WILLISTON AREA TRANSPORTATION PLAN

CORRIDOR STUDY
for

CORRIDOR D

ND Highway 1804

Little Muddy River Crossing
to
123rd Avenue / County Road 42

Williston, ND

December 16, 2016

Prepared for: City of Williston, Williams County, and NDDOT
Written By: SRF Consulting Group, Inc.

SRF:
0158658

SRF Consulting Group, Inc. | Engineers Planners Designers

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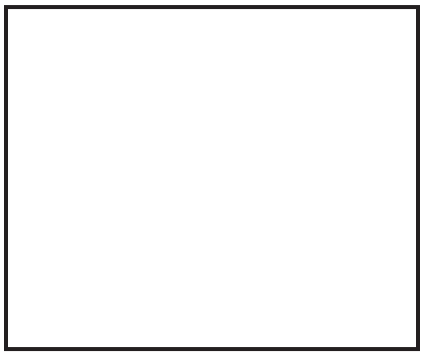
CERTIFICATION

I hereby certify that this report was prepared by me or under my direct supervision and that I am a duly registered professional engineer under the laws of the State of North Dakota. This document was originally issued and sealed by Matthew R Pacyna, Registration number PE-7630 on 12/16/2016 and the original document is stored at SRF Consulting Group, Inc.



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Matthew R Pacyna, P.E. Date

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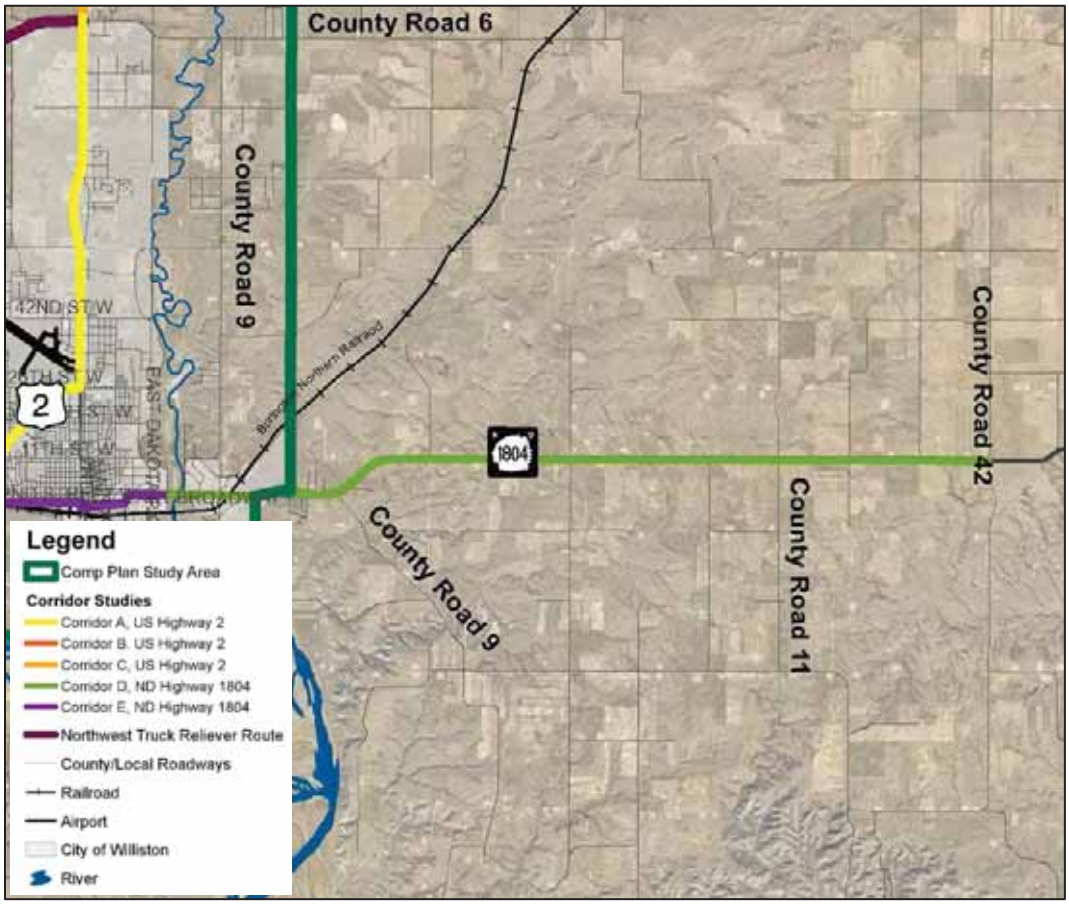
1.0 Introduction

As part of the City Comprehensive Plan and Transportation Plan update process, five specific corridors were identified for more in-depth study. The goals of these corridor studies are to identify the short- and long-term needs of each corridor, particularly from a traffic operations perspective, to ensure safe and efficient operations within the study area. The analysis included and focused on access, crashes, roadway and intersection capacity, and any other issues identified through stakeholder involvement. The purpose of the study is to help prioritize the needs within each study corridor, lay the framework for specific project development, and provide stakeholders with a vision to build upon as opportunities arise.

This document focuses on Corridor D, which includes ND Highway 1804 from the Little Muddy River Crossing to 123rd Avenue/County Road 42 as shown in Figure 1. It should be noted that the ND Highway 1804/East Dakota Parkway intersection was included as part of the Corridor E study, and is not specifically addressed as part of this study. Corridor D is approximately 12-miles in length and is generally a four-lane undivided roadway with a rural cross-section west of 133rd Drive and transitions to a two-lane undivided roadway with a rural cross-section east of 133rd Drive. The posted speed limit is 45 miles per hour (mph) west of 133rd Drive and 65 mph east of 133rd Drive. In recent years, several developments and roadway/access improvements have been implemented. The biggest known issues are with respect to access, both in terms of side-street delay and safety. Therefore, the Corridor D study will address both existing and future access, safety, and operations. The following information summarizes the results of the Corridor D study.

Figure 1 – Study Corridor Overview



2.0 Existing Conditions

The following sections outline the data collection, roadway characteristics, crash analysis, access inventory, and capacity analysis conducted as part of the existing conditions analysis.

2.1 Data Collection

Traffic Volumes

Weekday a.m. and p.m. peak period turning movement counts were collected at approximately 15 locations along Corridor D within the study area. These data collection locations, which are graphically shown in Figure 2, were collected using a variety of methods. First, SRF reviewed historical and existing traffic counts provided by the NDDOT. Based on the available data, SRF collected supplemental intersection turning movement counts during August 2014. These supplemental counts were collected either using CountCam video equipment or manual short-duration (i.e. pulse) counts. The purpose of the pulse counts are to identify general travel patterns and the traffic volume order of magnitude.

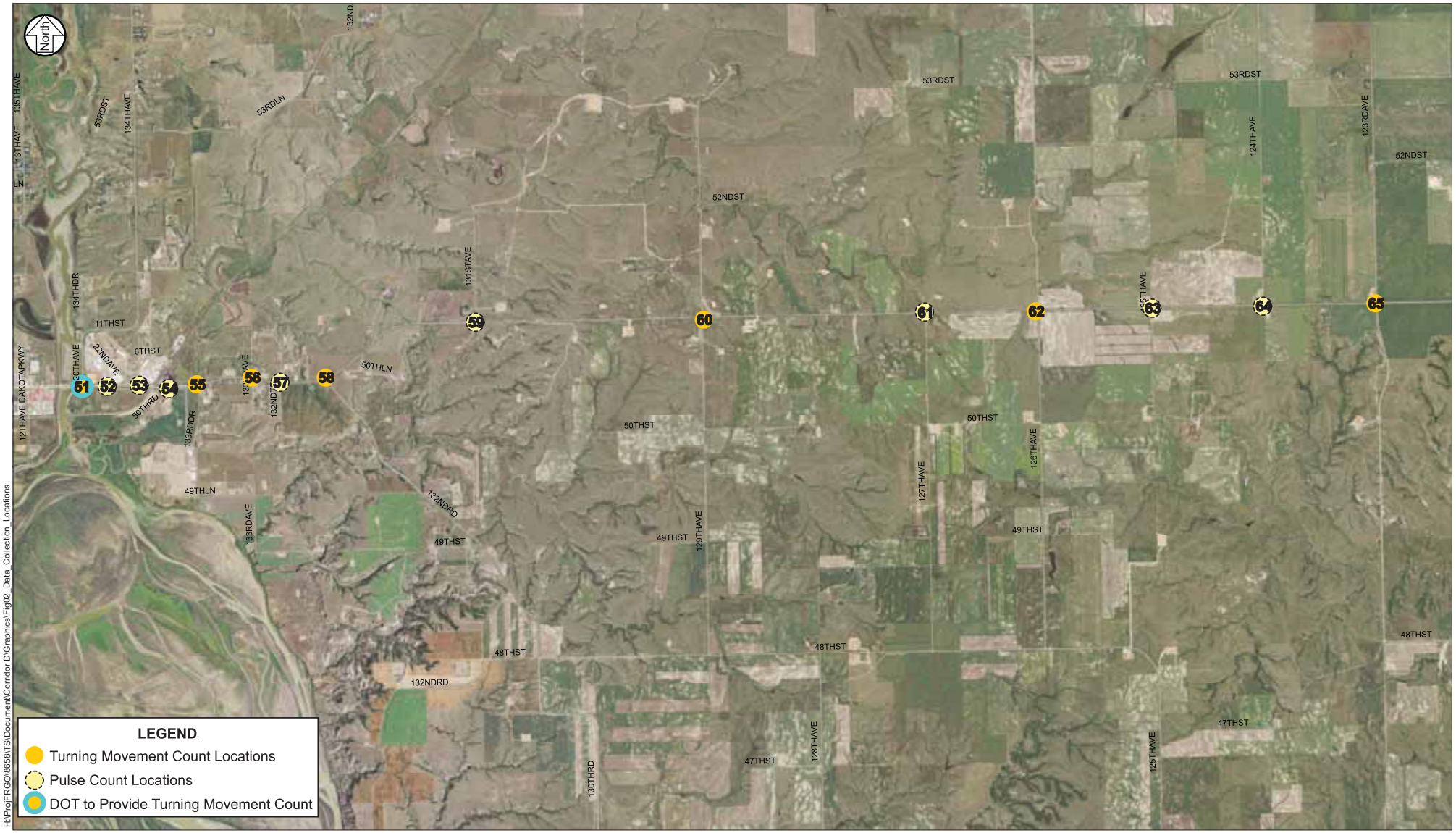
Once completed, SRF compiled the available traffic volume data and developed existing traffic volumes for all of Corridor D. To rectify any differences in the data sets, modifications were made to balance traffic volumes along the corridor based on engineering judgment. The resultant existing traffic volumes are shown in Figures 3.

Select intersection turning movement counts from three locations along the study corridor were utilized to obtain a daily traffic volume profile and vehicle classification information. The three locations were chosen to achieve a representative sample of the entire corridor. The locations included:

- Location 1: ND Highway 1804 east of 20th Avenue/County Road 9
- Location 2: ND Highway 1804 east 132nd Road
- Location 3: ND Highway 1804 west 123rd Avenue/County Road 42

Figure 4 represents the traffic volume profile by hour for the selected locations along the corridor. As shown in Figure 4, traffic volumes begin to increase around 6:00 a.m. and continue to be relatively steady until approximately 7:00 p.m. There are peak periods that generally occur during the morning (7:30 a.m.), midday (12:30 p.m.), and evening (5:30 p.m.) timeframes. The relatively steady traffic volumes along ND Highway 1804 are primarily a result of the specific land uses and oil related activity within the region.

In addition to the intersection turning movement counts, historical average daily traffic (ADT) volumes within the study area were also provided by the NDDOT. In locations where data was not available from the NDDOT, ADT volumes were estimated based on existing traffic volumes and engineering judgment. Existing ADT volumes along ND Highway 1804 within the study area range from approximately 3,200 vehicles per day (vpd) to 12,000 vpd. It should be noted that traffic volumes fluctuate based on the time of year and level of oil related activity within this corridor. The higher end of the volume range occurs on the western segments near East Dakota Parkway, while the lower end occurs near 123rd Avenue/ Country Road 42.



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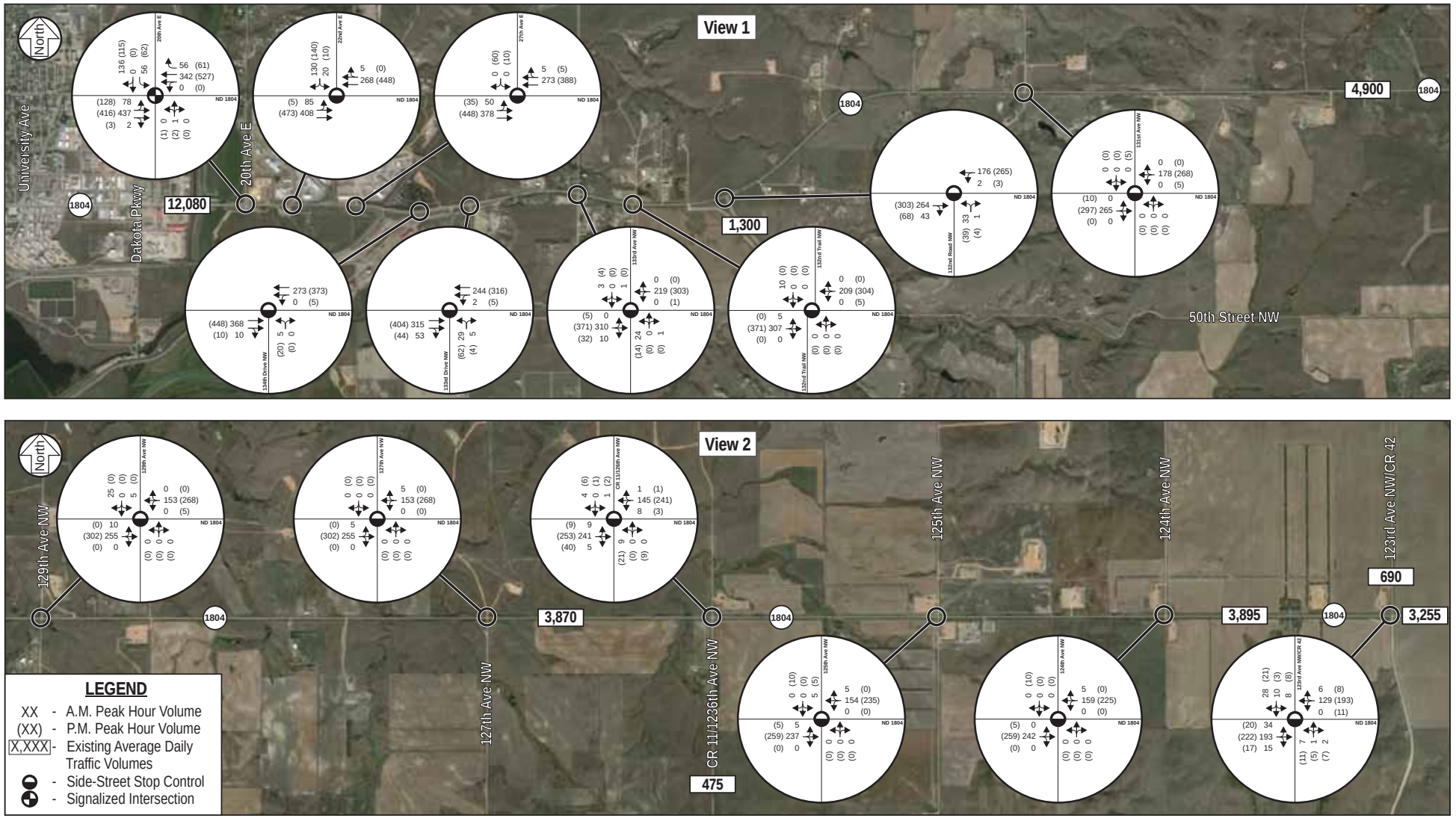
Data Collection Locations

Williston Area Transportation Plan Corridor Study (Corridor D)
City of Williston, Williams County, and NDDOT

Figure 2



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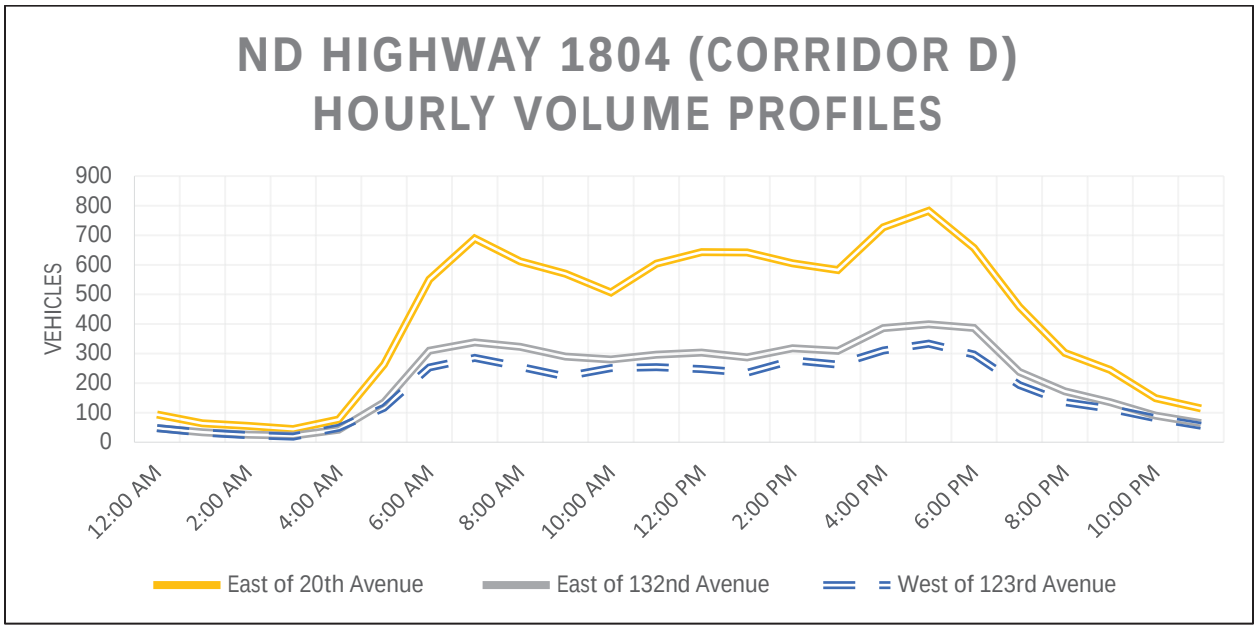
Existing Conditions

Williston Area Transportation Plan Corridor Study (Corridor D)
City of Williston, Williams County, and NDDOT

Figure 3

Figure 4 – Traffic Volume Profile



Vehicle Classification

Utilizing the selected locations noted earlier, the existing and average vehicle classification data was summarized. The Federal Highway Administration (FHWA) Vehicle Classifications criteria was used, and is shown in Table 1. In general, classifications one through three were considered passenger vehicles/light trucks, classifications four through seven medium trucks, and classifications eight through 13 heavy/ articulated trucks. Figure 5 represents the daily vehicles per classification at the selected locations reviewed, as well as the overall corridor average. In general, there are approximately five to 10 percent medium trucks and 10 to 15 percent heavy/articulated trucks along the study corridor. The percentages were provided in a range since vehicle classification varies based on the time of the year.

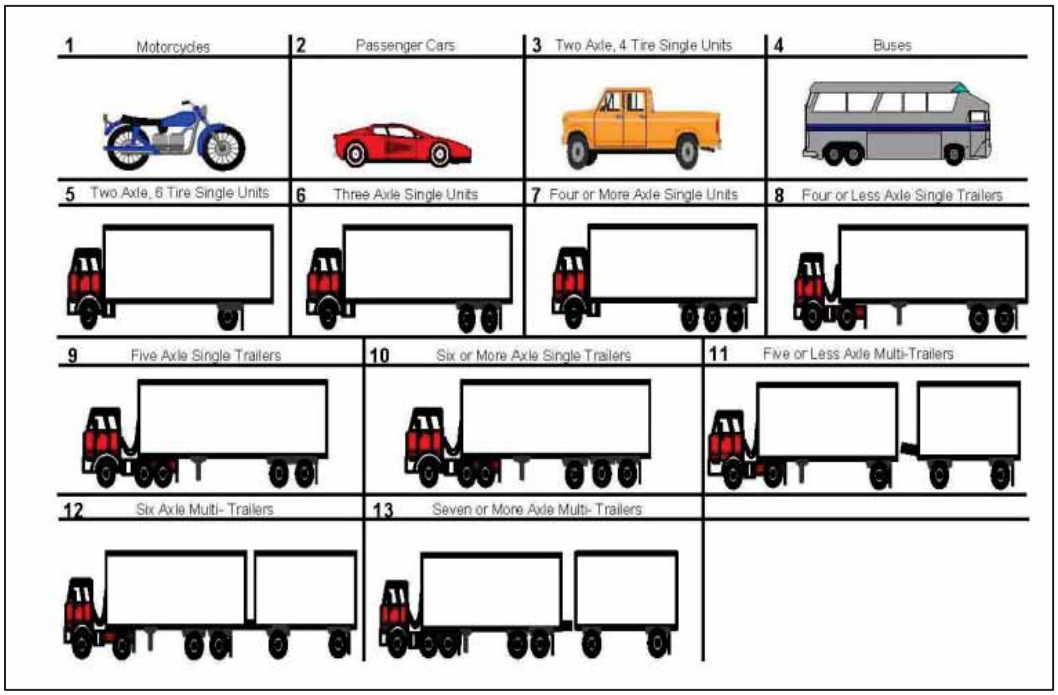
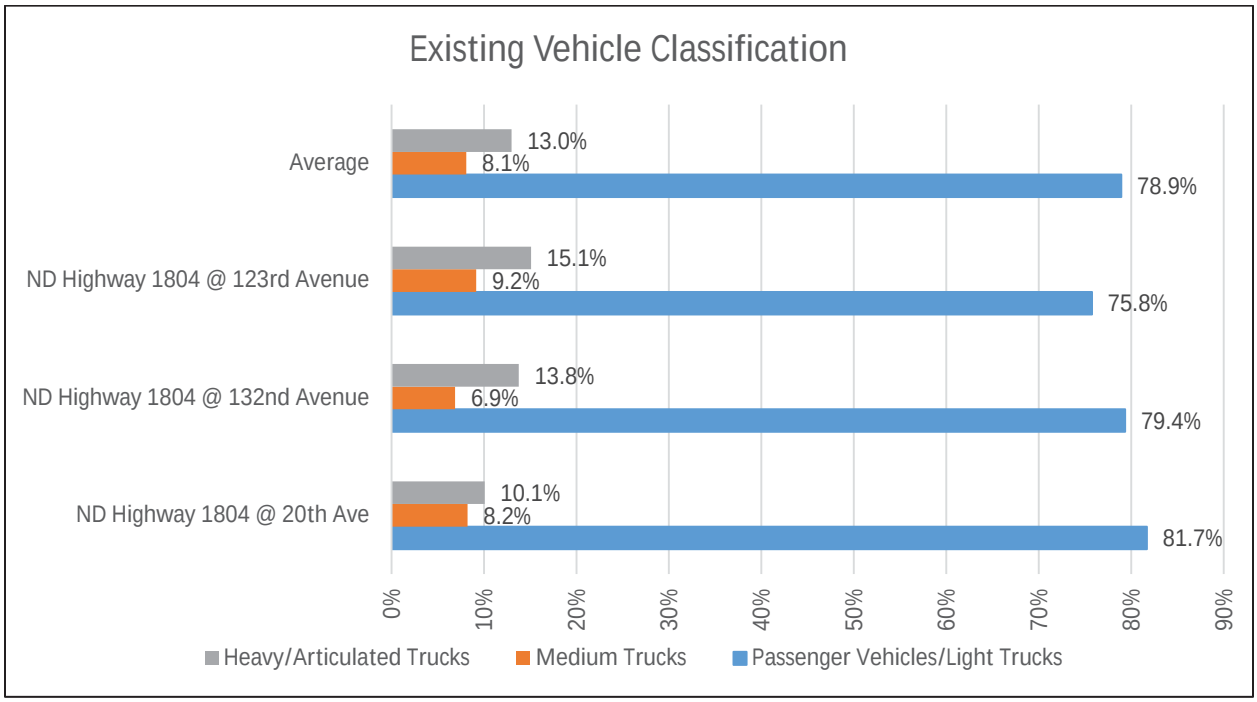


Table 1 - FHWA Vehicle Classifications

Note: #9 represents a standard Semi-Truck

Figure 5 – Existing Vehicle Classification



Travel Speeds

Vehicular speed data was not collected as part of this study due to safety concerns with respect to the data collection process.

2.2 Roadway Characteristics

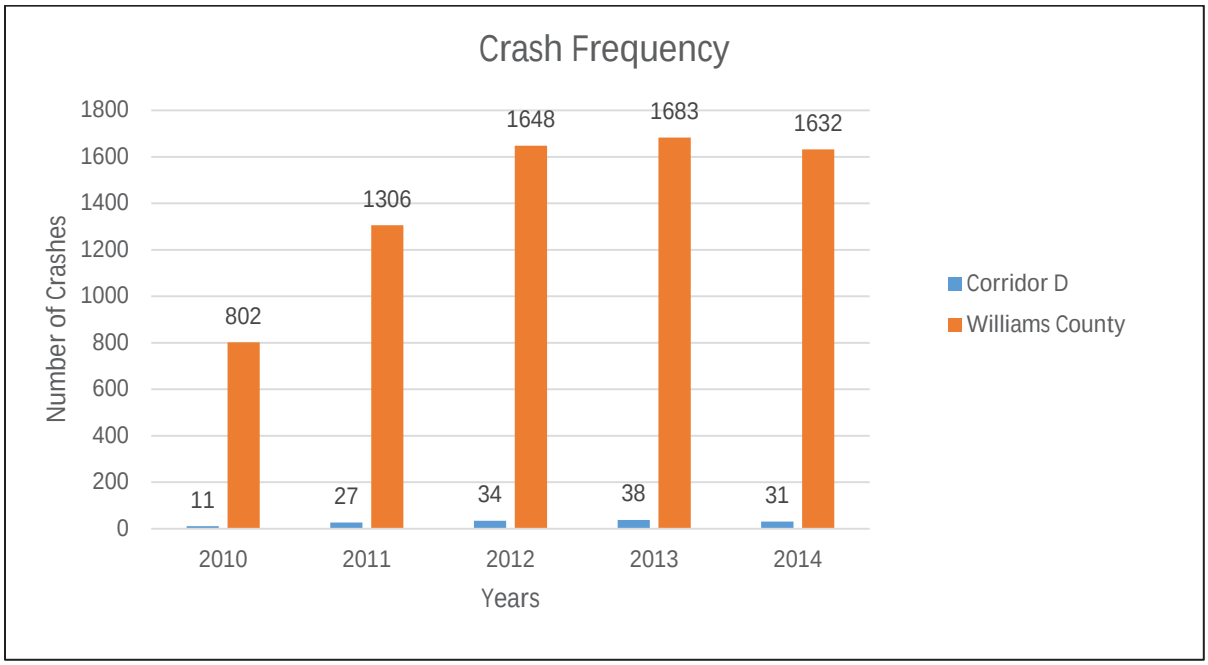
In addition to traffic data collection, the following observations were completed to identify roadway characteristics within the study area (i.e. roadway geometry, posted speed limits, and traffic controls).

ND Highway 1804 from East Dakota Parkway to 123rd Avenue/County Road 42 is a principal arterial roadway. Corridor D is generally a four-lane undivided roadway with a rural cross-section west of 133rd Drive and transitions to a two-lane undivided roadway with a rural cross-section east of 133rd Drive. The posted speed limit is 45 mph west of 133rd Drive and 65 mph east of 133rd Drive. Traffic controls along the study corridor are all side-street stop control, with the exception of the ND Highway 1804 and 20th Avenue/County Road 9 intersection, which is signalized.

2.3 Crash History

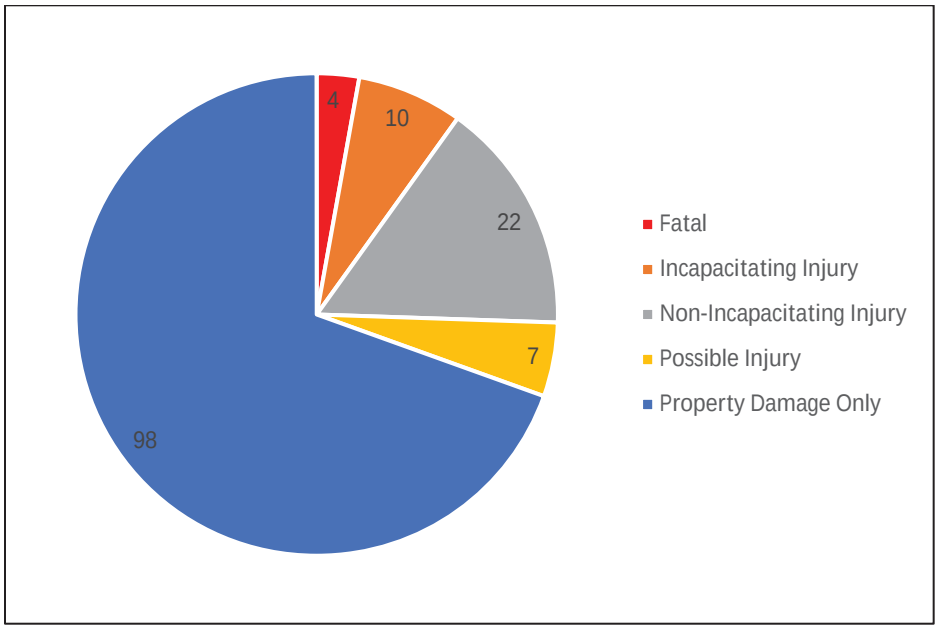
Crash data was provided by the NDDOT from January 1, 2010 through December 31, 2014, which represents the most recent five-year period available at the beginning of this study. This data was used to establish current crash trends and issues along Corridor D. There has been approximately 141 reported crashes along ND Highway 1804 from the Little Muddy River Crossing to 123rd Avenue/County Road 42. A summary of the reported crashes by year for Corridor D is shown in Figure 6, as well as the overall reported crashes for all of Williams County during the same time period.

Figure 6 – Crash Frequency by Year



In addition to the overall crash frequency along the study corridor, a more detailed crash analysis was completed that reviewed segment and intersection crashes. This review focused on both the frequency in relation to the roadway characteristics (i.e. crash rates) and the type and general severity of the crashes. The location of the reported crashes within the study period along Corridor D is illustrated in Figure 8. This also illustrates the crash severity (i.e. fatal, incapacitating injury, non-incapacitating injury, possible injury, and property damage), which is summarized in Figure 7.

Figure 7 – Crash Severity Summary



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Reported Crashes

Williston Area Transportation Plan Corridor Study (Corridor D)
City of Williston, Williams County, and NDDOT

Figure 8

As noted, there were four (4) reported fatal crashes within the study segment, all of which had alcohol involved. Three of the four fatal crashes occurred within the four-lane segment, while the other occurred at 132nd Trail. There were also a total of 10 reported incapacitating injury crashes along the study segment of ND Highway 1804, of which three (3) had alcohol involved. Eight of the 10 crashes occurred within the two-lane segment, of which six (6) were a non-collision with a motor vehicle.

The next step in the crash analysis was to review segment and intersection crash rates. The purpose of reviewing crash rates is to determine the statistical significance of the number of crashes. Crash rates were calculated and then compared to typical crash rates for intersections/segments with similar characteristics. Since the NDDOT does not publish crash rates by roadway type or traffic control, published crash rates from the Minnesota Department of Transportation (MnDOT) were referenced for comparison purposes. Crash rates are per million entering vehicles (MEV) for intersections and per million vehicle miles (MVM) for segments.

It should be noted that a higher than typical crash rates do not necessarily indicate a significant crash problem. Therefore, the critical crash rate was calculated to determine the statistical significance of the above average crash rates. If the calculated crash rates are below the critical crash rates, crashes that occurred are likely due to the random nature of crashes and not necessarily a geometric design or traffic control issue. If the calculated crash rates are above the critical crash rates, there are generally a significant number of crashes above normal to warrant further review or mitigation.

Based on review of the intersection crash rates, the following intersections were identified as having an existing crash rate above the critical crash rate for locations with similar characteristics:

1) ND Highway 1804 and 132nd Road
2) ND Highway 1804 and 131st Avenue
3) ND Highway 1804 and 129th Avenue
4) ND Highway 1804 and 126th Avenue/County Road 11

In addition, both the four-lane and two-lane segments of ND Highway 1804 from the Little Muddy River Crossing to 123rd Avenue/County Road 42 were identified with a crash rate above the critical crash rate. The ND Highway 1804 intersections at 20th Avenue/County Road 9, 133rd Drive, 133rd Avenue, 132nd Trail, 127th Avenue, 123rd Avenue/County Road 42 have above average crash rates.

To determine if there are any trends associated with the types of crashes occurring at the exceeding critical crash rate locations, a more detailed crash analysis was completed. Results of the crash type summary for the locations with a statistically significant amount of crashes are summarized in Table 2.

Table 2 - Crash Type Summary

Intersection	Left Turn / Right Angle	Rear End	Sideswipe	Head On	NCWMV(1)	Total
@ 132nd Road (2)	0 (0%)	1 (14%)	3 (43%)	0 (0%)	3 (43%)	**7**
@ 131st Avenue (2)	3 (60%)	0 (0%)	1 (20%)	0 (0%)	1 (20%)	**5**
@ 129th Avenue (2)	1 (11%)	1 (11%)	0 (0%)	0 (0%)	7 (78%)	**9**
@ 126th Avenue/CR 11 (2)	0 (0%)	3 (43%)	0 (0%)	0 (0%)	4 (57%)	**7**
4-Lane Segment	1 (7%)	1 (7%)	5 (33%)	1 (7%)	7 (47%)	**15**
2-Lane Segment	2 (4%)	12 (22%)	7 (13%)	3 (6%)	30 (56%)	**54**

(1) Represents a non-collision with a moving vehicle type crash
(2) Indicates an unsignalized intersection with side-street stop control

Review of the crash types at the key intersections and study segments indicate that the majority of the crashes that are occurring are non-collision with motorized vehicle. These types of crashes are likely a combination of the hilly terrain, lack of shoulders, and limited turn lanes on ND Highway 1804. No fatal or incapacitating injury crashes were reported at the key intersections identified to be over critical.

2.4 Access

To determine the existing level of access along ND Highway 1804, an access inventory was completed and is presented in Figure 9. In addition to the study intersections previously mentioned, other access locations along the corridor include public (roadways), commercial (retail and office), and farm/residential type uses. The ND Highway 1804 corridor (from the Little Muddy River Crossing to 123rd Avenue/County Road 42) is approximately 12-miles in length and has a total of 81 access locations (21 public, 9 commercial, and 51 farm/residential). This equates to an access density of approximately seven (7) accesses per mile.

In addition to the overall corridor access, a compliance review of the existing access with respect to current guidance was conducted. This access looked at both the NDDOT and City of Williston guidance, which included:

1) NDDOT
    a. Intersections should be spaced at least 400 to 600 feet apart.
    b. No more than five (5) access points per side per mile.
2) City of Williston
    a. Principal arterial intersection spacing no less than 1/4 mile.

Based on this criteria, there are locations along Corridor D that do not currently fall within existing guidance. In addition to the segment from 133rd Drive to 132nd Road having greater than five (5) access points per mile, there are many locations where access spacing is less than 400 feet. The majority of locations where access spacing does not meet existing guidelines are locations with private and farm access. In general, private and farm access should be removed as opportunities arise to maintain safe and efficient operations along ND Highway 1804, as well as to reduce potential conflicts. All access locations will be reviewed further as part of the mitigation analysis.

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Access Inventory

Williston Area Transportation Plan Corridor Study (Corridor D)
City of Williston, Williams County, and NDDOT

Figure 9

2.5 Capacity Analysis

To establish and quantify current operations along the study corridor, a detailed intersection capacity analysis was completed. Traditionally, both a planning-level ADT volume review and a detailed intersection/corridor capacity analysis would be completed. However, given the higher than normal heavy commercial vehicles percentages, the planning level ADT review was not completed as part of this study. Although it should be noted that the ADT volume ranges from approximately 3,200 vpd to 12,000 vpd along the study corridor. Therefore, only the detailed intersection/corridor capacity analysis was completed. This analysis utilized Synchro/SimTraffic (version 8.0) to evaluate the existing a.m. and p.m. peak hours.

Capacity analysis results identify a Level of Service (LOS), which indicates the quality of traffic flow through an intersection. Intersections are given a ranking of LOS A through LOS F. The LOS results are based on average delay per vehicle, which correspond to the delay threshold values shown in Table 3. LOS A indicates the best traffic operation, with vehicles experiencing minimal delays. LOS F indicates an intersection where demand exceeds capacity, or a breakdown of traffic flow. An overall LOS A through C is considered acceptable traffic flow conditions based on the NDDOT.

Table 3 - Level of Service Criteria for Signalized and Unsignalized Intersections

LOS Designation	Signalized Intersection Average Delay/Vehicle (seconds)	Unsignalized Intersection Average Delay/Vehicle (seconds)
A	≤ 10	≤ 10
B	> 10 - 20	> 10 - 15
C	> 20 - 35	> 15 - 25
D	> 35 - 55	> 25 - 35
E	> 55 - 80	> 35 - 50
F	> 80	> 50

For side-street stop intersections, special emphasis is given to providing an estimate for the level of service of the side-street approach. Traffic operations at an unsignalized intersection with side-street stop can be described in two ways. First, consideration is given to the overall intersection level of service. This takes into account the total number of vehicles entering the intersection and the capability of the intersection to support these volumes.

Second, it is important to consider the delay on the minor approach. Since the mainline does not have to stop, the majority of delay is attributed to the side-street approaches. It is typical of intersections with higher mainline traffic volumes to experience high levels of delay (i.e. poor level of service) on the side-street approaches, but an acceptable overall intersection level of service during peak hour conditions.

Results of the existing intersection capacity analysis shown in Table 4 indicate that all study intersections currently operate at an acceptable overall LOS A during a.m. and p.m. peak hours with the existing geometric layout and traffic control. No significant side-street delay or queuing was observed.

Table 4 - Existing Peak Hour Intersection Capacity Analysis

ND Highway 1804 Intersection	Level of Service (Delay)	
	A.M. Peak Hour	P.M. Peak Hour
@ 20th Avenue/County Road 9	A (5 sec.)	A (6 sec.)
@ 22nd Avenue (1)	A/B (11 sec.)	A/B (12 sec.)
@ 27th Avenue (1)	A/A (< 5 sec.)	A/B (11 sec.)
@ 134th Drive (1)	A/B (13 sec.)	A/C (21 sec.)
@ 133rd Drive (1)	A/B (14 sec.)	A/C (16 sec.)
@ 133rd Avenue (1)	A/B (14 sec.)	A/C (18 sec.)
@ 132nd Trail (1)	A/B (10 sec.)	A/A (< 5 sec.)
@ 132nd Road (1)	A/B (12 sec.)	A/B (14 sec.)
@ 131st Avenue (1)	A/A (< 5 sec.)	A/B (14 sec.)
@ 129th Avenue (1)	A/A (9 sec.)	A/A (< 5 sec.)
@ 127th Avenue (1)	A/A (< 5 sec.)	A/A (< 5 sec.)
@ 126th Avenue/County Road 11 (1)	A/B (14 sec.)	A/B (14 sec.)
@ 125th Avenue (1)	A/B (12 sec.)	A/B (13 sec.)
@ 124th Avenue (1)	A/A (< 5 sec.)	A/B (10 sec.)
@ 123rd Avenue/County Road 42 (1)	A/B (13 sec.)	A/B (13 sec.)

(1) Indicates an unsignalized intersection with side-street stop control where the overall LOS is shown followed by the worst approach LOS.

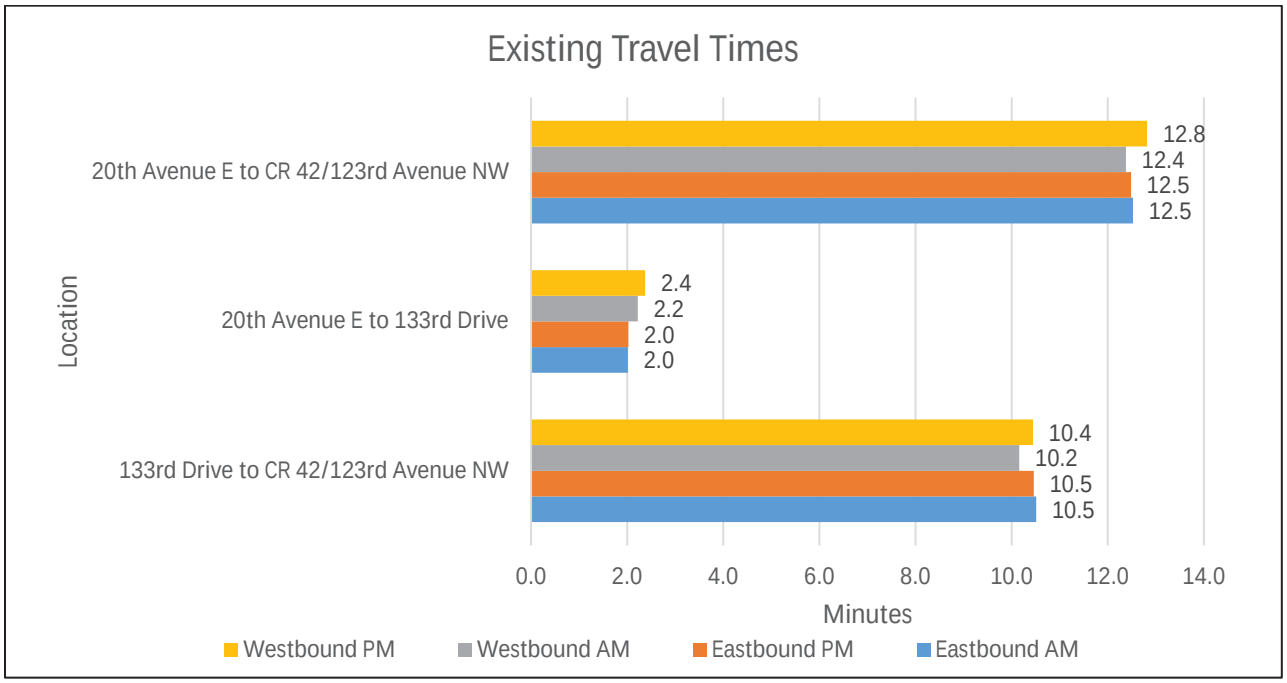
2.6 Travel Time

Corridor travel time was reviewed to establish a baseline condition in which future operations can be compared. The corridor travel times were based on the existing intersection capacity analysis. The overall corridor travel time was calculated, as well as two sub-segments to help illustrate how potential changes may impact the overall corridor travel time. The sub-segments include:

1) 20th Avenue/County Road 9 to 133rd Drive
2) 133rd Drive to 123rd Avenue/County Road 42

A summary of the existing travel times are shown in Figure 10, which includes each segment and direction. For purposes of this review, the travel times were shown for both the a.m. and p.m. peak hours. Results of the travel time review indicate that the overall corridor travel time from 20th Avenue/County Road 9 to 123rd Avenue/County Road 42 is approximately 13 minutes, regardless of the time of day and direction of travel.

Figure 10 – Corridor Travel Time



2.7 Public Input

A preliminary public input meeting was held in February 2015. The purpose of the meeting was to introduce the corridor study, provide preliminary traffic and safety information, and receive feedback regarding current issues/concerns. Based on the feedback received at this meeting, an issues map was developed that summarized the key questions and concerns, which is shown in Figure 11.

The most common issues noted were with respect to the intersection site distance, lack of shoulders, narrow travel lanes, and hilly terrain. Further review of these issues will be conducted as part of the mitigation alternatives section within this document.

LEGEND

 # Access

#1 - 131st Ave is identified as a possible option for the East Truck Bypass

 # Safety

#1 - Near intersection of 129th Ave and Hwy 1804 there is a washout which has collected water for over 30 years

 # Roadway Improvements

#1 - Hwy 1804 extended as 4 lane divided highway to C.R. 11 would be desirable
#2 - Consider upgrading 130th Rd NW to legal limits to pull oil well traffic off of Hwy 1804 between 130th Rd NW & 126th Ave NW

 # Other

#1 -Traffic signal placement at intersection of 1804 and 20th Ave E is helping eliminate delay

 # General Concerns

Many comments on Hwy 1804 is too narrow for hauling trucks

Sight distance along Corridor D is problematic due to number of hills

Corridor D Hwy 1804 hills to be cut down is desirable

State park, golf course and weekend recreational traffic is a concern-vehicles hauling boats, R.V.'s and A.T.V.'s as well as trucks

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Public Input Summary (West)

Williston Area Transportation Plan Corridor Study (Corridor D)
City of Williston, Williams County, and NDDOT

Figure 11A

LEGEND

 # Safety

#1 - 129th Ave NW & 1804 intersection-sight distance concern due to terrain

#2 - 127th Ave NW & 1804 intersection-sight distance concern due to terrain

#3 - 126th Ave NW at the intersection of 1804-accesss is to narrow and road is damaged and limits the turning radius for traffic entering 126th Ave NW

#4 - 126th Ave NW at the intersection of 1804-culvert and drainage issues with water sitting in the field and over NCC manholes

#5 - 125th Ave NW & 1804 intersection-sight distance concern due to terrain

#6 - 124th Ave NW & 1804 intersection-sight distance concern due to terrain

#7 - 123rd Ave NW (C.R. 9) & 1804 intersection-sight distance concern due to terrain

 # Roadway Improvements

#1 - Hwy 1804 extended as 4 lane divided highway to C.R. 11 would be desirable

#2 - 129th Ave NW realignment with Hwy 1804 is desirable

#3 - 126th Ave-reconstruct intersections to handle heavy volume/load truck traffic

 # General Concerns

Many comments on Hwy 1804 is too narrow for hauling trucks

Sight distance along Corridor D to intersecting roads is problematic due to number and grade of hills

126th Ave NW-identified as C.R. 11

Need to find a better way to keep trucks out of town

Corridor D Hwy 1804 hills to be cut down is desirable

123rd Ave NW-identified as C.R. 42

State park, golf course and weekend recreational traffic is a concern-vehicles hauling boats, R.V.'s and A.T.V.'s are a concern as well as trucks

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Public Input Summary (East)

Williston Area Transportation Plan Corridor Study (Corridor D)
City of Williston, Williams County, and NDDOT

Figure 11B

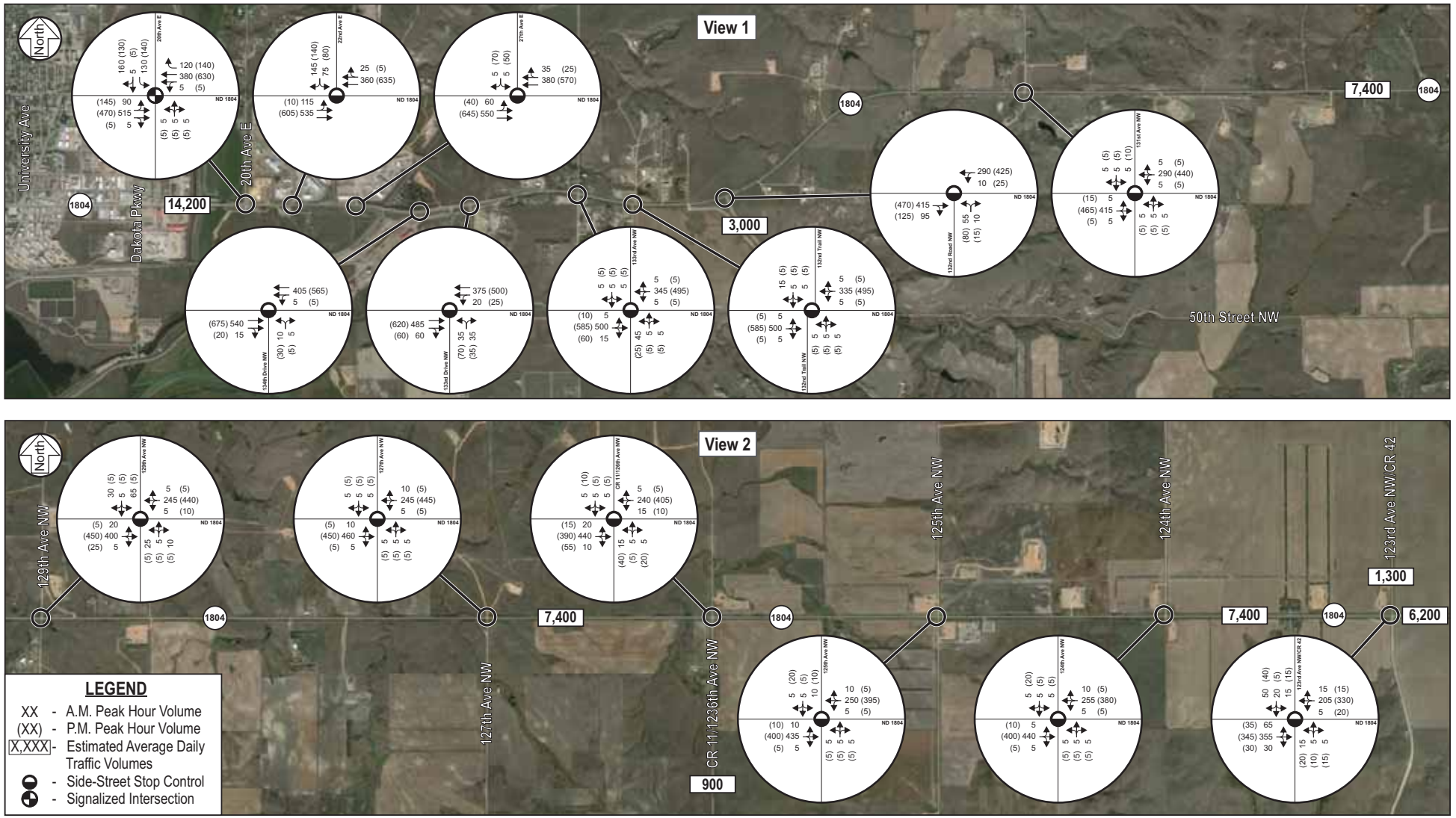
3.0 Traffic Forecasts

Traffic forecasts were developed for year 2040 conditions as part of the *Williston Transportation Plan and Comprehensive Plan Update*. The forecasts incorporate both updated land use within and near the Williston City limits, as well as planned transportation improvements. The main transportation improvement is the reconstruction of ND Highway 1804 between the Little Muddy River Crossing and 131st Avenue. The western section of this segment (west of 132nd Road/County Road 9) will be reconstructed as a five-lane facility while the eastern segment (between 132nd Road/County Road 9 and 131 Avenue) will be reconstructed as a three-lane facility. No traffic control improvements were planned at this time. In addition, historical traffic volume trends were reviewed to help refine the traffic forecasts. Detailed assumptions, methods, and results are provided in the *Williston Transportation Plan and Comprehensive Plan Update*.

Based on the forecasts, traffic volumes are expected to increase along the study corridor. The ADT volumes along ND Highway 1804 are expected to range from approximately 6,200 vpd to 16,200 vpd, with the higher totals near the western segment of this study corridor (west of 20th Avenue/County Road 9). The percentage of heavy commercial vehicles is expected to remain relatively steady within this study corridor (i.e. approximately 25 to 30 percent).

It should be noted that a future Northeast Williston Bypass has the potential to impact traffic volumes along ND Highway 1804, particularly west of the bypass connection. However, there is a concurrent environmental study of the potential impacts associated with the Northeast Williston Bypass. Therefore, since there is no specific timeline for the bypass, only a cursory review of the potential impacts to ND Highway 1804 was completed as part of this study. Further details of the cursory review are provided later in this document.

The forecast average daily traffic volumes (assuming no Northeast Williston Bypass) were then modified to reflect year 2040 a.m. and p.m. peak hour conditions, which are summarized in Figures 12. The peak hour volumes were utilized to determine the future year 2040 intersection capacity and ultimately the future capacity needs of the transportation network.



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February 2016

Year 2040 Conditions

Williston Area Transportation Plan Corridor Study (Corridor D)
City of Williston, Williams County, and NDDOT

Figure 12

4.0 Year 2040 Conditions

4.1 Capacity Analysis

To determine how the existing and planned transportation system will be able to accommodate the future year 2040 traffic forecasts, a detailed intersection capacity analysis was completed. As noted earlier, this analysis does not include a future Northeast Williston Bypass, but does include reconstruction between the Little Muddy River Crossing and 131st Avenue. The analysis was conducted using Synchro/SimTraffic software.

Results of the year 2040 peak hour intersection capacity analysis, shown in Table 5, indicates that all study intersections are expected to operate at an overall LOS B or better during the a.m. and p.m. peak hours assuming the current geometric layout and traffic control. Side-street access is expected to become progressively more challenging as volumes increase along the corridor. However, these side-street delays are expected to be within the acceptable range. The corridor and side-street access should be monitored, particularly as development occurs to determine if mitigation is necessary.

Table 5 - Year 2040 Peak Hour Intersection Capacity Analysis

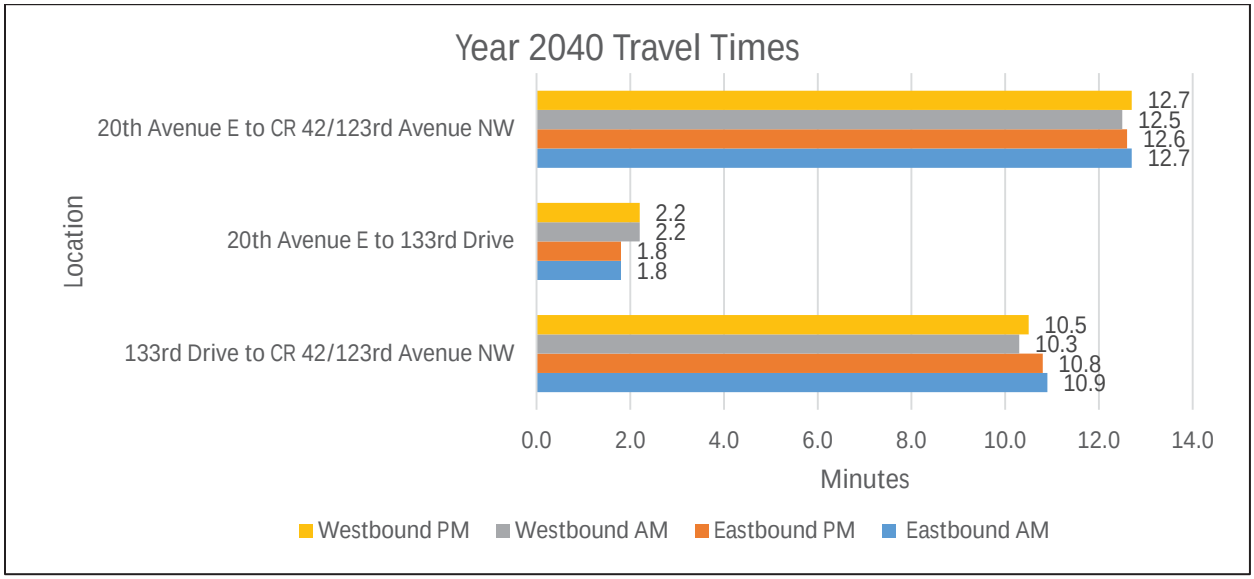
ND Highway 1804 Intersection	Level of Service (Delay)	
	A.M. Peak Hour	P.M. Peak Hour
@ 20th Avenue/County Road 9	A (9 sec.)	B (10 sec.)
@ 22nd Avenue (1)	A/B (14 sec.)	A/C (16 sec.)
@ 27th Avenue (1)	A/B (12 sec.)	A/C (15 sec.)
@ 134th Drive (1)	A/B (13 sec.)	A/C (18 sec.)
@ 133rd Drive (1)	A/B (13 sec.)	A/C (18 sec.)
@ 133rd Avenue (1)	A/C (21 sec.)	A/D (29 sec.)
@ 132nd Trail (1)	A/C (17 sec.)	A/C (22 sec.)
@ 132nd Road (1)	A/B (13 sec.)	A/C (16 sec.)
@ 131st Avenue (1)	A/C (16 sec.)	A/C (22 sec.)
@ 129th Avenue (1)	A/C (19 sec.)	A/C (20 sec.)
@ 127th Avenue (1)	A/C (16 sec.)	A/C (20 sec.)
@ 126th Avenue/County Road 11 (1)	A/C (18 sec.)	A/C (24 sec.)
@ 125th Avenue (1)	A/C (16 sec.)	A/C (18 sec.)
@ 124th Avenue (1)	A/C (16 sec.)	A/C (18 sec.)
@ 123rd Avenue/County Road 42 (1)	A/C (19 sec.)	A/C (21 sec.)

(1) Indicates an unsignalized intersection with side-street stop control where the overall LOS is shown followed by the worst approach LOS.

4.2 Travel Times

A review of the future year 2040 corridor travel times indicates that the average travel time from 20th Avenue/County Road 9 to 123rd Avenue/County Road 42 is expected to be approximately 13 minutes. This represents approximately a one (1) minute increase from existing conditions, which can be expected as traffic volumes increase.

Figure 13 – Year 2040 Corridor Travel Time



5.0 Issues Summary and Mitigation Alternatives

5.1 Issues and Mitigation

Based on the results of the existing conditions analysis, which looked at current issues with respect to access, safety, and roadway capacity as well as the future year 2040 capacity analysis, several locations along the corridor need or are expected to need mitigation to ensure safe and efficient operations. The necessary mitigation alternatives comprise of a combination of access modifications and/or turn lane/roadway reconfigurations.

Therefore, a variety of mitigation alternatives were identified to address both the access and safety challenges. The following issues summary and mitigation alternatives were developed and offered for consideration as part of this corridor study, which are also shown in Figures 14.

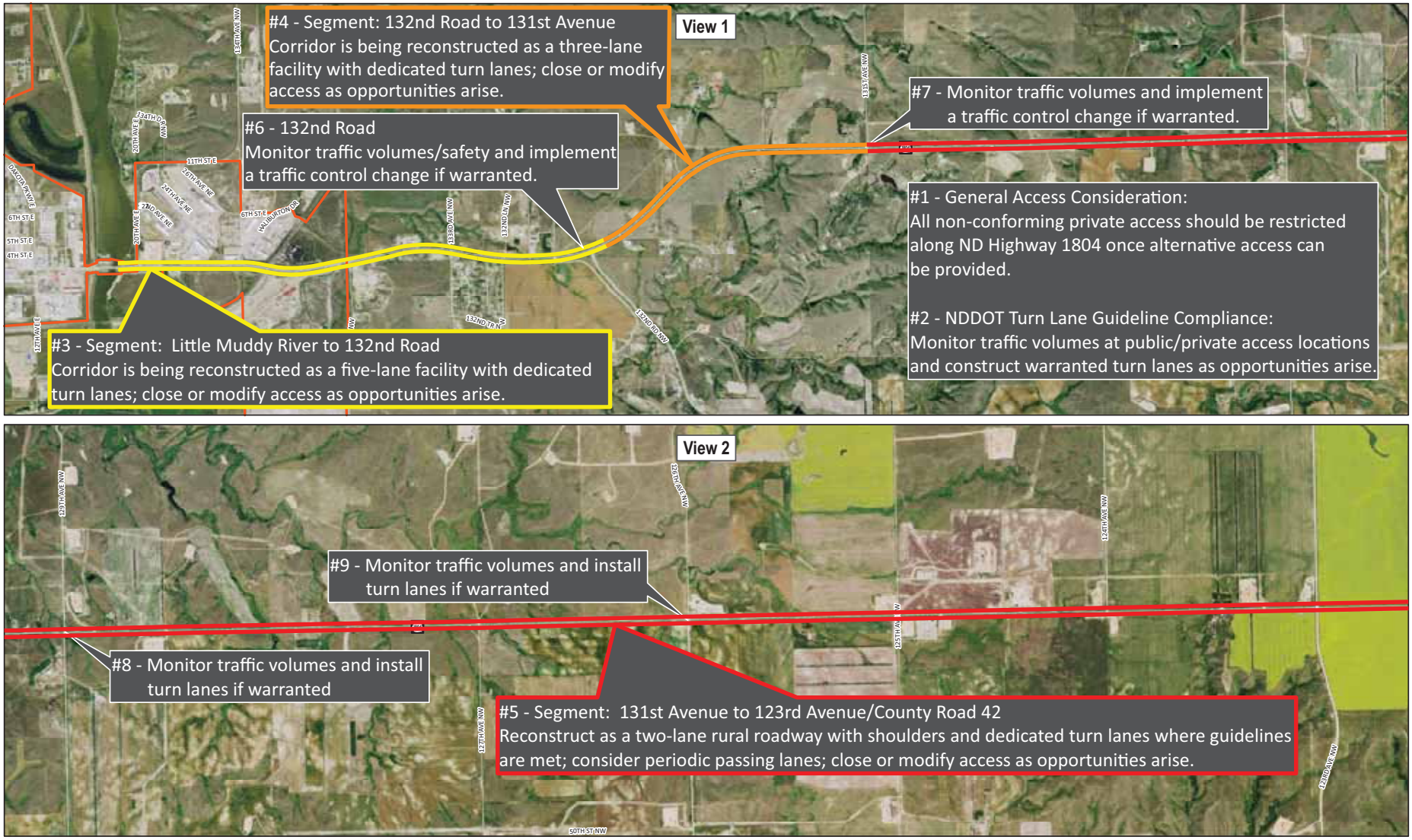
1) General Access Consideration
   a. Issue(s): Private access along ND Highway 1804
   b. Mitigation: All non-conforming private access should be restricted along ND Highway 1804 once alternative access can be provided.

2) NDDOT Turn Lane Guideline Compliance
   a. Issue(s): There are limited to no turn lanes along the majority of the study corridor.
   b. Mitigation: Monitor traffic volumes at public/private access locations and construct warranted turn lanes as opportunities arise. Based on the current traffic volumes along ND Highway 1804, a minimum of 50 turning passenger car equivalents (PCEs) are needed to warrant turn lanes.

3) Segment: Little Muddy River to 132nd Road
   a. Issue(s): Statistically significant amount of crashes (primarily side-swipe or non-collision with motor vehicles type crashes); several accesses do not meet current spacing guidance.
   b. Mitigation: Corridor is being reconstructed as a five-lane facility with dedicated turn lanes; close or modify access as opportunities arise.

4) Segment: 132nd Road to 131 Avenue
   a. Issue(s): Statistically significant amount of crashes (primarily rear-end, side-swipe, or non-collision with motor vehicles type crashes); several accesses do not meet current spacing guidance.
   b. Mitigation: Corridor is being reconstructed as a three-lane facility with dedicated turn lanes; close or modify access as opportunities arise.

5) Segment: 131st Avenue to 123rd Avenue/County Road 42
   a. Issue(s): Statistically significant amount of crashes (primarily rear-end, side-swipe, or non-collision with motor vehicles type crashes); several accesses do not meet current spacing guidance.
   b. Mitigation: Reconstruct as a two-lane rural roadway with shoulders and dedicated turn lanes where guidelines are met (or as a three-lane facility); consider periodic passing lanes to reduce conflicts between heavy commercial and passenger vehicles, particularly near terrain changes; close or modify access as opportunities arise.



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SRF Consulting Group, Inc.

0158658
July 2016

Mitigation Alternatives

Williston Area Transportation Plan Corridor Study (Corridor D)
City of Williston, Williams County, and NDDOT

Figure 14

6) 132nd Road/County Road 9
    a. Issue(s): Statistically significant amount of crashes.
    b. Mitigation: Intersection is being reconstructed as a five-lane facility with dedicated turn lanes; Monitor traffic volumes/safety and implement a traffic control change if warranted.

7) 131st Avenue
    a. Issue(s): Statistically significant amount of crashes, relative to the current traffic volumes. This intersection averages one (1) crash per year.
    b. Mitigation: Intersection is being reconstructed as a three-lane facility with dedicated turn lanes; Monitor traffic volumes and implement a traffic control change if warranted.

8) 129th Avenue
    a. Issue(s): Statistically significant amount of crashes.
    b. Mitigation: Monitor traffic volumes and install turn lanes if warranted.

9) 126th Avenue/County Road 11
    a. Issue(s): Statistically significant amount of crashes.
    b. Mitigation: Monitor traffic volumes and install turn lanes if warranted.

5.2 Mitigation Considerations

Given the types of crashes that are occurring along ND Highway 1804 within the study area, an enhanced roadway cross-section should be considered. This would help address the primary issues along the corridor, which were related to safety. As noted earlier, the NDDOT is planning to reconstruct the segment of ND Highway 1804 from the Little Muddy River to 132nd Road/County Road 9 as a five-lane facility in 2017. In addition, this project will include a three-lane facility from 132nd Road/County Road 9 to 131st Avenue. Eventually, the NDDOT would like to provide an enhanced cross-section along ND Highway 1804 extending to New Town. Further discussion with project stakeholders should occur to confirm the limits, design, and timeline for these types of improvements.

In addition to the roadway cross-section, a future Northeast Williston Bypass is under consideration. The exact location/alignment has not been confirmed at the time of this study. However, this bypass would have an impact to traffic volumes along ND Highway 1804, particularly west of the proposed tie-in location. In particular, the bypass is expected to change the amount of heavy commercial vehicles along the western segment of the corridor. Although until businesses relocate, trucks are still expected to utilize this segment. Traffic volumes along ND Highway 1804 east of the bypass will be minimally impacted by the future bypass.

6.0 Project Prioritization

6.1 Prioritization Approach

Given the mitigation necessary to ensure long-term safe and efficient operations along ND Highway 1804, there is a need to help prioritize the potential improvements. However, since there are multiple projects currently in-progress, as well as potential development that could re-prioritize the improvements, a planning level prioritization approach was completed. This approach focused on locations with existing issues, but was also mindful of the current benefit/cost associated with each improvement as most of the issues existing today (i.e. lower priority for locations with lower traffic volumes). Mitigation alternatives were prioritized into short- (existing to year 2020), medium- (year 2020 to year 2030), and long-term (year 2030 to year 2040+) improvements and are summarized as follows:

1) Short-Term Mitigation (Existing to Year 2020)
    a. General Access Considerations
    b. NDDOT Turn Lane Guideline Compliance
    c. Segment: Little Muddy River Crossing to 132nd Road/County Road 9 (under construction)
    d. Segment: 132nd Road/County Road 9 to 131st Avenue (under construction)
    e. Segment: 131st Avenue to 123rd Avenue/County Road 42
2) Mid-Term Mitigation (Year 2020 to Year 2030)
    a. 132nd Road/County Road 9
    b. 131st Avenue
    c. 129th Avenue
    d. 126th Avenue/County Road 11
3) Long-Term Mitigation (Year 2030 to Year 2040+)
    a. None

Although these projects were prioritized based on existing and future needs, the City, County, and NDDOT should monitor area operations and leverage opportunities when available to complete this mitigation.

6.2 Preliminary Cost Estimates

To aide in future corridor planning, preliminary concept cost estimates were developed. The intent of these cost estimates is to provide an approximate cost to allow stakeholders to adequately plan for future improvements along the study corridor. The preliminary cost estimates utilized typical planning level thresholds for various traffic controls and roadway improvements. The following information summarizes the planning level cost estimates, which generally follows the ND Highway 1804 projects as listed in the previous section, as well as the mitigation ID listed in Section 5.0. Costs shown are based on year 2016 pricing and do not include any contingency, engineering/administration, and/or right-of-way.

Table 6 - Mitigation and Preliminary Cost Estimate Summary

Mitigation ID(s)	ND Highway 1804 Location	Type of Improvement	Priority	Approximate Cost ($)
1	General Access Considerations	Monitor/Study	Short-Term	TBD
2	NDDOT Turn Lane Guideline Compliance	Monitor/Study	Short-Term	TBD
3	Segment: Five-Lane Facility	Safety, Access	Short-Term	Under Construction
4	Segment: Three-Lane Facility	Safety, Access	Short-Term	Under Construction
5	Segment: Enhanced Two-Lane Facility	Safety, Access	Short-Term	---
	131st Avenue to CR 42	---	---	$20.9M *
	Periodic Passing Lanes	---	---	$1.8M
6	132nd Road/County Road 9	Safety	Mid-Term	---
	Optional Traffic Control Improvement	---	---	$0.5M
7	131st Avenue	Safety/Monitor	Mid-Term	TBD
8	129th Avenue	Safety/Monitor	Mid-Term	TBD
9	126th Avenue/County Road 11	Safety/Monitor	Mid-Term	TBD

* Excludes periodic passing lanes.

Since the majority of the issues identified are current issues, no costs were developed for the mid- and long-term improvements identified. However to assist with planning, a general rule of thumb for turn lane improvements is to use approximately $100,000 per turn lane for this corridor. As for the periodic passing lanes identified, the costs assume a total of four 1-mile passing lanes. This is the equivalent of two-passing lanes per direction along the corridor from 132nd Road to 123rd Avenue/County Road 42, which is consistent with other similar ND Highways recently constructed within the region.

7.0 Summary and Conclusions

The goal of this corridor study was to identify the short- and long-term needs of ND Highway 1804 from the Little Muddy River Crossing to 123rd Avenue/County Road 42. The identified needs of the corridor were based on traffic operations, providing as safe and efficient operations within the study area as possible. The analysis included and focused on access, crashes, roadway and intersection capacity, and any other issues identified through stakeholder involvement. Through this analysis, several issues were identified throughout the study corridor.

To address the issues identified, multiple mitigation alternatives were developed for the corridor. The issues and corresponding mitigation alternatives are summarized in Section 5 (Issues Summary and Mitigation Alternatives). These mitigation alternatives were then prioritized based on need (safety, capacity, access) into short- (existing to year 2020), medium- (year 2020 to year 2030), and long-term (year 2030 to year 2040+) mitigation, which is summarized in Table 6. Furthermore, preliminary cost estimates were developed for the majority of the mitigation alternatives to help with capital planning and funding. This preliminary costs estimates are also summarized in Table 6. Further discussion with stakeholders should occur as planning and opportunities arise with respect to infrastructure investment.