

# Memorandum

SRF No. 11648

**To:** Michael Maddox  
Fargo-Moorhead Metro COG

**From:** Leif Garnass, PE, Principal  
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**Date:** May 3, 2019

**Subject:** US 10/75 Corridor Study – Traffic Forecasts Technical Memorandum

## Introduction

This memorandum summarizes the assumptions and methodology used to develop the year 2045 traffic forecasts for the US 10/75 Corridor Study. To evaluate how the existing roadway network and alternatives will operate in the long-term, year 2045 traffic forecasts were developed using the Fargo-Moorhead Regional Travel Demand Model, which accounts for planned roadway and land use within the area, as well as engineering judgment. The following sections discuss the historical traffic volume trends, the expected growth rate for the study area, and a planning-level capacity review.

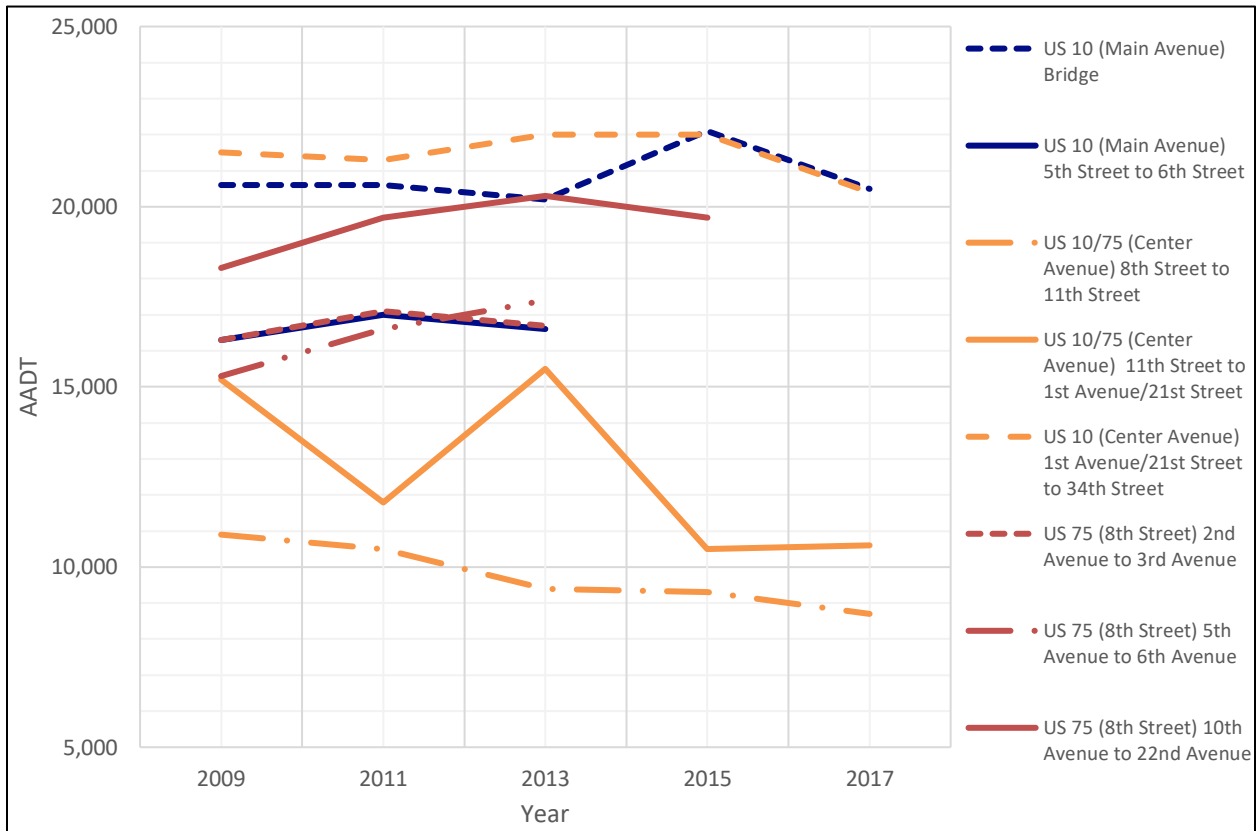
## Historical Traffic Volume Trends

Recent and historical annualized average daily traffic (AADT) volumes were provided by MnDOT for the study area. The traffic volumes were reviewed to identify traffic volume growth trends along Main Avenue (US 10), Center Avenue (US 10/75), and 8th Street (US 75). A graph of the traffic volumes is shown in Figure 1.

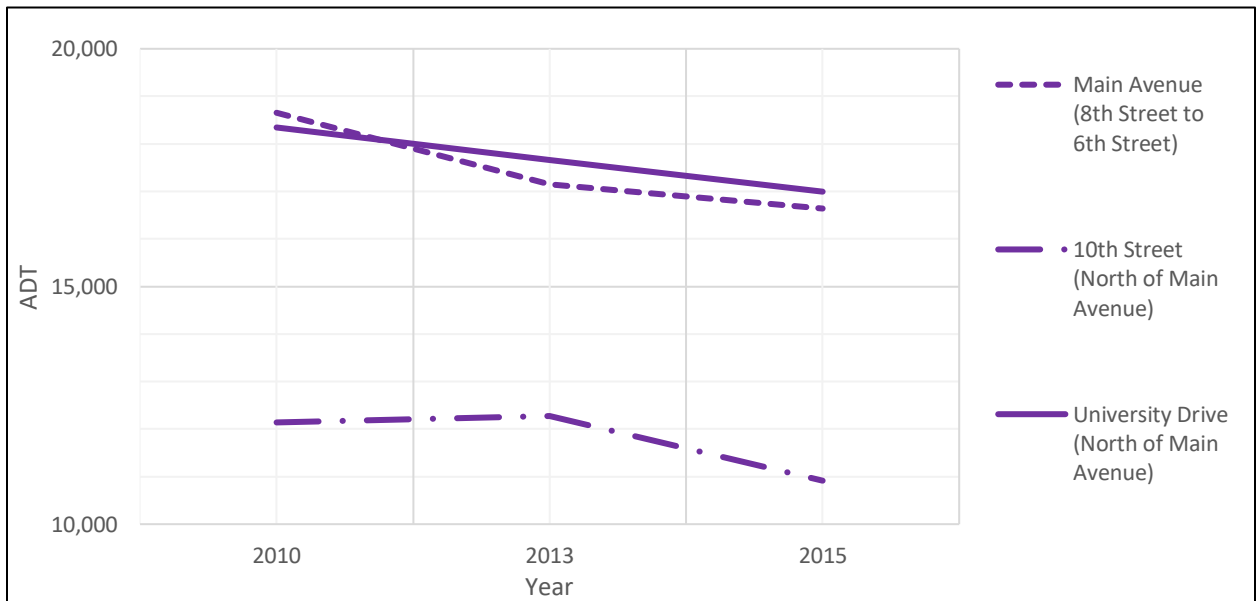
A review of data between year 2009 and 2017 indicates that traffic volumes have remained relatively consistent. There are some locations where traffic volumes have increased an average of three (3) percent per year (e.g., along 8th Street (US 75) between 5th Avenue and 6th Avenue) and locations where traffic volumes have decreased an average of five (5) percent per year (e.g., along Center Avenue (US 10/75) between 11th Street and 21st Street/1st Avenue). The AADT volumes by location and average growth rate (i.e., calculated using MnDOT's linear projection method) for each location are provided in Appendix A.

Additional traffic volume data in Downtown Fargo were also reviewed. In the last 10 to 15 years, redevelopment growth in Fargo has significantly increased with the addition of apartment complexes along with office and retail development. However, as shown in Figure 2, traffic volumes along the major roadways in Downtown Fargo, such as Main Avenue, 10th Street, and University Drive, have not increased. This could suggest that a mode shift has occurred that is associated with the development growth in Downtown Fargo where there is a greater number of people walking/biking/taking transit and/or residents/employees are making more multi-use type trips.

**Figure 1. Historical Traffic Volumes (obtained from MnDOT)**



**Figure 2. Historical Downtown Fargo Traffic Volumes (obtained from NDDOT)**



*Assumptions/ Summary:*

- Historical traffic volumes in Moorhead have remained relatively unchanged.
- Redevelopment growth in Downtown Fargo has significantly increased, but traffic volumes on major roadways have not increased, suggesting that a mode shift has occurred.

## **Travel Demand Model**

The Advanced Traffic Analysis Center (ATAC) provided the project team a travel demand model that was used to determine the expected daily traffic forecast volumes along the US 10/75 corridors. As part of this study, the year 2045 socio-economic (SE) data in the traffic analysis zones (TAZs) near Downtown Moorhead were reviewed and updated based on input provided by Metro COG and the City of Moorhead to be consistent with current development expectations in the Downtown area. The existing (year 2015) and year 2045 SE data (e.g., number of households and number of employees) assumed for this study were mapped and are included in Appendix B.

In addition to modifications to the SE data, SRF also modified the external growth rate in the Travel Demand Model from 2.5 percent to 0.25 percent. A growth rate of 0.25 percent is more consistent with the historical traffic volume growth along roadways external to the Fargo-Moorhead area.

Results of this analysis indicate that an annual growth rate of approximately one (1) percent is expected; however, as previously noted historical traffic volumes in Moorhead have remained relatively unchanged and data reviewed in downtown Fargo suggests that a mode shift has occurred. Therefore, for this study the year 2045 analysis assuming a one (1) percent growth rate was used to assess the risk of the implementation of the alternatives if assumptions were to change in the future. Based on historical data in both downtown Moorhead and downtown Fargo, we do not expect a growth rate of one (1) percent to occur.

*Assumptions/ Summary:*

- Results of this analysis indicate that an annual growth rate of approximately one (1) percent is expected; however, as previously noted historical traffic volumes in Moorhead have remained relatively unchanged and data reviewed in downtown Fargo suggests that a mode shift has occurred. Based on historical data in both downtown Moorhead and downtown Fargo, we do not expect a growth rate of one (1) percent to occur.

## **Planning-Level Capacity Analysis**

Congestion on the roadway system is judged to exist when the ratio of traffic volume to roadway capacity (i.e., v/c ratio) approaches or exceeds 1.0. The ratio of volume-to-capacity provides a measure of congestion along a stretch of roadway and can help determine where roadway improvements, access management, transit services, or demand management strategies need to be implemented. It does not, however, provide a basis for determining the need for specific intersection improvements.

Table 1 provides a method to evaluate roadway capacity. For each facility type, the typical planning-level AADT capacity ranges and 85th percentile AADT volume ranges are listed. These volume ranges are based upon guidance from the Highway Capacity Manual and professional engineering judgment. A range is used since the maximum capacity of any roadway design (i.e.,  $v/c = 1.0$ ) is a theoretical measure that can be affected by its functional classification, traffic peaking characteristics, access spacing, speed, and other roadway characteristics. Further, to define a facility’s “daily capacity,” it is recommended that the top of each facility type’s volume range be used. This allows for capacity improvements that can be achieved by roadway performance enhancements.

**Table 1. Planning-Level Roadway Capacities by Facility Type**

Facility Type	Daily Capacity Ranges (AADT)	Near Capacity (85 % of AADT)
Three-lane Urban	14,000 - 17,000	14,450
Four-lane Undivided Urban	18,000 - 22,000	18,700
Five-lane Urban	28,000 - 32,000	27,200
Four-lane Divided Rural	35,000 - 38,000	32,300

An annual growth rate of one-half (0.5) and one (1) percent was applied to the existing traffic volumes along the US 10/75 Study corridors and compared to the planning-level traffic thresholds in Table 1 based on the existing facility type. As shown in Table 2, no study segments were identified to have existing capacity issues or are expected to in the current planning horizon.

**Table 2. Planning-Level Roadway Capacities (Without Jurisdictional Transfer or Grade Separation)**

Section	Existing Roadway Type	Near Capacity	Existing AADT	Year 2045 AADT (0.5%)	Year 2045 AADT (1.0%)
Main Avenue (US 10) the River to 8th Street	Five-lane Urban	27,200	18,500	21,500	24,900
Main Avenue (US 10) 8th Street to 11th Street	Five-lane Urban	27,200	10,600	12,300	14,300
Center Avenue (US 10/US 75) 8th Street to 14th Street	Five-lane Urban	27,200	9,600	11,200	12,900
Center Avenue (US 10/US 75) 14th Street to 21st Street/1st Avenue	Four-lane Divided Rural	32,300	10,600	12,300	14,300
Center Avenue (US 10) 21st Street/1st Avenue to 34th Street	Four-lane Divided Rural	32,300	22,000	25,500	29,700
8th Street (US 75) 2nd Avenue to 10th Avenue	Five-lane Urban	27,200	17,500	20,300	23,600
8th Street (US 75) 10th Avenue to 22nd Avenue	Five-lane Urban	27,200	19,700	22,900	26,600

*Assumptions/Summary:*

- Based on the existing facility type, no study segments were identified to have existing capacity issues or are expected to in the current planning horizon.

## Route Changes

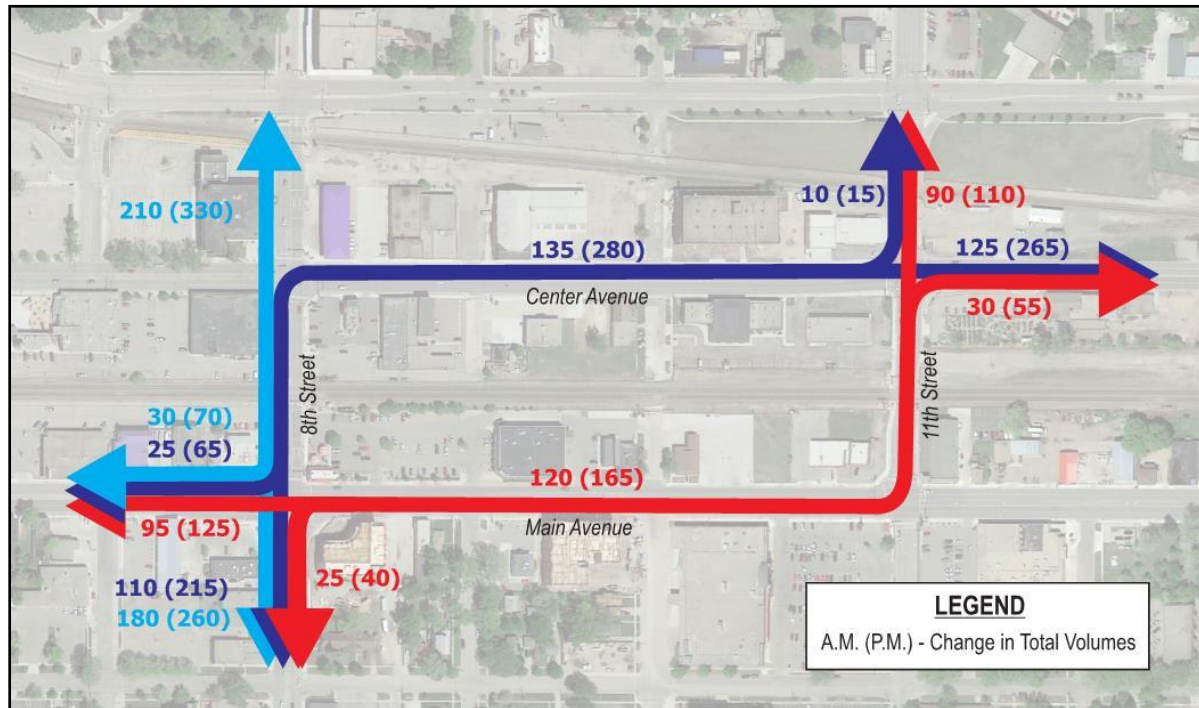
### Jurisdictional Transfer

The 2013 Corridor Study and subsequent Moorhead Downtown Grade Separation Study recommended a jurisdictional transfer of US 10/75 from the existing jurisdiction along 8th Street (between Main Avenue and Center Avenue) and along Center Avenue (between 8th Street and 11th Street) to a future jurisdiction along Main Avenue (between 8th Street and 11th Street) and along 11th Street (between Main Avenue and Center Avenue). This transfer is expected to occur regardless of if/when 11th Street has grade-separated railroad crossings between Main Avenue and Center Avenue (BNSF KO Subdivision) and between Center Avenue and 1st Avenue (BNSF Prosper Subdivision).

To determine the expected traffic shifts for the jurisdictional transfer and for when 11th Street is grade-separated, existing traffic volumes and patterns were reviewed. It was assumed that trucks and vehicles utilizing GPS or drivers that are unfamiliar with the roadway network are the most likely to follow the road jurisdiction. Additionally, the existing travel times and peak hour traffic volumes for motorists using the existing and future jurisdiction were reviewed to identify the potential for motorists to change their route.

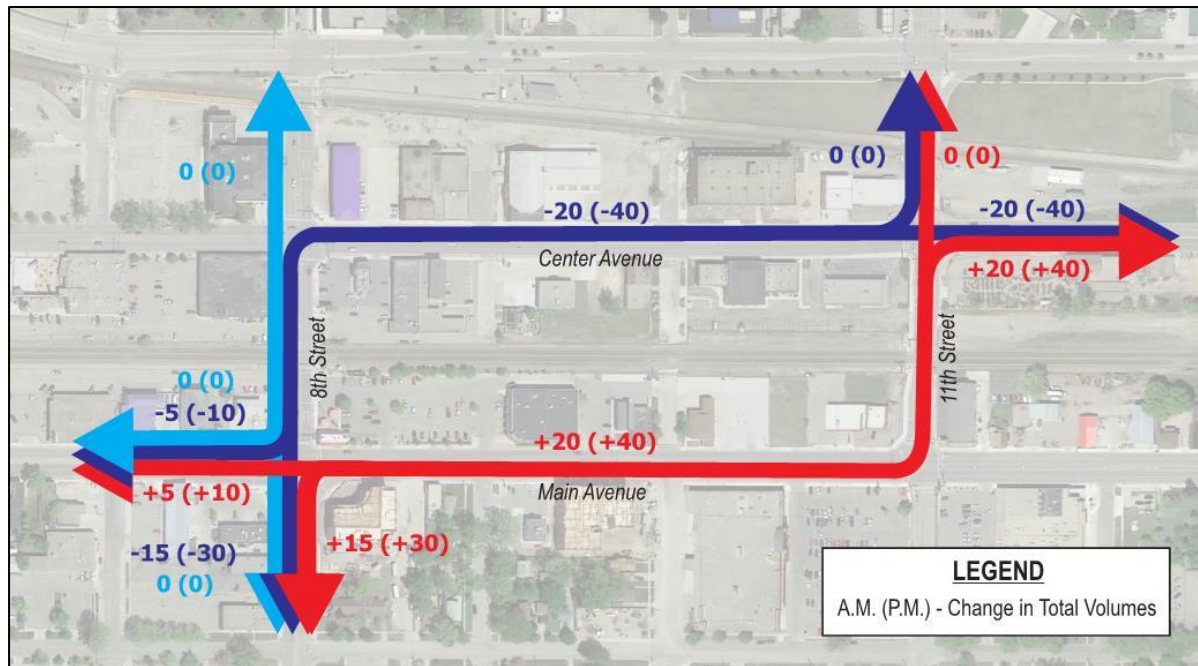
Results of the travel time analysis indicate that the future jurisdiction on 11th Street has the same or faster travel time in both directions compared to the existing jurisdiction on 8th Street. Further review of existing traffic volumes and patterns indicates that motorists are generally selecting the route that they need to make the least amount of turns, in particular left-turns. The existing volumes are summarized in Figure 3. It should be noted that vehicles traveling northbound and southbound along 8th Street, with origins/destinations north of 1st Avenue are included in Figure 3 (light blue) and discussed further under the grade separation alternative.

**Figure 3. Existing Traffic Volumes Along Existing/Future Jurisdiction and 8th Street**



Based on this review, it is estimated that with the jurisdictional transfer, approximately 15 percent of motorists will change their route from the current alignment (dark blue) to the future jurisdiction (red). The 15 percent includes trucks, which make up approximately five (5) percent of vehicles, as well as motorists that are using GPS or are unfamiliar with the area, which are estimated to make up approximately 10 percent of vehicles. The change to peak hour volumes with existing traffic volumes between the existing and future jurisdiction is shown in Figure 4.

**Figure 4. Jurisdictional Transfer Existing Traffic Volume Shift**



### Grade-Separation

If/when 11th Street is grade-separated between Main Avenue and Center Avenue (BNSF KO Subdivision) and between Center Avenue and 1st Avenue (BNSF Prosper Subdivision), this provides a reliable routing option for motorists without risk of getting stopped by a train. Once this grade-separation occurs, it is anticipated that more motorists will change their route to 11th Street and a behavioral change will result in more motorists using 11th Street regardless of if there is a train or not. In addition to reviewing the percent of vehicles expected to change their route from the current to future jurisdiction under the grade-separation alternative, a similar percent of vehicles currently traveling northbound or southbound along 8th Street at Center Avenue, are expected to reroute to the 11th Street corridor to avoid the at-grade railroad crossings along 8th Street. It is estimated that with the grade-separation, approximately 75 percent (60 percent shift plus 15 percent from jurisdictional transfer) of daily traffic volume trips will change their route to utilize the grade-separation along 11th Street. This is consistent with the assumptions used for the 2013 Corridor Study.

However, during peak periods, it is expected that less than 75 percent of trips will shift to 11th Street due to traffic operational and queuing issues along Main Avenue at the 8th Street and 11th Street intersections. Therefore, through an iterative process that balanced the expected demand of motorists that would want to use 11th Street with the expected traffic operations during the peak periods at the study intersections, it was determined that approximately 50 percent of peak hour trips would be expected to change their route from 8th Street to 11th Street. The change to peak hour volumes with existing traffic volumes with the grade-separation and jurisdictional transfer is shown in Figure 5. The existing traffic volumes with the resultant grade-separation and jurisdictional transfer shifts is shown in Figure 6.

Figure 5. Grade-Separation and Jurisdictional Transfer Existing Traffic Volume Shift

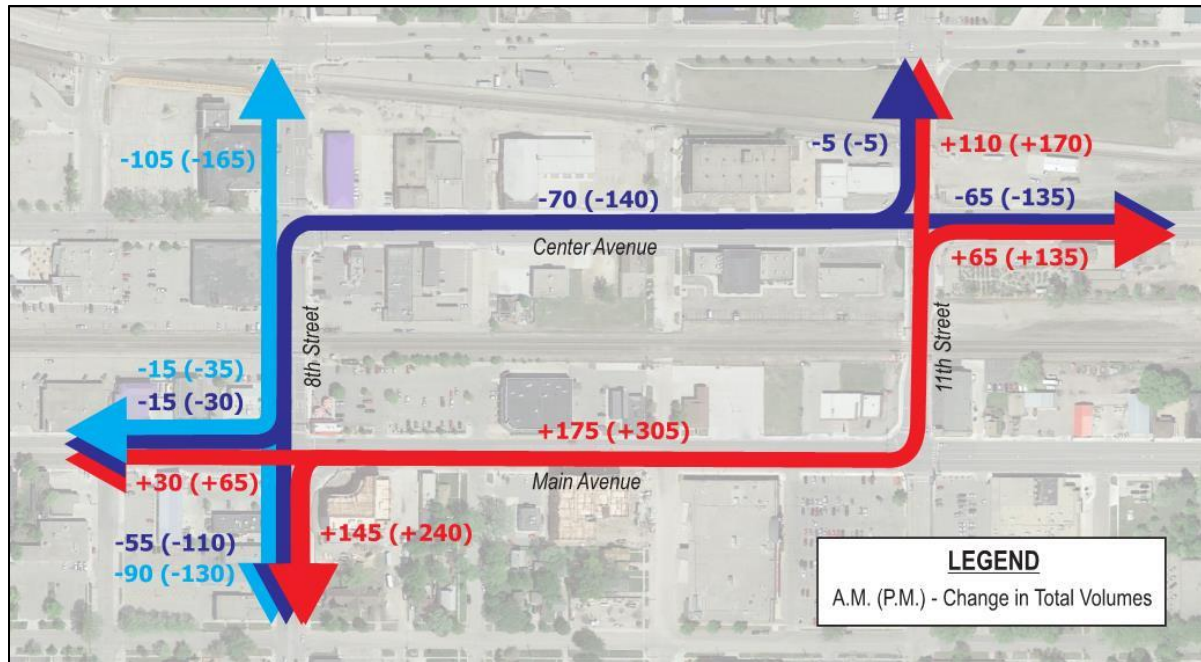
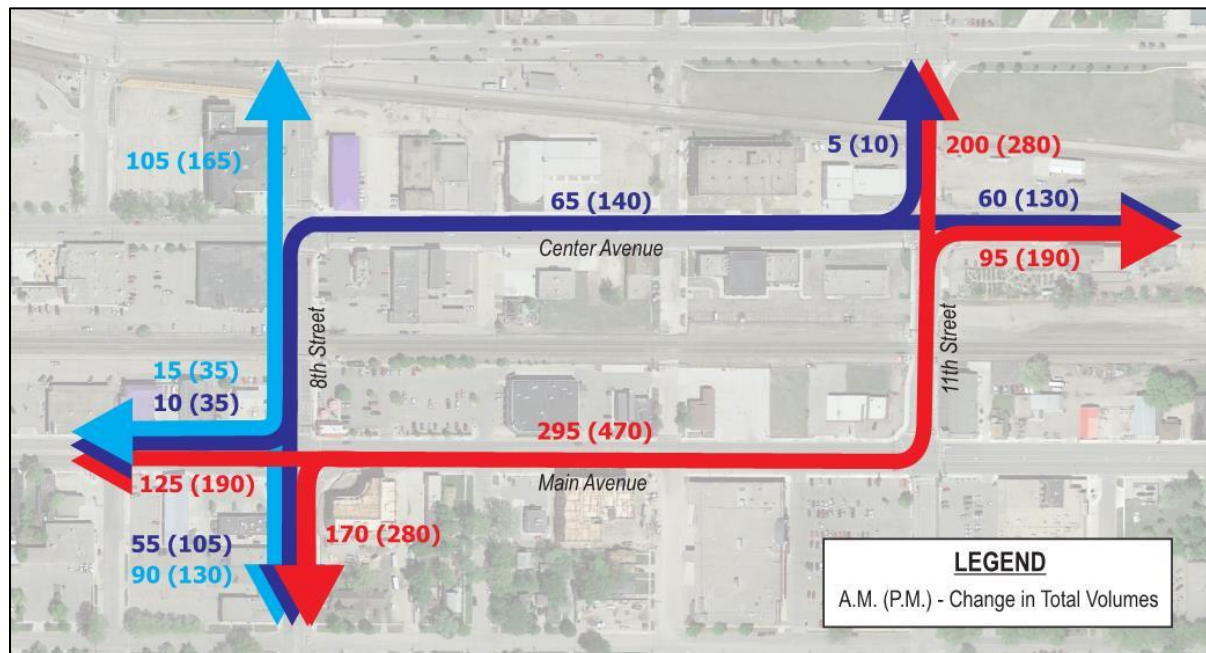


Figure 6. Existing Traffic Volumes with Grade-Separation and Jurisdictional Transfer





The grade-separation has the potential to impact travel patterns for other movements that are not shown in Figure 5. However, since these travel pattern routes are relatively minor movements (20 or less peak hour trips), minimal travel pattern shifts are expected for these movements due the 11th Street grade separation and therefore those motorists were not rerouted. Existing, year 2045 base (1% growth rate), year 2045 with the jurisdictional transfer, and year 2045 with the grade-separation peak hour intersection turning movement volumes are provided in Appendix C and estimated change in AADT's for each alternative are shown below in Table 3.

**Table 3. AADT Summary**

<b>Section</b>	<b>Existing Roadway Type</b>	<b>Existing AADT</b>	<b>2045 Base (1%)</b>	<b>2045 Jurisdictional Transfer</b>	<b>2045 Grade-Separation</b>
Main Avenue (US 10) 8th Street to 11th Street	Five-lane Urban	10,600	14,300	14,800	19,300
Center Avenue (US 10/US 75) 8th Street to 14th Street	Five-lane Urban	9,600	12,900	12,400	10,900

*Assumptions/ Summary:*

- It is estimated that with the jurisdictional transfer, approximately 15 percent of motorists will change their route from the current jurisdiction to the future jurisdiction.
- If/when 11th Street is grade-separated, approximately 75 percent of motorists will change their route from the current jurisdiction, including northbound/southbound vehicles along 8th Street at Center Avenue, to the future jurisdiction/11th Street corridor.
  - It is anticipated that 50 percent of these motorists will change their route during the peak hours, due to operational and queuing issues along Main Avenue at the 8th Street and 11th Street intersections.

**Appendix A**  
**Historical Traffic Trends**

# Historical Traffic Volume Review

## Moorhead

### 1 US 10 (Main Avenue) Bridge

2009	20600	
2011	20600	
2013	20200	0.32%
2015	22100	
2017	20500	

### 5 US 10 (Center Avenue) 1st Avenue/21st Street to 34th Street

2009	21500	
2011	21300	
2013	22000	-0.37%
2015	22000	
2017	20400	

### 2 US 10 (Main Avenue) 5th Street to 6th Street

2009	16300	
2011	17000	0.45%
2013	16600	

### 6 US 75 (8th Street) 2nd Avenue to 3rd Avenue

2009	16300	
2011	17100	0.60%
2013	16700	

### 3 US 10/75 (Center Avenue) 8th Street to 11th

2009	10900	
2011	10500	
2013	9400	-3.22%
2015	9300	
2017	8700	

### 7 US 75 (8th Street) 5th Avenue to 6th Avenue

2009	15300	
2011	16600	3.02%
2013	17400	

### 4 US 10/75 (Center Avenue) 11th Street to 1st

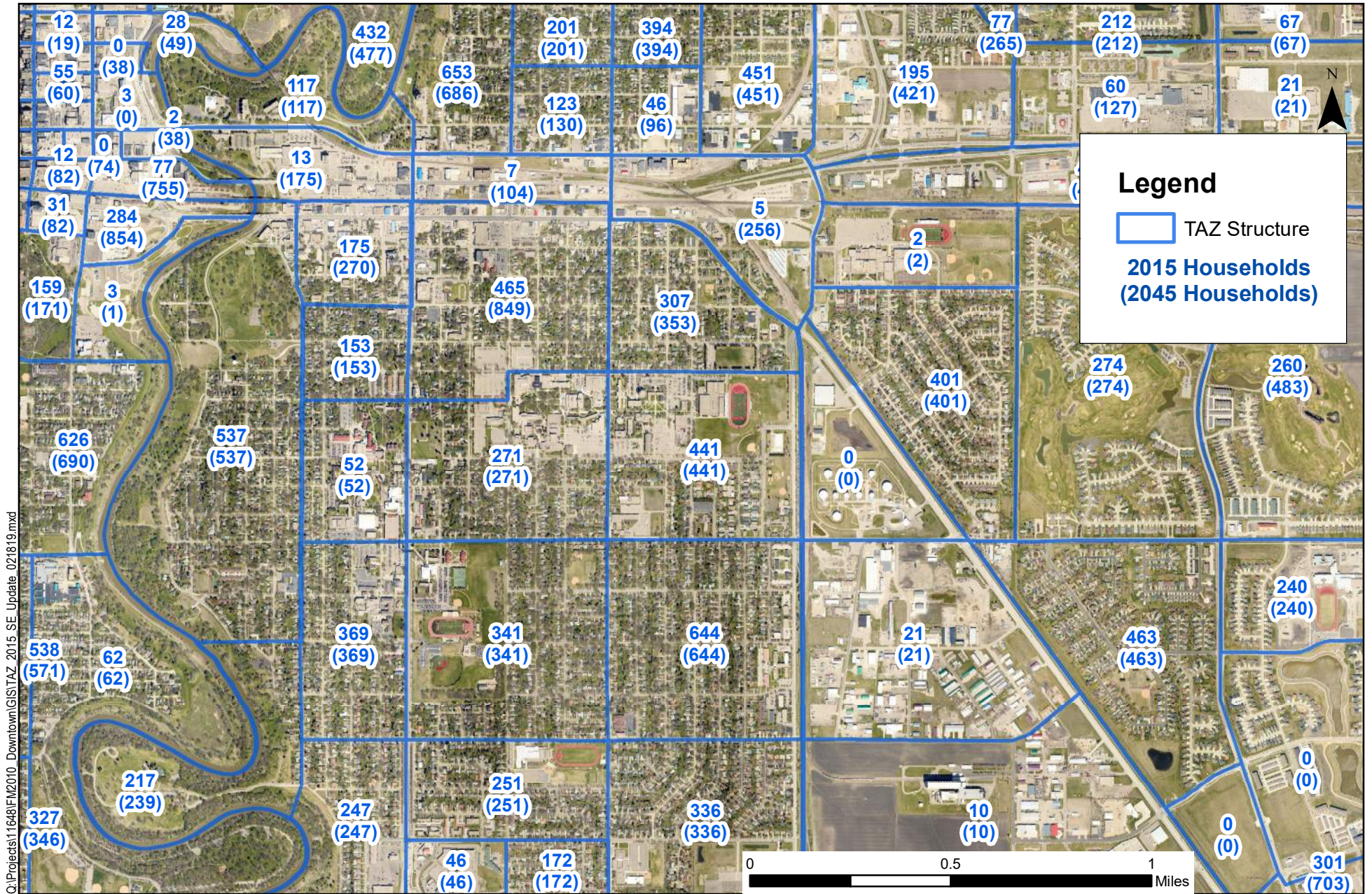
2009	15200	
2011	11800	
2013	15500	-4.95%
2015	10500	
2017	10600	

### 8 US 75 (8th Street) 10th Avenue to 22nd Avenue

2009	18300	
2011	19700	1.22%
2013	20300	
2015	19700	

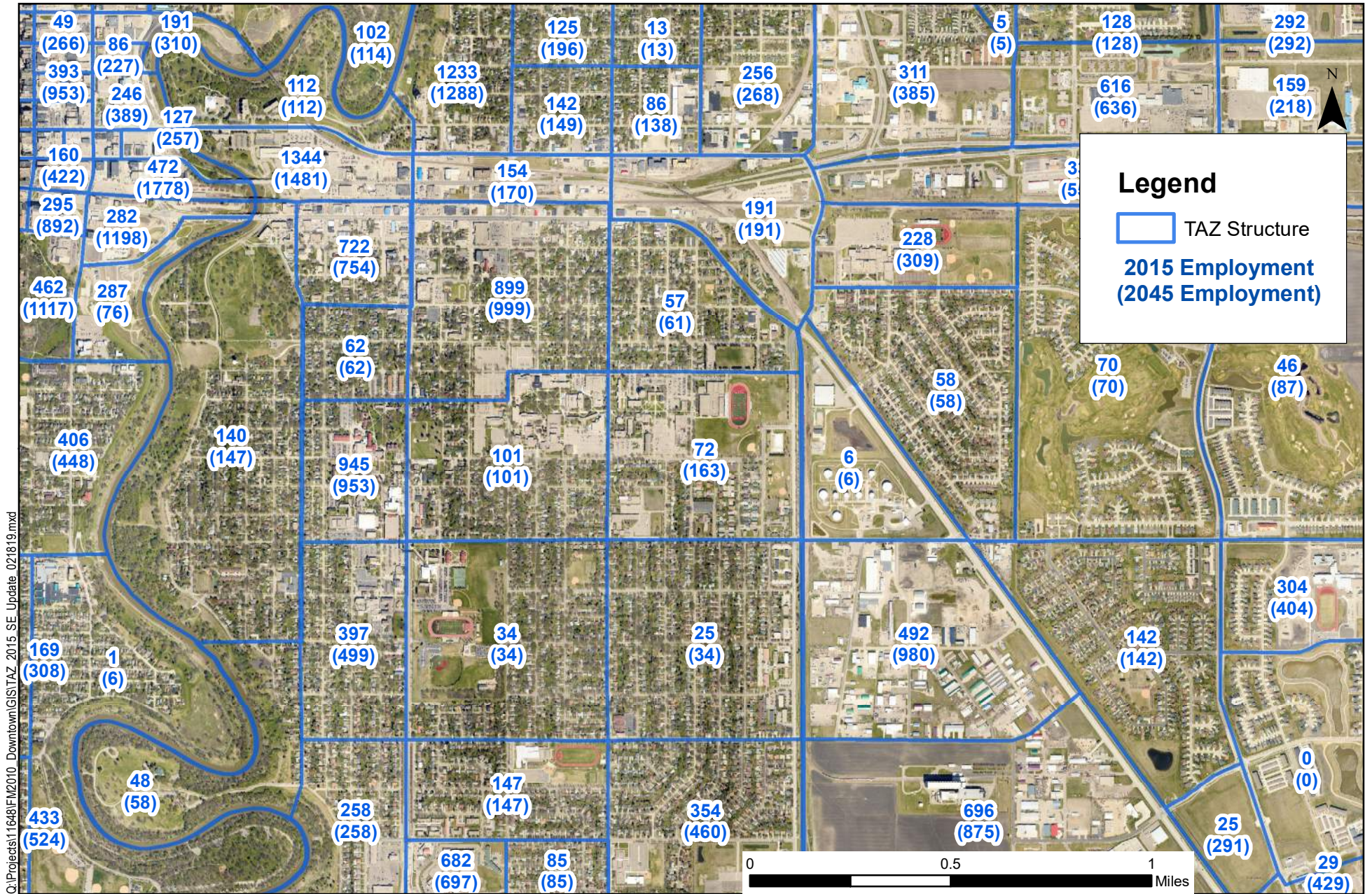
Average Growth Rate **-0.37%**

**Appendix B**  
**TAZ Maps**



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**Households by TAZ**



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**Employment by TAZ**

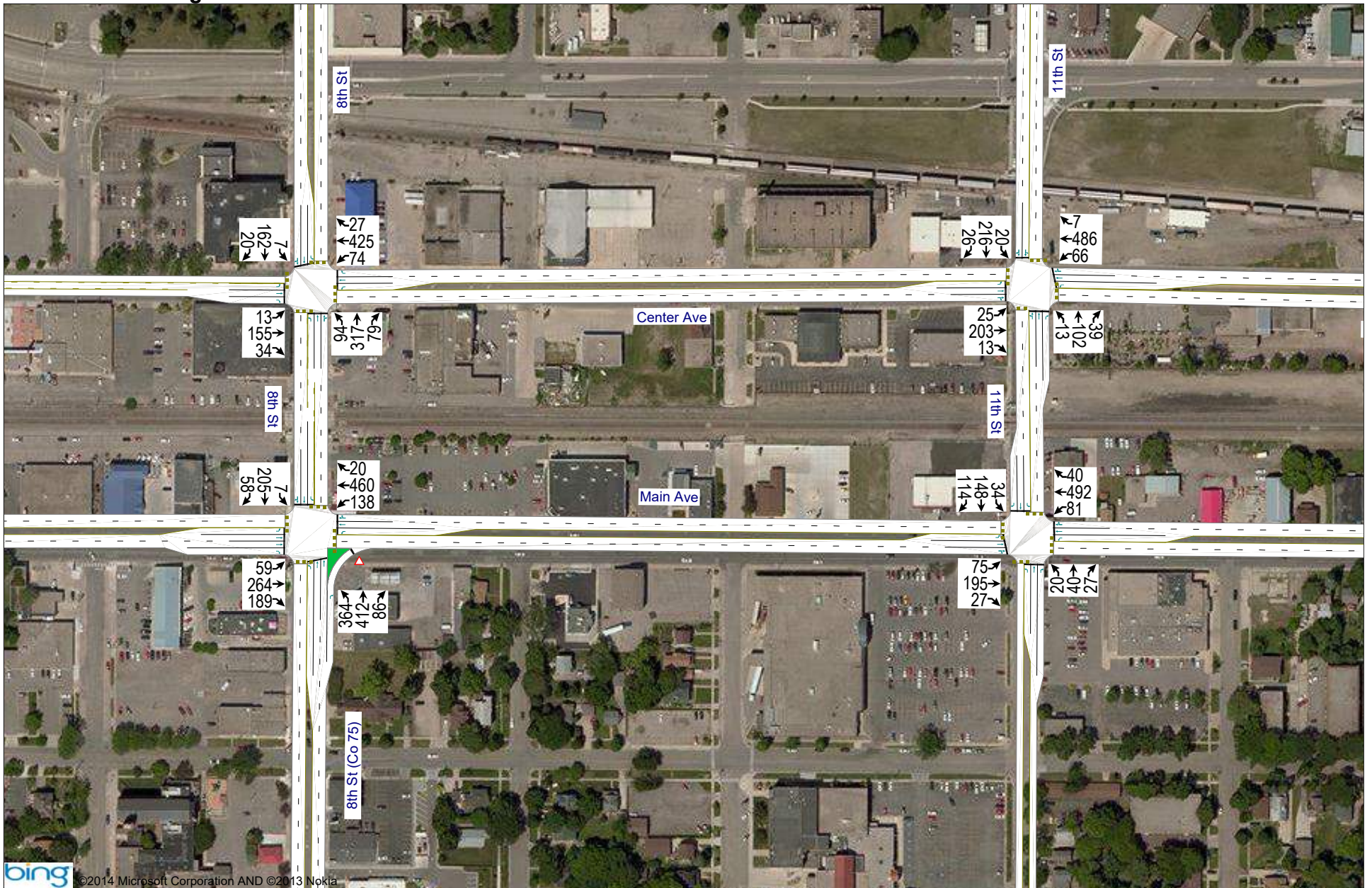
**Appendix C**  
**Existing and Year 2045**  
**Intersection TMC**

**2045 AM Peak Hour - 1% Growth Rate  
Base Conditions**





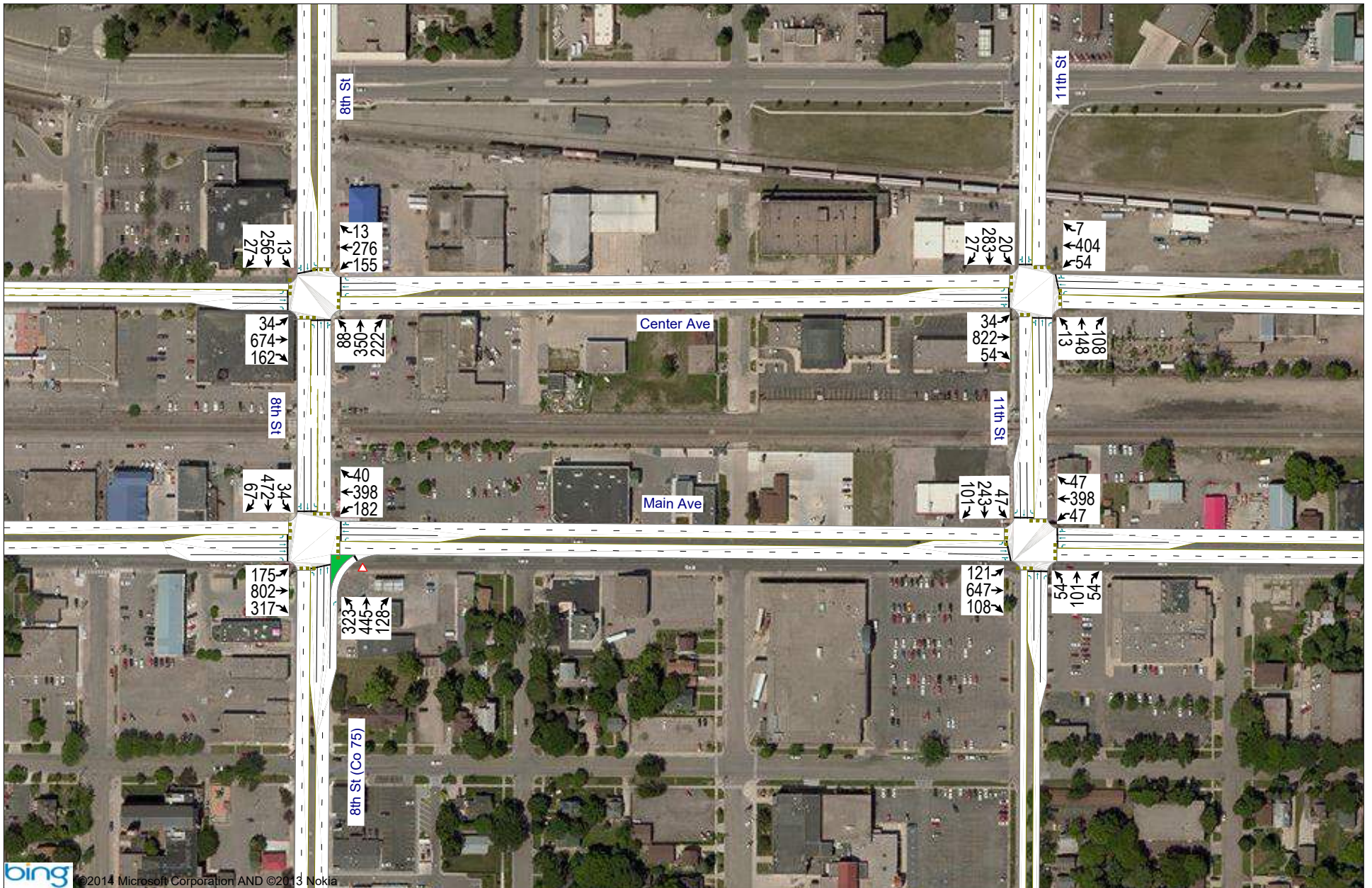
**2045 AM Peak Hour - 1% Growth Rate  
Jurisdiction Change**



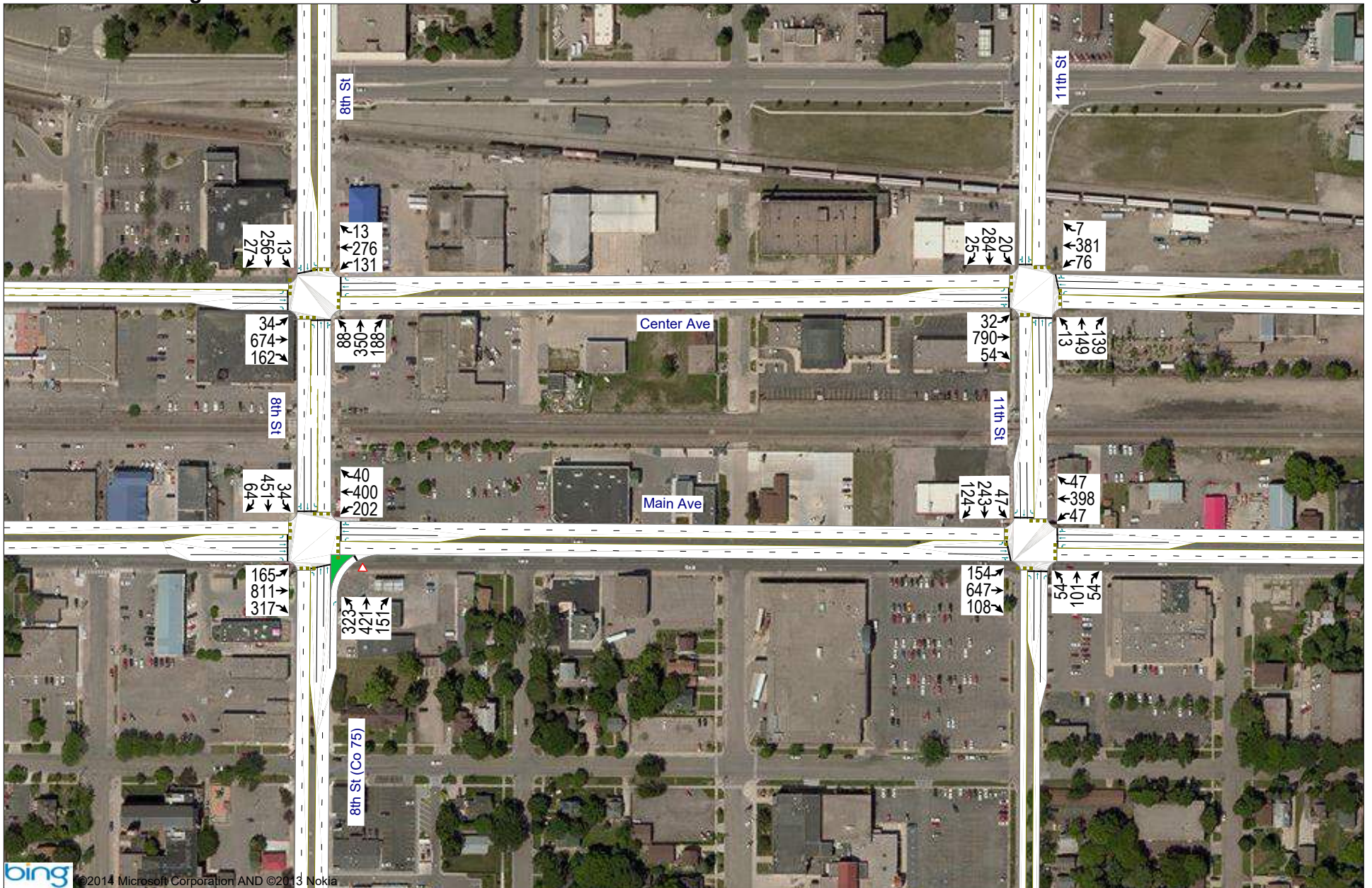
2045 AM Peak Hour - 1% Growth Rate  
 11th Street Underpass



**2045 PM Peak Hour - 1% Growth Rate  
Base Conditions**



**2045 PM Peak Hour - 1% Growth Rate  
Jurisdiction Change**



2045 PM Peak Hour - 1% Growth Rate  
 11th Street Underpass

