13th Avenue Corridor Study

Main Avenue W to 17th Street E

West Fargo, North Dakota

February 1, 2019

METROCOG
FARGO-MOORHEAD METROPOLITAN COUNCIL OF GOVERNMENTS

City of WEST FARGO

The preparation of this document was funded in part by the United States Department of Transportation with funding administered through the North Dakota Department of Transportation, the Federal Highway Administration, and the Federal Transit Administration. Additional funding was provided through local contributions from the City of West Fargo. The United States Government and the States of North Dakota and Minnesota assume no liability for the contents or use thereof.

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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		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

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.

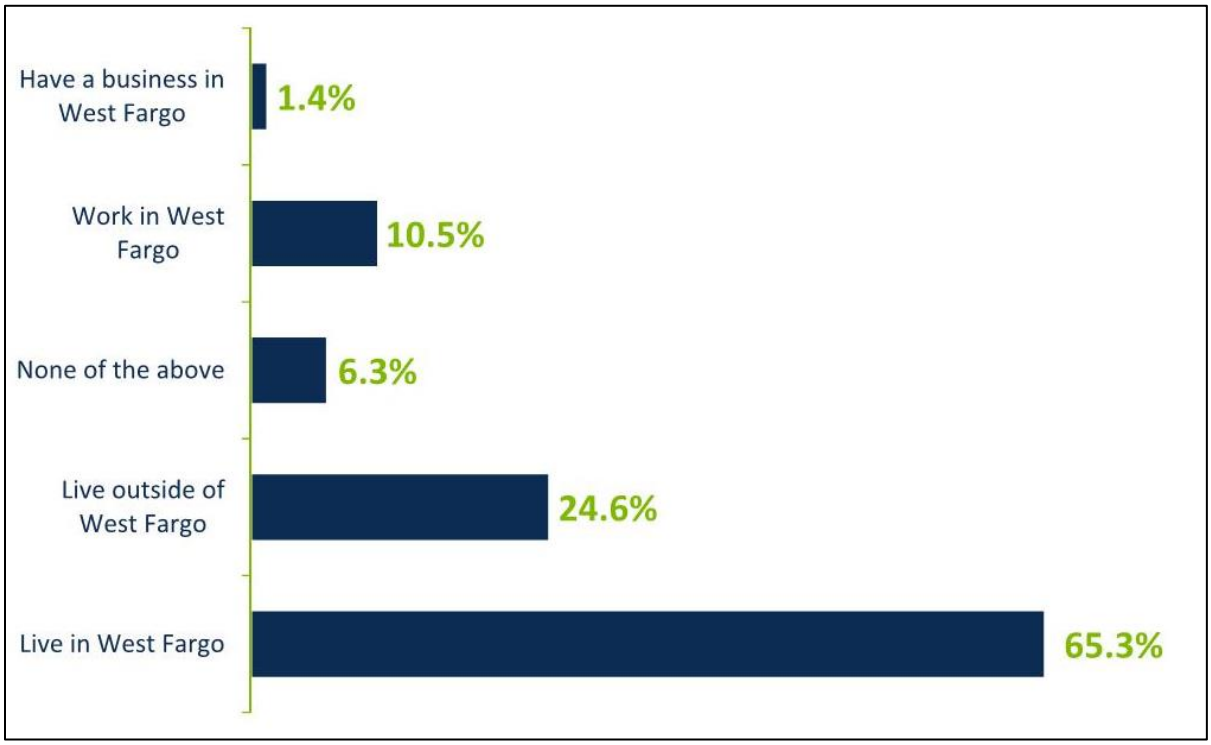

Figure 1. Online Survey Respondent Demographics

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.

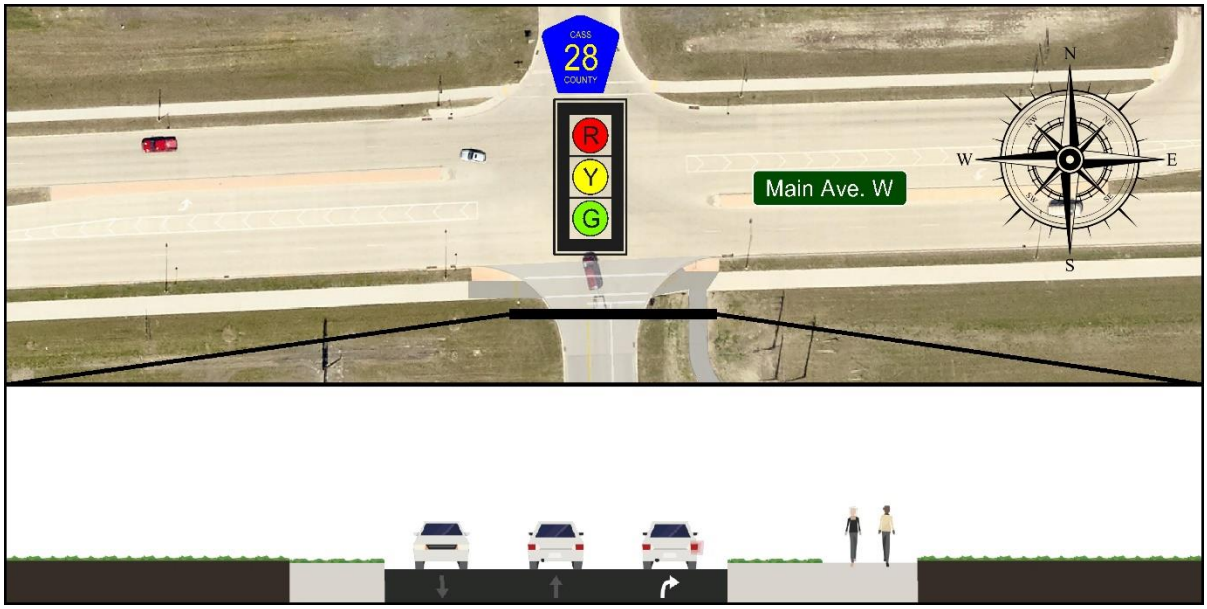

Figure 3. Existing Main Avenue W Intersection

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.

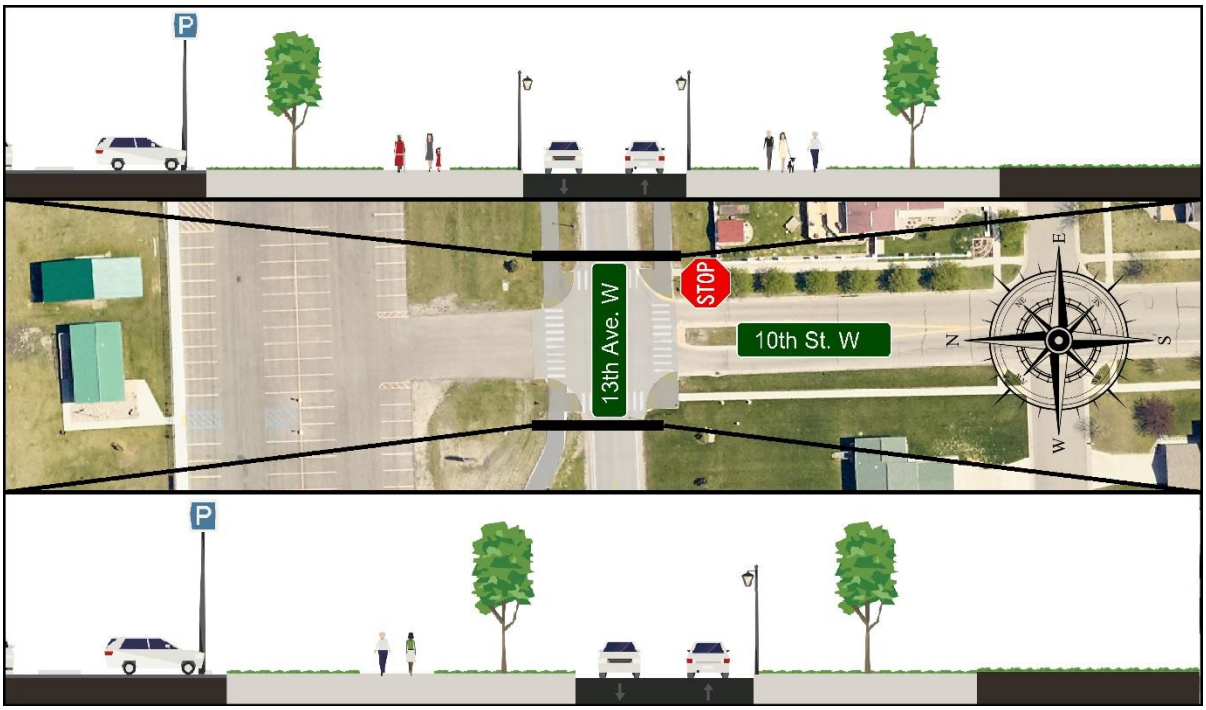

Figure 4. Existing 10th Street W Intersection

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.

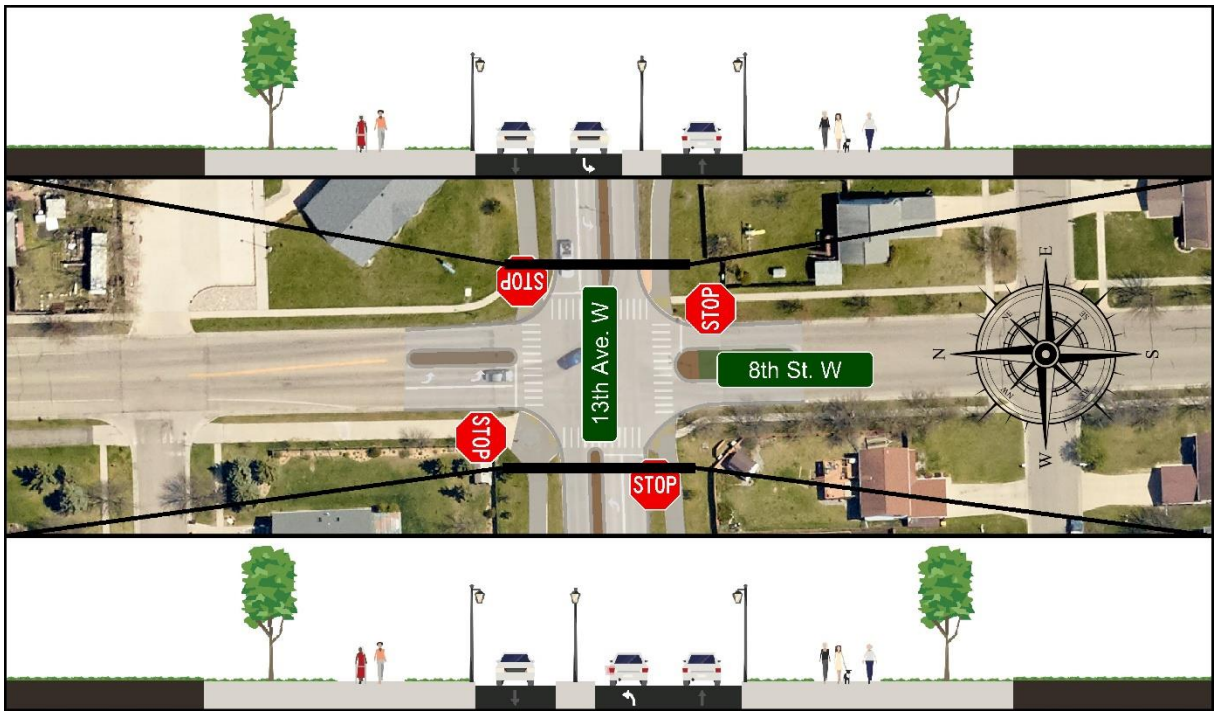

Figure 5. Existing 8th Street W Intersection

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.

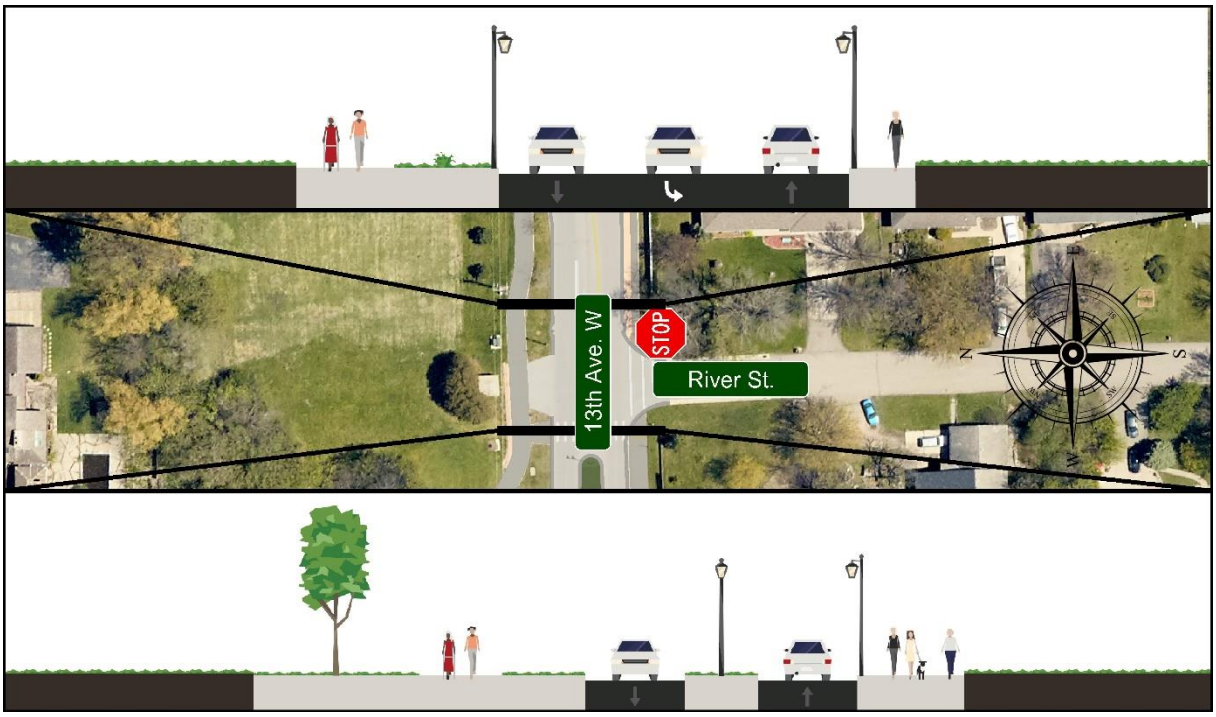

Figure 6. Existing River Street Intersection

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.

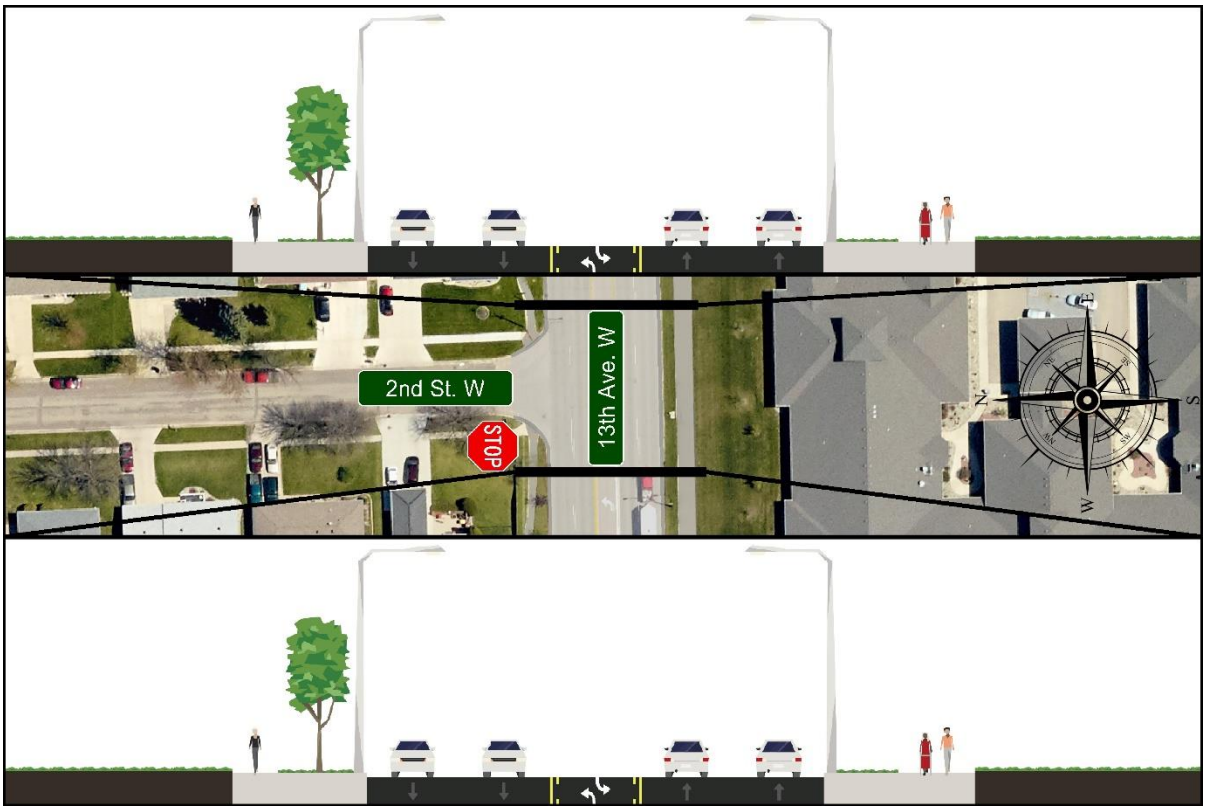

Figure 8. Existing 2nd Street W Intersection

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.

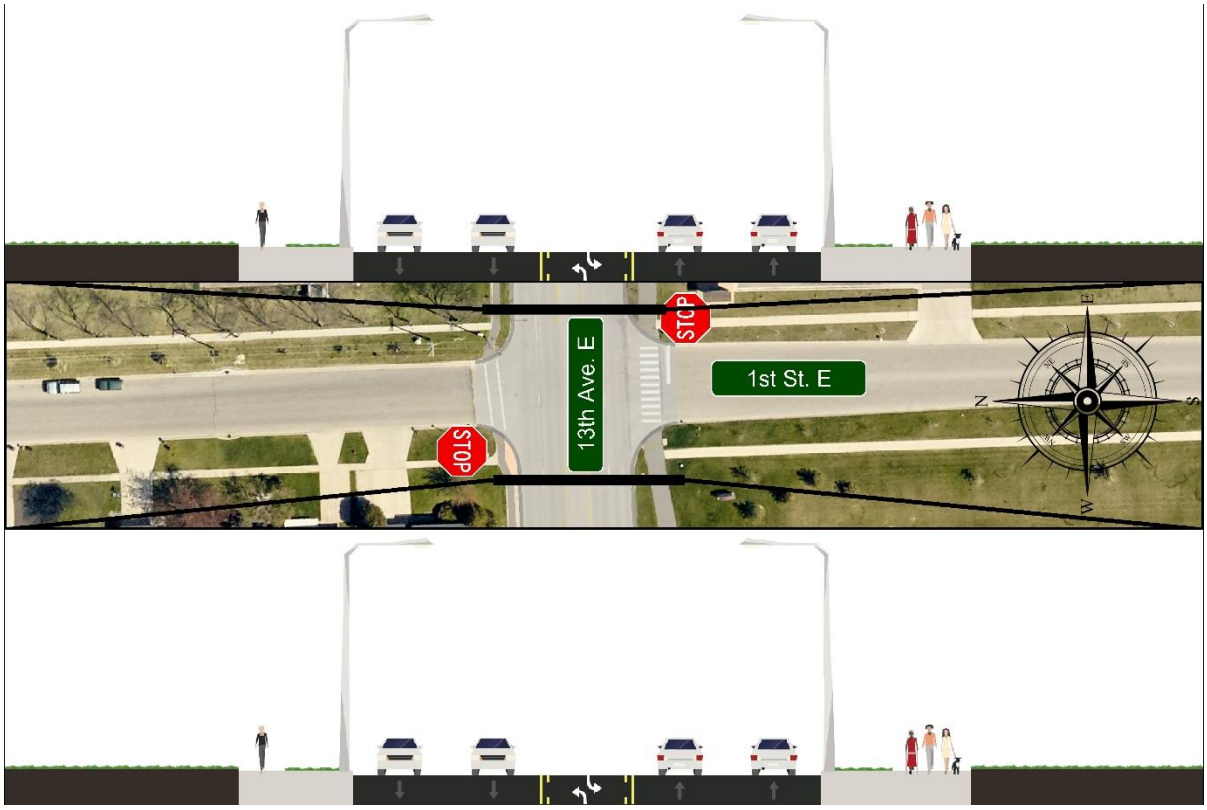

Figure 9. Existing 1st Street E Intersection

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.

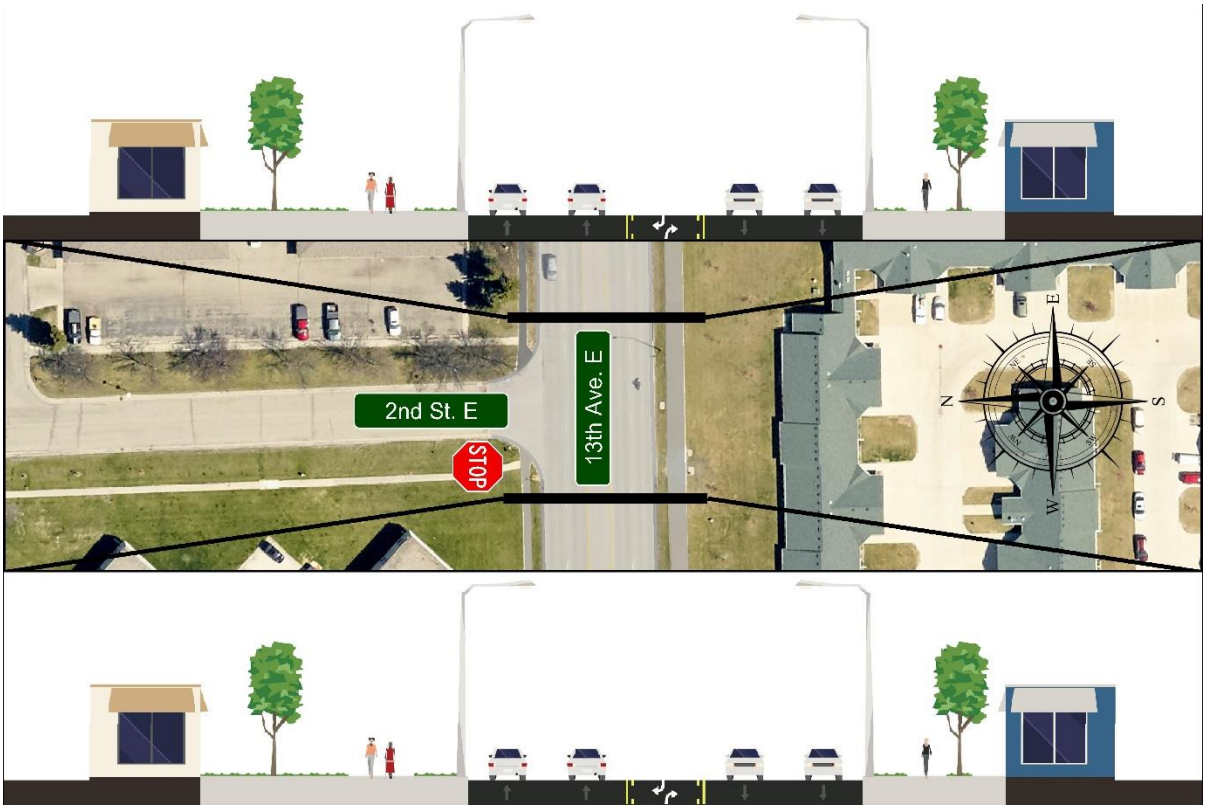

Figure 10. Existing 2nd Street E Intersection

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.

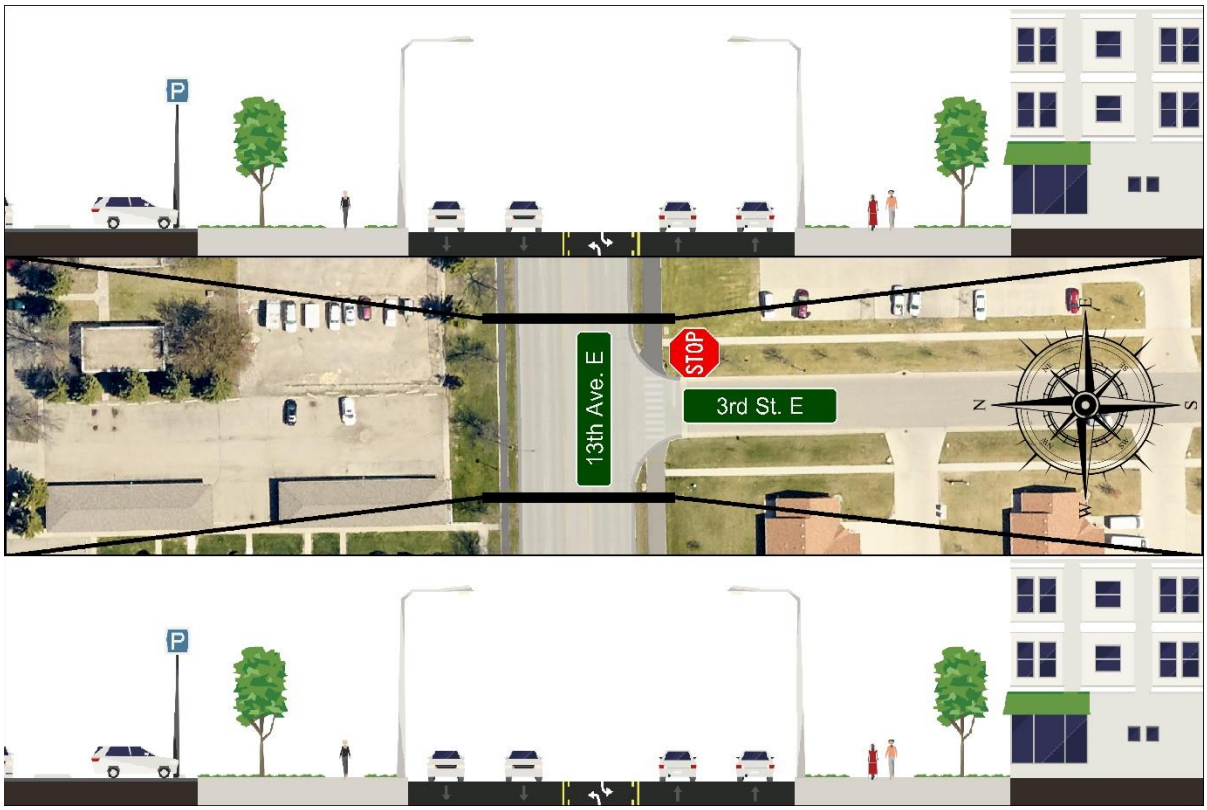

Figure 11. Existing 3rd Street E Intersection

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.

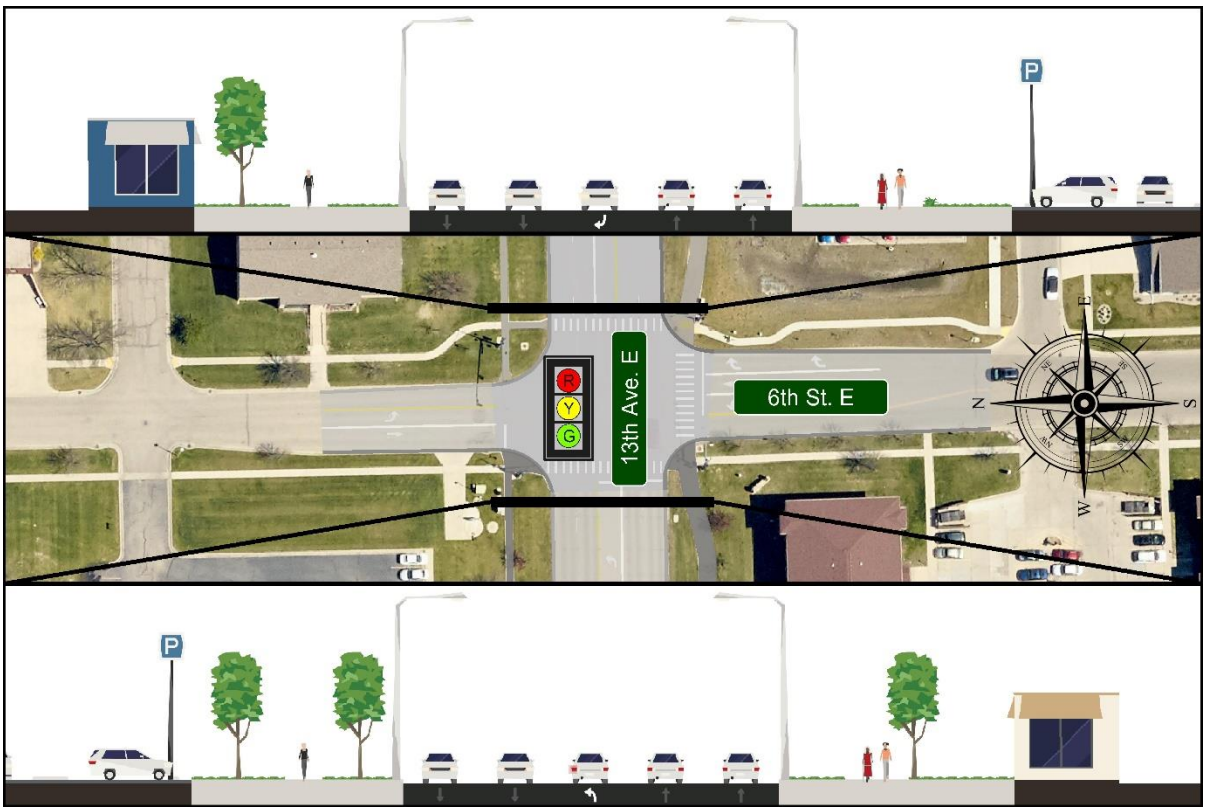

Figure 12. Existing 6th Street E Intersection

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.

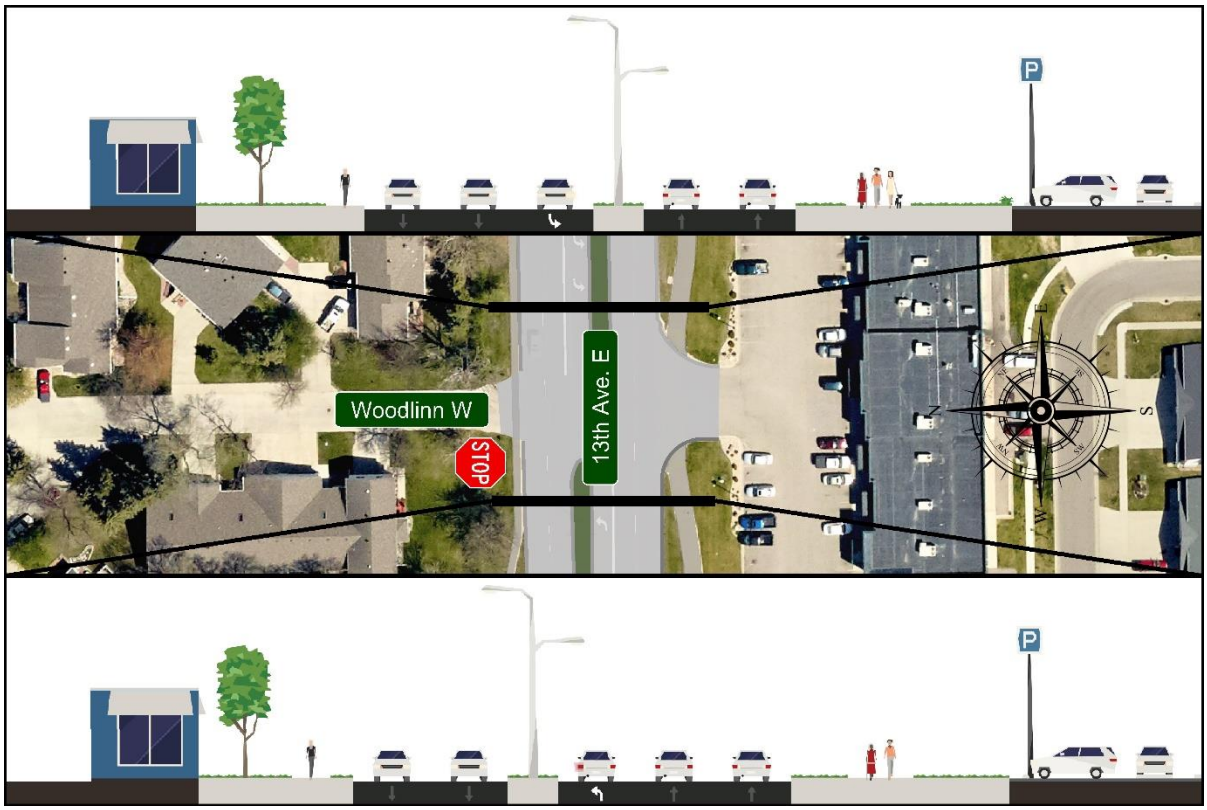

Figure 13. Existing Woodlinn West Intersection

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.

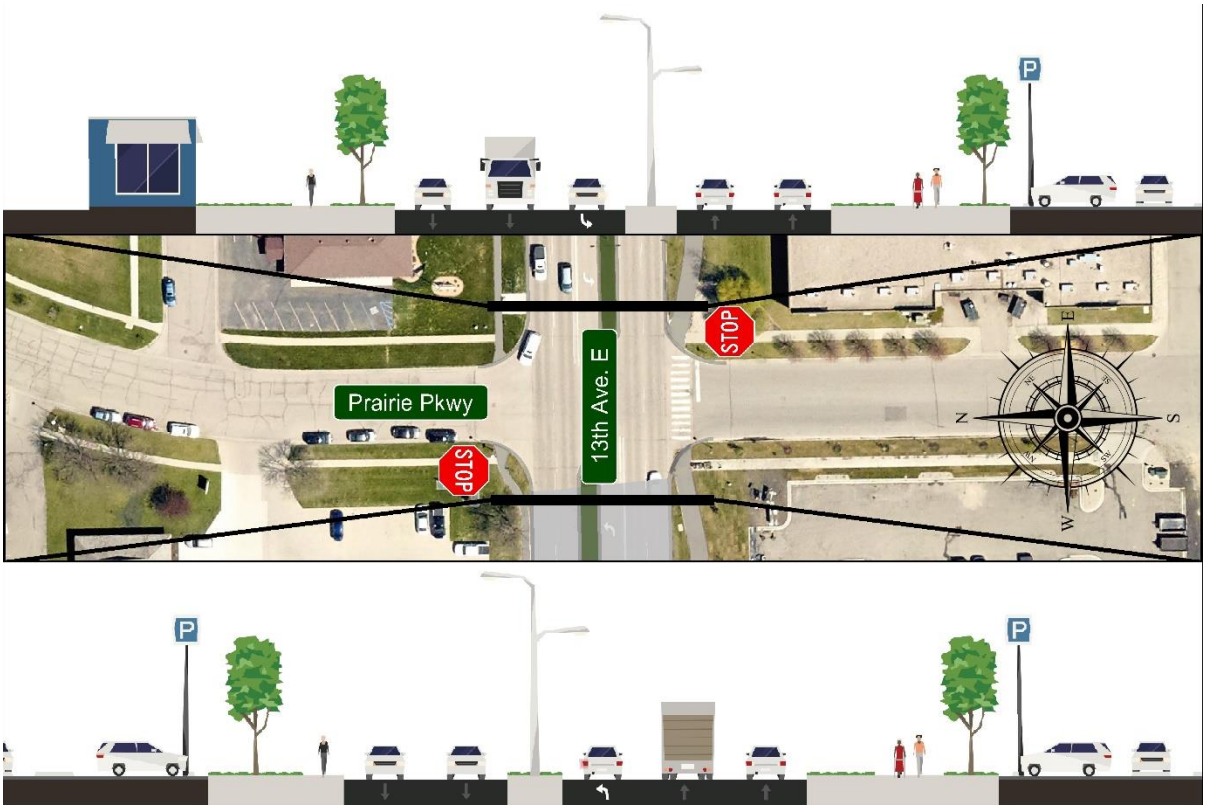

Figure 14. Existing Prairie Parkway Intersection

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.

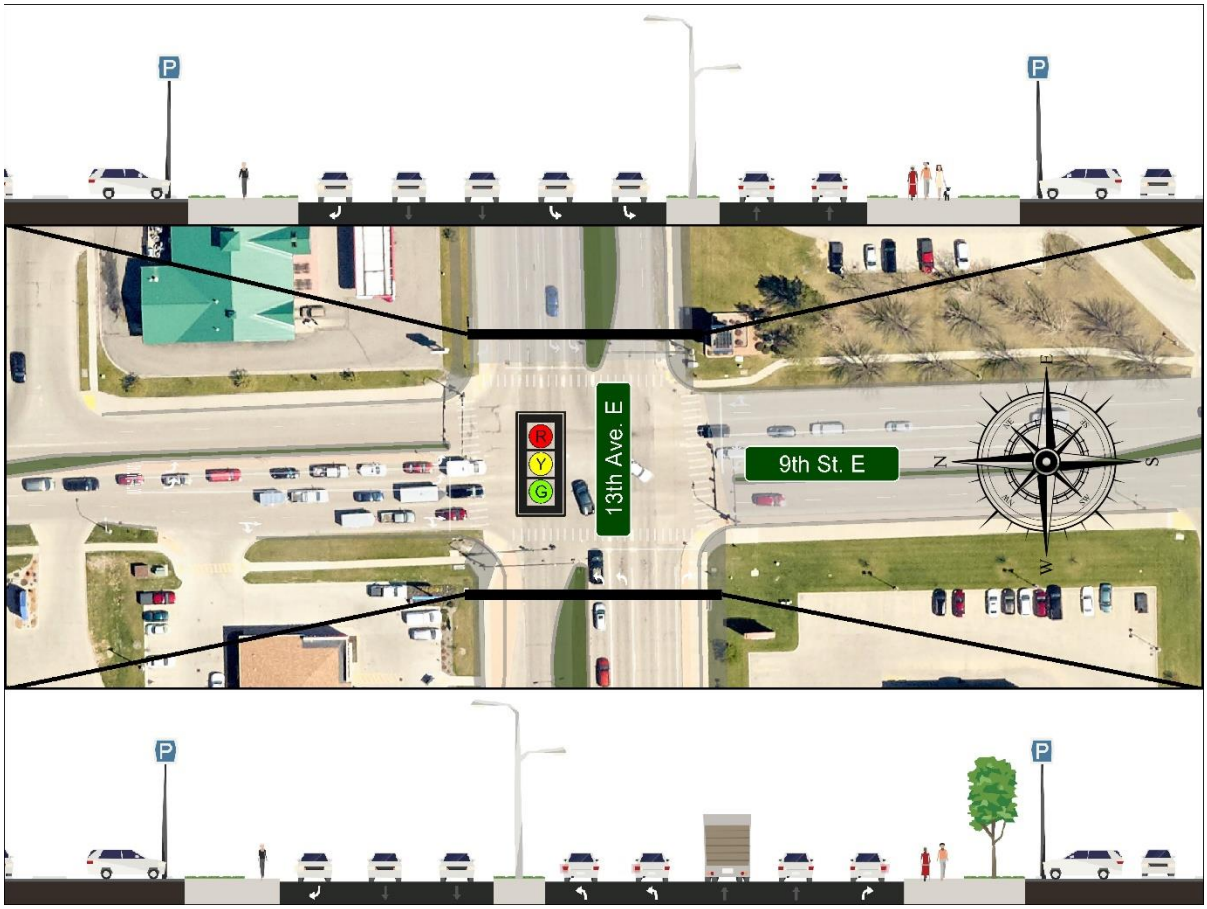

Figure 15. Existing 9th Street E Intersection

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.

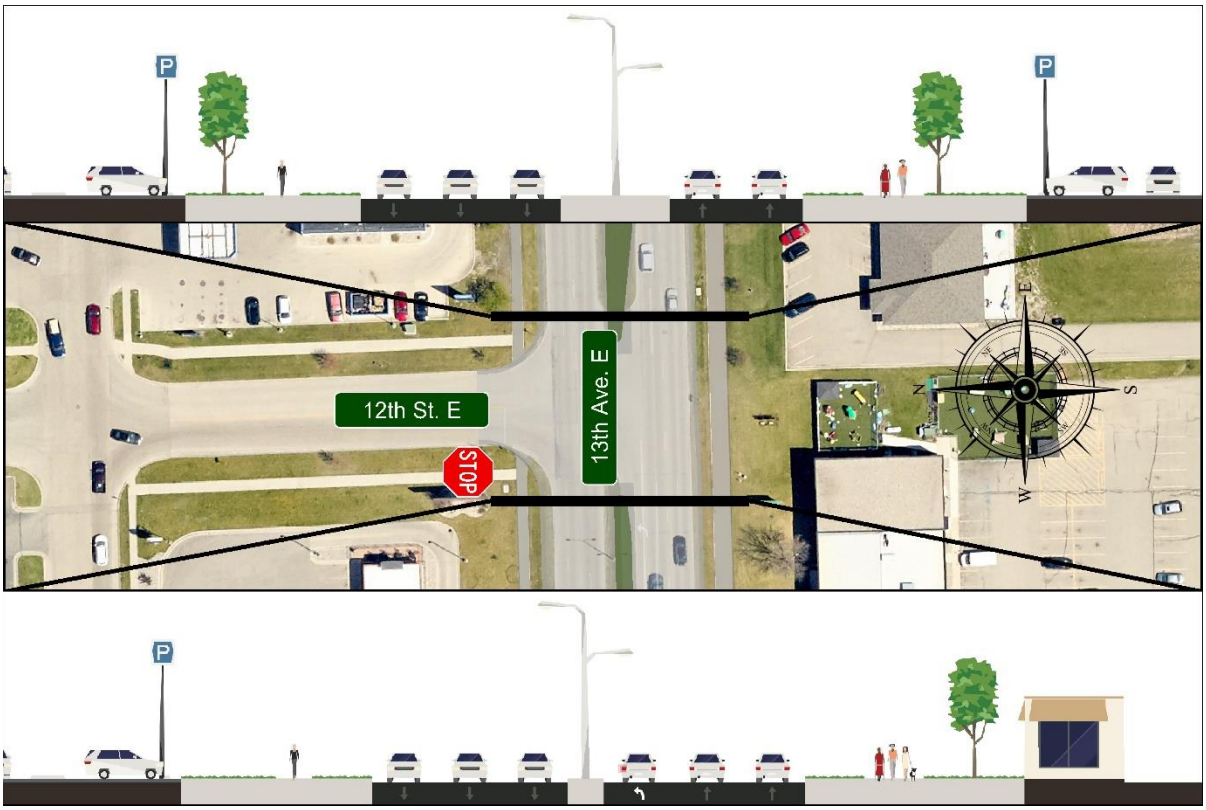

Figure 16. Existing 12th Street E Intersection

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.

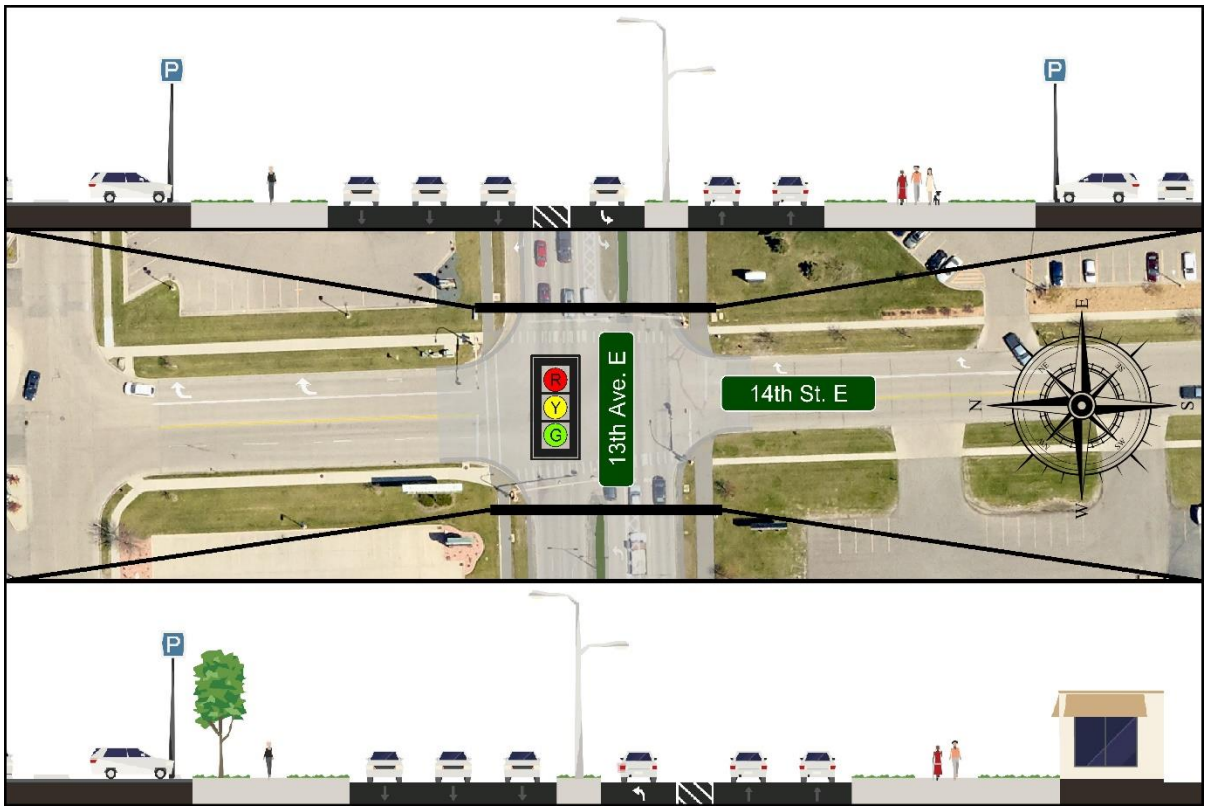

Figure 17. Existing 14th Street E Intersection

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.

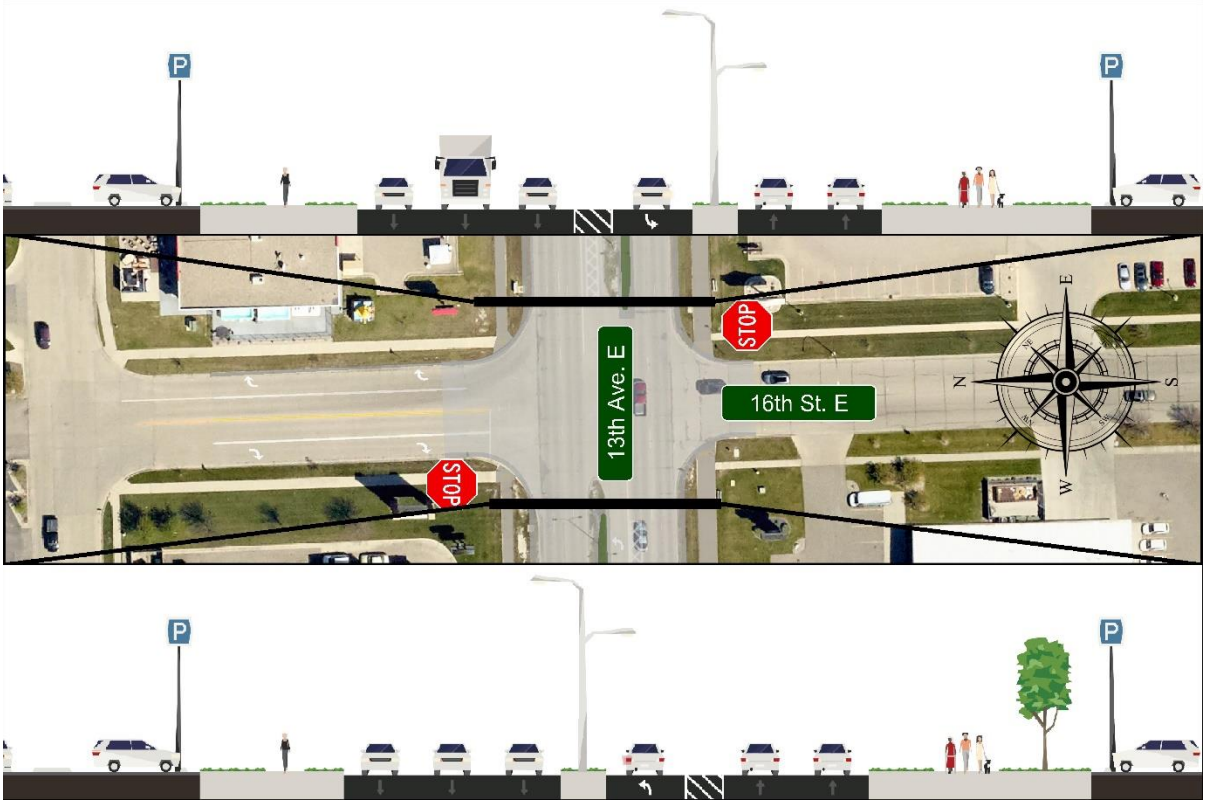

Figure 18. Existing 16th Street E Intersection

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

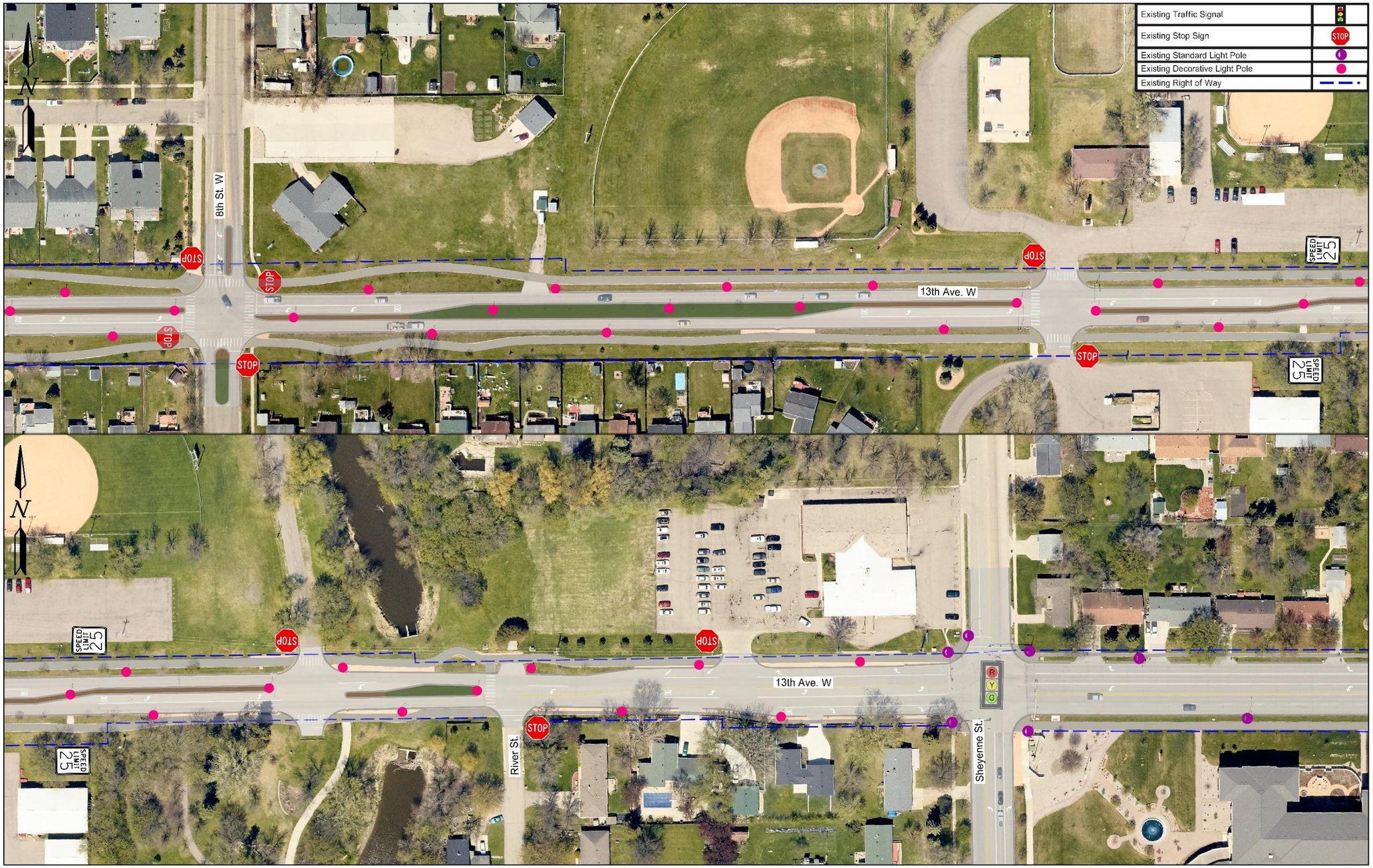

Figure 23. Existing Lane Configurations D

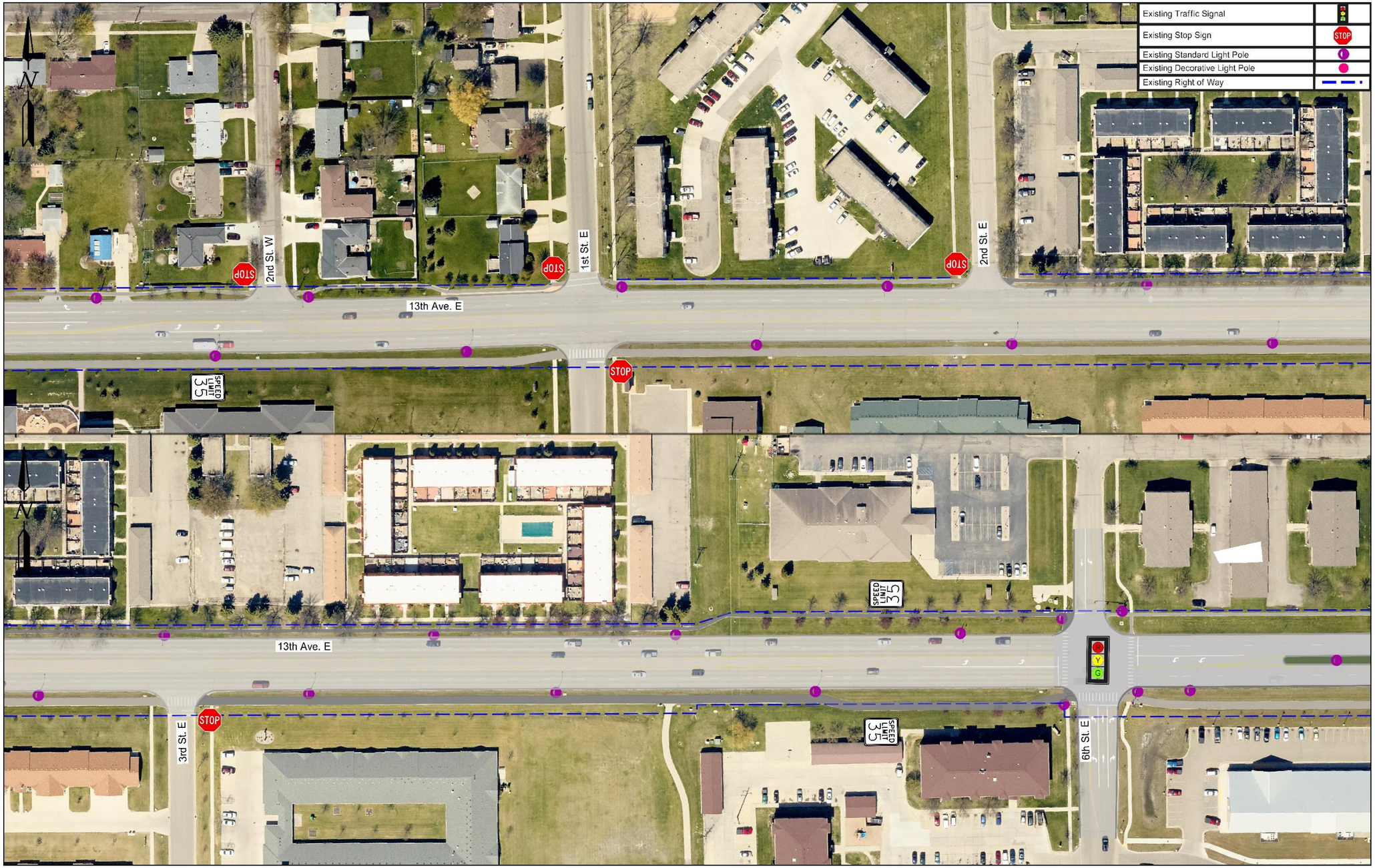

Figure 24. Existing Lane Configurations E

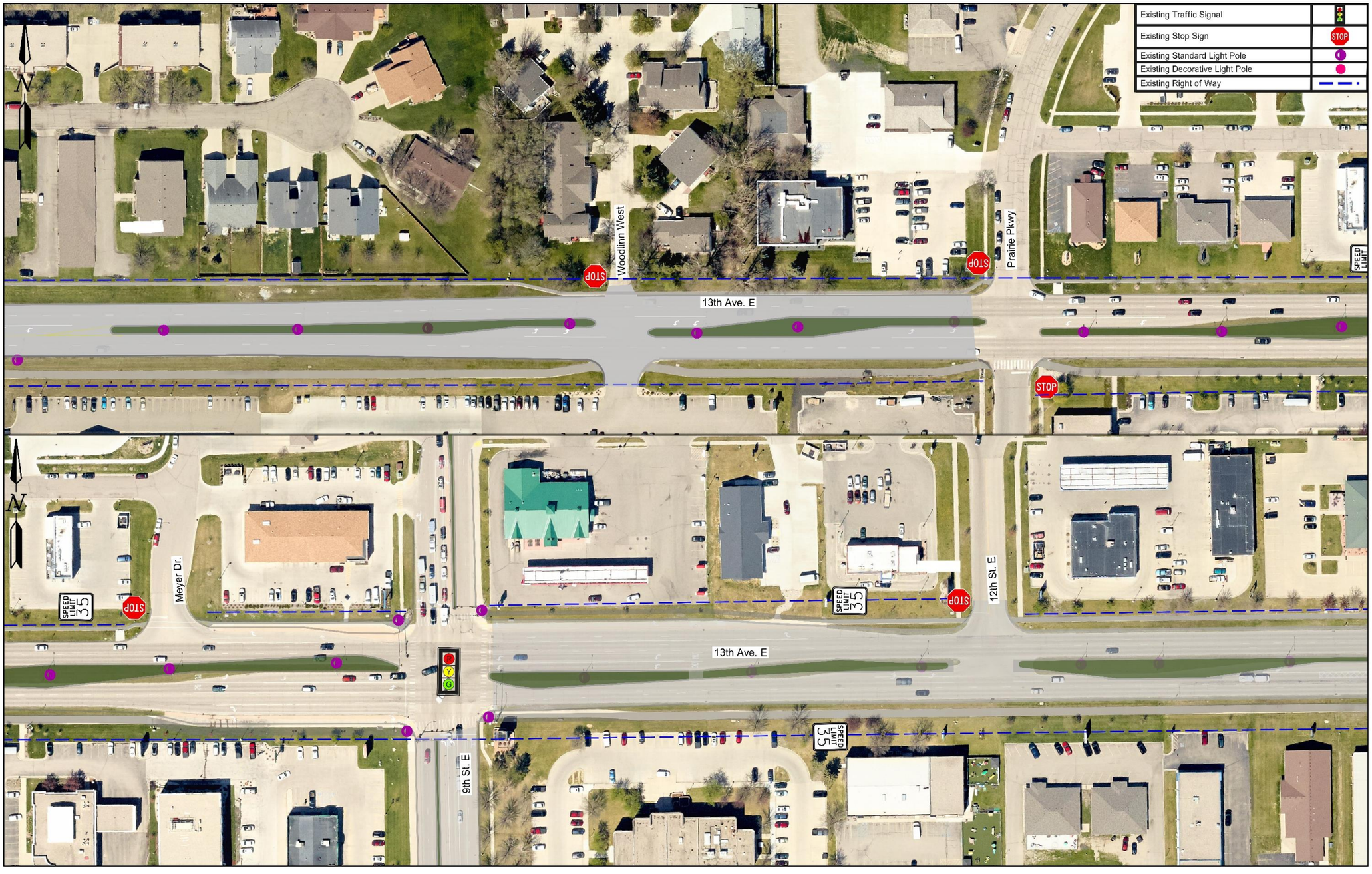

Figure 25. Existing Lane Configurations F

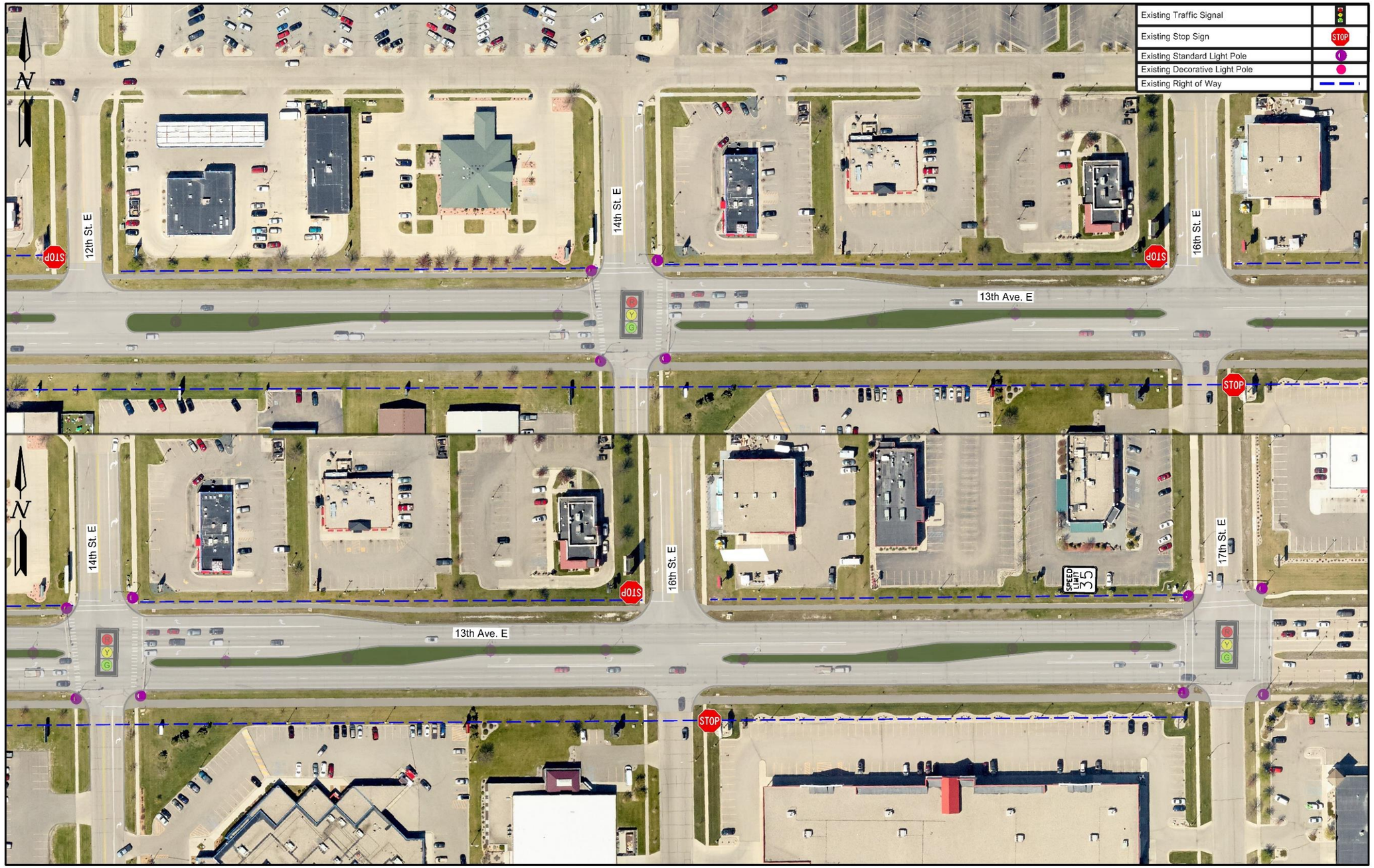

Figure 26. Existing Lane Configurations G

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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

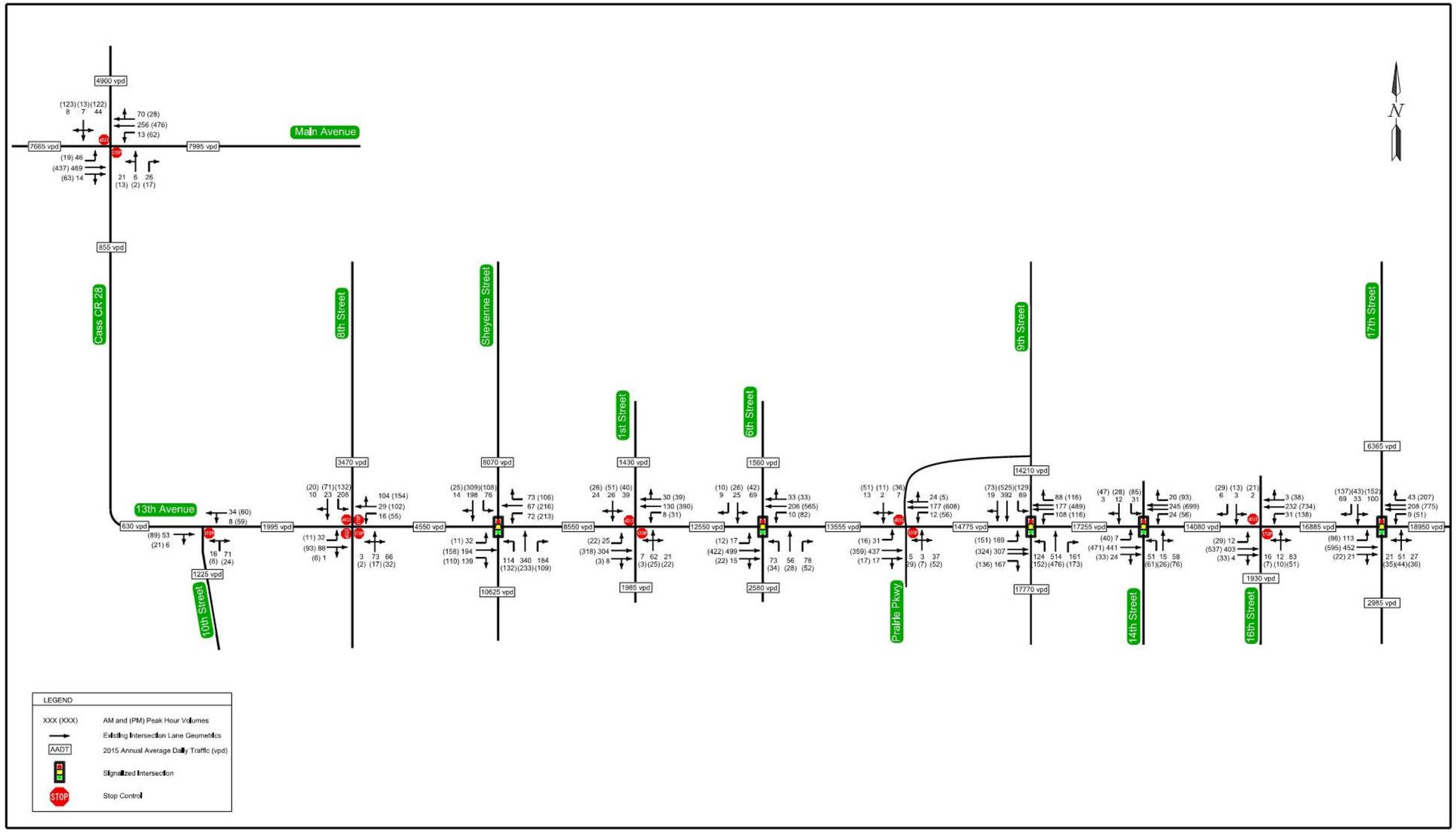

Figure 27. 2015 Turning Movement Counts

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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

			2015 Existing Conditions					
			AM			PM		
Intersection	Control	Movement	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.

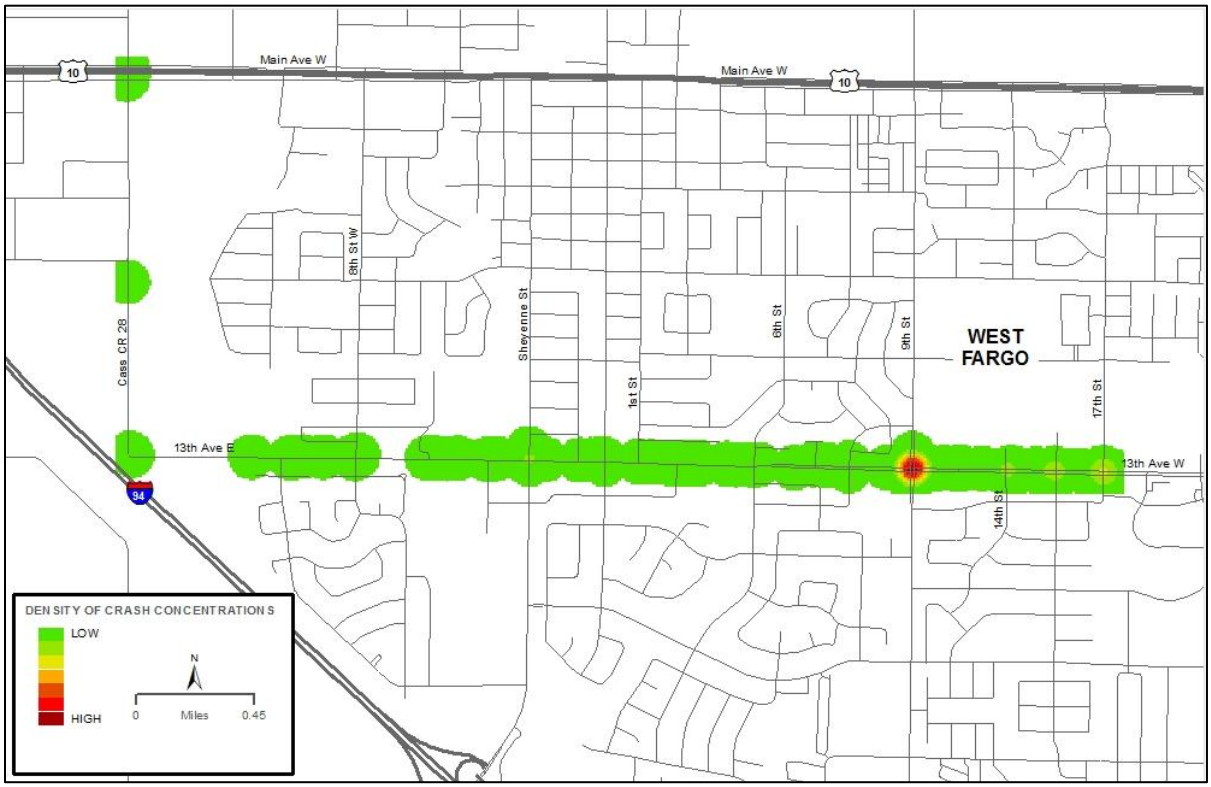

Figure 28. Heat Map of Crash Densities

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.

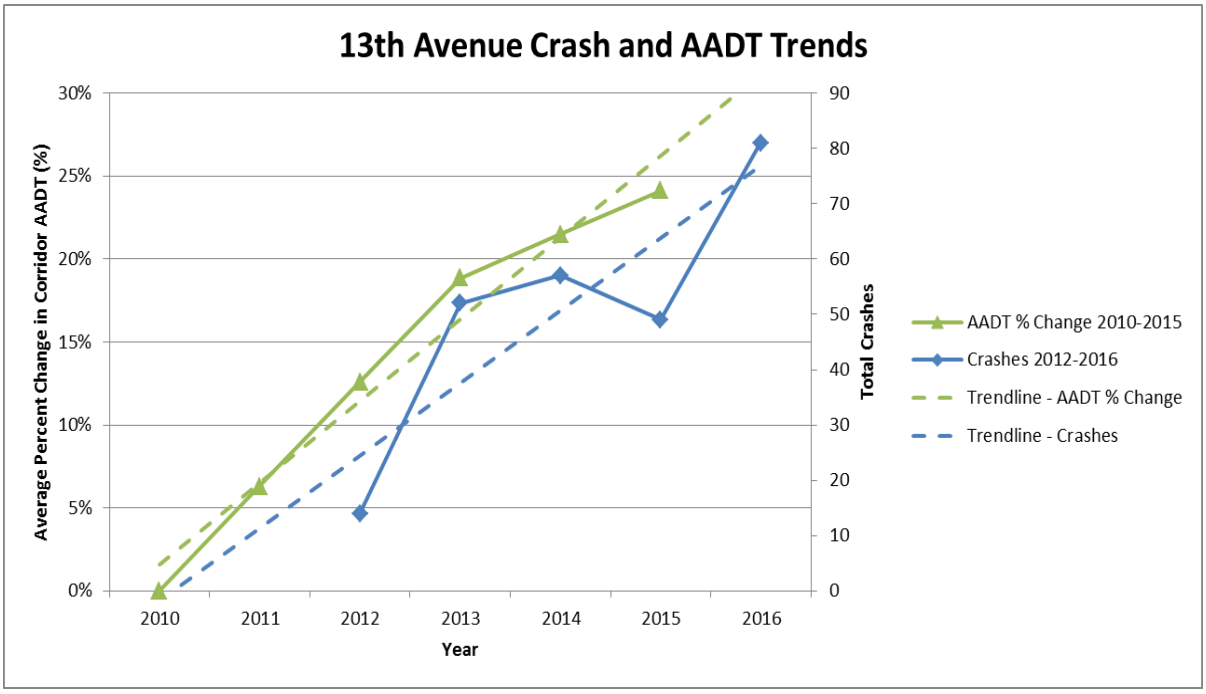

Figure 29. Annual Crash (2012-2016) and AADT (2010-2015) Trends

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					
	2012	2013	2014	2015	2016	Total
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.

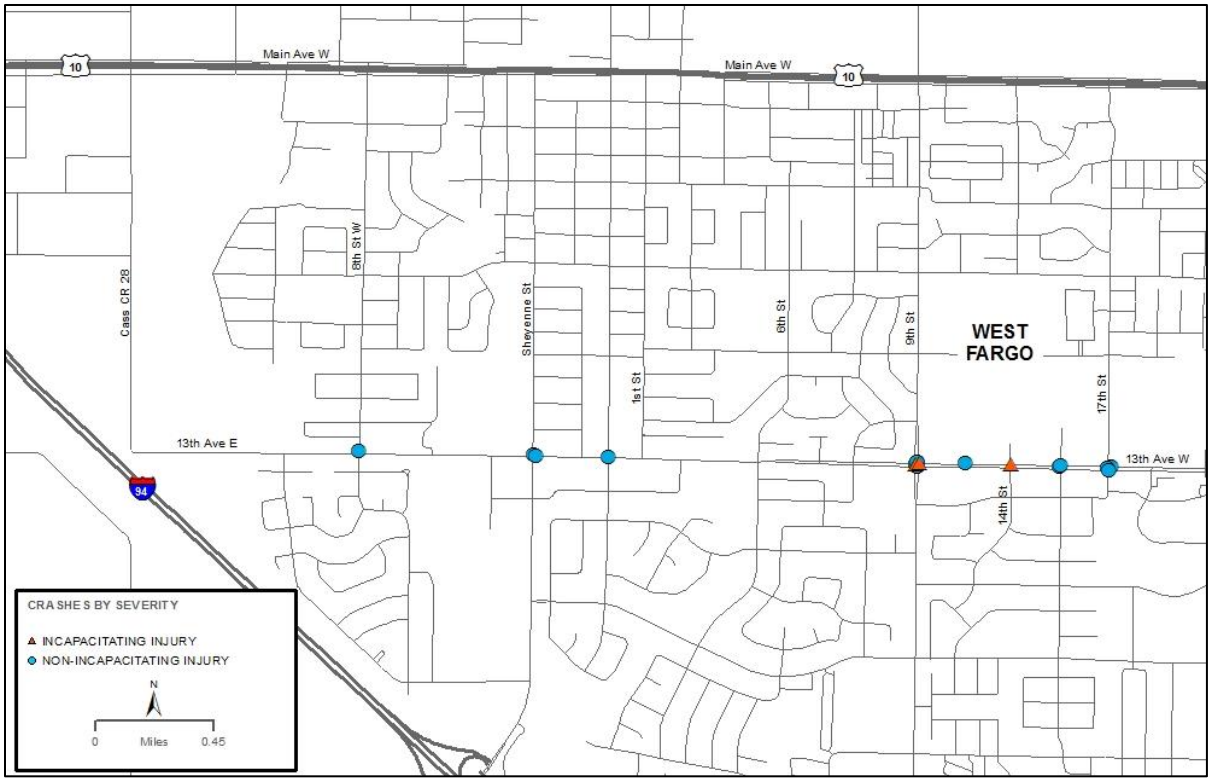

Figure 30. Injury-Related Intersection Crashes

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

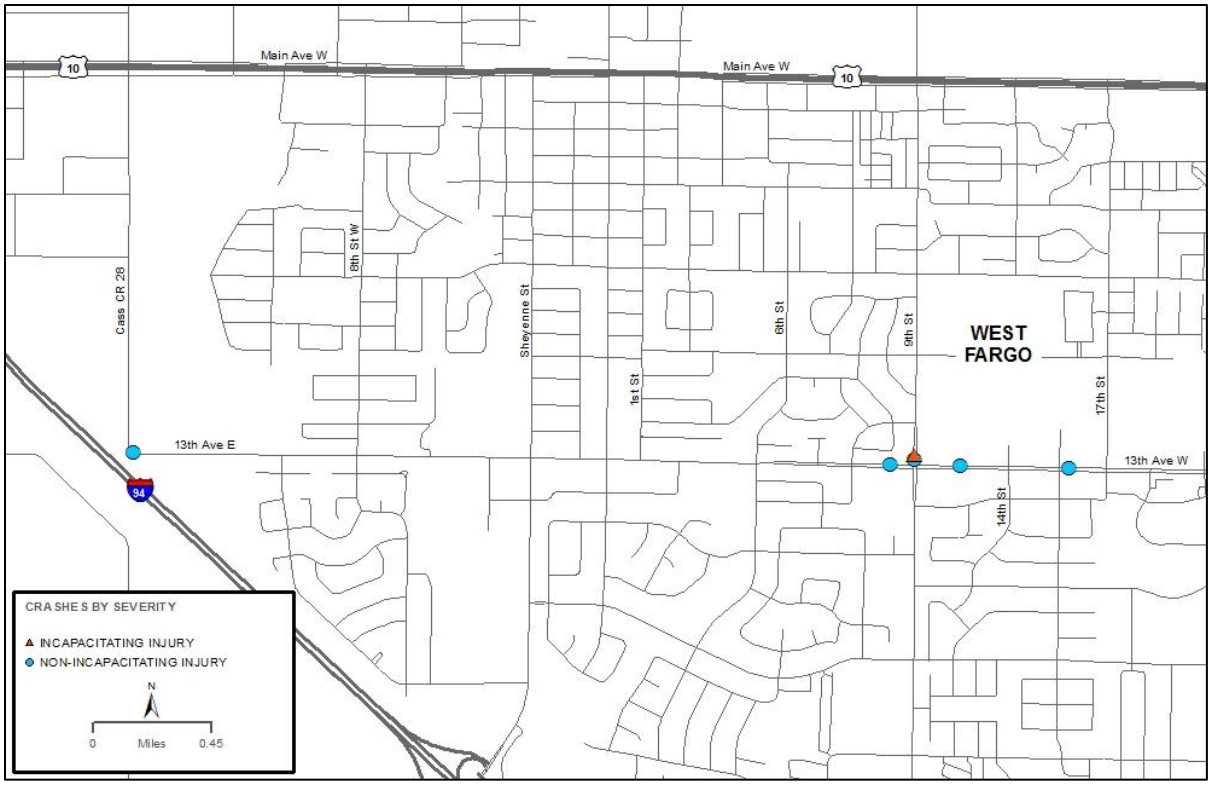

Figure 31. Injury-Related Segment Corridor Crashes

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					
	2012	2013	2014	2015	2016	Total
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.

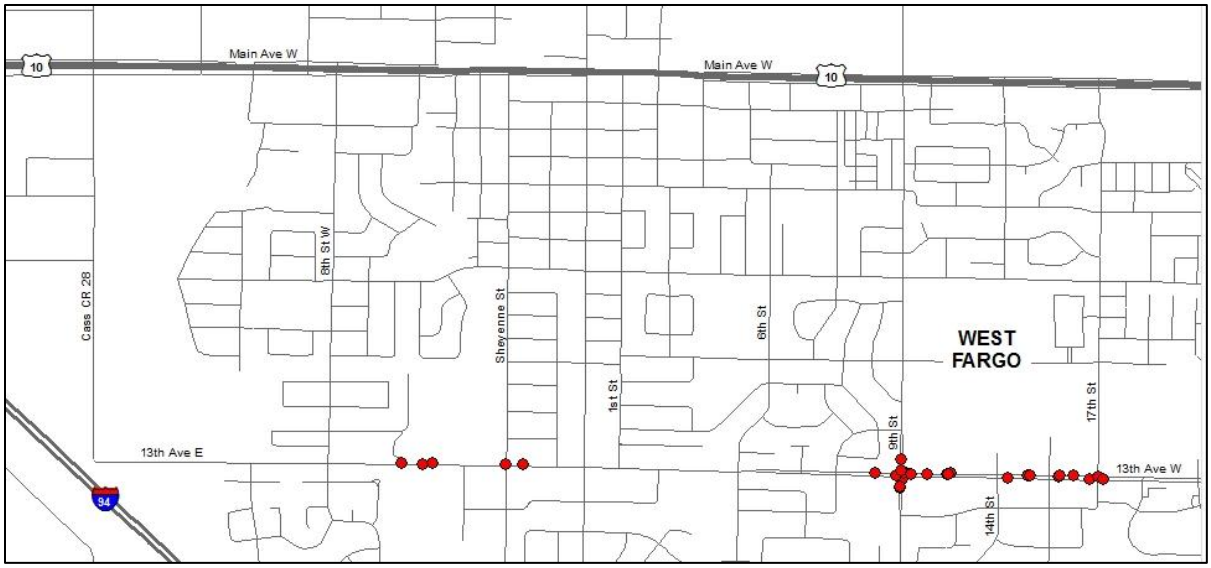

Figure 32. Segment Rear End Crashes

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.

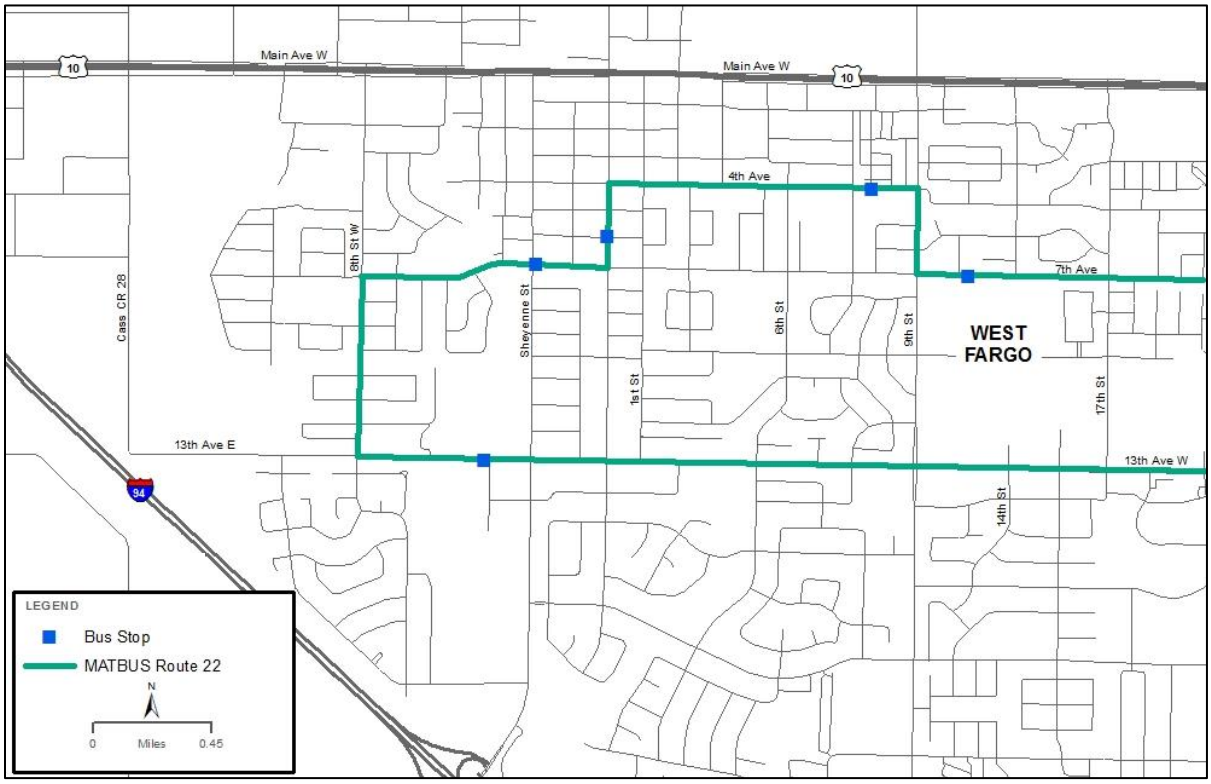

Figure 33. MATBUS Route along 13th Avenue Corridor

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.

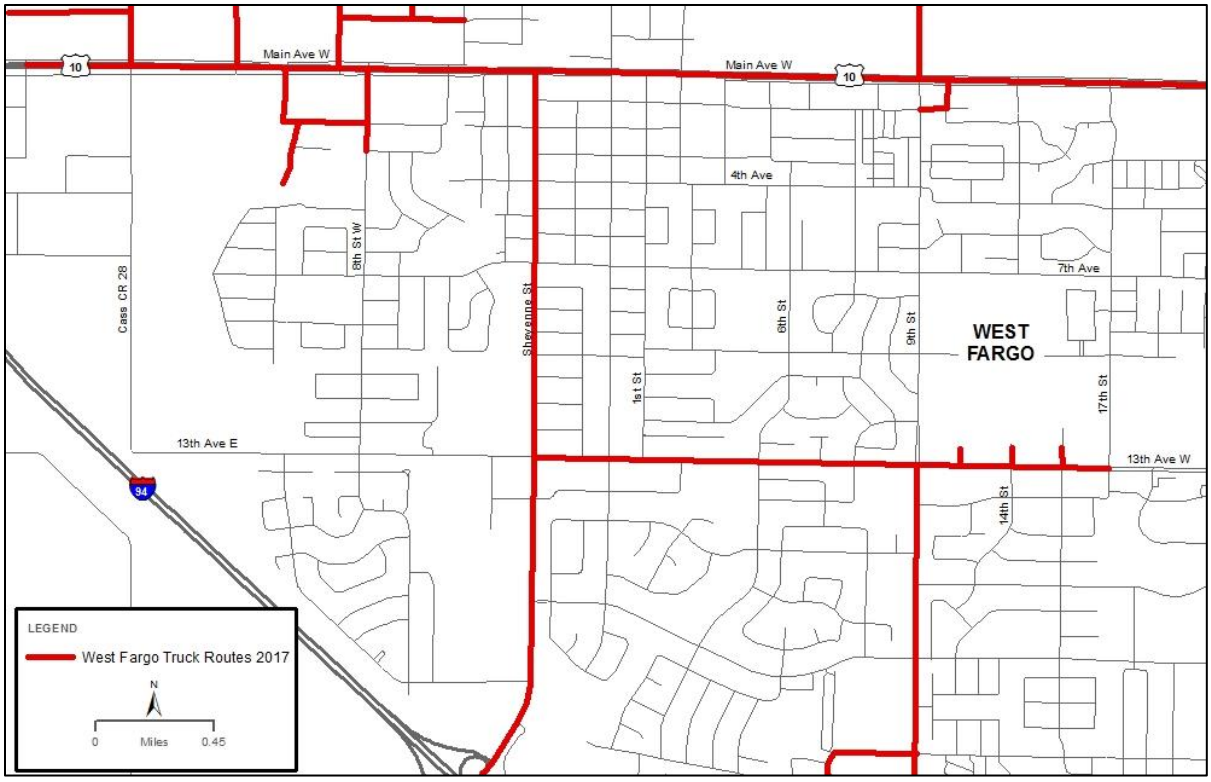

Figure 34. Existing Truck Routes along 13th Avenue Corridor

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) - 13th Avenue Overpass Connection	Transportation Scenario 2 (T2) - 15th 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.

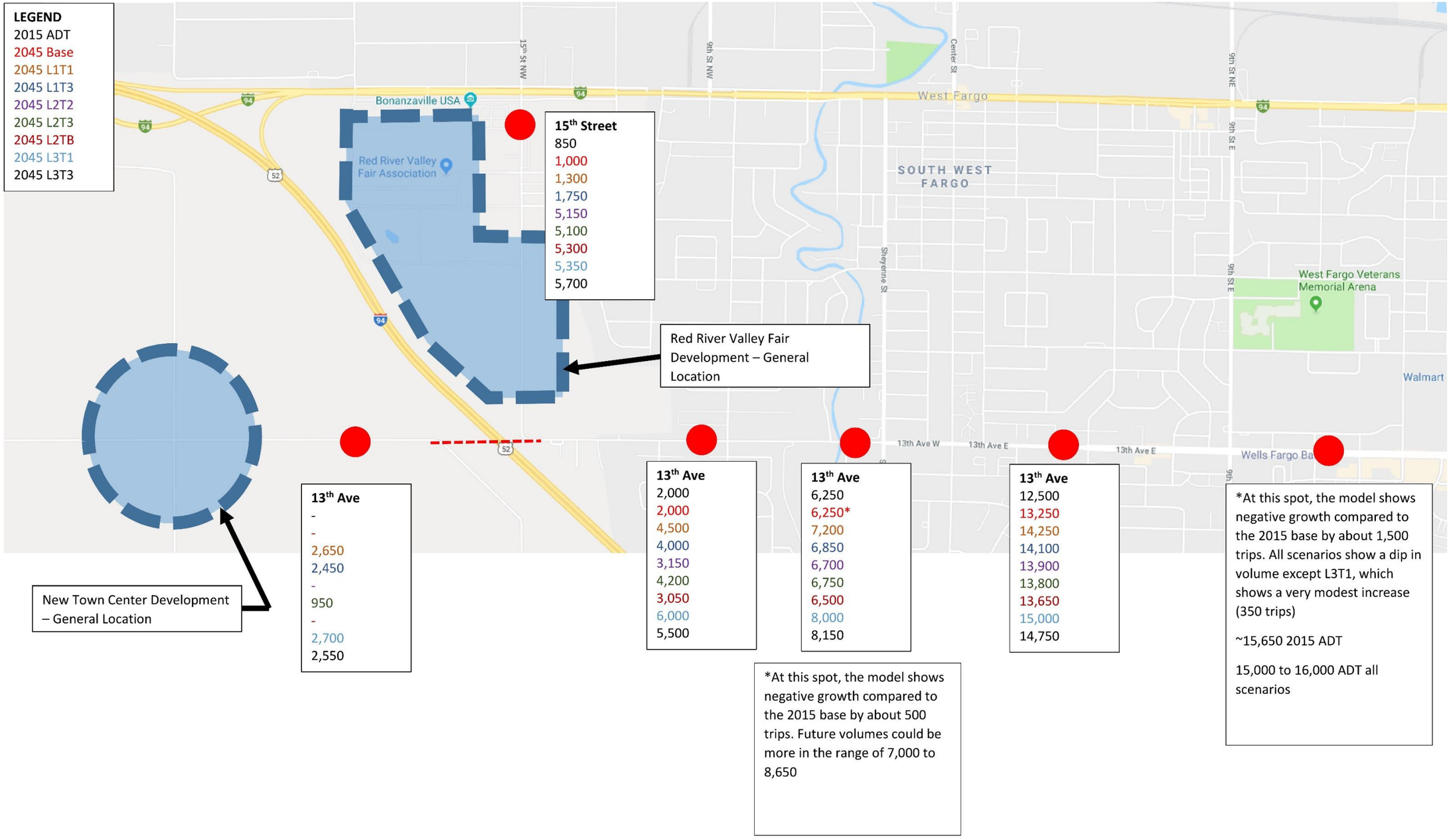

Figure 35. Scenario Development Traffic Projections

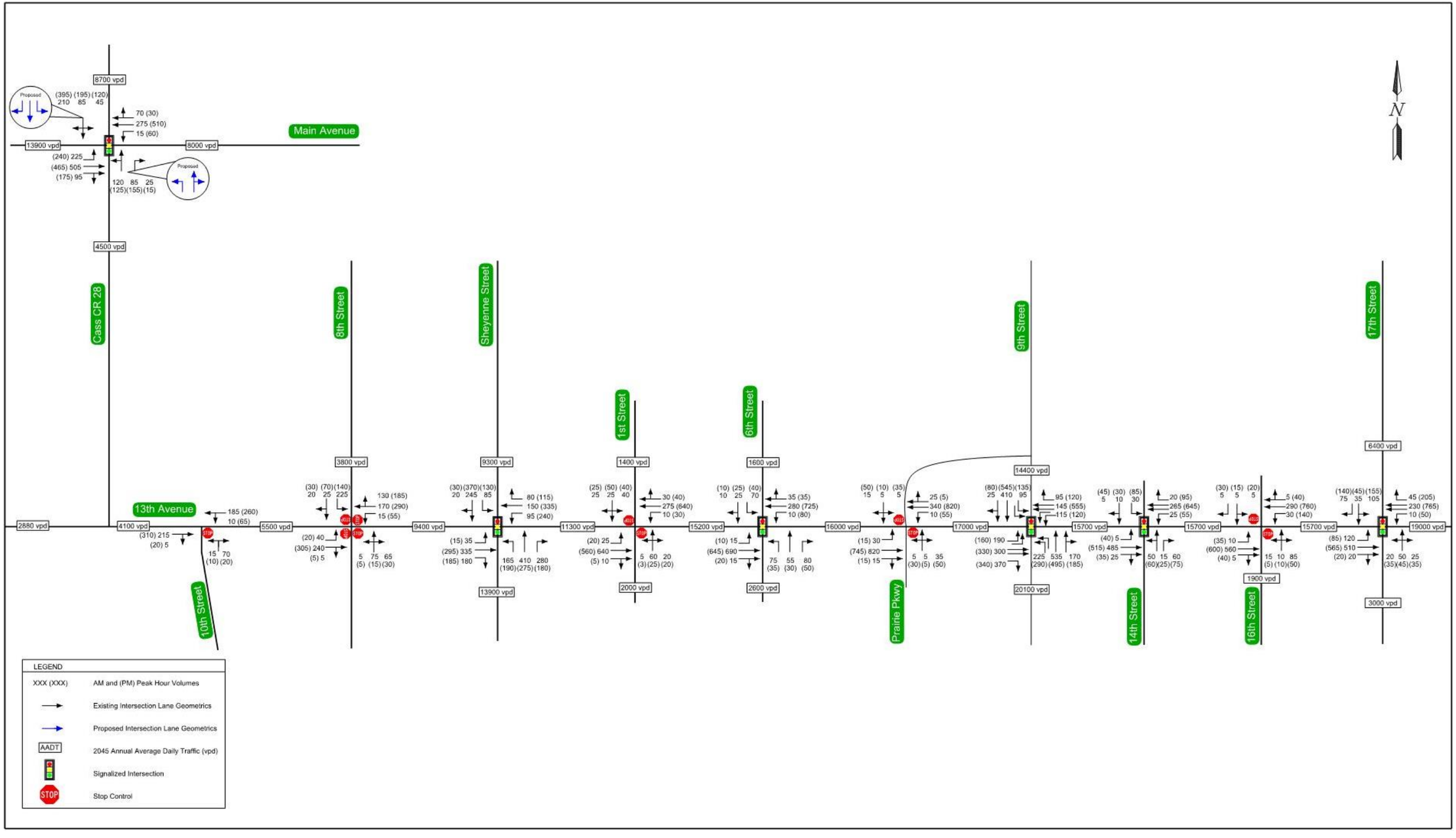

Figure 36. 2045 Forecasted Traffic Volumes and Turn Movements

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 Utililzing 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

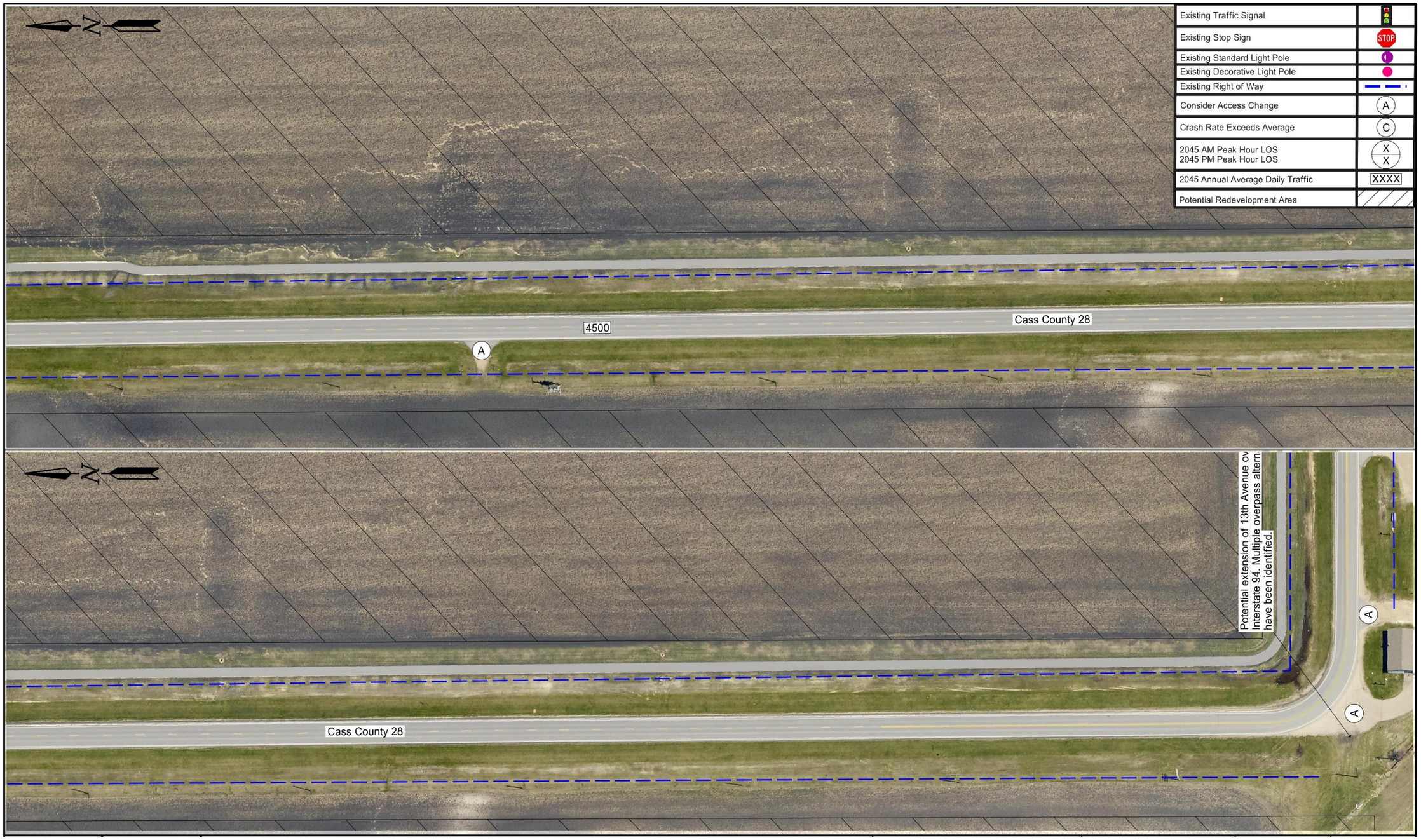

Figure 38. Issues and Needs Summary B

Figure 39. Issues and Needs Summary C

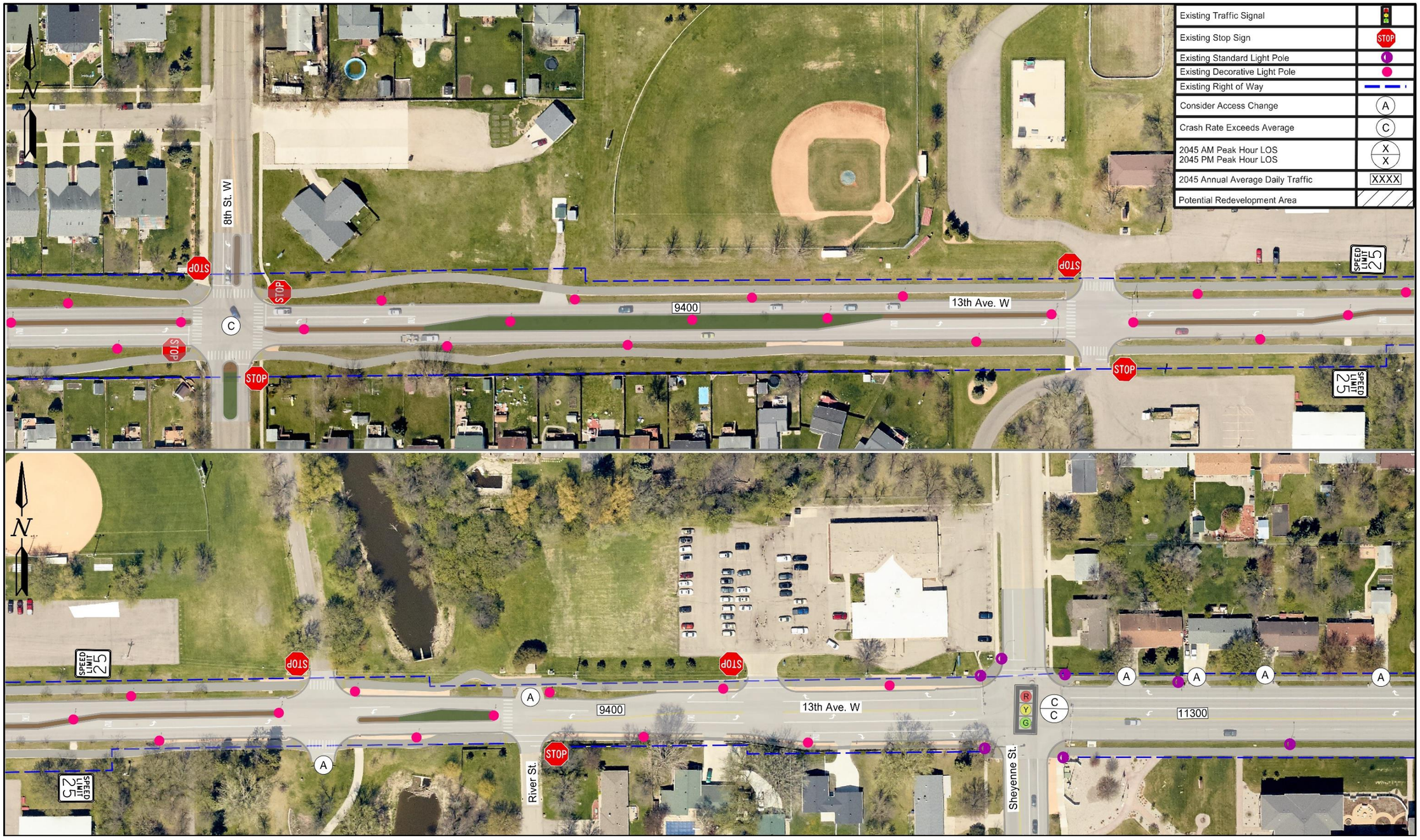

Figure 40. Issues and Needs Summary D

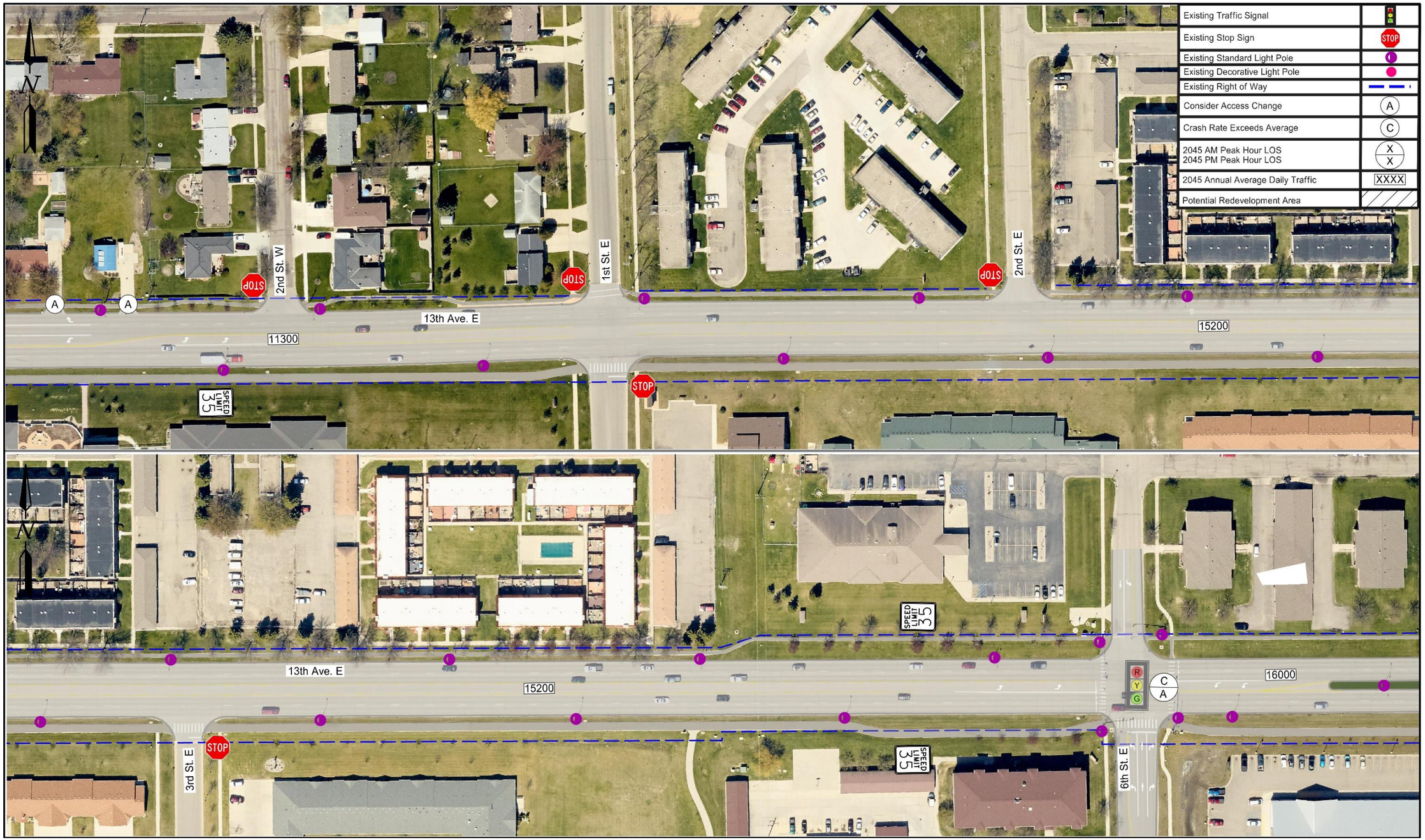

Figure 41. Issues and Needs Summary E

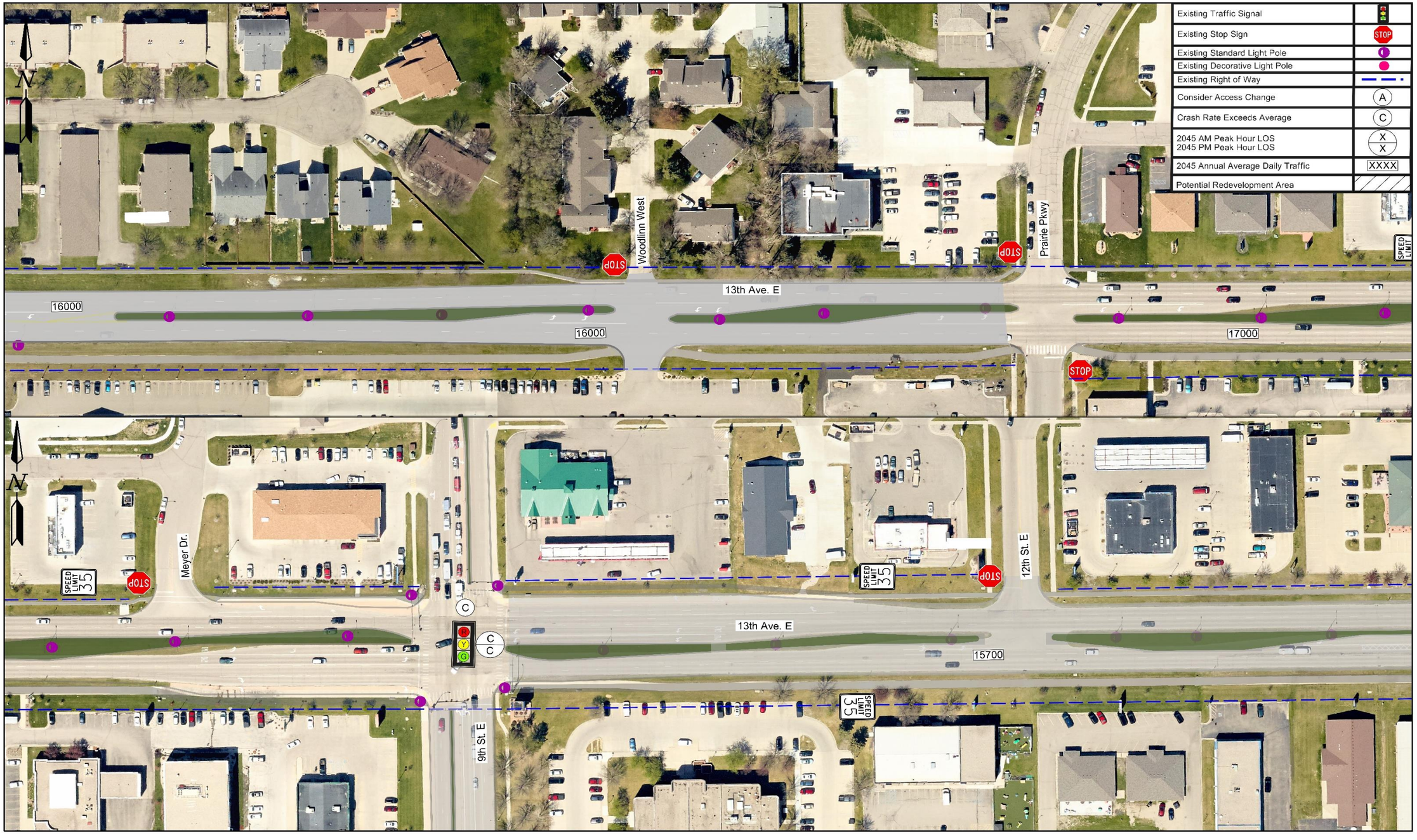

Figure 42. Issues and Needs Summary F

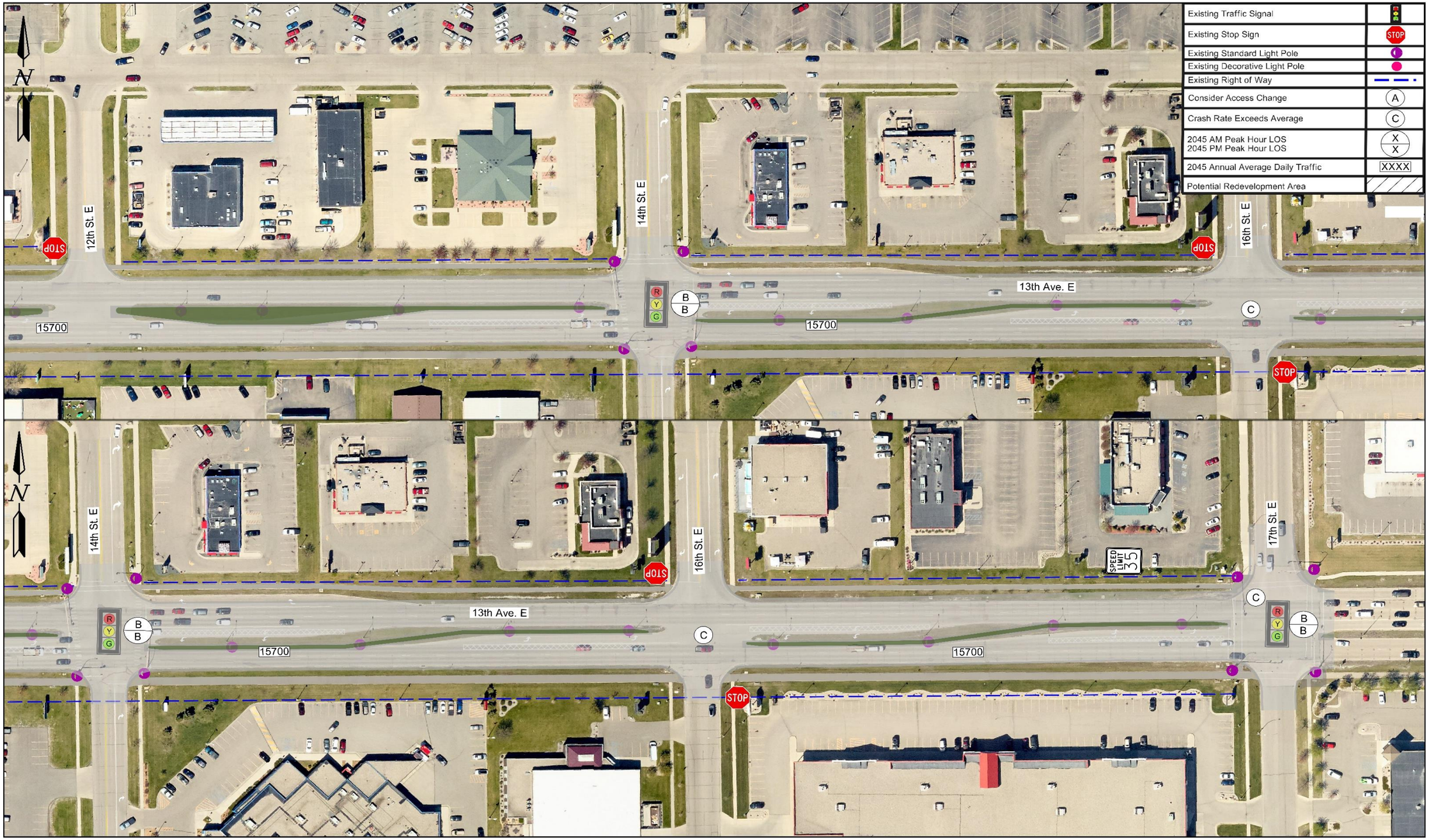

Figure 43. Issues and Needs Summary G

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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.

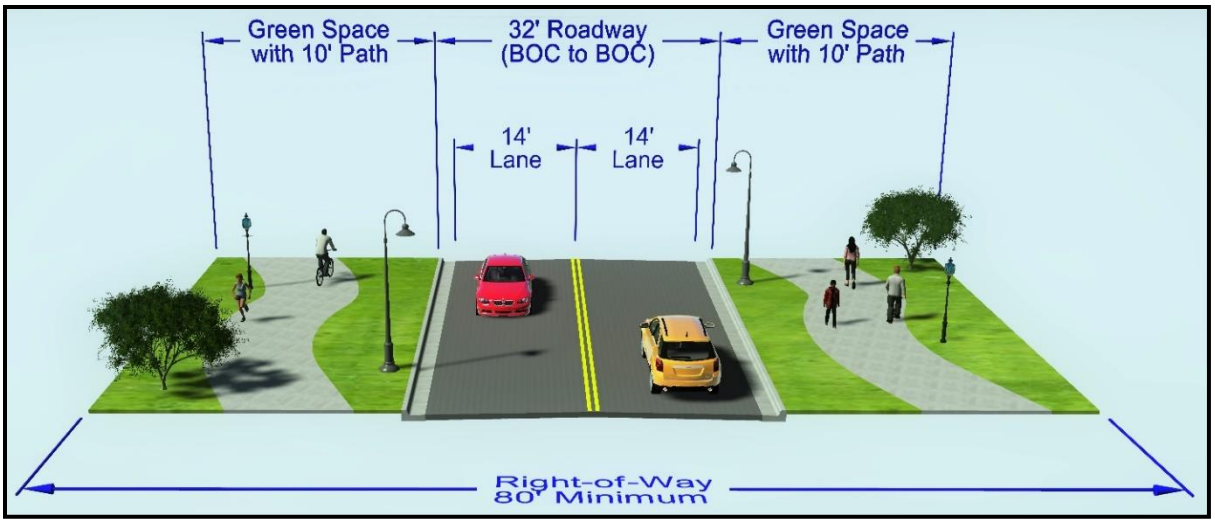

Figure 44. Two-Lane Urban Typical Section

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.

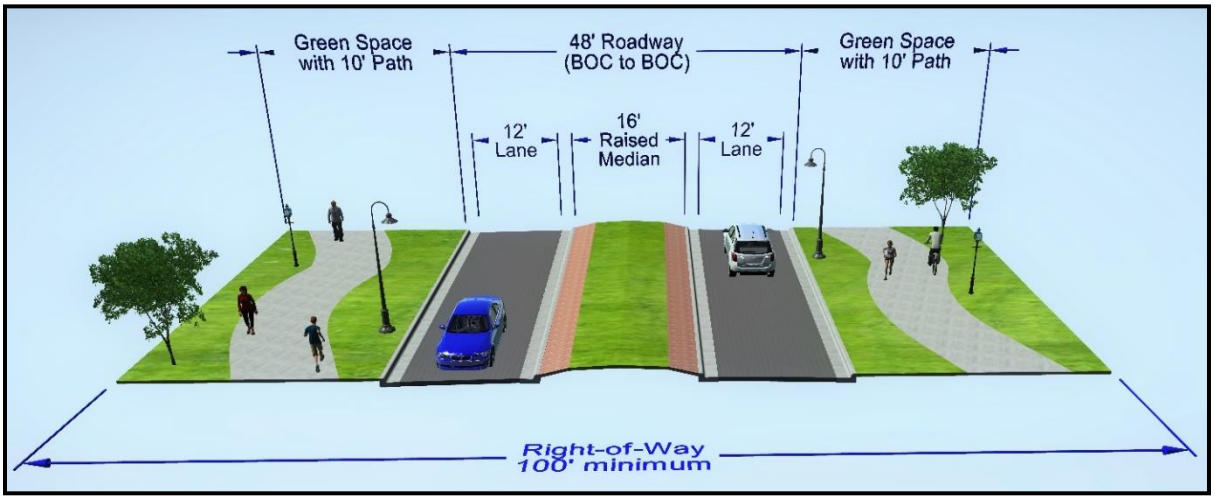

Figure 45. Two-Lane Divided Urban Typical Section

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.

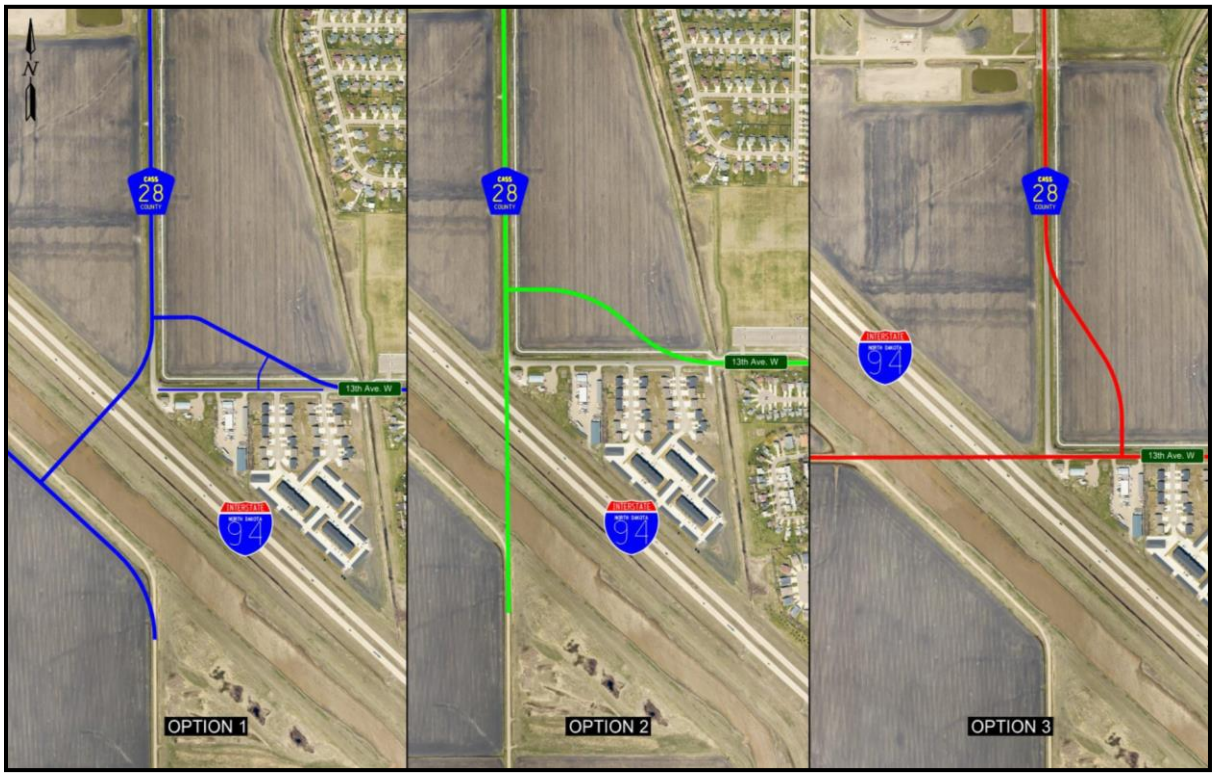

Figure 46. I-94 Overpass Alternatives

- 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.

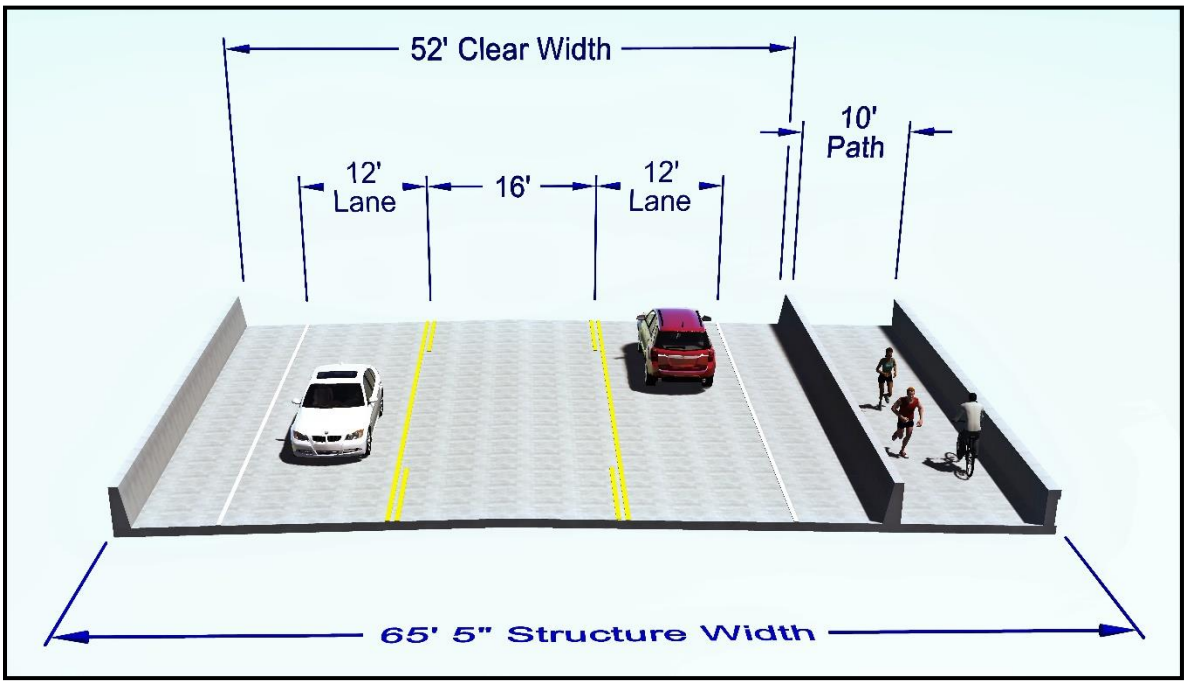

Figure 47. Proposed Structure Typical Section

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.

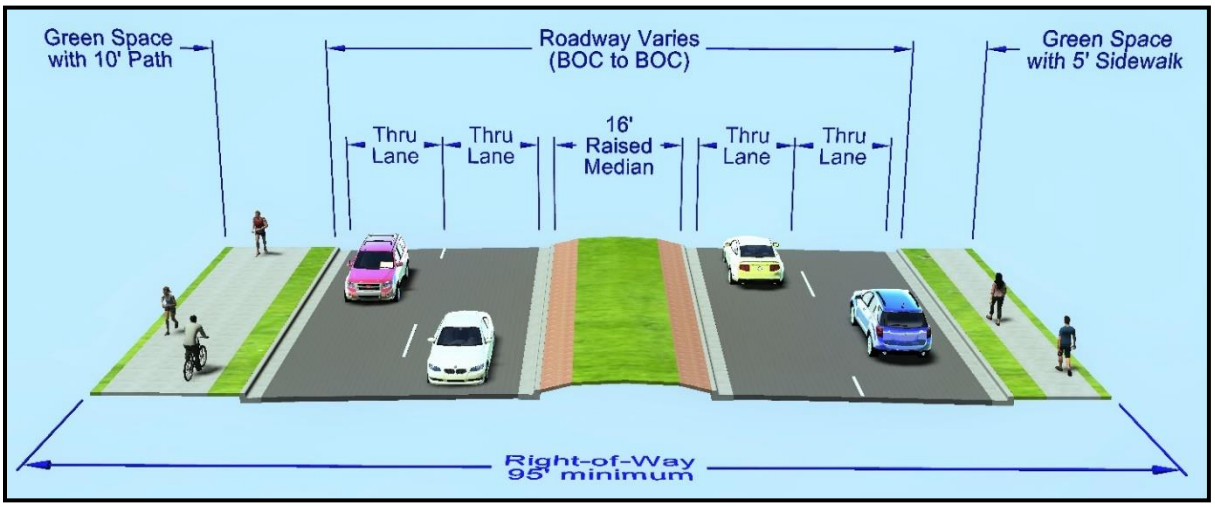

Figure 48. Four-Lane Divided Urban Typical Section

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

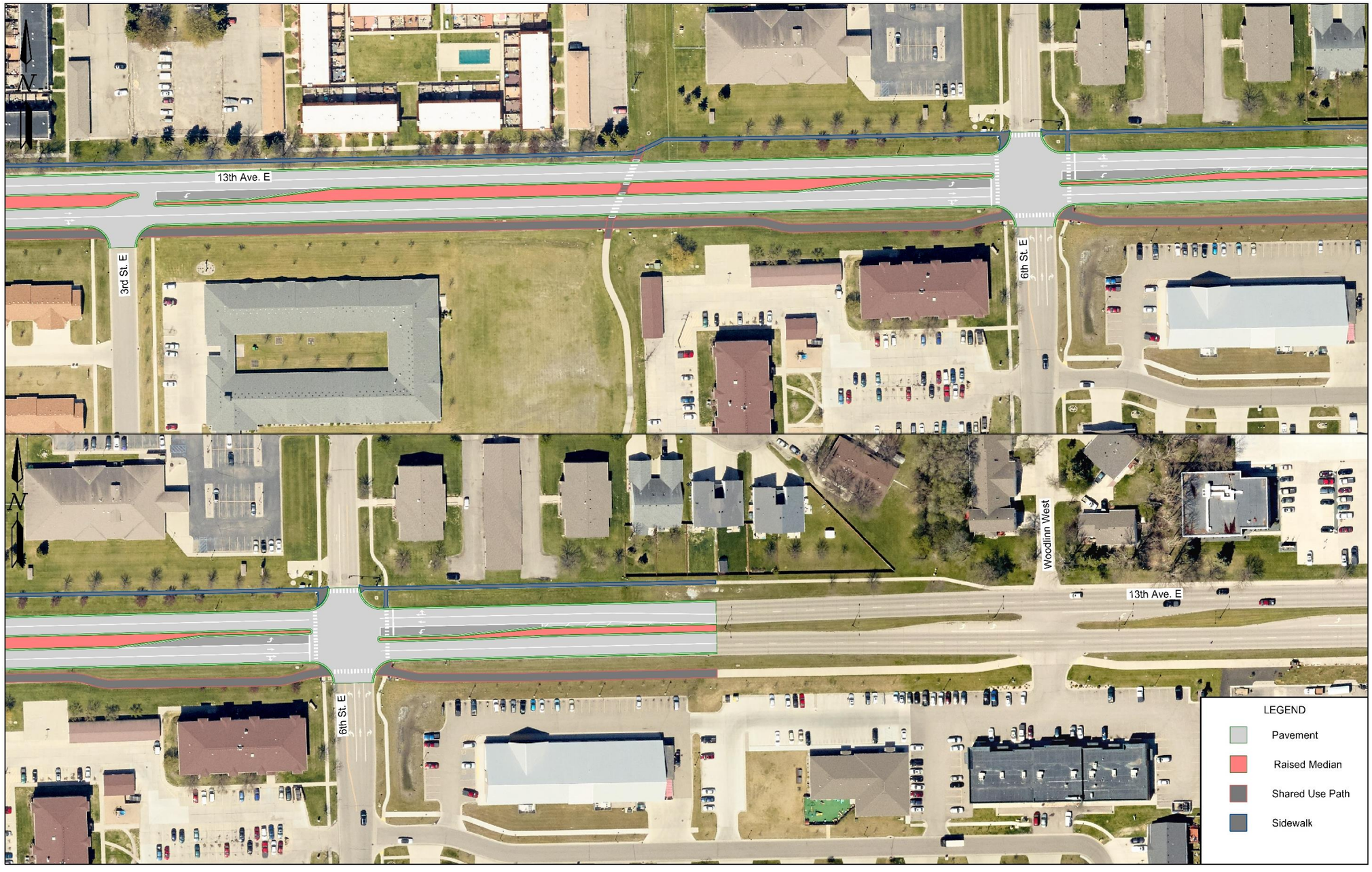

Figure 55. Alternative Development G

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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.

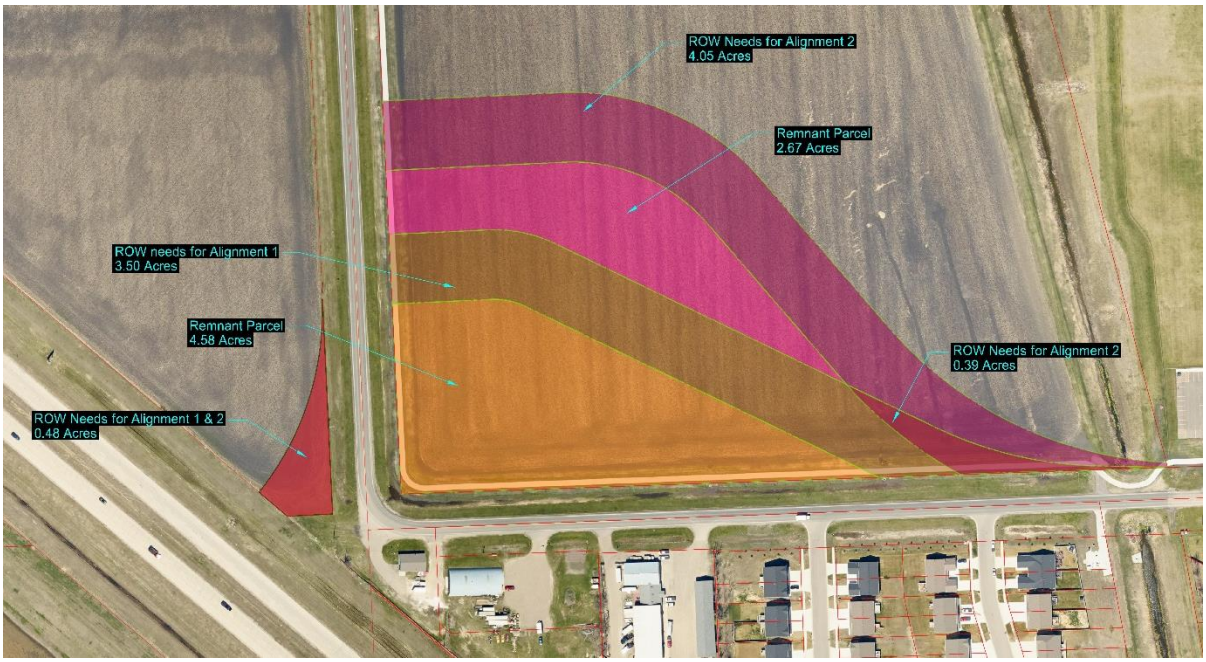

Figure 56. Right-of-Way for CR 28/13th Avenue Realignment

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.

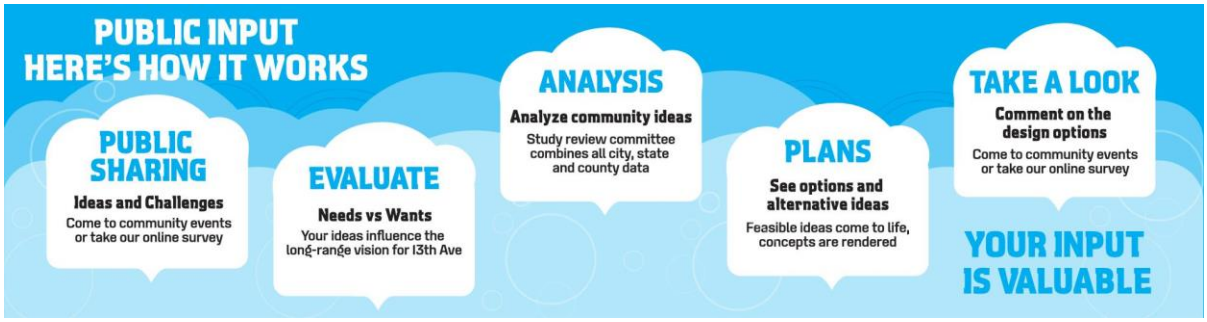

Figure 57. Public Involvement Process

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.

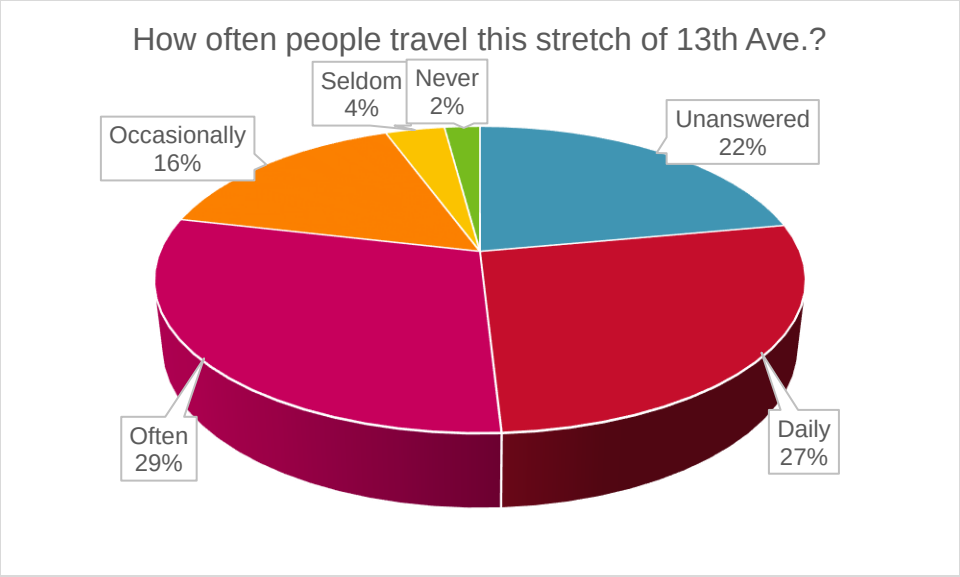

Figure 58. Survey Answers – 13th Avenue Use Frequency

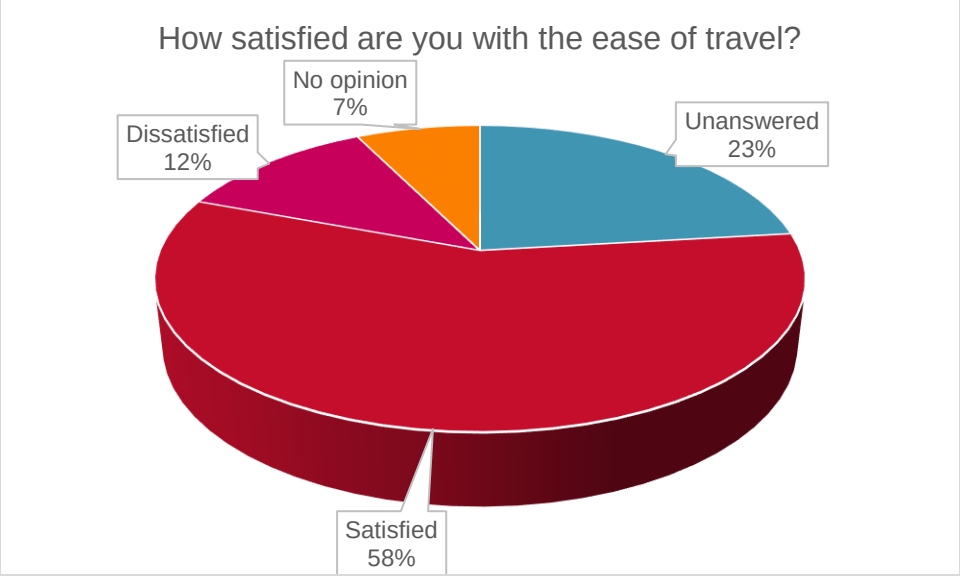

Figure 59. Survey Answers – 13th Avenue Ease of Travel Satisfaction

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.

Appendices

13th Avenue Corridor Study

West Fargo, North Dakota

February 1, 2019

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Appendix A – Public Input Documentation

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Minutes

Project:	FM Metro COG: 13th Avenue Corridor Study – Main Avenue to 17th Street E
Subject:	Project Kick Off Meeting
Date:	Friday, September 08, 2017
Location:	West Fargo City Hall

1. Introductions / Project Team
    a. Confirm distribution list for agenda, meeting minutes, etc.
       Add MnDOT, NDDOT, FTA & FHWA to SRC List
       Add West Fargo Park District and School District to SRC List
2. Deliverables
   Discussed extending study north of Main Ave along 15th Street
   Potentially Phase II or Later Study
    a. Technical Memorandums
        i. Scenario Development
        ii. Existing Conditions
        iii. 2040 Traffic Forecast
        iv. Existing/No-Build Traffic Operations
        v. Issues & Needs
        vi. Alternative Impact Analysis
    b. Draft & Final Public Participation Plan
    c. Purpose and Need Statement
    d. Draft & Final Report
3. Schedule
    a. NTP – 8/10/2017
    b. SRC Meetings
        i. #1 – Early October 2017 (Scenario Development Workshop)
        ii. #2 – Early January 2018
        iii. #3 – Late February 2018
    c. Public Meetings
        i. WestFest September 2017
        ii. Late February 2018
           Online Public Meeting
           Developer Pop-Up Meeting
    d. Draft Report – ~~4/2017~~ 4/2018
    e. Final Report – ~~5/2017~~ 5/2018
4. Project Scope Discussion
    a. Data Gathering & Collection
        i. Previous Studies & On-Going Studies
            1. Sheyenne Street Corridor Study – Phase I & II
            2. West Fargo Comprehensive Plan

3. 9th Street/Veteran's Blvd Corridor Study
4. Metro 2040 Final Report
   West Fargo 2.0 – West Fargo to bring relevant info to SRC
   Meeting #1 (Scenario Development Workshop)

ii. Data Files
1. Metro COG Travel Demand Model –HDR to request from ATAC
2. 13th Avenue Operational Conditions Index –HDR to request from City of West Fargo and Cass County Highway

iii. Traffic Data
With construction on corridor counts done now will be skewed
1. Average Annual Daily Traffic Counts
2. Turning Movement Counts – HDR to request from City (Completed Spring of 2016)
3. Traffic Signal Timings –HDR to request from City
   Signals along corridor have interconnect
4. Crash Data (last 5 years) –Request from NDDOT through the City

iv. Other Items
1. GIS Files –HDR will compile list to request data from City / County
2. As-Built Plans –HDR to request from City / County

b. Project Development and Planning
i. Discuss Purpose & Need – Develop a draft early on and will revisit after Issues and Needs Assessment
ii. Scenario Development Workshop
Once date is set Tim will book the West Fargo City Hall Training Room
1. Identify stakeholders
   SRC, Commissioner Simmons
2. Identify potential dates
   1st or 3rd Week of October
   Brian to send out poll to find date
3. Discuss data needs
   Travel Demand Model / Social Economic Data
   Assumes FM Area Diversion is built

c. Public Participation
West Fargo would like to see the numbers
Geographical area covered
Neighborhood surveyed lives in
How long have they lived in West Fargo
i. Discuss Public Participation Plan
This will be a living document
ii. Discuss WestFest

Will have a tent with survey and "kids zone"
Push cart

5. Other Items
   Website
   West Fargo in the process of updating City's website
   HDR – Flint to develop project website
   Either link or embed in City's website
6. Adjourn

Action Items

Action Item	Responsible Party	Due Date
West Fargo Neighborhood List	Melissa Richard	9/11/17 EOB
Draft Questionnaire Comments	SRC	9/11/17 EOB
List of GIS / As Built Needs	Matthew Huettl	9/12/17
SRC #1 Poll for Date	Brian Ray	9/15/17

METROCOG
FARGO-MOORHEAD METROPOLITAN COUNCIL OF GOVERNMENTS

Minutes

Project:	FM Metro COG: 13th Avenue Corridor Study – Main Avenue to 17th Street E
Subject:	Scenario Development Workshop
Date:	Wednesday, October 18, 2017
Time:	1:00 PM – ~~4:30 PM~~ 3:30 PM
Location:	West Fargo City Hall – Training Room

1. Welcome/Introductions
    a. See attached Sign-in Sheet
2. Project Status Update
    a. Matthew gave a brief project status update
        i. Outstanding Data
            1. Pavement Condition Index – Chris working on providing
            2. Crash Data – Request Being Drafted to NDDOT
    b. Melissa (Flint) gave brief recap on WestFest Efforts and Results
3. Discuss Scenario Development Workshop Objectives
    a. Brian gave and overview of the workshop and what the goals were
    b. General Discussion on assumptions
        i. FM Diversion In vs. Out
        ii. 2045 Demographic Data
4. Discuss Land Use Scenarios
    a. Review 2045 Socio-Economic Data
        i. Brian discussed current and 2045 travel analysis zone (TAZ) data
    b. Brainstorm Potential Land Development Scenarios
        i. Between FM Diversion & I94
            1. Town Center location from West Fargo 2.0
            2. Mixed use
            3. Employment Type and Household Numbers
                a. Coordinate with City Planning to determine practical numbers
        ii. Fairground Annex
            1. 84,000 sf Convention Center with attached hotel
                a. 40 Acres of initial development
            2. Potential for 150-200 acres to be sold and developed
                a. Southern End of RRVF Property
                b. Commercial Development
                c. More jobs created than households built
        iii. North of Main Avenue – Industrial Development
            1. Current Data shows growth of 1700 Jobs in area
    c. Identify up to 3 Feasible Land Use Scenarios
    d. Define each Land Use Scenario

i. L1 – SW I-94 Town Center Growth Area
ii. L2 – Fair Grounds Annexation Development
iii. L3 – Combine L1 with L2
iv. LB – Baseline

5. Discuss Transportation Scenarios
   a. Brainstorm Potential Transportation Scenarios
      i. 13th Ave Overpass over I-94
         1. Which street would become through movement?
         2. Concerns of higher traffic volumes around Elmwood Park expressed
         3. Potentially slight positive impact to soccer complex traffic
      ii. Extend 15th St / CR28 north of Main Avenue to 19th Avenue N
      iii. Sheyenne Street Improvements
         1. Would this change traffic on 13th Ave?
   b. Identify up to 3 Feasible Transportation Scenarios
   c. Define each Transportation Scenario
      i. T1 – I-94 Overpass
      ii. T2 – 15th St / CR28 Extension
      iii. T3 – Combine T1 with T2
      iv. TB – Baseline

6. Identify Combinations of Land Use/Transportation Scenarios

	T1	**T2**	**T3**	**TB**
L1	✓		✓	
L2		✓	✓	✓
L3	✓		✓	
LB		✓		✓

7. Next Steps
   a. Coordinate needed data
   b. Run models and analyze
   c. Develop scenario development tech memo

8. Adjourn

Action Items

Action Item	Responsible Party	Due Date
Obtain Southwest / Sheyenne Study Travel Demand Model	**Brian / Michael**	
Coordinate feasible input data for growth areas	**Brian / WF Planning**	

13th Ave Corridor Study | Scenario Development Workshop
Sign-In Sheet

Sign-In Sheet

Project: FM Metro COG: 13th Avenue Corridor Study – Main Avenue to 17th Street E

Subject: Scenario Development Workshop

Date: Wednesday, October 18, 2017

Time: 1:00 PM – 4:30 PM

Location: West Fargo City Hall – Training Room

NAME	AGENCY	EMAIL
Matthew Stamness	Cass Co. Hwy. Dept.	stamnessm@casscountynd.gov
Larry Weil	City Planning	larry.weil@westfargond.gov
Barb Erbstoesser	WF Park District	barb@wfparks.org
Bradley Redmond	WF Public Schools	redmond@west-fargo.k12.nd.us
Dustin Scott	Moore Engineering	dscott@mooreengineeringinc.com
Michael Maddox	Metro COG	maddox@fmmetrocog.org
Heith Janke	WF Police Dept.	heithjanke@westfargond.gov
Amy Acquard	Flint Group	amy.acquard@flint-group.com
Chris L Hagen	Flint Group	chris.hagen@flint-group.com
Melissa Reichert	Flint Group	melissa.reichert@flint-group.com
Melissa Richard	City of West Fargo Comm	melissa.richard@westfargond.gov
Tina Fisk	City of WF	tina.fiske@westfargond.gov

hdrinc.com 51 N. Broadway, Suite 550, Fargo, ND 58102-4970
(701) 353-6100

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Sign-In Sheet

Project: FM Metro COG: 13th Avenue Corridor Study – Main Avenue to 17th Street E

Subject: Scenario Development Workshop

Date: Wednesday, October 18, 2017

Time: 1:00 PM – 4:30 PM

Location: West Fargo City Hall – Training Room

NAME	AGENCY	EMAIL
Brian Ray	HDR	brian.ray@hdrinc.com
CHRIS BRUNGARDT	WFPW	CHRIS.BRUNGARDT@WESTFARGOND.GOV
Tim Solberg	City of West Fargo	tim.solberg@westfargond.gov

Minutes

Project:	FM Metro COG: 13th Avenue Corridor Study – Main Avenue to 17th Street E
Subject:	Scenario Development Land Use – Web Meeting
Date:	Wednesday, November 15, 2017
Location:	Web Meeting
Attendees:	Tim Solberg (City of West Fargo) Dan Farnsworth (FM COG) Jason Carbee (HDR) Brian Ray (HDR) Matt Huettl (HDR)

1. Introductions

2. Discuss Land Use Options SW I-94 Town Center
   a. Review various town centers
      - **New Town – St Charles, Mo** https://www.google.com/maps/@38.8323072,-90.5002652,3928m/data=!3m1!1e3?hl=en
      - **Fallbrook – Lincoln, NE** https://www.google.com/maps/@40.8801494,-96.7269717,1597m/data=!3m1!1e3?hl=en
      - **Somerset – Ames, IA** https://www.google.com/maps/@42.049628,-93.6459688,1414m/data=!3m1!1e3?hl=en
      - **Village Gardens – Lincoln, NE** https://www.google.com/maps/@40.7381648,-96.6415596,655m/data=!3m1!1e3?hl=en
      - **Aksarben Village – Omaha, NE** https://www.google.com/maps/@41.2401161,-96.0157362,1102m/data=!3m1!1e3?hl=en
      - **West Glen – West Des Moines, IA** https://www.google.com/maps/@41.5620946,-93.7830214,880m/data=!3m1!1e3?hl=en
      - **Peninsula Neighborhood – Iowa City, IA** (mostly neo traditional residential) https://www.google.com/maps/@41.676163,-91.5567703,536m/data=!3m1!1e3?hl=en
      - **Park Place - Leawood, KS** - https://www.google.com/maps/@38.9180166,-94.6469314,762m/data=!3m1!1e3

   b. Identify appropriate land use mix (residential, office, retail)
      - The town center development should focus on housing
      - It will be more boutique/service type retail, not regional retail
      - It will be designed to be a self-sustaining community
      - Housing will be more dense at the core
      - Potential for an elementary school

c. Amount of land to be developed
   - During the planning horizon (next 20-25) years the town center would be developed with this scenario, but there would still be quite of bit of undeveloped land in this area.
   - The increase in socio-economic data in this zone would be offset by reductions in other zones throughout the region.

3. Next Steps
   - HDR will develop the proposed TAZ socio-economic changes for this scenario and send them to FM COG for their review.
   - FM COG will coordinate to determine the appropriate model and socio-economic data to use for this analysis.
4. Other Items

Action Items

Action Item	Responsible Party	Due Date
Develop proposed TAZ socio-economic changes for this scenario and submit to FM COG for review	**Brian / Jason**	
Coordinate with ATAC to determine appropriate model and socio-economic data to use.	**Dan**	

Minutes

Project:	FM Metro COG: 13th Avenue Corridor Study – Main Avenue to 17th Street E
Subject:	Scenario Development Tech. Memo Discussion
Date:	Thursday, July 19, 2018
Time:	9:00 AM – 9:45 AM
Location:	Conference Call

Attendees:

Brian Ray – HDR	Dan Farnsworth – Metro COG	Tina Fisk – WF Admin.
Jason Carbee – HDR	Larry Weil – WF Planning	Melissa Richard – WF Comm.
Matthew Huettl – HDR	Tim Solberg – WF Planning	Matt Marshall – WF Econ. Dev.

Discussion:

- Brian R. discussed the Land Development scenarios
  - Town Center SW of I-94
  - RRVF Grounds redevelopment
- Brian R. discussed the potential transportation scenarios
  - 13th Ave Overpass over I-94
  - Extension of 15th St to the North
- Brian R. discussed the model (traffic volumes) output
  - Seeing increases with adding scenarios in traffic west of Sheyenne
  - East of Sheyenne is not seeing significant increases in volumes
  - With new developments 13th Ave is not carrying longer trips
    - These are getting rerouted to other routes
- Further intersection analysis will need to be performed
- Dan F. had no questions
  - Decision from West Fargo on which scenario to move forward with
- Tim S. stated the WF Comp. plan shows both scenarios
  - Suggested moving forward as both LD as the scenario
- Matt M. discussed the RRVF Grounds Development
  - Normal fair does not have a constant traffic flow (high peaks, low valleys)
  - If developed into commercial this would increase constant traffic flow
- Brian R. & Jason C. discussed assumptions for the RRVF Grounds developments used in the modeling.
- Tim S. asked Dan F. if he was comfortable with making the assumptions.
  - Dan F. comfortable with Town Center
  - Comfortable moving forward with assumptions and utilizing combination of TC & RRVF Grounds Development
- Tim S. asked if L2 needs to be tweaked in the language
  - Brian R. suggested to include text to state that this is one scenario and is used as a place holder for similar development scenarios that would produce similar traffic volumes

Decision:

Move forward with L3 / T3 Scenario

Action Items:

Action Item	Responsible Party	Due Date
Update Technical Memorandum wording for L2	**HDR**	
Begin detailed analysis of corridor	**HDR**	

METROCOG
FARGO-MOORHEAD METROPOLITAN COUNCIL OF GOVERNMENTS

Minutes

Project:	FM Metro COG: 13th Avenue Corridor Study – Main Avenue to 17th Street E
Subject:	Study Review Committee Meeting
Date:	Friday, October 19, 2018
Time:	10:00 AM – 12:00 PM
Location:	West Fargo City Hall – West Fargo Room Conference Call Info: #866.583.7984 code: 1066009

1. Welcome/Introductions
2. Project Status Update
3. 2045 Traffic Projection Overview
    a. Brian Ray explained Scenario Development & Analysis
4. Issues and Needs Discussion
    a. Brian Ray explained Issues and Needs Tech Memo
5. Discuss Alternatives
    a. Segment 1 (Main Ave W – 10th Street W)
    b. I-94 Overpass
        i. Extend Cass 28 to the South
        ii. Extend 13th Ave W to the West
        iii. Cross perpendicular to I-94
    c. Segment 2 (10th Street W – Sheyenne Street)
    d. Segment 3 (Sheyenne Street – 6th Street E)
    e. Segment 4 (6th Street E – 17th Street E)
6. Identify Alternatives to Develop
    a. Segment 1 (Main Ave W – 10th Street W)
        i. No - Build
        ii. 2 Lane Divided
        iii. Access Spacing Recommendations
    b. I-94 Overpass
        i. Cross perpendicular to I-94 (Identify ROW Needs)
    c. Segment 2 (10th Street W – Sheyenne Street)
        i. No - Build
        ii. Spot Improvements
        iii. Safety Improvements
    d. Segment 3 (Sheyenne Street – 6th Street E)
        i. 4 Lane Divided
        ii. Access Control
            1. Right-in Right-out access
            2. Keep 1st Street E & 6th Street E as full access intersections
            3. Pedestrian crossing options Near 6th Street E
    e. Segment 4 (6th Street E – 17th Street E)
        i. No - Build
    f. Consistent corridor
    g. Pedestrian Facilities
7. Next Steps
8. Adjourn

Action Items

Action Item	Responsible Party	Due Date
Develop Alternatives	HDR	

METROCOG
FARGO-MOORHEAD METROPOLITAN COUNCIL OF GOVERNMENTS

Minutes

Project:	FM Metro COG: 13th Avenue Corridor Study – Main Avenue to 17th Street E
Subject:	Study Review Committee Meeting
Date:	Tuesday, January 22, 2019
Time:	10:00 AM – 11:30 AM
Location:	West Fargo City Hall – West Fargo Room Conference Call Info: #515.739.1015 ID: 994.487.338

1. Welcome/Introductions

2. Project Status Update
   a. Matthew updated the SRC on project

3. Report Discussion / Comments
   a. Verify Lane Configurations between 9th Street E and 17th Street E
   b. SRC discussed showing bridge typical without raised median
   c. Right-of-Way Costs are low
      i. Due to the variability in ROW it was discussed to remove specific cost of ROW.
   d. Simplify Cost Estimates to better represent what is included

4. Final Report Submittal *(2/1/2019)*

5. Final Report Presentations
   a. Presentations to be made at:
      i. West Fargo Planning Commission (2nd Tuesday of Month)
      ii. West Fargo City Commission (1st & 3rd Monday of Month)
      iii. Metro COG Transportation Technical Committee (2nd Thursday of Month)
      iv. Metro COG Policy Board (3rd Thursday of Month)

6. Adjourn

Action Items

Action Item	Responsible Party	Due Date
SRC Review Comments	SRC	1/25/2019
Final Report	HDR	2/1/2019

Sign-In Sheet

Project: FM Metro COG: 13th Avenue Corridor Study – Main Avenue to 17th Street E

Subject: Study Review Committee Meeting

Date: Tuesday, January 22, 2019

Time: 10:00 AM – 11:30 AM

Location: West Fargo City Hall – West Fargo Room
Conference Call Info: #515.739.1015 ID: 994.487.338

Attendee	Organization	Email
Matthew Huettl	HDR	matthew.huettl@hdrinc.com
Tim Solberg	City of West Fargo	tim.solberg@westfargond.gov
Tom Soucy	Cass Co. Hwy.	soucyt@cassruralnd.gov
Dan Farnsworth	Metro COG	farnsworth@fmmetrocog.org
Larry Weil	City of West Fargo	larry.weil@westfargond.gov
MATT MARSHALL	CITY OF WEST FARGO	Matt.Marshall@westfargond.gov
Dan Bergerson	HDR	dan.bergerson@hdrinc.com
Kyle Wieler	HDR	kyle.wieler@hdrinc.com
Brian Ray	HDR	brian.ray@hdrinc.com
Melissa Richard	City of West Fargo	melissa.richard@westfargond.gov

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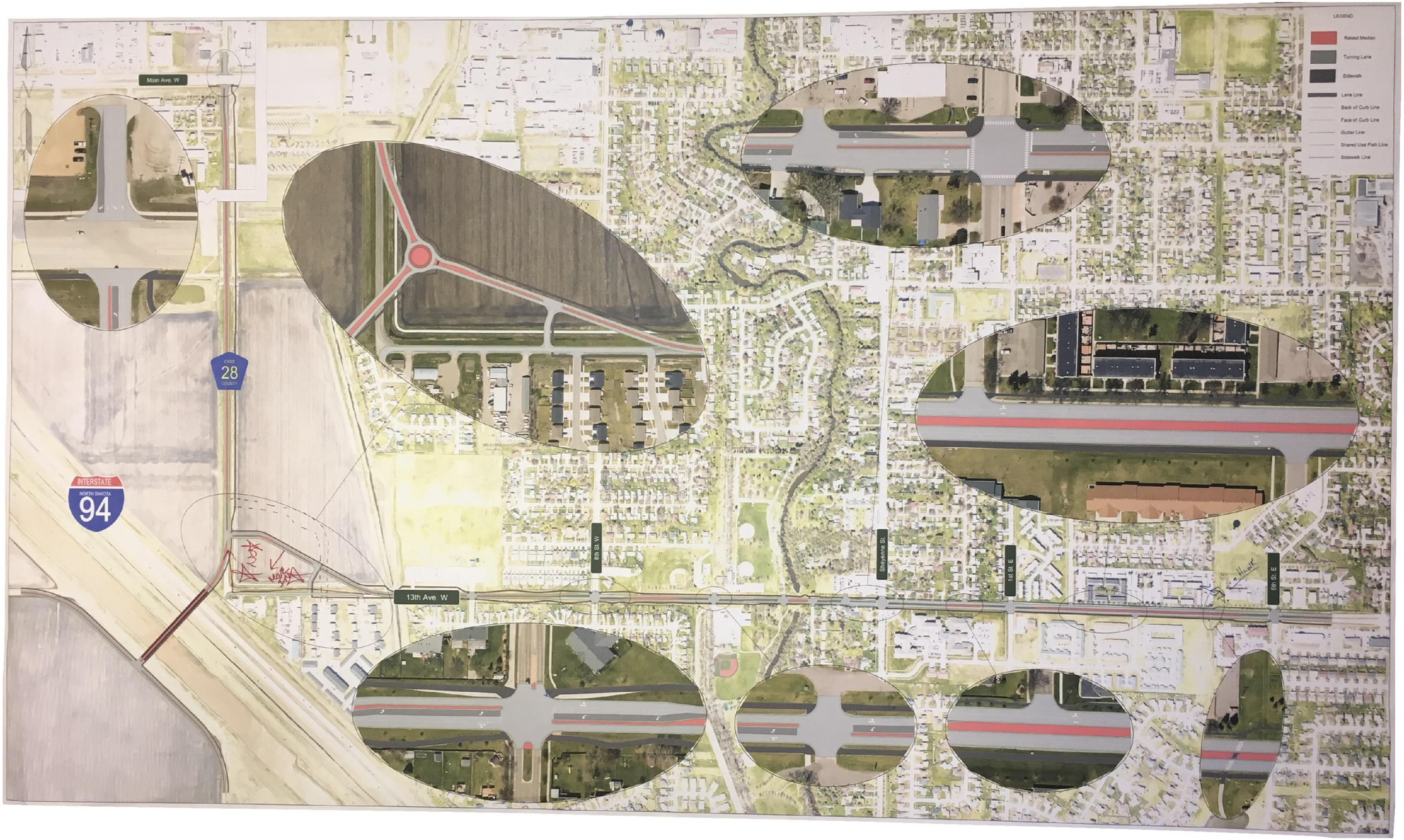
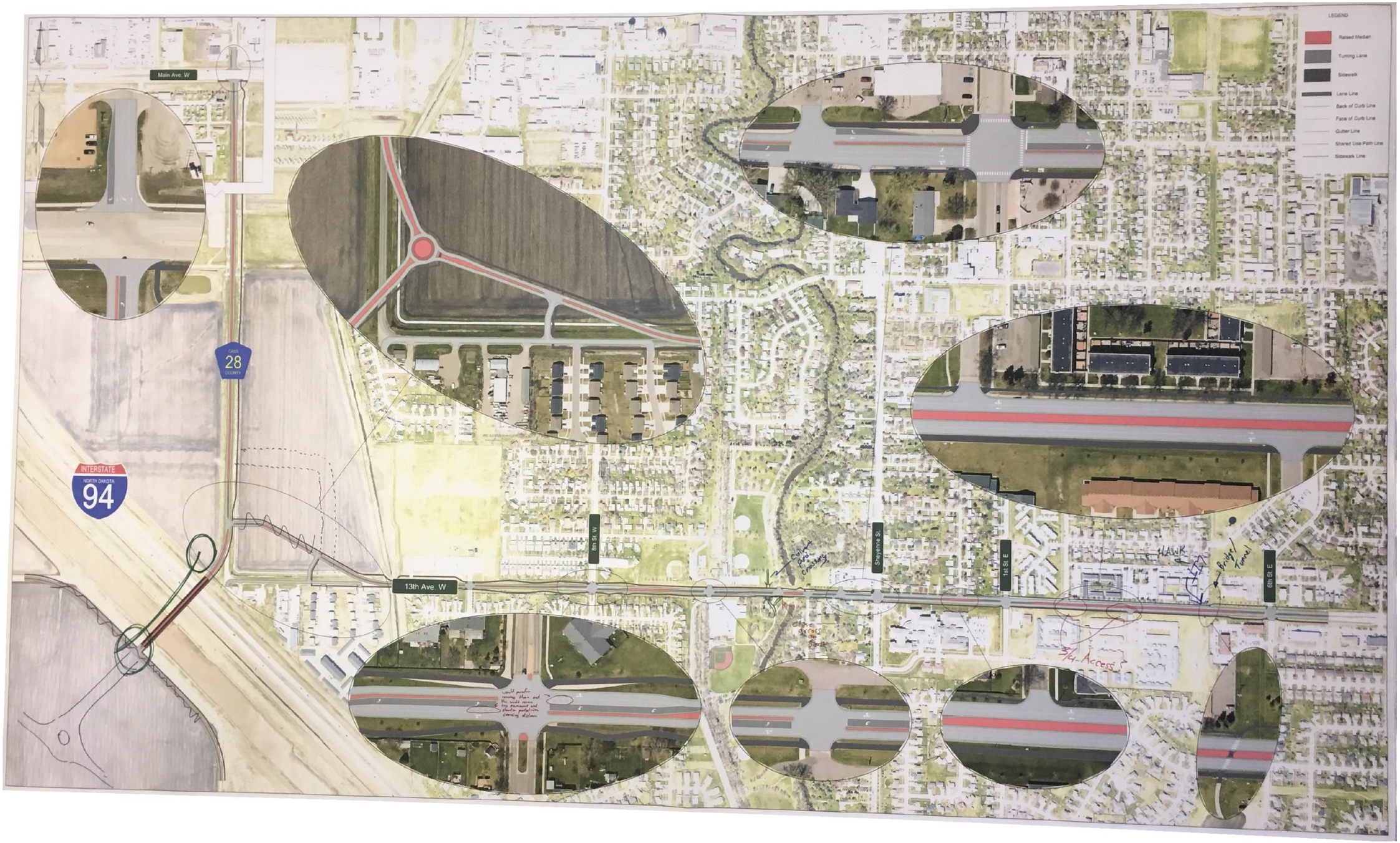

LEGEND
Raised Median
Turning Lane
Sidewalk
Lane Line
Back of Curb Line
Face of Curb Line
Gutter Line
Shared Use Path Line
Sidewalk Line
Main Ave. W
CASS
28
COUNTY
INTERSTATE
NORTH DAKOTA
94
8th St. W
13th Ave. W
Sheyenne St.
1st St. E
6th St. E


LEGEND
Raised Median
Turning Lane
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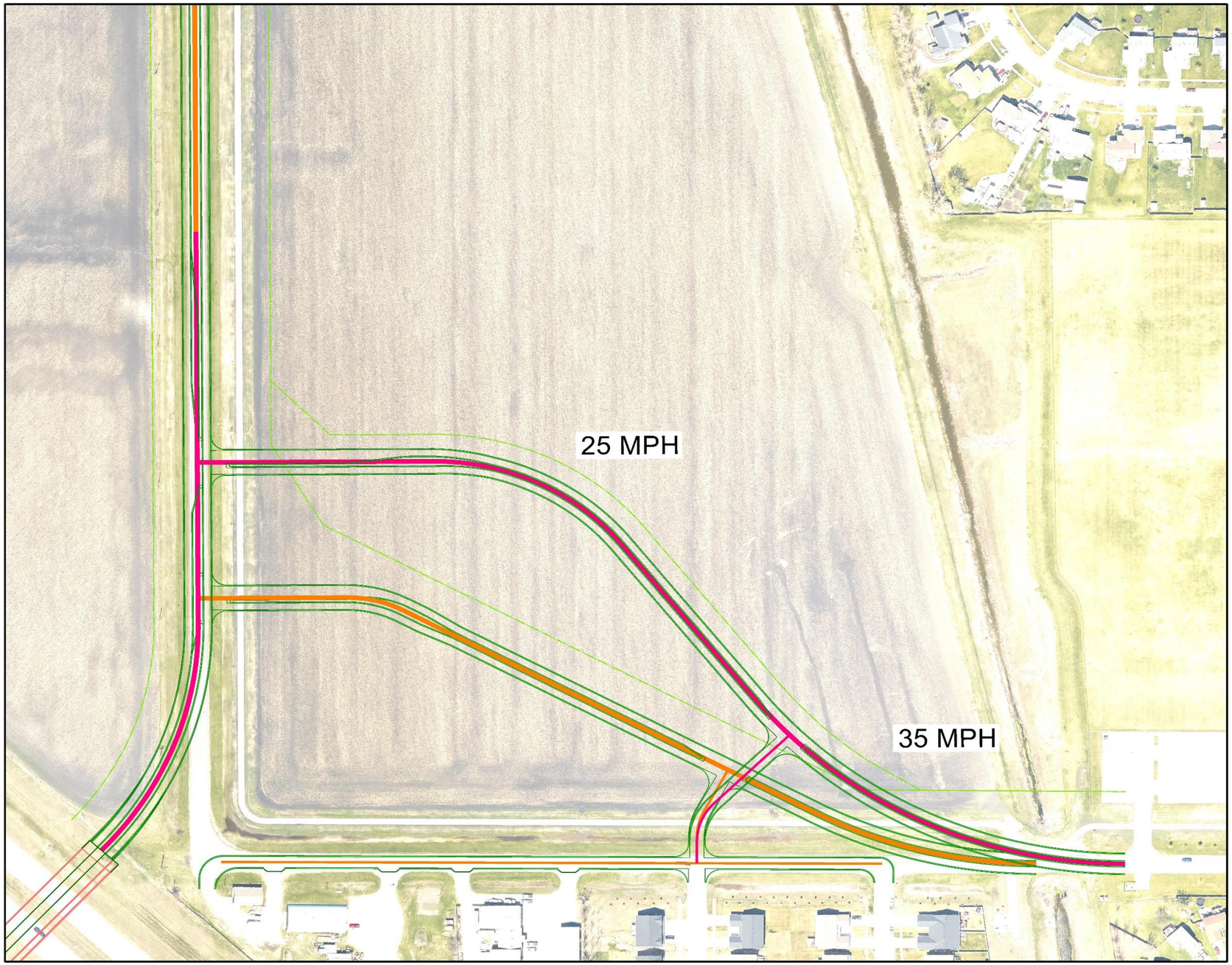
Lane Line
Back of Curb Line
Face of Curb Line
Gutter Line
Shared Use Path Line
Sidewalk Line
Main Ave. W
CASS
28
COUNTY
INTERSTATE
NORTH DAKOTA
94
8th St. W
13th Ave. W
Sheyenne St.
1st St. E
6th St. E
HAWK
Bridge/ Tunnel
3/4 Access


25 MPH
35 MPH

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Appendix B – Synchro Data

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Lanes, Volumes, Timings
1: 17th St

12/22/2017

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	113	452	21	9	208	43	21	51	27	100	33	69
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (ft)	160		0	230		0	0		0	0		100
Storage Lanes	1		0	1		1	0		0	0		1
Taper Length (ft)	120			120			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.992				0.850		0.968				0.850
Flt Protected	0.950			0.950				0.988			0.963	
Satd. Flow (prot)	1604	3234	0	1583	3167	1417	0	1641	0	0	1620	1430
Flt Permitted	0.552			0.403				0.858			0.659	
Satd. Flow (perm)	932	3234	0	672	3167	1417	0	1425	0	0	1109	1430
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		7				60		18				84
Link Speed (mph)		35			35			25			25	
Link Distance (ft)		674			651			394			798	
Travel Time (s)		13.1			12.7			10.7			21.8	
Peak Hour Factor	0.63	0.73	0.58	0.56	0.90	0.72	0.58	0.64	0.75	0.61	0.64	0.82
Heavy Vehicles (%)	2%	2%	2%	5%	5%	5%	2%	2%	2%	4%	4%	4%
Bus Blockages (#/hr)	4	0	0	0	0	0	0	0	0	0	0	0
Adj. Flow (vph)	179	619	36	16	231	60	36	80	36	164	52	84
Shared Lane Traffic (%)												
Lane Group Flow (vph)	179	655	0	16	231	60	0	152	0	0	216	84
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.13	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2	1	1	2		1	2	1
Detector Template	Left	Thru		Left	Thru	Right	Left	Thru		Left	Thru	Right
Leading Detector (ft)	20	100		20	100	20	20	100		20	100	20
Trailing Detector (ft)	0	0		0	0	0	0	0		0	0	0
Detector 1 Position(ft)	0	0		0	0	0	0	0		0	0	0
Detector 1 Size(ft)	20	6		20	6	20	20	6		20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA		pm+pt	NA	Perm	Perm	NA		Perm	NA	Perm
Protected Phases	5	2		1	6			4			8	

Lanes, Volumes, Timings
1: 17th St

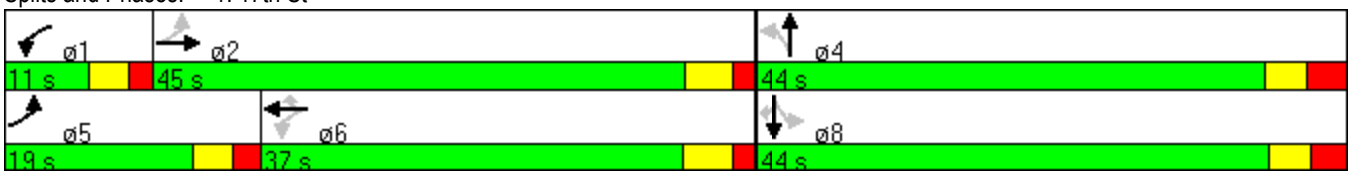
12/22/2017

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Permitted Phases	2			6		6	4			8		8
Detector Phase	5	2		1	6	6	4	4		8	8	8
Switch Phase												
Minimum Initial (s)	5.0	15.0		5.0	15.0	15.0	7.0	7.0		7.0	7.0	7.0
Minimum Split (s)	19.0	45.0		11.0	37.0	37.0	44.0	44.0		44.0	44.0	44.0
Total Split (s)	19.0	45.0		11.0	37.0	37.0	44.0	44.0		44.0	44.0	44.0
Total Split (%)	19.0%	45.0%		11.0%	37.0%	37.0%	44.0%	44.0%		44.0%	44.0%	44.0%
Maximum Green (s)	14.0	39.6		6.2	31.5	31.5	37.7	37.7		38.0	38.0	38.0
Yellow Time (s)	3.0	3.6		3.0	3.6	3.6	3.2	3.2		3.2	3.2	3.2
All-Red Time (s)	2.0	1.8		1.8	1.9	1.9	3.1	3.1		2.8	2.8	2.8
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0		0.0			0.0	0.0
Total Lost Time (s)	5.0	5.4		4.8	5.5	5.5		6.3			6.0	6.0
Lead/Lag	Lead	Lag		Lead	Lag	Lag						
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes						
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Recall Mode	None	C-Max		None	C-Max	C-Max	None	None		None	None	None
Walk Time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	5.0
Flash Dont Walk (s)		14.0			16.0	16.0	26.0	26.0		22.0	22.0	22.0
Pedestrian Calls (#/hr)		0			0	0	0	0		0	0	0
Act Effct Green (s)	64.8	59.8		55.6	48.9	48.9		23.9			24.2	24.2
Actuated g/C Ratio	0.65	0.60		0.56	0.49	0.49		0.24			0.24	0.24
v/c Ratio	0.27	0.34		0.04	0.15	0.08		0.43			0.80	0.20
Control Delay	9.7	15.0		9.7	16.9	6.0		30.2			56.4	6.7
Queue Delay	0.0	0.0		0.0	0.0	0.0		0.0			0.0	0.0
Total Delay	9.7	15.0		9.7	16.9	6.0		30.2			56.4	6.7
LOS	A	B		A	B	A		C			E	A
Approach Delay		13.8			14.4			30.2			42.5	
Approach LOS		B			B			C			D	
Queue Length 50th (ft)	42	134		3	40	0		72			130	0
Queue Length 95th (ft)	69	190		9	84	16		74			121	26
Internal Link Dist (ft)		594			571			314			718	
Turn Bay Length (ft)	160			230								100
Base Capacity (vph)	699	1938		434	1549	724		548			421	595
Starvation Cap Reductn	0	0		0	0	0		0			0	0
Spillback Cap Reductn	0	0		0	0	0		0			0	0
Storage Cap Reductn	0	0		0	0	0		0			0	0
Reduced v/c Ratio	0.26	0.34		0.04	0.15	0.08		0.28			0.51	0.14

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 16 (16%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 100
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.80
Intersection Signal Delay: 20.9 Intersection LOS: C
Intersection Capacity Utilization 47.6% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 1: 17th St



Lanes, Volumes, Timings
8: 9th St

12/22/2017

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	189	307	167	108	177	88	124	514	161	89	392	19
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (ft)	165		230	230		380	220		0	300		0
Storage Lanes	1		1	1		1	1		1	1		0
Taper Length (ft)	95			100			50			50		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	0.95	0.95
Frt			0.850			0.850			0.850		0.992	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1630	3260	1458	1599	3197	1430	1614	1699	1444	1568	3112	0
Flt Permitted	0.493			0.501			0.408			0.178		
Satd. Flow (perm)	846	3260	1458	843	3197	1430	693	1699	1444	294	3112	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			232			111			192		8	
Link Speed (mph)		35			35			30			30	
Link Distance (ft)		681			935			622			954	
Travel Time (s)		13.3			18.2			14.1			21.7	
Peak Hour Factor	0.56	0.72	0.72	0.79	0.92	0.79	0.78	0.82	0.84	0.72	0.84	0.68
Heavy Vehicles (%)	2%	2%	2%	4%	4%	4%	3%	3%	3%	6%	6%	6%
Adj. Flow (vph)	338	426	232	137	192	111	159	627	192	124	467	28
Shared Lane Traffic (%)												
Lane Group Flow (vph)	338	426	232	137	192	111	159	627	192	124	495	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2	1	1	2	1	1	2	
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	
Leading Detector (ft)	20	100	20	20	100	20	20	100	20	20	100	
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	
Detector 1 Position(ft)	0	0	0	0	0	0	0	0	0	0	0	
Detector 1 Size(ft)	20	6	20	20	6	20	20	6	20	20	6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases	2		2	6		6	4		4	8		

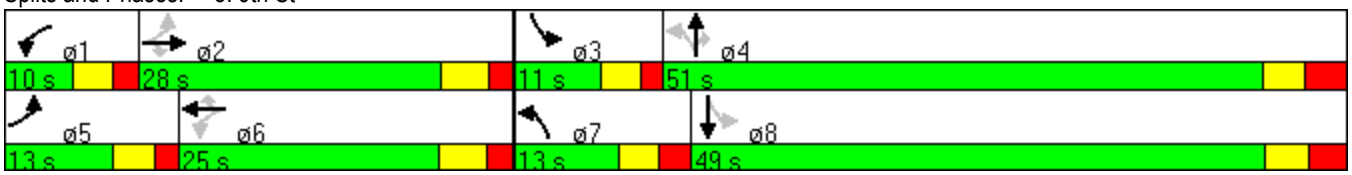
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	5	2	2	1	6	6	7	4	4	3	8	
Switch Phase												
Minimum Initial (s)	5.0	15.0	15.0	5.0	15.0	15.0	5.0	15.0	15.0	5.0	15.0	
Minimum Split (s)	13.0	28.0	28.0	10.0	25.0	25.0	13.0	51.0	51.0	11.0	49.0	
Total Split (s)	13.0	28.0	28.0	10.0	25.0	25.0	13.0	51.0	51.0	11.0	49.0	
Total Split (%)	13.0%	28.0%	28.0%	10.0%	25.0%	25.0%	13.0%	51.0%	51.0%	11.0%	49.0%	
Maximum Green (s)	8.1	22.4	22.4	5.1	19.3	19.3	7.7	44.6	44.6	6.3	42.8	
Yellow Time (s)	3.0	3.6	3.6	3.0	3.6	3.6	3.0	3.2	3.2	3.0	3.2	
All-Red Time (s)	1.9	2.0	2.0	1.9	2.1	2.1	2.3	3.2	3.2	1.7	3.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	4.9	5.6	5.6	4.9	5.7	5.7	5.3	6.4	6.4	4.7	6.2	
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	C-Min	C-Min	None	C-Min	C-Min	None	None	None	None	None	
Walk Time (s)		5.0	5.0		5.0	5.0		5.0	5.0		5.0	
Flash Dont Walk (s)		20.0	20.0		19.0	19.0		26.0	26.0		28.0	
Pedestrian Calls (#/hr)		0	0		0	0		0	0		0	
Act Effct Green (s)	33.9	22.8	22.8	24.8	17.4	17.4	51.0	41.4	41.4	49.0	40.0	
Actuated g/C Ratio	0.34	0.23	0.23	0.25	0.17	0.17	0.51	0.41	0.41	0.49	0.40	
v/c Ratio	0.89	0.57	0.45	0.53	0.35	0.33	0.37	0.89	0.27	0.52	0.40	
Control Delay	59.5	40.2	10.5	35.2	38.0	13.3	13.4	43.2	3.5	18.7	21.6	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	59.5	40.2	10.5	35.2	38.0	13.3	13.4	43.2	3.5	18.7	21.6	
LOS	E	D	B	D	D	B	B	D	A	B	C	
Approach Delay		39.8			30.9			30.6			21.0	
Approach LOS		D			C			C			C	
Queue Length 50th (ft)	~217	137	6	76	61	0	43	344	0	32	107	
Queue Length 95th (ft)	157	141	25	108	95	44	66	425	31	48	137	
Internal Link Dist (ft)		601			855			542			874	
Turn Bay Length (ft)	165		230	230		380	220			300		
Base Capacity (vph)	381	785	528	260	617	366	433	758	750	240	1338	
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.89	0.54	0.44	0.53	0.31	0.30	0.37	0.83	0.26	0.52	0.37	

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 98 (98%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 100
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.89
Intersection Signal Delay: 31.7 Intersection LOS: C
Intersection Capacity Utilization 76.7% ICU Level of Service D
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

Splits and Phases: 8: 9th St



Lanes, Volumes, Timings
22: Sheyenne St & 13th Ave

12/22/2017

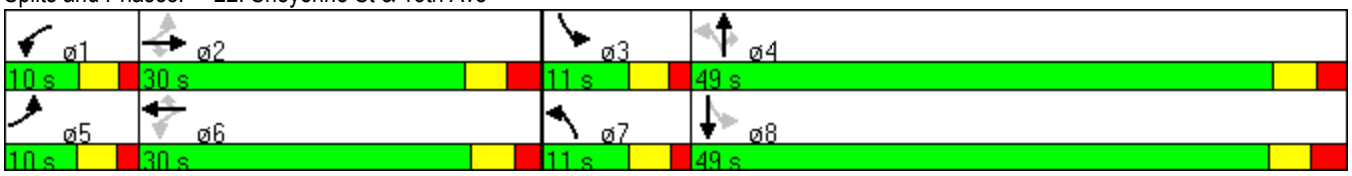
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	32	194	139	72	67	73	114	340	184	76	198	14
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (ft)	240		200	415		0	230		230	132		0
Storage Lanes	1		1	1		1	1		1	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850			0.850			0.850		0.983	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1614	1699	1444	1599	1683	1430	1630	1716	1458	1599	1654	0
Flt Permitted	0.702			0.528			0.478			0.295		
Satd. Flow (perm)	1193	1699	1444	888	1683	1430	820	1716	1458	496	1654	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			164			92			271		8	
Link Speed (mph)		25			35			30			25	
Link Distance (ft)		646			849			723			965	
Travel Time (s)		17.6			16.5			16.4			26.3	
Peak Hour Factor	0.80	0.90	0.85	0.69	0.80	0.79	0.71	0.82	0.68	0.76	0.88	0.50
Heavy Vehicles (%)	3%	3%	3%	4%	4%	4%	2%	2%	2%	4%	4%	4%
Adj. Flow (vph)	40	216	164	104	84	92	161	415	271	100	225	28
Shared Lane Traffic (%)												
Lane Group Flow (vph)	40	216	164	104	84	92	161	415	271	100	253	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane											Yes	
Headway Factor	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2	1	1	2	1	1	2	
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	
Leading Detector (ft)	20	100	20	20	100	20	20	100	20	20	100	
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	
Detector 1 Position(ft)	0	0	0	0	0	0	0	0	0	0	0	
Detector 1 Size(ft)	20	6	20	20	6	20	20	6	20	20	6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases	2		2	6		6	4		4	8		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	5	2	2	1	6	6	7	4	4	3	8	
Switch Phase												
Minimum Initial (s)	5.0	7.0	7.0	5.0	7.0	7.0	5.0	15.0	15.0	5.0	15.0	
Minimum Split (s)	10.0	30.0	30.0	10.0	30.0	30.0	11.0	49.0	49.0	11.0	49.0	
Total Split (s)	10.0	30.0	30.0	10.0	30.0	30.0	11.0	49.0	49.0	11.0	49.0	
Total Split (%)	10.0%	30.0%	30.0%	10.0%	30.0%	30.0%	11.0%	49.0%	49.0%	11.0%	49.0%	
Maximum Green (s)	5.4	24.3	24.3	5.5	24.7	24.7	6.5	43.4	43.4	6.4	43.1	
Yellow Time (s)	3.0	3.0	3.0	3.0	3.2	3.2	3.0	3.2	3.2	3.0	3.0	
All-Red Time (s)	1.6	2.7	2.7	1.5	2.1	2.1	1.5	2.4	2.4	1.6	2.9	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	4.6	5.7	5.7	4.5	5.3	5.3	4.5	5.6	5.6	4.6	5.9	
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	None	None	None	None	
Walk Time (s)		5.0	5.0		5.0	5.0		5.0	5.0		5.0	
Flash Dont Walk (s)		13.0	13.0		13.0	13.0		17.0	17.0		16.0	
Pedestrian Calls (#/hr)		0	0		0	0		0	0		0	
Act Effct Green (s)	43.5	36.7	36.7	46.9	40.6	40.6	38.8	32.5	32.5	37.7	30.0	
Actuated g/C Ratio	0.44	0.37	0.37	0.47	0.41	0.41	0.39	0.32	0.32	0.38	0.30	
v/c Ratio	0.07	0.35	0.26	0.22	0.12	0.14	0.43	0.74	0.41	0.39	0.50	
Control Delay	18.0	29.4	6.1	23.9	30.8	13.3	20.8	38.1	4.5	20.0	29.8	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	18.0	29.4	6.1	23.9	30.8	13.3	20.8	38.1	4.5	20.0	29.8	
LOS	B	C	A	C	C	B	C	D	A	B	C	
Approach Delay		19.2			22.5			24.1			27.0	
Approach LOS		B			C			C			C	
Queue Length 50th (ft)	13	106	0	42	41	0	62	237	0	37	125	
Queue Length 95th (ft)	34	195	43	71	75	28	66	263	9	47	166	
Internal Link Dist (ft)		566			769			643			885	
Turn Bay Length (ft)	240		200	415			230		230	132		
Base Capacity (vph)	547	624	634	476	683	635	371	745	786	258	717	
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.07	0.35	0.26	0.22	0.12	0.14	0.43	0.56	0.34	0.39	0.35	

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 43 (43%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 100
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.74
Intersection Signal Delay: 23.3 Intersection LOS: C
Intersection Capacity Utilization 56.4% ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 22: Sheyenne St & 13th Ave



Lanes, Volumes, Timings
24: 6th St & 13th Ave

12/22/2017

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	17	499	15	10	206	33	73	56	78	69	25	9
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (ft)	140		0	92		0	100		100	100		0
Storage Lanes	1		0	1		0	1		1	0		1
Taper Length (ft)	25			80			50			50		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.992			0.974				0.850			0.850
Flt Protected	0.950			0.950			0.950				0.962	
Satd. Flow (prot)	1630	3234	0	1630	3175	0	1630	1716	1458	0	1650	1458
Flt Permitted	0.584			0.412			0.641				0.722	
Satd. Flow (perm)	1002	3234	0	707	3175	0	1100	1716	1458	0	1239	1458
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		15			48				132			16
Link Speed (mph)		35			35			25			25	
Link Distance (ft)		489			566			615			526	
Travel Time (s)		9.5			11.0			16.8			14.3	
Peak Hour Factor	0.53	0.85	0.47	0.42	0.92	0.69	0.79	0.74	0.59	0.48	0.62	0.56
Adj. Flow (vph)	32	587	32	24	224	48	92	76	132	144	40	16
Shared Lane Traffic (%)												
Lane Group Flow (vph)	32	619	0	24	272	0	92	76	132	0	184	16
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2	1	1	2	1
Detector Template	Left	Thru		Left	Thru		Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100		20	100		20	100	20	20	100	20
Trailing Detector (ft)	0	0		0	0		0	0	0	0	0	0
Detector 1 Position(ft)	0	0		0	0		0	0	0	0	0	0
Detector 1 Size(ft)	20	6		20	6		20	6	20	20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4		4	8		8
Detector Phase	2	2		6	6		4	4	4	8	8	8

Lanes, Volumes, Timings
24: 6th St & 13th Ave

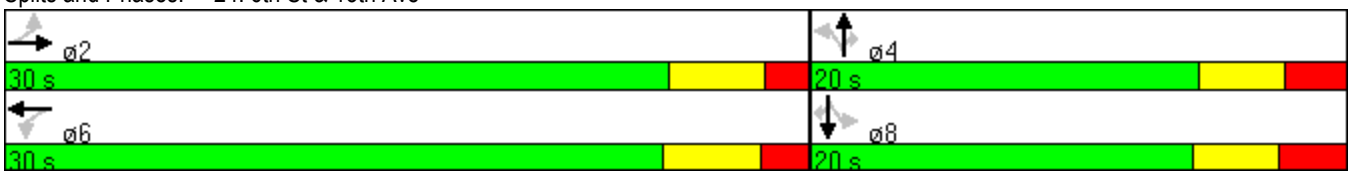
12/22/2017

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Switch Phase												
Minimum Initial (s)	15.0	15.0		15.0	15.0		7.0	7.0	7.0	7.0	7.0	7.0
Minimum Split (s)	30.0	30.0		30.0	30.0		20.0	20.0	20.0	20.0	20.0	20.0
Total Split (s)	30.0	30.0		30.0	30.0		20.0	20.0	20.0	20.0	20.0	20.0
Total Split (%)	60.0%	60.0%		60.0%	60.0%		40.0%	40.0%	40.0%	40.0%	40.0%	40.0%
Maximum Green (s)	24.7	24.7		24.5	24.5		14.4	14.4	14.4	14.2	14.2	14.2
Yellow Time (s)	3.6	3.6		3.6	3.6		3.2	3.2	3.2	3.2	3.2	3.2
All-Red Time (s)	1.7	1.7		1.9	1.9		2.4	2.4	2.4	2.6	2.6	2.6
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0		0.0	0.0
Total Lost Time (s)	5.3	5.3		5.5	5.5		5.6	5.6	5.6		5.8	5.8
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	C-Max	C-Max		C-Max	C-Max		Max	Max	Max	Max	Max	Max
Walk Time (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0
Flash Dont Walk (s)	14.0	14.0		12.0	12.0		17.0	17.0	17.0	19.0	19.0	19.0
Pedestrian Calls (#/hr)	0	0		0	0		0	0	0	0	0	0
Act Effct Green (s)	24.7	24.7		24.5	24.5		14.4	14.4	14.4		14.2	14.2
Actuated g/C Ratio	0.49	0.49		0.49	0.49		0.29	0.29	0.29		0.28	0.28
v/c Ratio	0.06	0.39		0.07	0.17		0.29	0.15	0.26		0.52	0.04
Control Delay	7.2	8.5		11.2	9.6		16.9	14.3	4.9		21.4	7.6
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0		0.0	0.0
Total Delay	7.2	8.5		11.2	9.6		16.9	14.3	4.9		21.4	7.6
LOS	A	A		B	A		B	B	A		C	A
Approach Delay		8.4			9.7			11.0			20.3	
Approach LOS		A			A			B			C	
Queue Length 50th (ft)	4	44		6	40		21	16	0		45	0
Queue Length 95th (ft)	9	87		8	52		44	33	8		59	5
Internal Link Dist (ft)		409			486			535			446	
Turn Bay Length (ft)	140			92			100		100			
Base Capacity (vph)	495	1605		346	1580		317	494	514		352	426
Starvation Cap Reductn	0	0		0	0		0	0	0		0	0
Spillback Cap Reductn	0	0		0	0		0	0	0		0	0
Storage Cap Reductn	0	0		0	0		0	0	0		0	0
Reduced v/c Ratio	0.06	0.39		0.07	0.17		0.29	0.15	0.26		0.52	0.04

Intersection Summary

Area Type: Other
Cycle Length: 50
Actuated Cycle Length: 50
Offset: 49 (98%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 50
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.52
Intersection Signal Delay: 10.9 Intersection LOS: B
Intersection Capacity Utilization 41.1% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 24: 6th St & 13th Ave



Lanes, Volumes, Timings
29: 14th St

12/22/2017

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	7	441	24	24	245	20	51	15	58	31	12	3
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (ft)	285		0	175		213	0		0	0		0
Storage Lanes	1		0	1		1	1		0	1		0
Taper Length (ft)	120			100			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.993				0.850		0.880			0.962	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1599	3175	0	1583	3167	1417	1614	1495	0	1525	1544	0
Flt Permitted	0.591			0.383			0.726			0.448		
Satd. Flow (perm)	994	3175	0	638	3167	1417	1233	1495	0	719	1544	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		7				32		81			12	
Link Speed (mph)		35			35			30			30	
Link Distance (ft)		935			658			457			346	
Travel Time (s)		18.2			12.8			10.4			7.9	
Peak Hour Factor	0.58	0.75	0.86	0.67	0.94	0.62	0.91	0.75	0.72	0.65	0.33	0.25
Heavy Vehicles (%)	4%	4%	4%	5%	5%	5%	3%	3%	3%	9%	9%	9%
Adj. Flow (vph)	12	588	28	36	261	32	56	20	81	48	36	12
Shared Lane Traffic (%)												
Lane Group Flow (vph)	12	616	0	36	261	32	56	101	0	48	48	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2	1	1	2		1	2	
Detector Template	Left	Thru		Left	Thru	Right	Left	Thru		Left	Thru	
Leading Detector (ft)	20	100		20	100	20	20	100		20	100	
Trailing Detector (ft)	0	0		0	0	0	0	0		0	0	
Detector 1 Position(ft)	0	0		0	0	0	0	0		0	0	
Detector 1 Size(ft)	20	6		20	6	20	20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA		pm+pt	NA	Perm	Perm	NA		pm+pt	NA	
Protected Phases	5	2		1	6			4		3	8	
Permitted Phases	2			6		6	4			8		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	5	2		1	6	6	4	4		3	8	
Switch Phase												
Minimum Initial (s)	5.0	15.0		5.0	15.0	15.0	7.0	7.0		5.0	7.0	
Minimum Split (s)	14.0	54.0		14.0	54.0	54.0	21.0	21.0		11.0	32.0	
Total Split (s)	14.0	54.0		14.0	54.0	54.0	21.0	21.0		11.0	32.0	
Total Split (%)	14.0%	54.0%		14.0%	54.0%	54.0%	21.0%	21.0%		11.0%	32.0%	
Maximum Green (s)	9.3	48.7		9.5	48.5	48.5	14.7	14.7		6.1	25.9	
Yellow Time (s)	3.0	3.6		3.0	3.6	3.6	3.2	3.2		3.0	3.2	
All-Red Time (s)	1.7	1.7		1.5	1.9	1.9	3.1	3.1		1.9	2.9	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.7	5.3		4.5	5.5	5.5	6.3	6.3		4.9	6.1	
Lead/Lag	Lead	Lag		Lead	Lag	Lag	Lag	Lag		Lead		
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes	Yes	Yes		Yes		
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	None	C-Max		None	C-Max	C-Max	None	None		None	None	
Walk Time (s)		5.0			5.0	5.0	5.0	5.0			5.0	
Flash Dont Walk (s)		14.0			16.0	16.0	28.0	28.0			27.0	
Pedestrian Calls (#/hr)		0			0	0	0	0			0	
Act Effct Green (s)	71.7	68.5		74.3	72.9	72.9	10.2	10.2		17.6	17.0	
Actuated g/C Ratio	0.72	0.68		0.74	0.73	0.73	0.10	0.10		0.18	0.17	
v/c Ratio	0.02	0.28		0.07	0.11	0.03	0.44	0.45		0.27	0.18	
Control Delay	12.3	20.4		3.9	6.1	3.4	52.4	19.6		34.8	26.5	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	12.3	20.4		3.9	6.1	3.4	52.4	19.6		34.8	26.5	
LOS	B	C		A	A	A	D	B		C	C	
Approach Delay		20.3			5.6			31.3			30.6	
Approach LOS		C			A			C			C	
Queue Length 50th (ft)	5	181		11	43	0	34	12		25	19	
Queue Length 95th (ft)	m10	196		4	82	15	72	40		37	13	
Internal Link Dist (ft)		855			578			377			266	
Turn Bay Length (ft)	285			175		213						
Base Capacity (vph)	788	2178		567	2309	1042	181	289		177	409	
Starvation Cap Reductn	0	0		0	0	0	0	0		0	0	
Spillback Cap Reductn	0	0		0	0	0	0	0		0	0	
Storage Cap Reductn	0	0		0	0	0	0	0		0	0	
Reduced v/c Ratio	0.02	0.28		0.06	0.11	0.03	0.31	0.35		0.27	0.12	

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 56 (56%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 100
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.45
Intersection Signal Delay: 18.5 Intersection LOS: B
Intersection Capacity Utilization 41.2% ICU Level of Service A
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 29: 14th St

Intersection	
Intersection Delay (sec/veh):	3.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Volume (vph)	46	469	14	13	256	70	21	6	26	44	7	8
Conflicting Peds.(#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
Right Turn Channelized	None	None	None	None	None	None	None	None	None	None	None	None
Storage Length	200		0	200		0	0		160	0		0
Median Width		12			12			0			0	
Grade (%)		0%			0%			0%			0%	
Peak Hour Factor	0.77	0.79	0.63	0.63	0.80	0.71	0.89	0.56	0.59	0.80	0.88	0.67
Heavy Vehicles(%)	6	6	6	6	6	6	6	6	6	6	6	6
Movement Flow Rate	60	594	22	21	320	99	24	11	44	55	8	12
Number of Lanes	1	2	0	1	2	0	0	1	1	0	1	0

Major/Minor	Major 1			Major 2			Minor 1			Minor 1		
Conflicting Flow Rate - All	419	0	0	616	0	0	929	1184	308	833	1146	209
Stage 1	0	0	0	0	0	0	724	724	0	411	411	0
Stage 2	0	0	0	0	0	0	205	460	0	422	735	0
Follow-up Headway	2.26	-	-	2.26	0	0	3.56	4.06	3.36	3.56	4.06	3.36
Pot Capacity-1 Maneuver	1109	-	-	932	-	-	216	182	677	255	192	784
Stage 1	-	-	-	-	-	-	374	419	-	578	583	-
Stage 2	-	-	-	-	-	-	766	554	-	569	414	-
Mov Capacity-1 Maneuver	1109	-	-	932	-	-	193.8	168.4	677	214	177.6	784
Mov Capacity-2 Maneuver	-	-	-	-	-	-	193.8	168.4	-	214	177.6	-
Stage 1	-	-	-	-	-	-	374	396.4	-	578	570.2	-
Stage 2	-	-	-	-	-	-	727.4	541.8	-	489.6	391.6	-

Approach	EB	WB	NB	SB
HCM Control Delay (s)	0.7	0.4	18.623	27.2
HCM LOS	A	A	C	D

Lane	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (vph)	185	677							236
HCM Control Delay (s)	28.8	10.7	8.431	-	-	8.95	-	-	27.2
HCM Lane VC Ratio	0.185	0.065	0.054	-	-	0.022	-	-	0.317
HCM Lane LOS	D	B	A	-	-	A	-	-	D
HCM 95th Percentile Queue (veh)	0.66	0.208	0.171	-	-	0.068	-	-	1.309

Intersection	
Intersection Delay (sec/veh):	5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Volume (vph)	53	6	8	34	16	71
Conflicting Peds.(#/hr)	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
Right Turn Channelized	None	None	None	None	None	None
Storage Length		0	0		0	0
Median Width	12			12	12	
Grade (%)	0%			0%	0%	
Peak Hour Factor	0.74	0.50	0.40	0.77	0.57	0.68
Heavy Vehicles(%)	2	2	2	2	2	2
Movement Flow Rate	72	12	20	44	28	104
Number of Lanes	1	0	0	1	1	0

Major/Minor	Major 1			Major 2		
Conflicting Flow Rate - All	0	0	84	0	162	78
Stage 1	0	0	0	0	78	0
Stage 2	0	0	0	0	84	0
Follow-up Headway	-	-	2.218	0	3.518	3.318
Pot Capacity-1 Maneuver	-	-	1506	-	829	981
Stage 1	-	-	-	-	945	-
Stage 2	-	-	-	-	939	-
Mov Capacity-1 Maneuver	-	-	1506	-	818.2	981
Mov Capacity-2 Maneuver	-	-	-	-	818.2	-
Stage 1	-	-	-	-	# 0	-
Stage 2	-	-	-	-	926.8	-

Approach	EB	WB	NB
HCM Control Delay (s)	0	2.3	9.5
HCM LOS	A	A	A

Lane	NBLn1	EBT	EBR	WBL	WBT
Capacity (vph)	941				
HCM Control Delay (s)	9.5	-	-	7.423	0
HCM Lane VC Ratio	0.141	0	-	0.013	-
HCM Lane LOS	A	-	-	A	-
HCM 95th Percentile Queue (veh)	0.489	0	-	0.04	-

Intersection	
Intersection Delay (sec/veh)	12.2
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Volume (vph)	32	88	1	16	29	104	3	73	66	208	23	10
Peak Hour Factor	0.80	0.67	0.25	0.67	0.81	0.68	0.38	0.65	0.75	0.83	0.52	0.83
Heavy Vehicles(%)	2	2	2	2	2	2	2	2	2	2	2	2
Movement Flow Rate	40	131	4	24	36	153	8	112	88	251	44	12
Number of Lanes	1	1	0	1	1	0	0	1	0	1	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	2	2	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	1	2	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	2	2	2
HCM Control Delay	11.1	11.1	12.2	13.7
HCM LOS	B	B	B	B

Lane	NBLn1	EBLn1	EBLn2	WBLn1	WBLn2	SBLn1	SBLn2
Volume Left (%)	2%	100%	0%	100%	0%	100%	0%
Volume Thru (%)	51%	0%	99%	0%	22%	0%	70%
Volume Right (%)	46%	0%	1%	0%	78%	0%	30%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Volume by Lane	142	32	89	16	133	208	33
Left Turning Volume	73	0	88	0	29	0	23
Through Volume	66	0	1	0	104	0	10
Right Turning Volume	3	32	0	16	0	208	0
Lane Flow Rate	208	40	135	24	189	251	56
Geometry Group	6	7	7	7	7	7	7
Degree of Utilization, X	0.346	0.077	0.242	0.046	0.307	0.455	0.091
Departure Headway, Hd	5.988	6.967	6.45	6.925	5.859	6.533	5.812
Convergence(Y/N)	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Capacity	600	513	555	516	612	551	615
Service Time	4.041	4.727	4.21	4.684	3.617	4.28	3.559
HCM Lane V/C Ratio	0.347	0.078	0.243	0.047	0.309	0.456	0.091
HCM Control Delay	12.2	10.3	11.3	10	11.2	14.7	9.1
HCM Lane LOS	B	B	B	A	B	B	A
HCM 95th Percentile Queue	1.6	0.3	1	0.1	1.3	2.5	0.3

Intersection	
Intersection Delay (sec/veh):	5.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Volume (vph)	25	304	8	8	130	30	7	62	21	39	26	24
Conflicting Peds.(#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
Right Turn Channelized	None	None	None	None	None	None	None	None	None	None	None	None
Storage Length	0		0	0		0	0		0	0		0
Median Width		24			24			0			0	
Grade (%)		0%			0%			0%			0%	
Peak Hour Factor	0.78	0.85	0.40	0.50	0.68	0.63	0.58	0.74	0.75	0.70	0.65	0.67
Heavy Vehicles(%)	2	2	2	2	2	2	2	2	2	2	2	2
Movement Flow Rate	32	358	20	16	191	48	12	84	28	56	40	36
Number of Lanes	1	2	0	1	2	0	0	1	0	0	1	0

Major/Minor	Major 1			Major 2			Minor 1			Minor 1		
Conflicting Flow Rate - All	239	0	0	378	0	0	580	703	189	532	689	119
Stage 1	0	0	0	0	0	0	432	432	0	247	247	0
Stage 2	0	0	0	0	0	0	148	271	0	285	442	0
Follow-up Headway	2.22	-	-	2.22	0	0	3.52	4.02	3.32	3.52	4.02	3.32
Pot Capacity-1 Maneuver	1328	-	-	1177	-	-	398	360	822	430	367	909
Stage 1	-	-	-	-	-	-	572	581	-	735	701	-
Stage 2	-	-	-	-	-	-	840	684	-	698	575	-
Mov Capacity-1 Maneuver	1328	-	-	1177	-	-	339.3	346.4	822	328.6	353.2	909
Mov Capacity-2 Maneuver	-	-	-	-	-	-	339.3	346.4	-	328.6	353.2	-
Stage 1	-	-	-	-	-	-	572	567.1	-	735	691.2	-
Stage 2	-	-	-	-	-	-	749.6	674.4	-	560.8	561.2	-

Approach	EB	WB	NB	SB
HCM Control Delay (s)	0.6	0.5	18.1	18
HCM LOS	A	A	C	C

Lane	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (vph)	398							408
HCM Control Delay (s)	18.1	7.778	-	-	8.101	-	-	18
HCM Lane VC Ratio	0.311	0.024	-	-	0.014	-	-	0.322
HCM Lane LOS	C	A	-	-	A	-	-	C
HCM 95th Percentile Queue (veh)	1.306	0.074	-	-	0.041	-	-	1.373

Intersection	
Intersection Delay (sec/veh):	2.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Volume (vph)	31	437	17	12	177	24	5	3	37	7	2	13
Conflicting Peds.(#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
Right Turn Channelized	None	None	None	None	None	None	None	None	None	None	None	None
Storage Length	130		0	150		0	0		0	0		0
Median Width		12			12			0			0	
Grade (%)		0%			0%			0%			0%	
Peak Hour Factor	0.78	0.85	0.61	0.60	0.82	0.67	0.42	0.38	0.66	0.44	0.81	0.61
Heavy Vehicles(%)	2	2	2	2	2	2	2	2	2	2	2	2
Movement Flow Rate	40	514	28	20	216	36	12	8	56	16	2	21
Number of Lanes	1	2	0	1	2	0	0	1	0	0	1	0

Major/Minor	Major 1			Major 2			Minor 1			Minor 1		
Conflicting Flow Rate - All	252	0	0	542	0	0	757	900	271	614	895	126
Stage 1	0	0	0	0	0	0	608	608	0	274	274	0
Stage 2	0	0	0	0	0	0	149	292	0	340	621	0
Follow-up Headway	2.22	-	-	2.22	0	0	3.52	4.02	3.32	3.52	4.02	3.32
Pot Capacity-1 Maneuver	1313	-	-	1024	-	-	297	277	727	376	279	902
Stage 1	-	-	-	-	-	-	450	484	-	709	682	-
Stage 2	-	-	-	-	-	-	838	670	-	648	477	-
Mov Capacity-1 Maneuver	1313	-	-	1024	-	-	277.1	263.3	727	326.3	265.2	902
Mov Capacity-2 Maneuver	-	-	-	-	-	-	277.1	263.3	-	326.3	265.2	-
Stage 1	-	-	-	-	-	-	450	469.5	-	709	668.4	-
Stage 2	-	-	-	-	-	-	798.9	656.6	-	570.3	462.7	-

Approach	EB	WB	NB	SB
HCM Control Delay (s)	0.5	0.6	13.4	13.1
HCM LOS	A	A	B	B

Lane	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (vph)	506							486
HCM Control Delay (s)	13.4	7.827	-	-	8.586	-	-	13.1
HCM Lane VC Ratio	0.15	0.03	-	-	0.02	-	-	0.082
HCM Lane LOS	B	A	-	-	A	-	-	B
HCM 95th Percentile Queue (veh)	0.524	0.094	-	-	0.06	-	-	0.266

Intersection	
Intersection Delay (sec/veh):	3.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Volume (vph)	12	403	4	31	232	3	16	12	83	2	3	6
Conflicting Peds.(#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
Right Turn Channelized	None	None	None	None	None	None	None	None	None	None	None	None
Storage Length	200		0	180		0	0		0	0		0
Median Width		12			12			0			0	
Grade (%)		0%			0%			0%			0%	
Peak Hour Factor	1.00	0.85	0.33	0.70	0.82	0.38	0.67	0.60	0.69	0.50	0.75	0.50
Heavy Vehicles(%)	2	2	2	2	2	2	2	2	2	2	2	2
Movement Flow Rate	12	474	12	44	283	8	24	20	120	4	4	12
Number of Lanes	1	2	0	1	2	0	0	1	0	0	1	1

Major/Minor		Major 1			Major 2			Minor 1			Minor 1	
Conflicting Flow Rate - All	291	0	0	486	0	0	736	883	243	646	885	145
Stage 1	0	0	0	0	0	0	504	504	0	375	375	0
Stage 2	0	0	0	0	0	0	232	379	0	271	510	0
Follow-up Headway	2.22	-	-	2.22	0	0	3.52	4.02	3.32	3.52	4.02	3.32
Pot Capacity-1 Maneuver	1270	-	-	1072	-	-	307	283	758	357	282	874
Stage 1	-	-	-	-	-	-	518	539	-	618	615	-
Stage 2	-	-	-	-	-	-	750	613	-	712	536	-
Mov Capacity-1 Maneuver	1270	-	-	1072	-	-	288	269	758	272.7	268	874
Mov Capacity-2 Maneuver	-	-	-	-	-	-	288	269	-	272.7	268	-
Stage 1	-	-	-	-	-	-	518	534.1	-	618	589.8	-
Stage 2	-	-	-	-	-	-	704.6	587.9	-	571.4	531.2	-

Approach	EB	WB	NB	SB
HCM Control Delay (s)	0.2	1.1	15.1	13
HCM LOS	A	A	C	B

Lane	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (vph)	520							270	874
HCM Control Delay (s)	15.1	7.862	-	-	8.503	-	-	18.7	9.2
HCM Lane VC Ratio	0.316	0.009	-	-	0.041	-	-	0.03	0.014
HCM Lane LOS	C	A	-	-	A	-	-	C	A
HCM 95th Percentile Queue (veh)	1.344	0.029	-	-	0.129	-	-	0.091	0.042

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	86	595	22	51	775	207	35	44	36	152	43	137
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (ft)	160		0	230		0	0		0	0		100
Storage Lanes	1		0	1		1	0		0	0		1
Taper Length (ft)	120			120			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.992				0.850		0.957				0.850
Flt Protected	0.950			0.950				0.983			0.965	
Satd. Flow (prot)	1604	3234	0	1583	3167	1417	0	1614	0	0	1624	1430
Flt Permitted	0.256			0.384				0.587			0.648	
Satd. Flow (perm)	432	3234	0	640	3167	1417	0	964	0	0	1090	1430
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		9				235		19				151
Link Speed (mph)		35			35			25			25	
Link Distance (ft)		674			651			394			798	
Travel Time (s)		13.1			12.7			10.7			21.8	
Peak Hour Factor	0.90	0.97	0.61	0.71	0.86	0.88	0.67	0.85	0.75	0.93	0.72	0.83
Heavy Vehicles (%)	2%	2%	2%	5%	5%	5%	2%	2%	2%	4%	4%	4%
Bus Blockages (#/hr)	4	0	0	0	0	0	0	0	0	0	0	0
Adj. Flow (vph)	96	613	36	72	901	235	52	52	48	163	60	165
Shared Lane Traffic (%)												
Lane Group Flow (vph)	96	649	0	72	901	235	0	152	0	0	223	165
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.13	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2	1	1	2		1	2	1
Detector Template	Left	Thru		Left	Thru	Right	Left	Thru		Left	Thru	Right
Leading Detector (ft)	20	100		20	100	20	20	100		20	100	20
Trailing Detector (ft)	0	0		0	0	0	0	0		0	0	0
Detector 1 Position(ft)	0	0		0	0	0	0	0		0	0	0
Detector 1 Size(ft)	20	6		20	6	20	20	6		20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA		pm+pt	NA	Perm	Perm	NA		Perm	NA	Perm
Protected Phases	5	2		1	6			4			8	

Lanes, Volumes, Timings
1: 17th St

12/22/2017

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Permitted Phases	2			6		6	4			8		8
Detector Phase	5	2		1	6	6	4	4		8	8	8
Switch Phase												
Minimum Initial (s)	5.0	15.0		5.0	15.0	15.0	7.0	7.0		7.0	7.0	7.0
Minimum Split (s)	13.0	69.0		13.0	69.0	69.0	28.0	28.0		28.0	28.0	28.0
Total Split (s)	13.0	69.0		13.0	69.0	69.0	28.0	28.0		28.0	28.0	28.0
Total Split (%)	11.8%	62.7%		11.8%	62.7%	62.7%	25.5%	25.5%		25.5%	25.5%	25.5%
Maximum Green (s)	8.0	63.6		8.2	63.5	63.5	21.7	21.7		22.0	22.0	22.0
Yellow Time (s)	3.0	3.6		3.0	3.6	3.6	3.2	3.2		3.2	3.2	3.2
All-Red Time (s)	2.0	1.8		1.8	1.9	1.9	3.1	3.1		2.8	2.8	2.8
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0		0.0			0.0	0.0
Total Lost Time (s)	5.0	5.4		4.8	5.5	5.5		6.3			6.0	6.0
Lead/Lag	Lead	Lag		Lead	Lag	Lag						
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes						
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Recall Mode	None	C-Max		None	C-Max	C-Max	None	None		None	None	None
Walk Time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	5.0
Flash Dont Walk (s)		14.0			16.0	16.0	26.0	26.0		22.0	22.0	22.0
Pedestrian Calls (#/hr)		0			0	0	0	0		0	0	0
Act Effct Green (s)	73.4	66.9		71.9	64.2	64.2		21.7			22.0	22.0
Actuated g/C Ratio	0.67	0.61		0.65	0.58	0.58		0.20			0.20	0.20
v/c Ratio	0.26	0.33		0.15	0.49	0.25		0.74			1.02	0.41
Control Delay	8.4	10.9		6.0	14.5	2.1		59.0			111.6	11.0
Queue Delay	0.0	0.0		0.0	0.0	0.0		0.0			0.0	0.0
Total Delay	8.4	10.9		6.0	14.5	2.1		59.0			111.6	11.0
LOS	A	B		A	B	A		E			F	B
Approach Delay		10.6			11.6			59.0			68.8	
Approach LOS		B			B			E			E	
Queue Length 50th (ft)	17	82		14	184	0		89			~168	8
Queue Length 95th (ft)	m42	133		22	221	30		#174			#225	52
Internal Link Dist (ft)		594			571			314			718	
Turn Bay Length (ft)	160			230								100
Base Capacity (vph)	375	1970		496	1848	925		205			218	407
Starvation Cap Reductn	0	0		0	0	0		0			0	0
Spillback Cap Reductn	0	0		0	0	0		0			0	0
Storage Cap Reductn	0	0		0	0	0		0			0	0
Reduced v/c Ratio	0.26	0.33		0.15	0.49	0.25		0.74			1.02	0.41

Intersection Summary

Area Type: Other
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 109 (99%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 110
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.02
Intersection Signal Delay: 23.1 Intersection LOS: C
Intersection Capacity Utilization 60.4% ICU Level of Service B
Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: 17th St

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	151	324	136	116	489	116	152	476	173	129	525	73
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (ft)	165		230	230		380	220		0	300		0
Storage Lanes	1		1	1		1	1		1	1		0
Taper Length (ft)	95			100			50			50		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	0.95	0.95
Frt			0.850			0.850			0.850		0.980	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1630	3260	1458	1599	3197	1430	1614	1699	1444	1568	3074	0
Flt Permitted	0.253			0.463			0.295			0.199		
Satd. Flow (perm)	434	3260	1458	779	3197	1430	501	1699	1444	329	3074	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			168			153			208		19	
Link Speed (mph)		35			35			30			30	
Link Distance (ft)		681			935			622			954	
Travel Time (s)		13.3			18.2			14.1			21.7	
Peak Hour Factor	0.71	0.89	0.81	0.82	0.80	0.76	0.86	0.92	0.83	0.85	0.94	0.84
Heavy Vehicles (%)	2%	2%	2%	4%	4%	4%	3%	3%	3%	6%	6%	6%
Adj. Flow (vph)	213	364	168	141	611	153	177	517	208	152	559	87
Shared Lane Traffic (%)												
Lane Group Flow (vph)	213	364	168	141	611	153	177	517	208	152	646	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2	1	1	2	1	1	2	
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	
Leading Detector (ft)	20	100	20	20	100	20	20	100	20	20	100	
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	
Detector 1 Position(ft)	0	0	0	0	0	0	0	0	0	0	0	
Detector 1 Size(ft)	20	6	20	20	6	20	20	6	20	20	6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases	2		2	6		6	4		4	8		

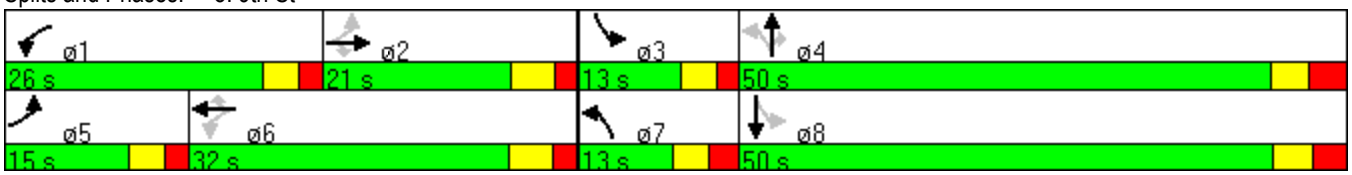
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	5	2	2	1	6	6	7	4	4	3	8	
Switch Phase												
Minimum Initial (s)	5.0	15.0	15.0	5.0	15.0	15.0	5.0	15.0	15.0	5.0	15.0	
Minimum Split (s)	15.0	21.0	21.0	26.0	32.0	32.0	13.0	50.0	50.0	13.0	50.0	
Total Split (s)	15.0	21.0	21.0	26.0	32.0	32.0	13.0	50.0	50.0	13.0	50.0	
Total Split (%)	13.6%	19.1%	19.1%	23.6%	29.1%	29.1%	11.8%	45.5%	45.5%	11.8%	45.5%	
Maximum Green (s)	10.1	15.4	15.4	21.1	26.3	26.3	7.7	43.6	43.6	8.3	43.8	
Yellow Time (s)	3.0	3.6	3.6	3.0	3.6	3.6	3.0	3.2	3.2	3.0	3.2	
All-Red Time (s)	1.9	2.0	2.0	1.9	2.1	2.1	2.3	3.2	3.2	1.7	3.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	4.9	5.6	5.6	4.9	5.7	5.7	5.3	6.4	6.4	4.7	6.2	
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	C-Min	C-Min	None	C-Min	C-Min	None	None	None	None	None	
Walk Time (s)		5.0	5.0		5.0	5.0		5.0	5.0		5.0	
Flash Dont Walk (s)		20.0	20.0		19.0	19.0		26.0	26.0		28.0	
Pedestrian Calls (#/hr)		0	0		0	0		0	0		0	
Act Effct Green (s)	42.3	29.7	29.7	41.9	29.6	29.6	47.4	38.4	38.4	48.5	38.6	
Actuated g/C Ratio	0.38	0.27	0.27	0.38	0.27	0.27	0.43	0.35	0.35	0.44	0.35	
v/c Ratio	0.72	0.41	0.33	0.37	0.71	0.31	0.60	0.87	0.33	0.63	0.59	
Control Delay	49.1	46.9	17.5	16.0	35.2	9.7	25.7	49.3	4.4	28.2	30.2	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	49.1	46.9	17.5	16.0	35.2	9.7	25.7	49.3	4.4	28.2	30.2	
LOS	D	D	B	B	D	A	C	D	A	C	C	
Approach Delay		40.9			27.9			34.3			29.8	
Approach LOS		D			C			C			C	
Queue Length 50th (ft)	129	133	12	56	220	38	68	328	0	57	183	
Queue Length 95th (ft)	#167	188	67	97	250	64	100	450	35	85	230	
Internal Link Dist (ft)		601			855			542			874	
Turn Bay Length (ft)	165		230	230		380	220			300		
Base Capacity (vph)	296	881	516	491	861	497	296	673	698	240	1235	
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.72	0.41	0.33	0.29	0.71	0.31	0.60	0.77	0.30	0.63	0.52	

Intersection Summary

Area Type: Other
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 84 (76%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 110
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.87
Intersection Signal Delay: 33.0 Intersection LOS: C
Intersection Capacity Utilization 76.8% ICU Level of Service D
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 8: 9th St



Lanes, Volumes, Timings
22: Sheyenne St & 13th Ave

12/22/2017

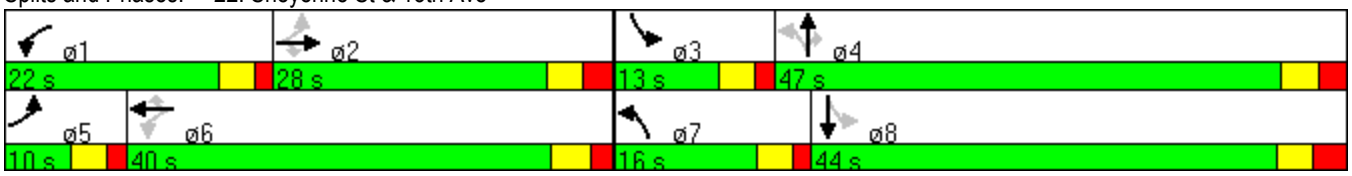
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	11	158	110	213	216	106	132	233	109	108	309	25
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (ft)	240		200	415		0	230		230	132		0
Storage Lanes	1		1	1		1	1		1	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850			0.850			0.850		0.989	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1614	1699	1444	1599	1683	1430	1630	1716	1458	1599	1664	0
Flt Permitted	0.612			0.531			0.245			0.536		
Satd. Flow (perm)	1040	1699	1444	894	1683	1430	420	1716	1458	902	1664	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			133			120			120		4	
Link Speed (mph)		25			35			30			25	
Link Distance (ft)		646			849			723			965	
Travel Time (s)		17.6			16.5			16.4			26.3	
Peak Hour Factor	0.39	0.92	0.83	0.83	0.92	0.88	0.83	0.97	0.91	0.87	0.89	0.89
Heavy Vehicles (%)	3%	3%	3%	4%	4%	4%	2%	2%	2%	4%	4%	4%
Adj. Flow (vph)	28	172	133	257	235	120	159	240	120	124	347	28
Shared Lane Traffic (%)												
Lane Group Flow (vph)	28	172	133	257	235	120	159	240	120	124	375	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane											Yes	
Headway Factor	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2	1	1	2	1	1	2	
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	
Leading Detector (ft)	20	100	20	20	100	20	20	100	20	20	100	
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	
Detector 1 Position(ft)	0	0	0	0	0	0	0	0	0	0	0	
Detector 1 Size(ft)	20	6	20	20	6	20	20	6	20	20	6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases	2		2	6		6	4		4	8		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	5	2	2	1	6	6	7	4	4	3	8	
Switch Phase												
Minimum Initial (s)	5.0	7.0	7.0	5.0	7.0	7.0	5.0	15.0	15.0	5.0	15.0	
Minimum Split (s)	10.0	28.0	28.0	22.0	40.0	40.0	16.0	47.0	47.0	13.0	44.0	
Total Split (s)	10.0	28.0	28.0	22.0	40.0	40.0	16.0	47.0	47.0	13.0	44.0	
Total Split (%)	9.1%	25.5%	25.5%	20.0%	36.4%	36.4%	14.5%	42.7%	42.7%	11.8%	40.0%	
Maximum Green (s)	5.4	22.3	22.3	17.5	34.7	34.7	11.5	41.4	41.4	8.4	38.1	
Yellow Time (s)	3.0	3.0	3.0	3.0	3.2	3.2	3.0	3.2	3.2	3.0	3.0	
All-Red Time (s)	1.6	2.7	2.7	1.5	2.1	2.1	1.5	2.4	2.4	1.6	2.9	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	4.6	5.7	5.7	4.5	5.3	5.3	4.5	5.6	5.6	4.6	5.9	
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	None	None	None	None	
Walk Time (s)		5.0	5.0		5.0	5.0		5.0	5.0		5.0	
Flash Dont Walk (s)		13.0	13.0		13.0	13.0		17.0	17.0		16.0	
Pedestrian Calls (#/hr)		0	0		0	0		0	0		0	
Act Effct Green (s)	40.5	33.3	33.3	54.3	47.0	47.0	44.8	32.7	32.7	39.3	29.8	
Actuated g/C Ratio	0.37	0.30	0.30	0.49	0.43	0.43	0.41	0.30	0.30	0.36	0.27	
v/c Ratio	0.07	0.33	0.25	0.48	0.33	0.18	0.54	0.47	0.23	0.33	0.83	
Control Delay	19.0	35.6	7.7	24.6	28.8	9.3	26.0	33.5	5.4	21.0	52.3	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	19.0	35.6	7.7	24.6	28.8	9.3	26.0	33.5	5.4	21.0	52.3	
LOS	B	D	A	C	C	A	C	C	A	C	D	
Approach Delay		23.1			23.2			24.7			44.5	
Approach LOS		C			C			C			D	
Queue Length 50th (ft)	10	96	0	108	108	7	69	137	0	53	246	
Queue Length 95th (ft)	12	179	41	157	170	36	91	189	37	77	321	
Internal Link Dist (ft)		566			769			643			885	
Turn Bay Length (ft)	240		200	415			230		230	132		
Base Capacity (vph)	414	515	530	556	719	679	300	646	624	377	579	
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.07	0.33	0.25	0.46	0.33	0.18	0.53	0.37	0.19	0.33	0.65	

Intersection Summary

Area Type: Other
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 109 (99%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 110
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.83
Intersection Signal Delay: 29.0 Intersection LOS: C
Intersection Capacity Utilization 66.2% ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 22: Sheyenne St & 13th Ave



Lanes, Volumes, Timings
24: 6th St & 13th Ave

12/22/2017

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	12	422	22	82	565	33	34	28	52	42	26	10
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (ft)	140		0	92		0	100		100	100		0
Storage Lanes	1		0	1		0	1		1	0		1
Taper Length (ft)	25			80			50			50		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.992			0.992				0.850			0.850
Flt Protected	0.950			0.950			0.950				0.971	
Satd. Flow (prot)	1630	3234	0	1630	3234	0	1630	1716	1458	0	1666	1458
Flt Permitted	0.381			0.412			0.700				0.806	
Satd. Flow (perm)	654	3234	0	707	3234	0	1201	1716	1458	0	1383	1458
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		8			9				80			16
Link Speed (mph)		35			35			25			25	
Link Distance (ft)		489			566			615			526	
Travel Time (s)		9.5			11.0			16.8			14.3	
Peak Hour Factor	0.60	0.86	0.79	0.76	0.84	0.83	0.61	0.78	0.65	0.81	0.72	0.63
Adj. Flow (vph)	20	491	28	108	673	40	56	36	80	52	36	16
Shared Lane Traffic (%)												
Lane Group Flow (vph)	20	519	0	108	713	0	56	36	80	0	88	16
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2	1	1	2	1
Detector Template	Left	Thru		Left	Thru		Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100		20	100		20	100	20	20	100	20
Trailing Detector (ft)	0	0		0	0		0	0	0	0	0	0
Detector 1 Position(ft)	0	0		0	0		0	0	0	0	0	0
Detector 1 Size(ft)	20	6		20	6		20	6	20	20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases	5	2		1	6			4			8	
Permitted Phases	2			6			4		4	8		8
Detector Phase	5	2		1	6		4	4	4	8	8	8

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Switch Phase												
Minimum Initial (s)	5.0	15.0		5.0	15.0		7.0	7.0	7.0	7.0	7.0	7.0
Minimum Split (s)	14.0	65.0		18.0	69.0		27.0	27.0	27.0	27.0	27.0	27.0
Total Split (s)	14.0	65.0		18.0	69.0		27.0	27.0	27.0	27.0	27.0	27.0
Total Split (%)	12.7%	59.1%		16.4%	62.7%		24.5%	24.5%	24.5%	24.5%	24.5%	24.5%
Maximum Green (s)	9.5	59.7		13.4	63.5		21.4	21.4	21.4	21.2	21.2	21.2
Yellow Time (s)	3.0	3.6		3.0	3.6		3.2	3.2	3.2	3.2	3.2	3.2
All-Red Time (s)	1.5	1.7		1.6	1.9		2.4	2.4	2.4	2.6	2.6	2.6
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0		0.0	0.0
Total Lost Time (s)	4.5	5.3		4.6	5.5		5.6	5.6	5.6		5.8	5.8
Lead/Lag	Lead	Lag		Lead	Lag							
Lead-Lag Optimize?	Yes	Yes		Yes	Yes							
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	C-Max		None	C-Max		Max	Max	Max	Max	Max	Max
Walk Time (s)		5.0			5.0		5.0	5.0	5.0	5.0	5.0	5.0
Flash Dont Walk (s)		14.0			12.0		17.0	17.0	17.0	19.0	19.0	19.0
Pedestrian Calls (#/hr)		0			0		0	0	0	0	0	0
Act Effct Green (s)	72.1	65.4		77.7	73.2		21.4	21.4	21.4		21.2	21.2
Actuated g/C Ratio	0.66	0.59		0.71	0.67		0.19	0.19	0.19		0.19	0.19
v/c Ratio	0.04	0.27		0.19	0.33		0.24	0.11	0.23		0.33	0.05
Control Delay	5.5	12.3		3.7	4.9		40.7	37.6	10.2		42.3	16.4
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0		0.0	0.0
Total Delay	5.5	12.3		3.7	4.9		40.7	37.6	10.2		42.3	16.4
LOS	A	B		A	A		D	D	B		D	B
Approach Delay		12.1			4.7			25.8			38.3	
Approach LOS		B			A			C			D	
Queue Length 50th (ft)	4	84		11	43		34	21	0		54	0
Queue Length 95th (ft)	8	128		m19	71		47	43	16		80	11
Internal Link Dist (ft)		409			486			535			446	
Turn Bay Length (ft)	140			92			100		100			
Base Capacity (vph)	534	1925		616	2154		234	334	348		267	294
Starvation Cap Reductn	0	0		0	0		0	0	0		0	0
Spillback Cap Reductn	0	0		0	0		0	0	0		0	0
Storage Cap Reductn	0	0		0	0		0	0	0		0	0
Reduced v/c Ratio	0.04	0.27		0.18	0.33		0.24	0.11	0.23		0.33	0.05

Intersection Summary

Area Type: Other
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 88 (80%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 110
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.33
Intersection Signal Delay: 11.5 Intersection LOS: B
Intersection Capacity Utilization 46.1% ICU Level of Service A
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 24: 6th St & 13th Ave

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	40	471	33	56	699	93	61	26	76	85	28	47
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (ft)	285		0	175		213	0		0	0		0
Storage Lanes	1		0	1		1	1		0	1		0
Taper Length (ft)	120			100			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.988				0.850		0.887			0.910	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1599	3159	0	1583	3167	1417	1614	1507	0	1525	1461	0
Flt Permitted	0.320			0.433			0.692			0.377		
Satd. Flow (perm)	538	3159	0	722	3167	1417	1176	1507	0	605	1461	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		14				104		109			60	
Link Speed (mph)		35			35			30			30	
Link Distance (ft)		935			658			457			346	
Travel Time (s)		18.2			12.8			10.4			7.9	
Peak Hour Factor	0.77	0.96	0.75	0.88	0.91	0.89	0.66	0.72	0.70	0.64	0.70	0.78
Heavy Vehicles (%)	4%	4%	4%	5%	5%	5%	3%	3%	3%	9%	9%	9%
Adj. Flow (vph)	52	491	44	64	768	104	92	36	109	133	40	60
Shared Lane Traffic (%)												
Lane Group Flow (vph)	52	535	0	64	768	104	92	145	0	133	100	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2	1	1	2		1	2	
Detector Template	Left	Thru		Left	Thru	Right	Left	Thru		Left	Thru	
Leading Detector (ft)	20	100		20	100	20	20	100		20	100	
Trailing Detector (ft)	0	0		0	0	0	0	0		0	0	
Detector 1 Position(ft)	0	0		0	0	0	0	0		0	0	
Detector 1 Size(ft)	20	6		20	6	20	20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA		pm+pt	NA	Perm	Perm	NA		pm+pt	NA	
Protected Phases	5	2		1	6			4		3	8	
Permitted Phases	2			6		6	4			8		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	5	2		1	6	6	4	4		3	8	
Switch Phase												
Minimum Initial (s)	5.0	15.0		5.0	15.0	15.0	7.0	7.0		5.0	7.0	
Minimum Split (s)	12.0	68.0		12.0	68.0	68.0	19.0	19.0		11.0	30.0	
Total Split (s)	12.0	68.0		12.0	68.0	68.0	19.0	19.0		11.0	30.0	
Total Split (%)	10.9%	61.8%		10.9%	61.8%	61.8%	17.3%	17.3%		10.0%	27.3%	
Maximum Green (s)	7.3	62.7		7.5	62.5	62.5	12.7	12.7		6.1	23.9	
Yellow Time (s)	3.0	3.6		3.0	3.6	3.6	3.2	3.2		3.0	3.2	
All-Red Time (s)	1.7	1.7		1.5	1.9	1.9	3.1	3.1		1.9	2.9	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.7	5.3		4.5	5.5	5.5	6.3	6.3		4.9	6.1	
Lead/Lag	Lead	Lag		Lead	Lag	Lag	Lag	Lag		Lead		
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes	Yes	Yes		Yes		
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	None	C-Max		None	C-Max	C-Max	None	None		None	None	
Walk Time (s)		5.0			5.0	5.0	5.0	5.0			5.0	
Flash Dont Walk (s)		14.0			16.0	16.0	28.0	28.0			27.0	
Pedestrian Calls (#/hr)		0			0	0	0	0			0	
Act Effct Green (s)	72.6	66.6		73.1	66.4	66.4	11.6	11.6		24.0	22.8	
Actuated g/C Ratio	0.66	0.61		0.66	0.60	0.60	0.11	0.11		0.22	0.21	
v/c Ratio	0.12	0.28		0.12	0.40	0.12	0.74	0.57		0.73	0.29	
Control Delay	13.0	21.5		3.4	6.3	0.5	80.8	23.5		61.0	18.7	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	13.0	21.5		3.4	6.3	0.5	80.8	23.5		61.0	18.7	
LOS	B	C		A	A	A	F	C		E	B	
Approach Delay		20.8			5.4			45.7			42.9	
Approach LOS		C			A			D			D	
Queue Length 50th (ft)	23	167		6	50	0	63	23		80	23	
Queue Length 95th (ft)	m38	218		m14	95	m1	85	51		95	45	
Internal Link Dist (ft)		855			578			377			266	
Turn Bay Length (ft)	285			175		213						
Base Capacity (vph)	428	1917		541	1912	897	136	270		183	364	
Starvation Cap Reductn	0	0		0	0	0	0	0		0	0	
Spillback Cap Reductn	0	0		0	0	0	0	0		0	0	
Storage Cap Reductn	0	0		0	0	0	0	0		0	0	
Reduced v/c Ratio	0.12	0.28		0.12	0.40	0.12	0.68	0.54		0.73	0.27	

Intersection Summary

Area Type: Other
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 26 (24%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 110
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.74
Intersection Signal Delay: 19.1 Intersection LOS: B
Intersection Capacity Utilization 50.5% ICU Level of Service A
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 29: 14th St

Intersection	
Intersection Delay (sec/veh):	3.3

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Volume (vph)	89	21	59	60	8	24
Conflicting Peds.(#/hr)	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
Right Turn Channelized	None	None	None	None	None	None
Storage Length		0	0		0	0
Median Width	12			12	12	
Grade (%)	0%			0%	0%	
Peak Hour Factor	0.82	0.88	0.64	0.88	0.67	0.86
Heavy Vehicles(%)	2	2	2	2	2	2
Movement Flow Rate	109	24	92	68	12	28
Number of Lanes	1	0	0	1	1	0

Major/Minor	Major 1			Major 2		
Conflicting Flow Rate - All	0	0	132	0	373	120
Stage 1	0	0	0	0	120	0
Stage 2	0	0	0	0	253	0
Follow-up Headway	-	-	2.218	0	3.518	3.318
Pot Capacity-1 Maneuver	-	-	1459	-	628	929
Stage 1	-	-	-	-	905	-
Stage 2	-	-	-	-	789	-
Mov Capacity-1 Maneuver	-	-	1459	-	588.4	929
Mov Capacity-2 Maneuver	-	-	-	-	588.4	-
Stage 1	-	-	-	-	# 0	-
Stage 2	-	-	-	-	739.3	-

Approach	EB	WB	NB
HCM Control Delay (s)	0	4.4	9.8
HCM LOS	A	A	A

Lane	NBLn1	EBT	EBR	WBL	WBT
Capacity (vph)	792				
HCM Control Delay (s)	9.8	-	-	7.634	0
HCM Lane VC Ratio	0.05	0	-	0.063	-
HCM Lane LOS	A	-	-	A	-
HCM 95th Percentile Queue (veh)	0.159	0	-	0.202	-

Intersection	
Intersection Delay (sec/veh)	12
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Volume (vph)	11	93	6	55	102	154	2	17	32	132	71	20
Peak Hour Factor	0.69	0.83	0.50	0.81	0.69	0.77	0.50	0.85	0.73	0.87	0.66	0.56
Heavy Vehicles(%)	2	2	2	2	2	2	2	2	2	2	2	2
Movement Flow Rate	16	112	12	68	148	200	4	20	44	152	108	36
Number of Lanes	1	1	0	1	1	0	0	1	0	1	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	2	2	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	1	2	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	2	2	2
HCM Control Delay	10.5	13.3	10.1	11.3
HCM LOS	B	B	B	B

Lane	NBLn1	EBLn1	EBLn2	WBLn1	WBLn2	SBLn1	SBLn2
Volume Left (%)	4%	100%	0%	100%	0%	100%	0%
Volume Thru (%)	33%	0%	94%	0%	40%	0%	78%
Volume Right (%)	63%	0%	6%	0%	60%	0%	22%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Volume by Lane	51	11	99	55	256	132	91
Left Turning Volume	17	0	93	0	102	0	71
Through Volume	32	0	6	0	154	0	20
Right Turning Volume	2	11	0	55	0	132	0
Lane Flow Rate	68	16	124	68	348	152	143
Geometry Group	6	7	7	7	7	7	7
Degree of Utilization, X	0.117	0.03	0.212	0.12	0.524	0.281	0.239
Departure Headway, Hd	6.208	6.717	6.166	6.359	5.427	6.664	6.004
Convergence(Y/N)	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Capacity	577	533	582	564	664	540	599
Service Time	4.254	4.461	3.909	4.094	3.162	4.4	3.739
HCM Lane V/C Ratio	0.118	0.03	0.213	0.121	0.524	0.281	0.239
HCM Control Delay	10.1	9.7	10.6	10	14	12	10.6
HCM Lane LOS	B	A	B	A	B	B	B
HCM 95th Percentile Queue	0.4	0.1	0.8	0.4	3.3	1.2	0.9

Intersection	
Intersection Delay (sec/veh):	7.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Volume (vph)	22	318	3	31	390	39	3	25	22	40	51	26
Conflicting Peds.(#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
Right Turn Channelized	None	None	None	None	None	None	None	None	None	None	None	None
Storage Length	0		0	0		0	0		0	0		0
Median Width		24			24			0			0	
Grade (%)		0%			0%			0%			0%	
Peak Hour Factor	0.55	0.81	0.38	0.65	0.96	0.65	0.75	0.78	0.69	0.67	0.71	0.81
Heavy Vehicles(%)	2	2	2	2	2	2	2	2	2	2	2	2
Movement Flow Rate	40	393	8	48	406	60	4	32	32	60	72	32
Number of Lanes	1	2	0	1	2	0	0	1	0	0	1	0

Major/Minor		Major 1			Major 2			Minor 1			Minor 1	
Conflicting Flow Rate - All	466	0	0	400	0	0	811	1039	200	824	1012	233
Stage 1	0	0	0	0	0	0	477	477	0	532	532	0
Stage 2	0	0	0	0	0	0	334	562	0	292	480	0
Follow-up Headway	2.22	-	-	2.22	0	0	3.52	4.02	3.32	3.52	4.02	3.32
Pot Capacity-1 Maneuver	1093	-	-	1154	-	-	271	229	809	265	238	769
Stage 1	-	-	-	-	-	-	538	554	-	499	524	-
Stage 2	-	-	-	-	-	-	653	508	-	692	553	-
Mov Capacity-1 Maneuver	1093	-	-	1154	-	-	183.2	211.5	809	212.1	219.8	769
Mov Capacity-2 Maneuver	-	-	-	-	-	-	183.2	211.5	-	212.1	219.8	-
Stage 1	-	-	-	-	-	-	538	533.5	-	499	502.5	-
Stage 2	-	-	-	-	-	-	514.3	487.2	-	601.7	532.5	-

Approach	EB	WB	NB	SB
HCM Control Delay (s)	0.8	0.8	19.3	42.4
HCM LOS	A	A	C	E

Lane	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (vph)	319							252
HCM Control Delay (s)	19.3	8.419	-	-	8.254	-	-	42.4
HCM Lane VC Ratio	0.213	0.037	-	-	0.041	-	-	0.649
HCM Lane LOS	C	A	-	-	A	-	-	E
HCM 95th Percentile Queue (veh)	0.792	0.114	-	-	0.129	-	-	4.062

Intersection	
Intersection Delay (sec/veh):	7.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Volume (vph)	16	359	17	56	608	5	29	7	52	36	11	51
Conflicting Peds.(#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
Right Turn Channelized	None	None	None	None	None	None	None	None	None	None	None	None
Storage Length	130		0	150		0	0		0	0		0
Median Width		12			12			0			0	
Grade (%)		0%			0%			0%			0%	
Peak Hour Factor	0.80	0.68	0.71	0.88	0.91	0.42	0.81	0.58	0.87	0.71	0.55	0.60
Heavy Vehicles(%)	2	2	2	2	2	2	2	2	2	2	2	2
Movement Flow Rate	20	528	24	64	668	12	36	12	60	51	20	85
Number of Lanes	1	2	0	1	2	0	0	1	0	0	1	0

Major/Minor	Major 1			Major 2			Minor 1			Minor 1		
Conflicting Flow Rate - All	680	0	0	552	0	0	1051	1387	276	1111	1393	340
Stage 1	0	0	0	0	0	0	580	580	0	801	801	0
Stage 2	0	0	0	0	0	0	471	807	0	310	592	0
Follow-up Headway	2.22	-	-	2.22	0	0	3.52	4.02	3.32	3.52	4.02	3.32
Pot Capacity-1 Maneuver	909	-	-	1015	-	-	181	142	720	164	141	655
Stage 1	-	-	-	-	-	-	467	498	-	344	395	-
Stage 2	-	-	-	-	-	-	542	392	-	675	492	-
Mov Capacity-1 Maneuver	909	-	-	1015	-	-	130.2	130.1	720	130.9	129.2	655
Mov Capacity-2 Maneuver	-	-	-	-	-	-	130.2	130.1	-	130.9	129.2	-
Stage 1	-	-	-	-	-	-	467	487	-	344	370.1	-
Stage 2	-	-	-	-	-	-	418.1	367.3	-	590.3	481.2	-

Approach	EB	WB	NB	SB
HCM Control Delay (s)	0.3	0.8	31.8	47.3
HCM LOS	A	A	D	E

Lane	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (vph)	239							232
HCM Control Delay (s)	31.8	9.049	-	-	8.784	-	-	47.3
HCM Lane VC Ratio	0.45	0.022	-	-	0.063	-	-	0.671
HCM Lane LOS	D	A	-	-	A	-	-	E
HCM 95th Percentile Queue (veh)	2.171	0.067	-	-	0.2	-	-	4.239

Intersection	
Intersection Delay (sec/veh):	62.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Volume (vph)	19	437	63	62	476	28	13	2	17	122	13	123
Conflicting Peds.(#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
Right Turn Channelized	None	None	None	None	None	None	None	None	None	None	None	None
Storage Length	200		0	200		0	0		160	0		0
Median Width		12			12			0			0	
Grade (%)		0%			0%			0%			0%	
Peak Hour Factor	0.71	0.82	0.69	0.88	0.87	0.62	0.71	0.75	0.65	0.87	0.65	0.43
Heavy Vehicles(%)	4	4	4	4	4	4	4	4	4	4	4	4
Movement Flow Rate	27	533	91	70	547	45	18	3	26	140	20	286
Number of Lanes	1	2	0	1	2	0	0	1	1	0	1	0

Major/Minor	Major 1			Major 2			Minor 1			Minor 1		
Conflicting Flow Rate - All	592	0	0	624	0	0	1056	1365	312	1032	1389	296
Stage 1	0	0	0	0	0	0	632	632	0	711	711	0
Stage 2	0	0	0	0	0	0	424	733	0	321	678	0
Follow-up Headway	2.24	-	-	2.24	0	0	3.54	4.04	3.34	3.54	4.04	3.34
Pot Capacity-1 Maneuver	967	-	-	940	-	-	177	144	679	184	139	693
Stage 1	-	-	-	-	-	-	430	467	-	385	430	-
Stage 2	-	-	-	-	-	-	573	420	-	660	445	-
Mov Capacity-1 Maneuver	967	-	-	940	-	-	84.3	129.5	679	160.7	125	693
Mov Capacity-2 Maneuver	-	-	-	-	-	-	84.3	129.5	-	160.7	125	-
Stage 1	-	-	-	-	-	-	430	453.9	-	385	397.8	-
Stage 2	-	-	-	-	-	-	295.6	388.5	-	613.2	432.5	-

Approach	EB	WB	NB	SB
HCM Control Delay (s)	0.4	1	31.775	249.1
HCM LOS	A	A	D	F

Lane	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (vph)	88	679							309
HCM Control Delay (s)	58.3	10.5	8.829	-	-	9.14	-	-	249.1
HCM Lane VC Ratio	0.238	0.039	0.028	-	-	0.075	-	-	1.444
HCM Lane LOS	F	B	A	-	-	A	-	-	F
HCM 95th Percentile Queue (veh)	0.852	0.12	0.085	-	-	0.243	-	-	24.103

Intersection	
Intersection Delay (sec/veh):	12.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Volume (vph)	29	537	33	138	734	38	7	10	51	21	13	29
Conflicting Peds.(#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
Right Turn Channelized	None	None	None	None	None	None	None	None	None	None	None	None
Storage Length	200		0	180		0	0		0	0		0
Median Width		12			12			0			0	
Grade (%)		0%			0%			0%			0%	
Peak Hour Factor	0.73	0.93	0.63	0.73	0.95	0.79	0.58	0.50	0.71	0.88	0.65	0.48
Heavy Vehicles(%)	2	2	2	2	2	2	2	2	2	2	2	2
Movement Flow Rate	40	577	52	189	773	48	12	20	72	24	20	60
Number of Lanes	1	2	0	1	2	0	0	1	0	0	1	1

Major/Minor	Major 1			Major 2			Minor 1			Minor 1		
Conflicting Flow Rate - All	821	0	0	630	0	0	1457	1882	315	1553	1884	410
Stage 1	0	0	0	0	0	0	683	683	0	1175	1175	0
Stage 2	0	0	0	0	0	0	774	1199	0	378	709	0
Follow-up Headway	2.22	-	-	2.22	0	0	3.52	4.02	3.32	3.52	4.02	3.32
Pot Capacity-1 Maneuver	804	-	-	950	-	-	91	70	682	77	70	591
Stage 1	-	-	-	-	-	-	405	447	-	204	264	-
Stage 2	-	-	-	-	-	-	357	257	-	616	435	-
Mov Capacity-1 Maneuver	804	-	-	950	-	-	47.9	53.3	682	40.4	53.3	591
Mov Capacity-2 Maneuver	-	-	-	-	-	-	47.9	53.3	-	40.4	53.3	-
Stage 1	-	-	-	-	-	-	405	425.1	-	204	211.5	-
Stage 2	-	-	-	-	-	-	232.4	205.9	-	499.5	413.7	-

Approach	EB	WB	NB	SB
HCM Control Delay (s)	0.6	1.8	79.5	119.019
HCM LOS	A	A	F	F

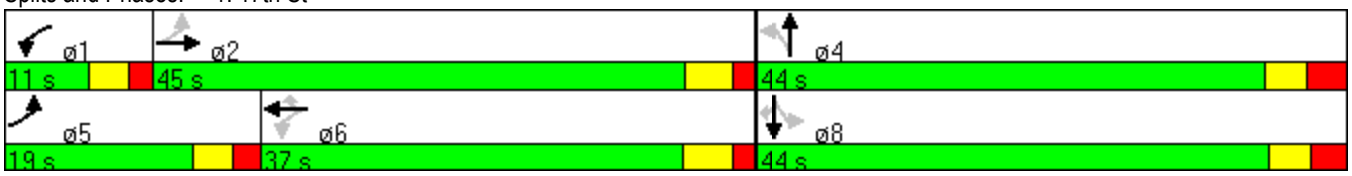
Lane	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (vph)	142							45	591
HCM Control Delay (s)	79.5	9.71	-	-	9.728	-	-	266.7	11.8
HCM Lane VC Ratio	0.732	0.049	-	-	0.199	-	-	0.975	0.102
HCM Lane LOS	F	A	-	-	A	-	-	F	B
HCM 95th Percentile Queue (veh)	4.3	0.156	-	-	0.74	-	-	3.985	0.34

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	120	510	20	10	230	45	20	50	25	105	35	75
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	160		0	230		0	0		0	0		100
Storage Lanes	1		0	1		1	0		0	0		1
Taper Length (ft)	120			120			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.994				0.850		0.965				0.850
Flt Protected	0.950			0.950				0.989			0.964	
Satd. Flow (prot)	1650	3333	0	1629	3257	1457	0	1684	0	0	1668	1471
Flt Permitted	0.529			0.435				0.899			0.773	
Satd. Flow (perm)	919	3333	0	746	3257	1457	0	1531	0	0	1338	1471
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		5				49		21				82
Link Speed (mph)		35			35			25			25	
Link Distance (ft)		674			651			394			798	
Travel Time (s)		13.1			12.7			10.7			21.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	2%	2%	5%	5%	5%	2%	2%	2%	4%	4%	4%
Bus Blockages (#/hr)	4	0	0	0	0	0	0	0	0	0	0	0
Adj. Flow (vph)	130	554	22	11	250	49	22	54	27	114	38	82
Shared Lane Traffic (%)												
Lane Group Flow (vph)	130	576	0	11	250	49	0	103	0	0	152	82
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.09	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2	1	1	2		1	2	1
Detector Template	Left	Thru		Left	Thru	Right	Left	Thru		Left	Thru	Right
Leading Detector (ft)	20	100		20	100	20	20	100		20	100	20
Trailing Detector (ft)	0	0		0	0	0	0	0		0	0	0
Detector 1 Position(ft)	0	0		0	0	0	0	0		0	0	0
Detector 1 Size(ft)	20	6		20	6	20	20	6		20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA		pm+pt	NA	Perm	Perm	NA		Perm	NA	Perm
Protected Phases	5	2		1	6			4			8	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Permitted Phases	2			6		6	4			8		8
Detector Phase	5	2		1	6	6	4	4		8	8	8
Switch Phase												
Minimum Initial (s)	5.0	15.0		5.0	15.0	15.0	7.0	7.0		7.0	7.0	7.0
Minimum Split (s)	19.0	45.0		11.0	37.0	37.0	44.0	44.0		44.0	44.0	44.0
Total Split (s)	19.0	45.0		11.0	37.0	37.0	44.0	44.0		44.0	44.0	44.0
Total Split (%)	19.0%	45.0%		11.0%	37.0%	37.0%	44.0%	44.0%		44.0%	44.0%	44.0%
Maximum Green (s)	14.0	39.6		6.2	31.5	31.5	37.7	37.7		38.0	38.0	38.0
Yellow Time (s)	3.0	3.6		3.0	3.6	3.6	3.2	3.2		3.2	3.2	3.2
All-Red Time (s)	2.0	1.8		1.8	1.9	1.9	3.1	3.1		2.8	2.8	2.8
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0		0.0			0.0	0.0
Total Lost Time (s)	5.0	5.4		4.8	5.5	5.5		6.3			6.0	6.0
Lead/Lag	Lead	Lag		Lead	Lag	Lag						
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes						
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Recall Mode	None	Max		None	Max	Max	None	None		None	None	None
Walk Time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	5.0
Flash Dont Walk (s)		14.0			16.0	16.0	26.0	26.0		22.0	22.0	22.0
Pedestrian Calls (#/hr)		0			0	0	0	0		0	0	0
Act Effct Green (s)	46.9	44.7		40.9	35.6	35.6		13.7			14.0	14.0
Actuated g/C Ratio	0.65	0.62		0.57	0.49	0.49		0.19			0.19	0.19
v/c Ratio	0.19	0.28		0.02	0.16	0.07		0.33			0.58	0.23
Control Delay	6.4	8.2		6.3	12.6	4.8		23.3			35.8	8.0
Queue Delay	0.0	0.0		0.0	0.0	0.0		0.0			0.0	0.0
Total Delay	6.4	8.2		6.3	12.6	4.8		23.3			35.8	8.0
LOS	A	A		A	B	A		C			D	A
Approach Delay		7.8			11.2			23.3			26.1	
Approach LOS		A			B			C			C	
Queue Length 50th (ft)	19	48		1	32	0		30			60	0
Queue Length 95th (ft)	49	133		8	66	20		76			124	33
Internal Link Dist (ft)		594			571			314			718	
Turn Bay Length (ft)	160			230								100
Base Capacity (vph)	742	2068		503	1610	745		816			710	819
Starvation Cap Reductn	0	0		0	0	0		0			0	0
Spillback Cap Reductn	0	0		0	0	0		0			0	0
Storage Cap Reductn	0	0		0	0	0		0			0	0
Reduced v/c Ratio	0.18	0.28		0.02	0.16	0.07		0.13			0.21	0.10

Intersection Summary	
Area Type: Other	
Cycle Length: 100	
Actuated Cycle Length: 72.1	
Natural Cycle: 100	
Control Type: Semi Act-Uncoord	
Maximum v/c Ratio: 0.58	
Intersection Signal Delay: 12.9	Intersection LOS: B
Intersection Capacity Utilization 48.0%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 1: 17th St



Lanes, Volumes, Timings
5: Main Ave & CR 28 / 15th St

9/14/2018

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	225	505	95	15	275	70	120	85	25	45	85	210
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	200		0	200		0	200		160	200		0
Storage Lanes	1		0	1		0	0		1	0		0
Taper Length (ft)	100			100			100			100		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.976			0.970				0.850		0.917	
Flt Protected	0.950			0.950				0.972			0.993	
Satd. Flow (prot)	1613	3149	0	1613	3130	0	0	1651	1443	0	1546	0
Flt Permitted	0.397			0.404				0.554			0.923	
Satd. Flow (perm)	674	3149	0	686	3130	0	0	941	1443	0	1437	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		36			51				27		153	
Link Speed (mph)		30			30			25			25	
Link Distance (ft)		769			603			1224			442	
Travel Time (s)		17.5			13.7			33.4			12.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%
Adj. Flow (vph)	245	549	103	16	299	76	130	92	27	49	92	228
Shared Lane Traffic (%)												
Lane Group Flow (vph)	245	652	0	16	375	0	0	222	27	0	369	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2	1	1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru	Right	Left	Thru	
Leading Detector (ft)	20	100		20	100		20	100	20	20	100	
Trailing Detector (ft)	0	0		0	0		0	0	0	0	0	
Detector 1 Position(ft)	0	0		0	0		0	0	0	0	0	
Detector 1 Size(ft)	20	6		20	6		20	6	20	20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA	Perm	Perm	NA	
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4			8			2		2	6		

Lanes, Volumes, Timings
5: Main Ave & CR 28 / 15th St

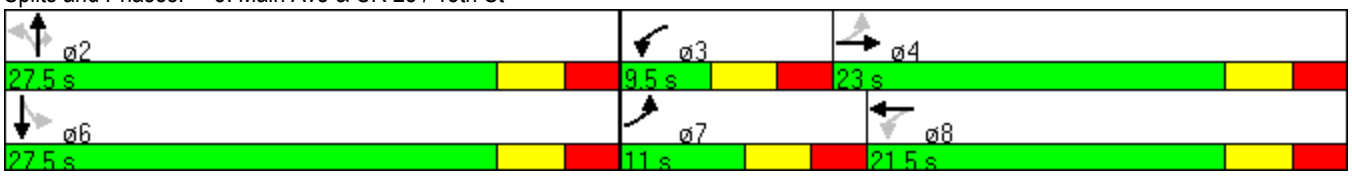
9/14/2018

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	7	4		3	8		2	2	2	6	6	
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Minimum Split (s)	9.5	21.5		9.5	21.5		27.5	27.5	27.5	27.5	27.5	
Total Split (s)	11.0	23.0		9.5	21.5		27.5	27.5	27.5	27.5	27.5	
Total Split (%)	18.3%	38.3%		15.8%	35.8%		45.8%	45.8%	45.8%	45.8%	45.8%	
Maximum Green (s)	5.5	17.5		4.0	16.0		22.0	22.0	22.0	22.0	22.0	
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
All-Red Time (s)	2.5	2.5		2.5	2.5		2.5	2.5	2.5	2.5	2.5	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0	0.0		0.0	
Total Lost Time (s)	5.5	5.5		5.5	5.5			5.5	5.5		5.5	
Lead/Lag	Lead	Lag		Lead	Lag							
Lead-Lag Optimize?	Yes	Yes		Yes	Yes							
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	Min		None	Min		None	None	None	None	None	
Walk Time (s)		5.0			5.0		5.0	5.0	5.0	5.0	5.0	
Flash Dont Walk (s)		11.0			11.0		17.0	17.0	17.0	17.0	17.0	
Pedestrian Calls (#/hr)		0			0		0	0	0	0	0	
Act Effct Green (s)	21.4	20.5		14.8	10.7			15.3	15.3		15.3	
Actuated g/C Ratio	0.44	0.42		0.30	0.22			0.31	0.31		0.31	
v/c Ratio	0.60	0.48		0.06	0.52			0.75	0.06		0.66	
Control Delay	19.7	13.1		9.9	17.7			33.0	5.9		14.9	
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0		0.0	
Total Delay	19.7	13.1		9.9	17.7			33.0	5.9		14.9	
LOS	B	B		A	B			C	A		B	
Approach Delay		14.9			17.4			30.1			14.9	
Approach LOS		B			B			C			B	
Queue Length 50th (ft)	42	58		2	42			53	0		47	
Queue Length 95th (ft)	#125	154		12	84			#155	13		134	
Internal Link Dist (ft)		689			523			1144			362	
Turn Bay Length (ft)	200			200					160			
Base Capacity (vph)	406	1347		287	1095			439	687		752	
Starvation Cap Reductn	0	0		0	0			0	0		0	
Spillback Cap Reductn	0	0		0	0			0	0		0	
Storage Cap Reductn	0	0		0	0			0	0		0	
Reduced v/c Ratio	0.60	0.48		0.06	0.34			0.51	0.04		0.49	

Intersection Summary

Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 48.6
Natural Cycle: 60
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.75
Intersection Signal Delay: 17.4 Intersection LOS: B
Intersection Capacity Utilization 74.3% ICU Level of Service D
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 5: Main Ave & CR 28 / 15th St



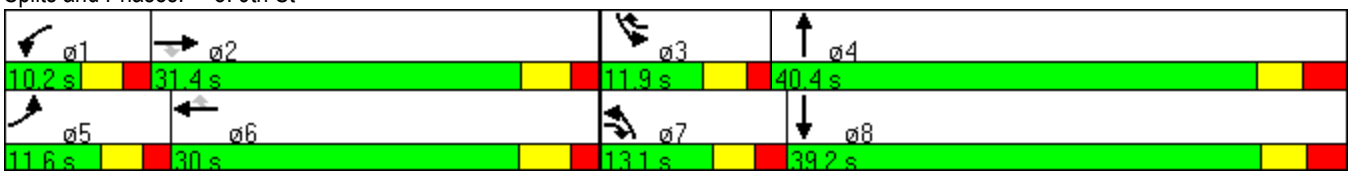
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	190	300	370	115	145	95	225	535	170	95	410	25
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	165		230	230		380	220		0	300		0
Storage Lanes	2		1	2		1	2		0	2		0
Taper Length (ft)	95			100			50			50		
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	0.95	0.97	0.95	0.95
Frt			0.850			0.850		0.964			0.991	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3252	3353	1500	3190	3288	1471	3221	3201	0	3130	3197	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3252	3353	1500	3190	3288	1471	3221	3201	0	3130	3197	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			186			103		51			7	
Link Speed (mph)		35			35			30			30	
Link Distance (ft)		681			935			622			954	
Travel Time (s)		13.3			18.2			14.1			21.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	2%	2%	4%	4%	4%	3%	3%	3%	6%	6%	6%
Adj. Flow (vph)	207	326	402	125	158	103	245	582	185	103	446	27
Shared Lane Traffic (%)												
Lane Group Flow (vph)	207	326	402	125	158	103	245	767	0	103	473	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2	1	1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru		Left	Thru	
Leading Detector (ft)	20	100	20	20	100	20	20	100		20	100	
Trailing Detector (ft)	0	0	0	0	0	0	0	0		0	0	
Detector 1 Position(ft)	0	0	0	0	0	0	0	0		0	0	
Detector 1 Size(ft)	20	6	20	20	6	20	20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Prot	NA	pm+ov	Prot	NA	pm+ov	Prot	NA		Prot	NA	
Protected Phases	5	2	7	1	6	3	7	4		3	8	
Permitted Phases			2			6						

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	5	2	7	1	6	3	7	4		3	8	
Switch Phase												
Minimum Initial (s)	5.0	15.0	5.0	5.0	15.0	5.0	5.0	15.0		5.0	15.0	
Minimum Split (s)	9.9	30.6	10.3	9.9	29.7	9.7	10.3	37.4		9.7	39.2	
Total Split (s)	11.6	31.4	13.1	10.2	30.0	11.9	13.1	40.4		11.9	39.2	
Total Split (%)	12.4%	33.4%	14.0%	10.9%	31.9%	12.7%	14.0%	43.0%		12.7%	41.7%	
Maximum Green (s)	6.7	25.8	7.8	5.3	24.3	7.2	7.8	34.0		7.2	33.0	
Yellow Time (s)	3.0	3.6	3.0	3.0	3.6	3.0	3.0	3.2		3.0	3.2	
All-Red Time (s)	1.9	2.0	2.3	1.9	2.1	1.7	2.3	3.2		1.7	3.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.9	5.6	5.3	4.9	5.7	4.7	5.3	6.4		4.7	6.2	
Lead/Lag	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	None	Min	None	None	Min	None	None	None		None	None	
Walk Time (s)		5.0			5.0			5.0			5.0	
Flash Dont Walk (s)		20.0			19.0			26.0			28.0	
Pedestrian Calls (#/hr)		0			0			0			0	
Act Effct Green (s)	6.7	16.7	30.1	5.3	15.1	27.8	7.8	23.7		6.9	22.4	
Actuated g/C Ratio	0.09	0.22	0.41	0.07	0.20	0.37	0.10	0.32		0.09	0.30	
v/c Ratio	0.70	0.43	0.56	0.55	0.24	0.17	0.72	0.73		0.35	0.49	
Control Delay	48.8	28.1	13.2	45.0	27.3	5.0	47.4	25.1		36.9	22.4	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	48.8	28.1	13.2	45.0	27.3	5.0	47.4	25.1		36.9	22.4	
LOS	D	C	B	D	C	A	D	C		D	C	
Approach Delay		26.3			27.1			30.5			25.0	
Approach LOS		C			C			C			C	
Queue Length 50th (ft)	48	67	67	28	32	0	56	152		23	91	
Queue Length 95th (ft)	#110	120	180	#67	65	32	#125	211		51	132	
Internal Link Dist (ft)		601			855			542			874	
Turn Bay Length (ft)	165		230	230		380	220			300		
Base Capacity (vph)	295	1170	719	229	1081	621	340	1500		305	1431	
Starvation Cap Reductn	0	0	0	0	0	0	0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	0		0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	0		0	0	
Reduced v/c Ratio	0.70	0.28	0.56	0.55	0.15	0.17	0.72	0.51		0.34	0.33	

Intersection Summary

Area Type: Other
Cycle Length: 93.9
Actuated Cycle Length: 74.3
Natural Cycle: 90
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.73
Intersection Signal Delay: 27.6 Intersection LOS: C
Intersection Capacity Utilization 61.8% ICU Level of Service B
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 8: 9th St



Lanes, Volumes, Timings
22: Sheyenne St & 13th Ave

9/14/2018

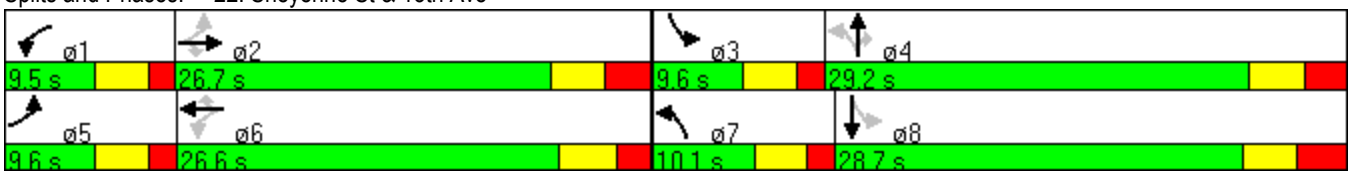
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	35	335	180	95	150	80	165	410	280	85	245	20
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	240		200	415		0	230		230	132		0
Storage Lanes	1		1	1		1	1		1	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850			0.850			0.850		0.989	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1660	1748	1485	1644	1731	1471	1676	1765	1500	1644	1712	0
Flt Permitted	0.654			0.350			0.441			0.294		
Satd. Flow (perm)	1143	1748	1485	606	1731	1471	778	1765	1500	509	1712	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			196			87			304		6	
Link Speed (mph)		25			35			30			25	
Link Distance (ft)		646			849			723			965	
Travel Time (s)		17.6			16.5			16.4			26.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	3%	3%	4%	4%	4%	2%	2%	2%	4%	4%	4%
Adj. Flow (vph)	38	364	196	103	163	87	179	446	304	92	266	22
Shared Lane Traffic (%)												
Lane Group Flow (vph)	38	364	196	103	163	87	179	446	304	92	288	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane					Yes						Yes	
Headway Factor	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2	1	1	2	1	1	2	
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	
Leading Detector (ft)	20	100	20	20	100	20	20	100	20	20	100	
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	
Detector 1 Position(ft)	0	0	0	0	0	0	0	0	0	0	0	
Detector 1 Size(ft)	20	6	20	20	6	20	20	6	20	20	6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases	2		2	6		6	4		4	8		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	5	2	2	1	6	6	7	4	4	3	8	
Switch Phase												
Minimum Initial (s)	5.0	7.0	7.0	5.0	7.0	7.0	5.0	15.0	15.0	5.0	15.0	
Minimum Split (s)	9.6	23.7	23.7	9.5	23.3	23.3	9.5	27.6	27.6	9.6	26.9	
Total Split (s)	9.6	26.7	26.7	9.5	26.6	26.6	10.1	29.2	29.2	9.6	28.7	
Total Split (%)	12.8%	35.6%	35.6%	12.7%	35.5%	35.5%	13.5%	38.9%	38.9%	12.8%	38.3%	
Maximum Green (s)	5.0	21.0	21.0	5.0	21.3	21.3	5.6	23.6	23.6	5.0	22.8	
Yellow Time (s)	3.0	3.0	3.0	3.0	3.2	3.2	3.0	3.2	3.2	3.0	3.0	
All-Red Time (s)	1.6	2.7	2.7	1.5	2.1	2.1	1.5	2.4	2.4	1.6	2.9	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	4.6	5.7	5.7	4.5	5.3	5.3	4.5	5.6	5.6	4.6	5.9	
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	Max	Max	None	Max	Max	None	None	None	None	None	
Walk Time (s)		5.0	5.0		5.0	5.0		5.0	5.0		5.0	
Flash Dont Walk (s)		13.0	13.0		13.0	13.0		17.0	17.0		16.0	
Pedestrian Calls (#/hr)		0	0		0	0		0	0		0	
Act Effct Green (s)	26.2	21.2	21.2	27.1	23.4	23.4	29.3	24.0	24.0	27.1	20.8	
Actuated g/C Ratio	0.37	0.30	0.30	0.38	0.33	0.33	0.41	0.34	0.34	0.38	0.29	
v/c Ratio	0.08	0.70	0.34	0.34	0.29	0.16	0.46	0.75	0.43	0.34	0.57	
Control Delay	13.5	32.5	5.4	17.0	21.6	6.1	17.3	32.7	4.8	15.6	26.5	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	13.5	32.5	5.4	17.0	21.6	6.1	17.3	32.7	4.8	15.6	26.5	
LOS	B	C	A	B	C	A	B	C	A	B	C	
Approach Delay		22.4			16.4			20.6			23.9	
Approach LOS		C			B			C			C	
Queue Length 50th (ft)	10	153	0	28	60	0	48	188	0	24	109	
Queue Length 95th (ft)	27	#275	45	58	110	31	87	#336	52	49	183	
Internal Link Dist (ft)		566			769			643			885	
Turn Bay Length (ft)	240		200	415			230		230	132		
Base Capacity (vph)	456	521	580	304	570	542	392	602	712	274	558	
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.08	0.70	0.34	0.34	0.29	0.16	0.46	0.74	0.43	0.34	0.52	

Intersection Summary

Area Type: Other
Cycle Length: 75
Actuated Cycle Length: 71.2
Natural Cycle: 75
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.75
Intersection Signal Delay: 21.0 Intersection LOS: C
Intersection Capacity Utilization 68.9% ICU Level of Service C
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 22: Sheyenne St & 13th Ave



Lanes, Volumes, Timings
24: 6th St & 13th Ave

9/14/2018

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	15	690	15	10	280	35	75	55	80	70	25	10
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	140		0	92		0	100		100	100		0
Storage Lanes	1		0	1		0	1		1	1		0
Taper Length (ft)	25			80			50			50		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.997			0.983				0.850		0.957	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1676	3343	0	1676	3296	0	1676	1765	1500	1676	1689	0
Flt Permitted	0.546			0.361			0.732			0.718		
Satd. Flow (perm)	964	3343	0	637	3296	0	1292	1765	1500	1267	1689	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		4			27				69		11	
Link Speed (mph)		35			35			25			25	
Link Distance (ft)		489			566			615			526	
Travel Time (s)		9.5			11.0			16.8			14.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	16	750	16	11	304	38	82	60	87	76	27	11
Shared Lane Traffic (%)												
Lane Group Flow (vph)	16	766	0	11	342	0	82	60	87	76	38	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane		Yes										
Headway Factor	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2	1	1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru	Right	Left	Thru	
Leading Detector (ft)	20	100		20	100		20	100	20	20	100	
Trailing Detector (ft)	0	0		0	0		0	0	0	0	0	
Detector 1 Position(ft)	0	0		0	0		0	0	0	0	0	
Detector 1 Size(ft)	20	6		20	6		20	6	20	20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4		4	8		
Detector Phase	2	2		6	6		4	4	4	8	8	

Lanes, Volumes, Timings
24: 6th St & 13th Ave

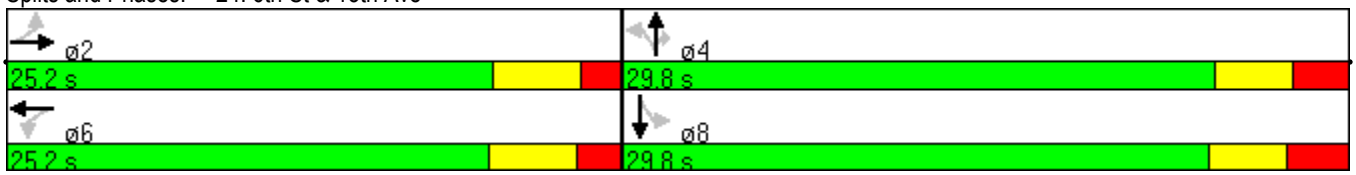
9/14/2018

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Switch Phase												
Minimum Initial (s)	15.0	15.0		15.0	15.0		7.0	7.0	7.0	7.0	7.0	
Minimum Split (s)	24.3	24.3		22.5	22.5		27.6	27.6	27.6	29.8	29.8	
Total Split (s)	25.2	25.2		25.2	25.2		29.8	29.8	29.8	29.8	29.8	
Total Split (%)	45.8%	45.8%		45.8%	45.8%		54.2%	54.2%	54.2%	54.2%	54.2%	
Maximum Green (s)	19.9	19.9		19.7	19.7		24.2	24.2	24.2	24.0	24.0	
Yellow Time (s)	3.6	3.6		3.6	3.6		3.2	3.2	3.2	3.2	3.2	
All-Red Time (s)	1.7	1.7		1.9	1.9		2.4	2.4	2.4	2.6	2.6	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.3	5.3		5.5	5.5		5.6	5.6	5.6	5.8	5.8	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Recall Mode	Max	Max		Max	Max		None	None	None	None	None	
Walk Time (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	
Flash Dont Walk (s)	14.0	14.0		12.0	12.0		17.0	17.0	17.0	19.0	19.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0	0	0	0	
Act Effct Green (s)	24.6	24.6		24.4	24.4		8.5	8.5	8.5	8.3	8.3	
Actuated g/C Ratio	0.61	0.61		0.60	0.60		0.21	0.21	0.21	0.21	0.21	
v/c Ratio	0.03	0.38		0.03	0.17		0.30	0.16	0.24	0.29	0.11	
Control Delay	5.9	6.6		6.1	5.4		16.1	13.5	7.2	16.1	10.6	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay	5.9	6.6		6.1	5.4		16.1	13.5	7.2	16.1	10.6	
LOS	A	A		A	A		B	B	A	B	B	
Approach Delay		6.6			5.4			12.0			14.3	
Approach LOS		A			A			B			B	
Queue Length 50th (ft)	1	45		1	16		15	11	3	14	5	
Queue Length 95th (ft)	9	94		7	38		40	30	26	38	20	
Internal Link Dist (ft)		409			486			535			446	
Turn Bay Length (ft)	140			92			100		100	100		
Base Capacity (vph)	587	2036		385	2004		775	1059	927	753	1009	
Starvation Cap Reductn	0	0		0	0		0	0	0	0	0	
Spillback Cap Reductn	0	0		0	0		0	0	0	0	0	
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	
Reduced v/c Ratio	0.03	0.38		0.03	0.17		0.11	0.06	0.09	0.10	0.04	

Intersection Summary

Area Type: Other
Cycle Length: 55
Actuated Cycle Length: 40.4
Natural Cycle: 55
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.38
Intersection Signal Delay: 7.7 — Intersection LOS: A
Intersection Capacity Utilization 46.2% — ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 24: 6th St & 13th Ave



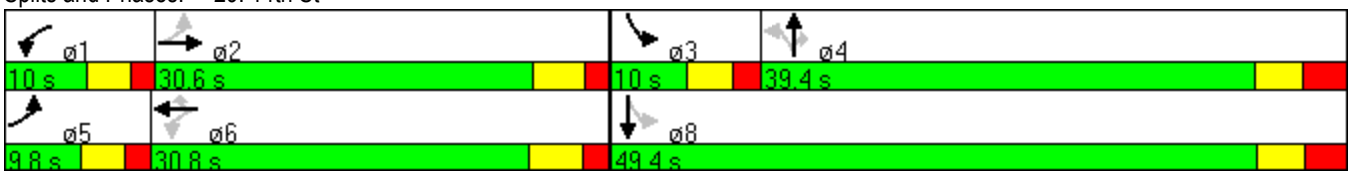
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	5	485	25	25	265	20	50	15	60	30	10	5
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	285		0	175		213	0		0	0		0
Storage Lanes	1		0	1		1	0		1	1		0
Taper Length (ft)	120			100			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.993				0.850			0.850		0.953	
Flt Protected	0.950			0.950				0.963		0.950		
Satd. Flow (prot)	1644	3265	0	1629	3257	1457	0	1683	1485	1569	1574	0
Flt Permitted	0.575			0.423				0.765		0.426		
Satd. Flow (perm)	995	3265	0	725	3257	1457	0	1337	1485	703	1574	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		6				22			65		5	
Link Speed (mph)		35			35			30			30	
Link Distance (ft)		935			658			457			346	
Travel Time (s)		18.2			12.8			10.4			7.9	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	4%	4%	4%	5%	5%	5%	3%	3%	3%	9%	9%	9%
Adj. Flow (vph)	5	527	27	27	288	22	54	16	65	33	11	5
Shared Lane Traffic (%)												
Lane Group Flow (vph)	5	554	0	27	288	22	0	70	65	33	16	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2	1	1	2	1	1	2	
Detector Template	Left	Thru		Left	Thru	Right	Left	Thru	Right	Left	Thru	
Leading Detector (ft)	20	100		20	100	20	20	100	20	20	100	
Trailing Detector (ft)	0	0		0	0	0	0	0	0	0	0	
Detector 1 Position(ft)	0	0		0	0	0	0	0	0	0	0	
Detector 1 Size(ft)	20	6		20	6	20	20	6	20	20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA		pm+pt	NA	Perm	Perm	NA	Perm	pm+pt	NA	
Protected Phases	5	2		1	6			4		3	8	
Permitted Phases	2			6		6	4		4	8		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	5	2		1	6	6	4	4	4	3	8	
Switch Phase												
Minimum Initial (s)	5.0	15.0		5.0	15.0	15.0	7.0	7.0	7.0	5.0	7.0	
Minimum Split (s)	9.7	24.3		9.5	26.5	26.5	39.3	39.3	39.3	9.9	38.1	
Total Split (s)	9.8	30.6		10.0	30.8	30.8	39.4	39.4	39.4	10.0	49.4	
Total Split (%)	10.9%	34.0%		11.1%	34.2%	34.2%	43.8%	43.8%	43.8%	11.1%	54.9%	
Maximum Green (s)	5.1	25.3		5.5	25.3	25.3	33.1	33.1	33.1	5.1	43.3	
Yellow Time (s)	3.0	3.6		3.0	3.6	3.6	3.2	3.2	3.2	3.0	3.2	
All-Red Time (s)	1.7	1.7		1.5	1.9	1.9	3.1	3.1	3.1	1.9	2.9	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0		0.0	0.0	0.0	0.0	
Total Lost Time (s)	4.7	5.3		4.5	5.5	5.5		6.3	6.3	4.9	6.1	
Lead/Lag	Lead	Lag		Lead	Lag	Lag	Lag	Lag	Lag	Lead		
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes		
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	Max		None	Max	Max	None	None	None	None	None	
Walk Time (s)		5.0			5.0	5.0	5.0	5.0	5.0		5.0	
Flash Dont Walk (s)		14.0			16.0	16.0	28.0	28.0	28.0		27.0	
Pedestrian Calls (#/hr)		0			0	0	0	0	0		0	
Act Effct Green (s)	34.4	33.4		35.5	34.9	34.9		8.8	8.8	12.7	12.3	
Actuated g/C Ratio	0.61	0.59		0.63	0.62	0.62		0.16	0.16	0.23	0.22	
v/c Ratio	0.01	0.29		0.05	0.14	0.02		0.33	0.23	0.14	0.05	
Control Delay	7.4	10.9		7.2	8.9	5.8		28.1	9.8	17.0	14.1	
Queue Delay	0.0	0.0		0.0	0.0	0.0		0.0	0.0	0.0	0.0	
Total Delay	7.4	10.9		7.2	8.9	5.8		28.1	9.8	17.0	14.1	
LOS	A	B		A	A	A		C	A	B	B	
Approach Delay		10.8			8.5			19.3			16.0	
Approach LOS		B			A			B			B	
Queue Length 50th (ft)	1	33		2	16	0		16	0	7	2	
Queue Length 95th (ft)	6	132		16	70	13		61	30	27	16	
Internal Link Dist (ft)		855			578			377			266	
Turn Bay Length (ft)	285			175		213						
Base Capacity (vph)	669	1941		549	2024	914		813	928	240	1253	
Starvation Cap Reductn	0	0		0	0	0		0	0	0	0	
Spillback Cap Reductn	0	0		0	0	0		0	0	0	0	
Storage Cap Reductn	0	0		0	0	0		0	0	0	0	
Reduced v/c Ratio	0.01	0.29		0.05	0.14	0.02		0.09	0.07	0.14	0.01	

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 56.2
Natural Cycle: 90
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.33
Intersection Signal Delay: 11.4 Intersection LOS: B
Intersection Capacity Utilization 42.2% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 29: 14th St



Intersection	
Intersection Delay (sec/veh):	1.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Volume (vph)	30	820	15	10	340	25	5	5	35	5	5	15
Conflicting Peds.(#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
Right Turn Channelized	None	None	None	None	None	None	None	None	None	None	None	None
Storage Length	130		0	150		0	0		0	0		0
Median Width		12			12			0			0	
Grade (%)		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles(%)	2	2	2	2	2	2	2	2	2	2	2	2
Movement Flow Rate	33	891	16	11	370	27	5	5	38	5	5	16
Number of Lanes	1	2	0	1	2	0	0	1	0	0	1	0

Major/Minor	Major 1			Major 2			Minor 1			Minor 1		
Conflicting Flow Rate - All	397	0	0	908	0	0	1174	1383	454	919	1378	198
Stage 1	0	0	0	0	0	0	965	965	0	405	405	0
Stage 2	0	0	0	0	0	0	209	418	0	514	973	0
Follow-up Headway	2.22	-	-	2.22	0	0	3.52	4.02	3.32	3.52	4.02	3.32
Pot Capacity-1 Maneuver	1157	-	-	745	-	-	147	143	553	226	144	808
Stage 1	-	-	-	-	-	-	274	331	-	593	597	-
Stage 2	-	-	-	-	-	-	774	589	-	511	329	-
Mov Capacity-1 Maneuver	1157	-	-	745	-	-	135.2	136.9	553	197.5	137.9	808
Mov Capacity-2 Maneuver	-	-	-	-	-	-	135.2	136.9	-	197.5	137.9	-
Stage 1	-	-	-	-	-	-	274	321.7	-	593	588	-
Stage 2	-	-	-	-	-	-	740.1	580.2	-	454.7	319.8	-

Approach	EB	WB	NB	SB
HCM Control Delay (s)	0.3	0.3	17.8	17.6
HCM LOS	A	A	C	C

Lane	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (vph)	329							312
HCM Control Delay (s)	17.8	8.202	-	-	9.904	-	-	17.6
HCM Lane VC Ratio	0.149	0.028	-	-	0.015	-	-	0.087
HCM Lane LOS	C	A	-	-	A	-	-	C
HCM 95th Percentile Queue (veh)	0.516	0.087	-	-	0.044	-	-	0.284

Intersection	
Intersection Delay (sec/veh):	1.9

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Volume (vph)	215	5	10	185	15	70
Conflicting Peds.(#/hr)	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
Right Turn Channelized	None	None	None	None	None	None
Storage Length		0	0		0	0
Median Width	12			12	12	
Grade (%)	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles(%)	2	2	2	2	2	2
Movement Flow Rate	234	5	11	201	16	76
Number of Lanes	1	0	0	1	1	0

Major/Minor	Major 1			Major 2		
Conflicting Flow Rate - All	0	0	239	0	459	236
Stage 1	0	0	0	0	236	0
Stage 2	0	0	0	0	223	0
Follow-up Headway	-	-	2.218	0	3.518	3.318
Pot Capacity-1 Maneuver	-	-	1329	-	560	801
Stage 1	-	-	-	-	803	-
Stage 2	-	-	-	-	814	-
Mov Capacity-1 Maneuver	-	-	1329	-	555.5	801
Mov Capacity-2 Maneuver	-	-	-	-	555.5	-
Stage 1	-	-	-	-	# 0	-
Stage 2	-	-	-	-	807.5	-

Approach	EB	WB	NB
HCM Control Delay (s)	0	0.4	10.5
HCM LOS	A	A	B

Lane	NBLn1	EBT	EBR	WBL	WBT
Capacity (vph)	743				
HCM Control Delay (s)	10.5	-	-	7.731	0
HCM Lane VC Ratio	0.124	0	-	0.008	-
HCM Lane LOS	B	-	-	A	-
HCM 95th Percentile Queue (veh)	0.424	0	-	0.025	-

Intersection	
Intersection Delay (sec/veh):	0

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Volume (vph)	40	240	5	15	170	130	5	75	65	225	25	20
Conflicting Peds.(#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Right Turn Channelized	None	None	None	None	None	None	None	None	None	None	None	None
Storage Length	215		0	190		0	0		0	60		0
Median Width		12			12			12			12	
Grade (%)		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles(%)	2	2	2	2	2	2	2	2	2	2	2	2
Movement Flow Rate	43	261	5	16	185	141	5	82	71	245	27	22
Number of Lanes	1	1	0	1	1	0	0	1	0	1	1	0

Major/Minor	Lane
Conflicting Flow Rate - All	Capacity (vph)
Stage 1	HCM Control Delay (s)
Stage 2	HCM Lane VC Ratio
Follow-up Headway	HCM Lane LOS
Pot Capacity-1 Maneuver	HCM 95th Percentile Queue (veh)
Stage 1	
Stage 2	
Mov Capacity-1 Maneuver	
Mov Capacity-2 Maneuver	
Stage 1	
Stage 2	

Approach
HCM Control Delay (s)
HCM LOS

Intersection	
Intersection Delay (sec/veh):	4.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Volume (vph)	25	640	10	10	275	30	5	60	20	40	25	25
Conflicting Peds.(#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
Right Turn Channelized	None	None	None	None	None	None	None	None	None	None	None	None
Storage Length	100		0	100		0	0		0	0		0
Median Width		12			12			0			0	
Grade (%)		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles(%)	2	2	2	2	2	2	2	2	2	2	2	2
Movement Flow Rate	27	696	11	11	299	33	5	65	22	43	27	27
Number of Lanes	1	2	0	1	2	0	0	1	0	0	1	0

Major/Minor	Major 1			Major 2			Minor 1			Minor 1		
Conflicting Flow Rate - All	332	0	0	707	0	0	940	1108	353	772	1098	166
Stage 1	0	0	0	0	0	0	755	755	0	337	337	0
Stage 2	0	0	0	0	0	0	185	353	0	435	761	0
Follow-up Headway	2.22	-	-	2.22	0	0	3.52	4.02	3.32	3.52	4.02	3.32
Pot Capacity-1 Maneuver	1222	-	-	887	-	-	218	209	642	289	211	850
Stage 1	-	-	-	-	-	-	367	415	-	651	640	-
Stage 2	-	-	-	-	-	-	799	629	-	570	412	-
Mov Capacity-1 Maneuver	1222	-	-	887	-	-	184.7	201.9	642	204.2	203.9	850
Mov Capacity-2 Maneuver	-	-	-	-	-	-	184.7	201.9	-	204.2	203.9	-
Stage 1	-	-	-	-	-	-	367	405.9	-	651	632.3	-
Stage 2	-	-	-	-	-	-	731.3	621.5	-	452	402.9	-

Approach	EB	WB	NB	SB
HCM Control Delay (s)	0.3	0.3	29.2	27.1
HCM LOS	A	A	D	D

Lane	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (vph)	239							259
HCM Control Delay (s)	29.2	8.013	-	-	9.109	-	-	27.1
HCM Lane VC Ratio	0.387	0.022	-	-	0.012	-	-	0.378
HCM Lane LOS	D	A	-	-	A	-	-	D
HCM 95th Percentile Queue (veh)	1.728	0.068	-	-	0.037	-	-	1.681

Intersection	
Intersection Delay (sec/veh):	2.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Volume (vph)	10	560	5	30	290	5	15	10	85	5	5	5
Conflicting Peds.(#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
Right Turn Channelized	None	None	None	None	None	None	None	None	None	None	None	None
Storage Length	200		0	180		0	0		0	0		0
Median Width		12			12			0			0	
Grade (%)		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles(%)	2	2	2	2	2	2	2	2	2	2	2	2
Movement Flow Rate	11	609	5	33	315	5	16	11	92	5	5	5
Number of Lanes	1	2	0	1	2	0	0	1	0	0	1	1

Major/Minor		Major 1			Major 2			Minor 1			Minor 1	
Conflicting Flow Rate - All	321	0	0	614	0	0	859	1019	307	715	1019	160
Stage 1	0	0	0	0	0	0	633	633	0	383	383	0
Stage 2	0	0	0	0	0	0	226	386	0	332	636	0
Follow-up Headway	2.22	-	-	2.22	0	0	3.52	4.02	3.32	3.52	4.02	3.32
Pot Capacity-1 Maneuver	1236	-	-	961	-	-	250	236	689	318	236	855
Stage 1	-	-	-	-	-	-	434	472	-	611	610	-
Stage 2	-	-	-	-	-	-	756	609	-	655	470	-
Mov Capacity-1 Maneuver	1236	-	-	961	-	-	235.9	225.9	689	256.7	225.9	855
Mov Capacity-2 Maneuver	-	-	-	-	-	-	235.9	225.9	-	256.7	225.9	-
Stage 1	-	-	-	-	-	-	434	467.8	-	611	589.3	-
Stage 2	-	-	-	-	-	-	719	588.3	-	549	465.8	-

Approach	EB	WB	NB	SB
HCM Control Delay (s)	0.1	0.8	15.1	16.867
HCM LOS	A	A	C	C

Lane	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (vph)	476							240	855
HCM Control Delay (s)	15.1	7.938	-	-	8.878	-	-	20.7	9.2
HCM Lane VC Ratio	0.251	0.009	-	-	0.034	-	-	0.045	0.006
HCM Lane LOS	C	A	-	-	A	-	-	C	A
HCM 95th Percentile Queue (veh)	0.985	0.027	-	-	0.105	-	-	0.142	0.019

Intersection	
Intersection Delay (sec/veh)	16.1
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Volume (vph)	40	240	5	15	170	130	5	75	65	225	25	20
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles(%)	2	2	2	2	2	2	2	2	2	2	2	2
Movement Flow Rate	43	261	5	16	185	141	5	82	71	245	27	22
Number of Lanes	1	1	0	1	1	0	0	1	0	1	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	2	2	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	1	2	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	2	2	2
HCM Control Delay	15.5	17.6	13.4	16.4
HCM LOS	C	C	B	C

Lane	NBLn1	EBLn1	EBLn2	WBLn1	WBLn2	SBLn1	SBLn2
Volume Left (%)	3%	100%	0%	100%	0%	100%	0%
Volume Thru (%)	52%	0%	98%	0%	57%	0%	56%
Volume Right (%)	45%	0%	2%	0%	43%	0%	44%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Volume by Lane	145	40	245	15	300	225	45
Left Turning Volume	75	0	240	0	170	0	25
Through Volume	65	0	5	0	130	0	20
Right Turning Volume	5	40	0	15	0	225	0
Lane Flow Rate	158	43	266	16	326	245	49
Geometry Group	6	7	7	7	7	7	7
Degree of Utilization, X	0.313	0.089	0.504	0.033	0.586	0.508	0.09
Departure Headway, Hd	7.144	7.337	6.811	7.29	6.468	7.482	6.654
Convergence(Y/N)	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Capacity	503	488	530	491	558	482	538
Service Time	5.197	5.08	4.554	5.031	4.209	5.227	4.399
HCM Lane V/C Ratio	0.314	0.088	0.502	0.033	0.584	0.508	0.091
HCM Control Delay	13.4	10.8	16.3	10.3	18	17.7	10.1
HCM Lane LOS	B	B	C	B	C	C	B
HCM 95th Percentile Queue	1.4	0.3	3	0.1	4.2	3.1	0.3

Lanes, Volumes, Timings
5: 15th & Main Ave

9/14/2018

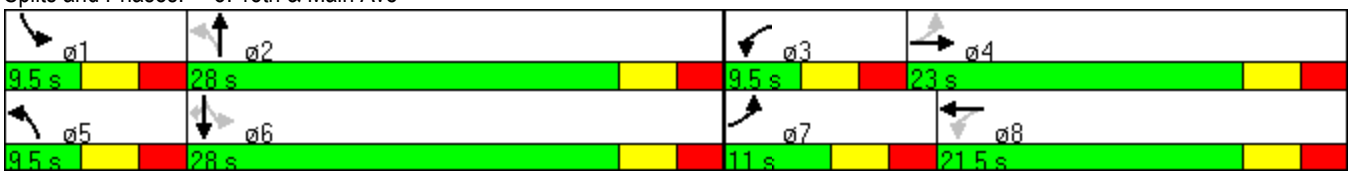
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	225	505	95	15	275	70	120	85	25	45	85	210
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	200		0	200		0	200		160	200		0
Storage Lanes	1		0	1		0	1		0	1		1
Taper Length (ft)	100			100			100			100		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.976			0.970			0.966				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1613	3149	0	1613	3130	0	1613	1640	0	1613	1698	1443
Flt Permitted	0.401			0.404			0.607			0.681		
Satd. Flow (perm)	681	3149	0	686	3130	0	1031	1640	0	1156	1698	1443
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		29			42			22				228
Link Speed (mph)		30			30			25			25	
Link Distance (ft)		769			603			1224			442	
Travel Time (s)		17.5			13.7			33.4			12.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%
Adj. Flow (vph)	245	549	103	16	299	76	130	92	27	49	92	228
Shared Lane Traffic (%)												
Lane Group Flow (vph)	245	652	0	16	375	0	130	119	0	49	92	228
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	1
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	Right
Leading Detector (ft)	20	100		20	100		20	100		20	100	20
Trailing Detector (ft)	0	0		0	0		0	0		0	0	0
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	0
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8			2			6		6

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	7	4		3	8		5	2		1	6	6
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Minimum Split (s)	9.5	21.5		9.5	21.5		9.5	27.5		9.5	27.5	27.5
Total Split (s)	11.0	23.0		9.5	21.5		9.5	28.0		9.5	28.0	28.0
Total Split (%)	15.7%	32.9%		13.6%	30.7%		13.6%	40.0%		13.6%	40.0%	40.0%
Maximum Green (s)	5.5	17.5		4.0	16.0		4.0	22.5		4.0	22.5	22.5
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
All-Red Time (s)	2.5	2.5		2.5	2.5		2.5	2.5		2.5	2.5	2.5
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	5.5	5.5		5.5	5.5		5.5	5.5		5.5	5.5	5.5
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Recall Mode	None	Min		None	Min		None	None		None	None	None
Walk Time (s)		5.0			5.0			5.0			5.0	5.0
Flash Dont Walk (s)		11.0			11.0			17.0			17.0	17.0
Pedestrian Calls (#/hr)		0			0			0			0	0
Act Effct Green (s)	21.6	20.7		15.0	10.8		13.8	12.4		11.5	8.5	8.5
Actuated g/C Ratio	0.44	0.42		0.30	0.22		0.28	0.25		0.23	0.17	0.17
v/c Ratio	0.60	0.49		0.06	0.52		0.39	0.28		0.16	0.31	0.52
Control Delay	20.0	13.6		9.9	18.6		17.0	16.7		13.3	22.4	8.3
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Delay	20.0	13.6		9.9	18.6		17.0	16.7		13.3	22.4	8.3
LOS	C	B		A	B		B	B		B	C	A
Approach Delay		15.3			18.2			16.9			12.5	
Approach LOS		B			B			B			B	
Queue Length 50th (ft)	45	64		3	45		26	19		9	24	0
Queue Length 95th (ft)	#127	157		12	87		65	69		30	63	48
Internal Link Dist (ft)		689			523			1144			362	
Turn Bay Length (ft)	200			200			200			200		
Base Capacity (vph)	406	1337		286	1081		337	787		309	803	803
Starvation Cap Reductn	0	0		0	0		0	0		0	0	0
Spillback Cap Reductn	0	0		0	0		0	0		0	0	0
Storage Cap Reductn	0	0		0	0		0	0		0	0	0
Reduced v/c Ratio	0.60	0.49		0.06	0.35		0.39	0.15		0.16	0.11	0.28

Intersection Summary

Area Type: Other
Cycle Length: 70
Actuated Cycle Length: 49.3
Natural Cycle: 70
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.60
Intersection Signal Delay: 15.6 Intersection LOS: B
Intersection Capacity Utilization 51.0% ICU Level of Service A
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 5: 15th & Main Ave



Lanes, Volumes, Timings
1: 17th St

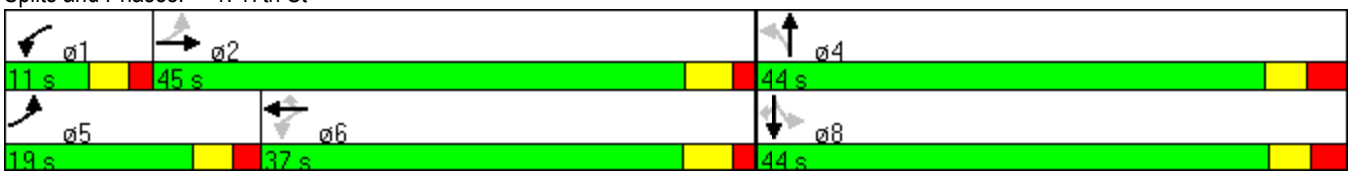
9/14/2018

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	85	565	20	50	765	205	35	45	35	155	45	140
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	160		0	230		0	0		0	0		100
Storage Lanes	1		0	1		1	0		0	0		1
Taper Length (ft)	120			120			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.995				0.850		0.959				0.850
Flt Protected	0.950			0.950				0.985			0.963	
Satd. Flow (prot)	1650	3336	0	1629	3257	1457	0	1667	0	0	1667	1471
Flt Permitted	0.249			0.404				0.842			0.729	
Satd. Flow (perm)	432	3336	0	693	3257	1457	0	1425	0	0	1262	1471
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		4				223		25				152
Link Speed (mph)		35			35			25			25	
Link Distance (ft)		674			651			394			798	
Travel Time (s)		13.1			12.7			10.7			21.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	2%	2%	5%	5%	5%	2%	2%	2%	4%	4%	4%
Bus Blockages (#/hr)	4	0	0	0	0	0	0	0	0	0	0	0
Adj. Flow (vph)	92	614	22	54	832	223	38	49	38	168	49	152
Shared Lane Traffic (%)												
Lane Group Flow (vph)	92	636	0	54	832	223	0	125	0	0	217	152
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.09	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2	1	1	2		1	2	1
Detector Template	Left	Thru		Left	Thru	Right	Left	Thru		Left	Thru	Right
Leading Detector (ft)	20	100		20	100	20	20	100		20	100	20
Trailing Detector (ft)	0	0		0	0	0	0	0		0	0	0
Detector 1 Position(ft)	0	0		0	0	0	0	0		0	0	0
Detector 1 Size(ft)	20	6		20	6	20	20	6		20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA		pm+pt	NA	Perm	Perm	NA		Perm	NA	Perm
Protected Phases	5	2		1	6			4			8	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Permitted Phases	2			6		6	4			8		8
Detector Phase	5	2		1	6	6	4	4		8	8	8
Switch Phase												
Minimum Initial (s)	5.0	15.0		5.0	15.0	15.0	7.0	7.0		7.0	7.0	7.0
Minimum Split (s)	19.0	45.0		11.0	37.0	37.0	44.0	44.0		44.0	44.0	44.0
Total Split (s)	19.0	45.0		11.0	37.0	37.0	44.0	44.0		44.0	44.0	44.0
Total Split (%)	19.0%	45.0%		11.0%	37.0%	37.0%	44.0%	44.0%		44.0%	44.0%	44.0%
Maximum Green (s)	14.0	39.6		6.2	31.5	31.5	37.7	37.7		38.0	38.0	38.0
Yellow Time (s)	3.0	3.6		3.0	3.6	3.6	3.2	3.2		3.2	3.2	3.2
All-Red Time (s)	2.0	1.8		1.8	1.9	1.9	3.1	3.1		2.8	2.8	2.8
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0		0.0			0.0	0.0
Total Lost Time (s)	5.0	5.4		4.8	5.5	5.5		6.3			6.0	6.0
Lead/Lag	Lead	Lag		Lead	Lag	Lag						
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes						
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Recall Mode	None	Max		None	Max	Max	None	None		None	None	None
Walk Time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	5.0
Flash Dont Walk (s)		14.0			16.0	16.0	26.0	26.0		22.0	22.0	22.0
Pedestrian Calls (#/hr)		0			0	0	0	0		0	0	0
Act Effct Green (s)	46.3	41.3		42.7	37.2	37.2		19.0			19.3	19.3
Actuated g/C Ratio	0.59	0.53		0.55	0.48	0.48		0.24			0.25	0.25
v/c Ratio	0.25	0.36		0.12	0.54	0.27		0.34			0.70	0.32
Control Delay	9.6	13.8		8.7	18.5	3.6		22.5			39.6	6.1
Queue Delay	0.0	0.0		0.0	0.0	0.0		0.0			0.0	0.0
Total Delay	9.6	13.8		8.7	18.5	3.6		22.5			39.6	6.1
LOS	A	B		A	B	A		C			D	A
Approach Delay		13.2			15.1			22.5			25.8	
Approach LOS		B			B			C			C	
Queue Length 50th (ft)	16	101		9	151	0		42			102	0
Queue Length 95th (ft)	47	178		30	272	44		87			175	41
Internal Link Dist (ft)		594			571			314			718	
Turn Bay Length (ft)	160			230								100
Base Capacity (vph)	486	1763		454	1551	811		714			626	806
Starvation Cap Reductn	0	0		0	0	0		0			0	0
Spillback Cap Reductn	0	0		0	0	0		0			0	0
Storage Cap Reductn	0	0		0	0	0		0			0	0
Reduced v/c Ratio	0.19	0.36		0.12	0.54	0.27		0.18			0.35	0.19

Intersection Summary	
Area Type: Other	
Cycle Length: 100	
Actuated Cycle Length: 78.2	
Natural Cycle: 100	
Control Type: Semi Act-Uncoord	
Maximum v/c Ratio: 0.70	
Intersection Signal Delay: 16.6	Intersection LOS: B
Intersection Capacity Utilization 59.3%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 1: 17th St



Lanes, Volumes, Timings
5: Main Ave & CR 28 / 15th St

9/14/2018

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	240	465	175	60	510	30	125	155	15	120	195	395
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	200		0	200		0	200		160	200		0
Storage Lanes	1		0	1		0	0		1	0		0
Taper Length (ft)	100			100			100			100		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.959			0.992				0.850		0.925	
Flt Protected	0.950			0.950				0.978			0.992	
Satd. Flow (prot)	1613	3094	0	1613	3201	0	0	1661	1443	0	1558	0
Flt Permitted	0.180			0.290				0.494			0.845	
Satd. Flow (perm)	306	3094	0	492	3201	0	0	839	1443	0	1327	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		65			7				16		110	
Link Speed (mph)		30			30			25			25	
Link Distance (ft)		769			603			1224			442	
Travel Time (s)		17.5			13.7			33.4			12.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%
Adj. Flow (vph)	261	505	190	65	554	33	136	168	16	130	212	429
Shared Lane Traffic (%)												
Lane Group Flow (vph)	261	695	0	65	587	0	0	304	16	0	771	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2	1	1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru	Right	Left	Thru	
Leading Detector (ft)	20	100		20	100		20	100	20	20	100	
Trailing Detector (ft)	0	0		0	0		0	0	0	0	0	
Detector 1 Position(ft)	0	0		0	0		0	0	0	0	0	
Detector 1 Size(ft)	20	6		20	6		20	6	20	20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA	Perm	Perm	NA	
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4			8			2		2	6		

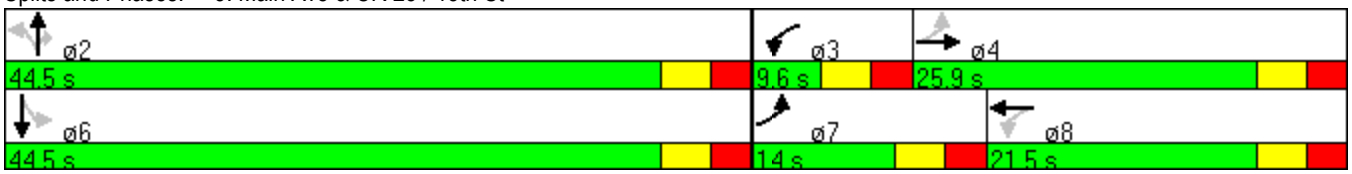
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	7	4		3	8		2	2	2	6	6	
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Minimum Split (s)	9.5	21.5		9.5	21.5		27.5	27.5	27.5	27.5	27.5	
Total Split (s)	14.0	25.9		9.6	21.5		44.5	44.5	44.5	44.5	44.5	
Total Split (%)	17.5%	32.4%		12.0%	26.9%		55.6%	55.6%	55.6%	55.6%	55.6%	
Maximum Green (s)	8.5	20.4		4.1	16.0		39.0	39.0	39.0	39.0	39.0	
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
All-Red Time (s)	2.5	2.5		2.5	2.5		2.5	2.5	2.5	2.5	2.5	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0	0.0		0.0	
Total Lost Time (s)	5.5	5.5		5.5	5.5			5.5	5.5		5.5	
Lead/Lag	Lead	Lag		Lead	Lag							
Lead-Lag Optimize?	Yes	Yes		Yes	Yes							
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	None		None	None		Min	Min	Min	Min	Min	
Walk Time (s)		5.0			5.0		5.0	5.0	5.0	5.0	5.0	
Flash Dont Walk (s)		11.0			11.0		17.0	17.0	17.0	17.0	17.0	
Pedestrian Calls (#/hr)		0			0		0	0	0	0	0	
Act Effct Green (s)	29.1	22.3		20.1	16.0			39.0	39.0		39.0	
Actuated g/C Ratio	0.36	0.28		0.25	0.20			0.49	0.49		0.49	
v/c Ratio	1.04	0.76		0.36	0.91			0.74	0.02		1.10	
Control Delay	93.8	31.5		23.2	51.6			30.3	5.3		83.8	
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0		0.0	
Total Delay	93.8	31.5		23.2	51.6			30.3	5.3		83.8	
LOS	F	C		C	D			C	A		F	
Approach Delay		48.5			48.7			29.0			83.8	
Approach LOS		D			D			C			F	
Queue Length 50th (ft)	~101	157		21	150			116	0		~414	
Queue Length 95th (ft)	#246	#246		47	#248			#255	9		#628	
Internal Link Dist (ft)		689			523			1144			362	
Turn Bay Length (ft)	200			200					160			
Base Capacity (vph)	250	909		181	646			409	712		703	
Starvation Cap Reductn	0	0		0	0			0	0		0	
Spillback Cap Reductn	0	0		0	0			0	0		0	
Storage Cap Reductn	0	0		0	0			0	0		0	
Reduced v/c Ratio	1.04	0.76		0.36	0.91			0.74	0.02		1.10	

Intersection Summary

Area Type: Other
Cycle Length: 80
Actuated Cycle Length: 80
Natural Cycle: 80
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.10
Intersection Signal Delay: 56.3 Intersection LOS: E
Intersection Capacity Utilization 107.6% ICU Level of Service G
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 5: Main Ave & CR 28 / 15th St



Lanes, Volumes, Timings
8: 9th St

9/14/2018

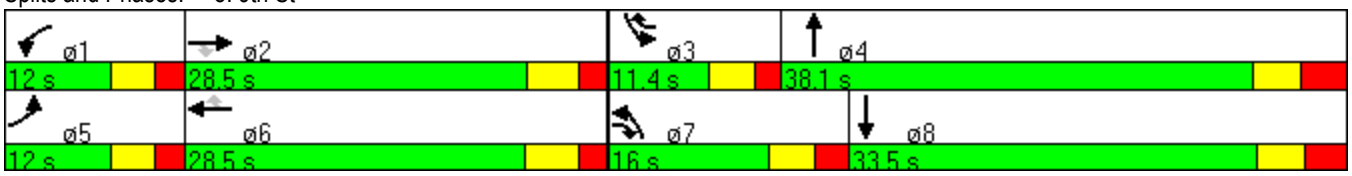
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	160	330	340	120	555	120	290	495	185	135	545	80
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	165		230	230		380	220		0	300		0
Storage Lanes	2		1	2		1	2		0	2		0
Taper Length (ft)	95			100			50			50		
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	0.95	0.97	0.95	0.95
Frt			0.850			0.850		0.959			0.981	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3252	3353	1500	3190	3288	1471	3221	3184	0	3130	3165	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3252	3353	1500	3190	3288	1471	3221	3184	0	3130	3165	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			90			128		66			19	
Link Speed (mph)		35			35			30			30	
Link Distance (ft)		681			935			622			954	
Travel Time (s)		13.3			18.2			14.1			21.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	2%	2%	4%	4%	4%	3%	3%	3%	6%	6%	6%
Adj. Flow (vph)	174	359	370	130	603	130	315	538	201	147	592	87
Shared Lane Traffic (%)												
Lane Group Flow (vph)	174	359	370	130	603	130	315	739	0	147	679	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2	1	1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru		Left	Thru	
Leading Detector (ft)	20	100	20	20	100	20	20	100		20	100	
Trailing Detector (ft)	0	0	0	0	0	0	0	0		0	0	
Detector 1 Position(ft)	0	0	0	0	0	0	0	0		0	0	
Detector 1 Size(ft)	20	6	20	20	6	20	20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Prot	NA	pm+ov	Prot	NA	pm+ov	Prot	NA		Prot	NA	
Protected Phases	5	2	7	1	6	3	7	4		3	8	
Permitted Phases			2			6						

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	5	2	7	1	6	3	7	4		3	8	
Switch Phase												
Minimum Initial (s)	5.0	15.0	5.0	5.0	15.0	5.0	5.0	15.0		5.0	15.0	
Minimum Split (s)	9.9	30.6	10.3	9.9	29.7	9.7	10.3	37.4		9.7	39.2	
Total Split (s)	12.0	28.5	16.0	12.0	28.5	11.4	16.0	38.1		11.4	33.5	
Total Split (%)	13.3%	31.7%	17.8%	13.3%	31.7%	12.7%	17.8%	42.3%		12.7%	37.2%	
Maximum Green (s)	7.1	22.9	10.7	7.1	22.8	6.7	10.7	31.7		6.7	27.3	
Yellow Time (s)	3.0	3.6	3.0	3.0	3.6	3.0	3.0	3.2		3.0	3.2	
All-Red Time (s)	1.9	2.0	2.3	1.9	2.1	1.7	2.3	3.2		1.7	3.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.9	5.6	5.3	4.9	5.7	4.7	5.3	6.4		4.7	6.2	
Lead/Lag	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	None	Min	None	None	Min	None	None	None		None	None	
Walk Time (s)		5.0			5.0			5.0			5.0	
Flash Dont Walk (s)		20.0			19.0			26.0			28.0	
Pedestrian Calls (#/hr)		0			0			0			0	
Act Effct Green (s)	7.2	23.0	39.2	7.0	20.0	32.5	10.6	26.9		6.7	22.6	
Actuated g/C Ratio	0.09	0.28	0.47	0.08	0.24	0.39	0.13	0.33		0.08	0.27	
v/c Ratio	0.62	0.39	0.49	0.48	0.76	0.20	0.76	0.68		0.58	0.77	
Control Delay	49.0	27.6	15.3	44.7	36.6	4.5	50.1	25.6		48.5	33.6	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	49.0	27.6	15.3	44.7	36.6	4.5	50.1	25.6		48.5	33.6	
LOS	D	C	B	D	D	A	D	C		D	C	
Approach Delay		26.7			33.0			33.0			36.3	
Approach LOS		C			C			C			D	
Queue Length 50th (ft)	47	85	104	35	157	1	86	161		40	170	
Queue Length 95th (ft)	#93	131	194	66	225	35	#159	227		#79	236	
Internal Link Dist (ft)		601			855			542			874	
Turn Bay Length (ft)	165		230	230		380	220			300		
Base Capacity (vph)	282	978	762	277	916	656	421	1274		256	1069	
Starvation Cap Reductn	0	0	0	0	0	0	0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	0		0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	0		0	0	
Reduced v/c Ratio	0.62	0.37	0.49	0.47	0.66	0.20	0.75	0.58		0.57	0.64	

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 82.7
Natural Cycle: 90
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.77
Intersection Signal Delay: 32.2 Intersection LOS: C
Intersection Capacity Utilization 66.8% ICU Level of Service C
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 8: 9th St



Lanes, Volumes, Timings
22: Sheyenne St & 13th Ave

9/14/2018

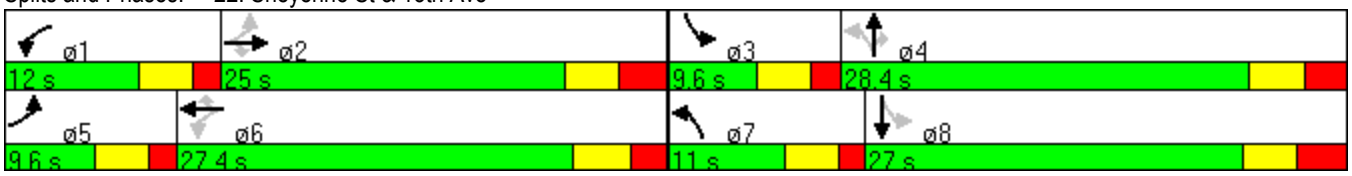
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	15	295	185	240	335	115	190	275	180	130	370	30
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	240		200	415		0	230		230	132		0
Storage Lanes	1		1	1		1	1		1	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850			0.850			0.850		0.989	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1660	1748	1485	1644	1731	1471	1676	1765	1500	1644	1712	0
Flt Permitted	0.526			0.344			0.196			0.498		
Satd. Flow (perm)	919	1748	1485	595	1731	1471	346	1765	1500	862	1712	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			201			125			196		5	
Link Speed (mph)		25			35			30			25	
Link Distance (ft)		646			849			723			965	
Travel Time (s)		17.6			16.5			16.4			26.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	3%	3%	4%	4%	4%	2%	2%	2%	4%	4%	4%
Adj. Flow (vph)	16	321	201	261	364	125	207	299	196	141	402	33
Shared Lane Traffic (%)												
Lane Group Flow (vph)	16	321	201	261	364	125	207	299	196	141	435	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane					Yes						Yes	
Headway Factor	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2	1	1	2	1	1	2	
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	
Leading Detector (ft)	20	100	20	20	100	20	20	100	20	20	100	
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	
Detector 1 Position(ft)	0	0	0	0	0	0	0	0	0	0	0	
Detector 1 Size(ft)	20	6	20	20	6	20	20	6	20	20	6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases	2		2	6		6	4		4	8		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	5	2	2	1	6	6	7	4	4	3	8	
Switch Phase												
Minimum Initial (s)	5.0	7.0	7.0	5.0	7.0	7.0	5.0	15.0	15.0	5.0	15.0	
Minimum Split (s)	9.6	23.7	23.7	9.5	23.3	23.3	9.5	27.6	27.6	9.6	26.9	
Total Split (s)	9.6	25.0	25.0	12.0	27.4	27.4	11.0	28.4	28.4	9.6	27.0	
Total Split (%)	12.8%	33.3%	33.3%	16.0%	36.5%	36.5%	14.7%	37.9%	37.9%	12.8%	36.0%	
Maximum Green (s)	5.0	19.3	19.3	7.5	22.1	22.1	6.5	22.8	22.8	5.0	21.1	
Yellow Time (s)	3.0	3.0	3.0	3.0	3.2	3.2	3.0	3.2	3.2	3.0	3.0	
All-Red Time (s)	1.6	2.7	2.7	1.5	2.1	2.1	1.5	2.4	2.4	1.6	2.9	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	4.6	5.7	5.7	4.5	5.3	5.3	4.5	5.6	5.6	4.6	5.9	
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	Max	Max	None	Max	Max	None	None	None	None	None	
Walk Time (s)		5.0	5.0		5.0	5.0		5.0	5.0		5.0	
Flash Dont Walk (s)		13.0	13.0		13.0	13.0		17.0	17.0		16.0	
Pedestrian Calls (#/hr)		0	0		0	0		0	0		0	
Act Effct Green (s)	25.4	19.3	19.3	32.1	29.8	29.8	30.3	24.1	24.1	26.7	20.4	
Actuated g/C Ratio	0.34	0.26	0.26	0.43	0.40	0.40	0.41	0.32	0.32	0.36	0.27	
v/c Ratio	0.04	0.71	0.38	0.72	0.52	0.19	0.80	0.52	0.32	0.39	0.92	
Control Delay	12.9	35.3	6.0	28.9	21.9	4.7	40.4	25.3	4.9	17.1	53.5	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	12.9	35.3	6.0	28.9	21.9	4.7	40.4	25.3	4.9	17.1	53.5	
LOS	B	D	A	C	C	A	D	C	A	B	D	
Approach Delay		23.7			21.5			24.1			44.6	
Approach LOS		C			C			C			D	
Queue Length 50th (ft)	4	136	0	79	119	0	58	116	0	38	192	
Queue Length 95th (ft)	15	#245	48	#167	#253	36	#144	192	43	72	#360	
Internal Link Dist (ft)		566			769			643			885	
Turn Bay Length (ft)	240		200	415			230		230	132		
Base Capacity (vph)	364	454	534	363	694	665	258	573	618	362	490	
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.04	0.71	0.38	0.72	0.52	0.19	0.80	0.52	0.32	0.39	0.89	

Intersection Summary

Area Type: Other
Cycle Length: 75
Actuated Cycle Length: 74.3
Natural Cycle: 75
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.92
Intersection Signal Delay: 27.8 Intersection LOS: C
Intersection Capacity Utilization 81.2% ICU Level of Service D
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 22: Sheyenne St & 13th Ave



Lanes, Volumes, Timings
23: 1st St & 13th Ave

9/14/2018

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	20	560	5	30	640	40	5	25	20	40	50	25
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	100		0	100		0	0		0	0		0
Storage Lanes	1		0	1		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.999			0.991			0.945			0.971	
Flt Protected	0.950			0.950				0.995			0.983	
Satd. Flow (prot)	1676	3350	0	1676	3323	0	0	1659	0	0	1684	0
Flt Permitted	0.950			0.950				0.995			0.983	
Satd. Flow (perm)	1676	3350	0	1676	3323	0	0	1659	0	0	1684	0
Link Speed (mph)		35			35			25			25	
Link Distance (ft)		849			489			370			658	
Travel Time (s)		16.5			9.5			10.1			17.9	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	22	609	5	33	696	43	5	27	22	43	54	27
Shared Lane Traffic (%)												
Lane Group Flow (vph)	22	614	0	33	739	0	0	54	0	0	124	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane		Yes			Yes							
Headway Factor	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Free			Free			Stop			Stop	

Intersection Summary

Area Type: Other
Control Type: Unsignalized
Intersection Capacity Utilization 46.4% ICU Level of Service A
Analysis Period (min) 15

Lanes, Volumes, Timings
24: 6th St & 13th Ave

9/14/2018

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	10	645	20	80	725	35	35	30	50	40	25	10
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	140		0	92		0	100		100	100		0
Storage Lanes	1		0	1		0	1		1	1		0
Taper Length (ft)	25			80			50			50		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.995			0.993				0.850		0.957	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1676	3336	0	1676	3329	0	1676	1765	1500	1676	1689	0
Flt Permitted	0.341			0.377			0.816			0.851		
Satd. Flow (perm)	602	3336	0	665	3329	0	1440	1765	1500	1502	1689	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		6			10				54		11	
Link Speed (mph)		35			35			25			25	
Link Distance (ft)		489			566			615			526	
Travel Time (s)		9.5			11.0			16.8			14.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	11	701	22	87	788	38	38	33	54	43	27	11
Shared Lane Traffic (%)												
Lane Group Flow (vph)	11	723	0	87	826	0	38	33	54	43	38	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane		Yes										
Headway Factor	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2	1	1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru	Right	Left	Thru	
Leading Detector (ft)	20	100		20	100		20	100	20	20	100	
Trailing Detector (ft)	0	0		0	0		0	0	0	0	0	
Detector 1 Position(ft)	0	0		0	0		0	0	0	0	0	
Detector 1 Size(ft)	20	6		20	6		20	6	20	20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4		4	8		
Detector Phase	2	2		6	6		4	4	4	8	8	

Lanes, Volumes, Timings
24: 6th St & 13th Ave

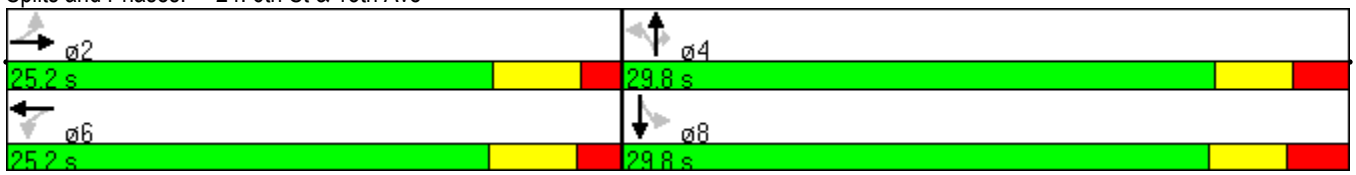
9/14/2018

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Switch Phase												
Minimum Initial (s)	15.0	15.0		15.0	15.0		7.0	7.0	7.0	7.0	7.0	
Minimum Split (s)	24.3	24.3		22.5	22.5		27.6	27.6	27.6	29.8	29.8	
Total Split (s)	25.2	25.2		25.2	25.2		29.8	29.8	29.8	29.8	29.8	
Total Split (%)	45.8%	45.8%		45.8%	45.8%		54.2%	54.2%	54.2%	54.2%	54.2%	
Maximum Green (s)	19.9	19.9		19.7	19.7		24.2	24.2	24.2	24.0	24.0	
Yellow Time (s)	3.6	3.6		3.6	3.6		3.2	3.2	3.2	3.2	3.2	
All-Red Time (s)	1.7	1.7		1.9	1.9		2.4	2.4	2.4	2.6	2.6	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.3	5.3		5.5	5.5		5.6	5.6	5.6	5.8	5.8	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Recall Mode	Max	Max		Max	Max		None	None	None	None	None	
Walk Time (s)	5.0	5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	
Flash Dont Walk (s)	14.0	14.0		12.0	12.0		17.0	17.0	17.0	19.0	19.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0	0	0	0	
Act Effct Green (s)	27.9	27.9		27.7	27.7		7.5	7.5	7.5	7.4	7.4	
Actuated g/C Ratio	0.71	0.71		0.70	0.70		0.19	0.19	0.19	0.19	0.19	
v/c Ratio	0.03	0.31		0.19	0.35		0.14	0.10	0.16	0.15	0.12	
Control Delay	5.1	4.9		6.5	5.2		14.0	13.3	6.3	14.3	11.4	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay	5.1	4.9		6.5	5.2		14.0	13.3	6.3	14.3	11.4	
LOS	A	A		A	A		B	B	A	B	B	
Approach Delay		4.9			5.3			10.5			12.9	
Approach LOS		A			A			B			B	
Queue Length 50th (ft)	1	40		9	48		7	6	0	8	5	
Queue Length 95th (ft)	6	74		30	87		23	20	18	25	20	
Internal Link Dist (ft)		409			486			535			446	
Turn Bay Length (ft)	140			92			100		100	100		
Base Capacity (vph)	427	2367		470	2353		887	1088	945	918	1036	
Starvation Cap Reductn	0	0		0	0		0	0	0	0	0	
Spillback Cap Reductn	0	0		0	0		0	0	0	0	0	
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	
Reduced v/c Ratio	0.03	0.31		0.19	0.35		0.04	0.03	0.06	0.05	0.04	

Intersection Summary

Area Type: Other
Cycle Length: 55
Actuated Cycle Length: 39.3
Natural Cycle: 55
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.35
Intersection Signal Delay: 5.8 — Intersection LOS: A
Intersection Capacity Utilization 57.7% — ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 24: 6th St & 13th Ave



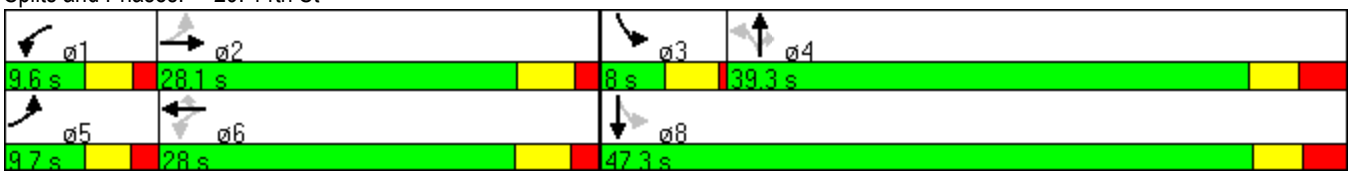
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	40	515	35	55	645	95	60	25	75	85	30	45
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	285		0	175		213	0		0	0		0
Storage Lanes	1		0	1		1	0		1	1		0
Taper Length (ft)	120			100			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.990				0.850			0.850		0.910	
Flt Protected	0.950			0.950				0.966		0.950		
Satd. Flow (prot)	1644	3256	0	1629	3257	1457	0	1688	1485	1569	1503	0
Flt Permitted	0.353			0.388				0.739		0.465		
Satd. Flow (perm)	611	3256	0	665	3257	1457	0	1291	1485	768	1503	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		8				103			82		49	
Link Speed (mph)		35			35			30			30	
Link Distance (ft)		935			658			457			346	
Travel Time (s)		18.2			12.8			10.4			7.9	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	4%	4%	4%	5%	5%	5%	3%	3%	3%	9%	9%	9%
Adj. Flow (vph)	43	560	38	60	701	103	65	27	82	92	33	49
Shared Lane Traffic (%)												
Lane Group Flow (vph)	43	598	0	60	701	103	0	92	82	92	82	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2	1	1	2	1	1	2	
Detector Template	Left	Thru		Left	Thru	Right	Left	Thru	Right	Left	Thru	
Leading Detector (ft)	20	100		20	100	20	20	100	20	20	100	
Trailing Detector (ft)	0	0		0	0	0	0	0	0	0	0	
Detector 1 Position(ft)	0	0		0	0	0	0	0	0	0	0	
Detector 1 Size(ft)	20	6		20	6	20	20	6	20	20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA		pm+pt	NA	Perm	Perm	NA	Perm	pm+pt	NA	
Protected Phases	5	2		1	6			4		3	8	
Permitted Phases	2			6		6	4		4	8		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	5	2		1	6	6	4	4	4	3	8	
Switch Phase												
Minimum Initial (s)	5.0	15.0		5.0	15.0	15.0	7.0	7.0	7.0	4.0	7.0	
Minimum Split (s)	9.7	24.3		9.5	26.5	26.5	39.3	39.3	39.3	8.0	38.1	
Total Split (s)	9.7	28.1		9.6	28.0	28.0	39.3	39.3	39.3	8.0	47.3	
Total Split (%)	11.4%	33.1%		11.3%	32.9%	32.9%	46.2%	46.2%	46.2%	9.4%	55.6%	
Maximum Green (s)	5.0	22.8		5.1	22.5	22.5	33.0	33.0	33.0	4.0	41.2	
Yellow Time (s)	3.0	3.6		3.0	3.6	3.6	3.2	3.2	3.2	3.5	3.2	
All-Red Time (s)	1.7	1.7		1.5	1.9	1.9	3.1	3.1	3.1	0.5	2.9	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0		0.0	0.0	0.0	0.0	
Total Lost Time (s)	4.7	5.3		4.5	5.5	5.5		6.3	6.3	4.0	6.1	
Lead/Lag	Lead	Lag		Lead	Lag	Lag	Lag	Lag	Lag	Lead		
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes		
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	Max		None	Max	Max	None	None	None	None	None	
Walk Time (s)		5.0			5.0	5.0	5.0	5.0	5.0		5.0	
Flash Dont Walk (s)		14.0			16.0	16.0	28.0	28.0	28.0		27.0	
Pedestrian Calls (#/hr)		0			0	0	0	0	0		0	
Act Effct Green (s)	30.6	28.7		31.7	30.3	30.3		9.6	9.6	16.7	15.9	
Actuated g/C Ratio	0.54	0.51		0.56	0.54	0.54		0.17	0.17	0.30	0.28	
v/c Ratio	0.10	0.36		0.13	0.40	0.12		0.42	0.26	0.32	0.18	
Control Delay	8.5	14.1		8.5	13.6	4.3		29.1	8.5	17.6	9.5	
Queue Delay	0.0	0.0		0.0	0.0	0.0		0.0	0.0	0.0	0.0	
Total Delay	8.5	14.1		8.5	13.6	4.3		29.1	8.5	17.6	9.5	
LOS	A	B		A	B	A		C	A	B	A	
Approach Delay		13.7			12.2			19.4			13.8	
Approach LOS		B			B			B			B	
Queue Length 50th (ft)	7	85		10	75	0		32	0	24	9	
Queue Length 95th (ft)	22	141		28	173	28		70	31	53	36	
Internal Link Dist (ft)		855			578			377			266	
Turn Bay Length (ft)	285			175		213						
Base Capacity (vph)	424	1655		461	1742	827		771	920	285	1134	
Starvation Cap Reductn	0	0		0	0	0		0	0	0	0	
Spillback Cap Reductn	0	0		0	0	0		0	0	0	0	
Storage Cap Reductn	0	0		0	0	0		0	0	0	0	
Reduced v/c Ratio	0.10	0.36		0.13	0.40	0.12		0.12	0.09	0.32	0.07	

Intersection Summary

Area Type: Other
Cycle Length: 85
Actuated Cycle Length: 56.6
Natural Cycle: 85
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.42
Intersection Signal Delay: 13.5 Intersection LOS: B
Intersection Capacity Utilization 48.3% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 29: 14th St



Intersection	
Intersection Delay (sec/veh):	8.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Volume (vph)	15	745	15	55	820	5	30	5	50	35	10	50
Conflicting Peds.(#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
Right Turn Channelized	None	None	None	None	None	None	None	None	None	None	None	None
Storage Length	130		0	150		0	0		0	0		0
Median Width		12			12			0			0	
Grade (%)		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles(%)	2	2	2	2	2	2	2	2	2	2	2	2
Movement Flow Rate	16	810	16	60	891	5	33	5	54	38	11	54
Number of Lanes	1	2	0	1	2	0	0	1	0	0	1	0

Major/Minor	Major 1			Major 2			Minor 1			Minor 1		
Conflicting Flow Rate - All	897	0	0	826	0	0	1422	1867	413	1454	1873	448
Stage 1	0	0	0	0	0	0	851	851	0	1014	1014	0
Stage 2	0	0	0	0	0	0	571	1016	0	440	859	0
Follow-up Headway	2.22	-	-	2.22	0	0	3.52	4.02	3.32	3.52	4.02	3.32
Pot Capacity-1 Maneuver	752	-	-	801	-	-	96	72	588	91	71	558
Stage 1	-	-	-	-	-	-	321	375	-	256	314	-
Stage 2	-	-	-	-	-	-	473	314	-	566	371	-
Mov Capacity-1 Maneuver	752	-	-	801	-	-	70	65.1	588	71.7	64.2	558
Mov Capacity-2 Maneuver	-	-	-	-	-	-	70	65.1	-	71.7	64.2	-
Stage 1	-	-	-	-	-	-	321	366.8	-	256	290.5	-
Stage 2	-	-	-	-	-	-	380.1	290.5	-	494.9	362.8	-

Approach	EB	WB	NB	SB
HCM Control Delay (s)	0.2	0.6	66.5	96.1
HCM LOS	A	A	F	F

Lane	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (vph)	144							130
HCM Control Delay (s)	66.5	9.893	-	-	9.857	-	-	96.1
HCM Lane VC Ratio	0.642	0.022	-	-	0.075	-	-	0.794
HCM Lane LOS	F	A	-	-	A	-	-	F
HCM 95th Percentile Queue (veh)	3.486	0.066	-	-	0.241	-	-	4.772

Intersection	
Intersection Delay (sec/veh):	1.3

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Volume (vph)	310	20	65	260	10	20
Conflicting Peds.(#/hr)	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
Right Turn Channelized	None	None	None	None	None	None
Storage Length		0	0		0	0
Median Width	12			12	12	
Grade (%)	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles(%)	2	2	2	2	2	2
Movement Flow Rate	337	22	71	283	11	22
Number of Lanes	1	0	0	1	1	0

Major/Minor	Major 1			Major 2		
Conflicting Flow Rate - All	0	0	359	0	772	348
Stage 1	0	0	0	0	348	0
Stage 2	0	0	0	0	424	0
Follow-up Headway	-	-	2.218	0	3.518	3.318
Pot Capacity-1 Maneuver	-	-	1200	-	368	695
Stage 1	-	-	-	-	715	-
Stage 2	-	-	-	-	660	-
Mov Capacity-1 Maneuver	-	-	1200	-	346.3	695
Mov Capacity-2 Maneuver	-	-	-	-	346.3	-
Stage 1	-	-	-	-	# 0	-
Stage 2	-	-	-	-	621.1	-

Approach	EB	WB	NB
HCM Control Delay (s)	0	1.6	12.4
HCM LOS	A	A	B

Lane	NBLn1	EBT	EBR	WBL	WBT
Capacity (vph)	520				
HCM Control Delay (s)	12.4	-	-	8.188	0
HCM Lane VC Ratio	0.063	0	-	0.059	-
HCM Lane LOS	B	-	-	A	-
HCM 95th Percentile Queue (veh)	0.2	0	-	0.187	-

Intersection	
Intersection Delay, s/veh	2.219957906527E-314

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Volume (vph)	20	305	5	55	290	185	5	15	30	140	70	30
Conflicting Peds.(#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Right Turn Channelized	None	None	None	None	None	None	None	None	None	None	None	None
Storage Length	215		0	190		0	0		0	60		0
Median Width		12			12			12			12	
Grade (%)		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles(%)	2	2	2	2	2	2	2	2	2	2	2	2
Movement Flow Rate	22	332	5	60	315	201	5	16	33	152	76	33
Number of Lanes	1	1	0	1	1	0	0	1	0	1	1	0

Major/Minor	Lane
Conflicting Flow Rate - All	Capacity (vph)
Stage 1	HCM Control Delay (s)
Stage 2	HCM Lane VC Ratio
Follow-up Headway	HCM Lane LOS
Pot Capacity-1 Maneuver	HCM 95th Percentile Queue (veh)
Stage 1	
Stage 2	
Mov Capacity-1 Maneuver	
Mov Capacity-2 Maneuver	
Stage 1	
Stage 2	

Approach
HCM Control Delay (s)
HCM LOS

Intersection	
Intersection Delay (sec/veh):	9.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Volume (vph)	20	560	5	30	640	40	5	25	20	40	50	25
Conflicting Peds.(#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
Right Turn Channelized	None	None	None	None	None	None	None	None	None	None	None	None
Storage Length	100		0	100		0	0		0	0		0
Median Width		12			12			0			0	
Grade (%)		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles(%)	2	2	2	2	2	2	2	2	2	2	2	2
Movement Flow Rate	22	609	5	33	696	43	5	27	22	43	54	27
Number of Lanes	1	2	0	1	2	0	0	1	0	0	1	0

Major/Minor	Major 1			Major 2			Minor 1			Minor 1		
Conflicting Flow Rate - All	739	0	0	614	0	0	1095	1459	307	1144	1441	370
Stage 1	0	0	0	0	0	0	655	655	0	783	783	0
Stage 2	0	0	0	0	0	0	440	804	0	361	658	0
Follow-up Headway	2.22	-	-	2.22	0	0	3.52	4.02	3.32	3.52	4.02	3.32
Pot Capacity-1 Maneuver	863	-	-	961	-	-	168	128	689	155	131	628
Stage 1	-	-	-	-	-	-	421	461	-	353	403	-
Stage 2	-	-	-	-	-	-	566	394	-	630	459	-
Mov Capacity-1 Maneuver	863	-	-	961	-	-	101.1	120.6	689	118.8	123.4	628
Mov Capacity-2 Maneuver	-	-	-	-	-	-	101.1	120.6	-	118.8	123.4	-
Stage 1	-	-	-	-	-	-	421	449.5	-	353	389.3	-
Stage 2	-	-	-	-	-	-	450.1	380.6	-	558.9	447.5	-

Approach	EB	WB	NB	SB
HCM Control Delay (s)	0.3	0.4	34.6	98.3
HCM LOS	A	A	D	F

Lane	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (vph)	175							147
HCM Control Delay (s)	34.6	9.279	-	-	8.878	-	-	98.3
HCM Lane VC Ratio	0.311	0.025	-	-	0.034	-	-	0.85
HCM Lane LOS	D	A	-	-	A	-	-	F
HCM 95th Percentile Queue (veh)	1.248	0.077	-	-	0.105	-	-	5.608

Intersection	
Intersection Delay (sec/veh):	6.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Volume (vph)	35	600	40	140	760	40	5	10	50	20	15	30
Conflicting Peds.(#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
Right Turn Channelized	None	None	None	None	None	None	None	None	None	None	None	None
Storage Length	200		0	180		0	0		0	0		0
Median Width		12			12			0			0	
Grade (%)		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles(%)	2	2	2	2	2	2	2	2	2	2	2	2
Movement Flow Rate	38	652	43	152	826	43	5	11	54	22	16	33
Number of Lanes	1	2	0	1	2	0	0	1	0	0	1	1

Major/Minor		Major 1			Major 2			Minor 1			Minor 1	
Conflicting Flow Rate - All	870	0	0	696	0	0	1476	1924	348	1560	1924	435
Stage 1	0	0	0	0	0	0	750	750	0	1152	1152	0
Stage 2	0	0	0	0	0	0	726	1174	0	408	772	0
Follow-up Headway	2.22	-	-	2.22	0	0	3.52	4.02	3.32	3.52	4.02	3.32
Pot Capacity-1 Maneuver	770	-	-	896	-	-	88	66	648	76	66	569
Stage 1	-	-	-	-	-	-	369	417	-	210	270	-
Stage 2	-	-	-	-	-	-	382	264	-	591	407	-
Mov Capacity-1 Maneuver	770	-	-	896	-	-	53.2	52.1	648	49.3	52.1	569
Mov Capacity-2 Maneuver	-	-	-	-	-	-	53.2	52.1	-	49.3	52.1	-
Stage 1	-	-	-	-	-	-	369	396.6	-	210	224.1	-
Stage 2	-	-	-	-	-	-	277.1	219.1	-	500.8	387.1	-

Approach	EB	WB	NB	SB
HCM Control Delay (s)	0.5	1.5	37.6	107.277
HCM LOS	A	A	E	F

Lane	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (vph)	179							50	569
HCM Control Delay (s)	37.6	9.918	-	-	9.838	-	-	189.2	11.7
HCM Lane VC Ratio	0.395	0.049	-	-	0.17	-	-	0.761	0.057
HCM Lane LOS	E	A	-	-	A	-	-	F	B
HCM 95th Percentile Queue (veh)	1.734	0.156	-	-	0.61	-	-	3.103	0.182

Intersection	
Intersection Delay (sec/veh)	23.1
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Volume (vph)	20	305	5	55	290	185	5	15	30	140	70	30
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles(%)	2	2	2	2	2	2	2	2	2	2	2	2
Movement Flow Rate	22	332	5	60	315	201	5	16	33	152	76	33
Number of Lanes	1	1	0	1	1	0	0	1	0	1	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	2	2	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	1	2	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	2	2	2
HCM Control Delay	18.4	31.5	11.7	13.2
HCM LOS	C	D	B	B

Lane	NBLn1	EBLn1	EBLn2	WBLn1	WBLn2	SBLn1	SBLn2
Volume Left (%)	10%	100%	0%	100%	0%	100%	0%
Volume Thru (%)	30%	0%	98%	0%	61%	0%	70%
Volume Right (%)	60%	0%	2%	0%	39%	0%	30%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Volume by Lane	50	20	310	55	475	140	100
Left Turning Volume	15	0	305	0	290	0	70
Through Volume	30	0	5	0	185	0	30
Right Turning Volume	5	20	0	55	0	140	0
Lane Flow Rate	54	22	337	60	516	152	109
Geometry Group	6	7	7	7	7	7	7
Degree of Utilization, X	0.116	0.042	0.606	0.112	0.852	0.327	0.211
Departure Headway, Hd	7.674	6.997	6.476	6.725	5.94	7.826	7
Convergence(Y/N)	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Capacity	470	508	553	530	604	463	509
Service Time	5.674	4.793	4.272	4.509	3.723	5.526	4.8
HCM Lane V/C Ratio	0.115	0.043	0.609	0.113	0.854	0.328	0.214
HCM Control Delay	11.7	10.1	18.9	10.4	33.9	14.3	11.7
HCM Lane LOS	B	B	C	B	D	B	B
HCM 95th Percentile Queue	0.4	0.1	4.6	0.4	16.8	1.5	0.8

Lanes, Volumes, Timings
5: 15th & Main Ave

9/14/2018

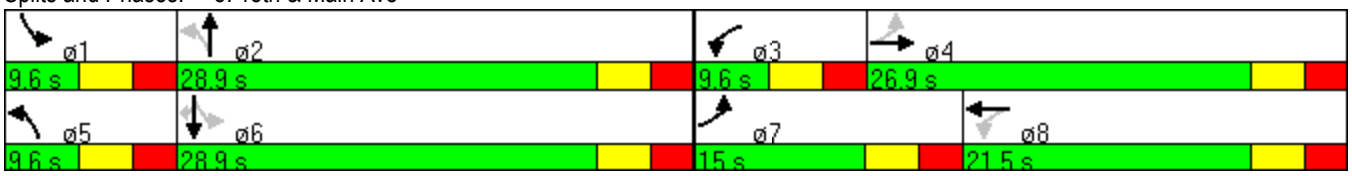
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	240	465	175	60	510	30	125	155	15	120	195	395
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	200		0	200		0	200		160	200		0
Storage Lanes	1		0	1		0	1		0	1		1
Taper Length (ft)	100			100			100			100		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.959			0.992			0.987				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1613	3094	0	1613	3201	0	1613	1676	0	1613	1698	1443
Flt Permitted	0.239			0.387			0.562			0.620		
Satd. Flow (perm)	406	3094	0	657	3201	0	954	1676	0	1053	1698	1443
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		73			7			7				296
Link Speed (mph)		30			30			25			25	
Link Distance (ft)		769			603			1224			442	
Travel Time (s)		17.5			13.7			33.4			12.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%
Adj. Flow (vph)	261	505	190	65	554	33	136	168	16	130	212	429
Shared Lane Traffic (%)												
Lane Group Flow (vph)	261	695	0	65	587	0	136	184	0	130	212	429
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	1
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	Right
Leading Detector (ft)	20	100		20	100		20	100		20	100	20
Trailing Detector (ft)	0	0		0	0		0	0		0	0	0
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	0
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8			2			6		6

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	7	4		3	8		5	2		1	6	6
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Minimum Split (s)	9.5	21.5		9.5	21.5		9.5	27.5		9.5	27.5	27.5
Total Split (s)	15.0	26.9		9.6	21.5		9.6	28.9		9.6	28.9	28.9
Total Split (%)	20.0%	35.9%		12.8%	28.7%		12.8%	38.5%		12.8%	38.5%	38.5%
Maximum Green (s)	9.5	21.4		4.1	16.0		4.1	23.4		4.1	23.4	23.4
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
All-Red Time (s)	2.5	2.5		2.5	2.5		2.5	2.5		2.5	2.5	2.5
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	5.5	5.5		5.5	5.5		5.5	5.5		5.5	5.5	5.5
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Recall Mode	None	None		None	None		None	Min		None	Min	Min
Walk Time (s)		5.0			5.0			5.0			5.0	5.0
Flash Dont Walk (s)		11.0			11.0			17.0			17.0	17.0
Pedestrian Calls (#/hr)		0			0			0			0	0
Act Effct Green (s)	30.6	25.4		19.4	15.1		18.3	15.2		18.3	15.2	15.2
Actuated g/C Ratio	0.48	0.39		0.30	0.23		0.28	0.24		0.28	0.24	0.24
v/c Ratio	0.69	0.55		0.25	0.77		0.43	0.46		0.39	0.53	0.76
Control Delay	26.2	18.9		15.5	33.2		19.7	24.6		18.5	27.0	17.1
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Delay	26.2	18.9		15.5	33.2		19.7	24.6		18.5	27.0	17.1
LOS	C	B		B	C		B	C		B	C	B
Approach Delay		20.9			31.4			22.5			20.1	
Approach LOS		C			C			C			C	
Queue Length 50th (ft)	65	113		14	116		37	63		35	77	46
Queue Length 95th (ft)	#177	199		41	#224		71	115		69	135	143
Internal Link Dist (ft)		689			523			1144			362	
Turn Bay Length (ft)	200			200			200			200		
Base Capacity (vph)	377	1266		260	828		314	634		336	638	727
Starvation Cap Reductn	0	0		0	0		0	0		0	0	0
Spillback Cap Reductn	0	0		0	0		0	0		0	0	0
Storage Cap Reductn	0	0		0	0		0	0		0	0	0
Reduced v/c Ratio	0.69	0.55		0.25	0.71		0.43	0.29		0.39	0.33	0.59

Intersection Summary

Area Type: Other
Cycle Length: 75
Actuated Cycle Length: 64.4
Natural Cycle: 75
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.77
Intersection Signal Delay: 23.4 Intersection LOS: C
Intersection Capacity Utilization 66.4% ICU Level of Service C
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 5: 15th & Main Ave



Lanes, Volumes, Timings
5: Main Ave & CR 28 / 15th St

11/28/2018

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	225	505	95	15	275	70	120	85	25	45	85	210
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	200		0	200		0	200		160	200		0
Storage Lanes	1		0	1		0	0		1	0		0
Taper Length (ft)	100			100			100			100		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.976			0.970				0.850		0.917	
Flt Protected	0.950			0.950				0.972			0.993	
Satd. Flow (prot)	1613	3149	0	1613	3130	0	0	1651	1443	0	1546	0
Flt Permitted	0.397			0.404				0.554			0.923	
Satd. Flow (perm)	674	3149	0	686	3130	0	0	941	1443	0	1437	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		36			51				27		153	
Link Speed (mph)		30			30			25			25	
Link Distance (ft)		769			603			1224			442	
Travel Time (s)		17.5			13.7			33.4			12.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%
Adj. Flow (vph)	245	549	103	16	299	76	130	92	27	49	92	228
Shared Lane Traffic (%)												
Lane Group Flow (vph)	245	652	0	16	375	0	0	222	27	0	369	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2	1	1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru	Right	Left	Thru	
Leading Detector (ft)	20	100		20	100		20	100	20	20	100	
Trailing Detector (ft)	0	0		0	0		0	0	0	0	0	
Detector 1 Position(ft)	0	0		0	0		0	0	0	0	0	
Detector 1 Size(ft)	20	6		20	6		20	6	20	20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA	Perm	Perm	NA	
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4			8			2		2	6		

Lanes, Volumes, Timings
5: Main Ave & CR 28 / 15th St

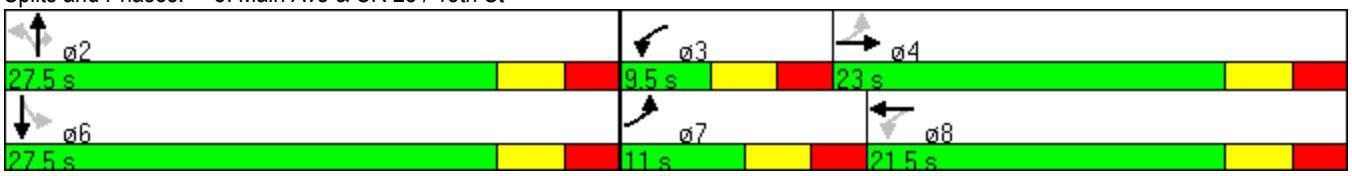
11/28/2018

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	7	4		3	8		2	2	2	6	6	
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Minimum Split (s)	9.5	21.5		9.5	21.5		27.5	27.5	27.5	27.5	27.5	
Total Split (s)	11.0	23.0		9.5	21.5		27.5	27.5	27.5	27.5	27.5	
Total Split (%)	18.3%	38.3%		15.8%	35.8%		45.8%	45.8%	45.8%	45.8%	45.8%	
Maximum Green (s)	5.5	17.5		4.0	16.0		22.0	22.0	22.0	22.0	22.0	
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
All-Red Time (s)	2.5	2.5		2.5	2.5		2.5	2.5	2.5	2.5	2.5	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0	0.0		0.0	
Total Lost Time (s)	5.5	5.5		5.5	5.5			5.5	5.5		5.5	
Lead/Lag	Lead	Lag		Lead	Lag							
Lead-Lag Optimize?	Yes	Yes		Yes	Yes							
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	Min		None	Min		None	None	None	None	None	
Walk Time (s)		5.0			5.0		5.0	5.0	5.0	5.0	5.0	
Flash Dont Walk (s)		11.0			11.0		17.0	17.0	17.0	17.0	17.0	
Pedestrian Calls (#/hr)		0			0		0	0	0	0	0	
Act Effct Green (s)	21.4	20.5		14.8	10.7			15.3	15.3		15.3	
Actuated g/C Ratio	0.44	0.42		0.30	0.22			0.31	0.31		0.31	
v/c Ratio	0.60	0.48		0.06	0.52			0.75	0.06		0.66	
Control Delay	19.7	13.1		9.9	17.7			33.0	5.9		14.9	
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0		0.0	
Total Delay	19.7	13.1		9.9	17.7			33.0	5.9		14.9	
LOS	B	B		A	B			C	A		B	
Approach Delay		14.9			17.4			30.1			14.9	
Approach LOS		B			B			C			B	
Queue Length 50th (ft)	42	58		2	42			53	0		47	
Queue Length 95th (ft)	#125	154		12	84			#155	13		134	
Internal Link Dist (ft)		689			523			1144			362	
Turn Bay Length (ft)	200			200					160			
Base Capacity (vph)	406	1347		287	1095			439	687		752	
Starvation Cap Reductn	0	0		0	0			0	0		0	
Spillback Cap Reductn	0	0		0	0			0	0		0	
Storage Cap Reductn	0	0		0	0			0	0		0	
Reduced v/c Ratio	0.60	0.48		0.06	0.34			0.51	0.04		0.49	

Intersection Summary

Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 48.6
Natural Cycle: 60
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.75
Intersection Signal Delay: 17.4 Intersection LOS: B
Intersection Capacity Utilization 74.3% ICU Level of Service D
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 5: Main Ave & CR 28 / 15th St



Intersection	
Intersection Delay (sec/veh):	1.9

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Volume (vph)	215	5	10	185	15	70
Conflicting Peds.(#/hr)	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
Right Turn Channelized	None	None	None	None	None	None
Storage Length		0	0		0	0
Median Width	12			12	12	
Grade (%)	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles(%)	2	2	2	2	2	2
Movement Flow Rate	234	5	11	201	16	76
Number of Lanes	1	0	0	1	1	0

Major/Minor	Major 1			Major 2		
Conflicting Flow Rate - All	0	0	239	0	459	236
Stage 1	0	0	0	0	236	0
Stage 2	0	0	0	0	223	0
Follow-up Headway	-	-	2.218	0	3.518	3.318
Pot Capacity-1 Maneuver	-	-	1329	-	560	801
Stage 1	-	-	-	-	803	-
Stage 2	-	-	-	-	814	-
Mov Capacity-1 Maneuver	-	-	1329	-	555.5	801
Mov Capacity-2 Maneuver	-	-	-	-	555.5	-
Stage 1	-	-	-	-	# 0	-
Stage 2	-	-	-	-	807.5	-

Approach	EB	WB	NB
HCM Control Delay (s)	0	0.4	10.5
HCM LOS	A	A	B

Lane	NBLn1	EBT	EBR	WBL	WBT
Capacity (vph)	743				
HCM Control Delay (s)	10.5	-	-	7.731	0
HCM Lane VC Ratio	0.124	0	-	0.008	-
HCM Lane LOS	B	-	-	A	-
HCM 95th Percentile Queue (veh)	0.424	0	-	0.025	-

Lanes, Volumes, Timings
5: Main Ave & CR 28 / 15th St

11/28/2018

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	240	465	175	60	510	30	125	155	15	120	195	395
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	200		0	200		0	200		160	200		0
Storage Lanes	1		0	1		0	0		1	0		0
Taper Length (ft)	100			100			100			100		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.959			0.992				0.850		0.925	
Flt Protected	0.950			0.950				0.978			0.992	
Satd. Flow (prot)	1613	3094	0	1613	3201	0	0	1661	1443	0	1558	0
Flt Permitted	0.180			0.290				0.494			0.845	
Satd. Flow (perm)	306	3094	0	492	3201	0	0	839	1443	0	1327	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		65			7				16		110	
Link Speed (mph)		30			30			25			25	
Link Distance (ft)		769			603			1224			442	
Travel Time (s)		17.5			13.7			33.4			12.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%
Adj. Flow (vph)	261	505	190	65	554	33	136	168	16	130	212	429
Shared Lane Traffic (%)												
Lane Group Flow (vph)	261	695	0	65	587	0	0	304	16	0	771	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2	1	1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru	Right	Left	Thru	
Leading Detector (ft)	20	100		20	100		20	100	20	20	100	
Trailing Detector (ft)	0	0		0	0		0	0	0	0	0	
Detector 1 Position(ft)	0	0		0	0		0	0	0	0	0	
Detector 1 Size(ft)	20	6		20	6		20	6	20	20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA	Perm	Perm	NA	
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4			8			2		2	6		

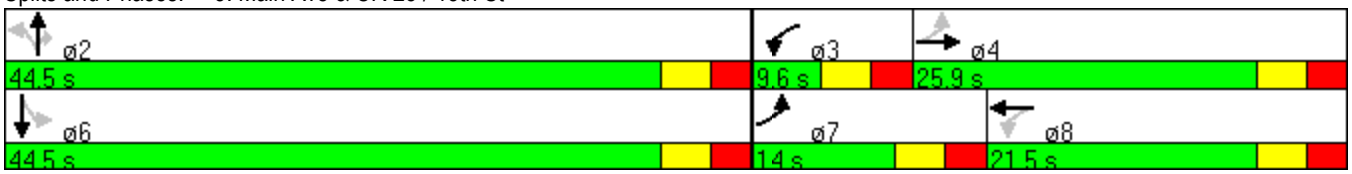
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	7	4		3	8		2	2	2	6	6	
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Minimum Split (s)	9.5	21.5		9.5	21.5		27.5	27.5	27.5	27.5	27.5	
Total Split (s)	14.0	25.9		9.6	21.5		44.5	44.5	44.5	44.5	44.5	
Total Split (%)	17.5%	32.4%		12.0%	26.9%		55.6%	55.6%	55.6%	55.6%	55.6%	
Maximum Green (s)	8.5	20.4		4.1	16.0		39.0	39.0	39.0	39.0	39.0	
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
All-Red Time (s)	2.5	2.5		2.5	2.5		2.5	2.5	2.5	2.5	2.5	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0	0.0		0.0	
Total Lost Time (s)	5.5	5.5		5.5	5.5			5.5	5.5		5.5	
Lead/Lag	Lead	Lag		Lead	Lag							
Lead-Lag Optimize?	Yes	Yes		Yes	Yes							
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	None		None	None		Min	Min	Min	Min	Min	
Walk Time (s)		5.0			5.0		5.0	5.0	5.0	5.0	5.0	
Flash Dont Walk (s)		11.0			11.0		17.0	17.0	17.0	17.0	17.0	
Pedestrian Calls (#/hr)		0			0		0	0	0	0	0	
Act Effct Green (s)	29.1	22.3		20.1	16.0			39.0	39.0		39.0	
Actuated g/C Ratio	0.36	0.28		0.25	0.20			0.49	0.49		0.49	
v/c Ratio	1.04	0.76		0.36	0.91			0.74	0.02		1.10	
Control Delay	93.8	31.5		23.2	51.6			30.3	5.3		83.8	
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0		0.0	
Total Delay	93.8	31.5		23.2	51.6			30.3	5.3		83.8	
LOS	F	C		C	D			C	A		F	
Approach Delay		48.5			48.7			29.0			83.8	
Approach LOS		D			D			C			F	
Queue Length 50th (ft)	~101	157		21	150			116	0		~414	
Queue Length 95th (ft)	#246	#246		47	#248			#255	9		#628	
Internal Link Dist (ft)		689			523			1144			362	
Turn Bay Length (ft)	200			200					160			
Base Capacity (vph)	250	909		181	646			409	712		703	
Starvation Cap Reductn	0	0		0	0			0	0		0	
Spillback Cap Reductn	0	0		0	0			0	0		0	
Storage Cap Reductn	0	0		0	0			0	0		0	
Reduced v/c Ratio	1.04	0.76		0.36	0.91			0.74	0.02		1.10	

Intersection Summary

Area Type: Other
Cycle Length: 80
Actuated Cycle Length: 80
Natural Cycle: 80
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.10
Intersection Signal Delay: 56.3 Intersection LOS: E
Intersection Capacity Utilization 107.6% ICU Level of Service G
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 5: Main Ave & CR 28 / 15th St



Intersection	
Intersection Delay (sec/veh):	1.3

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Volume (vph)	310	20	65	260	10	20
Conflicting Peds.(#/hr)	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
Right Turn Channelized	None	None	None	None	None	None
Storage Length		0	0		0	0
Median Width	12			12	12	
Grade (%)	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles(%)	2	2	2	2	2	2
Movement Flow Rate	337	22	71	283	11	22
Number of Lanes	1	0	0	1	1	0

Major/Minor	Major 1			Major 2		
Conflicting Flow Rate - All	0	0	359	0	772	348
Stage 1	0	0	0	0	348	0
Stage 2	0	0	0	0	424	0
Follow-up Headway	-	-	2.218	0	3.518	3.318
Pot Capacity-1 Maneuver	-	-	1200	-	368	695
Stage 1	-	-	-	-	715	-
Stage 2	-	-	-	-	660	-
Mov Capacity-1 Maneuver	-	-	1200	-	346.3	695
Mov Capacity-2 Maneuver	-	-	-	-	346.3	-
Stage 1	-	-	-	-	# 0	-
Stage 2	-	-	-	-	621.1	-

Approach	EB	WB	NB
HCM Control Delay (s)	0	1.6	12.4
HCM LOS	A	A	B

Lane	NBLn1	EBT	EBR	WBL	WBT
Capacity (vph)	520				
HCM Control Delay (s)	12.4	-	-	8.188	0
HCM Lane VC Ratio	0.063	0	-	0.059	-
HCM Lane LOS	B	-	-	A	-
HCM 95th Percentile Queue (veh)	0.2	0	-	0.187	-

Lanes, Volumes, Timings
5: 15th & Main Ave

11/28/2018

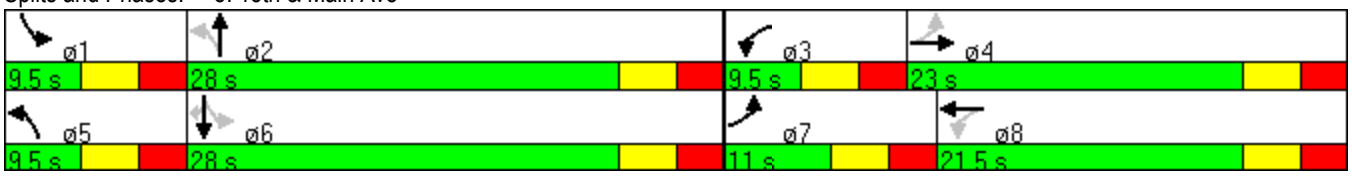
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	225	505	95	15	275	70	120	85	25	45	85	210
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	200		0	200		0	200		160	200		0
Storage Lanes	1		0	1		0	1		0	1		1
Taper Length (ft)	100			100			100			100		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.976			0.970			0.966				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1613	3149	0	1613	3130	0	1613	1640	0	1613	1698	1443
Flt Permitted	0.401			0.404			0.607			0.681		
Satd. Flow (perm)	681	3149	0	686	3130	0	1031	1640	0	1156	1698	1443
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		29			42			22				228
Link Speed (mph)		30			30			25			25	
Link Distance (ft)		769			603			1224			442	
Travel Time (s)		17.5			13.7			33.4			12.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%
Adj. Flow (vph)	245	549	103	16	299	76	130	92	27	49	92	228
Shared Lane Traffic (%)												
Lane Group Flow (vph)	245	652	0	16	375	0	130	119	0	49	92	228
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	1
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	Right
Leading Detector (ft)	20	100		20	100		20	100		20	100	20
Trailing Detector (ft)	0	0		0	0		0	0		0	0	0
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	0
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8			2			6		6

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	7	4		3	8		5	2		1	6	6
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Minimum Split (s)	9.5	21.5		9.5	21.5		9.5	27.5		9.5	27.5	27.5
Total Split (s)	11.0	23.0		9.5	21.5		9.5	28.0		9.5	28.0	28.0
Total Split (%)	15.7%	32.9%		13.6%	30.7%		13.6%	40.0%		13.6%	40.0%	40.0%
Maximum Green (s)	5.5	17.5		4.0	16.0		4.0	22.5		4.0	22.5	22.5
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
All-Red Time (s)	2.5	2.5		2.5	2.5		2.5	2.5		2.5	2.5	2.5
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	5.5	5.5		5.5	5.5		5.5	5.5		5.5	5.5	5.5
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Recall Mode	None	Min		None	Min		None	None		None	None	None
Walk Time (s)		5.0			5.0			5.0			5.0	5.0
Flash Dont Walk (s)		11.0			11.0			17.0			17.0	17.0
Pedestrian Calls (#/hr)		0			0			0			0	0
Act Effct Green (s)	21.6	20.7		15.0	10.8		13.8	12.4		11.5	8.5	8.5
Actuated g/C Ratio	0.44	0.42		0.30	0.22		0.28	0.25		0.23	0.17	0.17
v/c Ratio	0.60	0.49		0.06	0.52		0.39	0.28		0.16	0.31	0.52
Control Delay	20.0	13.6		9.9	18.6		17.0	16.7		13.3	22.4	8.3
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Delay	20.0	13.6		9.9	18.6		17.0	16.7		13.3	22.4	8.3
LOS	C	B		A	B		B	B		B	C	A
Approach Delay		15.3			18.2			16.9			12.5	
Approach LOS		B			B			B			B	
Queue Length 50th (ft)	45	64		3	45		26	19		9	24	0
Queue Length 95th (ft)	#127	157		12	87		65	69		30	63	48
Internal Link Dist (ft)		689			523			1144			362	
Turn Bay Length (ft)	200			200			200			200		
Base Capacity (vph)	406	1337		286	1081		337	787		309	803	803
Starvation Cap Reductn	0	0		0	0		0	0		0	0	0
Spillback Cap Reductn	0	0		0	0		0	0		0	0	0
Storage Cap Reductn	0	0		0	0		0	0		0	0	0
Reduced v/c Ratio	0.60	0.49		0.06	0.35		0.39	0.15		0.16	0.11	0.28

Intersection Summary

Area Type: Other
Cycle Length: 70
Actuated Cycle Length: 49.3
Natural Cycle: 70
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.60
Intersection Signal Delay: 15.6 Intersection LOS: B
Intersection Capacity Utilization 51.0% ICU Level of Service A
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 5: 15th & Main Ave



Intersection	
Intersection Delay (sec/veh):	1.9

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Volume (vph)	215	5	10	185	15	70
Conflicting Peds.(#/hr)	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
Right Turn Channelized	None	None	None	None	None	None
Storage Length		0	0		0	0
Median Width	0			12	12	
Grade (%)	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles(%)	2	2	2	2	2	2
Movement Flow Rate	234	5	11	201	16	76
Number of Lanes	1	0	0	1	1	0

Major/Minor	Major 1			Major 2		
Conflicting Flow Rate - All	0	0	239	0	459	236
Stage 1	0	0	0	0	236	0
Stage 2	0	0	0	0	223	0
Follow-up Headway	-	-	2.218	0	3.518	3.318
Pot Capacity-1 Maneuver	-	-	1329	-	560	801
Stage 1	-	-	-	-	803	-
Stage 2	-	-	-	-	814	-
Mov Capacity-1 Maneuver	-	-	1329	-	555.5	801
Mov Capacity-2 Maneuver	-	-	-	-	555.5	-
Stage 1	-	-	-	-	# 0	-
Stage 2	-	-	-	-	807.5	-

Approach	EB	WB	NB
HCM Control Delay (s)	0	0.4	10.5
HCM LOS	A	A	B

Lane	NBLn1	EBT	EBR	WBL	WBT
Capacity (vph)	743				
HCM Control Delay (s)	10.5	-	-	7.731	0
HCM Lane VC Ratio	0.124	0	-	0.008	-
HCM Lane LOS	B	-	-	A	-
HCM 95th Percentile Queue (veh)	0.424	0	-	0.025	-

Lanes, Volumes, Timings
5: 15th & Main Ave

11/28/2018

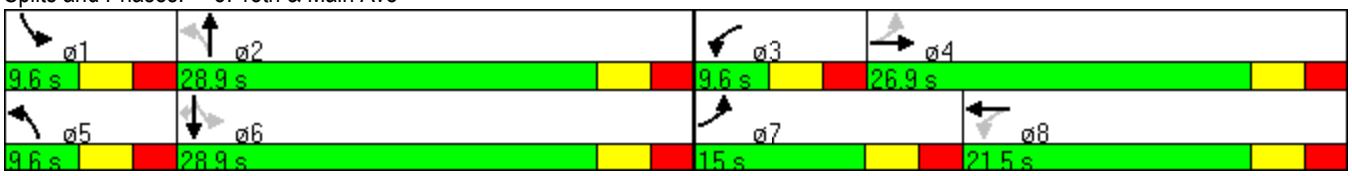
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	240	465	175	60	510	30	125	155	15	120	195	395
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	200		0	200		0	200		160	200		0
Storage Lanes	1		0	1		0	1		0	1		1
Taper Length (ft)	100			100			100			100		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.959			0.992			0.987				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1613	3094	0	1613	3201	0	1613	1676	0	1613	1698	1443
Flt Permitted	0.239			0.387			0.562			0.620		
Satd. Flow (perm)	406	3094	0	657	3201	0	954	1676	0	1053	1698	1443
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		73			7			7				296
Link Speed (mph)		30			30			25			25	
Link Distance (ft)		769			603			1224			442	
Travel Time (s)		17.5			13.7			33.4			12.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%
Adj. Flow (vph)	261	505	190	65	554	33	136	168	16	130	212	429
Shared Lane Traffic (%)												
Lane Group Flow (vph)	261	695	0	65	587	0	136	184	0	130	212	429
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	1
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	Right
Leading Detector (ft)	20	100		20	100		20	100		20	100	20
Trailing Detector (ft)	0	0		0	0		0	0		0	0	0
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	0
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8			2			6		6

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	7	4		3	8		5	2		1	6	6
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Minimum Split (s)	9.5	21.5		9.5	21.5		9.5	27.5		9.5	27.5	27.5
Total Split (s)	15.0	26.9		9.6	21.5		9.6	28.9		9.6	28.9	28.9
Total Split (%)	20.0%	35.9%		12.8%	28.7%		12.8%	38.5%		12.8%	38.5%	38.5%
Maximum Green (s)	9.5	21.4		4.1	16.0		4.1	23.4		4.1	23.4	23.4
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
All-Red Time (s)	2.5	2.5		2.5	2.5		2.5	2.5		2.5	2.5	2.5
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	5.5	5.5		5.5	5.5		5.5	5.5		5.5	5.5	5.5
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Recall Mode	None	None		None	None		None	Min		None	Min	Min
Walk Time (s)		5.0			5.0			5.0			5.0	5.0
Flash Dont Walk (s)		11.0			11.0			17.0			17.0	17.0
Pedestrian Calls (#/hr)		0			0			0			0	0
Act Effct Green (s)	30.6	25.4		19.4	15.1		18.3	15.2		18.3	15.2	15.2
Actuated g/C Ratio	0.48	0.39		0.30	0.23		0.28	0.24		0.28	0.24	0.24
v/c Ratio	0.69	0.55		0.25	0.77		0.43	0.46		0.39	0.53	0.76
Control Delay	26.2	18.9		15.5	33.2		19.7	24.6		18.5	27.0	17.1
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Delay	26.2	18.9		15.5	33.2		19.7	24.6		18.5	27.0	17.1
LOS	C	B		B	C		B	C		B	C	B
Approach Delay		20.9			31.4			22.5			20.1	
Approach LOS		C			C			C			C	
Queue Length 50th (ft)	65	113		14	116		37	63		35	77	46
Queue Length 95th (ft)	#177	199		41	#224		71	115		69	135	143
Internal Link Dist (ft)		689			523			1144			362	
Turn Bay Length (ft)	200			200			200			200		
Base Capacity (vph)	377	1266		260	828		314	634		336	638	727
Starvation Cap Reductn	0	0		0	0		0	0		0	0	0
Spillback Cap Reductn	0	0		0	0		0	0		0	0	0
Storage Cap Reductn	0	0		0	0		0	0		0	0	0
Reduced v/c Ratio	0.69	0.55		0.25	0.71		0.43	0.29		0.39	0.33	0.59

Intersection Summary

Area Type: Other
Cycle Length: 75
Actuated Cycle Length: 64.4
Natural Cycle: 75
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.77
Intersection Signal Delay: 23.4 Intersection LOS: C
Intersection Capacity Utilization 66.4% ICU Level of Service C
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 5: 15th & Main Ave



Intersection	
Intersection Delay (sec/veh):	1.3

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Volume (vph)	310	20	65	260	10	20
Conflicting Peds.(#/hr)	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
Right Turn Channelized	None	None	None	None	None	None
Storage Length		0	0		0	0
Median Width	0			12	12	
Grade (%)	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles(%)	2	2	2	2	2	2
Movement Flow Rate	337	22	71	283	11	22
Number of Lanes	1	0	0	1	1	0

Major/Minor	Major 1			Major 2		
Conflicting Flow Rate - All	0	0	359	0	772	348
Stage 1	0	0	0	0	348	0
Stage 2	0	0	0	0	424	0
Follow-up Headway	-	-	2.218	0	3.518	3.318
Pot Capacity-1 Maneuver	-	-	1200	-	368	695
Stage 1	-	-	-	-	715	-
Stage 2	-	-	-	-	660	-
Mov Capacity-1 Maneuver	-	-	1200	-	346.3	695
Mov Capacity-2 Maneuver	-	-	-	-	346.3	-
Stage 1	-	-	-	-	# 0	-
Stage 2	-	-	-	-	621.1	-

Approach	EB	WB	NB
HCM Control Delay (s)	0	1.6	12.4
HCM LOS	A	A	B

Lane	NBLn1	EBT	EBR	WBL	WBT
Capacity (vph)	520				
HCM Control Delay (s)	12.4	-	-	8.188	0
HCM Lane VC Ratio	0.063	0	-	0.059	-
HCM Lane LOS	B	-	-	A	-
HCM 95th Percentile Queue (veh)	0.2	0	-	0.187	-

Lanes, Volumes, Timings
5: 15th & Main Ave

11/28/2018

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	225	505	95	15	275	70	120	85	25	45	85	210
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	200		0	200		0	200		160	200		0
Storage Lanes	1		0	1		0	1		0	1		1
Taper Length (ft)	100			100			100			100		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.976			0.970			0.966				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1613	3149	0	1613	3130	0	1613	1640	0	1613	1698	1443
Flt Permitted	0.401			0.404			0.607			0.681		
Satd. Flow (perm)	681	3149	0	686	3130	0	1031	1640	0	1156	1698	1443
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		29			42			22				228
Link Speed (mph)		30			30			25			25	
Link Distance (ft)		769			603			1224			442	
Travel Time (s)		17.5			13.7			33.4			12.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%
Adj. Flow (vph)	245	549	103	16	299	76	130	92	27	49	92	228
Shared Lane Traffic (%)												
Lane Group Flow (vph)	245	652	0	16	375	0	130	119	0	49	92	228
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			16			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	1
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	Right
Leading Detector (ft)	20	100		20	100		20	100		20	100	20
Trailing Detector (ft)	0	0		0	0		0	0		0	0	0
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	0
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8			2			6		6

Lanes, Volumes, Timings
5: 15th & Main Ave

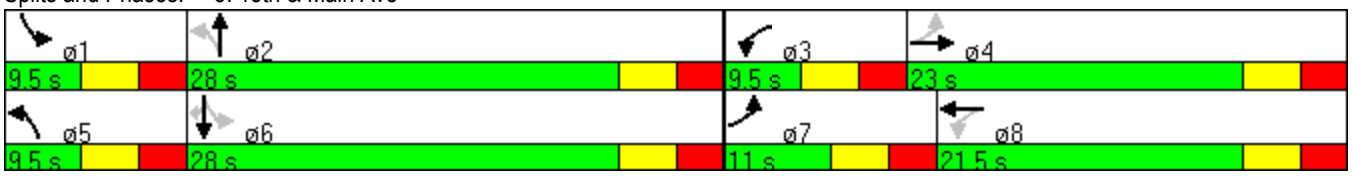
11/28/2018

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	7	4		3	8		5	2		1	6	6
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Minimum Split (s)	9.5	21.5		9.5	21.5		9.5	27.5		9.5	27.5	27.5
Total Split (s)	11.0	23.0		9.5	21.5		9.5	28.0		9.5	28.0	28.0
Total Split (%)	15.7%	32.9%		13.6%	30.7%		13.6%	40.0%		13.6%	40.0%	40.0%
Maximum Green (s)	5.5	17.5		4.0	16.0		4.0	22.5		4.0	22.5	22.5
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
All-Red Time (s)	2.5	2.5		2.5	2.5		2.5	2.5		2.5	2.5	2.5
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	5.5	5.5		5.5	5.5		5.5	5.5		5.5	5.5	5.5
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Recall Mode	None	Min		None	Min		None	None		None	None	None
Walk Time (s)		5.0			5.0			5.0			5.0	5.0
Flash Dont Walk (s)		11.0			11.0			17.0			17.0	17.0
Pedestrian Calls (#/hr)		0			0			0			0	0
Act Effct Green (s)	21.6	20.7		15.0	10.8		13.8	12.4		11.5	8.5	8.5
Actuated g/C Ratio	0.44	0.42		0.30	0.22		0.28	0.25		0.23	0.17	0.17
v/c Ratio	0.60	0.49		0.06	0.52		0.39	0.28		0.16	0.31	0.52
Control Delay	20.0	13.6		9.9	18.6		17.0	16.7		13.3	22.4	8.3
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Delay	20.0	13.6		9.9	18.6		17.0	16.7		13.3	22.4	8.3
LOS	C	B		A	B		B	B		B	C	A
Approach Delay		15.3			18.2			16.9			12.5	
Approach LOS		B			B			B			B	
Queue Length 50th (ft)	45	64		3	45		26	19		9	24	0
Queue Length 95th (ft)	#127	157		12	87		65	69		30	63	48
Internal Link Dist (ft)		689			523			1144			362	
Turn Bay Length (ft)	200			200			200			200		
Base Capacity (vph)	406	1337		286	1081		337	787		309	803	803
Starvation Cap Reductn	0	0		0	0		0	0		0	0	0
Spillback Cap Reductn	0	0		0	0		0	0		0	0	0
Storage Cap Reductn	0	0		0	0		0	0		0	0	0
Reduced v/c Ratio	0.60	0.49		0.06	0.35		0.39	0.15		0.16	0.11	0.28

Intersection Summary

Area Type: Other
Cycle Length: 70
Actuated Cycle Length: 49.3
Natural Cycle: 70
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.60
Intersection Signal Delay: 15.6 Intersection LOS: B
Intersection Capacity Utilization 51.0% ICU Level of Service A
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 5: 15th & Main Ave



Intersection	
Intersection Delay (sec/veh):	1.9

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Volume (vph)	215	5	10	185	15	70
Conflicting Peds.(#/hr)	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
Right Turn Channelized	None	None	None	None	None	None
Storage Length		0	0		0	0
Median Width	16			12	12	
Grade (%)	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles(%)	2	2	2	2	2	2
Movement Flow Rate	234	5	11	201	16	76
Number of Lanes	1	0	0	1	1	0

Major/Minor	Major 1			Major 2		
Conflicting Flow Rate - All	0	0	239	0	459	236
Stage 1	0	0	0	0	236	0
Stage 2	0	0	0	0	223	0
Follow-up Headway	-	-	2.218	0	3.518	3.318
Pot Capacity-1 Maneuver	-	-	1329	-	560	801
Stage 1	-	-	-	-	803	-
Stage 2	-	-	-	-	814	-
Mov Capacity-1 Maneuver	-	-	1329	-	555.5	801
Mov Capacity-2 Maneuver	-	-	-	-	555.5	-
Stage 1	-	-	-	-	# 0	-
Stage 2	-	-	-	-	807.5	-

Approach	EB	WB	NB
HCM Control Delay (s)	0	0.4	10.5
HCM LOS	A	A	B

Lane	NBLn1	EBT	EBR	WBL	WBT
Capacity (vph)	743				
HCM Control Delay (s)	10.5	-	-	7.731	0
HCM Lane VC Ratio	0.124	0	-	0.008	-
HCM Lane LOS	B	-	-	A	-
HCM 95th Percentile Queue (veh)	0.424	0	-	0.025	-

Lanes, Volumes, Timings
5: 15th & Main Ave

11/28/2018

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	225	505	95	15	275	70	120	85	25	45	85	210
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	200		0	200		0	200		160	200		0
Storage Lanes	1		0	1		0	1		0	1		1
Taper Length (ft)	100			100			100			100		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.976			0.970			0.966				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1613	3149	0	1613	3130	0	1613	1640	0	1613	1698	1443
Flt Permitted	0.401			0.404			0.607			0.681		
Satd. Flow (perm)	681	3149	0	686	3130	0	1031	1640	0	1156	1698	1443
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		29			42			22				228
Link Speed (mph)		30			30			25			25	
Link Distance (ft)		769			603			1224			442	
Travel Time (s)		17.5			13.7			33.4			12.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%
Adj. Flow (vph)	245	549	103	16	299	76	130	92	27	49	92	228
Shared Lane Traffic (%)												
Lane Group Flow (vph)	245	652	0	16	375	0	130	119	0	49	92	228
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			16			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	1
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	Right
Leading Detector (ft)	20	100		20	100		20	100		20	100	20
Trailing Detector (ft)	0	0		0	0		0	0		0	0	0
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	0
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8			2			6		6

Lanes, Volumes, Timings
5: 15th & Main Ave

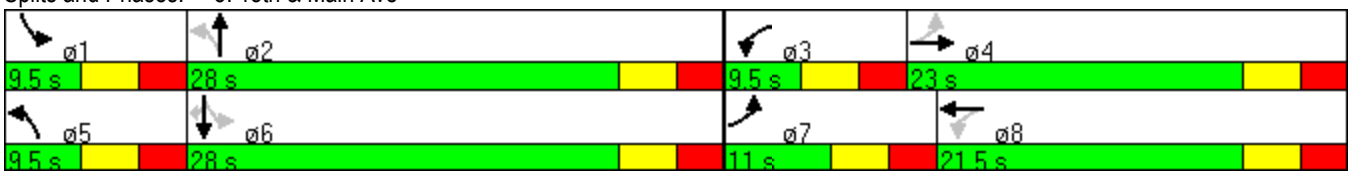
11/28/2018

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	7	4		3	8		5	2		1	6	6
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Minimum Split (s)	9.5	21.5		9.5	21.5		9.5	27.5		9.5	27.5	27.5
Total Split (s)	11.0	23.0		9.5	21.5		9.5	28.0		9.5	28.0	28.0
Total Split (%)	15.7%	32.9%		13.6%	30.7%		13.6%	40.0%		13.6%	40.0%	40.0%
Maximum Green (s)	5.5	17.5		4.0	16.0		4.0	22.5		4.0	22.5	22.5
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
All-Red Time (s)	2.5	2.5		2.5	2.5		2.5	2.5		2.5	2.5	2.5
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	5.5	5.5		5.5	5.5		5.5	5.5		5.5	5.5	5.5
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Recall Mode	None	Min		None	Min		None	None		None	None	None
Walk Time (s)		5.0			5.0			5.0			5.0	5.0
Flash Dont Walk (s)		11.0			11.0			17.0			17.0	17.0
Pedestrian Calls (#/hr)		0			0			0			0	0
Act Effct Green (s)	21.6	20.7		15.0	10.8		13.8	12.4		11.5	8.5	8.5
Actuated g/C Ratio	0.44	0.42		0.30	0.22		0.28	0.25		0.23	0.17	0.17
v/c Ratio	0.60	0.49		0.06	0.52		0.39	0.28		0.16	0.31	0.52
Control Delay	20.0	13.6		9.9	18.6		17.0	16.7		13.3	22.4	8.3
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Delay	20.0	13.6		9.9	18.6		17.0	16.7		13.3	22.4	8.3
LOS	C	B		A	B		B	B		B	C	A
Approach Delay		15.3			18.2			16.9			12.5	
Approach LOS		B			B			B			B	
Queue Length 50th (ft)	45	64		3	45		26	19		9	24	0
Queue Length 95th (ft)	#127	157		12	87		65	69		30	63	48
Internal Link Dist (ft)		689			523			1144			362	
Turn Bay Length (ft)	200			200			200			200		
Base Capacity (vph)	406	1337		286	1081		337	787		309	803	803
Starvation Cap Reductn	0	0		0	0		0	0		0	0	0
Spillback Cap Reductn	0	0		0	0		0	0		0	0	0
Storage Cap Reductn	0	0		0	0		0	0		0	0	0
Reduced v/c Ratio	0.60	0.49		0.06	0.35		0.39	0.15		0.16	0.11	0.28

Intersection Summary

Area Type: Other
Cycle Length: 70
Actuated Cycle Length: 49.3
Natural Cycle: 70
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.60
Intersection Signal Delay: 15.6 Intersection LOS: B
Intersection Capacity Utilization 51.0% ICU Level of Service A
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 5: 15th & Main Ave



Intersection	
Intersection Delay (sec/veh):	1.9

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Volume (vph)	215	5	10	185	15	70
Conflicting Peds.(#/hr)	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
Right Turn Channelized	None	None	None	None	None	None
Storage Length		0	0		0	0
Median Width	16			12	12	
Grade (%)	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles(%)	2	2	2	2	2	2
Movement Flow Rate	234	5	11	201	16	76
Number of Lanes	1	0	0	1	1	0

Major/Minor	Major 1			Major 2		
Conflicting Flow Rate - All	0	0	239	0	459	236
Stage 1	0	0	0	0	236	0
Stage 2	0	0	0	0	223	0
Follow-up Headway	-	-	2.218	0	3.518	3.318
Pot Capacity-1 Maneuver	-	-	1329	-	560	801
Stage 1	-	-	-	-	803	-
Stage 2	-	-	-	-	814	-
Mov Capacity-1 Maneuver	-	-	1329	-	555.5	801
Mov Capacity-2 Maneuver	-	-	-	-	555.5	-
Stage 1	-	-	-	-	# 0	-
Stage 2	-	-	-	-	807.5	-

Approach	EB	WB	NB
HCM Control Delay (s)	0	0.4	10.5
HCM LOS	A	A	B

Lane	NBLn1	EBT	EBR	WBL	WBT
Capacity (vph)	743				
HCM Control Delay (s)	10.5	-	-	7.731	0
HCM Lane VC Ratio	0.124	0	-	0.008	-
HCM Lane LOS	B	-	-	A	-
HCM 95th Percentile Queue (veh)	0.424	0	-	0.025	-

Lanes, Volumes, Timings
5: 15th & Main Ave

11/28/2018

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	240	465	175	60	510	30	125	155	15	120	195	395
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	200		0	200		0	200		160	200		0
Storage Lanes	1		0	1		0	1		0	1		1
Taper Length (ft)	100			100			100			100		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.959			0.992			0.987				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1613	3094	0	1613	3201	0	1613	1676	0	1613	1698	1443
Flt Permitted	0.239			0.387			0.562			0.620		
Satd. Flow (perm)	406	3094	0	657	3201	0	954	1676	0	1053	1698	1443
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		73			7			7				296
Link Speed (mph)		30			30			25			25	
Link Distance (ft)		769			603			1224			442	
Travel Time (s)		17.5			13.7			33.4			12.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%
Adj. Flow (vph)	261	505	190	65	554	33	136	168	16	130	212	429
Shared Lane Traffic (%)												
Lane Group Flow (vph)	261	695	0	65	587	0	136	184	0	130	212	429
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			16			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	1
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	Right
Leading Detector (ft)	20	100		20	100		20	100		20	100	20
Trailing Detector (ft)	0	0		0	0		0	0		0	0	0
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	0
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8			2			6		6

Lanes, Volumes, Timings
5: 15th & Main Ave

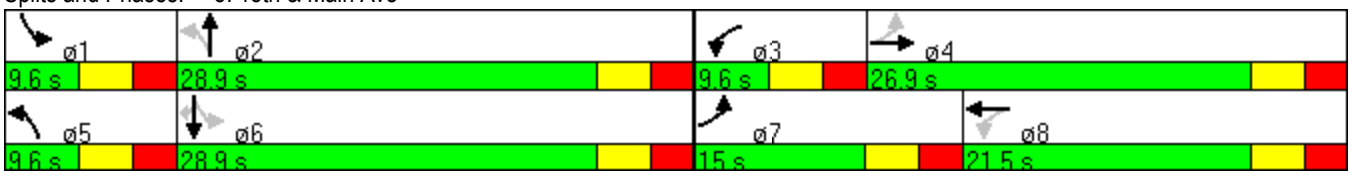
11/28/2018

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	7	4		3	8		5	2		1	6	6
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Minimum Split (s)	9.5	21.5		9.5	21.5		9.5	27.5		9.5	27.5	27.5
Total Split (s)	15.0	26.9		9.6	21.5		9.6	28.9		9.6	28.9	28.9
Total Split (%)	20.0%	35.9%		12.8%	28.7%		12.8%	38.5%		12.8%	38.5%	38.5%
Maximum Green (s)	9.5	21.4		4.1	16.0		4.1	23.4		4.1	23.4	23.4
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
All-Red Time (s)	2.5	2.5		2.5	2.5		2.5	2.5		2.5	2.5	2.5
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	5.5	5.5		5.5	5.5		5.5	5.5		5.5	5.5	5.5
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Recall Mode	None	None		None	None		None	Min		None	Min	Min
Walk Time (s)		5.0			5.0			5.0			5.0	5.0
Flash Dont Walk (s)		11.0			11.0			17.0			17.0	17.0
Pedestrian Calls (#/hr)		0			0			0			0	0
Act Effct Green (s)	30.6	25.4		19.4	15.1		18.3	15.2		18.3	15.2	15.2
Actuated g/C Ratio	0.48	0.39		0.30	0.23		0.28	0.24		0.28	0.24	0.24
v/c Ratio	0.69	0.55		0.25	0.77		0.43	0.46		0.39	0.53	0.76
Control Delay	26.2	18.9		15.5	33.2		19.7	24.6		18.5	27.0	17.1
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Delay	26.2	18.9		15.5	33.2		19.7	24.6		18.5	27.0	17.1
LOS	C	B		B	C		B	C		B	C	B
Approach Delay		20.9			31.4			22.5			20.1	
Approach LOS		C			C			C			C	
Queue Length 50th (ft)	65	113		14	116		37	63		35	77	46
Queue Length 95th (ft)	#177	199		41	#224		71	115		69	135	143
Internal Link Dist (ft)		689			523			1144			362	
Turn Bay Length (ft)	200			200			200			200		
Base Capacity (vph)	377	1266		260	828		314	634		336	638	727
Starvation Cap Reductn	0	0		0	0		0	0		0	0	0
Spillback Cap Reductn	0	0		0	0		0	0		0	0	0
Storage Cap Reductn	0	0		0	0		0	0		0	0	0
Reduced v/c Ratio	0.69	0.55		0.25	0.71		0.43	0.29		0.39	0.33	0.59

Intersection Summary

Area Type: Other
Cycle Length: 75
Actuated Cycle Length: 64.4
Natural Cycle: 75
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.77
Intersection Signal Delay: 23.4 Intersection LOS: C
Intersection Capacity Utilization 66.4% ICU Level of Service C
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 5: 15th & Main Ave



Intersection	
Intersection Delay (sec/veh):	1.3

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Volume (vph)	310	20	65	260	10	20
Conflicting Peds.(#/hr)	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
Right Turn Channelized	None	None	None	None	None	None
Storage Length		0	0		0	0
Median Width	16			12	12	
Grade (%)	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles(%)	2	2	2	2	2	2
Movement Flow Rate	337	22	71	283	11	22
Number of Lanes	1	0	0	1	1	0

Major/Minor	Major 1			Major 2		
Conflicting Flow Rate - All	0	0	359	0	772	348
Stage 1	0	0	0	0	348	0
Stage 2	0	0	0	0	424	0
Follow-up Headway	-	-	2.218	0	3.518	3.318
Pot Capacity-1 Maneuver	-	-	1200	-	368	695
Stage 1	-	-	-	-	715	-
Stage 2	-	-	-	-	660	-
Mov Capacity-1 Maneuver	-	-	1200	-	346.3	695
Mov Capacity-2 Maneuver	-	-	-	-	346.3	-
Stage 1	-	-	-	-	# 0	-
Stage 2	-	-	-	-	621.1	-

Approach	EB	WB	NB
HCM Control Delay (s)	0	1.6	12.4
HCM LOS	A	A	B

Lane	NBLn1	EBT	EBR	WBL	WBT
Capacity (vph)	520				
HCM Control Delay (s)	12.4	-	-	8.188	0
HCM Lane VC Ratio	0.063	0	-	0.059	-
HCM Lane LOS	B	-	-	A	-
HCM 95th Percentile Queue (veh)	0.2	0	-	0.187	-

HCM Unsignalized Intersection Capacity Analysis
36: 13th Ave & 15th

11/30/2018

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	60	140	90	50	145	50
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	65	152	98	54	158	54
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						1224
pX, platoon unblocked						
vC, conflicting volume	467	98			152	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	467	98			152	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	87	84			89	
cM capacity (veh/h)	493	958			1429	

Direction, Lane #	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	65	152	98	54	158	54
Volume Left	65	0	0	0	158	0
Volume Right	0	152	0	54	0	0
cSH	493	958	1700	1700	1429	1700
Volume to Capacity	0.13	0.16	0.06	0.03	0.11	0.03
Queue Length 95th (ft)	11	14	0	0	9	0
Control Delay (s)	13.4	9.5	0.0	0.0	7.8	0.0
Lane LOS	B	A			A	
Approach Delay (s)	10.7		0.0		5.8	
Approach LOS	B					

Intersection Summary			
Average Delay	6.1		
Intersection Capacity Utilization	25.3%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
36: 13th Ave & 15th

11/30/2018

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	55	180	115	50	280	150
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	60	196	125	54	304	163
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						1224
pX, platoon unblocked						
vC, conflicting volume	897	125			179	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	897	125			179	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	75	79			78	
cM capacity (veh/h)	243	926			1396	

Direction, Lane #	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	60	196	125	54	304	163
Volume Left	60	0	0	0	304	0
Volume Right	0	196	0	54	0	0
cSH	243	926	1700	1700	1396	1700
Volume to Capacity	0.25	0.21	0.07	0.03	0.22	0.10
Queue Length 95th (ft)	24	20	0	0	21	0
Control Delay (s)	24.6	9.9	0.0	0.0	8.3	0.0
Lane LOS	C	A			A	
Approach Delay (s)	13.4		0.0		5.4	
Approach LOS	B					

Intersection Summary			
Average Delay	6.6		
Intersection Capacity Utilization	33.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	90	50	60	140	145	50
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	98	54	65	152	158	54
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	217				315	65
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	217				315	65
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	93				75	95
cM capacity (veh/h)	1352				629	999

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1	SB 2
Volume Total	98	54	65	152	158	54
Volume Left	98	0	0	0	158	0
Volume Right	0	0	0	152	0	54
cSH	1352	1700	1700	1700	629	999
Volume to Capacity	0.07	0.03	0.04	0.09	0.25	0.05
Queue Length 95th (ft)	6	0	0	0	25	4
Control Delay (s)	7.9	0.0	0.0	0.0	12.6	8.8
Lane LOS	A				B	A
Approach Delay (s)	5.1		0.0		11.7	
Approach LOS					B	

Intersection Summary			
Average Delay	5.6		
Intersection Capacity Utilization	27.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	115	50	55	180	280	150
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	125	54	60	196	304	163
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	255				364	60
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	255				364	60
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	90				47	84
cM capacity (veh/h)	1310				575	1006

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1	SB 2
Volume Total	125	54	60	196	304	163
Volume Left	125	0	0	0	304	0
Volume Right	0	0	0	196	0	163
cSH	1310	1700	1700	1700	575	1006
Volume to Capacity	0.10	0.03	0.04	0.12	0.53	0.16
Queue Length 95th (ft)	8	0	0	0	77	14
Control Delay (s)	8.0	0.0	0.0	0.0	18.1	9.3
Lane LOS	A				C	A
Approach Delay (s)	5.6		0.0		15.0	
Approach LOS					C	

Intersection Summary			
Average Delay	8.9		
Intersection Capacity Utilization	36.4%	ICU Level of Service	A
Analysis Period (min)	15		

Lanes, Volumes, Timings
22: Sheyenne St & 13th Ave

11/28/2018

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	35	335	180	95	150	80	165	410	280	85	245	20
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	240		200	415		0	230		230	132		0
Storage Lanes	1		1	1		1	1		1	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850			0.850			0.850		0.989	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1660	1748	1485	1644	1731	1471	1676	1765	1500	1644	1712	0
Flt Permitted	0.654			0.350			0.441			0.294		
Satd. Flow (perm)	1143	1748	1485	606	1731	1471	778	1765	1500	509	1712	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			196			87			304		6	
Link Speed (mph)		25			35			30			25	
Link Distance (ft)		646			849			723			965	
Travel Time (s)		17.6			16.5			16.4			26.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	3%	3%	4%	4%	4%	2%	2%	2%	4%	4%	4%
Adj. Flow (vph)	38	364	196	103	163	87	179	446	304	92	266	22
Shared Lane Traffic (%)												
Lane Group Flow (vph)	38	364	196	103	163	87	179	446	304	92	288	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			16			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane											Yes	
Headway Factor	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2	1	1	2	1	1	2	
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	
Leading Detector (ft)	20	100	20	20	100	20	20	100	20	20	100	
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	
Detector 1 Position(ft)	0	0	0	0	0	0	0	0	0	0	0	
Detector 1 Size(ft)	20	6	20	20	6	20	20	6	20	20	6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases	2		2	6		6	4		4	8		

Lanes, Volumes, Timings
22: Sheyenne St & 13th Ave

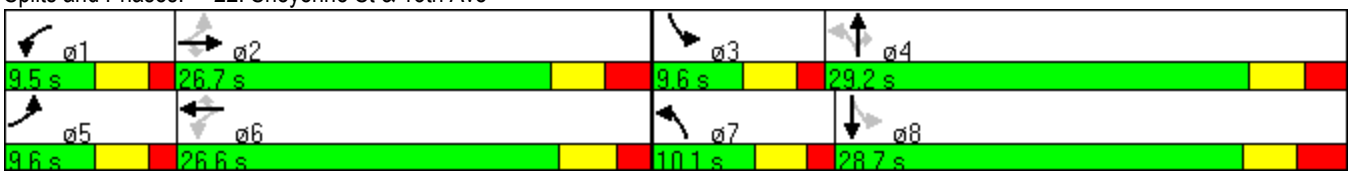
11/28/2018

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	5	2	2	1	6	6	7	4	4	3	8	
Switch Phase												
Minimum Initial (s)	5.0	7.0	7.0	5.0	7.0	7.0	5.0	15.0	15.0	5.0	15.0	
Minimum Split (s)	9.6	23.7	23.7	9.5	23.3	23.3	9.5	27.6	27.6	9.6	26.9	
Total Split (s)	9.6	26.7	26.7	9.5	26.6	26.6	10.1	29.2	29.2	9.6	28.7	
Total Split (%)	12.8%	35.6%	35.6%	12.7%	35.5%	35.5%	13.5%	38.9%	38.9%	12.8%	38.3%	
Maximum Green (s)	5.0	21.0	21.0	5.0	21.3	21.3	5.6	23.6	23.6	5.0	22.8	
Yellow Time (s)	3.0	3.0	3.0	3.0	3.2	3.2	3.0	3.2	3.2	3.0	3.0	
All-Red Time (s)	1.6	2.7	2.7	1.5	2.1	2.1	1.5	2.4	2.4	1.6	2.9	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	4.6	5.7	5.7	4.5	5.3	5.3	4.5	5.6	5.6	4.6	5.9	
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	Max	Max	None	Max	Max	None	None	None	None	None	
Walk Time (s)		5.0	5.0		5.0	5.0		5.0	5.0		5.0	
Flash Dont Walk (s)		13.0	13.0		13.0	13.0		17.0	17.0		16.0	
Pedestrian Calls (#/hr)		0	0		0	0		0	0		0	
Act Effct Green (s)	26.2	21.2	21.2	27.1	23.4	23.4	29.3	24.0	24.0	27.1	20.8	
Actuated g/C Ratio	0.37	0.30	0.30	0.38	0.33	0.33	0.41	0.34	0.34	0.38	0.29	
v/c Ratio	0.08	0.70	0.34	0.34	0.29	0.16	0.46	0.75	0.43	0.34	0.57	
Control Delay	13.5	32.5	5.4	17.0	21.6	6.1	17.3	32.7	4.8	15.6	26.5	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	13.5	32.5	5.4	17.0	21.6	6.1	17.3	32.7	4.8	15.6	26.5	
LOS	B	C	A	B	C	A	B	C	A	B	C	
Approach Delay		22.4			16.4			20.6			23.9	
Approach LOS		C			B			C			C	
Queue Length 50th (ft)	10	153	0	28	60	0	48	188	0	24	109	
Queue Length 95th (ft)	27	#275	45	58	110	31	87	#336	52	49	183	
Internal Link Dist (ft)		566			769			643			885	
Turn Bay Length (ft)	240		200	415			230		230	132		
Base Capacity (vph)	456	521	580	304	570	542	392	602	712	274	558	
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.08	0.70	0.34	0.34	0.29	0.16	0.46	0.74	0.43	0.34	0.52	

Intersection Summary

Area Type: Other
Cycle Length: 75
Actuated Cycle Length: 71.2
Natural Cycle: 75
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.75
Intersection Signal Delay: 21.0 Intersection LOS: C
Intersection Capacity Utilization 68.9% ICU Level of Service C
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 22: Sheyenne St & 13th Ave



Intersection	
Intersection Delay (sec/veh):	4.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Volume (vph)	25	640	10	10	275	30	5	60	20	40	25	25
Conflicting Peds.(#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
Right Turn Channelized	None	None	None	None	None	None	None	None	None	None	None	None
Storage Length	100		0	100		0	0		0	0		0
Median Width		16			16			0			0	
Grade (%)		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles(%)	2	2	2	2	2	2	2	2	2	2	2	2
Movement Flow Rate	27	696	11	11	299	33	5	65	22	43	27	27
Number of Lanes	1	2	0	1	2	0	0	1	0	0	1	0

Major/Minor	Major 1			Major 2			Minor 1			Minor 1		
Conflicting Flow Rate - All	332	0	0	707	0	0	940	1108	353	772	1098	166
Stage 1	0	0	0	0	0	0	755	755	0	337	337	0
Stage 2	0	0	0	0	0	0	185	353	0	435	761	0
Follow-up Headway	2.22	-	-	2.22	0	0	3.52	4.02	3.32	3.52	4.02	3.32
Pot Capacity-1 Maneuver	1222	-	-	887	-	-	218	209	642	289	211	850
Stage 1	-	-	-	-	-	-	367	415	-	651	640	-
Stage 2	-	-	-	-	-	-	799	629	-	570	412	-
Mov Capacity-1 Maneuver	1222	-	-	887	-	-	184.7	201.9	642	204.2	203.9	850
Mov Capacity-2 Maneuver	-	-	-	-	-	-	184.7	201.9	-	204.2	203.9	-
Stage 1	-	-	-	-	-	-	367	405.9	-	651	632.3	-
Stage 2	-	-	-	-	-	-	731.3	621.5	-	452	402.9	-

Approach	EB	WB	NB	SB
HCM Control Delay (s)	0.3	0.3	29.2	27.1
HCM LOS	A	A	D	D

Lane	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (vph)	239							259
HCM Control Delay (s)	29.2	8.013	-	-	9.109	-	-	27.1
HCM Lane VC Ratio	0.387	0.022	-	-	0.012	-	-	0.378
HCM Lane LOS	D	A	-	-	A	-	-	D
HCM 95th Percentile Queue (veh)	1.728	0.068	-	-	0.037	-	-	1.681

Lanes, Volumes, Timings
24: 6th St & 13th Ave

11/28/2018

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	15	690	15	10	280	35	75	55	80	70	25	10
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	140		0	92		0	100		100	100		0
Storage Lanes	1		0	1		0	1		1	1		0
Taper Length (ft)	25			80			50			50		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.997			0.983				0.850		0.957	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1676	3343	0	1676	3296	0	1676	1765	1500	1676	1689	0
Flt Permitted	0.546			0.314			0.506			0.909		
Satd. Flow (perm)	964	3343	0	554	3296	0	893	1765	1500	1604	1689	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		3			18				87		11	
Link Speed (mph)		35			35			25			25	
Link Distance (ft)		489			566			615			526	
Travel Time (s)		9.5			11.0			16.8			14.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	16	750	16	11	304	38	82	60	87	76	27	11
Shared Lane Traffic (%)												
Lane Group Flow (vph)	16	766	0	11	342	0	82	60	87	76	38	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		16			16			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2	1	1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru	Right	Left	Thru	
Leading Detector (ft)	20	100		20	100		20	100	20	20	100	
Trailing Detector (ft)	0	0		0	0		0	0	0	0	0	
Detector 1 Position(ft)	0	0		0	0		0	0	0	0	0	
Detector 1 Size(ft)	20	6		20	6		20	6	20	20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases	2			6			4		4	8		
Detector Phase	5	2		1	6		7	4	4	3	8	

Lanes, Volumes, Timings
24: 6th St & 13th Ave

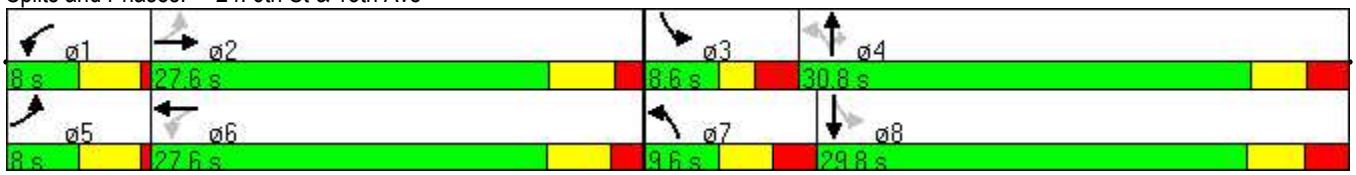
11/28/2018

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Switch Phase												
Minimum Initial (s)	4.0	15.0		4.0	15.0		4.0	7.0	7.0	4.0	7.0	
Minimum Split (s)	8.0	24.3		8.0	22.5		9.5	27.6	27.6	8.5	29.8	
Total Split (s)	8.0	27.6		8.0	27.6		9.6	30.8	30.8	8.6	29.8	
Total Split (%)	10.7%	36.8%		10.7%	36.8%		12.8%	41.1%	41.1%	11.5%	39.7%	
Maximum Green (s)	4.0	22.3		4.0	22.1		4.1	25.2	25.2	4.1	24.0	
Yellow Time (s)	3.5	3.6		3.5	3.6		3.0	3.2	3.2	2.0	3.2	
All-Red Time (s)	0.5	1.7		0.5	1.9		2.5	2.4	2.4	2.5	2.6	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	4.0	5.3		4.0	5.5		5.5	5.6	5.6	4.5	5.8	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag	Lag	Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes	Yes	Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	Max		None	Max		None	None	None	None	None	
Walk Time (s)		5.0			5.0			5.0	5.0		5.0	
Flash Dont Walk (s)		14.0			12.0			17.0	17.0		19.0	
Pedestrian Calls (#/hr)		0			0			0	0		0	
Act Effct Green (s)	28.1	27.3		28.1	27.1		10.4	7.8	7.8	8.3	7.3	
Actuated g/C Ratio	0.58	0.57		0.58	0.56		0.22	0.16	0.16	0.17	0.15	
v/c Ratio	0.03	0.40		0.03	0.18		0.28	0.21	0.28	0.27	0.14	
Control Delay	6.9	10.4		7.0	8.8		16.3	21.6	8.6	17.5	18.1	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay	6.9	10.4		7.0	8.8		16.3	21.6	8.6	17.5	18.1	
LOS	A	B		A	A		B	C	A	B	B	
Approach Delay		10.4			8.7			14.8			17.7	
Approach LOS		B			A			B			B	
Queue Length 50th (ft)	2	74		2	27		16	16	0	21	7	
Queue Length 95th (ft)	10	163		8	67		49	47	32	45	31	
Internal Link Dist (ft)		409			486			535			446	
Turn Bay Length (ft)	140			92			100		100	100		
Base Capacity (vph)	621	1894		417	1863		298	939	839	284	861	
Starvation Cap Reductn	0	0		0	0		0	0	0	0	0	
Spillback Cap Reductn	0	0		0	0		0	0	0	0	0	
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	
Reduced v/c Ratio	0.03	0.40		0.03	0.18		0.28	0.06	0.10	0.27	0.04	

Intersection Summary

Area Type: Other
Cycle Length: 75
Actuated Cycle Length: 48.2
Natural Cycle: 75
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.40
Intersection Signal Delay: 11.2 — Intersection LOS: B
Intersection Capacity Utilization 43.4% — ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 24: 6th St & 13th Ave



Intersection	
Intersection Delay (sec/veh):	1.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Volume (vph)	30	820	15	10	340	25	5	5	35	5	5	15
Conflicting Peds.(#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
Right Turn Channelized	None	None	None	None	None	None	None	None	None	None	None	None
Storage Length	130		0	150		0	0		0	0		0
Median Width		16			12			0			0	
Grade (%)		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles(%)	2	2	2	2	2	2	2	2	2	2	2	2
Movement Flow Rate	33	891	16	11	370	27	5	5	38	5	5	16
Number of Lanes	1	2	0	1	2	0	0	1	0	0	1	0

Major/Minor	Major 1			Major 2			Minor 1			Minor 1		
Conflicting Flow Rate - All	397	0	0	908	0	0	1174	1383	454	919	1378	198
Stage 1	0	0	0	0	0	0	965	965	0	405	405	0
Stage 2	0	0	0	0	0	0	209	418	0	514	973	0
Follow-up Headway	2.22	-	-	2.22	0	0	3.52	4.02	3.32	3.52	4.02	3.32
Pot Capacity-1 Maneuver	1157	-	-	745	-	-	147	143	553	226	144	808
Stage 1	-	-	-	-	-	-	274	331	-	593	597	-
Stage 2	-	-	-	-	-	-	774	589	-	511	329	-
Mov Capacity-1 Maneuver	1157	-	-	745	-	-	135.2	136.9	553	197.5	137.9	808
Mov Capacity-2 Maneuver	-	-	-	-	-	-	135.2	136.9	-	197.5	137.9	-
Stage 1	-	-	-	-	-	-	274	321.7	-	593	588	-
Stage 2	-	-	-	-	-	-	740.1	580.2	-	454.7	319.8	-

Approach	EB	WB	NB	SB
HCM Control Delay (s)	0.3	0.3	17.8	17.6
HCM LOS	A	A	C	C

Lane	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (vph)	329							312
HCM Control Delay (s)	17.8	8.202	-	-	9.904	-	-	17.6
HCM Lane VC Ratio	0.149	0.028	-	-	0.015	-	-	0.087
HCM Lane LOS	C	A	-	-	A	-	-	C
HCM 95th Percentile Queue (veh)	0.516	0.087	-	-	0.044	-	-	0.284

Lanes, Volumes, Timings
22: Sheyenne St & 13th Ave

11/28/2018

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	15	295	185	240	335	115	190	275	180	130	370	30
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	240		200	415		0	230		230	132		0
Storage Lanes	1		1	1		1	1		1	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850			0.850			0.850		0.989	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1660	1748	1485	1644	1731	1471	1676	1765	1500	1644	1712	0
Flt Permitted	0.526			0.344			0.196			0.498		
Satd. Flow (perm)	919	1748	1485	595	1731	1471	346	1765	1500	862	1712	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			201			125			196		5	
Link Speed (mph)		25			35			30			25	
Link Distance (ft)		646			849			723			965	
Travel Time (s)		17.6			16.5			16.4			26.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	3%	3%	4%	4%	4%	2%	2%	2%	4%	4%	4%
Adj. Flow (vph)	16	321	201	261	364	125	207	299	196	141	402	33
Shared Lane Traffic (%)												
Lane Group Flow (vph)	16	321	201	261	364	125	207	299	196	141	435	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			16			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane											Yes	
Headway Factor	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2	1	1	2	1	1	2	
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	
Leading Detector (ft)	20	100	20	20	100	20	20	100	20	20	100	
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	
Detector 1 Position(ft)	0	0	0	0	0	0	0	0	0	0	0	
Detector 1 Size(ft)	20	6	20	20	6	20	20	6	20	20	6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases	2		2	6		6	4		4	8		

Lanes, Volumes, Timings
22: Sheyenne St & 13th Ave

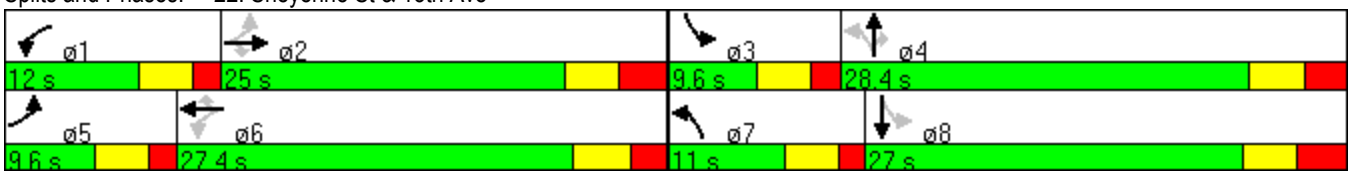
11/28/2018

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	5	2	2	1	6	6	7	4	4	3	8	
Switch Phase												
Minimum Initial (s)	5.0	7.0	7.0	5.0	7.0	7.0	5.0	15.0	15.0	5.0	15.0	
Minimum Split (s)	9.6	23.7	23.7	9.5	23.3	23.3	9.5	27.6	27.6	9.6	26.9	
Total Split (s)	9.6	25.0	25.0	12.0	27.4	27.4	11.0	28.4	28.4	9.6	27.0	
Total Split (%)	12.8%	33.3%	33.3%	16.0%	36.5%	36.5%	14.7%	37.9%	37.9%	12.8%	36.0%	
Maximum Green (s)	5.0	19.3	19.3	7.5	22.1	22.1	6.5	22.8	22.8	5.0	21.1	
Yellow Time (s)	3.0	3.0	3.0	3.0	3.2	3.2	3.0	3.2	3.2	3.0	3.0	
All-Red Time (s)	1.6	2.7	2.7	1.5	2.1	2.1	1.5	2.4	2.4	1.6	2.9	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	4.6	5.7	5.7	4.5	5.3	5.3	4.5	5.6	5.6	4.6	5.9	
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	Max	Max	None	Max	Max	None	None	None	None	None	
Walk Time (s)		5.0	5.0		5.0	5.0		5.0	5.0		5.0	
Flash Dont Walk (s)		13.0	13.0		13.0	13.0		17.0	17.0		16.0	
Pedestrian Calls (#/hr)		0	0		0	0		0	0		0	
Act Effct Green (s)	25.4	19.3	19.3	32.1	29.8	29.8	30.3	24.1	24.1	26.7	20.4	
Actuated g/C Ratio	0.34	0.26	0.26	0.43	0.40	0.40	0.41	0.32	0.32	0.36	0.27	
v/c Ratio	0.04	0.71	0.38	0.72	0.52	0.19	0.80	0.52	0.32	0.39	0.92	
Control Delay	12.9	35.3	6.0	28.9	21.9	4.7	40.4	25.3	4.9	17.1	53.5	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	12.9	35.3	6.0	28.9	21.9	4.7	40.4	25.3	4.9	17.1	53.5	
LOS	B	D	A	C	C	A	D	C	A	B	D	
Approach Delay		23.7			21.5			24.1			44.6	
Approach LOS		C			C			C			D	
Queue Length 50th (ft)	4	136	0	79	119	0	58	116	0	38	192	
Queue Length 95th (ft)	15	#245	48	#167	#253	36	#144	192	43	72	#360	
Internal Link Dist (ft)		566			769			643			885	
Turn Bay Length (ft)	240		200	415			230		230	132		
Base Capacity (vph)	364	454	534	363	694	665	258	573	618	362	490	
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.04	0.71	0.38	0.72	0.52	0.19	0.80	0.52	0.32	0.39	0.89	

Intersection Summary

Area Type: Other
Cycle Length: 75
Actuated Cycle Length: 74.3
Natural Cycle: 75
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.92
Intersection Signal Delay: 27.8 Intersection LOS: C
Intersection Capacity Utilization 81.2% ICU Level of Service D
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 22: Sheyenne St & 13th Ave



Intersection	
Intersection Delay (sec/veh):	9.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Volume (vph)	20	560	5	30	640	40	5	25	20	40	50	25
Conflicting Peds.(#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
Right Turn Channelized	None	None	None	None	None	None	None	None	None	None	None	None
Storage Length	100		0	100		0	0		0	0		0
Median Width		16			16			0			0	
Grade (%)		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles(%)	2	2	2	2	2	2	2	2	2	2	2	2
Movement Flow Rate	22	609	5	33	696	43	5	27	22	43	54	27
Number of Lanes	1	2	0	1	2	0	0	1	0	0	1	0

Major/Minor	Major 1			Major 2			Minor 1			Minor 1		
Conflicting Flow Rate - All	739	0	0	614	0	0	1095	1459	307	1144	1441	370
Stage 1	0	0	0	0	0	0	655	655	0	783	783	0
Stage 2	0	0	0	0	0	0	440	804	0	361	658	0
Follow-up Headway	2.22	-	-	2.22	0	0	3.52	4.02	3.32	3.52	4.02	3.32
Pot Capacity-1 Maneuver	863	-	-	961	-	-	168	128	689	155	131	628
Stage 1	-	-	-	-	-	-	421	461	-	353	403	-
Stage 2	-	-	-	-	-	-	566	394	-	630	459	-
Mov Capacity-1 Maneuver	863	-	-	961	-	-	101.1	120.6	689	118.8	123.4	628
Mov Capacity-2 Maneuver	-	-	-	-	-	-	101.1	120.6	-	118.8	123.4	-
Stage 1	-	-	-	-	-	-	421	449.5	-	353	389.3	-
Stage 2	-	-	-	-	-	-	450.1	380.6	-	558.9	447.5	-

Approach	EB	WB	NB	SB
HCM Control Delay (s)	0.3	0.4	34.6	98.3
HCM LOS	A	A	D	F

Lane	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (vph)	175							147
HCM Control Delay (s)	34.6	9.279	-	-	8.878	-	-	98.3
HCM Lane VC Ratio	0.311	0.025	-	-	0.034	-	-	0.85
HCM Lane LOS	D	A	-	-	A	-	-	F
HCM 95th Percentile Queue (veh)	1.248	0.077	-	-	0.105	-	-	5.608

Lanes, Volumes, Timings
24: 6th St & 13th Ave

11/28/2018

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	10	645	20	80	725	35	35	30	50	40	25	10
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	140		0	92		0	100		100	100		0
Storage Lanes	1		0	1		0	2		1	2		0
Taper Length (ft)	25			80			50			50		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	0.97	1.00	1.00	0.97	1.00	1.00
Frt		0.995			0.993				0.850		0.957	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1676	3336	0	1676	3329	0	3252	1765	1500	3252	1689	0
Flt Permitted	0.320			0.368			0.950			0.950		
Satd. Flow (perm)	565	3336	0	649	3329	0	3252	1765	1500	3252	1689	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		5			8				54		11	
Link Speed (mph)		35			35			25			25	
Link Distance (ft)		489			566			615			526	
Travel Time (s)		9.5			11.0			16.8			14.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	11	701	22	87	788	38	38	33	54	43	27	11
Shared Lane Traffic (%)												
Lane Group Flow (vph)	11	723	0	87	826	0	38	33	54	43	38	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		16			16			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07	1.07
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2	1	1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru	Right	Left	Thru	
Leading Detector (ft)	20	100		20	100		20	100	20	20	100	
Trailing Detector (ft)	0	0		0	0		0	0	0	0	0	
Detector 1 Position(ft)	0	0		0	0		0	0	0	0	0	
Detector 1 Size(ft)	20	6		20	6		20	6	20	20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		Perm	NA		Prot	NA	Perm	Prot	NA	
Protected Phases		2			6		7	4		3	8	
Permitted Phases	2			6					4			
Detector Phase	2	2		6	6		7	4	4	3	8	

Lanes, Volumes, Timings
24: 6th St & 13th Ave

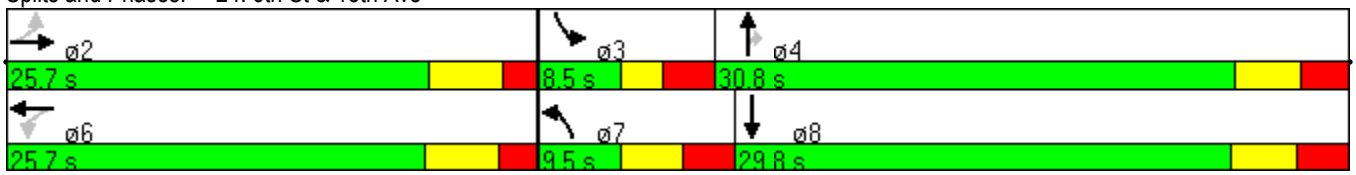
11/28/2018

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Switch Phase												
Minimum Initial (s)	15.0	15.0		15.0	15.0		4.0	7.0	7.0	4.0	7.0	
Minimum Split (s)	24.3	24.3		22.5	22.5		9.5	27.6	27.6	8.5	29.8	
Total Split (s)	25.7	25.7		25.7	25.7		9.5	30.8	30.8	8.5	29.8	
Total Split (%)	39.5%	39.5%		39.5%	39.5%		14.6%	47.4%	47.4%	13.1%	45.8%	
Maximum Green (s)	20.4	20.4		20.2	20.2		4.0	25.2	25.2	4.0	24.0	
Yellow Time (s)	3.6	3.6		3.6	3.6		3.0	3.2	3.2	2.0	3.2	
All-Red Time (s)	1.7	1.7		1.9	1.9		2.5	2.4	2.4	2.5	2.6	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.3	5.3		5.5	5.5		5.5	5.6	5.6	4.5	5.8	
Lead/Lag							Lead	Lag	Lag	Lead	Lag	
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Recall Mode	Max	Max		Max	Max		None	None	None	None	None	
Walk Time (s)	5.0	5.0		5.0	5.0			5.0	5.0		5.0	
Flash Dont Walk (s)	14.0	14.0		12.0	12.0			17.0	17.0		19.0	
Pedestrian Calls (#/hr)	0	0		0	0			0	0		0	
Act Effct Green (s)	29.2	29.2		29.1	29.1		4.0	7.7	7.7	4.0	7.2	
Actuated g/C Ratio	0.67	0.67		0.67	0.67		0.09	0.18	0.18	0.09	0.17	
v/c Ratio	0.03	0.32		0.20	0.37		0.13	0.11	0.17	0.14	0.13	
Control Delay	8.3	7.3		9.9	7.8		20.7	17.0	7.8	20.9	15.1	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay	8.3	7.3		9.9	7.8		20.7	17.0	7.8	20.9	15.1	
LOS	A	A		A	A		C	B	A	C	B	
Approach Delay		7.3			8.0			14.2			18.1	
Approach LOS		A			A			B			B	
Queue Length 50th (ft)	1	40		9	48		4	6	0	4	5	
Queue Length 95th (ft)	9	115		44	136		16	26	22	17	26	
Internal Link Dist (ft)		409			486			535			446	
Turn Bay Length (ft)	140			92			100		100	100		
Base Capacity (vph)	381	2252		436	2239		303	1036	902	303	949	
Starvation Cap Reductn	0	0		0	0		0	0	0	0	0	
Spillback Cap Reductn	0	0		0	0		0	0	0	0	0	
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	
Reduced v/c Ratio	0.03	0.32		0.20	0.37		0.13	0.03	0.06	0.14	0.04	

Intersection Summary

Area Type: Other
Cycle Length: 65
Actuated Cycle Length: 43.3
Natural Cycle: 65
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 0.37
Intersection Signal Delay: 8.6 — Intersection LOS: A
Intersection Capacity Utilization 56.5% — ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 24: 6th St & 13th Ave



Intersection	
Intersection Delay (sec/veh):	8.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Volume (vph)	15	745	15	55	820	5	30	5	50	35	10	50
Conflicting Peds.(#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
Right Turn Channelized	None	None	None	None	None	None	None	None	None	None	None	None
Storage Length	130		0	150		0	0		0	0		0
Median Width		16			12			0			0	
Grade (%)		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles(%)	2	2	2	2	2	2	2	2	2	2	2	2
Movement Flow Rate	16	810	16	60	891	5	33	5	54	38	11	54
Number of Lanes	1	2	0	1	2	0	0	1	0	0	1	0

Major/Minor	Major 1			Major 2			Minor 1			Minor 1		
Conflicting Flow Rate - All	897	0	0	826	0	0	1422	1867	413	1454	1873	448
Stage 1	0	0	0	0	0	0	851	851	0	1014	1014	0
Stage 2	0	0	0	0	0	0	571	1016	0	440	859	0
Follow-up Headway	2.22	-	-	2.22	0	0	3.52	4.02	3.32	3.52	4.02	3.32
Pot Capacity-1 Maneuver	752	-	-	801	-	-	96	72	588	91	71	558
Stage 1	-	-	-	-	-	-	321	375	-	256	314	-
Stage 2	-	-	-	-	-	-	473	314	-	566	371	-
Mov Capacity-1 Maneuver	752	-	-	801	-	-	70	65.1	588	71.7	64.2	558
Mov Capacity-2 Maneuver	-	-	-	-	-	-	70	65.1	-	71.7	64.2	-
Stage 1	-	-	-	-	-	-	321	366.8	-	256	290.5	-
Stage 2	-	-	-	-	-	-	380.1	290.5	-	494.9	362.8	-

Approach	EB	WB	NB	SB
HCM Control Delay (s)	0.2	0.6	66.5	96.1
HCM LOS	A	A	F	F

Lane	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (vph)	144							130
HCM Control Delay (s)	66.5	9.893	-	-	9.857	-	-	96.1
HCM Lane VC Ratio	0.642	0.022	-	-	0.075	-	-	0.794
HCM Lane LOS	F	A	-	-	A	-	-	F
HCM 95th Percentile Queue (veh)	3.486	0.066	-	-	0.241	-	-	4.772