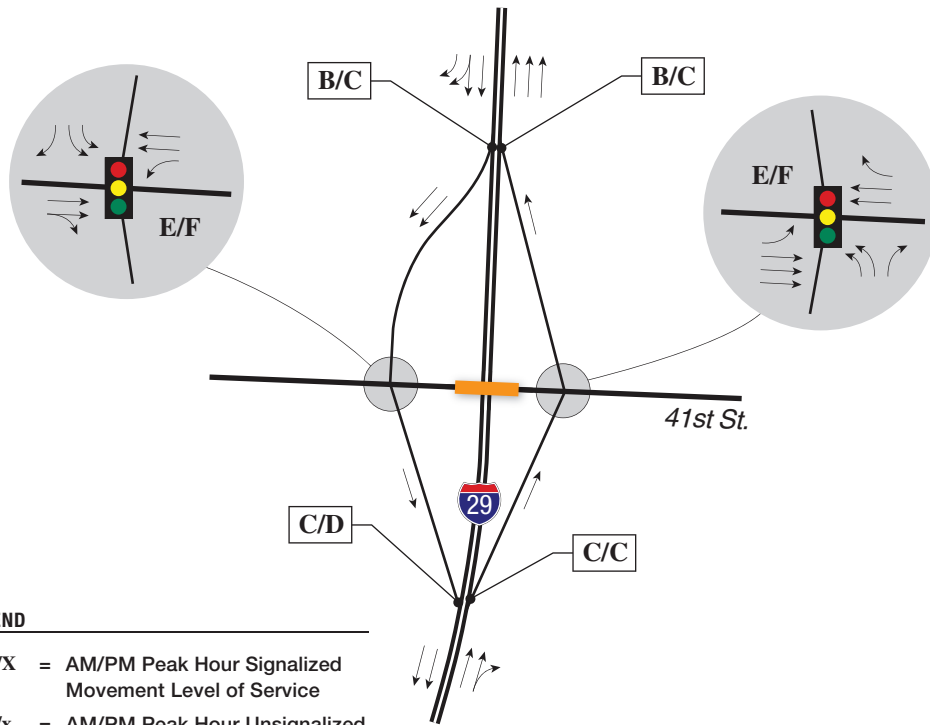
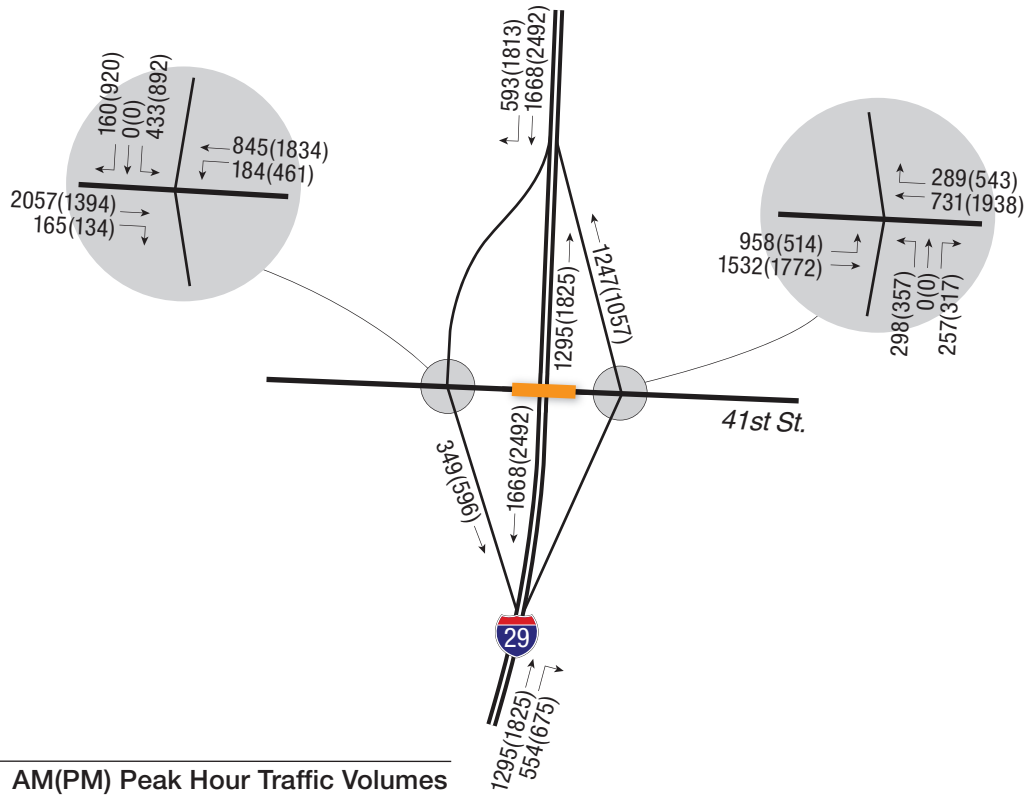
Interchange Geometry	Criteria	A	B	C	D	Achieved?
Interchange Type (Diamond, Full/Partial Cloverleaf, Trumpet etc.)	Diamond					-----
Design Speed	50 mph**					
Number of Lanes		1	1	1	2	
Right Turn Storage Length		-	-	-	380'	
Left Turn Storage Length		-	-	-	-	
Superelevation (e max)	6%	-	-	-	-	
Minimum Horizontal Radius for e max of 6% (50 mph / 30 mph)	833 / 231 feet	2292'	955'	955'	1146'	Acceptable
Maximum Degree of Curvature (50 mph / 30 mph)	6° 53' / 24° 48'	2° 30'	6° 00'	6° 00'	5° 00'	Acceptable
Minimum Clear Zone From the Edge of Travel Lane	30 feet	>30'	>30'	>30'	>30'	Acceptable
Maximum Grade on Ramp (Ascending)	+3% to +5%	-	1.60%		3.45%	Acceptable
Maximum Grade on Ramp (Descending)	-3% to -5%	-2.55%		4.00%	-	Acceptable
Minimum Lane Width						
With Auxiliary Lanes	12 feet	22	-	-	36.5	Acceptable
As Single Lane	15 feet (19 for loops)	-	18.5'	16.5'	-	Acceptable
Shoulder Width						
Right Shoulder	8 feet (4 for loops)	6.0'	4.5'	5.0'	7.5'	Supports Impr.
Left Shoulder	2 feet	2.5'	2.0'	2.0'	2.0'	Acceptable
Inslope	6:1	6:1	6:1	4:1	6:1	Supports Impr.
Minimum Off-Ramp Taper Rate	20:1	-	23:1	-	25:1	Acceptable
Minimum On-Ramp Taper Rate	50:1	-	-	29:1	-	Supports Impr.
Ramp Features						
K-Value Ranges						
Minimum for a Crest Vertical Curve (50 mph / 30 mph)	84 / 19		185	100	121	Acceptable
Minimum for a Sag Vertical Curve (50 mph / 30 mph)	96 / 37	151	144	80	-	Supports Impr.
Minimum Stopping Sight Distance (50 mph / 30 mph)	425 / 200 feet	526'	>425'	367'	754'	Supports Impr.
Cross Road Features						
K-Value Ranges		To West		To East		
Minimum for a Crest Vertical Curve (50 mph / 30 mph)	84 / 19	100		100		Acceptable
Minimum for a Sag Vertical Curve (50 mph / 30 mph)	96 / 37	-		100		Acceptable
Minimum Stopping Sight Distance (50 mph / 30 mph)	425 / 200 feet	>425'		444'		Acceptable
Ramp Intersection Sight Distance (50 mph / 30 mph)***	425 / 200 feet	ok		ok		Acceptable
Maximum Longitudinal Grade - Rolling Terrain (Urban Arterial)	7%	0.00%		4.00%		Acceptable
Minimum Longitudinal Grade (Min. / Des.)	0.3% / 0.5%	0.00%		0.00%		Supports Impr.
Minimum Control of Access from Interchange Ramps (Min. / Des.)	300 / 660 feet	200'		400'		Supports Impr.

** Loop ramp design speed = 30 mph

***Substandard Intersection Sight Distance locations could not be determined from the interchange plans. Substandard locations, therefore, are intersections that demonstrate sight distance limitations based on a general field evaluation or the presence of a substandard k-value or Stopping Sight Distance along the crossroad approaching the intersection.

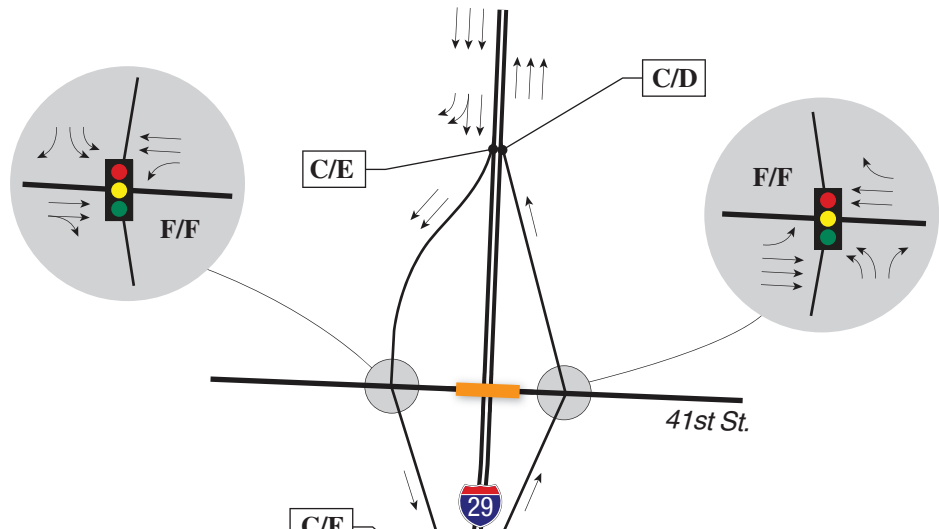
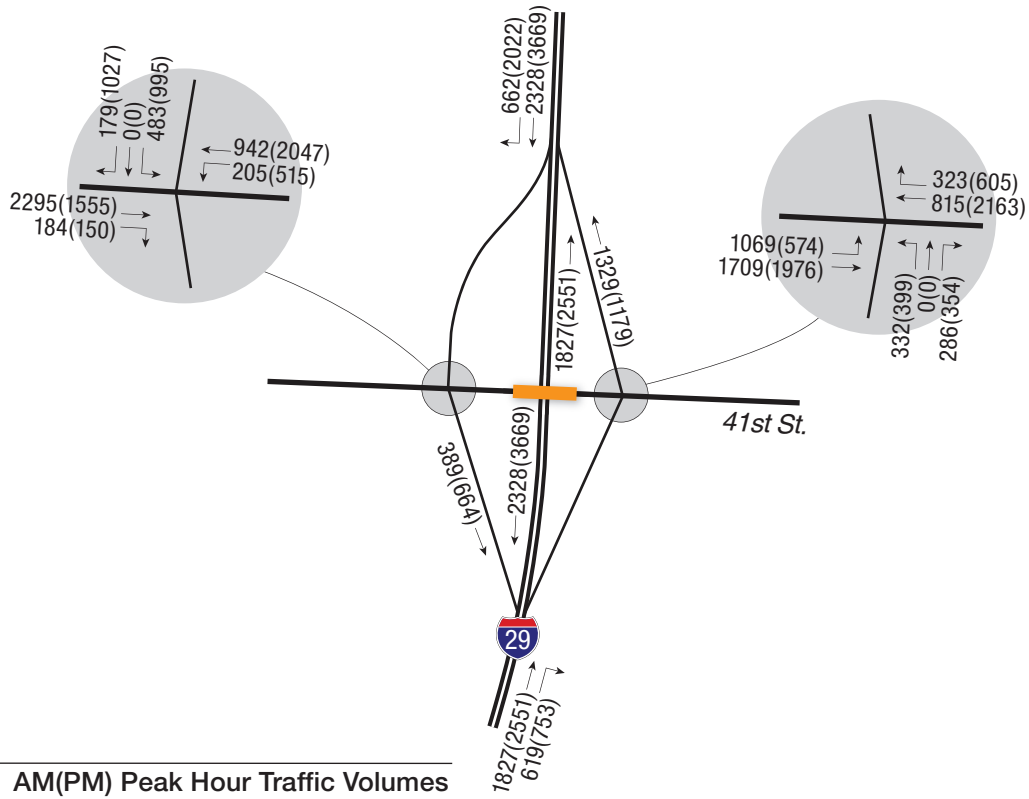
Comments

Ramp D has 2 lanes exiting. The outer lane is an auxiliary lane exiting. Both lanes turn left
Ramp A has an auxiliary lane for the on ramp
Ramp B has an unstriped right turn lane.



Interstate 29 Exit 77
 Traffic Conditions Year 2009

NORTH

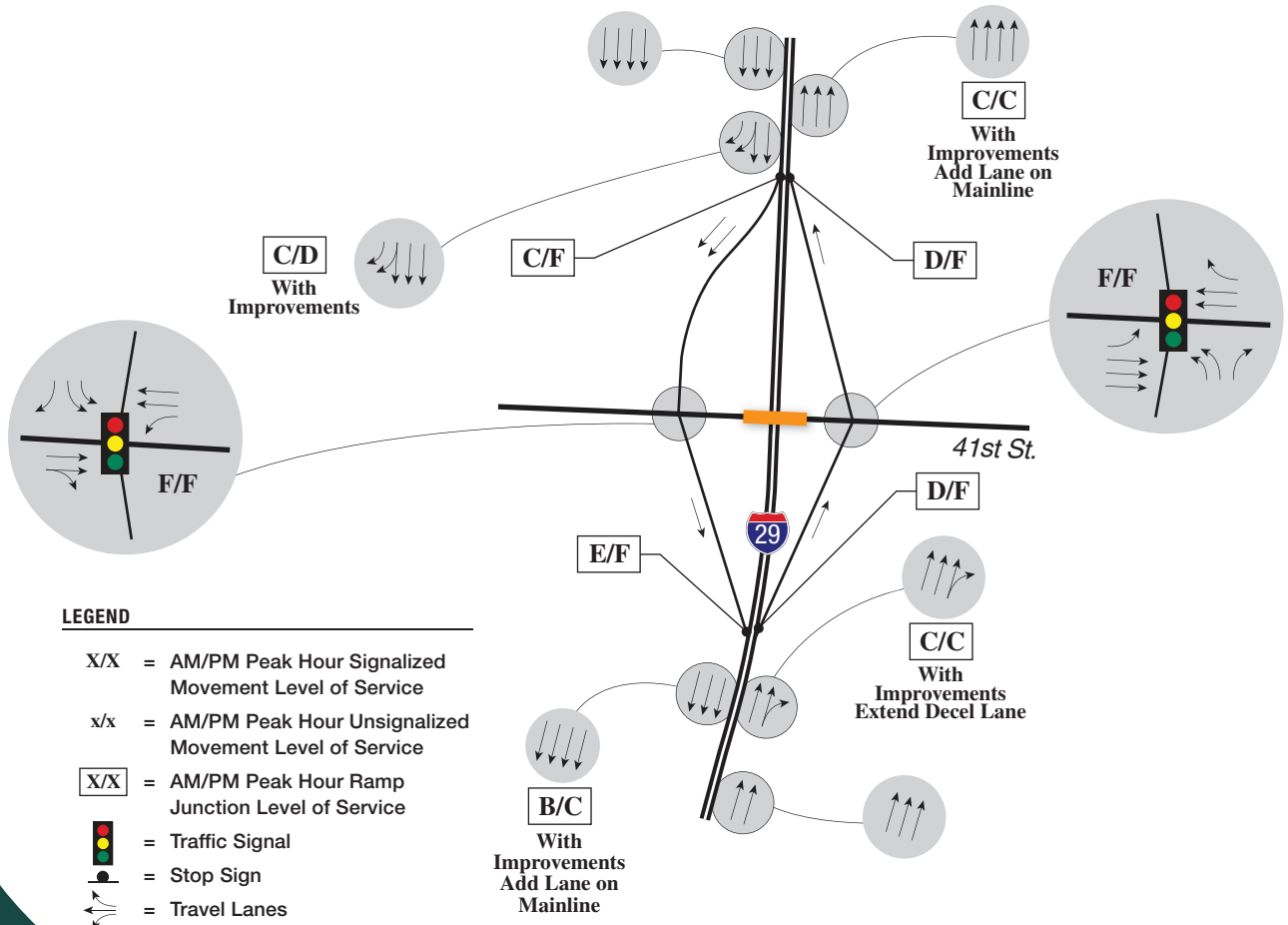
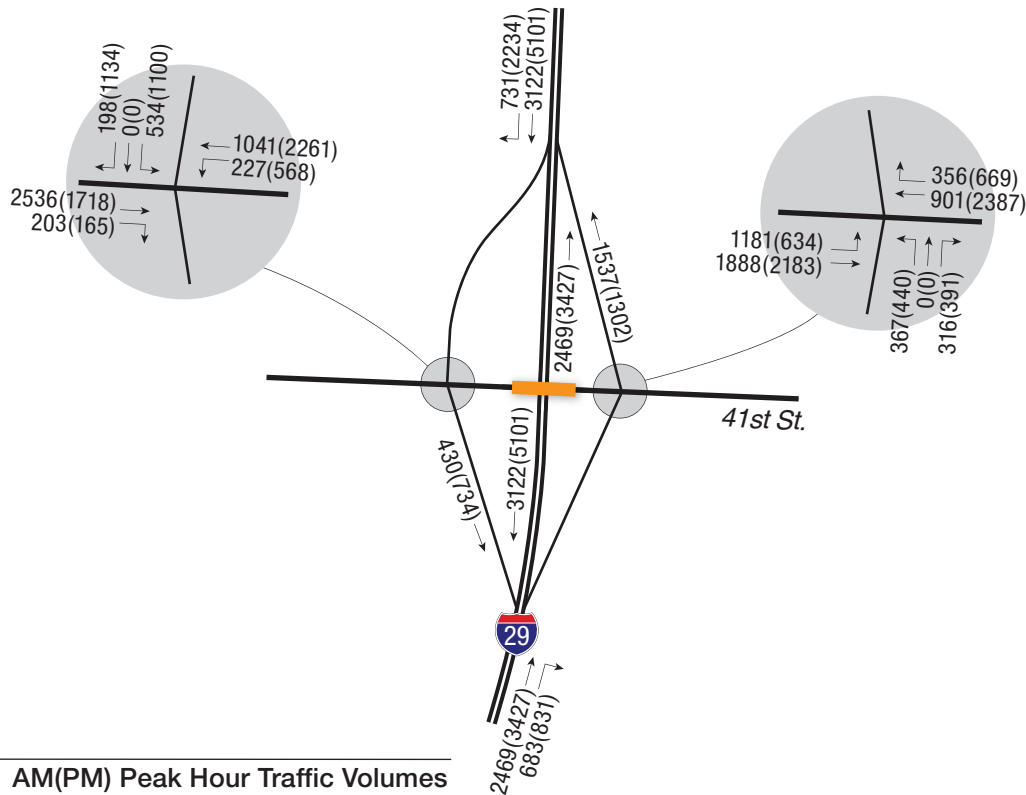


- LEGEND**
- X/X = AM/PM Peak Hour Signalized Movement Level of Service
 - x/x = AM/PM Peak Hour Unsignalized Movement Level of Service
 - X/X = AM/PM Peak Hour Ramp Junction Level of Service
 - = Traffic Signal
 - = Stop Sign
 - = Travel Lanes

Interstate 29 Exit 77
 Traffic Conditions Year 2020

NORTH

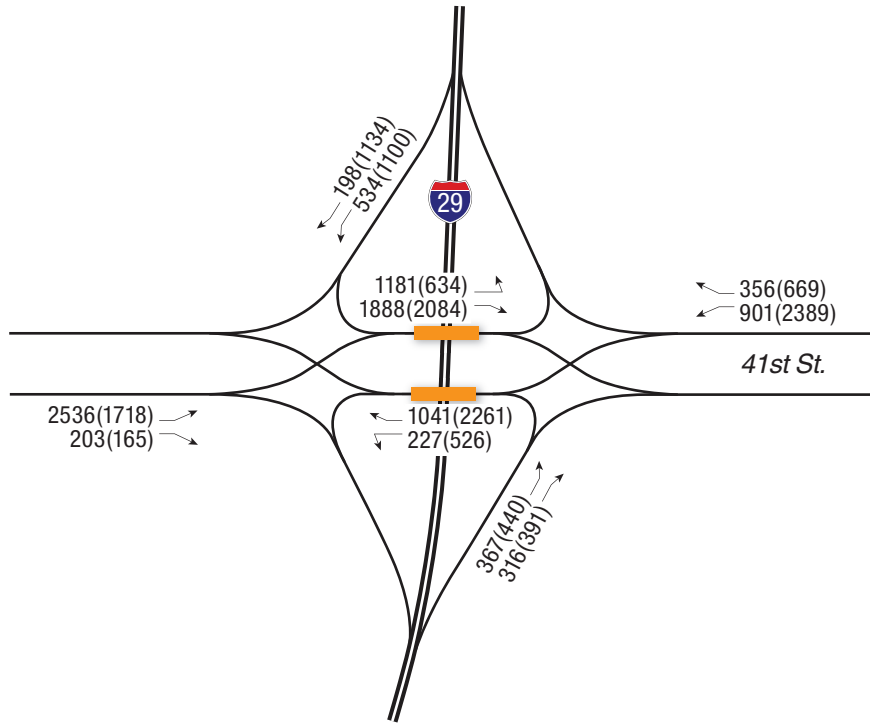




Interstate 29 Exit 77
 Traffic Conditions Year 2030

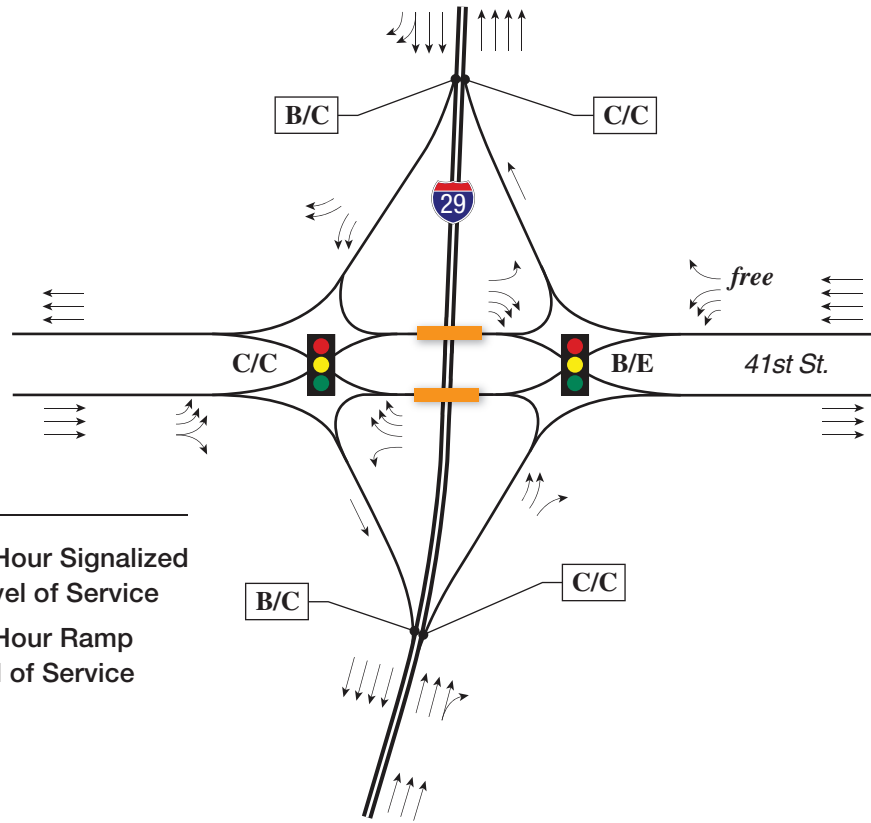
NORTH





LEGEND

XXX(XXX) = AM(PM) Peak Hour Traffic Volumes



LEGEND

X/X = AM/PM Peak Hour Signalized Movement Level of Service

X/X = AM/PM Peak Hour Ramp Junction Level of Service

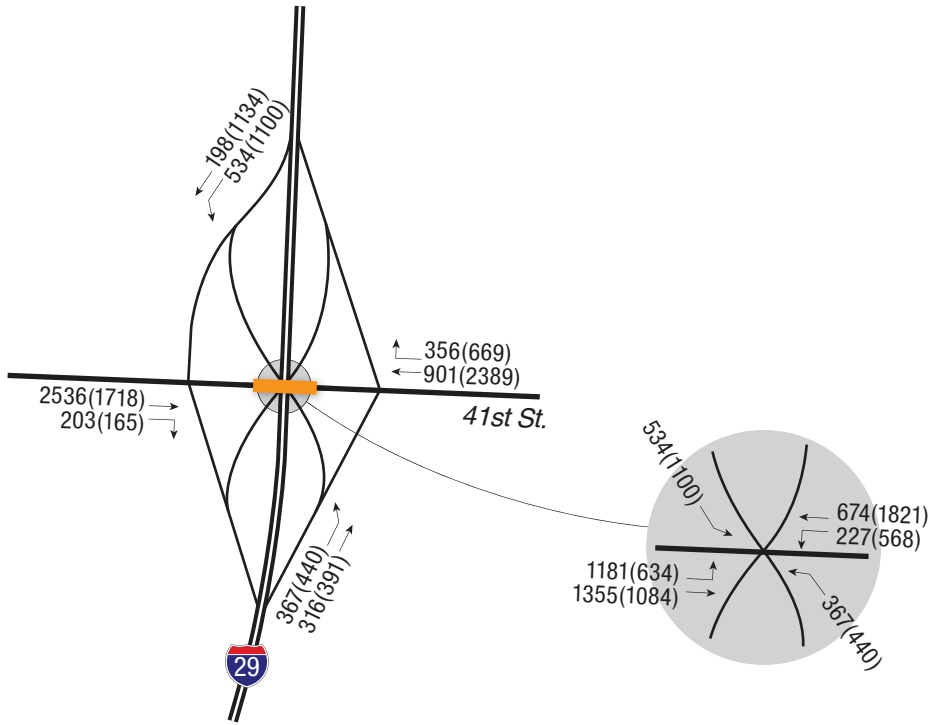
= Traffic Signal

= Travel Lanes

Interstate 29 Exit 77
 Diverging Diamond Alternative
 Traffic Conditions Year 2030

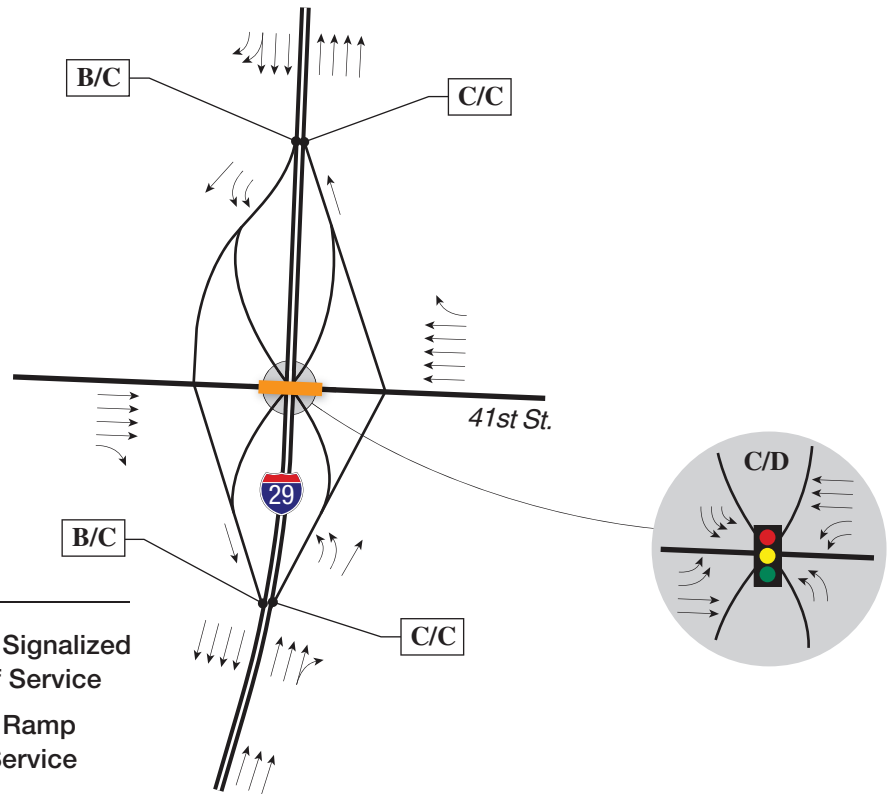
NORTH





LEGEND

XXX(XXX) = AM(PM) Peak Hour Traffic Volumes



LEGEND

X/X = AM/PM Peak Hour Signalized Movement Level of Service

X/X = AM/PM Peak Hour Ramp Junction Level of Service

= Traffic Signal

= Travel Lanes

Interstate 29 Exit 77
 SPUI Alternative
 Traffic Conditions Year 2030



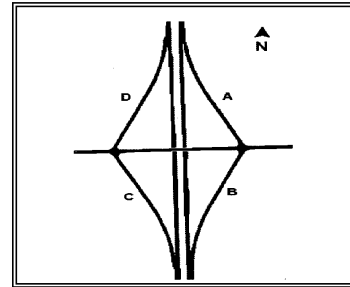
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I-29 EXIT 86 RENNER/CROOKS

INTERCHANGE GEOMETRICS CHECKLIST
SDDOT Interstate Corridor Study

Interstate: I-29
Interchange: Exit 86
Analyst: JLB
Date: 1/20/2010

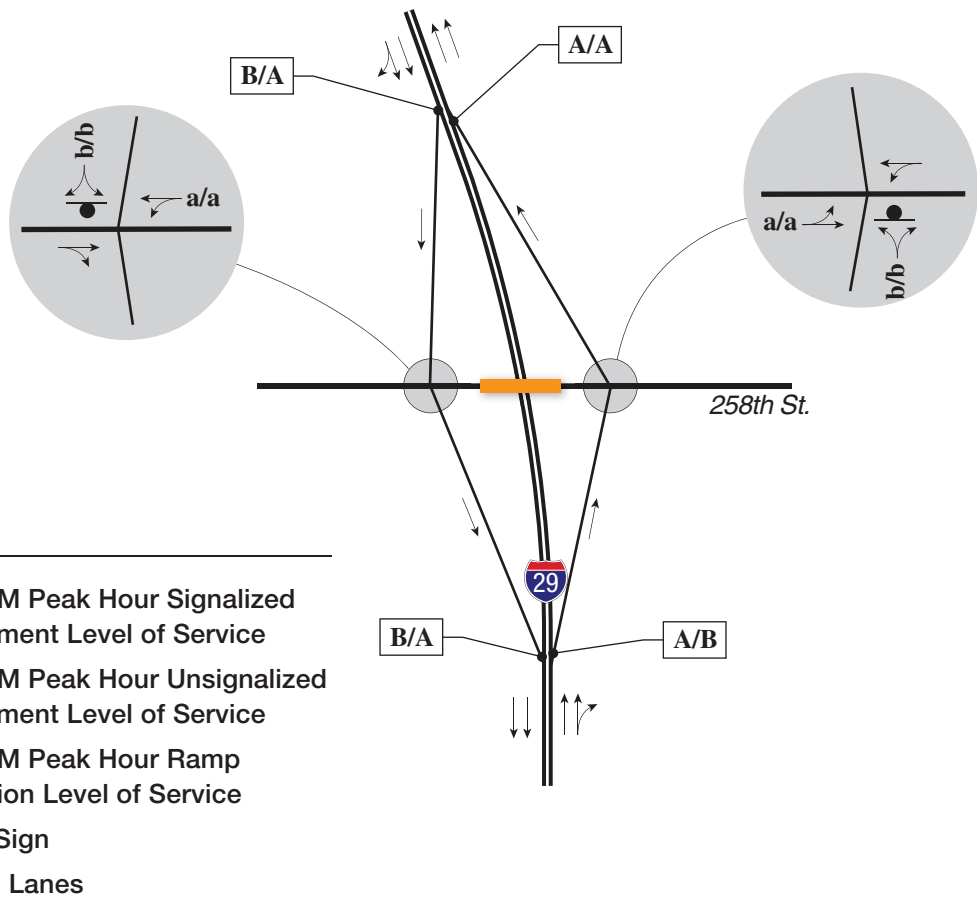
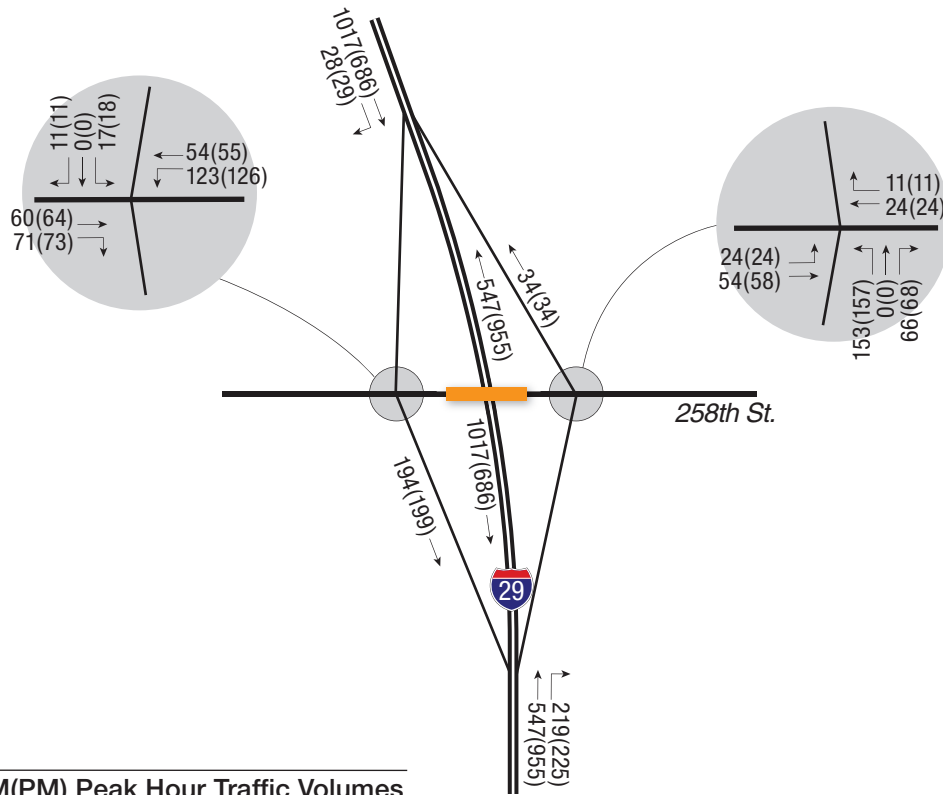


Interchange Geometry	Criteria	A	B	C	D	Achieved?
Interchange Type (Diamond, Full/Partial Cloverleaf, Trumpet etc.)	Diamond					-----
Design Speed	50 mph**					
Number of Lanes		1	1	1	1	
Right Turn Storage Length						
Left Turn Storage Length						
Superelevation (e max)	6%	3.00%	5.00%	3.00%	5.00%	Acceptable
Minimum Horizontal Radius for e max of 6% (50 mph / 30 mph)	833 / 231 feet	1910'	1910'	1910'	1910'	Acceptable
Maximum Degree of Curvature (50 mph / 30 mph)	6° 53' / 24° 48'	3° 00'	3° 00'	3° 00'	3° 00'	Acceptable
Minimum Clear Zone From the Edge of Travel Lane	30 feet	< 30'	< 30'	< 30'	< 30'	Supports Impr.
Maximum Grade on Ramp (Ascending)	+3% to +5%	-	2.90%	-	3.57%	Acceptable
Maximum Grade on Ramp (Descending)	-3% to -5%	-2.59%	-	-4.61%	-	Acceptable
Minimum Lane Width						
With Auxiliary Lanes	12 feet	-	-	-	-	
As Single Lane	15 feet (19 for loops)	16.5'	18.0'	17.5'	15.0'	Acceptable
Shoulder Width						
Right Shoulder	8 feet (4 for loops)	5.5'	5.0'	4.0'	6.5'	Supports Impr.
Left Shoulder	2 feet	3.5'	3.5'	2.5'	1.0'	Supports Impr.
Inslope	6:1	3:1	3:1	3:1	3:1	Supports Impr.
Minimum Off-Ramp Taper Rate	20:1	-	41:1	-	41:1	Acceptable
Minimum On-Ramp Taper Rate	50:1	62:1	-	62:1	-	Acceptable
Ramp Features						
K-Value Ranges						
Minimum for a Crest Vertical Curve (50 mph / 30 mph)	84 / 19	192	285	129	117	Acceptable
Minimum for a Sag Vertical Curve (50 mph / 30 mph)	96 / 37	221	193	152	154	Acceptable
Minimum Stopping Sight Distance (50 mph / 30 mph)	425 / 200 feet	719'	835'	547'	570'	Acceptable
Cross Road Features						
K-Value Ranges		To West		To East		
Minimum for a Crest Vertical Curve (50 mph / 30 mph)	84 / 19	141		171		Acceptable
Minimum for a Sag Vertical Curve (50 mph / 30 mph)	96 / 37	-		397		Acceptable
Minimum Stopping Sight Distance (50 mph / 30 mph)	425 / 200 feet	551'		620'		Acceptable
Ramp Intersection Sight Distance (50 mph / 30 mph)***	425 / 200 feet	ok		ok		Acceptable
Maximum Longitudinal Grade - Rolling Terrain (Urban Arterial)	7%	2.96%		4.22%		Acceptable
Minimum Longitudinal Grade (Min. / Des.)	0.3% / 0.5%	1.30%		3.47%		Acceptable
Minimum Control of Access from Interchange Ramps (Min. / Des.)	300 / 660 feet	650'		250'		Supports Impr.

** Loop ramp design speed = 30 mph

***Substandard Intersection Sight Distance locations could not be determined from the interchange plans. Substandard locations, therefore, are intersections that demonstrate sight distance limitations based on a general field evaluation or the presence of a substandard k-value or Stopping Sight Distance along the crossroad approaching the intersection.

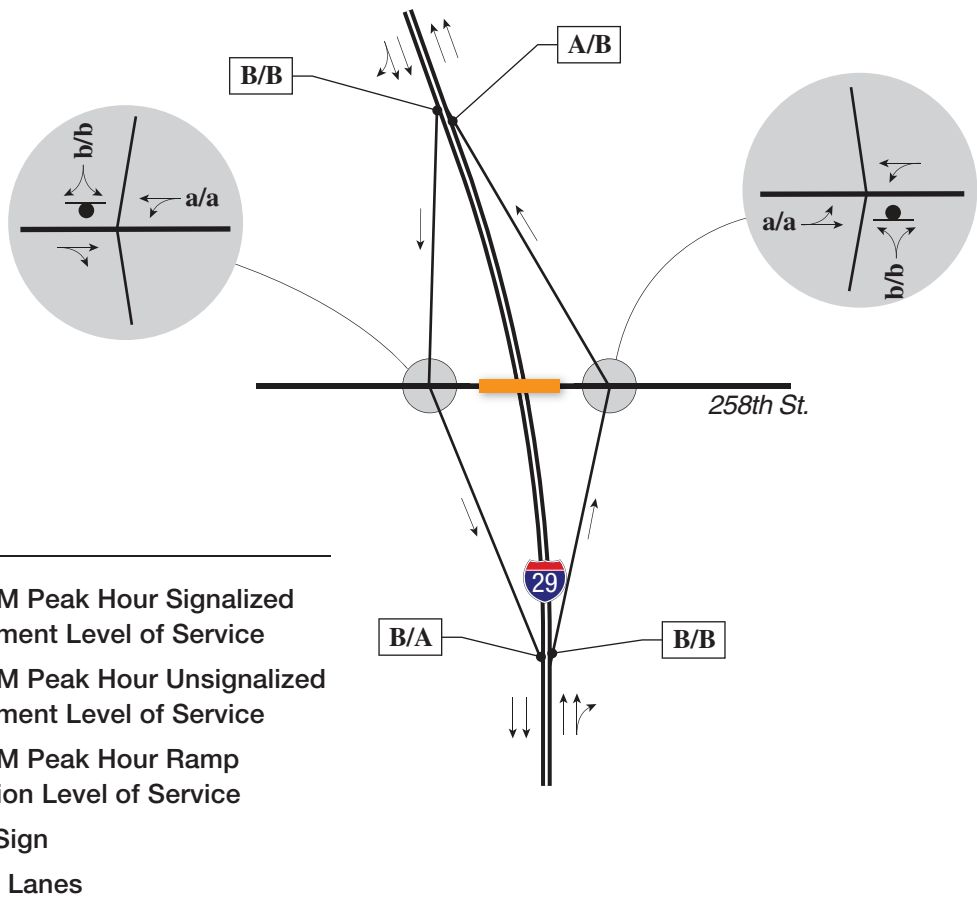
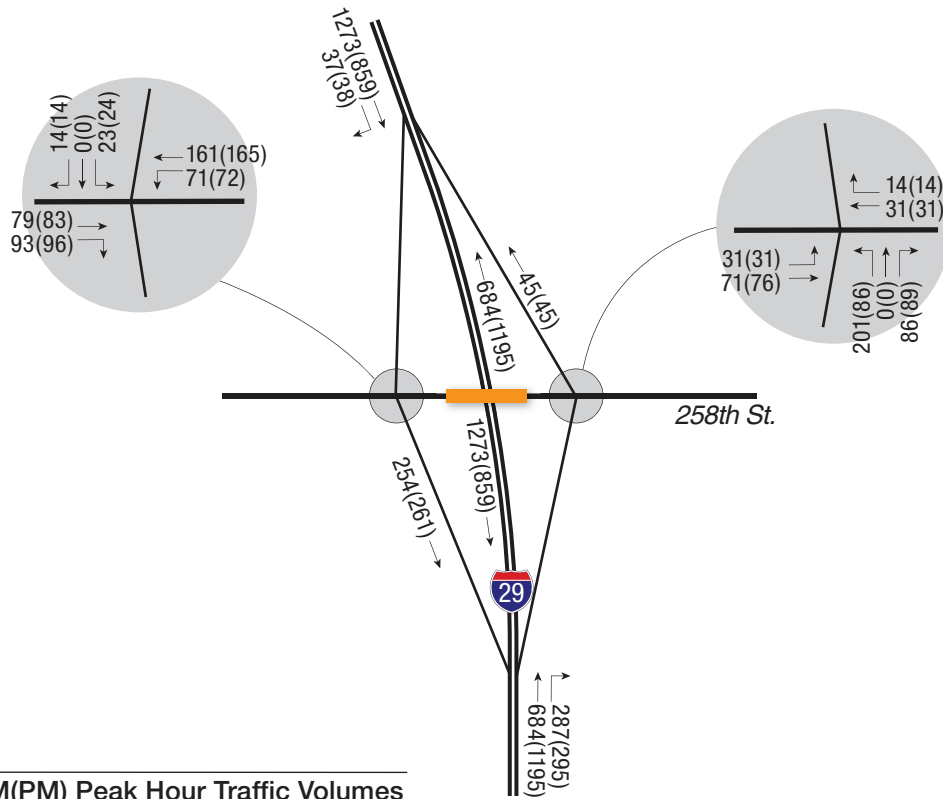
Comments



Interstate 29 Exit 86
 Traffic Conditions Year 2009

NORTH

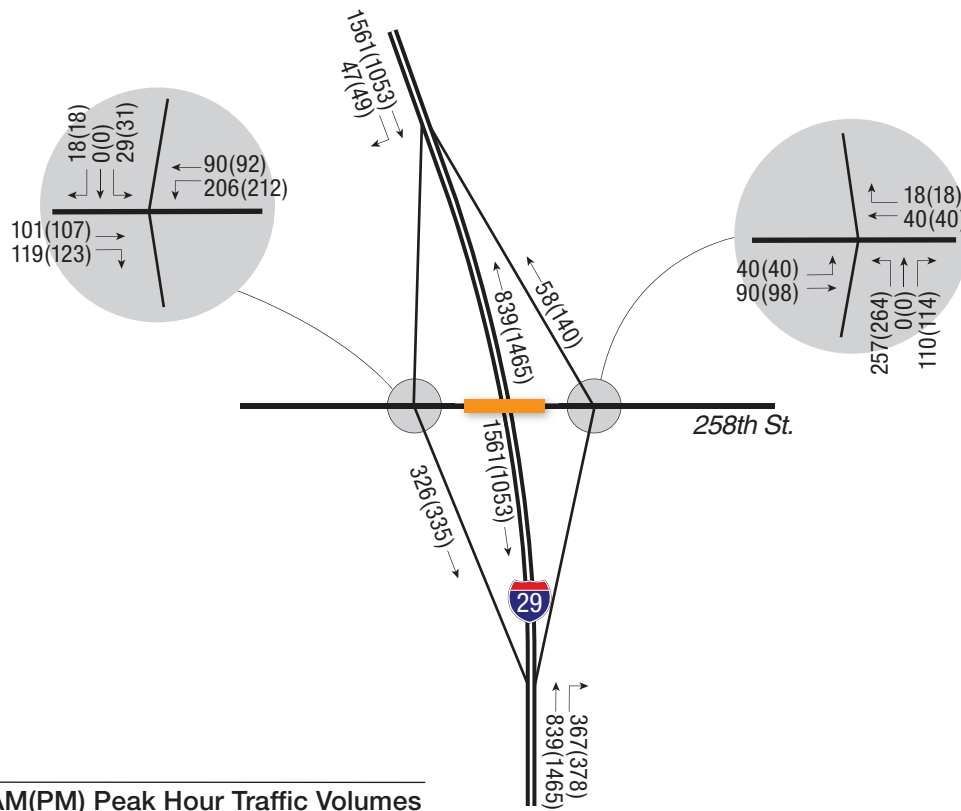




Interstate 29 Exit 86
 Traffic Conditions Year 2020

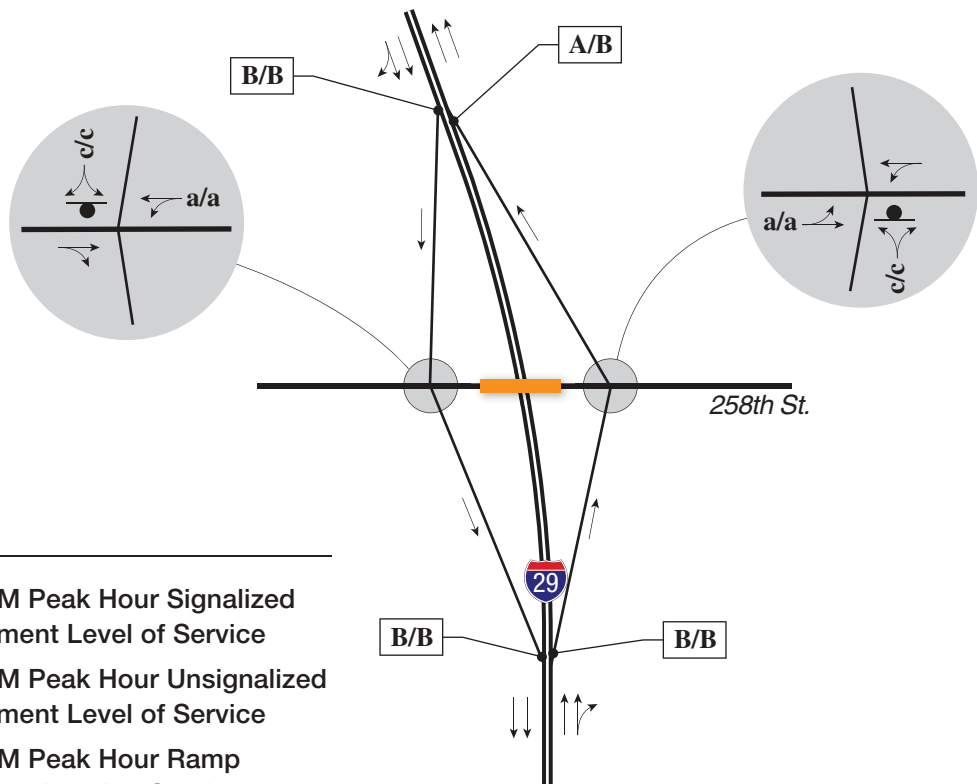
NORTH





LEGEND

XXX(XXX) = AM(PM) Peak Hour Traffic Volumes



LEGEND

- X/X = AM/PM Peak Hour Signalized Movement Level of Service
- x/x = AM/PM Peak Hour Unsignalized Movement Level of Service
- X/X = AM/PM Peak Hour Ramp Junction Level of Service
- = Stop Sign
- ↔ = Travel Lanes

Interstate 29 Exit 86
Traffic Conditions Year 2030

NORTH



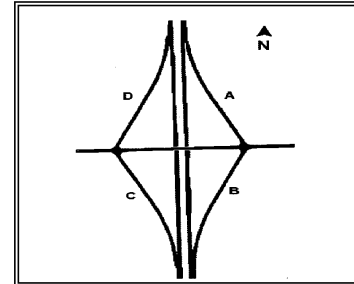
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I-29 EXIT 98 DELL RAPIDS

INTERCHANGE GEOMETRICS CHECKLIST
SDDOT Interstate Corridor Study

Interstate: I-29
Interchange: Exit 98
Analyst: MBM
Date: 1/20/2010

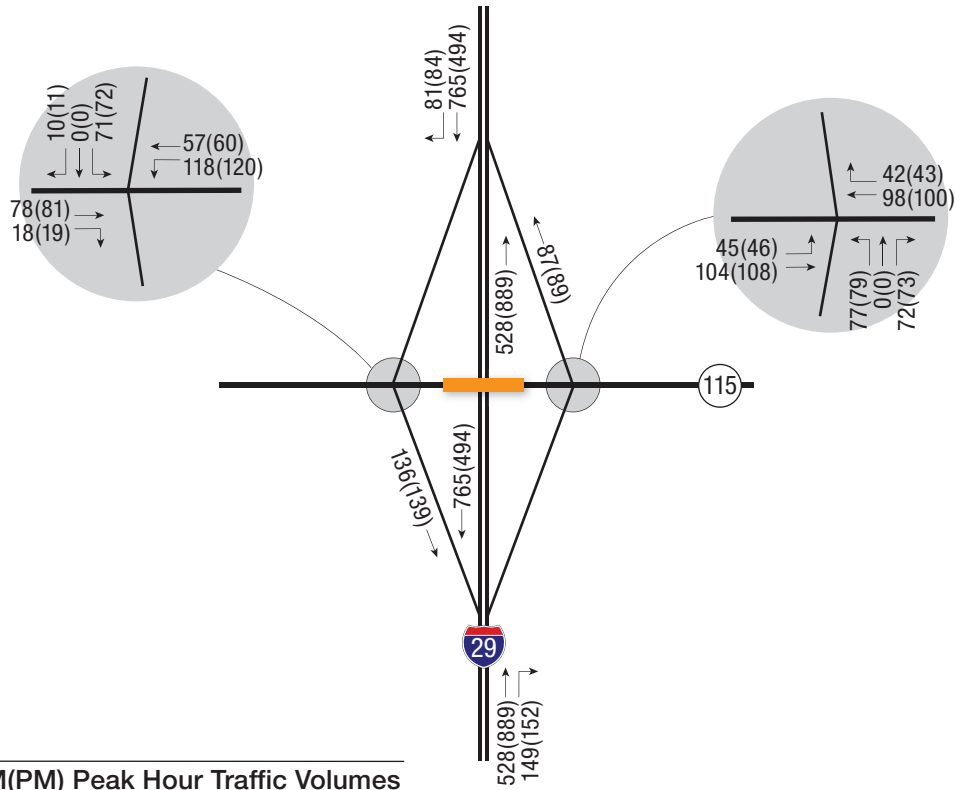


Interchange Geometry	Criteria	A	B	C	D	Achieved?
Interchange Type (Diamond, Full/Partial Cloverleaf, Trumpet etc.)	Diamond					-----
Design Speed	50 mph**					
Number of Lanes		1	1	1	1	
Right Turn Storage Length		-	-	-	-	
Left Turn Storage Length		-	-	-	-	
Superelevation (e max)	6%	3.00%	-	-	5.00%	Acceptable
Minimum Horizontal Radius for e max of 6% (50 mph / 30 mph)	833 / 231 feet	1910'	1910'	1910'	1910'	Acceptable
Maximum Degree of Curvature (50 mph / 30 mph)	6° 53' / 24° 48'	3° 00'	3° 00'	3° 00'	3° 00'	Acceptable
Minimum Clear Zone From the Edge of Travel Lane	30 feet	>30'	>30'	>30'	>30'	Acceptable
Maximum Grade on Ramp (Ascending)	+3% to +5%	-	2.10%	-	4.10%	Acceptable
Maximum Grade on Ramp (Descending)	-3% to -5%	-2.14%	-	-3.82%	-	Acceptable
Minimum Lane Width						
With Auxiliary Lanes	12 feet	-	-	-	-	
As Single Lane	15 feet (19 for loops)	16.0'	15.5'	16.0'	15.5'	Acceptable
Shoulder Width						
Right Shoulder	8 feet (4 for loops)	3.0'	5.5'	5.5'	5.0'	Supports Impr.
Left Shoulder	2 feet	3.0'	3.5'	3.5'	5.5'	Acceptable
Inslope	6:1	4:1	4:1	4:1	4:1	Supports Impr.
Minimum Off-Ramp Taper Rate	20:1	-	40:1	-	40:1	Acceptable
Minimum On-Ramp Taper Rate	50:1	61:1	-	61:1	-	Acceptable
Ramp Features						
K-Value Ranges						
Minimum for a Crest Vertical Curve (50 mph / 30 mph)	84 / 19	-	108	172	90	Acceptable
Minimum for a Sag Vertical Curve (50 mph / 30 mph)	96 / 37	503	385	150	141	Acceptable
Minimum Stopping Sight Distance (50 mph / 30 mph)	425 / 200 feet	>425'	537'	770'	1,322'	Acceptable
Cross Road Features						
K-Value Ranges						
Minimum for a Crest Vertical Curve (50 mph / 30 mph)	84 / 19	To West		To East		
Minimum for a Sag Vertical Curve (50 mph / 30 mph)	96 / 37	220		220		Acceptable
Minimum Stopping Sight Distance (50 mph / 30 mph)	425 / 200 feet	689'		689'		Acceptable
Ramp Intersection Sight Distance (50 mph / 30 mph)***	425 / 200 feet	ok		ok		Acceptable
Maximum Longitudinal Grade - Rolling Terrain (Urban Arterial)	7%	0.54%		3.69%		Acceptable
Minimum Longitudinal Grade (Min. / Des.)	0.3% / 0.5%	-		-		
Minimum Control of Access from Interchange Ramps (Min. / Des.)	300 / 660 feet	250'		650'		Supports Impr.

** Loop ramp design speed = 30 mph

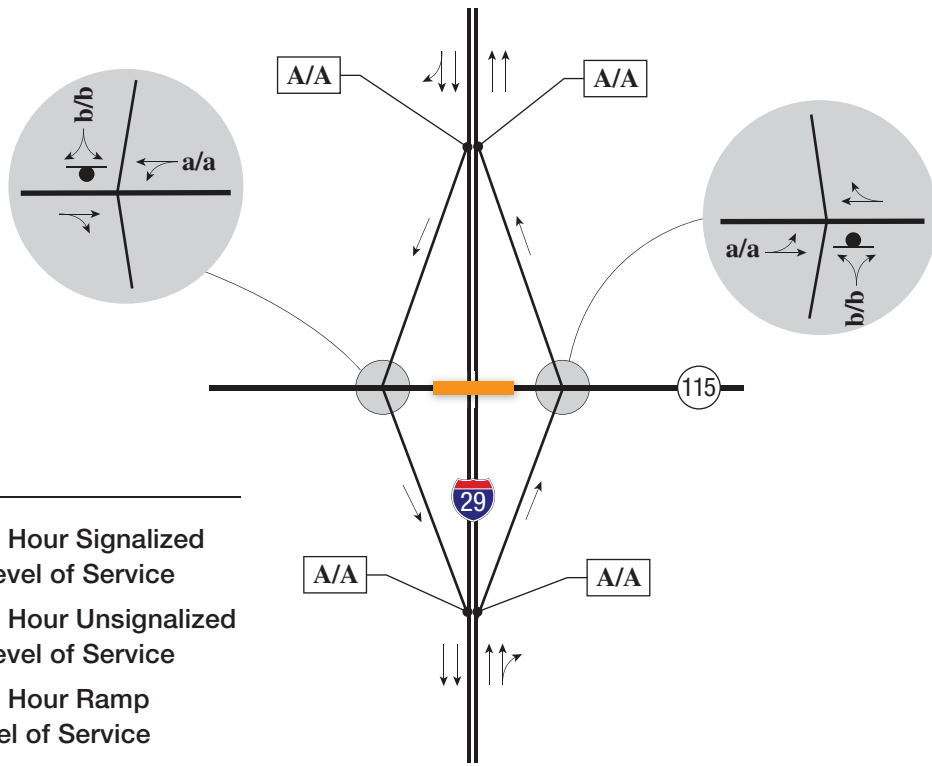
***Substandard Intersection Sight Distance locations could not be determined from the interchange plans. Substandard locations, therefore, are intersections that demonstrate sight distance limitations based on a general field evaluation or the presence of a substandard k-value or Stopping Sight Distance along the crossroad approaching the intersection.

Comments



LEGEND

XXX(XXX) = AM(PM) Peak Hour Traffic Volumes



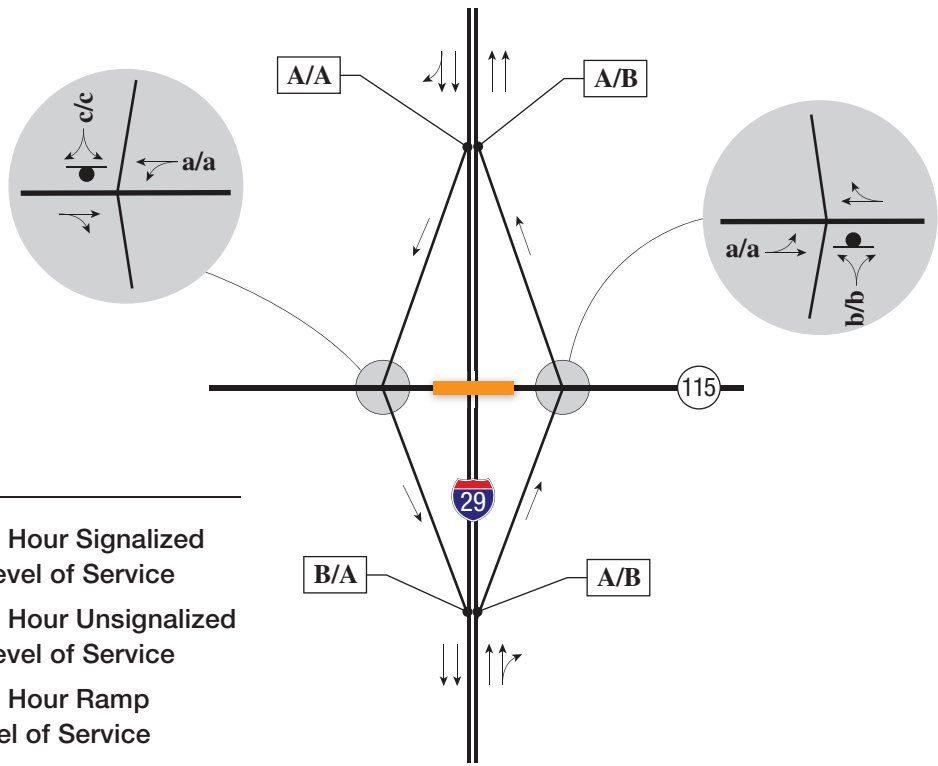
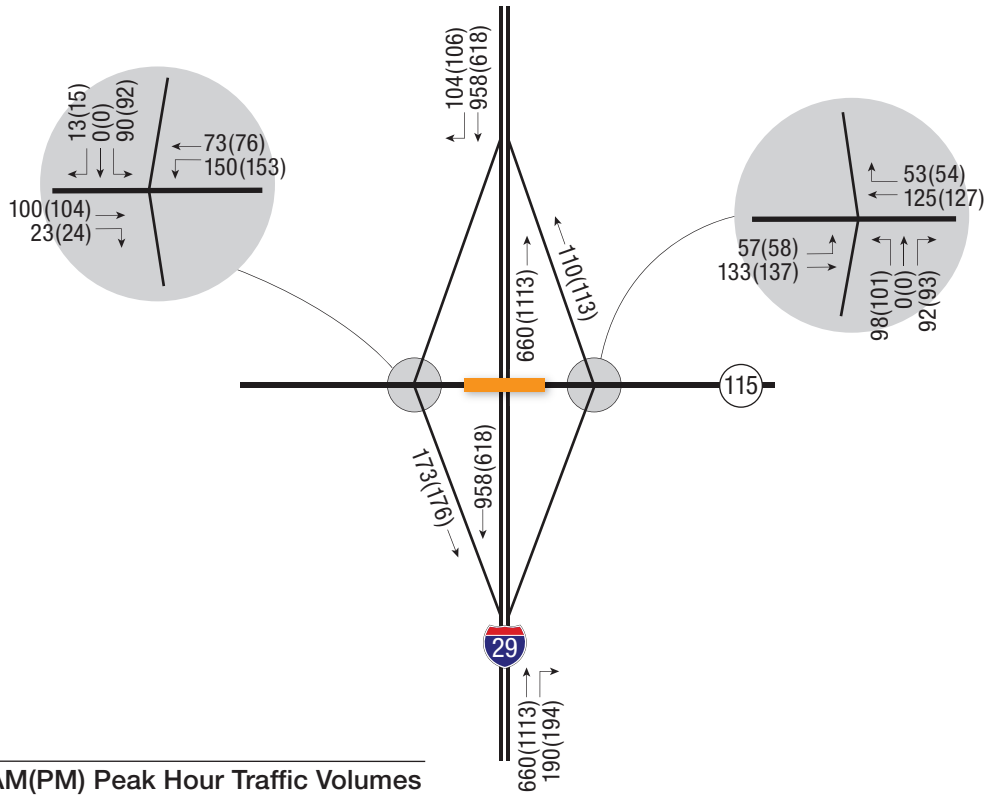
LEGEND

- X/X = AM/PM Peak Hour Signalized Movement Level of Service
- x/x = AM/PM Peak Hour Unsignalized Movement Level of Service
- X/X = AM/PM Peak Hour Ramp Junction Level of Service
- = Stop Sign
- ↔ = Travel Lanes

Interstate 29 Exit 98
Traffic Conditions Year 2009

NORTH

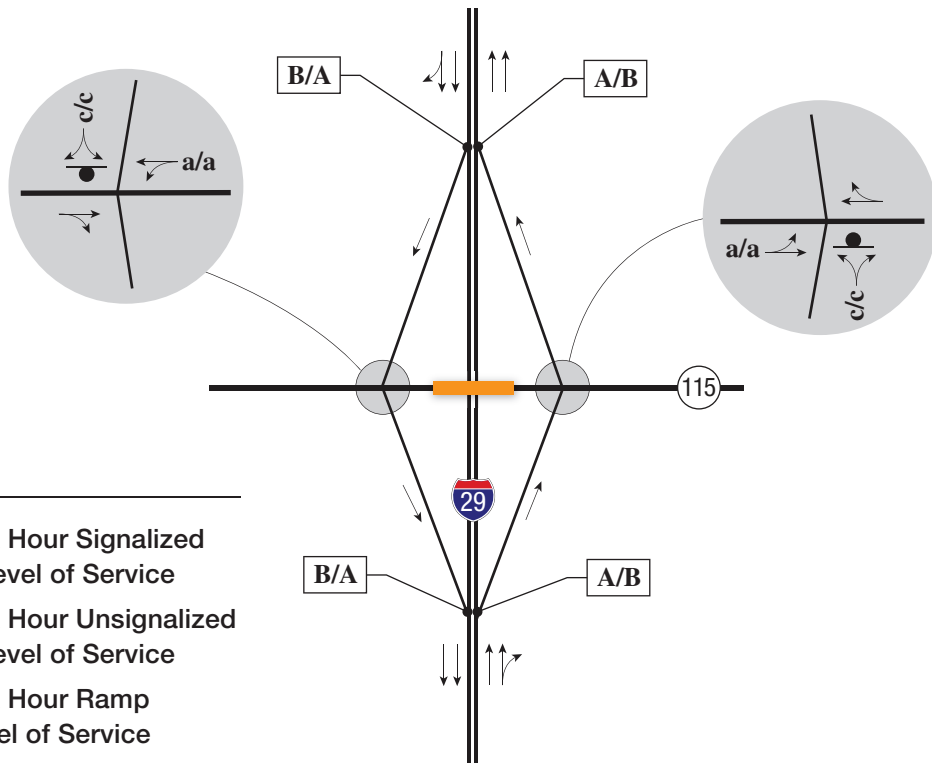
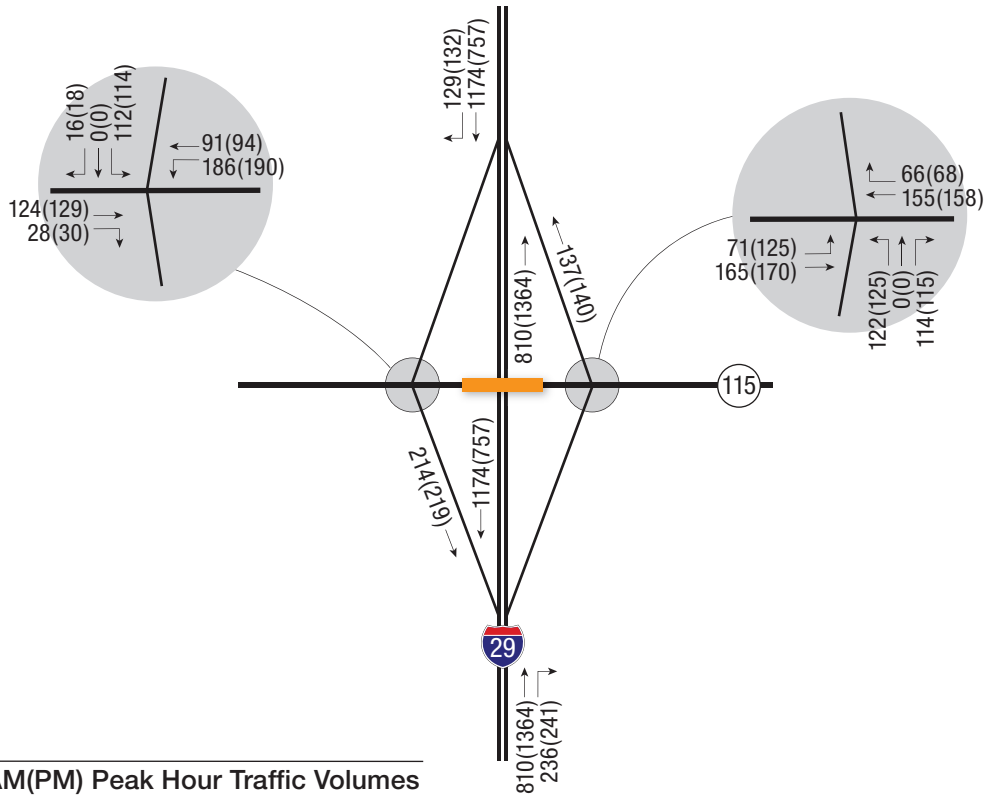




Interstate 29 Exit 98
 Traffic Conditions Year 2020

NORTH





Interstate 29 Exit 98
 Traffic Conditions Year 2030

NORTH



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I-229 EXIT 2 WESTERN AVE



Figure 1
I-229 Exit 2 - Western Ave
Lane Addition and Striping Plan

Probable Construction Costs
I-229 Exit 2 - Lane Addition and Striping Plan

<i>Item Description</i>	<i>Quantity</i>	<i>Unit</i>	<i>Unit Cost</i>	<i>Total Cost</i>
Mobilization	1	LUMP SUM	\$2,000.00	\$2,000
Traffic Control	1	LUMP SUM	\$3,000.00	\$3,000
Clearing	1	LUMP SUM	\$1,000.00	\$1,000
Removal of Concrete Pavement		SQ. YD.	\$3.88	\$0
Removal of Asphalt Pavement	-	SQ. YD.	\$7.39	\$0
Remove Bridge	-	SQ. FT.	\$9.00	\$0
Borrow, Unclassified Excavation	3,049	CU. YD.	\$5.30	\$16,165
Base Course	20	TON	\$10.64	\$216
Asphalt Composite	-	TON	\$80.91	\$0
PCC Pavement 11" (mainline)	-	SQ. YD.	\$33.12	\$0
PCC Pavement 8" (Cross St)	400	SQ. YD.	\$43.40	\$17,358
Concrete Approach Slab	-	SQ. YD.	\$188.34	\$0
Bridges	-	SQ. FT.	\$100.00	\$0
Guard Rail	0	LF	\$100.00	\$0
Permanent Signing/Markings	1	LUMP SUM	\$1,000.00	\$1,000
Traffic Signal	0	EACH	\$125,000.00	\$0
Roadway Lighting	1	LUMP SUM	\$0.00	\$0
Drainage (18" RCP)	15	LF	\$24.53	<u>\$368</u>
Subtotal				\$40,000
Contingencies	25%			<u>\$10,000</u>
Total Probable Construction Costs				\$50,000
Engineering, Administration	15%			\$7,500
Total Project Costs				\$60,000

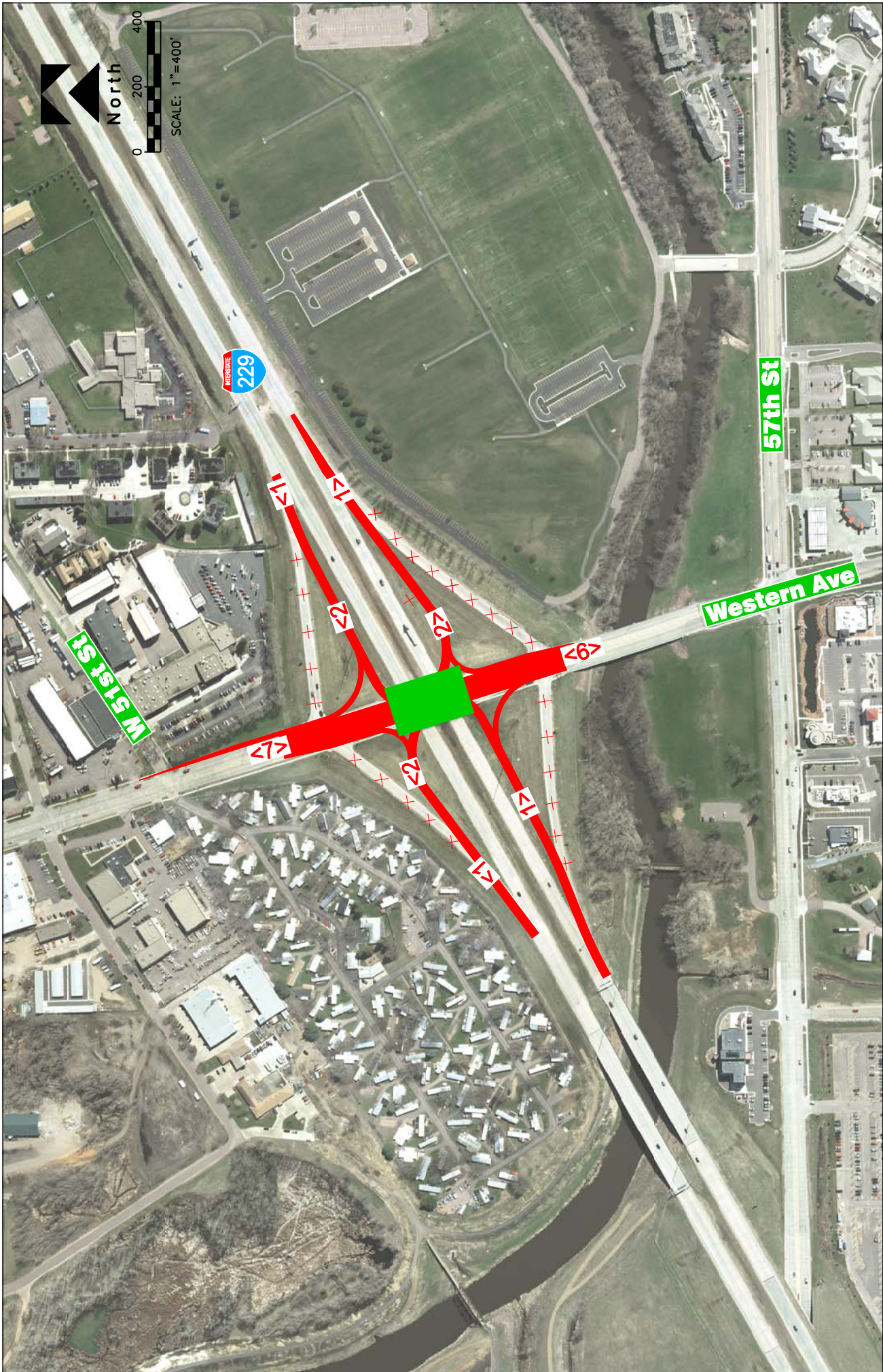


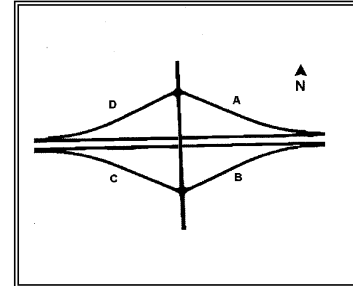
Figure 2
I-229 Exit 2 - Western Ave
Single Point Urban Interchange

Probable Construction Costs
I-229 Exit 2 - Single Point Urban Interchange

<i>Item Description</i>	<i>Quantity</i>	<i>Unit</i>	<i>Unit Cost</i>	<i>Total Cost</i>
Mobilization	1	LUMP SUM	\$353,000.00	\$353,000
Traffic Control	1	LUMP SUM	\$706,000.00	\$706,000
Clearing	1	LUMP SUM	\$141,000.00	\$141,000
Removal of Concrete Pavement	5,400	SQ. YD.	\$3.88	\$20,968
Removal of Asphalt Pavement		SQ. YD.	\$7.39	\$0
Remove Bridge	27,840	SQ. FT.	\$9.00	\$250,560
Borrow, Unclassified Excavation	105,531	CU. YD.	\$5.30	\$559,525
Base Course	4,422	TON	\$10.64	\$47,032
Asphalt Composite	-	TON	\$80.91	\$0
PCC Pavement 8" (cross street)	6,320	SQ. YD.	\$33.12	\$209,325
PCC Pavement 8" (ramps)	9,681	SQ. YD.	\$43.40	\$420,088
Concrete Approach Slab	9,600	SQ. YD.	\$188.34	\$1,808,083
Bridges	36,480	SQ. FT.	\$100.00	\$3,648,000
Guard Rail	900	LF	\$100.00	\$90,000
Permanent Signing/Markings	1	LUMP SUM	\$210,000.00	\$210,000
Traffic Signal	1	EACH	\$125,000.00	\$125,000
Roadway Lighting	1	LUMP SUM	\$140,000.00	\$140,000
Drainage (18" RCP)	90	LF	\$24.53	<u>\$2,208</u>
Subtotal				\$8,730,000
Contingencies	25%			<u>\$2,182,500</u>
Total Probable Construction Costs				\$10,910,000
Engineering, Administration	15%			\$1,636,500
Total Project Costs				\$12,550,000

INTERCHANGE GEOMETRICS CHECKLIST
SDDOT Interstate Corridor Study

Interstate: I-229
Interchange: Exit 2
Analyst: BLM
Date: 1/20/2010



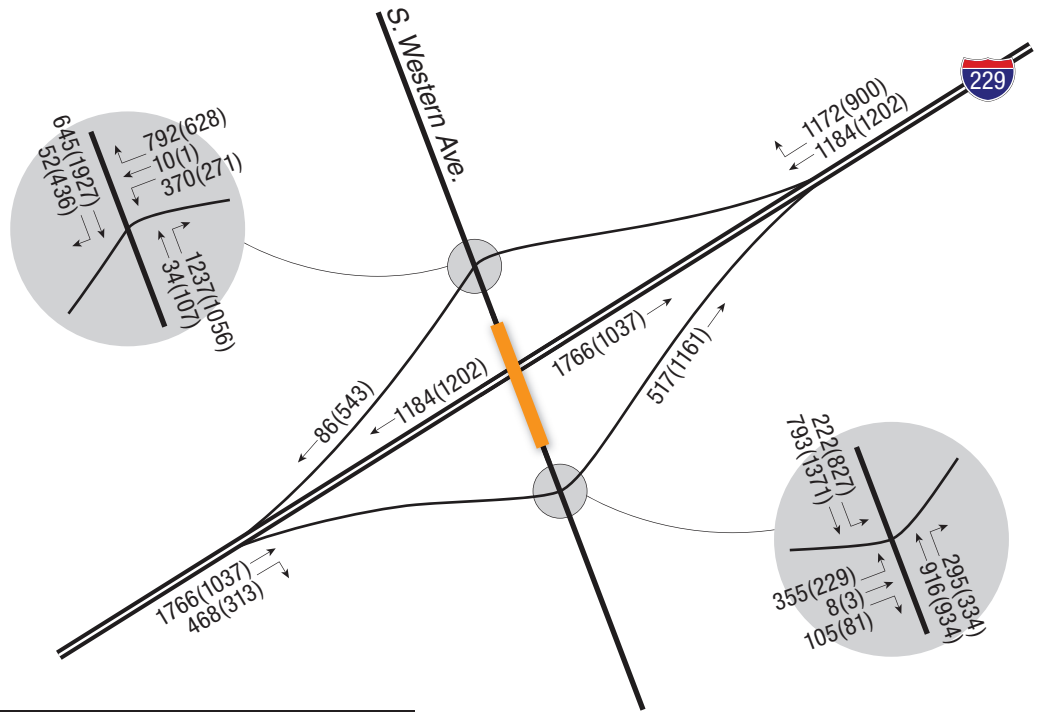
Interchange Geometry	Criteria	A	B	C	D	Achieved?
Interchange Type (Diamond, Full/Partial Cloverleaf, Trumpet etc.)	Diamond					-----
Design Speed	50 mph**					
Number of Lanes		1	1	1	1	
Right Turn Storage Length		250'	-	250'	-	
Left Turn Storage Length		250'	-	250'	-	
Superelevation (e max)	6%	-	-	-	-	
Minimum Horizontal Radius for e max of 6% (50 mph / 30 mph)	833 / 231 feet	1432'	1637'	716'	716'	Supports Impr.
Maximum Degree of Curvature (50 mph / 30 mph)	6° 53' / 24° 48'	4° 00'	3° 30'	8° 00'	8° 00'	Supports Impr.
Minimum Clear Zone From the Edge of Travel Lane	30 feet	>30'	>30'	>30'	>30'	Acceptable
Maximum Grade on Ramp (Ascending)	+3% to +5%	3.29%	-	4.35	-	Acceptable
Maximum Grade on Ramp (Descending)	-3% to -5%	-	-2.35%	-	-2.80%	Acceptable
Minimum Lane Width						
With Auxiliary Lanes	12 feet	25.5'	29.0'	27.0'	28.0'	Acceptable
As Single Lane	15 feet (19 for loops)					
Shoulder Width						
Right Shoulder	8 feet (4 for loops)	4.0'	2.0'	1.5'	3.0'	Supports Impr.
Left Shoulder	2 feet	1.5'	1.5'	2.0'	2.0'	Supports Impr.
Inslope	6:1	4:1	4:1	4:1	4:1	Supports Impr.
Minimum Off-Ramp Taper Rate	20:1	-	-	-	-	Acceptable
Minimum On-Ramp Taper Rate	50:1	-	-	-	-	Acceptable
Ramp Features						
K-Value Ranges						
Minimum for a Crest Vertical Curve (50 mph / 30 mph)	84 / 19					
Minimum for a Sag Vertical Curve (50 mph / 30 mph)	96 / 37	72	93	61	62	Supports Impr.
Minimum Stopping Sight Distance (50 mph / 30 mph)	425 / 200 feet	341'	463'	298'	301'	Supports Impr.
Cross Road Features						
K-Value Ranges		To North		To South		
Minimum for a Crest Vertical Curve (50 mph / 30 mph)	84 / 19	116		116		Acceptable
Minimum for a Sag Vertical Curve (50 mph / 30 mph)	96 / 37	74		120		Supports Impr.
Minimum Stopping Sight Distance (50 mph / 30 mph)	425 / 200 feet	344'		392'		Supports Impr.
Ramp Intersection Sight Distance (50 mph / 30 mph)***	425 / 200 feet	substandard		substandard		Supports Impr.
Maximum Longitudinal Grade - Rolling Terrain (Urban Arterial)	7%	3.56%		2.50%		Acceptable
Minimum Longitudinal Grade (Min. / Des.)	0.3% / 0.5%	0.50%		0.00%		Supports Impr.
Minimum Control of Access from Interchange Ramps (Min. / Des.)	300 / 660 feet	350'		750'		Acceptable

** Loop ramp design speed = 30 mph

***Substandard Intersection Sight Distance locations could not be determined from the interchange plans. Substandard locations, therefore, are intersections that demonstrate sight distance limitations based on a general field evaluation or the presence of a substandard k-value or Stopping Sight Distance along the crossroad approaching the intersection.

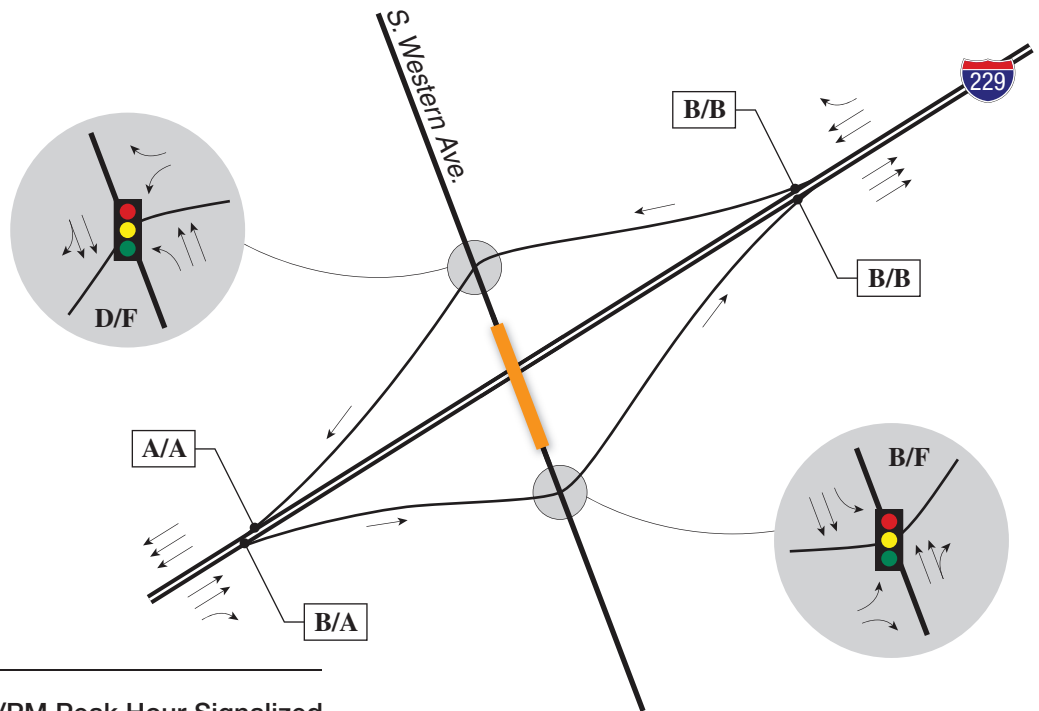
Comments

Auxiliary lanes are on either side of the interchange that continue to next ramp going both directions.
 Plans show new grading over parts with new pavement 6:1
 Rt & Lt storage lengths measured off of aerial photo



LEGEND

XXX(XXX) = AM(PM) Peak Hour Traffic Volumes



LEGEND

X/X = AM/PM Peak Hour Signalized Movement Level of Service

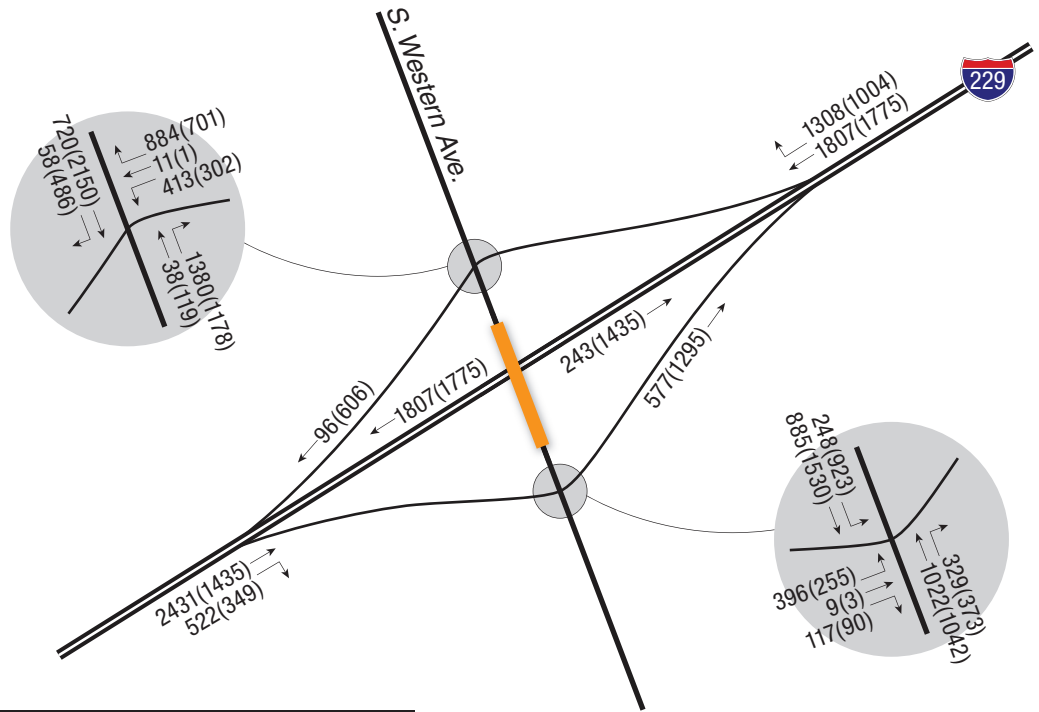
X/X = AM/PM Peak Hour Ramp Junction Level of Service

= Traffic Signal

= Travel Lanes

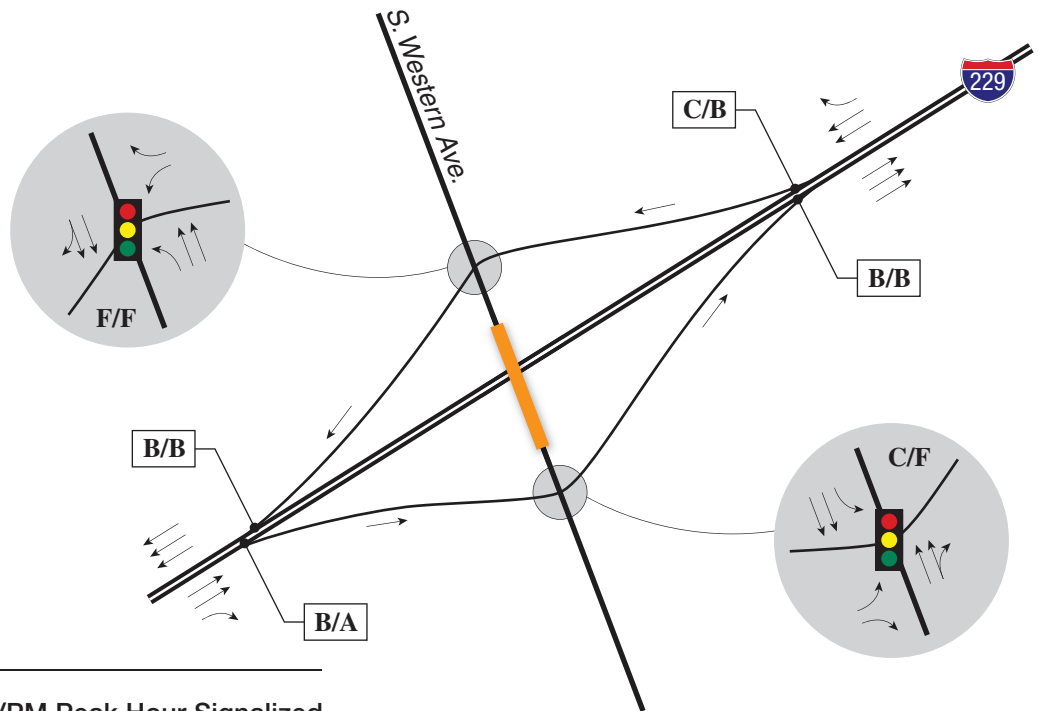
Interstate 229 Exit 2
Traffic Conditions Year 2009

NORTH



LEGEND

XXX(XXX) = AM(PM) Peak Hour Traffic Volumes



LEGEND

X/X = AM/PM Peak Hour Signalized Movement Level of Service

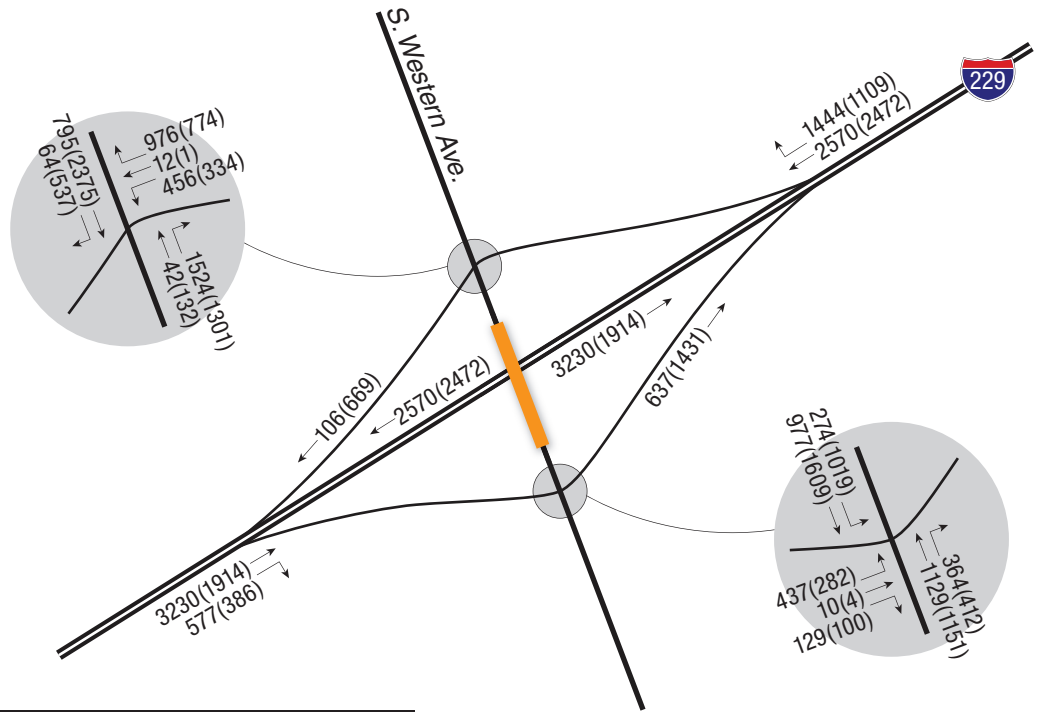
X/X = AM/PM Peak Hour Ramp Junction Level of Service

= Traffic Signal

= Travel Lanes

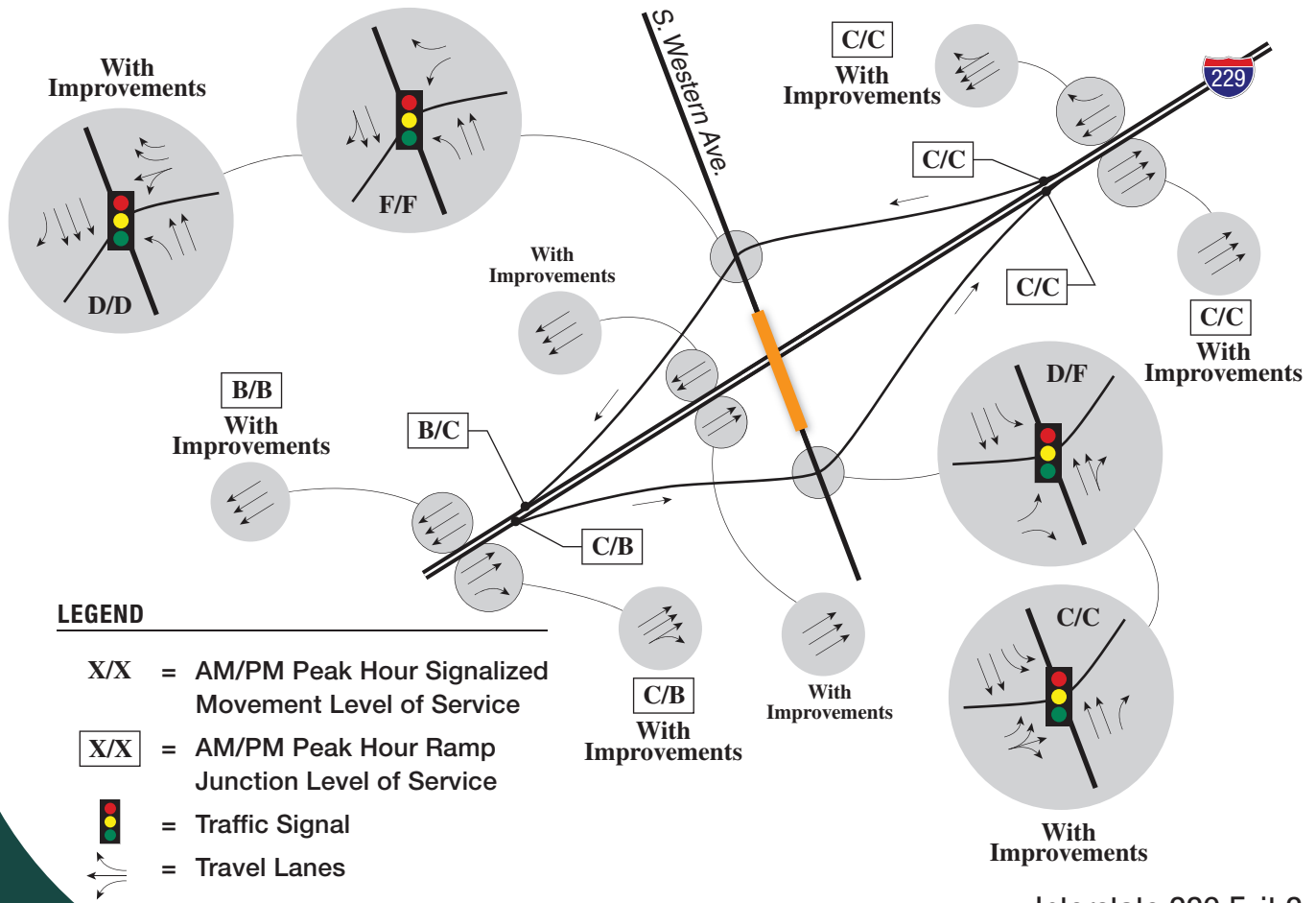
Interstate 229 Exit 2
Traffic Conditions Year 2020

NORTH



LEGEND

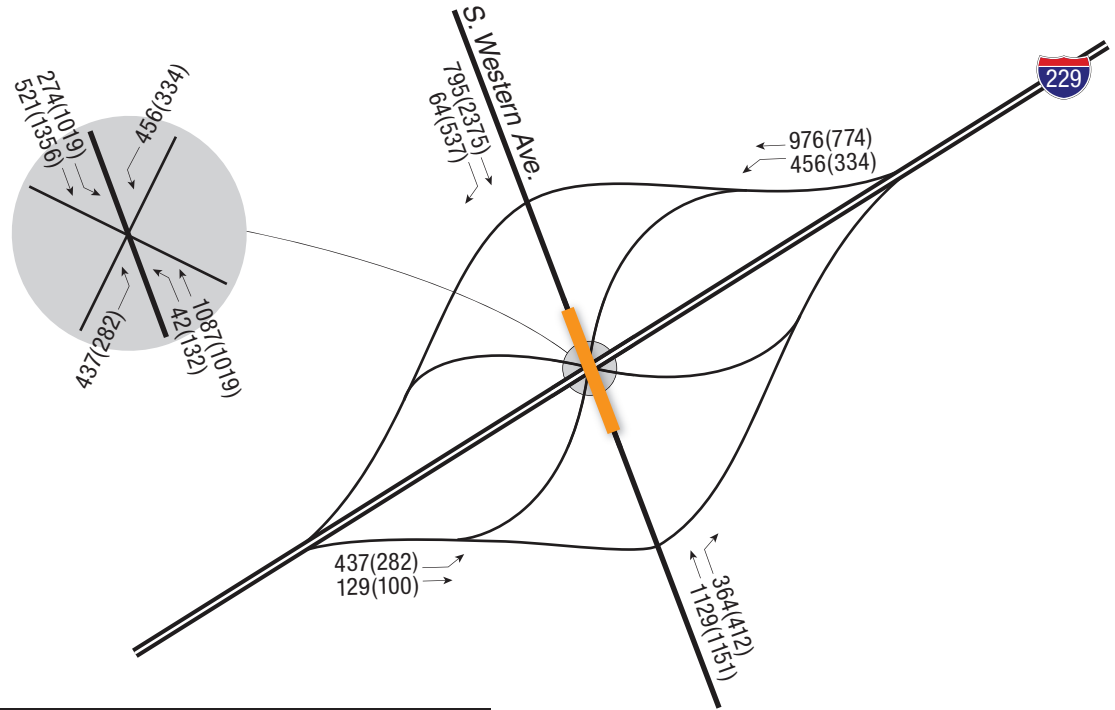
XXX(XXX) = AM(PM) Peak Hour Traffic Volumes



Interstate 229 Exit 2
Traffic Conditions Year 2030

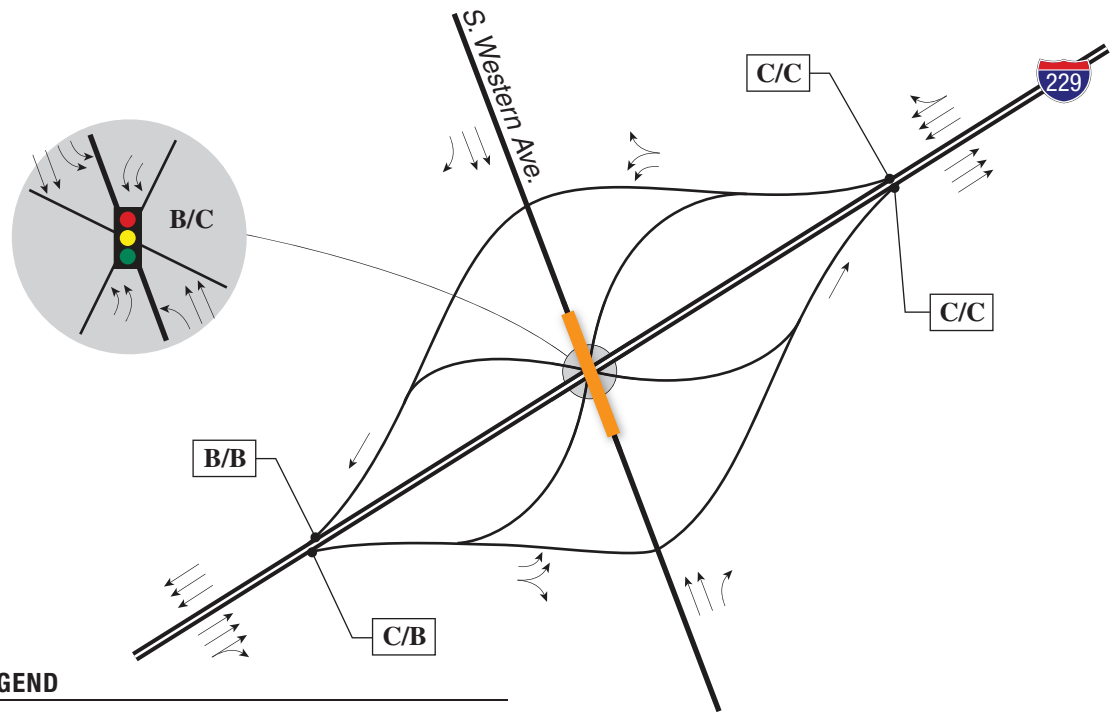
NORTH





LEGEND

XXX(XXX) = AM(PM) Peak Hour Traffic Volumes



LEGEND

X/X = AM/PM Peak Hour Signalized Movement Level of Service

X/X = AM/PM Peak Hour Ramp Junction Level of Service

= Traffic Signal

= Travel Lanes

Interstate 229 Exit 2
 SPUI Alternative
 Traffic Conditions Year 2030

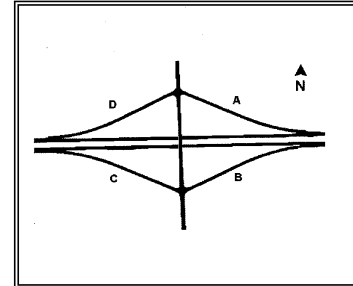




I-229 EXIT 3 MINNESOTA AVE

INTERCHANGE GEOMETRICS CHECKLIST
SDDOT Interstate Corridor Study

Interstate: I-229
Interchange: Exit 3
Analyst: BLM
Date: 1/20/2010



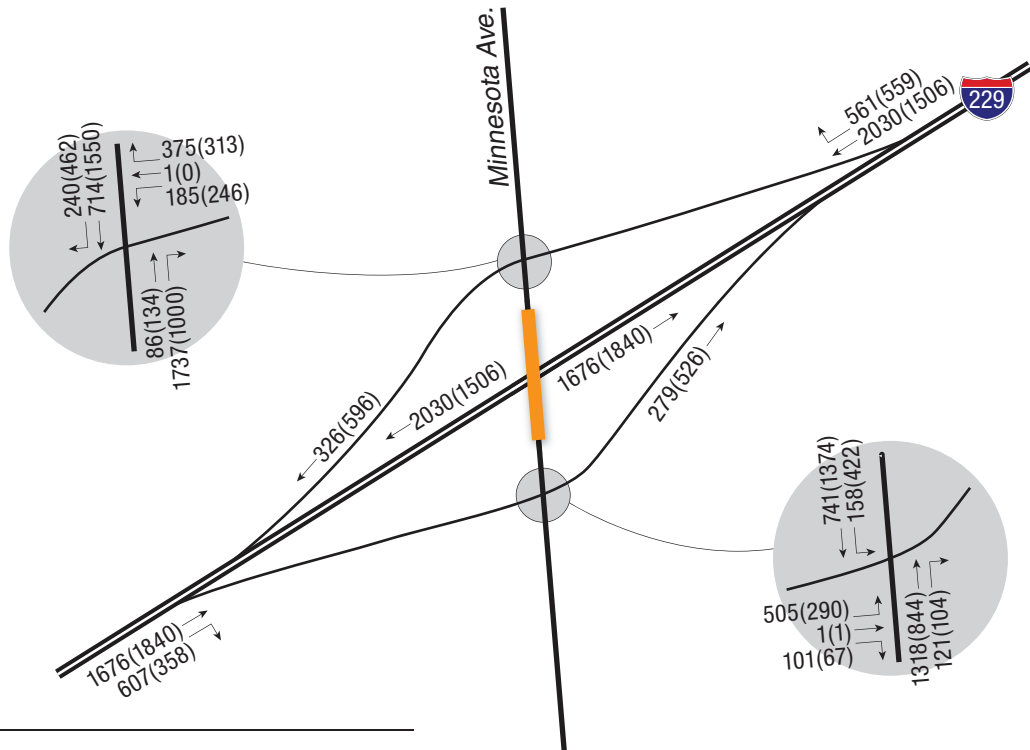
Interchange Geometry	Criteria	A	B	C	D	Achieved?
Interchange Type (Diamond, Full/Partial Cloverleaf, Trumpet etc.)	Diamond					-----
Design Speed	50 mph**					
Number of Lanes		1	1	1	1	
Right Turn Storage Length		250	-	250	-	
Left Turn Storage Length		250	-	250	-	
Superelevation (e max)	6%	4.00%	-	2.00%	5.60%	Acceptable
Minimum Horizontal Radius for e max of 6% (50 mph / 30 mph)	833 / 231 feet	2292'	2292'	2293'	1637'	Acceptable
Maximum Degree of Curvature (50 mph / 30 mph)	6° 53' / 24° 48'	2° 30'	2° 30'	3° 30'	2° 30'	Acceptable
Minimum Clear Zone From the Edge of Travel Lane	30 feet	>30'	>30'	>30'	>30'	Acceptable
Maximum Grade on Ramp (Ascending)	+3% to +5%	0.72%	3.52%	1.13%	2.90%	Acceptable
Maximum Grade on Ramp (Descending)	-3% to -5%	0.63%	-2.66%	-	-2.19%	Acceptable
Minimum Lane Width						
With Auxiliary Lanes	12 feet	20.0'	18.0'	17.5'	20.0'	Acceptable
As Single Lane	15 feet (19 for loops)					
Shoulder Width						
Right Shoulder	8 feet (4 for loops)	3.0'	3.5'	4.0'	3.0'	Supports Impr.
Left Shoulder	2 feet	1.5'	3.5'	3.5'	1.5'	Supports Impr.
Inslope	6:1	4:1	4:1	4:1	4:1	Supports Impr.
Minimum Off-Ramp Taper Rate	20:1	-	-	-	-	Acceptable
Minimum On-Ramp Taper Rate	50:1	-	-	-	-	Acceptable
Ramp Features						
K-Value Ranges						
Minimum for a Crest Vertical Curve (50 mph / 30 mph)	84 / 19	261	110	127	76	Supports Impr.
Minimum for a Sag Vertical Curve (50 mph / 30 mph)	96 / 37	-	-	-	-	
Minimum Stopping Sight Distance (50 mph / 30 mph)	425 / 200 feet	978'	487'	783'	506'	Acceptable
Cross Road Features						
K-Value Ranges		To North		To South		
Minimum for a Crest Vertical Curve (50 mph / 30 mph)	84 / 19	-		-		
Minimum for a Sag Vertical Curve (50 mph / 30 mph)	96 / 37	-		-		
Minimum Stopping Sight Distance (50 mph / 30 mph)	425 / 200 feet	-		-		
Ramp Intersection Sight Distance (50 mph / 30 mph)***	425 / 200 feet					
Maximum Longitudinal Grade - Rolling Terrain (Urban Arterial)	7%	-		-		
Minimum Longitudinal Grade (Min. / Des.)	0.3% / 0.5%	-		-		
Minimum Control of Access from Interchange Ramps (Min. / Des.)	300 / 660 feet	160'		200'		Supports Impr.

** Loop ramp design speed = 30 mph

***Substandard Intersection Sight Distance locations could not be determined from the interchange plans. Substandard locations, therefore, are intersections that demonstrate sight distance limitations based on a general field evaluation or the presence of a substandard k-value or Stopping Sight Distance along the crossroad approaching the intersection.

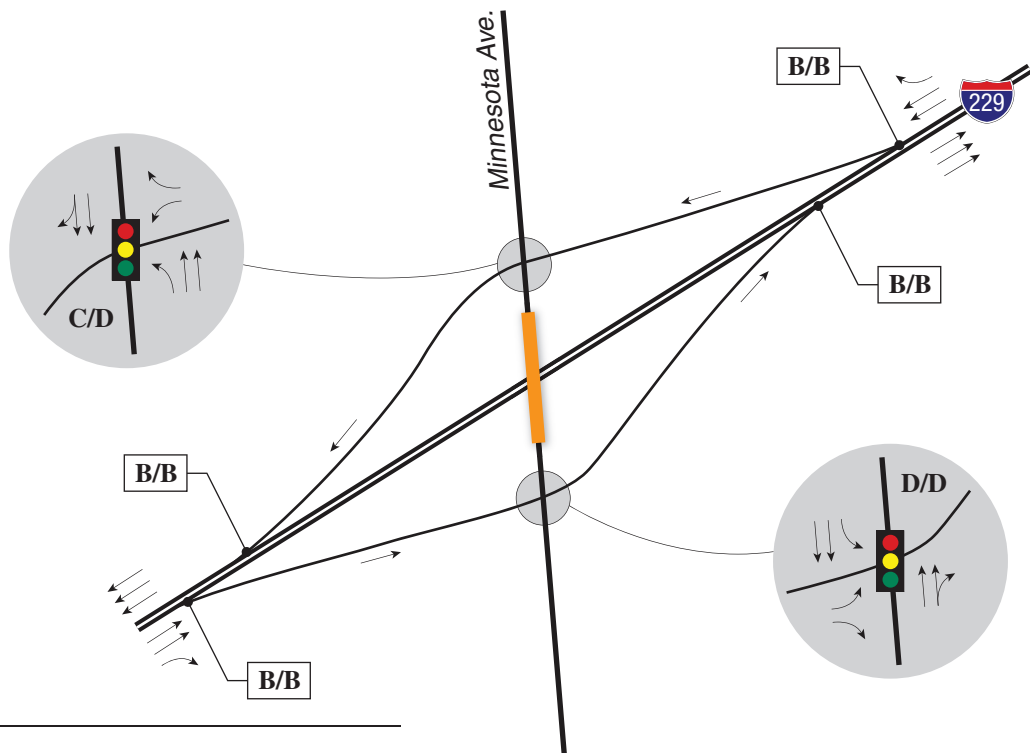
Comments

Auxiliary lanes are on either side of the interchange that continue to next ramp going both directions.
 Plans show 6:1 grading over parts with new pavement
 Ramp A has vertical spline to interstate
 Ramp terminals are signalized



LEGEND

XXX(XXX) = AM(PM) Peak Hour Traffic Volumes



LEGEND

X/X = AM/PM Peak Hour Signalized Movement Level of Service

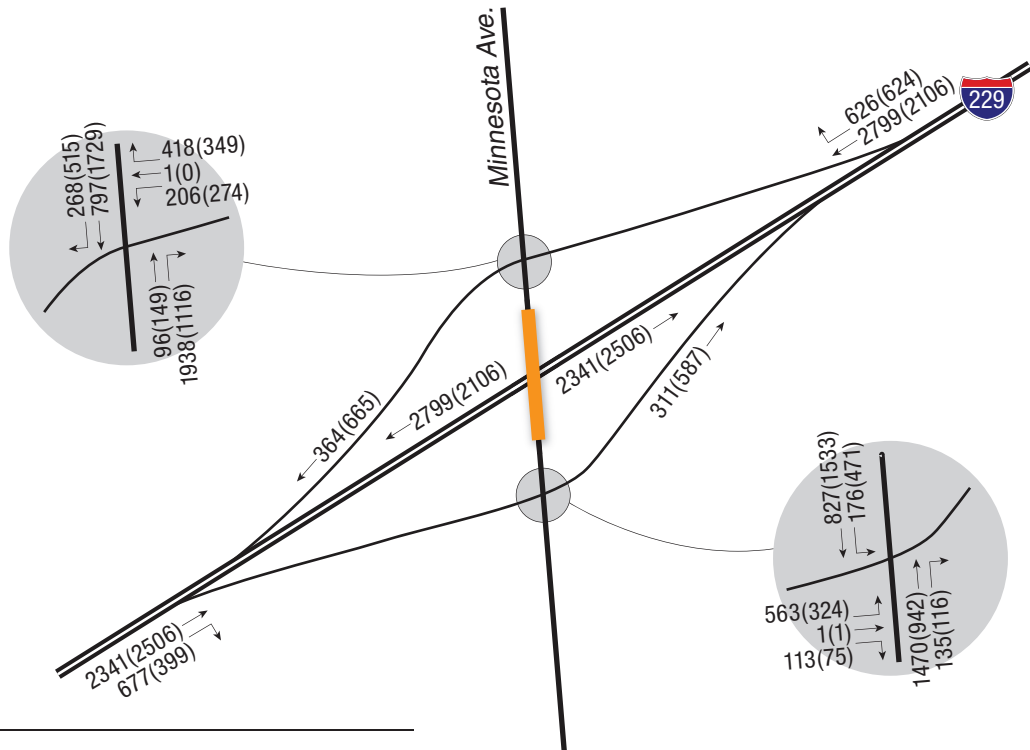
X/X = AM/PM Peak Hour Ramp Junction Level of Service

= Traffic Signal

= Travel Lanes

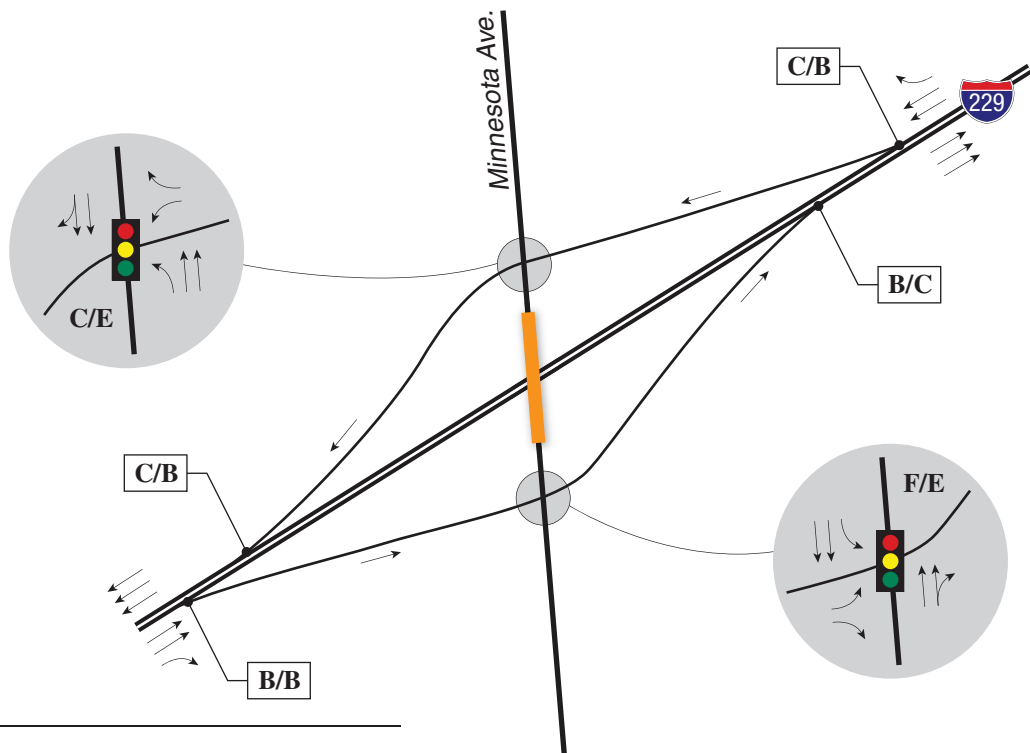
Interstate 229 Exit 3
Traffic Conditions Year 2009

NORTH



LEGEND

XXX(XXX) = AM(PM) Peak Hour Traffic Volumes



LEGEND

X/X = AM/PM Peak Hour Signalized Movement Level of Service

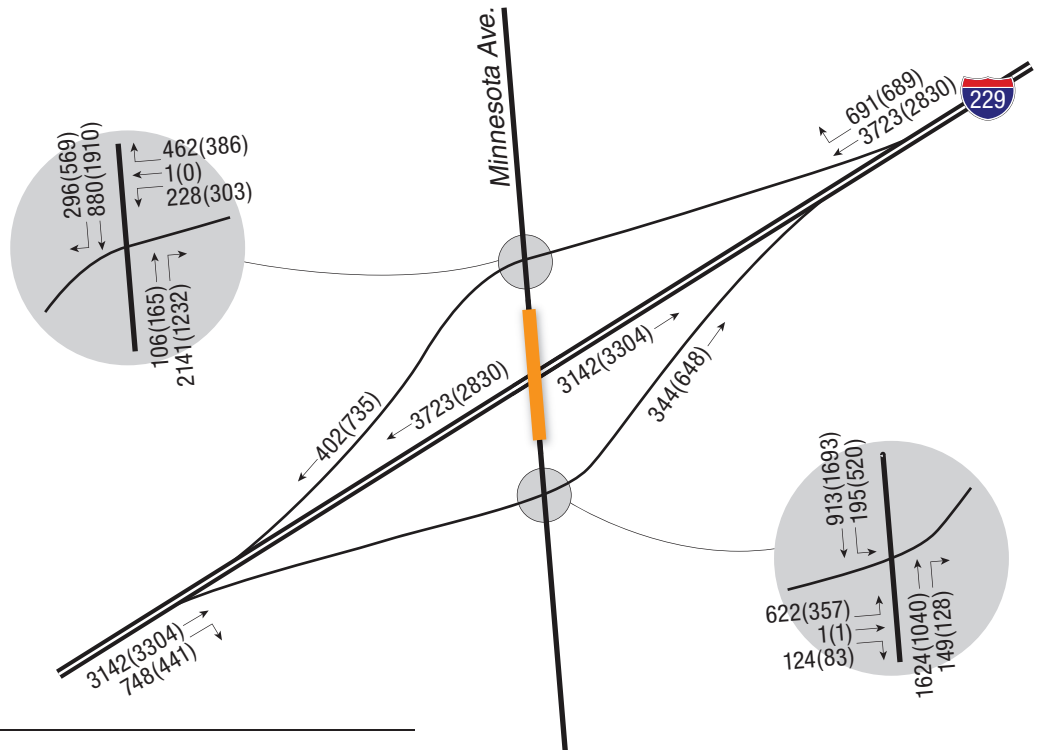
X/X = AM/PM Peak Hour Ramp Junction Level of Service

= Traffic Signal

= Travel Lanes

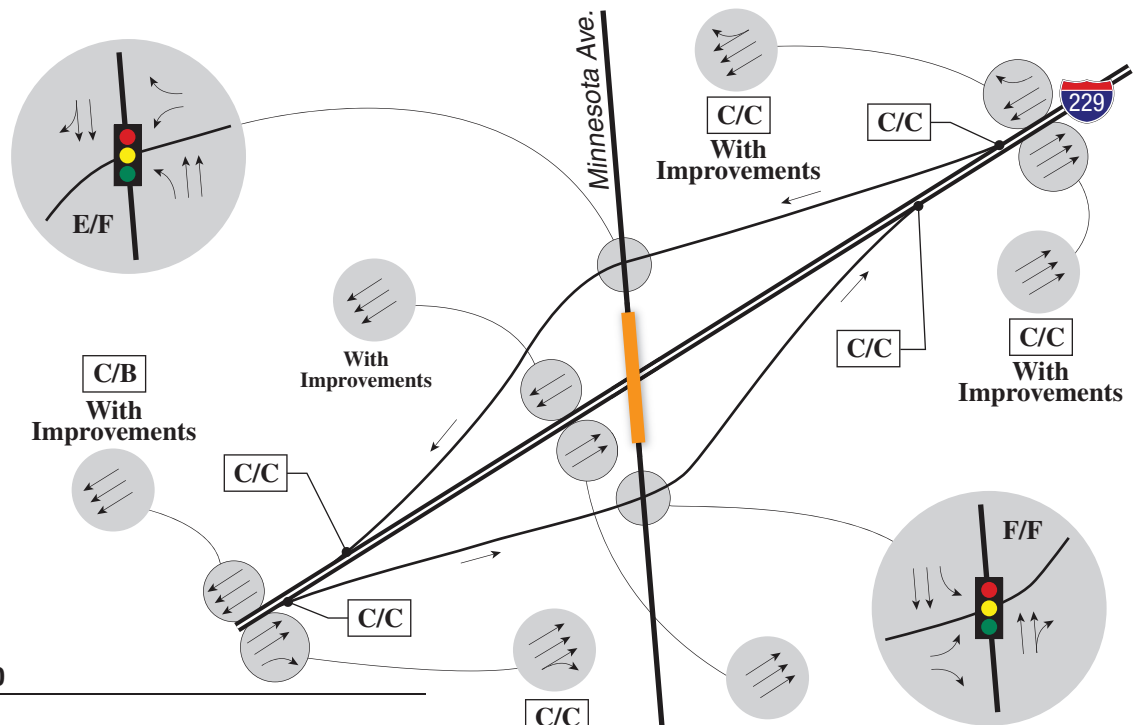
Interstate 229 Exit 3
Traffic Conditions Year 2020

NORTH



LEGEND

XXX(XXX) = AM(PM) Peak Hour Traffic Volumes



LEGEND

X/X = AM/PM Peak Hour Signalized Movement Level of Service

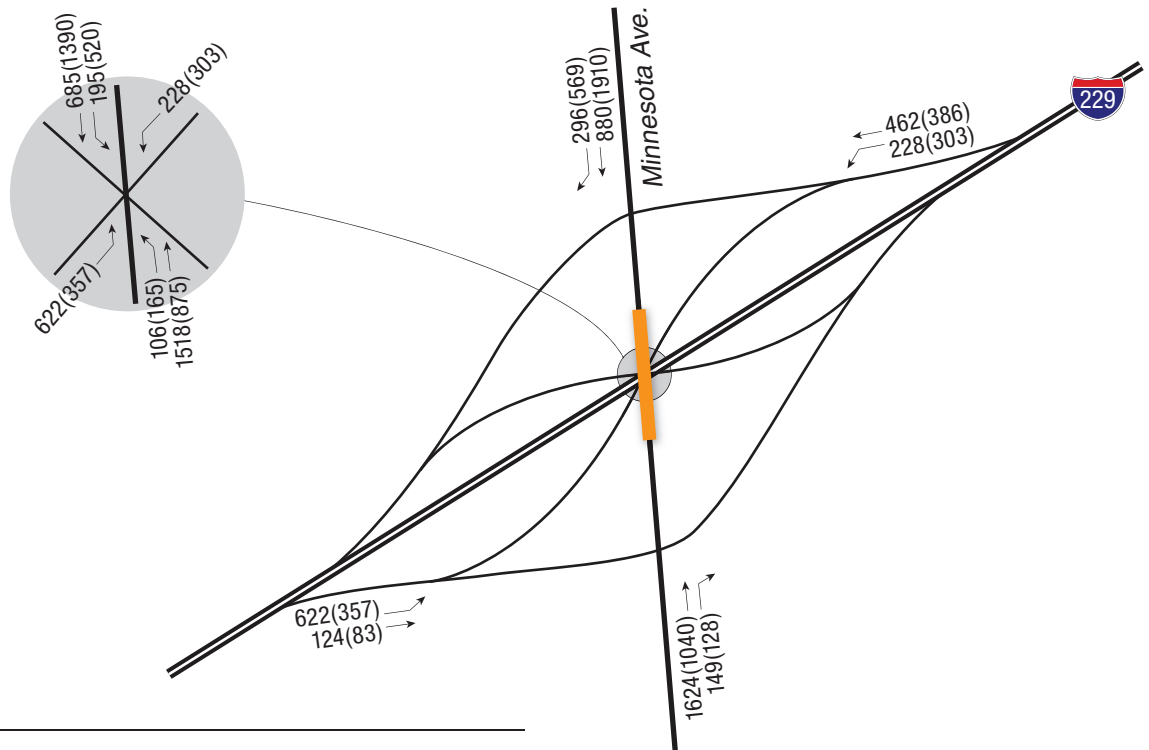
X/X = AM/PM Peak Hour Ramp Junction Level of Service

= Traffic Signal

= Travel Lanes

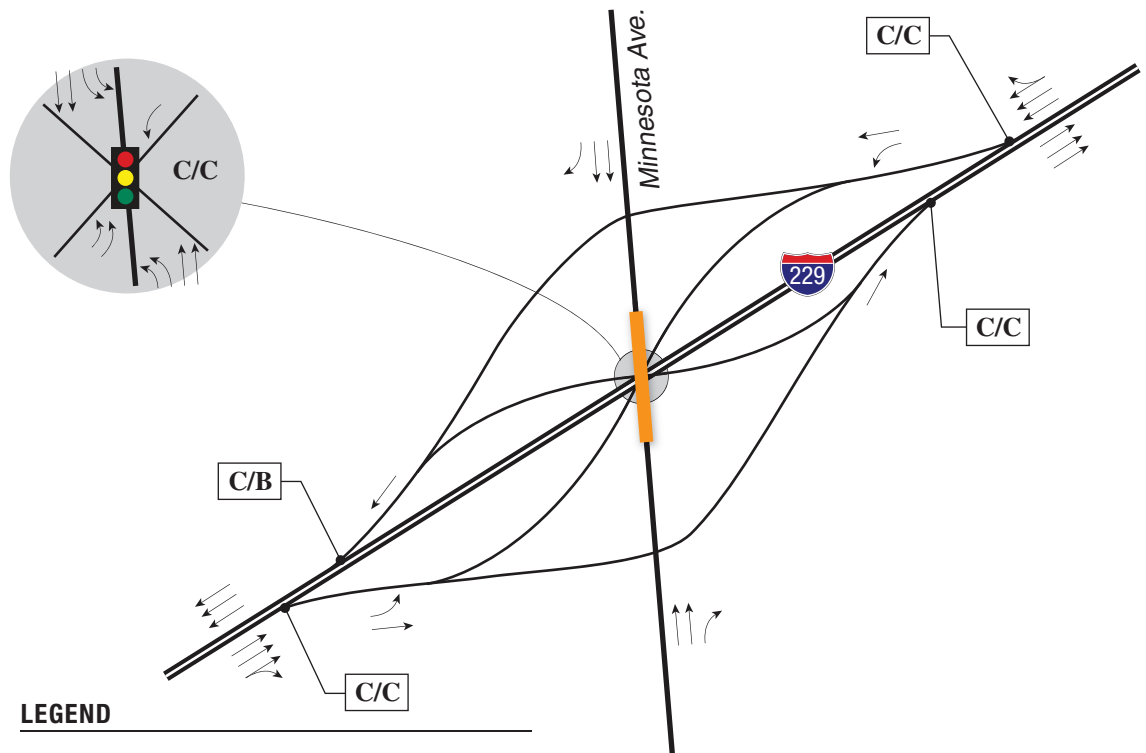
Interstate 229 Exit 3
Traffic Conditions Year 2030

NORTH



LEGEND

XXX(XXX) = AM(PM) Peak Hour Traffic Volumes



LEGEND

X/X = AM/PM Peak Hour Signalized Movement Level of Service

X/X = AM/PM Peak Hour Ramp Junction Level of Service

🚦 = Traffic Signal

↔ = Travel Lanes

Interstate 229 Exit 3
SPUI Alternative
Traffic Conditions Year 2030





I-229 EXIT 4 CLIFF AVE



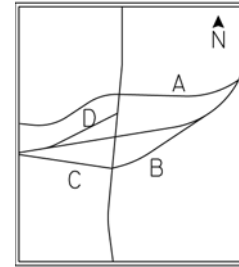
Figure 1
I-229 Exit 4 - Cliff Ave
Lane Addition

**Probable Construction Costs
I-229 Exit 4 - Lane Addition**

<i>Item Description</i>	<i>Quantity</i>	<i>Unit</i>	<i>Unit Cost</i>	<i>Total Cost</i>
Mobilization	1	LUMP SUM	\$2,000.00	\$2,000
Traffic Control	1	LUMP SUM	\$4,000.00	\$4,000
Clearing	1	LUMP SUM	\$1,000.00	\$1,000
Removal of Concrete Pavement		SQ. YD.	\$3.88	\$0
Removal of Asphalt Pavement	-	SQ. YD.	\$7.39	\$0
Remove Bridge	-	SQ. FT.	\$9.00	\$0
Borrow, Unclassified Excavation	2,014	CU. YD.	\$5.30	\$10,681
Base Course	152	TON	\$10.64	\$1,619
Asphalt Composite		TON	\$80.91	\$0
PCC Pavement 8" (cross street)	367	SQ. YD.	\$33.12	\$12,144
PCC Pavement 8" (ramps)	333	SQ. YD.	\$43.40	\$14,465
Concrete Approach Slab	-	SQ. YD.	\$188.34	\$0
Bridges	-	SQ. FT.	\$100.00	\$0
Guard Rail	0	LF	\$100.00	\$0
Permanent Signing/Markings	1	LUMP SUM	\$0.00	\$0
Traffic Signal	1	EACH	\$125,000.00	\$125,000
Roadway Lighting	1	LUMP SUM	\$0.00	\$0
Drainage (18" RCP)	30	LF	\$24.53	<u>\$736</u>
Subtotal				\$170,000
Contingencies	25%			<u>\$42,500</u>
Total Probable Construction Costs				\$210,000
Engineering, Administration	15%			\$31,500
Total Project Costs				\$240,000

INTERCHANGE GEOMETRICS CHECKLIST
SDDOT Interstate Corridor Study

Interstate: I-229
Interchange: Exit 4
Analyst: JLB
Date: 1/20/2010



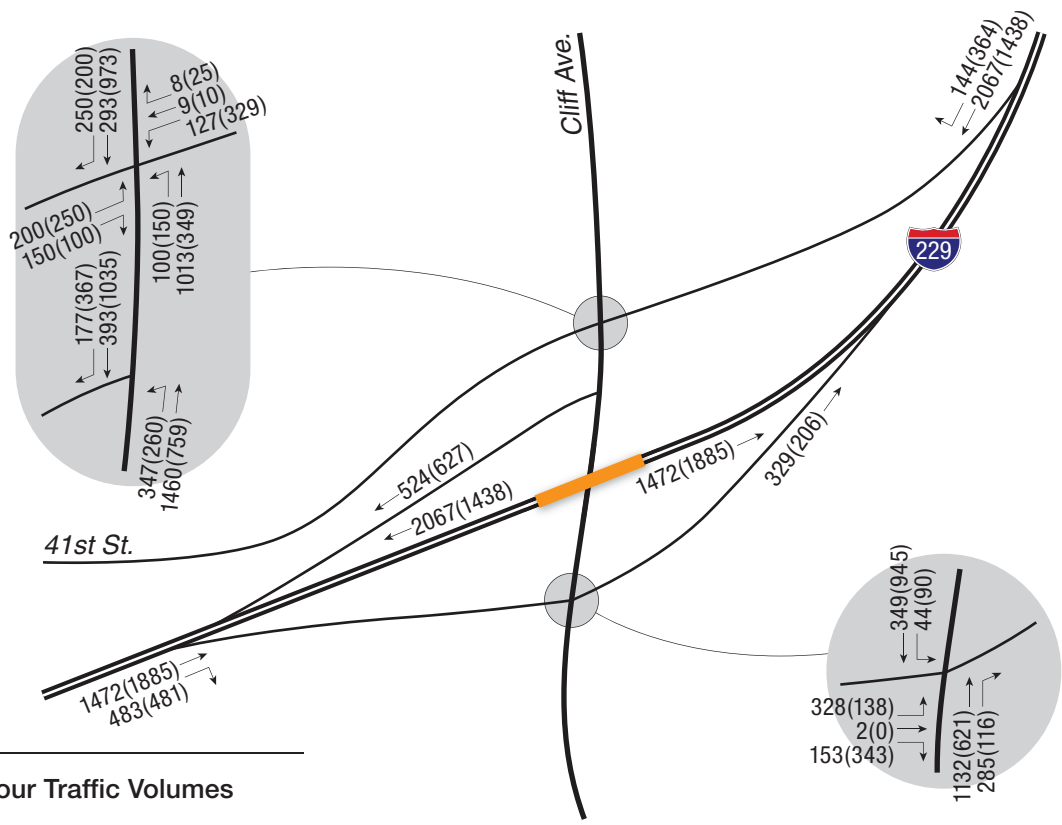
Interchange Geometry	Criteria	A	B	C	D	Achieved?
Interchange Type (Diamond, Full/Partial Cloverleaf, Trumpet etc.)	Diamond					-----
Design Speed	50 mph**					
Number of Lanes		1	1	1	1	
Right Turn Storage Length		250'	-	250'	-	
Left Turn Storage Length		250'	-	250'	-	
Superelevation (e max)	6%	6.00%	-	3.16%	-	Acceptable
Minimum Horizontal Radius for e max of 6% (50 mph / 30 mph)	833 / 231 feet	1848'	2291'	2292'	2292'	Acceptable
Maximum Degree of Curvature (50 mph / 30 mph)	6° 53' / 24° 48'	3° 06'	2° 30'	2° 30'	2° 30'	Acceptable
Minimum Clear Zone From the Edge of Travel Lane	30 feet	>30'	>30'	>30'	>30'	Acceptable
Maximum Grade on Ramp (Ascending)	+3% to +5%	3.29%	-	1.12	1.49%	Acceptable
Maximum Grade on Ramp (Descending)	-3% to -5%	-	-2.35%	-0.82%	-	Acceptable
Minimum Lane Width						
With Auxiliary Lanes	12 feet	-	-	-	-	
As Single Lane	15 feet (19 for loops)	20.0'	16.5'	22.0'	12.0'	Supports Impr.
Shoulder Width						
Right Shoulder	8 feet (4 for loops)	3.5'	6.0'	-	7.0'	Supports Impr.
Left Shoulder	2 feet	1.5'	2.5'	3.0'	2.0'	Supports Impr.
Inslope	6:1	3:1	3:1	3:1	3:1	Supports Impr.
Minimum Off-Ramp Taper Rate	20:1	-	-	-	-	Acceptable
Minimum On-Ramp Taper Rate	50:1	-	-	-	-	Acceptable
Ramp Features						
K-Value Ranges						
Minimum for a Crest Vertical Curve (50 mph / 30 mph)	84 / 19	87	125	154	112	Acceptable
Minimum for a Sag Vertical Curve (50 mph / 30 mph)	96 / 37	159	252			Acceptable
Minimum Stopping Sight Distance (50 mph / 30 mph)	425 / 200 feet	>425	532'	705'	508'	Acceptable
Cross Road Features						
K-Value Ranges		To North		To South		
Minimum for a Crest Vertical Curve (50 mph / 30 mph)	84 / 19	-		-		
Minimum for a Sag Vertical Curve (50 mph / 30 mph)	96 / 37	-		-		
Minimum Stopping Sight Distance (50 mph / 30 mph)	425 / 200 feet	-		-		
Ramp Intersection Sight Distance (50 mph / 30 mph)***	425 / 200 feet					
Maximum Longitudinal Grade - Rolling Terrain (Urban Arterial)	7%	-		-		
Minimum Longitudinal Grade (Min. / Des.)	0.3% / 0.5%	-		-		
Minimum Control of Access from Interchange Ramps (Min. / Des.)	300 / 660 feet	200'		150'		Supports Impr

** Loop ramp design speed = 30 mph

***Substandard Intersection Sight Distance locations could not be determined from the interchange plans. Substandard locations, therefore, are intersections that demonstrate sight distance limitations based on a general field evaluation or the presence of a substandard k-value or Stopping Sight Distance along the crossroad approaching the intersection.

Comments

Auxiliary lanes are on either side of the interchange that continue to next ramp going both directions.
 Plans show new grading over parts with new pavement 6:1
 Ramp A has a vertical spline off interstate on original plans. As built plans show a small curve at that point with a 508' SSD
 Plans show 3:1 max slope on typicals
 South ramp terminal is signalized, north off-ramp terminal is signalized, north on-ramp terminal not signalized

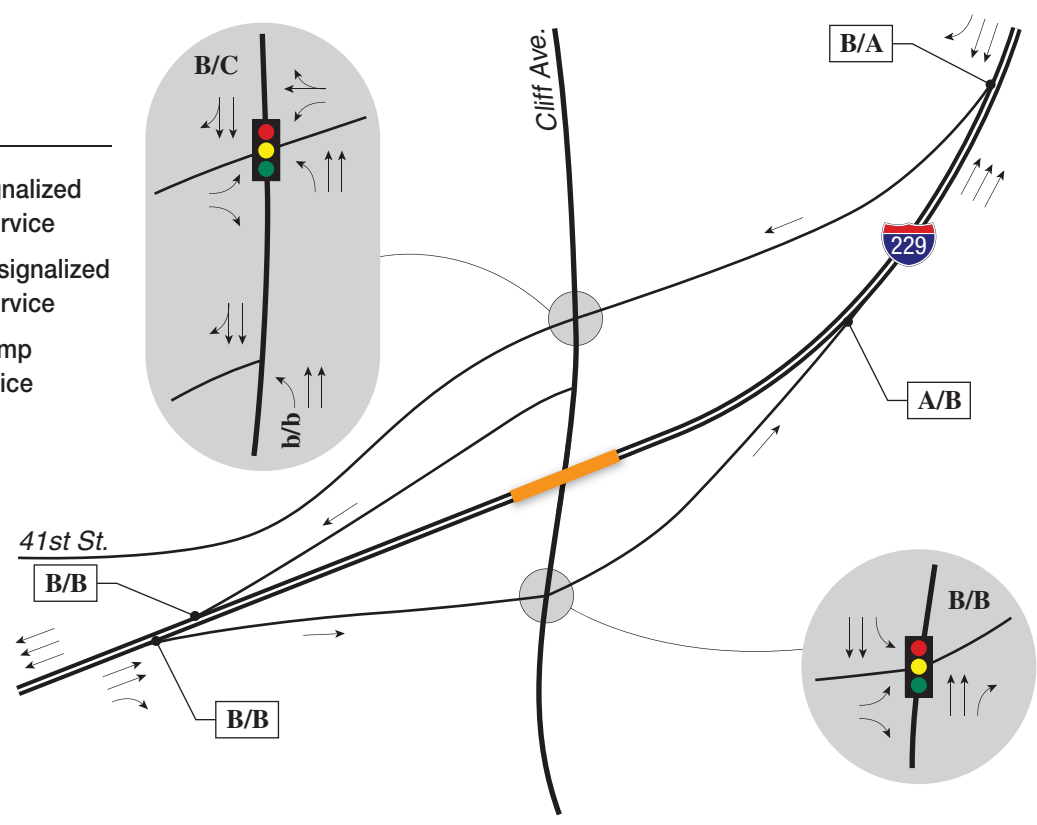


LEGEND

XXX(XXX) = AM(PM) Peak Hour Traffic Volumes

LEGEND

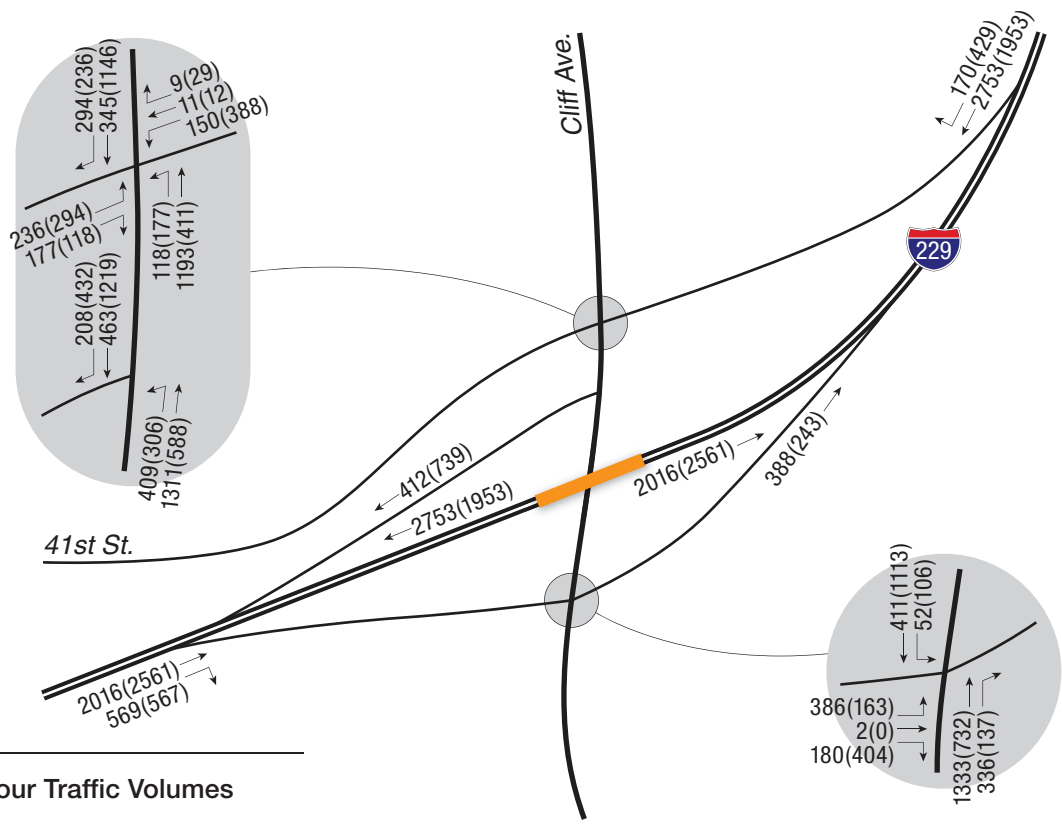
- X/X = AM/PM Peak Hour Signalized Movement Level of Service
- x/x = AM/PM Peak Hour Unsignalized Movement Level of Service
- X/X = AM/PM Peak Hour Ramp Junction Level of Service
- = Traffic Signal
- = Travel Lanes



Interstate 229 Exit 4
Traffic Conditions Year 2009

NORTH



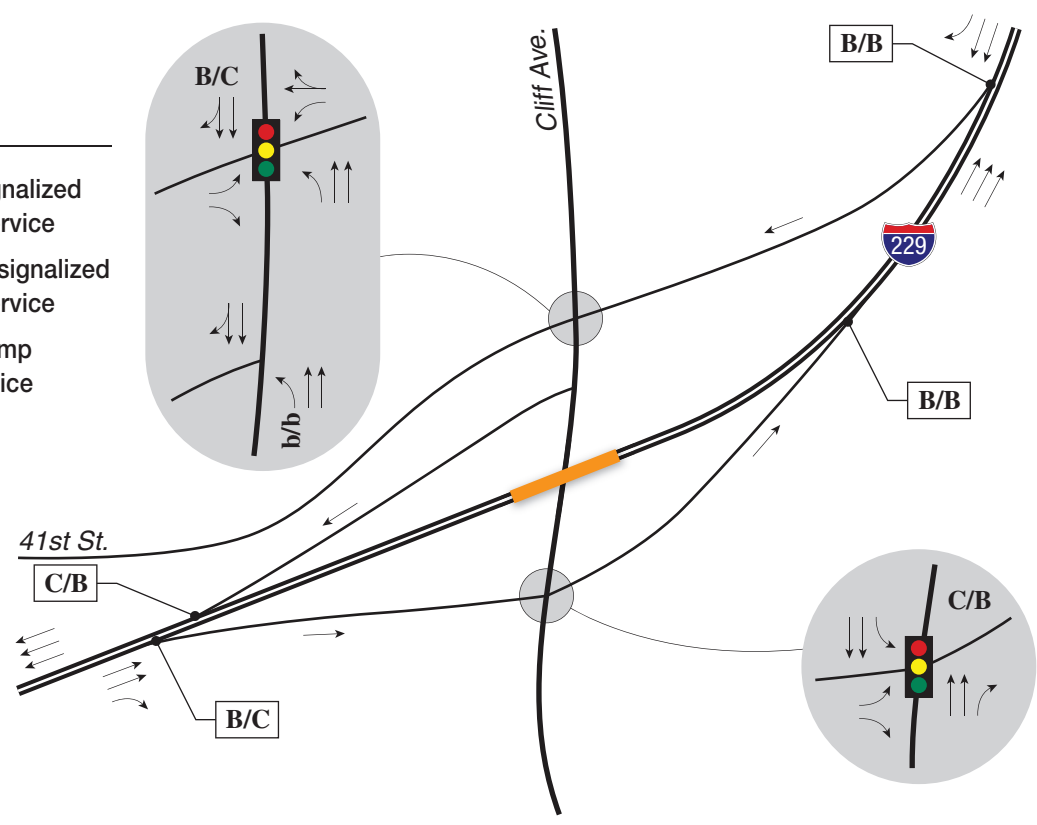


LEGEND

XXX(XXX) = AM(PM) Peak Hour Traffic Volumes

LEGEND

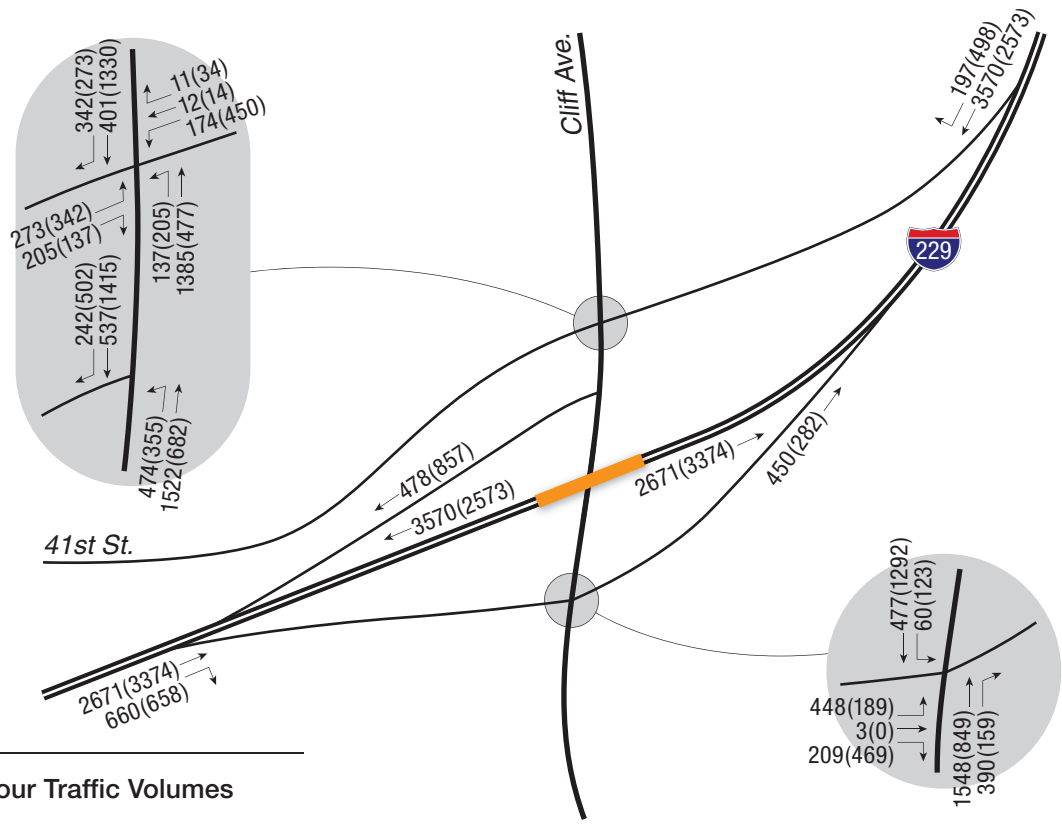
- X/X = AM/PM Peak Hour Signalized Movement Level of Service
- x/x = AM/PM Peak Hour Unsignalized Movement Level of Service
- X/X = AM/PM Peak Hour Ramp Junction Level of Service
- = Traffic Signal
- = Travel Lanes



Interstate 229 Exit 4
Traffic Conditions Year 2020

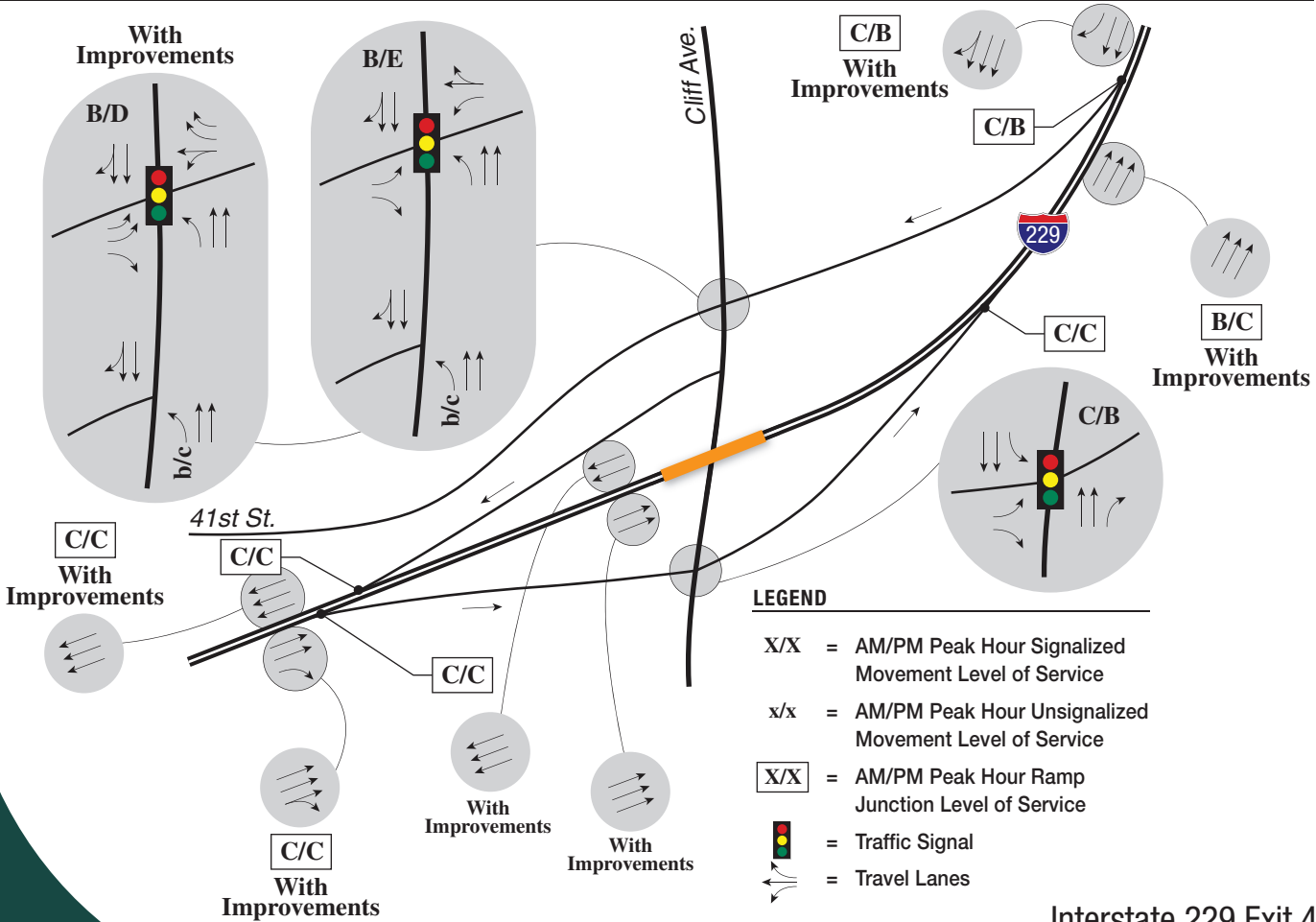
NORTH





LEGEND

XXX(XXX) = AM(PM) Peak Hour Traffic Volumes



LEGEND

- X/X = AM/PM Peak Hour Signalized Movement Level of Service
- x/x = AM/PM Peak Hour Unsignalized Movement Level of Service
- X/X = AM/PM Peak Hour Ramp Junction Level of Service
- [Traffic Signal Icon] = Traffic Signal
- [Travel Lane Icon] = Travel Lanes

Interstate 229 Exit 4
Traffic Conditions Year 2030

NORTH



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I-229 EXIT 5 26TH STREET

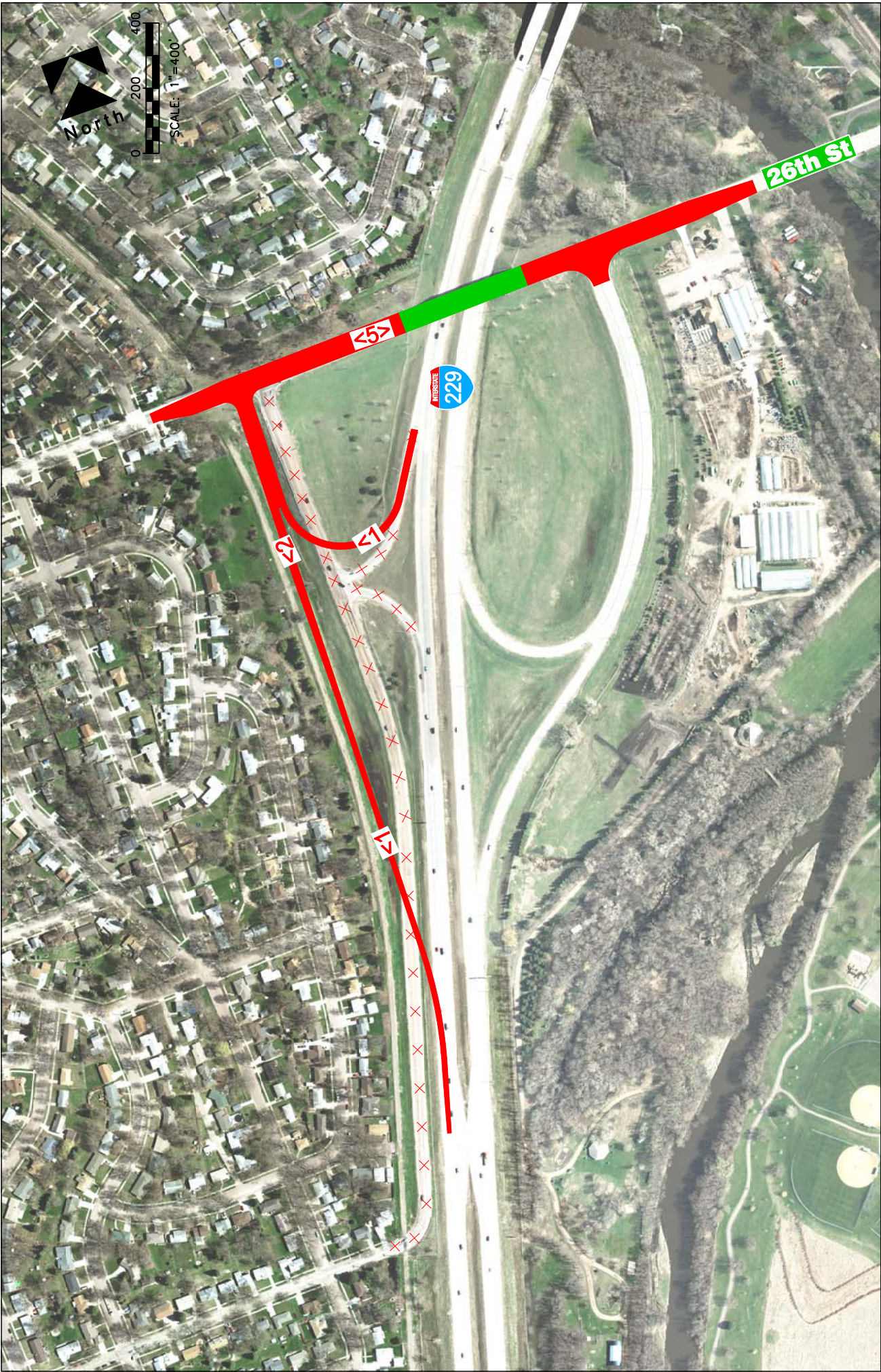


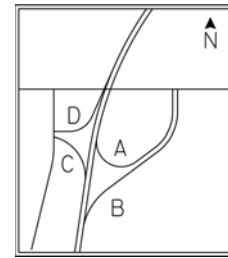
Figure 1
I-229 Exit 5 - 26th Street
Cross Road and Ramp Improvements

Probable Construction Costs
I-229 Exit 5 - Cross Road and Ramp Improvements

<i>Item Description</i>	<i>Quantity</i>	<i>Unit</i>	<i>Unit Cost</i>	<i>Total Cost</i>
Mobilization	1	LUMP SUM	\$247,000.00	\$247,000
Traffic Control	1	LUMP SUM	\$493,000.00	\$493,000
Clearing	1	LUMP SUM	\$99,000.00	\$99,000
Removal of Concrete Pavement	20,365	SQ. YD.	\$3.88	\$79,077
Removal of Asphalt Pavement		SQ. YD.	\$7.39	\$0
Remove Bridge	23,200	SQ. FT.	\$9.00	\$208,800
Borrow, Unclassified Excavation	22,575	CU. YD.	\$5.30	\$119,693
Base Course	4,477	TON	\$10.64	\$47,618
Asphalt Composite		TON	\$80.91	\$0
PCC Pavement 8" (cross street)	10,516	SQ. YD.	\$33.12	\$348,286
PCC Pavement 8" (ramps)	8,236	SQ. YD.	\$43.40	\$357,406
Concrete Approach Slab	6,400	SQ. YD.	\$188.34	\$1,205,389
Bridges	25,600	SQ. FT.	\$100.00	\$2,560,000
Guard Rail	0	LF	\$100.00	\$0
Permanent Signing/Markings	1	LUMP SUM	\$150,000.00	\$150,000
Traffic Signal	1	EACH	\$125,000.00	\$125,000
Roadway Lighting	1	LUMP SUM	\$100,000.00	\$100,000
Drainage (18" RCP)	180	LF	\$24.53	<u>\$4,415</u>
Subtotal				\$6,140,000
Contingencies	25%			<u>\$1,535,000</u>
Total Probable Construction Costs				\$7,680,000
Engineering, Administration	15%			\$1,152,000
Total Project Costs				\$8,830,000

INTERCHANGE GEOMETRICS CHECKLIST
SDDOT Interstate Corridor Study

Interstate: I-229
Interchange: Exit 5
Analyst: JLB
Date: 1/20/2010



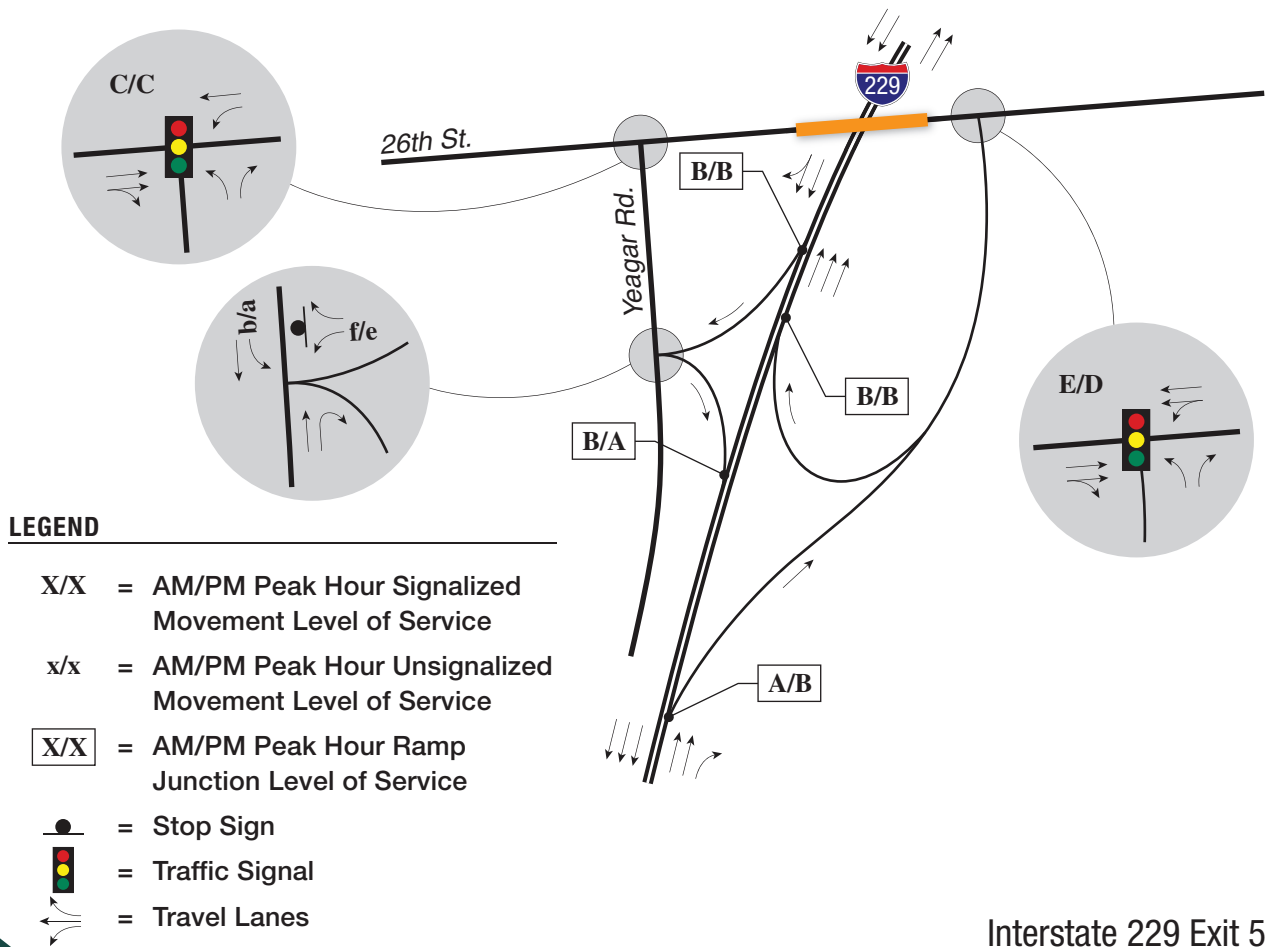
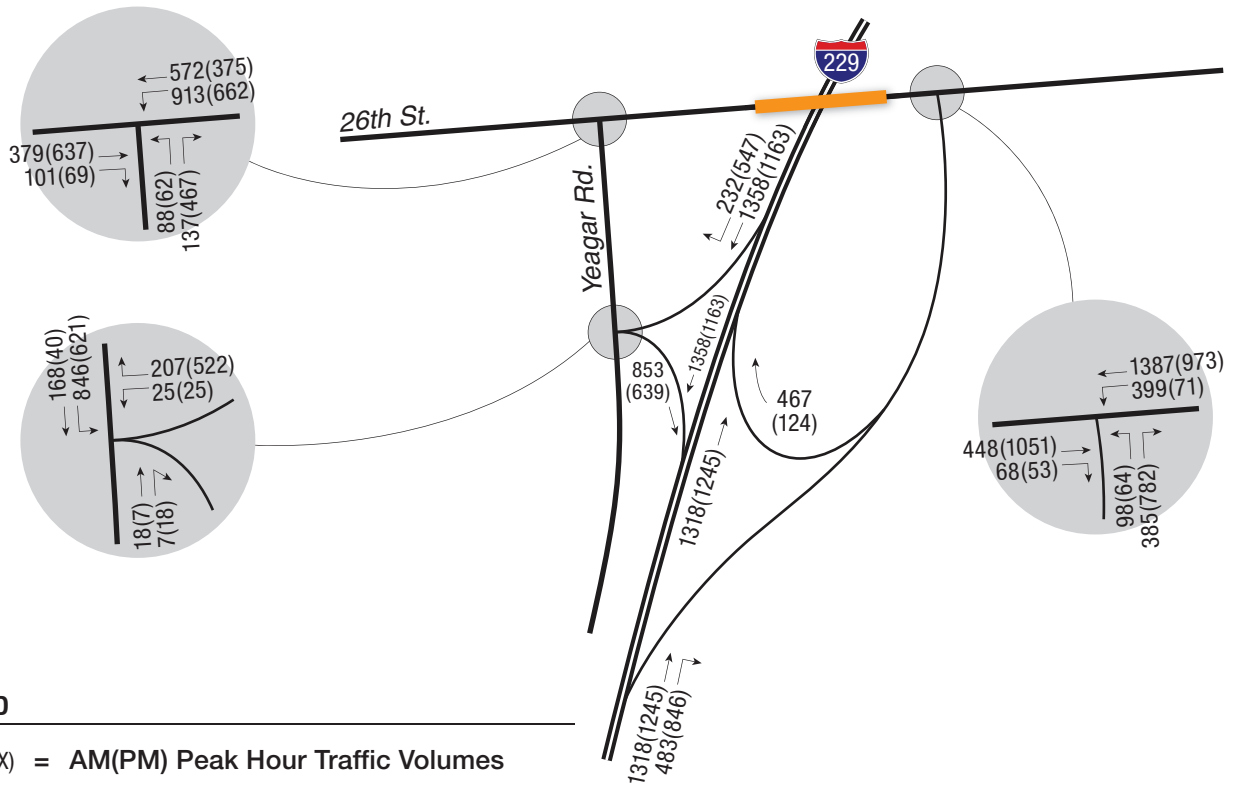
Interchange Geometry	Criteria	A	B	C	D	Achieved?
Interchange Type (Diamond, Full/Partial Cloverleaf, Trumpet etc.)	Partial Cloverleaf					-----
Design Speed	50 mph**					
Number of Lanes		1	1	1	1	
Right Turn Storage Length			200'			
Left Turn Storage Length			200'			
Superelevation (e max)	6%	5.6%	5.6%	4.0%	5.0%	Acceptable
Minimum Horizontal Radius for e max of 6% (50 mph / 30 mph)	833 / 231 feet	205'	1145'	212'	230'	Supports Impr.
Maximum Degree of Curvature (50 mph / 30 mph)	6° 53' / 24° 48'	28°	5°	27° 01'	24° 54'	Supports Impr.
Minimum Clear Zone From the Edge of Travel Lane	30 feet	>30'	>30'	>30'	>30'	Acceptable
Maximum Grade on Ramp (Ascending)	+3% to +5%	3.57%	-	-	2.69%	Acceptable
Maximum Grade on Ramp (Descending)	-3% to -5%	-	-1.96%	-3.52%	-	Acceptable
Minimum Lane Width						
With Auxiliary Lanes	12 feet	-	-	-	-	
As Single Lane	15 feet (19 for loops)	19.0'	20.0'	20.0'	24.5'	Acceptable
Shoulder Width						
Right Shoulder	8 feet (4 for loops)	2.5'	2.5'	1.5'	-	Supports Impr.
Left Shoulder	2 feet	3.0'	2.0'	3.0'	-	Acceptable
Inslope	6:1	6:1	6:1	6:1	6:1	Acceptable
Minimum Off-Ramp Taper Rate	20:1	-	-	-	-	Acceptable
Minimum On-Ramp Taper Rate	50:1	-	-	-	-	Acceptable
Ramp Features						
K-Value Ranges						
Minimum for a Crest Vertical Curve (50 mph / 30 mph)	84 / 19	133	270	30	82	Supports Impr.
Minimum for a Sag Vertical Curve (50 mph / 30 mph)	96 / 37	185	413	51	91	Supports Impr.
Minimum Stopping Sight Distance (50 mph / 30 mph)	425 / 200 feet	747'	1551'	257'	406'	Supports Impr.
Cross Road Features	v					
K-Value Ranges			To West	To West		
Minimum for a Crest Vertical Curve (50 mph / 30 mph)	84 / 19	-	-	-	-	
Minimum for a Sag Vertical Curve (50 mph / 30 mph)	96 / 37	-	-	-	-	
Minimum Stopping Sight Distance (50 mph / 30 mph)	425 / 200 feet	-	-	-	-	
Ramp Intersection Sight Distance (50 mph / 30 mph)***	425 / 200 feet	-	-	-	-	
Maximum Longitudinal Grade - Rolling Terrain (Urban Arterial)	7%	-	-	-	-	
Minimum Longitudinal Grade (Min. / Des.)	0.3% / 0.5%	-	-	-	-	
Minimum Control of Access from Interchange Ramps (Min. / Des.)	300 / 660 feet	260'	-	670'	-	Supports Impr.

** Loop ramp design speed = 30 mph

***Substandard Intersection Sight Distance locations could not be determined from the interchange plans. Substandard locations, therefore, are intersections that demonstrate sight distance limitations based on a general field evaluation or the presence of a substandard k-value or Stopping Sight Distance along the crossroad approaching the intersection.

Comments

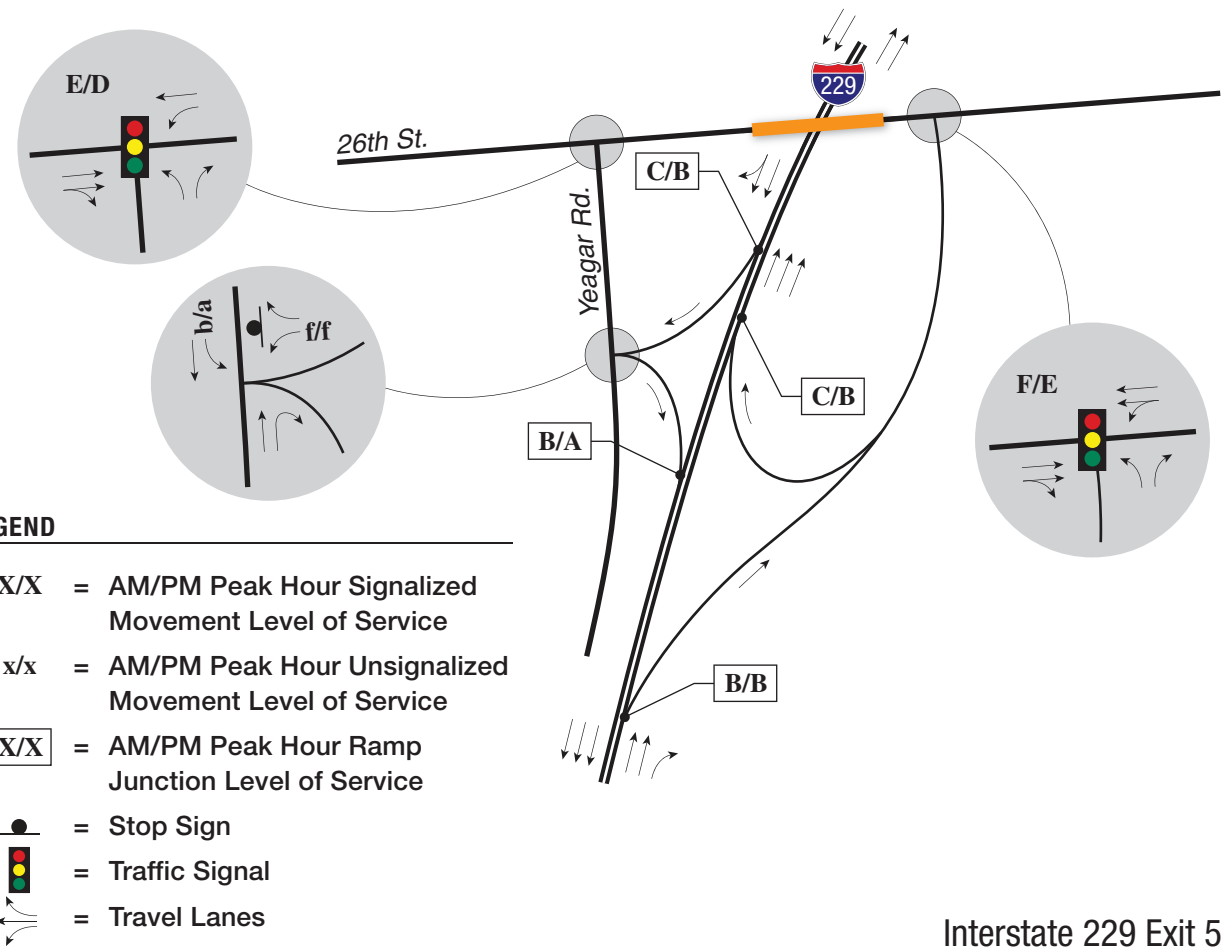
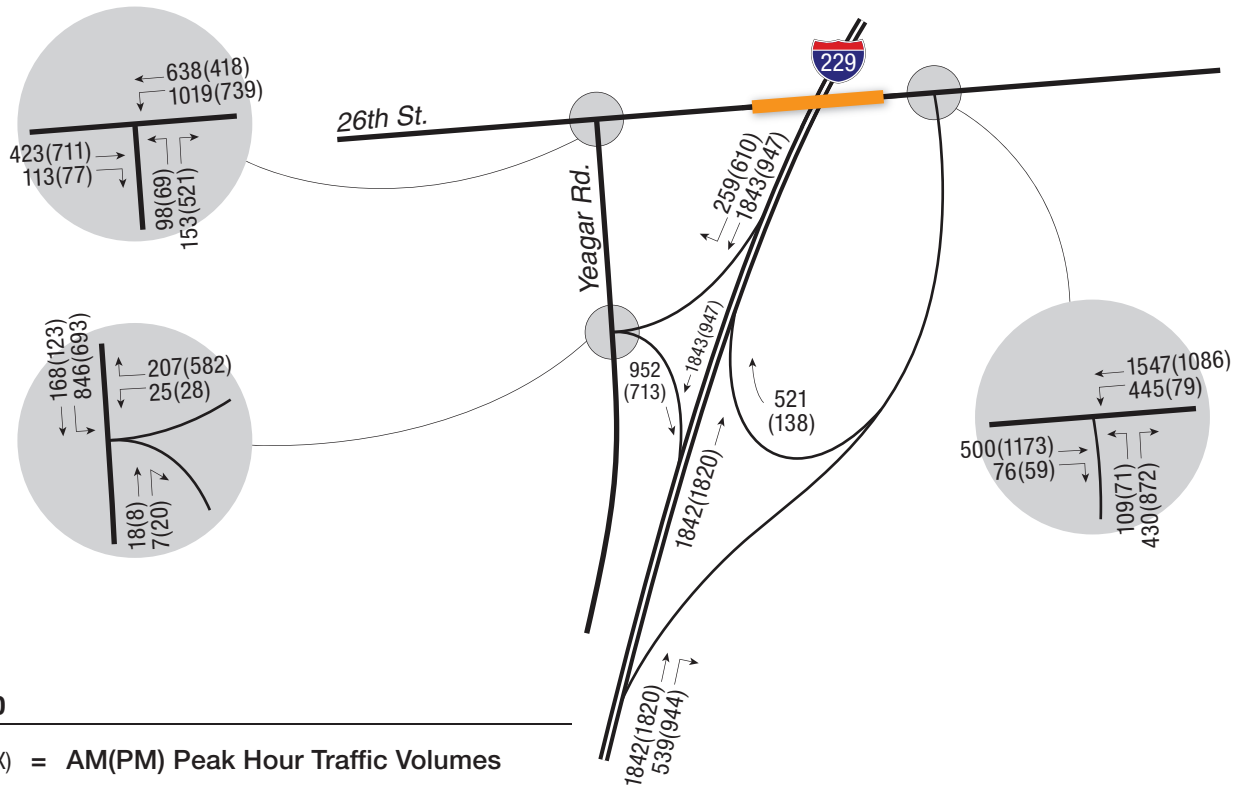
- Auxillary lanes on and off are present in each direction for on and off ramp
- No cross road info
- East ramp terminal is signaled



Interstate 229 Exit 5
Traffic Conditions Year 2009

NORTH

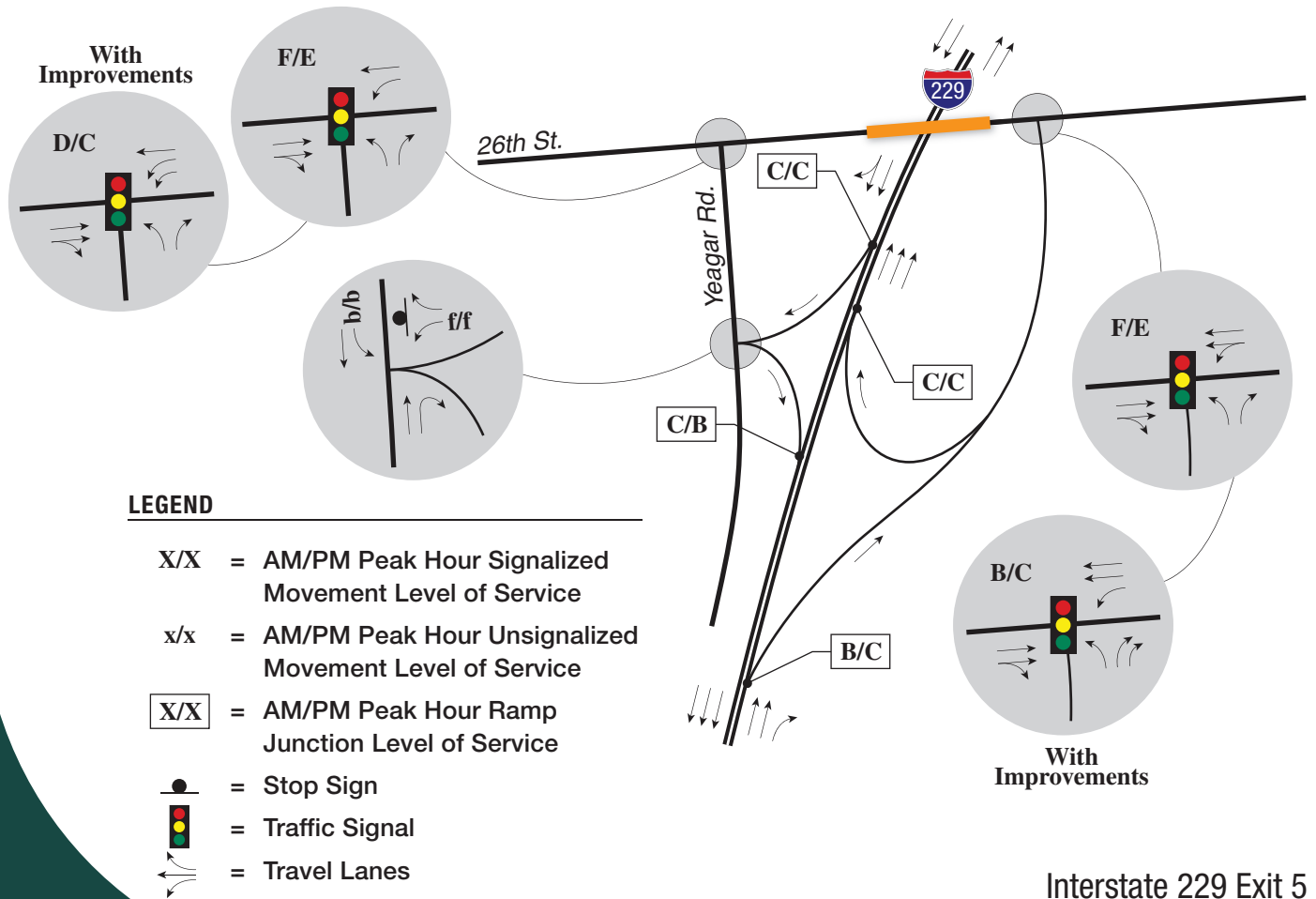
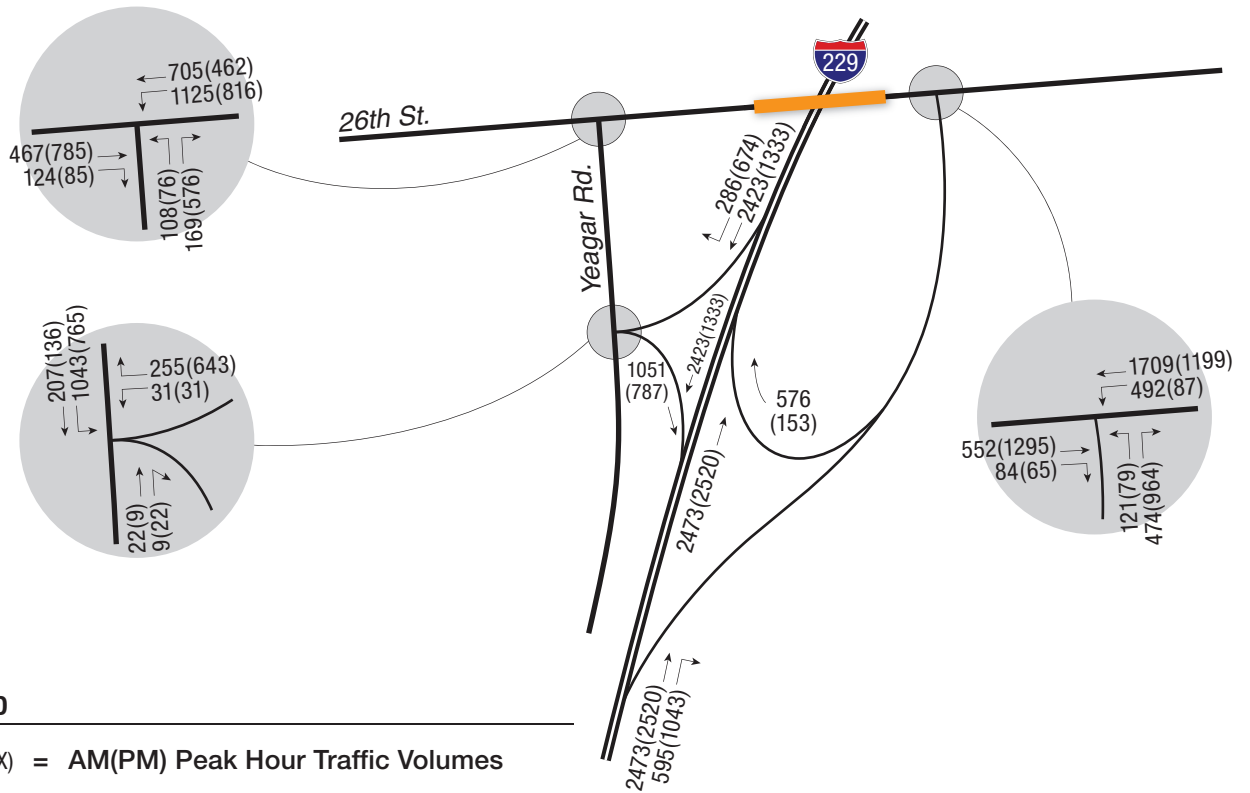




Interstate 229 Exit 5
Traffic Conditions Year 2020

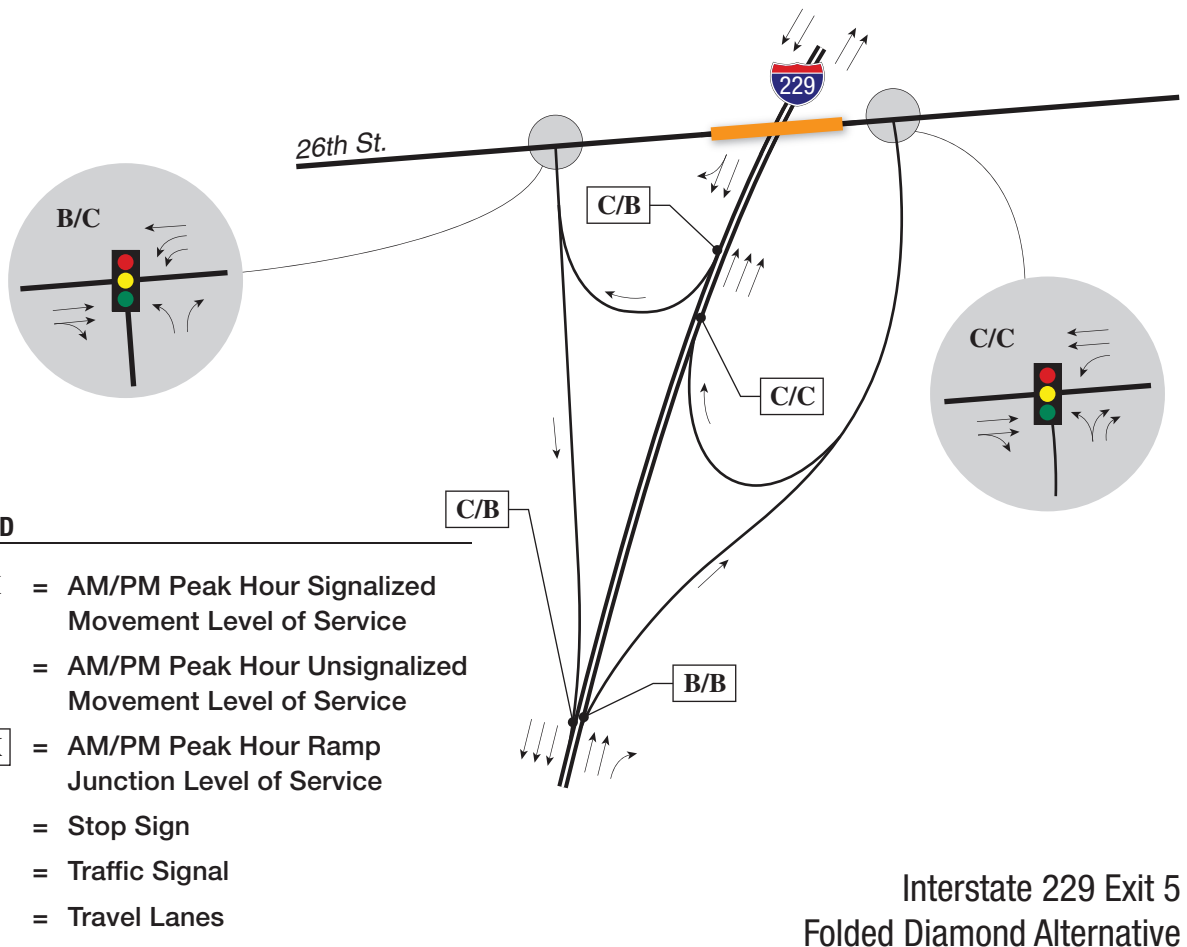
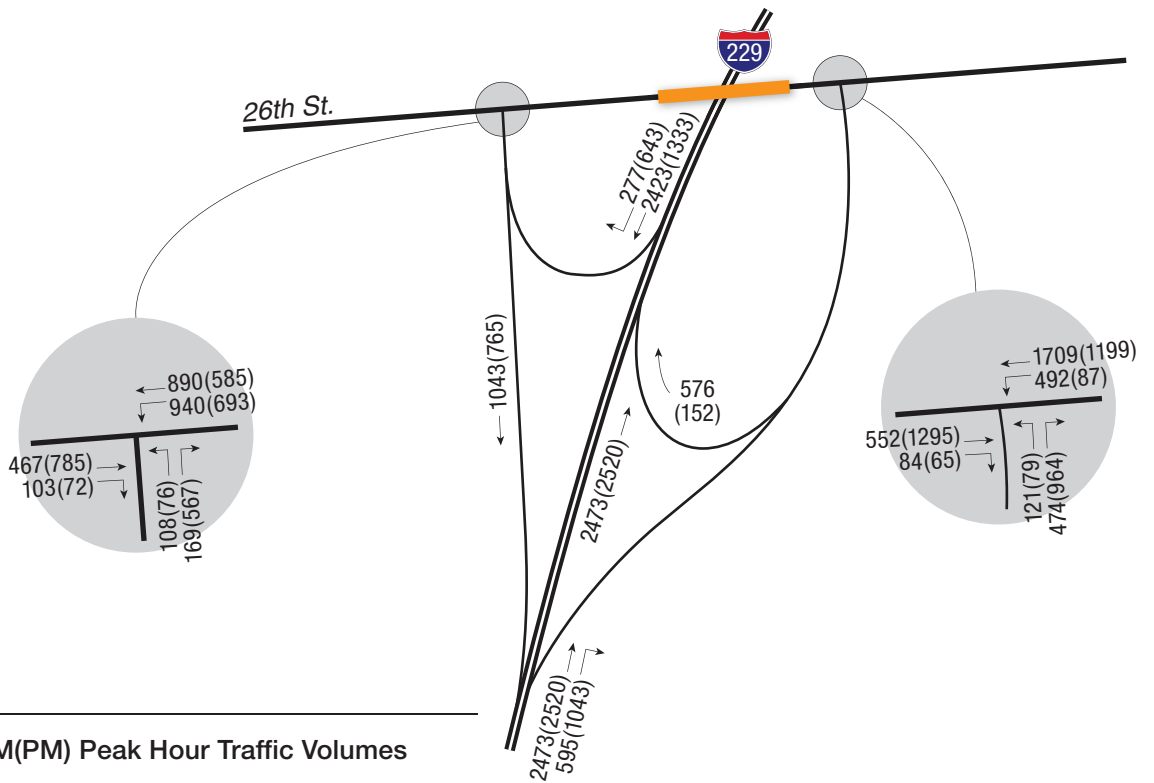
NORTH





Interstate 229 Exit 5
Traffic Conditions Year 2030

NORTH

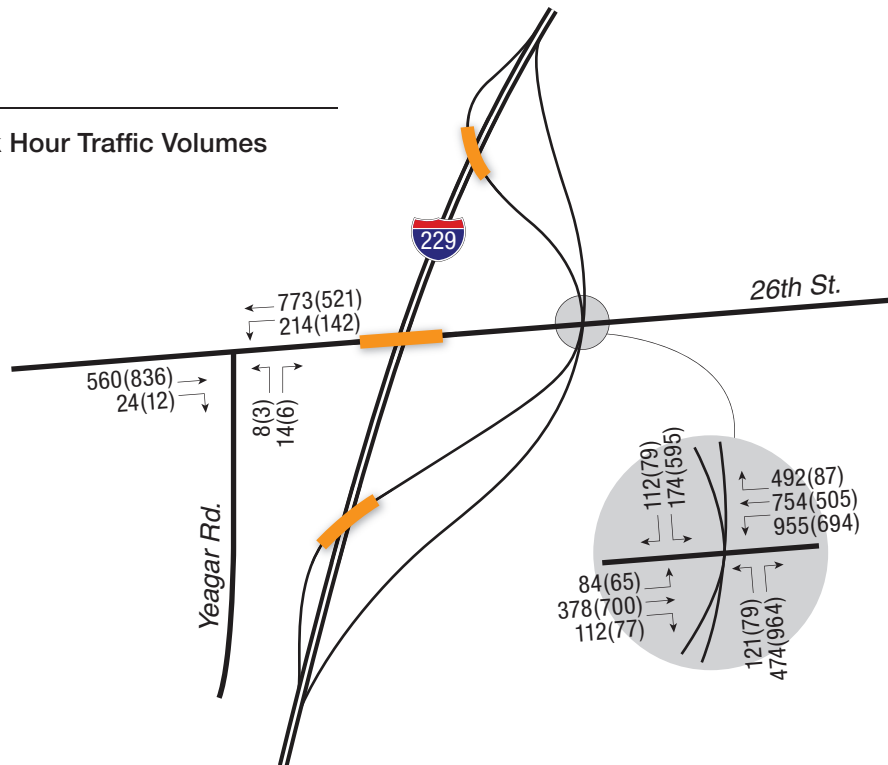


Interstate 229 Exit 5
 Folded Diamond Alternative
 Traffic Conditions Year 2030

NORTH

LEGEND

XXX(XXX) = AM(PM) Peak Hour Traffic Volumes



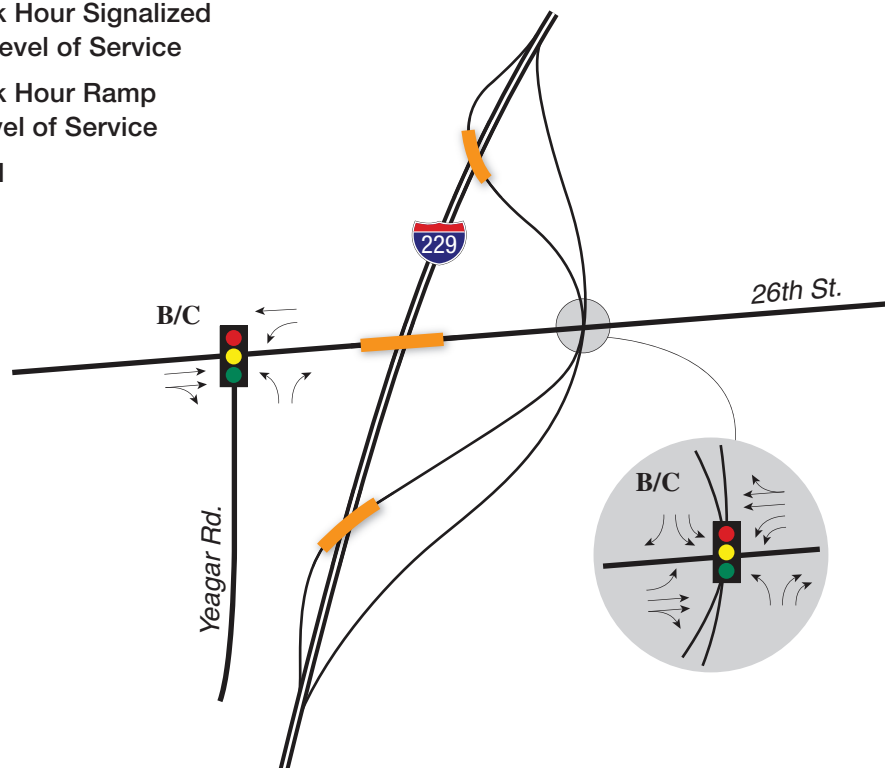
LEGEND

X/X = AM/PM Peak Hour Signalized Movement Level of Service

X/X = AM/PM Peak Hour Ramp Junction Level of Service

= Traffic Signal

= Travel Lanes



Interstate 229 Exit 5
Offset SPUI Alternative
Traffic Conditions Year 2030

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I-229 EXIT 7 RICE STREET



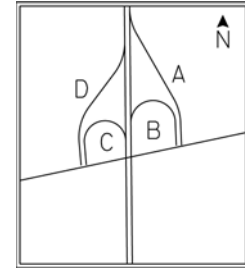
Figure 1
I-229 Exit 7 - Rice Street
Ramp Reconstruction and Cross Road Improvements

Probable Construction Costs
I-229 Exit 7 - Ramp Reconstruction and Cross Road Improvements

<i>Item Description</i>	<i>Quantity</i>	<i>Unit</i>	<i>Unit Cost</i>	<i>Total Cost</i>
Mobilization	1	LUMP SUM	\$29,000.00	\$29,000
Traffic Control	1	LUMP SUM	\$58,000.00	\$58,000
Clearing	1	LUMP SUM	\$12,000.00	\$12,000
Removal of Concrete Pavement	10,254	SQ. YD.	\$3.88	\$39,818
Removal of Asphalt Pavement		SQ. YD.	\$7.39	\$0
Remove Bridge	-	SQ. FT.	\$9.00	\$0
Borrow, Unclassified Excavation	14,575	CU. YD.	\$5.30	\$77,274
Base Course	1,391	TON	\$10.64	\$14,791
Asphalt Composite		TON	\$80.91	\$0
PCC Pavement 8" (cross street)	9,516	SQ. YD.	\$33.12	\$315,165
PCC Pavement 8" (ramps)	3,044	SQ. YD.	\$43.40	\$132,114
Concrete Approach Slab	-	SQ. YD.	\$188.34	\$0
Bridges	-	SQ. FT.	\$100.00	\$0
Guard Rail	0	LF	\$100.00	\$0
Permanent Signing/Markings	1	LUMP SUM	\$20,000.00	\$20,000
Traffic Signal	1	EACH	\$125,000.00	\$125,000
Roadway Lighting	1	LUMP SUM	\$10,000.00	\$10,000
Drainage (18" RCP)	150	LF	\$24.53	<u>\$3,680</u>
Subtotal				\$840,000
Contingencies	25%			<u>\$210,000</u>
Total Probable Construction Costs				\$1,050,000
Engineering, Administration	15%			\$157,500
Total Project Costs				\$1,210,000

INTERCHANGE GEOMETRICS CHECKLIST
SDDOT Interstate Corridor Study

Interstate: I-229
Interchange: Exit 7
Analyst: JLB
Date: 1/20/2010



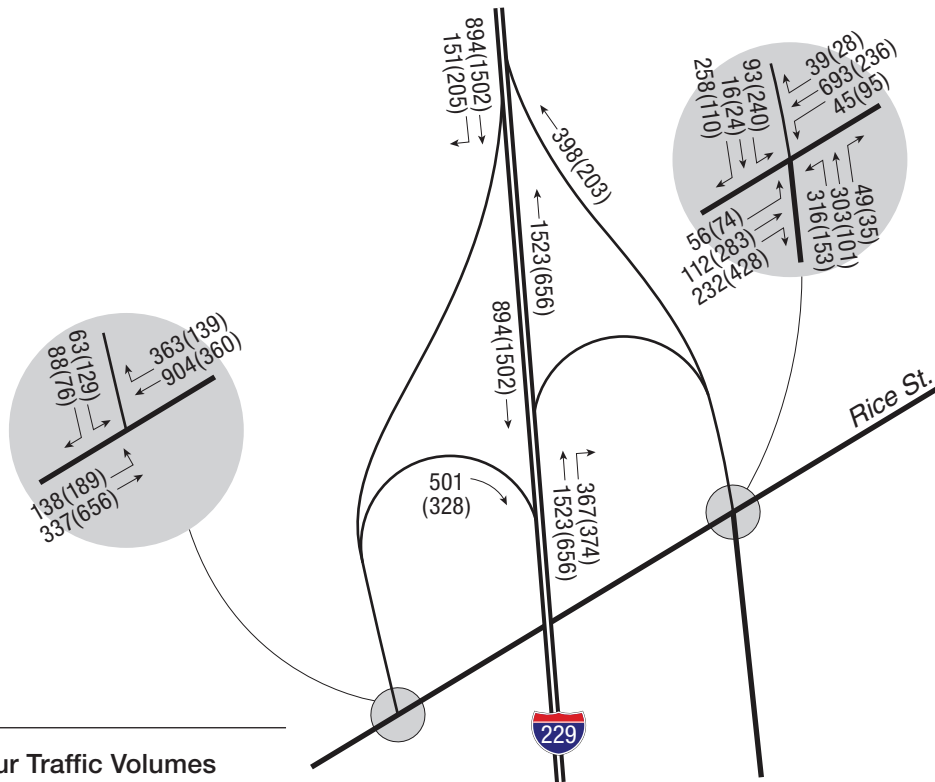
Interchange Geometry	Criteria	A	B	C	D	Achieved?
Interchange Type (Diamond, Full/Partial Cloverleaf, Trumpet etc.)	Folded Diamond					-----
Design Speed	50 mph**					
Number of Lanes		1	1	1	1	
Right Turn Storage Length			-			
Left Turn Storage Length			125'			
Superelevation (e max)	6%	5.9%	5.9%	6.0%	5.5%	Acceptable
Minimum Horizontal Radius for e max of 6% (50 mph / 30 mph)	833 / 231 feet	955'	160'	160'	939'	Supports Impr.
Maximum Degree of Curvature (50 mph / 30 mph)	6° 53' / 24° 48'	6° 00'	35° 48'	35° 48'	6° 06'	Supports Impr.
Minimum Clear Zone From the Edge of Travel Lane	30 feet	>30'	>30'	>30'	>30'	Acceptable
Maximum Grade on Ramp (Ascending)	+3% to +5%	3.57%	-	5.34%		Acceptable
Maximum Grade on Ramp (Descending)	-3% to -5%	-	-1.96%		-1.61%	Acceptable
Minimum Lane Width						
With Auxiliary Lanes	12 feet	-	-	-	-	
As Single Lane	15 feet (19 for loops)	15.5'	18.0'	20.0'	15.0'	Acceptable
Shoulder Width						
Right Shoulder	8 feet (4 for loops)	6.0'	4.0'	3.0'	5.5'	Supports Impr.
Left Shoulder	2 feet	2.5'	3.5'	3.0'	3.5'	Acceptable
Inslope	6:1	4:1	4:1	5:1	5:1	Supports Impr.
Minimum Off-Ramp Taper Rate	20:1	-	-	-	-	Acceptable
Minimum On-Ramp Taper Rate	50:1	-	-	-	-	Acceptable
Ramp Features						
K-Value Ranges						
Minimum for a Crest Vertical Curve (50 mph / 30 mph)	84 / 19	133	270	30	82	Supports Impr.
Minimum for a Sag Vertical Curve (50 mph / 30 mph)	96 / 37	185	413	51	91	Supports Impr.
Minimum Stopping Sight Distance (50 mph / 30 mph)	425 / 200 feet	747'	1551'	257'	406'	Supports Impr.
Cross Road Features	v					
K-Value Ranges		To West		To East		
Minimum for a Crest Vertical Curve (50 mph / 30 mph)	84 / 19	-		-		
Minimum for a Sag Vertical Curve (50 mph / 30 mph)	96 / 37	-		-		
Minimum Stopping Sight Distance (50 mph / 30 mph)	425 / 200 feet	-		-		
Ramp Intersection Sight Distance (50 mph / 30 mph)***	425 / 200 feet	-		-		
Maximum Longitudinal Grade - Rolling Terrain (Urban Arterial)	7%	-		-		
Minimum Longitudinal Grade (Min. / Des.)	0.3% / 0.5%	-		-		
Minimum Control of Access from Interchange Ramps (Min. / Des.)	300 / 660 feet	450'		350'		Acceptable

** Loop ramp design speed = 30 mph

***Substandard Intersection Sight Distance locations could not be determined from the interchange plans. Substandard locations, therefore, are intersections that demonstrate sight distance limitations based on a general field evaluation or the presence of a substandard k-value or Stopping Sight Distance along the crossroad approaching the intersection.

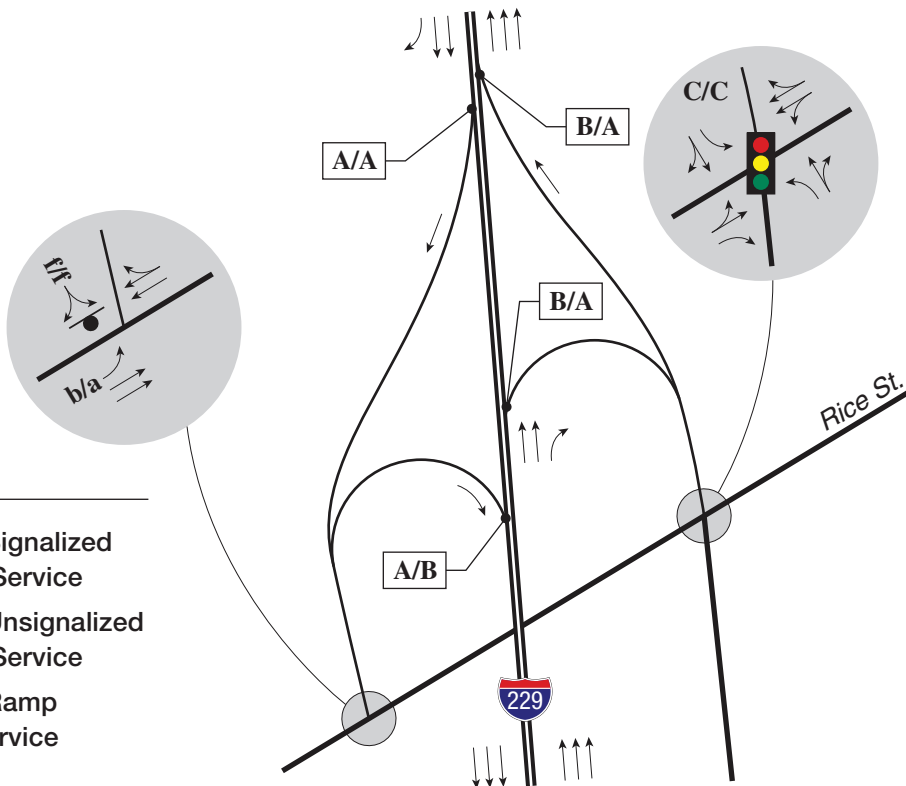
Comments

No taper on and off. Auxillary lanes on and off are present in each direction for on and off ramp[
 New pavement on cross road from aerial. No information included with plans
 East Ramp terminal is signalized, west is not



LEGEND

xxx(xxx) = AM(PM) Peak Hour Traffic Volumes

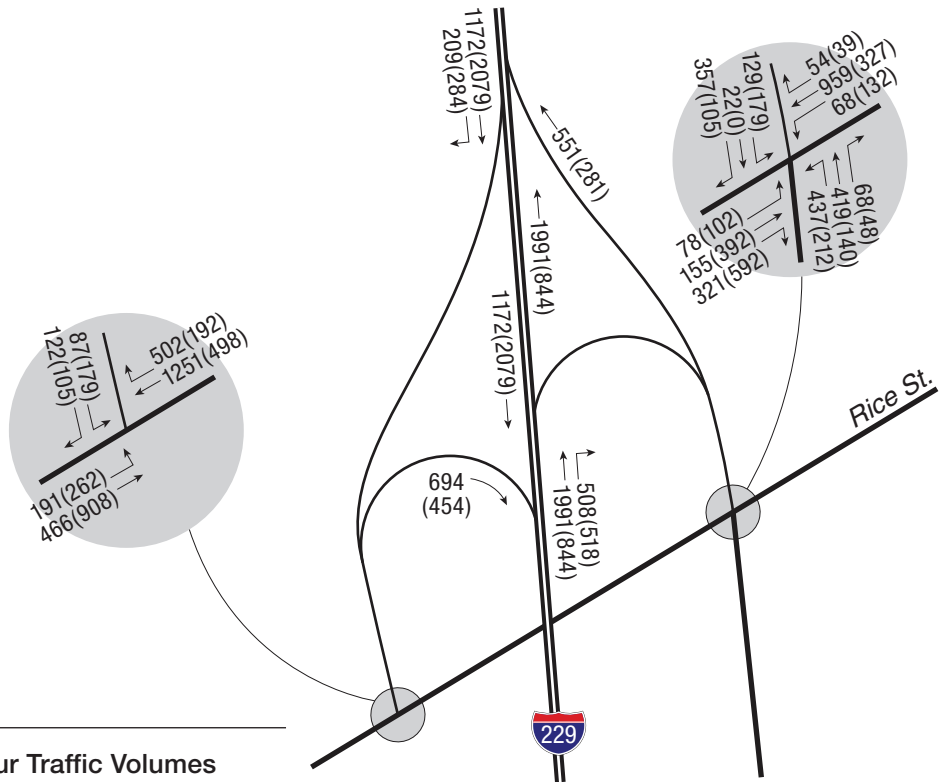


LEGEND

- X/X = AM/PM Peak Hour Signalized Movement Level of Service
- x/x = AM/PM Peak Hour Unsignalized Movement Level of Service
- X/X = AM/PM Peak Hour Ramp Junction Level of Service
- = Stop Sign
- 🚦 = Traffic Signal
- ↔ = Travel Lanes

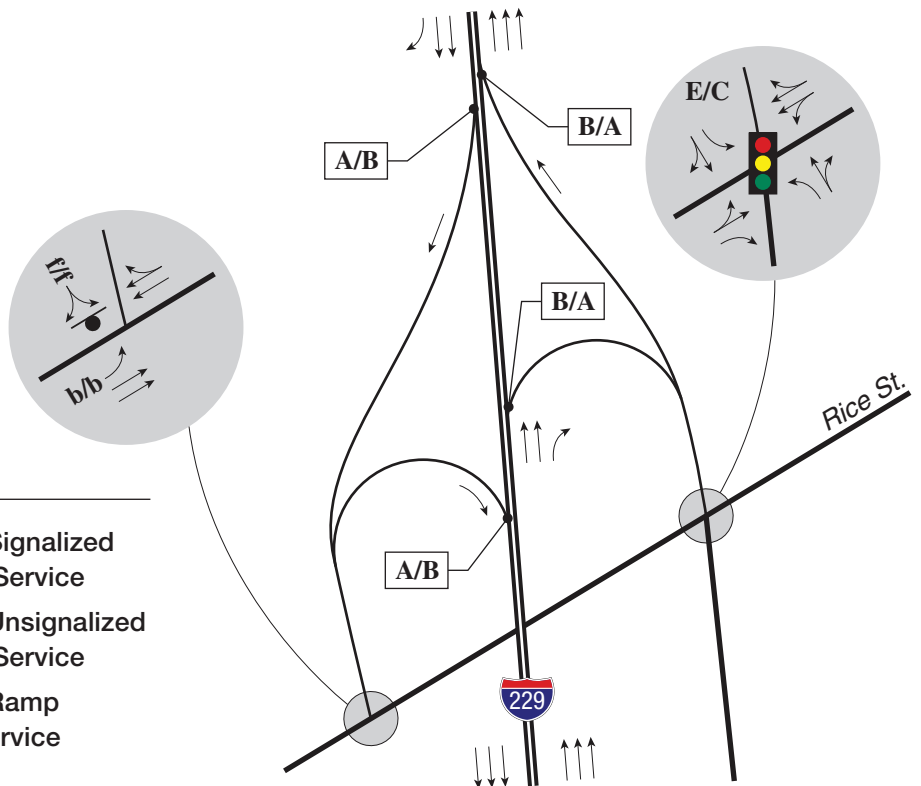
Interstate 229 Exit 7
Traffic Conditions Year 2009

NORTH



LEGEND

XXX(XXX) = AM(PM) Peak Hour Traffic Volumes

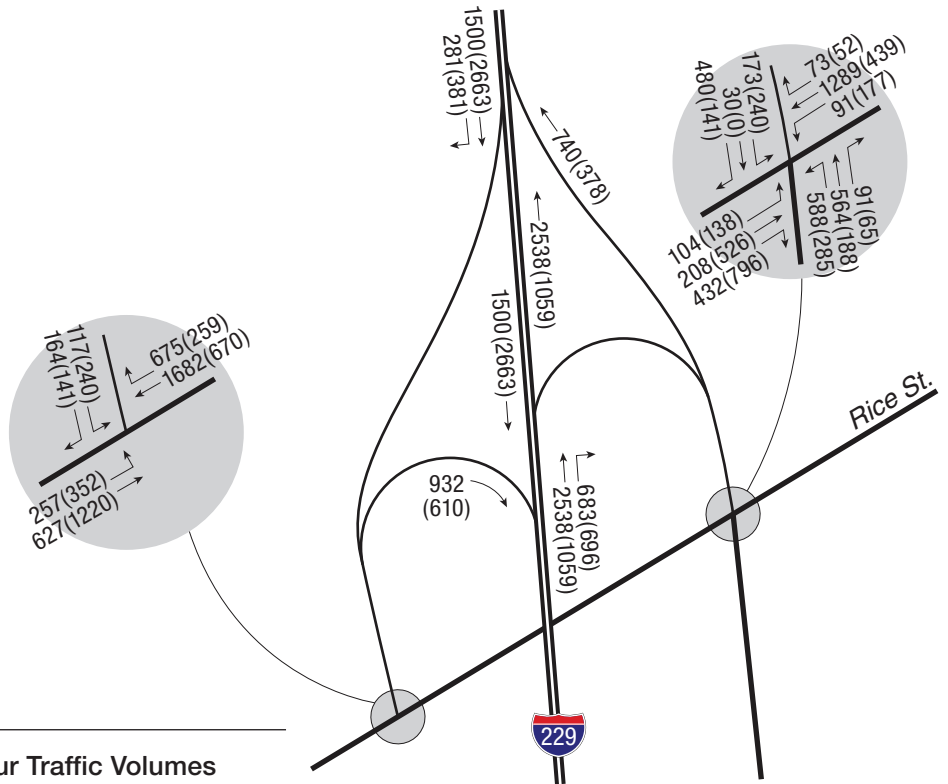


LEGEND

- X/X = AM/PM Peak Hour Signalized Movement Level of Service
- x/x = AM/PM Peak Hour Unsignalized Movement Level of Service
- X/X = AM/PM Peak Hour Ramp Junction Level of Service
- = Stop Sign
- 🚦 = Traffic Signal
- ↔ = Travel Lanes

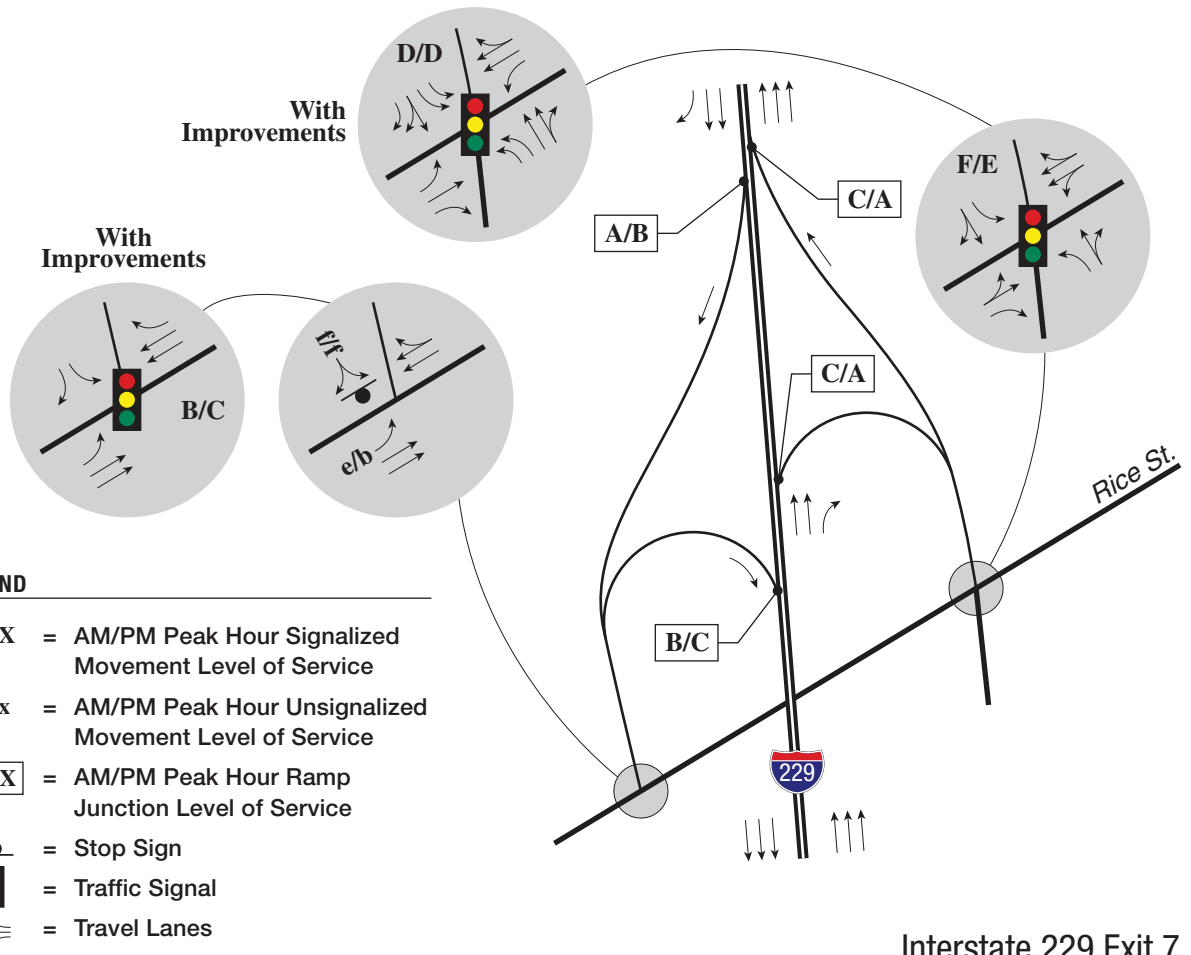
Interstate 229 Exit 7
Traffic Conditions Year 2020

NORTH



LEGEND

XXX(XXX) = AM(PM) Peak Hour Traffic Volumes



LEGEND

- X/X = AM/PM Peak Hour Signalized Movement Level of Service
- x/x = AM/PM Peak Hour Unsignalized Movement Level of Service
- X/X = AM/PM Peak Hour Ramp Junction Level of Service
- = Stop Sign
- 🚦 = Traffic Signal
- ↔ = Travel Lanes

Interstate 229 Exit 7
Traffic Conditions Year 2030

NORTH

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I-229 EXIT 9 BENSON ROAD

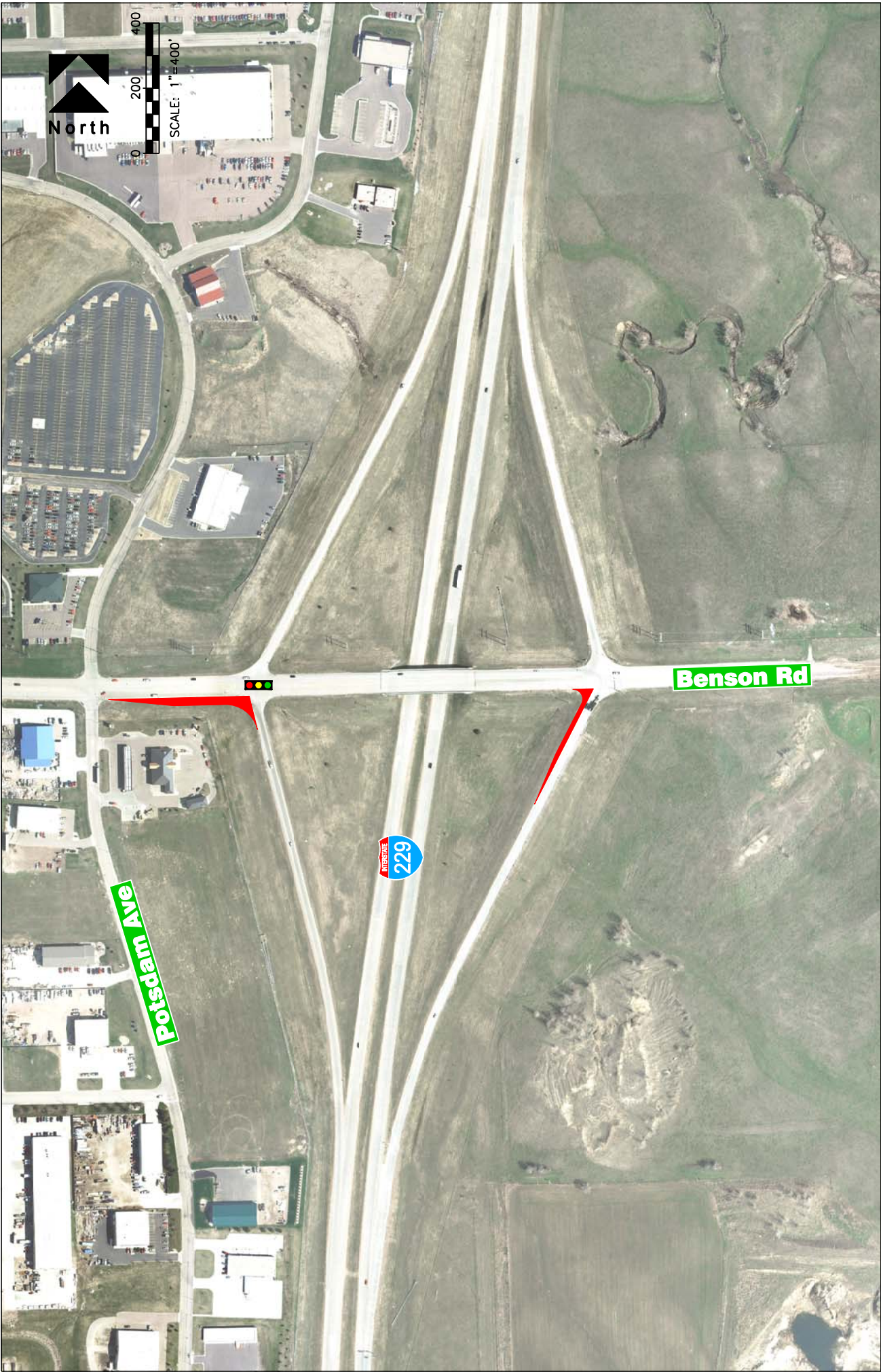


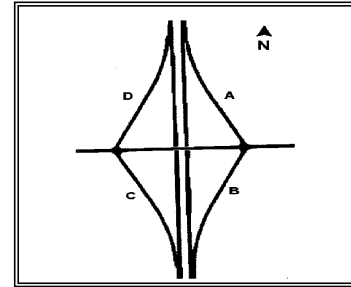
Figure 1
I-229 Exit 9 - Benson Road
Lane Addition and Signalization Improvements

Probable Construction Costs
I-229 Exit 9 - Lane Addition Signalization Improvements

<i>Item Description</i>	<i>Quantity</i>	<i>Unit</i>	<i>Unit Cost</i>	<i>Total Cost</i>
Mobilization	1	LUMP SUM	\$5,000.00	\$5,000
Traffic Control	1	LUMP SUM	\$10,000.00	\$10,000
Clearing	1	LUMP SUM	\$2,000.00	\$2,000
Removal of Concrete Pavement		SQ. YD.	\$3.88	\$0
Removal of Asphalt Pavement	-	SQ. YD.	\$7.39	\$0
Remove Bridge	-	SQ. FT.	\$9.00	\$0
Borrow, Unclassified Excavation	4,708	CU. YD.	\$5.30	\$24,963
Base Course	244	TON	\$10.64	\$2,591
Asphalt Composite		TON	\$80.91	\$0
PCC Pavement 8" (cross street)	1,067	SQ. YD.	\$43.40	\$46,288
PCC Pavement 8" (ramps)	533	SQ. YD.	\$43.40	\$23,144
Concrete Approach Slab	-	SQ. YD.	\$188.34	\$0
Bridges	-	SQ. FT.	\$100.00	\$0
Guard Rail	0	LF	\$100.00	\$0
Permanent Signing/Markings	1	LUMP SUM	\$0.00	\$0
Traffic Signal	1	EACH	\$125,000.00	\$125,000
Roadway Lighting	1	LUMP SUM	\$0.00	\$0
Drainage (18" RCP)	45	LF	\$24.53	<u>\$1,104</u>
Subtotal				\$240,000
Contingencies	25%			<u>\$60,000</u>
Total Probable Construction Costs				\$300,000
Engineering, Administration	15%			\$45,000
Total Project Costs				\$350,000

INTERCHANGE GEOMETRICS CHECKLIST
SDDOT Interstate Corridor Study

Interstate: I-229
Interchange: Exit 9
Analyst: JLB
Date: 1/20/2010



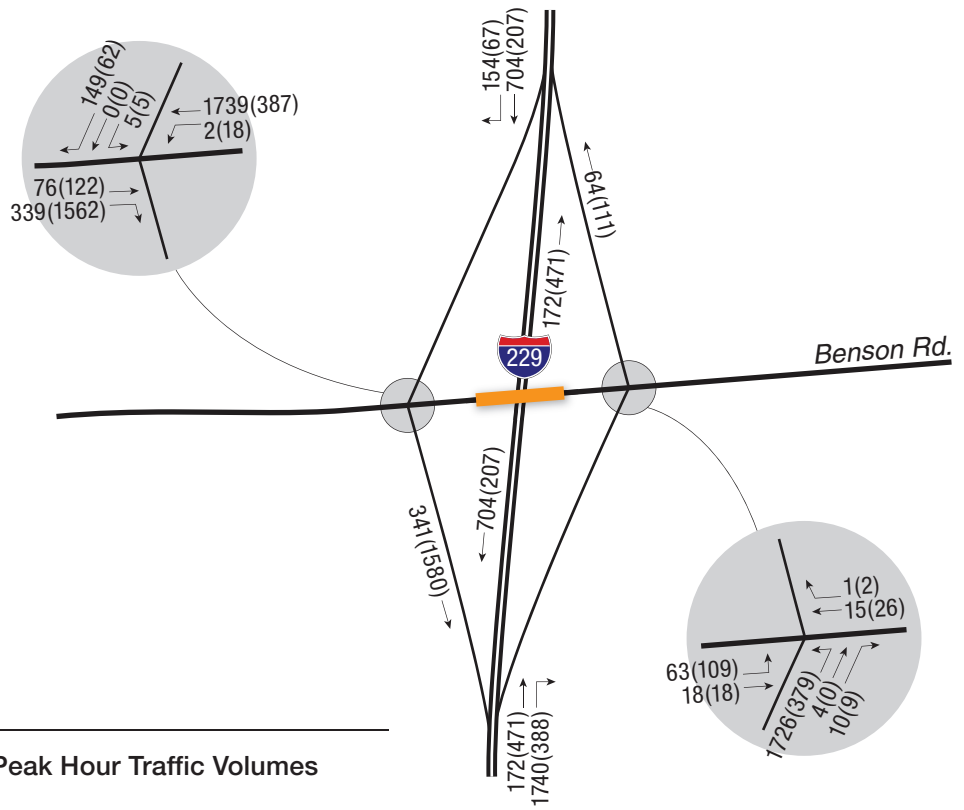
Interchange Geometry	Criteria	A	B	C	D	Achieved?
Interchange Type (Diamond, Full/Partial Cloverleaf, Trumpet etc.)	Diamond					-----
Design Speed	50 mph**					
Number of Lanes		1	2	1	1	
Right Turn Storage Length		-	-	-	-	
Left Turn Storage Length		-	-	-	-	
Superelevation (e max)	6%	4.0%	4.0%	4.0%	4.0%	Acceptable
Minimum Horizontal Radius for e max of 6% (50 mph / 30 mph)	833 / 231 feet	2291'	2291'	2291'	2291'	Acceptable
Maximum Degree of Curvature (50 mph / 30 mph)	6° 53' / 24° 48'	2° 30'	2° 30'	2° 30'	2° 30'	Acceptable
Minimum Clear Zone From the Edge of Travel Lane	30 feet	> 30'	> 30'	> 30'	> 30'	Acceptable
Maximum Grade on Ramp (Ascending)	+3% to +5%		1.27%		2.66%	Acceptable
Maximum Grade on Ramp (Descending)	-3% to -5%	3.25%		1.45%		Acceptable
Minimum Lane Width						
With Auxiliary Lanes	12 feet	-	25.0'	-	-	Acceptable
As Single Lane	15 feet (19 for loops)	15.5'	-	15.0'	22.5'	Acceptable
Shoulder Width						
Right Shoulder	8 feet (4 for loops)	7.5'	-	8.0'	1.0'	Supports Impr.
Left Shoulder	2 feet	2.0'	0.0'	2.0'	2.0'	Supports Impr.
Inslope	6:1	6:1	6:1	6:1	6:1	Acceptable
Minimum Off-Ramp Taper Rate	20:1				20:1	Acceptable
Minimum On-Ramp Taper Rate	50:1	50:1				Acceptable
Ramp Features						
K-Value Ranges						
Minimum for a Crest Vertical Curve (50 mph / 30 mph)	84 / 19					
Minimum for a Sag Vertical Curve (50 mph / 30 mph)	96 / 37	123	158	101	267	Acceptable
Minimum Stopping Sight Distance (50 mph / 30 mph)	425 / 200 feet	524'	650'	446'	1036'	Acceptable
Cross Road Features	v					
K-Value Ranges			North	South		
Minimum for a Crest Vertical Curve (50 mph / 30 mph)	84 / 19		224	449		Acceptable
Minimum for a Sag Vertical Curve (50 mph / 30 mph)	96 / 37		-	244'		Acceptable
Minimum Stopping Sight Distance (50 mph / 30 mph)	425 / 200 feet		859'	859'		Acceptable
Ramp Intersection Sight Distance (50 mph / 30 mph)***	425 / 200 feet		ok	ok		Acceptable
Maximum Longitudinal Grade - Rolling Terrain (Urban Arterial)	7%		2.3%	0.8%		Acceptable
Minimum Longitudinal Grade (Min. / Des.)	0.3% / 0.5%		0.8%	0.7%		Acceptable
Minimum Control of Access from Interchange Ramps (Min. / Des.)	300 / 660 feet		> 300'	> 300'		Acceptable

** Loop ramp design speed = 30 mph

***Substandard Intersection Sight Distance locations could not be determined from the interchange plans. Substandard locations, therefore, are intersections that demonstrate sight distance limitations based on a general field evaluation or the presence of a substandard k-value or Stopping Sight Distance along the crossroad approaching the intersection.

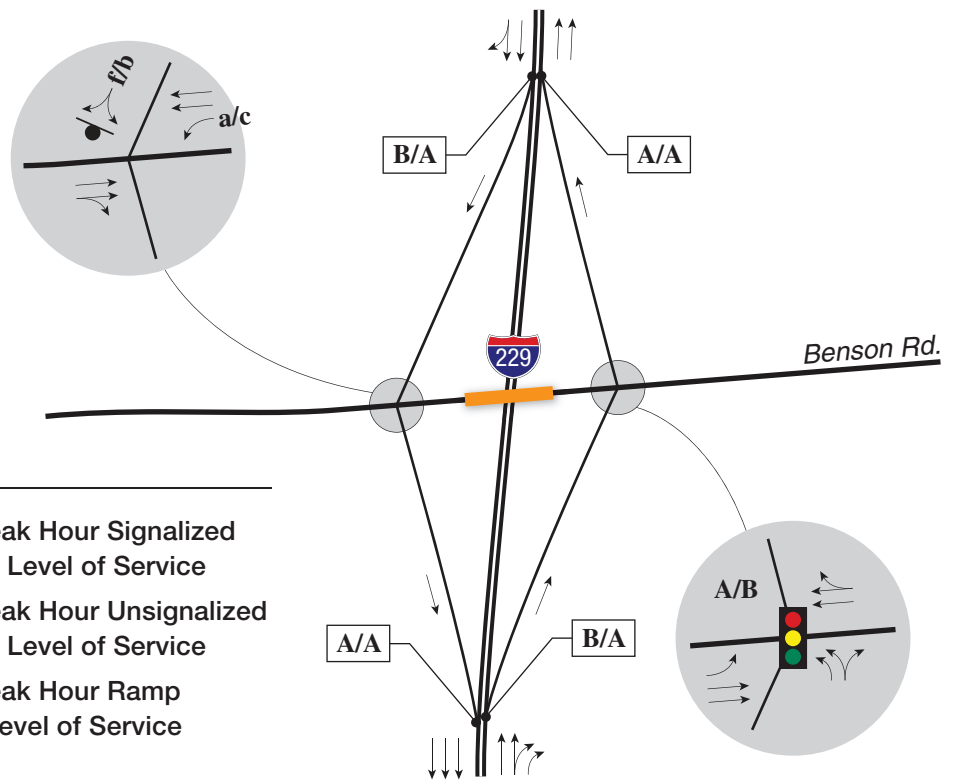
Comments

Ramp B & C have an auxiliary lanes entering and exiting.
 East ramp terminal is signalized and west ramp terminal is not



LEGEND

XXX(XXX) = AM(PM) Peak Hour Traffic Volumes

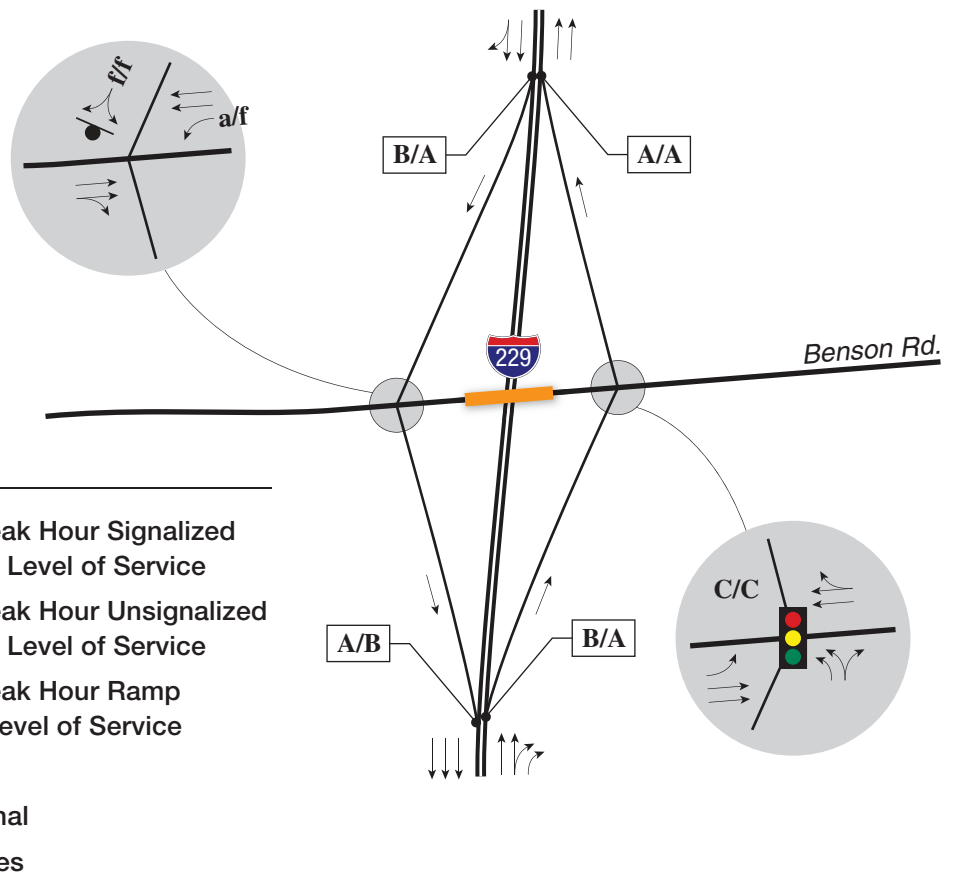
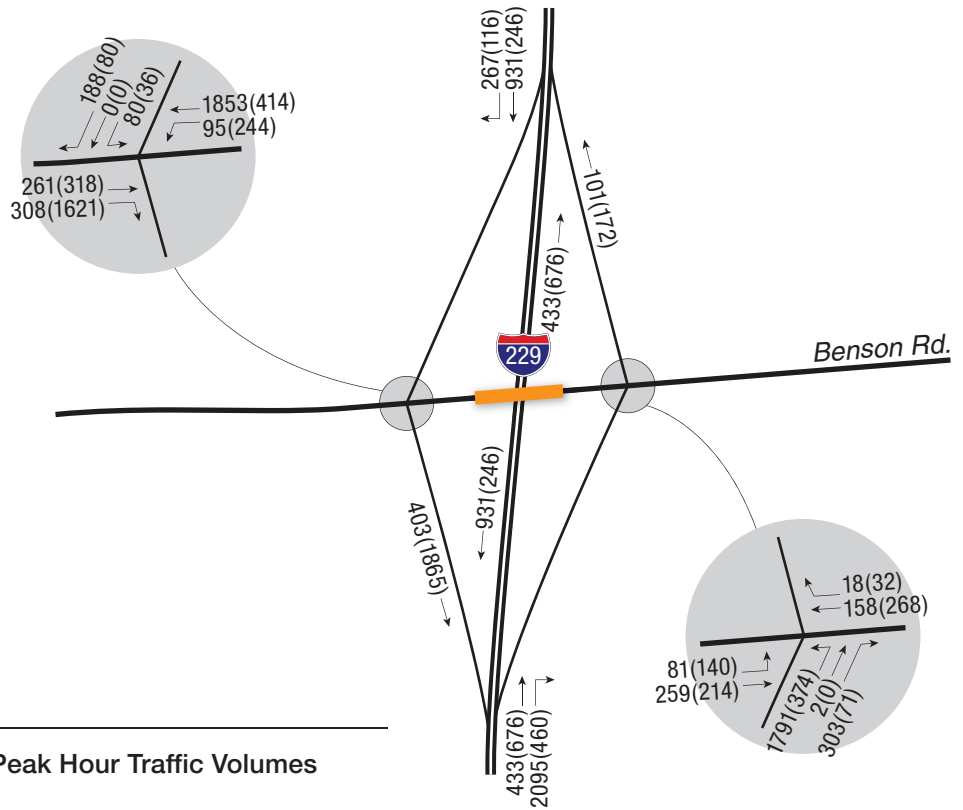


LEGEND

- X/X = AM/PM Peak Hour Signalized Movement Level of Service
- x/x = AM/PM Peak Hour Unsignalized Movement Level of Service
- X/X = AM/PM Peak Hour Ramp Junction Level of Service
- = Stop Sign
- 🚦 = Traffic Signal
- ↔ = Travel Lanes

Interstate 229 Exit 9
Traffic Conditions Year 2009

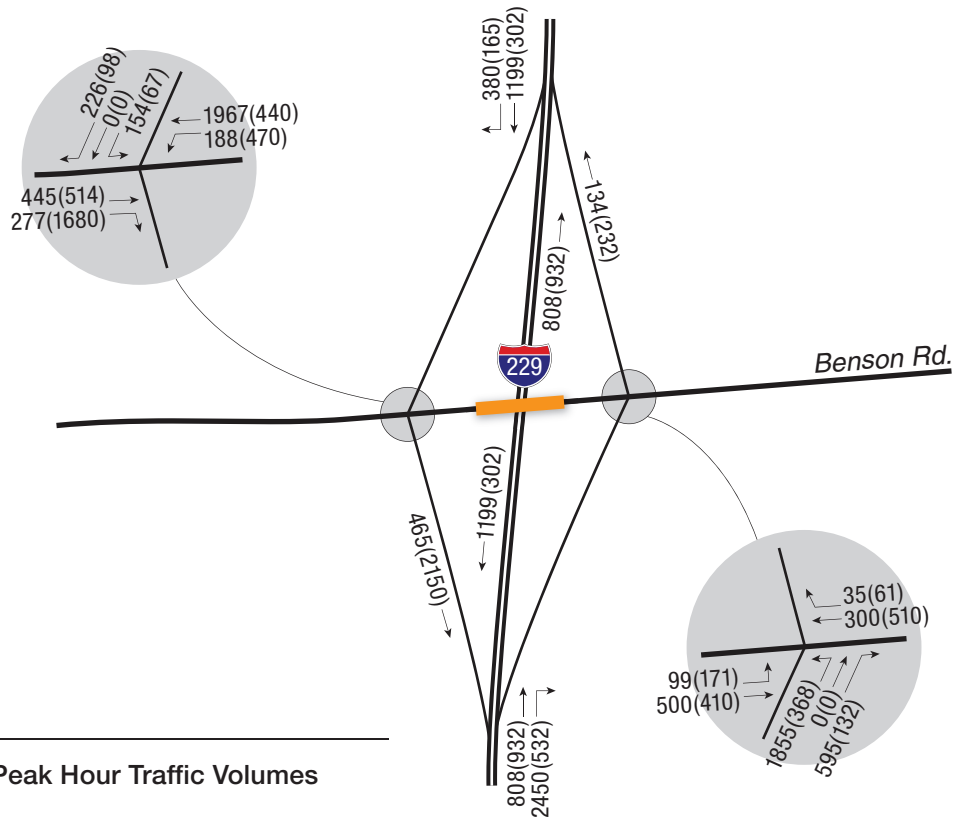
NORTH



Interstate 229 Exit 9
 Traffic Conditions Year 2020

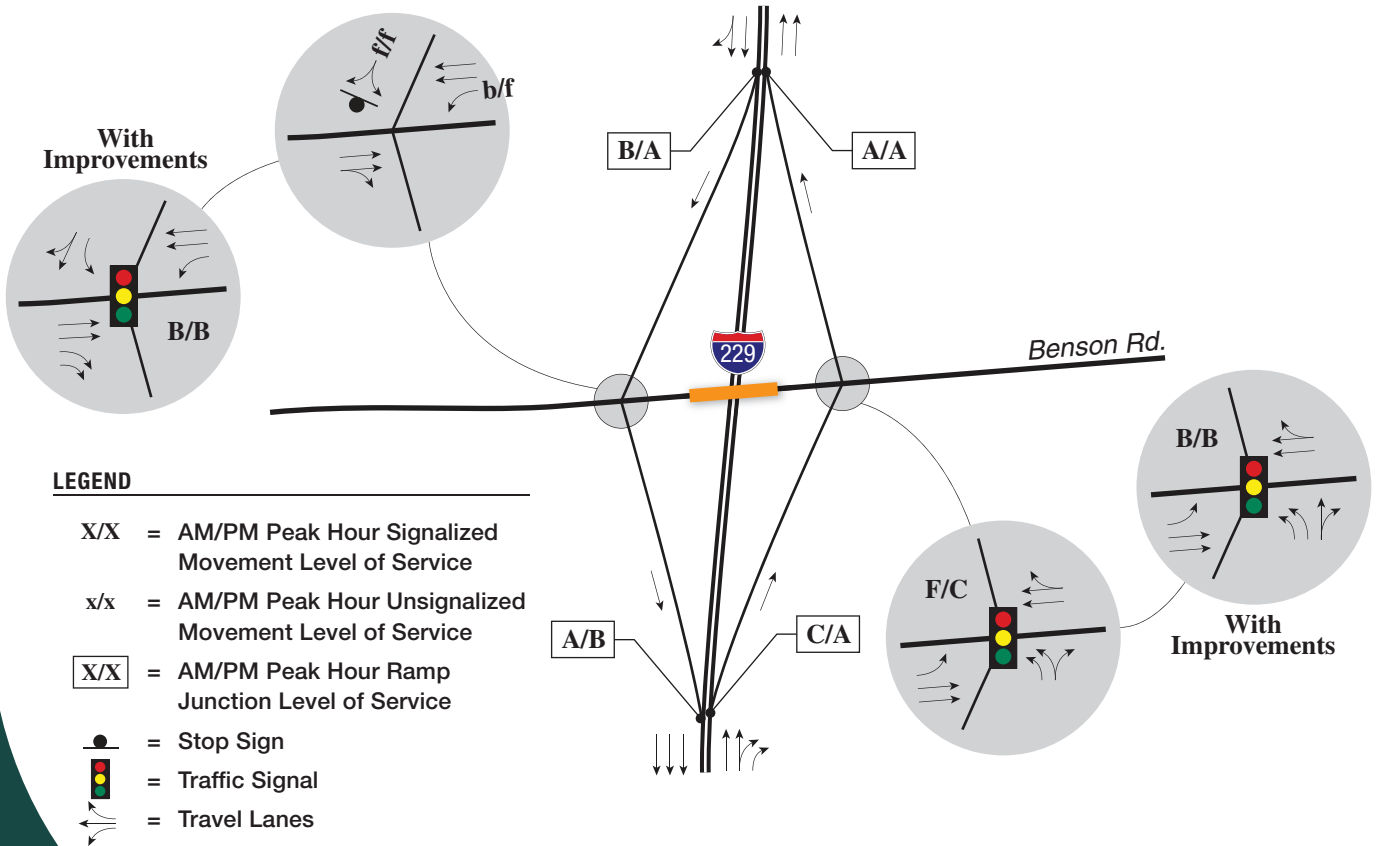
NORTH





LEGEND

xxx(xxx) = AM(PM) Peak Hour Traffic Volumes



LEGEND

- X/X = AM/PM Peak Hour Signalized Movement Level of Service
- x/x = AM/PM Peak Hour Unsignalized Movement Level of Service
- X/X = AM/PM Peak Hour Ramp Junction Level of Service
- = Stop Sign
- 🚦 = Traffic Signal
- ↔ = Travel Lanes

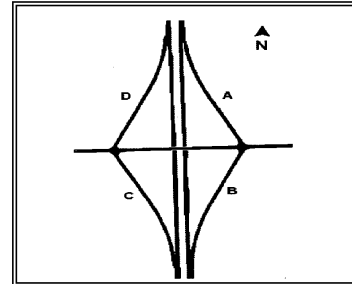
Interstate 229 Exit 9
Traffic Conditions Year 2030

NORTH



INTERCHANGE GEOMETRICS CHECKLIST
SDDOT Interstate Corridor Study

Interstate: I-29
Interchange: Exit 98
Analyst: MBM
Date: 1/20/2010

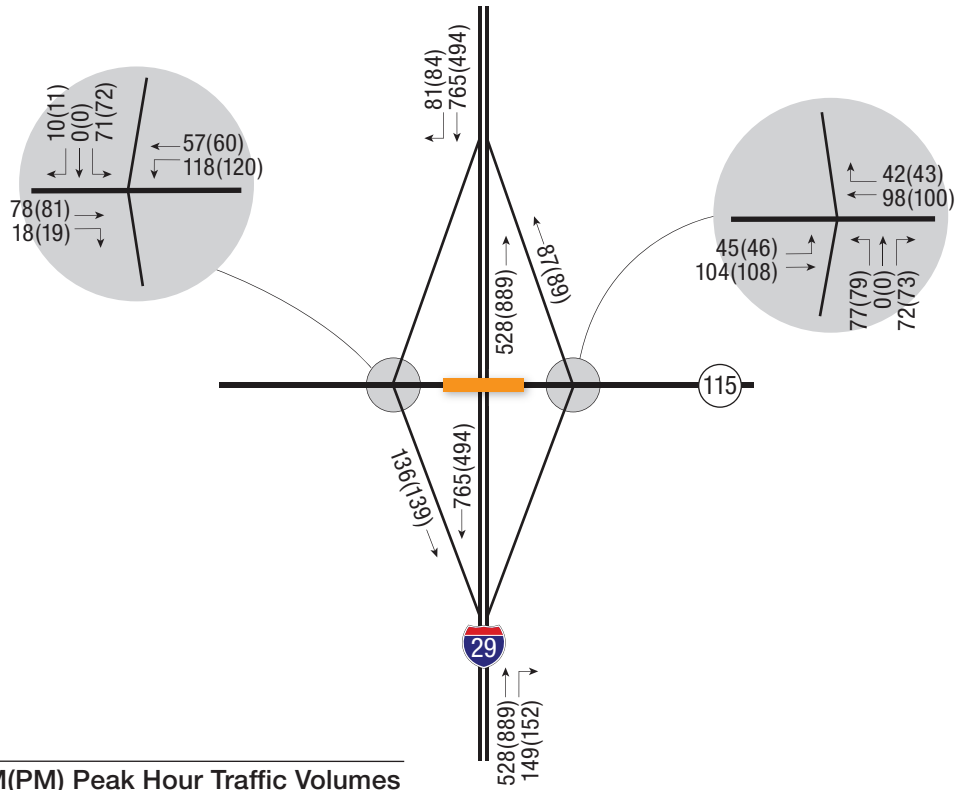


Interchange Geometry	Criteria	A	B	C	D	Achieved?
Interchange Type (Diamond, Full/Partial Cloverleaf, Trumpet etc.)	Diamond					-----
Design Speed	50 mph**					
Number of Lanes		1	1	1	1	
Right Turn Storage Length		-	-	-	-	
Left Turn Storage Length		-	-	-	-	
Superelevation (e max)	6%	3.00%	-	-	5.00%	Acceptable
Minimum Horizontal Radius for e max of 6% (50 mph / 30 mph)	833 / 231 feet	1910'	1910'	1910'	1910'	Acceptable
Maximum Degree of Curvature (50 mph / 30 mph)	6° 53' / 24° 48'	3° 00'	3° 00'	3° 00'	3° 00'	Acceptable
Minimum Clear Zone From the Edge of Travel Lane	30 feet	>30'	>30'	>30'	>30'	Acceptable
Maximum Grade on Ramp (Ascending)	+3% to +5%	-	2.10%	-	4.10%	Acceptable
Maximum Grade on Ramp (Descending)	-3% to -5%	-2.14%	-	-3.82%	-	Acceptable
Minimum Lane Width						
With Auxiliary Lanes	12 feet	-	-	-	-	
As Single Lane	15 feet (19 for loops)	16.0'	15.5'	16.0'	15.5'	Acceptable
Shoulder Width						
Right Shoulder	8 feet (4 for loops)	3.0'	5.5'	5.5'	5.0'	Supports Impr.
Left Shoulder	2 feet	3.0'	3.5'	3.5'	5.5'	Acceptable
Inslope	6:1	4:1	4:1	4:1	4:1	Supports Impr.
Minimum Off-Ramp Taper Rate	20:1	-	40:1	-	40:1	Acceptable
Minimum On-Ramp Taper Rate	50:1	61:1	-	61:1	-	Acceptable
Ramp Features						
K-Value Ranges						
Minimum for a Crest Vertical Curve (50 mph / 30 mph)	84 / 19	-	108	172	90	Acceptable
Minimum for a Sag Vertical Curve (50 mph / 30 mph)	96 / 37	503	385	150	141	Acceptable
Minimum Stopping Sight Distance (50 mph / 30 mph)	425 / 200 feet	>425'	537'	770'	1,322'	Acceptable
Cross Road Features						
K-Value Ranges						
Minimum for a Crest Vertical Curve (50 mph / 30 mph)	84 / 19	To West		To East		
Minimum for a Sag Vertical Curve (50 mph / 30 mph)	96 / 37	220		220		Acceptable
Minimum Stopping Sight Distance (50 mph / 30 mph)	425 / 200 feet	689'		689'		Acceptable
Ramp Intersection Sight Distance (50 mph / 30 mph)***	425 / 200 feet	ok		ok		Acceptable
Maximum Longitudinal Grade - Rolling Terrain (Urban Arterial)	7%	0.54%		3.69%		Acceptable
Minimum Longitudinal Grade (Min. / Des.)	0.3% / 0.5%	-		-		
Minimum Control of Access from Interchange Ramps (Min. / Des.)	300 / 660 feet	250'		650'		Supports Impr.

** Loop ramp design speed = 30 mph

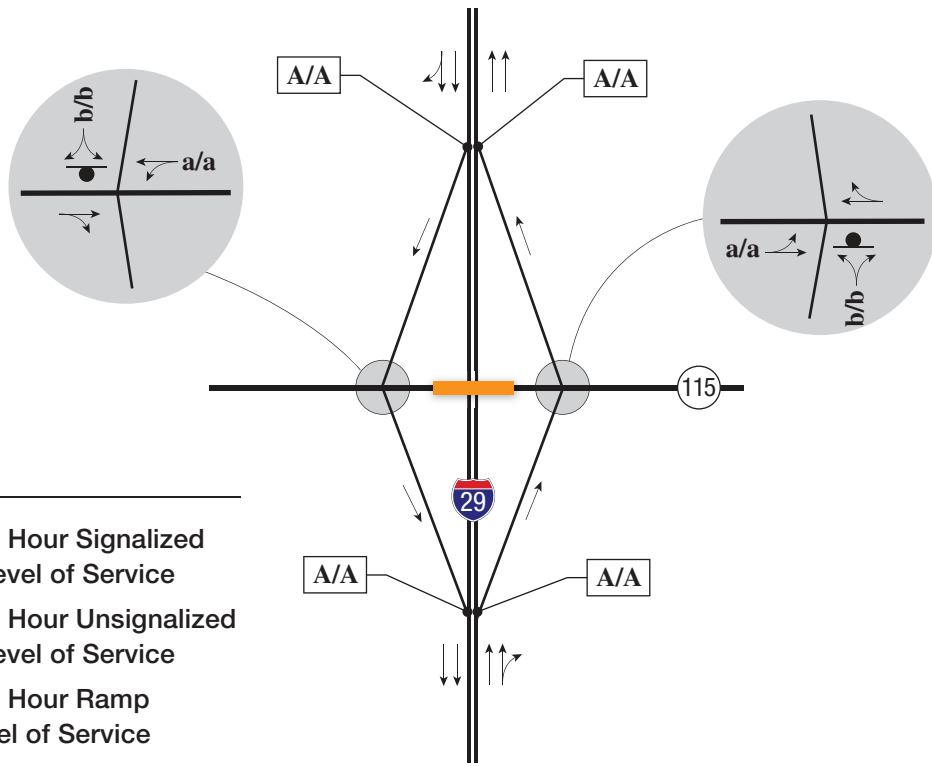
***Substandard Intersection Sight Distance locations could not be determined from the interchange plans. Substandard locations, therefore, are intersections that demonstrate sight distance limitations based on a general field evaluation or the presence of a substandard k-value or Stopping Sight Distance along the crossroad approaching the intersection.

Comments



LEGEND

XXX(XXX) = AM(PM) Peak Hour Traffic Volumes



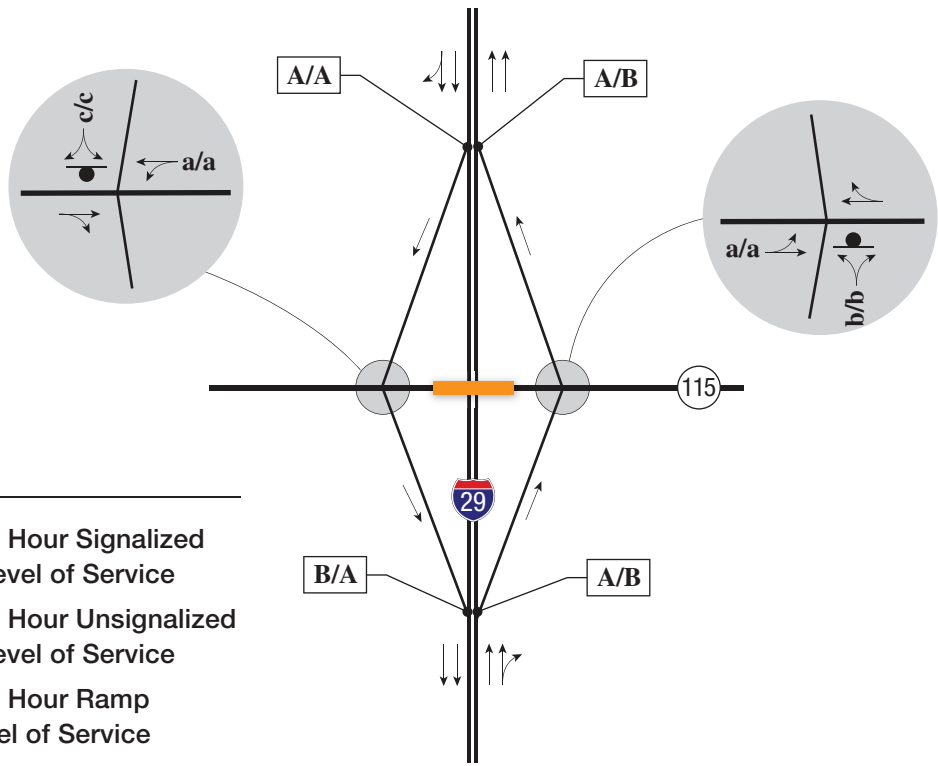
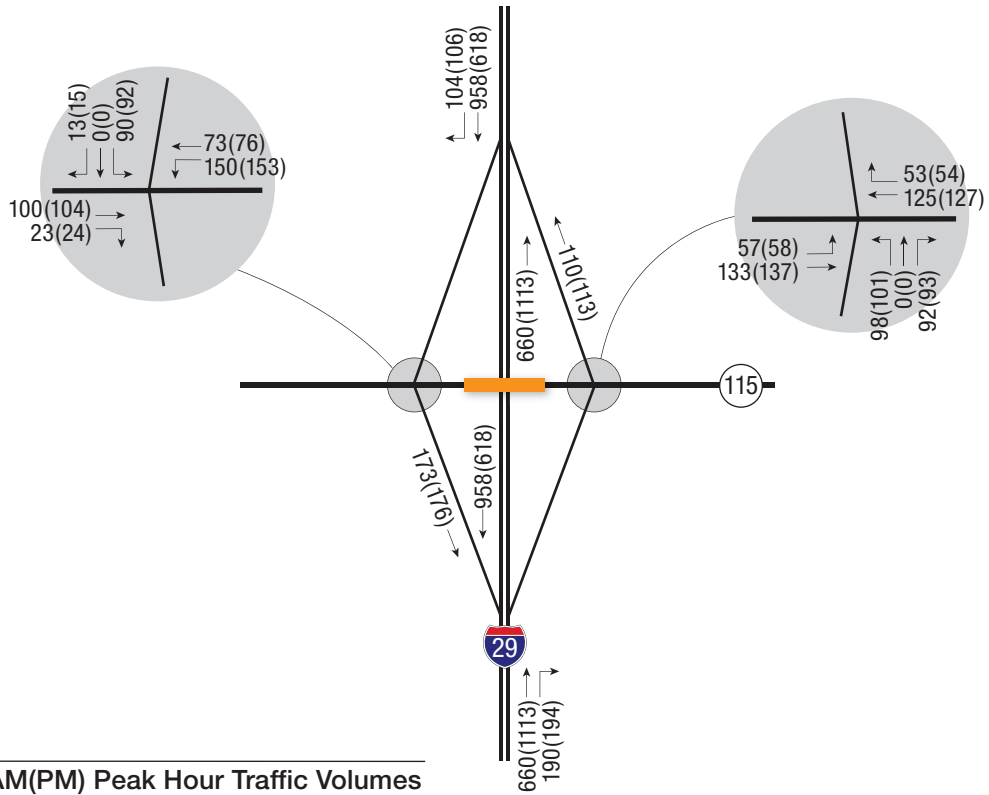
LEGEND

- X/X = AM/PM Peak Hour Signalized Movement Level of Service
- x/x = AM/PM Peak Hour Unsignalized Movement Level of Service
- X/X = AM/PM Peak Hour Ramp Junction Level of Service
- = Stop Sign
- ↔ = Travel Lanes

Interstate 29 Exit 98
Traffic Conditions Year 2009

NORTH

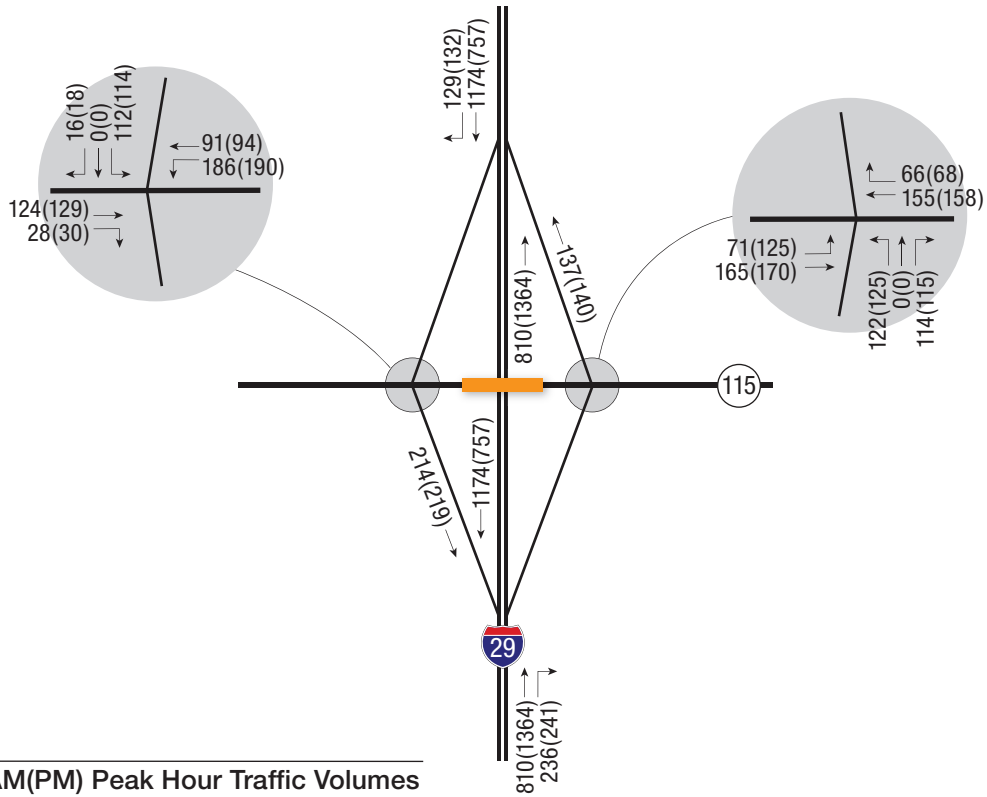




Interstate 29 Exit 98
 Traffic Conditions Year 2020

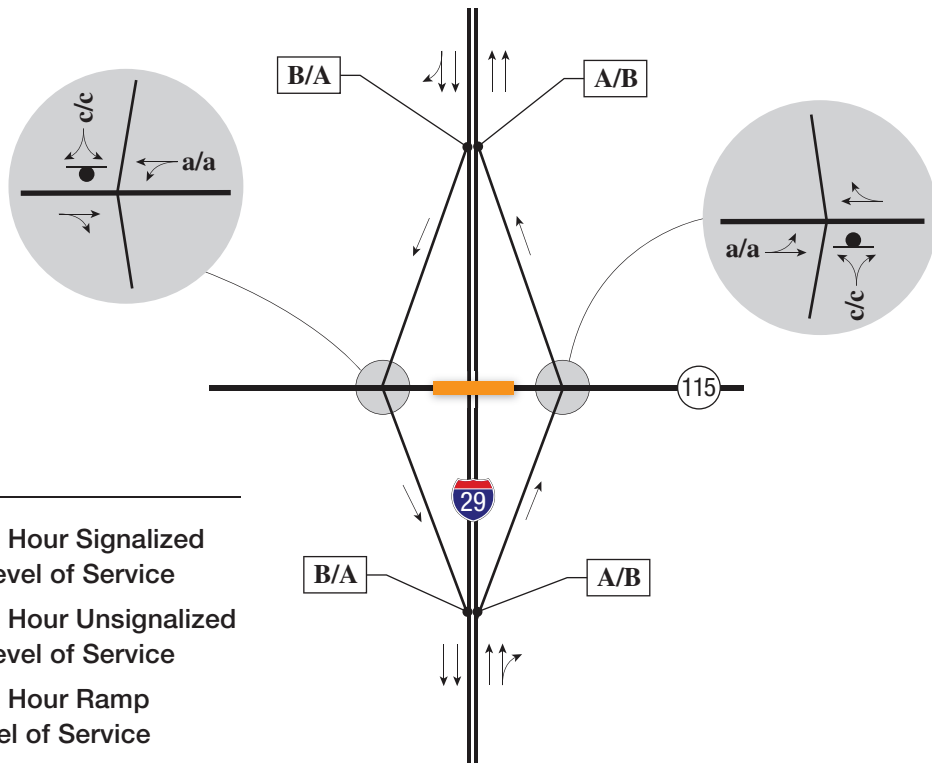
NORTH





LEGEND

XXX(XXX) = AM(PM) Peak Hour Traffic Volumes



LEGEND

- X/X = AM/PM Peak Hour Signalized Movement Level of Service
- x/x = AM/PM Peak Hour Unsignalized Movement Level of Service
- X/X = AM/PM Peak Hour Ramp Junction Level of Service
- = Stop Sign
- ↔ = Travel Lanes

Interstate 29 Exit 98
Traffic Conditions Year 2030

NORTH



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I-90 EXIT 330 MITCHELL/HURON

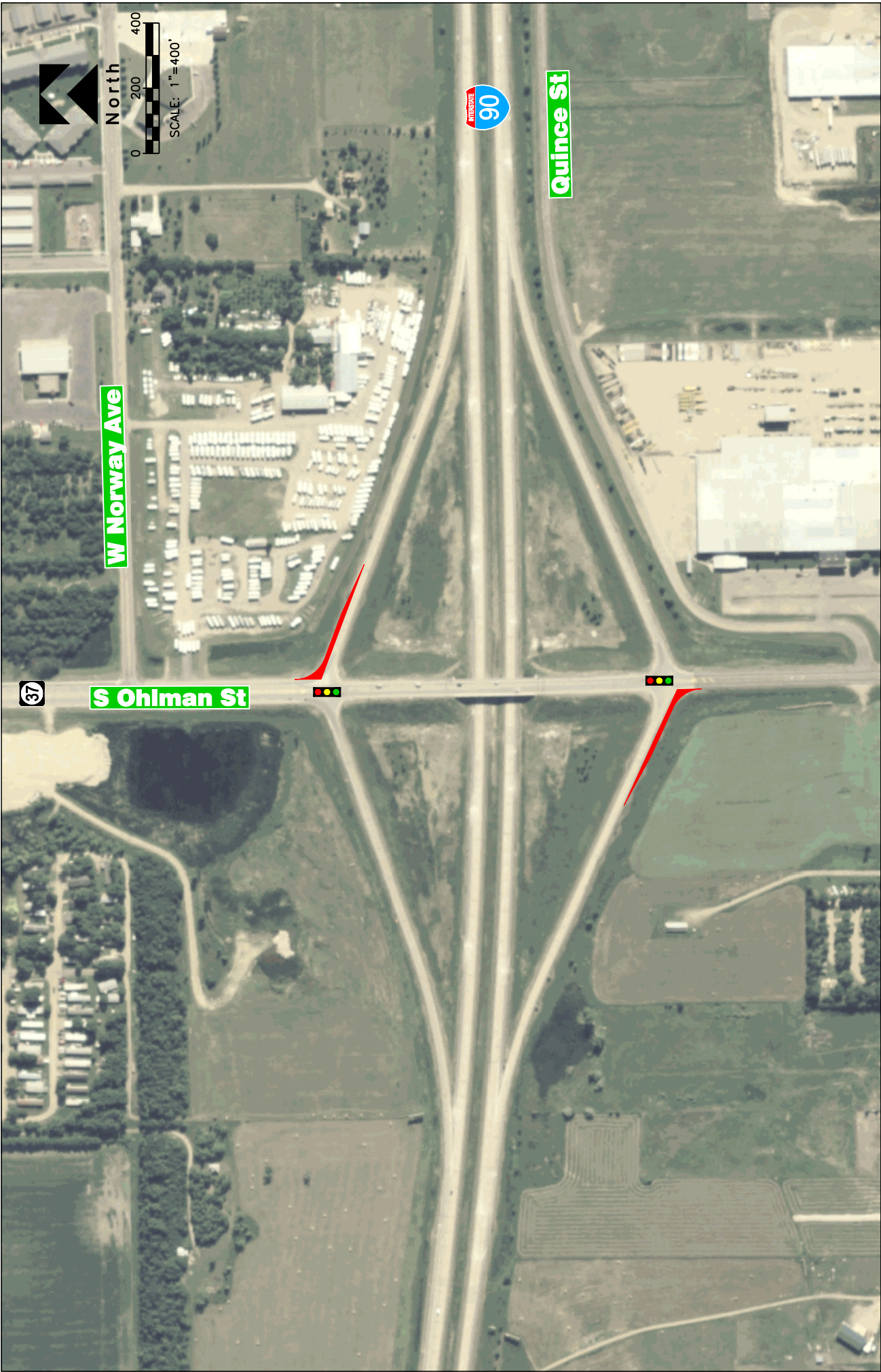


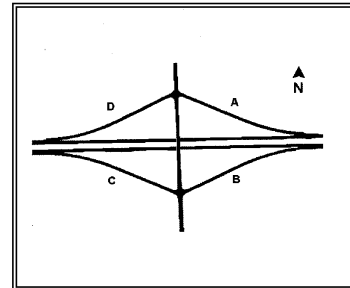
Figure 1
I-90 Exit 330 - Mitchell/Huron
Lane Addition and Signalization Improvements

Probable Construction Costs
I-90 Exit 330 - Lane Addition and Signalization Improvements

<i>Item Description</i>	<i>Quantity</i>	<i>Unit</i>	<i>Unit Cost</i>	<i>Total Cost</i>
Mobilization	1	LUMP SUM	\$3,000.00	\$3,000
Traffic Control	1	LUMP SUM	\$7,000.00	\$7,000
Clearing	1	LUMP SUM	\$1,000.00	\$1,000
Removal of Concrete Pavement	-	SQ. YD.	\$3.88	\$0
Removal of Asphalt Pavement	-	SQ. YD.	\$7.39	\$0
Remove Bridge	-	SQ. FT.	\$9.00	\$0
Borrow, Unclassified Excavation	1,206	CU. YD.	\$5.30	\$6,392
Base Course	571	TON	\$10.64	\$6,073
Asphalt Composite		TON	\$80.91	\$0
PCC Pavement 11" (mainline)	-	SQ. YD.	\$33.12	\$0
PCC Pavement 8" (ramps)	1,250	SQ. YD.	\$43.40	\$54,244
Concrete Approach Slab	-	SQ. YD.	\$188.34	\$0
Bridges	-	SQ. FT.	\$100.00	\$0
Guard Rail	0	LF	\$100.00	\$0
Permanent Signing/Markings	1	LUMP SUM	\$0.00	\$0
Traffic Signal	2	EACH	\$125,000.00	\$250,000
Roadway Lighting	1	LUMP SUM	\$0.00	\$0
Drainage (18" RCP)	60	LF	\$24.53	<u>\$1,472</u>
Subtotal				\$330,000
Contingencies	25%			<u>\$82,500</u>
Total Probable Construction Costs				\$410,000
Engineering, Administration	15%			\$61,500
Total Project Costs				\$470,000

INTERCHANGE GEOMETRICS CHECKLIST
SDDOT Interstate Corridor Study

Interstate: I-90
Interchange: Exit 330
Analyst: BLM
Date: 1/20/2010

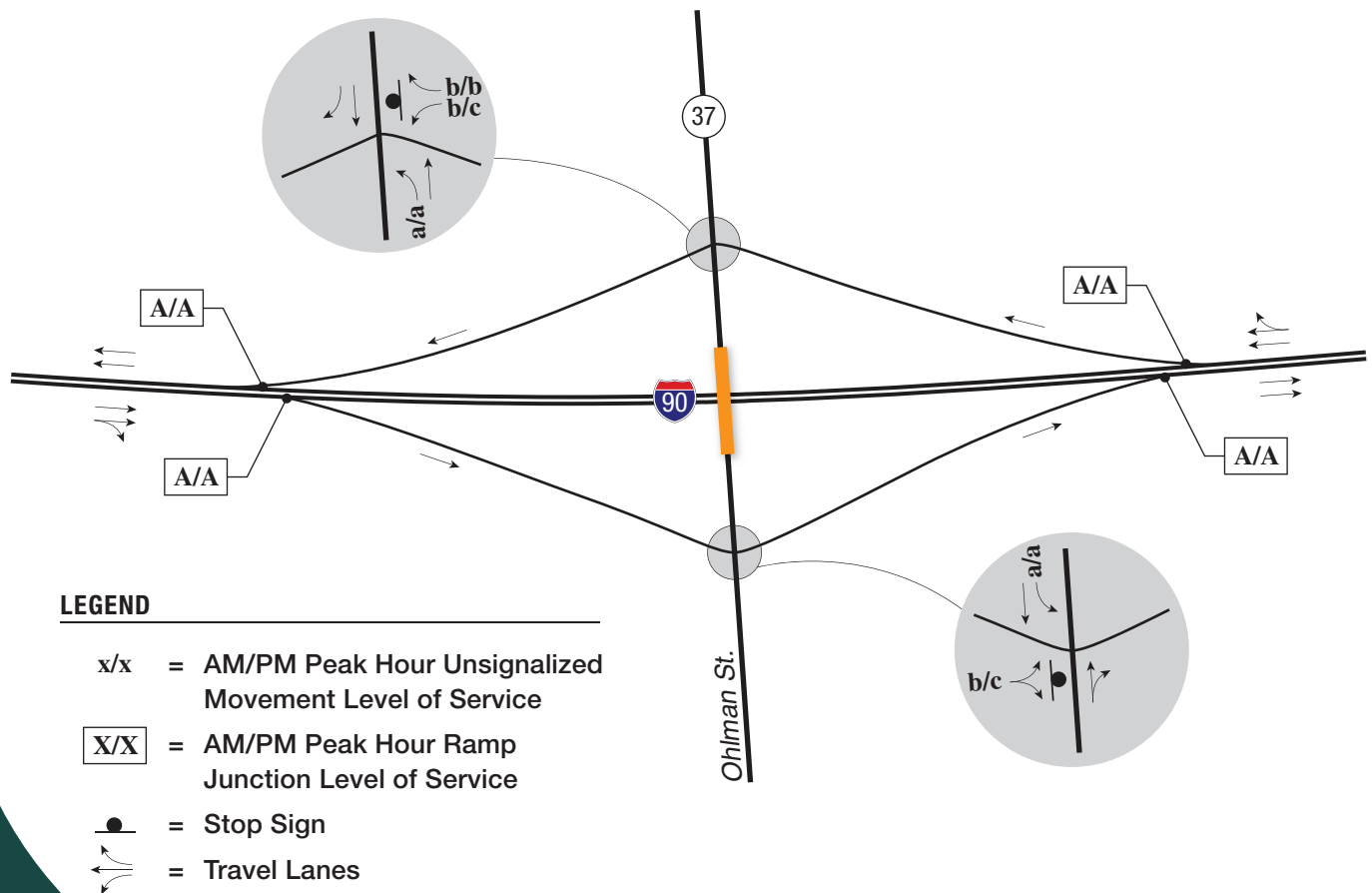
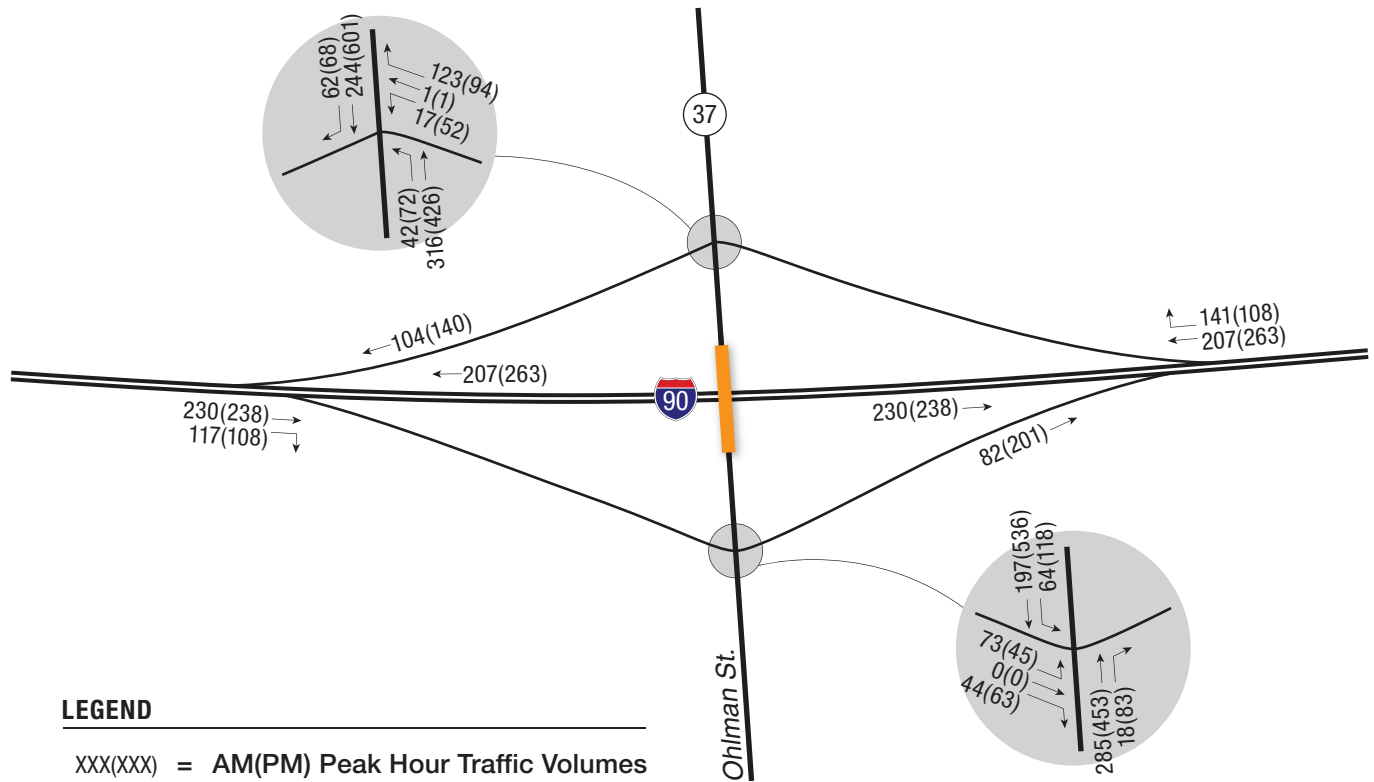


Interchange Geometry	Criteria	A	B	C	D	Achieved?
Interchange Type (Diamond, Full/Partial Cloverleaf, Trumpet etc.)	Diamond					
Design Speed	50 mph**					
Number of Lanes		1	1	1	1	
Right Turn Storage Length		-	-	-	-	
Left Turn Storage Length		-	-	-	-	
Superelevation (e max)	6%	5.0%	3.0%	5.0%	3.0%	Acceptable
Minimum Horizontal Radius for e max of 6% (50 mph / 30 mph)	833 / 231 feet	1910'	1910'	1910'	1910'	Acceptable
Maximum Degree of Curvature (50 mph / 30 mph)	6° 53' / 24° 48'	3° 00'	3° 00'	3° 00'	3° 00'	Acceptable
Minimum Clear Zone From the Edge of Travel Lane	30 feet	>30'	>30'	>30'	>30'	Acceptable
Maximum Grade on Ramp (Ascending)	+3% to +5%	1.08%	-	2.26%	-	Acceptable
Maximum Grade on Ramp (Descending)	-3% to -5%	-	-1.12%	-	-1.81%	Acceptable
Minimum Lane Width						
With Auxiliary Lanes	12 feet	-	-	-	-	
As Single Lane	15 feet (19 for loops)	18.0'	18.0'	18.0'	18.0'	Acceptable
Shoulder Width						
Right Shoulder	8 feet (4 for loops)	4.0'	4.0'	4.0'	5.0'	Supports Impr.
Left Shoulder	2 feet	4.0'	4.0'	4.0'	4.0'	Acceptable
Inslope	6:1	4:1	4:1	4:1	4:1	Supports Impr.
Minimum Off-Ramp Taper Rate	20:1	40:1	-	41:1	-	Acceptable
Minimum On-Ramp Taper Rate	50:1	-	61:1	-	63:1	Acceptable
Ramp Features						
K-Value Ranges						
Minimum for a Crest Vertical Curve (50 mph / 30 mph)	84 / 19	796	-	234	-	Acceptable
Minimum for a Sag Vertical Curve (50 mph / 30 mph)	96 / 37	176	234	182	250	Acceptable
Minimum Stopping Sight Distance (50 mph / 30 mph)	425 / 200 feet	1246'	>425'	830'	>425'	Acceptable
Cross Road Features						
K-Value Ranges		To North		To South		
Minimum for a Crest Vertical Curve (50 mph / 30 mph)	84 / 19	264		264		Acceptable
Minimum for a Sag Vertical Curve (50 mph / 30 mph)	96 / 37	262		175		Acceptable
Minimum Stopping Sight Distance (50 mph / 30 mph)	425 / 200 feet	754'		754'		Acceptable
Ramp Intersection Sight Distance (50 mph / 30 mph)***	425 / 200 feet	ok		ok		Acceptable
Maximum Longitudinal Grade - Rolling Terrain (Urban Arterial)	7%	2.50%		3.00%		Acceptable
Minimum Longitudinal Grade (Min. / Des.)	0.3% / 0.5%	0.02%		0.14%		Supports Impr.
Minimum Control of Access from Interchange Ramps (Min. / Des.)	300 / 660 feet	420'		620'		Acceptable

** Loop ramp design speed = 30 mph

***Substandard Intersection Sight Distance locations could not be determined from the interchange plans. Substandard locations, therefore, are intersections that demonstrate sight distance limitations based on a general field evaluation or the presence of a substandard k-value or Stopping Sight Distance along the crossroad approaching the intersection.

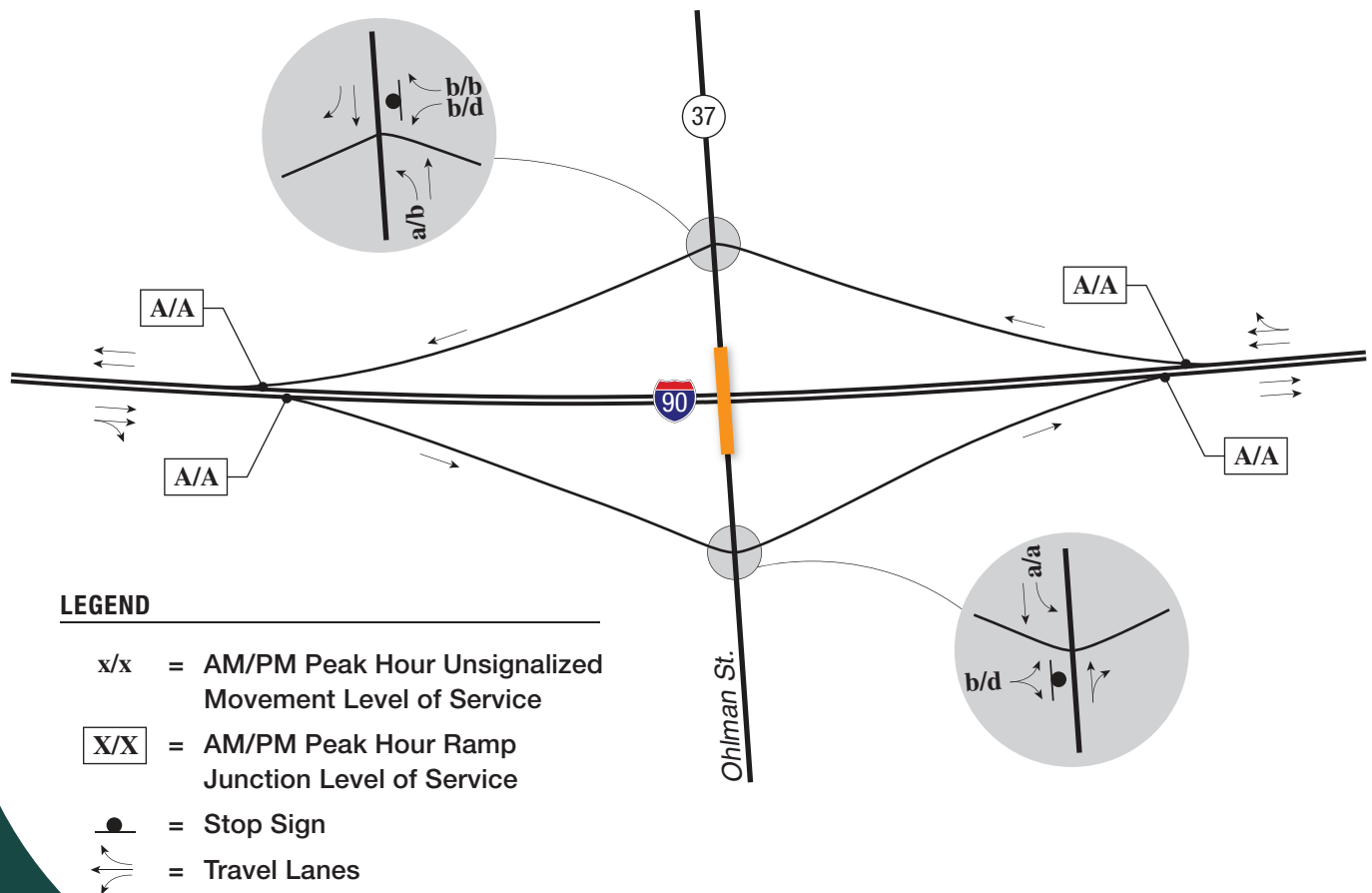
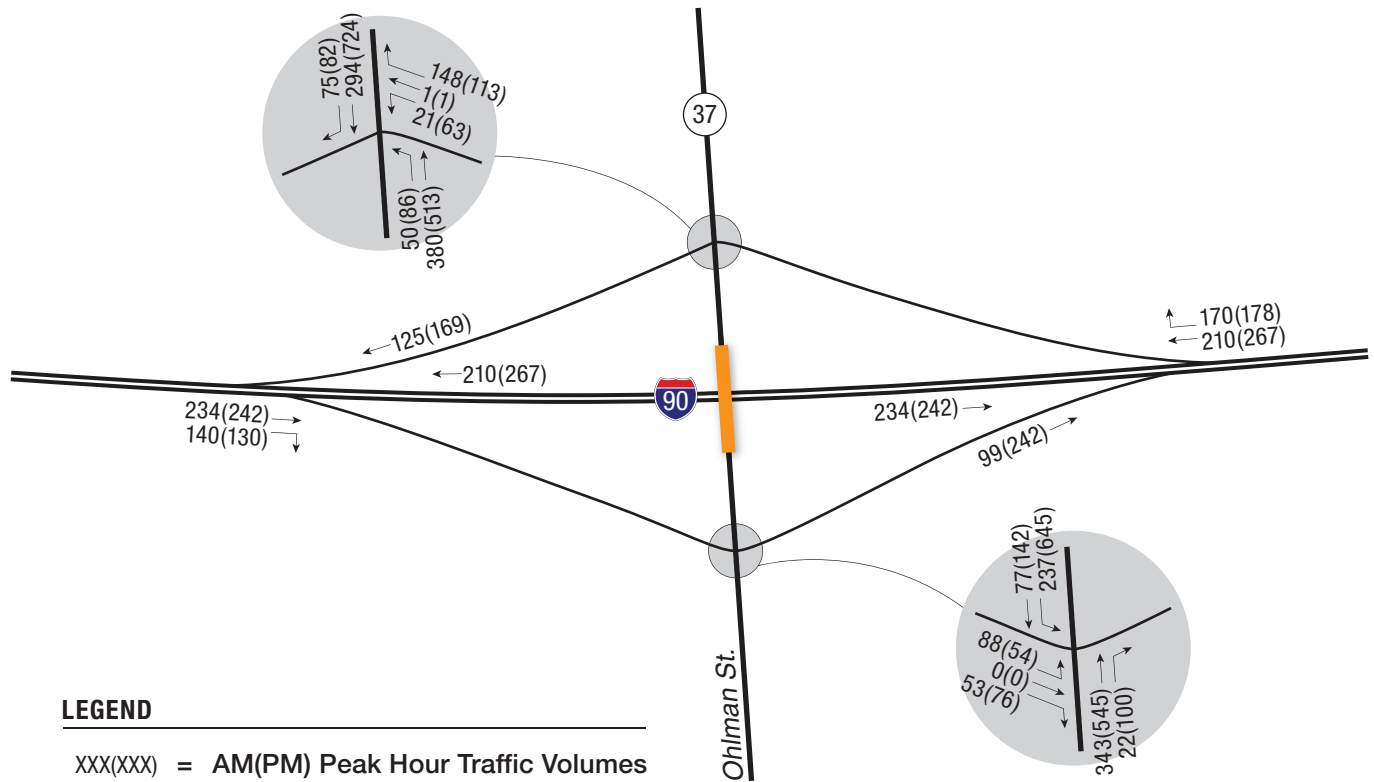
Comments



Interstate 90 Exit 330
Traffic Conditions Year 2009

NORTH

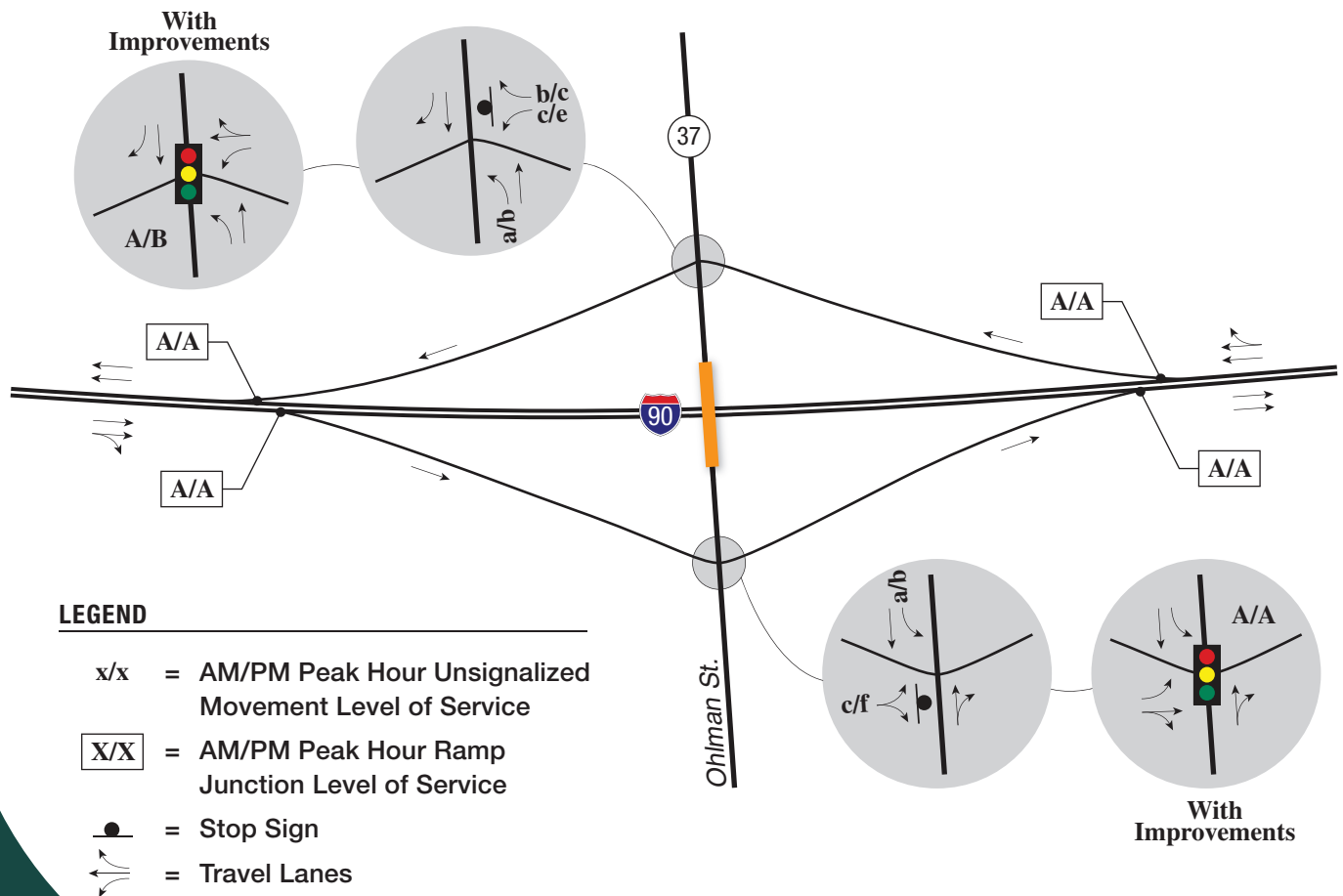
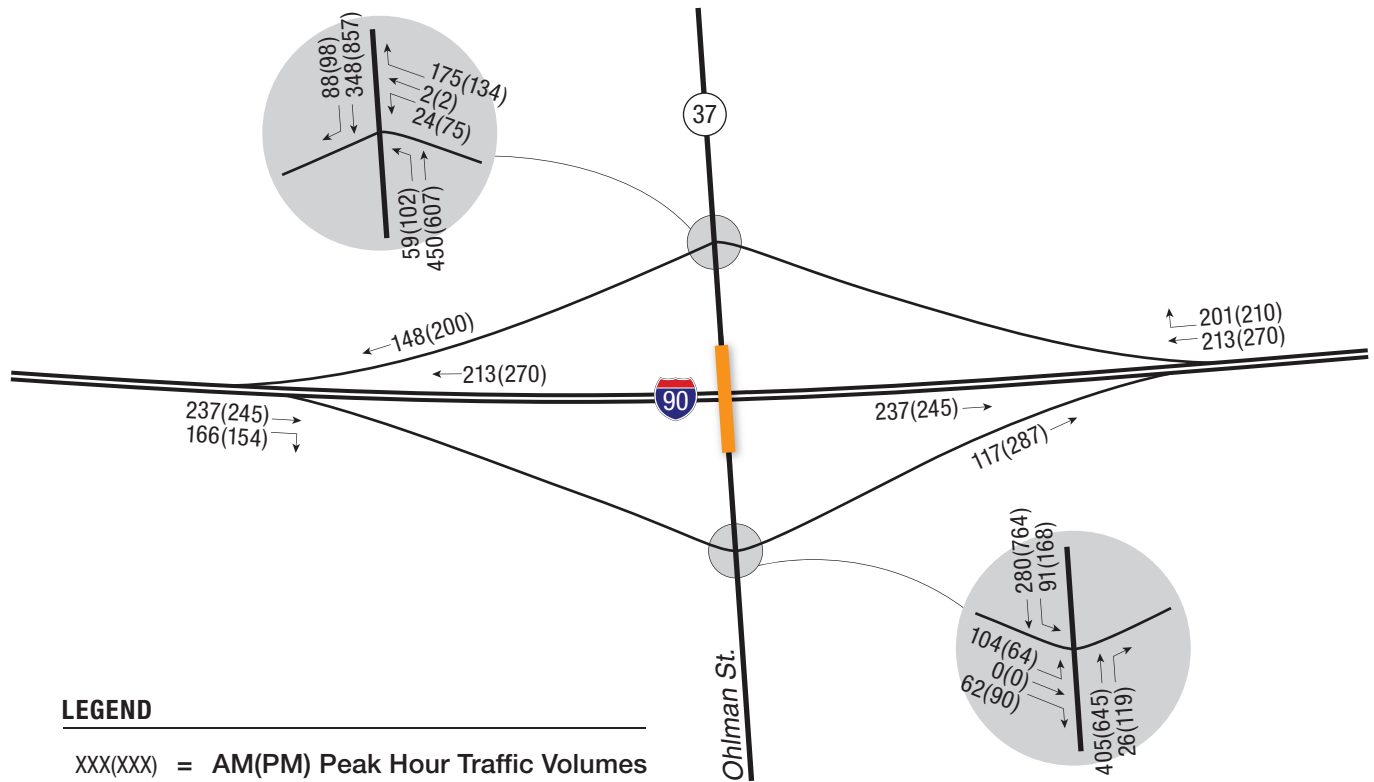




Interstate 90 Exit 330
Traffic Conditions Year 2020

NORTH





Interstate 90 Exit 330
Traffic Conditions Year 2030

NORTH



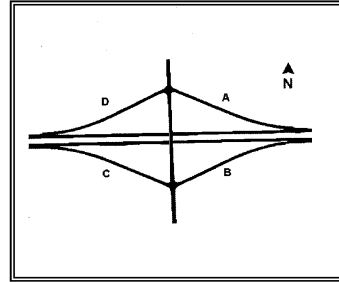
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I-90 EXIT 332 MITCHELL/PARKSTON

INTERCHANGE GEOMETRICS CHECKLIST
SDDOT Interstate Corridor Study

Interstate: I-90
Interchange: Exit 332
Analyst: MBM
Date: 1/20/2010

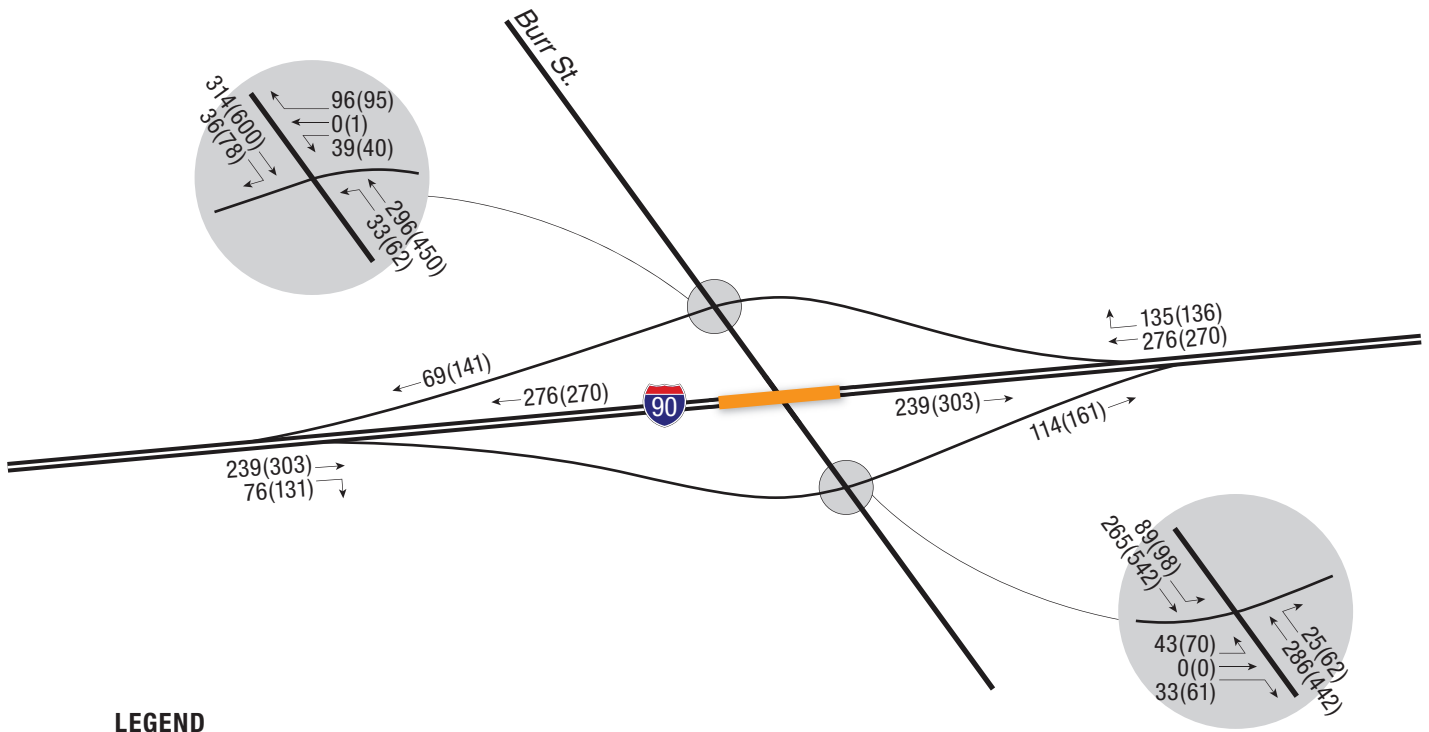


Interchange Geometry	Criteria	A	B	C	D	Achieved?
Interchange Type (Diamond, Full/Partial Cloverleaf, Trumpet etc.)	Diamond					
Design Speed	50 mph**					
Number of Lanes		2	1	2	1	
Right Turn Storage Length		550'	-	500'	-	
Left Turn Storage Length		-	-	-	-	
Superelevation (e max)	6%	6.0%	4.0%	5.0%	3.0%	Acceptable
Minimum Horizontal Radius for e max of 6% (50 mph / 30 mph)	833 / 231 feet	1910'	1910'	1146'	1146'	Acceptable
Maximum Degree of Curvature (50 mph / 30 mph)	6° 53' / 24° 48'	3°	3°	5°	5°	Acceptable
Minimum Clear Zone From the Edge of Travel Lane	30 feet	>30'	>30'	>30'	>30'	Acceptable
Maximum Grade on Ramp (Ascending)	+3% to +5%	-	4.30%	-	1.92%	Acceptable
Maximum Grade on Ramp (Descending)	-3% to -5%	-3.68%	-	-1.29%	-	Acceptable
Minimum Lane Width						
With Auxiliary Lanes	12 feet	12.0'	-	12.0'	-	Acceptable
As Single Lane	15 feet (19 for loops)	12.0'	18.0'	12.0'	18.0'	Supports Impr.
Shoulder Width						
Right Shoulder	8 feet (4 for loops)	8.0'	4.0'	8.0'	4.0'	Supports Impr.
Left Shoulder	2 feet	2.5'	4.0'	2.5'	4.5'	Acceptable
Inslope	6:1	4:1	4:1	4:1	4:1	Supports Impr.
Minimum Off-Ramp Taper Rate	20:1	40:1	-	40:1	-	Acceptable
Minimum On-Ramp Taper Rate	50:1	-	62:1	-	60:1	Acceptable
Ramp Features						
K-Value Ranges						
Minimum for a Crest Vertical Curve (50 mph / 30 mph)	84 / 19	165	134	287	298	Acceptable
Minimum for a Sag Vertical Curve (50 mph / 30 mph)	96 / 37	-	-	292	-	Acceptable
Minimum Stopping Sight Distance (50 mph / 30 mph)	425 / 200 feet	595'	539'	912'	836'	Acceptable
Cross Road Features						
K-Value Ranges						
Minimum for a Crest Vertical Curve (50 mph / 30 mph)	84 / 19	To North		To South		Acceptable
Minimum for a Sag Vertical Curve (50 mph / 30 mph)	96 / 37	418		-		Acceptable
Minimum Stopping Sight Distance (50 mph / 30 mph)	425 / 200 feet	949'		>425'		Acceptable
Ramp Intersection Sight Distance (50 mph / 30 mph)***	425 / 200 feet	ok		ok		Acceptable
Maximum Longitudinal Grade - Rolling Terrain (Urban Arterial)	7%	2.60%		1.30%		Acceptable
Minimum Longitudinal Grade (Min. / Des.)	0.3% / 0.5%	0.20%		0.20%		Supports Impr.
Minimum Control of Access from Interchange Ramps (Min. / Des.)	300 / 660 feet	400'		400'		Acceptable

** Loop ramp design speed = 30 mph
 ***Substandard Intersection Sight Distance locations could not be determined from the interchange plans. Substandard locations, therefore, are intersections that demonstrate sight distance limitations based on a general field evaluation or the presence of a substandard k-value or Stopping Sight Distance along the crossroad approaching the intersection

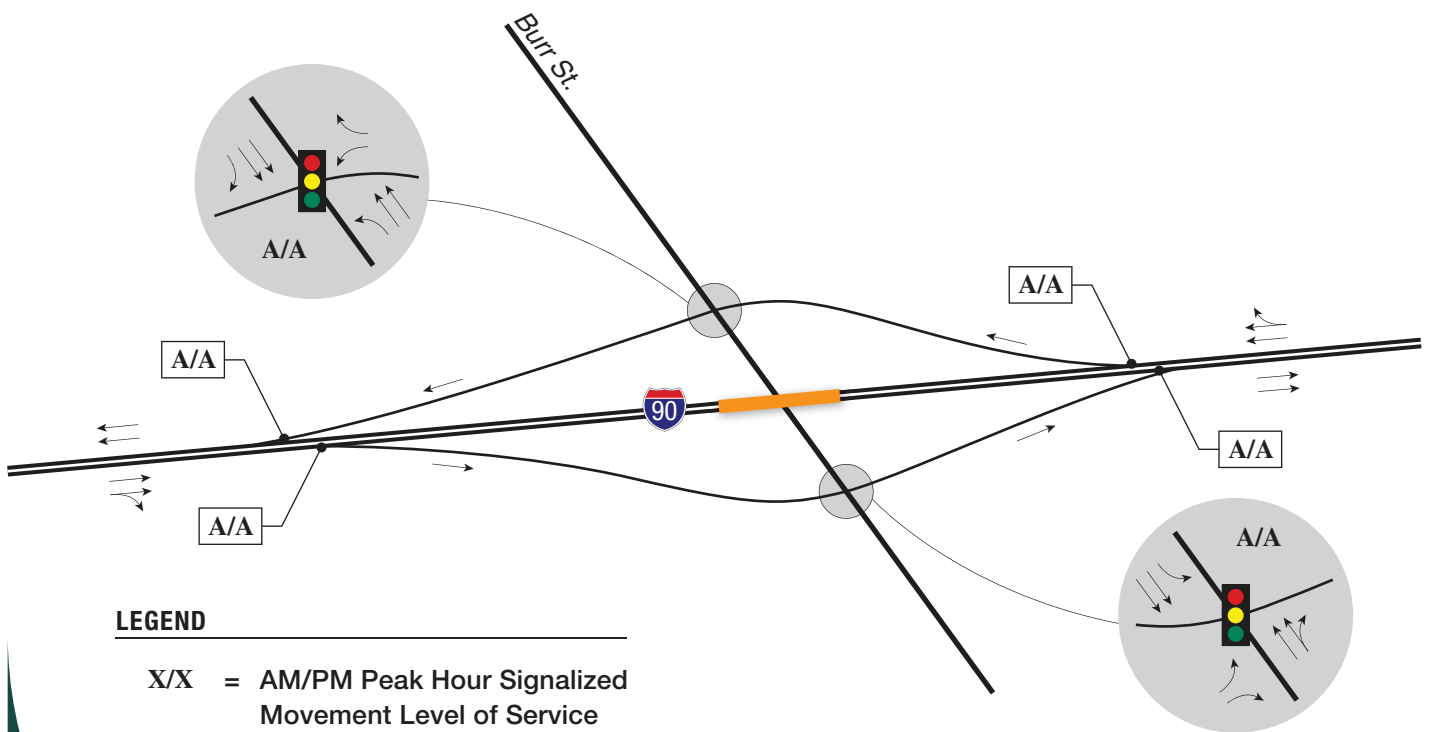
** Loop ramp design speed = 30 mph

Comments



LEGEND

XXX(XXX) = AM(PM) Peak Hour Traffic Volumes



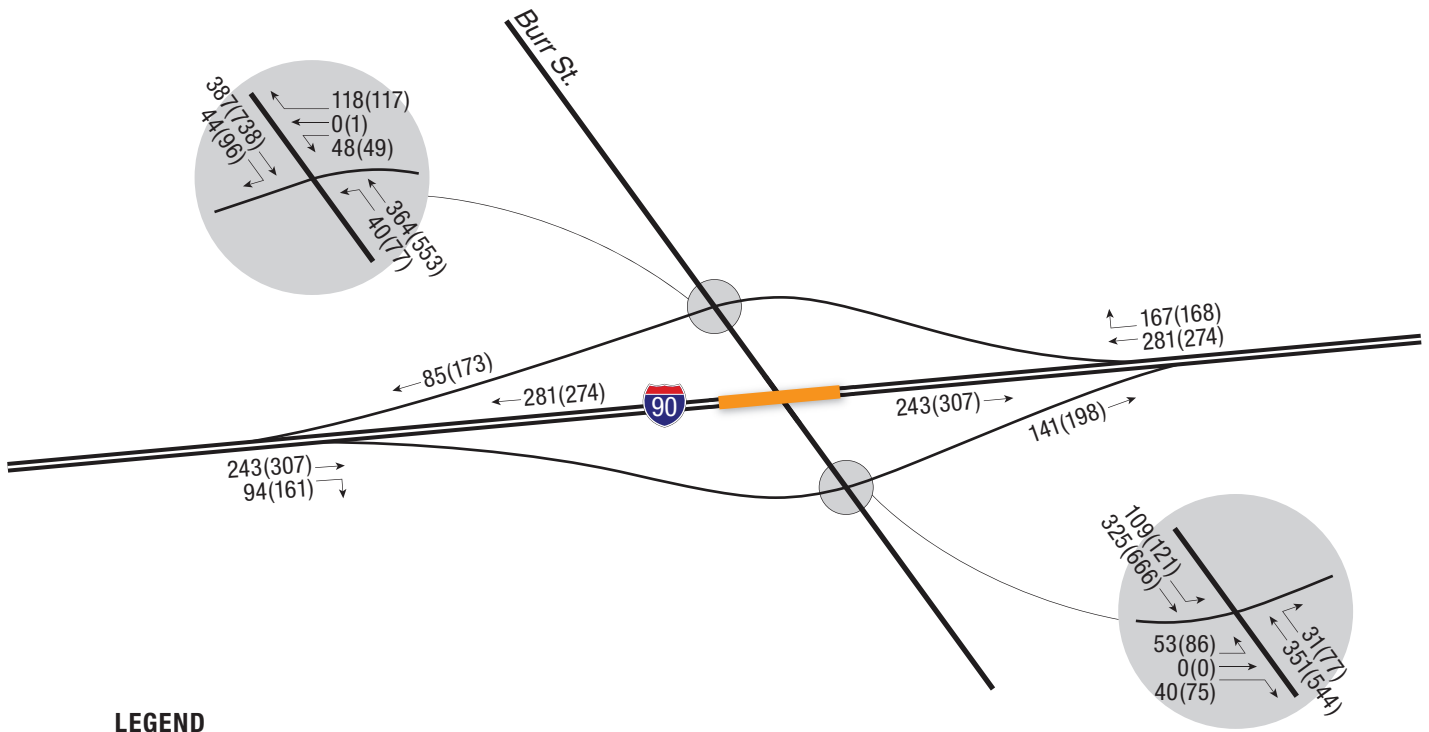
LEGEND

- X/X = AM/PM Peak Hour Signalized Movement Level of Service
- X/X = AM/PM Peak Hour Ramp Junction Level of Service
- = Stop Sign
- ↔ = Travel Lanes

Interstate 90 Exit 332
Traffic Conditions Year 2009

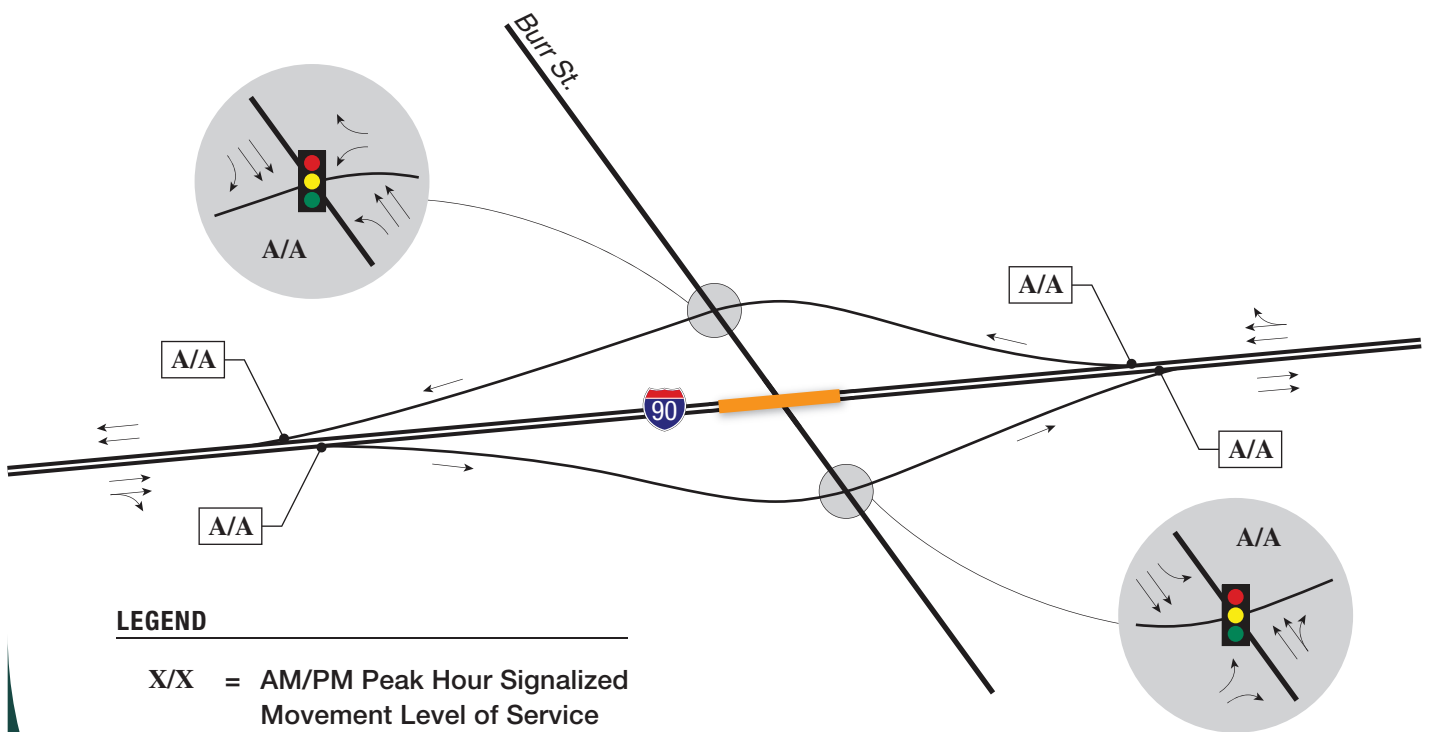
NORTH





LEGEND

XXX(XXX) = AM(PM) Peak Hour Traffic Volumes



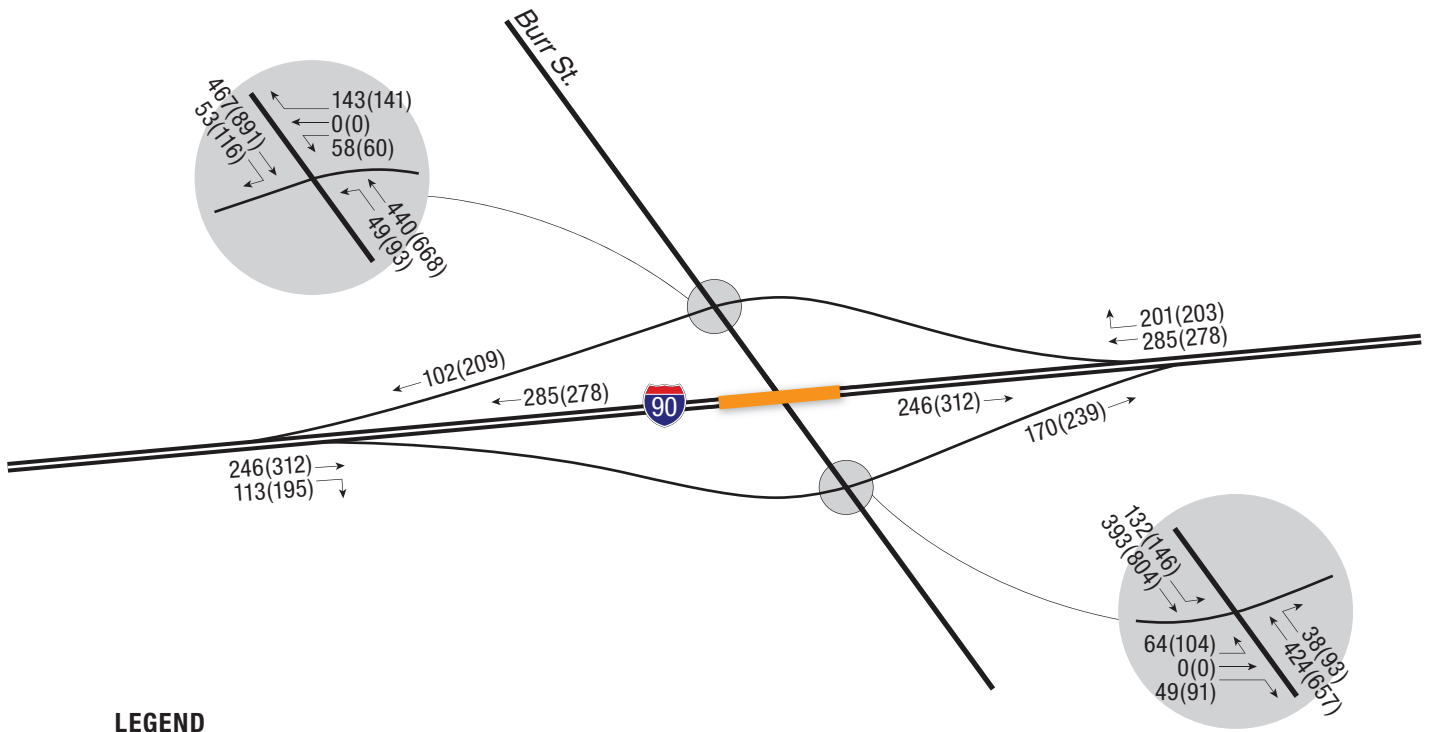
LEGEND

- X/X = AM/PM Peak Hour Signalized Movement Level of Service
- X/X = AM/PM Peak Hour Ramp Junction Level of Service
- = Stop Sign
- ↔ = Travel Lanes

Interstate 90 Exit 332
Traffic Conditions Year 2020

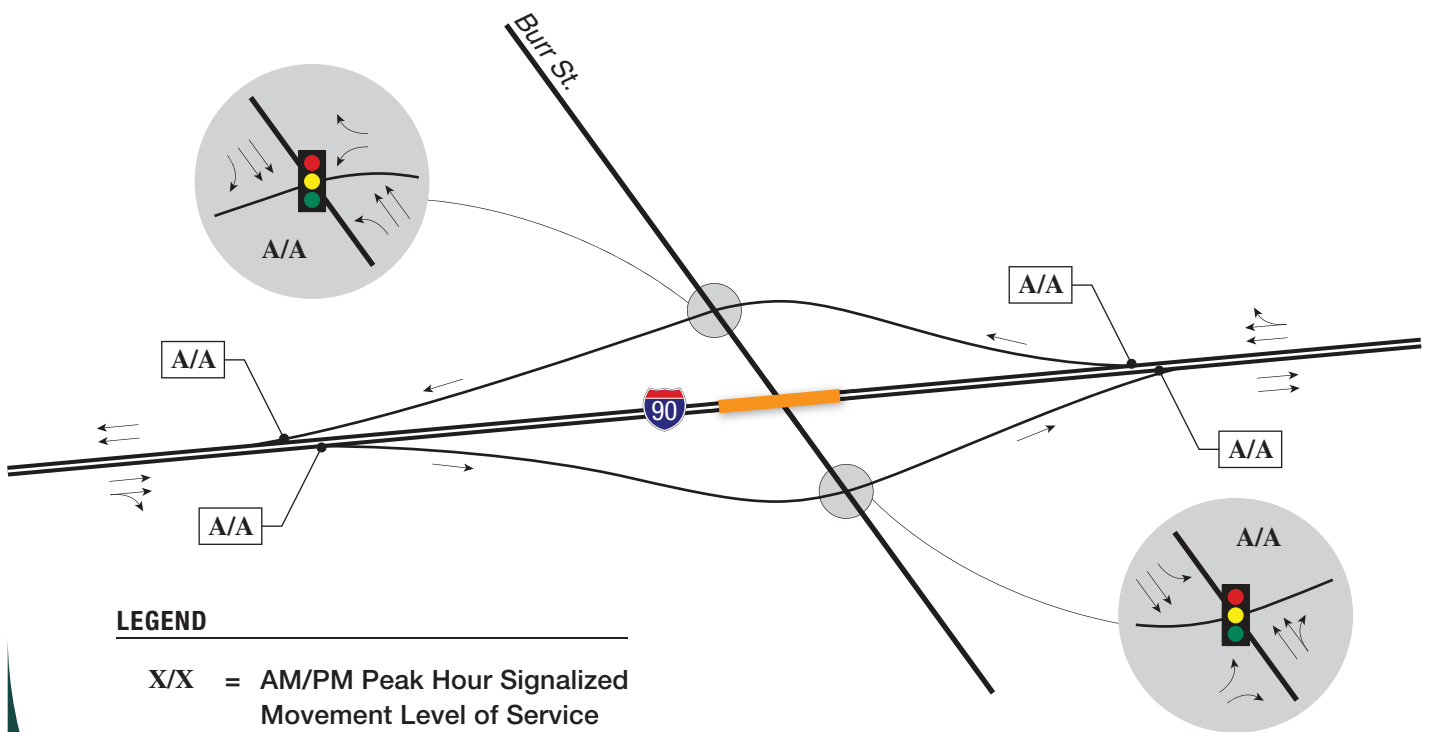
NORTH





LEGEND

XXX(XXX) = AM(PM) Peak Hour Traffic Volumes



LEGEND

- X/X = AM/PM Peak Hour Signalized Movement Level of Service
- X/X = AM/PM Peak Hour Ramp Junction Level of Service
- = Stop Sign
- ↔ = Travel Lanes

Interstate 90 Exit 332
Traffic Conditions Year 2030

NORTH



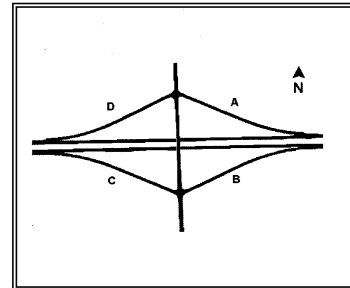
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I-90 EXIT 387 HARTFORD

INTERCHANGE GEOMETRICS CHECKLIST
SDDOT Interstate Corridor Study

Interstate: I-90
Interchange: Exit 387
Analyst: JLB
Date: 1/20/2010

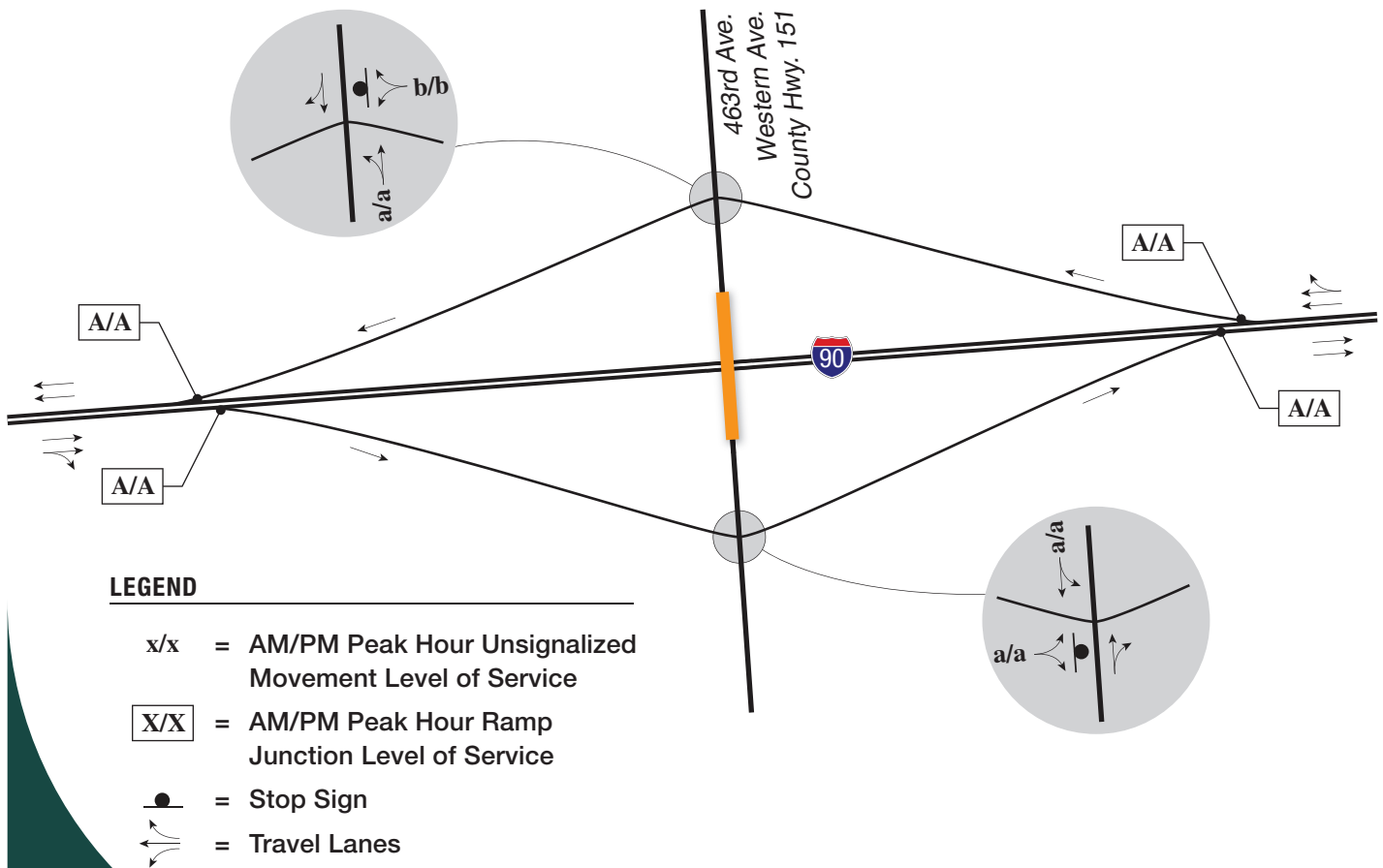
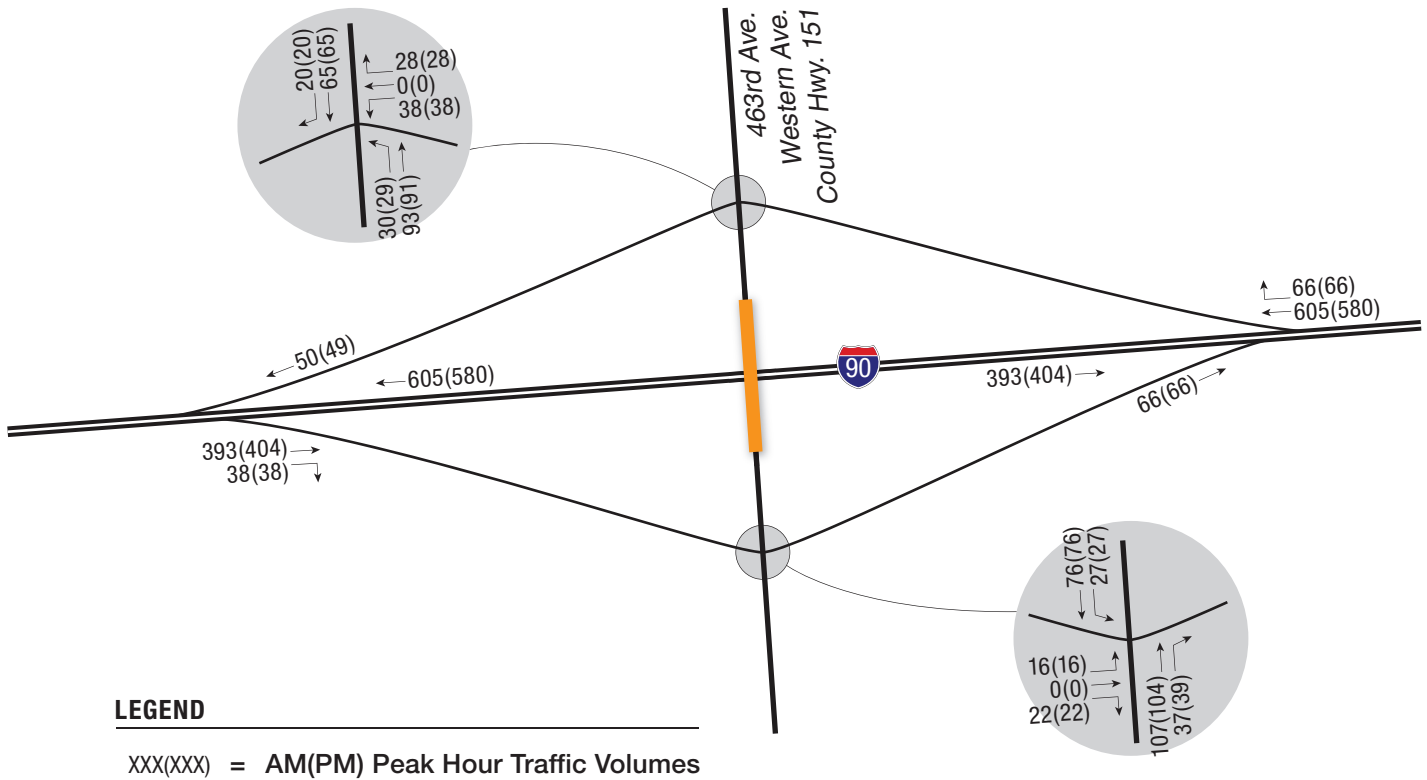


Interchange Geometry	Criteria	A	B	C	D	Achieved?
Interchange Type (Diamond, Full/Partial Cloverleaf, Trumpet etc.)	Diamond					
Design Speed	50 mph**					
Number of Lanes		1	1	1	1	
Right Turn Storage Length		-	-	-	-	
Left Turn Storage Length		-	-	-	-	
Superelevation (e max)	6%	4.2%	4.2%	4.2%	4.2%	Acceptable
Minimum Horizontal Radius for e max of 6% (50 mph / 30 mph)	833 / 231 feet	1910'	1910'	1910'	1910'	Acceptable
Maximum Degree of Curvature (50 mph / 30 mph)	6° 53' / 24° 48'	3° 00'	3° 00'	3° 00'	3° 00'	Acceptable
Minimum Clear Zone From the Edge of Travel Lane	30 feet	>30'	>30'	>30'	>30'	Acceptable
Maximum Grade on Ramp (Ascending)	+3% to +5%	1.35%	-	0.92%	1.11%	Acceptable
Maximum Grade on Ramp (Descending)	-3% to -5%	-	-1.50%	-1.08%	-	Acceptable
Minimum Lane Width						
With Auxiliary Lanes	12 feet	-	-	-	-	
As Single Lane	15 feet (19 for loops)	15.5'	14.5'	14.0'	14.0'	Supports Impr.
Shoulder Width						
Right Shoulder	8 feet (4 for loops)	6.0'	5.0'	6.0'	5.0'	Supports Impr.
Left Shoulder	2 feet	1.5'	1.0'	1.0'	2.0'	Supports Impr.
Inslope	6:1	4:1	4:1	4:1	4:1	Supports Impr.
Minimum Off-Ramp Taper Rate	20:1	38:1	-	38:1	-	Acceptable
Minimum On-Ramp Taper Rate	50:1	-	61:1	-	61:1	Acceptable
Ramp Features						
K-Value Ranges						
Minimum for a Crest Vertical Curve (50 mph / 30 mph)	84 / 19					
Minimum for a Sag Vertical Curve (50 mph / 30 mph)	96 / 37	388	191	250	233	Acceptable
Minimum Stopping Sight Distance (50 mph / 30 mph)	425 / 200 feet	>425'	>425'	2,820'	>425'	Acceptable
Cross Road Features						
K-Value Ranges		To North		To South		
Minimum for a Crest Vertical Curve (50 mph / 30 mph)	84 / 19	150		150		Acceptable
Minimum for a Sag Vertical Curve (50 mph / 30 mph)	96 / 37	-		-		
Minimum Stopping Sight Distance (50 mph / 30 mph)	425 / 200 feet	569'		569'		Acceptable
Ramp Intersection Sight Distance (50 mph / 30 mph)***	425 / 200 feet	ok		ok		Acceptable
Maximum Longitudinal Grade - Rolling Terrain (Urban Arterial)	7%	4.00%		3.00%		Acceptable
Minimum Longitudinal Grade (Min. / Des.)	0.3% / 0.5%	-		-		
Minimum Control of Access from Interchange Ramps (Min. / Des.)	300 / 660 feet	550'		300'		Acceptable

** Loop ramp design speed = 30 mph

***Substandard Intersection Sight Distance locations could not be determined from the interchange plans. Substandard locations, therefore, are intersections that demonstrate sight distance limitations based on a general field evaluation or the presence of a substandard k-value or Stopping Sight Distance along the crossroad approaching the intersection.

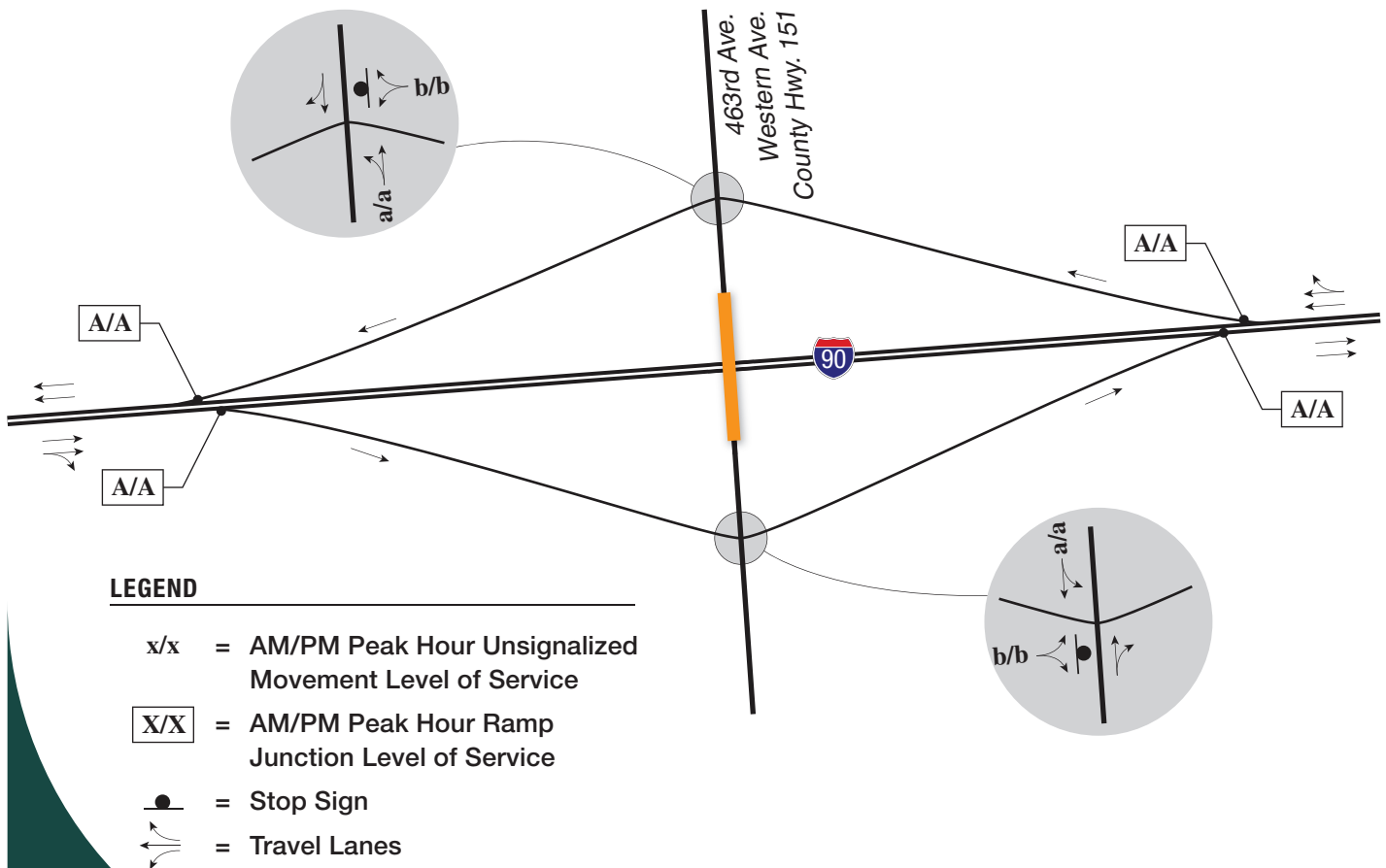
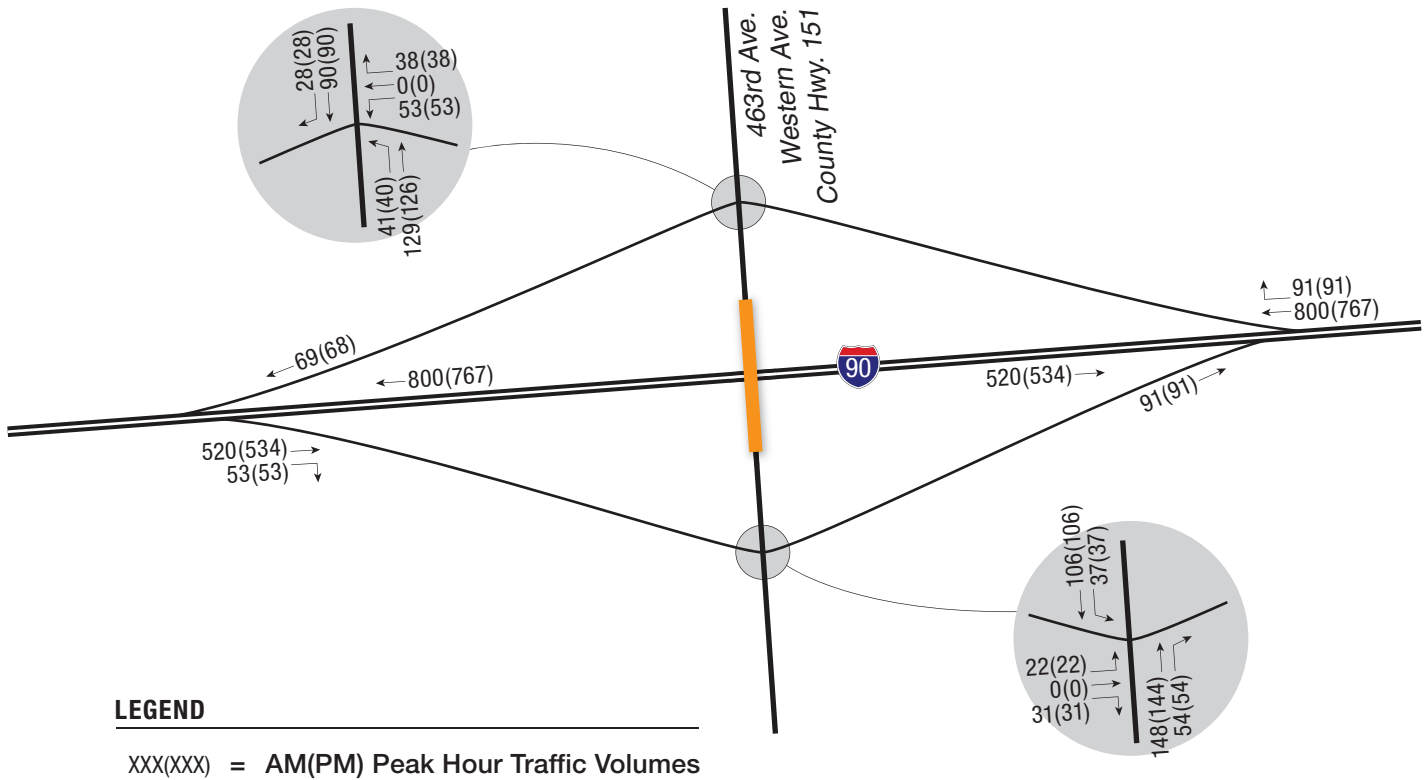
Comments



Interstate 90 Exit 387
Traffic Conditions Year 2009

NORTH

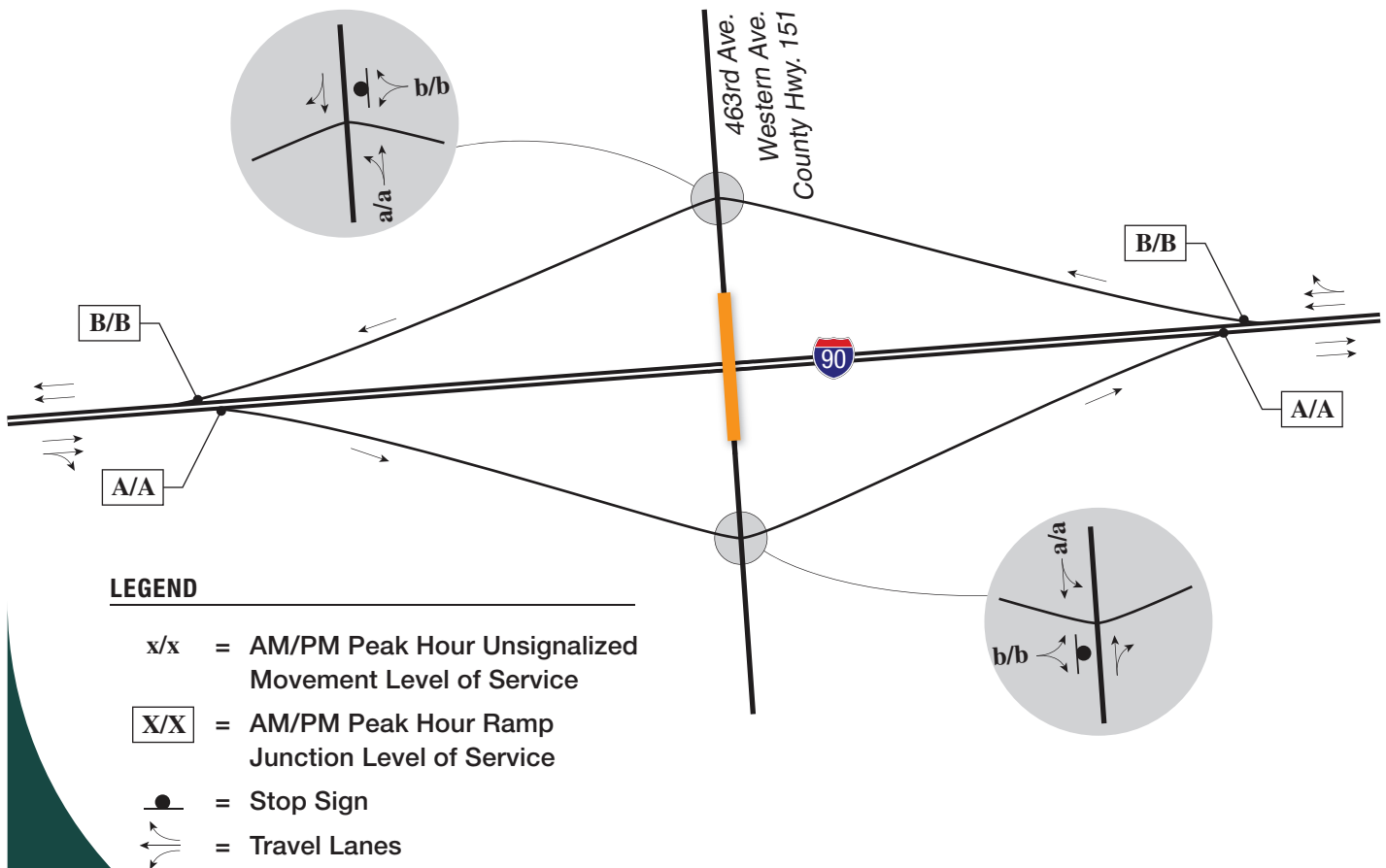
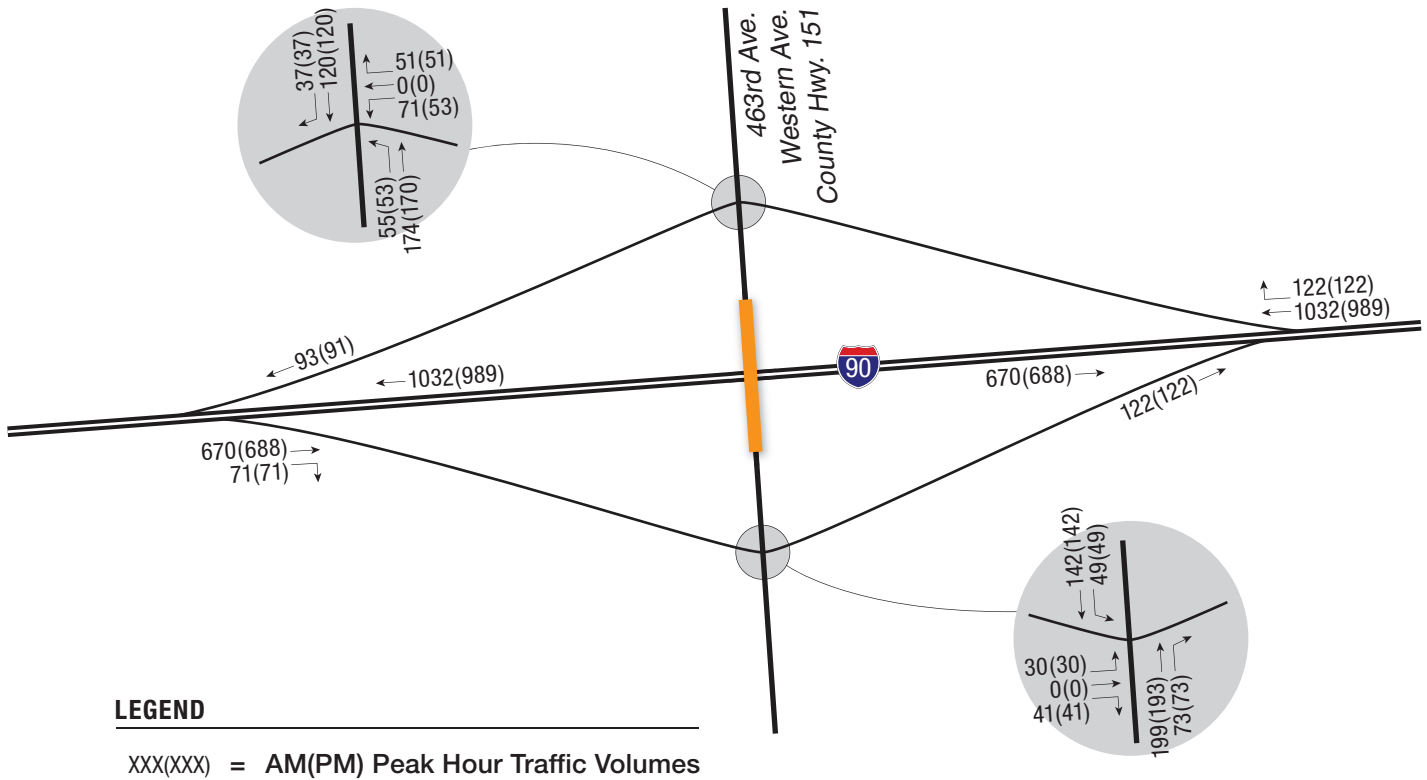




Interstate 90 Exit 387
Traffic Conditions Year 2020

NORTH





Interstate 90 Exit 387
Traffic Conditions Year 2030

NORTH



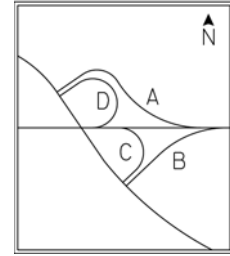
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I-90 EXIT 390 HARTFORD

INTERCHANGE GEOMETRICS CHECKLIST
SDDOT Interstate Corridor Study

Interstate: I-90
Interchange: Exit 390
Analyst: JLB
Date: 1/20/2010



Interchange Geometry	Criteria	A	B	C	D	Achieved?
Interchange Type (Diamond, Full/Partial Cloverleaf, Trumpet etc.)	Folded Diamond					
Design Speed	50 mph**					
Number of Lanes		1	1	1	1	
Right Turn Storage Length		-	-	-	-	
Left Turn Storage Length		-	-	-	-	
Superelevation (e max)	6%	6%	5%	6%	6%	Acceptable
Minimum Horizontal Radius for e max of 6% (50 mph / 30 mph)	833 / 231 feet	1432'	955'	252'	252'	Acceptable
Maximum Degree of Curvature (50 mph / 30 mph)	6° 53' / 24° 48'	4° 00'	6° 00'	22° 34'	22° 34'	Acceptable
Minimum Clear Zone From the Edge of Travel Lane	30 feet	>30'	>30'	>30'	>30'	Acceptable
Maximum Grade on Ramp (Ascending)	+3% to +5%	2.22%	3.54%		2.74%	Acceptable
Maximum Grade on Ramp (Descending)	-3% to -5%	-2.47%	-2.34%	-3.33%		Acceptable
Minimum Lane Width						
With Auxiliary Lanes	12 feet	-	-	-	-	
As Single Lane	15 feet (19 for loops)	16.5'	15.5'	15.0'	14.5'	Supports Impr.
Shoulder Width						
Right Shoulder	8 feet (4 for loops)	7.0'	4.5'	6.5'	7.5'	Supports Impr.
Left Shoulder	2 feet	2.0'	2.5'	2.0'	2.0'	Acceptable
Inslope	6:1	3:1	3:1	3:1	3:1	Supports Impr.
Minimum Off-Ramp Taper Rate	20:1	41:1	-	-	41:1	Acceptable
Minimum On-Ramp Taper Rate	50:1	-	61:1	61:1	-	Acceptable
Ramp Features						
K-Value Ranges						
Minimum for a Crest Vertical Curve (50 mph / 30 mph)	84 / 19	213	77	-	-	Supports Impr.
Minimum for a Sag Vertical Curve (50 mph / 30 mph)	96 / 37	-	-	72	109	Acceptable
Minimum Stopping Sight Distance (50 mph / 30 mph)	425 / 200 feet	776'	407'	380'	617'	Supports Impr.
Cross Road Features						
K-Value Ranges		To North		To South		
Minimum for a Crest Vertical Curve (50 mph / 30 mph)	84 / 19	-		-		Not Available
Minimum for a Sag Vertical Curve (50 mph / 30 mph)	96 / 37	-		-		Not Available
Minimum Stopping Sight Distance (50 mph / 30 mph)	425 / 200 feet	-		-		Not Available
Ramp Intersection Sight Distance (50 mph / 30 mph)***	425 / 200 feet	-		-		Not Available
Maximum Longitudinal Grade - Rolling Terrain (Urban Arterial)	7%	-		-		Not Available
Minimum Longitudinal Grade (Min. / Des.)	0.3% / 0.5%	-		-		Not Available
Minimum Control of Access from Interchange Ramps (Min. / Des.)	300 / 660 feet	400'		400'		Acceptable

** Loop ramp design speed = 30 mph

***Substandard Intersection Sight Distance locations could not be determined from the interchange plans. Substandard locations, therefore, are intersections that demonstrate sight distance limitations based on a general field evaluation or the presence of a substandard k-value or Stopping Sight Distance along the crossroad approaching the intersection.

Comments

No cross road information in plans



I-90 EXIT 406 BRANDON/CORSON

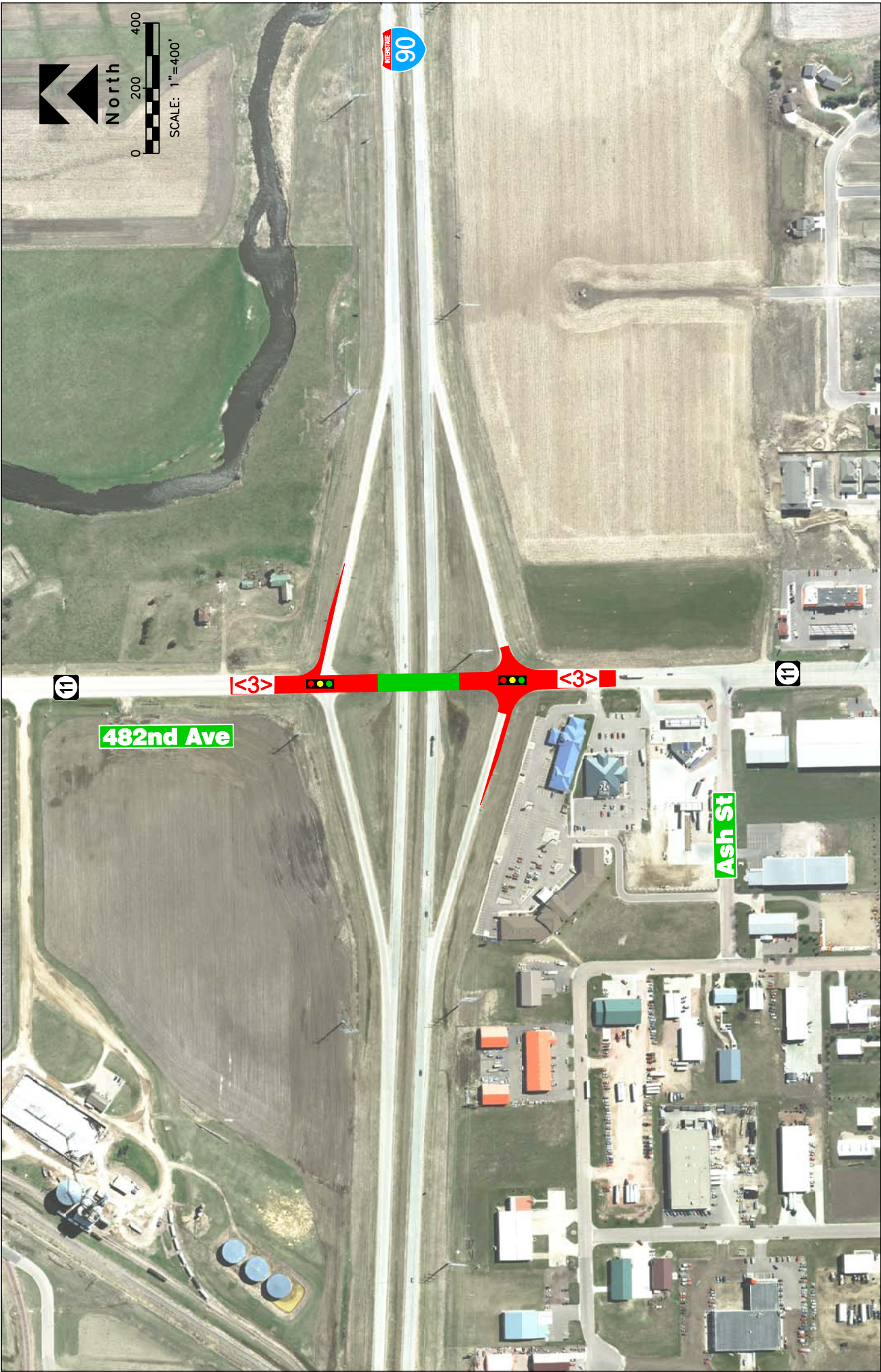


Figure 1
I-90 Exit 406 - Brandon/Corson
Lane Addition, Signalization Improvements, Bridge Replacement

Probable Construction Costs
I-90 Exit 406 - Lane Addition, Signalization Improvements, Bridge Replacement

<i>Item Description</i>	<i>Quantity</i>	<i>Unit</i>	<i>Unit Cost</i>	<i>Total Cost</i>
Mobilization	1	LUMP SUM	\$158,000.00	\$158,000
Traffic Control	1	LUMP SUM	\$316,000.00	\$316,000
Clearing	1	LUMP SUM	\$63,000.00	\$63,000
Removal of Concrete Pavement	2,477	SQ. YD.	\$3.88	\$9,619
Removal of Asphalt Pavement		SQ. YD.	\$7.39	\$0
Remove Bridge	8,840	SQ. FT.	\$9.00	\$79,560
Borrow, Unclassified Excavation	1,206	CU. YD.	\$5.30	\$6,392
Base Course	571	TON	\$10.64	\$6,073
Asphalt Composite	-	TON	\$80.91	\$0
PCC Pavement 8" (cross street)	4,911	SQ. YD.	\$33.12	\$162,661
PCC Pavement 8" (ramps)	1,250	SQ. YD.	\$43.40	\$54,244
Concrete Approach Slab	5,200	SQ. YD.	\$188.34	\$979,378
Bridges	17,680	SQ. FT.	\$100.00	\$1,768,000
Guard Rail	900	LF	\$100.00	\$90,000
Permanent Signing/Markings	1	LUMP SUM	\$90,000.00	\$90,000
Traffic Signal	2	EACH	\$125,000.00	\$250,000
Roadway Lighting	1	LUMP SUM	\$60,000.00	\$60,000
Drainage (18" RCP)	110	LF	\$24.53	<u>\$2,698</u>
Subtotal				\$4,100,000
Contingencies	25%			<u>\$1,025,000</u>
Total Probable Construction Costs				\$5,130,000
Engineering, Administration	15%			\$769,500
Total Project Costs				\$5,900,000



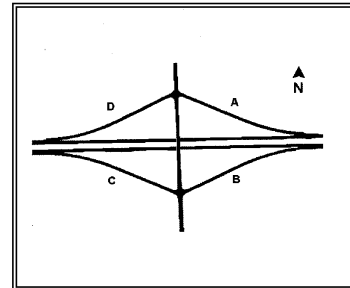
Figure 2
I-90 Exit 406 - Brandon/Corson
Single Point Urban Interchange

Probable Construction Costs
I-90 Exit 406 - Singe Point Urban Interchange

<i>Item Description</i>	<i>Quantity</i>	<i>Unit</i>	<i>Unit Cost</i>	<i>Total Cost</i>
Mobilization	1	LUMP SUM	\$259,000.00	\$259,000
Traffic Control	1	LUMP SUM	\$517,000.00	\$517,000
Clearing	1	LUMP SUM	\$103,000.00	\$103,000
Removal of Concrete Pavement	6,683	SQ. YD.	\$3.88	\$25,949
Removal of Asphalt Pavement		SQ. YD.	\$7.39	\$0
Remove Bridge	8,840	SQ. FT.	\$9.00	\$79,560
Borrow, Unclassified Excavation	125,184	CU. YD.	\$5.30	\$663,724
Base Course	5,245	TON	\$10.64	\$55,791
Asphalt Composite	-	TON	\$80.91	\$0
PCC Pavement 8" (cross street)	6,987	SQ. YD.	\$33.12	\$231,405
PCC Pavement 8" (ramps)	11,483	SQ. YD.	\$43.40	\$498,319
Concrete Approach Slab	4,200	SQ. YD.	\$188.34	\$791,036
Bridges	27,360	SQ. FT.	\$100.00	\$2,736,000
Guard Rail	900	LF	\$100.00	\$90,000
Permanent Signing/Markings	1	LUMP SUM	\$160,000.00	\$160,000
Traffic Signal	1	EACH	\$125,000.00	\$125,000
Roadway Lighting	1	LUMP SUM	\$100,000.00	\$100,000
Drainage (18" RCP)	90	LF	\$24.53	<u>\$2,208</u>
Subtotal				\$6,440,000
Contingencies	25%			<u>\$1,610,000</u>
Total Probable Construction Costs				\$8,050,000
Engineering, Administration	15%			\$1,207,500
Total Project Costs				\$9,260,000

INTERCHANGE GEOMETRICS CHECKLIST
SDDOT Interstate Corridor Study

Interstate: I-90
Interchange: Exit 406
Analyst: JLB
Date: 1/20/2010



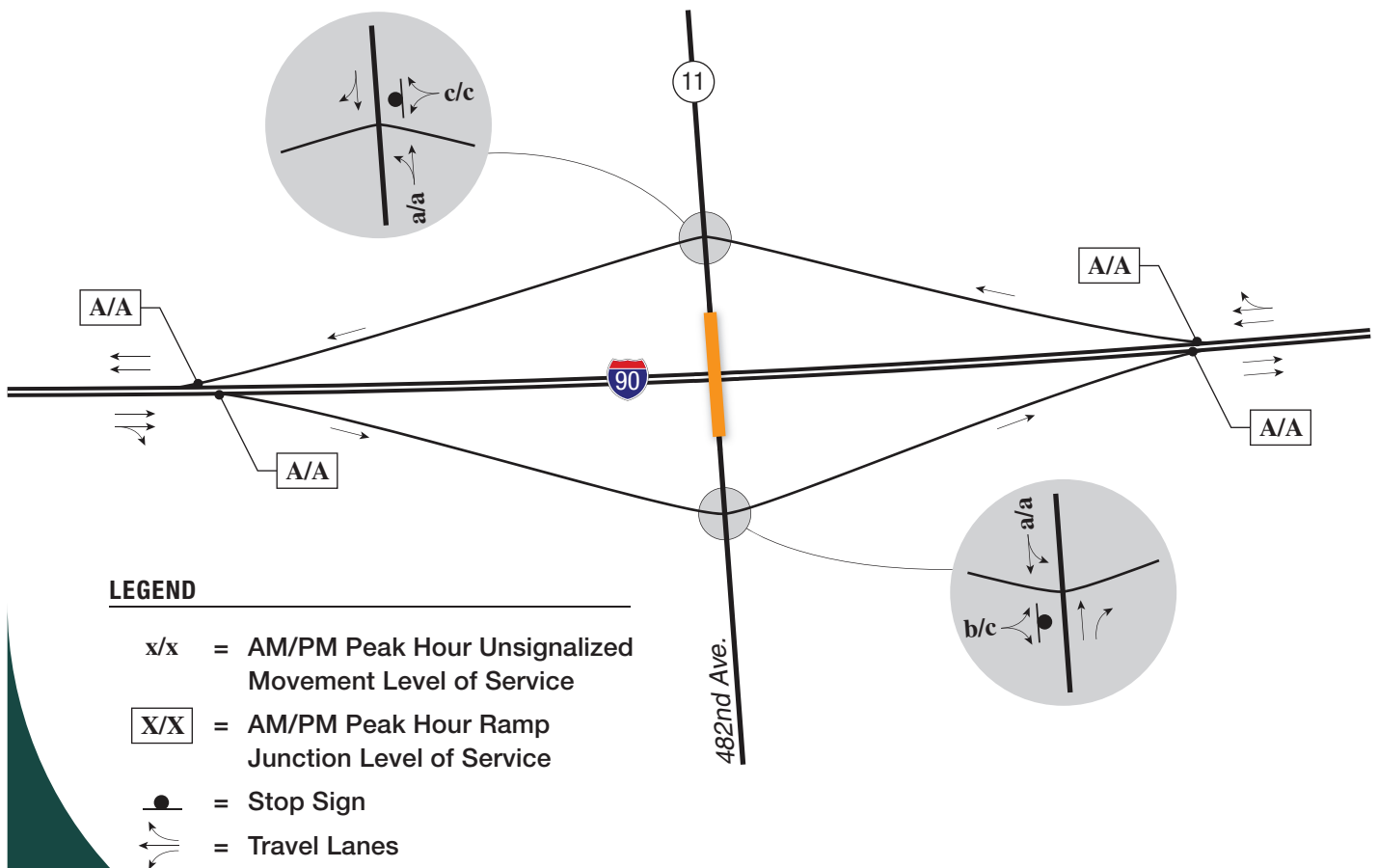
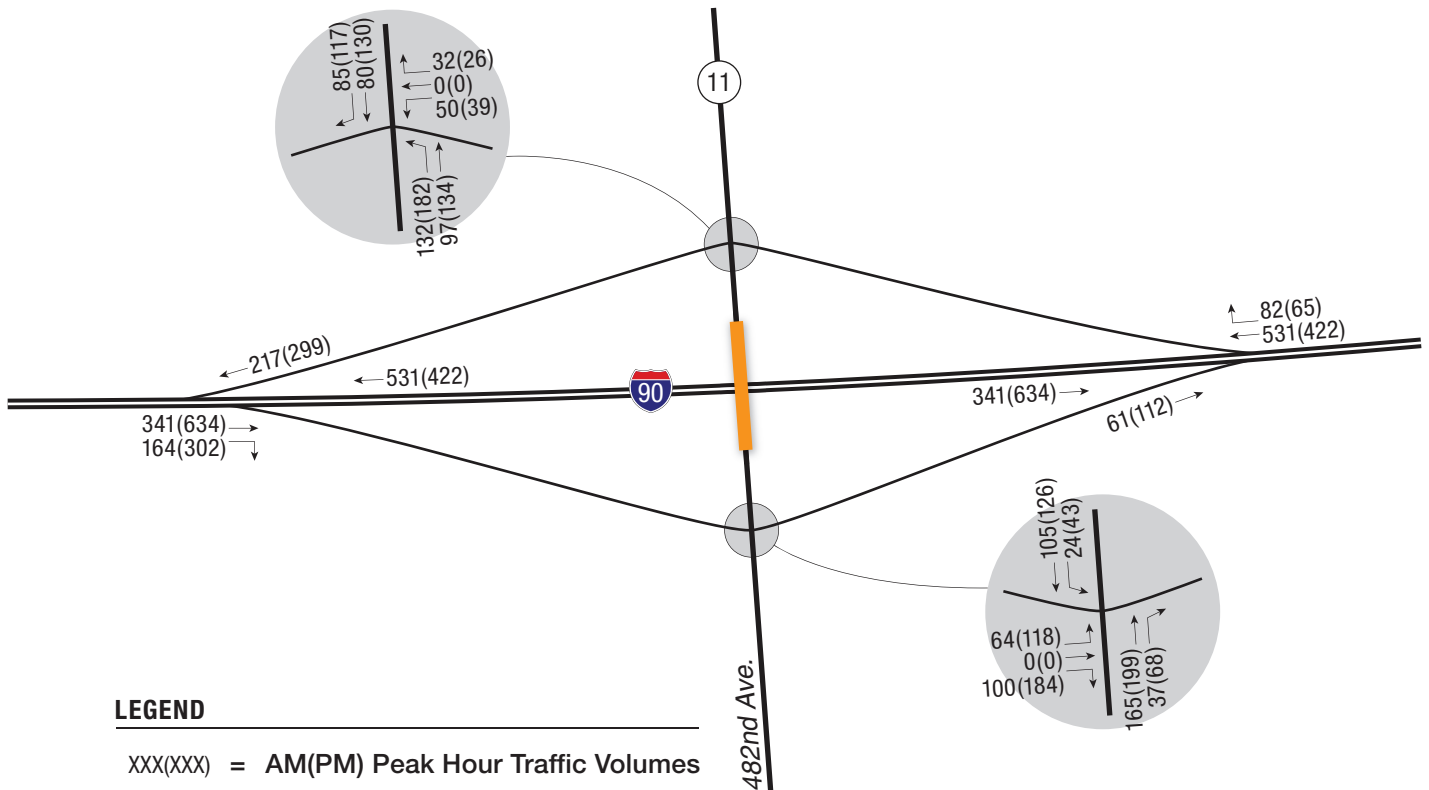
Interchange Geometry	Criteria	A	B	C	D	Achieved?
Interchange Type (Diamond, Full/Partial Cloverleaf, Trumpet etc.)	Diamond					
Design Speed	50 mph**					
Number of Lanes		1	1	1	1	
Right Turn Storage Length		-	-	-	-	
Left Turn Storage Length		-	-	-	-	
Superelevation (e max)	6%	6%	2%	6%	2%	Acceptable
Minimum Horizontal Radius for e max of 6% (50 mph / 30 mph)	833 / 231 feet	1432'	1432'	1432'	1432'	Acceptable
Maximum Degree of Curvature (50 mph / 30 mph)	6° 53' / 24° 48'	4°00'	4°00'	4°00'	4°00'	Acceptable
Minimum Clear Zone From the Edge of Travel Lane	30 feet	< 30'	< 30'	< 30'	< 30'	Supports Impr.
Maximum Grade on Ramp (Ascending)	+3% to +5%	6.00%		2.67%	1.65%	Supports Impr.
Maximum Grade on Ramp (Descending)	-3% to -5%		-5.17%	-2.32%	-2.44%	Supports Impr.
Minimum Lane Width						
With Auxiliary Lanes	12 feet	-	-	-	-	
As Single Lane	15 feet (19 for loops)	15.5'	17.0'	15.0'	16.5'	Acceptable
Shoulder Width						
Right Shoulder	8 feet (4 for loops)	5.5'	4.5'	6.0'	6.0'	Supports Impr.
Left Shoulder	2 feet	3.0'	2.5'	3.0'	1.5'	Supports Impr.
Inslope	6:1	3:1	3:1	3:1	3:1	Supports Impr.
Minimum Off-Ramp Taper Rate	20:1	27:1	-	27:1	-	Acceptable
Minimum On-Ramp Taper Rate	50:1	-	29:1	-	30:1	Supports Impr.
Ramp Features						
K-Value Ranges						
Minimum for a Crest Vertical Curve (50 mph / 30 mph)	84 / 19	-		123	132	Acceptable
Minimum for a Sag Vertical Curve (50 mph / 30 mph)	96 / 37	107	115	96	123	Acceptable
Minimum Stopping Sight Distance (50 mph / 30 mph)	425 / 200 feet	466'	524'	427'	524'	Acceptable
Cross Road Features						
K-Value Ranges		To North		To South		
Minimum for a Crest Vertical Curve (50 mph / 30 mph)	84 / 19	249		249		Acceptable
Minimum for a Sag Vertical Curve (50 mph / 30 mph)	96 / 37	-		-		
Minimum Stopping Sight Distance (50 mph / 30 mph)	425 / 200 feet	871'		871'		Acceptable
Ramp Intersection Sight Distance (50 mph / 30 mph)***	425 / 200 feet	ok		ok		Acceptable
Maximum Longitudinal Grade - Rolling Terrain (Urban Arterial)	7%	0.48%		1.13%		Acceptable
Minimum Longitudinal Grade (Min. / Des.)	0.3% / 0.5%	-		-		
Minimum Control of Access from Interchange Ramps (Min. / Des.)	300 / 660 feet	600'		400'		Acceptable

** Loop ramp design speed = 30 mph

***Substandard Intersection Sight Distance locations could not be determined from the interchange plans. Substandard locations, therefore, are intersections that demonstrate sight distance limitations based on a general field evaluation or the presence of a substandard k-value or Stopping Sight Distance along the crossroad approaching the intersection.

Comments

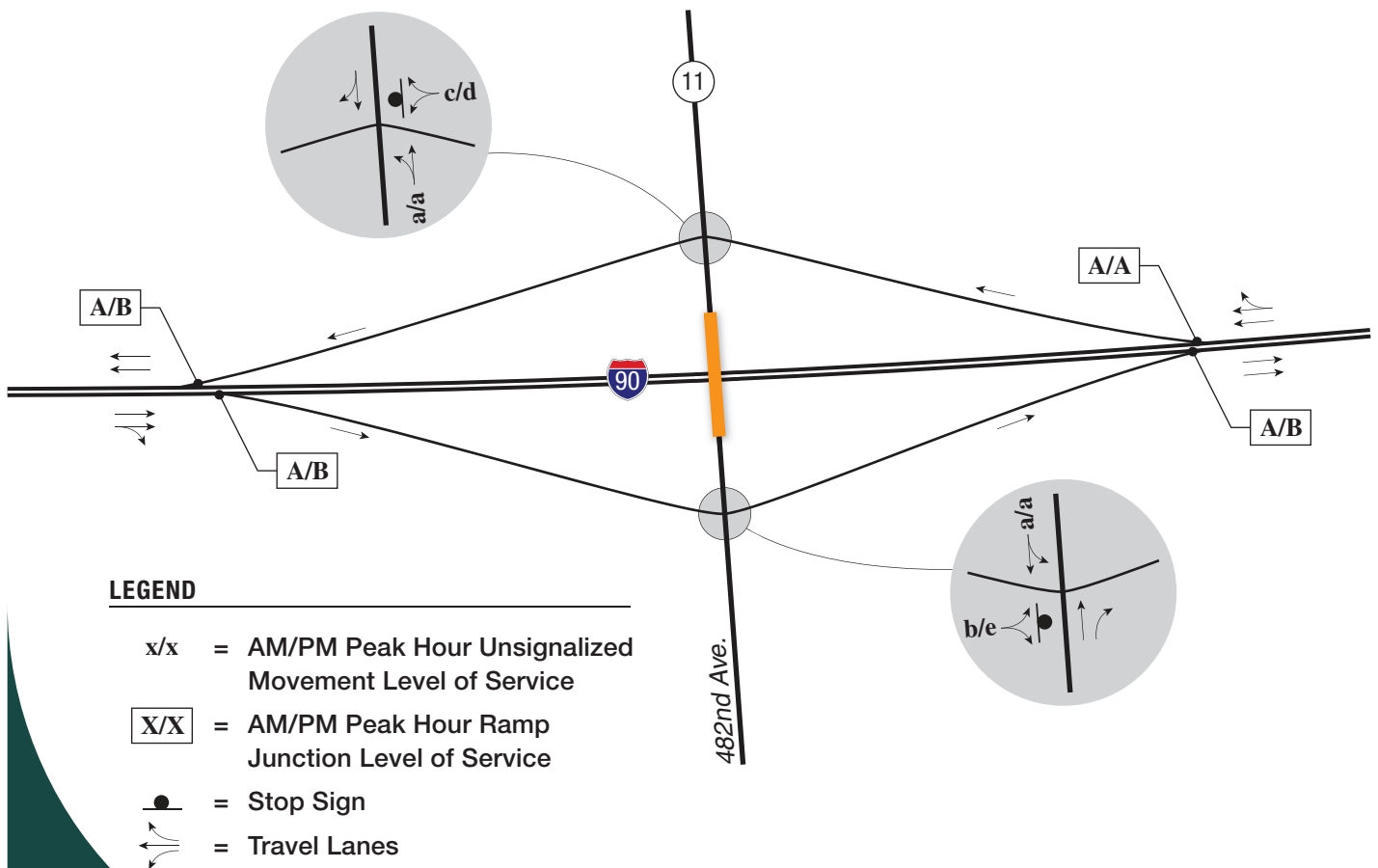
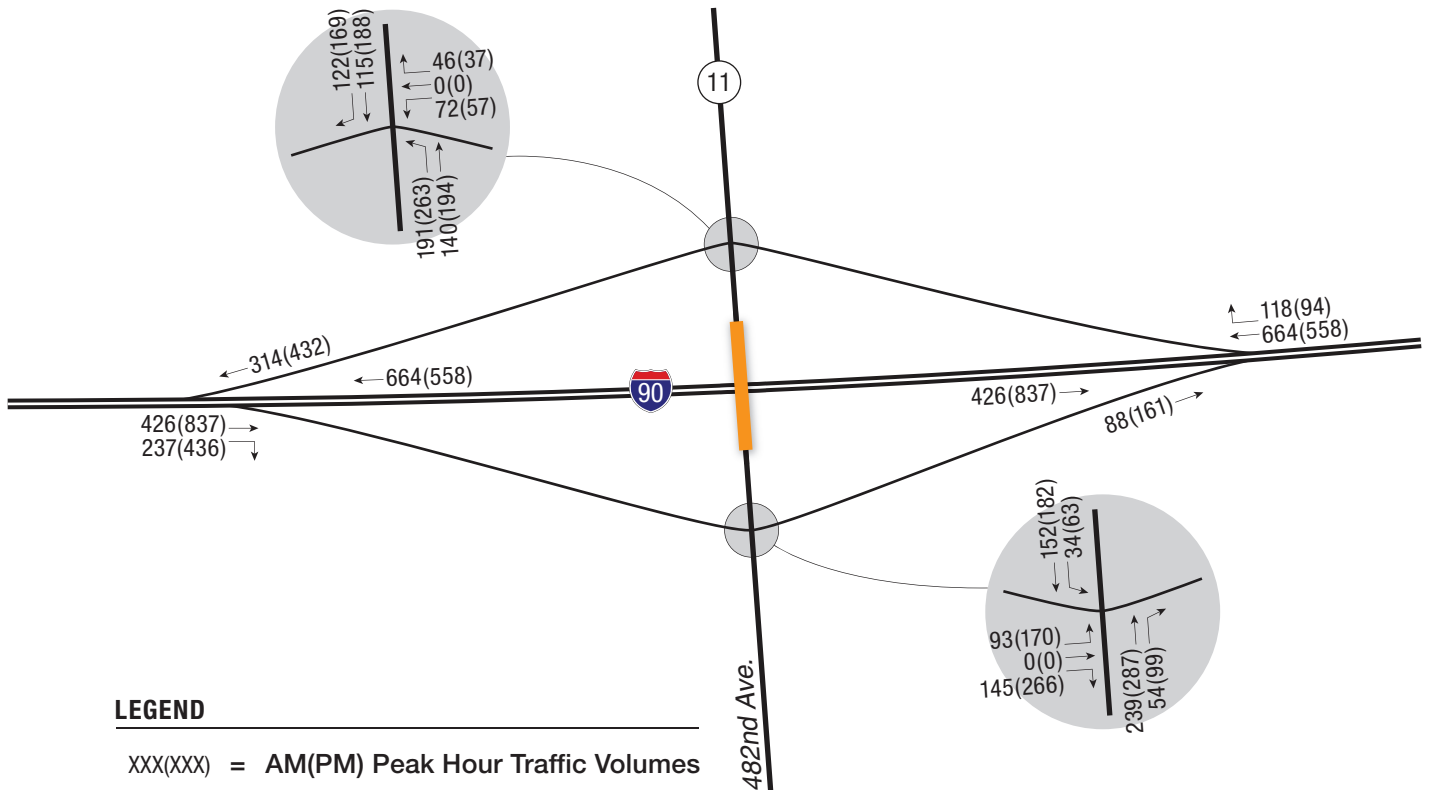
Ramp B has 2 turn lanes



Interstate 90 Exit 406
Traffic Conditions Year 2009

NORTH

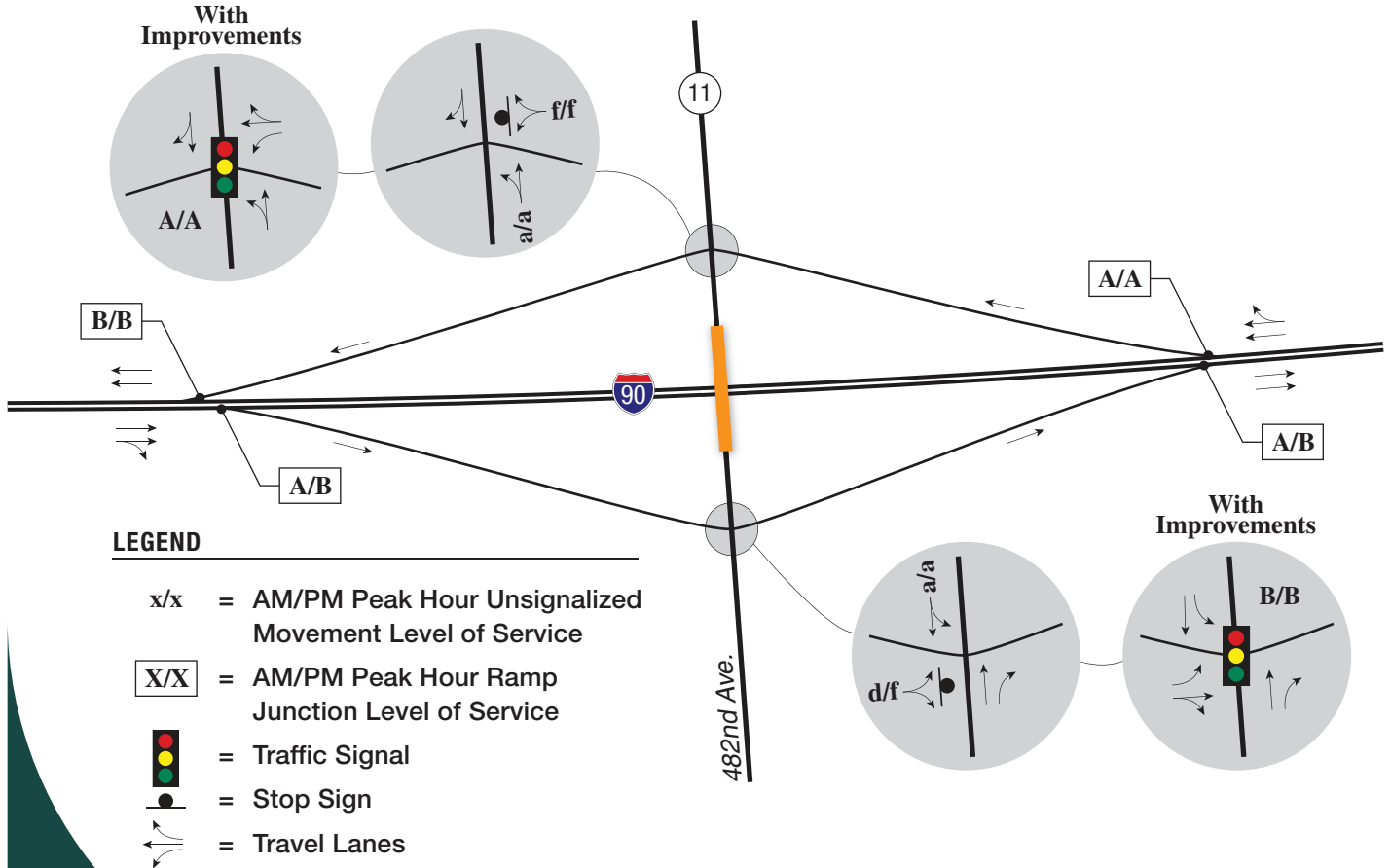
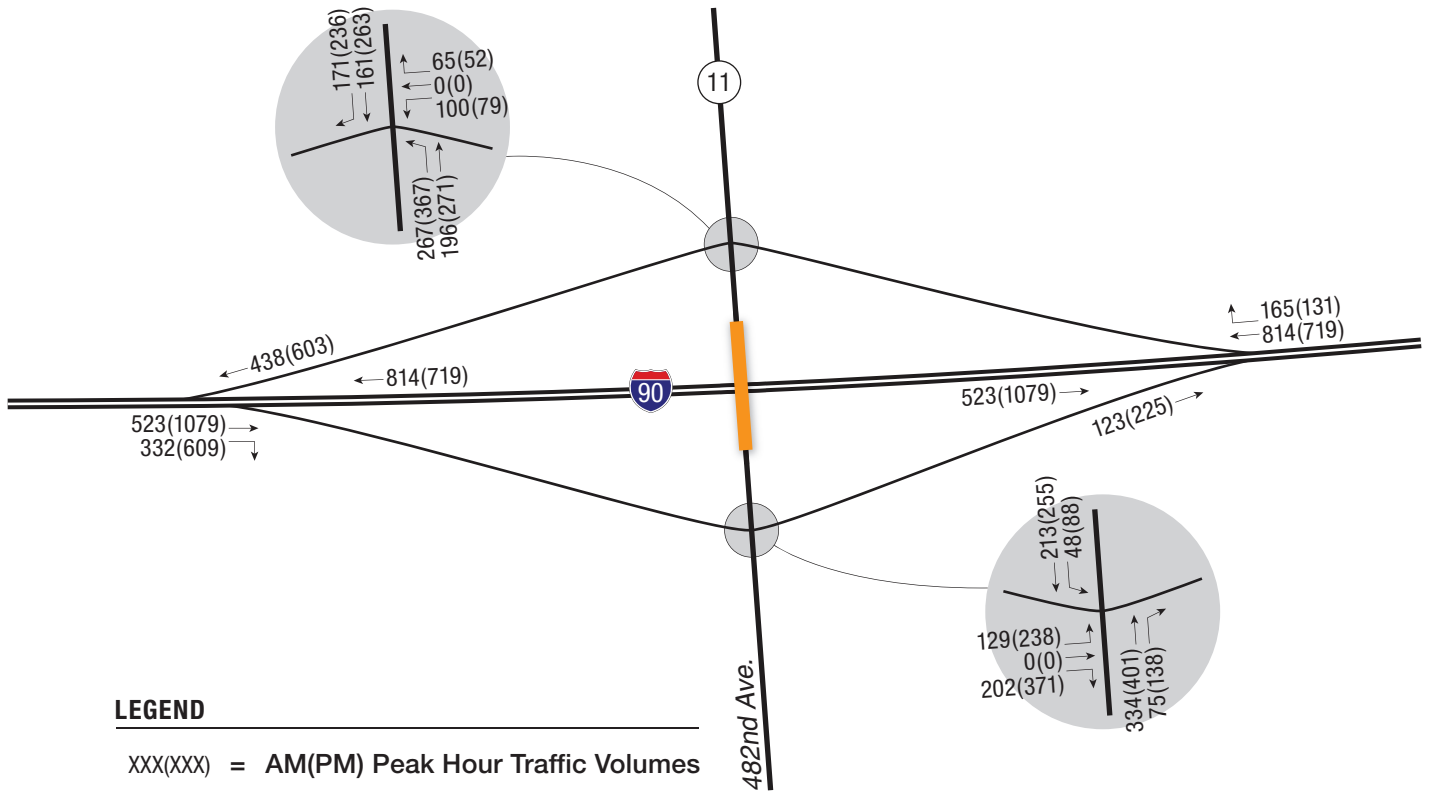




Interstate 90 Exit 406
Traffic Conditions Year 2020

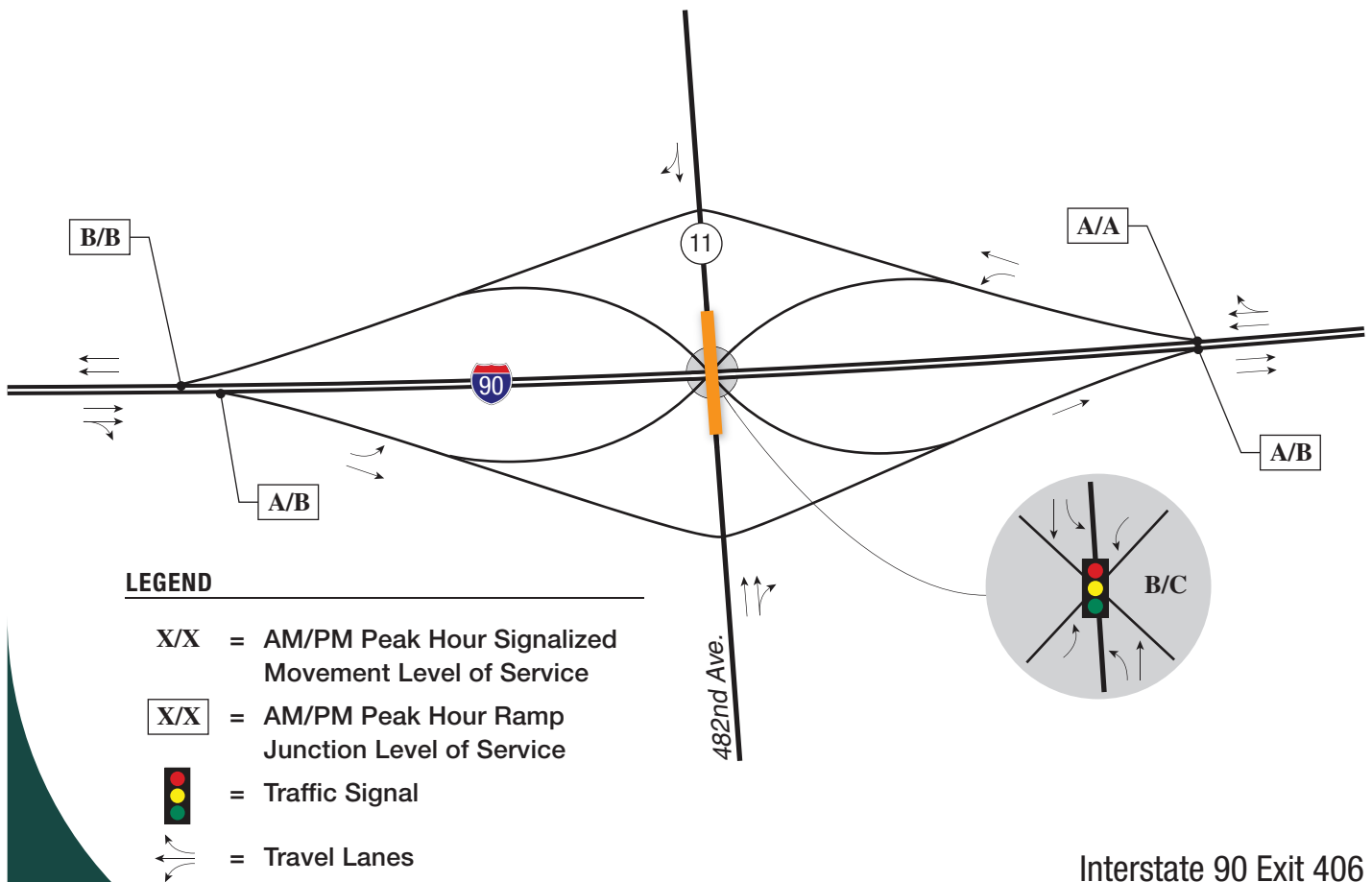
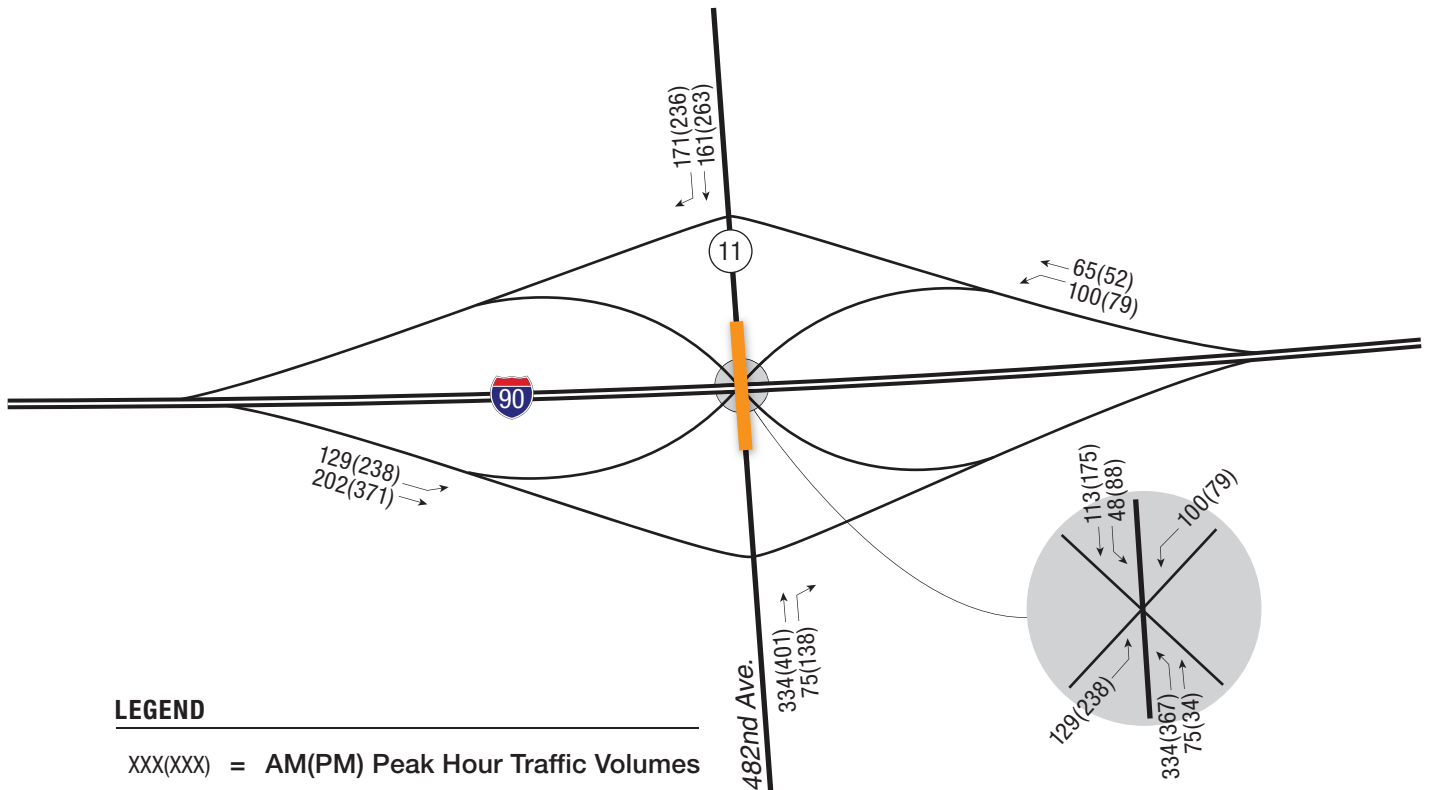
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Interstate 90 Exit 406
Traffic Conditions Year 2030

NORTH



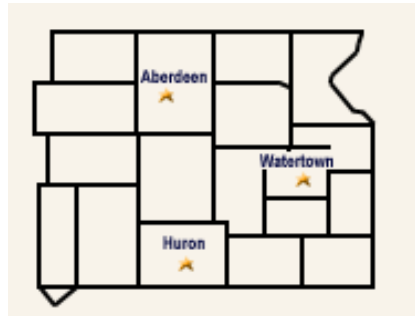
Interstate 90 Exit 406
 SPU Alternative
 Traffic Conditions Year 2030

NORTH



South Dakota Decennial Interstate Corridor Study

PHASE ONE REPORT



ABERDEEN REGION

Interstate 29, MRM 124.00 to MRM 252.65

Total Interchanges: 18

Studied Interchanges: 18

<u>Deficient Interchanges (6):</u>	<u>Page</u>
I-29 Exit 132	A-283
I-29 Exit 133	A-291
I-29 Exit 177	A-293
I-29 Exit 201	A-301
I-29 Exit 207	A-303
I-29 Exit 232	A-309

**Summary of Mainline Segment Geometric Performance
Aberdeen Region**

I-29	Lane Width (12 ft min.)	Right Shldr. Width (10 ft min.)	Left Shldr. Width (4 ft min.)	Design Speed (65 mph min.)	Max. Degree of Curve (2° 15' max.)	Clear Zone (30 ft min.)	Inslope (6:1 min.)	Superelevation Rate (6% max.)	Paved Section Width (38 ft min.)	Bridge Section Width (38 ft min./40 ft des.)	Vertical Clearance (16 ft min.)	Maximum Grade (3% level/4% rolling)
MP 121-127	12	10	4	70	0° 06'	> 30	4:1	n/a	38	30	n/a	2.50%
MP 127-132	12	10	4	70	0° 06'	> 30	4:1	n/a	38	30	15' 11"	1.85%
MP 132-133	12	10	4	70	0° 00'	> 30	4:1	n/a	38	30	n/a	0.40%
MP 133-140	12	10	4	70	0° 00'	> 30	4:1	n/a	38	38	15' 9"	1.27%
MP 140-150	12	10	4	70	0° 30'	> 30	6:1	n/a	38	n/a	n/a	0.48%
MP 150-157												
MP 157-164												
MP 164-177												
MP 177-180												
MP 180-185												
MP 185-193												
MP 193-201												
MP 201-207												
MP 207-213	12	10	4	75	1° 00'	> 30	6:1	3.70%	38	N/A	17' 3"	3.62%
MP 213-224	12	10	4	75	1° 00'	> 30	6:1	3.70%	38	40	n/a	4.31%
MP 224-232	12	10	4	75	0° 40'	> 30'	6:1	3.70%	38	n/a	16' 0"	1.50%
MP 232-242	12	10	4	75	0° 04'	> 30	6:1	3.00%	38	n/a	n/a	1.50%
MP 242-246	12	10	4	75	1° 00'	> 30'	6:1	3.50%	38	40	N/A	0.99%
MP 246-ND	12	10	4	75	1° 00'	> 30'	6:1	n/a	38	40	n/a	2.00%

LEGEND:

Existing Value does not meet standard criteria
Mainline section recently reconstructed

**Summary of Mainline Segments, Traffic Volumes and Levels of Service
Aberdeen Region**

I-29 Exits:	Current Lanes	Existing		2020		2030	
		AADT	LOS	AADT	LOS	AADT	LOS
127 to 132	4	11,420	A	12,308	A	13,101	A
132 to 133	4	8,940	A	9,833	A	10,645	A
133 to 140	4	8,820	A	9,701	A	10,502	A
140 to 150	4	7,220	A	8,388	A	9,505	A
150 to 157	4	7,480	A	8,690	A	9,847	A
157 to 164	4	7,450	A	8,656	A	9,808	A
164 to 177	4	7,410	A	8,382	A	9,288	A
177 to 180	4	6,400	A	7,239	A	8,022	A
180 to 185	4	6,140	A	6,750	A	7,304	A
185 to 193	4	6,260	A	6,882	A	7,447	A
193 to 201	4	6,200	A	7,350	A	8,471	A
201 to 207	4	6,050	A	6,610	A	7,116	A
207 to 213	4	5,170	A	5,649	A	6,081	A
213 to 224	4	4,930	A	5,386	A	5,799	A
224 to 232	4	4,400	A	4,807	A	5,175	A
232 to 242	4	4,470	A	4,884	A	5,258	A
242 to 246	4	4,630	A	5,059	A	5,446	A

Structurally Deficient and Functionally Obsolete Mainline Structure Summary - Aberdeen Region

		Number of Bridges	Length	Existing Deck Out-to-Out Width	Existing Area	Unit Price	Removal Cost	Proposed Deck Clear Roadway Width	Proposed Area	Unit Price	Bridge Cost
I-29 MRM 124 to 252.65											
	I-29 over Medary Creek at M/RM 127.05 (Functionally Obsolete-NARROW)	2	152	34	10,393	\$9	\$93,536	40	12,120	\$100	\$1,212,000
	I-29 over 8th St at M/RM 131.89 (Functionally Obsolete-NARROW)	2	153	34	10,503	\$9	\$94,524	40	12,248	\$100	\$1,224,800
	I-29 over 186A St at M/RM 159.16 (Functionally Obsolete-LOW CLEARANCE)	2	233	41	18,966	\$9	\$170,696	40	18,640	\$100	\$1,864,000
	I-29 over 149th St (Exit 201) at M/RM 201.05 (Structurally Deficient)	2	132	43	11,273	\$9	\$101,455	40	10,560	\$100	\$1,056,000
	I-29 over 458th Ave (Exit 212) at M/RM 212.24 (Structurally Deficient)	2	281	43	23,997	\$9	\$215,977	40	22,480	\$100	\$2,248,000
	Private Road and RR at M/RM 131.89 (Functionally Obsolete-NARROW)	2	153	34	10,503	\$9	\$94,524	40	12,248	\$100	\$1,224,800
	I-29 over Sisseton and Milbank RR at M/RM 227.11 TUNNEL (Multi-plate) (Functionally Obsolete-NARROW)	1	479 LF	34	479 LF	\$1,290 (per LF)	\$617,910	40	479 LF	\$6,000 (per LF)	\$2,874,000

ABERDEEN REGION

I-29	Location	Geometric Performance																	Crashes, 2006-2009						2009/2020/2030 Level of Service							
		Max. Superelevation Rates (6%)	Min. Radius (833 ft)	Max. Degree of Curve (Standard - 6° 53' / Loop - 24° 48')	Clear Zone (30 ft)	Max. Grade on Ramp (5%)	Min. Lane Width (15 ft)	Min. Right Shldr. Width (8 ft)	Min. Left Shldr. Width (2 ft)	Inslope (6:1)	Min. Off-Ramp Taper (20:1)	Min. On Ramp Taper (50:1)	Min. Ramp K Values (84/96)	Min. Ramp Stopping Sight Distance (425 ft)	Min. Ramp Intersection Sight Distance (425 ft)	Min. Cross Road k Values (84/96)	Min. Cross Road Sight Distance (425 ft)	Max. Cross Road Grade (7%)	Min. Control of Access (300 ft min./660 ft des.)	Fatalities	Injury	PDO	Total	Wgtd. Total	Wgtd. Rate	State Rank by Rate	EB / NB Diverge	EB / NB Merge	WB / SB Diverge	WB / SB Merge	EB / NB Ramp Terminal	WB / SB Ramp Terminal
Exit 127	Elkton/Sinai	5.0%	1910'	3° 00'	> 30'	1.49%	16.0'	3.0'	2.5'	4:1	40	61	254	> 425'	> 425'	151	608'	3.5%	450'	0	2	9	11	15	0.93	49	Not evaluated due to interchange screening method					
Exit 132	Brookings	5.0%	1910'	3° 00'	> 30'	2.33%	17.0'	2.5'	3.5'	4:1	40	61	169	757'	> 425'	291	792'	3.5%	610'	1	3	23	27	44	1.45	27	A/A/A	A/A/A	A/A/A	A/A/A	f/f/f	e/f/f
Exit 133	Brookings/Huron	5.0%	1910'	3° 00'	> 30'	1.98%	17.5'	3.5'	3.5'	4:1	40	61	197	986'	> 425'	182	768'	2.1%	370'	1	1	9	11	24	1.66	21	A/A/A	A/A/A	A/A/A	A/A/B	b/b/c	b/b/b
Exit 140	White	4.4%	1910'	3° 00'	> 30'	3.85%	15.5'	5.0'	1.5'	6:1	40	61	90	434'	> 425'	251	736'	3.2%	600'	0	0	2	2	2	0.17	113	Not evaluated due to interchange screening method					
Exit 150	Toronto/Estelline	5.0%	1910'	3° 00'	> 30'	2.21%	14.5'	5.0'	2.0'	6:1	40	61	205	886'	> 425'	258	865'	3.0%	300'	0	1	3	4	6	0.53	79						
Exit 157	Brandt	5.0%	1910'	3° 00'	> 30'	3.73%	14.5'	4.5'	1.5'	6:1	40	61	107	478'	> 425'	205	664'	4.2%	300'	0	1	7	8	10	1.19	38						
Exit 164	Castlewood/Clear Lake	5.0%	1910'	3° 00'	> 30'	4.00%	15.0'	4.0'	1.5'	6:1	40	61	71	335'	> 425'	255	917'	2.9%	300'	0	3	6	9	15	1.43	28						
Exit 177	Watertown	6.0%	1910'	3° 00'	> 30'	3.00%	15.5'	5.5'	2.0'	6:1	40	61	168	778'	> 425'	880	> 425'	1.4%	350'	1	4	18	23	42	1.90	14	A/A/A	A/A/A	A/A/A	A/A/A	c/f/f	b/b/c
Exit 180	Watertown	5.0%	1910'	3° 00'	> 30'	2.28%	19.0'	1.0'	2.0'	6:1	40	61	206	891'	sub	93	414'	2.8%	500'	0	0	11	11	11	1.28	35	Not evaluated due to interchange screening method					
Exit 185	Waverly	5.0%	1910'	3° 00'	> 30'	2.24%	19.5'	2.0'	2.5'	6:1	40	61	163	466'	-	-	-	875'	0	0	5	5	5	0.63	70							
Exit 193	South Shore/Stockholm	5.0%	1910'	3° 00'	> 30'	3.35%	19.0'	2.5'	3.0'	6:1	40	60	96	496'	> 425'	276	1155'	2.2%	490'	0	0	2	2	2	0.25	111						
Exit 201	Twin Brooks	5.0%	1910'	3° 00'	> 30'	3.57%	18.0'	3.0'	3.0'	6:1	40	61	127	538'	> 425'	206	823'	2.3%	250'	1	4	6	11	30	4.22	1						
Exit 207	Summit/Aberdeen	6.0%	1146'	5° 00'	> 30'	3.28%	-	-	-	6:1	61	83	85	386'	> 425'	1599	> 425'	0.1%	> 300'	0	5	6	11	21	1.67	20	A/A/A	A/A/A	A/A/A	A/A/A	b/b/b	b/b/b
Exit 213	Wilmot	4.8%	1910'	3° 00'	> 30'	6.63%	15.5'	2.0'	2.5'	6:1	36	32	71	338'	> 425'	241	500'	4.1%	350'	0	0	1	1	1	0.15	116	Not evaluated due to interchange screening method					
Exit 224	Peever	4.4%	1910'	3° 00'	> 30'	2.36%	17.5'	1.5'	2.0'	6:1	40	61	152	660'	> 425'	348	1977'	0.5%	250'	0	1	0	1	3	0.43	93	Not evaluated due to interchange screening method					
Exit 232	Sisseton	6.0%	1910'	3° 00'	> 30'	3.40%	17.0'	3.0'	2.5'	6:1	-	-	120	514'	> 425'	306	813'	2.5%	> 300'	0	0	3	3	3	0.28	106	A/A/A	A/A/A	A/A/A	A/A/A	b/b/b	b/b/b
Exit 242	100th St	5.0%	1910'	3° 00'	> 30'	2.18%	16.0'	1.0'	4.0'	6:1	41	82	150	647'	> 425'	> 96	> 425'	0.1%	300'	0	0	3	3	3	0.55	76	Not evaluated due to interchange screening method					
Exit 246	New Effington/Rosholt	4.4%	1910'	3° 00'	> 30'	2.40%	16.0'	3.5'	3.0'	6:1	63	83	205	670'	> 425'	> 96	> 425'	0.4%	> 300'	0	0	1	1	1	0.16	115						

Legend

Existing value does not meet standard criteria
Information not available or easily discernable from plans

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I-29 EXIT 132 BROOKINGS



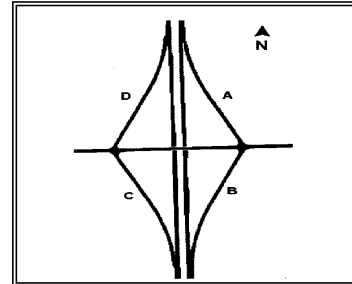
Figure 1
I-29 Exit 132 - Brookings
Lane Addition and Signalization Improvements

Probable Construction Costs
I-29 Exit 132 - Lane Addition and Signalization Improvements

<i>Item Description</i>	<i>Quantity</i>	<i>Unit</i>	<i>Unit Cost</i>	<i>Total Cost</i>
Mobilization	1	LUMP SUM	\$3,000.00	\$3,000
Traffic Control	1	LUMP SUM	\$7,000.00	\$7,000
Clearing	1	LUMP SUM	\$1,000.00	\$1,000
Removal of Concrete Pavement	-	SQ. YD.	\$3.88	\$0
Removal of Asphalt Pavement	-	SQ. YD.	\$7.39	\$0
Remove Bridge	-	SQ. FT.	\$9.00	\$0
Borrow, Unclassified Excavation	1,206	CU. YD.	\$5.30	\$6,392
Base Course	571	TON	\$10.64	\$6,073
Asphalt Composite		TON	\$80.91	\$0
PCC Pavement 11" (mainline)	-	SQ. YD.	\$33.12	\$0
PCC Pavement 8" (ramps)	1,250	SQ. YD.	\$43.40	\$54,244
Concrete Approach Slab	-	SQ. YD.	\$188.34	\$0
Bridges	-	SQ. FT.	\$100.00	\$0
Guard Rail	0	LF	\$100.00	\$0
Permanent Signing/Markings	1	LUMP SUM	\$0.00	\$0
Traffic Signal	2	EACH	\$125,000.00	\$250,000
Roadway Lighting	1	LUMP SUM	\$0.00	\$0
Drainage (18" RCP)	60	LF	\$24.53	<u>\$1,472</u>
Subtotal				\$330,000
Contingencies	25%			<u>\$82,500</u>
Total Probable Construction Costs				\$410,000
Engineering, Administration	15%			\$61,500
Total Project Costs				\$470,000

INTERCHANGE GEOMETRICS CHECKLIST
SDDOT Interstate Corridor Study

Interstate: I-29
Interchange: Exit 132
Analyst: BLM
Date: 1/20/2010

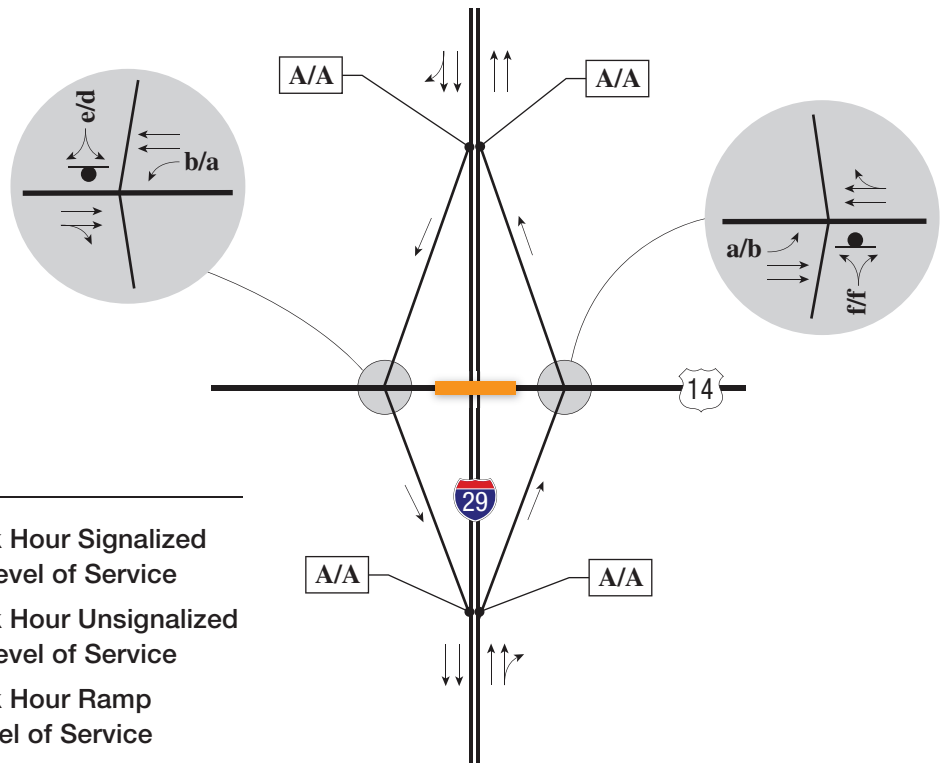
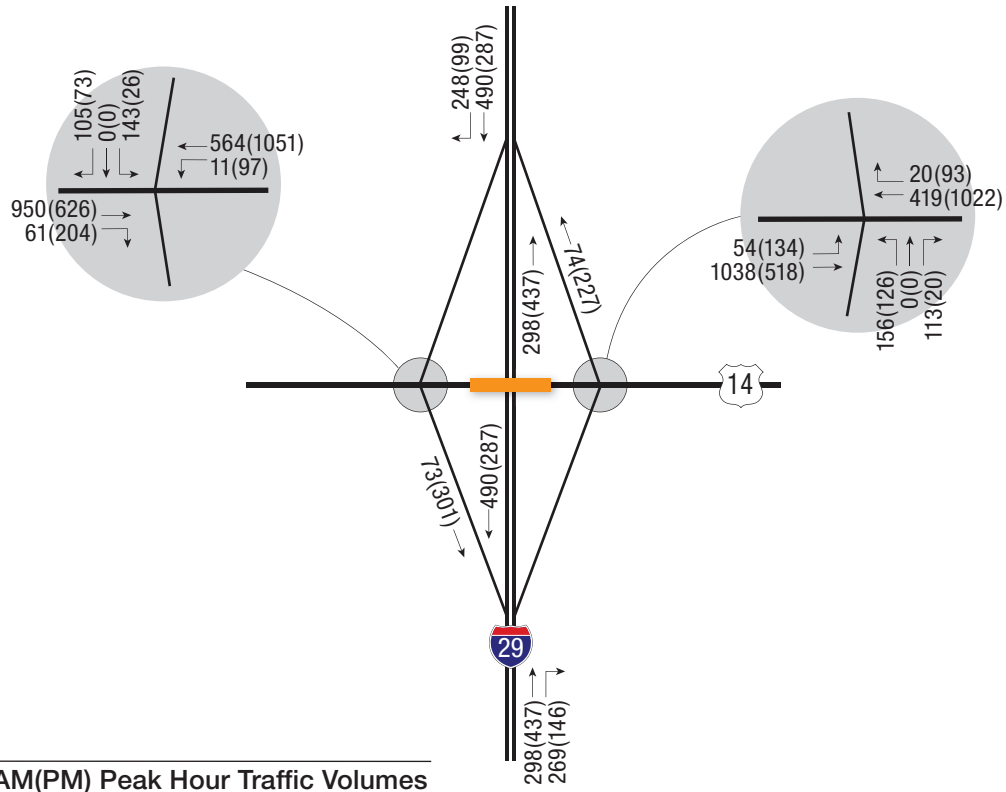


Interchange Geometry	Criteria	A	B	C	D	Achieved?
Interchange Type (Diamond, Full/Partial Cloverleaf, Trumpet etc.)	Diamond					-----
Design Speed	50 mph**					
Number of Lanes		1	2	1	2	
Right Turn Storage Length		-	120'	-	70'	
Left Turn Storage Length		-	-	-	-	
Superelevation (e max)	6%	3%	5%	3%	5%	Acceptable
Minimum Horizontal Radius for e max of 6% (50 mph / 30 mph)	833 / 231 feet	1909'	1909'	1909'	1909'	Acceptable
Maximum Degree of Curvature (50 mph / 30 mph)	6° 53' / 24° 48'	3° 00'	3° 00'	3° 00'	3° 00'	Acceptable
Minimum Clear Zone From the Edge of Travel Lane	30 feet	>30'	>30'	>30'	>30'	Acceptable
Maximum Grade on Ramp (Ascending)	+3% to +5%	-	1.51%	-	2.33%	Acceptable
Maximum Grade on Ramp (Descending)	-3% to -5%	-1.34%	-	-2.12%	-	Acceptable
Minimum Lane Width						
With Auxiliary Lanes	12 feet	-	-	-	-	
As Single Lane	15 feet (19 for loops)	18.0'	18.0'	17.0'	17.5'	Acceptable
Shoulder Width						
Right Shoulder	8 feet (4 for loops)	3.5'	2.5'	3.0'	3.5'	Supports Impr.
Left Shoulder	2 feet	3.5'	3.5'	3.5'	3.5'	Acceptable
Inslope	6:1	4:1	4:1	4:1	4:1	Supports Impr.
Minimum Off-Ramp Taper Rate	20:1	-	40:1	-	40:1	Acceptable
Minimum On-Ramp Taper Rate	50:1	61:1	-	61:1	-	Acceptable
Ramp Features						
K-Value Ranges						
Minimum for a Crest Vertical Curve (50 mph / 30 mph)	84 / 19	-	364	-	169	Acceptable
Minimum for a Sag Vertical Curve (50 mph / 30 mph)	96 / 37	299	300	188	192	Acceptable
Minimum Stopping Sight Distance (50 mph / 30 mph)	425 / 200 feet	>425'	>425'	<425'	757'	Acceptable
Cross Road Features						
K-Value Ranges		To West		To East		
Minimum for a Crest Vertical Curve (50 mph / 30 mph)	84 / 19	291		291		Acceptable
Minimum for a Sag Vertical Curve (50 mph / 30 mph)	96 / 37	-		-		
Minimum Stopping Sight Distance (50 mph / 30 mph)	425 / 200 feet	792'		792'		Acceptable
Ramp Intersection Sight Distance (50 mph / 30 mph)	425 / 200 feet	ok		ok		Acceptable
Maximum Longitudinal Grade - Rolling Terrain (Urban Arterial)***	7%	0.28%		3.50%		Acceptable
Minimum Longitudinal Grade (Min. / Des.)	0.3% / 0.5%	0.28%		-		Supports Impr.
Minimum Control of Access from Interchange Ramps (Min. / Des.)	300 / 660 feet	610'		>300		Acceptable

** Loop ramp design speed = 30 mph

***Substandard Intersection Sight Distance locations could not be determined from the interchange plans. Substandard locations, therefore, are intersections that demonstrate sight distance limitations based on a general field evaluation or the presence of a substandard k-value or Stopping Sight Distance along the crossroad approaching the intersection.

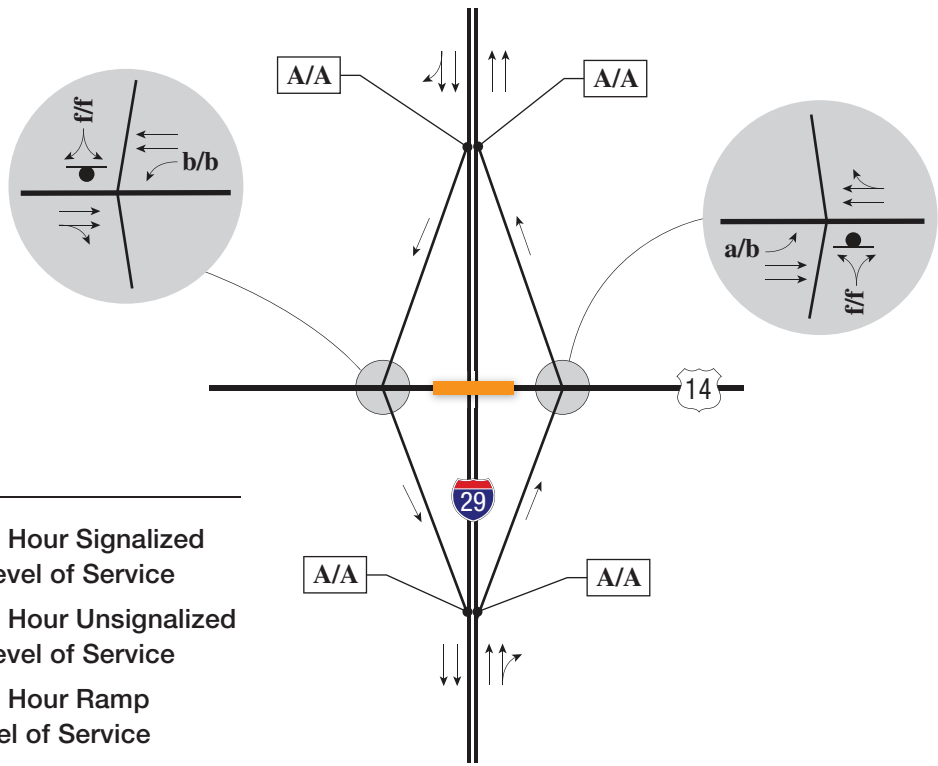
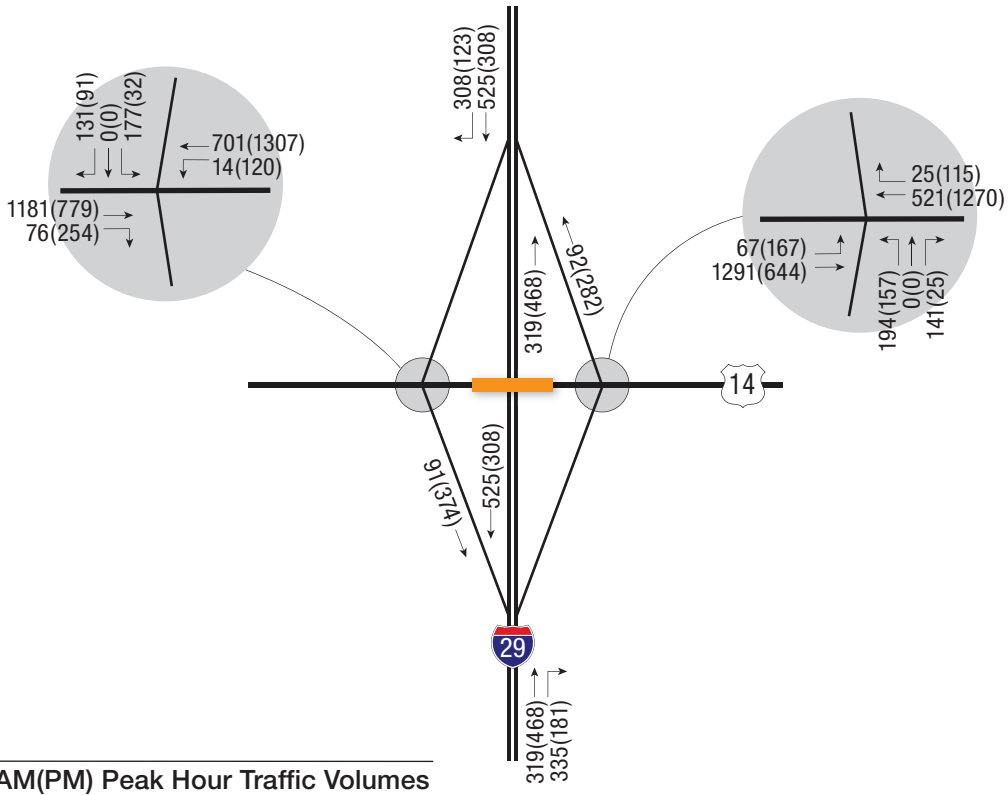
Comments



Interstate 29 Exit 132
 Traffic Conditions Year 2009

NORTH

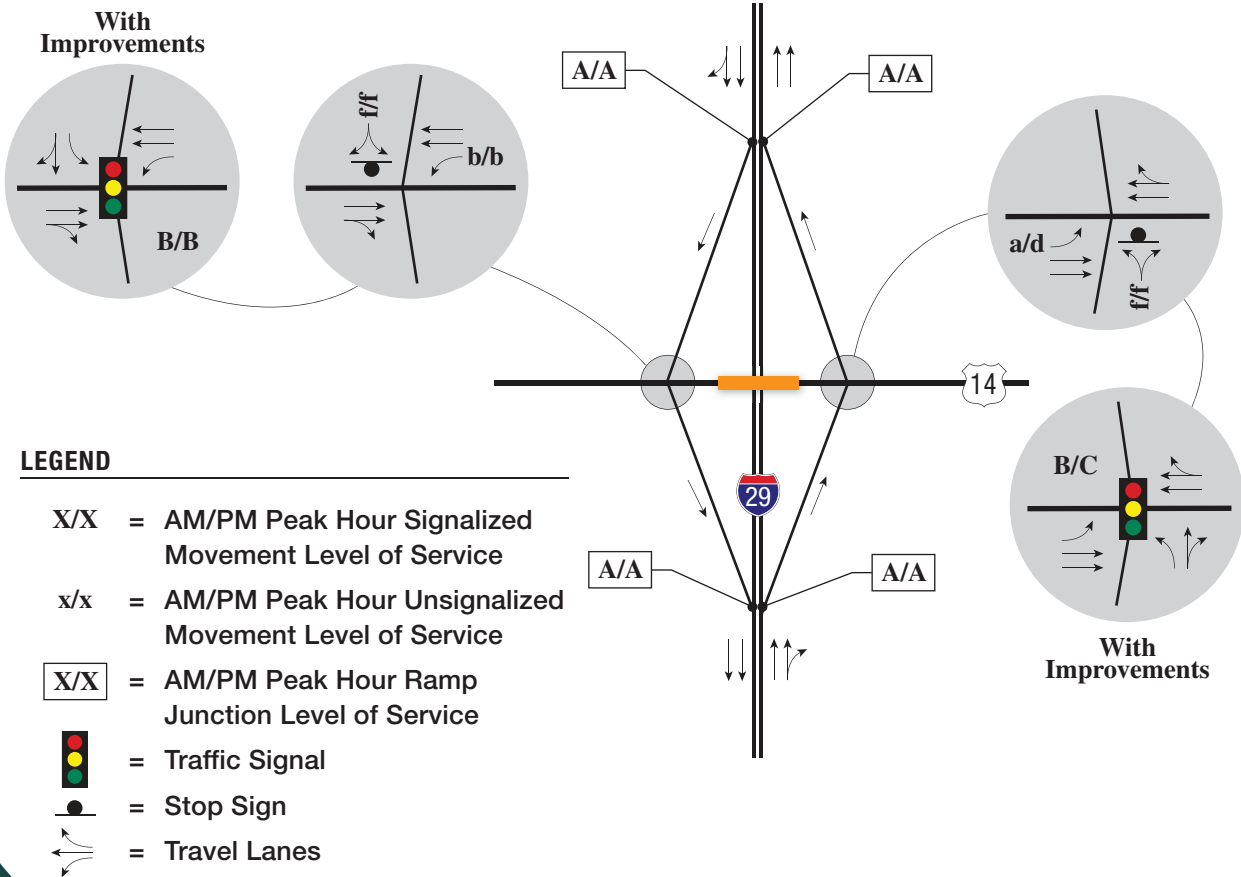
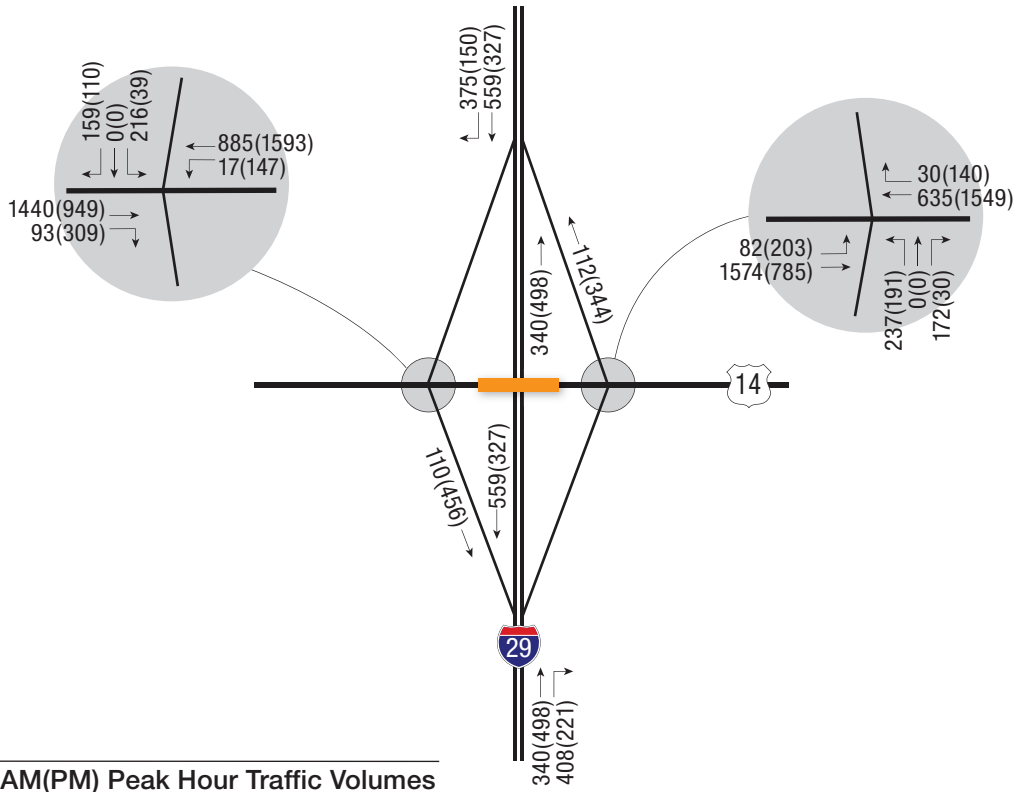




Interstate 29 Exit 132
 Traffic Conditions Year 2020

NORTH





Interstate 29 Exit 132
 Traffic Conditions Year 2030

NORTH



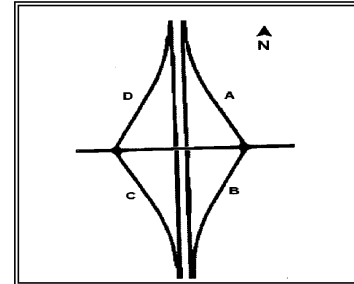
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I-29 EXIT 133 BROOKINGS/HURON

INTERCHANGE GEOMETRICS CHECKLIST
SDDOT Interstate Corridor Study

Interstate: I-29
Interchange: Exit 133
Analyst: BLM
Date: 1/20/2010



Interchange Geometry	Criteria	A	B	C	D	Achieved?
Interchange Type (Diamond, Full/Partial Cloverleaf, Trumpet etc.)	Diamond					-----
Design Speed	50 mph**					
Number of Lanes		1	1	1	1	
Right Turn Storage Length		-	-	-	-	
Left Turn Storage Length		-	-	-	-	
Superelevation (e max)	6%	3.0%	5.0%	3.0%	5.0%	Acceptable
Minimum Horizontal Radius for e max of 6% (50 mph / 30 mph)	833 / 231 feet	1909'	1909'	1909'	1909'	Acceptable
Maximum Degree of Curvature (50 mph / 30 mph)	6° 53' / 24° 48'	3°	3°	3°	3°	Acceptable
Minimum Clear Zone From the Edge of Travel Lane	30 feet	>30'	>30'	>30'	>30'	Acceptable
Maximum Grade on Ramp (Ascending)	+3% to +5%	-	1.42%	-	1.98%	Acceptable
Maximum Grade on Ramp (Descending)	-3% to -5%	-1.66%	-	-1.34%	-	Acceptable
Minimum Lane Width						
With Auxiliary Lanes	12 feet	-	-	-	-	
As Single Lane	15 feet (19 for loops)	17.5'	17.5'	17.5'	18.0'	Acceptable
Shoulder Width						
Right Shoulder	8 feet (4 for loops)	3.5'	3.5'	4.0'	4.0'	Supports Impr.
Left Shoulder	2 feet	4.5'	4.0'	4.5'	3.5'	Acceptable
Inslope	6:1	4:1	4:1	4:1	4:1	Supports Impr.
Minimum Off-Ramp Taper Rate	20:1	-	40:1	-	40:1	Acceptable
Minimum On-Ramp Taper Rate	50:1	61:1	-	61:1	-	Acceptable
Ramp Features						
K-Value Ranges						
Minimum for a Crest Vertical Curve (50 mph / 30 mph)	84 / 19	-	-	-	232	Acceptable
Minimum for a Sag Vertical Curve (50 mph / 30 mph)	96 / 37	223	213	198	197	Acceptable
Minimum Stopping Sight Distance (50 mph / 30 mph)	425 / 200 feet	>425'	>425'	>425'	986'	Acceptable
Cross Road Features						
K-Value Ranges		To West		To East		
Minimum for a Crest Vertical Curve (50 mph / 30 mph)	84 / 19	287		287		Acceptable
Minimum for a Sag Vertical Curve (50 mph / 30 mph)	96 / 37	-		182		Acceptable
Minimum Stopping Sight Distance (50 mph / 30 mph)	425 / 200 feet	786'		768'		Acceptable
Ramp Intersection Sight Distance (50 mph / 30 mph)***	425 / 200 feet	ok		ok		Acceptable
Maximum Longitudinal Grade - Rolling Terrain (Urban Arterial)	7%	1.79%		2.05%		Acceptable
Minimum Longitudinal Grade (Min. / Des.)	0.3% / 0.5%	-		1.25%		Acceptable
Minimum Control of Access from Interchange Ramps (Min. / Des.)	300 / 660 feet	370'		550'		Acceptable

** Loop ramp design speed = 30 mph

***Substandard Intersection Sight Distance locations could not be determined from the interchange plans. Substandard locations, therefore, are intersections that demonstrate sight distance limitations based on a general field evaluation or the presence of a substandard k-value or Stopping Sight Distance along the crossroad approaching the intersection.

Comments



I-29 EXIT 177 WATERTOWN

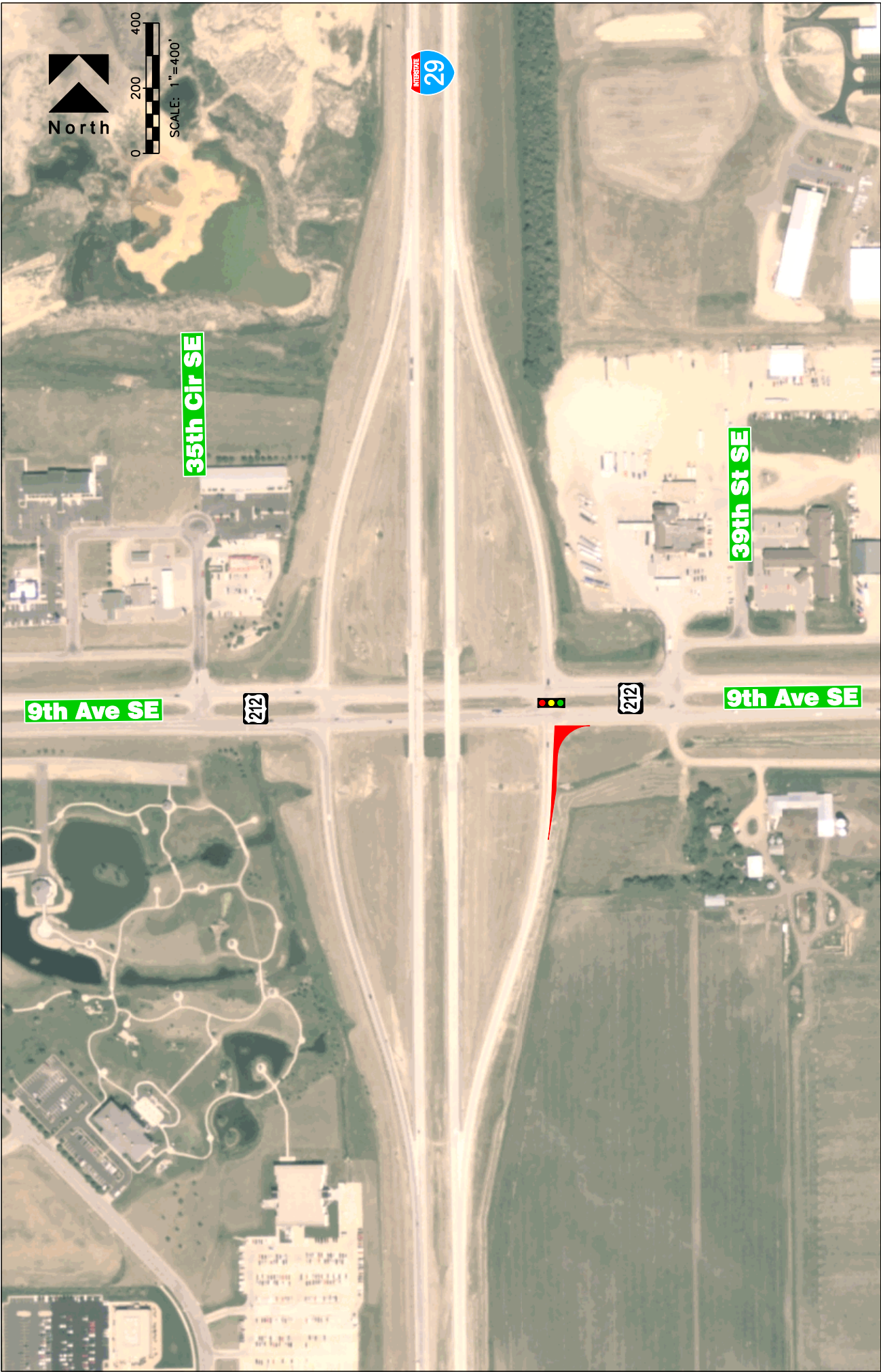


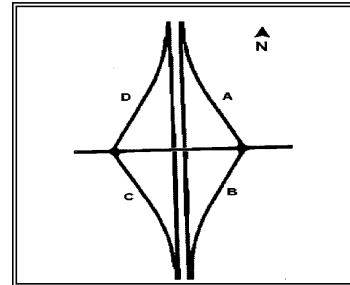
Figure 1
I-29 Exit 177 - Watertown
Lane Addition and Signalization Improvements

Probable Construction Costs
I-29 Exit 177 - Lane Addition and Signalization Improvements

<i>Item Description</i>	<i>Quantity</i>	<i>Unit</i>	<i>Unit Cost</i>	<i>Total Cost</i>
Mobilization	1	LUMP SUM	\$2,000.00	\$2,000
Traffic Control	1	LUMP SUM	\$3,000.00	\$3,000
Clearing	1	LUMP SUM	\$1,000.00	\$1,000
Removal of Concrete Pavement	-	SQ. YD.	\$3.88	\$0
Removal of Asphalt Pavement	-	SQ. YD.	\$7.39	\$0
Remove Bridge	-	SQ. FT.	\$9.00	\$0
Borrow, Unclassified Excavation	603	CU. YD.	\$5.30	\$3,196
Base Course	285	TON	\$10.64	\$3,037
Asphalt Composite		TON	\$80.91	\$0
PCC Pavement 11" (mainline)	-	SQ. YD.	\$33.12	\$0
PCC Pavement 8" (ramps)	625	SQ. YD.	\$43.40	\$27,122
Concrete Approach Slab	-	SQ. YD.	\$188.34	\$0
Bridges	-	SQ. FT.	\$100.00	\$0
Guard Rail	0	LF	\$100.00	\$0
Permanent Signing/Markings	1	LUMP SUM	\$0.00	\$0
Traffic Signal	1	EACH	\$125,000.00	\$125,000
Roadway Lighting	1	LUMP SUM	\$0.00	\$0
Drainage (18" RCP)	30	LF	\$24.53	<u>\$736</u>
Subtotal				\$170,000
Contingencies	25%			<u>\$42,500</u>
Total Probable Construction Costs				\$210,000
Engineering, Administration	15%			\$31,500
Total Project Costs				\$240,000

INTERCHANGE GEOMETRICS CHECKLIST
SDDOT Interstate Corridor Study

Interstate: I-29
Interchange: Exit 177
Analyst: JLB
Date: 1/20/2010

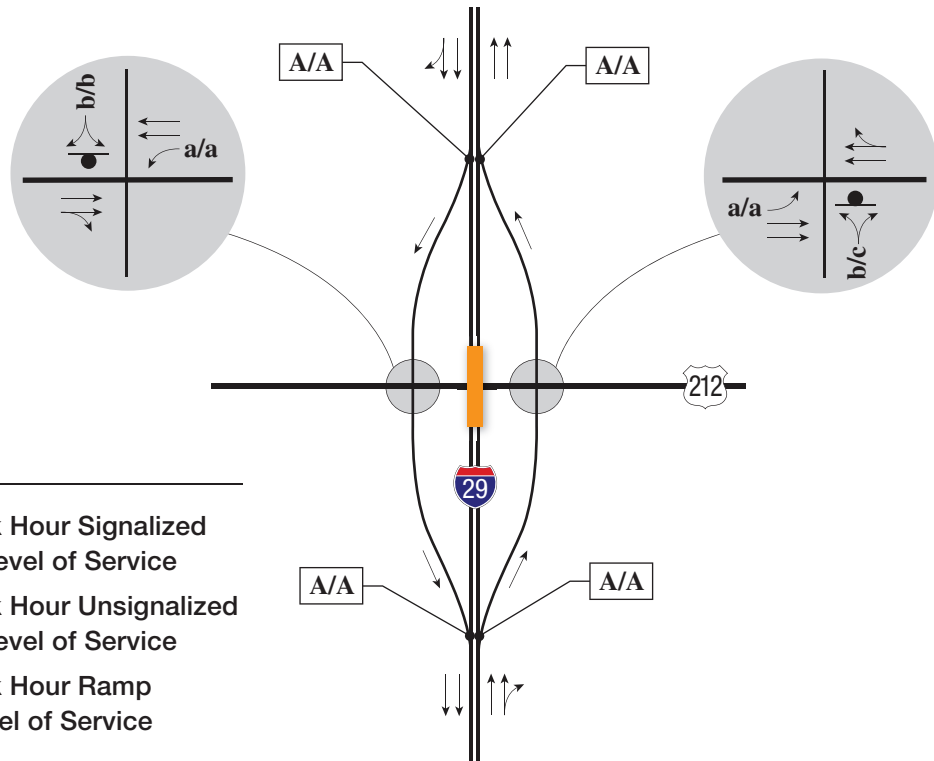
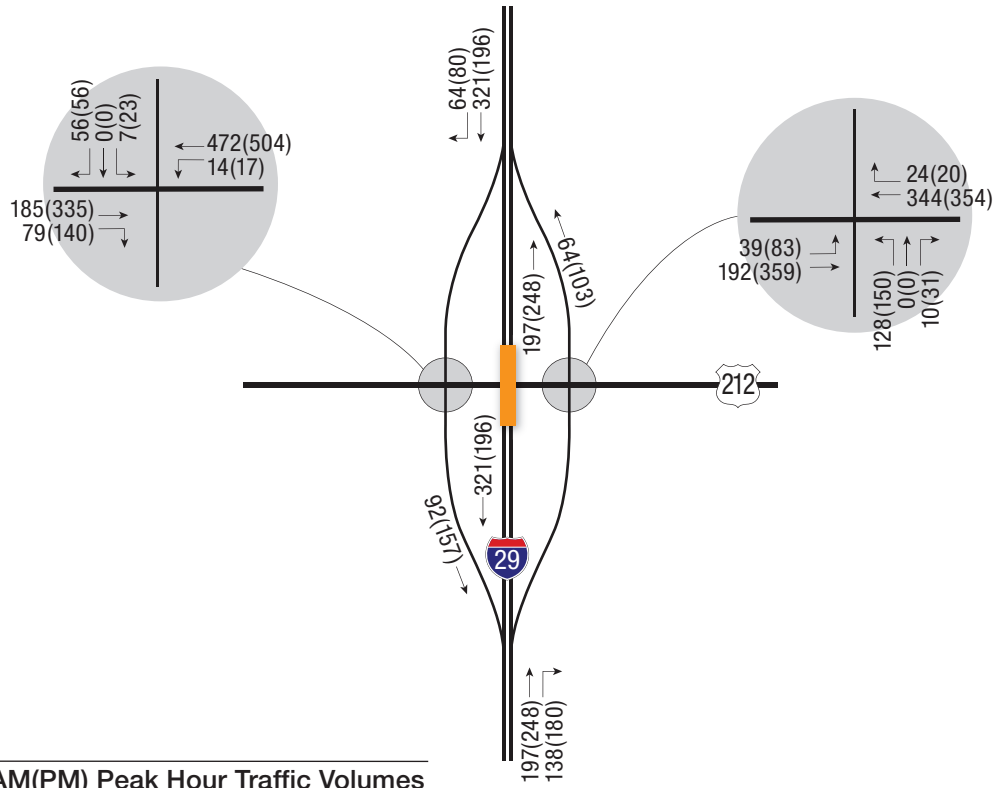


Interchange Geometry	Criteria	A	B	C	D	Achieved?
Interchange Type (Diamond, Full/Partial Cloverleaf, Trumpet etc.)	Diamond					-----
Design Speed	50 mph**					
Number of Lanes		1	1	1	1	
Right Turn Storage Length		-	-	-	-	
Left Turn Storage Length		-	-	-	-	
Superelevation (e max)	6%	6.00%	6.00%	6.00%	6.00%	Acceptable
Minimum Horizontal Radius for e max of 6% (50 mph / 30 mph)	833 / 231 feet	1910'	1910'	1910'	1910'	Acceptable
Maximum Degree of Curvature (50 mph / 30 mph)	6° 53' / 24° 48'	3° 00'	3° 00'	3° 00'	3° 00'	Acceptable
Minimum Clear Zone From the Edge of Travel Lane	30 feet	>30'	>30'	>30'	>30'	Acceptable
Maximum Grade on Ramp (Ascending)	+3% to +5%	1.60%	-	3.00%	-	Acceptable
Maximum Grade on Ramp (Descending)	-3% to -5%	-	-2.38%	-	-2.09%	Acceptable
Minimum Lane Width						
With Auxiliary Lanes	12 feet	-	-	-	-	
As Single Lane	15 feet (19 for loops)	15.5'	16.0'	17.5'	16.0'	Acceptable
Shoulder Width						
Right Shoulder	8 feet (4 for loops)	8.0'	7.0'	5.5'	7.5'	Supports Impr.
Left Shoulder	2 feet	2.0'	2.0'	2.5'	2.0'	Acceptable
Inslope	6:1	6:1	6:1	6:1	6:1	Acceptable
Minimum Off-Ramp Taper Rate	20:1	-	40:1	-	40:1	Acceptable
Minimum On-Ramp Taper Rate	50:1	61:1	-	61:1	-	Acceptable
Ramp Features						
K-Value Ranges						
Minimum for a Crest Vertical Curve (50 mph / 30 mph)	84 / 19	245	276	195	318	Acceptable
Minimum for a Sag Vertical Curve (50 mph / 30 mph)	96 / 37	168	177	279	225	Acceptable
Minimum Stopping Sight Distance (50 mph / 30 mph)	425 / 200 feet	778'	>425'	>425'	>425'	Acceptable
Cross Road Features						
K-Value Ranges		To West		To East		
Minimum for a Crest Vertical Curve (50 mph / 30 mph)	84 / 19	-		-		Acceptable
Minimum for a Sag Vertical Curve (50 mph / 30 mph)	96 / 37	880		880		Acceptable
Minimum Stopping Sight Distance (50 mph / 30 mph)	425 / 200 feet	>425'		>425'		Acceptable
Ramp Intersection Sight Distance (50 mph / 30 mph)***	425 / 200 feet	ok		ok		Acceptable
Maximum Longitudinal Grade - Rolling Terrain (Urban Arterial)	7%	1.44%		0.07%		Acceptable
Minimum Longitudinal Grade (Min. / Des.)	0.3% / 0.5%	-		0.07%		Supports Impr.
Minimum Control of Access from Interchange Ramps (Min. / Des.)	300 / 660 feet	350'		350'		Acceptable

** Loop ramp design speed = 30 mph

***Substandard Intersection Sight Distance locations could not be determined from the interchange plans. Substandard locations, therefore, are intersections that demonstrate sight distance limitations based on a general field evaluation or the presence of a substandard k-value or Stopping Sight Distance along the crossroad approaching the intersection.

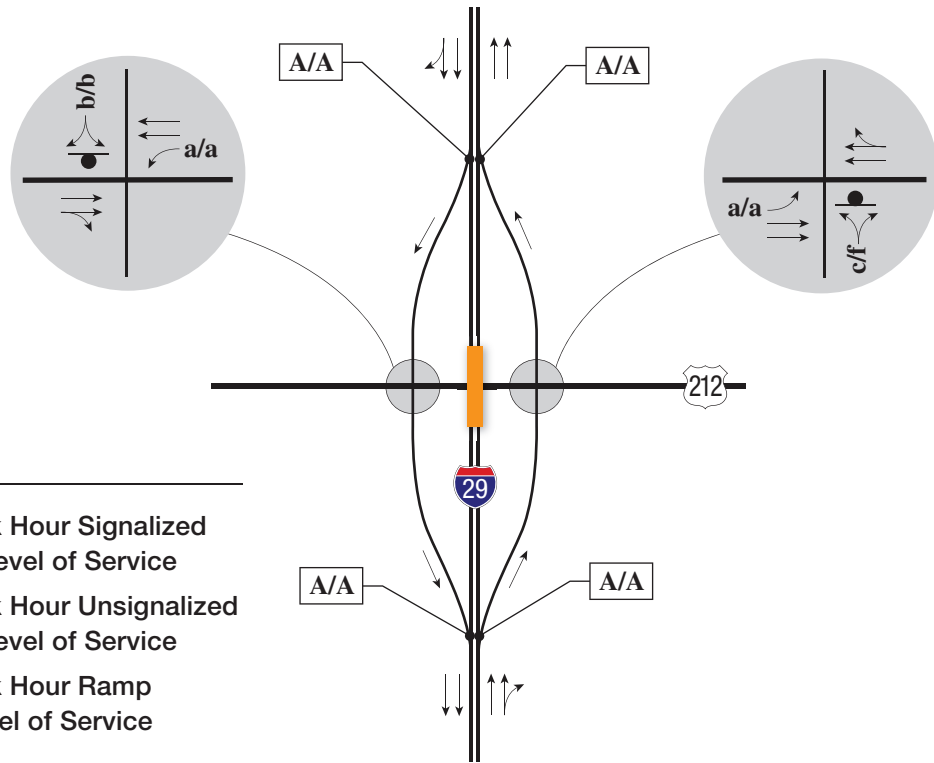
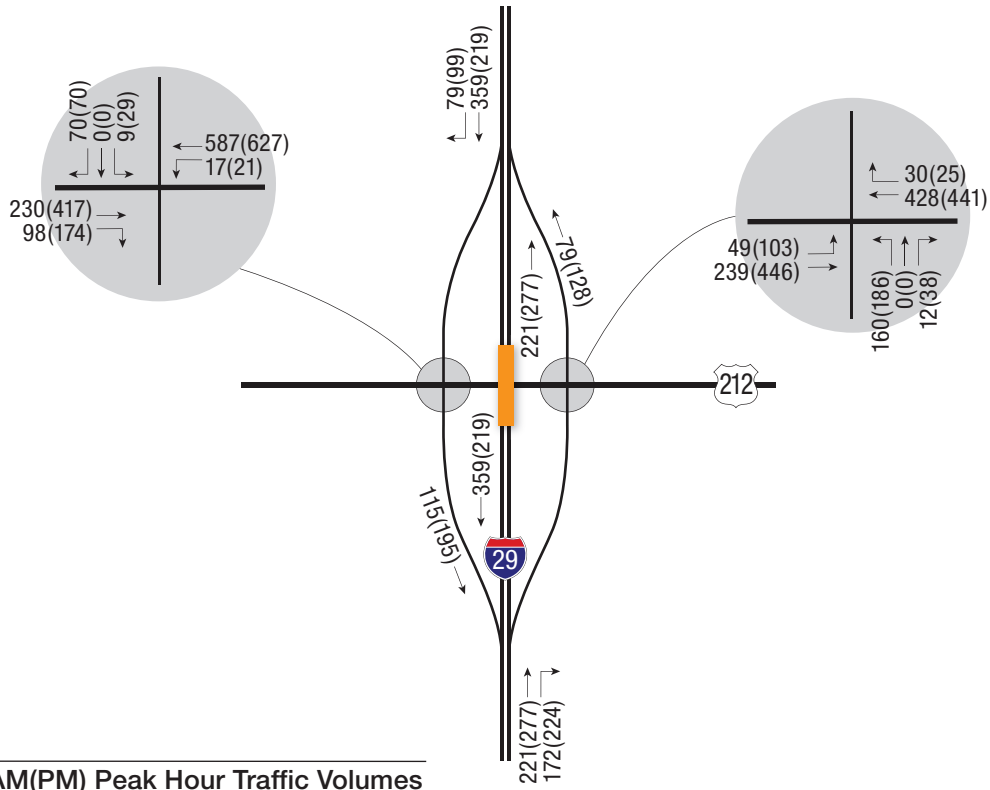
Comments



Interstate 29 Exit 177
 Traffic Conditions Year 2009

NORTH





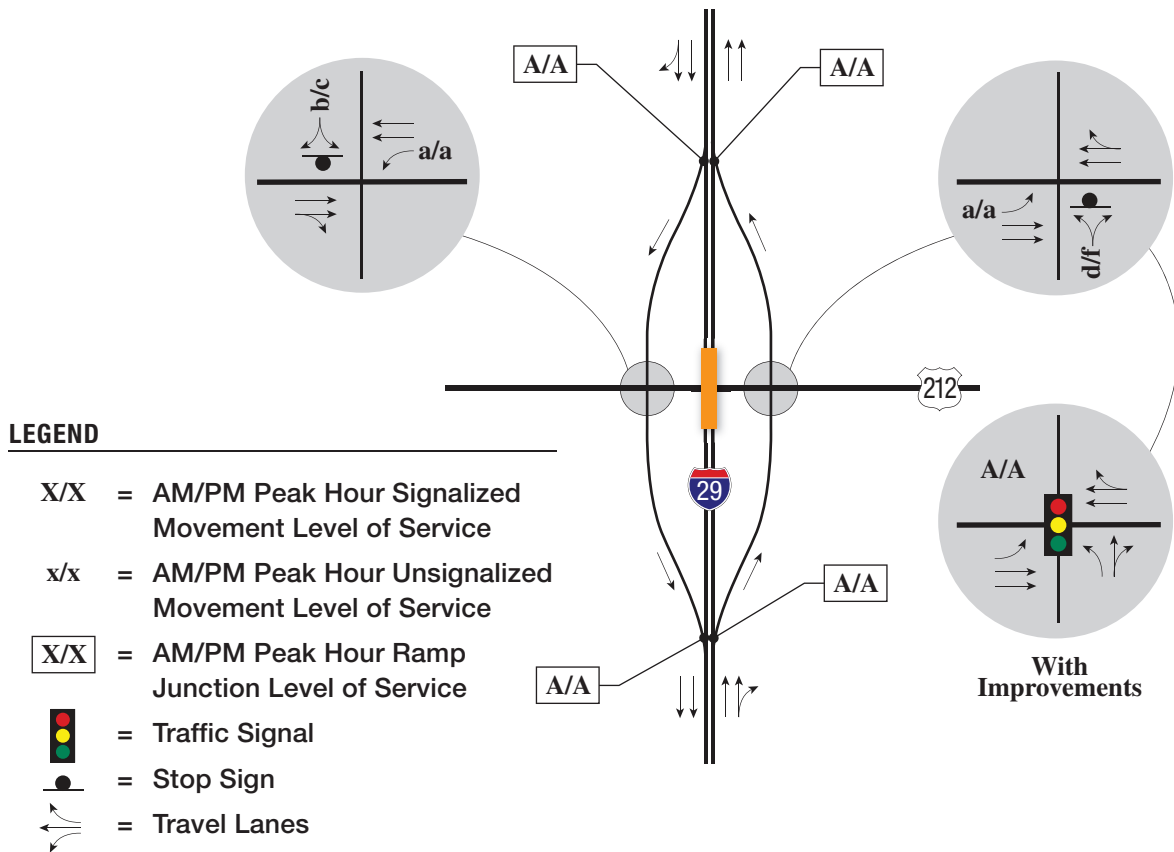
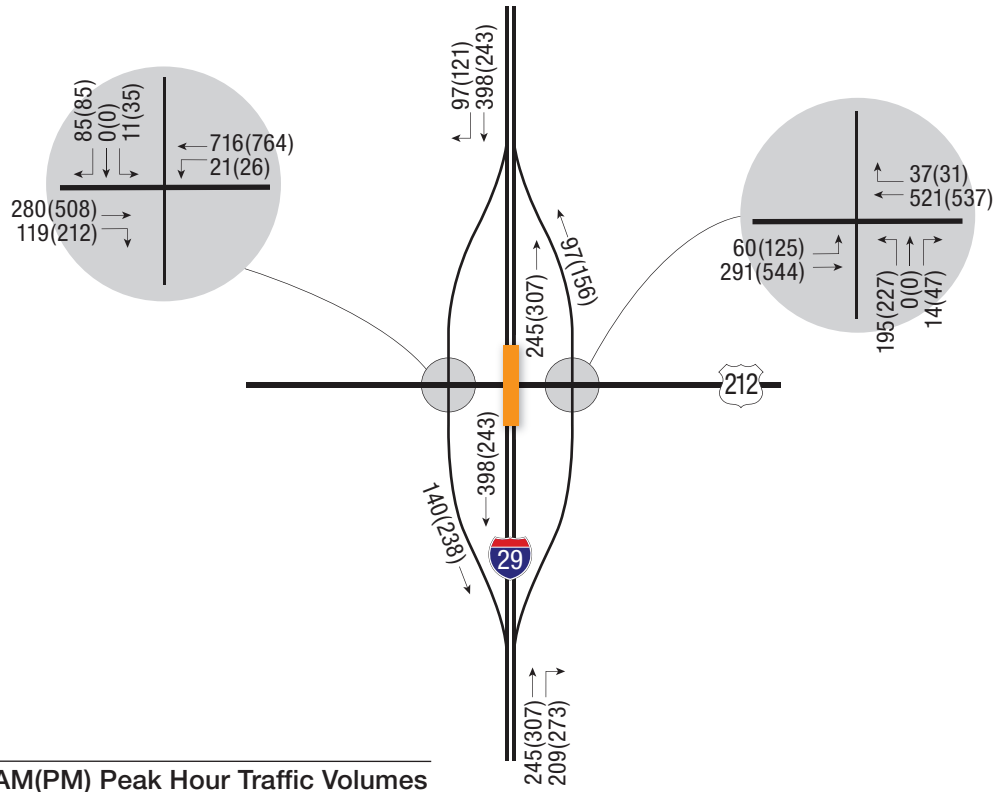
LEGEND

- X/X = AM/PM Peak Hour Signalized Movement Level of Service
- x/x = AM/PM Peak Hour Unsignalized Movement Level of Service
- X/X = AM/PM Peak Hour Ramp Junction Level of Service
- = Stop Sign
- ↔ = Travel Lanes

Interstate 29 Exit 177
 Traffic Conditions Year 2020

NORTH





Interstate 29 Exit 177
 Traffic Conditions Year 2030

NORTH



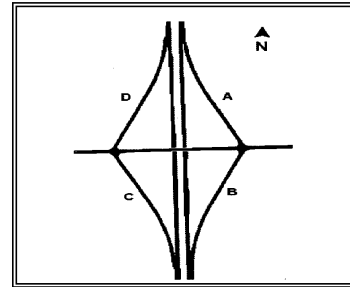
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I-29 EXIT 201 TWIN BROOKS

INTERCHANGE GEOMETRICS CHECKLIST
SDDOT Interstate Corridor Study

Interstate: I-29
Interchange: Exit 201
Analyst: MBM
Date: 1/20/2010



Interchange Geometry	Criteria	A	B	C	D	Achieved?
Interchange Type (Diamond, Full/Partial Cloverleaf, Trumpet etc.)	Diamond					-----
Design Speed	50 mph**					
Number of Lanes		1	1	1	1	
Right Turn Storage Length		-	-	-	-	
Left Turn Storage Length		-	-	-	-	
Superelevation (e max)	6%	3.00%	5.00%	3.00%	5.00%	Acceptable
Minimum Horizontal Radius for e max of 6% (50 mph / 30 mph)	833 / 231 feet	1910'	1910'	1910'	1910'	Acceptable
Maximum Degree of Curvature (50 mph / 30 mph)	6° 53' / 24° 48'	3° 00'	3° 00'	3° 00'	3° 00'	Acceptable
Minimum Clear Zone From the Edge of Travel Lane	30 feet	>30'	>30'	>30'	>30'	Acceptable
Maximum Grade on Ramp (Ascending)	+3% to +5%	-	-	1.66%	3.57%	Acceptable
Maximum Grade on Ramp (Descending)	-3% to -5%	-3.59%	-1.96%	-0.77%	-	Acceptable
Minimum Lane Width						
With Auxiliary Lanes	12 feet	-	-	-	-	
As Single Lane	15 feet (19 for loops)	18.0'	18.0'	18.0'	18.0'	Acceptable
Shoulder Width						
Right Shoulder	8 feet (4 for loops)	3.0'	3.0'	3.0'	3.0'	Supports Impr.
Left Shoulder	2 feet	3.0'	3.0'	3.0'	3.0'	Acceptable
Inslope	6:1	6:1	6:1	6:1	6:1	Acceptable
Minimum Off-Ramp Taper Rate	20:1	-	40:1	-	40:1	Acceptable
Minimum On-Ramp Taper Rate	50:1	61:1	-	61:1	-	Acceptable
Ramp Features						
K-Value Ranges						
Minimum for a Crest Vertical Curve (50 mph / 30 mph)	84 / 19	208	227	268	227	Acceptable
Minimum for a Sag Vertical Curve (50 mph / 30 mph)	96 / 37	127	207	314	163	Acceptable
Minimum Stopping Sight Distance (50 mph / 30 mph)	425 / 200 feet	538'	741'	769'	666'	Acceptable
Cross Road Features						
K-Value Ranges		To West		To East		
Minimum for a Crest Vertical Curve (50 mph / 30 mph)	84 / 19	-		-		Acceptable
Minimum for a Sag Vertical Curve (50 mph / 30 mph)	96 / 37	206'		-		Acceptable
Minimum Stopping Sight Distance (50 mph / 30 mph)	425 / 200 feet	823'		-		Acceptable
Ramp Intersection Sight Distance (50 mph / 30 mph)***	425 / 200 feet	ok				Acceptable
Maximum Longitudinal Grade - Rolling Terrain (Urban Arterial)	7%	2.3%		0.1%		Acceptable
Minimum Longitudinal Grade (Min. / Des.)	0.3% / 0.5%	0.1%		0.1%		Supports Impr.
Minimum Control of Access from Interchange Ramps (Min. / Des.)	300 / 660 feet	260'		670'		Supports Impr.

** Loop ramp design speed = 30 mph

***Substandard Intersection Sight Distance locations could not be determined from the interchange plans. Substandard locations, therefore, are intersections that demonstrate sight distance limitations based on a general field evaluation or the presence of a substandard k-value or Stopping Sight Distance along the crossroad approaching the intersection.

Comments

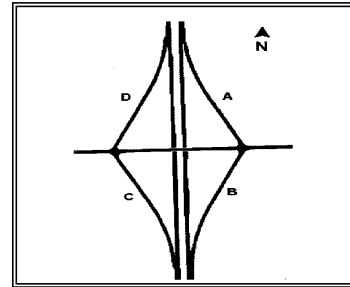
Interchange under construction



I-29 EXIT 207 SUMMIT/ABERDEEN

INTERCHANGE GEOMETRICS CHECKLIST
SDDOT Interstate Corridor Study

Interstate: I-29
Interchange: Exit 207
Analyst: JLB
Date: 1/20/2010



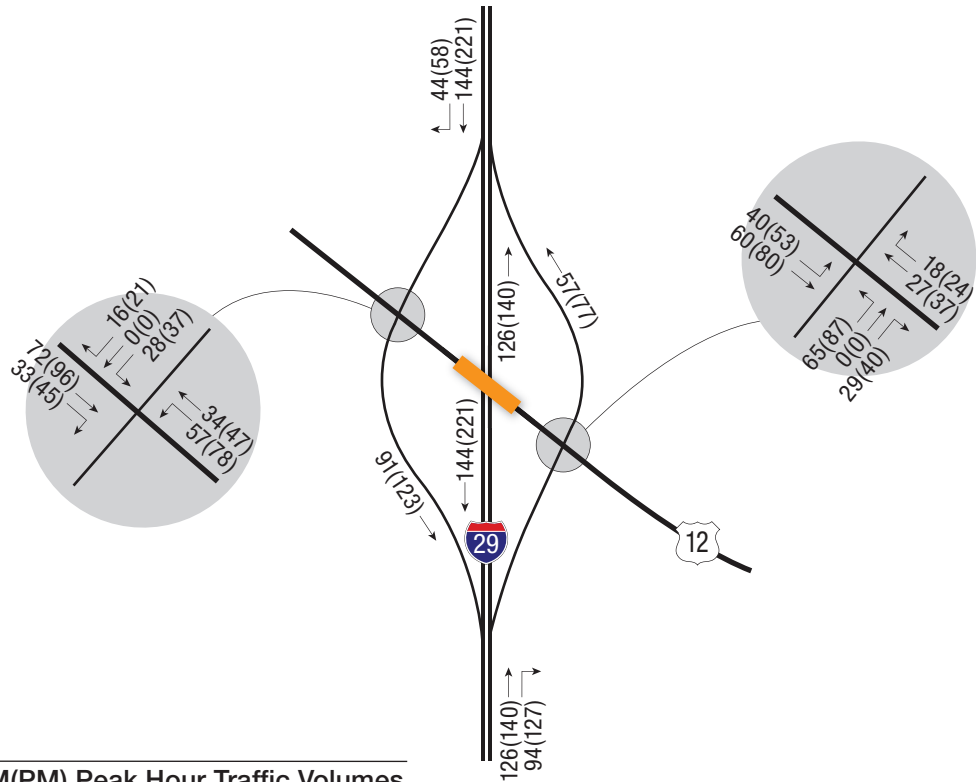
Interchange Geometry	Criteria	A	B	C	D	Achieved?
Interchange Type (Diamond, Full/Partial Cloverleaf, Trumpet etc.)	Diamond					-----
Design Speed	50 mph**					
Number of Lanes		1	1	1	1	
Right Turn Storage Length		-	-	-	-	
Left Turn Storage Length		-	-	-	-	
Superelevation (e max)	6%	6.00%	4.40%	6.00%	4.40%	Acceptable
Minimum Horizontal Radius for e max of 6% (50 mph / 30 mph)	833 / 231 feet	1146'	1910'	1146'	1910'	Acceptable
Maximum Degree of Curvature (50 mph / 30 mph)	6° 53' / 24° 48'	5° 00'	3° 00'	5° 00'	3° 00'	Acceptable
Minimum Clear Zone From the Edge of Travel Lane	30 feet	>30'	>30'	>30'	>30'	Acceptable
Maximum Grade on Ramp (Ascending)	+3% to +5%	-	3.28%	-	2.38%	Acceptable
Maximum Grade on Ramp (Descending)	-3% to -5%	-2.83%	-	-2.00%	-	Acceptable
Minimum Lane Width						
With Auxiliary Lanes	12 feet	-	-	-	-	Acceptable
As Single Lane	15 feet (19 for loops)	-	-	-	-	Acceptable
Shoulder Width						
Right Shoulder	8 feet (4 for loops)	-	-	-	-	Acceptable
Left Shoulder	2 feet	-	-	-	-	Acceptable
Inslope	6:1	6:1	6:1	6:1	6:1	Acceptable
Minimum Off-Ramp Taper Rate	20:1	-	61:1	-	61:1	Acceptable
Minimum On-Ramp Taper Rate	50:1	83:1	-	83:1	-	Acceptable
Ramp Features						
K-Value Ranges						
Minimum for a Crest Vertical Curve (50 mph / 30 mph)	84 / 19	154	106	285	161	Acceptable
Minimum for a Sag Vertical Curve (50 mph / 30 mph)	96 / 37	122	85	147	144	Supports Impr.
Minimum Stopping Sight Distance (50 mph / 30 mph)	425 / 200 feet	558'	386'	636'	730'	Supports Impr.
Cross Road Features						
K-Value Ranges		To West	To East			
Minimum for a Crest Vertical Curve (50 mph / 30 mph)	84 / 19	-	-			
Minimum for a Sag Vertical Curve (50 mph / 30 mph)	96 / 37	1599'	1599'			Acceptable
Minimum Stopping Sight Distance (50 mph / 30 mph)	425 / 200 feet	>425'	>425'			Acceptable
Ramp Intersection Sight Distance (50 mph / 30 mph)***	425 / 200 feet	ok	ok			Acceptable
Maximum Longitudinal Grade - Rolling Terrain (Urban Arterial)	7%			1.15%		Acceptable
Minimum Longitudinal Grade (Min. / Des.)	0.3% / 0.5%	0.10%				Supports Impr.
Minimum Control of Access from Interchange Ramps (Min. / Des.)	300 / 660 feet	>300'		>300'		Acceptable

** Loop ramp design speed = 30 mph

***Substandard Intersection Sight Distance locations could not be determined from the interchange plans. Substandard locations, therefore, are intersections that demonstrate sight distance limitations based on a general field evaluation or the presence of a substandard k-value or Stopping Sight Distance along the crossroad approaching the intersection.

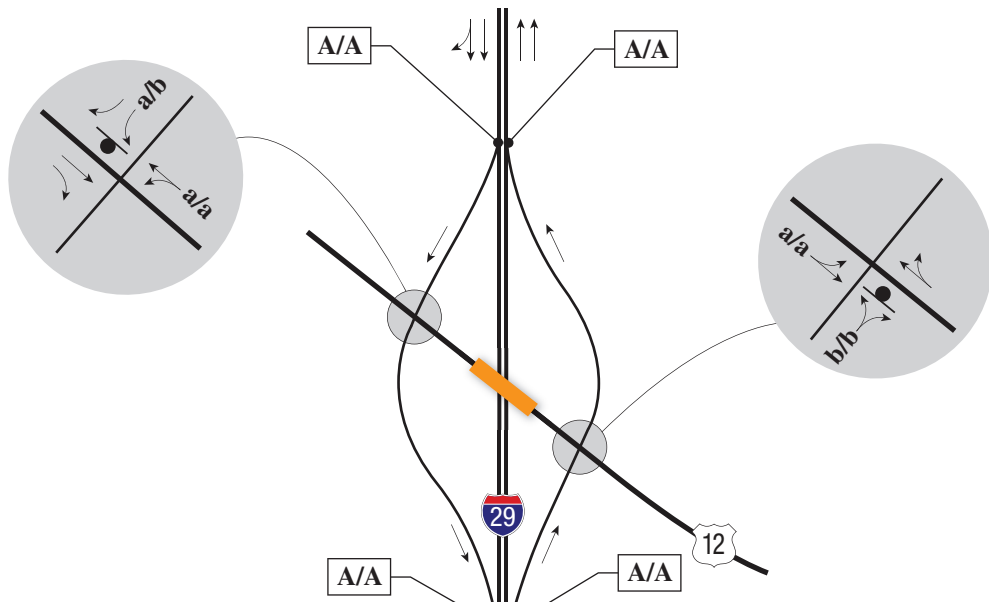
Comments

Interchange under construction
 According to grading plans pavement width meets criteria.



LEGEND

XXX(XXX) = AM(PM) Peak Hour Traffic Volumes



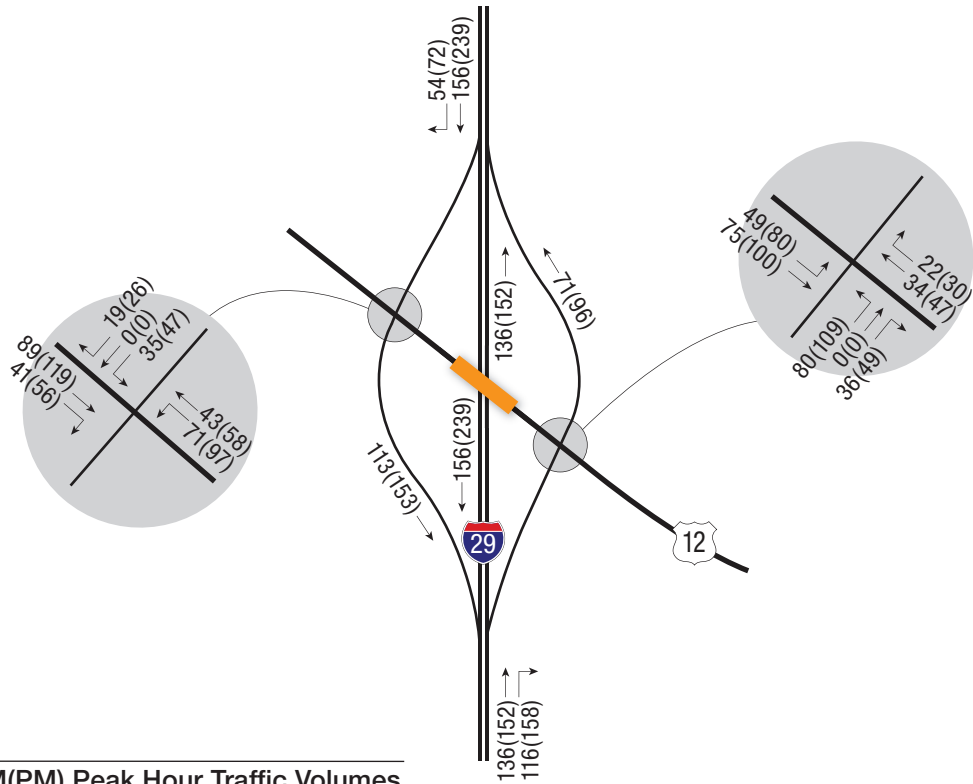
LEGEND

- X/X** = AM/PM Peak Hour Signalized Movement Level of Service
- x/x** = AM/PM Peak Hour Unsignalized Movement Level of Service
- X/X** = AM/PM Peak Hour Ramp Junction Level of Service
- = Stop Sign
- ↔** = Travel Lanes

Interstate 29 Exit 207
Traffic Conditions Year 2009

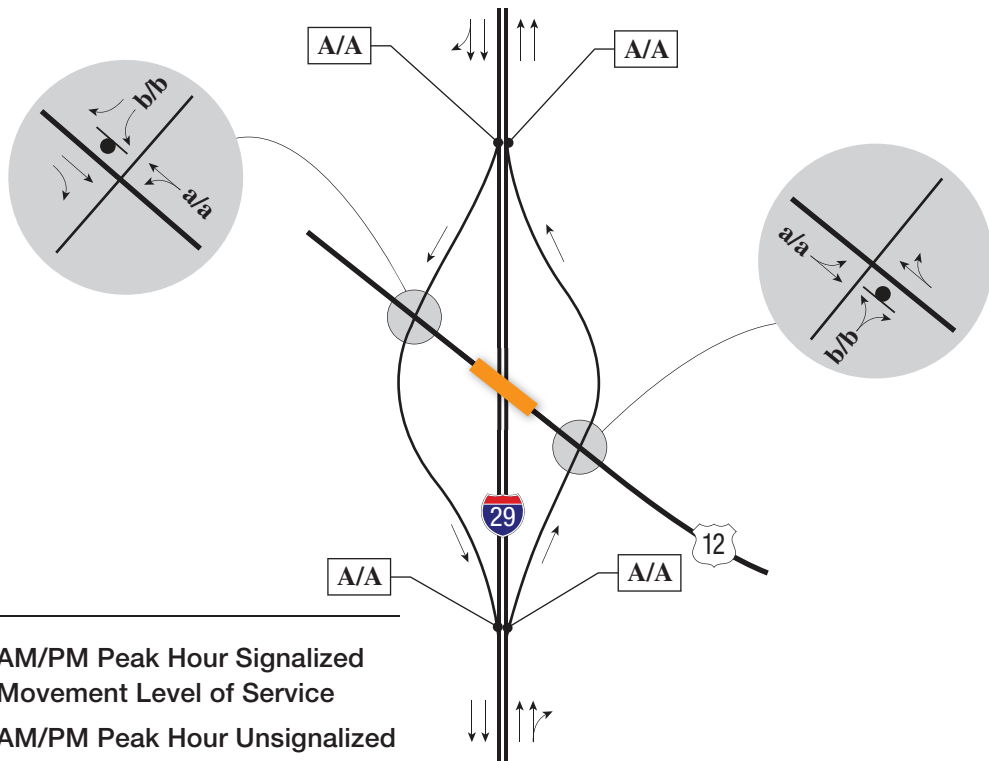
NORTH





LEGEND

XXX(XXX) = AM(PM) Peak Hour Traffic Volumes



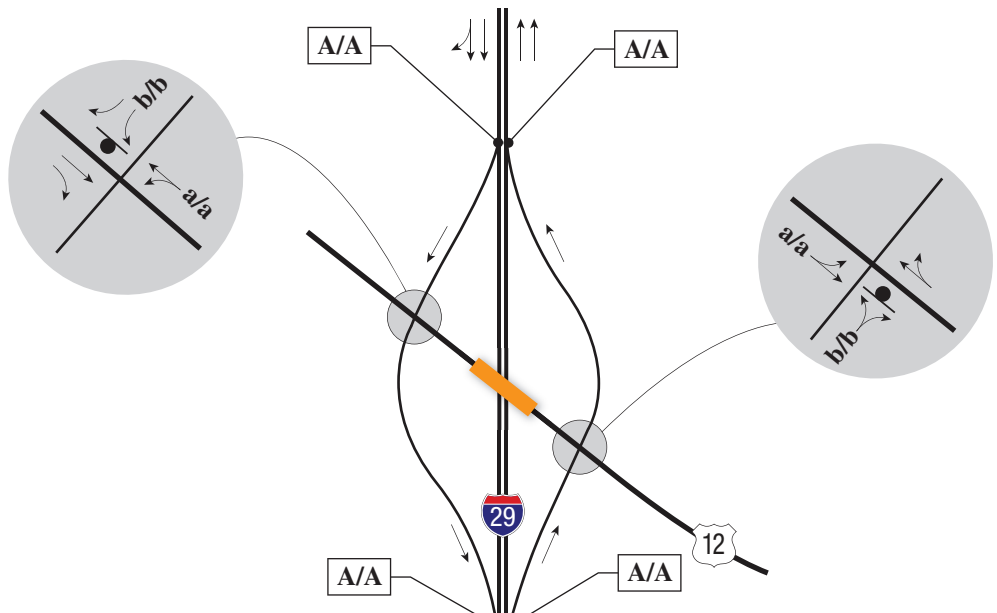
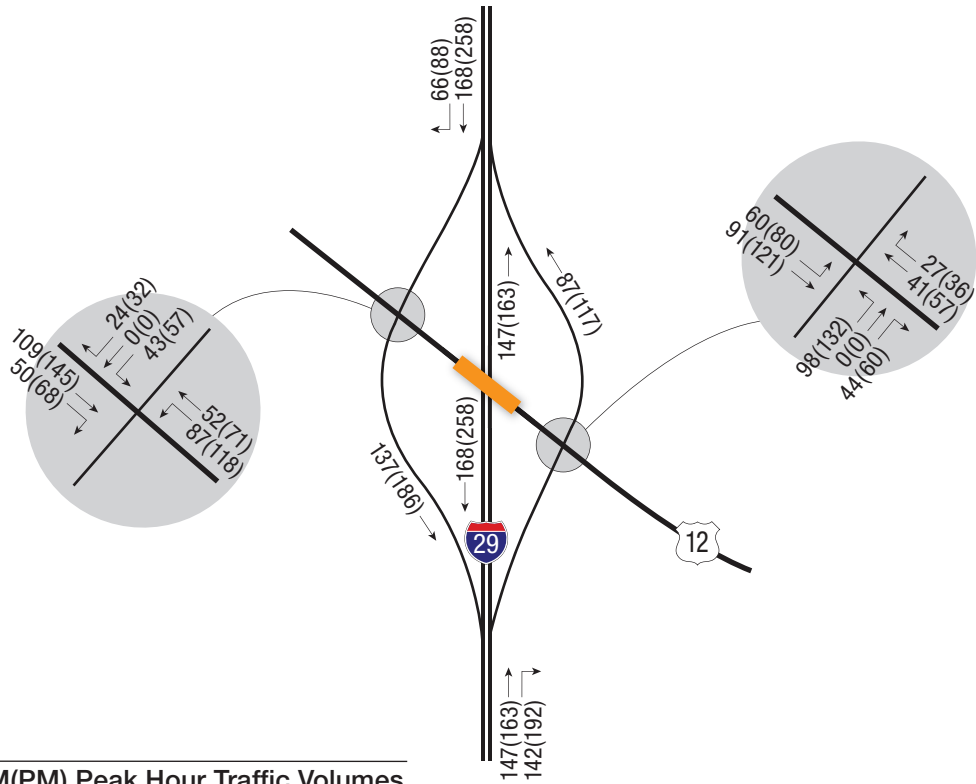
LEGEND

- X/X** = AM/PM Peak Hour Signalized Movement Level of Service
- x/x** = AM/PM Peak Hour Unsignalized Movement Level of Service
- X/X** = AM/PM Peak Hour Ramp Junction Level of Service
- = Stop Sign
- ↔** = Travel Lanes

Interstate 29 Exit 207
Traffic Conditions Year 2020

NORTH





LEGEND

- X/X** = AM/PM Peak Hour Signalized Movement Level of Service
- x/x** = AM/PM Peak Hour Unsignalized Movement Level of Service
- X/X** = AM/PM Peak Hour Ramp Junction Level of Service
- = Stop Sign
- ↔ = Travel Lanes

Interstate 29 Exit 207
Traffic Conditions Year 2030

NORTH



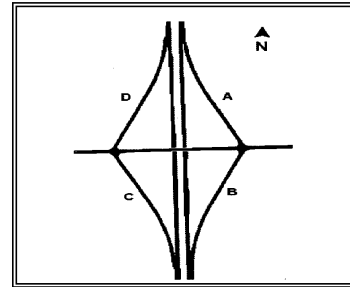
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I-29 EXIT 232 SISSETON

INTERCHANGE GEOMETRICS CHECKLIST
SDDOT Interstate Corridor Study

Interstate: I-29
Interchange: Exit 232
Analyst: JLB
Date: 1/20/2010



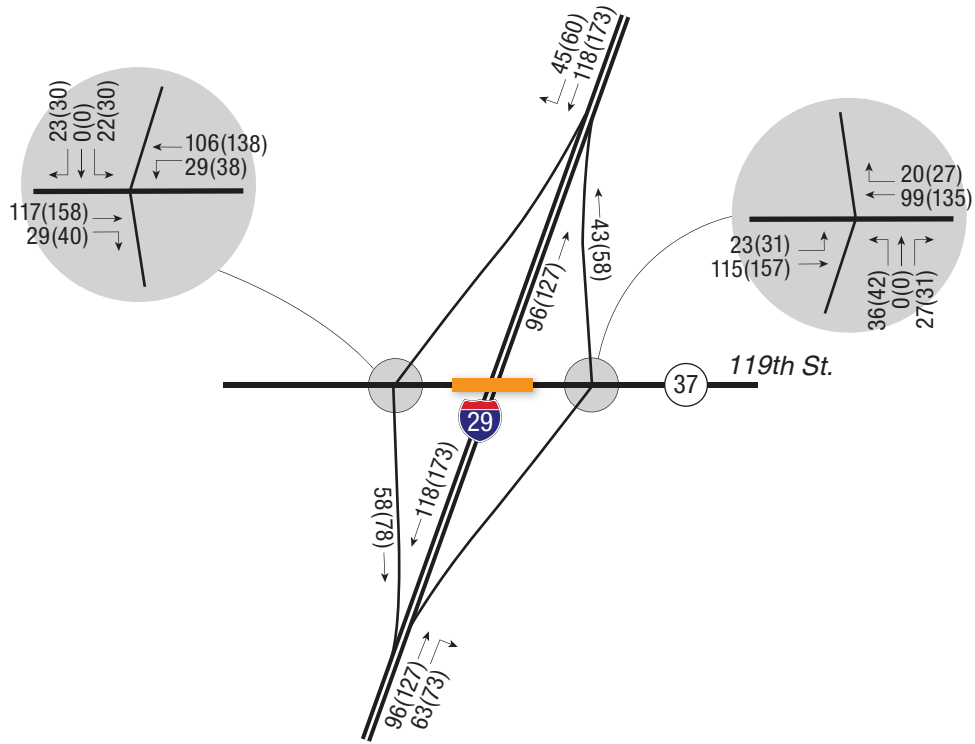
Interchange Geometry	Criteria	A	B	C	D	Achieved?
Interchange Type (Diamond, Full/Partial Cloverleaf, Trumpet etc.)	Diamond					-----
Design Speed	50 mph**					
Number of Lanes		1	1	1	1	
Right Turn Storage Length		-	-	-	-	
Left Turn Storage Length		-	-	-	-	
Superelevation (e max)	6%	6.00%	6.00%	6.00%	6.00%	Acceptable
Minimum Horizontal Radius for e max of 6% (50 mph / 30 mph)	833 / 231 feet	1910'	1910'	1910'	1910'	Acceptable
Maximum Degree of Curvature (50 mph / 30 mph)	6° 53' / 24° 48'	3° 00'	3° 00'	3° 00'	3° 00'	Acceptable
Minimum Clear Zone From the Edge of Travel Lane	30 feet	>30'	>30'	>30'	>30'	Acceptable
Maximum Grade on Ramp (Ascending)	+3% to +5%	-	2.87%		3.40%	Acceptable
Maximum Grade on Ramp (Descending)	-3% to -5%	-2.80%		-2.90%		Acceptable
Minimum Lane Width						
With Auxiliary Lanes	12 feet	-	-	-	-	
As Single Lane	15 feet (19 for loops)	17.5'	17.0'	18.5'	18.0'	Acceptable
Shoulder Width						
Right Shoulder	8 feet (4 for loops)	3.0'	3.5'	3.0'	4.0'	Supports Impr.
Left Shoulder	2 feet	4.0'	4.0'	2.5'	4.0'	Acceptable
Inslope	6:1	6:1	6:1	6:1	6:1	Acceptable
Minimum Off-Ramp Taper Rate	20:1	-	-	-	-	Acceptable
Minimum On-Ramp Taper Rate	50:1	-	-	-	-	Acceptable
Ramp Features						
K-Value Ranges						
Minimum for a Crest Vertical Curve (50 mph / 30 mph)	84 / 19	212	127	198	165	Acceptable
Minimum for a Sag Vertical Curve (50 mph / 30 mph)	96 / 37	196	152	120	176	Acceptable
Minimum Stopping Sight Distance (50 mph / 30 mph)	425 / 200 feet	707'	>425'	514'	606'	Acceptable
Cross Road Features						
K-Value Ranges			To West	To East		
Minimum for a Crest Vertical Curve (50 mph / 30 mph)	84 / 19		306	306		Acceptable
Minimum for a Sag Vertical Curve (50 mph / 30 mph)	96 / 37		-	-		
Minimum Stopping Sight Distance (50 mph / 30 mph)	425 / 200 feet		813'	813'		Acceptable
Ramp Intersection Sight Distance (50 mph / 30 mph)***	425 / 200 feet		ok	ok		Acceptable
Maximum Longitudinal Grade - Rolling Terrain (Urban Arterial)	7%		0.82%	-2.45%		Acceptable
Minimum Longitudinal Grade (Min. / Des.)	0.3% / 0.5%		-	-		
Minimum Control of Access from Interchange Ramps (Min. / Des.)	300 / 660 feet		>300'	>300'		Acceptable

** Loop ramp design speed = 30 mph

***Substandard Intersection Sight Distance locations could not be determined from the interchange plans. Substandard locations, therefore, are intersections that demonstrate sight distance limitations based on a general field evaluation or the presence of a substandard k-value or Stopping Sight Distance along the crossroad approaching the intersection.

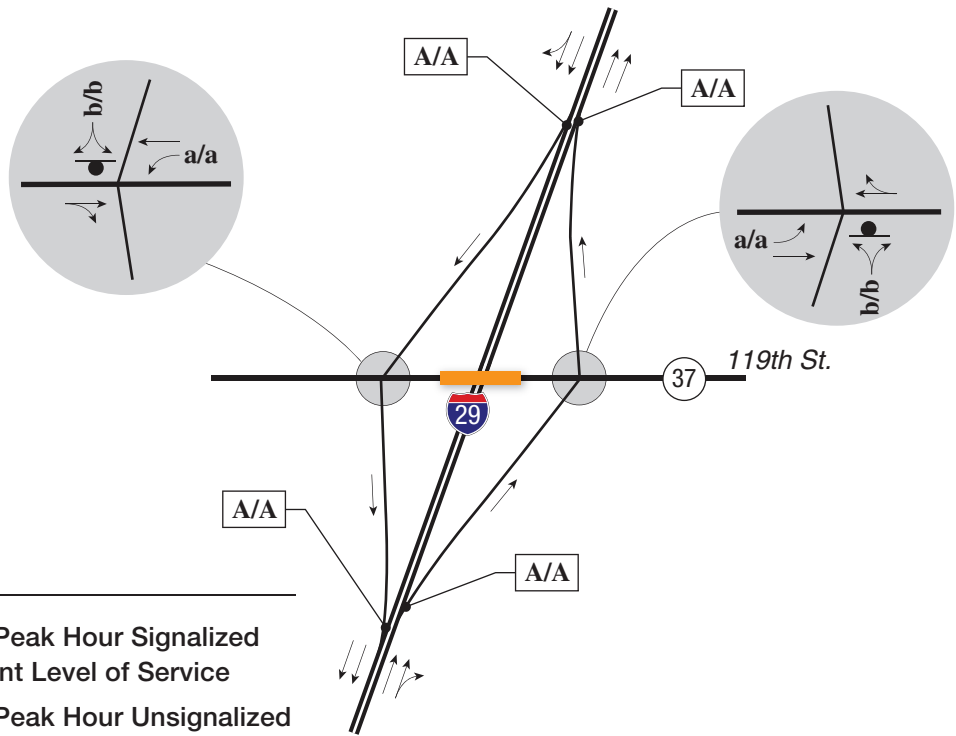
Comments

Ramps have a radius instead of a straight taper



LEGEND

XXX(XXX) = AM(PM) Peak Hour Traffic Volumes



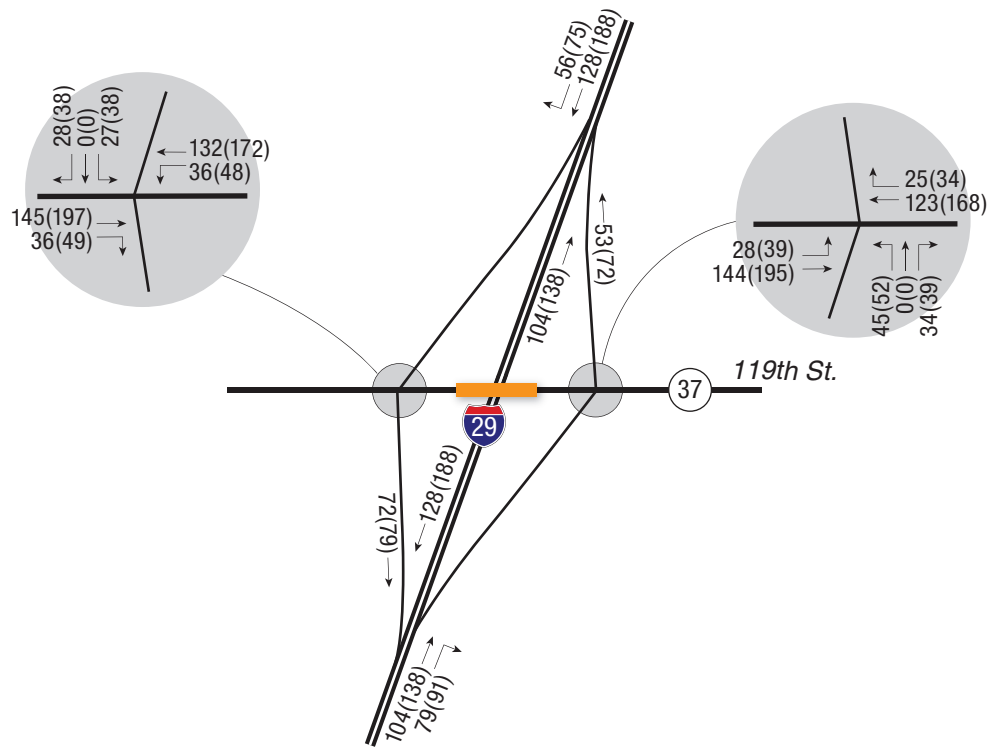
LEGEND

- X/X = AM/PM Peak Hour Signalized Movement Level of Service
- x/x = AM/PM Peak Hour Unsignalized Movement Level of Service
- X/X = AM/PM Peak Hour Ramp Junction Level of Service
- = Stop Sign
- ↔ = Travel Lanes

Interstate 29 Exit 232
Traffic Conditions Year 2009

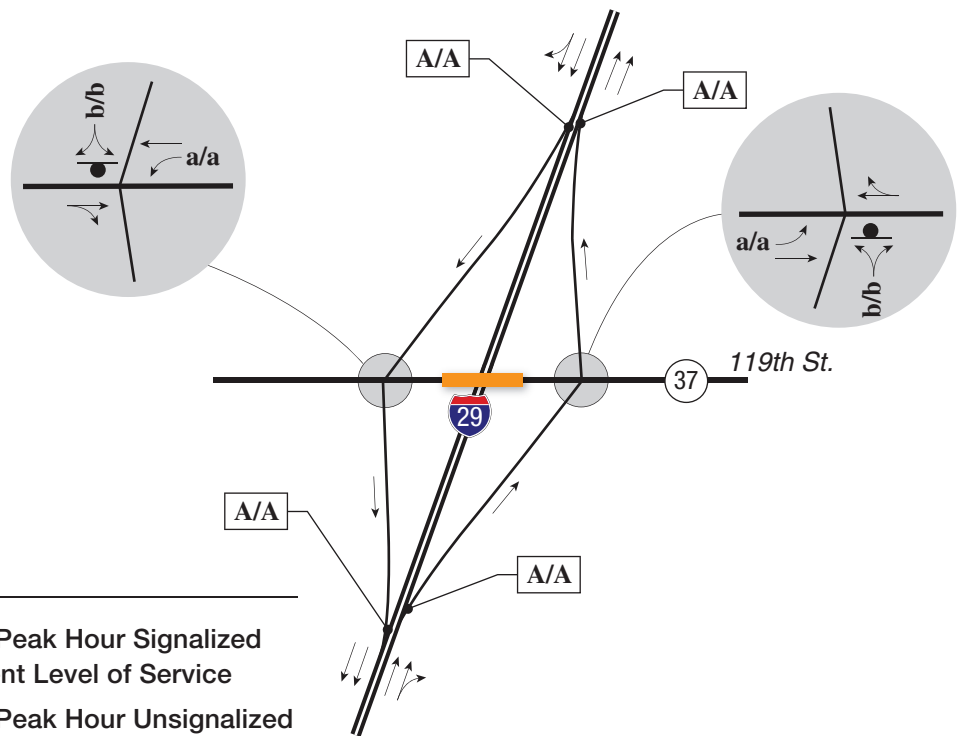
NORTH





LEGEND

XXX(XXX) = AM(PM) Peak Hour Traffic Volumes



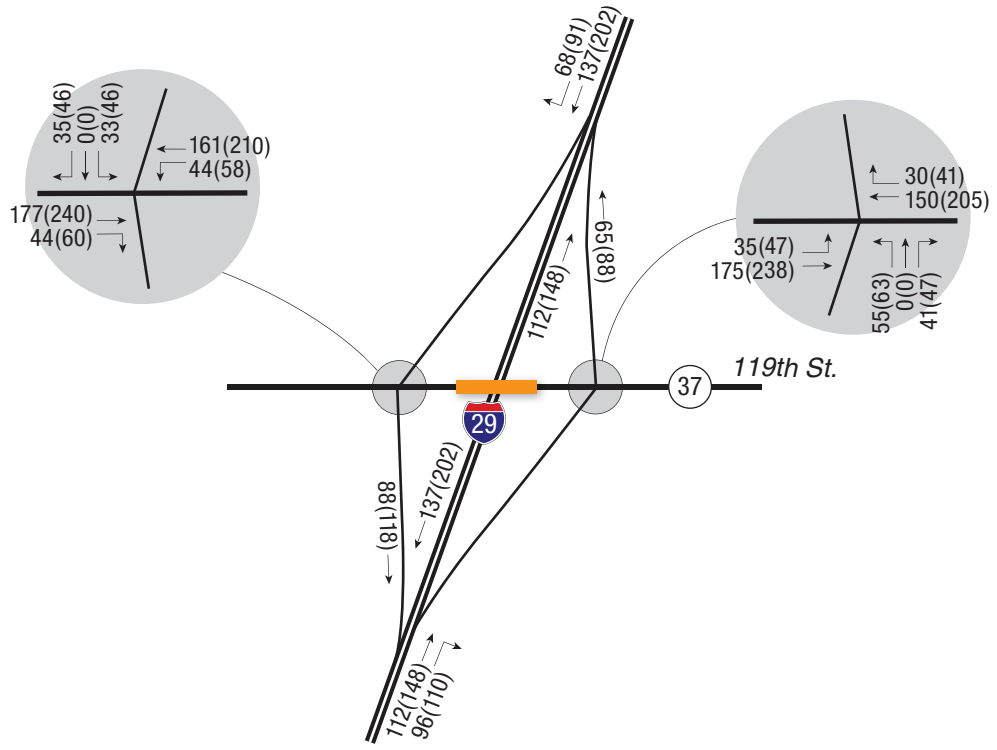
LEGEND

- X/X = AM/PM Peak Hour Signalized Movement Level of Service
- x/x = AM/PM Peak Hour Unsignalized Movement Level of Service
- X/X = AM/PM Peak Hour Ramp Junction Level of Service
- = Stop Sign
- ↔ = Travel Lanes

Interstate 29 Exit 232
Traffic Conditions Year 2020

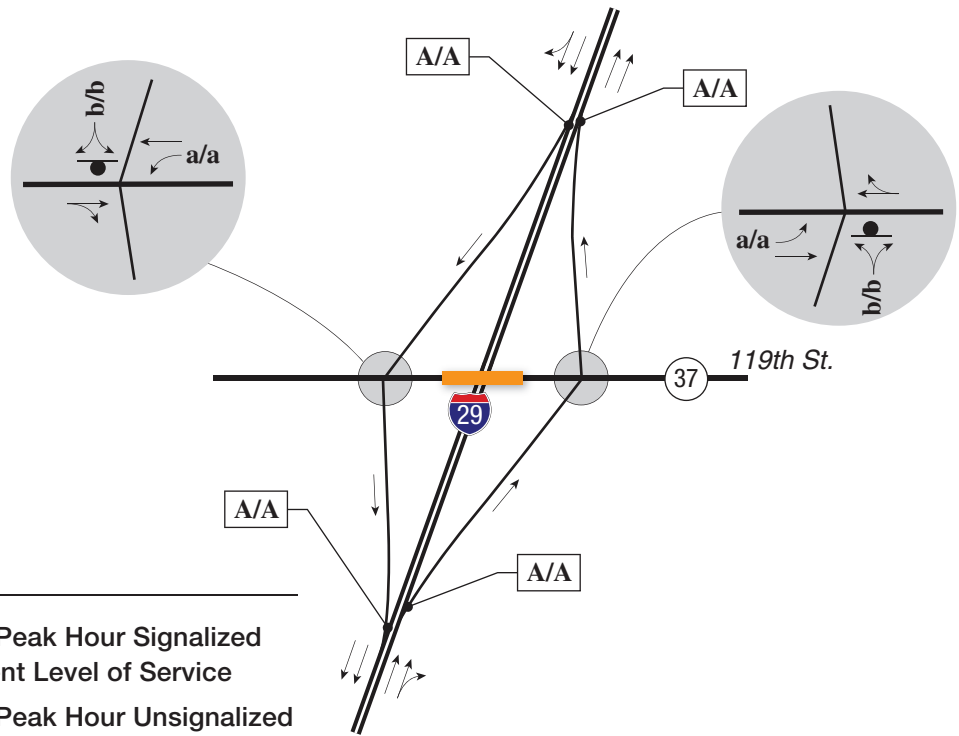
NORTH





LEGEND

XXX(XXX) = AM(PM) Peak Hour Traffic Volumes



LEGEND

- X/X = AM/PM Peak Hour Signalized Movement Level of Service
- x/x = AM/PM Peak Hour Unsignalized Movement Level of Service
- X/X = AM/PM Peak Hour Ramp Junction Level of Service
- = Stop Sign
- ↔ = Travel Lanes

Interstate 29 Exit 232
Traffic Conditions Year 2030



NORTH



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