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MEMORANDUM

TO: Chad Orn – Office of Project Development Director

FROM: Paul Benning – Local Government Engineer PB DS

DATE: May 21, 2020

SUBJECT: Request for Decision on Project Development Activities

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Project: SHE-4-002(135)144, PCN 22829 – Minot, US Highway 2 from Burdick Expressway to Evergreen Avenue

Length: 0.874 Miles

Classification: Principal Arterial, Interregional Corridor

Cost Participation: Primary Regional, Safety funds – 90% Federal, 10% State, 0% Local

Funding: $1,500,000 Total
$1,350,000 Federal
$150,000 State
$0 Local

Proposed STIP Info:

Proposed Improvement:	Intersection improvements
Tentative Bid Date:	October 18, 2021
Construction Year:	2022

Purpose and Need Statement:

The purpose of the project is to address issues/deficiencies affecting the intersections of US 2 with Burdick Expressway, 18th St SW, and Evergreen Ave. An HSIP application was submitted by the Minot District and the City of Minot requesting that the US 2 and Evergreen Ave Intersection be changed to a ¾ intersection with potential U-turn locations. No changes were proposed to the Burdick Expressway intersection as part of the application, but the south access at the 18th St SW intersection be removed if a U-turn was put in at that location. NDDOT Traffic Operations analyzed the three intersections mentioned in the application. The Burdick and Evergreen intersections experience a significant number of crashes and the Evergreen Ave intersection ranked 26th on the NDDOT's 2016-2018 list of high crash locations. A variety of intersection layouts were analyzed and offset right turn lanes were proposed to improve sight distance address crashes. A Scoping Report signed on May 4, 2020 identified improvements for Evergreen and 18th St intersections, but noted the Burdick options to be held for now and continue discussions with the City.

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Proposed Improvements:

US 2 & 18th St Intersection Options:

- Remove South Access to Frontage Road

US 2 & Evergreen Ave Intersection Options:

- High T Intersection
- Three Quarter Intersection
- Reduced Conflict Intersection

Offset Right Turn Lanes Options

- WB Offset Right Turn Lane @ Burdick Expressway
- EB Offset Right Turn Lane @ Evergreen Avenue
- WB Offset Right Turn Lane @ Evergreen Avenue

Additional traffic operation considerations for roundabouts, signals, and other intersection modifications were considered but not included due to feasibility.

Decision Requested:

Would the NDDOT Office of Project Development like to perform the project development for this project, or would you recommend that a consultant be hired to do this work?

_____ NDDOT Office of Project Development will do this work

_X_ A consultant should be hired to do this work *

**** If it is a Consultant, which of the following items should be included in their contract?***

	Consultant	NDDOT	N/A
o Environmental Document	☒	☐	☐
o Survey	☒	☐	☐
o Cultural Resources/Delineation	☒	☐	☐
o Aquatic Resources Delineation	☒	☐	☐
o Noise Analysis	☐	☐	☒
o Bridge Preliminary Concept	☐	☐	☒
o Traffic Operations	☐	☒	☐
o Materials and Research	☒	☐	☐
o Borrow	☐	☐	☒

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○ Hydraulic Report	☐	☐	☒
○ Roadway Design	☒	☐	☐
○ Right of Way			
▪ Title Information	☒	☐	☐
▪ Plats	☒	☐	☐
▪ Appraisals	☒	☐	☐
▪ Acquisition	☒	☐	☐
▪ Relocation	☐	☐	☒
▪ Borrow	☐	☐	☒
○ Environmental Permits			
▪ Mitigation	☒	☐	☐
▪ Permit Application(s)	☒	☐	☐
○ Bridge Design	☒	☐	☒
○ Materials and Research	☒	☐	☐
○ Roadway Hydraulics	☒	☐	☐
○ Bridge Hydraulics	☐	☐	☒
○ Utility Coordination	☒	☐	☐

Comments:

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Chad M. Orn – Office of Project Development

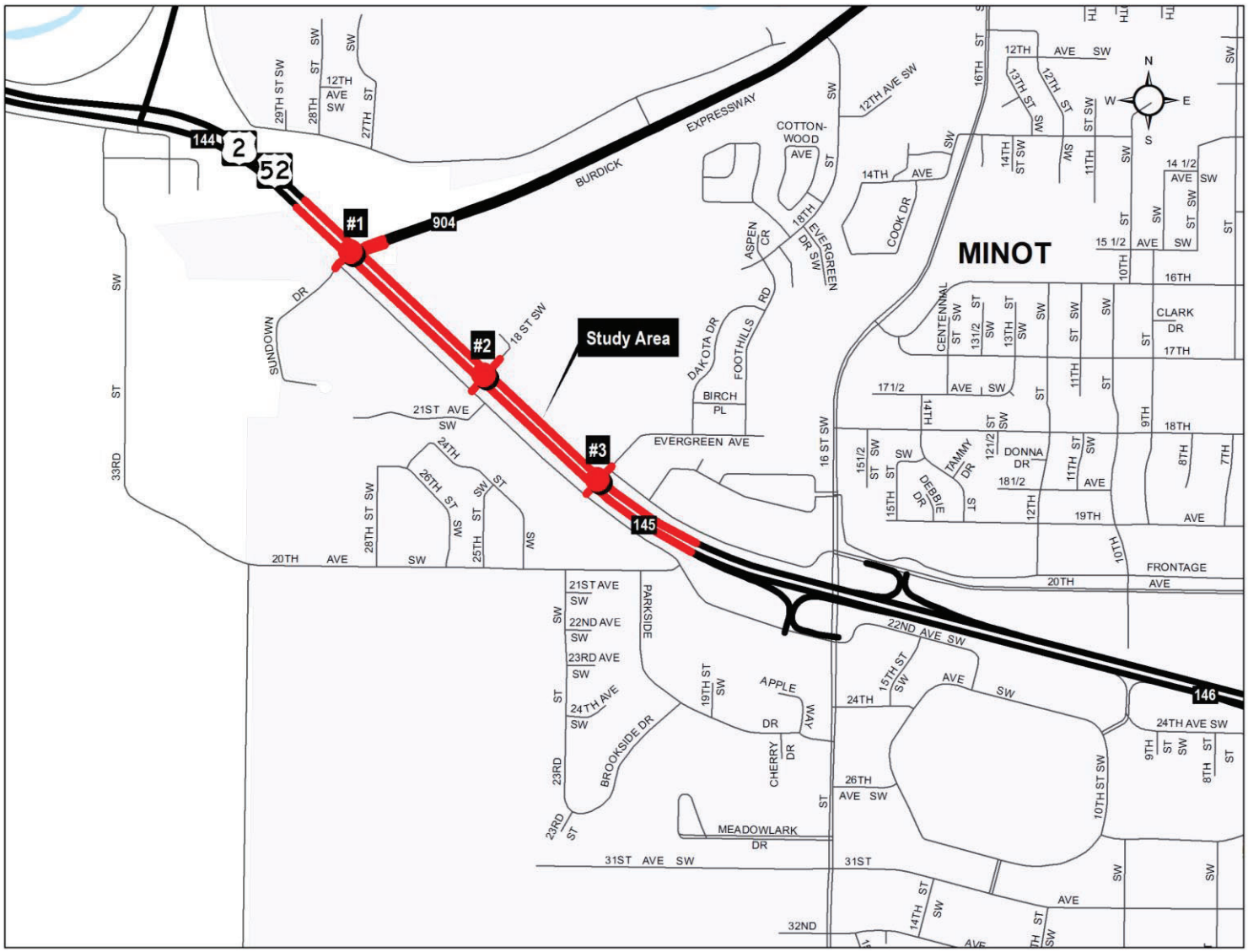
5/27/2020
Date

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TRAFFIC OPERATIONS STUDY

US 2, Burdick Expwy to Evergreen Ave
RP 144.894
HSIP #481001



Prepared By:
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION
PROGRAMMING DIVISION
TRAFFIC OPERATIONS SECTION

September 2019

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TRAFFIC OPERATIONS STUDY
US 2, Burdick Expwy to Evergreen Ave
HSIP #481001

INTRODUCTION

The traffic control recommendations in this study are based on:

- The 2009 Manual on Uniform Traffic Control Devices (MUTCD), FHWA
- A Policy on Geometric Design of Highways and Streets, AASHTO, 2018
- The Highway Capacity Manual 6th Edition, TRB, 2016
- Highway Safety Manual, 1st Edition, AASHTO, 2010
- Lighting Warrant Policy, NDDOT, 2015
- NDDOT Traffic Operations Manual, June 2019

BACKGROUND

The study area is from the intersection of US 2 and Burdick Expressway to US 2 and Evergreen Ave in Minot. The purpose of this study is to identify possible safety improvements and examine the traffic operations in this area. Note that the divided highway is signed as both US 2 and US 52, for the purpose of this report the roadway is referred to as "US 2".

Study Intersections	Traffic Control	Lighting
1. US 2 / Burdick Expwy	Two-way Stop	Illumination
2. US 2 / 18 St SW	Two-way Stop	None
3. US 2 / Evergreen Ave	Two-way Stop	Illumination (High Mast)

Highway	Functional Classification	Performance Classification	Speed Limit
US 2	Principal Arterial Urban	Rural Interregional Corridor	50 mph



Figure 1 – View EB at Evergreen Ave intersection, RP 144.832 (from NDDOT Pathweb)

The area context of US 2 through the Minot area is a combination of interchanges, at-grade signalized intersections, and two-way stop controlled at-grade intersections. The Evergreen Ave intersection is located less than ½ mile from the 16th St SW interchange.



Figure 2 – Aerial Photo of Study Area

CORRIDOR HISTORY / PAST STUDIES

The 2002 Metropolitan Land Use and Transportation Plan called for interim conversion of the bypass to an expressway, and ultimate conversion of the bypass to operate as a freeway. In 2007 a corridor study of the US 2 Bypass discussed a "freeway concept" that would allow the corridor to operate unimpeded by cross-street traffic. The study stated that "a freeway concept may not be economically feasible" and "to develop and refine alternatives associated with the expressway concept" which would allow existing at-grade intersections to remain and traffic signals could be installed along the corridor where warranted.

Potential improvements from 2007 Traffic Operations Study (under the expressway concept):

- US 2 and West Burdick Expressway
  - Shift intersection to the southeast,
  - Add free-flow right turn lanes (WBR, SBR)
  - Eventual construction of warranted traffic signals
- US 2 and Evergreen Ave
  - Convert to a ¾ access

May 2008 - NDDOT Ref #3624 looked at possible changes to US 2 and West Burdick Expressway. The memo stated that a traffic signal or reduced conflict intersection (RCI) were not feasible. Feasible options included the following:

- Realign skewed side street approaches
- Overhead flashing beacon (overhead beacon was approved in August 2008 and installed in 2009)
- Enhance signing on US 2/52
- Lower US 2/52 speed limit (speed study shows WB 59.36 mph, EB 53.84 mph)
- Conduct road safety audit

The overhead beacon was torn down on 11/30/2015. Subsequent memo from March 2016 recommended not to re-install the overhead beacon. This memo recommended a safety review be conducted at the US 2 and West Burdick

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Expressway intersection with possible consideration of a WB offset right-turn lane. The memo also recommended a safety review be conducted at US 2 and Evergreen Ave.

A road safety review (RSR) was done on 10/6/2016 and recommended the following:

- US 2 and West Burdick Expressway
  - Do nothing
  - Install traffic signal
  - Install ¾ access intersection
- US 2 and Evergreen Ave
  - Do nothing
  - Install ¾ access intersection
  - Install traffic signal
  - Close median

On 1/3/18, as part of an HSIP application, the City of Minot and NDDOT Minot District proposed the following:

- US 2 and West Burdick Expressway
  - Do nothing
- US 2 and Evergreen Ave
  - ¾ intersection + possible U-turn locations (at RP 144.64 and RP 145.07)

Note that this traffic study focuses on the 3 intersections shown on the cover page. However, any changes made at these 3 intersections may impact the corridor operations outside of the study area. Depending on the decisions made as a result of this study, traffic studies of the adjacent road network (such as at the 16th St SW interchange) may be needed to address the ripple effect that occurs due to any changes made to existing traffic patterns.

TRAFFIC DATA

Traffic data was acquired from the Roadway Data Section based on counts from January 2019. The peak hour occurs between 4:45 – 5:45pm. Current AADTs, peak hour turning movements are shown in figure 3. Traffic volume details are in appendix A.

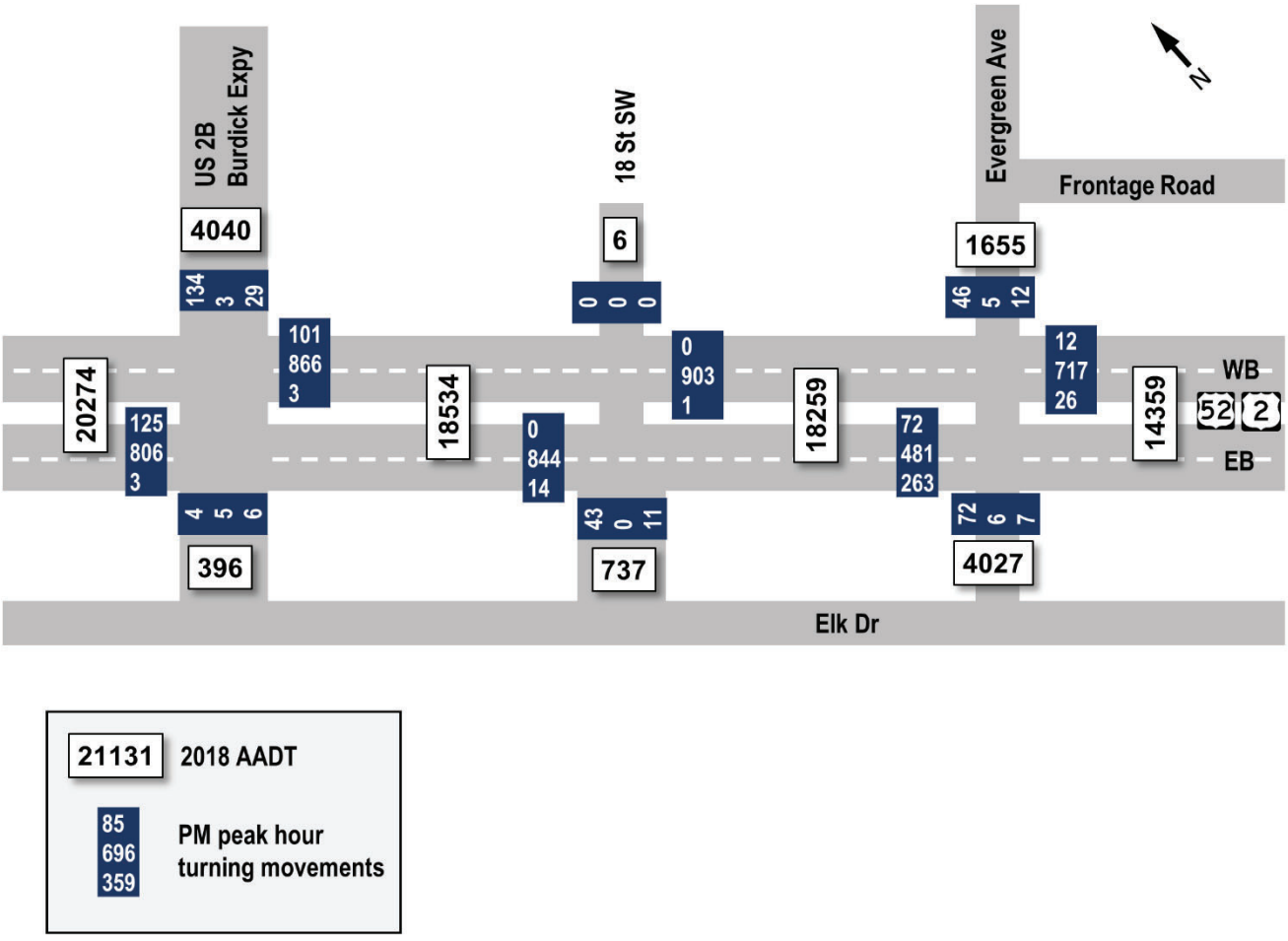


Figure 3 – 2019 Traffic Data

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CRASH HISTORY

Crash data for the study area was collected from June 1, 2014 through May 31, 2019.

	US 2 & W Burdick	US 2 & 18 St SW	US 2 & Evergreen	US 2 Segment Crashes	
	By Intersection				**Totals**
Crash Severity	**1**	**2**	**3**		
Incapacitating Injury			5		5
Non-incapacitating Injury	7		6		13
Possible Injury	4		8		12
Property Damage Only	19	3	24	3	49
Total	**30**	**3**	**43**	**3**	**79**
Manner of Collision	**1**	**2**	**3**		
Angle	10	1	29		40
Rear End	18	1	4		23
Left Turn	1		4		5
Sideswipe (same direction)	1	1	3	1	6
Single Vehicle			1	2	3
Other			2		2
Total	**30**	**3**	**43**	**3**	**79**
Surface Conditions	**1**	**2**	**3**	**4**	
Dry	25	1	34	2	62
Wet, ice, snow, frost, other	5	2	9	1	17
Total	**30**	**3**	**43**	**3**	**79**

Most severe crashes are angle type and are occurring at the US 2 intersections of Burdick Expwy and Evergreen Ave (#1, #3). The angle crashes' contributing factor is "failure to yield". A common theme in the crash narratives is that the driver on the minor road did not see the conflicting vehicle approaching on US 2. At the stop sign on the minor road, sometimes the driver's view is blocked due to vehicles in the right turn lane on US 2. One possible countermeasure is to construct offset right turn lanes on the major road approaches. "Offset right turn lanes give drivers on the minor approach (at the stop bar) an unobstructed view of through traffic in the near lanes, which allows for more effective use of gaps."[1]

The intersection of US 2 & Evergreen Avenue is ranked 26th on the 2016-2018 NDDOT's annual list of high crash locations. This intersection has been on the list in previous years as well.

There were no reported crashes involving pedestrians or bicyclists in the study area.

See appendix B for details on the crash data.

Reference:

1. NDDOT, "*Guidelines for the Installation of Turn Lanes along State Highways*," July 2014.

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SEGMENT LIGHTING WARRANT		
RP 144.46 to RP 144.80		**Met?**
4A	Curb and gutter present on one side	No
4B	Development present on both sides of the road	No – see discussion below
4C	Between 2 illuminated intersections ≤ 0.5 mile spacing	Yes
4D	Engineering judgment	Yes – see discussion below
4E	Existing lighting system present	No
4F	Local government pays 50% and maintains	No

Warrant 4B considers the presence of “substantial” development on both sides of the highway, the Highway Performance Classification System is interregional corridor, and the current AADT is over 1,000. Consideration of development includes sites on both sides of the highway: motel, mobile-home park, boat dealer, landscaping supply store, hotel, restaurants, dentist, and an assisted living facility. However, this development is concentrated mostly on the south side of the highway and the unlit area coincides with a relatively undeveloped area on the north side (see figure 4 below). Thus warrant 4B is not met. The three study intersections within the study area all warrant illumination lighting and are spaced less than 0.5 miles apart (thus warrant 4C is met). Elk Drive has streetlights, this frontage road parallels an unlit portion of US 2 between the illumination lighting at Burdick Expwy to high mast lights near Evergreen Ave. Therefore segment lighting is recommended based on engineering judgment (warrant 4D). Based on these reasons, **segment lighting is warranted between RP 144.46 to RP 144.80**. The existing and proposed lighting is shown in figure 4.



Figure 4 – Existing and Proposed Lighting

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OVERVIEW OF INTERSECTION ALTERNATIVES

Several alternatives were analyzed for each of the three intersections. A "removal" would represent the disconnection of the minor roads to US 2. Traffic would need to find alternate routes to access the adjacent properties. Right-in/right-out would allow the minor road traffic to only turn right onto US 2 and traffic on US 2 could make a right turn onto the minor road. No left turns or minor road through movements would be allowed. A three-quarter intersection takes the right-in/right-out concept but would also allow left turn movements from US 2 onto the minor road. The three-quarter intersection was originally identified for the US 2 and Evergreen Ave intersection in the HSIP application. A "reduced conflict intersection" (RCI) would take the three-quarter concept one step further with the addition of U-turns on US 2 on the east and west sides of the existing intersection. This type of intersection would allow all traffic movements (without re-routing traffic onto the adjacent roadway network) and has been shown to reduce the severity of crashes.

Other alternatives examined in this study include a roundabout, traffic signal, and a "High-T" configuration.

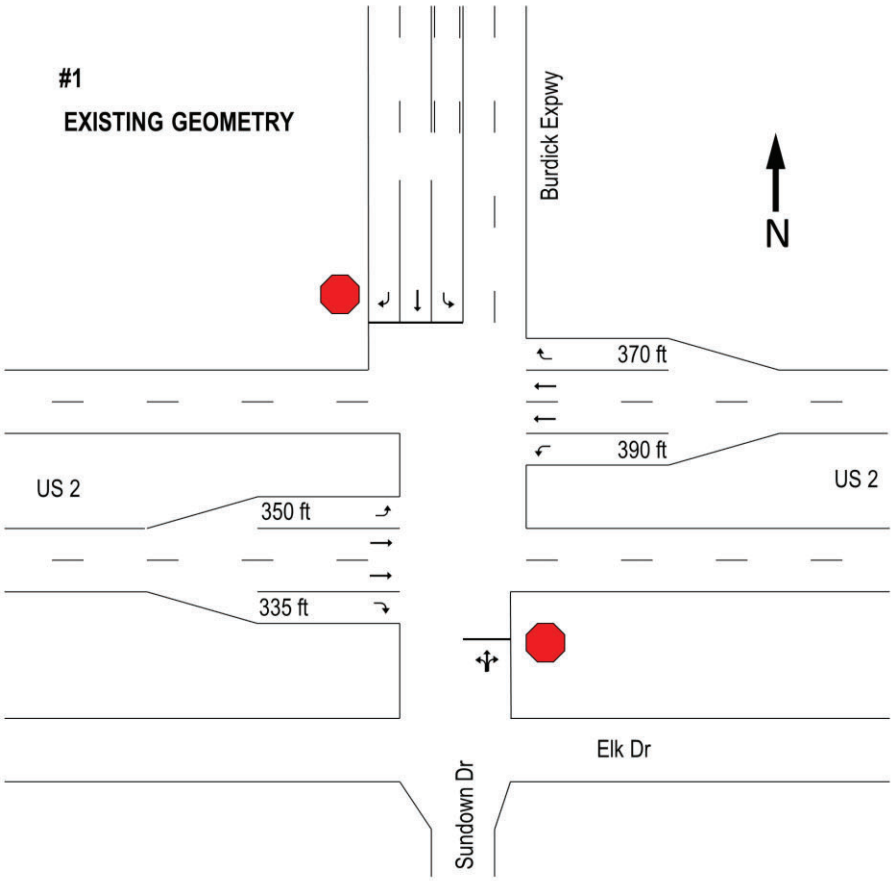
Depending on the intersection, some options were ruled out from further analysis. For example, at intersection #1, complete removal or converting to a right-in/right-out was not analyzed because there are not suitable alternative routes for vehicles to take to access the area businesses. An intersection conflict warning system (ICWS) was not evaluated at any of the intersections due to the high volume on US 2. Expensive alternatives, such as grade-separations and/or interchanges were not evaluated since the previous studies of the US 2 corridor indicated that the freeway concept is not economically feasible. A summary of the alternatives are shown in the table below.

Capacity Analysis	Intersection #1 US 2 / Burdick Expwy	Intersection #2 US 2 / 18 St SW	Intersection #3 US 2 / Evergreen Ave
Existing TWSC (do nothing)	Page 9	Page 15	Page 18
Remove	Not Analyzed	Page 16	Page 20
Right-in / Right-out	Not Analyzed	Page 17	Page 21
3/4 Intersection	Page 10	Not Analyzed	Page 22
RCI	Page 11	Not Analyzed	Page 23
Roundabout	Page 12	Not Analyzed	Page 24
Traffic Signal	Page 13	Not Analyzed	Page 25
High-T	Page 14	Not Analyzed	Page 26

The alternatives studied are at a conceptual level for the primary purpose of reducing the number of conflict points and/or simplify the decision-making tasks for the driver. The capacity analysis did not account for the potential re-routing of individual vehicles that may occur with the various alternatives. Other factors such as terrain, roadway network, area context, environmental issues, public input, etc. may have a large influence on the feasibility of these alternatives and are outside of the scope of this study.

INTERSECTION #1: US 2 & Burdick Expressway

#1 EXISTING GEOMETRY



Capacity analysis – EXISTING GEOMETRY PM Peak Hour

Approach	2019 LOS	2019 Delay (sec)	2039 LOS	2039 Delay (sec)
Eastbound:	A*	1	A*	2
Westbound:	A*	0	A*	0
Northbound:	D	31	F	75
Southbound:	C	18	D	27
Intersection	**A***	**2**	**A***	**4**

*Equivalent LOS shown, mainline approaches and the overall intersection LOS are not calculated for TWSC intersections.

Intersection-related Crashes

There were 30 crashes at this intersection during the study period. Of these crashes 10 were angle, 18 were rear end, 1 was left turn and 1 was sideswipe same direction. Failure to yield was a common contributing factor, especially with injury crashes. Most of the angle crashes involved a westbound vehicle colliding with a southbound vehicle. Over half of all the crashes occurred between 4:00pm and 6:00pm. Nearly all the rear end crashes involved southbound vehicles where the lead vehicle was turning right.

Major Road Turn Lane	Existing?	Criteria 1.A Met?	Meets current design standards?
EB to NB Left	Yes	Yes	No – ex. 350 ft, should be 365 ft
WB to SB Left	Yes	Yes	Yes
EB to SB Right	Yes	Yes	Yes
WB to NB Right	Yes	Yes	Yes

Illumination Lighting Warrant		Met?
5A	All signalized intersections	No
5B	All roundabout and J-turn intersections	No
5C	Raised channelization/medians present	No
5D	Roadway segment lighting	No
5E	AADT cross product ≥ 10,000,000	Yes – cross product is 81.9 million

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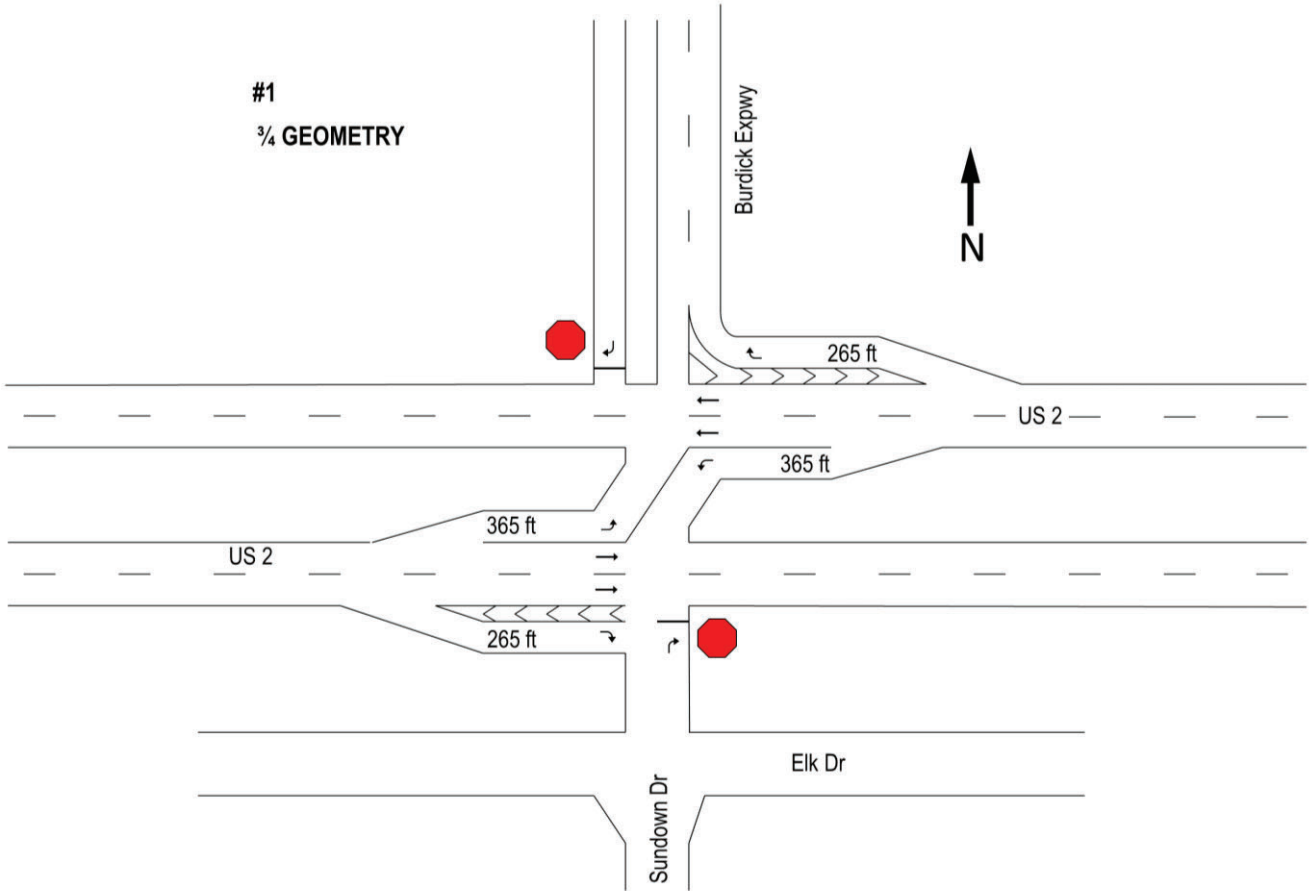
5F	Engineering judgment	No
5G	Existing illumination lighting present	Yes
5H	Local government pays 50% and maintains	No

Illumination lighting is warranted.

Traffic Signal Warrant		Met?
1	Eight-Hour Vehicular Volume	Yes
2	Four-Hour Vehicular Volume	Yes
3	Peak Hour	N/A
4	Pedestrian Volume	N/A
5	School Crossing	N/A
6	Coordinated Signal System	N/A
7	Crash Experience	N/A
8	Roadway Network	Yes
9	Intersection near a grade crossing	N/A

A traffic signal is warranted. See appendix D for details on the signal warrant analysis.

#1 THREE QUARTER INTERSECTION



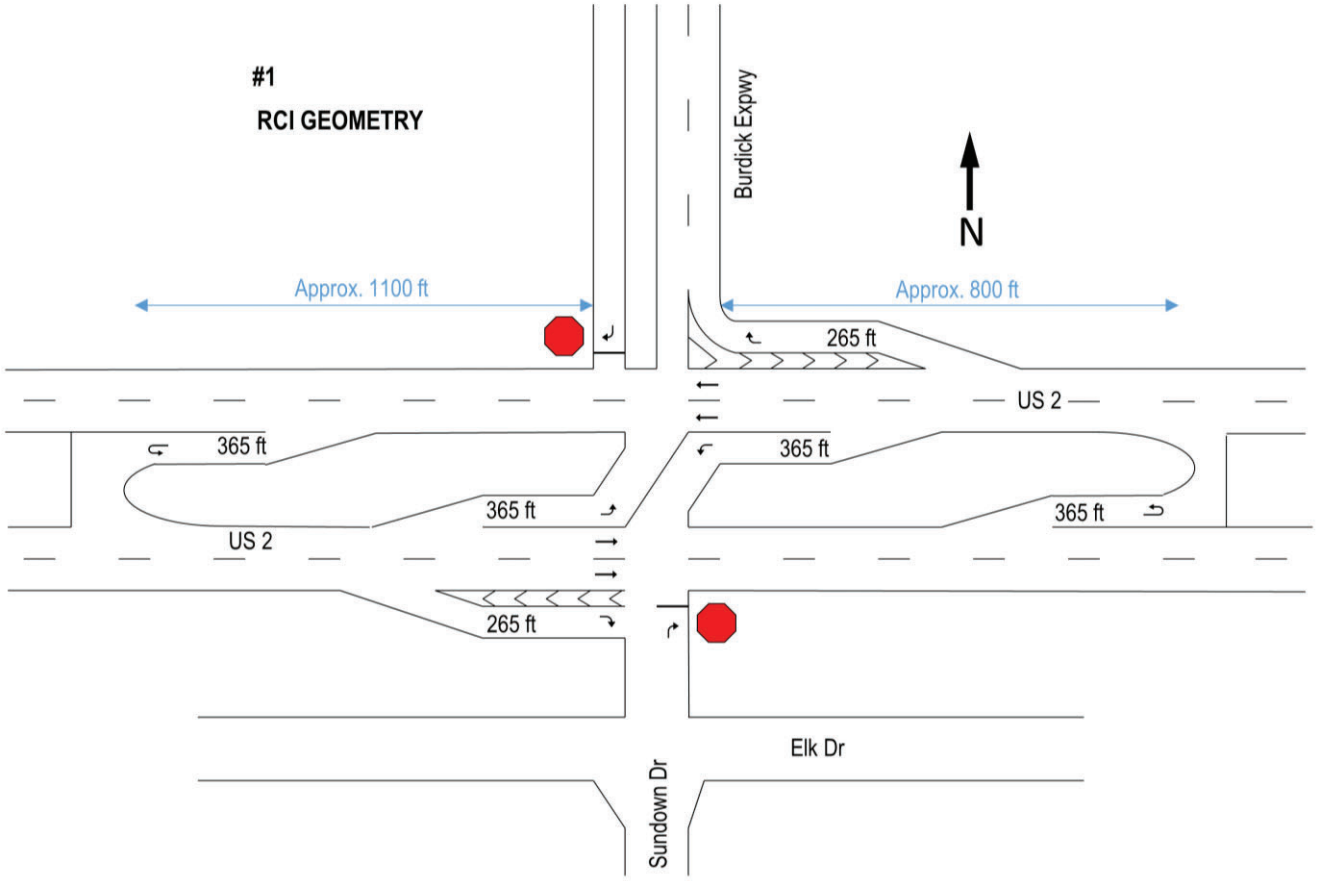
Capacity analysis – ¾ GEOMETRY PM Peak Hour				
Approach	2019 LOS	2019 Delay (sec)	2039 LOS	2039 Delay (sec)
Eastbound:	A	2*	A	2*
Westbound:	A	0*	A	0*
Northbound:	B	12	B	13
Southbound:	B	15	C	21
Intersection	**A***	**2**	**A***	**8**

*Equivalent LOS shown, mainline approaches and the overall intersection LOS are not calculated for TWSC intersections.

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#1 REDUCED CONFLICT INTERSECTION (RCI)

Note that an NDDOT analysis in 2008 stated that this configuration was not feasible (referred to as a "J-turn" at that time) due to the railroad overpass. However this option was included in this study for comparision purposes and the possibility that newer design techniques (new Green Book) may apply. This railroad overpass is about 600 feet west of this intersection, the west side U-turn was located appoximately 1100 feet west in the capacity analysis.



Capacity analysis – RCI GEOMETRY PM Peak Hour

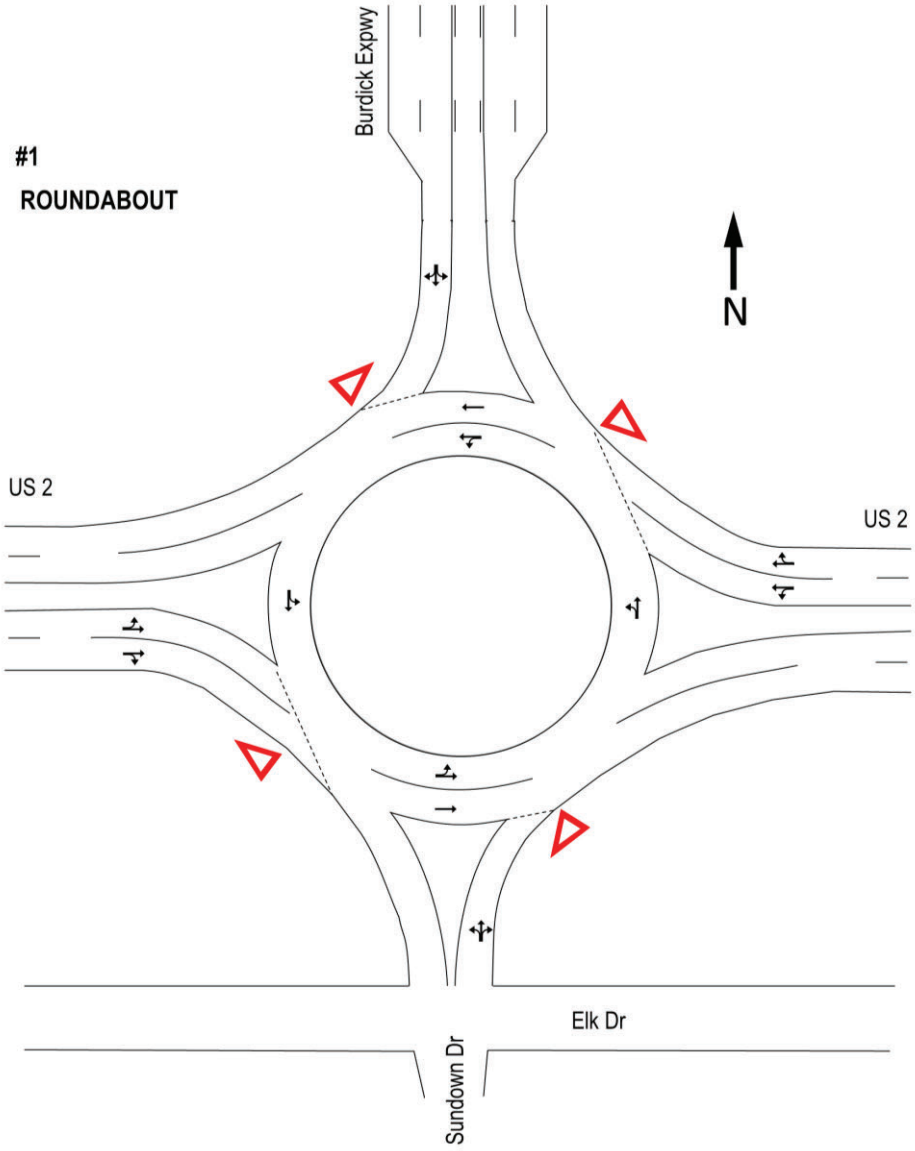
Approach	2019 LOS	2019 Delay (sec)	2039 LOS	2039 Delay (sec)
Eastbound:	A	2	A	2
Westbound:	A	0	A	0
Northbound:	C	34	D	40
Southbound:	C	24	C	31
Intersection	**A**	**3**	**A**	**4**

Note that the side street delay includes the extra distance travel time from the stop sign.

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#1 ROUNDABOUT

For the purpose of this study, it is assumed that a 2 lane (for the major movement) by 1 lane (for the minor movements) roundabout would be used at this intersection. For the north approach, the transition from one lane to the existing 5-lane section would need further evaluation and refinement. A concept of this is shown below.



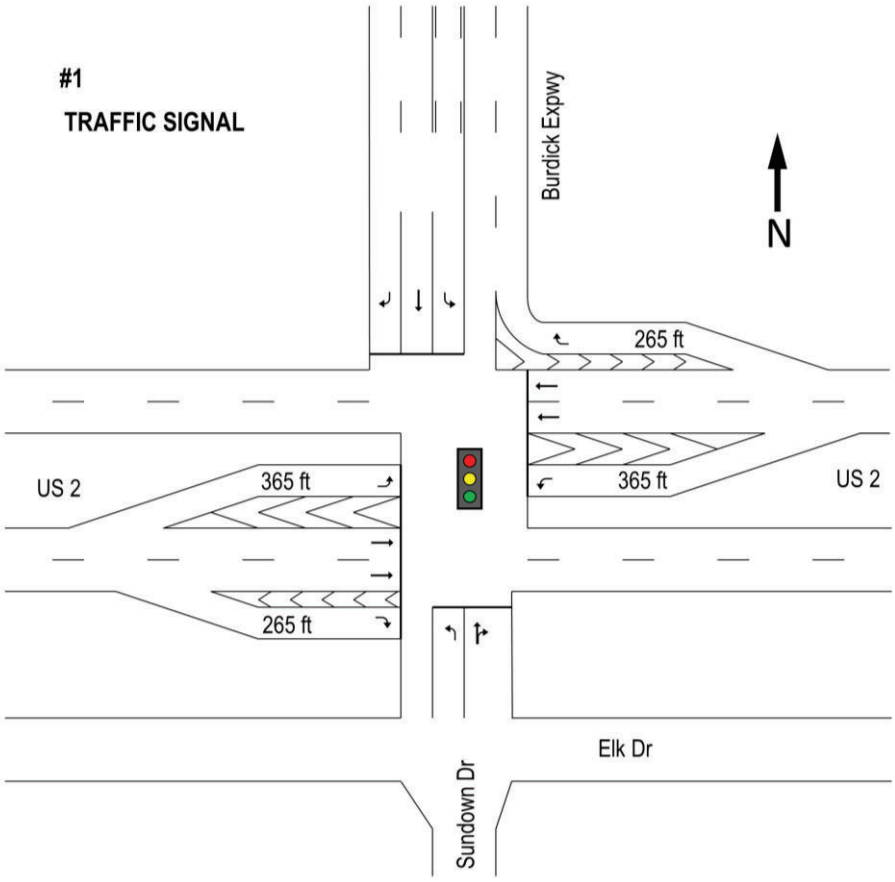
Capacity analysis – ROUNDABOUT GEOMETRY PM Peak Hour

Approach	2019 LOS	2019 Delay (sec)	2039 LOS	2039 Delay (sec)
Eastbound:	A	7	A	7
Westbound:	A	9	A	9
Northbound:	A	8	A	8
Southbound:	B	12	C	12
Intersection	**A**	**8**	**A**	**8**

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#1 TRAFFIC SIGNAL

If a traffic signal is installed it is recommended to realign the left turn lanes with zero offset (as shown in the schematic below) or with positive offset.



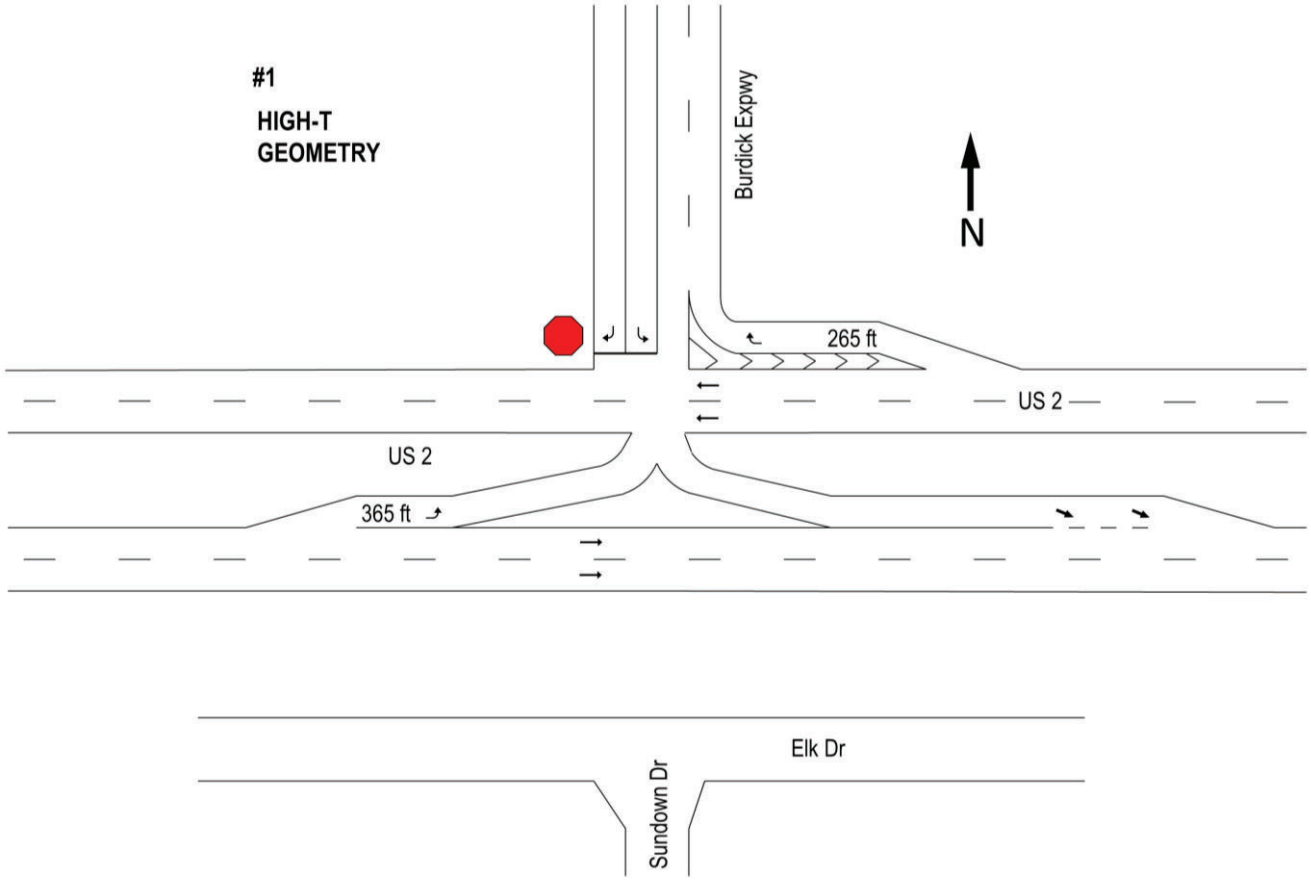
Capacity analysis – TRAFFIC SIGNAL GEOMETRY PM Peak Hour				
Approach	**2019 LOS**	**2019 Delay (sec)**	**2039 LOS**	**2039 Delay (sec)**
Eastbound:	A	7	A	9
Westbound:	A	10	B	13
Northbound:	C	27	C	25
Southbound:	C	35	C	34
Intersection	**B**	**11**	**B**	**13**

Signal Timing used for this capacity analysis: Cycle Length 70, coordinated, protected/permissive WBL & EBL

Ø1 WBL 13 sec	**Ø2** EB 33 sec	**Ø3**	**Ø4** NB 24 sec
Ø5 EBL 13 sec	**Ø6** WB 33 sec	**Ø7**	**Ø8** SB 24 sec

#1 HIGH-T

This configuration would be set up by closing the northbound approach, the southbound approach would allow left turns in and out. See page 27 for more details on the High-T configuration.



Capacity analysis – HIGH-T GEOMETRY PM Peak Hour

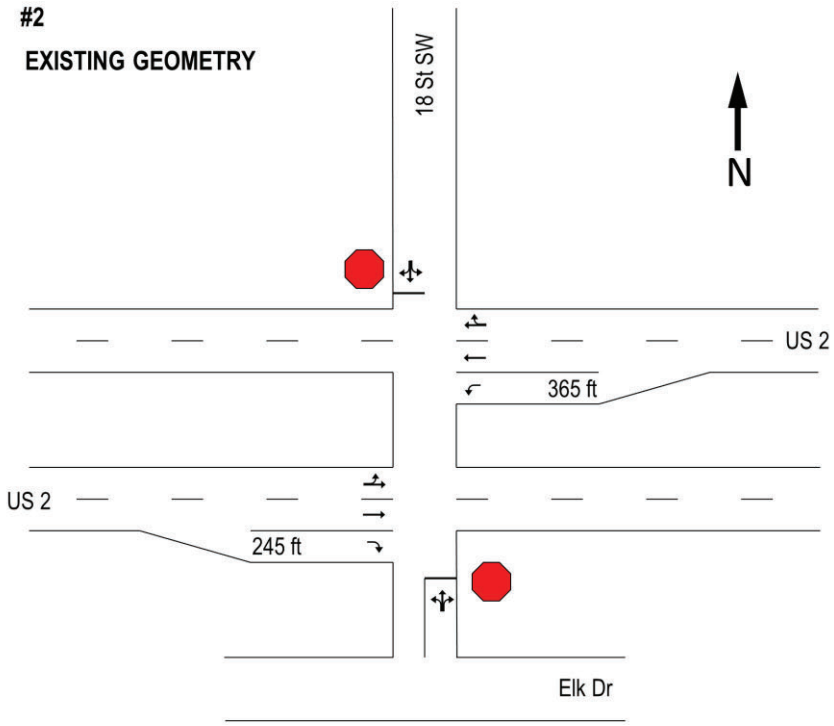
Approach	2019 LOS	2019 Delay (sec)	2039 LOS	2039 Delay (sec)
Eastbound:	A*	2	A*	2
Westbound:	A*	0	A*	0
Northbound:	-	-	-	-
Southbound:	C	17	C	23
Intersection	**A***	**2**	**A***	**3**

*Equivalent LOS shown, mainline approaches and the overall intersection LOS are not calculated for TWSC intersections.

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INTERSECTION #2: US 2 & 18 St SW

#2 EXISTING GEOMETRY



Capacity analysis – EXISTING GEOMETRY PM Peak Hour

Approach	2019 LOS	2019 Delay (sec)	2039 LOS	2039 Delay (sec)
Eastbound:	A*	0	A*	0
Westbound:	A*	0	A*	0
Northbound:	C	25	E	39
Southbound:	D	25	D	32
Intersection	**A***	**1**	**A***	**1**

*Equivalent LOS shown, mainline approaches and the overall intersection LOS are not calculated for TWSC intersections.

Intersection-related Crashes

There were 3 crashes at this intersection during the study period: a rear-end, a sideswipe, and an angle. No crash patterns were identified.

Major Road Turn Lane	Existing?	Criteria 1.A Met?	Meets current design standards?
EB to NB Left	No	No	N/A
WB to SB Left	Yes	Yes	Yes
EB to SB Right	Yes	Yes	No - ex. 245 ft, should be 265 ft
WB to NB Right	No	No	N/A

Illumination Lighting Warrant		Met?
5A	All signalized intersections	No
5B	All roundabout and J-turn intersections	No
5C	Raised channelization/medians present	No
5D	Roadway segment lighting	No
5E	AADT cross product ≥ 10,000,000	Yes – cross product is 13.7 million
5F	Engineering judgment	No
5G	Existing illumination lighting present	No
5H	Local government pays 50% and maintains	No

Illumination lighting is warranted.

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#2 REMOVE INTERSECTION

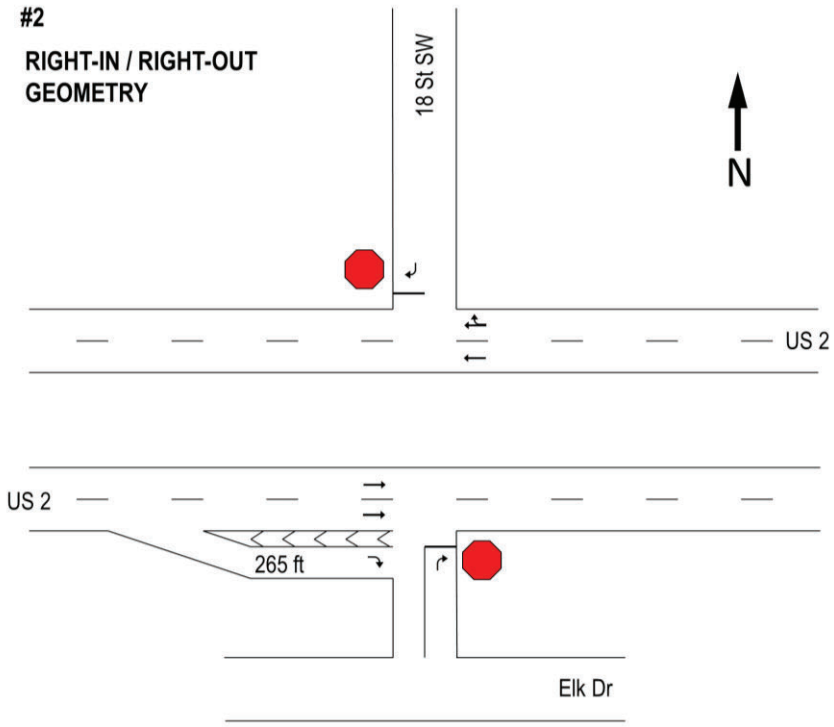
This intersection has the lowest minor road volumes out of the 3 study intersections. Removing the south approach and median is shown below. This alternative is feasible since the existing frontage road (Elk Dr) would allow traffic to access US 2 using the adjacent intersections. The north approach carries a very low traffic volume to a fire department training facility. Since there does not appear to be another route to this facility the north approach would remain under this alternative.



Figure 5 – Removal of intersection (Aerial photo from Google Earth)

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#2 RIGHT-IN / RIGHT-OUT GEOMETRY



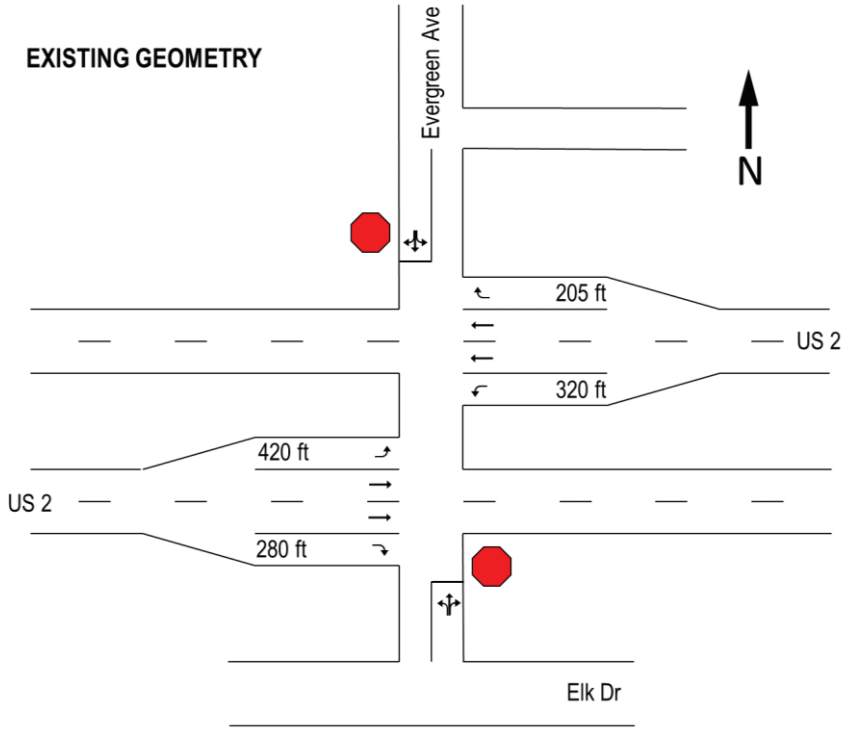
Capacity analysis – RIGHT-IN / RIGHT-OUT GEOMETRY PM Peak Hour

Approach	2019 LOS	2019 Delay (sec)	2039 LOS	2039 Delay (sec)
Eastbound:	A*	0	A*	0
Westbound:	A*	0	A*	0
Northbound:	B	12	B	14
Southbound:	B	12	B	13
Intersection	**A***	**0**	**A***	**0**

*Equivalent LOS shown, mainline approaches and the overall intersection LOS are not calculated for TWSC intersections.

INTERSECTION #3: US 2 & EVERGREEN AVE

#3 EXISTING GEOMETRY



In general, this study does not focus on the origin/destination of individual vehicles, however it is notable at this intersection that the EB right turn to access Elk Dr has a very heavy volume (263 vehicles during the PM peak hour). According to the Minot District, many vehicles are making this turn in order to access 16 St SW and the mall area to the east instead of taking the off ramp near RP 145.10 (blue route on figure 6). This is because of the longer delay due to the stop condition at 22 Ave SW. Local drivers have learned that the a free-flow movement through this intersection is faster (yellow route on figure 6). The evaluation of the US 2 Ramps/22 Ave SW intersection is outside of the scope of this study however any decisions made at US 2 and Evergreen will have an impact on this intersection. Further study of this intersection and the entire 16 St SW interchange may be needed.

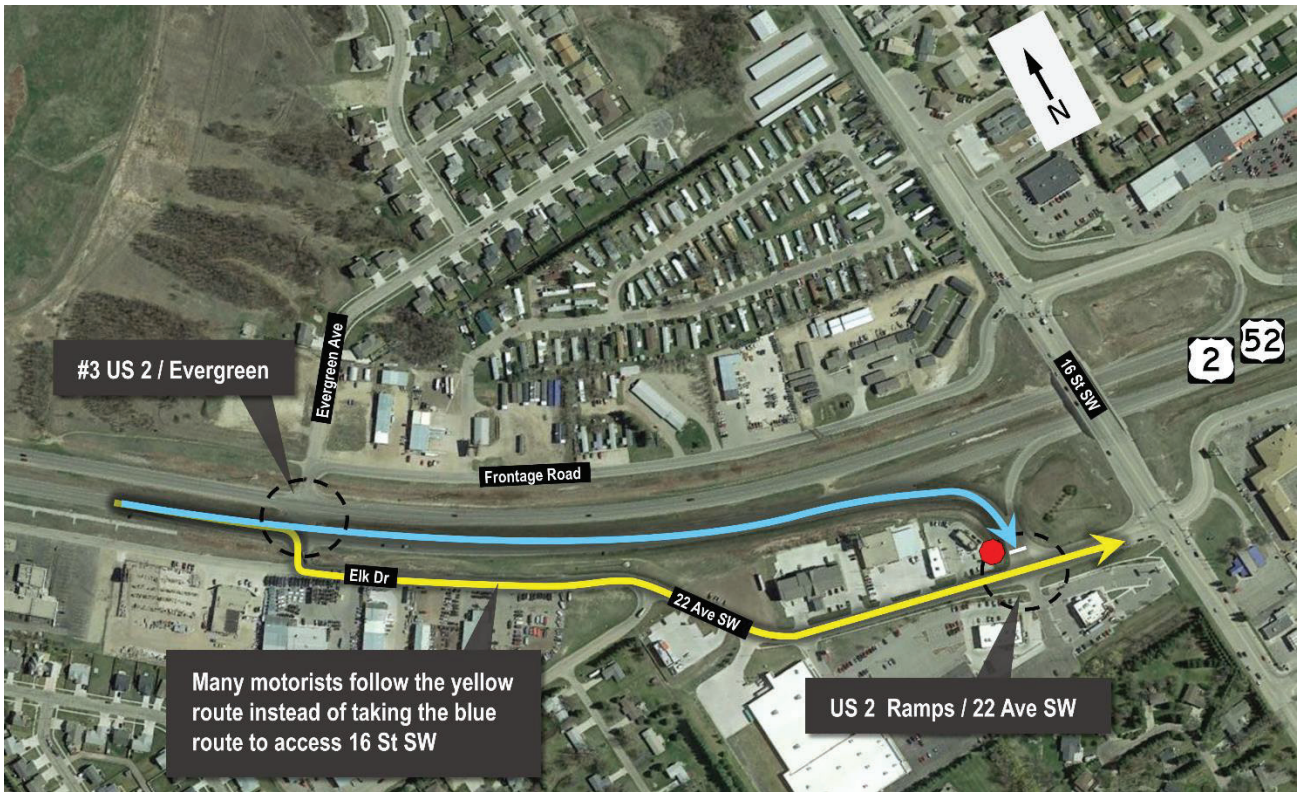


Figure 6 – EB traffic pattern (Aerial photo from Google Earth)

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Capacity analysis – EXISTING GEOMETRY PM Peak Hour				
Approach	2018 LOS	2018 Delay (sec)	2038 LOS	2038 Delay (sec)
Eastbound:	A*	1	A*	1
Westbound:	A*	1	A*	1
Northbound:	D	30	F	66
Southbound:	C	16	C	21
Intersection	**A***	**3**	**A***	**5**

*Equivalent LOS shown, mainline approaches and the overall intersection LOS are not calculated for TWSC intersections.

Intersection-related Crashes

There were 39 crashes at this intersection during the study period. Of these crashes, 25 were angle, 4 were rear end, 4 were left turn, 3 were sideswipes, 1 was a single vehicle and 2 were "other". The severe crashes tend to be angle. Many of the crashes' contributing factor was "failure to yield". For vehicles at the stop sign, the visibility of approaching vehicles on US 2 may be a factor in some of these crashes. More than half the angle crashes were northbound vehicles colliding with eastbound vehicles. A possible factor in these crashes are vehicles in the EB right turn lane blocking the view towards the west. An option to address this is to install an offset right turn lane. This should be considered for both the EB right and WB right turn lanes.

There were no fatal crashes during the *study period*. However, on May 3, 2012 there was a fatal crash at this intersection. This crash involved a NB vehicle that proceeded into the intersection and was struck by a westbound semi.

Major Road Turn Lane	Existing?	Criteria 1.A Met?	Meets current design standards?
EB to NB Left	Yes	Yes	Yes
WB to SB Left	Yes	Yes	No – ex. 320 ft, should be 365 ft
EB to SB Right	Yes	Yes	Yes
WB to NB Right	Yes	Yes	No – ex. 205 ft, should be 265 ft

Illumination Lighting Warrant		Met?
5A	All signalized intersections	No
5B	All roundabout and J-turn intersections	No
5C	Raised channelization/medians present	No
5D	Roadway segment lighting	Yes – high mast lighting in place
5E	AADT cross product ≥ 10,000,000	Yes – cross product is 73.5 million
5F	Engineering judgment	No
5G	Existing illumination lighting present	Yes – high mast lighting in place
5H	Local government pays 50% and maintains	No

Illumination lighting is warranted.

Traffic Signal Warrant		Met?
1	Eight-Hour Vehicular Volume	Yes
2	Four-Hour Vehicular Volume	No
3	Peak Hour	N/A
4	Pedestrian Volume	N/A
5	School Crossing	N/A
6	Coordinated Signal System	N/A
7	Crash Experience	N/A
8	Roadway Network	N/A
9	Intersection near a grade crossing	N/A

A traffic signal is warranted. See appendix D for details on the signal warrant analysis. Capacity analysis of a traffic signal is shown on page 24.

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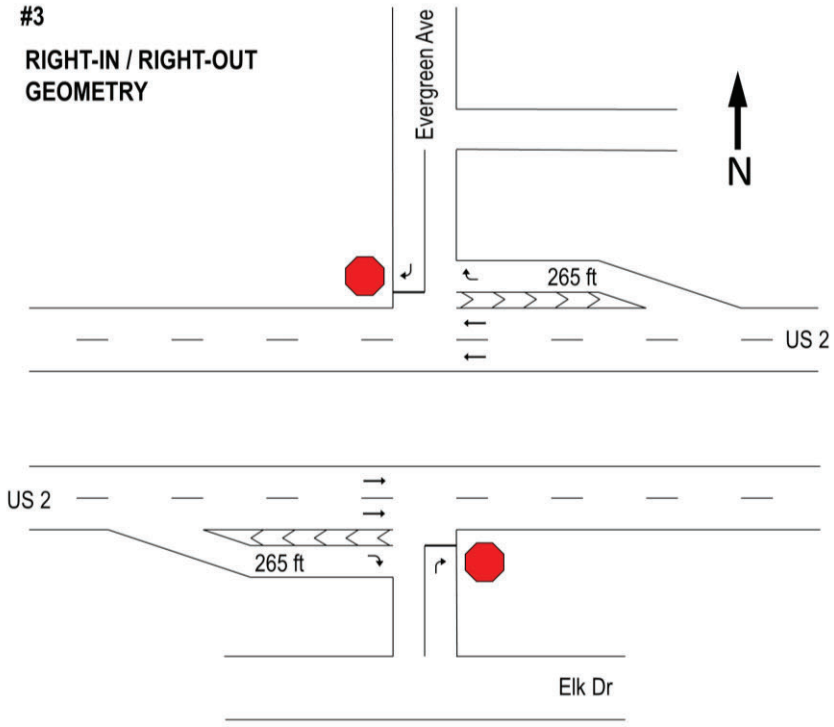
#3 REMOVE INTERSECTION



Figure 7 – Removal of intersection (Aerial photo from Google Earth)

The Evergreen Ave intersection is an at-grade intersection that is less than a half mile away from an existing interchange. Removing the intersection entirely is an option since there is an existing network of roads that would allow vehicles to access US 2 via the 16th St interchange. However, the existing EB right turns at Evergreen Ave may turn right further west at 18 St SW thus putting more traffic on Elk Dr with this alternative. See figure 7.

#3 RIGHT-IN / RIGHT-OUT GEOMETRY

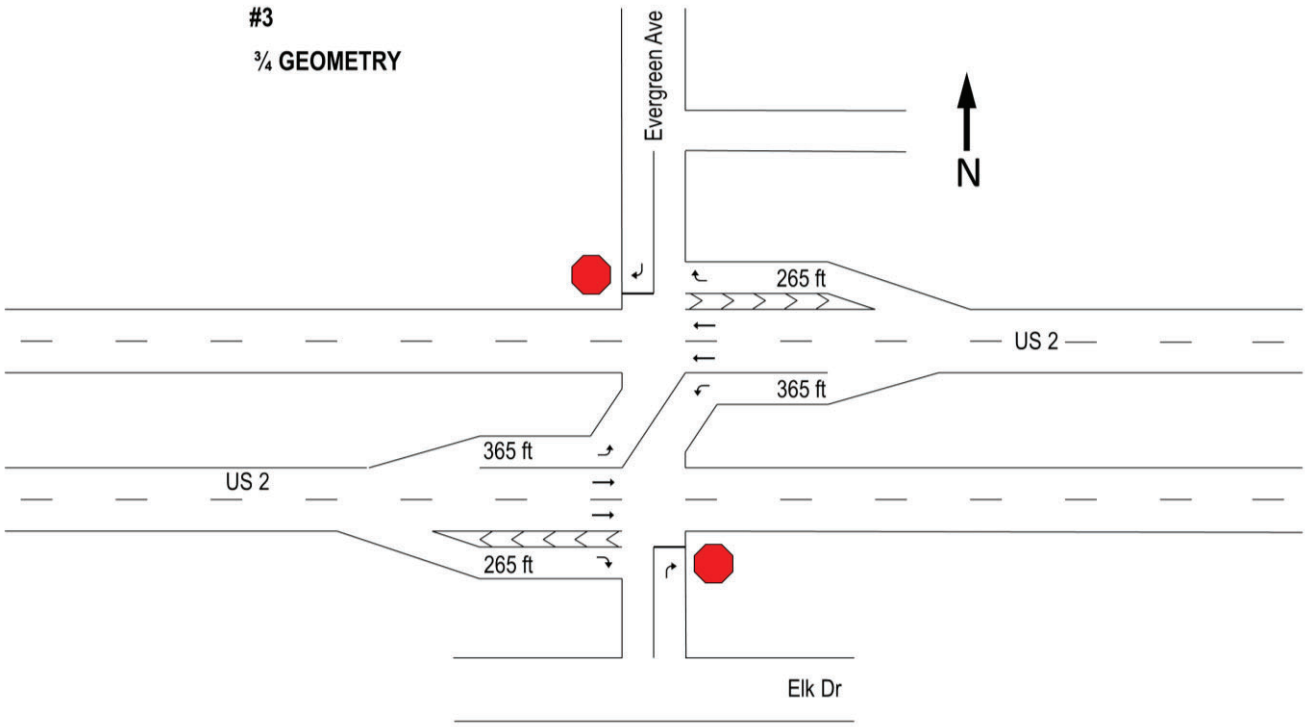


Capacity analysis – RIGHT-IN / RIGHT-OUT GEOMETRY PM Peak Hour

Approach	2019 LOS	2019 Delay (sec)	2039 LOS	2039 Delay (sec)
Eastbound:	A*	0	A*	0
Westbound:	A*	0	A*	0
Northbound:	B	11	B	11
Southbound:	B	12	B	13
Intersection	**A***	**1**	**A***	**1**

*Equivalent LOS shown, mainline approaches and the overall intersection LOS are not calculated for TWSC intersections.

#3 THREE QUARTER INTERSECTION

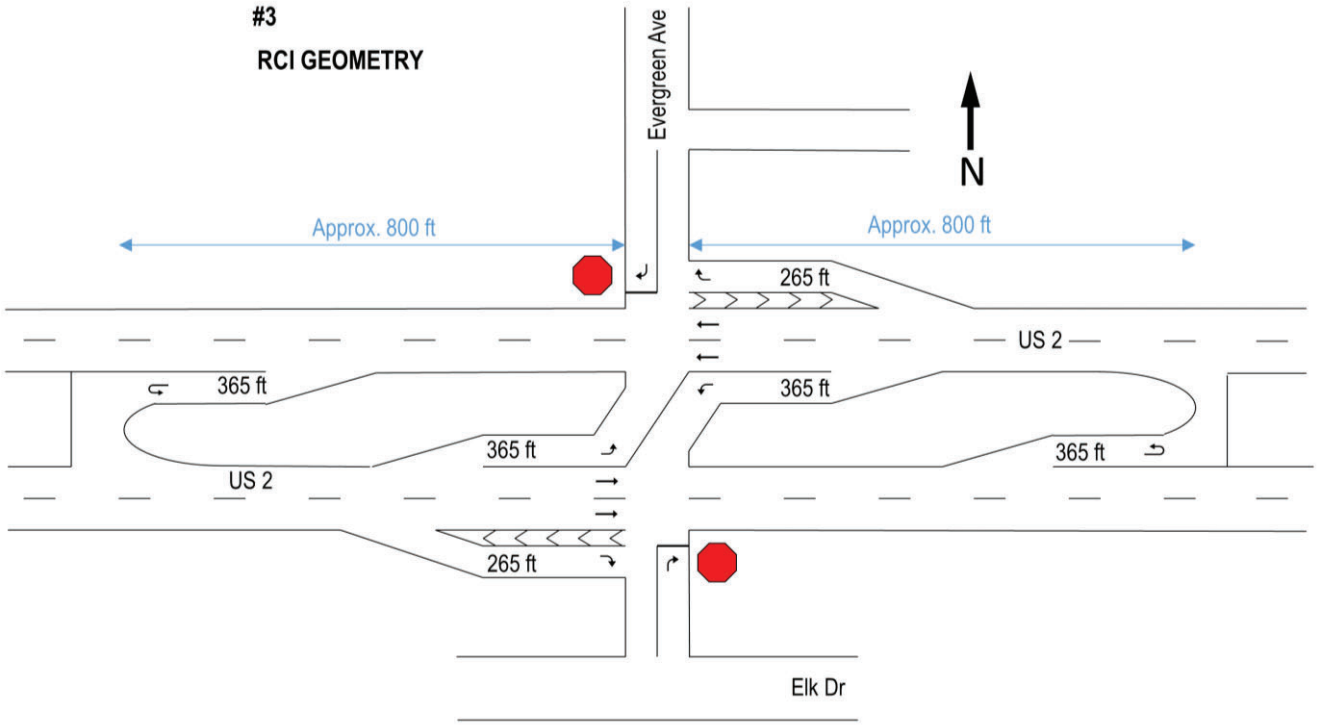


Capacity analysis – ¾ GEOMETRY PM Peak Hour

Approach	2019 LOS	2019 Delay (sec)	2039 LOS	2039 Delay (sec)
Eastbound:	A*	1	A*	1*
Westbound:	A*	0	A*	0*
Northbound:	B	11	B	12
Southbound:	B	12	B	13
Intersection	**A***	**2**	**A***	**2**

*Equivalent LOS shown, mainline approaches and the overall intersection LOS are not calculated for TWSC intersections.

#3 REDUCED CONFLICT INTERSECTION (RCI)



Capacity analysis – RCI GEOMETRY PM Peak Hour

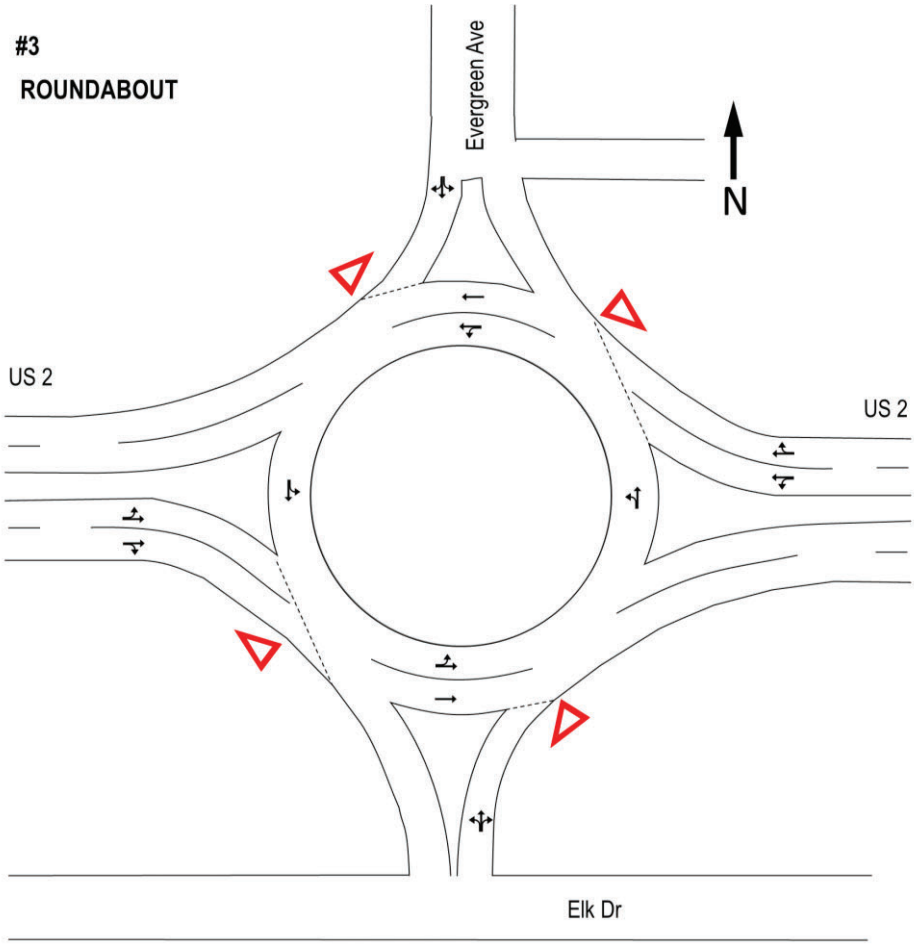
Approach	2019 LOS	2019 Delay (sec)	2039 LOS	2039 Delay (sec)
Eastbound:	A	1	A	1
Westbound:	A	0	A	0
Northbound:	D	45	D	53
Southbound:	C	22	C	25
Intersection	**A**	**4**	**A**	**4**

Note that the side street delay includes the extra distance travel time from the stop sign.

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#3 ROUNDABOUT

For the purpose of this study, it is assumed that a 2 lane (for the major movement) by 1 lane (for the minor movements) roundabout would be used at this intersection. A concept of this is shown below.

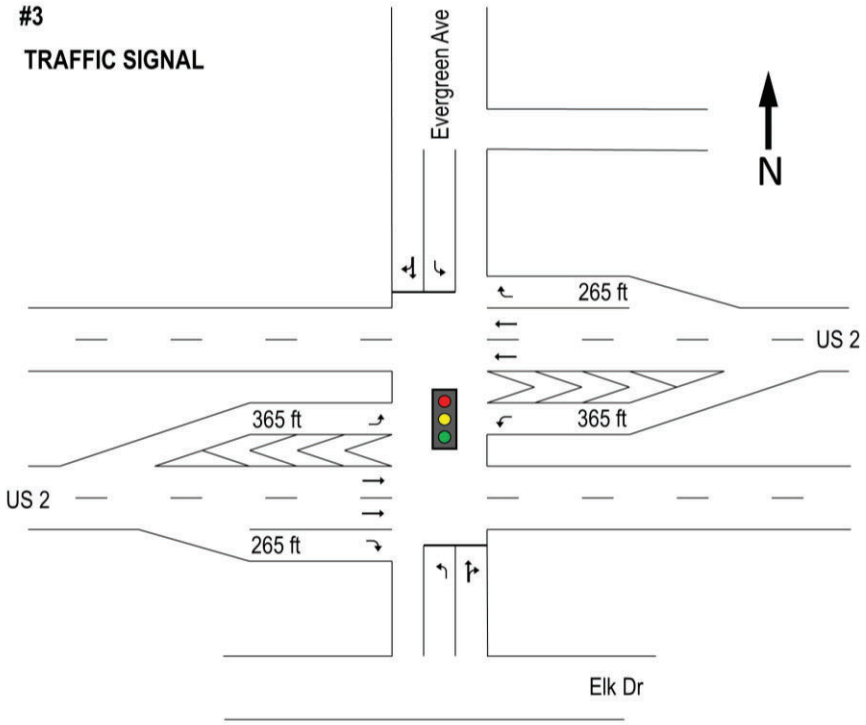


Capacity analysis – ROUNDABOUT GEOMETRY PM Peak Hour

Approach	2019 LOS	2019 Delay (sec)	2039 LOS	2039 Delay (sec)
Eastbound:	A	6	A	8
Westbound:	A	7	A	9
Northbound:	A	6	A	8
Southbound:	A	8	A	10
Intersection	**A**	**7**	**A**	**8**

#3 TRAFFIC SIGNAL

If a traffic signal is installed it is recommended to realign the left turn lanes with zero offset (as shown in the schematic below) or with positive offset.



Capacity analysis – TRAFFIC SIGNAL GEOMETRY PM Peak Hour				
Approach	**2019 LOS**	**2019 Delay (sec)**	**2039 LOS**	**2039 Delay (sec)**
Eastbound:	A	8	A	9
Westbound:	A	10	B	12
Northbound:	B	16	B	19
Southbound:	B	15	B	17
Intersection	**A**	**9**	**B**	**11**

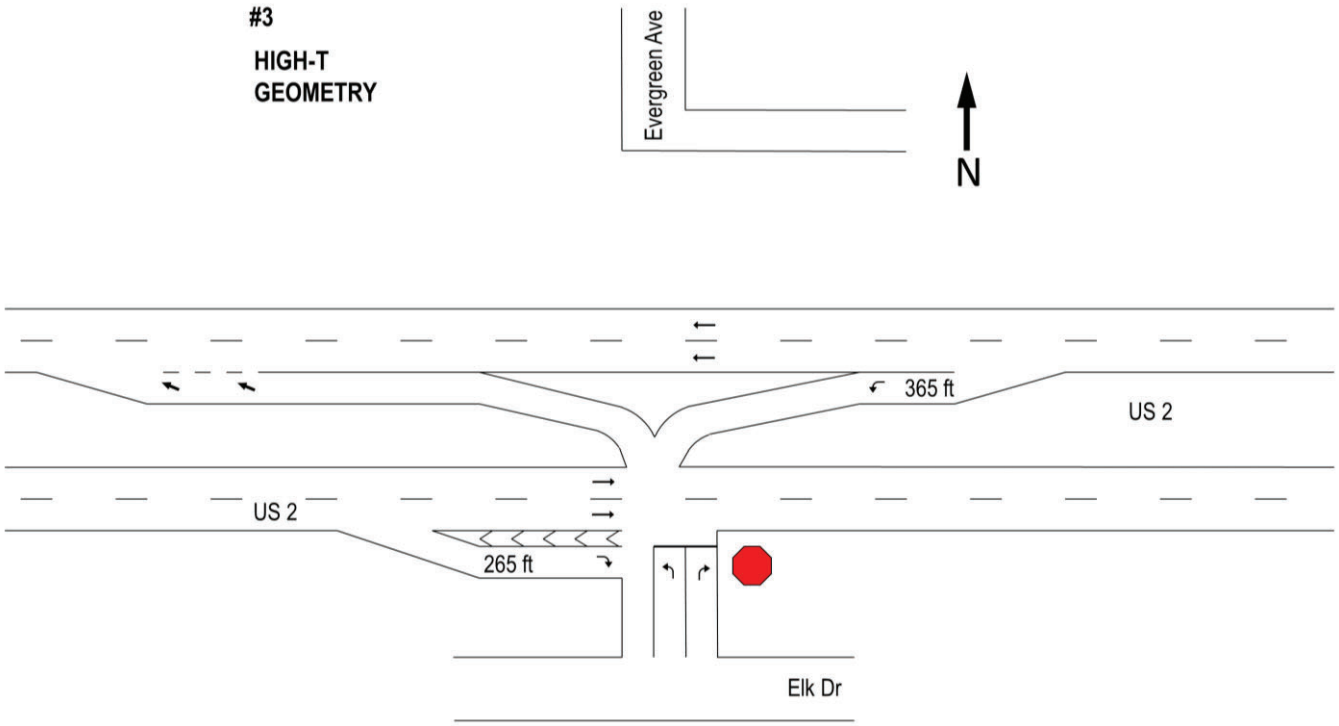
Signal Timing used for this capacity analysis: Cycle Length 70, uncoordinated, protected/permissive WBL & EBL

Ø1 WBL 13 sec	**Ø2** EB 33 sec	**Ø3**	**Ø4** NB 24 sec
Ø5 EBL 13 sec	**Ø6** WB 33 sec	**Ø7**	**Ø8** SB 24 sec

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#3 HIGH-T

This configuration would be set up by closing the southbound approach, the northbound approach would allow left turns in and out. See page 27 for more details on the High-T configuration.



Capacity analysis – HIGH-T GEOMETRY PM Peak Hour				
Approach	**2019 LOS**	**2019 Delay (sec)**	**2039 LOS**	**2039 Delay (sec)**
Eastbound:	A*	0	A*	0
Westbound:	A*	0	A*	0
Northbound:	C	17	C	22
Southbound:	-	-	-	-
Intersection	**A***	**1**	**A***	**1**

*Equivalent LOS shown, mainline approaches and the overall intersection LOS are not calculated for TWSC intersections.

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DETAILS ON THE HIGH-T CONFIGURATIONS

Intersections #1 and #3 with the "High-T" configurations are intended to strike a balance between reducing the number of conflict points while still allowing turning movements that are carrying higher volumes. The major road movements are free-flow and the minor road is stop-controlled. Note that this geometry can be signalized later if needed (i.e. "Continuous Green T-Intersection"). The unsignalized design has had success in Nevada and an example location is shown below. These configurations use median acceleration lanes which are typically considered if all of the following are met:

- There is a significant history of rear-end or sideswipe crashes
- Intersection sight distance is inadequate for left-turning traffic entering the divided highway
- There is a high volume of left-turning trucks (75 or more per day) entering the divided highway

At both intersections, the three criteria are not met. In addition, median acceleration lanes have fallen out of favor since NDDOT has found through past history that motorists generally do not use them. However, given the complex traffic operations and crash history in this corridor—this option should not be ruled out. With some channelization elements as shown in the figures below, drivers may be more likely to use the acceleration lanes as intended.



Figure 8 – US 50 near Stagecoach, NV (from Google Earth)



Figure 9 – US 50 near Stagecoach, NV (from Google Map Street view)

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CITY OF MINOT COMMENTS

The City of Minot (with concurrence from the Minot District) had an opportunity to review a draft version of this traffic study and offered the following comments.

#1 US 2 / Burdick Expwy

- It is unlikely an immediate short term improvement can be done without a reconstruction project.
- A ¾ intersection is not feasible due to concerns over the re-routing of left-turns from Burdick.
- With the RCI, the City's concern is that that for the Burdick eastbound left-turn U-turn path, the location of the U-turn would be on the curve and on a downward incline. This could make truck movements difficult and slow, especially during slick times.
- Roundabout – the City of Minot is not sure they are ready for a roundabout on a high-speed roadway.
- Signal – not preferred due to Burdick being on the middle of a hill and the high truck traffic on US 2. Westbound US 2 could have a high rear-end crash potential and eastbound US 2 could have slow accelerations if queues reach the incline.
- High-T – preferred option for the intersection but would maintain access to the retirement homes a right-in/right-out.

#2 US 2 / 18 St SW

- Access to the Fire Training Grounds will have to be maintained. The City of Minot is in favor of removing the access on the south side.

#3 US 2 / Evergreen Ave

- Need to consider the 16th Street interchange for all scenarios.
- Full removal of the intersection isn't likely due to the businesses and traffic flow.
- Right-In/Right-Out may be a decent tradeoff of maintaining access.
- A ¾ Intersection would have an immediate safety improvement as it would eliminate most of the turning movements that has had crashes within the past 5 years.
- If an RCI is chosen, need to consider if the vehicles that want to make a NB to WB left turn would instead backtrack to the 16th St interchange.
- A traffic signal is not preferred here—it is too close to the 16th Street interchange and the frontage roads are too close to US 2.
- High-T – the City states that this "could possibly work here as well" but maintain a right-in/right-out on the north side.

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SUMMARY

Based on the capacity analysis, LOS guidance is met with the current peak hour traffic. However, even though the study intersections do not have any delay issues in their existing configuration, drivers may still *perceive* operational problems while waiting for a gap at the stop sign.

Based on the crash history, roadway improvements are needed within the study area. This study examined various intersection configurations with a goal of reducing the number and severity of crashes by simplifying the decision-making tasks for the driver.

RECOMMENDATIONS

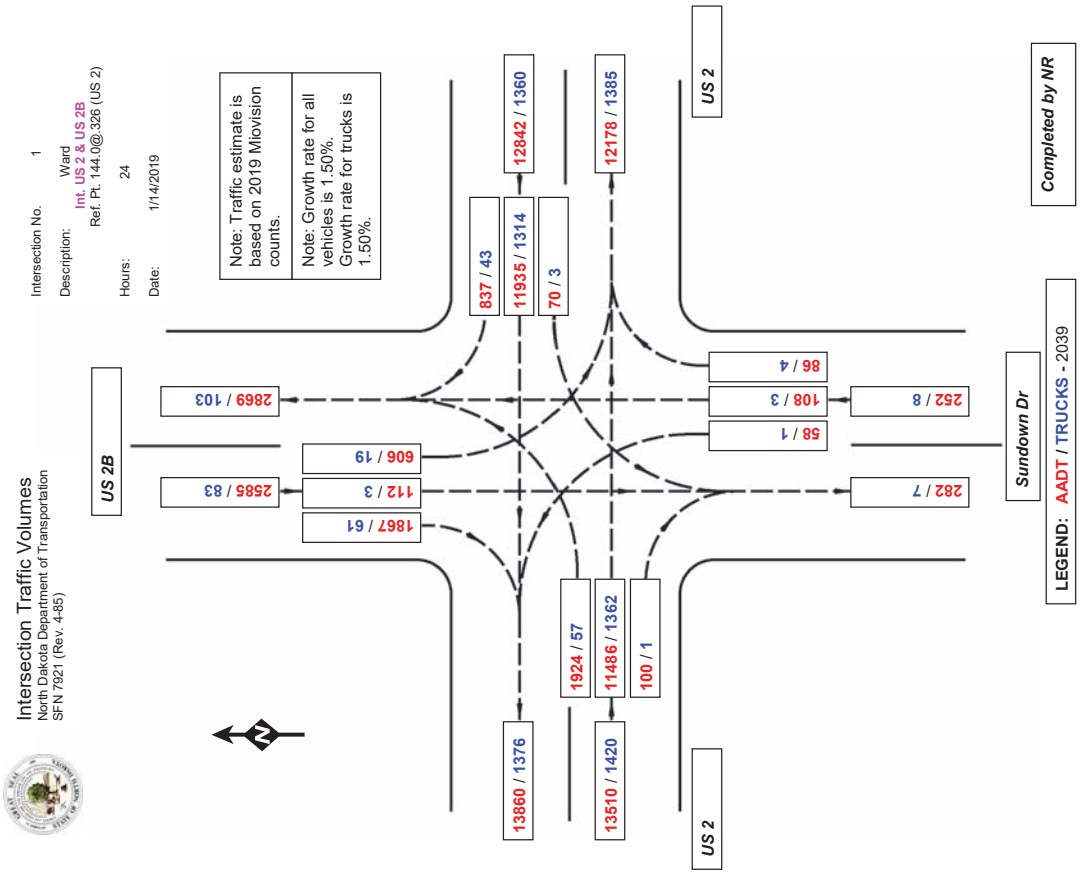
To improve safety in this corridor and at the study intersections, minimizing the number of conflict points is recommended. Study intersection improvements should consist of, but not limited to, a combination of one or more of the alternatives shown in the list below.

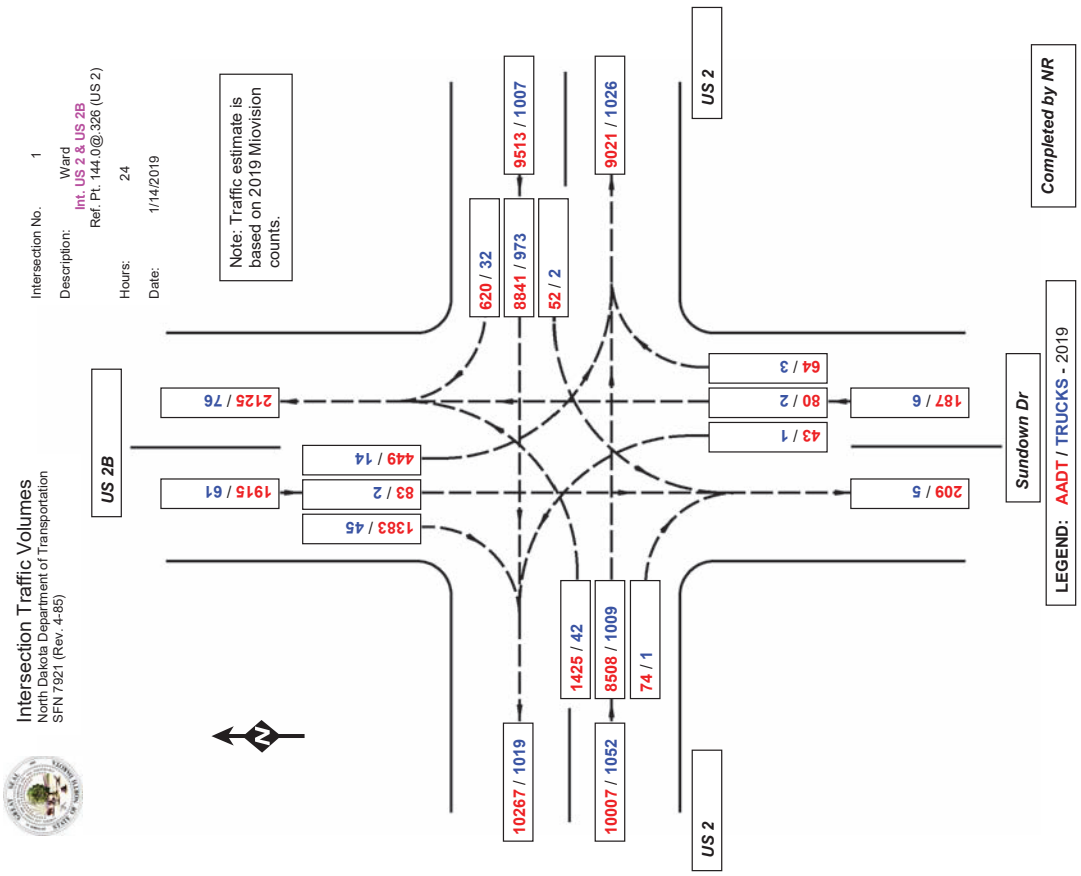
Alternative	**Number of Conflict Points**
Remove	0
Right-in/Right-out	4
High-T	10
Roundabout	12
Three-quarter intersection	20
RCI	24
Traffic Signal	42
Do nothing	42

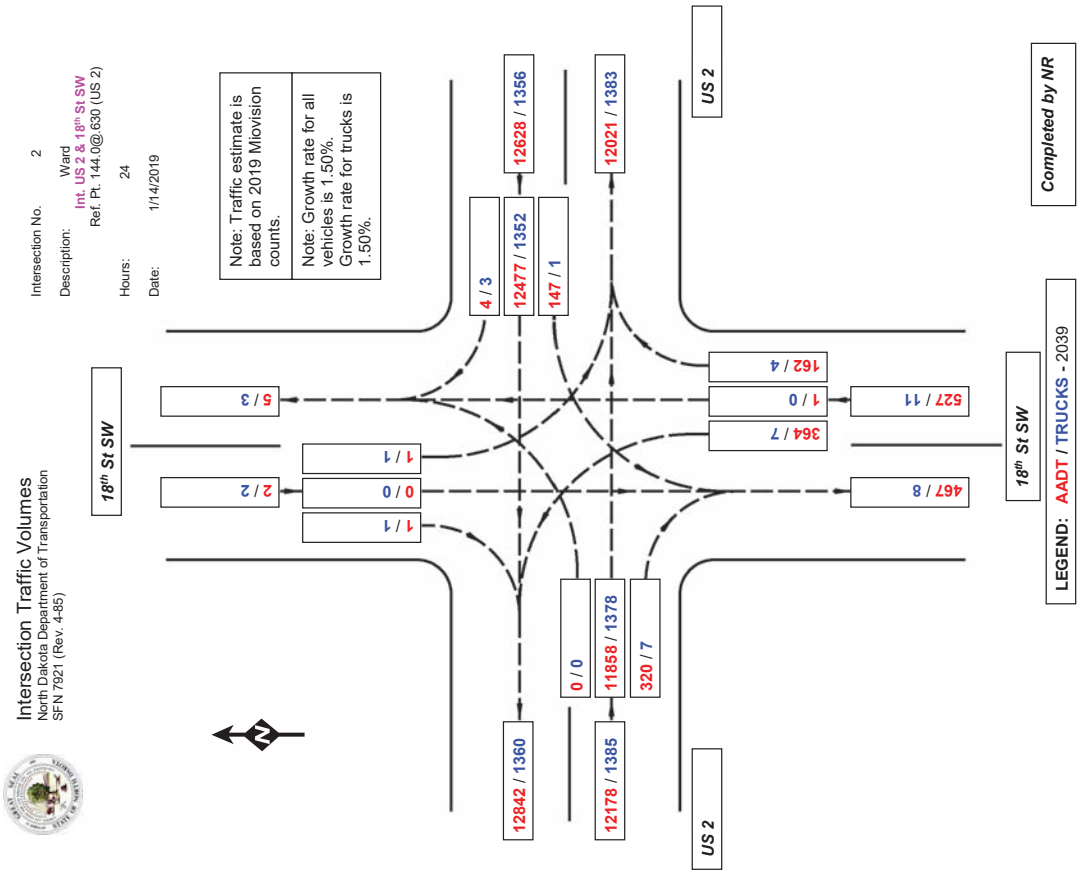
It is recommended to further evaluate and refine these alternatives during the project development process. Traffic impacts to the adjacent road network may need further traffic analysis along with consideration of other factors as well (such as terrain, roadway network, area context, environmental issues, public input, etc.).

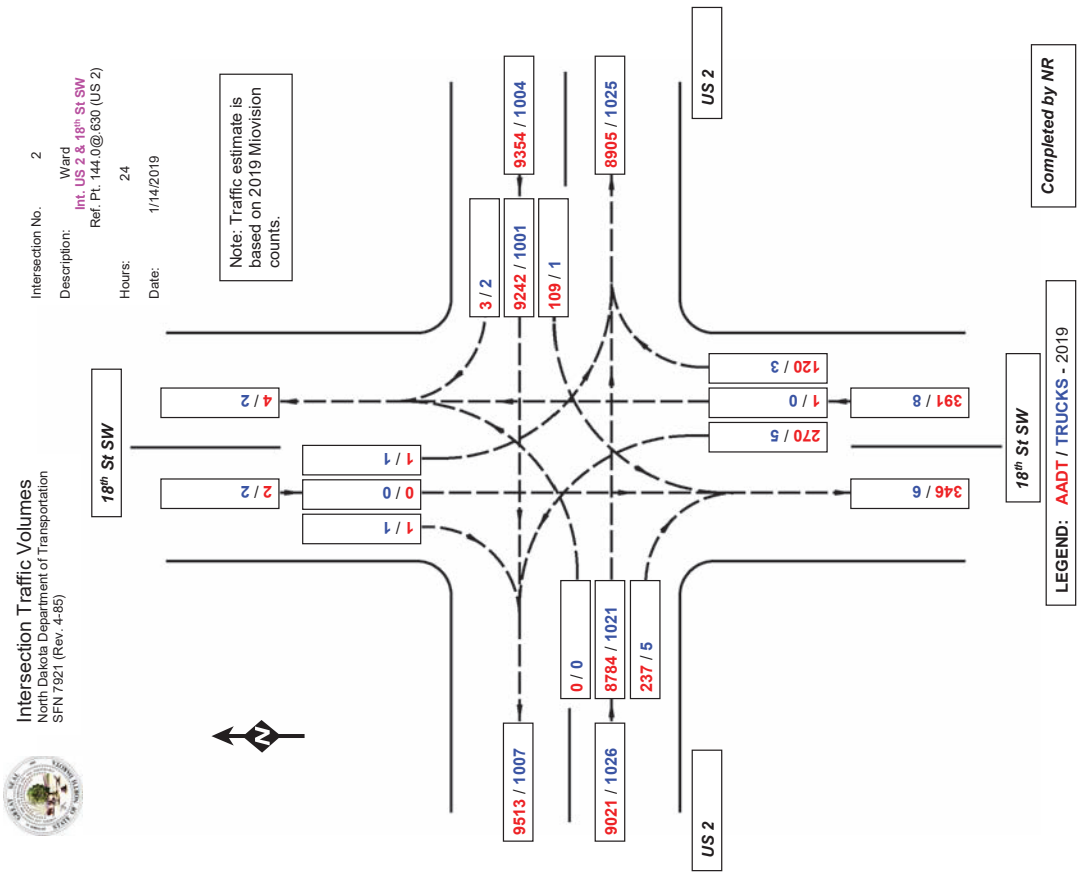
In addition, the following is recommended:

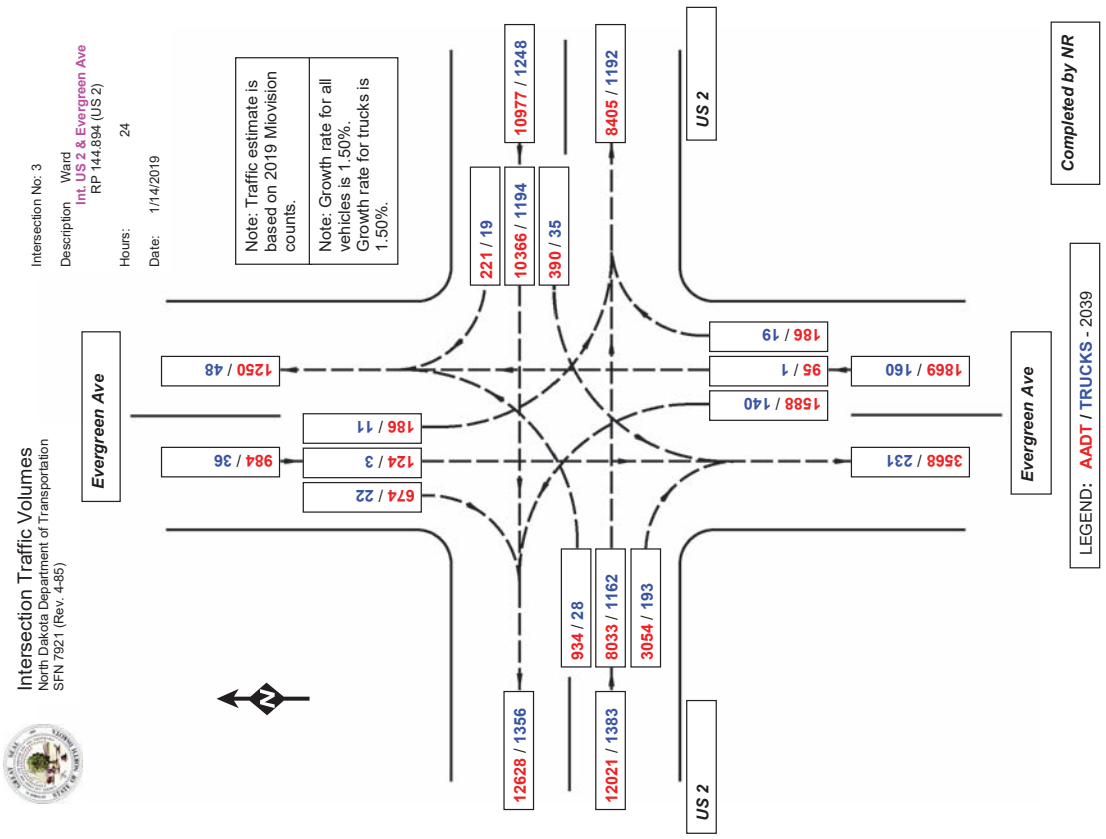
- Offset right turn lanes on US 2 (see page 6)
- Segment lighting as shown in figure 4 (see page 7)

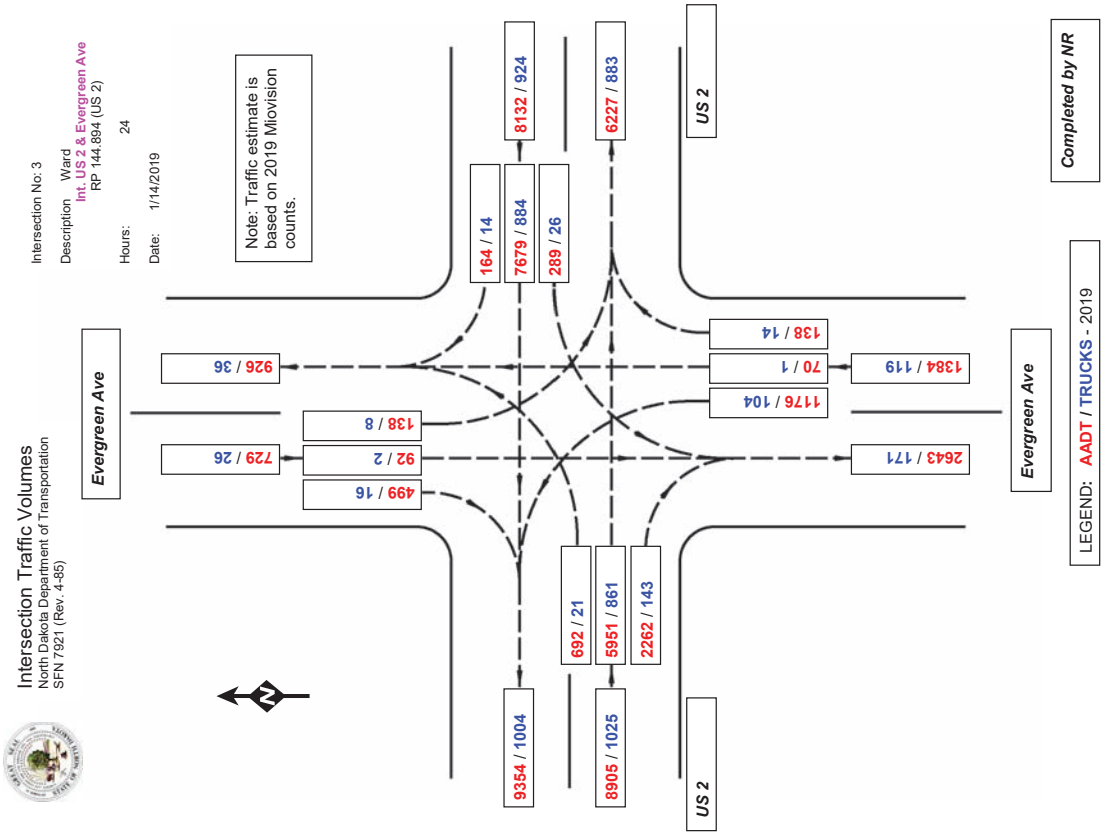

Intersection Traffic Volumes
North Dakota Department of Transportation
SFN 7921 (Rev. 4-85)
Intersection No. 1
Description: Ward
Int. US 2 & US 2B
Ref. Pt. 144.0@.326 (US 2)
Hours: 24
Date: 1/14/2019
Note: Traffic estimate is based on 2019 Miovision counts.
Note: Growth rate for all vehicles is 1.50%. Growth rate for trucks is 1.50%.
US 2B
Sundown Dr
US 2
US 2
2869 / 103
2585 / 83
606 / 19
112 / 3
1867 / 61
837 / 43
11935 / 1314
70 / 3
12842 / 1360
12178 / 1385
86 / 4
108 / 3
58 / 1
252 / 8
282 / 7
1924 / 57
11486 / 1362
100 / 1
13860 / 1376
13510 / 1420
Completed by NR
LEGEND: AADT / TRUCKS - 2039


Intersection Traffic Volumes
North Dakota Department of Transportation
SFN 7921 (Rev. 4-85)
Intersection No. 1
Description: Ward
Int. US 2 & US 2B
Ref. Pt. 144.0@.326 (US 2)
Hours: 24
Date: 1/14/2019
Note: Traffic estimate is based on 2019 Miovision counts.
US 2B
Sundown Dr
US 2
US 2
2125 / 76
1915 / 61
449 / 14
83 / 2
1383 / 45
620 / 32
8841 / 973
52 / 2
9513 / 1007
9021 / 1026
64 / 3
80 / 2
43 / 1
187 / 6
209 / 5
1425 / 42
8508 / 1009
74 / 1
10267 / 1019
10007 / 1052
Completed by NR
LEGEND: AADT / TRUCKS - 2019


Intersection Traffic Volumes
North Dakota Department of Transportation
SFN 7921 (Rev. 4-85)
Intersection No. 2
Description: Ward
Int. US 2 & 18th St SW
Ref. Pt. 144.0@.630 (US 2)
Hours: 24
Date: 1/14/2019
Note: Traffic estimate is based on 2019 Miovision counts.
Note: Growth rate for all vehicles is 1.50%. Growth rate for trucks is 1.50%.
18th St SW
US 2
4 / 3
12628 / 1356
12477 / 1352
147 / 1
12021 / 1383
5 / 3
2 / 2
1 / 1
0 / 0
1 / 1
162 / 4
1 / 0
364 / 7
527 / 11
467 / 8
0 / 0
11858 / 1378
320 / 7
12842 / 1360
12178 / 1385
LEGEND: AADT / TRUCKS - 2039
Completed by NR


Intersection Traffic Volumes
North Dakota Department of Transportation
SFN 7921 (Rev. 4-85)
Intersection No. 2
Description: Ward
Int. US 2 & 18th St SW
Ref. Pt. 144.0@.630 (US 2)
Hours: 24
Date: 1/14/2019
Note: Traffic estimate is based on 2019 Miovision counts.
18th St SW
US 2
3 / 2
9354 / 1004
9242 / 1001
109 / 1
8905 / 1025
4 / 2
2 / 2
1 / 1
0 / 0
1 / 1
120 / 3
1 / 0
270 / 5
391 / 8
346 / 6
0 / 0
8784 / 1021
237 / 5
9513 / 1007
9021 / 1026
LEGEND: AADT / TRUCKS - 2019
Completed by NR


Intersection Traffic Volumes
North Dakota Department of Transportation
SFN 7921 (Rev. 4-85)
Intersection No: 3
Description Ward
Int. US 2 & Evergreen Ave
RP 144.894 (US 2)
Hours: 24
Date: 1/14/2019
Note: Traffic estimate is based on 2019 Miovision counts.
Note: Growth rate for all vehicles is 1.50%. Growth rate for trucks is 1.50%.
Evergreen Ave
US 2
1250 / 48
984 / 36
186 / 11
124 / 3
674 / 22
221 / 19
10366 / 1194
390 / 35
10977 / 1248
8405 / 1192
186 / 19
95 / 1
1588 / 140
1869 / 160
3568 / 231
934 / 28
8033 / 1162
3054 / 193
12628 / 1356
12021 / 1383
Completed by NR
LEGEND: AADT / TRUCKS - 2039


Intersection Traffic Volumes
North Dakota Department of Transportation
SFN 7921 (Rev. 4-85)
Intersection No: 3
Description Ward
Int. US 2 & Evergreen Ave
RP 144.894 (US 2)
Hours: 24
Date: 1/14/2019
Note: Traffic estimate is based on 2019 Miovision counts.
Evergreen Ave
US 2
926 / 36
729 / 26
138 / 8
92 / 2
499 / 16
164 / 14
7679 / 884
289 / 26
8132 / 924
6227 / 883
138 / 14
70 / 1
1176 / 104
1384 / 119
2643 / 171
692 / 21
5951 / 861
2262 / 143
9354 / 1004
8905 / 1025
Completed by NR
LEGEND: AADT / TRUCKS - 2019

Intersection and/or Urban Crash Summary Sheets

Total Crashes: 30 (Sorted by Date)
City: Minot
Location: US 2 / Burdick Expwy
Start - End Date: 6/1/2014 - 5/31/2019 (5 Years)

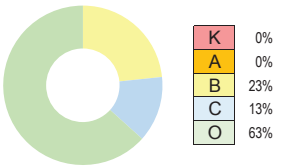
Notes: Animal crashes were not included.

23 USC § 409 Documents
NDDOT Reserves All Objections

VISION ZERO

Statistics

Crash Severity	Letter Code	No. of Crashes
Fatal	K	0
Incapacitating Injury	A	0
Non-incapacitating Injury	B	7
Possible Injury	C	4
Property Damage Only	O	19
		30



Under Construction

Yes = 2 7%

Day of Week

Monday =	5	17%
Tuesday =	9	30%
Wednesday =	5	17%
Thursday =	8	27%
Friday =	0	0%
Saturday =	2	7%
Sunday =	1	3%
	30	

Manner of Collision			Breakdown by Severity K	A	B	C	O
Angle	10	33%	0	0	5	3	2
Rear End	18	60%	0	0	1	1	16
Left Turn	1	3%	0	0	1	0	0
Sideswipe (same dir.)	1	3%	0	0	0	0	1
Sideswipe (opp dir.)	0	0%	0	0	0	0	0
Single Vehicle	0	0%	0	0	0	0	0
Ped/Bike	0	0%	0	0	0	0	0
Head On	0	0%	0	0	0	0	0
Backing	0	0%	0	0	0	0	0
Other	0	0%	0	0	0	0	0
	30	100%	0	0	7	4	19

Surface Conditions			Breakdown by Severity K	A	B	C	O
Dry	25	83%	0	0	5	4	16
Wet	3	10%	0	0	1	0	2
Ice / Snow	2	7%	0	0	1	0	1
Other	0	0%	0	0	0	0	0
	30	100%	0	0	7	4	19

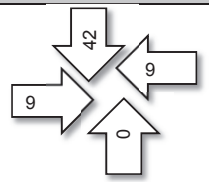
Lighting Conditions			Breakdown by Severity K	A	B	C	O
Dawn/Dusk	1	3%	0	0	0	0	1
Daylight	24	80%	0	0	5	3	16
Dark	0	0%	0	0	0	0	0
Dark (lighted)	5	17%	0	0	2	1	2
Unknown	0	0%	0	0	0	0	0
	30	100%	0	0	7	4	19

V1 and V2 Configuration*

Passenger Car =	23
PU / Van / Utility =	36
Truck =	1
Bus / Motorhome =	0
Motorcycle + Moped =	0
Ped or Bike =	0

These are only the most popular choices.

V1 and V2 Directions



NB = 0
SB = 42
EB = 9
WB = 9

D1 and D2 Alcohol / Drugs*

Yes (alcohol or drugs present) = 1

D1 and D2 Age/Sex

Age	M	F	Total
0-17	3	1	4
18-20	0	2	2
21-24	1	3	4
25-34	9	5	14
35-44	6	5	11
45-54	6	3	9
55-64	4	0	4
65-74	3	2	5
75+	4	2	6
	36	23	59

Month

Military Time	1 Jan	2 Feb	3 Mar	4 Apr	5 May	6 Jun	7 Jul	8 Aug	9 Sept	10 Oct	11 Nov	12 Dec		
0													0	0%
1													0	0%
2													0	0%
3													0	0%
4													0	0%
5													0	0%
6													0	0%
7					1								1	3%
8		1				1		1					3	10%
9								1					1	3%
10													0	0%
11													0	0%
12						1		1					2	7%
13	1				1								2	7%
14													0	0%
15									1				1	3%
16	1		1	1		1	1	1		1	1		9	30%
17	1	1					1		1		1		6	20%
18		1				1							2	7%
19													0	0%
20						1					1		2	7%
21													0	0%
22											1		1	3%
23													0	0%
Total	3	3	2	1	2	5	2	4	2	1	5	0	30	

*Within the Manner of Collision table, values equal to zero are not shown in order to reduce clutter.

Manner of Collision

Year	Start Date	End Date	Angle NB+EB	Angle NB+WB	Angle SB+EB	Angle SB+WB	Angle Sub Total	Rear End NB	Rear End SB	Rear End EB	Rear End WB	Rear End Sub Total	Left Turn NB to WB	Left Turn SB to EB	Left Turn EB to NB	Left Turn WB to SB	Left Turn Sub Total	Sideswipe Same Dir. NB	Sideswipe Same Dir. SB	Sideswipe Same Dir. EB	Sideswipe Same Dir. WB	Sideswipe Same Dir. Sub Total	Backing	Ped / Bike	Single Veh.	Head on or Other	Total
1	6/1/2014	5/31/2015				1	1		4			4															**5**
2	6/1/2015	5/31/2016			1	1	2		3			3							1		1						**6**
3	6/1/2016	5/31/2017			1	2	3		5			5															**8**
4	6/1/2017	5/31/2018				1	1		1	1		2															**3**
5	6/1/2018	5/31/2019				3	3		3	1		4			1		1										**8**
					2	**8**	**10**		**16**	**2**		**18**			**1**		**1**		**1**		**1**							**30**

Total Crashes: 30 (Sorted by Date)
City: Minot
Location: US 2 / Burdick Expwy
Start - End Date: 6/1/2014 - 5/31/2019 (5 Years)

23 USC § 409 Documents
NDDOT Reserves All Objections

LEGEND
- ▶ *Fatal*
- ▶ *Incapacitating Injury*
- ▶ *Non-Incapacitating Injury*
- ▷ *Possible Injury*
- ♦ *Wet surface*
- ❄ *Snow, Ice, Slush, Frost*
- ▲ *Crash related to work zone*
- ① *Unit number*

1. Contributing Factor
** = alcohol or drugs involved*

2. Most Harmful Event
For single vehicle crashes, the most harmful event is shown in parentheses in the "Type of Collision" column

VISION ZERO

Crash No.	Crash Severity Date Day Surface Conditions (Weather) Lighting & Time	Type of Collision	① AGE SEX CITY STATE Unit Configuration Movement (traffic control) Contributing Factor[1] Most Harmful Event[2]			Shortened Narrative	Diagram
314201	PDO 10/30/14 Thursday Dry (Clear) Daylight 4:55 PM	Rear End	① 33M MINOT ND Pickup - Van - Utility SB Going Straight (Stop) Following too Close	② 46M BERTHOLD ND Passenger Car SB Turning Right (Stop)			
315478	PDO 11/20/14 Thursday Dry (Clear) Dark(L) 5:43 PM	Rear End	① 55M MINOT ND Passenger Car SB Turning Right (Stop) Following too Close	② 43F MINOT ND Pickup - Van - Utility SB Turning Right (Stop)			
321708	PDO 01/27/15 Tuesday Wet (Cloudy) ♦ Daylight 4:21 PM	Rear End	① 65M MINOT ND Pickup - Van - Utility SB Going Straight (Stop) Attn Distracted-Outside Parked MV	② 31F WILLISTON ND Pickup - Van - Utility SB Waiting to Turn Right (Stop) Parked MV			
321946 ▶	Non-incapacitating injury 02/14/15 Saturday Slush (Snow) ❄ Daylight 5:05 PM	Angle	① 54M BIRTHHOLD ND Passenger Car WB Going Straight	② 76F DONNYBROOK ND Pickup - Van - Utility SB Going Straight (Stop) Failed to Yield			
322501	PDO 02/18/15 Wednesday Slush (Clear) ❄ Daylight 8:39 AM	Rear End	① 33M MINOT ND Passenger Car SB Going Straight (Stop) Following too Close	② 34M MINOT ND Passenger Car SB Going Straight (Stop)			
328907	PDO 06/01/15 Monday Dry (Clear) Daylight 4:19 PM	Rear End	① 71M DES LACS ND Passenger Car SB Going Straight (Stop) Following too Close	② 39F GARRISON ND Passenger Car SB Slowing/Stopping (Stop)			
329674 ▷	Possible Injury 07/07/15 Tuesday Dry (Clear) Daylight 4:24 PM	Angle ▲	① 91M MINOT ND Passenger Car SB Going Straight (Oth) Other MV Tran in Other Rdwy	② 48M MINOT ND Pickup - Van - Utility WB Going Straight MV Tran in Other Rdwy			
332122	PDO 08/23/15 Sunday Dry (Clear) Daylight 12:07 PM	Rear End	① 70M MINOT ND Pickup - Van - Utility SB Turning Right (Stop) Failed to Yield	② 35M MINOT ND Passenger Car SB Turning Right (Stop)			
332275	PDO 08/27/15 Thursday Dry (Clear) Daylight 4:37 PM	Rear End	① 17M MINOT ND Passenger Car SB Going Straight (Stop) Following too Close	② 21F MINOT ND Pickup - Van - Utility SB Going Straight (Stop)			
336109 ▷	Possible Injury 11/30/15 Monday Dry (Clear) Dark(L) 5:30 PM	Angle	① 75F MINOT ND Pickup - Van - Utility SB Going Straight Other	② 33M MINOT ND Pickup - Van - Utility EB Going Straight	③ 58M SASKATOON SK Pickup - Van - Utility EB Going Straight		

Intersection and/or Urban Crash Summary Sheets

Total Crashes: 30 (Sorted by Date)
City: Minot
Location: US 2 / Burdick Expwy
Start - End Date: 6/1/2014 - 5/31/2019 (5 Years)

23 USC § 409 Documents
NDDOT Reserves All Objections

LEGEND
- ▶ *Fatal*
- ▶ *Incapacitating Injury*
- ▶ *Non-Incapacitating Injury*
- ▷ *Possible Injury*
- ♦ *Wet surface*
- ❄ *Snow, Ice, Slush, Frost*
- ▲ *Crash related to work zone*
- ① *Unit number*

1. Contributing Factor
* = alcohol or drugs involved

2. Most Harmful Event
For single vehicle crashes, the most harmful event is shown in parentheses in the "Type of Collision" column

VISION ZERO

Crash No.	Crash Severity Date Day Surface Conditions (Weather) Lighting & Time	Type of Collision	① AGE SEX CITY STATE Unit Configuration Movement (traffic control) Contributing Factor[1] Most Harmful Event[2]			Shortened Narrative	Diagram
1009206	PDO 03/14/16 Monday Dry (Clear) Daylight 4:45 PM	Sideswipe (Same Dir.)	① 16M MINOT ND Passenger Car EB Merging/Diverging Failed to Yield	② 24F MINOT ND Pickup - Van - Utility EB Going Straight	③ 22F MINOT ND Pickup - Van - Utility EB Going Straight		
1012475	PDO 06/02/16 Thursday Wet (Rain) ♦ Dusk 6:35 PM	Rear End	① 28F DES LACS ND Passenger Car SB Going Straight Following too Close	② 39M MINOT ND Pickup - Van - Utility SB Turning Right			
1013376 ▷	Possible Injury 06/23/16 Thursday Dry (Clear) Daylight 8:42 PM	Rear End	① 31M BURLINGTON ND Passenger Car SB Turning Right (Stop) Following too Close	② 62M MINOT ND Pickup - Van - Utility SB Turning Right (Stop)			
1013917	PDO 07/06/16 Wednesday Dry (Cloudy) Daylight 5:25 PM	Rear End	① 25F MINOT ND Pickup - Van - Utility SB Going Straight (Stop) Following too Close	② 36F BERTHOLD ND Passenger Car SB Merging/Diverging (Stop)			
1015751 ▷	Possible Injury 08/09/16 Tuesday Dry (Clear) Daylight 8:30 AM	Angle	① 26M MINOT ND Pickup - Van - Utility EB Going Straight Speed	② 86M MINOT ND Pickup - Van - Utility SB Going Straight (Stop) Failed to Yield			
1017739	PDO 09/13/16 Tuesday Dry (Clear) Daylight 5:11 PM	Rear End	① 23M BURLINGTON ND Pickup - Van - Utility SB Turning Left Following too Close	② 45F BERTHOLD ND Pickup - Van - Utility SB Going Straight			
1021289 ▶	Non-incapacitating injury 11/10/16 Thursday Dry (Clear) Dark(L) 10:20 PM	Angle	① 17M MINOT ND Pickup - Van - Utility WB Going Straight	② 69F MANDAN ND Pickup - Van - Utility SB Turning Left (Stop) Failed to Yield			
1030397	PDO 02/28/17 Tuesday Dry (Clear) Dark(L) 6:50 PM	Rear End	① 56M BURLINGTON ND Passenger Car SB Going Straight Following	② 23F KENMARE ND Pickup - Van - Utility SB Turning Right			
1030789 ▶	Non-incapacitating injury 03/14/17 Tuesday Wet (Cloudy) ♦ Daylight 4:42 PM	Angle	① 28F MINOT ND Passenger Car WB Going Straight	② 26F MINOT ND Pickup - Van - Utility SB Going Straight (Stop) Failed to Yield			
1047950	PDO 01/13/18 Saturday Dry (Clear) Daylight 1:00 PM	Angle	① 35M SIDNEY MT Passenger Car SB Going Straight (Stop) Failed to Yield	② 25M MINOT ND Pickup - Van - Utility WB Other Action on Roadway			

Total Crashes: 30 (Sorted by Date)
City: Minot
Location: US 2 / Burdick Expwy
Start - End Date: 6/1/2014 - 5/31/2019 (5 Years)

23 USC § 409 Documents
NDDOT Reserves All Objections

LEGEND
▶ *Fatal*
▶ *Incapacitating Injury*
▶ *Non-Incapacitating Injury*
▷ *Possible Injury*
♦ *Wet surface*
❄ *Snow, Ice, Slush, Frost*
▲ *Crash related to work zone*
① *Unit number*

1. Contributing Factor
** = alcohol or drugs involved*

2. Most Harmful Event
For single vehicle crashes, the most harmful event is shown in parentheses in the "Type of Collision" column

VISION ZERO

Crash No.	Crash Severity Date Day Surface Conditions (Weather) Lighting & Time	Type of Collision	① AGE SEX CITY STATE Unit Configuration Movement (traffic control) Contributing Factor[1] Most Harmful Event[2]			Shortened Narrative	Diagram
1053820	PDO 04/05/18 Thursday Dry (Clear) Daylight 4:56 PM	Rear End	① 16F MINOT ND Passenger Car SB Turning Right (Stop) Following too Close	② 52F MINOT ND Passenger Car SB Turning Right (Stop)			
1055333 ▶	Non-incapacitating injury 05/14/18 Monday Dry (Clear) Daylight 1:51 PM	Rear End	① 58M BERTHOLD ND Passenger Car EB Going Straight	② 93M VELVA ND Pickup - Van - Utility EB Turning Left (Stop) Failed to Yield	③ 58M EDMONTON AB Truck Tractor EB Going Straight		
1056952	PDO 06/06/18 Wednesday Dry (Clear) Daylight 8:00 AM	Angle	① 54M COTTAGE GROVE MN Passenger Car WB Going Straight (Stop)	② 67F MINOT ND Pickup - Van - Utility SB Turning Left (Stop) Failed to Yield			
1057266	PDO 06/21/18 Thursday Dry (Clear) Daylight 12:15 PM	Rear End	① 76M WILLISTON ND Pickup - Van - Utility EB Going Straight Following too Close	② 37F SURREY ND Pickup - Van - Utility EB Going Straight			
1060261	PDO 08/14/18 Tuesday Dry (Clear) Daylight 9:10 AM	Rear End	① 49M MINOT ND Pickup - Van - Utility SB Turning Right (Stop) Following too Close	② Pickup - Van - Utility SB Turning Right (Stop)			
1062319 ▶	Non-incapacitating injury 09/25/18 Tuesday Dry (Clear) Daylight 3:27 PM	Left Turn ▲	① 48F MINOT ND Pickup - Van - Utility WB Going Straight	② 18F MINOT ND Passenger Car EB Turning Left (Beacon) Improper Turn			
1065030	PDO 11/05/18 Monday Dry (Clear) Daylight 4:50 PM	Rear End	① 45M SURREY ND Pickup - Van - Utility SB Turning Right (Stop) Following too Close	② 30M MINOT ND Passenger Car SB Turning Right (Stop)			
1066332 ▶	Non-incapacitating injury 11/14/18 Wednesday Dry (Clear) Dark(L) 8:55 PM	Angle	① 42M MINOT ND Pickup - Van - Utility SB Turning Right (Stop) Ran Red Light*	② 39M NEW WESTMINSTER BC Truck Tractor WB Going Straight			
1069512	PDO 01/15/19 Tuesday Dry (Clear) Daylight 5:00 PM	Rear End	① 41M MINOT ND Pickup - Van - Utility SB Turning Right (Stop)	② 26M MOHALL ND Pickup - Van - Utility SB Turning Right (Stop)			
1078015 ▶	Non-incapacitating injury 05/15/19 Wednesday Dry (Clear) Daylight 7:51 AM	Angle	① 18F MINOT ND Pickup - Van - Utility SB Turning Left (Stop) Failed to Stop	② 38F MINOT ND Pickup - Van - Utility WB Going Straight			

Intersection and/or Urban Crash Summary Sheets

Total Crashes: 3 (Sorted by Date)
City: Minot
Location: US 2 / 18 St SW
Start - End Date: 6/1/2014 - 5/31/2019 (5 Years)

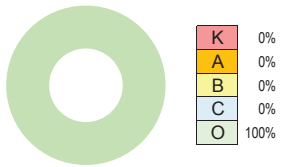
Notes: Animal crashes were not included.

23 USC § 409 Documents
NDDOT Reserves All Objections

VISION ZERO

Statistics

Crash Severity	Letter Code	No. of Crashes
Fatal	K	0
Incapacitating Injury	A	0
Non-incapacitating Injury	B	0
Possible Injury	C	0
Property Damage Only	O	3
		3



Under Construction

Yes = 0 0%

Day of Week

Monday =	0	0%
Tuesday =	0	0%
Wednesday =	1	33%
Thursday =	0	0%
Friday =	0	0%
Saturday =	2	67%
Sunday =	0	0%
	3	

Manner of Collision			Breakdown by Severity K	A	B	C	O
Angle	1	33%	0	0	0	0	1
Rear End	1	33%	0	0	0	0	1
Left Turn	0	0%	0	0	0	0	0
Sideswipe (same dir.)	1	33%	0	0	0	0	1
Sideswipe (opp dir.)	0	0%	0	0	0	0	0
Single Vehicle	0	0%	0	0	0	0	0
Ped/Bike	0	0%	0	0	0	0	0
Head On	0	0%	0	0	0	0	0
Backing	0	0%	0	0	0	0	0
Other	0	0%	0	0	0	0	0
	3	100%	0	0	0	0	3

Surface Conditions			Breakdown by Severity K	A	B	C	O
Dry	1	33%	0	0	0	0	1
Wet	2	67%	0	0	0	0	2
Ice / Snow	0	0%	0	0	0	0	0
Other	0	0%	0	0	0	0	0
	3	100%	0	0	0	0	3

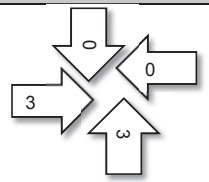
Lighting Conditions			Breakdown by Severity K	A	B	C	O
Dawn/Dusk	0	0%	0	0	0	0	0
Daylight	3	100%	0	0	0	0	3
Dark	0	0%	0	0	0	0	0
Dark (lighted)	0	0%	0	0	0	0	0
Unknown	0	0%	0	0	0	0	0
	3	100%	0	0	0	0	3

V1 and V2 Configuration*

Passenger Car =	4
PU / Van / Utility =	2
Truck =	0
Bus / Motorhome =	0
Motorcycle + Moped =	0
Ped or Bike =	0

These are only the most popular choices.

V1 and V2 Directions



NB = 3
SB = 0
EB = 3
WB = 0

D1 and D2 Alcohol / Drugs*

Yes (alcohol or drugs present) = 0

D1 and D2 Age/Sex

Age	M	F	Total
0-17	0	0	0
18-20	0	0	0
21-24	1	0	1
25-34	0	1	1
35-44	0	0	0
45-54	1	0	1
55-64	2	0	2
65-74	0	0	0
75+	1	0	1
	5	1	6

Month

Military Time	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec		
0													0	0%
1													0	0%
2													0	0%
3													0	0%
4													0	0%
5													0	0%
6													0	0%
7													0	0%
8													0	0%
9													0	0%
10													0	0%
11							■						1	33%
12													0	0%
13													0	0%
14										■			1	33%
15													0	0%
16													0	0%
17													0	0%
18													0	0%
19								■					1	33%
20													0	0%
21													0	0%
22													0	0%
23													0	0%
Total	0	0	0	0	0	0	1	1	0	1	0	0	3	

*Within the Manner of Collision table, values equal to zero are not shown in order to reduce clutter.

Manner of Collision

Year	Start Date	End Date	Angle NB+EB	Angle NB+WB	Angle SB+EB	Angle SB+WB	Angle Sub Total	Rear End NB	Rear End SB	Rear End EB	Rear End WB	Rear End Sub Total	Left Turn NB to WB	Left Turn SB to EB	Left Turn EB to NB	Left Turn WB to SB	Left Turn Sub Total	Sideswipe Same Dir. NB	Sideswipe Same Dir. SB	Sideswipe Same Dir. EB	Sideswipe Same Dir. WB	Sideswipe Same Dir. Sub Total	Backing	Ped / Bike	Single Veh.	Head on or Other	Total
1	6/1/2014	5/31/2015						1				1															1
2	6/1/2015	5/31/2016																									0
3	6/1/2016	5/31/2017																	1		1						1
4	6/1/2017	5/31/2018																									0
5	6/1/2018	5/31/2019	1				1																				1
			1				1	1				1							1		1						3

Intersection and/or Urban Crash Summary Sheets

Total Crashes: 3 (Sorted by Date)
City: Minot
Location: US 2 / 18 St SW
Start - End Date: 6/1/2014 - 5/31/2019 (5 Years)

23 USC § 409 Documents
NDDOT Reserves All Objections

LEGEND
- ▶ *Fatal*
- ▶ *Incapacitating Injury*
- ▶ *Non-Incapacitating Injury*
- ▷ *Possible Injury*
- ♦ *Wet surface*
- ❄ *Snow, Ice, Slush, Frost*
- ▲ *Crash related to work zone*
- ① *Unit number*

1. Contributing Factor
* = alcohol or drugs involved

2. Most Harmful Event
For single vehicle crashes, the most harmful event is shown in parentheses in the "Type of Collision" column

VISION ZERO

Crash No.	Crash Severity Date Day Surface Conditions (Weather) Lighting & Time	Type of Collision	① AGE SEX CITY STATE Unit Configuration Movement (traffic control) Contributing Factor[1] Most Harmful Event[2]		Shortened Narrative	Diagram
308180	PDO 08/02/14 Saturday Dry (Clear) Daylight 7:18 PM	Rear End	① 30F SAWYER ND Passenger Car NB Turning Left Attn Distracted-Outside	② 63M BURLINGTON ND Pickup - Van - Utility NB Turning Left		
1014234	PDO 07/13/16 Wednesday Wet (Cloudy) ♦ Daylight 11:35 AM	Sideswipe (Same Dir.)	① 88M BURLINGTON ND Passenger Car EB Going Straight	② 52M ARDEN HILLS MN Passenger Car EB Going Straight		
1064320	PDO 10/27/18 Saturday Wet (Cloudy) ♦ Daylight 2:40 PM	Angle	① 56M MINOT ND Pickup - Van - Utility NB Going Straight (Stop) Failed to Yield	② 21M MINOT ND Passenger Car EB Going Straight		

Intersection and/or Urban Crash Summary Sheets

Total Crashes: 43 (Sorted by Date)
City: Minot
Location: US 2 / Evergreen Ave
Start - End Date: 6/1/2014 - 5/31/2019 (5 Years)

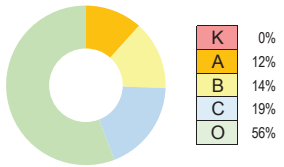
Notes: Animal crashes were not included.

23 USC § 409 Documents
NDDOT Reserves All Objections

VISION ZERO

Statistics

Crash Severity	Letter Code	No. of Crashes
Fatal	K	0
Incapacitating Injury	A	5
Non-incapacitating Injury	B	6
Possible Injury	C	8
Property Damage Only	O	24
		43



Under Construction

Yes = 0 0%

Day of Week

Monday =	6	14%
Tuesday =	5	12%
Wednesday =	9	21%
Thursday =	7	16%
Friday =	9	21%
Saturday =	7	16%
Sunday =	0	0%
	43	

Manner of Collision			Breakdown by Severity K	A	B	C	O
Angle	29	67%	0	4	6	6	13
Rear End	4	9%	0	0	0	1	3
Left Turn	4	9%	0	0	0	0	4
Sideswipe (same dir.)	3	7%	0	0	0	1	2
Sideswipe (opp dir.)	0	0%	0	0	0	0	0
Single Vehicle	1	2%	0	1	0	0	0
Ped/Bike	0	0%	0	0	0	0	0
Head On	0	0%	0	0	0	0	0
Backing	0	0%	0	0	0	0	0
Other	2	5%	0	0	0	0	2
	43	100%	0	5	6	8	24

Surface Conditions			Breakdown by Severity K	A	B	C	O
Dry	34	79%	0	4	5	7	18
Wet	7	16%	0	1	1	1	4
Ice / Snow	2	5%	0	0	0	0	2
Other	0	0%	0	0	0	0	0
	43	100%	0	5	6	8	24

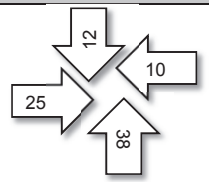
Lighting Conditions			Breakdown by Severity K	A	B	C	O
Dawn/Dusk	2	5%	0	0	0	1	1
Daylight	34	79%	0	5	4	7	18
Dark	2	5%	0	0	1	0	1
Dark (lighted)	3	7%	0	0	0	0	3
Unknown	2	5%	0	0	1	0	1
	43	100%	0	5	6	8	24

V1 and V2 Configuration*

Passenger Car =	40
PU / Van / Utility =	41
Truck =	1
Bus / Motorhome =	0
Motorcycle + Moped =	2
Ped or Bike =	0

These are only the most popular choices.

V1 and V2 Directions



NB = 38
SB = 12
EB = 25
WB = 10

D1 and D2 Alcohol / Drugs*

Yes (alcohol or drugs present) = 1

D1 and D2 Age/Sex

Age	M	F	Total
0-17	4	1	5
18-20	5	1	6
21-24	11	6	17
25-34	7	8	15
35-44	9	3	12
45-54	3	4	7
55-64	6	2	8
65-74	1	3	4
75+	6	3	9
	52	31	83

Month

Military Time	1 Jan	2 Feb	3 Mar	4 Apr	5 May	6 Jun	7 Jul	8 Aug	9 Sept	10 Oct	11 Nov	12 Dec		
0													1	2%
1													1	2%
2													0	0%
3													0	0%
4													0	0%
5													0	0%
6													0	0%
7													4	9%
8													1	2%
9													0	0%
10													0	0%
11													3	7%
12													2	5%
13													5	12%
14													2	5%
15													4	9%
16													6	14%
17													7	16%
18													3	7%
19													2	5%
20													2	5%
21													0	0%
22													0	0%
23													0	0%
Total	2	2	6	7	3	2	1	5	3	3	4	5	43	

*Within the Manner of Collision table, values equal to zero are not shown in order to reduce clutter.

Manner of Collision

Year	Start Date	End Date	Angle NB+EB	NB+WB	SB+EB	SB+WB	Sub Total	Rear End NB	SB	EB	WB	Sub Total	Left Turn NB to WB	SB to EB	EB to NB	WB to SB	Sub Total	Sideswipe Same Dir. NB	SB	EB	WB	Sub Total	Backing	Ped / Bike	Single Veh.	Head on or Other	Total
1	6/1/2014	5/31/2015	2	1	2	1	6		1			1													1	1	**9**
2	6/1/2015	5/31/2016	2	1			3									1	1	1			1						**5**
3	6/1/2016	5/31/2017	6				6	1				1	1				1										**8**
4	6/1/2017	5/31/2018	3	1		3	7						1				1	1			1						**9**
5	6/1/2018	5/31/2019	7				7	2				2		1			1			1	1					1	**12**
			20	**3**	**2**	**4**	**29**	**3**	**1**			**4**	**2**	**1**		**1**	**4**	**2**		**1**	**3**				**1**	**2**	**43**

Total Crashes: 43 (Sorted by Date)
City: Minot
Location: US 2 / Evergreen Ave
Start - End Date: 6/1/2014 - 5/31/2019 (5 Years)

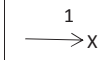
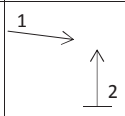
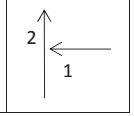
23 USC § 409 Documents
NDDOT Reserves All Objections

LEGEND
- ▶ *Fatal*
- ▶ *Incapacitating Injury*
- ▶ *Non-Incapacitating Injury*
- ▷ *Possible Injury*
- ♦ *Wet surface*
- ❄ *Snow, Ice, Slush, Frost*
- ▲ *Crash related to work zone*
- ① *Unit number*

1. Contributing Factor
** = alcohol or drugs involved*

2. Most Harmful Event
For single vehicle crashes, the most harmful event is shown in parentheses in the "Type of Collision" column

VISION ZERO

Crash No.	Crash Severity Date Day Surface Conditions (Weather) Lighting & Time	Type of Collision	① AGE SEX CITY STATE Unit Configuration Movement (traffic control) Contributing Factor[1] Most Harmful Event[2]		Shortened Narrative	Diagram
308685	PDO 08/04/14 Monday Dry (Clear) Daylight 7:15 PM	Rear End	① 18M LIGNITE ND Pickup - Van - Utility SB Going Straight (Stop) Attn Distracted-Inside	② 55M GLEN EWEN SK Pickup - Van - Utility SB Stopped (Stop)		
310243	▶ Incapacitating Injury 08/28/14 Thursday Dry (Clear) Daylight 5:11 PM	Single Veh (Overturn / Rollover)	① 33M MINOT ND EJECTED Motorcycle EB Going Straight Improper Evasive Action		A vehicle was stopped waiting to make a NB left turn. An EB motorcycle V1 noticed that the vehicle pulled ahead then stopped. V1 locked brakes, slid and crashed.	
311220	PDO 09/13/14 Saturday Dry (Cloudy) Dark(L) 8:55 PM	Angle	① 17M MINOT ND Pickup - Van - Utility SB Going Straight (Stop) Failed to Yield	② 63M DAVENPORT FL Passenger Car EB Going Straight		
315263	▷ Possible Injury 11/18/14 Tuesday Dry (Cloudy) Daylight 11:55 AM	Angle	① 23F MINOT ND Passenger Car EB Going Straight	② 70F WEYBURN SK Passenger Car SB Going Straight Failed to Yield		
315750	▷ Possible Injury 11/24/14 Monday Dry (Clear) Dawn 7:30 AM	Angle	① 22M MINOT ND Pickup - Van - Utility EB Going Straight	② 45M KALISPELL MT Pickup - Van - Utility NB Going Straight (Stop) Failed to Yield		
321057	▶ Non-incapacitating injury 02/03/15 Tuesday Wet (Clear) ♦ Dark 7:15 PM	Angle	① 68M BURLINGTON ND Pickup - Van - Utility WB Going Straight	② 88M MINOT ND Pickup - Van - Utility NB Going Straight Failed to Yield		
323756	PDO 03/14/15 Saturday Dry (Clear) Dark(L) 1:06 AM	Other	① 46M MINOT ND Pickup - Van - Utility SB Turning Right Speed *	② 29M RUGBY ND Passenger Car NB Turning Left (Stop)	V1 making EB right turn struck NB V2 who was stopped at the stop sign.	
325842	▷ Possible Injury 04/27/15 Monday Wet (Cloudy) ♦ Daylight 12:30 PM	Angle	① 37M MINOT ND Passenger Car WB Going Straight	② 32F MINOT ND Pickup - Van - Utility SB Going Straight (Stop) Failed to Yield		
326280	▷ Possible Injury 05/04/15 Monday Dry (Clear) Daylight 8:20 PM	Angle	① 36M MAPLE GROVE MN Pickup - Van - Utility EB Going Straight	② 63F MINOT ND Passenger Car NB Going Straight (Stop) Failed to Yield		
334278	▶ Incapacitating Injury 10/08/15 Thursday Dry (Clear) Daylight 12:46 PM	Angle	① 75M BERTHOLD ND Pickup - Van - Utility WB Going Straight	② 80F CARPIO ND Passenger Car NB Going Straight Failed to Yield	V1 WB at 46-47mph in outside lane. V2 NB in median area pulled into the WB lanes was T-boned by V1.	

Total Crashes: 43 (Sorted by Date)
City: Minot
Location: US 2 / Evergreen Ave
Start - End Date: 6/1/2014 - 5/31/2019 (5 Years)

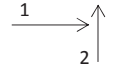
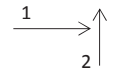
23 USC § 409 Documents
NDDOT Reserves All Objections

LEGEND
- ▶ *Fatal*
- ▶ *Incapacitating Injury*
- ▶ *Non-Incapacitating Injury*
- ▷ *Possible Injury*
- ♦ *Wet surface*
- ❄ *Snow, Ice, Slush, Frost*
- ▲ *Crash related to work zone*
- ① *Unit number*

1. Contributing Factor
** = alcohol or drugs involved*

2. Most Harmful Event
For single vehicle crashes, the most harmful event is shown in parentheses in the "Type of Collision" column

VISION ZERO

Crash No.	Crash Severity Date Day Surface Conditions (Weather) Lighting & Time	Type of Collision	① AGE SEX CITY STATE Unit Configuration Movement (traffic control) Contributing Factor[1] Most Harmful Event[2]		Shortened Narrative	Diagram
1005448	PDO 12/24/15 Thursday Wet (Cloudy) ♦ Daylight 1:41 PM	Sideswipe (Same Dir.)	① 23M MINOT ND Passenger Car NB Going Straight Following	② 37F MINOT ND Pickup - Van - Utility NB Turning Left		
1006196	PDO 01/12/16 Tuesday Dry (Clear) Dark 6:03 PM	Angle	① 49F MINOT ND Pickup - Van - Utility EB Going Straight Other	② 21M MINOT ND Pickup - Van - Utility NB Going Straight (Stop) Ran Red Light		
1009692	PDO 03/25/16 Friday Dry (Clear) Daylight 1:00 PM	Left Turn	① 79M DONNYBROOK ND Passenger Car WB Turning Left (Yield) Careless/Reckless Driving	② 25M MINOT ND Passenger Car EB Going Straight		
1010909 ▷	Possible Injury 04/27/16 Wednesday Dry (Clear) Daylight 7:43 AM	Angle	① 44F BERTHOLD ND Passenger Car EB Going Straight	② 24M MINOT ND Passenger Car NB Going Straight (Stop) Failed to Yield		
1015254 ▶	Incapacitating Injury 07/30/16 Saturday Dry (Clear) Daylight 1:20 PM	Angle	① 32M MINOT ND EJECTED Motorcycle EB Going Straight	② 35M RUTHVILLE ND Pickup - Van - Utility NB Going Straight (Stop) Ran Red Light	V2 at stop sign proceeded to make a NB left turn did not see approaching EB V1. There were a lot of vehicles in the EB right turn lane that may have blocked V2's view.	
1016748	PDO 08/27/16 Saturday Dry (Clear) Daylight 11:26 AM	Left Turn	① 29F MINOT ND Pickup - Van - Utility NB Turning Left Improper Turn	② 16M MINOT ND Passenger Car SB Stopped Improper License		
1019753 ▶	Incapacitating Injury 10/19/16 Wednesday Dry (Clear) Daylight 7:50 AM	Angle	① 18M MINOT ND Pickup - Van - Utility EB Going Straight	② 33M MINOT ND Passenger Car NB Going Straight (Stop) Failed to Yield	NB V2 attempted to get into the median area to make a NB left turn but was struck by EB V1.	
1022313	PDO 11/16/16 Wednesday Dry (Clear) Dark(L) 5:45 PM	Rear End	① 23M RUGBY ND Passenger Car NB Turning Left Following too Close	② 48F MINOT ND Passenger Car NB Turning Left		
1024434	PDO 12/21/16 Wednesday Wet (Clear) ♦ Daylight 4:13 PM	Angle	① 21M FARGO ND Pickup - Van - Utility NB Going Straight (Stop)	② 29F CANDO ND Pickup - Van - Utility EB Going Straight		
1025085	PDO 12/30/16 Friday Wet (Cloudy) ♦ Daylight 1:04 PM	Angle	① 14F KENMARE ND Pickup - Van - Utility NB Going Straight (Stop) Failed to Yield	② U Hit and Run EB Going Straight		

Total Crashes: 43 (Sorted by Date)
City: Minot
Location: US 2 / Evergreen Ave
Start - End Date: 6/1/2014 - 5/31/2019 (5 Years)

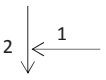
23 USC § 409 Documents
NDDOT Reserves All Objections

LEGEND
- ▶ *Fatal*
- ▶ *Incapacitating Injury*
- ▶ *Non-Incapacitating Injury*
- ▷ *Possible Injury*
- ♦ *Wet surface*
- ❄ *Snow, Ice, Slush, Frost*
- ▲ *Crash related to work zone*
- ① *Unit number*

1. Contributing Factor
** = alcohol or drugs involved*

2. Most Harmful Event
For single vehicle crashes, the most harmful event is shown in parentheses in the "Type of Collision" column

VISION ZERO

Crash No.	Crash Severity Date Day Surface Conditions (Weather) Lighting & Time	Type of Collision	① AGE SEX CITY STATE Unit Configuration Movement (traffic control) Contributing Factor[1] Most Harmful Event[2]		Shortened Narrative	Diagram
1031869	PDO 04/07/17 Friday Dry (Clear) Daylight 4:50 PM	Angle	① 60M MINOT ND Pickup - Van - Utility NB Going Straight (Stop) Failed to Yield	② 20M MINOT ND Passenger Car EB Going Straight		
1032138	PDO 04/14/17 Friday Dry (Clear) Daylight 11:30 AM	Angle	① 49F BOWBELLS ND Pickup - Van - Utility EB Going Straight	② 61M NEW TOWN ND Pickup - Van - Utility NB Going Straight (Stop) Failed to Yield		
1036399 ▷	Possible Injury 06/23/17 Friday Dry (Clear) Daylight 2:45 PM	Sideswipe (Same Dir.)	① 43F MINOT ND Passenger Car NB Turning Left (Stop) Other	② 21F KENMARE ND Pickup - Van - Utility NB Turning Left D.U.I. (Drugs)		
1038850 ▶	Non-incapacitating injury 08/23/17 Wednesday Dry (Clear) Daylight 3:58 PM	Angle	① 24F BISMARCK ND Pickup - Van - Utility NB Going Straight (Stop) Failed to Yield	② 28F MINOT ND Pickup - Van - Utility EB Going Straight		
1039759 ▷	Possible Injury 09/09/17 Saturday Dry (Clear) Daylight 5:55 PM	Angle	① 57M BURLINGTON ND Passenger Car EB Going Straight	② 19F LANSFORD ND Passenger Car NB Turning Left (Stop) Failed to Yield		
1044296 ▶	Non-incapacitating injury 11/27/17 Monday Dry (Cloudy) Unknown 12:00 AM	Angle	① 68F MINOT ND Pickup - Van - Utility SB Going Straight (Stop) Failed to Yield	② 29F RUTHVILLE (MINOT) ND Passenger Car WB Going Straight		
1046168	PDO 12/21/17 Thursday Dry (Unkown) Unknown 6:00 PM	Angle	① 37M STANLEY ND Pickup - Van - Utility NB Going Straight (Stop) Failed to Yield	② 22M MINOT ND Passenger Car EB Going Straight		
1048818	PDO 01/25/18 Thursday Dry (Clear) Daylight 1:55 PM	Left Turn	① 24F MINOT ND Passenger Car NB Turning Left (Stop) Failed to Yield	② 21F MINOT ND Pickup - Van - Utility SB Turning Left (Stop) Failed to Stop		
1052022	PDO 03/14/18 Wednesday Dry (Clear) Daylight 5:55 PM	Angle	① 24F MINOT ND Passenger Car NB Merging/Diverging (Yield) Failed to Yield	② 30M MINOT ND Passenger Car WB Going Straight		
1052399 ▶	Incapacitating Injury 03/20/18 Tuesday Wet (Clear) ♦ Daylight 5:35 PM	Angle	① 23M MINOT AIR FORCE BASE ND Passenger Car WB Going Straight	② 88F STANLEY ND Passenger Car SB Going Straight (Stop) Failed to Yield	V2 at stop sign proceeded SB and was struck by WB V1.	

Total Crashes: 43 (Sorted by Date)
City: Minot
Location: US 2 / Evergreen Ave
Start - End Date: 6/1/2014 - 5/31/2019 (5 Years)

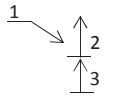
23 USC § 409 Documents
NDDOT Reserves All Objections

LEGEND
- ▶ *Fatal*
- ▶ *Incapacitating Injury*
- ▶ *Non-Incapacitating Injury*
- ▷ *Possible Injury*
- ♦ *Wet surface*
- ❄ *Snow, Ice, Slush, Frost*
- ▲ *Crash related to work zone*
- ① *Unit number*

1. Contributing Factor
** = alcohol or drugs involved*

2. Most Harmful Event
For single vehicle crashes, the most harmful event is shown in parentheses in the "Type of Collision" column

VISION ZERO

Crash No.	Crash Severity Date Day Surface Conditions (Weather) Lighting & Time	Type of Collision	① AGE SEX CITY STATE Unit Configuration Movement (traffic control) Contributing Factor[1] Most Harmful Event[2]			Shortened Narrative	Diagram
1055918	PDO 05/24/18 Thursday Dry (Clear) Daylight 5:15 PM	Angle	① 83M WILLISTON ND Pickup - Van - Utility SB Going Straight Failed to Yield	② 22M BURLINGTON ND Passenger Car WB Going Straight			
1056252	PDO 06/01/18 Friday Dry (Clear) Daylight 4:55 PM	Angle	① 24U MINOT ND Pickup - Van - Utility NB Turning Left (Stop) Failed to Yield	② 20M MINOT ND Passenger Car EB Going Straight			
1060391 ▶	Non-incapacitating injury 08/21/18 Tuesday Dry (Clear) Daylight 7:47 AM	Angle	① 24M SAWYER ND Pickup - Van - Utility NB Going Straight (Stop) Failed to Yield	② 43M MINOT ND Pickup - Van - Utility EB Going Straight			
1061744	PDO 09/14/18 Friday Dry (Clear) Daylight 4:12 PM	Sideswipe (Same Dir.)	① 81M MINOT ND Pickup - Van - Utility WB Turning Left Fail Keep in Proper Lane	② 39M DULUTH MN Truck Tractor WB Going Straight			
1062854 ▷	Possible Injury 10/04/18 Thursday Dry (Clear) Daylight 3:15 PM	Rear End	① 78F MINOT ND Pickup - Van - Utility NB Going Straight (Yield)	② 32F MINOT ND Pickup - Van - Utility NB Going Straight (Yield)			
1068327	PDO 12/21/18 Friday Snow (Snow) ❄ Daylight 3:30 PM	Other	① 20M STANLEY ND Passenger Car EB Turning Right To Fast for Conditions	② 24M MINOT ND Passenger Car NB Turning Left (Stop)	③ 24M MINOT ND Pickup - Van - Utility NB Turning Left (Stop)	V1 making EB right turn at 40 mph, unable to turn due to slippery conditions. V1 struck V2, then struck V3.	
1073126	PDO 02/16/19 Saturday Snow (Clear) ❄ Daylight 4:38 PM	Rear End	① 42M MINOT ND Pickup - Van - Utility NB Turning Left (Yield) Improper Turn	② 46F MINOT ND Passenger Car NB Merging/Diverging (Yield)			
1074446	PDO 03/06/19 Wednesday Dry (Clear) Dusk 5:45 PM	Left Turn	① 40M OGDEN UT Passenger Car NB Going Straight (Stop) Failed to Yield	② 17M MINOT ND Passenger Car SB Turning Left (Yield)			
1075711	PDO 03/27/19 Wednesday Dry (Clear) Daylight 3:57 PM	Angle	① 52M BISMARCK ND Pickup - Van - Utility EB Going Straight	② 70F MINOT ND Passenger Car NB Going Straight (Stop) Failed to Yield			
1076120	PDO 04/06/19 Saturday Wet (Cloudy) ♦ Daylight 8:57 AM	Angle	① 75M MINOT ND Passenger Car NB Going Straight (Stop) Failed to Yield	② 61F FOXHOLM ND Passenger Car EB Going Straight			

Intersection and/or Urban Crash Summary Sheets

Total Crashes: 43 (Sorted by Date)
City: Minot
Location: US 2 / Evergreen Ave
Start - End Date: 6/1/2014 - 5/31/2019 (5 Years)

23 USC § 409 Documents
NDDOT Reserves All Objections

LEGEND
- ▶ *Fatal*
- ▶ *Incapacitating Injury*
- ▶ *Non-Incapacitating Injury*
- ▷ *Possible Injury*
- ♦ *Wet surface*
- ❄ *Snow, Ice, Slush, Frost*
- ▲ *Crash related to work zone*
- ① *Unit number*

1. Contributing Factor
* = alcohol or drugs involved

2. Most Harmful Event
For single vehicle crashes, the most harmful event is shown in parentheses in the "Type of Collision" column

VISION ZERO

Crash No. / Crash Severity / Date Day / Surface Conditions (Weather) / Lighting & Time	Type of Collision	① AGE SEX CITY STATE / Unit Configuration / Movement (traffic control) / Contributing Factor[1] / Most Harmful Event[2]		Shortened Narrative	Diagram
1076294 PDO 04/10/19 Wednesday Dry (Clear) Daylight 2:41 PM	Angle	① 30F MINOT ND Passenger Car EB Going Straight	② 29F MINOT ND Passenger Car NB Merging/Diverging (Stop) Failed to Yield		
1076873 ▶ Non-incapacitating injury 04/12/19 Friday Dry (Clear) Daylight 6:15 PM	Angle	① 38M MAKOTI ND Pickup - Van - Utility EB Going Straight	② 61M MINOT ND Passenger Car NB Going Straight Failed to Yield		
1077950 ▶ Non-incapacitating injury 05/13/19 Monday Dry (Cloudy) Daylight 4:43 PM	Angle	① 16M MINOT ND Pickup - Van - Utility EB Going Straight	② 32M MINOT ND Pickup - Van - Utility NB Going Straight (Stop) Failed to Yield		

Crash Summary Sheets

Total Crashes: 3 (Sorted by Date)
Location: US 2 from Burdick Expwy to Evergreen Ave
Reference Points: 144.326-144.894
Start - End Date: 6/1/2014 - 5/31/2019 (5 Years)

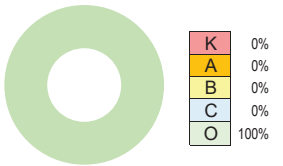
Notes: Animal crashes were not included.

23 USC § 409 Documents
NDDOT Reserves All Objections

VISION ZERO

Statistics for Total Crashes

Crash Severity	Letter Code	No. of Crashes
Fatal	K	0
Incapacitating Injury	A	0
Non-incapacitating Injury	B	0
Possible Injury	C	0
Property Damage Only	O	3
		3



Manner of Collision			Breakdown by Severity K	A	B	C	O
Angle	0	0%	0	0	0	0	0
Rear End	0	0%	0	0	0	0	0
Left Turn	0	0%	0	0	0	0	0
Sideswipe (same dir.)	1	33%	0	0	0	0	1
Sideswipe (opp dir.)	0	0%	0	0	0	0	0
Single Vehicle	2	67%	0	0	0	0	2
Ped/Bike	0	0%	0	0	0	0	0
Head On	0	0%	0	0	0	0	0
Backing	0	0%	0	0	0	0	0
Other	0	0%	0	0	0	0	0
	3	100%	0	0	0	0	3

Surface Conditions			Breakdown by Severity K	A	B	C	O
Dry	2	67%	0	0	0	0	2
Wet	0	0%	0	0	0	0	0
Ice / Snow	1	33%	0	0	0	0	1
Other	0	0%	0	0	0	0	0
	3	100%	0	0	0	0	3

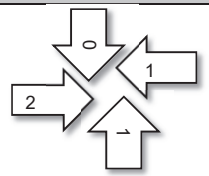
Lighting Conditions			Breakdown by Severity K	A	B	C	O
Dawn/Dusk	0	0%	0	0	0	0	0
Daylight	2	67%	0	0	0	0	2
Dark	0	0%	0	0	0	0	0
Dark (lighted)	1	33%	0	0	0	0	1
Unknown	0	0%	0	0	0	0	0
	3	100%	0	0	0	0	3

Roadway Geometrics		
Straight (on level) =	2	67%
Straight (on grade) =	1	33%
Curve (on level) =	0	0%
Curve (on grade) =	0	0%
Hill Crest =	0	0%
Unknown =	0	0%
	3	

V1 and V2 Configuration*	
Passenger Car =	2
PU / Van / Utility =	2
Truck =	0
Bus / Motorhome =	0
Motorcycle + Moped =	0
Ped or Bike =	0

These are only the most popular choices.

V1 and V2 Directions



NB =	1
SB =	0
EB =	2
WB =	1

D1 and D2 Alcohol / Drugs*

Yes (alcohol or drugs present) = 2

Month

Military Time	1 Jan	2 Feb	3 Mar	4 Apr	5 May	6 Jun	7 Jul	8 Aug	9 Sept	10 Oct	11 Nov	12 Dec	
0	■												1
1													0
2													0
3													0
4													0
5													0
6													0
7													0
8													0
9													0
10													0
11													0
12													0
13													0
14													0
15		■						■					2
16													0
17													0
18													0
19													0
20													0
21													0
22													0
23													0
Total	1	1	0	0	0	0	0	1	0	0	0	0	3

Under Construction

Yes = 0 0%

D1 and D2 Contr. Factors*

Attention Distracted =	0
Weather =	0
Speed =	0
Too Fast for Conditions =	0
Fail to Yield =	0
Improper Backing/Turning =	0

These are only the most popular choices.

D1 or D2 Ejected*

Yes (partially or fully) = 0

This info is not available for all units.

D1 and D2 Age/Sex

Age	M	F	Total
0-17	0	0	0
18-20	0	1	1
21-24	0	0	0
25-34	0	1	1
35-44	1	1	2
45-54	0	0	0
55-64	0	0	0
65-74	0	0	0
75+	0	0	0
	1	3	4

First Harmful Event

Motor Vehicle in Transport =	1	33%
Animal =	0	0%
Jackknife =	0	0%
Ran Off Roadway (not including below crashes) =	0	0%
Guardrail + Concrete Barrier + Bridge Rail =	2	67%
Bridge / Pier / Abutment / Overhead Structure =	0	0%
Poles / Posts / Trees / Overhead Sign Supports =	0	0%

These are only the most popular choices.

Vision Zero Emphasis Areas		Breakdown by Severity K	A	B	C	O
2	Lane Departure Crashes	0	0	0	0	2
0	Intersection Crashes	0	0	0	0	0
1	Alcohol and/or Drug Related Crashes	0	0	0	0	1
0	Unbelted Vehicle Occupant Crashes	0	0	0	0	0
0	Speed Related Crashes	0	0	0	0	0
1	Young Driver Crashes	0	0	0	0	1

General Summary

Yr	Start Date	End Date	Intersection (or Alley / Drvwy)	Non-Intersection Single Veh	Non-Intersection Mult. Veh	Total	AADT (two-way)	Crash Rate
1	6/1/2014	5/31/2015		1	1	2		
2	6/1/2015	5/31/2016						
3	6/1/2016	5/31/2017						
4	6/1/2017	5/31/2018						
5	6/1/2018	5/31/2019		1		1		
			0	2	1	3		
			0%	67%	33%			

Day of Week		
Monday =	1	33%
Tuesday =	1	33%
Wednesday =	0	0%
Thursday =	0	0%
Friday =	0	0%
Saturday =	1	33%
Sunday =	0	0%
	3	

Relation to Junction		
Non-Junction =	3	100%
Intersection + Intersection-Related =	0	0%
Alley / Driveway Access =	0	0%
Interchange Area + Exit / Entrance Ramp =	0	0%

These are only the most popular choices.

Crash Summary Sheets

Total Crashes: 3 (Sorted by Date)
Location: US 2 from Burdick Expwy to Evergreen Ave
Reference Points: 144.326-144.894
Start - End Date: 6/1/2014 - 5/31/2019 (5 Years)

Notes: Animal crashes were not included.

23 USC § 409 Documents
NDDOT Reserves All Objections

VISION ZERO

Statistics for Intersection-Related Crashes ONLY

Crash Severity

K =	0	#DIV/0!
A =	0	#DIV/0!
B =	0	#DIV/0!
C =	0	#DIV/0!
O =	0	#DIV/0!
	0	

Surface Conditions

Dry =	0	#DIV/0!
Wet =	0	#DIV/0!
Ice / Snow =	0	#DIV/0!
Other =	0	#DIV/0!

Lighting Conditions

Dawn =	0	#DIV/0!
Daylight =	0	#DIV/0!
Dusk =	0	#DIV/0!
Dark =	0	#DIV/0!
Dark (lighted) =	0	#DIV/0!

Under Construction

Yes =	0	#DIV/0!

Relation to Junction

Intersection + Intersection-Related =	0	#DIV/0!
Alley / Driveway Access =	0	#DIV/0!

Manner of Collision

Angle =	0	#DIV/0!
Rear End =	0	#DIV/0!
Left Turn =	0	#DIV/0!
Sideswipe (same direction) =	0	#DIV/0!
Single Vehicle =	0	#DIV/0!
Ped / Bike =	0	#DIV/0!
Other =	0	#DIV/0!

D1 and D2 Contributing Factors*

Attention Distracted =	0
Weather =	0
Speed =	0
Too Fast for Conditions =	0
Fail to Yield =	0
Improper Backing / Turning =	0

These are only the most popular choices.

D1 and D2 Alcohol / Drugs Present*

Yes (alcohol or drugs) =	0

V1 and V2 Unit Config.*

Passenger Car =	0
PU / Van / Utility =	0
Truck =	0
Bus / Motorhome =	0
Motorcycle + Moped =	0

These are only the most popular choices.

V1 and V2 Traffic Control

	V1	V2
Signal =	0	0
Stop =	0	0
Beacon =	0	0

These are only the most popular choices.

**This info is not available for all units.*

Statistics for Non-Intersection Crashes ONLY

Multiple Vehicle Crashes ONLY

Crash Severity

K =	0	0%
A =	0	0%
B =	0	0%
C =	0	0%
O =	1	100%
	1	

Surface Conditions

Dry =	1	100%
Wet =	0	0%
Ice / Snow =	0	0%
Other =	0	0%

Lighting Conditions

Dawn =	0	0%
Daylight =	1	100%
Dusk =	0	0%
Dark =	0	0%
Dark (lighted) =	0	0%

Road Geometrics

Straight (on level) =	1	100%
Straight (on grade) =	0	0%
Curve (on level) =	0	0%
Curve (on grade) =	0	0%
Hill Crest =	0	0%

Under Construction

Yes =	0	0%

D1 or D2 Ejected*

Yes =	0

Manner of Collision

Angle =	0	0%
Rear End =	0	0%
Left Turn =	0	0%
Sideswipe (same direction) =	1	100%
Head-On + Sideswipe (opp direction) =	0	0%
Other =	0	0%

D1 and D2 Alcohol/Drugs Present*

Yes (alcohol or drugs) =	0

V1 and V2 Unit Config.*

Passenger Car =	1
PU / Van / Utility =	1
Truck =	0
Bus / Motorhome =	0
Motorcycle + Moped =	0

These are only the most popular choices.

Non-Collision with Motor Vehicle (a.k.a. Single Vehicle) Crashes ONLY

Crash Severity

K =	0	0%
A =	0	0%
B =	0	0%
C =	0	0%
O =	2	100%
	2	

Surface Conditions

Dry =	1	50%
Wet =	0	0%
Ice / Snow =	1	50%
Other =	0	0%

Lighting Conditions

Dawn =	0	0%
Daylight =	1	50%
Dusk =	0	0%
Dark =	0	0%
Dark (lighted) =	1	50%

Road Geometrics

Straight (on level) =	1	50%
Straight (on grade) =	1	50%
Curve (on level) =	0	0%
Curve (on grade) =	0	0%
Hill Crest =	0	0%

Under Construction

Yes =	0	0%

D1 Ejected*

Yes (partially or fully) =	0	0%

D1 Most Harmful Event*

Motor Vehicle in Transport =	0	0%
Animal =	0	0%
Jackknife =	0	0%
Ran Off Roadway (not including below crashes) =	0	0%
Guardrail + Concrete Barrier + Bridge Rail =	2	100%
Bridge / Pier / Abutment / Overhead Structure =	0	0%
Poles / Posts / Trees / Overhead Sign Supports =	0	0%

These are only the most popular choices.

D1 Alcohol / Drugs Present*

Yes (alcohol or drugs) =	2	100%

V1 Unit Config.*

Passenger Car =	1	50%
PU / Van / Utility =	1	50%
Truck =	0	0%
Bus / Motorhome =	0	0%
Motorcycle + Moped =	0	0%

These are only the most popular choices.

**This info is not available for all units.*

Total Crashes: 3 (Sorted by Date)
Location: US 2 from Burdick Expwy to Evergreen Ave
Reference Points: 144.326-144.894
Start - End Date: 6/1/2014 - 5/31/2019 (5 Years)

23 USC § 409 Documents
NDDOT Reserves All Objections

LEGEND
- ▶ *Fatal*
- ▶ *Incapacitating Injury*
- ▶ *Non-Incapacitating Injury*
- ▷ *Possible Injury*
- ♦ *Wet surface*
- ❄ *Snow, Ice, Slush, Frost*
- ▲ *Crash related to work zone*
- ① *Unit number*

1. Contributing Factor
** = alcohol or drugs involved*

2. Most Harmful Event
For single vehicle crashes, the most harmful event is shown in parentheses in the "Type of Collision" column

VISION ZERO

Crash No. / Hwy / RP / Date Day / Surface Conditions (Weather) / Lighting & Time / Road Geometrics / Relation to Jct	Type of Collision	① AGE SEX CITY STATE / Unit Configuration / Movement (traffic control) / Contributing Factor[1] / Most Harmful Event[2]	Shortened Narrative	Name of Intersection
309494 PDO 08/25/14 Monday Dry (Clear) Daylight 3:31 PM Straight (on Level) / Non-junction	Sideswipe (Same Dir.)	① 42M MINOTND ND Pickup - Van - Utility EB Slowing/Stopping Care Required ② 43F MINOT ND Passenger Car EB Slowing/Stopping		
320875 2 144.376 PDO 01/31/15 Saturday Dry (Clear) Dark(L) 12:30 AM Straight (on Grade) / Non-junction	Single Veh (Guardrail Face)	① 30F MINOT ND Pickup - Van - Utility NB Swerving Careless/Reckless Driving*		
1071251 PDO 02/05/19 Tuesday Snow (Snow) ❄ Daylight 3:35 PM Straight (on Level) / Non-junction	Single Veh (Other Traffic Barrier)	① 20F KENMARE ND Passenger Car WB Going Straight Careless/Reckless Driving*		

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HCS7 Two-Way Stop-Control Report

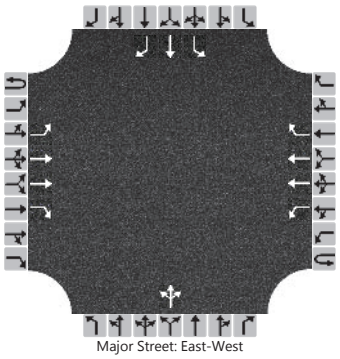
General Information

Analyst	DMS
Agency/Co.	NDDOT
Date Performed	5/10/2019
Analysis Year	2019
Time Analyzed	
Intersection Orientation	East-West
Project Description	HSIP 481001

Site Information

Intersection	#1
Jurisdiction	NDDOT
East/West Street	US 2
North/South Street	Burdick Expwy
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	1	2	1	0	1	2	1		0	1	0		1	1	1
Configuration		L	T	R		L	T	R			LTR			L	T	R
Volume (veh/h)	0	125	806	3	0	3	866	101		4	5	6		29	3	134
Percent Heavy Vehicles (%)	3	3			3	5				2	3	5		3	2	3
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized	No				No								No			
Median Type | Storage	Left + Thru								1							

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.5	6.5	6.9		7.5	6.5	6.9
Critical Headway (sec)		4.16				4.20				7.54	6.56	7.00		7.56	6.54	6.96
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)		2.23				2.25				3.52	4.03	3.35		3.53	4.02	3.33

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		136				3					16			32	3	146
Capacity, c (veh/h)		652				746					153			153	136	537
v/c Ratio		0.21				0.00					0.11			0.21	0.02	0.27
95% Queue Length, Q_{95} (veh)		0.8				0.0					0.4			0.7	0.1	1.1
Control Delay (s/veh)		12.0				9.8					31.3			34.6	32.2	14.2
Level of Service (LOS)		B				A					D			D	D	B
Approach Delay (s/veh)	1.6				0.0				31.3				18.1			
Approach LOS									D				C			

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HCS7 Two-Way Stop-Control Report

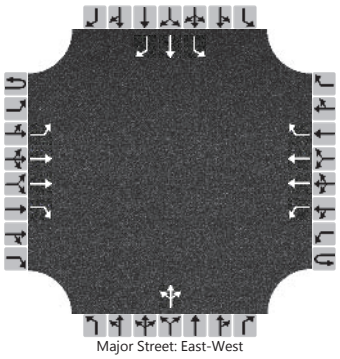
General Information

Analyst	DMS
Agency/Co.	NDDOT
Date Performed	5/10/2019
Analysis Year	2039
Time Analyzed	
Intersection Orientation	East-West
Project Description	HSIP 481001

Site Information

Intersection	#1
Jurisdiction	NDDOT
East/West Street	US 2
North/South Street	Burdick Expwy
Peak Hour Factor	1.00
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

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	2	1	0	1	2	1		0	1	0		1	1	1
Configuration		L	T	R		L	T	R			LTR			L	T	R
Volume (veh/h)	0	168	1086	4	0	4	1167	136		5	7	8		39	3	180
Percent Heavy Vehicles (%)	3	3			3	4				2	3	5		3	2	3
Proportion Time Blocked																
Percent Grade (%)										0				0		
Right Turn Channelized		No				No								No		
Median Type | Storage		Left + Thru								1						

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.5	6.5	6.9		7.5	6.5	6.9
Critical Headway (sec)		4.16				4.18				7.54	6.56	7.00		7.56	6.54	6.96
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)		2.23				2.24				3.52	4.03	3.35		3.53	4.02	3.33

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		168				4					20			39	3	180
Capacity, c (veh/h)		522				624					70			98	86	453
v/c Ratio		0.32				0.01					0.28			0.40	0.03	0.40
95% Queue Length, Q_{95} (veh)		1.4				0.0					1.0			1.6	0.1	1.9
Control Delay (s/veh)		15.1				10.8					75.2			64.1	48.2	18.1
Level of Service (LOS)		C				B					F			F	E	C
Approach Delay (s/veh)		2.0				0.0				75.2				26.6		
Approach LOS										F				D		

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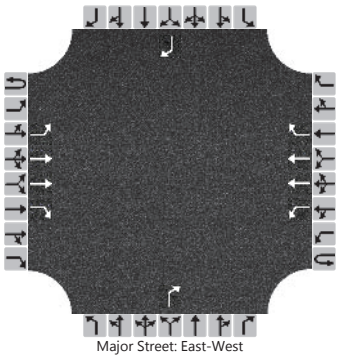
General Information

Analyst	DMS
Agency/Co.	NDDOT
Date Performed	5/10/2019
Analysis Year	2019
Time Analyzed	
Intersection Orientation	East-West
Project Description	HSIP 481001

Site Information

Intersection	#1
Jurisdiction	NDDOT
East/West Street	US 2
North/South Street	Burdick Expwy
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

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	2	1	0	1	2	1		0	0	1		0	0	1
Configuration		L	T	R		L	T	R				R				R
Volume (veh/h)	0	125	806	3	0	3	866	101				15				166
Percent Heavy Vehicles (%)	3	3			3	5						5				3
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized	No				No				No				No			
Median Type | Storage	Left + Thru								1							

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1						6.9				6.9
Critical Headway (sec)		4.16				4.20						7.00				6.96
Base Follow-Up Headway (sec)		2.2				2.2						3.3				3.3
Follow-Up Headway (sec)		2.23				2.25						3.35				3.33

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		136				3						16				180
Capacity, c (veh/h)		652				746						558				537
v/c Ratio		0.21				0.00						0.03				0.34
95% Queue Length, Q_{95} (veh)		0.8				0.0						0.1				1.5
Control Delay (s/veh)		12.0				9.8						11.6				15.1
Level of Service (LOS)		B				A						B				C
Approach Delay (s/veh)	1.6				0.0				11.6				15.1			
Approach LOS									B				C			

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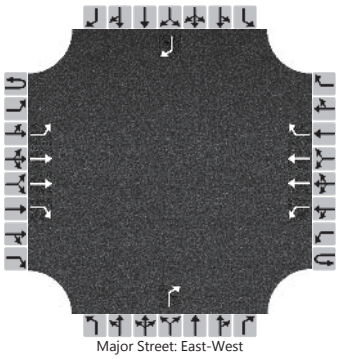
General Information

Analyst	DMS
Agency/Co.	NDDOT
Date Performed	5/10/2019
Analysis Year	2039
Time Analyzed	
Intersection Orientation	East-West
Project Description	HSIP 481001

Site Information

Intersection	#1
Jurisdiction	NDDOT
East/West Street	US 2
North/South Street	Burdick Expwy
Peak Hour Factor	1.00
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

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	2	1	0	1	2	1		0	0	1		0	0	1
Configuration		L	T	R		L	T	R				R				R
Volume (veh/h)	0	168	1125	8	0	4	1172	143				20				223
Percent Heavy Vehicles (%)	3	3			3	5						5				3
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized	No				No				No				No			
Median Type | Storage	Left + Thru								1							

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1						6.9				6.9
Critical Headway (sec)		4.16				4.20						7.00				6.96
Base Follow-Up Headway (sec)		2.2				2.2						3.3				3.3
Follow-Up Headway (sec)		2.23				2.25						3.35				3.33

Delay, Queue Length, and Level of Service

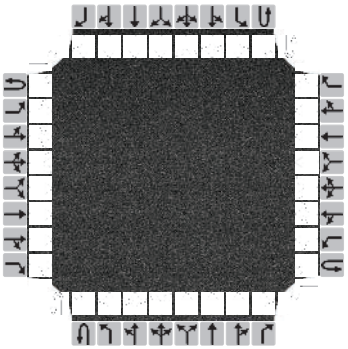
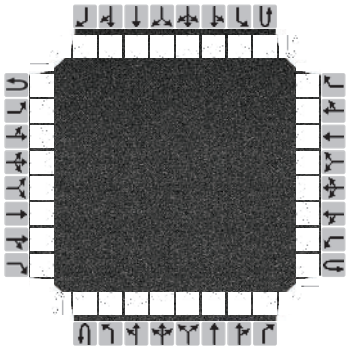
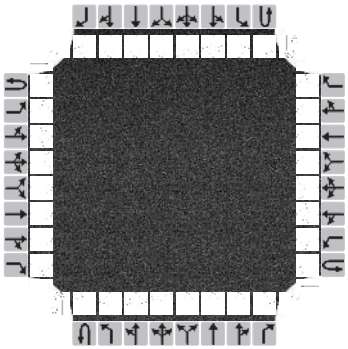
Flow Rate, v (veh/h)		168				4						20				223
Capacity, c (veh/h)		516				595						462				451
v/c Ratio		0.33				0.01						0.04				0.49
95% Queue Length, Q_{95} (veh)		1.4				0.0						0.1				2.7
Control Delay (s/veh)		15.3				11.1						13.1				20.5
Level of Service (LOS)		C				B						B				C
Approach Delay (s/veh)	2.0				0.0				13.1				20.5			
Approach LOS									B				C			

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HCS7 Alternative Intersections Results Summary

General Information				Alternative Intersection Information	
Agency	NDDOT			Intersection Type	RCUT with TWSC
Analyst	DMS	Analysis Date	6/7/2019	Segment One Distance, ft	1100
Jurisdiction		Duration, h	0.25	Segment Two Distance, ft	800
Intersection	1	PHF	0.92	Arterial Direction	East-West
Main Intersection File	1_RCUT_2019.xtw				
West Crossover File	1_West_RCUT_2019.xtw				
East Crossover File	1_East_RCUT_2019.xtw				
Project Description					

Demand	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL	SBT	SBR
Intersection One Demand (*v*), veh/h			934		32		1004									
Intersection Two Demand (*v*), veh/h	0	125	835	6	0	3	870	106				15				166
Intersection Three Demand (*v*), veh/h	9		841				970									

(1) West Crossover	(2) Main Intersection	(3) East Crossover
		

Queue-to-Storage Ratio	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL	SBT	SBR
Intersection One (R_Q)					0.03											
Intersection Two (R_Q)		0.06				0.00						0.02				0.38
Intersection Three (R_Q)	0.01															

Alternative Intesection Results

O-D	O-D Movements	Flow Rate (veh/h)	Control Delay (s/veh)	EDTT (s/veh)	ETT (s/veh)	LOS
EBL	EBL(2)	136	12.0	--	12.0	B
EBT	--	876	0.0	--	0.0	A
EBR	--	3	0.0	--	0.0	A
WBL	WBL(2)	3	10.0	--	10.0	A
WBT	--	941	0.0	--	0.0	A
WBR	--	110	0.0	--	0.0	A
NBL	NBR(2) + EBU(3)	4	29.0	21.8	50.8	D
NBT	NBR(2) + EBU(3)	5	29.0	21.8	50.8	D
NBR	NBR(2)	7	11.7	--	11.7	B
SBL	SBR(2) + WBU(1)	32	32.6	29.9	62.5	E
SBT	SBR(2) + WBU(1)	3	32.4	29.9	62.3	E
SBR	SBR(2)	146	15.1	--	15.1	B

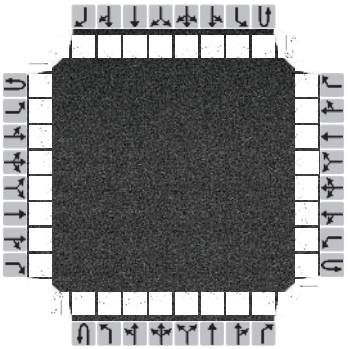
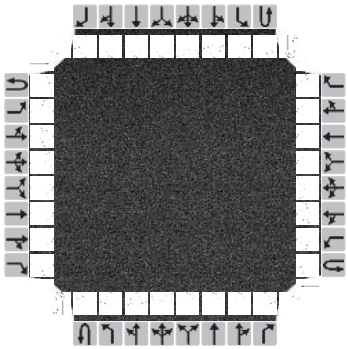
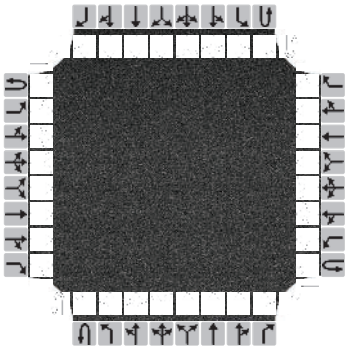
Overall Results	EB		WB		NB		SB	
Approach ETT, s/veh | LOS	1.6	A	0.0	A	33.7	C	24.3	C
Intersection ETT, s/veh | LOS	2.9				A			

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HCS7 Alternative Intersections Results Summary

General Information				Alternative Intersection Information	
Agency	NDDOT			Intersection Type	RCUT with TWSC
Analyst	DMS	Analysis Date	6/10/2019	Segment One Distance, ft	1100
Jurisdiction		Duration, h	0.25	Segment Two Distance, ft	800
Intersection	1	PHF	1	Arterial Direction	East-West
Main Intersection File	1_RCUT_2039.xtw				
West Crossover File	1_West_RCUT_2039.xtw				
East Crossover File	1_East_RCUT_2039.xtw				
Project Description					

Demand	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL	SBT	SBR
Intersection One Demand (*v*), veh/h			1258		43		1352									
Intersection Two Demand (*v*), veh/h	0	168	1125	8	0	4	1172	143				20				223
Intersection Three Demand (*v*), veh/h	12		1133				1307									

(1) West Crossover	(2) Main Intersection	(3) East Crossover
		

Queue-to-Storage Ratio	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL	SBT	SBR
Intersection One (R_Q)																
Intersection Two (R_Q)		0.10				0.00						0.03				0.69
Intersection Three (R_Q)																

Alternative Intesection Results

O-D	O-D Movements	Flow Rate (veh/h)	Control Delay (s/veh)	EDTT (s/veh)	ETT (s/veh)	LOS
EBL	EBL(2)	168	15.3	--	15.3	B
EBT	--	1125	0.0	--	0.0	A
EBR	--	8	0.0	--	0.0	A
WBL	WBL(2)	4	11.0	--	11.0	B
WBT	--	1172	0.0	--	0.0	A
WBR	--	143	0.0	--	0.0	A
NBL	NBR(2) + EBU(3)	5	36.4	21.8	58.2	E
NBT	NBR(2) + EBU(3)	7	36.4	21.8	58.2	E
NBR	NBR(2)	8	13.0	--	13.0	B
SBL	SBR(2) + WBU(1)	39	45.4	29.9	75.3	E
SBT	SBR(2) + WBU(1)	4	43.9	29.9	73.8	E
SBR	SBR(2)	180	20.5	--	20.5	C

Overall Results	EB		WB		NB		SB	
Approach ETT, s/veh | LOS	2.0	A	0.0	A	40.1	D	31.0	C
Intersection ETT, s/veh | LOS	3.6				A			

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HCS7 Roundabouts Report

General Information

Analyst	DMS
Agency or Co.	NDDOT
Date Performed	5/21/2019
Analysis Year	2019
Time Analyzed	PM Peak
Project Description	

Site Information

Intersection	1
E/W Street Name	US 2
N/S Street Name	Burdick Expy
Analysis Time Period (hrs)	0.25
Peak Hour Factor	0.88
Jurisdiction	

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	2	0	0	0	2	0	0	0	1	0	0	0	1	0
Lane Assignment	LT		TR		LT		TR				LTR				LTR	
Volume (V), veh/h	0	125	806	3	0	3	866	101	0	4	5	6	0	29	3	134
Percent Heavy Vehicles, %	3	3	12	1	3	4	11	5	3	2	3	5	3	3	2	3
Flow Rate (v_{PCE}), pc/h	0	146	1026	3	0	4	1092	121	0	5	6	7	0	34	3	157
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				2				2			
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)	4.5436	4.5436		4.5436	4.5436			4.3276			4.3276	
Follow-Up Headway (s)	2.5352	2.5352		2.5352	2.5352			2.5352			2.5352	

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	552.25	622.75		571.99	645.01			18.00			194.00	
Entry Volume veh/h	498.57	562.22		518.35	584.52			17.39			188.38	
Circulating Flow (v_c), pc/h	41			157			1206			1101		
Exiting Flow (v_{ex}), pc/h	1067			1254			273			10		
Capacity (c_{pce}), pc/h	1368.00	1368.00		1230.96	1230.96			509.44			557.00	
Capacity (c), veh/h	1235.03	1235.03		1115.52	1115.52			492.29			540.86	
v/c Ratio (x)	0.40	0.46		0.46	0.52			0.04			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	6.9	7.6		8.3	9.3			7.8			11.9	
Lane LOS	A	A		A	A			A			B	
95% Queue, veh	2.0	2.4		2.5	3.2			0.1			1.5	
Approach Delay, s/veh	7.3			8.9			7.8			11.9		
Approach LOS	A			A			A			B		
Intersection Delay, s/veh | LOS	8.4						A					

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HCS7 Roundabouts Report

General Information		Site Information	
Analyst	DMS	Intersection	1
Agency or Co.	NDDOT	E/W Street Name	US 2
Date Performed	6/7/2019	N/S Street Name	Burdick Expy
Analysis Year	2039	Analysis Time Period (hrs)	0.25
Time Analyzed	PM Peak	Peak Hour Factor	1.00
Project Description		Jurisdiction	

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	2	0	0	0	2	0	0	0	1	0	0	0	1	0
Lane Assignment	LT		TR		LT		TR				LTR				LTR	
Volume (V), veh/h	0	168	1086	4	0	4	1167	136	0	5	7	8	0	39	4	180
Percent Heavy Vehicles, %	3	3	12	1	3	4	11	5	3	2	3	5	3	3	2	3
Flow Rate (v_{PCE}), pc/h	0	173	1216	4	0	4	1295	143	0	5	7	8	0	40	4	185
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				2				2			
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)	4.5436	4.5436		4.5436	4.5436			4.3276			4.3276	
Follow-Up Headway (s)	2.5352	2.5352		2.5352	2.5352			2.5352			2.5352	

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	654.71	738.29		677.74	764.26			20.00			229.00	
Entry Volume veh/h	591.09	666.55		614.15	692.55			19.32			222.37	
Circulating Flow (v_c), pc/h	48			185			1429			1304		
Exiting Flow (v_{ex}), pc/h	1264			1485			323			12		
Capacity (c_{pce}), pc/h	1359.32	1359.32		1199.99	1199.99			421.48			468.73	
Capacity (c), veh/h	1227.22	1227.22		1087.40	1087.40			407.09			455.15	
v/c Ratio (x)	0.48	0.54		0.56	0.64			0.05			0.49	

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	8.0	9.1		10.3	12.1			9.5			17.7	
Lane LOS	A	A		B	B			A			C	
95% Queue, veh	2.7	3.4		3.7	4.8			0.1			2.6	
Approach Delay, s/veh	8.6			11.3			9.5			17.7		
Approach LOS	A			B			A			C		
Intersection Delay, s/veh | LOS	10.6						B					

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	125	806	3	3	866	101	4	5	6	29	3	134
Future Volume (veh/h)	125	806	3	3	866	101	4	5	6	29	3	134
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1709	1586	1736	1695	1600	1682	1723	1709	1709	1709	1723	1709
Adj Flow Rate, veh/h	136	876	3	3	941	0	4	5	7	32	3	146
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	3	12	1	4	11	5	2	3	3	3	2	3
Cap, veh/h	449	1960	957	424	1787		260	83	116	272	222	186
Arrive On Green	0.07	0.65	0.65	0.00	0.59	0.00	0.13	0.13	0.13	0.13	0.13	0.13
Sat Flow, veh/h	1628	3014	1471	1615	3040	1425	1239	644	902	1391	1723	1448
Grp Volume(v), veh/h	136	876	3	3	941	0	4	0	12	32	3	146
Grp Sat Flow(s),veh/h/ln	1628	1507	1471	1615	1520	1425	1239	0	1547	1391	1723	1448
Q Serve(g_s), s	2.0	10.0	0.1	0.1	12.9	0.0	0.2	0.0	0.5	1.4	0.1	6.8
Cycle Q Clear(g_c), s	2.0	10.0	0.1	0.1	12.9	0.0	0.3	0.0	0.5	1.9	0.1	6.8
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.58	1.00		1.00
Lane Grp Cap(c), veh/h	449	1960	957	424	1787		260	0	199	272	222	186
V/C Ratio(X)	0.30	0.45	0.00	0.01	0.53		0.02	0.00	0.06	0.12	0.01	0.78
Avail Cap(c_a), veh/h	539	1960	957	614	1787		437	0	420	471	468	393
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	5.9	6.0	4.3	6.1	8.6	0.0	26.8	0.0	26.8	27.6	26.6	29.6
Incr Delay (d2), s/veh	0.4	0.7	0.0	0.0	1.1	0.0	0.0	0.0	0.1	0.2	0.0	7.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.4	2.1	0.0	0.0	3.2	0.0	0.1	0.0	0.2	0.5	0.0	2.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	6.3	6.8	4.3	6.1	9.7	0.0	26.8	0.0	26.9	27.8	26.6	36.6
LnGrp LOS	A	A	A	A	A		C	A	C	C	C	D
Approach Vol, veh/h		1015			944	A		16			181	
Approach Delay, s/veh		6.7			9.7			26.9			34.9	
Approach LOS		A			A			C			C	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	4.8	51.2		14.0	9.1	46.9		14.0				
Change Period (Y+Rc), s	4.5	5.7		5.0	4.5	5.7		5.0				
Max Green Setting (Gmax), s	8.5	27.3		19.0	8.5	27.3		19.0				
Max Q Clear Time (g_c+I1), s	2.1	12.0		2.5	4.0	14.9		8.8				
Green Ext Time (p_c), s	0.0	4.9		0.0	0.1	4.7		0.4				

Intersection Summary			
HCM 6th Ctrl Delay		10.5	
HCM 6th LOS		B	

Notes

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	168	1086	4	4	1167	136	5	7	8	39	4	180
Future Volume (veh/h)	168	1086	4	4	1167	136	5	7	8	39	4	180
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1709	1586	1736	1695	1600	1682	1723	1709	1709	1709	1723	1709
Adj Flow Rate, veh/h	168	1086	4	4	1167	0	5	7	8	39	4	180
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	3	12	1	4	11	5	2	3	3	3	2	3
Cap, veh/h	352	1881	918	321	1704		285	112	128	304	264	222
Arrive On Green	0.07	0.62	0.62	0.01	0.56	0.00	0.15	0.15	0.15	0.15	0.15	0.15
Sat Flow, veh/h	1628	3014	1471	1615	3040	1425	1200	728	832	1387	1723	1448
Grp Volume(v), veh/h	168	1086	4	4	1167	0	5	0	15	39	4	180
Grp Sat Flow(s),veh/h/ln	1628	1507	1471	1615	1520	1425	1200	0	1559	1387	1723	1448
Q Serve(g_s), s	2.8	14.8	0.1	0.1	19.2	0.0	0.2	0.0	0.6	1.7	0.1	8.4
Cycle Q Clear(g_c), s	2.8	14.8	0.1	0.1	19.2	0.0	0.4	0.0	0.6	2.3	0.1	8.4
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.53	1.00		1.00
Lane Grp Cap(c), veh/h	352	1881	918	321	1704		285	0	239	304	264	222
V/C Ratio(X)	0.48	0.58	0.00	0.01	0.68		0.02	0.00	0.06	0.13	0.02	0.81
Avail Cap(c_a), veh/h	437	1881	918	509	1704		426	0	423	468	468	393
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	9.5	7.7	5.0	7.4	11.0	0.0	25.3	0.0	25.3	26.3	25.1	28.6
Incr Delay (d2), s/veh	1.0	1.3	0.0	0.0	2.3	0.0	0.0	0.0	0.1	0.2	0.0	6.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.6	3.3	0.0	0.0	5.1	0.0	0.1	0.0	0.2	0.5	0.1	3.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	10.5	9.0	5.0	7.4	13.2	0.0	25.3	0.0	25.4	26.5	25.2	35.5
LnGrp LOS	B	A	A	A	B		C	A	C	C	C	D
Approach Vol, veh/h		1258			1171	A		20			223	
Approach Delay, s/veh		9.2			13.2			25.4			33.8	
Approach LOS		A			B			C			C	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	4.9	49.4		15.7	9.3	44.9		15.7				
Change Period (Y+Rc), s	4.5	5.7		5.0	4.5	5.7		5.0				
Max Green Setting (Gmax), s	8.5	27.3		19.0	8.5	27.3		19.0				
Max Q Clear Time (g_c+I1), s	2.1	16.8		2.6	4.8	21.2		10.4				
Green Ext Time (p_c), s	0.0	5.0		0.0	0.1	3.6		0.4				

Intersection Summary			
HCM 6th Ctrl Delay		13.1	
HCM 6th LOS		B	

Notes

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

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HCS7 Two-Way Stop-Control Report

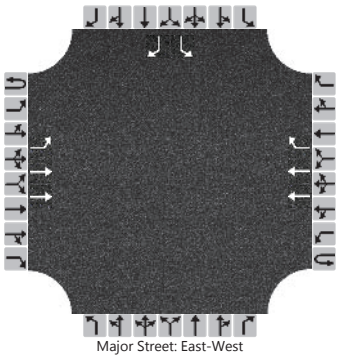
General Information

Analyst	DMS
Agency/Co.	NDDOT
Date Performed	8/22/2019
Analysis Year	2019
Time Analyzed	
Intersection Orientation	East-West
Project Description	HSIP 481001

Site Information

Intersection	#1
Jurisdiction	NDDOT
East/West Street	US 2
North/South Street	Burdick Expwy
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

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	2	0	0	0	2	1		0	0	0		1	0	1
Configuration		L	T				T	R						L		R
Volume (veh/h)	0	125	806				866	101						29		134
Percent Heavy Vehicles (%)	3	3												3		3
Proportion Time Blocked																
Percent Grade (%)													0			
Right Turn Channelized					No								No			
Median Type | Storage	Left + Thru								1							

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.5		6.9
Critical Headway (sec)		4.16												6.86		6.96
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.23												3.53		3.33

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		136												32		146
Capacity, c (veh/h)		652												189		537
v/c Ratio		0.21												0.17		0.27
95% Queue Length, Q_{95} (veh)		0.8												0.6		1.1
Control Delay (s/veh)		12.0												27.8		14.2
Level of Service (LOS)		B												D		B
Approach Delay (s/veh)	1.6												16.6			
Approach LOS													C			

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HCS7 Two-Way Stop-Control Report

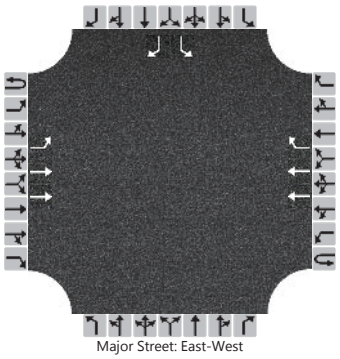
General Information

Analyst	DMS
Agency/Co.	NDDOT
Date Performed	8/22/2019
Analysis Year	2039
Time Analyzed	
Intersection Orientation	East-West
Project Description	HSIP 481001

Site Information

Intersection	#1
Jurisdiction	NDDOT
East/West Street	US 2
North/South Street	Burdick Expwy
Peak Hour Factor	1.00
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

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	2	0	0	0	2	1		0	0	0		1	0	1
Configuration		L	T				T	R						L		R
Volume (veh/h)	0	168	1086				1167	136						39		180
Percent Heavy Vehicles (%)	3	3												3		3
Proportion Time Blocked																
Percent Grade (%)														0		
Right Turn Channelized							No							No		
Median Type | Storage			Left + Thru								1					

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.5		6.9
Critical Headway (sec)		4.16												6.86		6.96
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.23												3.53		3.33

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		168												39		180
Capacity, c (veh/h)		522												130		453
v/c Ratio		0.32												0.30		0.40
95% Queue Length, Q_{95} (veh)		1.4												1.2		1.9
Control Delay (s/veh)		15.1												44.3		18.1
Level of Service (LOS)		C												E		C
Approach Delay (s/veh)		2.0												22.8		
Approach LOS														C		

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HCS7 Two-Way Stop-Control Report

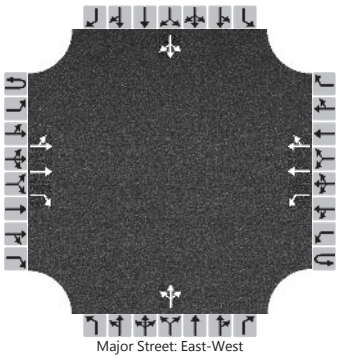
General Information

Analyst	DMS
Agency/Co.	NDDOT
Date Performed	6/10/2019
Analysis Year	2019
Time Analyzed	
Intersection Orientation	East-West
Project Description	HSIP 481001

Site Information

Intersection	#2
Jurisdiction	NDDOT
East/West Street	US 2
North/South Street	18 St SW
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

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	2	1	0	1	2	0		0	1	0		0	1	0
Configuration		LT	T	R		L	T	TR			LTR				LTR	
Volume (veh/h)		0	844	14	0	1	903	0		43	0	11		0	1	0
Percent Heavy Vehicles (%)		0			3	1				2	0	3		3	3	3
Proportion Time Blocked																
Percent Grade (%)										0				0		
Right Turn Channelized		No														
Median Type | Storage		Left + Thru								1						

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.5	6.5	6.9		7.5	6.5	6.9
Critical Headway (sec)		4.10				4.12				7.54	6.50	6.96		7.56	6.56	6.96
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				2.21				3.52	4.00	3.33		3.53	4.03	3.33

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		0				1					59				1	
Capacity, c (veh/h)		711				736					241				181	
v/c Ratio		0.00				0.00					0.24				0.01	
95% Queue Length, Q_{95} (veh)		0.0				0.0					0.9				0.0	
Control Delay (s/veh)		10.1				9.9					24.6				25.0	
Level of Service (LOS)		B				A					C				D	
Approach Delay (s/veh)		0.0				0.0				24.6				25.0		
Approach LOS										C				D		

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HCS7 Two-Way Stop-Control Report

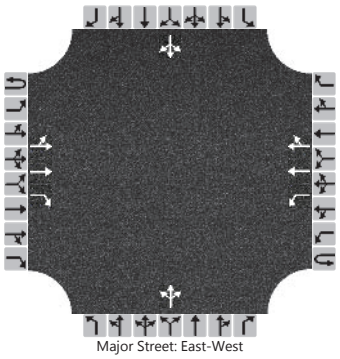
General Information

Analyst	DMS
Agency/Co.	NDDOT
Date Performed	6/10/2019
Analysis Year	2039
Time Analyzed	
Intersection Orientation	East-West
Project Description	HSIP 481001

Site Information

Intersection	#2
Jurisdiction	NDDOT
East/West Street	US 2
North/South Street	18 St SW
Peak Hour Factor	1.00
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	2	1	0	1	2	0		0	1	0		0	1	0
Configuration		LT	T	R		L	T	TR			LTR				LTR	
Volume (veh/h)		0	1137	19	0	1	1216	0		58	0	15		0	1	0
Percent Heavy Vehicles (%)		0			3	1				2	0	3		3	3	3
Proportion Time Blocked																
Percent Grade (%)										0				0		
Right Turn Channelized		No														
Median Type | Storage		Left + Thru								1						

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.5	6.5	6.9		7.5	6.5	6.9
Critical Headway (sec)		4.10				4.12				7.54	6.50	6.96		7.56	6.56	6.96
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				2.21				3.52	4.00	3.33		3.53	4.03	3.33

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		0				1					73				1	
Capacity, c (veh/h)		581				606					178				133	
v/c Ratio		0.00				0.00					0.41				0.01	
95% Queue Length, Q_{95} (veh)		0.0				0.0					1.8				0.0	
Control Delay (s/veh)		11.2				11.0					38.6				32.3	
Level of Service (LOS)		B				B					E				D	
Approach Delay (s/veh)		0.0				0.0				38.6				32.3		
Approach LOS										E				D		

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HCS7 Two-Way Stop-Control Report

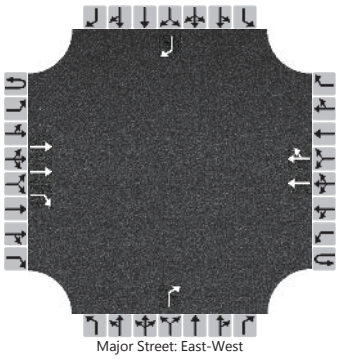
General Information

Analyst	DMS
Agency/Co.	NDDOT
Date Performed	6/10/2019
Analysis Year	2019
Time Analyzed	
Intersection Orientation	East-West
Project Description	HSIP 481001

Site Information

Intersection	#2
Jurisdiction	NDDOT
East/West Street	US 2
North/South Street	18 St SW
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

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	2	1	0	0	2	0		0	0	1		0	0	1
Configuration			T	R			T	TR				R				R
Volume (veh/h)			844	14			903	0				54				1
Percent Heavy Vehicles (%)												3				3
Proportion Time Blocked																
Percent Grade (%)										0				0		
Right Turn Channelized		No								No				No		
Median Type | Storage			Left + Thru								1					

Critical and Follow-up Headways

Base Critical Headway (sec)												6.9				6.9
Critical Headway (sec)												6.96				6.96
Base Follow-Up Headway (sec)												3.3				3.3
Follow-Up Headway (sec)												3.33				3.33

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)												59				1
Capacity, c (veh/h)												547				521
v/c Ratio												0.11				0.00
95% Queue Length, Q_{95} (veh)												0.4				0.0
Control Delay (s/veh)												12.4				11.9
Level of Service (LOS)												B				B
Approach Delay (s/veh)										12.4				11.9		
Approach LOS										B				B		

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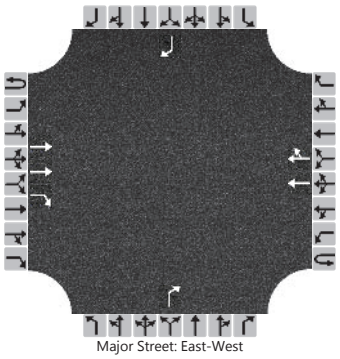
General Information

Analyst	DMS
Agency/Co.	NDDOT
Date Performed	6/10/2019
Analysis Year	2039
Time Analyzed	
Intersection Orientation	East-West
Project Description	HSIP 481001

Site Information

Intersection	#2
Jurisdiction	NDDOT
East/West Street	US 2
North/South Street	18 St SW
Peak Hour Factor	1.00
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	2	1	0	0	2	0		0	0	1		0	0	1
Configuration			T	R			T	TR				R				R
Volume (veh/h)			1137	19			1216	0				73				1
Percent Heavy Vehicles (%)												3				3
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized		No								No				No		
Median Type | Storage			Left + Thru								1					

Critical and Follow-up Headways

Base Critical Headway (sec)												6.9				6.9
Critical Headway (sec)												6.96				6.96
Base Follow-Up Headway (sec)												3.3				3.3
Follow-Up Headway (sec)												3.33				3.33

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)												73				1
Capacity, c (veh/h)												463				436
v/c Ratio												0.16				0.00
95% Queue Length, Q_{95} (veh)												0.6				0.0
Control Delay (s/veh)												14.2				13.3
Level of Service (LOS)												B				B
Approach Delay (s/veh)									14.2				13.3			
Approach LOS									B				B			

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HCS7 Two-Way Stop-Control Report

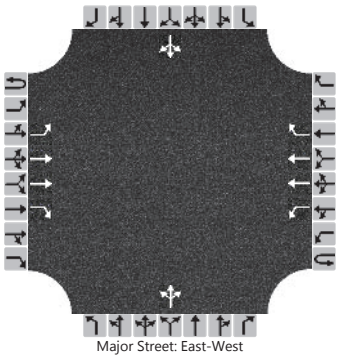
General Information

Analyst	DMS
Agency/Co.	NDDOT
Date Performed	6/10/2019
Analysis Year	2019
Time Analyzed	
Intersection Orientation	East-West
Project Description	HSIP 481001

Site Information

Intersection	#3
Jurisdiction	NDDOT
East/West Street	US 2
North/South Street	Evergreen Ave
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

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	2	1	0	1	2	1		0	1	0		0	1	0
Configuration		L	T	R		L	T	R			LTR				LTR	
Volume (veh/h)	0	72	481	263	0	26	717	12		72	6	7		12	5	46
Percent Heavy Vehicles (%)	3	3			3	9				9	1	10		6	2	3
Proportion Time Blocked																
Percent Grade (%)										0				0		
Right Turn Channelized		No				No										
Median Type | Storage		Left + Thru								1						

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.5	6.5	6.9		7.5	6.5	6.9
Critical Headway (sec)		4.16				4.28				7.68	6.52	7.10		7.62	6.54	6.96
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)		2.23				2.29				3.59	4.01	3.40		3.56	4.02	3.33

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		78				28					92				68	
Capacity, c (veh/h)		818				769					236				393	
v/c Ratio		0.10				0.04					0.39				0.17	
95% Queue Length, Q_{95} (veh)		0.3				0.1					1.8				0.6	
Control Delay (s/veh)		9.9				9.9					29.7				16.1	
Level of Service (LOS)		A				A					D				C	
Approach Delay (s/veh)		0.9				0.3				29.7				16.1		
Approach LOS										D				C		

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HCS7 Two-Way Stop-Control Report

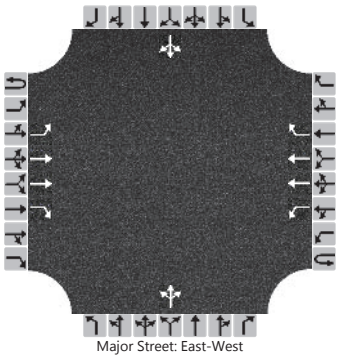
General Information

Analyst	DMS
Agency/Co.	NDDOT
Date Performed	6/10/2019
Analysis Year	2039
Time Analyzed	
Intersection Orientation	East-West
Project Description	HSIP 481001

Site Information

Intersection	#3
Jurisdiction	NDDOT
East/West Street	US 2
North/South Street	Evergreen Ave
Peak Hour Factor	1.00
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

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	2	1	0	1	2	1		0	1	0		0	1	0
Configuration		L	T	R		L	T	R			LTR				LTR	
Volume (veh/h)	0	97	648	354	0	35	966	16		97	8	9		16	7	62
Percent Heavy Vehicles (%)	3	3			3	9				9	1	10		6	2	3
Proportion Time Blocked																
Percent Grade (%)										0				0		
Right Turn Channelized		No				No										
Median Type | Storage		Left + Thru								1						

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.5	6.5	6.9		7.5	6.5	6.9
Critical Headway (sec)		4.16				4.28				7.68	6.52	7.10		7.62	6.54	6.96
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)		2.23				2.29				3.59	4.01	3.40		3.56	4.02	3.33

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		97				35					114				85	
Capacity, c (veh/h)		693				646					164				303	
v/c Ratio		0.14				0.05					0.69				0.28	
95% Queue Length, Q_{95} (veh)		0.5				0.2					4.1				1.1	
Control Delay (s/veh)		11.0				10.9					65.8				21.4	
Level of Service (LOS)		B				B					F				C	
Approach Delay (s/veh)		1.0				0.4				65.8				21.4		
Approach LOS										F				C		

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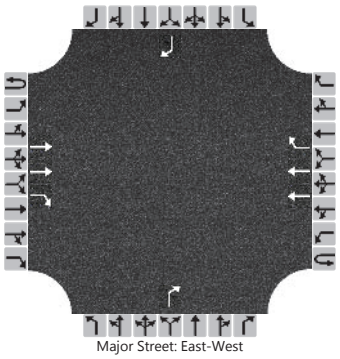
General Information

Analyst	DMS
Agency/Co.	NDDOT
Date Performed	6/10/2019
Analysis Year	2019
Time Analyzed	
Intersection Orientation	East-West
Project Description	HSIP 481001

Site Information

Intersection	#3
Jurisdiction	NDDOT
East/West Street	US 2
North/South Street	Evergreen Ave
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

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	2	1	0	0	2	1		0	0	1		0	0	1
Configuration			T	R			T	R				R				R
Volume (veh/h)			481	263			717	12				85				63
Percent Heavy Vehicles (%)												10				6
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized	No				No				No				No			
Median Type | Storage	Left + Thru								1							

Critical and Follow-up Headways

Base Critical Headway (sec)												6.9				6.9
Critical Headway (sec)												7.10				7.02
Base Follow-Up Headway (sec)												3.3				3.3
Follow-Up Headway (sec)												3.40				3.36

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)												92				68
Capacity, c (veh/h)												714				598
v/c Ratio												0.13				0.11
95% Queue Length, Q_{95} (veh)												0.4				0.4
Control Delay (s/veh)												10.8				11.8
Level of Service (LOS)												B				B
Approach Delay (s/veh)									10.8				11.8			
Approach LOS									B				B			

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HCS7 Two-Way Stop-Control Report

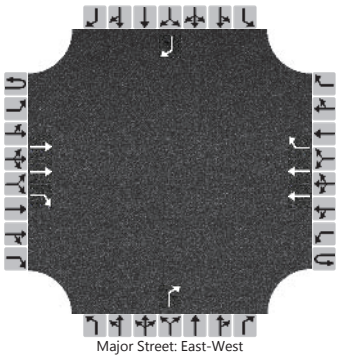
General Information

Analyst	DMS
Agency/Co.	NDDOT
Date Performed	6/10/2019
Analysis Year	2039
Time Analyzed	
Intersection Orientation	East-West
Project Description	HSIP 481001

Site Information

Intersection	#3
Jurisdiction	NDDOT
East/West Street	US 2
North/South Street	Evergreen Ave
Peak Hour Factor	1.00
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

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	2	1	0	0	2	1		0	0	1		0	0	1
Configuration			T	R			T	R				R				R
Volume (veh/h)			648	354			966	16				9				62
Percent Heavy Vehicles (%)												10				3
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized	No				No				No				No			
Median Type | Storage	Left + Thru								1							

Critical and Follow-up Headways

Base Critical Headway (sec)												6.9				6.9
Critical Headway (sec)												7.10				6.96
Base Follow-Up Headway (sec)												3.3				3.3
Follow-Up Headway (sec)												3.40				3.33

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)												9				62
Capacity, c (veh/h)												649				527
v/c Ratio												0.01				0.12
95% Queue Length, Q_{95} (veh)												0.0				0.4
Control Delay (s/veh)												10.6				12.7
Level of Service (LOS)												B				B
Approach Delay (s/veh)									10.6				12.7			
Approach LOS									B				B			

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HCS7 Two-Way Stop-Control Report

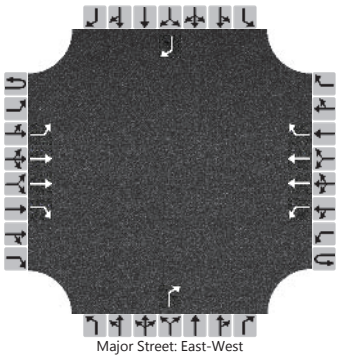
General Information

Analyst	DMS
Agency/Co.	NDDOT
Date Performed	6/10/2019
Analysis Year	2019
Time Analyzed	
Intersection Orientation	East-West
Project Description	HSIP 481001

Site Information

Intersection	#3
Jurisdiction	NDDOT
East/West Street	US 2
North/South Street	Evergreen Ave
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

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	2	1	0	1	2	1		0	0	1		0	0	1
Configuration		L	T	R		L	T	R				R				R
Volume (veh/h)	0	72	481	263	0	26	717	12				85				63
Percent Heavy Vehicles (%)	3	3			3	9						10				3
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized	No				No				No				No			
Median Type | Storage	Left + Thru								1							

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1						6.9				6.9
Critical Headway (sec)		4.16				4.28						7.10				6.96
Base Follow-Up Headway (sec)		2.2				2.2						3.3				3.3
Follow-Up Headway (sec)		2.23				2.29						3.40				3.33

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		78				28						92				68
Capacity, c (veh/h)		818				769						714				606
v/c Ratio		0.10				0.04						0.13				0.11
95% Queue Length, Q_{95} (veh)		0.3				0.1						0.4				0.4
Control Delay (s/veh)		9.9				9.9						10.8				11.7
Level of Service (LOS)		A				A						B				B
Approach Delay (s/veh)	0.9				0.3				10.8				11.7			
Approach LOS									B				B			

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HCS7 Two-Way Stop-Control Report

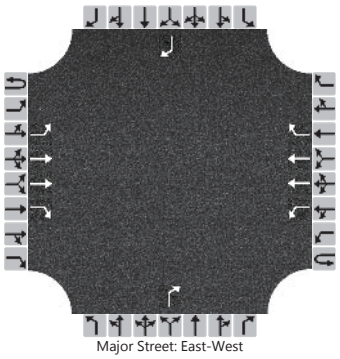
General Information

Analyst	DMS
Agency/Co.	NDDOT
Date Performed	6/10/2019
Analysis Year	2039
Time Analyzed	
Intersection Orientation	East-West
Project Description	HSIP 481001

Site Information

Intersection	#3
Jurisdiction	NDDOT
East/West Street	US 2
North/South Street	Evergreen Ave
Peak Hour Factor	1.00
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

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	2	1	0	1	2	1		0	0	1		0	0	1
Configuration		L	T	R		L	T	R				R				R
Volume (veh/h)	0	97	648	354	0	35	966	16				114				85
Percent Heavy Vehicles (%)	3	3			3	9						10				3
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized	No				No				No				No			
Median Type | Storage	Left + Thru								1							

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1						6.9				6.9
Critical Headway (sec)		4.16				4.28						7.10				6.96
Base Follow-Up Headway (sec)		2.2				2.2						3.3				3.3
Follow-Up Headway (sec)		2.23				2.29						3.40				3.33

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		97				35						114				85
Capacity, c (veh/h)		693				646						649				527
v/c Ratio		0.14				0.05						0.18				0.16
95% Queue Length, Q_{95} (veh)		0.5				0.2						0.6				0.6
Control Delay (s/veh)		11.0				10.9						11.7				13.1
Level of Service (LOS)		B				B						B				B
Approach Delay (s/veh)	1.0				0.4				11.7				13.1			
Approach LOS									B				B			

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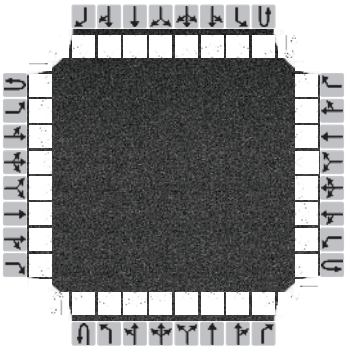
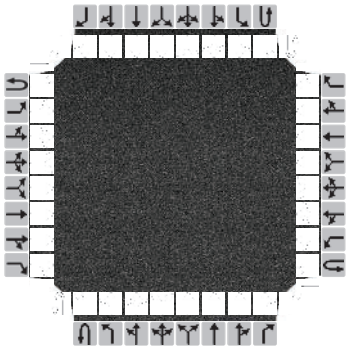
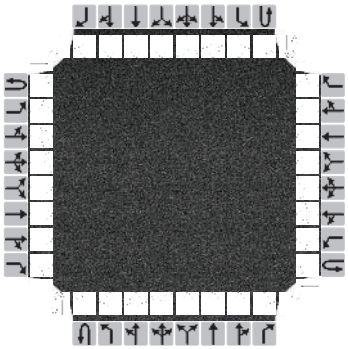
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HCS7 Alternative Intersections Results Summary

General Information				Alternative Intersection Information	
Agency	NDDOT			Intersection Type	RCUT with TWSC
Analyst	DMS	Analysis Date	6/11/2019	Segment One Distance, ft	800
Jurisdiction		Duration, h	0.25	Segment Two Distance, ft	800
Intersection	3	PHF	0.92	Arterial Direction	East-West
Main Intersection File	3_RCUT_2019.xtw				
West Crossover File	3_West_RCUT_2019.xtw				
East Crossover File	3_East_RCUT_2019.xtw				
Project Description					

Demand	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL	SBT	SBR
Intersection One Demand (*v*), veh/h			816		17		835									
Intersection Two Demand (*v*), veh/h	0	72	493	268	0	26	789	18				85				63
Intersection Three Demand (*v*), veh/h	78		500				755									

(1) West Crossover	(2) Main Intersection	(3) East Crossover
		

Queue-to-Storage Ratio	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL	SBT	SBR
Intersection One (R_Q)					0.01											
Intersection Two (R_Q)		0.02				0.01						0.12				0.10
Intersection Three (R_Q)	0.06															

Alternative Intesection Results

O-D	O-D Movements	Flow Rate (veh/h)	Control Delay (s/veh)	EDTT (s/veh)	ETT (s/veh)	LOS
EBL	EBL(2)	78	10.3	--	10.3	B
EBT	--	523	0.0	--	0.0	A
EBR	--	286	0.0	--	0.0	A
WBL	WBL(2)	28	9.9	--	9.9	A
WBT	--	779	0.0	--	0.0	A
WBR	--	13	0.0	--	0.0	A
NBL	NBR(2) + EBU(3)	78	26.8	21.8	48.6	D
NBT	NBR(2) + EBU(3)	7	26.8	21.8	48.6	D
NBR	NBR(2)	8	10.8	--	10.8	B
SBL	SBR(2) + WBU(1)	13	27.5	21.8	49.3	D
SBT	SBR(2) + WBU(1)	5	28.1	21.8	49.9	D
SBR	SBR(2)	50	12.2	--	12.2	B

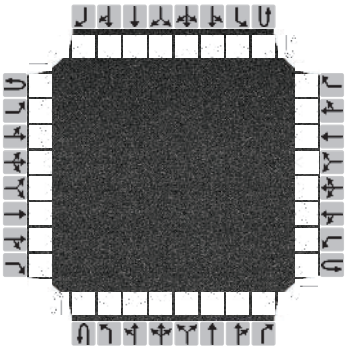
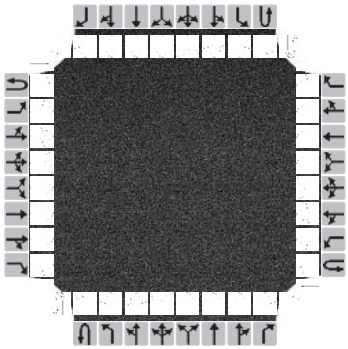
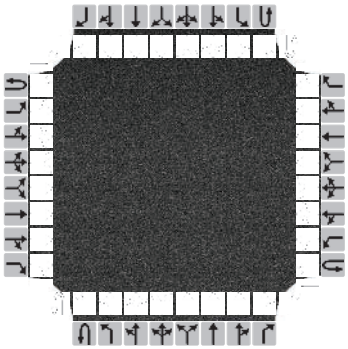
Overall Results	EB		WB		NB		SB	
Approach ETT, s/veh | LOS	0.9	A	0.3	A	45.3	D	22.1	C
Intersection ETT, s/veh | LOS	3.6				A			

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HCS7 Alternative Intersections Results Summary

General Information				Alternative Intersection Information	
Agency	NDDOT			Intersection Type	RCUT with TWSC
Analyst	DMS	Analysis Date	6/11/2019	Segment One Distance, ft	800
Jurisdiction		Duration, h	0.25	Segment Two Distance, ft	800
Intersection	3	PHF	1	Arterial Direction	East-West
Main Intersection File	3_RCUT_2039.xtw				
West Crossover File	3_West_RCUT_2039.xtw				
East Crossover File	3_East_RCUT_2039.xtw				
Project Description					

Demand	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL	SBT	SBR
Intersection One Demand (*v*), veh/h			1099		23		1125									
Intersection Two Demand (*v*), veh/h	0	97	664	361	0	35	1063	24				114				85
Intersection Three Demand (*v*), veh/h	105		673				1017									

(1) West Crossover	(2) Main Intersection	(3) East Crossover
		

Queue-to-Storage Ratio	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL	SBT	SBR
Intersection One (R_Q)					0.02											
Intersection Two (R_Q)		0.04				0.01						0.17				0.16
Intersection Three (R_Q)	0.11															

Alternative Intesection Results

O-D	O-D Movements	Flow Rate (veh/h)	Control Delay (s/veh)	EDTT (s/veh)	ETT (s/veh)	LOS
EBL	EBL(2)	97	11.7	--	11.7	B
EBT	--	648	0.0	--	0.0	A
EBR	--	354	0.0	--	0.0	A
WBL	WBL(2)	35	11.0	--	11.0	B
WBT	--	966	0.0	--	0.0	A
WBR	--	16	0.0	--	0.0	A
NBL	NBR(2) + EBU(3)	97	34.4	21.8	56.2	E
NBT	NBR(2) + EBU(3)	8	34.4	21.8	56.2	E
NBR	NBR(2)	9	11.8	--	11.8	B
SBL	SBR(2) + WBU(1)	16	33.7	21.8	55.5	E
SBT	SBR(2) + WBU(1)	7	36.5	21.8	58.3	E
SBR	SBR(2)	62	13.9	--	13.9	B

Overall Results	EB		WB		NB		SB	
Approach ETT, s/veh | LOS	1.0	A	0.4	A	52.7	D	25.4	C
Intersection ETT, s/veh | LOS	4.2				A			

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HCS7 Roundabouts Report

General Information

Analyst	DMS
Agency or Co.	NDDOT
Date Performed	5/21/2019
Analysis Year	2019
Time Analyzed	PM Peak
Project Description	

Site Information

Intersection	3
E/W Street Name	US 2
N/S Street Name	Evergreen Ave
Analysis Time Period (hrs)	0.25
Peak Hour Factor	0.92
Jurisdiction	

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	2	0	0	0	2	0	0	0	1	0	0	0	1	0
Lane Assignment	LT		TR		LT		TR				LTR				LTR	
Volume (V), veh/h	0	72	481	263	0	26	717	12	0	72	6	7	0	12	5	46
Percent Heavy Vehicles, %	3	3	14	6	3	9	12	9	3	9	1	10	3	6	2	3
Flow Rate (v_{PCE}), pc/h	0	81	596	303	0	31	873	14	0	85	7	8	0	14	6	52
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				2				2			
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)	4.5436	4.5436		4.5436	4.5436			4.3276			4.3276	
Follow-Up Headway (s)	2.5352	2.5352		2.5352	2.5352			2.5352			2.5352	

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	460.60	519.40		431.46	486.54			100.00			72.00	
Entry Volume veh/h	417.03	470.27		385.75	435.00			92.19			69.58	
Circulating Flow (v_c), pc/h	51			173			691			989		
Exiting Flow (v_{ex}), pc/h	618			1010			102			340		
Capacity (c_{pce}), pc/h	1355.61	1355.61		1213.16	1213.16			789.24			612.63	
Capacity (c), veh/h	1227.38	1227.38		1084.64	1084.64			727.56			592.00	
v/c Ratio (x)	0.34	0.38		0.36	0.40			0.13			0.12	

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	6.1	6.7		6.9	7.5			6.3			7.5	
Lane LOS	A	A		A	A			A			A	
95% Queue, veh	1.5	1.8		1.6	2.0			0.4			0.4	
Approach Delay, s/veh	6.4			7.2			6.3			7.5		
Approach LOS	A			A			A			A		
Intersection Delay, s/veh | LOS	6.8						A					

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HCS7 Roundabouts Report

General Information

Analyst	DMS
Agency or Co.	NDDOT
Date Performed	5/21/2019
Analysis Year	2039
Time Analyzed	PM Peak
Project Description	

Site Information

Intersection	3
E/W Street Name	US 2
N/S Street Name	Evergreen Ave
Analysis Time Period (hrs)	0.25
Peak Hour Factor	1.00
Jurisdiction	

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	2	0	0	0	2	0	0	0	1	0	0	0	1	0
Lane Assignment	LT		TR		LT		TR				LTR				LTR	
Volume (V), veh/h	0	97	648	354	0	35	966	16	0	97	8	9	0	16	7	62
Percent Heavy Vehicles, %	3	3	14	6	3	9	12	9	3	9	1	10	3	6	2	3
Flow Rate (v_{PCE}), pc/h	0	100	739	375	0	38	1082	17	0	106	8	10	0	17	7	64
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				2				2			
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)	4.5436	4.5436		4.5436	4.5436			4.3276			4.3276	
Follow-Up Headway (s)	2.5352	2.5352		2.5352	2.5352			2.5352			2.5352	

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	570.58	643.42		534.39	602.61			124.00			88.00	
Entry Volume veh/h	516.58	582.53		477.77	538.76			114.26			85.04	
Circulating Flow (v_c), pc/h	62			214			856			1226		
Exiting Flow (v_{ex}), pc/h	766			1252			125			420		
Capacity (c_{pce}), pc/h	1342.11	1342.11		1168.73	1168.73			685.96			500.85	
Capacity (c), veh/h	1215.09	1215.09		1044.90	1044.90			632.07			483.99	
v/c Ratio (x)	0.43	0.48		0.46	0.52			0.18			0.18	

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	7.3	8.1		8.6	9.6			7.9			9.9	
Lane LOS	A	A		A	A			A			A	
95% Queue, veh	2.2	2.7		2.4	3.0			0.7			0.6	
Approach Delay, s/veh	7.7			9.1			7.9			9.9		
Approach LOS	A			A			A			A		
Intersection Delay, s/veh | LOS	8.4						A					

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	72	481	263	26	717	12	72	6	7	12	5	46
Future Volume (veh/h)	72	481	263	26	717	12	72	6	7	12	5	46
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1709	1559	1668	1627	1586	1627	1627	1736	1736	1668	1723	1723
Adj Flow Rate, veh/h	78	523	286	28	779	13	78	7	8	13	5	50
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	3	14	6	9	12	9	9	1	1	6	2	2
Cap, veh/h	437	1276	609	444	1175	538	310	91	104	351	17	166
Arrive On Green	0.07	0.43	0.43	0.03	0.39	0.39	0.12	0.12	0.12	0.12	0.12	0.12
Sat Flow, veh/h	1628	2962	1414	1550	3014	1379	1274	739	845	1354	135	1346
Grp Volume(v), veh/h	78	523	286	28	779	13	78	0	15	13	0	55
Grp Sat Flow(s),veh/h/ln	1628	1481	1414	1550	1507	1379	1274	0	1584	1354	0	1480
Q Serve(g_s), s	1.0	4.5	5.3	0.4	7.8	0.2	2.2	0.0	0.3	0.3	0.0	1.2
Cycle Q Clear(g_c), s	1.0	4.5	5.3	0.4	7.8	0.2	3.4	0.0	0.3	0.6	0.0	1.2
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.53	1.00		0.91
Lane Grp Cap(c), veh/h	437	1276	609	444	1175	538	310	0	196	351	0	183
V/C Ratio(X)	0.18	0.41	0.47	0.06	0.66	0.02	0.25	0.00	0.08	0.04	0.00	0.30
Avail Cap(c_a), veh/h	690	2191	1046	748	2229	1020	808	0	816	881	0	762
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	6.5	7.3	7.5	6.4	9.3	6.9	16.3	0.0	14.3	14.6	0.0	14.7
Incr Delay (d2), s/veh	0.2	0.2	0.6	0.1	0.6	0.0	0.4	0.0	0.2	0.0	0.0	0.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.2	0.7	0.8	0.1	1.4	0.0	0.6	0.0	0.1	0.1	0.0	0.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	6.7	7.5	8.1	6.4	9.9	7.0	16.7	0.0	14.5	14.6	0.0	15.6
LnGrp LOS	A	A	A	A	A	A	B	A	B	B	A	B
Approach Vol, veh/h		887			820			93			68	
Approach Delay, s/veh		7.6			9.7			16.3			15.4	
Approach LOS		A			A			B			B	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	5.7	21.6		9.6	7.3	20.1		9.6				
Change Period (Y+Rc), s	4.5	5.7		5.0	4.5	5.7		5.0				
Max Green Setting (Gmax), s	8.5	27.3		19.0	8.5	27.3		19.0				
Max Q Clear Time (g_c+I1), s	2.4	7.3		5.4	3.0	9.8		3.2				
Green Ext Time (p_c), s	0.0	4.0		0.2	0.1	4.5		0.2				

Intersection Summary			
HCM 6th Ctrl Delay		9.3	
HCM 6th LOS		A	

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	168	1086	4	4	1167	136	5	7	8	39	4	180
Future Volume (veh/h)	168	1086	4	4	1167	136	5	7	8	39	4	180
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1709	1586	1736	1695	1600	1682	1723	1709	1709	1709	1723	1709
Adj Flow Rate, veh/h	168	1086	4	4	1167	0	5	7	8	39	4	180
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	3	12	1	4	11	5	2	3	3	3	2	3
Cap, veh/h	352	1881	918	321	1704		285	112	128	304	264	222
Arrive On Green	0.07	0.62	0.62	0.01	0.56	0.00	0.15	0.15	0.15	0.15	0.15	0.15
Sat Flow, veh/h	1628	3014	1471	1615	3040	1425	1200	728	832	1387	1723	1448
Grp Volume(v), veh/h	168	1086	4	4	1167	0	5	0	15	39	4	180
Grp Sat Flow(s),veh/h/ln	1628	1507	1471	1615	1520	1425	1200	0	1559	1387	1723	1448
Q Serve(g_s), s	2.8	14.8	0.1	0.1	19.2	0.0	0.2	0.0	0.6	1.7	0.1	8.4
Cycle Q Clear(g_c), s	2.8	14.8	0.1	0.1	19.2	0.0	0.4	0.0	0.6	2.3	0.1	8.4
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.53	1.00		1.00
Lane Grp Cap(c), veh/h	352	1881	918	321	1704		285	0	239	304	264	222
V/C Ratio(X)	0.48	0.58	0.00	0.01	0.68		0.02	0.00	0.06	0.13	0.02	0.81
Avail Cap(c_a), veh/h	437	1881	918	509	1704		426	0	423	468	468	393
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	9.5	7.7	5.0	7.4	11.0	0.0	25.3	0.0	25.3	26.3	25.1	28.6
Incr Delay (d2), s/veh	1.0	1.3	0.0	0.0	2.3	0.0	0.0	0.0	0.1	0.2	0.0	6.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.6	3.3	0.0	0.0	5.1	0.0	0.1	0.0	0.2	0.5	0.1	3.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	10.5	9.0	5.0	7.4	13.2	0.0	25.3	0.0	25.4	26.5	25.2	35.5
LnGrp LOS	B	A	A	A	B		C	A	C	C	C	D
Approach Vol, veh/h		1258			1171	A		20			223	
Approach Delay, s/veh		9.2			13.2			25.4			33.8	
Approach LOS		A			B			C			C	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	4.9	49.4		15.7	9.3	44.9		15.7				
Change Period (Y+Rc), s	4.5	5.7		5.0	4.5	5.7		5.0				
Max Green Setting (Gmax), s	8.5	27.3		19.0	8.5	27.3		19.0				
Max Q Clear Time (g_c+I1), s	2.1	16.8		2.6	4.8	21.2		10.4				
Green Ext Time (p_c), s	0.0	5.0		0.0	0.1	3.6		0.4				

Intersection Summary			
HCM 6th Ctrl Delay		13.1	
HCM 6th LOS		B	

Notes

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

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HCS7 Two-Way Stop-Control Report

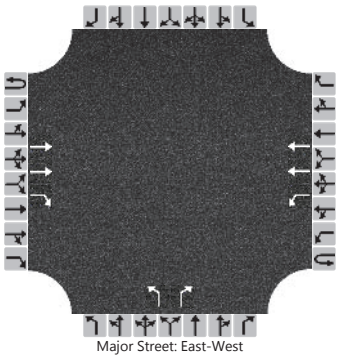
General Information

Analyst	DMS
Agency/Co.	NDDOT
Date Performed	8/22/2019
Analysis Year	2019
Time Analyzed	
Intersection Orientation	East-West
Project Description	HSIP 481001

Site Information

Intersection	#3
Jurisdiction	NDDOT
East/West Street	US 2
North/South Street	Evergreen Ave
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	2	1	0	1	2	0		1	0	1		0	0	0
Configuration			T	R		L	T			L		R				
Volume (veh/h)			481	263	0	26	717			72		7				
Percent Heavy Vehicles (%)					3	9				9		10				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized			No							No						
Median Type | Storage			Left + Thru							1						

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.5		6.9				
Critical Headway (sec)						4.28				6.98		7.10				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.29				3.59		3.40				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						28				78		8				
Capacity, c (veh/h)						769				358		714				
v/c Ratio						0.04				0.22		0.01				
95% Queue Length, Q_{95} (veh)						0.1				0.8		0.0				
Control Delay (s/veh)						9.9				17.8		10.1				
Level of Service (LOS)						A				C		B				
Approach Delay (s/veh)						0.3				17.2						
Approach LOS										C						

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HCS7 Two-Way Stop-Control Report

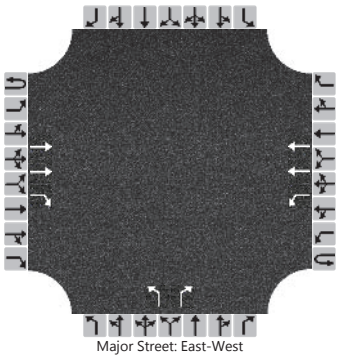
General Information

Analyst	DMS
Agency/Co.	NDDOT
Date Performed	8/22/2019
Analysis Year	2039
Time Analyzed	
Intersection Orientation	East-West
Project Description	HSIP 481001

Site Information

Intersection	#3
Jurisdiction	NDDOT
East/West Street	US 2
North/South Street	Evergreen Ave
Peak Hour Factor	1.00
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

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	2	1	0	1	2	0		1	0	1		0	0	0
Configuration			T	R		L	T			L		R				
Volume (veh/h)			648	354	0	35	966			97		9				
Percent Heavy Vehicles (%)					3	9				9		10				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized			No							No						
Median Type | Storage			Left + Thru							1						

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.5		6.9				
Critical Headway (sec)						4.28				6.98		7.10				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.29				3.59		3.40				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						35				97		9				
Capacity, c (veh/h)						646				290		649				
v/c Ratio						0.05				0.33		0.01				
95% Queue Length, Q_{95} (veh)						0.2				1.4		0.0				
Control Delay (s/veh)						10.9				23.5		10.6				
Level of Service (LOS)						B				C		B				
Approach Delay (s/veh)						0.4				22.4						
Approach LOS										C						

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TRAFFIC CONTROL STUDY - WARRANTS FOR TRAFFIC SIGNALS

North Dakota Department of Transportation, Programming
SFN 7924 (2-2016)

23 USC § 409 Documents
NDDOT Reserves All Objections

Date	Prepared by	City	Analysis Year
07/16/2019	DMS	Minot	2018

Major Road	Speed Limit (mph)	Number of Lanes
US 2	50	2
Minor Road	Speed Limit (mph)	Number of Lanes
Burdick Expy	40	1

Minor road right-turn traffic excluded from the analysis because there is an exclusive right-turn lane and right-turn traffic enters the Major Road with minimal conflict: ☐ Yes ☒ No

1. Posted or 85th-percentile speed of major road traffic is > 40 mph: ☒ Yes ☐ No

2. In built-up area of isolated community < 10,000 population: ☐ Yes ☒ No

If question 1 or 2 is answered yes, then use 70% volume criteria: ☒ 70% ☐ 100%

WARRANT 1, EIGHT-HOUR VEHICULAR VOLUME

Requirements: Either Condition A (Minimum Vehicular Volume) or Condition B (Interruption of Continuous Traffic) is satisfied to 100% of the stated volumes for each of any 8 hours of an average day.
Or: Both Condition A and Condition B are satisfied to 80% of the stated volumes for each of any 8 hours of an average day.

Table 4C-1. Warrant 1, Eight-Hour Vehicular Volume

Condition A - Minimum Vehicular Volume

Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume minor-street approach (one direction only)			
Major Street	Minor Street	100%[a]	80%[b]	70%[c]	56%[d]	100%[a]	80%[b]	70%[c]	56%[d]
1	1	500	400	350	280	150	120	105	84
2 or more	1	600	480	420	336	150	120	105	84
2 or more	2 or more	600	480	420	336	200	160	140	112
1	2 or more	500	400	350	280	200	160	140	112

Condition B - Interruption of Continuous Traffic

Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume minor-street approach (one direction only)			
Major Street	Minor Street	100%[a]	80%[b]	70%[c]	56%[d]	100%[a]	80%[b]	70%[c]	56%[d]
1	1	750	600	525	420	75	60	53	42
2 or more	1	900	720	630	504	75	60	53	42
2 or more	2 or more	900	720	630	504	100	80	70	56
1	2 or more	750	600	525	420	100	80	70	56

[a] Basic minimum hourly volume
[b] Used for combination of Conditions A and B after adequate trial of other remedial measures
[c] May be used when the major-street speed exceeds 40 mph or in an isolated community with a population of less than 10,000
[d] May be used for combination of Conditions A and B after adequate trial of other remedial measures when the major-street speed exceeds 40 mph or in an isolated community with a population of less than 10,000

8 Highest Hour Volumes								
	1	2	3	4	5	6	7	8
Both Approaches Major Road	1,867	1,608	1,383	1,305	1,207	1,137	1,123	1,097
Highest Approach Minor Road	149	138	86	142	106	91	114	80

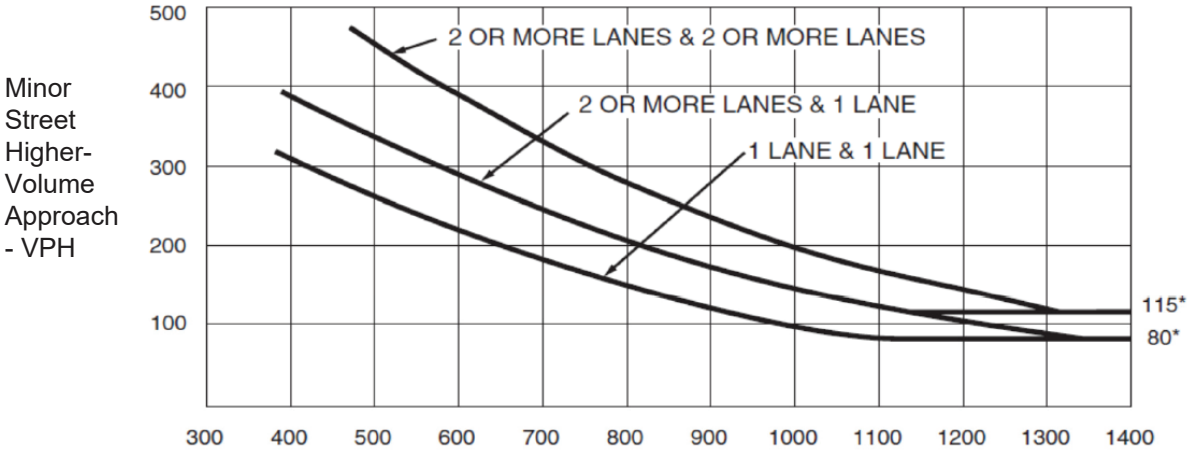
Warrant 1 Met? ☒ Yes ☐ No ☐ Does not apply

23 USC § 409 Documents
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WARRANT 2, FOUR-HOUR VEHICULAR VOLUME

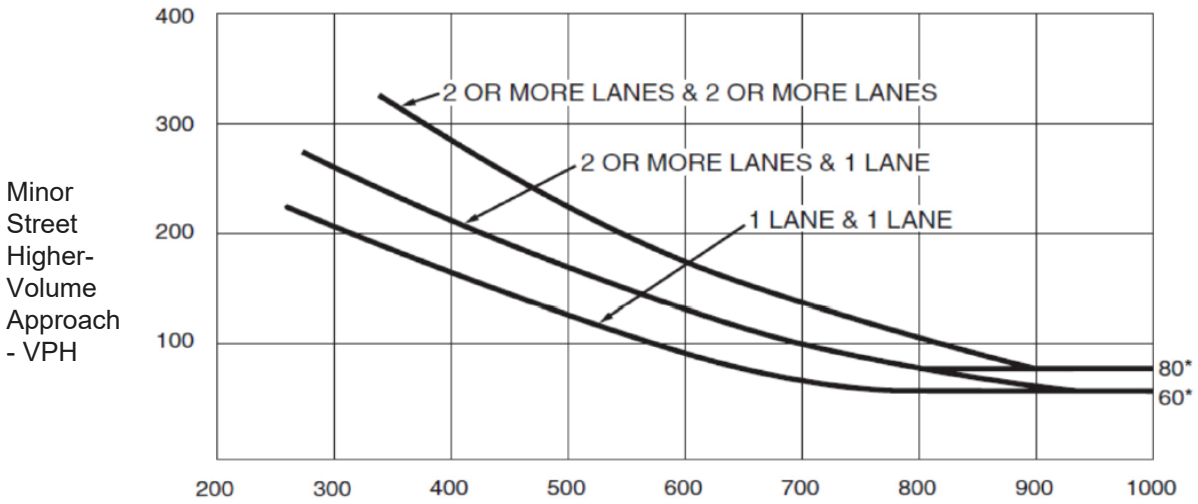
Requirements: Plot four highest hour volumes on the applicable figure below. If four points lie above the applicable curve then the warrant is satisfied.

Figure 4C-1. Warrant 2, Four-Hour Vehicular Volume



*Note: 115 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 80 vph applies as the lower threshold volume for a minor-street approach with one lane.

Figure 4C-2. Warrant 2, Four-Hour Vehicular Volume (70% Factor)
(Community Less than 10,000 Population or Above 40 MPH on Major Street)



*Note: 80 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 60 vph applies as the lower threshold volume for a minor-street approach with one lane.

Warrant 2 Met? ☒ Yes ☐ No ☐ Does not apply

23 USC § 409 Documents
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WARRANT 3, PEAK HOUR

Requirements: This signal warrant shall only be applied in unusual cases. Such cases include, but are not limited to, office complexes, manufacturing plants, industrial complexes, or high occupancy vehicle facilities that attract or discharge large numbers of vehicles over a short time.

Unusual Condition

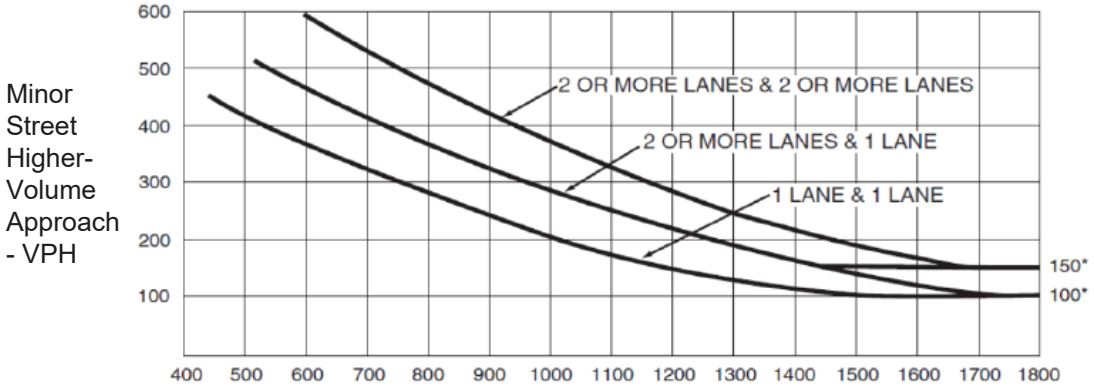
Either Condition A or Condition B is satisfied.

Condition A: The condition is satisfied if all three of the criteria are satisfied.

Criteria	Criteria Met if	Peak-Hour Value	Satisfied? Yes	Satisfied? No
Delay on Minor Approach (veh-hr)	4 veh-hr for 1 lane approach or 5 veh-hr for two-lane approach		☐	☒
Volume on Minor Approach (veh/hr)	100 veh/hr for one moving lane of traffic, or 150 veh/hr for two lanes		☐	☒
Total Entering Volume (veh/hr)	650 veh/hr for 3 approaches or 800 veh/hr for 4 or more		☐	☒

Condition B: Plot peak hour volumes on the applicable figure below. These conditions exist for the same 1 hour (and four consecutive, 15-minute periods) of an average day. If the point is above the appropriate line, then the warrant is satisfied.

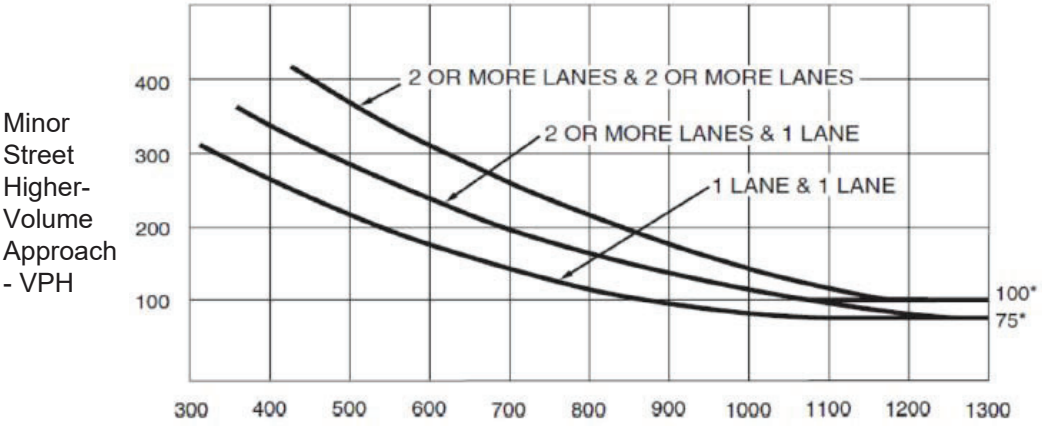
Figure 4C-3. Warrant 3, Peak Hour



*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Figure 4C-4. Warrant 3, Peak Hour (70% Factor)

(Community Less than 10,000 Population or Above 40 MPH on Major Street)



*Note: 100 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 75 vph applies as the lower threshold volume for a minor-street approach with one lane.

Warrant 3 Met? ☐ Yes ☐ No ☒ Does not apply

23 USC § 409 Documents
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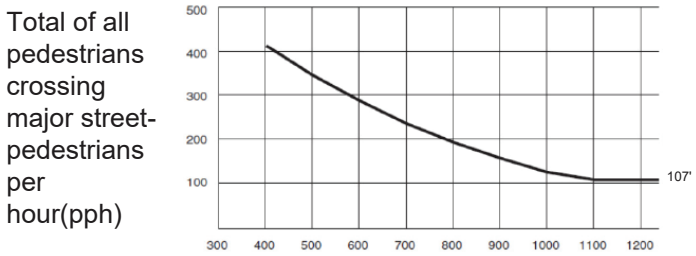
WARRANT 4, PEDESTRIAN VOLUME

Requirements: This warrant is intended for application where the traffic volume on a major street is so heavy that pedestrians experience excessive delay in crossing the major street. It shall not be applied at locations where the distance to the nearest traffic signal or stop sign controlling the street that pedestrians desire to cross is less than 300 feet.

Either criterion A or criterion B is satisfied.

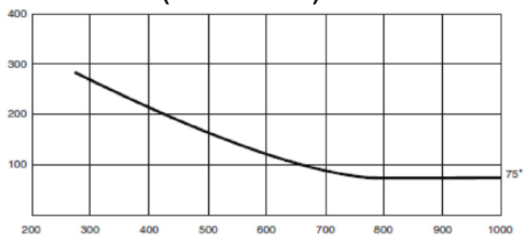
A: For each of any 4 hours of an average day, the plotted point representing the vehicles per hour on the major street (total of both approaches) and the corresponding pedestrians per hour crossing the major street (total of all crossings) all fall above the curve in Figure 4C-5.

Figure 4C-5. Warrant 4, Pedestrian Four-Hour Volume



*Note: 107 pph applies as the lower threshold volume.

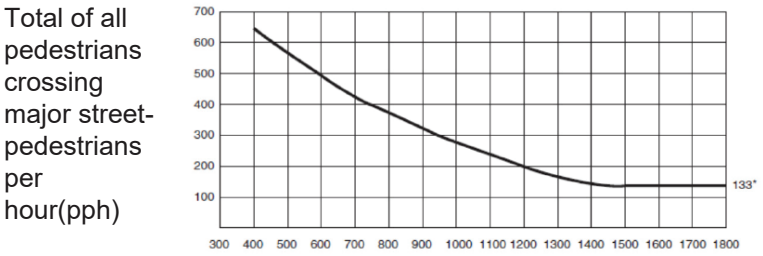
Figure 4C-6. Warrant 4, Pedestrian Four-Hour Volume (70% Factor)



*Note: 75 pph applies as the lower threshold volume.

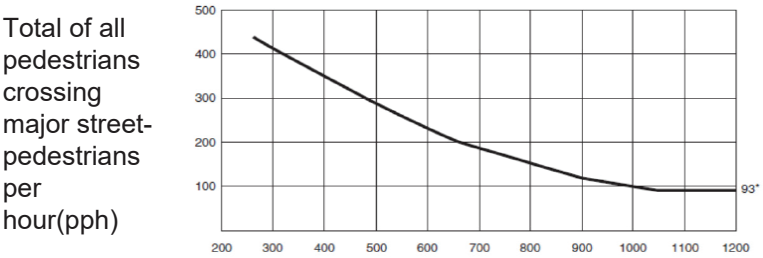
B: For 1 hour (any four consecutive 15-minute periods) of any 4 hours of an average day, the plotted points representing the vehicles per hour on the major street (total of both approaches) and the corresponding pedestrians per hour crossing the major street (total of all crossings) all fall above the curve in Figure 4C-7.

Figure 4C-7. Warrant 4, Pedestrian Peak Hour



*Note: 133 pph applies as the lower threshold volume.

Figure 4C-8. Warrant 4, Pedestrian Peak Hour (70% Factor)



*Note: 93 pph applies as the lower threshold volume.

If the speed on major street exceeds 40 mph, or if population is less than 10,000, Figure 4C-6 or 4C-8 may be used.

Warrant 4 Met? ☐ Yes ☐ No ☒ Does not apply

23 USC § 409 Documents
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WARRANT 5, SCHOOL CROSSING

Requirements: This warrant is intended for application where the fact that schoolchildren cross the major street is the principal reason to consider installing a traffic control signal. For the purposes of this warrant, the word "schoolchildren" includes elementary through high school students.

The warrant is satisfied if all three of the criteria are satisfied.

Criteria	Satisfied? Yes	No
During the time period when schoolchildren are using the crossing: Gaps < Number of minutes	☐	☐
There are a minimum of 20 schoolchildren during the highest crossing hour	☐	☐
The nearest traffic signal along the major road is located more than 300 ft away. Or, the nearest traffic signal is within 300 ft but the proposed traffic signal will not restrict the progressive movement of traffic.	☐	☐

Warrant 5 Met? ☐ Yes ☐ No ☒ Does not apply

WARRANT 6, COORDINATED SIGNAL SYSTEM

Requirements: This warrant is satisfied if either criteria is satisfied. This warrant should not be applied when the resulting signal spacing would be less than 1000 ft.

Criteria	Satisfied? Yes	No
On a one-way street or a street that has traffic predominantly in one direction, the adjacent signals are so far apart that they do not provide the necessary degree of vehicular platooning.	☐	☐
On a two-way street, adjacent traffic control signals do not provide the necessary degree of platooning and the proposed and adjacent traffic control signals will collectively provide a progressive operation.	☐	☐

Warrant 6 Met? ☐ Yes ☐ No ☒ Does not apply

WARRANT 7, CRASH EXPERIENCE

Requirements: The warrant is satisfied if all three of the criteria are satisfied.

Criteria		Hour	Satisfied? Yes	No
One of the warrants to the right is met:	Warrant 4.1at 80% of volume requirements: 80 ped/hr for 4 hrs or 152 ped/hr for 1 hr		☐	☒
	Warrant 1, Condition A (80% satisfied)		☐	☒
	Warrant 1, Condition B (80% satisfied)		☐	☒
Adequate trial of other remedial measures has failed to reduce crash frequency.		Measures Tried	☐	☒
Five or more reported crashes, of types susceptible to correction by signal control, have occurred within a 12 month period.		Number of Crashes	☐	☒

Warrant 7 Met? ☐ Yes ☐ No ☒ Does not apply

23 USC § 409 Documents
NDDOT Reserves All Objections

WARRANT 8, ROADWAY NETWORK

Requirements: A "major route" as used in this signal warrant shall have at least one of the following characteristics:

Characteristics of a Major Route	Satisfied? Yes	No
Part of the street or highway system that serves as a principal roadway network for through traffic flow.	☒	☐
Rural or suburban highway outside of, entering, or traversing a city.	☒	☐
Appears as a major route on an official plan.	☒	☐

The need for a traffic control signal shall be considered if an engineering study finds that the common intersection of two or more major routes meets one or both of the following criteria:

Criteria			Satisfied Yes	No
1. Both of the criteria to the right are met.	a. Total entering volume of at least 1,000 veh/hr during typical weekday peak hour.	Entering Volume: 2085	☒	☐
	b. Five-year projected volumes that satisfy one or more of Warrants 1,2, or 3.	Warrant(s) satisfied: 1,2	☒	☐
2. Total entering volume of at least 1,000 veh/hr for each of any 5 hours of a non-normal business day (Sat. or Sun.)		Hour / Volume	☐	☐

Warrant 8 Met? ☒ Yes ☐ No ☐ Does not apply

WARRANT 9, INTERSECTION NEAR A GRADE CROSSING

Requirements: This warrant is intended for use at a location where none of the conditions described in the other eight traffic signal warrants are met, but the proximity to the intersection of grade crossing on an intersection approach controlled by a STOP or YIELD sign is the principal reason to consider installing a traffic signal.

Both condition A and condition B are satisfied.

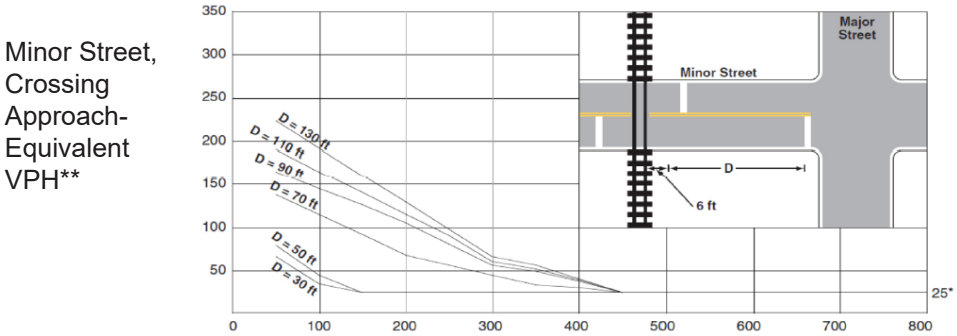
Criteria	Satisfied? Yes	No
A. A grade crossing exists on an approach controlled by a STOP or YIELD sign and the center of the track nearest to the intersection is within 140 feet of the stop line or yield line on the approach.	☐	☐
B. During the highest traffic volume hour during which rail traffic use the crossing, the plotted point representing the vehicles per hour on the major street (total of both approaches) and the corresponding vehicles per hour on the minor-street approach that crosses the track (one direction only, approaching the intersection) falls above the applicable curve in Figure 4C-9 or 4C-10 for the existing combination of approach lanes over the track and the distance D, which is the clear storage distance as defined in Section 1A.13.	☐	☐

Warrant 9 Continued on next page

23 USC § 409 Documents
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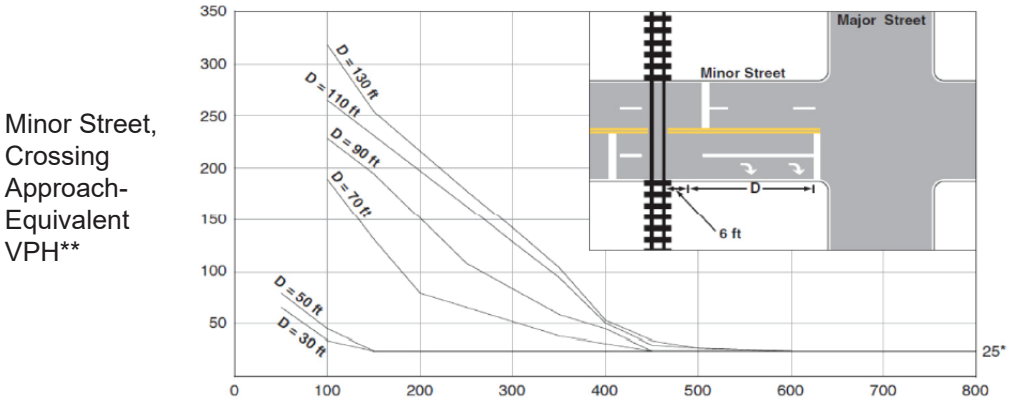
WARRANT 9, CONTINUED

Figure 4C-9. Warrant 9, Intersection near a Grade Crossing (one Approach Lane at the Track Crossing)



*Note: 25 vph applies as the lower threshold volume.
**Note: VPH after applying the adjustment factors in Tables 4C-2, 4C-3, and/or 4C-4, if appropriate.

Figure 4C-10. Warrant 9, Intersection near a Grade Crossing (Two or More Approach Lanes at the Track Crossing)



*Note: 25 vph applies as the lower threshold volume.
**Note: VPH after applying the adjustment factors in Tables 4C-2, 4C-3, and/or 4C-4, if appropriate.

Warrant 9 Met? ☐ Yes ☐ No ☒ Does not apply

CONCLUSION

Warrants Satisfied
1,2,8

Signal Warranted ☒ Yes ☐ No

Remarks
Minor road right turn volume included (SB rights) because it does not enter the major road with minimal conflict. This is based on the rear-end crash pattern for SB to WB right turning vehicles.

TRAFFIC CONTROL STUDY - WARRANTS FOR TRAFFIC SIGNALS

North Dakota Department of Transportation, Programming
SFN 7924 (2-2016)

23 USC § 409 Documents
NDDOT Reserves All Objections

Date	Prepared by	City	Analysis Year
06/10/2019	DMS	Minot	2019

Major Road	Speed Limit (mph)	Number of Lanes
US 2	50	2
Minor Road	Speed Limit (mph)	Number of Lanes
Evergreen Ave	25	1

Minor road right-turn traffic excluded from the analysis because there is an exclusive right-turn lane and right-turn traffic enters the Major Road with minimal conflict: ☒ Yes ☐ No

1. Posted or 85th-percentile speed of major road traffic is > 40 mph: ☒ Yes ☐ No

2. In built-up area of isolated community < 10,000 population: ☐ Yes ☒ No

If question 1 or 2 is answered yes, then use 70% volume criteria: ☒ 70% ☐ 100%

WARRANT 1, EIGHT-HOUR VEHICULAR VOLUME

Requirements: Either Condition A (Minimum Vehicular Volume) or Condition B (Interruption of Continuous Traffic) is satisfied to 100% of the stated volumes for each of any 8 hours of an average day.
Or: Both Condition A and Condition B are satisfied to 80% of the stated volumes for each of any 8 hours of an average day.

Table 4C-1. Warrant 1, Eight-Hour Vehicular Volume

Condition A - Minimum Vehicular Volume

Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume minor-street approach (one direction only)			
Major Street	Minor Street	100%[a]	80%[b]	70%[c]	56%[d]	100%[a]	80%[b]	70%[c]	56%[d]
1	1	500	400	350	280	150	120	105	84
2 or more	1	600	480	420	336	150	120	105	84
2 or more	2 or more	600	480	420	336	200	160	140	112
1	2 or more	500	400	350	280	200	160	140	112

Condition B - Interruption of Continuous Traffic

Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume minor-street approach (one direction only)			
Major Street	Minor Street	100%[a]	80%[b]	70%[c]	56%[d]	100%[a]	80%[b]	70%[c]	56%[d]
1	1	750	600	525	420	75	60	53	42
2 or more	1	900	720	630	504	75	60	53	42
2 or more	2 or more	900	720	630	504	100	80	70	56
1	2 or more	750	600	525	420	100	80	70	56

[a] Basic minimum hourly volume
[b] Used for combination of Conditions A and B after adequate trial of other remedial measures
[c] May be used when the major-street speed exceeds 40 mph or in an isolated community with a population of less than 10,000
[d] May be used for combination of Conditions A and B after adequate trial of other remedial measures when the major-street speed exceeds 40 mph or in an isolated community with a population of less than 10,000

8 Highest Hour Volumes								
	1	2	3	4	5	6	7	8
Both Approaches Major Road	1,521	1,336	1,047	1,024	950	875	833	812
Highest Approach Minor Road	91	68	75	61	80	57	68	60

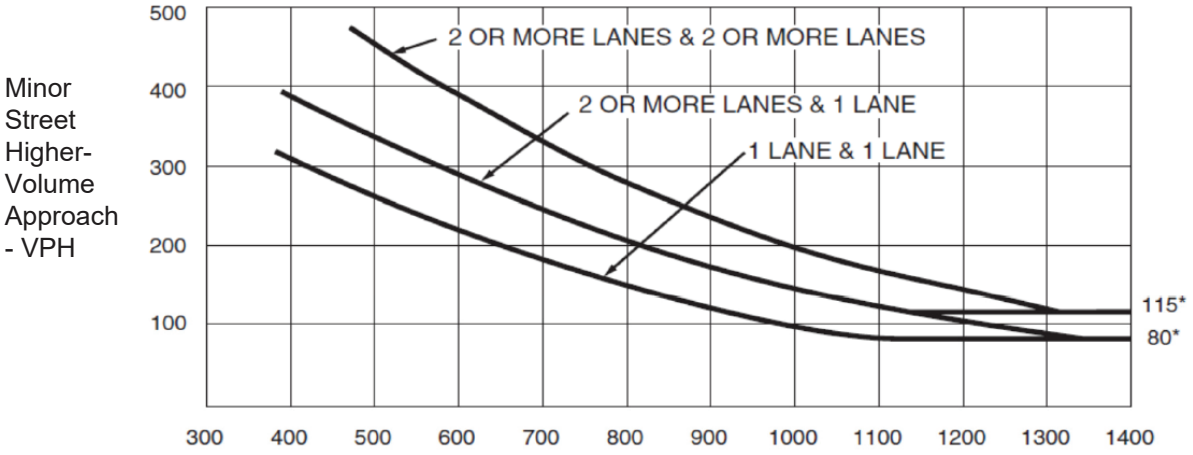
Warrant 1 Met? ☒ Yes ☐ No ☐ Does not apply

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NDDOT Reserves All Objections

WARRANT 2, FOUR-HOUR VEHICULAR VOLUME

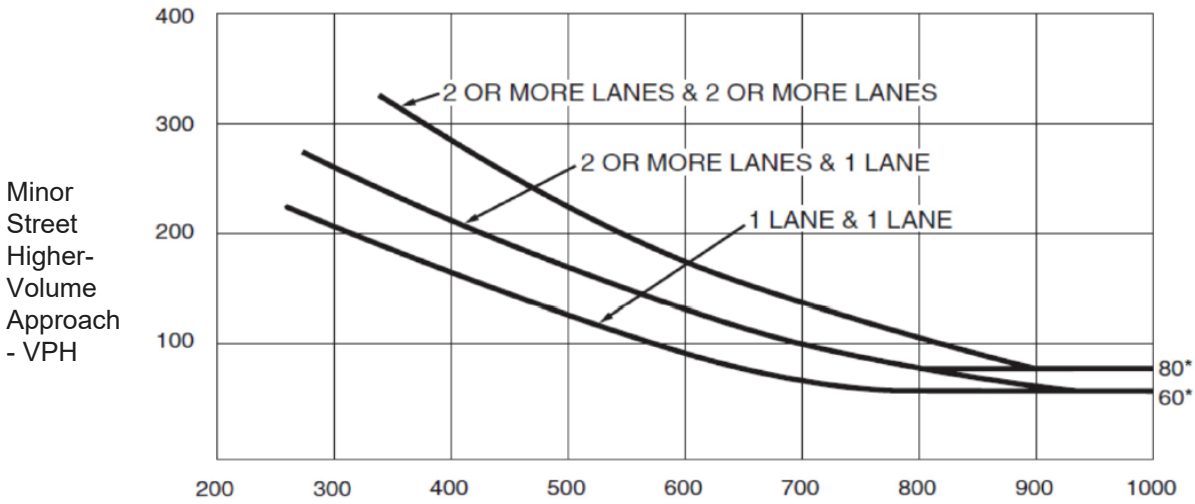
Requirements: Plot four highest hour volumes on the applicable figure below. If four points lie above the applicable curve then the warrant is satisfied.

Figure 4C-1. Warrant 2, Four-Hour Vehicular Volume



*Note: 115 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 80 vph applies as the lower threshold volume for a minor-street approach with one lane.

Figure 4C-2. Warrant 2, Four-Hour Vehicular Volume (70% Factor)
(Community Less than 10,000 Population or Above 40 MPH on Major Street)



*Note: 80 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 60 vph applies as the lower threshold volume for a minor-street approach with one lane.

Warrant 2 Met? ☐ Yes ☒ No ☐ Does not apply

23 USC § 409 Documents
NDDOT Reserves All Objections

WARRANT 3, PEAK HOUR

Requirements: This signal warrant shall only be applied in unusual cases. Such cases include, but are not limited to, office complexes, manufacturing plants, industrial complexes, or high occupancy vehicle facilities that attract or discharge large numbers of vehicles over a short time.

Unusual Condition

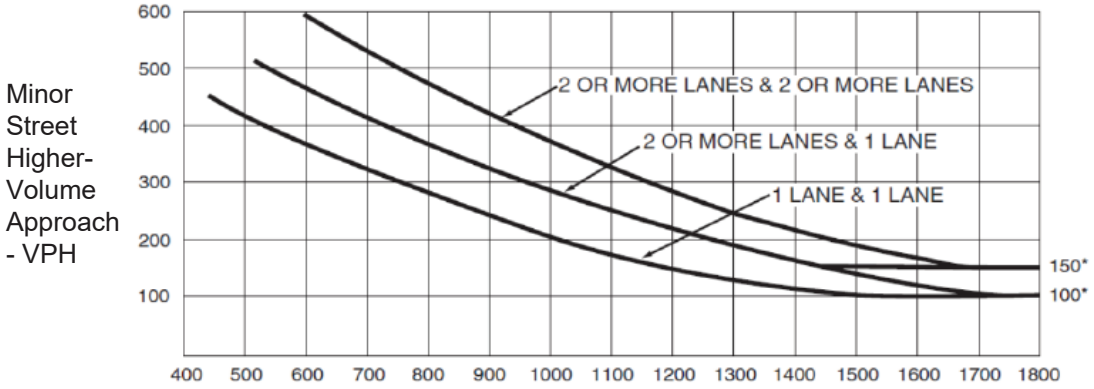
Either Condition A or Condition B is satisfied.

Condition A: The condition is satisfied if all three of the criteria are satisfied.

Criteria	Criteria Met if	Peak-Hour Value	Satisfied? Yes	Satisfied? No
Delay on Minor Approach (veh-hr)	4 veh-hr for 1 lane approach or 5 veh-hr for two-lane approach		☐	☒
Volume on Minor Approach (veh/hr)	100 veh/hr for one moving lane of traffic, or 150 veh/hr for two lanes		☐	☒
Total Entering Volume (veh/hr)	650 veh/hr for 3 approaches or 800 veh/hr for 4 or more		☐	☒

Condition B: Plot peak hour volumes on the applicable figure below. These conditions exist for the same 1 hour (and four consecutive, 15-minute periods) of an average day. If the point is above the appropriate line, then the warrant is satisfied.

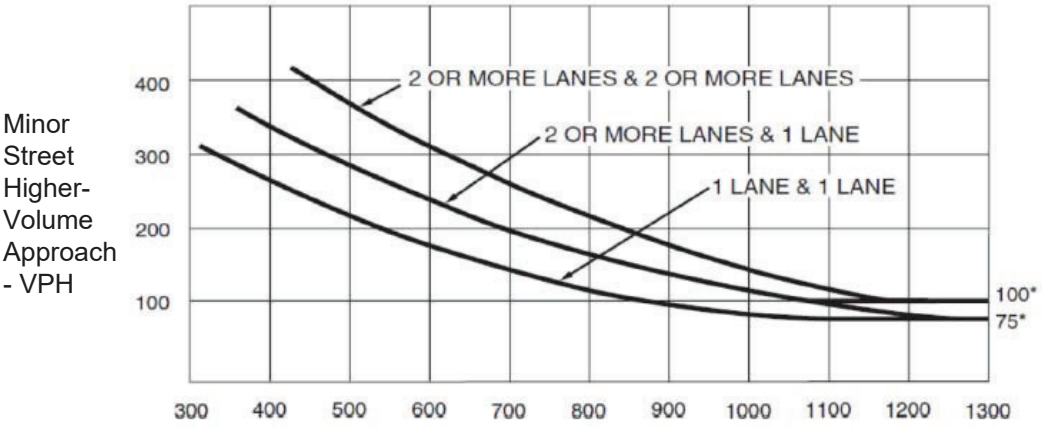
Figure 4C-3. Warrant 3, Peak Hour



*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Figure 4C-4. Warrant 3, Peak Hour (70% Factor)

(Community Less than 10,000 Population or Above 40 MPH on Major Street)



*Note: 100 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 75 vph applies as the lower threshold volume for a minor-street approach with one lane.

Warrant 3 Met? ☐ Yes ☐ No ☒ Does not apply

23 USC § 409 Documents
NDDOT Reserves All Objections

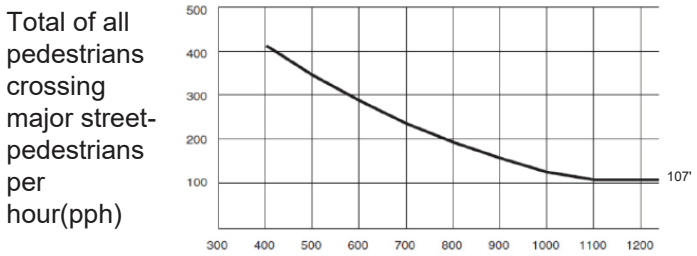
WARRANT 4, PEDESTRIAN VOLUME

Requirements: This warrant is intended for application where the traffic volume on a major street is so heavy that pedestrians experience excessive delay in crossing the major street. It shall not be applied at locations where the distance to the nearest traffic signal or stop sign controlling the street that pedestrians desire to cross is less than 300 feet.

Either criterion A or criterion B is satisfied.

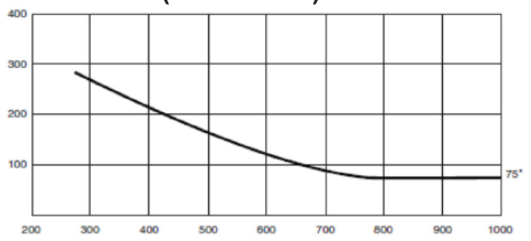
A: For each of any 4 hours of an average day, the plotted point representing the vehicles per hour on the major street (total of both approaches) and the corresponding pedestrians per hour crossing the major street (total of all crossings) all fall above the curve in Figure 4C-5.

Figure 4C-5. Warrant 4, Pedestrian Four-Hour Volume



*Note: 107 pph applies as the lower threshold volume.

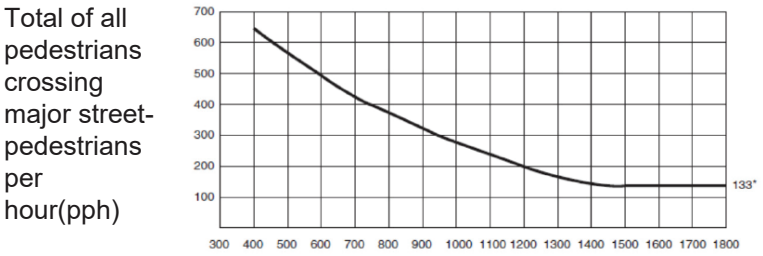
Figure 4C-6. Warrant 4, Pedestrian Four-Hour Volume (70% Factor)



*Note: 75 pph applies as the lower threshold volume.

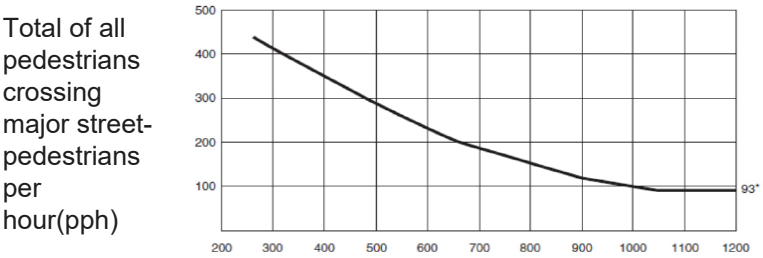
B: For 1 hour (any four consecutive 15-minute periods) of any 4 hours of an average day, the plotted points representing the vehicles per hour on the major street (total of both approaches) and the corresponding pedestrians per hour crossing the major street (total of all crossings) all fall above the curve in Figure 4C-7.

Figure 4C-7. Warrant 4, Pedestrian Peak Hour



*Note: 133 pph applies as the lower threshold volume.

Figure 4C-8. Warrant 4, Pedestrian Peak Hour (70% Factor)



*Note: 93 pph applies as the lower threshold volume.

If the speed on major street exceeds 40 mph, or if population is less than 10,000, Figure 4C-6 or 4C-8 may be used.

Warrant 4 Met? ☐ Yes ☐ No ☒ Does not apply

23 USC § 409 Documents
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WARRANT 5, SCHOOL CROSSING

Requirements: This warrant is intended for application where the fact that schoolchildren cross the major street is the principal reason to consider installing a traffic control signal. For the purposes of this warrant, the word "schoolchildren" includes elementary through high school students.

The warrant is satisfied if all three of the criteria are satisfied.

Criteria	Satisfied? Yes	No
During the time period when schoolchildren are using the crossing: Gaps < Number of minutes	☐	☐
There are a minimum of 20 schoolchildren during the highest crossing hour	☐	☐
The nearest traffic signal along the major road is located more than 300 ft away. Or, the nearest traffic signal is within 300 ft but the proposed traffic signal will not restrict the progressive movement of traffic.	☐	☐

Warrant 5 Met? ☐ Yes ☐ No ☒ Does not apply

WARRANT 6, COORDINATED SIGNAL SYSTEM

Requirements: This warrant is satisfied if either criteria is satisfied. This warrant should not be applied when the resulting signal spacing would be less than 1000 ft.

Criteria	Satisfied? Yes	No
On a one-way street or a street that has traffic predominantly in one direction, the adjacent signals are so far apart that they do not provide the necessary degree of vehicular platooning.	☐	☐
On a two-way street, adjacent traffic control signals do not provide the necessary degree of platooning and the proposed and adjacent traffic control signals will collectively provide a progressive operation.	☐	☐

Warrant 6 Met? ☐ Yes ☐ No ☒ Does not apply

WARRANT 7, CRASH EXPERIENCE

Requirements: The warrant is satisfied if all three of the criteria are satisfied.

Criteria		Hour	Satisfied? Yes	No
One of the warrants to the right is met:	Warrant 4.1at 80% of volume requirements: 80 ped/hr for 4 hrs or 152 ped/hr for 1 hr		☐	☒
	Warrant 1, Condition A (80% satisfied)		☐	☒
	Warrant 1, Condition B (80% satisfied)		☒	☐
Adequate trial of other remedial measures has failed to reduce crash frequency.		Measures Tried	☐	☒
Five or more reported crashes, of types susceptible to correction by signal control, have occurred within a 12 month period.		Number of Crashes 5	☒	☐

Warrant 7 Met? ☐ Yes ☐ No ☒ Does not apply

23 USC § 409 Documents
NDDOT Reserves All Objections

WARRANT 8, ROADWAY NETWORK

Requirements: A "major route" as used in this signal warrant shall have at least one of the following characteristics:

Characteristics of a Major Route	Satisfied? Yes	No
Part of the street or highway system that serves as a principal roadway network for through traffic flow.	☐	☐
Rural or suburban highway outside of, entering, or traversing a city.	☐	☐
Appears as a major route on an official plan.	☐	☐

The need for a traffic control signal shall be considered if an engineering study finds that the common intersection of two or more major routes meets one or both of the following criteria:

Criteria			Satisfied Yes	No
1. Both of the criteria to the right are met.	a. Total entering volume of at least 1,000 veh/hr during typical weekday peak hour.	Entering Volume:	☐	☐
	b. Five-year projected volumes that satisfy one or more of Warrants 1,2, or 3.	Warrant(s) satisfied:	☐	☐
2. Total entering volume of at least 1,000 veh/hr for each of any 5 hours of a non-normal business day (Sat. or Sun.)		Hour / Volume	☐	☐

Warrant 8 Met? ☐ Yes ☐ No ☒ Does not apply

WARRANT 9, INTERSECTION NEAR A GRADE CROSSING

Requirements: This warrant is intended for use at a location where none of the conditions described in the other eight traffic signal warrants are met, but the proximity to the intersection of grade crossing on an intersection approach controlled by a STOP or YIELD sign is the principal reason to consider installing a traffic signal.

Both condition A and condition B are satisfied.

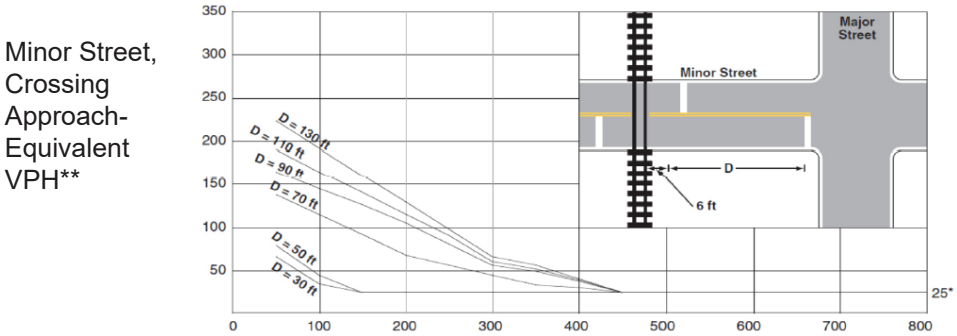
Criteria	Satisfied? Yes	No
A. A grade crossing exists on an approach controlled by a STOP or YIELD sign and the center of the track nearest to the intersection is within 140 feet of the stop line or yield line on the approach.	☐	☐
B. During the highest traffic volume hour during which rail traffic use the crossing, the plotted point representing the vehicles per hour on the major street (total of both approaches) and the corresponding vehicles per hour on the minor-street approach that crosses the track (one direction only, approaching the intersection) falls above the applicable curve in Figure 4C-9 or 4C-10 for the existing combination of approach lanes over the track and the distance D, which is the clear storage distance as defined in Section 1A.13.	☐	☐

Warrant 9 Continued on next page

23 USC § 409 Documents
NDDOT Reserves All Objections

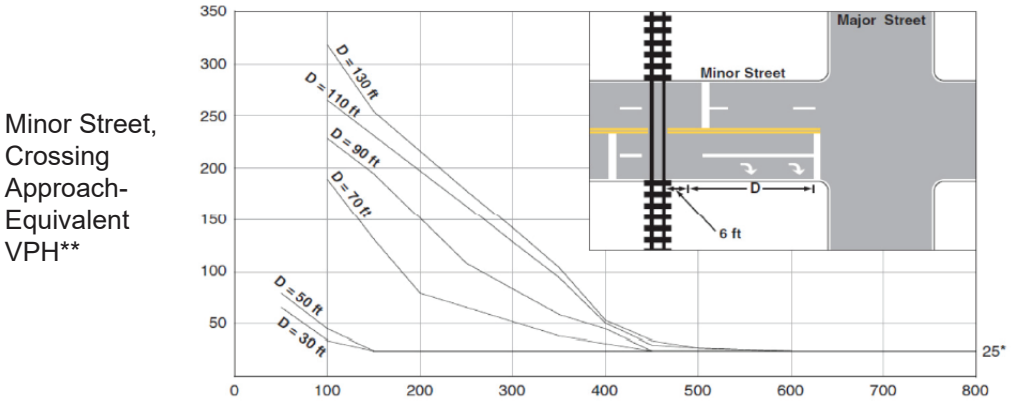
WARRANT 9, CONTINUED

Figure 4C-9. Warrant 9, Intersection near a Grade Crossing (one Approach Lane at the Track Crossing)



*Note: 25 vph applies as the lower threshold volume.
**Note: VPH after applying the adjustment factors in Tables 4C-2, 4C-3, and/or 4C-4, if appropriate.

Figure 4C-10. Warrant 9, Intersection near a Grade Crossing (Two or More Approach Lanes at the Track Crossing)



*Note: 25 vph applies as the lower threshold volume.
**Note: VPH after applying the adjustment factors in Tables 4C-2, 4C-3, and/or 4C-4, if appropriate.

Warrant 9 Met? ☐ Yes ☐ No ☒ Does not apply

CONCLUSION

Warrants Satisfied
1

Signal Warranted ☒ Yes ☐ No

Remarks

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SCOPING REPORT

Project No.
SHE-4-002(135)144

PCN
22829

Burdick Expressway to Evergreen Ave



Prepared by

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION
BISMARCK, NORTH DAKOTA

http://www.dot.nd.gov/

DIRECTOR
William T. Panos

OFFICE OF TRANSPORTATION PROGRAMS
Steve Salwei, P.E.

Principal Author: Michael Wilz, P.E.
April 2020

23 USC § 409
NDDOT Reserves All Objections

DocuSign Envelope ID: B94A614E-4302-43FE-8CAE-AE470373A1F6

SCOPING REPORT

A. GENERAL INFORMATION

Project Number:
District: Minot
Highway: US 2
Location: Burdick Expressway to Evergreen Ave
Reference Point: 144.24 to 145.179

Counties: Ward
Legal Description: T155N R83W Sec 27

Functional and Funding Roadway Classification: Interregional
National Highway System: Yes
Speed Limit: 50 mph
Freight Level: 1
Freight Constraints: None
Project Schedule: Proposed to be added to the HSIP

dTIMS Recommendations: WB - Constrained: N/A EB - Constrained: PM Asphalt 2022
Unconstrained: N/A Unconstrained: PM Asphalt 2019

B. PURPOSE, NEED, AND IMPROVEMENTS

Purpose and Need of Project:
The purpose of the project is to address issues/deficiencies affecting the intersections of US 2 with Burdick Expressway, 18th St SW, and Evergreen Ave. An HSIP application was submitted by the Minot District and the City of Minot requesting that the US 2 and Evergreen Ave Intersection be changed to a ¾ intersection with potential U-turn locations. No changes were proposed to the Burdick Expressway intersection as part of the application, but the south access at the 18th St SW intersection be removed if a U-turn was put in at that location. Traffic Operations analyzed the two intersections mentioned in the application and added the Burdick intersection due to the its proximity. The Burdick and Evergreen intersections experience a significant number of crashes and the Evergreen Ave intersection ranked 26th on the NDDOT's 2016-2018 list of high crash locations. A variety of intersection layouts were analyzed and offset right turn lanes were proposed to improve sight distance address crashes.

Proposed Improvements:

US 2 & Burdick Expressway Intersection Options

-High T Intersection

US 2 & 18th St Intersection Options

-Remove South Access to Frontage Road

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US 2 & Evergreen Ave Intersection Options

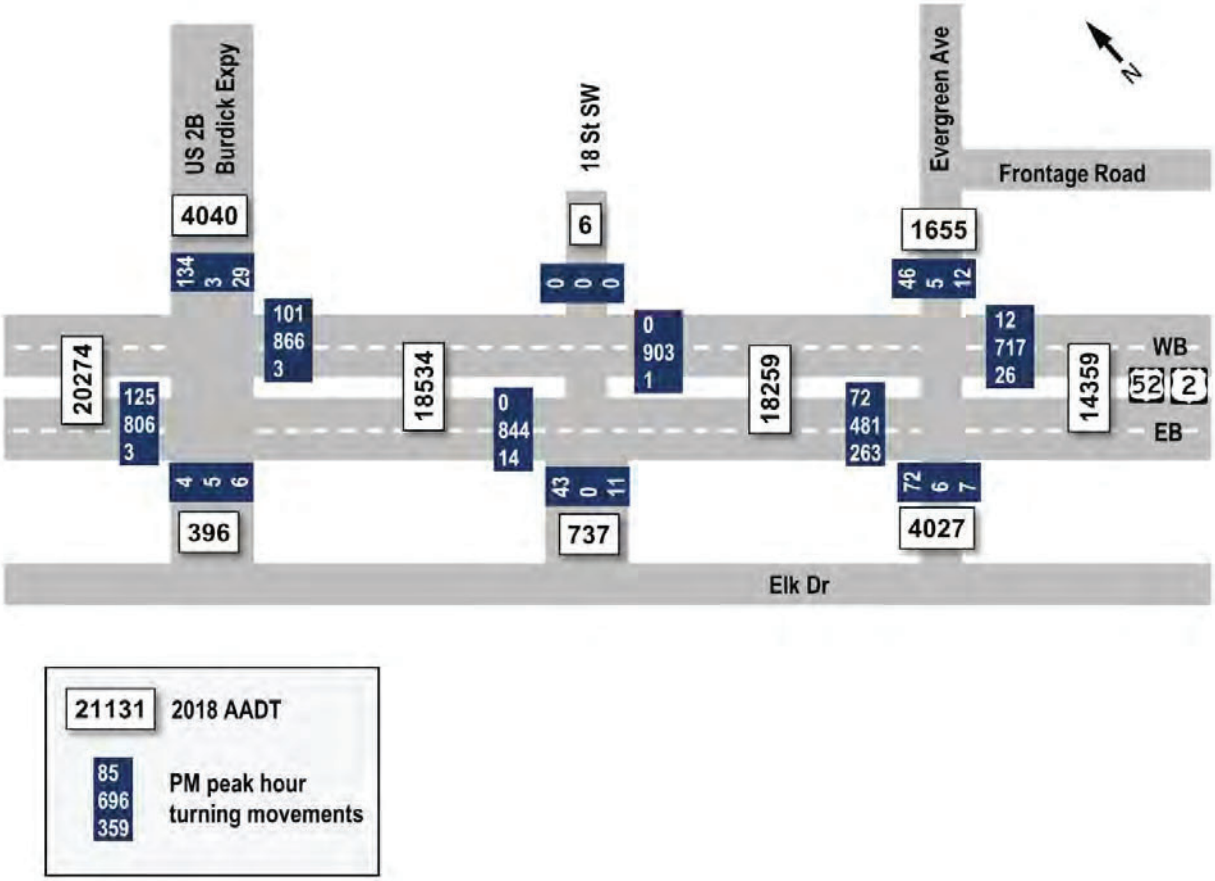
-High T Intersection
-Three Quarter Intersection
-Reduced Conflict Intersection

Offset Right Turn Lanes Options

-WB Offset Right Turn Lane @ Burdick Expressway
-EB Offset Right Turn Lane @ Evergreen Avenue
-WB Offset Right Turn Lane @ Evergreen Avenue

Additional traffic operation considerations for roundabouts, signals, and other intersection modifications were considered but not included due to feasibility.

C. TRAFFIC AND CRASH ANALYSIS



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Crash Analysis:

Crash History by Intersection			
	US 2 & W Burdick	**US 2 & 18th St SW**	**US 2 & Evergreen**
Fatal	-	-	-
Incapacitating Injury	-	-	5
Non-incapacitating Injury	7	-	6
Possible Injury	4	-	8
Property Damage Only	19	3	24
Total	**30**	**3**	**43**

Notes/Trends:

- The intersection of US 2 & Evergreen Avenue is ranked 26th on the 2016-2018 NDDOT's annual list of high crash locations. This intersection has been on the list in previous years as well.

-Most severe crashes are angle type and are occurring at the US 2 intersections of Burdick Expwy and Evergreen Ave. The angle crashes' contributing factor is "failure to yield". A common theme in the crash narratives is that the driver on the minor road did not see the conflicting vehicle approaching on US 2.

-At the stop sign on the minor road, sometimes the driver's view is blocked due to vehicles in the right turn lane on US 2.
-There were no reported crashes involving pedestrians or bicyclists in the study area.

Recommendation: One possible countermeasure is to construct offset right turn lanes on the major road approaches. "Offset right turn lanes give drivers on the minor approach (at the stop bar) an unobstructed view of through traffic in the near lanes, which allows for more effective use of gaps."

D. EXISTING ROADWAY CHARACTERISTICS

	International Roughness Index (IRI)	Distress Score	Rut
Excellent	< =60	≥ 98	< 0.25″
Good	61 – 99	88 – 97	0.25″ to 0.375″
Fair	100 – 145	77 – 87	0.376″ to 0.50″
Poor	> 145	≤ 76	> 0.50″

RP 144.165 TO 144.326 WB

Actual Age	IRI	IRI Rating	SI or SCI	Faulting
10	N/A	N/A	N/A	N/A
Effective Age	Distress	Distress Score	Rutting	Rutting Score
10	N/A	N/A	N/A	N/A

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CONSTRUCTION HISTORY				
Year	Construction	Depth (in)	Width (ft)	Oil
2009	GRADE	-	60.0	-
2009	SALVAGED AGGR BASE	18.0	45.0	-
2009	HOT BIT PAVEMENT	4.0	10.0, 24.0, 4.0	PG 58-28
2009	HOT BIT PAVEMENT	2.0	10.0, 24.0, 4.0	PG 64-34
2015	MICROSURFACING	-	25.0	-

RP 144.326 TO 145.179 WB

Actual Age	IRI	IRI Rating	SI or SCI	Faulting
62	72	Good	3	N/A
Effective Age	Distress	Distress Score	Rutting	Rutting Score
22	90	Good	0.15	Good

CONSTRUCTION HISTORY				
Year	Construction	Depth (in)	Width (ft)	Oil
1957	GRADE	-	48.0	
1957	AGGREGATE BASE	9.0	44.0	
1957	HOT BIT PAVEMENT	2.0	42.0	
1957	HOT BIT PAVEMENT	3.0	24.0	
1992	DRIVE SLOPE FLATTENING	-		
1992	MILLING	-1.0	24.0	
1992	HOT BIT PAVEMENT	4.5	27.0	120-150
1999	CONTRACT CHIP SEAL	-	26.0	
2010	HBP SUPERPAVE FAA 45	2.0	10.0, 24.0, 4.0	PG 58-28
2015	MICROSURFACING	-	25.0	

RP 144.24 TO 145.179 EB

Actual Age	IRI	IRI Rating	SI or SCI	Faulting
39	82	Good	5	N/A
Effective Age	Distress	Distress Score	Rutting	Rutting Score
22	90	Good	0.15	Good

CONSTRUCTION HISTORY				
Year	Construction	Depth (in)	Width (ft)	Oil
1979	GRADE	-	48.0	
1980	AGGREGATE BASE	9.0	42.0	
1980	HOT BIT PAVEMENT	2.0	30.0	120-150
1980	HOT BIT PAVEMENT	3.0	27.0	120-150
1995	HOT BIT PAVEMENT	4.5	24.0	120-150
1999	CONTRACT CHIP SEAL	-	26.0	
2010	HBP SUPERPAVE FAA 45	2.0	3.0, 24.0, 10.0	PG 58-28
2015	MICROSURFACING	-	25.0	

Existing Foreslopes: 6:1
Centerline to Centerline: 84’

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E. EXISTING GEOMETRY

Horizontal Curves: No proposed changes to horizontal geometry.
Vertical Curves: No proposed changes to vertical geometry.

F. EXISTING STRUCTURES

Bridges: None
Centerline Pipes: Use existing. Pipes affected by widening should be extended.

G. LAND INTERESTS

Communities: Minot
Reservation: None
Public Land: None
Waterfall Production Area: None
Adjacent Land Usage: Commercial

H. ISSUES AND APPURTENANCES CHECKLIST

1. Curb and Gutter? Yes X No _____

   There is no existing curb and gutter, but the proposed options do include placing mountable curb and gutter in the median to direct certain traffic movements and prevent others.

2. Sidewalk? Yes _____ No X

3. Multi-Use Path? Yes _____ No X

4. ADA Ramps? Yes _____ No X

5. State Bicycling Network? Yes _____ No X

6. Lighting? Yes X No _____

   There is existing standard lighting at the US 2 and Burdick Expressway intersection and existing high mast lighting at the US 2 and Evergreen Ave intersection with an unlit section in between. There are no suggested improvements to the existing high mast lighting. The Traffic Operations report recommended lighting the gap area in between the intersections. The standard lights are only in fair condition and are still HPS bulbs. Two lighting options have been provided. The first option includes high mast lighting for the gap area and replacing the standard lighting with high mast lights. The second option includes standard lighting for the gap area and replacing the existing standard lights. If neither option is not selected the existing HPS lights will be upgraded to LED.

7. Signals? Yes _____ No X

8. Storm Sewer? Yes X No _____

   Inlets and storm sewer that outlets to the ditches may be required to drain the raised median islands.

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9. Manholes? Yes ____ No X

10. Other Underground Work? Yes ____ No X

11. Parking Facilities? Yes ____ No X

12. Frontage Roads? Yes X No ____

There is a south frontage road along the length of the project area and a north frontage road starting at Evergreen Ave that continues to the east. The south frontage road is on NDDOT ROW and the north frontage road is on city ROW. No suggested improvements.

13. Utility Issues? Yes ____ No X

14. Landscaping? Yes ____ No X

15. Approach or Ditch Block Flattening? Yes ____ No X

16. T Intersection Recovery Approaches? Yes ____ No X

17. Fence? Yes ____ No X

18. Railroad Crossings? Yes ____ No X

19. Detours? Yes X No ____

Detours may be needed to construct changes to median accesses.

20. Automatic Traffic Recorder Locations? Yes ____ No X

21. Weigh-In-Motion Sites? Yes ____ No X

22. ITS (Deicing, Snow Gates, VMS, RWIS, etc.)? Yes ____ No X

23. Highway Patrol/Truck Pullouts or Rest Areas? Yes ____ No X

24. Additional Right of Way? Yes ____ No X

25. Drainage Issues? Yes ____ No X

26. Snow Impact Areas? Yes ____ No X

27. Subgrade Issues? Yes ____ No X

28. Noise Analysis: Type I Project? Yes ____ No X Maybe ____

29. Maintenance Issues? Yes ____ No X

30. Guardrail? Yes ____ No X

31. Milling? Yes ____ No X

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I. Load Restrictions

Travel Information Map Proposed Load Restriction: Legal Weight
HPCS Load Restrictions: Legal Weight
Freight Level Required Minimum Load Restriction: Legal Weight
Projected Load Restrictions after project is complete: Legal Weight

J. Roadway Widths

Required Minimum Roadway Width: N/A
Freight Level Required Minimum Width: N/A

K. PERFORMANCE GUIDELINES

Design Speed: 50 mph
Clear Zone: 22'
Foreslopes: 6:1

L. PROPOSED IMPROVEMENTS

US 2 & Burdick Expressway Intersection Options

-High T Intersection

US 2 & 18th St Intersection Options

-Remove South Access to Frontage Road

US 2 & Evergreen Ave Intersection Options

-High T Intersection
-Three Quarter Intersection
-Reduced Conflict Intersection

Offset Right Turn Lane Options

-WB Offset Right Turn Lane @ Burdick Expressway
-EB Offset Right Turn Lane @ Evergreen Avenue
-WB Offset Right Turn Lane @ Evergreen Avenue

Conceptual layouts of the proposed improvements are shown on the following pages.
Design criteria such as curb and gutter length, acceleration lane details, median island radii, etc. should be determined during project development.

The proposed improvements modify access/movements and in turn will displace traffic to other intersections. The amount of traffic displaced and the associated effects vary by option and were not studied in the traffic operations analysis.

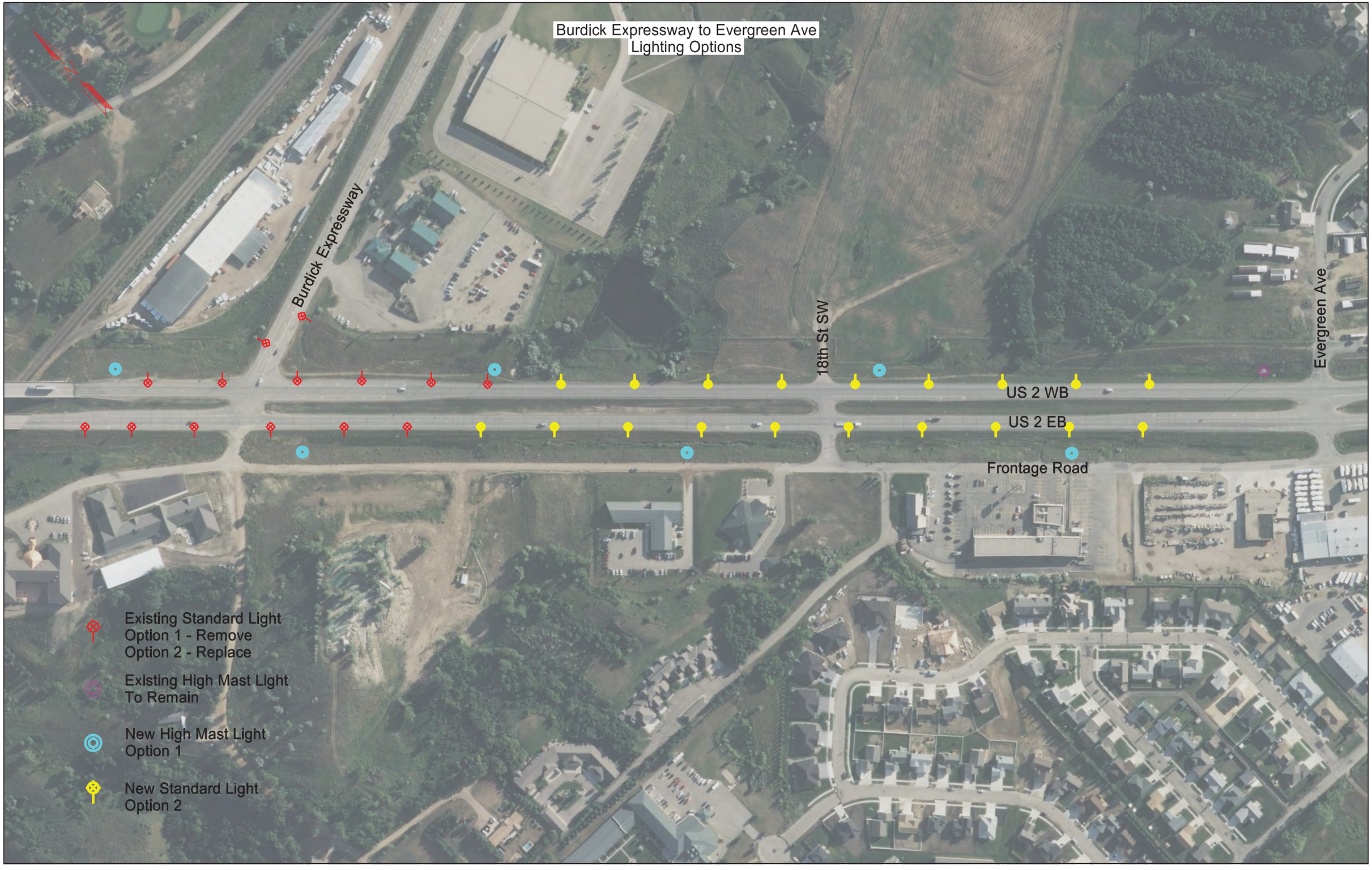

Burdick Expressway
High T Intersection w/ Accleration Lane
Burdick Expressway
Right Turn Lane
Left Turn Lane
US 2 WB
US 2 EB
Frontage Road
Median Island
Widen/Acceleration Lane
Remove


Evergreen Ave
High T Intersection w/ Accleration Lane
18th St SW
Evergreen Ave
Frontage Road
US 2 WB
US 2 EB
Frontage Road
Median Island
Widen/Acceleration Lane
Remove


Evergreen Ave
3/4 Access or RCI (3/4 Access with U-turns)
18th St SW
US 2 WB
US 2 EB
Evergreen Ave
Frontage Road
Frontage Road
Median Island
Widen/U-Turn
Remove Access


Burdick Expressway
Offset Right Turn Lane
Burdick Expressway
US 2 WB
US 2 EB
Frontage Road
Widening/Offset Right Turn Lane


Evergreen Ave
Offset Right Turn Lanes
18th St SW
US 2 WB
US 2 EB
Frontage Road
Evergreen Ave
Frontage Road
Widening/Offset Right Turn Lane
Remove Access


Burdick Expressway to Evergreen Ave
Lighting Options
Burdick Expressway
18th St SW
Evergreen Ave
US 2 WB
US 2 EB
Frontage Road
Existing Standard Light
Option 1 - Remove
Option 2 - Replace
Existing High Mast Light
To Remain
New High Mast Light
Option 1
New Standard Light
Option 2

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M. ADDITIONAL COMMENTS

District Engineer:

L. COST ESTIMATE

(Inflation factor of 4% was used to estimate costs for bid year)

Proposed Improvements	Estimated Cost
Burdick Expressway Intersection Options	
High T Intersection w/ Acceleration Lane	$310,000
18th St SW Options	
Remove South Access	$40,000
Evergreen Ave Intersection Options	
High T Intersection w/ Acceleration Lane	$300,000
3/4 Intersection	$75,000
Reduced Conflict Intersection	$230,000
Offset Right Turn Lanes Options	
Offset WB Right @ Burdick Expressway	$155,000
Offset WB Right @ Evergreen Avenue	$135,000
Offset EB Right @ Evergreen Avenue	$150,000
Lighting Options	
High Mast Lighting	$840,000
Standard Lighting	$230,000

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M. DECISIONS

1. * What option(s) should advance with the project for the US 2 & Burdick Expressway Intersection?

   _____High-T Intersection **Estimated Cost = $310,000**

   _____Do Nothing

2. What option(s) should advance with the project for the US 2 & 18th St Intersection?

   __X__Remove south access to frontage road **Estimated Cost = $40,000**

   __X__Do Nothing

3. What option(s) should advance with the project for the US 2 & Evergreen Ave Intersection?

   __X__High-T Intersection **Estimated Cost = $300,000**

   __X__¾ Intersection **Estimated Cost = $75,000**

   __X__Reduced Conflict Intersection **Estimated Cost = $230,000**

   _____Do Nothing

4. Which offset right turn lanes should advance with the project?

   _____Offset WB Right @ Burdick Expressway **Estimated Cost = $155,000**

   __X__Offset WB Right @ Evergreen Avenue **Estimated Cost = $135,000**

   __X__Offset EB Right @ Evergreen Avenue **Estimated Cost = $150,000**

   _____Do Nothing

5. Which lighting option should advance with the project?

   __X__Use high mast lighting to replace existing standard lights and light the gap area. **Estimated Cost = $840,000**

   _____Use standard lighting to replace existing standard lights and light the gap area. **Estimated Cost = $230,000**

   _____Do Nothing **Estimated Cost = $25,000**

DDE Comments: * Bring options forward after discussion with City. Will hold with Burdick Expressway.

Deputy Director for Engineering

5/4/2020
Date