

13th Avenue Corridor Study

Main Avenue W to 17th Street E

West Fargo, North Dakota

February 1, 2019



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Executive Summary

The 13th Avenue Corridor in West Fargo has experienced an increase in traffic volumes, deteriorating pavement conditions, and is expected to undergo development along the west end in the near future. This study was conducted to identify existing and future anticipated traffic patterns, as well as develop proposed build or no-build alternatives necessary to accommodate the multimodal needs of the corridor.

Project Background

The study area consisted of 13th Avenue and Cass County Road 28 (CR28), limits of the study were from Main Avenue W to 17th Street E. The corridor serves various land uses, ranging from commercial development between 17th Street E and Sheyenne Street, transitioning to residential housing through a park between Sheyenne Street and 10th Street W. The Red River Valley Fairgrounds encompasses the segment of CR28 included in the study, which begins west of 10th Street W. All segments of the corridor bring unique issues and needs. The study area was broken into four segments during alternative development because of the varying needs and issues. They are:

- Segment 1 – CR28 from Main Avenue W to 10th Street W
- Segment 2 – 13th Avenue W from 10th Street W to Sheyenne Street
- Segment 3 – 13th Avenue W / E from Sheyenne Street to Prairie Parkway
- Segment 4 – 13th Avenue E from Prairie Parkway to 17th Street E

The City of West Fargo recently completed two separate reconstruction projects on Segment 4. Those projects included the intersection of 13th Avenue E and 9th Street E which began in 2017 and concluded in late 2018. The second project was located along 13th Avenue E from 12th Street E to 17th Street E (West Fargo City limits). The remaining segments of the corridor currently are not programmed by the City of West Fargo within their five-year budget.

Figure 2. Corridor Overview



Existing Traffic Operations

2015 was selected as the baseline year for the existing conditions analysis due to the fact that it had the most consistent data in regards to annual average daily traffic (AADT) counts and turning movement counts at the major signalized intersections. Any 2017 counts received or collected were adjusted to 2015 volumes based on AADT growth rates at similar locations along the corridor between 2015 and 2017. The 2015 turning movement counts are provided in Figure 26.

Synchro 8 software was utilized in analyzing the 13th Avenue corridor intersections to determine Level of Service (LOS), capacity, delay, and queue lengths of turning lanes. The following analysis results were determined:

Signalized intersection findings from Table 2:

- Sheyenne Street and 9th Street are the only signalized intersections that experienced LOS D or E on the eastbound and/or westbound approaches. All other signalized intersections that experienced LOS D or lower occurred on the northbound or southbound approaches.
- Significant queue lengths occurred on the eastbound left-turn lane at the intersection of 13th Avenue/9th Street, as well as the northbound and southbound left/through lanes at 13th Avenue/17th Street.
- The 13th Avenue and 9th Street intersection is currently under construction with the intent of incorporating a dual left turn lane for the southbound approach.
- The intersections of 13th Avenue/14th Street and 13th Avenue/17th Street experience unacceptable LOS for both northbound and southbound left-turning vehicles during AM and PM peak hours.

Two-way stop controlled intersection findings, from Table 4:

- The intersection of Main Avenue/Cass County 28 is the only intersection to experience an approach LOS lower than C during the AM peak hour. During the PM peak hour however, four of the five intersections experience unacceptable LOS on the minor approaches.
- The intersections of 13th Avenue/1st Street and 13th Avenue/Prairie Parkway experienced a southbound approach LOS E, while Main Avenue/Cass County 28 and 13th Avenue/16th Street experienced LOS F.

The all-way stop intersection of 13th Avenue/8th Street, shown in Table 3, experienced acceptable LOS for all approaches during both the AM and PM peak hours under existing traffic volumes.



Safety Analysis

Using crash data provided from NDDOT for the years 2012 to 2016, a heat map was developed to identify locations or intersections that experience high density levels in terms of crashes. The only intersection identified with high crash density levels is the intersection of 13th Avenue and 9th Street. During the five-year study period, a total of 253 crashes occurred on the corridor between Main Ave and 17th Street. There were zero fatalities. Seventy-five total crashes were injury-related and 178 crashes resulted in property damage only.

Intersection Crashes

- Of the total 253 crashes previously mentioned, 195 were categorized as intersection crashes.
- Of the total 195 intersection crashes, 84 (43 percent) were categorized as angle-type crashes. A total of 72 (37 percent) were rear end crashes, while the third most common type of crash (11 percent) was identified as non-collision with motor vehicle, meaning the crash was between a vehicle and another obstacle rather than with another vehicle.

Segment Corridor Crashes

- The 13th Avenue corridor study area had 58 reported segment crashes during the five-year analysis period.
- Of those 58 crashes, only six were confirmed as injury-related.
- The only incapacitating injury crash was located on the north approach of 9th Street.

Crash Rates

Crash rates were also calculated and reviewed for intersections and segments along the corridor. All crashes that occurred within the study period of 2012 to 2016 were included in the exposure rate. Table 7 and Table 8 summarize and provide comparison for the calculated segment and intersection crash rates for the study area.

Table 7. Corridor Crash Rates by Segment

Segment	Ranking	Crash Rate (Crashes/MVMT)	MnDOT Comparison for Similar Section
13th Avenue - 10th Street to 8th Street	Highest	4.12	1.32
13th Avenue - Prairie Parkway to 9th Street		2.32	2.76
13th Avenue - 14th Street to 16th Street		1.80	2.76
13th Avenue - 9th Street to 14th Street		1.78	2.76
13th Avenue - Average Crash Rate for Corridor		1.57	-
13th Avenue - 16th Street to 17th Street		1.35	2.76
13th Avenue - 8th Street to Sheyenne Street		1.07	1.32
13th Avenue - Sheyenne Street to 1st Street		0.96	3.80
Cass County 28 - Main Avenue to 10th Street		0.92	1.46
13th Avenue - 1st Street to 6th Street		0.87	3.80
13th Avenue - 6th Street to Prairie Parkway	Lowest	0.49	2.76

*Yellow highlight denotes crash rate higher than corridor average

Table 8. Corridor Crashes by Intersection

Intersection	Ranking	Crash Rate (Crashes/MEV)	MnDOT Comparison for Similar Intersection
13th Avenue / 9th Street	Highest	1.63	0.70
13th Avenue / 17th Street		0.75	0.70
13th Avenue / 16th Street		0.71	0.18
13th Avenue / 8th Street		0.63	0.35
13th Avenue / Sheyenne Street		0.59	0.52
Average Intersection Crash Rate for Corridor		0.54	-
13th Avenue / 6th Street	Lowest	0.51	0.52
13th Avenue / 14th Street		0.49	0.70
Main Avenue / Cass County 28		0.36	0.18
13th Avenue / 1st Street		0.13	0.18
13th Avenue / Prairie Parkway		0.11	0.18
13th Avenue / 10th Street		0.00	0.18

*Yellow highlight denotes crash rate higher than corridor average

Crash Rate Findings:

- The study area result comparison provided in Table 8 reiterates what the crash density heat map showed in that the intersection of the 13th Avenue and 9th Street experiences a very high frequency of crashes.
- Five intersections demonstrated crash rates that exceeded the average comparison for the study corridor of 0.54 crashes per million entering vehicles. These four locations of the highest crash rates include the intersections of 13th Avenue and 8th Street, 9th Street, 17th Street, and 16th Street.
- The segment of 13th Avenue between 10th Street and 8th Street is shown to have the highest crash rate for segments along the corridor.

Traffic Forecasting

A scenario development workshop was conducted with the Study Review Committee (SRC) to identify potential land use and transportation network scenarios that may impact the 13th Avenue corridor. The SRC identified various land use and transportation network scenarios. Using 2015 as the baseline, each scenario combination identified as feasible was analyzed with FM Metro COG’s 2045 Travel Demand Model to identify the future traffic projections. For each land use scenario, socio-economic data was developed to account for the land use changes in the travel analysis zones (TAZ).

The results of the 2045 forecasted LOS under No-Build conditions were analyzed for each corridor intersection, and are provided below.

Signalized intersection findings include the following:

- All but one of the signalized intersections demonstrated acceptable LOS for the existing lane configurations under forecasted traffic volumes, except for the intersection of Main Avenue/CR28 during the PM peak hour.

- The intersection of Main Avenue/CR28 showed significant delays and an overall intersection LOS of E under the existing lane configuration. During the PM peak hour, the eastbound and westbound approaches experienced LOS D, with the eastbound left-turning movement experiencing LOS F. The south approach experienced LOS F as well.

For two-way stop controlled intersections:

- The increase in the projected traffic volumes resulted in unacceptable LOS for the northbound and southbound minor approaches at three of the four intersections during the PM peak hour.
- These intersections were evaluated to determine if traffic signal warrants were met using the criteria identified in the Manual on Uniform Traffic Control Devices. None of these intersections met the signal warrant criteria.
- Also, all three of these intersections have alternate ways to access 13th Avenue at a signalized intersection.

For all-way stop control:

- The all-way stop intersection of 13th Avenue/8th Street experienced acceptable LOS for all approaches during both the AM and PM peak hours under forecasted traffic volumes.

Further analysis regarding the effectiveness of lane improvements was conducted on the intersection of Main Avenue/CR28 to improve its PM peak hour LOS. The 2045 forecasted LOS was evaluated again for this intersection under proposed Build Conditions.

The following recommendations are based on LOS results:

- Implement a southbound right turn lane at the intersection of Main Avenue/CR28.
- Implement a southbound protected-permissive left turn lane at the intersection of Main Avenue/CR28.
- Install a northbound protected-permissive designated left at the intersection of Main Avenue/CR28.
- Implement protected-permissive left turns when possible at all other intersections to optimize capacity.

No other lane improvements were deemed necessary since all of the other signalized intersections experienced LOS D or better. Also, as previously mentioned, none of the stop-controlled intersections meet warrants for conversion to traffic signals.

Issues and Needs

The following is a list of specific needs/issues that were identified for this study:

- Sections of the corridor are experiencing failing pavement conditions which will result in the need for reconstruction in the near future.
- Vacant land along the western portion of the corridor has been targeted for development. Access management, traffic operations, and safety will need to be addressed as this area develops.
- With future growth areas potentially opening up southwest of Interstate 94, an overpass connection across Interstate 94 may be considered in the future. The traffic and safety impact on 13th Avenue resulting from a grade separation will need to be addressed.
- The CR28 and Main Avenue intersection is projected to have failing traffic operations by the year 2045 during the PM peak hour. It should be noted that analysis of this intersection was completed before the traffic signals were added.

The primary goal of this study is to develop feasible solutions for these issues and needs.

Alternatives

Development

The alternatives developed for this analysis were completed utilizing a high-level, concept-based layout. It is recommended that further detailed analysis and design be required if any specific alternative moves forward into a project. As a result of the recently developed comprehensive plan, *West Fargo 2.0: Redefining Tomorrow*, the City would like to include certain aesthetics and corridor characteristics as part of future projects. It is recommended to incorporate these desires through both geometric design and streetscaping in efforts to promote consistency and cohesiveness along the corridor.

A bulleted list of alternatives are listed below; further discussion is provided in the Development of Alternatives section of this report.

- Segment 1
 - No Build
 - Two-Lane (Urban)
 - Two-Lane (Rural)
 - Interstate 94 (I-94) Overpass Connection
- Segment 2
 - No Build
 - Safety Improvements
- Segment 3
 - No Build
 - Four-Lane Divided (Urban)
- Segment 4
 - No Build



Analysis

While additional lanes are not warranted along the 13th Avenue Corridor, the addition of a raised median to a lane configuration can help increase safety. The two-lane divided (urban) alternative in Segment 1 and the four-lane divided (urban) alternative in Segment 3 incorporate raised medians. Safety improvements along all segments of the corridor include potentially reconstructing left turn lanes to have positive offsets, updating all pedestrian signing to ensure adequate reflectivity, updating all crosswalk pavement markings, and adjusting truncated domes on pedestrian ramps to sidewalks so they are properly aligned with crosswalks.

High-level cost estimates for each alternative within each segment are listed below. Costs shown are in 2019 U.S. dollars.

Segment 1

- No Build..... NA
- Two-Lane Urban..... \$5,500,000
- Two-Lane Divided Urban \$6,750,000
- I-94 Overpass Connection (90° realign)
 - Bridge \$11,500,000
 - Right-of-Way \$150,000
 - Standard Intersection option \$1,400,000
 - Roundabout option..... \$4,000,000
- I-94 Overpass Connection (13th Ave or CR 28 current alignment)
 - Bridge \$17,500,000
 - Right-of-Way \$150,000
 - Standard Intersection option \$1,400,000
 - Roundabout option..... \$4,000,000

Segment 2

- No Build..... NA
- Safety Improvements..... \$500,000

Segment 3

- No Build..... NA
- Four-Lane Divided Urban..... \$6,350,000

Segment 4

- No Build..... NA

Public Involvement

The public involvement process was introduced at two stages of the study, the initial input opportunities began with data gathering and the public was given opportunities to comment on the alternatives once they were developed. A combination of grass-roots events, online surveys, Study Review Committee (SRC) meetings, a public open house, and a virtual open house were utilized throughout the study to facilitate public involvement.

The online survey had 285 respondents. Figure 1 shows a breakdown of demographics of the respondents.

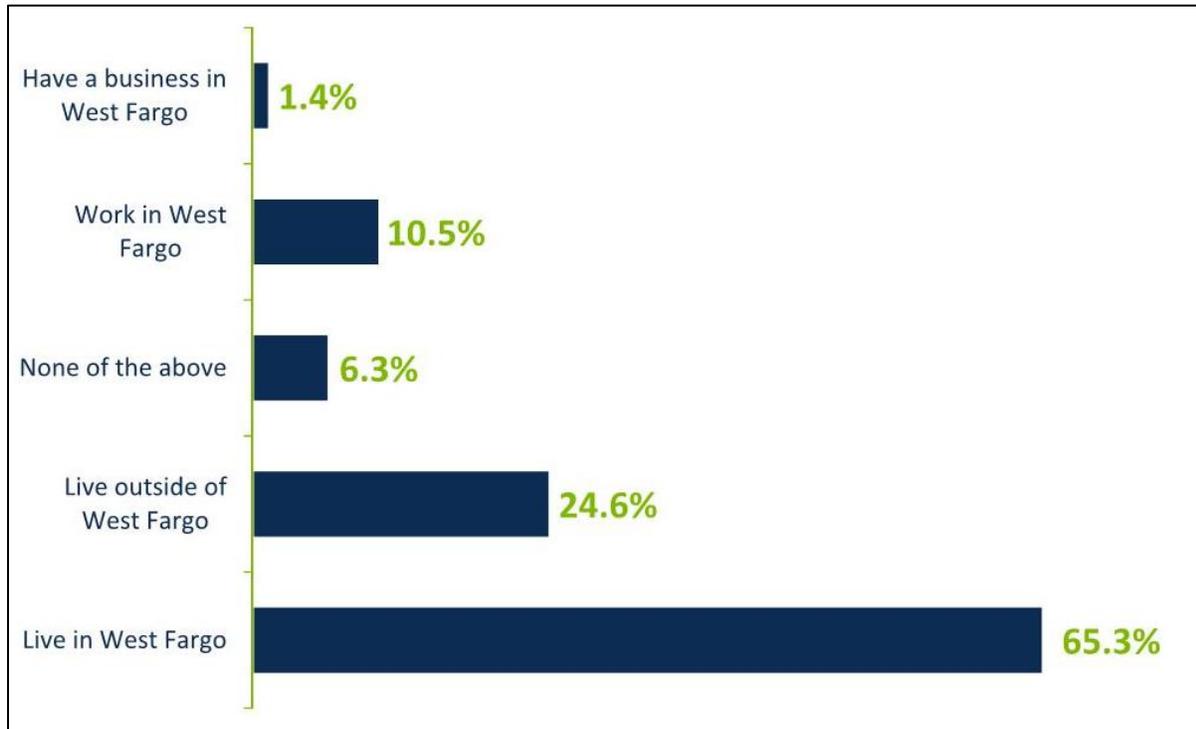


Figure 1. Online Survey Respondent Demographics

Project Background

Introduction

The 13th Avenue corridor in West Fargo has experienced an increase in traffic volumes, deteriorating pavement conditions, and is expected to undergo development along the west end in the near future. As a result, the Fargo-Moorhead Metropolitan Council of Governments (Metro COG) has requested a study to identify existing and future anticipated traffic patterns, as well as develop proposed build or no-build alternatives necessary to accommodate the multimodal needs of the corridor.

Study Area

As shown in Figure 2, this study includes Cass County Road 28 (CR28) from Main Avenue W to 10th Street W and 13th Avenue from the City limits to 17th Street E. This corridor has been divided into four unique segments because of varying needs and issues:

- Segment 1 – CR28 from Main Avenue W to 10th Street W
- Segment 2 – 13th Avenue W from 10th Street W to Sheyenne Street
- Segment 3 – 13th Avenue W / E from Sheyenne Street to Prairie Parkway
- Segment 4 – 13th Avenue E from Prairie Parkway to 17th Street E.



Figure 2. Corridor Overview

Study Review Committee

The Study Review Committee (SRC) was composed of members from the City of West Fargo, Fargo-Moorhead Metropolitan Council of Governments, Cass County, North Dakota Department of Transportation, and Federal Highway Administration. Following is a list of meetings held for the SRC:

- SRC Meeting #1: Project Kick-Off Meeting
- SRC Meeting #2: Scenario Development Workshop
- SRC Meeting #3: Development of Alternatives Discussion
- SRC Meeting #4: Draft Report Review.

Members of the SRC were as follows:

- Dan Farnsworth – Fargo Moorhead Metropolitan Council of Governments
- Larry Weil – City of West Fargo Planning and Zoning
- Tim Solberg – City of West Fargo Planning and Zoning
- Chris Brungardt – City of West Fargo Public Works
- Dustin Scott – City of West Fargo Engineering
- Matthew Marshall – City of West Fargo Economic Development
- Tina Fisk – City of West Fargo Administrator
- Melissa Richard – City of West Fargo Communication
- Tom Soucy – Cass County Highway Department
- Bob Walton – North Dakota Department of Transportation
- Michael Johnson – North Dakota Department of Transportation
- Richard Duran – Federal Highway Administration.

Project Identification

The City of West Fargo recently completed two separate reconstruction projects on Segment 4. Those projects included the intersection of 13th Avenue E and 9th Street E which began in 2017 and concluded in late 2018. The second project was located along 13th Avenue E from 12th Street E to 17th Street E (West Fargo City limits). The remaining segments of the corridor currently are not programmed by the City of West Fargo within their five-year budget.

Existing Roadway Conditions

Introduction

The existing roadway geometrics were documented as part of the existing conditions analysis. Intersection layouts and lane configurations were included in this analysis. Information collected through the evaluation of the existing roadway was utilized as input for the traffic operations software analysis; ultimately determining 2017 existing levels of operation.

The following discusses the physical characteristics of the 13th Avenue and CR28 corridors between Main Avenue W and 17th Street E, as well as corresponding intersections located within the defined study area. Items such as lane configurations, lighting, median presence, pedestrian facilities, existing right-of-way limits, and intersection control are all included in the existing roadway analysis.

13th Avenue Existing Intersections

Main Avenue W and CR28

CR28 runs north/south while Main Avenue W runs east/west. CR28 has a northbound and southbound lane for thru traffic. There is one right-turn lane for the northbound traffic on the south leg of the intersection. Main Avenue W has five lanes total and a median on the east and west legs of the intersection. There are two lanes for westbound thru traffic, two lanes for eastbound thru traffic, and a left turn lane for each direction. Figure 3 shows the typical lane configuration of the south leg of this intersection. Traffic signals were added to this intersection in 2018.

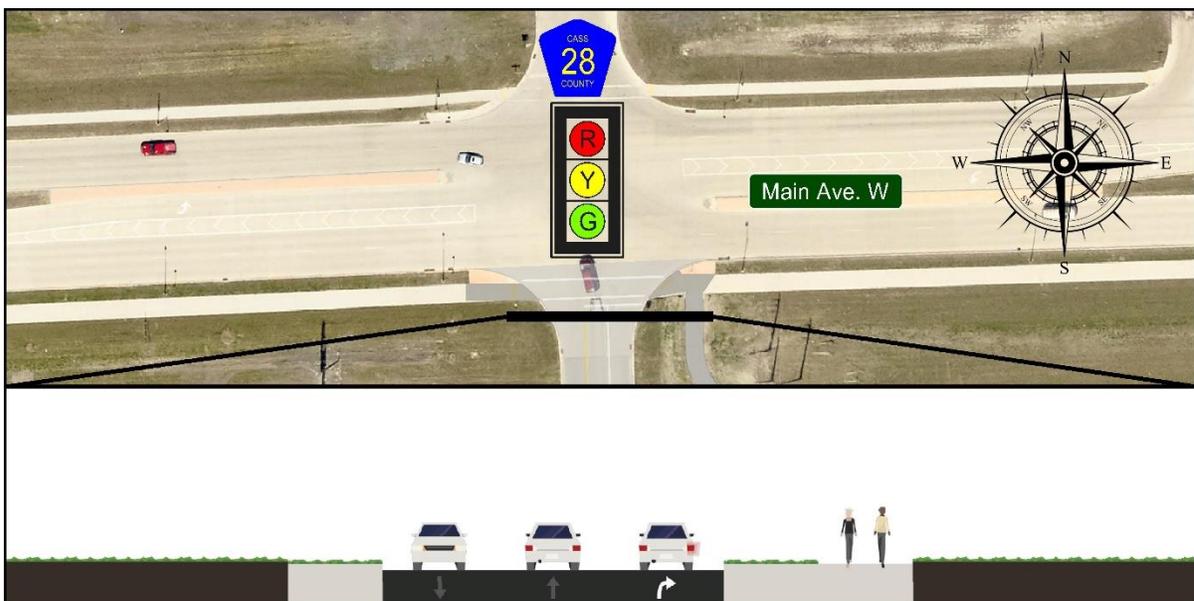


Figure 3. Existing Main Avenue W Intersection

13th Avenue W and 10th Street W

10th Street W runs north/south while 13th Avenue W runs east/west. The south leg of 10th Street W is two lanes divided by a median and is stop controlled utilizing a stop sign. It has one lane for northbound traffic and one lane for southbound traffic. The north leg of the intersection serves as the access to the *Scheels Soccer Complex* parking lot. 13th Avenue W has one lane for eastbound traffic and one lane for westbound traffic. See Figure 4 for the typical lane configuration of the west leg of this intersection.

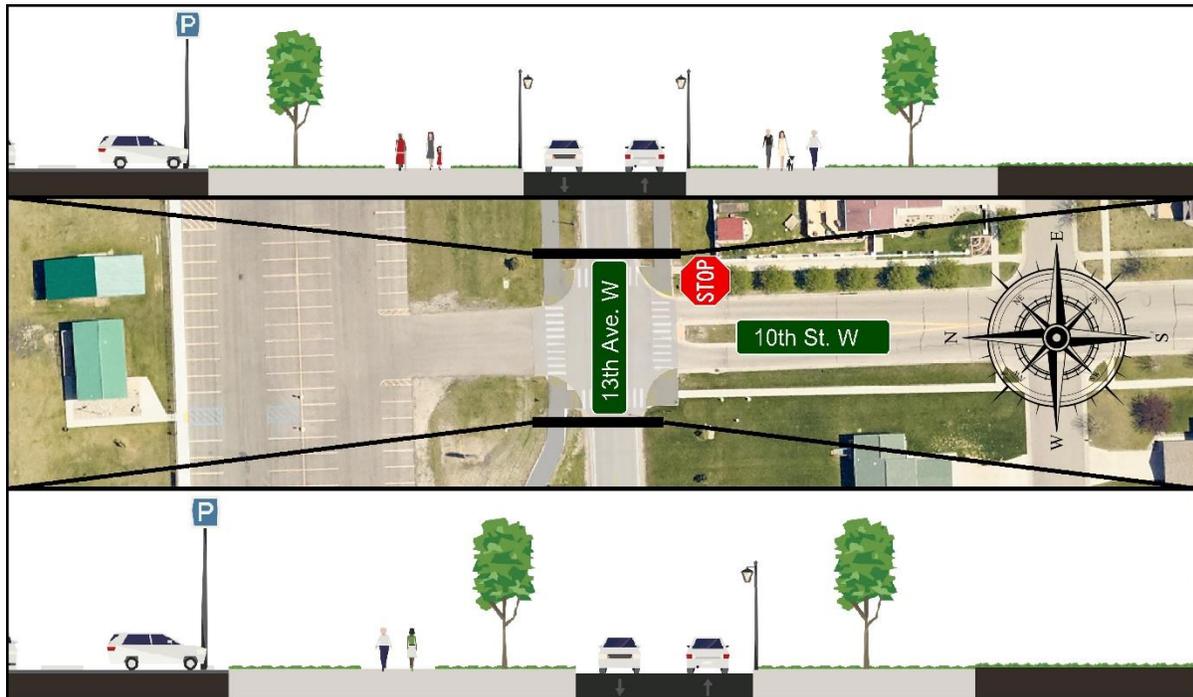


Figure 4. Existing 10th Street W Intersection

13th Avenue W and 8th Street W

8th Street W runs north/south while 13th Avenue W runs east/west. Each leg of this intersection has a median and is stop controlled utilizing stop signs. 8th Street W has one lane for each northbound and southbound thru traffic and one left-turn lane for southbound traffic on the north leg of the intersection. 13th Avenue W has one lane for each eastbound and westbound thru traffic, and one left-turn lane for each direction. See Figure 5 for the typical lane configurations of the west and east legs of this intersection.

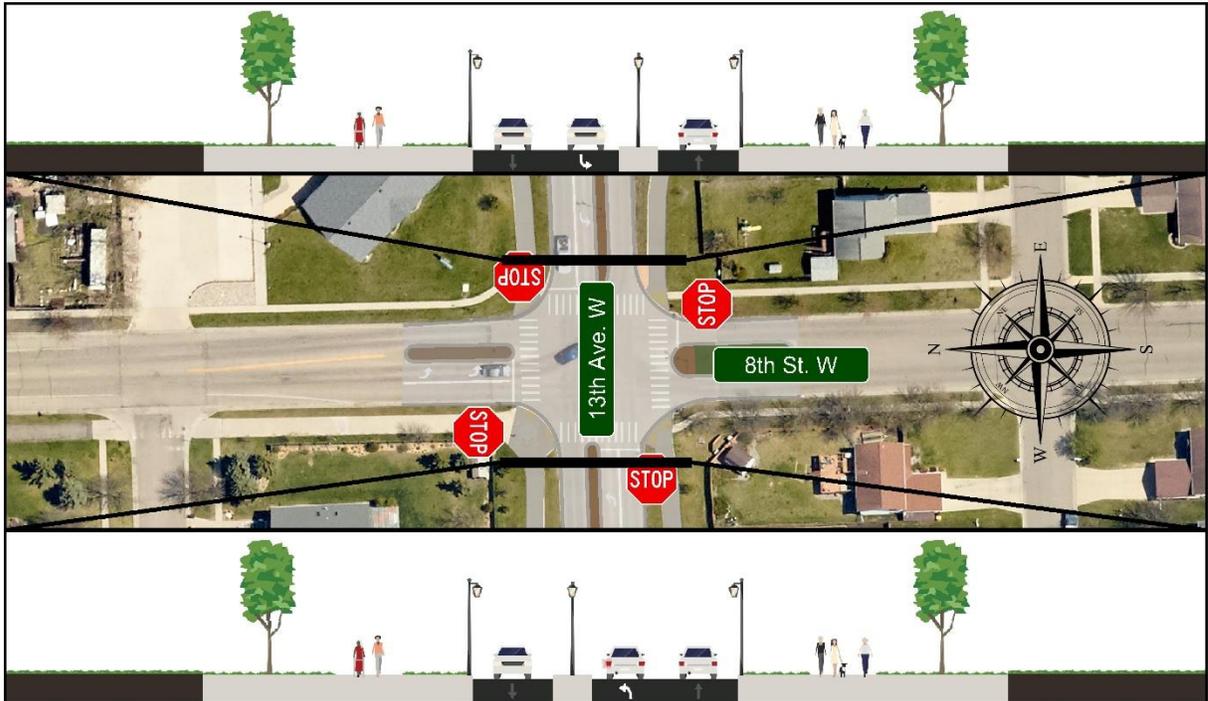


Figure 5. Existing 8th Street W Intersection

13th Avenue W and River Street

River Street runs north/south while 13th Avenue W runs east/west. River Street has one lane for each northbound and southbound thru traffic and is stop controlled utilizing a stop sign on the south leg of the intersection. The north leg of the intersection serves as the access to the multi-use path for maintenance vehicles. 13th Avenue W has one lane for each eastbound and westbound thru traffic. There is one left-turn lane for westbound traffic on the east leg of the intersection and a median on the west leg of the intersection. See Figure 6 for the typical lane configurations of the west and east legs of this intersection.

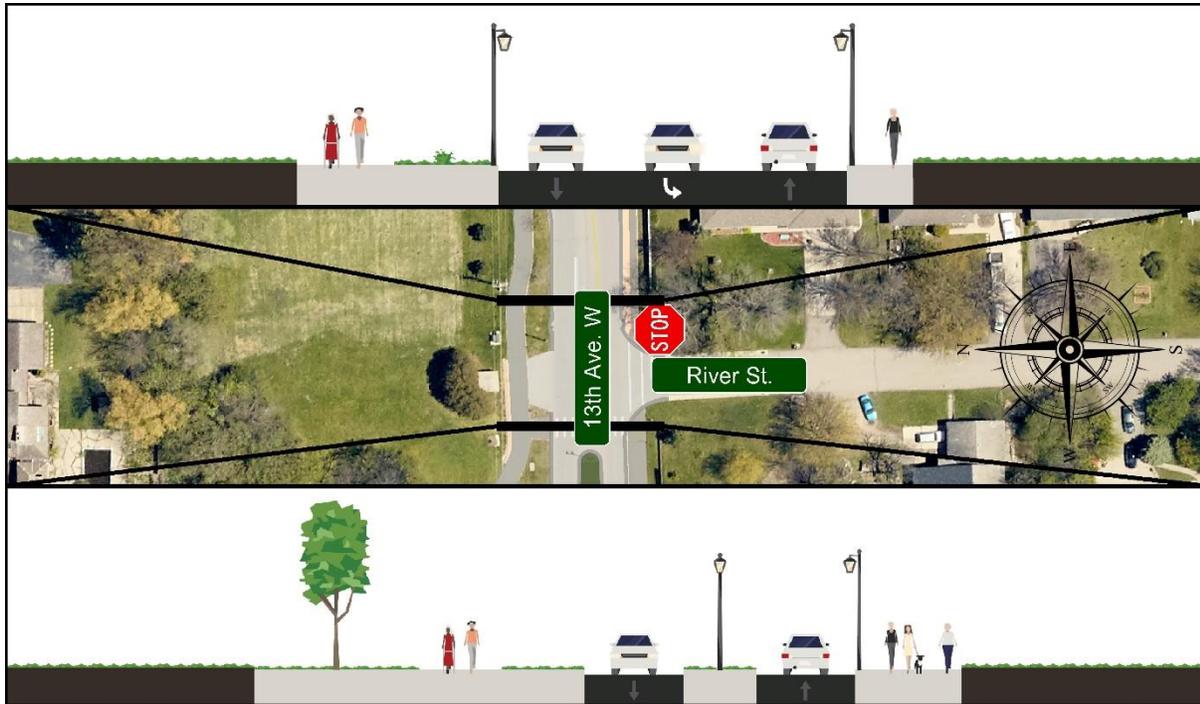


Figure 6. Existing River Street Intersection

13th Avenue W and Sheyenne Street

Sheyenne Street runs north/south while 13th Avenue W runs east/west. This intersection is signal controlled utilizing signal heads. Each leg of the intersection has one five-section signal head for traffic turning left and one three-section signal head for thru traffic. The north leg of Sheyenne Street has one lane each for northbound and southbound thru traffic and one left-turn lane for southbound traffic. The south leg of Sheyenne Street has one lane each for northbound and southbound thru traffic, one left-turn lane, and one right-turn lane for northbound traffic. The each leg of 13th Avenue W has two lanes for eastbound thru traffic, one lane for westbound thru traffic, and one right-turn lane and one left-turn lane for eastbound traffic. The west leg of 13th Avenue W has one lane for westbound thru traffic, one right-turn lane for westbound traffic, one lane for eastbound thru traffic, and one right-turn lane and one left-turn lane for eastbound traffic. See Figure 7 for the typical lane configurations of the west and east legs of this intersection. This intersection was reconstructed as part of the Sheyenne Street Project during the summer of 2018.



Figure 7. Existing Sheyenne Street Intersection

13th Avenue W and 2nd Street W

2nd Street W runs north/south while 13th Avenue E runs east/west. 2nd Street W has one lane for northbound traffic and one lane for southbound traffic and is stop controlled utilizing a stop sign. This intersection does not have a south leg. 13th Avenue W has five lanes of traffic. There are two lanes for each westbound and eastbound thru traffic, and there is one shared left-turn lane in the middle. See Figure 8 for the typical lane configurations of the west and east legs of this intersection.

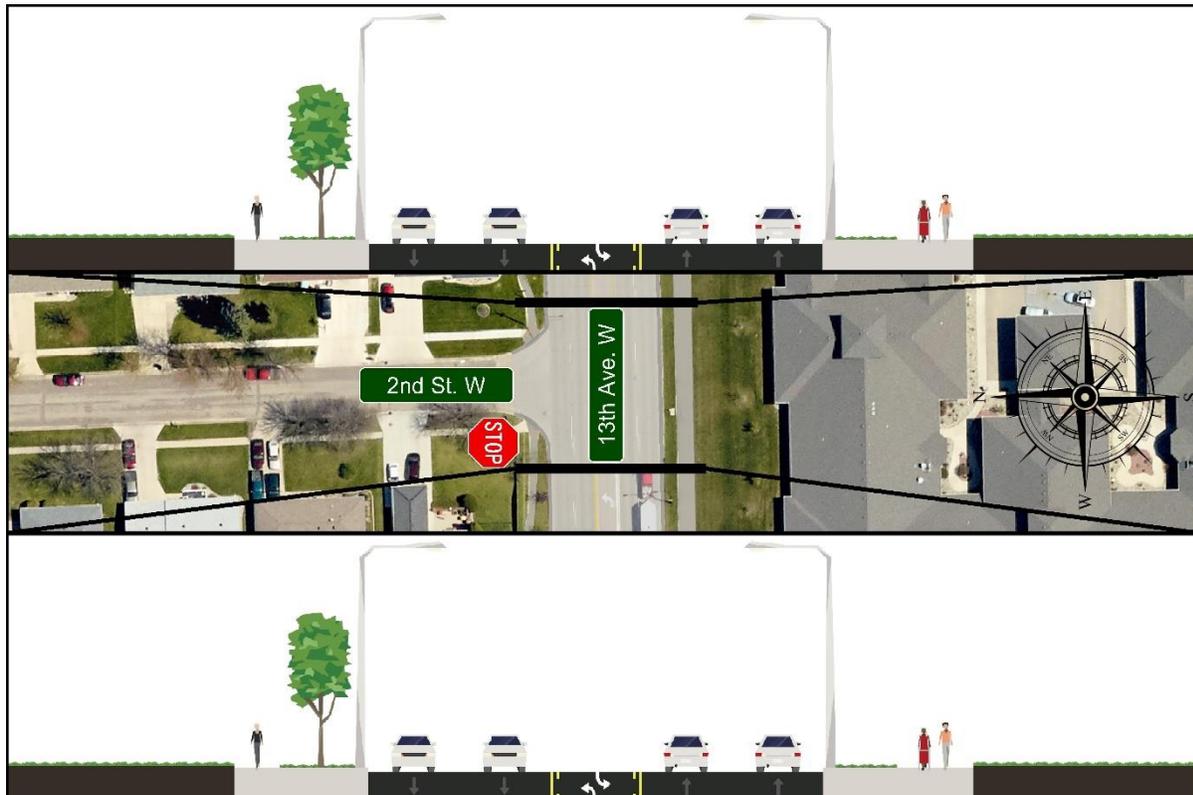


Figure 8. Existing 2nd Street W Intersection

13th Avenue E and 1st Street E

1st Street E runs north/south while 13th Avenue E runs east/west. 1st Street E has one lane for northbound traffic and one lane for southbound traffic and is stop controlled utilizing a stop sign on each leg. 13th Avenue E has a total of five lanes of traffic. There are two lanes for each eastbound and westbound thru traffic and one shared left-turn lane in the middle. See Figure 9 for the typical lane configurations of the east and west legs of this intersection.

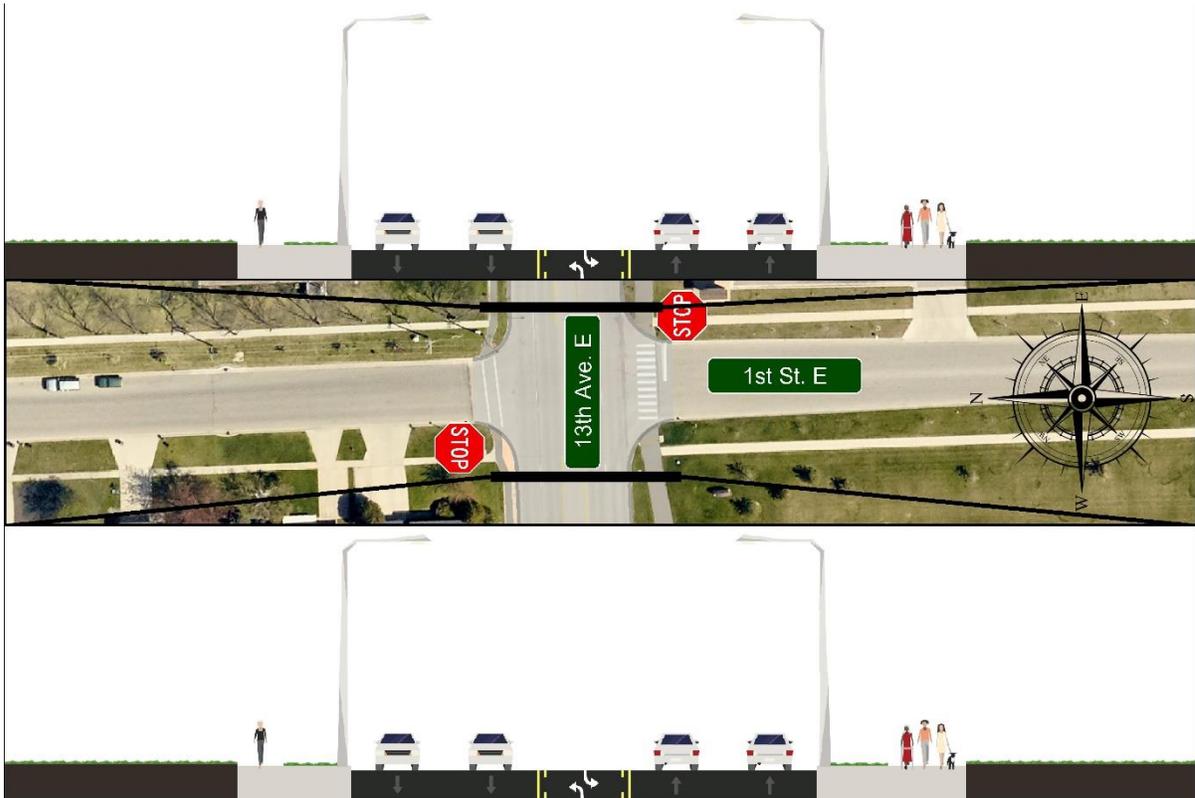


Figure 9. Existing 1st Street E Intersection

13th Avenue E and 2nd Street E

2nd Street E runs north/south while 13th Avenue E runs east/west. 2nd Street E has one lane for northbound and one lane for southbound traffic and is stop controlled utilizing a stop sign on the north leg of the intersection. This intersection does not have a south leg. 13th Avenue E has a total of five lanes of traffic. There are two lanes for eastbound thru traffic, two lanes for westbound thru traffic, and one shared left-turn lane in the middle. See Figure 10 for the typical lane configurations of the east and west legs of this intersection.

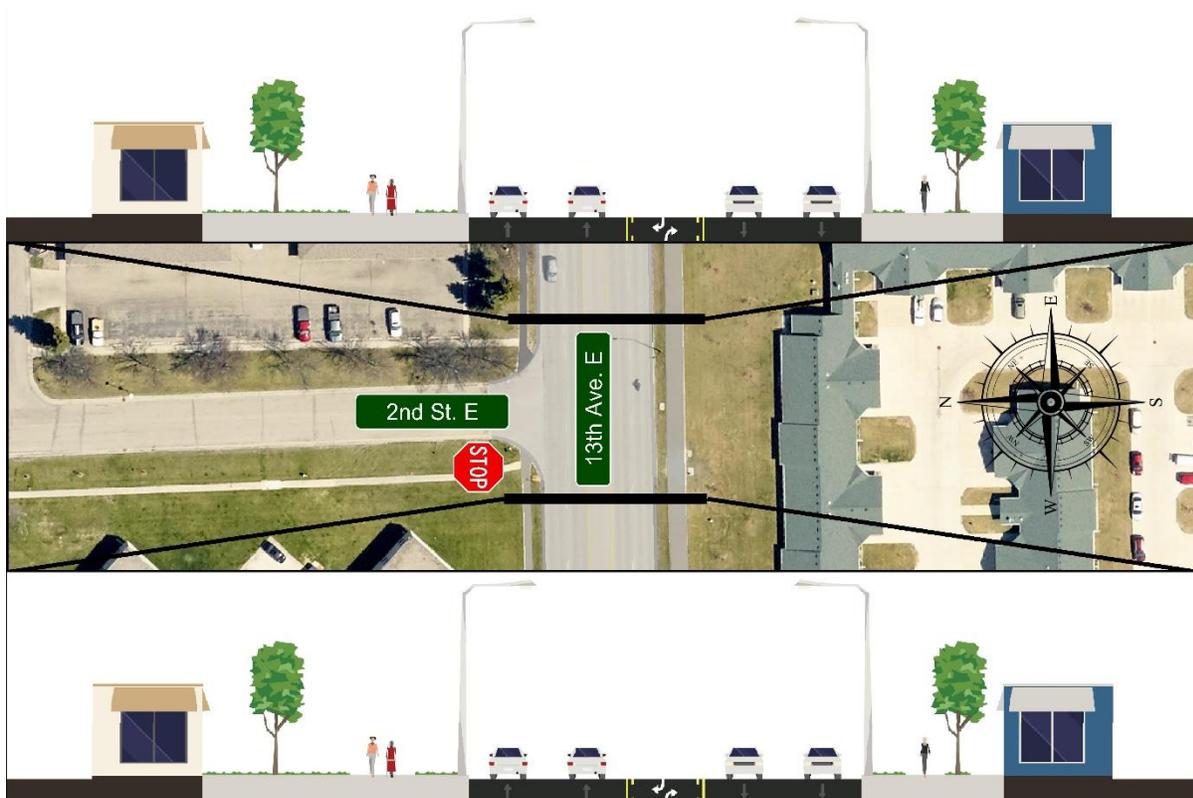


Figure 10. Existing 2nd Street E Intersection

13th Avenue E and 3rd Street E

3rd Street E runs north/south while 13th Avenue E runs east/west. 3rd Street E has one lane for northbound traffic and one lane for southbound traffic, and is stop controlled utilizing a stop sign on the south leg of the intersection. This intersection does not have a north leg. 13th Avenue E has a total of five lanes of traffic. There are two lanes for eastbound thru traffic and two lanes for westbound thru traffic. There is one shared left-turn lane in the center of 13th Avenue E. See Figure 11 for the typical lane configurations of the west and east legs of the intersection.

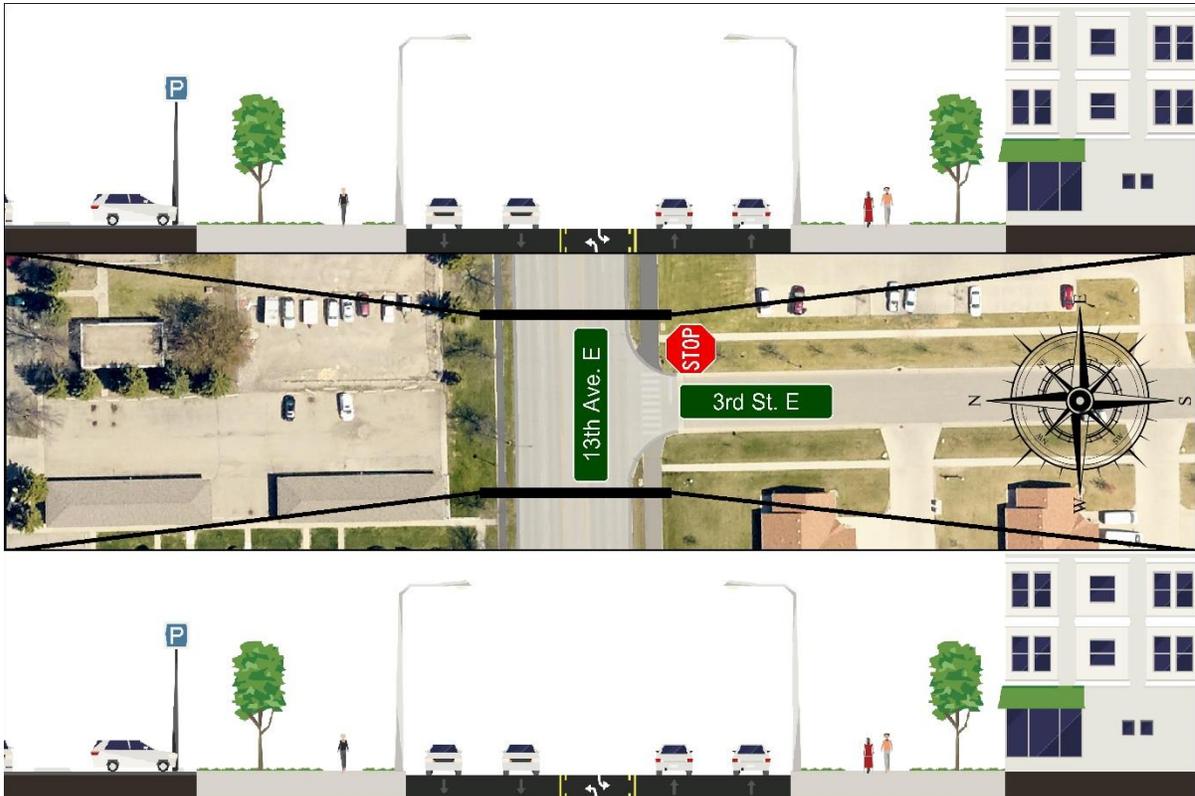


Figure 11. Existing 3rd Street E Intersection

13th Avenue E and 6th Street E

6th Street E runs north/south while 13th Avenue E runs east/west. This intersection is signal controlled utilizing signal heads. There are two three-section signal heads for traffic on each leg (north and south) of 6th Street E. There is one five-section signal head and one three-section signal head for 13th Avenue E traffic on each leg (east and west). 6th Street E has one lane each for northbound thru traffic and southbound thru traffic. 6th Street E also has one left-turn lane northbound traffic, one left-turn lane for southbound traffic, and one right-turn lane for northbound traffic. 13th Avenue E has two lanes for eastbound thru traffic, two lanes for westbound thru traffic, one left-turn lane for eastbound traffic, and one left-turn lane for westbound traffic. See Figure 12 for the typical lane configurations of the west and east legs of this intersection.

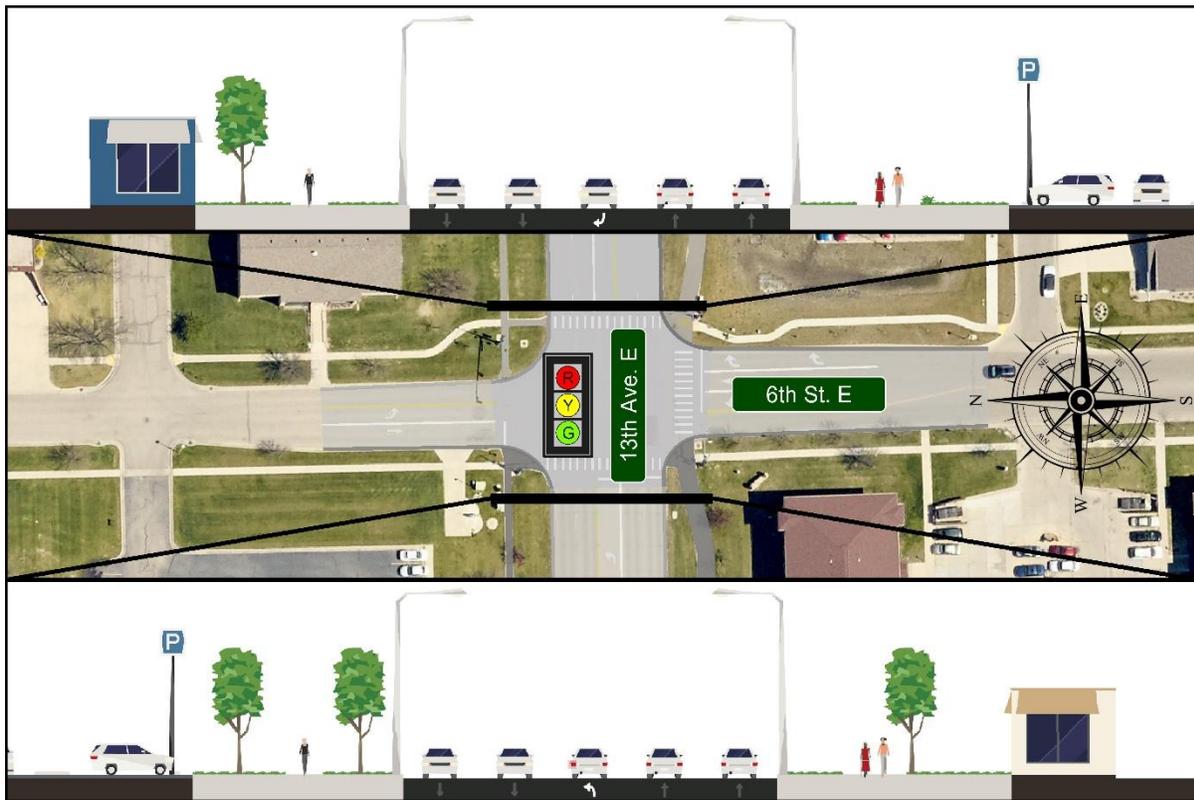


Figure 12. Existing 6th Street E Intersection

13th Avenue E and Woodlinn West

Woodlinn West runs north/south while 13th Avenue E runs east/west. This intersection does not have a south leg. The north leg has one lane for northbound traffic and one lane for southbound traffic. The north leg is stop controlled utilizing a stop sign. 13th Avenue E has two lanes for eastbound traffic and two lanes for westbound traffic. 13th Avenue E also has a left-turn lane for eastbound traffic, a left-turn lane for westbound traffic, and a median for each leg (east and west). See Figure 13 for the typical lane configurations of the west leg of this intersection.

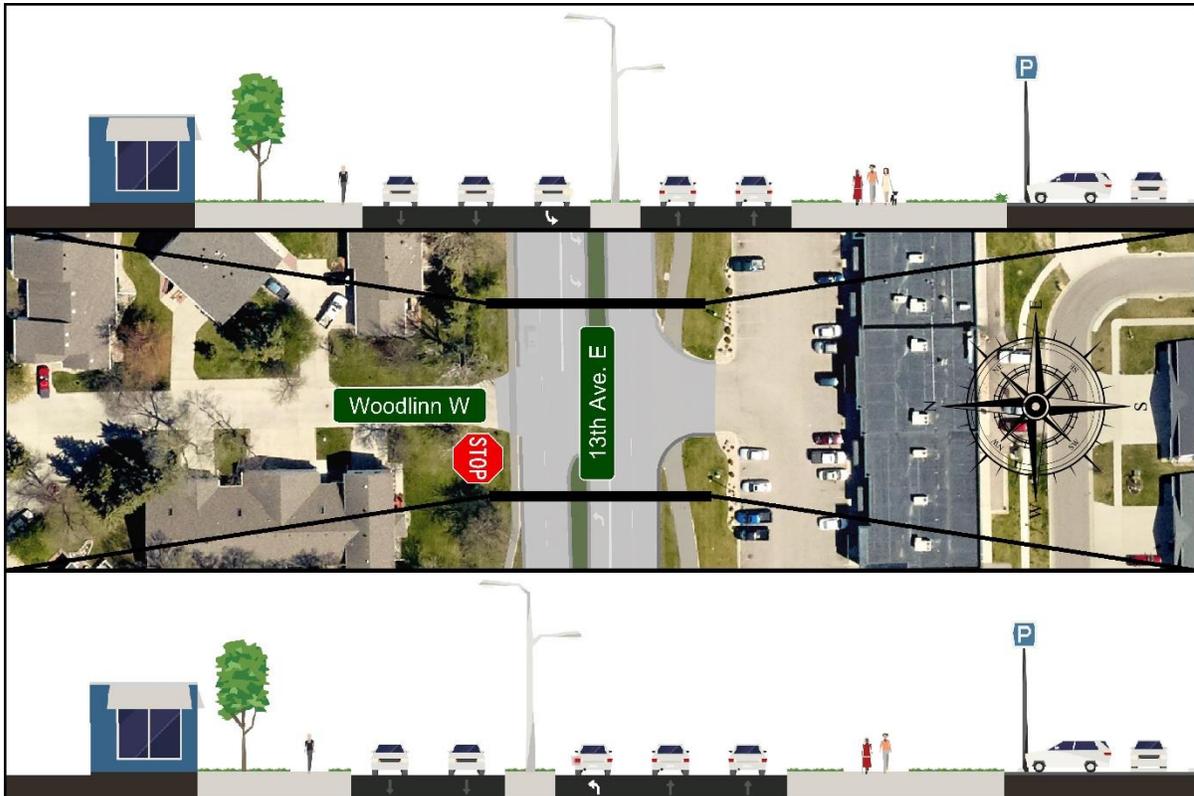


Figure 13. Existing Woodlinn West Intersection

13th Avenue E and Prairie Parkway

Prairie Parkway runs north/south while 13th Avenue E runs east/west. Prairie Parkway has one lane for northbound traffic and one lane for southbound traffic. Prairie Parkway is stop controlled utilizing a stop sign on the north leg, and a stop sign on the south leg. 13th Avenue E has two lanes for each direction of traffic, a median, and a left turn lane for each leg (east and west). See Figure 14 for the typical lane configurations of the east and west legs of this intersection.

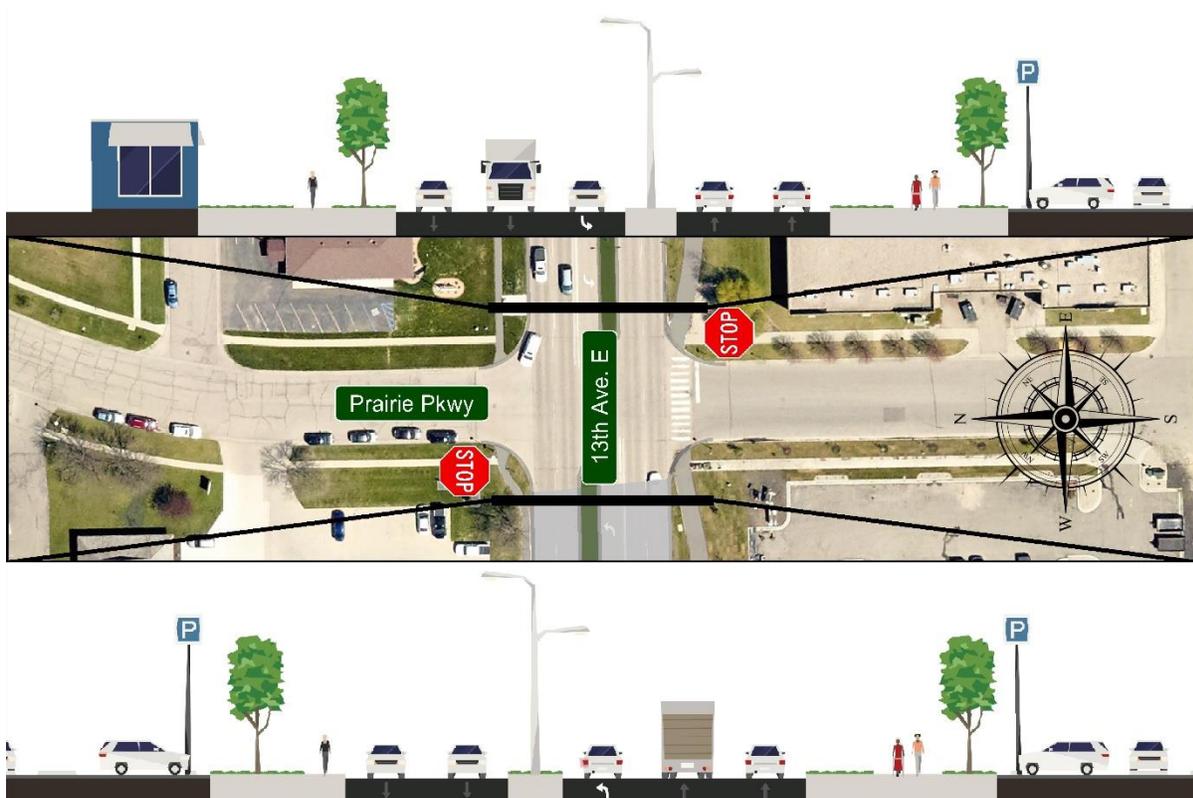


Figure 14. Existing Prairie Parkway Intersection

13th Avenue E and 9th Street E

9th Street E runs north/south while 13th Avenue E runs east/west. Reconstruction of this intersection was completed in the summer of 2018. This intersection is signal controlled utilizing signal heads. This intersection currently has one five-section signal head and one three-section signal head on each leg of the intersection. There is also a median in each leg of the intersection. The north leg of 9th Street E has two lanes for northbound thru traffic, one lane for southbound thru traffic, one right-turn lane for southbound traffic, and one left-turn lane for southbound traffic. The south leg of 9th Street E has two lanes for southbound thru traffic, one lane for northbound thru traffic, and one right-turn lane and one left-turn lane for northbound traffic. 13th Avenue E has two lanes each for eastbound thru traffic and westbound thru traffic. There is a right-turn lane and left-turn lane on each of the east and west legs. The reconstruction added a left turn lane on each leg of this intersection. See Figure 15 for the typical lane configurations of the east and west legs of this intersection.

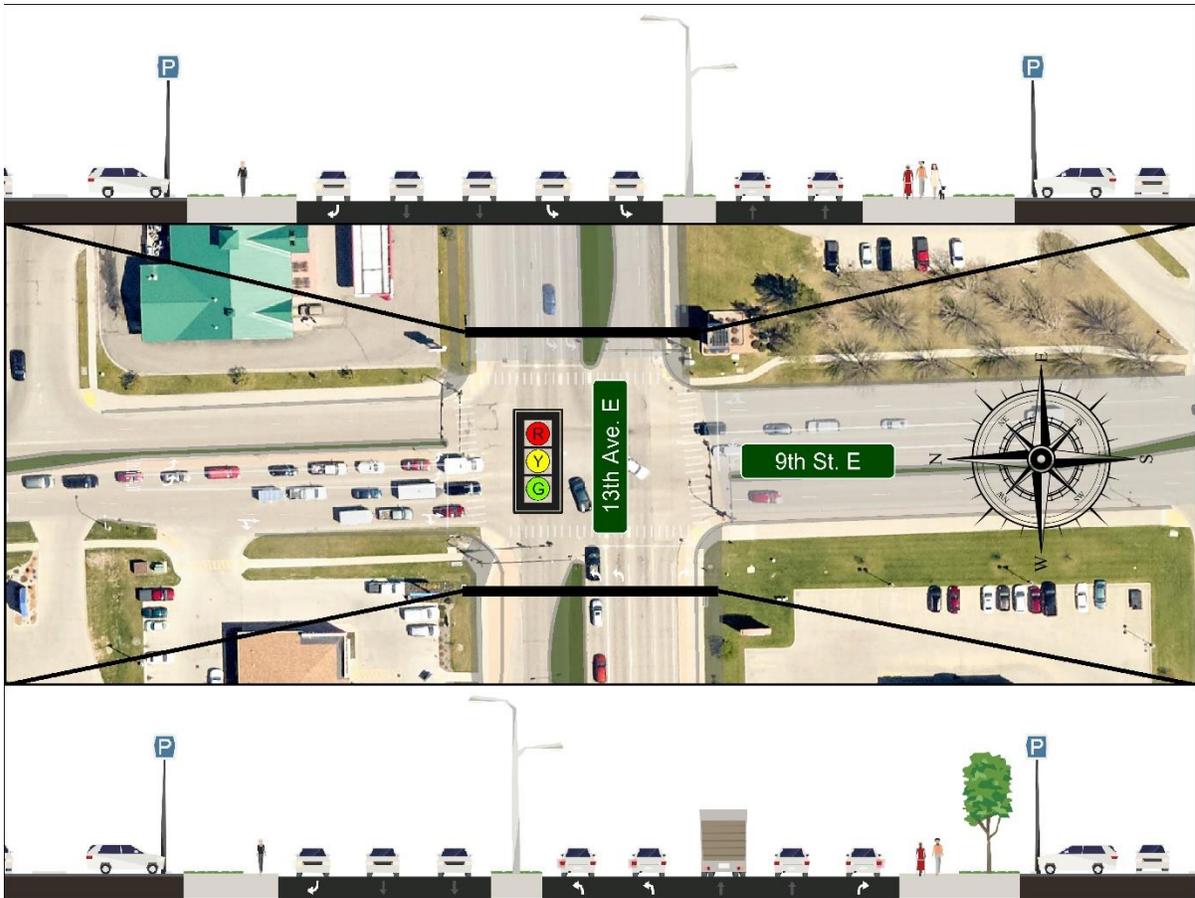


Figure 15. Existing 9th Street E Intersection

13th Avenue E and 12th Street E

12th Street E runs north/south while 13th Avenue E runs east/west. 12th Street E has one lane for northbound traffic, one lane for southbound traffic, and is stop controlled utilizing a stop sign on the north leg of the intersection. This intersection does not have a south leg. 13th Avenue E has two lanes eastbound thru traffic and three lanes for westbound thru traffic. 13th Avenue E also has a median on each leg (east and west). 13th Avenue E also has a left-turn lane for eastbound traffic on the west leg of the intersection. See Figure 16 for the typical lane configurations of the east and west legs of the intersection.

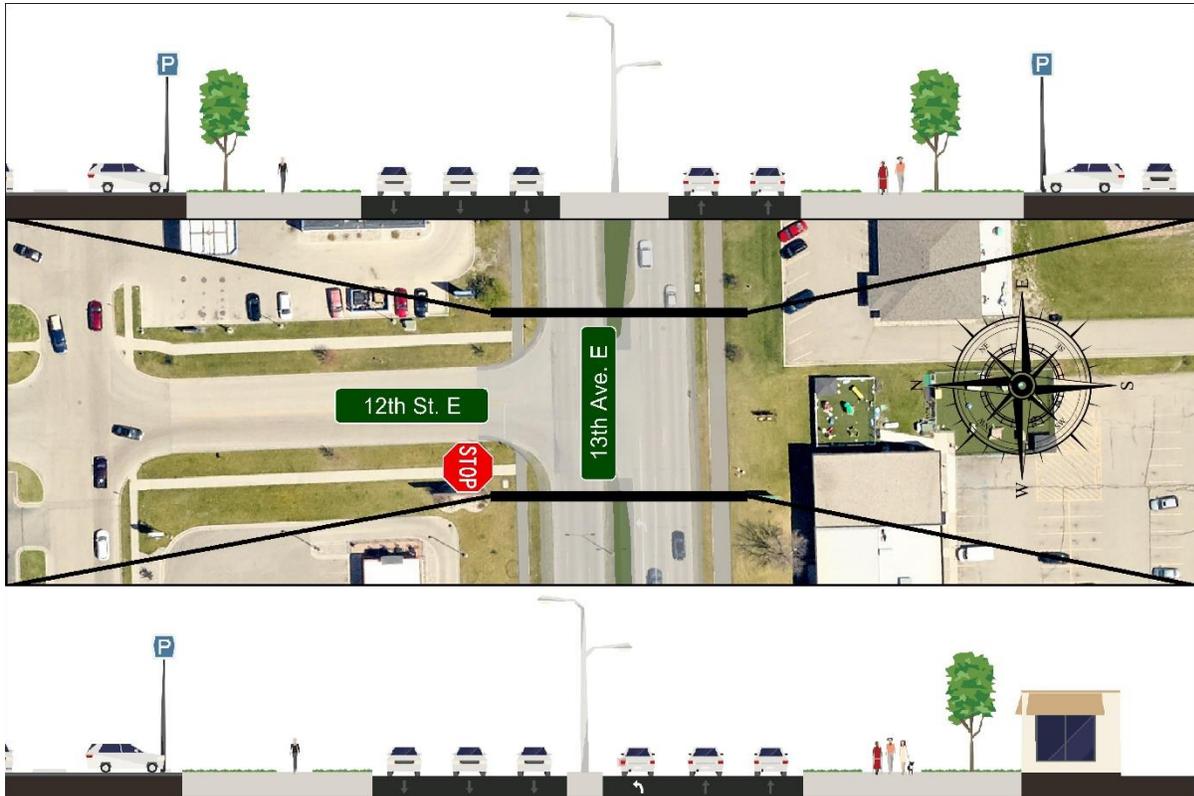


Figure 16. Existing 12th Street E Intersection

13th Avenue E and 14th Street E

14th Street E runs north/south while 13th Avenue E runs east/west. This intersection is signal controlled utilizing signal heads. The north and south legs each have one five-section signal head and one three-section signal head. The east and west legs each have one five-section signal head and two three-section signal heads. The south leg of 14th Street E has one lane for southbound thru traffic, one lane for northbound thru traffic and one right turn lane for northbound traffic. The north leg of 14th Street E has one lane each for southbound and northbound thru traffic and one right-turn lane each for southbound and northbound traffic. The east leg of 13th Avenue E has two lanes for eastbound thru traffic, three lanes for westbound thru traffic, and one left-turn lane for westbound traffic. The west leg of 13th Avenue E has two lanes for eastbound thru traffic and three lanes for westbound thru traffic, and one left-turn lane for eastbound traffic. There is a median on both the east leg and the west leg of 13th Avenue E. See Figure 17 for the typical lane configurations of the east and west legs of this intersection.

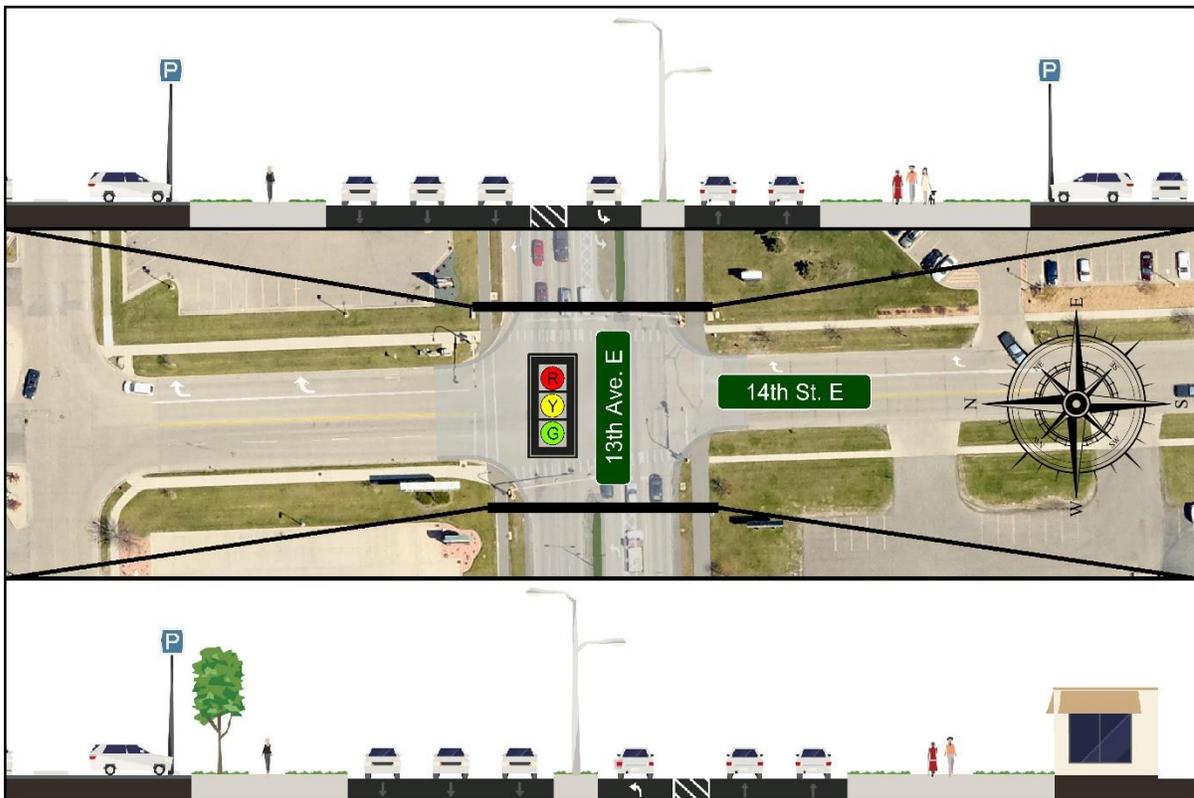


Figure 17. Existing 14th Street E Intersection

13th Avenue E and 16th Street E

16th Street E runs north/south while 13th Avenue E runs east/west. 16th Street E has one lane for northbound thru traffic and one lane for southbound thru traffic. There is also one right-turn lane each for northbound and southbound traffic on the north leg of the intersection. 16th Street E is stop controlled utilizing stop signs on both the north and south leg of the intersection. 13th Avenue E has two lanes for eastbound thru traffic, three lanes for westbound thru traffic, a median, a left-turn lane on the east leg, and a left-turn lane on the west leg of the intersection. See Figure 18 for the typical lane configurations of the east and west legs of this intersection.

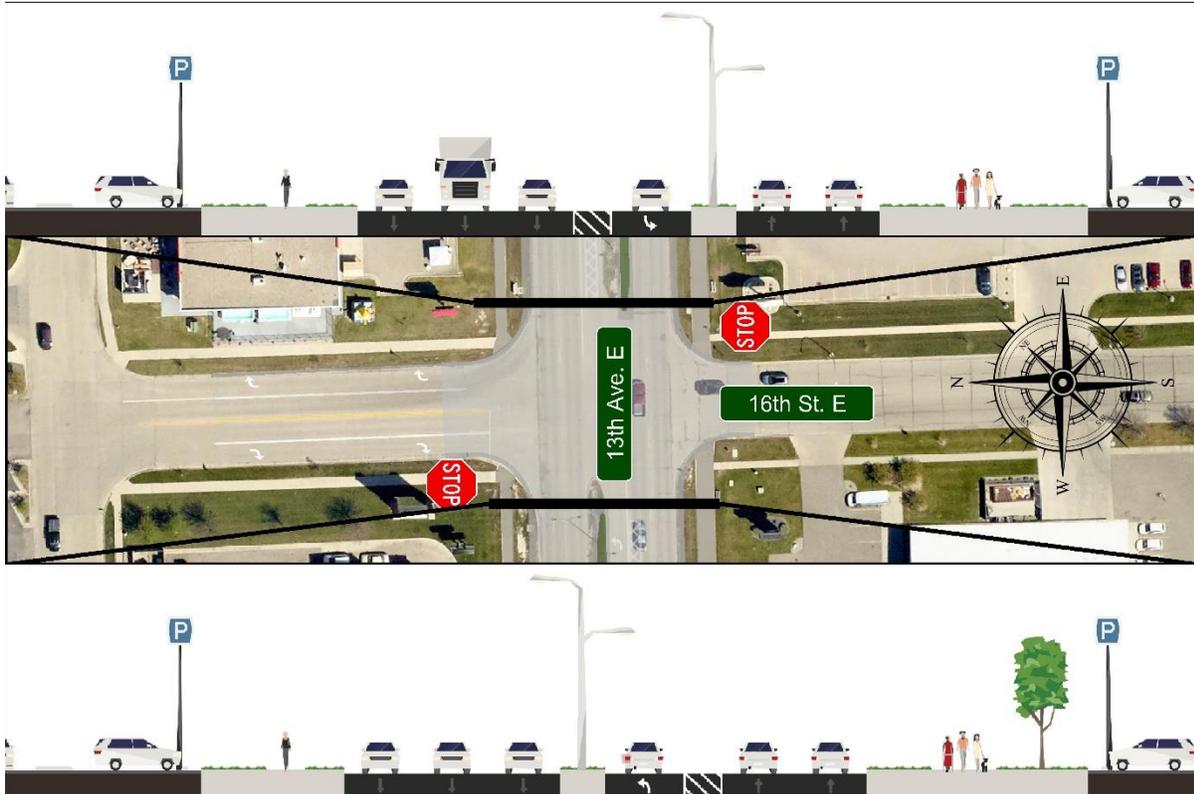


Figure 18. Existing 16th Street E Intersection

13th Avenue E and 17th Street E

17th Street E runs north/south while 13th Avenue E runs east/west. This intersection is signal controlled utilizing signal heads. The north and south legs each have three three-section signal heads. The east and west legs each have one five-section signal head and two three-section signal heads. The north leg of 17th Street E has one lane for southbound thru traffic, one lane for northbound thru traffic, and one southbound right-turn lane. The south leg of 17th Street E has one lane for northbound thru traffic and one lane for southbound thru traffic. The east leg of 13th Avenue E has two lanes for eastbound thru traffic, three lanes for westbound thru traffic, and one left-turn lane for westbound traffic. The west leg of 13th Avenue E has two lanes for eastbound traffic, three lanes for westbound traffic, and one left-turn lane for eastbound traffic. 13th Avenue has a median on both the east and west legs of the intersection. See Figure 19 for the typical lane configuration of the west leg of this intersection.



Figure 19. Existing 17th Street E Intersection

13th Avenue Existing Lane Configurations

Main Avenue W to 10th Street W

From the intersection of Main Avenue W and Cass County 28 to the intersection of 10th Street W and 13th Avenue W, there are two 12-foot lanes of traffic, one in each direction of travel. There is a 10-foot-wide multi-use path to the north/east of the road. There are 19 access points along the south/west side of the road and 12 along the north/east side of the road. See Figure 3 and Figure 4 for the typical sections and Figure 20 through Figure 22 for the typical lane configurations of this section of the study corridor.

10th Street W to River Street

From the intersection of 10th Street W and 13th Avenue W to the intersection of River Street and 13th Avenue W, there are two 12-foot lanes of traffic for eastbound traffic and two 12-foot lanes of traffic for westbound traffic. There is also a raised median and left-turn lane, which switches from eastbound to westbound as needed. There is a ten foot wide multi-use path on each of the north and south legs of the road. There are six access points along the north side of the road and five access points along the south side of the road. See Figure 4, Figure 5, and Figure 6 for the typical sections and Figure 22 and Figure 23 for the typical lane configurations of this section of the study corridor.

River Street to 6th Street E

From the intersection of River Street and 13th Avenue E to the intersection of 6th Street E and 13th Avenue E, there are five lanes of traffic. There are two 12-foot lanes for eastbound traffic, two 12-foot lanes for westbound traffic, and one shared left-turn lane in the middle. There is a ten foot wide multi-use path on the south side of the road and there is a 6-foot-wide sidewalk on the north side of the road. There are seven access points along the south side of the road and 12 access points along the north side of the road. See Figure 6 through Figure 12 for the typical sections and Figure 23 and Figure 24 for the typical lane configurations of this section of the study corridor.

6th Street E to 17th Street E

From the intersection of 6th Street E and 13th Avenue E to the intersection of 9th Street E and 13th Avenue E, there are two lanes of traffic for each westbound and eastbound traffic. There is also a raised median and left-turn lane, which switches from eastbound to westbound as needed. From the intersection of 12th Street E and 13th Avenue E to the intersection of 17th Street E and 13th Avenue E there are two lanes for eastbound traffic and 3 lanes for westbound traffic. Raised medians and left turn lanes are also utilized in this stretch. There is a 10-foot-wide multi-use path on the south side of the road and a six foot wide sidewalk on the north side of the road. For this total segment there are nine access points along the north side of the road and there are seven access points along the south side of the road. See Figure 12 through Figure 19 for the typical sections and Figure 25 and Figure 26 for the typical lane configurations of this section of the study corridor. A portion of this section from the intersection of 12th Street and 13th Avenue to the intersection of 17th Street and 13th Avenue was reconstructed in the summer of 2018.



Figure 20. Existing Lane Configurations A



Figure 21. Existing Lane Configurations B



Figure 22. Existing Lane Configurations C

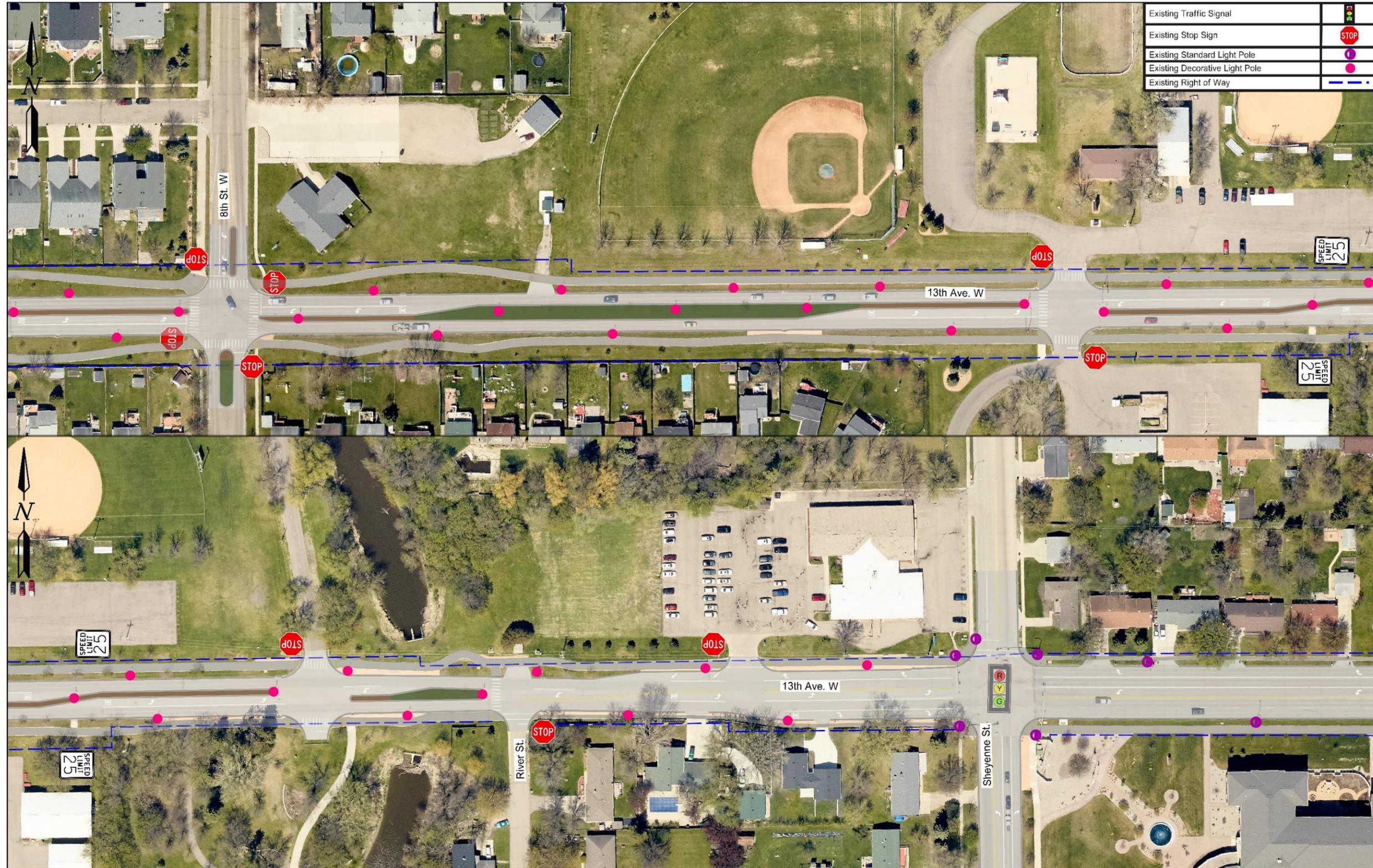


Figure 23. Existing Lane Configurations D

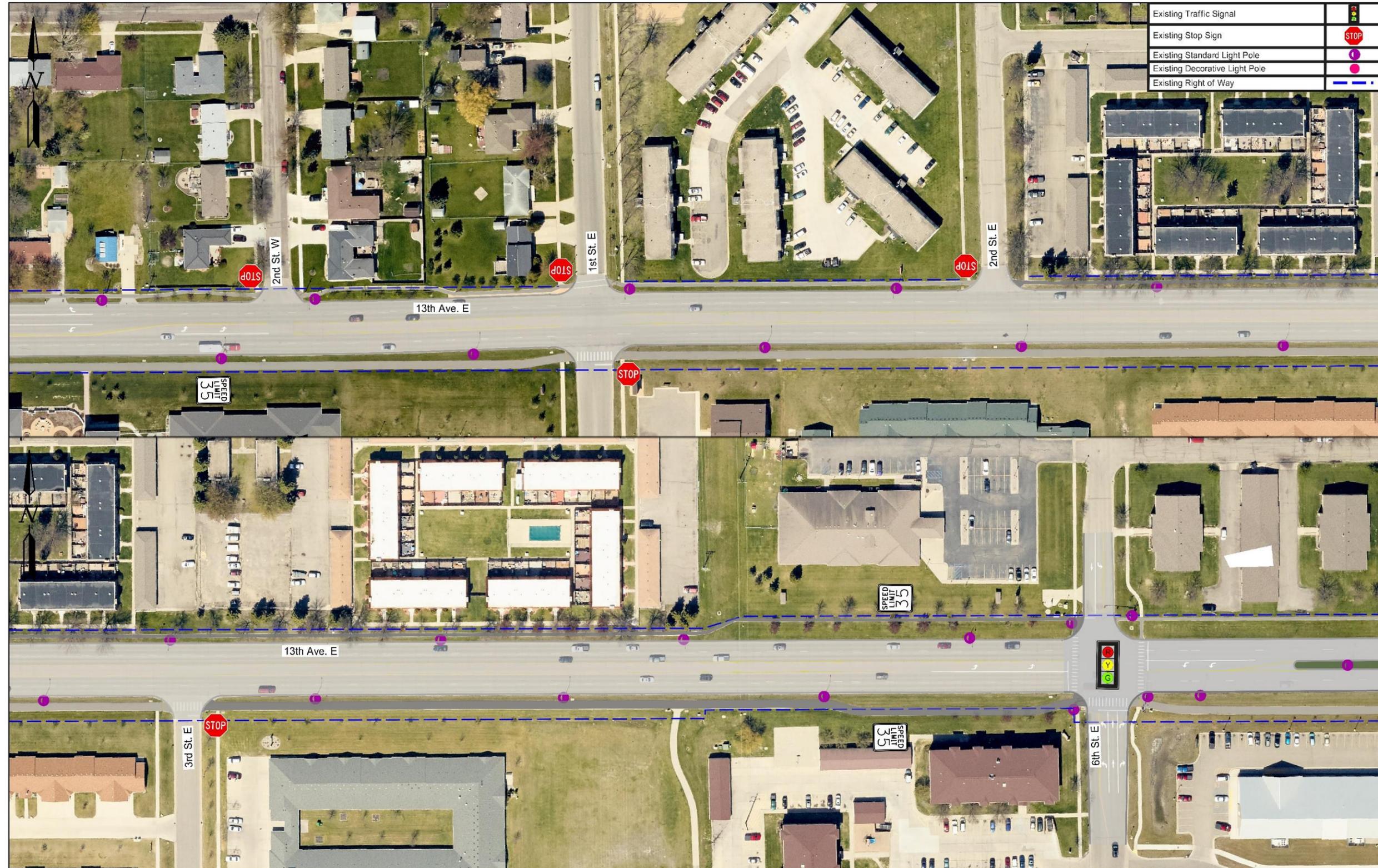


Figure 24. Existing Lane Configurations E

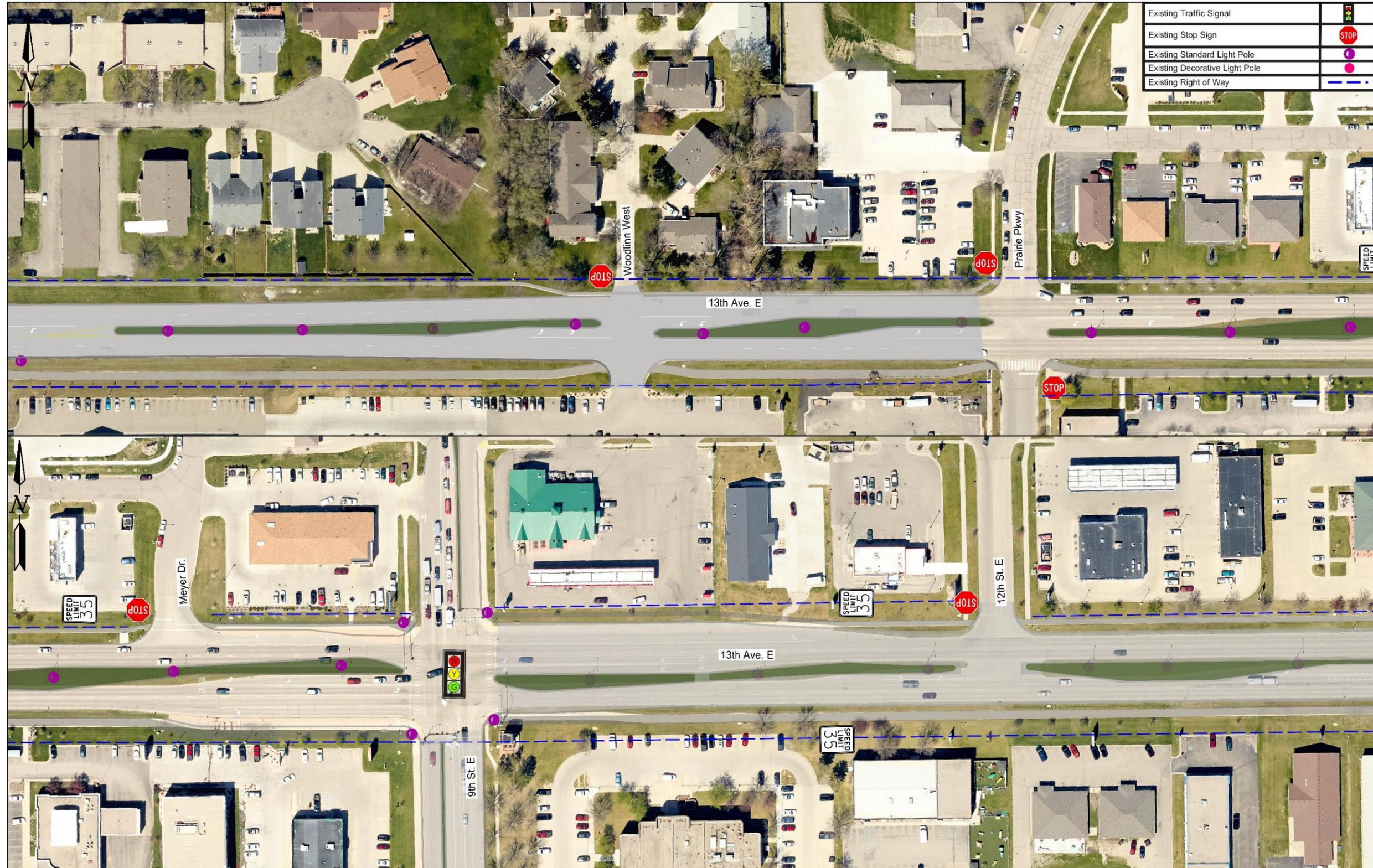


Figure 25. Existing Lane Configurations F

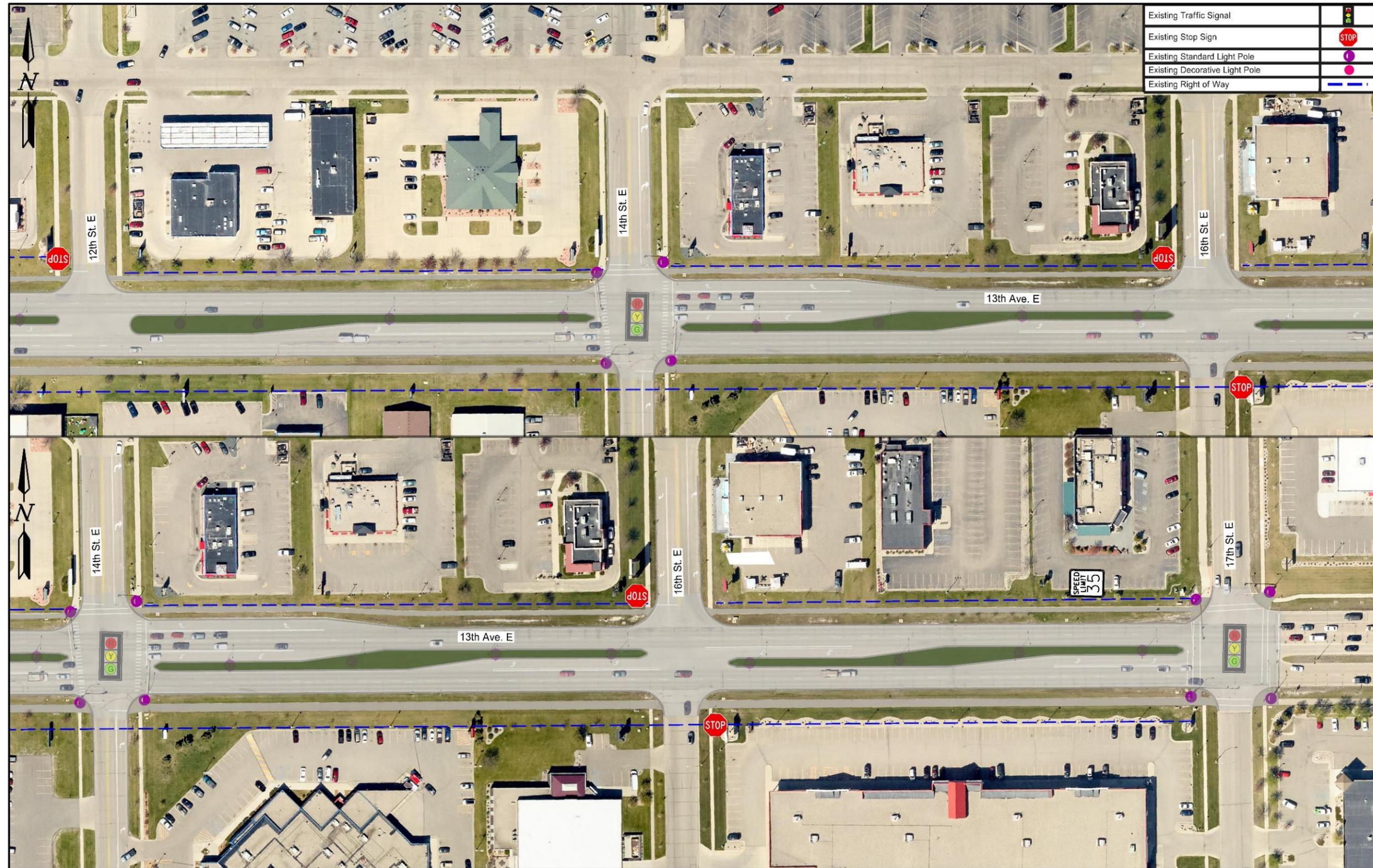


Figure 26. Existing Lane Configurations G

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Existing Traffic Operations

Data Collection

The following data were provided to HDR:

- 2045 Metro COG Travel Demand model was provided by the Advanced Traffic Analysis Center (ATAC)
- Socio-economic data and transportation analysis zone (TAZ) polygon shapefiles for the 2045 model were provided by ATAC as well
- Traffic signal timings for major intersections within the study area were provided by the FM Metro COG and City of West Fargo
- 2015 AM and PM peak hour turning movement counts were provided by the City of West Fargo for the following major signalized intersections:
 - 13th Avenue and Sheyenne Street
 - 13th Avenue and 6th Street
 - 13th Avenue and 9th Street
 - 13th Avenue and 14th Street
 - 13th Avenue and 17th Street
- 2017 AM and PM peak hour intersection counts for the intersection of Main Avenue and 15th Street W were provided by North Dakota Department of Transportation (NDDOT)
- 2015 and 2017 (where available) average annual daily traffic (AADT) count data for approximately ten locations throughout the 13th Avenue corridor were also provided by NDDOT
- 13th Avenue and CR28 crash data were provided by NDDOT for the calendar year range of 2012 to 2016. The data included crash summaries for all intersection and segment crashes, as well as a supplemental GIS shapefile for use in mapping.

Minor intersection turning movement counts were collected by HDR in November 2017 for the following intersections:

- 13th Avenue and 10th Street
- 13th Avenue and 8th Street
- 13th Avenue and 1st Street
- 13th Avenue and Prairie Parkway
- 13th Avenue and 16th Street.

Existing Traffic Volumes

2015 was selected as the baseline year for the existing conditions analysis due to the fact that it had the most consistent data in regards to AADT counts and turning movement counts at the major signalized intersections. Any 2017 counts received or collected were adjusted to 2015 volumes based on AADT growth rates at similar locations along the corridor between 2015 and 2017.

The 2015 turning movement counts are provided in Figure 27. The AM peak hour was identified as 7:30 to 8:30 AM. The PM peak hour was identified as 4:45 to 5:45 PM for most of the 13th Avenue corridor.

Capacity Analysis

Each major intersection within the 13th Avenue corridor study area was analyzed using Synchro 8 software utilizing capacity analysis methods as outlined in the 2010 Highway Capacity Manual. Factors such as level of service (LOS) for AM and PM peak hours, vehicle delay, and 95 percent queue lengths for turn lanes were analyzed to determine existing levels of operations. Truck percentages and intersection peak hour factors were developed from the collected data and applied to the analysis software as well. The AM and PM peak hour Synchro results can be found in Appendix B – Synchro Data.

LOS is an effective way of measuring how an intersection is functioning by assigning it a grade between A and F. Generally speaking, a LOS A,B,C or D are considered acceptable, with stable low-to-mid density traffic flow and high degree of freedom for drivers to select speed and limited interaction between vehicles. LOS E and F are considered unacceptable, with high-density fully congested traffic flow. Table 1 provides a visual representation of what traffic levels look like at each LOS. NDDOT’s guidance for intersection LOS is that an intersection must meet or exceed an overall LOS D.

Table 1. LOS Background

Level of Service	Flow Conditions	Technical Descriptions
A		Highest quality of service. Free traffic flow with few restrictions on maneuverability or speed. No Delays
B		Stable traffic flow. Speed becoming slightly restricted. Low restriction on maneuverability. No Delays
C		Stable traffic flow, but less freedom to selection speed, change lanes, or pass. Minimal Delays
D		Traffic flow becoming unstable. Speeds subject to sudden change. Passing is difficult. Minimal Delays
E		Unstable traffic flow. Speed change quickly and maneuverability is low. Significant Delays
F		Heavily congested traffic. Demand exceeds capacity and speeds vary greatly. Significant Delays

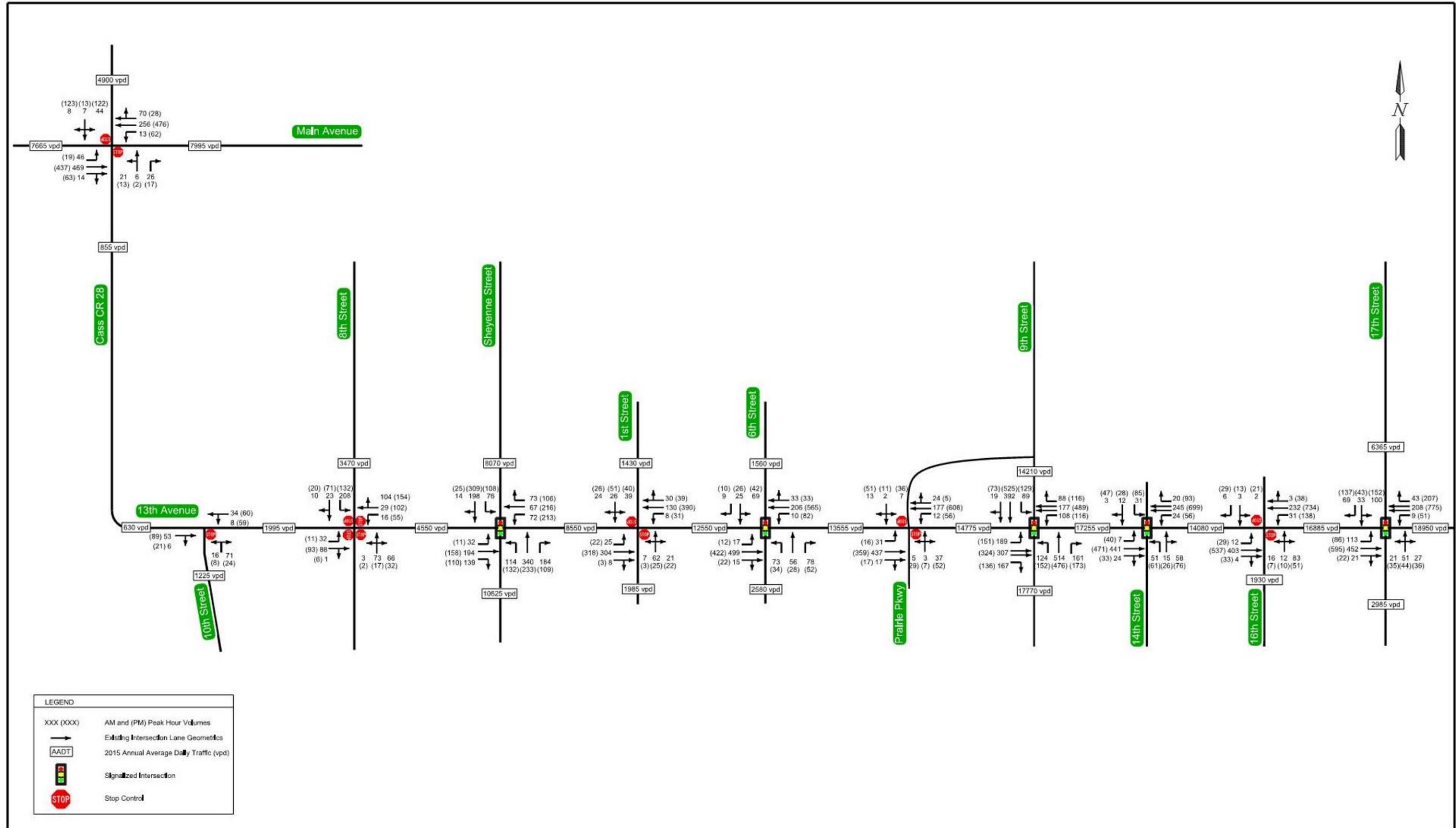


Figure 27. 2015 Turning Movement Counts

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Existing Level of Service

Existing intersection LOS results for 13th Avenue are provided in the following three tables. Table 2 depicts the LOS results for signalized intersections. These values represent traffic operations under existing 2015 roadway conditions and traffic volumes. Cells highlighted in yellow designate LOS D, signaling the lowest acceptable LOS. Cells with LOS E and LOS F are highlighted in orange and red, respectively.

Table 2. Existing 2015 LOS for Signalized Intersections

Intersection	Control	Movement	2015 Existing Conditions					
			AM			PM		
			Delay (s/veh)	LOS	95% Queue (ft)	Delay (s/veh)	LOS	95% Queue (ft)
13th Avenue / Sheyenne Street	Signalized	Overall Intersection	23.3	C	-	29.0	C	-
		EB Approach	19.2	B	-	23.1	C	-
		Left	18.0	B	34	19.0	B	12
		Through	29.4	C	195	35.6	D	179
		Right	6.1	A	43	7.7	A	41
		WB Approach	22.5	C	-	23.2	C	-
		Left	23.9	C	71	24.6	C	157
		Through	30.8	C	75	28.8	C	170
		Right	13.3	B	28	9.3	A	36
		NB Approach	24.1	C	-	24.7	C	-
		Left	20.8	C	66	26.0	C	91
		Through	38.1	D	263	33.5	C	189
		Right	4.5	A	9	5.4	A	37
		SB Approach	27.0	C	-	44.5	D	-
Left	20.0	B	47	21.0	C	77		
Through/Right	29.8	C	166	52.3	D	321		
13th Avenue / 6th Street	Signalized	Overall Intersection	10.9	B	-	11.5	B	-
		EB Approach	8.4	A	-	12.1	B	-
		Left	7.2	A	9	5.5	A	8
		Through/Right	8.5	B	87	12.3	B	128
		WB Approach	9.7	A	-	4.7	A	-
		Left	11.2	B	8	3.7	A	19
		Through/Right	9.6	A	52	4.9	A	71
		NB Approach	11.0	B	-	25.8	C	-
		Left	16.9	B	44	40.7	D	47
		Through	14.3	B	33	37.6	D	43
		Right	4.9	A	8	10.2	B	16
		SB Approach	20.3	C	-	38.3	D	-
		Left/Through	21.4	C	59	42.3	D	80
		Right	7.6	A	5	16.4	B	11

Table 2. Existing 2015 LOS for Signalized Intersections (continued)

13th Avenue / 9th Street	Signalized	Overall Intersection	31.7	C	-	33.0	C	-
		EB Approach	39.8	D	-	40.9	D	-
		Left	59.5	E	157	49.1	D	#167
		Through	40.2	D	141	46.9	D	188
		Right	10.5	B	25	17.5	B	67
		WB Approach	30.9	C	-	27.9	C	-
		Left	35.2	D	108	16.0	B	97
		Through	38.0	D	95	35.2	D	250
		Right	13.3	B	44	9.7	A	64
		NB Approach	30.6	C	-	34.3	C	-
		Left	13.4	B	66	25.7	C	100
		Through	43.2	D	425	49.3	D	450
		Right	3.5	A	31	4.4	A	35
		SB Approach	21.0	C	-	29.8	C	-
		Left	18.7	B	48	28.2	C	85
Through/Right	21.6	C	137	30.2	C	230		
13th Avenue / 14th Street	Signalized	Overall Intersection	18.5	B	-	19.1	B	-
		EB Approach	20.3	C	-	20.8	C	-
		Left	12.3	B	10	13.0	B	38
		Through/Right	20.4	C	196	21.5	C	218
		WB Approach	5.6	A	-	5.4	A	-
		Left	3.9	A	4	3.4	A	14
		Through	6.1	A	82	6.3	A	95
		Right	3.4	A	15	0.5	A	1
		NB Approach	31.3	C	-	45.7	D	-
		Left	52.4	D	72	80.8	F	85
		Through/Right	19.6	B	40	23.5	C	51
		SB Approach	30.6	C	-	42.9	D	-
		Left	34.8	C	37	61.0	E	95
Through/Right	26.5	C	13	18.7	B	45		
13th Avenue / 17th Street	Signalized	Overall Intersection	20.9	C	-	23.1	C	-
		EB Approach	13.8	B	-	10.6	B	-
		Left	9.7	A	69	8.4	A	42
		Through/Right	15.0	B	190	10.9	B	133
		WB Approach	14.4	B	-	11.6	B	-
		Left	9.7	A	9	6.0	A	22
		Through	16.9	B	84	14.5	B	221
		Right	6.0	A	16	2.1	A	30
		NB Approach	30.2	C	-	59.0	E	-
		Left/Through/Right	30.2	C	74	59.0	E	#174
		SB Approach	42.5	D	-	68.8	E	-
		Left/Through	56.4	E	121	111.6	F	#225
Right	6.7	A	26	11.0	B	52		

denotes queue volume exceeding capacity

Signalized intersection findings:

- Sheyenne Street and 9th Street are the only signalized intersections that experienced LOS D or E on the eastbound and/or westbound approaches. All other signalized intersections that experienced LOS D or lower occurred on the northbound or southbound approaches.
- Significant queue lengths occurred on the eastbound left-turn lane at the intersection of 13th Avenue/9th Street, as well as the northbound and southbound left/through lanes at 13th Avenue/17th Street.



- The 13th Avenue and 9th Street intersection is currently under construction with the intent of incorporating a dual left turn lane for the southbound approach.
- The intersections of 13th Avenue/14th Street and 13th Avenue/17th Street experience unacceptable LOS for both northbound and southbound left-turning vehicles during AM and PM peak hours.

Table 3 and Table 4 show the LOS values for intersections where four-way or two-way stop control is present on the minor approaches. It is important to note that LOS of intersections with two-way stop control are based on the average delay for vehicles on the minor roadway approaches. The major roadway approaches will generally have much better LOS in comparison with the minor approaches because the through and right turns are unconstrained by delay and the left-turning vehicles only need to wait for gaps identified in opposing traffic platoons.

The all-way stop intersection of 13th Avenue/8th Street, shown in Table 3, experienced acceptable LOS for all approaches during both the AM and PM peak hours under existing traffic volumes.

Table 3. Existing 2015 LOS for Four-Way Stop Controlled Intersections

Intersection	Control	Movement	2015 Existing Conditions					
			AM			PM		
			Delay (s/veh)	LOS	95% Queue (ft)	Delay (s/veh)	LOS	95% Queue (ft)
13th Avenue / 8th Street	Four-Way Stop Control	Overall Intersection	12.2	B	-	12.0	B	-
		EB Approach	11.1	B	-	10.5	B	-
		Left	10.3	B	8	9.7	A	3
		Through/Right	11.3	B	25	10.6	B	20
		WB Approach	11.1	B	-	13.3	B	-
		Left	10.0	A	3	10.0	A	10
		Through/Right	11.2	B	33	14.0	B	83
		NB Approach	12.2	B	-	10.1	B	-
		Left/Through/Right	12.2	B	40	10.1	B	10
		SB Approach	13.7	B	-	11.3	B	-
		Left	14.7	B	63	12.0	B	30
		Through/Right	9.1	A	8	10.6	B	23

Based on the results shown in Table 4 for two-way stop controlled intersections:

- The intersection of Main Avenue/Cass County 28 is the only intersection to experience an approach LOS lower than C during the AM peak hour. During the PM peak hour however, four of the five intersections experience unacceptable LOS on the minor approaches.
- The intersections of 13th Avenue/1st Street and 13th Avenue/Prairie Parkway experienced a southbound approach LOS E, while Main Avenue/Cass County 28 and 13th Avenue/16th Street experienced LOS F.

Table 4. Existing 2015 LOS for Two-Way Stop Controlled Intersections

Intersection	Control	Movement	2015 Existing Conditions					
			AM			PM		
			Delay (s/veh)	LOS	95% Queue (ft)	Delay (s/veh)	LOS	95% Queue (ft)
Main Avenue W / Cass County 28	Two-Way Stop Control	Overall Intersection	3.3	-	-	62.9	-	-
		EB Approach	0.7	A	-	0.4	A	-
		Left	8.4	A	4	8.8	A	2
		Through/Right	-	-	-	-	-	-
		WB Approach	0.4	A	-	1.0	A	-
		Left	8.9	A	2	9.1	A	6
		Through/Right	-	-	-	-	-	-
		NB Approach	18.6	C	-	31.8	D	-
		Left/Through	28.8	D	16	58.3	F	21
		Right	10.7	B	5	10.5	B	3
		SB Approach	27.2	D	-	249.1	F	-
Left/Through/Right	27.2	D	33	249.1	F	600		
13th Avenue / 10th Street	Two-Way Stop Control	Overall Intersection	5.0	-	-	3.3	-	-
		EB Approach	0.0	A	-	0.0	A	-
		Through/Right	-	-	-	-	-	-
		WB Approach	2.3	A	-	4.4	A	-
		Left/Through	7.4	A	1	7.6	A	5
		NB Approach	9.5	A	-	9.8	A	-
		Left/Right	9.5	A	12	9.8	A	4
13th Avenue / 1st Street	Two-Way Stop Control	Overall Intersection	5.4	-	-	7.6	-	-
		EB Approach	0.6	A	-	0.8	A	-
		Left	7.8	A	2	8.4	A	3
		Through/Right	-	-	-	-	-	-
		WB Approach	0.5	A	-	0.8	A	-
		Left	8.1	A	1	8.3	A	3
		Through/Right	-	-	-	-	-	-
		NB Approach	18.1	C	-	19.3	C	-
		Left/Through/Right	18.1	C	33	19.3	C	20
		SB Approach	18.0	C	-	42.4	E	-
Left/Through/Right	18.0	C	34	42.4	E	102		
13th Avenue / Prairie Parkway	Two-Way Stop Control	Overall Intersection	2.1	-	-	7.3	-	-
		EB Approach	0.5	A	-	0.3	A	-
		Left	7.8	A	2	9.0	A	2
		Through/Right	-	-	-	-	-	-
		WB Approach	0.6	A	-	0.8	A	-
		Left	8.6	A	2	8.8	A	5
		Through/Right	-	-	-	-	-	-
		NB Approach	13.4	B	-	31.8	D	-
		Left/Through/Right	13.4	B	13	31.8	D	54
		SB Approach	13.1	B	-	47.3	E	-
Left/Through/Right	13.1	B	7	47.3	E	106		
13th Avenue / 16th Street	Two-Way Stop Control	Overall Intersection	3.2	-	-	12.1	-	-
		EB Approach	0.2	A	-	0.6	A	-
		Left	7.9	A	1	9.7	A	4
		Through/Right	-	-	-	-	-	-
		WB Approach	1.1	A	-	1.8	A	-
		Left	8.5	A	3	9.7	A	19
		Through/Right	-	-	-	-	-	-
		NB Approach	15.1	C	-	79.5	F	-
		Left/Through/Right	15.1	C	34	79.5	F	108
		SB Approach	13.0	B	-	119.0	F	-
Left/Through	18.7	C	2	266.7	F	100		
Right	9.2	A	1	11.8	B	9		

Safety Analysis

First, utilizing the five-year crash data (2012–2016) provided by NDDOT, a heat map was developed to identify locations or intersections that experience high density levels in terms of crashes. The heat map is provided in Figure 28. Areas of red and orange represent the highest density of crash occurrences and can be considered high-priority, and therefore should receive additional focus for potential safety mitigation. Areas of green shown in the heat map represent demonstrate that crashes occurring in those locations are low-density and not cause for concern. The only intersection identified with high crash density levels is the intersection of 13th Avenue and 9th Street. It should be noted that this intersection was reconstructed in 2018 to address safety issues.



Figure 28. Heat Map of Crash Densities

During the five-year study period, a total of 253 crashes occurred on the corridor between Main Ave and 17th Street. There were zero fatalities. Seventy-five total crashes were injury-related and 178 crashes resulted in property damage only. Figure 29 depicts the yearly crash totals between the 2012 and 2016 study period. The linear trend line shows that the annual crash total increases at an average rate of approximately 13 crashes a year.

Because of the significant increase in crashes for the corridor, the percent changes in AADT between the years 2010, 2013 and 2015, AADT were evaluated as well. The AADT of the 13th Avenue corridor was found to increase by an average of 24.13 percent between 2010 and 2015.

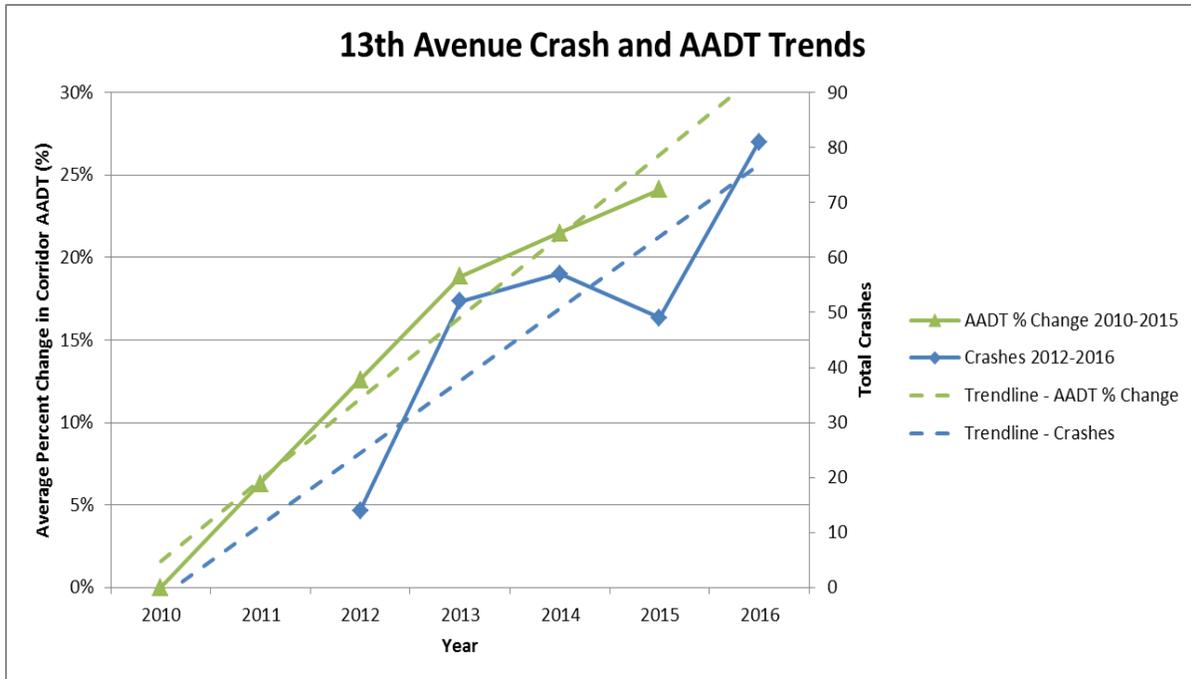


Figure 29. Annual Crash (2012-2016) and AADT (2010-2015) Trends

Intersection Crashes

Of the total 253 crashes previously mentioned, 195 were categorized as intersection crashes. Table 5 shows the breakdown of these crashes by manner of collision and year. Of the total 195 intersection crashes, 84 (43 percent) were categorized as angle-type crashes. A total of 72 (37 percent) were rear end crashes, while the third most common type of crash (11 percent) was identified as non-collision with motor vehicle, meaning the crash was between a vehicle and another obstacle rather than with another vehicle.

Table 5. Intersection Crashes by Manner of Collision

Manner of Collision	Year					Total
	2012	2013	2014	2015	2016	
Angle	5	14	22	20	23	84
Head On	0	0	0	2	6	8
Rear End	4	19	15	11	23	72
Sideswipe (Opp. Dir)	0	1	0	0	2	3
Sideswipe (Same Dir)	1	4	0	1	1	7
Non-Collision w/ Motor Vehicle	2	4	5	3	7	21
Total Intersection Crashes						195

Figure 30 shows the most severe intersection crash locations for the 13th Avenue study area during the 2012 to 2016 time period. Of the 195 total intersection crashes that took place, 23 (12 percent) resulted in a confirmed injury categorized as either an incapacitating injury or non-incapacitating injury. As shown in the figure, only three incapacitating injury crashes were reported: two at the intersection of 9th Street and 13th Avenue and one at the intersection of 14th Street and 13th Avenue.



Figure 30. Injury-Related Intersection Crashes

Segment Corridor Crashes

The data were also evaluated based on segment corridor crashes as well. These crashes are characterized as “non-junction” incidents in the crash reports. The 13th Avenue corridor study area had 58 reported segment crashes during the five-year analysis period. Of those 58 crashes, only six were confirmed as injury-related. Figure 31 shows the locations of each of the injury-related segment crashes. The only incapacitating injury crash was located on the north approach of 9th Street



Figure 31. Injury-Related Segment Corridor Crashes

Additionally, crashes were evaluated based on manner of collision. Table 6 demonstrates that the most common type of collision experienced on this portion of 13th Avenue is rear end, consisting of 29 (50 percent) of the total 58 segment crashes.

Table 6. Segment Corridor Crashes by Manner of Collision

Manner of Collision	Year					Total
	2012	2013	2014	2015	2016	
Angle	0	1	2	1	2	6
Head On	0	1	0	0	0	1
Rear End	0	5	5	7	12	29
Sideswipe (Same Dir)	1	2	4	2	1	10
Non-Collision w/ Motor Vehicle	1	1	4	2	4	12
Total Segment Crashes						58

Focusing more closely on rear end crashes, which are shown in red in Figure 32, most rear end crashes occurring on 13th Avenue are taking place between the 9th Street and 17th Street intersections. The 9th Street and 17th Street intersections are approximately 0.5 mile apart. 9th Street, 14th Street, and 17th Street are all signalized intersections and 16th Street is two-way stop control, with 13th Avenue being the free uncontrolled movement.



Figure 32. Segment Rear End Crashes

Crash Rates

Crash rates were also calculated and reviewed for intersections and segments along the corridor. Crash rates are beneficial in comparing the number of crashes that occur along a segment or at an intersection to the amount of exposure that occurs. For roadway segments, crash rates are measured in terms of how many crashes occur over one million vehicles miles traveled, while intersection crash rates are measured in crashes per million entering vehicles. All crashes that occurred within the study period of 2012 to 2016 were included in the exposure rate. Table 7 and Table 8 summarize and provide comparison for the calculated segment and intersection crash rates for the study area.

Table 7. Corridor Crash Rates by Segment

Segment	Ranking	Crash Rate (Crashes/MVMT)	MnDOT Comparison for Similar Section
13th Avenue - 10th Street to 8th Street	Highest	4.12	1.32
13th Avenue - Prairie Parkway to 9th Street		2.32	2.76
13th Avenue - 14th Street to 16th Street		1.80	2.76
13th Avenue - 9th Street to 14th Street		1.78	2.76
13th Avenue - Average Crash Rate for Corridor		1.57	-
13th Avenue - 16th Street to 17th Street		1.35	2.76
13th Avenue - 8th Street to Sheyenne Street		1.07	1.32
13th Avenue - Sheyenne Street to 1st Street		0.96	3.80
Cass County 28 - Main Avenue to 10th Street		0.92	1.46
13th Avenue - 1st Street to 6th Street		0.87	3.80
13th Avenue - 6th Street to Prairie Parkway	Lowest	0.49	2.76

*Yellow highlight denotes crash rate higher than corridor average

Table 8. Corridor Crashes by Intersection

Intersection	Ranking	Crash Rate (Crashes/MEV)	MnDOT Comparison for Similar Intersection
13th Avenue / 9th Street	Highest	1.63	0.70
13th Avenue / 17th Street		0.75	0.70
13th Avenue / 16th Street		0.71	0.18
13th Avenue / 8th Street		0.63	0.35
13th Avenue / Sheyenne Street		0.59	0.52
Average Intersection Crash Rate for Corridor		0.54	-
13th Avenue / 6th Street		0.51	0.52
13th Avenue / 14th Street		0.49	0.70
Main Avenue / Cass County 28		0.36	0.18
13th Avenue / 1st Street		0.13	0.18
13th Avenue / Prairie Parkway		0.11	0.18
13th Avenue / 10th Street	Lowest	0.00	0.18

*Yellow highlight denotes crash rate higher than corridor average

The study area result comparison provided in Table 8 reiterates what the crash density heat map showed in that the intersection of the 13th Avenue and 9th Street experiences a very high frequency of crashes. The 9th Street intersection also demonstrates a crash rate significantly higher than comparable intersections recorded by the Minnesota Department of Transportation. Construction at this intersection was completed in 2018; therefore, it should be monitored in the future to determine if further safety mitigation efforts are required. Five intersections demonstrated crash rates that exceeded the average comparison for the study corridor of 0.54 crashes per million entering vehicles. These four locations of the highest crash rates include the intersections of 13th Avenue and 8th Street, 9th Street, 17th Street, and 16th Street.

The segment of 13th Avenue between 10th Street and 8th Street is shown to have the highest crash rate for segments along the corridor, and its crash rate is much higher than Minnesota’s statewide comparison for similar roadway sections. However, the total length of that segment is only 0.2 mile.

Multimodal Operations

Existing Transit Operations

Metro Area Transit (MATBUS) Route 20 currently services part of the 13th Avenue Corridor. The section that it services is from 8th Street W to 17th Street E. See Figure 33 for the MATBUS Route 20 service area. There is currently only one bus stop along this portion of the corridor, which is located near the Sanford West Fargo Clinic.

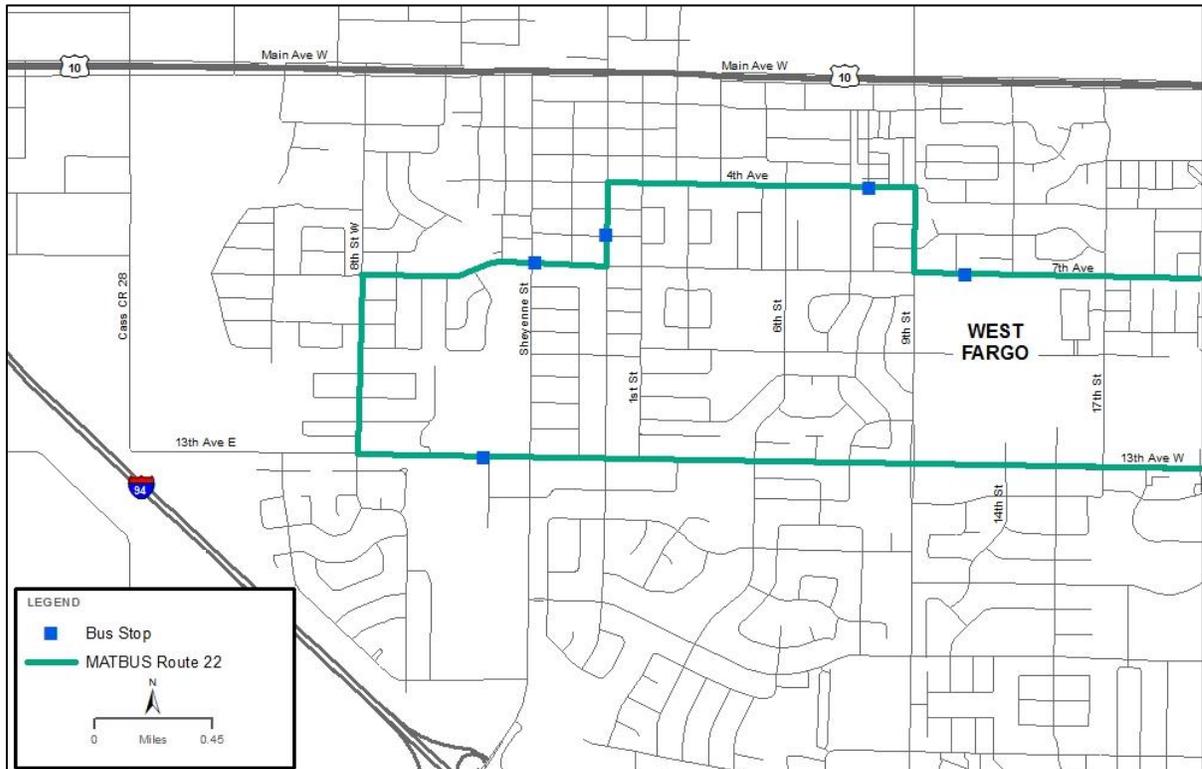


Figure 33. MATBUS Route along 13th Avenue Corridor

Future Transit Operations

Based on the Fargo-Moorhead 2016-2020 Transit Development Plan, there is no plan to expand transit in any of the study area. The current segment of 13th Avenue from 8th Street W to 17th Street E will be serviced by MATBUS Route 20 as it currently runs.

Truck Routes

The City of West Fargo Truck Routes map of 2017, Figure 34, currently shows Sheyenne Street, 13th Avenue between Sheyenne and 17th Street, and 9th Street as being utilized for existing truck routes.

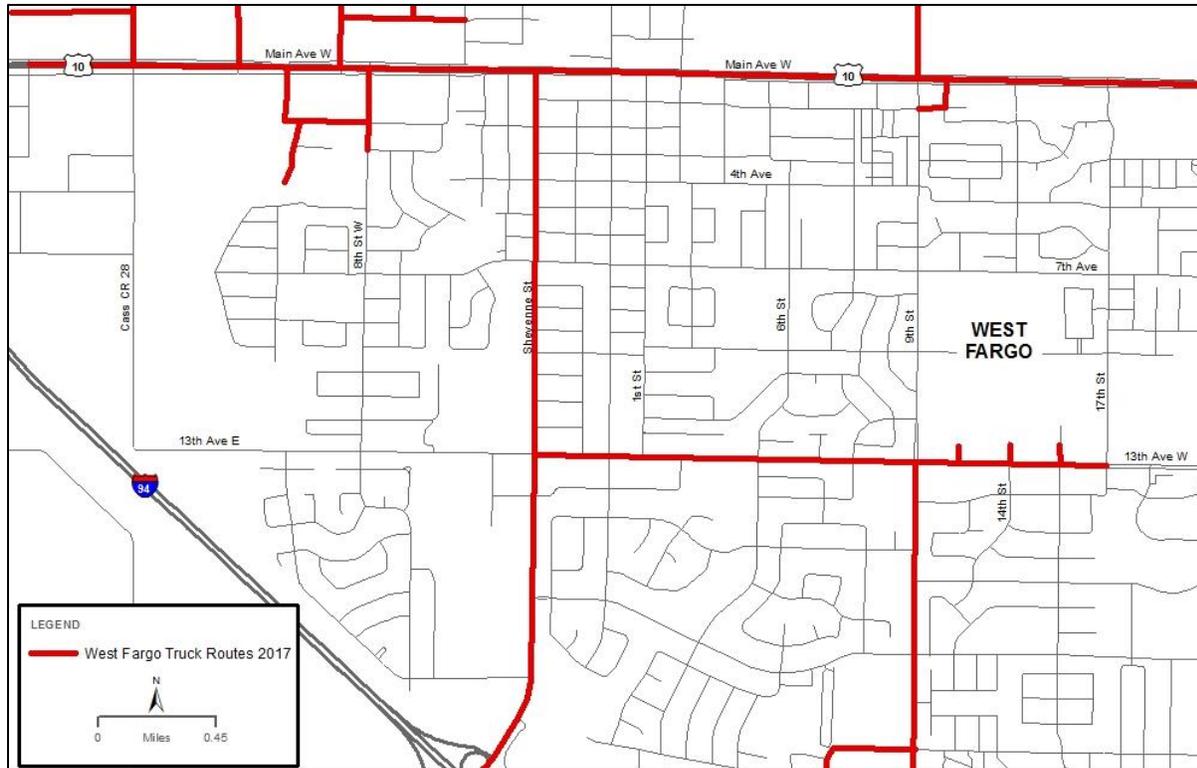


Figure 34. Existing Truck Routes along 13th Avenue Corridor

The presence of heavy vehicles utilizing these sections of roadway will be important to consider when developing future alternatives because factors such as efficient mobility, sight distance, and turning radii will be necessary to consider.

Traffic Forecasting

Scenario Development

A scenario development workshop was conducted with the SRC to identify potential land use and transportation network scenarios that may impact the 13th Avenue corridor. The SRC identified three land use and three transportation network scenarios. The three land use scenarios are as follows:

- Land Use 1 (L1) – New Town Center Development (Southwest of I-94)
 - This area was identified in the West Fargo 2.0 Comprehensive Plan. It is located between I-94 and the proposed FM Diversion. The plan is a mixed-use town center concept at this location.
- Land Use 2 (L2) – Red River Valley Fair Development
 - The Red River Valley Fairgrounds is being considered for annexation and redevelopment by the City of West Fargo. The redevelopment would include a convention center and hotel close to Main Avenue and additional commercial development along CR28 north of 13th Avenue W. Note that at



this time it is unknown how this site might redevelop. For now, the above assumptions will be used as a placeholder for similar development scenarios that would produce similar traffic volumes.

- Land Use 3 (L3) – L1 combined with L2

The three transportation network scenarios are as follows:

- Transportation Scenario 1 (T1) – 13th Avenue Overpass Connection
 - This scenario includes the construction of an overpass connection across I-94 to connect the corridor on the east and west sides of I-94.
- Transportation Scenario 2 (T2) – 15th Street Extension
 - This scenario includes extending 15th Street north of Main Avenue to 19th Avenue.
- Transportation Scenario 3 (T3) – T1 combined with T2.

After identifying the land use and transportation network scenarios, feasible combinations of these scenarios were identified. Table 9 shows the feasible combinations that were identified.

Table 9. Scenario Combinations

	Transportation Scenario 1 (T1) - 13 th Avenue Overpass Connection	Transportation Scenario 2 (T2) - 15 th Street Extension	Transportation Scenario 3 (T3) - T1 combined with T2	Baseline Transportation Network (TB)
Land Use 1 (L1) - New Town Center Development (Southwest of I-94)	✓		✓	
Land Use 2 (L2) - Red River Valley Fair Development		✓	✓	✓
Land Use 3 (L3) - L1 combined with L2	✓		✓	
Baseline Land Use (LB)		✓		✓

Travel Demand Modeling

Using 2015 as the baseline, each scenario combination identified as feasible was analyzed with FM Metro COG's 2045 Travel Demand Model to identify the future traffic projections. For each land use scenario, socio-economic data was developed to account for the land use changes in the travel analysis zones (TAZ). In order to remain consistent with the 2045 regional socio-economic control totals, the socio-economic data were reduced on other TAZs from across the metro, so there would not be a net increase. The 2045 projected average daily traffic volumes for each of the scenario combinations along with the 2015 average daily traffic and the 2045 base projection are shown on Figure 35.

2045 Forecasted Traffic Volumes

As mentioned previously, the 2015 volumes were used as the baseline for determining the 2045 turning movement forecasts. Several model runs utilizing different land use and development scenarios were completed for the 13th Avenue corridor and its crossroads within the study area. In doing so, the 2045 average daily traffic (ADT) volumes were established utilizing the development generators shown in Figure 35. Turning movement volumes were adjusted to balance traffic between intersections where appropriate. The 2045 turning movement counts used for the forecasted analysis are provided in Figure 36.

8th Street West Signal Warrant

The 8th Street West and 13th Avenue intersection is currently an all-way stop controlled intersection. A signal warrant analysis was completed to see if a traffic signal is currently warranted at this intersection or if it is anticipated that traffic signal warrants may be met in the future. The Manual on Uniform Traffic Control Devices (MUTCD) 2009 Edition was used to assess the signal warrants. Due to limited available traffic count data at this intersection, the only warrant that was analyzed was Warrant 3 – Peak Hour. The existing year peak hour turning movements do not meet signal warrants. The future year traffic projections indicate that this intersection may meet signal warrants by year 2045. It is recommended to monitor this intersection and install a traffic signal when warrants are met.

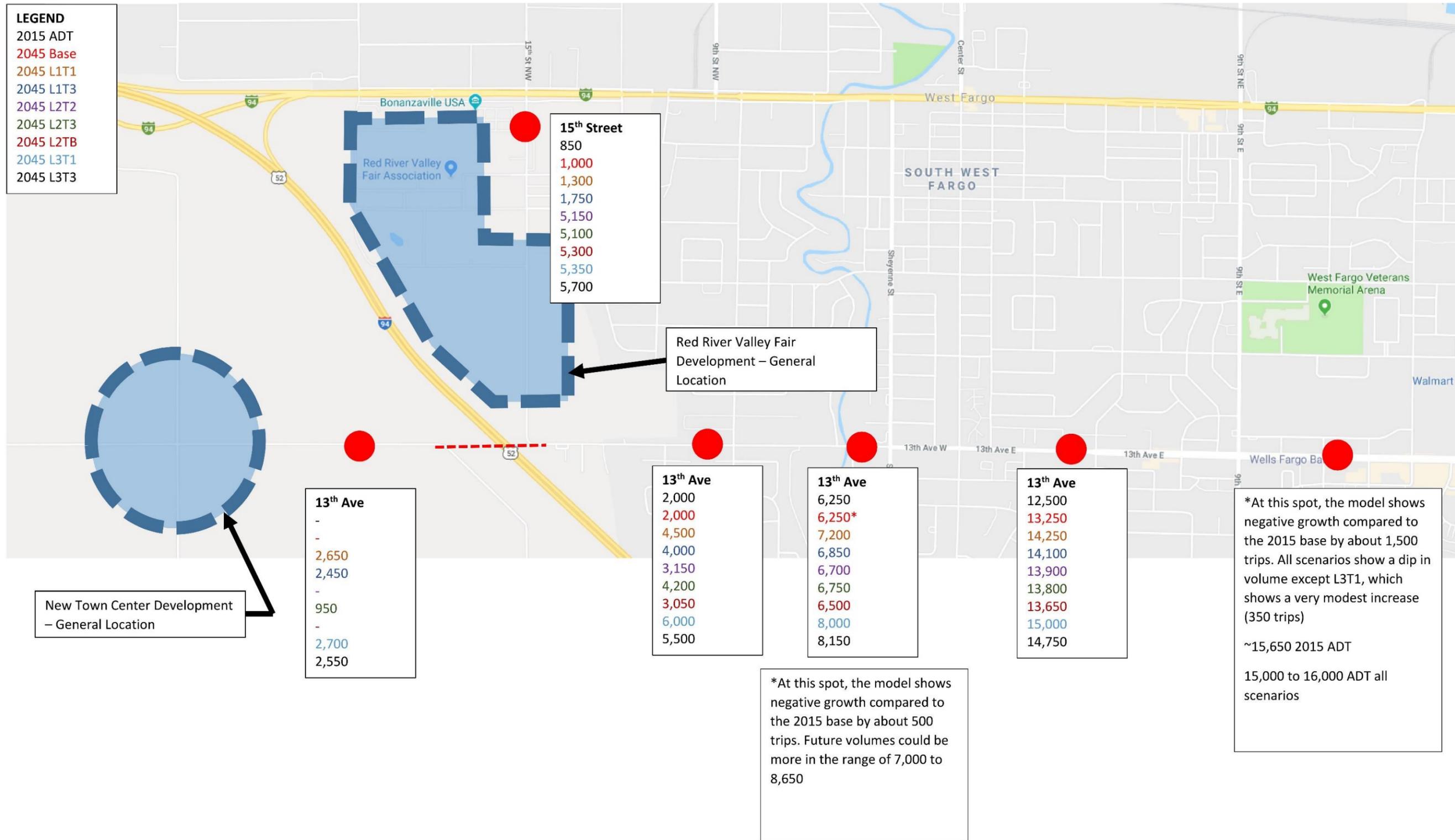


Figure 35. Scenario Development Traffic Projections

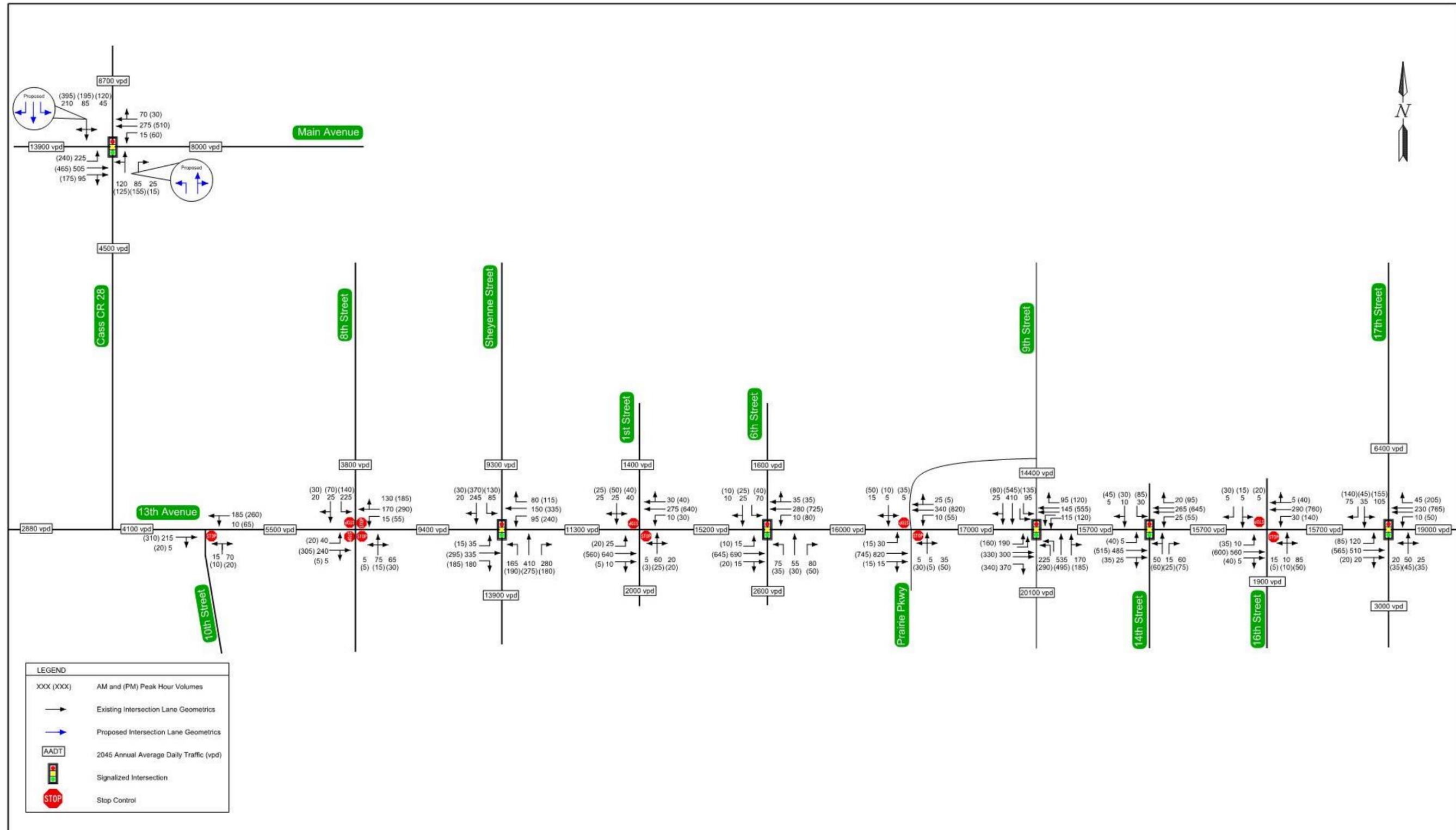


Figure 36. 2045 Forecasted Traffic Volumes and Turn Movements

Forecasted Level of Service – No Build

Intersection LOS for 13th Avenue are provided in Table 10 through Table 13. Table 10 depicts the LOS results for signalized intersections under the 2045 traffic volumes using the existing lane configurations. NDDOT's guidance for intersection LOS is that an intersection must meet or exceed an overall LOS D under forecasted conditions. Therefore, intersections meeting or exceeding LOS D are assumed to function adequately to meet forecasted traffic needs and no changes will be recommended. Intersections operating below LOS D will be analyzed to determine what geometric or signalized improvements can be made to improve its LOS. As was done for the existing analysis tables, cells with LOS D are highlighted in yellow to denote the lowest acceptable LOS based on NDDOT guidelines. LOS E is shown in orange and LOS F is shown as red to denote failing LOS.

Signalized intersection findings include the following:

- All but one of the signalized intersections demonstrated acceptable LOS for the existing lane configurations under forecasted traffic volumes, except for the intersection of Main Avenue/CR28 during the PM peak hour.
- The intersection of Main Avenue/CR28 showed significant delays and an overall intersection LOS of E under the existing lane configuration. During the PM peak hour, the eastbound and westbound approaches experienced LOS D, with the eastbound left-turning movement experiencing LOS F. The south approach experienced LOS F as well.

Table 10. Forecasted 2045 LOS for Signalized Intersections Utilizing Existing Lane Configurations

Intersection	Control	Movement	2045 Forecasted Conditions Utilizing Existing Lane Configurations					
			AM			PM		
			Delay (s/veh)	LOS	95% Queue (ft)	Delay (s/veh)	LOS	95% Queue (ft)
Main Avenue W / Cass County 28	Signalized	Overall Intersection	17.4	B	-	56.3	E	-
		EB Approach	14.9	B	-	48.5	D	-
		Left	19.7	B	#125	93.8	F	#246
		Through/Right	13.1	B	154	31.5	C	#246
		WB Approach	17.4	B	-	48.7	D	-
		Left	9.9	A	12	23.2	C	47
		Through/Right	17.7	B	84	51.6	D	#248
		NB Approach	30.1	C	-	29.0	C	-
		Left/Through	33.0	C	#155	30.3	C	#255
		Right	5.9	A	13	5.3	A	9
		SB Approach	14.9	B	-	83.8	F	-
Left/Through/Right	14.9	B	134	83.8	F	#628		
13th Avenue / Sheyenne Street	Signalized	Overall Intersection	21.0	C	-	27.8	C	-
		EB Approach	22.4	C	-	23.7	C	-
		Left	13.5	B	27	12.9	B	15
		Through	32.5	C	#275	35.3	D	#245
		Right	5.4	A	45	6.0	A	48
		WB Approach	16.4	B	-	21.5	C	-
		Left	17.0	B	58	28.9	C	#167
		Through	21.6	C	110	21.9	C	#253
		Right	6.1	A	31	4.7	A	36
		NB Approach	20.6	C	-	24.1	C	-
		Left	17.3	B	87	40.4	D	#144
		Through	32.7	C	#336	25.3	C	192
		Right	4.8	A	52	4.9	A	43
		SB Approach	23.9	C	-	44.6	D	-
		Left	15.6	B	49	17.1	B	72
Through/Right	26.5	C	183	53.5	D	#360		
13th Avenue / 6th Street	Signalized	Overall Intersection	7.7	C	-	5.8	A	-
		EB Approach	6.6	A	-	4.9	A	-
		Left	5.9	A	9	5.1	A	6
		Through/Right	6.6	A	94	4.9	A	74
		WB Approach	5.4	A	-	5.3	A	-
		Left	6.1	A	7	6.5	A	30
		Through/Right	5.4	A	38	5.2	A	87
		NB Approach	12.0	B	-	10.5	B	-
		Left	16.1	B	40	14.0	B	23
		Through	13.5	B	30	13.3	B	20
		Right	7.2	A	26	6.3	A	18
		SB Approach	14.3	B	-	12.9	B	-
		Left	16.1	B	38	14.3	B	25
Through/Right	10.6	B	20	11.4	B	20		



Table 10. Forecasted 2045 LOS for Signalized Intersections Utilizing Existing Lane Configurations (continued)

13th Avenue / 9th Street	Signalized	Overall Intersection	27.6	C	-	32.3	C	-
		EB Approach	26.3	C	-	26.7	C	-
		Left	48.8	D	#110	49.0	D	#93
		Through	28.1	C	120	27.6	C	141
		Right	13.2	B	180	15.3	B	194
		WB Approach	27.1	C	-	33.0	C	-
		Left	45.0	D	#67	44.7	D	66
		Through	27.3	C	65	36.6	D	225
		Right	5.0	A	32	4.5	A	35
		NB Approach	30.5	C	-	33.0	C	-
		Left	47.4	D	#125	50.1	D	#159
		Through/Right	25.1	C	211	25.6	C	227
		SB Approach	25.0	C	-	36.3	C	-
		Left	36.8	D	51	48.5	D	#79
Through/Right	22.4	C	132	33.6	C	236		
13th Avenue / 14th Street	Signalized	Overall Intersection	11.4	B	-	13.5	B	-
		EB Approach	10.8	B	-	13.7	B	-
		Left	7.4	A	6	8.5	A	22
		Through/Right	10.9	B	132	14.1	B	141
		WB Approach	8.5	A	-	12.2	B	-
		Left	7.2	A	16	8.5	A	28
		Through	8.9	A	70	13.6	B	173
		Right	5.8	A	13	4.3	A	28
		NB Approach	19.3	B	-	19.4	B	-
		Left/Through	28.1	C	61	29.1	C	70
		Right	9.8	A	30	8.5	A	31
		SB Approach	16.0	B	-	13.8	B	-
		Left	17.0	B	27	17.6	B	53
		Through/Right	14.1	B	16	9.5	A	36
13th Avenue / 17th Street	Signalized	Overall Intersection	12.9	B	-	16.6	B	-
		EB Approach	7.8	A	-	13.2	B	-
		Left	6.4	A	49	9.6	A	47
		Through/Right	8.2	A	133	13.8	B	178
		WB Approach	11.2	B	-	15.1	B	-
		Left	6.3	A	8	8.7	A	30
		Through	12.6	B	66	18.5	B	272
		Right	4.8	A	20	3.6	A	44
		NB Approach	23.3	C	-	22.5	C	-
		Left/Through/Right	23.3	C	76	22.5	C	87
		SB Approach	26.1	C	-	25.8	C	-
		Left/Through	35.8	D	124	39.6	D	175
		Right	8.0	A	33	6.1	A	41

denotes queue volume exceeding capacity

Table 11 and Table 12 show the LOS values for intersections where two-way or four-way stop control is present on the minor approaches. It is important to note that LOS of intersections with two-way stop control are based on the average delay for vehicles on the minor roadway approaches. The major roadway approaches will generally have much better LOS in comparison to the minor approaches because the through and right turns are

unconstrained by delay and the left-turning vehicles only need to wait for gaps identified in opposing traffic platoons.

For all-way stop control:

- The all-way stop intersection of 13th Avenue/8th Street experienced acceptable LOS for all approaches during both the AM and PM peak hours under forecasted traffic volumes.

Table 11 Forecasted 2045 LOS for Four-Way Stop Controlled Intersections

Intersection	Control	Movement	2045 Forecasted Conditions					
			AM			PM		
			Delay (s/veh)	LOS	95% Queue (ft)	Delay (s/veh)	LOS	95% Queue (ft)
13th Avenue / 8th Street	Four-Way Stop Control	Overall Intersection	16.1	C	-	23.1	C	-
		EB Approach	15.5	B	-	18.4	B	-
		Left	10.8	B	8	10.1	B	3
		Through/Right	16.3	C	75	18.9	C	115
		WB Approach	17.6	B	-	31.5	D	-
		Left	10.3	B	3	10.4	B	10
		Through/Right	18.0	C	105	33.9	D	420
		NB Approach	13.4	B	-	11.7	B	-
		Left/Through/Right	13.4	B	35	11.7	B	10
		SB Approach	16.4	B	-	13.2	B	-
		Left	17.7	C	78	14.3	B	38
Through/Right	10.1	B	8	11.7	B	20		

For two-way stop controlled intersections:

- The increase in the projected traffic volumes resulted in unacceptable LOS for the northbound and southbound minor approaches at three of the four intersections during the PM peak hour.
- These intersections were evaluated to determine if traffic signal warrants were met using the criteria identified in the Manual on Uniform Traffic Control Devices. None of these intersections met the signal warrant criteria.
- Also, all three of these intersections have alternate ways to access 13th Street at a signalized intersection.



Table 12. Forecasted 2045 LOS for Two-Way Stop Controlled Intersections

Intersection	Control	Movement	2045 Forecasted Conditions					
			AM			PM		
			Delay (s/veh)	LOS	95% Queue (ft)	Delay (s/veh)	LOS	95% Queue (ft)
13th Avenue / 10th Street	Two-Way Stop Control	Overall Intersection	1.9	-	-	1.3	-	-
		EB Approach	0.0	A	-	0.0	A	-
		Through/Right	-	-	-	-	-	-
		WB Approach	0.4	A	-	1.6	A	-
		Left/Through	7.7	A	1	8.2	A	5
		NB Approach	10.5	B	-	12.4	B	-
		Left/Right	10.5	B	11	12.4	B	5
13th Avenue / 1st Street	Two-Way Stop Control	Overall Intersection	4.5	-	-	9.2	-	-
		EB Approach	0.3	A	-	0.3	A	-
		Left	8.0	A	2	9.3	A	2
		Through/Right	-	-	-	-	-	-
		WB Approach	0.3	A	-	0.4	A	-
		Left	9.1	A	1	8.9	A	3
		Through/Right	-	-	-	-	-	-
		NB Approach	29.2	C	-	34.6	D	-
		Left/Through/Right	29.2	D	43	34.6	D	31
		SB Approach	27.1	C	-	98.3	F	-
Left/Through/Right	27.1	D	42	98.3	F	140		
13th Avenue / Prairie Parkway	Two-Way Stop Control	Overall Intersection	1.2	-	-	8.4	-	-
		EB Approach	0.3	A	-	0.2	A	-
		Left	8.2	A	2	9.9	A	2
		Through/Right	-	-	-	-	-	-
		WB Approach	0.3	A	-	0.6	A	-
		Left	9.9	A	1	9.9	A	6
		Through/Right	-	-	-	-	-	-
		NB Approach	17.8	C	-	66.5	F	-
		Left/Through/Right	17.8	C	13	66.5	F	87
		SB Approach	17.6	C	-	96.1	F	-
Left/Through/Right	17.6	C	7	96.1	F	119		
13th Avenue / 16th Street	Two-Way Stop Control	Overall Intersection	2.2	-	-	6.4	-	-
		EB Approach	0.1	A	-	0.5	A	-
		Left	7.9	A	1	9.9	A	4
		Through/Right	-	-	-	-	-	-
		WB Approach	0.8	A	-	1.5	A	-
		Left	8.9	A	3	9.8	A	15
		Through/Right	-	-	-	-	-	-
		NB Approach	15.1	C	-	37.6	E	-
		Left/Through/Right	15.1	C	25	37.6	E	43
		SB Approach	16.9	C	-	107.2	F	-
		Left/Through	20.7	C	4	189.2	F	78
		Right	9.2	A	0	11.7	B	5

Forecasted Level of Service – with Lane Improvements

Further analysis regarding the effectiveness of lane improvements was conducted on the intersection of Main Avenue/CR28 to improve its PM peak hour LOS. The northbound and southbound lane configurations were changed to the following:

- Northbound protected-permissive left
- Northbound shared through/right
- Southbound protected-permissive left
- Southbound through
- Southbound permissive designated right

The intersection LOS results for this lane configuration are provided in Table 13. The change in lane configuration improved the overall intersection LOS from E to C during the PM peak hour. The southbound and eastbound approaches also no longer experience LOS F. The overall intersection and each approach are now expected to experience LOS B during the AM peak and LOS C during the PM peak.

No other lane improvements were deemed necessary since all of the other signalized intersections experienced LOS D or better. Also, as previously mentioned, none of the stop-controlled intersections meet warrants for conversion to traffic signals.

Table 13. Forecasted 2045 LOS for Main Avenue/CR 8 with Lane Improvements

Intersection	Control	Movement	2045 Forecasted Conditions With Lane Improvements					
			AM			PM		
			Delay (s/veh)	LOS	95% Queue (ft)	Delay (s/veh)	LOS	95% Queue (ft)
Main Avenue W / Cass County 28	Signalized	Overall Intersection	15.6	B	-	23.4	C	-
		EB Approach	15.3	B	-	20.9	C	-
		Left	20.0	C	#127	26.2	C	#177
		Through/Right	13.6	B	157	18.9	B	199
		WB Approach	18.2	B	-	31.4	C	-
		Left	9.9	A	12	15.5	B	41
		Through/Right	18.6	B	87	33.2	C	#224
		NB Approach	16.9	B	-	22.5	C	-
		Left	17.0	B	65	19.7	B	71
		Through/Right	16.7	B	69	24.6	C	115
		SB Approach	12.5	B	-	20.1	C	-
		Left	13.3	B	30	18.5	B	69
		Through	22.4	C	63	27.0	C	135
		Right	8.3	A	48	17.1	B	143

denotes queue volume exceeding capacity

The following recommendations are based on LOS results:

- Implement a southbound right turn lane at the intersection of Main Avenue/CR28.
- Implement a southbound protected-permissive left turn lane at the intersection of Main Avenue/CR28.
- Install a northbound protected-permissive designated left at the intersection of Main Avenue/CR28.
- Implement protected-permissive left turns when possible at all other intersections to optimize capacity.

Issues and Needs Assessment

Purpose and Need

The purpose of this study is to identify the future needs of this corridor in order to establish recommended transportation improvements to occur in the near future and in the next 20 to 25 years. The following is a list of specific needs/issues that were identified for this study:

- Sections of the corridor are experiencing failing pavement conditions which will result in the need for reconstruction in the near future.
- Vacant land along the western portion of the corridor has been targeted for development. Access management, traffic operations, and safety will need to be addressed as this area develops.
- With future growth areas potentially opening up southwest of Interstate 94, an overpass connection across Interstate 94 may be considered in the future. The traffic and safety impact on 13th Avenue resulting from a grade separation will need to be addressed.
- The CR28 and Main Avenue intersection is projected to have failing traffic operations by the year 2045 during the PM peak hour. It should be noted that analysis of this intersection was completed before the traffic signals were added.

The primary goal of this study is to develop feasible solutions to address the issues and needs. Figure 37 through Figure 43 show the entire corridor with a summary of the issues and needs.

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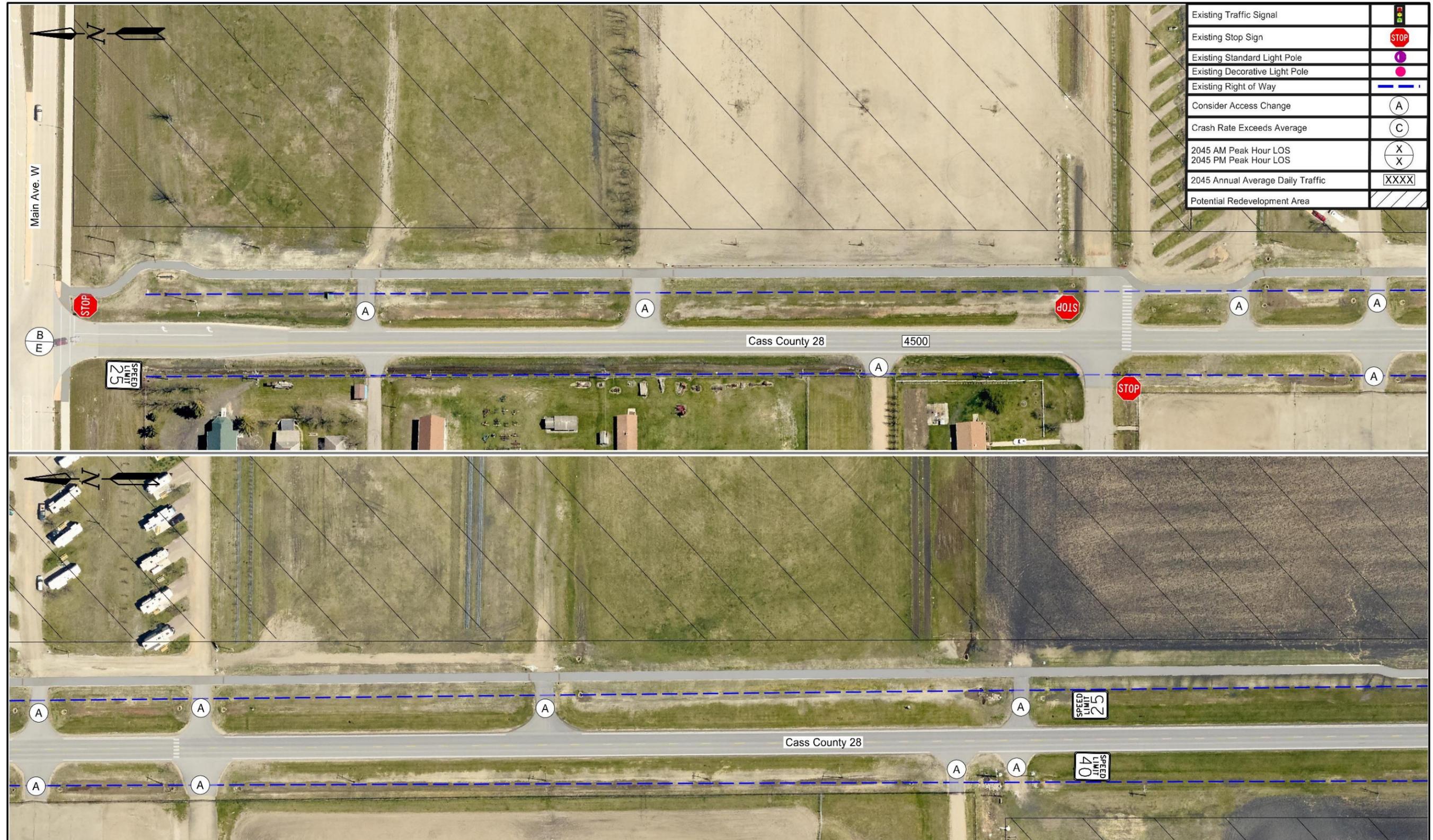


Figure 37. Issues and Needs Summary A

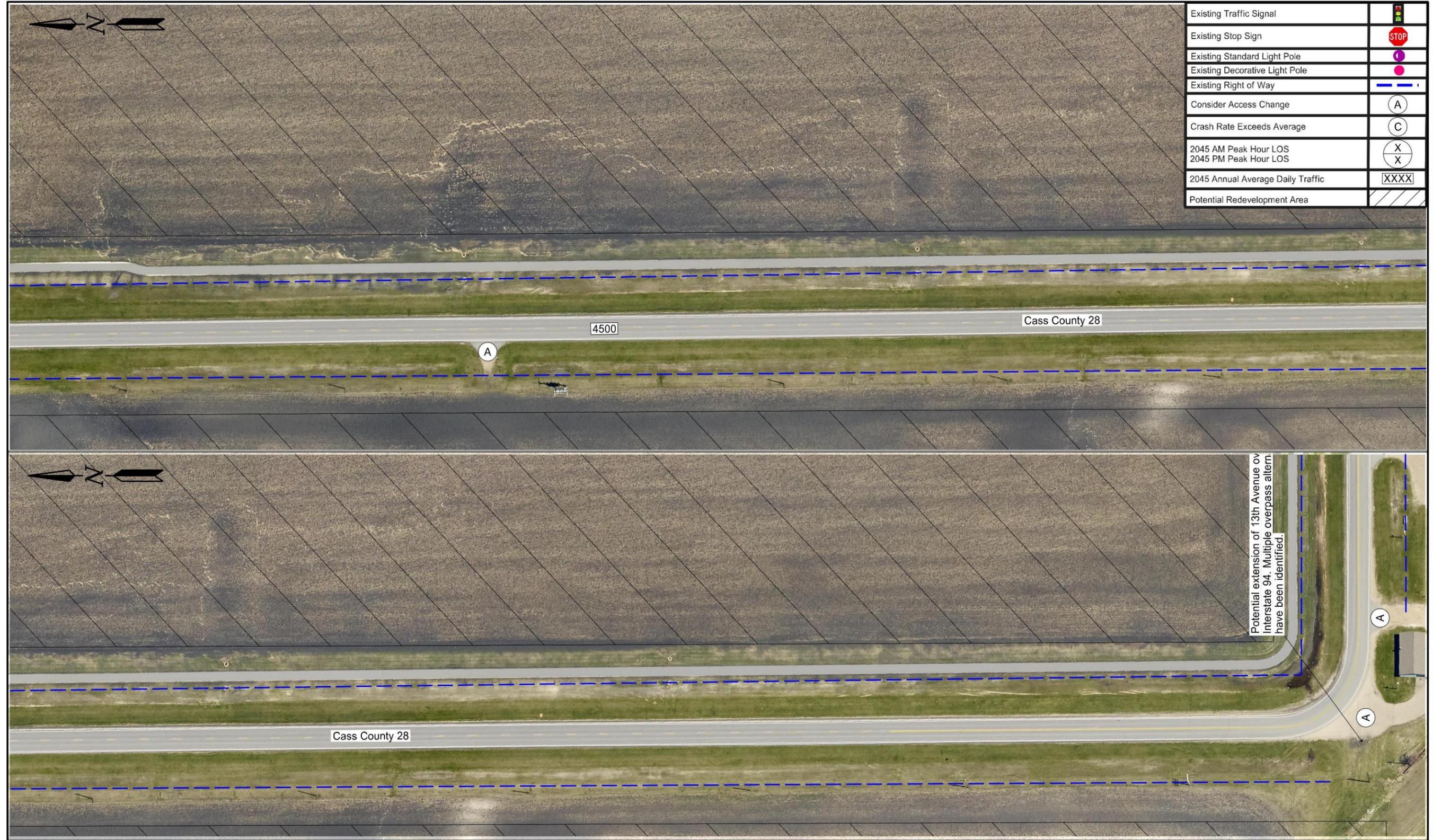


Figure 38. Issues and Needs Summary B



Figure 39. Issues and Needs Summary C

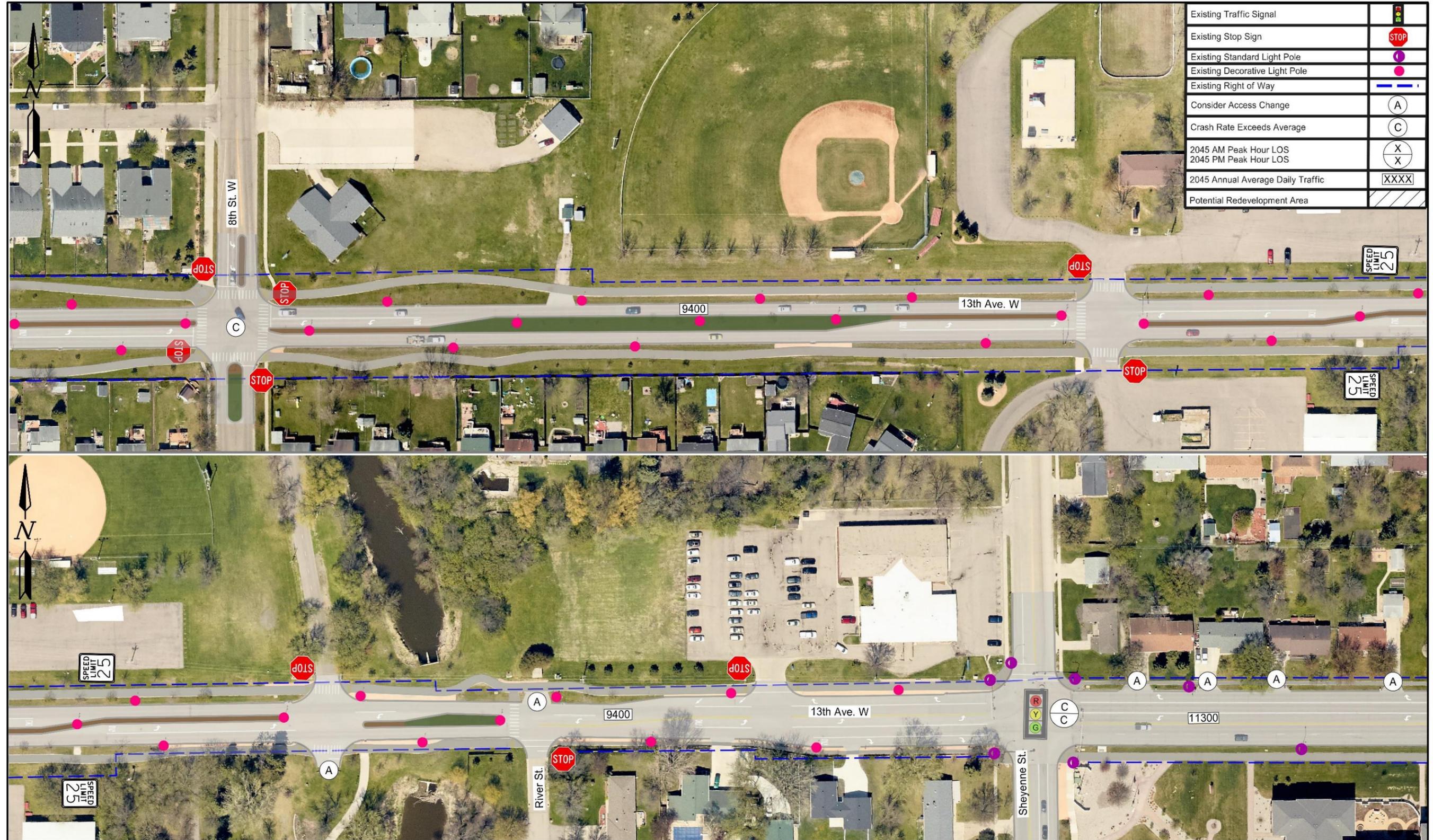


Figure 40. Issues and Needs Summary D

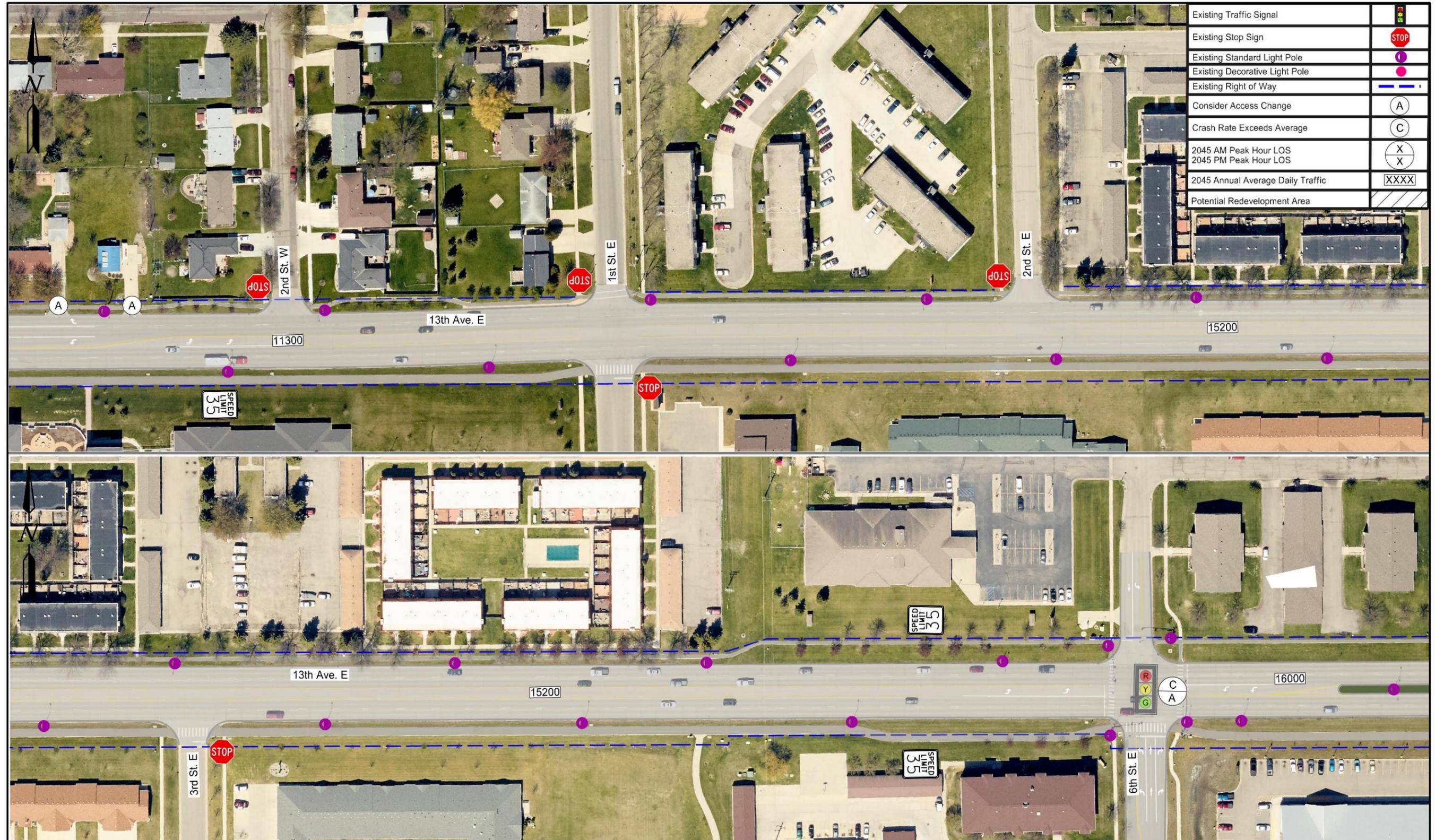


Figure 41. Issues and Needs Summary E

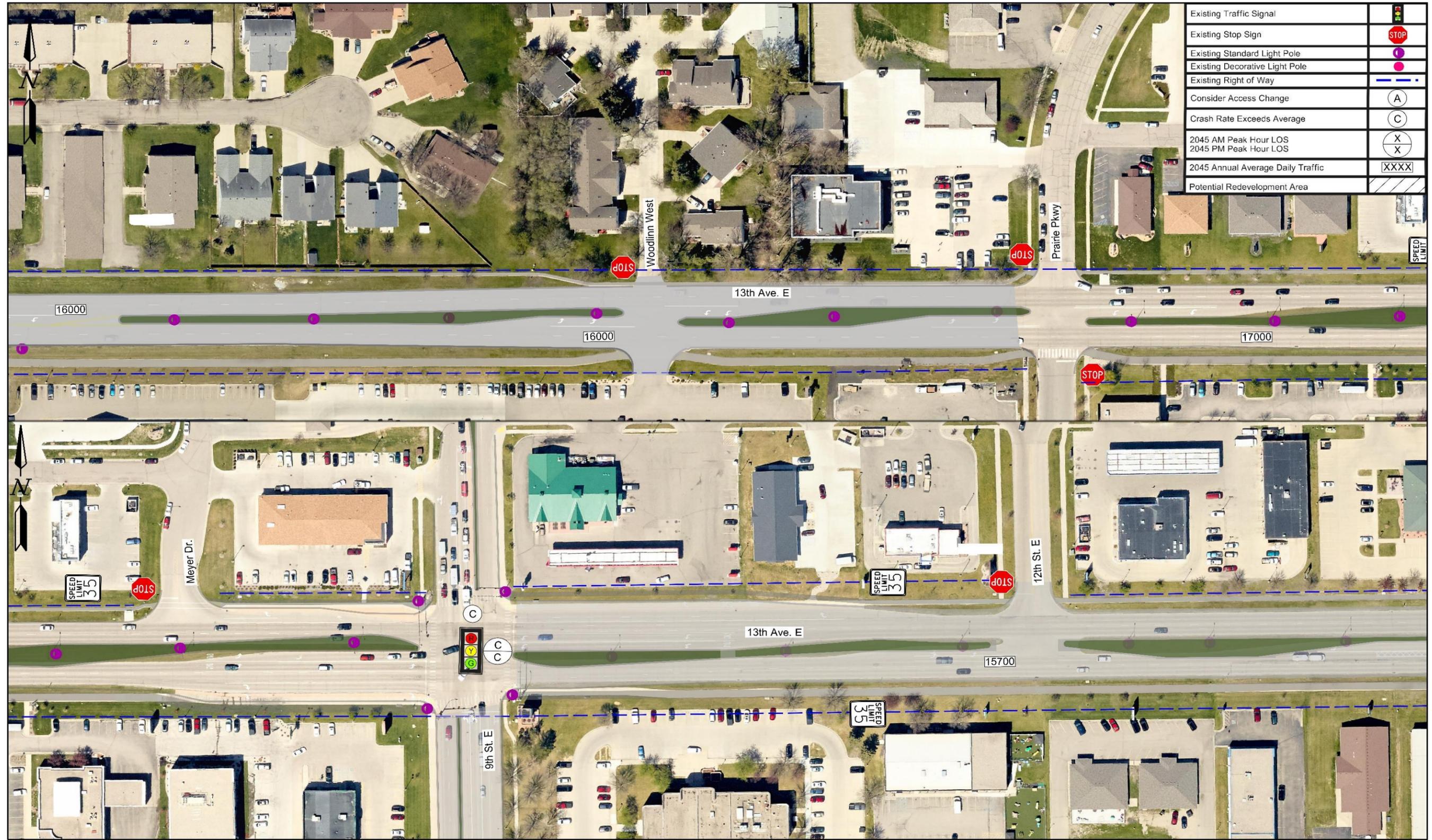


Figure 42. Issues and Needs Summary F



Figure 43. Issues and Needs Summary G

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Development of Alternatives

Introduction

The alternatives developed for this analysis were completed utilizing a high-level, concept-based layout. It is recommended that further detailed analysis and design be required if any specific alternative moves forward into a project. It is also important to note that the City of West Fargo recently underwent development through *West Fargo 2.0: Redefining Tomorrow*, their comprehensive plan for the future growth in the City.

As a result, the City would like to include certain aesthetics and corridor characteristics as part of future projects. With this in mind, as alternatives are developed and carried forward into project phases, it is recommended to incorporate these desires through both geometric design and streetscaping in efforts to promote consistency and cohesiveness along the corridor.

Segment 1: Cass County Road 28 (CR28): Main Avenue to 10th Street W

The SRC discussed four alternatives for Segment 1 of the 13th Avenue Corridor Study. All vary in operations, impacts, and costs. These four alternatives are listed as follows:

- No Build
- Two-Lane (Urban)
- Two-Lane Divided (Urban)
- Interstate 94 (I-94) Overpass Connection.

No Build

The no build alternative would leave the current two-lane rural roadway configuration in place. Maintenance operations would continue as currently scheduled.

Two-Lane (Urban)

The two-lane urban section would leave the current roadway configuration in place, with the addition of curb and gutter to the roadway section. The two-lane urban typical section is shown in Figure 44.

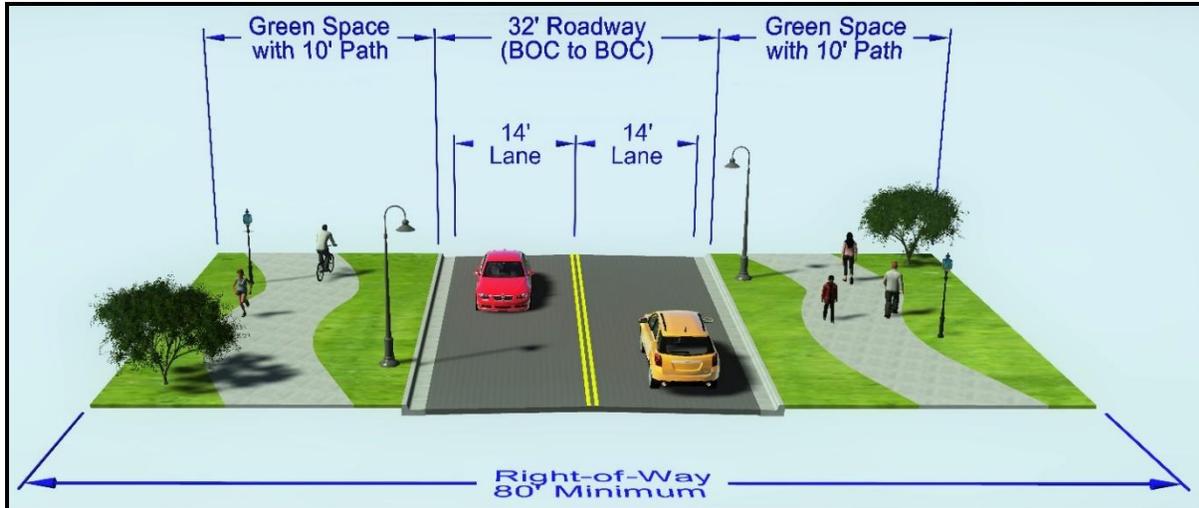


Figure 44. Two-Lane Urban Typical Section

Two-Lane Divided (Urban)

The two-lane divided urban section would add a raised median to provide access management opportunities once this area becomes developed, as well as the addition of curb and gutter. The current shared use path would be maintained and connections would be made where gaps in accessibility exist. A typical section is shown in Figure 45. Plan view layouts are also shown in Figure 49 through Figure 53.

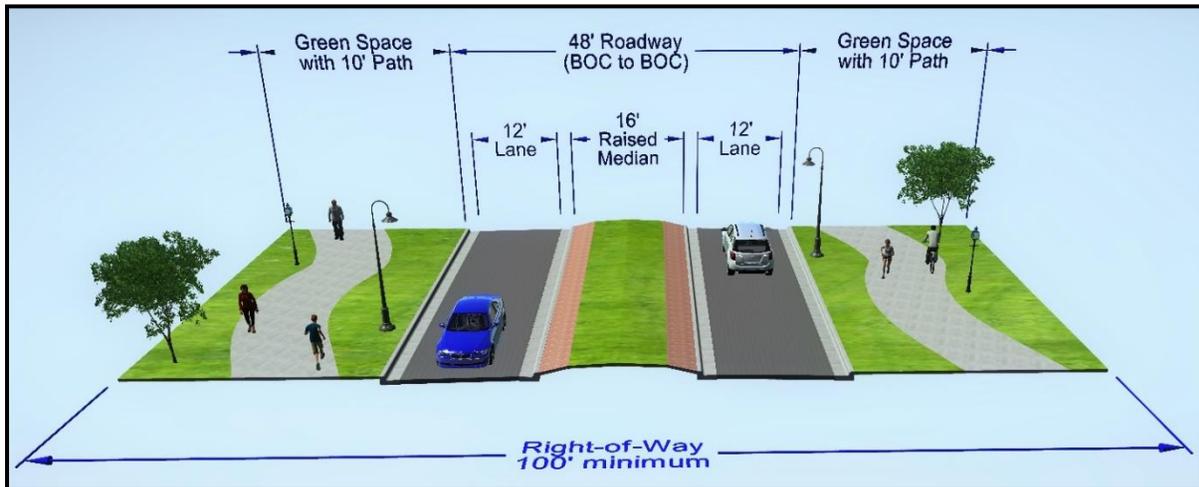


Figure 45. Two-Lane Divided Urban Typical Section

Interstate 94 Overpass Connection

Segment 1 currently consists of a 90 degree curve adjacent to I-94. At the request of the City, as part of this study an overpass connection across I-94 was analyzed. The overpass connection would allow future areas of development southwest of I-94 a shorter connection to both the 13th Avenue and the Main Avenue corridors. The I-94 overpass connection could be incorporated into any of the other three alternatives for Segment 1 if progressed into a project.

During the third SRC meeting, three separate options for the overpass were discussed, with one being chosen for further evaluation. As mentioned previously, alternatives developed for this high-level analysis are concept-based and are anticipated to undergo further analysis before moving forward into the project phase. As an overpass connection would cross the Sheyenne River Diversion (Diversion) which was a federally authorized flood control project. This is a major flood protection asset and work in the channel or on the levees will need to be coordinated further with the U.S. Army Corps of Engineers and 408 permits will need to be obtained. Any environmental or hydraulic impacts will need to be further assessed. The potential overpass alternatives are discussed below and are shown in Figure 46.

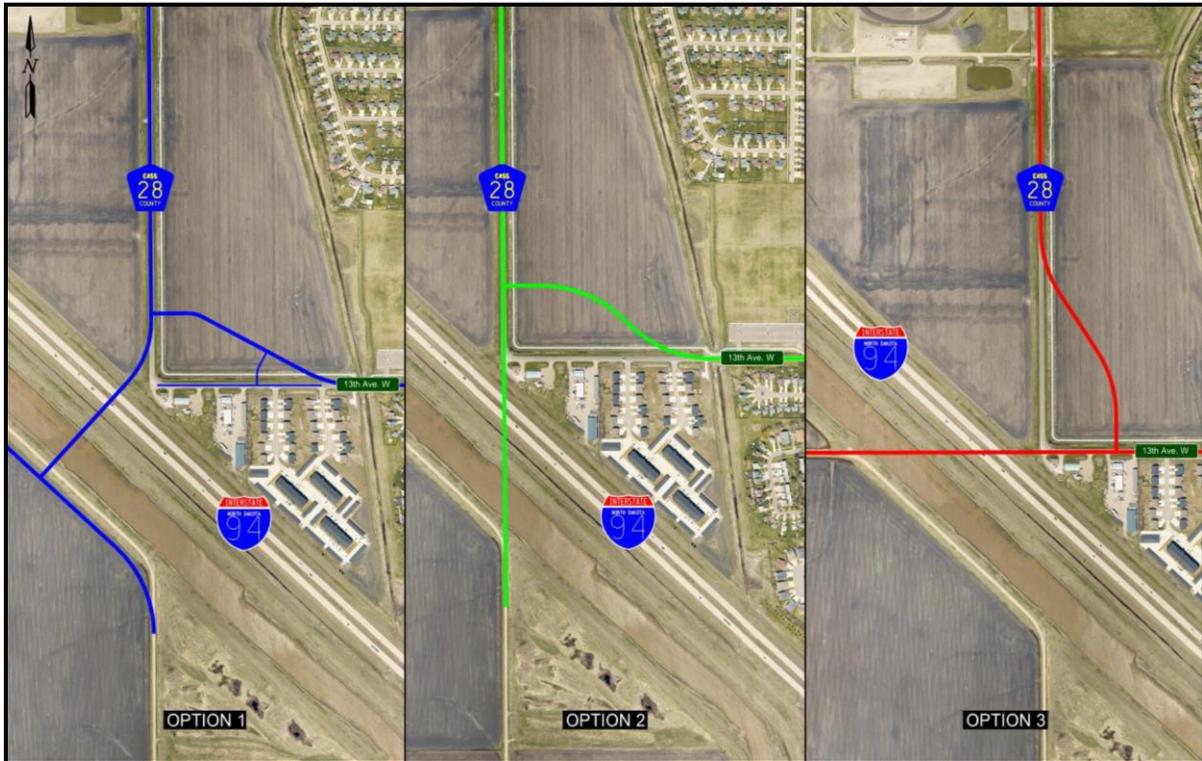


Figure 46. I-94 Overpass Alternatives

- Option 1: Cross I-94 at 90° (±5°) with CR28, tying 13th Avenue W into the new alignment of CR28. This option would require realignment of 13th Avenue W. A plan view variant of this option is shown in Figure 51 and Figure 52.
- Option 2: Cross I-94 along the current alignment of CR28, tying 13th Avenue W into the alignment of CR28. Realignment of 13th Avenue W would be required in this option.
- Option 3: Cross I-94 along the current alignment of 13th Avenue W, tying CR28 into the alignment of 13th Avenue W. This option requires the realignment of CR28.

Due to the extreme skew angle of crossing I-94 along either of the current alignments, which would result in longer structures as well as higher design and construction costs; Options 2 and 3 were removed from further development and analysis.

The proposed overall structure width is approximately 64 feet, including two 12-foot thru lanes (one in each direction of travel), a 17-foot raised median, and a 10-foot shared use path on one side of the structure. The barrier face to barrier face clear width provided provides adequate space for future lane reconfiguration for a four-lane undivided section through the structure. A typical section is shown in Figure 47.

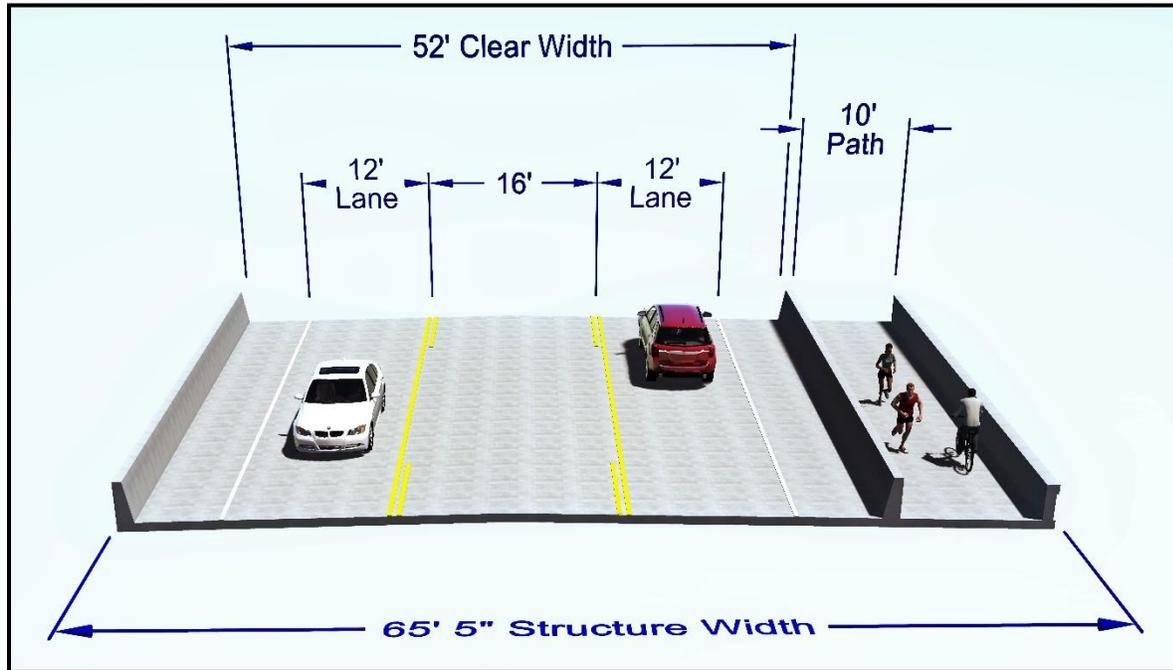


Figure 47. Proposed Structure Typical Section

Segment 2: 13th Avenue W: 10th Street W to Sheyenne Street

The SRC discussed two alternatives for segment 2 of the 13th Avenue Corridor Study, listed below. Once again, all vary in operations, impacts, and costs.

No Build

The no build alternative would leave the current two-lane divided urban roadway configuration in place. Maintenance operations would continue as scheduled.

Safety Improvements

Projected 2045 traffic volumes along 13th Avenue W through segment 2 are not expected to exceed the capacity of the current roadway section. As discussed at the SRC meeting, focus was given to spot improvements with the intent of improving safety, as well as pedestrian and bicyclist operations. These spot improvements include potentially reconstructing left turn lanes to have positive offsets at 8th Street W, as well as updating all pedestrian signing to ensure adequate reflectivity, updating all crosswalk pavement markings, and adjusting truncated domes on pedestrian ramps to sidewalks so they are properly aligned with crosswalks. A plan view of some of these improvements is shown in Figure 53 and Figure 54.

The SRC committee brought up high pedestrian traffic around Elmwood Park during sporting events. There are additional items that can be added at pedestrian crosswalks to increase their effectiveness. Some of these items include:

- High Visibility Markings
- Illumination
- Signing
- Advance Stop Bars
- Median Islands
- Curb Extensions
- Rectangular Rapid Flash Beacon
- Pedestrian Signal
- Pedestrian Hybrid Beacon (aka HAWK)

The type of treatment will vary depending on the roadway characteristics, pedestrian volumes and surrounding environment. An engineering study may be necessary for implementation of beacons or signals.

Segment 3: 13th Ave W/E: Sheyenne Street to Prairie Parkway

The SRC discussed two alternatives for Segment 2 of the 13th Avenue Corridor Study, listed below. Once again, all vary in operations, impacts, and cost.

- No Build
- Four-Lane Divided (Urban).

No Build

The no build alternative would leave the five-lane roadway configuration in place. Maintenance operations would continue as scheduled.

Four-Lane Divided (Urban)

The four-lane divided urban section shown in Figure 48 would add a raised median producing a consistent corridor from Segment 2 to Segment 4. The raised median also provides opportunity for access management along this segment of roadway. This alternative would keep the full access intersections at Sheyenne Street, 1st Street E, and 6th Street E; all other intersections and access points would be limited to right-in/right-out traffic operations. A plan view of a variant of this alternative is shown in Figure 54 and Figure 55.

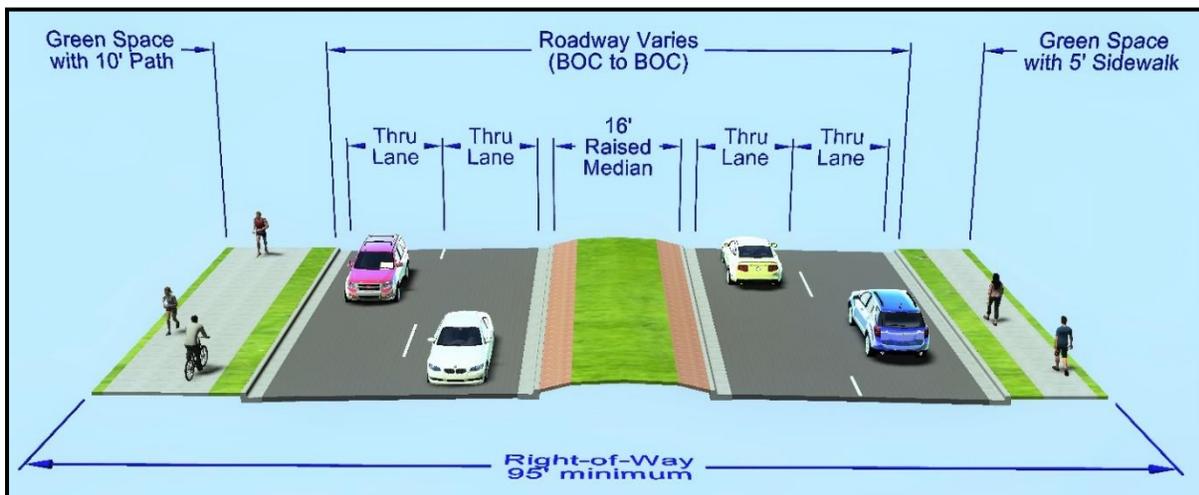


Figure 48. Four-Lane Divided Urban Typical Section

Segment 4: 13th Ave E: Prairie Pkwy to 17th St E

The portion of 13th Avenue included in Segment 4 was recently updated as part of two separate construction projects. The intersection of 13th Avenue E and 9th Street E reconstruction project began in 2017 and concluded in late 2018. The project consisted of reconstructing and widening the intersection to accommodate dual left turn lanes on all legs of the intersection. The project limits along 13th Avenue E stretched from Prairie Parkway to 12th Street E. The second construction project was located along 13th Avenue E from 12th Street E to 17th Street E (West Fargo City Limits). Work consisted of complete reconstruction of three westbound lanes and two eastbound lanes along 13th Avenue E. The SRC determined, due to the recent construction projects throughout Segment 4, that development of alternatives for this segment was not warranted.



Figure 49. Alternative Development A



Figure 50. Alternative Development B



Figure 51. Alternative Development C



Figure 52. Alternative Development D



Figure 53. Alternative Development E



Figure 54. Alternative Development F

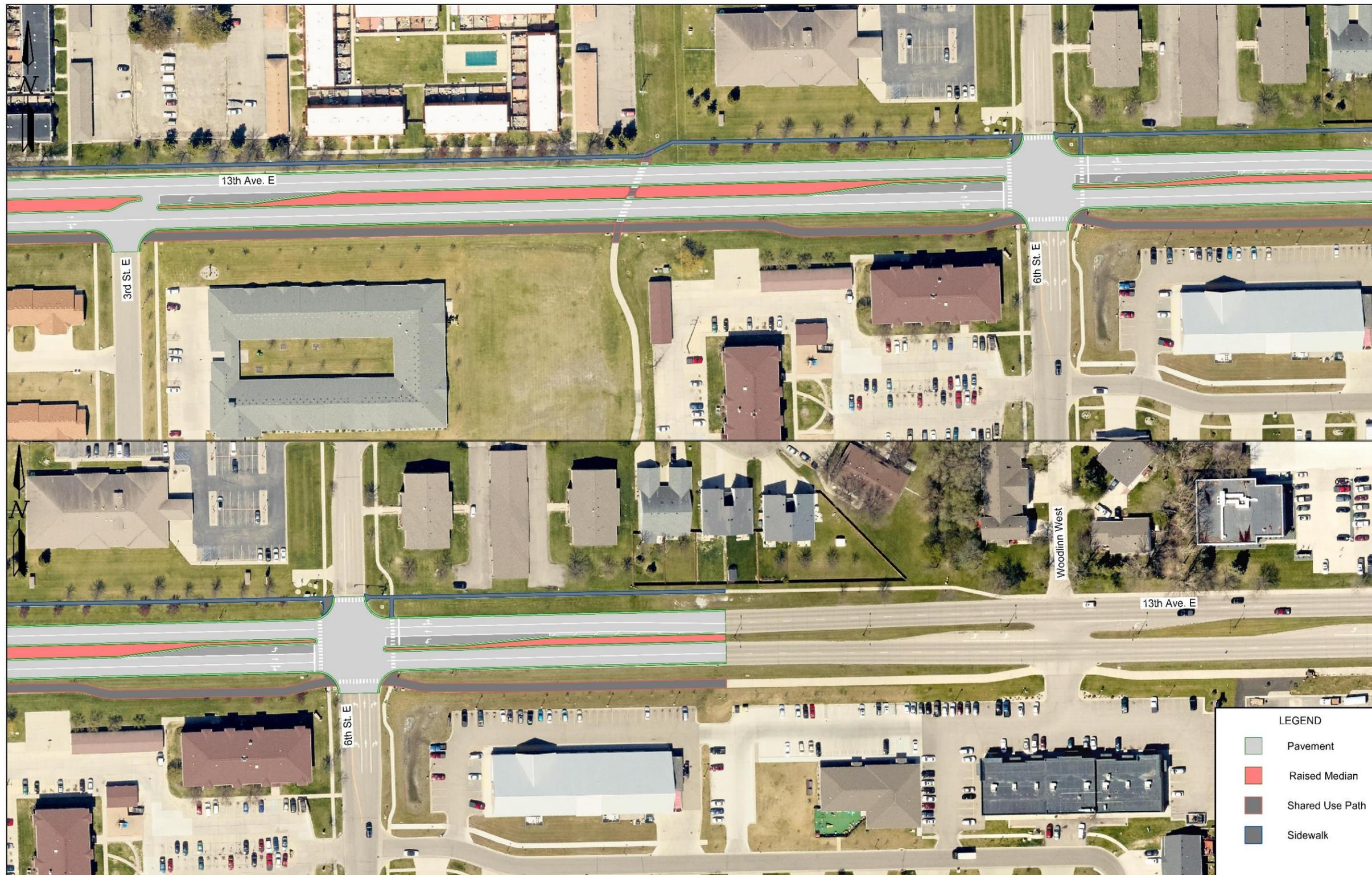


Figure 55. Alternative Development G

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Analysis of Alternatives

Introduction

As previously stated, the alternatives developed for this analysis were completed utilizing a high-level, concept-based layout. It is recommended that further detailed analysis and design be required if any specific alternative moves forward into a project.

Design Considerations

While additional lanes are not warranted along the 13th Avenue Corridor, the addition of a raised median to a lane configuration can help to increase safety. Raised medians are a recognized Crash Modification Factor. A raised median increases safety by providing a physical barrier between opposing traffic, can reduce speed by making the traveled way appear more narrow, serves as access management where needed, and can provide an opportunity for pedestrian refuge. The two-lane divided urban alternative in Segment 1 and the four-lane divided urban alternative in Segment 3 incorporate raised medians.

Cost Estimates

High-level cost estimates for each alternative within each segment are listed below. The primary function of these cost estimates is for comparison of alternatives. Costs shown are in 2019 U.S. dollars. In all instances of no build options, NA represents that cost estimates are not applicable, however regularly scheduled maintenance activities will continue.

Segment 1

- No Build NA
- Two-Lane Urban \$5,500,000
- Two-Lane Divided Urban \$6,750,000
- I-94 Overpass Connection (90° realign)
 - Standard Intersection option \$12,900,000
 - Roundabout option \$15,500,000
- I-94 Overpass Connection (13th Ave or CR 28 current alignment)
 - Standard Intersection option \$18,900,000
 - Roundabout option \$21,500,000

Segment 2

- No Build NA
- Safety Improvements \$500,000

Segment 3

- No Build NA
- Four-Lane Divided Urban \$6,350,000

Segment 4

- No Build NA

Access Management

It is recommended that all new access along the 13th Avenue corridor follow the recently developed recommendations from the *Fargo/West Fargo Parking & Access Study*, completed in 2018 and any existing access be evaluated further during the design of any alternative moving into a project. Also, since a portion of the corridor being studied is CR28 the following recommended access spacing from Cass County's access ordinance should be utilized, "10.1.2 Spacing of Adjacent Access Points and Intersecting Streets to function effectively, adjacent access points and intersecting streets shall be spaced to ensure safe and efficient traffic movements and operations. Access shall generally be restricted to one access per one-quarter mile."

Right-of-Way Needs

The right-of-way needed for a realignment of the junction of CR 28 and 13th Avenue will be approximately 5 acres for nearly all options explored. This includes a 130 foot wide corridor of right-of-way. A cost estimate for right-of-way is not included in this study due to the high level of variability that is inherent when dealing with real estate prices. Right-of-way for two realignment scenarios is shown in Figure 56.

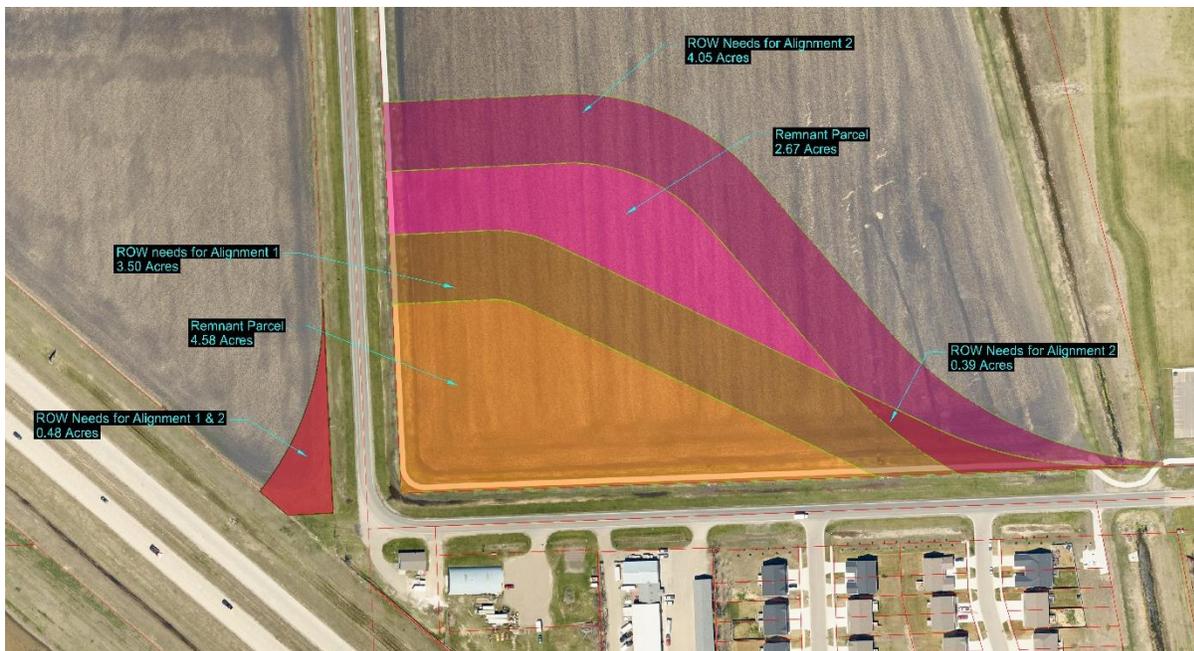


Figure 56. Right-of-Way for CR 28/13th Avenue Realignment

Summary of Public Involvement

Introduction

The public involvement process was introduced at two stages of the study; the initial input opportunities began with data gathering and the public was given opportunities to comment on the alternatives once they were developed. A combination of grass-roots events, online surveys, Study Review Committee (SRC) meetings, a public open house, and a virtual open house were utilized throughout the study to facilitate public involvement. Figure 57 shows the five steps of public input as it pertains to the study.



Figure 57. Public Involvement Process

Summaries of public involvement events are provided below with meeting documents and minutes in Appendix A – Public Input Documentation.

SRC Meeting #1: Project Kick-Off Meeting

This first meeting of the SRC was held to introduce all stakeholders to the study and lay out the needs and expectations of the study team. Project scope and extents of the study were discussed.

Online Survey

As part of the initial phase of the study, an online survey was developed to gain public input on several aspects of the corridor. The survey was designed to help develop alternatives that were in line with the public's needs and wants. The online survey had 285 respondents, where 60% lived in West Fargo, 23% lived outside of West Fargo, 10% worked in West Fargo, 1% had a business in West Fargo, and 6% responded "none of the above." Questions included, "How often do you use this stretch of 13th Avenue?", "How do you travel most often?", and "On most days, how satisfied are you with the ease of travel within this corridor?" A total of 97 percent of respondents said they travel the corridor by vehicle, while the other 3 percent said they use MATBUS. Other statistics are shown in Figure 58 and Figure 59.

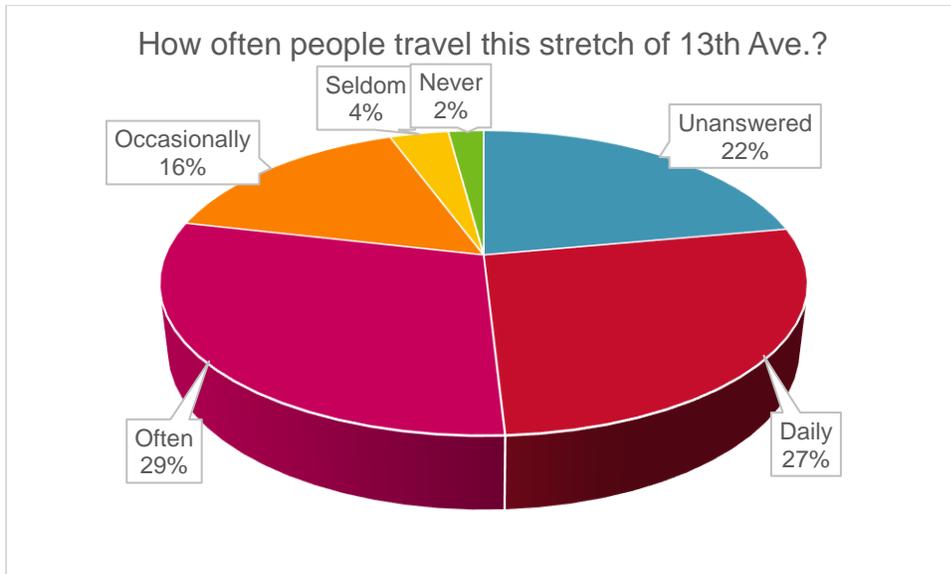


Figure 58. Survey Answers – 13th Avenue Use Frequency

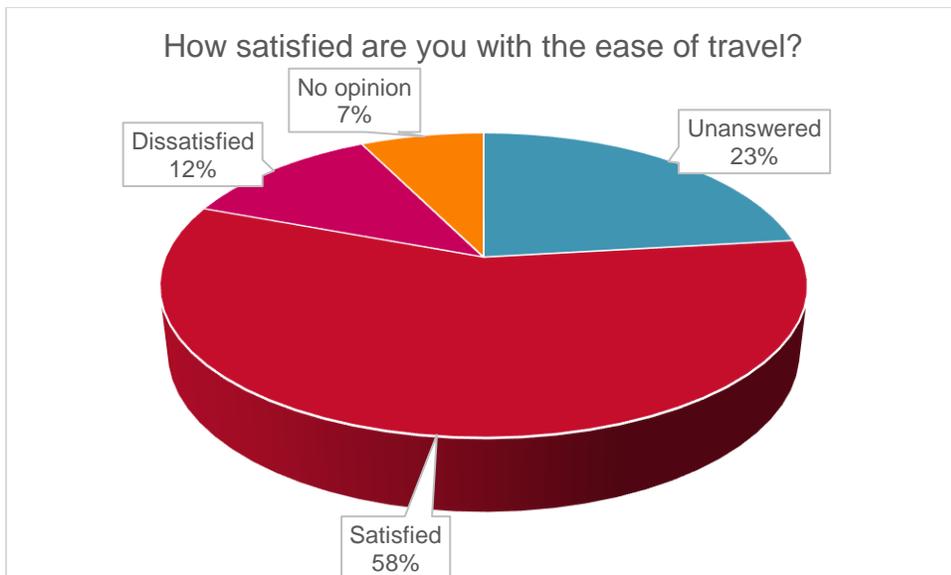


Figure 59. Survey Answers – 13th Avenue Ease of Travel Satisfaction

WestFest Public Input Booth

The first grassroots event identified to gather public input was at the annual WestFest event held along Sheyenne Street in West Fargo. Staff from HDR and Flint worked a booth along the parade route prior to and during the parade. The booth was promoted on social media and staff distributed door knockers in neighborhoods surrounding the corridor in the week prior to the event. A mobile cart was utilized to engage the crowd waiting to watch the parade with the online survey. Paper copies of the survey were filled out at the booth and mobile cart after the parade staff set up the mobile cart within the inflatable games area.



Figure 60. WestFest Public Input Booth

SRC Meeting #2: Scenario Development Workshop

A scenario development workshop was conducted with the SRC to identify potential land use and transportation network scenarios that may impact the 13th Avenue Corridor. The discussed scenarios were consistent with the direction of *West Fargo 2.0: Redefining Tomorrow*. The SRC identified three land use and three transportation network scenarios at this meeting.

Santa's Pajama Party Public Input Booth

The consultant team set up a booth at *Santa's Pajama Party*, a community event held at the Rustad Recreation Center in West Fargo on December 10, 2017. This was identified as a grassroots event at which additional surveys were collected about the public's use of the 13th Avenue Corridor. Staff from HDR and Flint Group were on site to receive comments from and discuss the study with the general public.



Figure 61. Santa's Pajama Party Public Input Booth

SRC Meeting #3: Development of Alternatives Discussion

An SRC meeting was held to discuss alternatives to carry forward into the development stage of the study. The corridor was discussed in four segments at this meeting. With the results of the analysis showing that additional lanes along the corridor were not warranted, much of the discussion was on safety—bicycle and pedestrian—and aesthetic updates.

Public Input Open House

A public open house was held for the City of West Fargo and Fargo Moorhead Metro COG's 13th Avenue Corridor Study from 4 PM to 6 PM on Thursday, December 6, 2018, at West Fargo City Hall.

Attendees had the opportunity to view and comment on the transportation vision for the 13th Avenue Corridor between 17th Street SE and Main Avenue W in West Fargo. General comments, both verbal and written, were encouraged and recorded. City of West Fargo, Metro COG, and HDR staff were available for the duration of the open house to interact with area residents, businesses, media, and other stakeholders.

Public Input Virtual Open House

A virtual open house was available online from December 7 to 21, 2018, to make it convenient for the community to participate in the study—especially those who were unable to attend the physical event. The virtual open house walked visitors through all the graphics presented at the physical event and provided opportunities to comment on any of the slides.

SRC Meeting #4: Draft Report Review

An SRC meeting was held to discuss the draft report. Members of the SRC provided comments on the draft report. These comments were discussed and resolved as well. Scheduling for presentations of the study report to the West Fargo Planning and City Commissions, Metro COG's Transportation Technical Committee, and Metro COG's Policy Board was also discussed at this meeting.