

## Appendix A. Traffic Study Report

# **NORTHSHORE DRIVE REALIGNMENT**

Project No: EM 8064(32)

Alternatives Analysis

**Prepared for:**



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## I. INTRODUCTION

### I.1 Project Introduction and Purpose

The City of North Sioux City and South Dakota Department of Transportation (SDDOT) have identified the need to improve traffic operations and safety along Northshore Drive. Northshore Drive is an important travel route for the local community, area businesses, schools, and residents in a growing part of the Siouxland metropolitan area.

The purpose of this project is to evaluate the construction of a new roadway north of Northshore Drive to separate agricultural, school, and commuter traffic from local traffic along McCook Lake, accommodate future growth, improve vehicle and pedestrian safety, and create a direct connection from Interstate 29 (I-29) to County Road 23 (CR 23).

The study area for this project includes segments and intersections of Northshore Drive from 484<sup>th</sup> Avenue/Westshore Drive to the I-29 Northbound Ramp. The existing cross-section of Northshore Drive is a two-lane undivided roadway. An alternatives analysis was conducted to determine if the construction of a new roadway would improve traffic operations along the roadway and determine the appropriate traffic control at each intersection with the construction of the new roadway.

Included in this report is a crash analysis, a signal warrant analysis, an auxiliary turn lane analysis, and an alternatives analysis. The primary focus is on traffic operations at the following intersections:

- Streeter Drive & Northshore Drive
- 484<sup>th</sup> Avenue/Westshore Drive & Northshore Drive

In order to better understand potential cumulative effects of the project, the following supplemental intersections were included:

- I-29 Northbound Ramp & Northshore Drive
- I-29 Southbound Ramp & Northshore Drive

The study evaluates the following time periods:

- Existing year (2022) AM and PM weekday peak hours
- Interim Year (2025) No-build and Build of the project for the AM and PM weekday peak hours
- Future Year (2045) No-build, Build (Constrained), and Build (Unconstrained) of the project for the AM and PM weekday peak hours

### I.2 Study Area

The study area for this alternative analysis includes Northshore Drive from 484<sup>th</sup> Avenue/Westshore Drive to the I-29 northbound interchange ramp. **Figure I-1** shows the study limits and the location of the project in relation to the surrounding roadway network.

### I.3 Existing Roadway/Sidewalk Network

The alternatives analysis evaluated Northshore Drive in the study area described above. The following section describes in more detail the study area roadway segments.

- **Northshore Drive** runs east-west and is classified as an Urban Minor Arterial. The street has a two-lane cross-section. The posted speed limit on Northshore Drive is 35 miles per hour (MPH) west of 484<sup>th</sup> Avenue/Westshore Drive and 25 MPH east of 484<sup>th</sup> Avenue/Westshore Drive. A 10-foot trail runs along the north side of Northshore Drive from 484<sup>th</sup> Avenue. There are currently 39 access points along the south side of the roadway and 15 access points on the north side from 484<sup>th</sup>

Avenue/Westshore Drive to just west of Streeter Drive. West of 484<sup>th</sup> Avenue/Westshore Drive, Northshore Drive becomes CR 23.

- **Interstate 29 (I-29)** runs north-south and is classified as an Urban Interstate. The roadway is a four-lane divided cross-section with a posted speed limit of 65 MPH. Currently, the interchange with Northshore Drive is a diamond interchange. The northbound and southbound on/off ramps with Northshore Drive are two-way stop-controlled (TWSC) intersections. I-29 serves as the main connection between Sioux Falls, North Sioux City, and Sioux City.
- **Streeter Drive** runs north-south along the west side of I-29 and is classified as an Urban Major Collector. The street has a two-lane cross-section with a posted speed limit of 40 MPH. The roadway merges with Leisure Lane just south of the intersection with Northshore Drive. The intersection with Northshore Drive is TWSC without left-turn or right-turn lanes provided.
- **484<sup>th</sup> Avenue/Westshore Drive** runs north-south along the west side of the study area and is classified as an Urban Major Collector north of Northshore Drive and a Local Street south of Northshore Drive. The street has a two-lane cross-section with a posted speed limit of 25 MPH. The intersection with Northshore Drive is TWSC, with stop-signs on the northbound and southbound approaches.

## 1.4 Existing Pedestrian/Bike Facilities

The McCook Lake Trail runs along the north side of Northshore Drive in the study area. The trail starts at the Adam's Homestead and Nature Preserve southwest of McCook Lake and runs along the west side of Westshore Drive then along the north side of Northshore Drive to just west of Streeter Drive. The trail then continues along the west side of Streeter Drive to River Drive.

Marked pedestrian crossings are located on the east leg of the intersection of 484<sup>th</sup> Avenue/Westshore Drive with Northshore Drive, the west leg of the intersection of Suncoast Drive with Northshore Drive, and the west leg of the intersection of Streeter Drive with Northshore Drive. Curb ramps are provided at the crossings, and pedestrian beacons are present on the eastbound and westbound approaches ahead of the crossings.

## 1.5 Education and Recreation Facilities

Schools in the area include Dakota Valley High School, Dakota Valley Middle School, and Dakota Valley Elementary School are located on the north side of Northshore Drive between 484<sup>th</sup> Avenue/Westshore Drive and Penrose Drive.

McCook Lake is located on the south side of Northshore Drive. The Adam's Homestead and Nature Preserve is located just southwest of the study area along 484<sup>th</sup> Avenue/Westshore Drive.

## 1.6 Other Area Studies

There are several ongoing and previously completed studies that evaluated the I-29 corridor in the study area. Those studies include the following:

- *I-29 Corridor Study*, Ongoing: I-29 Corridor Study, conducted by the SDDOT, focuses on a 11-mile segment of I-29 in Union County, encompassing North Sioux City and Dakota Dunes. Scheduled between 2030 and 2035, the study aims to modernize the corridor's infrastructure while accommodating long-term growth and enhancing safety. Key objectives include evaluating and planning interchange improvements at Exits 1 (Dakota Dunes Boulevard), 2 (River Drive), and 4 (McCook Lake/Northshore Drive), creating an implementation schedule for construction, and preparing for future environmental and design phases. Public engagement is integral, with community input gathered through meetings and other channels.

The study also seeks to establish a comprehensive vision for the corridor, addressing traffic flow, safety, and sustainability. By collaborating with partner agencies and incorporating public feedback, SDDOT is crafting a framework to guide upcoming projects on I-29. The study will inform the planning and implementation of the corridor's major reconstruction, ensuring the infrastructure supports both current and future needs effectively.

- 2020 Decennial Interstate Corridor Study, 2020: This is a comprehensive statewide study that outline a comprehensive approach to addressing the needs of interstate system. The study was broken into three phases and highlights relating to Exit 4 at McCook Lake are as follows:

**Phase 1:** This phase assessed systemic deficiencies, revealing that Exit 4 required attention for existing and future traffic operations. Safety and operational issues were noted, particularly with outdated interchange configurations that failed to accommodate projected 2050 traffic volumes effectively. The analysis highlighted structural needs, including bridge and geometric improvements, to ensure compliance with modern standards. Potential solutions identified in this phase included a wider structure for better traffic flow and safer ramp terminal alignments.

**Phase 2:** A detailed evaluation was conducted to refine improvement options for Exit 4. The recommended approach involved bridge widening and ramp terminal realignment to enhance traffic operations and safety. The design aimed to address the current Level of Service (LOS) deficiencies and accommodate the future increase in traffic demand. The project was estimated at \$7.9 million, balancing cost considerations with the need for durable improvements. This phase also incorporated feedback on geometric and environmental compatibility.

**Phase 3:** Exit 4 was prioritized within the broader state framework, focusing on the significance and timing of improvements. The ranking methodology emphasized safety and operational urgency, ensuring that the interchange's upgrades aligned with state and federal strategic goals. The plan integrated Exit 4's enhancements with adjacent projects to optimize resources and scheduling. As a result, Exit 4 is set to support both immediate needs and long-term regional growth effectively.

- Dakota Dunes/N. Sioux City Planning Study Operations Analysis and Recommendations, 2018: The study highlights significant considerations for Exit 4 at McCook Lake in relation to traffic flow and future planning. The primary focus around this interchange includes improving the level of service (LOS) and addressing traffic congestion. The recommendations emphasize the potential for long-term upgrades, including monitoring and considering options for the southbound ramp terminal. Notably, the concept of a roundabout has been endorsed by North Sioux City to improve safety and reduce delays at the interchange. These proposed improvements align with projected growth and increasing vehicular demand within the area through the 2040 planning horizon.

Additionally, Exit 4's northbound ramp terminal will be evaluated for signal warrants to enhance traffic operations. The study suggests constructing a new street along the north side of local schools or reconstructing Northshore Drive as a three-lane road to address anticipated traffic volumes and operational challenges. These enhancements aim to ensure a seamless connection between local roads and the interstate while supporting community growth and safety objectives.



## 2. EXISTING TRAFFIC CONDITIONS

### 2.1 2022 Existing Traffic Volumes

Intersection turning movement counts (TMCs) were conducted by All Traffic Data (ATD) at the four study intersections. Traffic counts were conducted on Tuesday, December 6, 2022. A 24-hour counts were conducted at the intersection of 484<sup>th</sup> Avenue/Westshore Drive and I-29 Southbound Ramps with Northshore Drive. Thirteen-hour (13) traffic counts were conducted at the two remaining study intersections. The 24-hour counts were used as the base count to estimate daily traffic volumes at the three locations where 13-hour counts were conducted. **Table 2-1** shows the date, duration, type, and source for each intersection count. **Appendix A** includes detailed turning movement data for each intersection.

**Table 2-1. Traffic Counts**

ID #	Location	Count Date	Bike	Ped	Cars	Trucks	Duration (hours)	Source
1	484 <sup>th</sup> Avenue/Westshore Drive & Northshore Dr	Tuesday, December 6, 2022	X	X	X	X	24	ATD
2	Streeter Drive & Northshore Dr	Tuesday, December 6, 2022	X	X	X	X	13	ATD
3	I-29 SB Ramp & Northshore Dr	Tuesday, December 6, 2022	X	X	X	X	24	ATD
4	I-29 NB Ramp & Northshore Dr	Tuesday, December 6, 2022	X	X	X	X	13	ATD

Vehicular traffic volumes for the study area intersections were compared to determine the study area peak hours, as shown in **Appendix A**. The AM peak hour was determined to be 7:30 AM to 8:30 AM, PM peak hour was 5:00 PM to 6:00 PM, and the Dismissal peak hour was determined to be from 3:15 PM to 4:15 PM. **Figure 2-1** shows the 2022 existing peak hour turning movements and average daily traffic (ADT) volumes.

### 2.2 Crash Analysis

SDDOT currently maintains a GIS crash database designed to monitor crash trends. As part of this corridor study, crash data were compiled for a 5-year period to identify significant crash patterns within the study area. The crash history was analyzed from January 2018 through December 2022. The crash data was reviewed for any trends. Calculations for crash rates at intersections are based on million entering vehicles (MEV). Weighted crash rates for study intersections and segments were calculated using the weight factors shown in

**Table 2-2** and applied to specific crash types and crash severity. Crashes with higher severity are given a higher weight. This allows intersections and segments that may have a low number of crashes with high severity to be compared to locations with a high number of crashes but low severity. Segment weighted crash rates were compared to the average statewide crash rate of 2.05 crashes/mvmt for the Urban Minor Arterials.

**Table 2-2. SDDOT Weighted Crash Factors**

Crash Type	Weight Factor
Wild animal hit	1.00
No injury	1.00
Possible	3.00
Non-incapacitating	3.00
Incapacitating	3.00
Fatal injury	12.00

### 2.2.1 Intersection Crash Analysis

**Table 2-3, Table 2-4, and Table 2-5** show a breakdown of intersection crashes by year/crash rate, severity, and type.

**Table 2-3. Intersection Crash Summary (2018 – 2022)**

ID #	Intersections (w/ Northshore Dr)	Northshore Dr; Intersection Crash Rates								
		2018	2019	2020	2021	2022	Total Crashes	EADT	5-Year MEV*	Weighted Crash Rate / MEV
4	I-29 NB Ramp	0	1	0	0	0	1	4,788	8.7	0.11
3	I-29 SB Ramp	0	0	0	0	0	0	6,183	11.3	0.00
2	Streeter Drive	0	3	3	2	0	8	6,663	12.2	0.66
1	484 <sup>th</sup> Avenue/ Westshore Drive	0	0	0	0	0	0	3,378	6.2	0.00
<b>Total / Average</b>		<b>0</b>	<b>4</b>	<b>3</b>	<b>2</b>	<b>0</b>	<b>9</b>	<b>5,253</b>	<b>9.6</b>	<b>-</b>

\*MEV = Million Entering Vehicles

**Table 2-4. Intersection Crash Severity Summary (2018 – 2022)**

ID #	Intersections (w/ Northshore Dr)	Northshore Dr; Intersection Crashes by Severity						
		Fatal Injury	Incapacitating Injury	Non- Incapacitating Injury	Possible Injury	No Injury	Wild Animal Hit	Total Crashes
4	I-29 NB Ramp	0	0	0	0	1	0	1
3	I-29 SB Ramp	0	0	0	0	0	0	0
2	Streeter Drive	0	0	0	0	8	0	8
1	484 <sup>th</sup> Avenue/ Westshore Drive	0	0	0	0	0	0	0
<b>Total</b>		<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>9</b>	<b>0</b>	<b>9</b>

**Table 2-5. Intersection Crash Type Summary (2018 – 2022)**

ID #	Intersections (w/ Northshore Dr)	Northshore Dr; Intersection Crashes by Type						
		Angle	Left-Turn Leaving	Rear-end	Animal	Sideswipe (same)	Ran off Road	Total Crashes
4	I-29 NB Ramp	0	0	1	0	0	0	1
3	I-29 SB Ramp	0	0	0	0	0	0	0
2	Streeter Drive	0	0	8	0	0	0	8
1	484 <sup>th</sup> Avenue/ Westshore Drive	0	0	0	0	0	0	0
<b>Total</b>		<b>0</b>	<b>0</b>	<b>9</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>9</b>

#### **Intersection #4 – I-29 NB Ramp with Northshore Drive**

There was one crash (No Injury) reported at the intersection of I-29 NB Ramps with Northshore Drive during the study period. The weighted crash rate for the intersection is 0.11 crashes per million entering vehicles (crashes/mev). The one crash that occurred at the intersection was a rear-end type crash.

#### **Intersection #2 – Streeter Drive with Northshore Drive**

A total of eight crashes were reported (8 No Injury) at the intersection of Streeter Drive with Northshore Drive during the study period. The weighted crash rate for the intersection is 0.66 crashes/mev. The eight crashes at this intersection were all rear-end crash types. Seven of the eight crashes were in the westbound direction. It was assumed that these occurred when vehicles stop to make a westbound left-turn at the intersection. No intersection crashes were observed at the remaining two study intersections.



### 2.2.2 Segment Crash Analysis

Findings for segments crashes by year/crash rate, severity, and type are summarized in **Table 2-6**, **Table 2-7**, and **Table 2-8**.

**Table 2-6. Segment Crash Summary (2018 – 2022)**

Segments (on Northshore Dr)	SDDOT Northshore Dr Study; Segment Crashes by Year								State Avg. Weighted Crash Rate <sup>^</sup>
	2018	2019	2020	2021	2022	Total Crashes	5-Year MVMT*	Weighted Crash Rate / MVMT	
I-29 NB Ramp – Military Rd	0	0	0	0	0	0	0.32	0.00	2.05
I-29 NB Ramp – I-29 SB Ramp	0	0	0	0	0	0	0.95	0.00	
I-29 SB Ramp – Streeter Dr	0	0	0	0	0	0	0.61	0.00	
Streeter Dr – Penrose Dr	1	0	0	0	0	1	3.20	0.09	
Penrose Dr – Westshore Dr	3	4	3	1	0	11	4.86	1.58	
<b>Total</b>	<b>4</b>	<b>4</b>	<b>3</b>	<b>1</b>	<b>0</b>	<b>12</b>	<b>2.0</b>	<b>0.33</b>	<b>-</b>

\*MVMT = Million Vehicle Miles Traveled <sup>^</sup>Assuming Urban Minor Arterial

**Table 2-7. Segment Crash Severity Summary (2018 – 2022)**

Segments (on Northshore Dr)	SDDOT Northshore Study; Segment Crashes by Severity						
	Fatal Injury	Incapacitating Injury	Non- Incapacitating Injury	Possible Injury	No Injury	Wild Animal Hit	Total Crashes
I-29 NB Ramp – Military Rd	0	0	0	0	0	0	0
I-29 NB Ramp – I-29 SB Ramp	0	0	0	0	0	0	0
I-29 SB Ramp – Streeter Dr	0	0	0	0	0	0	0
Streeter Dr – Penrose Dr	0	0	0	0	1	0	1
Penrose Dr – Westshore Dr	0	0	0	1	9	1	11
<b>Total</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>10</b>	<b>1</b>	<b>12</b>

**Table 2-8. Segment Crash Type Summary (2018 – 2022)**

Segments (on Northshore Dr)	SDDOT Northshore Dr Study; Segment Crashes by Type						
	Angle	Left-Turn Leaving	Rear-End	Animal	Sideswipe (same)	Ran off Road	Total Crashes
I-29 NB Ramp – Military Rd	0	0	0	0	0	0	0
I-29 NB Ramp – I-29 SB Ramp	0	0	0	0	0	0	0
I-29 SB Ramp – Streeter Dr	0	0	0	0	0	0	0
Streeter Dr – Penrose Dr	0	0	0	0	0	1	1
Penrose Dr – Westshore Dr	2	0	8	1	0	0	11
<b>Total</b>	<b>2</b>	<b>0</b>	<b>8</b>	<b>1</b>	<b>0</b>	<b>1</b>	<b>12</b>

#### Segments – Streeter Drive to Penrose Drive

There was one crash (No Injury) that occurred along Northshore Drive between the intersections with Streeter Drive and Penrose Drive. The weighted crash rate for the segment is 0.09 crashes/mvmt. The weighted crash rate for the segment is below the SDDOT average weighted crash rate for Urban Minor Arterials. The one crash reported at the intersection was ran-off road type crash that occurred during wet/icy roadway conditions and due to speeding.

#### Segments – Penrose Drive to Westshore Drive

There was a total of eleven segment crashes (1 Possible Injury, 9 No Injury, 1 Wild Animal Hit) along Northshore Drive between the intersections with Penrose Drive and Westshore Drive. The weighted crash rate for the segment is 1.58 crashes/mvmt. The weighted crash rate for the segment is below the SDDOT average weighted crash rate for Urban Minor Arterials. Of the eleven crashes reported, eight were rear-end type crashes. The other three crashes consisted of two angle crashes and one animal crash.



### 2.3 Existing (2022) Traffic Operations Analysis

Traffic operations were analyzed for the study intersections using procedures documented in the *Highway Capacity Manual, Sixth Edition: A Guide for Multimodal Mobility Analysis (HCM)*, Transportation Research Board, October 2016. From the analyses, a key measure or “level of service” (LOS) rating of the traffic operational condition was obtained. For intersection operations, LOS provides a qualitative assessment of traffic operational conditions within a traffic stream in terms of the average stopped delay per vehicle at a controlled intersection. Levels of service is described with a letter designation of A, B, C, D, E, or F, with LOS A representing essentially uninterrupted flow, and LOS F representing a breakdown of traffic flow with noticeable congestion and delay.

HCS 2023 (stop-controlled and roundabout intersections) traffic analysis software was used to analyze traffic operations at the study intersections.

**Table 2-9** summarizes LOS criteria for signalized and unsignalized intersections.

**Table 2-9. Intersection Level of Service Criteria**

Level of Service	Average Control Delay (sec/veh)	
	Stop Controlled / Roundabout Intersections	Signalized Intersections
A	≤ 10	≤ 10
B	> 10 to 15	> 10 to 20
C	> 15 to 25	> 20 to 35
D	> 25 to 35	> 35 to 55
E	> 35 to 50	> 55 to 80
F	> 50	> 80

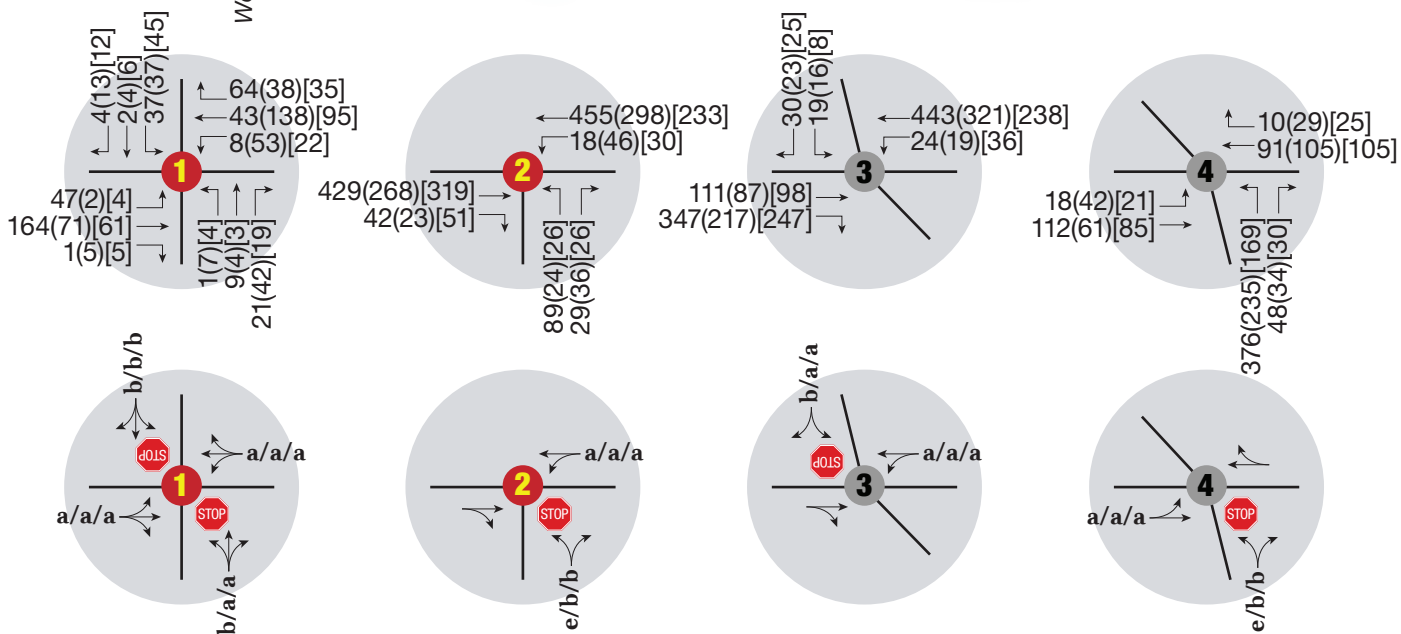
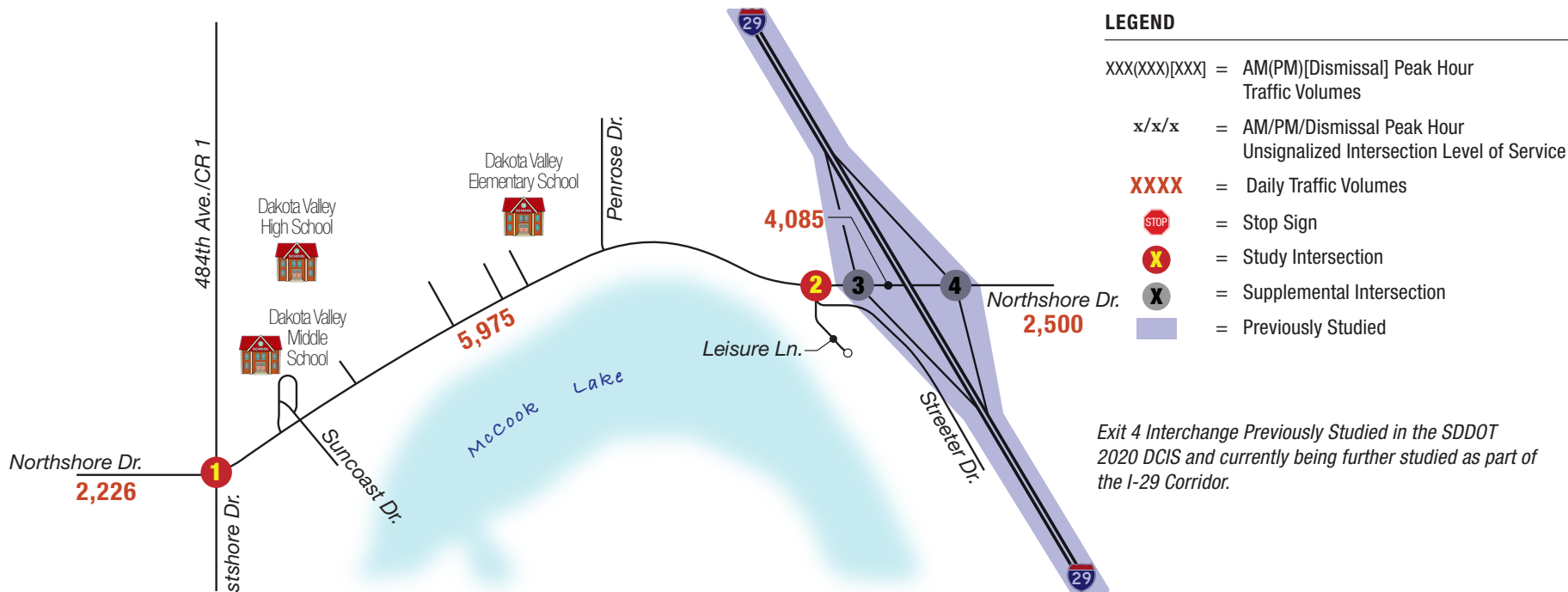
Source: HCM 6<sup>th</sup> Edition, Exhibit 18-4 & 19-8

Traffic operations were analyzed for the AM, PM, and Dismissal peak hours at the four study intersections using the collected traffic volumes with existing intersection configurations. **Figure 2-1** shows the Existing (2022) traffic operations.

At the study intersections, all movements operate at LOS C or better during the peak hours except for the following two movements, which operate at LOS E during the AM peak hour:

- Northbound shared left/right-turn movement at the intersection of I-29 NB Ramp with Northshore Drive (ID # 4).
- Northbound shared left/right-turn movement at the intersection of Streeter Drive with Northshore Drive (ID #2).

It is not uncommon for side street movements to operate at LOS E or LOS F during peak hour conditions. **Appendix E** provides additional information on the analysis software reports.



### 3. FUTURE VOLUME DEVELOPMENT

Two separate volume scenarios were developed for this study. The constrained traffic volume scenario utilizes data from the SIMPCO travel demand model that is based upon land use identified in the *2045 Long Range Transportation Plan (LRTP)*. The unconstrained traffic volume scenario utilized land use information from the *Master Planning North of Northshore Drive Study (Master Plan)* by Stockwell Engineers, which includes additional land uses not included in the LRTP in the study area.

#### 3.1 Constrained 2025 and 2045 Traffic Volume Development

SIMPCO provided traffic flow projections for the study intersections from their 2045 travel demand model. Based on observed AADT and base traffic flow were provided on the network links for the base year (2017) and the future year (2045). These forecasts are provided in **Appendix B**.

The 2017 and 2045 model output from SIMPCO were used to determine the annual growth rates for each leg of the study. These rates were applied to the estimated 24-hour counts collected as part of the project to develop 2025 and 2045 forecast ADT volumes. The average annual growth rate in the study area from 2017 to 2045 is approximately 0.5% along Northshore Drive and 1.0% along I-29. **Table 3-1** shows the 2022 existing daily volumes, 2025 and 2045 forecast daily volumes, and estimated 2022 to 2045 annual growth rates. Future traffic volumes reported in the *Dakota Dunes/N. Sioux City Planning Study, January 2018* were reviewed for the study area intersections. Volumes reported in the study were found to be consistent with those projected using the provided SIMPCO projections and current traffic counts.

Estimated peak hour turning movements for 2025 and 2045 were developed for study area intersections based on guidelines and methodologies documented in *NCHRP Report 255* and *NCHRP Report 765*, evaluating existing traffic counts, SIMPCO projections for 2045, and adjusting for local travel patterns.

**Figure 5-3** and **Figure 5-4** illustrate the projected interim 2025 and future 2045 traffic volumes at the study intersections under the No Build scenario, which assumes the roadway network remains unchanged, but traffic volumes continue to increase.

**Table 3-1. Daily Traffic Volume Forecasts**

ID #	Intersection	Leg	2022 ADT	2025 ADT	2045 ADT	SIMPCO Annual Growth Rate
1	484 <sup>th</sup> Avenue/Westshore Drive & Northshore Drive	North	794	900	900	0.2%
		East	3,049	3,200	3,400	0.4%
		South	687	700	800	0.2%
		West	2,226	2,300	2,500	0.3%
2	Streeter Drive & Northshore Drive	North	-	-	-	-
		East	6,025	5,800	5,400	-0.5%
		South	1,325	1,400	1,400	0.0%
		West	5,975	6,200	6,500	0.4%
3	I-29 SB Ramp & Northshore Drive	North	425	500	600	1.2%
		East	3,969	3,900	3,600	-0.5%
		South	2,309	2,500	2,900	0.9%
		West	5,663	5,900	6,200	0.4%
4	I-29 NB Ramp & Northshore Drive	North	450	500	600	1.1%
		East	2,500	2,500	2,300	-0.5%
		South	2,425	2,800	3,500	1.5%
		West	4,200	4,400	4,600	0.4%

### 3.2 Constrained Traffic Volume Reassignment

Traffic volumes for interim 2025 and future 2045 were reassigned along the Northshore Drive corridor to account for the construction of a new roadway north of Northshore Drive and existing schools. The new roadway is called S. 333<sup>rd</sup> Avenue for report purposes. Traffic was reassigned to separate agricultural, school, and commuter traffic along the existing Northshore Drive roadway and the proposed roadway. Additionally, multiple access points to the existing schools would be removed to reroute traffic to the new roadway. This would encourage school traffic coming from I-29 to utilize the new roadway and establish Northshore Drive as a local street. The school trips to/from these drives were reassigned to the new alignment. Traffic assignments were based on existing traffic patterns, estimated trip generation for the existing schools and residential housing, and engineering judgment. Turning movements counts conducted as part of previous studies were reviewed to estimate the number of trips generated by the existing schools in the area. The reassigned constrained traffic volumes for interim 2025 and future 2045 conditions are illustrated on **Figure 5-5** and **Figure 5-7**, respectively.

### 3.3 Unconstrained 2045 Future Volume Development

With the proposed roadway, S. 333<sup>rd</sup> Street, further growth in the study area is anticipated by 2045 in addition to the traffic projections from the SIMPCO model. The proposed roadway provides through connection and access to currently undeveloped land. Stockwell Engineers completed the Master Plan North of Northshore Drive for the development of the area north of the Dakota Valley Schools. Zoning for the undeveloped areas were provided in the Master Plan North of Northshore Drive and were used to develop trip generation estimated for the area. The land use plan from the Master Plan North of Northshore Drive is provided in **Appendix B**.

Trip generation average rates from the Institute of Transportation Engineers' (ITE) Trip Generation Manual, Tenth Edition, 2017, were utilized to estimate the traffic generated by zoning area shown in the Master Plan. Assumed site uses were analyzed using the appropriate land use types from the ITE Trip Generation Manual. It should be noted that a mix of average rates and equation rates were utilized from the ITE Trip Generation Manual based on the methodology outlined in ITE Trip Generation Handbook, 3rd Edition, 2017 for selecting the proper rates. Exact building square footages for the lots were developed using a floor to area ratio (FAR) of 0.20 for commercial lots and 0.40 for residential lots. A mixed-use reduction of 15% was assumed, based on NCHRP 684 Enhancing Internal Trip Capture Estimation for Mixed-Use Developments and ITE Trip Generation Manual methodology, and included in the site trips generated by the proposed development.

**Table 3-2** summarizes the estimated vehicle trips that would be generated by each land use and zoning district for the undeveloped lots.

**Table 3-2. Unconstrained Site Trip Generation**

ITE Code	Land Use Description	Size	Unit	Daily	AM Peak Hour		PM Peak Hour		Total	Total
				Total	In	Out	Total	In	Out	
770	Business Park (B-R)	244.8	KSF	3,315	270	47	317	83	238	321
210	Single-Family Detached Housing (R-1)	31	DU	344	7	20	26	21	12	33
220	Multi-Family Low-Rise Housing (R-3)	70	DU	524	11	34	45	32	19	51
215	Single-Family Attached Housing (R-2)	411	DU	3,081	52	156	208	143	100	243
<i>Subtotal</i>				7,264	340	257	596	279	369	648
<i>15% Mixed Use Reduction</i>				-1,090	-51	-39	-89	-42	-55	-97
<b>Total Vehicles (w/15% Reduction)</b>				<b>6,174</b>	<b>289</b>	<b>218</b>	<b>507</b>	<b>237</b>	<b>314</b>	<b>551</b>
DU=Dwelling Units KSF=1,000 Square Feet										

As shown above, with the assumed 15% mixed-use reduction, the development is anticipated to generate approximately 6,174 daily vehicle-trips to the roadway network, including 507 vehicle-trips during the AM and 551 vehicle-trips during the PM peak hour.

### 3.4 Unconstrained Traffic Volume Reassignment

The estimated distribution of site generated trips within the roadway network was based on existing traffic patterns, the location of the undeveloped lots, and projected growth in the project area. The following distribution percentages were used to assign site generated vehicle-trips to the adjacent roadway network:

- **10%** oriented to/from the north via Westshore Ave/S. 484<sup>th</sup> Avenue
- **25%** oriented to/from the west via Northshore Drive/CR 23
- **60%** oriented to/from the south via I-29
- **5%** oriented to/from the north via I-29

The distribution percentages were used to assign site generated vehicle-trips from **Table 3-2** for the undeveloped lots to the adjacent roadway network for AM and PM peak hour traffic scenarios. The calculated traffic distribution percentages dictate vehicle movements both to and from the lots. Traffic volumes for 2045 future unconstrained conditions with the development of the zoning districts is shown on **Figure 5-9**.

## 4. INTERSECTION WARRANT ANALYSIS

### 4.1 Traffic Control Device Warrants

A review was performed to determine if traffic signals are anticipated to be warranted in the interim year 2025 and the future year 2045 based on the Manual on Uniform Traffic Control Devices (MUTCD) at each study intersection under the constrained and unconstrained traffic volume scenarios. Warrants were evaluated at the study intersections using the reassigned traffic volumes to account for the proposed roadway. Warrant 1 – Eight-Hour Vehicular Volume and Warrant 2 – Four-Hour Vehicular Volume. **Table 4-1** summarizes the results of the traffic control device warrant analysis for Warrant 1 and Warrant 2.

**Table 4-1. Traffic Control Device Warrant Summary (Warrant 1 – 2)**

ID #	Intersection	Year	Warrant 1			Warrant 2
			A	B	A&B	
1	484 <sup>th</sup> Avenue/Westshore Drive & Northshore Drive	2025 (Constrained)	NO	NO	NO	NO
		2045 (Constrained)	NO	NO	NO	NO
		2045 (Unconstrained)	NO	NO	NO	NO
2	Streeter Drive & Northshore Drive	2025 (Constrained)	NO	NO	NO	NO
		2045 (Constrained)	NO	NO	NO	NO
		2045 (Unconstrained)	NO	NO	NO	NO
3	I-29 SB Ramp & Northshore Drive	2025 (Constrained)	NO	NO	NO	NO
		2045 (Constrained)	NO	NO	NO	NO
		2045 (Unconstrained)	NO	NO	NO	NO
4	I-29 NB Ramp & Northshore Drive	2025 (Constrained)	NO	NO	NO	NO
		2045 (Constrained)	NO	NO	NO	NO
		2045 (Unconstrained)	NO	NO	NO	NO
5	Westshore Drive & S. 333 <sup>rd</sup> Avenue	2025 (Constrained)	NO	NO	NO	NO
		2045 (Constrained)	NO	NO	NO	NO
		2045 (Unconstrained)	NO	NO	NO	NO
6	Northshore Drive & S. 333 <sup>rd</sup> Avenue	2025 (Constrained)	NO	NO	NO	NO
		2045 (Constrained)	NO	NO	NO	NO
		2045 (Unconstrained)	NO	NO	NO	NO

Based on the results, traffic signal warrants are not satisfied at the at the study intersections. However, signal warrants are close to being met at the intersection of I-29 NB Ramp with Northshore Drive under the Future (2045) Unconstrained volume scenario. The intersection should be continuously monitored to determine if traffic signal warrants are met in the future. A traffic signal was evaluated as an alternative as a part of this study. Detailed results are provided in **Appendix C**.

### 4.2 Auxiliary Lane Analysis

The SDDOT has developed guidelines to determine if an auxiliary left and/or right-turn lane should be installed on the major road at unsignalized intersections. The methodologies are based on an evaluation of Criterion 1 – Vehicular Volume, Criterion 2 – Crash Experience, and Criterion 3 – Special Cases. Additionally, compliance with access management spacing standards and conformance to appropriate design guidelines needs to be evaluated. These guidelines were used to evaluate the intersections of I-29 NB Ramps and I-29 SB Ramps with Northshore Drive. A more detailed description of the three criteria is provided in Chapter 15 of the *South Dakota Department of Transportation Road Design Manual*.

The National Cooperative Highway Research Program (NCHRP) has developed guidance to determine if an auxiliary left or right-turn lane is warranted on the major road or if two-lanes should be considered for the minor-street approaches of a two-way stop-controlled intersection. These guidelines are published in *NCHRP Report 457: Evaluating Intersection Improvements*. The methodologies are based on an evaluation of the operating and collision costs associated with the turning maneuver relative to the cost of constructing a turn lane. Additional measures considered for each analysis are detailed below.

#### Auxiliary Left-turn Lanes

- Major road 85<sup>th</sup> percentile speed (posted speed can be used if data is unavailable)
- Percent of left-turns in advancing volume
- Major road peak hour advancing and opposing traffic volumes

#### Auxiliary Right-turn Lanes

- Major road 85<sup>th</sup> percentile speed (posted speed can be used if data is unavailable)
- Major road peak hour approaching traffic volumes
- Right-turn traffic volumes

#### Minor-street Approaches

- Major road peak hour traffic volumes (total of both directions)
- Minor road peak hour approaching traffic volumes
- Right-turn traffic volumes
- Percentage of right-turns

These guidelines were used to evaluate the study intersections along Northshore Drive, west of I-29, and the future intersections anticipated with the construction of the bypass.

**Table 4-2** summarizes the results of the auxiliary turn lane analyses. Detailed results are provided in **Appendix D**.

**Table 4-2. Auxiliary Lane Analysis Summary**

ID #	Intersection	Auxiliary Lane	2025 Interim (Constrained)	2045 Future (Constrained)	2045 Future (Unconstrained)
1	484 <sup>th</sup> Avenue/Westshore Drive & Northshore Drive^	NB Approach	One Lane	One Lane	One Lane
		EB Left-Turn	NO	NO	NO
		EB Right-Turn	NO	NO	NO
		WB Left-Turn	NO	NO	NO
		WB Right-Turn	NO	NO	NO
		SB Approach	One Lane	One Lane	One Lane
2	Streeter Drive & Northshore Drive^	NB Approach	One Lane	One Lane	One Lane
		EB Right-Turn	NO	NO	NO
		WB Left-Turn	NO	NO	NO
3	I-29 SB Ramp & Northshore Drive*	EB Right-Turn	YES	YES	YES
		WB Left-Turn	YES	YES	YES
4	I-29 NB Ramp & Northshore Drive*	EB Left-Turn	NO	YES	YES
		WB Right-Turn	NO	NO	NO
5	Westshore Drive & S. 333 <sup>rd</sup> Avenue^	NB Right-Turn	YES	YES	YES
		WB Approach	One Lane	One Lane	One Lane
		SB Left-turn	NO	NO	NO
6	Northshore Drive & S. 333 <sup>rd</sup> Avenue^	NB Approach	One Lane	One Lane	One Lane
		EB Right-Turn	NO	NO	NO
		WB Left-Turn	YES	YES	YES
Remove from existing condition.		Maintain existing condition.		Add to existing condition.	

\*Based on guidelines in the *SDDOT Road Design Manual*

<sup>^</sup>Based on guidelines in the *NCHRP Report 457*

Based on the SDDOT guidelines for left-turn and right-turn auxiliary lanes, an eastbound left-turn lane at the intersection of I-29 NB Ramp with Northshore Drive is recommended. At the intersection of I-29 SB Ramp with Northshore Drive, an eastbound right-turn lane and westbound left-turn lane are recommended. Based on the NCHRP Auxiliary Turn-Lane Analysis, a northbound right-turn lane and westbound left-turn lane are recommended at the intersections of Westshore Drive and Northshore Drive with S. 333<sup>rd</sup> Avenue, respectively.



## 5. ALTERNATIVES ANALYSIS

An alternative analysis was completed for the corridor to evaluate traffic operations and safety along the study area segments and intersections. The segment alternative consisted of evaluating the construction of a new roadway to separate agricultural, school, and commuter traffic. Alternatives were developed for the study intersections based on input from operational goals, safety analysis, and traffic signal/turn-lane warrant analysis results. This section describes the methodology and procedures for evaluating alternatives for the study area intersections. The analysis was based on several factors, such as:

- Vehicle Safety
- Pedestrian Safety
- Vehicle Capacity
- Traffic Operations
- Access Management

### 5.1 Description of Alternatives

#### 5.1.1 Alignment Alternatives

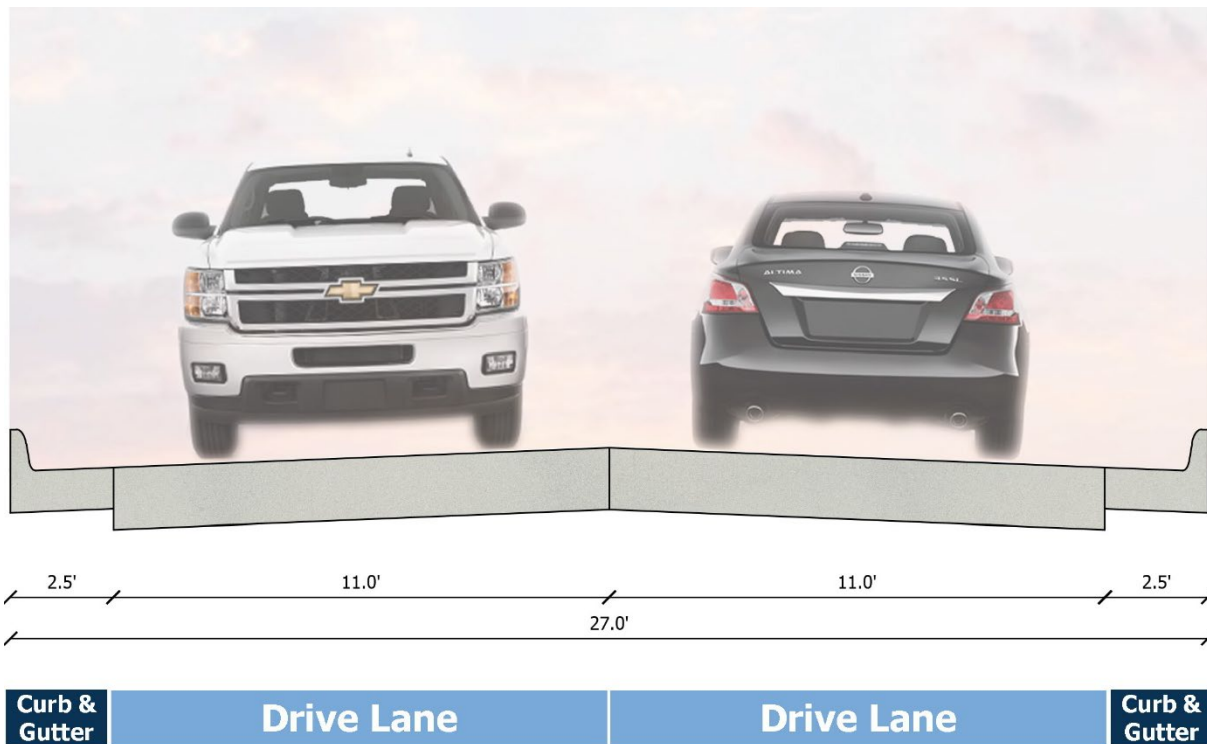
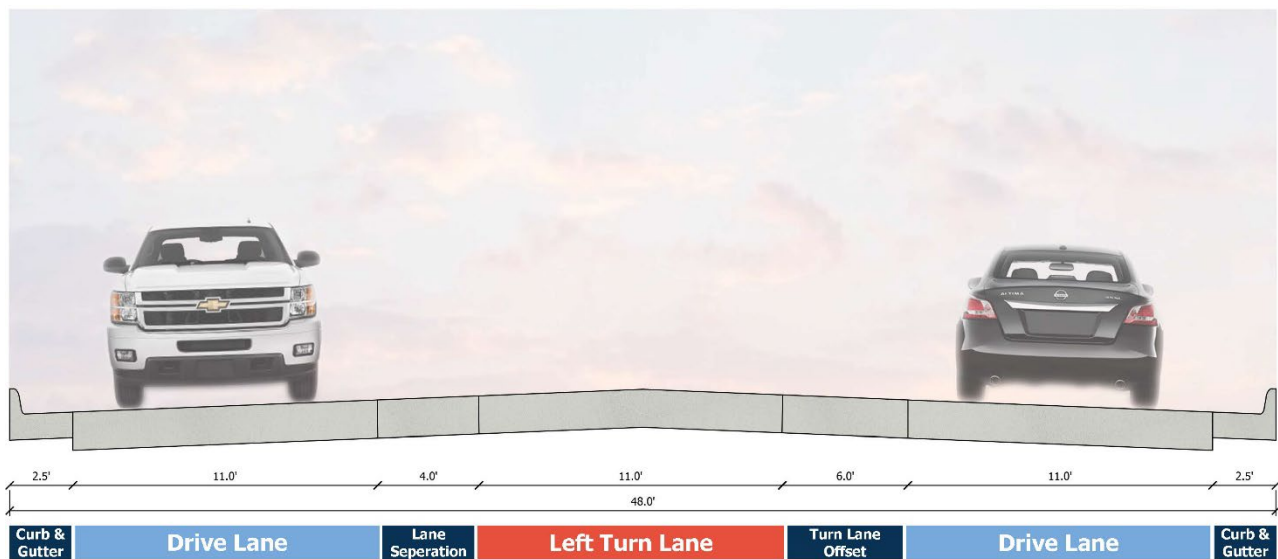
There were four (4) alignments alternatives evaluated in the study area. The alternatives consisted of using the existing roadway alignment and the construction of a new roadway north of Northshore Drive to provide a bypass for agricultural and commuter traffic. The following alignment alternatives were considered:

- No Build Alternative (Alt 0)
- Build Alternative 1 (Alt 1)
- Build Alternative 2 (Alt 2)
- Build Alternative 3 (Alt 3)

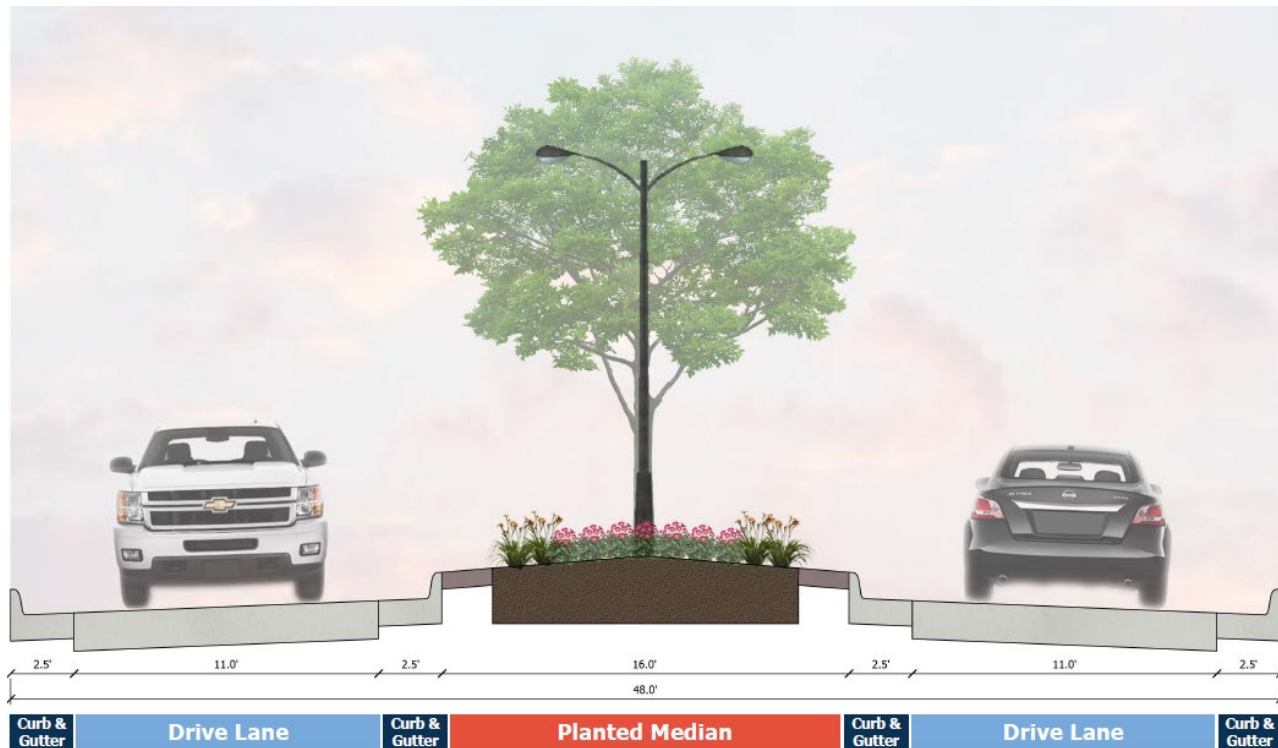
The No Build Alternative (Alt 0) was evaluated as the do-nothing scenario for the study. The build alternatives were compared to no-build alternative to evaluate the impact of the proposed improvements. Build Alternative 1 (Alt 1) evaluated the alignment of the proposed bypass roadway being constructed just north of the baseball fields near the Dakota Valley Elementary School. Build Alternative 2 (Alt 2) evaluated the bypass road being constructed further north, approximately 630-feet from the baseball fields. Build Alternative 3 (Alt 3) evaluated widening the existing alignment of Northshore Drive to provide additional capacity on the roadway.

#### 5.1.2 Cross-Section Alternatives

In addition to the alignment alternatives considered, the cross-section type was also evaluated. Two alternatives were considered for the new alignment. Alternative 1 is a two-lane cross-section and Alternative 2 is a three-lane cross-section. Alternative 2 is shown without a center median where turn lanes will be developed, and with a center median between intersections for access control. Conceptual typical sections for the two alternative cross-sections are shown below on **Figure 5-1**, **Figure 5-2A**, and **Figure 5-2B**, respectively. A planning level roadway capacity analysis was completed to determine the cross-section for the new alignment of Northshore Drive.

**Figure 5-1. Alternative 1: Two-lane Typical Cross-Section****Figure 5-2A. Alternative 2A: Three-lane Typical Cross-Section with Turn-Lane**

**Figure 5-2B. Alternative 2B: Three-lane Typical Cross-Section with Median**



### 5.1.3 Intersection Alternatives

The alternatives at the intersections consisted of standard three-legged or four-legged intersections, sweeping curve intersections/channelized right-turn lanes, and roundabouts. Under existing conditions, turn lanes are not provided at any of the study intersections. **Table 5-1** summarizes the intersection alternatives that were examined as part of this study.

**Table 5-1. Intersection Alternatives**

ID #	Intersection	Existing Traffic Control	Alternative 1	Alternative 2	Alternative 3
1	Westshore Drive & Northshore Drive	TWSC	No Build	TWSC w/ Sweeping Curve Alignment	Roundabout
2	Streeter Drive & Northshore Drive	TWSC	TWSC (No Auxillary Lanes)	TWSC (w/ SB Channelized RT)	Roundabout
5	484 <sup>th</sup> Avenue & S. 333 <sup>rd</sup> Avenue	-	TWSC (w/ NB RT)	TWSC w/ Sweeping Curve Alignment	-
6	Northshore Drive & S. 333 <sup>rd</sup> Avenue	-	TWSC (w/ WB LT)	TWSC (w/ WB LT & NB Channelized RT)	Roundabout

\*A traffic signal is not warranted but intersection should be continually monitored

At the I-29 interchange ramps, several configurations were evaluated including left-turn lanes right-turn lanes, and traffic signals where warranted. These configurations align with recommendations from previous studies complete for the Exit 4 interchange.

## 5.2 Traffic Operations Analysis

### 5.2.1 Roadway Capacity Analysis

A planning level cross-section analysis was conducted for the study area roadway segments. This analysis used estimated roadway segment ADTs for 2025 interim and 2045 future No Build and Build (with the proposed Northshore Drive Realignment). **Figure 5-3** and **Figure 5-4** display the No-build ADTs and **Figure 5-5** and **Figure 5-7** display the Build Constrained ADTs. The 2045 future ADTs for the Unconstrained Build scenario are shown on **Figure 5-9**.

This planning level analysis serves as an initial screening and other factors such as intersection operations, safety, right-of-way impacts, and grades should be investigated. The auxiliary turn-lane analysis and intersection analysis describes individual intersection operations.

For this planning level analysis, roadway capacity level of service (LOS) is a qualitative assessment of traffic operational conditions within a traffic stream in terms of its volume to capacity (V/C) ratio of the roadway segment. Levels of service are described with a letter designation of A, B, C, D, E, or F, with LOS A representing essentially uninterrupted flow, and LOS F representing a breakdown of traffic flow with noticeable congestion and delay. Theoretical capacity is reached when the V/C ratio of that facility is at or exceeds 1.0. To correlate the V/C ratio to a LOS value the following ranges were used and are as follows:

- **LOS A:** Volume-to-capacity ratio is less than 0.45
- **LOS B:** Volume-to-capacity ratio at least 0.46 but less than 0.7
- **LOS C:** Volume-to-capacity ratio at least 0.71 but less than 0.8
- **LOS D:** Volume-to-capacity ratio at least 0.81 but less than 0.9
- **LOS E:** Volume-to-capacity ratio at least 0.91 but less than 1.0
- **LOS F:** Volume-to-capacity ratio is 1.0 or greater

Capacity thresholds from the *South Dakota Roadway Design Manual* were used to develop roadway segment LOS for the study area roadway network. These thresholds represent the LOS E to LOS F threshold, or the point at which the V/C ratio exceeds 1.0. The SDDOT identifies LOS B as the acceptable LOS threshold for Minor Arterials and Collectors. For the Northshore Drive realignment, two alternative cross-sections were analyzed: a two-lane cross-section (Alternative 1) and a three-lane cross-section with a center left-turn lane (Alternative 2). **Table 5-2** displays the volume thresholds by number of lanes.

For the Northshore Drive realignment, two alternative cross-sections were analyzed: a two-lane cross-section (Alternative 1) and a three-lane cross-section with a center left-turn lane (Alternative 2).

**Table 5-2. SDDOT Roadway Capacities**

Number of Lanes	Planning Level Capacity (ADT)
2 Lanes	8,000
3 Lanes	16,000

*All volumes are two-way.*

*All capacities represent ultimate capacity (LOS E).*

SDDOT roadway capacities and the LOS ranges were used to analyze alternative cross-sections under 2025 interim and 2045 future year forecast traffic volumes. **Table 5-3** shows the facility type and projected LOS for 2025 and 2045 No-build conditions and **Table 5-4** shows the Build conditions (with the proposed Northshore Drive realignment).

**Table 5-3. Roadway Segment LOS Summary – No Build**

No Build Conditions						ADT	V/C Ratio	LOS	ADT	V/C Ratio	LOS	SDDOT Capacity Threshold
ID #	Location	Facility Type				2025 No Build (Constrained)			2045 No Build (Constrained)			
W.O. 1	CR 23 w/o Westshore Drive	Rural	35 MPH	2-Lanes Undivided	Existing	2,300	0.29	A	2,500	0.31	A	8,000
1 – 2	Northshore Dr Westshore Dr – Streeter Dr	Urban	25 MPH	2-Lanes Undivided	Existing	6,100	0.76	C	6,500	0.81	D	8,000
2 – 3	Northshore Dr Streeter Dr - I-29 NB	Rural	35 MPH	2-Lanes Undivided	Existing	4,200	0.53	B	4,550	0.57	B	8,000
3 – 4	Northshore Dr I-29 NB - SD 105	Rural	35 MPH	2-Lanes Undivided	Existing	2,600	0.33	A	2,900	0.36	A	8,000
	= Exceeds LOS Guidelines			= Acceptable LOS Guidelines					= Deficient LOS Guidelines			

**Table 5-4. Roadway Segment LOS Summary – Build**

Build Conditions						ADT	V/C Ratio	LOS	ADT	V/C Ratio	LOS	ADT	V/C Ratio	LOS	SDDOT Capacity Threshold
ID #	Location	Facility Type				2025 Build (Constrained)			2045 Build (Constrained)			2045 Build (Unconstrained)			
W.O. 1	CR 23 w/o Westshore Dr	Rural	35 MPH	2-Lanes Undivided	Existing	1,925	0.24	A	2,950	0.37	A	3,550	0.44	A	8,000
1 – 2	Northshore Dr Westshore Dr – S. 333 <sup>rd</sup> Ave	Urban	25 MPH	2-Lanes Undivided	Existing	2,350	0.29	A	2,850	0.36	A	4,600	0.58	B	8,000
3 – 6	Northshore Dr S. 333 <sup>rd</sup> Ave – I-29 NB	Rural	35 MPH	2-Lanes Undivided	Existing	4,200	0.53	B	4,550	0.57	B	7,800	0.98	E	8,000
E.O. 4	Northshore Dr I-29 NB – SD 105	Urban	35 MPH	2-Lanes Undivided	Existing	2,600	0.33	A	2,900	0.36	A	2,900	0.36	A	8,000
5 – 6	S. 333 <sup>rd</sup> Ave (New Alignment) Northshore Dr – CR 23	Urban	45 MPH	2-Lanes Undivided	Alt. 1	5,750	0.72	C	6,400	0.80	D	10,750	1.34	F	8,000
				3-Lanes w/ TWLTL	Alt. 2	5,750	0.36	A	6,400	0.40	A	10,750	0.67	B	16,000
		= Exceeds LOS Guidelines					= Acceptable LOS Guidelines					= Deficient LOS Guidelines			

Based on the results of the planning level roadway capacity analysis under No Build 2025 and 2045 traffic conditions, acceptable operations are not anticipated along Northshore Drive from Westshore Drive to Streeter Drive.

Under Build 2025 and 2045 traffic conditions, with the Northshore Drive realignment, acceptable operations are anticipated along Northshore Drive from Westshore Drive to Streeter Drive with the diversion of traffic to the new alignment. For the Northshore Drive realignment, both the rural two-lane and three-lane cross-section provide acceptable operations under the 2045 constrained traffic volumes. Under the 2045 unconstrained traffic volumes, the two-lane cross section is anticipated to operate at LOS F and the three-lane cross section is anticipated to operate at LOS B. A three-lane cross-section is the preferred cross-section for the new alignment to accommodate future development along the corridor.

### 5.2.2 95<sup>th</sup> Percentile Queue Length Analysis

For the intersection alternatives analysis, the 95<sup>th</sup> percentile queue lengths were reviewed for 2025 interim year and 2045 future year traffic conditions for the study intersections under the No Build traffic conditions and the intersection alternatives evaluated.

**Table 5-5** summarizes the findings for study intersections under the No Build Alternative. **Table 5-6** summarizes the findings for study intersections under 2045 traffic conditions for the intersection alternatives evaluated.

Based on the No Build queue analysis, it is anticipated that queuing issues will occur on the south legs at the intersections of I-29 Northbound Ramp and Streeter Drive with Northshore Drive during the AM peak hour. The intersection alternatives were evaluated under 2045 constrained future traffic volumes, queuing issues are not anticipated for any of the alternatives evaluated. It should be noted that queuing concerns are still anticipated at the south leg of the intersection of I-29 Northbound Ramp with Northshore Drive.

**Table 5-5. 95<sup>th</sup> Percentile Queue Lengths – No Build**

ID #	Location	Critical Movements	Existing Storage Length	95% Queue Length (ft)	
				Interim (2025) (AM / PM / Dis)	Future (2045) (AM / PM / Dis)
1	484 <sup>th</sup> Ave/Westshore Dr & Northshore Drive	NB Left-turn <sup>+</sup>	-	5 / 5 / 3	8 / 8 / 5
		EB Left-turn <sup>+</sup>	-	3 / 0 / 0	3 / 0 / 0
		WB Left-turn <sup>+</sup>	-	0 / 3 / 3	0 / 3 / 3
		SB Left-turn <sup>+</sup>	-	8 / 10 / 10	13 / 13 / 13
2	Streeter Drive & Northshore Drive	NB Left-turn <sup>+</sup>	-	103 / 10 / 18	175 / 15 / 25
		EB Left-turn <sup>+</sup>	-	3 / 3 / 3	3 / 3 / 3
3	I-29 SB Ramp & Northshore Drive	WB Left-turn <sup>+</sup>	-	3 / 3 / 3	3 / 3 / 5
		SB Left-turn <sup>+</sup>	-	18 / 3 / 3	20 / 5 / 5
4	I-29 NB Ramp & Northshore Drive	NB Left-turn <sup>+</sup>	-	298 / 58 / 35	483 / 88 / 48
		EB Left-turn <sup>+</sup>	-	3 / 3 / 3	3 / 3 / 3

**Table 5-6. 95<sup>th</sup> Percentile Queue Lengths – Future (2045) Constrained**

ID #	Location	Critical Movements	95% Queue Length (ft)		
			Alternative 1 (AM / PM / Dis)	Alternative 2 (AM / PM / Dis)	Alternative 3 (AM / PM / Dis)
1	Westshore Drive & Northshore Drive	NB Through <sup>+</sup>	13 / 10 / 5	- / - / -	5 / 5 / 3
		EB Through <sup>+</sup>	13 / 0 / 0	0 / 0 / 0	25 / 8 / 8
		WB Through <sup>+</sup>	0 / 3 / 0	15 / 18 / 13	8 / 8 / 5
		SB Through <sup>+</sup>	5 / 18 / 15	0 / 3 / 3	3 / 10 / 10
2	Streeter Drive & Northshore Drive	NB Left-turn	48 / 15 / 18	38 / 5 / 5	13 / 5 / 5 <sup>+</sup>
		NB Right-turn	- / - / -	5 / 5 / 3	
		EB Through <sup>+</sup>	0 / 0 / 0	0 / 0 / 0	30 / 18 / 30
		WB Left-turn <sup>+</sup>	3 / 5 / 3	3 / 3 / 3	53 / 20 / 13
3	I-29 SB Ramp & Northshore Drive	WB Left-turn	3 / 3 / 5	3 / 3 / 5	- / - / -
		SB Left-turn <sup>+</sup>	20 / 5 / 5	20 / 5 / 5	- / - / -
4	I-29 NB Ramp & Northshore Drive	NB Left-turn <sup>+</sup>	483 / 88 / 48	483 / 88 / 48	- / - / -
		EB Left-turn	3 / 3 / 3	3 / 3 / 3	- / - / -
5	484 <sup>th</sup> Avenue & S. 333 <sup>rd</sup> Avenue	EB Left-turn	- / - / -	5 / 0 / 0	- / - / -
		WB Left-turn	0 / 15 / 10	- / - / -	- / - / -
		WB Right-turn	8 / 3 / 3	0 / 0 / 0	- / - / -
		SB Left-turn <sup>+</sup>	3 / 3 / 3	8 / 5 / 5	- / - / -
6	Northshore Drive & S. 333 <sup>rd</sup> Avenue	NB Left-turn	56 / 30 / 43	5 / 3 / 0	38 / 20 / 30 <sup>+</sup>
		NB Right-turn	- / - / -	55 / 28 / 40	
		EB Through <sup>+</sup>	0 / 0 / 0	0 / 0 / 0	28 / 13 / 8
		WB Left-turn	43 / 18 / 10	43 / 18 / 10	55 / 35 / 25
		WB Through	0 / 0 / 0	0 / 0 / 0	

<sup>+</sup>shared lane



### 5.2.3 Intersection Alternative Traffic Operations

Intersection alternatives along Northshore Drive and the proposed street of 333<sup>rd</sup> Avenue were analyzed for the AM, PM, and Dismissal peak hours using 2025 interim year and 2045 future year volumes.

Alternative traffic control and lane configurations were assessed at the study intersections for the two analysis years. **Figure 5-6** and **Figure 5-8** illustrate the anticipated traffic operations for the alternatives evaluated under 2025 interim year and 2045 future year constrained traffic volumes, respectively.

**Figure 5-10** illustrates the anticipated traffic operations for the alternatives evaluated under 2045 future year unconstrained traffic volumes. The analysis software reports in **Appendix E** provides additional information.

#### **ID #1: 484<sup>th</sup> Avenue/Westshore Drive with Northshore Drive**

Based on NCHRP Auxiliary Turn Lane Warrants, under interim 2025 constrained and future 2045 constrained and unconstrained traffic volumes, auxiliary turn lanes are not warranted at the intersection. Three intersection alternatives were evaluated at the intersection, these include a standard TWSC intersection with no auxiliary lanes (No Build) (Alternative 1), a TWSC with the roadway being realigned to a sweeping curve (Alternative 2), a single-lane roundabout (Alternative 3).

Under Interim (2025) constrained traffic conditions, all intersection movements are anticipated to operate at LOS C or better during the peak hours under Alternative 1 and Alternative 2. As a single-lane roundabout (Alternative 3) all movements are estimated to operate at LOS A during peak hours.

Under Future (2045) constrained and unconstrained traffic conditions, all intersection movements are anticipated to operate at LOS C or better during the peak hours under the Alternative 1 and Alternative 2. As a single-lane roundabout (Alternative 3) all movements are estimated to operate at LOS A during peak hours.

#### **ID #2: Streeter Drive with Northshore Drive**

Based on NCHRP Auxiliary Turn Lane Warrants, under interim 2025 and future 2045 traffic volumes, auxiliary turn lanes are not warranted at the intersection. There were three intersection alternatives evaluated at the intersection. This includes a standard TWSC intersection with no auxiliary lanes (Alternative 1), TWSC intersection with a sweeping northbound right-turn lane (Alternative 2), and a single-lane roundabout (Alternative 3).

Under Interim (2025) constrained and Future (2045) constrained and unconstrained traffic conditions, all intersection movements are anticipated to operate at LOS C or better during the peak hours under the Alternative 1 and Alternative 2. As a single-lane roundabout (Alternative 3) all movements are estimated to operate at LOS A during the peak hours.

#### **ID #3: I-29 Southbound Ramp with Northshore Drive**

Based on the SDDOT Roadway Design Manual, an eastbound right-turn lane and westbound left-turn lane are warranted at the intersection upon interim 2025 traffic conditions. Assuming a design speed of 30 MPH (posted speed limit plus 5 MPH), the turn lanes should provide an approach taper length of 180 feet, and a deceleration length of 105 feet. The westbound left-turn lane should also provide at least 50-feet of vehicle storage based on design guidelines from the SDDOT Road Design Manual.

Under Interim (2025) constrained traffic conditions, with the proposed improvements, all movements are anticipated to operate at LOS B or better during the peak hours.

Under Future (2045) constrained and unconstrained traffic conditions, with the proposed improvements, all movements are estimated to operate at LOS C or better during the peak hours.

**ID #4: I-29 Northbound Ramp with Northshore Drive**

Based on the SDDOT Roadway Design Manual, an eastbound left-turn lane is warranted at the intersection upon 2045 future traffic conditions. This improvement was assumed to be constructed upon 2025 interim conditions with improvements at the adjacent intersections. Assuming a design speed of 30 MPH (posted speed limit plus 5 MPH), the left-turn lane should provide an approach taper length of 180 feet, a deceleration length of 105 feet, and 50-feet of vehicle storage based on design guidelines from the SDDOT Road Design Manual.

Under Interim (2025) constrained traffic conditions, with the proposed improvements, all movements are anticipated to operate at LOS B or better during the peak hours except for the northbound shared left/right-turn movement, which is estimated to operate at LOS E during the AM peak hour.

Under Future (2045) constrained and unconstrained traffic conditions, with the proposed improvements, all movements are estimated to operate at LOS C or better during the peak hours except for the northbound shared left/right-turn movement, which is anticipated to operate at LOS F during the AM and PM peak hours. It should be noted that it is not uncommon for side street movements to operate at LOS E or F during the peak hours at stop-controlled intersections. Under the Future (2045) unconstrained traffic volumes, a traffic signal is close to satisfying MUTCD signal warrants. The intersection should be continually monitored for warrants and further improvements to the interchange may be considered but were not evaluated as part of this study.

**ID #5: 484<sup>th</sup> Avenue/Westshore Drive with S. 333<sup>rd</sup> Avenue**

Based on NCHRP Auxiliary Turn Lane Warrants, under interim 2025 constrained and future 2045 constrained and unconstrained traffic volumes, a northbound right-turn lane is warranted at the intersection under interim 2025 traffic conditions. Two intersection alternatives were evaluated under the analysis years. Alternative 1 evaluated a standard TWSC T-intersection with a northbound right-turn lane, and Alternative 2 evaluated a TWSC with a sweeping alignment north to east northbound right-turn lane. Assuming a design speed of 45 MPH (posted speed limit plus 5 MPH), the right-turn lane should provide an approach taper length of 405 feet and a deceleration length of 220 feet based on design guidelines from the SDDOT Road Design Manual.

Under Interim (2025) constrained and Future (2045) constrained and unconstrained traffic conditions, all intersection movements are anticipated to operate at LOS B or better during the peak hours under Alternative 1 and Alternative 2.

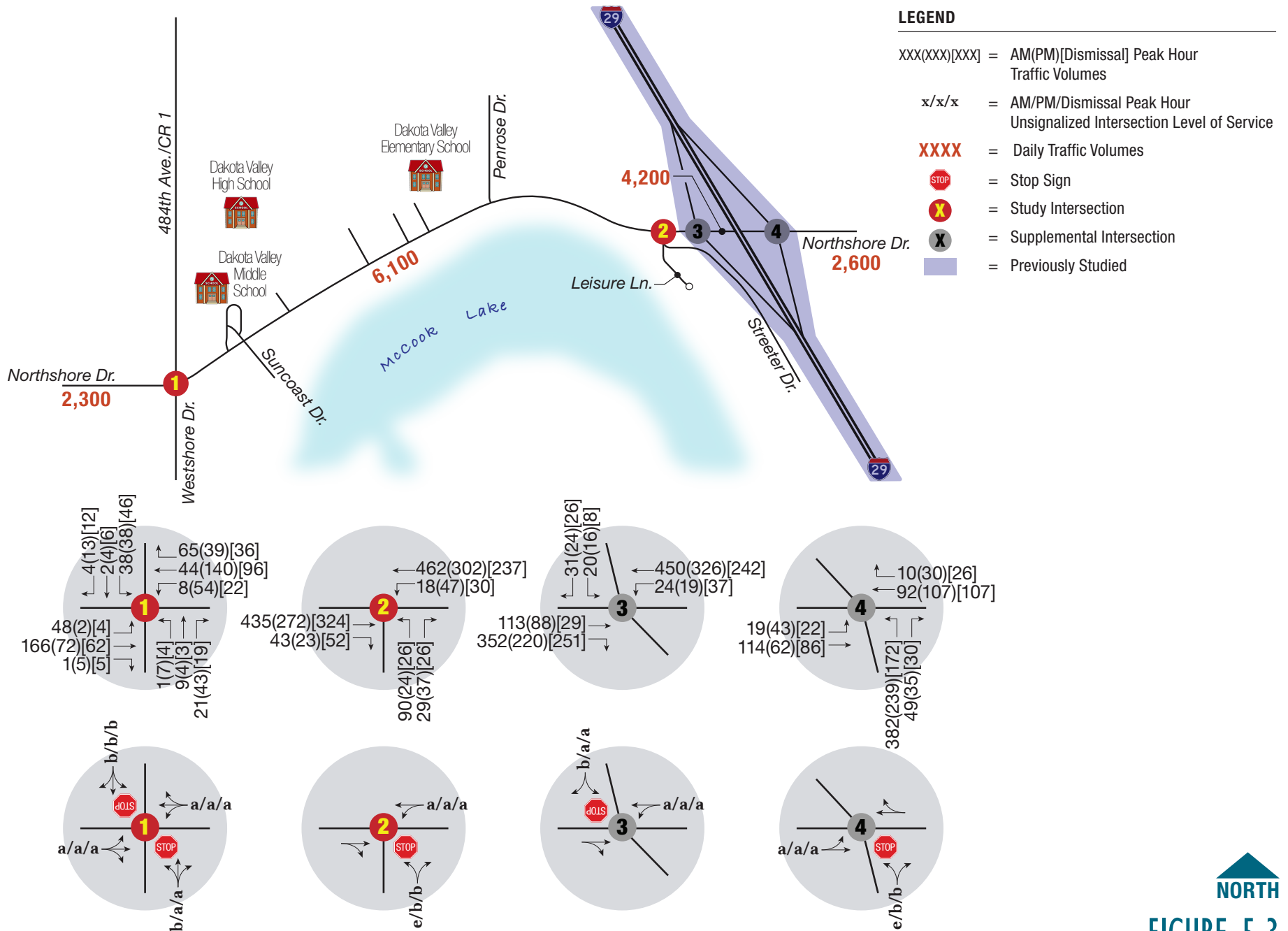
**ID #6: Northshore Drive with S. 333<sup>rd</sup> Avenue**

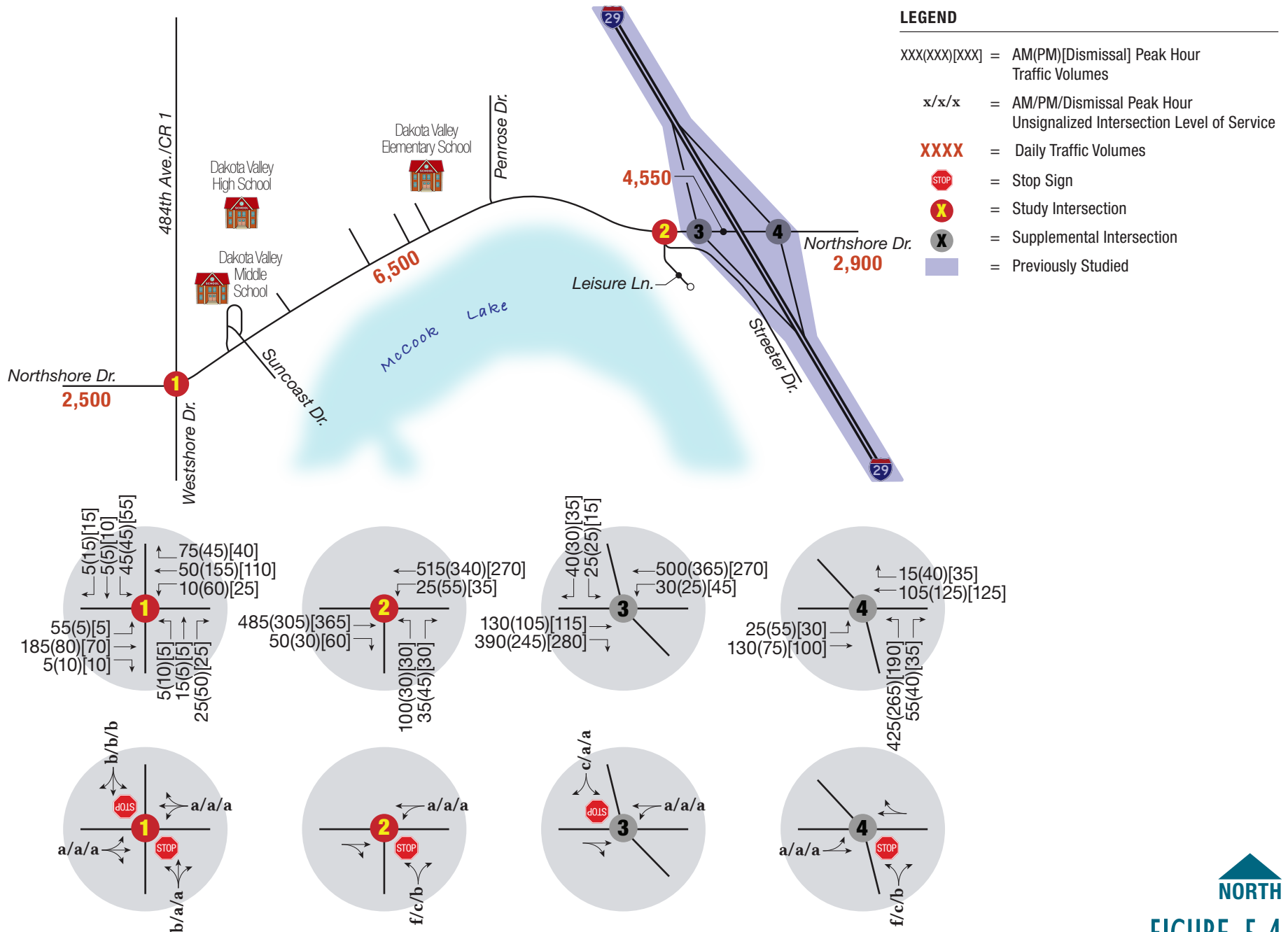
Based on NCHRP Auxiliary Turn Lane Warrants, under interim 2025 and future 2045 traffic volumes, a westbound left-turn lane is warranted at the intersection under interim 2025 traffic conditions. There were three intersection alternatives evaluated at the intersection. This includes a standard TWSC intersection with a westbound left-turn lane (Alternative 1), TWSC intersection with a westbound left-turn lane and a sweeping northbound right-turn lane (Alternative 2), and a single-lane roundabout (Alternative 3). Assuming a design speed of 30 MPH (posted speed limit plus 5 MPH), the westbound left-turn lane should provide an approach taper length of 180 feet, a deceleration length of 105 feet, and 385-feet of vehicle storage based on design guidelines from the SDDOT Road Design Manual.

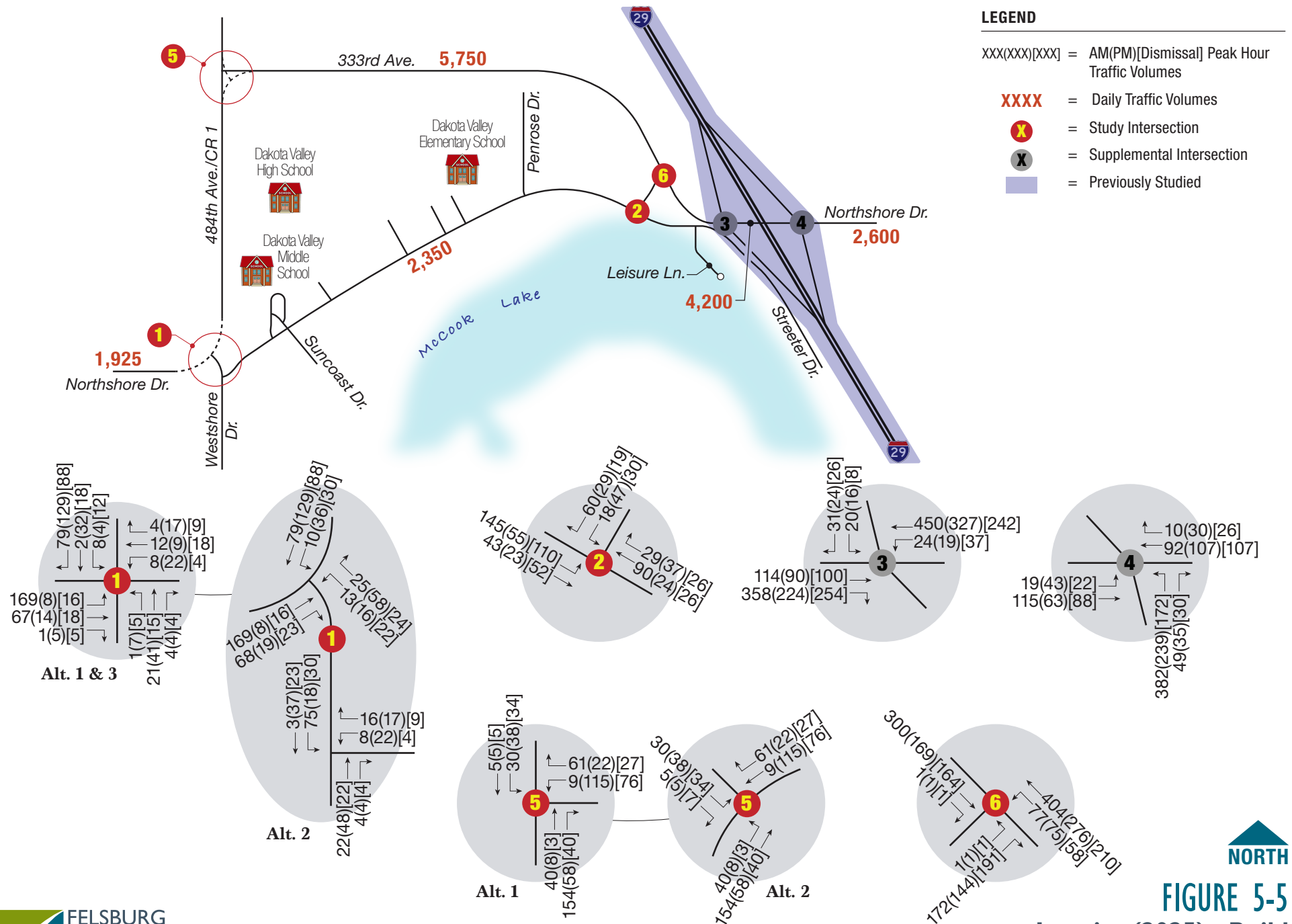
Under Interim (2025) constrained traffic conditions, all intersection movements are anticipated to operate at LOS B or better during the peak hours under the Alternative 1. Under Alternative 2, all intersection movements are estimated to operate at LOS D or better during the peak hours. As a single-lane roundabout (Alternative 3) all movements are anticipated to operate at LOS A during peak hours.



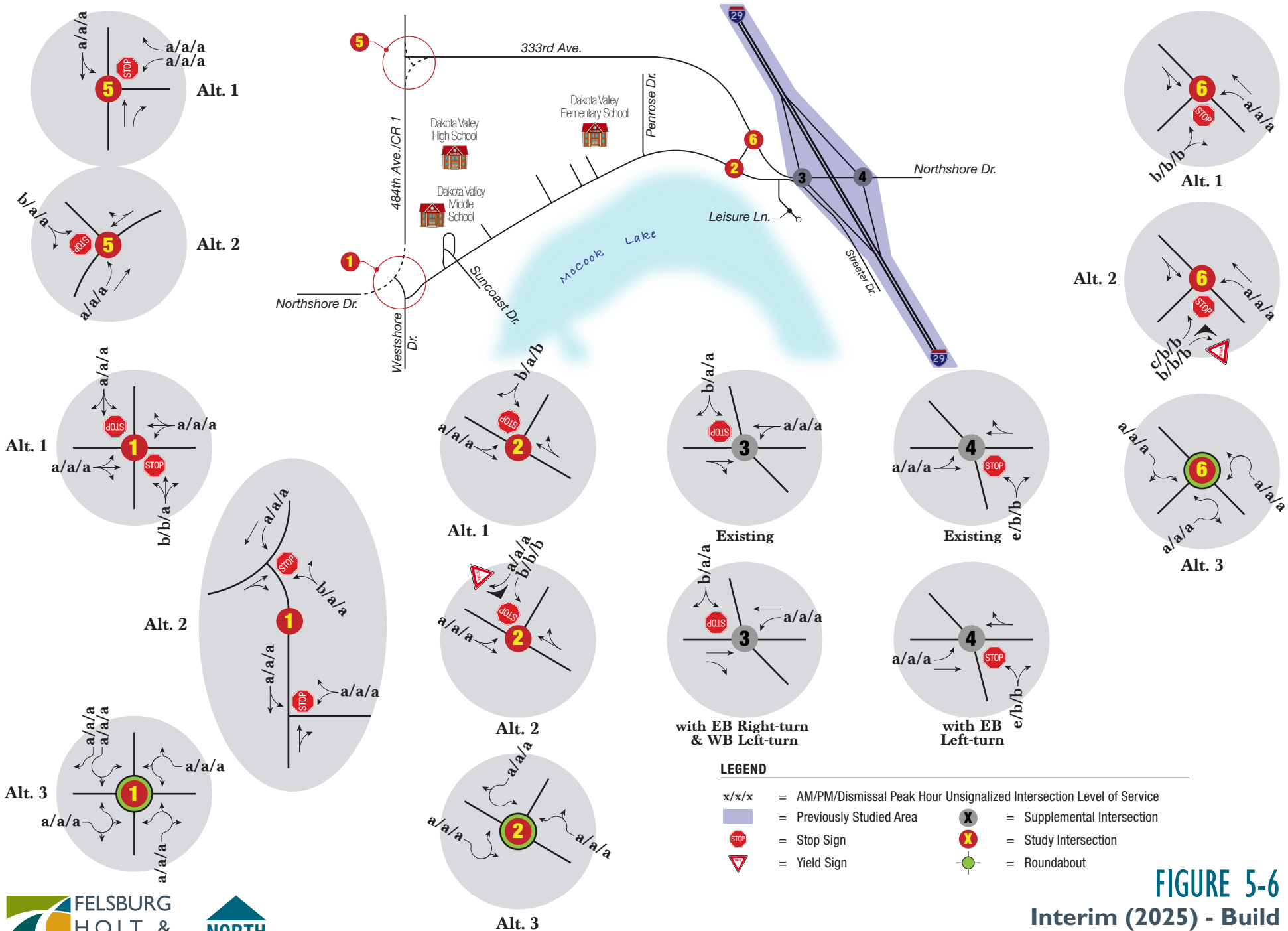
Under Future (2045) constrained and unconstrained traffic conditions, all intersection movements are anticipated to operate at LOS B or better during the peak hours under Alternative 1. Under Alternative 2, all intersection movements are estimated to operate at LOS C or better during the peak hours except for the northbound left-turn movement during the AM peak hour, which estimated to operate at LOS E under the 2045 constrained and LOS F under the 2045 unconstrained traffic volumes. As a single-lane roundabout (Alternative 3) all movements are anticipated to operate at LOS A during peak hours. It should be noted that it is not uncommon for side street movements to operate at LOS E or F during peak hours at stop-controlled intersections.

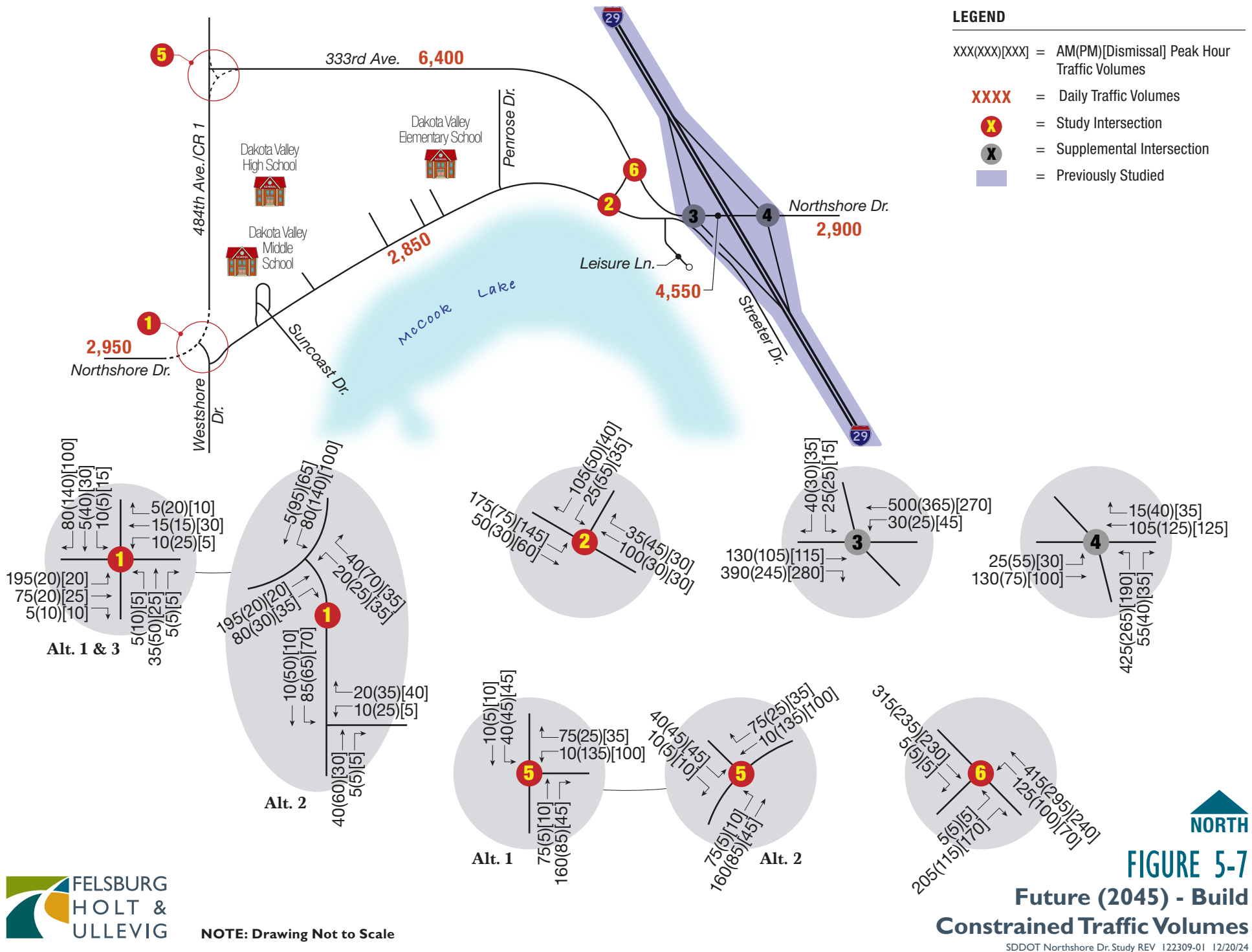


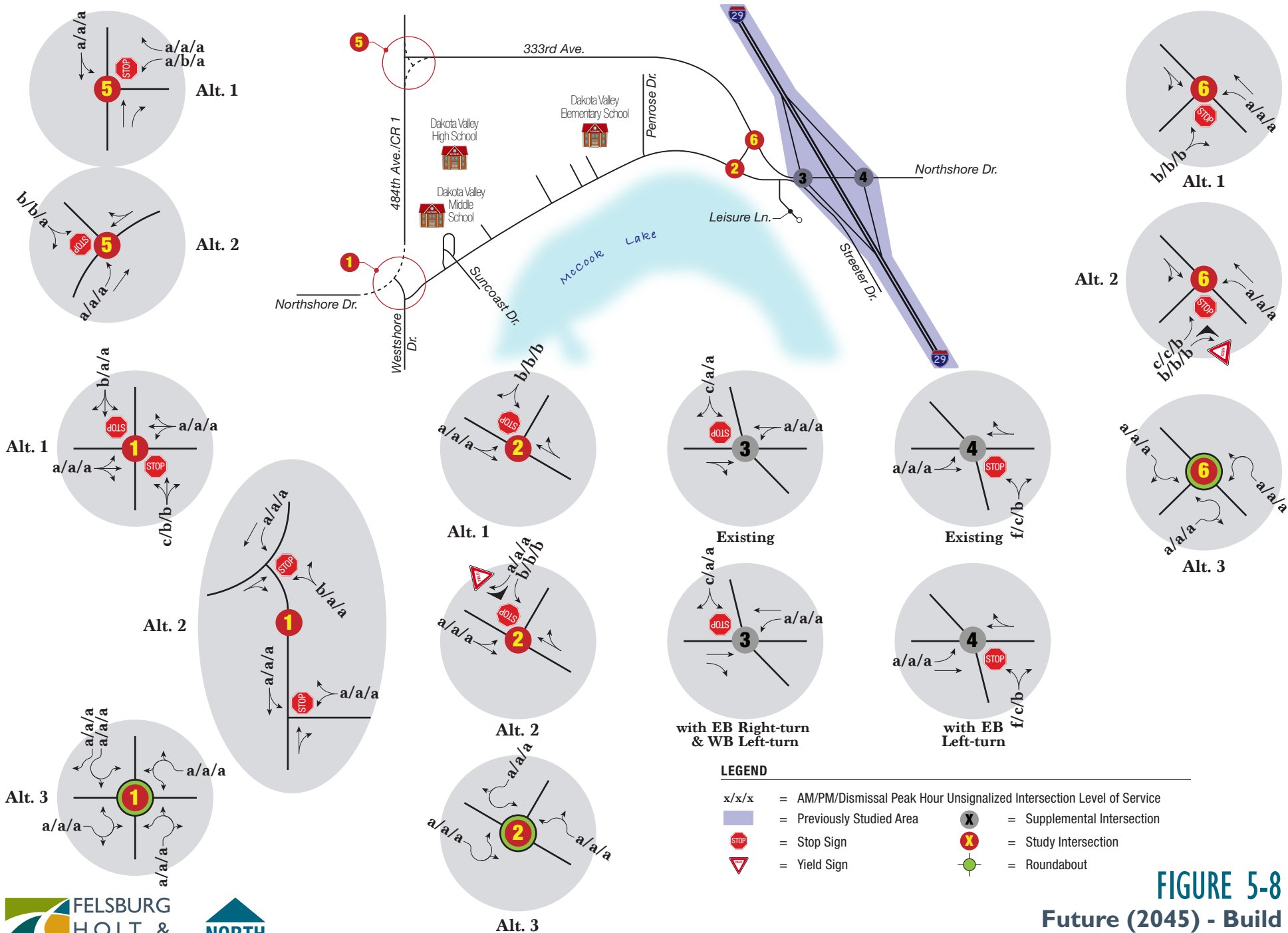




**FIGURE 5-5**  
Interim (2025) - Build  
Constrained Traffic Volumes

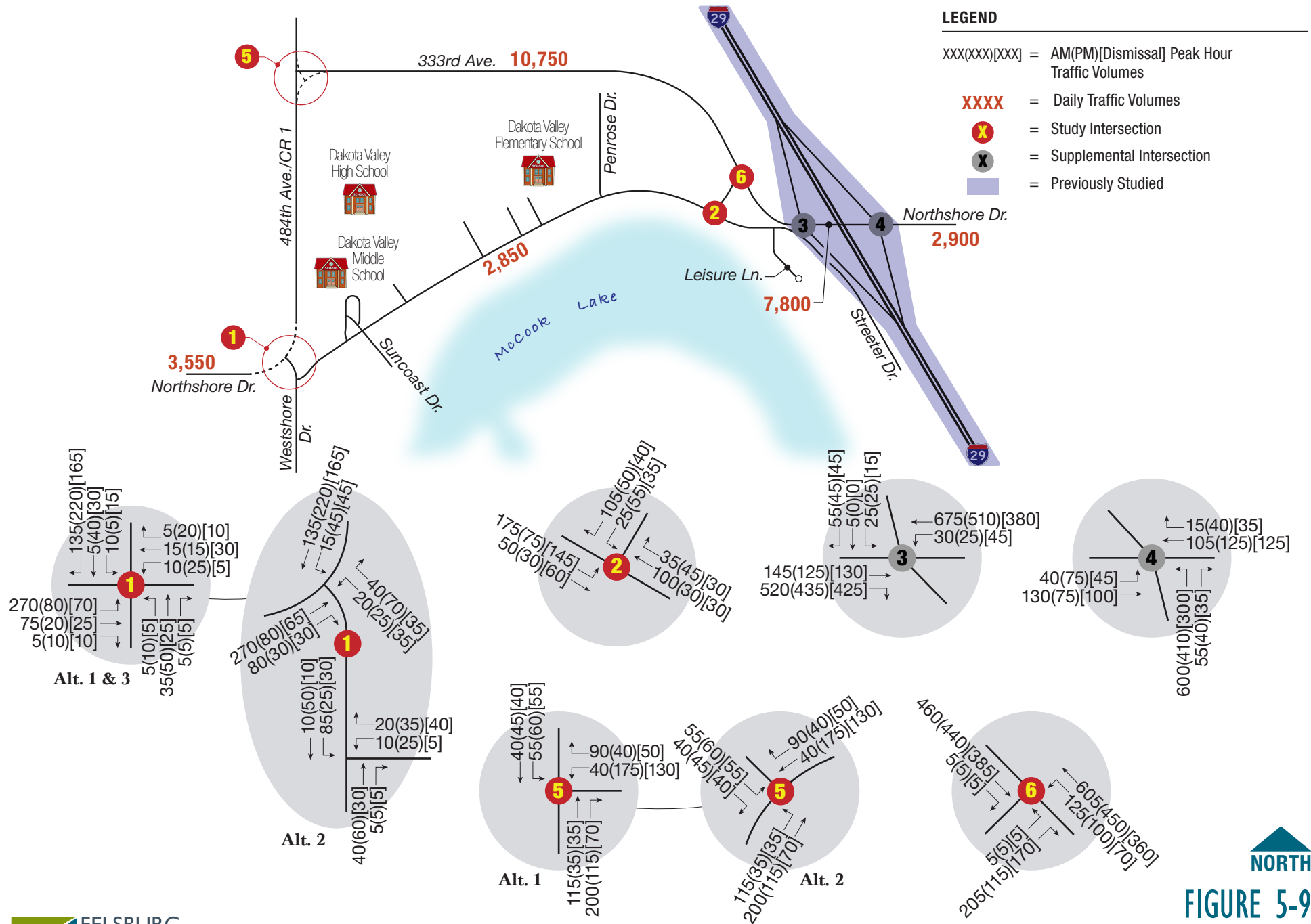








NOTE: Drawing Not to Scale



## LEGEND

xxx(XXX)[xxx] = AM(PM)[Dismissal] Peak Hour Traffic Volumes

XXXX = Daily Traffic Volumes

X = Study Intersection

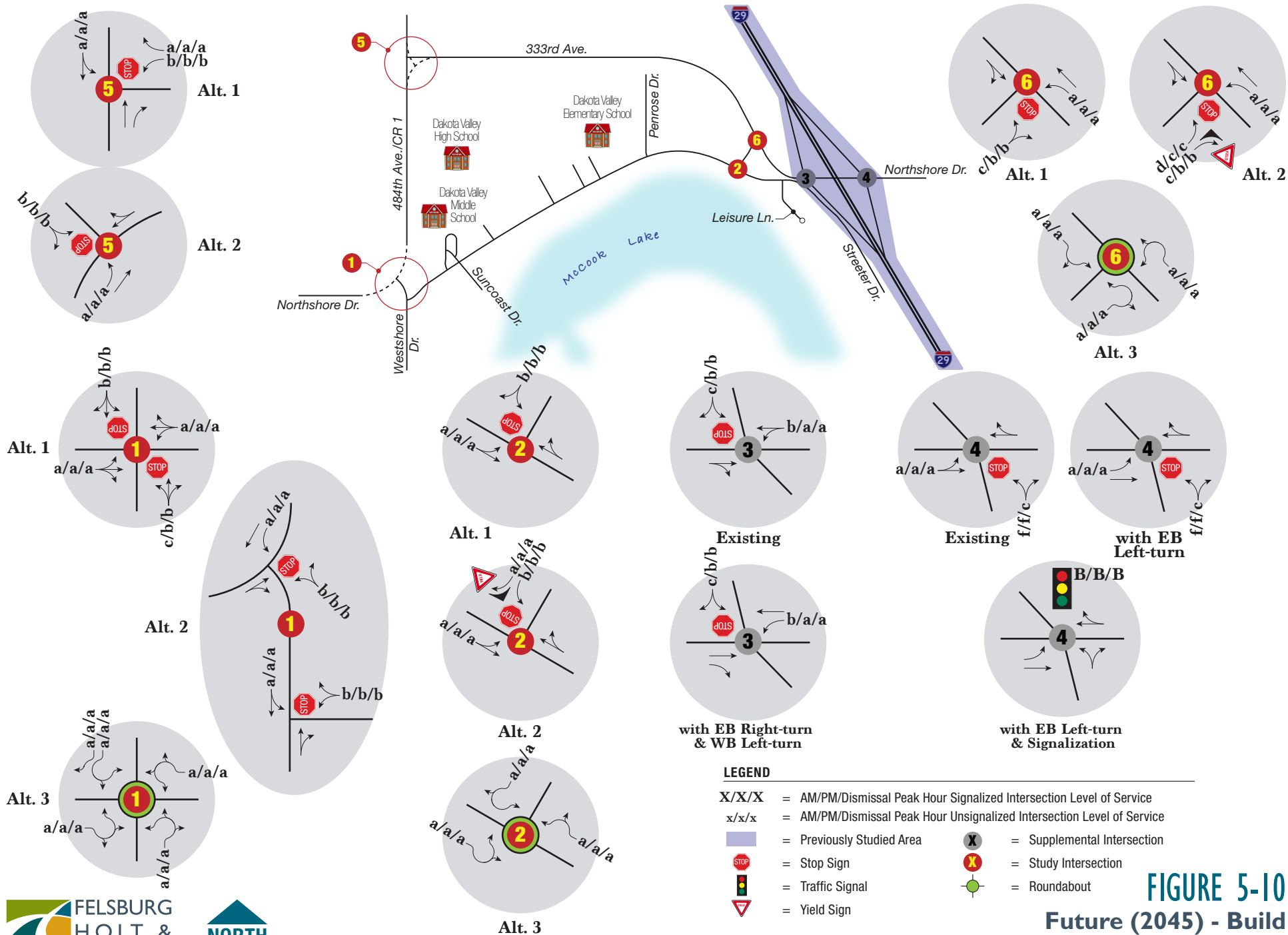
X = Supplemental Intersection

Shaded Area = Previously Studied



**FIGURE 5-9**  
**Future (2045) - Build**  
**Unconstrained Traffic Volumes**





### 5.3 Alternatives Screening Methodology

In order to help determine the recommended alternatives, several key criteria were used to screen each alternative. These included: traffic operations, safety impacts, pedestrian and bicycle facilities, and access management. An evaluation matrix was created to assess each concept based on impacts to the roadway and the surrounding area. The concepts were ranked on a scale from Highly Positive to Highly Negative to determine how well they satisfied the objectives of each criterion, which are described in more detail below:

- **Traffic Operations:** Traffic operations were considered for the rankings based on intersection and roadway segment level of service (LOS) results under opening year 2025 and future 2045 traffic volumes. At the intersection level, the alternatives were evaluated based on their expected friction and interruption of traffic flow along the proposed roadway.

Additionally, travel time analysis was calculated for the three alignment alternatives to compare the drive time between 484<sup>th</sup> Street and the just west of the I-29 southbound interchange ramps.

Travel time to/from the school was also considered. This considered travel time for each alternative alignment from the just west of the I-29 southbound interchange ramps to a common point just east of the existing high school parking lot. Two routes were considered. The first included utilizing the proposed alternatives alignment and a new connection to the school. The second determined the fastest possible path to the school, which evaluated if utilizing existing Northshore Drive provided a faster route than taking the alternative alignment. Travel distance to the school was also considered.

- **Safety Impacts:** Each alternative was ranked based on potential vehicle safety improvements and how existing crash patterns would be addressed. Crash Reduction Factors (CRF) were used to determine the safety impacts of the alternatives evaluated. A CRF is the percentage crash reduction that may be expected after implementing a given countermeasure. CRFs were obtained from the *Crash Modification Factors Clearinghouse* (<http://www.cmfclearinghouse.org>). In addition, driver expectations for intersections were considered as differences from these expectations can lead to confusion and potentially unsafe driving behavior.
- **Funding Source:** Each alignment alternative was evaluated based on fulfilling the funding requirements for the project. Federal funding was provided through an earmark in the 2022 Omnibus Bill and was designated to create a bypass to route farm, school, and residential traffic off the existing Northshore Drive between Westshore Drive and I-29/Streeter Drive.
- **Pedestrian / Bicycle Facilities:** Each alternative was ranked based on its ability to enhance and integrate new and existing infrastructure with surrounding facilities. The separation between pedestrians and vehicular traffic, roadway width, and pedestrian refuge at crossings were ranked in each alternative.
- **Access Management & Connectivity:** Each alternative was ranked on how it applies access management principles to existing residents and businesses.
- **Property Impacts & ROW:** Each alternative was ranked on based on the amount of right-of-way (ROW) needed to complete the alternative and the number of existing properties that would be impacted by the construction of each alternative.
- **Cost:** Each alternative was ranked based on the anticipated cost of construction associated with each alternative.

Segment safety measures for the existing roadway (No Build) and the proposed new roadway (Build Alternative) were evaluated. In addition, operations and safety measures were assessed for the intersection alternatives at the study intersection. The No Build and Alternatives were analyzed under 2045 traffic conditions.

### 5.3.1 Alignment Alternative Comparison

Three build alternatives alignments were evaluated and compared to the no-build alternative (Alt 0) to identify the impacts of the improvements. Build Alternative 1 (Alt 1) evaluated the alignment of the proposed bypass roadway being constructed just north of the baseball fields near the Dakota Valley Elementary School. Build Alternative 2 (Alt 2) evaluated the bypass road being constructed further north, approximately 630-feet from the baseball fields. Build Alternative 3 (Alt 3) evaluated widening the existing alignment of Northshore Drive to provide additional capacity on the roadway.

Based on the findings of this study, it is recommended that the Build Alternative 1 (Alt 1) alignment, north of Northshore Drive, be constructed in the future. Under the No Build condition, acceptable traffic operations are not achieved on Northshore Drive. With the construction of the new roadway, traffic operations are anticipated to improve with the additional capacity and split of traffic. The daily traffic volumes on Northshore Drive between 484<sup>th</sup> Avenue/Westshore Drive and Streeter Drive are anticipated to decrease from 6,500 to 4,600 vehicles per day. The results of the travel time analysis conducted indicate that this alternative would provide the fastest route between 484<sup>th</sup> Street and Streeter Drive due to the higher posted speed and reduced number of access points in comparison to the existing alignment. Additionally, to fulfill the funding requirements of the project, a bypass had to be constructed to reroute Northshore Drive traffic. Build Alternative 3 (Alt 3) does not meet this requirement, and therefore was not further progressed as an alternative.

Additionally, safety benefits are expected as traffic volumes decrease on Northshore Drive. The addition of the new roadway is anticipated to reduce follower density (followers/mile/lane) along Northshore Drive by approximately 20% based on future traffic volumes developed. Rear-ends were the most prevalent crash type observed along Northshore Drive, a reduction in follower density is anticipated to result in less rear-end type crashes. Also, the lower traffic volumes along the corridor should improve accessibility to driveways along the roadway.

Two cross-section alternatives were evaluated, Alternative 1 is a two-lane cross-section and Alternative 2 is a three-lane cross-section. Two options, Option A and Option B, were considered for Alternative 2. Option A would consist of a three-lane cross section with a two-way left-turn lane (TWLTL) through the entire stretch of the roadway. Option B considered a median divided three-lane cross section with a left-turn lane provided at major intersections and driveways for access control.

Based on the findings, it is recommended that cross-section Alternative 2B be constructed. The three-lane cross-section would accommodate future development along the new alignment. Under the 2045 unconstrained traffic volumes, the new alignment is anticipated to operate at LOS F with a two-lane cross-section and LOS B with a three-lane cross-section. This cross-section would also provide safety benefits by providing separation between the two travel lanes, reducing the possibility of crash types such as head-on collisions and sideswipes in the opposite direction.

### 5.3.2 Intersection Alternative Screening

Intersection alternatives were evaluated at the intersections of Westshore Drive with Northshore Drive, Streeter Drive with Northshore Drive, 484<sup>th</sup> Avenue with S. 333<sup>rd</sup> Avenue, and 484<sup>th</sup> Avenue with S. 333<sup>rd</sup> Avenue based on the selection criteria developed for the project. An alternatives analysis was not completed for the interchange ramp terminals due to past studies identifying independent future improvements. A summary of the screening results is shown in **Figure 5-11**.

***ID #1: Westshore Drive with Northshore Drive***

Based on the findings of the study, it is recommended that the intersection be TWSC with a sweeping curve alignment (Alt. 2) connecting Westshore Drive to Northshore Drive. Westshore Drive will T into the sweeping curve. Under this alternative, the proposed lane geometry and traffic control is anticipated to discourage traffic to and from CR-23 to cut-through Northshore Drive. In addition to improved traffic operations for intersection movements, this intersection alternative does not stop traffic along the new roadway and therefore provides minimal interruption to traffic flow. This promotes the continuous east-west connection from I-29 to County Road 23. This alternative is expected to improve safety for vulnerable users as it reduces vehicle exposure by shifting the intersection away from the school.

***ID #2: Streeter Drive with Northshore Drive***

Based on the findings of the study, it is recommended that the intersection be TWSC (Alt. 1) connecting Northshore Drive/Streeter Drive to the proposed bypass. This alternative provides adequate traffic operations and a continuous connection between Northshore Drive and Streeter Drive. Additionally, this alternative provides minimal ROW and property impacts.

***ID #5: 484<sup>th</sup> Avenue with S. 333<sup>rd</sup> Avenue***

Based on the findings of the study, it is recommended that the intersection be TWSC with a sweeping curve alignment (Alt. 2) connecting 333<sup>rd</sup> Avenue to 484<sup>th</sup> Avenue. 484<sup>th</sup> Avenue will T into the sweeping curve. This alternative provides improved traffic operations and provides a continuous east-west connection from I-29 to County Road 23. By not stopping traffic on the new roadway at the intersection with Westshore Drive, it allows for minimal interruptions in traffic flow when traveling east-west between I-29 and County Road 23.

***ID #6: Northshore Drive with S. 333<sup>rd</sup> Avenue***

Based on the findings of the study, it is recommended the intersection be a TWSC T-intersection with a westbound left-turn lane (Alt. 1). This alternative provides improved traffic operations and vehicle safety by incorporating intersection geometry and traffic control that is typical to driver expectations. The intersection control allows for continuous traffic flow, with minimal interruptions along the new roadway from I-29 to County Road 23. Additionally, this alternative provides minimal impacts to properties and ROW.

**5.4 Access Control**

Access control is a vital system implemented to manage and regulate the entry of vehicles and pedestrians onto roadways. This control mechanism ensures the safety and security of the transportation infrastructure and the surrounding environment. Restricting roadway access control helps prevent unauthorized entry, reduce traffic congestion, and minimizes the risk of crashes. Additionally, it allows authorities to manage traffic flow efficiently, especially during emergencies or peak hours, leading to smoother travel experiences for commuters. With the proposed Northshore Drive realignment (333<sup>rd</sup> Avenue) an access control policy is recommended. Access spacing should be limited to full access locations at 1/4 mile spacing and limited access (RIRO or 3/4 access) locations at 1/8 mile spacing. A center median would provide a physical barrier for access control along the corridor.

Evaluation Factors	Intersection Control Screening										
	Int. # 1 Westshore Dr & Northshore Dr			Int. # 2 Northshore Dr & Streeter Dr			Int. # 5 484th Ave & S. 333rd Ave		Int. # 6 Northshore Dr & S. 333rd Ave		
	Alt. 1	Alt. 2	Alt. 3	Alt. 1	Alt. 2	Alt. 3	Alt. 1	Alt. 2	Alt. 1	Alt. 2	Alt. 3
	TWSC (Standard Intersection)	TWSC (Sweeping Curve)	Roundabout	TWSC (No Auxiliary Lanes)	TWSC (w/ SB Channelized RT)	Roundabout	TWSC (Standard Intersection)	TWSC (Sweeping Curve)	TWSC (w/ WB LT)	TWSC (w/ WB LT & NB Channelized RT)	Roundabout
Traffic Operations*											
Future (2045)	LOS C	LOS C	LOS A	LOS C	LOS C	LOS A	LOS B	LOS B	LOS B	LOS B	LOS A
Traffic Flow Friction/Interruption	High Friction	Minimal Friction	Moderate Friction	Minimal Friction	Minimal Friction	Moderate Friction	High Friction	Minimal Friction	Minimal Friction	Minimal Friction	Moderate Friction
Safety Impacts											
Max CRF of Proposed Intersection Improvement	-	26.6%	72.0%	-	26.6%	72.0%	-	26.6%	33.0%	24.0%	72.0%
Driver Expectation	Familiar	Familiar	Unfamiliar	Familiar	Familiar	Unfamiliar	Familiar	Familiar	Familiar	Familiar	Unfamiliar
Access Management											
Driveways Impacted	None	None	None	None	None	One Driveway	None	None	None	None	None
Pedestrian & Bicycle Facilities											
Safety Improvements for Users	Status Quo	Reduced Vehilce Exposure	Pedestrian Refuge on Splitter Islands	Status Quo	Multi-Lane Crossing	Pedestrian Refuge on Splitter Islands	N/A	N/A	Status Quo	Multi-Lane Crossing	Pedestrian Refuge on Splitter Islands
Property Impacts & ROW											
Anticipated ROW Needed (Acres)	0.3	2.9	1.6	1.0	1.0	2.1	0.3	3.0	1.0	1.0	2.1
Number of Properties Impacted	0	1	1	0	0	2	0	1	0	0	1
Cost											
Anticipated Cost of Construction	\$ 1,725,000	\$ 1,900,000	\$ 2,910,000	\$ 2,300,000	\$ 2,300,000	\$ 2,400,000	\$ 2,550,000	\$ 1,600,000	\$ 2,300,000	\$ 2,300,000	\$ 3,050,000
Evaluation Rating											
Ranking	2	1	3	1	2	3	2	1	1	2	3

\*Traffic signal is not warranted but intersection should be continually monitored

Rating Scale	
Highly Positive	
Moderately Positive	
Neutral	
Moderately Negative	
Highly Negative	



FIGURE 5-11  
Intersection Alternatives Evaluation Matrix  
SDDOT Northshore Dr. Study 122309-01 12/20/24

Evaluation Factors	Alignment Alternative Screening			
	No Build Alternative (Alt 0)	Build Alternative 1 (Alt 1)	Build Alternative 2 (Alt 2)	Build Alternative 3 (Alt 3)
<b>Traffic Operations</b>				
Future (2045)	LOS D	LOS A	LOS A	LOS A
Travel Time From I-29 to 484th (minutes)	3.17	1.83	2.12	3.03
Travel Time To School Using Alignment (minutes)	2.14	1.76	2.37	2.12
Travel Time To School Using Fastest Route (minutes)	2.14	1.76	2.12	2.12
Creates a Faster Route for School Traffic	-	Yes	No	-
Distance to School (feet)	3,750	4,850	6,000	4,000
<b>Safety Impacts</b>				
Roadway Geometrics	Does not meet standards	Current Roadway Standards	Current Roadway Standards	Current Roadway Standards
Intersection Design	No Improvements	Safety Improvements	Safety Improvements	Safety Improvements
<b>Funding Source</b>				
Fulfillment of the congressional funding granted	No	Yes	Yes	No
<b>Access Management &amp; Connectivity</b>				
Access to existing properties	No changes to access	Additional school access	Additional school access	Improves access to existing properties
Future growth and development	Limits future growth	Supports future growth	Supports future growth	Limits future growth
<b>Property Impacts &amp; ROW</b>				
Anticipated ROW Needed (Acres)	-	19.5	20.7	11.2
Number of Properties Impacted	0	3	2	15+
<b>Cost</b>				
Anticipated Cost of Construction	-	\$ 22,121,272	\$ 24,608,343	\$ 60,639,125
<b>Evaluation Rating</b>				
Status	EXISTING	RECOMMENDED	ADVANCED	ELIMNATED

Rating Scale	
Highly Positive	
Moderately Positive	
Neutral	
Moderately Negative	
Highly Negative	

**FIGURE 5-12**  
**Alignment Alternatives Evaluation Matrix**



## 6. SUMMARY AND RECOMMENDATIONS

### 6.1 Study Findings and Recommendations

Key findings and recommendations of this study are summarized as follows:

- For the study area intersections, the AM peak hour was determined to be 7:30 AM to 8:30 AM, PM peak hour was 5:00 PM to 6:00 PM, and Dismissal peak hours were determined to be 3:15 PM to 4:15 PM.
- Under Existing (2022) traffic conditions, At the study intersections, all movements operate at LOS C or better during the peak hours except for the following two movements, which operate at LOS E during the AM peak hour:
  - Northbound shared left/right-turn movement at the intersections of I-29 NB Ramp and Streeter Drive with Northshore Drive.
  - Northbound shared left/right-turn movement at the intersection of Streeter Drive with Northshore Drive.
- Crash data for Northshore Drive from 484<sup>th</sup> Avenue/Westshore Drive to the I-29 Northbound Ramps was compiled and reviewed for any trends. Weighted crash rates for study intersections and segments were calculated using the SDDOT weight factors for crash severity. Segments were compared with the statewide average weighted crash rate for Urban Minor Arterials. All study segments were below the statewide average rate. Additionally, there were no study intersections identified with a high weighted crash rate. It should be noted that all 9 of the intersections related crashes and 8 of the 12 segment related crashes were rear-end type crashes.
- Based on SIMPCO growth projections, The average annual growth rate in the study area from 2017 to 2045 is approximately 0.5% along Northshore Drive and 1.0% along I-29. Existing volumes, projected growth rates, future ADTs, and NCHRP Report 255 & NCHRP Report 765 methodologies were used to develop 2025 and 2045 background traffic volumes.
- With the proposed roadway, S. 333<sup>rd</sup> Street, additional growth in the study area is anticipated in addition to the growth project through the SIMPCO model. Zoning for the undeveloped areas were provided in the Master Plan North of Northshore Drive put together by Stockwell Engineers and was used to develop trip generation estimates for the area. The development of the lots is anticipated to generate approximately 6,174 daily vehicle-trips to the roadway network, including 507 vehicle-trips during the AM and 551 vehicle-trips during the PM peak hour.

#### **Alignment Alternative Analysis:**

- An analysis was conducted to determine whether the construction of the proposed roadway would improve traffic and safety along the corridor. As part of the analysis conducted, alternative alignments and cross-sections were considered to accommodate the purpose and need of the project.
  - Based on the results, traffic operations are anticipated to improve along Northshore Drive to an acceptable level with additional capacity from the split of traffic to the new roadway. The daily traffic volumes on Northshore Drive between 484<sup>th</sup> Avenue/Westshore Drive and Streeter Drive are anticipated to decrease from 6,500 to 4,600 vehicles per day.
  - Safety benefits are expected as traffic volumes decrease on Northshore Drive. The addition of the new roadway is anticipated to reduce follower density (followers/mile/lane) along

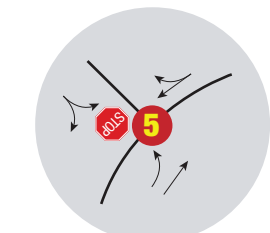
Northshore Drive by approximately 20% based on future traffic volumes developed. Lower traffic volumes should improve accessibility to driveways along the corridor.

- The addition of the new roadway will provide an access-controlled route through the area, limiting the number of vehicles and pedestrian conflict points. There are currently 39 access points along the south side of Northshore Drive and 15 access points on the north side from 484<sup>th</sup> Avenue/Westshore Drive to just west of Streeter Drive.
- It is recommended that **Alternative 1** alignment, just north of the Dakota Valley Schools, be constructed. This alignment accommodates for future growth in the area and provides the fastest and most direct east-west route and brings school traffic off Northshore Drive by providing a faster route to the schools.
- It is recommended that **Alternative 2B**, a median divided three-lane cross-section, be constructed for the realigned Northshore Drive.
- Access spacing along the realigned Northshore Drive should be limited to full access locations at 1/4 mile spacing and limited access (R/O or 3/4 access) locations at 1/8 mile spacing. Auxiliary turn lanes shall be provided along the corridor as needed.

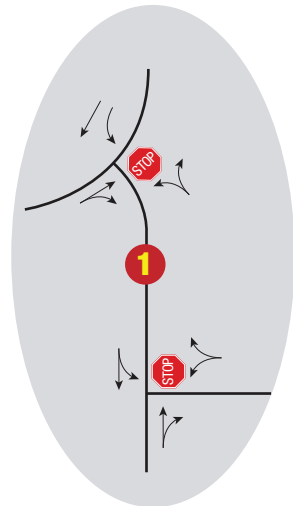
### **Intersection Alternative Analysis:**

- An intersection alternative evaluation was completed along Northshore Drive and the proposed S. 333<sup>rd</sup> Avenue. Results from the intersection operations analysis, crash analysis, and pedestrian and bicycle safety were utilized to determine the recommended intersection configurations for these locations. The appropriate traffic control and lane assignment at the study intersections was determined based on the alternatives developed. **Figure 6-1** illustrates the proposed intersection traffic control and lane assignment for anticipated 2045 future traffic operations.
- The following intersection alternatives are recommended:
  - Streeter Drive with Northshore Drive – **Alternative 1: TWSC (No Auxiliary Lanes).**
    - The connecting roadway between Northshore Drive and 333<sup>rd</sup> Avenue shall T into Northshore Drive.
  - Westshore Drive with Northshore Drive – **Alternative 2: TWSC T-intersection with sweeping curve alignment.**
    - Westshore Drive shall T into the sweeping curve and Northshore Drive shall T into Westshore Drive.
  - 484<sup>th</sup> Avenue with the proposed S. 333<sup>rd</sup> Avenue – **Alternative 2: TWSC T-intersection with sweeping curve alignment.**
    - 484<sup>th</sup> Avenue shall T into S. 333<sup>rd</sup> Avenue.
  - Northshore Drive with the proposed S. 333<sup>rd</sup> Avenue – **Alternative 1: TWSC T-intersection with a westbound left-turn lane.**
    - Northshore Drive shall T into S. 333<sup>rd</sup> Avenue.

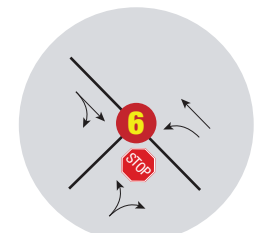




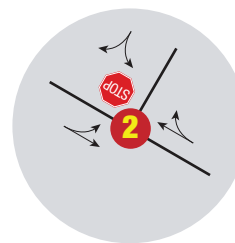
Alt. 2



Alt. 2



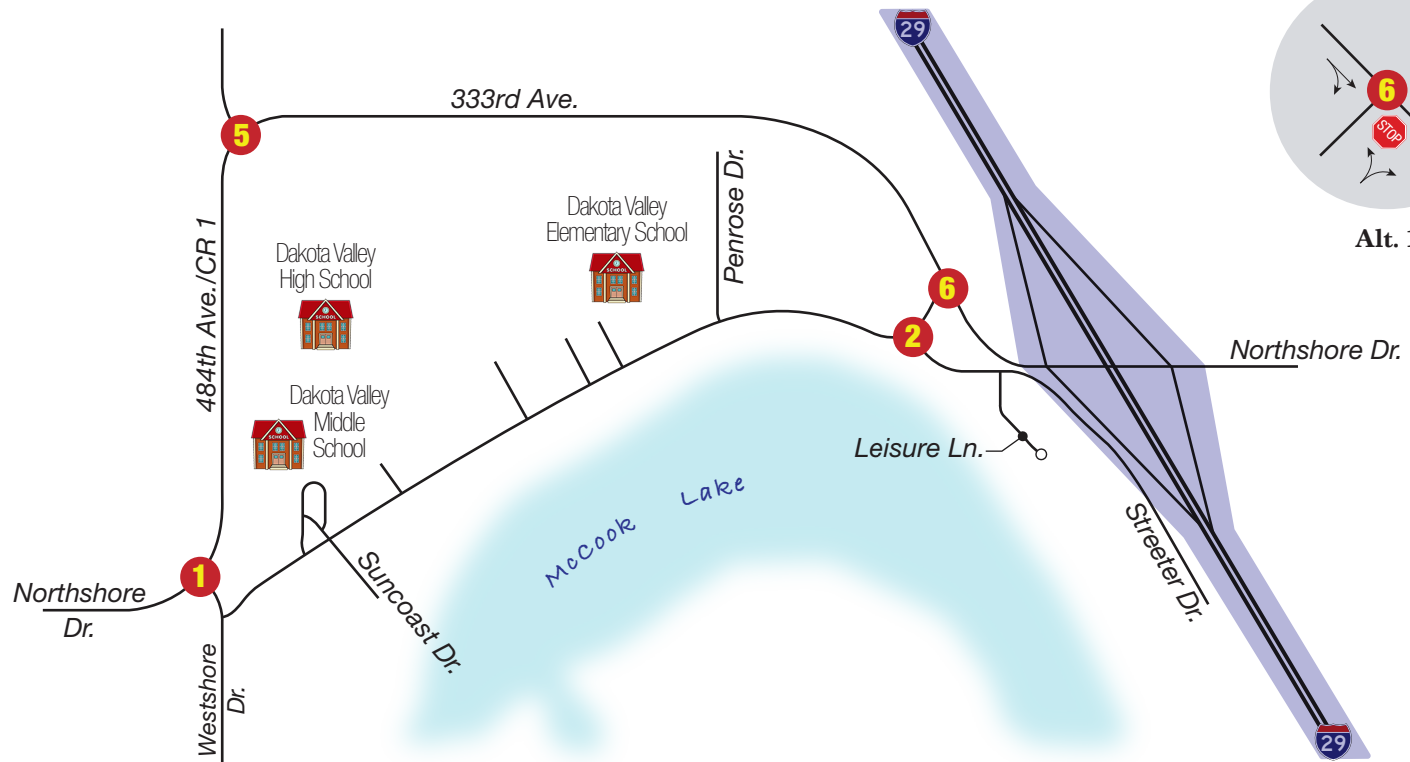
Alt. 1



Alt. 1

# LEGEND

- = Stop Sign
- = Study Intersection
- = Supplemental Intersection
- = Previously Studied



## APPENDIX A. TRAFFIC COUNT



ALL TRAFFIC DATA SERVICES

(303) 216-2439

www.alltrafficdata.net

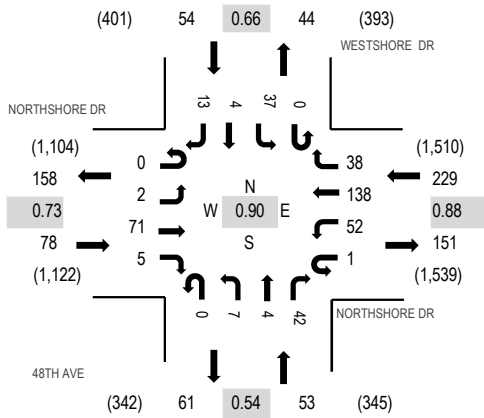
Location: 1 48TH AVE & NORTHSORE DR AM

Date: Tuesday, December 6, 2022

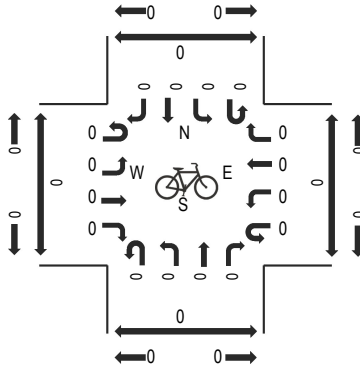
Peak Hour: 05:00 PM - 06:00 PM

Peak 15-Minutes: 05:00 PM - 05:15 PM

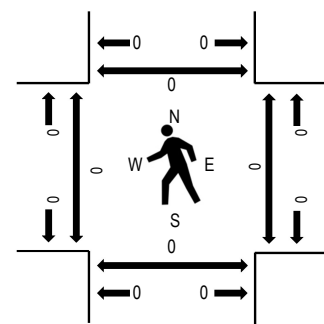
### Peak Hour - Motorized Vehicles



### Peak Hour - Bicycles



### Peak Hour - Pedestrians



Note: Total study counts contained in parentheses.

### Traffic Counts - Motorized Vehicles

Interval Start Time	NORTHSORE DR Eastbound				NORTHSORE DR Westbound				48TH AVE Northbound				WESTSHORE DR Southbound				Total	Rolling Hour	Pedestrian Crossings			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right			West	East	South	North
12:00 AM	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	2	0	0	0	0
12:15 AM	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	3	0	0	0	0
12:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0
12:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0
1:00 AM	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	2	9	0	0	0	0
1:15 AM	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	8	0	0	0	0
1:30 AM	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	2	7	0	0	0	0
1:45 AM	0	0	1	0	0	0	0	1	0	0	0	1	0	1	0	0	4	6	0	0	0	0
2:00 AM	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	2	0	0	0	0
2:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0
2:30 AM	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	3	0	0	0	0
2:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0
3:00 AM	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0
3:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0
4:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0	0	0	0
4:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13	0	0	0	0
4:30 AM	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2	23	0	0	0	0
4:45 AM	0	0	3	0	0	0	0	1	0	0	0	1	0	0	0	0	5	32	0	0	0	0
5:00 AM	0	0	5	0	0	0	0	0	0	0	0	0	0	0	1	0	6	44	0	0	0	0
5:15 AM	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	10	55	0	0	0	0
5:30 AM	0	0	6	1	0	0	0	1	0	0	0	2	0	1	0	0	11	69	0	0	0	0
5:45 AM	1	0	8	0	0	0	2	2	0	1	0	2	0	1	0	0	17	102	0	0	0	0
6:00 AM	0	1	11	0	0	1	2	1	0	0	0	1	0	0	0	0	17	118	0	0	0	0
6:15 AM	0	3	12	0	0	0	2	3	0	0	0	4	0	0	0	0	24	148	0	0	0	0
6:30 AM	0	0	25	1	0	1	4	7	0	0	0	3	0	3	0	0	44	182	0	0	0	0
6:45 AM	0	2	22	0	0	1	2	2	0	1	0	1	0	2	0	0	33	256	0	0	0	0
7:00 AM	0	0	23	0	0	0	6	9	0	0	0	4	0	5	0	0	47	335	0	0	0	0
7:15 AM	0	3	27	0	0	0	6	9	0	0	1	4	0	7	1	0	58	393	0	0	0	0
7:30 AM	0	7	66	0	0	0	4	18	0	1	2	7	0	11	1	1	118	401	0	0	0	0
7:45 AM	0	9	46	1	0	3	7	23	0	0	3	4	0	15	1	0	112	317	0	0	0	0
8:00 AM	0	22	32	0	0	4	15	15	0	0	3	7	0	7	0	0	105	251	0	0	0	0
8:15 AM	0	9	20	0	0	1	17	8	0	0	1	3	0	4	0	3	66	179	0	0	0	0

8:30 AM	0	0	17	1	0	1	7	1	0	1	0	5	0	1	0	0	34	157	2	1	1	0
8:45 AM	0	0	18	0	0	2	8	8	0	0	1	2	0	5	0	2	46	166	0	0	1	0
9:00 AM	0	2	12	0	0	3	11	2	0	0	0	1	0	2	0	0	33	153	0	0	0	0
9:15 AM	0	0	14	0	0	0	14	5	0	0	1	4	0	5	0	1	44	157	0	0	0	0
9:30 AM	0	4	19	0	0	3	9	2	0	2	0	3	0	1	0	0	43	137	0	1	0	0
9:45 AM	0	0	18	0	0	4	6	1	0	0	0	2	0	2	0	0	33	122	1	0	0	1
10:00 AM	0	0	12	1	0	1	15	1	0	0	0	4	0	0	0	3	37	105	0	0	0	0
10:15 AM	0	0	12	0	0	0	5	2	0	0	0	3	0	1	0	1	24	97	0	0	0	0
10:30 AM	0	0	15	0	1	1	7	0	0	0	0	2	0	1	0	1	28	113	0	0	0	0
10:45 AM	0	0	8	0	0	1	4	0	0	0	0	2	0	1	0	0	16	118	0	0	0	0
11:00 AM	0	0	8	0	0	4	12	1	0	0	0	3	0	1	0	0	29	152	0	0	0	0
11:15 AM	0	0	16	0	0	3	12	4	0	0	0	2	0	3	0	0	40	165	0	0	0	0
11:30 AM	0	2	13	0	0	3	5	2	0	0	0	4	0	1	2	1	33	169	0	0	0	0
11:45 AM	0	2	14	0	0	1	16	4	0	1	3	2	0	4	1	2	50	176	0	0	0	0
12:00 PM	0	0	14	1	0	4	14	1	0	0	1	3	0	4	0	0	42	162	0	0	0	0
12:15 PM	0	1	16	1	0	2	17	0	0	1	1	2	0	3	0	0	44	167	0	0	0	0
12:30 PM	0	1	14	2	0	1	11	6	0	0	0	1	0	2	1	1	40	151	0	0	0	0
12:45 PM	0	0	17	0	0	0	14	3	0	2	0	0	0	0	0	0	36	152	0	0	0	0
1:00 PM	0	2	14	0	0	0	18	5	0	0	0	0	0	7	1	0	47	160	0	0	0	0
1:15 PM	0	0	8	0	0	2	15	0	0	0	1	1	0	1	0	0	28	154	0	0	0	0
1:30 PM	0	1	9	1	0	2	18	4	0	0	0	1	0	5	0	0	41	166	0	0	0	0
1:45 PM	0	1	10	1	0	2	14	8	0	0	0	3	0	4	0	1	44	189	0	0	0	0
2:00 PM	0	2	9	0	0	5	13	1	0	0	1	3	0	5	0	2	41	196	0	0	0	0
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2:30 PM	0	1	12	0	0	1	13	2	0	1	0	5	0	16	3	10	64	264	0	0	0	0
2:45 PM	0	2	14	0	0	2	19	2	0	0	1	0	0	6	1	4	51	262	0	0	0	0
3:00 PM	0	5	18	0	0	3	9	5	0	0	1	2	0	4	2	6	55	291	0	0	1	0
3:15 PM	0	1	20	0	0	9	23	10	0	2	1	4	0	17	2	5	94	311	0	18	18	0
3:30 PM	0	1	12	3	0	5	24	3	0	0	0	4	0	7	0	3	62	321	0	1	1	0
3:45 PM	0	2	15	0	0	8	25	7	0	0	1	9	0	10	1	2	80	340	0	0	0	0
4:00 PM	0	0	14	2	0	13	23	2	0	2	1	2	0	11	3	2	75	339	1	0	0	0
4:15 PM	0	0	24	2	0	15	27	5	0	1	3	10	0	12	4	1	104	379	0	0	0	0
4:30 PM	0	0	17	0	0	9	34	5	0	0	0	9	0	5	0	2	81	383	0	0	0	0
4:45 PM	0	0	16	5	0	13	26	8	0	0	0	4	0	6	0	1	79	406	0	0	0	0
5:00 PM	0	1	15	0	0	22	33	11	0	6	1	16	0	8	0	2	115	414	0	0	0	0
5:15 PM	0	0	19	1	1	8	41	12	0	0	0	5	0	17	0	4	108	359	0	0	0	0
5:30 PM	0	0	25	4	0	14	33	10	0	0	1	5	0	7	1	4	104	309	0	0	0	0
5:45 PM	0	1	12	0	0	8	31	5	0	1	2	16	0	5	3	3	87	300	0	0	0	0
6:00 PM	0	0	17	0	0	6	29	0	0	1	1	3	0	2	1	0	60	260	0	0	0	0
6:15 PM	0	2	12	1	0	11	23	1	0	0	0	4	0	4	0	0	58	233	0	0	0	0
6:30 PM	0	1	20	4	0	16	23	0	0	8	0	20	0	2	1	0	95	214	0	0	0	0
6:45 PM	0	0	3	0	0	9	21	0	0	0	1	8	0	4	1	0	47	140	0	0	0	0
7:00 PM	0	0	5	0	0	4	13	0	0	1	0	10	0	0	0	0	33	128	0	0	0	0
7:15 PM	0	0	4	0	0	5	17	0	0	1	1	10	0	1	0	0	39	126	0	0	0	0
7:30 PM	0	0	5	0	0	0	13	1	0	0	0	1	0	1	0	0	21	123	0	0	0	0
7:45 PM	0	0	4	0	0	4	24	1	0	0	0	0	0	0	0	2	35	136	0	0	0	0
8:00 PM	0	0	7	0	0	3	16	1	0	0	1	2	0	0	0	1	31	125	0	0	0	0
8:15 PM	0	0	11	1	0	7	15	0	0	0	0	1	0	0	1	0	36	124	0	0	0	0
8:30 PM	0	0	8	0	0	4	11	1	0	1	1	7	0	0	1	0	34	103	0	0	0	0
8:45 PM	0	0	3	0	0	2	15	0	0	0	0	1	0	2	0	1	24	85	0	0	0	0
9:00 PM	0	1	4	1	0	2	6	2	0	2	1	6	0	4	1	0	30	71	0	0	0	0
9:15 PM	0	0	3	0	0	2	6	0	0	0	0	0	0	0	1	3	15	69	0	0	0	0
9:30 PM	0	0	2	0	0	0	12	1	0	0	0	0	0	0	0	1	16	62	0	0	0	0
9:45 PM	0	0	3	0	0	1	4	2	0	0	0	0	0	0	0	0	10	54	0	0	0	0
10:00 PM	0	1	2	0	0	1	14	1	0	0	0	4	0	3	2	0	28	45	0	0	0	0
10:15 PM	0	0	0	0	0	0	3	0	0	0	0	0	0	1	1	3	8	19	0	0	0	0
10:30 PM	0	0	0	0	0	0	3	0	0	0	0	1	0	3	0	1	8	14	0	0	0	0
10:45 PM	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	7	0	0	0	0
11:00 PM	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	2	7	0	0	0	0
11:15 PM	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	3		0	0	0	0
11:30 PM	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1		0	0	0	0

11:45 PM	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Count Total	1	96	990	35	2	267	981	260	0	38	37	270	0	277	40	84	3,378	4	21	22	1
Peak Hour	0	2	71	5	1	52	138	38	0	7	4	42	0	37	4	13	414	0	0	0	0



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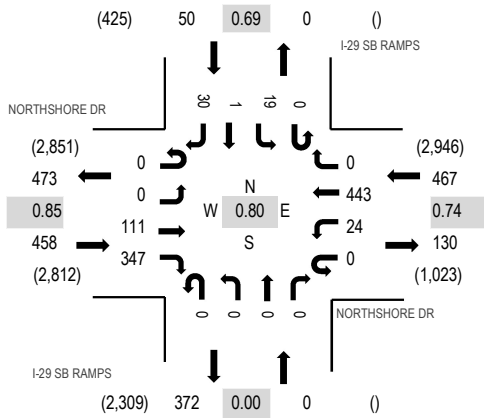
Location: 2 I-29 SB RAMPS & NORTHSORE DR AM

Date: Tuesday, December 6, 2022

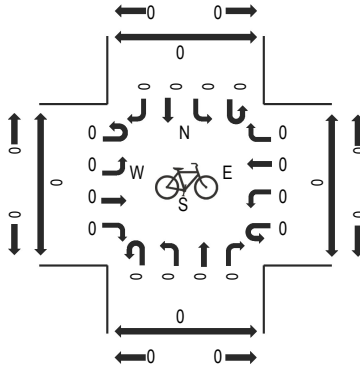
Peak Hour: 07:30 AM - 08:30 AM

Peak 15-Minutes: 07:45 AM - 08:00 AM

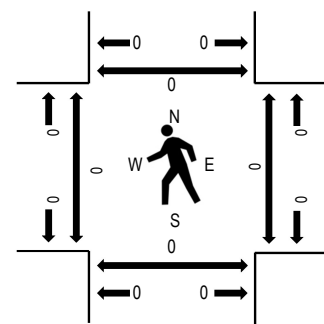
### Peak Hour - Motorized Vehicles



### Peak Hour - Bicycles



### Peak Hour - Pedestrians



Note: Total study counts contained in parentheses.

### Traffic Counts - Motorized Vehicles

Interval Start Time	NORTHSORE DR Eastbound				NORTHSORE DR Westbound				I-29 SB RAMPS Northbound				I-29 SB RAMPS Southbound				Total	Rolling Hour	Pedestrian Crossings			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right			West	East	South	North
12:00 AM	0	0	0	3	0	0	2	0	0	0	0	0	0	0	0	0	5	7	0	0	0	0
12:15 AM	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	4	0	0	0	0
12:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0	0	0	0
12:45 AM	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	9	0	0	0	0
1:00 AM	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	2	14	0	0	0	0
1:15 AM	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	4	15	0	0	0	0
1:30 AM	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	2	14	0	0	0	0
1:45 AM	0	0	2	0	0	0	4	0	0	0	0	0	0	0	0	0	6	14	0	0	0	0
2:00 AM	0	0	1	1	0	0	1	0	0	0	0	0	0	0	0	0	3	8	0	0	0	0
2:15 AM	0	0	1	1	0	0	1	0	0	0	0	0	0	0	0	0	3	7	0	0	0	0
2:30 AM	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	2	5	0	0	0	0
2:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0
3:00 AM	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	2	6	0	0	0	0
3:15 AM	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	5	0	0	0	0
3:30 AM	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	6	0	0	0	0
3:45 AM	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	2	12	0	0	0	0
4:00 AM	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	25	0	0	0	0
4:15 AM	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2	36	0	0	0	0
4:30 AM	0	0	3	1	0	2	0	0	0	0	0	0	0	1	0	0	7	53	0	0	0	0
4:45 AM	0	0	5	5	0	1	2	0	0	0	0	0	0	2	0	0	15	72	0	0	0	0
5:00 AM	0	0	4	7	0	0	1	0	0	0	0	0	0	0	0	0	12	83	0	0	0	0
5:15 AM	0	0	7	8	0	1	1	0	0	0	0	0	0	2	0	0	19	102	0	0	0	0
5:30 AM	0	0	12	8	0	3	1	0	0	0	0	0	0	2	0	0	26	138	0	0	0	0
5:45 AM	0	0	2	14	0	2	4	0	0	0	0	0	0	4	0	0	26	170	0	0	0	0
6:00 AM	0	0	7	9	0	1	12	0	0	0	0	0	0	1	0	1	31	216	0	0	0	0
6:15 AM	0	0	7	26	0	2	14	0	0	0	0	0	0	4	0	2	55	265	0	0	0	0
6:30 AM	0	0	10	26	0	6	13	0	0	0	0	0	0	3	0	0	58	313	0	0	0	0
6:45 AM	0	0	12	33	0	3	10	0	0	0	0	0	0	12	0	2	72	471	0	0	0	0
7:00 AM	0	0	15	21	0	8	25	0	0	0	0	0	0	8	0	3	80	702	0	0	0	0
7:15 AM	0	0	12	32	0	11	41	0	0	0	0	0	0	3	0	4	103	919	0	0	0	0
7:30 AM	0	0	24	89	0	7	77	0	0	0	0	0	0	6	0	13	216	975	0	0	0	0
7:45 AM	0	0	29	101	0	4	148	0	0	0	0	0	0	10	1	10	303	841	0	0	0	0
8:00 AM	0	0	36	99	0	8	149	0	0	0	0	0	0	2	0	3	297	602	0	0	0	0
8:15 AM	0	0	22	58	0	5	69	0	0	0	0	0	0	1	0	4	159	358	0	0	0	0

8:30 AM	0	0	19	27	0	10	20	0	0	0	0	0	0	3	1	2	82	268	0	0	0	0
8:45 AM	0	0	15	19	0	7	22	0	0	0	0	0	0	1	0	0	64	243	0	0	0	0
9:00 AM	0	0	7	14	0	5	21	0	0	0	0	0	0	2	0	4	53	242	0	0	0	0
9:15 AM	0	0	8	24	0	5	28	0	0	0	0	0	0	2	0	2	69	246	0	0	0	0
9:30 AM	0	0	7	29	0	6	12	0	0	0	0	0	0	1	0	2	57	229	0	0	0	0
9:45 AM	0	0	14	18	0	2	21	0	0	0	0	0	0	7	0	1	63	227	0	0	0	0
10:00 AM	0	0	7	18	0	2	24	0	0	0	0	0	0	6	0	0	57	217	0	0	0	0
10:15 AM	0	0	6	13	0	7	21	0	0	0	0	0	0	1	0	4	52	224	0	0	0	0
10:30 AM	0	0	8	22	0	4	15	0	0	0	0	0	0	2	0	4	55	237	0	0	0	0
10:45 AM	0	0	12	14	0	4	18	0	0	0	0	0	0	2	0	3	53	253	0	0	0	0
11:00 AM	0	0	12	13	0	5	29	0	0	0	0	0	0	4	0	1	64	269	0	0	0	0
11:15 AM	0	0	8	18	0	6	26	0	0	0	0	0	0	2	0	5	65	284	0	0	0	0
11:30 AM	0	0	13	31	0	5	21	0	0	0	0	0	0	0	0	1	71	282	0	0	0	0
11:45 AM	0	0	8	26	0	2	29	0	0	0	0	0	0	2	0	2	69	261	0	0	0	0
12:00 PM	0	0	10	24	0	4	33	0	0	0	0	0	0	3	1	4	79	265	0	0	0	0
12:15 PM	0	0	12	19	0	3	25	0	0	0	0	0	0	1	0	3	63	265	0	0	0	0
12:30 PM	0	0	6	16	0	5	21	0	0	0	0	0	0	1	0	1	50	265	0	0	0	0
12:45 PM	0	0	10	19	0	3	35	0	0	0	0	0	0	3	0	3	73	273	0	0	0	0
1:00 PM	0	0	12	20	0	6	36	0	0	0	0	0	0	4	0	1	79	267	0	0	0	0
1:15 PM	1	0	8	16	0	4	33	0	0	0	0	0	0	1	0	0	63	260	0	0	0	0
1:30 PM	0	0	9	12	0	3	26	0	0	0	0	0	0	4	0	4	58	277	0	0	0	0
1:45 PM	0	0	14	12	0	2	33	0	0	0	0	0	0	4	0	2	67	348	0	0	0	0
2:00 PM	0	0	7	26	0	5	32	0	0	0	0	0	0	1	0	1	72	397	0	0	0	0
2:15 PM	0	0	12	22	0	6	34	0	0	0	0	0	0	3	1	2	80	467	0	0	0	0
2:30 PM	0	0	16	62	0	4	40	0	0	0	0	0	0	1	0	6	129	602	0	0	0	0
2:45 PM	0	0	12	20	0	4	71	0	0	0	0	0	0	5	1	3	116	618	0	0	0	0
3:00 PM	0	0	12	43	0	9	72	0	0	0	0	0	0	4	0	2	142	642	0	0	0	0
3:15 PM	0	0	31	106	0	7	66	0	0	0	0	0	0	2	0	3	215	653	0	0	0	0
3:30 PM	0	0	18	64	0	11	46	0	0	0	0	0	0	1	0	5	145	598	0	0	0	0
3:45 PM	0	0	19	43	0	10	59	0	0	0	0	0	0	2	0	7	140	598	0	0	0	0
4:00 PM	0	0	30	35	0	8	67	0	0	0	0	0	0	3	0	10	153	593	0	0	0	0
4:15 PM	0	0	19	40	0	7	78	0	0	0	0	0	0	4	0	12	160	616	0	0	0	0
4:30 PM	0	0	23	41	0	13	63	0	0	0	0	0	0	3	0	2	145	626	0	0	0	0
4:45 PM	0	0	22	22	0	7	73	0	0	0	0	0	0	8	0	3	135	643	0	0	0	0
5:00 PM	0	0	20	50	0	4	94	0	0	0	0	0	0	4	0	4	176	672	0	0	0	0
5:15 PM	0	0	13	46	0	8	89	0	0	0	0	0	0	6	0	8	170	587	0	0	0	0
5:30 PM	0	0	26	50	0	6	67	0	0	0	0	0	0	5	0	8	162	506	0	0	0	0
5:45 PM	0	0	28	71	0	1	60	0	0	0	0	0	0	1	0	3	164	469	0	0	0	0
6:00 PM	0	0	5	26	0	5	47	0	0	0	0	0	0	2	0	6	91	369	0	0	0	0
6:15 PM	0	0	5	20	0	6	46	0	0	0	0	0	0	1	1	10	89	326	0	0	0	0
6:30 PM	0	0	13	45	0	4	56	0	0	0	0	0	0	2	0	5	125	301	0	0	0	0
6:45 PM	0	0	9	18	0	4	30	0	0	0	0	0	0	0	0	3	64	218	0	0	0	0
7:00 PM	0	0	7	8	0	3	26	0	0	0	0	0	0	2	0	2	48	218	0	0	0	0
7:15 PM	0	0	3	21	0	1	36	0	0	0	0	0	0	1	0	2	64	220	0	0	0	0
7:30 PM	0	0	6	8	0	0	26	0	0	0	0	0	0	1	0	1	42	205	0	0	0	0
7:45 PM	0	0	4	7	0	1	49	0	0	0	0	0	0	1	1	1	64	196	0	0	0	0
8:00 PM	0	0	4	14	0	6	25	0	0	0	0	0	0	0	0	1	50	165	0	0	0	0
8:15 PM	0	0	2	18	0	3	21	0	0	0	0	0	0	0	0	5	49	158	0	0	0	0
8:30 PM	0	0	4	12	0	0	17	0	0	0	0	0	0	0	0	0	33	137	0	0	0	0
8:45 PM	0	0	3	4	0	2	19	0	0	0	0	0	0	3	0	2	33	130	0	0	0	0
9:00 PM	0	0	6	15	0	2	19	0	0	0	0	0	0	0	0	1	43	116	0	0	0	0
9:15 PM	0	0	1	12	0	2	11	0	0	0	0	0	0	0	1	1	28	101	0	0	0	0
9:30 PM	0	0	5	3	0	1	15	0	0	0	0	0	0	1	1	0	26	100	0	0	0	0
9:45 PM	0	0	0	4	0	0	8	0	0	0	0	0	0	1	0	6	19	87	0	0	0	0
10:00 PM	0	0	1	8	0	0	14	0	0	0	0	0	0	0	0	5	28	72	0	0	0	0
10:15 PM	0	0	1	16	0	4	4	0	0	0	0	0	0	2	0	0	27	48	0	0	0	0
10:30 PM	0	0	2	5	0	0	3	0	0	0	0	0	0	2	0	1	13	28	0	0	0	0
10:45 PM	0	0	0	2	0	0	1	0	0	0	0	0	0	1	0	0	4	18	0	0	0	0
11:00 PM	0	0	0	1	0	0	3	0	0	0	0	0	0	0	0	0	4	16	0	0	0	0
11:15 PM	0	0	0	0	0	0	5	0	0	0	0	0	0	1	0	1	7		0	0	0	0
11:30 PM	0	0	1	1	0	0	1	0	0	0	0	0	0	0	0	0	3		0	0	0	0

11:45 PM	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	2	0	0	0	0
Count Total	1	0	831	1,980	0	320	2,626	0	0	0	0	0	0	192	9	224	6,183	0	0	0	0
Peak Hour	0	0	111	347	0	24	443	0	0	0	0	0	0	19	1	30	975	0	0	0	0





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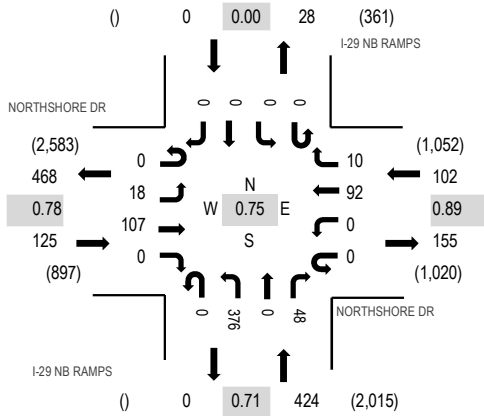
Location: 3 I-29 NB RAMPS &amp; NORTHSORE DR AM

Date: Tuesday, December 6, 2022

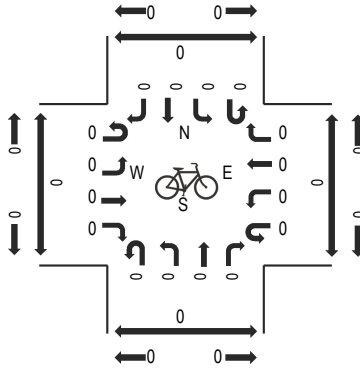
Peak Hour: 07:30 AM - 08:30 AM

Peak 15-Minutes: 07:45 AM - 08:00 AM

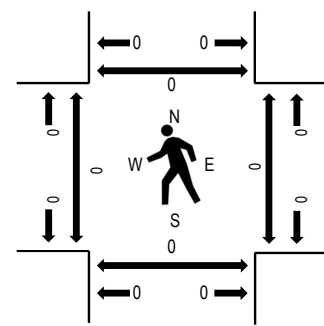
## Peak Hour - Motorized Vehicles



## Peak Hour - Bicycles



## Peak Hour - Pedestrians



Note: Total study counts contained in parentheses.

## Traffic Counts - Motorized Vehicles

Interval Start Time	NORTHSORE DR Eastbound				NORTHSORE DR Westbound				I-29 NB RAMPS Northbound				I-29 NB RAMPS Southbound				Total	Rolling Hour	Pedestrian Crossings			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right			West	East	South	North
6:00 AM	0	1	5	0	0	0	4	1	0	9	0	2	0	0	0	0	22	133	0	0	0	0
6:15 AM	0	2	9	0	0	0	7	0	0	11	0	4	0	0	0	0	33	172	0	0	0	0
6:30 AM	0	3	9	0	0	0	9	1	0	10	0	2	0	0	0	0	34	214	0	0	0	0
6:45 AM	0	4	21	0	0	0	7	1	0	5	0	6	0	0	0	0	44	301	0	0	0	0
7:00 AM	0	5	18	0	0	0	10	1	0	23	0	4	0	0	0	0	61	474	0	0	0	0
7:15 AM	0	5	11	0	0	0	19	4	0	32	0	4	0	0	0	0	75	627	0	0	0	0
7:30 AM	0	5	21	0	0	0	19	4	0	65	0	7	0	0	0	0	121	651	0	0	0	0
7:45 AM	0	6	34	0	0	0	24	3	0	130	0	20	0	0	0	0	217	585	0	0	0	0
8:00 AM	0	3	35	0	0	0	30	3	0	128	0	15	0	0	0	0	214	420	0	0	0	0
8:15 AM	0	4	17	0	0	0	19	0	0	53	0	6	0	0	0	0	99	245	0	0	0	0
8:30 AM	0	1	18	0	0	0	17	4	0	10	0	5	0	0	0	0	55	200	0	0	0	0
8:45 AM	0	1	17	0	0	0	16	1	0	14	0	3	0	0	0	0	52	176	0	0	0	0
9:00 AM	0	3	6	0	0	0	13	2	0	12	0	3	0	0	0	0	39	175	0	0	0	0
9:15 AM	0	2	8	0	0	0	15	5	0	20	0	4	0	0	0	0	54	182	0	0	0	0
9:30 AM	0	1	7	0	0	0	9	1	0	11	0	2	0	0	0	0	31	170	0	0	0	0
9:45 AM	0	4	18	0	0	0	6	2	0	16	0	5	0	0	0	0	51	177	0	0	0	0
10:00 AM	0	1	10	0	0	0	14	2	0	14	0	5	0	0	0	0	46	168	0	0	0	0
10:15 AM	0	1	7	0	0	0	10	3	0	17	0	4	0	0	0	0	42	180	0	0	0	0
10:30 AM	0	0	11	0	0	0	9	2	0	11	0	5	0	0	0	0	38	187	0	0	0	0
10:45 AM	0	2	12	0	0	0	12	3	0	10	0	3	0	0	0	0	42	190	0	0	0	0
11:00 AM	0	0	16	0	0	0	11	1	0	24	0	6	0	0	0	0	58	197	0	0	0	0
11:15 AM	0	2	8	0	0	0	13	2	0	20	0	4	0	0	0	0	49	199	0	0	0	0
11:30 AM	0	1	12	0	0	0	12	1	0	15	0	0	0	0	0	0	41	202	0	0	0	0
11:45 AM	0	4	7	0	0	0	12	1	0	20	0	5	0	0	0	0	49	208	0	0	0	0
12:00 PM	0	2	9	0	0	0	11	7	0	26	0	5	0	0	0	0	60	220	0	0	0	0
12:15 PM	0	2	12	0	0	0	13	3	0	16	0	6	0	0	0	0	52	228	0	0	0	0
12:30 PM	0	2	5	0	0	0	13	2	0	13	0	12	0	0	0	0	47	227	0	0	0	0
12:45 PM	0	2	10	0	0	0	12	4	0	26	0	7	0	0	0	0	61	225	0	0	0	0
1:00 PM	0	4	13	0	0	0	18	1	0	24	0	8	0	0	0	0	68	224	0	0	0	0
1:15 PM	0	2	7	0	0	0	16	2	0	20	0	4	0	0	0	0	51	209	0	0	0	0
1:30 PM	0	2	12	0	0	0	10	3	0	18	0	0	0	0	0	0	45	217	0	0	0	0
1:45 PM	0	1	18	0	0	0	19	1	0	16	0	5	0	0	0	0	60	247	0	0	0	0
2:00 PM	0	1	6	0	0	0	18	5	0	20	0	3	0	0	0	0	53	293	0	0	0	0
2:15 PM	0	4	13	0	0	0	20	3	0	18	0	1	0	0	0	0	59	342	0	0	0	0

2:30 PM	0	1	16	0	0	0	19	4	0	28	0	7	0	0	0	0	75	401	0	0	0	0
2:45 PM	0	0	17	0	0	0	20	7	0	56	0	6	0	0	0	0	106	416	0	0	0	0
3:00 PM	0	2	13	0	0	0	29	7	0	47	0	4	0	0	0	0	102	408	0	0	0	0
3:15 PM	0	6	27	0	0	0	19	4	0	53	0	9	0	0	0	0	118	432	0	0	0	0
3:30 PM	0	2	17	0	0	0	25	5	0	32	0	9	0	0	0	0	90	430	0	0	0	0
3:45 PM	0	5	16	0	0	0	33	7	0	35	0	2	0	0	0	0	98	456	0	1	0	0
4:00 PM	0	8	24	0	0	0	26	9	0	49	0	10	0	0	0	0	126	498	0	1	0	0
4:15 PM	0	7	16	0	0	0	21	5	0	61	0	6	0	0	0	0	116	513	0	0	0	0
4:30 PM	0	5	19	0	0	0	25	6	0	50	0	11	0	0	0	0	116	534	0	0	0	0
4:45 PM	0	5	26	0	0	0	25	12	0	58	0	14	0	0	0	0	140	538	0	0	0	0
5:00 PM	0	6	18	0	0	0	34	8	0	66	0	9	0	0	0	0	141	499	0	0	0	0
5:15 PM	0	6	11	0	0	0	26	13	0	68	0	13	0	0	0	0	137	423	0	0	0	0
5:30 PM	0	10	23	0	0	0	22	6	0	51	0	8	0	0	0	0	120	354	0	0	0	0
5:45 PM	0	20	9	0	0	0	16	2	0	50	0	4	0	0	0	0	101	310	0	0	0	0
6:00 PM	0	1	6	0	0	0	22	4	0	28	0	4	0	0	0	0	65	255	0	0	0	0
6:15 PM	0	0	6	0	0	0	18	3	0	35	2	4	0	0	0	0	68		0	0	0	0
6:30 PM	0	3	11	0	0	0	12	2	0	48	0	0	0	0	0	0	76		0	0	0	0
6:45 PM	0	3	7	0	0	0	8	2	0	24	1	1	0	0	0	0	46		0	0	0	0
Count Total	0	173	724	0	0	0	867	185	0	1,716	3	296	0	0	0	0	3,964		0	2	0	0
Peak Hour	0	18	107	0	0	0	92	10	0	376	0	48	0	0	0	0	651		0	0	0	0



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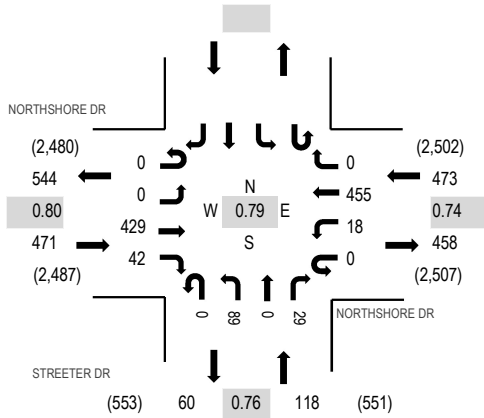
**Location:** 4 STREETER DR & NORTHSHORE DR AM

**Date:** Tuesday, December 6, 2022

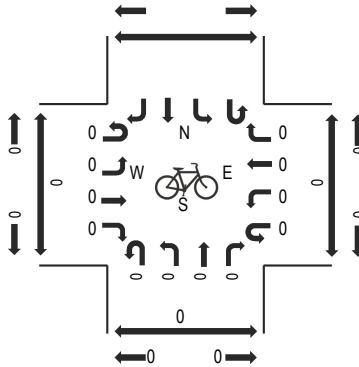
**Peak Hour:** 07:30 AM - 08:30 AM

**Peak 15-Minutes:** 08:00 AM - 08:15 AM

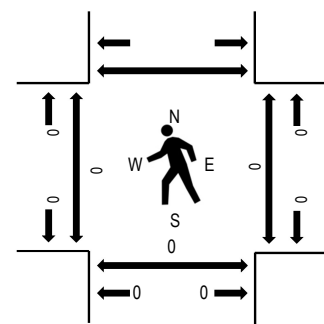
### Peak Hour - Motorized Vehicles



### Peak Hour - Bicycles



### Peak Hour - Pedestrians



Note: Total study counts contained in parentheses.

### Traffic Counts - Motorized Vehicles

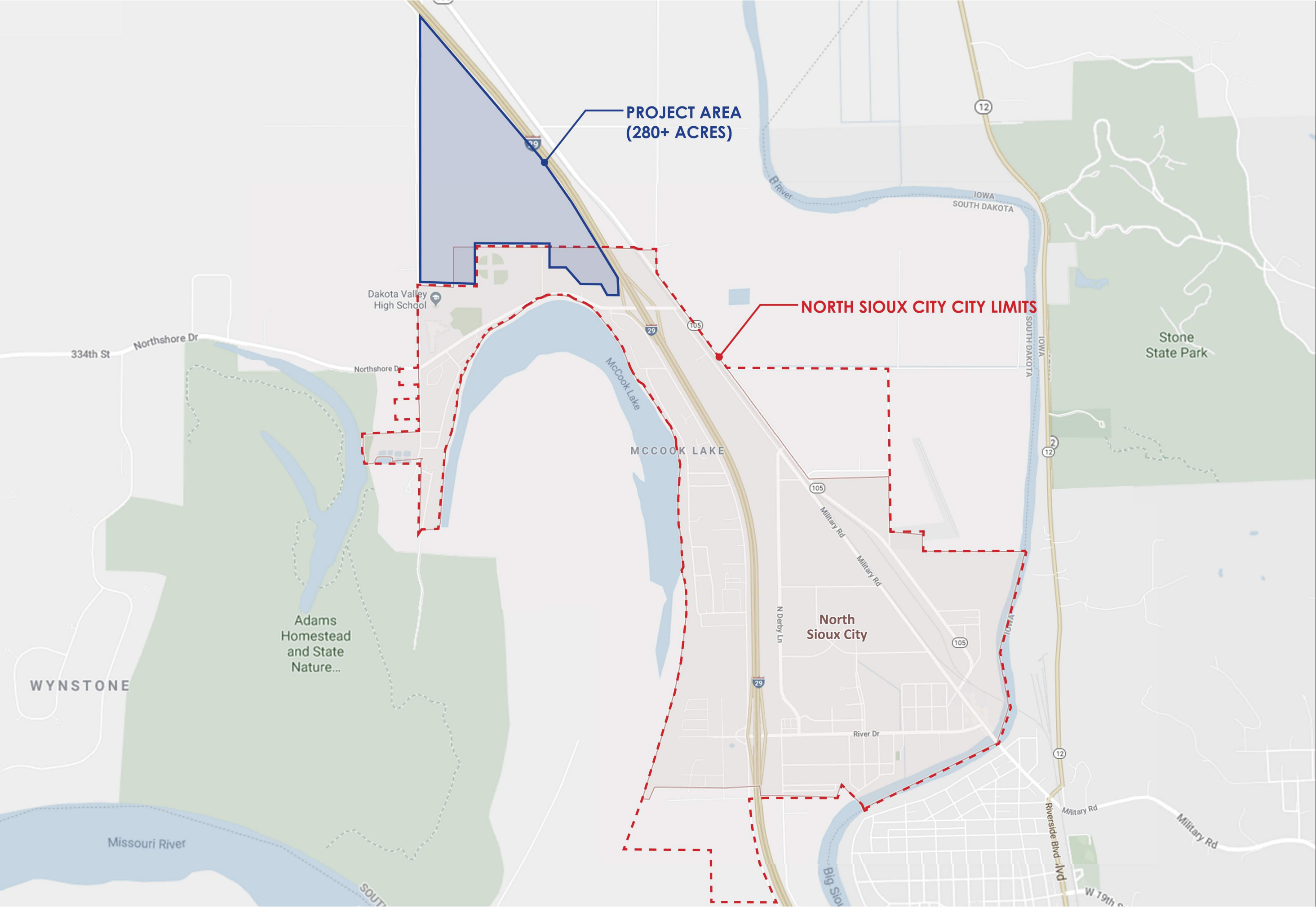
Interval Start Time	NORTHSHORE DR Eastbound				NORTHSHORE DR Westbound				STREETER DR Northbound				Southbound				Total	Rolling Hour	Pedestrian Crossings			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right			West	East	South	North
6:00 AM	0	0	13	1	0	3	11	0	0	1	0	3					32	194	0	0	0	0
6:15 AM	0	0	29	0	0	3	12	0	0	1	0	4					49	228	0	0	0	0
6:30 AM	0	0	30	2	0	2	12	0	0	0	0	4					50	282	0	0	0	0
6:45 AM	0	0	39	3	0	5	7	0	0	1	0	8					63	452	0	0	0	0
7:00 AM	0	0	31	2	0	1	26	0	0	1	0	5					66	715	0	0	0	0
7:15 AM	0	0	39	2	0	1	45	0	0	9	0	7					103	986	0	0	0	0
7:30 AM	0	0	101	5	0	4	84	0	0	15	0	11					220	1,062	0	0	0	0
7:45 AM	0	0	122	12	0	5	154	0	0	26	0	7					326	914	0	0	0	0
8:00 AM	0	0	134	13	0	5	146	0	0	36	0	3					337	648	0	0	0	0
8:15 AM	0	0	72	12	0	4	71	0	0	12	0	8					179	364	0	0	0	0
8:30 AM	0	0	40	3	0	4	16	0	0	4	0	5					72	263	0	0	0	0
8:45 AM	0	0	28	3	0	3	19	0	0	1	0	6					60	248	0	0	0	0
9:00 AM	0	0	19	4	0	5	21	0	0	2	0	2					53	244	0	0	0	0
9:15 AM	0	0	30	4	0	3	36	0	0	3	0	2					78	249	0	0	0	0
9:30 AM	0	0	33	2	0	4	12	0	0	2	0	4					57	218	0	0	0	0
9:45 AM	0	0	21	1	0	1	21	0	0	3	0	9					56	218	0	0	0	0
10:00 AM	0	0	23	4	0	2	23	0	0	4	0	2					58	212	0	0	0	0
10:15 AM	0	0	16	3	0	8	16	0	0	0	0	4					47	210	0	0	0	0
10:30 AM	0	0	27	4	0	4	17	0	0	1	0	4					57	230	0	0	0	0
10:45 AM	0	0	14	6	0	11	9	0	0	0	0	10					50	252	0	0	0	0
11:00 AM	0	0	20	0	0	5	26	0	0	0	0	5					56	282	0	0	0	0
11:15 AM	0	0	25	7	0	6	26	0	0	2	0	1					67	307	0	0	0	0
11:30 AM	0	0	40	4	0	2	20	0	0	7	0	6					79	306	0	0	0	0
11:45 AM	0	0	30	6	0	4	27	0	0	10	0	3					80	274	0	0	0	0
12:00 PM	0	0	32	5	0	7	28	0	0	6	0	3					81	260	0	0	0	0
12:15 PM	0	0	28	2	0	5	23	0	0	4	0	4					66	249	0	0	0	0
12:30 PM	0	0	17	2	0	3	19	0	0	1	0	5					47	245	0	0	0	0
12:45 PM	0	0	27	0	0	7	29	0	0	0	0	3					66	256	0	0	0	0
1:00 PM	0	0	27	2	0	8	29	0	0	0	0	4					70	254	0	0	0	0
1:15 PM	0	0	21	0	0	4	30	0	0	4	0	3					62	259	0	0	0	0
1:30 PM	0	0	19	4	0	3	27	0	0	3	0	2					58	269	0	0	0	0
1:45 PM	0	0	22	1	0	8	27	0	0	1	0	5					64	356	0	0	0	0
2:00 PM	0	0	31	3	0	7	26	0	0	3	0	5					75	400	0	0	0	0
2:15 PM	0	0	30	3	0	9	26	0	0	1	0	3					72	463	0	0	0	0

2:30 PM	0	0	76	13	0	9	36	0	0	6	0	5	145	631	0	0	0
2:45 PM	0	0	25	2	0	5	65	0	0	6	0	5	108	637	0	0	0
3:00 PM	0	0	54	2	0	3	73	0	0	4	0	2	138	669	0	0	0
3:15 PM	0	0	132	27	0	8	61	0	0	7	0	5	240	682	0	0	0
3:30 PM	0	0	78	14	0	7	43	0	0	6	0	3	151	601	0	0	0
3:45 PM	0	0	55	6	0	7	59	0	0	5	0	8	140	594	0	0	0
4:00 PM	0	0	54	4	0	8	67	0	0	8	0	10	151	586	0	0	0
4:15 PM	0	0	54	6	0	10	80	0	0	5	0	4	159	616	0	0	0
4:30 PM	0	0	55	9	0	8	55	0	0	8	0	9	144	636	0	0	0
4:45 PM	0	0	38	4	0	9	68	0	0	7	0	6	132	656	0	0	0
5:00 PM	0	0	58	5	0	16	80	0	0	7	0	15	181	694	0	0	0
5:15 PM	0	0	48	6	0	10	99	0	0	8	0	8	179	617	0	0	0
5:30 PM	0	0	72	6	0	10	64	0	0	6	0	6	164	523	0	0	0
5:45 PM	0	0	89	6	0	10	55	0	0	3	0	7	170	487	0	0	0
6:00 PM	0	0	25	4	0	7	43	0	0	21	0	4	104	382	0	0	0
6:15 PM	0	0	21	1	0	11	46	0	0	2	0	4	85		0	0	0
6:30 PM	0	0	52	4	0	6	55	0	0	7	0	4	128		0	0	0
6:45 PM	0	0	24	3	0	6	26	0	0	4	0	2	65		0	0	0
Count Total	0	0	2,240	247	0	306	2,196	0	0	284	0	267	5,540		0	0	0
Peak Hour	0	0	429	42	0	18	455	0	0	89	0	29	1,062		0	0	0

## APPENDIX B. TRAFFIC FORECAST DATA

ID #	Intersection	Leg	2022 ADT (Count)	Base AADT	2030 Forecast (Estimated)	2045 Forecast (Estimated)	2022 Base Flow (SIMP CO)	2045 Forecast Flow (SIMP CO)	2030 Lin. Interp. (SIMP CO)	2025-2045 Growth % (SIMP CO)	2030 Gr. Factor (SIMP CO)	2045 Gr. Factor (SIMP CO)
1	I-29 NB Ramp & Northshore Dr	North	450	656	500	600	288	369	320	1.1%	1.090	1.281
		East	2,500	7,492	2,500	2,300	2,563	2,289	2,470	-0.5%	0.961	0.893
		South	2,425	1,896	2,800	3,500	6,058	8,587	6,940	1.5%	1.129	1.417
		West	4,200	3,415	4,400	4,600	8,074	8,779	8,320	0.4%	1.030	1.087
2	I-29 SB Ramp & Northshore Dr	North	425	642	500	600	284	372	315	1.2%	1.098	1.310
		East	3,969	7,492	3,900	3,600	2,563	2,289	2,470	-0.5%	0.961	0.893
		South	2,309	5,476	2,500	2,900	2,532	3,125	2,740	0.9%	1.076	1.234
		West	5,663	3,415	5,900	6,200	8,074	8,779	8,320	0.4%	1.030	1.087
3	Streeter Dr & Northshore Dr	North	-	-	-	-	-	-	-	-	-	-
		East	6,025	7,492	5,800	5,400	2,563	2,289	2,470	-0.5%	0.961	0.893
		South	1,325	1,275	1,400	1,400	94	94	95	0.0%	1.000	1.000
		West	5,975	3,415	6,200	6,500	8,075	8,779	8,320	0.4%	1.030	1.087
4	48th Ave/Westshore Dr & Northshore Dr	North	794	425	900	900	912	945	925	0.2%	1.012	1.036
		East	3,049	3,415	3,200	3,400	7,519	8,212	7,765	0.4%	1.031	1.092
		South	687	-	700	800	2,930	3,033	2,970	0.2%	1.012	1.035
		West	2,226	-	2,300	2,500	4,306	4,665	4,435	0.3%	1.028	1.083



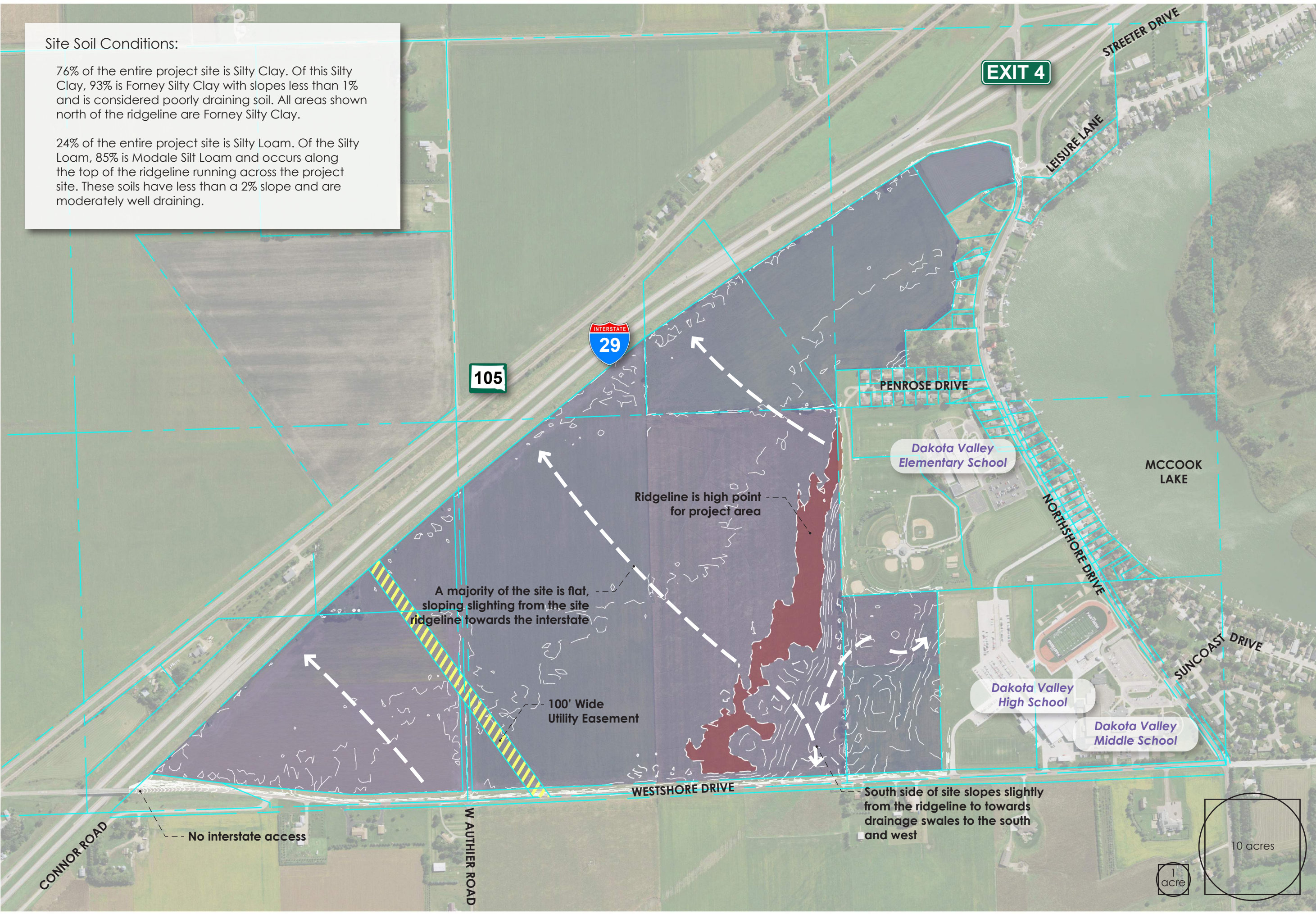





Site Soil Conditions:


76% of the entire project site is Silty Clay. Of this Silty Clay, 93% is Forney Silty Clay with slopes less than 1% and is considered poorly draining soil. All areas shown north of the ridgeline are Forney Silty Clay.

24% of the entire project site is Silty Loam. Of the Silty Loam, 85% is Modale Silt Loam and occurs along the top of the ridgeline running across the project site. These soils have less than a 2% slope and are moderately well draining.






STOCKWELL  
STOCKWELL ENGINEERS, INC.  
801 N. PHILLIPS AVENUE, SUITE 100  
SIOUX FALLS, SD 57104  
AND 201 WALNUT STREET  
YANKTON, SD 57078  
STOCKWELLENGINEERS.COM  
PH: 605.338.6668



North  
Sioux City  
SOUTH DAKOTA

**EXISTING CONDITIONS**  
MASTER PLANNING NORTH OF NORTHSHORE DRIVE  
NORTH SIOUX CITY, SOUTH DAKOTA  
SEI PROJECT #: 19029



1" = 600'  
2020/03/18

**EXHIBIT**  
**02 of 07**



Legend:

- R-1 Single-Family Residential District (153.4 acres)
- R-2 One & Two Family Residential District (12.8 acres)
- R-3 Multiple Family District (32.6 acres)
- B-R Business District - Restricted (28.1 acres)
- Greenspace
- Multi-use Trail Route
- Existing Property Lines

Note:  
Acres denoted on exhibit are totals for each zoning area and do not take into consideration utilization reductions due to future required right-of-way, detention, or park area.

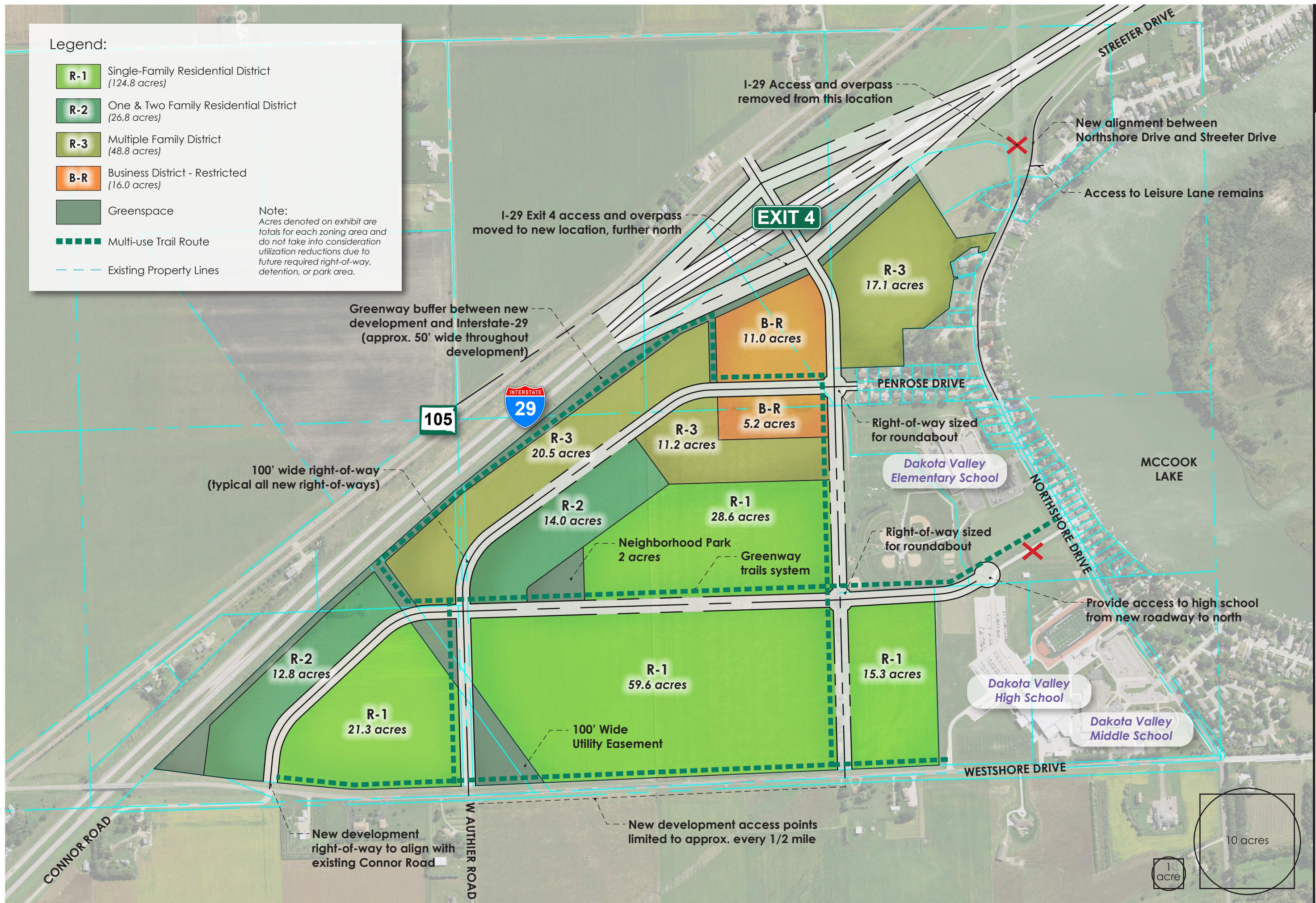




Legend:

- R-1** Single-Family Residential District (124.8 acres)
- R-2** One & Two Family Residential District (26.8 acres)
- R-3** Multiple Family District (48.8 acres)
- B-R** Business District - Restricted (16.0 acres)
- Greenspace
- Multi-use Trail Route
- Existing Property Lines

Note:  
Acres denoted on exhibit are totals for each zoning area and do not take into consideration utilization reductions due to future required right-of-way, detention, or park area.







SINGLE-FAMILY  
RESIDENTIAL DISTRICT (R-1)

- USES PERMITTED**
- Single-family detached dwelling
  - Churches and accessory buildings
  - Museums, libraries, parks, playgrounds or community centers
  - Private swimming pools (with fence)
  - Hospitals and clinics (not animal)
  - Nursery schools and child care centers

**BUILDING HEIGHT LIMIT**  
2.5 stories, but not exceeding 35' in height; and no accessory building shall exceed 1 story or 15' in height.

**MINIMUM LOT AREA**  
6,500 square feet for each dwelling with its accessory buildings. However, where public sewer and water facilities are not available, not less than 20,000 square feet. If public water only is available, not less than 10,000 square feet.

**MINIMUM LOT WIDTH**  
50'

**MINIMUM FRONT YARD DEPTH**  
30'

**MINIMUM SIDE YARD WIDTH**  
7' for a dwelling and 7' for any other building.

**MINIMUM REAR YARD DEPTH**  
25' for a dwelling.



ONE & TWO FAMILY  
RESIDENTIAL DISTRICT (R-2)

- USES PERMITTED**
- Uses permitted in R-1 Districts
  - Two-family dwellings (in accordance with the lot area, frontage and yard requirements)

**BUILDING HEIGHT LIMIT**  
(Same as R-1 District)  
2.5 stories, but not exceeding 35' in height; and no accessory building shall exceed 1 story or 15' in height.

**MINIMUM LOT AREA**  
6,500 square feet for each single-family dwelling and 8,100 square feet for each two-family dwelling; however, where public sewer and water facilities are not available, not less than 20,000 square feet. If public water only is available, not less than 10,000 square feet.

**MINIMUM LOT WIDTH**  
50' for a single-family dwelling or two-family dwelling. Where public sewer and water facilities are not available 100'. If public water only is available, 80'.

**MINIMUM FRONT YARD DEPTH**  
30'. The front yard shall be measured from the proposed right-of-way line.

**MINIMUM SIDE YARD WIDTH**  
7' for a dwelling and 7' for any other building.

**MINIMUM REAR YARD DEPTH**  
25' for a dwelling.



MULTIPLE FAMILY  
DISTRICT (R-3)

- USES PERMITTED**
- Uses permitted in R-2 districts
  - Multiple dwellings including row housing and condominiums
  - Private clubs, lodges, or veterans organizations, excepting those holding a beer permit or liquor license
  - Boarding and lodging houses
  - Funeral homes
  - Office of a dentist or physician
  - Hospitals, clinics, nursing and convalescent homes, excepting animal hospitals and clinics
  - Institutions of religious, education or philanthropic nature

**BUILDING HEIGHT LIMIT**  
Principal building: 45', except that for each 1' that the building or a portion of it sets back beyond the required front, side, and rear yards, 1' may be added to the height limit of such building or portion thereof.  
Accessory building: 12'

**MINIMUM LOT AREA**  
Single-family dwelling: 7,500 square feet  
Two-family dwelling: 7,500 square feet  
Multifamily dwelling: 9,500 square feet plus an additional 2,000 square feet for each unit over 3.

**MINIMUM LOT WIDTH**  
Single-family dwelling: 50'  
Two-family dwelling: 50'  
Multifamily dwelling: 75'

**MINIMUM FRONT YARD DEPTH**  
30'. Front yards shall be measured from street right-of-way line.

**MINIMUM SIDE YARDS**  
1.5 stories: side yard: 7'; minimum on one side: 7'  
2 and 2.5 stories: side yard: 7'; minimum on one side: 7'  
3 stories or more up to 45': total side yard: 25'; minimum on one side: 10'  
Structures above 45': see height regulations above.

**MINIMUM REAR YARD DEPTH**  
25'

**LOTS NOT SERVED BY SEWER & WATER**  
Single-family and two-family dwelling: where neither public sewer nor public water is available, 20,000 square feet lot area and 100' lot width. Where public water only is available, 10,000 square feet lot area and 80' lot width.  
Multifamily dwelling: where public sewer is not available, special consideration shall be given to determine lot area and width requirements.



BUSINESS DISTRICT  
- RESTRICTED (B-R)

- USES PERMITTED**
- Wearing apparel and accessories; small household appliances, radios, televisions, and music supplies; drugs and propriety medicines; books and magazines; cameras and photographic supplies; gifts, novelties, and souvenirs; optical goods; sales and services thereof; Finance, insurance and real estate services
  - Photographic services including commercial services; beauty and barber services; apparel repair, alterations, and cleaning pickup services; shoe repair services
  - Business services, excluding any warehousing and storage services
  - Professional services
  - Governmental services
  - Educational services
  - Churches, synagogues, and temples; welfare and charitable services; business associations, professional membership organizations, labor unions and similar labor organizations; and civic, service, and similar organizations
  - Eating and drinking places (nonalcoholic)
  - Communication and utility uses
  - Public buildings and grounds
  - Automobile parking
  - Parks
  - On-site signs

**BUILDING HEIGHT LIMIT**  
The height of all structures shall not exceed 45'.

**MINIMUM LOT REQUIREMENTS**  
The minimum lot area shall be 2,400 square feet and the minimum lot width shall be 20'.

**MINIMUM YARD REQUIREMENTS**  
All buildings located on lots adjacent to a residential district (R) shall be located so as to conform on the adjacent side with the side yard requirements for the adjacent residential district (R).

**MAXIMUM LOT COVERAGE**  
The maximum lot coverage for all buildings shall not be more than 90% of the total lot area.



Legend:

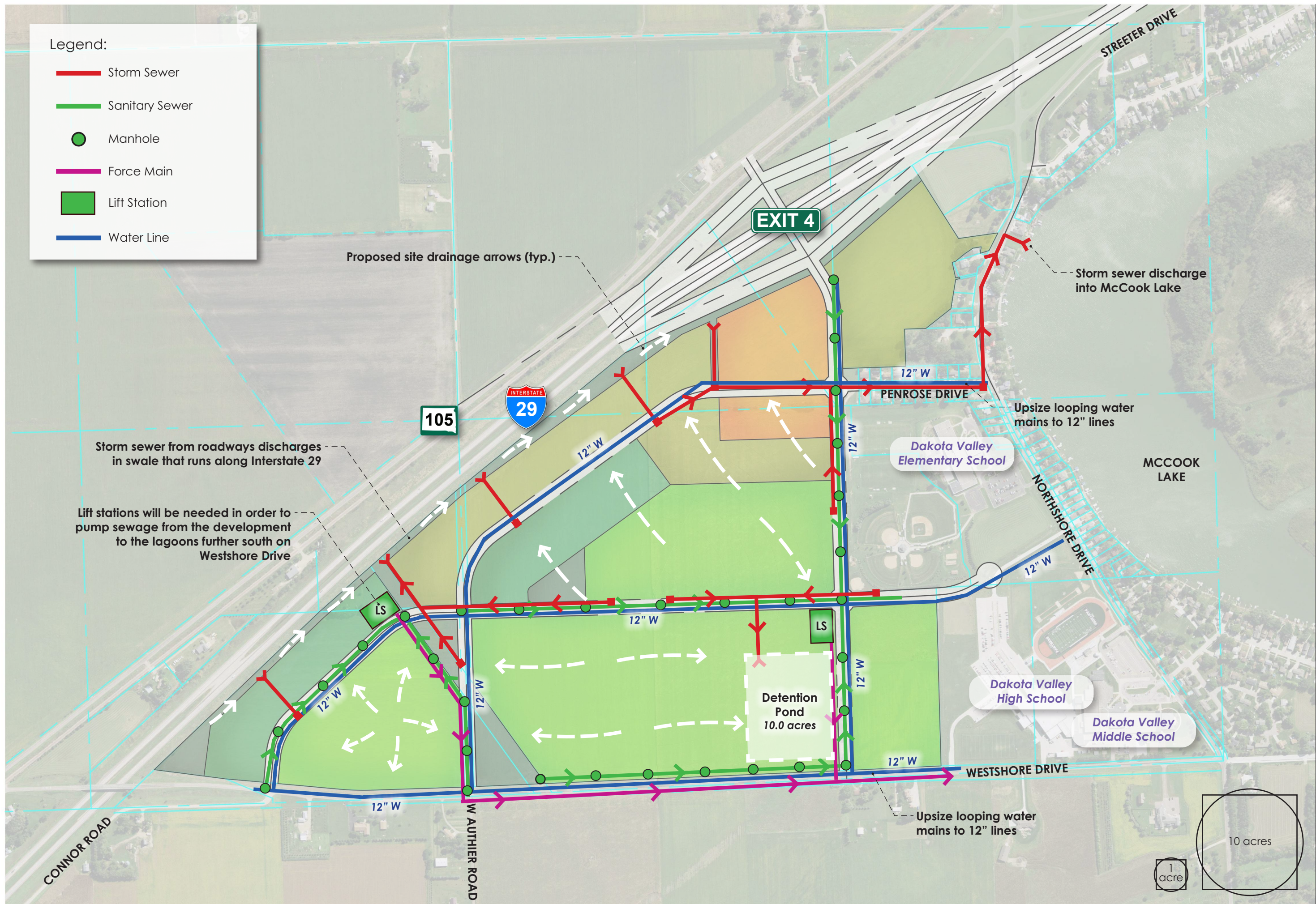
- Storm Sewer
- Sanitary Sewer
- Manhole
- Force Main
- Lift Station
- Water Line





Legend:

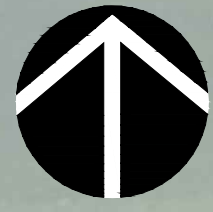
- Storm Sewer
- Sanitary Sewer
- Manhole
- Force Main
- Lift Station
- Water Line





## APPENDIX C. ALIGNMENT & INTERSECTION ALTERNATIVES EXHIBITS

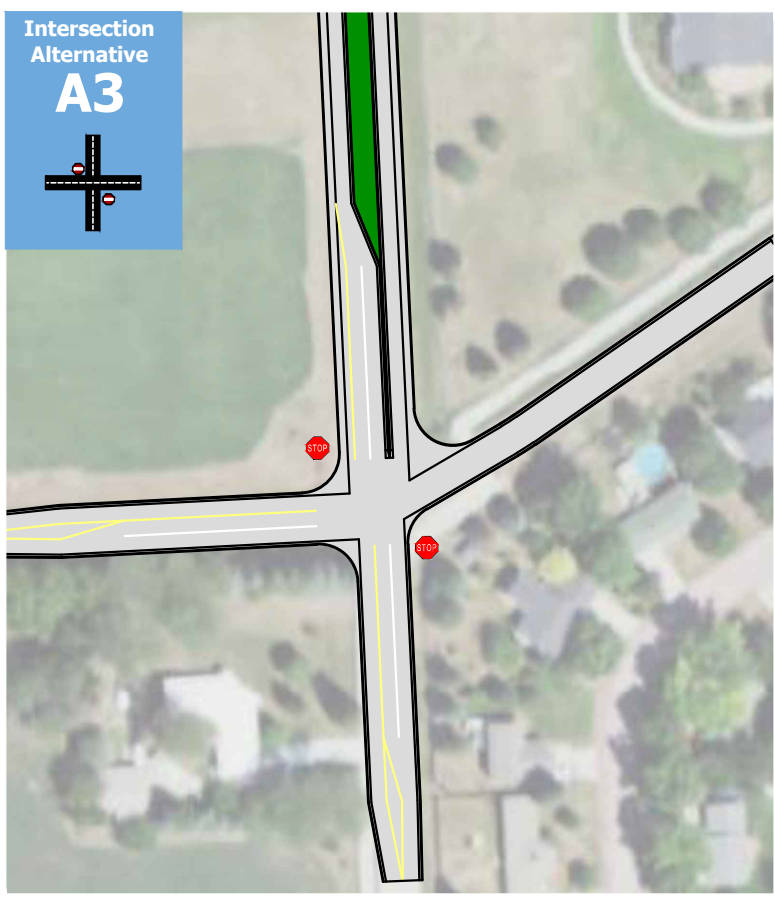
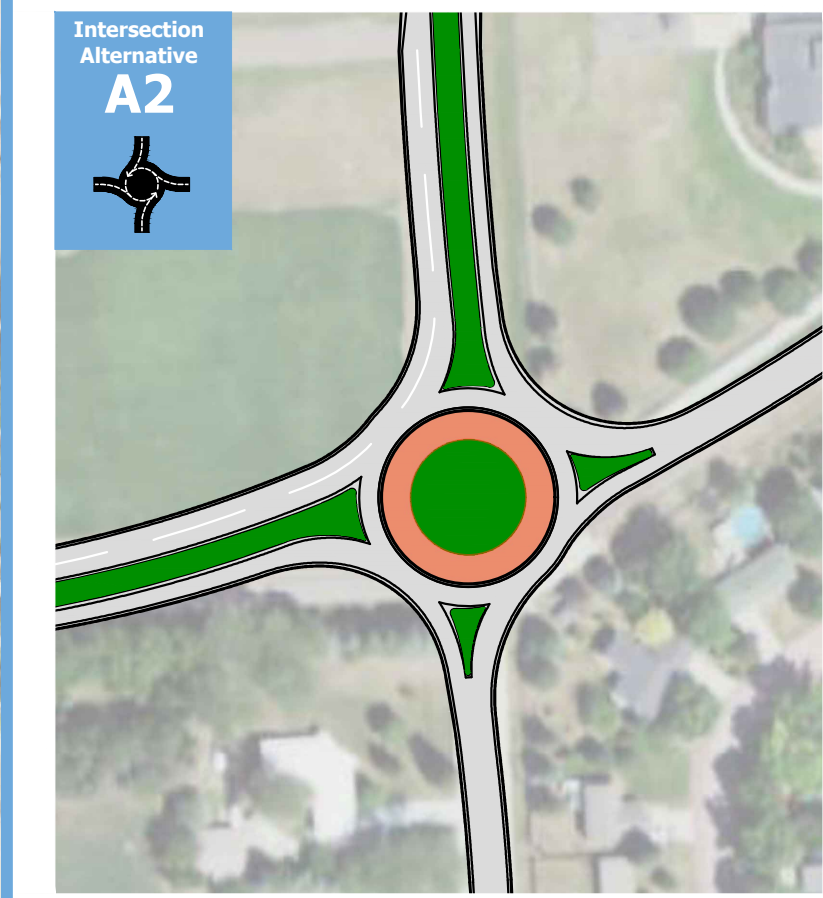
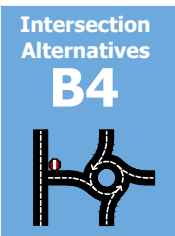
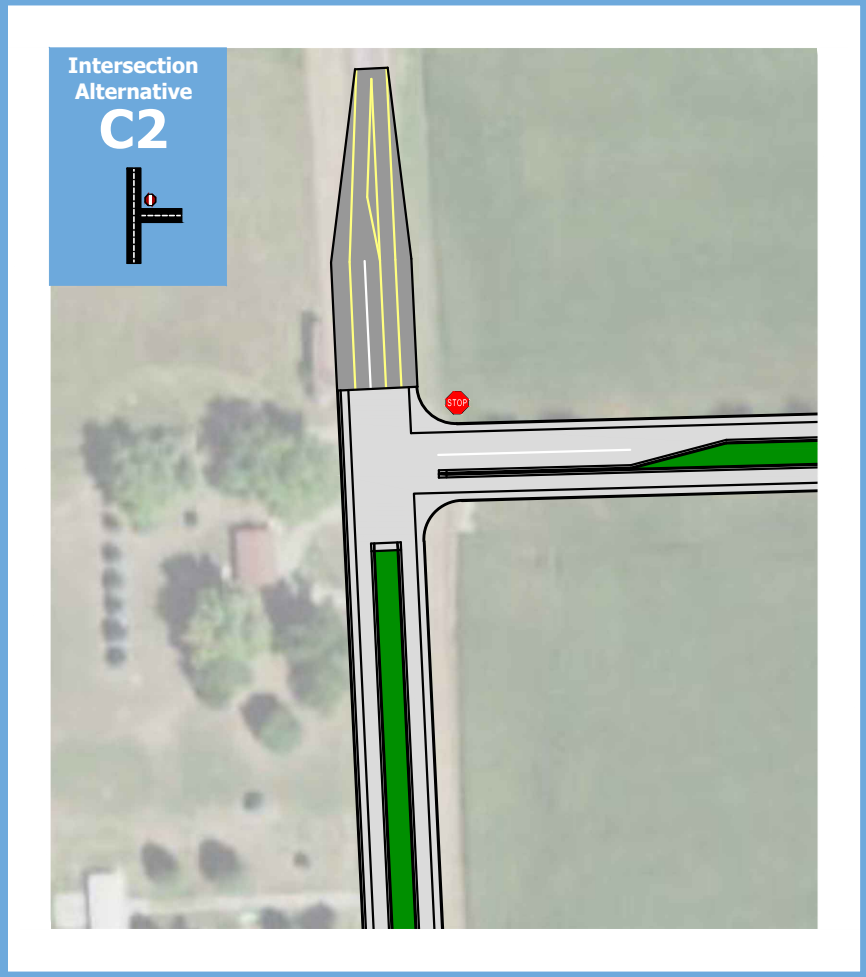




Scale: 1" = 300'

Alignment	Running Length (ft)	Unit cost per RL (\$)	RL total	Acquisition ROW (ac)	Unit cost per ac (\$)	ROW total	Construction + ROW cost
Alternate 1	10,647	\$1,790	\$19,058,130	19.5	\$43,560	\$850,391	\$19,908,521
Alternate 2	11,647	\$1,790	\$20,848,130	20.7	\$43,560	\$902,203	\$21,750,333
Alternate 3	7,299	\$4,625	\$33,757,875	11.2	\$2,395,800	\$26,881,250	\$60,639,125

Intersections	Additional Cost
Alternate A1	-
Alternate A2	\$1,010,000
Alternate A3	(\$175,000)
Alternate B1	-
Alternate B2	\$850,000
Alternate B3	\$100,000
Alternate B4	\$750,000
Alternate C1	-
Alternate C2	\$950,000



File Location: S:\Projects\2021\21227 - Northshore Drive Realignment (North Sioux City)\Exhibits\Working Files\CAD Files\21227 - Alternate Overview.dwg | Plot Date: 12/4/2023 2:47 PM

Alternate Overview  
Northshore Bypass



## APPENDIX D. TRAFFIC CONTROL DEVICE WARRANTS

**MUTCD Volume-based Warrant Evaluation**  
**I-29 NB On-Ramp & Northshore Dr**  
**Interim (2025) - No Build**



Major Street: I-29 NB On-Ramp

Minor Street: Northshore Dr

Lanes Moving Traffic: 1

Lanes Moving Traffic: 1

Approach Speed: 75 MPH

Right Turn Volume Included: 0% EB, 0% WB

Option: High speed major-street

**WARRANT 1, Condition A - Minimum Vehicular Volume**

70% Satisfied

No

	Vehicles per hour 70% (56%)	Peak Hour	2nd Highest	3rd Highest	4th Highest	5th Highest	6th Highest	7th Highest	8th Highest
Both Apprchs. Major Street	350 (280)	274	253	238	218	169	163	147	129
Highest Apprch. Minor Street	105 (84)	137	107	175	103	70	47	84	51

**WARRANT 1, Condition B - Interruption of Continuous Traffic**

70% Satisfied

No

	Vehicles per hour 70% (56%)	Peak Hour	2nd Highest	3rd Highest	4th Highest	5th Highest	6th Highest	7th Highest	8th Highest
Both Apprchs. Major Street	525 (420)	274	253	238	218	169	163	147	129
Highest Apprch. Minor Street	53 (42)	137	107	175	103	70	47	84	51

**WARRANT 1, Condition A and Condition B**

56% Satisfied

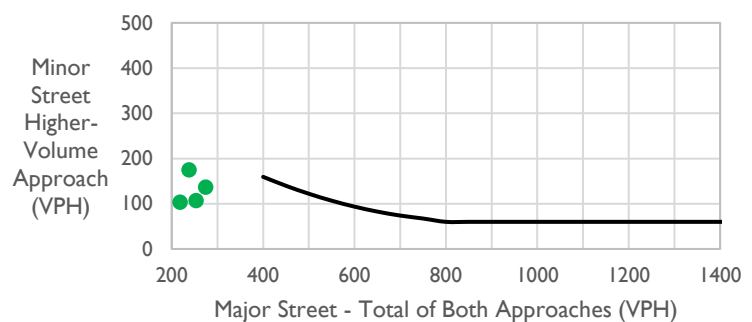
No

**WARRANT 2, Four Hour Volume**

70% Satisfied

No

	Both Apprchs. Major Street	Higher Vol. Apprch. Minor Street
Peak Hour	274	137
2nd Highest	253	107
3rd Highest	238	175
4th Highest	218	103



**MUTCD Volume-based Warrant Evaluation**  
**I-29 NB On-Ramp & Northshore Dr**  
**Future (2045) - No Build**



Major Street: I-29 NB On-Ramp

Minor Street: Northshore Dr

Lanes Moving Traffic: 1

Lanes Moving Traffic: 1

Approach Speed: 75 MPH

Right Turn Volume Included: 0% EB, 0% WB

Option: High speed major-street

**WARRANT 1, Condition A - Minimum Vehicular Volume**

70% Satisfied

No

	Vehicles per hour 70% (56%)	Peak Hour	2nd Highest	3rd Highest	4th Highest	5th Highest	6th Highest	7th Highest	8th Highest
Both Apprchs. Major Street	350 (280)	305	282	265	243	188	181	164	143
Highest Apprch. Minor Street	105 (84)	165	129	211	124	84	56	101	62

**WARRANT 1, Condition B - Interruption of Continuous Traffic**

70% Satisfied

No

	Vehicles per hour 70% (56%)	Peak Hour	2nd Highest	3rd Highest	4th Highest	5th Highest	6th Highest	7th Highest	8th Highest
Both Apprchs. Major Street	525 (420)	305	282	265	243	188	181	164	143
Highest Apprch. Minor Street	53 (42)	165	129	211	124	84	56	101	62

**WARRANT 1, Condition A and Condition B**

56% Satisfied

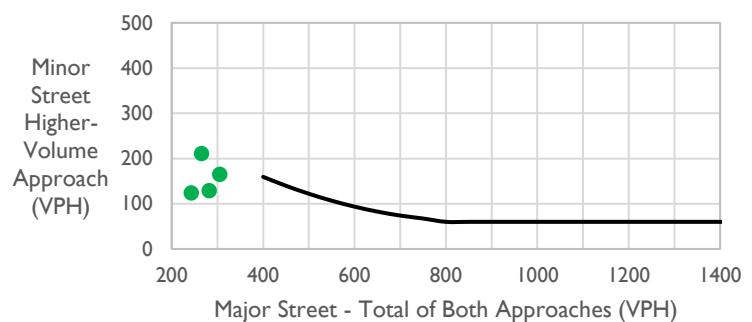
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**WARRANT 2, Four Hour Volume**

70% Satisfied

No

	Both Apprchs. Major Street	Higher Vol. Apprch. Minor Street
Peak Hour	305	165
2nd Highest	282	129
3rd Highest	265	211
4th Highest	243	124



**MUTCD Volume-based Warrant Evaluation**  
**I-29 SB Off-Ramp & Northshore Dr**  
**Interim (2025) - No Build**



Major Street: Northshore Dr

Minor Street: I-29 SB Off-Ramp

Lanes Moving Traffic: 1

Lanes Moving Traffic: 1

Approach Speed: 25 MPH

Right Turn Volume Included: 0% SB

Option: Low speed, urban community

**WARRANT 1, Condition A - Minimum Vehicular Volume**

100% Satisfied

No

	Vehicles per hour 100% (80%)	Peak Hour	2nd Highest	3rd Highest	4th Highest	5th Highest	6th Highest	7th Highest	8th Highest
Both Apprchs. Major Street	500 (400)	939	870	863	853	809	639	477	386
Highest Apprch. Minor Street	150 (120)	62	49	28	18	46	33	22	18

**WARRANT 1, Condition B - Interruption of Continuous Traffic**

100% Satisfied

No

	Vehicles per hour 100% (80%)	Peak Hour	2nd Highest	3rd Highest	4th Highest	5th Highest	6th Highest	7th Highest	8th Highest
Both Apprchs. Major Street	750 (600)	939	870	863	853	809	639	477	386
Highest Apprch. Minor Street	75 (60)	62	49	28	18	46	33	22	18

**WARRANT 1, Condition A and Condition B**

80% Satisfied

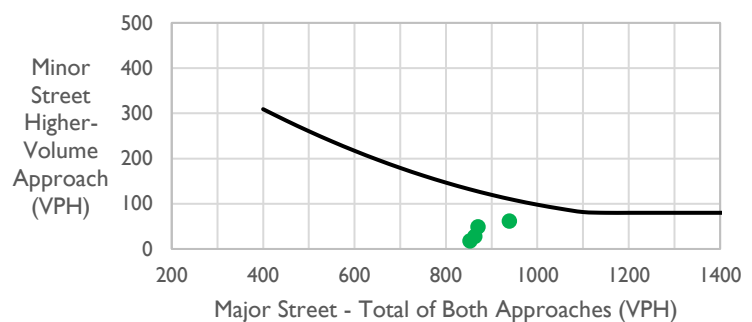
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**WARRANT 2, Four Hour Volume**

100% Satisfied

No

	Both Apprchs. Major Street	Higher Vol. Apprch. Minor Street
Peak Hour	939	62
2nd Highest	870	49
3rd Highest	863	28
4th Highest	853	18



**MUTCD Volume-based Warrant Evaluation**  
**I-29 SB Off-Ramp & Northshore Dr**  
**Future (2045) - No Build**



Major Street: Northshore Dr

Minor Street: I-29 SB Off-Ramp

Lanes Moving Traffic: 1

Lanes Moving Traffic: 1

Approach Speed: 25 MPH

Right Turn Volume Included: 0% SB

Option: Low speed, urban community

**WARRANT 1, Condition A - Minimum Vehicular Volume**

**100% Satisfied** No

	Vehicles per hour 100% (80%)	Peak Hour	2nd Highest	3rd Highest	4th Highest	5th Highest	6th Highest	7th Highest	8th Highest
Both Apprchs. Major Street	500 (400)	1050	973	965	954	905	714	533	432
Highest Apprch. Minor Street	150 (120)	70	56	31	21	52	37	25	21

**WARRANT 1, Condition B - Interruption of Continuous Traffic**

**100% Satisfied** No

	Vehicles per hour 100% (80%)	Peak Hour	2nd Highest	3rd Highest	4th Highest	5th Highest	6th Highest	7th Highest	8th Highest
Both Apprchs. Major Street	750 (600)	1050	973	965	954	905	714	533	432
Highest Apprch. Minor Street	75 (60)	70	56	31	21	52	37	25	21

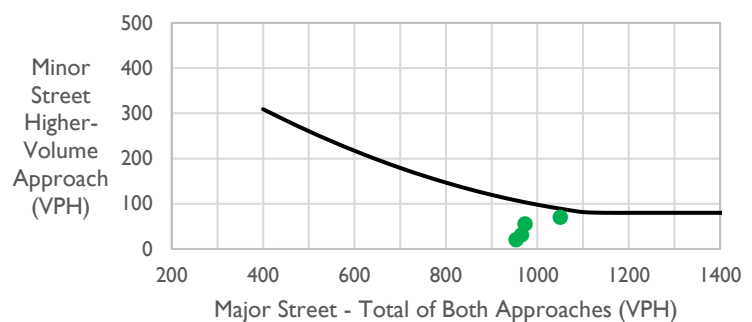
**WARRANT 1, Condition A and Condition B**

**80% Satisfied** No

**WARRANT 2, Four Hour Volume**

**100% Satisfied** No

	Both Apprchs. Major Street	Higher Vol. Apprch. Minor Street
Peak Hour	1050	70
2nd Highest	973	56
3rd Highest	965	31
4th Highest	954	21



**MUTCD Volume-based Warrant Evaluation**  
**Streeter Dr & Northshore Dr**  
**Interim (2025) - No Build**



Major Street: Northshore Dr

Minor Street: Streeter Dr

Lanes Moving Traffic: 1

Lanes Moving Traffic: 1

Approach Speed: 25 MPH

Right Turn Volume Included: 0% NB

Option: Low speed, urban community

**WARRANT 1, Condition A - Minimum Vehicular Volume**

100% Satisfied

No

	Vehicles per hour 100% (80%)	Peak Hour	2nd Highest	3rd Highest	4th Highest	5th Highest	6th Highest	7th Highest	8th Highest
Both Apprchs. Major Street	500 (400)	960	907	898	868	813	659	495	407
Highest Apprch. Minor Street	150 (120)	119	56	93	110	84	76	43	56

**WARRANT 1, Condition B - Interruption of Continuous Traffic**

100% Satisfied

No

	Vehicles per hour 100% (80%)	Peak Hour	2nd Highest	3rd Highest	4th Highest	5th Highest	6th Highest	7th Highest	8th Highest
Both Apprchs. Major Street	750 (600)	960	907	898	868	813	659	495	407
Highest Apprch. Minor Street	75 (60)	119	56	93	110	84	76	43	56

**WARRANT 1, Condition A and Condition B**

80% Satisfied

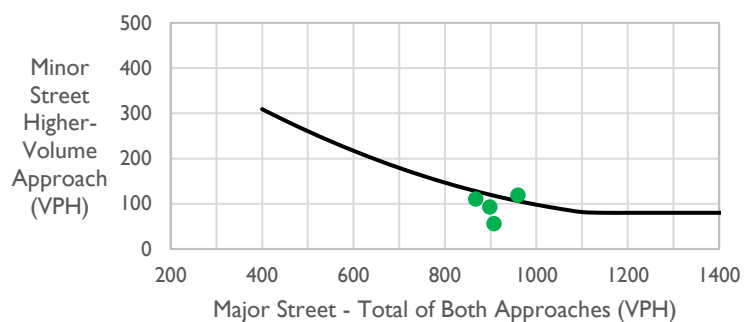
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**WARRANT 2, Four Hour Volume**

100% Satisfied

No

	Both Apprchs. Major Street	Higher Vol. Apprch. Minor Street
Peak Hour	960	119
2nd Highest	907	56
3rd Highest	898	93
4th Highest	868	110



**MUTCD Volume-based Warrant Evaluation**  
**Streeter Dr & Northshore Dr**  
**Future (2045) - No Build**



Major Street: Northshore Dr

Minor Street: Streeter Dr

Lanes Moving Traffic: 1

Lanes Moving Traffic: 1

Approach Speed: 25 MPH

Right Turn Volume Included: 0% NB

Option: Low speed, urban community

**WARRANT 1, Condition A - Minimum Vehicular Volume**

100% Satisfied

No

	Vehicles per hour 100% (80%)	Peak Hour	2nd Highest	3rd Highest	4th Highest	5th Highest	6th Highest	7th Highest	8th Highest
Both Apprchs. Major Street	500 (400)	1075	1016	1005	972	911	738	554	456
Highest Apprch. Minor Street	150 (120)	135	63	105	125	95	87	48	63

**WARRANT 1, Condition B - Interruption of Continuous Traffic**

100% Satisfied

No

	Vehicles per hour 100% (80%)	Peak Hour	2nd Highest	3rd Highest	4th Highest	5th Highest	6th Highest	7th Highest	8th Highest
Both Apprchs. Major Street	750 (600)	1075	1016	1005	972	911	738	554	456
Highest Apprch. Minor Street	75 (60)	135	63	105	125	95	87	48	63

**WARRANT 1, Condition A and Condition B**

80% Satisfied

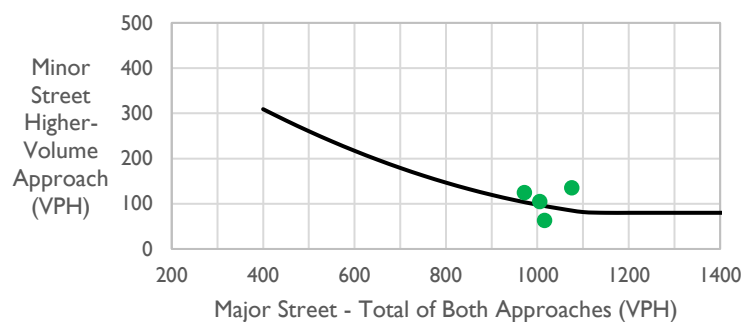
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**WARRANT 2, Four Hour Volume**

100% Satisfied

No

	Both Apprchs. Major Street	Higher Vol. Apprch. Minor Street
Peak Hour	1075	135
2nd Highest	1016	63
3rd Highest	1005	105
4th Highest	972	125



**MUTCD Volume-based Warrant Evaluation**  
**Westshore Dr & Northshore Dr**  
**Interim (2025) - No Build**



Major Street: Northshore Dr

Minor Street: Westshore Dr

Lanes Moving Traffic: 1

Lanes Moving Traffic: 1

Approach Speed: 35 MPH

Right Turn Volume Included: 0% SB, 0% NB

Option: Low speed, urban community

**WARRANT 1, Condition A - Minimum Vehicular Volume**

100% Satisfied

No

	Vehicles per hour 100% (80%)	Peak Hour	2nd Highest	3rd Highest	4th Highest	5th Highest	6th Highest	7th Highest	8th Highest
Both Apprchs. Major Street	500 (400)	342	311	256	243	179	157	152	139
Highest Apprch. Minor Street	150 (120)	44	46	35	57	78	18	61	18

**WARRANT 1, Condition B - Interruption of Continuous Traffic**

100% Satisfied

No

	Vehicles per hour 100% (80%)	Peak Hour	2nd Highest	3rd Highest	4th Highest	5th Highest	6th Highest	7th Highest	8th Highest
Both Apprchs. Major Street	750 (600)	342	311	256	243	179	157	152	139
Highest Apprch. Minor Street	75 (60)	44	46	35	57	78	18	61	18

**WARRANT 1, Condition A and Condition B**

80% Satisfied

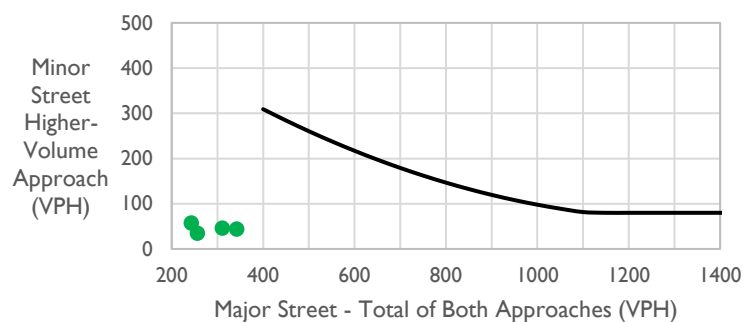
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**WARRANT 2, Four Hour Volume**

100% Satisfied

No

	Both Apprchs. Major Street	Higher Vol. Apprch. Minor Street
Peak Hour	342	44
2nd Highest	311	46
3rd Highest	256	35
4th Highest	243	57





**MUTCD Volume-based Warrant Evaluation**  
**Westshore Dr & Northshore Dr**  
**Future (2045) - No Build**



Major Street: Northshore Dr

Minor Street: Westshore Dr

Lanes Moving Traffic: 1

Lanes Moving Traffic: 1

Approach Speed: 35 MPH

Right Turn Volume Included: 0% SB, 0% NB

Option: Low speed, urban community

**WARRANT 1, Condition A - Minimum Vehicular Volume**

100% Satisfied

No

	Vehicles per hour 100% (80%)	Peak Hour	2nd Highest	3rd Highest	4th Highest	5th Highest	6th Highest	7th Highest	8th Highest
Both Apprchs. Major Street	500 (400)	380	345	285	270	199	174	169	155
Highest Apprch. Minor Street	150 (120)	55	58	43	72	97	23	77	23

**WARRANT 1, Condition B - Interruption of Continuous Traffic**

100% Satisfied

No

	Vehicles per hour 100% (80%)	Peak Hour	2nd Highest	3rd Highest	4th Highest	5th Highest	6th Highest	7th Highest	8th Highest
Both Apprchs. Major Street	750 (600)	380	345	285	270	199	174	169	155
Highest Apprch. Minor Street	75 (60)	55	58	43	72	97	23	77	23

**WARRANT 1, Condition A and Condition B**

80% Satisfied

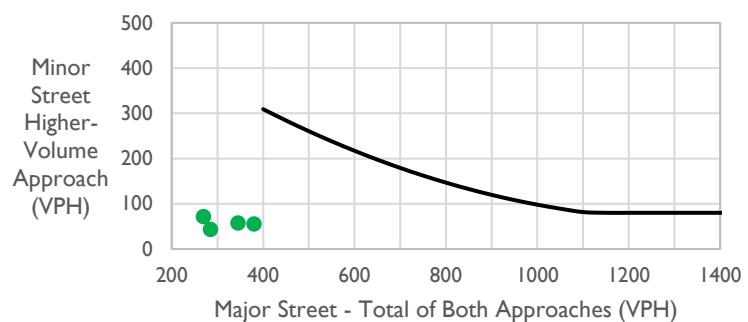
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**WARRANT 2, Four Hour Volume**

100% Satisfied

No

	Both Apprchs. Major Street	Higher Vol. Apprch. Minor Street
Peak Hour	380	55
2nd Highest	345	58
3rd Highest	285	43
4th Highest	270	72



MUTCD Volume-based Warrant Evaluation  
I-29 NB On-Ramp & Northshore Dr  
Interim (2025) - Build (Constrained)



Major Street: I-29 NB On-Ramp  
Lanes Moving Traffic: 1  
Approach Speed: 75 MPH  
Option: High speed major-street

Minor Street: Northshore Dr  
Lanes Moving Traffic: 1  
Right Turn Volume Included: 0% EB, 0% WB

WARRANT 1, Condition A - Minimum Vehicular Volume

70% Satisfied

No

	Vehicles per hour 70% (56%)	Peak Hour	2nd Highest	3rd Highest	4th Highest	5th Highest	6th Highest	7th Highest	8th Highest
Both Apprchs. Major Street	350 (280)	274	253	238	218	169	163	147	129
Highest Apprch. Minor Street	105 (84)	137	107	175	103	70	47	84	51

WARRANT 1, Condition B - Interruption of Continuous Traffic

70% Satisfied

No

	Vehicles per hour 70% (56%)	Peak Hour	2nd Highest	3rd Highest	4th Highest	5th Highest	6th Highest	7th Highest	8th Highest
Both Apprchs. Major Street	525 (420)	274	253	238	218	169	163	147	129
Highest Apprch. Minor Street	53 (42)	137	107	175	103	70	47	84	51

WARRANT 1, Condition A and Condition B

56% Satisfied

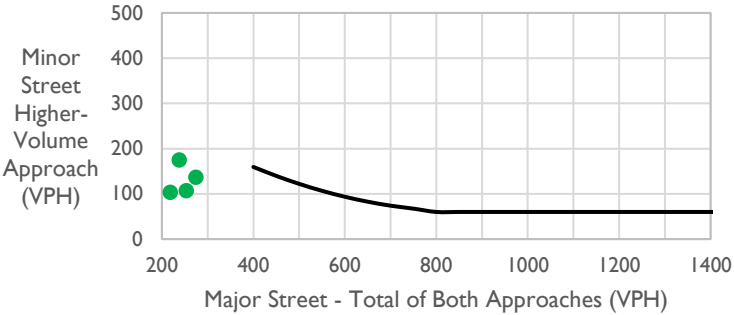
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WARRANT 2, Four Hour Volume

70% Satisfied

No

	Both Apprchs. Major Street	Higher Vol. Apprch. Minor Street
Peak Hour	274	137
2nd Highest	253	107
3rd Highest	238	175
4th Highest	218	103



MUTCD Volume-based Warrant Evaluation  
I-29 NB On-Ramp & Northshore Dr  
Future (2045) - Build (Constrained)



Major Street: I-29 NB On-Ramp  
Lanes Moving Traffic: 1  
Approach Speed: 75 MPH  
Option: High speed major-street

Minor Street: Northshore Dr  
Lanes Moving Traffic: 1  
Right Turn Volume Included: 0% EB, 0% WB

WARRANT 1, Condition A - Minimum Vehicular Volume

70% Satisfied

No

	Vehicles per hour 70% (56%)	Peak Hour	2nd Highest	3rd Highest	4th Highest	5th Highest	6th Highest	7th Highest	8th Highest
Both Apprchs. Major Street	350 (280)	305	282	265	243	188	181	164	143
Highest Apprch. Minor Street	105 (84)	165	129	211	124	84	56	101	62

WARRANT 1, Condition B - Interruption of Continuous Traffic

70% Satisfied

No

	Vehicles per hour 70% (56%)	Peak Hour	2nd Highest	3rd Highest	4th Highest	5th Highest	6th Highest	7th Highest	8th Highest
Both Apprchs. Major Street	525 (420)	305	282	265	243	188	181	164	143
Highest Apprch. Minor Street	53 (42)	165	129	211	124	84	56	101	62

WARRANT 1, Condition A and Condition B

56% Satisfied

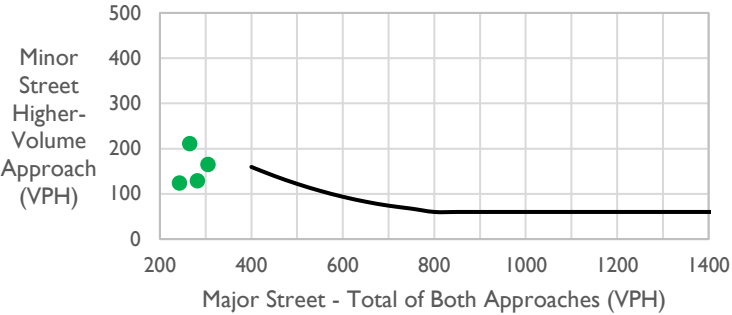
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WARRANT 2, Four Hour Volume

70% Satisfied

No

	Both Apprchs. Major Street	Higher Vol. Apprch. Minor Street
Peak Hour	305	165
2nd Highest	282	129
3rd Highest	265	211
4th Highest	243	124



MUTCD Volume-based Warrant Evaluation  
I-29 NB On-Ramp & Northshore Dr  
Future (2045) - Build (Unconstrained)



Major Street: I-29 NB On-Ramp  
Lanes Moving Traffic: 1  
Approach Speed: 75 MPH  
Option: High speed major-street

Minor Street: Northshore Dr  
Lanes Moving Traffic: 1  
Right Turn Volume Included: 0% EB, 0% WB

WARRANT 1, Condition A - Minimum Vehicular Volume

70% Satisfied

No

	Vehicles per hour 70% (56%)	Peak Hour	2nd Highest	3rd Highest	4th Highest	5th Highest	6th Highest	7th Highest	8th Highest
Both Apprchs. Major Street	350 (280)	450	416	391	359	278	267	242	212
Highest Apprch. Minor Street	105 (84)	165	129	211	124	84	56	101	62

WARRANT 1, Condition B - Interruption of Continuous Traffic

70% Satisfied

No

	Vehicles per hour 70% (56%)	Peak Hour	2nd Highest	3rd Highest	4th Highest	5th Highest	6th Highest	7th Highest	8th Highest
Both Apprchs. Major Street	525 (420)	450	416	391	359	278	267	242	212
Highest Apprch. Minor Street	53 (42)	165	129	211	124	84	56	101	62

WARRANT 1, Condition A and Condition B

56% Satisfied

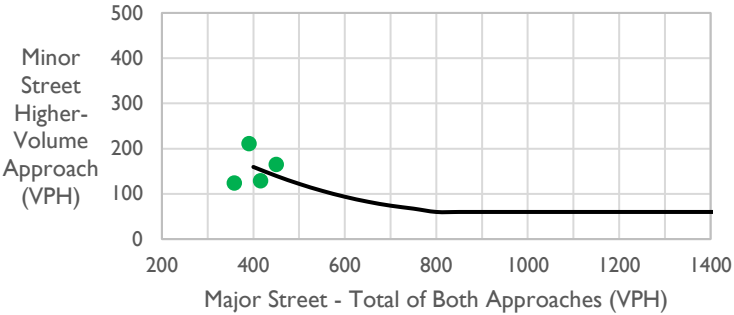
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WARRANT 2, Four Hour Volume

70% Satisfied

No

	Both Apprchs. Major Street	Higher Vol. Apprch. Minor Street
Peak Hour	450	165
2nd Highest	416	129
3rd Highest	391	211
4th Highest	359	124



MUTCD Volume-based Warrant Evaluation  
I-29 SB Off-Ramp & Northshore Dr  
Interim (2025) - Build (Constrained)



Major Street: Northshore Dr

Minor Street: I-29 SB Off-Ramp

Lanes Moving Traffic: 2 or more

Lanes Moving Traffic: 1

Approach Speed: 25 MPH

Right Turn Volume Included: 0% SB

Option: Low speed, urban community

WARRANT 1, Condition A - Minimum Vehicular Volume

100% Satisfied

No

	Vehicles per hour 100% (80%)	Peak Hour	2nd Highest	3rd Highest	4th Highest	5th Highest	6th Highest	7th Highest	8th Highest
Both Apprchs. Major Street	600 (480)	949	880	872	862	818	645	482	391
Highest Apprch. Minor Street	150 (120)	52	41	23	15	39	28	19	15

WARRANT 1, Condition B - Interruption of Continuous Traffic

100% Satisfied

No

	Vehicles per hour 100% (80%)	Peak Hour	2nd Highest	3rd Highest	4th Highest	5th Highest	6th Highest	7th Highest	8th Highest
Both Apprchs. Major Street	900 (720)	949	880	872	862	818	645	482	391
Highest Apprch. Minor Street	75 (60)	52	41	23	15	39	28	19	15

WARRANT 1, Condition A and Condition B

80% Satisfied

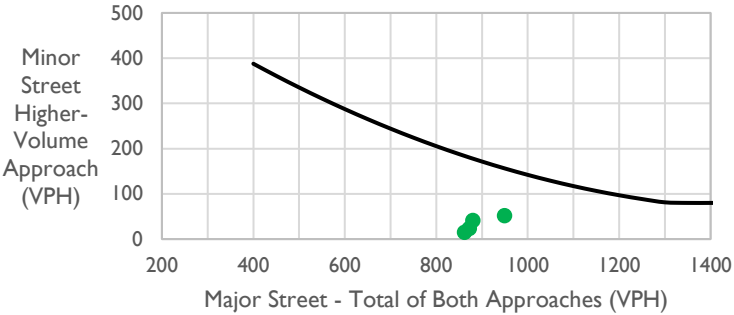
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WARRANT 2, Four Hour Volume

100% Satisfied

No

	Both Apprchs. Major Street	Higher Vol. Apprch. Minor Street
Peak Hour	949	52
2nd Highest	880	41
3rd Highest	872	23
4th Highest	862	15



MUTCD Volume-based Warrant Evaluation  
I-29 SB Off-Ramp & Northshore Dr  
Future (2045) - Build (Constrained)



Major Street: Northshore Dr

Minor Street: I-29 SB Off-Ramp

Lanes Moving Traffic: 2 or more

Lanes Moving Traffic: 1

Approach Speed: 25 MPH

Right Turn Volume Included: 0% SB

Option: Low speed, urban community

WARRANT 1, Condition A - Minimum Vehicular Volume

100% Satisfied

No

	Vehicles per hour 100% (80%)	Peak Hour	2nd Highest	3rd Highest	4th Highest	5th Highest	6th Highest	7th Highest	8th Highest
Both Apprchs. Major Street	600 (480)	1050	973	965	954	905	714	533	432
Highest Apprch. Minor Street	150 (120)	70	56	31	21	52	37	25	21

WARRANT 1, Condition B - Interruption of Continuous Traffic

100% Satisfied

No

	Vehicles per hour 100% (80%)	Peak Hour	2nd Highest	3rd Highest	4th Highest	5th Highest	6th Highest	7th Highest	8th Highest
Both Apprchs. Major Street	900 (720)	1050	973	965	954	905	714	533	432
Highest Apprch. Minor Street	75 (60)	70	56	31	21	52	37	25	21

WARRANT 1, Condition A and Condition B

80% Satisfied

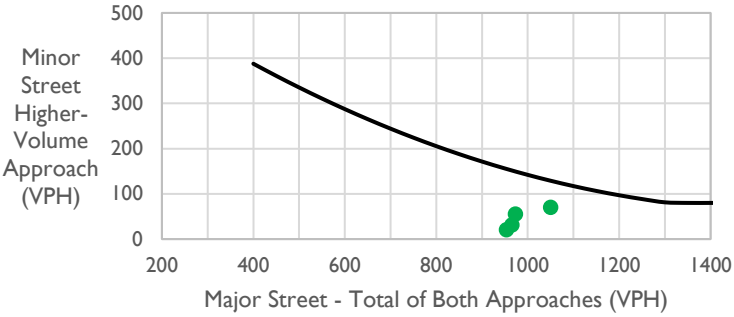
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WARRANT 2, Four Hour Volume

100% Satisfied

No

	Both Apprchs. Major Street	Higher Vol. Apprch. Minor Street
Peak Hour	1050	70
2nd Highest	973	56
3rd Highest	965	31
4th Highest	954	21



MUTCD Volume-based Warrant Evaluation  
I-29 SB Off-Ramp & Northshore Dr  
Future (2045) - Build (Unconstrained)



Major Street: Northshore Dr

Minor Street: I-29 SB Off-Ramp

Lanes Moving Traffic: 2 or more

Lanes Moving Traffic: 1

Approach Speed: 25 MPH

Right Turn Volume Included: 0% SB

Option: Low speed, urban community

WARRANT 1, Condition A - Minimum Vehicular Volume

100% Satisfied

No

	Vehicles per hour 100% (80%)	Peak Hour	2nd Highest	3rd Highest	4th Highest	5th Highest	6th Highest	7th Highest	8th Highest
Both Apprchs. Major Street	600 (480)	1370	1270	1259	1244	1181	932	696	564
Highest Apprch. Minor Street	150 (120)	85	67	38	25	63	45	31	25

WARRANT 1, Condition B - Interruption of Continuous Traffic

100% Satisfied

No

	Vehicles per hour 100% (80%)	Peak Hour	2nd Highest	3rd Highest	4th Highest	5th Highest	6th Highest	7th Highest	8th Highest
Both Apprchs. Major Street	900 (720)	1370	1270	1259	1244	1181	932	696	564
Highest Apprch. Minor Street	75 (60)	85	67	38	25	63	45	31	25

WARRANT 1, Condition A and Condition B

80% Satisfied

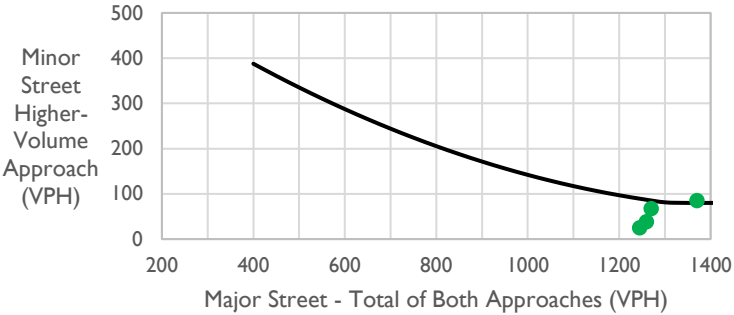
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WARRANT 2, Four Hour Volume

100% Satisfied

No

	Both Apprchs. Major Street	Higher Vol. Apprch. Minor Street
Peak Hour	1370	85
2nd Highest	1270	67
3rd Highest	1259	38
4th Highest	1244	25



MUTCD Volume-based Warrant Evaluation  
Streeter Dr & Northshore Dr  
Interim (2025) - Build (Constrained)



Major Street: Northshore Dr

Minor Street: Streeter Dr

Lanes Moving Traffic: 1

Lanes Moving Traffic: 1

Approach Speed: 25 MPH

Right Turn Volume Included: 0% NB

Option: Low speed, urban community

WARRANT 1, Condition A - Minimum Vehicular Volume

100% Satisfied

No

	Vehicles per hour 100% (80%)	Peak Hour	2nd Highest	3rd Highest	4th Highest	5th Highest	6th Highest	7th Highest	8th Highest
Both Apprchs. Major Street	500 (400)	720	680	673	651	610	494	371	305
Highest Apprch. Minor Street	150 (120)	119	56	93	110	84	76	43	56

WARRANT 1, Condition B - Interruption of Continuous Traffic

100% Satisfied

No

	Vehicles per hour 100% (80%)	Peak Hour	2nd Highest	3rd Highest	4th Highest	5th Highest	6th Highest	7th Highest	8th Highest
Both Apprchs. Major Street	750 (600)	720	680	673	651	610	494	371	305
Highest Apprch. Minor Street	75 (60)	119	56	93	110	84	76	43	56

WARRANT 1, Condition A and Condition B

80% Satisfied

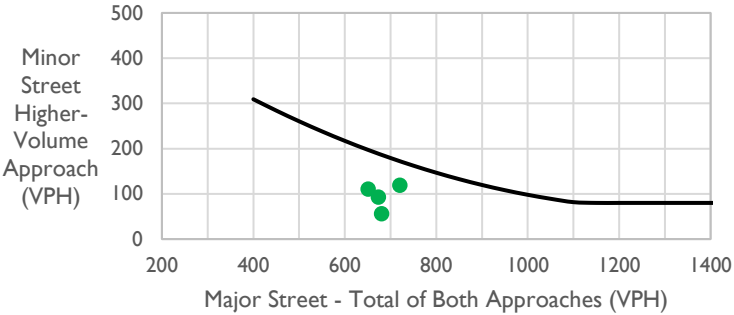
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WARRANT 2, Four Hour Volume

100% Satisfied

No

	Both Apprchs. Major Street	Higher Vol. Apprch. Minor Street
Peak Hour	720	119
2nd Highest	680	56
3rd Highest	673	93
4th Highest	651	110





MUTCD Volume-based Warrant Evaluation  
Streeter Dr & Northshore Dr  
Future (2045) - Build (Constrained)



Major Street: Northshore Dr

Minor Street: Streeter Dr

Lanes Moving Traffic: 1

Lanes Moving Traffic: 1

Approach Speed: 25 MPH

Right Turn Volume Included: 0% NB

Option: Low speed, urban community

WARRANT 1, Condition A - Minimum Vehicular Volume

100% Satisfied

No

	Vehicles per hour 100% (80%)	Peak Hour	2nd Highest	3rd Highest	4th Highest	5th Highest	6th Highest	7th Highest	8th Highest
Both Apprchs. Major Street	500 (400)	810	765	758	732	686	556	418	344
Highest Apprch. Minor Street	150 (120)	135	63	105	125	95	87	48	63

WARRANT 1, Condition B - Interruption of Continuous Traffic

100% Satisfied

No

	Vehicles per hour 100% (80%)	Peak Hour	2nd Highest	3rd Highest	4th Highest	5th Highest	6th Highest	7th Highest	8th Highest
Both Apprchs. Major Street	750 (600)	810	765	758	732	686	556	418	344
Highest Apprch. Minor Street	75 (60)	135	63	105	125	95	87	48	63

WARRANT 1, Condition A and Condition B

80% Satisfied

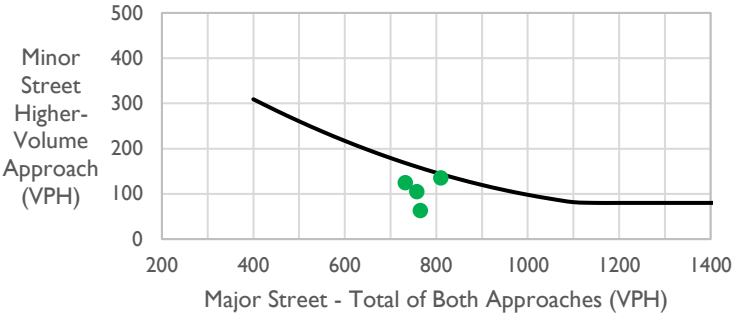
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WARRANT 2, Four Hour Volume

100% Satisfied

No

	Both Apprchs. Major Street	Higher Vol. Apprch. Minor Street
Peak Hour	810	135
2nd Highest	765	63
3rd Highest	758	105
4th Highest	732	125



MUTCD Volume-based Warrant Evaluation  
Streeter Dr & Northshore Dr / County Rd 23  
Future (2045) - Build (Unconstrained)



Major Street: Northshore Dr / County Rd 23

Minor Street: Streeter Dr

Lanes Moving Traffic: 1

Lanes Moving Traffic: 1

Approach Speed: 25 MPH

Right Turn Volume Included: 0% NB

Option: Low speed, urban community

WARRANT 1, Condition A - Minimum Vehicular Volume

100% Satisfied

No

	Vehicles per hour 100% (80%)	Peak Hour	2nd Highest	3rd Highest	4th Highest	5th Highest	6th Highest	7th Highest	8th Highest
Both Apprchs. Major Street	500 (400)	810	765	758	732	686	556	418	344
Highest Apprch. Minor Street	150 (120)	135	63	105	125	95	87	48	63

WARRANT 1, Condition B - Interruption of Continuous Traffic

100% Satisfied

No

	Vehicles per hour 100% (80%)	Peak Hour	2nd Highest	3rd Highest	4th Highest	5th Highest	6th Highest	7th Highest	8th Highest
Both Apprchs. Major Street	750 (600)	810	765	758	732	686	556	418	344
Highest Apprch. Minor Street	75 (60)	135	63	105	125	95	87	48	63

WARRANT 1, Condition A and Condition B

80% Satisfied

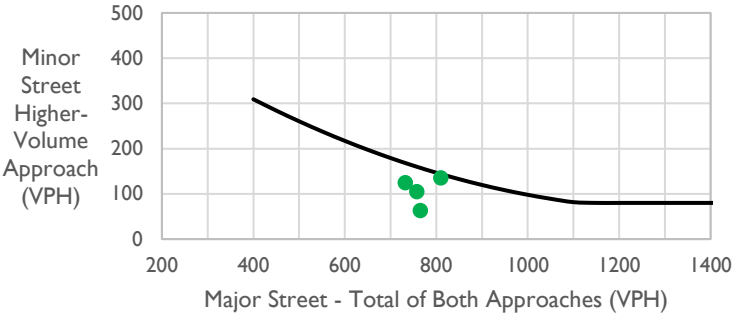
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WARRANT 2, Four Hour Volume

100% Satisfied

No

	Both Apprchs. Major Street	Higher Vol. Apprch. Minor Street
Peak Hour	810	135
2nd Highest	765	63
3rd Highest	758	105
4th Highest	732	125



MUTCD Volume-based Warrant Evaluation  
484th Ave & Northshore Dr  
Interim (2025) - Alt I (Constrained)



Major Street: Northshore Dr

Minor Street: 484th Ave

Lanes Moving Traffic: 1

Lanes Moving Traffic: 1

Approach Speed: 35 MPH

Right Turn Volume Reduction: 0% SB, 0% NB

Option: Low speed, urban community

WARRANT 1, Condition A - Minimum Vehicular Volume

100% Satisfied

No

	Vehicles per hour 100% (80%)	Peak Hour	2nd Highest	3rd Highest	4th Highest	5th Highest	6th Highest	7th Highest	8th Highest
Both Apprchs. Major Street	500 (400)	293	266	220	208	153	134	130	119
Highest Apprch. Minor Street	150 (120)	26	27	21	34	46	11	36	11

WARRANT 1, Condition B - Interruption of Continuous Traffic

100% Satisfied

No

	Vehicles per hour 100% (80%)	Peak Hour	2nd Highest	3rd Highest	4th Highest	5th Highest	6th Highest	7th Highest	8th Highest
Both Apprchs. Major Street	750 (600)	293	266	220	208	153	134	130	119
Highest Apprch. Minor Street	75 (60)	26	27	21	34	46	11	36	11

WARRANT 1, Condition A and Condition B

80% Satisfied

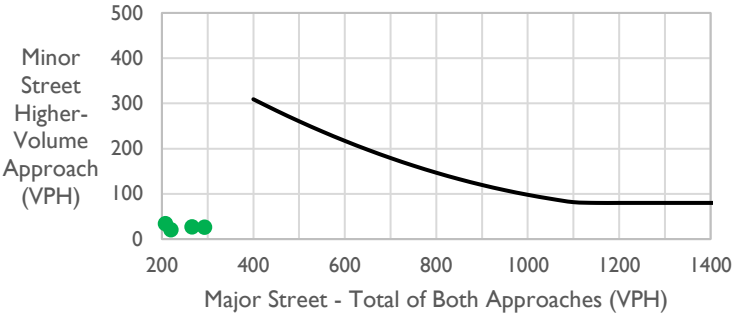
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WARRANT 2, Four Hour Volume

100% Satisfied

No

	Both Apprchs. Major Street	Higher Vol. Apprch. Minor Street
Peak Hour	293	26
2nd Highest	266	27
3rd Highest	220	21
4th Highest	208	34



MUTCD Volume-based Warrant Evaluation  
Westshore Dr & 484th Ave  
Interim (2025) - Alt 2 (Constrained)



Major Street: Westshore Dr

Minor Street: 484th Ave

Lanes Moving Traffic: 1

Lanes Moving Traffic: 1

Approach Speed: 35 MPH

Right Turn Volume Reduction: 0% WB

Option: Low speed, urban community

WARRANT 1, Condition A - Minimum Vehicular Volume

100% Satisfied

No

	Vehicles per hour 100% (80%)	Peak Hour	2nd Highest	3rd Highest	4th Highest	5th Highest	6th Highest	7th Highest	8th Highest
Both Apprchs. Major Street	500 (400)	251	228	188	178	131	115	111	102
Highest Apprch. Minor Street	150 (120)	70	73	55	91	124	29	98	29

WARRANT 1, Condition B - Interruption of Continuous Traffic

100% Satisfied

No

	Vehicles per hour 100% (80%)	Peak Hour	2nd Highest	3rd Highest	4th Highest	5th Highest	6th Highest	7th Highest	8th Highest
Both Apprchs. Major Street	750 (600)	251	228	188	178	131	115	111	102
Highest Apprch. Minor Street	75 (60)	70	73	55	91	124	29	98	29

WARRANT 1, Condition A and Condition B

80% Satisfied

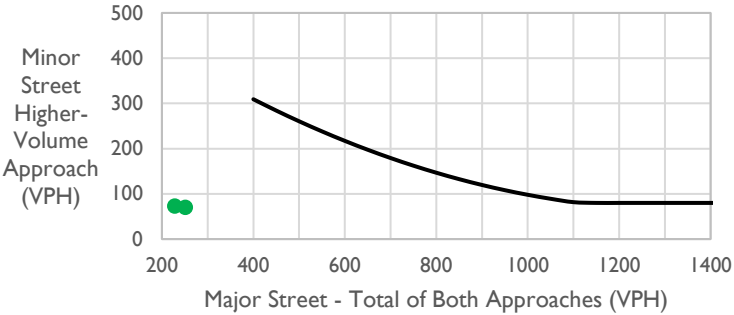
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WARRANT 2, Four Hour Volume

100% Satisfied

No

	Both Apprchs. Major Street	Higher Vol. Apprch. Minor Street
Peak Hour	251	70
2nd Highest	228	73
3rd Highest	188	55
4th Highest	178	91



MUTCD Volume-based Warrant Evaluation  
484th Ave & Northshore Dr  
Future (2045) - Alt I (Constrained)



Major Street: Northshore Dr

Minor Street: 484th Ave

Lanes Moving Traffic: 1

Lanes Moving Traffic: 1

Approach Speed: 35 MPH

Right Turn Volume Reduction: 0% SB, 0% NB

Option: Low speed, urban community

WARRANT 1, Condition A - Minimum Vehicular Volume

100% Satisfied

No

	Vehicles per hour 100% (80%)	Peak Hour	2nd Highest	3rd Highest	4th Highest	5th Highest	6th Highest	7th Highest	8th Highest
Both Apprchs. Major Street	500 (400)	340	309	255	241	178	156	151	138
Highest Apprch. Minor Street	150 (120)	45	47	36	59	80	19	63	19

WARRANT 1, Condition B - Interruption of Continuous Traffic

100% Satisfied

No

	Vehicles per hour 100% (80%)	Peak Hour	2nd Highest	3rd Highest	4th Highest	5th Highest	6th Highest	7th Highest	8th Highest
Both Apprchs. Major Street	750 (600)	340	309	255	241	178	156	151	138
Highest Apprch. Minor Street	75 (60)	45	47	36	59	80	19	63	19

WARRANT 1, Condition A and Condition B

80% Satisfied

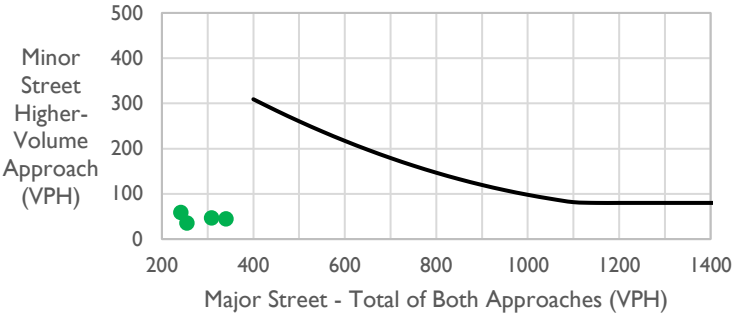
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WARRANT 2, Four Hour Volume

100% Satisfied

No

	Both Apprchs. Major Street	Higher Vol. Apprch. Minor Street
Peak Hour	340	45
2nd Highest	309	47
3rd Highest	255	36
4th Highest	241	59



MUTCD Volume-based Warrant Evaluation  
Westshore Dr & 484th Ave  
Future (2045) - Alt 2 (Constrained)



Major Street: Westshore Dr

Minor Street: 484th Ave

Lanes Moving Traffic: 1

Lanes Moving Traffic: 1

Approach Speed: 35 MPH

Right Turn Volume Reduction: 0% WB

Option: Low speed, urban community

WARRANT 1, Condition A - Minimum Vehicular Volume

100% Satisfied

No

	Vehicles per hour 100% (80%)	Peak Hour	2nd Highest	3rd Highest	4th Highest	5th Highest	6th Highest	7th Highest	8th Highest
Both Apprchs. Major Street	500 (400)	295	268	221	209	154	135	131	120
Highest Apprch. Minor Street	150 (120)	95	99	75	124	168	40	133	40

WARRANT 1, Condition B - Interruption of Continuous Traffic

100% Satisfied

No

	Vehicles per hour 100% (80%)	Peak Hour	2nd Highest	3rd Highest	4th Highest	5th Highest	6th Highest	7th Highest	8th Highest
Both Apprchs. Major Street	750 (600)	295	268	221	209	154	135	131	120
Highest Apprch. Minor Street	75 (60)	95	99	75	124	168	40	133	40

WARRANT 1, Condition A and Condition B

80% Satisfied

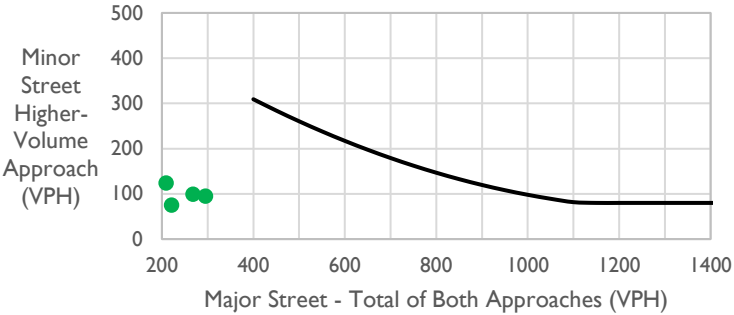
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WARRANT 2, Four Hour Volume

100% Satisfied

No

	Both Apprchs. Major Street	Higher Vol. Apprch. Minor Street
Peak Hour	295	95
2nd Highest	268	99
3rd Highest	221	75
4th Highest	209	124



MUTCD Volume-based Warrant Evaluation  
Westshore Dr & Northshore Dr  
Future (2045) - Alt I (Unconstrained)



Major Street: Northshore Dr

Minor Street: Westshore Dr

Lanes Moving Traffic: 1

Lanes Moving Traffic: 1

Approach Speed: 35 MPH

Right Turn Volume Reduction: 0% SB, 0% NB

Option: Low speed, urban community

WARRANT 1, Condition A - Minimum Vehicular Volume

100% Satisfied

No

	Vehicles per hour 100% (80%)	Peak Hour	2nd Highest	3rd Highest	4th Highest	5th Highest	6th Highest	7th Highest	8th Highest
Both Apprchs. Major Street	500 (400)	415	377	311	294	217	190	184	169
Highest Apprch. Minor Street	150 (120)	75	78	59	98	133	31	105	31

WARRANT 1, Condition B - Interruption of Continuous Traffic

100% Satisfied

No

	Vehicles per hour 100% (80%)	Peak Hour	2nd Highest	3rd Highest	4th Highest	5th Highest	6th Highest	7th Highest	8th Highest
Both Apprchs. Major Street	750 (600)	415	377	311	294	217	190	184	169
Highest Apprch. Minor Street	75 (60)	75	78	59	98	133	31	105	31

WARRANT 1, Condition A and Condition B

80% Satisfied

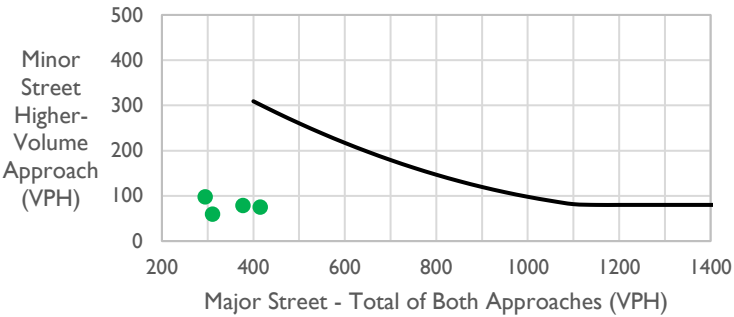
No

WARRANT 2, Four Hour Volume

100% Satisfied

No

	Both Apprchs. Major Street	Higher Vol. Apprch. Minor Street
Peak Hour	415	75
2nd Highest	377	78
3rd Highest	311	59
4th Highest	294	98



MUTCD Volume-based Warrant Evaluation  
Westshore Dr & Westshore Dr  
Future (2045) - Alt 2 (Unconstrained)



Major Street: Westshore Dr

Minor Street: Westshore Dr

Lanes Moving Traffic: 1

Lanes Moving Traffic: 1

Approach Speed: 25 MPH

Right Turn Volume Reduction: 0% SB, 0% NB

Option: Low speed, urban community

WARRANT 1, Condition A - Minimum Vehicular Volume

100% Satisfied

No

	Vehicles per hour 100% (80%)	Peak Hour	2nd Highest	3rd Highest	4th Highest	5th Highest	6th Highest	7th Highest	8th Highest
Both Apprchs. Major Street	500 (400)	95	86	71	67	50	44	42	39
Highest Apprch. Minor Street	150 (120)	95	99	75	124	168	40	133	40

WARRANT 1, Condition B - Interruption of Continuous Traffic

100% Satisfied

No

	Vehicles per hour 100% (80%)	Peak Hour	2nd Highest	3rd Highest	4th Highest	5th Highest	6th Highest	7th Highest	8th Highest
Both Apprchs. Major Street	750 (600)	95	86	71	67	50	44	42	39
Highest Apprch. Minor Street	75 (60)	95	99	75	124	168	40	133	40

WARRANT 1, Condition A and Condition B

80% Satisfied

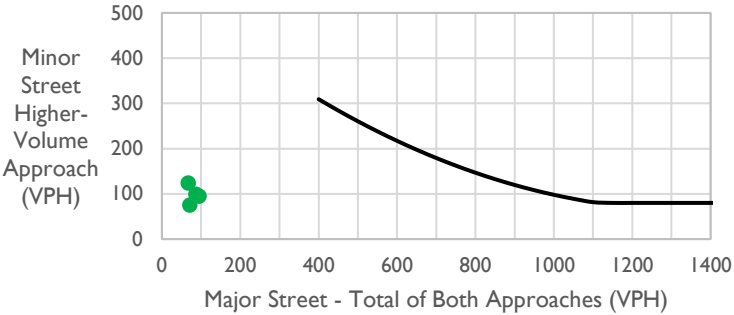
No

WARRANT 2, Four Hour Volume

100% Satisfied

No

	Both Apprchs. Major Street	Higher Vol. Apprch. Minor Street
Peak Hour	95	95
2nd Highest	86	99
3rd Highest	71	75
4th Highest	67	124





MUTCD Volume-based Warrant Evaluation  
Westshore Dr & S. 333rd Ave  
Interim (2025) - Alt I (Constrained)



Major Street: Westshore Dr

Minor Street: S. 333rd Ave

Lanes Moving Traffic: 1

Lanes Moving Traffic: 1

Approach Speed: 55 MPH

Right Turn Volume Reduction: 0% WB

Option: High speed major-street

WARRANT 1, Condition A - Minimum Vehicular Volume

70% Satisfied

No

	Vehicles per hour 70% (56%)	Peak Hour	2nd Highest	3rd Highest	4th Highest	5th Highest	6th Highest	7th Highest	8th Highest
Both Apprchs. Major Street	350 (280)	229	215	201	187	173	159	145	131
Highest Apprch. Minor Street	105 (84)	137	129	120	112	103	95	87	78

WARRANT 1, Condition B - Interruption of Continuous Traffic

70% Satisfied

No

	Vehicles per hour 70% (56%)	Peak Hour	2nd Highest	3rd Highest	4th Highest	5th Highest	6th Highest	7th Highest	8th Highest
Both Apprchs. Major Street	525 (420)	229	215	201	187	173	159	145	131
Highest Apprch. Minor Street	53 (42)	137	129	120	112	103	95	87	78

WARRANT 1, Condition A and Condition B

56% Satisfied

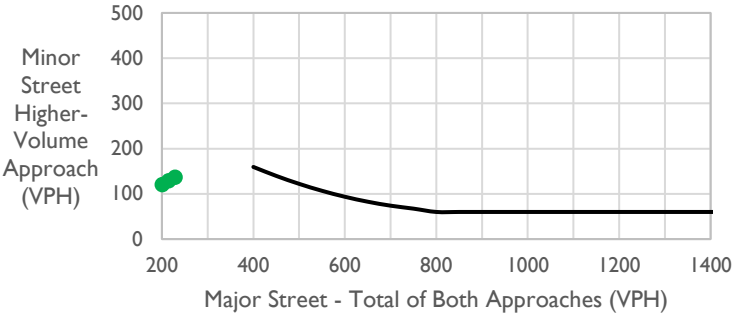
No

WARRANT 2, Four Hour Volume

70% Satisfied

No

	Both Apprchs. Major Street	Higher Vol. Apprch. Minor Street
Peak Hour	229	137
2nd Highest	215	129
3rd Highest	201	120
4th Highest	187	112



MUTCD Volume-based Warrant Evaluation  
Westshore Dr & S. 333rd Ave  
Interim (2025) - Alt 2 (Constrained)



Major Street: S. 333rd Ave

Minor Street: Westshore Dr

Lanes Moving Traffic: 1

Lanes Moving Traffic: 1

Approach Speed: 40 MPH

Right Turn Volume Reduction: 0% SB

Option: Low speed, urban community

WARRANT 1, Condition A - Minimum Vehicular Volume

100% Satisfied

No

	Vehicles per hour 100% (80%)	Peak Hour	2nd Highest	3rd Highest	4th Highest	5th Highest	6th Highest	7th Highest	8th Highest
Both Apprchs. Major Street	500 (400)	264	248	232	215	199	183	167	151
Highest Apprch. Minor Street	150 (120)	43	40	38	35	32	30	27	25

WARRANT 1, Condition B - Interruption of Continuous Traffic

100% Satisfied

No

	Vehicles per hour 100% (80%)	Peak Hour	2nd Highest	3rd Highest	4th Highest	5th Highest	6th Highest	7th Highest	8th Highest
Both Apprchs. Major Street	750 (600)	264	248	232	215	199	183	167	151
Highest Apprch. Minor Street	75 (60)	43	40	38	35	32	30	27	25

WARRANT 1, Condition A and Condition B

80% Satisfied

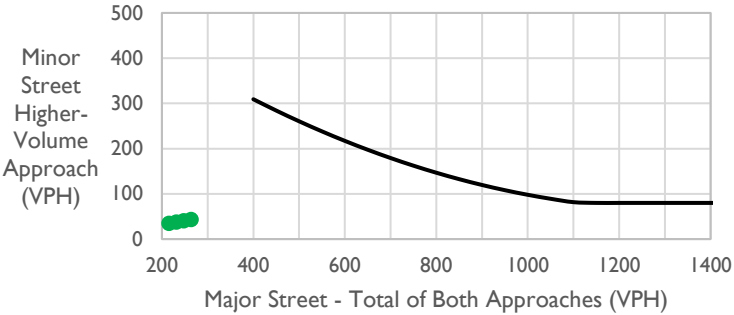
No

WARRANT 2, Four Hour Volume

100% Satisfied

No

	Both Apprchs. Major Street	Higher Vol. Apprch. Minor Street
Peak Hour	264	43
2nd Highest	248	40
3rd Highest	232	38
4th Highest	215	35



MUTCD Volume-based Warrant Evaluation  
Westshore Dr & S. 333rd Ave  
Future (2045) - Alt I (Constrained)



Major Street: Westshore Dr

Minor Street: S. 333rd Ave

Lanes Moving Traffic: 1

Lanes Moving Traffic: 1

Approach Speed: 55 MPH

Right Turn Volume Reduction: 0% WB

Option: High speed major-street

WARRANT 1, Condition A - Minimum Vehicular Volume

70% Satisfied

No

	Vehicles per hour 70% (56%)	Peak Hour	2nd Highest	3rd Highest	4th Highest	5th Highest	6th Highest	7th Highest	8th Highest
Both Apprchs. Major Street	350 (280)	285	268	250	233	215	198	180	163
Highest Apprch. Minor Street	105 (84)	160	150	140	131	121	111	101	91

WARRANT 1, Condition B - Interruption of Continuous Traffic

70% Satisfied

No

	Vehicles per hour 70% (56%)	Peak Hour	2nd Highest	3rd Highest	4th Highest	5th Highest	6th Highest	7th Highest	8th Highest
Both Apprchs. Major Street	525 (420)	285	268	250	233	215	198	180	163
Highest Apprch. Minor Street	53 (42)	160	150	140	131	121	111	101	91

WARRANT 1, Condition A and Condition B

56% Satisfied

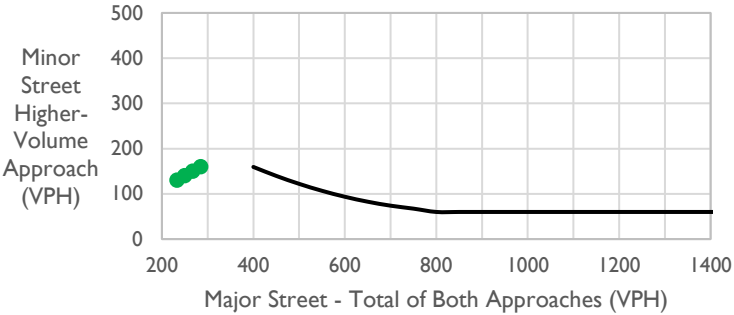
No

WARRANT 2, Four Hour Volume

70% Satisfied

No

	Both Apprchs. Major Street	Higher Vol. Apprch. Minor Street
Peak Hour	285	160
2nd Highest	268	150
3rd Highest	250	140
4th Highest	233	131



MUTCD Volume-based Warrant Evaluation  
Westshore Dr & S. 333rd Ave  
Future (2045) - Alt 2 (Constrained)



Major Street: S. 333rd Ave

Minor Street: Westshore Dr

Lanes Moving Traffic: 1

Lanes Moving Traffic: 1

Approach Speed: 40 MPH

Right Turn Volume Reduction: 0% SB

Option: Low speed, urban community

WARRANT 1, Condition A - Minimum Vehicular Volume

100% Satisfied

No

	Vehicles per hour 100% (80%)	Peak Hour	2nd Highest	3rd Highest	4th Highest	5th Highest	6th Highest	7th Highest	8th Highest
Both Apprchs. Major Street	500 (400)	320	300	281	261	242	222	202	183
Highest Apprch. Minor Street	150 (120)	55	52	48	45	42	38	35	31

WARRANT 1, Condition B - Interruption of Continuous Traffic

100% Satisfied

No

	Vehicles per hour 100% (80%)	Peak Hour	2nd Highest	3rd Highest	4th Highest	5th Highest	6th Highest	7th Highest	8th Highest
Both Apprchs. Major Street	750 (600)	320	300	281	261	242	222	202	183
Highest Apprch. Minor Street	75 (60)	55	52	48	45	42	38	35	31

WARRANT 1, Condition A and Condition B

80% Satisfied

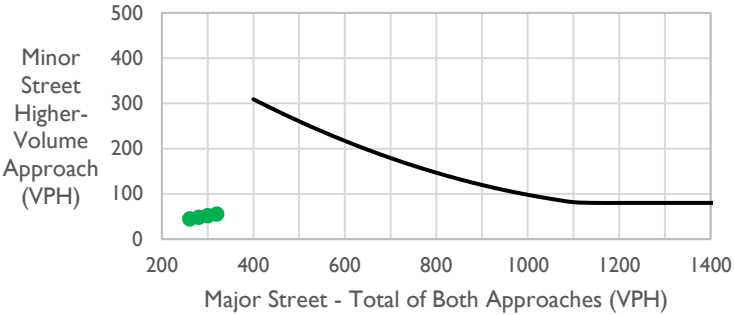
No

WARRANT 2, Four Hour Volume

100% Satisfied

No

	Both Apprchs. Major Street	Higher Vol. Apprch. Minor Street
Peak Hour	320	55
2nd Highest	300	52
3rd Highest	281	48
4th Highest	261	45



MUTCD Volume-based Warrant Evaluation  
Westshore Dr & Northshore Dr  
Future (2045) - Alt I (Unconstrained)



Major Street: Westshore Dr  
Lanes Moving Traffic: 1  
Approach Speed: 55 MPH  
Option: High speed major-street

Minor Street: Northshore Dr  
Lanes Moving Traffic: 1  
Right Turn Volume Reduction: 0% WB

WARRANT 1, Condition A - Minimum Vehicular Volume 70% Satisfied No

	Vehicles per hour 70% (56%)	Peak Hour	2nd Highest	3rd Highest	4th Highest	5th Highest	6th Highest	7th Highest	8th Highest
Both Apprchs. Major Street	350 (280)	410	385	360	335	309	284	259	234
Highest Apprch. Minor Street	105 (84)	215	202	189	175	162	149	136	123

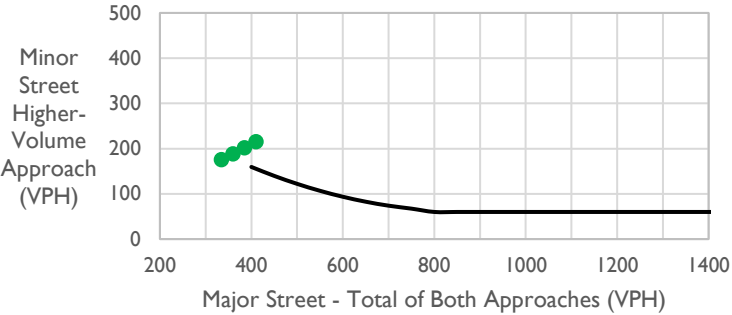
WARRANT 1, Condition B - Interruption of Continuous Traffic 70% Satisfied No

	Vehicles per hour 70% (56%)	Peak Hour	2nd Highest	3rd Highest	4th Highest	5th Highest	6th Highest	7th Highest	8th Highest
Both Apprchs. Major Street	525 (420)	410	385	360	335	309	284	259	234
Highest Apprch. Minor Street	53 (42)	215	202	189	175	162	149	136	123

WARRANT 1, Condition A and Condition B 56% Satisfied No

WARRANT 2, Four Hour Volume 70% Satisfied No

	Both Apprchs. Major Street	Higher Vol. Apprch. Minor Street
Peak Hour	410	215
2nd Highest	385	202
3rd Highest	360	189
4th Highest	335	175



MUTCD Volume-based Warrant Evaluation  
Westshore Dr & Westshore Dr / Northshore Dr  
Future (2045) - Alt 2 (Unconstrained)



Major Street: Westshore Dr / Northshore Dr

Minor Street: Westshore Dr

Lanes Moving Traffic: 1

Lanes Moving Traffic: 1

Approach Speed: 40 MPH

Right Turn Volume Reduction: 0% SB

Option: Low speed, urban community

WARRANT 1, Condition A - Minimum Vehicular Volume

100% Satisfied

No

	Vehicles per hour 100% (80%)	Peak Hour	2nd Highest	3rd Highest	4th Highest	5th Highest	6th Highest	7th Highest	8th Highest
Both Apprchs. Major Street	500 (400)	445	418	390	363	336	309	281	254
Highest Apprch. Minor Street	150 (120)	105	99	92	86	79	73	66	60

WARRANT 1, Condition B - Interruption of Continuous Traffic

100% Satisfied

No

	Vehicles per hour 100% (80%)	Peak Hour	2nd Highest	3rd Highest	4th Highest	5th Highest	6th Highest	7th Highest	8th Highest
Both Apprchs. Major Street	750 (600)	445	418	390	363	336	309	281	254
Highest Apprch. Minor Street	75 (60)	105	99	92	86	79	73	66	60

WARRANT 1, Condition A and Condition B

80% Satisfied

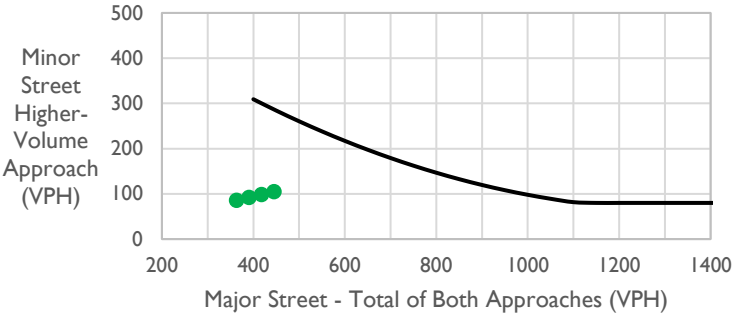
No

WARRANT 2, Four Hour Volume

100% Satisfied

No

	Both Apprchs. Major Street	Higher Vol. Apprch. Minor Street
Peak Hour	445	105
2nd Highest	418	99
3rd Highest	390	92
4th Highest	363	86



MUTCD Volume-based Warrant Evaluation  
Northshore Dr & S. 333rd Ave  
Interim (2025) - Alt I (Constrained)



Major Street: S. 333rd Ave  
Lanes Moving Traffic: 2 or more  
Approach Speed: 40 MPH  
Option: Low speed, urban community

Minor Street: Northshore Dr  
Lanes Moving Traffic: 1  
Right Turn Volume Reduction: 50% NB

WARRANT 1, Condition A - Minimum Vehicular Volume

100% Satisfied

No

	Vehicles per hour 100% (80%)	Peak Hour	2nd Highest	3rd Highest	4th Highest	5th Highest	6th Highest	7th Highest	8th Highest
Both Apprchs. Major Street	600 (480)	665	624	583	543	502	461	420	380
Highest Apprch. Minor Street	150 (120)	147	138	129	120	111	102	93	84

WARRANT 1, Condition B - Interruption of Continuous Traffic

100% Satisfied

No

	Vehicles per hour 100% (80%)	Peak Hour	2nd Highest	3rd Highest	4th Highest	5th Highest	6th Highest	7th Highest	8th Highest
Both Apprchs. Major Street	900 (720)	665	624	583	543	502	461	420	380
Highest Apprch. Minor Street	75 (60)	147	138	129	120	111	102	93	84

WARRANT 1, Condition A and Condition B

80% Satisfied

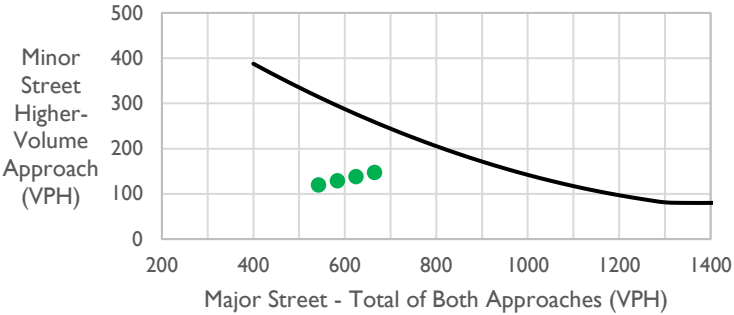
No

WARRANT 2, Four Hour Volume

100% Satisfied

No

	Both Apprchs. Major Street	Higher Vol. Apprch. Minor Street
Peak Hour	665	147
2nd Highest	624	138
3rd Highest	583	129
4th Highest	543	120



MUTCD Volume-based Warrant Evaluation  
S. 333rd Ave & S. 333rd Ave / Northshore Dr  
Interim (2025) - Alt 2 (Constrained)



Major Street: S. 333rd Ave / Northshore Dr

Minor Street: S. 333rd Ave

Lanes Moving Traffic: 1

Lanes Moving Traffic: 2 or more

Approach Speed: 40 MPH

Right Turn Volume Reduction: 50% NB

Option: Low speed, urban community

WARRANT 1, Condition A - Minimum Vehicular Volume

100% Satisfied

No

	Vehicles per hour 100% (80%)	Peak Hour	2nd Highest	3rd Highest	4th Highest	5th Highest	6th Highest	7th Highest	8th Highest
Both Apprchs. Major Street	500 (400)	665	624	583	543	502	461	420	380
Highest Apprch. Minor Street	200 (160)	147	138	129	120	111	102	93	84

WARRANT 1, Condition B - Interruption of Continuous Traffic

100% Satisfied

No

	Vehicles per hour 100% (80%)	Peak Hour	2nd Highest	3rd Highest	4th Highest	5th Highest	6th Highest	7th Highest	8th Highest
Both Apprchs. Major Street	750 (600)	665	624	583	543	502	461	420	380
Highest Apprch. Minor Street	100 (80)	147	138	129	120	111	102	93	84

WARRANT 1, Condition A and Condition B

80% Satisfied

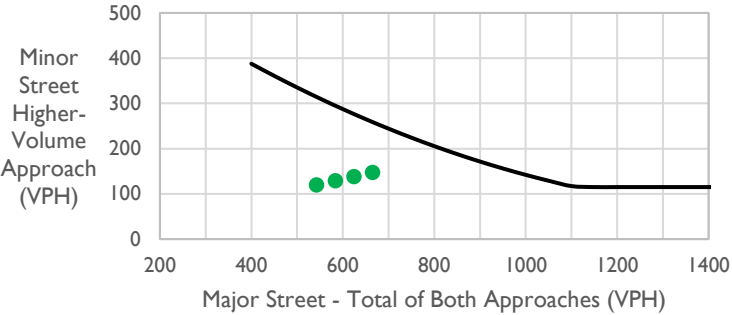
No

WARRANT 2, Four Hour Volume

100% Satisfied

No

	Both Apprchs. Major Street	Higher Vol. Apprch. Minor Street
Peak Hour	665	147
2nd Highest	624	138
3rd Highest	583	129
4th Highest	543	120





MUTCD Volume-based Warrant Evaluation  
Northshore Dr & S. 333rd Ave  
Future (2045) - Alt I (Constrained)



Major Street: S. 333rd Ave  
Lanes Moving Traffic: 2 or more  
Approach Speed: 40 MPH  
Option: Low speed, urban community

Minor Street: Northshore Dr  
Lanes Moving Traffic: 1  
Right Turn Volume Reduction: 50% NB

WARRANT 1, Condition A - Minimum Vehicular Volume

100% Satisfied

No

	Vehicles per hour 100% (80%)	Peak Hour	2nd Highest	3rd Highest	4th Highest	5th Highest	6th Highest	7th Highest	8th Highest
Both Apprchs. Major Street	600 (480)	740	695	649	604	559	513	468	423
Highest Apprch. Minor Street	150 (120)	168	158	147	137	127	117	106	96

WARRANT 1, Condition B - Interruption of Continuous Traffic

100% Satisfied

No

	Vehicles per hour 100% (80%)	Peak Hour	2nd Highest	3rd Highest	4th Highest	5th Highest	6th Highest	7th Highest	8th Highest
Both Apprchs. Major Street	900 (720)	740	695	649	604	559	513	468	423
Highest Apprch. Minor Street	75 (60)	168	158	147	137	127	117	106	96

WARRANT 1, Condition A and Condition B

80% Satisfied

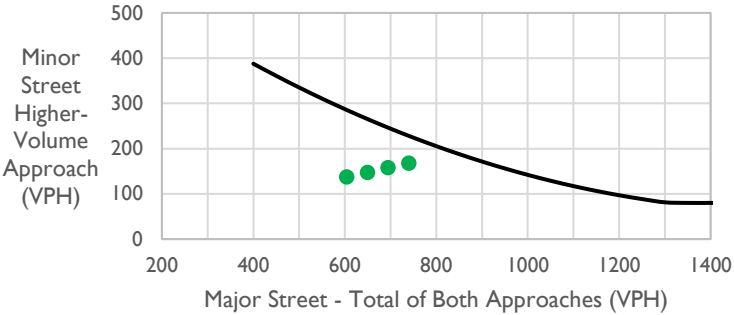
No

WARRANT 2, Four Hour Volume

100% Satisfied

No

	Both Apprchs. Major Street	Higher Vol. Apprch. Minor Street
Peak Hour	740	168
2nd Highest	695	158
3rd Highest	649	147
4th Highest	604	137



MUTCD Volume-based Warrant Evaluation  
Northshore Dr & S. 333rd Ave  
Future (2045) - Alt 2 (Constrained)



Major Street: S. 333rd Ave  
Lanes Moving Traffic: 2 or more  
Approach Speed: 40 MPH  
Option: Low speed, urban community

Minor Street: Northshore Dr  
Lanes Moving Traffic: 2 or more  
Right Turn Volume Reduction: 50% NB

WARRANT 1, Condition A - Minimum Vehicular Volume

100% Satisfied

No

	Vehicles per hour 100% (80%)	Peak Hour	2nd Highest	3rd Highest	4th Highest	5th Highest	6th Highest	7th Highest	8th Highest
Both Apprchs. Major Street	600 (480)	740	695	649	604	559	513	468	423
Highest Apprch. Minor Street	200 (160)	168	158	147	137	127	117	106	96

WARRANT 1, Condition B - Interruption of Continuous Traffic

100% Satisfied

No

	Vehicles per hour 100% (80%)	Peak Hour	2nd Highest	3rd Highest	4th Highest	5th Highest	6th Highest	7th Highest	8th Highest
Both Apprchs. Major Street	900 (720)	740	695	649	604	559	513	468	423
Highest Apprch. Minor Street	100 (80)	168	158	147	137	127	117	106	96

WARRANT 1, Condition A and Condition B

80% Satisfied

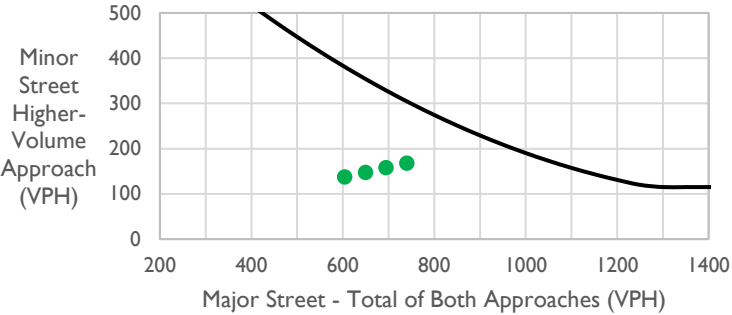
No

WARRANT 2, Four Hour Volume

100% Satisfied

No

	Both Apprchs. Major Street	Higher Vol. Apprch. Minor Street
Peak Hour	740	168
2nd Highest	695	158
3rd Highest	649	147
4th Highest	604	137



MUTCD Volume-based Warrant Evaluation  
Northshore Dr & S. 333rd St / Northshore Dr  
Future (2045) - Alt I (Constrained)



Major Street: S. 333rd St / Northshore Dr

Minor Street: Northshore Dr

Lanes Moving Traffic: 2 or more

Lanes Moving Traffic: 2 or more

Approach Speed: 40 MPH

Right Turn Volume Reduction: 50% NB

Option: Low speed, urban community

WARRANT 1, Condition A - Minimum Vehicular Volume

100% Satisfied

No

	Vehicles per hour 100% (80%)	Peak Hour	2nd Highest	3rd Highest	4th Highest	5th Highest	6th Highest	7th Highest	8th Highest
Both Apprchs. Major Street	600 (480)	1075	1009	943	877	811	746	680	614
Highest Apprch. Minor Street	200 (160)	168	158	147	137	127	117	106	96

WARRANT 1, Condition B - Interruption of Continuous Traffic

100% Satisfied

No

	Vehicles per hour 100% (80%)	Peak Hour	2nd Highest	3rd Highest	4th Highest	5th Highest	6th Highest	7th Highest	8th Highest
Both Apprchs. Major Street	900 (720)	1075	1009	943	877	811	746	680	614
Highest Apprch. Minor Street	100 (80)	168	158	147	137	127	117	106	96

WARRANT 1, Condition A and Condition B

80% Satisfied

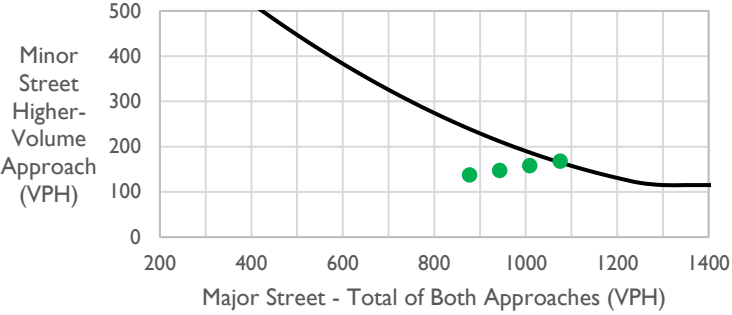
No

WARRANT 2, Four Hour Volume

100% Satisfied

No

	Both Apprchs. Major Street	Higher Vol. Apprch. Minor Street
Peak Hour	1075	168
2nd Highest	1009	158
3rd Highest	943	147
4th Highest	877	137



## APPENDIX E.      AUXILIARY LANE ANALYSIS

## Left Turn Lane Warrants

EB	WB
NO	NO

### Left Turn Lane Evaluation Process

EB WB

- |     |    |   |
|-----|----|---|
| YES | NO | • The left turn lane complies with access management spacing standards. |
| YES | NO | • The left turn lane conforms to appropriate design guidelines.         |
| NO  | NO | • Criterion 1 (Volume), 2 (Crash), or 3 (Special Cases) is met.         |
- 

### Criterion 1: Vehicular Volume

- |    |    |                                      |
|----|----|--------------------------------------|
| NO | NO | • Refer to Figure 15-2 on next page. |
|----|----|--------------------------------------|

### Criterion 2: Crash Experience

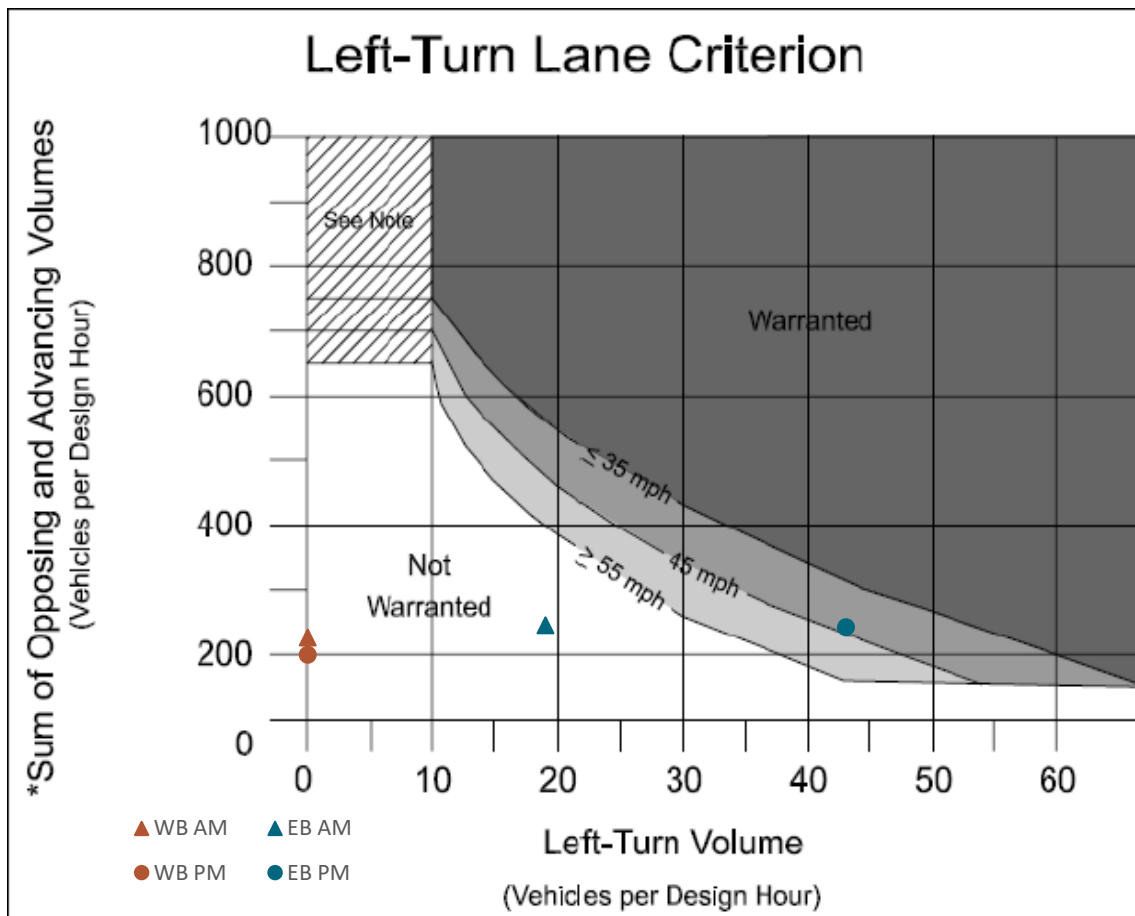
The crash experience criterion is satisfied when either Condition 1 or 2 are met and Condition 3 is met:

- |    |    |  |
|----|----|--|
| NO | NO | 1. A history of crashes of the type susceptible to correction by a left turn lane (e.g. rear-end crashes involving turning vehicles). A separate left turn lane may be warranted if three or more reported intersection related crashes occur within a 12 month period.  |
| NO | NO | 2. An economic analysis using predictive measures consistent with the AASHTO Highway Safety Manual (HSM) shows a benefit/cost ratio $\geq 1.0$ and at least two crashes in the last ten years are of the type susceptible to correction by a left turn lane (e.g. rear-end crashes involving turning vehicles), or based on the Highway Safety Engineer's recommendation to add a turn lane. |
| NO | NO | 3. The installation of the left turn lane does not adversely impact the operations of the intersection.  |
| NO | NO | • Criterion 2 Satisfied.   |

### Criterion 3: Special Cases

- |    |    |   |    |    |  |    |    |  |
|----|----|---|----|----|--|----|----|--|
| NO | NO | 1. <u>Railroad Crossings</u> : If a railroad is parallel to the roadway, then the likelihood of train movements preventing left turns and creating stopped queues on the highway should be taken into consideration. The provided left turn lane storage length will be dependent on the duration that the side road is closed, the expected number of vehicle arrivals, and the location of the crossing. The analysis should consider all the variables influencing the design of the left turn lane and may allow a design for conditions other than the worst-case storage requirements, provided safety is not compromised.  |    |    |  |    |    |  |
| NO | NO | 2. <u>Geometric/Safety Concerns</u> : Sight distance, alignment, operating speeds, adjacent access points, and other safety related concerns should be taken into consideration.  |    |    |  |    |    |  |
| NO | NO | 3. <u>Non-Traversable Median</u> : A left turn lane may be considered to be installed at a break in a non-traversable median where left turns are not prohibited and either of the following conditions exist: <table border="0" style="margin-left: 20px;"> <tr> <td>NO</td> <td>NO</td> <td>a. If Criterion 1 (Vehicular Volume) is not met but there is a significant amount of left turn movements; or</td> </tr> <tr> <td>NO</td> <td>NO</td> <td>b. If Criterion 2 (Crash Experience) is not met but there has been a pattern of crashes that has occurred, and a left turn lane would prevent or limit those types of crashes to occur if installed.</td> </tr> </table> | NO | NO | a. If Criterion 1 (Vehicular Volume) is not met but there is a significant amount of left turn movements; or | NO | NO | b. If Criterion 2 (Crash Experience) is not met but there has been a pattern of crashes that has occurred, and a left turn lane would prevent or limit those types of crashes to occur if installed. |
| NO | NO | a. If Criterion 1 (Vehicular Volume) is not met but there is a significant amount of left turn movements; or  |    |    |  |    |    |  |
| NO | NO | b. If Criterion 2 (Crash Experience) is not met but there has been a pattern of crashes that has occurred, and a left turn lane would prevent or limit those types of crashes to occur if installed.  |    |    |  |    |    |  |

Criterion I: Vehicular Volume



\*(Advancing Vol / # of Advancing Through Lanes)+(Opposing Vol / # of Opposing Through Lanes)

Note: The criterion is not met from zero to ten left turn vehicles per hour, but careful consideration should be given to installing a left turn lane due to the increased potential for crashes in the through lanes. While the turn volumes are low, the adverse safety and operational impacts may require installation of a left turn. The final determination will be based on a field study.

**Figure 15-2** Left Turn Lane Volume Warrant

## Left Turn Lane Warrants

EB	WB
YES	NO

### Left Turn Lane Evaluation Process

EB WB

YES NO

- The left turn lane complies with access management spacing standards.

YES NO

- The left turn lane conforms to appropriate design guidelines.

YES NO

- Criterion 1 (Volume), 2 (Crash), or 3 (Special Cases) is met.

### Criterion 1: Vehicular Volume

YES NO

- Refer to Figure 15-2 on next page.

### Criterion 2: Crash Experience

The crash experience criterion is satisfied when either Condition 1 or 2 are met and Condition 3 is met:

NO NO

1. A history of crashes of the type susceptible to correction by a left turn lane (e.g. rear-end crashes involving turning vehicles). A separate left turn lane may be warranted if three or more reported intersection related crashes occur within a 12 month period.

NO NO

2. An economic analysis using predictive measures consistent with the AASHTO Highway Safety Manual (HSM) shows a benefit/cost ratio  $\geq 1.0$  and at least two crashes in the last ten years are of the type susceptible to correction by a left turn lane (e.g. rear-end crashes involving turning vehicles), or based on the Highway Safety Engineer's recommendation to add a turn lane.

NO NO

3. The installation of the left turn lane does not adversely impact the operations of the intersection.

NO NO

- Criterion 2 Satisfied.

### Criterion 3: Special Cases

NO NO

1. Railroad Crossings: If a railroad is parallel to the roadway, then the likelihood of train movements preventing left turns and creating stopped queues on the highway should be taken into consideration. The provided left turn lane storage length will be dependent on the duration that the side road is closed, the expected number of vehicle arrivals, and the location of the crossing. The analysis should consider all the variables influencing the design of the left turn lane and may allow a design for conditions other than the worst-case storage requirements, provided safety is not compromised.

NO NO

2. Geometric/Safety Concerns: Sight distance, alignment, operating speeds, adjacent access points, and other safety related concerns should be taken into consideration.

NO NO

3. Non-Traversable Median: A left turn lane may be considered to be installed at a break in a non-traversable median where left turns are not prohibited and either of the following conditions exist:

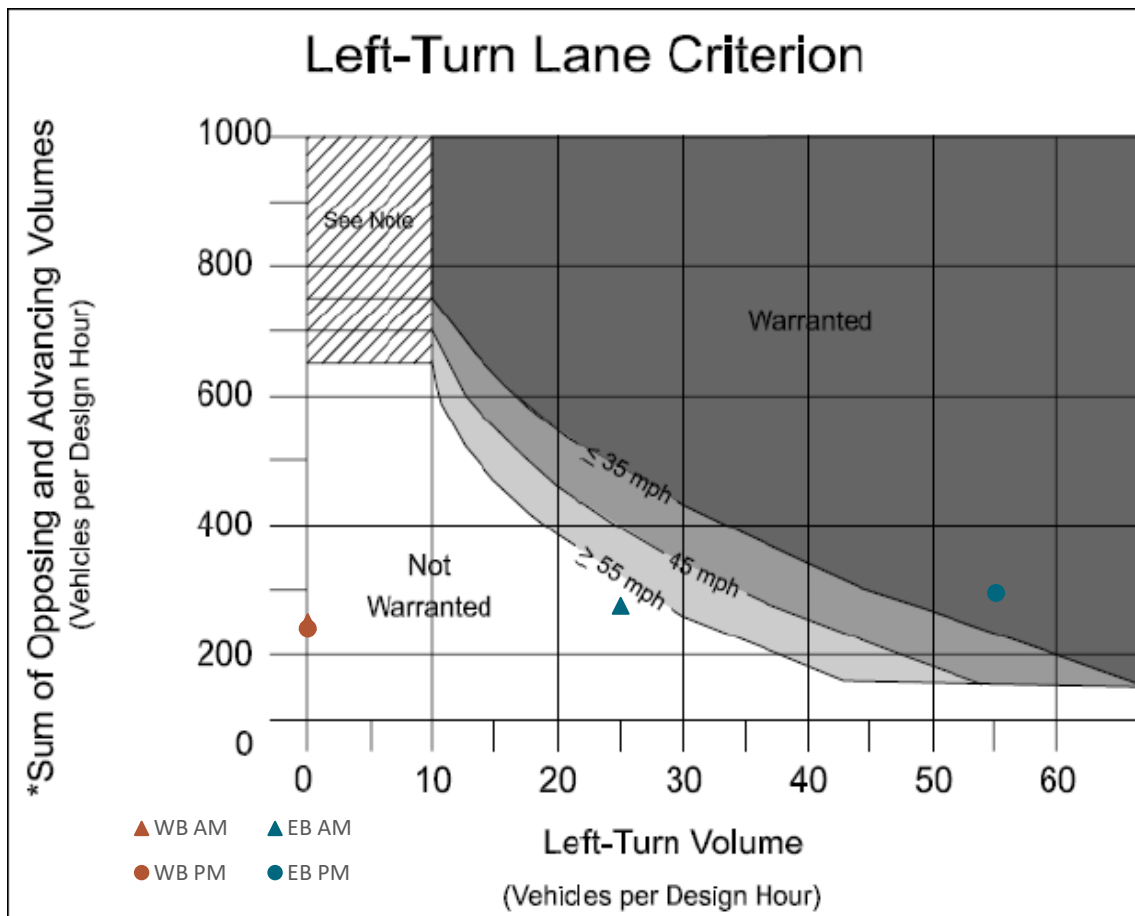
NO NO

- a. If Criterion 1 (Vehicular Volume) is not met but there is a significant amount of left turn movements; or

NO NO

- b. If Criterion 2 (Crash Experience) is not met but there has been a pattern of crashes that has occurred, and a left turn lane would prevent or limit those types of crashes to occur if installed.

Criterion I: Vehicular Volume



\*(Advancing Vol / # of Advancing Through Lanes)+(Opposing Vol / # of Opposing Through Lanes)

Note: The criterion is not met from zero to ten left turn vehicles per hour, but careful consideration should be given to installing a left turn lane due to the increased potential for crashes in the through lanes. While the turn volumes are low, the adverse safety and operational impacts may require installation of a left turn. The final determination will be based on a field study.

Figure 15-2 Left Turn Lane Volume Warrant



## Left Turn Lane Warrants

EB	WB
YES	NO

### Left Turn Lane Evaluation Process

EB WB

YES NO

- The left turn lane complies with access management spacing standards.

YES NO

- The left turn lane conforms to appropriate design guidelines.

YES NO

- Criterion 1 (Volume), 2 (Crash), or 3 (Special Cases) is met.

### Criterion 1: Vehicular Volume

YES NO

- Refer to Figure 15-2 on next page.

### Criterion 2: Crash Experience

The crash experience criterion is satisfied when either Condition 1 or 2 are met and Condition 3 is met:

NO NO

1. A history of crashes of the type susceptible to correction by a left turn lane (e.g. rear-end crashes involving turning vehicles). A separate left turn lane may be warranted if three or more reported intersection related crashes occur within a 12 month period.

NO NO

2. An economic analysis using predictive measures consistent with the AASHTO Highway Safety Manual (HSM) shows a benefit/cost ratio  $\geq 1.0$  and at least two crashes in the last ten years are of the type susceptible to correction by a left turn lane (e.g. rear-end crashes involving turning vehicles), or based on the Highway Safety Engineer's recommendation to add a turn lane.

NO NO

3. The installation of the left turn lane does not adversely impact the operations of the intersection.

NO NO

- Criterion 2 Satisfied.

### Criterion 3: Special Cases

NO NO

1. Railroad Crossings: If a railroad is parallel to the roadway, then the likelihood of train movements preventing left turns and creating stopped queues on the highway should be taken into consideration. The provided left turn lane storage length will be dependent on the duration that the side road is closed, the expected number of vehicle arrivals, and the location of the crossing. The analysis should consider all the variables influencing the design of the left turn lane and may allow a design for conditions other than the worst-case storage requirements, provided safety is not compromised.

NO NO

2. Geometric/Safety Concerns: Sight distance, alignment, operating speeds, adjacent access points, and other safety related concerns should be taken into consideration.

NO NO

3. Non-Traversable Median: A left turn lane may be considered to be installed at a break in a non-traversable median where left turns are not prohibited and either of the following conditions exist:

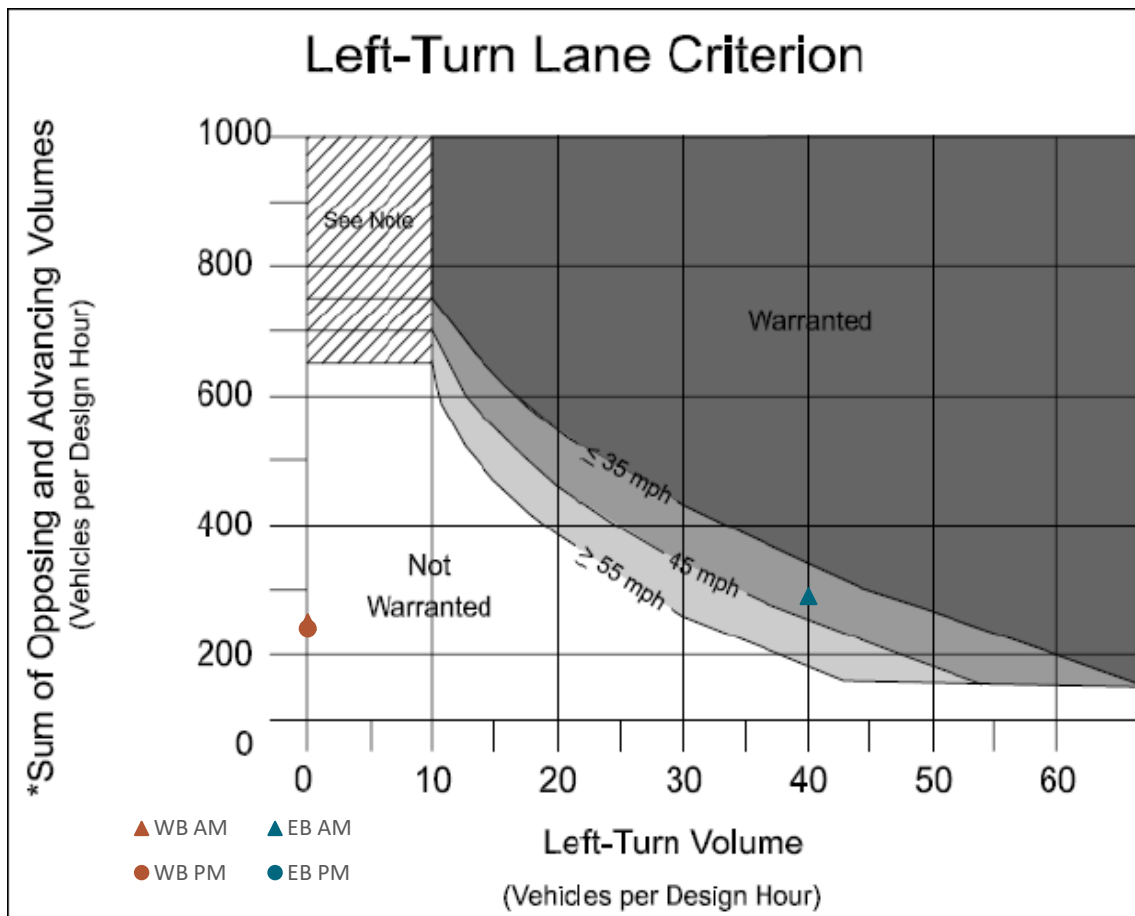
NO NO

- a. If Criterion 1 (Vehicular Volume) is not met but there is a significant amount of left turn movements; or

NO NO

- b. If Criterion 2 (Crash Experience) is not met but there has been a pattern of crashes that has occurred, and a left turn lane would prevent or limit those types of crashes to occur if installed.

Criterion I: Vehicular Volume



\*(Advancing Vol / # of Advancing Through Lanes)+(Opposing Vol / # of Opposing Through Lanes)

Note: The criterion is not met from zero to ten left turn vehicles per hour, but careful consideration should be given to installing a left turn lane due to the increased potential for crashes in the through lanes. While the turn volumes are low, the adverse safety and operational impacts may require installation of a left turn. The final determination will be based on a field study.

Figure 15-2 Left Turn Lane Volume Warrant

## Left Turn Lane Warrants

EB	WB
NO	YES

### Left Turn Lane Evaluation Process

- | EB | WB  |   |
|----|-----|---|
| NO | YES | • The left turn lane complies with access management spacing standards. |
| NO | YES | • The left turn lane conforms to appropriate design guidelines.         |
| NO | YES | • Criterion 1 (Volume), 2 (Crash), or 3 (Special Cases) is met.         |
- 

### Criterion 1: Vehicular Volume

- |    |     |                                      |
|----|-----|--------------------------------------|
| NO | YES | • Refer to Figure 15-2 on next page. |
|----|-----|--------------------------------------|

### Criterion 2: Crash Experience

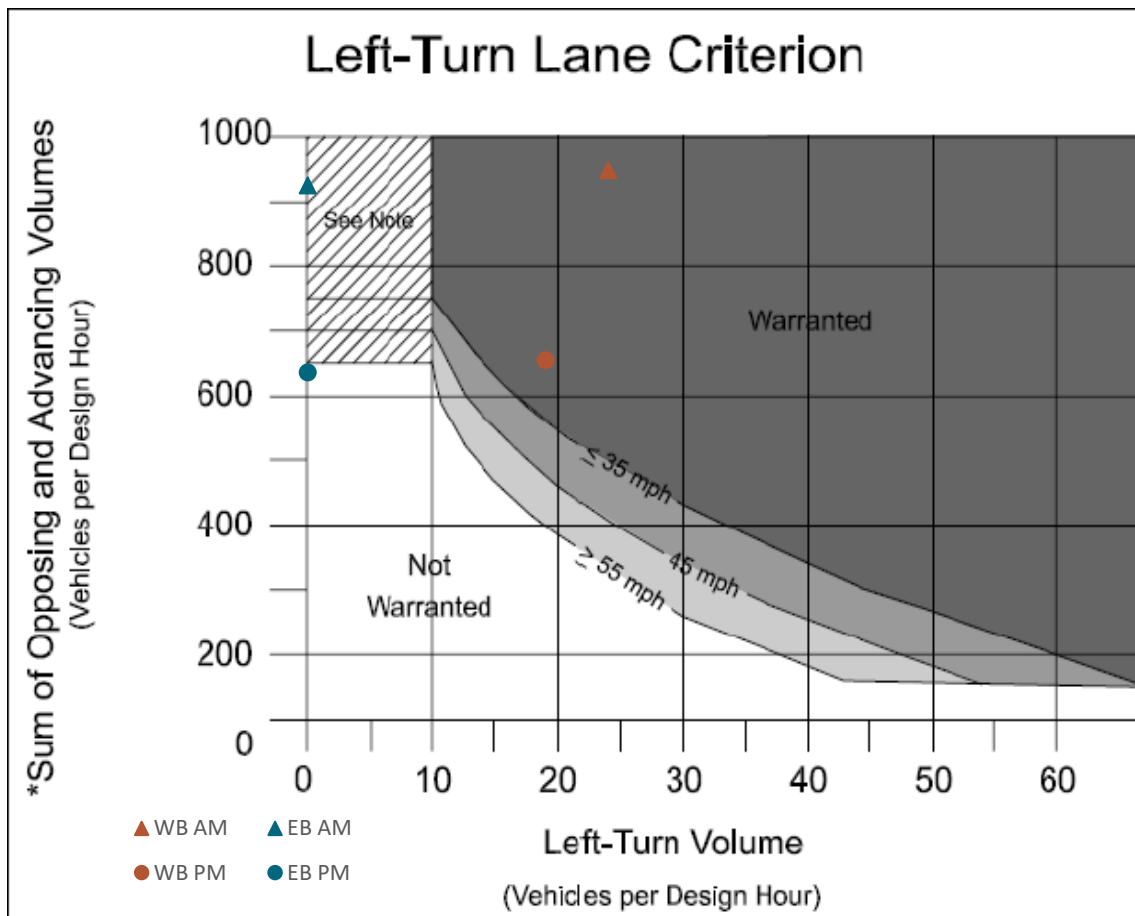
The crash experience criterion is satisfied when either Condition 1 or 2 are met and Condition 3 is met:

- |    |    |  |
|----|----|--|
| NO | NO | 1. A history of crashes of the type susceptible to correction by a left turn lane (e.g. rear-end crashes involving turning vehicles). A separate left turn lane may be warranted if three or more reported intersection related crashes occur within a 12 month period.  |
| NO | NO | 2. An economic analysis using predictive measures consistent with the AASHTO Highway Safety Manual (HSM) shows a benefit/cost ratio $\geq 1.0$ and at least two crashes in the last ten years are of the type susceptible to correction by a left turn lane (e.g. rear-end crashes involving turning vehicles), or based on the Highway Safety Engineer's recommendation to add a turn lane. |
| NO | NO | 3. The installation of the left turn lane does not adversely impact the operations of the intersection.  |
| NO | NO | • Criterion 2 Satisfied.   |

### Criterion 3: Special Cases

- |    |    |   |    |    |  |    |    |  |
|----|----|---|----|----|--|----|----|--|
| NO | NO | 1. <u>Railroad Crossings</u> : If a railroad is parallel to the roadway, then the likelihood of train movements preventing left turns and creating stopped queues on the highway should be taken into consideration. The provided left turn lane storage length will be dependent on the duration that the side road is closed, the expected number of vehicle arrivals, and the location of the crossing. The analysis should consider all the variables influencing the design of the left turn lane and may allow a design for conditions other than the worst-case storage requirements, provided safety is not compromised.  |    |    |  |    |    |  |
| NO | NO | 2. <u>Geometric/Safety Concerns</u> : Sight distance, alignment, operating speeds, adjacent access points, and other safety related concerns should be taken into consideration.  |    |    |  |    |    |  |
| NO | NO | 3. <u>Non-Traversable Median</u> : A left turn lane may be considered to be installed at a break in a non-traversable median where left turns are not prohibited and either of the following conditions exist: <table border="0" style="margin-left: 20px;"> <tr> <td>NO</td> <td>NO</td> <td>a. If Criterion 1 (Vehicular Volume) is not met but there is a significant amount of left turn movements; or</td> </tr> <tr> <td>NO</td> <td>NO</td> <td>b. If Criterion 2 (Crash Experience) is not met but there has been a pattern of crashes that has occurred, and a left turn lane would prevent or limit those types of crashes to occur if installed.</td> </tr> </table> | NO | NO | a. If Criterion 1 (Vehicular Volume) is not met but there is a significant amount of left turn movements; or | NO | NO | b. If Criterion 2 (Crash Experience) is not met but there has been a pattern of crashes that has occurred, and a left turn lane would prevent or limit those types of crashes to occur if installed. |
| NO | NO | a. If Criterion 1 (Vehicular Volume) is not met but there is a significant amount of left turn movements; or  |    |    |  |    |    |  |
| NO | NO | b. If Criterion 2 (Crash Experience) is not met but there has been a pattern of crashes that has occurred, and a left turn lane would prevent or limit those types of crashes to occur if installed.  |    |    |  |    |    |  |

Criterion I: Vehicular Volume



\*(Advancing Vol / # of Advancing Through Lanes)+(Opposing Vol / # of Opposing Through Lanes)

Note: The criterion is not met from zero to ten left turn vehicles per hour, but careful consideration should be given to installing a left turn lane due to the increased potential for crashes in the through lanes. While the turn volumes are low, the adverse safety and operational impacts may require installation of a left turn. The final determination will be based on a field study.

**Figure 15-2** Left Turn Lane Volume Warrant

## Left Turn Lane Warrants

EB	WB
NO	YES

### Left Turn Lane Evaluation Process

- | EB | WB  |   |
|----|-----|---|
| NO | YES | • The left turn lane complies with access management spacing standards. |
| NO | YES | • The left turn lane conforms to appropriate design guidelines.         |
| NO | YES | • Criterion 1 (Volume), 2 (Crash), or 3 (Special Cases) is met.         |
- 

### Criterion 1: Vehicular Volume

- |    |     |                                      |
|----|-----|--------------------------------------|
| NO | YES | • Refer to Figure 15-2 on next page. |
|----|-----|--------------------------------------|

### Criterion 2: Crash Experience

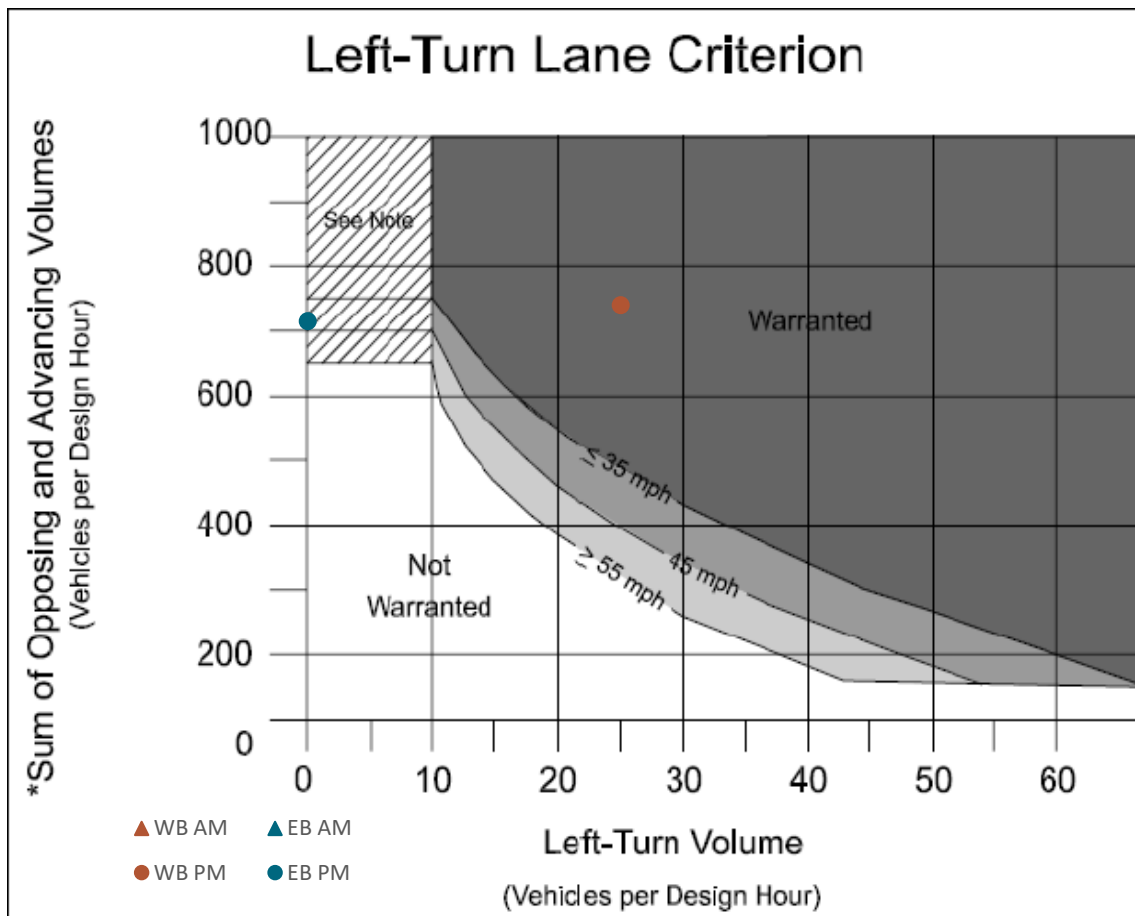
The crash experience criterion is satisfied when either Condition 1 or 2 are met and Condition 3 is met:

- |    |    |  |
|----|----|--|
| NO | NO | 1. A history of crashes of the type susceptible to correction by a left turn lane (e.g. rear-end crashes involving turning vehicles). A separate left turn lane may be warranted if three or more reported intersection related crashes occur within a 12 month period.  |
| NO | NO | 2. An economic analysis using predictive measures consistent with the AASHTO Highway Safety Manual (HSM) shows a benefit/cost ratio $\geq 1.0$ and at least two crashes in the last ten years are of the type susceptible to correction by a left turn lane (e.g. rear-end crashes involving turning vehicles), or based on the Highway Safety Engineer's recommendation to add a turn lane. |
| NO | NO | 3. The installation of the left turn lane does not adversely impact the operations of the intersection.  |
| NO | NO | • Criterion 2 Satisfied.   |

### Criterion 3: Special Cases

- |    |    |   |    |    |  |    |    |  |
|----|----|---|----|----|--|----|----|--|
| NO | NO | 1. <u>Railroad Crossings</u> : If a railroad is parallel to the roadway, then the likelihood of train movements preventing left turns and creating stopped queues on the highway should be taken into consideration. The provided left turn lane storage length will be dependent on the duration that the side road is closed, the expected number of vehicle arrivals, and the location of the crossing. The analysis should consider all the variables influencing the design of the left turn lane and may allow a design for conditions other than the worst-case storage requirements, provided safety is not compromised.  |    |    |  |    |    |  |
| NO | NO | 2. <u>Geometric/Safety Concerns</u> : Sight distance, alignment, operating speeds, adjacent access points, and other safety related concerns should be taken into consideration.  |    |    |  |    |    |  |
| NO | NO | 3. <u>Non-Traversable Median</u> : A left turn lane may be considered to be installed at a break in a non-traversable median where left turns are not prohibited and either of the following conditions exist: <table border="0" style="margin-left: 20px;"> <tr> <td>NO</td> <td>NO</td> <td>a. If Criterion 1 (Vehicular Volume) is not met but there is a significant amount of left turn movements; or</td> </tr> <tr> <td>NO</td> <td>NO</td> <td>b. If Criterion 2 (Crash Experience) is not met but there has been a pattern of crashes that has occurred, and a left turn lane would prevent or limit those types of crashes to occur if installed.</td> </tr> </table> | NO | NO | a. If Criterion 1 (Vehicular Volume) is not met but there is a significant amount of left turn movements; or | NO | NO | b. If Criterion 2 (Crash Experience) is not met but there has been a pattern of crashes that has occurred, and a left turn lane would prevent or limit those types of crashes to occur if installed. |
| NO | NO | a. If Criterion 1 (Vehicular Volume) is not met but there is a significant amount of left turn movements; or  |    |    |  |    |    |  |
| NO | NO | b. If Criterion 2 (Crash Experience) is not met but there has been a pattern of crashes that has occurred, and a left turn lane would prevent or limit those types of crashes to occur if installed.  |    |    |  |    |    |  |

Criterion I: Vehicular Volume



\*(Advancing Vol / # of Advancing Through Lanes)+(Opposing Vol / # of Opposing Through Lanes)

Note: The criterion is not met from zero to ten left turn vehicles per hour, but careful consideration should be given to installing a left turn lane due to the increased potential for crashes in the through lanes. While the turn volumes are low, the adverse safety and operational impacts may require installation of a left turn. The final determination will be based on a field study.

Figure 15-2 Left Turn Lane Volume Warrant

## Left Turn Lane Warrants

EB	WB
NO	YES

### Left Turn Lane Evaluation Process

- | EB | WB  |   |
|----|-----|---|
| NO | YES | • The left turn lane complies with access management spacing standards. |
| NO | YES | • The left turn lane conforms to appropriate design guidelines.         |
| NO | YES | • Criterion 1 (Volume), 2 (Crash), or 3 (Special Cases) is met.         |
- 

### Criterion 1: Vehicular Volume

- |    |     |                                      |
|----|-----|--------------------------------------|
| NO | YES | • Refer to Figure 15-2 on next page. |
|----|-----|--------------------------------------|

### Criterion 2: Crash Experience

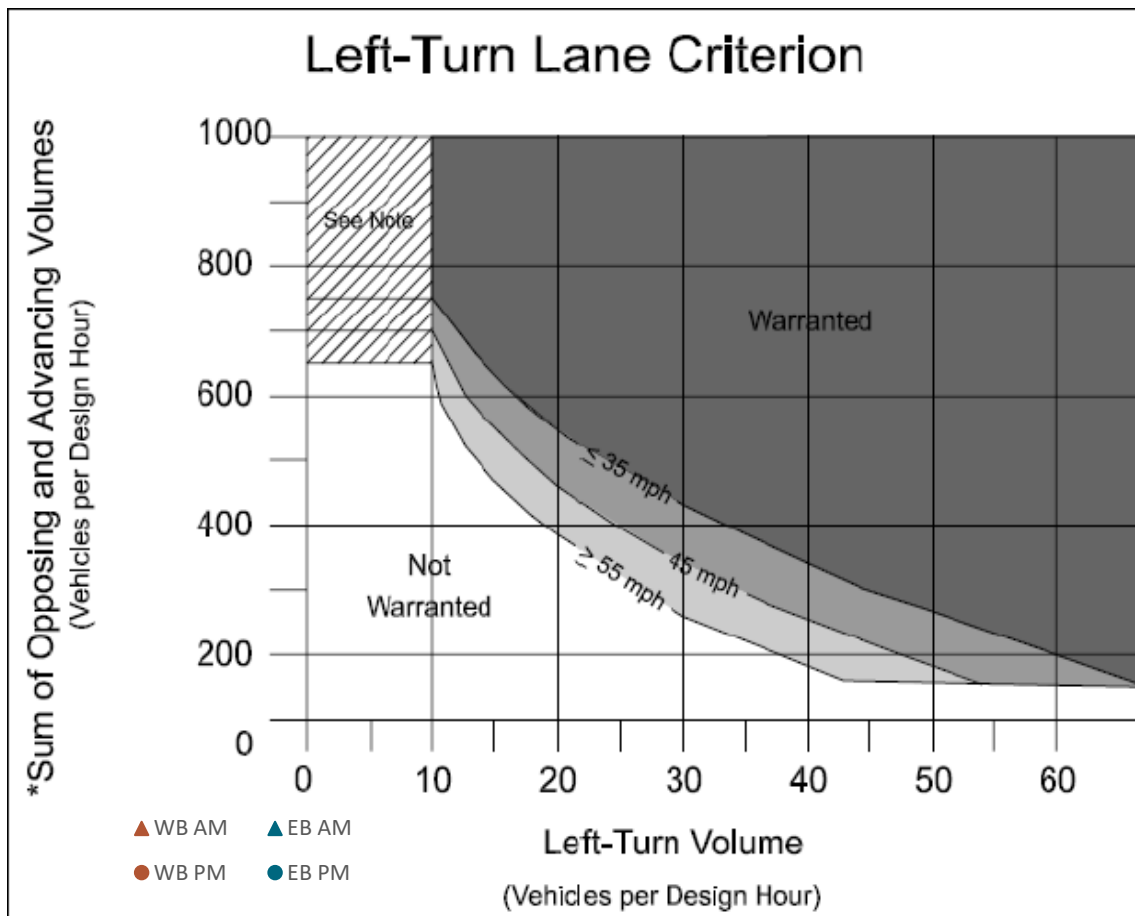
The crash experience criterion is satisfied when either Condition 1 or 2 are met and Condition 3 is met:

- |    |    |  |
|----|----|--|
| NO | NO | 1. A history of crashes of the type susceptible to correction by a left turn lane (e.g. rear-end crashes involving turning vehicles). A separate left turn lane may be warranted if three or more reported intersection related crashes occur within a 12 month period.  |
| NO | NO | 2. An economic analysis using predictive measures consistent with the AASHTO Highway Safety Manual (HSM) shows a benefit/cost ratio $\geq 1.0$ and at least two crashes in the last ten years are of the type susceptible to correction by a left turn lane (e.g. rear-end crashes involving turning vehicles), or based on the Highway Safety Engineer's recommendation to add a turn lane. |
| NO | NO | 3. The installation of the left turn lane does not adversely impact the operations of the intersection.  |
| NO | NO | • Criterion 2 Satisfied.   |

### Criterion 3: Special Cases

- |    |    |   |    |    |  |    |    |  |
|----|----|---|----|----|--|----|----|--|
| NO | NO | 1. <u>Railroad Crossings</u> : If a railroad is parallel to the roadway, then the likelihood of train movements preventing left turns and creating stopped queues on the highway should be taken into consideration. The provided left turn lane storage length will be dependent on the duration that the side road is closed, the expected number of vehicle arrivals, and the location of the crossing. The analysis should consider all the variables influencing the design of the left turn lane and may allow a design for conditions other than the worst-case storage requirements, provided safety is not compromised.  |    |    |  |    |    |  |
| NO | NO | 2. <u>Geometric/Safety Concerns</u> : Sight distance, alignment, operating speeds, adjacent access points, and other safety related concerns should be taken into consideration.  |    |    |  |    |    |  |
| NO | NO | 3. <u>Non-Traversable Median</u> : A left turn lane may be considered to be installed at a break in a non-traversable median where left turns are not prohibited and either of the following conditions exist: <table border="0" style="margin-left: 20px;"> <tr> <td>NO</td> <td>NO</td> <td>a. If Criterion 1 (Vehicular Volume) is not met but there is a significant amount of left turn movements; or</td> </tr> <tr> <td>NO</td> <td>NO</td> <td>b. If Criterion 2 (Crash Experience) is not met but there has been a pattern of crashes that has occurred, and a left turn lane would prevent or limit those types of crashes to occur if installed.</td> </tr> </table> | NO | NO | a. If Criterion 1 (Vehicular Volume) is not met but there is a significant amount of left turn movements; or | NO | NO | b. If Criterion 2 (Crash Experience) is not met but there has been a pattern of crashes that has occurred, and a left turn lane would prevent or limit those types of crashes to occur if installed. |
| NO | NO | a. If Criterion 1 (Vehicular Volume) is not met but there is a significant amount of left turn movements; or  |    |    |  |    |    |  |
| NO | NO | b. If Criterion 2 (Crash Experience) is not met but there has been a pattern of crashes that has occurred, and a left turn lane would prevent or limit those types of crashes to occur if installed.  |    |    |  |    |    |  |

Criterion I: Vehicular Volume



\*(Advancing Vol / # of Advancing Through Lanes)+(Opposing Vol / # of Opposing Through Lanes)

Note: The criterion is not met from zero to ten left turn vehicles per hour, but careful consideration should be given to installing a left turn lane due to the increased potential for crashes in the through lanes. While the turn volumes are low, the adverse safety and operational impacts may require installation of a left turn. The final determination will be based on a field study.

Figure 15-2 Left Turn Lane Volume Warrant



## Right Turn Lane Warrants

EB	WB
NO	NO

### Right Turn Lane Evaluation Process

- | EB | WB  |  |
|----|-----|--|
| NO | YES | • The right turn lane complies with access management spacing standards. |
| NO | YES | • The right turn lane conforms to the appropriate design guidelines.     |
| NO | NO  | • Criterion 1 (Volume), 2 (Crash), or 3 (Special Cases) is met.          |
- 

### Criterion 1: Vehicular Volume

- |    |    |                                      |
|----|----|--------------------------------------|
| NO | NO | • Refer to Figure 15-3 on next page. |
|----|----|--------------------------------------|

### Criterion 2: Crash Experience

The crash experience criterion is satisfied when either Condition 1 or 2 are met and Condition 3 is met:

- |    |    |   |
|----|----|---|
| NO | NO | 1. A history of crashes of the type susceptible to correction by a right turn lane (e.g. rear-end crashes involving turning vehicles). A separate right turn lane may be warranted if three or more reported intersection- related crashes occur within a 12 month period.  |
| NO | NO | 2. An economic analysis using predictive measures consistent with the AASHTO Highway Safety Manual (HSM) shows a benefit/cost ratio $\geq 1.0$ and at least two crashes in the last ten years are of the type susceptible to correction by a right turn lane (e.g. rear-end crashes involving turning vehicles), or based on the Highway Safety Engineer's recommendation to add a turn lane. |
| NO | NO | 3. The installation of the right turn lane does not adversely affect bicyclists or pedestrians.   |
| NO | NO | • Criterion 2 Satisfied.  |

### Criterion 3: Special Cases

- |    |    |   |
|----|----|---|
| NO | NO | 1. <u>Railroad Crossings</u> : If a railroad is parallel to the roadway, then the likelihood of train movements preventing right turns and creating stopped queues on the highway should be taken into consideration. The provided right turn lane storage length will be dependent on the duration that the side road is closed, the expected number of vehicle arrivals, and the location of the crossing. The analysis should consider all the variables influencing the design of the right turn lane and may allow a design for conditions other than the worst-case storage requirements, provided safety is not compromised. |
| NO | NO | 2. <u>Geometric/Safety Concerns</u> : Sight distance, alignment, operating speeds, adjacent access points, and other safety related concerns should be taken into consideration.  |

Criterion I: Vehicular Volume

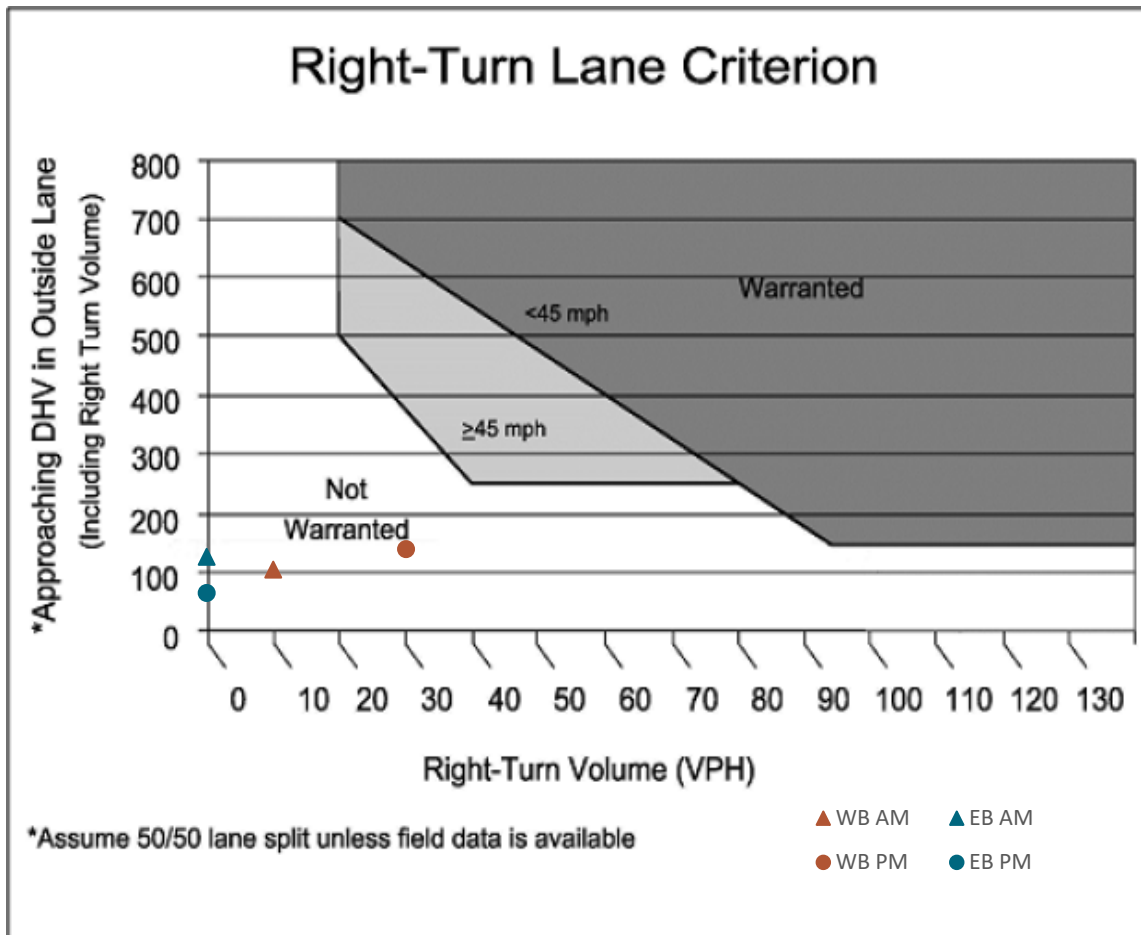


Figure 15-2 Right Turn Lane Volume Warrant

## Right Turn Lane Warrants

EB	WB
NO	NO

### Right Turn Lane Evaluation Process

- | EB | WB  |  |
|----|-----|--|
| NO | YES | • The right turn lane complies with access management spacing standards. |
| NO | YES | • The right turn lane conforms to the appropriate design guidelines.     |
| NO | NO  | • Criterion 1 (Volume), 2 (Crash), or 3 (Special Cases) is met.          |
- 

### Criterion 1: Vehicular Volume

- |    |    |                                      |
|----|----|--------------------------------------|
| NO | NO | • Refer to Figure 15-3 on next page. |
|----|----|--------------------------------------|

### Criterion 2: Crash Experience

The crash experience criterion is satisfied when either Condition 1 or 2 are met and Condition 3 is met:

- |    |    |   |
|----|----|---|
| NO | NO | 1. A history of crashes of the type susceptible to correction by a right turn lane (e.g. rear-end crashes involving turning vehicles). A separate right turn lane may be warranted if three or more reported intersection- related crashes occur within a 12 month period.  |
| NO | NO | 2. An economic analysis using predictive measures consistent with the AASHTO Highway Safety Manual (HSM) shows a benefit/cost ratio $\geq 1.0$ and at least two crashes in the last ten years are of the type susceptible to correction by a right turn lane (e.g. rear-end crashes involving turning vehicles), or based on the Highway Safety Engineer's recommendation to add a turn lane. |
| NO | NO | 3. The installation of the right turn lane does not adversely affect bicyclists or pedestrians.   |
| NO | NO | • Criterion 2 Satisfied.  |

### Criterion 3: Special Cases

- |    |    |   |
|----|----|---|
| NO | NO | 1. <u>Railroad Crossings</u> : If a railroad is parallel to the roadway, then the likelihood of train movements preventing right turns and creating stopped queues on the highway should be taken into consideration. The provided right turn lane storage length will be dependent on the duration that the side road is closed, the expected number of vehicle arrivals, and the location of the crossing. The analysis should consider all the variables influencing the design of the right turn lane and may allow a design for conditions other than the worst-case storage requirements, provided safety is not compromised. |
| NO | NO | 2. <u>Geometric/Safety Concerns</u> : Sight distance, alignment, operating speeds, adjacent access points, and other safety related concerns should be taken into consideration.  |

Criterion I: Vehicular Volume

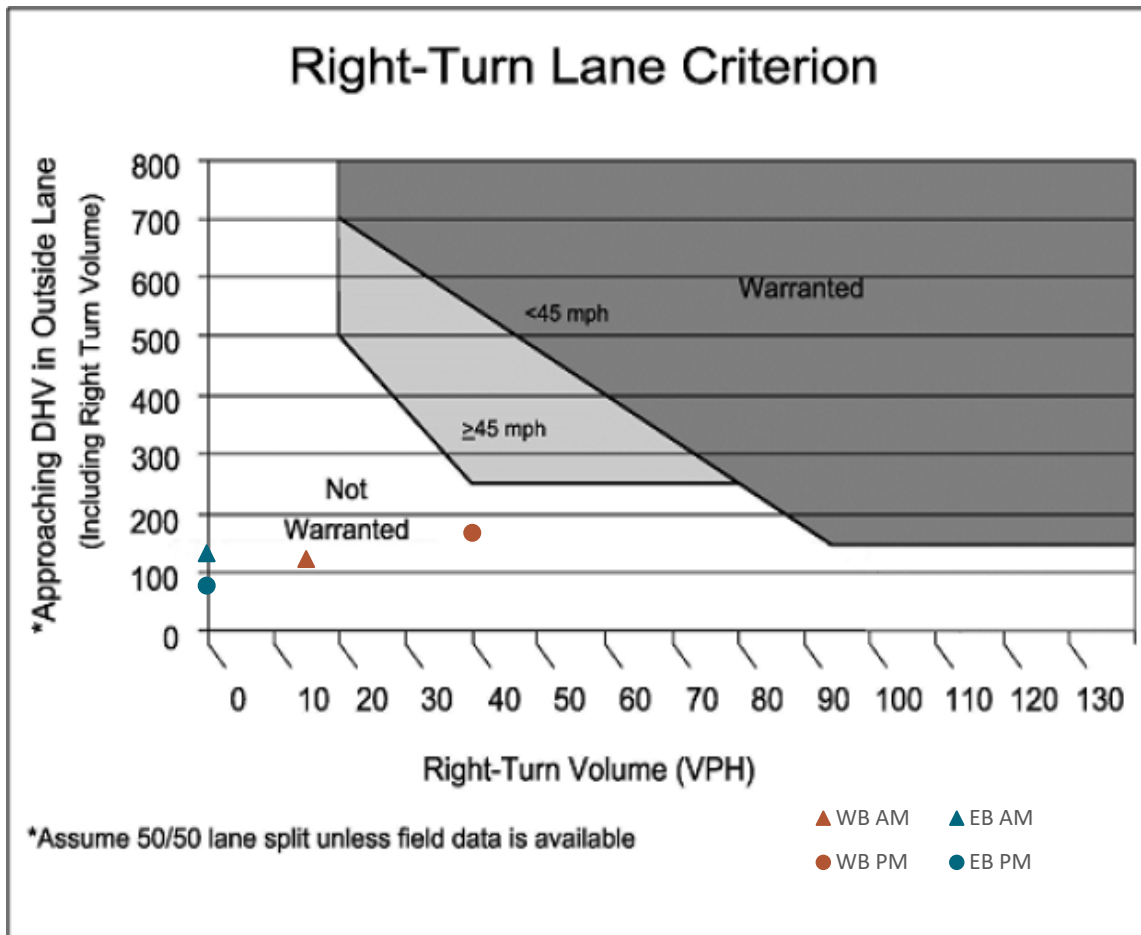


Figure 15-2 Right Turn Lane Volume Warrant

## Right Turn Lane Warrants

EB	WB
NO	NO

### Right Turn Lane Evaluation Process

- | EB | WB  |  |
|----|-----|--|
| NO | YES | • The right turn lane complies with access management spacing standards. |
| NO | YES | • The right turn lane conforms to the appropriate design guidelines.     |
| NO | NO  | • Criterion 1 (Volume), 2 (Crash), or 3 (Special Cases) is met.          |
- 

### Criterion 1: Vehicular Volume

- |    |    |                                      |
|----|----|--------------------------------------|
| NO | NO | • Refer to Figure 15-3 on next page. |
|----|----|--------------------------------------|

### Criterion 2: Crash Experience

The crash experience criterion is satisfied when either Condition 1 or 2 are met and Condition 3 is met:

- |    |    |   |
|----|----|---|
| NO | NO | 1. A history of crashes of the type susceptible to correction by a right turn lane (e.g. rear-end crashes involving turning vehicles). A separate right turn lane may be warranted if three or more reported intersection- related crashes occur within a 12 month period.  |
| NO | NO | 2. An economic analysis using predictive measures consistent with the AASHTO Highway Safety Manual (HSM) shows a benefit/cost ratio $\geq 1.0$ and at least two crashes in the last ten years are of the type susceptible to correction by a right turn lane (e.g. rear-end crashes involving turning vehicles), or based on the Highway Safety Engineer's recommendation to add a turn lane. |
| NO | NO | 3. The installation of the right turn lane does not adversely affect bicyclists or pedestrians.   |
| NO | NO | • Criterion 2 Satisfied.  |

### Criterion 3: Special Cases

- |    |    |   |
|----|----|---|
| NO | NO | 1. <u>Railroad Crossings</u> : If a railroad is parallel to the roadway, then the likelihood of train movements preventing right turns and creating stopped queues on the highway should be taken into consideration. The provided right turn lane storage length will be dependent on the duration that the side road is closed, the expected number of vehicle arrivals, and the location of the crossing. The analysis should consider all the variables influencing the design of the right turn lane and may allow a design for conditions other than the worst-case storage requirements, provided safety is not compromised. |
| NO | NO | 2. <u>Geometric/Safety Concerns</u> : Sight distance, alignment, operating speeds, adjacent access points, and other safety related concerns should be taken into consideration.  |

Criterion I: Vehicular Volume

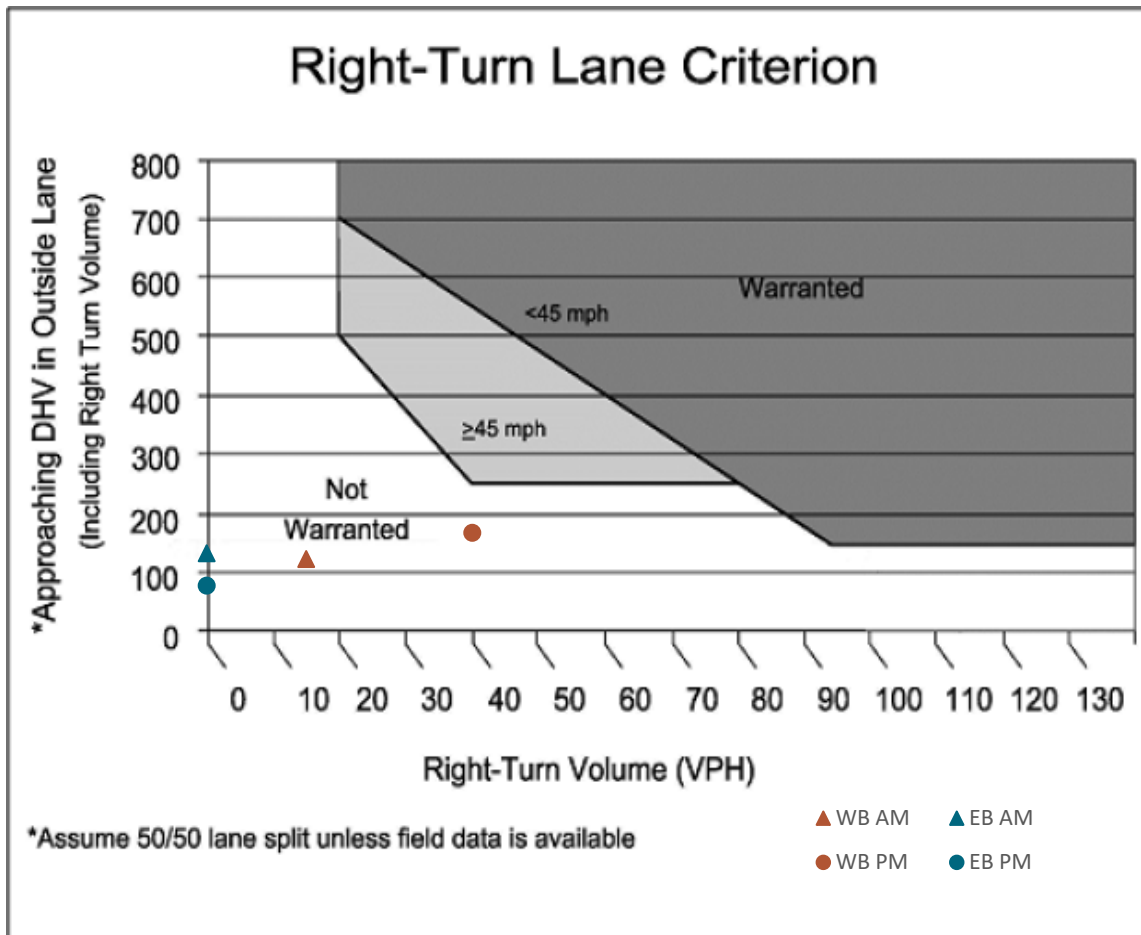


Figure 15-2 Right Turn Lane Volume Warrant

## Right Turn Lane Warrants

EB	WB
YES	NO

### Right Turn Lane Evaluation Process

EB WB

YES NO

- The right turn lane complies with access management spacing standards.

YES NO

- The right turn lane conforms to the appropriate design guidelines.

YES NO

- Criterion 1 (Volume), 2 (Crash), or 3 (Special Cases) is met.

### Criterion 1: Vehicular Volume

YES NO

- Refer to Figure 15-3 on next page.

### Criterion 2: Crash Experience

The crash experience criterion is satisfied when either Condition 1 or 2 are met and Condition 3 is met:

NO NO

1. A history of crashes of the type susceptible to correction by a right turn lane (e.g. rear-end crashes involving turning vehicles). A separate right turn lane may be warranted if three or more reported intersection- related crashes occur within a 12 month period.

NO NO

2. An economic analysis using predictive measures consistent with the AASHTO Highway Safety Manual (HSM) shows a benefit/cost ratio  $\geq 1.0$  and at least two crashes in the last ten years are of the type susceptible to correction by a right turn lane (e.g. rear-end crashes involving turning vehicles), or based on the Highway Safety Engineer's recommendation to add a turn lane.

NO NO

3. The installation of the right turn lane does not adversely affect bicyclists or pedestrians.

NO NO

- Criterion 2 Satisfied.

### Criterion 3: Special Cases

NO NO

1. Railroad Crossings: If a railroad is parallel to the roadway, then the likelihood of train movements preventing right turns and creating stopped queues on the highway should be taken into consideration. The provided right turn lane storage length will be dependent on the duration that the side road is closed, the expected number of vehicle arrivals, and the location of the crossing. The analysis should consider all the variables influencing the design of the right turn lane and may allow a design for conditions other than the worst-case storage requirements, provided safety is not compromised.

NO NO

2. Geometric/Safety Concerns: Sight distance, alignment, operating speeds, adjacent access points, and other safety related concerns should be taken into consideration.

Criterion I: Vehicular Volume

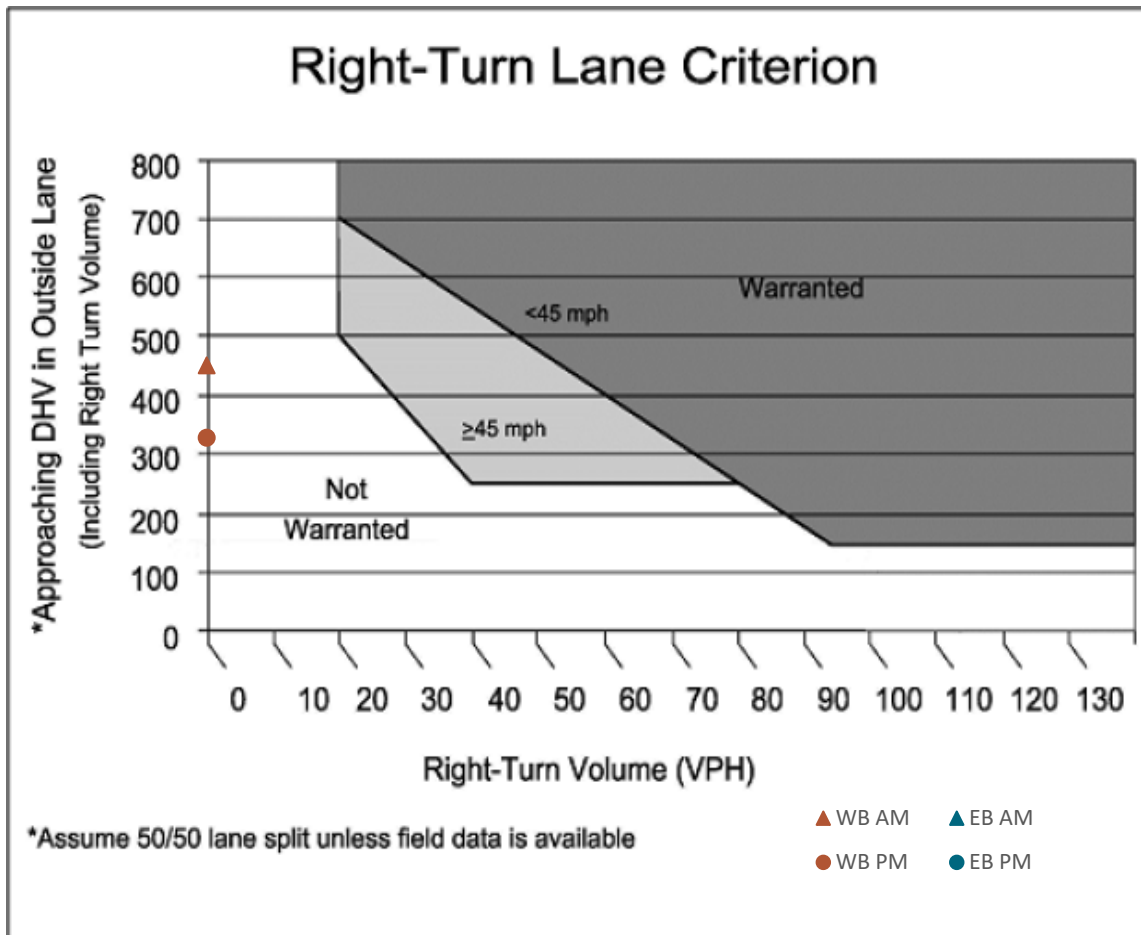


Figure 15-2 Right Turn Lane Volume Warrant



## Right Turn Lane Warrants

EB	WB
YES	NO

### Right Turn Lane Evaluation Process

EB WB

YES NO

- The right turn lane complies with access management spacing standards.

YES NO

- The right turn lane conforms to the appropriate design guidelines.

YES NO

- Criterion 1 (Volume), 2 (Crash), or 3 (Special Cases) is met.

### Criterion 1: Vehicular Volume

YES NO

- Refer to Figure 15-3 on next page.

### Criterion 2: Crash Experience

The crash experience criterion is satisfied when either Condition 1 or 2 are met and Condition 3 is met:

NO NO

1. A history of crashes of the type susceptible to correction by a right turn lane (e.g. rear-end crashes involving turning vehicles). A separate right turn lane may be warranted if three or more reported intersection- related crashes occur within a 12 month period.

NO NO

2. An economic analysis using predictive measures consistent with the AASHTO Highway Safety Manual (HSM) shows a benefit/cost ratio  $\geq 1.0$  and at least two crashes in the last ten years are of the type susceptible to correction by a right turn lane (e.g. rear-end crashes involving turning vehicles), or based on the Highway Safety Engineer's recommendation to add a turn lane.

NO NO

3. The installation of the right turn lane does not adversely affect bicyclists or pedestrians.

NO NO

- Criterion 2 Satisfied.

### Criterion 3: Special Cases

NO NO

1. Railroad Crossings: If a railroad is parallel to the roadway, then the likelihood of train movements preventing right turns and creating stopped queues on the highway should be taken into consideration. The provided right turn lane storage length will be dependent on the duration that the side road is closed, the expected number of vehicle arrivals, and the location of the crossing. The analysis should consider all the variables influencing the design of the right turn lane and may allow a design for conditions other than the worst-case storage requirements, provided safety is not compromised.

NO NO

2. Geometric/Safety Concerns: Sight distance, alignment, operating speeds, adjacent access points, and other safety related concerns should be taken into consideration.

Criterion I: Vehicular Volume

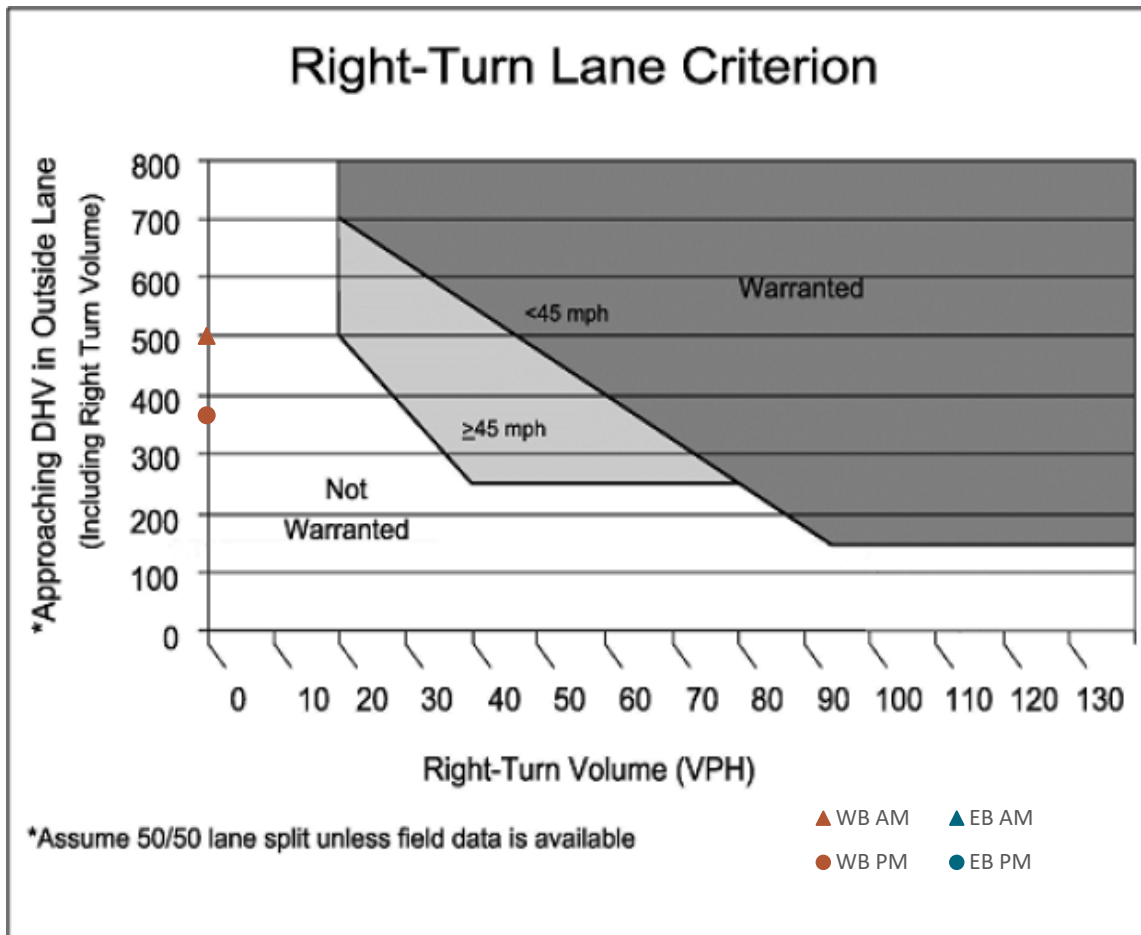


Figure 15-2 Right Turn Lane Volume Warrant

## Right Turn Lane Warrants

EB	WB
YES	NO

### Right Turn Lane Evaluation Process

EB WB

YES NO

- The right turn lane complies with access management spacing standards.

YES NO

- The right turn lane conforms to the appropriate design guidelines.

YES NO

- Criterion 1 (Volume), 2 (Crash), or 3 (Special Cases) is met.

### Criterion 1: Vehicular Volume

YES NO

- Refer to Figure 15-3 on next page.

### Criterion 2: Crash Experience

The crash experience criterion is satisfied when either Condition 1 or 2 are met and Condition 3 is met:

NO NO

1. A history of crashes of the type susceptible to correction by a right turn lane (e.g. rear-end crashes involving turning vehicles). A separate right turn lane may be warranted if three or more reported intersection- related crashes occur within a 12 month period.

NO NO

2. An economic analysis using predictive measures consistent with the AASHTO Highway Safety Manual (HSM) shows a benefit/cost ratio  $\geq 1.0$  and at least two crashes in the last ten years are of the type susceptible to correction by a right turn lane (e.g. rear-end crashes involving turning vehicles), or based on the Highway Safety Engineer's recommendation to add a turn lane.

NO NO

3. The installation of the right turn lane does not adversely affect bicyclists or pedestrians.

NO NO

- Criterion 2 Satisfied.

### Criterion 3: Special Cases

NO NO

1. Railroad Crossings: If a railroad is parallel to the roadway, then the likelihood of train movements preventing right turns and creating stopped queues on the highway should be taken into consideration. The provided right turn lane storage length will be dependent on the duration that the side road is closed, the expected number of vehicle arrivals, and the location of the crossing. The analysis should consider all the variables influencing the design of the right turn lane and may allow a design for conditions other than the worst-case storage requirements, provided safety is not compromised.

NO NO

2. Geometric/Safety Concerns: Sight distance, alignment, operating speeds, adjacent access points, and other safety related concerns should be taken into consideration.

Criterion I: Vehicular Volume

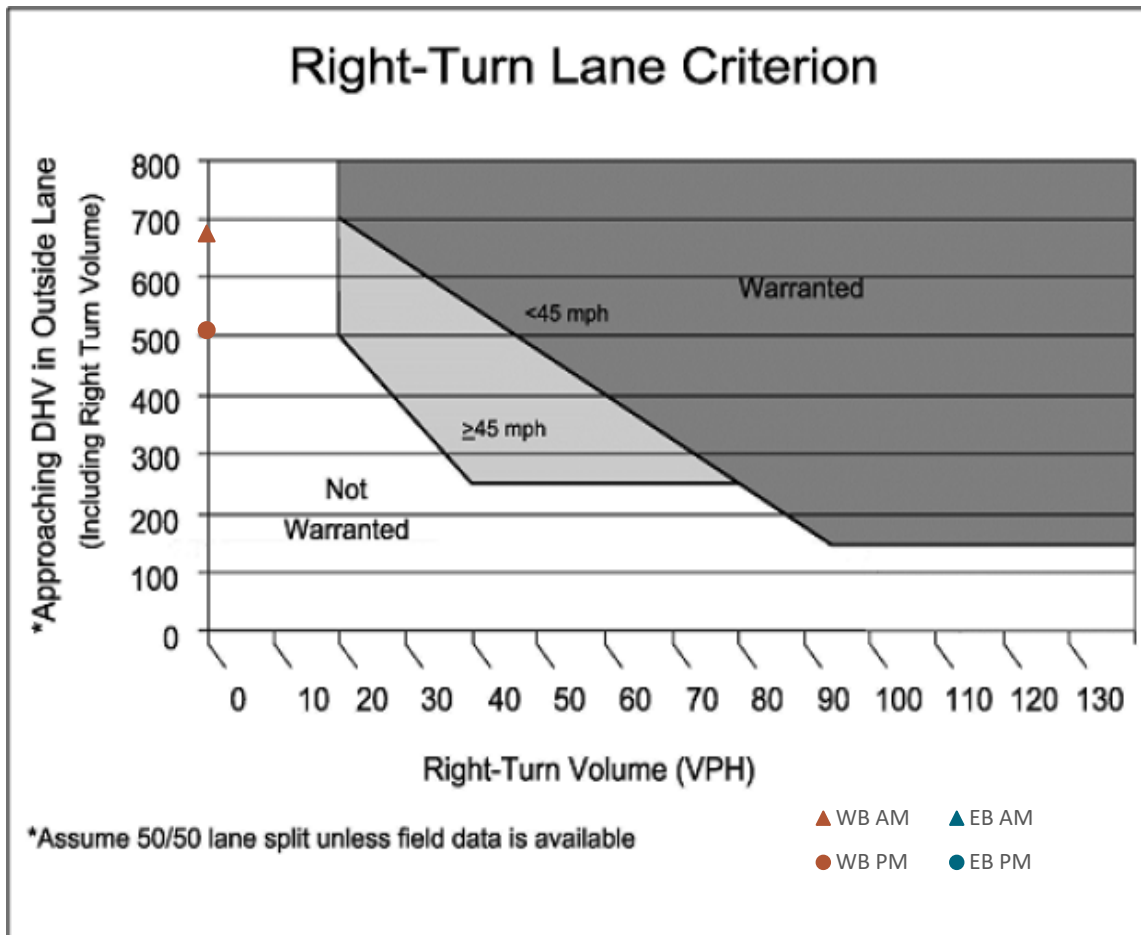


Figure 15-2 Right Turn Lane Volume Warrant

## Minor Approach Lane Warrant - NCHRP 457

Streeter Dr & Northshore Dr

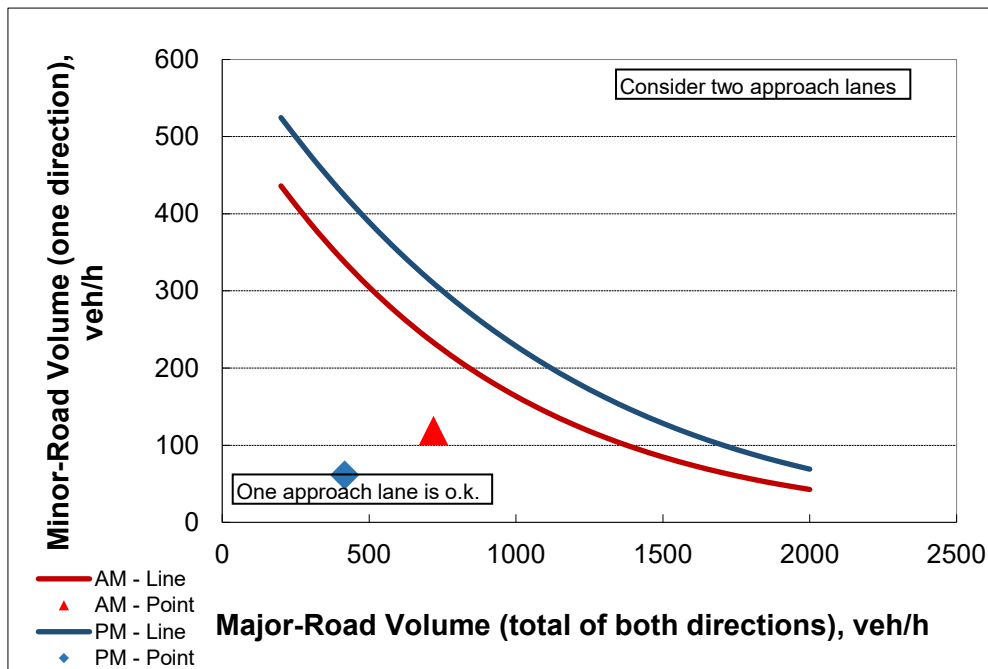
Interim (2025) - Build (Constrained)



Major Street: Northshore Dr

Minor Street: Streeter Dr

Direction: **Northbound**



### INPUT

Variable	AM	PM	Dismissal
Major-road volume (total of both directions), veh/h:	720	417	472
Percentage of right-turns on minor road, %:	24%	61%	50%
Minor-road volume (one direction), veh/h:	119	61	52

### OUTPUT

Variable	AM	PM	Dismissal
Limiting minor-road volume (one direction), veh/h:	233	423	371
<b>Guidance for determining minor-road approach geometry:</b>			
<b>ONE approach lane is O.K.</b>			

### CALIBRATION CONSTANTS

Minor Road, Gap Acceptance (s)	Critical	Follow
Right-turn capacity, veh/h:	6.2	3.3
Left-turn and through capacity, veh/h:	6.5	4.0

\* according to Table 17 - 5 of the HCM

## Left-turn Lane Warrant (2 Lane) - NCHRP 457

Streeter Dr & Northshore Dr

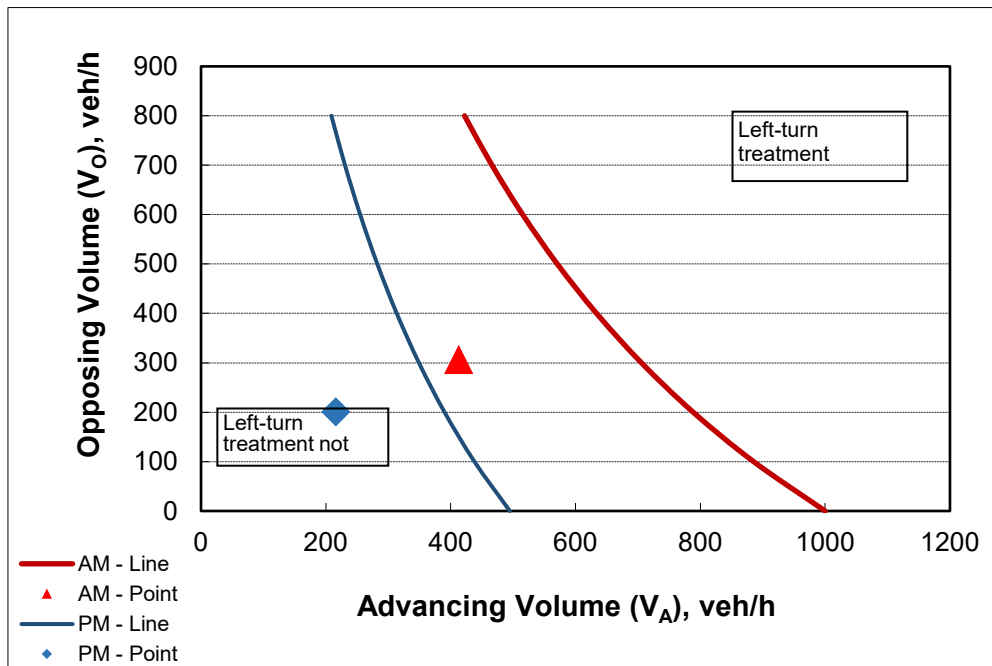
Interim (2025) - Build (Constrained)



Major Street: Northshore Dr

Minor Street: Streeter Dr

Direction: **Westbound**



### INPUT

Variable	AM	PM	Dismissal
85 <sup>th</sup> percentile speed, mph:	25		
Percent of left-turns in advancing volume ( $V_A$ ), %:	4%	22%	0%
Advancing volume ( $V_A$ ), veh/h:	413	216	305
Opposing volume ( $V_O$ ), veh/h:	307	201	137

### OUTPUT

Variable	AM	PM	Dismissal
Limiting advancing volume ( $V_A$ ), veh/h:	700	390	373
<b>Guidance for determining the need for a major-road left-turn bay:</b>			
<b>Left-turn treatment NOT warranted.</b>			

### CALIBRATION CONSTANTS

Variable	Value
Average time for making left-turn, s:	3.0
Critical headway, s:	5.0
Average time for left-turn veh. to clear advancing lane, s:	1.9

## Right-turn Lane Warrant (2 Lane) - NCHRP 457

Streeter Dr & Northshore Dr

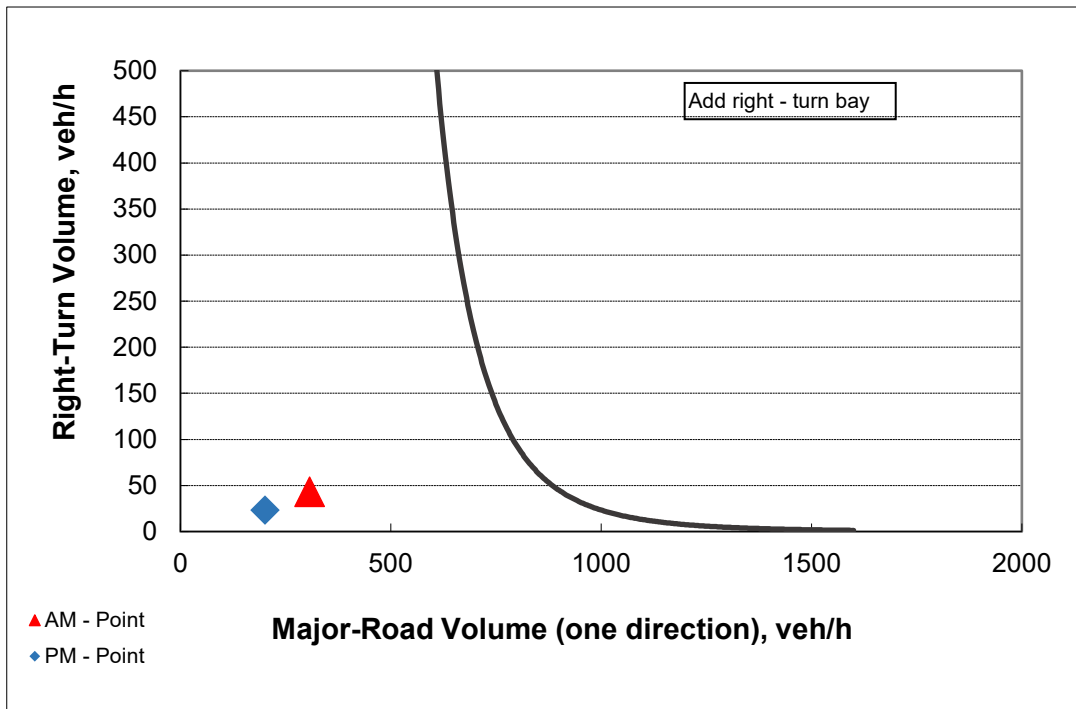
Interim (2025) - Build (Constrained)



Major Street: Northshore Dr

Minor Street: Streeter Dr

Direction: **Eastbound**



### INPUT

Variable	AM	PM	Dismissal
Major-road speed, mph:	25		
Major-road volume (one direction), veh/h:	307	201	305
Right-turn volume, veh/h:	43	23	52

### OUTPUT

Variable	AM	PM	Dismissal
Limiting right-turn volume, veh/h:	34773	478260	36208
<b>Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:</b>			
<b>Do NOT add right-turn bay.</b>			

## Minor Approach Lane Warrant - NCHRP 457

Streeter Dr & Northshore Dr

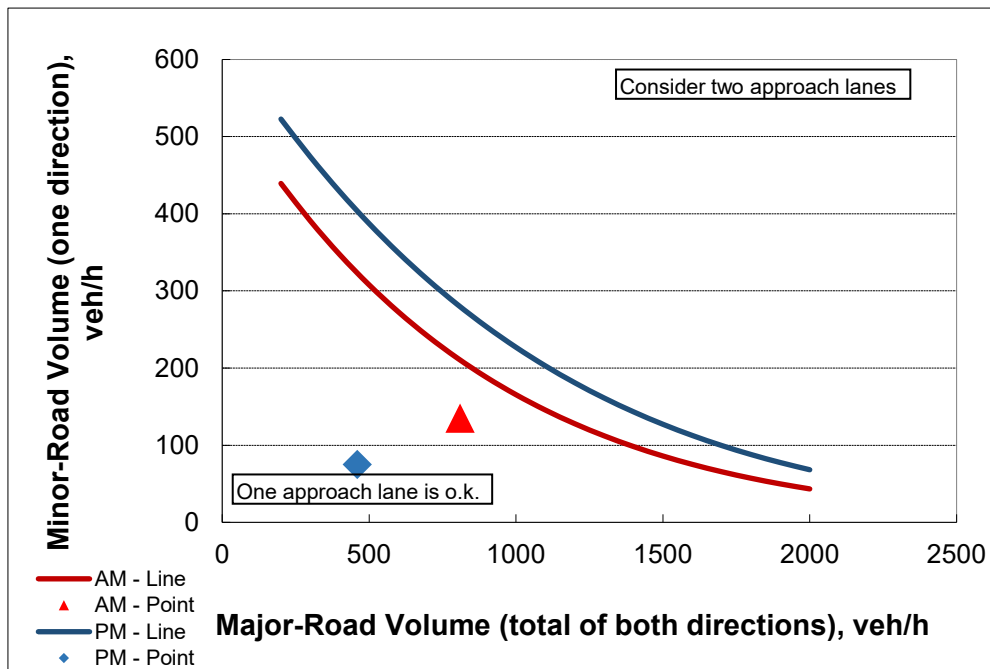
Future (2045) - Build (Constrained)



Major Street: Northshore Dr

Minor Street: Streeter Dr

Direction: **Northbound**



### INPUT

Variable	AM	PM	Dismissal
Major-road volume (total of both directions), veh/h:	810	460	525
Percentage of right-turns on minor road, %:	26%	60%	50%
Minor-road volume (one direction), veh/h:	135	75	60

### OUTPUT

Variable	AM	PM	Dismissal
Limiting minor-road volume (one direction), veh/h:	210	403	350
<b>Guidance for determining minor-road approach geometry:</b>			
<b>ONE approach lane is O.K.</b>			

### CALIBRATION CONSTANTS

Minor Road, Gap Acceptance (s)	Critical	Follow
Right-turn capacity, veh/h:	6.2	3.3
Left-turn and through capacity, veh/h:	6.5	4.0

\* according to Table 17 - 5 of the HCM



## Left-turn Lane Warrant (2 Lane) - NCHRP 457

Streeter Dr & Northshore Dr

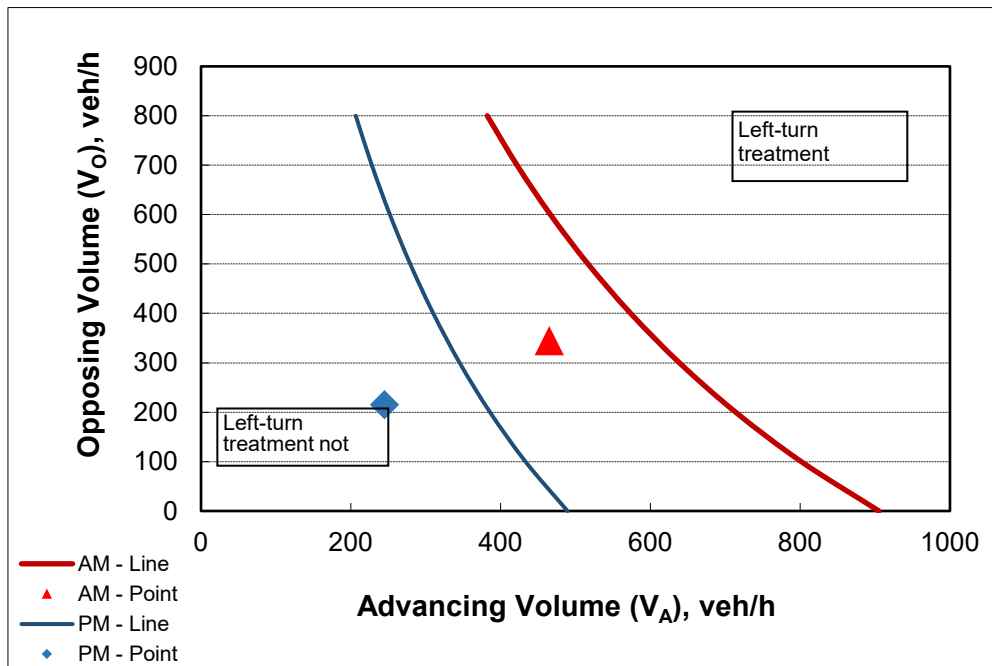
Future (2045) - Build (Constrained)



Major Street: Northshore Dr

Minor Street: Streeter Dr

Direction: **Westbound**



### INPUT

Variable	AM	PM	Dismissal
85 <sup>th</sup> percentile speed, mph:	25		
Percent of left-turns in advancing volume ( $V_A$ ), %:	5%	22%	0%
Advancing volume ( $V_A$ ), veh/h:	465	245	345
Opposing volume ( $V_O$ ), veh/h:	345	215	145

### OUTPUT

Variable	AM	PM	Dismissal
Limiting advancing volume ( $V_A$ ), veh/h:	608	379	347
<b>Guidance for determining the need for a major-road left-turn bay:</b>			
<b>Left-turn treatment NOT warranted.</b>			

### CALIBRATION CONSTANTS

Variable	Value
Average time for making left-turn, s:	3.0
Critical headway, s:	5.0
Average time for left-turn veh. to clear advancing lane, s:	1.9

## Right-turn Lane Warrant (2 Lane) - NCHRP 457

Streeter Dr & Northshore Dr

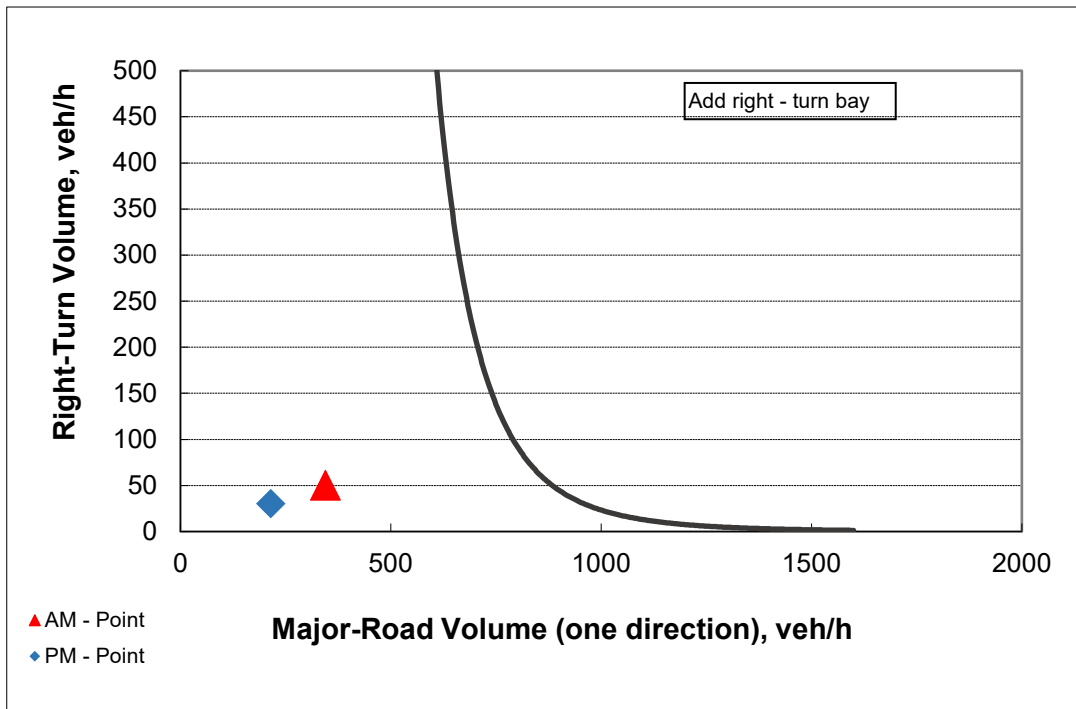
Future (2045) - Build (Constrained)



Major Street: Northshore Dr

Minor Street: Streeter Dr

Direction: **Eastbound**



### INPUT

Variable	AM	PM	Dismissal
Major-road speed, mph:	25		
Major-road volume (one direction), veh/h:	345	215	345
Right-turn volume, veh/h:	50	30	60

### OUTPUT

Variable	AM	PM	Dismissal
Limiting right-turn volume, veh/h:	16888	315270	16888
<b>Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:</b>			
<b>Do NOT add right-turn bay.</b>			

## Minor Approach Lane Warrant - NCHRP 457

Streeter Dr & Northshore Dr

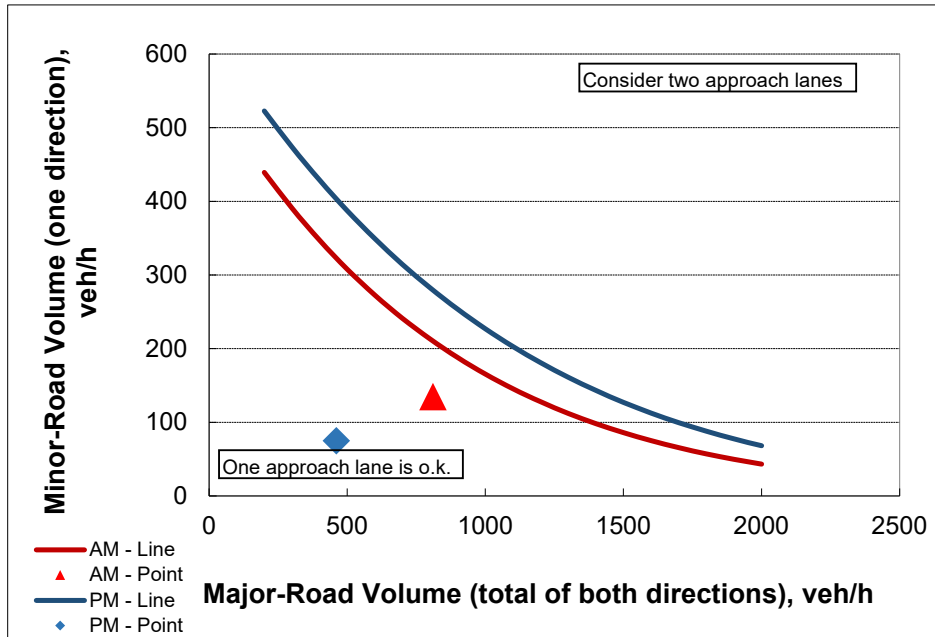
Future (2045) - Build (Unconstrained)



Major Street: Northshore Dr

Minor Street: Streeter Dr

Direction: **Northbound**



### INPUT

Variable	AM	PM	Dismissal
Major-road volume (total of both directions), veh/h:	810	460	525
Percentage of right-turns on minor road, %:	26%	60%	50%
Minor-road volume (one direction), veh/h:	135	75	60

### OUTPUT

Variable	AM	PM	Dismissal
Limiting minor-road volume (one direction), veh/h:	210	403	350
Guidance for determining minor-road approach geometry:			
ONE approach lane is O.K.			

### CALIBRATION CONSTANTS

Minor Road, Gap Acceptance (s)	Critical	Follow
Right-turn capacity, veh/h:	6.2	3.3
Left-turn and through capacity, veh/h:	6.5	4.0

\* according to Table 17 - 5 of the HCM

## Left-turn Lane Warrant (2 Lane) - NCHRP 457

Streeter Dr & Northshore Dr

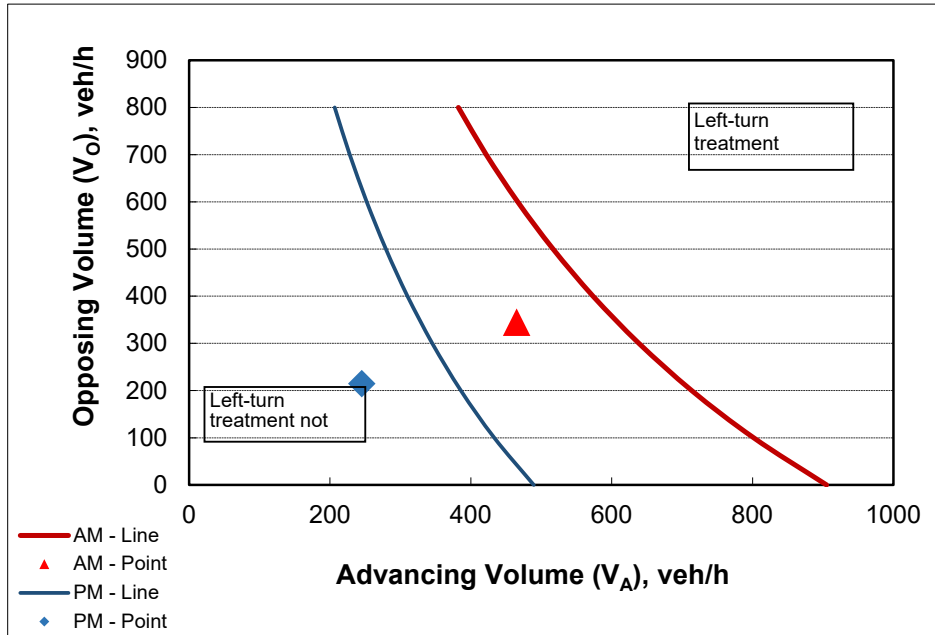
Future (2045) - Build (Unconstrained)



Major Street: Northshore Dr

Minor Street: Streeter Dr

Direction: **Westbound**



### INPUT

Variable	AM	PM	Dismissal
85 <sup>th</sup> percentile speed, mph:	25		
Percent of left-turns in advancing volume ( $V_A$ ), %:	5%	22%	0%
Advancing volume ( $V_A$ ), veh/h:	465	245	345
Opposing volume ( $V_O$ ), veh/h:	345	215	145

### OUTPUT

Variable	AM	PM	Dismissal
Limiting advancing volume ( $V_A$ ), veh/h:	608	379	347
Guidance for determining the need for a major-road left-turn bay:			
Left-turn treatment <b>NOT</b> warranted.			

### CALIBRATION CONSTANTS

Variable	Value
Average time for making left-turn, s:	3.0
Critical headway, s:	5.0
Average time for left-turn veh. to clear advancing lane, s:	1.9

## Right-turn Lane Warrant (2 Lane) - NCHRP 457

Streeter Dr & Northshore Dr

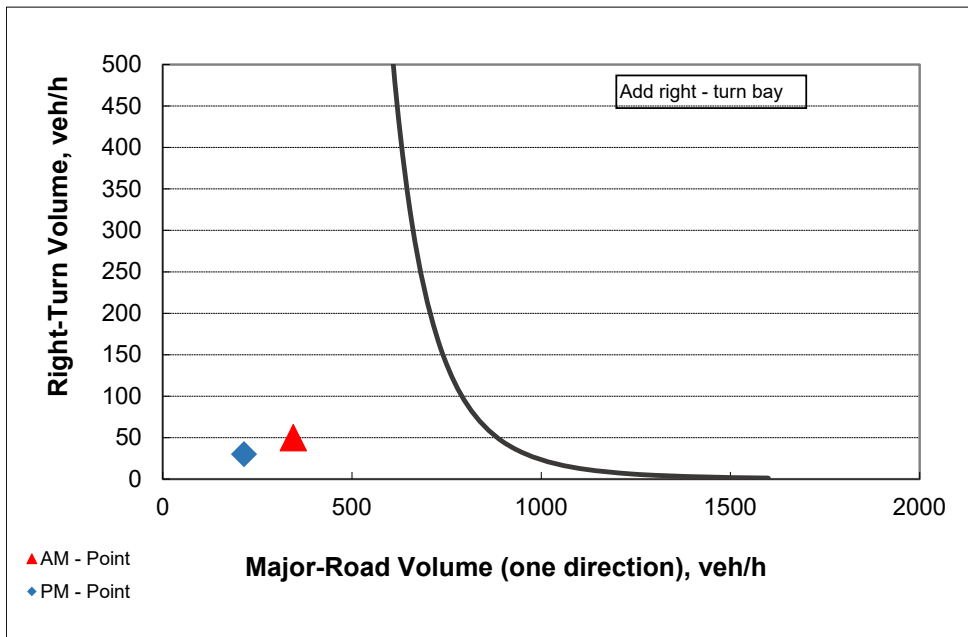
Future (2045) - Build (Unconstrained)



Major Street: Northshore Dr

Minor Street: Streeter Dr

Direction: **Eastbound**



### INPUT

Variable	AM	PM	Dismissal
Major-road speed, mph:	25		
Major-road volume (one direction), veh/h:	345	215	345
Right-turn volume, veh/h:	50	30	60

### OUTPUT

Variable	AM	PM	Dismissal
Limiting right-turn volume, veh/h:	16888	315270	16888
<b>Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:</b>			
<b>Do NOT add right-turn bay.</b>			

## Minor Approach Lane Warrant - NCHRP 457

48th Ave/Westshore Dr & Northshore Dr

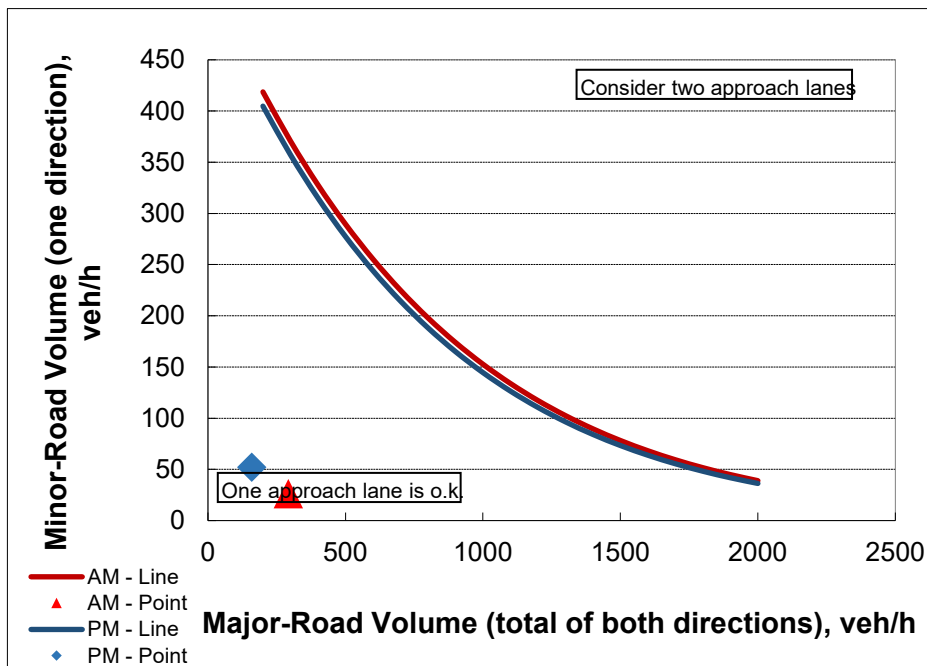
Interim (2025) - Build (Constrained)



Major Street: Northshore Dr

Minor Street: 48th Ave/Westshore Dr

Direction: **Northbound**



### INPUT

Variable	AM	PM	Dismissal
Major-road volume (total of both directions), veh/h	293	160	136
Percentage of right-turns on minor road, %	15%	8%	15%
Minor-road volume (one direction), veh/h:	26	52	26

### OUTPUT

Variable	AM	PM	Dismissal
Limiting minor-road volume (one direction), veh/h	374	425	452
Guidance for determining minor-road approach geometry:			
ONE approach lane is O.K.			

### CALIBRATION CONSTANTS

Minor Road, Gap Acceptance (s)	Critical	Follo
Right-turn capacity, veh/h:	6.2	3.3
Left-turn and through capacity, veh/h:	6.5	4.0

\* according to Table 17 - 5 of the HCM

## Minor Approach Lane Warrant - NCHRP 457

48th Ave/Westshore Dr & Northshore Dr

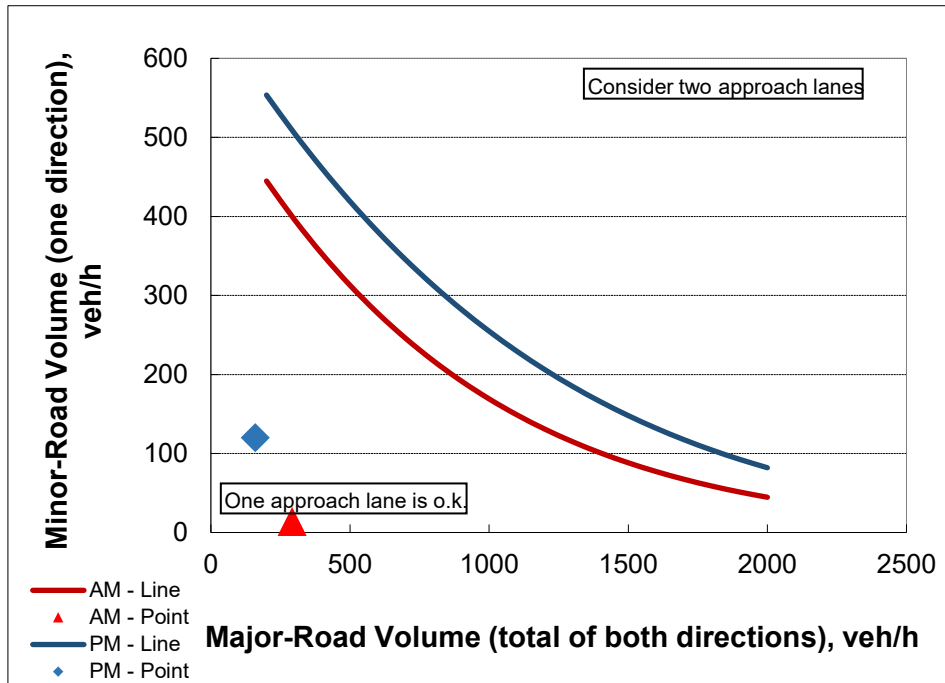
Interim (2025) - Build (Constrained)



Major Street: Northshore Dr

Minor Street: 48th Ave/Westshore Dr

Direction: **Southbound**



### INPUT

Variable	AM	PM	Dismissal
Major-road volume (total of both directions), veh/h	293	160	136
Percentage of right-turns on minor road, %	29%	70%	15%
Minor-road volume (one direction), veh/h:	14	120	26

### OUTPUT

Variable	AM	PM	Dismissal
Limiting minor-road volume (one direction), veh/h	399	574	567
Guidance for determining minor-road approach geometry:			
ONE approach lane is O.K.			

### CALIBRATION CONSTANTS

Minor Road, Gap Acceptance (s)	Critical	Follo
Right-turn capacity, veh/h:	6.2	3.3
Left-turn and through capacity, veh/h:	6.5	4.0

\* according to Table 17 - 5 of the HCM

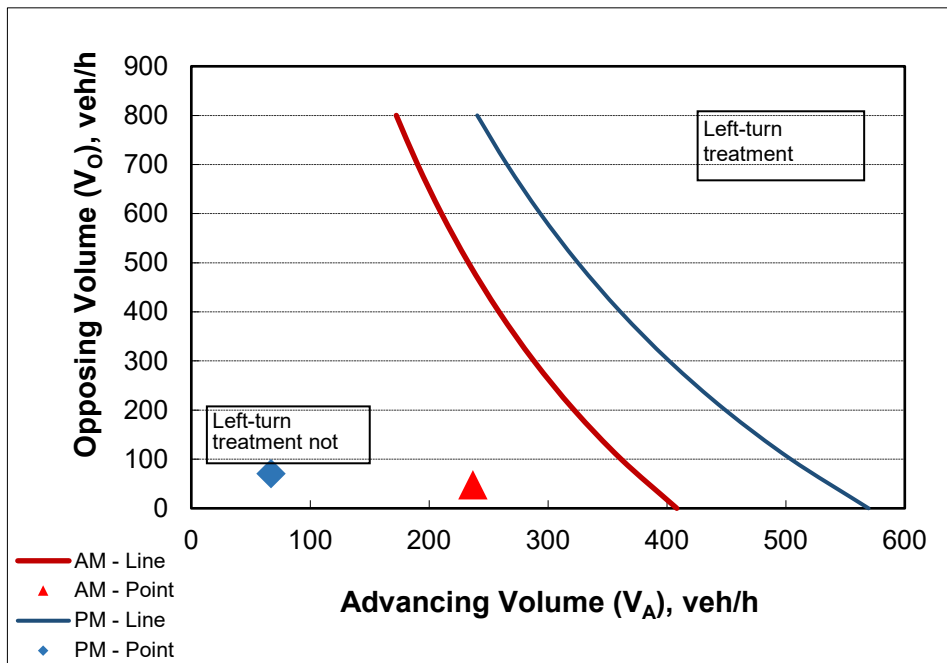
## Left-turn Lane Warrant (2 Lane) - NCHRP 457

48th Ave/Westshore Dr & Northshore Dr

Interim (2025) - Build (Constrained)



Major Street: Northshore Dr  
Minor Street: 48th Ave/Westshore Dr  
Direction: **Eastbound**



### INPUT

Variable	AM	PM	Dismissal
85 <sup>th</sup> percentile speed, mph:	35		
Percent of left-turns in advancing volume ( $V_A$ ), %:	71%	12%	23%
Advancing volume ( $V_A$ ), veh/h:	237	67	70
Opposing volume ( $V_O$ ), veh/h:	48	71	62

### OUTPUT

Variable	AM	PM	Dismissal
Limiting advancing volume ( $V_A$ ), veh/h:	385	543	407
<b>Guidance for determining the need for a major-road left-turn bay:</b>			
<b>Left-turn treatment NOT warranted.</b>			

### CALIBRATION CONSTANTS

Variable	Value
Average time for making left-turn, s:	3.0
Critical headway, s:	5.0
Average time for left-turn veh. to clear advancing lane, s:	1.9



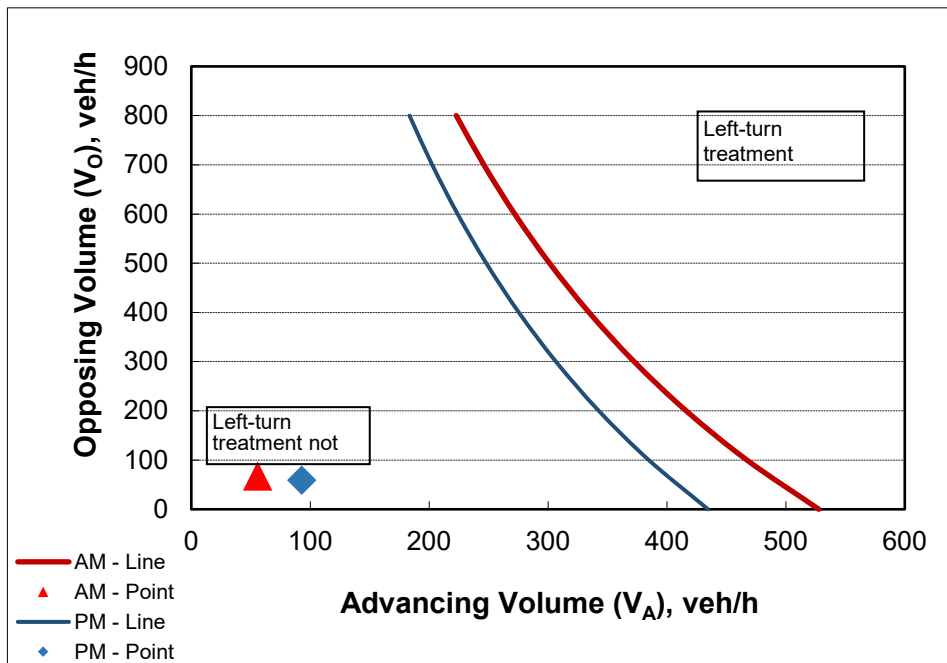
## Left-turn Lane Warrant (2 Lane) - NCHRP 457

48th Ave/Westshore Dr & Northshore Dr

Interim (2025) - Build (Constrained)



Major Street: Northshore Dr  
Minor Street: 48th Ave/Westshore Dr  
Direction: **Westbound**



### INPUT

Variable	AM	PM	Dismissal
85 <sup>th</sup> percentile speed, mph:	35		
Percent of left-turns in advancing volume ( $V_A$ ), %	14%	24%	23%
Advancing volume ( $V_A$ ), veh/h:	56	93	70
Opposing volume ( $V_O$ ), veh/h:	68	59	62

### OUTPUT

Variable	AM	PM	Dismissal
Limiting advancing volume ( $V_A$ ), veh/h:	485	404	724
<b>Guidance for determining the need for a major-road left-turn bay:</b>			
<b>Left-turn treatment NOT warranted.</b>			

### CALIBRATION CONSTANTS

Variable	Value
Average time for making left-turn, s:	3.0
Critical headway, s:	5.0
Average time for left-turn veh. to clear advancing lane, s:	1.9

## Right-turn Lane Warrant (2 Lane) - NCHRP 457

48th Ave/Westshore Dr & Northshore Dr

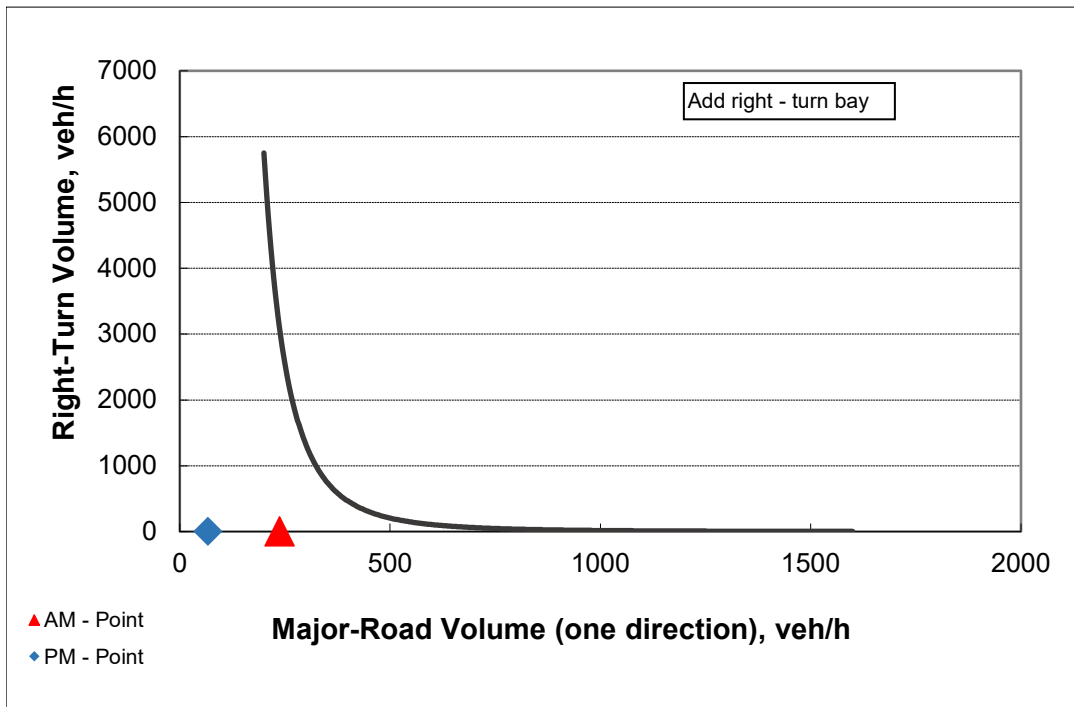
Interim (2025) - Build (Constrained)



Major Street: Northshore Dr

Minor Street: 48th Ave/Westshore Dr

Direction: **Eastbound**



### INPUT

Variable	AM	PM	Dismissal
Major-road speed, mph:	35		
Major-road volume (one direction), veh/h:	237	67	70
Right-turn volume, veh/h:	1	5	5

### OUTPUT

Variable	AM	PM	Dismissal
Limiting right-turn volume, veh/h:	3103	#####	261668
<b>Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:</b>			
<b>Do NOT add right-turn bay.</b>			

## Right-turn Lane Warrant (2 Lane) - NCHRP 457

48th Ave/Westshore Dr & Northshore Dr

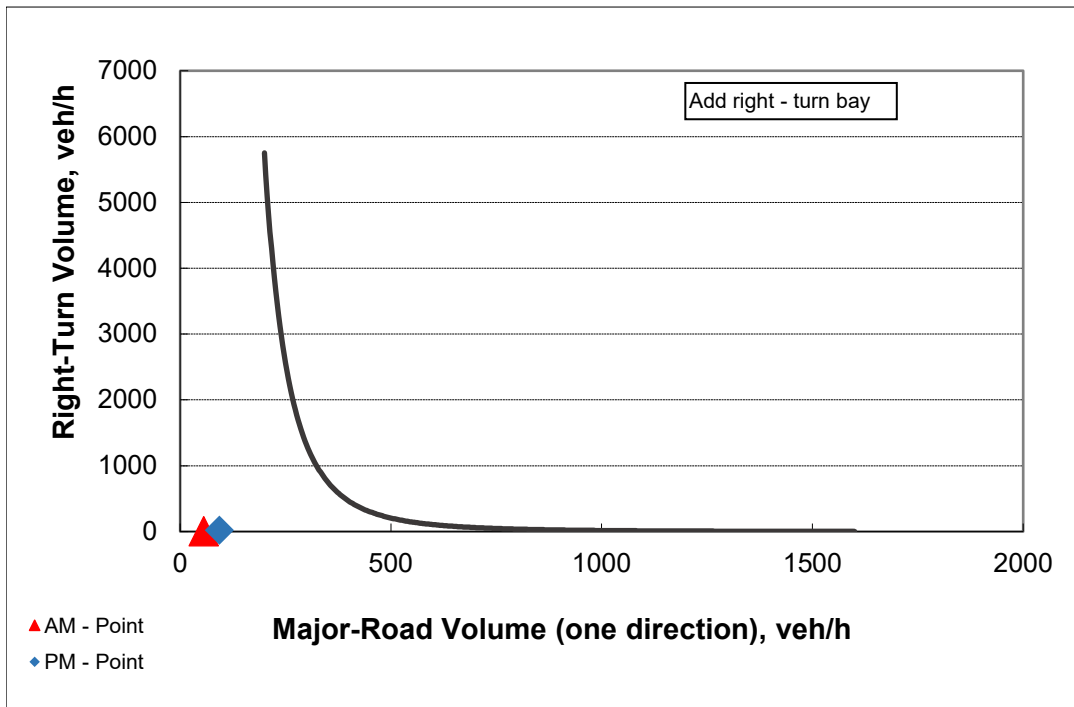
Interim (2025) - Build (Constrained)



Major Street: Northshore Dr

Minor Street: 48th Ave/Westshore Dr

Direction: **Westbound**



### INPUT

Variable	AM	PM	Dismissal
Major-road speed, mph:	35		
Major-road volume (one direction), veh/h:	56	93	66
Right-turn volume, veh/h:	4	17	9

### OUTPUT

Variable	AM	PM	Dismissal
Limiting right-turn volume, veh/h:	589035	93130	324095
<b>Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:</b>			
<b>Do NOT add right-turn bay.</b>			

## Minor Approach Lane Warrant - NCHRP 457

484th St/Westshore Dr & Northshore Dr

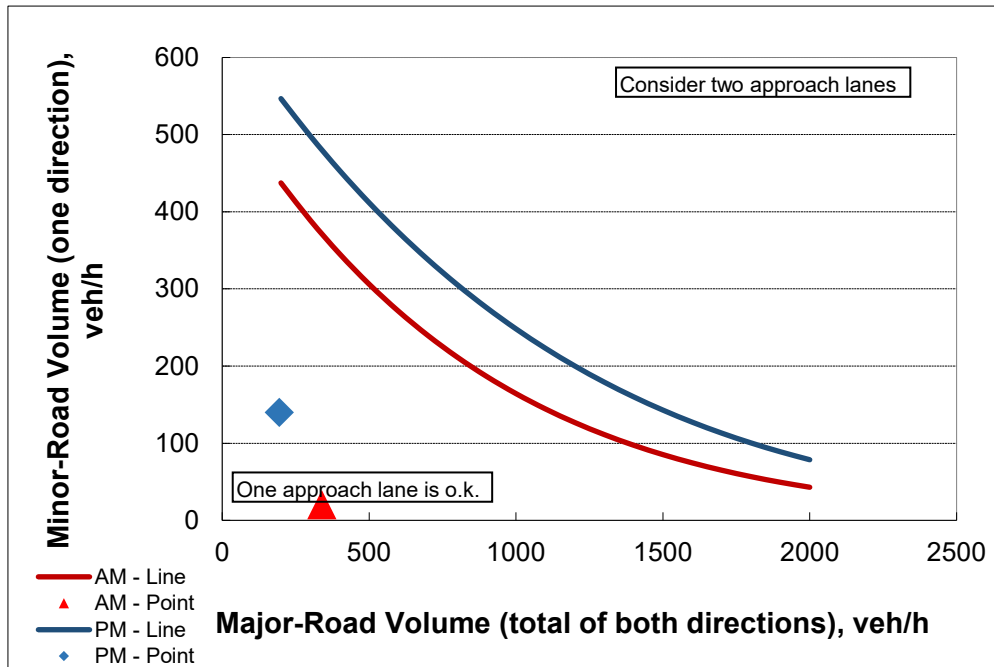
Future (2045) - Build (Constrained)



Major Street: Northshore Dr

Minor Street: 484th St/Westshore Dr

Direction: **Southbound**



### INPUT

Variable	AM	PM	Dismissal
Major-road volume (total of both directions), veh/h:	340	195	160
Percentage of right-turns on minor road, %:	25%	68%	14%
Minor-road volume (one direction), veh/h:	20	140	35

### OUTPUT

Variable	AM	PM	Dismissal
Limiting minor-road volume (one direction), veh/h:	371	549	541
<b>Guidance for determining minor-road approach geometry:</b>			
<b>ONE approach lane is O.K.</b>			

### CALIBRATION CONSTANTS

Minor Road, Gap Acceptance (s)	Critical	Follow
Right-turn capacity, veh/h:	6.2	3.3
Left-turn and through capacity, veh/h:	6.5	4.0

\* according to Table 17 - 5 of the HCM

## Minor Approach Lane Warrant - NCHRP 457

484th St/Westshore Dr & Northshore Dr

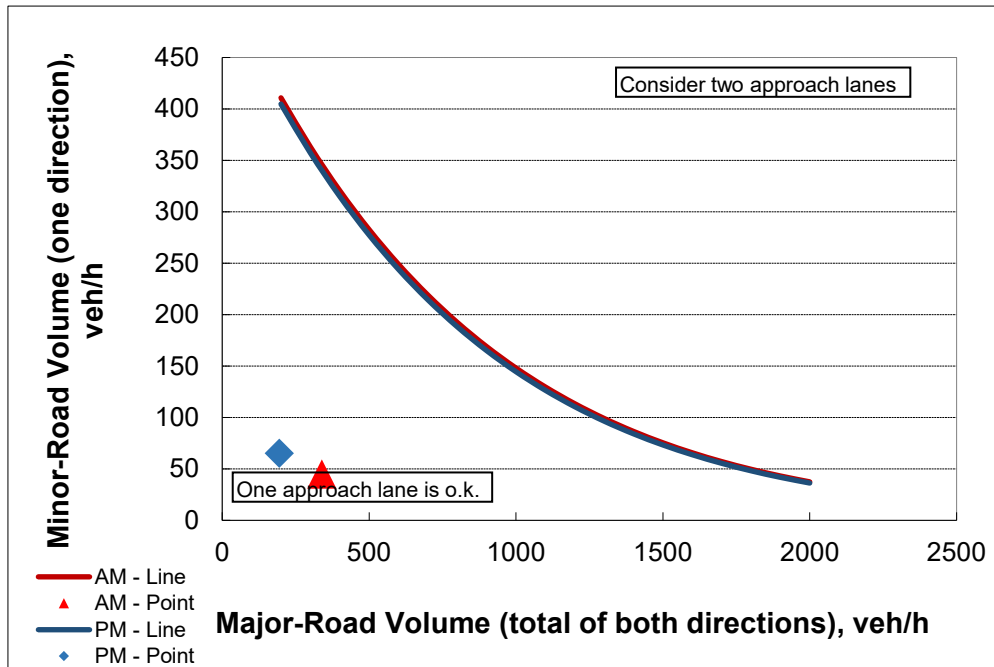
Future (2045) - Build (Constrained)



Major Street: Northshore Dr

Minor Street: 484th St/Westshore Dr

Direction: **Northbound**



### INPUT

Variable	AM	PM	Dismissal
Major-road volume (total of both directions), veh/h:	340	195	160
Percentage of right-turns on minor road, %:	11%	8%	14%
Minor-road volume (one direction), veh/h:	45	65	35

### OUTPUT

Variable	AM	PM	Dismissal
Limiting minor-road volume (one direction), veh/h:	346	407	437
<b>Guidance for determining minor-road approach geometry:</b>			
<b>ONE approach lane is O.K.</b>			

### CALIBRATION CONSTANTS

Minor Road, Gap Acceptance (s)	Critical	Follow
Right-turn capacity, veh/h:	6.2	3.3
Left-turn and through capacity, veh/h:	6.5	4.0

\* according to Table 17 - 5 of the HCM

## Left-turn Lane Warrant (2 Lane) - NCHRP 457

484th St/Westshore Dr & Northshore Dr

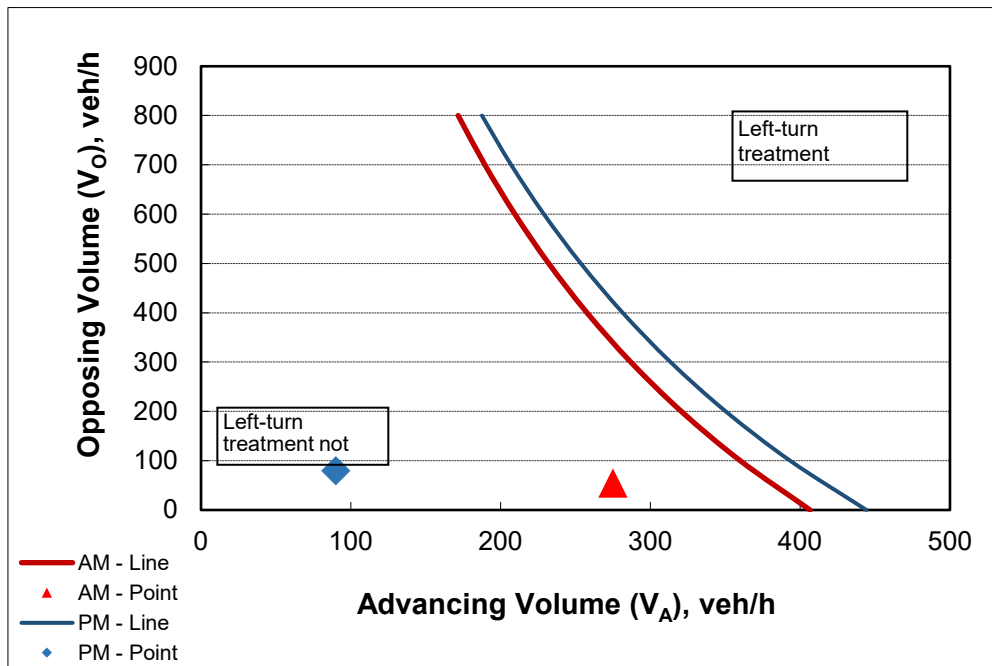
Future (2045) - Build (Constrained)



Major Street: Northshore Dr

Minor Street: 484th St/Westshore Dr

Direction: **Eastbound**



### INPUT

Variable	AM	PM	Dismissal
85 <sup>th</sup> percentile speed, mph:	35		
Percent of left-turns in advancing volume ( $V_A$ ), %:	71%	22%	24%
Advancing volume ( $V_A$ ), veh/h:	275	90	85
Opposing volume ( $V_O$ ), veh/h:	55	80	70

### OUTPUT

Variable	AM	PM	Dismissal
Limiting advancing volume ( $V_A$ ), veh/h:	380	421	400
<b>Guidance for determining the need for a major-road left-turn bay:</b>			
<b>Left-turn treatment NOT warranted.</b>			

### CALIBRATION CONSTANTS

Variable	Value
Average time for making left-turn, s:	3.0
Critical headway, s:	5.0
Average time for left-turn veh. to clear advancing lane, s:	1.9

## Left-turn Lane Warrant (2 Lane) - NCHRP 457

484th St/Westshore Dr & Northshore Dr

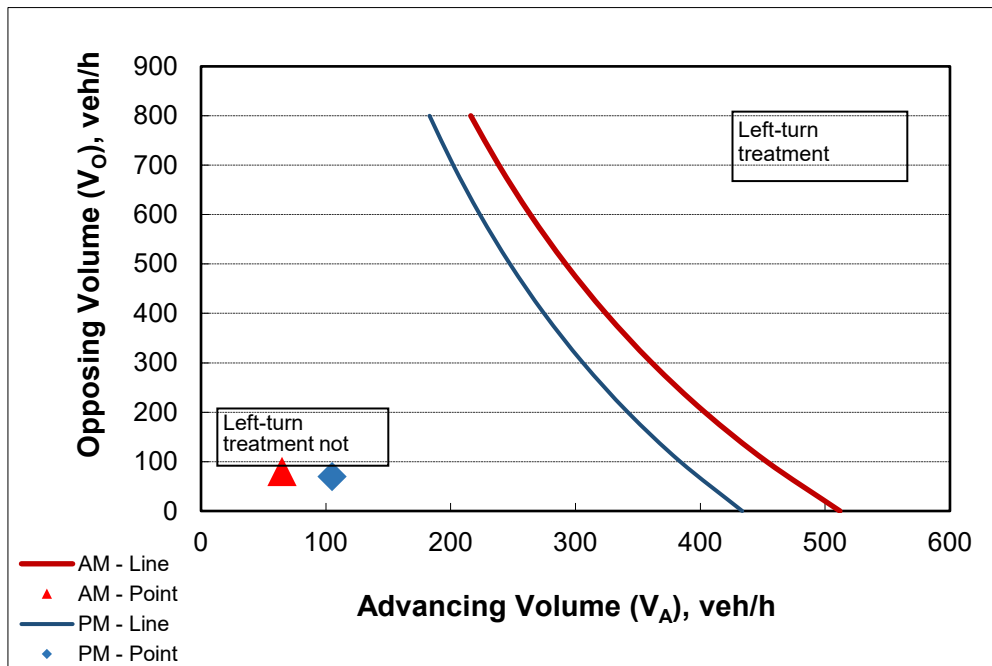
Future (2045) - Build (Constrained)



Major Street: Northshore Dr

Minor Street: 484th St/Westshore Dr

Direction: **Westbound**



### INPUT

Variable	AM	PM	Dismissal
85 <sup>th</sup> percentile speed, mph:	35		
Percent of left-turns in advancing volume ( $V_A$ ), %:	15%	24%	24%
Advancing volume ( $V_A$ ), veh/h:	65	105	85
Opposing volume ( $V_O$ ), veh/h:	80	70	70

### OUTPUT

Variable	AM	PM	Dismissal
Limiting advancing volume ( $V_A$ ), veh/h:	464	398	683
<b>Guidance for determining the need for a major-road left-turn bay:</b>			
<b>Left-turn treatment NOT warranted.</b>			

### CALIBRATION CONSTANTS

Variable	Value
Average time for making left-turn, s:	3.0
Critical headway, s:	5.0
Average time for left-turn veh. to clear advancing lane, s:	1.9

## Right-turn Lane Warrant (2 Lane) - NCHRP 457

484th St/Westshore Dr & Northshore Dr

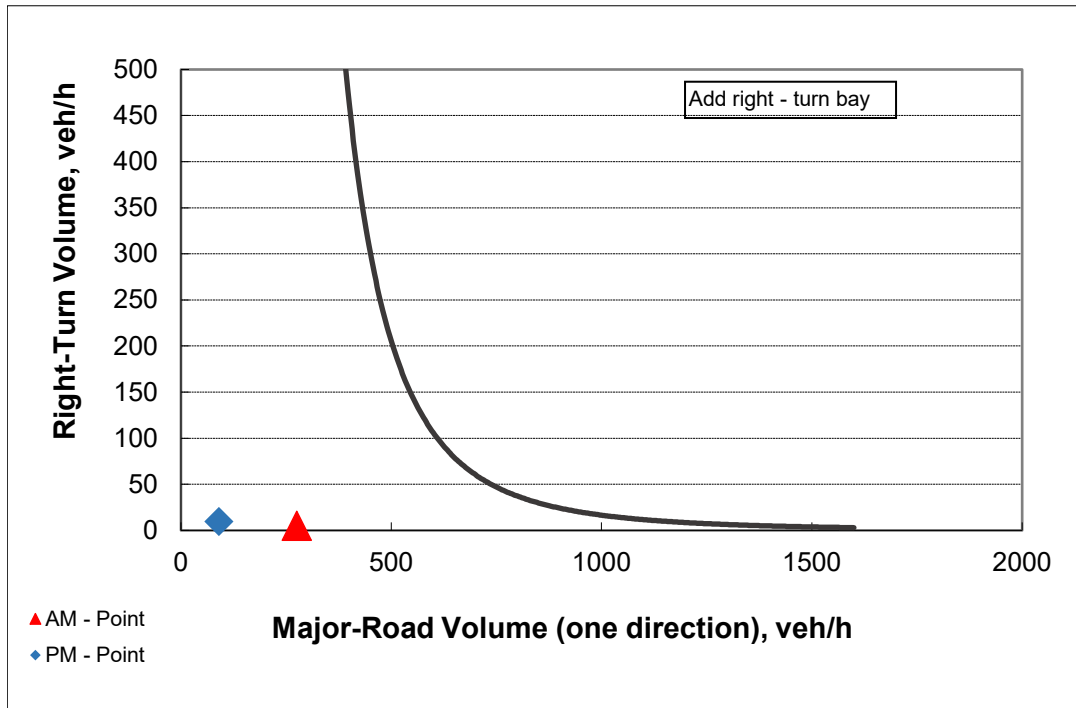
Future (2045) - Build (Constrained)



Major Street: Northshore Dr

Minor Street: 484th St/Westshore Dr

Direction: **Eastbound**



### INPUT

Variable	AM	PM	Dismissal
Major-road speed, mph:	35		
Major-road volume (one direction), veh/h:	275	90	85
Right-turn volume, veh/h:	5	10	10

### OUTPUT

Variable	AM	PM	Dismissal
Limiting right-turn volume, veh/h:	1807	104924	129163
<b>Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:</b>			
<b>Do NOT add right-turn bay.</b>			



## Right-turn Lane Warrant (2 Lane) - NCHRP 457

484th St/Westshore Dr & Northshore Dr

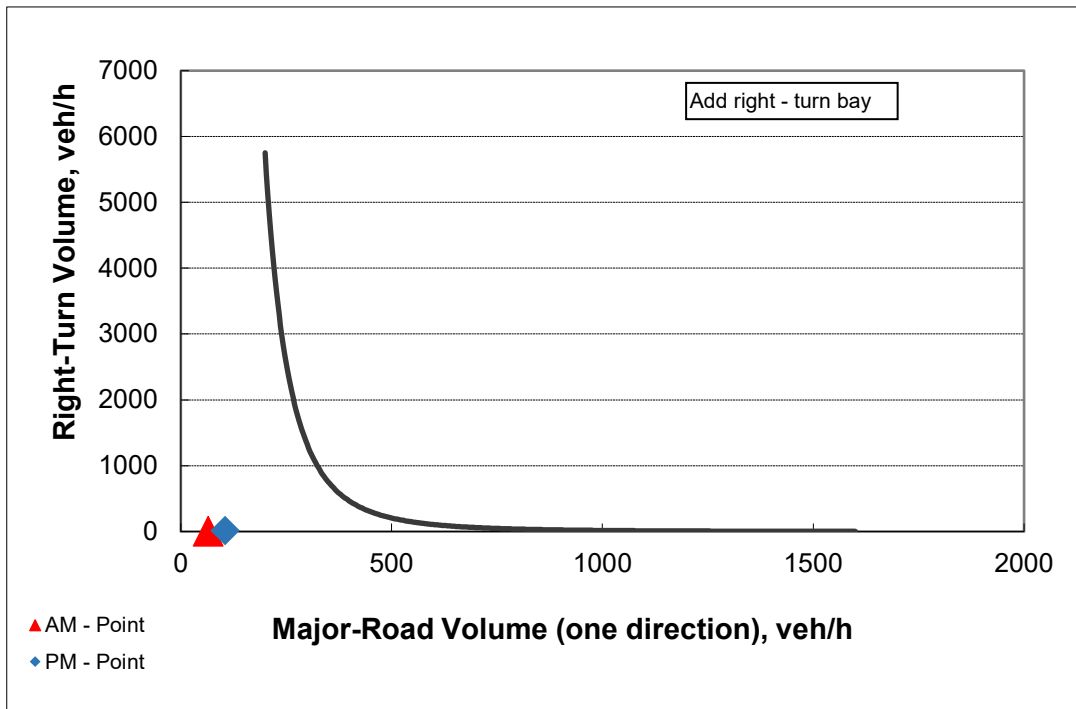
Future (2045) - Build (Constrained)



Major Street: Northshore Dr

Minor Street: 484th St/Westshore Dr

Direction: **Westbound**



### INPUT

Variable	AM	PM	Dismissal
Major-road speed, mph:	35		
Major-road volume (one direction), veh/h:	65	105	75
Right-turn volume, veh/h:	5	20	10

### OUTPUT

Variable	AM	PM	Dismissal
Limiting right-turn volume, veh/h:	342597	59901	203609
<b>Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:</b>			
<b>Do NOT add right-turn bay.</b>			

## Minor Approach Lane Warrant - NCHRP 457

48th Ave/Westshore Dr & Northshore Dr

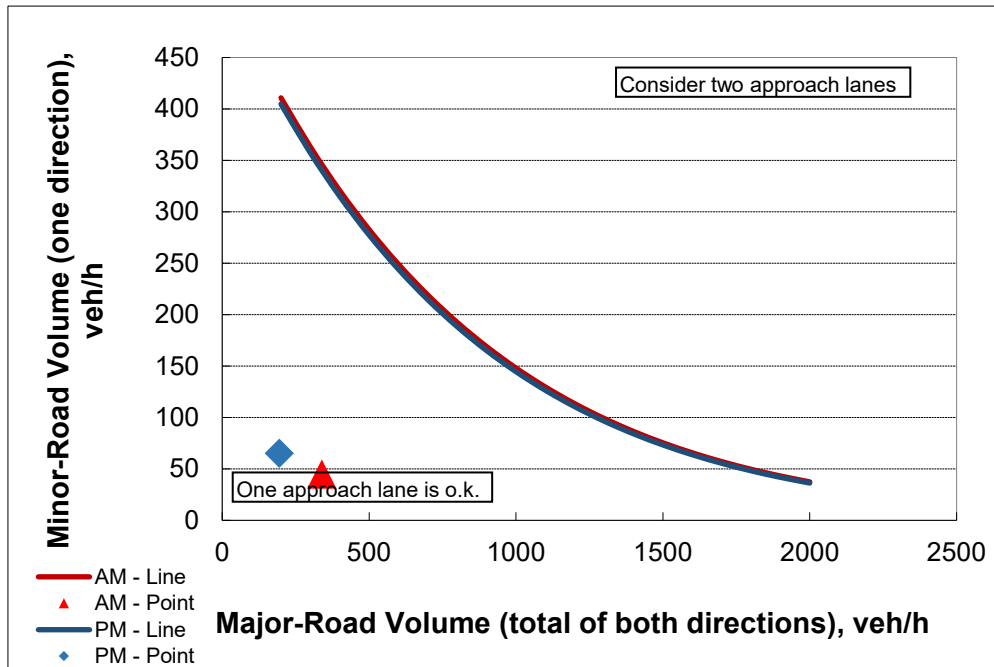
Future (2045) - Alt I (Constrained)



Major Street: Northshore Dr

Minor Street: 48th Ave/Westshore Dr

Direction: **Northbound**



### INPUT

Variable	AM	PM	Dismissal
Major-road volume (total of both directions), veh/h:	340	195	160
Percentage of right-turns on minor road, %:	11%	8%	14%
Minor-road volume (one direction), veh/h:	45	65	35

### OUTPUT

Variable	AM	PM	Dismissal
Limiting minor-road volume (one direction), veh/h:	346	407	437
<b>Guidance for determining minor-road approach geometry:</b>			
<b>ONE approach lane is O.K.</b>			

### CALIBRATION CONSTANTS

Minor Road, Gap Acceptance (s)	Critical	Follow
Right-turn capacity, veh/h:	6.2	3.3
Left-turn and through capacity, veh/h:	6.5	4.0

\* according to Table 17 - 5 of the HCM

## Minor Approach Lane Warrant - NCHRP 457

48th Ave/Westshore Dr & Northshore Dr

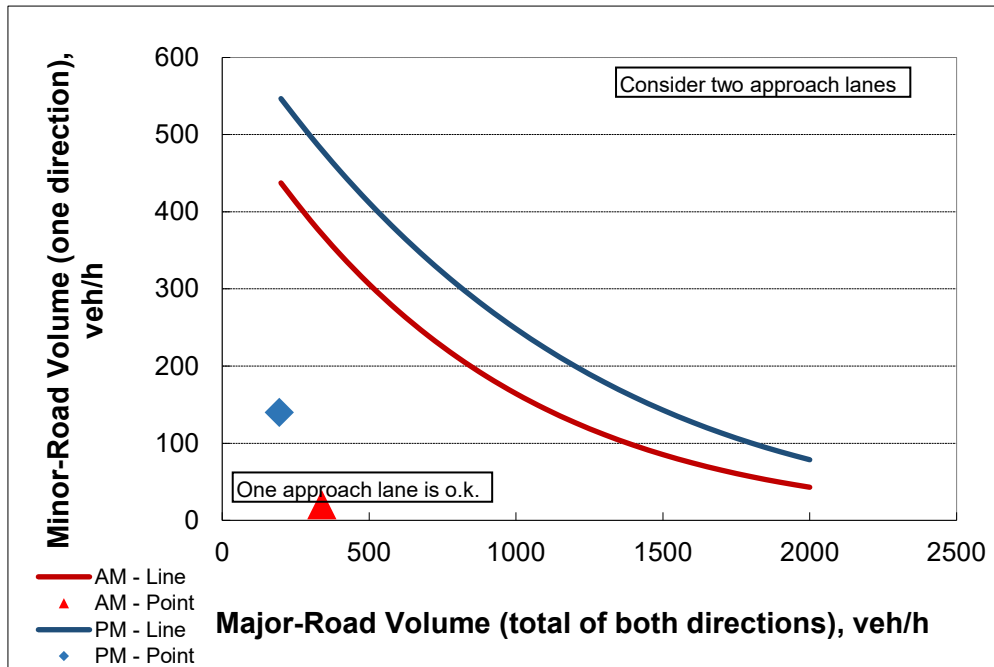
Future (2045) - Alt I (Constrained)



Major Street: Northshore Dr

Minor Street: 48th Ave/Westshore Dr

Direction: **Southbound**



### INPUT

Variable	AM	PM	Dismissal
Major-road volume (total of both directions), veh/h:	340	195	160
Percentage of right-turns on minor road, %:	25%	68%	14%
Minor-road volume (one direction), veh/h:	20	140	35

### OUTPUT

Variable	AM	PM	Dismissal
Limiting minor-road volume (one direction), veh/h:	371	549	541
<b>Guidance for determining minor-road approach geometry:</b>			
<b>ONE approach lane is O.K.</b>			

### CALIBRATION CONSTANTS

Minor Road, Gap Acceptance (s)	Critical	Follow
Right-turn capacity, veh/h:	6.2	3.3
Left-turn and through capacity, veh/h:	6.5	4.0

\* according to Table 17 - 5 of the HCM

## Left-turn Lane Warrant (2 Lane) - NCHRP 457

48th Ave/Westshore Dr & Northshore Dr

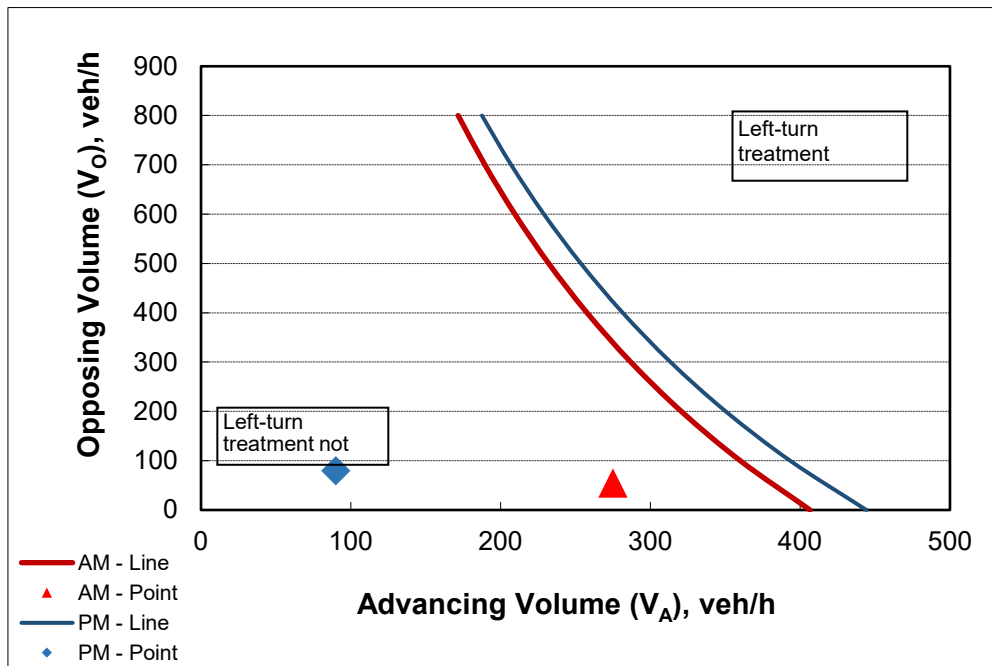
Future (2045) - Alt I (Constrained)



Major Street: Northshore Dr

Minor Street: 48th Ave/Westshore Dr

Direction: **Eastbound**



### INPUT

Variable	AM	PM	Dismissal
85 <sup>th</sup> percentile speed, mph:	35		
Percent of left-turns in advancing volume ( $V_A$ ), %:	71%	22%	24%
Advancing volume ( $V_A$ ), veh/h:	275	90	85
Opposing volume ( $V_O$ ), veh/h:	55	80	70

### OUTPUT

Variable	AM	PM	Dismissal
Limiting advancing volume ( $V_A$ ), veh/h:	380	421	400
<b>Guidance for determining the need for a major-road left-turn bay:</b>			
<b>Left-turn treatment NOT warranted.</b>			

### CALIBRATION CONSTANTS

Variable	Value
Average time for making left-turn, s:	3.0
Critical headway, s:	5.0
Average time for left-turn veh. to clear advancing lane, s:	1.9

## Left-turn Lane Warrant (2 Lane) - NCHRP 457

48th Ave/Westshore Dr & Northshore Dr

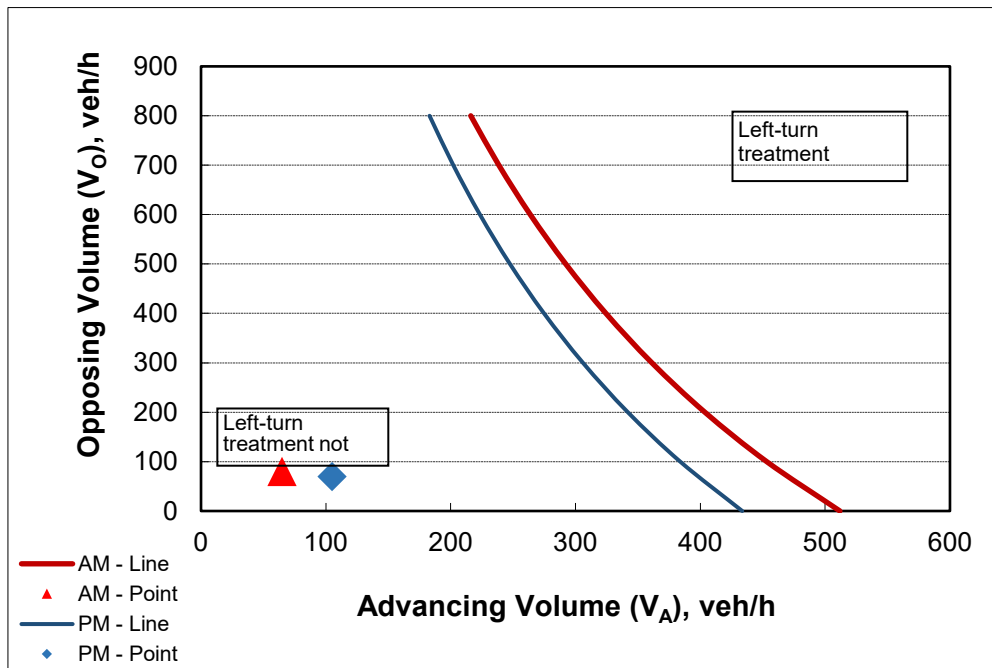
Future (2045) - Alt I (Constrained)



Major Street: Northshore Dr

Minor Street: 48th Ave/Westshore Dr

Direction: **Westbound**



### INPUT

Variable	AM	PM	Dismissal
85 <sup>th</sup> percentile speed, mph:	35		
Percent of left-turns in advancing volume ( $V_A$ ), %:	15%	24%	24%
Advancing volume ( $V_A$ ), veh/h:	65	105	85
Opposing volume ( $V_O$ ), veh/h:	80	70	70

### OUTPUT

Variable	AM	PM	Dismissal
Limiting advancing volume ( $V_A$ ), veh/h:	464	398	683
<b>Guidance for determining the need for a major-road left-turn bay:</b>			
<b>Left-turn treatment NOT warranted.</b>			

### CALIBRATION CONSTANTS

Variable	Value
Average time for making left-turn, s:	3.0
Critical headway, s:	5.0
Average time for left-turn veh. to clear advancing lane, s:	1.9

## Right-turn Lane Warrant (2 Lane) - NCHRP 457

48th Ave/Westshore Dr & Northshore Dr

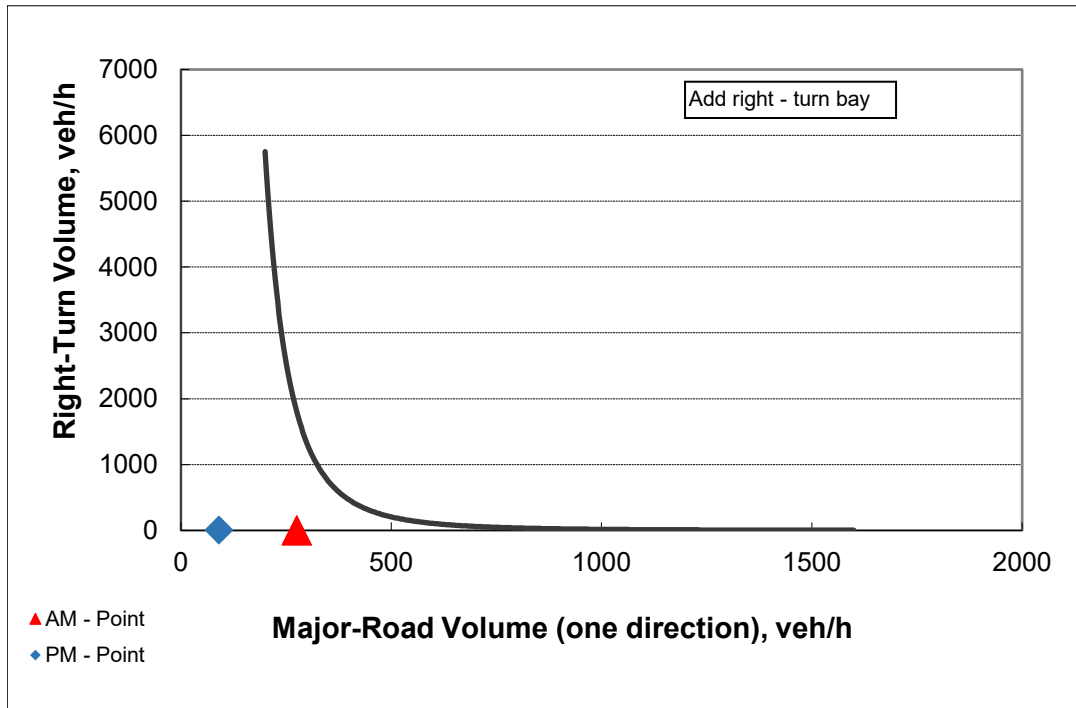
Future (2045) - Alt I (Constrained)



Major Street: Northshore Dr

Minor Street: 48th Ave/Westshore Dr

Direction: **Eastbound**



### INPUT

Variable	AM	PM	Dismissal
Major-road speed, mph:	35		
Major-road volume (one direction), veh/h:	275	90	85
Right-turn volume, veh/h:	5	10	10

### OUTPUT

Variable	AM	PM	Dismissal
Limiting right-turn volume, veh/h:	1807	104924	129163
<b>Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:</b>			
<b>Do NOT add right-turn bay.</b>			

## Right-turn Lane Warrant (2 Lane) - NCHRP 457

48th Ave/Westshore Dr & Northshore Dr

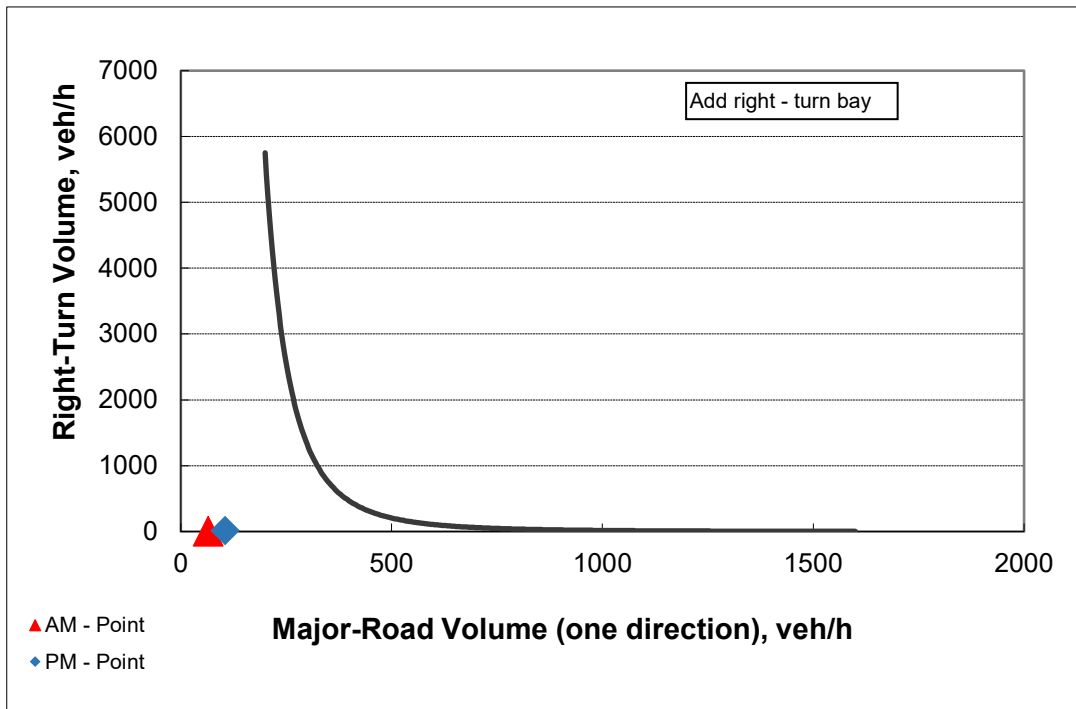
Future (2045) - Alt I (Constrained)



Major Street: Northshore Dr

Minor Street: 48th Ave/Westshore Dr

Direction: **Westbound**



### INPUT

Variable	AM	PM	Dismissal
Major-road speed, mph:	35		
Major-road volume (one direction), veh/h:	65	105	75
Right-turn volume, veh/h:	5	20	10

### OUTPUT

Variable	AM	PM	Dismissal
Limiting right-turn volume, veh/h:	342597	59901	203609
<b>Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:</b>			
<b>Do NOT add right-turn bay.</b>			

## Minor Approach Lane Warrant - NCHRP 457

484th St/Westshore Dr & Northshore Dr

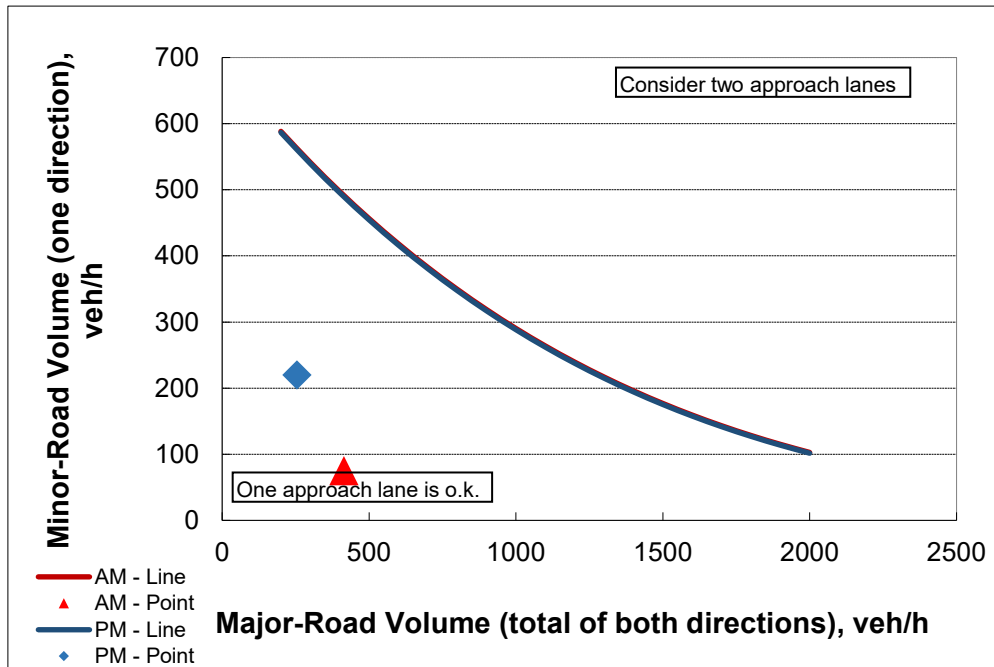
Future (2045) - Build (Unconstrained)



Major Street: Northshore Dr

Minor Street: 484th St/Westshore Dr

Direction: **Southbound**



### INPUT

Variable	AM	PM	Dismissal
Major-road volume (total of both directions), veh/h:	415	255	210
Percentage of right-turns on minor road, %:	80%	80%	14%
Minor-road volume (one direction), veh/h:	75	220	35

### OUTPUT

Variable	AM	PM	Dismissal
Limiting minor-road volume (one direction), veh/h:	491	560	563
<b>Guidance for determining minor-road approach geometry:</b>			
<b>ONE approach lane is O.K.</b>			

### CALIBRATION CONSTANTS

Minor Road, Gap Acceptance (s)	Critical	Follow
Right-turn capacity, veh/h:	6.2	3.3
Left-turn and through capacity, veh/h:	6.5	4.0

\* according to Table 17 - 5 of the HCM



## Left-turn Lane Warrant (2 Lane) - NCHRP 457

484th St/Westshore Dr & Northshore Dr

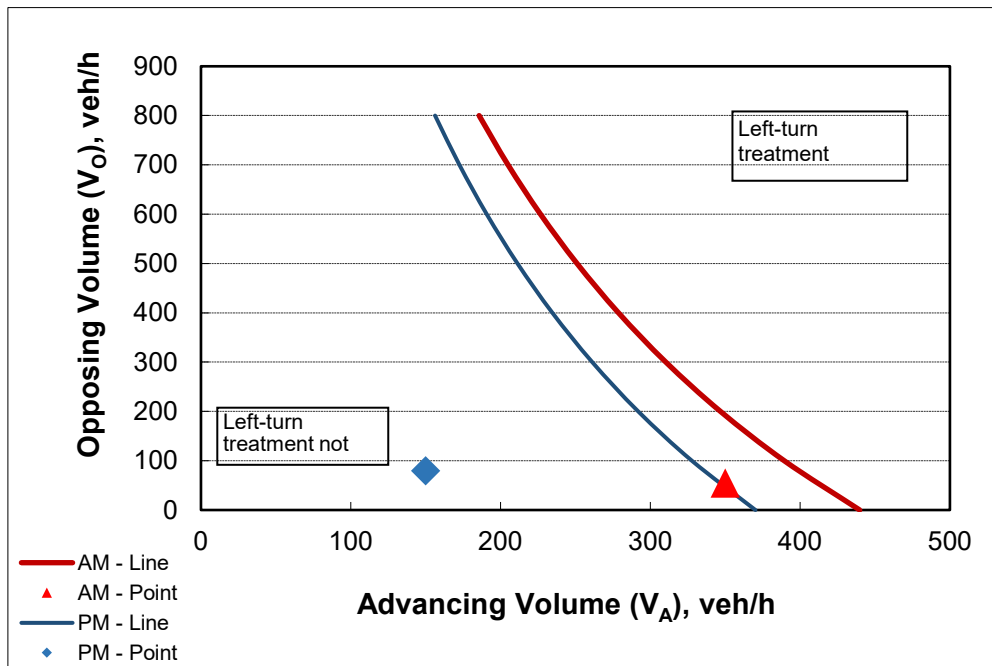
Future (2045) - Build (Unconstrained)



Major Street: Northshore Dr

Minor Street: 484th St/Westshore Dr

Direction: **Eastbound**



### INPUT

Variable	AM	PM	Dismissal
85 <sup>th</sup> percentile speed, mph:	35		
Percent of left-turns in advancing volume ( $V_A$ ), %:	77%	53%	52%
Advancing volume ( $V_A$ ), veh/h:	350	150	135
Opposing volume ( $V_O$ ), veh/h:	55	80	70

### OUTPUT

Variable	AM	PM	Dismissal
Limiting advancing volume ( $V_A$ ), veh/h:	411	351	339
<b>Guidance for determining the need for a major-road left-turn bay:</b>			
<b>Left-turn treatment NOT warranted.</b>			

### CALIBRATION CONSTANTS

Variable	Value
Average time for making left-turn, s:	3.0
Critical headway, s:	5.0
Average time for left-turn veh. to clear advancing lane, s:	1.9

## Minor Approach Lane Warrant - NCHRP 457

484th St/Westshore Dr & Northshore Dr

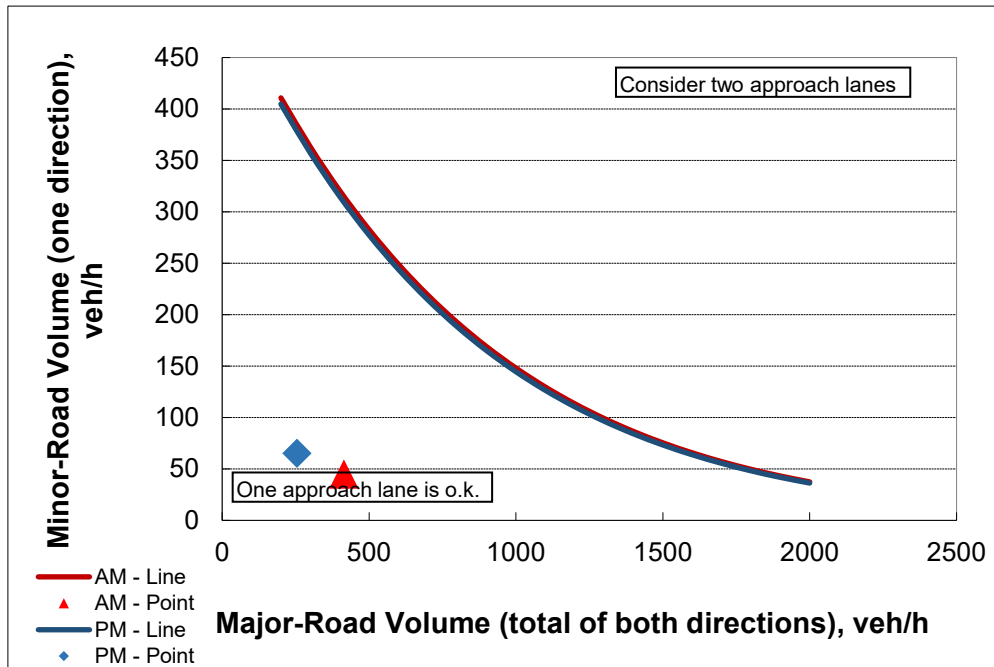
Future (2045) - Build (Unconstrained)



Major Street: Northshore Dr

Minor Street: 484th St/Westshore Dr

Direction: **Northbound**



### INPUT

Variable	AM	PM	Dismissal
Major-road volume (total of both directions), veh/h:	415	255	210
Percentage of right-turns on minor road, %:	11%	8%	14%
Minor-road volume (one direction), veh/h:	45	65	35

### OUTPUT

Variable	AM	PM	Dismissal
Limiting minor-road volume (one direction), veh/h:	315	378	412
<b>Guidance for determining minor-road approach geometry:</b>			
<b>ONE approach lane is O.K.</b>			

### CALIBRATION CONSTANTS

Minor Road, Gap Acceptance (s)	Critical	Follow
Right-turn capacity, veh/h:	6.2	3.3
Left-turn and through capacity, veh/h:	6.5	4.0

\* according to Table 17 - 5 of the HCM

## Left-turn Lane Warrant (2 Lane) - NCHRP 457

484th St/Westshore Dr & Northshore Dr

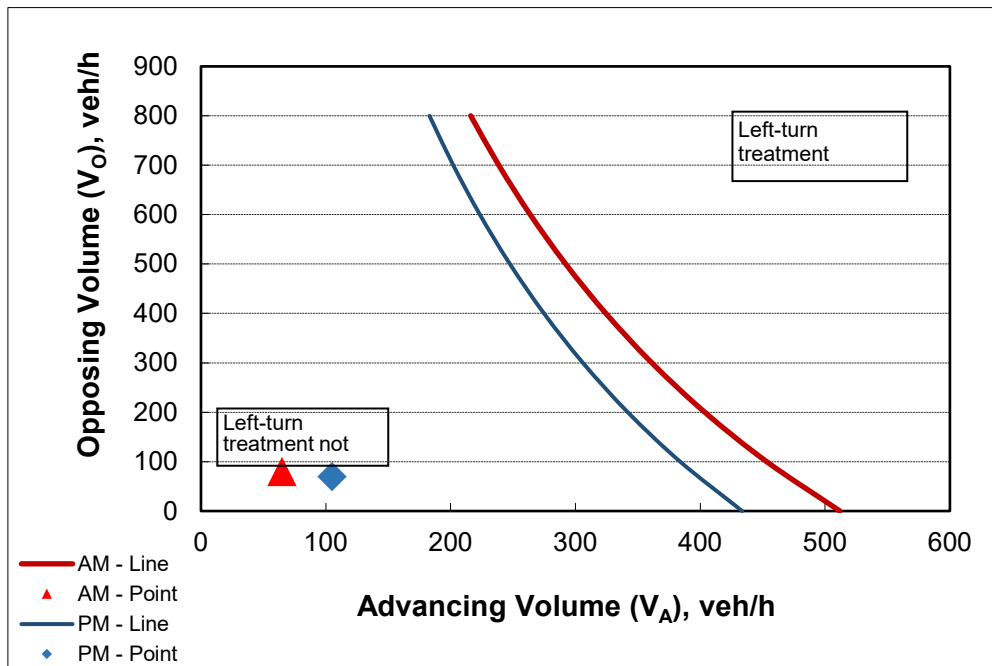
Future (2045) - Build (Unconstrained)



Major Street: Northshore Dr

Minor Street: 484th St/Westshore Dr

Direction: **Westbound**



### INPUT

Variable	AM	PM	Dismissal
85 <sup>th</sup> percentile speed, mph:	35		
Percent of left-turns in advancing volume ( $V_A$ ), %:	15%	24%	52%
Advancing volume ( $V_A$ ), veh/h:	65	105	135
Opposing volume ( $V_O$ ), veh/h:	80	70	70

### OUTPUT

Variable	AM	PM	Dismissal
Limiting advancing volume ( $V_A$ ), veh/h:	464	398	683
<b>Guidance for determining the need for a major-road left-turn bay:</b>			
<b>Left-turn treatment NOT warranted.</b>			

### CALIBRATION CONSTANTS

Variable	Value
Average time for making left-turn, s:	3.0
Critical headway, s:	5.0
Average time for left-turn veh. to clear advancing lane, s:	1.9

## Right-turn Lane Warrant (2 Lane) - NCHRP 457

484th St/Westshore Dr & Northshore Dr

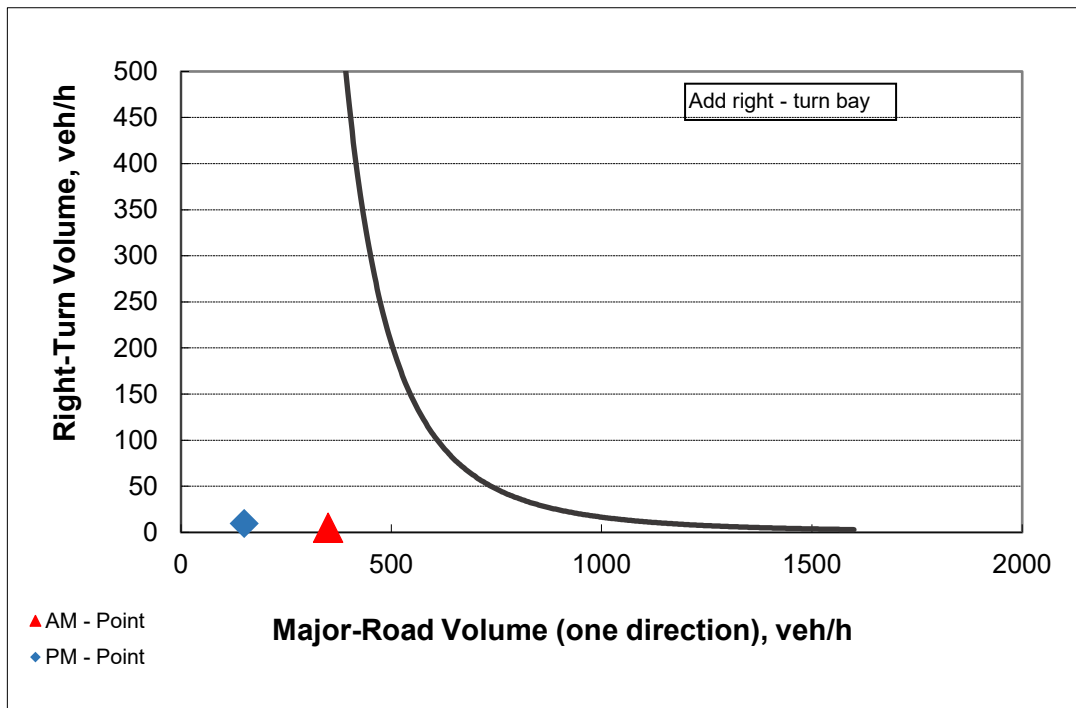
Future (2045) - Build (Unconstrained)



Major Street: Northshore Dr

Minor Street: 484th St/Westshore Dr

Direction: **Eastbound**



### INPUT

Variable	AM	PM	Dismissal
Major-road speed, mph:	35		
Major-road volume (one direction), veh/h:	350	150	135
Right-turn volume, veh/h:	5	10	10

### OUTPUT

Variable	AM	PM	Dismissal
Limiting right-turn volume, veh/h:	752	16375	24019
<b>Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:</b>			
<b>Do NOT add right-turn bay.</b>			

## Right-turn Lane Warrant (2 Lane) - NCHRP 457

484th St/Westshore Dr & Northshore Dr

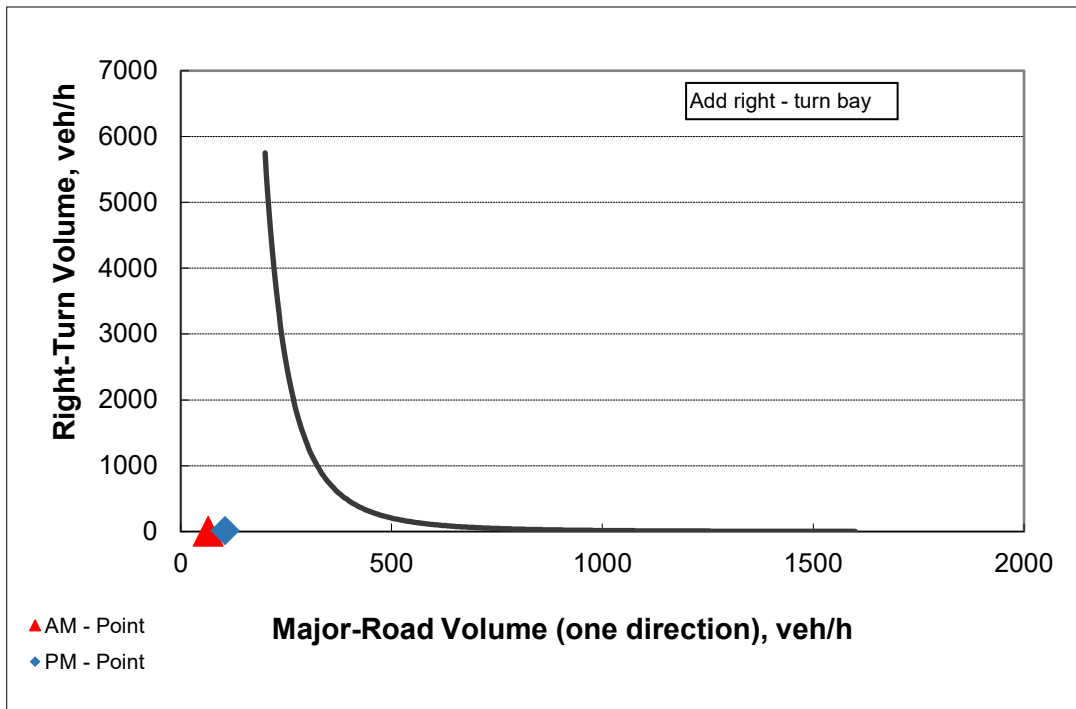
Future (2045) - Build (Unconstrained)



Major Street: Northshore Dr

Minor Street: 484th St/Westshore Dr

Direction: **Westbound**



### INPUT

Variable	AM	PM	Dismissal
Major-road speed, mph:	35		
Major-road volume (one direction), veh/h:	65	105	75
Right-turn volume, veh/h:	5	20	10

### OUTPUT

Variable	AM	PM	Dismissal
Limiting right-turn volume, veh/h:	342597	59901	203609
<b>Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:</b>			
<b>Do NOT add right-turn bay.</b>			

## Minor Approach Lane Warrant - NCHRP 457

Northshore Dr & S. 333rd Ave

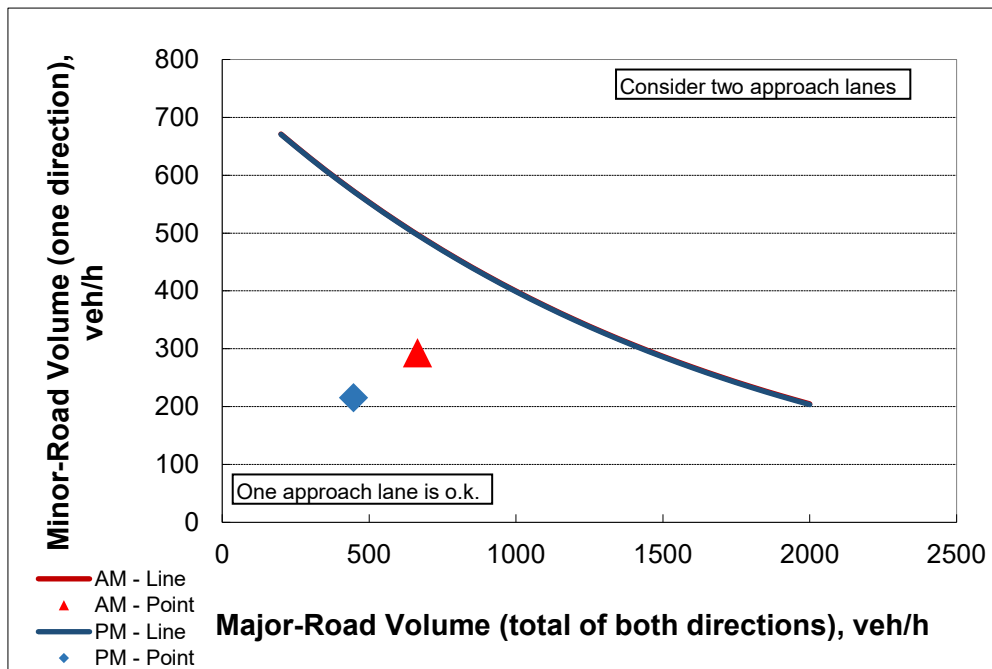
Interim (2025) - Build (Constrained)



Major Street: S. 333rd Ave

Minor Street: Northshore Dr

Direction: **Northbound**



### INPUT

Variable	AM	PM	Dismissal
Major-road volume (total of both directions), veh/h:	665	447	342
Percentage of right-turns on minor road, %:	100%	100%	100%
Minor-road volume (one direction), veh/h:	293	215	279

### OUTPUT

Variable	AM	PM	Dismissal
Limiting minor-road volume (one direction), veh/h:	497	572	613
<b>Guidance for determining minor-road approach geometry:</b>			
<b>ONE approach lane is O.K.</b>			

### CALIBRATION CONSTANTS

Minor Road, Gap Acceptance (s)	Critical	Follow
Right-turn capacity, veh/h:	6.2	3.3
Left-turn and through capacity, veh/h:	6.5	4.0

\* according to Table 17 - 5 of the HCM



## Left-turn Lane Warrant (2 Lane) - NCHRP 457

Northshore Dr & S. 333rd Ave

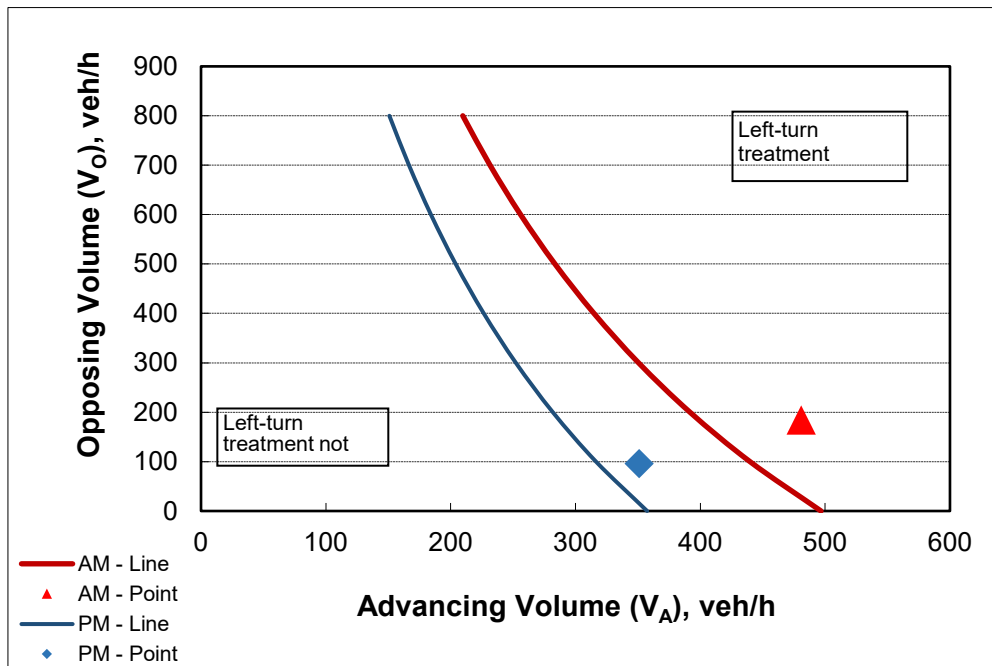
Interim (2025) - Build (Constrained)



Major Street: S. 333rd Ave

Minor Street: Northshore Dr

Direction: **Westbound**



### INPUT

Variable	AM	PM	Dismissal
85 <sup>th</sup> percentile speed, mph:	40		
Percent of left-turns in advancing volume ( $V_A$ ), %:	86%	61%	0%
Advancing volume ( $V_A$ ), veh/h:	481	351	74
Opposing volume ( $V_O$ ), veh/h:	184	96	102

### OUTPUT

Variable	AM	PM	Dismissal
Limiting advancing volume ( $V_A$ ), veh/h:	399	318	327
<b>Guidance for determining the need for a major-road left-turn bay:</b>			
<b>Left-turn treatment warranted.</b>			

### CALIBRATION CONSTANTS

Variable	Value
Average time for making left-turn, s:	3.0
Critical headway, s:	5.0
Average time for left-turn veh. to clear advancing lane, s:	1.9

## Right-turn Lane Warrant (2 Lane) - NCHRP 457

Northshore Dr & S. 333rd Ave

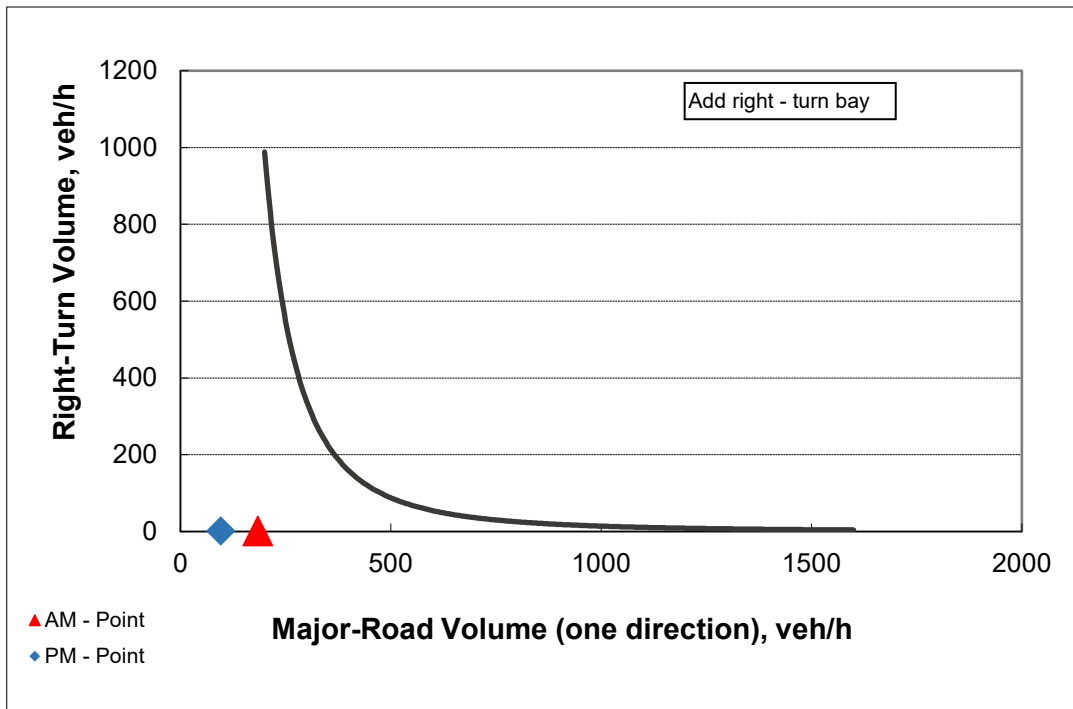
Interim (2025) - Build (Constrained)



Major Street: S. 333rd Ave

Minor Street: Northshore Dr

Direction: **Eastbound**



### INPUT

Variable	AM	PM	Dismissal
Major-road speed, mph:	40		
Major-road volume (one direction), veh/h:	184	96	74
Right-turn volume, veh/h:	1	1	1

### OUTPUT

Variable	AM	PM	Dismissal
Limiting right-turn volume, veh/h:	1232	6866	13651
<b>Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:</b>			
<b>Do NOT add right-turn bay.</b>			

## Minor Approach Lane Warrant - NCHRP 457

Northshore Dr & S. 333rd Ave

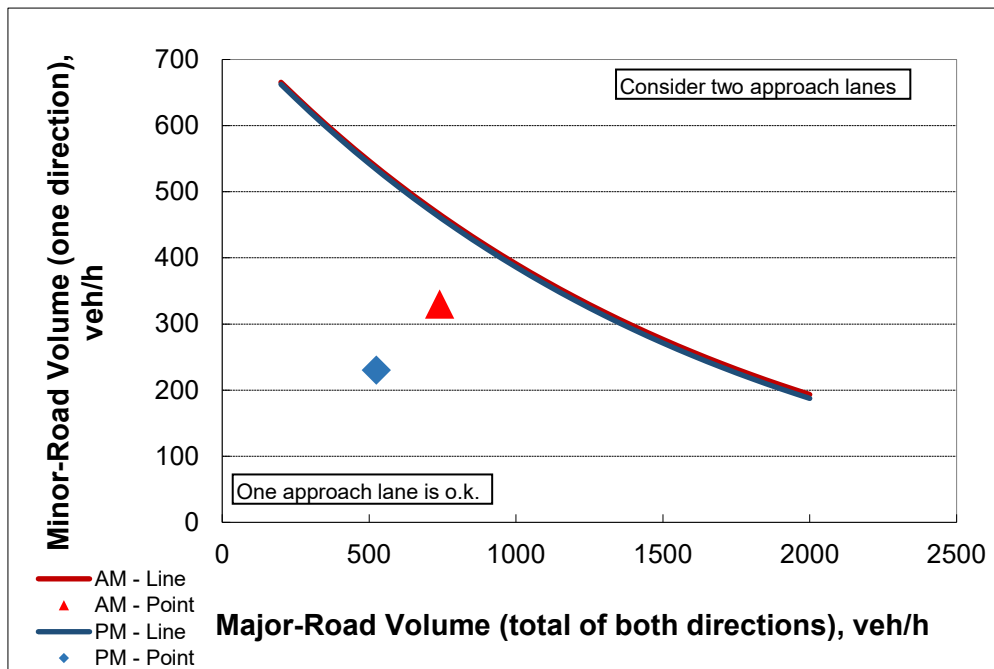
Future (2045) - Build (Constrained)



Major Street: S. 333rd Ave

Minor Street: Northshore Dr

Direction: **Northbound**



### INPUT

Variable	AM	PM	Dismissal
Major-road volume (total of both directions), veh/h:	740	525	395
Percentage of right-turns on minor road, %:	98%	98%	98%
Minor-road volume (one direction), veh/h:	330	230	315

### OUTPUT

Variable	AM	PM	Dismissal
Limiting minor-road volume (one direction), veh/h:	466	534	585
<b>Guidance for determining minor-road approach geometry:</b>			
<b>ONE approach lane is O.K.</b>			

### CALIBRATION CONSTANTS

Minor Road, Gap Acceptance (s)	Critical	Follow
Right-turn capacity, veh/h:	6.2	3.3
Left-turn and through capacity, veh/h:	6.5	4.0

\* according to Table 17 - 5 of the HCM

## Left-turn Lane Warrant (2 Lane) - NCHRP 457

Northshore Dr & S. 333rd Ave

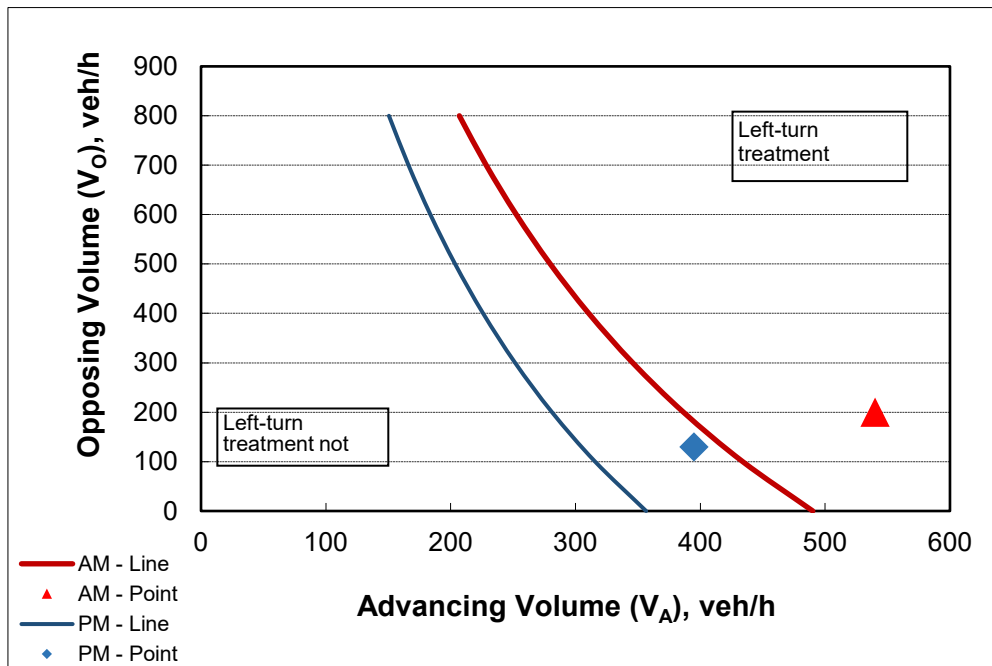
Future (2045) - Build (Constrained)



Major Street: S. 333rd Ave

Minor Street: Northshore Dr

Direction: **Westbound**



### INPUT

Variable	AM	PM	Dismissal
85 <sup>th</sup> percentile speed, mph:	40		
Percent of left-turns in advancing volume ( $V_A$ ), %:	85%	61%	0%
Advancing volume ( $V_A$ ), veh/h:	540	395	90
Opposing volume ( $V_O$ ), veh/h:	200	130	130

### OUTPUT

Variable	AM	PM	Dismissal
Limiting advancing volume ( $V_A$ ), veh/h:	387	305	315
<b>Guidance for determining the need for a major-road left-turn bay:</b>			
<b>Left-turn treatment warranted.</b>			

### CALIBRATION CONSTANTS

Variable	Value
Average time for making left-turn, s:	3.0
Critical headway, s:	5.0
Average time for left-turn veh. to clear advancing lane, s:	1.9

## Right-turn Lane Warrant (2 Lane) - NCHRP 457

Northshore Dr & S. 333rd Ave

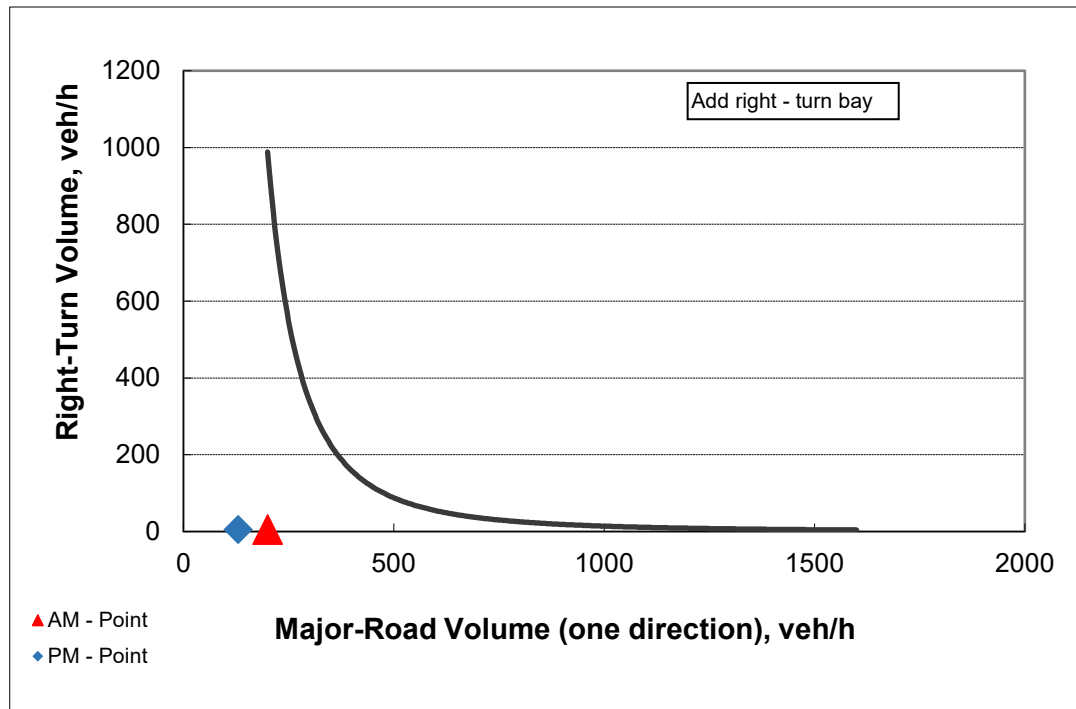
Future (2045) - Build (Constrained)



Major Street: S. 333rd Ave

Minor Street: Northshore Dr

Direction: **Eastbound**



### INPUT

Variable	AM	PM	Dismissal
Major-road speed, mph:	40		
Major-road volume (one direction), veh/h:	200	130	90
Right-turn volume, veh/h:	5	5	5

### OUTPUT

Variable	AM	PM	Dismissal
Limiting right-turn volume, veh/h:	988	3083	8141
<b>Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:</b>			
<b>Do NOT add right-turn bay.</b>			

## Minor Approach Lane Warrant - NCHRP 457

Northshore Dr & S. 333rd Ave

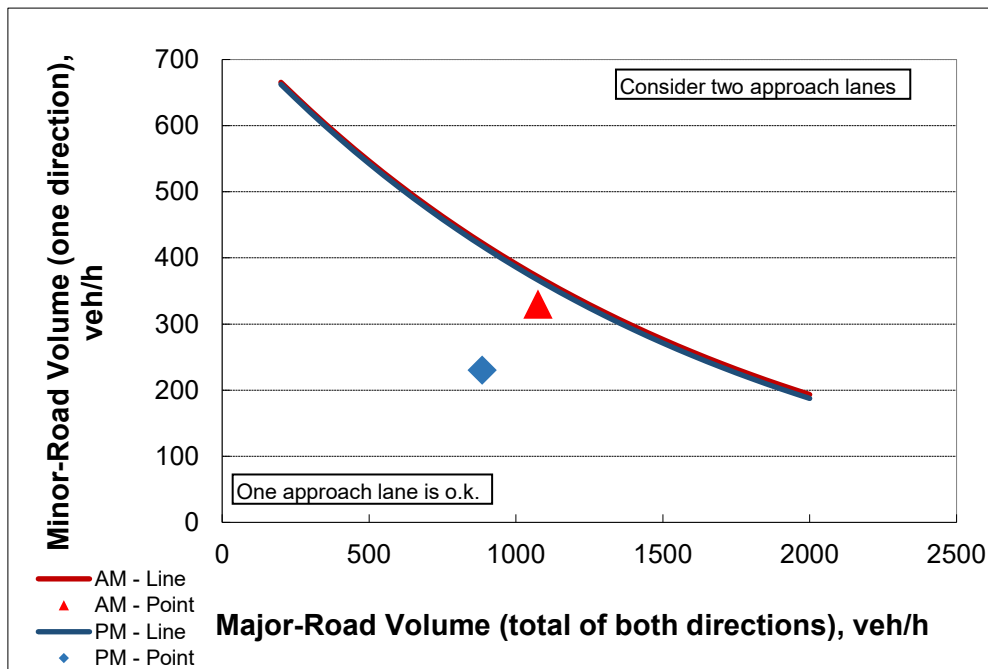
Future (2045) - Build (Unconstrained)



Major Street: S. 333rd Ave

Minor Street: Northshore Dr

Direction: **Northbound**



### INPUT

Variable	AM	PM	Dismissal
Major-road volume (total of both directions), veh/h:	1075	885	675
Percentage of right-turns on minor road, %:	98%	98%	98%
Minor-road volume (one direction), veh/h:	330	230	315

### OUTPUT

Variable	AM	PM	Dismissal
Limiting minor-road volume (one direction), veh/h:	371	418	486
<b>Guidance for determining minor-road approach geometry:</b>			
<b>ONE approach lane is O.K.</b>			

### CALIBRATION CONSTANTS

Minor Road, Gap Acceptance (s)	Critical	Follow
Right-turn capacity, veh/h:	6.2	3.3
Left-turn and through capacity, veh/h:	6.5	4.0

\* according to Table 17 - 5 of the HCM



## Left-turn Lane Warrant (2 Lane) - NCHRP 457

Northshore Dr & S. 333rd Ave

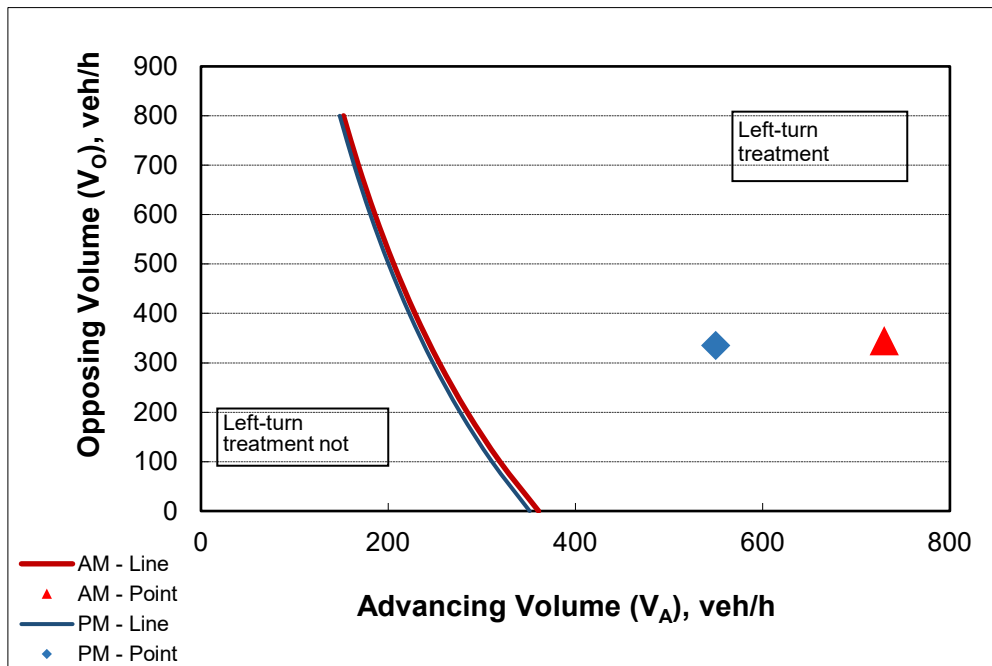
Future (2045) - Build (Unconstrained)



Major Street: S. 333rd Ave

Minor Street: Northshore Dr

Direction: **Westbound**



### INPUT

Variable	AM	PM	Dismissal
85 <sup>th</sup> percentile speed, mph:	40		
Percent of left-turns in advancing volume ( $V_A$ ), %:	63%	44%	0%
Advancing volume ( $V_A$ ), veh/h:	730	550	250
Opposing volume ( $V_O$ ), veh/h:	345	335	250

### OUTPUT

Variable	AM	PM	Dismissal
Limiting advancing volume ( $V_A$ ), veh/h:	242	239	264
<b>Guidance for determining the need for a major-road left-turn bay:</b>			
<b>Left-turn treatment warranted.</b>			

### CALIBRATION CONSTANTS

Variable	Value
Average time for making left-turn, s:	3.0
Critical headway, s:	5.0
Average time for left-turn veh. to clear advancing lane, s:	1.9

## Right-turn Lane Warrant (2 Lane) - NCHRP 457

Northshore Dr & S. 333rd Ave

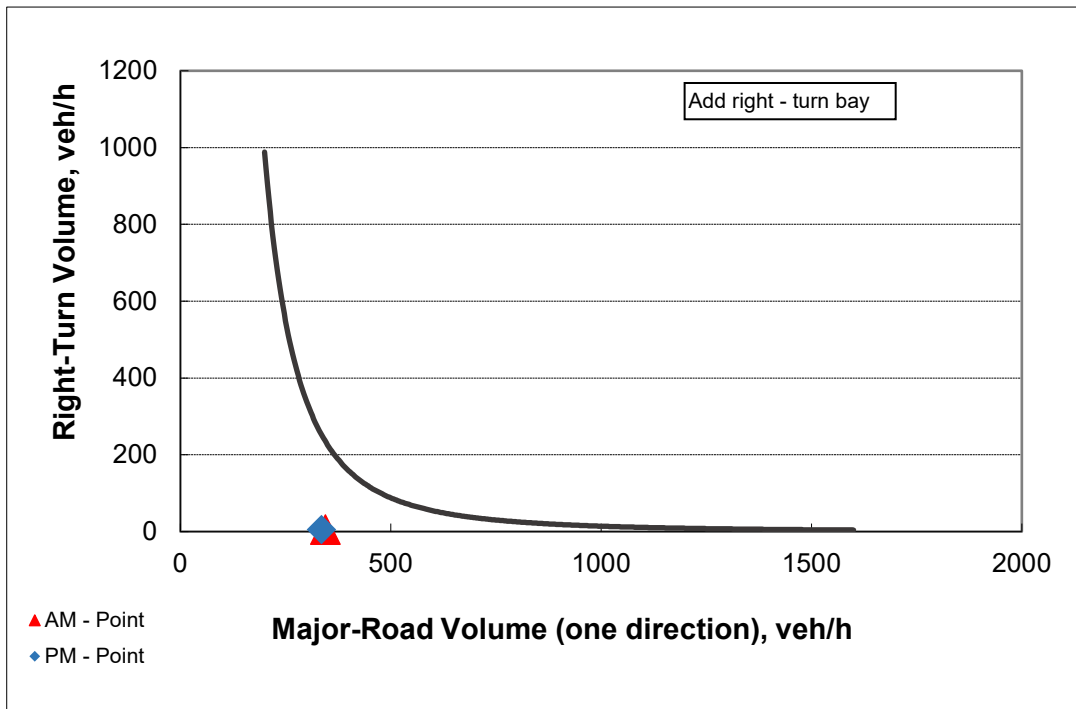
Future (2045) - Build (Unconstrained)



Major Street: S. 333rd Ave

Minor Street: Northshore Dr

Direction: **Eastbound**



### INPUT

Variable	AM	PM	Dismissal
Major-road speed, mph:	40		
Major-road volume (one direction), veh/h:	345	335	250
Right-turn volume, veh/h:	5	5	5

### OUTPUT

Variable	AM	PM	Dismissal
Limiting right-turn volume, veh/h:	234	253	548
<b>Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:</b>			
<b>Do NOT add right-turn bay.</b>			

## Minor Approach Lane Warrant - NCHRP 457

Westshore Dr & S. 333rd Ave

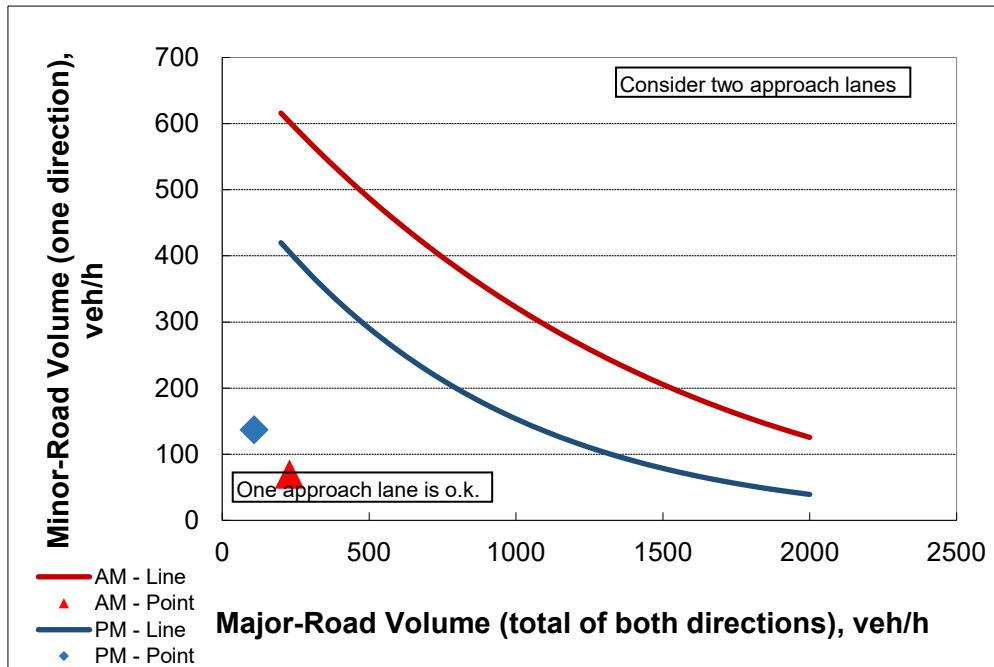
Interim (2025) - Alt I (Constrained)



Major Street: Westshore Dr

Minor Street: S. 333rd Ave

Direction: **Westbound**



### INPUT

Variable	AM	PM	Dismissal
Major-road volume (total of both directions), veh/h:	229	109	84
Percentage of right-turns on minor road, %:	87%	16%	-
Minor-road volume (one direction), veh/h:	70	137	0

### OUTPUT

Variable	AM	PM	Dismissal
Limiting minor-road volume (one direction), veh/h:	602	468	503
Guidance for determining minor-road approach geometry:			
ONE approach lane is O.K.			

### CALIBRATION CONSTANTS

Minor Road, Gap Acceptance (s)	Critical	Follow
Right-turn capacity, veh/h:	6.2	3.3
Left-turn and through capacity, veh/h:	6.5	4.0

\* according to Table 17 - 5 of the HCM

## Left-turn Lane Warrant (2 Lane) - NCHRP 457

Westshore Dr & S. 333rd Ave

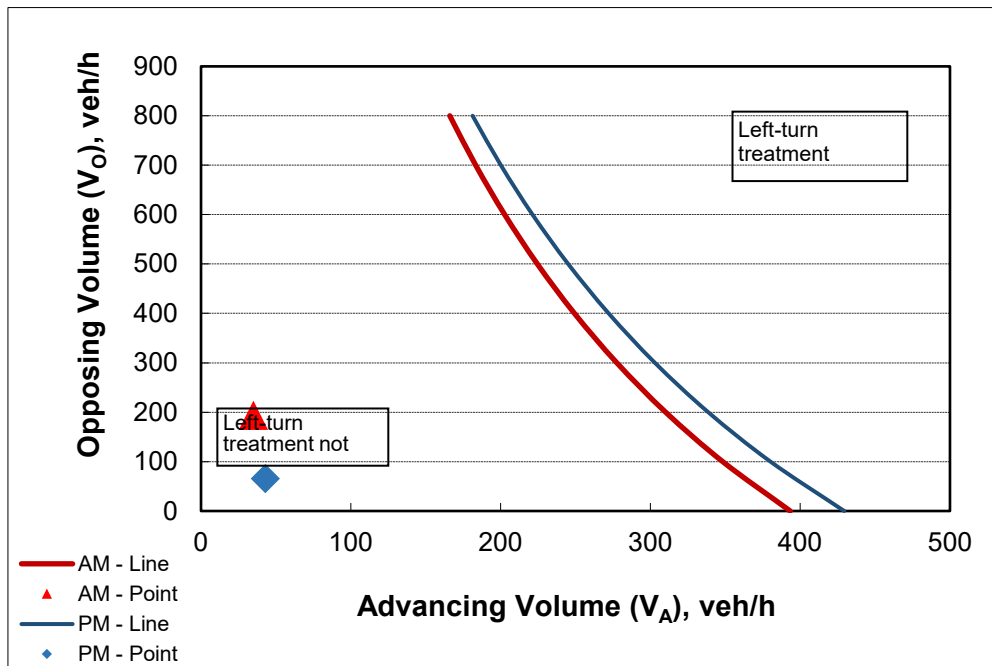
Interim (2025) - Alt I (Constrained)



Major Street: Westshore Dr

Minor Street: S. 333rd Ave

Direction: **Southbound**



### INPUT

Variable	AM	PM	Dismissal
85 <sup>th</sup> percentile speed, mph:	55		
Percent of left-turns in advancing volume ( $V_A$ ), %:	86%	88%	0%
Advancing volume ( $V_A$ ), veh/h:	35	43	43
Opposing volume ( $V_O$ ), veh/h:	194	66	7

### OUTPUT

Variable	AM	PM	Dismissal
Limiting advancing volume ( $V_A$ ), veh/h:	312	396	347
<b>Guidance for determining the need for a major-road left-turn bay:</b>			
<b>Left-turn treatment NOT warranted.</b>			

### CALIBRATION CONSTANTS

Variable	Value
Average time for making left-turn, s:	3.0
Critical headway, s:	5.0
Average time for left-turn veh. to clear advancing lane, s:	1.9

## Right-turn Lane Warrant (2 Lane) - NCHRP 457

Westshore Dr & S. 333rd Ave

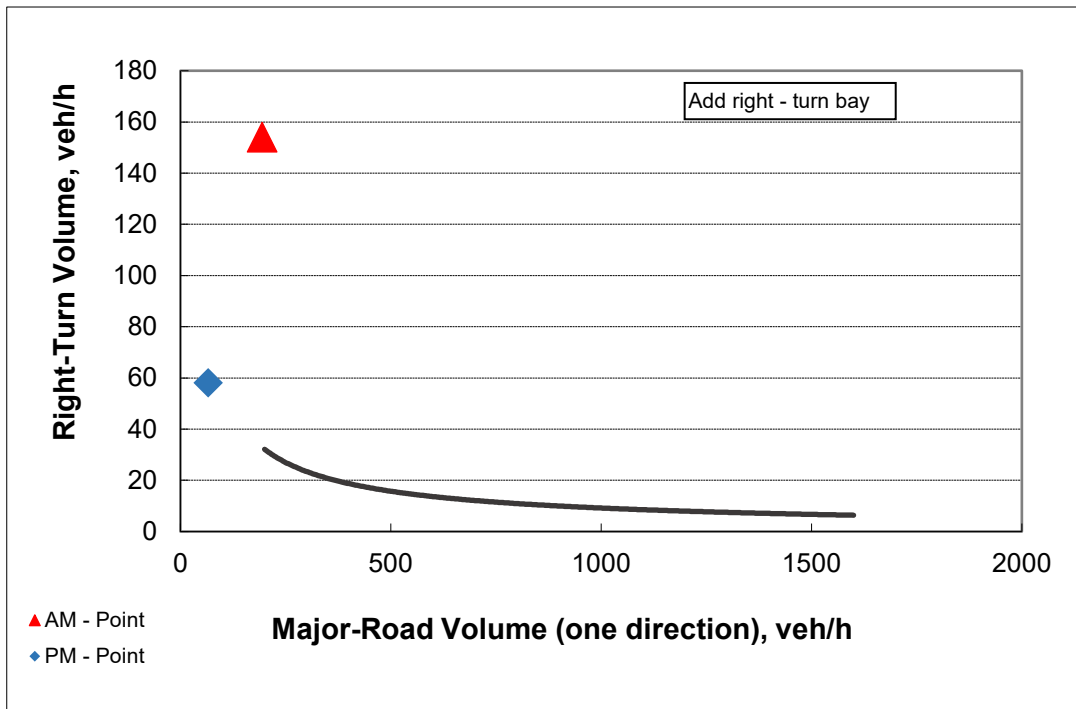
Interim (2025) - Alt I (Constrained)



Major Street: Westshore Dr

Minor Street: S. 333rd Ave

Direction: **Northbound**



### INPUT

Variable	AM	PM	Dismissal
Major-road speed, mph:	55		
Major-road volume (one direction), veh/h:	194	66	43
Right-turn volume, veh/h:	154	58	40

### OUTPUT

Variable	AM	PM	Dismissal
Limiting right-turn volume, veh/h:	33	76	106
<b>Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:</b>			
<b>Add right-turn bay.</b>			

## Minor Approach Lane Warrant - NCHRP 457

Westshore Dr & S. 333rd Ave

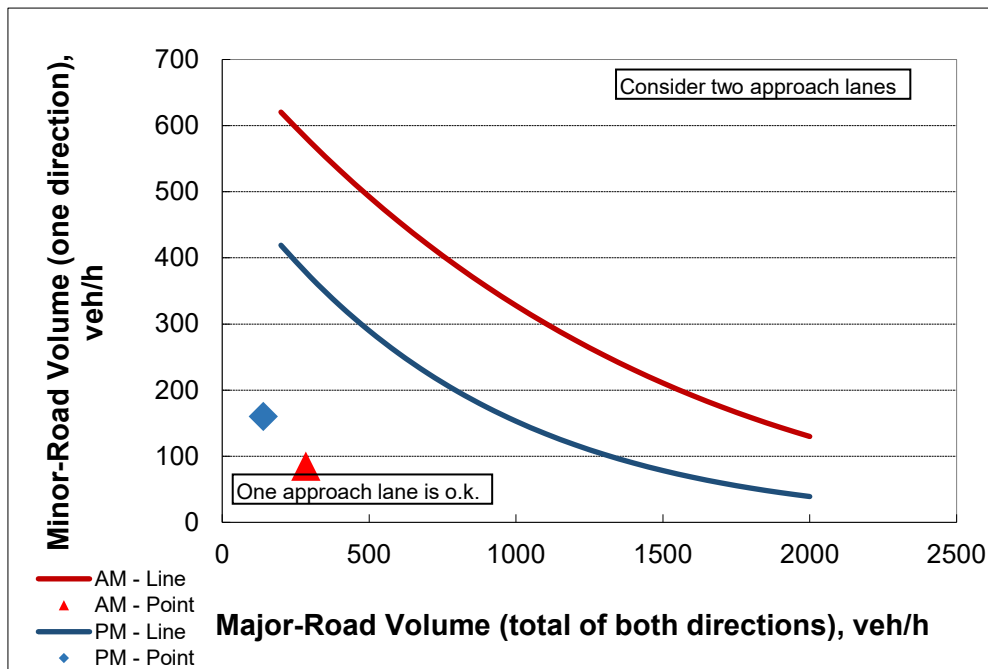
Future (2045) - Alt I (Constrained)



Major Street: Westshore Dr

Minor Street: S. 333rd Ave

Direction: **Westbound**



### INPUT

Variable	AM	PM	Dismissal
Major-road volume (total of both directions), veh/h:	285	140	110
Percentage of right-turns on minor road, %:	88%	16%	-
Minor-road volume (one direction), veh/h:	85	160	0

### OUTPUT

Variable	AM	PM	Dismissal
Limiting minor-road volume (one direction), veh/h:	582	450	487
<b>Guidance for determining minor-road approach geometry:</b>			
<b>ONE approach lane is O.K.</b>			

### CALIBRATION CONSTANTS

Minor Road, Gap Acceptance (s)	Critical	Follow
Right-turn capacity, veh/h:	6.2	3.3
Left-turn and through capacity, veh/h:	6.5	4.0

\* according to Table 17 - 5 of the HCM



## Left-turn Lane Warrant (2 Lane) - NCHRP 457

Westshore Dr & S. 333rd Ave

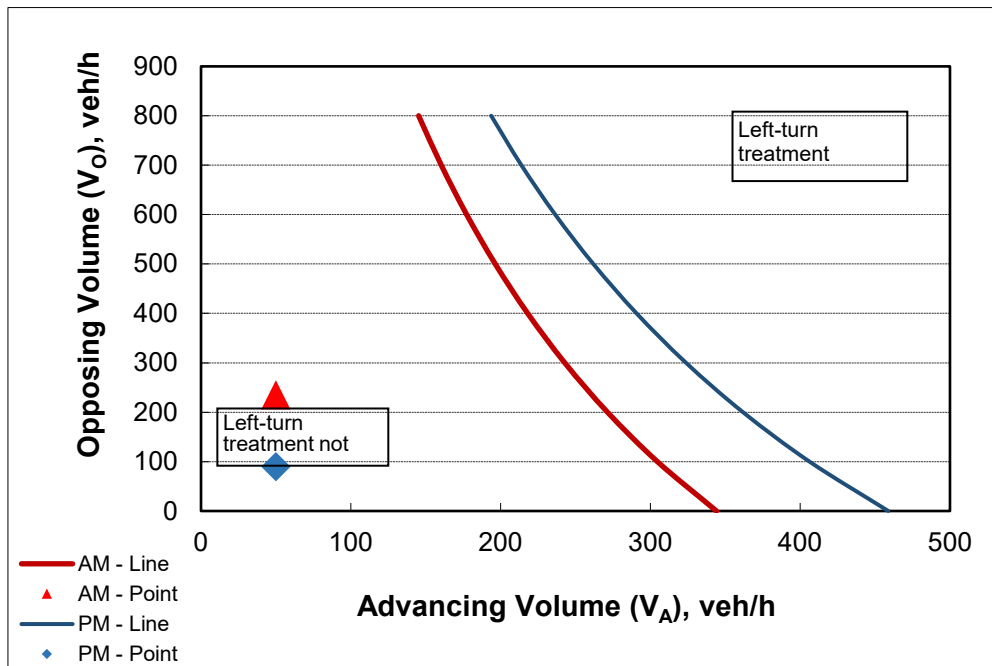
Future (2045) - Alt I (Constrained)



Major Street: Westshore Dr

Minor Street: S. 333rd Ave

Direction: **Southbound**



### INPUT

Variable	AM	PM	Dismissal
85 <sup>th</sup> percentile speed, mph:	55		
Percent of left-turns in advancing volume ( $V_A$ ), %:	80%	90%	0%
Advancing volume ( $V_A$ ), veh/h:	50	50	55
Opposing volume ( $V_O$ ), veh/h:	235	90	10

### OUTPUT

Variable	AM	PM	Dismissal
Limiting advancing volume ( $V_A$ ), veh/h:	261	411	333
<b>Guidance for determining the need for a major-road left-turn bay:</b>			
<b>Left-turn treatment NOT warranted.</b>			

### CALIBRATION CONSTANTS

Variable	Value
Average time for making left-turn, s:	3.0
Critical headway, s:	5.0
Average time for left-turn veh. to clear advancing lane, s:	1.9

## Right-turn Lane Warrant (2 Lane) - NCHRP 457

Westshore Dr & S. 333rd Ave

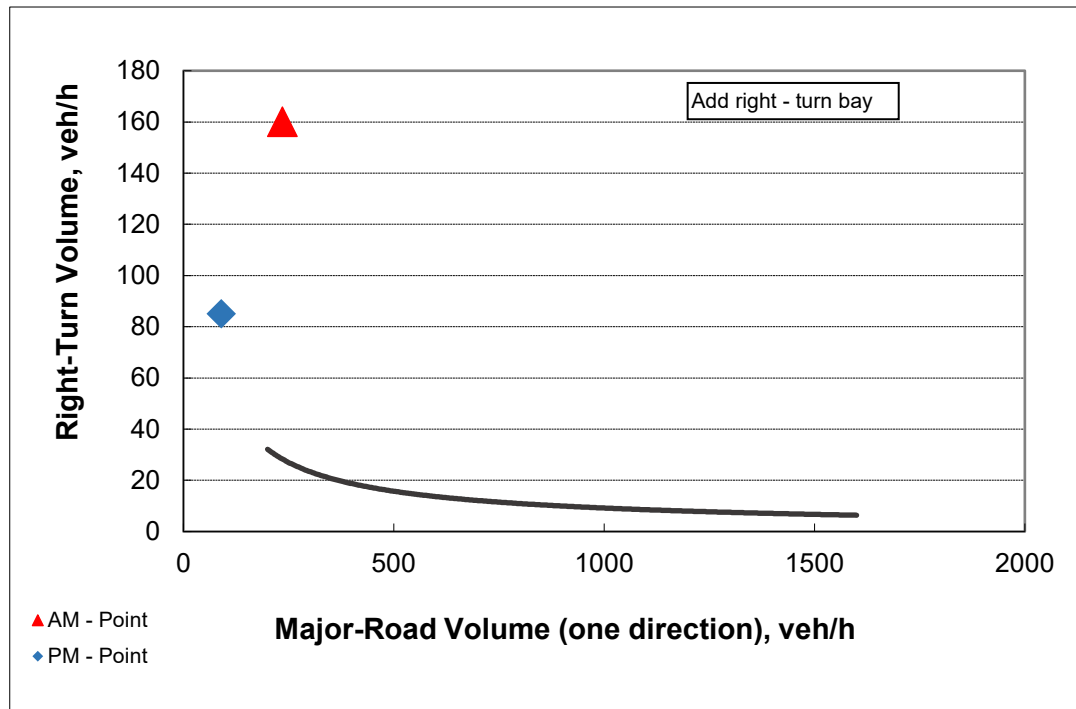
Future (2045) - Alt I (Constrained)



Major Street: Westshore Dr

Minor Street: S. 333rd Ave

Direction: **Northbound**



### INPUT

Variable	AM	PM	Dismissal
Major-road speed, mph:	55		
Major-road volume (one direction), veh/h:	235	90	55
Right-turn volume, veh/h:	160	85	45

### OUTPUT

Variable	AM	PM	Dismissal
Limiting right-turn volume, veh/h:	28	60	88
<b>Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:</b>			
<b>Add right-turn bay.</b>			

## Minor Approach Lane Warrant - NCHRP 457

Westshore Dr & S. 333rd Ave

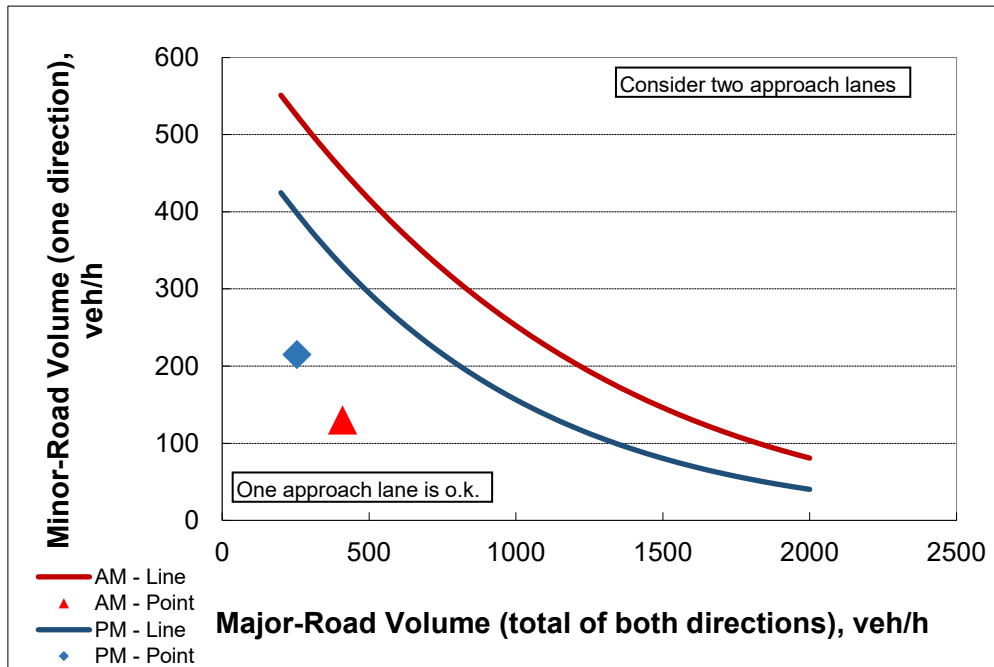
Future (2045) - Build (Unconstrained)



Major Street: Westshore Dr

Minor Street: S. 333rd Ave

Direction: **Westbound**



### INPUT

Variable	AM	PM	Dismissal
Major-road volume (total of both directions), veh/h:	410	255	200
Percentage of right-turns on minor road, %:	69%	19%	-
Minor-road volume (one direction), veh/h:	130	215	0

### OUTPUT

Variable	AM	PM	Dismissal
Limiting minor-road volume (one direction), veh/h:	454	398	443
<b>Guidance for determining minor-road approach geometry:</b>			
<b>ONE approach lane is O.K.</b>			

### CALIBRATION CONSTANTS

Minor Road, Gap Acceptance (s)	Critical	Follow
Right-turn capacity, veh/h:	6.2	3.3
Left-turn and through capacity, veh/h:	6.5	4.0

\* according to Table 17 - 5 of the HCM

## Left-turn Lane Warrant (2 Lane) - NCHRP 457

Westshore Dr & S. 333rd Ave

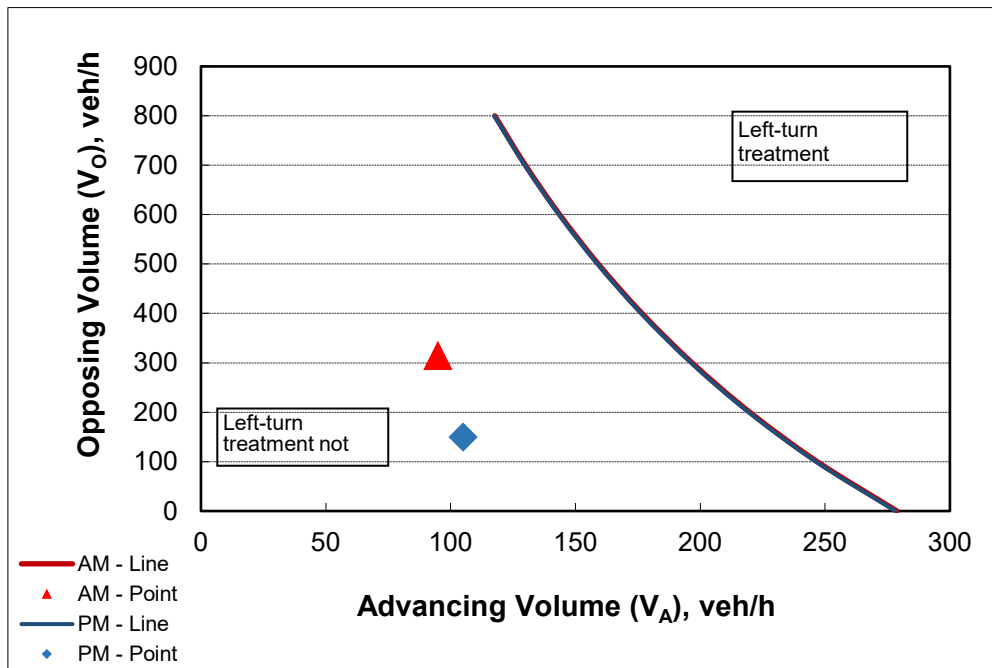
Future (2045) - Build (Unconstrained)



Major Street: Westshore Dr

Minor Street: S. 333rd Ave

Direction: **Southbound**



### INPUT

Variable	AM	PM	Dismissal
85 <sup>th</sup> percentile speed, mph:	55		
Percent of left-turns in advancing volume ( $V_A$ ), %:	58%	57%	0%
Advancing volume ( $V_A$ ), veh/h:	95	105	105
Opposing volume ( $V_O$ ), veh/h:	315	150	40

### OUTPUT

Variable	AM	PM	Dismissal
Limiting advancing volume ( $V_A$ ), veh/h:	194	232	245
<b>Guidance for determining the need for a major-road left-turn bay:</b>			
<b>Left-turn treatment NOT warranted.</b>			

### CALIBRATION CONSTANTS

Variable	Value
Average time for making left-turn, s:	3.0
Critical headway, s:	5.0
Average time for left-turn veh. to clear advancing lane, s:	1.9

## Right-turn Lane Warrant (2 Lane) - NCHRP 457

Westshore Dr & S. 333rd Ave

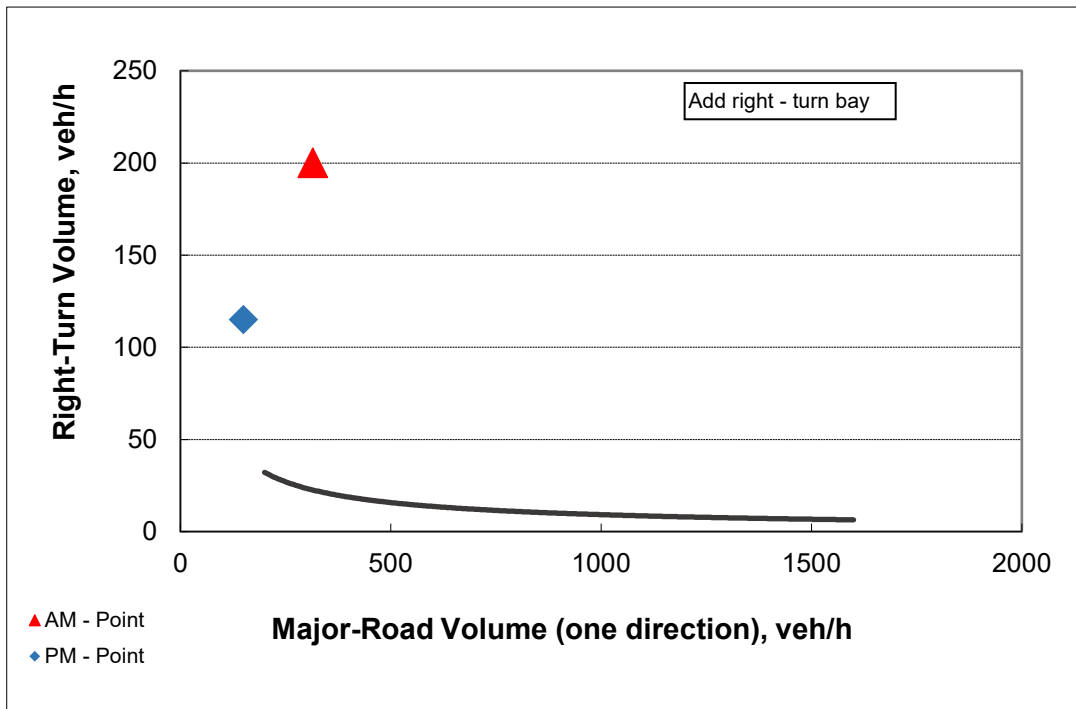
Future (2045) - Build (Unconstrained)



Major Street: Westshore Dr

Minor Street: S. 333rd Ave

Direction: **Northbound**



### INPUT

Variable	AM	PM	Dismissal
Major-road speed, mph:	55		
Major-road volume (one direction), veh/h:	315	150	105
Right-turn volume, veh/h:	200	115	70

### OUTPUT

Variable	AM	PM	Dismissal
Limiting right-turn volume, veh/h:	23	40	53
<b>Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:</b>			
<b>Add right-turn bay.</b>			

## APPENDIX F. ANALYSIS SOFTWARE REPORTS



# HCS7 Two-Way Stop-Control Report

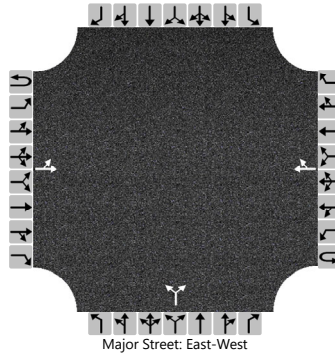
## General Information

Analyst	KG
Agency/Co.	Felsburg Holt & Ullevig
Date Performed	1/30/2023
Analysis Year	2022
Time Analyzed	AM Peak Hour
Intersection Orientation	East-West
Project Description	SDDOT Northshore Dr

## Site Information

Intersection	I-29 NB Ramp & Northshore
Jurisdiction	SDDOT
East/West Street	Northshore Dr
North/South Street	I-29 NB Ramp
Peak Hour Factor	0.75
Analysis Time Period (hrs)	0.25

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	0	0
Configuration		LT						TR			LR					
Volume (veh/h)		18	112				91	10		376		48				
Percent Heavy Vehicles (%)		0								2		8				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)		4.1								7.1		6.2				
Critical Headway (sec)		4.10								7.12		6.28				
Base Follow-Up Headway (sec)		2.2								3.5		3.3				
Follow-Up Headway (sec)		2.20								3.52		3.37				

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		24								565						
Capacity, c (veh/h)		1462								652						
v/c Ratio		0.02								0.87						
95% Queue Length, Q <sub>95</sub> (veh)		0.1								10.1						
Control Delay (s/veh)		7.5								35.8						
Level of Service (LOS)		A								E						
Approach Delay (s/veh)	1.2								35.8							
Approach LOS									E							

# HCS7 Two-Way Stop-Control Report

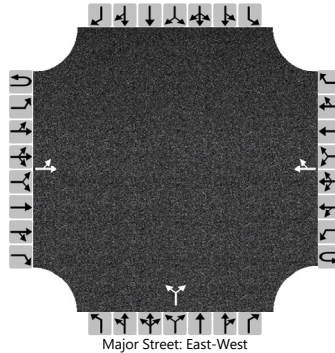
## General Information

Analyst	KG
Agency/Co.	Felsburg Holt & Ullevig
Date Performed	1/30/2023
Analysis Year	2022
Time Analyzed	Dismissal Peak Hour
Intersection Orientation	East-West
Project Description	SDDOT Northshore Dr

## Site Information

Intersection	I-29 NB Ramp & Northshore
Jurisdiction	SDDOT
East/West Street	Northshore Dr
North/South Street	I-29 NB Ramp
Peak Hour Factor	0.86
Analysis Time Period (hrs)	0.25

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	0	0
Configuration		LT						TR			LR					
Volume (veh/h)		21	85				105	25		169		30				
Percent Heavy Vehicles (%)		7								0		6				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)		4.1								7.1		6.2				
Critical Headway (sec)		4.17								7.10		6.26				
Base Follow-Up Headway (sec)		2.2								3.5		3.3				
Follow-Up Headway (sec)		2.26								3.50		3.35				

## Delay, Queue Length, and Level of Service

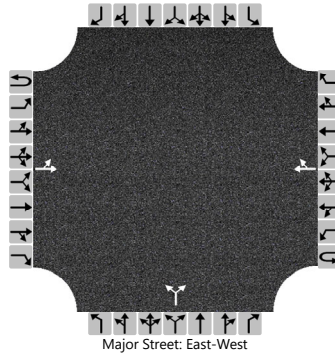
Flow Rate, v (veh/h)		24								231						
Capacity, c (veh/h)		1400								737						
v/c Ratio		0.02								0.31						
95% Queue Length, Q <sub>95</sub> (veh)		0.1								1.3						
Control Delay (s/veh)		7.6								12.1						
Level of Service (LOS)		A								B						
Approach Delay (s/veh)	1.6								12.1							
Approach LOS									B							

# HCS7 Two-Way Stop-Control Report

## General Information

Analyst	KG	Intersection	I-29 NB Ramp & Northshore
Agency/Co.	Felsburg Holt & Ullevig	Jurisdiction	SDDOT
Date Performed	1/30/2023	East/West Street	Northshore Dr
Analysis Year	2022	North/South Street	I-29 NB Ramp
Time Analyzed	PM Peak Hour	Peak Hour Factor	0.88
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	SDDOT Northshore Dr		

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	0	0
Configuration		LT						TR			LR					
Volume (veh/h)		42	61				105	29		235		34				
Percent Heavy Vehicles (%)		0								1		2				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)		4.1								7.1		6.2				
Critical Headway (sec)		4.10								7.11		6.22				
Base Follow-Up Headway (sec)		2.2								3.5		3.3				
Follow-Up Headway (sec)		2.20								3.51		3.32				

## Delay, Queue Length, and Level of Service

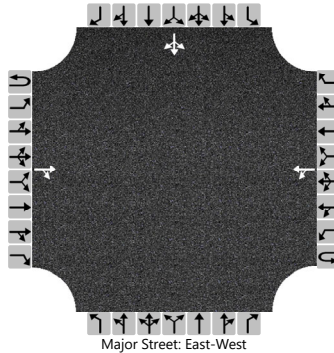
Flow Rate, v (veh/h)		48								306						
Capacity, c (veh/h)		1441								698						
v/c Ratio		0.03								0.44						
95% Queue Length, Q <sub>95</sub> (veh)		0.1								2.2						
Control Delay (s/veh)		7.6								14.1						
Level of Service (LOS)		A								B						
Approach Delay (s/veh)	3.2								14.1							
Approach LOS									B							

# HCS7 Two-Way Stop-Control Report

## General Information

Analyst	KG	Intersection	I-29 SB Ramp & Northshore
Agency/Co.	Felsburg Holt & Ullevig	Jurisdiction	SDDOT
Date Performed	1/30/2023	East/West Street	Northshore Dr
Analysis Year	2022	North/South Street	I-29 SB Ramp
Time Analyzed	AM Peak Hour	Peak Hour Factor	0.80
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	SDDOT Northshore Dr		

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	0	0		0	1	0
Configuration				TR		LT									LTR	
Volume (veh/h)			111	347		24	443							19	1	30
Percent Heavy Vehicles (%)						21								5	0	0
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)						4.1								7.1	6.5	6.2
Critical Headway (sec)						4.31								7.15	6.50	6.20
Base Follow-Up Headway (sec)						2.2								3.5	4.0	3.3
Follow-Up Headway (sec)						2.39								3.55	4.00	3.30

## Delay, Queue Length, and Level of Service

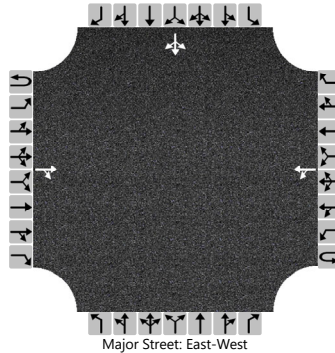
Flow Rate, v (veh/h)						30									63	
Capacity, c (veh/h)						913									548	
v/c Ratio						0.03									0.11	
95% Queue Length, Q <sub>95</sub> (veh)						0.1									0.4	
Control Delay (s/veh)						9.1									12.4	
Level of Service (LOS)						A									B	
Approach Delay (s/veh)					0.9								12.4			
Approach LOS													B			

# HCS7 Two-Way Stop-Control Report

## General Information

Analyst	KG	Intersection	I-29 SB Ramp & Northshore
Agency/Co.	Felsburg Holt & Ullevig	Jurisdiction	SDDOT
Date Performed	1/30/2023	East/West Street	Northshore Dr
Analysis Year	2022	North/South Street	I-29 SB Ramp
Time Analyzed	Dismissal Peak Hour	Peak Hour Factor	0.76
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	SDDOT Northshore Dr		

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	0	0		0	1	0
Configuration				TR		LT									LTR	
Volume (veh/h)			98	247		36	238							8	0	25
Percent Heavy Vehicles (%)						14								13	0	4
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)						4.1								7.1	6.5	6.2
Critical Headway (sec)						4.24								7.23	6.50	6.24
Base Follow-Up Headway (sec)						2.2								3.5	4.0	3.3
Follow-Up Headway (sec)						2.33								3.62	4.00	3.34

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						47									43	
Capacity, c (veh/h)						1046									954	
v/c Ratio						0.05									0.05	
95% Queue Length, Q <sub>95</sub> (veh)						0.1									0.1	
Control Delay (s/veh)						8.6									9.0	
Level of Service (LOS)						A									A	
Approach Delay (s/veh)					1.5								9.0			
Approach LOS													A			

# HCS7 Two-Way Stop-Control Report

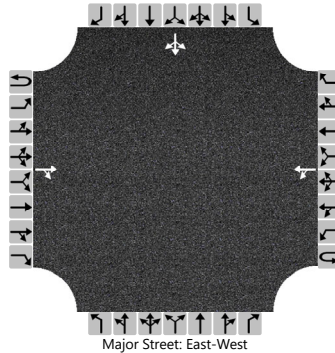
## General Information

Analyst	KG
Agency/Co.	Felsburg Holt & Ullevig
Date Performed	1/30/2023
Analysis Year	2022
Time Analyzed	PM Peak Hour
Intersection Orientation	East-West
Project Description	SDDOT Northshore Dr

## Site Information

Intersection	I-29 SB Ramp & Northshore
Jurisdiction	SDDOT
East/West Street	Northshore Dr
North/South Street	I-29 SB Ramp
Peak Hour Factor	0.95
Analysis Time Period (hrs)	0.25

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	0	0		0	1	0
Configuration				TR		LT									LTR	
Volume (veh/h)			87	217		19	321							16	0	23
Percent Heavy Vehicles (%)						11								0	0	0
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)						4.1								7.1	6.5	6.2
Critical Headway (sec)						4.21								7.10	6.50	6.20
Base Follow-Up Headway (sec)						2.2								3.5	4.0	3.3
Follow-Up Headway (sec)						2.30								3.50	4.00	3.30

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						20									41	
Capacity, c (veh/h)						1191									1023	
v/c Ratio						0.02									0.04	
95% Queue Length, Q <sub>95</sub> (veh)						0.1									0.1	
Control Delay (s/veh)						8.1									8.7	
Level of Service (LOS)						A									A	
Approach Delay (s/veh)					0.6								8.7			
Approach LOS													A			

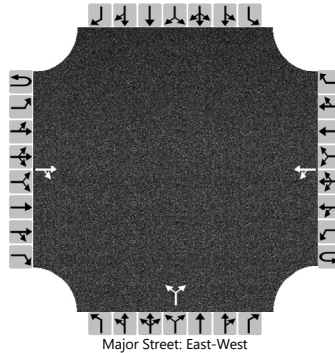


# HCS7 Two-Way Stop-Control Report

## General Information

Analyst	KG	Intersection	Streeter Dr & Northshore
Agency/Co.	Felsburg Holt & Ullevig	Jurisdiction	SDDOT
Date Performed	1/30/2023	East/West Street	Northshore Dr
Analysis Year	2022	North/South Street	Streeter Dr
Time Analyzed	AM Peak Hour	Peak Hour Factor	0.79
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	SDDOT Northshore Dr		

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	0	0
Configuration				TR		LT					LR					
Volume (veh/h)			429	42		18	455			89		29				
Percent Heavy Vehicles (%)						0				2		0				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.10				6.42		6.20				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.20				3.52		3.30				

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						23					149					
Capacity, c (veh/h)						990					236					
v/c Ratio						0.02					0.63					
95% Queue Length, Q <sub>95</sub> (veh)						0.1					3.8					
Control Delay (s/veh)						8.7					43.4					
Level of Service (LOS)						A					E					
Approach Delay (s/veh)					0.6				43.4							
Approach LOS									E							

# HCS7 Two-Way Stop-Control Report

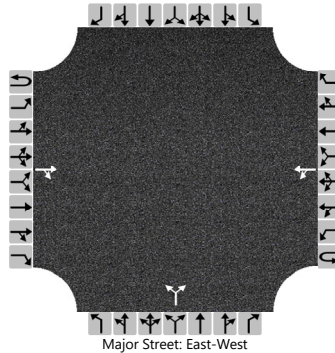
## General Information

Analyst	KG
Agency/Co.	Felsburg Holt & Ullevig
Date Performed	1/30/2023
Analysis Year	2022
Time Analyzed	Dismissal Peak Hour
Intersection Orientation	East-West
Project Description	SDDOT Northshore Dr

## Site Information

Intersection	Streeter Dr & Northshore
Jurisdiction	SDDOT
East/West Street	Northshore Dr
North/South Street	Streeter Dr
Peak Hour Factor	0.71
Analysis Time Period (hrs)	0.25

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	0	0
Configuration				TR		LT					LR					
Volume (veh/h)			319	51		30	233			26		26				
Percent Heavy Vehicles (%)						0				0		0				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.10				6.40		6.20				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.20				3.50		3.30				

## Delay, Queue Length, and Level of Service

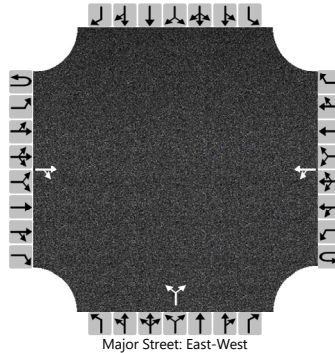
Flow Rate, v (veh/h)						42					73					
Capacity, c (veh/h)						1055					394					
v/c Ratio						0.04					0.19					
95% Queue Length, Q <sub>95</sub> (veh)						0.1					0.7					
Control Delay (s/veh)						8.6					16.2					
Level of Service (LOS)						A					C					
Approach Delay (s/veh)					1.3				16.2							
Approach LOS									C							

# HCS7 Two-Way Stop-Control Report

## General Information

Analyst	KG	Intersection	Streeter Dr & Northshore
Agency/Co.	Felsburg Holt & Ullevig	Jurisdiction	SDDOT
Date Performed	1/30/2023	East/West Street	Northshore Dr
Analysis Year	2022	North/South Street	Streeter Dr
Time Analyzed	PM Peak Hour	Peak Hour Factor	0.96
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	SDDOT Northshore Dr		

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	0	0
Configuration				TR		LT					LR					
Volume (veh/h)			268	23		46	298			24		36				
Percent Heavy Vehicles (%)						0				0		0				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.10				6.40		6.20				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.20				3.50		3.30				

## Delay, Queue Length, and Level of Service

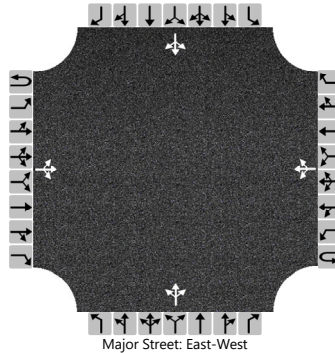
Flow Rate, v (veh/h)						48					63					
Capacity, c (veh/h)						1269					550					
v/c Ratio						0.04					0.11					
95% Queue Length, Q <sub>95</sub> (veh)						0.1					0.4					
Control Delay (s/veh)						7.9					12.4					
Level of Service (LOS)						A					B					
Approach Delay (s/veh)					1.4				12.4							
Approach LOS									B							

# HCS7 Two-Way Stop-Control Report

## General Information

Analyst	KG	Intersection	484th Ave & Northshore Dr
Agency/Co.	Felsburg Holt & Ullevig	Jurisdiction	SDDOT
Date Performed	1/30/2023	East/West Street	Northshore Dr
Analysis Year	2022	North/South Street	484th Ave/Westshore Dr
Time Analyzed	AM Peak Hour	Peak Hour Factor	0.85
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	SDDOT Northshore Dr		

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		47	164	1		8	43	64		1	9	21		37	2	4
Percent Heavy Vehicles (%)		0				0				0	0	0		0	0	0
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.10				4.10				7.10	6.50	6.20		7.10	6.50	6.20
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.20				2.20				3.50	4.00	3.30		3.50	4.00	3.30

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		55				9					36				51	
Capacity, c (veh/h)		1473				1391					687				521	
v/c Ratio		0.04				0.01					0.05				0.10	
95% Queue Length, Q <sub>95</sub> (veh)		0.1				0.0					0.2				0.3	
Control Delay (s/veh)		7.5				7.6					10.5				12.7	
Level of Service (LOS)		A				A					B				B	
Approach Delay (s/veh)	1.9				0.6				10.5				12.7			
Approach LOS									B				B			

# HCS7 Two-Way Stop-Control Report

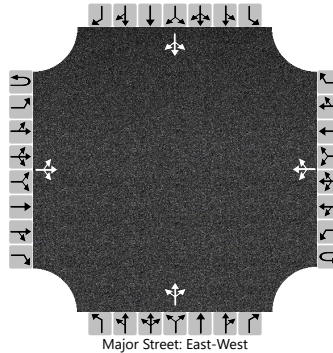
## General Information

Analyst	KG
Agency/Co.	Felsburg Holt & Ullevig
Date Performed	1/30/2023
Analysis Year	2022
Time Analyzed	Dismissal Peak Hour
Intersection Orientation	East-West
Project Description	SDDOT Northshore Dr

## Site Information

Intersection	484th Ave & Northshore Dr
Jurisdiction	SDDOT
East/West Street	Northshore Dr
North/South Street	484th Ave/Westshore Dr
Peak Hour Factor	0.83
Analysis Time Period (hrs)	0.25

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		4	61	5		22	95	35		4	3	19		45	6	12
Percent Heavy Vehicles (%)		0				6				0	0	5		7	0	0
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.10				4.16				7.10	6.50	6.25		7.17	6.50	6.20
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.20				2.25				3.50	4.00	3.35		3.56	4.00	3.30

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		5			27				31				76			
Capacity, c (veh/h)		1436			1494				848				665			
v/c Ratio		0.00			0.02				0.04				0.11			
95% Queue Length, Q <sub>95</sub> (veh)		0.0			0.1				0.1				0.4			
Control Delay (s/veh)		7.5			7.5				9.4				11.1			
Level of Service (LOS)		A			A				A				B			
Approach Delay (s/veh)	0.5				1.2				9.4				11.1			
Approach LOS									A				B			

# HCS7 Two-Way Stop-Control Report

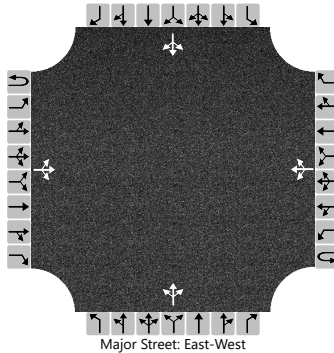
## General Information

Analyst	KG
Agency/Co.	Felsburg Holt & Ullevig
Date Performed	1/30/2023
Analysis Year	2022
Time Analyzed	PM Peak Hour
Intersection Orientation	East-West
Project Description	SDDOT Northshore Dr

## Site Information

Intersection	484th Ave & Northshore Dr
Jurisdiction	SDDOT
East/West Street	Northshore Dr
North/South Street	484th Ave/Westshore Dr
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		2	71	5		53	138	38		7	4	42		37	4	13
Percent Heavy Vehicles (%)		0				0				0	0	0		0	0	0
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.10				4.10				7.10	6.50	6.20		7.10	6.50	6.20
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.20				2.20				3.50	4.00	3.30		3.50	4.00	3.30

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		2			59				59				60			
Capacity, c (veh/h)		1389			1525				837				571			
v/c Ratio		0.00			0.04				0.07				0.11			
95% Queue Length, Q <sub>95</sub> (veh)		0.0			0.1				0.2				0.4			
Control Delay (s/veh)		7.6			7.5				9.6				12.0			
Level of Service (LOS)		A			A				A				B			
Approach Delay (s/veh)	0.2				2.0				9.6				12.0			
Approach LOS									A				B			



# HCS7 Two-Way Stop-Control Report

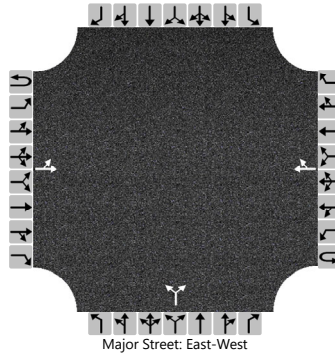
## General Information

Analyst	KG
Agency/Co.	Felsburg Holt & Ullevig
Date Performed	2/6/2023
Analysis Year	2025
Time Analyzed	AM Peak Hour
Intersection Orientation	East-West
Project Description	SDDOT Northshore Dr

## Site Information

Intersection	I-29 NB Ramp & Northshore
Jurisdiction	SDDOT
East/West Street	Northshore Dr
North/South Street	I-29 NB Ramp
Peak Hour Factor	0.75
Analysis Time Period (hrs)	0.25

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	0	0
Configuration		LT						TR			LR					
Volume (veh/h)		19	124				92	10		382		49				
Percent Heavy Vehicles (%)		0								2		8				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)		4.1								7.1		6.2				
Critical Headway (sec)		4.10								7.12		6.28				
Base Follow-Up Headway (sec)		2.2								3.5		3.3				
Follow-Up Headway (sec)		2.20								3.52		3.37				

## Delay, Queue Length, and Level of Service

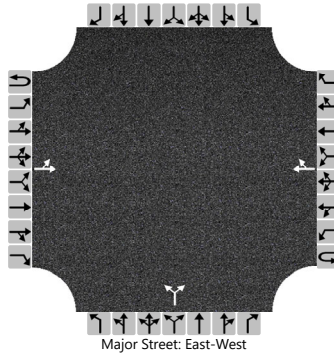
Flow Rate, v (veh/h)		25									575					
Capacity, c (veh/h)		1461									631					
v/c Ratio		0.02									0.91					
95% Queue Length, Q <sub>95</sub> (veh)		0.1									11.6					
Control Delay (s/veh)		7.5									43.0					
Level of Service (LOS)		A									E					
Approach Delay (s/veh)	1.1								43.0							
Approach LOS									E							

# HCS7 Two-Way Stop-Control Report

## General Information

Analyst	KG	Intersection	I-29 NB Ramp & Northshore
Agency/Co.	Felsburg Holt & Ullevig	Jurisdiction	SDDOT
Date Performed	2/6/2023	East/West Street	Northshore Dr
Analysis Year	2025	North/South Street	I-29 NB Ramp
Time Analyzed	Dismissal Peak Hour	Peak Hour Factor	0.86
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	SDDOT Northshore Dr		

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	0	0
Configuration		LT						TR			LR					
Volume (veh/h)		22	86				107	26		172		30				
Percent Heavy Vehicles (%)		7								0		6				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)		4.1								7.1		6.2				
Critical Headway (sec)		4.17								7.10		6.26				
Base Follow-Up Headway (sec)		2.2								3.5		3.3				
Follow-Up Headway (sec)		2.26								3.50		3.35				

## Delay, Queue Length, and Level of Service

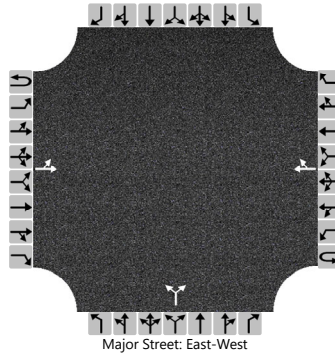
Flow Rate, v (veh/h)		26								235						
Capacity, c (veh/h)		1396								728						
v/c Ratio		0.02								0.32						
95% Queue Length, Q <sub>95</sub> (veh)		0.1								1.4						
Control Delay (s/veh)		7.6								12.3						
Level of Service (LOS)		A								B						
Approach Delay (s/veh)	1.7								12.3							
Approach LOS									B							

# HCS7 Two-Way Stop-Control Report

## General Information

Analyst	KG	Intersection	I-29 NB Ramp & Northshore
Agency/Co.	Felsburg Holt & Ullevig	Jurisdiction	SDDOT
Date Performed	2/6/2023	East/West Street	Northshore Dr
Analysis Year	2025	North/South Street	I-29 NB Ramp
Time Analyzed	PM Peak Hour	Peak Hour Factor	0.88
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	SDDOT Northshore Dr		

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	0	0
Configuration		LT						TR			LR					
Volume (veh/h)		43	62				107	30		239		35				
Percent Heavy Vehicles (%)		0								1		2				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)		4.1								7.1		6.2				
Critical Headway (sec)		4.10								7.11		6.22				
Base Follow-Up Headway (sec)		2.2								3.5		3.3				
Follow-Up Headway (sec)		2.20								3.51		3.32				

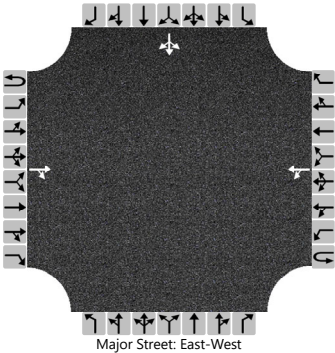
## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		49								311						
Capacity, c (veh/h)		1437								692						
v/c Ratio		0.03								0.45						
95% Queue Length, Q <sub>95</sub> (veh)		0.1								2.3						
Control Delay (s/veh)		7.6								14.4						
Level of Service (LOS)		A								B						
Approach Delay (s/veh)	3.3								14.4							
Approach LOS									B							

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	KG	Intersection	I-29 SB Ramp & Northshore
Agency/Co.	Felsburg Holt & Ullevig	Jurisdiction	SDDOT
Date Performed	2/6/23	East/West Street	Northshore Dr
Analysis Year	2025	North/South Street	I-29 SB Ramp
Time Analyzed	AM Peak Hour	Peak Hour Factor	0.80
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	SDDOT Northshore Dr - No Build		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	0	0		0	1	0
Configuration				TR		LT									LTR	
Volume (veh/h)			113	352		24	450							30	1	30
Percent Heavy Vehicles (%)						21								5	0	0
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized																
Median Type   Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1								7.1	6.5	6.2
Critical Headway (sec)						4.31								7.15	6.50	6.20
Base Follow-Up Headway (sec)						2.2								3.5	4.0	3.3
Follow-Up Headway (sec)						2.39								3.55	4.00	3.30

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						30									76	
Capacity, c (veh/h)						906									423	
v/c Ratio						0.03									0.18	
95% Queue Length, Q <sub>95</sub> (veh)						0.1									0.7	
Control Delay (s/veh)						9.1									15.4	
Level of Service (LOS)						A									C	
Approach Delay (s/veh)					0.9								15.4			
Approach LOS													C			

# HCS7 Two-Way Stop-Control Report

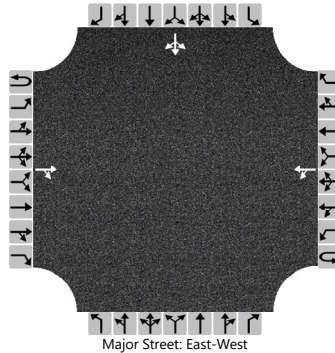
## General Information

Analyst	KG
Agency/Co.	Felsburg Holt & Ullevig
Date Performed	2/6/23
Analysis Year	2025
Time Analyzed	Dismissal Peak Hour
Intersection Orientation	East-West
Project Description	SDDOT Northshore Dr - No Build

## Site Information

Intersection	I-29 SB Ramp & Northshore
Jurisdiction	SDDOT
East/West Street	Northshore Dr
North/South Street	I-29 SB Ramp
Peak Hour Factor	0.76
Analysis Time Period (hrs)	0.25

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	0	0		0	1	0
Configuration				TR		LT									LTR	
Volume (veh/h)			100	251		37	242							8	0	26
Percent Heavy Vehicles (%)						14								13	0	4
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)						4.1								7.1	6.5	6.2
Critical Headway (sec)						4.24								7.23	6.50	6.24
Base Follow-Up Headway (sec)						2.2								3.5	4.0	3.3
Follow-Up Headway (sec)						2.33								3.62	4.00	3.34

## Delay, Queue Length, and Level of Service

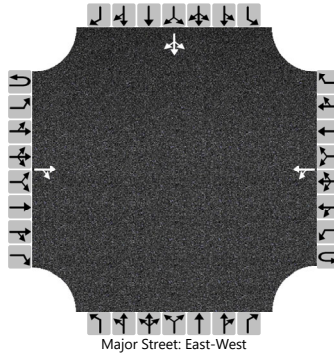
Flow Rate, v (veh/h)						49									45	
Capacity, c (veh/h)						1039									938	
v/c Ratio						0.05									0.05	
95% Queue Length, Q <sub>95</sub> (veh)						0.1									0.1	
Control Delay (s/veh)						8.6									9.0	
Level of Service (LOS)						A									A	
Approach Delay (s/veh)					1.6								9.0			
Approach LOS													A			

# HCS7 Two-Way Stop-Control Report

## General Information

Analyst	KG	Intersection	I-29 SB Ramp & Northshore
Agency/Co.	Felsburg Holt & Ullevig	Jurisdiction	SDDOT
Date Performed	2/6/23	East/West Street	Northshore Dr
Analysis Year	2025	North/South Street	I-29 SB Ramp
Time Analyzed	PM Peak Hour	Peak Hour Factor	0.95
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	SDDOT Northshore Dr - No Build		

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	0	0		0	1	0
Configuration				TR		LT									LTR	
Volume (veh/h)			89	220		19	327							16	0	24
Percent Heavy Vehicles (%)						11								0	0	0
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)						4.1								7.1	6.5	6.2
Critical Headway (sec)						4.21								7.10	6.50	6.20
Base Follow-Up Headway (sec)						2.2								3.5	4.0	3.3
Follow-Up Headway (sec)						2.30								3.50	4.00	3.30

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)					20										42	
Capacity, c (veh/h)					1185										1033	
v/c Ratio					0.02										0.04	
95% Queue Length, Q <sub>95</sub> (veh)					0.1										0.1	
Control Delay (s/veh)					8.1										8.6	
Level of Service (LOS)					A										A	
Approach Delay (s/veh)					0.6								8.6			
Approach LOS													A			

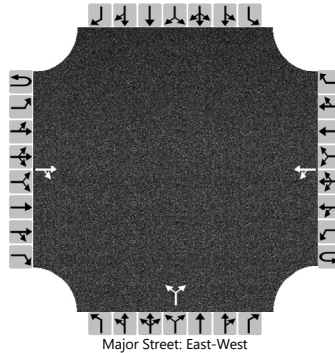


# HCS7 Two-Way Stop-Control Report

## General Information

Analyst	KG	Intersection	Streeter Dr & Northshore
Agency/Co.	Felsburg Holt & Ullevig	Jurisdiction	SDDOT
Date Performed	2/6/2023	East/West Street	Northshore Dr
Analysis Year	2025	North/South Street	Streeter Dr
Time Analyzed	AM Peak Hour	Peak Hour Factor	0.79
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	SDDOT Northshore Dr		

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	0	0
Configuration				TR		LT					LR					
Volume (veh/h)			436	46		18	463			90		29				
Percent Heavy Vehicles (%)						0				2		0				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.10				6.42		6.20				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.20				3.52		3.30				

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						23					151					
Capacity, c (veh/h)						978					229					
v/c Ratio						0.02					0.66					
95% Queue Length, Q <sub>95</sub> (veh)						0.1					4.1					
Control Delay (s/veh)						8.8					46.7					
Level of Service (LOS)						A					E					
Approach Delay (s/veh)					0.6				46.7							
Approach LOS									E							

# HCS7 Two-Way Stop-Control Report

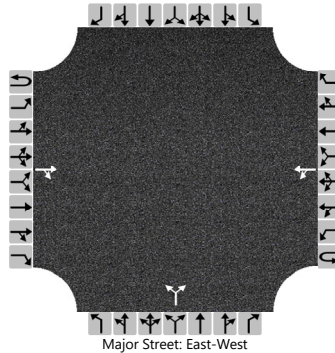
## General Information

Analyst	KG
Agency/Co.	Felsburg Holt & Ullevig
Date Performed	2/6/2023
Analysis Year	2025
Time Analyzed	Dismissal Peak Hour
Intersection Orientation	East-West
Project Description	SDDOT Northshore Dr

## Site Information

Intersection	Streeter Dr & Northshore
Jurisdiction	SDDOT
East/West Street	Northshore Dr
North/South Street	Streeter Dr
Peak Hour Factor	0.71
Analysis Time Period (hrs)	0.25

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	0	0
Configuration				TR		LT					LR					
Volume (veh/h)			325	52		30	238			26		26				
Percent Heavy Vehicles (%)						0				0		8				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.10				6.40		6.28				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.20				3.50		3.37				

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						42					73					
Capacity, c (veh/h)						1047					383					
v/c Ratio						0.04					0.19					
95% Queue Length, Q <sub>95</sub> (veh)						0.1					0.7					
Control Delay (s/veh)						8.6					16.6					
Level of Service (LOS)						A					C					
Approach Delay (s/veh)					1.3				16.6							
Approach LOS									C							

# HCS7 Two-Way Stop-Control Report

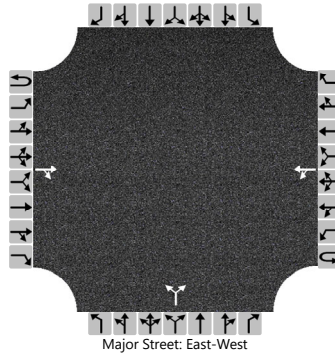
## General Information

Analyst	KG
Agency/Co.	Felsburg Holt & Ullevig
Date Performed	2/6/2023
Analysis Year	2025
Time Analyzed	PM Peak Hour
Intersection Orientation	East-West
Project Description	SDDOT Northshore Dr

## Site Information

Intersection	Streeter Dr & Northshore
Jurisdiction	SDDOT
East/West Street	Northshore Dr
North/South Street	Streeter Dr
Peak Hour Factor	0.96
Analysis Time Period (hrs)	0.25

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	0	0
Configuration				TR		LT					LR					
Volume (veh/h)			272	23		47	304			24		37				
Percent Heavy Vehicles (%)						0				0		0				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.10				6.40		6.20				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.20				3.50		3.30				

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						49					64					
Capacity, c (veh/h)						1265					545					
v/c Ratio						0.04					0.12					
95% Queue Length, Q <sub>95</sub> (veh)						0.1					0.4					
Control Delay (s/veh)						8.0					12.5					
Level of Service (LOS)						A					B					
Approach Delay (s/veh)					1.4				12.5							
Approach LOS									B							

# HCS7 Two-Way Stop-Control Report

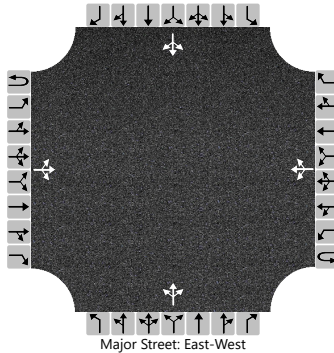
## General Information

Analyst	KG
Agency/Co.	Felsbrug Holt & Ullevig
Date Performed	2/6/2023
Analysis Year	2025
Time Analyzed	AM Peak Hour
Intersection Orientation	East-West
Project Description	SDDOT Northshore Dr - No Build

## Site Information

Intersection	484th Ave & Northshore Dr
Jurisdiction	SDDOT
East/West Street	Northshore Dr
North/South Street	484th Ave/Westshore Dr
Peak Hour Factor	0.85
Analysis Time Period (hrs)	0.25

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		48	166	1		8	54	65		1	9	21		38	2	4
Percent Heavy Vehicles (%)		0				10				0	0	5		3	0	0
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.10				4.20				7.10	6.50	6.25		7.13	6.50	6.20
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.20				2.29				3.50	4.00	3.35		3.53	4.00	3.30

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		56				9					36				52	
Capacity, c (veh/h)		1456				1330					672				500	
v/c Ratio		0.04				0.01					0.05				0.10	
95% Queue Length, Q <sub>95</sub> (veh)		0.1				0.0					0.2				0.3	
Control Delay (s/veh)		7.6				7.7					10.7				13.0	
Level of Service (LOS)		A				A					B				B	
Approach Delay (s/veh)	1.9				0.5				10.7				13.0			
Approach LOS									B				B			

# HCS7 Two-Way Stop-Control Report

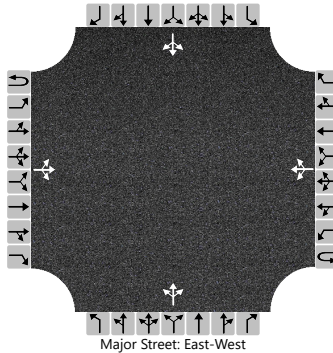
## General Information

Analyst	KG
Agency/Co.	Felsbrug Holt & Ullevig
Date Performed	2/6/2023
Analysis Year	2025
Time Analyzed	Dismissal Peak Hour
Intersection Orientation	East-West
Project Description	SDDOT Northshore Dr - No Build

## Site Information

Intersection	484th Ave & Northshore Dr
Jurisdiction	SDDOT
East/West Street	Northshore Dr
North/South Street	484th Ave/Westshore Dr
Peak Hour Factor	0.83
Analysis Time Period (hrs)	0.25

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		4	62	5		22	96	36		4	3	19		46	6	12
Percent Heavy Vehicles (%)		0				6				0	0	5		7	0	0
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.10				4.16				7.10	6.50	6.25		7.17	6.50	6.20
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.20				2.25				3.50	4.00	3.35		3.56	4.00	3.30

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		5				27					31				77	
Capacity, c (veh/h)		1433				1492					846				661	
v/c Ratio		0.00				0.02					0.04				0.12	
95% Queue Length, Q <sub>95</sub> (veh)		0.0				0.1					0.1				0.4	
Control Delay (s/veh)		7.5				7.5					9.4				11.2	
Level of Service (LOS)		A				A					A				B	
Approach Delay (s/veh)	0.4				1.2				9.4				11.2			
Approach LOS									A				B			

# HCS7 Two-Way Stop-Control Report

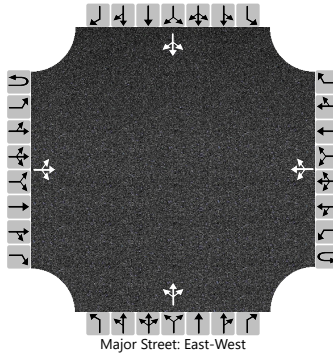
## General Information

Analyst	KG
Agency/Co.	Felsbrug Holt & Ullevig
Date Performed	2/6/2023
Analysis Year	2025
Time Analyzed	PM Peak Hour
Intersection Orientation	East-West
Project Description	SDDOT Northshore Dr - No Build

## Site Information

Intersection	484th Ave & Northshore Dr
Jurisdiction	SDDOT
East/West Street	Northshore Dr
North/South Street	484th Ave/Westshore Dr
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		2	72	5		54	140	39		7	4	43		38	4	13
Percent Heavy Vehicles (%)		0				0				0	0	0		0	0	0
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.10				4.10				7.10	6.50	6.20		7.10	6.50	6.20
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.20				2.20				3.50	4.00	3.30		3.50	4.00	3.30

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		2			60				60				61			
Capacity, c (veh/h)		1386			1524				836				563			
v/c Ratio		0.00			0.04				0.07				0.11			
95% Queue Length, Q <sub>95</sub> (veh)		0.0			0.1				0.2				0.4			
Control Delay (s/veh)		7.6			7.5				9.6				12.2			
Level of Service (LOS)		A			A				A				B			
Approach Delay (s/veh)	0.2				2.0				9.6				12.2			
Approach LOS									A				B			

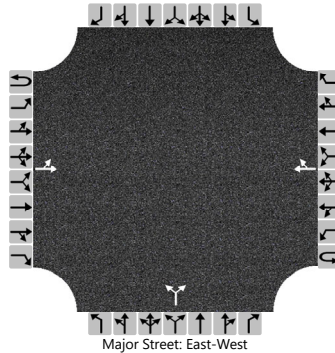


# HCS7 Two-Way Stop-Control Report

## General Information

Analyst	KG	Intersection	I-29 NB Ramp & Northshore
Agency/Co.	Felsburg Holt & Ullevig	Jurisdiction	SDDOT
Date Performed	1/30/2023	East/West Street	Northshore Dr
Analysis Year	2045	North/South Street	I-29 NB Ramp
Time Analyzed	AM Peak Hour	Peak Hour Factor	0.75
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	SDDOT Northshore Dr - No Build		

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	0	0
Configuration		LT						TR			LR					
Volume (veh/h)		25	130				105	15		425		55				
Percent Heavy Vehicles (%)		0								2		8				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)		4.1								7.1		6.2				
Critical Headway (sec)		4.10								7.12		6.28				
Base Follow-Up Headway (sec)		2.2								3.5		3.3				
Follow-Up Headway (sec)		2.20								3.52		3.37				

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		33								640						
Capacity, c (veh/h)		1432								585						
v/c Ratio		0.02								1.09						
95% Queue Length, Q <sub>95</sub> (veh)		0.1								19.3						
Control Delay (s/veh)		7.6								91.2						
Level of Service (LOS)		A								F						
Approach Delay (s/veh)	1.4								91.2							
Approach LOS									F							

# HCS7 Two-Way Stop-Control Report

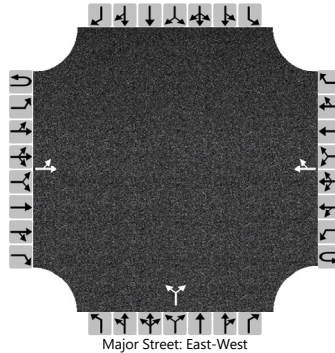
## General Information

Analyst	KG
Agency/Co.	Felsburg Holt & Ullevig
Date Performed	1/30/2023
Analysis Year	2045
Time Analyzed	Dismissal Peak Hour
Intersection Orientation	East-West
Project Description	SDDOT Northshore Dr - No Build

## Site Information

Intersection	I-29 NB Ramp & Northshore
Jurisdiction	SDDOT
East/West Street	Northshore Dr
North/South Street	I-29 NB Ramp
Peak Hour Factor	0.86
Analysis Time Period (hrs)	0.25

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	0	0
Configuration		LT						TR			LR					
Volume (veh/h)		30	100				125	35		190		35				
Percent Heavy Vehicles (%)		7								0		6				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)		4.1								7.1		6.2				
Critical Headway (sec)		4.17								7.10		6.26				
Base Follow-Up Headway (sec)		2.2								3.5		3.3				
Follow-Up Headway (sec)		2.26								3.50		3.35				

## Delay, Queue Length, and Level of Service

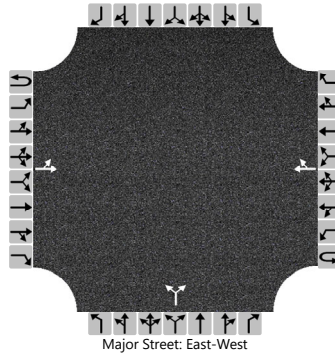
Flow Rate, v (veh/h)		35								262						
Capacity, c (veh/h)		1359								666						
v/c Ratio		0.03								0.39						
95% Queue Length, Q <sub>95</sub> (veh)		0.1								1.9						
Control Delay (s/veh)		7.7								13.9						
Level of Service (LOS)		A								B						
Approach Delay (s/veh)	1.9								13.9							
Approach LOS									B							

# HCS7 Two-Way Stop-Control Report

## General Information

Analyst	KG	Intersection	I-29 NB Ramp & Northshore
Agency/Co.	Felsburg Holt & Ullevig	Jurisdiction	SDDOT
Date Performed	1/30/2023	East/West Street	Northshore Dr
Analysis Year	2045	North/South Street	I-29 NB Ramp
Time Analyzed	PM Peak Hour	Peak Hour Factor	0.88
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	SDDOT Northshore Dr - No Build		

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	0	0
Configuration		LT						TR			LR					
Volume (veh/h)		55	75				125	40		265		40				
Percent Heavy Vehicles (%)		0								1		2				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)		4.1								7.1		6.2				
Critical Headway (sec)		4.10								7.11		6.22				
Base Follow-Up Headway (sec)		2.2								3.5		3.3				
Follow-Up Headway (sec)		2.20								3.51		3.32				

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		63									347					
Capacity, c (veh/h)		1399									613					
v/c Ratio		0.04									0.57					
95% Queue Length, Q <sub>95</sub> (veh)		0.1									3.5					
Control Delay (s/veh)		7.7									18.2					
Level of Service (LOS)		A									C					
Approach Delay (s/veh)	3.5								18.2							
Approach LOS									C							

# HCS7 Two-Way Stop-Control Report

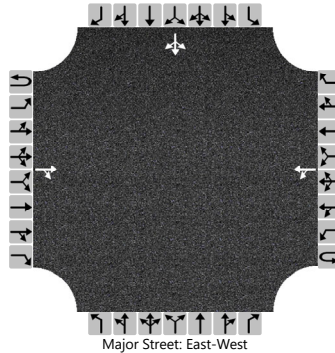
## General Information

Analyst	KG
Agency/Co.	Felsburg Holt & Ullevig
Date Performed	1/30/2023
Analysis Year	2045
Time Analyzed	AM Peak Hour
Intersection Orientation	East-West
Project Description	SDDOT Northshore Dr - No Build

## Site Information

Intersection	I-29 SB Ramp & Northshore
Jurisdiction	SDDOT
East/West Street	Northshore Dr
North/South Street	I-29 SB Ramp
Peak Hour Factor	0.80
Analysis Time Period (hrs)	0.25

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	0	0		0	1	0
Configuration				TR		LT									LTR	
Volume (veh/h)			130	390		30	500							25	5	40
Percent Heavy Vehicles (%)						21								5	0	0
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)						4.1								7.1	6.5	6.2
Critical Headway (sec)						4.31								7.15	6.50	6.20
Base Follow-Up Headway (sec)						2.2								3.5	4.0	3.3
Follow-Up Headway (sec)						2.39								3.55	4.00	3.30

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						38									88	
Capacity, c (veh/h)						852									394	
v/c Ratio						0.04									0.22	
95% Queue Length, Q <sub>95</sub> (veh)						0.1									0.8	
Control Delay (s/veh)						9.4									16.7	
Level of Service (LOS)						A									C	
Approach Delay (s/veh)					1.1								16.7			
Approach LOS													C			

# HCS7 Two-Way Stop-Control Report

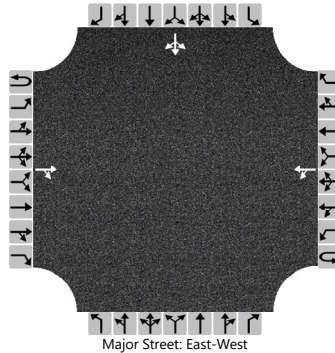
## General Information

Analyst	KG
Agency/Co.	Felsburg Holt & Ullevig
Date Performed	1/30/2023
Analysis Year	2045
Time Analyzed	Dismissal Peak Hour
Intersection Orientation	East-West
Project Description	SDDOT Northshore Dr - No Build

## Site Information

Intersection	I-29 SB Ramp & Northshore
Jurisdiction	SDDOT
East/West Street	Northshore Dr
North/South Street	I-29 SB Ramp
Peak Hour Factor	0.76
Analysis Time Period (hrs)	0.25

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	0	0		0	1	0
Configuration				TR		LT									LTR	
Volume (veh/h)			115	280		45	270							15	0	35
Percent Heavy Vehicles (%)						14								13	0	4
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)						4.1								7.1	6.5	6.2
Critical Headway (sec)						4.24								7.23	6.50	6.24
Base Follow-Up Headway (sec)						2.2								3.5	4.0	3.3
Follow-Up Headway (sec)						2.33								3.62	4.00	3.34

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						59									66	
Capacity, c (veh/h)						988									900	
v/c Ratio						0.06									0.07	
95% Queue Length, Q <sub>95</sub> (veh)						0.2									0.2	
Control Delay (s/veh)						8.9									9.3	
Level of Service (LOS)						A									A	
Approach Delay (s/veh)					1.8								9.3			
Approach LOS													A			

# HCS7 Two-Way Stop-Control Report

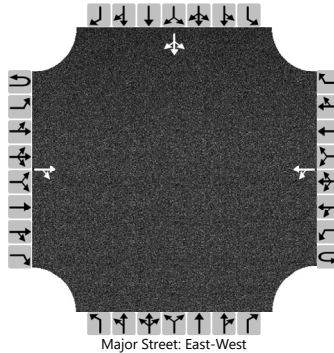
## General Information

Analyst	KG
Agency/Co.	Felsburg Holt & Ullevig
Date Performed	1/30/2023
Analysis Year	2045
Time Analyzed	PM Peak Hour
Intersection Orientation	East-West
Project Description	SDDOT Northshore Dr - No Build

## Site Information

Intersection	I-29 SB Ramp & Northshore
Jurisdiction	SDDOT
East/West Street	Northshore Dr
North/South Street	I-29 SB Ramp
Peak Hour Factor	0.95
Analysis Time Period (hrs)	0.25

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	0	0		0	1	0
Configuration				TR		LT									LTR	
Volume (veh/h)			105	245		25	365							25	0	30
Percent Heavy Vehicles (%)						11								0	0	0
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)						4.1								7.1	6.5	6.2
Critical Headway (sec)						4.21								7.10	6.50	6.20
Base Follow-Up Headway (sec)						2.2								3.5	4.0	3.3
Follow-Up Headway (sec)						2.30								3.50	4.00	3.30

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)					26										58	
Capacity, c (veh/h)					1142										795	
v/c Ratio					0.02										0.07	
95% Queue Length, Q <sub>95</sub> (veh)					0.1										0.2	
Control Delay (s/veh)					8.2										9.9	
Level of Service (LOS)					A										A	
Approach Delay (s/veh)					0.8								9.9			
Approach LOS													A			



# HCS7 Two-Way Stop-Control Report

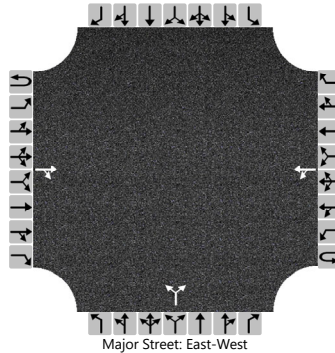
## General Information

Analyst	KG
Agency/Co.	Felsburg Holt & Ullevig
Date Performed	1/30/2023
Analysis Year	2045
Time Analyzed	AM Peak Hour
Intersection Orientation	East-West
Project Description	SDDOT Northshore Dr - No Build

## Site Information

Intersection	Streeter Dr & Northshore
Jurisdiction	SDDOT
East/West Street	Northshore Dr
North/South Street	Streeter Dr
Peak Hour Factor	0.79
Analysis Time Period (hrs)	0.25

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	0	0
Configuration				TR		LT					LR					
Volume (veh/h)			485	50		25	515			100		35				
Percent Heavy Vehicles (%)						0				2		0				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.10				6.42		6.20				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.20				3.52		3.30				

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						32					171					
Capacity, c (veh/h)						924					187					
v/c Ratio						0.03					0.91					
95% Queue Length, Q <sub>95</sub> (veh)						0.1					7.0					
Control Delay (s/veh)						9.0					95.3					
Level of Service (LOS)						A					F					
Approach Delay (s/veh)					0.9				95.3							
Approach LOS									F							

# HCS7 Two-Way Stop-Control Report

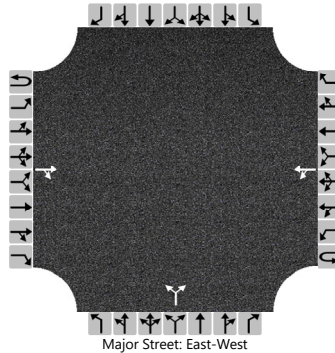
## General Information

Analyst	KG
Agency/Co.	Felsburg Holt & Ullevig
Date Performed	1/30/2023
Analysis Year	2045
Time Analyzed	Dismissal Peak Hour
Intersection Orientation	East-West
Project Description	SDDOT Northshore Dr - No Build

## Site Information

Intersection	Streeter Dr & Northshore
Jurisdiction	SDDOT
East/West Street	Northshore Dr
North/South Street	Streeter Dr
Peak Hour Factor	0.71
Analysis Time Period (hrs)	0.25

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	0	0
Configuration				TR		LT					LR					
Volume (veh/h)			365	60		35	270			30		30				
Percent Heavy Vehicles (%)						0				0		8				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.10				6.40		6.28				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.20				3.50		3.37				

## Delay, Queue Length, and Level of Service

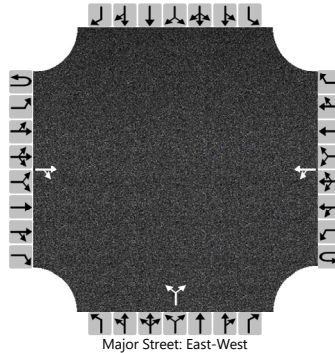
Flow Rate, v (veh/h)						49					85					
Capacity, c (veh/h)						988					331					
v/c Ratio						0.05					0.26					
95% Queue Length, Q <sub>95</sub> (veh)						0.2					1.0					
Control Delay (s/veh)						8.8					19.6					
Level of Service (LOS)						A					C					
Approach Delay (s/veh)					1.5				19.6							
Approach LOS									C							

# HCS7 Two-Way Stop-Control Report

## General Information

Analyst	KG	Intersection	Streeter Dr & Northshore
Agency/Co.	Felsburg Holt & Ullevig	Jurisdiction	SDDOT
Date Performed	1/30/2023	East/West Street	Northshore Dr
Analysis Year	2045	North/South Street	Streeter Dr
Time Analyzed	PM Peak Hour	Peak Hour Factor	0.96
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	SDDOT Northshore Dr - No Build		

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	0	0
Configuration				TR		LT					LR					
Volume (veh/h)			305	30		55	340			30		45				
Percent Heavy Vehicles (%)						0				0		0				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.10				6.40		6.20				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.20				3.50		3.30				

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						57					78					
Capacity, c (veh/h)						1221					491					
v/c Ratio						0.05					0.16					
95% Queue Length, Q <sub>95</sub> (veh)						0.1					0.6					
Control Delay (s/veh)						8.1					13.7					
Level of Service (LOS)						A					B					
Approach Delay (s/veh)					1.5				13.7							
Approach LOS									B							

# HCS7 Two-Way Stop-Control Report

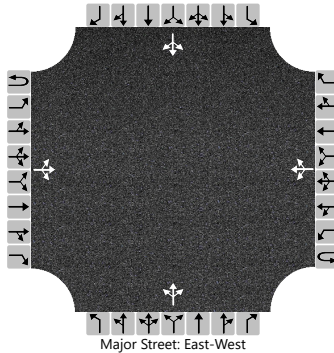
## General Information

Analyst	KG
Agency/Co.	Felsburg Holt & Ullevig
Date Performed	1/30/2023
Analysis Year	2045
Time Analyzed	AM Peak Hour
Intersection Orientation	East-West
Project Description	SDDOT Northshore Dr - No Build

## Site Information

Intersection	484th Ave & Northshore Dr
Jurisdiction	SDDOT
East/West Street	Northshore Dr
North/South Street	484th Ave/Westshore Dr
Peak Hour Factor	0.85
Analysis Time Period (hrs)	0.25

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		55	185	5		10	50	75		5	15	25		45	5	5
Percent Heavy Vehicles (%)		0				0				0	0	0		0	0	0
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.10				4.10				7.10	6.50	6.20		7.10	6.50	6.20
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.20				2.20				3.50	4.00	3.30		3.50	4.00	3.30

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		65				12					53				65	
Capacity, c (veh/h)		1447				1357					596				457	
v/c Ratio		0.04				0.01					0.09				0.14	
95% Queue Length, Q <sub>95</sub> (veh)		0.1				0.0					0.3				0.5	
Control Delay (s/veh)		7.6				7.7					11.6				14.2	
Level of Service (LOS)		A				A					B				B	
Approach Delay (s/veh)	2.0				0.6				11.6				14.2			
Approach LOS									B				B			

# HCS7 Two-Way Stop-Control Report

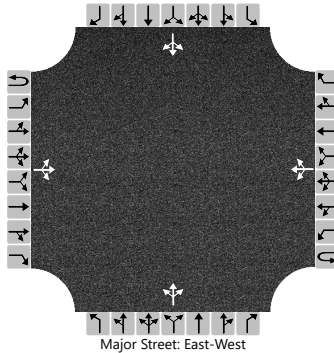
## General Information

Analyst	KG
Agency/Co.	Felsburg Holt & Ullevig
Date Performed	1/30/2023
Analysis Year	2045
Time Analyzed	Dismissal Peak Hour
Intersection Orientation	East-West
Project Description	SDDOT Northshore Dr - No Build

## Site Information

Intersection	484th Ave & Northshore Dr
Jurisdiction	SDDOT
East/West Street	Northshore Dr
North/South Street	484th Ave/Westshore Dr
Peak Hour Factor	0.83
Analysis Time Period (hrs)	0.25

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		5	70	10		25	110	40		5	5	25		55	10	15
Percent Heavy Vehicles (%)		0				0				0	0	0		0	0	0
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.10				4.10				7.10	6.50	6.20		7.10	6.50	6.20
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.20				2.20				3.50	4.00	3.30		3.50	4.00	3.30

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		6				30					42				96	
Capacity, c (veh/h)		1407				1510					814				624	
v/c Ratio		0.00				0.02					0.05				0.15	
95% Queue Length, Q <sub>95</sub> (veh)		0.0				0.1					0.2				0.5	
Control Delay (s/veh)		7.6				7.4					9.7				11.8	
Level of Service (LOS)		A				A					A				B	
Approach Delay (s/veh)	0.5				1.2				9.7				11.8			
Approach LOS									A				B			

# HCS7 Two-Way Stop-Control Report

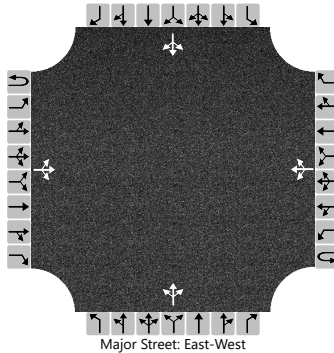
## General Information

Analyst	KG
Agency/Co.	Felsburg Holt & Ullevig
Date Performed	1/30/2023
Analysis Year	2045
Time Analyzed	PM Peak Hour
Intersection Orientation	East-West
Project Description	SDDOT Northshore Dr - No Build

## Site Information

Intersection	484th Ave & Northshore Dr
Jurisdiction	SDDOT
East/West Street	Northshore Dr
North/South Street	484th Ave/Westshore Dr
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		5	80	10		60	155	5		10	5	50		45	5	15
Percent Heavy Vehicles (%)		0				0				0	0	0		0	0	0
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.10				4.10				7.10	6.50	6.20		7.10	6.50	6.20
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.20				2.20				3.50	4.00	3.30		3.50	4.00	3.30

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		6				67					72				72	
Capacity, c (veh/h)		1410				1505					799				531	
v/c Ratio		0.00				0.04					0.09				0.14	
95% Queue Length, Q <sub>95</sub> (veh)		0.0				0.1					0.3				0.5	
Control Delay (s/veh)		7.6				7.5					10.0				12.8	
Level of Service (LOS)		A				A					A				B	
Approach Delay (s/veh)	0.4				2.3				10.0				12.8			
Approach LOS									A				B			



# HCS7 Two-Way Stop-Control Report

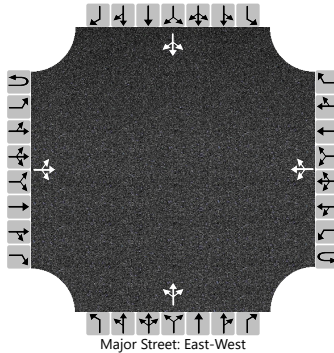
## General Information

Analyst	KG
Agency/Co.	Felsbrug Holt & Ullevig
Date Performed	2/6/2023
Analysis Year	2025
Time Analyzed	AM Peak Hour
Intersection Orientation	East-West
Project Description	SDDOT Northshore Dr - Build

## Site Information

Intersection	484th Ave & Northshore Dr
Jurisdiction	SDDOT
East/West Street	Northshore Dr
North/South Street	484th Ave/Westshore Dr
Peak Hour Factor	0.85
Analysis Time Period (hrs)	0.25

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		169	67	1		8	44	4		1	21	4		8	2	4
Percent Heavy Vehicles (%)		0				10				0	0	5		3	0	0
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.10				4.20				7.10	6.50	6.25		7.13	6.50	6.20
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.20				2.29				3.50	4.00	3.35		3.53	4.00	3.30

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		199				9					31				16	
Capacity, c (veh/h)		1561				1469					422				453	
v/c Ratio		0.13				0.01					0.07				0.04	
95% Queue Length, Q <sub>95</sub> (veh)		0.4				0.0					0.2				0.1	
Control Delay (s/veh)		7.6				7.5					14.2				13.2	
Level of Service (LOS)		A				A					B				B	
Approach Delay (s/veh)	5.7				1.1				14.2				13.2			
Approach LOS									B				B			

# HCS7 Two-Way Stop-Control Report

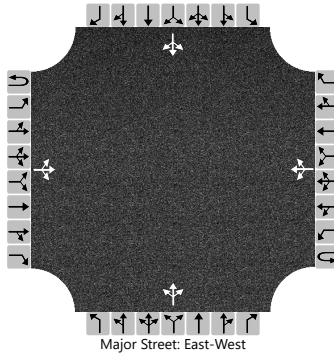
## General Information

Analyst	KG
Agency/Co.	Felsbrug Holt & Ullevig
Date Performed	2/6/2023
Analysis Year	2025
Time Analyzed	Dismissal Peak Hour
Intersection Orientation	East-West
Project Description	SDDOT Northshore Dr - Build

## Site Information

Intersection	484th Ave & Northshore Dr
Jurisdiction	SDDOT
East/West Street	Northshore Dr
North/South Street	484th Ave/Westshore Dr
Peak Hour Factor	0.83
Analysis Time Period (hrs)	0.25

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		16	49	5		4	53	9		4	18	4		12	18	53
Percent Heavy Vehicles (%)		0				6				0	0	5		7	0	0
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.10				4.16				7.10	6.50	6.25		7.17	6.50	6.20
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.20				2.25				3.50	4.00	3.35		3.56	4.00	3.30

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		19			5				31				100			
Capacity, c (veh/h)		1537			1512				728				872			
v/c Ratio		0.01			0.00				0.04				0.11			
95% Queue Length, Q <sub>95</sub> (veh)		0.0			0.0				0.1				0.4			
Control Delay (s/veh)		7.4			7.4				10.2				9.7			
Level of Service (LOS)		A			A				B				A			
Approach Delay (s/veh)	1.8				0.5				10.2				9.7			
Approach LOS									B				A			

# HCS7 Two-Way Stop-Control Report

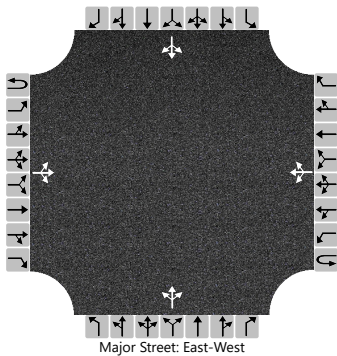
## General Information

Analyst	KG
Agency/Co.	Felsbrug Holt & Ullevig
Date Performed	2/6/2023
Analysis Year	2025
Time Analyzed	PM Peak Hour
Intersection Orientation	East-West
Project Description	SDDOT Northshore Dr - Build

## Site Information

Intersection	484th Ave & Northshore Dr
Jurisdiction	SDDOT
East/West Street	Northshore Dr
North/South Street	484th Ave/Westshore Dr
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		8	54	5		22	54	17		7	51	4		4	32	84
Percent Heavy Vehicles (%)		0				0				0	0	0		0	0	0
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.10				4.10				7.10	6.50	6.20		7.10	6.50	6.20
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.20				2.20				3.50	4.00	3.30		3.50	4.00	3.30

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		9				24					69				133	
Capacity, c (veh/h)		1532				1549					680				876	
v/c Ratio		0.01				0.02					0.10				0.15	
95% Queue Length, Q <sub>95</sub> (veh)		0.0				0.0					0.3				0.5	
Control Delay (s/veh)		7.4				7.4					10.9				9.8	
Level of Service (LOS)		A				A					B				A	
Approach Delay (s/veh)	0.9				1.8				10.9				9.8			
Approach LOS									B				A			

# HCS7 Two-Way Stop-Control Report

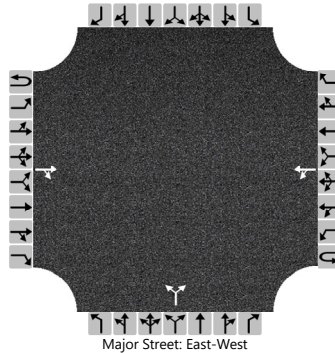
## General Information

Analyst	KG
Agency/Co.	Felsburg Holt & Ullevig
Date Performed	2/6/2023
Analysis Year	2025
Time Analyzed	AM Peak Hour
Intersection Orientation	East-West
Project Description	SDDOT Northshore Dr - Build

## Site Information

Intersection	Streeter Dr & Northshore
Jurisdiction	SDDOT
East/West Street	Northshore Dr
North/South Street	Streeter Dr
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	0	0
Configuration				TR		LT					LR					
Volume (veh/h)			264	43		18	395			90		29				
Percent Heavy Vehicles (%)						0				2		0				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.10				6.42		6.20				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.20				3.52		3.30				

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)					20					129						
Capacity, c (veh/h)					1237					408						
v/c Ratio					0.02					0.32						
95% Queue Length, Q <sub>95</sub> (veh)					0.0					1.3						
Control Delay (s/veh)					8.0					17.9						
Level of Service (LOS)					A					C						
Approach Delay (s/veh)					0.5				17.9							
Approach LOS									C							

# HCS7 Two-Way Stop-Control Report

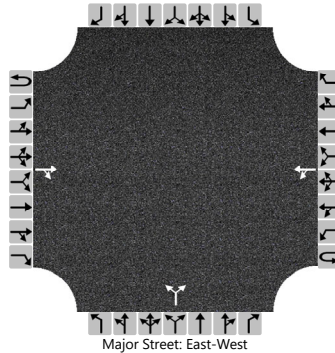
## General Information

Analyst	KG
Agency/Co.	Felsburg Holt & Ullevig
Date Performed	2/6/2023
Analysis Year	2025
Time Analyzed	Dismissal Peak Hour
Intersection Orientation	East-West
Project Description	SDDOT Northshore Dr - Build

## Site Information

Intersection	Streeter Dr & Northshore
Jurisdiction	SDDOT
East/West Street	Northshore Dr
North/South Street	Streeter Dr
Peak Hour Factor	0.71
Analysis Time Period (hrs)	0.25

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	0	0
Configuration				TR		LT					LR					
Volume (veh/h)			253	52		30	137			26		26				
Percent Heavy Vehicles (%)						0				0		8				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.10				6.40		6.28				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.20				3.50		3.37				

## Delay, Queue Length, and Level of Service

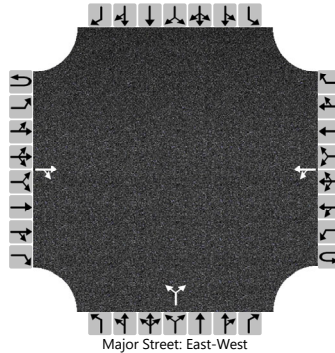
Flow Rate, v (veh/h)					42					73						
Capacity, c (veh/h)					1141					499						
v/c Ratio					0.04					0.15						
95% Queue Length, Q <sub>95</sub> (veh)					0.1					0.5						
Control Delay (s/veh)					8.3					13.5						
Level of Service (LOS)					A					B						
Approach Delay (s/veh)					1.8				13.5							
Approach LOS									B							

# HCS7 Two-Way Stop-Control Report

## General Information

Analyst	KG	Intersection	Streeter Dr & Northshore
Agency/Co.	Felsburg Holt & Ullevig	Jurisdiction	SDDOT
Date Performed	2/6/2023	East/West Street	Northshore Dr
Analysis Year	2025	North/South Street	Streeter Dr
Time Analyzed	AM Peak Hour	Peak Hour Factor	0.79
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	SDDOT Northshore Dr - Build		

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	0	0
Configuration				TR		LT					LR					
Volume (veh/h)			178	23		47	169			24		37				
Percent Heavy Vehicles (%)						0				2		0				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.10				6.42		6.20				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.20				3.52		3.30				

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)					59					77						
Capacity, c (veh/h)					1322					619						
v/c Ratio					0.04					0.12						
95% Queue Length, Q <sub>95</sub> (veh)					0.1					0.4						
Control Delay (s/veh)					7.9					11.6						
Level of Service (LOS)					A					B						
Approach Delay (s/veh)					2.0				11.6							
Approach LOS									B							

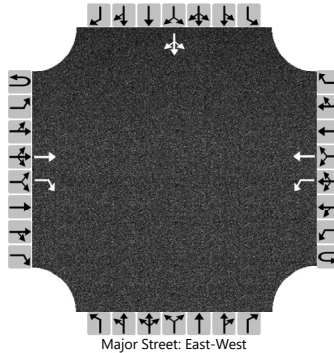


# HCS7 Two-Way Stop-Control Report

## General Information

Analyst	KG	Intersection	I-29 SB Ramp & Northshore
Agency/Co.	Felsburg Holt & Ullevig	Jurisdiction	SDDOT
Date Performed	1/30/2023	East/West Street	Northshore Dr
Analysis Year	2025	North/South Street	I-29 SB Ramp
Time Analyzed	AM Peak Hour	Peak Hour Factor	0.80
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	SDDOT Northshore Dr - Build		

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	1	0	1	1	0		0	0	0		0	1	0
Configuration			T	R		L	T								LTR	
Volume (veh/h)			111	347		24	443							19	1	30
Percent Heavy Vehicles (%)						21								5	0	0
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized	No															
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)						4.1								7.1	6.5	6.2
Critical Headway (sec)						4.31								7.15	6.50	6.20
Base Follow-Up Headway (sec)						2.2								3.5	4.0	3.3
Follow-Up Headway (sec)						2.39								3.55	4.00	3.30

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						30									63	
Capacity, c (veh/h)						913									554	
v/c Ratio						0.03									0.11	
95% Queue Length, Q <sub>95</sub> (veh)						0.1									0.4	
Control Delay (s/veh)						9.1									12.3	
Level of Service (LOS)						A									B	
Approach Delay (s/veh)					0.5								12.3			
Approach LOS													B			

# HCS7 Two-Way Stop-Control Report

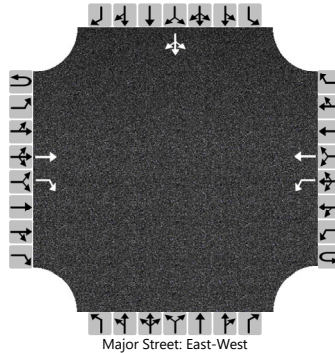
## General Information

Analyst	KG
Agency/Co.	Felsburg Holt & Ullevig
Date Performed	2/6/23
Analysis Year	2025
Time Analyzed	Dismissal Peak Hour
Intersection Orientation	East-West
Project Description	SDDOT Northshore Dr - Build

## Site Information

Intersection	I-29 SB Ramp & Northshore
Jurisdiction	SDDOT
East/West Street	Northshore Dr
North/South Street	I-29 SB Ramp
Peak Hour Factor	0.76
Analysis Time Period (hrs)	0.25

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	1	0	1	1	0		0	0	0		0	1	0
Configuration			T	R		L	T								LTR	
Volume (veh/h)			100	251		37	242							8	0	26
Percent Heavy Vehicles (%)						14								13	0	4
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized	No															
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)						4.1								7.1	6.5	6.2
Critical Headway (sec)						4.24								7.23	6.50	6.24
Base Follow-Up Headway (sec)						2.2								3.5	4.0	3.3
Follow-Up Headway (sec)						2.33								3.62	4.00	3.34

## Delay, Queue Length, and Level of Service

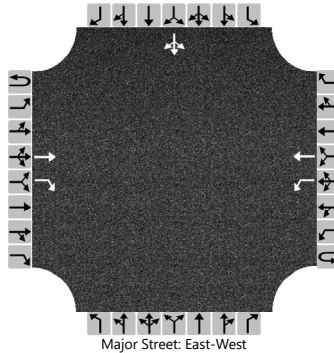
Flow Rate, v (veh/h)						49									45	
Capacity, c (veh/h)						1039									938	
v/c Ratio						0.05									0.05	
95% Queue Length, Q <sub>95</sub> (veh)						0.1									0.1	
Control Delay (s/veh)						8.6									9.0	
Level of Service (LOS)						A									A	
Approach Delay (s/veh)					1.1								9.0			
Approach LOS													A			

# HCS7 Two-Way Stop-Control Report

## General Information

Analyst	KG	Intersection	I-29 SB Ramp & Northshore
Agency/Co.	Felsburg Holt & Ullevig	Jurisdiction	SDDOT
Date Performed	2/6/23	East/West Street	Northshore Dr
Analysis Year	2025	North/South Street	I-29 SB Ramp
Time Analyzed	PM Peak Hour	Peak Hour Factor	0.95
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	SDDOT Northshore Dr - Build		

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	1	0	1	1	0		0	0	0		0	1	0
Configuration			T	R		L	T								LTR	
Volume (veh/h)			89	220		19	327							16	0	24
Percent Heavy Vehicles (%)						11								0	0	0
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized	No															
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)						4.1								7.1	6.5	6.2
Critical Headway (sec)						4.21								7.10	6.50	6.20
Base Follow-Up Headway (sec)						2.2								3.5	4.0	3.3
Follow-Up Headway (sec)						2.30								3.50	4.00	3.30

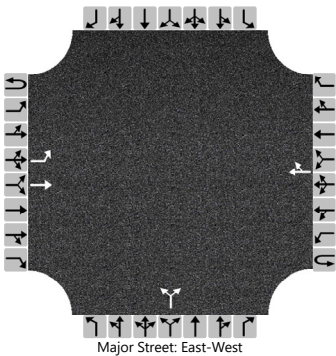
## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)					20										42	
Capacity, c (veh/h)					1185										1036	
v/c Ratio					0.02										0.04	
95% Queue Length, Q <sub>95</sub> (veh)					0.1										0.1	
Control Delay (s/veh)					8.1										8.6	
Level of Service (LOS)					A										A	
Approach Delay (s/veh)					0.4								8.6			
Approach LOS													A			

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	KG	Intersection	I-29 NB Ramp & Northshore
Agency/Co.	Felsburg Holt & Ullevig	Jurisdiction	SDDOT
Date Performed	2/6/2023	East/West Street	Northshore Dr
Analysis Year	2025	North/South Street	I-29 NB Ramp
Time Analyzed	AM Peak Hour	Peak Hour Factor	0.75
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	SDDOT Northshore Dr - Build		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	1	0		0	1	0		0	0	0
Configuration		L	T					TR			LR					
Volume (veh/h)		19	124				92	10		382		49				
Percent Heavy Vehicles (%)		0								2		8				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized																
Median Type   Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1								7.1		6.2				
Critical Headway (sec)		4.10								7.12		6.28				
Base Follow-Up Headway (sec)		2.2								3.5		3.3				
Follow-Up Headway (sec)		2.20								3.52		3.37				

Delay, Queue Length, and Level of Service

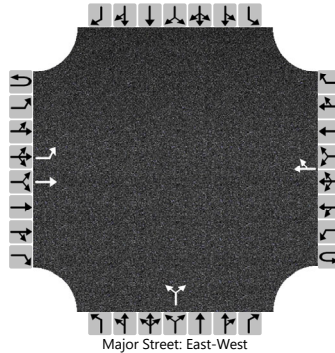
Flow Rate, v (veh/h)		25									575					
Capacity, c (veh/h)		1461									632					
v/c Ratio		0.02									0.91					
95% Queue Length, Q <sub>95</sub> (veh)		0.1									11.5					
Control Delay (s/veh)		7.5									42.8					
Level of Service (LOS)		A									E					
Approach Delay (s/veh)	1.0								42.8							
Approach LOS									E							

# HCS7 Two-Way Stop-Control Report

## General Information

Analyst	KG	Intersection	I-29 NB Ramp & Northshore
Agency/Co.	Felsburg Holt & Ullevig	Jurisdiction	SDDOT
Date Performed	2/6/2023	East/West Street	Northshore Dr
Analysis Year	2025	North/South Street	I-29 NB Ramp
Time Analyzed	Dismissal Peak Hour	Peak Hour Factor	0.86
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	SDDOT Northshore Dr - Build		

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	1	0		0	1	0		0	0	0
Configuration		L	T					TR			LR					
Volume (veh/h)		22	86				107	26		172		30				
Percent Heavy Vehicles (%)		7								0		6				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)		4.1								7.1		6.2				
Critical Headway (sec)		4.17								7.10		6.26				
Base Follow-Up Headway (sec)		2.2								3.5		3.3				
Follow-Up Headway (sec)		2.26								3.50		3.35				

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		26								235						
Capacity, c (veh/h)		1396								729						
v/c Ratio		0.02								0.32						
95% Queue Length, Q <sub>95</sub> (veh)		0.1								1.4						
Control Delay (s/veh)		7.6								12.3						
Level of Service (LOS)		A								B						
Approach Delay (s/veh)	1.6								12.3							
Approach LOS									B							

# HCS7 Two-Way Stop-Control Report

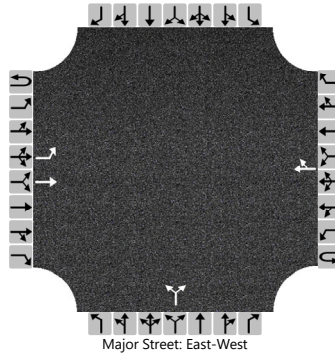
## General Information

Analyst	KG
Agency/Co.	Felsburg Holt & Ullevig
Date Performed	2/6/2023
Analysis Year	2025
Time Analyzed	PM Peak Hour
Intersection Orientation	East-West
Project Description	SDDOT Northshore Dr - Build

## Site Information

Intersection	I-29 NB Ramp & Northshore
Jurisdiction	SDDOT
East/West Street	Northshore Dr
North/South Street	I-29 NB Ramp
Peak Hour Factor	0.88
Analysis Time Period (hrs)	0.25

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	1	0		0	1	0		0	0	0
Configuration		L	T					TR			LR					
Volume (veh/h)		43	62				107	30		239		35				
Percent Heavy Vehicles (%)		0								1		2				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)		4.1								7.1		6.2				
Critical Headway (sec)		4.10								7.11		6.22				
Base Follow-Up Headway (sec)		2.2								3.5		3.3				
Follow-Up Headway (sec)		2.20								3.51		3.32				

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		49								311						
Capacity, c (veh/h)		1437								692						
v/c Ratio		0.03								0.45						
95% Queue Length, Q <sub>95</sub> (veh)		0.1								2.3						
Control Delay (s/veh)		7.6								14.4						
Level of Service (LOS)		A								B						
Approach Delay (s/veh)	3.1								14.4							
Approach LOS									B							

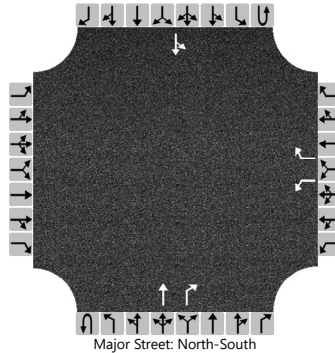


# HCS7 Two-Way Stop-Control Report

## General Information

Analyst	KG	Intersection	Westshore Dr & 333rd Ave
Agency/Co.	Felsburg Holt & Ullevig	Jurisdiction	SDDOT
Date Performed	2/7/23	East/West Street	333rd Ave
Analysis Year	2025	North/South Street	Westshore Dr
Time Analyzed	AM Peak Hour	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	SDDOT Northshore Dr - Build		

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		1	0	1	0	0	1	1	0	0	1	0
Configuration						L		R			T	R		LT		
Volume (veh/h)						9		61			40	154		30	5	
Percent Heavy Vehicles (%)						2		2						2		
Proportion Time Blocked																
Percent Grade (%)					0											
Right Turn Channelized					No				No							
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)						7.1		6.2						4.1		
Critical Headway (sec)						6.42		6.22						4.12		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.52		3.32						2.22		

## Delay, Queue Length, and Level of Service

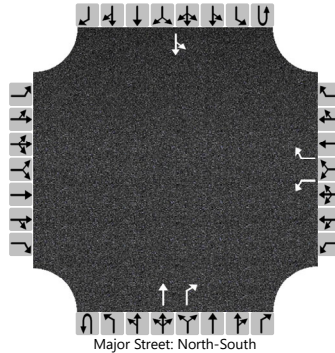
Flow Rate, v (veh/h)						10		66						33		
Capacity, c (veh/h)						861		1027						1360		
v/c Ratio						0.01		0.06						0.02		
95% Queue Length, Q <sub>95</sub> (veh)						0.0		0.2						0.1		
Control Delay (s/veh)						9.2		8.7						7.7		
Level of Service (LOS)						A		A						A		
Approach Delay (s/veh)					8.8								6.6			
Approach LOS					A											

# HCS7 Two-Way Stop-Control Report

## General Information

Analyst	KG	Intersection	Westshore Dr & 333rd Ave
Agency/Co.	Felsburg Holt & Ullevig	Jurisdiction	SDDOT
Date Performed	2/7/23	East/West Street	333rd Ave
Analysis Year	2025	North/South Street	Westshore Dr
Time Analyzed	Dismissal Peak Hour	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	SDDOT Northshore Dr - Build Sweeping Curve		

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		1	0	1	0	0	1	1	0	0	1	0
Configuration						L		R			T	R		LT		
Volume (veh/h)						76		27			3	40		34	7	
Percent Heavy Vehicles (%)						2		2						2		
Proportion Time Blocked																
Percent Grade (%)					0											
Right Turn Channelized					No				No							
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)						7.1		6.2						4.1		
Critical Headway (sec)						6.42		6.22						4.12		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.52		3.32						2.22		

## Delay, Queue Length, and Level of Service

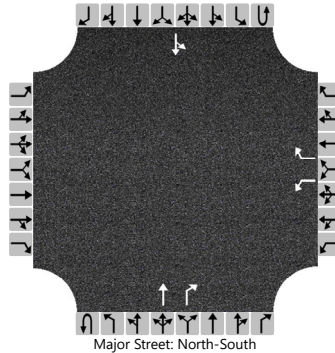
Flow Rate, v (veh/h)						83		29						37		
Capacity, c (veh/h)						895		1081						1561		
v/c Ratio						0.09		0.03						0.02		
95% Queue Length, Q <sub>95</sub> (veh)						0.3		0.1						0.1		
Control Delay (s/veh)						9.4		8.4						7.4		
Level of Service (LOS)						A		A						A		
Approach Delay (s/veh)					9.2								6.1			
Approach LOS					A											

# HCS7 Two-Way Stop-Control Report

## General Information

Analyst	KG	Intersection	Westshore Dr & 333rd Ave
Agency/Co.	Felsburg Holt & Ullevig	Jurisdiction	SDDOT
Date Performed	2/7/23	East/West Street	333rd Ave
Analysis Year	2025	North/South Street	Westshore Dr
Time Analyzed	PM Peak Hour	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	SDDOT Northshore Dr - Build Sweeping Curve		

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		1	0	1	0	0	1	1	0	0	1	0
Configuration						L		R			T	R		LT		
Volume (veh/h)						115		22			8	285		35	5	
Percent Heavy Vehicles (%)						2		2						2		
Proportion Time Blocked																
Percent Grade (%)					0											
Right Turn Channelized					No				No							
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)						7.1		6.2						4.1		
Critical Headway (sec)						6.42		6.22						4.12		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.52		3.32						2.22		

## Delay, Queue Length, and Level of Service

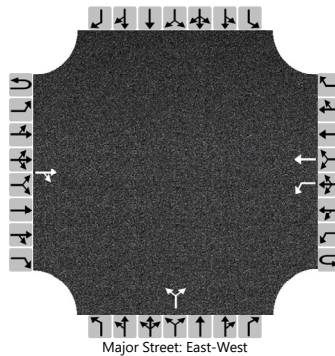
Flow Rate, v (veh/h)						125		24						38		
Capacity, c (veh/h)						882		1073						1242		
v/c Ratio						0.14		0.02						0.03		
95% Queue Length, Q <sub>95</sub> (veh)						0.5		0.1						0.1		
Control Delay (s/veh)						9.8		8.4						8.0		
Level of Service (LOS)						A		A						A		
Approach Delay (s/veh)					9.5								7.0			
Approach LOS					A											

# HCS7 Two-Way Stop-Control Report

## General Information

Analyst	KG	Intersection	Northshore Dr & 333rd Ave
Agency/Co.	Felsburg Holt & Ullevig	Jurisdiction	SDDOT
Date Performed	2/7/23	East/West Street	333rd Ave
Analysis Year	2025	North/South Street	Northshore Dr
Time Analyzed	AM Peak Hour	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	SDDOT Northshore Dr - Build Sweeping Curves		

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	1	1	0		0	1	0		0	0	0
Configuration				TR		L	T				LR					
Volume (veh/h)			183	1		412	69			1		292				
Percent Heavy Vehicles (%)						2				2		2				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.12				6.42		6.22				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.22				3.52		3.32				

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						448					318					
Capacity, c (veh/h)						1372					828					
v/c Ratio						0.33					0.38					
95% Queue Length, Q <sub>95</sub> (veh)						1.4					1.8					
Control Delay (s/veh)						8.9					12.0					
Level of Service (LOS)						A					B					
Approach Delay (s/veh)					7.6				12.0							
Approach LOS									B							

# HCS7 Two-Way Stop-Control Report

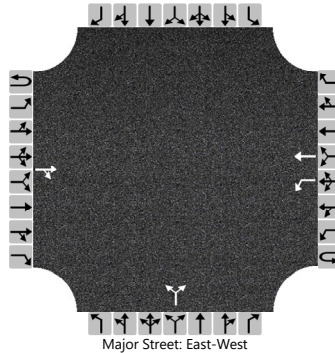
## General Information

Analyst	KG
Agency/Co.	Felsburg Holt & Ullevig
Date Performed	2/7/23
Analysis Year	2025
Time Analyzed	Dismissal Peak Hour
Intersection Orientation	East-West
Project Description	SDDOT Northshore Dr - Build Sweeping Curve

## Site Information

Intersection	Northshore Dr & 333rd Ave
Jurisdiction	SDDOT
East/West Street	333rd Ave
North/South Street	Northshore Dr
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	1	1	0		0	1	0		0	0	0
Configuration				TR		L	T				LR					
Volume (veh/h)			73	1		166	102			1		278				
Percent Heavy Vehicles (%)						2				2		2				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.12				6.42		6.22				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.22				3.52		3.32				

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						180					303					
Capacity, c (veh/h)						1517					976					
v/c Ratio						0.12					0.31					
95% Queue Length, Q <sub>95</sub> (veh)						0.4					1.3					
Control Delay (s/veh)						7.7					10.3					
Level of Service (LOS)						A					B					
Approach Delay (s/veh)					4.8				10.3							
Approach LOS									B							

# HCS7 Two-Way Stop-Control Report

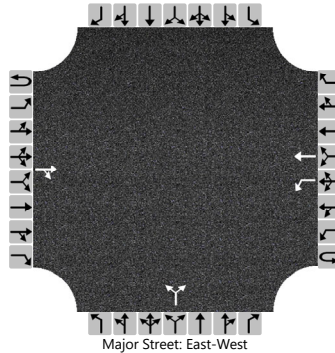
## General Information

Analyst	KG
Agency/Co.	Felsburg Holt & Ullevig
Date Performed	2/7/23
Analysis Year	2025
Time Analyzed	PM Peak Hour
Intersection Orientation	East-West
Project Description	SDDOT Northshore Dr - Build Sweeping Curve

## Site Information

Intersection	Northshore Dr & 333rd Ave
Jurisdiction	SDDOT
East/West Street	333rd Ave
North/South Street	Northshore Dr
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	1	1	0		0	1	0		0	0	0
Configuration				TR		L	T				LR					
Volume (veh/h)			95	1		215	136			1		214				
Percent Heavy Vehicles (%)						2				2		2				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.12				6.42		6.22				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.22				3.52		3.32				

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						234					234					
Capacity, c (veh/h)						1487					943					
v/c Ratio						0.16					0.25					
95% Queue Length, Q <sub>95</sub> (veh)						0.6					1.0					
Control Delay (s/veh)						7.9					10.1					
Level of Service (LOS)						A					B					
Approach Delay (s/veh)					4.8				10.1							
Approach LOS									B							



# HCS7 Two-Way Stop-Control Report

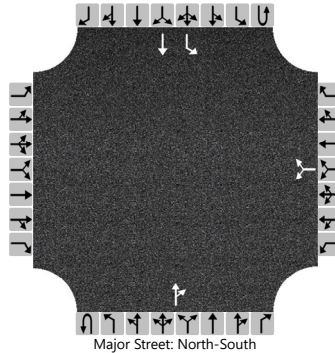
## General Information

Analyst	KG
Agency/Co.	Felsbrug Holt & Ullevig
Date Performed	2/6/2023
Analysis Year	2025
Time Analyzed	AM Peak Hour
Intersection Orientation	North-South
Project Description	SDDOT Northshore Dr - Build Sweeping Curve

## Site Information

Intersection	484th Ave & Northshore Dr
Jurisdiction	SDDOT
East/West Street	Northshore Dr
North/South Street	484th Ave/Westshore Dr
Peak Hour Factor	0.85
Analysis Time Period (hrs)	0.25

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	0	0	1	1	0
Configuration							LR					TR		L	T	
Volume (veh/h)						45		25			169	68		10	4	
Percent Heavy Vehicles (%)						10		3						3		
Proportion Time Blocked																
Percent Grade (%)					0											
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)						7.1		6.2						4.1		
Critical Headway (sec)						6.50		6.23						4.13		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.59		3.33						2.23		

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						82								12		
Capacity, c (veh/h)						731								1278		
v/c Ratio						0.11								0.01		
95% Queue Length, Q <sub>95</sub> (veh)						0.4								0.0		
Control Delay (s/veh)						10.5								7.8		
Level of Service (LOS)						B								A		
Approach Delay (s/veh)					10.5								5.6			
Approach LOS					B											

# HCS7 Two-Way Stop-Control Report

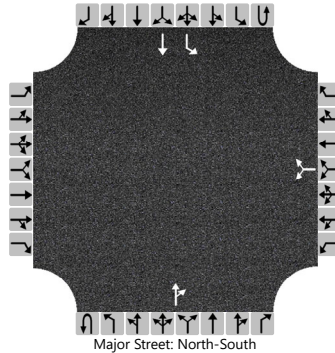
## General Information

Analyst	KG
Agency/Co.	Felsbrug Holt & Ullevig
Date Performed	2/6/2023
Analysis Year	2025
Time Analyzed	Dismissal Peak Hour
Intersection Orientation	North-South
Project Description	SDDOT Northshore Dr - Build Sweeping Curve

## Site Information

Intersection	484th Ave & Northshore Dr
Jurisdiction	SDDOT
East/West Street	Northshore Dr
North/South Street	484th Ave/Westshore Dr
Peak Hour Factor	0.83
Analysis Time Period (hrs)	0.25

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	0	0	1	1	0
Configuration							LR					TR		L	T	
Volume (veh/h)						27		27			16	54		30	53	
Percent Heavy Vehicles (%)						6		3						7		
Proportion Time Blocked																
Percent Grade (%)					0											
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)						7.1		6.2						4.1		
Critical Headway (sec)						6.46		6.23						4.17		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.55		3.33						2.26		

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						65								36		
Capacity, c (veh/h)						877								1481		
v/c Ratio						0.07								0.02		
95% Queue Length, Q <sub>95</sub> (veh)						0.2								0.1		
Control Delay (s/veh)						9.4								7.5		
Level of Service (LOS)						A								A		
Approach Delay (s/veh)					9.4								2.7			
Approach LOS					A											

# HCS7 Two-Way Stop-Control Report

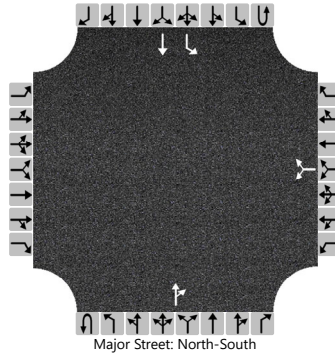
## General Information

Analyst	KG
Agency/Co.	Felsbrug Holt & Ullevig
Date Performed	2/6/2023
Analysis Year	2025
Time Analyzed	PM Peak Hour
Intersection Orientation	North-South
Project Description	SDDOT Northshore Dr - Build Sweeping Curve

## Site Information

Intersection	484th Ave & Northshore Dr
Jurisdiction	SDDOT
East/West Street	Northshore Dr
North/South Street	484th Ave/Westshore Dr
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	0	0	1	1	0
Configuration							LR					TR		L	T	
Volume (veh/h)						61		58			8	59		35	84	
Percent Heavy Vehicles (%)						0		3						0		
Proportion Time Blocked																
Percent Grade (%)					0											
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)						7.1		6.2						4.1		
Critical Headway (sec)						6.40		6.23						4.10		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.50		3.33						2.20		

## Delay, Queue Length, and Level of Service

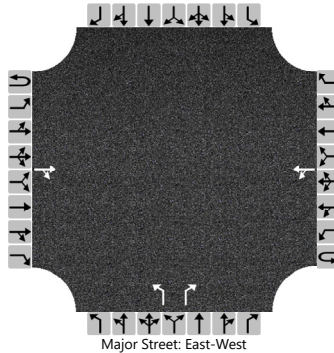
Flow Rate, v (veh/h)						132								39		
Capacity, c (veh/h)						870								1538		
v/c Ratio						0.15								0.03		
95% Queue Length, Q <sub>95</sub> (veh)						0.5								0.1		
Control Delay (s/veh)						9.9								7.4		
Level of Service (LOS)						A								A		
Approach Delay (s/veh)					9.9								2.2			
Approach LOS					A											

# HCS7 Two-Way Stop-Control Report

## General Information

Analyst	KG	Intersection	Streeter Dr & CR 23
Agency/Co.	Felsburg Holt & Ullevig	Jurisdiction	SDDOT
Date Performed	2/6/2023	East/West Street	County Rd 23
Analysis Year	2025	North/South Street	Streeter Dr
Time Analyzed	AM Peak Hour	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	SDDOT Northshore Dr - Build Sweeping Curve		

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		1	0	1		0	0	0
Configuration				TR		LT				L		R				
Volume (veh/h)			264	43		18	395			90		29				
Percent Heavy Vehicles (%)						0				2		0				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized									Yes							
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.10				6.42		6.20				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.20				3.52		3.30				

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)					20				98		32					
Capacity, c (veh/h)					1237				357		734					
v/c Ratio					0.02				0.27		0.04					
95% Queue Length, Q <sub>95</sub> (veh)					0.0				1.1		0.1					
Control Delay (s/veh)					8.0				18.9		10.1					
Level of Service (LOS)					A				C		B					
Approach Delay (s/veh)					0.5				16.7							
Approach LOS									C							

# HCS7 Two-Way Stop-Control Report

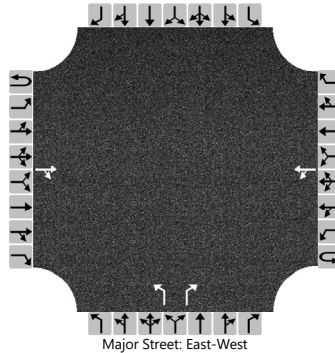
## General Information

Analyst	KG
Agency/Co.	Felsburg Holt & Ullevig
Date Performed	2/6/2023
Analysis Year	2025
Time Analyzed	Dismissal Peak Hour
Intersection Orientation	East-West
Project Description	SDDOT Northshore Dr - Build Sweeping Curve

## Site Information

Intersection	Streeter Dr & Northshore
Jurisdiction	SDDOT
East/West Street	Northshore Dr
North/South Street	Streeter Dr
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		1	0	1		0	0	0
Configuration				TR		LT				L		R				
Volume (veh/h)			253	52		30	137			26		26				
Percent Heavy Vehicles (%)						0				0		8				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized									Yes							
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.10				6.40		6.28				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.20				3.50		3.37				

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						33				28		28				
Capacity, c (veh/h)						1239				507		723				
v/c Ratio						0.03				0.06		0.04				
95% Queue Length, Q <sub>95</sub> (veh)						0.1				0.2		0.1				
Control Delay (s/veh)						8.0				12.5		10.2				
Level of Service (LOS)						A				B		B				
Approach Delay (s/veh)					1.6				11.4							
Approach LOS									B							

# HCS7 Two-Way Stop-Control Report

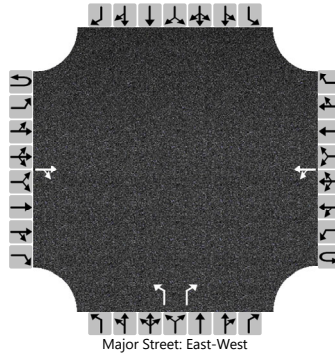
## General Information

Analyst	KG
Agency/Co.	Felsburg Holt & Ullevig
Date Performed	2/6/2023
Analysis Year	2025
Time Analyzed	PM Peak Hour
Intersection Orientation	East-West
Project Description	SDDOT Northshore Dr - Build Sweeping Curve

## Site Information

Intersection	Streeter Dr & Northshore
Jurisdiction	SDDOT
East/West Street	Northshore Dr
North/South Street	Streeter Dr
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		1	0	1		0	0	0
Configuration				TR		LT				L		R				
Volume (veh/h)			178	23		47	169			24		37				
Percent Heavy Vehicles (%)						0				2		0				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized									Yes							
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.10				6.42		6.20				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.20				3.52		3.30				

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						51				26		40				
Capacity, c (veh/h)						1363				514		840				
v/c Ratio						0.04				0.05		0.05				
95% Queue Length, Q <sub>95</sub> (veh)						0.1				0.2		0.2				
Control Delay (s/veh)						7.7				12.4		9.5				
Level of Service (LOS)						A				B		A				
Approach Delay (s/veh)					1.9				10.6							
Approach LOS									B							

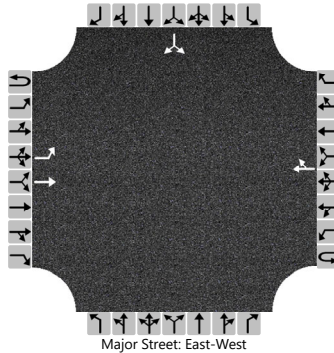


# HCS7 Two-Way Stop-Control Report

## General Information

Analyst	KG	Intersection	Westshore Dr & Northshore
Agency/Co.	Felsburg Holt & Ullevig	Jurisdiction	SDDOT
Date Performed	2/7/23	East/West Street	333rd Ave
Analysis Year	2025	North/South Street	Westshore Dr
Time Analyzed	AM Peak Hour	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	SDDOT Northshore Dr - Build Sweeping Curve		

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	1	0		0	0	0		0	1	0
Configuration		L	T					TR							LR	
Volume (veh/h)		40	154				9	61						30		5
Percent Heavy Vehicles (%)		0												2		0
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.1		6.2
Critical Headway (sec)		4.10												6.42		6.20
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.20												3.52		3.30

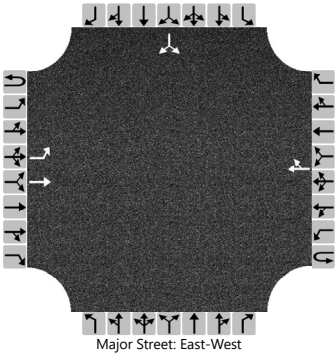
## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		43													38	
Capacity, c (veh/h)		1536													710	
v/c Ratio		0.03													0.05	
95% Queue Length, Q <sub>95</sub> (veh)		0.1													0.2	
Control Delay (s/veh)		7.4													10.4	
Level of Service (LOS)		A													B	
Approach Delay (s/veh)	1.5												10.4			
Approach LOS													B			

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	KG	Intersection	Westshore Dr & 333rd Ave
Agency/Co.	Felsburg Holt & Ullevig	Jurisdiction	SDDOT
Date Performed	2/7/23	East/West Street	333rd Ave
Analysis Year	2025	North/South Street	Westshore Dr
Time Analyzed	Dismissal Peak Hour	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	SDDOT Northshore Dr - Build Sweeping Curve		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	1	0		0	0	0		0	1	0
Configuration		L	T					TR							LR	
Volume (veh/h)		3	40				76	27						34		7
Percent Heavy Vehicles (%)		0												2		0
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized																
Median Type   Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.1		6.2
Critical Headway (sec)		4.10												6.42		6.20
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.20												3.52		3.30

Delay, Queue Length, and Level of Service

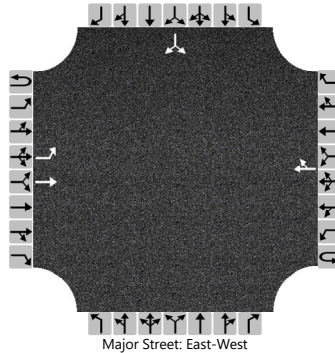
Flow Rate, v (veh/h)		3													45	
Capacity, c (veh/h)		1490													862	
v/c Ratio		0.00													0.05	
95% Queue Length, Q <sub>95</sub> (veh)		0.0													0.2	
Control Delay (s/veh)		7.4													9.4	
Level of Service (LOS)		A													A	
Approach Delay (s/veh)	0.5												9.4			
Approach LOS													A			

# HCS7 Two-Way Stop-Control Report

## General Information

Analyst	KG	Intersection	Westshore Dr & 333rd Ave
Agency/Co.	Felsburg Holt & Ullevig	Jurisdiction	SDDOT
Date Performed	2/7/23	East/West Street	333rd Ave
Analysis Year	2025	North/South Street	Westshore Dr
Time Analyzed	PM Peak Hour	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	SDDOT Northshore Dr - Build Sweeping Curve		

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	1	0		0	0	0		0	1	0
Configuration		L	T					TR							LR	
Volume (veh/h)		8	58				115	22						38		5
Percent Heavy Vehicles (%)		0												2		0
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.1		6.2
Critical Headway (sec)		4.10												6.42		6.20
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.20												3.52		3.30

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		9													47	
Capacity, c (veh/h)		1445													781	
v/c Ratio		0.01													0.06	
95% Queue Length, Q <sub>95</sub> (veh)		0.0													0.2	
Control Delay (s/veh)		7.5													9.9	
Level of Service (LOS)		A													A	
Approach Delay (s/veh)	0.9												9.9			
Approach LOS													A			

# HCS7 Two-Way Stop-Control Report

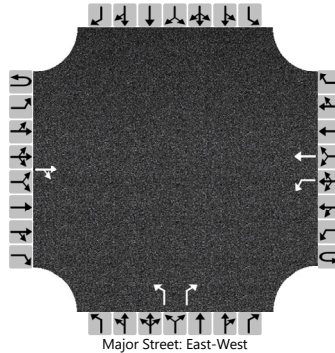
## General Information

Analyst	KG
Agency/Co.	Felsburg Holt & Ullevig
Date Performed	2/7/23
Analysis Year	2025
Time Analyzed	AM Peak Hour
Intersection Orientation	East-West
Project Description	SDDOT Northshore Dr - Build Sweeping Curves

## Site Information

Intersection	Northshore Dr & 333rd Ave
Jurisdiction	SDDOT
East/West Street	333rd Ave
North/South Street	Northshore Dr
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	1	1	0		1	0	1		0	0	0
Configuration				TR		L	T			L		R				
Volume (veh/h)			183	1		412	69			1		292				
Percent Heavy Vehicles (%)						2				2		2				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized									Yes							
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.12				6.42		6.22				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.22				3.52		3.32				

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						448				1		317				
Capacity, c (veh/h)						1372				144		842				
v/c Ratio						0.33				0.01		0.38				
95% Queue Length, Q <sub>95</sub> (veh)						1.4				0.0		1.8				
Control Delay (s/veh)						8.9				30.3		11.8				
Level of Service (LOS)						A				D		B				
Approach Delay (s/veh)					7.6				11.9							
Approach LOS									B							

# HCS7 Two-Way Stop-Control Report

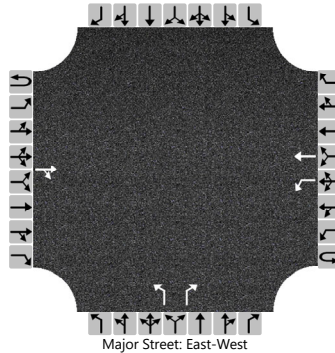
## General Information

Analyst	KG
Agency/Co.	Felsburg Holt & Ullevig
Date Performed	2/7/23
Analysis Year	2025
Time Analyzed	Dismissal Peak Hour
Intersection Orientation	East-West
Project Description	SDDOT Northshore Dr - Build Sweeping Curve

## Site Information

Intersection	Northshore Dr & 333rd Ave
Jurisdiction	SDDOT
East/West Street	333rd Ave
North/South Street	Northshore Dr
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	1	1	0		1	0	1		0	0	0
Configuration				TR		L	T			L		R				
Volume (veh/h)			73	1		166	102			1		278				
Percent Heavy Vehicles (%)						2				2		2				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized									Yes							
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.12				6.42		6.22				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.22				3.52		3.32				

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						180				1		302				
Capacity, c (veh/h)						1517				436		980				
v/c Ratio						0.12				0.00		0.31				
95% Queue Length, Q <sub>95</sub> (veh)						0.4				0.0		1.3				
Control Delay (s/veh)						7.7				13.3		10.3				
Level of Service (LOS)						A				B		B				
Approach Delay (s/veh)					4.8				10.3							
Approach LOS									B							

# HCS7 Two-Way Stop-Control Report

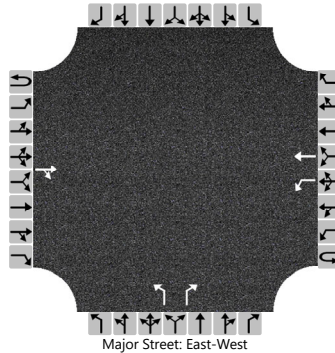
## General Information

Analyst	KG
Agency/Co.	Felsburg Holt & Ullevig
Date Performed	2/7/23
Analysis Year	2025
Time Analyzed	PM Peak Hour
Intersection Orientation	East-West
Project Description	SDDOT Northshore Dr - Build Sweeping Curve

## Site Information

Intersection	Northshore Dr & 333rd Ave
Jurisdiction	SDDOT
East/West Street	333rd Ave
North/South Street	Northshore Dr
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	1	1	0		1	0	1		0	0	0
Configuration				TR		L	T			L		R				
Volume (veh/h)			95	1		215	136			1		214				
Percent Heavy Vehicles (%)						2				2		2				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized									Yes							
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.12				6.42		6.22				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.22				3.52		3.32				

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						234				1		233				
Capacity, c (veh/h)						1487				333		951				
v/c Ratio						0.16				0.00		0.24				
95% Queue Length, Q <sub>95</sub> (veh)						0.6				0.0		1.0				
Control Delay (s/veh)						7.9				15.8		10.0				
Level of Service (LOS)						A				C		B				
Approach Delay (s/veh)					4.8				10.0							
Approach LOS									B							



# HCS7 Two-Way Stop-Control Report

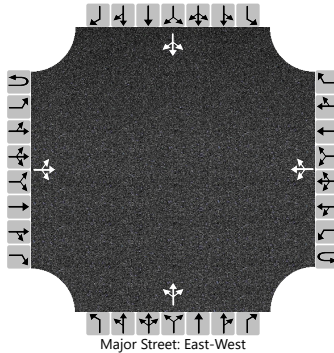
## General Information

Analyst	KG
Agency/Co.	Felsbrug Holt & Ullevig
Date Performed	2/6/2023
Analysis Year	2045
Time Analyzed	AM Peak Hour
Intersection Orientation	East-West
Project Description	SDDOT Northshore Dr - Build

## Site Information

Intersection	484th Ave & Northshore Dr
Jurisdiction	SDDOT
East/West Street	Northshore Dr
North/South Street	484th Ave/Westshore Dr
Peak Hour Factor	0.85
Analysis Time Period (hrs)	0.25

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		195	75	5		10	50	5		5	35	5		10	5	5
Percent Heavy Vehicles (%)		0				10				0	0	5		3	0	0
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.10				4.20				7.10	6.50	6.25		7.13	6.50	6.20
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.20				2.29				3.50	4.00	3.35		3.53	4.00	3.30

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		229				12					53				24	
Capacity, c (veh/h)		1550				1451					358				372	
v/c Ratio		0.15				0.01					0.15				0.06	
95% Queue Length, Q <sub>95</sub> (veh)		0.5				0.0					0.5				0.2	
Control Delay (s/veh)		7.7				7.5					16.8				15.3	
Level of Service (LOS)		A				A					C				C	
Approach Delay (s/veh)	5.8				1.2				16.8				15.3			
Approach LOS									C				C			

# HCS7 Two-Way Stop-Control Report

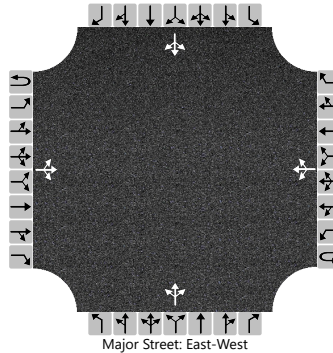
## General Information

Analyst	KG
Agency/Co.	Felsbrug Holt & Ullevig
Date Performed	2/6/2023
Analysis Year	2045
Time Analyzed	Dismissal Peak Hour
Intersection Orientation	East-West
Project Description	SDDOT Northshore Dr - Build

## Site Information

Intersection	484th Ave & Northshore Dr
Jurisdiction	SDDOT
East/West Street	Northshore Dr
North/South Street	484th Ave/Westshore Dr
Peak Hour Factor	0.83
Analysis Time Period (hrs)	0.25

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		20	55	10		5	60	10		5	25	5		15	30	65
Percent Heavy Vehicles (%)		0				6				0	0	5		7	0	0
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.10				4.16				7.10	6.50	6.25		7.17	6.50	6.20
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.20				2.25				3.50	4.00	3.35		3.56	4.00	3.30

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		24				6					42				133	
Capacity, c (veh/h)		1525				1495					690				829	
v/c Ratio		0.02				0.00					0.06				0.16	
95% Queue Length, Q <sub>95</sub> (veh)		0.0				0.0					0.2				0.6	
Control Delay (s/veh)		7.4				7.4					10.6				10.2	
Level of Service (LOS)		A				A					B				B	
Approach Delay (s/veh)	1.8				0.5				10.6				10.2			
Approach LOS									B				B			

# HCS7 Two-Way Stop-Control Report

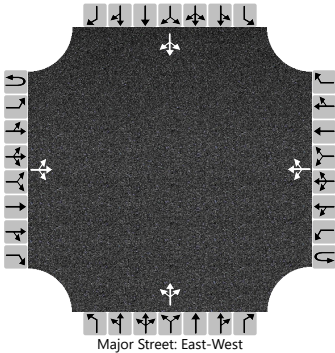
## General Information

Analyst	KG
Agency/Co.	Felsbrug Holt & Ullevig
Date Performed	2/6/2023
Analysis Year	2045
Time Analyzed	PM Peak Hour
Intersection Orientation	East-West
Project Description	SDDOT Northshore Dr - Build

## Site Information

Intersection	484th Ave & Northshore Dr
Jurisdiction	SDDOT
East/West Street	Northshore Dr
North/South Street	484th Ave/Westshore Dr
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		20	60	10		25	60	20		10	50	5		5	40	95
Percent Heavy Vehicles (%)		0				0				0	0	0		0	0	0
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.10				4.10				7.10	6.50	6.20		7.10	6.50	6.20
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.20				2.20				3.50	4.00	3.30		3.50	4.00	3.30

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		22				28					72				156	
Capacity, c (veh/h)		1519				1534					624				834	
v/c Ratio		0.01				0.02					0.12				0.19	
95% Queue Length, Q <sub>95</sub> (veh)		0.0				0.1					0.4				0.7	
Control Delay (s/veh)		7.4				7.4					11.5				10.3	
Level of Service (LOS)		A				A					B				B	
Approach Delay (s/veh)	1.7				1.9				11.5				10.3			
Approach LOS									B				B			

# HCS7 Two-Way Stop-Control Report

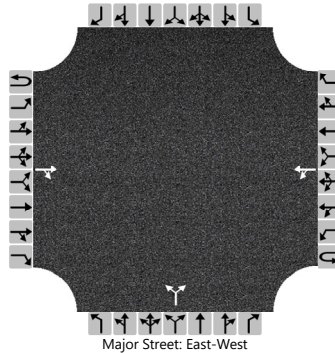
## General Information

Analyst	KG
Agency/Co.	Felsburg Holt & Ullevig
Date Performed	2/6/2023
Analysis Year	2045
Time Analyzed	AM Peak Hour
Intersection Orientation	East-West
Project Description	SDDOT Northshore Dr - Build

## Site Information

Intersection	Streeter Dr & Northshore
Jurisdiction	SDDOT
East/West Street	Northshore Dr
North/South Street	Streeter Dr
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	0	0
Configuration				TR		LT					LR					
Volume (veh/h)			295	50		25	440			100		35				
Percent Heavy Vehicles (%)						0				2		0				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.10				6.42		6.20				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.20				3.52		3.30				

## Delay, Queue Length, and Level of Service

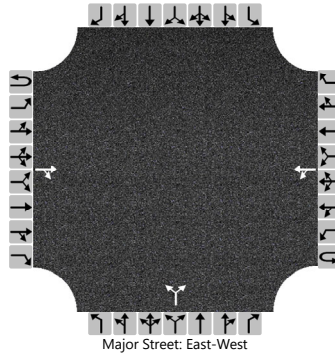
Flow Rate, v (veh/h)						27					147					
Capacity, c (veh/h)						1195					360					
v/c Ratio						0.02					0.41					
95% Queue Length, Q <sub>95</sub> (veh)						0.1					1.9					
Control Delay (s/veh)						8.1					21.7					
Level of Service (LOS)						A					C					
Approach Delay (s/veh)					0.7				21.7							
Approach LOS									C							

# HCS7 Two-Way Stop-Control Report

## General Information

Analyst	KG	Intersection	Streeter Dr & Northshore
Agency/Co.	Felsburg Holt & Ullevig	Jurisdiction	SDDOT
Date Performed	2/6/2023	East/West Street	Northshore Dr
Analysis Year	2045	North/South Street	Streeter Dr
Time Analyzed	Dismissal Peak Hour	Peak Hour Factor	0.71
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	SDDOT Northshore Dr - Build		

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	0	0
Configuration				TR		LT					LR					
Volume (veh/h)			285	60		35	145			30		30				
Percent Heavy Vehicles (%)						0				0		8				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.10				6.40		6.28				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.20				3.50		3.37				

## Delay, Queue Length, and Level of Service

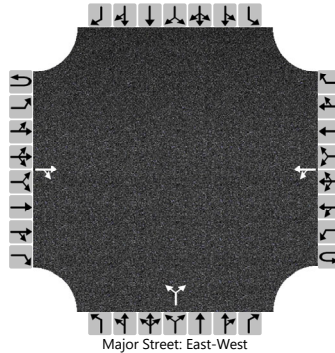
Flow Rate, v (veh/h)						49					85					
Capacity, c (veh/h)						1087					454					
v/c Ratio						0.05					0.19					
95% Queue Length, Q <sub>95</sub> (veh)						0.1					0.7					
Control Delay (s/veh)						8.5					14.7					
Level of Service (LOS)						A					B					
Approach Delay (s/veh)					2.0				14.7							
Approach LOS									B							

# HCS7 Two-Way Stop-Control Report

## General Information

Analyst	KG	Intersection	Streeter Dr & Northshore
Agency/Co.	Felsburg Holt & Ullevig	Jurisdiction	SDDOT
Date Performed	2/6/2023	East/West Street	Northshore Dr
Analysis Year	2045	North/South Street	Streeter Dr
Time Analyzed	PM Peak Hour	Peak Hour Factor	0.79
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	SDDOT Northshore Dr - Build		

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	0	0
Configuration				TR		LT					LR					
Volume (veh/h)			185	30		55	190			30		45				
Percent Heavy Vehicles (%)						0				2		0				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.10				6.42		6.20				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.20				3.52		3.30				

## Delay, Queue Length, and Level of Service

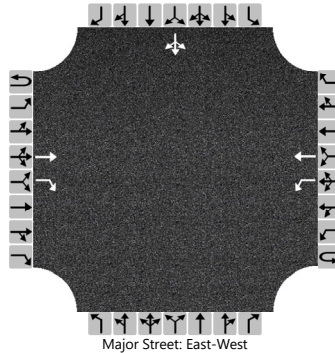
Flow Rate, v (veh/h)						70					95					
Capacity, c (veh/h)						1303					582					
v/c Ratio						0.05					0.16					
95% Queue Length, Q <sub>95</sub> (veh)						0.2					0.6					
Control Delay (s/veh)						7.9					12.4					
Level of Service (LOS)						A					B					
Approach Delay (s/veh)					2.2				12.4							
Approach LOS									B							

# HCS7 Two-Way Stop-Control Report

## General Information

Analyst	KG	Intersection	I-29 SB Ramp & Northshore
Agency/Co.	Felsburg Holt & Ullevig	Jurisdiction	SDDOT
Date Performed	1/30/2023	East/West Street	Northshore Dr
Analysis Year	2045	North/South Street	I-29 SB Ramp
Time Analyzed	AM Peak Hour	Peak Hour Factor	0.80
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	SDDOT Northshore Dr - Build		

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	1	0	1	1	0		0	0	0		0	1	0
Configuration			T	R		L	T								LTR	
Volume (veh/h)			130	390		30	500							25	5	40
Percent Heavy Vehicles (%)						21								5	0	0
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized	No															
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)						4.1								7.1	6.5	6.2
Critical Headway (sec)						4.31								7.15	6.50	6.20
Base Follow-Up Headway (sec)						2.2								3.5	4.0	3.3
Follow-Up Headway (sec)						2.39								3.55	4.00	3.30

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						38									88	
Capacity, c (veh/h)						852									402	
v/c Ratio						0.04									0.22	
95% Queue Length, Q <sub>95</sub> (veh)						0.1									0.8	
Control Delay (s/veh)						9.4									16.4	
Level of Service (LOS)						A									C	
Approach Delay (s/veh)					0.5								16.4			
Approach LOS													C			



# HCS7 Two-Way Stop-Control Report

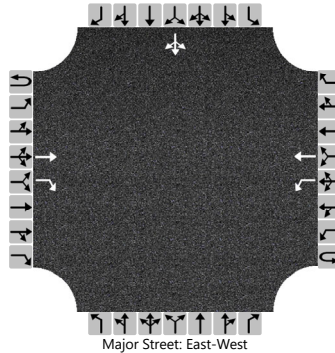
## General Information

Analyst	KG
Agency/Co.	Felsburg Holt & Ullevig
Date Performed	2/6/23
Analysis Year	2045
Time Analyzed	Dismissal Peak Hour
Intersection Orientation	East-West
Project Description	SDDOT Northshore Dr - Build

## Site Information

Intersection	I-29 SB Ramp & Northshore
Jurisdiction	SDDOT
East/West Street	Northshore Dr
North/South Street	I-29 SB Ramp
Peak Hour Factor	0.76
Analysis Time Period (hrs)	0.25

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	1	0	1	1	0		0	0	0		0	1	0
Configuration			T	R		L	T								LTR	
Volume (veh/h)			115	280		45	270							15	0	35
Percent Heavy Vehicles (%)						14								13	0	4
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized	No															
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)						4.1								7.1	6.5	6.2
Critical Headway (sec)						4.24								7.23	6.50	6.24
Base Follow-Up Headway (sec)						2.2								3.5	4.0	3.3
Follow-Up Headway (sec)						2.33								3.62	4.00	3.34

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						59									66	
Capacity, c (veh/h)						988									911	
v/c Ratio						0.06									0.07	
95% Queue Length, Q <sub>95</sub> (veh)						0.2									0.2	
Control Delay (s/veh)						8.9									9.3	
Level of Service (LOS)						A									A	
Approach Delay (s/veh)					1.3								9.3			
Approach LOS													A			

# HCS7 Two-Way Stop-Control Report

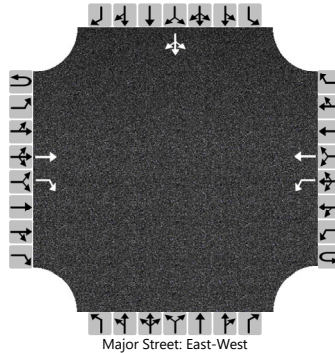
## General Information

Analyst	KG
Agency/Co.	Felsburg Holt & Ullevig
Date Performed	2/6/23
Analysis Year	2045
Time Analyzed	PM Peak Hour
Intersection Orientation	East-West
Project Description	SDDOT Northshore Dr - Build

## Site Information

Intersection	I-29 SB Ramp & Northshore
Jurisdiction	SDDOT
East/West Street	Northshore Dr
North/South Street	I-29 SB Ramp
Peak Hour Factor	0.95
Analysis Time Period (hrs)	0.25

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	1	0	1	1	0		0	0	0		0	1	0
Configuration			T	R		L	T								LTR	
Volume (veh/h)			105	245		25	365							25	0	30
Percent Heavy Vehicles (%)						11								0	0	0
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized	No															
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)						4.1								7.1	6.5	6.2
Critical Headway (sec)						4.21								7.10	6.50	6.20
Base Follow-Up Headway (sec)						2.2								3.5	4.0	3.3
Follow-Up Headway (sec)						2.30								3.50	4.00	3.30

## Delay, Queue Length, and Level of Service

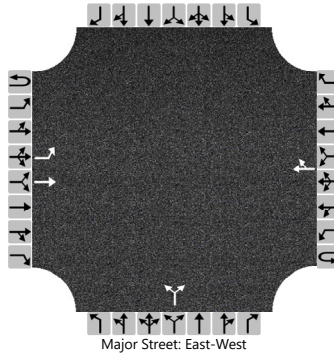
Flow Rate, v (veh/h)						26									58	
Capacity, c (veh/h)						1142									799	
v/c Ratio						0.02									0.07	
95% Queue Length, Q <sub>95</sub> (veh)						0.1									0.2	
Control Delay (s/veh)						8.2									9.9	
Level of Service (LOS)						A									A	
Approach Delay (s/veh)					0.5								9.9			
Approach LOS													A			

# HCS7 Two-Way Stop-Control Report

## General Information

Analyst	KG	Intersection	I-29 NB Ramp & Northshore
Agency/Co.	Felsburg Holt & Ullevig	Jurisdiction	SDDOT
Date Performed	2/6/2023	East/West Street	Northshore Dr
Analysis Year	2045	North/South Street	I-29 NB Ramp
Time Analyzed	AM Peak Hour	Peak Hour Factor	0.75
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	SDDOT Northshore Dr - Build		

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	1	0		0	1	0		0	0	0
Configuration		L	T					TR			LR					
Volume (veh/h)		25	130				105	15		425		55				
Percent Heavy Vehicles (%)		0								2		8				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)		4.1								7.1		6.2				
Critical Headway (sec)		4.10								7.12		6.28				
Base Follow-Up Headway (sec)		2.2								3.5		3.3				
Follow-Up Headway (sec)		2.20								3.52		3.37				

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		33								640						
Capacity, c (veh/h)		1432								586						
v/c Ratio		0.02								1.09						
95% Queue Length, Q <sub>95</sub> (veh)		0.1								19.2						
Control Delay (s/veh)		7.6								90.5						
Level of Service (LOS)		A								F						
Approach Delay (s/veh)	1.2								90.5							
Approach LOS									F							

# HCS7 Two-Way Stop-Control Report

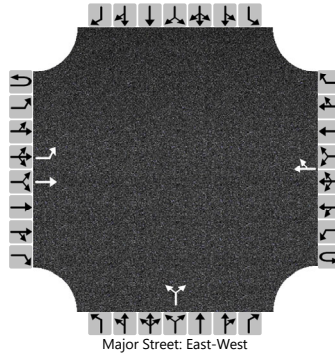
## General Information

Analyst	KG
Agency/Co.	Felsburg Holt & Ullevig
Date Performed	2/6/2023
Analysis Year	2045
Time Analyzed	Dismissal Peak Hour
Intersection Orientation	East-West
Project Description	SDDOT Northshore Dr - Build

## Site Information

Intersection	I-29 NB Ramp & Northshore
Jurisdiction	SDDOT
East/West Street	Northshore Dr
North/South Street	I-29 NB Ramp
Peak Hour Factor	0.86
Analysis Time Period (hrs)	0.25

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	1	0		0	1	0		0	0	0
Configuration		L	T					TR			LR					
Volume (veh/h)		30	100				125	35		190		35				
Percent Heavy Vehicles (%)		7								0		6				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)		4.1								7.1		6.2				
Critical Headway (sec)		4.17								7.10		6.26				
Base Follow-Up Headway (sec)		2.2								3.5		3.3				
Follow-Up Headway (sec)		2.26								3.50		3.35				

## Delay, Queue Length, and Level of Service

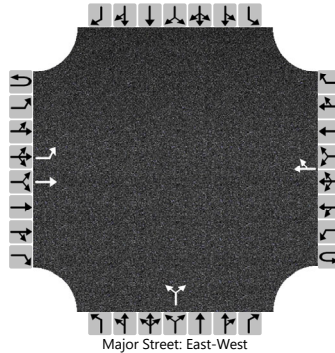
Flow Rate, v (veh/h)		35								262						
Capacity, c (veh/h)		1359								667						
v/c Ratio		0.03								0.39						
95% Queue Length, Q <sub>95</sub> (veh)		0.1								1.9						
Control Delay (s/veh)		7.7								13.8						
Level of Service (LOS)		A								B						
Approach Delay (s/veh)	1.8								13.8							
Approach LOS									B							

# HCS7 Two-Way Stop-Control Report

## General Information

Analyst	KG	Intersection	I-29 NB Ramp & Northshore
Agency/Co.	Felsburg Holt & Ullevig	Jurisdiction	SDDOT
Date Performed	2/6/2023	East/West Street	Northshore Dr
Analysis Year	2045	North/South Street	I-29 NB Ramp
Time Analyzed	PM Peak Hour	Peak Hour Factor	0.88
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	SDDOT Northshore Dr - Build		

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	1	0		0	1	0		0	0	0
Configuration		L	T					TR			LR					
Volume (veh/h)		55	75				125	40		265		40				
Percent Heavy Vehicles (%)		0								1		2				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)		4.1								7.1		6.2				
Critical Headway (sec)		4.10								7.11		6.22				
Base Follow-Up Headway (sec)		2.2								3.5		3.3				
Follow-Up Headway (sec)		2.20								3.51		3.32				

## Delay, Queue Length, and Level of Service

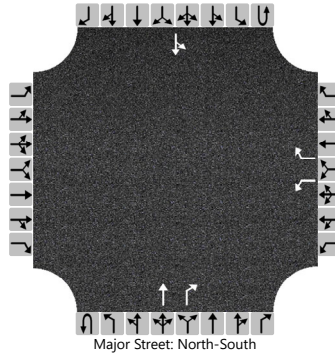
Flow Rate, v (veh/h)		63									347					
Capacity, c (veh/h)		1399									614					
v/c Ratio		0.04									0.56					
95% Queue Length, Q <sub>95</sub> (veh)		0.1									3.5					
Control Delay (s/veh)		7.7									18.2					
Level of Service (LOS)		A									C					
Approach Delay (s/veh)	3.3								18.2							
Approach LOS									C							

# HCS7 Two-Way Stop-Control Report

## General Information

Analyst	KG	Intersection	Westshore Dr & 333rd Ave
Agency/Co.	Felsburg Holt & Ullevig	Jurisdiction	SDDOT
Date Performed	2/7/23	East/West Street	333rd Ave
Analysis Year	2045	North/South Street	Westshore Dr
Time Analyzed	AM Peak Hour	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	SDDOT Northshore Dr - Build		

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		1	0	1	0	0	1	1	0	0	1	0
Configuration						L		R			T	R		LT		
Volume (veh/h)						10		75			75	160		40	10	
Percent Heavy Vehicles (%)						2		2						2		
Proportion Time Blocked																
Percent Grade (%)					0											
Right Turn Channelized					No				No							
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)						7.1		6.2						4.1		
Critical Headway (sec)						6.42		6.22						4.12		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.52		3.32						2.22		

## Delay, Queue Length, and Level of Service

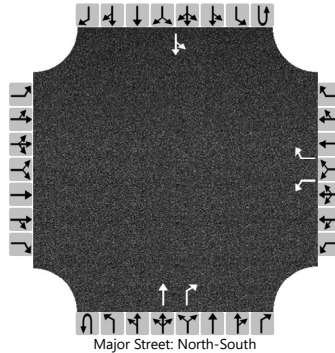
Flow Rate, v (veh/h)						11		82						43		
Capacity, c (veh/h)						783		978						1310		
v/c Ratio						0.01		0.08						0.03		
95% Queue Length, Q <sub>95</sub> (veh)						0.0		0.3						0.1		
Control Delay (s/veh)						9.7		9.0						7.8		
Level of Service (LOS)						A		A						A		
Approach Delay (s/veh)					9.1								6.3			
Approach LOS					A											

# HCS7 Two-Way Stop-Control Report

## General Information

Analyst	KG	Intersection	Westshore Dr & 333rd Ave
Agency/Co.	Felsburg Holt & Ullevig	Jurisdiction	SDDOT
Date Performed	2/7/23	East/West Street	333rd Ave
Analysis Year	2045	North/South Street	Westshore Dr
Time Analyzed	Dismissal Peak Hour	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	SDDOT Northshore Dr - Build		

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		1	0	1	0	0	1	1	0	0	1	0
Configuration						L		R			T	R		LT		
Volume (veh/h)						100		35			10	45		45	10	
Percent Heavy Vehicles (%)						2		2						2		
Proportion Time Blocked																
Percent Grade (%)					0											
Right Turn Channelized					No				No							
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)						7.1		6.2						4.1		
Critical Headway (sec)						6.42		6.22						4.12		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.52		3.32						2.22		

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						109		38						49		
Capacity, c (veh/h)						848		1070						1544		
v/c Ratio						0.13		0.04						0.03		
95% Queue Length, Q <sub>95</sub> (veh)						0.4		0.1						0.1		
Control Delay (s/veh)						9.9		8.5						7.4		
Level of Service (LOS)						A		A						A		
Approach Delay (s/veh)					9.5								6.1			
Approach LOS					A											

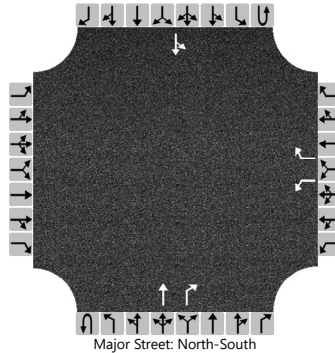


# HCS7 Two-Way Stop-Control Report

## General Information

Analyst	KG	Intersection	Westshore Dr & 333rd Ave
Agency/Co.	Felsburg Holt & Ullevig	Jurisdiction	SDDOT
Date Performed	2/7/23	East/West Street	333rd Ave
Analysis Year	2045	North/South Street	Westshore Dr
Time Analyzed	PM Peak Hour	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	SDDOT Northshore Dr - Build		

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		1	0	1	0	0	1	1	0	0	1	0
Configuration						L		R			T	R		LT		
Volume (veh/h)						135		25			5	85		45	5	
Percent Heavy Vehicles (%)						2		2						2		
Proportion Time Blocked																
Percent Grade (%)					0											
Right Turn Channelized					No				No							
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)						7.1		6.2						4.1		
Critical Headway (sec)						6.42		6.22						4.12		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.52		3.32						2.22		

## Delay, Queue Length, and Level of Service

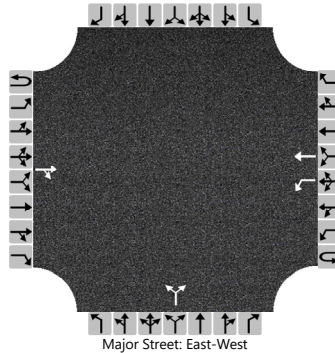
Flow Rate, v (veh/h)						147		27						49		
Capacity, c (veh/h)						859		1078						1495		
v/c Ratio						0.17		0.03						0.03		
95% Queue Length, Q <sub>95</sub> (veh)						0.6		0.1						0.1		
Control Delay (s/veh)						10.0		8.4						7.5		
Level of Service (LOS)						B		A						A		
Approach Delay (s/veh)					9.8								6.8			
Approach LOS					A											

# HCS7 Two-Way Stop-Control Report

## General Information

Analyst	KG	Intersection	Northshore Dr & 333rd Ave
Agency/Co.	Felsburg Holt & Ullevig	Jurisdiction	SDDOT
Date Performed	2/7/23	East/West Street	333rd Ave
Analysis Year	2045	North/South Street	Northshore Dr
Time Analyzed	AM Peak Hour	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	SDDOT Northshore Dr - Build		

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	1	1	0		0	1	0		0	0	0
Configuration				TR		L	T				LR					
Volume (veh/h)			195	5		460	80			5		325				
Percent Heavy Vehicles (%)						2				2		2				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.12				6.42		6.22				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.22				3.52		3.32				

## Delay, Queue Length, and Level of Service

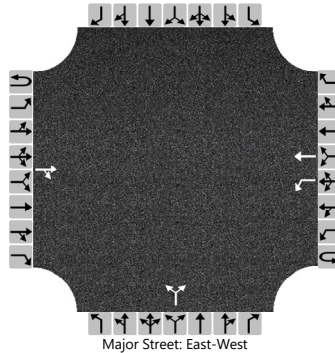
Flow Rate, v (veh/h)					500					359						
Capacity, c (veh/h)					1352					753						
v/c Ratio					0.37					0.48						
95% Queue Length, Q <sub>95</sub> (veh)					1.7					2.6						
Control Delay (s/veh)					9.2					14.1						
Level of Service (LOS)					A					B						
Approach Delay (s/veh)					7.9				14.1							
Approach LOS									B							

# HCS7 Two-Way Stop-Control Report

## General Information

Analyst	KG	Intersection	Northshore Dr & 333rd Ave
Agency/Co.	Felsburg Holt & Ullevig	Jurisdiction	SDDOT
Date Performed	2/7/23	East/West Street	333rd Ave
Analysis Year	2045	North/South Street	Northshore Dr
Time Analyzed	Dismissal Peak Hour	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	SDDOT Northshore Dr - Build		

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	1	1	0		0	1	0		0	0	0
Configuration				TR		L	T				LR					
Volume (veh/h)			85	5		175	130			5		310				
Percent Heavy Vehicles (%)						2				2		2				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.12				6.42		6.22				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.22				3.52		3.32				

## Delay, Queue Length, and Level of Service

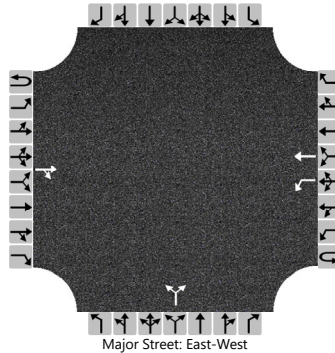
Flow Rate, v (veh/h)					190					342						
Capacity, c (veh/h)					1495					940						
v/c Ratio					0.13					0.36						
95% Queue Length, Q <sub>95</sub> (veh)					0.4					1.7						
Control Delay (s/veh)					7.8					11.0						
Level of Service (LOS)					A					B						
Approach Delay (s/veh)					4.5				11.0							
Approach LOS									B							

# HCS7 Two-Way Stop-Control Report

## General Information

Analyst	KG	Intersection	Northshore Dr & 333rd Ave
Agency/Co.	Felsburg Holt & Ullevig	Jurisdiction	SDDOT
Date Performed	2/7/23	East/West Street	333rd Ave
Analysis Year	2045	North/South Street	Northshore Dr
Time Analyzed	PM Peak Hour	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	SDDOT Northshore Dr - Build		

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	1	1	0		0	1	0		0	0	0
Configuration				TR		L	T				LR					
Volume (veh/h)			125	5		240	155			5		225				
Percent Heavy Vehicles (%)						2				2		2				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.12				6.42		6.22				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.22				3.52		3.32				

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						261					250					
Capacity, c (veh/h)						1442					867					
v/c Ratio						0.18					0.29					
95% Queue Length, Q <sub>95</sub> (veh)						0.7					1.2					
Control Delay (s/veh)						8.0					10.8					
Level of Service (LOS)						A					B					
Approach Delay (s/veh)					4.9				10.8							
Approach LOS									B							

# HCS7 Two-Way Stop-Control Report

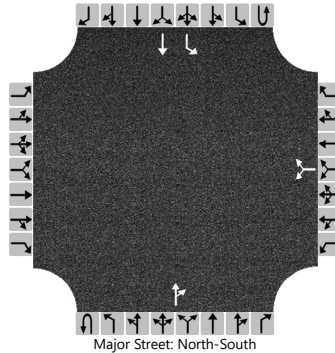
## General Information

Analyst	KG
Agency/Co.	Felsbrug Holt & Ullevig
Date Performed	2/6/2023
Analysis Year	2045
Time Analyzed	AM Peak Hour
Intersection Orientation	North-South
Project Description	SDDOT Northshore Dr - Build Sweeping Curve

## Site Information

Intersection	484th Ave & Northshore Dr
Jurisdiction	SDDOT
East/West Street	Northshore Dr
North/South Street	484th Ave/Westshore Dr
Peak Hour Factor	0.85
Analysis Time Period (hrs)	0.25

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	0	0	1	1	0
Configuration							LR					TR		L	T	
Volume (veh/h)						55		40			195	80		15	5	
Percent Heavy Vehicles (%)						10		3						3		
Proportion Time Blocked																
Percent Grade (%)					0											
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)						7.1		6.2						4.1		
Critical Headway (sec)						6.50		6.23						4.13		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.59		3.33						2.23		

## Delay, Queue Length, and Level of Service

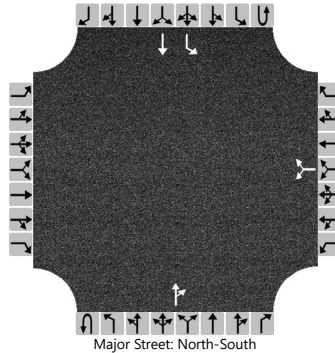
Flow Rate, v (veh/h)						112								18		
Capacity, c (veh/h)						692								1231		
v/c Ratio						0.16								0.01		
95% Queue Length, Q <sub>95</sub> (veh)						0.6								0.0		
Control Delay (s/veh)						11.2								8.0		
Level of Service (LOS)						B								A		
Approach Delay (s/veh)					11.2								6.0			
Approach LOS					B											

# HCS7 Two-Way Stop-Control Report

## General Information

Analyst	KG	Intersection	484th Ave & Northshore Dr
Agency/Co.	Felsbrug Holt & Ullevig	Jurisdiction	SDDOT
Date Performed	2/6/2023	East/West Street	Northshore Dr
Analysis Year	2045	North/South Street	484th Ave/Westshore Dr
Time Analyzed	Dismissal Peak Hour	Peak Hour Factor	0.83
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	SDDOT Northshore Dr - Build Sweeping Curve		

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	0	0	1	1	0
Configuration							LR					TR		L	T	
Volume (veh/h)						65		35			20	65		45	65	
Percent Heavy Vehicles (%)						6		3						7		
Proportion Time Blocked																
Percent Grade (%)					0											
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)						7.1		6.2						4.1		
Critical Headway (sec)						6.46		6.23						4.17		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.55		3.33						2.26		

## Delay, Queue Length, and Level of Service

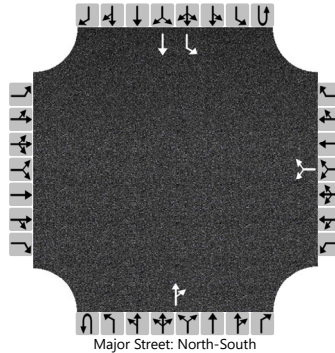
Flow Rate, v (veh/h)						120								54		
Capacity, c (veh/h)						784								1459		
v/c Ratio						0.15								0.04		
95% Queue Length, Q <sub>95</sub> (veh)						0.5								0.1		
Control Delay (s/veh)						10.4								7.6		
Level of Service (LOS)						B								A		
Approach Delay (s/veh)					10.4								3.1			
Approach LOS					B											

# HCS7 Two-Way Stop-Control Report

## General Information

Analyst	KG	Intersection	484th Ave & Northshore Dr
Agency/Co.	Felsbrug Holt & Ullevig	Jurisdiction	SDDOT
Date Performed	2/6/2023	East/West Street	Northshore Dr
Analysis Year	2045	North/South Street	484th Ave/Westshore Dr
Time Analyzed	PM Peak Hour	Peak Hour Factor	0.90
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	SDDOT Northshore Dr - Build Sweeping Curve		

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	0	0	1	1	0
Configuration							LR					TR		L	T	
Volume (veh/h)						70		70			20	70		45	95	
Percent Heavy Vehicles (%)						0		3						0		
Proportion Time Blocked																
Percent Grade (%)					0											
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)						7.1		6.2						4.1		
Critical Headway (sec)						6.40		6.23						4.10		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.50		3.33						2.20		

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						156								50		
Capacity, c (veh/h)						826								1505		
v/c Ratio						0.19								0.03		
95% Queue Length, Q <sub>95</sub> (veh)						0.7								0.1		
Control Delay (s/veh)						10.4								7.5		
Level of Service (LOS)						B								A		
Approach Delay (s/veh)					10.4								2.4			
Approach LOS					B											

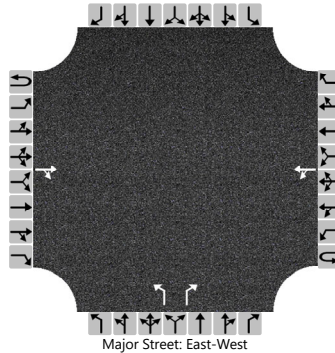


# HCS7 Two-Way Stop-Control Report

## General Information

Analyst	KG	Intersection	Streeter Dr & Northshore
Agency/Co.	Felsburg Holt & Ullevig	Jurisdiction	SDDOT
Date Performed	2/6/2023	East/West Street	Northshore Dr
Analysis Year	2045	North/South Street	Streeter Dr
Time Analyzed	AM Peak Hour	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	SDDOT Northshore Dr - Build Sweeping Curve		

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		1	0	1		0	0	0
Configuration				TR		LT				L		R				
Volume (veh/h)			295	50		25	440			100		35				
Percent Heavy Vehicles (%)						0				2		0				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized									Yes							
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.10				6.42		6.20				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.20				3.52		3.30				

## Delay, Queue Length, and Level of Service

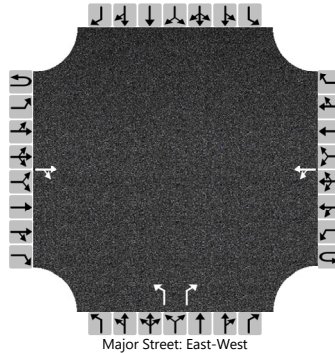
Flow Rate, v (veh/h)						27				109		38				
Capacity, c (veh/h)						1195				308		700				
v/c Ratio						0.02				0.35		0.05				
95% Queue Length, Q <sub>95</sub> (veh)						0.1				1.5		0.2				
Control Delay (s/veh)						8.1				23.0		10.4				
Level of Service (LOS)						A				C		B				
Approach Delay (s/veh)					0.7				19.7							
Approach LOS									C							

# HCS7 Two-Way Stop-Control Report

## General Information

Analyst	KG	Intersection	Streeter Dr & Northshore
Agency/Co.	Felsburg Holt & Ullevig	Jurisdiction	SDDOT
Date Performed	2/6/2023	East/West Street	Northshore Dr
Analysis Year	2045	North/South Street	Streeter Dr
Time Analyzed	Dismissal Peak Hour	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	SDDOT Northshore Dr - Build Sweeping Curve		

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		1	0	1		0	0	0
Configuration				TR		LT				L		R				
Volume (veh/h)			285	60		35	145			30		30				
Percent Heavy Vehicles (%)						0				0		8				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized									Yes							
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.10				6.40		6.28				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.20				3.50		3.37				

## Delay, Queue Length, and Level of Service

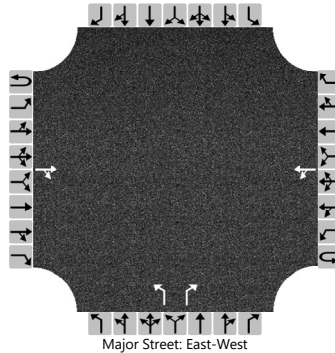
Flow Rate, v (veh/h)						38				33		33				
Capacity, c (veh/h)						1195				466		687				
v/c Ratio						0.03				0.07		0.05				
95% Queue Length, Q <sub>95</sub> (veh)						0.1				0.2		0.1				
Control Delay (s/veh)						8.1				13.3		10.5				
Level of Service (LOS)						A				B		B				
Approach Delay (s/veh)					1.8				11.9							
Approach LOS									B							

# HCS7 Two-Way Stop-Control Report

## General Information

Analyst	KG	Intersection	Streeter Dr & Northshore
Agency/Co.	Felsburg Holt & Ullevig	Jurisdiction	SDDOT
Date Performed	2/6/2023	East/West Street	Northshore Dr
Analysis Year	2045	North/South Street	Streeter Dr
Time Analyzed	AM Peak Hour	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	SDDOT Northshore Dr - Build Sweeping Curve		

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		1	0	1		0	0	0
Configuration				TR		LT				L		R				
Volume (veh/h)			185	30		55	190			30		45				
Percent Heavy Vehicles (%)						0				2		0				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized									Yes							
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.10				6.42		6.20				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.20				3.52		3.30				

## Delay, Queue Length, and Level of Service

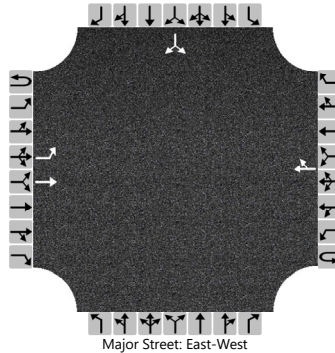
Flow Rate, v (veh/h)						60				33		49				
Capacity, c (veh/h)						1346				475		827				
v/c Ratio						0.04				0.07		0.06				
95% Queue Length, Q <sub>95</sub> (veh)						0.1				0.2		0.2				
Control Delay (s/veh)						7.8				13.1		9.6				
Level of Service (LOS)						A				B		A				
Approach Delay (s/veh)					2.1				11.0							
Approach LOS									B							

# HCS7 Two-Way Stop-Control Report

## General Information

Analyst	KG	Intersection	Westshore Dr & 333rd Ave
Agency/Co.	Felsburg Holt & Ullevig	Jurisdiction	SDDOT
Date Performed	2/7/23	East/West Street	333rd Ave
Analysis Year	2045	North/South Street	Westshore Dr
Time Analyzed	AM Peak Hour	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	SDDOT Northshore Dr - Build Sweeping Curve		

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	1	0		0	0	0		0	1	0
Configuration		L	T					TR							LR	
Volume (veh/h)		75	160				10	75						40		10
Percent Heavy Vehicles (%)		0												2		0
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.1		6.2
Critical Headway (sec)		4.10												6.42		6.20
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.20												3.52		3.30

## Delay, Queue Length, and Level of Service

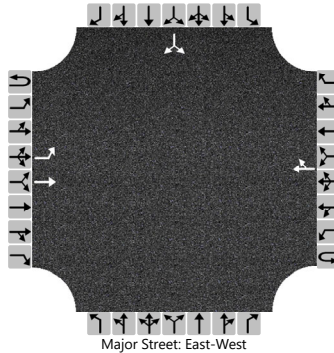
Flow Rate, v (veh/h)		82													54	
Capacity, c (veh/h)		1515													637	
v/c Ratio		0.05													0.09	
95% Queue Length, Q <sub>95</sub> (veh)		0.2													0.3	
Control Delay (s/veh)		7.5													11.2	
Level of Service (LOS)		A													B	
Approach Delay (s/veh)	2.4												11.2			
Approach LOS													B			

# HCS7 Two-Way Stop-Control Report

## General Information

Analyst	KG	Intersection	Westshore Dr & 333rd Ave
Agency/Co.	Felsburg Holt & Ullevig	Jurisdiction	SDDOT
Date Performed	2/7/23	East/West Street	333rd Ave
Analysis Year	2045	North/South Street	Westshore Dr
Time Analyzed	Dismissal Peak Hour	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	SDDOT Northshore Dr - Build Sweeping Curve		

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	1	0		0	0	0		0	1	0
Configuration		L	T					TR							LR	
Volume (veh/h)		10	45				100	35						45		10
Percent Heavy Vehicles (%)		0												2		0
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.1		6.2
Critical Headway (sec)		4.10												6.42		6.20
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.20												3.52		3.30

## Delay, Queue Length, and Level of Service

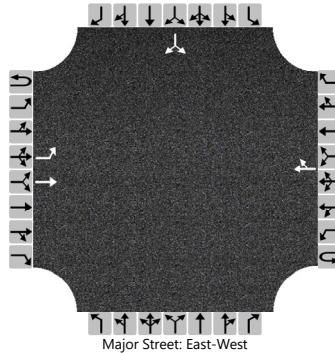
Flow Rate, v (veh/h)		11													60	
Capacity, c (veh/h)		1448													807	
v/c Ratio		0.01													0.07	
95% Queue Length, Q <sub>95</sub> (veh)		0.0													0.2	
Control Delay (s/veh)		7.5													9.8	
Level of Service (LOS)		A													A	
Approach Delay (s/veh)	1.4												9.8			
Approach LOS													A			

# HCS7 Two-Way Stop-Control Report

## General Information

Analyst	KG	Intersection	Westshore Dr & 333rd Ave
Agency/Co.	Felsburg Holt & Ullevig	Jurisdiction	SDDOT
Date Performed	2/7/23	East/West Street	333rd Ave
Analysis Year	2045	North/South Street	Westshore Dr
Time Analyzed	PM Peak Hour	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	SDDOT Northshore Dr - Build Sweeping Curve		

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	1	0		0	0	0		0	1	0
Configuration		L	T					TR							LR	
Volume (veh/h)		5	85				135	25						45		5
Percent Heavy Vehicles (%)		0												2		0
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.1		6.2
Critical Headway (sec)		4.10												6.42		6.20
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.20												3.52		3.30

## Delay, Queue Length, and Level of Service

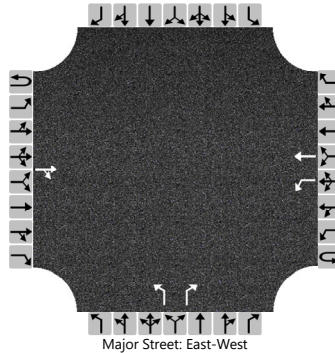
Flow Rate, v (veh/h)		5													54	
Capacity, c (veh/h)		1415													736	
v/c Ratio		0.00													0.07	
95% Queue Length, Q <sub>95</sub> (veh)		0.0													0.2	
Control Delay (s/veh)		7.6													10.3	
Level of Service (LOS)		A													B	
Approach Delay (s/veh)	0.4												10.3			
Approach LOS													B			

# HCS7 Two-Way Stop-Control Report

## General Information

Analyst	KG	Intersection	Northshore Dr & 333rd Ave
Agency/Co.	Felsburg Holt & Ullevig	Jurisdiction	SDDOT
Date Performed	2/7/23	East/West Street	333rd Ave
Analysis Year	2045	North/South Street	Northshore Dr
Time Analyzed	AM Peak Hour	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	SDDOT Northshore Dr - Build Sweeping Curves		

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	1	1	0		1	0	1		0	0	0
Configuration				TR		L	T			L		R				
Volume (veh/h)			195	5		460	80			5		325				
Percent Heavy Vehicles (%)						2				2		2				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized									Yes							
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.12				6.42		6.22				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.22				3.52		3.32				

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)					500				5		353					
Capacity, c (veh/h)					1352				112		825					
v/c Ratio					0.37				0.05		0.43					
95% Queue Length, Q <sub>95</sub> (veh)					1.7				0.2		2.2					
Control Delay (s/veh)					9.2				38.8		12.6					
Level of Service (LOS)					A				E		B					
Approach Delay (s/veh)					7.9				13.0							
Approach LOS									B							



# HCS7 Two-Way Stop-Control Report

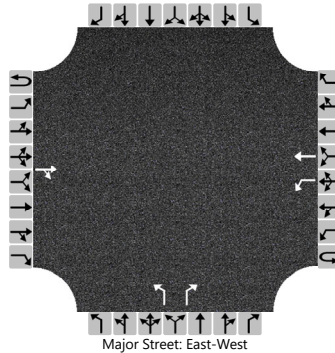
## General Information

Analyst	KG
Agency/Co.	Felsburg Holt & Ullevig
Date Performed	2/7/23
Analysis Year	2045
Time Analyzed	Dismissal Peak Hour
Intersection Orientation	East-West
Project Description	SDDOT Northshore Dr - Build Sweeping Curve

## Site Information

Intersection	Northshore Dr & 333rd Ave
Jurisdiction	SDDOT
East/West Street	333rd Ave
North/South Street	Northshore Dr
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	1	1	0		1	0	1		0	0	0
Configuration				TR		L	T			L		R				
Volume (veh/h)			85	5		175	130			5		310				
Percent Heavy Vehicles (%)						2				2		2				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized									Yes							
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.12				6.42		6.22				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.22				3.52		3.32				

## Delay, Queue Length, and Level of Service

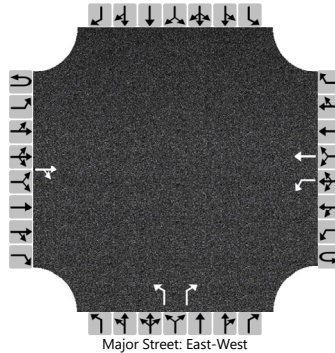
Flow Rate, v (veh/h)						190				5		337				
Capacity, c (veh/h)						1495				396		962				
v/c Ratio						0.13				0.01		0.35				
95% Queue Length, Q <sub>95</sub> (veh)						0.4				0.0		1.6				
Control Delay (s/veh)						7.8				14.2		10.8				
Level of Service (LOS)						A				B		B				
Approach Delay (s/veh)					4.5				10.8							
Approach LOS									B							

# HCS7 Two-Way Stop-Control Report

## General Information

Analyst	KG	Intersection	Northshore Dr & 333rd Ave
Agency/Co.	Felsburg Holt & Ullevig	Jurisdiction	SDDOT
Date Performed	2/7/23	East/West Street	333rd Ave
Analysis Year	2045	North/South Street	Northshore Dr
Time Analyzed	PM Peak Hour	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	SDDOT Northshore Dr - Build Sweeping Curve		

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	1	1	0		1	0	1		0	0	0
Configuration				TR		L	T			L		R				
Volume (veh/h)			125	5		240	155			5		225				
Percent Heavy Vehicles (%)						2				2		2				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized									Yes							
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.12				6.42		6.22				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.22				3.52		3.32				

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						261				5		245				
Capacity, c (veh/h)						1442				279		910				
v/c Ratio						0.18				0.02		0.27				
95% Queue Length, Q <sub>95</sub> (veh)						0.7				0.1		1.1				
Control Delay (s/veh)						8.0				18.2		10.4				
Level of Service (LOS)						A				C		B				
Approach Delay (s/veh)					4.9				10.6							
Approach LOS									B							

# HCS7 Two-Way Stop-Control Report

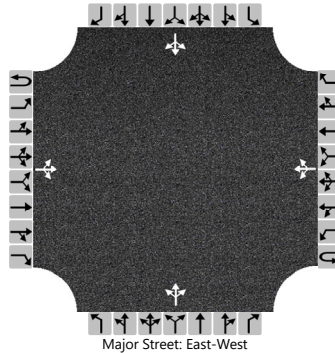
## General Information

Analyst	KG
Agency/Co.	Felsbrug Holt & Ullevig
Date Performed	2/6/2023
Analysis Year	2045
Time Analyzed	AM Peak Hour
Intersection Orientation	East-West
Project Description	SDDOT Northshore Dr - Build (Unconstrained)

## Site Information

Intersection	484th Ave & Northshore Dr
Jurisdiction	SDDOT
East/West Street	Northshore Dr
North/South Street	484th Ave/Westshore Dr
Peak Hour Factor	0.85
Analysis Time Period (hrs)	0.25

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		270	75	5		10	50	5		5	35	5		10	5	60
Percent Heavy Vehicles (%)		0				10				0	0	5		3	0	0
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.10				4.20				7.10	6.50	6.25		7.13	6.50	6.20
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.20				2.29				3.50	4.00	3.35		3.53	4.00	3.30

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		318				12					53				88	
Capacity, c (veh/h)		1550				1451					262				584	
v/c Ratio		0.20				0.01					0.20				0.15	
95% Queue Length, Q <sub>95</sub> (veh)		0.8				0.0					0.7				0.5	
Control Delay (s/veh)		7.9				7.5					22.2				12.3	
Level of Service (LOS)		A				A					C				B	
Approach Delay (s/veh)	6.5				1.2				22.2				12.3			
Approach LOS									C				B			

# HCS7 Two-Way Stop-Control Report

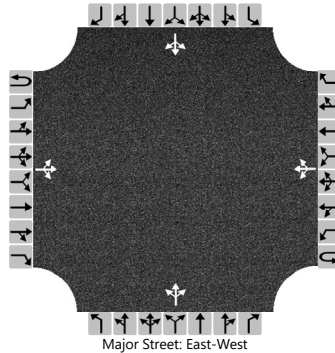
## General Information

Analyst	KG
Agency/Co.	Felsbrug Holt & Ullevig
Date Performed	2/6/2023
Analysis Year	2045
Time Analyzed	Dismissal Peak Hour
Intersection Orientation	East-West
Project Description	SDDOT Northshore Dr - Build (Unconstrained)

## Site Information

Intersection	484th Ave & Northshore Dr
Jurisdiction	SDDOT
East/West Street	Northshore Dr
North/South Street	484th Ave/Westshore Dr
Peak Hour Factor	0.83
Analysis Time Period (hrs)	0.25

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		70	55	10		5	60	10		5	25	5		15	30	130
Percent Heavy Vehicles (%)		0				6				0	0	5		7	0	0
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.10				4.16				7.10	6.50	6.25		7.17	6.50	6.20
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.20				2.25				3.50	4.00	3.35		3.56	4.00	3.30

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		84				6					42				211	
Capacity, c (veh/h)		1525				1495					559				818	
v/c Ratio		0.06				0.00					0.08				0.26	
95% Queue Length, Q <sub>95</sub> (veh)		0.2				0.0					0.2				1.0	
Control Delay (s/veh)		7.5				7.4					12.0				10.9	
Level of Service (LOS)		A				A					B				B	
Approach Delay (s/veh)	4.1				0.5				12.0				10.9			
Approach LOS									B				B			

# HCS7 Two-Way Stop-Control Report

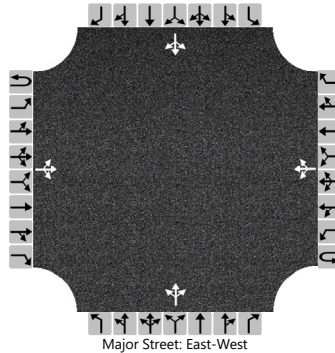
## General Information

Analyst	KG
Agency/Co.	Felsbrug Holt & Ullevig
Date Performed	2/6/2023
Analysis Year	2045
Time Analyzed	PM Peak Hour
Intersection Orientation	East-West
Project Description	SDDOT Northshore Dr - Build (Unconstrained)

## Site Information

Intersection	484th Ave & Northshore Dr
Jurisdiction	SDDOT
East/West Street	Northshore Dr
North/South Street	484th Ave/Westshore Dr
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		80	60	10		25	60	20		10	50	5		5	40	175
Percent Heavy Vehicles (%)		0				0				0	0	0		0	0	0
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.10				4.10				7.10	6.50	6.20		7.10	6.50	6.20
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.20				2.20				3.50	4.00	3.30		3.50	4.00	3.30

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		89				28					72				244	
Capacity, c (veh/h)		1519				1534					485				825	
v/c Ratio		0.06				0.02					0.15				0.30	
95% Queue Length, Q <sub>95</sub> (veh)		0.2				0.1					0.5				1.2	
Control Delay (s/veh)		7.5				7.4					13.7				11.2	
Level of Service (LOS)		A				A					B				B	
Approach Delay (s/veh)	4.2				1.9				13.7				11.2			
Approach LOS									B				B			

# HCS7 Two-Way Stop-Control Report

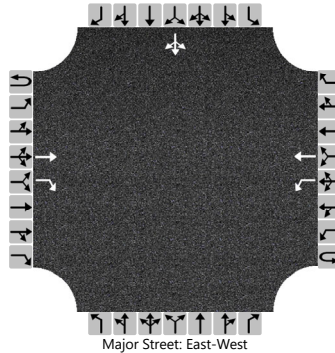
## General Information

Analyst	KG
Agency/Co.	Felsburg Holt & Ullevig
Date Performed	1/30/2023
Analysis Year	2045
Time Analyzed	AM Peak Hour
Intersection Orientation	East-West
Project Description	SDDOT Northshore Dr - Build (Unconstrained)

## Site Information

Intersection	I-29 SB Ramp & Northshore
Jurisdiction	SDDOT
East/West Street	Northshore Dr
North/South Street	I-29 SB Ramp
Peak Hour Factor	0.80
Analysis Time Period (hrs)	0.25

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	1	0	1	1	0		0	0	0		0	1	0
Configuration			T	R		L	T								LTR	
Volume (veh/h)			145	520		30	675							25	5	55
Percent Heavy Vehicles (%)						21								5	0	0
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized	No															
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)						4.1								7.1	6.5	6.2
Critical Headway (sec)						4.31								7.15	6.50	6.20
Base Follow-Up Headway (sec)						2.2								3.5	4.0	3.3
Follow-Up Headway (sec)						2.39								3.55	4.00	3.30

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						38									106	
Capacity, c (veh/h)						725									289	
v/c Ratio						0.05									0.37	
95% Queue Length, Q <sub>95</sub> (veh)						0.2									1.6	
Control Delay (s/veh)						10.2									24.5	
Level of Service (LOS)						B									C	
Approach Delay (s/veh)					0.4								24.5			
Approach LOS													C			

# HCS7 Two-Way Stop-Control Report

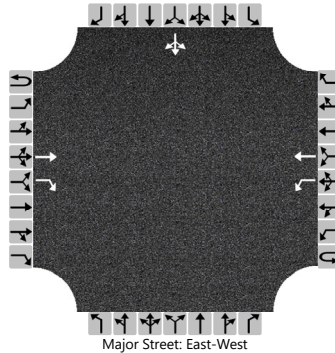
## General Information

Analyst	KG
Agency/Co.	Felsburg Holt & Ullevig
Date Performed	2/6/23
Analysis Year	2045
Time Analyzed	Dismissal Peak Hour
Intersection Orientation	East-West
Project Description	SDDOT Northshore Dr - Build (Unconstrained)

## Site Information

Intersection	I-29 SB Ramp & Northshore
Jurisdiction	SDDOT
East/West Street	Northshore Dr
North/South Street	I-29 SB Ramp
Peak Hour Factor	0.76
Analysis Time Period (hrs)	0.25

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	1	0	1	1	0		0	0	0		0	1	0
Configuration			T	R		L	T								LTR	
Volume (veh/h)			130	425		45	380							15	0	45
Percent Heavy Vehicles (%)						14								13	0	4
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized	No															
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)						4.1								7.1	6.5	6.2
Critical Headway (sec)						4.24								7.23	6.50	6.24
Base Follow-Up Headway (sec)						2.2								3.5	4.0	3.3
Follow-Up Headway (sec)						2.33								3.62	4.00	3.34

## Delay, Queue Length, and Level of Service

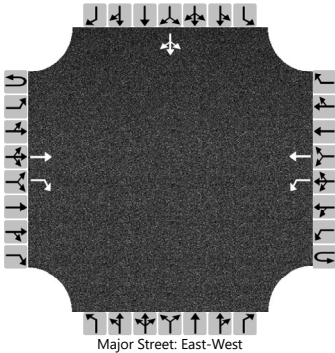
Flow Rate, v (veh/h)						59									79	
Capacity, c (veh/h)						821									717	
v/c Ratio						0.07									0.11	
95% Queue Length, Q <sub>95</sub> (veh)						0.2									0.4	
Control Delay (s/veh)						9.7									10.6	
Level of Service (LOS)						A									B	
Approach Delay (s/veh)					1.0								10.6			
Approach LOS													B			



HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	KG	Intersection	I-29 SB Ramp & Northshore
Agency/Co.	Felsburg Holt & Ullevig	Jurisdiction	SDDOT
Date Performed	2/6/23	East/West Street	Northshore Dr
Analysis Year	2045	North/South Street	I-29 SB Ramp
Time Analyzed	PM Peak Hour	Peak Hour Factor	0.95
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	SDDOT Northshore Dr - Build (Unconstrained)		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	1	0	1	1	0		0	0	0		0	1	0
Configuration			T	R		L	T								LTR	
Volume (veh/h)			125	435		25	510							25	0	45
Percent Heavy Vehicles (%)						11								0	0	0
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized	No															
Median Type   Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1								7.1	6.5	6.2
Critical Headway (sec)						4.21								7.10	6.50	6.20
Base Follow-Up Headway (sec)						2.2								3.5	4.0	3.3
Follow-Up Headway (sec)						2.30								3.50	4.00	3.30

Delay, Queue Length, and Level of Service

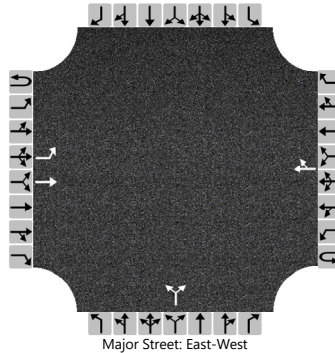
Flow Rate, v (veh/h)						26									74	
Capacity, c (veh/h)						943									663	
v/c Ratio						0.03									0.11	
95% Queue Length, Q <sub>95</sub> (veh)						0.1									0.4	
Control Delay (s/veh)						8.9									11.1	
Level of Service (LOS)						A									B	
Approach Delay (s/veh)					0.4								11.1			
Approach LOS													B			

# HCS7 Two-Way Stop-Control Report

## General Information

Analyst	KG	Intersection	I-29 NB Ramp & Northshore
Agency/Co.	Felsburg Holt & Ullevig	Jurisdiction	SDDOT
Date Performed	2/6/2023	East/West Street	Northshore Dr
Analysis Year	2045	North/South Street	I-29 NB Ramp
Time Analyzed	AM Peak Hour	Peak Hour Factor	0.75
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	SDDOT Northshore Dr - Build (Unconstrained)		

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	1	0		0	1	0		0	0	0
Configuration		L	T					TR			LR					
Volume (veh/h)		40	130				105	15		600		55				
Percent Heavy Vehicles (%)		0								2		8				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)		4.1								7.1		6.2				
Critical Headway (sec)		4.10								7.12		6.28				
Base Follow-Up Headway (sec)		2.2								3.5		3.3				
Follow-Up Headway (sec)		2.20								3.52		3.37				

## Delay, Queue Length, and Level of Service

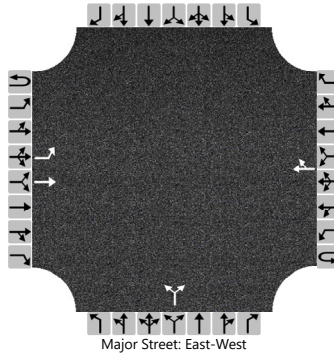
Flow Rate, v (veh/h)		53								873						
Capacity, c (veh/h)		1432								538						
v/c Ratio		0.04								1.62						
95% Queue Length, Q <sub>95</sub> (veh)		0.1								48.6						
Control Delay (s/veh)		7.6								308.1						
Level of Service (LOS)		A								F						
Approach Delay (s/veh)	1.8								308.1							
Approach LOS									F							

# HCS7 Two-Way Stop-Control Report

## General Information

Analyst	KG	Intersection	I-29 NB Ramp & Northshore
Agency/Co.	Felsburg Holt & Ullevig	Jurisdiction	SDDOT
Date Performed	2/6/2023	East/West Street	Northshore Dr
Analysis Year	2045	North/South Street	I-29 NB Ramp
Time Analyzed	Dismissal Peak Hour	Peak Hour Factor	0.86
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	SDDOT Northshore Dr - Build (Unconstrained)		

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	1	0		0	1	0		0	0	0
Configuration		L	T					TR			LR					
Volume (veh/h)		45	100				125	35		300		35				
Percent Heavy Vehicles (%)		7								0		6				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)		4.1								7.1		6.2				
Critical Headway (sec)		4.17								7.10		6.26				
Base Follow-Up Headway (sec)		2.2								3.5		3.3				
Follow-Up Headway (sec)		2.26								3.50		3.35				

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		52								390						
Capacity, c (veh/h)		1359								597						
v/c Ratio		0.04								0.65						
95% Queue Length, Q <sub>95</sub> (veh)		0.1								4.8						
Control Delay (s/veh)		7.8								21.7						
Level of Service (LOS)		A								C						
Approach Delay (s/veh)	2.4								21.7							
Approach LOS									C							

# HCS7 Two-Way Stop-Control Report

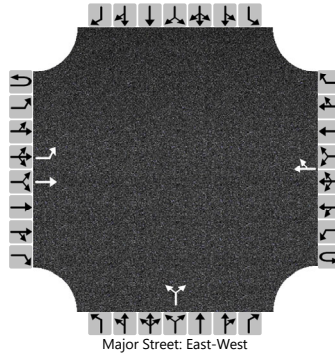
## General Information

Analyst	KG
Agency/Co.	Felsburg Holt & Ullevig
Date Performed	2/6/2023
Analysis Year	2045
Time Analyzed	PM Peak Hour
Intersection Orientation	East-West
Project Description	SDDOT Northshore Dr - Build (Unconstrained)

## Site Information

Intersection	I-29 NB Ramp & Northshore
Jurisdiction	SDDOT
East/West Street	Northshore Dr
North/South Street	I-29 NB Ramp
Peak Hour Factor	0.88
Analysis Time Period (hrs)	0.25

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	1	0		0	1	0		0	0	0
Configuration		L	T					TR			LR					
Volume (veh/h)		75	75				125	40		410		40				
Percent Heavy Vehicles (%)		0								1		2				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)		4.1								7.1		6.2				
Critical Headway (sec)		4.10								7.11		6.22				
Base Follow-Up Headway (sec)		2.2								3.5		3.3				
Follow-Up Headway (sec)		2.20								3.51		3.32				

## Delay, Queue Length, and Level of Service

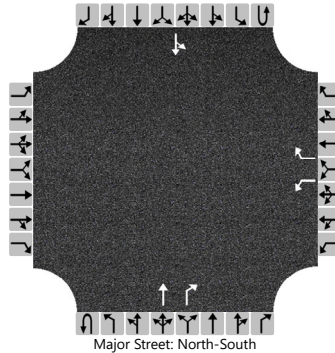
Flow Rate, v (veh/h)		85								511						
Capacity, c (veh/h)		1399								546						
v/c Ratio		0.06								0.94						
95% Queue Length, Q <sub>95</sub> (veh)		0.2								11.8						
Control Delay (s/veh)		7.7								51.9						
Level of Service (LOS)		A								F						
Approach Delay (s/veh)	3.9								51.9							
Approach LOS									F							

# HCS7 Two-Way Stop-Control Report

## General Information

Analyst	KG	Intersection	Westshore Dr & 333rd Ave
Agency/Co.	Felsburg Holt & Ullevig	Jurisdiction	SDDOT
Date Performed	2/7/23	East/West Street	333rd Ave
Analysis Year	2045	North/South Street	Westshore Dr
Time Analyzed	AM Peak Hour	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	SDDOT Northshore Dr - Build (Unconstrained)		

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		1	0	1	0	0	1	1	0	0	1	0
Configuration						L		R			T	R		LT		
Volume (veh/h)						40		90			115	200		55	40	
Percent Heavy Vehicles (%)						2		2						2		
Proportion Time Blocked																
Percent Grade (%)					0											
Right Turn Channelized					No				No							
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)						7.1		6.2						4.1		
Critical Headway (sec)						6.42		6.22						4.12		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.52		3.32						2.22		

## Delay, Queue Length, and Level of Service

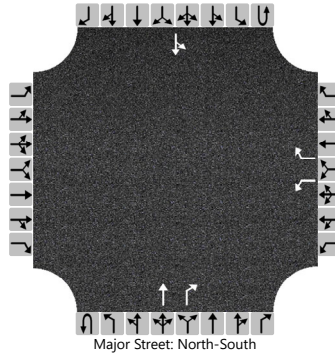
Flow Rate, v (veh/h)						43		98						60		
Capacity, c (veh/h)						667		926						1217		
v/c Ratio						0.07		0.11						0.05		
95% Queue Length, Q <sub>95</sub> (veh)						0.2		0.4						0.2		
Control Delay (s/veh)						10.8		9.3						8.1		
Level of Service (LOS)						B		A						A		
Approach Delay (s/veh)					9.8								4.9			
Approach LOS					A											

# HCS7 Two-Way Stop-Control Report

## General Information

Analyst	KG	Intersection	Westshore Dr & 333rd Ave
Agency/Co.	Felsburg Holt & Ullevig	Jurisdiction	SDDOT
Date Performed	2/7/23	East/West Street	333rd Ave
Analysis Year	2045	North/South Street	Westshore Dr
Time Analyzed	Dismissal Peak Hour	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	SDDOT Northshore Dr - Build (Unconstrained)		

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		1	0	1	0	0	1	1	0	0	1	0
Configuration						L		R			T	R		LT		
Volume (veh/h)						130		50			35	70		55	40	
Percent Heavy Vehicles (%)						2		2						2		
Proportion Time Blocked																
Percent Grade (%)					0											
Right Turn Channelized					No				No							
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)						7.1		6.2						4.1		
Critical Headway (sec)						6.42		6.22						4.12		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.52		3.32						2.22		

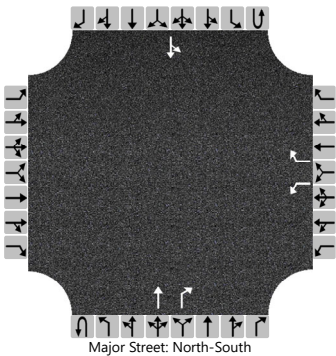
## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						141		54						60		
Capacity, c (veh/h)						755		1034						1475		
v/c Ratio						0.19		0.05						0.04		
95% Queue Length, Q <sub>95</sub> (veh)						0.7		0.2						0.1		
Control Delay (s/veh)						10.9		8.7						7.5		
Level of Service (LOS)						B		A						A		
Approach Delay (s/veh)					10.3								4.5			
Approach LOS					B											

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	KG	Intersection	Westshore Dr & 333rd Ave
Agency/Co.	Felsburg Holt & Ullevig	Jurisdiction	SDDOT
Date Performed	2/7/23	East/West Street	333rd Ave
Analysis Year	2045	North/South Street	Westshore Dr
Time Analyzed	PM Peak Hour	Peak Hour Factor	0.92
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	SDDOT Northshore Dr - Build (Unconstrained)		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		1	0	1	0	0	1	1	0	0	1	0
Configuration						L		R			T	R		LT		
Volume (veh/h)						175		40			35	115		60	45	
Percent Heavy Vehicles (%)						2		2						2		
Proportion Time Blocked																
Percent Grade (%)					0											
Right Turn Channelized					No				No							
Median Type   Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)						7.1		6.2						4.1		
Critical Headway (sec)						6.42		6.22						4.12		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.52		3.32						2.22		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						190		43						65		
Capacity, c (veh/h)						734		1034						1416		
v/c Ratio						0.26		0.04						0.05		
95% Queue Length, Q <sub>95</sub> (veh)						1.0		0.1						0.1		
Control Delay (s/veh)						11.6		8.6						7.7		
Level of Service (LOS)						B		A						A		
Approach Delay (s/veh)					11.1								4.5			
Approach LOS					B											



# HCS7 Two-Way Stop-Control Report

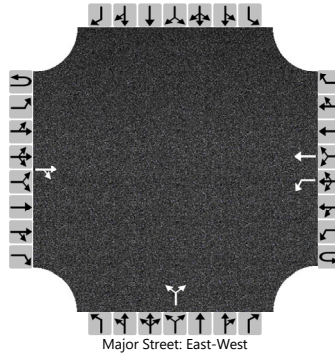
## General Information

Analyst	KG
Agency/Co.	Felsburg Holt & Ullevig
Date Performed	2/7/23
Analysis Year	2045
Time Analyzed	AM Peak Hour
Intersection Orientation	East-West
Project Description	SDDOT Northshore Dr - Build (Unconstrained)

## Site Information

Intersection	Northshore Dr & 333rd Ave
Jurisdiction	SDDOT
East/West Street	333rd Ave
North/South Street	Northshore Dr
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	1	1	0		0	1	0		0	0	0
Configuration				TR		L	T				LR					
Volume (veh/h)			340	5		460	270			5		325				
Percent Heavy Vehicles (%)						2				2		2				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.12				6.42		6.22				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.22				3.52		3.32				

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)					500					359						
Capacity, c (veh/h)					1183					585						
v/c Ratio					0.42					0.61						
95% Queue Length, Q <sub>95</sub> (veh)					2.1					4.1						
Control Delay (s/veh)					10.2					20.4						
Level of Service (LOS)					B					C						
Approach Delay (s/veh)					6.5				20.4							
Approach LOS									C							

# HCS7 Two-Way Stop-Control Report

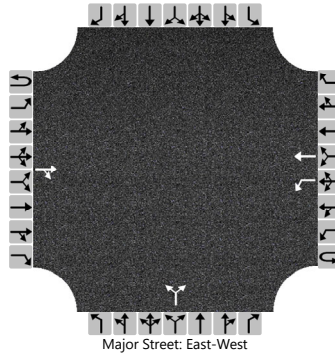
## General Information

Analyst	KG
Agency/Co.	Felsburg Holt & Ullevig
Date Performed	2/7/23
Analysis Year	2045
Time Analyzed	Dismissal Peak Hour
Intersection Orientation	East-West
Project Description	SDDOT Northshore Dr - Build (Unconstrained)

## Site Information

Intersection	Northshore Dr & 333rd Ave
Jurisdiction	SDDOT
East/West Street	333rd Ave
North/South Street	Northshore Dr
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	1	1	0		0	1	0		0	0	0
Configuration				TR		L	T				LR					
Volume (veh/h)			245	5		175	250			5		310				
Percent Heavy Vehicles (%)						2				2		2				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.12				6.42		6.22				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.22				3.52		3.32				

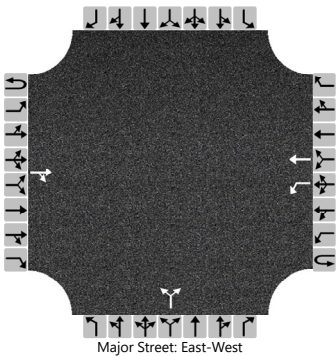
## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						190					342					
Capacity, c (veh/h)						1292					746					
v/c Ratio						0.15					0.46					
95% Queue Length, Q <sub>95</sub> (veh)						0.5					2.4					
Control Delay (s/veh)						8.3					13.9					
Level of Service (LOS)						A					B					
Approach Delay (s/veh)					3.4				13.9							
Approach LOS									B							

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	KG	Intersection	Northshore Dr & 333rd Ave
Agency/Co.	Felsburg Holt & Ullevig	Jurisdiction	SDDOT
Date Performed	2/7/23	East/West Street	333rd Ave
Analysis Year	2045	North/South Street	Northshore Dr
Time Analyzed	PM Peak Hour	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	SDDOT Northshore Dr - Build (Unconstrained)		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	1	1	0		0	1	0		0	0	0
Configuration				TR		L	T				LR					
Volume (veh/h)			330	5		240	310			5		225				
Percent Heavy Vehicles (%)						2				2		2				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized																
Median Type   Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.12				6.42		6.22				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.22				3.52		3.32				

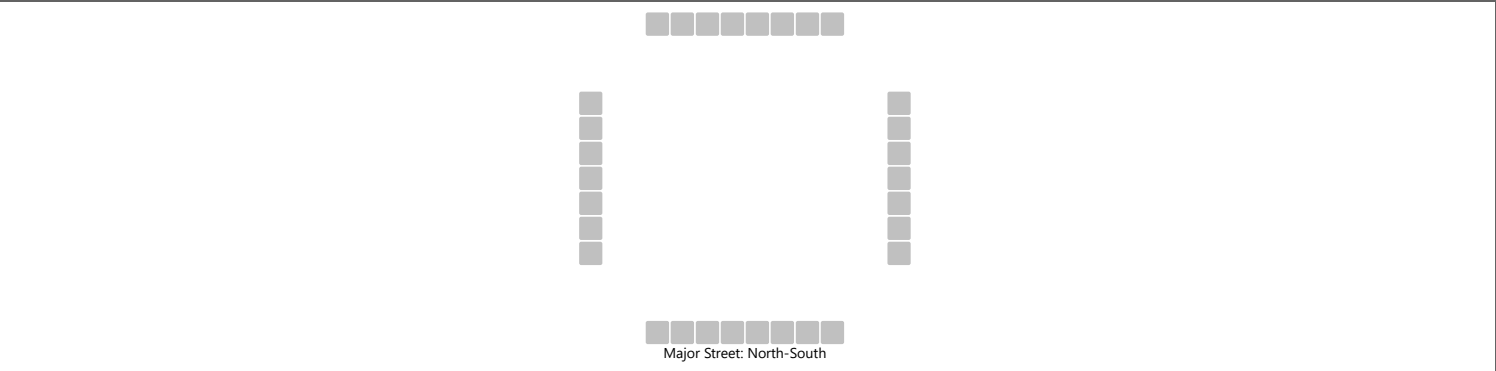
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)					261					250						
Capacity, c (veh/h)					1194					636						
v/c Ratio					0.22					0.39						
95% Queue Length, Q <sub>95</sub> (veh)					0.8					1.9						
Control Delay (s/veh)					8.9					14.3						
Level of Service (LOS)					A					B						
Approach Delay (s/veh)					3.9				14.3							
Approach LOS									B							

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	KG	Intersection	484th Ave & Northshore Dr
Agency/Co.	Felsbrug Holt & Ullevig	Jurisdiction	SDDOT
Date Performed	2/6/2023	East/West Street	Northshore Dr
Analysis Year	2045	North/South Street	484th Ave/Westshore Dr
Time Analyzed	AM Peak Hour	Peak Hour Factor	0.85
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	SDDOT Northshore Dr-Sweeping Curve (Unconstrained)		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	0	0	1	1	0
Configuration							LR					TR		L	T	
Volume (veh/h)						55		40			370	80		15	60	
Percent Heavy Vehicles (%)						10		3						3		
Proportion Time Blocked																
Percent Grade (%)					0											
Right Turn Channelized																
Median Type   Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)						7.1		6.2						4.1		
Critical Headway (sec)						6.50		6.23						4.13		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.59		3.33						2.23		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						112								18		
Capacity, c (veh/h)						498								1033		
v/c Ratio						0.22								0.02		
95% Queue Length, Q <sub>95</sub> (veh)						0.9								0.1		
Control Delay (s/veh)						14.3								8.5		
Level of Service (LOS)						B								A		
Approach Delay (s/veh)					14.3								1.7			
Approach LOS					B											

# HCS7 Two-Way Stop-Control Report

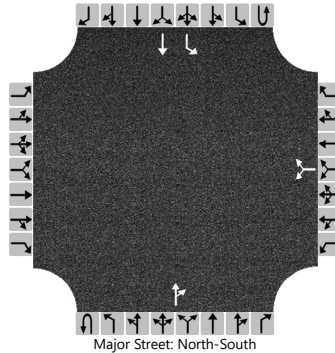
## General Information

Analyst	KG
Agency/Co.	Felsbrug Holt & Ullevig
Date Performed	2/6/2023
Analysis Year	2045
Time Analyzed	Dismissal Peak Hour
Intersection Orientation	North-South
Project Description	SDDOT Northshore Dr-Sweeping Curve (Unconstrained)

## Site Information

Intersection	484th Ave & Northshore Dr
Jurisdiction	SDDOT
East/West Street	Northshore Dr
North/South Street	484th Ave/Westshore Dr
Peak Hour Factor	0.83
Analysis Time Period (hrs)	0.25

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	0	0	1	1	0
Configuration							LR					TR		L	T	
Volume (veh/h)						65		35			65	65		45	130	
Percent Heavy Vehicles (%)						6		3						7		
Proportion Time Blocked																
Percent Grade (%)					0											
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)						7.1		6.2						4.1		
Critical Headway (sec)						6.46		6.23						4.17		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.55		3.33						2.26		

## Delay, Queue Length, and Level of Service

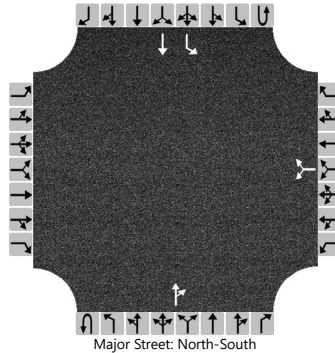
Flow Rate, v (veh/h)						120								54		
Capacity, c (veh/h)						676								1393		
v/c Ratio						0.18								0.04		
95% Queue Length, Q <sub>95</sub> (veh)						0.6								0.1		
Control Delay (s/veh)						11.5								7.7		
Level of Service (LOS)						B								A		
Approach Delay (s/veh)					11.5								2.0			
Approach LOS					B											

# HCS7 Two-Way Stop-Control Report

## General Information

Analyst	KG	Intersection	484th Ave & Northshore Dr
Agency/Co.	Felsbrug Holt & Ullevig	Jurisdiction	SDDOT
Date Performed	2/6/2023	East/West Street	Northshore Dr
Analysis Year	2045	North/South Street	484th Ave/Westshore Dr
Time Analyzed	PM Peak Hour	Peak Hour Factor	0.90
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	SDDOT Northshore Dr-Sweeping Curve (Unconstrained)		

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	0	0	1	1	0
Configuration							LR					TR		L	T	
Volume (veh/h)						70		70			80	70		45	175	
Percent Heavy Vehicles (%)						0		3						0		
Proportion Time Blocked																
Percent Grade (%)					0											
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)						7.1		6.2						4.1		
Critical Headway (sec)						6.40		6.23						4.10		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.50		3.33						2.20		

## Delay, Queue Length, and Level of Service

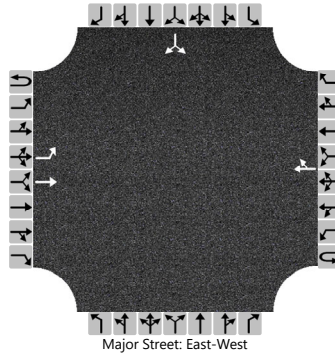
Flow Rate, v (veh/h)						156								50		
Capacity, c (veh/h)						705								1424		
v/c Ratio						0.22								0.04		
95% Queue Length, Q <sub>95</sub> (veh)						0.8								0.1		
Control Delay (s/veh)						11.5								7.6		
Level of Service (LOS)						B								A		
Approach Delay (s/veh)					11.5								1.6			
Approach LOS					B											

# HCS7 Two-Way Stop-Control Report

## General Information

Analyst	KG	Intersection	Westshore Dr & 333rd Ave
Agency/Co.	Felsburg Holt & Ullevig	Jurisdiction	SDDOT
Date Performed	2/7/23	East/West Street	333rd Ave
Analysis Year	2045	North/South Street	Westshore Dr
Time Analyzed	AM Peak Hour	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	SDDOT Northshore Dr-Sweeping Curve (Unconstrained)		

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	1	0		0	0	0		0	1	0
Configuration		L	T					TR							LR	
Volume (veh/h)		115	200				40	90						55		40
Percent Heavy Vehicles (%)		0												2		0
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.1		6.2
Critical Headway (sec)		4.10												6.42		6.20
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.20												3.52		3.30

## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		125													103	
Capacity, c (veh/h)		1454													579	
v/c Ratio		0.09													0.18	
95% Queue Length, Q <sub>95</sub> (veh)		0.3													0.6	
Control Delay (s/veh)		7.7													12.6	
Level of Service (LOS)		A													B	
Approach Delay (s/veh)	2.8												12.6			
Approach LOS													B			

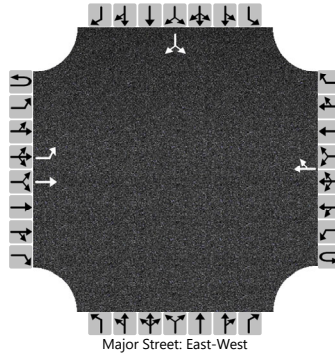


# HCS7 Two-Way Stop-Control Report

## General Information

Analyst	KG	Intersection	Westshore Dr & 333rd Ave
Agency/Co.	Felsburg Holt & Ullevig	Jurisdiction	SDDOT
Date Performed	2/7/23	East/West Street	333rd Ave
Analysis Year	2045	North/South Street	Westshore Dr
Time Analyzed	Dismissal Peak Hour	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	SDDOT Northshore Dr-Sweeping Curve (Unconstrained)		

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	1	0		0	0	0		0	1	0
Configuration		L	T					TR							LR	
Volume (veh/h)		35	70				130	50						55		40
Percent Heavy Vehicles (%)		0												2		0
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.1		6.2
Critical Headway (sec)		4.10												6.42		6.20
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.20												3.52		3.30

## Delay, Queue Length, and Level of Service

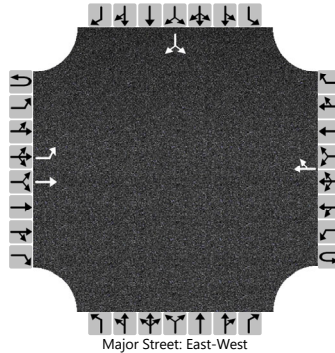
Flow Rate, v (veh/h)		38													103	
Capacity, c (veh/h)		1389													734	
v/c Ratio		0.03													0.14	
95% Queue Length, Q <sub>95</sub> (veh)		0.1													0.5	
Control Delay (s/veh)		7.7													10.7	
Level of Service (LOS)		A													B	
Approach Delay (s/veh)	2.6												10.7			
Approach LOS													B			

# HCS7 Two-Way Stop-Control Report

## General Information

Analyst	KG	Intersection	Westshore Dr & 333rd Ave
Agency/Co.	Felsburg Holt & Ullevig	Jurisdiction	SDDOT
Date Performed	2/7/23	East/West Street	333rd Ave
Analysis Year	2045	North/South Street	Westshore Dr
Time Analyzed	PM Peak Hour	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	SDDOT Northshore Dr-Sweeping Curve (Unconstrained)		

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	1	0		0	0	0		0	1	0
Configuration		L	T					TR							LR	
Volume (veh/h)		35	115				175	40						60		45
Percent Heavy Vehicles (%)		0												2		0
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized																
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.1		6.2
Critical Headway (sec)		4.10												6.42		6.20
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.20												3.52		3.30

## Delay, Queue Length, and Level of Service

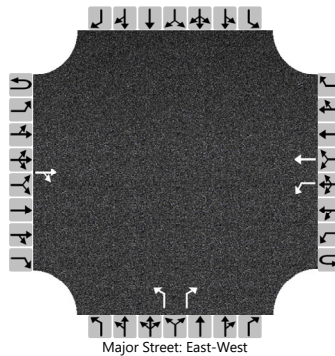
Flow Rate, v (veh/h)		38													114	
Capacity, c (veh/h)		1346													666	
v/c Ratio		0.03													0.17	
95% Queue Length, Q <sub>95</sub> (veh)		0.1													0.6	
Control Delay (s/veh)		7.8													11.5	
Level of Service (LOS)		A													B	
Approach Delay (s/veh)	1.8												11.5			
Approach LOS													B			

# HCS7 Two-Way Stop-Control Report

## General Information

Analyst	KG	Intersection	Northshore Dr & 333rd Ave
Agency/Co.	Felsburg Holt & Ullevig	Jurisdiction	SDDOT
Date Performed	2/7/23	East/West Street	333rd Ave
Analysis Year	2045	North/South Street	Northshore Dr
Time Analyzed	AM Peak Hour	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	SDDOT Northshore Dr-Sweeping Curve (Unconstrained)		

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	1	1	0		1	0	1		0	0	0
Configuration				TR		L	T			L		R				
Volume (veh/h)			340	5		460	270			5		325				
Percent Heavy Vehicles (%)						2				2		2				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized									Yes							
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.12				6.42		6.22				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.22				3.52		3.32				

## Delay, Queue Length, and Level of Service

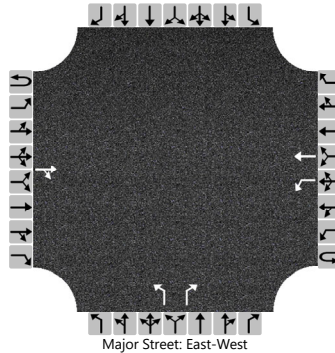
Flow Rate, v (veh/h)					500				5		353					
Capacity, c (veh/h)					1183				61		674					
v/c Ratio					0.42				0.09		0.52					
95% Queue Length, Q <sub>95</sub> (veh)					2.1				0.3		3.1					
Control Delay (s/veh)					10.2				69.3		16.1					
Level of Service (LOS)					B				F		C					
Approach Delay (s/veh)					6.5				16.9							
Approach LOS									C							

# HCS7 Two-Way Stop-Control Report

## General Information

Analyst	KG	Intersection	Northshore Dr & 333rd Ave
Agency/Co.	Felsburg Holt & Ullevig	Jurisdiction	SDDOT
Date Performed	2/7/23	East/West Street	333rd Ave
Analysis Year	2045	North/South Street	Northshore Dr
Time Analyzed	Dismissal Peak Hour	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	SDDOT Northshore Dr-Sweeping Curve (Unconstrained)		

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	1	1	0		1	0	1		0	0	0
Configuration				TR		L	T			L		R				
Volume (veh/h)			245	5		175	250			5		310				
Percent Heavy Vehicles (%)						2				2		2				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized									Yes							
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.12				6.42		6.22				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.22				3.52		3.32				

## Delay, Queue Length, and Level of Service

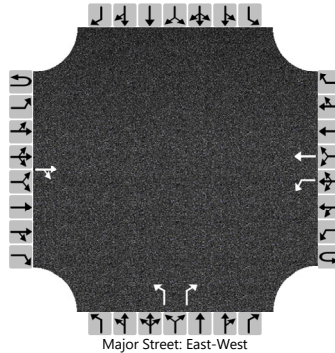
Flow Rate, v (veh/h)					190				5		337					
Capacity, c (veh/h)					1292				256		770					
v/c Ratio					0.15				0.02		0.44					
95% Queue Length, Q <sub>95</sub> (veh)					0.5				0.1		2.2					
Control Delay (s/veh)					8.3				19.4		13.3					
Level of Service (LOS)					A				C		B					
Approach Delay (s/veh)					3.4				13.4							
Approach LOS									B							

# HCS7 Two-Way Stop-Control Report

## General Information

Analyst	KG	Intersection	Northshore Dr & 333rd Ave
Agency/Co.	Felsburg Holt & Ullevig	Jurisdiction	SDDOT
Date Performed	2/7/23	East/West Street	333rd Ave
Analysis Year	2045	North/South Street	Northshore Dr
Time Analyzed	PM Peak Hour	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	SDDOT Northshore Dr-Sweeping Curve (Unconstrained)		

## Lanes



## Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	1	1	0		1	0	1		0	0	0
Configuration				TR		L	T			L		R				
Volume (veh/h)			330	5		240	310			5		225				
Percent Heavy Vehicles (%)						2				2		2				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized									Yes							
Median Type   Storage	Undivided															

## Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.12				6.42		6.22				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.22				3.52		3.32				

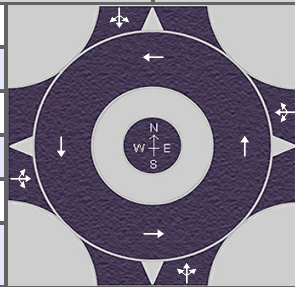
## Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						261				5		245				
Capacity, c (veh/h)						1194				155		683				
v/c Ratio						0.22				0.03		0.36				
95% Queue Length, Q <sub>95</sub> (veh)						0.8				0.1		1.6				
Control Delay (s/veh)						8.9				29.0		13.2				
Level of Service (LOS)						A				D		B				
Approach Delay (s/veh)					3.9				13.5							
Approach LOS									B							

# HCS7 Roundabouts Report

## General Information

Analyst	KG
Agency or Co.	Felsburg Holt & Ullevig
Date Performed	2/7/2023
Analysis Year	2025
Time Analyzed	AM Peak Hour
Project Description	SDDOT Northshore Dr - Build



## Site Information

Intersection	484th Ave & Nortshore Dr
E/W Street Name	Northshore Dr
N/S Street Name	484th Ave/Westshore Dr
Analysis Time Period (hrs)	0.25
Peak Hour Factor	0.85
Jurisdiction	SDDOT

## Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0
Lane Assignment	LTR				LTR				LTR				LTR			
Volume (V), veh/h	0	169	67	1	0	8	44	4	0	1	21	4	0	8	2	4
Percent Heavy Vehicles, %	0	0	1	10	0	10	5	2	0	0	0	5	0	3	0	0
Flow Rate ( $V_{PCE}$ ), pc/h	0	199	80	1	0	10	54	5	0	1	25	5	0	10	2	5
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				1				1			
Pedestrians Crossing, p/h	0				0				0				0			

## Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)		4.9763			4.9763			4.9763			4.9763	
Follow-Up Headway (s)		2.6087			2.6087			2.6087			2.6087	

## Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow ( $v_e$ ), pc/h		280			69			31			17	
Entry Volume, veh/h		279			65			31			17	
Circulating Flow ( $v_c$ ), pc/h	22			225			289			65		
Exiting Flow ( $v_{ex}$ ), pc/h	95			60			229			13		
Capacity ( $C_{PCE}$ ), pc/h		1349			1097			1028			1291	
Capacity (c), veh/h		1345			1040			1020			1269	
v/c Ratio (x)		0.21			0.06			0.03			0.01	

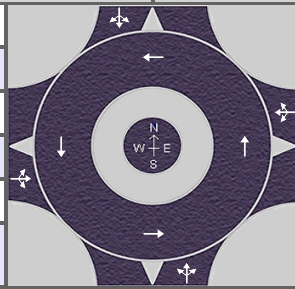
## Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		4.4			4.0			3.8			2.9	
Lane LOS		A			A			A			A	
95% Queue, veh		0.8			0.2			0.1			0.0	
Approach Delay, s/veh	4.4			4.0			3.8			2.9		
Approach LOS	A			A			A			A		
Intersection Delay, s/veh   LOS	4.2						A					

# HCS7 Roundabouts Report

## General Information

Analyst	KG
Agency or Co.	Felsburg Holt & Ullevig
Date Performed	2/7/2023
Analysis Year	2025
Time Analyzed	Dismissal Peak Hour
Project Description	SDDOT Northshore Dr - Build



## Site Information

Intersection	484th Ave & Northshore
E/W Street Name	Northshore Drive
N/S Street Name	484th Ave/Westshore Dr
Analysis Time Period (hrs)	0.25
Peak Hour Factor	0.83
Jurisdiction	SDDOT

## Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0
Lane Assignment	LTR				LTR				LTR				LTR			
Volume (V), veh/h	0	16	49	5	0	4	53	9	0	4	18	4	0	12	18	53
Percent Heavy Vehicles, %	0	0	3	10	0	6	3	5	0	0	0	5	0	7	0	0
Flow Rate ( $V_{PCE}$ ), pc/h	0	19	61	7	0	5	66	11	0	5	22	5	0	15	22	64
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				1				1			
Pedestrians Crossing, p/h	0				0				0				0			

## Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)		4.9763			4.9763			4.9763			4.9763	
Follow-Up Headway (s)		2.6087			2.6087			2.6087			2.6087	

## Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow ( $v_e$ ), pc/h		87			82			32			101	
Entry Volume, veh/h		85			79			32			100	
Circulating Flow ( $v_c$ ), pc/h	42			46			95			76		
Exiting Flow ( $v_{ex}$ ), pc/h	81			135			52			34		
Capacity ( $C_{PCE}$ ), pc/h		1322			1317			1253			1277	
Capacity (c), veh/h		1285			1273			1243			1265	
v/c Ratio (x)		0.07			0.06			0.03			0.08	

## Delay and Level of Service

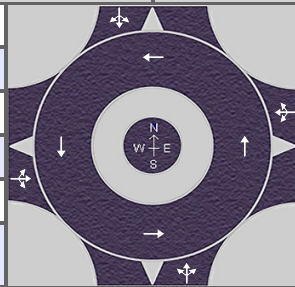
Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		3.3			3.3			3.1			3.5	
Lane LOS		A			A			A			A	
95% Queue, veh		0.2			0.2			0.1			0.3	
Approach Delay, s/veh	3.3			3.3			3.1			3.5		
Approach LOS	A			A			A			A		
Intersection Delay, s/veh   LOS	3.4						A					



# HCS7 Roundabouts Report

## General Information

Analyst	KG
Agency or Co.	Felsburg Holt & Ullevig
Date Performed	2/7/2023
Analysis Year	2025
Time Analyzed	PM Peak Hour
Project Description	SDDOT Northshore Dr - Build



## Site Information

Intersection	484th Ave & Northshore Dr
E/W Street Name	Northshore Dr
N/S Street Name	484th Ave/Westshore Dr
Analysis Time Period (hrs)	0.25
Peak Hour Factor	0.90
Jurisdiction	SDDOT

## Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0
Lane Assignment	LTR				LTR				LTR				LTR			
Volume (V), veh/h	0	8	54	5	0	22	54	17	0	7	41	4	0	4	32	84
Percent Heavy Vehicles, %	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Flow Rate ( $V_{PCE}$ ), pc/h	0	9	60	6	0	24	61	19	0	8	46	4	0	4	36	93
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				1				1			
Pedestrians Crossing, p/h	0				0				0				0			

## Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)		4.9763			4.9763			4.9763			4.9763	
Follow-Up Headway (s)		2.6087			2.6087			2.6087			2.6087	

## Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow ( $v_e$ ), pc/h		75			104			58			133	
Entry Volume, veh/h		75			103			58			133	
Circulating Flow ( $v_c$ ), pc/h	64			63			73			93		
Exiting Flow ( $v_{ex}$ ), pc/h	68			162			74			66		
Capacity ( $C_{PCE}$ ), pc/h		1293			1294			1281			1255	
Capacity (c), veh/h		1293			1287			1281			1255	
v/c Ratio (x)		0.06			0.08			0.05			0.11	

## Delay and Level of Service

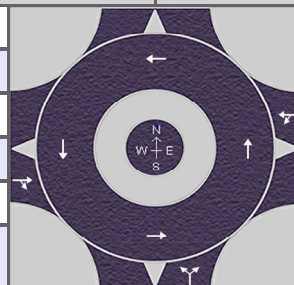
Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		3.2			3.4			3.2			3.7	
Lane LOS		A			A			A			A	
95% Queue, veh		0.2			0.3			0.1			0.4	
Approach Delay, s/veh	3.2			3.4			3.2			3.7		
Approach LOS	A			A			A			A		
Intersection Delay, s/veh   LOS	3.5						A					

# HCS7 Roundabouts Report

## General Information

Analyst	KG
Agency or Co.	Felsburg Holt & Ullevig
Date Performed	2/7/2023
Analysis Year	2025
Time Analyzed	AM Peak Hour
Project Description	SDDOT Northshore Dr - Build

## Site Information



Intersection	Streeter Dr & Northshore
E/W Street Name	Northshore Dr
N/S Street Name	Streeter Dr
Analysis Time Period (hrs)	0.25
Peak Hour Factor	0.92
Jurisdiction	SDDOT

## Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	1	0	0	0	1	0	0	0	0	0
Lane Assignment	TR				LT				LR							
Volume (V), veh/h	0		264	43	0	18	395		0	90		29				
Percent Heavy Vehicles, %	0		2	2	0	2	2		0	2		2				
Flow Rate ( $V_{PCE}$ ), pc/h	0		293	48	0	20	438		0	100		32				
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				1							
Pedestrians Crossing, p/h	0				0				0							

## Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)		4.9763			4.9763			4.9763				
Follow-Up Headway (s)		2.6087			2.6087			2.6087				

## Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow ( $v_e$ ), pc/h		341			458			132				
Entry Volume, veh/h		334			449			129				
Circulating Flow ( $v_c$ ), pc/h	20			100			293			558		
Exiting Flow ( $v_{ex}$ ), pc/h	325			538			0			68		
Capacity ( $C_{PCE}$ ), pc/h		1352			1246			1023				
Capacity (c), veh/h		1326			1222			1003				
v/c Ratio (x)		0.25			0.37			0.13				

## Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		4.9			6.5			4.8				
Lane LOS		A			A			A				
95% Queue, veh		1.0			1.7			0.4				
Approach Delay, s/veh	4.9			6.5			4.8					
Approach LOS	A			A			A					
Intersection Delay, s/veh   LOS	5.7						A					

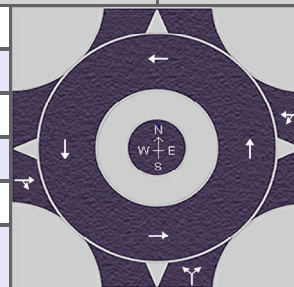
# HCS7 Roundabouts Report

## General Information

Analyst	KG
Agency or Co.	Felsburg Holt & Ullevig
Date Performed	2/7/2023
Analysis Year	2025
Time Analyzed	Dismissal Peak Hour
Project Description	SDDOT Northshore Dr - Build

## Site Information

Intersection	Streeter Dr & Northshore
E/W Street Name	Northshore Dr
N/S Street Name	Streeter Dr
Analysis Time Period (hrs)	0.25
Peak Hour Factor	0.92
Jurisdiction	SDDOT



## Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	1	0	0	0	1	0	0	0	0	0
Lane Assignment	TR				LT				LR							
Volume (V), veh/h	0		253	52	0	30	137		0	26		26				
Percent Heavy Vehicles, %	0		2	2	0	2	2		0	2		2				
Flow Rate ( $V_{PCE}$ ), pc/h	0		280	58	0	33	152		0	29		29				
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				1							
Pedestrians Crossing, p/h	0				0				0							

## Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)		4.9763			4.9763			4.9763				
Follow-Up Headway (s)		2.6087			2.6087			2.6087				

## Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow ( $v_e$ ), pc/h		338			185			58				
Entry Volume, veh/h		331			181			57				
Circulating Flow ( $v_c$ ), pc/h	33			29			280			214		
Exiting Flow ( $v_{ex}$ ), pc/h	309			181			0			91		
Capacity ( $C_{PCE}$ ), pc/h		1334			1340			1037				
Capacity (c), veh/h		1308			1314			1017				
v/c Ratio (x)		0.25			0.14			0.06				

## Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		4.9			3.9			4.0				
Lane LOS		A			A			A				
95% Queue, veh		1.0			0.5			0.2				
Approach Delay, s/veh	4.9			3.9			4.0					
Approach LOS	A			A			A					
Intersection Delay, s/veh   LOS	4.5						A					

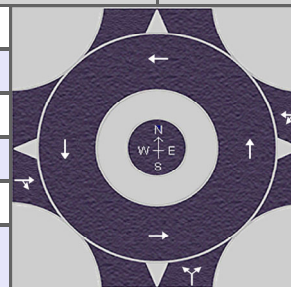
# HCS7 Roundabouts Report

## General Information

Analyst	KG
Agency or Co.	Felsburg Holt & Ullevig
Date Performed	2/7/2023
Analysis Year	2025
Time Analyzed	PM Peak Hour
Project Description	SDDOT Northshore Dr - Build

## Site Information

Intersection	Streeter Dr & Northshore
E/W Street Name	Northshore Dr
N/S Street Name	Streeter Dr
Analysis Time Period (hrs)	0.25
Peak Hour Factor	0.92
Jurisdiction	SDDOT



## Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	1	0	0	0	1	0	0	0	0	0
Lane Assignment	TR				LT				LR							
Volume (V), veh/h	0		178	23	0	47	169		0	24		37				
Percent Heavy Vehicles, %	0		2	2	0	2	2		0	2		2				
Flow Rate ( $V_{PCE}$ ), pc/h	0		197	26	0	52	187		0	27		41				
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				1							
Pedestrians Crossing, p/h	0				0				0							

## Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)		4.9763			4.9763			4.9763				
Follow-Up Headway (s)		2.6087			2.6087			2.6087				

## Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow ( $v_e$ ), pc/h		223			239			68				
Entry Volume, veh/h		219			234			67				
Circulating Flow ( $v_c$ ), pc/h	52			27			197			266		
Exiting Flow ( $v_{ex}$ ), pc/h	238			214			0			78		
Capacity ( $C_{PCE}$ ), pc/h		1309			1343			1129				
Capacity (c), veh/h		1283			1316			1107				
v/c Ratio (x)		0.17			0.18			0.06				

## Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		4.2			4.2			3.8				
Lane LOS		A			A			A				
95% Queue, veh		0.6			0.6			0.2				
Approach Delay, s/veh	4.2			4.2			3.8					
Approach LOS	A			A			A					
Intersection Delay, s/veh   LOS	4.2						A					

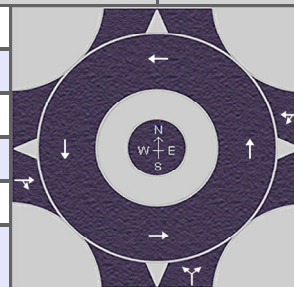
# HCS7 Roundabouts Report

## General Information

Analyst	KG
Agency or Co.	Felsburg Holt & Ullevig
Date Performed	2/7/2023
Analysis Year	2025
Time Analyzed	AM Peak Hour
Project Description	SDDOT Northshore Dr - Build

## Site Information

Intersection	Northshore Dr & 333rd Ave
E/W Street Name	333rd Ave
N/S Street Name	Northshore Dr
Analysis Time Period (hrs)	0.25
Peak Hour Factor	0.92
Jurisdiction	SDDOT



## Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	1	0	0	0	1	0	0	0	0	0
Lane Assignment	TR				LT				LR							
Volume (V), veh/h	0		183	1	0	412	69		0	1		292				
Percent Heavy Vehicles, %	0		3	2	0	0	2		0	0		2				
Flow Rate ( $V_{PCE}$ ), pc/h	0		205	1	0	448	76		0	1		324				
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				1							
Pedestrians Crossing, p/h	0				0				0							

## Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)		4.9763			4.9763			4.9763				
Follow-Up Headway (s)		2.6087			2.6087			2.6087				

## Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow ( $v_e$ ), pc/h		206			524			325				
Entry Volume, veh/h		200			523			319				
Circulating Flow ( $v_c$ ), pc/h	448			1			205			525		
Exiting Flow ( $v_{ex}$ ), pc/h	529			77			0			449		
Capacity ( $C_{PCE}$ ), pc/h		874			1379			1120				
Capacity (c), veh/h		848			1375			1098				
v/c Ratio (x)		0.24			0.38			0.29				

## Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		6.7			6.1			6.1				
Lane LOS		A			A			A				
95% Queue, veh		0.9			1.8			1.2				
Approach Delay, s/veh	6.7			6.1			6.1					
Approach LOS	A			A			A					
Intersection Delay, s/veh   LOS	6.2						A					

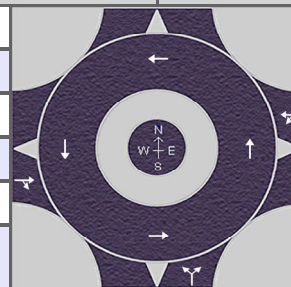
# HCS7 Roundabouts Report

## General Information

Analyst	KG
Agency or Co.	Felsburg Holt & Ullevig
Date Performed	2/7/2023
Analysis Year	2025
Time Analyzed	Dismissal Peak Hour
Project Description	SDDOT Northshore Dr - Build

## Site Information

Intersection	Northshore Dr & 333rd Ave
E/W Street Name	333rd Ave
N/S Street Name	Northshore Dr
Analysis Time Period (hrs)	0.25
Peak Hour Factor	0.92
Jurisdiction	SDDOT



## Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	1	0	0	0	1	0	0	0	0	0
Lane Assignment	TR				LT				LR							
Volume (V), veh/h	0		73	1	0	166	102		0	1		278				
Percent Heavy Vehicles, %	0		4	6	0	0	2		0	0		8				
Flow Rate ( $V_{PCE}$ ), pc/h	0		83	1	0	180	113		0	1		326				
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				1							
Pedestrians Crossing, p/h	0				0				0							

## Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)		4.9763			4.9763			4.9763				
Follow-Up Headway (s)		2.6087			2.6087			2.6087				

## Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow ( $v_e$ ), pc/h		84			293			327				
Entry Volume, veh/h		81			291			303				
Circulating Flow ( $v_c$ ), pc/h	180			1			83			294		
Exiting Flow ( $v_{ex}$ ), pc/h	409			114			0			181		
Capacity ( $C_{pce}$ ), pc/h		1149			1379			1268				
Capacity (c), veh/h		1104			1368			1174				
v/c Ratio (x)		0.07			0.21			0.26				

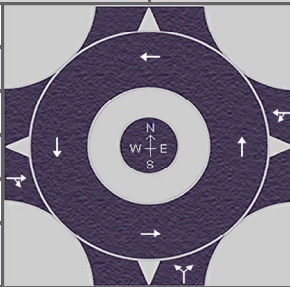
## Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		3.9			4.4			5.4				
Lane LOS		A			A			A				
95% Queue, veh		0.2			0.8			1.0				
Approach Delay, s/veh	3.9			4.4			5.4					
Approach LOS	A			A			A					
Intersection Delay, s/veh   LOS	4.8						A					

# HCS7 Roundabouts Report

## General Information

Analyst	KG
Agency or Co.	Felsburg Holt & Ullevig
Date Performed	2/7/2023
Analysis Year	2025
Time Analyzed	PM Peak Hour
Project Description	SDDOT Northshore Dr - Build



## Site Information

Intersection	Northshore Dr & 333rd Ave
E/W Street Name	333rd Ave
N/S Street Name	Northshore Dr
Analysis Time Period (hrs)	0.25
Peak Hour Factor	0.92
Jurisdiction	SDDOT

## Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	1	0	0	0	1	0	0	0	0	0
Lane Assignment	TR				LT				LR							
Volume (V), veh/h	0		95	1	0	215	136		0	1		214				
Percent Heavy Vehicles, %	0		0	0	0	0	1		0	0		0				
Flow Rate ( $V_{PCE}$ ), pc/h	0		103	1	0	234	149		0	1		233				
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				1							
Pedestrians Crossing, p/h	0				0				0							

## Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)		4.9763			4.9763			4.9763				
Follow-Up Headway (s)		2.6087			2.6087			2.6087				

## Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow ( $v_e$ ), pc/h		104			383			234				
Entry Volume, veh/h		104			382			234				
Circulating Flow ( $v_c$ ), pc/h	234			1			103			384		
Exiting Flow ( $v_{ex}$ ), pc/h	336			150			0			235		
Capacity ( $C_{pce}$ ), pc/h		1087			1379			1242				
Capacity (c), veh/h		1087			1373			1242				
v/c Ratio (x)		0.10			0.28			0.19				

## Delay and Level of Service

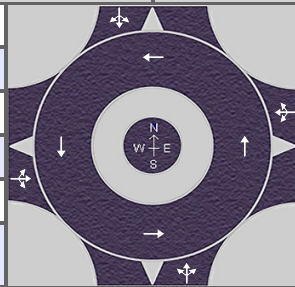
Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		4.1			5.0			4.5				
Lane LOS		A			A			A				
95% Queue, veh		0.3			1.1			0.7				
Approach Delay, s/veh	4.1			5.0			4.5					
Approach LOS	A			A			A					
Intersection Delay, s/veh   LOS	4.7						A					



# HCS7 Roundabouts Report

## General Information

Analyst	KG
Agency or Co.	Felsburg Holt & Ullevig
Date Performed	2/7/2023
Analysis Year	2045
Time Analyzed	AM Peak Hour
Project Description	SDDOT Northshore Dr - Build



## Site Information

Intersection	484th Ave & Northshore Dr
E/W Street Name	Northshore Dr
N/S Street Name	484th Ave/Westshore Dr
Analysis Time Period (hrs)	0.25
Peak Hour Factor	0.85
Jurisdiction	SDDOT

## Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0
Lane Assignment	LTR				LTR				LTR				LTR			
Volume (V), veh/h	0	195	75	5	0	10	50	5	0	5	35	5	0	10	5	5
Percent Heavy Vehicles, %	0	0	1	10	0	10	5	2	0	0	0	5	0	3	0	0
Flow Rate ( $V_{PCE}$ ), pc/h	0	229	89	6	0	13	62	6	0	6	41	6	0	12	6	6
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				1				1			
Pedestrians Crossing, p/h	0				0				0				0			

## Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)		4.9763			4.9763			4.9763			4.9763	
Follow-Up Headway (s)		2.6087			2.6087			2.6087			2.6087	

## Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow ( $v_e$ ), pc/h		324			81			53			24	
Entry Volume, veh/h		323			77			53			24	
Circulating Flow ( $v_c$ ), pc/h	31			276			330			81		
Exiting Flow ( $v_{ex}$ ), pc/h	107			74			276			25		
Capacity ( $C_{PCE}$ ), pc/h		1337			1041			986			1271	
Capacity (c), veh/h		1331			987			980			1252	
v/c Ratio (x)		0.24			0.08			0.05			0.02	

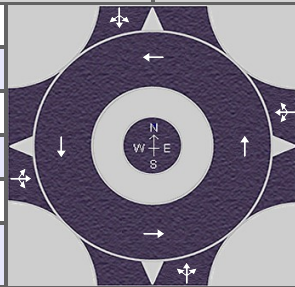
## Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		4.8			4.3			4.1			3.0	
Lane LOS		A			A			A			A	
95% Queue, veh		1.0			0.3			0.2			0.1	
Approach Delay, s/veh	4.8			4.3			4.1			3.0		
Approach LOS	A			A			A			A		
Intersection Delay, s/veh   LOS	4.6						A					

# HCS7 Roundabouts Report

## General Information

Analyst	KG
Agency or Co.	Felsburg Holt & Ullevig
Date Performed	2/7/2023
Analysis Year	2045
Time Analyzed	Dismissal Peak Hour
Project Description	SDDOT Northshore Dr - Build



## Site Information

Intersection	484th Ave & Northshore Dr
E/W Street Name	Northshore Dr
N/S Street Name	484th Ave/Westshore Dr
Analysis Time Period (hrs)	0.25
Peak Hour Factor	0.83
Jurisdiction	SDDOT

## Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0
Lane Assignment	LTR				LTR				LTR				LTR			
Volume (V), veh/h	0	20	55	10	0	5	60	10	0	5	25	5	0	15	30	65
Percent Heavy Vehicles, %	0	0	3	10	0	6	3	5	0	0	0	5	0	7	0	0
Flow Rate ( $V_{PCE}$ ), pc/h	0	24	68	13	0	6	74	13	0	6	30	6	0	19	36	78
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				1				1			
Pedestrians Crossing, p/h	0				0				0				0			

## Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)		4.9763			4.9763			4.9763			4.9763	
Follow-Up Headway (s)		2.6087			2.6087			2.6087			2.6087	

## Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow ( $v_e$ ), pc/h		105			93			42			133	
Entry Volume, veh/h		102			90			42			132	
Circulating Flow ( $v_c$ ), pc/h	61			60			111			86		
Exiting Flow ( $v_{ex}$ ), pc/h	93			158			67			55		
Capacity ( $C_{PCE}$ ), pc/h		1297			1298			1232			1264	
Capacity (c), veh/h		1258			1255			1224			1252	
v/c Ratio (x)		0.08			0.07			0.03			0.11	

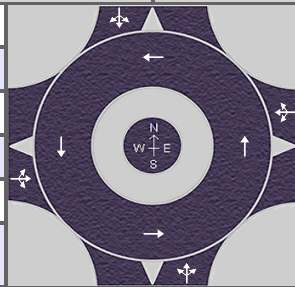
## Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		3.5			3.4			3.2			3.7	
Lane LOS		A			A			A			A	
95% Queue, veh		0.3			0.2			0.1			0.4	
Approach Delay, s/veh	3.5			3.4			3.2			3.7		
Approach LOS	A			A			A			A		
Intersection Delay, s/veh   LOS	3.5						A					

# HCS7 Roundabouts Report

## General Information

Analyst	KG
Agency or Co.	Felsburg Holt & Ullevig
Date Performed	2/7/2023
Analysis Year	2045
Time Analyzed	PM Peak Hour
Project Description	SDDOT Northshore Dr - Build



## Site Information

Intersection	484th Ave & Northshore Dr
E/W Street Name	Northshore Dr
N/S Street Name	484th Ave/Westshore Dr
Analysis Time Period (hrs)	0.25
Peak Hour Factor	0.90
Jurisdiction	SDDOT

## Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0
Lane Assignment	LTR				LTR				LTR				LTR			
Volume (V), veh/h	0	20	60	10	0	25	60	20	0	10	50	5	0	5	40	95
Percent Heavy Vehicles, %	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Flow Rate ( $V_{PCE}$ ), pc/h	0	22	67	11	0	28	67	22	0	11	56	6	0	6	44	106
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				1				1			
Pedestrians Crossing, p/h	0				0				0				0			

## Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)		4.9763			4.9763			4.9763			4.9763	
Follow-Up Headway (s)		2.6087			2.6087			2.6087			2.6087	

## Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow ( $v_e$ ), pc/h		100			117			73			156	
Entry Volume, veh/h		100			116			73			156	
Circulating Flow ( $v_c$ ), pc/h	78			89			95			106		
Exiting Flow ( $v_{ex}$ ), pc/h	79			184			100			83		
Capacity ( $C_{PCE}$ ), pc/h		1274			1260			1253			1239	
Capacity (c), veh/h		1274			1253			1253			1239	
v/c Ratio (x)		0.08			0.09			0.06			0.13	

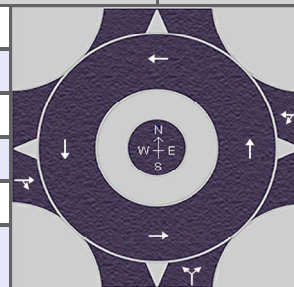
## Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		3.5			3.6			3.3			4.0	
Lane LOS		A			A			A			A	
95% Queue, veh		0.3			0.3			0.2			0.4	
Approach Delay, s/veh	3.5			3.6			3.3			4.0		
Approach LOS	A			A			A			A		
Intersection Delay, s/veh   LOS	3.7						A					

# HCS7 Roundabouts Report

## General Information

Analyst	KG
Agency or Co.	Felsburg Holt & Ullevig
Date Performed	2/7/2023
Analysis Year	2045
Time Analyzed	AM Peak Hour
Project Description	SDDOT Northshore Dr - Build



## Site Information

Intersection	Streeter Dr & Northshore
E/W Street Name	Northshore Dr
N/S Street Name	Streeter Dr
Analysis Time Period (hrs)	0.25
Peak Hour Factor	0.92
Jurisdiction	SDDOT

## Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	1	0	0	0	1	0	0	0	0	0
Lane Assignment	TR				LT				LR							
Volume (V), veh/h	0		295	50	0	25	440		0	100		35				
Percent Heavy Vehicles, %	0		2	2	0	2	2		0	2		2				
Flow Rate ( $V_{PCE}$ ), pc/h	0		327	55	0	28	488		0	111		39				
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				1							
Pedestrians Crossing, p/h	0				0				0							

## Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)		4.9763			4.9763			4.9763				
Follow-Up Headway (s)		2.6087			2.6087			2.6087				

## Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow ( $v_e$ ), pc/h		382			516			150				
Entry Volume, veh/h		375			506			147				
Circulating Flow ( $v_c$ ), pc/h	28			111			327			627		
Exiting Flow ( $v_{ex}$ ), pc/h	366			599			0			83		
Capacity ( $C_{PCE}$ ), pc/h		1341			1232			989				
Capacity (c), veh/h		1315			1208			969				
v/c Ratio (x)		0.28			0.42			0.15				

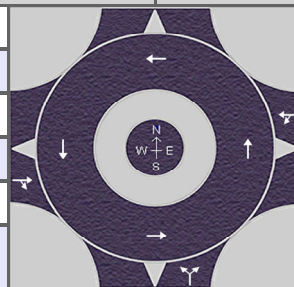
## Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		5.2			7.2			5.1				
Lane LOS		A			A			A				
95% Queue, veh		1.2			2.1			0.5				
Approach Delay, s/veh	5.2			7.2			5.1					
Approach LOS	A			A			A					
Intersection Delay, s/veh   LOS	6.2						A					

# HCS7 Roundabouts Report

## General Information

Analyst	KG
Agency or Co.	Felsburg Holt & Ullevig
Date Performed	2/7/2023
Analysis Year	2045
Time Analyzed	Dismissal Peak Hour
Project Description	SDDOT Northshore Dr - Build



## Site Information

Intersection	Streeter Dr & Northshore
E/W Street Name	Northshore Dr
N/S Street Name	Streeter Dr
Analysis Time Period (hrs)	0.25
Peak Hour Factor	0.92
Jurisdiction	SDDOT

## Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	1	0	0	0	1	0	0	0	0	0
Lane Assignment	TR				LT				LR							
Volume (V), veh/h	0		285	60	0	35	145		0	30		30				
Percent Heavy Vehicles, %	0		2	2	0	2	2		0	2		2				
Flow Rate ( $V_{PCE}$ ), pc/h	0		316	67	0	39	161		0	33		33				
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				1							
Pedestrians Crossing, p/h	0				0				0							

## Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)		4.9763			4.9763			4.9763				
Follow-Up Headway (s)		2.6087			2.6087			2.6087				

## Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow ( $v_e$ ), pc/h		383			200			66				
Entry Volume, veh/h		375			196			65				
Circulating Flow ( $v_c$ ), pc/h	39			33			316			233		
Exiting Flow ( $v_{ex}$ ), pc/h	349			194			0			106		
Capacity ( $C_{PCE}$ ), pc/h		1326			1334			1000				
Capacity (c), veh/h		1300			1308			980				
v/c Ratio (x)		0.29			0.15			0.07				

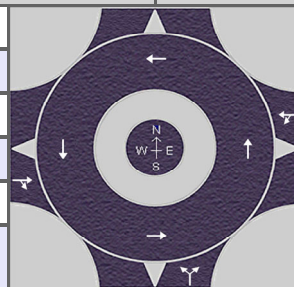
## Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		5.3			4.0			4.3				
Lane LOS		A			A			A				
95% Queue, veh		1.2			0.5			0.2				
Approach Delay, s/veh	5.3			4.0			4.3					
Approach LOS	A			A			A					
Intersection Delay, s/veh   LOS	4.8						A					

# HCS7 Roundabouts Report

## General Information

Analyst	KG
Agency or Co.	Felsburg Holt & Ullevig
Date Performed	2/7/2023
Analysis Year	2045
Time Analyzed	PM Peak Hour
Project Description	SDDOT Northshore Dr - Build



## Site Information

Intersection	Streeeter Dr & Northshore
E/W Street Name	Northshore Dr
N/S Street Name	Streeeter Dr
Analysis Time Period (hrs)	0.25
Peak Hour Factor	0.92
Jurisdiction	SDDOT

## Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	1	0	0	0	1	0	0	0	0	0
Lane Assignment	TR				LT				LR							
Volume (V), veh/h	0		185	30	0	55	190		0	30		45				
Percent Heavy Vehicles, %	0		2	2	0	2	2		0	2		2				
Flow Rate ( $V_{PCE}$ ), pc/h	0		205	33	0	61	211		0	33		50				
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				1							
Pedestrians Crossing, p/h	0				0				0							

## Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)		4.9763			4.9763			4.9763				
Follow-Up Headway (s)		2.6087			2.6087			2.6087				

## Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow ( $v_e$ ), pc/h		238			272			83				
Entry Volume, veh/h		233			267			81				
Circulating Flow ( $v_c$ ), pc/h	61			33			205			305		
Exiting Flow ( $v_{ex}$ ), pc/h	255			244			0			94		
Capacity ( $C_{pce}$ ), pc/h		1297			1334			1120				
Capacity (c), veh/h		1271			1308			1098				
v/c Ratio (x)		0.18			0.20			0.07				

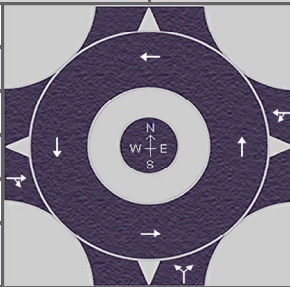
## Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		4.4			4.5			3.9				
Lane LOS		A			A			A				
95% Queue, veh		0.7			0.8			0.2				
Approach Delay, s/veh	4.4			4.5			3.9					
Approach LOS	A			A			A					
Intersection Delay, s/veh   LOS	4.4						A					

# HCS7 Roundabouts Report

## General Information

Analyst	KG
Agency or Co.	Felsburg Holt & Ullevig
Date Performed	2/7/2023
Analysis Year	2045
Time Analyzed	AM Peak Hour
Project Description	SDDOT Northshore Dr - Build



## Site Information

Intersection	Northshore Dr & 333rd Ave
E/W Street Name	333rd Ave
N/S Street Name	Northshore Dr
Analysis Time Period (hrs)	0.25
Peak Hour Factor	0.92
Jurisdiction	SDDOT

## Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	1	0	0	0	1	0	0	0	0	0
Lane Assignment	TR				LT				LR							
Volume (V), veh/h	0		195	5	0	460	80		0	5		325				
Percent Heavy Vehicles, %	0		3	2	0	0	2		0	0		2				
Flow Rate ( $V_{PCE}$ ), pc/h	0		218	6	0	500	89		0	5		360				
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				1							
Pedestrians Crossing, p/h	0				0				0							

## Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)		4.9763			4.9763			4.9763				
Follow-Up Headway (s)		2.6087			2.6087			2.6087				

## Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow ( $v_e$ ), pc/h		224			589			365				
Entry Volume, veh/h		218			587			358				
Circulating Flow ( $v_c$ ), pc/h	500			5			218			594		
Exiting Flow ( $v_{ex}$ ), pc/h	578			94			0			506		
Capacity ( $C_{PCE}$ ), pc/h		829			1373			1105				
Capacity (c), veh/h		805			1369			1083				
v/c Ratio (x)		0.27			0.43			0.33				

## Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		7.5			6.7			6.6				
Lane LOS		A			A			A				
95% Queue, veh		1.1			2.2			1.5				
Approach Delay, s/veh	7.5			6.7			6.6					
Approach LOS	A			A			A					
Intersection Delay, s/veh   LOS	6.8						A					

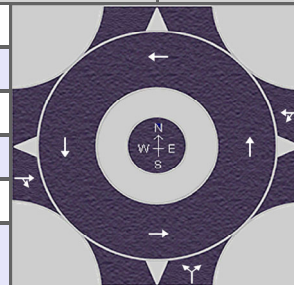


# HCS7 Roundabouts Report

## General Information

Analyst	KG
Agency or Co.	Felsburg Holt & Ullevig
Date Performed	2/7/2023
Analysis Year	2045
Time Analyzed	Dismissal Peak Hour
Project Description	SDDOT Northshore Dr - Build

## Site Information



Intersection	Northshore Dr & 333rd Ave
E/W Street Name	333rd Ave
N/S Street Name	Northshore Dr
Analysis Time Period (hrs)	0.25
Peak Hour Factor	0.92
Jurisdiction	SDDOT

## Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	1	0	0	0	1	0	0	0	0	0
Lane Assignment	TR				LT				LR							
Volume (V), veh/h	0		85	5	0	175	130		0	5		310				
Percent Heavy Vehicles, %	0		4	6	0	0	2		0	0		8				
Flow Rate ( $V_{PCE}$ ), pc/h	0		96	6	0	190	144		0	5		364				
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				1							
Pedestrians Crossing, p/h	0				0				0							

## Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)		4.9763			4.9763			4.9763				
Follow-Up Headway (s)		2.6087			2.6087			2.6087				

## Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow ( $v_e$ ), pc/h		102			334			369				
Entry Volume, veh/h		98			331			342				
Circulating Flow ( $v_c$ ), pc/h	190			5			96			339		
Exiting Flow ( $v_{ex}$ ), pc/h	460			149			0			196		
Capacity ( $C_{pce}$ ), pc/h		1137			1373			1251				
Capacity (c), veh/h		1092			1361			1160				
v/c Ratio (x)		0.09			0.24			0.29				

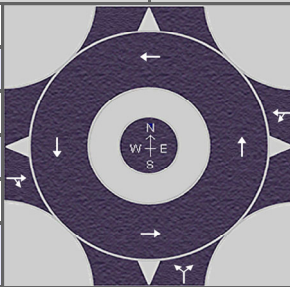
## Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		4.1			4.7			5.9				
Lane LOS		A			A			A				
95% Queue, veh		0.3			1.0			1.2				
Approach Delay, s/veh	4.1			4.7			5.9					
Approach LOS	A			A			A					
Intersection Delay, s/veh   LOS	5.1						A					

# HCS7 Roundabouts Report

## General Information

Analyst	KG
Agency or Co.	Felsburg Holt & Ullevig
Date Performed	2/7/2023
Analysis Year	2045
Time Analyzed	PM Peak Hour
Project Description	SDDOT Northshore Dr - Build



## Site Information

Intersection	Northshore Dr & 333rd Ave
E/W Street Name	333rd Ave
N/S Street Name	Northshore Dr
Analysis Time Period (hrs)	0.25
Peak Hour Factor	0.92
Jurisdiction	SDDOT

## Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	1	0	0	0	1	0	0	0	0	0
Lane Assignment	TR				LT				LR							
Volume (V), veh/h	0		125	5	0	240	155		0	5		225				
Percent Heavy Vehicles, %	0		0	0	0	0	1		0	0		0				
Flow Rate ( $V_{PCE}$ ), pc/h	0		136	5	0	261	170		0	5		245				
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				1							
Pedestrians Crossing, p/h	0				0				0							

## Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)		4.9763			4.9763			4.9763				
Follow-Up Headway (s)		2.6087			2.6087			2.6087				

## Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow ( $v_e$ ), pc/h		141			431			250				
Entry Volume, veh/h		141			429			250				
Circulating Flow ( $v_c$ ), pc/h	261			5			136			436		
Exiting Flow ( $v_{ex}$ ), pc/h	381			175			0			266		
Capacity ( $C_{PCE}$ ), pc/h		1057			1373			1201				
Capacity (c), veh/h		1057			1368			1201				
v/c Ratio (x)		0.13			0.31			0.21				

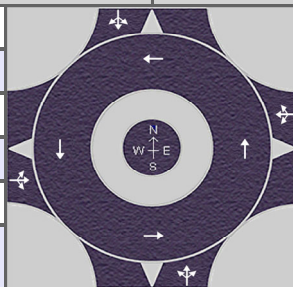
## Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		4.6			5.4			4.8				
Lane LOS		A			A			A				
95% Queue, veh		0.5			1.4			0.8				
Approach Delay, s/veh	4.6			5.4			4.8					
Approach LOS	A			A			A					
Intersection Delay, s/veh   LOS	5.1						A					

# HCS7 Roundabouts Report

## General Information

Analyst	KG
Agency or Co.	Felsburg Holt & Ullevig
Date Performed	2/7/2023
Analysis Year	2045
Time Analyzed	AM Peak Hour
Project Description	SDDOT Northshore Dr - Build...



## Site Information

Intersection	484th Ave & Northshore Dr
E/W Street Name	Northshore Dr
N/S Street Name	484th Ave/Westshore Dr
Analysis Time Period (hrs)	0.25
Peak Hour Factor	0.85
Jurisdiction	SDDOT

## Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0
Lane Assignment	LTR				LTR				LTR				LTR			
Volume (V), veh/h	0	270	75	5	0	10	50	5	0	5	35	5	0	10	5	60
Percent Heavy Vehicles, %	0	0	1	10	0	10	5	2	0	0	0	5	0	3	0	0
Flow Rate ( $V_{PCE}$ ), pc/h	0	318	89	6	0	13	62	6	0	6	41	6	0	12	6	71
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				1				1			
Pedestrians Crossing, p/h	0				0				0				0			

## Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)		4.9763			4.9763			4.9763			4.9763	
Follow-Up Headway (s)		2.6087			2.6087			2.6087			2.6087	

## Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow ( $v_e$ ), pc/h		413			81			53			89	
Entry Volume, veh/h		412			77			53			89	
Circulating Flow ( $v_c$ ), pc/h	31			365			419			81		
Exiting Flow ( $v_{ex}$ ), pc/h	107			139			365			25		
Capacity ( $C_{PCE}$ ), pc/h		1337			951			900			1271	
Capacity (c), veh/h		1332			901			895			1266	
v/c Ratio (x)		0.31			0.09			0.06			0.07	

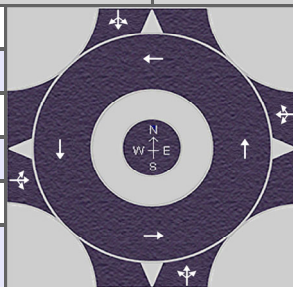
## Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		5.4			4.8			4.6			3.4	
Lane LOS		A			A			A			A	
95% Queue, veh		1.3			0.3			0.2			0.2	
Approach Delay, s/veh	5.4			4.8			4.6			3.4		
Approach LOS	A			A			A			A		
Intersection Delay, s/veh   LOS	5.0						A					

# HCS7 Roundabouts Report

## General Information

Analyst	KG
Agency or Co.	Felsburg Holt & Ullevig
Date Performed	2/7/2023
Analysis Year	2045
Time Analyzed	Dismissal Peak Hour
Project Description	SDDOT Northshore Dr - Buil...



## Site Information

Intersection	484th Ave & Northshore Dr
E/W Street Name	Northshore Dr
N/S Street Name	484th Ave/Westshore Dr
Analysis Time Period (hrs)	0.25
Peak Hour Factor	0.83
Jurisdiction	SDDOT

## Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0
Lane Assignment	LTR				LTR				LTR				LTR			
Volume (V), veh/h	0	70	55	10	0	5	60	10	0	5	25	5	0	15	30	130
Percent Heavy Vehicles, %	0	0	3	10	0	6	3	5	0	0	0	5	0	7	0	0
Flow Rate ( $V_{PCE}$ ), pc/h	0	84	68	13	0	6	74	13	0	6	30	6	0	19	36	157
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				1				1			
Pedestrians Crossing, p/h	0				0				0				0			

## Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)		4.9763			4.9763			4.9763			4.9763	
Follow-Up Headway (s)		2.6087			2.6087			2.6087			2.6087	

## Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow ( $v_e$ ), pc/h		165			93			42			212	
Entry Volume, veh/h		162			90			42			211	
Circulating Flow ( $v_c$ ), pc/h	61			120			171			86		
Exiting Flow ( $v_{ex}$ ), pc/h	93			237			127			55		
Capacity ( $C_{PCE}$ ), pc/h		1297			1221			1159			1264	
Capacity (c), veh/h		1272			1180			1151			1257	
v/c Ratio (x)		0.13			0.08			0.04			0.17	

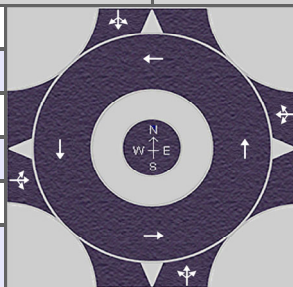
## Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		3.9			3.7			3.4			4.3	
Lane LOS		A			A			A			A	
95% Queue, veh		0.4			0.2			0.1			0.6	
Approach Delay, s/veh	3.9			3.7			3.4			4.3		
Approach LOS	A			A			A			A		
Intersection Delay, s/veh   LOS	4.0						A					

# HCS7 Roundabouts Report

## General Information

Analyst	KG
Agency or Co.	Felsburg Holt & Ullevig
Date Performed	2/7/2023
Analysis Year	2045
Time Analyzed	PM Peak Hour
Project Description	SDDOT Northshore Dr - Buil...



## Site Information

Intersection	484th Ave & Northshore Dr
E/W Street Name	Northshore Dr
N/S Street Name	484th Ave/Westshore Dr
Analysis Time Period (hrs)	0.25
Peak Hour Factor	0.90
Jurisdiction	SDDOT

## Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0
Lane Assignment	LTR				LTR				LTR				LTR			
Volume (V), veh/h	0	80	60	10	0	25	60	20	0	10	50	5	0	5	40	175
Percent Heavy Vehicles, %	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Flow Rate ( $V_{PCE}$ ), pc/h	0	89	67	11	0	28	67	22	0	11	56	6	0	6	44	194
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				1				1			
Pedestrians Crossing, p/h	0				0				0				0			

## Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)		4.9763			4.9763			4.9763			4.9763	
Follow-Up Headway (s)		2.6087			2.6087			2.6087			2.6087	

## Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow ( $v_e$ ), pc/h		167			117			73			244	
Entry Volume, veh/h		167			116			73			244	
Circulating Flow ( $v_c$ ), pc/h	78			156			162			106		
Exiting Flow ( $v_{ex}$ ), pc/h	79			272			167			83		
Capacity ( $C_{PCE}$ ), pc/h		1274			1177			1170			1239	
Capacity (c), veh/h		1274			1170			1170			1239	
v/c Ratio (x)		0.13			0.10			0.06			0.20	

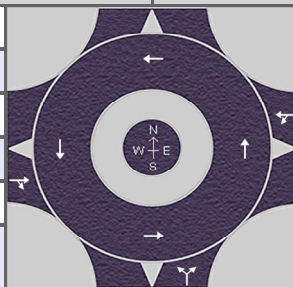
## Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		3.9			3.9			3.6			4.6	
Lane LOS		A			A			A			A	
95% Queue, veh		0.5			0.3			0.2			0.7	
Approach Delay, s/veh	3.9			3.9			3.6			4.6		
Approach LOS	A			A			A			A		
Intersection Delay, s/veh   LOS	4.2						A					

# HCS7 Roundabouts Report

## General Information

Analyst	KG
Agency or Co.	Felsburg Holt & Ullevig
Date Performed	2/7/2023
Analysis Year	2045
Time Analyzed	AM Peak Hour
Project Description	SDDOT Northshore Dr - Buil...



## Site Information

Intersection	Northshore Dr & 333rd Ave
E/W Street Name	333rd Ave
N/S Street Name	Northshore Dr
Analysis Time Period (hrs)	0.25
Peak Hour Factor	0.92
Jurisdiction	SDDOT

## Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	1	0	0	0	1	0	0	0	0	0
Lane Assignment	TR				LT				LR							
Volume (V), veh/h	0		330	5	0	460	270		0	5		325				
Percent Heavy Vehicles, %	0		3	2	0	0	2		0	0		2				
Flow Rate ( $V_{PCE}$ ), pc/h	0		369	6	0	500	299		0	5		360				
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				1							
Pedestrians Crossing, p/h	0				0				0							

## Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)		4.9763			4.9763			4.9763				
Follow-Up Headway (s)		2.6087			2.6087			2.6087				

## Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow ( $v_e$ ), pc/h		375			799			365				
Entry Volume, veh/h		364			793			358				
Circulating Flow ( $v_c$ ), pc/h	500			5			369			804		
Exiting Flow ( $v_{ex}$ ), pc/h	729			304			0			506		
Capacity ( $C_{PCE}$ ), pc/h		829			1373			947				
Capacity (c), veh/h		805			1363			929				
v/c Ratio (x)		0.45			0.58			0.39				

## Delay and Level of Service

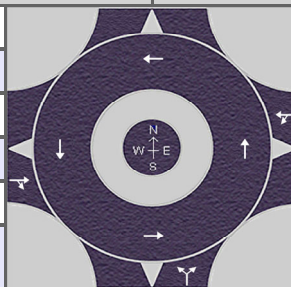
Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		10.4			9.2			8.2				
Lane LOS		B			A			A				
95% Queue, veh		2.4			4.0			1.8				
Approach Delay, s/veh	10.4			9.2			8.2					
Approach LOS	B			A			A					
Intersection Delay, s/veh   LOS	9.2						A					

# HCS7 Roundabouts Report

## General Information

Analyst	KG
Agency or Co.	Felsburg Holt & Ullevig
Date Performed	2/7/2023
Analysis Year	2045
Time Analyzed	Dismissal Peak Hour
Project Description	SDDOT Northshore Dr - Buil...

## Site Information



Intersection	Northshore Dr & 333rd Ave
E/W Street Name	333rd Ave
N/S Street Name	Northshore Dr
Analysis Time Period (hrs)	0.25
Peak Hour Factor	0.92
Jurisdiction	SDDOT

## Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	1	0	0	0	1	0	0	0	0	0
Lane Assignment	TR				LT				LR							
Volume (V), veh/h	0		245	5	0	175	250		0	5		310				
Percent Heavy Vehicles, %	0		4	6	0	0	2		0	0		8				
Flow Rate ( $V_{PCE}$ ), pc/h	0		277	6	0	190	277		0	5		364				
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				1							
Pedestrians Crossing, p/h	0				0				0							

## Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)		4.9763			4.9763			4.9763				
Follow-Up Headway (s)		2.6087			2.6087			2.6087				

## Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow ( $v_e$ ), pc/h		283			467			369				
Entry Volume, veh/h		272			462			342				
Circulating Flow ( $v_c$ ), pc/h	190			5			277			472		
Exiting Flow ( $v_{ex}$ ), pc/h	641			282			0			196		
Capacity ( $C_{PCE}$ ), pc/h		1137			1373			1040				
Capacity (c), veh/h		1093			1357			964				
v/c Ratio (x)		0.25			0.34			0.35				

## Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		5.6			5.7			7.5				
Lane LOS		A			A			A				
95% Queue, veh		1.0			1.5			1.6				
Approach Delay, s/veh	5.6			5.7			7.5					
Approach LOS	A			A			A					
Intersection Delay, s/veh   LOS	6.3						A					

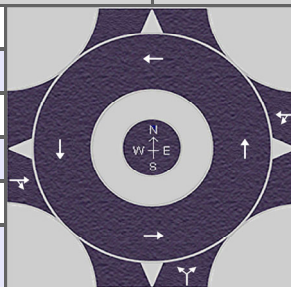


# HCS7 Roundabouts Report

## General Information

Analyst	KG
Agency or Co.	Felsburg Holt & Ullevig
Date Performed	2/7/2023
Analysis Year	2045
Time Analyzed	PM Peak Hour
Project Description	SDDOT Northshore Dr - Build...

## Site Information



Intersection	Northshore Dr & 333rd Ave
E/W Street Name	333rd Ave
N/S Street Name	Northshore Dr
Analysis Time Period (hrs)	0.25
Peak Hour Factor	0.92
Jurisdiction	SDDOT

## Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	1	0	0	0	1	0	0	0	0	0
Lane Assignment	TR				LT				LR							
Volume (V), veh/h	0		330	5	0	240	310		0	5		225				
Percent Heavy Vehicles, %	0		0	0	0	0	1		0	0		0				
Flow Rate ( $V_{PCE}$ ), pc/h	0		359	5	0	261	340		0	5		245				
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				1							
Pedestrians Crossing, p/h	0				0				0							

## Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)		4.9763			4.9763			4.9763				
Follow-Up Headway (s)		2.6087			2.6087			2.6087				

## Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow ( $v_e$ ), pc/h		364			601			250				
Entry Volume, veh/h		364			598			250				
Circulating Flow ( $v_c$ ), pc/h	261			5			359			606		
Exiting Flow ( $v_{ex}$ ), pc/h	604			345			0			266		
Capacity ( $C_{PCE}$ ), pc/h		1057			1373			957				
Capacity (c), veh/h		1057			1365			957				
v/c Ratio (x)		0.34			0.44			0.26				

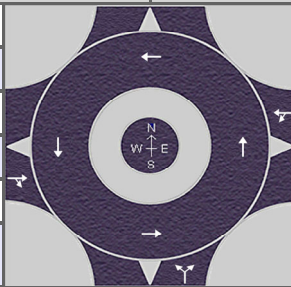
## Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		6.9			6.9			6.4				
Lane LOS		A			A			A				
95% Queue, veh		1.5			2.3			1.0				
Approach Delay, s/veh	6.9			6.9			6.4					
Approach LOS	A			A			A					
Intersection Delay, s/veh   LOS	6.8						A					

# HCS7 Roundabouts Report

## General Information

Analyst	KG
Agency or Co.	Felsburg Holt & Ullevig
Date Performed	2/7/2023
Analysis Year	2045
Time Analyzed	AM Peak Hour
Project Description	SDDOT Northshore Dr - Build



## Site Information

Intersection	Northshore Dr & 333rd Ave
E/W Street Name	333rd Ave
N/S Street Name	Northshore Dr
Analysis Time Period (hrs)	0.25
Peak Hour Factor	0.92
Jurisdiction	SDDOT

## Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	1	0	0	0	1	0	0	0	0	0
Lane Assignment	TR				LT				LR							
Volume (V), veh/h	0		330	5	0	460	270		0	5		325				
Percent Heavy Vehicles, %	0		3	2	0	0	2		0	0		2				
Flow Rate ( $V_{PCE}$ ), pc/h	0		369	6	0	500	299		0	5		360				
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				1							
Pedestrians Crossing, p/h	0				0				0							

## Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)		4.9763			4.9763			4.9763				
Follow-Up Headway (s)		2.6087			2.6087			2.6087				

## Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow ( $v_e$ ), pc/h		375			799			365				
Entry Volume, veh/h		364			793			358				
Circulating Flow ( $v_c$ ), pc/h	500			5			369			804		
Exiting Flow ( $v_{ex}$ ), pc/h	729			304			0			506		
Capacity ( $C_{PCE}$ ), pc/h		829			1373			947				
Capacity (c), veh/h		805			1363			929				
v/c Ratio (x)		0.45			0.58			0.39				

## Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		10.4			9.2			8.2				
Lane LOS		B			A			A				
95% Queue, veh		2.4			4.0			1.8				
Approach Delay, s/veh	10.4			9.2			8.2					
Approach LOS	B			A			A					
Intersection Delay, s/veh   LOS	9.2						A					