

Memo

Date: Monday, April 25, 2016

Project: Mandan and Bismarck Corridors Improvement Study

To: Steve Saunders, Bismarck-Mandan MPO and Justin Froseth, Mandan City Engineer

From: HDR Engineering

Subject: Mandan Truck Route Assessment

The purpose of this memorandum is to provide a summary of the Mandan Truck Route Assessment.

Existing Truck Patterns

To determine the existing truck patterns on Main Street through central Mandan three different sources of data were used to assess truck flows, focusing particularly on through truck movements (See appendix A Truck Demand Assessment Memorandum):

- A StreetLight commercial vehicle flow dataset was purchased from StreetLight Data, Inc.
- Assessing current corridor truck patterns based on NDDOT truck counts from the corridor.
- Conducting interviews with major trucking companies and locations that generate truck traffic in and around Mandan to understand truck travel patterns.

Based upon the StreetLight Data collected for commercial vehicles, the majority of the truck traffic on Main Street is the result of direct east-west trips. The general travel patterns in the StreetLight data indicates that if an alternate truck route were to have the possibility of moving traffic off of Main Street, a route south of Main Street would provide the most direct option. However, the data indicates that Main Street is the most direct route for many commercial trips through Mandan.

Average Daily Traffic (ADT) truck counts available from NDDOT were reviewed. These data provided some additional reference for evaluating truck patterns through the Main Street corridor. Approximately 645 to 680 trucks per day travel along Main Street between 6th Avenue NW and 6th Avenue SE.

HDR conducted interviews with several companies and operations that generate high levels of truck trips in November 2015. These interviews provided insights into the percentage of current locally-generated trucks and patterns through Mandan, particularly from the aggregate pit and asphalt plant located west of Mandan. Most local operations have defined routes that trucks typically travel. These routes typically connect to the Interstate or Expressway as quickly as possible.

The aggregate pit generates approximately 360 trucks per day. Based upon conversations with the aggregate pit owner, the aggregate pit will be relocated in the near future due to lack of available natural resources within the area. The proposed location of the new pit may reduce traffic along Main Street in Mandan as trucks will have reduced travel time utilizing other roadways.

The asphalt plant west of Mandan generates approximately 75 trucks per day during the construction season. The asphalt plant will be relocated in the near future to the Twin City Industrial Site in East Mandan, thus further reducing the truck traffic on Main Street. With these two truck-generating sites relocated, truck traffic along Main Street could be reduced by as much as 66%.

Alternative Truck Routes

The general truck travel patterns indicate that if an alternate truck route were considered to move traffic off of Main Street, a route south of Main Street would provide the most direct option. As discussed previously, truck traffic along Main Street could be reduced by up to two-thirds of current utilization due to the relocation of the aggregate pit and asphalt plant.

ND Hwy 6 accounts for approximately 70 trucks per day on Main Street. Roadway improvements and signed truck routes south of Mandan may further reduce the number of trucks on Main Street.

The east west corridors south of Main Street shown in Figure 1 are the potential truck routes being considered.

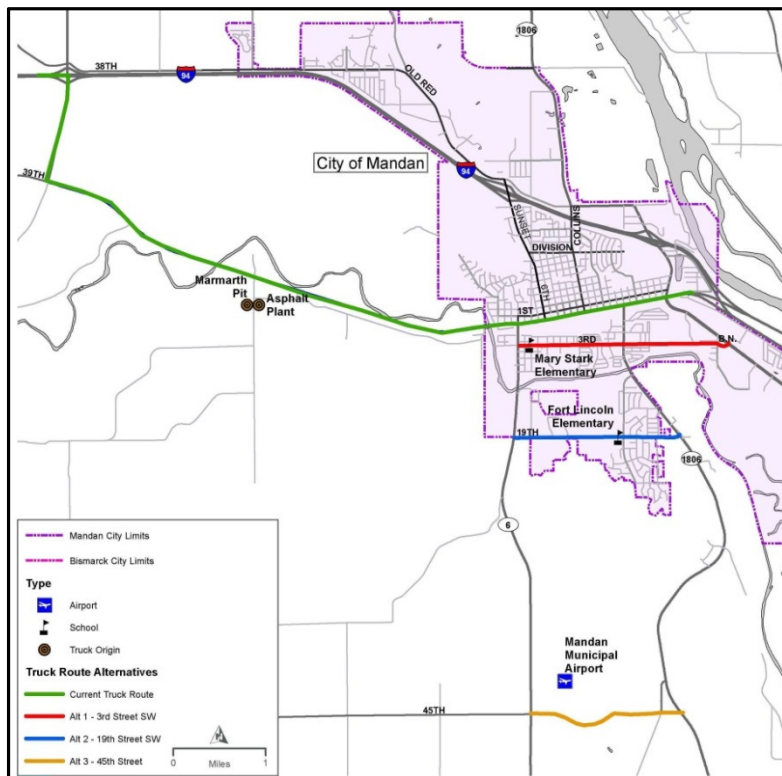


Figure 1: Mandan Truck Route Alternatives

3rd Street SW from ND Hwy 6 (10th Avenue SW) to Memorial Highway

3rd Street SW is an asphalt surfaced 36' wide urban street traversing through established residential neighborhoods. Mary Stark Elementary School is located on the south side of 3rd Street SW between 8th Avenue SW and 9th Avenue SW. The intersections of 8th Avenue and 9th Avenue with 3rd Street are controlled by a four-way stop with marked crosswalks. Except for the signalized intersection at ND Hwy 1806 and the stop signs at Memorial Highway, the remaining intersections with local residential streets are uncontrolled.

Considering the location of Mary Stark Elementary School and the residential neighborhoods, we do not recommend further consideration of this alternative.

19th Street SW from ND Hwy 6 (10th Avenue SW) to ND Hwy 1806

19th Street SW is an asphalt surfaced 24' two lane rural roadway from ND Hwy 6 to Ridge Drive and an asphalt surfaced 45' wide urban street from Ridge Drive to ND Hwy 1806. Currently four residential subdivisions are under development along 19th Street from ND Hwy 6 to 8th Avenue SW and from 8th Avenue SW to ND Hwy 1806. 19th Street SW traverses through proposed developments and existing residential neighborhoods. Fort Lincoln Elementary School is located on the south side of 19th Avenue SW between Ridge Drive and 8th Avenue SE.

In consideration of the location of Fort Lincoln Elementary School and the residential neighborhoods, we do not recommend further consideration of this alternative.

45th Street (CR 138) from ND Hwy 6 (10th Avenue SW) to ND Hwy 1806

45th Street is a 30' wide rural county roadway with a gravel surface from ND Hwy 6 to ND Hwy 1806 and is approximately 4 miles south of Main Street and just south of the Mandan Municipal Airport. Located just south of the Mandan Municipal Airport, this east-west roadway is approximately 1.7 miles long from ND Hwy 6 to ND Hwy 1806. In an effort to handle the increased truck traffic and accommodate trucks in a safe and efficient manner, 45th Street would need to be reconstructed to a hard surface roadway with some minor geometric improvements such as increasing the radius of horizontal curves and reducing the slope of the vertical profile at the east end the corridor near ND Hwy 1806. These improvements would require additional right of way and the reconstruction cost would be approximately \$4.6 million.

Summary and Recommendation

In consideration of the significant reduction of the truck traffic on Main Street due to the relocation of the aggregate pit and the asphalt plant, and the cost for improvement of 45th Street from ND Hwy 6 to ND Hwy 1806 to serve as a truck route for a small volume of trucks, we recommend the no-build alternative.

Appendix A

Memo

Date: Wednesday, November 25, 2015

Project: Mandan and Bismarck Corridors Improvement Study

To: Steve Saunders, Bismarck-Mandan MPO

From: Rick Stoppelmoor

Subject: Evaluation of Truck Patterns through Mandan

The purpose of this memorandum is to provide an assessment of truck patterns through Mandan for potential truck route analysis. Three different sources of data were used to assess truck flows through Mandan, focusing particularly on through truck movements on Main Street through central Mandan:

- A StreetLight commercial vehicle flow dataset was purchased from StreetLight Data, Inc.
- Conducting interviews with major firms / locations that generate truck traffic in and around Mandan to understand where their trucks came from / went to.
- Assessing current corridor truck patterns based on NDDOT truck counts from the corridor.

Assessment of StreetLight Data

StreetLight Data's product analyzes data from anonymous mobile devices (phones, GPS systems in vehicles, etc.) and takes that time and location data, analyzes it, and provides commercial or all vehicle mobility patterns for a place.

For this study, the StreetLight data were a summary of origin-destination patterns in Mandan for commercial truck trips. The data provided were summarized from seven (7) months of "typical traffic days" in 2014 and 2015¹ in a format of *Origin Zone – Middle Filter Zone – Destination Zone*. The data allow an understanding of commercial vehicle patterns through the study area, specifically set up to report which major roadways the trips originated from and where they were destined to when passing through the "middle filter" zone of interest – Main Street between 6th Avenue NW and Collins Avenue.

Application of the StreetLight Data

Figure 1 illustrates the locations of the Origin / Destination zones, along with the Middle Filter Zone on West Main St. As shown, the origin / destination zones covered the major entry and exit points into the central Mandan area, both east and west of the Main Street Filter Zone. Thus, most of the through traffic traveling through central Mandan via West Main Street should be picked up at one zone east of the Filter zone and at one zone west of the Filter zone.

¹ May, August, and November 2014 and January, April, May, and June 2015. The data analyzed were from average weekdays (Monday through Thursday).



STREETLIGHT DATA ORIGIN - DESTINATION ZONES AND MIDDLE FILTER ZONE

(FIGURE 1)

(MANDAN AND BISMARCK CORRIDORS STUDY)

The data received from StreetLight were treated as a relative / proportional data set of travel through the area, with the understanding that the data represent only a sample of all commercial vehicles traveling through the study area. It is not known what portion of the StreetLight data sampled the major truck generators within Mandan (such as trucks accessing the Sunny Pit west of Mandan). Further, it is understood that a large portion of the StreetLight database includes light and medium commercial vehicles, so some of these trucks sampled were likely making local deliveries. To overcome this, stations were set up to identify those commercial trucks that were traveling through central Mandan.²

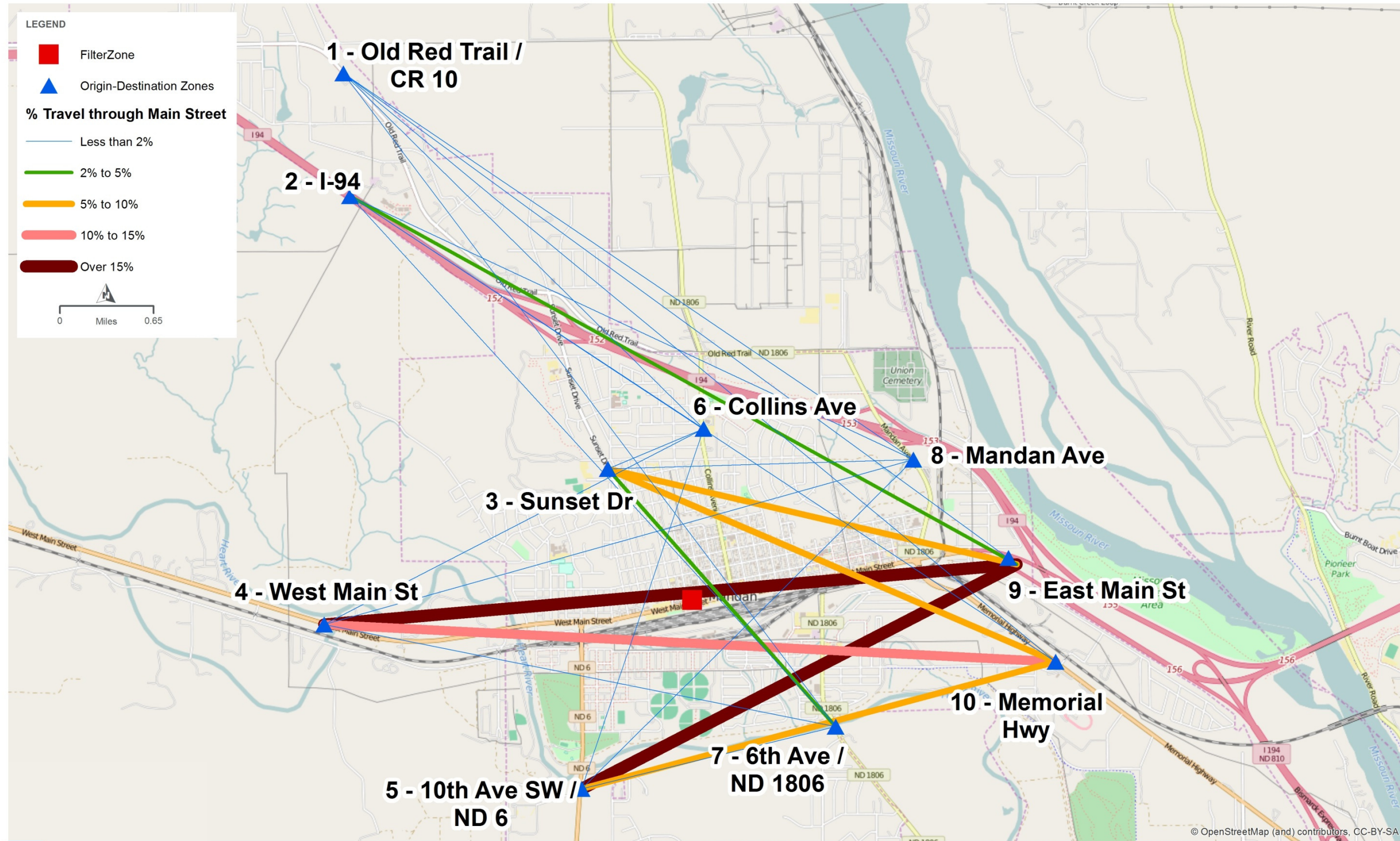
The origin-destination stations were structured to focusing on trucks traveling directly through the study area (of all types), regardless of truck type, that are candidates to use an alternative truck route corridor. The proportional levels of travel through the Main Street Corridor are illustrated in Matrix form in **Table 1**.

Table 1. Matrix of Proportional Travel through the Main Street Corridor, Percentage by Origin-Destination Pair

Origin / Destination Zones	1 Old Red Trail	2 I-94 W	3 Sunset Dr	4 West Main	5 ND 6 S	6 Collins Ave	7 ND 1806 S	8 Mandan Ave	9 East Main St	10 Memorial Hwy	Total West to East
1 Old Red Trail	No Data – Both Stations West of Main Street Filter Zone					0.0%	1.0%	0.2%	0.3%	1.1%	2.6%
2 I-94 W						0.0%	0.7%	0.2%	0.8%	1.5%	3.1%
3 Sunset Dr						0.2%	2.8%	0.7%	3.6%	6.0%	13.2%
4 West Main						0.2%	0.2%	0.5%	7.8%	5.1%	13.8%
5 ND 6 S						0.5%	0.0%	0.8%	11.3%	5.6%	18.2%
6 Collins Ave	0.0%	0.0%	0.3%	0.2%	0.8%	No Data – Both Stations East of Main Street Filter Zone					1.3%
7 ND 1806 S	0.0%	0.2%	1.1%	0.5%	0.0%						1.8%
8 Mandan Ave	0.0%	0.3%	0.8%	1.0%	1.1%						3.3%
9 East Main St	0.7%	2.2%	5.8%	7.8%	12.9%						29.4%
10 Memorial Hwy	0.2%	0.5%	3.1%	6.3%	3.3%						13.4%
Total East to West	0.8%	3.1%	11.2%	15.7%	18.2%	0.8%	4.6%	2.3%	23.8%	19.4%	100.0%

The same data are illustrated as “desire lines” in **Figure 2**, where the higher the level of travel between two stations, the thicker the line is depicted.

² Upon review of the StreetLight data, a portion of the heavy commercial trucks traveling through Mandan on West Main are likely not captured in the data. Thus it is important to consider the other data sources provided in this memo. However, the travel patterns reflected in the StreetLight data are likely generally representative of through traffic in Mandan.



STREETLIGHT DESIRE LINES OF TRAVEL FREQUENCY BETWEEN ORIGIN / DESTINATION ZONES VIA MAIN STREET

As shown in **Table 1** and **Figure 2**, the highest-frequency O-D patterns through the Main Street corridor, in order are between:

- ND 6 south of Main Street and East Main Street
- West Main Street and East Main Street
- West Main Street and Memorial Highway
- Sunset Drive and Memorial Highway
- Sunset Drive and East Main Street

Commercial vehicle travel patterns from the data indicate:

- The majority of the through travel are direct east-west trips through the Main Street corridor, or are to and from the south. Trip ends on the west side of Mandan are from West Main Street or south on Highway 6 (10th Ave SW) and on the east side of Mandan are oriented to I-94 or Memorial Highway.
- The general travel patterns in the StreetLight data would indicate that if an alternate truck route were to have the possibility of moving traffic off of Main Street, a route south of Main Street would provide the most direct option. However, the data indicate that Main Street is the most direct route for many through commercial trips in Mandan.

Local Interviews of Truck Trip Generators

HDR conducted interviews with several firms and operations that generate high levels of truck trips in November 2015. These data provide insights into the percentage of current locally-generated trucks and patterns through Mandan, particularly from the Sunny Pit. Most operations have defined routes that trucks typically travel. These routes typically connect to the Interstate or Expressway as quickly as possible. That is the case for many of the large Commercial/Industrial operations including Kist Livestock, Tesoro Refinery and Cloverdale Meats where the major connector is close to the business of operation. Though these operations all use separate routes, they are able to directly access an arterial route directly without creating traffic in downtown Mandan, via routes including: Memorial Highway to Interstate 194 (Bismarck Expressway), Old Red Trail to Interstate 94, and Mandan Avenue to Interstate 94. This is the case with the exception of local truck deliveries.

The greatest generator of truck traffic in Mandan is aggregate trucks that are coming from or heading to the Sunny Pit. In discussions with two of the largest operations that use the Sunny Pit, they generate up to 360 truck trips daily on Main Street alone during peak construction seasons. This number does not include private trucks and smaller operations that are hauling from that location also. The primary haul route for these trucks is across the entire length of Main Street from west to east until they merge onto Interstate 94 east of downtown. The only route to avoid Main Street is to “back track” 2.5 miles to the west and use the I-94 Business Loop exit (Exit 147). For trucks oriented to the east, this is a significant amount of out-of-direction travel.

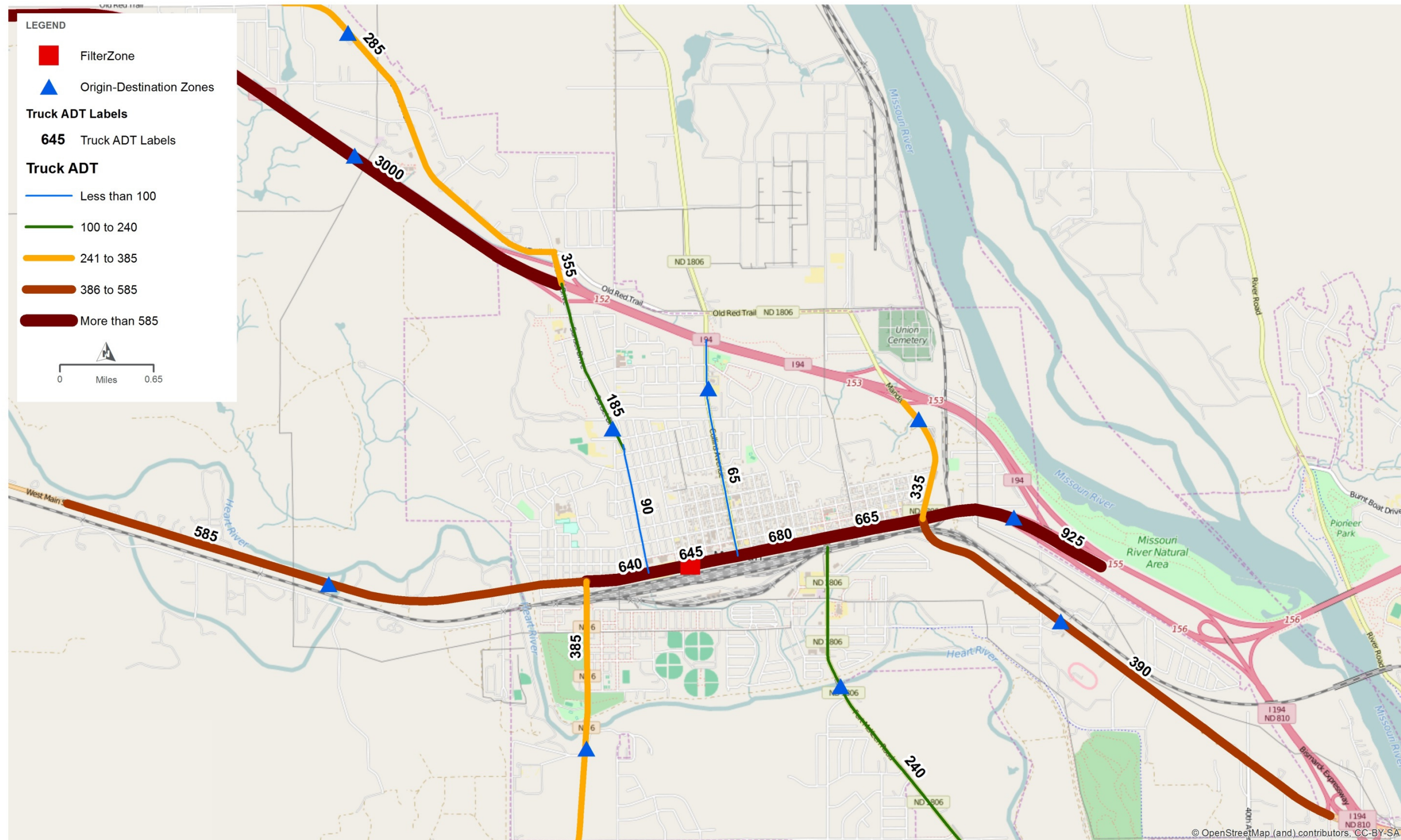
In talking with the owner of the pit, the owner stated that the remaining useful life of the Sunny Pit is between 2 and 5 years. While the owner encouraged the concept of a truck route, they

believed that aggregate trucks from the pit could potentially use it very little since the pit / mining operation would be moved to an undetermined location in the near future. Thus, the closing of the pit at its current location would reduce heavy truck traffic by an estimated 50-60 percent on Main Street through Mandan in the next 2 to 5 years. While there is uncertainty about where the next regional aggregate operation will arise in the future, as it stands a large percentage of Mandan's Main Street truck traffic will disappear with a "Do Nothing" truck route approach. The uncertainty is where in the region the aggregate trucks will be routed when a new pit is established.

Review of NDDOT Truck Counts

Average Daily Traffic (ADT) truck counts available from NDDOT were reviewed. These data provide some additional reference for evaluating truck patterns through the Main Street corridor. A sample of those truck ADTs taken from the NDDOT website at each of our origin / destination stations is shown in **Figure 3**. In general, the truck ADTs shown in **Figure 3** are somewhat consistent with the desire line travel patterns reflected in **Figure 2**. Specifically:

- Truck volumes are relatively consistent (+/- 5%) through the Main St corridor in Central Mandan. This consistent level of truck traffic between Highway 6 and Memorial Highway indicates there are few major "sinks" or "sources" of truck traffic along the corridor.
- Similar to the Streetlight data, prevailing travel patterns indicate two major movements:
 - Travel directly through Mandan from east to west on Main Street.
 - Travel between locations south of Main (ND 6 and ND 1806 and Memorial Highway) and east and west Main Street.
- There appears to be limited truck traffic traveling between south and north Mandan (via Sunset Drive and Collins Ave / ND 1806).



NDDOT AVERAGE DAILY TRAFFIC (ADT) FOR TRUCKS AT STREETLIGHT ORIGIN / DESTINATION STATIONS

Summary

Based on a review of all available data sources, it appears that current truck patterns through central Mandan are predominantly:

- Travel directly through Mandan from east to west on Main Street.
- Travel between locations south of Main (ND 6 and ND 1806 and Memorial Highway) and east and west Main Street.

The general travel patterns reflected by the StreetLight data and NDDOT traffic counts indicate that if an alternate truck route were to have the possibility of moving traffic off of Main Street, a route south of Main Street appears to provide the most direct option. However, the data also indicate that Main Street is the most direct route for many truck trips in Mandan.

As noted, the Sunny Pit operation is anticipated to only have 2 to 5 years of remaining serviceable life at its current location. Based on our interview with local truck generators, and the traffic counts available from NDDOT, this operation accounts for at least 60% of the peak seasonal truck traffic along Main Street through Mandan. Thus, there is some uncertainty about the long term truck patterns through Mandan after this mining operation closes and potentially relocates within the area.