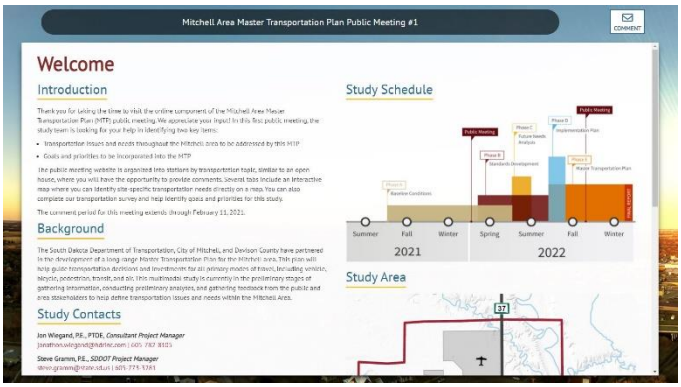
Appendix A: Public Engagement Summary

MITCHELL
Master Transportation Plan





Public Involvement Meetings #1 and Travel Survey Summary

Mitchell Area Master Transportation Plan

Meeting Date: January 27, 2022

Mitchell, SD

March 29, 2022

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Public Meeting Overview

In-person Public Meeting: Thursday, January 27, 2022

- Corn Palace, Harrisburg, SD
- 5:30 – 7:00 p.m.

Virtual (Online) Public Meeting and Comment Period: Thursday, January 27, 2022, through Friday, February 11, 2022

Study Website: https://mitchellmtp.com/

Virtual (Online) Public Meeting Website: https://mitchellmtp.com/online-meeting/

The first of two public meetings was a hybrid type meeting where there was an in-person open house on January 27, 2022, and a self-guided virtual component available on the study website starting on the same day and extending through the comment period.

The following is a summary of available public involvement statistics:

- In-person public meeting attendance: ~9 plus Study Advisory Team
- Study website users (January 26 – February 14, 2022):
  - 269 unique users
  - 281 total sessions
- Study website access:
  - Direct: 142
  - Other websites: 100 Facebook, 21 Mitchellrepublic.com
- Devices used to access study website:
  - Desktop: 121
  - Mobile: 138
  - Tablet: 10
- Virtual public meeting users (January 26 – February 14, 2022):
  - 78 unique users
  - 94 total sessions

Stakeholder Meeting Overview

Thursday, January 27, 2022

Corn Palace, Mitchell, SD

Bicycle & Pedestrian: 10 a.m.

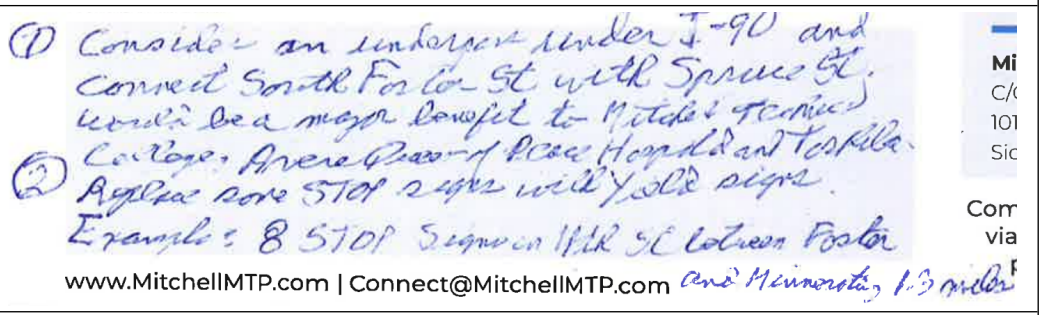
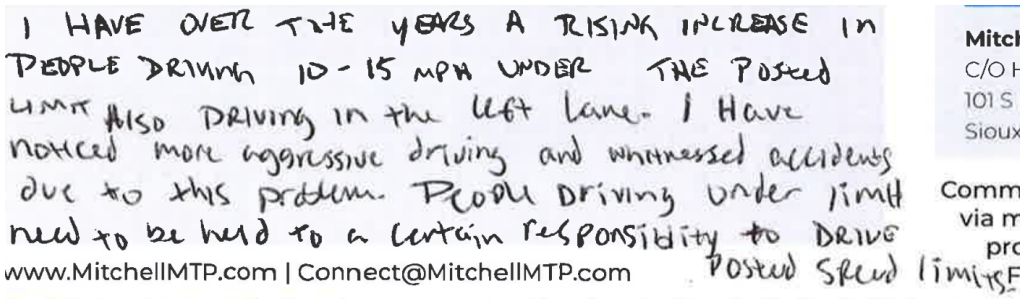
Business, organization, and community leaders: 1 p.m., 2:30 p.m., and 4 p.m.

Stakeholder meeting notes are summarized in the Stakeholder and Public Meeting 'Issues and Needs' Summary section. Approximately 19 stakeholders plus Study Advisory Team members attended the meetings.

Written Comments

A summary of written comments provided to the study team are included below. The method used to submit the comment and submittal date are noted.

Table 1: Written Comment Summary

Information	Method	Comment
2/8/2022	PIM Website	Some land should be annexed into the city. Both of the two places you talked about the need for improvements that won't happen because you can't assess the other side of the road that is in the county. Then you can do what is right for the roads. Bike/walking paths are needed on Ohlman from the Cemetary Road clear to the Lake. We already lost one kid along there. Similarly a bike trail from Highway 37 to the National Guard is needed for kids to ride to the soccer fields. You may need road upgrades if there will be new Rodeo Grounds on the North Soccer Field area. The Mattie Road can also be solved with annexing land into the city and would assist in development. More places to cross the railroad as now we have only 5 ways to go from North to the South side of town and visa versa. A viaduct on Havens by the Dog Food plant as the train often blocks that road for extended time. An underpass on Foster going to Mitchell Tech or better yet another exit?
1/31/2022	Map	Make this intersection an oversized roundabout *(note: SD37 & Main Street)*
1/31/2022	Map	Make this intersection an oversized roundabout *(note: 7th Avenue & Kimball Street)*
1/31/2022	Map	Make this intersection an oversized roundabout *(note: Spruce Street & Burr Street/SD37)*
1/31/2022	Map	Make this interchange a single point diamond intersection. This will allow for semi trucks to make the corner easier and increase overall flow *(note: I-90 Exit 332 – Burr Street interchange)*
2/11/2022	Map	The north/south light has a very long cycle and could use a dedicated turn light *(note: Havens Avenue & Minnesota Street)*
1/27/2022	Comment Card	
1/27/2022	Comment Card	

Stakeholder and Public Meeting 'Issues and Needs' Summary

The following summarizes transportation issues and needs identified by public and stakeholder comments. Methods for recording these needs include written comment submittal via comment card or study website, mark-up on the public meeting open house map, and stakeholder meeting discussion/notes. Written comments are provided in their entirety in the **Appendix**.

Comment topic key:

- Roadway segment
- Intersection
- Bicycle and Pedestrian
- Area-wide or long-range

Public Meeting Comments and Map Markups

Bicycle & Pedestrian

Shared-Use Path Needs

1. **Ohlman St:** National Guard Rd north to soccer fields (shared-use path)
2. **Harmon Dr (north side of lake):** connect existing path with Harmon Drive east of Livesay Ln (shared-use path)
3. **Connectivity:** Cabela's Drive area paths – Dakota Wesleyan University area paths – Cadwell Park/Mitchell Middle School paths (shared-use path)
4. **Burr Street:** connect Burr St path with Dry Run Creek path (shared-use path)
5. **Dry Run Creek:** extend east to Foster Street (shared-use path)
6. **I-90/Rowley St underpass:** widen for path (shared-use path) (2022 planned project)

Crossing Improvement Needs

7. **Havens Ave** (Sanborn Blvd to Burr St): distance between signalized crossings creates a barrier for residents south of Havens Avenue and east of Rowley St to travel to Dry Run Creek

Traffic & Safety

Roadway Segments/Corridors

1. **254th St** (from SD37 west): number of lanes and overall roadway width
2. **Havens Ave:** slow moving vehicles (10-15 mph below speed limit)
3. **Havens Ave:** narrow lanes
4. **W 23rd Ave:** slow moving vehicles (10 mph below speed limit)
5. **Foster St** (SD38 to Spruce St): extension, tie to Spruce Street where feasible between RR tracks and Dakotafest
6. **11th Avenue** (Minnesota St to Foster St): priority east/west route and number of stops for east/west traffic (particularly at west end)

Intersections

7. **254th St & SD37:** extend NB to EB free right turn edge line further east due to conflicts with SB to EB LT traffic turning directly over into outside through lane
8. **SD37 & Sanborn Blvd:** extend WB LT lane
9. **5th Ave & Duff St:** safety, slow or stop EB/WB traffic
10. **7th Ave & Kimball St:** safety, slow or stop EB/WB traffic
11. **7th Ave & Burr St:** traffic operations
12. **Spruce St & Rowley St:** traffic operations, traffic signal needs

Long-Range Considerations

13. Annex land to assess both sides of a road for improvements
14. Impacts from increases in train traffic
15. Slow driving impacts to traffic operations and safety

Stakeholder Meeting Notes

Bicycle & Pedestrian

Shared-Use Path Needs

1. **National Guard Rd:** SD37 west to Ohlman St (shared-use path)
2. **National Guard Rd:** SD37 east to Foster St (shared-use path)
3. **Foster St:** National Guard Rd to Spruce St (shared-use path or shoulders)
    a. Narrow roadway/bridge from Firesteel Creek north
4. **Dry Run Creek**: connections to Havens Ave and Foster St (shared-use path)
5. **Dry Run Creek**: add lighting
    a. City received 2022 grant for design and construction
6. **RR path:** SD37 to Foster St (shared-use path)
7. **RR path**: modify surfacing from Lake Mitchell (northwest corner) to Ohlman St
    a. Desire all-weather (paved), currently crushed rock
8. **RR path**: add parking near Ohlman Street
9. **Burr St**: connect Burr St path with Dry Run Creek and future RR path (shared-use path)
    a. Safety concerns due to narrow sidewalk widths: back of curb sidewalk, retaining walls, limited space at underpass
10. **Ohlman St:** extend path from Indian Village Rd south to 23rd Ave
11. **Rowley St:** extend shoulder/path southward from Spruce St due to increasing development
12. **SD38P:** no shoulders, sidewalk or paths

Safety Concerns

13. **SD38P:** no shoulders, sidewalk, or paths
14. **Harmon Dr:** shared road safety concerns (vehicle speed)

Crossing Improvement Needs

15. **SD37 & 8th St:** difficult for bicyclists to cross SD37 due to volumes and speed
    a. Existing underpass at 4th Ave – opportunities to enhance connectivity
16. **SD37 & 3rd St:** difficult for bicyclists to cross SD37 due to volumes and speed
    a. Existing underpass at 4th Ave – opportunities to enhance connectivity
17. **Minnesota Ave:** pedestrian crossings from Middle School south
    a. 8th Ave and 7th Ave intersections, in particular
18. **Norway Ave & Rowley St:** pedestrian crossing conflicts

Downtown

19. In general, downtown area is a walkable area
20. Add curb extensions at crossing locations
21. Confusing where bikes can and can't go (shared-lanes or sidewalks?)
22. Lacking outside gathering areas and street furniture

General

23. Hard-surfaced paths are preferred
24. Consider additional water fountains

Long-Range Vision

25. Shared-use path loop in Mitchell area
26. Dedicated path between Mitchell and Mount Vernon (Mt. Vernon Development Corporation)
27. Mitchell Tech / Spruce Street second option and connectivity

Traffic & Safety

Roadway Segments/Corridors

1. **Ohlman St:** 3-lanes between Harmon Dr and 23rd Ave
    a. Narrow roadway, traffic volumes and turning vehicles
2. **Ohlman St:** 3-lanes between SD37 (via 8th St) and 23rd Ave
    b. Traffic volumes
3. **Main St:** operations and safety due to low (20 mph) speed limit
    c. 12th Ave to 7th Ave
    d. May contribute to higher volumes on side-streets (to avoid the 20mph section)
4. **8th Ave:** road surfacing
    e. Elevator Road – Lytle St – RR crossing: gravel section due heavy truck use
5. **254th St** (from SD37 west): number of lanes and overall roadway width
    f. Existing building setbacks will be a challenge

Intersections

6. **Sanborn Ave:** safety
    g. Sight distance due fencing (i.e., 13th & Sanborn, 14th & Sanborn)
    h. City has sight triangle requirement, but nothing for fence setback (can go up to ROW)
7. **5th Ave & Duff St:** safety
    i. High localized volumes with church and post office
    j. Night north/south through volumes
    k. Unexpected vehicles, speeds, sight distance (parking, trees, etc.) on 5th Ave
8. **7th Ave & Kimball St:** safety
    l. Varying/unexpected speeds with adjacent intersections being stop-controlled
    m. Sight distance concerns with trees and parking
9. **15th Ave & Main St:** safety
    n. Offset 'T' intersection
    o. Lewis access has created some concern being slightly offset from 15th Ave and no NB LT lane
10. **Havens Ave & Ohlman St** (SD37): safety
    p. Trucks off tracking into pedestrian space and knocking over ped buttons

11. **Havens Ave & Minnesota St:** traffic operations
    q. traffic signal timing due to long side-street delay
12. **SD37 & Spruce St:** safety
    r. NB T trucks running red lights
    s. SB RT YIELD compliance (was previously a free RT)
13. **Spruce St Walmart access:** safety
    t. Motorists turning left into right-in right-out; knocking down stop sign
14. **SD37 & Spruce St:** traffic operations
    u. SB LT queues exceed available storage
    v. Motorists use parking lot as cut-through to jump queue
    w. City has planned project to convert SB LT to dual LTs and improve Spruce Street through the RR crossing
15. **Cabela Dr & Rowley St:** traffic operations
    x. Increasing traffic volumes

Downtown

1. Mixed responses on sufficiency of parking in downtown area
2. Add electric vehicle parking/charging stations
3. Freight travel noted as good. Delivery trucks can park in center lane to load/unload.
4. Eliminate one-way streets (2nd, 3rd, and 4th Ave)
5. Concerns with speeds and traffic control compliance on streets surrounding downtown, feel that these routes are used as quick 'bypass' routes around downtown

Long-Range Considerations

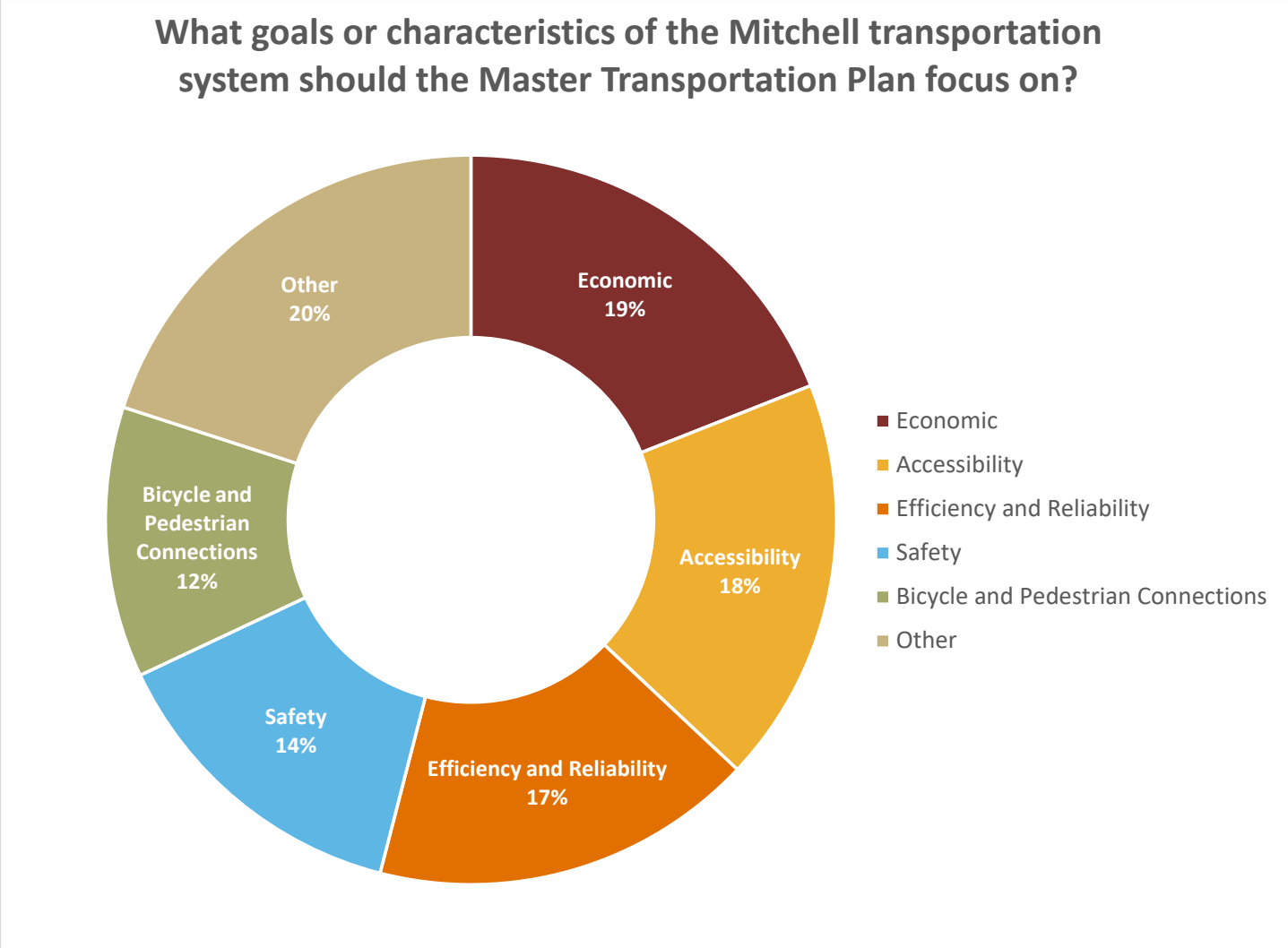
1. Second high school
2. Increased train traffic
3. Avera hospital relocation to the Grasslands area
4. Sight distance and signage reviews in older sections of town (i.e., residential areas)
5. Route prioritization within the urban core area

Top Three Goals Summary

The question **'What goals or characteristics of the Mitchell transportation system should the Master Transportation Plan focus on? (select top 3)**' was asked at the public and stakeholder meetings, on the virtual public meeting website, and through the travel survey. The goal of this question was to help the study team identify key transportation priorities to address within the MTP. Categories to pick from:

- ☐ **Safety:** Reducing the risk of harm to users of Mitchell transportation system
- ☐ **Accessibility:** Connecting people to goods and services as well as providing choices for different modes of travel
- ☐ **Economic:** Focusing on transportation as a means of supporting and promoting the economic vitality of the Mitchell Area. Connecting people with jobs, shopping, and schools
- ☐ **Resiliency:** Creating a transportation system that is adaptable and providing service when significant impactful events occur
- ☐ **Efficiency and Reliability:** Providing for the efficient and reliability movement of people, services, and goods
- ☐ **Placemaking:** Integrating the transportation system with land use to provide transportation facilities that fit in with their surrounding neighborhoods and development. Creating well-designed places and complete communities
- ☐ **Innovative:** Incorporating emerging trends and technologies into the transportation system
- ☐ **Bicycle and Pedestrian Connections:** Providing enhanced infrastructure and connections for pedestrians and bicyclists. These investments could include more trails and shared-use paths, enhanced pedestrian crossings of streets, and potential on-street bike routes
- ☐ **Other** (please specify):

The following summarizes results of this question. Because it was asked through various methods, there was the opportunity for people to respond multiple times and thus these results should be looked at as an order of magnitude perspective of key priorities.



Note: Question asks respondent to choose up to three categories. Percentage reflects the number of times a category was selected out of all respondent selections.

'Other' category includes:

- Resiliency: 7%
- Placemaking: 6%
- Innovative: 7%
- Other (write-in category): <1%

Travel Survey Summary

A travel survey was available through the study website starting on January 8, 2022. The survey ended on February 14, 2022.

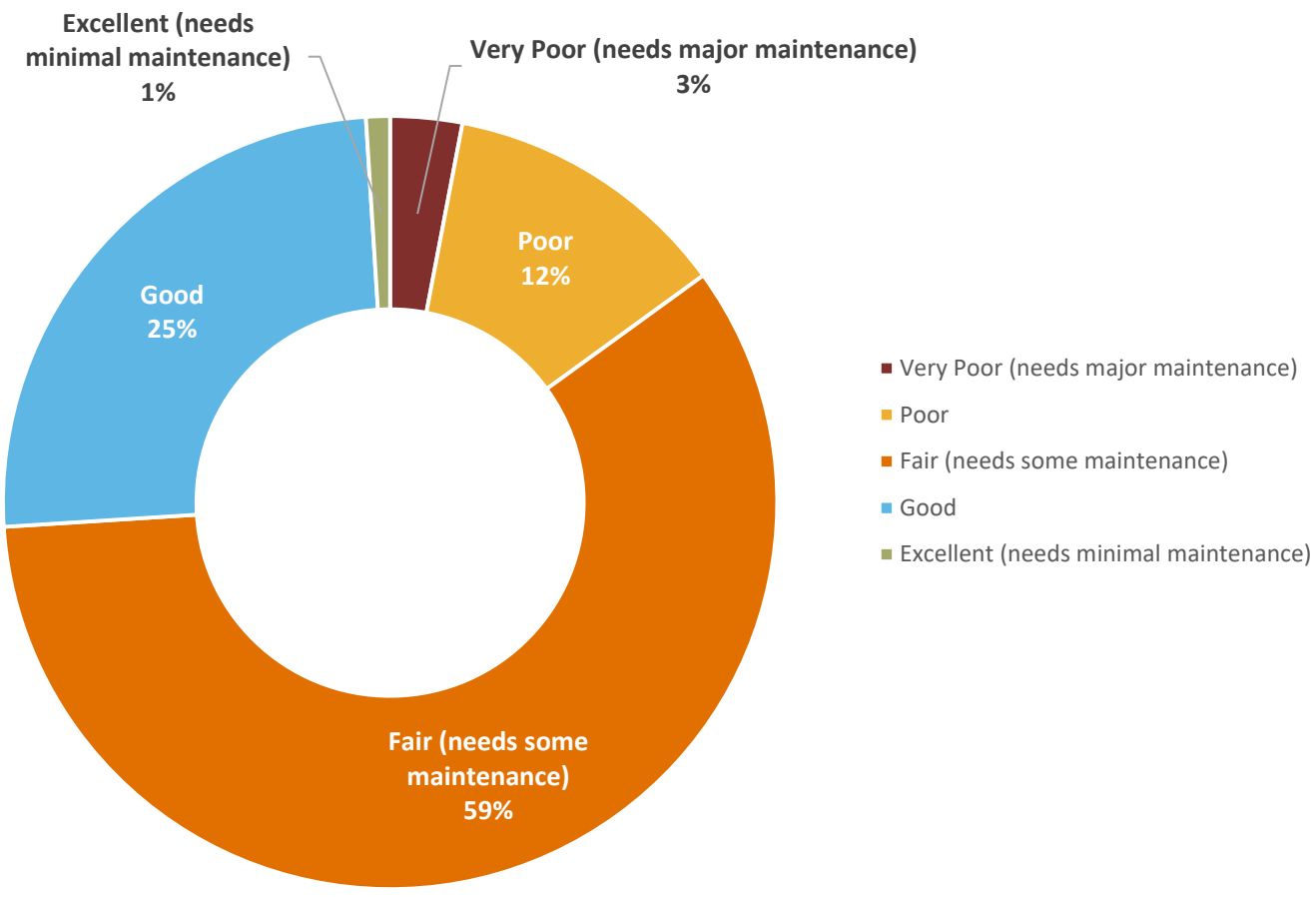
There were up to 469 respondents, though not every respondent answered every question.

The survey consisted of 12 questions related to issues and needs of the Mitchell area transportation network and then four demographic questions.

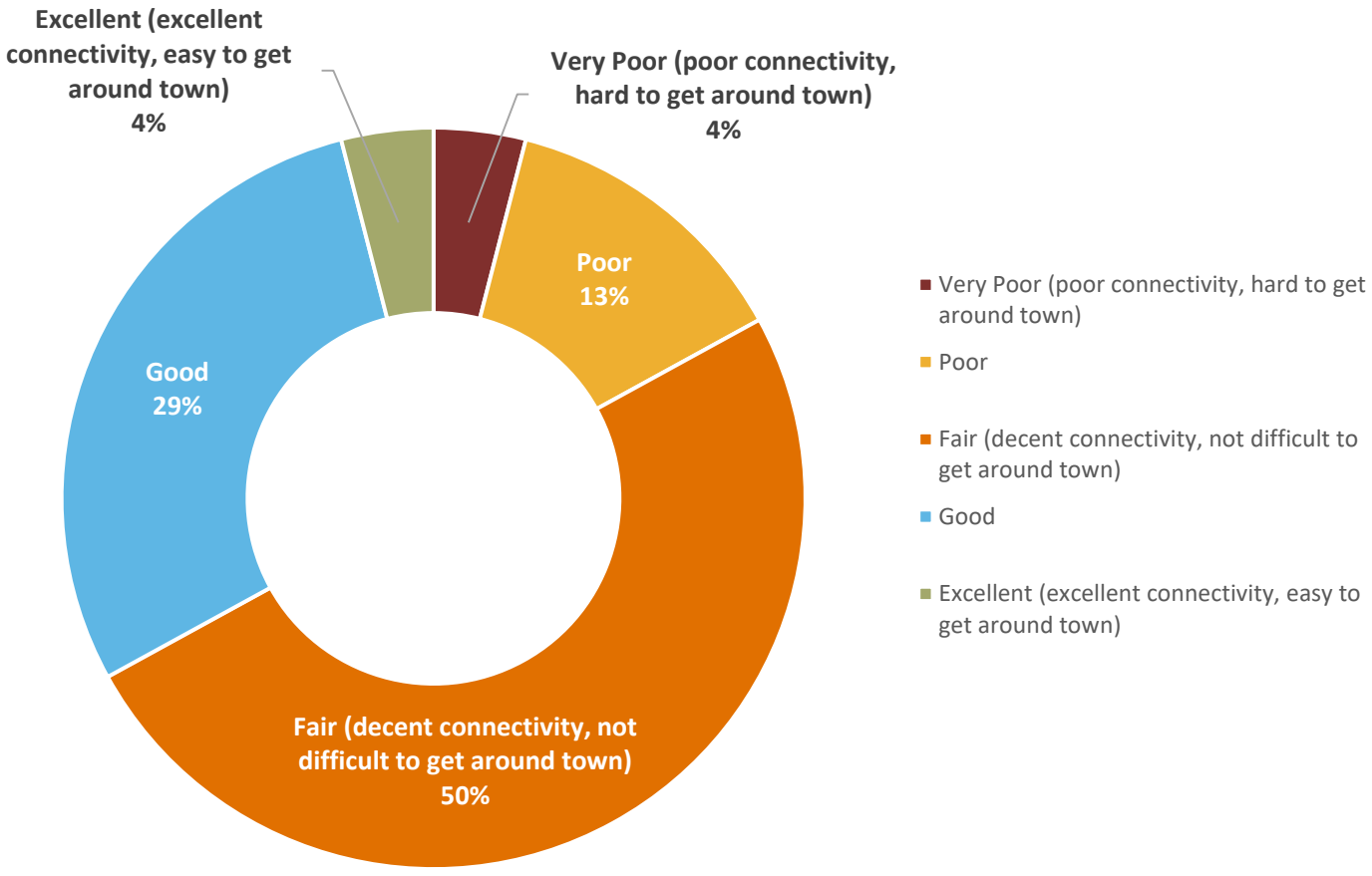
The following is a summary of survey questions and responses. The full travel survey is attached in the **Appendix**.

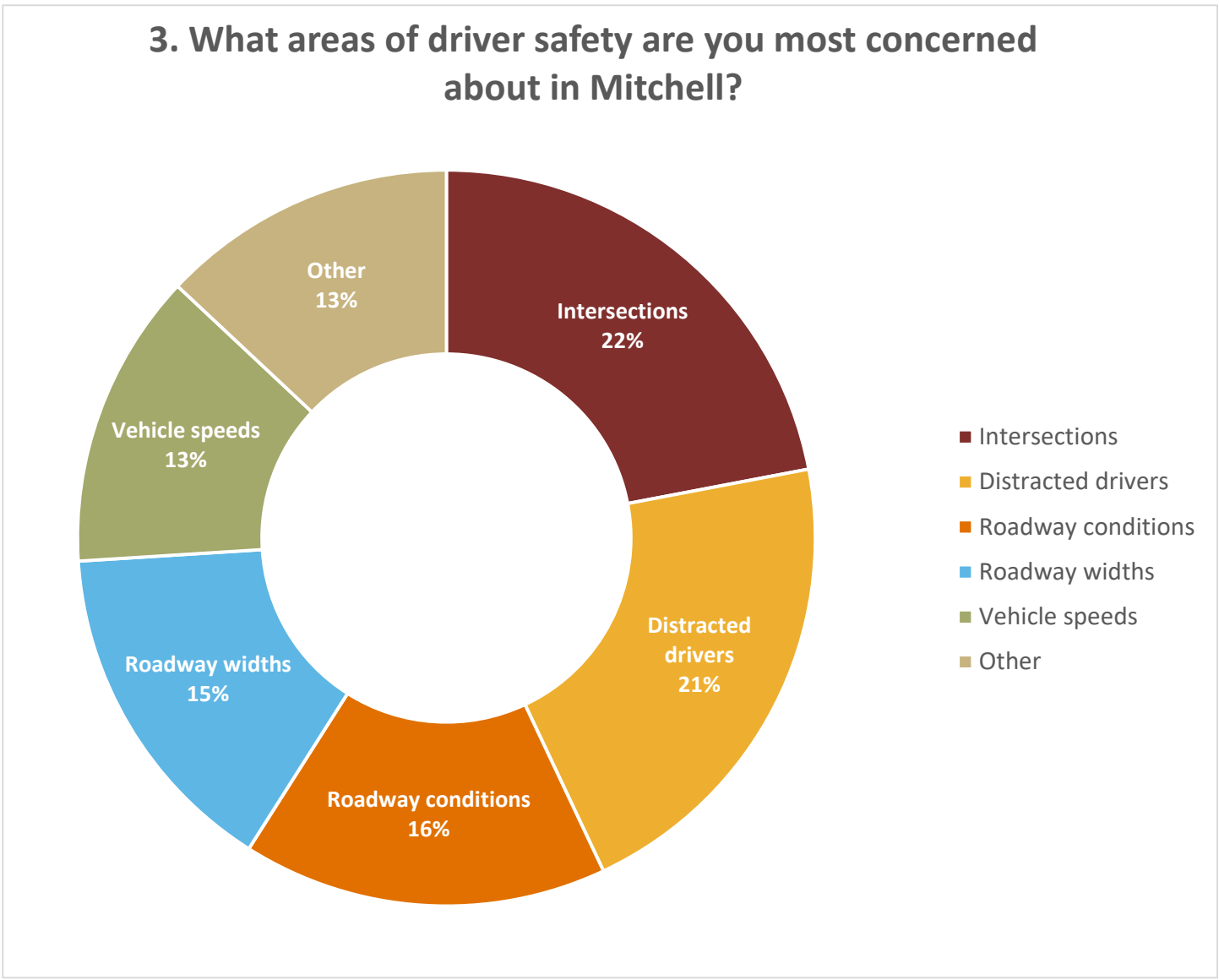
Streets/Roadways (Questions 1-4)

1. How would you rate the overall condition of the streets/roads in Mitchell?



2. How would you rate the overall connectivity of the street/road network in Mitchell?



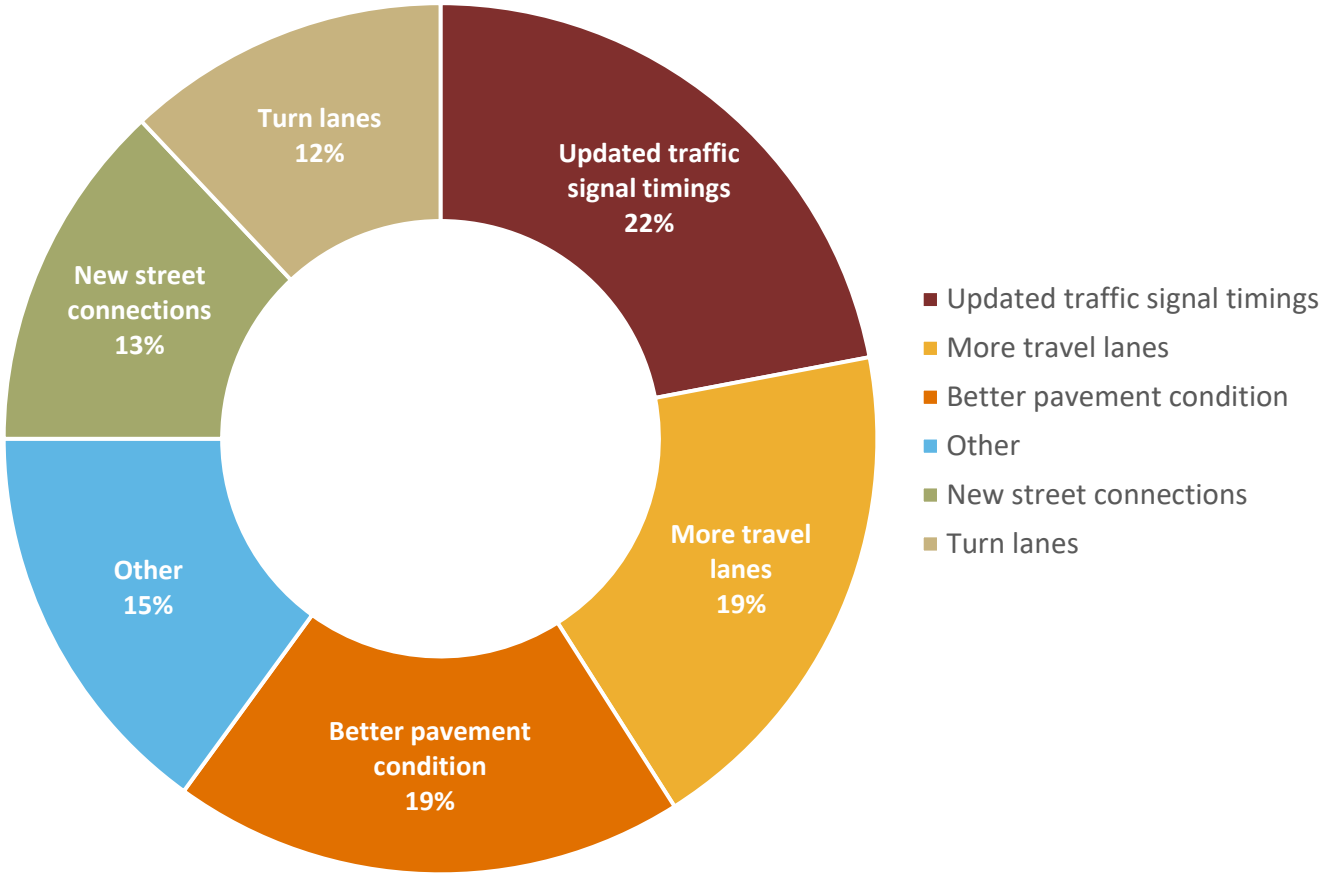


Note: Question asks respondent to choose up to three categories. Percentage reflects the number of times a category was selected out of all respondent selections.

'Other' category includes:

- Access to homes, businesses, etc.: 5%
- Traffic congestion: 5%
- I have no safety concerns: 3%

4. What improvements do you feel are necessary to enhance the street network in Mitchell?



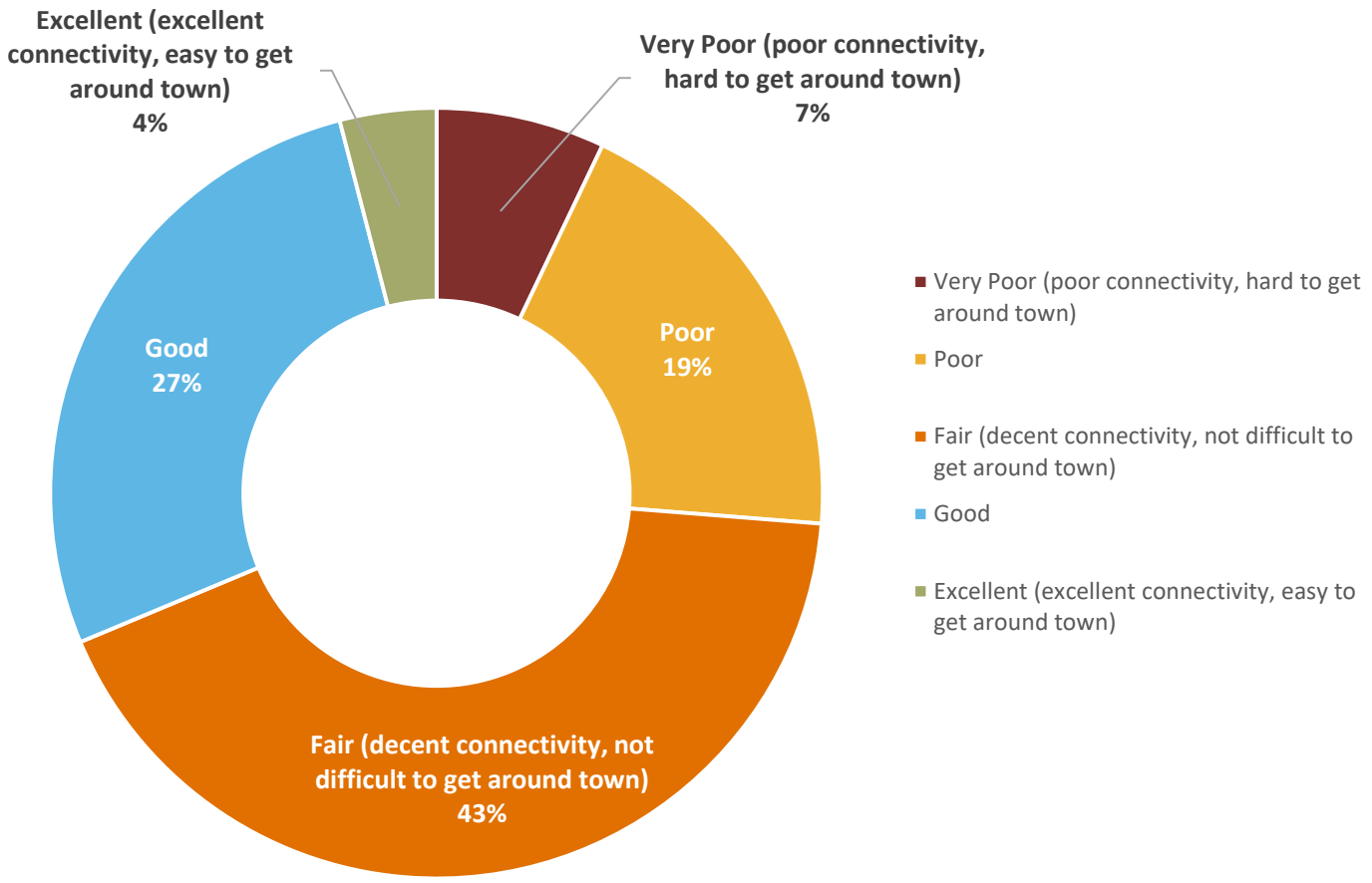
Note: Question asks respondent to choose up to three categories. Percentage reflects the number of times a category was selected out of all respondent selections.

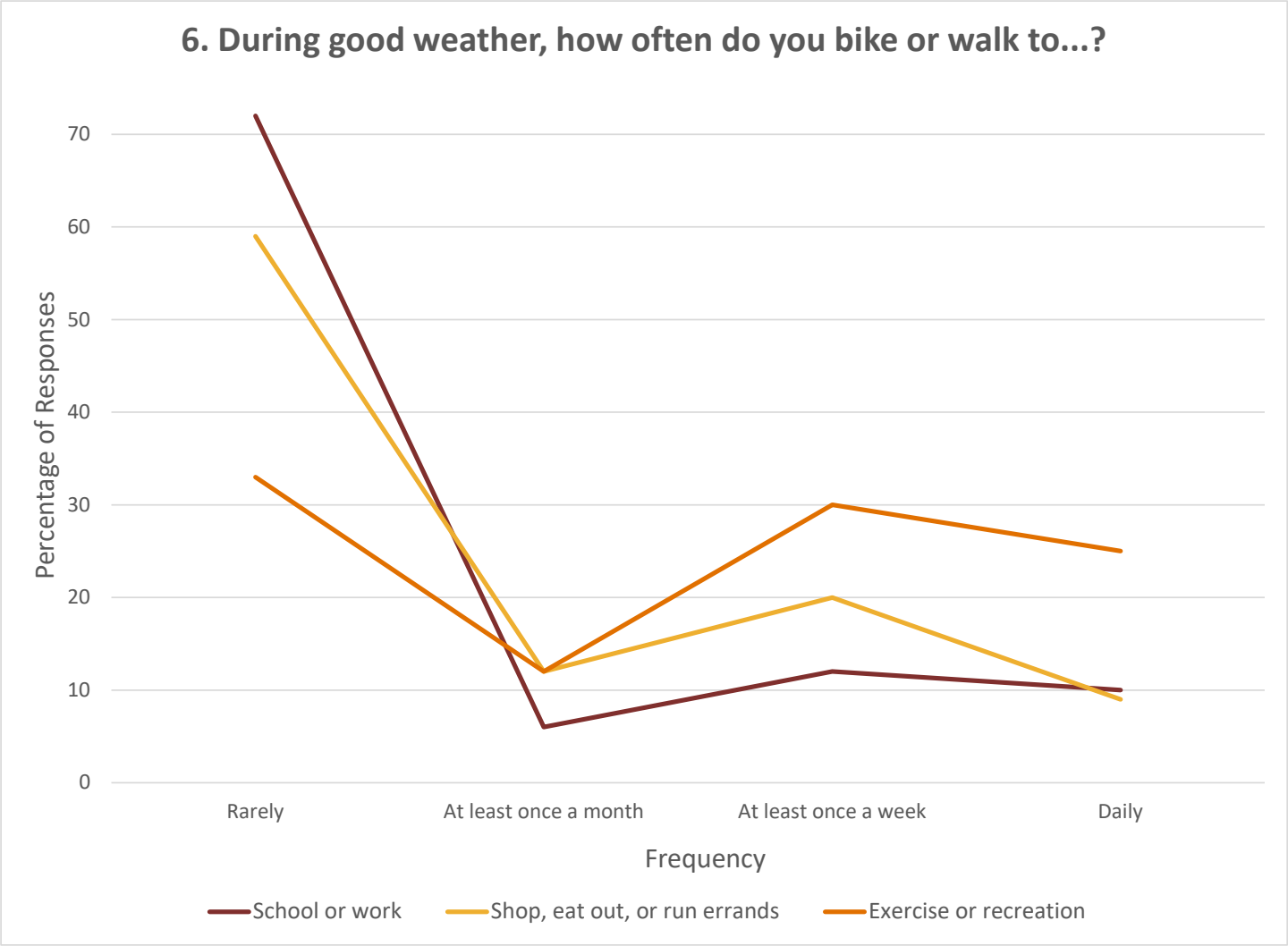
'Other' category includes:

- More traffic signals: 9%
- Roundabouts: 6%
- Medians and/or access management: <1%

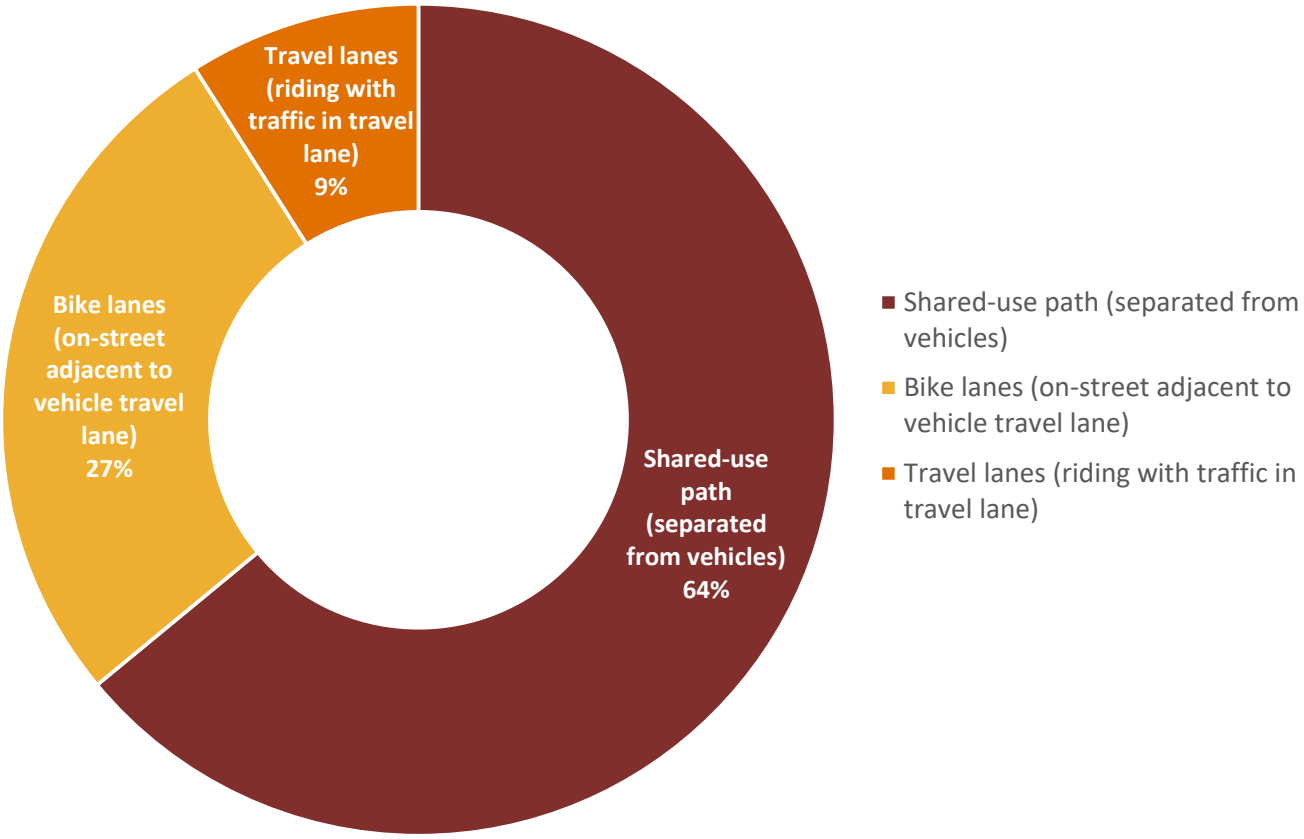
Bicycle/Pedestrian (Questions 5-8)

5. How would you rate the quality of the sidewalks and shared-use paths/trail network in Mitchell?



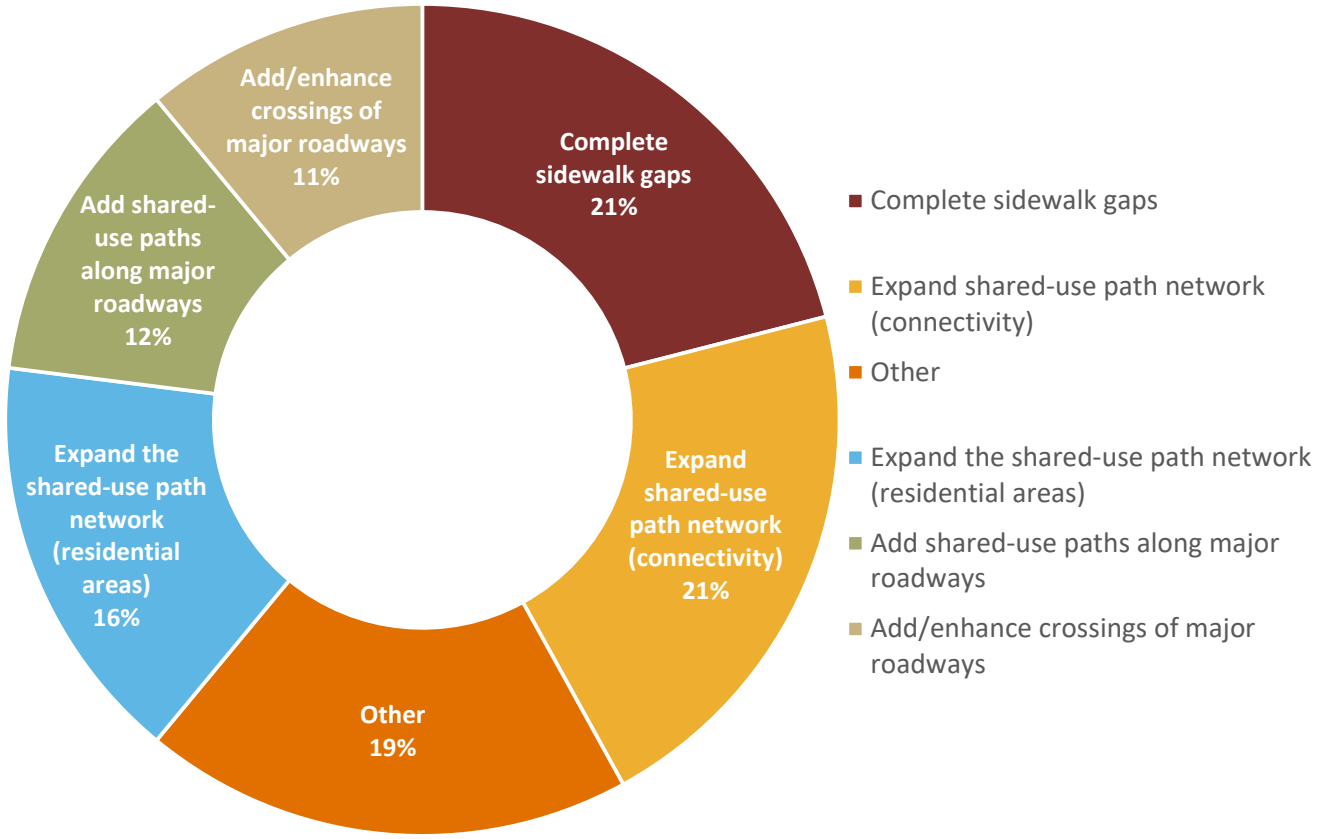

6. During good weather, how often do you bike or walk to...?
Percentage of Responses
70
60
50
40
30
20
10
0
Rarely
At least once a month
At least once a week
Daily
Frequency
School or work
Shop, eat out, or run errands
Exercise or recreation

7. Which type of bike facilities do you feel comfortable using?



Note: Question asks respondent to choose up to three categories. Percentage reflects the number of times a category was selected out of all respondent selections.

8. Which of the following do you believe would most improve the bicycle and pedestrian network?

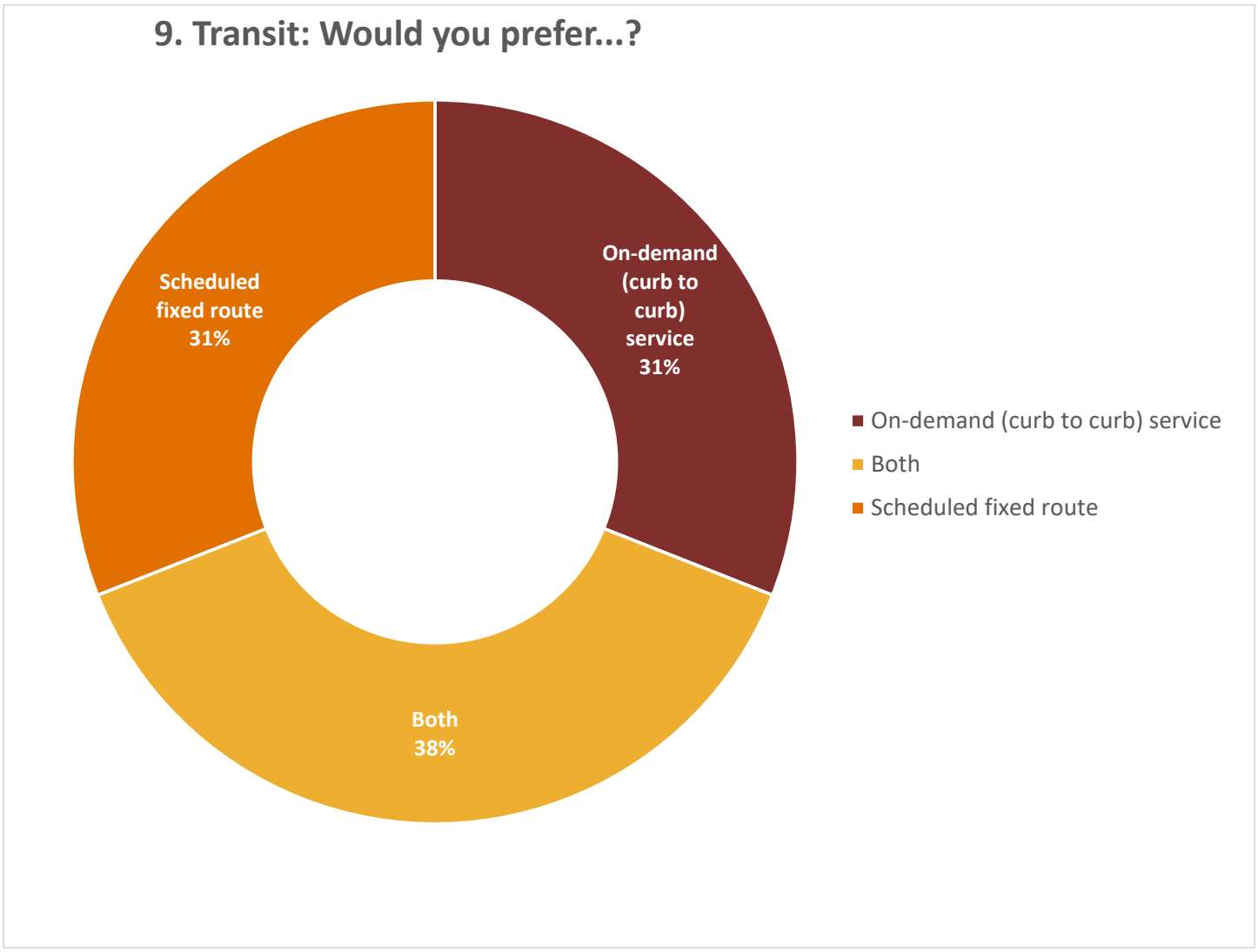


Note: Question asks respondent to choose up to three categories. Percentage reflects the number of times a category was selected out of all respondent selections.

'Other' category includes:

- Add bike lanes to major roadways: 10%
- Identify a network of lower speed neighborhood bikeways through signage and pavement markings to improve connectivity: 9%

Transit (Question 9)



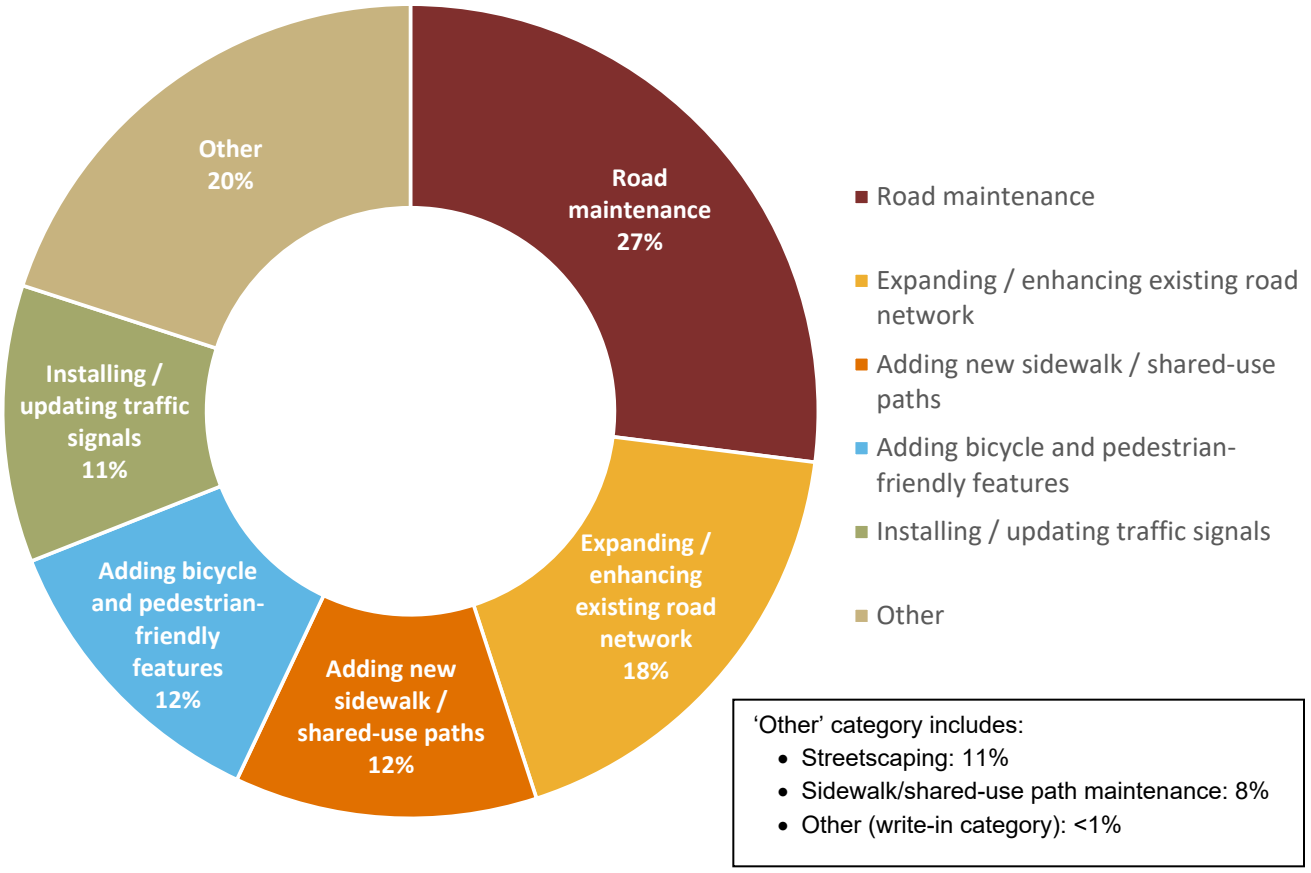
Priorities (Questions 10-12)

Question 10: What goals or characteristics of the Mitchell transportation system should the Master Transportation Plan focus on?

Top three goals include ‘Economic’, ‘Accessibility’, and ‘Efficiency and Reliability’.

See ‘Top Three Goals’ section for additional information.

11. What do you believe are the top budget priorities for transportation improvements in Mitchell?



Note: Question asks respondent to choose up to three categories. Percentage reflects the number of times a category was selected out of all respondent selections.

Question 12: Overall, what do you think are the most pressing transportation issues/needs for Mitchell?

Full list of responses provided in the **Appendix**.

In general, topics primarily focused on items such as:

- Roadway improvements and needs (extensions, connectivity)
- Bicycle/pedestrian enhancements
- Traffic signal needs (removals, new installations, and upgrades)
- Transit improvements and needs
- Traffic operations and safety (specific locations, speed, distracted driving)
- Maintenance
- Funding/spending preferences

General Questions (Questions 13-16)

Question 13: Do you live in Mitchell?

Response	Percent
Yes	82
No, but I work in Mitchell	13
No, but I often travel to or through Mitchell	5
No, and I don't ever visit Mitchell	<1

Question 14: If you live in Mitchell, how long have you lived here?

Response	Percent
I don't live in Mitchell	11
Less than 1 year	2
1 to 5 years	8
5 to 10 years	10
10 to 20 years	20
More than 20 years	49

Question 15: What is your gender?

Response	Percent
Female	51
Male	46
Prefer not to disclose	3

Question 16: What is your age?

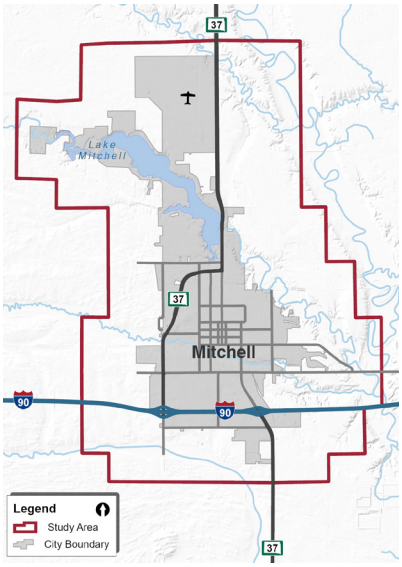
Response	Percent
Under 25	7
26 to 35	18
36 to 45	30
46 to 55	16
56 to 65	14
66+	14

Appendix A: Informational Handout

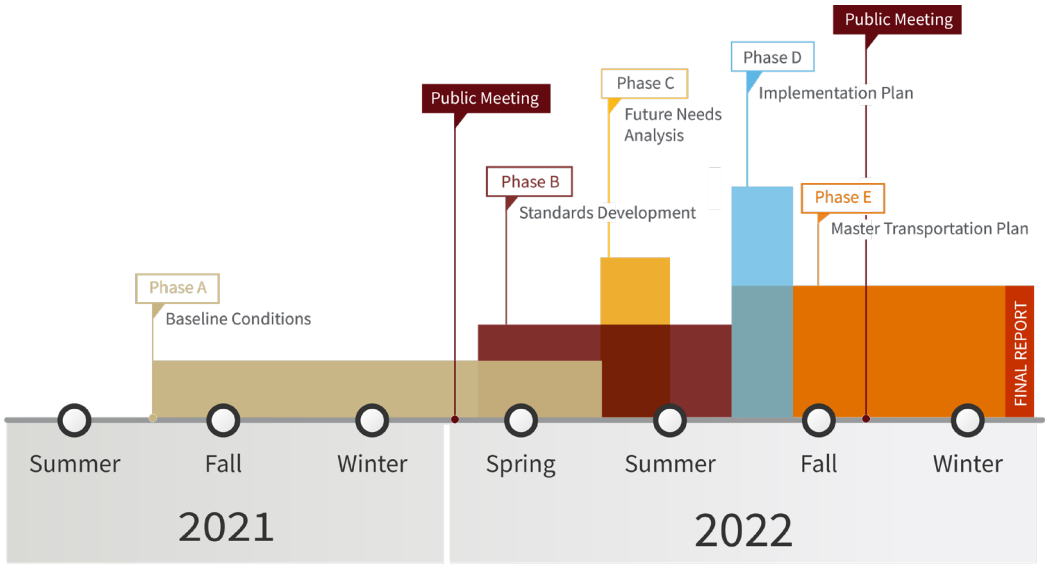
Study Overview

The South Dakota Department of Transportation, City of Mitchell, and Davison County have partnered in the development of a long-range Master Transportation Plan (MTP) for the Mitchell area. This multimodal plan will help guide transportation decisions and investments for primary modes of travel, including vehicle, bicycle, pedestrian, transit, and air. The study is currently in the preliminary stages of collecting information, conducting analyses, and gathering feedback from the public and area stakeholders to help define transportation issues and needs within the Mitchell area.

Study Area



Study Schedule



Master Transportation Plan Components

A — Baseline Conditions Analysis

B — Standards Development

1. Major Street Plan
2. Bicycle & Pedestrian Plan
3. Transit Plan
4. Pavement Management Plan
5. Traffic Signal System Plan

C — Future Needs Analysis

1. Intersection & corridor projects
2. Traffic signal projects
3. Bicycle & pedestrian projects
4. Pavement preservation projects
5. Transit, freight, airport, wayfinding, and gateway projects

D — Implementation Plan

1. Fiscally constrained list of future projects
2. Transportation funding opportunities

E — Master Transportation Plan Report

Public Information Open House
January 27, 2022

Today's Meeting Objectives

Thank you for attending the Mitchell Area Master Transportation Plan (MTP) public information open house. We appreciate your input!

In this first public meeting, the study team is looking for your help in identifying two key items:

- Transportation issues and needs throughout the Mitchell area to be addressed by this MTP
- Goals and priorities to be incorporated into the MTP

Please provide your comments by February 11, 2022 to help shape the Mitchell MTP!

Study Contacts

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Online Option

There is also an online option to this first public meeting that can be accessed through the study website through February 11, 2022. All information presented at the open house is available online, including the opportunity to provide comments and feedback on transportation issues and needs that should be addressed by this MTP.

Travel Survey

A survey is being conducted to learn more about the Michell area's transportation issues, needs, and priorities for improvements. The survey may be completed online through the study website or by submitting a paper copy provided at the open house.

Link:
https://form.jotform.com/213605937113048
or
Scan this QR code with your smart phone.

Appendix B: Travel Survey

Travel Survey – Mitchell Area Master Transportation Plan

Streets/Roadways

1. **How would you rate the overall condition of the streets/roads in Mitchell?**
   - ☐ Very Poor (needs major maintenance)
   - ☐ Poor
   - ☐ Fair (needs some maintenance)
   - ☐ Good
   - ☐ Excellent (needs minimal maintenance)

2. **How would you rate the overall connectivity of the street/road network in Mitchell?**
   - ☐ Very Poor (provides poor connectivity – hard to get around town)
   - ☐ Poor
   - ☐ Fair (provides decent connectivity – not difficult to get around town)
   - ☐ Good
   - ☐ Excellent (provides excellent connectivity – easy to get around town)

3. **What areas of driver safety are you most concerned about in Mitchell? (Select up to 3)**
   - ☐ Vehicle speeds
   - ☐ Intersections
   - ☐ Roadway widths
   - ☐ Roadway conditions (pavement surfacing condition, markings, signage, etc.)
   - ☐ Access to homes, businesses, etc.
   - ☐ Traffic congestion
   - ☐ Distracted drivers
   - ☐ I have no safety concerns

4. **What improvements do you feel are necessary to enhance the street network in Mitchell? (Select top 3)**
   - ☐ More traffic signals
   - ☐ Updated traffic signal timings
   - ☐ Roundabouts
   - ☐ Turn lanes
   - ☐ More travel lanes (street widening)
   - ☐ Medians and/or access management
   - ☐ New street connections
   - ☐ Better pavement condition

Bicycle/Pedestrian

5. **How would you rate the quality of the sidewalks and shared-use paths/trail network in Mitchell?**
   - ☐ Very Poor (provides poor connectivity – hard to get around town)
   - ☐ Poor
   - ☐ Fair (provides good connectivity – not difficult to get around town)
   - ☐ Good
   - ☐ Excellent (provides excellent connectivity – easy to get around town)

6. **During good weather, how often do you:**

   Bike or walk to work or school? (circle one)

   Daily At least once a week At least once a month Rarely

   Bike or walk to shop, eat out, or run errands? (circle one)

   Daily At least once a week At least once a month Rarely

   Bike or walk for exercise/recreation? (circle one)

   Daily At least once a week At least once a month Rarely

7. **Which type of bike facilities do you feel comfortable using? (Select all that apply)**
   - ☐ Shared-use path (Bike/pedestrian separated from vehicles)
   - ☐ Bike lanes (On-street adjacent to vehicle travel lane)
   - ☐ Travel lanes (riding with traffic in travel lane)

8. **Which of the following do you believe would most improve the bicycle and pedestrian network? (Select up to 3)**
   - ☐ Complete sidewalk gaps
   - ☐ Expand the shared-use path network within residential areas
   - ☐ Expand the shared-use path network to provide regional links and connections to popular area destinations and recreational facilities
   - ☐ Add and/or enhance street crossings of major roadways
   - ☐ Add bike lanes to major roadways
   - ☐ Add shared-use paths along major roadways
   - ☐ Identify a network of lower speed neighborhood bikeways through signage and pavement markings to improve connectivity

Transit

9. **Would you prefer (pick one or both):**
   - ☐ **On-demand (curb to curb) service that:**
     - Requires you to request service 24 hours in advance
     - Picks you up and drops you off at your requested locations
     - Reflects the current Palace Transit service
   - ☐ **Scheduled fixed route that:**
     - Operates on a fixed timetable and does not require any advance service requests
     - Picks you up at defined bus stop locations and may require walking or other means of transportation to/from the bus stops
   - ☐ **Both**

Priorities

10. **What goals or characteristics of the Mitchell transportation system should the Master Transportation Plan focus on? (select top 3)**
    - ☐ **Safety:** Reducing the risk of harm to users of Mitchell transportation system
    - ☐ **Accessibility:** Connecting people to goods and services as well as providing choices for different modes of travel
    - ☐ **Economic:** Focusing on transportation as a means of supporting and promoting the economic vitality of the Mitchell Area. Connecting people with jobs, shopping, and schools
    - ☐ **Resiliency:** Creating a transportation system that is adaptable and providing service when significant impactful events occur
    - ☐ **Efficiency and Reliability:** Providing for the efficient and reliability movement of people, services, and goods
    - ☐ **Placemaking:** Integrating the transportation system with land use to provide transportation facilities that fit in with their surrounding neighborhoods and development. Creating well-designed places and complete communities
    - ☐ **Innovative:** Incorporating emerging trends and technologies into the transportation system
    - ☐ **Bicycle and Pedestrian Connections:** Providing enhanced infrastructure and connections for pedestrians and bicyclists. These investments could include more trails and shared-use paths, enhanced pedestrian crossings of streets, and potential on-street bike routes
    - ☐ **Other** (please specify):

      _____

      _____

11. What do you believe are the top <u>budget</u> priorities for transportation improvements in Mitchell? (select top 3)

- ☐ Road maintenance
- ☐ Expanding/enhancing existing road network (additional lanes, new connections, paving gravel roads, etc.)
- ☐ Sidewalk/shared-use path maintenance
- ☐ Adding new sidewalk and shared-use paths
- ☐ Adding bicycle and pedestrian-friendly features (path lighting, bike lanes, crosswalks, bike racks, benches, etc.)
- ☐ Installing/updating traffic signals
- ☐ Streetscaping (aesthetics, plantings, street trees, creating a sense of place)
- ☐ **Other** (please specify):

_____

_____

12. Overall, what do you think are the most pressing transportation issues/needs for Mitchell?

_____

_____

_____

_____

<u>General Questions</u>

13. Do you live in Mitchell?

- ☐ Yes
- ☐ No, but I work in Mitchell
- ☐ No, but I often travel to or through Mitchell
- ☐ No, and I don't ever visit Mitchell

14. If you live in Mitchell, how long have you lived here?

- ☐ I don't live in Mitchell
- ☐ Less than 1 year
- ☐ 1 to 5 years
- ☐ 5 to 10 years
- ☐ 10 to 20 years
- ☐ More than 20 years

15. What is your gender?

- ☐ Male
- ☐ Female
- ☐ Prefer not to disclose

16. What is your age?

- ☐ Under 18
- ☐ 18 to 25
- ☐ 26 to 35
- ☐ 36 to 45
- ☐ 46 to 55
- ☐ 56 to 65
- ☐ 66+
- ☐ Prefer not to disclose

Appendix C: Travel Survey Question 12 Responses

12. Overall, what do you think are the most pressing transportation issues/needs for Mitchell?

Look at what damage Govt has done to inner Mitchell by creating roads to avoid town. Creating more parking on the street downtown, diagonal, is a first step.
I would like traffic lights to be adjusted to reduce the amount of time that vehicles on busier streets wait at red lights with no through traffic from the less traveled streets. Example: when driving on Sanborn it's not uncommon to hit every red light even though there is no traffic on the cross roads.
Multiple news outlets stated a soybean processing plant is scheduled to be built south of Mitchell. I am highly concerned about the increased congestion that will result from numerous semi trucks entering this already busy and at times unsafe roadway. I am wondering how the city plans this keep this area safe as hundreds of cars commute back and forth on this stretch of highway on a daily basis. I feel this needs to be a top priority.
Bike safety. I ride my bike regularly with my children and I feel very unsafe riding on the streets, there are no bike lanes and areas that you aren't allowed on the sidewalk. Some drivers are very aggressive and dangerous.
We need to pave roads that have been waiting for years such as Maddie Ave
Roadway widths, lighting, updrading gravel roads
Public Transit should be on a schedule and not feel like a taxi service. You may think that Mitchell is not big enough. But it is growing, it's better to have something in place now than to scramble to figure out something later.
The timing of the turn signals on a few intersections needs to be reconsidered as they are too fast and only one vehicle can go at a time. And the conditions of the roads with potholes or patches needs to be addressed. It's hard on vehicles and makes for a bumpy ride around town.
Speed zones - something to slow down? Monitoring?
more than one way into Mitchell Tech.
Reducing speed limit on highway 37 south of Walmart until further out of town. Right turn lane off highway 37 at Carl Left turn signal at 1st & Burr for east/west traffic. Traffic becomes congested after school. Make Foster thru street to south of interstate 90
Updated roads and lights on Burr are great but the fact that they turn red and you can't turn when there is no traffic coming from the other way. Occasionally you're sitting at the light for minutes and there doesn't seem to be a reason for it.
**Consistent Routes for the bus to run for those that are not of age to drive or.... are unable to drive, yet old enough to use the services to get across town in a SAFE & AFFORDABLE way!!! *******FOR the love of Mitchell no more YIELD signs just make them STOP signs! (Seriously the cops don't even yield!!!)

12. Overall, what do you think are the most pressing transportation issues/needs for Mitchell?

Road/Street conditions and connectivity.
Need for more traffic signals at busy intersections.
I commute to Mitchell for work. The upgrade at the intersection of Spruce and Hwy 37 is incredible. I typically only use the "main arteries" in town - Havens, Burr, Sanborn, Etc. but do get downtown once in a while. These streets are in good repair, but I do believe you need to install traffic lights on the side streets that turn onto 1st Ave - it's a forever wait to get turned there and and gets dangerous. The other thing that HAS to happen is changing the turn signal at Spruce and Burr to turn south onto 37. It does not flash yellow and it needs to. Drivers have to wait through two light cycles if they don't get there in time for the sensor to pick them up.
More bussing options that do not require 24-hour notice with busses that have wheelchair tie-downs in the FRONT of the bus. The wheelchair tie-downs in the back of the bus are too hard (because of the bouncing that takes place behind the axles) on the elderly! Longer bussing hours. Palace Transit does an amazing job, just wish the hours of service went into the evening on weekends.
There needs to be an additional road added to access Mitchell Tech for safety reasons. If the train is crossing and someone gets injured, emergency vehicles need to travel a great distance to get to them. The road and added pull off lanes to the south of MTC need to be paved and signage added.
The route to Mitchell Technical College needs to be looked at and reconfigured. As it creates daily traffic congestion, students speeding behind blarneys because of the untimely light that gives a minimum amount of cars through. Mitchell Technical College should have a double turn lane if the light is going to be that short, or the arrow that blinks yellow for a yield. Speed bumps should be considered behind blarneys as well as clear traffic road paintings due to high amount of traffic using this route in the AM.
-We have a tourist attraction that receives 250,000 + visitors during the summer time and it is difficult to get there and you have to travel through residential areas. The route that the busses have to take are cumbersome. Once they get downtown it is difficult to move around. -Downtown is an absolute disaster and currently it should be hidden from view. Traffic to the Corn Palace needs to be direct from the interstate to the building. Showing tourists our downtown area is like inviting people to your home and walking them through the dirty bathroom to get to the less dirty kitchen. Then constantly telling them that they should focus on the improvements to the kitchen. -We need to move traffic to the bypass and south end of town and develop there. That is where the opportunities are. -We did a study years ago and it found that the citizens of Mitchell wanted to focus on Main Street Development. I believe this conclusion was misinterpreted. Mitchell residents want main street to be developed to the point where it simply isn't falling over into the street.

12. Overall, what do you think are the most pressing transportation issues/needs for Mitchell?

-Development and traffic needs to go South to our major retailers. Walmart should have the interstate go through their parking lot as they are the largest payer of sales tax in in County.
Connecting the bike path around Lake Mitchell including a safe waling path on Indian Village Road. There are many people that walk, bike or run on that road and there is not a safe place to walk. The curves make it dangerous because you don't see each other from a distance.
none
Road from Highway 37 to Mitchell Tech needs replaced and widened
Road Repair and connectivity
Transportation for those without their own means of transportation, whether because they don't drive, don't have a car, or are elderly/disabled.
Better biking paths on streets and road and completed sidewalks across Mitchell. Updated timers and signals for streets especially around schools in town.
adding sidewalks
Adjust the timing and control of the street lights to favor the large traffic flows NOT the small traffic flows. Don't cycle lights on a timer; cycle when needed favoring the main flow of traffic.
Take out the speed bump in front of corn palace.
Road conditions.
More public and private choices for people who can’t drive. Road maintenance on neighborhood streets.
OVerall I don't think they are too bad. Cost of adding streets is an issue. Keep up maintenance.
Poor road conditions and bike connections through city streets
Public transportation more readily available, road maintenance, and update traffic signals
North Harmon needs to be a real street with curb, gutter, and sidewalk. It’s ridiculous to focus on the same in these new areas when one of the oldest, and inhabited by the highest income earners in Mitchell, is not subject to the same safety and logistic criteria. It’s unsafe pure and simple. Poorly developed sewer and drainage is another huge area of concern. Culdesacs with no drains isn’t up to code and the developer and city are at fault for allowing this.
More camera systems to catch young drivers texting while driving
Keeping the roads up to date .

12. Overall, what do you think are the most pressing transportation issues/needs for Mitchell?

saftey
Getting people from Interstate to downtown is cumbersome - the signage is adequate, but a direct lead would be more efficient and aesthetically showcase the city better.
Actually removing snow curb to curb not one pass with the plow down the middle of the road. Improving drainage from the sidewalks in the neighborhoods around dwu. Improve the east entrance/exit of Walmart onto spruce or better sign.
speed, distracted driver cell phone, not enough stop signs on side streets
Streets with so many pot holes. Old sidewalk replaced because particularly missing cement, , more sidewalks with handicap exit & entrance.
Quality of the roads and a consistent train schedule that doesn't hit during peak traffic times, up to 3 roads can be stopped for a train over the lunch hour
Make pedestrians feel safer out walking alone
Bike paths need to all connect, we have paths that lead to nowhere. We also need more sidewalks. My neighborhood has none and farther away has houses with some sidewalks and others with none. Every residential area should have sidewalks. It is a safety issue especially with kids. One other lesser issue is that when it is raining at night it is almost impossible to see the road. Better stripes or more striping.
Distracted drivers
Drivers not respecting speed limits as well as park and school speed zones. Cars racing at night.
More options for those of us that choose not to drive. Roundabout instead of stop signs at rowley/spruce intersection and spruce/hwy 37 would keep flow moving while keeping it safe.
Fix all the pot holes
Need more sidewalks and walking paths. We have too many no outlet streets so hard to get to places without going around.
Unlicensed drivers
Reliable bussing that runs daily ona schedule
Stop or yield signs on intersections in town without any at all.
Overpass or underpass for Foster
Maintenance of roads, sidewalk connections
south burr street in terrible. they should have left it like it was before. fix the damn traffic light sensors at Walmart
Expanded bike/running trail

12. Overall, what do you think are the most pressing transportation issues/needs for Mitchell?

Terrible snow removal in winter! Our transit system is not efficient nor affordable. It appears to cater to kids more than adults. The 24 hour notice is not realistic and the cost is ridiculous. The transit needs to have a bus or two that just runs a route with fixed stops/pick ups.
Better road conditions. Wider roadways
Lack of connection from one side of town to the other for side walks and tansportation to all areas at all times
Not to have a traffic light on the bypass. I've seen semis that are not able to stop in time, this kid going to cause an accident. I personally almost got hit from a pickup that did not stop on a red light. Also more side walks for children. Fix west havens street road is terrible all throughout that high way. Causes me to almost go into the ditch.
Clean streets in winter curb to cub and down to street Reliable and timely Palace Transit service
Better roads
The lights timing needs work. They are terrible.
Intersection on Sanborn crossing from east to west by CHR is difficult to see due to Daily sign on southeast corner obstructing view of north bound traffic.
Well if the powers didn't go like a bad out of hell plowing the streets they wouldn't be so messed up.
Better snow removal in winter. Bike routes. Hwy 37 north leaving town...median fix up....it disgraceful looking.
Palace trans employees need to quit telling people that it's a government regulation that they cannot pick up anybody that is outside the scheduled route. And they need to have a bus directly for call ins period
Maintain existing roads. Repair them before more damage can occur. Hire a competent street superintendent.
Other than the bypass, getting across town is a slow process. Our infrastructure doesn't really have a quick and clear way across. Also there a few busy intersections that could use a traffic light, the bypass and W 8th and also the Vern Eide Ford corner of N Main and W 23rd.
There are some safety issues with plants/trees blocking the view. For example, on Burr Street when you are headed south and want to make a left turn into the caribou/gas station lot, the trees and shrubs planted block the view of oncoming traffic and it's very unsafe.
Improve residential streets and more 4way stops instead of all the traffic lights.
Access. Far too often I spend extra time trying to get where I want to go. Or looking for parking when I get there.

12. Overall, what do you think are the most pressing transportation issues/needs for Mitchell?

Having transit for elementary age kids to get to and from school/activities. Making busier roadways (Sanborn, Havens, Burr, etc) more runner/bicycle friendly, as well as adding lighting in certain areas. Connecting the bike paths throughout town a little better so that runners or bikers can use them to get around town without having to be on the side of the main roads and having to deal with traffic.
I see no "pressing" issues. Some of the intersections off of the interstate by the truck stop and graham's can get difficult to negotiate. Ex. Difficult to make a Left turn (east) when a semi is in the west turning lane as it's difficult to see past them. It might be nice to have some painted lines also for turning out of each of those places. I've seen vehicles that arent familiar with those corners want to turn past on oncoming vehicle instead of turning in front of each other, which made the other vehicle nearly collide as they were expecting to turn in front of each other.
The road conditions. Driving around town on these roads is awful. I feel like my vehicle is being shook apart from the sheer amount of bumps and potholes on the roads.
The sidewalks
Adding bike lanes and making it safer for them in Mitchell.
Improving the efficiency of movement through busy intersections while also improving the safety for all travelers in those intersections.
I believe the most pressing thing is for there to be street light at the intersection of west 8th and the bypass. This is a heavily congested area and seems to be getting worse with more construction going on by the lake. Also I believe there should be some thought into the intersection of cemetery broad and hwy 37 by Vern eide.
Updated bike trails/sidewalks (more), updated traffic signals. (Stop light put in by the bypass could use an arrow, the cross walk button at the intersection of Minnesota and Havens is broken, etc.)
Working on traffic signals and adjust timing. The stop light by m&h is horrible for timing when you're going from Rowley to Havens, and the turn signals on 37 by Wal-Mart need work too. It doesn't always detect vehicles trying to turn onto burr so you end up sitting there for a few complete cycles before you get to turn.
Random 1 way to 2 way streets downtown 2nd,3rd,4th.
Making sure the bike path is completely done connected around the entire city for all to use.
We need better parking downtown.
Safety. People run yields and stop signs all the time.
Street repair and maintenance. And making sure all streets in town are paved, no gravel!

12. Overall, what do you think are the most pressing transportation issues/needs for Mitchell?

Make people realize that some roads have a speed limit above 25. So many streets people drive 20 of 25, when the limit is 35. This is a safety issue when people drive that much Below the speed limit. It's especially bad on Spruce and Cabela's drive
Intersections are a problem. I believe the lights are not timed correctly and this encourages people to run through them faster and not pay attention.
New sidewalk connections and side walk improvements. It's abysmal trying to navigate which streets have sidewalks, that are not on a busy street. Also, public transportation. There is a huge wage gap between the poor and rich in this city. Reliable, consistent, and affordable public transportation will have a huge impact on the community.
The roads are falling apart. People are walking in the middle of the street because there is no sidewalk. Sidewalks on Main Street have big chunks missing and people and people in wheelchairs can't use them without falling out of their wheelchair.
Area that was rebuilt by i-90 and thr truckstop is a disaster for turningbecause the turning lanes are not aligned. Also at the lake and the area north of the west end bridge for the newly marked biked baths puts traffic in each other's lane
Too many uncontrolled intersections. I would like to see more yield signs.
Anthony Ave needs to be paved
Ohlman and Cemetery Road intersection
Maintenance of roads
Road conditions and pedestrian and bicycle safety
Parking on main Street! Why did the city give the lot located on the corner of 3rd and main to the new owners for the crafty fox building for apt parking g rather than using it for public parking? Build a parking ramp there! You want to increase shopping on main Street. Make it accessible!
Poor public transportation
Not enough public transportation after 9
Be more bike friendly
Limited accessibility
Street light times
Widen havens street, fix Minnesota and havens stop light
Move the Massage Therapy sign on Havens. Totally blocks vision entering Havens from the South on Edmunds. Why is there a boulevard hedge on East 11th by the stadium? Isn't it illegal since it takes up the full boulevard right up to the curb. Too many dangerous

12. Overall, what do you think are the most pressing transportation issues/needs for Mitchell?

overhanging branches even on Main, Lawler, Rowley and all thru town. The bike paths we have are getting in bad shape and underused. We cannot afford more paths until the ones we have are fixed and why should 98% of the taxpayers spend hundreds of thousands on more bike paths that they don't use? FAR more people walk than use bikes. Bikes should be on the sidewalk, NOT the streets. If a biker meets walkers, they should stop and make sure pedestrians are safely passed. They DO NOT belong in the street. They act like they own the road. Joggers also do not belong in the street if there is a sidewalk available. Growing up we were told to stay out of the streets, even by policemen when we were running or biking, BUT we were also courteous to pedestrians and didn't act like because we had a bike we were more important than walkers, joggers or Motor Vehicle Drivers. Thank You.
Upkeep of road surfaces
Increase the number of roads that connect the north to the south. When Sanborn was closed, Minnesota and Burr were overwhelmed.
Road network is decent, and pavement is kept in very good condition. Main areas of improvement should be pedestrian safety! Especially in the area around the interstate. I frequently see people walking from north of the interstate to the south, and they are often walking on the road because pedestrian options are terrible there.
Palace Transit is not a good system for people with disabilities. They experience long wait times and sometimes the people are not treated kindly.
I think everything mentioned so far is important. Two things not mentioned: 1. lack of visibility for drivers at many, many places like intersections and when turning out of businesses and alleys and driveways because of parked vehicles often with attached trailers and/or actual campers and work trailers and plantings. For just one example, turning left out of County Fair onto Edgerton St. 2. You can add all the turn lanes you want, which I do think are necessary in several places, if drivers don't obey the rules they don't work! I fine from a place with roundabouts and am okay with them but I can't imagine them working here!
Keep bicycles off public roads , and for the love of all that's holy change the timing between the street lights on burr street at least between i90 and Norway st
Street light timing!!!! Many lights have lines of stopped vehicles and the other side with the green light, there are no vehicles!
the intersection on burr and spruce should be better aligned
bike lanes
affordable transit for low income
Stop lights on extremely busy corners (Ex: Bypass and 8th) and 4 way stops on busy intersections in town. Also widening streets for better flow of traffic (Ex: East 7th, East 6th and so on).

12. Overall, what do you think are the most pressing transportation issues/needs for Mitchell?

I think public transportation really STINKS!!!
Quality of roads and city bus reliability and assess ability for elderly and low income. Also needs to run on holidays. The bus has been two hours late picking up my elderly mother from a doctor's appointment and also forgotten her and also taken her to the wrong place. It needs to be reliable.
Havens St needs wider lanes. Large vehicles are very close & when snow is piled along the edges the lanes are even narrower. Also sidewalks shouldn't be soo close to the roadways. I never feel comfortable walking on a side walk next to a road where cars are whizzing by at 30+ mph. Tack on distracted drivers..no way. Even when people are walking along a road I'm traveling I get uneasy, especially if they are walking with children. Maybe the city could acquire smaller vehicles for day to day pick up & drop offs. The big busses are usually empty, having only a couple passengers. Seems wasteful.
Traffic flow, where trucks and buses can operate. Parking in business / tourist areas.
Norway, Minnesota and Foster need to be 30 mph not 25 mph
Follow the principles of Strong Towns. Make Mitchell a walkable city that is easy to get around without a car. Focus on the easy of movement of people not cars. Shops, restaurants and stores serve people not cars so put people first.
Sidewalks by busy roads (Ohlman)
1. regulating stoplight timing - Burr Street 2. Connecting up bike/pedestrian pathways 3. Review difficult intersections for traffic lights
Women in there crossovers are the WORST drivers
Frontage roads and turn lanes . The south Burr street from Havens to I 90 is very confusing and hard to drive at night. Just have never liked the design and traffic flow of that highway. Frontage roads need to addressed more in the design of new construction.
After a snow one night I was on first street heading west, wanted to turn south on burr, and thought there was a turning lane. The snow had all markings covered, and here I was in the oncoming lane. Nothing happened, but could have. I like turning lanes.
Adding onto foster street to the south so that is crosses Interstate and connects with Spruce Street/255th street.
Outer limits and access into city
the city roads are good compared to other citys
We need more major through roadways that connect all parts of the city easily.
Trains going at busy times of day.
Lack of Forward Thinking and city not taking initiative (i.e. Mattie Street - want everyone else to pay; Foster or alternative route from MTI) Time to actually make the moves instead of just

12. Overall, what do you think are the most pressing transportation issues/needs for Mitchell?

talking about them. Its paralysis by analysis. FORCE AND DIRECT ALL TOURISTS down main street to enhance attractiveness of our downtown and help businesses. This would not be an expensive endeavor.
I think road maintenance is the most pressing. I would also like a turning lane on the corner of 1st Avenue and Burr St. We have many unmarked intersections and I feel that many drivers have no clue what they need to do when there are multiple vehicles going in different directions.
Not enough north south corridors.
Not enough taxis and operable hours without having to plan 24 hours ahead using the bus
Residential streets that are narrow need to have parking on one side only and no parking to curb signs very dangerous Snow removal downtown is awful
Weeds along the curb and boulevard. Looks terrible in the Summer and Fall
Sidewalks around the lake. I only there are trails but the bikers want to speed down them therefore I have to walk on the road and hope drivers see me and go around
Stoplights holding up traffic flow
Getting people to stop texting while driving
More efficient paths from north half of town(1st Ave) to the south half of town (havens st) and a solution to the trains blocking the road on E. Havens by performance pet when trains decide to stop for whatever reason
Cleaning snow off roads in the winter
Need a turning lane at Havens and Burr St. turning east. Waste a lot of time when the car is going straight, North, and several cars want to turn east. Now would be the perfect time to get it done beings the motel or gone.
Please dear god pick up the dog poop littering the path by butterfly garden loop. Best spot for a jog. so sad in winter.
updating existing infrastructure, paving gravel roads inside city of Mitchell
Maintaining & connecting bike paths; clear roadway markings; retaining 2way traffic in downtown area.
Unsigned intersections in residential neighborhoods.
Keep routes for vehicles, bikes, and pedestrians open, accessible, and in good working condition.

12. Overall, what do you think are the most pressing transportation issues/needs for Mitchell?

The east turn lane on 1st and burr.. it's extreme difficult to see if oncoming cars are approaching
Rough roads
Not sure anything can be done but the trains sitting on the road at Minnesota street and on east havens has been getting ridiculous. also would like more yield signs at uncontrolled intersections. people cannot seem to grasp the yield to the right concept.
Another way to get from the North to South side, other them Burr or Minnesota street.
Updating/expanding roadways and traffic flow where significant housing development is occurring
Connect south of the interstate sidewalks to rest of town. Rowley and Ohlman streets specifically
Residential Streets in Mitchell do not line up correctly and cause confusion. Too many Traffic Lights in Areas not necessary, especially on Sanborn. Road Maintainence.
We need a bus line that we can expect to arrive at a bus stop at certain time. Instead to call the Palace transit and picking you up whenever they want. We have no a "reliable public transportation" also the price is ridiculous expensive for taxis. People is paying 6 dollars per one way ride, it means 12 dollars per round trip! it is 4 x more than a gallon of gas costs.
Making sure that the City is usable to all types of workforce, not just the top level should be a priority. We need to make sure that all workers can get to and from work safely and in a timely manner.
Removing many (half?) of the traffic lights on Main Street. I avoid downtown because Main Street is just a traffic trap. No more traffic lights on Highway 37 bypass. The bypass should be a fast way for drivers to get around town. Traffic lights defeat the purpose. Increase the options people have to get outside to walk, run, ride bike, etc., and to get closer to nature (i.e., not on roads or on sidewalks in built-up neighborhoods). The walking/biking trails along North Ohlman, by Sandy Beach, and along the railroad tracks north of Twin City Fan are quite popular. How about more trails like that? A rail-trail type of trail between Mitchell and Mt. Vernon, although mostly outside this committee's responsibility, would be popular. A trail out to the new water- retention area on the northwest end of town perhaps?
Drivers not slowing down at unmarked intersections. Traffic parked on the side streets.
Maintaining what we have while expanding the road system to handle updated traffic patterns and numbers.

12. Overall, what do you think are the most pressing transportation issues/needs for Mitchell?

Updating high traffic areas/intersections. Change the I90 Burr st intersection to a single point diamond which would allow for a higher traffic flow and easier cornering with semi trucks. Oversized roundabouts on burr st and spurce st, burr and 7th st, as well as north main and the bypass.
Consideration for an alternate route to Mitchell Technical College.
#1 set up a website where people can report sidewalks that are in need of repair, completion, tree branches trimmed, snow and ice removed... That way only one person needs to report it instead of a lot of people or other people thinking it has already been reported. Same for illegally parked vehicles and trailers. Wider streets. Streets that connect Walking paths and sidewalk completed
Some stops signs on 4 way streets so it can limit the speed and accidents on them
Bus routes. Affordable public transportation for low-income residents
Road repairs
Safety- seems to be an inordinate amount of excessive speed, rolling stops, red light running (mostly on turn lanes), and over tint of windows.
Make it less car centric, give people options that don't require a car, make it more pedestrian friendly.
The three area of focus for me would be: 1) Lighting bike path use that is currently involved. 2) Maintaining sidewalk conditions. Things like the Railroad and Minnesota (1st and Min.) intersection for sidewalk isn't acceptable and it has been like that for over 4 years. 3) Figuring out a transit system that elevates the drinking and driving that I see in this town.
Speed, traffic on major and side streets are driving at outrageous speeds which is Endangering other drivers and pedestrians
Enforce-ticket all distracting driving also possible signage with fines, consequences . Enforce-ticket property's that visuals effect signage, signal lights example stop sign, pedestrian crossing, biking, speed limits. Completing side walks ,
The stoplight at Holman and Minnesota street needs to be addressed
Connecting bike paths throughout the city. Eliminating traffic signals on Main Street. They are an eye sore. Roundabouts where appropriate instead of 4 way stops.
Try to devise a system of easier connectivity. That Mais Street is not a through street is the root of many problems moving people from the southern part of the city (I-90) to the Corn Palace.
Snow removal improvements. Pave gravel roads around M&H gas station.

12. Overall, what do you think are the most pressing transportation issues/needs for Mitchell?

For some reason, EVERYONE in this town drives 5mph UNDER the posted speed limit. Either the true lane to turn south into County Fair is too thin, or people cant figure out how to pull completely into the turn lane. They leave 12" of their vehicle in the lane of travel, slowing the flow. traffic light timing needs to be updated, like, 5 years ago. There is no reason that a vehicle traveling at the posted speed limit catches every red light! They should be catching every light as it turns green. It's a waste of fuel.
better curb to curb plowing, as well as increasing curb appeal of main street and the down town area
More traffic lights are needed. The one on Minnesota and the By-Pass has been a great improvement.
Opening up commerce for Mitchell by connecting north to south east to west.
Eliminate all gravel roads within the city limits. Second, the ever popular education of drivers. The majority of drivers in our community do not understand the laws of the road, how a 4 way stop works or a turn lane. This sometimes leads to the elimination of 4 way stops in lieu of stop lights which to me is a step backwards for efficiency. Education is cheaper and more effective than new infra structure. (Good luck with education)
General speed limits could be upped 5mph on most roadways. 4 lane roadways should not be less than 35mph ever. Better connection from the interstate to downtown Mitchell.
three areas of improvement ideas have an exit off the interstate to connect foster and the east side of the tech school somehow connect burr street to main street north of havens. Getting across town on the east side of main street is very difficult certain times of day, also it would bring business along the route sidewalks are also a public safety thing, the city is doing a good job in slowly getting all neighborhoods updated.
Road maintenance and the accessibility to Mitchell Technical College.
Spend the money on improving the roads we already have. Most roads are wide enough with the exception of Havens. Improve upon what we have, spend extra to make it right!
Maintaining the streets we have. Putting bump-outs on Main Street and having stop signs instead of street lights is only going to push traffic away from Main Street.

12. Overall, what do you think are the most pressing transportation issues/needs for Mitchell?

I think the roads to the hospital need to be widened and better marked. I also think there should be no stops to the hospital. All cross traffic should be required to stopped
Proper road maintenance
More/expanded bike paths with new pavement.
Widen Havens street to accommodate center turn lane. Widen inertsection of Burr and Havens for North bound traffic. Intersection of 1st and Burr
More family friendly paved trails for biking and walking/running. Would be really cool to have a paved walkway all the way around the lake!
Connectivity for expanding city limits, growth to the South and West of Mitchell area. Transit from North to South of Creek and Railroad.
Dedicated Right turn and Left turn lane at all intersections where there is a stop light. People in this town do understand the proper flow of traffic on streets that do not have a stop sign or yield sign so having signage on all these streets would help with traffic flow.
City streets are to narrow and need to be made wider when they are redone. Complete 15th Ave W to connect with N. Ohlman St. Sidewalks/bike paths need to be added, especially around businesses, schools, and major roads. East Norway from Rowley St to Burr St.; South Rowley St from West Pine to Spruce St: SD 37 By Pass from W 15th to North Sanborn; North Ohlman from W 23rd to Kemper Ave; West 23rd from N Minnesota to N Main St. W 8th from SD 37 By Pass to N Ohlman North Ohlman From W 8th Ave to W 23rd Ave Pave walking bike trail starting at W23rd that goes to N Navin Rd (Lake Mitchell.) Walking/bike path on S Ohlman over I90 Walking/bike path on S Rowley St under I90
Thank you for the opertunity to take your survey. The intent is all wrong, we have enough bike paths. DO NOT BUILD MORE SIDEWALKS AND BIKE PATHS. The problem with the traffic in this town is that there are many drivers that do not drive with any intent at all. The speed limits need to be increased, and poor and dangerous drivers need to be ticket. Drivers need to pay more attention, and not drive like their daily commute is their Sunday drive. There is a lack of enforcement of traffic violations. We also have a fastly increasing aging population, and it is a fact that driving skill worsen with age. There are engineering design changes that are needed. 1st Ave intersections, Burr, Sanborn,

12. Overall, what do you think are the most pressing transportation issues/needs for Mitchell?

and Minnesota, are all terrible and need attention. As well as increased budget to enforce traffic violation.
Bikes on the road around the lake is an extremely dangerous situation. Road needs to be wider and striped for cars and bikes and walkers.
Road maintenance and streetscape through out the entire city
pave allys
Adding more roadways to make it easier to get to certain areas of town. A traffic light or 4 way stop on the corner of E 1st and Foster would be nice. Making sure we do not have gravel roads in town or potholes. Working on streetscaping to make the town look inviting to people that not only live here but visit, also making sure there are no weeds growing in the streets, boulevards or sidewalks.
Accessibility for public transit, especially for those who cannot afford to drive to work, dr. appts., grocery store, etc. Roadways need improved maintenance. Intersections need to be cleared of trees/shrubs/landscaping close to the corner creating blind spots in numerous places around town.
Intersections - some are very busy and need traffic lights. 1st & Foster is soooo dangerous! Especially between 7:30am to 8:30am and 4:30pm to 5:30pm.
Downtown stop lights need to be removed and other traffic lights need to be timed or updated to allow for the efficient movement of traffic.
It is time for a pedestrian connection bridge between Dry Run Creek Park and the downtown area. Both areas would benefit from bridging those two parts of the city, which right now feel foreign from each other because of the train tracks between them and hopefully would help drive development in the south part of downtown. Also, it is important to continue to build out the bike/walking paths from the Lake Mitchell area to the rest of the city.
Safety... Sanborn... Several wood fences have been built creating visual constraints ... built right up to the sidewalk... city zoning must get serious of not allowing these- to get better line of site. Alley traffic is a major issue for many... considering the large amount of garage placements in the core of Mitchell....we must have better alley conditions...AND the condition of our alley in restricting drainage contributes to flooding and residual water ponding. Gravel roads inside of the city of Mitchell.... why do we have any unfinished roads in Mitchell such as single block roads between paved roads? These are ridiculous in the City...creating more moisture issues. When ask for the paving, the City simply sends a pricing listing of how much the owners in the area to make that happen - why do they have to do so when they pay taxes just like others do - that have full pavements already - so please fix this injustice.

12. Overall, what do you think are the most pressing transportation issues/needs for Mitchell?

Sanborn construction last years- please do not build a contoured pavement... suggest connecting more drainage entries instead. Highway 16 ... going west - why have building permits been issued to build so close to the roadway.... is there no masterplan to widen that to 3 or 4 lanes as more traffic is anticipated...please work with the County to make that happen... or is there another anticipated travel road upgrade for the future. The Masterplan needs to also interlace with the work done with the Davison County Masterplan of about 7 years ago. One of the recurrent needs is to finally get the Foster Street access to Mitchell Tec- or a bridgeover behind Hampton to the east. This has been a circular issue ..... never fixed yet!
The need for road maintenance with city streets and shared streets with Davison County.
The Burr Street project goal was to improve safety and turn-ins to businesses. The turn in on Burr street from Spruce to Havens are very dangerous. When a Truck/Semi are sitting in the turn lane you cant see around or behind them for oncoming traffic. Instead you have to inch your way out to see and hope that no oncoming traffic is coming that doesnt take the front of your car off. The design of the turning lanes was not engineered correctly and reversed the goal of safety , it is now more dangerous to turn off of Burr Street
Badly need a sidewalk on Ohlman street between cemetery road and Lakeview golf course entrance. Also a bike path next to the road on Indian village road. In the summer there are a lot of bikes and people walking on the road. Would like to see Indian village boat ramp be paved. Less gravel would be on the pavement then.
Bus system and to improve side streets especially East 1st that goes by Oakwood golf course it needs to be widened.
The current bus system is way too cumbersome and very expensive for the people who need to use it. Having to schedule a trip to the clinic and then not being able to stop at a pharmacy with scheduling that stop 24 hours in advance is ridiculous
The city needs to do more to address transportation for seniors and those with mobility issues who need access to safe, reliable, inexpensive, and consistent means of traveling to medical facilities, entertainment, shopping, restaurant, and popular destinations throughout the city. And a airport shuttle to Sioux Falls would be a welcome addition, even if only once or twice daily. Anything would be better than the over $300 roundtrip taxi expense.
Better traffic flow and safety options to busy areas, such as MTI campus.
Our street maintenance, snow removal, etc. is generally pretty good! Our biggest transportation problem is that simply trying to get across/around town reasonably quickly is an exercise in futility! Virtually ALL of our existing thoroughfares are either blocked or choked off by some combination of railroad tracks, the Interstate, schools, and/or creeks making in-town travel overly onerous & time consuming. This directly results in frustrated -

12. Overall, what do you think are the most pressing transportation issues/needs for Mitchell?

and inherently less safe - residents who NEED to be able to move reasonably quickly across & around town. Safety can be enhanced by enabling efficient & quick traffic flow between areas of town. Mitchell's current traffic flow and travel time efficiency is HORRIBLE compared to other even much larger municipalities within which I've lived. Thank goodness this situation is FINALLY being addressed!
I think 1st thru 4th Street One Way's are a mess. It should either be One Way all the way through or not at all. There are many intersections in town where business signs are out on by the curbside and make it hard to see the cross traffic. You have to go past the stop sign and almost into traffic to see around it. Take 9th and Sanborn going East and looking South for example. I think there should be ordinances against this and if there are ordinances, they need to be enforced.
In Mitchell the most pressing transportation issues are a combination of vehicle and pedestrian/bike shared use infrastructure. 1. With traffic aware traffic signals, vehicles are able to move in and out of the community more efficiently which has an economic and environmental impact for all using vehicles. The less people are sitting at a stop light with no one traveling the opposite direction, the less wasted time and gas for community members. 2. Shared pedestrian/bike paths or side walks in residential areas are often disconnected. This is less of an issue for adults, and more of an issue for children. I live on North Harmon Drive, and kids trying to get exercise by walking or biking on the street becomes very dangerous. The high speeds, width of the street, curves and lack of a multi use paved path in that area often lead to unsafe conditions for kids and sometimes adults. North Harmon is used by the local residents but also by Lake cruisers out enjoying the scenery, and joy riders trying to get as much speed around the curves as possible. Having a separated hard trail that linked to the single track trails would improve safety significantly in this area. There are similar gaps in sidewalks and hard trails in other residential areas around the city. The city has been doing a good job of improving this in the past, but there is still work to be done. 3. Connecting residential areas to shopping and commercial districts via shared use paths would improve safety especially if the areas are disconnected by major streets or highways. This would encourage more people to bike, run, or walk to and from these areas. I know this is in the works along HWY 37 going north from the intersection of the bypass and Main. I think this is a great idea. 4. Finally, a review of speed limits in town in general would be good. Some areas such as the hwy bypass and the north end of main street seem too slow. 20mph on main street seems crazy slow. 35mph after the intersection of main street and the bypass also seems too slow. Also on the South end of the by pass, 35mph and 40mph also seems too slow as well. This road is meant to get people moved in and around the community quickly. After the Minnesota street intersection, it seems like 50 mph is a very reasonable speed until the I-90 on ramps. 5. Long term, Mitchell needs more North/South streets that go all the way through Mitchell. Kimball and Capital get used heavily, but don't continue due to the rail road. Thought into

12. Overall, what do you think are the most pressing transportation issues/needs for Mitchell?

this would be good. Also an East/West street that goes all the way through Mitchell would be beneficial as well. 11th, 7th, and 5th all seem like good options or potential options to make this happen, but long term planning would be needed.
Renovation of older streets and infrastructure
Roads need care, even the new Sanborn Boulevard rides like a roller coaster (up and down, bumpy). We need traffic lights and turning lanes to keep traffic moving and more lights in high traffic areas. Our transportation network should include space for bikes and walking that are safe from high speed traffic and semi's.
Set schedule transportation for workers at our biggest employee based plants. If we are to grow that need is going to be greater. If we can make it easier for people to travel to work and shop in town with public transporation, then they will spread the word to other friends/family that Mitchell is looking forward and trying to be proactive. Our best recruiter where i work is referrals, so what better way to get the word out than making life easier for our current residents.
Pave ally's
Scheduled mass transit so there is an alternative to "car culture."
Completing the bike paths around the lake Removing stop lights on Main Street
expanding roads into new development areas; plus, who owns 1st Avenue between the Golf Course and Foster? It needs to be fixed, wider... I'm amazed there aren't more accidents, as people speed, don't stay in their lane, it's not maintained, etc.
road width, shared use paths, intersection congestion, round about
Better public transit (cheaper, scheduled)
Need more roundabouts. There is a need for more streetscape for downtown and the areas where people enter Mitchell.
What you are doing right now - planning for the future. It would be exciting to have plans for a additional bike paths and feel confident that in the next few year it will occur. I love the idea of place making and offering alternative of modes for travel, but I don't know how practical will be given our short tourism season and lengthy winter. I appreciate the forward thinking and work of the 3 partners: City, State and County.
Paving those few remaining streets that are still gravel. Increasing the shared use path network. They are far safer than bikes in traffic lanes. Adding sidewalks where there are none on either side of the street.
The congestion around the high school before and after school needs to be addressed. The intersection at 11th and Capital running east and west being offset along with the parking lots right beside it on both the east and west side of Capital is an accident waiting to happen.

12. Overall, what do you think are the most pressing transportation issues/needs for Mitchell?

Also, Kimball and 7th becomes difficult to cross in the afternoons with both the traffic from the high school and Gertie Belle converging together. As far as sidewalk and bike paths, so much of that system has been developed on the west side of town, to the north around the Lake and soon to be on the south of town. Those of us on the east side of town would enjoy bike paths as well and do not want to be forgotten (we pay our taxes too!). I feel that walking and biking along Foster street is very dangerous and it would be great to develop something there that connects with the existing paths in the other areas of town. As far as public transit, I know of an individual who cannot drive due to a medical condition and who regularly depends on the transit service. The current arrangement of scheduling in advance along with the limited night-time and weekend hours is very difficult and makes managing transportation to/from work shifts that are other than 8-5 impossible. It also allows no flexibility for daily living. There should be a better solution.
Connectivity is an issue in Mitchell. I don't know how you change that is there is only one street that can take you from one side of town to the other north and south which is Ohlman. There is no street that can take you from one side of town to the other east and west with the exception of Spruce Street and Havens.
There needs to be a turning lane on hwy 37 to Carl road or don’t have the speed limit go up to 65 until after that corner.

MITCHELL
Master Transportation Plan





Public Involvement Meetings #2 Summary

Mitchell Area Master Transportation Plan

Meeting Date: March 20, 2023

Mitchell, SD
April 21, 2023

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Public Meeting Overview

In-person Public Meeting: Monday, March 20, 2023

- Corn Palace, Mitchell, SD
- 5 – 7 p.m.

Virtual (Online) Public Meeting and Comment Period: Monday, March 20, 2023, through Friday, April 14, 2023

Study Website: https://mitchellmtp.com/

Virtual (Online) Public Meeting Website: RESOURCES (mitchellmtp.com)

The second of two public meetings was a hybrid type meeting where there was an in-person open house with an introductory overview presentation on March 20, 2023, and a self-guided virtual component available on the study website starting on the same day and extending through the comment period.

The following is a summary of available public involvement statistics:

- In-person public meeting attendance: ~13 plus Study Advisory Team
- Study website users (March 20 – April 14, 2023):
  - 66 unique users
  - 71 total sessions
- Study website access:
  - Direct: 42
  - Organic Search: 9
  - Referral: 5
- Devices used to access study website:
  - Desktop: 41
  - Mobile: 15
- Virtual public meeting users (March 20 – April 14, 2023):
  - 14 total sessions

Stakeholder Meeting Overview

Monday, March 20, 2023

Corn Palace, Mitchell, SD

Bicycle & Pedestrian: 1 p.m.

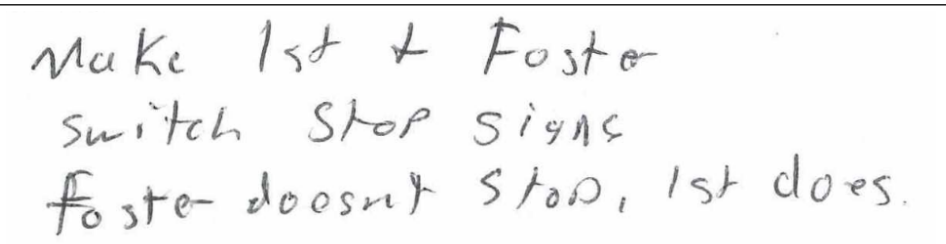
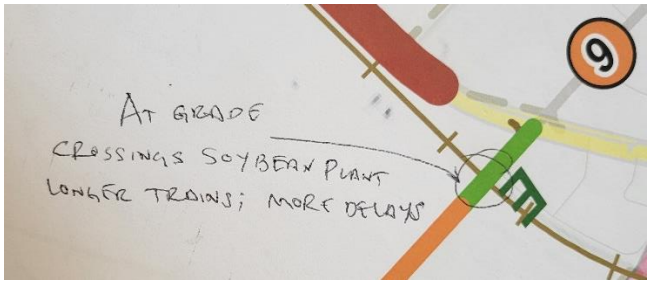
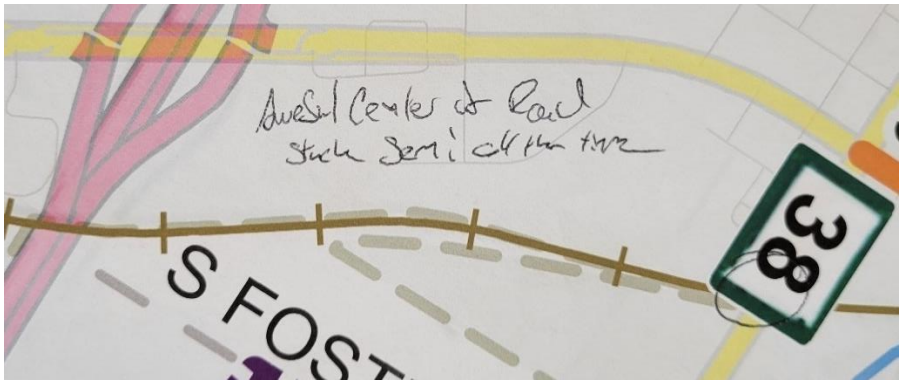
Business, organization, and community leaders: 3 p.m.

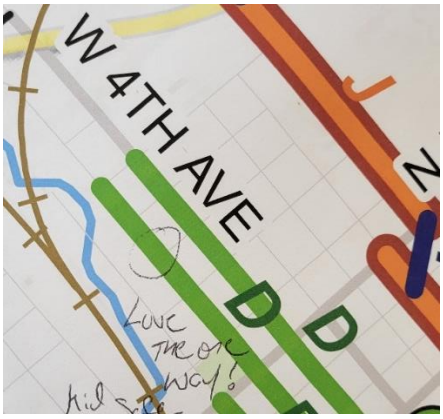
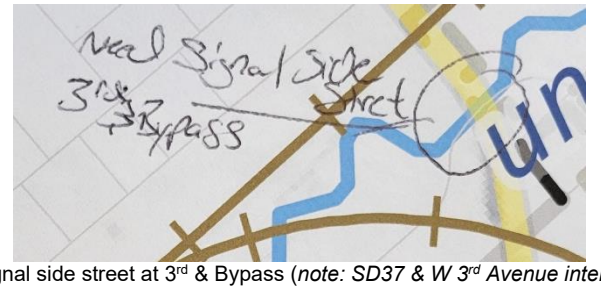
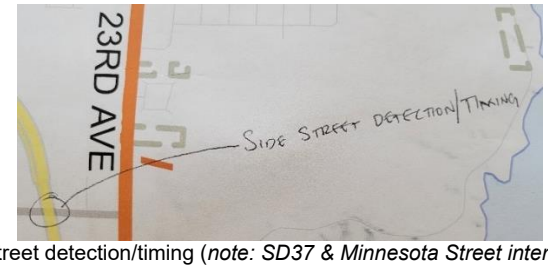
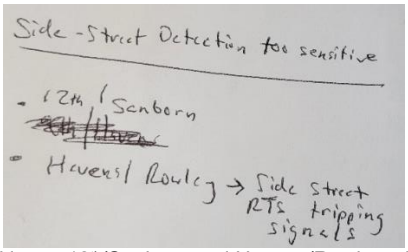
Stakeholder meeting notes are summarized in the Stakeholder and Public Meeting Preliminary Recommendations Feedback Summary section. Approximately 10 stakeholders plus Study Advisory Team members attended the meetings.

Written Comments

A summary of written comments provided to the study team are included below. The method used to submit the comment and submittal date are noted.

Table 1: Written Comment Summary

Information	Method	Comment
3/20/2023	Comment Card	
3/20/2023	PIM Website	Focus on transportation grants and other external funding sources. Adjust project priorities (short-term, mid-term, and long-range) and defer certain projects to a later date.
3/20/2023	Map	 At Grade Crossings Soybean Plant Longer trains; More Delays (*note: at-grade railroad crossing at Spruce Street*)
3/20/2023	Map	 Goes w/ Center of Road Stuck Semi all the time (*note: railroad crossing at SD38*)

3/20/2023	Map	 Love the one way! (*note: along 3rd Avenue*)
3/20/2023	Map	 Need signal side street at 3rd & Bypass (*note: SD37 & W 3rd Avenue intersection*)
3/20/2023	Map	 Side street detection/timing (*note: SD37 & Minnesota Street intersection*)
3/20/2023	Map	 Side street detection too sensitive at 12th/Sanborn and Havens/Rowley where side street right turns trip signals (*note: Sanborn Boulevard & 12th Avenue; Havens Avenue & Rowley Street*)
3/20/2023	Map	 Shared Road Bike Lane (*note: along Harmon Drive between SD37 and National Guard Road*)

Stakeholder and Public Meeting Preliminary Recommendations Feedback Summary

The following summarizes preliminary recommendations feedback received from public and stakeholder comments. Methods for recording these needs include written comment submittal via comment card or study website, mark-up on the public meeting open house map, and stakeholder meeting discussion/notes. Written comments are provided in their entirety in the **Appendix**.

Comment topic key:

- Vehicular (roadways, intersections)
- Multimodal (bicycle, pedestrian, transit)
- Funding

Public Meeting Comments and Map Markups

Multimodal Travel

Shared-Use Path

1. **Lake Mitchell / Harmon Drive:** Install a bike lane or shared use path from SD38 to National Guard Road.

Vehicular Travel

Roadway Segments/Corridors

- **Spruce Street:** Concern about longer trains and more delay at the at-grade railroad crossing with the proposed soybean plant.
- **SD38:** Semis are frequently stuck at the railroad crossing at SD38.
- **3rd Avenue:** Love the one-way along 3rd Avenue.

Intersections

- **Foster Street & 1st Avenue:** Switch stop-control from northbound and southbound approaches to eastbound and westbound approaches.
- **SD37 & Minnesota Avenue:** Review signal timings and side-street detection.
- **SD37 & W 3rd Avenue:** Review intersection traffic control.
- **Sanborn Boulevard & 12th Avenue:** Review signal timings and side-street detection.
- **Havens Avenue & Rowley Street:** Review signal timings and side-street detection.

Other

- **Proposed Soybean Plant:** A proposed soybean plant is anticipated to be constructed south of the study area adjacent to SD37. A traffic impact study for the proposed plant is being developed to identify SD37 and county road improvements outside of the Mitchell MTP study area.

Funding

- Focus on transportation grants and other external funding sources. Adjust project priorities (short-term, mid-term, and long-range) and defer certain projects to a later date.

Stakeholder Meeting Notes

Multimodal Travel

Bicycle and Pedestrian Project Recommendations

- Bicycle and Pedestrian Facilities
    - **Dry Run Creek Area:**
        - Burr Street from Havens to 1st Avenue (shared use path)
            - This connection is desirable as the pedestrian network is growing in this area due to the nearby park amenities, such as the pool and skatepark, attracting more pedestrians, bicyclists, and skateboarders.
    - **Lake Mitchell Area:**
        - Ohlman Street from Kemper Avenue to 23rd Avenue / from N Harmon Drive to Indian Village Road (shared use path)
            - The proposed shared use path along Ohlman Street will likely be on the east side of the roadway to connect with the existing shared use path between Indian Village Road and Kemper Avenue.
    - **Mitchell Growth Area Corridors:**
        - 1st Avenue from Foster Street to Wallace Street (sidewalk)
            - Consider allowing bikes to use the sidewalk as bicyclists are currently only allowed on the shoulder.
        - National Guard Road from SD37 to Foster Street (shared roadway / shared use path [long-term])
            - This extension will be utilized by the planned housing development in this area.
            - This route would be popular for bicyclists.
    - **I-90 Corridor Area:**
        - Rowley Street from Cabela Drive to Spruce Street (shared use path)
            - Shared-use path to Spruce Street will likely not be constructed until the road section is urbanized.
    - **Mitchell Core Bicycle Network:**
        - Main Street from 7th Avenue to Railroad Avenue (to Ash Street Bicycle Boulevard when installed) (shared roadway / bike lane [long-term option])

- Bump outs and bikes racks are planned at each intersection on this corridor.
- Parents and children don't feel comfortable riding on the street due to the opening of car doors.
- Main Street pedestrian signage:
  - Most intersections along Main Street are already marked with signage to indicate "no biking, skateboard, etc".
  - Main Street pedestrian signage should differentiate between the desire for bicyclists to be able to walk their bicycles on the sidewalk versus the mentality that this is not allowed.

- Minnesota Street from 23rd Avenue to McCabe Street (bike lane)
  - Keep both the existing shared-use path and the proposed bike lane.
  - Adult bicyclists on Minnesota Street tend to ride their bicycles in the roadway.

- 11th Avenue from Kimball Street to Foster Street (bike lane)
  - Pedestrian/Bicyclist routes to Lake Mitchell:
    - Many will likely use Park Drive to get to Kimball Street and then go north to Lake Mitchell.
    - If 11th Avenue is marked as "share the road" to Kimball Street, then users might shift routes and utilize the proposed bike lane on 11th Avenue.
    - Bicyclists and pedestrians are witnessing speeding vehicles on Park Drive.

- Pedestrian Crossings
  - **Key Pedestrian Crossing Improvement #30:** Pedestrian Hybrid Beacon (HAWK) at Burr Street and Ash Avenue
    - Bicyclists in attendance commented that a bicycle/pedestrian crossing along Burr Street would be most appropriate at the 1st Avenue intersection due to sight distance limitations.

Safety Concerns

- **Lake Mitchell Area / Harmon Drive / National Guard Road:**
  - Roadways with shared bike facilities in this area are posted with slower speed limits but drivers continue to speed.
    - The City of Mitchell has signage and paint that will be installed in Summer 2023 to better delineate that bike users share the road with vehicles.
  - Pedestrian/bicyclist concerns at National Guard Road:
    - Road edges are broken and create challenges for bicyclists
    - Vehicle speeds while bicyclists ride in driving lanes
    - No lighting present

        - Traffic levels present challenges for bicyclists during events like soccer tournaments, National Guard drill weekends, and Hendrickson manufacturing plant shift changes.
    - Increased amount of parked motorcycles and ATVs on the pedestrian bridge.

- **Lake Mitchell Area / Ohlman Street:**
    - There are damaged sections of the existing shared-use path along Ohlman Street that are creating hazards for users.

Transit Recommendations

- **Transit Development Plan:**
    - Possible service expansions include evening and weekend services options.
    - Palace Transit is looking for employees willing to take on evening and weekend shifts.

Funding

- **Project Planning:**
    - Grants are available for both the planning and design/construction (capital) portions of projects. For example, a “Reconnecting Communities” planning grant might be applicable to the Foster Street Extension project.

Vehicular Travel

Projects

- Roadway and intersections
    - Intersections near planned developments include:
        - Ohlman Street & 23rd Avenue (study intersection)
        - SD37 & National Guard Road (study intersection)
        - SD37 & Harmon Drive (study intersection)
        - Foster Street & 8th Avenue
    - The City of Mitchell is looking into a total signal replacement at the SD37 & Havens Avenue intersection.
    - Foster Street Extension:
        - Project is illustrative; no timeline is identified in the MTP
        - MTP is recommending a feasibility study for this corridor project
    - The City of Mitchell anticipates street widths will stay the same for potential one-way to two-way conversion locations.

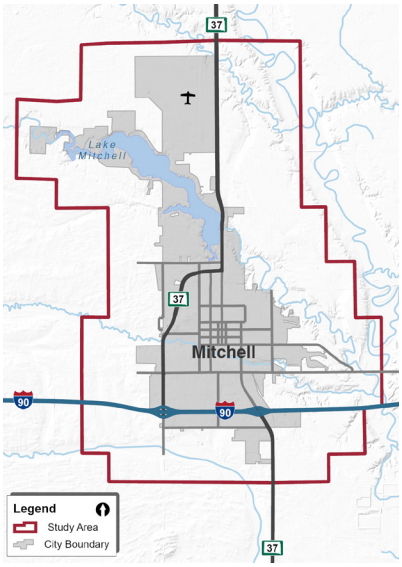
Appendix A: Informational Handout

MITCHELL
Master Transportation Plan

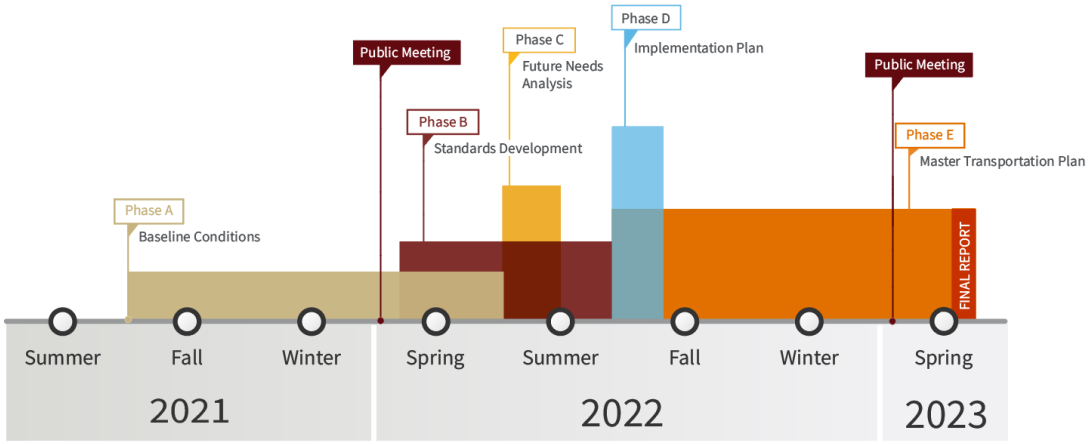
Study Overview

The South Dakota Department of Transportation, City of Mitchell, and Davison County have partnered in the development of a long-range Master Transportation Plan (MTP) for the Mitchell area. This multimodal plan will help guide transportation decisions and investments for primary modes of travel, including vehicle, bicycle, pedestrian, transit, and air. The study team is currently developing the final report and is gathering feedback from the public and area stakeholders to help refine recommendations.

Study Area



Study Schedule



Master Transportation Plan Components

A — Baseline Conditions Analysis

B — Standards Development

1. Major Street Plan
2. Bicycle & Pedestrian Plan
3. Transit Plan
4. Pavement Management Plan
5. Traffic Signal System Plan

C — Future Needs Analysis

1. Intersection & corridor projects
2. Traffic signal projects
3. Bicycle & pedestrian projects
4. Pavement preservation projects
5. Transit, freight, airport, wayfinding, and gateway projects

D — Implementation Plan

1. Fiscally constrained list of future projects
2. Transportation funding opportunities

E — Master Transportation Plan Report

Public Information Open House #2
March 20, 2023

Today's Meeting Objectives

Thank you for attending the Mitchell Area Master Transportation Plan (MTP) public information open house. We appreciate your input!

At this second public meeting, the study team is looking for your feedback on the following preliminary recommendations:

- Long-range transportation projects and priorities
- Allocation of future funding to different transportation elements

We are also looking for your feedback and suggestions to narrow the anticipated gap in funding between forecasted revenue and the preliminary project recommendations. A short presentation will take place at 5:10 p.m. An introductory presentation will also be posted on the study website.

Please provide your comments by April 5, 2023 to help shape the final recommendations in the Mitchell Area MTP!

Study Contacts

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Online Option

All information shared at the in-person open house can be accessed through the study website beginning March 20, 2023.

Comments!

Please visit the following link or scan this QR code to submit comments through your phone and answer a question about transportation funding and project priorities!

https://form.jotform.com/230614987899073

Comments may also be submitted through the study website, via comment card at the open house, or to any of the study contacts.

Appendix B: Crash History Review Memo

Crash History Review Memo

Date:	Monday, May 02, 2022
Project:	Mitchell Area Master Transportation Plan Update
To:	Study Advisory Team
From:	HDR
Subject:	Crash History Review Memo

Introduction

The purpose of this memorandum is to present and assess the crash history throughout the City of Mitchell and the surrounding area. Crashes within the study area were evaluated from a high-level perspective, focusing on crashes that occurred at intersections and select roadway segments, involved bicyclists and pedestrians, and were related to railroad crossings. This review will ultimately help identify the safety needs on the Mitchell area road network and support the development of the Mitchell Area Master Transportation Plan.

Crash location and density maps are provided in the **Appendix**.

Methodology

Crash records from the State of South Dakota crash database for years 2016 through 2020 were provided by the South Dakota Department of Transportation (SDDOT) in a GIS geodatabase. Study area crashes were sorted into the following categories:

- Intersections
- Interstate 90 Freeway and Ramp Segments
- Bicycle and Pedestrian
- Railroad Crossings

Crash characteristics such as total crashes, injury severity, manner of collision, month, light condition, and road surface condition were tabulated and presented in the crash tables.

Crash rates and critical crash rates were calculated for both intersections and roadway segments. Intersection crash rates were calculated in terms of crashes per million entering vehicles (crashes/MEV). Roadway segment crash rates were calculated in terms of million vehicle miles traveled (crashes/MVMT). Critical crash rates were calculated based on the statistical populations for each crash location (intersection or segment), using methods presented in the Highway Safety Manual (American Association of State Highway and Transportation Officials (AASHTO), 2010). A critical crash rate accounts for a desired level of confidence (95 percent used in this study), vehicle exposure, and similar facility types. Intersections and segments where a crash rate exceeds the critical rate were noted for further investigation.

Mitchell Area Summary

To assess the overall safety performance of the Mitchell area roadway network, all crashes were summarized by select characteristics. A total of 1,720 crashes were reported within the Mitchell area between 2016 and 2020. **Table 1** presents summarized crash characteristics by injury severity, month, year, manner of collision, light condition, road surface condition, and emphasis areas outlined in the 2019 Strategic Highway Safety Plan (SHSP). Crash locations, in terms of injury severity, are depicted in **Figure 1** and **Figure 3**. Crash density maps are provided in **Figure 2** and **Figure 4**.

Table 1: Mitchell Area Crash History (2016 – 2020)

Injury Severity	Total # Crashes	
Fatal Injury	1	<1%
Incapacitating Injury	24	1%
Non-Incapacitating Injury	106	6%
Possible Injury	142	8%
No Injury	1,274	74%
Wild Animal Hit	173	10%
Total Crashes	1,720	

Month	Total # Crashes	
January	144	8%
February	159	9%
March	136	8%
April	125	7%
May	144	8%
June	116	7%
July	140	8%
August	120	7%
September	126	7%
October	150	9%
November	160	9%
December	200	12%

Year	Total # Crashes	
2016	377	22%
2017	321	19%
2018	379	22%
2019	335	19%
2020	308	18%

Manner of Collision	Total # Crashes	
Single Vehicle	701	41%
Angle	584	34%
Rear-end	339	20%
Sideswipe	93	5%
Head-on	3	<1%

Light Condition	Total # Crashes	
Daylight	1,214	71%
Dark – Lighted Roadway	238	14%
Dark – Roadway Not Lighted	197	12%
Dusk	32	2%
Dawn	30	2%
Dark – Unknown Roadway Lighting	9	1%

Road Surface Condition	Total # Crashes	
Dry	1,239	72%
Snow	232	14%
Wet	136	8%
Ice	86	5%
Slush	16	1%
Sand, mud, dirt, or gravel	5	<1%
Unknown	3	<1%
Frost	2	<1%
Oil	1	<1%

2019 SHSP Emphasis Area	Crashes	
Speeding/Aggressive Driving	204	12%
Unbuckled Vehicle Occupants	173	10%
Alcohol/Drugs	116	7%
Distracted Driving	115	7%
Motorcycles	40	2%

Major Roadway Projects

Major roadway reconstruction projects occurring during the crash history analysis time frame include:

- **SD37/Burr Street, from south of Spruce Street to Havens Avenue:** reconstructed in 2017-2018
- **Sanborn Boulevard, from Havens Avenue to 15th Avenue:** reconstructed in three phases in 2018-2020
    - 2018 Phase I: Havens Avenue to overpass
    - 2019 Phase II: 1st Avenue to 7th Avenue
    - 2020 Phase III: 7th Avenue to 15th Avenue
- **SD37 and Minnesota Avenue intersection:** signal installed in 2021

Planned future reconstruction projects include:

- **SD37, from Minnesota Avenue through 250th Street:** reconstruction starting in 2023

Intersections

Crashes that occurred within a 250-foot radius of an intersection and defined as intersection related in the GIS crash geodatabase were categorized as an intersection crash. This analysis was performed at a high-level view where intersections were only investigated if they had 5 or more crashes and/or a fatal or incapacitating injury crash. Intersections were then ranked based on crash frequencies and crash rates.

Crash Frequency

Crash frequency is defined as the total number of crashes that occurred at an intersection. Crash frequency is important as it indicates locations that record frequent crash events, but it does not consider traffic exposure which can lead to an under-emphasis of intersections with lower volumes and an overemphasis of intersections with higher traffic volumes. The 22 intersections with 6 or more reported crashes are ranked by overall crash frequency in **Table 2** (injury severity) and **Table 3** (manner of collision).

Intersections along major corridors within Mitchell were summarized by the number of high crash frequency intersections and an associated ranking of those intersections. Major corridors exhibiting high frequency crash intersections include the following:

- **SD37/Burr Street:** 2nd, 4th-6th highest crash frequency intersections (6 of 22 total)
- **SD37/Ohlman Street:** 1st highest crash frequency intersection (5 of 22 total)
- **SD38/Havens Avenue:** 1st, 3rd, and 6th highest crash frequency intersections (4 of 22 total)
- **Sanborn Boulevard:** 3rd highest crash frequency intersection (4 of 22 total)

Table 2: Mitchell Intersection Crash Frequency Rankings – Injury Severity (2016 – 2020)

Rank	Intersection	Traffic Control Device	Total	Injury Severity					Daily Entering Volume	Crash Rate *(Crashes / MEV)*
				Fatal	Major*	Minor*	Possible	PDO		
1	SD37 (Ohlman Street) & Havens Avenue	Signal	28	0	0	1	4	23	15,500	0.99
2	SD37 (Burr Street) & I-90 WB RTI	Signal	26	0	0	1	3	22	15,000	0.95
3	Sanborn Boulevard & Havens Avenue	Signal	24	0	0	1	1	22	16,500	0.80
4	SD37 (Burr Street) & I-90 EB RTI	Signal	23	0	2	1	1	19	13,900	0.91
5	SD37 (Burr Street) & Spruce Street	Signal	21	0	0	0	2	19	13,100	0.88
6	SD38 (Havens Avenue) & Burr Street	Signal	20	0	0	0	5	15	18,200	0.60
7	Sanborn Boulevard & 1st Avenue	Signal	17	0	0	2	2	13	13,200	0.70
8	SD37 & Minnesota Street	Signal	17	0	1	3	2	11	7,300	1.29
9	Kimball Street & 7th Avenue	TWSC	16	0	1	0	2	13	7,700	1.14
10	Burr Street & 1st Avenue	Signal	11	0	0	2	0	9	9,500	0.63
11	Main Street & SD37	Signal	10	0	0	0	1	9	11,000	0.50
12	Sanborn Boulevard & 7th Avenue	Signal	10	0	0	1	2	7	10,500	0.52
13	Burr Street & Norway Avenue	Signal	9	0	1	1	2	5	17,700	0.28
14	Main Street & West 15th Avenue	TWSC	9	0	0	0	1	8	7,300	0.67
15	Rowley Street & Norway Avenue	AWSC	8	0	0	0	2	6	8,300	0.53
16	SD37 & National Guard Road	TWSC	8	0	1	2	0	5	4,900	0.90
17	Rowley Street & Spruce Street	AWSC	7	0	0	0	0	7	7,700	0.50
18	Sanborn Boulevard & SD37	TWSC	7	0	0	1	0	6	7,400	0.52
19	Main Street & 1st Avenue	Signal	7	0	0	0	0	7	6,100	0.63
20	Foster Street & 1st Avenue	TWSC	6	0	0	0	2	4	5,200	0.63
21	Rowley Street & Havens Avenue	Signal	6	0	0	0	1	5	15,000	0.22
22	Duff Street & 5th Avenue	TWSC	6	0	1	0	1	4	4,200	0.78

AWSC: All-Way Stop Control; TWSC: Two-Way Stop Control

*Incapacitating injuries are referred to as Major Injury, non-incapacitating injuries are referred to as Minor Injury

Table 3: Mitchell Intersection Crash Frequency Rankings – Manner of Collision (2016 – 2020)

Rank	Intersection	Traffic Control Device	Total	Manner of Collision					Daily Entering Volume	Crash Rate *(Crashes / MEV)*
				Angle	Rear-end	Head-on	Sideswipe	Single Vehicle		
1	SD37 (Ohlman Street) & Havens Avenue	Signal	28	17	10	0	0	1	15,500	0.99
2	SD37 (Burr Street) & I-90 WB RTI	Signal	26	11	13	0	1	1	15,000	0.95
3	Sanborn Boulevard & Havens Avenue	Signal	24	16	8	0	0	0	16,500	0.80
4	SD37 (Burr Street) & I-90 EB RTI	Signal	23	5	16	0	0	2	13,900	0.91
5	SD37 (Burr Street) & Spruce Street	Signal	21	7	8	0	5	1	13,100	0.88
6	SD38 (Havens Avenue) & Burr Street	Signal	20	10	7	1	2	0	18,200	0.60
7	Sanborn Boulevard & 1st Avenue	Signal	17	8	7	0	1	1	13,200	0.70
8	SD37 & Minnesota Street	Signal	17	13	2	0	0	2	7,300	1.29
9	Kimball Street & 7th Avenue	TWSC	16	11	5	0	0	0	7,700	1.14
10	Burr Street & 1st Avenue	Signal	11	5	6	0	0	0	9,500	0.63
11	Main Street & SD37	Signal	10	5	4	0	0	1	11,000	0.50
12	Sanborn Boulevard & 7th Avenue	Signal	10	9	0	0	0	1	10,500	0.52
13	Burr Street & Norway Avenue	Signal	9	2	7	0	0	0	17,700	0.28
14	Main Street & West 15th Avenue	TWSC	9	7	2	0	0	0	7,300	0.67
15	Rowley Street & Norway Avenue	AWSC	8	4	4	0	0	0	8,300	0.53
16	SD37 & National Guard Road	TWSC	8	6	2	0	0	0	4,900	0.90
17	Rowley Street & Spruce Street	AWSC	7	3	3	0	0	1	7,700	0.50
18	Sanborn Boulevard & SD37	TWSC	7	3	1	0	0	3	7,400	0.52
19	Main Street & 1st Avenue	Signal	7	1	3	0	2	1	6,100	0.63
20	Foster Street & 1st Avenue	TWSC	6	5	1	0	0	0	5,200	0.63
21	Rowley Street & Havens Avenue	Signal	6	3	3	0	0	0	15,000	0.22
22	Duff Street & 5th Avenue	TWSC	6	5	0	0	0	1	4,200	0.78

AWSC: All-Way Stop Control; TWSC: Two-Way Stop Control

Crash Rates

Crash rates were calculated to further assess traffic safety conditions within the Mitchell area. Two scenarios were reviewed, one encompassing the full five years of crash data and the second where pre- and during-construction crashes were removed at major project locations along Sanborn Boulevard and Burr Street corridors, and at the SD37 and Minnesota Avenue intersection. This second scenario is noted as the '2016-2020, Adjusted' scenario and only includes post-construction crashes. Tables presenting the highest crash rate intersections in terms of injury and manner of collision are provided in the following:

- **Table 4:** Injury Severity
- **Table 5:** Manner of Collision
- **Table 6:** Injury Severity (2016-2020, Adjusted)
- **Table 7:** Manner of Collision (2016-2020, Adjusted)

In the '2016-2020, Adjusted' scenarios, the years of data included in the analysis is indicated in the 'Adjustment Notes column.

Intersections where the critical index ratio (critical crash rate divided by crash rate) meet or exceed 0.75 are noted in **bold orange**.

Table 4: Mitchell Intersection Crash Rates Rankings – Injury Severity (2016 – 2020)

Rank	Intersection	Traffic Control Device	Total	Injury Severity					Daily Entering Volume	Crash Rate *(Crashes / MEV)*	Critical Crash Rate	Critical Index Ratio
				Fatal	Major*	Minor*	Possible	PDO				
1	SD37 & Minnesota Street	Signal	17	0	1	3	2	11	7,300	1.29	0.64	**2.00**
2	Kimball Street & 7th Avenue	TWSC	16	0	1	0	2	13	7,700	1.14	0.63	**1.80**
3	SD37 (Ohlman Street) & Havens Avenue	Signal	28	0	0	1	4	23	15,500	0.99	1.04	**0.95**
4	SD37 (Burr Street) & I-90 WB RTI	Signal	26	0	0	1	3	22	15,000	0.95	1.04	**0.91**
5	470th Avenue & 249th Street	TWSC	1	0	1	0	0	0	600	0.91	1.72	0.53
6	SD37 (Burr Street) & I-90 EB RTI	Signal	23	0	2	1	1	19	13,900	0.91	1.05	**0.86**
7	SD37 & National Guard Road	TWSC	8	0	1	2	0	5	4,900	0.90	0.72	**1.25**
8	SD37 & Spruce Street	Signal	21	0	0	0	2	19	13,100	0.88	1.06	**0.83**
9	Sanborn Boulevard & Havens Avenue	Signal	24	0	0	1	1	22	16,500	0.80	1.03	**0.78**
10	Duff Street & 5th Avenue	TWSC	6	0	1	0	1	4	4,200	0.78	0.75	**1.04**
11	Sanborn Boulevard & 1st Avenue	Signal	17	0	0	2	2	13	13,200	0.70	1.06	0.66
12	Ohlman Street & 23rd Avenue	TWSC	5	0	0	0	0	5	3,900	0.70	0.77	**0.91**
13	Main Street & West 15th Avenue	TWSC	9	0	0	0	1	8	7,300	0.67	0.64	**1.05**
14	Burr Street & 1st Avenue	Signal	11	0	0	2	0	9	9,500	0.63	1.12	0.57
15	Foster Street & 1st Avenue	TWSC	6	0	0	0	2	4	5,200	0.63	0.71	**0.89**
16	Main Street & 1st Avenue	Signal	7	0	0	0	0	7	6,100	0.63	1.22	0.51
17	SD38 (Havens Avenue) & Burr Street	Signal	20	0	0	0	5	15	18,200	0.60	1.01	0.59
18	Rowley Street & Norway Avenue	AWSC	8	0	0	0	2	6	8,300	0.53	0.62	**0.85**
19	Sanborn Boulevard & 7th Avenue	Signal	10	0	0	1	2	7	10,500	0.52	1.10	0.47
20	SD37 & Sanborn Boulevard	TWSC	7	0	0	1	0	6	7,400	0.52	0.64	**0.81**

AWSC: All-Way Stop Control; TWSC: Two-Way Stop Control

*Incapacitating injuries are referred to as Major Injury, non-incapacitating injuries are referred to as Minor Injury

Table 5: Mitchell Intersection Crash Rate Rankings – Manner of Collision (2016 – 2020)

Rank	Intersection	Traffic Control Device	Total	Manner of Collision					Daily Entering Volume	Crash Rate *(Crashes / MEV)*	Critical Crash Rate	Critical Index Ratio
				Angle	Rear-end	Head-on	Sideswipe	No Collision				
1	SD37 & Minnesota Street	Signal	17	13	2	0	0	2	7,300	1.29	0.64	**2.00**
2	Kimball Street & 7th Avenue	TWSC	16	11	5	0	0	0	7,700	1.14	0.63	**1.80**
3	SD37 (Ohlman Street) & Havens Avenue	Signal	28	17	10	0	0	1	15,500	0.99	1.04	**0.95**
4	SD37 (Burr Street) & I-90 WB RTI	Signal	26	11	13	0	1	1	15,000	0.95	1.04	**0.91**
5	470th Avenue & 249th Street	TWSC	1	0	0	0	0	1	600	0.91	1.72	0.53
6	SD37 (Burr Street) & I-90 EB RTI	Signal	23	5	16	0	0	2	13,900	0.91	1.05	**0.86**
7	SD37 & National Guard Road	TWSC	8	6	2	0	0	0	4,900	0.90	0.72	**1.25**
8	SD37 & Spruce Street	Signal	21	7	8	0	5	1	13,100	0.88	1.06	**0.83**
9	Sanborn Boulevard & Havens Avenue	Signal	24	16	8	0	0	0	16,500	0.80	1.03	**0.78**
10	Duff Street & 5th Avenue	TWSC	6	5	0	0	0	1	4,200	0.78	0.75	**1.04**
11	Sanborn Boulevard & 1st Avenue	Signal	17	8	7	0	1	1	13,200	0.70	1.06	0.66
12	Ohlman Street & 23rd Avenue	TWSC	5	3	1	0	0	1	3,900	0.70	0.77	**0.91**
13	Main Street & West 15th Avenue	TWSC	9	7	2	0	0	0	7,300	0.67	0.64	**1.05**
14	Burr Street & 1st Avenue	Signal	11	5	6	0	0	0	9,500	0.63	1.12	0.57
15	Foster Street & 1st Avenue	TWSC	6	5	1	0	0	0	5,200	0.63	0.71	**0.89**
16	Main Street & 1st Avenue	Signal	7	1	3	0	2	1	6,100	0.63	1.22	0.51
17	SD38 (Havens Avenue) & Burr Street	Signal	20	10	7	1	2	0	18,200	0.60	1.01	0.59
18	Rowley Street & Norway Avenue	AWSC	8	4	4	0	0	0	8,300	0.53	0.62	**0.85**
19	Sanborn Boulevard & 7th Avenue	Signal	10	9	0	0	0	1	10,500	0.52	1.10	0.47
20	SD37 & Sanborn Boulevard	TWSC	7	3	1	0	0	3	7,400	0.52	0.64	**0.81**

AWSC: All-Way Stop Control; TWSC: Two-Way Stop Control

**MEV: Million Entering Vehicles

Table 6: Mitchell Intersection Crash Rate Rankings – Injury Severity (2016 – 2020, Adjusted)

Rank	Intersection	Traffic Control Device	Total	Injury Severity					Daily Entering Volume	Crash Rate *(Crashes / MEV)*	Critical Crash Rate	Critical Index Ratio	Adjustment Notes
				Fatal	Major*	Minor*	Possible	PDO					
1	SD37 & Minnesota Street	Signal	-	-	-	-	-	-	7,300	-	-	-	*New signal 2021*
2	Kimball Street & 7th Avenue	TWSC	16	0	1	0	2	13	7,700	1.14	0.68	**1.67**	
3	SD37 (Ohlman Street) & Havens Avenue	Signal	28	0	0	1	4	23	15,500	0.99	0.80	**1.23**	
4	SD37 (Burr Street) & I-90 WB RTI	Signal	6	0	0	0	1	5	15,000	0.55	0.97	0.56	*2019-2020*
5	470th Avenue & 249th Street	TWSC	1	0	1	0	0	0	600	0.91	1.80	0.51	
6	SD37 (Burr Street) & I-90 EB RTI	Signal	7	0	1	0	1	5	13,900	0.69	0.99	0.70	*2019-2020*
7	SD37 & National Guard Road	TWSC	8	0	1	2	0	5	4,900	0.90	0.77	**1.17**	
8	SD37 (Burr Street) & Spruce Street	Signal	9	0	0	0	0	9	13,100	0.94	1.00	**0.94**	*2019-2020*
9	Sanborn Boulevard & Havens Avenue	Signal	10	0	0	1	0	9	16,500	0.83	0.95	**0.88**	*2019-2020*
10	Duff Street & 5th Avenue	TWSC	6	0	1	0	1	4	4,200	0.78	0.81	**0.97**	
11	Sanborn Boulevard & 1st Avenue	Signal	3	0	0	0	0	3	13,200	0.62	1.22	0.51	*2020*
12	Ohlman Street & 23rd Avenue	TWSC	5	0	0	0	0	5	3,900	0.70	0.83	**0.85**	
13	Main Street & West 15th Avenue	TWSC	9	0	0	0	1	8	7,300	0.67	0.69	**0.98**	
14	Burr Street & 1st Avenue	Signal	11	0	0	2	0	9	9,500	0.63	0.88	0.72	
15	Foster Street & 1st Avenue	TWSC	6	0	0	0	2	4	5,200	0.63	0.76	**0.83**	
16	Main Street & 1st Avenue	Signal	7	0	0	0	0	7	6,100	0.63	0.97	0.65	
17	SD38 (Havens Avenue) & Burr Street	Signal	11	0	0	0	3	8	18,200	0.83	0.93	**0.89**	*2019-2020*
18	Rowley Street & Norway Avenue	AWSC	8	0	0	0	2	6	8,300	0.53	0.67	**0.79**	
19	Sanborn Boulevard & 7th Avenue	Signal	-	-	-	-	-	-	10,500	-	-	-	*Completed 2020*
20	SD37 & Sanborn Boulevard	TWSC	7	0	0	1	0	6	7,400	0.52	0.69	**0.75**	

Table includes adjustments at intersections that were reconstructed during the analysis period to only include crashes post-reconstruction. All crashes occurring before or during reconstruction have been removed. Years of data included at these intersections noted in the 'Adjustment Notes' column.

AWSC: All-Way Stop Control; TWSC: Two-Way Stop Control

*Incapacitating injuries are referred to as Major Injury, non-incapacitating injuries are referred to as Minor Injury

Table 7: Mitchell Intersection Crash Rate Rankings – Manner of Collision (2016 – 2020, Adjusted)

Rank	Intersection	Traffic Control Device	Total	Manner of Collision					Daily Entering Volume	Crash Rate *(Crashes / MEV)*	Critical Crash Rate	Critical Index Ratio	Adjustment Notes
				Angle	Rear-end	Head-on	Sideswipe	No Collision					
1	SD37 & Minnesota Street	Signal	-	-	-	-	-	-	7,300	-	-	-	*New signal 2021*
2	Kimball Street & 7th Avenue	TWSC	16	11	5	0	0	0	7,700	1.14	0.68	**1.67**	
3	SD37 (Ohlman Street) & Havens Avenue	Signal	28	17	10	0	0	1	15,500	0.99	0.80	**1.23**	
4	SD37 (Burr Street) & I-90 WB RTI	Signal	6	3	3	0	0	0	15,000	0.55	0.97	0.56	*2019-2020*
5	470th Avenue & 249th Street	TWSC	1	0	0	0	0	1	600	0.91	1.80	0.51	
6	SD37 (Burr Street) & I-90 EB RTI	Signal	7	0	6	0	0	1	13,900	0.69	0.99	0.70	*2019-2020*
7	SD37 & National Guard Road	TWSC	8	6	2	0	0	0	4,900	0.90	0.77	**1.17**	
8	SD37 (Burr Street) & Spruce Street	Signal	9	1	5	0	3	0	13,100	0.94	1.00	**0.94**	*2019-2020*
9	Sanborn Boulevard & Havens Avenue	Signal	10	7	3	0	0	0	16,500	0.83	0.95	**0.88**	*2019-2020*
10	Duff Street & 5th Avenue	TWSC	6	5	0	0	0	1	4,200	0.78	0.81	**0.97**	
11	Sanborn Boulevard & 1st Avenue	Signal	3	1	2	0	0	0	13,200	0.62	1.22	0.51	*2020*
12	Ohlman Street & 23rd Avenue	TWSC	5	3	1	0	0	1	3,900	0.70	0.83	**0.85**	
13	Main Street & West 15th Avenue	TWSC	9	7	2	0	0	0	7,300	0.67	0.69	**0.98**	
14	Burr Street & 1st Avenue	Signal	11	5	6	0	0	0	9,500	0.63	0.88	0.72	
15	Foster Street & 1st Avenue	TWSC	6	5	1	0	0	0	5,200	0.63	0.76	**0.83**	
16	Main Street & 1st Avenue	Signal	7	1	3	0	2	1	6,100	0.63	0.97	0.65	
17	SD38/Havens Avenue & Burr Street	Signal	11	5	5	0	1	0	18,200	0.83	0.93	**0.89**	*2019-2020*
18	Rowley Street & Norway Avenue	AWSC	8	4	4	0	0	0	8,300	0.53	0.67	**0.79**	
19	Sanborn Boulevard & 7th Avenue	Signal	-	-	-	-	-	-	10,500	-	-	-	*Completed 2020*
20	SD37 & Sanborn Boulevard	TWSC	7	3	1	0	0	3	7,400	0.52	0.69	**0.75**	

Table includes adjustments at intersections that were reconstructed during the analysis period to only include crashes post-reconstruction. All crashes occurring before or during reconstruction have been removed. Years of data included at these intersections noted in the 'Adjustment Notes' column.

AWSC: All-Way Stop Control; TWSC: Two-Way Stop Control

Intersections exhibiting a critical index ratio of 0.75 or greater in the '2016-2020, Adjusted' scenario were flagged for further investigation. These intersections are identified as having an elevated number of crashes compared to other analysis intersections.

- **Kimball Street and 7th Avenue** (16 total crashes)
  - 7 of 11 angle crashes involved southbound and eastbound vehicles
    - Included 1 incapacitating injury crash
  - 3 of 11 angle crashes involved northbound and westbound vehicles
  - 12 crashes involved a failure to yield to a vehicle
- **SD37 (Ohlman Street) and Havens Avenue** (28 total crashes)
  - 6 of 10 rear-end crashes occurred in the northbound direction
  - 6 of 17 angle crashes involved a southbound and westbound movement
- **SD37 and National Guard Road** (8 total crashes)
  - Reconstruction planned in 2023 (SDDOT SD37 project)
  - 4 of 6 angle crashes involved a failure to yield between eastbound and northbound through movements
    - Resulted in 1 incapacitating and 2 non-incapacitating injury crashes
  - 4 of 8 crashes occurred during cloudy weather
- **SD37 (Burr Street) and Spruce Street** (9 total crashes 2019-2020)
  - 3 crashes involved vehicles following too closely
  - 3 sideswipe crashes that occurred in northbound and eastbound directions
  - 5 crashes involved an eastbound movement
- **Sanborn Boulevard and Havens Avenue** (10 total crashes 2019-2020)
  - 6 of 7 angle crashes involved a westbound through vehicle
  - 2 of 3 rear-end crashes occurred in the eastbound direction and involved speeding
- **Duff Street and 5th Avenue** (6 total crashes)
  - 4 of 5 angle crashes involved a northbound movement
  - 1 crash involved a pedalcycle (incapacitating injury)
- **Ohlman Street and 23rd Avenue** (5 total crashes)
  - 2 of 3 angle crashes involved southbound and westbound movements
- **Main Street and West 15th Avenue** (9 total crashes)
  - 4 of 7 angle crashes involved eastbound and southbound movements
  - 7 crashes involved an eastbound vehicle
- **Foster Street and 1st Avenue** (6 total crashes)
  - 4 of 5 angle crashes involved a southbound and westbound movement
  - 40% of angle crashes resulted in an injury
- **SD38/Haven Avenue and Burr Street** (11 total crashes 2019-2020)
  - 3 of 5 rear-end crash occurred in the eastbound direction and involved speeding
  - 7 of 10 crashes occurred during wet, snowy, or icy conditions
- **Rowley Street and Norway Avenue** (8 total crashes)
  - 3 of 4 angle crashes involved northbound and eastbound through movements
- **SD37 and Sanborn Boulevard** (7 total crashes)
  - 3 angle crashes each involved different approach movement combinations

Intersection Crash Manner of Collision Trends

Observed intersections that exhibit a single crash type exceeding 70 percent of all crashes at that intersection are highlighted in **Table 8** (angle crashes) and **Table 9** (rear-end crashes).

Table 8: Intersection Crash Manner of Collision Trends - Angle Crashes (2016 – 2020, Adjusted)

Intersection	Angle Crashes		
	# Crashes	% Injury Crashes	% of Total Crashes
Foster Street & 1st Avenue	5	40%	**83%**
Duff Street & 5th Avenue	5	20%	**83%**
Main Street & East 15th Avenue	4	25%	**80%**
Main Street & West 15th Avenue	7	14%	**78%**
SD37 & National Guard Road	6	50%	**75%**

Table 9: Intersection Crash Manner of Collision Trends - Rear-end Crashes (2016 – 2020, Adjusted)

Intersection	Rear-end Crashes		
	# Crashes	% Injury Crashes	% of Total Crashes
SD37 (Burr Street) & I-90 EB RTI	6	17%	**86%**
Burr Street & Ash Avenue	5	20%	**100%**
Burr Street & Norway Avenue	7	43%	**78%**

Bicycles and Pedestrians

Table 10 presents the number of bicycle and pedestrian crashes by injury severity for the 5-year period of 2016-2020. In total, twenty-two bicycle or pedestrian-related crashes occurred with nine bicycle crashes and thirteen pedestrian crashes. All but one crash resulted in an injury and four crashes (18 percent) resulted in a serious injury. Bicycle and pedestrian related crash locations are shown in **Figure 5**.

Table 10: Bicycle and Pedestrian Crashes by Injury Severity

Year	Fatal Injury	*Major Injury	*Minor Injury	Possible Injury	No Injury	Total
2016	0	0	5	0	1	6
2017	0	1	2	1	0	4
2018	0	2	4	1	0	7
2019	0	0	2	1	0	3
2020	0	1	1	0	0	2
Total	**0**	**4**	**14**	**3**	**1**	**22**

*Incapacitating injuries are referred to as Major Injury, non-incapacitating injuries are referred to as Minor Injury

Interstate 90 Freeway and Ramp Segments

A cursory review of Mitchell-area Interstate 90 Freeway and Ramp segment crash characteristics are summarized in **Table 11** and **Table 12.** Segment crash rates were calculated in terms of crashes per million vehicle miles traveled (MVMT) using 2016 – 2020 reported crashes and recent traffic volumes. Segment crash totals and rates include only segment crashes with the respective study corridor (intersection crashes are excluded). Critical crash rates were calculated based on the average segment crash rate.

Table 11: Interstate Corridor Segment Crash Rates (2016 – 2020)

Roadway Corridor	Limits	Length (miles)	Crash Rate (Crashes / MVMT)	Critical Crash Rate	Critical Index Ratio
Interstate 90 (EB)	West of Ohlman Street (Exit 330)	1.11	1.96	1.65	**1.19**
	Ohlman Street Interchange Area (Exit 330)	0.94	0.11	1.65	0.06
	Ohlman Street to SD37	0.83	0.60	1.70	0.35
	SD37 Interchange Area (Exit 332)	0.74	0.80	1.74	0.46
	East of SD37 (Exit 332)	1.85	0.86	1.47	0.58
Interstate 90 (WB)	West of Ohlman Street (Exit 330)	0.94	0.98	1.70	0.57
	Ohlman Street Interchange Area (Exit 330)	0.99	1.01	1.64	0.61
	Ohlman Street to SD37	0.74	0.54	1.74	0.31
	SD37 Interchange Area (Exit 332)	0.87	1.36	1.68	0.81
	East of SD37 (Exit 332)	1.94	1.43	1.46	0.98

Table 12: Interstate Ramp Corridor Segment Crash Rates (2016 – 2020)

Interchange	Limits	Length (miles)	Crash Rate (Crashes / MVMT)	Critical Crash Rate	Critical Index Ratio
Interstate 90 Exit 330	I-90 EB Off-Ramp	0.30	1.01	3.49	0.29
	I-90 EB On-Ramp	0.33	0.00	2.84	0.00
	I-90 WB Off-Ramp	0.31	0.93	3.38	0.28
	I-90 WB On-Ramp	0.32	3.08	4.18	0.74
Interstate 90 Exit 332	I-90 EB Off-Ramp	0.30	1.10	3.62	0.30
	I-90 EB On-Ramp	0.20	1.32	3.90	0.34
	I-90 WB Off-Ramp	0.26	0.79	3.17	0.25
	I-90 WB On-Ramp	0.28	0.00	3.37	0.00

Overall, only the Interstate 90 eastbound segment west of Exit 330 exhibited a crash rate that exceeded the critical crash rate. Crashes observed in this segment were primarily wild animal related that occurred in the dark on a non-illuminated portion of I-90. A fatal crash was reported in this area, occurring on westbound Interstate 90, east of Exit 332, due to a vehicle hitting cattle in the roadway and then being rear-ended by another vehicle.

Railroad Crossings

Rail lines cross through Mitchell in the north/south direction on the western side and on the southeastern side of the city and in the east-west direction through the central portion of the city. Most of these lines are owned and operated by Burlington Northern Santa Fe Railway (BNSF), part of a connection between Aberdeen, SD, Yankton, SD, and Canton, SD. The east/west rail line beginning on the western side of the city is owned and operated by Ringneck and Western which is part of a connection to Rapid City, SD through Chamberlain, SD.

The Federal Railroad Administration (FRA) maintains an inventory of rail crossings throughout the United States. Their inventory indicates 13 public and private at-grade highway/rail crossings within the Mitchell area.

The crash history at highway/rail crossings was reviewed between 2016 and 2020. Five reported crashes occurred at or were related to a rail crossing, which are summarized in **Table 13**.

Table 13: Rail Crossing Crashes (2016 – 2020)

Roadway Corridor	Crossing Location	Crossing Number	Railroad	Total Crashes	Trains / Day	Crossing Control
8th Avenue	West of Ohlman Street	386033E	BNSF	1	2	Active – flashing lights (mast mounted) and gate arms
SD37	Between 3rd Avenue and Hanson Avenue	386036A	BNSF	1	2	Active – flashing lights (mast and cantilever mounted)
SD38	East of Capital Street	382397R	BNSF	2	2	Active – flashing lights (mast and cantilever mounted)
Spruce Street	East of Mall Drive	382394V	BNSF	1	2	Active – flashing lights (mast mounted)

No injury crashes reported

Overall, the dispersion of crashes across four crossing locations illustrates the random nature of crossing crashes, even in urban areas with higher volumes. The most, two crashes, was reported at the BNSF crossing on SD38 just east of Capital Street. No injury crashes were reported. It is important to continually improve crossings through a systematic process of identifying and addressing potential issues of vehicle-train, vehicle-pedestrian, and vehicle-vehicle conflicts as well as single-vehicle roadway departure risks.

Findings

The following are the main trends and general findings derived from the crash history review:

Mitchell Area Summary

- A total of 1,720 crashes occurred within study area between 2016 and 2020
- 25 severe crashes (1 fatal injury crash and 24 incapacitating injury crashes) occurred.
- 72 percent of crashes occurred on dry pavement conditions
- December, November, and February were the 3 highest crash frequency months

Intersections

- Twelve intersections exhibited elevated crash rates compared to the critical crash rate based on '2016-2020, Adjusted' crash data:
    - Kimball Street and 7th Avenue
    - SD37 (Ohlman Street) and Havens Avenue
    - SD37 and National Guard Road
    - SD37 (Burr Street) and Spruce Street
    - Sanborn Boulevard and Havens Avenue
    - Duff Street and 5th Avenue
    - Ohlman Street and 23rd Avenue
    - Main Street and W 15th Avenue
    - Foster Street and 1st Avenue
    - SD38/Havens Avenue and Burr Street
    - Rowley Street and Norway Avenue
    - SD37 and Sanborn Boulevard

I-90 Freeway and Ramp Segments

- Interstate 90 eastbound freeway segment west of Exit 330 exhibited a crash rate that exceeded the critical crash rate
- One fatal injury crash was reported on the Interstate 90 westbound freeway segment east of Exit 332

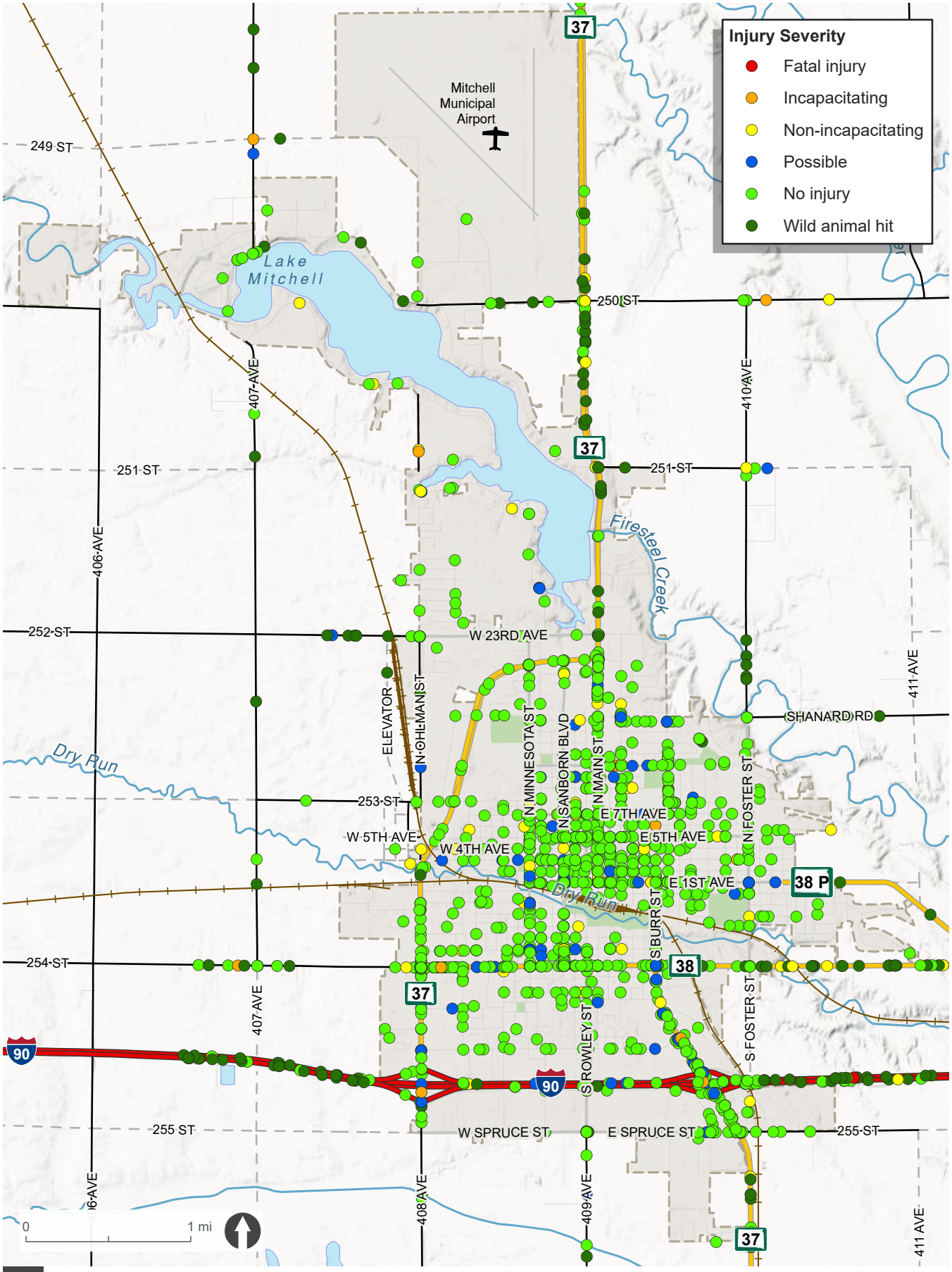
Bicycle and Pedestrian-Related Crashes

- 22 total bicycle/pedestrian-related crashes occurred with 9 bicycle crashes and 13 pedestrian crashes
- All bicycle/pedestrian-related crashes but one resulted in an injury (95 percent)
- 4 bicycle or pedestrian-related crashes resulted in a serious injury (18 percent)

Railroad Crossing-Related Crashes

- 5 total crashes occurred at or were related to a railroad crossing
- No injury crashes were reported
- Railroad crossing-related crashes were largely dispersed across 4 crossing locations These crashes had no notable trends and were random in nature

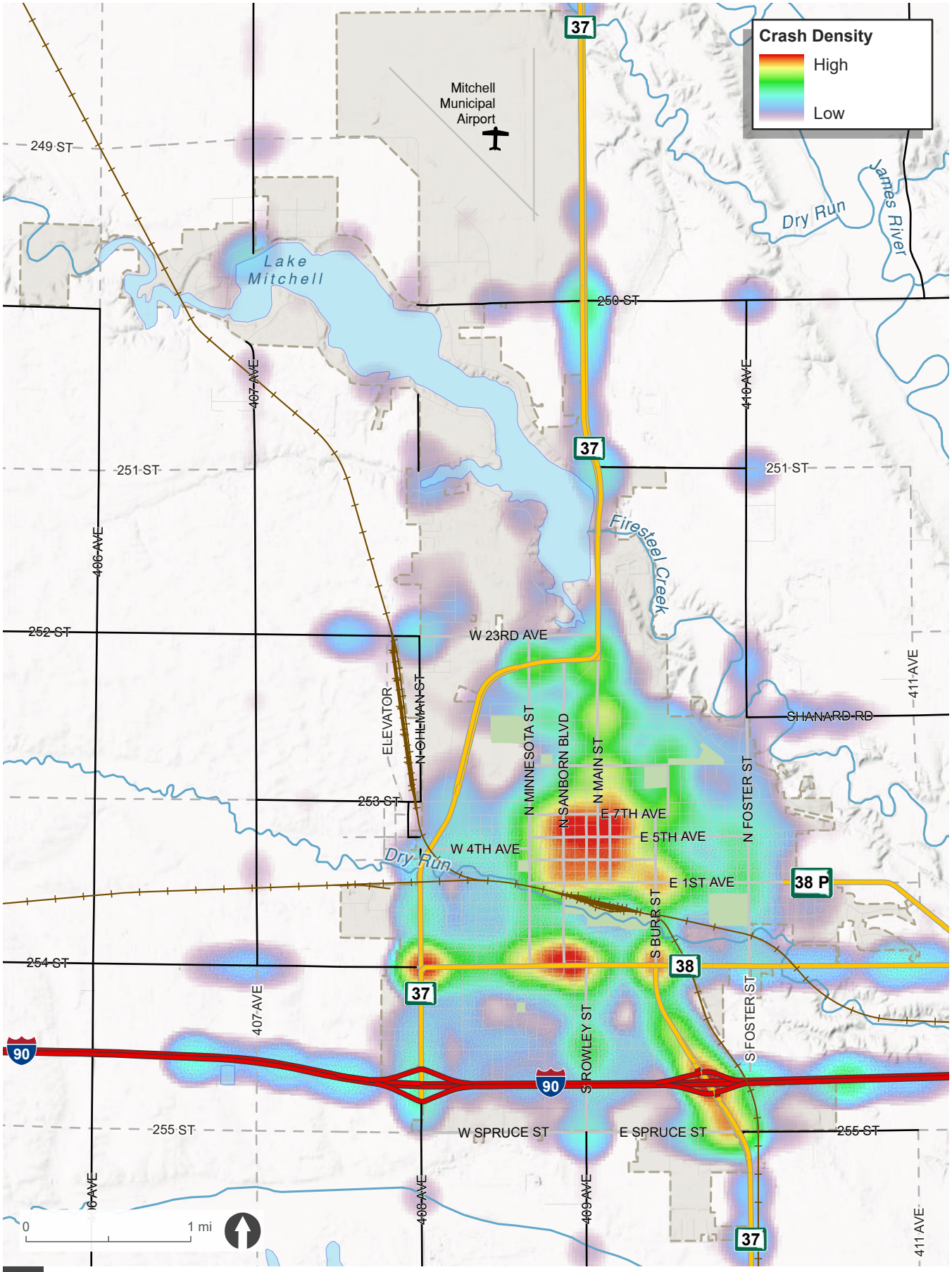
Appendix



MITCHELL Master Transportation Plan

CRASH HISTORY (2016 - 2020)

FIGURE 1

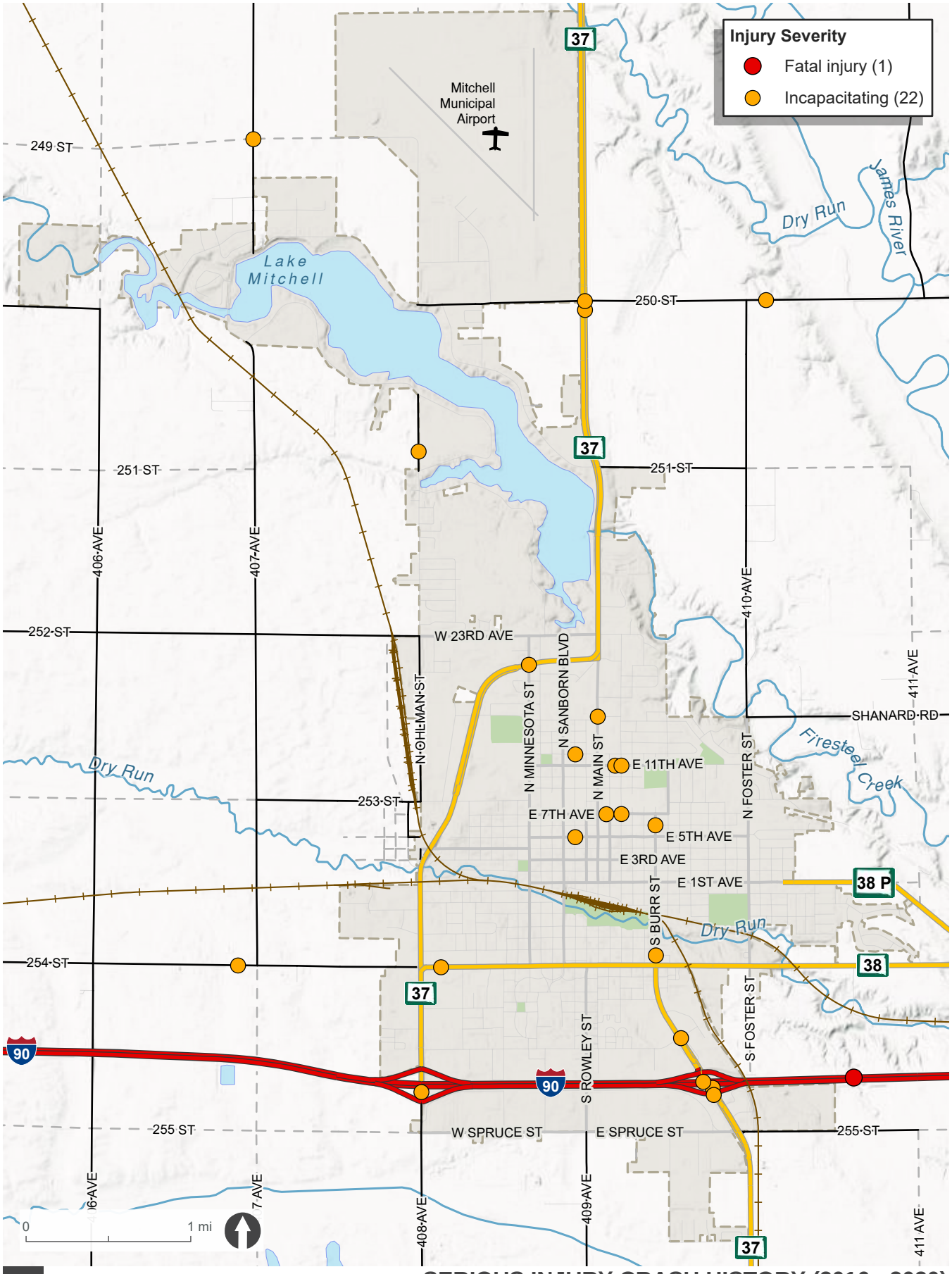


MITCHELL Master Transportation Plan

CRASH HISTORY (2016 - 2020)

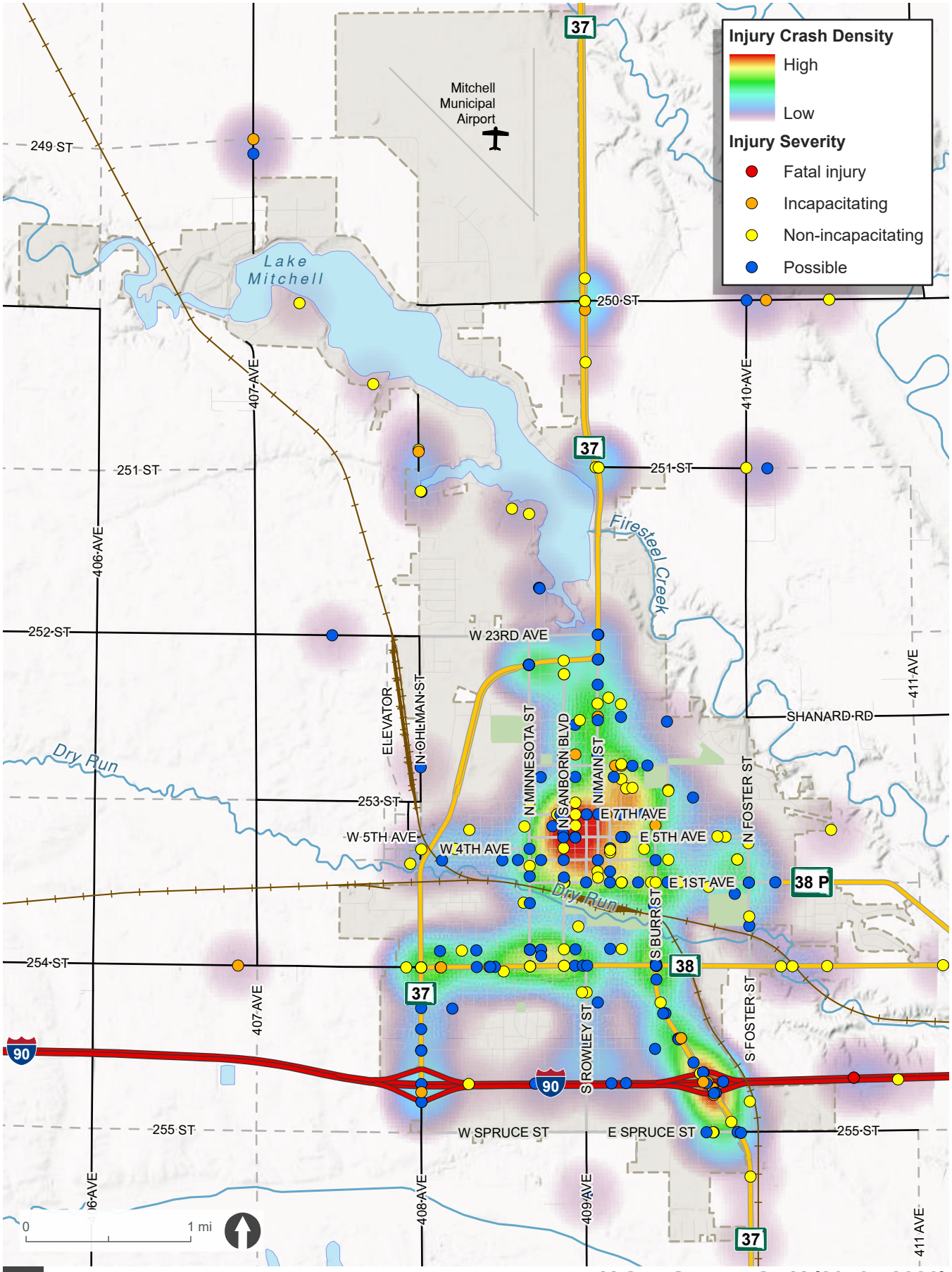
FIGURE 2

MITCHELL, SD | MASTER TRANSPORTATION PLAN



SERIOUS INJURY CRASH HISTORY (2016 - 2020)

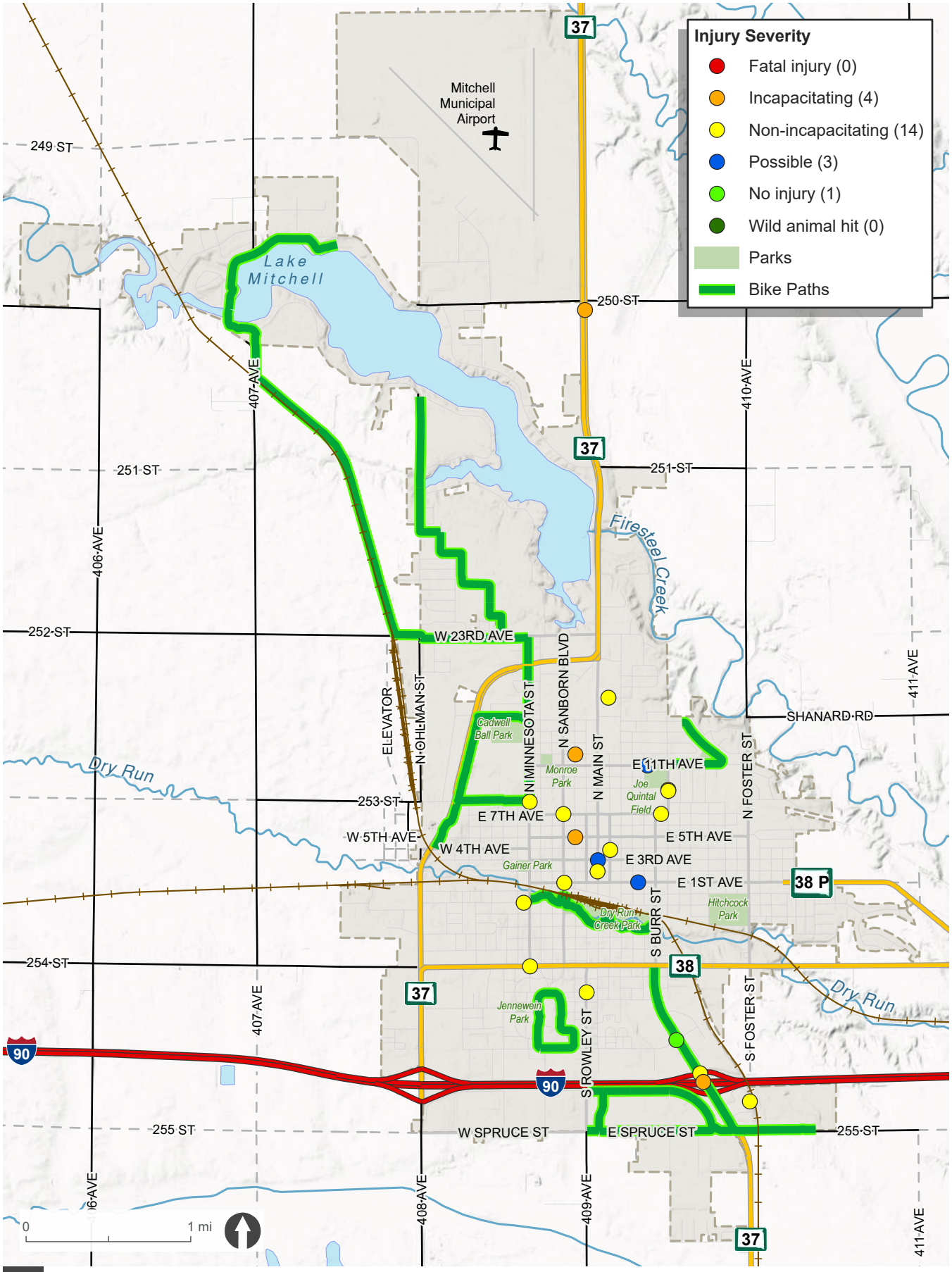
FIGURE 3



MITCHELL Master Transportation Plan

INJURY CRASH DENSITY (2016 - 2020)

FIGURE 4



BICYCLE AND PEDESTRIAN CRASHES (2016 - 2020)

FIGURE 5

Appendix C: Traffic Forecasts and Operations Analysis Memos

Memo

Date:	Friday, December 10, 2021
Project:	Mitchell Area Master Transportation Plan
To:	Study Advisory Team
From:	HDR
Subject:	Traffic Forecasts

Introduction

The purpose of this memo is to present sources of data and methodology used to develop traffic forecasts for the Mitchell Area Master Transportation Plan. The following volume scenarios were developed:

- Existing Conditions (Year 2022)
- 2032 Interim Conditions (10-year interim forecast)
- 2045 Planning Horizon

Sources of Data

Roadway Segment Volumes

The South Dakota Department of Transportation (SDDOT) provided historical daily traffic volumes collected as part of their annual count programs. Recent count years ranged between 2017 and 2021, with most counts occurring in 2018 and 2021.

Intersection Turning Movement Volumes

12-hour intersection turning movement counts were collected at 10 intersections as part of this study. The SDDOT also provided intersection turning movement counts at nine additional locations. These intersections are summarized in **Figure 1**.

Growth Rates

The following sources of potential growth rates were reviewed as part of the volume forecasting process:

- Historical counts provided by SDDOT
- SDDOT-derived growth rates for Davison County area roadways
- Future land-use maps provided by City of Mitchell
- Population trends

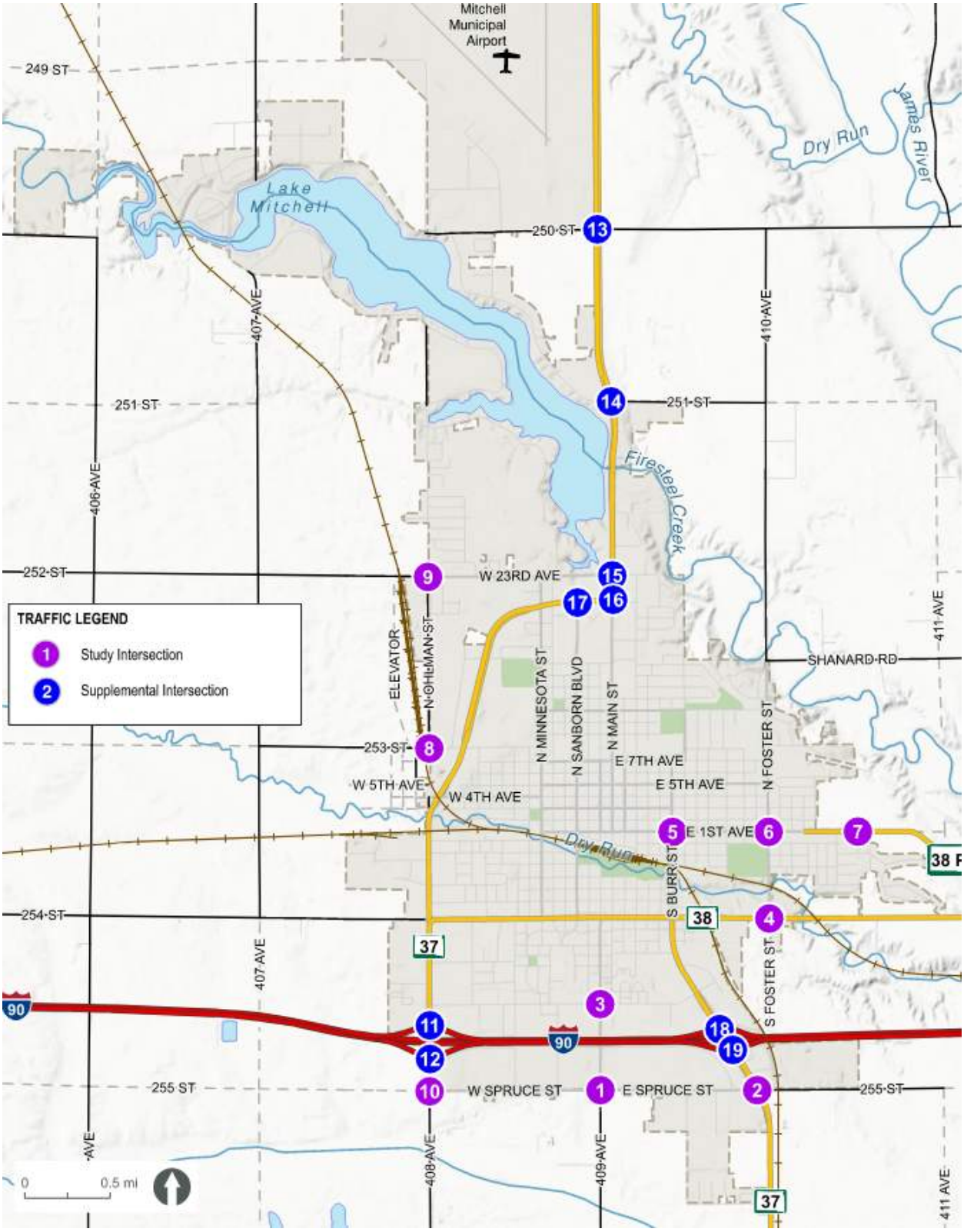


Figure 1: Intersection Turning Movement Count Locations

Forecast Methodology

Growth Rate Review

Findings from the review of potential growth rate data sources are summarized in the following. All percent increase/decrease trends are presented in terms of **annual, straight-line growth**.

Historical Counts

- In developing fringe areas:
  - West and south sides: 1.5% to 3% growth (typical)
  - East side: varies, generally 1% decrease to 1% growth (typical)
- In the Mitchell core area:
  - <1% growth (typical), with a few locations showing a decrease

SDDOT-Derived Growth Rates for Davison County Area Roadways

- Urban Arterials/Collectors/Locals: 1.9%
- Urban Interstate: 2.3%
- Rural (County) Arterials/Collectors/Locals: 2.3%

Future Land Use Maps

- The west and south sides of Mitchell:
  - Anticipated to see the most significant, traffic generating growth due to commercial, industrial, and higher-density residential development
- East side and northwest area surrounding Lake Mitchell:
  - Also anticipated to see growth, but likely lower-density single-family and multifamily development

Population Trends

- Average population growth between 1960 (12,555) and 2020 (15,660): 0.41% annually
- Average population growth between 1990 (13,798) and 2020 (15,660): 0.45% annually
- Average population growth between 2010 (15,254) and 2020 (15,660): 0.27% annually

Selected Growth Rates

Based on the above review, the following annual, straight-line growth rates were applied to historical counts to develop 2032 and 2045 traffic volumes:

- West and south developing areas: 2.5% (equivalent 10-year factor: 1.25)
- Mitchell core local roadways: 1.0% (10-year factor: 1.10)
- State highways: 1.9% (10-year factor: 1.19)
- Interstate highways: 2.3% (10-year factor: 1.23)

Seasonal Adjustment

All volumes were factored to a September design season (reflective of an Average Daily Traffic volume, or ADT). The AADT to September design season factor used in the study was 0.91

(September design season volume = AADT / 0.91) for all non-interstate roadways within the study area. This factoring process results in a higher volume than the count location's Average Annual Daily Traffic (AADT) value presented on SDDOT traffic maps.

Forecast Process

The following process was used to develop the Existing and future-year traffic volumes for the study:

A. Existing Condition Volumes

1. Identify baseline daily segment and intersection peak hour volumes
    a. Segments: SDDOT-provided daily count volumes
    b. Intersections: SDDOT-provided and HDR-collected intersection count volumes
2. Apply seasonal factor to factor all counts to a September design season
3. Apply growth factor to adjust volumes to a common 2022 year
4. Smooth and/or balance intersection peak hour volumes; smooth daily volumes

B. 2045 Planning Horizon Volumes

1. Apply growth factor to volumes developed above in Step A.2
2. Smooth and/or balance intersection peak hour volumes; smooth daily volumes

C. 2032 Interim Year Volumes

1. Straight-line interpolation between Existing (Step A.4) and 2045 Planning Horizon (Step B.2) traffic volumes

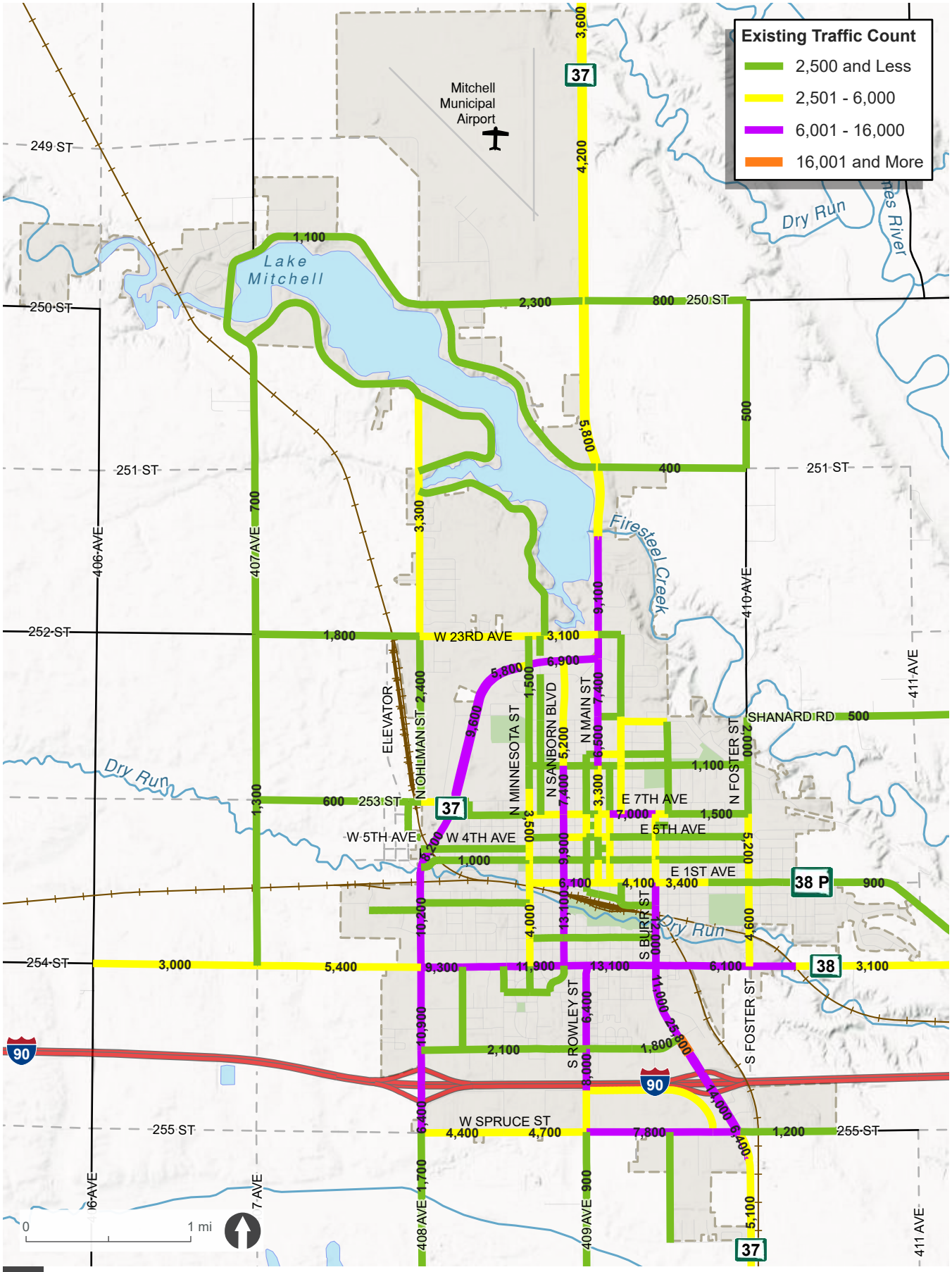
Truck percentages are based on available truck counts within the sources of data.

Where historical counts and growth factors were determined to not fully account for future development, such as on the side-street approaches to/from the development or a new connection, development generated traffic was estimated using ITE Trip Generation Rates. Forecasted volumes (developed via growth rates) were compared with estimated development-generated traffic and differences were reconciled via post-processing methods. This process reflects an 'order of magnitude' planning level overlay of estimated trips and does not encompass the level of detail typical for a Traffic Impact Study. A summary of estimated trip generation for future development areas identified by the SAT is provided in the **Appendix**.

Existing and Forecasted Traffic Volumes

Existing and forecasted traffic volumes are presented in the following figures:

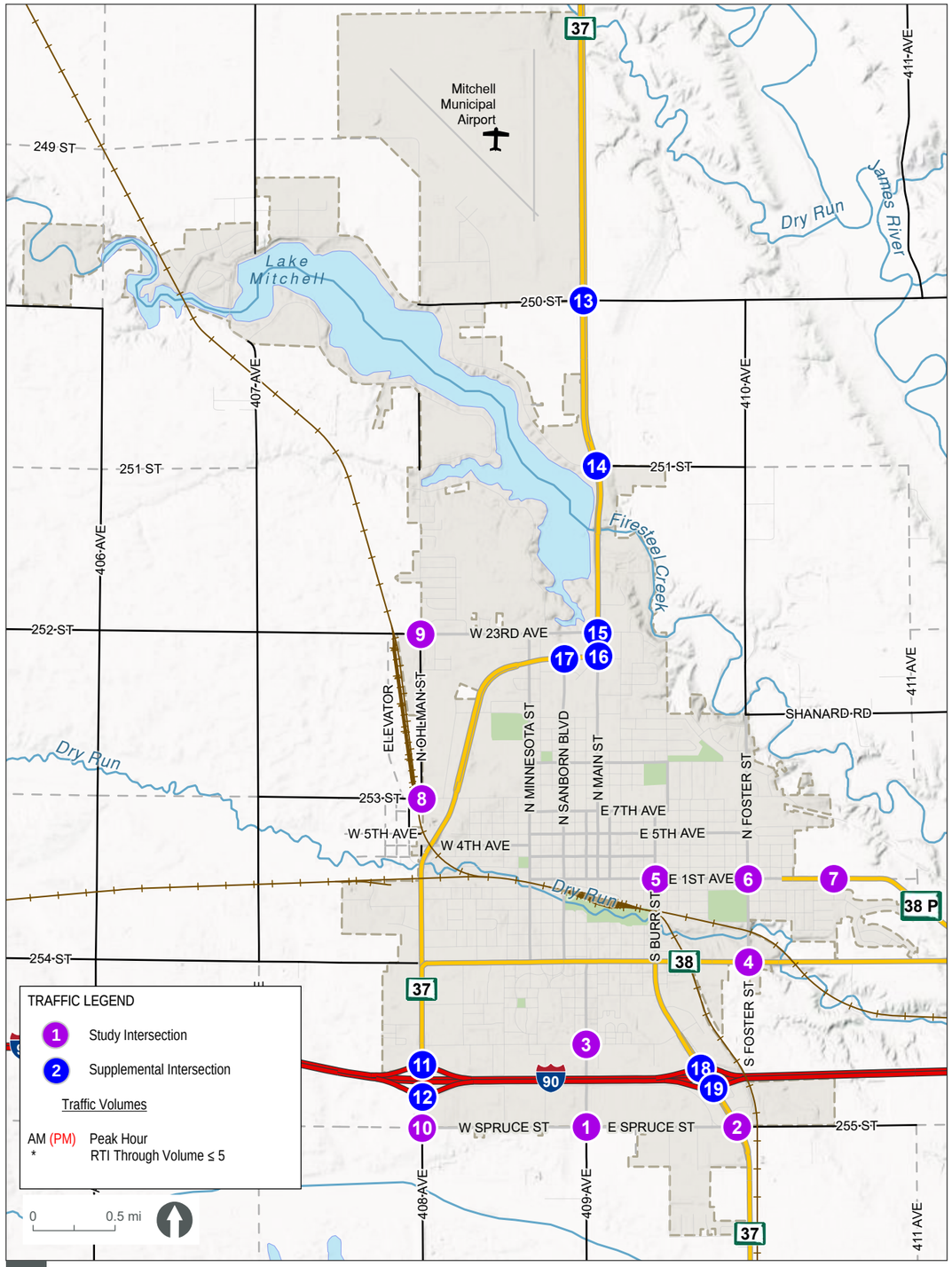
- **Figure 2: Existing Daily Segment Volumes**
- **Figure 3: Existing Intersection Peak Hour Volumes**
- **Figure 4: 2032 Daily Segment Volumes**
- **Figure 5: 2032 Intersection Peak Hour Volumes**
- **Figure 6: 2045 Daily Segment Volumes**
- **Figure 7: 2045 Intersection Peak Hour Volumes**



MITCHELL Master Transportation Plan

EXISTING DAILY TRAFFIC VOLUMES

FIGURE 2



1 Rowley Street & Spruce Street

(25) (40) (125)
15 25 75
(45) 60 → 55 (85)
(155) 100 → 50 (135)
(10) 5 → 5 (10)
10 50 10
(5) (25) (15)

2 SD37 / Burr Street & Spruce Street

(305) (220) (45)
140 115 180
(330) 105 → 40 (100)
(25) 90 → 10 (40)
(40) 15 → 1 (15)
35 225 30
(20) (170) (5)

3 Rowley Street & Norway Avenue

(5) (140) (25)
25 135 35
(10) 10 → 25 (30)
(75) 65 → 70 (60)
(70) 65 → 20 (25)
60 95 35
(70) (210) (25)

4 SD38 / Havens Ave & Foster Street

(145) (1) (20)
195 1 25
(190) 125 → 15 (25)
(135) 70 → 125 (95)
(5) 1 → 1 (1)
1 1 1
(5) (1) (1)

5 Burr Street & 1st Avenue

(15) (260) (10)
15 250 10
(10) 25 → 5 (5)
(115) 65 → 90 (90)
(175) 110 → 50 (35)
100 250 30
(165) (280) (50)

6 Foster Street & 1st Avenue

(20) (135) (45)
20 135 20
(30) 15 → 110 (20)
(45) 20 → 55 (55)
(30) 25 → 35 (15)
20 95 5
(15) (130) (25)

7 Mattie Street & 1st Avenue

(1) (1) (1)
5 1 1
(5) 1 → 1 (1)
(40) 20 → 55 (15)
(20) 5 → 1 (1)
20 1 1
(15) (1) (1)

8 Ohlman Street & 8th Avenue

(15) (145)
10 130
(5) 5 → 65 (125)
(15) 15 → 10 (20)

9 Ohlman Street & 23rd Avenue

(10) (55) (65)
15 85 110
(15) 5 → 30 (95)
(50) 90 → 40 (70)
(15) 15 → 10 (15)
10 25 5
(15) (80) (40)

10 Ohlman Street & Spruce Street

(15) (105) (165)
1 40 150
(1) 10 → 70 (190)
(5) 5 → 1 (5)
(1) 1 → 5 (20)
1 110 20
(1) (40) (5)

11 SD37 / Ohlman Street & I-90 WB RTI

(110) (470)
80 350
175 (105)
* (*)
10 (15)
15 320
(45) (435)

12 SD37 / Ohlman Street & I-90 EB RTI

(330) (155)
230 130
(90) 85 → *
(*) * →
(35) 30 → 10
250 5
(390) (30)

13 SD37 & National Guard Road

(5) (140) (15)
5 245 15
(10) 2 → 10 (15)
(20) 20 → 5 (20)
(130) 65 → 15 (10)
40 75 5
(60) (185) (15)

14 SD37 & Harmon Drive

(1) (255) (10)
1 285 20
(1) 1 → 5 (5)
(1) 10 → 1 (5)
(25) 45 → 15 (5)
15 160 5
(40) (270) (15)

15 SD37 & 23rd Avenue

(20) (350) (20)
15 315 40
(20) 10 → 25 (30)
(30) 35 → 20 (45)
(125) 180 → 10 (25)
50 140 25
(150) (330) (30)

16 SD37 & Main Street

(180) (260) (60)
180 295 30
(190) 110 → 5 (20)
(65) 80 → 105 (40)
(85) 85 → 10 (10)
85 100 10
(95) (300) (10)

17 SD37 & Sanborn Boulevard

(5) (10) (5)
5 1 1
(2) 5 → 10 (5)
(240) 225 → 285 (220)
(50) 65 → 75 (90)
45 5 50
(105) (5) (95)

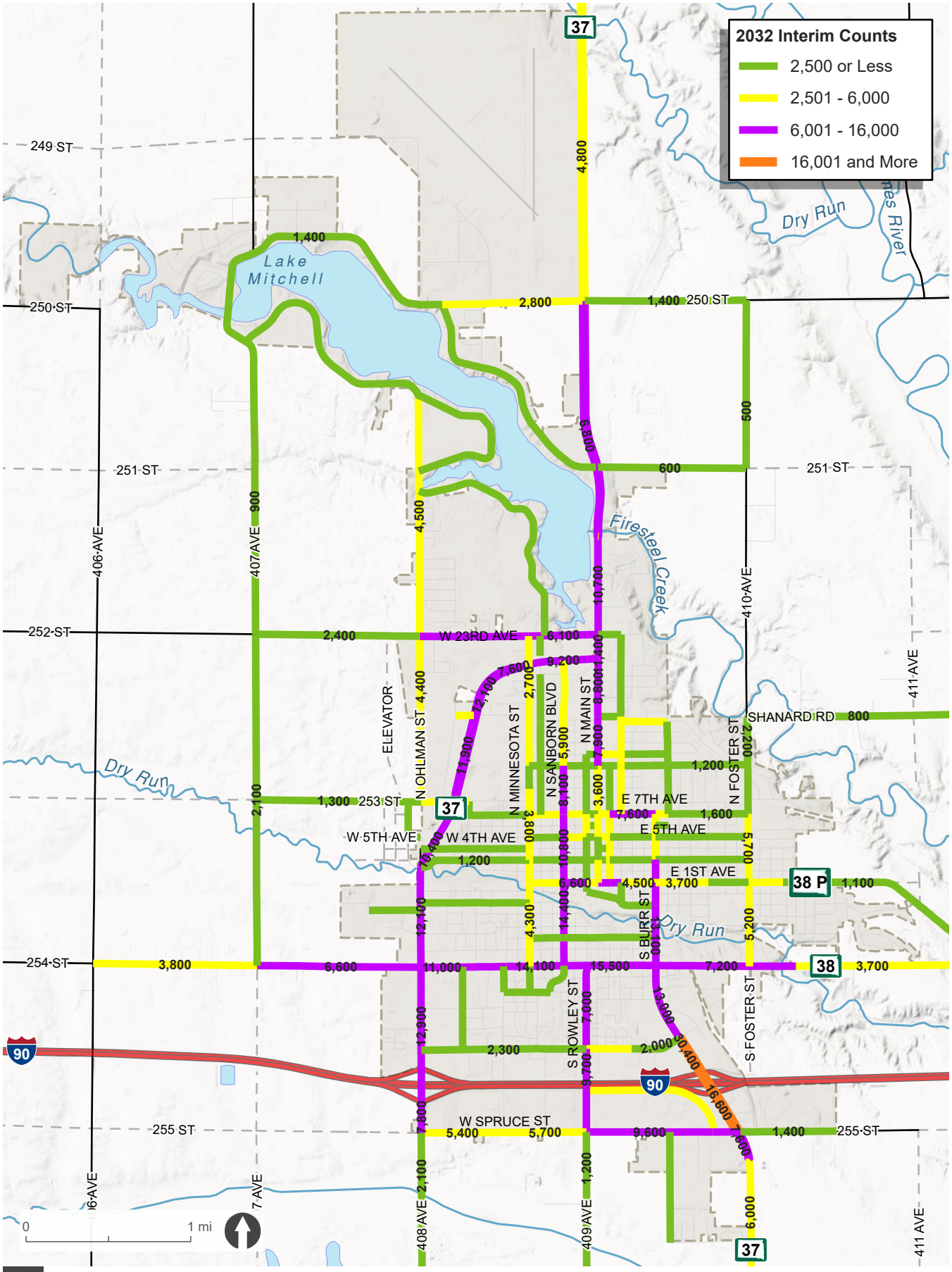
18 SD37 / Burr Street & I-90 WB RTI

(90) (600)
100 420
130 (170)
* (*)
90 (85)
85 290
(70) (510)

19 SD37 / Burr Street & I-90 EB RTI

(565) (120)
440 70
(70) 55 →
(*) * →
(115) 95 →
320 35
(510) (150)

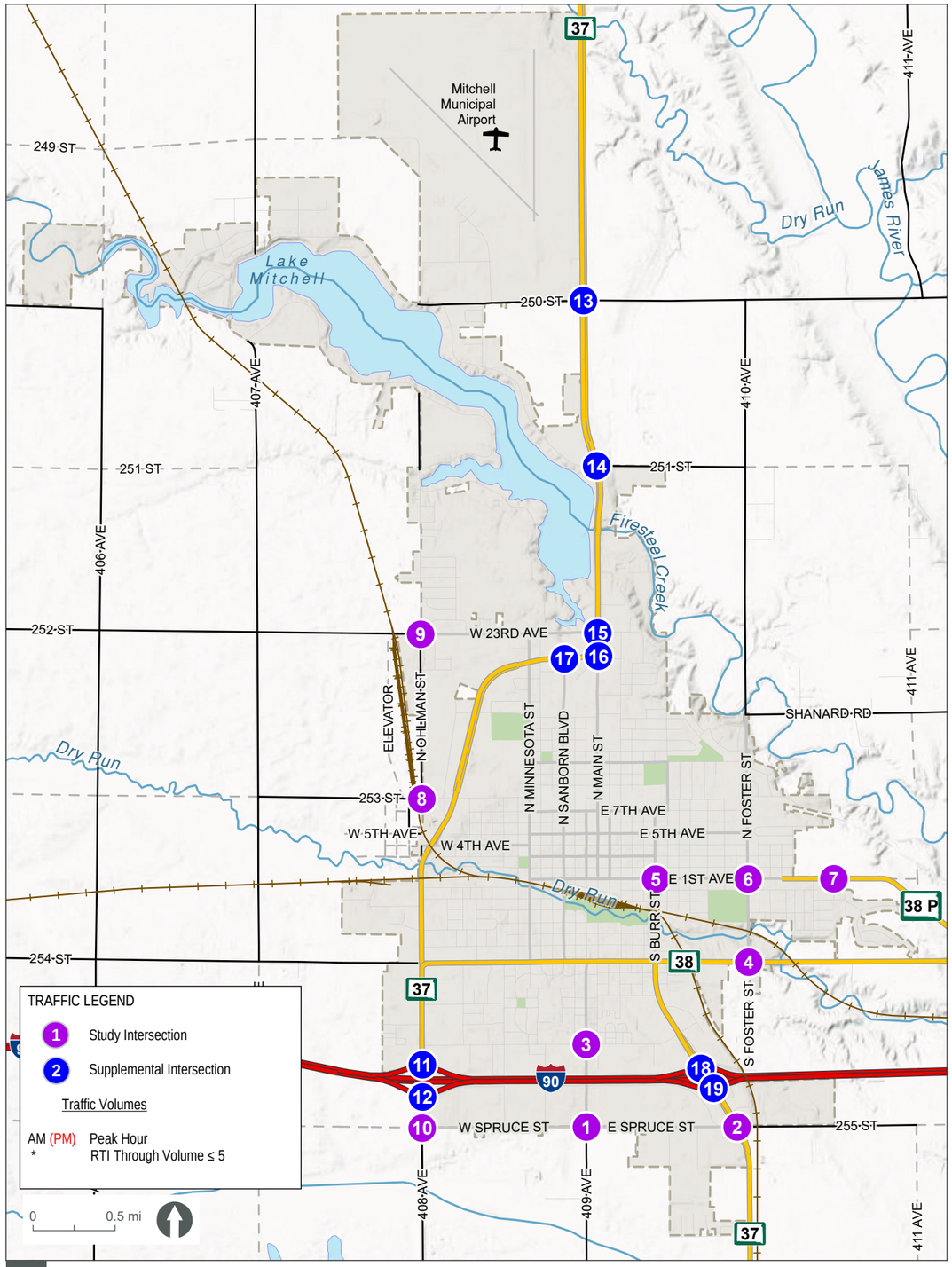
EXISTING INTERSECTION PEAK HOUR VOLUMES



MITCHELL Master Transportation Plan

2032 INTERIM DAILY TRAFFIC VOLUMES

FIGURE 4



1 Rowley Street & Spruce Street

(30) (50) (160)
20 30 95
(55) 75 → 70 (110)
(190) 125 → 60 (170)
(15) 10 → 10 (15)
15 65 15
(10) (30) (20)

2 SD37 / Burr Street & Spruce Street

(360) (260) (50)
165 140 210
(395) 125 → 45 (120)
(30) 110 → 15 (45)
(50) 20 → 5 (20)
40 270 40
(25) (205) (5)

3 Rowley Street & Norway Avenue

(10) (180) (30)
30 170 40
(15) 15 → 30 (35)
(90) 80 → 85 (75)
(90) 80 → 25 (30)
75 120 45
(85) (265) (35)

4 Foster Street & SD38 / Havens Ave

(175) (5) (25)
240 5 30
(240) 150 → 20 (30)
(160) 80 → 150 (115)
(10) 5 → 5 (5)
5 5 5
(5) (5) (5)

5 Burr Street & 1st Avenue

(20) (285) (15)
20 275 15
(15) 30 → 10 (10)
(125) 75 → 95 (95)
(195) 120 → 55 (40)
110 275 35
(180) (310) (55)

6 Foster Street & 1st Avenue

(25) (150) (60)
25 150 25
(35) 20 → 130 (30)
(65) 30 → 70 (65)
(35) 30 → 50 (25)
25 105 15
(20) (145) (40)

7 Mattie Street & 1st Avenue

(20) (5) (5)
35 5 5
(40) 15 → 5 (5)
(45) 25 → 60 (20)
(35) 10 → 5 (5)
30 5 5
(25) (5) (5)

8 Ohlman Street & 8th Avenue

(30) (245)
25 220
(20) 15 → 135 (215)
(40) 40 → 35 (45)

9 Ohlman Street & 23rd Avenue

(15) (75) (85)
25 125 155
(25) 10 → 45 (140)
(65) 120 → 50 (95)
(25) 25 → 55 (70)
20 35 60
(25) (120) (90)

10 Ohlman Street & Spruce Street

(20) (130) (205)
5 45 190
(5) 15 → 90 (240)
(10) 10 → 5 (10)
(5) 5 → 10 (25)
5 135 25
(5) (55) (10)

11 SD37 / Ohlman Street & I-90 WB RTI

(135) (575)
100 425
215 (130)
* (*)
15 (20)
20 395
(55) (535)

12 SD37 / Ohlman Street & I-90 EB RTI

(405) (190)
280 160
(115) 105 → 215 (130)
(*) * → * (*)
(45) 35 → 15 (20)
310 10
(475) (35)

13 SD37 & National Guard Road

(10) (175) (20)
10 300 20
(15) 5 → 15 (20)
(25) 25 → 10 (25)
(160) 80 → 55 (25)
55 95 20
(80) (225) (55)

14 SD37 & Harmon Drive

(5) (325) (15)
5 380 25
(5) 5 → 15 (15)
(5) 15 → 5 (10)
(30) 50 → 30 (15)
20 200 15
(45) (360) (30)

15 SD37 & 23rd Avenue

(40) (425) (25)
50 400 50
(55) 25 → 30 (40)
(35) 40 → 25 (55)
(170) 240 → 15 (30)
75 170 30
(215) (415) (40)

16 SD37 & Main Street

(225) (325) (75)
240 380 35
(250) 140 → 10 (25)
(80) 95 → 125 (55)
(125) 125 → 15 (15)
125 125 15
(135) (395) (15)

17 SD37 & Sanborn Boulevard

(10) (15) (10)
5 5 5
(5) 10 → 15 (10)
(325) 290 → 380 (295)
(65) 85 → 95 (110)
55 10 65
(130) (10) (120)

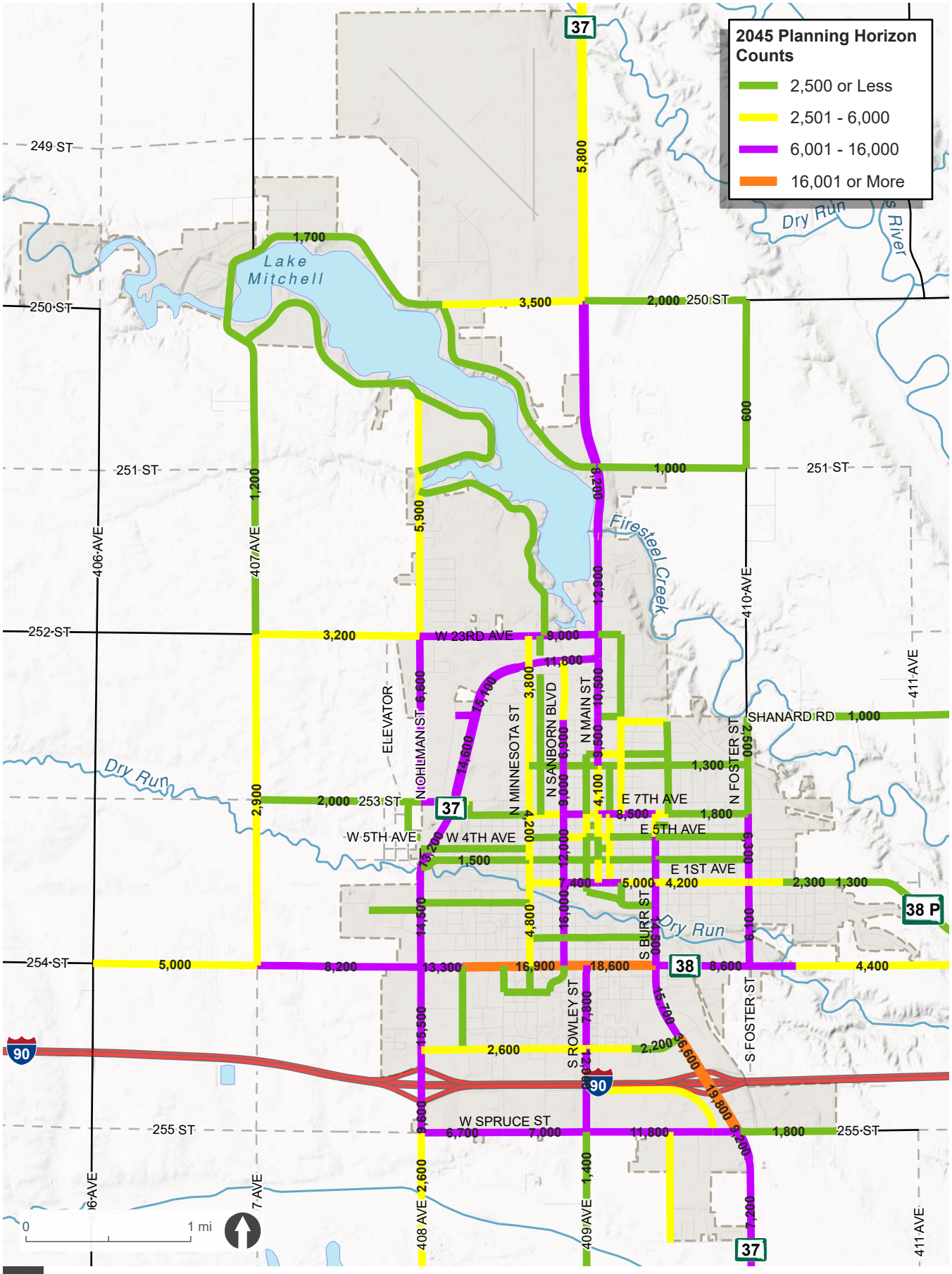
18 SD37 / Burr Street & I-90 WB RTI

(110) (735)
120 515
160 (210)
* (*)
110 (105)
105 355
(85) (635)

19 SD37 / Burr Street & I-90 EB RTI

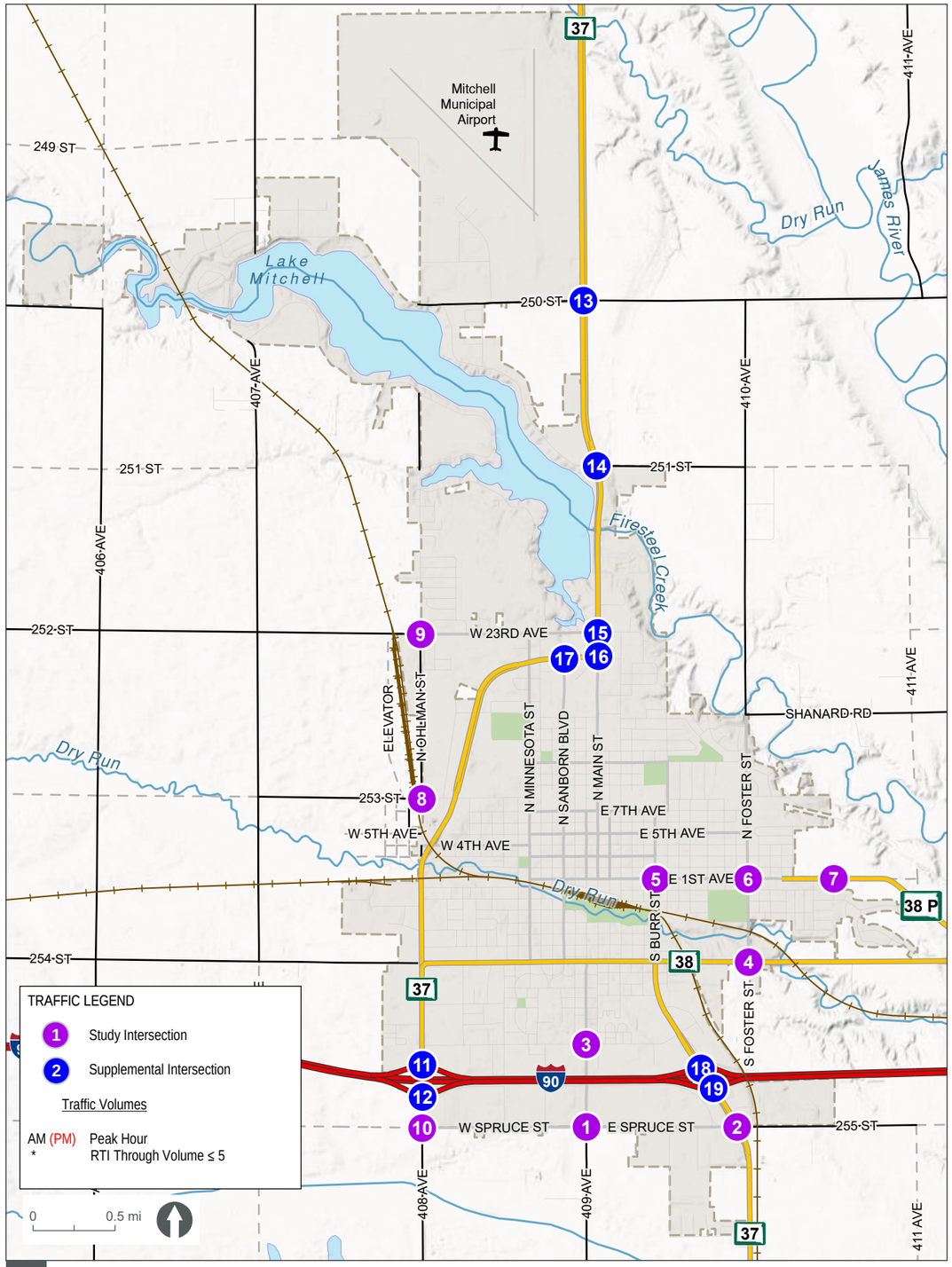
(690) (150)
540 85
(90) 65
(*) *
(140) 120
395 45
(630) (185)

2032 INTERSECTION PEAK HOUR VOLUMES



2045 PLANNING HORIZON DAILY TRAFFIC VOLUMES

FIGURE 6



1 Rowley Street & Spruce Street

	(40) (65) (210)	
	25 35 125	
(75) 100		95 (145)
(255) 170		80 (220)
(20) 15		15 (20)
	20 85 20	
	(15) (40) (25)	

2 SD37 / Burr Street & Spruce Street

	(450) (325) (65)	
	205 175 265	
(495) 155		55 (150)
(35) 135		20 (60)
(60) 25		10 (25)
	50 335 45	
	(30) (255) (10)	

3 Rowley Street & Norway Avenue

	(15) (235) (40)	
	40 225 55	
(20) 20		35 (50)
(120) 105		110 (100)
(115) 105		30 (40)
	100 160 60	
	(110) (350) (45)	

4 Foster Street & SD38 / Havens Ave

	(225) (10) (30)	
	305 10 35	
(305) 195		25 (40)
(200) 100		190 (140)
(15) 10		10 (10)
	10 10 10	
	(10) (10) (10)	

5 Burr Street & 1st Avenue

	(25) (320) (20)	
	25 310 20	
(20) 35		15 (15)
(140) 85		110 (110)
(220) 135		60 (40)
	125 315 40	
	(205) (350) (65)	

6 Foster Street & 1st Avenue

	(30) (165) (75)	
	30 165 35	
(40) 25		155 (40)
(85) 40		95 (80)
(40) 35		65 (40)
	30 120 20	
	(25) (165) (55)	

7 Mattie Street & 1st Avenue

	(40) (10) (15)	
	65 10 15	
(75) 25		10 (15)
(50) 30		65 (25)
(45) 15		10 (10)
	40 10 10	
	(35) (10) (10)	

8 Ohlman Street & 8th Avenue

	(40)	(365)
	35	325
(30) 30		215 (325)
(60) 65		55 (65)

9 Ohlman Street & 23rd Avenue

	(25) (100) (115)	
	35 175 220	
(35) 15		65 (200)
(90) 160		75 (125)
(35) 40		95 (125)
	30 50 115	
	(35) (170) (150)	

10 Ohlman Street & Spruce Street

	(30) (170) (270)	
	10 65 250	
(10) 20		115 (315)
(15) 15		10 (15)
(10) 10		15 (30)
	10 180 30	
	(10) (70) (15)	

11 SD37 / Ohlman Street & I-90 WB RTI

	(175) (750)	
	130 550	
		275 (170)
		* (*)
		20 (25)
	25 510	
	(75) (685)	

12 SD37 / Ohlman Street & I-90 EB RTI

	(530) (245)	
	360 210	
(145) 135		
(*) *		
(60) 45		
	400 15	
	(615) (45)	

13 SD37 & National Guard Road

	(15) (225) (25)	
	15 375 25	
		20 (25)
		15 (30)
		95 (40)
(20) 15		
(30) 30		
(200) 100		
	65 120 35	
	(95) (285) (95)	

14 SD37 & Harmon Drive

	(10) (420) (20)	
	10 500 35	
		25 (20)
		10 (15)
		45 (25)
(10) 10		
(10) 20		
(35) 65		
	25 265 25	
	(55) (480) (45)	

15 SD37 & 23rd Avenue

	(60) (535) (30)	
	80 510 60	
		35 (45)
		30 (65)
		20 (35)
(95) 40		
(40) 50		
(225) 315		
	95 220 40	
	(290) (530) (45)	

16 SD37 & Main Street

	(295) (410) (90)	
	315 495 35	
		15 (30)
		155 (65)
		20 (20)
(320) 180		
(100) 120		
(165) 170		
	165 160 20	
	(190) (515) (20)	

17 SD37 & Sanborn Boulevard

	(15) (20) (15)	
	10 10 10	
		20 (15)
		490 (395)
		125 (145)
(10) 15		
(415) 380		
(85) 110		
	75 15 85	
	(165) (15) (160)	

18 SD37 / Burr Street & I-90 WB RTI

	(145) (955)	
	155 665	
		210 (270)
		* (*)
		145 (140)
	135 460	
	(110) (820)	

19 SD37 / Burr Street & I-90 EB RTI

	(905) (190)	
	705 105	
(115) 85		
(*) *		
(180) 155		
	510 60	
	(815) (235)	

2045 INTERSECTION PEAK HOUR VOLUMES

Appendix

Estimated trips for future development areas identified by the SAT:

Intersection	Area	Land Use Description	ITE Code	Quantity	Unit	Trip Rates			Total Trips			AM			PM		
						Daily	AM	PM	Daily	AM	PM	In	Out	Pass-By*	In	Out	Pass-By*
Mattie St & 1st Ave	NW Quadrant	Single Family Detached	210	100	Dw. Units	9.43	0.7	0.94	943	70	94	18	52		59	35	
	SW/SE Quadrants	Single Family Detached	210	30	Dw. Units	9.43	0.7	0.94	283	21	28	5	16		18	10	
								Total New Trips:	***1226***	***91***	***122***	***24***	***67***		***77***	***45***	
Ohlman St & 23rd Ave	NW Quadrant	Single Family Detached	210	85	Dw. Units	9.43	0.7	0.94	802	60	80	15	44		50	30	
	North, near Harmon Dr	Single Family Detached	210	100	Dw. Units	9.43	0.7	0.94	943	70	94	18	52		59	35	
	SE Quadrant	Office Park (20 ac)	750	305	1000 SF GFA	11.07	1.33	1.3	3375	406	396	361	45		55	341	
	SE Quadrant	Retail/General Commercial (20 ac)	820	218	1000 SF GFA	37.01	0.84	3.4	8061	183	741	113	70	55	355	385	222
	SE Quadrant	Single Family Detached	210	20	Dw. Units	9.43	0.7	0.94	189	14	19	4	10		12	7	
								Subtotal:	***13369***	***732***	***1330***	***512***	***220***	***55***	***532***	***797***	***222***
								Total New Trips:	***10951***			***484***	***193***		***421***	***686***	
Ohlman St & 8th Ave	NE Quadrant	Office (10 ac)	750	152	1000 SF GFA	11.07	1.33	1.3	1688	203	198	180	22		28	170	
	NE Quadrant	Retail/General Commercial (10 ac)	820	109	1000 SF GFA	37.01	0.84	3.4	4030	91	370	57	35	27	178	193	111
	NE Quadrant	Light Industrial (20 ac)	110	305	1000 SF GFA	4.87	0.74	0.65	1485	226	198	199	27		28	170	
								Subtotal:	***7203***	***520***	***767***	***436***	***84***	***27***	***233***	***533***	***111***
								Total New Trips:	***5994***			***422***	***70***		***178***	***478***	
SD37 & National Guard Rd	East of SD37	Singl Family Detached	210	77	Dw. Units	9.43	0.7	0.94	726	54	72	14	40		46	27	
								Total New Trips:	***726***	***54***	***72***	***14***	***40***		***46***	***27***	

Existing and Future No-Build Operations Memo

Date: Thursday, December 23, 2021

Project: Mitchell Area Master Transportation Plan

To: Study Advisory Team

From: HDR

Subject: Existing and Future No-Build Condition Intersection Traffic Operations Analysis

Introduction

The purpose of this memo is to document existing and future-year No-Build condition intersection traffic operations analyses of the following scenarios:

- Existing (2022)
- 2032 No-Build
- 2045 No-Build

Existing and No-Build condition findings will be used to establish transportation needs at study intersections within the Mitchell area.

Study Intersections

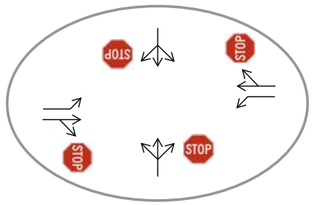
Study and supplemental analysis intersections are summarized in **Table 1**. Existing intersection lane configurations and traffic control are shown in **Figure 1**.

Table 1: Analysis Intersections

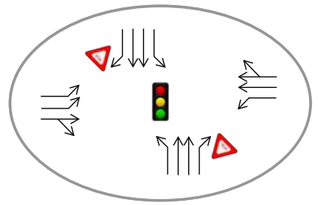
Ref #	Street #1	Street #2	Study Intersection	Supplemental Intersection
1	Rowley Street	Spruce Street	X	
2	SD 37 / Burr Street	Spruce Street	X	
3	Rowley Street	Norway Avenue	X	
4	Foster Street	SD38 / Havens Avenue	X	
5	Burr Street	1st Avenue	X	
6	Foster Street	1st Avenue	X	
7	Mattie Street	1st Avenue	X	
8	Ohlman Street	8th Avenue	X	
9	Ohlman Street	23rd Avenue	X	
10	Ohlman Street	Spruce Street	X	
11	SD37 / Ohlman Street	I-90 WB RTI		X
12	SD37 / Ohlman Street	I-90 EB RTI		X
13	SD37	National Guard Road		X
14	SD37	Harmon Drive		X
15	SD37	23rd Avenue		X
16	SD37	Main Street		X
17	SD37	Sanborn Boulevard		X
18	SD37 / Burr Street	I-90 WB RTI		X
19	SD37 / Burr Street	I-90 EB RTI		X



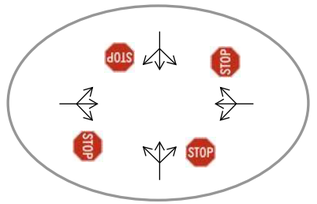
1 Rowley Street & Spruce Street



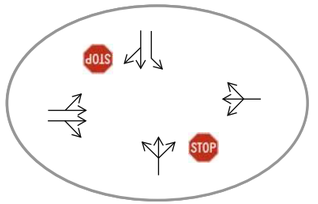
2 SD37 / Burr Street & Spruce Street



3 Rowley Street & Norway Avenue



4 SD38 / Havens Ave & Foster Street



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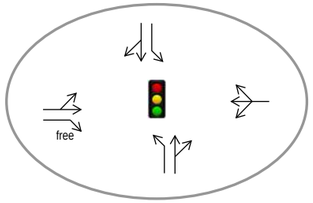
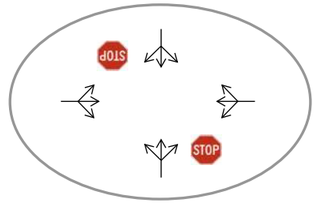
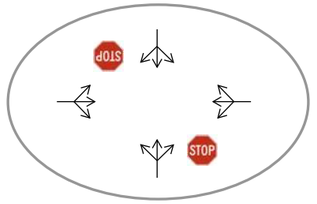


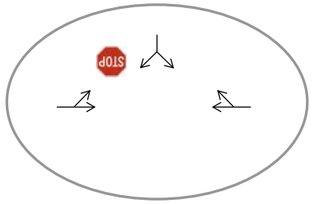
6 Foster Street & 1st Avenue



7 Mattie Street & 1st Avenue



8 Ohlman Street & 8th Avenue



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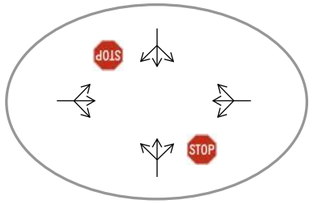
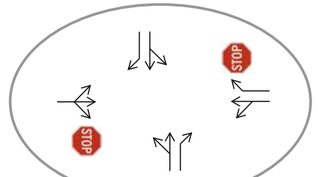
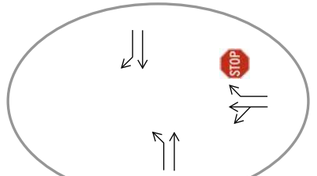


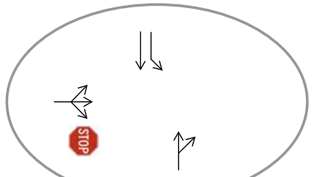
10 Ohlman Street & Spruce Street



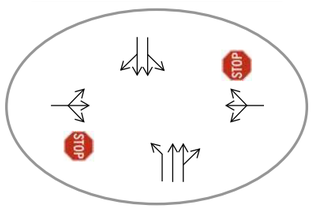
11 SD37 / Ohlman Street & I-90 WB RTI



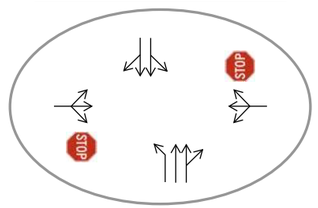
12 SD37 / Ohlman Street & I-90 EB RTI



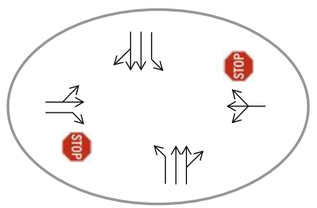
13 SD37 & National Guard Road



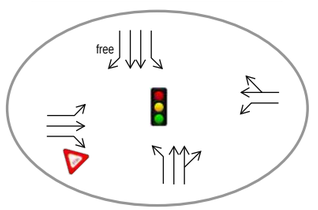
14 SD37 & Harmon Drive



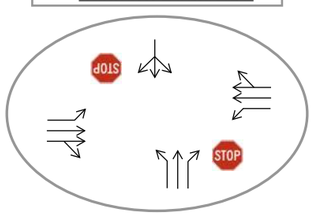
15 SD37 & 23rd Avenue



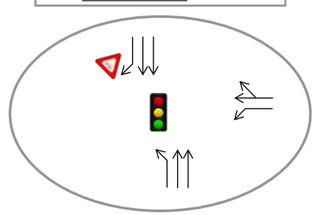
16 SD37 & Main Street



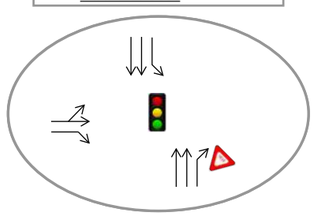
17 SD37 & Sanborn Boulevard



18 SD37 / Burr Street & I-90 WB RTI



19 SD37 / Burr Street & I-90 EB RTI



EXISTING INTERSECTION LANE CONFIGURATIONS

FIGURE 1

MITCHELL, SD | MASTER TRANSPORTATION PLAN

Intersection Traffic Volumes

12-hour intersection turning movement counts were collected at 10 intersections as part of this study. The SDDOT also provided intersection turning movement counts at nine additional locations.

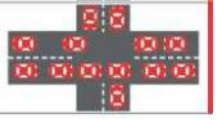
Traffic forecasts were developed using annual, straight-line growth rates based on historical counts. Additional information on the forecasting process is available in the *Mitchell Area Master Transportation Plan Traffic Forecasts Technical Memo*.

Peak hour traffic volumes are summarized in the following figures:

- **Figure 3:** 2022 Existing Conditions Traffic Volumes and LOS 2022 Existing conditions
- **Figure 4:** 2032 No-Build conditions
- **Figure 5:** 2045 No-Build conditions

Intersection Operational Performance

Intersection operational performance is evaluated in terms of quality of service, which describes how well a transportation facility operates from a traveler's perspective. Quality of service is typically measured with 'Level of Service' (LOS), which is presented by a letter grade similar to those used in school. A summary of LOS measures for signalized and unsignalized intersections pertinent to this study are provided in **Figure 2**.

	Unsignalized Intersection	Signalized Intersection	
A	Queuing is rare **Intersection Control Delay:** ≤10 seconds/vehicle	Very minimal queuing; excellent corridor progression and/or short cycle lengths **Intersection Control Delay:** ≤10 seconds/vehicle	
B	Occasional queuing **Intersection Control Delay:** >10–15 seconds/vehicle	Some queuing; good corridor progression and/or short cycle lengths **Intersection Control Delay:** >10–20 seconds/vehicle	
C	Regular queuing **Intersection Control Delay:** >15–25 seconds/vehicle	Regular queuing; not all demand may be serviced on some cycles (cycle failure) **Intersection Control Delay:** >20–35 seconds/vehicle	
D	Queue lengths increased **Intersection Control Delay:** >25–35 seconds/vehicle	Queue lengths increased; routine cycle failures **Intersection Control Delay:** >35–55 seconds/vehicle	
E	Significant queuing **Intersection Control Delay:** >35–50 seconds/vehicle	Long queues, congested conditions; majority of cycles fail **Intersection Control Delay:** >55–80 seconds/vehicle	
F	Volume to capacity ratio approaches 1.0; very long queues **Intersection Control Delay:** >50 seconds/vehicle	Volume to capacity ratio near 1.0; very long queues, almost all cycles fail **Intersection Control Delay:** >80 seconds/vehicle	

Note: Unsignalized intersection control delay shown in figure for overall (or weighted) intersection delay. Two-way stop-control delay (TWSC) is measured from the worst-case stop-controlled approach with the same average delay (seconds/vehicle) thresholds.

Figure 2: LOS Descriptions

Peak hour LOS is calculated for study area intersections using Synchro (Version 11) and methodology described in the 6th Edition of the Highway Capacity Manual (HCM6). Guidelines for use of Synchro 11 in this study is documented in the M&A document. A summary of the following operational measures and associated LOS thresholds applicable to this study area are provided in **Table 2**.

Table 2: Minimum Allowable Level of Service by Facility

Roadway Feature	Minimum Allowable LOS		Notes
	Rural	Urban	
Intersections (general)	LOS B	LOS C	Individual movements allowed to operate at LOS E in urban areas Individual movements that exceed a v/c ratio > 1.0 will result in LOS F Queue storage ratios that exceed 1.0 will result in LOS F
Signalized Intersections	LOS B	LOS C	Individual movements allowed to operate at LOS E in urban areas
Unsignalized Intersections	LOS B	LOS C	TWSC, AWSC, and roundabouts LOS based on weighted average intersection delay (with the exception of rural TWSC intersections where LOS is based on worst-case stop-controlled (WCSC) approach delay Worst-case stop-controlled (WCSC) approach delay and LOS may be lower than the minimum allowable LOS
SDDOT Intersections	LOS B	LOS D	SDDOT currently allows LOS D on state routes

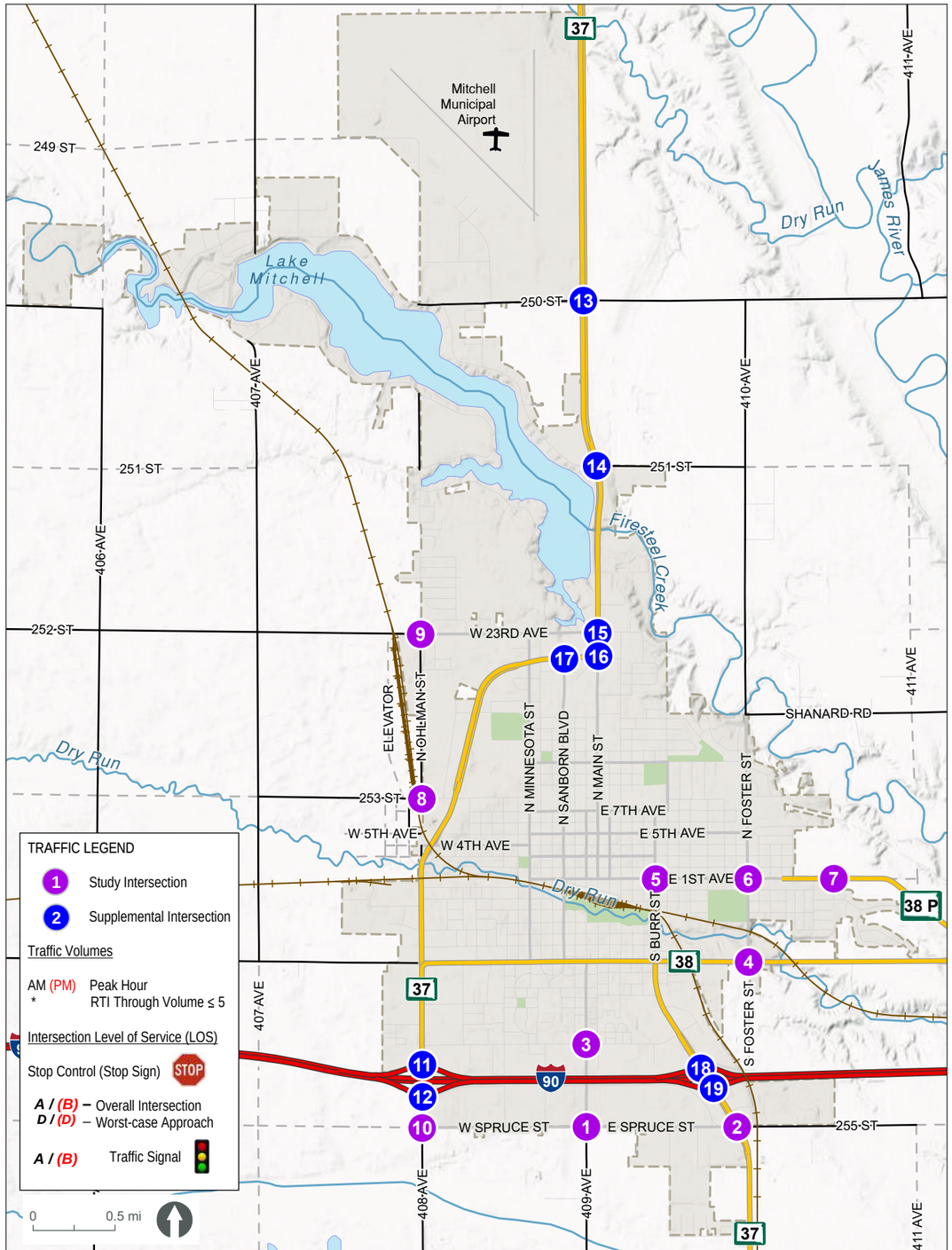
The following sections summarize the existing and No-Build condition analyses. Locations that do not meet study goals are noted in **bold Orange text** in the tables.

2022 Existing Condition Analysis

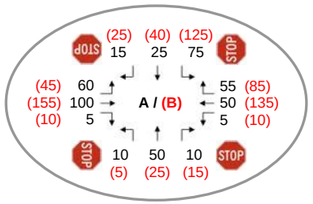
Existing condition operational results are summarized in **Table 3** and depicted in **Figure 3**.

Table 3: Intersection Operations – 2022 Existing Conditions

Ref #	Intersection	Control	Measure	AM LOS	PM LOS
1	Rowley Street / Spruce Street	AWSC	Overall:	9.1 / A	10.1 / B
2	SD37 (Burr Street) / Spruce Street	Signal	Overall:	24.4 / C	15.5 / B
3	Rowley Street / Norway Avenue	AWSC	Overall:	11.5 / B	10.8 / B
4	SD38 (Havens Avenue) / Foster Street	TWSC	Overall: (WCSC):	6.3 / A (14.6 / B)	5.5 / A (18.9 / C)
5	Burr Street / 1st Avenue	Signal	Overall:	12.0 / B	11.1 / B
6	Foster Street / 1st Avenue	TWSC	Overall: (WCSC):	8.8 / A (15.3 / C)	9.6 / A (14.4 / B)
7	Mattie Street / 1st Avenue	TWSC	Overall: (WCSC):	2.5 / A (9.3 / A)	2.2 / A (9.2 / A)
8	Ohlman Street / 8th Avenue	TWSC	Overall: (WCSC):	6.0 / A (9.8 / A)	5.3 / A (10.6 / B)
9	Ohlman Street / 23rd Avenue	TWSC	Overall: (WCSC):	8.0 / A (14.1 / B)	6.8 / A (13.4 / B)
10	Ohlman Street / Spruce Street	TWSC	Overall: (WCSC):	5.5 / A (17.3 / C)	6.3 / A (14.1 / B)
11	SD37 (Ohlman Street) / I-90 WB RTI (Exit 330)	TWSC	Overall: (WCSC):	0.4 / A (19.6 / C)	0.7 / A (23.3 / C)
12	SD37 (Ohlman Street) / I-90 EB RTI (Exit 330)	TWSC	Overall: (WCSC):	10.9 / B **(59.0 / F)**	7.8 / A **(53.4 / F)**
13	SD37 / National Guard Road	TWSC	Overall: (WCSC):	3.5 / A (12.0 / B)	5.2 / A (15.5 / C)
14	SD37 / Harmon Drive	TWSC	Overall: (WCSC):	2.2 / A (14.1 / B)	1.4 / A (14.7 / B)
15	SD37 / 23rd Avenue	TWSC	Overall: (WCSC):	6.1 / A (20.3 / C)	11.3 / B **(73.3 / F)**
16	SD37 (Main Street) / SD37	Signal	Overall:	9.8 / A	9.8 / A
17	SD37 / Sanborn Boulevard	TWSC	Overall: (WCSC):	3.2 / A (17.6 / C)	6.4 / A (20.5 / C)
18	SD37 (Burr Street) / I-90 WB RTI (Exit 332)	Signal	Overall:	10.6 / B	11.2 / B
19	SD37 (Burr Street) / I-90 EB RTI (Exit 332)	Signal	Overall:	8.5 / A	10.8 / B



1 Rowley Street & Spruce Street



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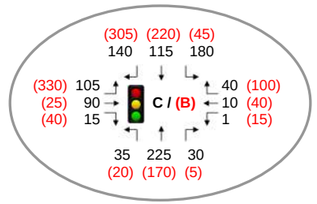
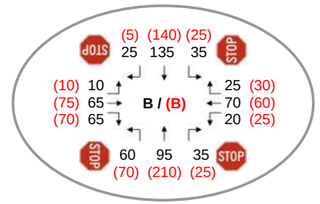
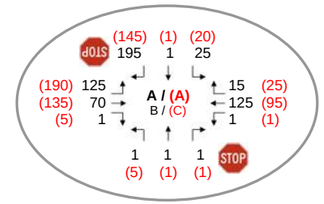


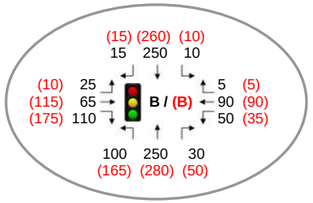
3 Rowley Street & Norway Avenue



4 SD38 / Havens Ave & Foster Street



5 Burr Street & 1st Avenue



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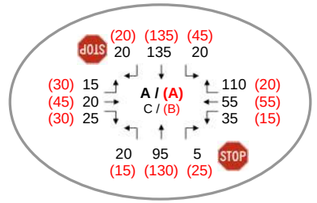
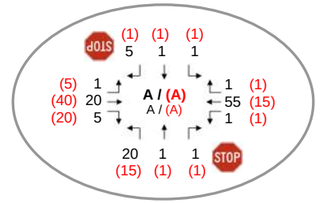
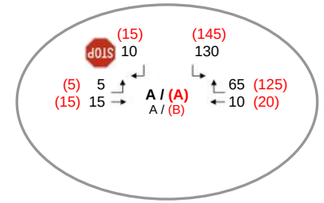


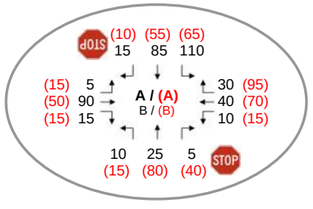
7 Mattie Street & 1st Avenue



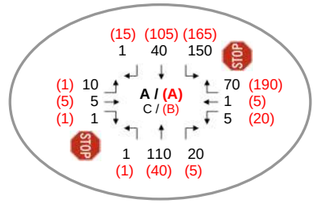
8 Ohlman Street & 8th Avenue



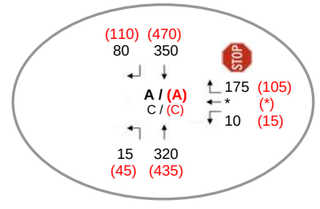
9 Ohlman Street & 23rd Avenue



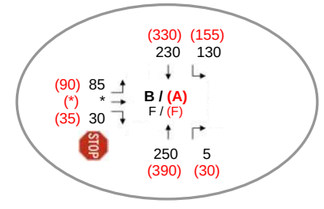
10 Ohlman Street & Spruce Street



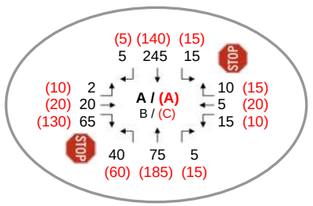
11 SD37 / Ohlman Street & I-90 WB RTI



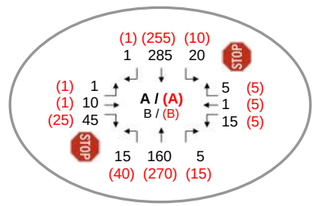
12 SD37 / Ohlman Street & I-90 EB RTI



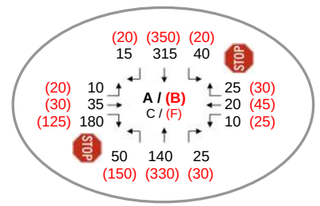
13 SD37 & National Guard Road



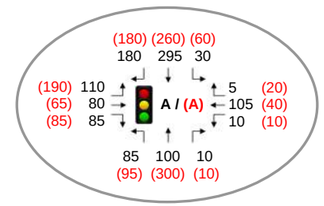
14 SD37 & Harmon Drive



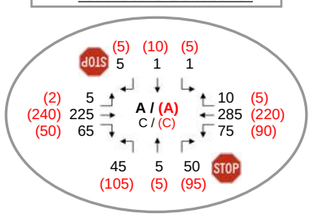
15 SD37 & 23rd Avenue



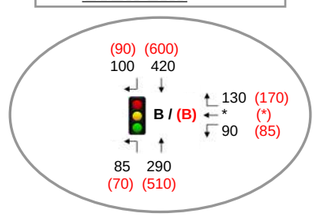
16 SD37 & Main Street



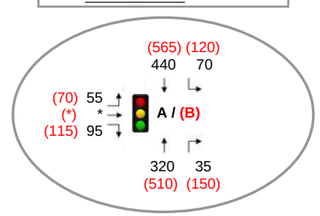
17 SD37 & Sanborn Boulevard



18 SD37 / Burr Street & I-90 WB RTI



19 SD37 / Burr Street & I-90 EB RTI



EXISTING CONDITIONS PEAK HOUR VOLUMES AND LOS

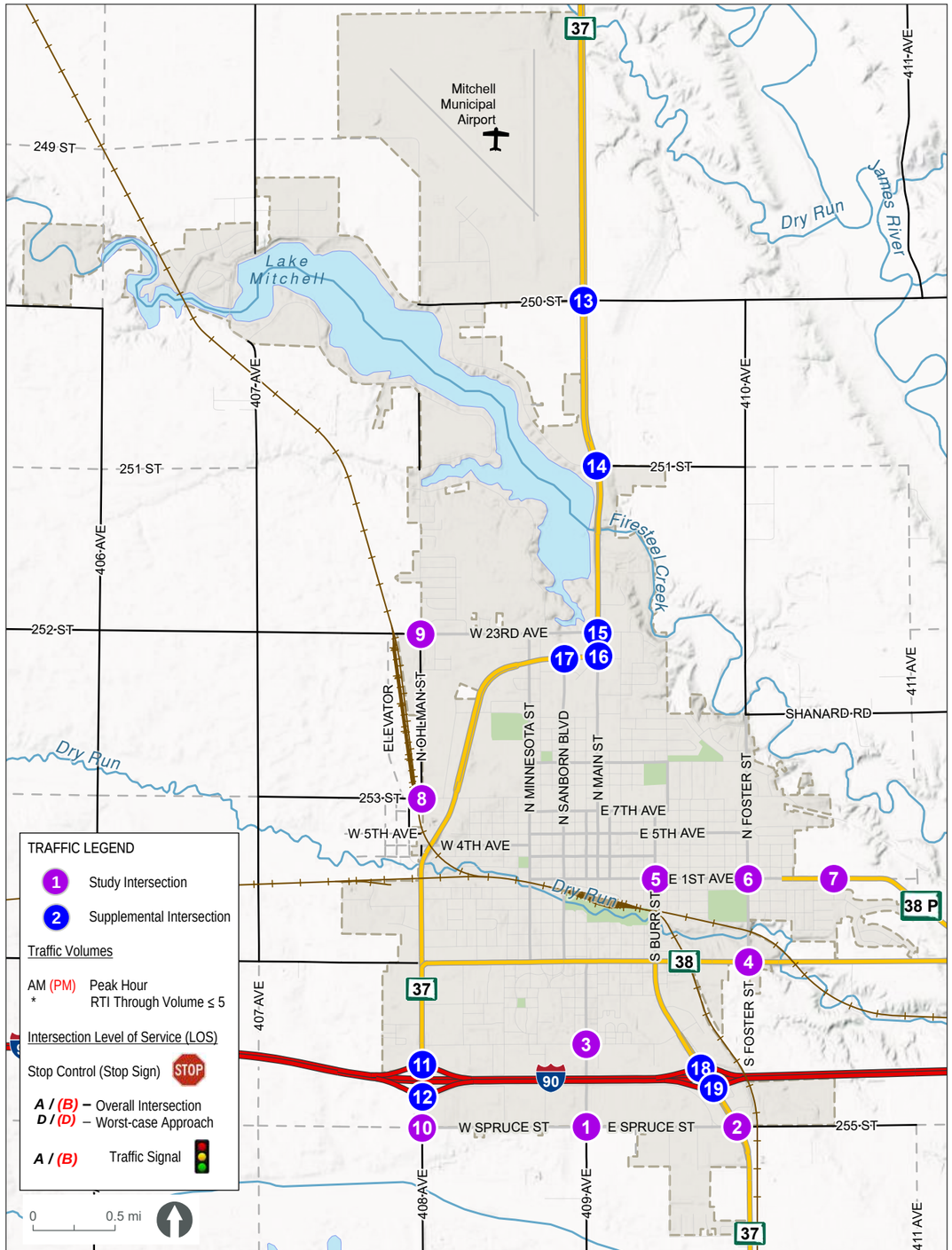
2032 No Build Condition Analysis

2032 No-Build condition operational results are summarized in **Table 4** and depicted in **Figure 4**.

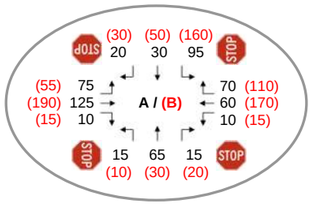
Table 4: Intersection Operations – 2032 No Build Conditions

Ref #	Intersection	Control	Measure	AM LOS	PM LOS
1	Rowley Street / Spruce Street	AWSC	Overall:	9.4 / A	12.6 / B
2	SD37 (Burr Street) / Spruce Street	Signal	Overall:	18.4 / B	17.0 / B
3	Rowley Street / Norway Avenue	AWSC	Overall:	11.5 / B	14.6 / B
4	SD38 (Havens Avenue) / Foster Street	TWSC	Overall: (WCSC):	6.8 / A (16.4 / C)	6.1 / A (21.3 / C)
5	Burr Street / 1st Avenue	Signal	Overall:	11.3 / B	11.5 / B
6	Foster Street / 1st Avenue	TWSC	Overall: (WCSC):	9.1 / A (16.4 / C)	11.3 / B (18.4 / C)
7	Mattie Street / 1st Avenue	TWSC	Overall: (WCSC):	4.6 / A (9.9 / A)	4.4 / A (10.1 / B)
8	Ohlman Street / 8th Avenue	TWSC	Overall: (WCSC):	6.4 / A (11.9 / B)	6.5 / A (13.6 / B)
9	Ohlman Street / 23rd Avenue	TWSC	Overall: (WCSC):	13.5 / B (25.7 / D)	12.7 / B (29.6 / D)
10	Ohlman Street / Spruce Street	TWSC	Overall: (WCSC):	6.0 / A (17.3 / C)	7.1 / A (17.9 / C)
11	SD37 (Ohlman Street) / I-90 WB RTI (Exit 330)	TWSC	Overall: (WCSC):	0.5 / A (19.7 / C)	1.0 / A (37.1 / E)
12	SD37 (Ohlman Street) / I-90 EB RTI (Exit 330)	TWSC	Overall: (WCSC):	8.9 / A (47.1 / E)	**75.9 / F*** **(588.6 / F)**
13	SD37 / National Guard Road	TWSC	Overall: (WCSC):	4.6 / A (15.5 / C)	5.5 / A (17.6 / C)
14	SD37 / Harmon Drive	TWSC	Overall: (WCSC):	2.6 / A (14.6 / B)	1.9 / A (16.6 / C)
15	SD37 / 23rd Avenue	TWSC	Overall: (WCSC):	6.6 / A (22.1 / C)	**65.5 / F*** **(328.8 / F)**
16	SD37 (Main Street) / SD37	Signal	Overall:	9.9 / A	11.6 / B
17	SD37 / Sanborn Boulevard	TWSC	Overall: (WCSC):	3.3 / A (19.3 / C)	8.4 / A (28.9 / D)
18	SD37 (Burr Street) / I-90 WB RTI (Exit 332)	Signal	Overall:	11.8 / B	20.2 / C
19	SD37 (Burr Street) / I-90 EB RTI (Exit 332)	Signal	Overall:	8.9 / A	10.4 / B

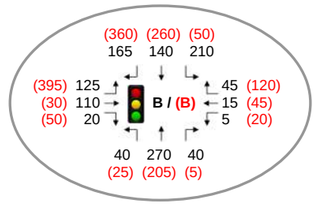
* Individual movement(s) with volume to capacity ratio(s) nearing or exceeding 1.0.



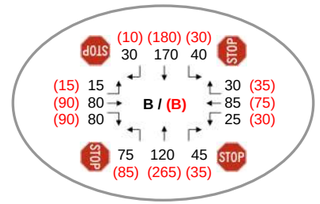
1 Rowley Street & Spruce Street



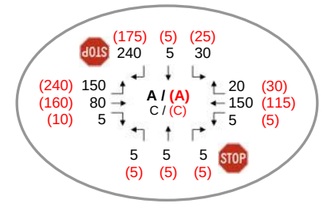
2 SD37 / Burr Street & Spruce Street



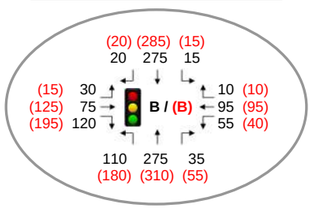
3 Rowley Street & Norway Avenue



4 SD38 / Havens Ave & Foster Street



5 Burr Street & 1st Avenue



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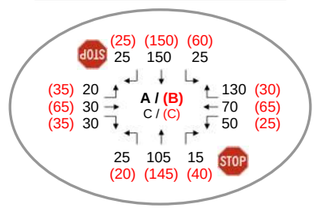
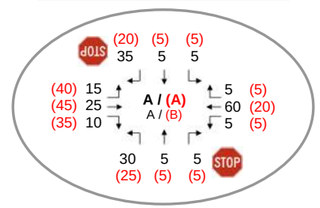
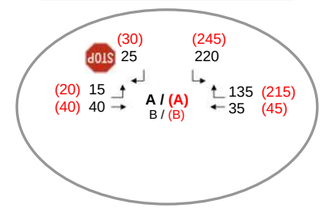


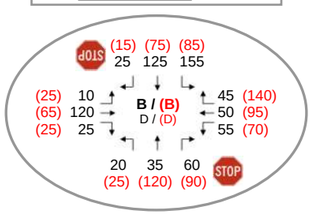
7 Mattie Street & 1st Avenue



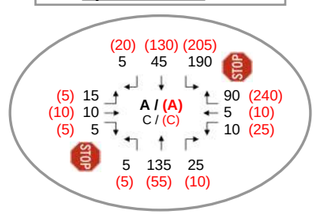
8 Ohlman Street & 8th Avenue



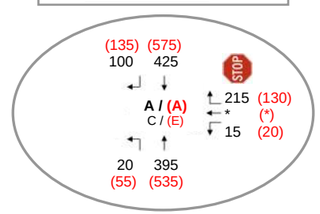
9 Ohlman Street & 23rd Avenue



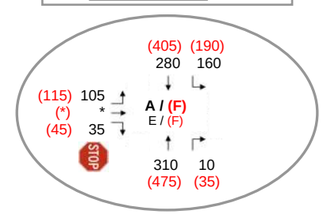
10 Ohlman Street & Spruce Street



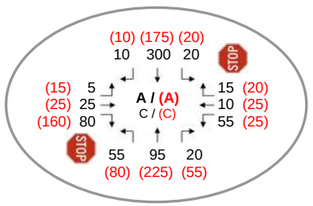
11 SD37 / Ohlman Street & I-90 WB RTI



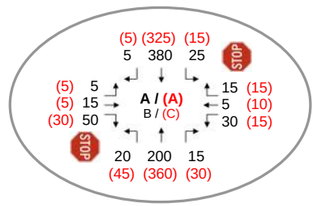
12 SD37 / Ohlman Street & I-90 EB RTI



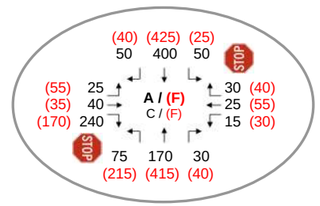
13 SD37 & National Guard Road



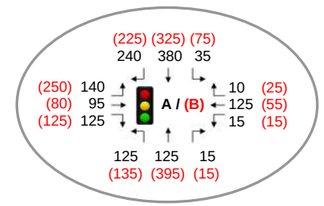
14 SD37 & Harmon Drive



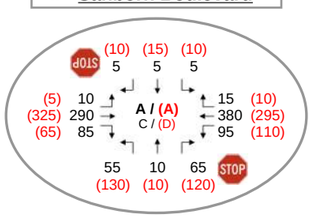
15 SD37 & 23rd Avenue



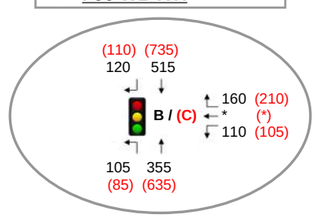
16 SD37 & Main Street



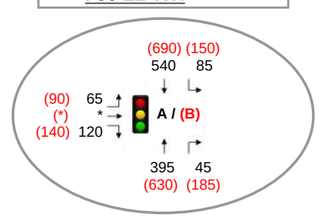
17 SD37 & Sanborn Boulevard



18 SD37 / Burr Street & I-90 WB RTI



19 SD37 / Burr Street & I-90 EB RTI



2032 NO-BUILD PEAK HOUR TRAFFIC VOLUMES AND LOS

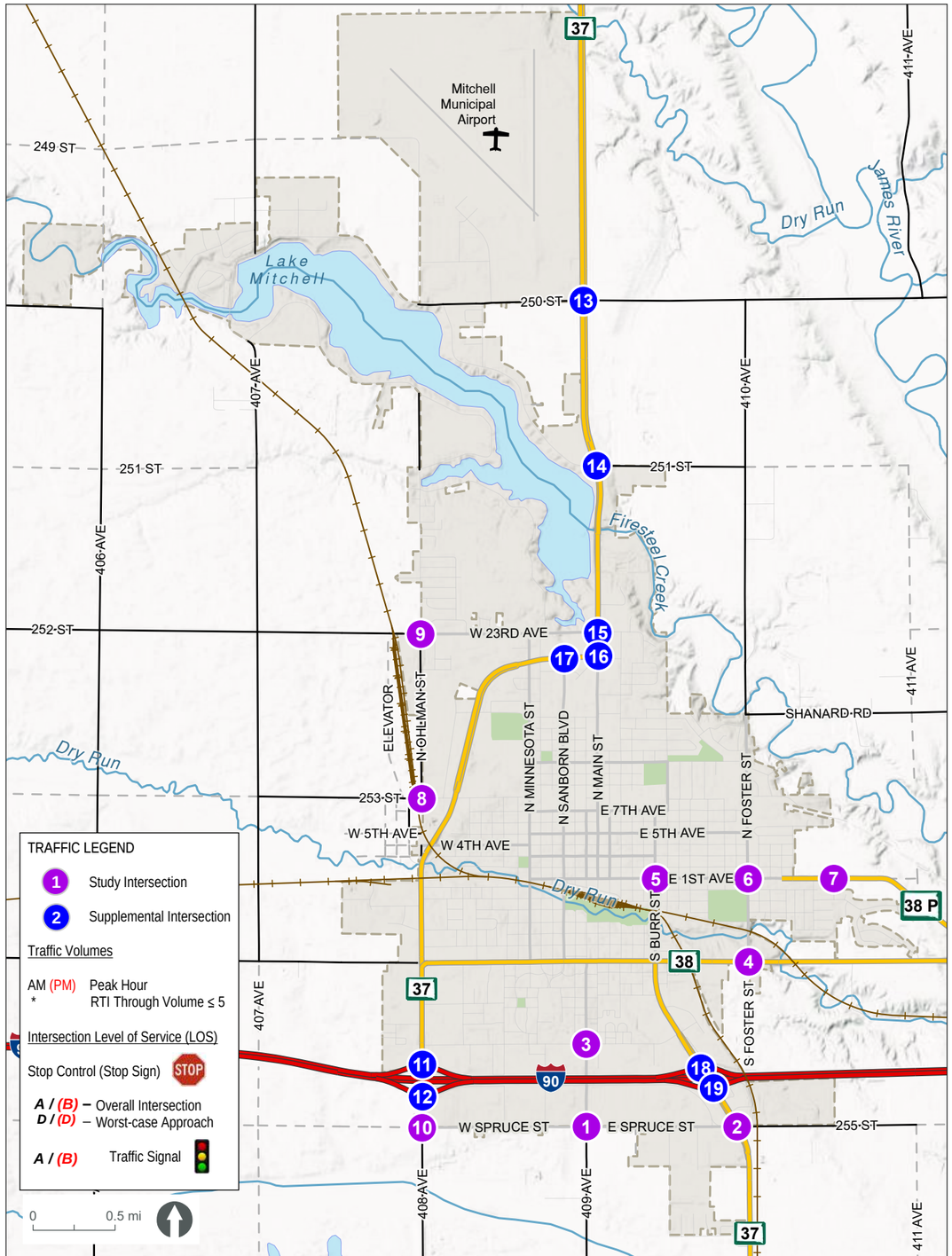
2045 No-Build Condition Analysis

2045 No-Build condition operational results are summarized in **Table 5** and depicted in **Figure 5**.

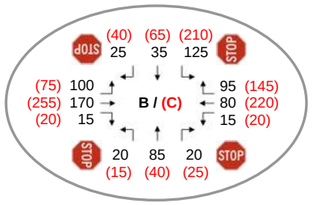
Table 5: Intersection Operations – 2045 No-Build Conditions

Ref #	Intersection	Control	Measure	AM LOS	PM LOS
1	Rowley Street / Spruce Street	AWSC	Overall:	11.0 / B	20.5 / C
2	SD37 (Burr Street) / Spruce Street	Signal	Overall:	20.1 / C	19.9 / B
3	Rowley Street / Norway Avenue	AWSC	Overall:	17.1 / C	**43.7 / E***
4	SD38 (Havens Avenue) / Foster Street	TWSC	Overall: (WCSC):	8.3 / A (25.2 / D)	7.9 / A (38.3 / E)
5	Burr Street / 1st Avenue	Signal	Overall:	12.4 / B	12.7 / B
6	Foster Street / 1st Avenue	TWSC	Overall: (WCSC):	11.9 / B (23.1 / C)	16.2 / C (30.2 / D)
7	Mattie Street / 1st Avenue	TWSC	Overall: (WCSC):	5.8 / A (10.7 / B)	5.7 / A (11.6 / B)
8	Ohlman Street / 8th Avenue	TWSC	Overall: (WCSC):	9.4 / A (18.2 / C)	12.3 / B (26.3 / D)
9	Ohlman Street / 23rd Avenue	TWSC	Overall: (WCSC):	**107.5 / F*** **(257.9 / F)**	**162.5 / F*** **(617.9 / F)**
10	Ohlman Street / Spruce Street	TWSC	Overall: (WCSC):	7.1 / A (25.6 / D)	8.6 / A (29.4 / D)
11	SD37 (Ohlman Street) / I-90 WB RTI (Exit 330)	TWSC	Overall: (WCSC):	0.6 / A (29.0 / D)	1.8 / A **(88.6 / F)**
12	SD37 (Ohlman Street) / I-90 EB RTI (Exit 330)	TWSC	Overall: (WCSC):	**46.9 / E*** **(292.8 / F)**	**186.4 / F*** **(1478.3 / F)**
13	SD37 / National Guard Road	TWSC	Overall: (WCSC):	6.8 / A (24.4 / C)	7.4 / A (29.9 / D)
14	SD37 / Harmon Drive	TWSC	Overall: (WCSC):	3.8 / A (21.4 / C)	2.9 / A (26.7 / D)
15	SD37 / 23rd Avenue	TWSC	Overall: (WCSC):	13.3 / B **(60.5 / F)**	**- / F*** **(- / F)**
16	SD37 (Main Street) / SD37	Signal	Overall:	12.6 / B	15.3 / B
17	SD37 / Sanborn Boulevard	TWSC	Overall: (WCSC):	6.3 / A (35.0 / E)	**38.2 / E*** **(153.4 / F)**
18	SD37 (Burr Street) / I-90 WB RTI (Exit 332)	Signal	Overall:	16.6 / B	22.1 / C
19	SD37 (Burr Street) / I-90 EB RTI (Exit 332)	Signal	Overall:	10.4 / B	18.6 / B

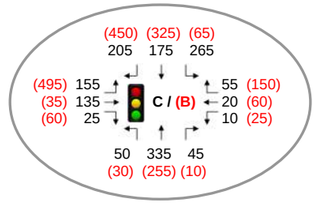
* Individual movement(s) with volume to capacity ratio(s) nearing or exceeding 1.0.



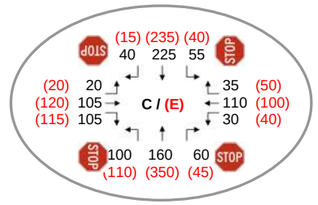
1 Rowley Street & Spruce Street



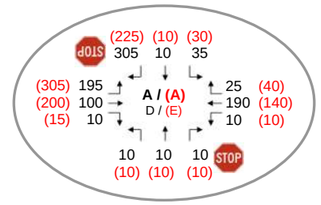
2 SD37 / Burr Street & Spruce Street



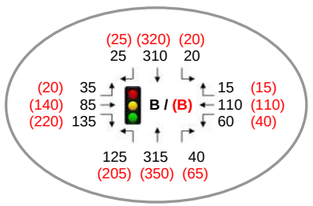
3 Rowley Street & Norway Avenue



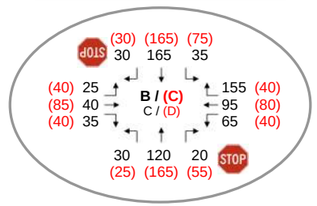
4 SD38 / Havens Ave & Foster Street



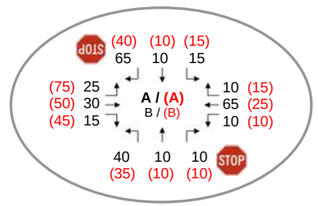
5 Burr Street & 1st Avenue



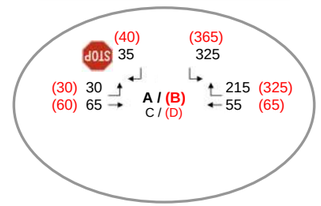
6 Foster Street & 1st Avenue



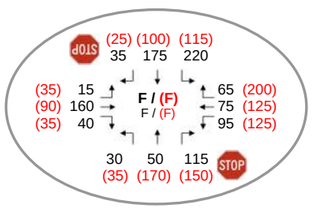
7 Mattie Street & 1st Avenue



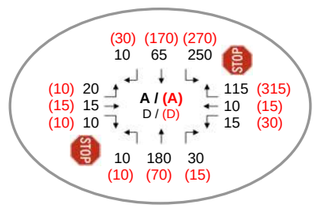
8 Ohlman Street & 8th Avenue



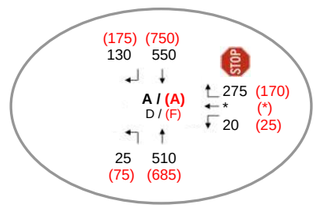
9 Ohlman Street & 23rd Avenue



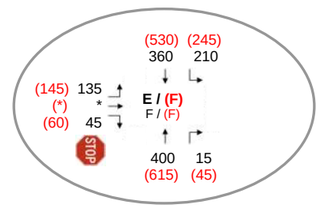
10 Ohlman Street & Spruce Street



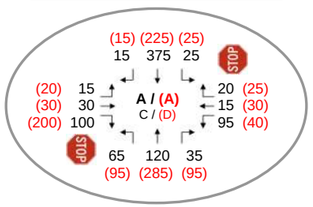
11 SD37 / Ohlman Street & I-90 WB RTI



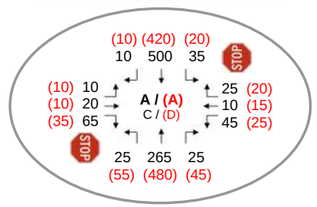
12 SD37 / Ohlman Street & I-90 EB RTI



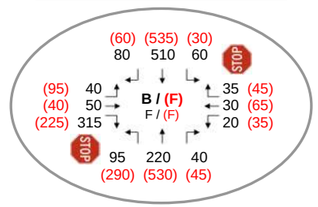
13 SD37 & National Guard Road



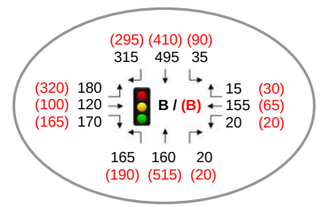
14 SD37 & Harmon Drive



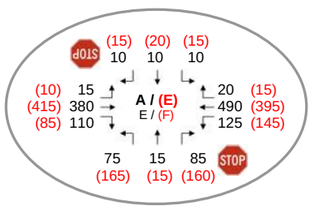
15 SD37 & 23rd Avenue



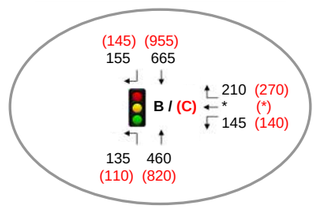
16 SD37 & Main Street



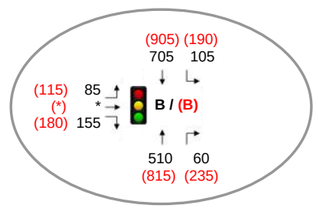
17 SD37 & Sanborn Boulevard



18 SD37 / Burr Street & I-90 WB RTI



19 SD37 / Burr Street & I-90 EB RTI



2045 NO-BUILD PEAK HOUR TRAFFIC VOLUMES AND LOS

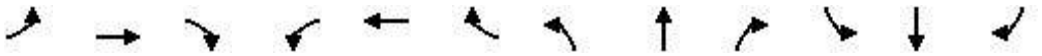
Appendix

Appendix A: Synchro 11 Output (2022 Existing Conditions)

Appendix B: Synchro 11 Output (2032 No-Build Conditions)

Appendix C: Synchro 11 Output (2045 No-Build Conditions)

Appendix A: Synchro 11 Output (2022 Existing Conditions)



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	60	100	5	5	50	55	10	50	10	75	25	15
Future Volume (vph)	60	100	5	5	50	55	10	50	10	75	25	15
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	170		0	170		0	0		0	0		0
Storage Lanes	1		0	1		0	0		0	0		0
Taper Length (ft)	75			75			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		0.993			0.921			0.980			0.983	
Flt Protected	0.950			0.950				0.993			0.968	
Satd. Flow (prot)	1710	1706	0	1500	1586	0	0	1682	0	0	1662	0
Flt Permitted	0.950			0.950				0.993			0.968	
Satd. Flow (perm)	1710	1706	0	1500	1586	0	0	1682	0	0	1662	0
Link Speed (mph)		35			35			35			35	
Link Distance (ft)		1332			1574			793			857	
Travel Time (s)		25.9			30.7			15.4			16.7	
Peak Hour Factor	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78
Heavy Vehicles (%)	0%	5%	0%	14%	4%	5%	0%	4%	9%	0%	14%	0%
Adj. Flow (vph)	77	128	6	6	64	71	13	64	13	96	32	19
Shared Lane Traffic (%)												
Lane Group Flow (vph)	77	134	0	6	135	0	0	90	0	0	147	0
Sign Control		Stop			Stop			Stop			Stop	

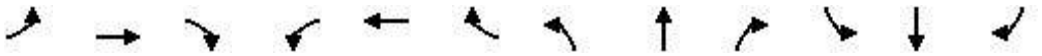
Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 30.2%		ICU Level of Service A	
Analysis Period (min) 15			

Intersection	
Intersection Delay, s/veh	9.1
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	60	100	5	5	50	55	10	50	10	75	25	15
Future Vol, veh/h	60	100	5	5	50	55	10	50	10	75	25	15
Peak Hour Factor	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78
Heavy Vehicles, %	0	5	0	14	4	5	0	4	9	0	14	0
Mvmt Flow	77	128	6	6	64	71	13	64	13	96	32	19
Number of Lanes	1	1	0	1	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	2	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	2	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	2	2
HCM Control Delay	9.3	8.9	8.7	9.3
HCM LOS	A	A	A	A

Lane	NBLn1	EBLn1	EBLn2	WBLn1	WBLn2	SBLn1
Vol Left, %	14%	100%	0%	100%	0%	65%
Vol Thru, %	71%	0%	95%	0%	48%	22%
Vol Right, %	14%	0%	5%	0%	52%	13%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	70	60	105	5	105	115
LT Vol	10	60	0	5	0	75
Through Vol	50	0	100	0	50	25
RT Vol	10	0	5	0	55	15
Lane Flow Rate	90	77	135	6	135	147
Geometry Grp	2	7	7	7	7	2
Degree of Util (X)	0.123	0.122	0.197	0.011	0.188	0.202
Departure Headway (Hd)	4.915	5.728	5.276	6.062	5.017	4.943
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	725	623	677	588	711	722
Service Time	2.972	3.486	3.034	3.822	2.776	2.994
HCM Lane V/C Ratio	0.124	0.124	0.199	0.01	0.19	0.204
HCM Control Delay	8.7	9.3	9.3	8.9	8.9	9.3
HCM Lane LOS	A	A	A	A	A	A
HCM 95th-tile Q	0.4	0.4	0.7	0	0.7	0.8



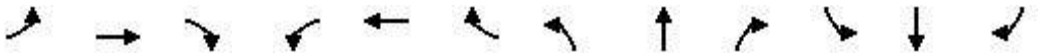
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	105	90	15	1	10	40	35	225	30	180	115	140
Future Volume (vph)	105	90	15	1	10	40	35	225	30	180	115	140
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	285		0	200		125	220		230	155		280
Storage Lanes	1		0	1		0	1		1	1		1
Taper Length (ft)	100			55			55			115		
Lane Util. Factor	0.97	1.00	1.00	1.00	0.95	0.95	1.00	0.95	1.00	1.00	0.95	1.00
Frt		0.979			0.880				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3130	1732	0	1710	2828	0	1710	3196	1443	1676	2948	1500
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3130	1732	0	1710	2828	0	1710	3196	1443	1676	2948	1500
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		11			53				327			227
Link Speed (mph)		35			35			35			35	
Link Distance (ft)		1814			1403			1364			1492	
Travel Time (s)		35.3			27.3			26.6			29.1	
Peak Hour Factor	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
Heavy Vehicles (%)	6%	2%	0%	0%	0%	8%	0%	7%	6%	2%	16%	2%
Adj. Flow (vph)	140	120	20	1	13	53	47	300	40	240	153	187
Shared Lane Traffic (%)												
Lane Group Flow (vph)	140	140	0	1	66	0	47	300	40	240	153	187
Turn Type	Prot	NA		Prot	NA		Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases									2			6
Detector Phase	7	4		3	8		5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	5.0	7.0		5.0	7.0		4.0	12.0	12.0	4.0	12.0	12.0
Minimum Split (s)	10.0	12.5		10.0	12.5		10.5	17.5	17.5	10.5	17.5	17.5
Total Split (s)	10.0	12.5		10.0	12.5		11.5	18.5	18.5	19.0	26.0	26.0
Total Split (%)	16.7%	20.8%		16.7%	20.8%		19.2%	30.8%	30.8%	31.7%	43.3%	43.3%
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0		1.0	1.0		1.5	1.5	1.5	1.5	1.5	1.5
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)	5.0	5.0		5.0	5.0		5.5	5.5	5.5	5.5	5.5	5.5
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	Min		None	Min		None	C-Max	C-Max	None	C-Max	C-Max
Act Effct Green (s)	5.0	13.1		5.0	7.1		6.1	16.6	16.6	12.3	27.3	27.3
Actuated g/C Ratio	0.08	0.22		0.08	0.12		0.10	0.28	0.28	0.20	0.46	0.46
v/c Ratio	0.54	0.36		0.01	0.17		0.27	0.34	0.06	0.70	0.11	0.23
Control Delay	34.6	23.0		25.0	11.5		29.1	20.5	0.2	33.9	12.8	2.3
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	34.6	23.0		25.0	11.5		29.1	20.5	0.2	33.9	12.8	2.3
LOS	C	C		C	B		C	C	A	C	B	A
Approach Delay		28.8			11.7			19.4			18.1	
Approach LOS		C			B			B			B	
Queue Length 50th (ft)	25	36		0	2		16	49	0	78	20	0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 95th (ft)	41	76		4	13		36	66	0	115	31	11
Internal Link Dist (ft)		1734			1323			1284			1412	
Turn Bay Length (ft)	285			200			220		230	155		280
Base Capacity (vph)	260	389		142	399		177	884	635	381	1341	805
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	0.54	0.36		0.01	0.17		0.27	0.34	0.06	0.63	0.11	0.23

Intersection Summary			
Area Type:	Other		
Cycle Length: 60			
Actuated Cycle Length: 60			
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green			
Natural Cycle: 60			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.70			
Intersection Signal Delay: 20.5		Intersection LOS: C	
Intersection Capacity Utilization 43.7%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 2: SD37 (Burr Street) & Spruce Street





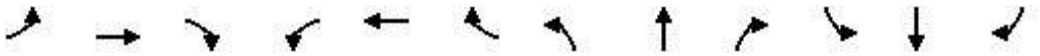
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	105	90	15	1	10	40	35	225	30	180	115	140
Future Volume (veh/h)	105	90	15	1	10	40	35	225	30	180	115	140
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1716	1772	1800	1800	1800	1688	1800	1702	1716	1772	1575	1772
Adj Flow Rate, veh/h	140	120	20	1	13	53	47	300	0	240	153	0
Peak Hour Factor	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
Percent Heavy Veh, %	6	2	0	0	0	8	0	7	6	2	16	2
Cap, veh/h	239	282	47	3	200	178	62	928		289	1263	
Arrive On Green	0.08	0.19	0.19	0.00	0.12	0.12	0.04	0.29	0.00	0.17	0.42	0.00
Sat Flow, veh/h	3170	1481	247	1714	1710	1525	1714	3233	1454	1688	2993	1502
Grp Volume(v), veh/h	140	0	140	1	13	53	47	300	0	240	153	0
Grp Sat Flow(s),veh/h/ln	1585	0	1727	1714	1710	1525	1714	1617	1454	1688	1497	1502
Q Serve(g_s), s	2.6	0.0	4.3	0.0	0.4	1.9	1.6	4.4	0.0	8.2	1.9	0.0
Cycle Q Clear(g_c), s	2.6	0.0	4.3	0.0	0.4	1.9	1.6	4.4	0.0	8.2	1.9	0.0
Prop In Lane	1.00		0.14	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	239	0	329	3	200	178	62	928		289	1263	
V/C Ratio(X)	0.59	0.00	0.43	0.35	0.07	0.30	0.76	0.32		0.83	0.12	
Avail Cap(c_a), veh/h	264	0	329	143	214	191	171	928		380	1263	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.97	0.97	0.00
Uniform Delay (d), s/veh	26.8	0.0	21.4	29.9	23.6	24.3	28.7	16.8	0.0	24.0	10.6	0.0
Incr Delay (d2), s/veh	2.8	0.0	0.9	60.7	0.1	0.9	16.9	0.9	0.0	11.0	0.2	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.0	0.0	1.7	0.1	0.2	0.7	0.9	1.6	0.0	3.9	0.6	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	29.6	0.0	22.3	90.6	23.7	25.2	45.6	17.7	0.0	35.0	10.8	0.0
LnGrp LOS	C	A	C	F	C	C	D	B		D	B	
Approach Vol, veh/h		280			67			347	A		393	A
Approach Delay, s/veh		25.9			25.9			21.5			25.6	
Approach LOS		C			C			C			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	15.8	22.7	5.1	16.4	7.7	30.8	9.5	12.0
Change Period (Y+Rc), s	5.5	5.5	5.0	5.0	5.5	5.5	5.0	5.0
Max Green Setting (Gmax), s	13.5	13.0	5.0	7.5	6.0	20.5	5.0	7.5
Max Q Clear Time (g_c+I1), s	10.2	6.4	2.0	6.3	3.6	3.9	4.6	3.9
Green Ext Time (p_c), s	0.2	0.9	0.0	0.1	0.0	0.7	0.0	0.1

Intersection Summary	
HCM 6th Ctrl Delay	24.4
HCM 6th LOS	C

Notes

Unsignalized Delay for [NBR, SBR] is excluded from calculations of the approach delay and intersection delay.



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	65	65	20	70	25	60	95	35	35	135	25
Future Volume (vph)	10	65	65	20	70	25	60	95	35	35	135	25
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
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		0.937			0.970			0.975			0.983	
Flt Protected		0.996			0.991			0.985			0.991	
Satd. Flow (prot)	0	1664	0	0	1695	0	0	1684	0	0	1683	0
Flt Permitted		0.996			0.991			0.985			0.991	
Satd. Flow (perm)	0	1664	0	0	1695	0	0	1684	0	0	1683	0
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		1160			1174			641			590	
Travel Time (s)		31.6			32.0			17.5			16.1	
Peak Hour Factor	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72
Heavy Vehicles (%)	0%	0%	2%	5%	2%	0%	2%	4%	0%	13%	1%	9%
Adj. Flow (vph)	14	90	90	28	97	35	83	132	49	49	188	35
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	194	0	0	160	0	0	264	0	0	272	0
Sign Control		Stop			Stop			Stop			Stop	

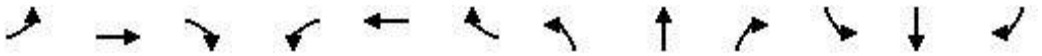
Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 37.6%		ICU Level of Service A	
Analysis Period (min) 15			

Intersection	
Intersection Delay, s/veh	11.5
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	10	65	65	20	70	25	60	95	35	35	135	25
Future Vol, veh/h	10	65	65	20	70	25	60	95	35	35	135	25
Peak Hour Factor	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72
Heavy Vehicles, %	0	0	2	5	2	0	2	4	0	13	1	9
Mvmt Flow	14	90	90	28	97	35	83	132	49	49	188	35
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	10.6	10.7	11.8	12.4
HCM LOS	B	B	B	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	32%	7%	17%	18%
Vol Thru, %	50%	46%	61%	69%
Vol Right, %	18%	46%	22%	13%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	190	140	115	195
LT Vol	60	10	20	35
Through Vol	95	65	70	135
RT Vol	35	65	25	25
Lane Flow Rate	264	194	160	271
Geometry Grp	1	1	1	1
Degree of Util (X)	0.39	0.291	0.252	0.414
Departure Headway (Hd)	5.327	5.384	5.691	5.497
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	673	665	629	653
Service Time	3.372	3.433	3.743	3.541
HCM Lane V/C Ratio	0.392	0.292	0.254	0.415
HCM Control Delay	11.8	10.6	10.7	12.4
HCM Lane LOS	B	B	B	B
HCM 95th-tile Q	1.9	1.2	1	2



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	125	70	1	1	125	15	1	1	1	25	1	195
Future Volume (vph)	125	70	1	1	125	15	1	1	1	25	1	195
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	0		0	0		0	0		0	100		0
Storage Lanes	0		0	0		0	0		0	1		0
Taper Length (ft)	25			25			25			60		
Lane Util. Factor	0.95	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.999			0.985			0.955			0.851	
Flt Protected		0.969						0.984		0.950		
Satd. Flow (prot)	0	3099	0	0	1649	0	0	1691	0	1710	1487	0
Flt Permitted		0.969						0.984		0.950		
Satd. Flow (perm)	0	3099	0	0	1649	0	0	1691	0	1710	1487	0
Link Speed (mph)		45			45			25			25	
Link Distance (ft)		2581			2852			1867			1496	
Travel Time (s)		39.1			43.2			50.9			40.8	
Peak Hour Factor	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81
Heavy Vehicles (%)	4%	12%	0%	0%	7%	12%	0%	0%	0%	0%	0%	3%
Adj. Flow (vph)	154	86	1	1	154	19	1	1	1	31	1	241
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	241	0	0	174	0	0	3	0	31	242	0
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 38.1%		ICU Level of Service A	
Analysis Period (min) 15			

Intersection	
Int Delay, s/veh	6.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	125	70	1	1	125	15	1	1	1	25	1	195
Future Vol, veh/h	125	70	1	1	125	15	1	1	1	25	1	195
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
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	81	81	81	81	81	81	81	81	81	81	81	81
Heavy Vehicles, %	4	12	0	0	7	12	0	0	0	0	0	3
Mvmt Flow	154	86	1	1	154	19	1	1	1	31	1	241

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	173	0	0	87	0	0	682	570	44	518	561	164
Stage 1	-	-	-	-	-	-	395	395	-	166	166	-
Stage 2	-	-	-	-	-	-	287	175	-	352	395	-
Critical Hdwy	4.16	-	-	4.1	-	-	7.3	6.5	6.9	7.3	6.5	6.245
Critical Hdwy Stg 1	-	-	-	-	-	-	6.5	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.5	5.5	-
Follow-up Hdwy	2.238	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3285
Pot Cap-1 Maneuver	1389	-	-	1522	-	-	353	434	1023	458	439	877
Stage 1	-	-	-	-	-	-	607	608	-	841	765	-
Stage 2	-	-	-	-	-	-	725	758	-	643	608	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1389	-	-	1522	-	-	232	383	1023	415	387	877
Mov Cap-2 Maneuver	-	-	-	-	-	-	232	383	-	415	387	-
Stage 1	-	-	-	-	-	-	536	537	-	743	764	-
Stage 2	-	-	-	-	-	-	525	757	-	566	537	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	5.1	0.1	14.6	11.1
HCM LOS			B	B

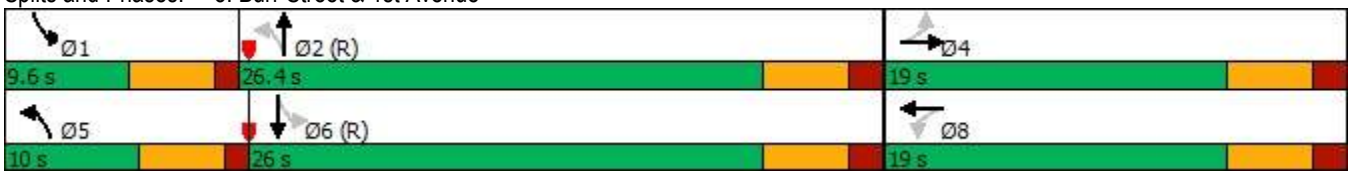
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	380	1389	-	-	1522	-	-	415	871
HCM Lane V/C Ratio	0.01	0.111	-	-	0.001	-	-	0.074	0.278
HCM Control Delay (s)	14.6	7.9	0.1	-	7.4	0	-	14.4	10.7
HCM Lane LOS	B	A	A	-	A	A	-	B	B
HCM 95th %tile Q(veh)	0	0.4	-	-	0	-	-	0.2	1.1

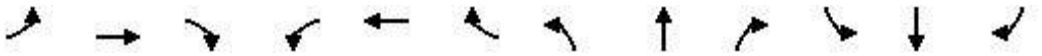
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	25	65	110	50	90	5	100	250	30	10	250	15
Future Volume (vph)	25	65	110	50	90	5	100	250	30	10	250	15
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	0		0	0		0	130		0	60		0
Storage Lanes	0		0	0		0	0		0	1		0
Taper Length (ft)	25			25			25			85		
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		0.926			0.995			0.984			0.991	
Flt Protected		0.994			0.983		0.950			0.950		
Satd. Flow (prot)	0	1657	0	0	1726	0	1693	1729	0	1710	1751	0
Flt Permitted		0.945			0.694		0.413			0.535		
Satd. Flow (perm)	0	1575	0	0	1219	0	736	1729	0	963	1751	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		108			3			13			7	
Link Speed (mph)		25			25			30			25	
Link Distance (ft)		1628			1096			1266			1178	
Travel Time (s)		44.4			29.9			28.8			32.1	
Peak Hour Factor	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73
Heavy Vehicles (%)	0%	0%	0%	4%	1%	0%	1%	2%	6%	0%	2%	0%
Adj. Flow (vph)	34	89	151	68	123	7	137	342	41	14	342	21
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	274	0	0	198	0	137	383	0	14	363	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		pm+pt	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		5	2		1	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0		4.0	8.0		4.0	8.0	
Minimum Split (s)	11.0	11.0		11.0	11.0		9.5	13.0		9.5	13.0	
Total Split (s)	19.0	19.0		19.0	19.0		10.0	26.4		9.6	26.0	
Total Split (%)	34.5%	34.5%		34.5%	34.5%		18.2%	48.0%		17.5%	47.3%	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.5	1.5		1.5	1.5		1.0	1.5		1.0	1.5	
Lost Time Adjust (s)		0.0			0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)		5.0			5.0		4.5	5.0		4.5	5.0	
Lead/Lag							Lead	Lag		Lead	Lag	
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	
Recall Mode	None	None		None	None		None	C-Max		None	C-Max	
Act Effct Green (s)		11.9			11.9		32.8	31.2		29.5	24.8	
Actuated g/C Ratio		0.22			0.22		0.60	0.57		0.54	0.45	
v/c Ratio		0.65			0.75		0.25	0.39		0.02	0.46	
Control Delay		18.9			38.3		6.5	9.6		5.4	14.5	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		18.9			38.3		6.5	9.6		5.4	14.5	
LOS		B			D		A	A		A	B	
Approach Delay		18.9			38.3			8.8			14.1	
Approach LOS		B			D			A			B	
Queue Length 50th (ft)		46			58		17	56		2	87	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 95th (ft)		74			88		30	119		6	116	
Internal Link Dist (ft)		1548			1016			1186			1098	
Turn Bay Length (ft)							130			60		
Base Capacity (vph)		481			312		541	987		589	791	
Starvation Cap Reductn		0			0		0	0		0	0	
Spillback Cap Reductn		0			0		0	0		0	0	
Storage Cap Reductn		0			0		0	0		0	0	
Reduced v/c Ratio		0.57			0.63		0.25	0.39		0.02	0.46	

Intersection Summary			
Area Type:	Other		
Cycle Length: 55			
Actuated Cycle Length: 55			
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green			
Natural Cycle: 55			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.75			
Intersection Signal Delay: 16.6		Intersection LOS: B	
Intersection Capacity Utilization 50.6%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 5: Burr Street & 1st Avenue





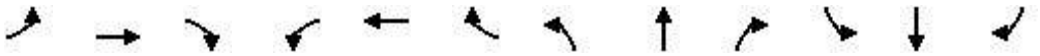
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	25	65	110	50	90	5	100	250	30	10	250	15
Future Volume (veh/h)	25	65	110	50	90	5	100	250	30	10	250	15
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1800	1800	1800	1744	1786	1800	1786	1772	1716	1800	1772	1800
Adj Flow Rate, veh/h	34	89	0	68	123	7	137	342	41	14	342	21
Peak Hour Factor	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73
Percent Heavy Veh, %	0	0	0	4	1	0	1	2	6	0	2	0
Cap, veh/h	133	223		160	179	9	639	878	105	605	851	52
Arrive On Green	0.16	0.16	0.00	0.16	0.16	0.16	0.06	0.57	0.57	0.01	0.51	0.51
Sat Flow, veh/h	315	1425	0	457	1139	59	1701	1552	186	1714	1652	101
Grp Volume(v), veh/h	123	0	0	198	0	0	137	0	383	14	0	363
Grp Sat Flow(s),veh/h/ln	1739	0	0	1655	0	0	1701	0	1738	1714	0	1754
Q Serve(g_s), s	0.0	0.0	0.0	2.8	0.0	0.0	2.0	0.0	6.8	0.2	0.0	7.0
Cycle Q Clear(g_c), s	3.4	0.0	0.0	6.2	0.0	0.0	2.0	0.0	6.8	0.2	0.0	7.0
Prop In Lane	0.28		0.00	0.34		0.04	1.00		0.11	1.00		0.06
Lane Grp Cap(c), veh/h	356	0		347	0	0	639	0	983	605	0	903
V/C Ratio(X)	0.35	0.00		0.57	0.00	0.00	0.21	0.00	0.39	0.02	0.00	0.40
Avail Cap(c_a), veh/h	514	0		502	0	0	700	0	983	740	0	903
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	21.0	0.0	0.0	22.1	0.0	0.0	5.7	0.0	6.7	6.3	0.0	8.2
Incr Delay (d2), s/veh	0.6	0.0	0.0	1.5	0.0	0.0	0.2	0.0	1.2	0.0	0.0	1.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.4	0.0	0.0	2.4	0.0	0.0	0.5	0.0	2.2	0.1	0.0	2.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	21.6	0.0	0.0	23.5	0.0	0.0	5.9	0.0	7.8	6.3	0.0	9.5
LnGrp LOS	C	A		C	A	A	A	A	A	A	A	A
Approach Vol, veh/h		123	A		198			520			377	
Approach Delay, s/veh		21.6			23.5			7.3			9.4	
Approach LOS		C			C			A			A	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	5.3	36.1		13.6	8.0	33.3		13.6				
Change Period (Y+Rc), s	4.5	5.0		5.0	4.5	5.0		5.0				
Max Green Setting (Gmax), s	5.1	21.4		14.0	5.5	21.0		14.0				
Max Q Clear Time (g_c+I1), s	2.2	8.8		5.4	4.0	9.0		8.2				
Green Ext Time (p_c), s	0.0	1.9		0.4	0.0	1.8		0.5				

Intersection Summary		
HCM 6th Ctrl Delay	12.0	
HCM 6th LOS	B	

Notes

Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	15	20	25	35	55	110	20	95	5	20	135	20
Future Volume (vph)	15	20	25	35	55	110	20	95	5	20	135	20
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
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		0.944			0.926			0.995			0.984	
Flt Protected		0.988			0.991			0.992			0.994	
Satd. Flow (prot)	0	1650	0	0	1625	0	0	1724	0	0	1729	0
Flt Permitted		0.988			0.991			0.992			0.994	
Satd. Flow (perm)	0	1650	0	0	1625	0	0	1724	0	0	1729	0
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		1313			1117			1098			1099	
Travel Time (s)		35.8			30.5			29.9			30.0	
Peak Hour Factor	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78
Heavy Vehicles (%)	7%	0%	0%	3%	4%	0%	0%	3%	17%	0%	1%	9%
Adj. Flow (vph)	19	26	32	45	71	141	26	122	6	26	173	26
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	77	0	0	257	0	0	154	0	0	225	0
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 33.5%		ICU Level of Service A	
Analysis Period (min) 15			

Intersection	
Int Delay, s/veh	8.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	15	20	25	35	55	110	20	95	5	20	135	20
Future Vol, veh/h	15	20	25	35	55	110	20	95	5	20	135	20
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
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	78	78	78	78	78	78	78	78	78	78	78	78
Heavy Vehicles, %	7	0	0	3	4	0	0	3	17	0	1	9
Mvmt Flow	19	26	32	45	71	141	26	122	6	26	173	26

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	212	0	0	58	0	0	411	382	42	376	328	142
Stage 1	-	-	-	-	-	-	80	80	-	232	232	-
Stage 2	-	-	-	-	-	-	331	302	-	144	96	-
Critical Hdwy	4.17	-	-	4.13	-	-	7.1	6.53	6.37	7.1	6.51	6.29
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.53	-	6.1	5.51	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.53	-	6.1	5.51	-
Follow-up Hdwy	2.263	-	-	2.227	-	-	3.5	4.027	3.453	3.5	4.009	3.381
Pot Cap-1 Maneuver	1329	-	-	1540	-	-	555	549	988	585	592	887
Stage 1	-	-	-	-	-	-	934	826	-	775	714	-
Stage 2	-	-	-	-	-	-	687	662	-	864	817	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1329	-	-	1540	-	-	396	523	988	460	564	887
Mov Cap-2 Maneuver	-	-	-	-	-	-	396	523	-	460	564	-
Stage 1	-	-	-	-	-	-	920	814	-	763	690	-
Stage 2	-	-	-	-	-	-	483	639	-	719	805	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.9	1.3	15.2	15.3
HCM LOS			C	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	506	1329	-	-	1540	-	-	573
HCM Lane V/C Ratio	0.304	0.014	-	-	0.029	-	-	0.392
HCM Control Delay (s)	15.2	7.7	0	-	7.4	0	-	15.3
HCM Lane LOS	C	A	A	-	A	A	-	C
HCM 95th %tile Q(veh)	1.3	0	-	-	0.1	-	-	1.9

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1	20	5	1	55	1	20	1	1	1	1	5
Future Volume (vph)	1	20	5	1	55	1	20	1	1	1	1	5
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
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		0.973			0.998			0.995			0.895	
Flt Protected		0.999			0.999			0.956			0.994	
Satd. Flow (prot)	0	1750	0	0	1795	0	0	1712	0	0	1601	0
Flt Permitted		0.999			0.999			0.956			0.994	
Satd. Flow (perm)	0	1750	0	0	1795	0	0	1712	0	0	1601	0
Link Speed (mph)		40			40			30			30	
Link Distance (ft)		1351			1587			1244			742	
Travel Time (s)		23.0			27.1			28.3			16.9	
Peak Hour Factor	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	1	27	7	1	74	1	27	1	1	1	1	7
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	35	0	0	76	0	0	29	0	0	9	0
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 15.9%		ICU Level of Service A	
Analysis Period (min) 15			

Intersection	
Int Delay, s/veh	2.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	1	20	5	1	55	1	20	1	1	1	1	5
Future Vol, veh/h	1	20	5	1	55	1	20	1	1	1	1	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
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	74	74	74	74	74	74	74	74	74	74	74	74
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	1	27	7	1	74	1	27	1	1	1	1	7

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	75	0	0	34	0	0	114	110	31	111	113	75
Stage 1	-	-	-	-	-	-	33	33	-	77	77	-
Stage 2	-	-	-	-	-	-	81	77	-	34	36	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1537	-	-	1591	-	-	868	784	1049	872	781	992
Stage 1	-	-	-	-	-	-	988	872	-	937	835	-
Stage 2	-	-	-	-	-	-	932	835	-	987	869	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1537	-	-	1591	-	-	859	782	1049	869	779	992
Mov Cap-2 Maneuver	-	-	-	-	-	-	859	782	-	869	779	-
Stage 1	-	-	-	-	-	-	987	871	-	936	834	-
Stage 2	-	-	-	-	-	-	923	834	-	983	868	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.3	0.1	9.3	8.9
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	862	1537	-	-	1591	-	-	936
HCM Lane V/C Ratio	0.034	0.001	-	-	0.001	-	-	0.01
HCM Control Delay (s)	9.3	7.3	0	-	7.3	0	-	8.9
HCM Lane LOS	A	A	A	-	A	A	-	A
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	5	15	10	65	130	10
Future Volume (vph)	5	15	10	65	130	10
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.883		0.991	
Flt Protected		0.988			0.956	
Satd. Flow (prot)	0	1778	1472	0	1634	0
Flt Permitted		0.988			0.956	
Satd. Flow (perm)	0	1778	1472	0	1634	0
Link Speed (mph)		25	25		30	
Link Distance (ft)		1004	963		5313	
Travel Time (s)		27.4	26.3		120.8	
Peak Hour Factor	0.81	0.81	0.81	0.81	0.81	0.81
Heavy Vehicles (%)	0%	0%	8%	8%	4%	9%
Adj. Flow (vph)	6	19	12	80	160	12
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	25	92	0	172	0
Sign Control		Free	Free		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 20.4%		ICU Level of Service A	
Analysis Period (min) 15			

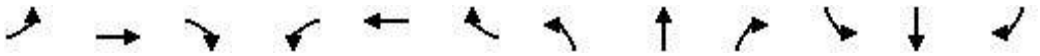
Intersection	
Int Delay, s/veh	6

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	5	15	10	65	130	10
Future Vol, veh/h	5	15	10	65	130	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	81	81	81	81	81	81
Heavy Vehicles, %	0	0	8	8	4	9
Mvmt Flow	6	19	12	80	160	12

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	92	0	-	0	83	52
Stage 1	-	-	-	-	52	-
Stage 2	-	-	-	-	31	-
Critical Hdwy	4.1	-	-	-	6.44	6.29
Critical Hdwy Stg 1	-	-	-	-	5.44	-
Critical Hdwy Stg 2	-	-	-	-	5.44	-
Follow-up Hdwy	2.2	-	-	-	3.536	3.381
Pot Cap-1 Maneuver	1515	-	-	-	914	996
Stage 1	-	-	-	-	965	-
Stage 2	-	-	-	-	986	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1515	-	-	-	910	996
Mov Cap-2 Maneuver	-	-	-	-	910	-
Stage 1	-	-	-	-	961	-
Stage 2	-	-	-	-	986	-

Approach	EB	WB	SB
HCM Control Delay, s	1.8	0	9.8
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1515	-	-	-	916
HCM Lane V/C Ratio	0.004	-	-	-	0.189
HCM Control Delay (s)	7.4	0	-	-	9.8
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.7



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	90	15	10	40	30	10	25	5	110	85	15
Future Volume (vph)	5	90	15	10	40	30	10	25	5	110	85	15
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
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		0.981			0.950			0.982			0.990	
Flt Protected		0.998			0.994			0.988			0.974	
Satd. Flow (prot)	0	1720	0	0	1674	0	0	1746	0	0	1736	0
Flt Permitted		0.998			0.994			0.988			0.974	
Satd. Flow (perm)	0	1720	0	0	1674	0	0	1746	0	0	1736	0
Link Speed (mph)		45			40			30			30	
Link Distance (ft)		807			813			5313			2460	
Travel Time (s)		12.2			13.9			120.8			55.9	
Peak Hour Factor	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76
Heavy Vehicles (%)	0%	3%	0%	0%	3%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	7	118	20	13	53	39	13	33	7	145	112	20
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	145	0	0	105	0	0	53	0	0	277	0
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 33.8%		ICU Level of Service A	
Analysis Period (min) 15			

Intersection	
Int Delay, s/veh	8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	5	90	15	10	40	30	10	25	5	110	85	15
Future Vol, veh/h	5	90	15	10	40	30	10	25	5	110	85	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
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	76	76	76	76	76	76	76	76	76	76	76	76
Heavy Vehicles, %	0	3	0	0	3	0	0	0	0	0	0	0
Mvmt Flow	7	118	20	13	53	39	13	33	7	145	112	20

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	92	0	0	138	0	0	307	260	128	261	251	73
Stage 1	-	-	-	-	-	-	142	142	-	99	99	-
Stage 2	-	-	-	-	-	-	165	118	-	162	152	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1515	-	-	1458	-	-	649	648	927	696	656	995
Stage 1	-	-	-	-	-	-	866	783	-	912	817	-
Stage 2	-	-	-	-	-	-	842	802	-	845	775	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1515	-	-	1458	-	-	546	639	927	657	647	995
Mov Cap-2 Maneuver	-	-	-	-	-	-	546	639	-	657	647	-
Stage 1	-	-	-	-	-	-	862	779	-	907	810	-
Stage 2	-	-	-	-	-	-	705	795	-	800	771	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.3	0.9	11.2	14.1
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	637	1515	-	-	1458	-	-	669
HCM Lane V/C Ratio	0.083	0.004	-	-	0.009	-	-	0.413
HCM Control Delay (s)	11.2	7.4	0	-	7.5	0	-	14.1
HCM Lane LOS	B	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	0.3	0	-	-	0	-	-	2

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	5	1	5	1	70	1	110	20	150	40	1
Future Volume (vph)	10	5	1	5	1	70	1	110	20	150	40	1
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	0		0	80		0	50		0	80		0
Storage Lanes	0		0	1		0	1		0	1		0
Taper Length (ft)	25			40			60			60		
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		0.994			0.852			0.977			0.997	
Flt Protected		0.969		0.950			0.950			0.950		
Satd. Flow (prot)	0	1650	0	1710	1448	0	1710	1583	0	1660	1476	0
Flt Permitted		0.969		0.950			0.950			0.950		
Satd. Flow (perm)	0	1650	0	1710	1448	0	1710	1583	0	1660	1476	0
Link Speed (mph)		25			35			45			45	
Link Distance (ft)		2694			2873			1930			987	
Travel Time (s)		73.5			56.0			29.2			15.0	
Peak Hour Factor	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74
Heavy Vehicles (%)	8%	0%	0%	0%	0%	6%	0%	12%	6%	3%	22%	0%
Adj. Flow (vph)	14	7	1	7	1	95	1	149	27	203	54	1
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	22	0	7	96	0	1	176	0	203	55	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 33.8%		ICU Level of Service A	
Analysis Period (min) 15			

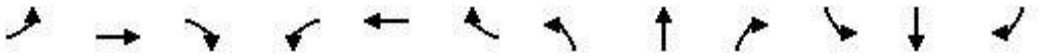
Intersection	
Int Delay, s/veh	5.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	10	5	1	5	1	70	1	110	20	150	40	1
Future Vol, veh/h	10	5	1	5	1	70	1	110	20	150	40	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	80	-	-	50	-	-	80	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	74	74	74	74	74	74	74	74	74	74	74	74
Heavy Vehicles, %	8	0	0	0	0	6	0	12	6	3	22	0
Mvmt Flow	14	7	1	7	1	95	1	149	27	203	54	1

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	674	639	55	630	626	163	55	0	0	176	0	0
Stage 1	461	461	-	165	165	-	-	-	-	-	-	-
Stage 2	213	178	-	465	461	-	-	-	-	-	-	-
Critical Hdwy	7.18	6.5	6.2	7.1	6.5	6.26	4.1	-	-	4.13	-	-
Critical Hdwy Stg 1	6.18	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.18	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.572	4	3.3	3.5	4	3.354	2.2	-	-	2.227	-	-
Pot Cap-1 Maneuver	360	397	1018	397	403	871	1563	-	-	1394	-	-
Stage 1	569	569	-	842	766	-	-	-	-	-	-	-
Stage 2	776	756	-	581	569	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	284	339	1018	347	344	871	1563	-	-	1394	-	-
Mov Cap-2 Maneuver	284	339	-	347	344	-	-	-	-	-	-	-
Stage 1	568	486	-	841	765	-	-	-	-	-	-	-
Stage 2	690	755	-	489	486	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	17.3	10.2	0.1	6.3
HCM LOS	C	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	1563	-	-	314	347	853	1394	-	-
HCM Lane V/C Ratio	0.001	-	-	0.069	0.019	0.112	0.145	-	-
HCM Control Delay (s)	7.3	-	-	17.3	15.6	9.8	8	-	-
HCM Lane LOS	A	-	-	C	C	A	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.2	0.1	0.4	0.5	-	-



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	10	0	175	15	320	0	0	350	80
Future Volume (vph)	0	0	0	10	0	175	15	320	0	0	350	80
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	0		0	0		150	80		0	0		0
Storage Lanes	0		0	0		1	1		0	0		1
Taper Length (ft)	25			25			60			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
Flt Protected					0.950		0.950					
Satd. Flow (prot)	0	0	0	0	1710	1404	1598	1748	0	0	1667	1366
Flt Permitted					0.950		0.950					
Satd. Flow (perm)	0	0	0	0	1710	1404	1598	1748	0	0	1667	1366
Link Speed (mph)		50			50			45			45	
Link Distance (ft)		1104			1070			1072			1043	
Travel Time (s)		15.1			14.6			16.2			15.8	
Peak Hour Factor	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73
Heavy Vehicles (%)	0%	0%	0%	0%	0%	9%	7%	3%	0%	0%	8%	12%
Adj. Flow (vph)	0	0	0	14	0	240	21	438	0	0	479	110
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	14	240	21	438	0	0	479	110
Sign Control		Free			Stop			Free			Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 35.9%		ICU Level of Service A	
Analysis Period (min) 15			

Intersection	
Int Delay, s/veh	0.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	10	0	175	15	320	0	0	350	80
Future Vol, veh/h	0	0	0	10	0	175	15	320	0	0	350	80
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	Free	-	-	None	-	-	None
Storage Length	-	-	-	-	-	150	80	-	-	-	-	0
Veh in Median Storage, #	-	1	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	73	73	73	73	73	73	73	73	73	73	73	73
Heavy Vehicles, %	0	0	0	0	0	9	7	3	0	0	8	12
Mvmt Flow	0	0	0	14	0	240	21	438	0	0	479	110

Major/Minor	Minor1			Major1			Major2		
Conflicting Flow All	1014	1069	-	589	0	-	-	-	0
Stage 1	480	480	-	-	-	-	-	-	-
Stage 2	534	589	-	-	-	-	-	-	-
Critical Hdwy	6.4	6.5	-	4.17	-	-	-	-	-
Critical Hdwy Stg 1	5.4	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.4	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	-	2.263	-	-	-	-	-
Pot Cap-1 Maneuver	267	223	0	962	-	0	0	-	-
Stage 1	627	558	0	-	-	0	0	-	-
Stage 2	592	499	0	-	-	0	0	-	-
Platoon blocked, %					-			-	-
Mov Cap-1 Maneuver	261	0	-	962	-	-	-	-	-
Mov Cap-2 Maneuver	261	0	-	-	-	-	-	-	-
Stage 1	613	0	-	-	-	-	-	-	-
Stage 2	592	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	19.6	0.4	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	WBLn1	WBLn2	SBT	SBR
Capacity (veh/h)	962	-	261	-	-	-
HCM Lane V/C Ratio	0.021	-	0.052	-	-	-
HCM Control Delay (s)	8.8	-	19.6	0	-	-
HCM Lane LOS	A	-	C	A	-	-
HCM 95th %tile Q(veh)	0.1	-	0.2	-	-	-

HCS7 Two-Way Stop-Control Text Report

TWO-WAY STOP CONTROL (TWSC) Analysis

File Name:	2022EC_AM_SD37_I-90 EB RTI.xtw
Analyst:	HDR
Agency:	HDR
Date Performed:	11/1/2021
Time Analyzed:	2022 EC - AM Peak
Jurisdiction:	SDDOT
Analysis Year:	2022
Project Description:	Mitchell MTP
Units:	U.S. Customary
Intersection Name:	SD37 & I-90 EB RTI
Major Street Direction:	North-South
East/West Street Name:	I-90 EB RTI
North/South Street Name:	SD37 / Ohlman Street
Analysis Time Period (hrs):	0.25

Vehicle Volumes and Adjustments

Major Street:									
Approach		NorthBound				SouthBound			
Movement	1U	1	2	3	4U	4	5	6	
	U	L	T	R	U	L	T	R	
Volume			250	5		130	230		
Peak Hour Factor, PHF					0.70				
Hourly Flow Rtae, HFR			357	7		186	329		
Percent Heavy Vehicles						16			
Number of Lanes	0	0	1	0	0	1	1	0	
Lane Configuration				TR		L	T		
Median Type					Undivided				
Median Storage									
RT channelized?									
Left-Turn Lane Storage									
Upstream Signal?					Not Present				

Minor Street:							
Approach	WestBound				EastBound		
Movement	7	8	9		10	11	12
	L	T	R		L	T	R
Volume					85	0	30
Peak Hour Factor, PHF				0.70			
Hourly Flow Rtae, HFR					121	0	43
Percent Heavy Vehicles					3	0	0
Number of Lanes	0	0	0		0	1	0
Lane Configuration						LTR	
RT channelized?							
Flared Approach | Storage		|		No	|	
Percent Grade						0	

Pedestrian Volumes and Adjustments

Approach	NB	SB	WB	EB
Movement	13	14	15	16
Flow (ped/hr)	0	0		0
Lane Width (ft)				
Walking Speed (ft/sec)				
Pedestrian Blockage Factor, f_pb				

Delay, Queue Length, and Level of Service

Approach	NB		SB		WestBound			EastBound		
Movement	1U	1	4U	4	7	8	9	10	11	12
Lane Configuration				L					LTR	
Flow Rate				186					164	
Lane Capacity				1121					218	
v/c				0.17					0.75	
95% Queue Length				0.6					5.2	
Control Delay				8.8					59.0	
LOS				A					F	
Approach Delay				3.2					59.0	
Approach LOS									F	
Intersction Delay	10.9									

Step 1: MOVEMENT PRIORITIES

Major Street:									
Approach		NorthBound				SouthBound			
Priority	1U	1	2	3	4U	4	5	6	
Movement	U	L	T	R	U	L	T	R	
Minor Street:									

Approach	WestBound			EastBound		
Priority	7	8	9	10	11	12
Movement	L	T	R	L	T	R

Step 2: MOVEMENT DEMAND VOLUMES AND FLOW RATES

Major Street:

Approach	NorthBound				SouthBound			
Movement	1U	1	2	3	4U	4	5	6
	U	L	T	R	U	L	T	R
Volume, V_x			250	5		130	230	
Flow Rate, v_x			357	7		186	329	

Minor Street:

Approach	WestBound			EastBound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume, V_x				85	0	30
Flow Rate, v_x				121	0	43

Step 3: CONFLICTING FLOW RATES

Major Street:

Approach	NorthBound				SouthBound			
Movement	1U	1	2	3	4U	4	5	6
	U	L	T	R	U	L	T	R
Flow Rate, v_x			357	7		186	329	
Conflicting Flow, v_c,x						364		

Minor Street:

Approach	WestBound			EastBound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Flow Rate, v_x				121	0	43
Conflicting Flow, v_c,x				1061	1064	329

Step 4: CRITICAL HEADWAYS and FOLLOW-UP HEADWAYS

CRITICAL HEADWAYS

Approach	NB		SB		WestBound			EastBound		
Movement	1U	1	4U	4	7	8	9	10	11	12
	U	L	U	L	L	T	R	L	T	R
t_c,base										
Single Stage				4.1				7.1	6.5	6.2
Stage I										
Stage II										
t_c,HV				1.0				1.0	1.0	1.0
P_HV				0.16				0.03	0.00	0.00
t_c,G								0.2	0.2	0.1
G								0	0	0
t_3,LT				0.0				0.0	0.0	0.0
t_c										
Single Stage				4.26				7.13	6.50	6.20
Stage I										
Stage II										

FOLLOW-UP HEADWAYS

Approach	NB		SB		WestBound			EastBound		
Movement	1U	1	4U	4	7	8	9	10	11	12
	U	L	U	L	L	T	R	L	T	R
t_f,base				2.2				3.5	4.0	3.3
t_f,HV				0.9				0.9	0.9	0.9
P_HV				0.16				0.03	0.00	0.00
t_f				2.34				3.53	4.00	3.30

Step 5: POTENTIAL CAPACITIES

NO UPSTREAM SIGNAL EFFECTS PRESENT

Approach	NB		SB		WestBound			EastBound		
Movement	1U	1	4U	4	7	8	9	10	11	12
	U	L	U	L	L	T	R	L	T	R
v_c,x				364				1061	1064	329
t_c,x				4.26				7.13	6.50	6.20
t_f,x				2.34				3.53	4.00	3.30
c_p,x				1121				201	225	717

Steps 6 - 9: MOVEMENT CAPACITIES

Pedestrian Impedance				
Approach	NB	SB	WB	EB

Movement	13	14	15	16
Pedestrian Flow Rate v_x	0	0		0
Lane Width, w				
Walking Speed, S_p				
Pedestrian Blockage Factor, f_pb				

Major-Street Left-Turn Movements	1	4
Conflicting Flow, v_c,x		364
Potential Capacity, c_p,x		1121
Pedestrian Impedance Factor, p_p,x		1.000
Movement Capacity, c_m,x		1121
Probability of Queue-free State, p_0,j		0.834
Major L-Shared Probability Queue-free State, p*_0,j		1.000

Minor-Street Right-Turn Movements	9	12
Conflicting Flow, v_c,x		329
Potential Capacity, c_p,x		717
Pedestrian Impedance Factor, p_p,x		1.000
Movement Capacity, c_m,x		717
Probability of Queue-free State, p_0,j		0.940

Major-Street U-Turn Movements	1U	4U
Conflicting Flow, v_c,x		
Potential Capacity, c_p,x		
Capacity Adjustment Factor, f_x		
Movement Capacity, c_m,x		
Shared L/U Capacity, c_SH		
Probability of Queue-free State, p_0,j		

Minor-Street Through Movements	8	11
Conflicting Flow, v_c,x		1064
Potential Capacity, c_p,x		225
Pedestrian Impedance Factor, p_p,x		1.000
Capacity Adjustment Factor, f_x		0.834
Movement Capacity, c_m,x		187
Probability of Queue-free State, p_0,j		1.000

Minor-Street Left-Turn Movements	7	10
Conflicting Flow, v_c,x		1061
Potential Capacity, c_p,x		201
Pedestrian Impedance Factor, p_p,x		1.000
Major L, Minor T Adjusted Impedance Factor, p"		0.834
Major L, Minor T Impedance Factor, p'		0.873
Capacity Adjustment Factor, f_x		0.873
Movement Capacity, c_m,x		175

Step 10: FINAL CAPACITY ADJUSTMENTS

SHARED-LANE CAPACITY OF MINOR STREET APPROACHES

Approach	WestBound			EastBound		
Movement	7	8	9	10	11	12
Lane Configuration					LTR	
Shared Flow Rate, v_y					164	
Movement Capacity, c_m,x				175	187	717
Shared Capacity, c_SH					218	

Step 11: CONTROL DELAY

CONTROL DELAY TO RANK 2 THROUGH 4 MOVEMENTS

Approach	NB			SB		WestBound		EastBound		
Movement	1U	1	4U	4	7	8	9	10	11	12
Flow Rate				186				121	0	43
Movement Capacity				1121				175	187	717
Lane Configuration				L					LTR	
Shared Capacity									218	
Control Delay				8.8					59.0	

Steps 12 - 13: APPROACH/INTERSECTION CONTROL DELAY and 95% QUEUE LENGTHS

Approach	NB			SB		WestBound		EastBound		
Movement	1U	1	4U	4	7	8	9	10	11	12
Lane Configuration				L					LTR	
Flow Rate				186					164	
Lane Capacity				1121					218	
v/c				0.17					0.75	
95% Queue Length				0.6					5.2	
Control Delay				8.8					59.0	

LOS		A	F
Approach Delay		3.2	59.0
Approach LOS			F
Intersction Delay	10.9		

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	2	20	65	15	5	10	40	75	5	15	245	5
Future Volume (vph)	2	20	65	15	5	10	40	75	5	15	245	5
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	0		0	0		0	150		0	0		0
Storage Lanes	0		0	0		0	1		0	0		0
Taper Length (ft)	25			25			105			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	0.95	0.95
Frt		0.899			0.955			0.991			0.997	
Flt Protected		0.999			0.976		0.950				0.997	
Satd. Flow (prot)	0	1585	0	0	1645	0	1676	3323	0	0	3333	0
Flt Permitted		0.999			0.976		0.950				0.997	
Satd. Flow (perm)	0	1585	0	0	1645	0	1676	3323	0	0	3333	0
Link Speed (mph)		40			40			65			65	
Link Distance (ft)		2897			2749			1385			1493	
Travel Time (s)		49.4			46.9			14.5			15.7	
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Adj. Flow (vph)	2	24	78	18	6	12	48	90	6	18	295	6
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	104	0	0	36	0	48	96	0	0	319	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 29.6%		ICU Level of Service A	
Analysis Period (min) 15			

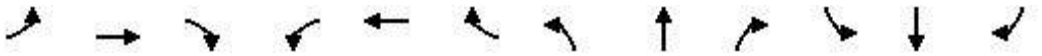
Intersection	
Int Delay, s/veh	3.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	2	20	65	15	5	10	40	75	5	15	245	5
Future Vol, veh/h	2	20	65	15	5	10	40	75	5	15	245	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	150	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	83	83	83	83	83	83	83	83	83	83	83	83
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	2	24	78	18	6	12	48	90	6	18	295	6

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	478	526	151	385	526	48	301	0	0	96	0	0
Stage 1	334	334	-	189	189	-	-	-	-	-	-	-
Stage 2	144	192	-	196	337	-	-	-	-	-	-	-
Critical Hdwy	7.54	6.54	6.94	7.54	6.54	6.94	4.14	-	-	4.14	-	-
Critical Hdwy Stg 1	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.52	4.02	3.32	3.52	4.02	3.32	2.22	-	-	2.22	-	-
Pot Cap-1 Maneuver	470	455	868	548	455	1011	1257	-	-	1496	-	-
Stage 1	653	642	-	795	743	-	-	-	-	-	-	-
Stage 2	844	740	-	787	640	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	441	432	868	459	432	1011	1257	-	-	1496	-	-
Mov Cap-2 Maneuver	441	432	-	459	432	-	-	-	-	-	-	-
Stage 1	628	633	-	765	715	-	-	-	-	-	-	-
Stage 2	795	712	-	679	631	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	11.1	12	2.7	0.4
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1257	-	-	692	554	1496	-	-
HCM Lane V/C Ratio	0.038	-	-	0.151	0.065	0.012	-	-
HCM Control Delay (s)	8	-	-	11.1	12	7.4	0	-
HCM Lane LOS	A	-	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0.5	0.2	0	-	-



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1	10	45	15	1	5	15	160	5	20	285	1
Future Volume (vph)	1	10	45	15	1	5	15	160	5	20	285	1
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	0		0	0		0	80		0	0		0
Storage Lanes	0		0	0		0	1		0	0		0
Taper Length (ft)	25			25			60			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	0.95	0.95
Frt		0.891			0.967			0.995				
Flt Protected		0.999			0.965		0.950				0.997	
Satd. Flow (prot)	0	1571	0	0	1647	0	1676	3336	0	0	3343	0
Flt Permitted		0.999			0.965		0.950				0.997	
Satd. Flow (perm)	0	1571	0	0	1647	0	1676	3336	0	0	3343	0
Link Speed (mph)		25			40			45			55	
Link Distance (ft)		1010			1235			1455			1882	
Travel Time (s)		27.5			21.1			22.0			23.3	
Peak Hour Factor	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71
Adj. Flow (vph)	1	14	63	21	1	7	21	225	7	28	401	1
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	78	0	0	29	0	21	232	0	0	430	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 31.7%		ICU Level of Service A	
Analysis Period (min) 15			

Intersection	
Int Delay, s/veh	2.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	1	10	45	15	1	5	15	160	5	20	285	1
Future Vol, veh/h	1	10	45	15	1	5	15	160	5	20	285	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	80	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	71	71	71	71	71	71	71	71	71	71	71	71
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	1	14	63	21	1	7	21	225	7	28	401	1

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	613	732	201	535	729	116	402	0	0	232	0	0
Stage 1	458	458	-	271	271	-	-	-	-	-	-	-
Stage 2	155	274	-	264	458	-	-	-	-	-	-	-
Critical Hdwy	7.54	6.54	6.94	7.54	6.54	6.94	4.14	-	-	4.14	-	-
Critical Hdwy Stg 1	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.52	4.02	3.32	3.52	4.02	3.32	2.22	-	-	2.22	-	-
Pot Cap-1 Maneuver	377	347	806	428	348	914	1153	-	-	1333	-	-
Stage 1	552	565	-	712	684	-	-	-	-	-	-	-
Stage 2	832	682	-	718	565	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	360	331	806	369	332	914	1153	-	-	1333	-	-
Mov Cap-2 Maneuver	360	331	-	369	332	-	-	-	-	-	-	-
Stage 1	542	550	-	699	672	-	-	-	-	-	-	-
Stage 2	809	670	-	627	550	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	11.5	14.1	0.7	0.6
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1153	-	-	630	427	1333	-	-
HCM Lane V/C Ratio	0.018	-	-	0.125	0.069	0.021	-	-
HCM Control Delay (s)	8.2	-	-	11.5	14.1	7.8	0.1	-
HCM Lane LOS	A	-	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0.4	0.2	0.1	-	-

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	35	180	10	20	25	50	140	25	40	315	15
Future Volume (vph)	10	35	180	10	20	25	50	140	25	40	315	15
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	0		50	0		0	100		0	100		0
Storage Lanes	0		1	0		0	1		0	1		0
Taper Length (ft)	25			25			220			290		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt			0.850		0.938			0.977			0.993	
Flt Protected		0.989			0.991		0.950			0.950		
Satd. Flow (prot)	0	1745	1500	0	1640	0	1676	3276	0	1676	3329	0
Flt Permitted		0.989			0.991		0.950			0.950		
Satd. Flow (perm)	0	1745	1500	0	1640	0	1676	3276	0	1676	3329	0
Link Speed (mph)		40			25			35			35	
Link Distance (ft)		1380			1122			778			1516	
Travel Time (s)		23.5			30.6			15.2			29.5	
Peak Hour Factor	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70
Adj. Flow (vph)	14	50	257	14	29	36	71	200	36	57	450	21
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	64	257	0	79	0	71	236	0	57	471	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 34.8%		ICU Level of Service A	
Analysis Period (min) 15			

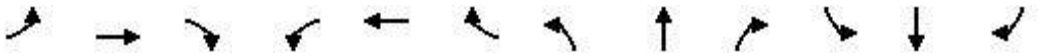
Intersection	
Int Delay, s/veh	6.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	10	35	180	10	20	25	50	140	25	40	315	15
Future Vol, veh/h	10	35	180	10	20	25	50	140	25	40	315	15
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	50	-	-	-	100	-	-	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	70	70	70	70	70	70	70	70	70	70	70	70
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	14	50	257	14	29	36	71	200	36	57	450	21

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	832	953	236	724	945	118	471	0	0	236	0	0
Stage 1	575	575	-	360	360	-	-	-	-	-	-	-
Stage 2	257	378	-	364	585	-	-	-	-	-	-	-
Critical Hdwy	7.54	6.54	6.94	7.54	6.54	6.94	4.14	-	-	4.14	-	-
Critical Hdwy Stg 1	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.52	4.02	3.32	3.52	4.02	3.32	2.22	-	-	2.22	-	-
Pot Cap-1 Maneuver	262	258	766	313	260	912	1087	-	-	1328	-	-
Stage 1	470	501	-	631	625	-	-	-	-	-	-	-
Stage 2	725	614	-	627	496	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	210	231	766	160	233	912	1087	-	-	1328	-	-
Mov Cap-2 Maneuver	210	231	-	160	233	-	-	-	-	-	-	-
Stage 1	439	479	-	590	584	-	-	-	-	-	-	-
Stage 2	619	574	-	357	475	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	15.1	20.3	2	0.8
HCM LOS	C	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1087	-	-	226	766	313	1328	-	-
HCM Lane V/C Ratio	0.066	-	-	0.284	0.336	0.251	0.043	-	-
HCM Control Delay (s)	8.5	-	-	27.1	12.1	20.3	7.8	-	-
HCM Lane LOS	A	-	-	D	B	C	A	-	-
HCM 95th %tile Q(veh)	0.2	-	-	1.1	1.5	1	0.1	-	-

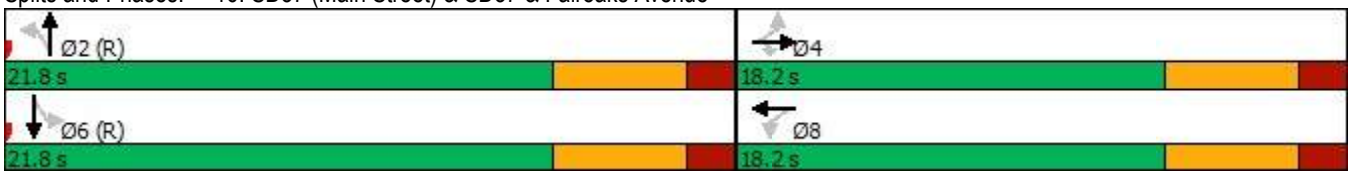


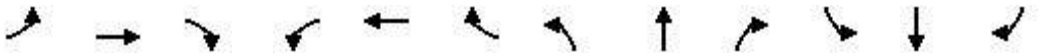
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	110	80	85	10	105	5	85	100	10	30	295	180
Future Volume (vph)	110	80	85	10	105	5	85	100	10	30	295	180
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	155		0	100		0	100		0	100		0
Storage Lanes	1		1	1		0	1		0	1		0
Taper Length (ft)	130			65			130			125		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt			0.850		0.994			0.986			0.943	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1676	1765	1500	1676	1754	0	1676	3306	0	1676	3162	0
Flt Permitted	0.666			0.690			0.418			0.661		
Satd. Flow (perm)	1175	1765	1500	1218	1754	0	738	3306	0	1166	3162	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			110		6			13			234	
Link Speed (mph)		40			25			30			35	
Link Distance (ft)		1120			746			1311			778	
Travel Time (s)		19.1			20.3			29.8			15.2	
Peak Hour Factor	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77
Adj. Flow (vph)	143	104	110	13	136	6	110	130	13	39	383	234
Shared Lane Traffic (%)												
Lane Group Flow (vph)	143	104	110	13	142	0	110	143	0	39	617	0
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Detector Phase	4	4	4	8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	15.5	15.5	15.5	15.5	15.5		15.5	15.5		15.5	15.5	
Total Split (s)	18.2	18.2	18.2	18.2	18.2		21.8	21.8		21.8	21.8	
Total Split (%)	45.5%	45.5%	45.5%	45.5%	45.5%		54.5%	54.5%		54.5%	54.5%	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	1.5	1.5	1.5	1.5	1.5		1.5	1.5		1.5	1.5	
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 Optimize?												
Recall Mode	Max	Max	Max	Min	Min		C-Max	C-Max		C-Max	C-Max	
Act Effct Green (s)	12.7	12.7	12.7	12.7	12.7		16.3	16.3		16.3	16.3	
Actuated g/C Ratio	0.32	0.32	0.32	0.32	0.32		0.41	0.41		0.41	0.41	
v/c Ratio	0.38	0.19	0.20	0.03	0.25		0.37	0.11		0.08	0.43	
Control Delay	14.4	11.0	4.0	9.8	11.3		12.7	7.1		7.9	6.2	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	14.4	11.0	4.0	9.8	11.3		12.7	7.1		7.9	6.2	
LOS	B	B	A	A	B		B	A		A	A	
Approach Delay		10.2			11.2			9.5			6.3	
Approach LOS		B			B			A			A	
Queue Length 50th (ft)	24	16	0	2	22		16	8		5	28	
Queue Length 95th (ft)	48	34	16	8	42		36	16		14	42	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Internal Link Dist (ft)		1040			666			1231			698	
Turn Bay Length (ft)	155			100			100			100		
Base Capacity (vph)	373	560	551	386	560		300	1354		475	1427	
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	0.38	0.19	0.20	0.03	0.25		0.37	0.11		0.08	0.43	

Intersection Summary			
Area Type:	Other		
Cycle Length: 40			
Actuated Cycle Length: 40			
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green			
Natural Cycle: 40			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.43			
Intersection Signal Delay: 8.4		Intersection LOS: A	
Intersection Capacity Utilization 49.9%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 16: SD37 (Main Street) & SD37 & Fairoaks Avenue





Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	110	80	85	10	105	5	85	100	10	30	295	180
Future Volume (veh/h)	110	80	85	10	105	5	85	100	10	30	295	180
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1772	1772	1772	1772	1772	1772	1772	1772	1772	1772	1772	1772
Adj Flow Rate, veh/h	143	104	0	13	136	6	110	130	13	39	383	0
Peak Hour Factor	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	501	563		535	535	24	512	1261	125	655	1372	
Arrive On Green	0.32	0.32	0.00	0.32	0.32	0.32	0.41	0.41	0.41	0.41	0.41	0.00
Sat Flow, veh/h	1246	1772	1502	1290	1684	74	1000	3095	306	1245	3455	0
Grp Volume(v), veh/h	143	104	0	13	0	142	110	70	73	39	383	0
Grp Sat Flow(s),veh/h/ln	1246	1772	1502	1290	0	1759	1000	1683	1717	1245	1683	0
Q Serve(g_s), s	3.8	1.7	0.0	0.3	0.0	2.4	3.3	1.0	1.1	0.8	3.0	0.0
Cycle Q Clear(g_c), s	6.2	1.7	0.0	2.0	0.0	2.4	6.3	1.0	1.1	1.9	3.0	0.0
Prop In Lane	1.00		1.00	1.00		0.04	1.00		0.18	1.00		0.00
Lane Grp Cap(c), veh/h	501	563		535	0	558	512	686	700	655	1372	
V/C Ratio(X)	0.29	0.18		0.02	0.00	0.25	0.22	0.10	0.10	0.06	0.28	
Avail Cap(c_a), veh/h	501	563		535	0	558	512	686	700	655	1372	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	12.5	9.9	0.0	10.6	0.0	10.1	10.0	7.3	7.3	7.9	7.9	0.0
Incr Delay (d2), s/veh	1.4	0.7	0.0	0.0	0.0	0.2	1.0	0.3	0.3	0.2	0.5	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.0	0.6	0.0	0.1	0.0	0.8	0.7	0.3	0.3	0.2	0.8	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	13.9	10.6	0.0	10.6	0.0	10.4	11.0	7.6	7.6	8.1	8.4	0.0
LnGrp LOS	B	B		B	A	B	B	A	A	A	A	
Approach Vol, veh/h		247	A		155			253			422	A
Approach Delay, s/veh		12.5			10.4			9.1			8.4	
Approach LOS		B			B			A			A	

Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		21.8		18.2		21.8		18.2				
Change Period (Y+Rc), s		5.5		5.5		5.5		5.5				
Max Green Setting (Gmax), s		16.3		12.7		16.3		12.7				
Max Q Clear Time (g_c+I1), s		8.3		8.2		5.0		4.4				
Green Ext Time (p_c), s		0.8		0.4		1.9		0.4				

Intersection Summary												
HCM 6th Ctrl Delay			9.8									
HCM 6th LOS			A									

Notes

Unsignalized Delay for [EBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	225	65	75	285	10	45	5	50	1	0	5
Future Volume (vph)	5	225	65	75	285	10	45	5	50	1	0	5
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	110		0	110		0	95		0	0		0
Storage Lanes	1		0	1		0	1		1	0		0
Taper Length (ft)	125			125			125			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		0.966			0.995				0.850		0.882	
Flt Protected	0.950			0.950			0.950				0.994	
Satd. Flow (prot)	1676	3239	0	1676	3336	0	1676	1765	1500	0	1547	0
Flt Permitted	0.950			0.950			0.950				0.994	
Satd. Flow (perm)	1676	3239	0	1676	3336	0	1676	1765	1500	0	1547	0
Link Speed (mph)		40			40			35			25	
Link Distance (ft)		1143			1120			993			528	
Travel Time (s)		19.5			19.1			19.3			14.4	
Peak Hour Factor	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68
Adj. Flow (vph)	7	331	96	110	419	15	66	7	74	1	0	7
Shared Lane Traffic (%)												
Lane Group Flow (vph)	7	427	0	110	434	0	66	7	74	0	8	0
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 32.4%		ICU Level of Service A	
Analysis Period (min) 15			

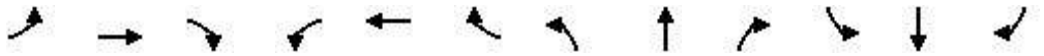
Intersection	
Int Delay, s/veh	3.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	5	225	65	75	285	10	45	5	50	1	0	5
Future Vol, veh/h	5	225	65	75	285	10	45	5	50	1	0	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
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	110	-	-	110	-	-	95	-	0	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	68	68	68	68	68	68	68	68	68	68	68	68
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	7	331	96	110	419	15	66	7	74	1	0	7

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	434	0	0	427	0	0	823	1047	214	830	1088	217
Stage 1	-	-	-	-	-	-	393	393	-	647	647	-
Stage 2	-	-	-	-	-	-	430	654	-	183	441	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	1122	-	-	1129	-	-	266	227	791	263	214	787
Stage 1	-	-	-	-	-	-	603	604	-	426	465	-
Stage 2	-	-	-	-	-	-	574	461	-	801	575	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1122	-	-	1129	-	-	243	204	791	214	192	787
Mov Cap-2 Maneuver	-	-	-	-	-	-	243	204	-	214	192	-
Stage 1	-	-	-	-	-	-	599	600	-	423	420	-
Stage 2	-	-	-	-	-	-	513	416	-	713	572	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	1.7	17.6	11.7
HCM LOS			C	B

Minor Lane/Major Mvmt	NBLn1	NBLn2	NBLn3	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	243	204	791	1122	-	-	1129	-	-	544
HCM Lane V/C Ratio	0.272	0.036	0.093	0.007	-	-	0.098	-	-	0.016
HCM Control Delay (s)	25.3	23.3	10	8.2	-	-	8.5	-	-	11.7
HCM Lane LOS	D	C	B	A	-	-	A	-	-	B
HCM 95th %tile Q(veh)	1.1	0.1	0.3	0	-	-	0.3	-	-	0

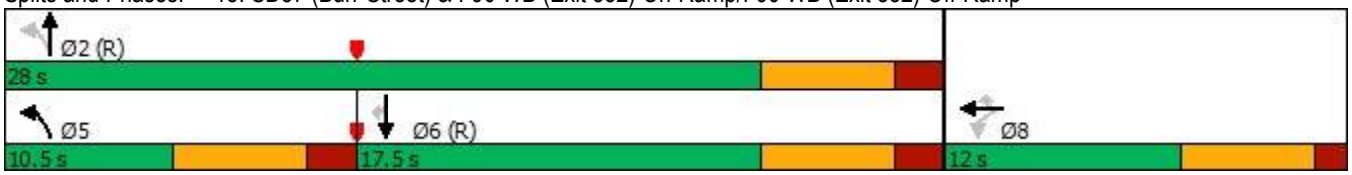


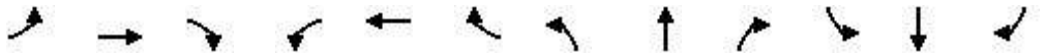
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	90	0	130	85	290	0	0	420	100
Future Volume (vph)	0	0	0	90	0	130	85	290	0	0	420	100
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	0		0	0		360	200		0	0		0
Storage Lanes	0		0	0		1	1		0	0		1
Taper Length (ft)	25			25			65			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt						0.850						0.850
Flt Protected					0.950		0.950					
Satd. Flow (prot)	0	0	0	0	1500	1378	1613	3226	0	0	3226	1354
Flt Permitted					0.950		0.338					
Satd. Flow (perm)	0	0	0	0	1500	1378	574	3226	0	0	3226	1354
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						218						205
Link Speed (mph)		50			50			35			35	
Link Distance (ft)		1127			1072			742			2179	
Travel Time (s)		15.4			14.6			14.5			42.4	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Heavy Vehicles (%)	0%	0%	0%	14%	0%	11%	6%	6%	0%	0%	6%	13%
Adj. Flow (vph)	0	0	0	106	0	153	100	341	0	0	494	118
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	106	153	100	341	0	0	494	118
Turn Type				Perm	NA	Perm	pm+pt	NA			NA	Perm
Protected Phases					8		5	2			6	
Permitted Phases				8		8	2					6
Detector Phase				8	8	8	5	2			6	6
Switch Phase												
Minimum Initial (s)				7.0	7.0	7.0	5.0	12.0			12.0	12.0
Minimum Split (s)				12.0	12.0	12.0	10.5	17.5			17.5	17.5
Total Split (s)				12.0	12.0	12.0	10.5	28.0			17.5	17.5
Total Split (%)				30.0%	30.0%	30.0%	26.3%	70.0%			43.8%	43.8%
Yellow Time (s)				4.0	4.0	4.0	4.0	4.0			4.0	4.0
All-Red Time (s)				1.0	1.0	1.0	1.5	1.5			1.5	1.5
Lost Time Adjust (s)					0.0	0.0	0.0	0.0			0.0	0.0
Total Lost Time (s)					5.0	5.0	5.5	5.5			5.5	5.5
Lead/Lag							Lead				Lag	Lag
Lead-Lag Optimize?							Yes				Yes	Yes
Recall Mode				Min	Min	Min	None	C-Max			C-Max	C-Max
Act Effct Green (s)					7.0	7.0	22.5	22.5			16.2	16.2
Actuated g/C Ratio					0.18	0.18	0.56	0.56			0.40	0.40
v/c Ratio					0.40	0.36	0.22	0.19			0.38	0.18
Control Delay					19.9	4.1	5.4	4.6			11.1	1.3
Queue Delay					0.0	0.0	0.0	0.0			0.0	0.0
Total Delay					19.9	4.1	5.4	4.6			11.1	1.3
LOS					B	A	A	A			B	A
Approach Delay					10.6			4.8			9.2	
Approach LOS					B			A			A	
Queue Length 50th (ft)					21	0	9	15			46	0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 95th (ft)					50	15	20	26			73	6
Internal Link Dist (ft)		1047			992			662			2099	
Turn Bay Length (ft)						360	200					
Base Capacity (vph)					262	421	452	1814			1306	670
Starvation Cap Reductn					0	0	0	0			0	0
Spillback Cap Reductn					0	0	0	0			0	0
Storage Cap Reductn					0	0	0	0			0	0
Reduced v/c Ratio					0.40	0.36	0.22	0.19			0.38	0.18

Intersection Summary			
Area Type:	Other		
Cycle Length: 40			
Actuated Cycle Length: 40			
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green			
Natural Cycle: 40			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.40			
Intersection Signal Delay: 8.0		Intersection LOS: A	
Intersection Capacity Utilization 36.4%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 18: SD37 (Burr Street) & I-90 WB (Exit 332) On-Ramp/I-90 WB (Exit 332) Off-Ramp





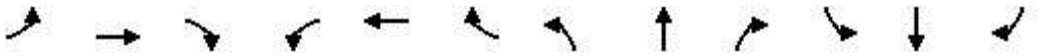
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	90	0	130	85	290	0	0	420	100
Future Volume (veh/h)	0	0	0	90	0	130	85	290	0	0	420	100
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach					No			No			No	
Adj Sat Flow, veh/h/ln				1603	1800	1646	1716	1716	0	0	1716	1617
Adj Flow Rate, veh/h				106	0	153	100	341	0	0	494	0
Peak Hour Factor				0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Percent Heavy Veh, %				14	0	11	6	6	0	0	6	13
Cap, veh/h				300	0	244	512	1834	0	0	1112	
Arrive On Green				0.17	0.00	0.17	0.08	0.56	0.00	0.00	0.34	0.00
Sat Flow, veh/h				1714	0	1395	1634	3346	0	0	3346	1371
Grp Volume(v), veh/h				106	0	153	100	341	0	0	494	0
Grp Sat Flow(s),veh/h/ln				1714	0	1395	1634	1630	0	0	1630	1371
Q Serve(g_s), s				2.2	0.0	4.1	1.4	2.0	0.0	0.0	4.7	0.0
Cycle Q Clear(g_c), s				2.2	0.0	4.1	1.4	2.0	0.0	0.0	4.7	0.0
Prop In Lane				1.00		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				300	0	244	512	1834	0	0	1112	
V/C Ratio(X)				0.35	0.00	0.63	0.20	0.19	0.00	0.00	0.44	
Avail Cap(c_a), veh/h				300	0	244	580	1834	0	0	1112	
HCM Platoon Ratio				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	0.00	1.00	0.96	0.96	0.00	0.00	1.00	0.00
Uniform Delay (d), s/veh				14.5	0.0	15.3	6.5	4.3	0.0	0.0	10.2	0.0
Incr Delay (d2), s/veh				0.7	0.0	5.0	0.2	0.2	0.0	0.0	1.3	0.0
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				0.7	0.0	1.3	0.3	0.4	0.0	0.0	1.4	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				15.2	0.0	20.3	6.7	4.5	0.0	0.0	11.5	0.0
LnGrp LOS				B	A	C	A	A	A	A	B	
Approach Vol, veh/h					259			441			494	A
Approach Delay, s/veh					18.2			5.0			11.5	
Approach LOS					B			A			B	

Timer - Assigned Phs		2			5	6		8				
Phs Duration (G+Y+Rc), s		28.0			8.9	19.1		12.0				
Change Period (Y+Rc), s		5.5			5.5	5.5		5.0				
Max Green Setting (Gmax), s		22.5			5.0	12.0		7.0				
Max Q Clear Time (g_c+I1), s		4.0			3.4	6.7		6.1				
Green Ext Time (p_c), s		2.0			0.0	1.4		0.1				

Intersection Summary		
HCM 6th Ctrl Delay	10.6	
HCM 6th LOS	B	

Notes

Unsignalized Delay for [SBR] is excluded from calculations of the approach delay and intersection delay.

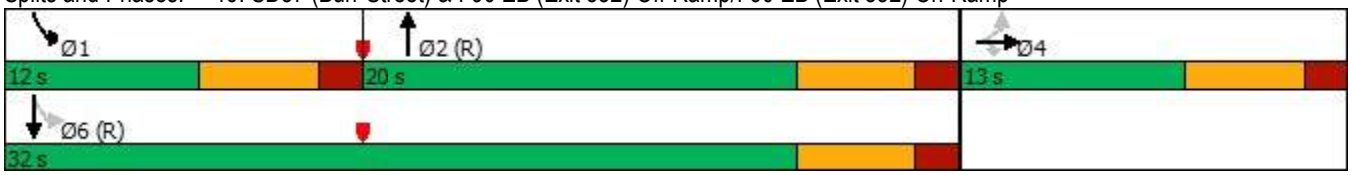


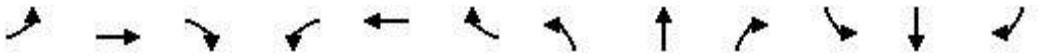
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	55	0	95	0	0	0	0	320	35	70	440	0
Future Volume (vph)	55	0	95	0	0	0	0	320	35	70	440	0
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	0		300	0		0	0		120	190		0
Storage Lanes	0		1	0		0	0		0	1		0
Taper Length (ft)	25			25			25			60		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	1.00
Frt			0.850					0.985				
Flt Protected		0.950								0.950		
Satd. Flow (prot)	0	1527	1430	0	0	0	0	3129	0	1425	3226	0
Flt Permitted		0.950								0.375		
Satd. Flow (perm)	0	1527	1430	0	0	0	0	3129	0	562	3226	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			194					27				
Link Speed (mph)		50			50			35			35	
Link Distance (ft)		1362			971			1492			742	
Travel Time (s)		18.6			13.2			29.1			14.5	
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Heavy Vehicles (%)	12%	0%	7%	0%	0%	0%	0%	5%	32%	20%	6%	0%
Adj. Flow (vph)	69	0	119	0	0	0	0	400	44	88	550	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	69	119	0	0	0	0	444	0	88	550	0
Turn Type	Perm	NA	Perm					NA		pm+pt	NA	
Protected Phases		4						2		1	6	
Permitted Phases	4		4							6		
Detector Phase	4	4	4					2		1	6	
Switch Phase												
Minimum Initial (s)	7.0	7.0	7.0					12.0		5.0	12.0	
Minimum Split (s)	12.5	12.5	12.5					18.0		10.5	18.0	
Total Split (s)	13.0	13.0	13.0					20.0		12.0	32.0	
Total Split (%)	28.9%	28.9%	28.9%					44.4%		26.7%	71.1%	
Yellow Time (s)	4.0	4.0	4.0					4.0		4.0	4.0	
All-Red Time (s)	1.5	1.5	1.5					1.5		1.5	1.5	
Lost Time Adjust (s)		0.0	0.0					0.0		0.0	0.0	
Total Lost Time (s)		5.5	5.5					5.5		5.5	5.5	
Lead/Lag								Lag		Lead		
Lead-Lag Optimize?								Yes		Yes		
Recall Mode	Min	Min	Min					C-Max		None	C-Max	
Act Effct Green (s)		7.3	7.3					19.5		26.7	26.7	
Actuated g/C Ratio		0.16	0.16					0.43		0.59	0.59	
v/c Ratio		0.28	0.30					0.32		0.19	0.29	
Control Delay		19.8	3.3					10.5		5.2	5.0	
Queue Delay		0.0	0.0					0.0		0.0	0.0	
Total Delay		19.8	3.3					10.5		5.2	5.0	
LOS		B	A					B		A	A	
Approach Delay		9.4						10.5			5.0	
Approach LOS		A						B			A	
Queue Length 50th (ft)		16	0					43		8	30	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 95th (ft)		37	7					63		18	42	
Internal Link Dist (ft)		1282			891			1412			662	
Turn Bay Length (ft)			300							190		
Base Capacity (vph)		254	400					1371		458	1915	
Starvation Cap Reductn		0	0					0		0	0	
Spillback Cap Reductn		0	0					0		0	0	
Storage Cap Reductn		0	0					0		0	0	
Reduced v/c Ratio		0.27	0.30					0.32		0.19	0.29	

Intersection Summary			
Area Type:	Other		
Cycle Length: 45			
Actuated Cycle Length: 45			
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBTL, Start of Green			
Natural Cycle: 45			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.32			
Intersection Signal Delay: 7.6		Intersection LOS: A	
Intersection Capacity Utilization 36.4%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 19: SD37 (Burr Street) & I-90 EB (Exit 332) Off-Ramp/I-90 EB (Exit 332) On-Ramp





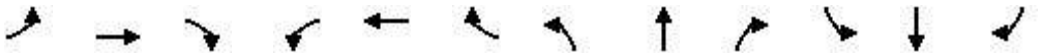
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	55	0	95	0	0	0	0	320	35	70	440	0
Future Volume (veh/h)	55	0	95	0	0	0	0	320	35	70	440	0
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No						No			No	
Adj Sat Flow, veh/h/ln	1632	1800	1702				0	1730	1351	1519	1716	0
Adj Flow Rate, veh/h	69	0	119				0	400	0	88	550	0
Peak Hour Factor	0.80	0.80	0.80				0.80	0.80	0.80	0.80	0.80	0.80
Percent Heavy Veh, %	12	0	7				0	5	32	20	6	0
Cap, veh/h	267	0	224				0	1327		538	1956	0
Arrive On Green	0.16	0.00	0.16				0.00	0.40	0.00	0.07	0.60	0.00
Sat Flow, veh/h	1714	0	1442				0	3460	0	1447	3346	0
Grp Volume(v), veh/h	69	0	119				0	400	0	88	550	0
Grp Sat Flow(s),veh/h/ln	1714	0	1442				0	1643	0	1447	1630	0
Q Serve(g_s), s	1.6	0.0	3.4				0.0	3.7	0.0	1.4	3.7	0.0
Cycle Q Clear(g_c), s	1.6	0.0	3.4				0.0	3.7	0.0	1.4	3.7	0.0
Prop In Lane	1.00		1.00				0.00		0.00	1.00		0.00
Lane Grp Cap(c), veh/h	267	0	224				0	1327		538	1956	0
V/C Ratio(X)	0.26	0.00	0.53				0.00	0.30		0.16	0.28	0.00
Avail Cap(c_a), veh/h	286	0	240				0	1327		640	1956	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00				0.00	0.92	0.00	0.93	0.93	0.00
Uniform Delay (d), s/veh	16.7	0.0	17.5				0.0	9.1	0.0	5.9	4.3	0.0
Incr Delay (d2), s/veh	0.5	0.0	1.9				0.0	0.5	0.0	0.1	0.3	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.5	0.0	1.0				0.0	1.1	0.0	0.3	0.7	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	17.2	0.0	19.4				0.0	9.6	0.0	6.0	4.7	0.0
LnGrp LOS	B	A	B				A	A		A	A	A
Approach Vol, veh/h		188						400	A		638	
Approach Delay, s/veh		18.6						9.6			4.8	
Approach LOS		B						A			A	

Timer - Assigned Phs	1	2		4		6
Phs Duration (G+Y+Rc), s	8.8	23.7		12.5		32.5
Change Period (Y+Rc), s	5.5	5.5		5.5		5.5
Max Green Setting (Gmax), s	6.5	14.5		7.5		26.5
Max Q Clear Time (g_c+I1), s	3.4	5.7		5.4		5.7
Green Ext Time (p_c), s	0.0	1.6		0.1		3.6

Intersection Summary	
HCM 6th Ctrl Delay	8.5
HCM 6th LOS	A

Notes

Unsignalized Delay for [NBR] is excluded from calculations of the approach delay and intersection delay.



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	45	155	10	10	135	85	5	25	15	125	40	25
Future Volume (vph)	45	155	10	10	135	85	5	25	15	125	40	25
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	170		0	170		0	0		0	0		0
Storage Lanes	1		0	1		0	0		0	0		0
Taper Length (ft)	75			75			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		0.991			0.942			0.955			0.982	
Flt Protected	0.950			0.950				0.995			0.968	
Satd. Flow (prot)	1710	1784	0	1710	1675	0	0	1596	0	0	1711	0
Flt Permitted	0.950			0.950				0.995			0.968	
Satd. Flow (perm)	1710	1784	0	1710	1675	0	0	1596	0	0	1711	0
Link Speed (mph)		35			35			35			35	
Link Distance (ft)		1332			1574			793			857	
Travel Time (s)		25.9			30.7			15.4			16.7	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles (%)	0%	0%	0%	0%	2%	0%	0%	8%	8%	0%	0%	0%
Adj. Flow (vph)	48	165	11	11	144	90	5	27	16	133	43	27
Shared Lane Traffic (%)												
Lane Group Flow (vph)	48	176	0	11	234	0	0	48	0	0	203	0
Sign Control		Stop			Stop			Stop			Stop	

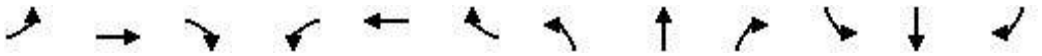
Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 44.1%		ICU Level of Service A	
Analysis Period (min) 15			

Intersection	
Intersection Delay, s/veh	10.1
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	45	155	10	10	135	85	5	25	15	125	40	25
Future Vol, veh/h	45	155	10	10	135	85	5	25	15	125	40	25
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles, %	0	0	0	0	2	0	0	8	8	0	0	0
Mvmt Flow	48	165	11	11	144	90	5	27	16	133	43	27
Number of Lanes	1	1	0	1	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	2	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	2	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	2	2
HCM Control Delay	9.8	10.4	8.7	10.4
HCM LOS	A	B	A	B

Lane	NBLn1	EBLn1	EBLn2	WBLn1	WBLn2	SBLn1
Vol Left, %	11%	100%	0%	100%	0%	66%
Vol Thru, %	56%	0%	94%	0%	61%	21%
Vol Right, %	33%	0%	6%	0%	39%	13%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	45	45	165	10	220	190
LT Vol	5	45	0	10	0	125
Through Vol	25	0	155	0	135	40
RT Vol	15	0	10	0	85	25
Lane Flow Rate	48	48	176	11	234	202
Geometry Grp	2	7	7	7	7	2
Degree of Util (X)	0.07	0.078	0.261	0.017	0.335	0.29
Departure Headway (Hd)	5.285	5.903	5.356	5.896	5.153	5.168
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	682	602	665	602	690	689
Service Time	3.285	3.687	3.139	3.678	2.934	3.243
HCM Lane V/C Ratio	0.07	0.08	0.265	0.018	0.339	0.293
HCM Control Delay	8.7	9.2	10	8.8	10.5	10.4
HCM Lane LOS	A	A	A	A	B	B
HCM 95th-tile Q	0.2	0.3	1	0.1	1.5	1.2



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	330	25	40	15	40	100	20	170	5	45	220	305
Future Volume (vph)	330	25	40	15	40	100	20	170	5	45	220	305
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	285		0	200		125	220		230	155		280
Storage Lanes	1		0	1		0	1		1	1		1
Taper Length (ft)	100			55			55			115		
Lane Util. Factor	0.97	1.00	1.00	1.00	0.95	0.95	1.00	0.95	1.00	1.00	0.95	1.00
Frt		0.908			0.893				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3285	1585	0	1710	2831	0	1710	3081	1275	1462	3196	1515
Flt Permitted	0.654			0.710			0.950			0.950		
Satd. Flow (perm)	2261	1585	0	1278	2831	0	1710	3081	1275	1462	3196	1515
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		44			111				182			339
Link Speed (mph)		35			35			35			35	
Link Distance (ft)		1814			1403			1364			1492	
Travel Time (s)		35.3			27.3			26.6			29.1	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	1%	8%	0%	0%	0%	11%	0%	11%	20%	17%	7%	1%
Adj. Flow (vph)	367	28	44	17	44	111	22	189	6	50	244	339
Shared Lane Traffic (%)												
Lane Group Flow (vph)	367	72	0	17	155	0	22	189	6	50	244	339
Turn Type	Perm	NA		Perm	NA		Prot	NA	Perm	Prot	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8					2			6
Detector Phase	4	4		8	8		5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	7.0	7.0		7.0	7.0		4.0	12.0	12.0	4.0	12.0	12.0
Minimum Split (s)	12.5	12.5		12.5	12.5		9.5	17.5	17.5	9.5	17.5	17.5
Total Split (s)	16.0	16.0		16.0	16.0		9.5	19.0	19.0	10.0	19.5	19.5
Total Split (%)	35.6%	35.6%		35.6%	35.6%		21.1%	42.2%	42.2%	22.2%	43.3%	43.3%
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0		1.0	1.0		1.5	1.5	1.5	1.5	1.5	1.5
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)	5.0	5.0		5.0	5.0		5.5	5.5	5.5	5.5	5.5	5.5
Lead/Lag							Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	Min	Min		Min	Min		None	C-Max	C-Max	None	C-Max	C-Max
Act Effct Green (s)	10.4	10.4		10.4	10.4		4.3	20.1	20.1	4.7	22.2	22.2
Actuated g/C Ratio	0.23	0.23		0.23	0.23		0.10	0.45	0.45	0.10	0.49	0.49
v/c Ratio	0.70	0.18		0.06	0.21		0.13	0.14	0.01	0.32	0.16	0.37
Control Delay	24.4	8.8		13.7	6.5		21.0	9.9	0.0	21.2	12.6	9.0
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	24.4	8.8		13.7	6.5		21.0	9.9	0.0	21.2	12.6	9.0
LOS	C	A		B	A		C	A	A	C	B	A
Approach Delay		21.9			7.2			10.7			11.3	
Approach LOS		C			A			B			B	
Queue Length 50th (ft)	43	6		3	4		5	11	0	12	25	35

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 95th (ft)	#90	28		14	21		21	36	0	37	63	96
Internal Link Dist (ft)		1734			1323			1284			1412	
Turn Bay Length (ft)	285			200			220		230	155		280
Base Capacity (vph)	552	420		312	775		165	1373	668	154	1574	918
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	0.66	0.17		0.05	0.20		0.13	0.14	0.01	0.32	0.16	0.37

Intersection Summary	
Area Type:	Other
Cycle Length: 45	
Actuated Cycle Length: 45	
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green	
Natural Cycle: 45	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.70	
Intersection Signal Delay: 13.9	Intersection LOS: B
Intersection Capacity Utilization 46.6%	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: 2: SD37 (Burr Street) & Spruce Street



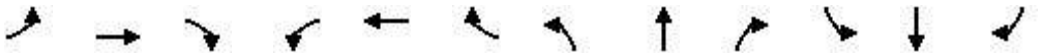
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	330	25	40	15	40	100	20	170	5	45	220	305
Future Volume (veh/h)	330	25	40	15	40	100	20	170	5	45	220	305
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1786	1688	1800	1800	1800	1646	1800	1646	1519	1561	1702	1786
Adj Flow Rate, veh/h	367	28	44	17	44	111	22	189	0	50	244	0
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	1	8	0	0	0	11	0	11	20	17	7	1
Cap, veh/h	766	145	227	439	418	373	37	1121		61	1224	
Arrive On Green	0.24	0.24	0.24	0.24	0.24	0.24	0.02	0.36	0.00	0.04	0.38	0.00
Sat Flow, veh/h	2409	591	929	1349	1710	1525	1714	3127	1287	1487	3233	1514
Grp Volume(v), veh/h	367	0	72	17	44	111	22	189	0	50	244	0
Grp Sat Flow(s),veh/h/ln	1204	0	1520	1349	1710	1525	1714	1563	1287	1487	1617	1514
Q Serve(g_s), s	6.6	0.0	1.7	0.5	0.9	2.7	0.6	1.9	0.0	1.5	2.3	0.0
Cycle Q Clear(g_c), s	9.3	0.0	1.7	2.1	0.9	2.7	0.6	1.9	0.0	1.5	2.3	0.0
Prop In Lane	1.00		0.61	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	766	0	372	439	418	373	37	1121		61	1224	
V/C Ratio(X)	0.48	0.00	0.19	0.04	0.11	0.30	0.60	0.17		0.81	0.20	
Avail Cap(c_a), veh/h	766	0	372	439	418	373	152	1121		149	1224	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.97	0.97	0.00
Uniform Delay (d), s/veh	17.6	0.0	13.5	14.3	13.2	13.9	21.8	9.8	0.0	21.4	9.4	0.0
Incr Delay (d2), s/veh	0.5	0.0	0.3	0.0	0.1	0.4	14.7	0.3	0.0	21.4	0.4	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.6	0.0	0.5	0.1	0.3	0.8	0.4	0.5	0.0	0.8	0.7	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	18.1	0.0	13.7	14.4	13.3	14.3	36.6	10.2	0.0	42.8	9.8	0.0
LnGrp LOS	B	A	B	B	B	B	D	B		D	A	
Approach Vol, veh/h		439			172			211	A		294	A
Approach Delay, s/veh		17.4			14.0			12.9			15.4	
Approach LOS		B			B			B			B	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	7.4	21.6		16.0	6.5	22.5		16.0				
Change Period (Y+Rc), s	5.5	5.5		5.0	5.5	5.5		5.0				
Max Green Setting (Gmax), s	4.5	13.5		11.0	4.0	14.0		11.0				
Max Q Clear Time (g_c+I1), s	3.5	3.9		11.3	2.6	4.3		4.7				
Green Ext Time (p_c), s	0.0	0.7		0.0	0.0	0.9		0.4				

Intersection Summary		
HCM 6th Ctrl Delay		15.5
HCM 6th LOS		B

Notes

Unsignalized Delay for [NBR, SBR] is excluded from calculations of the approach delay and intersection delay.



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	75	70	25	60	30	70	210	25	25	140	5
Future Volume (vph)	10	75	70	25	60	30	70	210	25	25	140	5
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
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		0.939			0.965			0.989			0.996	
Flt Protected		0.997			0.989			0.989			0.993	
Satd. Flow (prot)	0	1637	0	0	1718	0	0	1743	0	0	1745	0
Flt Permitted		0.997			0.989			0.989			0.993	
Satd. Flow (perm)	0	1637	0	0	1718	0	0	1743	0	0	1745	0
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		1160			1174			641			590	
Travel Time (s)		31.6			32.0			17.5			16.1	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Heavy Vehicles (%)	0%	6%	0%	0%	0%	0%	0%	1%	4%	8%	1%	0%
Adj. Flow (vph)	11	81	75	27	65	32	75	226	27	27	151	5
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	167	0	0	124	0	0	328	0	0	183	0
Sign Control		Stop			Stop			Stop			Stop	

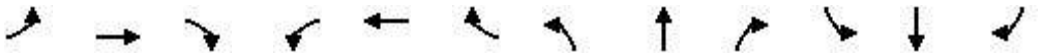
Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 48.6%		ICU Level of Service A	
Analysis Period (min) 15			

Intersection	
Intersection Delay, s/veh	10.8
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	10	75	70	25	60	30	70	210	25	25	140	5
Future Vol, veh/h	10	75	70	25	60	30	70	210	25	25	140	5
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Heavy Vehicles, %	0	6	0	0	0	0	0	1	4	8	1	0
Mvmt Flow	11	81	75	27	65	32	75	226	27	27	151	5
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	9.8	9.6	12.1	10.3
HCM LOS	A	A	B	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	23%	6%	22%	15%
Vol Thru, %	69%	48%	52%	82%
Vol Right, %	8%	45%	26%	3%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	305	155	115	170
LT Vol	70	10	25	25
Through Vol	210	75	60	140
RT Vol	25	70	30	5
Lane Flow Rate	328	167	124	183
Geometry Grp	1	1	1	1
Degree of Util (X)	0.454	0.239	0.185	0.269
Departure Headway (Hd)	4.982	5.17	5.384	5.301
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	728	693	667	678
Service Time	2.982	3.205	3.42	3.331
HCM Lane V/C Ratio	0.451	0.241	0.186	0.27
HCM Control Delay	12.1	9.8	9.6	10.3
HCM Lane LOS	B	A	A	B
HCM 95th-tile Q	2.4	0.9	0.7	1.1



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	190	135	5	1	95	25	5	1	1	20	1	145
Future Volume (vph)	190	135	5	1	95	25	5	1	1	20	1	145
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	0		0	0		0	0		0	100		0
Storage Lanes	0		0	0		0	0		0	1		0
Taper Length (ft)	25			25			25			60		
Lane Util. Factor	0.95	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.998			0.972			0.981			0.851	
Flt Protected		0.972						0.966		0.950		
Satd. Flow (prot)	0	3121	0	0	1587	0	0	1706	0	1710	1502	0
Flt Permitted		0.972						0.966		0.950		
Satd. Flow (perm)	0	3121	0	0	1587	0	0	1706	0	1710	1502	0
Link Speed (mph)		45			45			25			25	
Link Distance (ft)		2581			2852			1867			1496	
Travel Time (s)		39.1			43.2			50.9			40.8	
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 (%)	1%	14%	0%	0%	13%	0%	0%	0%	0%	0%	0%	2%
Adj. Flow (vph)	207	147	5	1	103	27	5	1	1	22	1	158
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	359	0	0	131	0	0	7	0	22	159	0
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 34.0%		ICU Level of Service A	
Analysis Period (min) 15			

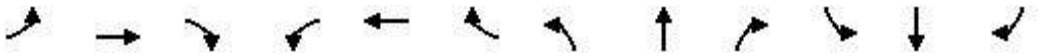
Intersection	
Int Delay, s/veh	5.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	190	135	5	1	95	25	5	1	1	20	1	145
Future Vol, veh/h	190	135	5	1	95	25	5	1	1	20	1	145
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
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	1	14	0	0	13	0	0	0	0	0	0	2
Mvmt Flow	207	147	5	1	103	27	5	1	1	22	1	158

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	130	0	0	152	0	0	762	696	76	607	685	117
Stage 1	-	-	-	-	-	-	564	564	-	119	119	-
Stage 2	-	-	-	-	-	-	198	132	-	488	566	-
Critical Hdwy	4.115	-	-	4.1	-	-	7.3	6.5	6.9	7.3	6.5	6.23
Critical Hdwy Stg 1	-	-	-	-	-	-	6.5	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.5	5.5	-
Follow-up Hdwy	2.2095	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.319
Pot Cap-1 Maneuver	1461	-	-	1441	-	-	311	368	976	398	373	934
Stage 1	-	-	-	-	-	-	483	512	-	890	801	-
Stage 2	-	-	-	-	-	-	808	791	-	535	511	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1461	-	-	1441	-	-	227	311	976	349	315	934
Mov Cap-2 Maneuver	-	-	-	-	-	-	227	311	-	349	315	-
Stage 1	-	-	-	-	-	-	408	433	-	752	800	-
Stage 2	-	-	-	-	-	-	670	790	-	450	432	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	4.6	0.1	18.9	10.5
HCM LOS			C	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	266	1461	-	-	1441	-	-	349	922
HCM Lane V/C Ratio	0.029	0.141	-	-	0.001	-	-	0.062	0.172
HCM Control Delay (s)	18.9	7.9	0.2	-	7.5	0	-	16	9.7
HCM Lane LOS	C	A	A	-	A	A	-	C	A
HCM 95th %tile Q(veh)	0.1	0.5	-	-	0	-	-	0.2	0.6



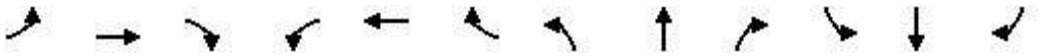
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	115	175	35	90	5	165	280	50	10	260	15
Future Volume (vph)	10	115	175	35	90	5	165	280	50	10	260	15
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	0		0	0		0	130		0	60		0
Storage Lanes	0		0	0		0	0		0	1		0
Taper Length (ft)	25			25			25			85		
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		0.921			0.995			0.977			0.992	
Flt Protected		0.998			0.987		0.950			0.950		
Satd. Flow (prot)	0	1635	0	0	1768	0	1693	1744	0	1710	1769	0
Flt Permitted		0.987			0.702		0.437			0.537		
Satd. Flow (perm)	0	1617	0	0	1257	0	779	1744	0	967	1769	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		127			4			18			6	
Link Speed (mph)		25			25			30			25	
Link Distance (ft)		1628			1096			1266			1178	
Travel Time (s)		44.4			29.9			28.8			32.1	
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Heavy Vehicles (%)	0%	0%	2%	0%	0%	0%	1%	1%	0%	0%	1%	0%
Adj. Flow (vph)	11	132	201	40	103	6	190	322	57	11	299	17
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	344	0	0	149	0	190	379	0	11	316	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		pm+pt	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		5	2		1	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0		4.0	8.0		4.0	8.0	
Minimum Split (s)	11.0	11.0		11.0	11.0		9.5	13.0		9.5	13.0	
Total Split (s)	20.0	20.0		20.0	20.0		11.0	25.4		9.6	24.0	
Total Split (%)	36.4%	36.4%		36.4%	36.4%		20.0%	46.2%		17.5%	43.6%	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.5	1.5		1.5	1.5		1.0	1.5		1.0	1.5	
Lost Time Adjust (s)		0.0			0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)		5.0			5.0		4.5	5.0		4.5	5.0	
Lead/Lag							Lead	Lag		Lead	Lag	
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	
Recall Mode	None	None		None	None		None	C-Max		None	C-Max	
Act Effct Green (s)		11.9			11.9		32.9	31.1		28.5	23.8	
Actuated g/C Ratio		0.22			0.22		0.60	0.57		0.52	0.43	
v/c Ratio		0.76			0.54		0.33	0.38		0.02	0.41	
Control Delay		23.9			25.2		7.3	9.7		5.8	15.0	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		23.9			25.2		7.3	9.7		5.8	15.0	
LOS		C			C		A	A		A	B	
Approach Delay		23.9			25.2			8.9			14.7	
Approach LOS		C			C			A			B	
Queue Length 50th (ft)		63			41		25	54		1	78	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 95th (ft)		127			80		52	155		6	136	
Internal Link Dist (ft)		1548			1016			1186			1098	
Turn Bay Length (ft)							130			60		
Base Capacity (vph)		533			345		582	995		574	768	
Starvation Cap Reductn		0			0		0	0		0	0	
Spillback Cap Reductn		0			0		0	0		0	0	
Storage Cap Reductn		0			0		0	0		0	0	
Reduced v/c Ratio		0.65			0.43		0.33	0.38		0.02	0.41	

Intersection Summary			
Area Type:	Other		
Cycle Length: 55			
Actuated Cycle Length: 55			
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green			
Natural Cycle: 55			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.76			
Intersection Signal Delay: 15.7		Intersection LOS: B	
Intersection Capacity Utilization 60.7%		ICU Level of Service B	
Analysis Period (min) 15			

Splits and Phases: 5: Burr Street & 1st Avenue





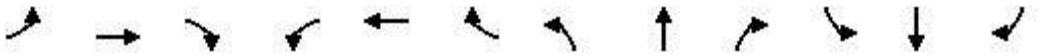
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	10	115	175	35	90	5	165	280	50	10	260	15
Future Volume (veh/h)	10	115	175	35	90	5	165	280	50	10	260	15
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1800	1800	1772	1800	1800	1800	1786	1786	1800	1800	1786	1800
Adj Flow Rate, veh/h	11	132	0	40	103	6	190	322	57	11	299	17
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Percent Heavy Veh, %	0	0	2	0	0	0	1	1	0	0	1	0
Cap, veh/h	80	212		126	161	9	729	888	157	650	892	51
Arrive On Green	0.12	0.12	0.00	0.12	0.12	0.12	0.08	0.60	0.60	0.01	0.53	0.53
Sat Flow, veh/h	73	1708	0	346	1300	69	1701	1477	262	1714	1674	95
Grp Volume(v), veh/h	143	0	0	149	0	0	190	0	379	11	0	316
Grp Sat Flow(s),veh/h/ln	1781	0	0	1715	0	0	1701	0	1739	1714	0	1769
Q Serve(g_s), s	0.0	0.0	0.0	0.3	0.0	0.0	2.5	0.0	6.1	0.2	0.0	5.6
Cycle Q Clear(g_c), s	4.2	0.0	0.0	4.4	0.0	0.0	2.5	0.0	6.1	0.2	0.0	5.6
Prop In Lane	0.08		0.00	0.27		0.04	1.00		0.15	1.00		0.05
Lane Grp Cap(c), veh/h	291	0		295	0	0	729	0	1046	650	0	943
V/C Ratio(X)	0.49	0.00		0.50	0.00	0.00	0.26	0.00	0.36	0.02	0.00	0.34
Avail Cap(c_a), veh/h	551	0		535	0	0	795	0	1046	790	0	943
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	22.9	0.0	0.0	23.0	0.0	0.0	4.6	0.0	5.6	5.8	0.0	7.3
Incr Delay (d2), s/veh	1.3	0.0	0.0	1.3	0.0	0.0	0.2	0.0	1.0	0.0	0.0	1.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.8	0.0	0.0	1.9	0.0	0.0	0.6	0.0	1.8	0.0	0.0	2.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	24.2	0.0	0.0	24.4	0.0	0.0	4.8	0.0	6.6	5.8	0.0	8.3
LnGrp LOS	C	A		C	A	A	A	A	A	A	A	A
Approach Vol, veh/h		143	A		149			569			327	
Approach Delay, s/veh		24.2			24.4			6.0			8.2	
Approach LOS		C			C			A			A	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	5.1	38.1		11.8	8.9	34.3		11.8				
Change Period (Y+Rc), s	4.5	5.0		5.0	4.5	5.0		5.0				
Max Green Setting (Gmax), s	5.1	20.4		15.0	6.5	19.0		15.0				
Max Q Clear Time (g_c+I1), s	2.2	8.1		6.2	4.5	7.6		6.4				
Green Ext Time (p_c), s	0.0	1.8		0.4	0.1	1.5		0.5				

Intersection Summary			
HCM 6th Ctrl Delay		11.1	
HCM 6th LOS		B	

Notes

Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	30	45	30	15	55	20	15	130	25	45	135	20
Future Volume (vph)	30	45	30	15	55	20	15	130	25	45	135	20
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
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		0.961			0.971			0.980			0.987	
Flt Protected		0.986			0.992			0.996			0.989	
Satd. Flow (prot)	0	1706	0	0	1714	0	0	1730	0	0	1734	0
Flt Permitted		0.986			0.992			0.996			0.989	
Satd. Flow (perm)	0	1706	0	0	1714	0	0	1730	0	0	1734	0
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		1313			1117			1098			1099	
Travel Time (s)		35.8			30.5			29.9			30.0	
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Heavy Vehicles (%)	0%	0%	0%	7%	0%	0%	0%	2%	0%	0%	2%	0%
Adj. Flow (vph)	34	51	34	17	62	22	17	146	28	51	152	22
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	119	0	0	101	0	0	191	0	0	225	0
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 39.1%		ICU Level of Service A	
Analysis Period (min) 15			

Intersection	
Int Delay, s/veh	9.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	30	45	30	15	55	20	15	130	25	45	135	20
Future Vol, veh/h	30	45	30	15	55	20	15	130	25	45	135	20
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
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	89	89	89	89	89	89	89	89	89	89	89	89
Heavy Vehicles, %	0	0	0	7	0	0	0	2	0	0	2	0
Mvmt Flow	34	51	34	17	62	22	17	146	28	51	152	22

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	84	0	0	85	0	0	330	254	68	330	260	73
Stage 1	-	-	-	-	-	-	136	136	-	107	107	-
Stage 2	-	-	-	-	-	-	194	118	-	223	153	-
Critical Hdwy	4.1	-	-	4.17	-	-	7.1	6.52	6.2	7.1	6.52	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.52	-	6.1	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.52	-	6.1	5.52	-
Follow-up Hdwy	2.2	-	-	2.263	-	-	3.5	4.018	3.3	3.5	4.018	3.3
Pot Cap-1 Maneuver	1526	-	-	1481	-	-	627	650	1001	627	645	995
Stage 1	-	-	-	-	-	-	872	784	-	903	807	-
Stage 2	-	-	-	-	-	-	812	798	-	784	771	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1526	-	-	1481	-	-	485	627	1001	487	622	995
Mov Cap-2 Maneuver	-	-	-	-	-	-	485	627	-	487	622	-
Stage 1	-	-	-	-	-	-	852	766	-	882	797	-
Stage 2	-	-	-	-	-	-	635	788	-	603	753	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	2.1	1.2	12.9	14.4
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	646	1526	-	-	1481	-	-	607
HCM Lane V/C Ratio	0.296	0.022	-	-	0.011	-	-	0.37
HCM Control Delay (s)	12.9	7.4	0	-	7.5	0	-	14.4
HCM Lane LOS	B	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	1.2	0.1	-	-	0	-	-	1.7

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	40	20	1	15	1	15	1	1	1	1	1
Future Volume (vph)	5	40	20	1	15	1	15	1	1	1	1	1
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
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		0.959			0.994			0.994			0.955	
Flt Protected		0.996			0.998			0.957			0.984	
Satd. Flow (prot)	0	1719	0	0	1786	0	0	1712	0	0	1691	0
Flt Permitted		0.996			0.998			0.957			0.984	
Satd. Flow (perm)	0	1719	0	0	1786	0	0	1712	0	0	1691	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1351			1587			1244			742	
Travel Time (s)		30.7			36.1			28.3			16.9	
Peak Hour Factor	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	7	54	27	1	20	1	20	1	1	1	1	1
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	88	0	0	22	0	0	22	0	0	3	0
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 15.2%		ICU Level of Service A	
Analysis Period (min) 15			

Intersection	
Int Delay, s/veh	2.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	5	40	20	1	15	1	15	1	1	1	1	1
Future Vol, veh/h	5	40	20	1	15	1	15	1	1	1	1	1
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
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	74	74	74	74	74	74	74	74	74	74	74	74
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	7	54	27	1	20	1	20	1	1	1	1	1

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	21	0	0	81	0	0	106	105	68	106	118	21
Stage 1	-	-	-	-	-	-	82	82	-	23	23	-
Stage 2	-	-	-	-	-	-	24	23	-	83	95	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1608	-	-	1529	-	-	878	789	1001	878	776	1062
Stage 1	-	-	-	-	-	-	931	831	-	1000	880	-
Stage 2	-	-	-	-	-	-	999	880	-	930	820	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1608	-	-	1529	-	-	872	784	1001	872	771	1062
Mov Cap-2 Maneuver	-	-	-	-	-	-	872	784	-	872	771	-
Stage 1	-	-	-	-	-	-	926	827	-	995	879	-
Stage 2	-	-	-	-	-	-	995	879	-	923	816	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.6	0.4	9.2	9.1
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	873	1608	-	-	1529	-	-	886
HCM Lane V/C Ratio	0.026	0.004	-	-	0.001	-	-	0.005
HCM Control Delay (s)	9.2	7.2	0	-	7.4	0	-	9.1
HCM Lane LOS	A	A	A	-	A	A	-	A
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	5	15	20	125	145	15
Future Volume (vph)	5	15	20	125	145	15
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.884		0.987	
Flt Protected		0.988			0.957	
Satd. Flow (prot)	0	1778	1477	0	1599	0
Flt Permitted		0.988			0.957	
Satd. Flow (perm)	0	1778	1477	0	1599	0
Link Speed (mph)		25	25		30	
Link Distance (ft)		1004	963		5313	
Travel Time (s)		27.4	26.3		120.8	
Peak Hour Factor	0.78	0.78	0.78	0.78	0.78	0.78
Heavy Vehicles (%)	0%	0%	6%	8%	7%	0%
Adj. Flow (vph)	6	19	26	160	186	19
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	25	186	0	205	0
Sign Control		Free	Free		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 25.4%		ICU Level of Service A	
Analysis Period (min) 15			

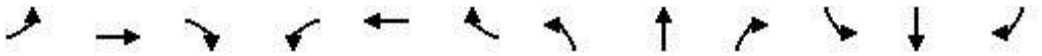
Intersection	
Int Delay, s/veh	5.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	5	15	20	125	145	15
Future Vol, veh/h	5	15	20	125	145	15
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	78	78	78	78	78	78
Heavy Vehicles, %	0	0	6	8	7	0
Mvmt Flow	6	19	26	160	186	19

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	186	0	-	0	137	106
Stage 1	-	-	-	-	106	-
Stage 2	-	-	-	-	31	-
Critical Hdwy	4.1	-	-	-	6.47	6.2
Critical Hdwy Stg 1	-	-	-	-	5.47	-
Critical Hdwy Stg 2	-	-	-	-	5.47	-
Follow-up Hdwy	2.2	-	-	-	3.563	3.3
Pot Cap-1 Maneuver	1401	-	-	-	845	954
Stage 1	-	-	-	-	906	-
Stage 2	-	-	-	-	979	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1401	-	-	-	842	954
Mov Cap-2 Maneuver	-	-	-	-	842	-
Stage 1	-	-	-	-	902	-
Stage 2	-	-	-	-	979	-

Approach	EB	WB	SB
HCM Control Delay, s	1.9	0	10.6
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1401	-	-	-	851
HCM Lane V/C Ratio	0.005	-	-	-	0.241
HCM Control Delay (s)	7.6	0	-	-	10.6
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.9



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	15	50	15	15	70	95	15	80	40	65	55	10
Future Volume (vph)	15	50	15	15	70	95	15	80	40	65	55	10
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
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		0.974			0.929			0.960			0.990	
Flt Protected		0.991			0.996			0.994			0.976	
Satd. Flow (prot)	0	1716	0	0	1631	0	0	1640	0	0	1689	0
Flt Permitted		0.991			0.996			0.994			0.976	
Satd. Flow (perm)	0	1716	0	0	1631	0	0	1640	0	0	1689	0
Link Speed (mph)		45			40			30			30	
Link Distance (ft)		807			813			5313			2460	
Travel Time (s)		12.2			13.9			120.8			55.9	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	0%	2%	0%	7%	4%	0%	0%	8%	0%	0%	7%	0%
Adj. Flow (vph)	17	56	17	17	78	106	17	89	44	72	61	11
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	90	0	0	201	0	0	150	0	0	144	0
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 33.1%		ICU Level of Service A	
Analysis Period (min) 15			

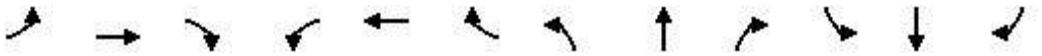
Intersection	
Int Delay, s/veh	6.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	15	50	15	15	70	95	15	80	40	65	55	10
Future Vol, veh/h	15	50	15	15	70	95	15	80	40	65	55	10
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
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	0	2	0	7	4	0	0	8	0	0	7	0
Mvmt Flow	17	56	17	17	78	106	17	89	44	72	61	11

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	184	0	0	73	0	0	300	317	65	330	272	131
Stage 1	-	-	-	-	-	-	99	99	-	165	165	-
Stage 2	-	-	-	-	-	-	201	218	-	165	107	-
Critical Hdwy	4.1	-	-	4.17	-	-	7.1	6.58	6.2	7.1	6.57	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.58	-	6.1	5.57	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.58	-	6.1	5.57	-
Follow-up Hdwy	2.2	-	-	2.263	-	-	3.5	4.072	3.3	3.5	4.063	3.3
Pot Cap-1 Maneuver	1403	-	-	1496	-	-	656	589	1005	627	626	924
Stage 1	-	-	-	-	-	-	912	802	-	842	752	-
Stage 2	-	-	-	-	-	-	805	712	-	842	797	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1403	-	-	1496	-	-	587	574	1005	518	610	924
Mov Cap-2 Maneuver	-	-	-	-	-	-	587	574	-	518	610	-
Stage 1	-	-	-	-	-	-	900	792	-	831	742	-
Stage 2	-	-	-	-	-	-	720	703	-	705	787	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.4	0.6	12.1	13.4
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	659	1403	-	-	1496	-	-	574
HCM Lane V/C Ratio	0.228	0.012	-	-	0.011	-	-	0.252
HCM Control Delay (s)	12.1	7.6	0	-	7.4	0	-	13.4
HCM Lane LOS	B	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	0.9	0	-	-	0	-	-	1



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1	5	1	20	5	190	1	40	5	165	105	16
Future Volume (vph)	1	5	1	20	5	190	1	40	5	165	105	16
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	0		0	80		0	50		0	80		0
Storage Lanes	0		0	1		0	1		0	1		0
Taper Length (ft)	25			40			60			60		
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		0.981			0.854			0.984			0.980	
Flt Protected		0.993		0.950			0.950			0.950		
Satd. Flow (prot)	0	1594	0	1710	1508	0	1710	1480	0	1676	1647	0
Flt Permitted		0.993		0.950			0.950			0.950		
Satd. Flow (perm)	0	1594	0	1710	1508	0	1710	1480	0	1676	1647	0
Link Speed (mph)		25			35			45			45	
Link Distance (ft)		2694			2873			1930			987	
Travel Time (s)		73.5			56.0			29.2			15.0	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Heavy Vehicles (%)	0%	14%	0%	0%	0%	2%	0%	22%	0%	2%	5%	21%
Adj. Flow (vph)	1	5	1	22	5	204	1	43	5	177	113	17
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	7	0	22	209	0	1	48	0	177	130	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 35.7%		ICU Level of Service A	
Analysis Period (min) 15			

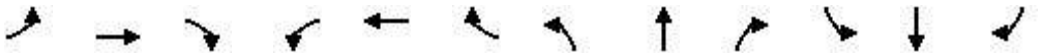
Intersection	
Int Delay, s/veh	6.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	1	5	1	20	5	190	1	40	5	165	105	16
Future Vol, veh/h	1	5	1	20	5	190	1	40	5	165	105	16
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	80	-	-	50	-	-	80	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	93	93	93	93	93	93	93	93	93
Heavy Vehicles, %	0	14	0	0	0	2	0	22	0	2	5	21
Mvmt Flow	1	5	1	22	5	204	1	43	5	177	113	17

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	628	526	122	527	532	46	130	0	0	48	0	0
Stage 1	476	476	-	48	48	-	-	-	-	-	-	-
Stage 2	152	50	-	479	484	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.64	6.2	7.1	6.5	6.22	4.1	-	-	4.12	-	-
Critical Hdwy Stg 1	6.1	5.64	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.64	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4.126	3.3	3.5	4	3.318	2.2	-	-	2.218	-	-
Pot Cap-1 Maneuver	398	440	935	465	456	1023	1468	-	-	1559	-	-
Stage 1	574	537	-	971	859	-	-	-	-	-	-	-
Stage 2	855	830	-	571	555	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	288	389	935	419	404	1023	1468	-	-	1559	-	-
Mov Cap-2 Maneuver	288	389	-	419	404	-	-	-	-	-	-	-
Stage 1	573	476	-	970	858	-	-	-	-	-	-	-
Stage 2	679	829	-	500	492	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	14.1	10	0.2	4.4
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	1468	-	-	402	419	984	1559	-	-
HCM Lane V/C Ratio	0.001	-	-	0.019	0.051	0.213	0.114	-	-
HCM Control Delay (s)	7.5	-	-	14.1	14.1	9.6	7.6	-	-
HCM Lane LOS	A	-	-	B	B	A	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.1	0.2	0.8	0.4	-	-



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	15	0	105	45	435	0	0	470	110
Future Volume (vph)	0	0	0	15	0	105	45	435	0	0	470	110
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	0		0	0		150	80		0	0		0
Storage Lanes	0		0	0		1	1		0	0		1
Taper Length (ft)	25			25			60			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
Flt Protected					0.950		0.950					
Satd. Flow (prot)	0	0	0	0	1598	1457	1710	1748	0	0	1765	1500
Flt Permitted					0.950		0.950					
Satd. Flow (perm)	0	0	0	0	1598	1457	1710	1748	0	0	1765	1500
Link Speed (mph)		50			50			45			45	
Link Distance (ft)		1104			1070			1072			1043	
Travel Time (s)		15.1			14.6			16.2			15.8	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles (%)	0%	0%	0%	7%	0%	5%	0%	3%	0%	0%	2%	2%
Adj. Flow (vph)	0	0	0	16	0	112	48	463	0	0	500	117
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	16	112	48	463	0	0	500	117
Sign Control		Free			Stop			Free			Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization	42.8%	ICU Level of Service	A
Analysis Period (min)	15		

Intersection	
Int Delay, s/veh	0.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	15	0	105	45	435	0	0	470	110
Future Vol, veh/h	0	0	0	15	0	105	45	435	0	0	470	110
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	Free	-	-	None	-	-	None
Storage Length	-	-	-	-	-	150	80	-	-	-	-	0
Veh in Median Storage, #	-	1	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	94	94	94	94	94	94	94	94	94	94	94	94
Heavy Vehicles, %	0	0	0	7	0	5	0	3	0	0	2	2
Mvmt Flow	0	0	0	16	0	112	48	463	0	0	500	117

Major/Minor	Minor1			Major1			Major2		
Conflicting Flow All	1118	1176	-	617	0	-	-	-	0
Stage 1	559	559	-	-	-	-	-	-	-
Stage 2	559	617	-	-	-	-	-	-	-
Critical Hdwy	6.47	6.5	-	4.1	-	-	-	-	-
Critical Hdwy Stg 1	5.47	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.47	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.563	4	-	2.2	-	-	-	-	-
Pot Cap-1 Maneuver	224	193	0	973	-	0	0	-	-
Stage 1	563	514	0	-	-	0	0	-	-
Stage 2	563	484	0	-	-	0	0	-	-
Platoon blocked, %					-			-	-
Mov Cap-1 Maneuver	213	0	-	973	-	-	-	-	-
Mov Cap-2 Maneuver	213	0	-	-	-	-	-	-	-
Stage 1	535	0	-	-	-	-	-	-	-
Stage 2	563	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	23.3	0.8	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	WBLn1	WBLn2	SBT	SBR
Capacity (veh/h)	973	-	213	-	-	-
HCM Lane V/C Ratio	0.049	-	0.075	-	-	-
HCM Control Delay (s)	8.9	-	23.3	0	-	-
HCM Lane LOS	A	-	C	A	-	-
HCM 95th %tile Q(veh)	0.2	-	0.2	-	-	-

HCS7 Two-Way Stop-Control Text Report

TWO-WAY STOP CONTROL (TWSC) Analysis

File Name:	2022EC_PM_SD37_I-90 EB RTI.xtw
Analyst:	HDR
Agency:	HDR
Date Performed:	11/1/2021
Time Analyzed:	2022 EBC - PM Peak
Jurisdiction:	SDDOT
Analysis Year:	2022
Project Description:	Mitchell MTP
Units:	U.S. Customary
Intersection Name:	SD37 & I-90 EB RTI
Major Street Direction:	North-South
East/West Street Name:	I-90 EB RTI
North/South Street Name:	SD37 / Ohlman Street
Analysis Time Period (hrs):	0.25

Vehicle Volumes and Adjustments

Major Street:									
Approach		NorthBound					SouthBound		
Movement	1U	1	2	3	4U		4	5	6
	U	L	T	R	U		L	T	R
Volume			390	30			155	330	
Peak Hour Factor, PHF					0.93				
Hourly Flow Rtae, HFR			419	32			167	355	
Percent Heavy Vehicles							4		
Number of Lanes	0	0	1	0		0	1	1	0
Lane Configuration				TR			L	T	
Median Type					Undivided				
Median Storage									
RT channelized?									
Left-Turn Lane Storage									
Upstream Signal?					Not Present				

Minor Street:							
Approach	WestBound				EastBound		
Movement	7	8	9		10	11	12
	L	T	R		L	T	R
Volume					90	0	35
Peak Hour Factor, PHF				0.93			
Hourly Flow Rtae, HFR					97	0	38
Percent Heavy Vehicles					8	0	6
Number of Lanes	0	0	0		0	1	0
Lane Configuration						LTR	
RT channelized?							
Flared Approach | Storage		|			No |	
Percent Grade						0	

Pedestrian Volumes and Adjustments

Approach	NB	SB	WB	EB
Movement	13	14	15	16
Flow (ped/hr)	0	0		0
Lane Width (ft)				
Walking Speed (ft/sec)				
Pedestrian Blockage Factor, f_pb				

Delay, Queue Length, and Level of Service

Approach	NB		SB		WestBound			EastBound		
Movement	1U	1	4U	4	7	8	9	10	11	12
Lane Configuration				L					LTR	
Flow Rate				167					134	
Lane Capacity				1098					200	
v/c				0.15					0.67	
95% Queue Length				0.5					4.1	
Control Delay				8.9					53.4	
LOS				A					F	
Approach Delay				2.8					53.4	
Approach LOS									F	
Intersction Delay	7.8									

Step 1: MOVEMENT PRIORITIES

Major Street:									
Approach		NorthBound					SouthBound		
Priority	1U	1	2	3	4U		4	5	6
Movement	U	L	T	R	U		L	T	R

Minor Street:

Approach	WestBound			EastBound		
Priority	7	8	9	10	11	12
Movement	L	T	R	L	T	R

Step 2: MOVEMENT DEMAND VOLUMES AND FLOW RATES

Major Street:

Approach	NorthBound				SouthBound			
Movement	1U	1	2	3	4U	4	5	6
	U	L	T	R	U	L	T	R
Volume, V_x			390	30		155	330	
Flow Rate, v_x			419	32		167	355	

Minor Street:

Approach	WestBound			EastBound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume, V_x				90	0	35
Flow Rate, v_x				97	0	38

Step 3: CONFLICTING FLOW RATES

Major Street:

Approach	NorthBound				SouthBound			
Movement	1U	1	2	3	4U	4	5	6
	U	L	T	R	U	L	T	R
Flow Rate, v_x			419	32		167	355	
Conflicting Flow, v_c,x						452		

Minor Street:

Approach	WestBound			EastBound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Flow Rate, v_x				97	0	38
Conflicting Flow, v_c,x				1124	1140	355

Step 4: CRITICAL HEADWAYS and FOLLOW-UP HEADWAYS

CRITICAL HEADWAYS

Approach	NB		SB		WestBound			EastBound		
Movement	1U	1	4U	4	7	8	9	10	11	12
	U	L	U	L	L	T	R	L	T	R
t_c,base										
Single Stage				4.1				7.1	6.5	6.2
Stage I										
Stage II										
t_c,HV				1.0				1.0	1.0	1.0
P_HV				0.04				0.08	0.00	0.06
t_c,G								0.2	0.2	0.1
G								0	0	0
t_3,LT				0.0				0.0	0.0	0.0
t_c										
Single Stage				4.14				7.18	6.50	6.26
Stage I										
Stage II										

FOLLOW-UP HEADWAYS

Approach	NB		SB		WestBound			EastBound		
Movement	1U	1	4U	4	7	8	9	10	11	12
	U	L	U	L	L	T	R	L	T	R
t_f,base				2.2				3.5	4.0	3.3
t_f,HV				0.9				0.9	0.9	0.9
P_HV				0.04				0.08	0.00	0.06
t_f				2.24				3.57	4.00	3.35

Step 5: POTENTIAL CAPACITIES

NO UPSTREAM SIGNAL EFFECTS PRESENT

Approach	NB		SB		WestBound			EastBound		
Movement	1U	1	4U	4	7	8	9	10	11	12
	U	L	U	L	L	T	R	L	T	R
v_c,x				452				1124	1140	355
t_c,x				4.14				7.18	6.50	6.26
t_f,x				2.24				3.57	4.00	3.35
c_p,x				1098				178	203	680

Steps 6 - 9: MOVEMENT CAPACITIES

Pedestrian Impedance				
Approach	NB	SB	WB	EB

Movement	13	14	15	16
Pedestrian Flow Rate v_x	0	0		0
Lane Width, w				
Walking Speed, S_p				
Pedestrian Blockage Factor, f_pb				

Major-Street Left-Turn Movements		1	4
Conflicting Flow, v_c,x			452
Potential Capacity, c_p,x			1098
Pedestrian Impedance Factor, p_p,x			1.000
Movement Capacity, c_m,x			1098
Probability of Queue-free State, p_0,j			0.848
Major L-Shared Probability Queue-free State, p*_0,j			1.000

Minor-Street Right-Turn Movements		9	12
Conflicting Flow, v_c,x			355
Potential Capacity, c_p,x			680
Pedestrian Impedance Factor, p_p,x			1.000
Movement Capacity, c_m,x			680
Probability of Queue-free State, p_0,j			0.945

Major-Street U-Turn Movements		1U	4U
Conflicting Flow, v_c,x			
Potential Capacity, c_p,x			
Capacity Adjustment Factor, f_x			
Movement Capacity, c_m,x			
Shared L/U Capacity, c_SH			
Probability of Queue-free State, p_0,j			

Minor-Street Through Movements		8	11
Conflicting Flow, v_c,x			1140
Potential Capacity, c_p,x			203
Pedestrian Impedance Factor, p_p,x			1.000
Capacity Adjustment Factor, f_x			0.848
Movement Capacity, c_m,x			172
Probability of Queue-free State, p_0,j			1.000

Minor-Street Left-Turn Movements		7	10
Conflicting Flow, v_c,x			1124
Potential Capacity, c_p,x			178
Pedestrian Impedance Factor, p_p,x			1.000
Major L, Minor T Adjusted Impedance Factor, p"			0.848
Major L, Minor T Impedance Factor, p'			0.884
Capacity Adjustment Factor, f_x			0.884
Movement Capacity, c_m,x			157

Step 10: FINAL CAPACITY ADJUSTMENTS

SHARED-LANE CAPACITY OF MINOR STREET APPROACHES

Approach	WestBound			EastBound		
Movement	7	8	9	10	11	12
Lane Configuration					LTR	
Shared Flow Rate, v_y					134	
Movement Capacity, c_m,x				157	172	680
Shared Capacity, c_SH					200	

Step 11: CONTROL DELAY

CONTROL DELAY TO RANK 2 THROUGH 4 MOVEMENTS

Approach	NB			SB		WestBound		EastBound		
Movement	1U	1	4U	4	7	8	9	10	11	12
Flow Rate				167				97	0	38
Movement Capacity				1098				157	172	680
Lane Configuration				L					LTR	
Shared Capacity									200	
Control Delay				8.9					53.4	

Steps 12 - 13: APPROACH/INTERSECTION CONTROL DELAY and 95% QUEUE LENGTHS

Approach	NB			SB		WestBound		EastBound		
Movement	1U	1	4U	4	7	8	9	10	11	12
Lane Configuration				L					LTR	
Flow Rate				167					134	
Lane Capacity				1098					200	
v/c				0.15					0.67	
95% Queue Length				0.5					4.1	
Control Delay				8.9					53.4	

LOS		A	F
Approach Delay		2.8	53.4
Approach LOS			F
Intersction Delay	7.8		

This TWSC text report was created in HCS™ TWSC Version 7.9 on 11/1/2021 3:19:20 PM

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	20	130	10	20	15	60	185	15	15	140	5
Future Volume (vph)	10	20	130	10	20	15	60	185	15	15	140	5
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	0		0	0		0	150		0	0		0
Storage Lanes	0		0	0		0	1		0	0		0
Taper Length (ft)	25			25			105			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	0.95	0.95
Frt		0.890			0.955			0.989			0.995	
Flt Protected		0.997			0.989		0.950				0.995	
Satd. Flow (prot)	0	1566	0	0	1667	0	1676	3316	0	0	3319	0
Flt Permitted		0.997			0.989		0.950				0.995	
Satd. Flow (perm)	0	1566	0	0	1667	0	1676	3316	0	0	3319	0
Link Speed (mph)		40			40			65			65	
Link Distance (ft)		2897			2749			1385			1493	
Travel Time (s)		49.4			46.9			14.5			15.7	
Peak Hour Factor	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72
Adj. Flow (vph)	14	28	181	14	28	21	83	257	21	21	194	7
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	223	0	0	63	0	83	278	0	0	222	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 31.5%		ICU Level of Service A	
Analysis Period (min) 15			

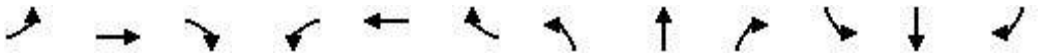
Intersection	
Int Delay, s/veh	5.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	10	20	130	10	20	15	60	185	15	15	140	5
Future Vol, veh/h	10	20	130	10	20	15	60	185	15	15	140	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	150	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	72	72	72	72	72	72	72	72	72	72	72	72
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	14	28	181	14	28	21	83	257	21	21	194	7

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	549	684	101	587	677	139	201	0	0	278	0	0
Stage 1	240	240	-	434	434	-	-	-	-	-	-	-
Stage 2	309	444	-	153	243	-	-	-	-	-	-	-
Critical Hdwy	7.54	6.54	6.94	7.54	6.54	6.94	4.14	-	-	4.14	-	-
Critical Hdwy Stg 1	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.52	4.02	3.32	3.52	4.02	3.32	2.22	-	-	2.22	-	-
Pot Cap-1 Maneuver	419	370	935	393	373	884	1368	-	-	1282	-	-
Stage 1	742	706	-	570	579	-	-	-	-	-	-	-
Stage 2	676	574	-	834	703	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	361	341	935	280	344	884	1368	-	-	1282	-	-
Mov Cap-2 Maneuver	361	341	-	280	344	-	-	-	-	-	-	-
Stage 1	697	693	-	535	544	-	-	-	-	-	-	-
Stage 2	588	539	-	634	690	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	12.4	15.5	1.8	0.8
HCM LOS	B	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1368	-	-	710	406	1282	-	-
HCM Lane V/C Ratio	0.061	-	-	0.313	0.154	0.016	-	-
HCM Control Delay (s)	7.8	-	-	12.4	15.5	7.9	0.1	-
HCM Lane LOS	A	-	-	B	C	A	A	-
HCM 95th %tile Q(veh)	0.2	-	-	1.3	0.5	0.1	-	-



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1	1	25	5	5	5	40	270	15	10	255	1
Future Volume (vph)	1	1	25	5	5	5	40	270	15	10	255	1
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	0		0	0		0	80		0	0		0
Storage Lanes	0		0	0		0	1		0	0		0
Taper Length (ft)	25			25			60			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	0.95	0.95
Frt		0.873			0.955			0.992				
Flt Protected		0.999			0.984		0.950				0.998	
Satd. Flow (prot)	0	1539	0	0	1658	0	1676	3326	0	0	3346	0
Flt Permitted		0.999			0.984		0.950				0.998	
Satd. Flow (perm)	0	1539	0	0	1658	0	1676	3326	0	0	3346	0
Link Speed (mph)		25			40			45			55	
Link Distance (ft)		1010			1235			1455			1882	
Travel Time (s)		27.5			21.1			22.0			23.3	
Peak Hour Factor	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78
Adj. Flow (vph)	1	1	32	6	6	6	51	346	19	13	327	1
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	34	0	0	18	0	51	365	0	0	341	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 29.5%		ICU Level of Service A	
Analysis Period (min) 15			

Intersection	
Int Delay, s/veh	1.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	1	1	25	5	5	5	40	270	15	10	255	1
Future Vol, veh/h	1	1	25	5	5	5	40	270	15	10	255	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	80	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	78	78	78	78	78	78	78	78	78	78	78	78
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	1	1	32	6	6	6	51	346	19	13	327	1

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	632	821	164	648	812	183	328	0	0	365	0	0
Stage 1	354	354	-	458	458	-	-	-	-	-	-	-
Stage 2	278	467	-	190	354	-	-	-	-	-	-	-
Critical Hdwy	7.54	6.54	6.94	7.54	6.54	6.94	4.14	-	-	4.14	-	-
Critical Hdwy Stg 1	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.52	4.02	3.32	3.52	4.02	3.32	2.22	-	-	2.22	-	-
Pot Cap-1 Maneuver	365	308	852	355	312	828	1228	-	-	1190	-	-
Stage 1	636	629	-	552	565	-	-	-	-	-	-	-
Stage 2	705	560	-	794	629	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	342	291	852	327	295	828	1228	-	-	1190	-	-
Mov Cap-2 Maneuver	342	291	-	327	295	-	-	-	-	-	-	-
Stage 1	609	621	-	529	541	-	-	-	-	-	-	-
Stage 2	663	536	-	753	621	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	10	14.7	1	0.3
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1228	-	-	756	392	1190	-	-
HCM Lane V/C Ratio	0.042	-	-	0.046	0.049	0.011	-	-
HCM Control Delay (s)	8.1	-	-	10	14.7	8.1	0	-
HCM Lane LOS	A	-	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0.1	0.2	0	-	-

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	20	30	125	25	45	30	150	330	30	20	350	20
Future Volume (vph)	20	30	125	25	45	30	150	330	30	20	350	20
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	0		50	0		0	100		0	100		0
Storage Lanes	0		1	0		0	1		0	1		0
Taper Length (ft)	25			25			220			290		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt			0.850		0.959			0.988			0.992	
Flt Protected		0.980			0.988		0.950			0.950		
Satd. Flow (prot)	0	1729	1500	0	1672	0	1676	3313	0	1676	3326	0
Flt Permitted		0.980			0.988		0.950			0.950		
Satd. Flow (perm)	0	1729	1500	0	1672	0	1676	3313	0	1676	3326	0
Link Speed (mph)		40			25			35			35	
Link Distance (ft)		1380			1122			778			1516	
Travel Time (s)		23.5			30.6			15.2			29.5	
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Adj. Flow (vph)	24	36	151	30	54	36	181	398	36	24	422	24
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	60	151	0	120	0	181	434	0	24	446	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 42.2%		ICU Level of Service A	
Analysis Period (min) 15			

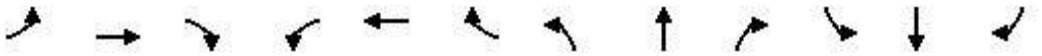
Intersection	
Int Delay, s/veh	11.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	20	30	125	25	45	30	150	330	30	20	350	20
Future Vol, veh/h	20	30	125	25	45	30	150	330	30	20	350	20
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	50	-	-	-	100	-	-	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	83	83	83	83	83	83	83	83	83	83	83	83
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	24	36	151	30	54	36	181	398	36	24	422	24

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1070	1278	223	1055	1272	217	446	0	0	434	0	0
Stage 1	482	482	-	778	778	-	-	-	-	-	-	-
Stage 2	588	796	-	277	494	-	-	-	-	-	-	-
Critical Hdwy	7.54	6.54	6.94	7.54	6.54	6.94	4.14	-	-	4.14	-	-
Critical Hdwy Stg 1	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.52	4.02	3.32	3.52	4.02	3.32	2.22	-	-	2.22	-	-
Pot Cap-1 Maneuver	175	165	780	180	166	787	1111	-	-	1122	-	-
Stage 1	534	552	-	355	405	-	-	-	-	-	-	-
Stage 2	462	397	-	706	545	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	100	135	780	100	136	787	1111	-	-	1122	-	-
Mov Cap-2 Maneuver	100	135	-	100	136	-	-	-	-	-	-	-
Stage 1	447	540	-	297	339	-	-	-	-	-	-	-
Stage 2	310	332	-	520	534	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	25.8	73.3	2.6	0.4
HCM LOS	D	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1111	-	-	118	780	162	1122	-	-
HCM Lane V/C Ratio	0.163	-	-	0.511	0.193	0.744	0.021	-	-
HCM Control Delay (s)	8.9	-	-	63.7	10.7	73.3	8.3	-	-
HCM Lane LOS	A	-	-	F	B	F	A	-	-
HCM 95th %tile Q(veh)	0.6	-	-	2.4	0.7	4.6	0.1	-	-

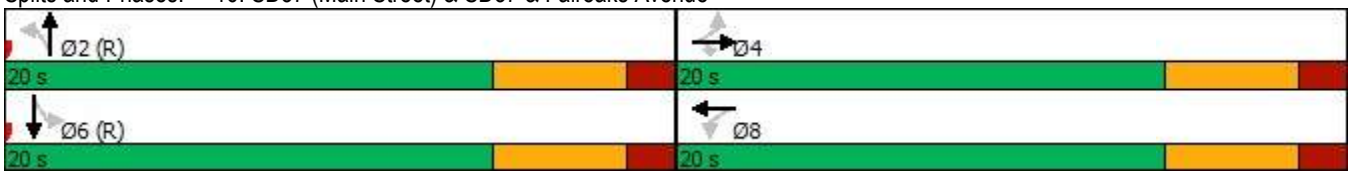


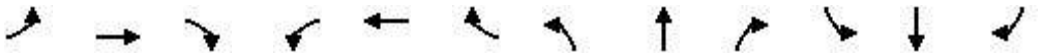
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	190	65	85	10	40	20	95	300	10	60	260	180
Future Volume (vph)	190	65	85	10	40	20	95	300	10	60	260	180
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	155		0	100		0	100		0	100		0
Storage Lanes	1		1	1		0	1		0	1		0
Taper Length (ft)	130			65			130			125		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt			0.850		0.951			0.995			0.939	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1676	1765	1500	1676	1678	0	1676	3336	0	1676	3148	0
Flt Permitted	0.713			0.709			0.471			0.543		
Satd. Flow (perm)	1258	1765	1500	1251	1678	0	831	3336	0	958	3148	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			96		22			9			202	
Link Speed (mph)		40			25			30			35	
Link Distance (ft)		1120			746			1311			778	
Travel Time (s)		19.1			20.3			29.8			15.2	
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Adj. Flow (vph)	213	73	96	11	45	22	107	337	11	67	292	202
Shared Lane Traffic (%)												
Lane Group Flow (vph)	213	73	96	11	67	0	107	348	0	67	494	0
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Detector Phase	4	4	4	8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	15.5	15.5	15.5	15.5	15.5		15.5	15.5		15.5	15.5	
Total Split (s)	20.0	20.0	20.0	20.0	20.0		20.0	20.0		20.0	20.0	
Total Split (%)	50.0%	50.0%	50.0%	50.0%	50.0%		50.0%	50.0%		50.0%	50.0%	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	1.5	1.5	1.5	1.5	1.5		1.5	1.5		1.5	1.5	
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 Optimize?												
Recall Mode	Max	Max	Max	Min	Min		C-Max	C-Max		C-Max	C-Max	
Act Effct Green (s)	14.5	14.5	14.5	14.5	14.5		14.5	14.5		14.5	14.5	
Actuated g/C Ratio	0.36	0.36	0.36	0.36	0.36		0.36	0.36		0.36	0.36	
v/c Ratio	0.47	0.11	0.16	0.02	0.11		0.36	0.29		0.19	0.39	
Control Delay	14.0	9.1	3.5	8.5	7.0		13.5	9.6		10.6	6.5	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	14.0	9.1	3.5	8.5	7.0		13.5	9.6		10.6	6.5	
LOS	B	A	A	A	A		B	A		B	A	
Approach Delay		10.4			7.2			10.6			7.0	
Approach LOS		B			A			B			A	
Queue Length 50th (ft)	35	10	0	2	6		17	26		10	23	
Queue Length 95th (ft)	77	28	19	8	23		45	47		29	47	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Internal Link Dist (ft)		1040			666			1231			698	
Turn Bay Length (ft)	155			100			100			100		
Base Capacity (vph)	456	639	604	453	622		301	1215		347	1269	
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	0.47	0.11	0.16	0.02	0.11		0.36	0.29		0.19	0.39	

Intersection Summary			
Area Type:	Other		
Cycle Length: 40			
Actuated Cycle Length: 40			
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green			
Natural Cycle: 40			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.47			
Intersection Signal Delay: 9.0		Intersection LOS: A	
Intersection Capacity Utilization 53.5%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 16: SD37 (Main Street) & SD37 & Fairoaks Avenue





Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	190	65	85	10	40	20	95	300	10	60	260	180
Future Volume (veh/h)	190	65	85	10	40	20	95	300	10	60	260	180
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1772	1772	1772	1772	1772	1772	1772	1772	1772	1772	1772	1772
Adj Flow Rate, veh/h	213	73	0	11	45	22	107	337	11	67	292	0
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	628	642		625	407	199	508	1206	39	480	1220	
Arrive On Green	0.36	0.36	0.00	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.00
Sat Flow, veh/h	1334	1772	1502	1327	1124	549	1087	3327	108	1033	3455	0
Grp Volume(v), veh/h	213	73	0	11	0	67	107	170	178	67	292	0
Grp Sat Flow(s),veh/h/ln	1334	1772	1502	1327	0	1673	1087	1683	1752	1033	1683	0
Q Serve(g_s), s	5.0	1.1	0.0	0.2	0.0	1.1	3.0	2.9	2.9	2.0	2.4	0.0
Cycle Q Clear(g_c), s	6.1	1.1	0.0	1.3	0.0	1.1	5.5	2.9	2.9	4.8	2.4	0.0
Prop In Lane	1.00		1.00	1.00		0.33	1.00		0.06	1.00		0.00
Lane Grp Cap(c), veh/h	628	642		625	0	606	508	610	635	480	1220	
V/C Ratio(X)	0.34	0.11		0.02	0.00	0.11	0.21	0.28	0.28	0.14	0.24	
Avail Cap(c_a), veh/h	628	642		625	0	606	508	610	635	480	1220	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	10.5	8.5	0.0	8.9	0.0	8.5	10.8	9.0	9.0	10.8	8.9	0.0
Incr Delay (d2), s/veh	1.5	0.4	0.0	0.0	0.0	0.1	0.9	1.1	1.1	0.6	0.5	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.3	0.3	0.0	0.1	0.0	0.3	0.7	1.0	1.0	0.4	0.7	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	12.0	8.8	0.0	8.9	0.0	8.5	11.8	10.2	10.1	11.4	9.4	0.0
LnGrp LOS	B	A		A	A	A	B	B	B	B	A	
Approach Vol, veh/h		286	A		78			455			359	A
Approach Delay, s/veh		11.2			8.6			10.5			9.7	
Approach LOS		B			A			B			A	

Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		20.0		20.0		20.0		20.0				
Change Period (Y+Rc), s		5.5		5.5		5.5		5.5				
Max Green Setting (Gmax), s		14.5		14.5		14.5		14.5				
Max Q Clear Time (g_c+I1), s		7.5		8.1		6.8		3.3				
Green Ext Time (p_c), s		1.4		0.5		1.2		0.2				

Intersection Summary												
HCM 6th Ctrl Delay			10.3									
HCM 6th LOS			B									

Notes

Unsignalized Delay for [EBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	2	240	50	90	220	5	105	5	95	5	10	5
Future Volume (vph)	2	240	50	90	220	5	105	5	95	5	10	5
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	110		0	110		0	95		0	0		0
Storage Lanes	1		0	1		0	1		1	0		0
Taper Length (ft)	125			125			125			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		0.974			0.997				0.850		0.968	
Flt Protected	0.950			0.950			0.950				0.988	
Satd. Flow (prot)	1676	3266	0	1676	3343	0	1676	1765	1500	0	1688	0
Flt Permitted	0.950			0.950			0.950				0.988	
Satd. Flow (perm)	1676	3266	0	1676	3343	0	1676	1765	1500	0	1688	0
Link Speed (mph)		40			40			35			25	
Link Distance (ft)		1143			1120			993			528	
Travel Time (s)		19.5			19.1			19.3			14.4	
Peak Hour Factor	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78
Adj. Flow (vph)	3	308	64	115	282	6	135	6	122	6	13	6
Shared Lane Traffic (%)												
Lane Group Flow (vph)	3	372	0	115	288	0	135	6	122	0	25	0
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 36.8%		ICU Level of Service A	
Analysis Period (min) 15			

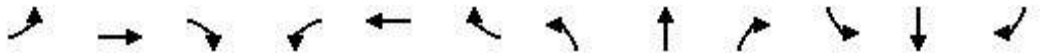
Intersection	
Int Delay, s/veh	6.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	2	240	50	90	220	5	105	5	95	5	10	5
Future Vol, veh/h	2	240	50	90	220	5	105	5	95	5	10	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
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	110	-	-	110	-	-	95	-	0	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	78	78	78	78	78	78	78	78	78	78	78	78
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	3	308	64	115	282	6	135	6	122	6	13	6

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	288	0	0	372	0	0	724	864	186	678	893	144
Stage 1	-	-	-	-	-	-	346	346	-	515	515	-
Stage 2	-	-	-	-	-	-	378	518	-	163	378	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	1271	-	-	1183	-	-	313	291	824	338	279	877
Stage 1	-	-	-	-	-	-	643	634	-	511	533	-
Stage 2	-	-	-	-	-	-	616	531	-	823	614	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1271	-	-	1183	-	-	276	262	824	261	251	877
Mov Cap-2 Maneuver	-	-	-	-	-	-	276	262	-	261	251	-
Stage 1	-	-	-	-	-	-	642	633	-	510	481	-
Stage 2	-	-	-	-	-	-	537	479	-	693	613	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	2.4	20.5	17.7
HCM LOS			C	C

Minor Lane/Major Mvmt	NBLn1	NBLn2	NBLn3	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	276	262	824	1271	-	-	1183	-	-	309
HCM Lane V/C Ratio	0.488	0.024	0.148	0.002	-	-	0.098	-	-	0.083
HCM Control Delay (s)	29.9	19.1	10.1	7.8	-	-	8.4	-	-	17.7
HCM Lane LOS	D	C	B	A	-	-	A	-	-	C
HCM 95th %tile Q(veh)	2.5	0.1	0.5	0	-	-	0.3	-	-	0.3

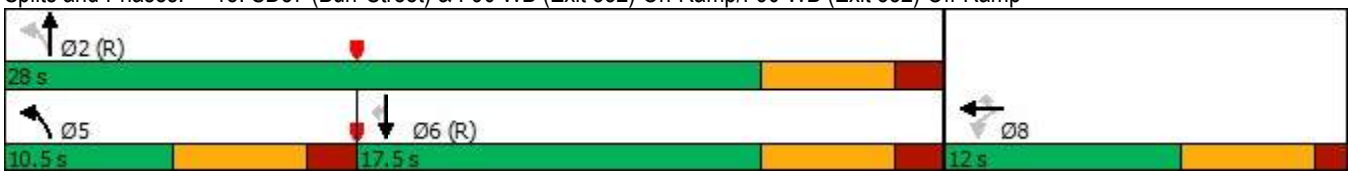


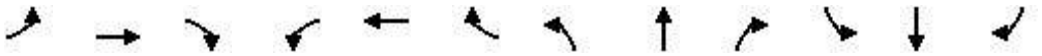
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	85	0	170	70	510	0	0	600	90
Future Volume (vph)	0	0	0	85	0	170	70	510	0	0	600	90
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	0		0	0		360	200		0	0		0
Storage Lanes	0		0	0		1	1		0	0		1
Taper Length (ft)	25			25			65			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt						0.850						0.850
Flt Protected					0.950		0.950					
Satd. Flow (prot)	0	0	0	0	1569	1378	1629	3226	0	0	3320	1430
Flt Permitted					0.950		0.284					
Satd. Flow (perm)	0	0	0	0	1569	1378	487	3226	0	0	3320	1430
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						218						205
Link Speed (mph)		50			50			35			35	
Link Distance (ft)		1127			1072			742			2179	
Travel Time (s)		15.4			14.6			14.5			42.4	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles (%)	0%	0%	0%	9%	0%	11%	5%	6%	0%	0%	3%	7%
Adj. Flow (vph)	0	0	0	90	0	181	74	543	0	0	638	96
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	90	181	74	543	0	0	638	96
Turn Type				Perm	NA	Perm	pm+pt	NA			NA	Perm
Protected Phases					8		5	2			6	
Permitted Phases				8		8	2					6
Detector Phase				8	8	8	5	2			6	6
Switch Phase												
Minimum Initial (s)				7.0	7.0	7.0	5.0	12.0			12.0	12.0
Minimum Split (s)				12.0	12.0	12.0	10.5	17.5			17.5	17.5
Total Split (s)				12.0	12.0	12.0	10.5	28.0			17.5	17.5
Total Split (%)				30.0%	30.0%	30.0%	26.3%	70.0%			43.8%	43.8%
Yellow Time (s)				4.0	4.0	4.0	4.0	4.0			4.0	4.0
All-Red Time (s)				1.0	1.0	1.0	1.5	1.5			1.5	1.5
Lost Time Adjust (s)					0.0	0.0	0.0	0.0			0.0	0.0
Total Lost Time (s)					5.0	5.0	5.5	5.5			5.5	5.5
Lead/Lag							Lead				Lag	Lag
Lead-Lag Optimize?							Yes				Yes	Yes
Recall Mode				Min	Min	Min	None	C-Max			C-Max	C-Max
Act Effct Green (s)					7.0	7.0	22.5	22.5			16.2	16.2
Actuated g/C Ratio					0.18	0.18	0.56	0.56			0.40	0.40
v/c Ratio					0.33	0.43	0.18	0.30			0.47	0.14
Control Delay					18.2	5.8	5.1	5.2			11.9	0.6
Queue Delay					0.0	0.0	0.0	0.0			0.0	0.0
Total Delay					18.2	5.8	5.1	5.2			11.9	0.6
LOS					B	A	A	A			B	A
Approach Delay					9.9			5.2			10.4	
Approach LOS					A			A			B	
Queue Length 50th (ft)					18	0	6	27			63	0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 95th (ft)					47	28	17	46			103	3
Internal Link Dist (ft)		1047			992			662			2099	
Turn Bay Length (ft)						360	200					
Base Capacity (vph)					274	421	416	1814			1344	701
Starvation Cap Reductn					0	0	0	0			0	0
Spillback Cap Reductn					0	0	0	0			0	0
Storage Cap Reductn					0	0	0	0			0	0
Reduced v/c Ratio					0.33	0.43	0.18	0.30			0.47	0.14

Intersection Summary			
Area Type:	Other		
Cycle Length: 40			
Actuated Cycle Length: 40			
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green			
Natural Cycle: 40			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.47			
Intersection Signal Delay: 8.3		Intersection LOS: A	
Intersection Capacity Utilization 46.5%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 18: SD37 (Burr Street) & I-90 WB (Exit 332) On-Ramp/I-90 WB (Exit 332) Off-Ramp





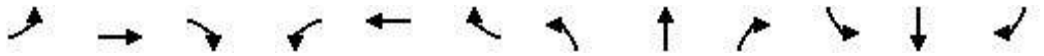
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	85	0	170	70	510	0	0	600	90
Future Volume (veh/h)	0	0	0	85	0	170	70	510	0	0	600	90
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach					No			No			No	
Adj Sat Flow, veh/h/ln				1674	1800	1646	1730	1716	0	0	1758	1702
Adj Flow Rate, veh/h				90	0	181	74	543	0	0	638	0
Peak Hour Factor				0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %				9	0	11	5	6	0	0	3	7
Cap, veh/h				300	0	244	452	1834	0	0	1185	
Arrive On Green				0.17	0.00	0.17	0.07	0.56	0.00	0.00	0.35	0.00
Sat Flow, veh/h				1714	0	1395	1647	3346	0	0	3428	1442
Grp Volume(v), veh/h				90	0	181	74	543	0	0	638	0
Grp Sat Flow(s),veh/h/ln				1714	0	1395	1647	1630	0	0	1670	1442
Q Serve(g_s), s				1.8	0.0	4.9	1.0	3.5	0.0	0.0	6.1	0.0
Cycle Q Clear(g_c), s				1.8	0.0	4.9	1.0	3.5	0.0	0.0	6.1	0.0
Prop In Lane				1.00		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				300	0	244	452	1834	0	0	1185	
V/C Ratio(X)				0.30	0.00	0.74	0.16	0.30	0.00	0.00	0.54	
Avail Cap(c_a), veh/h				300	0	244	542	1834	0	0	1185	
HCM Platoon Ratio				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	0.00	1.00	0.85	0.85	0.00	0.00	1.00	0.00
Uniform Delay (d), s/veh				14.4	0.0	15.6	6.7	4.6	0.0	0.0	10.3	0.0
Incr Delay (d2), s/veh				0.6	0.0	11.5	0.1	0.4	0.0	0.0	1.8	0.0
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				0.6	0.0	1.9	0.2	0.7	0.0	0.0	1.9	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				14.9	0.0	27.1	6.8	4.9	0.0	0.0	12.0	0.0
LnGrp LOS				B	A	C	A	A	A	A	B	
Approach Vol, veh/h					271			617			638	A
Approach Delay, s/veh					23.1			5.2			12.0	
Approach LOS					C			A			B	

Timer - Assigned Phs		2			5	6		8				
Phs Duration (G+Y+Rc), s		28.0			8.3	19.7		12.0				
Change Period (Y+Rc), s		5.5			5.5	5.5		5.0				
Max Green Setting (Gmax), s		22.5			5.0	12.0		7.0				
Max Q Clear Time (g_c+I1), s		5.5			3.0	8.1		6.9				
Green Ext Time (p_c), s		3.3			0.0	1.5		0.0				

Intersection Summary		
HCM 6th Ctrl Delay	11.2	
HCM 6th LOS	B	

Notes

Unsignalized Delay for [SBR] is excluded from calculations of the approach delay and intersection delay.

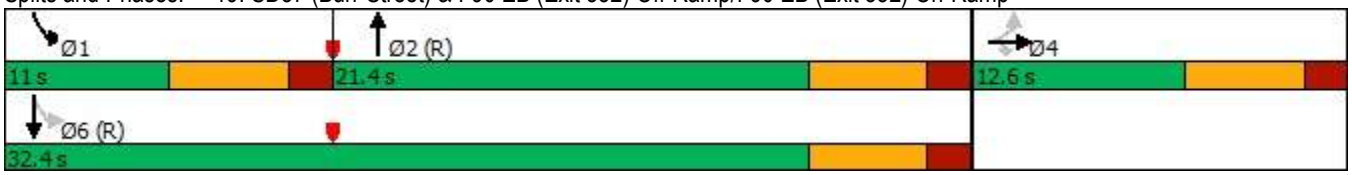


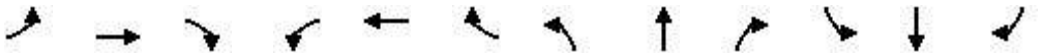
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	70	0	115	0	0	0	0	510	150	120	565	0
Future Volume (vph)	70	0	115	0	0	0	0	510	150	120	565	0
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	0		300	0		0	0		120	190		0
Storage Lanes	0		1	0		0	0		0	1		0
Taper Length (ft)	25			25			25			60		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	1.00
Frt			0.850					0.966				
Flt Protected		0.950								0.950		
Satd. Flow (prot)	0	1413	1443	0	0	0	0	3166	0	1613	3320	0
Flt Permitted		0.950								0.271		
Satd. Flow (perm)	0	1413	1443	0	0	0	0	3166	0	460	3320	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			194					94				
Link Speed (mph)		50			50			35			35	
Link Distance (ft)		1362			971			1492			742	
Travel Time (s)		18.6			13.2			29.1			14.5	
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	21%	0%	6%	0%	0%	0%	0%	3%	9%	6%	3%	0%
Adj. Flow (vph)	72	0	119	0	0	0	0	526	155	124	582	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	72	119	0	0	0	0	681	0	124	582	0
Turn Type	Perm	NA	Perm					NA		pm+pt	NA	
Protected Phases		4						2		1	6	
Permitted Phases	4		4							6		
Detector Phase	4	4	4					2		1	6	
Switch Phase												
Minimum Initial (s)	7.0	7.0	7.0					12.0		5.0	12.0	
Minimum Split (s)	12.5	12.5	12.5					17.5		10.5	17.5	
Total Split (s)	12.6	12.6	12.6					21.4		11.0	32.4	
Total Split (%)	28.0%	28.0%	28.0%					47.6%		24.4%	72.0%	
Yellow Time (s)	4.0	4.0	4.0					4.0		4.0	4.0	
All-Red Time (s)	1.5	1.5	1.5					1.5		1.5	1.5	
Lost Time Adjust (s)		0.0	0.0					0.0		0.0	0.0	
Total Lost Time (s)		5.5	5.5					5.5		5.5	5.5	
Lead/Lag								Lag		Lead		
Lead-Lag Optimize?								Yes		Yes		
Recall Mode	Min	Min	Min					C-Max		None	C-Max	
Act Effct Green (s)		7.1	7.1					18.1		26.9	26.9	
Actuated g/C Ratio		0.16	0.16					0.40		0.60	0.60	
v/c Ratio		0.33	0.31					0.51		0.30	0.29	
Control Delay		21.4	3.4					5.9		5.9	4.9	
Queue Delay		0.0	0.0					0.0		0.0	0.0	
Total Delay		21.4	3.4					5.9		5.9	4.9	
LOS		C	A					A		A	A	
Approach Delay		10.2						5.9			5.1	
Approach LOS		B						A			A	
Queue Length 50th (ft)		17	0					30		11	31	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 95th (ft)		45	13					40		26	50	
Internal Link Dist (ft)		1282			891			1412			662	
Turn Bay Length (ft)			300							190		
Base Capacity (vph)		222	391					1331		416	1987	
Starvation Cap Reductn		0	0					0		0	0	
Spillback Cap Reductn		0	0					0		0	0	
Storage Cap Reductn		0	0					0		0	0	
Reduced v/c Ratio		0.32	0.30					0.51		0.30	0.29	

Intersection Summary			
Area Type:	Other		
Cycle Length: 45			
Actuated Cycle Length: 45			
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBTL, Start of Green			
Natural Cycle: 45			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.51			
Intersection Signal Delay: 6.0		Intersection LOS: A	
Intersection Capacity Utilization 46.5%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 19: SD37 (Burr Street) & I-90 EB (Exit 332) Off-Ramp/I-90 EB (Exit 332) On-Ramp





Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	70	0	115	0	0	0	0	510	150	120	565	0
Future Volume (veh/h)	70	0	115	0	0	0	0	510	150	120	565	0
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No						No			No	
Adj Sat Flow, veh/h/ln	1505	1800	1716				0	1758	1674	1716	1758	0
Adj Flow Rate, veh/h	72	0	119				0	526	0	124	582	0
Peak Hour Factor	0.97	0.97	0.97				0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	21	0	6				0	3	9	6	3	0
Cap, veh/h	267	0	226				0	1303		511	2004	0
Arrive On Green	0.16	0.00	0.16				0.00	0.13	0.00	0.09	0.60	0.00
Sat Flow, veh/h	1714	0	1454				0	3516	0	1634	3428	0
Grp Volume(v), veh/h	72	0	119				0	526	0	124	582	0
Grp Sat Flow(s),veh/h/ln	1714	0	1454				0	1670	0	1634	1670	0
Q Serve(g_s), s	1.7	0.0	3.4				0.0	6.5	0.0	1.8	3.8	0.0
Cycle Q Clear(g_c), s	1.7	0.0	3.4				0.0	6.5	0.0	1.8	3.8	0.0
Prop In Lane	1.00		1.00				0.00		0.00	1.00		0.00
Lane Grp Cap(c), veh/h	267	0	226				0	1303		511	2004	0
V/C Ratio(X)	0.27	0.00	0.53				0.00	0.40		0.24	0.29	0.00
Avail Cap(c_a), veh/h	270	0	229				0	1303		568	2004	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	0.33	0.33	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00				0.00	0.85	0.00	0.88	0.88	0.00
Uniform Delay (d), s/veh	16.7	0.0	17.5				0.0	14.8	0.0	6.5	4.4	0.0
Incr Delay (d2), s/veh	0.5	0.0	2.1				0.0	0.8	0.0	0.2	0.3	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.5	0.0	1.0				0.0	2.3	0.0	0.4	0.8	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	17.3	0.0	19.6				0.0	15.6	0.0	6.7	4.7	0.0
LnGrp LOS	B	A	B				A	B		A	A	A
Approach Vol, veh/h		191						526	A		706	
Approach Delay, s/veh		18.7						15.6			5.0	
Approach LOS		B						B			A	

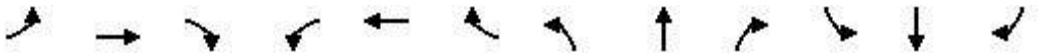
Timer - Assigned Phs	1	2		4		6
Phs Duration (G+Y+Rc), s	9.4	23.1		12.5		32.5
Change Period (Y+Rc), s	5.5	5.5		5.5		5.5
Max Green Setting (Gmax), s	5.5	15.9		7.1		26.9
Max Q Clear Time (g_c+I1), s	3.8	8.5		5.4		5.8
Green Ext Time (p_c), s	0.0	2.0		0.1		3.8

Intersection Summary	
HCM 6th Ctrl Delay	10.8
HCM 6th LOS	B

Notes

Unsignalized Delay for [NBR] is excluded from calculations of the approach delay and intersection delay.

Appendix B: Synchro 11 Output (2032 No-Build Conditions)



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	75	125	10	10	60	70	15	65	15	95	30	20
Future Volume (vph)	75	125	10	10	60	70	15	65	15	95	30	20
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	170		0	170		0	0		0	0		0
Storage Lanes	1		0	1		0	0		0	0		0
Taper Length (ft)	75			75			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		0.989			0.919			0.978			0.982	
Flt Protected	0.950			0.950				0.992			0.968	
Satd. Flow (prot)	1710	1701	0	1500	1582	0	0	1677	0	0	1663	0
Flt Permitted	0.950			0.950				0.992			0.968	
Satd. Flow (perm)	1710	1701	0	1500	1582	0	0	1677	0	0	1663	0
Link Speed (mph)		35			35			35			35	
Link Distance (ft)		1332			1574			793			857	
Travel Time (s)		25.9			30.7			15.4			16.7	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	0%	5%	0%	14%	4%	5%	0%	4%	9%	0%	14%	0%
Adj. Flow (vph)	83	139	11	11	67	78	17	72	17	106	33	22
Shared Lane Traffic (%)												
Lane Group Flow (vph)	83	150	0	11	145	0	0	106	0	0	161	0
Sign Control		Stop			Stop			Stop			Stop	

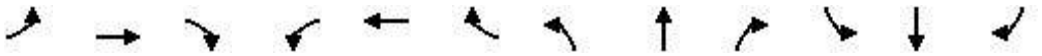
Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 37.4%		ICU Level of Service A	
Analysis Period (min) 15			

Intersection	
Intersection Delay, s/veh	9.4
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	75	125	10	10	60	70	15	65	15	95	30	20
Future Vol, veh/h	75	125	10	10	60	70	15	65	15	95	30	20
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles, %	0	5	0	14	4	5	0	4	9	0	14	0
Mvmt Flow	83	139	11	11	67	78	17	72	17	106	33	22
Number of Lanes	1	1	0	1	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	2	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	2	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	2	2
HCM Control Delay	9.6	9.2	9	9.6
HCM LOS	A	A	A	A

Lane	NBLn1	EBLn1	EBLn2	WBLn1	WBLn2	SBLn1
Vol Left, %	16%	100%	0%	100%	0%	66%
Vol Thru, %	68%	0%	93%	0%	46%	21%
Vol Right, %	16%	0%	7%	0%	54%	14%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	95	75	135	10	130	145
LT Vol	15	75	0	10	0	95
Through Vol	65	0	125	0	60	30
RT Vol	15	0	10	0	70	20
Lane Flow Rate	106	83	150	11	144	161
Geometry Grp	2	7	7	7	7	2
Degree of Util (X)	0.147	0.135	0.223	0.019	0.206	0.226
Departure Headway (Hd)	5.03	5.834	5.363	6.18	5.122	5.058
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	707	611	665	576	695	706
Service Time	3.102	3.605	3.133	3.955	2.897	3.123
HCM Lane V/C Ratio	0.15	0.136	0.226	0.019	0.207	0.228
HCM Control Delay	9	9.5	9.7	9.1	9.2	9.6
HCM Lane LOS	A	A	A	A	A	A
HCM 95th-tile Q	0.5	0.5	0.8	0.1	0.8	0.9

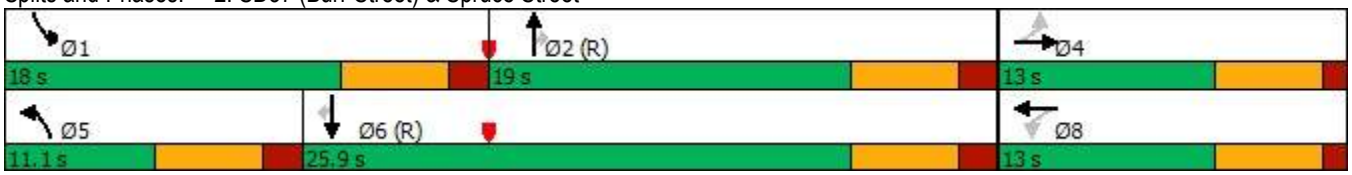


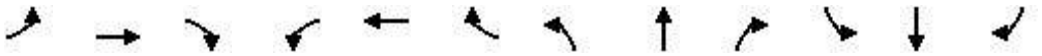
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	125	110	20	5	15	45	40	270	40	210	140	165
Future Volume (vph)	125	110	20	5	15	45	40	270	40	210	140	165
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	285		0	200		125	220		230	155		280
Storage Lanes	1		0	1		0	1		1	1		1
Taper Length (ft)	100			55			55			115		
Lane Util. Factor	0.97	1.00	1.00	1.00	0.95	0.95	1.00	0.95	1.00	1.00	0.95	1.00
Frt		0.977			0.888				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3130	1729	0	1710	2866	0	1710	3196	1443	1676	2948	1500
Flt Permitted	0.711			0.665			0.950			0.950		
Satd. Flow (perm)	2342	1729	0	1197	2866	0	1710	3196	1443	1676	2948	1500
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		15			50				284			183
Link Speed (mph)		35			35			35			35	
Link Distance (ft)		1814			1403			1364			1492	
Travel Time (s)		35.3			27.3			26.6			29.1	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	6%	2%	0%	0%	0%	8%	0%	7%	6%	2%	16%	2%
Adj. Flow (vph)	139	122	22	6	17	50	44	300	44	233	156	183
Shared Lane Traffic (%)												
Lane Group Flow (vph)	139	144	0	6	67	0	44	300	44	233	156	183
Turn Type	Perm	NA		Perm	NA		Prot	NA	Perm	Prot	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8					2			6
Detector Phase	4	4		8	8		5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	7.0	7.0		7.0	7.0		4.0	12.0	12.0	4.0	12.0	12.0
Minimum Split (s)	12.5	12.5		12.5	12.5		9.5	17.5	17.5	9.5	17.5	17.5
Total Split (s)	13.0	13.0		13.0	13.0		11.1	19.0	19.0	18.0	25.9	25.9
Total Split (%)	26.0%	26.0%		26.0%	26.0%		22.2%	38.0%	38.0%	36.0%	51.8%	51.8%
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0		1.0	1.0		1.5	1.5	1.5	1.5	1.5	1.5
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)	5.0	5.0		5.0	5.0		5.5	5.5	5.5	5.5	5.5	5.5
Lead/Lag							Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	Min	Min		Min	Min		None	C-Max	C-Max	None	C-Max	C-Max
Act Effct Green (s)	7.7	7.7		7.7	7.7		5.6	15.4	15.4	10.9	27.4	27.4
Actuated g/C Ratio	0.15	0.15		0.15	0.15		0.11	0.31	0.31	0.22	0.55	0.55
v/c Ratio	0.39	0.52		0.03	0.14		0.23	0.30	0.07	0.64	0.10	0.20
Control Delay	22.4	24.6		18.4	9.6		23.5	15.1	0.2	26.0	7.5	2.7
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	22.4	24.6		18.4	9.6		23.5	15.1	0.2	26.0	7.5	2.7
LOS	C	C		B	A		C	B	A	C	A	A
Approach Delay		23.5			10.3			14.3			13.5	
Approach LOS		C			B			B			B	
Queue Length 50th (ft)	19	35		2	2		12	36	0	60	7	0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 95th (ft)	40	78		9	15		35	64	0	115	28	28
Internal Link Dist (ft)		1734			1323			1284			1412	
Turn Bay Length (ft)	285			200			220		230	155		280
Base Capacity (vph)	374	289		191	500		192	985	641	419	1613	903
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	0.37	0.50		0.03	0.13		0.23	0.30	0.07	0.56	0.10	0.20

Intersection Summary			
Area Type:	Other		
Cycle Length: 50			
Actuated Cycle Length: 50			
Offset: 40.5 (81%), Referenced to phase 2:NBT and 6:SBT, Start of Green			
Natural Cycle: 50			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.64			
Intersection Signal Delay: 15.7		Intersection LOS: B	
Intersection Capacity Utilization 46.0%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 2: SD37 (Burr Street) & Spruce Street





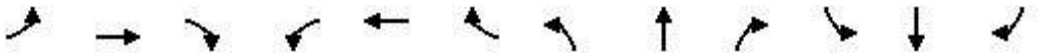
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	125	110	20	5	15	45	40	270	40	210	140	165
Future Volume (veh/h)	125	110	20	5	15	45	40	270	40	210	140	165
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1716	1772	1800	1800	1800	1688	1800	1702	1716	1772	1575	1772
Adj Flow Rate, veh/h	139	122	22	6	17	50	44	300	0	233	156	0
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	6	2	0	0	0	8	0	7	6	2	16	2
Cap, veh/h	566	205	37	222	239	214	63	1194		288	1507	
Arrive On Green	0.14	0.14	0.14	0.14	0.14	0.14	0.04	0.37	0.00	0.17	0.50	0.00
Sat Flow, veh/h	2506	1461	263	1264	1710	1525	1714	3233	1454	1688	2993	1502
Grp Volume(v), veh/h	139	0	144	6	17	50	44	300	0	233	156	0
Grp Sat Flow(s),veh/h/ln	1253	0	1724	1264	1710	1525	1714	1617	1454	1688	1497	1502
Q Serve(g_s), s	2.6	0.0	3.9	0.2	0.4	1.5	1.3	3.2	0.0	6.6	1.4	0.0
Cycle Q Clear(g_c), s	4.1	0.0	3.9	4.1	0.4	1.5	1.3	3.2	0.0	6.6	1.4	0.0
Prop In Lane	1.00		0.15	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	566	0	241	222	239	214	63	1194		288	1507	
V/C Ratio(X)	0.25	0.00	0.60	0.03	0.07	0.23	0.70	0.25		0.81	0.10	
Avail Cap(c_a), veh/h	616	0	276	247	274	244	192	1194		422	1507	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.96	0.96	0.00
Uniform Delay (d), s/veh	20.9	0.0	20.2	22.1	18.7	19.1	23.8	11.0	0.0	20.0	6.5	0.0
Incr Delay (d2), s/veh	0.2	0.0	2.7	0.0	0.1	0.6	13.3	0.5	0.0	7.0	0.1	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.7	0.0	1.6	0.1	0.2	0.5	0.7	1.0	0.0	2.8	0.3	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	21.1	0.0	22.9	22.2	18.8	19.7	37.1	11.5	0.0	27.0	6.6	0.0
LnGrp LOS	C	A	C	C	B	B	D	B		C	A	
Approach Vol, veh/h		283			73			344	A		389	A
Approach Delay, s/veh		22.0			19.7			14.7			18.8	
Approach LOS		C			B			B			B	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	14.0	24.0		12.0	7.3	30.7		12.0				
Change Period (Y+Rc), s	5.5	5.5		5.0	5.5	5.5		5.0				
Max Green Setting (Gmax), s	12.5	13.5		8.0	5.6	20.4		8.0				
Max Q Clear Time (g_c+I1), s	8.6	5.2		6.1	3.3	3.4		6.1				
Green Ext Time (p_c), s	0.2	1.1		0.3	0.0	0.8		0.0				

Intersection Summary			
HCM 6th Ctrl Delay		18.4	
HCM 6th LOS		B	

Notes

Unsignalized Delay for [NBR, SBR] is excluded from calculations of the approach delay and intersection delay.



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	15	80	80	25	85	30	75	120	45	40	170	30
Future Volume (vph)	15	80	80	25	85	30	75	120	45	40	170	30
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
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		0.938			0.971			0.975			0.983	
Flt Protected		0.996			0.991			0.985			0.992	
Satd. Flow (prot)	0	1666	0	0	1696	0	0	1684	0	0	1688	0
Flt Permitted		0.996			0.991			0.985			0.992	
Satd. Flow (perm)	0	1666	0	0	1696	0	0	1684	0	0	1688	0
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		1160			1174			641			590	
Travel Time (s)		31.6			32.0			17.5			16.1	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	0%	0%	2%	5%	2%	0%	2%	4%	0%	13%	1%	9%
Adj. Flow (vph)	17	89	89	28	94	33	83	133	50	44	189	33
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	195	0	0	155	0	0	266	0	0	266	0
Sign Control		Stop			Stop			Stop			Stop	

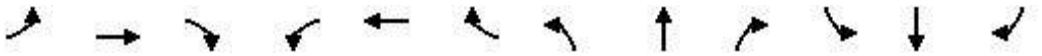
Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 45.2%		ICU Level of Service A	
Analysis Period (min) 15			

Intersection	
Intersection Delay, s/veh	11.5
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	15	80	80	25	85	30	75	120	45	40	170	30
Future Vol, veh/h	15	80	80	25	85	30	75	120	45	40	170	30
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles, %	0	0	2	5	2	0	2	4	0	13	1	9
Mvmt Flow	17	89	89	28	94	33	83	133	50	44	189	33
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	10.6	10.6	11.8	12.3
HCM LOS	B	B	B	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	31%	9%	18%	17%
Vol Thru, %	50%	46%	61%	71%
Vol Right, %	19%	46%	21%	12%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	240	175	140	240
LT Vol	75	15	25	40
Through Vol	120	80	85	170
RT Vol	45	80	30	30
Lane Flow Rate	267	194	156	267
Geometry Grp	1	1	1	1
Degree of Util (X)	0.393	0.29	0.246	0.406
Departure Headway (Hd)	5.304	5.374	5.684	5.486
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	677	667	630	656
Service Time	3.346	3.423	3.735	3.529
HCM Lane V/C Ratio	0.394	0.291	0.248	0.407
HCM Control Delay	11.8	10.6	10.6	12.3
HCM Lane LOS	B	B	B	B
HCM 95th-tile Q	1.9	1.2	1	2



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	150	80	5	5	150	20	5	5	5	30	5	240
Future Volume (vph)	150	80	5	5	150	20	5	5	5	30	5	240
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	0		0	0		0	0		0	100		0
Storage Lanes	0		0	0		0	0		0	1		0
Taper Length (ft)	25			25			25			60		
Lane Util. Factor	0.95	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.997			0.985			0.955			0.853	
Flt Protected		0.969			0.998			0.984		0.950		
Satd. Flow (prot)	0	3099	0	0	1648	0	0	1691	0	1710	1492	0
Flt Permitted		0.969			0.998			0.984		0.950		
Satd. Flow (perm)	0	3099	0	0	1648	0	0	1691	0	1710	1492	0
Link Speed (mph)		45			45			25			25	
Link Distance (ft)		2581			2852			1867			1496	
Travel Time (s)		39.1			43.2			50.9			40.8	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	4%	12%	0%	0%	7%	12%	0%	0%	0%	0%	0%	3%
Adj. Flow (vph)	167	89	6	6	167	22	6	6	6	33	6	267
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	262	0	0	195	0	0	18	0	33	273	0
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 44.6%		ICU Level of Service A	
Analysis Period (min) 15			

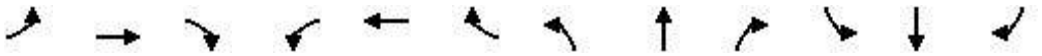
Intersection	
Int Delay, s/veh	6.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	150	80	5	5	150	20	5	5	5	30	5	240
Future Vol, veh/h	150	80	5	5	150	20	5	5	5	30	5	240
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
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	4	12	0	0	7	12	0	0	0	0	0	3
Mvmt Flow	167	89	6	6	167	22	6	6	6	33	6	267

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	189	0	0	95	0	0	753	627	48	572	619	178
Stage 1	-	-	-	-	-	-	426	426	-	190	190	-
Stage 2	-	-	-	-	-	-	327	201	-	382	429	-
Critical Hdwy	4.16	-	-	4.1	-	-	7.3	6.5	6.9	7.3	6.5	6.245
Critical Hdwy Stg 1	-	-	-	-	-	-	6.5	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.5	5.5	-
Follow-up Hdwy	2.238	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3285
Pot Cap-1 Maneuver	1370	-	-	1512	-	-	315	403	1017	420	407	861
Stage 1	-	-	-	-	-	-	582	589	-	816	747	-
Stage 2	-	-	-	-	-	-	690	739	-	618	587	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1370	-	-	1512	-	-	193	350	1017	371	353	861
Mov Cap-2 Maneuver	-	-	-	-	-	-	193	350	-	371	353	-
Stage 1	-	-	-	-	-	-	507	513	-	711	744	-
Stage 2	-	-	-	-	-	-	471	736	-	530	511	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	5.1	0.2	16.4	11.9
HCM LOS			C	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	333	1370	-	-	1512	-	-	371	836
HCM Lane V/C Ratio	0.05	0.122	-	-	0.004	-	-	0.09	0.326
HCM Control Delay (s)	16.4	8	0.1	-	7.4	0	-	15.7	11.4
HCM Lane LOS	C	A	A	-	A	A	-	C	B
HCM 95th %tile Q(veh)	0.2	0.4	-	-	0	-	-	0.3	1.4

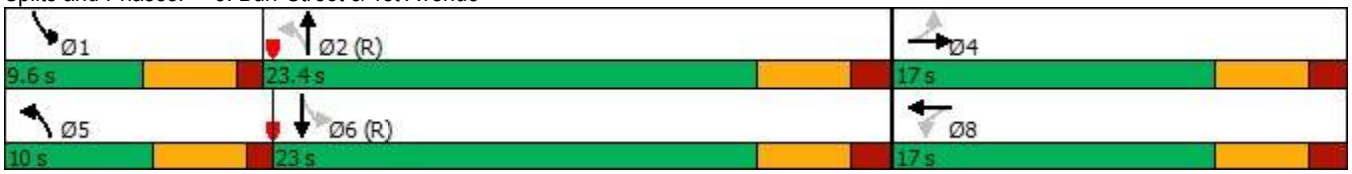


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	30	75	120	55	95	10	110	275	35	15	275	20
Future Volume (vph)	30	75	120	55	95	10	110	275	35	15	275	20
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	0		0	0		0	130		0	60		0
Storage Lanes	0		0	0		0	0		0	1		0
Taper Length (ft)	25			25			25			85		
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		0.928			0.992			0.983			0.990	
Flt Protected		0.993			0.983		0.950			0.950		
Satd. Flow (prot)	0	1659	0	0	1721	0	1693	1727	0	1710	1749	0
Flt Permitted		0.944			0.745		0.441			0.554		
Satd. Flow (perm)	0	1577	0	0	1305	0	786	1727	0	997	1749	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		109			6			15			8	
Link Speed (mph)		25			25			30			25	
Link Distance (ft)		1628			1096			1266			1178	
Travel Time (s)		44.4			29.9			28.8			32.1	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	0%	0%	0%	4%	1%	0%	1%	2%	6%	0%	2%	0%
Adj. Flow (vph)	33	83	133	61	106	11	122	306	39	17	306	22
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	249	0	0	178	0	122	345	0	17	328	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		pm+pt	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		5	2		1	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0		4.0	8.0		4.0	8.0	
Minimum Split (s)	11.0	11.0		11.0	11.0		9.5	13.0		9.5	13.0	
Total Split (s)	17.0	17.0		17.0	17.0		10.0	23.4		9.6	23.0	
Total Split (%)	34.0%	34.0%		34.0%	34.0%		20.0%	46.8%		19.2%	46.0%	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.5	1.5		1.5	1.5		1.0	1.5		1.0	1.5	
Lost Time Adjust (s)		0.0			0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)		5.0			5.0		4.5	5.0		4.5	5.0	
Lead/Lag							Lead	Lag		Lead	Lag	
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	
Recall Mode	None	None		None	None		None	C-Max		None	C-Max	
Act Effct Green (s)		10.2			10.2		29.5	27.9		26.3	21.5	
Actuated g/C Ratio		0.20			0.20		0.59	0.56		0.53	0.43	
v/c Ratio		0.61			0.66		0.21	0.36		0.03	0.43	
Control Delay		16.9			29.7		5.9	8.9		5.1	13.8	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		16.9			29.7		5.9	8.9		5.1	13.8	
LOS		B			C		A	A		A	B	
Approach Delay		16.9			29.7			8.1			13.4	
Approach LOS		B			C			A			B	
Queue Length 50th (ft)		35			45		14	43		2	71	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 95th (ft)		89			#100		31	137		8	132	
Internal Link Dist (ft)		1548			1016			1186			1098	
Turn Bay Length (ft)							130			60		
Base Capacity (vph)		461			317		568	969		600	756	
Starvation Cap Reductn		0			0		0	0		0	0	
Spillback Cap Reductn		0			0		0	0		0	0	
Storage Cap Reductn		0			0		0	0		0	0	
Reduced v/c Ratio		0.54			0.56		0.21	0.36		0.03	0.43	

Intersection Summary			
Area Type:	Other		
Cycle Length: 50			
Actuated Cycle Length: 50			
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green			
Natural Cycle: 50			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.66			
Intersection Signal Delay: 14.5		Intersection LOS: B	
Intersection Capacity Utilization 54.1%		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: Burr Street & 1st Avenue



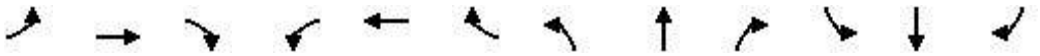
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	30	75	120	55	95	10	110	275	35	15	275	20
Future Volume (veh/h)	30	75	120	55	95	10	110	275	35	15	275	20
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1800	1800	1800	1744	1786	1800	1786	1772	1716	1800	1772	1800
Adj Flow Rate, veh/h	33	83	0	61	106	11	122	306	39	17	306	22
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	0	0	0	4	1	0	1	2	6	0	2	0
Cap, veh/h	141	205		163	160	15	661	843	107	630	815	59
Arrive On Green	0.15	0.15	0.00	0.15	0.15	0.15	0.07	0.55	0.55	0.02	0.50	0.50
Sat Flow, veh/h	331	1404	0	453	1098	102	1701	1540	196	1714	1633	117
Grp Volume(v), veh/h	116	0	0	178	0	0	122	0	345	17	0	328
Grp Sat Flow(s),veh/h/ln	1735	0	0	1653	0	0	1701	0	1737	1714	0	1751
Q Serve(g_s), s	0.0	0.0	0.0	2.1	0.0	0.0	1.7	0.0	5.6	0.2	0.0	5.8
Cycle Q Clear(g_c), s	3.0	0.0	0.0	5.0	0.0	0.0	1.7	0.0	5.6	0.2	0.0	5.8
Prop In Lane	0.28		0.00	0.34		0.06	1.00		0.11	1.00		0.07
Lane Grp Cap(c), veh/h	346	0		338	0	0	661	0	950	630	0	873
V/C Ratio(X)	0.34	0.00		0.53	0.00	0.00	0.18	0.00	0.36	0.03	0.00	0.38
Avail Cap(c_a), veh/h	498	0		487	0	0	737	0	950	776	0	873
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	19.5	0.0	0.0	20.3	0.0	0.0	5.5	0.0	6.4	6.0	0.0	7.7
Incr Delay (d2), s/veh	0.6	0.0	0.0	1.3	0.0	0.0	0.1	0.0	1.1	0.0	0.0	1.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.2	0.0	0.0	1.9	0.0	0.0	0.4	0.0	1.8	0.1	0.0	2.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	20.1	0.0	0.0	21.6	0.0	0.0	5.6	0.0	7.5	6.0	0.0	9.0
LnGrp LOS	C	A		C	A	A	A	A	A	A	A	A
Approach Vol, veh/h		116	A		178			467			345	
Approach Delay, s/veh		20.1			21.6			7.0			8.8	
Approach LOS		C			C			A			A	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	5.3	32.4		12.3	7.8	29.9		12.3				
Change Period (Y+Rc), s	4.5	5.0		5.0	4.5	5.0		5.0				
Max Green Setting (Gmax), s	5.1	18.4		12.0	5.5	18.0		12.0				
Max Q Clear Time (g_c+I1), s	2.2	7.6		5.0	3.7	7.8		7.0				
Green Ext Time (p_c), s	0.0	1.5		0.3	0.0	1.4		0.4				

Intersection Summary		
HCM 6th Ctrl Delay		11.3
HCM 6th LOS		B

Notes

Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	20	30	30	50	70	130	25	105	15	25	150	25
Future Volume (vph)	20	30	30	50	70	130	25	105	15	25	150	25
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
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		0.949			0.930			0.986			0.983	
Flt Protected		0.988			0.990			0.991			0.994	
Satd. Flow (prot)	0	1659	0	0	1629	0	0	1692	0	0	1726	0
Flt Permitted		0.988			0.990			0.991			0.994	
Satd. Flow (perm)	0	1659	0	0	1629	0	0	1692	0	0	1726	0
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		1313			1117			1098			1099	
Travel Time (s)		35.8			30.5			29.9			30.0	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	7%	0%	0%	3%	4%	0%	0%	3%	17%	0%	1%	9%
Adj. Flow (vph)	22	33	33	56	78	144	28	117	17	28	167	28
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	88	0	0	278	0	0	162	0	0	223	0
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 39.6%		ICU Level of Service A	
Analysis Period (min) 15			

Intersection	
Int Delay, s/veh	9.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	20	30	30	50	70	130	25	105	15	25	150	25
Future Vol, veh/h	20	30	30	50	70	130	25	105	15	25	150	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
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	7	0	0	3	4	0	0	3	17	0	1	9
Mvmt Flow	22	33	33	56	78	144	28	117	17	28	167	28

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	222	0	0	66	0	0	454	428	50	423	372	150
Stage 1	-	-	-	-	-	-	94	94	-	262	262	-
Stage 2	-	-	-	-	-	-	360	334	-	161	110	-
Critical Hdwy	4.17	-	-	4.13	-	-	7.1	6.53	6.37	7.1	6.51	6.29
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.53	-	6.1	5.51	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.53	-	6.1	5.51	-
Follow-up Hdwy	2.263	-	-	2.227	-	-	3.5	4.027	3.453	3.5	4.009	3.381
Pot Cap-1 Maneuver	1318	-	-	1529	-	-	520	518	977	545	560	878
Stage 1	-	-	-	-	-	-	918	815	-	747	693	-
Stage 2	-	-	-	-	-	-	662	641	-	846	806	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1318	-	-	1529	-	-	364	487	977	418	527	878
Mov Cap-2 Maneuver	-	-	-	-	-	-	364	487	-	418	527	-
Stage 1	-	-	-	-	-	-	902	801	-	734	663	-
Stage 2	-	-	-	-	-	-	459	613	-	698	792	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.9	1.5	16.1	16.4
HCM LOS			C	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	484	1318	-	-	1529	-	-	536
HCM Lane V/C Ratio	0.333	0.017	-	-	0.036	-	-	0.415
HCM Control Delay (s)	16.1	7.8	0	-	7.4	0	-	16.4
HCM Lane LOS	C	A	A	-	A	A	-	C
HCM 95th %tile Q(veh)	1.4	0.1	-	-	0.1	-	-	2

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	15	25	10	5	60	5	30	5	5	5	5	35
Future Volume (vph)	15	25	10	5	60	5	30	5	5	5	5	35
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
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		0.973			0.990			0.982			0.897	
Flt Protected		0.985			0.996			0.965			0.994	
Satd. Flow (prot)	0	1725	0	0	1775	0	0	1706	0	0	1605	0
Flt Permitted		0.985			0.996			0.965			0.994	
Satd. Flow (perm)	0	1725	0	0	1775	0	0	1706	0	0	1605	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1351			1587			1244			742	
Travel Time (s)		30.7			36.1			28.3			16.9	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	17	28	11	6	67	6	33	6	6	6	6	39
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	56	0	0	79	0	0	45	0	0	51	0
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 23.1%		ICU Level of Service A	
Analysis Period (min) 15			

Intersection	
Int Delay, s/veh	4.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	15	25	10	5	60	5	30	5	5	5	5	35
Future Vol, veh/h	15	25	10	5	60	5	30	5	5	5	5	35
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
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	17	28	11	6	67	6	33	6	6	6	6	39

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	73	0	0	39	0	0	173	153	34	156	155	70
Stage 1	-	-	-	-	-	-	68	68	-	82	82	-
Stage 2	-	-	-	-	-	-	105	85	-	74	73	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1540	-	-	1584	-	-	794	742	1045	815	741	998
Stage 1	-	-	-	-	-	-	947	842	-	931	831	-
Stage 2	-	-	-	-	-	-	906	828	-	940	838	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1540	-	-	1584	-	-	750	731	1045	797	730	998
Mov Cap-2 Maneuver	-	-	-	-	-	-	750	731	-	797	730	-
Stage 1	-	-	-	-	-	-	937	833	-	921	828	-
Stage 2	-	-	-	-	-	-	861	825	-	919	829	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	2.2	0.5	9.9	9.1
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	775	1540	-	-	1584	-	-	934
HCM Lane V/C Ratio	0.057	0.011	-	-	0.004	-	-	0.054
HCM Control Delay (s)	9.9	7.4	0	-	7.3	0	-	9.1
HCM Lane LOS	A	A	A	-	A	A	-	A
HCM 95th %tile Q(veh)	0.2	0	-	-	0	-	-	0.2



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	15	40	35	135	220	25
Future Volume (vph)	15	40	35	135	220	25
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.893		0.986	
Flt Protected		0.986			0.957	
Satd. Flow (prot)	0	1775	1488	0	1625	0
Flt Permitted		0.986			0.957	
Satd. Flow (perm)	0	1775	1488	0	1625	0
Link Speed (mph)		25	25		30	
Link Distance (ft)		1004	963		5313	
Travel Time (s)		27.4	26.3		120.8	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	0%	0%	8%	8%	4%	9%
Adj. Flow (vph)	17	44	39	150	244	28
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	61	189	0	272	0
Sign Control		Free	Free		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 37.2%		ICU Level of Service A	
Analysis Period (min) 15			

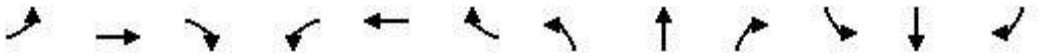
Intersection	
Int Delay, s/veh	6.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	15	40	35	135	220	25
Future Vol, veh/h	15	40	35	135	220	25
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	0	0	8	8	4	9
Mvmt Flow	17	44	39	150	244	28

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	189	0	-	0	192	114
Stage 1	-	-	-	-	114	-
Stage 2	-	-	-	-	78	-
Critical Hdwy	4.1	-	-	-	6.44	6.29
Critical Hdwy Stg 1	-	-	-	-	5.44	-
Critical Hdwy Stg 2	-	-	-	-	5.44	-
Follow-up Hdwy	2.2	-	-	-	3.536	3.381
Pot Cap-1 Maneuver	1397	-	-	-	792	920
Stage 1	-	-	-	-	906	-
Stage 2	-	-	-	-	940	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1397	-	-	-	782	920
Mov Cap-2 Maneuver	-	-	-	-	782	-
Stage 1	-	-	-	-	895	-
Stage 2	-	-	-	-	940	-

Approach	EB	WB	SB
HCM Control Delay, s	2.1	0	11.9
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1397	-	-	-	794
HCM Lane V/C Ratio	0.012	-	-	-	0.343
HCM Control Delay (s)	7.6	0	-	-	11.9
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	1.5



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	120	25	55	50	45	20	35	60	155	125	25
Future Volume (vph)	10	120	25	55	50	45	20	35	60	155	125	25
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
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		0.978			0.960			0.929			0.989	
Flt Protected		0.997			0.982			0.991			0.975	
Satd. Flow (prot)	0	1715	0	0	1680	0	0	1657	0	0	1736	0
Flt Permitted		0.997			0.982			0.991			0.975	
Satd. Flow (perm)	0	1715	0	0	1680	0	0	1657	0	0	1736	0
Link Speed (mph)		45			40			30			30	
Link Distance (ft)		807			813			5313			2460	
Travel Time (s)		12.2			13.9			120.8			55.9	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	0%	3%	0%	0%	3%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	11	133	28	61	56	50	22	39	67	172	139	28
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	172	0	0	167	0	0	128	0	0	339	0
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 52.0%		ICU Level of Service A	
Analysis Period (min) 15			

Intersection	
Int Delay, s/veh	13.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	10	120	25	55	50	45	20	35	60	155	125	25
Future Vol, veh/h	10	120	25	55	50	45	20	35	60	155	125	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
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	0	3	0	0	3	0	0	0	0	0	0	0
Mvmt Flow	11	133	28	61	56	50	22	39	67	172	139	28

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	106	0	0	161	0	0	456	397	147	425	386	81
Stage 1	-	-	-	-	-	-	169	169	-	203	203	-
Stage 2	-	-	-	-	-	-	287	228	-	222	183	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1498	-	-	1430	-	-	518	544	905	543	551	985
Stage 1	-	-	-	-	-	-	838	763	-	804	737	-
Stage 2	-	-	-	-	-	-	725	719	-	785	752	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1498	-	-	1430	-	-	384	515	905	455	521	985
Mov Cap-2 Maneuver	-	-	-	-	-	-	384	515	-	455	521	-
Stage 1	-	-	-	-	-	-	831	757	-	798	703	-
Stage 2	-	-	-	-	-	-	539	686	-	684	746	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.5	2.8	12.4	25.7
HCM LOS			B	D

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	617	1498	-	-	1430	-	-	503
HCM Lane V/C Ratio	0.207	0.007	-	-	0.043	-	-	0.674
HCM Control Delay (s)	12.4	7.4	0	-	7.6	0	-	25.7
HCM Lane LOS	B	A	A	-	A	A	-	D
HCM 95th %tile Q(veh)	0.8	0	-	-	0.1	-	-	5

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	15	10	5	10	5	90	5	135	25	190	45	5
Future Volume (vph)	15	10	5	10	5	90	5	135	25	190	45	5
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	0		0	80		0	50		0	80		0
Storage Lanes	0		0	1		0	1		0	1		0
Taper Length (ft)	25			40			60			60		
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		0.976			0.858			0.976			0.984	
Flt Protected		0.976		0.950			0.950			0.950		
Satd. Flow (prot)	0	1649	0	1710	1462	0	1710	1582	0	1660	1480	0
Flt Permitted		0.976		0.950			0.950			0.950		
Satd. Flow (perm)	0	1649	0	1710	1462	0	1710	1582	0	1660	1480	0
Link Speed (mph)		25			35			45			45	
Link Distance (ft)		2694			2873			1930			987	
Travel Time (s)		73.5			56.0			29.2			15.0	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	8%	0%	0%	0%	0%	6%	0%	12%	6%	3%	22%	0%
Adj. Flow (vph)	17	11	6	11	6	100	6	150	28	211	50	6
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	34	0	11	106	0	6	178	0	211	56	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 38.6%		ICU Level of Service A	
Analysis Period (min) 15			

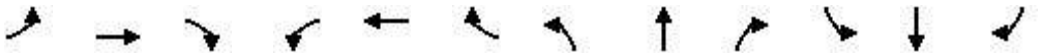
Intersection	
Int Delay, s/veh	6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	15	10	5	10	5	90	5	135	25	190	45	5
Future Vol, veh/h	15	10	5	10	5	90	5	135	25	190	45	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	80	-	-	50	-	-	80	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	8	0	0	0	0	6	0	12	6	3	22	0
Mvmt Flow	17	11	6	11	6	100	6	150	28	211	50	6

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	704	665	53	660	654	164	56	0	0	178	0	0
Stage 1	475	475	-	176	176	-	-	-	-	-	-	-
Stage 2	229	190	-	484	478	-	-	-	-	-	-	-
Critical Hdwy	7.18	6.5	6.2	7.1	6.5	6.26	4.1	-	-	4.13	-	-
Critical Hdwy Stg 1	6.18	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.18	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.572	4	3.3	3.5	4	3.354	2.2	-	-	2.227	-	-
Pot Cap-1 Maneuver	344	383	1020	379	389	870	1562	-	-	1392	-	-
Stage 1	559	561	-	831	757	-	-	-	-	-	-	-
Stage 2	760	747	-	568	559	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	265	324	1020	324	329	870	1562	-	-	1392	-	-
Mov Cap-2 Maneuver	265	324	-	324	329	-	-	-	-	-	-	-
Stage 1	557	476	-	828	754	-	-	-	-	-	-	-
Stage 2	665	744	-	468	474	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	17.3	10.8	0.2	6.4
HCM LOS	C	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	1562	-	-	325	324	801	1392	-	-
HCM Lane V/C Ratio	0.004	-	-	0.103	0.034	0.132	0.152	-	-
HCM Control Delay (s)	7.3	-	-	17.3	16.5	10.2	8	-	-
HCM Lane LOS	A	-	-	C	C	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.3	0.1	0.5	0.5	-	-



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	15	0	215	20	395	0	0	425	100
Future Volume (vph)	0	0	0	15	0	215	20	395	0	0	425	100
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	0		0	0		150	80		0	0		0
Storage Lanes	0		0	0		1	1		0	0		1
Taper Length (ft)	25			25			60			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
Flt Protected					0.950		0.950					
Satd. Flow (prot)	0	0	0	0	1710	1404	1598	1748	0	0	1667	1366
Flt Permitted					0.950		0.950					
Satd. Flow (perm)	0	0	0	0	1710	1404	1598	1748	0	0	1667	1366
Link Speed (mph)		50			50			45			45	
Link Distance (ft)		1104			1070			1072			1043	
Travel Time (s)		15.1			14.6			16.2			15.8	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	0%	0%	0%	0%	0%	9%	7%	3%	0%	0%	8%	12%
Adj. Flow (vph)	0	0	0	17	0	239	22	439	0	0	472	111
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	17	239	22	439	0	0	472	111
Sign Control		Free			Stop			Free			Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization	42.7%	ICU Level of Service	A
Analysis Period (min)	15		

Intersection	
Int Delay, s/veh	0.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	15	0	215	20	395	0	0	425	100
Future Vol, veh/h	0	0	0	15	0	215	20	395	0	0	425	100
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	Free	-	-	None	-	-	None
Storage Length	-	-	-	-	-	150	80	-	-	-	-	0
Veh in Median Storage, #	-	1	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	0	0	9	7	3	0	0	8	12
Mvmt Flow	0	0	0	17	0	239	22	439	0	0	472	111

Major/Minor	Minor1			Major1			Major2		
Conflicting Flow All	1011	1066	-	583	0	-	-	-	0
Stage 1	483	483	-	-	-	-	-	-	-
Stage 2	528	583	-	-	-	-	-	-	-
Critical Hdwy	6.4	6.5	-	4.17	-	-	-	-	-
Critical Hdwy Stg 1	5.4	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.4	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	-	2.263	-	-	-	-	-
Pot Cap-1 Maneuver	268	224	0	967	-	0	0	-	-
Stage 1	625	556	0	-	-	0	0	-	-
Stage 2	596	502	0	-	-	0	0	-	-
Platoon blocked, %					-			-	-
Mov Cap-1 Maneuver	262	0	-	967	-	-	-	-	-
Mov Cap-2 Maneuver	262	0	-	-	-	-	-	-	-
Stage 1	611	0	-	-	-	-	-	-	-
Stage 2	596	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	19.7	0.4	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	WBLn1	WBLn2	SBT	SBR
Capacity (veh/h)	967	-	262	-	-	-
HCM Lane V/C Ratio	0.023	-	0.064	-	-	-
HCM Control Delay (s)	8.8	-	19.7	0	-	-
HCM Lane LOS	A	-	C	A	-	-
HCM 95th %tile Q(veh)	0.1	-	0.2	-	-	-

HCS7 Two-Way Stop-Control Text Report

TWO-WAY STOP CONTROL (TWSC) Analysis

File Name:	2032NBC_AM_SD37_I-90 EB RTI.xtw
Analyst:	HDR
Agency:	HDR
Date Performed:	11/1/2021
Time Analyzed:	2032 NBC - AM Peak
Jurisdiction:	SDDOT
Analysis Year:	2032
Project Description:	Mitchell MTP
Units:	U.S. Customary
Intersection Name:	SD37 & I-90 EB RTI
Major Street Direction:	North-South
East/West Street Name:	I-90 EB RTI
North/South Street Name:	SD37 / Ohlman Street
Analysis Time Period (hrs):	0.25

Vehicle Volumes and Adjustments

Major Street:									
Approach		NorthBound					SouthBound		
Movement	1U	1	2	3	4U		4	5	6
	U	L	T	R	U		L	T	R
Volume			310	10			160	280	
Peak Hour Factor, PHF					0.90				
Hourly Flow Rtae, HFR			344	11			178	311	
Percent Heavy Vehicles							16		
Number of Lanes	0	0	1	0	0		1	1	0
Lane Configuration				TR			L	T	
Median Type					Undivided				
Median Storage									
RT channelized?									
Left-Turn Lane Storage									
Upstream Signal?					Not Present				

Minor Street:							
Approach	WestBound				EastBound		
Movement	7	8	9		10	11	12
	L	T	R		L	T	R
Volume					105	0	35
Peak Hour Factor, PHF				0.90			
Hourly Flow Rtae, HFR					117	0	39
Percent Heavy Vehicles					3	0	0
Number of Lanes	0	0	0		0	1	0
Lane Configuration						LTR	
RT channelized?							
Flared Approach | Storage		|			No |	
Percent Grade						0	

Pedestrian Volumes and Adjustments

Approach	NB	SB	WB	EB
Movement	13	14	15	16
Flow (ped/hr)	0	0		0
Lane Width (ft)				
Walking Speed (ft/sec)				
Pedestrian Blockage Factor, f_pb				

Delay, Queue Length, and Level of Service

Approach	NB			SB		WestBound			EastBound		
Movement	1U	1	4U	4	7	8	9	10	11	12	
Lane Configuration				L					LTR		
Flow Rate				178					156		
Lane Capacity				1130					232		
v/c				0.16					0.67		
95% Queue Length				0.6					4.2		
Control Delay				8.8					47.1		
LOS				A					E		
Approach Delay				3.2					47.1		
Approach LOS									E		
Intersction Delay	8.9										

Step 1: MOVEMENT PRIORITIES

Major Street:									
Approach		NorthBound					SouthBound		
Priority	1U	1	2	3	4U		4	5	6
Movement	U	L	T	R	U		L	T	R
Minor Street:									

Approach	WestBound			EastBound		
Priority	7	8	9	10	11	12
Movement	L	T	R	L	T	R

Step 2: MOVEMENT DEMAND VOLUMES AND FLOW RATES

Major Street:

Approach	NorthBound				SouthBound			
Movement	1U	1	2	3	4U	4	5	6
	U	L	T	R	U	L	T	R
Volume, V_x			310	10		160	280	
Flow Rate, v_x			344	11		178	311	

Minor Street:

Approach	WestBound			EastBound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume, V_x				105	0	35
Flow Rate, v_x				117	0	39

Step 3: CONFLICTING FLOW RATES

Major Street:

Approach	NorthBound				SouthBound			
Movement	1U	1	2	3	4U	4	5	6
	U	L	T	R	U	L	T	R
Flow Rate, v_x			344	11		178	311	
Conflicting Flow, v_c,x						356		

Minor Street:

Approach	WestBound			EastBound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Flow Rate, v_x				117	0	39
Conflicting Flow, v_c,x				1017	1022	311

Step 4: CRITICAL HEADWAYS and FOLLOW-UP HEADWAYS

CRITICAL HEADWAYS

Approach	NB		SB		WestBound			EastBound		
Movement	1U	1	4U	4	7	8	9	10	11	12
	U	L	U	L	L	T	R	L	T	R
t_c,base				4.1				7.1	6.5	6.2
Single Stage										
Stage I										
Stage II										
t_c,HV				1.0				1.0	1.0	1.0
P_HV				0.16				0.03	0.00	0.00
t_c,G								0.2	0.2	0.1
G								0	0	0
t_3,LT				0.0				0.0	0.0	0.0
t_c										
Single Stage				4.26				7.13	6.50	6.20
Stage I										
Stage II										

FOLLOW-UP HEADWAYS

Approach	NB		SB		WestBound			EastBound		
Movement	1U	1	4U	4	7	8	9	10	11	12
	U	L	U	L	L	T	R	L	T	R
t_f,base				2.2				3.5	4.0	3.3
t_f,HV				0.9				0.9	0.9	0.9
P_HV				0.16				0.03	0.00	0.00
t_f				2.34				3.53	4.00	3.30

Step 5: POTENTIAL CAPACITIES

NO UPSTREAM SIGNAL EFFECTS PRESENT

Approach	NB		SB		WestBound			EastBound		
Movement	1U	1	4U	4	7	8	9	10	11	12
	U	L	U	L	L	T	R	L	T	R
v_c,x				356				1017	1022	311
t_c,x				4.26				7.13	6.50	6.20
t_f,x				2.34				3.53	4.00	3.30
c_p,x				1130				215	238	734

Steps 6 - 9: MOVEMENT CAPACITIES

Pedestrian Impedance				
Approach	NB	SB	WB	EB

Movement	13	14	15	16
Pedestrian Flow Rate v_x	0	0		0
Lane Width, w				
Walking Speed, S_p				
Pedestrian Blockage Factor, f_pb				

Major-Street Left-Turn Movements	1	4
Conflicting Flow, v_c,x		356
Potential Capacity, c_p,x		1130
Pedestrian Impedance Factor, p_p,x		1.000
Movement Capacity, c_m,x		1130
Probability of Queue-free State, p_0,j		0.843
Major L-Shared Probability Queue-free State, p*_0,j		1.000

Minor-Street Right-Turn Movements	9	12
Conflicting Flow, v_c,x		311
Potential Capacity, c_p,x		734
Pedestrian Impedance Factor, p_p,x		1.000
Movement Capacity, c_m,x		734
Probability of Queue-free State, p_0,j		0.947

Major-Street U-Turn Movements	1U	4U
Conflicting Flow, v_c,x		
Potential Capacity, c_p,x		
Capacity Adjustment Factor, f_x		
Movement Capacity, c_m,x		
Shared L/U Capacity, c_SH		
Probability of Queue-free State, p_0,j		

Minor-Street Through Movements	8	11
Conflicting Flow, v_c,x		1022
Potential Capacity, c_p,x		238
Pedestrian Impedance Factor, p_p,x		1.000
Capacity Adjustment Factor, f_x		0.843
Movement Capacity, c_m,x		200
Probability of Queue-free State, p_0,j		1.000

Minor-Street Left-Turn Movements	7	10
Conflicting Flow, v_c,x		1017
Potential Capacity, c_p,x		215
Pedestrian Impedance Factor, p_p,x		1.000
Major L, Minor T Adjusted Impedance Factor, p"		0.843
Major L, Minor T Impedance Factor, p'		0.879
Capacity Adjustment Factor, f_x		0.879
Movement Capacity, c_m,x		189

Step 10: FINAL CAPACITY ADJUSTMENTS

SHARED-LANE CAPACITY OF MINOR STREET APPROACHES

Approach	WestBound			EastBound		
Movement	7	8	9	10	11	12
Lane Configuration					LTR	
Shared Flow Rate, v_y					156	
Movement Capacity, c_m,x				189	200	734
Shared Capacity, c_SH					232	

Step 11: CONTROL DELAY

CONTROL DELAY TO RANK 2 THROUGH 4 MOVEMENTS

Approach	NB			SB		WestBound		EastBound		
Movement	1U	1	4U	4	7	8	9	10	11	12
Flow Rate				178				117	0	39
Movement Capacity				1130				189	200	734
Lane Configuration				L					LTR	
Shared Capacity									232	
Control Delay				8.8					47.1	

Steps 12 - 13: APPROACH/INTERSECTION CONTROL DELAY and 95% QUEUE LENGTHS

Approach	NB			SB		WestBound		EastBound		
Movement	1U	1	4U	4	7	8	9	10	11	12
Lane Configuration				L					LTR	
Flow Rate				178					156	
Lane Capacity				1130					232	
v/c				0.16					0.67	
95% Queue Length				0.6					4.2	
Control Delay				8.8					47.1	

LOS		A	E
Approach Delay		3.2	47.1
Approach LOS			E
Intersction Delay	8.9		

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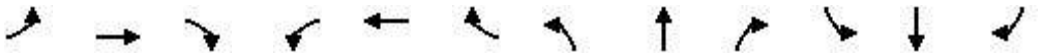


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	25	80	55	10	15	55	95	20	20	300	10
Future Volume (vph)	5	25	80	55	10	15	55	95	20	20	300	10
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	0		0	0		0	150		0	0		0
Storage Lanes	0		0	0		0	1		0	0		0
Taper Length (ft)	25			25			105			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	0.95	0.95
Frt		0.902			0.974			0.974			0.995	
Flt Protected		0.998			0.967		0.950				0.997	
Satd. Flow (prot)	0	1589	0	0	1662	0	1676	3266	0	0	3326	0
Flt Permitted		0.998			0.967		0.950				0.997	
Satd. Flow (perm)	0	1589	0	0	1662	0	1676	3266	0	0	3326	0
Link Speed (mph)		40			40			65			65	
Link Distance (ft)		2897			2749			1385			1493	
Travel Time (s)		49.4			46.9			14.5			15.7	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	6	28	89	61	11	17	61	106	22	22	333	11
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	123	0	0	89	0	61	128	0	0	366	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 34.6%		ICU Level of Service A	
Analysis Period (min) 15			

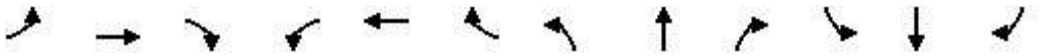
Intersection	
Int Delay, s/veh	4.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	5	25	80	55	10	15	55	95	20	20	300	10
Future Vol, veh/h	5	25	80	55	10	15	55	95	20	20	300	10
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	150	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	6	28	89	61	11	17	61	106	22	22	333	11

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	564	633	172	464	627	64	344	0	0	128	0	0
Stage 1	383	383	-	239	239	-	-	-	-	-	-	-
Stage 2	181	250	-	225	388	-	-	-	-	-	-	-
Critical Hdwy	7.54	6.54	6.94	7.54	6.54	6.94	4.14	-	-	4.14	-	-
Critical Hdwy Stg 1	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.52	4.02	3.32	3.52	4.02	3.32	2.22	-	-	2.22	-	-
Pot Cap-1 Maneuver	408	395	842	481	399	987	1212	-	-	1456	-	-
Stage 1	611	610	-	743	706	-	-	-	-	-	-	-
Stage 2	803	699	-	757	607	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	372	368	842	384	372	987	1212	-	-	1456	-	-
Mov Cap-2 Maneuver	372	368	-	384	372	-	-	-	-	-	-	-
Stage 1	580	598	-	706	671	-	-	-	-	-	-	-
Stage 2	737	664	-	633	595	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	12.2	15.5	2.6	0.5
HCM LOS	B	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1212	-	-	624	432	1456	-	-
HCM Lane V/C Ratio	0.05	-	-	0.196	0.206	0.015	-	-
HCM Control Delay (s)	8.1	-	-	12.2	15.5	7.5	0.1	-
HCM Lane LOS	A	-	-	B	C	A	A	-
HCM 95th %tile Q(veh)	0.2	-	-	0.7	0.8	0	-	-



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	15	50	30	5	15	20	200	15	25	380	5
Future Volume (vph)	5	15	50	30	5	15	20	200	15	25	380	5
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	0		0	0		0	80		0	0		0
Storage Lanes	0		0	0		0	1		0	0		0
Taper Length (ft)	25			25			60			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	0.95	0.95
Frt		0.904			0.959			0.989			0.998	
Flt Protected		0.996			0.971		0.950				0.997	
Satd. Flow (prot)	0	1589	0	0	1643	0	1676	3316	0	0	3336	0
Flt Permitted		0.996			0.971		0.950				0.997	
Satd. Flow (perm)	0	1589	0	0	1643	0	1676	3316	0	0	3336	0
Link Speed (mph)		25			40			45			55	
Link Distance (ft)		1010			1235			1455			1882	
Travel Time (s)		27.5			21.1			22.0			23.3	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	6	17	56	33	6	17	22	222	17	28	422	6
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	79	0	0	56	0	22	239	0	0	456	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 38.0%		ICU Level of Service A	
Analysis Period (min) 15			

Intersection	
Int Delay, s/veh	2.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	5	15	50	30	5	15	20	200	15	25	380	5
Future Vol, veh/h	5	15	50	30	5	15	20	200	15	25	380	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	80	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	6	17	56	33	6	17	22	222	17	28	422	6

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	639	764	214	551	759	120	428	0	0	239	0	0
Stage 1	481	481	-	275	275	-	-	-	-	-	-	-
Stage 2	158	283	-	276	484	-	-	-	-	-	-	-
Critical Hdwy	7.54	6.54	6.94	7.54	6.54	6.94	4.14	-	-	4.14	-	-
Critical Hdwy Stg 1	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.52	4.02	3.32	3.52	4.02	3.32	2.22	-	-	2.22	-	-
Pot Cap-1 Maneuver	361	332	791	417	334	909	1128	-	-	1325	-	-
Stage 1	535	552	-	708	681	-	-	-	-	-	-	-
Stage 2	828	676	-	707	550	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	337	316	791	359	318	909	1128	-	-	1325	-	-
Mov Cap-2 Maneuver	337	316	-	359	318	-	-	-	-	-	-	-
Stage 1	524	537	-	694	667	-	-	-	-	-	-	-
Stage 2	790	662	-	619	535	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	12.5	14.6	0.7	0.6
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1128	-	-	558	432	1325	-	-
HCM Lane V/C Ratio	0.02	-	-	0.139	0.129	0.021	-	-
HCM Control Delay (s)	8.3	-	-	12.5	14.6	7.8	0.1	-
HCM Lane LOS	A	-	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0.5	0.4	0.1	-	-

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	25	40	240	15	25	30	75	170	30	50	400	50
Future Volume (vph)	25	40	240	15	25	30	75	170	30	50	400	50
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	0		50	0		0	100		0	100		0
Storage Lanes	0		1	0		0	1		0	1		0
Taper Length (ft)	25			25			220			290		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt			0.850		0.943			0.978			0.983	
Flt Protected		0.981			0.989		0.950			0.950		
Satd. Flow (prot)	0	1731	1500	0	1646	0	1676	3279	0	1676	3296	0
Flt Permitted		0.981			0.989		0.950			0.950		
Satd. Flow (perm)	0	1731	1500	0	1646	0	1676	3279	0	1676	3296	0
Link Speed (mph)		40			25			35			35	
Link Distance (ft)		1380			1122			778			1516	
Travel Time (s)		23.5			30.6			15.2			29.5	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	28	44	267	17	28	33	83	189	33	56	444	56
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	72	267	0	78	0	83	222	0	56	500	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 43.2%		ICU Level of Service A	
Analysis Period (min) 15			

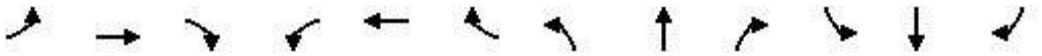
Intersection	
Int Delay, s/veh	6.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	25	40	240	15	25	30	75	170	30	50	400	50
Future Vol, veh/h	25	40	240	15	25	30	75	170	30	50	400	50
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	50	-	-	-	100	-	-	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	28	44	267	17	28	33	83	189	33	56	444	56

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	859	972	250	728	984	111	500	0	0	222	0	0
Stage 1	584	584	-	372	372	-	-	-	-	-	-	-
Stage 2	275	388	-	356	612	-	-	-	-	-	-	-
Critical Hdwy	7.54	6.54	6.94	7.54	6.54	6.94	4.14	-	-	4.14	-	-
Critical Hdwy Stg 1	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.52	4.02	3.32	3.52	4.02	3.32	2.22	-	-	2.22	-	-
Pot Cap-1 Maneuver	250	251	750	311	247	921	1060	-	-	1344	-	-
Stage 1	465	496	-	621	617	-	-	-	-	-	-	-
Stage 2	708	607	-	634	482	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	199	222	750	155	218	921	1060	-	-	1344	-	-
Mov Cap-2 Maneuver	199	222	-	155	218	-	-	-	-	-	-	-
Stage 1	429	475	-	573	569	-	-	-	-	-	-	-
Stage 2	598	560	-	355	462	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	16.2	22.1	2.4	0.8
HCM LOS	C	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1060	-	-	213	750	287	1344	-	-
HCM Lane V/C Ratio	0.079	-	-	0.339	0.356	0.271	0.041	-	-
HCM Control Delay (s)	8.7	-	-	30.3	12.4	22.1	7.8	-	-
HCM Lane LOS	A	-	-	D	B	C	A	-	-
HCM 95th %tile Q(veh)	0.3	-	-	1.4	1.6	1.1	0.1	-	-

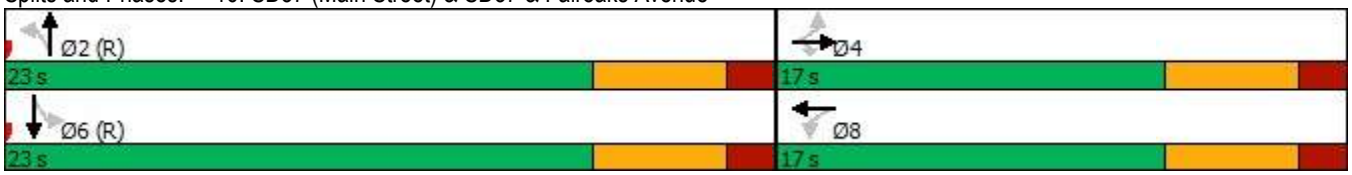


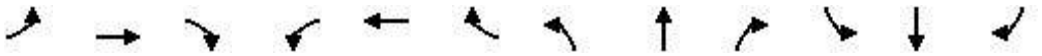
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	140	95	125	15	125	10	125	125	15	35	380	240
Future Volume (vph)	140	95	125	15	125	10	125	125	15	35	380	240
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	155		0	100		0	100		0	100		0
Storage Lanes	1		1	1		0	1		0	1		0
Taper Length (ft)	130			65			130			125		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt			0.850		0.989			0.984			0.942	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1676	1765	1500	1676	1745	0	1676	3299	0	1676	3158	0
Flt Permitted	0.662			0.689			0.386			0.653		
Satd. Flow (perm)	1168	1765	1500	1216	1745	0	681	3299	0	1152	3158	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			139		10			17			267	
Link Speed (mph)		40			25			30			35	
Link Distance (ft)		1120			746			1311			778	
Travel Time (s)		19.1			20.3			29.8			15.2	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	156	106	139	17	139	11	139	139	17	39	422	267
Shared Lane Traffic (%)												
Lane Group Flow (vph)	156	106	139	17	150	0	139	156	0	39	689	0
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Detector Phase	4	4	4	8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	15.5	15.5	15.5	15.5	15.5		15.5	15.5		15.5	15.5	
Total Split (s)	17.0	17.0	17.0	17.0	17.0		23.0	23.0		23.0	23.0	
Total Split (%)	42.5%	42.5%	42.5%	42.5%	42.5%		57.5%	57.5%		57.5%	57.5%	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	1.5	1.5	1.5	1.5	1.5		1.5	1.5		1.5	1.5	
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 Optimize?												
Recall Mode	Max	Max	Max	Min	Min		C-Max	C-Max		C-Max	C-Max	
Act Effct Green (s)	11.5	11.5	11.5	11.5	11.5		17.5	17.5		17.5	17.5	
Actuated g/C Ratio	0.29	0.29	0.29	0.29	0.29		0.44	0.44		0.44	0.44	
v/c Ratio	0.47	0.21	0.26	0.05	0.30		0.47	0.11		0.08	0.45	
Control Delay	17.2	12.1	4.4	10.9	12.4		14.5	6.3		7.1	5.7	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	17.2	12.1	4.4	10.9	12.4		14.5	6.3		7.1	5.7	
LOS	B	B	A	B	B		B	A		A	A	
Approach Delay		11.4			12.3			10.1			5.8	
Approach LOS		B			B			B			A	
Queue Length 50th (ft)	28	18	0	3	24		20	8		5	29	
Queue Length 95th (ft)	68	43	26	12	56		58	20		16	56	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Internal Link Dist (ft)		1040			666			1231			698	
Turn Bay Length (ft)	155			100			100			100		
Base Capacity (vph)	335	507	530	349	508		297	1452		504	1531	
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	0.47	0.21	0.26	0.05	0.30		0.47	0.11		0.08	0.45	

Intersection Summary			
Area Type:	Other		
Cycle Length: 40			
Actuated Cycle Length: 40			
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green			
Natural Cycle: 40			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.47			
Intersection Signal Delay: 8.7		Intersection LOS: A	
Intersection Capacity Utilization 62.5%		ICU Level of Service B	
Analysis Period (min) 15			

Splits and Phases: 16: SD37 (Main Street) & SD37 & Fairoaks Avenue





Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	140	95	125	15	125	10	125	125	15	35	380	240
Future Volume (veh/h)	140	95	125	15	125	10	125	125	15	35	380	240
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1772	1772	1772	1772	1772	1772	1772	1772	1772	1772	1772	1772
Adj Flow Rate, veh/h	156	106	0	17	139	11	139	139	17	39	422	0
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	453	509		492	466	37	524	1323	160	685	1473	
Arrive On Green	0.29	0.29	0.00	0.29	0.29	0.29	0.44	0.44	0.44	0.44	0.44	0.00
Sat Flow, veh/h	1237	1772	1502	1288	1621	128	965	3025	365	1231	3455	0
Grp Volume(v), veh/h	156	106	0	17	0	150	139	76	80	39	422	0
Grp Sat Flow(s),veh/h/ln	1237	1772	1502	1288	0	1749	965	1683	1706	1231	1683	0
Q Serve(g_s), s	4.5	1.8	0.0	0.4	0.0	2.7	4.3	1.1	1.1	0.8	3.2	0.0
Cycle Q Clear(g_c), s	7.2	1.8	0.0	2.2	0.0	2.7	7.6	1.1	1.1	1.9	3.2	0.0
Prop In Lane	1.00		1.00	1.00		0.07	1.00		0.21	1.00		0.00
Lane Grp Cap(c), veh/h	453	509		492	0	503	524	736	747	685	1473	
V/C Ratio(X)	0.34	0.21		0.03	0.00	0.30	0.27	0.10	0.11	0.06	0.29	
Avail Cap(c_a), veh/h	453	509		492	0	503	524	736	747	685	1473	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	13.9	10.8	0.0	11.6	0.0	11.1	9.7	6.6	6.6	7.2	7.2	0.0
Incr Delay (d2), s/veh	2.1	0.9	0.0	0.0	0.0	0.3	1.2	0.3	0.3	0.2	0.5	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.2	0.6	0.0	0.1	0.0	0.9	0.9	0.3	0.3	0.2	0.9	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	16.0	11.7	0.0	11.7	0.0	11.4	10.9	6.9	6.9	7.3	7.7	0.0
LnGrp LOS	B	B		B	A	B	B	A	A	A	A	
Approach Vol, veh/h		262	A		167			295			461	A
Approach Delay, s/veh		14.3			11.5			8.8			7.7	
Approach LOS		B			B			A			A	

Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		23.0		17.0		23.0		17.0				
Change Period (Y+Rc), s		5.5		5.5		5.5		5.5				
Max Green Setting (Gmax), s		17.5		11.5		17.5		11.5				
Max Q Clear Time (g_c+I1), s		9.6		9.2		5.2		4.7				
Green Ext Time (p_c), s		0.9		0.2		2.2		0.4				

Intersection Summary												
HCM 6th Ctrl Delay			9.9									
HCM 6th LOS			A									

Notes

Unsignalized Delay for [EBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	290	85	95	380	15	55	10	65	5	5	5
Future Volume (vph)	10	290	85	95	380	15	55	10	65	5	5	5
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	110		0	110		0	95		0	0		0
Storage Lanes	1		0	1		0	1		1	0		0
Taper Length (ft)	125			125			125			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		0.966			0.994				0.850		0.955	
Flt Protected	0.950			0.950			0.950				0.984	
Satd. Flow (prot)	1676	3239	0	1676	3333	0	1676	1765	1500	0	1658	0
Flt Permitted	0.950			0.950			0.950				0.984	
Satd. Flow (perm)	1676	3239	0	1676	3333	0	1676	1765	1500	0	1658	0
Link Speed (mph)		40			40			35			25	
Link Distance (ft)		1143			1120			993			528	
Travel Time (s)		19.5			19.1			19.3			14.4	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	11	322	94	106	422	17	61	11	72	6	6	6
Shared Lane Traffic (%)												
Lane Group Flow (vph)	11	416	0	106	439	0	61	11	72	0	18	0
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 34.9%		ICU Level of Service A	
Analysis Period (min) 15			

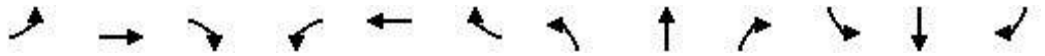
Intersection	
Int Delay, s/veh	3.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	10	290	85	95	380	15	55	10	65	5	5	5
Future Vol, veh/h	10	290	85	95	380	15	55	10	65	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
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	110	-	-	110	-	-	95	-	0	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	11	322	94	106	422	17	61	11	72	6	6	6

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	439	0	0	416	0	0	817	1042	208	832	1081	220
Stage 1	-	-	-	-	-	-	391	391	-	643	643	-
Stage 2	-	-	-	-	-	-	426	651	-	189	438	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	1117	-	-	1139	-	-	268	228	798	262	216	784
Stage 1	-	-	-	-	-	-	605	606	-	428	467	-
Stage 2	-	-	-	-	-	-	577	463	-	795	577	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1117	-	-	1139	-	-	240	205	798	211	194	784
Mov Cap-2 Maneuver	-	-	-	-	-	-	240	205	-	211	194	-
Stage 1	-	-	-	-	-	-	599	600	-	424	424	-
Stage 2	-	-	-	-	-	-	513	420	-	703	571	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.2	1.6	17.4	19.3
HCM LOS			C	C

Minor Lane/Major Mvmt	NBLn1	NBLn2	NBLn3	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	240	205	798	1117	-	-	1139	-	-	269
HCM Lane V/C Ratio	0.255	0.054	0.091	0.01	-	-	0.093	-	-	0.062
HCM Control Delay (s)	25	23.6	10	8.3	-	-	8.5	-	-	19.3
HCM Lane LOS	D	C	B	A	-	-	A	-	-	C
HCM 95th %tile Q(veh)	1	0.2	0.3	0	-	-	0.3	-	-	0.2

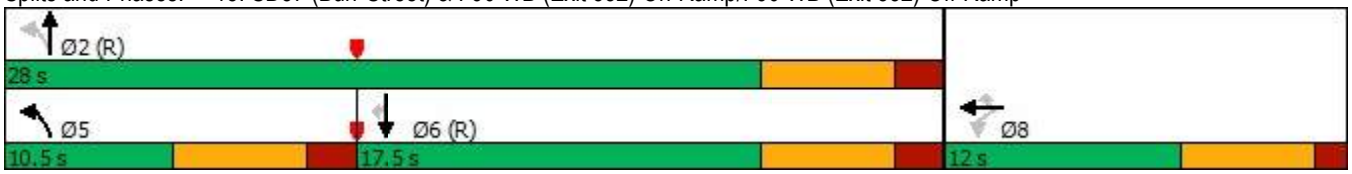


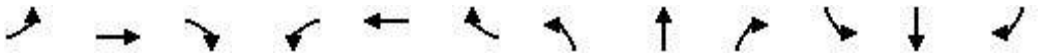
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	110	0	160	105	355	0	0	515	120
Future Volume (vph)	0	0	0	110	0	160	105	355	0	0	515	120
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	0		0	0		360	200		0	0		0
Storage Lanes	0		0	0		1	1		0	0		1
Taper Length (ft)	25			25			65			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt						0.850						0.850
Flt Protected					0.950		0.950					
Satd. Flow (prot)	0	0	0	0	1500	1378	1613	3226	0	0	3226	1354
Flt Permitted					0.950		0.314					
Satd. Flow (perm)	0	0	0	0	1500	1378	533	3226	0	0	3226	1354
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						218						205
Link Speed (mph)		50			50			35			35	
Link Distance (ft)		1127			1072			742			2179	
Travel Time (s)		15.4			14.6			14.5			42.4	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	0%	0%	0%	14%	0%	11%	6%	6%	0%	0%	6%	13%
Adj. Flow (vph)	0	0	0	122	0	178	117	394	0	0	572	133
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	122	178	117	394	0	0	572	133
Turn Type				Perm	NA	Perm	pm+pt	NA			NA	Perm
Protected Phases					8		5	2			6	
Permitted Phases				8		8	2					6
Detector Phase				8	8	8	5	2			6	6
Switch Phase												
Minimum Initial (s)				7.0	7.0	7.0	5.0	12.0			12.0	12.0
Minimum Split (s)				12.0	12.0	12.0	10.5	17.5			17.5	17.5
Total Split (s)				12.0	12.0	12.0	10.5	28.0			17.5	17.5
Total Split (%)				30.0%	30.0%	30.0%	26.3%	70.0%			43.8%	43.8%
Yellow Time (s)				4.0	4.0	4.0	4.0	4.0			4.0	4.0
All-Red Time (s)				1.0	1.0	1.0	1.5	1.5			1.5	1.5
Lost Time Adjust (s)					0.0	0.0	0.0	0.0			0.0	0.0
Total Lost Time (s)					5.0	5.0	5.5	5.5			5.5	5.5
Lead/Lag							Lead				Lag	Lag
Lead-Lag Optimize?							Yes				Yes	Yes
Recall Mode				Min	Min	Min	None	C-Max			C-Max	C-Max
Act Effct Green (s)					7.0	7.0	22.5	22.5			16.2	16.2
Actuated g/C Ratio					0.18	0.18	0.56	0.56			0.40	0.40
v/c Ratio					0.47	0.42	0.27	0.22			0.44	0.20
Control Delay					21.4	5.6	5.8	4.7			11.6	1.7
Queue Delay					0.0	0.0	0.0	0.0			0.0	0.0
Total Delay					21.4	5.6	5.8	4.7			11.6	1.7
LOS					C	A	A	A			B	A
Approach Delay					12.0			5.0			9.7	
Approach LOS					B			A			A	
Queue Length 50th (ft)					25	0	10	18			55	0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 95th (ft)					#61	27	25	33			93	12
Internal Link Dist (ft)		1047			992			662			2099	
Turn Bay Length (ft)						360	200					
Base Capacity (vph)					262	421	434	1814			1306	670
Starvation Cap Reductn					0	0	0	0			0	0
Spillback Cap Reductn					0	0	0	0			0	0
Storage Cap Reductn					0	0	0	0			0	0
Reduced v/c Ratio					0.47	0.42	0.27	0.22			0.44	0.20

Intersection Summary			
Area Type:	Other		
Cycle Length: 40			
Actuated Cycle Length: 40			
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green			
Natural Cycle: 40			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.47			
Intersection Signal Delay: 8.6		Intersection LOS: A	
Intersection Capacity Utilization 40.9%		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: 18: SD37 (Burr Street) & I-90 WB (Exit 332) On-Ramp/I-90 WB (Exit 332) Off-Ramp





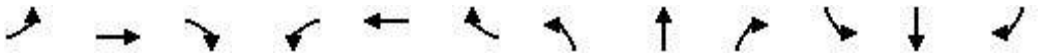
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	110	0	160	105	355	0	0	515	120
Future Volume (veh/h)	0	0	0	110	0	160	105	355	0	0	515	120
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach					No			No			No	
Adj Sat Flow, veh/h/ln				1603	1800	1646	1716	1716	0	0	1716	1617
Adj Flow Rate, veh/h				122	0	178	117	394	0	0	572	0
Peak Hour Factor				0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %				14	0	11	6	6	0	0	6	13
Cap, veh/h				300	0	244	485	1834	0	0	1089	
Arrive On Green				0.17	0.00	0.17	0.09	0.56	0.00	0.00	0.33	0.00
Sat Flow, veh/h				1714	0	1395	1634	3346	0	0	3346	1371
Grp Volume(v), veh/h				122	0	178	117	394	0	0	572	0
Grp Sat Flow(s),veh/h/ln				1714	0	1395	1634	1630	0	0	1630	1371
Q Serve(g_s), s				2.5	0.0	4.8	1.6	2.4	0.0	0.0	5.7	0.0
Cycle Q Clear(g_c), s				2.5	0.0	4.8	1.6	2.4	0.0	0.0	5.7	0.0
Prop In Lane				1.00		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				300	0	244	485	1834	0	0	1089	
V/C Ratio(X)				0.41	0.00	0.73	0.24	0.21	0.00	0.00	0.53	
Avail Cap(c_a), veh/h				300	0	244	541	1834	0	0	1089	
HCM Platoon Ratio				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	0.00	1.00	0.94	0.94	0.00	0.00	1.00	0.00
Uniform Delay (d), s/veh				14.7	0.0	15.6	6.8	4.4	0.0	0.0	10.8	0.0
Incr Delay (d2), s/veh				0.9	0.0	10.5	0.2	0.3	0.0	0.0	1.8	0.0
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				0.8	0.0	1.8	0.4	0.5	0.0	0.0	1.8	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				15.5	0.0	26.1	7.0	4.6	0.0	0.0	12.6	0.0
LnGrp LOS				B	A	C	A	A	A	A	B	
Approach Vol, veh/h					300			511			572	A
Approach Delay, s/veh					21.8			5.2			12.6	
Approach LOS					C			A			B	

Timer - Assigned Phs		2			5	6		8				
Phs Duration (G+Y+Rc), s		28.0			9.1	18.9		12.0				
Change Period (Y+Rc), s		5.5			5.5	5.5		5.0				
Max Green Setting (Gmax), s		22.5			5.0	12.0		7.0				
Max Q Clear Time (g_c+I1), s		4.4			3.6	7.7		6.8				
Green Ext Time (p_c), s		2.3			0.0	1.4		0.0				

Intersection Summary		
HCM 6th Ctrl Delay	11.8	
HCM 6th LOS	B	

Notes

Unsignalized Delay for [SBR] is excluded from calculations of the approach delay and intersection delay.

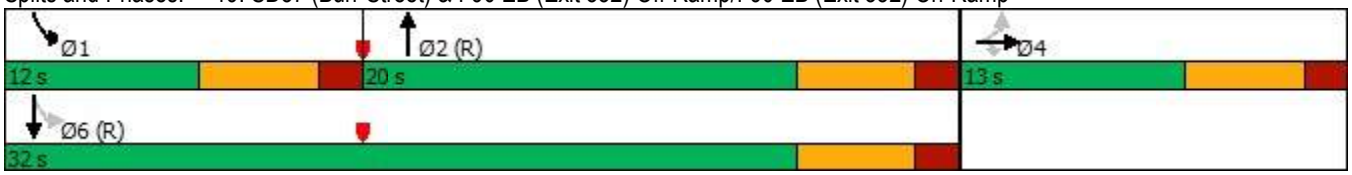


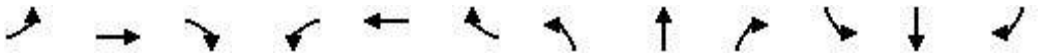
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	65	0	120	0	0	0	0	395	45	85	540	0
Future Volume (vph)	65	0	120	0	0	0	0	395	45	85	540	0
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	0		300	0		0	0		120	190		0
Storage Lanes	0		1	0		0	0		0	1		0
Taper Length (ft)	25			25			25			60		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	1.00
Frt			0.850					0.985				
Flt Protected		0.950								0.950		
Satd. Flow (prot)	0	1527	1430	0	0	0	0	3126	0	1425	3226	0
Flt Permitted		0.950								0.359		
Satd. Flow (perm)	0	1527	1430	0	0	0	0	3126	0	538	3226	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			194					29				
Link Speed (mph)		50			50			35			35	
Link Distance (ft)		1362			971			1492			742	
Travel Time (s)		18.6			13.2			29.1			14.5	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	12%	0%	7%	0%	0%	0%	0%	5%	32%	20%	6%	0%
Adj. Flow (vph)	72	0	133	0	0	0	0	439	50	94	600	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	72	133	0	0	0	0	489	0	94	600	0
Turn Type	Perm	NA	Perm					NA		pm+pt	NA	
Protected Phases		4						2		1	6	
Permitted Phases	4		4							6		
Detector Phase	4	4	4					2		1	6	
Switch Phase												
Minimum Initial (s)	7.0	7.0	7.0					12.0		5.0	12.0	
Minimum Split (s)	12.5	12.5	12.5					17.5		10.5	17.5	
Total Split (s)	13.0	13.0	13.0					20.0		12.0	32.0	
Total Split (%)	28.9%	28.9%	28.9%					44.4%		26.7%	71.1%	
Yellow Time (s)	4.0	4.0	4.0					4.0		4.0	4.0	
All-Red Time (s)	1.5	1.5	1.5					1.5		1.5	1.5	
Lost Time Adjust (s)		0.0	0.0					0.0		0.0	0.0	
Total Lost Time (s)		5.5	5.5					5.5		5.5	5.5	
Lead/Lag								Lag		Lead		
Lead-Lag Optimize?								Yes		Yes		
Recall Mode	Min	Min	Min					C-Max		None	C-Max	
Act Effct Green (s)		7.3	7.3					19.5		26.7	26.7	
Actuated g/C Ratio		0.16	0.16					0.43		0.59	0.59	
v/c Ratio		0.29	0.34					0.36		0.21	0.31	
Control Delay		20.0	4.1					10.8		5.3	5.2	
Queue Delay		0.0	0.0					0.0		0.0	0.0	
Total Delay		20.0	4.1					10.8		5.3	5.2	
LOS		C	A					B		A	A	
Approach Delay		9.7						10.8			5.2	
Approach LOS		A						B			A	
Queue Length 50th (ft)		17	0					48		9	33	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 95th (ft)		44	18					81		22	53	
Internal Link Dist (ft)		1282			891			1412			662	
Turn Bay Length (ft)			300							190		
Base Capacity (vph)		254	400					1370		447	1915	
Starvation Cap Reductn		0	0					0		0	0	
Spillback Cap Reductn		0	0					0		0	0	
Storage Cap Reductn		0	0					0		0	0	
Reduced v/c Ratio		0.28	0.33					0.36		0.21	0.31	

Intersection Summary			
Area Type:	Other		
Cycle Length: 45			
Actuated Cycle Length: 45			
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBTL, Start of Green			
Natural Cycle: 45			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.36			
Intersection Signal Delay: 7.8		Intersection LOS: A	
Intersection Capacity Utilization 40.9%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 19: SD37 (Burr Street) & I-90 EB (Exit 332) Off-Ramp/I-90 EB (Exit 332) On-Ramp





Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	65	0	120	0	0	0	0	395	45	85	540	0
Future Volume (veh/h)	65	0	120	0	0	0	0	395	45	85	540	0
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No						No			No	
Adj Sat Flow, veh/h/ln	1632	1800	1702				0	1730	1351	1519	1716	0
Adj Flow Rate, veh/h	72	0	133				0	439	0	94	600	0
Peak Hour Factor	0.90	0.90	0.90				0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	12	0	7				0	5	32	20	6	0
Cap, veh/h	267	0	224				0	1318		523	1956	0
Arrive On Green	0.16	0.00	0.16				0.00	0.40	0.00	0.08	0.60	0.00
Sat Flow, veh/h	1714	0	1442				0	3460	0	1447	3346	0
Grp Volume(v), veh/h	72	0	133				0	439	0	94	600	0
Grp Sat Flow(s),veh/h/ln	1714	0	1442				0	1643	0	1447	1630	0
Q Serve(g_s), s	1.7	0.0	3.9				0.0	4.2	0.0	1.5	4.1	0.0
Cycle Q Clear(g_c), s	1.7	0.0	3.9				0.0	4.2	0.0	1.5	4.1	0.0
Prop In Lane	1.00		1.00				0.00		0.00	1.00		0.00
Lane Grp Cap(c), veh/h	267	0	224				0	1318		523	1956	0
V/C Ratio(X)	0.27	0.00	0.59				0.00	0.33		0.18	0.31	0.00
Avail Cap(c_a), veh/h	286	0	240				0	1318		620	1956	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00				0.00	0.95	0.00	0.90	0.90	0.00
Uniform Delay (d), s/veh	16.7	0.0	17.7				0.0	9.3	0.0	6.0	4.4	0.0
Incr Delay (d2), s/veh	0.5	0.0	3.4				0.0	0.6	0.0	0.1	0.4	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.5	0.0	1.2				0.0	1.2	0.0	0.3	0.8	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	17.3	0.0	21.1				0.0	10.0	0.0	6.1	4.8	0.0
LnGrp LOS	B	A	C				A	A		A	A	A
Approach Vol, veh/h		205						439	A		694	
Approach Delay, s/veh		19.8						10.0			5.0	
Approach LOS		B						A			A	

Timer - Assigned Phs	1	2		4		6
Phs Duration (G+Y+Rc), s	9.0	23.5		12.5		32.5
Change Period (Y+Rc), s	5.5	5.5		5.5		5.5
Max Green Setting (Gmax), s	6.5	14.5		7.5		26.5
Max Q Clear Time (g_c+I1), s	3.5	6.2		5.9		6.1
Green Ext Time (p_c), s	0.1	1.7		0.1		3.9

Intersection Summary	
HCM 6th Ctrl Delay	8.9
HCM 6th LOS	A

Notes

Unsignalized Delay for [NBR] is excluded from calculations of the approach delay and intersection delay.

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	55	190	15	15	170	110	10	30	20	160	50	30
Future Volume (vph)	55	190	15	15	170	110	10	30	20	160	50	30
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	170		0	170		0	0		0	0		0
Storage Lanes	1		0	1		0	0		0	0		0
Taper Length (ft)	75			75			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		0.989			0.941			0.955			0.983	
Flt Protected	0.950			0.950				0.992			0.968	
Satd. Flow (prot)	1710	1780	0	1710	1673	0	0	1599	0	0	1713	0
Flt Permitted	0.950			0.950				0.992			0.968	
Satd. Flow (perm)	1710	1780	0	1710	1673	0	0	1599	0	0	1713	0
Link Speed (mph)		35			35			35			35	
Link Distance (ft)		1332			1574			793			857	
Travel Time (s)		25.9			30.7			15.4			16.7	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	0%	0%	0%	0%	2%	0%	0%	8%	8%	0%	0%	0%
Adj. Flow (vph)	61	211	17	17	189	122	11	33	22	178	56	33
Shared Lane Traffic (%)												
Lane Group Flow (vph)	61	228	0	17	311	0	0	66	0	0	267	0
Sign Control		Stop			Stop			Stop			Stop	

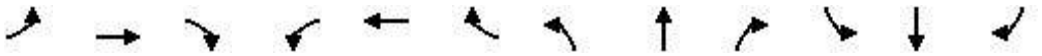
Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 50.6%		ICU Level of Service A	
Analysis Period (min) 15			

Intersection	
Intersection Delay, s/veh	12.6
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	55	190	15	15	170	110	10	30	20	160	50	30
Future Vol, veh/h	55	190	15	15	170	110	10	30	20	160	50	30
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles, %	0	0	0	0	2	0	0	8	8	0	0	0
Mvmt Flow	61	211	17	17	189	122	11	33	22	178	56	33
Number of Lanes	1	1	0	1	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	2	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	2	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	2	2
HCM Control Delay	11.7	13.7	9.8	13
HCM LOS	B	B	A	B

Lane	NBLn1	EBLn1	EBLn2	WBLn1	WBLn2	SBLn1
Vol Left, %	17%	100%	0%	100%	0%	67%
Vol Thru, %	50%	0%	93%	0%	61%	21%
Vol Right, %	33%	0%	7%	0%	39%	12%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	60	55	205	15	280	240
LT Vol	10	55	0	15	0	160
Through Vol	30	0	190	0	170	50
RT Vol	20	0	15	0	110	30
Lane Flow Rate	67	61	228	17	311	267
Geometry Grp	2	7	7	7	7	2
Degree of Util (X)	0.111	0.11	0.375	0.03	0.492	0.426
Departure Headway (Hd)	5.975	6.48	5.92	6.441	5.688	5.753
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	597	552	606	555	632	624
Service Time	4.043	4.227	3.667	4.186	3.433	3.804
HCM Lane V/C Ratio	0.112	0.111	0.376	0.031	0.492	0.428
HCM Control Delay	9.8	10	12.2	9.4	13.9	13
HCM Lane LOS	A	A	B	A	B	B
HCM 95th-tile Q	0.4	0.4	1.7	0.1	2.7	2.1

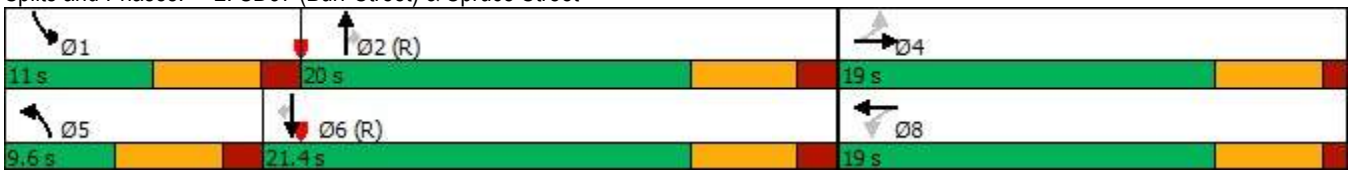


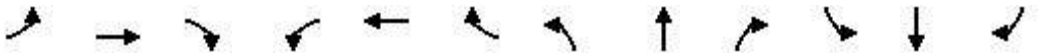
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	395	30	50	20	45	120	25	205	5	50	260	360
Future Volume (vph)	395	30	50	20	45	120	25	205	5	50	260	360
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	285		0	200		125	220		230	155		280
Storage Lanes	1		0	1		0	1		1	1		1
Taper Length (ft)	100			55			55			115		
Lane Util. Factor	0.97	1.00	1.00	1.00	0.95	0.95	1.00	0.95	1.00	1.00	0.95	1.00
Frt		0.906			0.891				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3285	1584	0	1710	2822	0	1710	3081	1275	1462	3196	1515
Flt Permitted	0.636			0.699			0.950			0.950		
Satd. Flow (perm)	2199	1584	0	1258	2822	0	1710	3081	1275	1462	3196	1515
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		56			133				164			400
Link Speed (mph)		35			35			35			35	
Link Distance (ft)		1814			1403			1364			1492	
Travel Time (s)		35.3			27.3			26.6			29.1	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	1%	8%	0%	0%	0%	11%	0%	11%	20%	17%	7%	1%
Adj. Flow (vph)	439	33	56	22	50	133	28	228	6	56	289	400
Shared Lane Traffic (%)												
Lane Group Flow (vph)	439	89	0	22	183	0	28	228	6	56	289	400
Turn Type	Perm	NA		Perm	NA		Prot	NA	Perm	Prot	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8					2			6
Detector Phase	4	4		8	8		5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	7.0	7.0		7.0	7.0		4.0	12.0	12.0	4.0	12.0	12.0
Minimum Split (s)	12.5	12.5		12.5	12.5		9.5	17.5	17.5	10.5	17.5	17.5
Total Split (s)	19.0	19.0		19.0	19.0		9.6	20.0	20.0	11.0	21.4	21.4
Total Split (%)	38.0%	38.0%		38.0%	38.0%		19.2%	40.0%	40.0%	22.0%	42.8%	42.8%
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0		1.0	1.0		1.5	1.5	1.5	1.5	1.5	1.5
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)	5.0	5.0		5.0	5.0		5.5	5.5	5.5	5.5	5.5	5.5
Lead/Lag							Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	Min	Min		Min	Min		None	C-Max	C-Max	None	C-Max	C-Max
Act Effct Green (s)	13.1	13.1		13.1	13.1		4.5	19.8	19.8	5.6	24.5	24.5
Actuated g/C Ratio	0.26	0.26		0.26	0.26		0.09	0.40	0.40	0.11	0.49	0.49
v/c Ratio	0.76	0.20		0.07	0.22		0.18	0.19	0.01	0.34	0.18	0.42
Control Delay	27.3	8.3		13.9	6.0		24.4	12.7	0.0	26.8	9.0	3.2
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	27.3	8.3		13.9	6.0		24.4	12.7	0.0	26.8	9.0	3.2
LOS	C	A		B	A		C	B	A	C	A	A
Approach Delay		24.1			6.8			13.7			7.2	
Approach LOS		C			A			B			A	
Queue Length 50th (ft)	58	7		5	5		8	26	0	16	21	0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 95th (ft)	#115	33		17	23		27	48	0	43	57	48
Internal Link Dist (ft)		1734			1323			1284			1412	
Turn Bay Length (ft)	285			200			220		230	155		280
Base Capacity (vph)	615	483		352	885		155	1220	604	164	1564	945
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	0.71	0.18		0.06	0.21		0.18	0.19	0.01	0.34	0.18	0.42

Intersection Summary			
Area Type:	Other		
Cycle Length: 50			
Actuated Cycle Length: 50			
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green			
Natural Cycle: 50			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.76			
Intersection Signal Delay: 13.3		Intersection LOS: B	
Intersection Capacity Utilization 48.6%		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: 2: SD37 (Burr Street) & Spruce Street





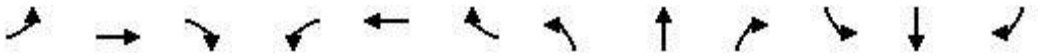
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	395	30	50	20	45	120	25	205	5	50	260	360
Future Volume (veh/h)	395	30	50	20	45	120	25	205	5	50	260	360
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1786	1688	1800	1800	1800	1646	1800	1646	1519	1561	1702	1786
Adj Flow Rate, veh/h	439	33	56	22	50	133	28	228	0	56	289	0
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	1	8	0	0	0	11	0	11	20	17	7	1
Cap, veh/h	784	157	267	456	479	427	44	1115		64	1210	
Arrive On Green	0.28	0.28	0.28	0.28	0.28	0.28	0.03	0.36	0.00	0.04	0.37	0.00
Sat Flow, veh/h	2348	562	954	1329	1710	1525	1714	3127	1287	1487	3233	1514
Grp Volume(v), veh/h	439	0	89	22	50	133	28	228	0	56	289	0
Grp Sat Flow(s),veh/h/ln	1174	0	1516	1329	1710	1525	1714	1563	1287	1487	1617	1514
Q Serve(g_s), s	9.1	0.0	2.2	0.6	1.1	3.4	0.8	2.5	0.0	1.9	3.1	0.0
Cycle Q Clear(g_c), s	12.5	0.0	2.2	2.9	1.1	3.4	0.8	2.5	0.0	1.9	3.1	0.0
Prop In Lane	1.00		0.63	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	784	0	424	456	479	427	44	1115		64	1210	
V/C Ratio(X)	0.56	0.00	0.21	0.05	0.10	0.31	0.63	0.20		0.87	0.24	
Avail Cap(c_a), veh/h	784	0	424	456	479	427	141	1115		164	1210	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.94	0.94	0.00
Uniform Delay (d), s/veh	19.1	0.0	13.8	14.9	13.4	14.2	24.1	11.2	0.0	23.8	10.8	0.0
Incr Delay (d2), s/veh	0.9	0.0	0.2	0.0	0.1	0.4	14.0	0.4	0.0	26.4	0.4	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.2	0.0	0.7	0.2	0.4	1.0	0.5	0.8	0.0	1.1	1.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	20.0	0.0	14.0	14.9	13.4	14.6	38.2	11.6	0.0	50.1	11.2	0.0
LnGrp LOS	C	A	B	B	B	B	D	B		D	B	
Approach Vol, veh/h		528			205			256	A		345	A
Approach Delay, s/veh		19.0			14.4			14.5			17.5	
Approach LOS		B			B			B			B	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	7.7	23.3		19.0	6.8	24.2		19.0				
Change Period (Y+Rc), s	5.5	5.5		5.0	5.5	5.5		5.0				
Max Green Setting (Gmax), s	5.5	14.5		14.0	4.1	15.9		14.0				
Max Q Clear Time (g_c+I1), s	3.9	4.5		14.5	2.8	5.1		5.4				
Green Ext Time (p_c), s	0.0	0.9		0.0	0.0	1.2		0.6				

Intersection Summary												
HCM 6th Ctrl Delay			17.0									
HCM 6th LOS			B									

Notes

Unsignalized Delay for [NBR, SBR] is excluded from calculations of the approach delay and intersection delay.



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	15	90	90	30	75	35	85	265	35	30	180	10
Future Volume (vph)	15	90	90	30	75	35	85	265	35	30	180	10
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
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		0.938			0.966			0.988			0.994	
Flt Protected		0.996			0.989			0.989			0.993	
Satd. Flow (prot)	0	1636	0	0	1720	0	0	1740	0	0	1744	0
Flt Permitted		0.996			0.989			0.989			0.993	
Satd. Flow (perm)	0	1636	0	0	1720	0	0	1740	0	0	1744	0
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		1160			1174			641			590	
Travel Time (s)		31.6			32.0			17.5			16.1	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	0%	6%	0%	0%	0%	0%	0%	1%	4%	8%	1%	0%
Adj. Flow (vph)	17	100	100	33	83	39	94	294	39	33	200	11
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	217	0	0	155	0	0	427	0	0	244	0
Sign Control		Stop			Stop			Stop			Stop	

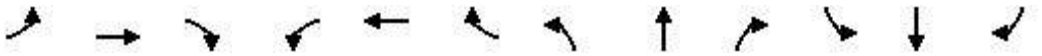
Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 58.1%		ICU Level of Service B	
Analysis Period (min) 15			

Intersection	
Intersection Delay, s/veh	14.6
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	15	90	90	30	75	35	85	265	35	30	180	10
Future Vol, veh/h	15	90	90	30	75	35	85	265	35	30	180	10
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles, %	0	6	0	0	0	0	0	1	4	8	1	0
Mvmt Flow	17	100	100	33	83	39	94	294	39	33	200	11
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	12.1	11.4	18	12.8
HCM LOS	B	B	C	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	22%	8%	21%	14%
Vol Thru, %	69%	46%	54%	82%
Vol Right, %	9%	46%	25%	5%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	385	195	140	220
LT Vol	85	15	30	30
Through Vol	265	90	75	180
RT Vol	35	90	35	10
Lane Flow Rate	428	217	156	244
Geometry Grp	1	1	1	1
Degree of Util (X)	0.646	0.35	0.264	0.398
Departure Headway (Hd)	5.434	5.82	6.102	5.864
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	659	613	583	609
Service Time	3.502	3.907	4.196	3.946
HCM Lane V/C Ratio	0.649	0.354	0.268	0.401
HCM Control Delay	18	12.1	11.4	12.8
HCM Lane LOS	C	B	B	B
HCM 95th-tile Q	4.7	1.6	1.1	1.9



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	240	160	10	5	115	30	5	5	5	25	5	175
Future Volume (vph)	240	160	10	5	115	30	5	5	5	25	5	175
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	0		0	0		0	0		0	100		0
Storage Lanes	0		0	0		0	0		0	1		0
Taper Length (ft)	25			25			25			60		
Lane Util. Factor	0.95	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.996			0.973			0.955			0.854	
Flt Protected		0.972			0.998			0.984		0.950		
Satd. Flow (prot)	0	3122	0	0	1590	0	0	1691	0	1710	1508	0
Flt Permitted		0.972			0.998			0.984		0.950		
Satd. Flow (perm)	0	3122	0	0	1590	0	0	1691	0	1710	1508	0
Link Speed (mph)		45			45			25			25	
Link Distance (ft)		2581			2852			1867			1496	
Travel Time (s)		39.1			43.2			50.9			40.8	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	1%	14%	0%	0%	13%	0%	0%	0%	0%	0%	0%	2%
Adj. Flow (vph)	267	178	11	6	128	33	6	6	6	28	6	194
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	456	0	0	167	0	0	18	0	28	200	0
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 44.3%		ICU Level of Service A	
Analysis Period (min) 15			

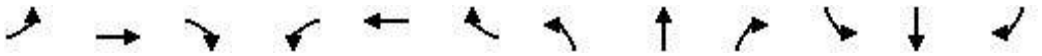
Intersection	
Int Delay, s/veh	6.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	240	160	10	5	115	30	5	5	5	25	5	175
Future Vol, veh/h	240	160	10	5	115	30	5	5	5	25	5	175
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
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	1	14	0	0	13	0	0	0	0	0	0	2
Mvmt Flow	267	178	11	6	128	33	6	6	6	28	6	194

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	161	0	0	189	0	0	975	891	95	783	880	145
Stage 1	-	-	-	-	-	-	718	718	-	157	157	-
Stage 2	-	-	-	-	-	-	257	173	-	626	723	-
Critical Hdwy	4.115	-	-	4.1	-	-	7.3	6.5	6.9	7.3	6.5	6.23
Critical Hdwy Stg 1	-	-	-	-	-	-	6.5	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.5	5.5	-
Follow-up Hdwy	2.2095	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.319
Pot Cap-1 Maneuver	1424	-	-	1397	-	-	220	284	949	300	288	902
Stage 1	-	-	-	-	-	-	391	436	-	850	772	-
Stage 2	-	-	-	-	-	-	752	760	-	443	434	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1424	-	-	1397	-	-	141	223	949	244	226	902
Mov Cap-2 Maneuver	-	-	-	-	-	-	141	223	-	244	226	-
Stage 1	-	-	-	-	-	-	309	344	-	672	768	-
Stage 2	-	-	-	-	-	-	583	756	-	342	343	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	4.8	0.3	21.3	12
HCM LOS			C	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	238	1424	-	-	1397	-	-	244	833
HCM Lane V/C Ratio	0.07	0.187	-	-	0.004	-	-	0.114	0.24
HCM Control Delay (s)	21.3	8.1	0.2	-	7.6	0	-	21.6	10.7
HCM Lane LOS	C	A	A	-	A	A	-	C	B
HCM 95th %tile Q(veh)	0.2	0.7	-	-	0	-	-	0.4	0.9



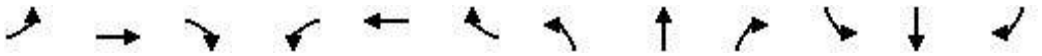
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	15	125	195	40	95	10	180	310	55	15	285	20
Future Volume (vph)	15	125	195	40	95	10	180	310	55	15	285	20
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	0		0	0		0	130		0	60		0
Storage Lanes	0		0	0		0	0		0	1		0
Taper Length (ft)	25			25			25			85		
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		0.921			0.991			0.977			0.990	
Flt Protected		0.998			0.987		0.950			0.950		
Satd. Flow (prot)	0	1635	0	0	1761	0	1693	1744	0	1710	1765	0
Flt Permitted		0.981			0.706		0.397			0.524		
Satd. Flow (perm)	0	1608	0	0	1259	0	708	1744	0	943	1765	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		128			7			18			7	
Link Speed (mph)		25			25			30			25	
Link Distance (ft)		1628			1096			1266			1178	
Travel Time (s)		44.4			29.9			28.8			32.1	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	0%	0%	2%	0%	0%	0%	1%	1%	0%	0%	1%	0%
Adj. Flow (vph)	17	139	217	44	106	11	200	344	61	17	317	22
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	373	0	0	161	0	200	405	0	17	339	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		pm+pt	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		5	2		1	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0		4.0	8.0		4.0	8.0	
Minimum Split (s)	11.0	11.0		11.0	11.0		9.5	13.0		9.5	13.0	
Total Split (s)	21.0	21.0		21.0	21.0		10.2	24.4		9.6	23.8	
Total Split (%)	38.2%	38.2%		38.2%	38.2%		18.5%	44.4%		17.5%	43.3%	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.5	1.5		1.5	1.5		1.0	1.5		1.0	1.5	
Lost Time Adjust (s)		0.0			0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)		5.0			5.0		4.5	5.0		4.5	5.0	
Lead/Lag							Lead	Lag		Lead	Lag	
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	
Recall Mode	None	None		None	None		None	C-Max		None	C-Max	
Act Effct Green (s)		13.0			13.0		31.7	30.1		27.0	21.1	
Actuated g/C Ratio		0.24			0.24		0.58	0.55		0.49	0.38	
v/c Ratio		0.78			0.53		0.38	0.42		0.03	0.50	
Control Delay		24.8			23.4		8.7	10.8		6.3	16.8	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		24.8			23.4		8.7	10.8		6.3	16.8	
LOS		C			C		A	B		A	B	
Approach Delay		24.8			23.4			10.1			16.3	
Approach LOS		C			C			B			B	
Queue Length 50th (ft)		70			42		28	63		2	86	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 95th (ft)		#153			87		60	184		9	155	
Internal Link Dist (ft)		1548			1016			1186			1098	
Turn Bay Length (ft)							130			60		
Base Capacity (vph)		558			371		523	962		537	681	
Starvation Cap Reductn		0			0		0	0		0	0	
Spillback Cap Reductn		0			0		0	0		0	0	
Storage Cap Reductn		0			0		0	0		0	0	
Reduced v/c Ratio		0.67			0.43		0.38	0.42		0.03	0.50	

Intersection Summary			
Area Type:	Other		
Cycle Length: 55			
Actuated Cycle Length: 55			
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green			
Natural Cycle: 55			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.78			
Intersection Signal Delay: 16.7		Intersection LOS: B	
Intersection Capacity Utilization 63.9%		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: 5: Burr Street & 1st Avenue





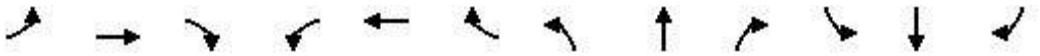
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	15	125	195	40	95	10	180	310	55	15	285	20
Future Volume (veh/h)	15	125	195	40	95	10	180	310	55	15	285	20
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1800	1800	1772	1800	1800	1800	1786	1786	1800	1800	1786	1800
Adj Flow Rate, veh/h	17	139	0	44	106	11	200	344	61	17	317	22
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	0	0	2	0	0	0	1	1	0	0	1	0
Cap, veh/h	87	220		130	164	15	700	868	154	620	860	60
Arrive On Green	0.13	0.13	0.00	0.13	0.13	0.13	0.08	0.59	0.59	0.02	0.52	0.52
Sat Flow, veh/h	111	1661	0	352	1241	117	1701	1477	262	1714	1651	115
Grp Volume(v), veh/h	156	0	0	161	0	0	200	0	405	17	0	339
Grp Sat Flow(s),veh/h/ln	1773	0	0	1709	0	0	1701	0	1739	1714	0	1765
Q Serve(g_s), s	0.0	0.0	0.0	0.2	0.0	0.0	2.7	0.0	6.9	0.3	0.0	6.3
Cycle Q Clear(g_c), s	4.5	0.0	0.0	4.8	0.0	0.0	2.7	0.0	6.9	0.3	0.0	6.3
Prop In Lane	0.11		0.00	0.27		0.07	1.00		0.15	1.00		0.06
Lane Grp Cap(c), veh/h	307	0		309	0	0	700	0	1022	620	0	920
V/C Ratio(X)	0.51	0.00		0.52	0.00	0.00	0.29	0.00	0.40	0.03	0.00	0.37
Avail Cap(c_a), veh/h	581	0		563	0	0	735	0	1022	750	0	920
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	22.7	0.0	0.0	22.8	0.0	0.0	5.0	0.0	6.1	6.0	0.0	7.8
Incr Delay (d2), s/veh	1.3	0.0	0.0	1.4	0.0	0.0	0.2	0.0	1.2	0.0	0.0	1.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.9	0.0	0.0	2.0	0.0	0.0	0.7	0.0	2.1	0.1	0.0	2.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	24.0	0.0	0.0	24.1	0.0	0.0	5.2	0.0	7.3	6.1	0.0	8.9
LnGrp LOS	C	A		C	A	A	A	A	A	A	A	A
Approach Vol, veh/h		156	A		161			605			356	
Approach Delay, s/veh		24.0			24.1			6.6			8.8	
Approach LOS		C			C			A			A	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	5.4	37.3		12.3	9.1	33.7		12.3				
Change Period (Y+Rc), s	4.5	5.0		5.0	4.5	5.0		5.0				
Max Green Setting (Gmax), s	5.1	19.4		16.0	5.7	18.8		16.0				
Max Q Clear Time (g_c+I1), s	2.3	8.9		6.5	4.7	8.3		6.8				
Green Ext Time (p_c), s	0.0	1.8		0.5	0.1	1.5		0.5				

Intersection Summary		
HCM 6th Ctrl Delay	11.5	
HCM 6th LOS	B	

Notes

Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	35	65	35	25	65	30	20	145	40	60	150	25
Future Volume (vph)	35	65	35	25	65	30	20	145	40	60	150	25
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
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		0.965			0.967			0.974			0.986	
Flt Protected		0.987			0.990			0.995			0.987	
Satd. Flow (prot)	0	1714	0	0	1698	0	0	1720	0	0	1730	0
Flt Permitted		0.987			0.990			0.995			0.987	
Satd. Flow (perm)	0	1714	0	0	1698	0	0	1720	0	0	1730	0
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		1313			1117			1098			1099	
Travel Time (s)		35.8			30.5			29.9			30.0	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	0%	0%	0%	7%	0%	0%	0%	2%	0%	0%	2%	0%
Adj. Flow (vph)	39	72	39	28	72	33	22	161	44	67	167	28
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	150	0	0	133	0	0	227	0	0	262	0
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 45.0%		ICU Level of Service A	
Analysis Period (min) 15			

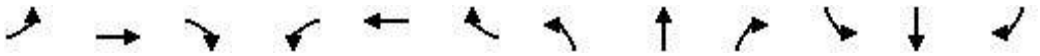
Intersection	
Int Delay, s/veh	11.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	35	65	35	25	65	30	20	145	40	60	150	25
Future Vol, veh/h	35	65	35	25	65	30	20	145	40	60	150	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
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	7	0	0	0	2	0	0	2	0
Mvmt Flow	39	72	39	28	72	33	22	161	44	67	167	28

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	105	0	0	111	0	0	412	331	92	417	334	89
Stage 1	-	-	-	-	-	-	170	170	-	145	145	-
Stage 2	-	-	-	-	-	-	242	161	-	272	189	-
Critical Hdwy	4.1	-	-	4.17	-	-	7.1	6.52	6.2	7.1	6.52	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.52	-	6.1	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.52	-	6.1	5.52	-
Follow-up Hdwy	2.2	-	-	2.263	-	-	3.5	4.018	3.3	3.5	4.018	3.3
Pot Cap-1 Maneuver	1499	-	-	1448	-	-	554	588	971	550	586	975
Stage 1	-	-	-	-	-	-	837	758	-	863	777	-
Stage 2	-	-	-	-	-	-	766	765	-	738	744	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1499	-	-	1448	-	-	399	560	971	394	558	975
Mov Cap-2 Maneuver	-	-	-	-	-	-	399	560	-	394	558	-
Stage 1	-	-	-	-	-	-	814	737	-	839	761	-
Stage 2	-	-	-	-	-	-	569	749	-	535	723	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.9	1.6	15	18.4
HCM LOS			C	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	585	1499	-	-	1448	-	-	526
HCM Lane V/C Ratio	0.389	0.026	-	-	0.019	-	-	0.496
HCM Control Delay (s)	15	7.5	0	-	7.5	0	-	18.4
HCM Lane LOS	C	A	A	-	A	A	-	C
HCM 95th %tile Q(veh)	1.8	0.1	-	-	0.1	-	-	2.7



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	40	45	35	5	20	5	25	5	5	5	5	20
Future Volume (vph)	40	45	35	5	20	5	25	5	5	5	5	20
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
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		0.960			0.976			0.980			0.913	
Flt Protected		0.984			0.991			0.966			0.991	
Satd. Flow (prot)	0	1700	0	0	1741	0	0	1704	0	0	1629	0
Flt Permitted		0.984			0.991			0.966			0.991	
Satd. Flow (perm)	0	1700	0	0	1741	0	0	1704	0	0	1629	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1351			1587			1244			742	
Travel Time (s)		30.7			36.1			28.3			16.9	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	44	50	39	6	22	6	28	6	6	6	6	22
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	133	0	0	34	0	0	40	0	0	34	0
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 26.2%		ICU Level of Service A	
Analysis Period (min) 15			

Intersection	
Int Delay, s/veh	4.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	40	45	35	5	20	5	25	5	5	5	5	20
Future Vol, veh/h	40	45	35	5	20	5	25	5	5	5	5	20
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
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	44	50	39	6	22	6	28	6	6	6	6	22

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	28	0	0	89	0	0	209	198	70	201	214	25
Stage 1	-	-	-	-	-	-	158	158	-	37	37	-
Stage 2	-	-	-	-	-	-	51	40	-	164	177	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1599	-	-	1519	-	-	753	701	998	762	687	1057
Stage 1	-	-	-	-	-	-	849	771	-	984	868	-
Stage 2	-	-	-	-	-	-	967	866	-	843	756	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1599	-	-	1519	-	-	714	678	998	734	664	1057
Mov Cap-2 Maneuver	-	-	-	-	-	-	714	678	-	734	664	-
Stage 1	-	-	-	-	-	-	824	749	-	955	865	-
Stage 2	-	-	-	-	-	-	937	863	-	808	734	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	2.4	1.2	10.1	9.1
HCM LOS			B	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	738	1599	-	-	1519	-	-	902
HCM Lane V/C Ratio	0.053	0.028	-	-	0.004	-	-	0.037
HCM Control Delay (s)	10.1	7.3	0	-	7.4	0	-	9.1
HCM Lane LOS	B	A	A	-	A	A	-	A
HCM 95th %tile Q(veh)	0.2	0.1	-	-	0	-	-	0.1



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	20	40	45	215	245	30
Future Volume (vph)	20	40	45	215	245	30
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.888		0.985	
Flt Protected		0.984			0.957	
Satd. Flow (prot)	0	1771	1485	0	1597	0
Flt Permitted		0.984			0.957	
Satd. Flow (perm)	0	1771	1485	0	1597	0
Link Speed (mph)		25	25		30	
Link Distance (ft)		1004	963		5313	
Travel Time (s)		27.4	26.3		120.8	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	0%	0%	6%	8%	7%	0%
Adj. Flow (vph)	22	44	50	239	272	33
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	66	289	0	305	0
Sign Control		Free	Free		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 43.8%		ICU Level of Service A	
Analysis Period (min) 15			

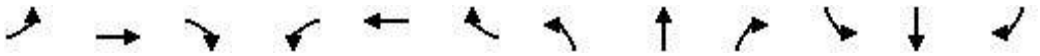
Intersection	
Int Delay, s/veh	6.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	20	40	45	215	245	30
Future Vol, veh/h	20	40	45	215	245	30
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	0	0	6	8	7	0
Mvmt Flow	22	44	50	239	272	33

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	289	0	-	0	258	170
Stage 1	-	-	-	-	170	-
Stage 2	-	-	-	-	88	-
Critical Hdwy	4.1	-	-	-	6.47	6.2
Critical Hdwy Stg 1	-	-	-	-	5.47	-
Critical Hdwy Stg 2	-	-	-	-	5.47	-
Follow-up Hdwy	2.2	-	-	-	3.563	3.3
Pot Cap-1 Maneuver	1284	-	-	-	720	879
Stage 1	-	-	-	-	848	-
Stage 2	-	-	-	-	923	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1284	-	-	-	707	879
Mov Cap-2 Maneuver	-	-	-	-	707	-
Stage 1	-	-	-	-	833	-
Stage 2	-	-	-	-	923	-

Approach	EB	WB	SB
HCM Control Delay, s	2.6	0	13.6
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1284	-	-	-	722
HCM Lane V/C Ratio	0.017	-	-	-	0.423
HCM Control Delay (s)	7.9	0	-	-	13.6
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0.1	-	-	-	2.1



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	25	65	25	70	95	140	25	120	90	85	75	15
Future Volume (vph)	25	65	25	70	95	140	25	120	90	85	75	15
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
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		0.970			0.938			0.948			0.988	
Flt Protected		0.989			0.989			0.995			0.976	
Satd. Flow (prot)	0	1708	0	0	1624	0	0	1631	0	0	1685	0
Flt Permitted		0.989			0.989			0.995			0.976	
Satd. Flow (perm)	0	1708	0	0	1624	0	0	1631	0	0	1685	0
Link Speed (mph)		45			40			30			30	
Link Distance (ft)		807			813			5313			2460	
Travel Time (s)		12.2			13.9			120.8			55.9	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	0%	2%	0%	7%	4%	0%	0%	8%	0%	0%	7%	0%
Adj. Flow (vph)	28	72	28	78	106	156	28	133	100	94	83	17
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	128	0	0	340	0	0	261	0	0	194	0
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 59.1%		ICU Level of Service B	
Analysis Period (min) 15			

Intersection	
Int Delay, s/veh	12.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	25	65	25	70	95	140	25	120	90	85	75	15
Future Vol, veh/h	25	65	25	70	95	140	25	120	90	85	75	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
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	0	2	0	7	4	0	0	8	0	0	7	0
Mvmt Flow	28	72	28	78	106	156	28	133	100	94	83	17

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	262	0	0	100	0	0	532	560	86	599	496	184
Stage 1	-	-	-	-	-	-	142	142	-	340	340	-
Stage 2	-	-	-	-	-	-	390	418	-	259	156	-
Critical Hdwy	4.1	-	-	4.17	-	-	7.1	6.58	6.2	7.1	6.57	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.58	-	6.1	5.57	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.58	-	6.1	5.57	-
Follow-up Hdwy	2.2	-	-	2.263	-	-	3.5	4.072	3.3	3.5	4.063	3.3
Pot Cap-1 Maneuver	1314	-	-	1462	-	-	461	429	978	416	468	864
Stage 1	-	-	-	-	-	-	866	768	-	679	630	-
Stage 2	-	-	-	-	-	-	638	580	-	750	759	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1314	-	-	1462	-	-	360	392	978	258	428	864
Mov Cap-2 Maneuver	-	-	-	-	-	-	360	392	-	258	428	-
Stage 1	-	-	-	-	-	-	846	750	-	663	590	-
Stage 2	-	-	-	-	-	-	503	543	-	541	742	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.7	1.7	19.6	29.6
HCM LOS			C	D

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	503	1314	-	-	1462	-	-	335
HCM Lane V/C Ratio	0.519	0.021	-	-	0.053	-	-	0.58
HCM Control Delay (s)	19.6	7.8	0	-	7.6	0	-	29.6
HCM Lane LOS	C	A	A	-	A	A	-	D
HCM 95th %tile Q(veh)	3	0.1	-	-	0.2	-	-	3.5

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	10	5	25	10	240	5	55	10	205	130	20
Future Volume (vph)	5	10	5	25	10	240	5	55	10	205	130	20
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	0		0	80		0	50		0	80		0
Storage Lanes	0		0	1		0	1		0	1		0
Taper Length (ft)	25			40			60			60		
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		0.965			0.856			0.977			0.980	
Flt Protected		0.987		0.950			0.950			0.950		
Satd. Flow (prot)	0	1607	0	1710	1512	0	1710	1482	0	1676	1647	0
Flt Permitted		0.987		0.950			0.950			0.950		
Satd. Flow (perm)	0	1607	0	1710	1512	0	1710	1482	0	1676	1647	0
Link Speed (mph)		25			35			45			45	
Link Distance (ft)		2694			2873			1930			987	
Travel Time (s)		73.5			56.0			29.2			15.0	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	0%	14%	0%	0%	0%	2%	0%	22%	0%	2%	5%	21%
Adj. Flow (vph)	6	11	6	28	11	267	6	61	11	228	144	22
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	23	0	28	278	0	6	72	0	228	166	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization	41.5%	ICU Level of Service	A
Analysis Period (min)	15		

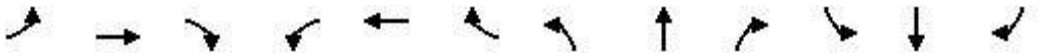
Intersection	
Int Delay, s/veh	7.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	5	10	5	25	10	240	5	55	10	205	130	20
Future Vol, veh/h	5	10	5	25	10	240	5	55	10	205	130	20
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	80	-	-	50	-	-	80	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	0	14	0	0	0	2	0	22	0	2	5	21
Mvmt Flow	6	11	6	28	11	267	6	61	11	228	144	22

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	829	695	155	699	701	67	166	0	0	72	0	0
Stage 1	611	611	-	79	79	-	-	-	-	-	-	-
Stage 2	218	84	-	620	622	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.64	6.2	7.1	6.5	6.22	4.1	-	-	4.12	-	-
Critical Hdwy Stg 1	6.1	5.64	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.64	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4.126	3.3	3.5	4	3.318	2.2	-	-	2.218	-	-
Pot Cap-1 Maneuver	292	351	896	357	365	997	1424	-	-	1528	-	-
Stage 1	484	466	-	935	833	-	-	-	-	-	-	-
Stage 2	789	802	-	479	482	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	184	298	896	305	310	997	1424	-	-	1528	-	-
Mov Cap-2 Maneuver	184	298	-	305	310	-	-	-	-	-	-	-
Stage 1	482	397	-	931	830	-	-	-	-	-	-	-
Stage 2	568	799	-	394	410	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	17.9	11.3	0.5	4.5
HCM LOS	C	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	1424	-	-	302	305	916	1528	-	-
HCM Lane V/C Ratio	0.004	-	-	0.074	0.091	0.303	0.149	-	-
HCM Control Delay (s)	7.5	-	-	17.9	18	10.6	7.8	-	-
HCM Lane LOS	A	-	-	C	C	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.2	0.3	1.3	0.5	-	-



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	20	0	130	55	535	0	0	575	135
Future Volume (vph)	0	0	0	20	0	130	55	535	0	0	575	135
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	0		0	0		150	80		0	0		0
Storage Lanes	0		0	0		1	1		0	0		1
Taper Length (ft)	25			25			60			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
Flt Protected					0.950		0.950					
Satd. Flow (prot)	0	0	0	0	1598	1457	1710	1748	0	0	1765	1500
Flt Permitted					0.950		0.950					
Satd. Flow (perm)	0	0	0	0	1598	1457	1710	1748	0	0	1765	1500
Link Speed (mph)		50			50			45			45	
Link Distance (ft)		1104			1070			1072			1043	
Travel Time (s)		15.1			14.6			16.2			15.8	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	0%	0%	0%	7%	0%	5%	0%	3%	0%	0%	2%	2%
Adj. Flow (vph)	0	0	0	22	0	144	61	594	0	0	639	150
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	22	144	61	594	0	0	639	150
Sign Control		Free			Stop			Free			Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization	48.6%	ICU Level of Service	A
Analysis Period (min)	15		

Intersection	
Int Delay, s/veh	1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	20	0	130	55	535	0	0	575	135
Future Vol, veh/h	0	0	0	20	0	130	55	535	0	0	575	135
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	Free	-	-	None	-	-	None
Storage Length	-	-	-	-	-	150	80	-	-	-	-	0
Veh in Median Storage, #	-	1	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	7	0	5	0	3	0	0	2	2
Mvmt Flow	0	0	0	22	0	144	61	594	0	0	639	150

Major/Minor	Minor1			Major1			Major2		
Conflicting Flow All	1430	1505	-	789	0	-	-	-	0
Stage 1	716	716	-	-	-	-	-	-	-
Stage 2	714	789	-	-	-	-	-	-	-
Critical Hdwy	6.47	6.5	-	4.1	-	-	-	-	-
Critical Hdwy Stg 1	5.47	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.47	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.563	4	-	2.2	-	-	-	-	-
Pot Cap-1 Maneuver	145	122	0	840	-	0	0	-	-
Stage 1	475	437	0	-	-	0	0	-	-
Stage 2	476	405	0	-	-	0	0	-	-
Platoon blocked, %					-			-	-
Mov Cap-1 Maneuver	134	0	-	840	-	-	-	-	-
Mov Cap-2 Maneuver	134	0	-	-	-	-	-	-	-
Stage 1	440	0	-	-	-	-	-	-	-
Stage 2	476	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	37.1	0.9	0
HCM LOS	E		

Minor Lane/Major Mvmt	NBL	NBT	WBLn1	WBLn2	SBT	SBR
Capacity (veh/h)	840	-	134	-	-	-
HCM Lane V/C Ratio	0.073	-	0.166	-	-	-
HCM Control Delay (s)	9.6	-	37.1	0	-	-
HCM Lane LOS	A	-	E	A	-	-
HCM 95th %tile Q(veh)	0.2	-	0.6	-	-	-

HCS7 Two-Way Stop-Control Text Report

TWO-WAY STOP CONTROL (TWSC) Analysis

File Name:	2032NBC_PM_SD37_I-90 EB RTI.xtw
Analyst:	HDR
Agency:	HDR
Date Performed:	11/1/2021
Time Analyzed:	2032 NBC - PM Peak
Jurisdiction:	SDDOT
Analysis Year:	2032
Project Description:	Mitchell MTP
Units:	U.S. Customary
Intersection Name:	SD37 & I-90 EB RTI
Major Street Direction:	North-South
East/West Street Name:	I-90 EB RTI
North/South Street Name:	SD37 / Ohlman Street
Analysis Time Period (hrs):	0.25

Vehicle Volumes and Adjustments

Major Street:									
Approach		NorthBound					SouthBound		
Movement	1U	1	2	3	4U		4	5	6
	U	L	T	R	U		L	T	R
Volume			475	35			190	405	
Peak Hour Factor, PHF					0.90				
Hourly Flow Rtae, HFR			528	39			211	450	
Percent Heavy Vehicles							4		
Number of Lanes	0	0	1	0		0	1	1	0
Lane Configuration				TR			L	T	
Median Type					Undivided				
Median Storage									
RT channelized?									
Left-Turn Lane Storage									
Upstream Signal?					Not Present				

Minor Street:							
Approach	WestBound				EastBound		
Movement	7	8	9		10	11	12
	L	T	R		L	T	R
Volume					115	0	45
Peak Hour Factor, PHF				0.90			
Hourly Flow Rtae, HFR					128	0	50
Percent Heavy Vehicles					80	0	6
Number of Lanes	0	0	0		0	1	0
Lane Configuration						LTR	
RT channelized?							
Flared Approach | Storage		|			No |	
Percent Grade						0	

Pedestrian Volumes and Adjustments

Approach	NB	SB	WB	EB
Movement	13	14	15	16
Flow (ped/hr)	0	0		0
Lane Width (ft)				
Walking Speed (ft/sec)				
Pedestrian Blockage Factor, f_pb				

Delay, Queue Length, and Level of Service

Approach	NB		SB		WestBound			EastBound		
Movement	1U	1	4U	4	7	8	9	10	11	12
Lane Configuration				L					LTR	
Flow Rate				211					178	
Lane Capacity				995					87	
v/c				0.21					2.05	
95% Queue Length				0.8					15.6	
Control Delay				9.6					588.6	
LOS				A					F	
Approach Delay				3.1					588.6	
Approach LOS									F	
Intersction Delay	75.9									

Step 1: MOVEMENT PRIORITIES

Major Street:									
Approach		NorthBound					SouthBound		
Priority	1U	1	2	3	4U		4	5	6
Movement	U	L	T	R	U		L	T	R

Minor Street:

Approach	WestBound			EastBound		
Priority	7	8	9	10	11	12
Movement	L	T	R	L	T	R

Step 2: MOVEMENT DEMAND VOLUMES AND FLOW RATES

Major Street:

Approach	NorthBound				SouthBound			
Movement	1U	1	2	3	4U	4	5	6
	U	L	T	R	U	L	T	R
Volume, V_x			475	35		190	405	
Flow Rate, v_x			528	39		211	450	

Minor Street:

Approach	WestBound			EastBound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume, V_x				115	0	45
Flow Rate, v_x				128	0	50

Step 3: CONFLICTING FLOW RATES

Major Street:

Approach	NorthBound				SouthBound			
Movement	1U	1	2	3	4U	4	5	6
	U	L	T	R	U	L	T	R
Flow Rate, v_x			528	39		211	450	
Conflicting Flow, v_c,x						567		

Minor Street:

Approach	WestBound			EastBound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Flow Rate, v_x				128	0	50
Conflicting Flow, v_c,x				1419	1439	450

Step 4: CRITICAL HEADWAYS and FOLLOW-UP HEADWAYS

CRITICAL HEADWAYS

Approach	NB		SB		WestBound			EastBound		
Movement	1U	1	4U	4	7	8	9	10	11	12
	U	L	U	L	L	T	R	L	T	R
t_c,base				4.1				7.1	6.5	6.2
Single Stage										
Stage I										
Stage II										
t_c,HV				1.0				1.0	1.0	1.0
P_HV				0.04				0.80	0.00	0.06
t_c,G								0.2	0.2	0.1
G								0	0	0
t_3,LT				0.0				0.0	0.0	0.0
t_c										
Single Stage				4.14				7.90	6.50	6.26
Stage I										
Stage II										

FOLLOW-UP HEADWAYS

Approach	NB		SB		WestBound			EastBound		
Movement	1U	1	4U	4	7	8	9	10	11	12
	U	L	U	L	L	T	R	L	T	R
t_f,base				2.2				3.5	4.0	3.3
t_f,HV				0.9				0.9	0.9	0.9
P_HV				0.04				0.80	0.00	0.06
t_f				2.24				4.22	4.00	3.35

Step 5: POTENTIAL CAPACITIES

NO UPSTREAM SIGNAL EFFECTS PRESENT

Approach	NB		SB		WestBound			EastBound		
Movement	1U	1	4U	4	7	8	9	10	11	12
	U	L	U	L	L	T	R	L	T	R
v_c,x				567				1419	1439	450
t_c,x				4.14				7.90	6.50	6.26
t_f,x				2.24				4.22	4.00	3.35
c_p,x				995				78	134	601

Steps 6 - 9: MOVEMENT CAPACITIES

Pedestrian Impedance				
Approach	NB	SB	WB	EB

Movement	13	14	15	16
Pedestrian Flow Rate v_x	0	0		0
Lane Width, w				
Walking Speed, S_p				
Pedestrian Blockage Factor, f_pb				

Major-Street Left-Turn Movements		1	4
Conflicting Flow, v_c,x			567
Potential Capacity, c_p,x			995
Pedestrian Impedance Factor, p_p,x			1.000
Movement Capacity, c_m,x			995
Probability of Queue-free State, p_0,j			0.788
Major L-Shared Probability Queue-free State, p*_0,j			1.000

Minor-Street Right-Turn Movements		9	12
Conflicting Flow, v_c,x			450
Potential Capacity, c_p,x			601
Pedestrian Impedance Factor, p_p,x			1.000
Movement Capacity, c_m,x			601
Probability of Queue-free State, p_0,j			0.917

Major-Street U-Turn Movements		1U	4U
Conflicting Flow, v_c,x			
Potential Capacity, c_p,x			
Capacity Adjustment Factor, f_x			
Movement Capacity, c_m,x			
Shared L/U Capacity, c_SH			
Probability of Queue-free State, p_0,j			

Minor-Street Through Movements		8	11
Conflicting Flow, v_c,x			1439
Potential Capacity, c_p,x			134
Pedestrian Impedance Factor, p_p,x			1.000
Capacity Adjustment Factor, f_x			0.788
Movement Capacity, c_m,x			106
Probability of Queue-free State, p_0,j			1.000

Minor-Street Left-Turn Movements		7	10
Conflicting Flow, v_c,x			1419
Potential Capacity, c_p,x			78
Pedestrian Impedance Factor, p_p,x			1.000
Major L, Minor T Adjusted Impedance Factor, p"			0.788
Major L, Minor T Impedance Factor, p'			0.837
Capacity Adjustment Factor, f_x			0.837
Movement Capacity, c_m,x			65

Step 10: FINAL CAPACITY ADJUSTMENTS

SHARED-LANE CAPACITY OF MINOR STREET APPROACHES

Approach	WestBound			EastBound		
Movement	7	8	9	10	11	12
Lane Configuration					LTR	
Shared Flow Rate, v_y					178	
Movement Capacity, c_m,x				65	106	601
Shared Capacity, c_SH					87	

Step 11: CONTROL DELAY

CONTROL DELAY TO RANK 2 THROUGH 4 MOVEMENTS

Approach	NB			SB		WestBound		EastBound		
Movement	1U	1	4U	4	7	8	9	10	11	12
Flow Rate				211				128	0	50
Movement Capacity				995				65	106	601
Lane Configuration				L					LTR	
Shared Capacity									87	
Control Delay				9.6					588.6	

Steps 12 - 13: APPROACH/INTERSECTION CONTROL DELAY and 95% QUEUE LENGTHS

Approach	NB			SB		WestBound		EastBound		
Movement	1U	1	4U	4	7	8	9	10	11	12
Lane Configuration				L					LTR	
Flow Rate				211					178	
Lane Capacity				995					87	
v/c				0.21					2.05	
95% Queue Length				0.8					15.6	
Control Delay				9.6					588.6	

LOS		A	F
Approach Delay		3.1	588.6
Approach LOS			F
Intersction Delay	75.9		

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	15	25	160	25	25	20	80	225	55	20	175	10
Future Volume (vph)	15	25	160	25	25	20	80	225	55	20	175	10
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	0		0	0		0	150		0	0		0
Storage Lanes	0		0	0		0	1		0	0		0
Taper Length (ft)	25			25			105			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	0.95	0.95
Frt		0.892			0.962			0.971			0.993	
Flt Protected		0.996			0.982		0.950				0.995	
Satd. Flow (prot)	0	1568	0	0	1667	0	1676	3256	0	0	3313	0
Flt Permitted		0.996			0.982		0.950				0.995	
Satd. Flow (perm)	0	1568	0	0	1667	0	1676	3256	0	0	3313	0
Link Speed (mph)		40			40			65			65	
Link Distance (ft)		2897			2749			1385			1493	
Travel Time (s)		49.4			46.9			14.5			15.7	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	17	28	178	28	28	22	89	250	61	22	194	11
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	223	0	0	78	0	89	311	0	0	227	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 37.5%		ICU Level of Service A	
Analysis Period (min) 15			

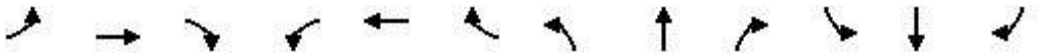
Intersection	
Int Delay, s/veh	5.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	15	25	160	25	25	20	80	225	55	20	175	10
Future Vol, veh/h	15	25	160	25	25	20	80	225	55	20	175	10
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	150	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	17	28	178	28	28	22	89	250	61	22	194	11

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	561	733	103	614	708	156	205	0	0	311	0	0
Stage 1	244	244	-	459	459	-	-	-	-	-	-	-
Stage 2	317	489	-	155	249	-	-	-	-	-	-	-
Critical Hdwy	7.54	6.54	6.94	7.54	6.54	6.94	4.14	-	-	4.14	-	-
Critical Hdwy Stg 1	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.52	4.02	3.32	3.52	4.02	3.32	2.22	-	-	2.22	-	-
Pot Cap-1 Maneuver	410	346	932	376	358	862	1364	-	-	1246	-	-
Stage 1	738	703	-	551	565	-	-	-	-	-	-	-
Stage 2	669	548	-	832	699	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	350	317	932	266	328	862	1364	-	-	1246	-	-
Mov Cap-2 Maneuver	350	317	-	266	328	-	-	-	-	-	-	-
Stage 1	690	689	-	515	528	-	-	-	-	-	-	-
Stage 2	577	512	-	633	685	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	12.8	17.6	1.7	0.9
HCM LOS	B	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1364	-	-	682	362	1246	-	-
HCM Lane V/C Ratio	0.065	-	-	0.326	0.215	0.018	-	-
HCM Control Delay (s)	7.8	-	-	12.8	17.6	7.9	0.1	-
HCM Lane LOS	A	-	-	B	C	A	A	-
HCM 95th %tile Q(veh)	0.2	-	-	1.4	0.8	0.1	-	-



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	5	30	15	10	15	45	360	30	15	325	5
Future Volume (vph)	5	5	30	15	10	15	45	360	30	15	325	5
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	0		0	0		0	80		0	0		0
Storage Lanes	0		0	0		0	1		0	0		0
Taper Length (ft)	25			25			60			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	0.95	0.95
Frt		0.901			0.949			0.989			0.998	
Flt Protected		0.993			0.981		0.950				0.998	
Satd. Flow (prot)	0	1579	0	0	1643	0	1676	3316	0	0	3340	0
Flt Permitted		0.993			0.981		0.950				0.998	
Satd. Flow (perm)	0	1579	0	0	1643	0	1676	3316	0	0	3340	0
Link Speed (mph)		25			40			45			55	
Link Distance (ft)		1010			1235			1455			1882	
Travel Time (s)		27.5			21.1			22.0			23.3	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	6	6	33	17	11	17	50	400	33	17	361	6
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	45	0	0	45	0	50	433	0	0	384	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 37.1%		ICU Level of Service A	
Analysis Period (min) 15			

Intersection	
Int Delay, s/veh	1.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	5	5	30	15	10	15	45	360	30	15	325	5
Future Vol, veh/h	5	5	30	15	10	15	45	360	30	15	325	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	80	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	6	6	33	17	11	17	50	400	33	17	361	6

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	704	931	184	735	918	217	367	0	0	433	0	0
Stage 1	398	398	-	517	517	-	-	-	-	-	-	-
Stage 2	306	533	-	218	401	-	-	-	-	-	-	-
Critical Hdwy	7.54	6.54	6.94	7.54	6.54	6.94	4.14	-	-	4.14	-	-
Critical Hdwy Stg 1	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.52	4.02	3.32	3.52	4.02	3.32	2.22	-	-	2.22	-	-
Pot Cap-1 Maneuver	324	265	827	308	270	787	1188	-	-	1123	-	-
Stage 1	599	601	-	509	532	-	-	-	-	-	-	-
Stage 2	679	523	-	764	599	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	293	249	827	277	254	787	1188	-	-	1123	-	-
Mov Cap-2 Maneuver	293	249	-	277	254	-	-	-	-	-	-	-
Stage 1	574	590	-	488	510	-	-	-	-	-	-	-
Stage 2	623	501	-	713	588	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	12.2	16.6	0.8	0.5
HCM LOS	B	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1188	-	-	545	355	1123	-	-
HCM Lane V/C Ratio	0.042	-	-	0.082	0.125	0.015	-	-
HCM Control Delay (s)	8.2	-	-	12.2	16.6	8.3	0.1	-
HCM Lane LOS	A	-	-	B	C	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0.3	0.4	0	-	-

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	55	35	170	30	55	40	215	415	40	25	425	40
Future Volume (vph)	55	35	170	30	55	40	215	415	40	25	425	40
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	0		50	0		0	100		0	100		0
Storage Lanes	0		1	0		0	1		0	1		0
Taper Length (ft)	25			25			220			290		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt			0.850		0.957			0.987			0.987	
Flt Protected		0.970			0.988		0.950			0.950		
Satd. Flow (prot)	0	1712	1500	0	1669	0	1676	3309	0	1676	3309	0
Flt Permitted		0.970			0.988		0.950			0.950		
Satd. Flow (perm)	0	1712	1500	0	1669	0	1676	3309	0	1676	3309	0
Link Speed (mph)		40			25			35			35	
Link Distance (ft)		1380			1122			778			1516	
Travel Time (s)		23.5			30.6			15.2			29.5	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	61	39	189	33	61	44	239	461	44	28	472	44
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	100	189	0	138	0	239	505	0	28	516	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 50.4%		ICU Level of Service A	
Analysis Period (min) 15			

Intersection	
Int Delay, s/veh	65.5

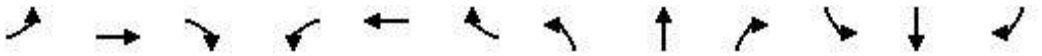
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	55	35	170	30	55	40	215	415	40	25	425	40
Future Vol, veh/h	55	35	170	30	55	40	215	415	40	25	425	40
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	50	-	-	-	100	-	-	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	61	39	189	33	61	44	239	461	44	28	472	44

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1289	1533	258	1273	1533	253	516	0	0	505	0	0
Stage 1	550	550	-	961	961	-	-	-	-	-	-	-
Stage 2	739	983	-	312	572	-	-	-	-	-	-	-
Critical Hdwy	7.54	6.54	6.94	7.54	6.54	6.94	4.14	-	-	4.14	-	-
Critical Hdwy Stg 1	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.52	4.02	3.32	3.52	4.02	3.32	2.22	-	-	2.22	-	-
Pot Cap-1 Maneuver	121	115	741	124	115	746	1046	-	-	1056	-	-
Stage 1	487	514	-	275	333	-	-	-	-	-	-	-
Stage 2	375	325	-	673	502	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	~ 40	86	741	49	86	746	1046	-	-	1056	-	-
Mov Cap-2 Maneuver	~ 40	86	-	49	86	-	-	-	-	-	-	-
Stage 1	376	500	-	212	257	-	-	-	-	-	-	-
Stage 2	207	251	-	450	488	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	222.8	$ 328.8	3	0.4
HCM LOS	F	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1046	-	-	51	741	96	1056	-	-
HCM Lane V/C Ratio	0.228	-	-	1.961	0.255	1.447	0.026	-	-
HCM Control Delay (s)	9.5	-	-	$ 621.9	11.5	$ 328.8	8.5	-	-
HCM Lane LOS	A	-	-	F	B	F	A	-	-
HCM 95th %tile Q(veh)	0.9	-	-	9.9	1	10.4	0.1	-	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

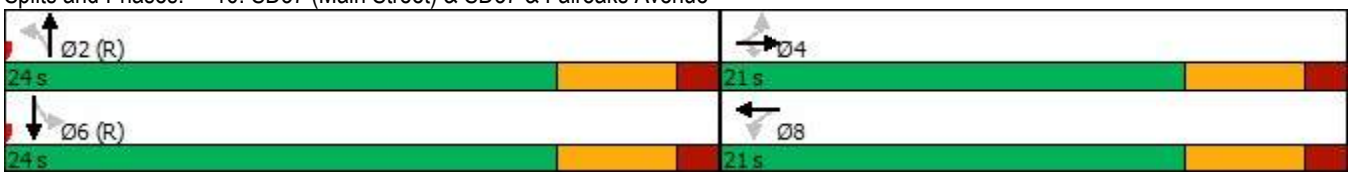


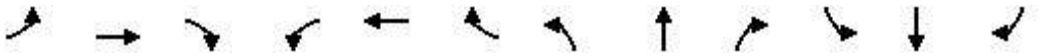
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	250	80	125	15	55	25	135	395	15	75	325	225
Future Volume (vph)	250	80	125	15	55	25	135	395	15	75	325	225
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	155		0	100		0	100		0	100		0
Storage Lanes	1		1	1		0	1		0	1		0
Taper Length (ft)	130			65			130			125		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt			0.850		0.953			0.994			0.939	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1676	1765	1500	1676	1682	0	1676	3333	0	1676	3148	0
Flt Permitted	0.699			0.699			0.415			0.489		
Satd. Flow (perm)	1234	1765	1500	1234	1682	0	732	3333	0	863	3148	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			139		28			10			250	
Link Speed (mph)		40			25			30			35	
Link Distance (ft)		1120			746			1311			778	
Travel Time (s)		19.1			20.3			29.8			15.2	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	278	89	139	17	61	28	150	439	17	83	361	250
Shared Lane Traffic (%)												
Lane Group Flow (vph)	278	89	139	17	89	0	150	456	0	83	611	0
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Detector Phase	4	4	4	8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	15.5	15.5	15.5	15.5	15.5		15.5	15.5		15.5	15.5	
Total Split (s)	21.0	21.0	21.0	21.0	21.0		24.0	24.0		24.0	24.0	
Total Split (%)	46.7%	46.7%	46.7%	46.7%	46.7%		53.3%	53.3%		53.3%	53.3%	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	1.5	1.5	1.5	1.5	1.5		1.5	1.5		1.5	1.5	
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 Optimize?												
Recall Mode	Max	Max	Max	Min	Min		C-Max	C-Max		C-Max	C-Max	
Act Effct Green (s)	15.5	15.5	15.5	15.5	15.5		18.5	18.5		18.5	18.5	
Actuated g/C Ratio	0.34	0.34	0.34	0.34	0.34		0.41	0.41		0.41	0.41	
v/c Ratio	0.65	0.15	0.23	0.04	0.15		0.50	0.33		0.23	0.42	
Control Delay	22.3	11.0	3.8	10.3	8.4		17.0	9.7		10.8	6.4	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	22.3	11.0	3.8	10.3	8.4		17.0	9.7		10.8	6.4	
LOS	C	B	A	B	A		B	A		B	A	
Approach Delay		15.2			8.7			11.5			7.0	
Approach LOS		B			A			B			A	
Queue Length 50th (ft)	59	15	0	3	10		27	38		13	30	
Queue Length 95th (ft)	#147	38	26	12	32		71	64		36	58	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Internal Link Dist (ft)		1040			666			1231			698	
Turn Bay Length (ft)	155			100			100			100		
Base Capacity (vph)	425	607	607	425	597		300	1376		354	1441	
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	0.65	0.15	0.23	0.04	0.15		0.50	0.33		0.23	0.42	

Intersection Summary			
Area Type:	Other		
Cycle Length: 45			
Actuated Cycle Length: 45			
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green			
Natural Cycle: 45			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.65			
Intersection Signal Delay: 10.7		Intersection LOS: B	
Intersection Capacity Utilization 60.5%		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: 16: SD37 (Main Street) & SD37 & Fairoaks Avenue





Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	250	80	125	15	55	25	135	395	15	75	325	225
Future Volume (veh/h)	250	80	125	15	55	25	135	395	15	75	325	225
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1772	1772	1772	1772	1772	1772	1772	1772	1772	1772	1772	1772
Adj Flow Rate, veh/h	278	89	0	17	61	28	150	439	17	83	361	0
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	562	610		565	396	182	507	1359	53	460	1384	
Arrive On Green	0.34	0.34	0.00	0.34	0.34	0.34	0.41	0.41	0.41	0.41	0.41	0.00
Sat Flow, veh/h	1308	1772	1502	1308	1149	528	1021	3305	128	935	3455	0
Grp Volume(v), veh/h	278	89	0	17	0	89	150	223	233	83	361	0
Grp Sat Flow(s),veh/h/ln	1308	1772	1502	1308	0	1677	1021	1683	1749	935	1683	0
Q Serve(g_s), s	8.4	1.6	0.0	0.4	0.0	1.7	5.1	4.1	4.1	3.0	3.2	0.0
Cycle Q Clear(g_c), s	10.1	1.6	0.0	2.0	0.0	1.7	8.3	4.1	4.1	7.0	3.2	0.0
Prop In Lane	1.00		1.00	1.00		0.31	1.00		0.07	1.00		0.00
Lane Grp Cap(c), veh/h	562	610		565	0	578	507	692	719	460	1384	
V/C Ratio(X)	0.49	0.15		0.03	0.00	0.15	0.30	0.32	0.32	0.18	0.26	
Avail Cap(c_a), veh/h	562	610		565	0	578	507	692	719	460	1384	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	13.7	10.2	0.0	10.9	0.0	10.2	11.5	9.0	9.0	11.4	8.7	0.0
Incr Delay (d2), s/veh	3.1	0.5	0.0	0.0	0.0	0.1	1.5	1.2	1.2	0.9	0.5	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.4	0.5	0.0	0.1	0.0	0.5	1.2	1.4	1.4	0.6	0.9	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	16.8	10.7	0.0	10.9	0.0	10.3	13.0	10.2	10.2	12.3	9.2	0.0
LnGrp LOS	B	B		B	A	B	B	B	B	B	A	
Approach Vol, veh/h		367	A		106			606			444	A
Approach Delay, s/veh		15.3			10.4			10.9			9.8	
Approach LOS		B			B			B			A	

Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		24.0		21.0		24.0		21.0				
Change Period (Y+Rc), s		5.5		5.5		5.5		5.5				
Max Green Setting (Gmax), s		18.5		15.5		18.5		15.5				
Max Q Clear Time (g_c+I1), s		10.3		12.1		9.0		4.0				
Green Ext Time (p_c), s		2.2		0.5		1.8		0.3				

Intersection Summary		
HCM 6th Ctrl Delay	11.6	
HCM 6th LOS	B	

Notes

Unsignalized Delay for [EBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	325	65	110	295	10	130	10	120	10	15	10
Future Volume (vph)	5	325	65	110	295	10	130	10	120	10	15	10
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	110		0	110		0	95		0	0		0
Storage Lanes	1		0	1		0	1		1	0		0
Taper Length (ft)	125			125			125			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		0.975			0.995				0.850		0.962	
Flt Protected	0.950			0.950			0.950				0.986	
Satd. Flow (prot)	1676	3269	0	1676	3336	0	1676	1765	1500	0	1674	0
Flt Permitted	0.950			0.950			0.950				0.986	
Satd. Flow (perm)	1676	3269	0	1676	3336	0	1676	1765	1500	0	1674	0
Link Speed (mph)		40			40			35			25	
Link Distance (ft)		1143			1120			993			528	
Travel Time (s)		19.5			19.1			19.3			14.4	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	6	361	72	122	328	11	144	11	133	11	17	11
Shared Lane Traffic (%)												
Lane Group Flow (vph)	6	433	0	122	339	0	144	11	133	0	39	0
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 42.4%		ICU Level of Service A	
Analysis Period (min) 15			

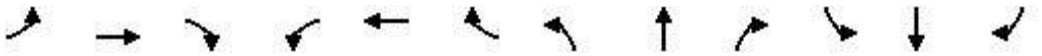
Intersection	
Int Delay, s/veh	8.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	5	325	65	110	295	10	130	10	120	10	15	10
Future Vol, veh/h	5	325	65	110	295	10	130	10	120	10	15	10
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
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	110	-	-	110	-	-	95	-	0	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	6	361	72	122	328	11	144	11	133	11	17	11

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	339	0	0	433	0	0	826	992	217	776	1023	170
Stage 1	-	-	-	-	-	-	409	409	-	578	578	-
Stage 2	-	-	-	-	-	-	417	583	-	198	445	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	1217	-	-	1123	-	-	264	244	787	287	234	844
Stage 1	-	-	-	-	-	-	590	594	-	468	499	-
Stage 2	-	-	-	-	-	-	584	497	-	785	573	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1217	-	-	1123	-	-	224	216	787	209	208	844
Mov Cap-2 Maneuver	-	-	-	-	-	-	224	216	-	209	208	-
Stage 1	-	-	-	-	-	-	587	591	-	466	445	-
Stage 2	-	-	-	-	-	-	494	443	-	637	570	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	2.3	28.9	20.8
HCM LOS			D	C

Minor Lane/Major Mvmt	NBLn1	NBLn2	NBLn3	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	224	216	787	1217	-	-	1123	-	-	266
HCM Lane V/C Ratio	0.645	0.051	0.169	0.005	-	-	0.109	-	-	0.146
HCM Control Delay (s)	46.3	22.6	10.5	8	-	-	8.6	-	-	20.8
HCM Lane LOS	E	C	B	A	-	-	A	-	-	C
HCM 95th %tile Q(veh)	3.9	0.2	0.6	0	-	-	0.4	-	-	0.5

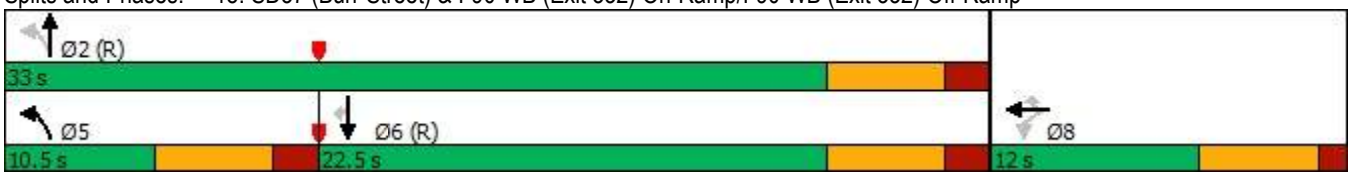


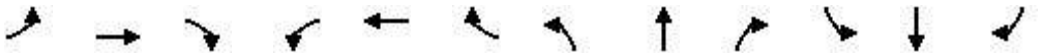
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	105	0	210	85	635	0	0	735	110
Future Volume (vph)	0	0	0	105	0	210	85	635	0	0	735	110
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	0		0	0		360	200		0	0		0
Storage Lanes	0		0	0		1	1		0	0		1
Taper Length (ft)	25			25			65			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt						0.850						0.850
Flt Protected					0.950		0.950					
Satd. Flow (prot)	0	0	0	0	1569	1378	1629	3226	0	0	3320	1430
Flt Permitted					0.950		0.229					
Satd. Flow (perm)	0	0	0	0	1569	1378	393	3226	0	0	3320	1430
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						233						182
Link Speed (mph)		50			50			35			35	
Link Distance (ft)		1127			1072			742			2179	
Travel Time (s)		15.4			14.6			14.5			42.4	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	0%	0%	0%	9%	0%	11%	5%	6%	0%	0%	3%	7%
Adj. Flow (vph)	0	0	0	117	0	233	94	706	0	0	817	122
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	117	233	94	706	0	0	817	122
Turn Type				Perm	NA	Perm	pm+pt	NA			NA	Perm
Protected Phases					8		5	2			6	
Permitted Phases				8		8	2					6
Detector Phase				8	8	8	5	2			6	6
Switch Phase												
Minimum Initial (s)				7.0	7.0	7.0	5.0	12.0			12.0	12.0
Minimum Split (s)				12.0	12.0	12.0	10.5	17.5			17.5	17.5
Total Split (s)				12.0	12.0	12.0	10.5	33.0			22.5	22.5
Total Split (%)				26.7%	26.7%	26.7%	23.3%	73.3%			50.0%	50.0%
Yellow Time (s)				4.0	4.0	4.0	4.0	4.0			4.0	4.0
All-Red Time (s)				1.0	1.0	1.0	1.5	1.5			1.5	1.5
Lost Time Adjust (s)					0.0	0.0	0.0	0.0			0.0	0.0
Total Lost Time (s)					5.0	5.0	5.5	5.5			5.5	5.5
Lead/Lag							Lead				Lag	Lag
Lead-Lag Optimize?							Yes				Yes	Yes
Recall Mode				Min	Min	Min	None	C-Max			C-Max	C-Max
Act Effct Green (s)					7.0	7.0	27.5	27.5			21.2	21.2
Actuated g/C Ratio					0.16	0.16	0.61	0.61			0.47	0.47
v/c Ratio					0.48	0.57	0.25	0.36			0.52	0.16
Control Delay					24.7	9.5	5.3	5.0			11.3	1.4
Queue Delay					0.0	0.0	0.0	0.0			0.0	0.0
Total Delay					24.7	9.5	5.3	5.0			11.3	1.4
LOS					C	A	A	A			B	A
Approach Delay					14.6			5.0			10.0	
Approach LOS					B			A			B	
Queue Length 50th (ft)					28	0	8	37			87	0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 95th (ft)					#67	#46	20	60			134	12
Internal Link Dist (ft)		1047			992			662			2099	
Turn Bay Length (ft)						360	200					
Base Capacity (vph)					244	411	377	1971			1564	769
Starvation Cap Reductn					0	0	0	0			0	0
Spillback Cap Reductn					0	0	0	0			0	0
Storage Cap Reductn					0	0	0	0			0	0
Reduced v/c Ratio					0.48	0.57	0.25	0.36			0.52	0.16

Intersection Summary			
Area Type:	Other		
Cycle Length: 45			
Actuated Cycle Length: 45			
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green			
Natural Cycle: 45			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.57			
Intersection Signal Delay: 8.9		Intersection LOS: A	
Intersection Capacity Utilization 53.0%		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: 18: SD37 (Burr Street) & I-90 WB (Exit 332) On-Ramp/I-90 WB (Exit 332) Off-Ramp





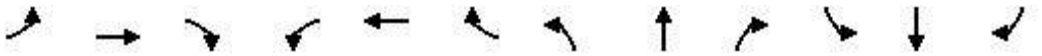
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	105	0	210	85	635	0	0	735	110
Future Volume (veh/h)	0	0	0	105	0	210	85	635	0	0	735	110
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach					No			No			No	
Adj Sat Flow, veh/h/ln				1674	1800	1646	1730	1716	0	0	1758	1702
Adj Flow Rate, veh/h				117	0	233	94	706	0	0	817	0
Peak Hour Factor				0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %				9	0	11	5	6	0	0	3	7
Cap, veh/h				267	0	217	431	1992	0	0	1376	
Arrive On Green				0.16	0.00	0.16	0.08	0.61	0.00	0.00	0.41	0.00
Sat Flow, veh/h				1714	0	1395	1647	3346	0	0	3428	1442
Grp Volume(v), veh/h				117	0	233	94	706	0	0	817	0
Grp Sat Flow(s),veh/h/ln				1714	0	1395	1647	1630	0	0	1670	1442
Q Serve(g_s), s				2.8	0.0	7.0	1.3	4.8	0.0	0.0	8.6	0.0
Cycle Q Clear(g_c), s				2.8	0.0	7.0	1.3	4.8	0.0	0.0	8.6	0.0
Prop In Lane				1.00		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				267	0	217	431	1992	0	0	1376	
V/C Ratio(X)				0.44	0.00	1.07	0.22	0.35	0.00	0.00	0.59	
Avail Cap(c_a), veh/h				267	0	217	488	1992	0	0	1376	
HCM Platoon Ratio				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	0.00	1.00	0.79	0.79	0.00	0.00	1.00	0.00
Uniform Delay (d), s/veh				17.2	0.0	19.0	6.6	4.3	0.0	0.0	10.3	0.0
Incr Delay (d2), s/veh				1.1	0.0	82.2	0.2	0.4	0.0	0.0	1.9	0.0
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				0.9	0.0	6.7	0.3	0.9	0.0	0.0	2.7	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				18.4	0.0	101.2	6.8	4.7	0.0	0.0	12.2	0.0
LnGrp LOS				B	A	F	A	A	A	A	B	
Approach Vol, veh/h					350			800			817	A
Approach Delay, s/veh					73.5			5.0			12.2	
Approach LOS					E			A			B	

Timer - Assigned Phs		2			5	6		8				
Phs Duration (G+Y+Rc), s		33.0			9.0	24.0		12.0				
Change Period (Y+Rc), s		5.5			5.5	5.5		5.0				
Max Green Setting (Gmax), s		27.5			5.0	17.0		7.0				
Max Q Clear Time (g_c+I1), s		6.8			3.3	10.6		9.0				
Green Ext Time (p_c), s		4.7			0.0	2.8		0.0				

Intersection Summary		
HCM 6th Ctrl Delay	20.2	
HCM 6th LOS	C	

Notes

Unsignalized Delay for [SBR] is excluded from calculations of the approach delay and intersection delay.

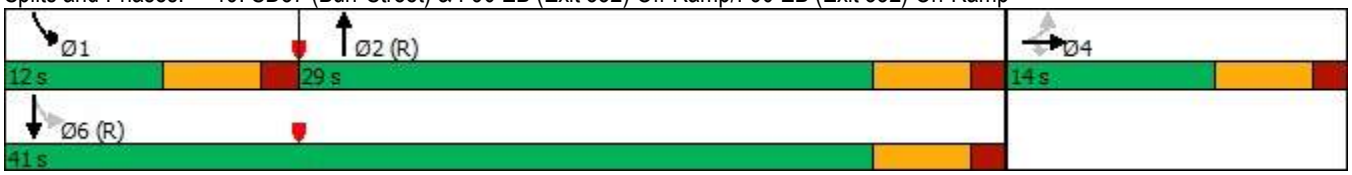


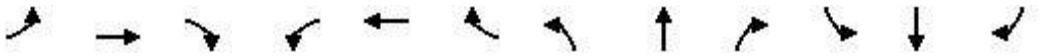
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	90	0	140	0	0	0	0	630	185	150	690	0
Future Volume (vph)	90	0	140	0	0	0	0	630	185	150	690	0
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	0		300	0		0	0		120	190		0
Storage Lanes	0		1	0		0	0		0	1		0
Taper Length (ft)	25			25			25			60		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	1.00
Frt			0.850					0.966				
Flt Protected		0.950								0.950		
Satd. Flow (prot)	0	1413	1443	0	0	0	0	3166	0	1613	3320	0
Flt Permitted		0.950								0.205		
Satd. Flow (perm)	0	1413	1443	0	0	0	0	3166	0	348	3320	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			159					87				
Link Speed (mph)		50			50			35			35	
Link Distance (ft)		1362			971			1492			742	
Travel Time (s)		18.6			13.2			29.1			14.5	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	21%	0%	6%	0%	0%	0%	0%	3%	9%	6%	3%	0%
Adj. Flow (vph)	100	0	156	0	0	0	0	700	206	167	767	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	100	156	0	0	0	0	906	0	167	767	0
Turn Type	Perm	NA	Perm					NA		pm+pt	NA	
Protected Phases		4						2		1	6	
Permitted Phases	4		4							6		
Detector Phase	4	4	4					2		1	6	
Switch Phase												
Minimum Initial (s)	7.0	7.0	7.0					12.0		5.0	12.0	
Minimum Split (s)	12.5	12.5	12.5					17.5		10.5	17.5	
Total Split (s)	14.0	14.0	14.0					29.0		12.0	41.0	
Total Split (%)	25.5%	25.5%	25.5%					52.7%		21.8%	74.5%	
Yellow Time (s)	4.0	4.0	4.0					4.0		4.0	4.0	
All-Red Time (s)	1.5	1.5	1.5					1.5		1.5	1.5	
Lost Time Adjust (s)		0.0	0.0					0.0		0.0	0.0	
Total Lost Time (s)		5.5	5.5					5.5		5.5	5.5	
Lead/Lag								Lag		Lead		
Lead-Lag Optimize?								Yes		Yes		
Recall Mode	Min	Min	Min					C-Max		None	C-Max	
Act Effct Green (s)		8.0	8.0					26.3		36.0	36.0	
Actuated g/C Ratio		0.15	0.15					0.48		0.65	0.65	
v/c Ratio		0.49	0.45					0.58		0.45	0.35	
Control Delay		30.1	9.1					12.2		7.7	4.9	
Queue Delay		0.0	0.0					0.0		0.0	0.0	
Total Delay		30.1	9.1					12.2		7.7	4.9	
LOS		C	A					B		A	A	
Approach Delay		17.3						12.2			5.4	
Approach LOS		B						B			A	
Queue Length 50th (ft)		30	0					104		17	49	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 95th (ft)		70	41					158		35	73	
Internal Link Dist (ft)		1282			891			1412			662	
Turn Bay Length (ft)			300							190		
Base Capacity (vph)		218	357					1560		378	2171	
Starvation Cap Reductn		0	0					0		0	0	
Spillback Cap Reductn		0	0					0		0	0	
Storage Cap Reductn		0	0					0		0	0	
Reduced v/c Ratio		0.46	0.44					0.58		0.44	0.35	

Intersection Summary			
Area Type:	Other		
Cycle Length: 55			
Actuated Cycle Length: 55			
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBTL, Start of Green			
Natural Cycle: 55			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.58			
Intersection Signal Delay: 9.8		Intersection LOS: A	
Intersection Capacity Utilization 53.0%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 19: SD37 (Burr Street) & I-90 EB (Exit 332) Off-Ramp/I-90 EB (Exit 332) On-Ramp





Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	90	0	140	0	0	0	0	630	185	150	690	0
Future Volume (veh/h)	90	0	140	0	0	0	0	630	185	150	690	0
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No						No			No	
Adj Sat Flow, veh/h/ln	1505	1800	1716				0	1758	1674	1716	1758	0
Adj Flow Rate, veh/h	100	0	156				0	700	0	167	767	0
Peak Hour Factor	0.90	0.90	0.90				0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	21	0	6				0	3	9	6	3	0
Cap, veh/h	242	0	205				0	1587		511	2201	0
Arrive On Green	0.14	0.00	0.14				0.00	0.48	0.00	0.08	0.66	0.00
Sat Flow, veh/h	1714	0	1454				0	3516	0	1634	3428	0
Grp Volume(v), veh/h	100	0	156				0	700	0	167	767	0
Grp Sat Flow(s),veh/h/ln	1714	0	1454				0	1670	0	1634	1670	0
Q Serve(g_s), s	2.9	0.0	5.7				0.0	7.7	0.0	2.5	5.6	0.0
Cycle Q Clear(g_c), s	2.9	0.0	5.7				0.0	7.7	0.0	2.5	5.6	0.0
Prop In Lane	1.00		1.00				0.00		0.00	1.00		0.00
Lane Grp Cap(c), veh/h	242	0	205				0	1587		511	2201	0
V/C Ratio(X)	0.41	0.00	0.76				0.00	0.44		0.33	0.35	0.00
Avail Cap(c_a), veh/h	265	0	225				0	1587		567	2201	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00				0.00	0.80	0.00	0.84	0.84	0.00
Uniform Delay (d), s/veh	21.5	0.0	22.7				0.0	9.6	0.0	6.1	4.2	0.0
Incr Delay (d2), s/veh	1.1	0.0	12.9				0.0	0.7	0.0	0.3	0.4	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.1	0.0	2.4				0.0	2.3	0.0	0.6	1.2	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	22.7	0.0	35.7				0.0	10.3	0.0	6.4	4.5	0.0
LnGrp LOS	C	A	D				A	B		A	A	A
Approach Vol, veh/h		256						700	A		934	
Approach Delay, s/veh		30.6						10.3			4.9	
Approach LOS		C						B			A	

Timer - Assigned Phs	1	2		4		6
Phs Duration (G+Y+Rc), s	10.1	31.6		13.3		41.7
Change Period (Y+Rc), s	5.5	5.5		5.5		5.5
Max Green Setting (Gmax), s	6.5	23.5		8.5		35.5
Max Q Clear Time (g_c+I1), s	4.5	9.7		7.7		7.6
Green Ext Time (p_c), s	0.1	3.9		0.1		5.7

Intersection Summary		
HCM 6th Ctrl Delay		10.4
HCM 6th LOS		B

Notes

Unsignalized Delay for [NBR] is excluded from calculations of the approach delay and intersection delay.

Appendix C: Synchro 11 Output (2045 No-Build Conditions)

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	100	170	15	15	80	95	20	85	20	125	35	25
Future Volume (vph)	100	170	15	15	80	95	20	85	20	125	35	25
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	170		0	170		0	0		0	0		0
Storage Lanes	1		0	1		0	0		0	0		0
Taper Length (ft)	75			75			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		0.988			0.918			0.978			0.982	
Flt Protected	0.950			0.950				0.992			0.967	
Satd. Flow (prot)	1710	1700	0	1500	1581	0	0	1677	0	0	1665	0
Flt Permitted	0.950			0.950				0.992			0.967	
Satd. Flow (perm)	1710	1700	0	1500	1581	0	0	1677	0	0	1665	0
Link Speed (mph)		35			35			35			35	
Link Distance (ft)		1332			1574			793			857	
Travel Time (s)		25.9			30.7			15.4			16.7	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	0%	5%	0%	14%	4%	5%	0%	4%	9%	0%	14%	0%
Adj. Flow (vph)	111	189	17	17	89	106	22	94	22	139	39	28
Shared Lane Traffic (%)												
Lane Group Flow (vph)	111	206	0	17	195	0	0	138	0	0	206	0
Sign Control		Stop			Stop			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 44.0%		ICU Level of Service A	
Analysis Period (min) 15			

Intersection	
Intersection Delay, s/veh	11
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	100	170	15	15	80	95	20	85	20	125	35	25
Future Vol, veh/h	100	170	15	15	80	95	20	85	20	125	35	25
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles, %	0	5	0	14	4	5	0	4	9	0	14	0
Mvmt Flow	111	189	17	17	89	106	22	94	22	139	39	28
Number of Lanes	1	1	0	1	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	2	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	2	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	2	2
HCM Control Delay	11.2	10.8	10.3	11.3
HCM LOS	B	B	B	B

Lane	NBLn1	EBLn1	EBLn2	WBLn1	WBLn2	SBLn1
Vol Left, %	16%	100%	0%	100%	0%	68%
Vol Thru, %	68%	0%	92%	0%	46%	19%
Vol Right, %	16%	0%	8%	0%	54%	14%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	125	100	185	15	175	185
LT Vol	20	100	0	15	0	125
Through Vol	85	0	170	0	80	35
RT Vol	20	0	15	0	95	25
Lane Flow Rate	139	111	206	17	194	206
Geometry Grp	2	7	7	7	7	2
Degree of Util (X)	0.217	0.195	0.333	0.031	0.305	0.321
Departure Headway (Hd)	5.636	6.306	5.827	6.712	5.646	5.622
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	636	569	617	534	636	639
Service Time	3.683	4.041	3.562	4.452	3.385	3.663
HCM Lane V/C Ratio	0.219	0.195	0.334	0.032	0.305	0.322
HCM Control Delay	10.3	10.6	11.5	9.7	10.9	11.3
HCM Lane LOS	B	B	B	A	B	B
HCM 95th-tile Q	0.8	0.7	1.5	0.1	1.3	1.4

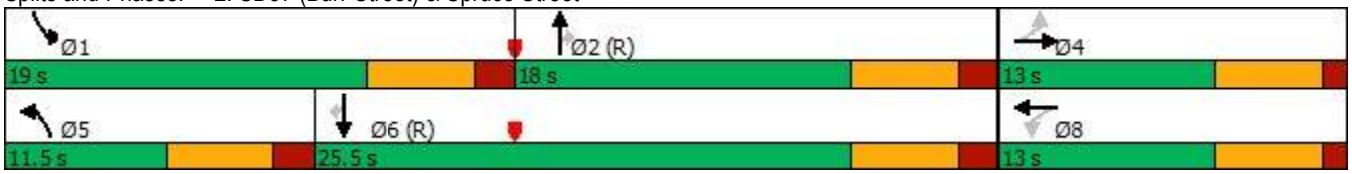
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	155	135	25	10	20	55	50	335	45	265	175	205
Future Volume (vph)	155	135	25	10	20	55	50	335	45	265	175	205
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	285		0	200		125	220		230	155		280
Storage Lanes	1		0	1		0	1		1	1		1
Taper Length (ft)	100			55			55			115		
Lane Util. Factor	0.97	1.00	1.00	1.00	0.95	0.95	1.00	0.95	1.00	1.00	0.95	1.00
Frt		0.976			0.890				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3130	1728	0	1710	2875	0	1710	3196	1443	1676	2948	1500
Flt Permitted	0.700			0.645			0.950			0.950		
Satd. Flow (perm)	2306	1728	0	1161	2875	0	1710	3196	1443	1676	2948	1500
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		16			61				284			228
Link Speed (mph)		35			35			35			35	
Link Distance (ft)		1814			1403			1364			1492	
Travel Time (s)		35.3			27.3			26.6			29.1	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	6%	2%	0%	0%	0%	8%	0%	7%	6%	2%	16%	2%
Adj. Flow (vph)	172	150	28	11	22	61	56	372	50	294	194	228
Shared Lane Traffic (%)												
Lane Group Flow (vph)	172	178	0	11	83	0	56	372	50	294	194	228
Turn Type	Perm	NA		Perm	NA		Prot	NA	Perm	Prot	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8					2			6
Detector Phase	4	4		8	8		5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	7.0	7.0		7.0	7.0		4.0	12.0	12.0	4.0	12.0	12.0
Minimum Split (s)	12.5	12.5		12.5	12.5		9.5	17.5	17.5	10.5	17.5	17.5
Total Split (s)	13.0	13.0		13.0	13.0		11.5	18.0	18.0	19.0	25.5	25.5
Total Split (%)	26.0%	26.0%		26.0%	26.0%		23.0%	36.0%	36.0%	38.0%	51.0%	51.0%
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0		1.0	1.0		1.5	1.5	1.5	1.5	1.5	1.5
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)	5.0	5.0		5.0	5.0		5.5	5.5	5.5	5.5	5.5	5.5
Lead/Lag							Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	Min	Min		Min	Min		None	C-Max	C-Max	None	C-Max	C-Max
Act Effct Green (s)	7.8	7.8		7.8	7.8		5.9	14.0	14.0	12.2	24.8	24.8
Actuated g/C Ratio	0.16	0.16		0.16	0.16		0.12	0.28	0.28	0.24	0.50	0.50
v/c Ratio	0.48	0.63		0.06	0.17		0.28	0.42	0.08	0.72	0.13	0.27
Control Delay	24.1	30.1		18.8	9.4		23.9	17.1	0.3	28.6	9.0	2.8
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	24.1	30.1		18.8	9.4		23.9	17.1	0.3	28.6	9.0	2.8
LOS	C	C		B	A		C	B	A	C	A	A
Approach Delay		27.2			10.5			16.1			15.1	
Approach LOS		C			B			B			B	
Queue Length 50th (ft)	23	45		3	3		15	48	0	75	18	0

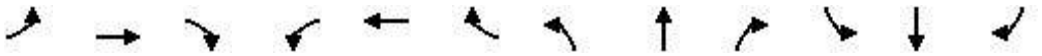
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 95th (ft)	47	#113		13	17		42	81	0	#162	34	31
Internal Link Dist (ft)		1734			1323			1284			1412	
Turn Bay Length (ft)	285			200			220		230	155		280
Base Capacity (vph)	368	289		185	511		205	895	608	452	1462	858
Starvation Cap Reductn	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	0.47	0.62		0.06	0.16		0.27	0.42	0.08	0.65	0.13	0.27

Intersection Summary	
Area Type:	Other
Cycle Length: 50	
Actuated Cycle Length: 50	
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green	
Natural Cycle: 50	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.72	
Intersection Signal Delay: 17.7	Intersection LOS: B
Intersection Capacity Utilization 50.2%	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: 2: SD37 (Burr Street) & Spruce Street





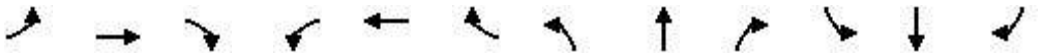
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	155	135	25	10	20	55	50	335	45	265	175	205
Future Volume (veh/h)	155	135	25	10	20	55	50	335	45	265	175	205
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1716	1772	1800	1800	1800	1688	1800	1702	1716	1772	1575	1772
Adj Flow Rate, veh/h	172	150	28	11	22	61	56	372	0	294	194	0
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	6	2	0	0	0	8	0	7	6	2	16	2
Cap, veh/h	564	214	40	204	252	225	74	1047		353	1465	
Arrive On Green	0.15	0.15	0.15	0.15	0.15	0.15	0.04	0.32	0.00	0.21	0.49	0.00
Sat Flow, veh/h	2470	1452	271	1225	1710	1525	1714	3233	1454	1688	2993	1502
Grp Volume(v), veh/h	172	0	178	11	22	61	56	372	0	294	194	0
Grp Sat Flow(s),veh/h/ln	1235	0	1723	1225	1710	1525	1714	1617	1454	1688	1497	1502
Q Serve(g_s), s	3.3	0.0	4.9	0.4	0.6	1.8	1.6	4.4	0.0	8.3	1.8	0.0
Cycle Q Clear(g_c), s	5.1	0.0	4.9	5.3	0.6	1.8	1.6	4.4	0.0	8.3	1.8	0.0
Prop In Lane	1.00		0.16	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	564	0	254	204	252	225	74	1047		353	1465	
V/C Ratio(X)	0.30	0.00	0.70	0.05	0.09	0.27	0.76	0.36		0.83	0.13	
Avail Cap(c_a), veh/h	595	0	276	220	274	244	206	1047		456	1465	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.91	0.91	0.00
Uniform Delay (d), s/veh	21.2	0.0	20.3	22.8	18.4	18.9	23.7	12.9	0.0	18.9	7.0	0.0
Incr Delay (d2), s/veh	0.3	0.0	7.0	0.1	0.1	0.6	14.3	0.9	0.0	9.2	0.2	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.9	0.0	2.2	0.1	0.2	0.6	0.9	1.5	0.0	3.7	0.4	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	21.5	0.0	27.3	22.9	18.6	19.6	38.0	13.9	0.0	28.2	7.1	0.0
LnGrp LOS	C	A	C	C	B	B	D	B		C	A	
Approach Vol, veh/h		350			94			428	A		488	A
Approach Delay, s/veh		24.5			19.7			17.0			19.8	
Approach LOS		C			B			B			B	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	15.9	21.7		12.4	7.7	30.0		12.4				
Change Period (Y+Rc), s	5.5	5.5		5.0	5.5	5.5		5.0				
Max Green Setting (Gmax), s	13.5	12.5		8.0	6.0	20.0		8.0				
Max Q Clear Time (g_c+I1), s	10.3	6.4		7.1	3.6	3.8		7.3				
Green Ext Time (p_c), s	0.3	1.2		0.2	0.0	1.0		0.0				

Intersection Summary		
HCM 6th Ctrl Delay		20.1
HCM 6th LOS		C

Notes

Unsignalized Delay for [NBR, SBR] is excluded from calculations of the approach delay and intersection delay.



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	20	105	105	30	110	35	100	160	60	55	225	40
Future Volume (vph)	20	105	105	30	110	35	100	160	60	55	225	40
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
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		0.938			0.973			0.975			0.983	
Flt Protected		0.996			0.992			0.985			0.991	
Satd. Flow (prot)	0	1666	0	0	1702	0	0	1684	0	0	1685	0
Flt Permitted		0.996			0.992			0.985			0.991	
Satd. Flow (perm)	0	1666	0	0	1702	0	0	1684	0	0	1685	0
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		1160			1174			641			590	
Travel Time (s)		31.6			32.0			17.5			16.1	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	0%	0%	2%	5%	2%	0%	2%	4%	0%	13%	1%	9%
Adj. Flow (vph)	22	117	117	33	122	39	111	178	67	61	250	44
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	256	0	0	194	0	0	356	0	0	355	0
Sign Control		Stop			Stop			Stop			Stop	

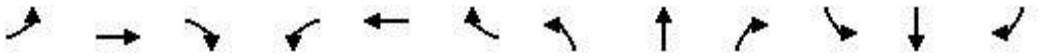
Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 55.9%		ICU Level of Service B	
Analysis Period (min) 15			

Intersection	
Intersection Delay, s/veh	17.1
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	20	105	105	30	110	35	100	160	60	55	225	40
Future Vol, veh/h	20	105	105	30	110	35	100	160	60	55	225	40
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles, %	0	0	2	5	2	0	2	4	0	13	1	9
Mvmt Flow	22	117	117	33	122	39	111	178	67	61	250	44
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	14.6	13.7	18.3	19.4
HCM LOS	B	B	C	C

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	31%	9%	17%	17%
Vol Thru, %	50%	46%	63%	70%
Vol Right, %	19%	46%	20%	12%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	320	230	175	320
LT Vol	100	20	30	55
Through Vol	160	105	110	225
RT Vol	60	105	35	40
Lane Flow Rate	356	256	194	356
Geometry Grp	1	1	1	1
Degree of Util (X)	0.607	0.451	0.365	0.625
Departure Headway (Hd)	6.148	6.356	6.761	6.326
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	587	565	529	569
Service Time	4.211	4.422	4.834	4.387
HCM Lane V/C Ratio	0.606	0.453	0.367	0.626
HCM Control Delay	18.3	14.6	13.7	19.4
HCM Lane LOS	C	B	B	C
HCM 95th-tile Q	4.1	2.3	1.7	4.3



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	195	100	10	10	190	25	10	10	10	35	10	305
Future Volume (vph)	195	100	10	10	190	25	10	10	10	35	10	305
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	0		0	0		0	0		0	100		0
Storage Lanes	0		0	0		0	0		0	1		0
Taper Length (ft)	25			25			25			60		
Lane Util. Factor	0.95	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.995			0.985			0.955			0.855	
Flt Protected		0.969			0.998			0.984		0.950		
Satd. Flow (prot)	0	3096	0	0	1650	0	0	1691	0	1710	1496	0
Flt Permitted		0.969			0.998			0.984		0.950		
Satd. Flow (perm)	0	3096	0	0	1650	0	0	1691	0	1710	1496	0
Link Speed (mph)		45			45			25			25	
Link Distance (ft)		2581			2852			1867			1496	
Travel Time (s)		39.1			43.2			50.9			40.8	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	4%	12%	0%	0%	7%	12%	0%	0%	0%	0%	0%	3%
Adj. Flow (vph)	217	111	11	11	211	28	11	11	11	39	11	339
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	339	0	0	250	0	0	33	0	39	350	0
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 54.6%		ICU Level of Service A	
Analysis Period (min) 15			

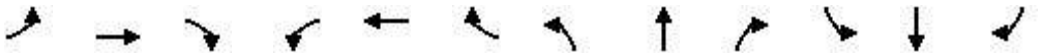
Intersection	
Int Delay, s/veh	8.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	195	100	10	10	190	25	10	10	10	35	10	305
Future Vol, veh/h	195	100	10	10	190	25	10	10	10	35	10	305
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
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	4	12	0	0	7	12	0	0	0	0	0	3
Mvmt Flow	217	111	11	11	211	28	11	11	11	39	11	339

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	239	0	0	122	0	0	973	812	61	742	803	225
Stage 1	-	-	-	-	-	-	551	551	-	247	247	-
Stage 2	-	-	-	-	-	-	422	261	-	495	556	-
Critical Hdwy	4.16	-	-	4.1	-	-	7.3	6.5	6.9	7.3	6.5	6.245
Critical Hdwy Stg 1	-	-	-	-	-	-	6.5	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.5	5.5	-
Follow-up Hdwy	2.238	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3285
Pot Cap-1 Maneuver	1313	-	-	1478	-	-	221	315	998	321	319	811
Stage 1	-	-	-	-	-	-	491	519	-	761	706	-
Stage 2	-	-	-	-	-	-	613	696	-	530	516	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1313	-	-	1478	-	-	107	257	998	264	260	811
Mov Cap-2 Maneuver	-	-	-	-	-	-	107	257	-	264	260	-
Stage 1	-	-	-	-	-	-	404	427	-	626	700	-
Stage 2	-	-	-	-	-	-	348	690	-	420	424	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	5.4	0.3	25.2	14.4
HCM LOS			D	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	211	1313	-	-	1478	-	-	264	760
HCM Lane V/C Ratio	0.158	0.165	-	-	0.008	-	-	0.147	0.461
HCM Control Delay (s)	25.2	8.3	0.2	-	7.5	0	-	21	13.7
HCM Lane LOS	D	A	A	-	A	A	-	C	B
HCM 95th %tile Q(veh)	0.5	0.6	-	-	0	-	-	0.5	2.4

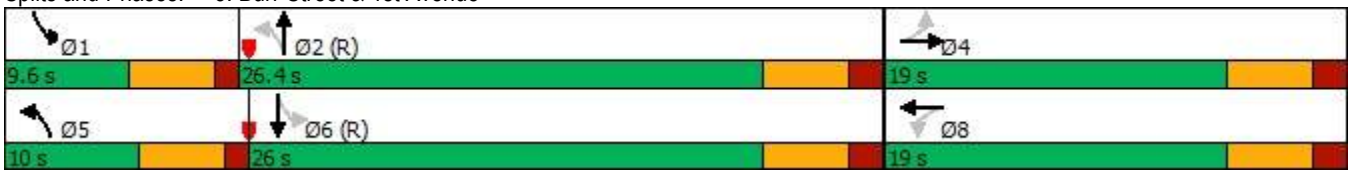


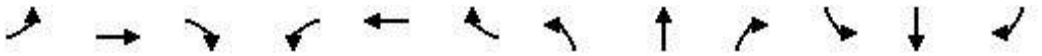
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	35	85	135	60	110	15	125	315	40	20	310	25
Future Volume (vph)	35	85	135	60	110	15	125	315	40	20	310	25
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	0		0	0		0	130		0	60		0
Storage Lanes	0		0	0		0	0		0	1		0
Taper Length (ft)	25			25			25			85		
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		0.928			0.989			0.983			0.989	
Flt Protected		0.993			0.984		0.950			0.950		
Satd. Flow (prot)	0	1659	0	0	1719	0	1693	1727	0	1710	1748	0
Flt Permitted		0.934			0.699		0.404			0.529		
Satd. Flow (perm)	0	1560	0	0	1221	0	720	1727	0	952	1748	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		99			8			13			9	
Link Speed (mph)		25			25			30			25	
Link Distance (ft)		1628			1096			1266			1178	
Travel Time (s)		44.4			29.9			28.8			32.1	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	0%	0%	0%	4%	1%	0%	1%	2%	6%	0%	2%	0%
Adj. Flow (vph)	39	94	150	67	122	17	139	350	44	22	344	28
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	283	0	0	206	0	139	394	0	22	372	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		pm+pt	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		5	2		1	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0		4.0	8.0		4.0	8.0	
Minimum Split (s)	11.0	11.0		11.0	11.0		9.5	13.0		9.5	13.0	
Total Split (s)	19.0	19.0		19.0	19.0		10.0	26.4		9.6	26.0	
Total Split (%)	34.5%	34.5%		34.5%	34.5%		18.2%	48.0%		17.5%	47.3%	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.5	1.5		1.5	1.5		1.0	1.5		1.0	1.5	
Lost Time Adjust (s)		0.0			0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)		5.0			5.0		4.5	5.0		4.5	5.0	
Lead/Lag							Lead	Lag		Lead	Lag	
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	
Recall Mode	None	None		None	None		None	C-Max		None	C-Max	
Act Effct Green (s)		12.0			12.0		32.7	31.1		29.5	24.7	
Actuated g/C Ratio		0.22			0.22		0.59	0.57		0.54	0.45	
v/c Ratio		0.68			0.76		0.26	0.40		0.04	0.47	
Control Delay		21.1			38.5		6.6	9.8		5.5	14.6	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		21.1			38.5		6.6	9.8		5.5	14.6	
LOS		C			D		A	A		A	B	
Approach Delay		21.1			38.5			9.0			14.1	
Approach LOS		C			D			A			B	
Queue Length 50th (ft)		52			59		18	59		3	89	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 95th (ft)		117			#140		38	168		10	160	
Internal Link Dist (ft)		1548			1016			1186			1098	
Turn Bay Length (ft)							130			60		
Base Capacity (vph)		470			316		532	982		584	789	
Starvation Cap Reductn		0			0		0	0		0	0	
Spillback Cap Reductn		0			0		0	0		0	0	
Storage Cap Reductn		0			0		0	0		0	0	
Reduced v/c Ratio		0.60			0.65		0.26	0.40		0.04	0.47	

Intersection Summary			
Area Type:	Other		
Cycle Length: 55			
Actuated Cycle Length: 55			
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green			
Natural Cycle: 55			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.76			
Intersection Signal Delay: 17.1		Intersection LOS: B	
Intersection Capacity Utilization 59.1%		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: 5: Burr Street & 1st Avenue





Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	35	85	135	60	110	15	125	315	40	20	310	25
Future Volume (veh/h)	35	85	135	60	110	15	125	315	40	20	310	25
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1800	1800	1800	1744	1786	1800	1786	1772	1716	1800	1772	1800
Adj Flow Rate, veh/h	39	94	0	67	122	17	139	350	44	22	344	28
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	0	0	0	4	1	0	1	2	6	0	2	0
Cap, veh/h	140	225		156	176	22	626	854	107	592	822	67
Arrive On Green	0.16	0.16	0.00	0.16	0.16	0.16	0.07	0.55	0.55	0.02	0.51	0.51
Sat Flow, veh/h	344	1391	0	427	1089	136	1701	1543	194	1714	1617	132
Grp Volume(v), veh/h	133	0	0	206	0	0	139	0	394	22	0	372
Grp Sat Flow(s),veh/h/ln	1735	0	0	1652	0	0	1701	0	1737	1714	0	1748
Q Serve(g_s), s	0.0	0.0	0.0	2.7	0.0	0.0	2.1	0.0	7.2	0.3	0.0	7.3
Cycle Q Clear(g_c), s	3.7	0.0	0.0	6.4	0.0	0.0	2.1	0.0	7.2	0.3	0.0	7.3
Prop In Lane	0.29		0.00	0.33		0.08	1.00		0.11	1.00		0.08
Lane Grp Cap(c), veh/h	366	0		354	0	0	626	0	962	592	0	889
V/C Ratio(X)	0.36	0.00		0.58	0.00	0.00	0.22	0.00	0.41	0.04	0.00	0.42
Avail Cap(c_a), veh/h	514	0		500	0	0	683	0	962	715	0	889
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	20.9	0.0	0.0	21.9	0.0	0.0	6.0	0.0	7.1	6.4	0.0	8.4
Incr Delay (d2), s/veh	0.6	0.0	0.0	1.5	0.0	0.0	0.2	0.0	1.3	0.0	0.0	1.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.5	0.0	0.0	2.5	0.0	0.0	0.6	0.0	2.3	0.1	0.0	2.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	21.5	0.0	0.0	23.4	0.0	0.0	6.2	0.0	8.4	6.4	0.0	9.9
LnGrp LOS	C	A		C	A	A	A	A	A	A	A	A
Approach Vol, veh/h		133	A		206			533			394	
Approach Delay, s/veh		21.5			23.4			7.8			9.7	
Approach LOS		C			C			A			A	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	5.6	35.5		13.9	8.1	33.0		13.9				
Change Period (Y+Rc), s	4.5	5.0		5.0	4.5	5.0		5.0				
Max Green Setting (Gmax), s	5.1	21.4		14.0	5.5	21.0		14.0				
Max Q Clear Time (g_c+I1), s	2.3	9.2		5.7	4.1	9.3		8.4				
Green Ext Time (p_c), s	0.0	1.9		0.4	0.0	1.8		0.5				

Intersection Summary		
HCM 6th Ctrl Delay		12.4
HCM 6th LOS		B

Notes

Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	25	40	35	65	95	155	30	120	20	35	165	30
Future Volume (vph)	25	40	35	65	95	155	30	120	20	35	165	30
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
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		0.953			0.934			0.984			0.983	
Flt Protected		0.988			0.990			0.991			0.992	
Satd. Flow (prot)	0	1665	0	0	1634	0	0	1686	0	0	1723	0
Flt Permitted		0.988			0.990			0.991			0.992	
Satd. Flow (perm)	0	1665	0	0	1634	0	0	1686	0	0	1723	0
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		1313			1117			1098			1099	
Travel Time (s)		35.8			30.5			29.9			30.0	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	7%	0%	0%	3%	4%	0%	0%	3%	17%	0%	1%	9%
Adj. Flow (vph)	28	44	39	72	106	172	33	133	22	39	183	33
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	111	0	0	350	0	0	188	0	0	255	0
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 47.5%		ICU Level of Service A	
Analysis Period (min) 15			

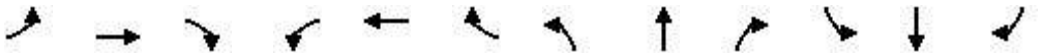
Intersection	
Int Delay, s/veh	11.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	25	40	35	65	95	155	30	120	20	35	165	30
Future Vol, veh/h	25	40	35	65	95	155	30	120	20	35	165	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
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	7	0	0	3	4	0	0	3	17	0	1	9
Mvmt Flow	28	44	39	72	106	172	33	133	22	39	183	33

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	278	0	0	83	0	0	564	542	64	533	475	192
Stage 1	-	-	-	-	-	-	120	120	-	336	336	-
Stage 2	-	-	-	-	-	-	444	422	-	197	139	-
Critical Hdwy	4.17	-	-	4.13	-	-	7.1	6.53	6.37	7.1	6.51	6.29
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.53	-	6.1	5.51	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.53	-	6.1	5.51	-
Follow-up Hdwy	2.263	-	-	2.227	-	-	3.5	4.027	3.453	3.5	4.009	3.381
Pot Cap-1 Maneuver	1257	-	-	1508	-	-	439	446	960	461	490	832
Stage 1	-	-	-	-	-	-	889	794	-	682	644	-
Stage 2	-	-	-	-	-	-	597	587	-	809	784	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1257	-	-	1508	-	-	272	410	960	318	451	832
Mov Cap-2 Maneuver	-	-	-	-	-	-	272	410	-	318	451	-
Stage 1	-	-	-	-	-	-	869	776	-	666	607	-
Stage 2	-	-	-	-	-	-	377	553	-	639	766	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	2	1.5	21.7	23.1
HCM LOS			C	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	401	1257	-	-	1508	-	-	449
HCM Lane V/C Ratio	0.471	0.022	-	-	0.048	-	-	0.569
HCM Control Delay (s)	21.7	7.9	0	-	7.5	0	-	23.1
HCM Lane LOS	C	A	A	-	A	A	-	C
HCM 95th %tile Q(veh)	2.4	0.1	-	-	0.2	-	-	3.5



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	25	30	15	10	65	10	40	10	10	15	10	65
Future Volume (vph)	25	30	15	10	65	10	40	10	10	15	10	65
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
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		0.971			0.984			0.977			0.903	
Flt Protected		0.982			0.994			0.968			0.992	
Satd. Flow (prot)	0	1716	0	0	1761	0	0	1702	0	0	1612	0
Flt Permitted		0.982			0.994			0.968			0.992	
Satd. Flow (perm)	0	1716	0	0	1761	0	0	1702	0	0	1612	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1351			1587			1244			742	
Travel Time (s)		30.7			36.1			28.3			16.9	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	28	33	17	11	72	11	44	11	11	17	11	72
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	78	0	0	94	0	0	66	0	0	100	0
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 26.2%		ICU Level of Service A	
Analysis Period (min) 15			

Intersection	
Int Delay, s/veh	5.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	25	30	15	10	65	10	40	10	10	15	10	65
Future Vol, veh/h	25	30	15	10	65	10	40	10	10	15	10	65
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
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	28	33	17	11	72	11	44	11	11	17	11	72

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	83	0	0	50	0	0	239	203	42	209	206	78
Stage 1	-	-	-	-	-	-	98	98	-	100	100	-
Stage 2	-	-	-	-	-	-	141	105	-	109	106	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1527	-	-	1570	-	-	719	697	1034	753	694	988
Stage 1	-	-	-	-	-	-	913	818	-	911	816	-
Stage 2	-	-	-	-	-	-	867	812	-	901	811	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1527	-	-	1570	-	-	645	679	1034	721	676	988
Mov Cap-2 Maneuver	-	-	-	-	-	-	645	679	-	721	676	-
Stage 1	-	-	-	-	-	-	896	802	-	894	810	-
Stage 2	-	-	-	-	-	-	787	806	-	862	796	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	2.6	0.9	10.7	9.6
HCM LOS			B	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	694	1527	-	-	1570	-	-	888
HCM Lane V/C Ratio	0.096	0.018	-	-	0.007	-	-	0.113
HCM Control Delay (s)	10.7	7.4	0	-	7.3	0	-	9.6
HCM Lane LOS	B	A	A	-	A	A	-	A
HCM 95th %tile Q(veh)	0.3	0.1	-	-	0	-	-	0.4



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	30	65	55	215	325	35
Future Volume (vph)	30	65	55	215	325	35
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.892		0.987	
Flt Protected		0.985			0.957	
Satd. Flow (prot)	0	1773	1487	0	1627	0
Flt Permitted		0.985			0.957	
Satd. Flow (perm)	0	1773	1487	0	1627	0
Link Speed (mph)		25	25		30	
Link Distance (ft)		1004	963		5313	
Travel Time (s)		27.4	26.3		120.8	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	0%	0%	8%	8%	4%	9%
Adj. Flow (vph)	33	72	61	239	361	39
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	105	300	0	400	0
Sign Control		Free	Free		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 53.7%		ICU Level of Service A	
Analysis Period (min) 15			

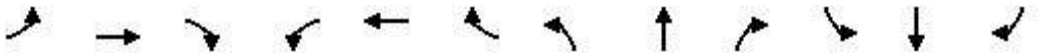
Intersection	
Int Delay, s/veh	9.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	30	65	55	215	325	35
Future Vol, veh/h	30	65	55	215	325	35
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	0	0	8	8	4	9
Mvmt Flow	33	72	61	239	361	39

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	300	0	-	0	319	181
Stage 1	-	-	-	-	181	-
Stage 2	-	-	-	-	138	-
Critical Hdwy	4.1	-	-	-	6.44	6.29
Critical Hdwy Stg 1	-	-	-	-	5.44	-
Critical Hdwy Stg 2	-	-	-	-	5.44	-
Follow-up Hdwy	2.2	-	-	-	3.536	3.381
Pot Cap-1 Maneuver	1273	-	-	-	670	844
Stage 1	-	-	-	-	845	-
Stage 2	-	-	-	-	884	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1273	-	-	-	652	844
Mov Cap-2 Maneuver	-	-	-	-	652	-
Stage 1	-	-	-	-	822	-
Stage 2	-	-	-	-	884	-

Approach	EB	WB	SB
HCM Control Delay, s	2.5	0	18.2
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1273	-	-	-	667
HCM Lane V/C Ratio	0.026	-	-	-	0.6
HCM Control Delay (s)	7.9	0	-	-	18.2
HCM Lane LOS	A	A	-	-	C
HCM 95th %tile Q(veh)	0.1	-	-	-	4



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	15	160	40	95	75	65	30	50	115	220	175	35
Future Volume (vph)	15	160	40	95	75	65	30	50	115	220	175	35
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
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		0.975			0.963			0.920			0.989	
Flt Protected		0.996			0.980			0.992			0.975	
Satd. Flow (prot)	0	1710	0	0	1683	0	0	1643	0	0	1736	0
Flt Permitted		0.996			0.980			0.992			0.975	
Satd. Flow (perm)	0	1710	0	0	1683	0	0	1643	0	0	1736	0
Link Speed (mph)		45			40			30			30	
Link Distance (ft)		807			813			5313			2460	
Travel Time (s)		12.2			13.9			120.8			55.9	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	0%	3%	0%	0%	3%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	17	178	44	106	83	72	33	56	128	244	194	39
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	239	0	0	261	0	0	217	0	0	477	0
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 76.4%		ICU Level of Service D	
Analysis Period (min) 15			

Intersection	
Int Delay, s/veh	107.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	15	160	40	95	75	65	30	50	115	220	175	35
Future Vol, veh/h	15	160	40	95	75	65	30	50	115	220	175	35
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
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	0	3	0	0	3	0	0	0	0	0	0	0
Mvmt Flow	17	178	44	106	83	72	33	56	128	244	194	39

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	155	0	0	222	0	0	682	601	200	657	587	119
Stage 1	-	-	-	-	-	-	234	234	-	331	331	-
Stage 2	-	-	-	-	-	-	448	367	-	326	256	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1438	-	-	1359	-	-	367	417	846	381	425	938
Stage 1	-	-	-	-	-	-	774	715	-	687	649	-
Stage 2	-	-	-	-	-	-	594	626	-	691	699	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1438	-	-	1359	-	-	197	376	846	266	383	938
Mov Cap-2 Maneuver	-	-	-	-	-	-	197	376	-	266	383	-
Stage 1	-	-	-	-	-	-	763	705	-	677	593	-
Stage 2	-	-	-	-	-	-	350	572	-	533	689	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.5	3.2	19.4	257.9
HCM LOS			C	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	463	1438	-	-	1359	-	-	325
HCM Lane V/C Ratio	0.468	0.012	-	-	0.078	-	-	1.47
HCM Control Delay (s)	19.4	7.5	0	-	7.9	0	-	257.9
HCM Lane LOS	C	A	A	-	A	A	-	F
HCM 95th %tile Q(veh)	2.4	0	-	-	0.3	-	-	26

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	20	15	10	15	10	115	10	180	30	250	65	10
Future Volume (vph)	20	15	10	15	10	115	10	180	30	250	65	10
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	0		0	80		0	50		0	80		0
Storage Lanes	0		0	1		0	1		0	1		0
Taper Length (ft)	25			40			60			60		
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		0.970			0.862			0.979			0.980	
Flt Protected		0.978		0.950			0.950			0.950		
Satd. Flow (prot)	0	1650	0	1710	1470	0	1710	1585	0	1660	1481	0
Flt Permitted		0.978		0.950			0.950			0.950		
Satd. Flow (perm)	0	1650	0	1710	1470	0	1710	1585	0	1660	1481	0
Link Speed (mph)		25			35			45			45	
Link Distance (ft)		2694			2873			1930			987	
Travel Time (s)		73.5			56.0			29.2			15.0	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	8%	0%	0%	0%	0%	6%	0%	12%	6%	3%	22%	0%
Adj. Flow (vph)	22	17	11	17	11	128	11	200	33	278	72	11
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	50	0	17	139	0	11	233	0	278	83	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 51.3%		ICU Level of Service A	
Analysis Period (min) 15			

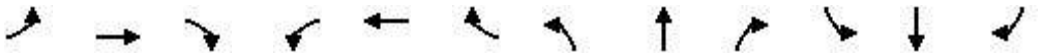
Intersection	
Int Delay, s/veh	7.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	20	15	10	15	10	115	10	180	30	250	65	10
Future Vol, veh/h	20	15	10	15	10	115	10	180	30	250	65	10
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	80	-	-	50	-	-	80	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	8	0	0	0	0	6	0	12	6	3	22	0
Mvmt Flow	22	17	11	17	11	128	11	200	33	278	72	11

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	942	889	78	887	878	217	83	0	0	233	0	0
Stage 1	634	634	-	239	239	-	-	-	-	-	-	-
Stage 2	308	255	-	648	639	-	-	-	-	-	-	-
Critical Hdwy	7.18	6.5	6.2	7.1	6.5	6.26	4.1	-	-	4.13	-	-
Critical Hdwy Stg 1	6.18	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.18	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.572	4	3.3	3.5	4	3.354	2.2	-	-	2.227	-	-
Pot Cap-1 Maneuver	237	285	988	267	289	813	1527	-	-	1329	-	-
Stage 1	457	476	-	769	711	-	-	-	-	-	-	-
Stage 2	689	700	-	462	474	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	161	224	988	208	227	813	1527	-	-	1329	-	-
Mov Cap-2 Maneuver	161	224	-	208	227	-	-	-	-	-	-	-
Stage 1	454	377	-	764	706	-	-	-	-	-	-	-
Stage 2	567	695	-	345	375	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	25.6	13	0.3	6.5
HCM LOS	D	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	1527	-	-	224	208	674	1329	-	-
HCM Lane V/C Ratio	0.007	-	-	0.223	0.08	0.206	0.209	-	-
HCM Control Delay (s)	7.4	-	-	25.6	23.8	11.7	8.4	-	-
HCM Lane LOS	A	-	-	D	C	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.8	0.3	0.8	0.8	-	-



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	20	0	275	25	510	0	0	550	130
Future Volume (vph)	0	0	0	20	0	275	25	510	0	0	550	130
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	0		0	0		150	80		0	0		0
Storage Lanes	0		0	0		1	1		0	0		1
Taper Length (ft)	25			25			60			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
Flt Protected					0.950		0.950					
Satd. Flow (prot)	0	0	0	0	1710	1404	1598	1748	0	0	1667	1366
Flt Permitted					0.950		0.950					
Satd. Flow (perm)	0	0	0	0	1710	1404	1598	1748	0	0	1667	1366
Link Speed (mph)		50			50			45			45	
Link Distance (ft)		1104			1070			1072			1043	
Travel Time (s)		15.1			14.6			16.2			15.8	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	0%	0%	0%	0%	0%	9%	7%	3%	0%	0%	8%	12%
Adj. Flow (vph)	0	0	0	22	0	306	28	567	0	0	611	144
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	22	306	28	567	0	0	611	144
Sign Control		Free			Stop			Free			Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization	53.0%	ICU Level of Service	A
Analysis Period (min)	15		

Intersection	
Int Delay, s/veh	0.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	20	0	275	25	510	0	0	550	130
Future Vol, veh/h	0	0	0	20	0	275	25	510	0	0	550	130
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	Free	-	-	None	-	-	None
Storage Length	-	-	-	-	-	150	80	-	-	-	-	0
Veh in Median Storage, #	-	1	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	0	0	9	7	3	0	0	8	12
Mvmt Flow	0	0	0	22	0	306	28	567	0	0	611	144

Major/Minor	Minor1			Major1			Major2		
Conflicting Flow All	1306	1378	-	755	0	-	-	-	0
Stage 1	623	623	-	-	-	-	-	-	-
Stage 2	683	755	-	-	-	-	-	-	-
Critical Hdwy	6.4	6.5	-	4.17	-	-	-	-	-
Critical Hdwy Stg 1	5.4	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.4	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	-	2.263	-	-	-	-	-
Pot Cap-1 Maneuver	178	146	0	833	-	0	0	-	-
Stage 1	539	481	0	-	-	0	0	-	-
Stage 2	505	420	0	-	-	0	0	-	-
Platoon blocked, %					-			-	-
Mov Cap-1 Maneuver	172	0	-	833	-	-	-	-	-
Mov Cap-2 Maneuver	172	0	-	-	-	-	-	-	-
Stage 1	521	0	-	-	-	-	-	-	-
Stage 2	505	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	29	0.4	0
HCM LOS	D		

Minor Lane/Major Mvmt	NBL	NBT	WBLn1	WBLn2	SBT	SBR
Capacity (veh/h)	833	-	172	-	-	-
HCM Lane V/C Ratio	0.033	-	0.129	-	-	-
HCM Control Delay (s)	9.5	-	29	0	-	-
HCM Lane LOS	A	-	D	A	-	-
HCM 95th %tile Q(veh)	0.1	-	0.4	-	-	-

HCS7 Two-Way Stop-Control Text Report

TWO-WAY STOP CONTROL (TWSC) Analysis

File Name:	2045NBC_AM_SD37_I-90 EB RTI.xtw
Analyst:	HDR
Agency:	HDR
Date Performed:	11/1/2021
Time Analyzed:	2045 NBC - AM Peak
Jurisdiction:	SDDOT
Analysis Year:	2045
Project Description:	Mitchell MTP
Units:	U.S. Customary
Intersection Name:	SD37 & I-90 EB RTI
Major Street Direction:	North-South
East/West Street Name:	I-90 EB RTI
North/South Street Name:	SD37 / Ohlman Street
Analysis Time Period (hrs):	0.25

Vehicle Volumes and Adjustments

Major Street:									
Approach		NorthBound				SouthBound			
Movement	1U	1	2	3	4U	4	5	6	
	U	L	T	R	U	L	T	R	
Volume			400	15		210	360		
Peak Hour Factor, PHF					0.90				
Hourly Flow Rtae, HFR			444	17		233	400		
Percent Heavy Vehicles						16			
Number of Lanes	0	0	1	0	0	1	1	0	
Lane Configuration				TR		L	T		
Median Type					Undivided				
Median Storage									
RT channelized?									
Left-Turn Lane Storage									
Upstream Signal?					Not Present				

Minor Street:							
Approach	WestBound				EastBound		
Movement	7	8	9		10	11	12
	L	T	R		L	T	R
Volume					135	0	45
Peak Hour Factor, PHF				0.90			
Hourly Flow Rtae, HFR					150	0	50
Percent Heavy Vehicles					3	0	0
Number of Lanes	0	0	0		0	1	0
Lane Configuration						LTR	
RT channelized?							
Flared Approach | Storage		|		No	|	
Percent Grade						0	

Pedestrian Volumes and Adjustments

Approach	NB	SB	WB	EB
Movement	13	14	15	16
Flow (ped/hr)	0	0		0
Lane Width (ft)				
Walking Speed (ft/sec)				
Pedestrian Blockage Factor, f_pb				

Delay, Queue Length, and Level of Service

Approach	NB		SB		WestBound			EastBound		
Movement	1U	1	4U	4	7	8	9	10	11	12
Lane Configuration				L					LTR	
Flow Rate				233					200	
Lane Capacity				1030					139	
v/c				0.23					1.44	
95% Queue Length				0.9					13.3	
Control Delay				9.5					292.8	
LOS				A					F	
Approach Delay				3.5					292.8	
Approach LOS									F	
Intersction Delay	46.9									

Step 1: MOVEMENT PRIORITIES

Major Street:									
Approach		NorthBound				SouthBound			
Priority	1U	1	2	3	4U	4	5	6	
Movement	U	L	T	R	U	L	T	R	
Minor Street:									

Approach	WestBound			EastBound		
Priority	7	8	9	10	11	12
Movement	L	T	R	L	T	R

Step 2: MOVEMENT DEMAND VOLUMES AND FLOW RATES

Major Street:

Approach	NorthBound				SouthBound			
Movement	1U	1	2	3	4U	4	5	6
	U	L	T	R	U	L	T	R
Volume, V_x			400	15		210	360	
Flow Rate, v_x			444	17		233	400	

Minor Street:

Approach	WestBound			EastBound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume, V_x				135	0	45
Flow Rate, v_x				150	0	50

Step 3: CONFLICTING FLOW RATES

Major Street:

Approach	NorthBound				SouthBound			
Movement	1U	1	2	3	4U	4	5	6
	U	L	T	R	U	L	T	R
Flow Rate, v_x			444	17		233	400	
Conflicting Flow, v_c,x						461		

Minor Street:

Approach	WestBound			EastBound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Flow Rate, v_x				150	0	50
Conflicting Flow, v_c,x				1319	1328	400

Step 4: CRITICAL HEADWAYS and FOLLOW-UP HEADWAYS

CRITICAL HEADWAYS

Approach	NB		SB		WestBound			EastBound		
Movement	1U	1	4U	4	7	8	9	10	11	12
	U	L	U	L	L	T	R	L	T	R
t_c,base				4.1				7.1	6.5	6.2
Single Stage										
Stage I										
Stage II										
t_c,HV				1.0				1.0	1.0	1.0
P_HV				0.16				0.03	0.00	0.00
t_c,G								0.2	0.2	0.1
G								0	0	0
t_3,LT				0.0				0.0	0.0	0.0
t_c										
Single Stage				4.26				7.13	6.50	6.20
Stage I										
Stage II										

FOLLOW-UP HEADWAYS

Approach	NB		SB		WestBound			EastBound		
Movement	1U	1	4U	4	7	8	9	10	11	12
	U	L	U	L	L	T	R	L	T	R
t_f,base				2.2				3.5	4.0	3.3
t_f,HV				0.9				0.9	0.9	0.9
P_HV				0.16				0.03	0.00	0.00
t_f				2.34				3.53	4.00	3.30

Step 5: POTENTIAL CAPACITIES

NO UPSTREAM SIGNAL EFFECTS PRESENT

Approach	NB		SB		WestBound			EastBound		
Movement	1U	1	4U	4	7	8	9	10	11	12
	U	L	U	L	L	T	R	L	T	R
v_c,x				461				1319	1328	400
t_c,x				4.26				7.13	6.50	6.20
t_f,x				2.34				3.53	4.00	3.30
c_p,x				1030				133	157	654

Steps 6 - 9: MOVEMENT CAPACITIES

Pedestrian Impedance				
Approach	NB	SB	WB	EB

Movement	13	14	15	16
Pedestrian Flow Rate v_x	0	0		0
Lane Width, w				
Walking Speed, S_p				
Pedestrian Blockage Factor, f_pb				

Major-Street Left-Turn Movements		1	4
Conflicting Flow, v_c,x			461
Potential Capacity, c_p,x			1030
Pedestrian Impedance Factor, p_p,x			1.000
Movement Capacity, c_m,x			1030
Probability of Queue-free State, p_0,j			0.774
Major L-Shared Probability Queue-free State, p*_0,j			1.000

Minor-Street Right-Turn Movements		9	12
Conflicting Flow, v_c,x			400
Potential Capacity, c_p,x			654
Pedestrian Impedance Factor, p_p,x			1.000
Movement Capacity, c_m,x			654
Probability of Queue-free State, p_0,j			0.924

Major-Street U-Turn Movements		1U	4U
Conflicting Flow, v_c,x			
Potential Capacity, c_p,x			
Capacity Adjustment Factor, f_x			
Movement Capacity, c_m,x			
Shared L/U Capacity, c_SH			
Probability of Queue-free State, p_0,j			

Minor-Street Through Movements		8	11
Conflicting Flow, v_c,x			1328
Potential Capacity, c_p,x			157
Pedestrian Impedance Factor, p_p,x			1.000
Capacity Adjustment Factor, f_x			0.774
Movement Capacity, c_m,x			121
Probability of Queue-free State, p_0,j			1.000

Minor-Street Left-Turn Movements		7	10
Conflicting Flow, v_c,x			1319
Potential Capacity, c_p,x			133
Pedestrian Impedance Factor, p_p,x			1.000
Major L, Minor T Adjusted Impedance Factor, p"			0.774
Major L, Minor T Impedance Factor, p'			0.825
Capacity Adjustment Factor, f_x			0.825
Movement Capacity, c_m,x			110

Step 10: FINAL CAPACITY ADJUSTMENTS

SHARED-LANE CAPACITY OF MINOR STREET APPROACHES

Approach	WestBound			EastBound		
Movement	7	8	9	10	11	12
Lane Configuration					LTR	
Shared Flow Rate, v_y					200	
Movement Capacity, c_m,x				110	121	654
Shared Capacity, c_SH					139	

Step 11: CONTROL DELAY

CONTROL DELAY TO RANK 2 THROUGH 4 MOVEMENTS

Approach	NB			SB		WestBound		EastBound		
Movement	1U	1	4U	4	7	8	9	10	11	12
Flow Rate				233				150	0	50
Movement Capacity				1030				110	121	654
Lane Configuration				L					LTR	
Shared Capacity									139	
Control Delay				9.5					292.8	

Steps 12 - 13: APPROACH/INTERSECTION CONTROL DELAY and 95% QUEUE LENGTHS

Approach	NB			SB		WestBound		EastBound		
Movement	1U	1	4U	4	7	8	9	10	11	12
Lane Configuration				L					LTR	
Flow Rate				233					200	
Lane Capacity				1030					139	
v/c				0.23					1.44	
95% Queue Length				0.9					13.3	
Control Delay				9.5					292.8	

LOS		A	F
Approach Delay		3.5	292.8
Approach LOS			F
Intersction Delay	46.9		

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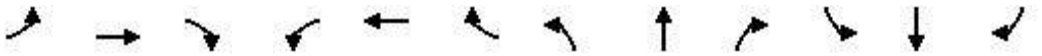


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	15	30	100	95	15	20	65	120	35	25	375	15
Future Volume (vph)	15	30	100	95	15	20	65	120	35	25	375	15
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	0		0	0		0	150		0	0		0
Storage Lanes	0		0	0		0	1		0	0		0
Taper Length (ft)	25			25			105			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	0.95	0.95
Frt		0.907			0.980			0.966			0.994	
Flt Protected		0.995			0.965		0.950				0.997	
Satd. Flow (prot)	0	1593	0	0	1669	0	1676	3239	0	0	3323	0
Flt Permitted		0.995			0.965		0.950				0.997	
Satd. Flow (perm)	0	1593	0	0	1669	0	1676	3239	0	0	3323	0
Link Speed (mph)		40			40			65			65	
Link Distance (ft)		2897			2749			1385			1493	
Travel Time (s)		49.4			46.9			14.5			15.7	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	17	33	111	106	17	22	72	133	39	28	417	17
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	161	0	0	145	0	72	172	0	0	462	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 46.9%		ICU Level of Service A	
Analysis Period (min) 15			

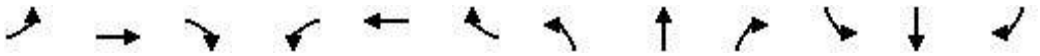
Intersection	
Int Delay, s/veh	6.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	15	30	100	95	15	20	65	120	35	25	375	15
Future Vol, veh/h	15	30	100	95	15	20	65	120	35	25	375	15
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	150	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	17	33	111	106	17	22	72	133	39	28	417	17

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	701	798	217	578	787	86	434	0	0	172	0	0
Stage 1	482	482	-	297	297	-	-	-	-	-	-	-
Stage 2	219	316	-	281	490	-	-	-	-	-	-	-
Critical Hdwy	7.54	6.54	6.94	7.54	6.54	6.94	4.14	-	-	4.14	-	-
Critical Hdwy Stg 1	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.52	4.02	3.32	3.52	4.02	3.32	2.22	-	-	2.22	-	-
Pot Cap-1 Maneuver	325	317	787	399	322	956	1122	-	-	1402	-	-
Stage 1	534	552	-	687	666	-	-	-	-	-	-	-
Stage 2	763	654	-	702	547	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	283	289	787	292	294	956	1122	-	-	1402	-	-
Mov Cap-2 Maneuver	283	289	-	292	294	-	-	-	-	-	-	-
Stage 1	500	538	-	643	623	-	-	-	-	-	-	-
Stage 2	679	612	-	551	533	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	15.3	24.4	2.5	0.5
HCM LOS	C	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1122	-	-	511	327	1402	-	-
HCM Lane V/C Ratio	0.064	-	-	0.315	0.442	0.02	-	-
HCM Control Delay (s)	8.4	-	-	15.3	24.4	7.6	0.1	-
HCM Lane LOS	A	-	-	C	C	A	A	-
HCM 95th %tile Q(veh)	0.2	-	-	1.3	2.2	0.1	-	-



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	20	65	45	10	25	25	265	25	35	500	10
Future Volume (vph)	10	20	65	45	10	25	25	265	25	35	500	10
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	0		0	0		0	80		0	0		0
Storage Lanes	0		0	0		0	1		0	0		0
Taper Length (ft)	25			25			60			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	0.95	0.95
Frt		0.907			0.958			0.987			0.997	
Flt Protected		0.995			0.973		0.950				0.997	
Satd. Flow (prot)	0	1593	0	0	1645	0	1676	3309	0	0	3333	0
Flt Permitted		0.995			0.973		0.950				0.997	
Satd. Flow (perm)	0	1593	0	0	1645	0	1676	3309	0	0	3333	0
Link Speed (mph)		25			40			45			55	
Link Distance (ft)		1010			1235			1455			1882	
Travel Time (s)		27.5			21.1			22.0			23.3	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	11	22	72	50	11	28	28	294	28	39	556	11
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	105	0	0	89	0	28	322	0	0	606	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 46.0%		ICU Level of Service A	
Analysis Period (min) 15			

Intersection	
Int Delay, s/veh	3.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	10	20	65	45	10	25	25	265	25	35	500	10
Future Vol, veh/h	10	20	65	45	10	25	25	265	25	35	500	10
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	80	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	11	22	72	50	11	28	28	294	28	39	556	11

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	849	1018	284	731	1009	161	567	0	0	322	0	0
Stage 1	640	640	-	364	364	-	-	-	-	-	-	-
Stage 2	209	378	-	367	645	-	-	-	-	-	-	-
Critical Hdwy	7.54	6.54	6.94	7.54	6.54	6.94	4.14	-	-	4.14	-	-
Critical Hdwy Stg 1	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.52	4.02	3.32	3.52	4.02	3.32	2.22	-	-	2.22	-	-
Pot Cap-1 Maneuver	254	236	713	310	239	855	1001	-	-	1235	-	-
Stage 1	430	468	-	627	622	-	-	-	-	-	-	-
Stage 2	774	614	-	625	466	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	223	219	713	243	222	855	1001	-	-	1235	-	-
Mov Cap-2 Maneuver	223	219	-	243	222	-	-	-	-	-	-	-
Stage 1	418	446	-	609	605	-	-	-	-	-	-	-
Stage 2	715	597	-	509	445	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	16.5	21.4	0.7	0.7
HCM LOS	C	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1001	-	-	418	308	1235	-	-
HCM Lane V/C Ratio	0.028	-	-	0.253	0.289	0.031	-	-
HCM Control Delay (s)	8.7	-	-	16.5	21.4	8	0.2	-
HCM Lane LOS	A	-	-	C	C	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	1	1.2	0.1	-	-

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	40	50	315	20	30	35	95	220	40	60	510	80
Future Volume (vph)	40	50	315	20	30	35	95	220	40	60	510	80
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	0		50	0		0	100		0	100		0
Storage Lanes	0		1	0		0	1		0	1		0
Taper Length (ft)	25			25			220			290		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt			0.850		0.944			0.977			0.980	
Flt Protected		0.978			0.988		0.950			0.950		
Satd. Flow (prot)	0	1726	1500	0	1646	0	1676	3276	0	1676	3286	0
Flt Permitted		0.978			0.988		0.950			0.950		
Satd. Flow (perm)	0	1726	1500	0	1646	0	1676	3276	0	1676	3286	0
Link Speed (mph)		40			25			35			35	
Link Distance (ft)		1380			1122			778			1516	
Travel Time (s)		23.5			30.6			15.2			29.5	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	44	56	350	22	33	39	106	244	44	67	567	89
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	100	350	0	94	0	106	288	0	67	656	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 53.3%		ICU Level of Service A	
Analysis Period (min) 15			

Intersection	
Int Delay, s/veh	13.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	40	50	315	20	30	35	95	220	40	60	510	80
Future Vol, veh/h	40	50	315	20	30	35	95	220	40	60	510	80
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	50	-	-	-	100	-	-	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	44	56	350	22	33	39	106	244	44	67	567	89

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1097	1246	328	924	1268	144	656	0	0	288	0	0
Stage 1	746	746	-	478	478	-	-	-	-	-	-	-
Stage 2	351	500	-	446	790	-	-	-	-	-	-	-
Critical Hdwy	7.54	6.54	6.94	7.54	6.54	6.94	4.14	-	-	4.14	-	-
Critical Hdwy Stg 1	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.52	4.02	3.32	3.52	4.02	3.32	2.22	-	-	2.22	-	-
Pot Cap-1 Maneuver	168	172	668	224	167	877	927	-	-	1271	-	-
Stage 1	372	419	-	537	554	-	-	-	-	-	-	-
Stage 2	639	541	-	561	400	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	116	144	668	66	140	877	927	-	-	1271	-	-
Mov Cap-2 Maneuver	116	144	-	66	140	-	-	-	-	-	-	-
Stage 1	330	397	-	476	491	-	-	-	-	-	-	-
Stage 2	504	479	-	218	379	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	33	60.5	2.5	0.7
HCM LOS	D	F		

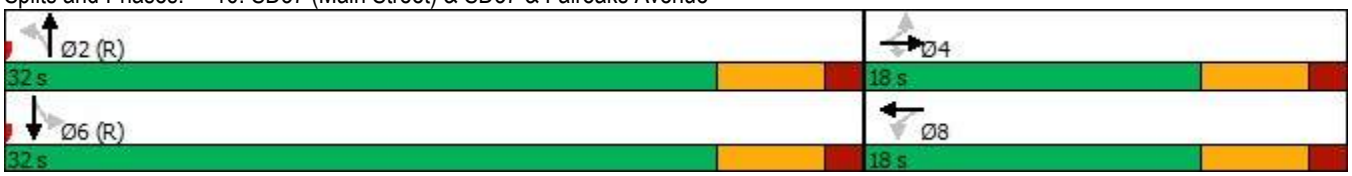
Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	927	-	-	130	668	153	1271	-	-
HCM Lane V/C Ratio	0.114	-	-	0.769	0.524	0.617	0.052	-	-
HCM Control Delay (s)	9.4	-	-	91.6	16.2	60.5	8	-	-
HCM Lane LOS	A	-	-	F	C	F	A	-	-
HCM 95th %tile Q(veh)	0.4	-	-	4.5	3.1	3.3	0.2	-	-

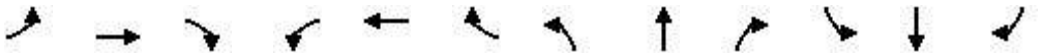
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	180	120	170	20	155	15	165	160	20	35	495	315
Future Volume (vph)	180	120	170	20	155	15	165	160	20	35	495	315
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	155		0	100		0	100		0	100		0
Storage Lanes	1		1	1		0	1		0	1		0
Taper Length (ft)	130			65			130			125		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt			0.850		0.987			0.983			0.942	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1676	1765	1500	1676	1742	0	1676	3296	0	1676	3158	0
Flt Permitted	0.639			0.672			0.282			0.626		
Satd. Flow (perm)	1128	1765	1500	1186	1742	0	498	3296	0	1105	3158	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			189		9			22			350	
Link Speed (mph)		40			25			30			35	
Link Distance (ft)		1120			746			1311			778	
Travel Time (s)		19.1			20.3			29.8			15.2	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	200	133	189	22	172	17	183	178	22	39	550	350
Shared Lane Traffic (%)												
Lane Group Flow (vph)	200	133	189	22	189	0	183	200	0	39	900	0
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Detector Phase	4	4	4	8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	15.5	15.5	15.5	15.5	15.5		15.5	15.5		15.5	15.5	
Total Split (s)	18.0	18.0	18.0	18.0	18.0		32.0	32.0		32.0	32.0	
Total Split (%)	36.0%	36.0%	36.0%	36.0%	36.0%		64.0%	64.0%		64.0%	64.0%	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	1.5	1.5	1.5	1.5	1.5		1.5	1.5		1.5	1.5	
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 Optimize?												
Recall Mode	Max	Max	Max	Min	Min		C-Max	C-Max		C-Max	C-Max	
Act Effct Green (s)	12.5	12.5	12.5	12.5	12.5		26.5	26.5		26.5	26.5	
Actuated g/C Ratio	0.25	0.25	0.25	0.25	0.25		0.53	0.53		0.53	0.53	
v/c Ratio	0.71	0.30	0.37	0.07	0.43		0.70	0.11		0.07	0.49	
Control Delay	34.8	17.5	5.5	15.2	18.6		27.8	5.4		6.2	5.3	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	34.8	17.5	5.5	15.2	18.6		27.8	5.4		6.2	5.3	
LOS	C	B	A	B	B		C	A		A	A	
Approach Delay		19.8			18.2			16.1			5.4	
Approach LOS		B			B			B			A	
Queue Length 50th (ft)	53	32	0	5	44		35	12		5	42	
Queue Length 95th (ft)	#138	68	38	18	90		#130	23		15	73	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Internal Link Dist (ft)		1040			666			1231			698	
Turn Bay Length (ft)	155			100			100			100		
Base Capacity (vph)	282	441	516	296	442		263	1757		585	1838	
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	0.71	0.30	0.37	0.07	0.43		0.70	0.11		0.07	0.49	

Intersection Summary			
Area Type:	Other		
Cycle Length: 50			
Actuated Cycle Length: 50			
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green			
Natural Cycle: 50			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.71			
Intersection Signal Delay: 12.3		Intersection LOS: B	
Intersection Capacity Utilization 73.2%		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: 16: SD37 (Main Street) & SD37 & Fairoaks Avenue





Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	180	120	170	20	155	15	165	160	20	35	495	315
Future Volume (veh/h)	180	120	170	20	155	15	165	160	20	35	495	315
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1772	1772	1772	1772	1772	1772	1772	1772	1772	1772	1772	1772
Adj Flow Rate, veh/h	200	133	0	22	172	17	183	178	22	39	550	0
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	334	443		382	397	39	520	1601	195	735	1784	
Arrive On Green	0.25	0.25	0.00	0.25	0.25	0.25	0.53	0.53	0.53	0.53	0.53	0.00
Sat Flow, veh/h	1194	1772	1502	1257	1587	157	858	3021	368	1182	3455	0
Grp Volume(v), veh/h	200	133	0	22	0	189	183	98	102	39	550	0
Grp Sat Flow(s),veh/h/ln	1194	1772	1502	1257	0	1744	858	1683	1706	1182	1683	0
Q Serve(g_s), s	7.9	3.0	0.0	0.7	0.0	4.6	7.6	1.5	1.5	0.9	4.6	0.0
Cycle Q Clear(g_c), s	12.5	3.0	0.0	3.8	0.0	4.6	12.2	1.5	1.5	2.3	4.6	0.0
Prop In Lane	1.00		1.00	1.00		0.09	1.00		0.22	1.00		0.00
Lane Grp Cap(c), veh/h	334	443		382	0	436	520	892	904	735	1784	
V/C Ratio(X)	0.60	0.30		0.06	0.00	0.43	0.35	0.11	0.11	0.05	0.31	
Avail Cap(c_a), veh/h	334	443		382	0	436	520	892	904	735	1784	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	21.2	15.2	0.0	16.7	0.0	15.8	10.0	5.9	5.9	6.5	6.6	0.0
Incr Delay (d2), s/veh	7.7	1.7	0.0	0.1	0.0	0.7	1.9	0.2	0.3	0.1	0.4	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.7	1.2	0.0	0.2	0.0	1.7	1.4	0.4	0.5	0.2	1.2	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	29.0	16.9	0.0	16.8	0.0	16.5	11.9	6.1	6.1	6.6	7.0	0.0
LnGrp LOS	C	B		B	A	B	B	A	A	A	A	
Approach Vol, veh/h		333	A		211			383			589	A
Approach Delay, s/veh		24.2			16.5			8.9			7.0	
Approach LOS		C			B			A			A	

Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		32.0		18.0		32.0		18.0				
Change Period (Y+Rc), s		5.5		5.5		5.5		5.5				
Max Green Setting (Gmax), s		26.5		12.5		26.5		12.5				
Max Q Clear Time (g_c+I1), s		14.2		14.5		6.6		6.6				
Green Ext Time (p_c), s		1.8		0.0		3.6		0.5				

Intersection Summary		
HCM 6th Ctrl Delay	12.6	
HCM 6th LOS	B	

Notes

Unsignalized Delay for [EBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	15	380	110	125	490	20	75	15	85	10	10	10
Future Volume (vph)	15	380	110	125	490	20	75	15	85	10	10	10
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	110		0	110		0	95		0	0		0
Storage Lanes	1		0	1		0	1		1	0		0
Taper Length (ft)	125			125			125			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		0.966			0.994				0.850		0.955	
Flt Protected	0.950			0.950			0.950				0.984	
Satd. Flow (prot)	1676	3239	0	1676	3333	0	1676	1765	1500	0	1658	0
Flt Permitted	0.950			0.950			0.950				0.984	
Satd. Flow (perm)	1676	3239	0	1676	3333	0	1676	1765	1500	0	1658	0
Link Speed (mph)		40			40			35			25	
Link Distance (ft)		1143			1120			993			528	
Travel Time (s)		19.5			19.1			19.3			14.4	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	17	422	122	139	544	22	83	17	94	11	11	11
Shared Lane Traffic (%)												
Lane Group Flow (vph)	17	544	0	139	566	0	83	17	94	0	33	0
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 43.1%		ICU Level of Service A	
Analysis Period (min) 15			

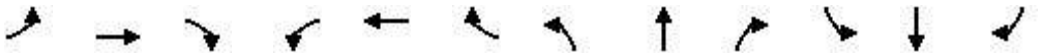
Intersection	
Int Delay, s/veh	6.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	15	380	110	125	490	20	75	15	85	10	10	10
Future Vol, veh/h	15	380	110	125	490	20	75	15	85	10	10	10
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
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	110	-	-	110	-	-	95	-	0	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	17	422	122	139	544	22	83	17	94	11	11	11

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	566	0	0	544	0	0	1073	1361	272	1087	1411	283
Stage 1	-	-	-	-	-	-	517	517	-	833	833	-
Stage 2	-	-	-	-	-	-	556	844	-	254	578	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	1002	-	-	1021	-	-	175	147	726	170	137	714
Stage 1	-	-	-	-	-	-	509	532	-	329	382	-
Stage 2	-	-	-	-	-	-	483	377	-	728	499	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1002	-	-	1021	-	-	141	125	726	118	116	714
Mov Cap-2 Maneuver	-	-	-	-	-	-	141	125	-	118	116	-
Stage 1	-	-	-	-	-	-	500	523	-	323	330	-
Stage 2	-	-	-	-	-	-	397	326	-	603	491	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.3	1.8	35	32.9
HCM LOS			E	D

Minor Lane/Major Mvmt	NBLn1	NBLn2	NBLn3	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	141	125	726	1002	-	-	1021	-	-	162
HCM Lane V/C Ratio	0.591	0.133	0.13	0.017	-	-	0.136	-	-	0.206
HCM Control Delay (s)	62	38.2	10.7	8.7	-	-	9.1	-	-	32.9
HCM Lane LOS	F	E	B	A	-	-	A	-	-	D
HCM 95th %tile Q(veh)	3	0.4	0.4	0.1	-	-	0.5	-	-	0.7

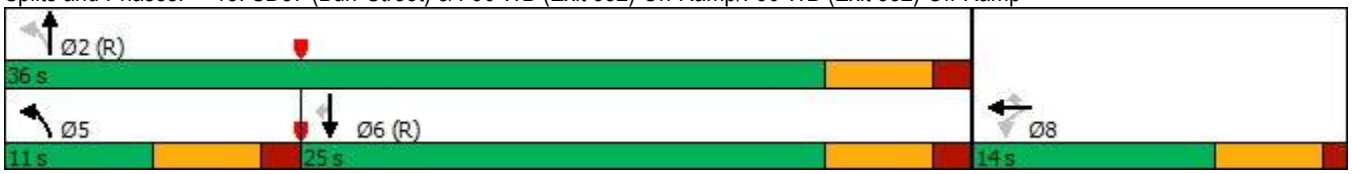


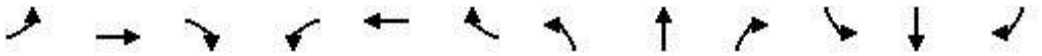
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	145	0	210	135	460	0	0	665	155
Future Volume (vph)	0	0	0	145	0	210	135	460	0	0	665	155
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	0		0	0		360	200		0	0		0
Storage Lanes	0		0	0		1	1		0	0		1
Taper Length (ft)	25			25			65			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt						0.850						0.850
Flt Protected					0.950		0.950					
Satd. Flow (prot)	0	0	0	0	1500	1378	1613	3226	0	0	3226	1354
Flt Permitted					0.950		0.259					
Satd. Flow (perm)	0	0	0	0	1500	1378	440	3226	0	0	3226	1354
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						233						172
Link Speed (mph)		50			50			35			35	
Link Distance (ft)		1127			1072			742			2179	
Travel Time (s)		15.4			14.6			14.5			42.4	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	0%	0%	0%	14%	0%	11%	6%	6%	0%	0%	6%	13%
Adj. Flow (vph)	0	0	0	161	0	233	150	511	0	0	739	172
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	161	233	150	511	0	0	739	172
Turn Type				Perm	NA	Perm	pm+pt	NA			NA	Perm
Protected Phases					8		5	2			6	
Permitted Phases				8		8	2					6
Detector Phase				8	8	8	5	2			6	6
Switch Phase												
Minimum Initial (s)				7.0	7.0	7.0	5.0	12.0			12.0	12.0
Minimum Split (s)				12.0	12.0	12.0	10.5	17.5			17.5	17.5
Total Split (s)				14.0	14.0	14.0	11.0	36.0			25.0	25.0
Total Split (%)				28.0%	28.0%	28.0%	22.0%	72.0%			50.0%	50.0%
Yellow Time (s)				4.0	4.0	4.0	4.0	4.0			4.0	4.0
All-Red Time (s)				1.0	1.0	1.0	1.5	1.5			1.5	1.5
Lost Time Adjust (s)					0.0	0.0	0.0	0.0			0.0	0.0
Total Lost Time (s)					5.0	5.0	5.5	5.5			5.5	5.5
Lead/Lag							Lead				Lag	Lag
Lead-Lag Optimize?							Yes				Yes	Yes
Recall Mode				Min	Min	Min	None	C-Max			C-Max	C-Max
Act Effct Green (s)					8.6	8.6	30.9	30.9			22.1	22.1
Actuated g/C Ratio					0.17	0.17	0.62	0.62			0.44	0.44
v/c Ratio					0.62	0.54	0.37	0.26			0.52	0.25
Control Delay					31.9	8.7	7.0	4.8			12.9	3.3
Queue Delay					0.0	0.0	0.0	0.0			0.0	0.0
Total Delay					31.9	8.7	7.0	4.8			12.9	3.3
LOS					C	A	A	A			B	A
Approach Delay					18.2			5.3			11.1	
Approach LOS					B			A			B	
Queue Length 50th (ft)					44	0	15	30			85	0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 95th (ft)					#108	46	33	47			131	28
Internal Link Dist (ft)		1047			992			662			2099	
Turn Bay Length (ft)						360	200					
Base Capacity (vph)					270	439	401	1993			1426	694
Starvation Cap Reductn					0	0	0	0			0	0
Spillback Cap Reductn					0	0	0	0			0	0
Storage Cap Reductn					0	0	0	0			0	0
Reduced v/c Ratio					0.60	0.53	0.37	0.26			0.52	0.25

Intersection Summary			
Area Type:	Other		
Cycle Length: 50			
Actuated Cycle Length: 50			
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green			
Natural Cycle: 50			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.62			
Intersection Signal Delay: 10.6		Intersection LOS: B	
Intersection Capacity Utilization 49.1%		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: 18: SD37 (Burr Street) & I-90 WB (Exit 332) On-Ramp/I-90 WB (Exit 332) Off-Ramp





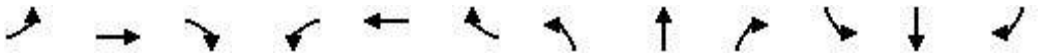
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	145	0	210	135	460	0	0	665	155
Future Volume (veh/h)	0	0	0	145	0	210	135	460	0	0	665	155
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach					No			No			No	
Adj Sat Flow, veh/h/ln				1603	1800	1646	1716	1716	0	0	1716	1617
Adj Flow Rate, veh/h				161	0	233	150	511	0	0	739	0
Peak Hour Factor				0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %				14	0	11	6	6	0	0	6	13
Cap, veh/h				309	0	251	454	1989	0	0	1345	
Arrive On Green				0.18	0.00	0.18	0.09	0.61	0.00	0.00	0.41	0.00
Sat Flow, veh/h				1714	0	1395	1634	3346	0	0	3346	1371
Grp Volume(v), veh/h				161	0	233	150	511	0	0	739	0
Grp Sat Flow(s),veh/h/ln				1714	0	1395	1634	1630	0	0	1630	1371
Q Serve(g_s), s				4.2	0.0	8.2	2.3	3.6	0.0	0.0	8.6	0.0
Cycle Q Clear(g_c), s				4.2	0.0	8.2	2.3	3.6	0.0	0.0	8.6	0.0
Prop In Lane				1.00		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				309	0	251	454	1989	0	0	1345	
V/C Ratio(X)				0.52	0.00	0.93	0.33	0.26	0.00	0.00	0.55	
Avail Cap(c_a), veh/h				309	0	251	491	1989	0	0	1345	
HCM Platoon Ratio				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	0.00	1.00	0.85	0.85	0.00	0.00	1.00	0.00
Uniform Delay (d), s/veh				18.6	0.0	20.2	7.3	4.5	0.0	0.0	11.2	0.0
Incr Delay (d2), s/veh				1.6	0.0	37.9	0.4	0.3	0.0	0.0	1.6	0.0
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				1.5	0.0	4.8	0.6	0.8	0.0	0.0	2.7	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				20.1	0.0	58.1	7.6	4.8	0.0	0.0	12.8	0.0
LnGrp LOS				C	A	E	A	A	A	A	B	
Approach Vol, veh/h					394			661			739	A
Approach Delay, s/veh					42.6			5.4			12.8	
Approach LOS					D			A			B	

Timer - Assigned Phs		2			5	6		8				
Phs Duration (G+Y+Rc), s		36.0			9.9	26.1		14.0				
Change Period (Y+Rc), s		5.5			5.5	5.5		5.0				
Max Green Setting (Gmax), s		30.5			5.5	19.5		9.0				
Max Q Clear Time (g_c+I1), s		5.6			4.3	10.6		10.2				
Green Ext Time (p_c), s		3.4			0.0	3.2		0.0				

Intersection Summary												
HCM 6th Ctrl Delay			16.6									
HCM 6th LOS			B									

Notes

Unsignalized Delay for [SBR] is excluded from calculations of the approach delay and intersection delay.

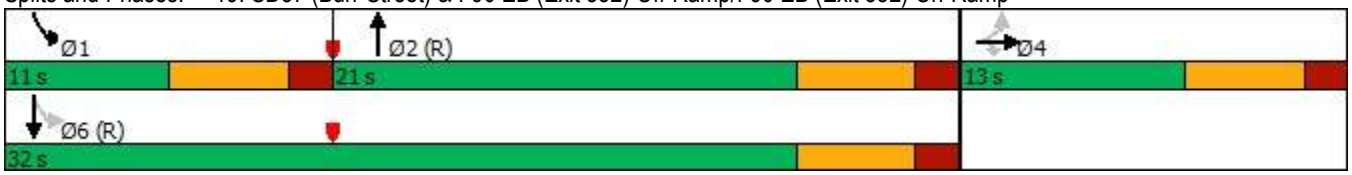


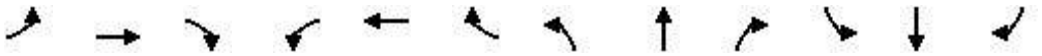
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	85	0	155	0	0	0	0	510	60	105	705	0
Future Volume (vph)	85	0	155	0	0	0	0	510	60	105	705	0
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	0		300	0		0	0		120	190		0
Storage Lanes	0		1	0		0	0		0	1		0
Taper Length (ft)	25			25			25			60		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	1.00
Frt			0.850					0.984				
Flt Protected		0.950								0.950		
Satd. Flow (prot)	0	1527	1430	0	0	0	0	3120	0	1425	3226	0
Flt Permitted		0.950								0.292		
Satd. Flow (perm)	0	1527	1430	0	0	0	0	3120	0	438	3226	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			194					31				
Link Speed (mph)		50			50			35			35	
Link Distance (ft)		1362			971			1492			742	
Travel Time (s)		18.6			13.2			29.1			14.5	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	12%	0%	7%	0%	0%	0%	0%	5%	32%	20%	6%	0%
Adj. Flow (vph)	94	0	172	0	0	0	0	567	67	117	783	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	94	172	0	0	0	0	634	0	117	783	0
Turn Type	Perm	NA	Perm					NA		pm+pt	NA	
Protected Phases		4						2		1	6	
Permitted Phases	4		4							6		
Detector Phase	4	4	4					2		1	6	
Switch Phase												
Minimum Initial (s)	7.0	7.0	7.0					12.0		5.0	12.0	
Minimum Split (s)	12.5	12.5	12.5					17.5		10.5	17.5	
Total Split (s)	13.0	13.0	13.0					21.0		11.0	32.0	
Total Split (%)	28.9%	28.9%	28.9%					46.7%		24.4%	71.1%	
Yellow Time (s)	4.0	4.0	4.0					4.0		4.0	4.0	
All-Red Time (s)	1.5	1.5	1.5					1.5		1.5	1.5	
Lost Time Adjust (s)		0.0	0.0					0.0		0.0	0.0	
Total Lost Time (s)		5.5	5.5					5.5		5.5	5.5	
Lead/Lag								Lag		Lead		
Lead-Lag Optimize?								Yes		Yes		
Recall Mode	Min	Min	Min					C-Max		None	C-Max	
Act Effct Green (s)		7.3	7.3					17.8		26.7	26.7	
Actuated g/C Ratio		0.16	0.16					0.40		0.59	0.59	
v/c Ratio		0.38	0.44					0.51		0.31	0.41	
Control Delay		21.8	6.8					12.6		6.4	5.8	
Queue Delay		0.0	0.0					0.0		0.0	0.0	
Total Delay		21.8	6.8					12.6		6.4	5.8	
LOS		C	A					B		A	A	
Approach Delay		12.1						12.6			5.8	
Approach LOS		B						B			A	
Queue Length 50th (ft)		22	0					64		11	47	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 95th (ft)		54	33					104		26	73	
Internal Link Dist (ft)		1282			891			1412			662	
Turn Bay Length (ft)			300							190		
Base Capacity (vph)		254	400					1252		382	1913	
Starvation Cap Reductn		0	0					0		0	0	
Spillback Cap Reductn		0	0					0		0	0	
Storage Cap Reductn		0	0					0		0	0	
Reduced v/c Ratio		0.37	0.43					0.51		0.31	0.41	

Intersection Summary			
Area Type:	Other		
Cycle Length: 45			
Actuated Cycle Length: 45			
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBTL, Start of Green			
Natural Cycle: 45			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.51			
Intersection Signal Delay: 9.1		Intersection LOS: A	
Intersection Capacity Utilization 49.1%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 19: SD37 (Burr Street) & I-90 EB (Exit 332) Off-Ramp/I-90 EB (Exit 332) On-Ramp





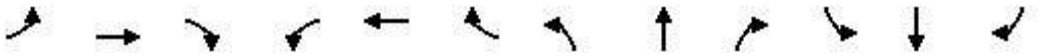
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	85	0	155	0	0	0	0	510	60	105	705	0
Future Volume (veh/h)	85	0	155	0	0	0	0	510	60	105	705	0
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No						No			No	
Adj Sat Flow, veh/h/ln	1632	1800	1702				0	1730	1351	1519	1716	0
Adj Flow Rate, veh/h	94	0	172				0	567	0	117	783	0
Peak Hour Factor	0.90	0.90	0.90				0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	12	0	7				0	5	32	20	6	0
Cap, veh/h	273	0	230				0	1278		473	1944	0
Arrive On Green	0.16	0.00	0.16				0.00	0.39	0.00	0.09	0.60	0.00
Sat Flow, veh/h	1714	0	1442				0	3460	0	1447	3346	0
Grp Volume(v), veh/h	94	0	172				0	567	0	117	783	0
Grp Sat Flow(s),veh/h/ln	1714	0	1442				0	1643	0	1447	1630	0
Q Serve(g_s), s	2.2	0.0	5.1				0.0	5.7	0.0	1.9	5.7	0.0
Cycle Q Clear(g_c), s	2.2	0.0	5.1				0.0	5.7	0.0	1.9	5.7	0.0
Prop In Lane	1.00		1.00				0.00		0.00	1.00		0.00
Lane Grp Cap(c), veh/h	273	0	230				0	1278		473	1944	0
V/C Ratio(X)	0.34	0.00	0.75				0.00	0.44		0.25	0.40	0.00
Avail Cap(c_a), veh/h	286	0	240				0	1278		526	1944	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00				0.00	0.90	0.00	0.84	0.84	0.00
Uniform Delay (d), s/veh	16.8	0.0	18.1				0.0	10.2	0.0	6.5	4.8	0.0
Incr Delay (d2), s/veh	0.7	0.0	11.7				0.0	1.0	0.0	0.2	0.5	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.7	0.0	2.1				0.0	1.7	0.0	0.4	1.1	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	17.6	0.0	29.8				0.0	11.2	0.0	6.7	5.3	0.0
LnGrp LOS	B	A	C				A	B		A	A	A
Approach Vol, veh/h		266						567	A		900	
Approach Delay, s/veh		25.5						11.2			5.5	
Approach LOS		C						B			A	

Timer - Assigned Phs	1	2		4		6
Phs Duration (G+Y+Rc), s	9.3	23.0		12.7		32.3
Change Period (Y+Rc), s	5.5	5.5		5.5		5.5
Max Green Setting (Gmax), s	5.5	15.5		7.5		26.5
Max Q Clear Time (g_c+I1), s	3.9	7.7		7.1		7.7
Green Ext Time (p_c), s	0.0	2.2		0.0		5.2

Intersection Summary	
HCM 6th Ctrl Delay	10.4
HCM 6th LOS	B

Notes

Unsignalized Delay for [NBR] is excluded from calculations of the approach delay and intersection delay.



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	75	255	20	20	220	145	15	40	25	210	65	40
Future Volume (vph)	75	255	20	20	220	145	15	40	25	210	65	40
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	170		0	170		0	0		0	0		0
Storage Lanes	1		0	1		0	0		0	0		0
Taper Length (ft)	75			75			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		0.989			0.940			0.958			0.983	
Flt Protected	0.950			0.950				0.991			0.968	
Satd. Flow (prot)	1710	1780	0	1710	1672	0	0	1605	0	0	1713	0
Flt Permitted	0.950			0.950				0.991			0.968	
Satd. Flow (perm)	1710	1780	0	1710	1672	0	0	1605	0	0	1713	0
Link Speed (mph)		35			35			35			35	
Link Distance (ft)		1332			1574			793			857	
Travel Time (s)		25.9			30.7			15.4			16.7	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	0%	0%	0%	0%	2%	0%	0%	8%	8%	0%	0%	0%
Adj. Flow (vph)	83	283	22	22	244	161	17	44	28	233	72	44
Shared Lane Traffic (%)												
Lane Group Flow (vph)	83	305	0	22	405	0	0	89	0	0	349	0
Sign Control		Stop			Stop			Stop			Stop	

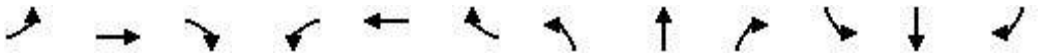
Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 61.1%		ICU Level of Service B	
Analysis Period (min) 15			

Intersection	
Intersection Delay, s/veh	20.5
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	75	255	20	20	220	145	15	40	25	210	65	40
Future Vol, veh/h	75	255	20	20	220	145	15	40	25	210	65	40
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles, %	0	0	0	0	2	0	0	8	8	0	0	0
Mvmt Flow	83	283	22	22	244	161	17	44	28	233	72	44
Number of Lanes	1	1	0	1	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	2	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	2	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	2	2
HCM Control Delay	17.2	24.9	12	21
HCM LOS	C	C	B	C

Lane	NBLn1	EBLn1	EBLn2	WBLn1	WBLn2	SBLn1
Vol Left, %	19%	100%	0%	100%	0%	67%
Vol Thru, %	50%	0%	93%	0%	60%	21%
Vol Right, %	31%	0%	7%	0%	40%	13%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	80	75	275	20	365	315
LT Vol	15	75	0	20	0	210
Through Vol	40	0	255	0	220	65
RT Vol	25	0	20	0	145	40
Lane Flow Rate	89	83	306	22	406	350
Geometry Grp	2	7	7	7	7	2
Degree of Util (X)	0.18	0.171	0.58	0.045	0.739	0.645
Departure Headway (Hd)	7.298	7.402	6.836	7.321	6.559	6.637
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	489	483	526	488	552	543
Service Time	5.38	5.162	4.596	5.076	4.314	4.69
HCM Lane V/C Ratio	0.182	0.172	0.582	0.045	0.736	0.645
HCM Control Delay	12	11.7	18.7	10.4	25.7	21
HCM Lane LOS	B	B	C	B	D	C
HCM 95th-tile Q	0.7	0.6	3.7	0.1	6.3	4.6



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	495	35	60	25	60	150	30	255	10	65	325	450
Future Volume (vph)	495	35	60	25	60	150	30	255	10	65	325	450
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	285		0	200		125	220		230	155		280
Storage Lanes	1		0	1		0	1		1	1		1
Taper Length (ft)	100			55			55			115		
Lane Util. Factor	0.97	1.00	1.00	1.00	0.95	0.95	1.00	0.95	1.00	1.00	0.95	1.00
Frt		0.905			0.893				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3285	1582	0	1710	2832	0	1710	3081	1275	1462	3196	1515
Flt Permitted	0.606			0.689			0.950			0.950		
Satd. Flow (perm)	2095	1582	0	1240	2832	0	1710	3081	1275	1462	3196	1515
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		67			167				149			500
Link Speed (mph)		35			35			35			35	
Link Distance (ft)		1814			1403			1364			1492	
Travel Time (s)		35.3			27.3			26.6			29.1	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	1%	8%	0%	0%	0%	11%	0%	11%	20%	17%	7%	1%
Adj. Flow (vph)	550	39	67	28	67	167	33	283	11	72	361	500
Shared Lane Traffic (%)												
Lane Group Flow (vph)	550	106	0	28	234	0	33	283	11	72	361	500
Turn Type	Perm	NA		Perm	NA		Prot	NA	Perm	Prot	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8					2			6
Detector Phase	4	4		8	8		5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	7.0	7.0		7.0	7.0		4.0	12.0	12.0	4.0	12.0	12.0
Minimum Split (s)	12.5	12.5		12.5	12.5		9.5	17.5	17.5	10.5	17.5	17.5
Total Split (s)	23.2	23.2		23.2	23.2		9.6	20.8	20.8	11.0	22.2	22.2
Total Split (%)	42.2%	42.2%		42.2%	42.2%		17.5%	37.8%	37.8%	20.0%	40.4%	40.4%
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0		1.0	1.0		1.5	1.5	1.5	1.5	1.5	1.5
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)	5.0	5.0		5.0	5.0		5.5	5.5	5.5	5.5	5.5	5.5
Lead/Lag							Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	Min	Min		Min	Min		None	C-Max	C-Max	None	C-Max	C-Max
Act Effct Green (s)	17.3	17.3		17.3	17.3		4.4	20.6	20.6	5.5	23.3	23.3
Actuated g/C Ratio	0.31	0.31		0.31	0.31		0.08	0.37	0.37	0.10	0.42	0.42
v/c Ratio	0.83	0.19		0.07	0.23		0.24	0.25	0.02	0.49	0.27	0.54
Control Delay	30.8	7.5		13.3	5.3		28.7	14.8	0.1	32.6	19.8	11.4
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	30.8	7.5		13.3	5.3		28.7	14.8	0.1	32.6	19.8	11.4
LOS	C	A		B	A		C	B	A	C	B	B
Approach Delay		27.0			6.2			15.7			16.3	
Approach LOS		C			A			B			B	
Queue Length 50th (ft)	82	9		6	7		11	38	0	23	53	36

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 95th (ft)	#156	36		20	27		32	65	0	m#57	99	119
Internal Link Dist (ft)		1734			1323			1284			1412	
Turn Bay Length (ft)	285			200			220		230	155		280
Base Capacity (vph)	693	568		410	1048		136	1153	570	147	1356	930
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	0.79	0.19		0.07	0.22		0.24	0.25	0.02	0.49	0.27	0.54

Intersection Summary

Area Type: Other
Cycle Length: 55
Actuated Cycle Length: 55
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 55
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.83
Intersection Signal Delay: 18.2 Intersection LOS: B
Intersection Capacity Utilization 53.1% 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.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: SD37 (Burr Street) & Spruce Street



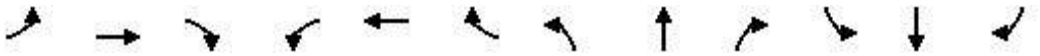
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	495	35	60	25	60	150	30	255	10	65	325	450
Future Volume (veh/h)	495	35	60	25	60	150	30	255	10	65	325	450
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1786	1688	1800	1800	1800	1646	1800	1646	1519	1561	1702	1786
Adj Flow Rate, veh/h	550	39	67	28	67	167	33	283	0	72	361	0
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	1	8	0	0	0	11	0	11	20	17	7	1
Cap, veh/h	819	184	317	498	566	505	49	1005		84	1130	
Arrive On Green	0.33	0.33	0.33	0.33	0.33	0.33	0.03	0.32	0.00	0.02	0.12	0.00
Sat Flow, veh/h	2242	558	958	1308	1710	1525	1714	3127	1287	1487	3233	1514
Grp Volume(v), veh/h	550	0	106	28	67	167	33	283	0	72	361	0
Grp Sat Flow(s),veh/h/ln	1121	0	1515	1308	1710	1525	1714	1563	1287	1487	1617	1514
Q Serve(g_s), s	13.4	0.0	2.8	0.9	1.5	4.5	1.0	3.7	0.0	2.7	5.6	0.0
Cycle Q Clear(g_c), s	18.0	0.0	2.8	3.6	1.5	4.5	1.0	3.7	0.0	2.7	5.6	0.0
Prop In Lane	1.00		0.63	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	819	0	501	498	566	505	49	1005		84	1130	
V/C Ratio(X)	0.67	0.00	0.21	0.06	0.12	0.33	0.67	0.28		0.86	0.32	
Avail Cap(c_a), veh/h	819	0	501	498	566	505	128	1005		149	1130	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.33	0.33	0.33
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.87	0.87	0.00
Uniform Delay (d), s/veh	20.6	0.0	13.2	14.5	12.8	13.8	26.4	13.9	0.0	26.8	18.3	0.0
Incr Delay (d2), s/veh	2.1	0.0	0.2	0.0	0.1	0.4	14.5	0.7	0.0	18.5	0.6	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.3	0.0	0.8	0.2	0.5	1.4	0.6	1.2	0.0	1.3	2.1	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	22.7	0.0	13.4	14.6	12.9	14.2	40.9	14.6	0.0	45.3	19.0	0.0
LnGrp LOS	C	A	B	B	B	B	D	B		D	B	
Approach Vol, veh/h		656			262			316	A		433	A
Approach Delay, s/veh		21.2			13.9			17.4			23.4	
Approach LOS		C			B			B			C	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	8.6	23.2		23.2	7.1	24.7		23.2				
Change Period (Y+Rc), s	5.5	5.5		5.0	5.5	5.5		5.0				
Max Green Setting (Gmax), s	5.5	15.3		18.2	4.1	16.7		18.2				
Max Q Clear Time (g_c+I1), s	4.7	5.7		20.0	3.0	7.6		6.5				
Green Ext Time (p_c), s	0.0	1.1		0.0	0.0	1.5		1.1				

Intersection Summary			
HCM 6th Ctrl Delay		19.9	
HCM 6th LOS		B	

Notes

Unsignalized Delay for [NBR, SBR] is excluded from calculations of the approach delay and intersection delay.



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	20	120	115	40	100	50	110	350	45	40	235	15
Future Volume (vph)	20	120	115	40	100	50	110	350	45	40	235	15
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
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		0.939			0.964			0.988			0.993	
Flt Protected		0.996			0.990			0.989			0.993	
Satd. Flow (prot)	0	1637	0	0	1718	0	0	1741	0	0	1742	0
Flt Permitted		0.996			0.990			0.989			0.993	
Satd. Flow (perm)	0	1637	0	0	1718	0	0	1741	0	0	1742	0
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		1160			1174			641			590	
Travel Time (s)		31.6			32.0			17.5			16.1	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	0%	6%	0%	0%	0%	0%	0%	1%	4%	8%	1%	0%
Adj. Flow (vph)	22	133	128	44	111	56	122	389	50	44	261	17
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	283	0	0	211	0	0	561	0	0	322	0
Sign Control		Stop			Stop			Stop			Stop	

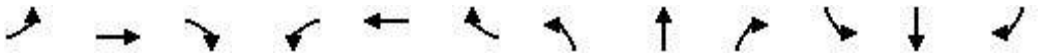
Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 74.0%		ICU Level of Service D	
Analysis Period (min) 15			

Intersection	
Intersection Delay, s/veh	43.7
Intersection LOS	E

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	20	120	115	40	100	50	110	350	45	40	235	15
Future Vol, veh/h	20	120	115	40	100	50	110	350	45	40	235	15
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles, %	0	6	0	0	0	0	0	1	4	8	1	0
Mvmt Flow	22	133	128	44	111	56	122	389	50	44	261	17
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	20.1	17.2	77.2	23.3
HCM LOS	C	C	F	C

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	22%	8%	21%	14%
Vol Thru, %	69%	47%	53%	81%
Vol Right, %	9%	45%	26%	5%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	505	255	190	290
LT Vol	110	20	40	40
Through Vol	350	120	100	235
RT Vol	45	115	50	15
Lane Flow Rate	561	283	211	322
Geometry Grp	1	1	1	1
Degree of Util (X)	1.046	0.573	0.45	0.65
Departure Headway (Hd)	6.709	7.492	7.909	7.46
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	544	484	458	487
Service Time	4.709	5.492	5.909	5.46
HCM Lane V/C Ratio	1.031	0.585	0.461	0.661
HCM Control Delay	77.2	20.1	17.2	23.3
HCM Lane LOS	F	C	C	C
HCM 95th-tile Q	16.1	3.5	2.3	4.6



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	305	200	15	10	140	40	10	10	10	30	10	225
Future Volume (vph)	305	200	15	10	140	40	10	10	10	30	10	225
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	0		0	0		0	0		0	100		0
Storage Lanes	0		0	0		0	0		0	1		0
Taper Length (ft)	25			25			25			60		
Lane Util. Factor	0.95	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.996			0.972			0.955			0.856	
Flt Protected		0.972			0.997			0.984		0.950		
Satd. Flow (prot)	0	3125	0	0	1591	0	0	1691	0	1710	1512	0
Flt Permitted		0.972			0.997			0.984		0.950		
Satd. Flow (perm)	0	3125	0	0	1591	0	0	1691	0	1710	1512	0
Link Speed (mph)		45			45			25			25	
Link Distance (ft)		2581			2852			1867			1496	
Travel Time (s)		39.1			43.2			50.9			40.8	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	1%	14%	0%	0%	13%	0%	0%	0%	0%	0%	0%	2%
Adj. Flow (vph)	339	222	17	11	156	44	11	11	11	33	11	250
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	578	0	0	211	0	0	33	0	33	261	0
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 54.0%		ICU Level of Service A	
Analysis Period (min) 15			

Intersection	
Int Delay, s/veh	7.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	305	200	15	10	140	40	10	10	10	30	10	225
Future Vol, veh/h	305	200	15	10	140	40	10	10	10	30	10	225
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
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	1	14	0	0	13	0	0	0	0	0	0	2
Mvmt Flow	339	222	17	11	156	44	11	11	11	33	11	250

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	200	0	0	239	0	0	1240	1131	120	995	1117	178
Stage 1	-	-	-	-	-	-	909	909	-	200	200	-
Stage 2	-	-	-	-	-	-	331	222	-	795	917	-
Critical Hdwy	4.115	-	-	4.1	-	-	7.3	6.5	6.9	7.3	6.5	6.23
Critical Hdwy Stg 1	-	-	-	-	-	-	6.5	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.5	5.5	-
Follow-up Hdwy	2.2095	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.319
Pot Cap-1 Maneuver	1378	-	-	1340	-	-	143	205	915	213	209	864
Stage 1	-	-	-	-	-	-	300	357	-	806	739	-
Stage 2	-	-	-	-	-	-	687	723	-	351	354	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1378	-	-	1340	-	-	75	146	915	154	148	864
Mov Cap-2 Maneuver	-	-	-	-	-	-	75	146	-	154	148	-
Stage 1	-	-	-	-	-	-	215	256	-	577	732	-
Stage 2	-	-	-	-	-	-	476	716	-	237	253	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	5.1	0.4	38.3	15.4
HCM LOS			E	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	141	1378	-	-	1340	-	-	154	716
HCM Lane V/C Ratio	0.236	0.246	-	-	0.008	-	-	0.216	0.365
HCM Control Delay (s)	38.3	8.5	0.3	-	7.7	0	-	34.7	12.9
HCM Lane LOS	E	A	A	-	A	A	-	D	B
HCM 95th %tile Q(veh)	0.9	1	-	-	0	-	-	0.8	1.7

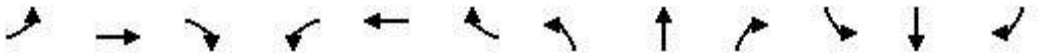
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	20	140	220	40	110	15	205	350	65	20	320	25
Future Volume (vph)	20	140	220	40	110	15	205	350	65	20	320	25
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	0		0	0		0	130		0	60		0
Storage Lanes	0		0	0		0	0		0	1		0
Taper Length (ft)	25			25			25			85		
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		0.922			0.987			0.977			0.989	
Flt Protected		0.997			0.988		0.950			0.950		
Satd. Flow (prot)	0	1636	0	0	1755	0	1693	1744	0	1710	1764	0
Flt Permitted		0.977			0.729		0.342			0.498		
Satd. Flow (perm)	0	1603	0	0	1295	0	610	1744	0	896	1764	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		117			9			18			7	
Link Speed (mph)		25			25			30			25	
Link Distance (ft)		1628			1096			1266			1178	
Travel Time (s)		44.4			29.9			28.8			32.1	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	0%	0%	2%	0%	0%	0%	1%	1%	0%	0%	1%	0%
Adj. Flow (vph)	22	156	244	44	122	17	228	389	72	22	356	28
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	422	0	0	183	0	228	461	0	22	384	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		pm+pt	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		5	2		1	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0		4.0	8.0		4.0	8.0	
Minimum Split (s)	11.0	11.0		11.0	11.0		9.5	13.0		9.5	13.0	
Total Split (s)	23.0	23.0		23.0	23.0		12.0	27.5		9.5	25.0	
Total Split (%)	38.3%	38.3%		38.3%	38.3%		20.0%	45.8%		15.8%	41.7%	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.5	1.5		1.5	1.5		1.0	1.5		1.0	1.5	
Lost Time Adjust (s)		0.0			0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)		5.0			5.0		4.5	5.0		4.5	5.0	
Lead/Lag							Lead	Lag		Lead	Lag	
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	
Recall Mode	None	None		None	None		None	C-Max		None	C-Max	
Act Effct Green (s)		15.7			15.7		34.4	32.4		28.1	22.4	
Actuated g/C Ratio		0.26			0.26		0.57	0.54		0.47	0.37	
v/c Ratio		0.84			0.53		0.47	0.49		0.04	0.58	
Control Delay		30.8			23.4		10.4	12.5		7.0	20.2	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		30.8			23.4		10.4	12.5		7.0	20.2	
LOS		C			C		B	B		A	C	
Approach Delay		30.8			23.4			11.8			19.5	
Approach LOS		C			C			B			B	
Queue Length 50th (ft)		97			51		39	90		3	114	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 95th (ft)		#228			103		73	226		12	197	
Internal Link Dist (ft)		1548			1016			1186			1098	
Turn Bay Length (ft)							130			60		
Base Capacity (vph)		562			394		488	950		490	661	
Starvation Cap Reductn		0			0		0	0		0	0	
Spillback Cap Reductn		0			0		0	0		0	0	
Storage Cap Reductn		0			0		0	0		0	0	
Reduced v/c Ratio		0.75			0.46		0.47	0.49		0.04	0.58	

Intersection Summary			
Area Type:	Other		
Cycle Length: 60			
Actuated Cycle Length: 60			
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green			
Natural Cycle: 60			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.84			
Intersection Signal Delay: 19.6		Intersection LOS: B	
Intersection Capacity Utilization 67.8%		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: 5: Burr Street & 1st Avenue





Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	20	140	220	40	110	15	205	350	65	20	320	25
Future Volume (veh/h)	20	140	220	40	110	15	205	350	65	20	320	25
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1800	1800	1772	1800	1800	1800	1786	1786	1800	1800	1786	1800
Adj Flow Rate, veh/h	22	156	0	44	122	17	228	389	72	22	356	28
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	0	0	2	0	0	0	1	1	0	0	1	0
Cap, veh/h	86	235		118	180	23	668	871	161	579	859	68
Arrive On Green	0.14	0.14	0.00	0.14	0.14	0.14	0.09	0.59	0.59	0.02	0.53	0.53
Sat Flow, veh/h	130	1640	0	302	1255	159	1701	1466	271	1714	1634	129
Grp Volume(v), veh/h	178	0	0	183	0	0	228	0	461	22	0	384
Grp Sat Flow(s),veh/h/ln	1769	0	0	1716	0	0	1701	0	1737	1714	0	1763
Q Serve(g_s), s	0.0	0.0	0.0	0.3	0.0	0.0	3.3	0.0	8.8	0.4	0.0	7.9
Cycle Q Clear(g_c), s	5.7	0.0	0.0	5.9	0.0	0.0	3.3	0.0	8.8	0.4	0.0	7.9
Prop In Lane	0.12		0.00	0.24		0.09	1.00		0.16	1.00		0.07
Lane Grp Cap(c), veh/h	321	0		321	0	0	668	0	1033	579	0	927
V/C Ratio(X)	0.55	0.00		0.57	0.00	0.00	0.34	0.00	0.45	0.04	0.00	0.41
Avail Cap(c_a), veh/h	589	0		572	0	0	729	0	1033	686	0	927
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	24.4	0.0	0.0	24.5	0.0	0.0	5.4	0.0	6.7	6.4	0.0	8.6
Incr Delay (d2), s/veh	1.5	0.0	0.0	1.6	0.0	0.0	0.3	0.0	1.4	0.0	0.0	1.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.4	0.0	0.0	2.5	0.0	0.0	0.9	0.0	2.8	0.1	0.0	2.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	25.9	0.0	0.0	26.1	0.0	0.0	5.7	0.0	8.1	6.5	0.0	10.0
LnGrp LOS	C	A		C	A	A	A	A	A	A	A	A
Approach Vol, veh/h		178	A		183			689			406	
Approach Delay, s/veh		25.9			26.1			7.3			9.8	
Approach LOS		C			C			A			A	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	5.7	40.7		13.6	9.8	36.5		13.6				
Change Period (Y+Rc), s	4.5	5.0		5.0	4.5	5.0		5.0				
Max Green Setting (Gmax), s	5.0	22.5		18.0	7.5	20.0		18.0				
Max Q Clear Time (g_c+I1), s	2.4	10.8		7.7	5.3	9.9		7.9				
Green Ext Time (p_c), s	0.0	2.3		0.7	0.1	1.7		0.7				

Intersection Summary		
HCM 6th Ctrl Delay	12.7	
HCM 6th LOS	B	

Notes

Unsignalized Delay for [EBR] is excluded from calculations of the approach delay and intersection delay.

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	40	85	40	40	80	40	25	165	55	75	165	30
Future Volume (vph)	40	85	40	40	80	40	25	165	55	75	165	30
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
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		0.967			0.966			0.970			0.985	
Flt Protected		0.988			0.988			0.995			0.986	
Satd. Flow (prot)	0	1720	0	0	1689	0	0	1714	0	0	1727	0
Flt Permitted		0.988			0.988			0.995			0.986	
Satd. Flow (perm)	0	1720	0	0	1689	0	0	1714	0	0	1727	0
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		1313			1117			1098			1099	
Travel Time (s)		35.8			30.5			29.9			30.0	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	0%	0%	0%	7%	0%	0%	0%	2%	0%	0%	2%	0%
Adj. Flow (vph)	44	94	44	44	89	44	28	183	61	83	183	33
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	182	0	0	177	0	0	272	0	0	299	0
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 51.3%		ICU Level of Service A	
Analysis Period (min) 15			

Intersection	
Int Delay, s/veh	16.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	40	85	40	40	80	40	25	165	55	75	165	30
Future Vol, veh/h	40	85	40	40	80	40	25	165	55	75	165	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
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	7	0	0	0	2	0	0	2	0
Mvmt Flow	44	94	44	44	89	44	28	183	61	83	183	33

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	133	0	0	138	0	0	511	425	116	525	425	111
Stage 1	-	-	-	-	-	-	204	204	-	199	199	-
Stage 2	-	-	-	-	-	-	307	221	-	326	226	-
Critical Hdwy	4.1	-	-	4.17	-	-	7.1	6.52	6.2	7.1	6.52	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.52	-	6.1	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.52	-	6.1	5.52	-
Follow-up Hdwy	2.2	-	-	2.263	-	-	3.5	4.018	3.3	3.5	4.018	3.3
Pot Cap-1 Maneuver	1464	-	-	1415	-	-	476	521	942	466	521	948
Stage 1	-	-	-	-	-	-	803	733	-	807	736	-
Stage 2	-	-	-	-	-	-	707	720	-	691	717	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1464	-	-	1415	-	-	309	487	942	294	487	948
Mov Cap-2 Maneuver	-	-	-	-	-	-	309	487	-	294	487	-
Stage 1	-	-	-	-	-	-	777	709	-	780	711	-
Stage 2	-	-	-	-	-	-	489	696	-	463	693	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.8	1.9	19.7	30.2
HCM LOS			C	D

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	512	1464	-	-	1415	-	-	432
HCM Lane V/C Ratio	0.532	0.03	-	-	0.031	-	-	0.694
HCM Control Delay (s)	19.7	7.5	0	-	7.6	0	-	30.2
HCM Lane LOS	C	A	A	-	A	A	-	D
HCM 95th %tile Q(veh)	3.1	0.1	-	-	0.1	-	-	5.2

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	75	50	45	10	25	15	35	10	10	15	10	40
Future Volume (vph)	75	50	45	10	25	15	35	10	10	15	10	40
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
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		0.964			0.959			0.976			0.917	
Flt Protected		0.979			0.990			0.969			0.988	
Satd. Flow (prot)	0	1699	0	0	1709	0	0	1702	0	0	1631	0
Flt Permitted		0.979			0.990			0.969			0.988	
Satd. Flow (perm)	0	1699	0	0	1709	0	0	1702	0	0	1631	0
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		1351			1587			1244			742	
Travel Time (s)		36.8			43.3			33.9			20.2	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	83	56	50	11	28	17	39	11	11	17	11	44
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	189	0	0	56	0	0	61	0	0	72	0
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 31.0%		ICU Level of Service A	
Analysis Period (min) 15			

Intersection	
Int Delay, s/veh	5.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	75	50	45	10	25	15	35	10	10	15	10	40
Future Vol, veh/h	75	50	45	10	25	15	35	10	10	15	10	40
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
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	83	56	50	11	28	17	39	11	11	17	11	44

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	45	0	0	106	0	0	333	314	81	317	331	37
Stage 1	-	-	-	-	-	-	247	247	-	59	59	-
Stage 2	-	-	-	-	-	-	86	67	-	258	272	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1576	-	-	1498	-	-	624	605	985	640	592	1041
Stage 1	-	-	-	-	-	-	761	706	-	958	850	-
Stage 2	-	-	-	-	-	-	927	843	-	751	688	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1576	-	-	1498	-	-	560	566	985	593	554	1041
Mov Cap-2 Maneuver	-	-	-	-	-	-	560	566	-	593	554	-
Stage 1	-	-	-	-	-	-	718	666	-	904	843	-
Stage 2	-	-	-	-	-	-	869	836	-	689	649	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	3.3	1.5	11.6	10
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	609	1576	-	-	1498	-	-	795
HCM Lane V/C Ratio	0.1	0.053	-	-	0.007	-	-	0.091
HCM Control Delay (s)	11.6	7.4	0	-	7.4	0	-	10
HCM Lane LOS	B	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	0.3	0.2	-	-	0	-	-	0.3



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	30	60	65	325	365	40
Future Volume (vph)	30	60	65	325	365	40
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.887		0.987	
Flt Protected		0.984			0.957	
Satd. Flow (prot)	0	1771	1483	0	1599	0
Flt Permitted		0.984			0.957	
Satd. Flow (perm)	0	1771	1483	0	1599	0
Link Speed (mph)		25	25		30	
Link Distance (ft)		1004	963		5313	
Travel Time (s)		27.4	26.3		120.8	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	0%	0%	6%	8%	7%	0%
Adj. Flow (vph)	33	67	72	361	406	44
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	100	433	0	450	0
Sign Control		Free	Free		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 61.9%		ICU Level of Service B	
Analysis Period (min) 15			

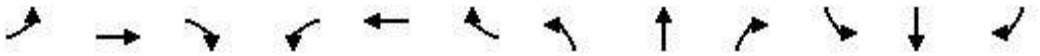
Intersection	
Int Delay, s/veh	12.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	30	60	65	325	365	40
Future Vol, veh/h	30	60	65	325	365	40
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	0	0	6	8	7	0
Mvmt Flow	33	67	72	361	406	44

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	433	0	-	0	386	253
Stage 1	-	-	-	-	253	-
Stage 2	-	-	-	-	133	-
Critical Hdwy	4.1	-	-	-	6.47	6.2
Critical Hdwy Stg 1	-	-	-	-	5.47	-
Critical Hdwy Stg 2	-	-	-	-	5.47	-
Follow-up Hdwy	2.2	-	-	-	3.563	3.3
Pot Cap-1 Maneuver	1137	-	-	-	607	791
Stage 1	-	-	-	-	778	-
Stage 2	-	-	-	-	881	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1137	-	-	-	589	791
Mov Cap-2 Maneuver	-	-	-	-	589	-
Stage 1	-	-	-	-	755	-
Stage 2	-	-	-	-	881	-

Approach	EB	WB	SB
HCM Control Delay, s	2.8	0	26.3
HCM LOS			D

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1137	-	-	-	604
HCM Lane V/C Ratio	0.029	-	-	-	0.745
HCM Control Delay (s)	8.3	0	-	-	26.3
HCM Lane LOS	A	A	-	-	D
HCM 95th %tile Q(veh)	0.1	-	-	-	6.5



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	35	90	35	125	125	200	35	170	150	115	100	25
Future Volume (vph)	35	90	35	125	125	200	35	170	150	115	100	25
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
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		0.970			0.940			0.943			0.986	
Flt Protected		0.989			0.986			0.995			0.977	
Satd. Flow (prot)	0	1708	0	0	1619	0	0	1627	0	0	1685	0
Flt Permitted		0.989			0.986			0.995			0.977	
Satd. Flow (perm)	0	1708	0	0	1619	0	0	1627	0	0	1685	0
Link Speed (mph)		45			40			30			30	
Link Distance (ft)		807			813			5313			2460	
Travel Time (s)		12.2			13.9			120.8			55.9	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	0%	2%	0%	7%	4%	0%	0%	8%	0%	0%	7%	0%
Adj. Flow (vph)	39	100	39	139	139	222	39	189	167	128	111	28
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	178	0	0	500	0	0	395	0	0	267	0
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 84.8%		ICU Level of Service E	
Analysis Period (min) 15			

Intersection	
Int Delay, s/veh	162.5

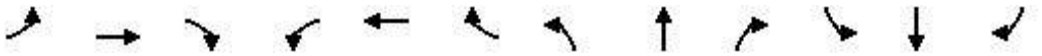
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	35	90	35	125	125	200	35	170	150	115	100	25
Future Vol, veh/h	35	90	35	125	125	200	35	170	150	115	100	25
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	0	2	0	7	4	0	0	8	0	0	7	0
Mvmt Flow	39	100	39	139	139	222	39	189	167	128	111	28

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	361	0	0	139	0	0	796	837	120	904	745	250
Stage 1	-	-	-	-	-	-	198	198	-	528	528	-
Stage 2	-	-	-	-	-	-	598	639	-	376	217	-
Critical Hdwy	4.1	-	-	4.17	-	-	7.1	6.58	6.2	7.1	6.57	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.58	-	6.1	5.57	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.58	-	6.1	5.57	-
Follow-up Hdwy	2.2	-	-	2.263	-	-	3.5	4.072	3.3	3.5	4.063	3.3
Pot Cap-1 Maneuver	1209	-	-	1414	-	-	307	296	937	260	336	794
Stage 1	-	-	-	-	-	-	808	726	-	538	520	-
Stage 2	-	-	-	-	-	-	492	461	-	649	714	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1209	-	-	1414	-	-	183	249	937	~ 73	283	794
Mov Cap-2 Maneuver	-	-	-	-	-	-	183	249	-	~ 73	283	-
Stage 1	-	-	-	-	-	-	780	701	-	519	454	-
Stage 2	-	-	-	-	-	-	313	402	-	376	689	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.8	2.2	130.3	$ 617.9
HCM LOS			F	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	343	1209	-	-	1414	-	-	122
HCM Lane V/C Ratio	1.15	0.032	-	-	0.098	-	-	2.186
HCM Control Delay (s)	130.3	8.1	0	-	7.8	0	-	$ 617.9
HCM Lane LOS	F	A	A	-	A	A	-	F
HCM 95th %tile Q(veh)	15.8	0.1	-	-	0.3	-	-	22.5

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	15	10	30	15	315	10	70	15	270	170	30
Future Volume (vph)	10	15	10	30	15	315	10	70	15	270	170	30
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	0		0	80		0	50		0	80		0
Storage Lanes	0		0	1		0	1		0	1		0
Taper Length (ft)	25			40			60			60		
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		0.962			0.857			0.973			0.978	
Flt Protected		0.986		0.950			0.950			0.950		
Satd. Flow (prot)	0	1609	0	1710	1514	0	1710	1483	0	1676	1639	0
Flt Permitted		0.986		0.950			0.950			0.950		
Satd. Flow (perm)	0	1609	0	1710	1514	0	1710	1483	0	1676	1639	0
Link Speed (mph)		25			35			45			45	
Link Distance (ft)		2694			2873			1930			987	
Travel Time (s)		73.5			56.0			29.2			15.0	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	0%	14%	0%	0%	0%	2%	0%	22%	0%	2%	5%	21%
Adj. Flow (vph)	11	17	11	33	17	350	11	78	17	300	189	33
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	39	0	33	367	0	11	95	0	300	222	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 50.5%		ICU Level of Service A	
Analysis Period (min) 15			

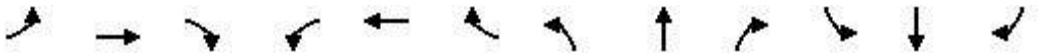
Intersection	
Int Delay, s/veh	8.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	10	15	10	30	15	315	10	70	15	270	170	30
Future Vol, veh/h	10	15	10	30	15	315	10	70	15	270	170	30
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	80	-	-	50	-	-	80	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	0	14	0	0	0	2	0	22	0	2	5	21
Mvmt Flow	11	17	11	33	17	350	11	78	17	300	189	33

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1098	923	206	929	931	87	222	0	0	95	0	0
Stage 1	806	806	-	109	109	-	-	-	-	-	-	-
Stage 2	292	117	-	820	822	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.64	6.2	7.1	6.5	6.22	4.1	-	-	4.12	-	-
Critical Hdwy Stg 1	6.1	5.64	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.64	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4.126	3.3	3.5	4	3.318	2.2	-	-	2.218	-	-
Pot Cap-1 Maneuver	192	258	840	250	269	971	1359	-	-	1499	-	-
Stage 1	379	378	-	901	809	-	-	-	-	-	-	-
Stage 2	720	776	-	372	391	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	97	205	840	195	214	971	1359	-	-	1499	-	-
Mov Cap-2 Maneuver	97	205	-	195	214	-	-	-	-	-	-	-
Stage 1	376	302	-	894	803	-	-	-	-	-	-	-
Stage 2	447	770	-	277	313	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	29.4	13.8	0.8	4.6
HCM LOS	D	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	1359	-	-	186	195	836	1499	-	-
HCM Lane V/C Ratio	0.008	-	-	0.209	0.171	0.439	0.2	-	-
HCM Control Delay (s)	7.7	-	-	29.4	27.2	12.6	8	-	-
HCM Lane LOS	A	-	-	D	D	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.8	0.6	2.3	0.7	-	-



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	25	0	170	75	685	0	0	750	175
Future Volume (vph)	0	0	0	25	0	170	75	685	0	0	750	175
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	0		0	0		150	80		0	0		0
Storage Lanes	0		0	0		1	1		0	0		1
Taper Length (ft)	25			25			60			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
Flt Protected					0.950		0.950					
Satd. Flow (prot)	0	0	0	0	1598	1457	1710	1748	0	0	1765	1500
Flt Permitted					0.950		0.950					
Satd. Flow (perm)	0	0	0	0	1598	1457	1710	1748	0	0	1765	1500
Link Speed (mph)		50			50			45			45	
Link Distance (ft)		1104			1070			1072			1043	
Travel Time (s)		15.1			14.6			16.2			15.8	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	0%	0%	0%	7%	0%	5%	0%	3%	0%	0%	2%	2%
Adj. Flow (vph)	0	0	0	28	0	189	83	761	0	0	833	194
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	28	189	83	761	0	0	833	194
Sign Control		Free			Stop			Free			Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 59.4%		ICU Level of Service B	
Analysis Period (min) 15			

Intersection	
Int Delay, s/veh	1.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	25	0	170	75	685	0	0	750	175
Future Vol, veh/h	0	0	0	25	0	170	75	685	0	0	750	175
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	Free	-	-	None	-	-	None
Storage Length	-	-	-	-	-	150	80	-	-	-	-	0
Veh in Median Storage, #	-	1	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	7	0	5	0	3	0	0	2	2
Mvmt Flow	0	0	0	28	0	189	83	761	0	0	833	194

Major/Minor	Minor1			Major1			Major2		
Conflicting Flow All	1857	1954	-	1027	0	-	-	-	0
Stage 1	927	927	-	-	-	-	-	-	-
Stage 2	930	1027	-	-	-	-	-	-	-
Critical Hdwy	6.47	6.5	-	4.1	-	-	-	-	-
Critical Hdwy Stg 1	5.47	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.47	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.563	4	-	2.2	-	-	-	-	-
Pot Cap-1 Maneuver	78	65	0	684	-	0	0	-	-
Stage 1	377	350	0	-	-	0	0	-	-
Stage 2	376	314	0	-	-	0	0	-	-
Platoon blocked, %					-			-	-
Mov Cap-1 Maneuver	69	0	-	684	-	-	-	-	-
Mov Cap-2 Maneuver	69	0	-	-	-	-	-	-	-
Stage 1	331	0	-	-	-	-	-	-	-
Stage 2	376	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	88.6	1.1	0
HCM LOS	F		

Minor Lane/Major Mvmt	NBL	NBT	WBLn1	WBLn2	SBT	SBR
Capacity (veh/h)	684	-	69	-	-	-
HCM Lane V/C Ratio	0.122	-	0.403	-	-	-
HCM Control Delay (s)	11	-	88.6	0	-	-
HCM Lane LOS	B	-	F	A	-	-
HCM 95th %tile Q(veh)	0.4	-	1.6	-	-	-

HCS7 Two-Way Stop-Control Text Report

TWO-WAY STOP CONTROL (TWSC) Analysis

File Name:	2045NBC_PM_SD37_I-90 EB RTI.xtw
Analyst:	HDR
Agency:	HDR
Date Performed:	11/1/2021
Time Analyzed:	2045 NBC - PM Peak
Jurisdiction:	SDDOT
Analysis Year:	2045
Project Description:	Mitchell MTP
Units:	U.S. Customary
Intersection Name:	SD37 & I-90 EB RTI
Major Street Direction:	North-South
East/West Street Name:	I-90 EB RTI
North/South Street Name:	SD37 / Ohlman Street
Analysis Time Period (hrs):	0.25

Vehicle Volumes and Adjustments

Major Street:									
Approach		NorthBound					SouthBound		
Movement	1U	1	2	3	|	4U	4	5	6
	U	L	T	R	|	U	L	T	R
Volume			615	45			245	530	
Peak Hour Factor, PHF					0.90				
Hourly Flow Rtae, HFR			683	50			272	589	
Percent Heavy Vehicles							4		
Number of Lanes	0	0	1	0		0	1	1	0
Lane Configuration				TR			L	T	
Median Type					Undivided				
Median Storage									
RT channelized?									
Left-Turn Lane Storage									
Upstream Signal?					Not Present				

Minor Street:								
Approach		WestBound				EastBound		
Movement	7	8	9	|		10	11	12
	L	T	R	|		L	T	R
Volume						145	0	60
Peak Hour Factor, PHF				0.90				
Hourly Flow Rtae, HFR						161	0	67
Percent Heavy Vehicles						8	0	6
Number of Lanes	0	0	0			0	1	0
Lane Configuration							LTR	
RT channelized?								
Flared Approach | Storage		|				No	|	
Percent Grade							0	

Pedestrian Volumes and Adjustments

Approach	NB	SB	WB	EB
Movement	13	14	15	16
Flow (ped/hr)	0	0		0
Lane Width (ft)				
Walking Speed (ft/sec)				
Pedestrian Blockage Factor, f_pb				

Delay, Queue Length, and Level of Service

Approach	NB		SB		WestBound			EastBound		
Movement	1U	1	4U	4	7	8	9	10	11	12
Lane Configuration				L					LTR	
Flow Rate				272					228	
Lane Capacity				862					58	
v/c				0.32					3.96	
95% Queue Length				1.4					24.7	
Control Delay				11.1					1478.3	
LOS				B					F	
Approach Delay				3.5					1478.3	
Approach LOS									F	
Intersction Delay	186.4									

Step 1: MOVEMENT PRIORITIES

Major Street:									
Approach		NorthBound					SouthBound		
Priority	1U	1	2	3	|	4U	4	5	6
Movement	U	L	T	R	|	U	L	T	R
Minor Street:									

Approach	WestBound			EastBound		
Priority	7	8	9	10	11	12
Movement	L	T	R	L	T	R

Step 2: MOVEMENT DEMAND VOLUMES AND FLOW RATES

Major Street:

Approach	NorthBound				SouthBound			
Movement	1U	1	2	3	4U	4	5	6
	U	L	T	R	U	L	T	R
Volume, V_x			615	45		245	530	
Flow Rate, v_x			683	50		272	589	

Minor Street:

Approach	WestBound			EastBound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume, V_x				145	0	60
Flow Rate, v_x				161	0	67

Step 3: CONFLICTING FLOW RATES

Major Street:

Approach	NorthBound				SouthBound			
Movement	1U	1	2	3	4U	4	5	6
	U	L	T	R	U	L	T	R
Flow Rate, v_x			683	50		272	589	
Conflicting Flow, v_c,x						733		

Minor Street:

Approach	WestBound			EastBound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Flow Rate, v_x				161	0	67
Conflicting Flow, v_c,x				1842	1867	589

Step 4: CRITICAL HEADWAYS and FOLLOW-UP HEADWAYS

CRITICAL HEADWAYS

Approach	NB		SB		WestBound			EastBound		
Movement	1U	1	4U	4	7	8	9	10	11	12
	U	L	U	L	L	T	R	L	T	R
t_c,base				4.1				7.1	6.5	6.2
Single Stage										
Stage I										
Stage II										
t_c,HV				1.0				1.0	1.0	1.0
P_HV				0.04				0.08	0.00	0.06
t_c,G								0.2	0.2	0.1
G								0	0	0
t_3,LT				0.0				0.0	0.0	0.0
t_c										
Single Stage				4.14				7.18	6.50	6.26
Stage I										
Stage II										

FOLLOW-UP HEADWAYS

Approach	NB		SB		WestBound			EastBound		
Movement	1U	1	4U	4	7	8	9	10	11	12
	U	L	U	L	L	T	R	L	T	R
t_f,base				2.2				3.5	4.0	3.3
t_f,HV				0.9				0.9	0.9	0.9
P_HV				0.04				0.08	0.00	0.06
t_f				2.24				3.57	4.00	3.35

Step 5: POTENTIAL CAPACITIES

NO UPSTREAM SIGNAL EFFECTS PRESENT

Approach	NB		SB		WestBound			EastBound		
Movement	1U	1	4U	4	7	8	9	10	11	12
	U	L	U	L	L	T	R	L	T	R
v_c,x				733				1842	1867	589
t_c,x				4.14				7.18	6.50	6.26
t_f,x				2.24				3.57	4.00	3.35
c_p,x				862				56	73	501

Steps 6 - 9: MOVEMENT CAPACITIES

Pedestrian Impedance

Approach	NB	SB	WB	EB

Movement	13	14	15	16
Pedestrian Flow Rate v_x	0	0		0
Lane Width, w				
Walking Speed, S_p				
Pedestrian Blockage Factor, f_pb				

Major-Street Left-Turn Movements	1	4
Conflicting Flow, v_c,x		733
Potential Capacity, c_p,x		862
Pedestrian Impedance Factor, p_p,x		1.000
Movement Capacity, c_m,x		862
Probability of Queue-free State, p_0,j		0.684
Major L-Shared Probability Queue-free State, p*_0,j		1.000

Minor-Street Right-Turn Movements	9	12
Conflicting Flow, v_c,x		589
Potential Capacity, c_p,x		501
Pedestrian Impedance Factor, p_p,x		1.000
Movement Capacity, c_m,x		501
Probability of Queue-free State, p_0,j		0.867

Major-Street U-Turn Movements	1U	4U
Conflicting Flow, v_c,x		
Potential Capacity, c_p,x		
Capacity Adjustment Factor, f_x		
Movement Capacity, c_m,x		
Shared L/U Capacity, c_SH		
Probability of Queue-free State, p_0,j		

Minor-Street Through Movements	8	11
Conflicting Flow, v_c,x		1867
Potential Capacity, c_p,x		73
Pedestrian Impedance Factor, p_p,x		1.000
Capacity Adjustment Factor, f_x		0.684
Movement Capacity, c_m,x		50
Probability of Queue-free State, p_0,j		1.000

Minor-Street Left-Turn Movements	7	10
Conflicting Flow, v_c,x		1842
Potential Capacity, c_p,x		56
Pedestrian Impedance Factor, p_p,x		1.000
Major L, Minor T Adjusted Impedance Factor, p"		0.684
Major L, Minor T Impedance Factor, p'		0.755
Capacity Adjustment Factor, f_x		0.755
Movement Capacity, c_m,x		42

Step 10: FINAL CAPACITY ADJUSTMENTS

SHARED-LANE CAPACITY OF MINOR STREET APPROACHES

Approach	WestBound			EastBound		
Movement	7	8	9	10	11	12
Lane Configuration					LTR	
Shared Flow Rate, v_y					228	
Movement Capacity, c_m,x				42	50	501
Shared Capacity, c_SH					58	

Step 11: CONTROL DELAY

CONTROL DELAY TO RANK 2 THROUGH 4 MOVEMENTS

Approach	NB			SB		WestBound		EastBound		
Movement	1U	1	4U	4	7	8	9	10	11	12
Flow Rate				272				161	0	67
Movement Capacity				862				42	50	501
Lane Configuration				L					LTR	
Shared Capacity									58	
Control Delay				11.1					1478.3	

Steps 12 - 13: APPROACH/INTERSECTION CONTROL DELAY and 95% QUEUE LENGTHS

Approach	NB			SB		WestBound		EastBound		
Movement	1U	1	4U	4	7	8	9	10	11	12
Lane Configuration				L					LTR	
Flow Rate				272					228	
Lane Capacity				862					58	
v/c				0.32					3.96	
95% Queue Length				1.4					24.7	
Control Delay				11.1					1478.3	

LOS		B	F
Approach Delay		3.5	1478.3
Approach LOS			F
Intersction Delay	186.4		

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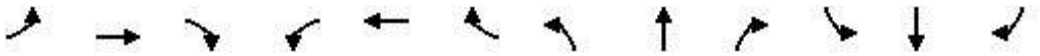

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	20	30	200	40	30	25	95	285	95	25	225	15
Future Volume (vph)	20	30	200	40	30	25	95	285	95	25	225	15
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	0		0	0		0	150		0	0		0
Storage Lanes	0		0	0		0	1		0	0		0
Taper Length (ft)	25			25			105			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	0.95	0.95
Frt		0.892			0.964			0.962			0.991	
Flt Protected		0.996			0.979		0.950				0.995	
Satd. Flow (prot)	0	1568	0	0	1665	0	1676	3226	0	0	3306	0
Flt Permitted		0.996			0.979		0.950				0.995	
Satd. Flow (perm)	0	1568	0	0	1665	0	1676	3226	0	0	3306	0
Link Speed (mph)		40			40			65			65	
Link Distance (ft)		2897			2749			1385			1493	
Travel Time (s)		49.4			46.9			14.5			15.7	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	22	33	222	44	33	28	106	317	106	28	250	17
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	277	0	0	105	0	106	423	0	0	295	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 47.1%		ICU Level of Service A	
Analysis Period (min) 15			

Intersection	
Int Delay, s/veh	7.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	20	30	200	40	30	25	95	285	95	25	225	15
Future Vol, veh/h	20	30	200	40	30	25	95	285	95	25	225	15
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	150	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	22	33	222	44	33	28	106	317	106	28	250	17

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	702	950	134	780	905	212	267	0	0	423	0	0
Stage 1	315	315	-	582	582	-	-	-	-	-	-	-
Stage 2	387	635	-	198	323	-	-	-	-	-	-	-
Critical Hdwy	7.54	6.54	6.94	7.54	6.54	6.94	4.14	-	-	4.14	-	-
Critical Hdwy Stg 1	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.52	4.02	3.32	3.52	4.02	3.32	2.22	-	-	2.22	-	-
Pot Cap-1 Maneuver	325	259	890	285	275	793	1294	-	-	1133	-	-
Stage 1	671	654	-	466	497	-	-	-	-	-	-	-
Stage 2	608	471	-	785	649	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	258	231	890	175	245	793	1294	-	-	1133	-	-
Mov Cap-2 Maneuver	258	231	-	175	245	-	-	-	-	-	-	-
Stage 1	616	635	-	428	456	-	-	-	-	-	-	-
Stage 2	499	432	-	542	630	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	16.8	29.9	1.6	0.9
HCM LOS	C	D		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1294	-	-	579	248	1133	-	-
HCM Lane V/C Ratio	0.082	-	-	0.48	0.426	0.025	-	-
HCM Control Delay (s)	8	-	-	16.8	29.9	8.3	0.1	-
HCM Lane LOS	A	-	-	C	D	A	A	-
HCM 95th %tile Q(veh)	0.3	-	-	2.6	2	0.1	-	-

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	10	35	25	15	20	55	480	45	20	420	10
Future Volume (vph)	10	10	35	25	15	20	55	480	45	20	420	10
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	0		0	0		0	80		0	0		0
Storage Lanes	0		0	0		0	1		0	0		0
Taper Length (ft)	25			25			60			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	0.95	0.95
Frt		0.914			0.956			0.987			0.997	
Flt Protected		0.991			0.980		0.950				0.998	
Satd. Flow (prot)	0	1598	0	0	1653	0	1676	3309	0	0	3336	0
Flt Permitted		0.991			0.980		0.950				0.998	
Satd. Flow (perm)	0	1598	0	0	1653	0	1676	3309	0	0	3336	0
Link Speed (mph)		25			40			45			55	
Link Distance (ft)		1010			1235			1455			1882	
Travel Time (s)		27.5			21.1			22.0			23.3	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	11	11	39	28	17	22	61	533	50	22	467	11
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	61	0	0	67	0	61	583	0	0	500	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 45.9%		ICU Level of Service A	
Analysis Period (min) 15			

Intersection	
Int Delay, s/veh	2.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	10	10	35	25	15	20	55	480	45	20	420	10
Future Vol, veh/h	10	10	35	25	15	20	55	480	45	20	420	10
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	80	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	11	11	39	28	17	22	61	533	50	22	467	11

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	914	1222	239	963	1202	292	478	0	0	583	0	0
Stage 1	517	517	-	680	680	-	-	-	-	-	-	-
Stage 2	397	705	-	283	522	-	-	-	-	-	-	-
Critical Hdwy	7.54	6.54	6.94	7.54	6.54	6.94	4.14	-	-	4.14	-	-
Critical Hdwy Stg 1	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.52	4.02	3.32	3.52	4.02	3.32	2.22	-	-	2.22	-	-
Pot Cap-1 Maneuver	228	178	762	210	183	704	1081	-	-	987	-	-
Stage 1	509	532	-	407	449	-	-	-	-	-	-	-
Stage 2	600	437	-	700	529	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	191	163	762	177	168	704	1081	-	-	987	-	-
Mov Cap-2 Maneuver	191	163	-	177	168	-	-	-	-	-	-	-
Stage 1	480	516	-	384	424	-	-	-	-	-	-	-
Stage 2	527	413	-	630	513	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	17.7	26.7	0.8	0.5
HCM LOS	C	D		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1081	-	-	345	232	987	-	-
HCM Lane V/C Ratio	0.057	-	-	0.177	0.287	0.023	-	-
HCM Control Delay (s)	8.5	-	-	17.7	26.7	8.7	0.1	-
HCM Lane LOS	A	-	-	C	D	A	A	-
HCM 95th %tile Q(veh)	0.2	-	-	0.6	1.1	0.1	-	-

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	95	40	225	35	65	45	290	530	45	30	535	60
Future Volume (vph)	95	40	225	35	65	45	290	530	45	30	535	60
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	0		50	0		0	100		0	100		0
Storage Lanes	0		1	0		0	1		0	1		0
Taper Length (ft)	25			25			220			290		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt			0.850		0.958			0.988			0.985	
Flt Protected		0.966			0.988		0.950			0.950		
Satd. Flow (prot)	0	1705	1500	0	1670	0	1676	3313	0	1676	3303	0
Flt Permitted		0.966			0.988		0.950			0.950		
Satd. Flow (perm)	0	1705	1500	0	1670	0	1676	3313	0	1676	3303	0
Link Speed (mph)		40			25			35			35	
Link Distance (ft)		1380			1122			778			1516	
Travel Time (s)		23.5			30.6			15.2			29.5	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	106	44	250	39	72	50	322	589	50	33	594	67
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	150	250	0	161	0	322	639	0	33	661	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 59.8%		ICU Level of Service B	
Analysis Period (min) 15			

HCS7 Two-Way Stop-Control Text Report

TWO-WAY STOP CONTROL (TWSC) Analysis

File Name:	2045NBC_PM_SD37_23rd Ave.xtw
Analyst:	HDR
Agency:	HDR
Date Performed:	11/1/2021
Time Analyzed:	2045 NBC - PM Peak
Jurisdiction:	SDDOT
Analysis Year:	2045
Project Description:	Mitchell MTP
Units:	U.S. Customary
Intersection Name:	SD37 & 23rd Ave
Major Street Direction:	North-South
East/West Street Name:	23rd Avenue
North/South Street Name:	SD37
Analysis Time Period (hrs):	0.25

Vehicle Volumes and Adjustments

Major Street:

Approach	NorthBound				SouthBound			
Movement	1U	1	2	3	4U	4	5	6
	U	L	T	R	U	L	T	R
Volume	0	290	530	45	0	30	535	60
Peak Hour Factor, PHF				0.90				
Hourly Flow Rtae, HFR		322	589	50		33	594	67
Percent Heavy Vehicles	0	2			0	2		
Number of Lanes	0	1	2	0	0	1	2	0
Lane Configuration		L	T	TR		L	T	TR
Median Type				Undivided				
Median Storage								
RT channelized?								
Left-Turn Lane Storage								
Upstream Signal?				Not Present				

Minor Street:

Approach	WestBound				EastBound		
Movement	7	8	9		10	11	12
	L	T	R		L	T	R
Volume	35	65	45		95	40	225
Peak Hour Factor, PHF			0.90				
Hourly Flow Rtae, HFR	39	72	50		106	44	250
Percent Heavy Vehicles	2	2	2		2	2	2
Number of Lanes	0	1	0		0	1	1
Lane Configuration		LTR			LT		R
RT channelized?							No
Flared Approach | Storage	No	|			|	
Percent Grade		0				0	

Pedestrian Volumes and Adjustments

Approach	NB	SB	WB	EB
Movement	13	14	15	16
Flow (ped/hr)	0	0	0	0
Lane Width (ft)				
Walking Speed (ft/sec)				
Pedestrian Blockage Factor, f_pb				

Delay, Queue Length, and Level of Service

Approach	NB		SB		WestBound			EastBound		
Movement	1U	1	4U	4	7	8	9	10	11	12
Lane Configuration		L		L		LTR		LT		R
Flow Rate		322		33		161		150		250
Lane Capacity		923		941						665
v/c		0.35		0.04						0.38
95% Queue Length		1.6		0.1						1.7
Control Delay		11.0		9.0						13.6
LOS		B		A						B
Approach Delay		3.7		0.4						
Approach LOS										
Intersction Delay										

Step 1: MOVEMENT PRIORITIES

Major Street:

Approach	NorthBound				SouthBound			
Priority	1U	1	2	3	4U	4	5	6
Movement	U	L	T	R	U	L	T	R

Minor Street:

Approach	WestBound			EastBound		
Priority	7	8	9	10	11	12
Movement	L	T	R	L	T	R

Step 2: MOVEMENT DEMAND VOLUMES AND FLOW RATES

Major Street:

Approach	NorthBound				SouthBound			
Movement	1U	1	2	3	4U	4	5	6
	U	L	T	R	U	L	T	R
Volume, V_x	0	290	530	45	0	30	535	60
Flow Rate, v_x		322	589	50		33	594	67

Minor Street:

Approach	WestBound			EastBound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume, V_x	35	65	45	95	40	225
Flow Rate, v_x	39	72	50	106	44	250

Step 3: CONFLICTING FLOW RATES

Major Street:

Approach	NorthBound				SouthBound			
Movement	1U	1	2	3	4U	4	5	6
	U	L	T	R	U	L	T	R
Flow Rate, v_x		322	589	50		33	594	67
Conflicting Flow, v_c,x		661				639		

Minor Street:

Approach	WestBound			EastBound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Flow Rate, v_x	39	72	50	106	44	250
Conflicting Flow, v_c,x	1644	1986	319	1669	1978	331

Step 4: CRITICAL HEADWAYS and FOLLOW-UP HEADWAYS

CRITICAL HEADWAYS

Approach	NB		SB		WestBound			EastBound		
Movement	1U	1	4U	4	7	8	9	10	11	12
	U	L	U	L	L	T	R	L	T	R
t_c,base										
Single Stage		4.1		4.1	7.5	6.5	6.9	7.5	6.5	6.9
Stage I										
Stage II										
t_c,HV		2.0		2.0	2.0	2.0	2.0	2.0	2.0	2.0
P_HV		0.02		0.02	0.02	0.02	0.02	0.02	0.02	0.02
t_c,G					0.2	0.2	0.1	0.2	0.2	0.1
G					0	0	0	0	0	0
t_3,LT		0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0
t_c										
Single Stage		4.14		4.14	7.54	6.54	6.94	7.54	6.54	6.94
Stage I										
Stage II										

FOLLOW-UP HEADWAYS

Approach	NB		SB		WestBound			EastBound		
Movement	1U	1	4U	4	7	8	9	10	11	12
	U	L	U	L	L	T	R	L	T	R
t_f,base		2.2		2.2	3.5	4.0	3.3	3.5	4.0	3.3
t_f,HV		1.0		1.0	1.0	1.0	1.0	1.0	1.0	1.0
P_HV		0.02		0.02	0.02	0.02	0.02	0.02	0.02	0.02
t_f		2.22		2.22	3.52	4.02	3.32	3.52	4.02	3.32

Step 5: POTENTIAL CAPACITIES

NO UPSTREAM SIGNAL EFFECTS PRESENT

Approach	NB		SB		WestBound			EastBound		
Movement	1U	1	4U	4	7	8	9	10	11	12
	U	L	U	L	L	T	R	L	T	R
v_c,x		661		639	1644	1986	319	1669	1978	331
t_c,x		4.14		4.14	7.54	6.54	6.94	7.54	6.54	6.94
t_f,x		2.22		2.22	3.52	4.02	3.32	3.52	4.02	3.32
c_p,x		923		941	66	60	676	63	61	665

Steps 6 - 9: MOVEMENT CAPACITIES

Pedestrian Impedance				
Approach	NB	SB	WB	EB

Movement	13	14	15	16
Pedestrian Flow Rate v_x	0	0	0	0
Lane Width, w				
Walking Speed, S_p				
Pedestrian Blockage Factor, f_pb				

Major-Street Left-Turn Movements		1	4
Conflicting Flow, v_c,x		661	639
Potential Capacity, c_p,x		923	941
Pedestrian Impedance Factor, p_p,x		1.000	1.000
Movement Capacity, c_m,x		923	941
Probability of Queue-free State, p_0,j		0.651	0.965
Major L-Shared Probability Queue-free State, p*_0,j		1.000	1.000

Minor-Street Right-Turn Movements		9	12
Conflicting Flow, v_c,x		319	331
Potential Capacity, c_p,x		676	665
Pedestrian Impedance Factor, p_p,x		1.000	1.000
Movement Capacity, c_m,x		676	665
Probability of Queue-free State, p_0,j		0.926	0.624

Major-Street U-Turn Movements		1U	4U
Conflicting Flow, v_c,x			
Potential Capacity, c_p,x			
Capacity Adjustment Factor, f_x			
Movement Capacity, c_m,x			
Shared L/U Capacity, c_SH			
Probability of Queue-free State, p_0,j			

Minor-Street Through Movements		8	11
Conflicting Flow, v_c,x		1986	1978
Potential Capacity, c_p,x		60	61
Pedestrian Impedance Factor, p_p,x		1.000	1.000
Capacity Adjustment Factor, f_x		0.628	0.628
Movement Capacity, c_m,x		38	38
Probability of Queue-free State, p_0,j			

Minor-Street Left-Turn Movements		7	10
Conflicting Flow, v_c,x		1644	1669
Potential Capacity, c_p,x		66	63
Pedestrian Impedance Factor, p_p,x		1.000	1.000
Major L, Minor T Adjusted Impedance Factor, p"			
Major L, Minor T Impedance Factor, p'			
Capacity Adjustment Factor, f_x			
Movement Capacity, c_m,x			

Step 10: FINAL CAPACITY ADJUSTMENTS

SHARED-LANE CAPACITY OF MINOR STREET APPROACHES

Approach	WestBound			EastBound		
Movement	7	8	9	10	11	12
Lane Configuration		LTR		LT		R
Shared Flow Rate, v_y		161		150		250
Movement Capacity, c_m,x		38	676		38	665
Shared Capacity, c_SH						

Step 11: CONTROL DELAY

CONTROL DELAY TO RANK 2 THROUGH 4 MOVEMENTS

Approach	NB			SB		WestBound		EastBound		
Movement	1U	1	4U	4	7	8	9	10	11	12
Flow Rate		322		33	39	72	50	106	44	250
Movement Capacity		923		941		38	676		38	665
Lane Configuration		L		L		LTR		LT		R
Shared Capacity										
Control Delay		11.0		9.0						13.6

Steps 12 - 13: APPROACH/INTERSECTION CONTROL DELAY and 95% QUEUE LENGTHS

Approach	NB			SB		WestBound		EastBound		
Movement	1U	1	4U	4	7	8	9	10	11	12
Lane Configuration		L		L		LTR		LT		R
Flow Rate		322		33		161		150		250
Lane Capacity		923		941						665
v/c		0.35		0.04						0.38
95% Queue Length		1.6		0.1						1.7
Control Delay		11.0		9.0						13.6

LOS	B	A	B
Approach Delay	3.7	0.4	
Approach LOS			
Intersction Delay			

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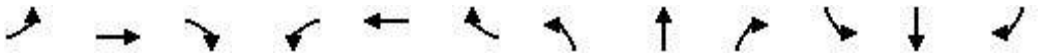
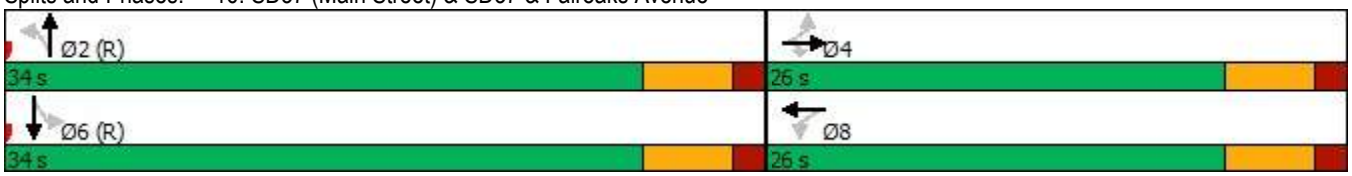


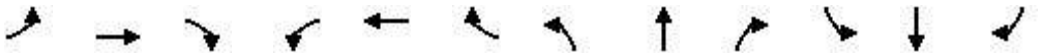
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	320	100	165	20	65	30	190	515	20	90	410	295
Future Volume (vph)	320	100	165	20	65	30	190	515	20	90	410	295
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	155		0	100		0	100		0	100		0
Storage Lanes	1		1	1		0	1		0	1		0
Taper Length (ft)	130			65			130			125		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt			0.850		0.953			0.994			0.937	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1676	1765	1500	1676	1682	0	1676	3333	0	1676	3142	0
Flt Permitted	0.689			0.685			0.307			0.411		
Satd. Flow (perm)	1216	1765	1500	1209	1682	0	542	3333	0	725	3142	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			183		33			9			328	
Link Speed (mph)		40			25			30			35	
Link Distance (ft)		1120			746			1311			778	
Travel Time (s)		19.1			20.3			29.8			15.2	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	356	111	183	22	72	33	211	572	22	100	456	328
Shared Lane Traffic (%)												
Lane Group Flow (vph)	356	111	183	22	105	0	211	594	0	100	784	0
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Detector Phase	4	4	4	8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	15.5	15.5	15.5	15.5	15.5		15.5	15.5		15.5	15.5	
Total Split (s)	26.0	26.0	26.0	26.0	26.0		34.0	34.0		34.0	34.0	
Total Split (%)	43.3%	43.3%	43.3%	43.3%	43.3%		56.7%	56.7%		56.7%	56.7%	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	1.5	1.5	1.5	1.5	1.5		1.5	1.5		1.5	1.5	
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 Optimize?												
Recall Mode	Max	Max	Max	Min	Min		C-Max	C-Max		C-Max	C-Max	
Act Effct Green (s)	20.5	20.5	20.5	20.5	20.5		28.5	28.5		28.5	28.5	
Actuated g/C Ratio	0.34	0.34	0.34	0.34	0.34		0.48	0.48		0.48	0.48	
v/c Ratio	0.86	0.18	0.29	0.05	0.18		0.82	0.37		0.29	0.47	
Control Delay	41.8	14.9	4.1	13.8	11.1		43.5	10.8		12.6	6.9	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	41.8	14.9	4.1	13.8	11.1		43.5	10.8		12.6	6.9	
LOS	D	B	A	B	B		D	B		B	A	
Approach Delay		26.6			11.6			19.3			7.6	
Approach LOS		C			B			B			A	
Queue Length 50th (ft)	117	28	0	5	18		61	66		21	50	
Queue Length 95th (ft)	#256	59	35	18	47		#177	99		50	86	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Internal Link Dist (ft)		1040			666			1231			698	
Turn Bay Length (ft)	155			100			100			100		
Base Capacity (vph)	415	603	632	413	596		257	1587		344	1664	
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	0.86	0.18	0.29	0.05	0.18		0.82	0.37		0.29	0.47	

Intersection Summary			
Area Type:	Other		
Cycle Length: 60			
Actuated Cycle Length: 60			
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green			
Natural Cycle: 60			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.86			
Intersection Signal Delay: 16.6		Intersection LOS: B	
Intersection Capacity Utilization 72.2%		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: 16: SD37 (Main Street) & SD37 & Fairoaks Avenue





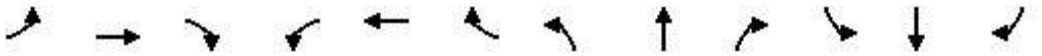
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	320	100	165	20	65	30	190	515	20	90	410	295
Future Volume (veh/h)	320	100	165	20	65	30	190	515	20	90	410	295
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1772	1772	1772	1772	1772	1772	1772	1772	1772	1772	1772	1772
Adj Flow Rate, veh/h	356	111	0	22	72	33	211	572	22	100	456	0
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	504	605		502	393	180	487	1570	60	421	1599	
Arrive On Green	0.34	0.34	0.00	0.34	0.34	0.34	0.47	0.47	0.47	0.47	0.47	0.00
Sat Flow, veh/h	1289	1772	1502	1282	1150	527	935	3305	127	823	3455	0
Grp Volume(v), veh/h	356	111	0	22	0	105	211	291	303	100	456	0
Grp Sat Flow(s),veh/h/ln	1289	1772	1502	1282	0	1677	935	1683	1749	823	1683	0
Q Serve(g_s), s	16.1	2.6	0.0	0.7	0.0	2.6	10.6	6.6	6.6	5.3	4.9	0.0
Cycle Q Clear(g_c), s	18.7	2.6	0.0	3.4	0.0	2.6	15.5	6.6	6.6	11.9	4.9	0.0
Prop In Lane	1.00		1.00	1.00		0.31	1.00		0.07	1.00		0.00
Lane Grp Cap(c), veh/h	504	605		502	0	573	487	800	831	421	1599	
V/C Ratio(X)	0.71	0.18		0.04	0.00	0.18	0.43	0.36	0.36	0.24	0.29	
Avail Cap(c_a), veh/h	504	605		502	0	573	487	800	831	421	1599	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	20.4	13.9	0.0	15.1	0.0	13.9	14.3	10.0	10.0	13.8	9.6	0.0
Incr Delay (d2), s/veh	8.1	0.7	0.0	0.0	0.0	0.2	2.8	1.3	1.2	1.3	0.4	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.3	1.0	0.0	0.2	0.0	1.0	2.4	2.3	2.4	1.0	1.6	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	28.6	14.5	0.0	15.1	0.0	14.0	17.1	11.3	11.2	15.1	10.0	0.0
LnGrp LOS	C	B		B	A	B	B	B	B	B	B	
Approach Vol, veh/h		467	A		127			805			556	A
Approach Delay, s/veh		25.2			14.2			12.8			10.9	
Approach LOS		C			B			B			B	

Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		34.0		26.0		34.0		26.0				
Change Period (Y+Rc), s		5.5		5.5		5.5		5.5				
Max Green Setting (Gmax), s		28.5		20.5		28.5		20.5				
Max Q Clear Time (g_c+I1), s		17.5		20.7		13.9		5.4				
Green Ext Time (p_c), s		3.6		0.0		3.1		0.5				

Intersection Summary												
HCM 6th Ctrl Delay			15.3									
HCM 6th LOS			B									

Notes

Unsignalized Delay for [EBR, SBR] is excluded from calculations of the approach delay and intersection delay.



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	415	85	145	395	15	165	15	160	15	20	15
Future Volume (vph)	10	415	85	145	395	15	165	15	160	15	20	15
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	110		0	110		0	95		0	0		0
Storage Lanes	1		0	1		0	1		1	0		0
Taper Length (ft)	125			125			125			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		0.975			0.994				0.850		0.959	
Flt Protected	0.950			0.950			0.950				0.985	
Satd. Flow (prot)	1676	3269	0	1676	3333	0	1676	1765	1500	0	1667	0
Flt Permitted	0.950			0.950			0.950				0.985	
Satd. Flow (perm)	1676	3269	0	1676	3333	0	1676	1765	1500	0	1667	0
Link Speed (mph)		40			40			35			25	
Link Distance (ft)		1143			1120			993			528	
Travel Time (s)		19.5			19.1			19.3			14.4	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	11	461	94	161	439	17	183	17	178	17	22	17
Shared Lane Traffic (%)												
Lane Group Flow (vph)	11	555	0	161	456	0	183	17	178	0	56	0
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 49.8%		ICU Level of Service A	
Analysis Period (min) 15			

Intersection	
Int Delay, s/veh	38.2

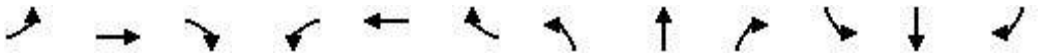
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	10	415	85	145	395	15	165	15	160	15	20	15
Future Vol, veh/h	10	415	85	145	395	15	165	15	160	15	20	15
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	110	-	-	110	-	-	95	-	0	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	11	461	94	161	439	17	183	17	178	17	22	17

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	456	0	0	555	0	0	1083	1308	278	1031	1347	228
Stage 1	-	-	-	-	-	-	530	530	-	770	770	-
Stage 2	-	-	-	-	-	-	553	778	-	261	577	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	1101	-	-	1011	-	-	~ 172	158	719	187	150	775
Stage 1	-	-	-	-	-	-	500	525	-	359	408	-
Stage 2	-	-	-	-	-	-	485	405	-	721	500	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1101	-	-	1011	-	-	~ 127	132	719	111	125	775
Mov Cap-2 Maneuver	-	-	-	-	-	-	~ 127	132	-	111	125	-
Stage 1	-	-	-	-	-	-	495	520	-	355	343	-
Stage 2	-	-	-	-	-	-	373	341	-	520	495	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.2	2.4	153.4	39.3
HCM LOS			F	E

Minor Lane/Major Mvmt	NBLn1	NBLn2	NBLn3	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	127	132	719	1101	-	-	1011	-	-	159
HCM Lane V/C Ratio	1.444	0.126	0.247	0.01	-	-	0.159	-	-	0.349
HCM Control Delay (s)	$ 301.6	36.2	11.6	8.3	-	-	9.2	-	-	39.3
HCM Lane LOS	F	E	B	A	-	-	A	-	-	E
HCM 95th %tile Q(veh)	12.5	0.4	1	0	-	-	0.6	-	-	1.4

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

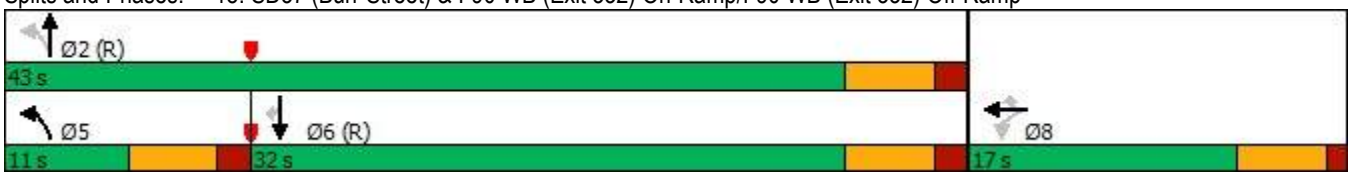


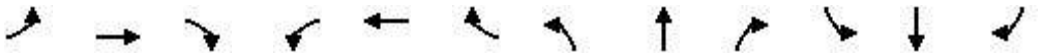
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	140	0	270	110	820	0	0	955	145
Future Volume (vph)	0	0	0	140	0	270	110	820	0	0	955	145
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	0		0	0		360	200		0	0		0
Storage Lanes	0		0	0		1	1		0	0		1
Taper Length (ft)	25			25			65			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt						0.850						0.850
Flt Protected					0.950		0.950					
Satd. Flow (prot)	0	0	0	0	1569	1378	1629	3226	0	0	3320	1430
Flt Permitted					0.950		0.160					
Satd. Flow (perm)	0	0	0	0	1569	1378	274	3226	0	0	3320	1430
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						161						161
Link Speed (mph)		50			50			35			35	
Link Distance (ft)		1127			1072			742			2179	
Travel Time (s)		15.4			14.6			14.5			42.4	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	0%	0%	0%	9%	0%	11%	5%	6%	0%	0%	3%	7%
Adj. Flow (vph)	0	0	0	156	0	300	122	911	0	0	1061	161
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	156	300	122	911	0	0	1061	161
Turn Type				Perm	NA	Perm	pm+pt	NA			NA	Perm
Protected Phases					8		5	2			6	
Permitted Phases				8		8	2					6
Detector Phase				8	8	8	5	2			6	6
Switch Phase												
Minimum Initial (s)				7.0	7.0	7.0	5.0	12.0			12.0	12.0
Minimum Split (s)				12.0	12.0	12.0	10.5	17.5			17.5	17.5
Total Split (s)				17.0	17.0	17.0	11.0	43.0			32.0	32.0
Total Split (%)				28.3%	28.3%	28.3%	18.3%	71.7%			53.3%	53.3%
Yellow Time (s)				4.0	4.0	4.0	4.0	4.0			4.0	4.0
All-Red Time (s)				1.0	1.0	1.0	1.5	1.5			1.5	1.5
Lost Time Adjust (s)					0.0	0.0	0.0	0.0			0.0	0.0
Total Lost Time (s)					5.0	5.0	5.5	5.5			5.5	5.5
Lead/Lag							Lead				Lag	Lag
Lead-Lag Optimize?							Yes				Yes	Yes
Recall Mode				Min	Min	Min	None	C-Max			C-Max	C-Max
Act Effct Green (s)					10.5	10.5	39.0	39.0			30.0	30.0
Actuated g/C Ratio					0.18	0.18	0.65	0.65			0.50	0.50
v/c Ratio					0.57	0.80	0.40	0.43			0.64	0.20
Control Delay					30.9	29.5	8.4	6.2			14.6	2.8
Queue Delay					0.0	0.0	0.0	0.0			0.0	0.0
Total Delay					30.9	29.5	8.4	6.2			14.6	2.8
LOS					C	C	A	A			B	A
Approach Delay					29.9			6.5			13.1	
Approach LOS					C			A			B	
Queue Length 50th (ft)					51	45	15	76			156	0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 95th (ft)					101	#156	32	110			222	27
Internal Link Dist (ft)		1047			992			662			2099	
Turn Bay Length (ft)						360	200					
Base Capacity (vph)					313	404	306	2097			1661	795
Starvation Cap Reductn					0	0	0	0			0	0
Spillback Cap Reductn					0	0	0	0			0	0
Storage Cap Reductn					0	0	0	0			0	0
Reduced v/c Ratio					0.50	0.74	0.40	0.43			0.64	0.20

Intersection Summary			
Area Type:	Other		
Cycle Length: 60			
Actuated Cycle Length: 60			
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green			
Natural Cycle: 60			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.80			
Intersection Signal Delay: 13.4		Intersection LOS: B	
Intersection Capacity Utilization 63.3%		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: 18: SD37 (Burr Street) & I-90 WB (Exit 332) On-Ramp/I-90 WB (Exit 332) Off-Ramp





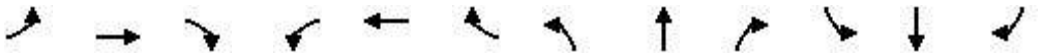
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	140	0	270	110	820	0	0	955	145
Future Volume (veh/h)	0	0	0	140	0	270	110	820	0	0	955	145
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach					No			No			No	
Adj Sat Flow, veh/h/ln				1674	1800	1646	1730	1716	0	0	1758	1702
Adj Flow Rate, veh/h				156	0	300	122	911	0	0	1061	0
Peak Hour Factor				0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %				9	0	11	5	6	0	0	3	7
Cap, veh/h				343	0	279	348	2037	0	0	1539	
Arrive On Green				0.20	0.00	0.20	0.07	0.63	0.00	0.00	0.46	0.00
Sat Flow, veh/h				1714	0	1395	1647	3346	0	0	3428	1442
Grp Volume(v), veh/h				156	0	300	122	911	0	0	1061	0
Grp Sat Flow(s),veh/h/ln				1714	0	1395	1647	1630	0	0	1670	1442
Q Serve(g_s), s				4.8	0.0	12.0	2.1	8.7	0.0	0.0	15.1	0.0
Cycle Q Clear(g_c), s				4.8	0.0	12.0	2.1	8.7	0.0	0.0	15.1	0.0
Prop In Lane				1.00		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				343	0	279	348	2037	0	0	1539	
V/C Ratio(X)				0.45	0.00	1.08	0.35	0.45	0.00	0.00	0.69	
Avail Cap(c_a), veh/h				343	0	279	380	2037	0	0	1539	
HCM Platoon Ratio				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	0.00	1.00	0.50	0.50	0.00	0.00	1.00	0.00
Uniform Delay (d), s/veh				21.1	0.0	24.0	9.3	5.9	0.0	0.0	12.8	0.0
Incr Delay (d2), s/veh				0.9	0.0	75.4	0.3	0.4	0.0	0.0	2.5	0.0
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				1.7	0.0	9.2	0.6	2.1	0.0	0.0	5.1	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				22.1	0.0	99.4	9.6	6.2	0.0	0.0	15.3	0.0
LnGrp LOS				C	A	F	A	A	A	A	B	
Approach Vol, veh/h					456			1033			1061	A
Approach Delay, s/veh					73.0			6.6			15.3	
Approach LOS					E			A			B	

Timer - Assigned Phs		2			5	6		8				
Phs Duration (G+Y+Rc), s		43.0			9.8	33.2		17.0				
Change Period (Y+Rc), s		5.5			5.5	5.5		5.0				
Max Green Setting (Gmax), s		37.5			5.5	26.5		12.0				
Max Q Clear Time (g_c+I1), s		10.7			4.1	17.1		14.0				
Green Ext Time (p_c), s		7.0			0.0	4.8		0.0				

Intersection Summary		
HCM 6th Ctrl Delay	22.1	
HCM 6th LOS	C	

Notes

Unsignalized Delay for [SBR] is excluded from calculations of the approach delay and intersection delay.

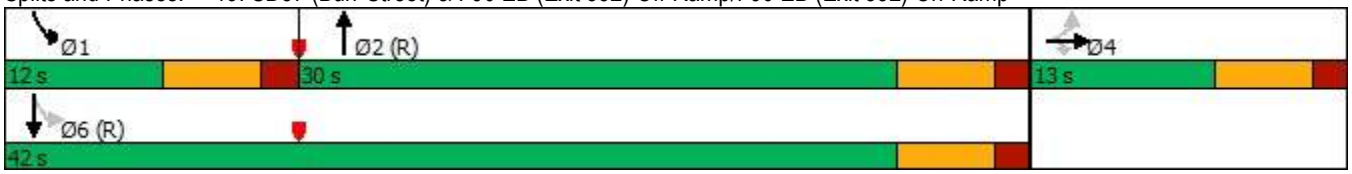


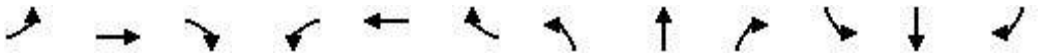
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	115	0	180	0	0	0	0	815	235	190	905	0
Future Volume (vph)	115	0	180	0	0	0	0	815	235	190	905	0
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (ft)	0		300	0		0	0		120	190		0
Storage Lanes	0		1	0		0	0		0	1		0
Taper Length (ft)	25			25			25			60		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	1.00
Frt			0.850					0.966				
Flt Protected		0.950								0.950		
Satd. Flow (prot)	0	1413	1443	0	0	0	0	3166	0	1613	3320	0
Flt Permitted		0.950								0.133		
Satd. Flow (perm)	0	1413	1443	0	0	0	0	3166	0	226	3320	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			159					87				
Link Speed (mph)		50			50			35			35	
Link Distance (ft)		1362			971			1492			742	
Travel Time (s)		18.6			13.2			29.1			14.5	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	21%	0%	6%	0%	0%	0%	0%	3%	9%	6%	3%	0%
Adj. Flow (vph)	128	0	200	0	0	0	0	906	261	211	1006	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	128	200	0	0	0	0	1167	0	211	1006	0
Turn Type	Perm	NA	Perm					NA		pm+pt	NA	
Protected Phases		4						2		1	6	
Permitted Phases	4		4							6		
Detector Phase	4	4	4					2		1	6	
Switch Phase												
Minimum Initial (s)	7.0	7.0	7.0					12.0		5.0	12.0	
Minimum Split (s)	12.5	12.5	12.5					17.5		10.5	17.5	
Total Split (s)	13.0	13.0	13.0					30.0		12.0	42.0	
Total Split (%)	23.6%	23.6%	23.6%					54.5%		21.8%	76.4%	
Yellow Time (s)	4.0	4.0	4.0					4.0		4.0	4.0	
All-Red Time (s)	1.5	1.5	1.5					1.5		1.5	1.5	
Lost Time Adjust (s)		0.0	0.0					0.0		0.0	0.0	
Total Lost Time (s)		5.5	5.5					5.5		5.5	5.5	
Lead/Lag								Lag		Lead		
Lead-Lag Optimize?								Yes		Yes		
Recall Mode	Min	Min	Min					C-Max		None	C-Max	
Act Effct Green (s)		7.4	7.4					24.6		36.6	36.6	
Actuated g/C Ratio		0.13	0.13					0.45		0.67	0.67	
v/c Ratio		0.68	0.60					0.80		0.67	0.46	
Control Delay		43.8	15.9					17.0		19.9	5.2	
Queue Delay		0.0	0.0					0.0		0.0	0.0	
Total Delay		43.8	15.9					17.0		19.9	5.2	
LOS		D	B					B		B	A	
Approach Delay		26.8						17.0			7.8	
Approach LOS		C						B			A	
Queue Length 50th (ft)		41	12					210		21	65	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Length 95th (ft)		#110	#77					#277		#101	95	
Internal Link Dist (ft)		1282			891			1412			662	
Turn Bay Length (ft)			300							190		
Base Capacity (vph)		192	334					1462		314	2209	
Starvation Cap Reductn		0	0					0		0	0	
Spillback Cap Reductn		0	0					0		0	0	
Storage Cap Reductn		0	0					0		0	0	
Reduced v/c Ratio		0.67	0.60					0.80		0.67	0.46	

Intersection Summary			
Area Type:	Other		
Cycle Length: 55			
Actuated Cycle Length: 55			
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBTL, Start of Green			
Natural Cycle: 55			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.80			
Intersection Signal Delay: 14.0		Intersection LOS: B	
Intersection Capacity Utilization 63.3%		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: 19: SD37 (Burr Street) & I-90 EB (Exit 332) Off-Ramp/I-90 EB (Exit 332) On-Ramp





Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	115	0	180	0	0	0	0	815	235	190	905	0
Future Volume (veh/h)	115	0	180	0	0	0	0	815	235	190	905	0
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No						No			No	
Adj Sat Flow, veh/h/ln	1505	1800	1716				0	1758	1674	1716	1758	0
Adj Flow Rate, veh/h	128	0	200				0	906	0	211	1006	0
Peak Hour Factor	0.90	0.90	0.90				0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	21	0	6				0	3	9	6	3	0
Cap, veh/h	234	0	198				0	1571		414	2217	0
Arrive On Green	0.14	0.00	0.14				0.00	0.16	0.00	0.09	0.66	0.00
Sat Flow, veh/h	1714	0	1454				0	3516	0	1634	3428	0
Grp Volume(v), veh/h	128	0	200				0	906	0	211	1006	0
Grp Sat Flow(s),veh/h/ln	1714	0	1454				0	1670	0	1634	1670	0
Q Serve(g_s), s	3.8	0.0	7.5				0.0	13.8	0.0	3.3	8.0	0.0
Cycle Q Clear(g_c), s	3.8	0.0	7.5				0.0	13.8	0.0	3.3	8.0	0.0
Prop In Lane	1.00		1.00				0.00		0.00	1.00		0.00
Lane Grp Cap(c), veh/h	234	0	198				0	1571		414	2217	0
V/C Ratio(X)	0.55	0.00	1.01				0.00	0.58		0.51	0.45	0.00
Avail Cap(c_a), veh/h	234	0	198				0	1571		454	2217	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	0.33	0.33	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00				0.00	0.73	0.00	0.73	0.73	0.00
Uniform Delay (d), s/veh	22.2	0.0	23.7				0.0	18.1	0.0	8.6	4.5	0.0
Incr Delay (d2), s/veh	2.7	0.0	66.2				0.0	1.1	0.0	0.7	0.5	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.5	0.0	5.8				0.0	6.2	0.0	0.8	1.6	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	24.8	0.0	89.9				0.0	19.3	0.0	9.3	4.9	0.0
LnGrp LOS	C	A	F				A	B		A	A	A
Approach Vol, veh/h		328						906	A		1217	
Approach Delay, s/veh		64.5						19.3			5.7	
Approach LOS		E						B			A	

Timer - Assigned Phs	1	2		4		6
Phs Duration (G+Y+Rc), s	10.6	31.4		13.0		42.0
Change Period (Y+Rc), s	5.5	5.5		5.5		5.5
Max Green Setting (Gmax), s	6.5	24.5		7.5		36.5
Max Q Clear Time (g_c+I1), s	5.3	15.8		9.5		10.0
Green Ext Time (p_c), s	0.1	3.9		0.0		7.9

Intersection Summary	
HCM 6th Ctrl Delay	18.6
HCM 6th LOS	B

Notes

Unsignalized Delay for [NBR] is excluded from calculations of the approach delay and intersection delay.

Future Conditions Memo

Date:	Friday, August 26, 2022
Project:	Mitchell Area Master Transportation Plan
To:	Study Advisory Team
From:	HDR
Subject:	Future Conditions Traffic Operations Analysis

Introduction

The purpose of this memo is to analyze proposed improvements to address corridor and intersection operational and safety needs identified in the following study documents:

- *Crash History Review memo*
- *Existing and Future No-Build Operations memo*
- *Corridor Segment Capacity Review memo*

In addition, supplemental scenarios were investigated to address considerations for new roads and development related changes.

Build Condition Analysis

Future-year Build condition recommendations reflect intersection and corridor improvements to address long-range operational and safety needs. These improvements typically entail modifications to intersection traffic control, intersection lane configurations, and corridor number of lanes.

Build conditions were analyzed with Synchro 11 and HCS7. A LOS comparison between intersections identified with a 2045 No Build condition operational need and the proposed improvements are shown in **Table 1**. Preliminary project sheets summarizing corridor-level recommendations are provided in **Appendix A**. Synchro 11 and HCS7 Output are provided in **Appendix C**.

Table 1: 2045 No Build vs. Build LOS Comparison

Ref #	Intersection	Existing Intersection Configuration					Proposed Modifications				
		Control	Lane Configuration	Measure	AM LOS	PM LOS	Control	Lane Configuration	Measure	AM LOS	PM LOS
3	Rowley Street & Norway Avenue	AWSC	EB: LT/T/RT WB: LT/T/RT NB: LT/T/RT SB: LT/T/RT	Overall:	**C**	**E***	AWSC	EB: LT/T/RT WB: LT/T/RT NB: **LT**, **T/RT** SB: **LT**, **T/RT**	Overall:	**B**	**C**
							Traffic Signal**	EB: **LT**, **T/RT** WB: **LT**, **T/RT** NB: **LT**, **T/RT** SB: **LT**, **T/RT**	Overall:	**B**	**B**
9	Ohlman Street & 23rd Avenue	TWSC	EB: LT/T/RT WB: LT/T/RT NB: LT/T/RT SB: LT/T/RT	Overall: (WCSC):	**F*** (F)	**F*** (F)	Traffic Signal	EB: **LT**, **T/RT** WB: **LT**, **T/RT** NB: **LT**, **T/RT** SB: **LT**, **T/RT**	Overall:	**B**	**C**
							Roundabout	EB: **LT/T/RT** WB: **LT/T/RT** NB: **LT/T/RT** SB: **LT/T/RT**	Overall:	**A**	**A**
11	SD37 (Ohlman Street) & I-90 WB RTI (Exit 330)	TWSC	WB: LT/T/RT NB: LT, T SB: T, RT	Overall: (WCSC):	**A** (D)	**A** (F)	**Traffic Signal**	WB: **LT/T**, **RT** NB: LT, T SB: T, RT	Overall:	**B**	**A**
12	SD37 (Ohlman Street) & I-90 EB RTI (Exit 330)	TWSC	EB: LT/T/RT NB: T/RT SB: LT, T	Overall: (WCSC):	**E*** (F)	**F*** (F)	**Traffic Signal**	EB: **LT**, **T/RT** NB: T/RT SB: LT, T	Overall:	**B**	**B**
15	SD37 & 23rd Avenue	TWSC	EB: LT/T, RT WB: LT/T/RT NB: LT, T, T/RT SB: LT, T, T/RT	Overall: (WCSC):	**B** (F)	**F*** (F)	**Traffic Signal**	EB: **LT**, **T**, **RT** WB: **LT**, **T/RT** NB: LT, T, T/RT SB: LT, T, T/RT	Overall:	**C**	**C**
17	SD 37 & Sanborn Boulevard	TWSC	EB: LT, T, T/RT WB: LT, T, T/RT NB: LT, T, RT SB: LT/T/RT	Overall: (WCSC):	**A** (E)	**E*** (F)	**Traffic Signal**	EB: LT, T, T/RT WB: LT, T, T/RT NB: LT, T, RT SB: LT/T/RT	Overall:	**B**	**B**

* Individual movement(s) with volume to capacity ratio(s) nearing or exceeding 1.0.

Proposed changes from existing conditions noted in **bold orange**.

Supplemental Scenario Analysis

In addition to the primary build condition analysis, several supplemental scenarios involving new roads and development related changes were analyzed, including:

- Foster Street Extension (SD38 to Spruce Street)
- Mattie Street Connection (Charles Avenue to SD38)
- Hospital Relocation (Rowley Street and Cabela Drive area)

Supplemental scenario recommendation summaries are provided in **Appendix B**. Synchro 11 and HCS7 Output are provided in **Appendix D**.

A. Foster Street Extension Scenario

- Extends Foster Street southward from SD38 (Havens Avenue) to Spruce Street
  - North connection: existing SD38 & Foster Street intersection
  - South connection: to be determined, likely east of Mitchell Technical College
  - Provides a new connection to Spruce Street south of I-90 (desirable for EMS services)
- Future corridor traffic demand likely centers on volumes associated with Mitchell Technical College, DakotaFest, and future development east of the railroad tracks
  - Railroad crossing and route reliability may limit long-range demand as high-volume connector between southern and eastern Mitchell
- SD37 & Burr Street intersection traffic patterns were the basis for estimated Foster Street extension traffic volumes
  - Future development south of Spruce Street will impact future-year traffic volumes
- Estimated 2045 daily segment volume: 3,000 – 5,000 vehicles

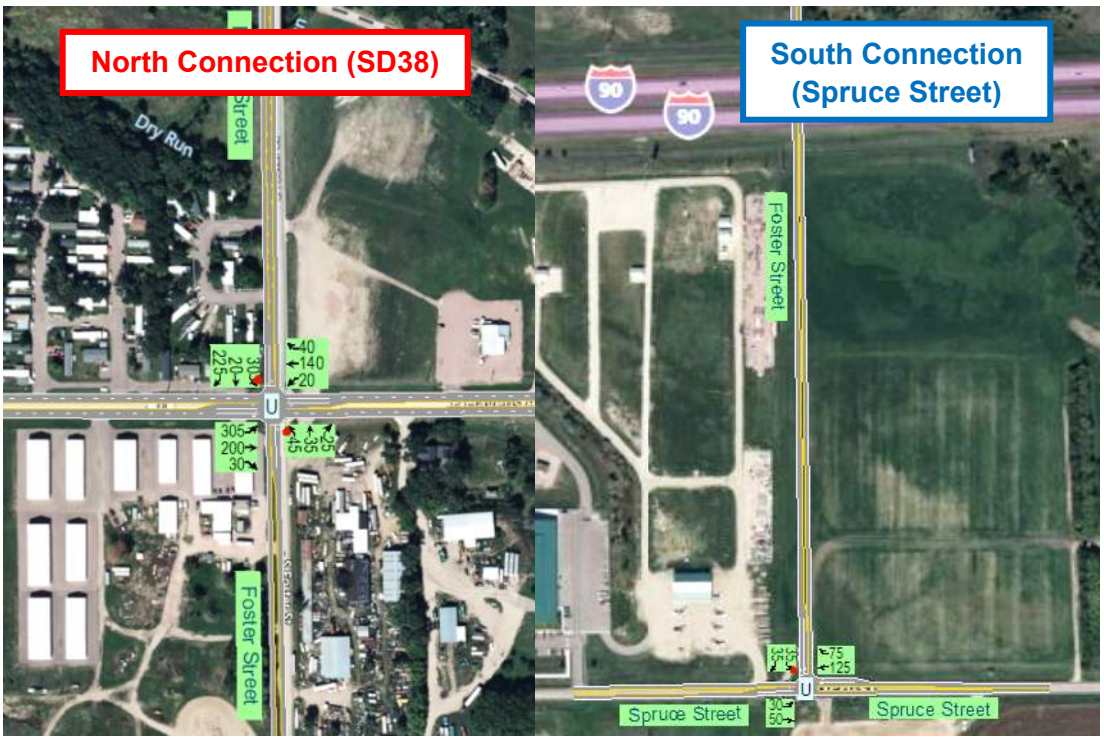


Figure 1: Foster Street Extension Scenario

B. Mattie Street Connection Scenario

- Extends Mattie Street southward from Charles Avenue to SD38 (Havens Avenue)
- Minor shift in traffic patterns expected at area intersections due to traffic utilizing the new connection
- Future residential development along Mattie Street was incorporated into the traffic forecasts
- Estimated 2045 daily segment volumes: 1,500 vehicles

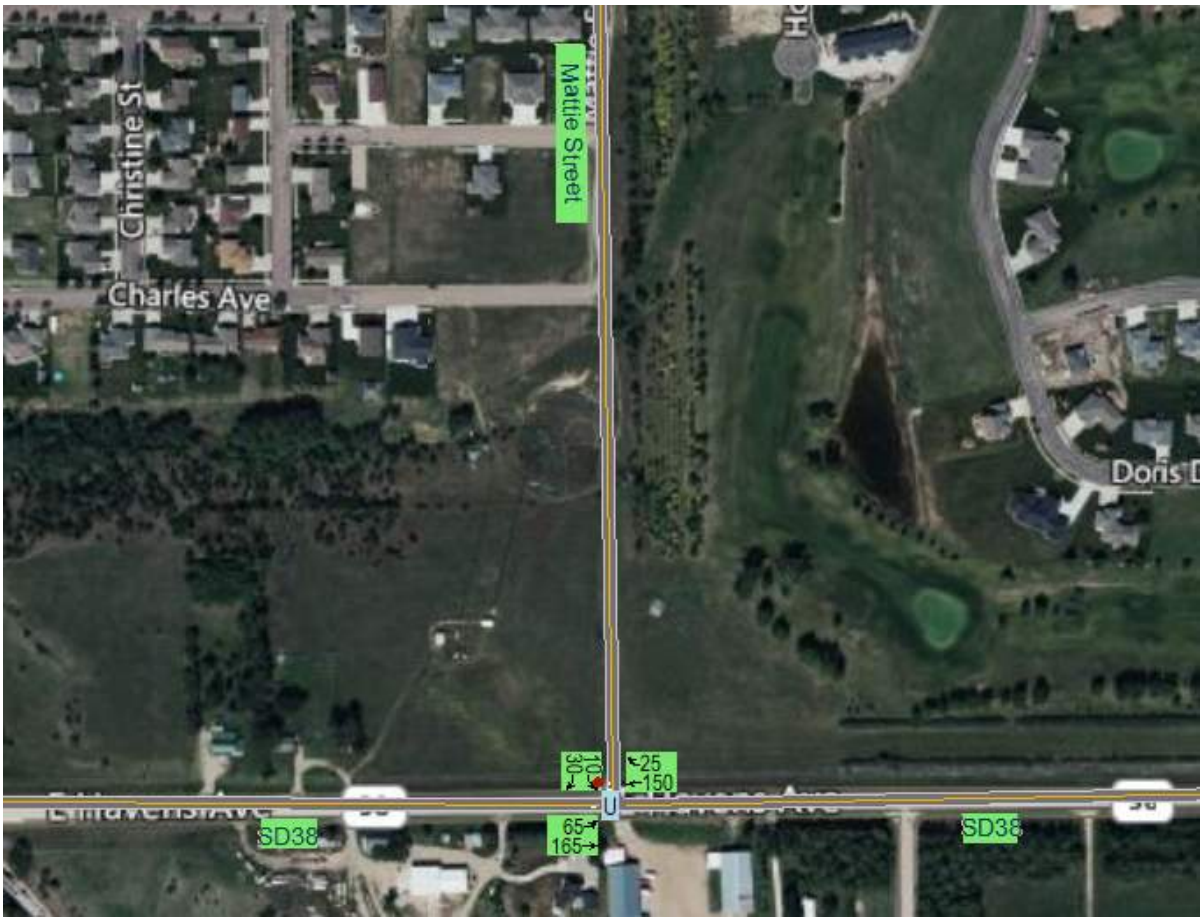


Figure 2: Mattie Street Connection Scenario

C. Hospital Relocation Scenario

- Relocates hospital from Foster Street & 7th Avenue intersection area to the Cabela Drive corridor, between Rowley Street and Cabela's
- Future hospital assumptions
  - Focus on same-day care
  - 100 bed capacity to provide a conservative review
  - Primary access via Cabela Drive
- Anticipated increases in traffic demand to north/south corridors
  - Burr Street and Ohlman Street have greatest available capacity to absorb traffic increases
  - Rowley Street is closest proximity to hospital and centrally located in the community, but exhibits long-range capacity needs
- Estimated daily trips generated by new hospital: 2,200 vehicles



Figure 3: Hospital Relocation Scenario

Appendix

Appendix A: Corridor and Intersection Improvements Summary Tables

Appendix B: Supplemental Scenarios Summary Tables

Appendix C: Synchro 11/HCS7 Output (Corridor and Intersection Improvements)

Appendix D: Synchro 11/HCS7 Output (Supplemental Scenarios)

Appendix A: Corridor and Intersection Improvements Summary Tables

SD37 & Sanborn Boulevard Intersection

Corridor Description

Limits: Intersection
Major Roads Plan:
SD37: Regional Arterial
Sanborn Boulevard: Local Arterial

Planning Horizon Corridor Vision

Signalized intersection

Summary of Needs

- Intersection Operations: LOS F (2045)
- Crash history
  - Elevated crash intersection
  - Most frequent crash type: angle and single vehicle
- Public comment indicated left turn lanes are too short and should be extended
- Multimodal:
  - Shared-use path connectivity between 15th Avenue and Main Street

Major Intersection Improvements Summary

Intersection	Option	Short-Term Improvements			Planning Horizon Improvements		
		Traffic Control	Summary	New Lane Configuration	Traffic Control	Summary	New Lane Configuration
SD37 & 23rd Avenue	Stop Control → Traffic Signal	TWSC	-	-	**Traffic Signal**	Signalize (when warranted)	-

*Changes noted in **Bold Orange***

Recommendations

- Monitor intersection traffic volumes and crash history for signalization and turn lane storage needs
  - Signalize when warranted
  - Extend SD37 turn lane striping based on observed queues

Long-Range (2040+)

Signalize Intersection

- Monitor intersection traffic volumes and signalize when warranted

23rd Avenue Corridor

Corridor Description

Limits: Ohlman Street to SD37
Major Roads Plan: Local Arterial

Planning Horizon Corridor Vision

3-lane urban section with center left turn lane

Summary of Needs

- Segment capacity: 3-lane section (2032)
- Intersection operations:
  - Ohlman Street & 23rd Avenue: LOS F (2045)
  - SD37 & 23rd Avenue: LOS F (2032)
- Crash history:
  - Ohlman Street & 23rd Avenue:
    - Elevated crash intersection
    - Most frequent crash type: angle crashes
- Multimodal:
  - Shared-use path connectivity between Minnesota Street and SD37
  - Intersection crossing improvements

Major Intersection Improvements Summary

Intersection	Option	Short-Term Improvements			Planning Horizon Improvements		
		Traffic Control	Summary	New Lane Configuration	Traffic Control	Summary	New Lane Configuration
Ohlman Street & 23rd Avenue	Stop Control → Traffic Signal	**TWSC / Signalize if warranted**	3-lane corridor improvements on all legs	EB: **LT**, **T/RT** WB: **LT**, **T/RT** NB: **LT**, **T/RT** SB: **LT**, **T/RT**	**Traffic Signal**	Signalize reconstructed intersection (when warranted)	-
	Roundabout	**Roundabout**	Single-lane roundabout	EB: **LT/T/RT** WB: **LT/T/RT** NB: **LT/T/RT** SB: **LT/T/RT**	-	-	-
SD37 & 23rd Avenue	Stop Control → Traffic Signal	**TWSC / Signalize if warranted**	3-lane corridor improvements on 23rd Ave	EB: **LT**, **T**, **RT** WB: **LT**, **T/RT** NB: LT, T, T/RT SB: LT, T, T/RT	**Traffic Signal**	Signalize reconstructed intersection (when warranted)	-

*Changes noted in **Bold Orange***

Recommendations

Reconstruct 23rd Avenue corridor as a 3-lane urban section to address emerging capacity needs. This segment is a key east/west arterial corridor south of Lake Mitchell and provides connectivity to developing areas. Monitor the Ohlman Street and SD37 intersections for traffic signal needs. A roundabout is recommended for further consideration at the Ohlman Street & 23rd Avenue intersection.

Coordinate with future Ohlman Street corridor projects.

Mid-Term (2030-2039)

23rd Avenue 3-Lane Urban Section Reconstruction

Ohlman Street to SD37

- Ohlman Street & 23rd Avenue intersection options:
  - Traditional intersection (signalize if warranted) or
  - Roundabout
- Signalize SD37 & 23rd Avenue intersection (if warranted)
- Extend shared-use path on south side to tie into SD37 path
- 23rd Avenue pedestrian crossing improvements

Long-Range (2040+)

Signalize Intersection (if not yet signalized, when warranted)

- Ohlman Street & 23rd Avenue (if traditional intersection)
- SD37 & 23rd Avenue

Ohlman Street Corridor

Corridor Description

Limits: S Harmon Drive to 8th Street
Major Roads Plan: Local Arterial

Planning Horizon Corridor Vision

3-lane urban section with center left turn lane

Summary of Needs

- Segment capacity:
  - 23rd Avenue to 8th Avenue: 3-lanes (2045)
  - S Harmon Drive to 23rd Avenue: dependent on future development
- Intersection operations
  - Ohlman Street & 23rd Avenue: LOS F (2045)
- Crash history:
  - Ohlman Street & 23rd Avenue:
    - Elevated crash intersection
    - Most frequent crash types: angle crashes
- Multimodal:
  - Shared-use path connectivity between Kemper Avenue and 23rd Avenue
  - Paved shoulder between 23rd Avenue and 8th Avenue
  - Intersection crossing improvements

Major Intersection Improvements Summary

Intersection	Option	Short-Term Improvements			Planning Horizon Improvements		
		Traffic Control	Summary	New Lane Configuration	Traffic Control	Summary	New Lane Configuration
Ohlman Street & 23rd Avenue	Stop Control → Traffic Signal	**TWSC / Signalize if warranted**	3-lane corridor improvements on all legs	EB: **LT**, **T/RT** WB: **LT**, **T/RT** NB: **LT**, **T/RT** SB: **LT**, **T/RT**	**Traffic Signal**	Signalize reconstructed intersection (when warranted)	-
	Roundabout	**Roundabout**	Single-lane roundabout	EB: **LT/T/RT** WB: **LT/T/RT** NB: **LT/T/RT** SB: **LT/T/RT**	-	-	-
Ohlman Street & 8th Avenue	Stop Control	TWSC	-	-	TWSC	3-lane corridor improvements on all legs	EB: **LT**, **T/RT** WB: **LT**, **T/RT** SB: **LT**, **T/RT**

Recommendations

Reconstruct Ohlman Street corridor as a 3-lane urban section to address emerging capacity needs. This segment is a key north/south arterial corridor west of SD37. It provides connectivity to SD37 Bypass, Lake Mitchell, and developing areas. Timing of needs likely dependent on development type, density, and timeline. South of 23rd Avenue, high truck volumes due to industrial development may accelerate the need for corridor improvements.

Construct shared-use path between Kemper Avenue and 23rd Avenue to provide greater connectivity on the bike trail / sidewalk system.

Monitor traffic volumes and crash history at the 23rd Avenue intersection for traffic signal needs. A roundabout is recommended at the intersection for further consideration.

Coordinate with future 23rd Avenue and 8th Avenue corridor projects.

Short-Term (<2030)

Construct shared-use path on the east side of Ohlman Street from 23rd Avenue to the existing sidewalk north of Kemper Avenue

Long-Range (2040+)

Ohlman Street 3-Lane Urban Section Reconstruction

23rd Avenue to 8th Avenue

- Paved shoulders, additional width for bicyclists, or shared-use path

Ohlman Street 3-Lane Urban Section Reconstruction

S. Harmon Drive to 23rd Avenue

- Dependent on future development
- Maintain existing or construct shared-use path

Signalize Intersection (when warranted)

- Ohlman Street & 23rd Avenue (if traditional intersection)

Rowley Street Corridor

Corridor Description

Limits: Havens Avenue to Spruce Street
Major Roads Plan: Local Arterial

Planning Horizon Corridor Vision

Havens Avenue to Norway Avenue
3-lane / 2-lane corridor

- 3-lane urban section with center left turn lane, or
- 2-lane urban section with turn lanes at major intersections

Norway Avenue to Spruce Street
3-lane urban section with center left turn lane

Summary of Needs

- Segment capacity: 3 lanes (2032)
- Intersection operations:
  - Rowley Street & Norway Avenue: LOS E (2045)
- Crash history:
  - Rowley Street & Norway Avenue intersection:
    - Elevated crash intersection
    - Most frequent crash types: angle and rear-end crashes
- Multimodal
  - Shared-use path connectivity:
    - Between Norway Avenue and Spruce Street
    - Between Rowley Street & Norway Avenue to Burr Street
  - Intersection crossing improvements

Major Intersection Improvements Summary

Intersection	Option	Short-Term Improvements			Planning Horizon Improvements		
		Traffic Control	Summary	New Lane Configuration	Traffic Control	Summary	New Lane Configuration
Rowley Street & Norway Avenue	Stop Control → Traffic Signal	AWSC	3-lane corridor improvements	EB: LT/T/RT WB: LT/T/RT NB: **LT**, **T/RT** SB: **LT**, **T/RT**	AWSC	3-lane corridor improvements	EB: LT/T/RT WB: LT/T/RT NB: **LT**, **T/RT** SB: **LT**, **T/RT**
		-	-	-	**Traffic Signal**	3-lane corridor improvements Signalize (when warranted)	EB: **LT**, **T/RT** WB: **LT**, **T/RT** NB: **LT**, **T/RT** SB: **LT**, **T/RT**
Rowley Street & Spruce Street	Stop Control	AWSC	3-lane corridor improvements	EB: LT, T/RT WB: LT, T/RT NB: LT/T/RT SB: **LT, T/RT**	AWSC	3-lane corridor improvements	EB: LT, T/RT WB: LT, T/RT NB: LT/T/RT SB: **LT, T/RT**
	Roundabout	**Roundabout**	Single-lane roundabout	EB: **LT/T/RT** WB: **LT/T/RT** NB: LT/T/RT SB: LT/T/RT	-	-	-

Recommendations

Reconstruct Rowley Street corridor as a 3-lane urban section to address emerging capacity needs. This segment is a key north/south arterial corridor in southern Mitchell with an I-90 crossing. It provides connectivity between Havens Avenue and Spruce Street, to developing areas south of I-90 and key east/west arterial corridors supporting local traffic. Development type, density, and timeline will influence the timing of 3-lane section needs south of Norway Avenue. One key design consideration is the overhead I-90 bridges that will constrict the roadway limits to a 2-lane section underneath I-90.

North of Norway Avenue, maintain existing 2-lane corridor with left turn lanes, as needed to meet operational and safety goals, at major intersections and access points through established areas.

Monitor traffic volumes and crash history at the Norway Avenue and Spruce Street intersections for future traffic signal needs. A roundabout is recommended at the Spruce Street intersection for further consideration.

Mid-Term (2030-2039)

Rowley Street Urban 3-Lane Section Restriping
Norway Avenue to I-90

- Rowley Street & Norway Avenue intersection improvements
- Shared-use path

Rowley Street Urban 3-Lane Section Reconstruction
I-90 to Spruce Street

- Rowley Street & Spruce Street intersection options
  - Traditional intersection with westbound right turn lane or
  - Roundabout
- Shared-use path

Long-Range (2040+)

Signalize Intersection (when warranted)

- Rowley Street & Norway Avenue
- Rowley Street & Spruce Street (if traditional intersection)

I-90 Exit 330 / Ohlman Street Interchange

Corridor Description

Limits: Norway Avenue to Spruce Street
Major Roads Plan: Local Arterial

Planning Horizon Corridor Summary

5-lane section with center left turn lane (north of WB RTI)
3-lane section with center left turn lane (south of WB RTI)

Summary of Needs

- Segment capacity: existing 3-lane section adequate within and south of interchange
- Intersection operations
  - I-90 WB RTI & SD37: off-ramp approach LOS E (2032) and LOS F (2045)
  - I-90 EB RTI & SD37: off-ramp approach and intersection LOS F (2032 & 2045)
- Tower lighting
- Multimodal
  - No sidewalk across I-90 interchange bridge or south of interchange to Spruce Street
    - Shoulders are available
  - Shared-use path connectivity between Norway Avenue and Spruce Street

Major Intersection Improvements Summary

Intersection	Option	Short-Term Improvements			Planning Horizon Improvements		
		Traffic Control	Summary	New Lane Configuration	Traffic Control	Summary	New Lane Configuration
I-90 WB RTI & SD37 (Ohlman Street)	Stop Control → Traffic Signal	TWSC	Construct WB RT Lane	WB: **LT/T**, **RT** NB: LT, T SB: T, RT	**Traffic Signal**	Signalize (when warranted)	-
I-90 EB RTI & SD37 (Ohlman Street)	Stop Control → Traffic Signal	**TWSC / Signalize if warranted**	Construct EB LT lane Signalize (when warranted)	EB: **LT**, **T/RT** NB: T/RT SB: LT, T	**Traffic Signal**	-	-

Recommendations

Long-range needs are focused to the two ramp terminal intersections. Existing SD37/Ohlman Street cross-section provides long-range segment capacity. Recommended RTI improvements align with the *SDDOT 2020 Decennial Interstate Corridor Study*.

Following construction of recommended turn lanes, monitor major intersections for traffic signal warrants.

Consider interchange lighting upgrades such as removing tower lighting and/or replacing luminaire type. Coordinate with SDDOT statewide lighting review.

Mid-Term (2030-2039)

I-90 Exit 330 Westbound Off-Ramp Right Turn Lane Extension

- Extend right turn lane beyond left/through lane queue

I-90 Exit 330 Eastbound Off-Ramp Right Turn Lane Construction

- Split left and right turn movements
- Review traffic signal warrants for eastbound left turn traffic

Long-Range (2040+)

Signalize Intersection (when warranted)

- I-90 Exit 330 westbound ramp terminal intersection
- I-90 Exit 330 eastbound ramp terminal intersection

Extend shared-use path from Norway Avenue south to Spruce Street

Foster Street Corridor

Corridor Description

Limits: 7th Avenue to SD38 (Havens Avenue)
Major Roads Plan: Local Arterial
Scenario does not include Foster Street extension

Planning Horizon Corridor Vision

3-lane / 2-lane corridor

- 3-lane urban section with center left turn lane, or
- 2-lane urban section with turn lanes at major intersections

Summary of Needs

- Segment capacity: 3 Lanes (2045)
- Crash history
  - Foster Street & 1st Avenue:
    - Elevated crash intersection (0.83 critical ratio) and angle crash frequency
    - All angle crashes involved a southbound left or though movement with an eastbound or westbound through movement
- Multimodal
  - Foster Street is a key, long-range north/south corridor for bicycles and pedestrians.
  - Intersection crossing improvements

Major Intersection Improvements Summary

Intersection	Option	Short-Term Improvements			Planning Horizon Improvements		
		Traffic Control	Summary	New Lane Configuration	Traffic Control	Summary	New Lane Configuration
Foster Street & 1st Avenue	Stop Control	TWSC	NB and SB left turn lanes NB and SB approach stop signs Access management and speed reduction measures	EB: LT/T/RT WB: LT/T/RT NB: **LT, T/RT** SB: **LT, T/RT**	TWSC	-	-
			NB and SB left turn lanes EB and WB approach stop signs Access management and speed reduction measures			-	
		AWSC	NB and SB left turn lanes All-way stop-control Access management and speed reduction measures		AWSC	-	

Recommendations

Projected traffic growth shows a need to consider left turn lanes at major intersections and access points and should be monitored to gauge timeline of improvements.

The hospital between 5th Avenue and 7th Avenue is a key generator of corridor traffic. If the hospital relocates to a different location in Mitchell, this will likely decrease traffic demand on the Foster Street corridor, change traffic patterns, and defer/eliminate some improvement needs.

Foster Street & 1st Avenue intersection modifications include changes in intersection traffic control, 1st Avenue speed management, access management and multimodal travel improvements. Implementing multiple elements as part of one project will change the look and feel of the intersection, which benefits short-term safety due to changes in traffic control.

The current intersection configuration exhibits an elevated overall and angle crash frequency, with most angle crashes involving a southbound vehicle and an eastbound or westbound vehicle. Traffic control options include:

- TWSC for NB/SB (Foster Street): existing condition
- TWSC for EB/WB (1st Avenue): provides free movement for higher volume northbound/southbound (Foster Street) through and left turn traffic
- AWSC: aligns with relative balance of entering volumes and provides for stop-controlled crossings for bicyclists and pedestrians

Consideration to speed management for 1st Avenue traffic, particularly westbound heading to Foster Street, includes:

- Intersection bump-outs: narrows roadway to encourage slower speeds entering the intersection; shortens pedestrian crossing distances
- Mid-segment bump-out: narrows roadway to encourage slower speeds ahead of the intersection; establishes a gateway feature

Access management should limit one access per street face per parcel, with the access as far away from the intersection physical area as feasible.

See the Foster Street extension to Spruce Street option for additional needs associated with the potential future connection.

Short-Term (<2030)

Foster Street & 1st Avenue Intersection Improvements

- Traffic Control Modifications
  - TWSC for NB/SB (Foster Street) (existing)
  - TWSC for EB/WB (1st Avenue)
  - Multiway stop (AWSC)
- Access Management
  - Access management in northwest quadrant (limit access to one access per street face)
- Traffic Calming
  - 1st Avenue & Foster Street intersection bump-outs (east and west intersection legs)
  - 1st Avenue mid-block bump-out (east of Foster Street)

Construct bike lane along Foster Street from 11th Avenue to Birch Avenue

Long-Range (10 to 20-Year Horizon)

Monitor intersection traffic operations and safety and stripe left turn lanes where needed to meet operational goals.

Burr Street Corridor

Corridor Description

Limits: SD38 (Havens Avenue) to 7th Avenue
Major Roads Plan: Local Arterial

Planning Horizon Corridor Vision

7th Avenue to 1st Avenue
3-lane / 2-lane corridor

- 3-lane urban section with center left turn lane, or
- 2-lane urban section with turn lanes at major intersections

1st Avenue to Havens Avenue
4-lane corridor (Existing)

- *'Maintain Existing' option maintains the existing 4-lane section*

3-lane urban section with center left turn lane (Option)

- *'Road Diet' option to convert existing 4-lane section to a 3-lane section with center left turn lane*

Summary of Needs

- Segment capacity:
  - Havens Avenue to 1st Avenue: feasibility to reduce from 4-lane section to 3-lane section through Year 2045
  - 1st Avenue to 3rd Avenue: 3 lanes (2032)
  - 3rd Avenue to 5th Avenue: 3 lanes (2045)
- Crash history
  - Burr Street & 1st Avenue:
    - Most frequent crash types: angle and rear-end
    - Angle crashes involve a westbound through movement
  - Burr Street & Ash Avenue
    - Elevated rear-end crash frequency on Burr Street approaches
- 1st Avenue intersection: truck turning movements, free right turn in neighborhood urban setting, and atypical configuration
- Multimodal
  - Segment links several shared-use paths and other multimodal destinations throughout the area
  - Sidewalk width (available space) constraints due to railroad underpass and limited ROW
  - Intersection crossing improvements

Major Intersection Improvements Summary

Intersection	Option	Short-Term Improvements			Planning Horizon Improvements		
		Traffic Control	Summary	New Lane Configuration	Traffic Control	Summary	New Lane Configuration
Burr Street & 1st Avenue	Reconstruction (A)	Traffic Signal	Reconstruct intersection to pull all lanes into main intersection	EB: **LT, T/RT** WB: **LT, T/RT** NB: LT, T/RT SB: LT, T/RT	Traffic Signal	-	-
	Road Diet (B)	Traffic Signal	3-lane section on Burr Street Reconstruct intersection to pull all lanes into main intersection	EB: **LT, T/RT** WB: **LT, T/RT** NB: LT, T/RT SB: LT, T/RT	Traffic Signal	-	-
	Roundabout (C)	**Roundabout**	Single-lane roundabout	EB: **LT/T/RT** WB: **LT/T/RT** NB: LT/T/RT SB: LT/T/RT	-	-	-
Burr Street & Havens Avenue	Road Diet	Traffic Signal	3-lane section on Burr Street	EB: LT, T, T/RT WB: LT, T, T/RT NB: **LT, T, RT** SB: **LT, T, RT**	Traffic Signal	-	-

Recommendations

North of 1st Avenue, monitor need for left turn lanes at major intersections or access points or a 3-lane urban section to address traffic growth.

Between 1st Avenue and Havens Avenue, long-range traffic volumes show feasibility of reducing the Burr Street cross-section from 4 lanes to 3 lanes and implementing a 'Road Diet'. This modification adds a center left turn lane and provides additional space for multimodal elements throughout the segment. The Road Diet could be implemented within the existing cross-section through striping modifications.

Two Burr Street & 1st Avenue intersection reconstruction options included, to reconstruct the existing intersection as a traditional intersection (with turn lane and traffic signal modifications) or a roundabout. Both intersection options are compatible with the Road Diet segment project and can be constructed separately or as a single project.

Short-Term (<2030)

Burr Street & 1st Avenue Intersection Safety Improvements

- Optimize traffic signal phase change and clearance intervals
- Update vehicle detection
- Add signal head on mast arms for northbound/southbound through movements and install retroreflective backplates

Mid-Term (2030-2039)

Burr Street & 1st Avenue Intersection Reconstruction

- Reconstruct Burr Street & 1st Avenue intersection to pull all lanes into main intersection (no free movements) and improve truck turning paths
  - Traditional intersection (with turn lane and traffic signal modifications) or
  - Roundabout

4-Lane to 3-Lane Conversion ('Road Diet')
1st Avenue to Havens Avenue

- Convert existing 4-lane section to a 3-lane section with center left turn lane

- Modify lane configuration at Burr Street & Havens Avenue intersection
- Shared-use path

Install bike lanes between Havens Avenue and 11th Avenue

Long-Range (2040+)

Monitor intersection traffic operations and safety and stripe left turn lanes where needed to meet operational goals

8th / 7th Avenue Corridor

Corridor Description

8th Avenue Limits: Ohlman Street to Minnesota Street
7th Avenue Limits: Minnesota Street to Foster Street
Major Roads Plan: Local Arterial

Planning Horizon Corridor Vision

3-lane / 2-lane corridor

- 3-lane section with center left turn lane, or
- 2-lane section with turn lanes at major intersections and access points

Summary of Needs

- Segment capacity:
  - 8th Avenue
    - Ohlman Street to SD37 Bypass: 3-lane section (2045)
  - 7th Avenue
    - Kimball Street to Burr Street: 3-lane section (2032)
    - Sanborn Boulevard to Kimball Street: 3-lane section (2045)
- Route continuity: 1-block north/south offset at Minnesota Street
- Crash history:
  - 7th Avenue & Kimball Street:
    - Elevated crash intersection (1.67 critical ratio, 2nd highest of all City intersections)
    - 11 angle crashes (7 involving southbound and eastbound vehicles)
    - 5 rear-end crashes (four in southbound direction)
- Multimodal: bike lane connectivity and intersection crossings

Major Intersection Improvements Summary

Intersection	Option	Short-Term Improvements			Planning Horizon Improvements		
		Traffic Control	Summary	New Lane Configuration	Traffic Control	Summary	New Lane Configuration
Ohlman Street & 8th Avenue	Maintain Existing	TWSC	-	-	TWSC		EB: **LT**, **T/RT** WB: **LT**, **T/RT** SB: **LT, T/RT**
SD37 & 8th Avenue	Stop Control	TWSC	-	-	TWSC	8th Avenue left turn lanes	EB: **LT, T/RT** WB: **LT, T/RT** NB: LT, T, T/RT SB: LT, T, T, RT
7th Avenue & Kimball Street	Stop Control	TWSC	3-lane section on EB and WB legs Install EB LT and WB LT lanes	EB: **LT, T/RT** WB: **LT, T/RT** NB: LT/T/RT SB: LT/T/RT	TWSC	3-lane section on EB and WB legs Install EB LT and WB LT lanes	EB: **LT, T/RT** WB: **LT, T/RT** NB: LT/T/RT SB: LT/T/RT
7th Avenue & Burr Street	Stop Control	AWSC	3-lane section on EB leg Install EB LT lane	EB: **LT, T/RT** WB: LT/T/RT NB: LT/T/RT SB: LT/T/RT	AWSC	3-lane section on EB leg Install EB LT lane	EB: **LT, T/RT** WB: LT/T/RT NB: LT/T/RT SB: LT/T/RT

Recommendations

Identified as a Local Arterial in the Major Roads Plan to provide east/west connectivity through Mitchell. With the built-out nature of the adjacent land, opportunities for expansion beyond the existing cross-section will be limited.

Left turn lanes at major intersections or 3-lane section segments will provide operational benefits where needed to meet future traffic growth. Corridor volumes should be monitored for timing of those needs.

Consider traffic calming measures to manage speeds through residential and downtown areas. Modify traffic control 7th Avenue intersections with Lawler Street and Kimball Street.

Coordinate with Ohlman Street, Burr Street, Main Street, and Foster Street corridor projects.

Short-Term (<2030)

7th Avenue & Kimball Street and 7th Avenue & Lawler Street Intersections Traffic Control Modifications

- Change traffic control:
  - Kimball Street: TWSC to AWSC
  - Lawler Street: AWSC to TWSC
- Review intersection sight distance in relation to stop bar location and roadway speed
- Restrict parking further back from stop sign to increase visibility of stop signs
- Review truck turning movements for conflicts and adjustment needs

Install bike lanes/buffered bike lanes between Ohlman Street and Foster Street

Mid-Term (2030-2039)

Corridor Traffic Calming
SD37 to Foster Street

- Speed feedback signs or bulb-out curb extensions through residential and downtown areas

Long-Range (2040+)

7th Avenue to 8th Avenue Diagonal Connector Construction
Minnesota Street to Wisconsin Street

- 3-lane section with center left turn lane through both intersections

8th Avenue 3-Lane Urban Reconstruction
Ohlman Street to SD37

- Review traffic signal warrants for signalization

Monitor intersection traffic operations and safety and stripe left turn lanes where needed to meet operational goals

1st Avenue Corridor

Corridor Description

Limits: Sanborn Boulevard to Burr Street
Major Roads Plan: Local Arterial

Planning Horizon Corridor Vision

3-lane / 2-lane corridor

- 3-lane section with center left turn lane, or
- 2-lane section with turn lanes at major intersections and access points

Summary of Needs

- Segment capacity:
  - Sanborn Boulevard to Kimball Street: 3 Lanes (2032)
- Crash history
  - Burr Street & 1st Avenue:
    - Rear end and angle crash frequency
  - Foster Street & 1st Avenue:
    - Elevated crash intersection (0.83 critical ratio) and angle crash frequency
    - All angle crashes involved a southbound left or though movement
    - 83% of crashes involved a failure to stop for stop sign
- Multimodal
  - Shared-use path connectivity between Foster Street and SD38/Havens Avenue
  - Intersection crossing improvements

Major Intersection Improvements Summary

Intersection	Option	Short-Term Improvements			Planning Horizon Improvements		
		Traffic Control	Summary	New Lane Configuration	Traffic Control	Summary	New Lane Configuration
1st Avenue & Burr Street	Burr Street Corridor Project - Reconstruction	Traffic Signal	Reconstruct intersection to pull all lanes into main intersection	EB: **LT, T/RT** WB: **LT, T/RT** NB: LT, T/RT SB: LT, T/RT	Traffic Signal	-	-
	Burr Street Corridor Project - Road Diet	Traffic Signal	3-lane section on Burr Street Reconstruct intersection to pull all lanes into main intersection	EB: **LT, T/RT** WB: **LT, T/RT** NB: LT, T/RT SB: LT, T/RT	Traffic Signal	-	-

Recommendations

Existing 1st Avenue corridor is a 3-lane / 2-lane corridor with left turn lanes already striped at major intersections. Monitor other downtown area intersections along 1st Street, such as Duff Street, Rowley Street, Lawler Street, Kimball Street for operational and safety needs associated with left turning vehicles. Parking will be impacted at modified intersections.

See Burr Street corridor for further discussion and projects associated with the 1st Avenue & Burr Street intersection.

Long-Range (2040+)

Monitor intersection traffic operations and safety and stripe left turn lanes where needed to meet operational goals

Havens Avenue Corridor

Corridor Description	**Planning Horizon Corridor Vision**
Limits: 406th Avenue to SD37 (Ohlman Street)	3-lane urban section with center left turn lane
Major Roads Plan: Regional Arterial	Turn lanes and intersection traffic control modifications

Summary of Needs

- Segment capacity
  - 407th Avenue to SD37 (Ohlman Street): 3 Lanes (2032)
- Intersection operations: no analysis intersections along corridor
- Crash history
  - SD37 (Ohlman Street) & Havens Avenue:
    - Elevated crash intersection (1.23 critical ratio, 3rd highest of all City intersections)
    - Highest crash frequency of all City intersections
    - Most frequent crash types: rear-end and angle
- Multimodal
  - No shoulder, sidewalk, or shared-use path along corridor

Major Intersection Improvements Summary

Intersection	Option	Short-Term Improvements			Planning Horizon Improvements		
		Traffic Control	Summary	New Lane Configuration	Traffic Control	Summary	New Lane Configuration
Havens Avenue & 406th Avenue	Stop control	TWSC	-	-	TWSC	3-lane corridor improvements Widen north and south legs to include LT lane	EB: **LT, T/RT** WB: **LT, T/RT** NB: **LT, T/RT** SB: **LT, T/RT**
Havens Avenue & 407th Avenue	Stop control	TWSC	3-lane corridor improvements Widen north and south legs to include LT lane	EB: **LT, T/RT** WB: **LT, T/RT** NB: **LT, T/RT** SB: **LT, T/RT**	TWSC	-	-
SD37 (Ohlman Street) & Havens Avenue	Traffic signal	Signal	Reconstruct west leg with 3-lane corridor improvements	EB: **LT, T, RT** WB: LT, T, RT NB: LT, T, T/RT (channelized) SB: LT, T, T/RT	Signal	-	-

Recommendations

Havens Avenue is currently a 2-lane rural section roadway west of SD37 (Ohlman Street) with numerous access points and large vehicles. Development is most prevalent between 407th Avenue and SD37 (Ohlman Street), though continued the westward growth is anticipated.

A future corridor with a left turn lane to remove turning vehicles from the through lane is desired. Due to the access density, a continuous left turn lane is recommended in conjunction with access management as part of a future reconstruction project.

The project could be phased, with the short-term need being between 407th Avenue and SD37 (Ohlman Street) and the long-range project being between 406th Avenue and 407th Avenue. It is recommended each project builds-out the western-most section-line intersection of the respective project, so the lane transitions occur beyond the 1-mile segment.

Short-Term (<2030)

Havens Avenue & SD37 (Ohlman Street) Intersection Safety Improvements

- Install flashing advance warning beacons for northbound and eastbound directions
- Manage access within intersection functional area by closing or moving access points further away from the physical intersection area
- Change protected/permitted left turn phasing to protected only
- Review SB to EB truck turning paths and potential conflict with NB to EB right turn lane add and WB left turn lane

Mid-Term (2030-2039)

Havens Avenue 3-Lane Urban Reconstruction

407th Avenue to SD37 (Ohlman Street)

- Includes Havens Avenue & 407th Avenue intersection
- Shared-use path

Long-Range (2040+)

Havens Avenue 3-Lane Urban Reconstruction

406th Avenue to 407th Avenue

- Includes Havens Avenue & 406th Avenue intersection
- Shared-use path

Appendix B: Supplemental Scenarios Summary Tables

Foster Street Extension Scenario

Scenario Description

Limits: SD38 (Havens Avenue) to Spruce Street
Major Roads Plan: Local Arterial
Foster Street extension from SD38 (Havens Avenue) to Spruce Street

Planning Horizon Corridor Summary

3-lane / 2-lane corridor

- 3-lane urban section with center left turn lane, or
- 2-lane urban section with turn lanes at major intersections

Summary of Needs

- Spruce Street rail crossing reliability and access redundancy
  - Trains often block this crossing, which leads to reliability issues when accessing Mitchell Technical College, Dakotafest, and businesses along the south side of Spruce Street
  - Emergency services have noted this being a concern
  - Existing alternate route is one mile south via gravel roads: 256th Street to 411th Avenue
- Multimodal
  - Extension of multimodal facilities across I-90 to connect east Mitchell residential areas with Spruce Street

Major Intersection Improvements Summary

Intersection	Option	Short-Term Improvements			Planning Horizon Improvements		
		Traffic Control	Summary	New Lane Configuration	Traffic Control	Summary	New Lane Configuration
Foster Street & SD38 (Havens Avenue)	Stop Control → Traffic Signal	-	-	-	**TWSC / Signalize if warranted**	3-lane / 2-lane corridor extension NB left turn lane	EB: **LT, T, T/RT** WB: **LT, T, T/RT** NB: **LT, T/RT** SB: LT, T/RT
Foster Street & Spruce Street	Stop Control	-	-	-	TWSC	3/2-lane corridor extension Foster Street stop-control Turn lanes on all approaches	EB: **LT, T** WB: **T, RT** SB: **LT, RT**
Spruce Street & SD37 (Burr Street)	Maintain Existing	-	-	-	Traffic Signal	-	-

Recommendations

Reconstruct and extend Foster Street southward between SD38 (Havens Avenue) and Spruce Street 3-lane / 2-lane with turn lanes at major intersections along the corridor. Construct a shared-use path on one side of the roadway. Review traffic signal warrants at SD38 (Havens Avenue) & Foster Street intersection due to projected increase in north/south crossing and left turn movements.

Left and right turn lanes are recommended on all approaches at the Spruce Street & Foster Street intersection if Spruce Street is a 2 or 3-lane section through the intersection.

No modifications are anticipated at the existing SD37 (Burr Street) & Foster Street intersection.

Routing, crossing feasibility, and future Spruce Street & Foster Street intersection location to be determined through future study.

Illustrative

Foster Street Extension Construction
SD38 (Havens Avenue) to Spruce Street

- Extend Foster Street as 3-lane / 2-lane section between Foster Street and Spruce Street
  - North limits: SD38 (Havens Avenue) & Foster Street Intersection
  - South limits: Spruce Street at a location to be determined through additional study
- I-29 crossing (overpass or underpass)
- Shared-use path
- SD38 (Havens Avenue) & Foster Street intersection improvements (signalize if warranted)

Mattie Street Connection Scenario

Corridor Description

Limits: 1st Street to SD38 (Havens Avenue)
Major Roads Plan: Collector
Mattie Street connection south to SD38 (Havens Avenue)

Planning Horizon Corridor Summary

2-lane urban section with turn lanes at major intersections

Summary of Needs

- North/south collector connectivity between 1st Avenue and SD38 (Havens Avenue) in developing residential area
- Multimodal:
  - Continuous north/south sidewalk for adjacent residential development

Major Intersection Improvements Summary

Intersection	Option	Short-Term Improvements			Planning Horizon Improvements		
		Traffic Control	Summary	New Lane Configuration	Traffic Control	Summary	New Lane Configuration
Mattie Street & 1st Avenue	Maintain Existing	TWSC	-	-	TWSC	-	-
Mattie Street & SD38 (Havens Avenue)	Stop Control	TWSC	2-Lane urban section Stop control on SB leg	EB: **LT/T** WB: **T/RT** SB: **LT/RT**	TWSC	-	-

Recommendations

Extend Mattie Street southward to SD38 (Havens Avenue) as a 2-lane urban section with parking and turn lanes at major intersections as needed.

No modifications anticipated to the Mattie Street & 1st Avenue intersection. Monitor side-street delay and stripe separate LT and T/RT lanes, as needed.

A southbound Mattie Street shared LT/T/RT lane at SD38 (Havens Avenue) meets operational goals for this study. SDDOT turn lane warrants for SD38 should be reviewed as part of the design process.

Sidewalk will be constructed in conjunction with future development.

Short-Term (<2030)

Mattie Street 2-Lane Urban Section Construction

1st Avenue to SD38 (Havens Avenue)

- Extend Mattie Street southward to SD38 (Havens Avenue) as a 2-lane urban section
  - North limits: Charles Avenue
  - South limits: SD38 (Havens Avenue)

Rowley Street Corridor - Hospital Relocation Scenario

Scenario Description	**Planning Horizon Corridor Summary**
Limits: Havens Avenue to Spruce Street Major Roads Plan: Local Arterial *Relocation of the hospital to the Rowley Street / Cabela Drive / Spruce Street area*	3-lane section with center left turn lane

Summary of Needs

- Potential relocation of hospital to the Rowley Street / Cabela Drive / Spruce Street area would be expected to generate additional traffic beyond what was accounted for in the baseline forecasts
    - 100-bed hospital assumed in trip generation
        - New hospital capacity is anticipated to be 50% of bed capacity assumption
        - Peak hour trips generated in this scenario will encompass traffic generated by same-day trips
    - New hospital will focus on same-day care
    - Cabela Drive will be primary access

Recommendations

Relocating the hospital to the Rowley Street / Cabela Drive / Spruce Street area is not shown to create significant additional improvement needs to area roadways. The identified Rowley Street corridor and intersection improvements identified as part of the base recommendations provide the additional capacity also needed to accommodate hospital traffic.

Appendix C: Synchro 11/HCS7 Output (Corridor and Intersection Improvements)

SD37 & Sanborn Boulevard Intersection

2045 Build Condition AM/PM (Signal)

2032 Build Condition Signal Warrants

2045 Build Condition Signal Warrants

HCM 6th Signalized Intersection Summary
17: Sanborn Boulevard & SD37

06/13/2022



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	15	380	110	125	490	20	75	15	85	10	10	10
Future Volume (veh/h)	15	380	110	125	490	20	75	15	85	10	10	10
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1772	1772	1772	1772	1772	1772	1772	1772	1772	1772	1772	1772
Adj Flow Rate, veh/h	17	422	122	139	544	22	83	17	94	11	11	11
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	504	1236	354	571	1759	71	351	289	245	132	116	84
Arrive On Green	0.02	0.48	0.48	0.05	0.36	0.36	0.16	0.16	0.16	0.16	0.16	0.16
Sat Flow, veh/h	1688	2583	740	1688	3298	133	1390	1772	1502	322	715	519
Grp Volume(v), veh/h	17	274	270	139	277	289	83	17	94	33	0	0
Grp Sat Flow(s),veh/h/ln	1688	1683	1639	1688	1683	1748	1390	1772	1502	1556	0	0
Q Serve(g_s), s	0.3	6.1	6.2	2.4	7.1	7.2	1.9	0.5	3.4	0.0	0.0	0.0
Cycle Q Clear(g_c), s	0.3	6.1	6.2	2.4	7.1	7.2	3.0	0.5	3.4	1.0	0.0	0.0
Prop In Lane	1.00		0.45	1.00		0.08	1.00		1.00	0.33		0.33
Lane Grp Cap(c), veh/h	504	806	784	571	898	932	351	289	245	333	0	0
V/C Ratio(X)	0.03	0.34	0.34	0.24	0.31	0.31	0.24	0.06	0.38	0.10	0.00	0.00
Avail Cap(c_a), veh/h	653	806	784	711	898	932	403	354	300	389	0	0
HCM Platoon Ratio	1.00	1.00	1.00	0.67	0.67	0.67	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.83	0.83	0.83	1.00	1.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	7.7	9.7	9.8	7.1	11.3	11.3	22.2	21.2	22.4	21.4	0.0	0.0
Incr Delay (d2), s/veh	0.0	1.1	1.2	0.2	0.7	0.7	0.3	0.1	1.0	0.1	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	2.0	2.0	0.7	2.4	2.5	1.0	0.2	1.2	0.4	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	7.8	10.9	11.0	7.3	12.0	12.0	22.5	21.3	23.4	21.6	0.0	0.0
LnGrp LOS	A	B	B	A	B	B	C	C	C	C	A	A
Approach Vol, veh/h		561			705			194			33	
Approach Delay, s/veh		10.8			11.1			22.9			21.6	
Approach LOS		B			B			C			C	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	11.0	34.2		14.8	7.7	37.5		14.8				
Change Period (Y+Rc), s	6.5	5.5		5.0	6.5	5.5		5.0				
Max Green Setting (Gmax), s	9.5	21.5		12.0	6.5	24.5		12.0				
Max Q Clear Time (g_c+I1), s	4.4	8.2		3.0	2.3	9.2		5.4				
Green Ext Time (p_c), s	0.1	2.6		0.1	0.0	2.8		0.3				

Intersection Summary		
HCM 6th Ctrl Delay		12.8
HCM 6th LOS		B

HCM 6th Signalized Intersection Summary
17: Sanborn Boulevard & SD37

06/13/2022



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	10	415	85	145	395	15	165	15	160	15	20	15
Future Volume (veh/h)	10	415	85	145	395	15	165	15	160	15	20	15
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1772	1772	1772	1772	1772	1772	1772	1772	1772	1772	1772	1772
Adj Flow Rate, veh/h	11	461	94	161	439	17	183	17	178	17	22	17
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	703	922	187	690	1266	49	345	291	247	119	131	77
Arrive On Green	0.19	0.33	0.33	0.49	0.77	0.77	0.16	0.16	0.16	0.16	0.16	0.16
Sat Flow, veh/h	1688	2789	565	1688	3305	128	1368	1772	1502	283	796	470
Grp Volume(v), veh/h	11	277	278	161	223	233	183	17	178	56	0	0
Grp Sat Flow(s),veh/h/ln	1688	1683	1670	1688	1683	1749	1368	1772	1502	1548	0	0
Q Serve(g_s), s	0.0	8.6	8.7	0.0	2.7	2.8	6.0	0.5	7.3	0.0	0.0	0.0
Cycle Q Clear(g_c), s	0.0	8.6	8.7	0.0	2.7	2.8	7.9	0.5	7.3	1.9	0.0	0.0
Prop In Lane	1.00		0.34	1.00		0.07	1.00		1.00	0.30		0.30
Lane Grp Cap(c), veh/h	703	557	552	690	645	670	345	291	247	327	0	0
V/C Ratio(X)	0.02	0.50	0.50	0.23	0.35	0.35	0.53	0.06	0.72	0.17	0.00	0.00
Avail Cap(c_a), veh/h	703	557	552	690	645	670	499	491	416	492	0	0
HCM Platoon Ratio	1.00	1.00	1.00	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	0.80	0.80	0.80	1.00	1.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	8.9	17.4	17.5	7.9	5.0	5.0	25.8	22.9	25.7	23.5	0.0	0.0
Incr Delay (d2), s/veh	0.0	3.2	3.3	0.1	1.2	1.1	1.3	0.1	4.0	0.2	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	3.4	3.4	0.9	0.9	0.9	2.6	0.2	2.7	0.7	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	8.9	20.6	20.7	8.1	6.2	6.2	27.1	23.0	29.7	23.7	0.0	0.0
LnGrp LOS	A	C	C	A	A	A	C	C	C	C	A	A
Approach Vol, veh/h		566			617			378			56	
Approach Delay, s/veh		20.4			6.7			28.1			23.7	
Approach LOS		C			A			C			C	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	22.3	27.0		15.7	18.9	30.4		15.7				
Change Period (Y+Rc), s	6.5	5.5		5.0	6.5	5.5		5.0				
Max Green Setting (Gmax), s	8.5	21.5		18.0	5.1	24.9		18.0				
Max Q Clear Time (g_c+I1), s	2.0	10.7		3.9	2.0	4.8		9.9				
Green Ext Time (p_c), s	0.2	2.3		0.2	0.0	2.4		0.8				

Intersection Summary		
HCM 6th Ctrl Delay		17.1
HCM 6th LOS		B

HCS7: MUTCD Signal Warrants Release 7.2

Analyst: HDR
Agency: HDR
Date: 5/16/2022
Project ID: Mitchell MTP
EW Street: SD37

Intersection: SD37 & Sanborn Blvd
Jurisdiction: SDDOT
Units: U.S. Customary
Analysis Year: 2032 Build
NS Street: Sanborn Boulevard

General Information

Major St. Speed (mph): 40
Nearest Signal (ft): 1115
Crashes per Yr: 0

Population: Not less than 10000
Coordinated Signal System: Y

School Crossing

Students in Highest Hour: 0
Adequate Gaps in Period: 0
Minutes in Period: 0

Roadway Network

Two Major Routes: 1
Weekend Count: 0
5-yr Growth Factor: 0

Geometry and Traffic

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	2	0	1	2	0	1	1	1	0	1	0
LaneUsage	L	TR		L	TR		L	T	R		LTR	

Results

Warrant 1: Eight-Hour Vehicular Volume	[ ]
1 A. Minimum Vehicular Volumes	[ ]
1 B. Interruption of Continuous Traffic	[ ]
1 80% Vehicular --and-- Interruption Volumes	[ ]
Warrant 2: Four-Hour Vehicular Volume	
2 A. Four-Hour Vehicular Volumes	[ ]
Warrant 3: Peak Hour	[ ]
3 A. Peak-Hour Conditions	[ ]
3 B. Peak-Hour Vehicular Volume Hours Met	[ ]
Warrant 4: Pedestrian Volume	[ ]
4 A. Four Hour Volumes	[ ]
4 B. One-Hour Volumes	[ ]
Warrant 5: School Crossing	[ ]
5 A. Student Volumes	[ ]
5 B. Gaps Same Period	[ ]
Warrant 6: Coordinated Signal System	
6 Degree of Platooning	[X]
Warrant 7: Crash Experience	[ ]
7 A. Adequate trials of alternatives	[ ]

7 B. Reported crashes [ ]
7 80% Volumes for Warrants 1A, 1B --or-- 4 [ ]

Warrant 8: Roadway Network [ ]
8 A. Weekday Volume [ ]
8 B. Weekend Volume [ ]

Warrant 9: Grade Crossing [ ]
9 A. Grade Crossing within 140 ft --and-- [ ]
9 B. Peak-Hour Vehicular Volumes [ ]

Summary

Hours	Major Volume	Minor Volume	Total Volume	Delay (Veh-hr)	1A 100%	1A 80%	1B 100%	1B 80%	2 100%	3A 100%	3B 100%
07-08	875	130	1020	0.0	No	No	No	Yes	No	No	No
08-09	0	0	0	0.0	No	No	No	No	No	No	No
09-10	0	0	0	0.0	No	No	No	No	No	No	No
10-11	0	0	0	0.0	No	No	No	No	No	No	No
11-12	0	0	0	0.0	No	No	No	No	No	No	No
12-13	0	0	0	0.0	No	No	No	No	No	No	No
13-14	0	0	0	0.0	No	No	No	No	No	No	No
14-15	0	0	0	0.0	No	No	No	No	No	No	No
15-16	0	0	0	0.0	No	No	No	No	No	No	No
16-17	810	260	1105	0.0	Yes	Yes	No	Yes	No	No	No
17-18	0	0	0	0.0	No	No	No	No	No	No	No
18-19	0	0	0	0.0	No	No	No	No	No	No	No
Total	1685	390	2125		1	1	0	2	0	0	0

Traffic Volumes (vph)

Eastbound			Westbound			Northbound			Southbound		
L	T	R	L	T	R	L	T	R	L	T	R
10	290	85	95	380	15	55	10	65	5	5	5
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
5	325	65	110	295	10	130	10	120	10	15	10
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0

Pedestrian Volumes and Gaps (Per Hour)

Volume	Gap	Volume	Gap	Volume	Gap	Volume	Gap
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0

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Delay	sec/veh	veh-hrs	sec/veh	veh-hrs	sec/veh	veh-hrs	sec/veh	veh-hrs
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

HCS7: MUTCD Signal Warrants Release 7.2

Analyst: HDR
Agency: HDR
Date: 5/16/2022
Project ID: Mitchell MTP
EW Street: SD37

Intersection: SD37 & Sanborn Blvd
Jurisdiction: SDDOT
Units: U.S. Customary
Analysis Year: 2045 Build
NS Street: Sanborn Boulevard

General Information

Major St. Speed (mph): 40
Nearest Signal (ft): 1115
Crashes per Yr: 0

Population: Not less than 10000
Coordinated Signal System: Y

School Crossing

Students in Highest Hour: 0
Adequate Gaps in Period: 0
Minutes in Period: 0

Roadway Network

Two Major Routes: 1
Weekend Count: 0
5-yr Growth Factor: 0

Geometry and Traffic

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	2	0	1	2	0	1	1	1	0	1	0
LaneUsage	L	TR		L	TR		L	T	R		LTR	

Results

Warrant 1: Eight-Hour Vehicular Volume	[ ]
1 A. Minimum Vehicular Volumes	[ ]
1 B. Interruption of Continuous Traffic	[ ]
1 80% Vehicular --and-- Interruption Volumes	[ ]
Warrant 2: Four-Hour Vehicular Volume	
2 A. Four-Hour Vehicular Volumes	[ ]
Warrant 3: Peak Hour	[ ]
3 A. Peak-Hour Conditions	[ ]
3 B. Peak-Hour Vehicular Volume Hours Met	[ ]
Warrant 4: Pedestrian Volume	[ ]
4 A. Four Hour Volumes	[ ]
4 B. One-Hour Volumes	[ ]
Warrant 5: School Crossing	[ ]
5 A. Student Volumes	[ ]
5 B. Gaps Same Period	[ ]
Warrant 6: Coordinated Signal System	
6 Degree of Platooning	[X]
Warrant 7: Crash Experience	[ ]
7 A. Adequate trials of alternatives	[ ]

7 B. Reported crashes [ ]
7 80% Volumes for Warrants 1A, 1B --or-- 4 [ ]

Warrant 8: Roadway Network [ ]
8 A. Weekday Volume [ ]
8 B. Weekend Volume [ ]

Warrant 9: Grade Crossing [ ]
9 A. Grade Crossing within 140 ft --and-- [ ]
9 B. Peak-Hour Vehicular Volumes [ ]

Summary

Hours	Major Volume	Minor Volume	Total Volume	Delay (Veh-hr)	1A 100%	1A 80%	1B 100%	1B 80%	2 100%	3A 100%	3B 100%
07-08	1140	175	1345	0.0	No	Yes	Yes	Yes	Yes	No	No
08-09	0	0	0	0.0	No	No	No	No	No	No	No
09-10	0	0	0	0.0	No	No	No	No	No	No	No
10-11	0	0	0	0.0	No	No	No	No	No	No	No
11-12	0	0	0	0.0	No	No	No	No	No	No	No
12-13	0	0	0	0.0	No	No	No	No	No	No	No
13-14	0	0	0	0.0	No	No	No	No	No	No	No
14-15	0	0	0	0.0	No	No	No	No	No	No	No
15-16	0	0	0	0.0	No	No	No	No	No	No	No
16-17	1065	340	1455	0.0	Yes	Yes	Yes	Yes	Yes	No	No
17-18	0	0	0	0.0	No	No	No	No	No	No	No
18-19	0	0	0	0.0	No	No	No	No	No	No	No
Total	2205	515	2800		1	2	2	2	2	0	0

Traffic Volumes (vph)

Eastbound			Westbound			Northbound			Southbound		
L	T	R	L	T	R	L	T	R	L	T	R
15	380	110	125	490	20	75	15	85	10	10	10
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
10	415	85	145	395	15	165	15	160	15	20	15
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0

Pedestrian Volumes and Gaps (Per Hour)

Volume	Gap	Volume	Gap	Volume	Gap	Volume	Gap
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0

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Delay	sec/veh	veh-hrs	sec/veh	veh-hrs	sec/veh	veh-hrs	sec/veh	veh-hrs
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

23rd Avenue Corridor

Ohlman Street & 23rd Avenue Intersection:

2032 Build Condition AM/PM (TWSC)
2032 Build Condition AM/PM (Roundabout)
2045 Build Condition AM/PM (TWSC)
2045 Build Condition AM/PM (Signal)
2045 Build Condition AM/PM (Roundabout)
2032 Build Condition Signal Warrants
2045 Build Condition Signal Warrants

SD37 & 23rd Avenue Intersection:

2032 Build Condition AM/PM (TWSC)
2032 Build Condition AM/PM (Signal)
2045 Build Condition AM/PM (Signal)
2032 Build Condition Signal Warrants
2045 Build Condition Signal Warrants

Intersection	
Int Delay, s/veh	9.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	10	120	25	55	50	45	20	35	60	155	125	25
Future Vol, veh/h	10	120	25	55	50	45	20	35	60	155	125	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
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	100	-	-	100	-	-	100	-	-	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	0	3	0	0	3	0	0	0	0	0	0	0
Mvmt Flow	11	133	28	61	56	50	22	39	67	172	139	28

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	106	0	0	161	0	0	456	397	147	425	386	81
Stage 1	-	-	-	-	-	-	169	169	-	203	203	-
Stage 2	-	-	-	-	-	-	287	228	-	222	183	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1498	-	-	1430	-	-	518	544	905	543	551	985
Stage 1	-	-	-	-	-	-	838	763	-	804	737	-
Stage 2	-	-	-	-	-	-	725	719	-	785	752	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1498	-	-	1430	-	-	386	517	905	456	523	985
Mov Cap-2 Maneuver	-	-	-	-	-	-	386	517	-	456	523	-
Stage 1	-	-	-	-	-	-	832	758	-	798	705	-
Stage 2	-	-	-	-	-	-	542	688	-	685	747	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.5	2.8	11.7	15.8
HCM LOS			B	C

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	386	709	1498	-	-	1430	-	-	456	567
HCM Lane V/C Ratio	0.058	0.149	0.007	-	-	0.043	-	-	0.378	0.294
HCM Control Delay (s)	14.9	11	7.4	-	-	7.6	-	-	17.6	14
HCM Lane LOS	B	B	A	-	-	A	-	-	C	B
HCM 95th %tile Q(veh)	0.2	0.5	0	-	-	0.1	-	-	1.7	1.2

Intersection	
Int Delay, s/veh	9.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	25	65	25	70	95	140	25	120	90	85	75	15
Future Vol, veh/h	25	65	25	70	95	140	25	120	90	85	75	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
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	100	-	-	100	-	-	100	-	-	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	0	2	0	7	4	0	0	8	0	0	7	0
Mvmt Flow	28	72	28	78	106	156	28	133	100	94	83	17

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	262	0	0	100	0	0	532	560	86	599	496	184
Stage 1	-	-	-	-	-	-	142	142	-	340	340	-
Stage 2	-	-	-	-	-	-	390	418	-	259	156	-
Critical Hdwy	4.1	-	-	4.17	-	-	7.1	6.58	6.2	7.1	6.57	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.58	-	6.1	5.57	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.58	-	6.1	5.57	-
Follow-up Hdwy	2.2	-	-	2.263	-	-	3.5	4.072	3.3	3.5	4.063	3.3
Pot Cap-1 Maneuver	1314	-	-	1462	-	-	461	429	978	416	468	864
Stage 1	-	-	-	-	-	-	866	768	-	679	630	-
Stage 2	-	-	-	-	-	-	638	580	-	750	759	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1314	-	-	1462	-	-	364	398	978	262	434	864
Mov Cap-2 Maneuver	-	-	-	-	-	-	364	398	-	262	434	-
Stage 1	-	-	-	-	-	-	848	752	-	665	597	-
Stage 2	-	-	-	-	-	-	510	549	-	542	743	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.7	1.7	16.8	20.3
HCM LOS			C	C

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	364	534	1314	-	-	1462	-	-	262	473
HCM Lane V/C Ratio	0.076	0.437	0.021	-	-	0.053	-	-	0.36	0.211
HCM Control Delay (s)	15.7	16.9	7.8	-	-	7.6	-	-	26.3	14.6
HCM Lane LOS	C	C	A	-	-	A	-	-	D	B
HCM 95th %tile Q(veh)	0.2	2.2	0.1	-	-	0.2	-	-	1.6	0.8

HCS7 Roundabouts Report

General Information

Analyst	HDR
Agency or Co.	HDR
Date Performed	5/7/2022
Analysis Year	2032 Future Conditions
Time Analyzed	AM Peak
Project Description	Mitchell MTP

Site Information

Intersection	Ohlman Street & 23rd Avenue
E/W Street Name	23rd Avenue
N/S Street Name	Ohlman Street
Analysis Time Period (hrs)	0.25
Peak Hour Factor	0.90
Jurisdiction	City of Mitchell

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0
Lane Assignment			LTR				LTR				LTR				LTR	
Volume (V), veh/h	0	10	120	25	0	55	50	45	0	20	35	60	0	155	125	25
Percent Heavy Vehicles, %	0	0	3	0	0	0	3	0	0	0	0	0	0	0	0	0
Flow Rate (v_{PCE}), pc/h	0	11	137	28	0	61	57	50	0	22	39	67	0	172	139	28
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				1				1			
Pedestrians Crossing, p/h	0				0				0				0			

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)		4.9763			4.9763			4.9763			4.9763	
Follow-Up Headway (s)		2.6087			2.6087			2.6087			2.6087	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h		176			168			128			339	
Entry Volume veh/h		172			166			128			339	
Circulating Flow (v_c), pc/h		372			72			320			140	
Exiting Flow (v_{ex}), pc/h		376			107			100			228	
Capacity (c_{pce}), pc/h		944			1282			996			1196	
Capacity (c), veh/h		923			1270			996			1196	
v/c Ratio (x)		0.19			0.13			0.13			0.28	

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		5.7			3.9			4.8			5.6	
Lane LOS		A			A			A			A	
95% Queue, veh		0.7			0.5			0.4			1.2	
Approach Delay, s/veh	5.7			3.9			4.8			5.6		
Approach LOS	A			A			A			A		
Intersection Delay, s/veh | LOS	5.2						A					

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HCS7 Roundabouts Report

General Information		Site Information	
Analyst	HDR	Intersection	Ohlman Street & 23rd Avenue
Agency or Co.	HDR	E/W Street Name	23rd Avenue
Date Performed	5/7/2022	N/S Street Name	Ohlman Street
Analysis Year	2032 Future Conditions	Analysis Time Period (hrs)	0.25
Time Analyzed	PM Peak	Peak Hour Factor	0.90
Project Description	Mitchell MTP	Jurisdiction	City of Mitchell

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0
Lane Assignment			LTR				LTR				LTR				LTR	
Volume (V), veh/h	0	25	65	25	0	70	95	140	0	25	120	90	0	85	75	15
Percent Heavy Vehicles, %	0	0	2	0	0	7	4	0	0	0	8	0	0	0	7	0
Flow Rate (v_{PCE}), pc/h	0	28	74	28	0	83	110	156	0	28	144	100	0	94	89	17
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				1				1			
Pedestrians Crossing, p/h	0				0				0				0			

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)		4.9763			4.9763			4.9763			4.9763	
Follow-Up Headway (s)		2.6087			2.6087			2.6087			2.6087	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h		130			349			272			200	
Entry Volume veh/h		129			339			261			194	
Circulating Flow (v_c), pc/h	266			200			196			221		
Exiting Flow (v_{ex}), pc/h	268			155			328			200		
Capacity (c_{pce}), pc/h		1052			1125			1130			1101	
Capacity (c), veh/h		1040			1094			1086			1069	
v/c Ratio (x)		0.12			0.31			0.24			0.18	

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		4.6			6.3			5.6			5.0	
Lane LOS		A			A			A			A	
95% Queue, veh		0.4			1.3			0.9			0.7	
Approach Delay, s/veh	4.6			6.3			5.6			5.0		
Approach LOS	A			A			A			A		
Intersection Delay, s/veh | LOS	5.6						A					

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Intersection	
Int Delay, s/veh	23.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	15	160	40	95	75	65	30	50	115	220	175	35
Future Vol, veh/h	15	160	40	95	75	65	30	50	115	220	175	35
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
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	100	-	-	100	-	-	100	-	-	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	0	3	0	0	3	0	0	0	0	0	0	0
Mvmt Flow	17	178	44	106	83	72	33	56	128	244	194	39

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	155	0	0	222	0	0	682	601	200	657	587	119
Stage 1	-	-	-	-	-	-	234	234	-	331	331	-
Stage 2	-	-	-	-	-	-	448	367	-	326	256	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1438	-	-	1359	-	-	367	417	846	381	425	938
Stage 1	-	-	-	-	-	-	774	715	-	687	649	-
Stage 2	-	-	-	-	-	-	594	626	-	691	699	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1438	-	-	1359	-	-	200	380	846	268	387	938
Mov Cap-2 Maneuver	-	-	-	-	-	-	200	380	-	268	387	-
Stage 1	-	-	-	-	-	-	765	706	-	679	598	-
Stage 2	-	-	-	-	-	-	354	577	-	534	691	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.5	3.2	15.3	49.9
HCM LOS			C	E

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	200	617	1438	-	-	1359	-	-	268	429
HCM Lane V/C Ratio	0.167	0.297	0.012	-	-	0.078	-	-	0.912	0.544
HCM Control Delay (s)	26.6	13.3	7.5	-	-	7.9	-	-	75.5	23
HCM Lane LOS	D	B	A	-	-	A	-	-	F	C
HCM 95th %tile Q(veh)	0.6	1.2	0	-	-	0.3	-	-	8.2	3.2

Intersection	
Int Delay, s/veh	59.8

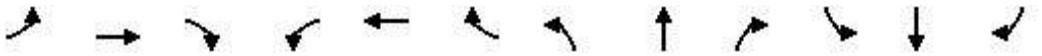
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	35	90	35	125	125	200	35	170	150	115	100	25
Future Vol, veh/h	35	90	35	125	125	200	35	170	150	115	100	25
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	100	-	-	100	-	-	100	-	-	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	0	2	0	7	4	0	0	8	0	0	7	0
Mvmt Flow	39	100	39	139	139	222	39	189	167	128	111	28

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	361	0	0	139	0	0	796	837	120	904	745	250
Stage 1	-	-	-	-	-	-	198	198	-	528	528	-
Stage 2	-	-	-	-	-	-	598	639	-	376	217	-
Critical Hdwy	4.1	-	-	4.17	-	-	7.1	6.58	6.2	7.1	6.57	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.58	-	6.1	5.57	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.58	-	6.1	5.57	-
Follow-up Hdwy	2.2	-	-	2.263	-	-	3.5	4.072	3.3	3.5	4.063	3.3
Pot Cap-1 Maneuver	1209	-	-	1414	-	-	307	296	937	260	336	794
Stage 1	-	-	-	-	-	-	808	726	-	538	520	-
Stage 2	-	-	-	-	-	-	492	461	-	649	714	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1209	-	-	1414	-	-	190	258	937	~ 79	293	794
Mov Cap-2 Maneuver	-	-	-	-	-	-	190	258	-	~ 79	293	-
Stage 1	-	-	-	-	-	-	782	703	-	521	469	-
Stage 2	-	-	-	-	-	-	327	416	-	378	691	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.8	2.2	55.6	212.6
HCM LOS			F	F

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	190	391	1209	-	-	1414	-	-	79	335
HCM Lane V/C Ratio	0.205	0.909	0.032	-	-	0.098	-	-	1.617	0.415
HCM Control Delay (s)	28.8	58.5	8.1	-	-	7.8	-	-	$ 418.6	23.1
HCM Lane LOS	D	F	A	-	-	A	-	-	F	C
HCM 95th %tile Q(veh)	0.7	9.5	0.1	-	-	0.3	-	-	10.6	2

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon



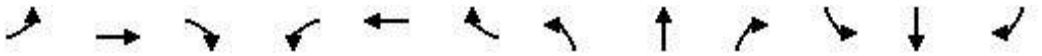
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	15	160	40	95	75	65	30	50	115	220	175	35
Future Volume (veh/h)	15	160	40	95	75	65	30	50	115	220	175	35
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1800	1758	1800	1800	1758	1800	1800	1800	1800	1800	1800	1800
Adj Flow Rate, veh/h	17	178	44	106	83	72	33	56	128	244	194	39
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	0	3	0	0	3	0	0	0	0	0	0	0
Cap, veh/h	389	285	71	354	226	196	387	85	194	453	410	82
Arrive On Green	0.02	0.21	0.21	0.07	0.26	0.26	0.04	0.17	0.17	0.14	0.28	0.28
Sat Flow, veh/h	1714	1361	336	1714	869	754	1714	487	1113	1714	1455	292
Grp Volume(v), veh/h	17	0	222	106	0	155	33	0	184	244	0	233
Grp Sat Flow(s),veh/h/ln	1714	0	1697	1714	0	1622	1714	0	1600	1714	0	1747
Q Serve(g_s), s	0.4	0.0	6.8	2.7	0.0	4.5	0.9	0.0	6.1	6.2	0.0	6.3
Cycle Q Clear(g_c), s	0.4	0.0	6.8	2.7	0.0	4.5	0.9	0.0	6.1	6.2	0.0	6.3
Prop In Lane	1.00		0.20	1.00		0.46	1.00		0.70	1.00		0.17
Lane Grp Cap(c), veh/h	389	0	356	354	0	422	387	0	279	453	0	493
V/C Ratio(X)	0.04	0.00	0.62	0.30	0.00	0.37	0.09	0.00	0.66	0.54	0.00	0.47
Avail Cap(c_a), veh/h	506	0	445	427	0	465	475	0	405	537	0	626
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	17.2	0.0	20.6	16.2	0.0	17.3	18.2	0.0	22.0	14.7	0.0	17.0
Incr Delay (d2), s/veh	0.0	0.0	1.8	0.5	0.0	0.5	0.1	0.0	2.6	1.0	0.0	0.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.2	0.0	2.6	1.0	0.0	1.5	0.3	0.0	2.3	2.2	0.0	2.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	17.2	0.0	22.4	16.7	0.0	17.9	18.3	0.0	24.7	15.7	0.0	17.7
LnGrp LOS	B	A	C	B	A	B	B	A	C	B	A	B
Approach Vol, veh/h		239			261			217			477	
Approach Delay, s/veh		22.0			17.4			23.7			16.7	
Approach LOS		C			B			C			B	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	14.2	15.5	10.6	17.0	8.0	21.6	7.7	19.9
Change Period (Y+Rc), s	6.0	5.5	6.5	5.0	6.0	5.5	6.5	5.0
Max Green Setting (Gmax), s	11.0	14.5	6.5	15.0	5.0	20.5	5.1	16.4
Max Q Clear Time (g_c+I1), s	8.2	8.1	4.7	8.8	2.9	8.3	2.4	6.5
Green Ext Time (p_c), s	0.2	0.5	0.0	0.6	0.0	1.0	0.0	0.5

Intersection Summary	
HCM 6th Ctrl Delay	19.2
HCM 6th LOS	B

HCM 6th Signalized Intersection Summary
9: Ohlman Street & 23rd Avenue

06/13/2022



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	35	90	35	125	125	200	35	170	150	115	100	25
Future Volume (veh/h)	35	90	35	125	125	200	35	170	150	115	100	25
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1800	1772	1800	1702	1744	1800	1800	1688	1800	1800	1702	1800
Adj Flow Rate, veh/h	39	100	39	139	139	222	39	189	167	128	111	28
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	0	2	0	7	4	0	0	8	0	0	7	0
Cap, veh/h	217	252	98	421	156	250	485	222	197	296	401	101
Arrive On Green	0.04	0.21	0.21	0.09	0.26	0.26	0.04	0.27	0.27	0.08	0.31	0.31
Sat Flow, veh/h	1714	1213	473	1621	605	966	1714	826	730	1714	1311	331
Grp Volume(v), veh/h	39	0	139	139	0	361	39	0	356	128	0	139
Grp Sat Flow(s),veh/h/ln	1714	0	1687	1621	0	1570	1714	0	1556	1714	0	1642
Q Serve(g_s), s	1.1	0.0	4.6	4.2	0.0	14.2	1.0	0.0	13.9	3.4	0.0	4.1
Cycle Q Clear(g_c), s	1.1	0.0	4.6	4.2	0.0	14.2	1.0	0.0	13.9	3.4	0.0	4.1
Prop In Lane	1.00		0.28	1.00		0.61	1.00		0.47	1.00		0.20
Lane Grp Cap(c), veh/h	217	0	351	421	0	406	485	0	419	296	0	502
V/C Ratio(X)	0.18	0.00	0.40	0.33	0.00	0.89	0.08	0.00	0.85	0.43	0.00	0.28
Avail Cap(c_a), veh/h	286	0	404	470	0	440	552	0	579	300	0	611
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	19.6	0.0	22.0	17.5	0.0	22.9	15.8	0.0	22.3	16.6	0.0	16.9
Incr Delay (d2), s/veh	0.4	0.0	0.7	0.5	0.0	18.7	0.1	0.0	8.6	1.0	0.0	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.4	0.0	1.7	1.5	0.0	6.7	0.4	0.0	5.7	1.3	0.0	1.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	20.0	0.0	22.7	18.0	0.0	41.6	15.8	0.0	30.8	17.6	0.0	17.2
LnGrp LOS	C	A	C	B	A	D	B	A	C	B	A	B
Approach Vol, veh/h		178			500			395			267	
Approach Delay, s/veh		22.1			35.1			29.3			17.4	
Approach LOS		C			D			C			B	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	10.8	22.8	12.3	18.4	8.5	25.1	9.0	21.6
Change Period (Y+Rc), s	6.0	5.5	6.5	5.0	6.0	5.5	6.5	5.0
Max Green Setting (Gmax), s	5.0	23.9	7.7	15.4	5.0	23.9	5.1	18.0
Max Q Clear Time (g_c+I1), s	5.4	15.9	6.2	6.6	3.0	6.1	3.1	16.2
Green Ext Time (p_c), s	0.0	1.4	0.0	0.4	0.0	0.6	0.0	0.4

Intersection Summary	
HCM 6th Ctrl Delay	28.1
HCM 6th LOS	C

HCS7 Roundabouts Report

General Information

Analyst	HDR
Agency or Co.	HDR
Date Performed	5/7/2022
Analysis Year	2045 Future Conditions
Time Analyzed	AM Peak
Project Description	Mitchell MTP

Site Information

Intersection	Ohlman Street & 23rd Avenue
E/W Street Name	23rd Avenue
N/S Street Name	Ohlman Street
Analysis Time Period (hrs)	0.25
Peak Hour Factor	0.90
Jurisdiction	City of Mitchell

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0
Lane Assignment			LTR				LTR				LTR				LTR	
Volume (V), veh/h	0	15	160	40	0	95	75	65	0	30	50	115	0	220	175	35
Percent Heavy Vehicles, %	0	0	3	0	0	0	3	0	0	0	0	0	0	0	0	0
Flow Rate (v_{PCE}), pc/h	0	17	183	44	0	106	86	72	0	33	56	128	0	244	194	39
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				1				1			
Pedestrians Crossing, p/h	0				0				0				0			

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)		4.9763			4.9763			4.9763			4.9763	
Follow-Up Headway (s)		2.6087			2.6087			2.6087			2.6087	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h		244			264			217			477	
Entry Volume veh/h		239			261			217			477	
Circulating Flow (v_c), pc/h		544			106			444			225	
Exiting Flow (v_{ex}), pc/h		555			158			145			344	
Capacity (c_{pce}), pc/h		792			1239			877			1097	
Capacity (c), veh/h		775			1227			877			1097	
v/c Ratio (x)		0.31			0.21			0.25			0.43	

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		8.2			4.8			6.7			8.0	
Lane LOS		A			A			A			A	
95% Queue, veh		1.3			0.8			1.0			2.2	
Approach Delay, s/veh	8.2			4.8			6.7			8.0		
Approach LOS	A			A			A			A		
Intersection Delay, s/veh | LOS	7.1						A					

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HCS7 Roundabouts Report

General Information

Analyst	HDR
Agency or Co.	HDR
Date Performed	5/7/2022
Analysis Year	2045 Future Conditions
Time Analyzed	PM Peak
Project Description	Mitchell MTP

Site Information

Intersection	Ohlman Street & 23rd Avenue
E/W Street Name	23rd Avenue
N/S Street Name	Ohlman Street
Analysis Time Period (hrs)	0.25
Peak Hour Factor	0.90
Jurisdiction	City of Mitchell

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0
Lane Assignment			LTR				LTR				LTR				LTR	
Volume (V), veh/h	0	35	90	35	0	125	125	200	0	35	170	150	0	115	100	25
Percent Heavy Vehicles, %	0	0	2	0	0	7	4	0	0	0	8	0	0	0	7	0
Flow Rate (v_{PCE}), pc/h	0	39	102	39	0	149	144	222	0	39	204	167	0	128	119	28
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				1				1			
Pedestrians Crossing, p/h	0				0				0				0			

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)		4.9763			4.9763			4.9763			4.9763	
Follow-Up Headway (s)		2.6087			2.6087			2.6087			2.6087	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h		180			515			410			275	
Entry Volume veh/h		178			500			395			267	
Circulating Flow (v_c), pc/h		396			282			269			332	
Exiting Flow (v_{ex}), pc/h		397			211			465			307	
Capacity (c_{pce}), pc/h		921			1035			1049			984	
Capacity (c), veh/h		911			1004			1010			956	
v/c Ratio (x)		0.20			0.50			0.39			0.28	

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		5.9			9.6			7.8			6.6	
Lane LOS		A			A			A			A	
95% Queue, veh		0.7			2.8			1.9			1.1	
Approach Delay, s/veh	5.9			9.6			7.8			6.6		
Approach LOS	A			A			A			A		
Intersection Delay, s/veh | LOS	8.0						A					

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HCS7: MUTCD Signal Warrants Release 7.2

Analyst: HDR
Agency: HDR
Date: 5/16/2022
Project ID: Mitchell MTP
EW Street: 23rd Avenue

Intersection: Ohlman St & 23rd Ave
Jurisdiction: SDDOT
Units: U.S. Customary
Analysis Year: 2032 Build
NS Street: Ohlman Street

General Information

Major St. Speed (mph): 35
Nearest Signal (ft): 0
Crashes per Yr: 0

Population: Not less than 10000
Coordinated Signal System: N

School Crossing

Students in Highest Hour: 0
Adequate Gaps in Period: 0
Minutes in Period: 0

Roadway Network

Two Major Routes: 1
Weekend Count: 0
5-yr Growth Factor: 0

Geometry and Traffic

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	1	0	1	1	0	1	1	0	1	1	0
LaneUsage	L	TR		L	TR		L	TR		L	TR	

Results

Warrant 1: Eight-Hour Vehicular Volume	[ ]
1 A. Minimum Vehicular Volumes	[ ]
1 B. Interruption of Continuous Traffic	[ ]
1 80% Vehicular --and-- Interruption Volumes	[ ]
Warrant 2: Four-Hour Vehicular Volume	
2 A. Four-Hour Vehicular Volumes	[ ]
Warrant 3: Peak Hour	[ ]
3 A. Peak-Hour Conditions	[ ]
3 B. Peak-Hour Vehicular Volume Hours Met	[ ]
Warrant 4: Pedestrian Volume	[ ]
4 A. Four Hour Volumes	[ ]
4 B. One-Hour Volumes	[ ]
Warrant 5: School Crossing	[ ]
5 A. Student Volumes	[ ]
5 B. Gaps Same Period	[ ]
Warrant 6: Coordinated Signal System	
6 Degree of Platooning	[ ]
Warrant 7: Crash Experience	[ ]
7 A. Adequate trials of alternatives	[ ]

7 B. Reported crashes [ ]
7 80% Volumes for Warrants 1A, 1B --or-- 4 [ ]

Warrant 8: Roadway Network [ ]
8 A. Weekday Volume [ ]
8 B. Weekend Volume [ ]

Warrant 9: Grade Crossing [ ]
9 A. Grade Crossing within 140 ft --and-- [ ]
9 B. Peak-Hour Vehicular Volumes [ ]

Summary

Hours	Major Volume	Minor Volume	Total Volume	Delay (Veh-hr)	1A 100%	1A 80%	1B 100%	1B 80%	2 100%	3A 100%	3B 100%
07-08	420	155	725	0.0	No	No	No	No	No	No	No
08-09	0	0	0	0.0	No	No	No	No	No	No	No
09-10	0	0	0	0.0	No	No	No	No	No	No	No
10-11	0	0	0	0.0	No	No	No	No	No	No	No
11-12	0	0	0	0.0	No	No	No	No	No	No	No
12-13	0	0	0	0.0	No	No	No	No	No	No	No
13-14	0	0	0	0.0	No	No	No	No	No	No	No
14-15	0	0	0	0.0	No	No	No	No	No	No	No
15-16	0	0	0	0.0	No	No	No	No	No	No	No
16-17	410	305	830	0.0	No	No	No	No	No	No	No
17-18	0	0	0	0.0	No	No	No	No	No	No	No
18-19	0	0	0	0.0	No	No	No	No	No	No	No
Total	830	460	1555		0	0	0	0	0	0	0

Traffic Volumes (vph)

Eastbound			Westbound			Northbound			Southbound		
L	T	R	L	T	R	L	T	R	L	T	R
10	120	25	55	50	45	20	35	60	155	125	25
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
25	65	25	70	95	140	25	120	90	85	75	15
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0

Pedestrian Volumes and Gaps (Per Hour)

Volume	Gap	Volume	Gap	Volume	Gap	Volume	Gap
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0

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Delay	sec/veh	veh-hrs	sec/veh	veh-hrs	sec/veh	veh-hrs	sec/veh	veh-hrs
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

HCS7: MUTCD Signal Warrants Release 7.2

Analyst: HDR
Agency: HDR
Date: 5/16/2022
Project ID: Mitchell MTP
EW Street: 23rd Avenue

Intersection: Ohlman St & 23rd Ave
Jurisdiction: SDDOT
Units: U.S. Customary
Analysis Year: 2045 Build
NS Street: Ohlman Street

General Information

Major St. Speed (mph): 35
Nearest Signal (ft): 0
Crashes per Yr: 0

Population: Not less than 10000
Coordinated Signal System: N

School Crossing

Students in Highest Hour: 0
Adequate Gaps in Period: 0
Minutes in Period: 0

Roadway Network

Two Major Routes: 1
Weekend Count: 0
5-yr Growth Factor: 0

Geometry and Traffic

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	1	0	1	1	0	1	1	0	1	1	0
LaneUsage	L	TR		L	TR		L	TR		L	TR	

Results

Warrant 1: Eight-Hour Vehicular Volume	[ ]
1 A. Minimum Vehicular Volumes	[ ]
1 B. Interruption of Continuous Traffic	[ ]
1 80% Vehicular --and-- Interruption Volumes	[ ]
Warrant 2: Four-Hour Vehicular Volume	
2 A. Four-Hour Vehicular Volumes	[ ]
Warrant 3: Peak Hour	[ ]
3 A. Peak-Hour Conditions	[ ]
3 B. Peak-Hour Vehicular Volume Hours Met	[ ]
Warrant 4: Pedestrian Volume	[ ]
4 A. Four Hour Volumes	[ ]
4 B. One-Hour Volumes	[ ]
Warrant 5: School Crossing	[ ]
5 A. Student Volumes	[ ]
5 B. Gaps Same Period	[ ]
Warrant 6: Coordinated Signal System	
6 Degree of Platooning	[ ]
Warrant 7: Crash Experience	[ ]
7 A. Adequate trials of alternatives	[ ]

7 B. Reported crashes [ ]
7 80% Volumes for Warrants 1A, 1B --or-- 4 [ ]

Warrant 8: Roadway Network [ ]
8 A. Weekday Volume [ ]
8 B. Weekend Volume [ ]

Warrant 9: Grade Crossing [ ]
9 A. Grade Crossing within 140 ft --and-- [ ]
9 B. Peak-Hour Vehicular Volumes [ ]

Summary

Hours	Major Volume	Minor Volume	Total Volume	Delay (Veh-hr)	1A 100%	1A 80%	1B 100%	1B 80%	2 100%	3A 100%	3B 100%
07-08	450	430	1075	0.0	No	No	No	No	No	No	No
08-09	0	0	0	0.0	No	No	No	No	No	No	No
09-10	0	0	0	0.0	No	No	No	No	No	No	No
10-11	0	0	0	0.0	No	No	No	No	No	No	No
11-12	0	0	0	0.0	No	No	No	No	No	No	No
12-13	0	0	0	0.0	No	No	No	No	No	No	No
13-14	0	0	0	0.0	No	No	No	No	No	No	No
14-15	0	0	0	0.0	No	No	No	No	No	No	No
15-16	0	0	0	0.0	No	No	No	No	No	No	No
16-17	610	355	1205	0.0	Yes	Yes	No	No	No	No	No
17-18	0	0	0	0.0	No	No	No	No	No	No	No
18-19	0	0	0	0.0	No	No	No	No	No	No	No
Total	1060	785	2280		1	1	0	0	0	0	0

Traffic Volumes (vph)

Eastbound			Westbound			Northbound			Southbound		
L	T	R	L	T	R	L	T	R	L	T	R
15	160	40	95	75	65	30	50	115	220	175	35
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
35	90	35	125	125	200	35	170	150	115	100	25
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0

Pedestrian Volumes and Gaps (Per Hour)

Volume	Gap	Volume	Gap	Volume	Gap	Volume	Gap
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0

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Delay	sec/veh	veh-hrs	sec/veh	veh-hrs	sec/veh	veh-hrs	sec/veh	veh-hrs
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Intersection	
Int Delay, s/veh	6.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	25	40	240	15	25	30	75	170	30	50	400	50
Future Vol, veh/h	25	40	240	15	25	30	75	170	30	50	400	50
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	100	-	100	100	-	-	100	-	-	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	28	44	267	17	28	33	83	189	33	56	444	56

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	859	972	250	728	984	111	500	0	0	222	0	0
Stage 1	584	584	-	372	372	-	-	-	-	-	-	-
Stage 2	275	388	-	356	612	-	-	-	-	-	-	-
Critical Hdwy	7.54	6.54	6.94	7.54	6.54	6.94	4.14	-	-	4.14	-	-
Critical Hdwy Stg 1	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.52	4.02	3.32	3.52	4.02	3.32	2.22	-	-	2.22	-	-
Pot Cap-1 Maneuver	250	251	750	311	247	921	1060	-	-	1344	-	-
Stage 1	465	496	-	621	617	-	-	-	-	-	-	-
Stage 2	708	607	-	634	482	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	199	222	750	155	218	921	1060	-	-	1344	-	-
Mov Cap-2 Maneuver	199	222	-	155	218	-	-	-	-	-	-	-
Stage 1	429	475	-	573	569	-	-	-	-	-	-	-
Stage 2	598	560	-	355	462	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	15.2	19.6	2.4	0.8
HCM LOS	C	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	EBLn3	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	1060	-	-	199	222	750	155	374	1344	-	-
HCM Lane V/C Ratio	0.079	-	-	0.14	0.2	0.356	0.108	0.163	0.041	-	-
HCM Control Delay (s)	8.7	-	-	26	25.2	12.4	31	16.5	7.8	-	-
HCM Lane LOS	A	-	-	D	D	B	D	C	A	-	-
HCM 95th %tile Q(veh)	0.3	-	-	0.5	0.7	1.6	0.4	0.6	0.1	-	-

Intersection	
Int Delay, s/veh	30.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	55	35	170	30	55	40	215	415	40	25	425	40
Future Vol, veh/h	55	35	170	30	55	40	215	415	40	25	425	40
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	100	-	100	100	-	-	100	-	-	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	61	39	189	33	61	44	239	461	44	28	472	44

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1289	1533	258	1273	1533	253	516	0	0	505	0	0
Stage 1	550	550	-	961	961	-	-	-	-	-	-	-
Stage 2	739	983	-	312	572	-	-	-	-	-	-	-
Critical Hdwy	7.54	6.54	6.94	7.54	6.54	6.94	4.14	-	-	4.14	-	-
Critical Hdwy Stg 1	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.52	4.02	3.32	3.52	4.02	3.32	2.22	-	-	2.22	-	-
Pot Cap-1 Maneuver	121	115	741	124	115	746	1046	-	-	1056	-	-
Stage 1	487	514	-	275	333	-	-	-	-	-	-	-
Stage 2	375	325	-	673	502	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	~ 40	86	741	49	86	746	1046	-	-	1056	-	-
Mov Cap-2 Maneuver	~ 40	86	-	49	86	-	-	-	-	-	-	-
Stage 1	376	500	-	212	257	-	-	-	-	-	-	-
Stage 2	207	251	-	450	488	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	121.5	108.5	3	0.4
HCM LOS	F	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	EBLn3	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	1046	-	-	40	86	741	49	137	1056	-	-
HCM Lane V/C Ratio	0.228	-	-	1.528	0.452	0.255	0.68	0.77	0.026	-	-
HCM Control Delay (s)	9.5	-	-	$ 489.4	77.6	11.5	172.9	88.2	8.5	-	-
HCM Lane LOS	A	-	-	F	F	B	F	F	A	-	-
HCM 95th %tile Q(veh)	0.9	-	-	6.3	1.9	1	2.7	4.6	0.1	-	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

HCM 6th Signalized Intersection Summary
15: SD37 & 23rd Avenue

06/13/2022

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	25	40	240	15	25	30	75	170	30	50	400	50
Future Volume (veh/h)	25	40	240	15	25	30	75	170	30	50	400	50
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1772	1772	1772	1772	1772	1772	1772	1772	1772	1772	1772	1772
Adj Flow Rate, veh/h	28	44	267	17	28	33	83	189	33	56	444	56
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	362	295	344	310	123	145	439	1041	179	572	1055	132
Arrive On Green	0.04	0.17	0.17	0.02	0.17	0.17	0.06	0.36	0.36	0.05	0.35	0.35
Sat Flow, veh/h	1688	1772	1502	1688	741	874	1688	2874	493	1688	3010	378
Grp Volume(v), veh/h	28	44	267	17	0	61	83	109	113	56	247	253
Grp Sat Flow(s),veh/h/ln	1688	1772	1502	1688	0	1615	1688	1683	1683	1688	1683	1704
Q Serve(g_s), s	0.0	1.3	5.6	0.0	0.0	2.0	1.8	2.7	2.7	1.2	6.7	6.8
Cycle Q Clear(g_c), s	0.0	1.3	5.6	0.0	0.0	2.0	1.8	2.7	2.7	1.2	6.7	6.8
Prop In Lane	1.00		1.00	1.00		0.54	1.00		0.29	1.00		0.22
Lane Grp Cap(c), veh/h	362	295	344	310	0	269	439	610	610	572	590	597
V/C Ratio(X)	0.08	0.15	0.78	0.05	0.00	0.23	0.19	0.18	0.18	0.10	0.42	0.42
Avail Cap(c_a), veh/h	440	295	344	416	0	296	516	610	610	628	590	597
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	0.97	0.97	0.97	1.00	1.00	1.00
Uniform Delay (d), s/veh	21.1	21.4	7.5	21.2	0.0	21.7	11.3	13.0	13.1	11.2	14.8	14.9
Incr Delay (d2), s/veh	0.1	0.2	10.7	0.1	0.0	0.4	0.2	0.6	0.6	0.1	2.2	2.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.3	0.5	3.4	0.2	0.0	0.7	0.6	1.0	1.0	0.4	2.6	2.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	21.1	21.6	18.2	21.3	0.0	22.1	11.5	13.7	13.7	11.2	17.0	17.0
LnGrp LOS	C	C	B	C	A	C	B	B	B	B	B	B
Approach Vol, veh/h		339			78			305			556	
Approach Delay, s/veh		18.9			21.9			13.1			16.4	
Approach LOS		B			C			B			B	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	9.5	26.7	7.7	16.0	10.2	26.0	8.7	15.0
Change Period (Y+Rc), s	6.5	5.0	6.5	6.0	6.5	5.0	6.5	5.0
Max Green Setting (Gmax), s	5.0	16.0	5.0	10.0	6.5	14.5	5.0	11.0
Max Q Clear Time (g_c+I1), s	3.2	4.7	2.0	7.6	3.8	8.8	2.0	4.0
Green Ext Time (p_c), s	0.0	0.8	0.0	0.3	0.0	1.4	0.0	0.1

Intersection Summary	
HCM 6th Ctrl Delay	16.6
HCM 6th LOS	B

HCM 6th Signalized Intersection Summary
15: SD37 & 23rd Avenue

06/13/2022



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	55	35	170	30	55	40	215	415	40	25	425	40
Future Volume (veh/h)	55	35	170	30	55	40	215	415	40	25	425	40
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1772	1772	1772	1772	1772	1772	1772	1772	1772	1772	1772	1772
Adj Flow Rate, veh/h	61	39	189	33	61	44	239	461	44	28	472	44
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	351	326	535	371	159	115	440	1008	96	172	649	60
Arrive On Green	0.05	0.18	0.18	0.04	0.17	0.17	0.34	0.65	0.65	0.03	0.21	0.21
Sat Flow, veh/h	1688	1772	1502	1688	957	690	1688	3107	295	1688	3114	289
Grp Volume(v), veh/h	61	39	189	33	0	105	239	249	256	28	254	262
Grp Sat Flow(s),veh/h/ln	1688	1772	1502	1688	0	1648	1688	1683	1719	1688	1683	1720
Q Serve(g_s), s	1.8	1.1	1.2	1.0	0.0	3.4	0.4	4.4	4.5	0.9	8.5	8.5
Cycle Q Clear(g_c), s	1.8	1.1	1.2	1.0	0.0	3.4	0.4	4.4	4.5	0.9	8.5	8.5
Prop In Lane	1.00		1.00	1.00		0.42	1.00		0.17	1.00		0.17
Lane Grp Cap(c), veh/h	351	326	535	371	0	274	440	546	558	172	351	358
V/C Ratio(X)	0.17	0.12	0.35	0.09	0.00	0.38	0.54	0.46	0.46	0.16	0.73	0.73
Avail Cap(c_a), veh/h	405	326	535	452	0	299	440	546	558	261	351	358
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	0.91	0.91	0.91	1.00	1.00	1.00
Uniform Delay (d), s/veh	19.1	20.4	3.6	19.5	0.0	22.3	16.2	7.9	7.9	23.2	22.1	22.2
Incr Delay (d2), s/veh	0.2	0.2	0.4	0.1	0.0	0.9	1.3	2.5	2.5	0.4	12.3	12.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.6	0.4	0.7	0.4	0.0	1.3	2.2	1.5	1.6	0.3	4.2	4.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	19.3	20.6	4.0	19.6	0.0	23.2	17.4	10.4	10.4	23.7	34.5	34.5
LnGrp LOS	B	C	A	B	A	C	B	B	B	C	C	C
Approach Vol, veh/h		289			138			744			544	
Approach Delay, s/veh		9.5			22.3			12.6			33.9	
Approach LOS		A			C			B			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	8.4	26.0	8.6	17.1	16.8	17.5	9.7	16.0
Change Period (Y+Rc), s	6.5	* 6.5	6.5	6.0	6.5	5.0	6.5	* 6
Max Green Setting (Gmax), s	5.0	* 16	5.0	10.0	8.5	12.5	5.1	* 11
Max Q Clear Time (g_c+I1), s	2.9	6.5	3.0	3.2	2.4	10.5	3.8	5.4
Green Ext Time (p_c), s	0.0	2.0	0.0	0.4	0.3	0.6	0.0	0.2

Intersection Summary	
HCM 6th Ctrl Delay	19.6
HCM 6th LOS	B

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

HCM 6th Signalized Intersection Summary
15: SD37 & 23rd Avenue

06/13/2022

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	40	50	315	20	30	35	95	220	40	60	510	80
Future Volume (veh/h)	40	50	315	20	30	35	95	220	40	60	510	80
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1772	1772	1772	1772	1772	1772	1772	1772	1772	1772	1772	1772
Adj Flow Rate, veh/h	44	56	350	22	33	39	106	244	44	67	567	89
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	73	327	487	43	123	146	384	907	161	266	729	114
Arrive On Green	0.04	0.18	0.18	0.03	0.17	0.17	0.28	0.63	0.63	0.06	0.25	0.25
Sat Flow, veh/h	1688	1772	1502	1688	740	875	1688	2857	507	1688	2917	457
Grp Volume(v), veh/h	44	56	350	22	0	72	106	142	146	67	327	329
Grp Sat Flow(s),veh/h/ln	1688	1772	1502	1688	0	1615	1688	1683	1681	1688	1683	1690
Q Serve(g_s), s	1.5	1.6	2.4	0.8	0.0	2.3	0.0	2.2	2.3	2.0	10.8	10.9
Cycle Q Clear(g_c), s	1.5	1.6	2.4	0.8	0.0	2.3	0.0	2.2	2.3	2.0	10.8	10.9
Prop In Lane	1.00		1.00	1.00		0.54	1.00		0.30	1.00		0.27
Lane Grp Cap(c), veh/h	73	327	487	43	0	269	384	534	533	266	421	422
V/C Ratio(X)	0.60	0.17	0.72	0.51	0.00	0.27	0.28	0.27	0.27	0.25	0.78	0.78
Avail Cap(c_a), veh/h	169	327	487	141	0	269	384	534	533	315	421	422
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	0.91	0.91	0.91	1.00	1.00	1.00
Uniform Delay (d), s/veh	28.2	20.6	5.3	28.9	0.0	21.8	18.3	7.9	7.9	21.4	20.9	21.0
Incr Delay (d2), s/veh	7.7	0.2	5.1	9.0	0.0	0.5	0.4	1.1	1.2	0.5	13.1	13.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.7	0.6	2.1	0.4	0.0	0.9	1.0	0.8	0.8	0.8	5.3	5.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	35.9	20.9	10.3	37.9	0.0	22.3	18.7	9.0	9.1	21.9	34.0	34.3
LnGrp LOS	D	C	B	D	A	C	B	A	A	C	C	C
Approach Vol, veh/h		450			94			394			723	
Approach Delay, s/veh		14.1			26.0			11.6			33.0	
Approach LOS		B			C			B			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	9.9	25.5	8.0	16.6	14.9	20.5	9.1	15.5
Change Period (Y+Rc), s	6.5	* 6.5	6.5	5.5	6.5	5.5	6.5	* 5.5
Max Green Setting (Gmax), s	5.1	* 15	5.0	10.5	5.5	15.0	6.0	* 10
Max Q Clear Time (g_c+I1), s	4.0	4.3	2.8	4.4	2.0	12.9	3.5	4.3
Green Ext Time (p_c), s	0.0	1.1	0.0	0.8	0.1	0.8	0.0	0.1

Intersection Summary	
HCM 6th Ctrl Delay	22.4
HCM 6th LOS	C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

HCM 6th Signalized Intersection Summary
15: SD37 & 23rd Avenue

06/13/2022

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	95	40	225	35	65	45	290	530	45	30	535	60
Future Volume (veh/h)	95	40	225	35	65	45	290	530	45	30	535	60
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1772	1772	1772	1772	1772	1772	1772	1772	1772	1772	1772	1772
Adj Flow Rate, veh/h	106	44	250	39	72	50	322	589	50	33	594	67
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	133	343	521	66	150	104	394	1094	93	184	746	84
Arrive On Green	0.08	0.19	0.19	0.04	0.15	0.15	0.31	0.70	0.70	0.03	0.24	0.24
Sat Flow, veh/h	1688	1772	1502	1688	974	676	1688	3141	266	1688	3050	343
Grp Volume(v), veh/h	106	44	250	39	0	122	322	315	324	33	327	334
Grp Sat Flow(s),veh/h/ln	1688	1772	1502	1688	0	1650	1688	1683	1724	1688	1683	1710
Q Serve(g_s), s	4.0	1.3	1.8	1.5	0.0	4.4	5.5	5.9	5.9	1.1	11.9	11.9
Cycle Q Clear(g_c), s	4.0	1.3	1.8	1.5	0.0	4.4	5.5	5.9	5.9	1.1	11.9	11.9
Prop In Lane	1.00		1.00	1.00		0.41	1.00		0.15	1.00		0.20
Lane Grp Cap(c), veh/h	133	343	521	66	0	254	394	586	600	184	412	418
V/C Ratio(X)	0.80	0.13	0.48	0.59	0.00	0.48	0.82	0.54	0.54	0.18	0.79	0.80
Avail Cap(c_a), veh/h	143	343	521	132	0	269	394	586	600	255	412	418
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	0.81	0.81	0.81	1.00	1.00	1.00
Uniform Delay (d), s/veh	29.4	21.7	5.0	30.7	0.0	25.1	19.8	7.3	7.3	23.0	23.0	23.0
Incr Delay (d2), s/veh	24.8	0.2	0.7	8.3	0.0	1.4	10.6	2.9	2.8	0.5	14.6	14.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.4	0.5	1.1	0.7	0.0	1.8	4.5	1.9	1.9	0.4	5.9	6.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	54.2	21.8	5.7	39.0	0.0	26.5	30.3	10.2	10.1	23.5	37.6	37.7
LnGrp LOS	D	C	A	D	A	C	C	B	B	C	D	D
Approach Vol, veh/h		400			161			961			694	
Approach Delay, s/veh		20.3			29.6			16.9			37.0	
Approach LOS		C			C			B			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	8.7	29.1	9.0	18.1	16.5	21.4	11.6	15.5
Change Period (Y+Rc), s	6.5	* 6.5	6.5	5.5	6.5	5.5	6.5	* 5.5
Max Green Setting (Gmax), s	5.0	* 20	5.1	10.5	9.5	15.9	5.5	* 11
Max Q Clear Time (g_c+I1), s	3.1	7.9	3.5	3.8	7.5	13.9	6.0	6.4
Green Ext Time (p_c), s	0.0	3.1	0.0	0.6	0.2	0.8	0.0	0.2

Intersection Summary	
HCM 6th Ctrl Delay	24.7
HCM 6th LOS	C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

HCS7: MUTCD Signal Warrants Release 7.2

Analyst: HDR
Agency: HDR
Date: 5/16/2022
Project ID: Mitchell MTP
EW Street: 23rd Avenue

Intersection: SD37 & 23rd Ave
Jurisdiction: SDDOT
Units: U.S. Customary
Analysis Year: 2032 Build
NS Street: SD37

General Information

Major St. Speed (mph): 35
Nearest Signal (ft): 795
Crashes per Yr: 0

Population: Not less than 10000
Coordinated Signal System: Y

School Crossing

Students in Highest Hour: 0
Adequate Gaps in Period: 0
Minutes in Period: 0

Roadway Network

Two Major Routes: 1
Weekend Count: 0
5-yr Growth Factor: 0

Geometry and Traffic

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	1	1	1	1	0	1	2	0	1	2	0
LaneUsage	L	T	R	L	TR		L	TR		L	TR	

Results

Warrant 1: Eight-Hour Vehicular Volume	[ ]
1 A. Minimum Vehicular Volumes	[ ]
1 B. Interruption of Continuous Traffic	[ ]
1 80% Vehicular --and-- Interruption Volumes	[ ]
Warrant 2: Four-Hour Vehicular Volume	
2 A. Four-Hour Vehicular Volumes	[ ]
Warrant 3: Peak Hour	[ ]
3 A. Peak-Hour Conditions	[ ]
3 B. Peak-Hour Vehicular Volume Hours Met	[ ]
Warrant 4: Pedestrian Volume	[ ]
4 A. Four Hour Volumes	[ ]
4 B. One-Hour Volumes	[ ]
Warrant 5: School Crossing	[ ]
5 A. Student Volumes	[ ]
5 B. Gaps Same Period	[ ]
Warrant 6: Coordinated Signal System	
6 Degree of Platooning	[X]
Warrant 7: Crash Experience	[ ]
7 A. Adequate trials of alternatives	[ ]

7 B. Reported crashes [ ]
7 80% Volumes for Warrants 1A, 1B --or-- 4 [ ]

Warrant 8: Roadway Network [ ]
8 A. Weekday Volume [ ]
8 B. Weekend Volume [ ]

Warrant 9: Grade Crossing [ ]
9 A. Grade Crossing within 140 ft --and-- [ ]
9 B. Peak-Hour Vehicular Volumes [ ]

Summary

Hours	Major Volume	Minor Volume	Total Volume	Delay (Veh-hr)	1A 100%	1A 80%	1B 100%	1B 80%	2 100%	3A 100%	3B 100%
07-08	775	305	1150	0.0	Yes	Yes	No	Yes	Yes	No	No
08-09	0	0	0	0.0	No	No	No	No	No	No	No
09-10	0	0	0	0.0	No	No	No	No	No	No	No
10-11	0	0	0	0.0	No	No	No	No	No	No	No
11-12	0	0	0	0.0	No	No	No	No	No	No	No
12-13	0	0	0	0.0	No	No	No	No	No	No	No
13-14	0	0	0	0.0	No	No	No	No	No	No	No
14-15	0	0	0	0.0	No	No	No	No	No	No	No
15-16	0	0	0	0.0	No	No	No	No	No	No	No
16-17	1160	260	1545	0.0	Yes	Yes	Yes	Yes	Yes	No	No
17-18	0	0	0	0.0	No	No	No	No	No	No	No
18-19	0	0	0	0.0	No	No	No	No	No	No	No
Total	1935	565	2695		2	2	1	2	2	0	0

Traffic Volumes (vph)

Eastbound			Westbound			Northbound			Southbound		
L	T	R	L	T	R	L	T	R	L	T	R
25	40	240	15	25	30	75	170	30	50	400	50
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
55	35	170	30	55	40	215	415	40	25	425	40
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0

Pedestrian Volumes and Gaps (Per Hour)

Volume	Gap	Volume	Gap	Volume	Gap	Volume	Gap
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0

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Delay	sec/veh	veh-hrs	sec/veh	veh-hrs	sec/veh	veh-hrs	sec/veh	veh-hrs
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

HCS7: MUTCD Signal Warrants Release 7.2

Analyst: HDR
Agency: HDR
Date: 5/16/2022
Project ID: Mitchell MTP
EW Street: 23rd Avenue

Intersection: SD37 & 23rd Ave
Jurisdiction: SDDOT
Units: U.S. Customary
Analysis Year: 2045 Build
NS Street: SD37

General Information

Major St. Speed (mph): 35
Nearest Signal (ft): 795
Crashes per Yr: 0

Population: Not less than 10000
Coordinated Signal System: Y

School Crossing

Students in Highest Hour: 0
Adequate Gaps in Period: 0
Minutes in Period: 0

Roadway Network

Two Major Routes: 1
Weekend Count: 0
5-yr Growth Factor: 0

Geometry and Traffic

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	1	1	1	1	0	1	2	0	1	2	0
LaneUsage	L	T	R	L	TR		L	TR		L	TR	

Results

Warrant 1: Eight-Hour Vehicular Volume	[ ]
1 A. Minimum Vehicular Volumes	[ ]
1 B. Interruption of Continuous Traffic	[ ]
1 80% Vehicular --and-- Interruption Volumes	[ ]
Warrant 2: Four-Hour Vehicular Volume	
2 A. Four-Hour Vehicular Volumes	[ ]
Warrant 3: Peak Hour	[X]
3 A. Peak-Hour Conditions	[ ]
3 B. Peak-Hour Vehicular Volume Hours Met	[X]
Warrant 4: Pedestrian Volume	[ ]
4 A. Four Hour Volumes	[ ]
4 B. One-Hour Volumes	[ ]
Warrant 5: School Crossing	[ ]
5 A. Student Volumes	[ ]
5 B. Gaps Same Period	[ ]
Warrant 6: Coordinated Signal System	
6 Degree of Platooning	[X]
Warrant 7: Crash Experience	[ ]
7 A. Adequate trials of alternatives	[ ]

7 B. Reported crashes [ ]
7 80% Volumes for Warrants 1A, 1B --or-- 4 [ ]

Warrant 8: Roadway Network [X]
8 A. Weekday Volume [X]
8 B. Weekend Volume [ ]

Warrant 9: Grade Crossing [ ]
9 A. Grade Crossing within 140 ft --and-- [ ]
9 B. Peak-Hour Vehicular Volumes [ ]

Summary

Hours	Major Volume	Minor Volume	Total Volume	Delay (Veh-hr)	1A 100%	1A 80%	1B 100%	1B 80%	2 100%	3A 100%	3B 100%
07-08	1005	405	1495	0.0	Yes	Yes	Yes	Yes	Yes	No	Yes
08-09	0	0	0	0.0	No	No	No	No	No	No	No
09-10	0	0	0	0.0	No	No	No	No	No	No	No
10-11	0	0	0	0.0	No	No	No	No	No	No	No
11-12	0	0	0	0.0	No	No	No	No	No	No	No
12-13	0	0	0	0.0	No	No	No	No	No	No	No
13-14	0	0	0	0.0	No	No	No	No	No	No	No
14-15	0	0	0	0.0	No	No	No	No	No	No	No
15-16	0	0	0	0.0	No	No	No	No	No	No	No
16-17	1490	360	1995	0.0	Yes	Yes	Yes	Yes	Yes	No	Yes
17-18	0	0	0	0.0	No	No	No	No	No	No	No
18-19	0	0	0	0.0	No	No	No	No	No	No	No
Total	2495	765	3490		2	2	2	2	2	0	2

Traffic Volumes (vph)

Eastbound			Westbound			Northbound			Southbound		
L	T	R	L	T	R	L	T	R	L	T	R
40	50	315	20	30	35	95	220	40	60	510	80
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
95	40	225	35	65	45	290	530	45	30	535	60
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0

Pedestrian Volumes and Gaps (Per Hour)

Volume	Gap	Volume	Gap	Volume	Gap	Volume	Gap
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0

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Delay	sec/veh	veh-hrs	sec/veh	veh-hrs	sec/veh	veh-hrs	sec/veh	veh-hrs
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Ohlman Street Corridor

Ohlman Street & 23rd Avenue Intersection:

(See 23rd Avenue Corridor section)

Ohlman Street & 8th Avenue Intersection:

2045 Build Condition AM/PM (TWSC)

Intersection	
Int Delay, s/veh	8

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	30	65	55	215	325	35
Future Vol, veh/h	30	65	55	215	325	35
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	100	-	-	-	100	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	0	0	8	8	4	9
Mvmt Flow	33	72	61	239	361	39

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	300	0	-	0	319	181
Stage 1	-	-	-	-	181	-
Stage 2	-	-	-	-	138	-
Critical Hdwy	4.1	-	-	-	6.44	6.29
Critical Hdwy Stg 1	-	-	-	-	5.44	-
Critical Hdwy Stg 2	-	-	-	-	5.44	-
Follow-up Hdwy	2.2	-	-	-	3.536	3.381
Pot Cap-1 Maneuver	1273	-	-	-	670	844
Stage 1	-	-	-	-	845	-
Stage 2	-	-	-	-	884	-
Platoon blocked, %			-	-	-	
Mov Cap-1 Maneuver	1273	-	-	-	653	844
Mov Cap-2 Maneuver	-	-	-	-	685	-
Stage 1	-	-	-	-	823	-
Stage 2	-	-	-	-	884	-

Approach	EB	WB	SB
HCM Control Delay, s	2.5	0	15.4
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1273	-	-	-	685	844
HCM Lane V/C Ratio	0.026	-	-	-	0.527	0.046
HCM Control Delay (s)	7.9	-	-	-	16	9.5
HCM Lane LOS	A	-	-	-	C	A
HCM 95th %tile Q(veh)	0.1	-	-	-	3.1	0.1

Intersection	
Int Delay, s/veh	9.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	30	60	65	325	365	40
Future Vol, veh/h	30	60	65	325	365	40
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	100	-	-	-	100	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	0	0	6	8	7	0
Mvmt Flow	33	67	72	361	406	44

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	433	0	-	0	386	253
Stage 1	-	-	-	-	253	-
Stage 2	-	-	-	-	133	-
Critical Hdwy	4.1	-	-	-	6.47	6.2
Critical Hdwy Stg 1	-	-	-	-	5.47	-
Critical Hdwy Stg 2	-	-	-	-	5.47	-
Follow-up Hdwy	2.2	-	-	-	3.563	3.3
Pot Cap-1 Maneuver	1137	-	-	-	607	791
Stage 1	-	-	-	-	778	-
Stage 2	-	-	-	-	881	-
Platoon blocked, %			-	-	-	
Mov Cap-1 Maneuver	1137	-	-	-	589	791
Mov Cap-2 Maneuver	-	-	-	-	634	-
Stage 1	-	-	-	-	755	-
Stage 2	-	-	-	-	881	-

Approach	EB	WB	SB
HCM Control Delay, s	2.8	0	19.2
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1137	-	-	-	634	791
HCM Lane V/C Ratio	0.029	-	-	-	0.64	0.056
HCM Control Delay (s)	8.3	-	-	-	20.2	9.8
HCM Lane LOS	A	-	-	-	C	A
HCM 95th %tile Q(veh)	0.1	-	-	-	4.6	0.2

Rowley Street Corridor

Rowley Street & Norway Avenue Intersection:

2032 Build Condition AM/PM (AWSC)
2045 Build Condition AM/PM (AWSC)
2045 Build Condition AM/PM (Signal)
2045 Build Condition Signal Warrants

Rowley Street & Spruce Street Intersection:

2032 Build Condition AM/PM (AWSC)
2032 Build Condition AM/PM (Roundabout)
2045 Build Condition AM/PM (AWSC)
2045 Build Condition AM/PM (Roundabout)

Intersection	
Intersection Delay, s/veh	10.9
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	15	80	80	25	85	30	75	120	45	40	170	30
Future Vol, veh/h	15	80	80	25	85	30	75	120	45	40	170	30
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles, %	0	0	2	5	2	0	2	4	0	13	1	9
Mvmt Flow	17	89	89	28	94	33	83	133	50	44	189	33
Number of Lanes	0	1	0	0	1	0	1	1	0	1	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	2	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	2	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	2	1	1
HCM Control Delay	10.6	10.6	10.7	11.4
HCM LOS	B	B	B	B

Lane	NBLn1	NBLn2	EBLn1	WBLn1	SBLn1	SBLn2
Vol Left, %	100%	0%	9%	18%	100%	0%
Vol Thru, %	0%	73%	46%	61%	0%	85%
Vol Right, %	0%	27%	46%	21%	0%	15%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	75	165	175	140	40	200
LT Vol	75	0	15	25	40	0
Through Vol	0	120	80	85	0	170
RT Vol	0	45	80	30	0	30
Lane Flow Rate	83	183	194	156	44	222
Geometry Grp	7	7	2	2	7	7
Degree of Util (X)	0.149	0.293	0.29	0.246	0.082	0.357
Departure Headway (Hd)	6.423	5.757	5.374	5.685	6.612	5.791
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	558	623	667	630	542	620
Service Time	4.163	3.496	3.419	3.732	4.352	3.531
HCM Lane V/C Ratio	0.149	0.294	0.291	0.248	0.081	0.358
HCM Control Delay	10.3	10.9	10.6	10.6	9.9	11.7
HCM Lane LOS	B	B	B	B	A	B
HCM 95th-tile Q	0.5	1.2	1.2	1	0.3	1.6

Intersection	
Intersection Delay, s/veh	13.1
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	15	90	90	30	75	35	85	265	35	30	180	10
Future Vol, veh/h	15	90	90	30	75	35	85	265	35	30	180	10
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles, %	0	6	0	0	0	0	0	1	4	8	1	0
Mvmt Flow	17	100	100	33	83	39	94	294	39	33	200	11
Number of Lanes	0	1	0	0	1	0	1	1	0	1	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	2	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	2	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	2	1	1
HCM Control Delay	12	11.3	14.7	12.3
HCM LOS	B	B	B	B

Lane	NBLn1	NBLn2	EBLn1	WBLn1	SBLn1	SBLn2
Vol Left, %	100%	0%	8%	21%	100%	0%
Vol Thru, %	0%	88%	46%	54%	0%	95%
Vol Right, %	0%	12%	46%	25%	0%	5%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	85	300	195	140	30	190
LT Vol	85	0	15	30	30	0
Through Vol	0	265	90	75	0	180
RT Vol	0	35	90	35	0	10
Lane Flow Rate	94	333	217	156	33	211
Geometry Grp	7	7	2	2	7	7
Degree of Util (X)	0.171	0.55	0.348	0.262	0.064	0.366
Departure Headway (Hd)	6.519	5.945	5.79	6.073	6.917	6.249
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	549	603	618	588	516	572
Service Time	4.278	3.703	3.86	4.151	4.685	4.016
HCM Lane V/C Ratio	0.171	0.552	0.351	0.265	0.064	0.369
HCM Control Delay	10.6	15.8	12	11.3	10.2	12.6
HCM Lane LOS	B	C	B	B	B	B
HCM 95th-tile Q	0.6	3.3	1.6	1	0.2	1.7

Intersection	
Intersection Delay, s/veh	14.3
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	20	105	105	30	110	35	100	160	60	55	225	40
Future Vol, veh/h	20	105	105	30	110	35	100	160	60	55	225	40
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles, %	0	0	2	5	2	0	2	4	0	13	1	9
Mvmt Flow	22	117	117	33	122	39	111	178	67	61	250	44
Number of Lanes	0	1	0	0	1	0	1	1	0	1	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	2	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	2	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	2	1	1
HCM Control Delay	14.1	13.3	13.7	15.7
HCM LOS	B	B	B	C

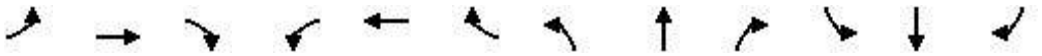
Lane	NBLn1	NBLn2	EBLn1	WBLn1	SBLn1	SBLn2
Vol Left, %	100%	0%	9%	17%	100%	0%
Vol Thru, %	0%	73%	46%	63%	0%	85%
Vol Right, %	0%	27%	46%	20%	0%	15%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	100	220	230	175	55	265
LT Vol	100	0	20	30	55	0
Through Vol	0	160	105	110	0	225
RT Vol	0	60	105	35	0	40
Lane Flow Rate	111	244	256	194	61	294
Geometry Grp	7	7	2	2	7	7
Degree of Util (X)	0.222	0.443	0.441	0.357	0.125	0.535
Departure Headway (Hd)	7.197	6.525	6.211	6.611	7.375	6.547
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	499	552	580	544	486	551
Service Time	4.939	4.267	4.251	4.655	5.117	4.288
HCM Lane V/C Ratio	0.222	0.442	0.441	0.357	0.126	0.534
HCM Control Delay	12	14.4	14.1	13.3	11.2	16.6
HCM Lane LOS	B	B	B	B	B	C
HCM 95th-tile Q	0.8	2.3	2.2	1.6	0.4	3.1

Intersection	
Intersection Delay, s/veh	23.9
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	20	120	115	40	100	50	110	350	45	40	235	15
Future Vol, veh/h	20	120	115	40	100	50	110	350	45	40	235	15
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles, %	0	6	0	0	0	0	0	1	4	8	1	0
Mvmt Flow	22	133	128	44	111	56	122	389	50	44	261	17
Number of Lanes	0	1	0	0	1	0	1	1	0	1	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	2	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	2	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	2	1	1
HCM Control Delay	18.6	16.1	32.3	19
HCM LOS	C	C	D	C

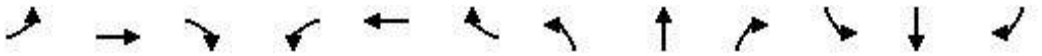
Lane	NBLn1	NBLn2	EBLn1	WBLn1	SBLn1	SBLn2
Vol Left, %	100%	0%	8%	21%	100%	0%
Vol Thru, %	0%	89%	47%	53%	0%	94%
Vol Right, %	0%	11%	45%	26%	0%	6%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	110	395	255	190	40	250
LT Vol	110	0	20	40	40	0
Through Vol	0	350	120	100	0	235
RT Vol	0	45	115	50	0	15
Lane Flow Rate	122	439	283	211	44	278
Geometry Grp	7	7	2	2	7	7
Degree of Util (X)	0.256	0.847	0.556	0.436	0.101	0.579
Departure Headway (Hd)	7.653	7.075	7.061	7.433	8.188	7.506
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	472	514	513	486	439	483
Service Time	5.353	4.775	5.076	5.465	5.907	5.225
HCM Lane V/C Ratio	0.258	0.854	0.552	0.434	0.1	0.576
HCM Control Delay	13	37.7	18.6	16.1	11.8	20.1
HCM Lane LOS	B	E	C	C	B	C
HCM 95th-tile Q	1	8.7	3.4	2.2	0.3	3.6



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	20	105	105	30	110	35	100	160	60	55	225	40
Future Volume (veh/h)	20	105	105	30	110	35	100	160	60	55	225	40
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1800	1800	1772	1730	1772	1800	1772	1744	1800	1617	1786	1674
Adj Flow Rate, veh/h	22	117	117	33	122	39	111	178	67	61	250	44
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	0	0	2	5	2	0	2	4	0	13	1	9
Cap, veh/h	111	166	153	138	239	69	518	415	156	509	470	83
Arrive On Green	0.20	0.20	0.20	0.20	0.20	0.20	0.09	0.34	0.34	0.06	0.32	0.32
Sat Flow, veh/h	75	815	749	173	1173	339	1688	1208	455	1540	1479	260
Grp Volume(v), veh/h	256	0	0	194	0	0	111	0	245	61	0	294
Grp Sat Flow(s),veh/h/ln	1639	0	0	1685	0	0	1688	0	1662	1540	0	1739
Q Serve(g_s), s	1.8	0.0	0.0	0.0	0.0	0.0	1.7	0.0	4.6	1.0	0.0	5.7
Cycle Q Clear(g_c), s	6.0	0.0	0.0	4.1	0.0	0.0	1.7	0.0	4.6	1.0	0.0	5.7
Prop In Lane	0.09		0.46	0.17		0.20	1.00		0.27	1.00		0.15
Lane Grp Cap(c), veh/h	430	0	0	447	0	0	518	0	572	509	0	552
V/C Ratio(X)	0.60	0.00	0.00	0.43	0.00	0.00	0.21	0.00	0.43	0.12	0.00	0.53
Avail Cap(c_a), veh/h	534	0	0	548	0	0	576	0	572	603	0	552
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	15.3	0.0	0.0	14.6	0.0	0.0	8.2	0.0	10.3	8.4	0.0	11.5
Incr Delay (d2), s/veh	1.3	0.0	0.0	0.7	0.0	0.0	0.2	0.0	2.3	0.1	0.0	3.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.1	0.0	0.0	1.5	0.0	0.0	0.5	0.0	1.7	0.3	0.0	2.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	16.6	0.0	0.0	15.3	0.0	0.0	8.4	0.0	12.7	8.5	0.0	15.1
LnGrp LOS	B	A	A	B	A	A	A	A	B	A	A	B
Approach Vol, veh/h		256			194			356			355	
Approach Delay, s/veh		16.6			15.3			11.3			14.0	
Approach LOS		B			B			B			B	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	8.5	19.1		13.4	9.6	18.0		13.4				
Change Period (Y+Rc), s	6.0	5.0		5.0	6.0	5.0		5.0				
Max Green Setting (Gmax), s	5.0	13.0		11.0	5.0	13.0		11.0				
Max Q Clear Time (g_c+I1), s	3.0	6.6		8.0	3.7	7.7		6.1				
Green Ext Time (p_c), s	0.0	0.7		0.4	0.0	0.8		0.4				

Intersection Summary												
HCM 6th Ctrl Delay			14.0									
HCM 6th LOS			B									



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	20	120	115	40	100	50	110	350	45	40	235	15
Future Volume (veh/h)	20	120	115	40	100	50	110	350	45	40	235	15
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1800	1716	1800	1800	1800	1800	1800	1786	1744	1688	1786	1800
Adj Flow Rate, veh/h	22	133	128	44	111	56	122	389	50	44	261	17
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	0	6	0	0	0	0	0	1	4	8	1	0
Cap, veh/h	89	175	156	133	220	97	585	657	84	421	645	42
Arrive On Green	0.22	0.22	0.22	0.22	0.22	0.22	0.08	0.42	0.42	0.05	0.39	0.39
Sat Flow, veh/h	62	794	707	222	1000	442	1714	1551	199	1607	1658	108
Grp Volume(v), veh/h	283	0	0	211	0	0	122	0	439	44	0	278
Grp Sat Flow(s),veh/h/ln	1563	0	0	1664	0	0	1714	0	1750	1607	0	1767
Q Serve(g_s), s	3.2	0.0	0.0	0.0	0.0	0.0	2.1	0.0	9.9	0.8	0.0	5.9
Cycle Q Clear(g_c), s	8.8	0.0	0.0	5.7	0.0	0.0	2.1	0.0	9.9	0.8	0.0	5.9
Prop In Lane	0.08		0.45	0.21		0.27	1.00		0.11	1.00		0.06
Lane Grp Cap(c), veh/h	420	0	0	451	0	0	585	0	741	421	0	687
V/C Ratio(X)	0.67	0.00	0.00	0.47	0.00	0.00	0.21	0.00	0.59	0.10	0.00	0.40
Avail Cap(c_a), veh/h	499	0	0	531	0	0	614	0	741	505	0	687
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	19.1	0.0	0.0	17.8	0.0	0.0	8.2	0.0	11.4	9.1	0.0	11.4
Incr Delay (d2), s/veh	2.8	0.0	0.0	0.8	0.0	0.0	0.2	0.0	3.5	0.1	0.0	1.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.3	0.0	0.0	2.1	0.0	0.0	0.7	0.0	4.0	0.3	0.0	2.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	21.9	0.0	0.0	18.6	0.0	0.0	8.4	0.0	14.9	9.3	0.0	13.2
LnGrp LOS	C	A	A	B	A	A	A	A	B	A	A	B
Approach Vol, veh/h		283			211			561			322	
Approach Delay, s/veh		21.9			18.6			13.5			12.6	
Approach LOS		C			B			B			B	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	8.3	26.8		16.3	10.1	25.0		16.3				
Change Period (Y+Rc), s	6.0	5.0		5.0	6.0	5.0		5.0				
Max Green Setting (Gmax), s	5.0	20.0		14.0	5.0	20.0		14.0				
Max Q Clear Time (g_c+I1), s	2.8	11.9		10.8	4.1	7.9		7.7				
Green Ext Time (p_c), s	0.0	1.8		0.5	0.0	1.3		0.6				

Intersection Summary			
HCM 6th Ctrl Delay		15.8	
HCM 6th LOS		B	

HCS7: MUTCD Signal Warrants Release 7.2

Analyst: HDR
Agency: HDR
Date: 5/16/2022
Project ID: Mitchell MTP
EW Street: Norway Avenue

Intersection: Rowley St & Norway Ave
Jurisdiction: SDDOT
Units: U.S. Customary
Analysis Year: 2045 Build
NS Street: Rowley Street

General Information

Major St. Speed (mph): 30
Nearest Signal (ft): 0
Crashes per Yr: 0

Population: Not less than 10000
Coordinated Signal System: N

School Crossing

Students in Highest Hour: 0
Adequate Gaps in Period: 0
Minutes in Period: 0

Roadway Network

Two Major Routes: 1
Weekend Count: 0
5-yr Growth Factor: 0

Geometry and Traffic

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	1	0	0	1	0	1	1	0	1	1	0
LaneUsage		LTR			LTR		L	TR		L	TR	

Results

Warrant 1: Eight-Hour Vehicular Volume	[ ]
1 A. Minimum Vehicular Volumes	[ ]
1 B. Interruption of Continuous Traffic	[ ]
1 80% Vehicular --and-- Interruption Volumes	[ ]
Warrant 2: Four-Hour Vehicular Volume	
2 A. Four-Hour Vehicular Volumes	[ ]
Warrant 3: Peak Hour	[ ]
3 A. Peak-Hour Conditions	[ ]
3 B. Peak-Hour Vehicular Volume Hours Met	[ ]
Warrant 4: Pedestrian Volume	[ ]
4 A. Four Hour Volumes	[ ]
4 B. One-Hour Volumes	[ ]
Warrant 5: School Crossing	[ ]
5 A. Student Volumes	[ ]
5 B. Gaps Same Period	[ ]
Warrant 6: Coordinated Signal System	
6 Degree of Platooning	[ ]
Warrant 7: Crash Experience	[ ]
7 A. Adequate trials of alternatives	[ ]

7 B. Reported crashes [ ]
7 80% Volumes for Warrants 1A, 1B --or-- 4 [ ]

Warrant 8: Roadway Network [ ]
8 A. Weekday Volume [ ]
8 B. Weekend Volume [ ]

Warrant 9: Grade Crossing [ ]
9 A. Grade Crossing within 140 ft --and-- [ ]
9 B. Peak-Hour Vehicular Volumes [ ]

Summary

Hours	Major Volume	Minor Volume	Total Volume	Delay (Veh-hr)	1A 100%	1A 80%	1B 100%	1B 80%	2 100%	3A 100%	3B 100%
07-08	405	320	1045	0.0	No	Yes	No	No	No	No	No
08-09	0	0	0	0.0	No	No	No	No	No	No	No
09-10	0	0	0	0.0	No	No	No	No	No	No	No
10-11	0	0	0	0.0	No	No	No	No	No	No	No
11-12	0	0	0	0.0	No	No	No	No	No	No	No
12-13	0	0	0	0.0	No	No	No	No	No	No	No
13-14	0	0	0	0.0	No	No	No	No	No	No	No
14-15	0	0	0	0.0	No	No	No	No	No	No	No
15-16	0	0	0	0.0	No	No	No	No	No	No	No
16-17	445	505	1240	0.0	No	Yes	No	No	Yes	No	No
17-18	0	0	0	0.0	No	No	No	No	No	No	No
18-19	0	0	0	0.0	No	No	No	No	No	No	No
Total	850	825	2285		0	2	0	0	1	0	0

Traffic Volumes (vph)

Eastbound			Westbound			Northbound			Southbound		
L	T	R	L	T	R	L	T	R	L	T	R
20	105	105	30	110	35	100	160	60	55	225	40
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
20	120	115	40	100	50	110	350	45	40	235	15
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0

Pedestrian Volumes and Gaps (Per Hour)

Volume	Gap	Volume	Gap	Volume	Gap	Volume	Gap
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0

!

Delay	sec/veh	veh-hrs	sec/veh	veh-hrs	sec/veh	veh-hrs	sec/veh	veh-hrs
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Intersection	
Intersection Delay, s/veh	9.7
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	75	125	10	10	60	70	15	65	15	95	30	20
Future Vol, veh/h	75	125	10	10	60	70	15	65	15	95	30	20
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles, %	0	5	0	14	4	5	0	4	9	0	14	0
Mvmt Flow	83	139	11	11	67	78	17	72	17	106	33	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	9.7	9.4	9.9	9.8
HCM LOS	A	A	A	A

Lane	NBLn1	EBLn1	EBLn2	WBLn1	WBLn2	SBLn1	SBLn2
Vol Left, %	16%	100%	0%	100%	0%	100%	0%
Vol Thru, %	68%	0%	93%	0%	46%	0%	60%
Vol Right, %	16%	0%	7%	0%	54%	0%	40%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	95	75	135	10	130	95	50
LT Vol	15	75	0	10	0	95	0
Through Vol	65	0	125	0	60	0	30
RT Vol	15	0	10	0	70	0	20
Lane Flow Rate	106	83	150	11	144	106	56
Geometry Grp	6	7	7	7	7	7	7
Degree of Util (X)	0.166	0.137	0.227	0.019	0.209	0.18	0.086
Departure Headway (Hd)	5.661	5.919	5.448	6.267	5.21	6.122	5.576
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	627	602	654	567	682	582	637
Service Time	3.753	3.695	3.224	4.05	2.992	3.908	3.361
HCM Lane V/C Ratio	0.169	0.138	0.229	0.019	0.211	0.182	0.088
HCM Control Delay	9.9	9.6	9.8	9.2	9.4	10.3	8.9
HCM Lane LOS	A	A	A	A	A	B	A
HCM 95th-tile Q	0.6	0.5	0.9	0.1	0.8	0.7	0.3

Intersection	
Intersection Delay, s/veh	12.5
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	55	190	15	15	170	110	10	30	20	160	50	30
Future Vol, veh/h	55	190	15	15	170	110	10	30	20	160	50	30
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles, %	0	0	0	0	2	0	0	8	8	0	0	0
Mvmt Flow	61	211	17	17	189	122	11	33	22	178	56	33
Number of Lanes	1	1	0	1	1	0	0	1	0	1	1	0

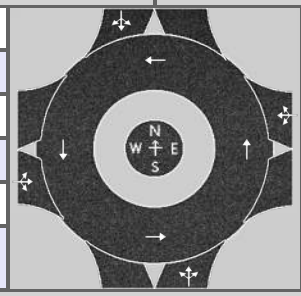
Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	2	2	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	1	2	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	2	2	2
HCM Control Delay	11.9	13.9	10.6	12
HCM LOS	B	B	B	B

Lane	NBLn1	EBLn1	EBLn2	WBLn1	WBLn2	SBLn1	SBLn2
Vol Left, %	17%	100%	0%	100%	0%	100%	0%
Vol Thru, %	50%	0%	93%	0%	61%	0%	62%
Vol Right, %	33%	0%	7%	0%	39%	0%	38%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	60	55	205	15	280	160	80
LT Vol	10	55	0	15	0	160	0
Through Vol	30	0	190	0	170	0	50
RT Vol	20	0	15	0	110	0	30
Lane Flow Rate	67	61	228	17	311	178	89
Geometry Grp	6	7	7	7	7	7	7
Degree of Util (X)	0.123	0.111	0.379	0.03	0.497	0.338	0.15
Departure Headway (Hd)	6.623	6.546	5.986	6.506	5.755	6.843	6.071
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	539	547	599	550	625	524	589
Service Time	4.69	4.295	3.736	4.255	3.503	4.594	3.821
HCM Lane V/C Ratio	0.124	0.112	0.381	0.031	0.498	0.34	0.151
HCM Control Delay	10.6	10.1	12.4	9.5	14.1	13.1	9.9
HCM Lane LOS	B	B	B	A	B	B	A
HCM 95th-tile Q	0.4	0.4	1.8	0.1	2.8	1.5	0.5

HCS Roundabouts Report

General Information

Analyst	HDR
Agency or Co.	HDR
Date Performed	7/13/2022
Analysis Year	2032
Time Analyzed	AM Peak
Project Description	Mitchell MTP: 2032 Future C...



Site Information

Intersection	Rowley Street & Spruce Street
E/W Street Name	Spruce Street
N/S Street Name	Rowley Street
Analysis Time Period, hrs	0.25
Peak Hour Factor	0.90
Jurisdiction	City of Mitchell

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0
Lane Assignment			LTR				LTR				LTR				LTR	
Volume (V), veh/h	0	75	125	10	0	10	60	70	0	15	65	15	0	95	30	20
Percent Heavy Vehicles, %	0	0	5	0	0	14	4	5	0	0	4	9	0	0	14	0
Flow Rate (v_{PCE}), pc/h	0	83	146	11	0	13	69	82	0	17	75	18	0	106	38	22
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				1				1			
Pedestrians Crossing, p/h	0				0				0				0			
Proportion of CAVs	0															

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway, s		4.9763			4.9763			4.9763			4.9763	
Follow-Up Headway, s		2.6087			2.6087			2.6087			2.6087	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h		240			164			110			166	
Entry Volume, veh/h		233			156			106			161	
Circulating Flow (v_c), pc/h	157			175			335			99		
Exiting Flow (v_{ex}), pc/h	270			108			240			62		
Capacity (c_{pce}), pc/h		1176			1154			981			1247	
Capacity (c), veh/h		1142			1097			942			1212	
v/c Ratio (x)		0.20			0.14			0.11			0.13	

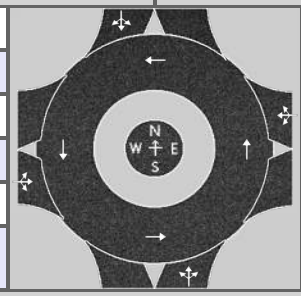
Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		5.0			4.5			4.9			4.1	
Lane LOS		A			A			A			A	
95% Queue, veh		0.8			0.5			0.4			0.5	
Approach Delay, s/veh	5.0			4.5			4.9			4.1		
Approach LOS	A			A			A			A		
Intersection Delay, s/veh | LOS	4.6						A					

HCS Roundabouts Report

General Information

Analyst	HDR
Agency or Co.	HDR
Date Performed	7/13/2022
Analysis Year	2032
Time Analyzed	PM Peak
Project Description	Mitchell MTP: 2032 Future C...



Site Information

Intersection	Rowley Street & Spruce Street
E/W Street Name	Spruce Street
N/S Street Name	Rowley Street
Analysis Time Period, hrs	0.25
Peak Hour Factor	0.90
Jurisdiction	City of Mitchell

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0
Lane Assignment			LTR				LTR				LTR				LTR	
Volume (V), veh/h	0	55	190	15	0	15	170	110	0	10	30	20	0	160	50	30
Percent Heavy Vehicles, %	0	0	0	0	0	0	2	0	0	0	8	8	0	0	0	0
Flow Rate (v_{PCE}), pc/h	0	61	211	17	0	17	193	122	0	11	36	24	0	178	56	33
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				1				1			
Pedestrians Crossing, p/h	0				0				0				0			
Proportion of CAVs	0															

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway, s		4.9763			4.9763			4.9763			4.9763	
Follow-Up Headway, s		2.6087			2.6087			2.6087			2.6087	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h		289			332			71			267	
Entry Volume, veh/h		289			328			67			267	
Circulating Flow (v_c), pc/h	251			108			450			221		
Exiting Flow (v_{ex}), pc/h	413			237			219			90		
Capacity (c_{pce}), pc/h		1068			1236			872			1101	
Capacity (c), veh/h		1068			1222			817			1101	
v/c Ratio (x)		0.27			0.27			0.08			0.24	

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		6.0			5.4			5.2			5.5	
Lane LOS		A			A			A			A	
95% Queue, veh		1.1			1.1			0.3			1.0	
Approach Delay, s/veh	6.0			5.4			5.2			5.5		
Approach LOS	A			A			A			A		
Intersection Delay, s/veh | LOS	5.6						A					

Intersection	
Intersection Delay, s/veh	11.2
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	100	170	15	15	80	95	20	85	20	125	35	25
Future Vol, veh/h	100	170	15	15	80	95	20	85	20	125	35	25
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles, %	0	5	0	14	4	5	0	4	9	0	14	0
Mvmt Flow	111	189	17	17	89	106	22	94	22	139	39	28
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	11.3	11	11.4	11.1
HCM LOS	B	B	B	B

Lane	NBLn1	EBLn1	EBLn2	WBLn1	WBLn2	SBLn1	SBLn2
Vol Left, %	16%	100%	0%	100%	0%	100%	0%
Vol Thru, %	68%	0%	92%	0%	46%	0%	58%
Vol Right, %	16%	0%	8%	0%	54%	0%	42%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	125	100	185	15	175	125	60
LT Vol	20	100	0	15	0	125	0
Through Vol	85	0	170	0	80	0	35
RT Vol	20	0	15	0	95	0	25
Lane Flow Rate	139	111	206	17	194	139	67
Geometry Grp	6	7	7	7	7	7	7
Degree of Util (X)	0.243	0.198	0.339	0.032	0.311	0.259	0.114
Departure Headway (Hd)	6.299	6.41	5.932	6.822	5.756	6.726	6.165
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	569	560	606	525	624	533	581
Service Time	4.349	4.15	3.671	4.566	3.499	4.473	3.912
HCM Lane V/C Ratio	0.244	0.198	0.34	0.032	0.311	0.261	0.115
HCM Control Delay	11.4	10.7	11.7	9.8	11.1	11.8	9.7
HCM Lane LOS	B	B	B	A	B	B	A
HCM 95th-tile Q	0.9	0.7	1.5	0.1	1.3	1	0.4

Intersection	
Intersection Delay, s/veh	19.2
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	75	255	20	20	220	145	15	40	25	210	65	40
Future Vol, veh/h	75	255	20	20	220	145	15	40	25	210	65	40
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles, %	0	0	0	0	2	0	0	8	8	0	0	0
Mvmt Flow	83	283	22	22	244	161	17	44	28	233	72	44
Number of Lanes	1	1	0	1	1	0	0	1	0	1	1	0

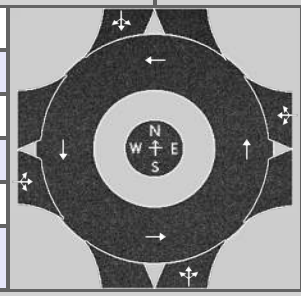
Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	2	2	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	1	2	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	2	2	2
HCM Control Delay	17.1	25	12.8	15.9
HCM LOS	C	C	B	C

Lane	NBLn1	EBLn1	EBLn2	WBLn1	WBLn2	SBLn1	SBLn2
Vol Left, %	19%	100%	0%	100%	0%	100%	0%
Vol Thru, %	50%	0%	93%	0%	60%	0%	62%
Vol Right, %	31%	0%	7%	0%	40%	0%	38%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	80	75	275	20	365	210	105
LT Vol	15	75	0	20	0	210	0
Through Vol	40	0	255	0	220	0	65
RT Vol	25	0	20	0	145	0	40
Lane Flow Rate	89	83	306	22	406	233	117
Geometry Grp	6	7	7	7	7	7	7
Degree of Util (X)	0.194	0.171	0.58	0.045	0.74	0.501	0.225
Departure Headway (Hd)	7.873	7.397	6.833	7.327	6.566	7.73	6.947
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	455	485	529	489	552	467	517
Service Time	5.937	5.141	4.576	5.068	4.307	5.474	4.69
HCM Lane V/C Ratio	0.196	0.171	0.578	0.045	0.736	0.499	0.226
HCM Control Delay	12.8	11.7	18.6	10.4	25.8	18	11.7
HCM Lane LOS	B	B	C	B	D	C	B
HCM 95th-tile Q	0.7	0.6	3.7	0.1	6.3	2.8	0.9

HCS Roundabouts Report

General Information

Analyst	HDR
Agency or Co.	HDR
Date Performed	7/13/2022
Analysis Year	2045
Time Analyzed	AM Peak
Project Description	Mitchell MTP: 2045 Future C...



Site Information

Intersection	Rowley Street & Spruce Street
E/W Street Name	Spruce Street
N/S Street Name	Rowley Street
Analysis Time Period, hrs	0.25
Peak Hour Factor	0.90
Jurisdiction	City of Mitchell

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0
Lane Assignment			LTR				LTR				LTR				LTR	
Volume (V), veh/h	0	100	170	15	0	15	80	95	0	20	85	20	0	125	35	25
Percent Heavy Vehicles, %	0	0	5	0	0	14	4	5	0	0	4	9	0	0	14	0
Flow Rate (v_{PCE}), pc/h	0	111	198	17	0	19	92	111	0	22	98	24	0	139	44	28
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				1				1			
Pedestrians Crossing, p/h	0				0				0				0			
Proportion of CAVs	0															

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway, s		4.9763			4.9763			4.9763			4.9763	
Follow-Up Headway, s		2.6087			2.6087			2.6087			2.6087	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h		326			222			144			211	
Entry Volume, veh/h		317			211			138			206	
Circulating Flow (v_c), pc/h	202			231			448			133		
Exiting Flow (v_{ex}), pc/h	361			142			320			80		
Capacity (c_{pce}), pc/h		1123			1090			874			1205	
Capacity (c), veh/h		1091			1036			839			1174	
v/c Ratio (x)		0.29			0.20			0.16			0.18	

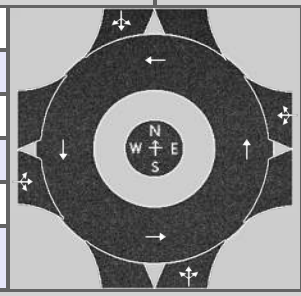
Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		6.1			5.4			6.0			4.6	
Lane LOS		A			A			A			A	
95% Queue, veh		1.2			0.8			0.6			0.6	
Approach Delay, s/veh	6.1			5.4			6.0			4.6		
Approach LOS	A			A			A			A		
Intersection Delay, s/veh | LOS	5.5						A					

HCS Roundabouts Report

General Information

Analyst	HDR
Agency or Co.	HDR
Date Performed	7/13/2022
Analysis Year	2045
Time Analyzed	PM Peak
Project Description	Mitchell MTP: 2045 Future C...



Site Information

Intersection	Rowley Street & Spruce Street
E/W Street Name	Spruce Street
N/S Street Name	Rowley Street
Analysis Time Period, hrs	0.25
Peak Hour Factor	0.90
Jurisdiction	City of Mitchell

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0
Lane Assignment			LTR				LTR				LTR				LTR	
Volume (V), veh/h	0	75	255	20	0	20	220	145	0	15	40	25	0	210	65	40
Percent Heavy Vehicles, %	0	0	0	0	0	0	2	0	0	0	8	8	0	0	0	0
Flow Rate (v_{PCE}), pc/h	0	83	283	22	0	22	249	161	0	17	48	30	0	233	72	44
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				1				1			
Pedestrians Crossing, p/h	0				0				0				0			
Proportion of CAVs	0															

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway, s		4.9763			4.9763			4.9763			4.9763	
Follow-Up Headway, s		2.6087			2.6087			2.6087			2.6087	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h		388			432			95			349	
Entry Volume, veh/h		388			427			89			349	
Circulating Flow (v_c), pc/h	327			148			599			288		
Exiting Flow (v_{ex}), pc/h	546			310			292			116		
Capacity (c_{pce}), pc/h		989			1187			749			1029	
Capacity (c), veh/h		989			1173			704			1029	
v/c Ratio (x)		0.39			0.36			0.13			0.34	

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		7.9			6.6			6.5			7.0	
Lane LOS		A			A			A			A	
95% Queue, veh		1.9			1.7			0.4			1.5	
Approach Delay, s/veh	7.9			6.6			6.5			7.0		
Approach LOS	A			A			A			A		
Intersection Delay, s/veh | LOS	7.1						A					

I-90 Exit 330 / Ohlman Street Corridor

I-90 WB RTI & SD37 Intersection:

2032 Build Condition AM/PM (TWSC)
2045 Build Condition AM/PM (TWSC)
2045 Build Condition AM/PM (Signal)
2032 Build Condition Signal Warrants
2045 Build Condition Signal Warrants

I-90 EB RTI & SD37 Intersection:

2032 Build Condition AM/PM (TWSC)
2032 Build Condition AM/PM (Signal)
2045 Build Condition AM/PM (TWSC)
2045 Build Condition AM/PM (Signal)
2032 Build Condition Signal Warrants
2045 Build Condition Signal Warrants

Intersection	
Int Delay, s/veh	0.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	15	0	215	20	395	0	0	425	100
Future Vol, veh/h	0	0	0	15	0	215	20	395	0	0	425	100
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	Free	-	-	None	-	-	None
Storage Length	-	-	-	-	-	150	80	-	-	-	-	0
Veh in Median Storage, #	-	1	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	0	0	9	7	3	0	0	8	12
Mvmt Flow	0	0	0	17	0	239	22	439	0	0	472	111

Major/Minor	Minor1			Major1			Major2		
Conflicting Flow All	1011	1066	-	583	0	-	-	-	0
Stage 1	483	483	-	-	-	-	-	-	-
Stage 2	528	583	-	-	-	-	-	-	-
Critical Hdwy	6.4	6.5	-	4.17	-	-	-	-	-
Critical Hdwy Stg 1	5.4	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.4	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	-	2.263	-	-	-	-	-
Pot Cap-1 Maneuver	268	224	0	967	-	0	0	-	-
Stage 1	625	556	0	-	-	0	0	-	-
Stage 2	596	502	0	-	-	0	0	-	-
Platoon blocked, %					-			-	-
Mov Cap-1 Maneuver	262	0	-	967	-	-	-	-	-
Mov Cap-2 Maneuver	262	0	-	-	-	-	-	-	-
Stage 1	611	0	-	-	-	-	-	-	-
Stage 2	596	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	19.7	0.4	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	WBLn1	WBLn2	SBT	SBR
Capacity (veh/h)	967	-	262	-	-	-
HCM Lane V/C Ratio	0.023	-	0.064	-	-	-
HCM Control Delay (s)	8.8	-	19.7	0	-	-
HCM Lane LOS	A	-	C	A	-	-
HCM 95th %tile Q(veh)	0.1	-	0.2	-	-	-

Intersection	
Int Delay, s/veh	1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	20	0	130	55	535	0	0	575	135
Future Vol, veh/h	0	0	0	20	0	130	55	535	0	0	575	135
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	Free	-	-	None	-	-	None
Storage Length	-	-	-	-	-	150	80	-	-	-	-	0
Veh in Median Storage, #	-	1	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	7	0	5	0	3	0	0	2	2
Mvmt Flow	0	0	0	22	0	144	61	594	0	0	639	150

Major/Minor	Minor1			Major1			Major2		
Conflicting Flow All	1430	1505	-	789	0	-	-	-	0
Stage 1	716	716	-	-	-	-	-	-	-
Stage 2	714	789	-	-	-	-	-	-	-
Critical Hdwy	6.47	6.5	-	4.1	-	-	-	-	-
Critical Hdwy Stg 1	5.47	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.47	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.563	4	-	2.2	-	-	-	-	-
Pot Cap-1 Maneuver	145	122	0	840	-	0	0	-	-
Stage 1	475	437	0	-	-	0	0	-	-
Stage 2	476	405	0	-	-	0	0	-	-
Platoon blocked, %					-			-	-
Mov Cap-1 Maneuver	134	0	-	840	-	-	-	-	-
Mov Cap-2 Maneuver	134	0	-	-	-	-	-	-	-
Stage 1	440	0	-	-	-	-	-	-	-
Stage 2	476	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	37.1	0.9	0
HCM LOS	E		

Minor Lane/Major Mvmt	NBL	NBT	WBLn1	WBLn2	SBT	SBR
Capacity (veh/h)	840	-	134	-	-	-
HCM Lane V/C Ratio	0.073	-	0.166	-	-	-
HCM Control Delay (s)	9.6	-	37.1	0	-	-
HCM Lane LOS	A	-	E	A	-	-
HCM 95th %tile Q(veh)	0.2	-	0.6	-	-	-

Intersection	
Int Delay, s/veh	0.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	20	0	275	25	510	0	0	550	130
Future Vol, veh/h	0	0	0	20	0	275	25	510	0	0	550	130
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	Free	-	-	None	-	-	None
Storage Length	-	-	-	-	-	150	80	-	-	-	-	0
Veh in Median Storage, #	-	1	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	0	0	9	7	3	0	0	8	12
Mvmt Flow	0	0	0	22	0	306	28	567	0	0	611	144

Major/Minor	Minor1			Major1			Major2		
Conflicting Flow All	1306	1378	-	755	0	-	-	-	0
Stage 1	623	623	-	-	-	-	-	-	-
Stage 2	683	755	-	-	-	-	-	-	-
Critical Hdwy	6.4	6.5	-	4.17	-	-	-	-	-
Critical Hdwy Stg 1	5.4	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.4	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	-	2.263	-	-	-	-	-
Pot Cap-1 Maneuver	178	146	0	833	-	0	0	-	-
Stage 1	539	481	0	-	-	0	0	-	-
Stage 2	505	420	0	-	-	0	0	-	-
Platoon blocked, %					-			-	-
Mov Cap-1 Maneuver	172	0	-	833	-	-	-	-	-
Mov Cap-2 Maneuver	172	0	-	-	-	-	-	-	-
Stage 1	521	0	-	-	-	-	-	-	-
Stage 2	505	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	29	0.4	0
HCM LOS	D		

Minor Lane/Major Mvmt	NBL	NBT	WBLn1	WBLn2	SBT	SBR
Capacity (veh/h)	833	-	172	-	-	-
HCM Lane V/C Ratio	0.033	-	0.129	-	-	-
HCM Control Delay (s)	9.5	-	29	0	-	-
HCM Lane LOS	A	-	D	A	-	-
HCM 95th %tile Q(veh)	0.1	-	0.4	-	-	-

Intersection	
Int Delay, s/veh	1.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	25	0	170	75	685	0	0	750	175
Future Vol, veh/h	0	0	0	25	0	170	75	685	0	0	750	175
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	Free	-	-	None	-	-	None
Storage Length	-	-	-	-	-	150	80	-	-	-	-	0
Veh in Median Storage, #	-	1	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	7	0	5	0	3	0	0	2	2
Mvmt Flow	0	0	0	28	0	189	83	761	0	0	833	194

Major/Minor	Minor1			Major1			Major2		
Conflicting Flow All	1857	1954	-	1027	0	-	-	-	0
Stage 1	927	927	-	-	-	-	-	-	-
Stage 2	930	1027	-	-	-	-	-	-	-
Critical Hdwy	6.47	6.5	-	4.1	-	-	-	-	-
Critical Hdwy Stg 1	5.47	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.47	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.563	4	-	2.2	-	-	-	-	-
Pot Cap-1 Maneuver	78	65	0	684	-	0	0	-	-
Stage 1	377	350	0	-	-	0	0	-	-
Stage 2	376	314	0	-	-	0	0	-	-
Platoon blocked, %					-			-	-
Mov Cap-1 Maneuver	69	0	-	684	-	-	-	-	-
Mov Cap-2 Maneuver	69	0	-	-	-	-	-	-	-
Stage 1	331	0	-	-	-	-	-	-	-
Stage 2	376	0	-	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	88.6	1.1	0
HCM LOS	F		

Minor Lane/Major Mvmt	NBL	NBT	WBLn1	WBLn2	SBT	SBR
Capacity (veh/h)	684	-	69	-	-	-
HCM Lane V/C Ratio	0.122	-	0.403	-	-	-
HCM Control Delay (s)	11	-	88.6	0	-	-
HCM Lane LOS	B	-	F	A	-	-
HCM 95th %tile Q(veh)	0.4	-	1.6	-	-	-



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	20	0	275	25	510	0	0	550	130
Future Volume (veh/h)	0	0	0	20	0	275	25	510	0	0	550	130
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach					No			No			No	
Adj Sat Flow, veh/h/ln				1800	1800	1674	1702	1758	0	0	1688	1632
Adj Flow Rate, veh/h				22	0	0	28	567	0	0	611	144
Peak Hour Factor				0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %				0	0	9	7	3	0	0	8	12
Cap, veh/h				56	0		618	1466	0	0	900	737
Arrive On Green				0.03	0.00	0.00	0.46	1.00	0.00	0.00	0.53	0.53
Sat Flow, veh/h				1714	0	1418	1621	1758	0	0	1688	1383
Grp Volume(v), veh/h				22	0	0	28	567	0	0	611	144
Grp Sat Flow(s),veh/h/ln				1714	0	1418	1621	1758	0	0	1688	1383
Q Serve(g_s), s				1.1	0.0	0.0	0.0	0.0	0.0	0.0	23.8	4.9
Cycle Q Clear(g_c), s				1.1	0.0	0.0	0.0	0.0	0.0	0.0	23.8	4.9
Prop In Lane				1.00		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				56	0		618	1466	0	0	900	737
V/C Ratio(X)				0.39	0.00		0.05	0.39	0.00	0.00	0.68	0.20
Avail Cap(c_a), veh/h				371	0		618	1466	0	0	900	737
HCM Platoon Ratio				1.00	1.00	1.00	2.00	2.00	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	0.00	0.00	0.80	0.80	0.00	0.00	1.00	1.00
Uniform Delay (d), s/veh				42.6	0.0	0.0	9.0	0.0	0.0	0.0	15.4	10.9
Incr Delay (d2), s/veh				4.3	0.0	0.0	0.0	0.6	0.0	0.0	4.1	0.6
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				0.5	0.0	0.0	0.2	0.3	0.0	0.0	8.8	1.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				47.0	0.0	0.0	9.0	0.6	0.0	0.0	19.5	11.5
LnGrp LOS				D	A		A	A	A	A	B	B
Approach Vol, veh/h					22	A		595			755	
Approach Delay, s/veh					47.0			1.0			18.0	
Approach LOS					D			A			B	

Timer - Assigned Phs	2		5	6		8						
Phs Duration (G+Y+Rc), s	81.5		27.0	54.5		8.5						
Change Period (Y+Rc), s	6.5		6.5	* 6.5		5.5						
Max Green Setting (Gmax), s	58.5		5.0	* 48		19.5						
Max Q Clear Time (g_c+I1), s	2.0		2.0	25.8		3.1						
Green Ext Time (p_c), s	3.7		0.0	4.2		0.0						

Intersection Summary		
HCM 6th Ctrl Delay	11.1	
HCM 6th LOS	B	

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	25	0	170	75	685	0	0	750	175
Future Volume (veh/h)	0	0	0	25	0	170	75	685	0	0	750	175
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach					No			No			No	
Adj Sat Flow, veh/h/ln				1702	1800	1730	1800	1758	0	0	1772	1772
Adj Flow Rate, veh/h				28	0	0	83	761	0	0	833	194
Peak Hour Factor				0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %				7	0	5	0	3	0	0	2	2
Cap, veh/h				61	0		502	1520	0	0	1186	1005
Arrive On Green				0.04	0.00	0.00	0.28	1.00	0.00	0.00	0.67	0.67
Sat Flow, veh/h				1714	0	1466	1714	1758	0	0	1772	1502
Grp Volume(v), veh/h				28	0	0	83	761	0	0	833	194
Grp Sat Flow(s),veh/h/ln				1714	0	1466	1714	1758	0	0	1772	1502
Q Serve(g_s), s				1.9	0.0	0.0	0.0	0.0	0.0	0.0	35.2	5.9
Cycle Q Clear(g_c), s				1.9	0.0	0.0	0.0	0.0	0.0	0.0	35.2	5.9
Prop In Lane				1.00		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				61	0		502	1520	0	0	1186	1005
V/C Ratio(X)				0.46	0.00		0.17	0.50	0.00	0.00	0.70	0.19
Avail Cap(c_a), veh/h				236	0		502	1520	0	0	1186	1005
HCM Platoon Ratio				1.00	1.00	1.00	2.00	2.00	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	0.00	0.00	0.66	0.66	0.00	0.00	1.00	1.00
Uniform Delay (d), s/veh				56.8	0.0	0.0	14.3	0.0	0.0	0.0	12.4	7.5
Incr Delay (d2), s/veh				5.4	0.0	0.0	0.1	0.8	0.0	0.0	3.5	0.4
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				0.9	0.0	0.0	1.1	0.3	0.0	0.0	12.9	1.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				62.1	0.0	0.0	14.4	0.8	0.0	0.0	15.9	8.0
LnGrp LOS				E	A		B	A	A	A	B	A
Approach Vol, veh/h					28	A		844			1027	
Approach Delay, s/veh					62.1			2.1			14.4	
Approach LOS					E			A			B	

Timer - Assigned Phs	2		5	6		8						
Phs Duration (G+Y+Rc), s	110.3		23.5	86.8		9.7						
Change Period (Y+Rc), s	6.5		6.5	* 6.5		5.5						
Max Green Setting (Gmax), s	91.5		5.7	* 80		16.5						
Max Q Clear Time (g_c+I1), s	2.0		2.0	37.2		3.9						
Green Ext Time (p_c), s	5.9		0.0	7.5		0.0						

Intersection Summary	
HCM 6th Ctrl Delay	9.6
HCM 6th LOS	A

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

HCS7: MUTCD Signal Warrants Release 7.2

Analyst: HDR
Agency: HDR
Date: 5/16/2022
Project ID: Mitchell MTP
EW Street: I-90 Exit 330 WB RTI

Intersection: Exit 330 WB RTI & SD37
Jurisdiction: SDDOT
Units: U.S. Customary
Analysis Year: 2032 Build
NS Street: SD37 (Ohlman Street)

General Information

Major St. Speed (mph): 40
Nearest Signal (ft): 1050
Crashes per Yr: 0

Population: Not less than 10000
Coordinated Signal System: Y

School Crossing

Students in Highest Hour: 0
Adequate Gaps in Period: 0
Minutes in Period: 0

Roadway Network

Two Major Routes: 1
Weekend Count: 0
5-yr Growth Factor: 0

Geometry and Traffic

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	0	0	0	1	1	1	1	0	0	1	1
LaneUsage					LT	R	L	T			T	R

Results

Warrant 1: Eight-Hour Vehicular Volume	[ ]
1 A. Minimum Vehicular Volumes	[ ]
1 B. Interruption of Continuous Traffic	[ ]
1 80% Vehicular --and-- Interruption Volumes	[ ]
Warrant 2: Four-Hour Vehicular Volume	
2 A. Four-Hour Vehicular Volumes	[ ]
Warrant 3: Peak Hour	[ ]
3 A. Peak-Hour Conditions	[ ]
3 B. Peak-Hour Vehicular Volume Hours Met	[ ]
Warrant 4: Pedestrian Volume	[ ]
4 A. Four Hour Volumes	[ ]
4 B. One-Hour Volumes	[ ]
Warrant 5: School Crossing	[ ]
5 A. Student Volumes	[ ]
5 B. Gaps Same Period	[ ]
Warrant 6: Coordinated Signal System	
6 Degree of Platooning	[X]
Warrant 7: Crash Experience	[ ]
7 A. Adequate trials of alternatives	[ ]

7 B. Reported crashes [ ]
7 80% Volumes for Warrants 1A, 1B --or-- 4 [ ]

Warrant 8: Roadway Network [ ]
8 A. Weekday Volume [ ]
8 B. Weekend Volume [ ]

Warrant 9: Grade Crossing [ ]
9 A. Grade Crossing within 140 ft --and-- [ ]
9 B. Peak-Hour Vehicular Volumes [ ]

Summary

Hours	Major Volume	Minor Volume	Total Volume	Delay (Veh-hr)	1A 100%	1A 80%	1B 100%	1B 80%	2 100%	3A 100%	3B 100%
07-08	940	230	1170	0.0	Yes	Yes	Yes	Yes	Yes	No	No
08-09	0	0	0	0.0	No	No	No	No	No	No	No
09-10	0	0	0	0.0	No	No	No	No	No	No	No
10-11	0	0	0	0.0	No	No	No	No	No	No	No
11-12	0	0	0	0.0	No	No	No	No	No	No	No
12-13	0	0	0	0.0	No	No	No	No	No	No	No
13-14	0	0	0	0.0	No	No	No	No	No	No	No
14-15	0	0	0	0.0	No	No	No	No	No	No	No
15-16	0	0	0	0.0	No	No	No	No	No	No	No
16-17	1300	150	1450	0.0	No	No	Yes	Yes	Yes	No	No
17-18	0	0	0	0.0	No	No	No	No	No	No	No
18-19	0	0	0	0.0	No	No	No	No	No	No	No
Total	2240	380	2620		1	1	2	2	2	0	0

Traffic Volumes (vph)

Eastbound			Westbound			Northbound			Southbound		
L	T	R	L	T	R	L	T	R	L	T	R
0	0	0	15	0	215	20	395	0	0	425	100
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	20	0	130	55	535	0	0	575	135
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0

Pedestrian Volumes and Gaps (Per Hour)

Volume	Gap	Volume	Gap	Volume	Gap	Volume	Gap
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0

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Delay	sec/veh	veh-hrs	sec/veh	veh-hrs	sec/veh	veh-hrs	sec/veh	veh-hrs
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

HCS7: MUTCD Signal Warrants Release 7.2

Analyst: HDR
Agency: HDR
Date: 5/16/2022
Project ID: Mitchell MTP
EW Street: I-90 Exit 330 WB RTI

Intersection: Exit 330 WB RTI & SD37
Jurisdiction: SDDOT
Units: U.S. Customary
Analysis Year: 2045 Build
NS Street: SD37 (Ohlman Street)

General Information

Major St. Speed (mph): 40
Nearest Signal (ft): 1050
Crashes per Yr: 0

Population: Not less than 10000
Coordinated Signal System: Y

School Crossing

Students in Highest Hour: 0
Adequate Gaps in Period: 0
Minutes in Period: 0

Roadway Network

Two Major Routes: 1
Weekend Count: 0
5-yr Growth Factor: 0

Geometry and Traffic

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	0	0	0	1	1	1	1	0	0	1	1
LaneUsage					LT	R	L	T			T	R

Results

Warrant 1: Eight-Hour Vehicular Volume	[ ]
1 A. Minimum Vehicular Volumes	[ ]
1 B. Interruption of Continuous Traffic	[ ]
1 80% Vehicular --and-- Interruption Volumes	[ ]
Warrant 2: Four-Hour Vehicular Volume	
2 A. Four-Hour Vehicular Volumes	[ ]
Warrant 3: Peak Hour	[X]
3 A. Peak-Hour Conditions	[ ]
3 B. Peak-Hour Vehicular Volume Hours Met	[X]
Warrant 4: Pedestrian Volume	[ ]
4 A. Four Hour Volumes	[ ]
4 B. One-Hour Volumes	[ ]
Warrant 5: School Crossing	[ ]
5 A. Student Volumes	[ ]
5 B. Gaps Same Period	[ ]
Warrant 6: Coordinated Signal System	
6 Degree of Platooning	[X]
Warrant 7: Crash Experience	[ ]
7 A. Adequate trials of alternatives	[ ]

7 B. Reported crashes [ ]
7 80% Volumes for Warrants 1A, 1B --or-- 4 [ ]

Warrant 8: Roadway Network [X]
8 A. Weekday Volume [X]
8 B. Weekend Volume [ ]

Warrant 9: Grade Crossing [ ]
9 A. Grade Crossing within 140 ft --and-- [ ]
9 B. Peak-Hour Vehicular Volumes [ ]

Summary

Hours	Major Volume	Minor Volume	Total Volume	Delay (Veh-hr)	1A 100%	1A 80%	1B 100%	1B 80%	2 100%	3A 100%	3B 100%
07-08	1215	295	1510	0.0	Yes	Yes	Yes	Yes	Yes	No	Yes
08-09	0	0	0	0.0	No	No	No	No	No	No	No
09-10	0	0	0	0.0	No	No	No	No	No	No	No
10-11	0	0	0	0.0	No	No	No	No	No	No	No
11-12	0	0	0	0.0	No	No	No	No	No	No	No
12-13	0	0	0	0.0	No	No	No	No	No	No	No
13-14	0	0	0	0.0	No	No	No	No	No	No	No
14-15	0	0	0	0.0	No	No	No	No	No	No	No
15-16	0	0	0	0.0	No	No	No	No	No	No	No
16-17	1685	195	1880	0.0	No	Yes	Yes	Yes	Yes	No	Yes
17-18	0	0	0	0.0	No	No	No	No	No	No	No
18-19	0	0	0	0.0	No	No	No	No	No	No	No
Total	2900	490	3390		1	2	2	2	2	0	2

Traffic Volumes (vph)

Eastbound			Westbound			Northbound			Southbound		
L	T	R	L	T	R	L	T	R	L	T	R
0	0	0	20	0	275	25	510	0	0	550	130
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	25	0	170	75	685	0	0	750	175
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0

Pedestrian Volumes and Gaps (Per Hour)

Volume	Gap	Volume	Gap	Volume	Gap	Volume	Gap
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0

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Delay	sec/veh	veh-hrs	sec/veh	veh-hrs	sec/veh	veh-hrs	sec/veh	veh-hrs
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Intersection	
Int Delay, s/veh	4.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	105	0	35	0	0	0	0	310	10	160	280	0
Future Vol, veh/h	105	0	35	0	0	0	0	310	10	160	280	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	150	-	-	-	-	-	-	-	-	80	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	3	0	0	0	0	0	0	5	14	16	3	0
Mvmt Flow	117	0	39	0	0	0	0	344	11	178	311	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1017	1022	311	-	1017	-	-	0	0	355	0	0
Stage 1	667	667	-	-	350	-	-	-	-	-	-	-
Stage 2	350	355	-	-	667	-	-	-	-	-	-	-
Critical Hdwy	7.13	6.5	6.2	-	6.5	-	-	-	-	4.26	-	-
Critical Hdwy Stg 1	6.13	5.5	-	-	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.13	5.5	-	-	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.527	4	3.3	-	4	-	-	-	-	2.344	-	-
Pot Cap-1 Maneuver	215	238	734	0	239	0	0	-	-	1130	-	0
Stage 1	447	460	-	0	636	0	0	-	-	-	-	0
Stage 2	664	633	-	0	460	0	0	-	-	-	-	0
Platoon blocked, %								-	-		-	
Mov Cap-1 Maneuver	189	200	734	-	201	-	-	-	-	1130	-	-
Mov Cap-2 Maneuver	299	281	-	-	302	-	-	-	-	-	-	-
Stage 1	447	387	-	-	636	-	-	-	-	-	-	-
Stage 2	664	633	-	-	387	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	20.9	0	0	3.2
HCM LOS	C	A		

Minor Lane/Major Mvmt	NBT	NBR	EBLn1	EBLn2	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	299	734	-	1130	-
HCM Lane V/C Ratio	-	-	0.39	0.053	-	0.157	-
HCM Control Delay (s)	-	-	24.5	10.2	0	8.8	-
HCM Lane LOS	-	-	C	B	A	A	-
HCM 95th %tile Q(veh)	-	-	1.8	0.2	-	0.6	-

Intersection	
Int Delay, s/veh	7.1

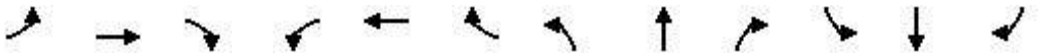
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	115	0	45	0	0	0	0	475	35	190	405	0
Future Vol, veh/h	115	0	45	0	0	0	0	475	35	190	405	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	150	-	-	-	-	-	-	-	-	80	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	8	0	6	0	0	0	0	2	4	4	1	0
Mvmt Flow	128	0	50	0	0	0	0	528	39	211	450	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1420	1439	450	-	1420	-	-	0	0	567	0	0
Stage 1	872	872	-	-	548	-	-	-	-	-	-	-
Stage 2	548	567	-	-	872	-	-	-	-	-	-	-
Critical Hdwy	7.18	6.5	6.26	-	6.5	-	-	-	-	4.14	-	-
Critical Hdwy Stg 1	6.18	5.5	-	-	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.18	5.5	-	-	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.572	4	3.354	-	4	-	-	-	-	2.236	-	-
Pot Cap-1 Maneuver	~ 111	134	601	0	138	0	0	-	-	995	-	0
Stage 1	337	371	-	0	520	0	0	-	-	-	-	0
Stage 2	510	510	-	0	371	0	0	-	-	-	-	0
Platoon blocked, %								-	-		-	
Mov Cap-1 Maneuver	~ 93	106	601	-	109	-	-	-	-	995	-	-
Mov Cap-2 Maneuver	187	183	-	-	215	-	-	-	-	-	-	-
Stage 1	337	292	-	-	520	-	-	-	-	-	-	-
Stage 2	510	510	-	-	292	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	44.9	0	0	3.1
HCM LOS	E	A		

Minor Lane/Major Mvmt	NBT	NBR	EBLn1	EBLn2	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	187	601	-	995	-
HCM Lane V/C Ratio	-	-	0.683	0.083	-	0.212	-
HCM Control Delay (s)	-	-	57.9	11.5	0	9.6	-
HCM Lane LOS	-	-	F	B	A	A	-
HCM 95th %tile Q(veh)	-	-	4.1	0.3	-	0.8	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

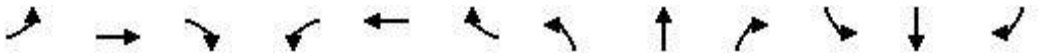


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	105	0	35	0	0	0	0	310	10	160	280	0
Future Volume (veh/h)	105	0	35	0	0	0	0	310	10	160	280	0
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No						No			No	
Adj Sat Flow, veh/h/ln	1758	1800	1800				0	1730	1603	1575	1758	0
Adj Flow Rate, veh/h	117	0	39				0	344	11	178	311	0
Peak Hour Factor	0.90	0.90	0.90				0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	3	0	0				0	5	14	16	3	0
Cap, veh/h	160	0	146				0	1307	42	760	1379	0
Arrive On Green	0.10	0.00	0.10				0.00	0.78	0.78	0.78	0.78	0.00
Sat Flow, veh/h	1674	0	1525				0	1667	53	912	1758	0
Grp Volume(v), veh/h	117	0	39				0	0	355	178	311	0
Grp Sat Flow(s),veh/h/ln	1674	0	1525				0	0	1720	912	1758	0
Q Serve(g_s), s	5.1	0.0	1.8				0.0	0.0	4.2	4.9	3.5	0.0
Cycle Q Clear(g_c), s	5.1	0.0	1.8				0.0	0.0	4.2	9.1	3.5	0.0
Prop In Lane	1.00		1.00				0.00		0.03	1.00		0.00
Lane Grp Cap(c), veh/h	160	0	146				0	0	1349	760	1379	0
V/C Ratio(X)	0.73	0.00	0.27				0.00	0.00	0.26	0.23	0.23	0.00
Avail Cap(c_a), veh/h	480	0	437				0	0	1349	760	1379	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00				0.00	0.00	1.00	0.90	0.90	0.00
Uniform Delay (d), s/veh	33.0	0.0	31.5				0.0	0.0	2.2	3.4	2.1	0.0
Incr Delay (d2), s/veh	6.2	0.0	1.0				0.0	0.0	0.5	0.6	0.3	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.2	0.0	0.6				0.0	0.0	0.6	0.6	0.5	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	39.2	0.0	32.4				0.0	0.0	2.7	4.1	2.5	0.0
LnGrp LOS	D	A	C				A	A	A	A	A	A
Approach Vol, veh/h		156						355			489	
Approach Delay, s/veh		37.5						2.7			3.1	
Approach LOS		D						A			A	

Timer - Assigned Phs		2		4		6						
Phs Duration (G+Y+Rc), s		63.3		11.7		63.3						
Change Period (Y+Rc), s		4.5		4.5		4.5						
Max Green Setting (Gmax), s		44.5		21.5		44.5						
Max Q Clear Time (g_c+I1), s		6.2		7.1		11.1						
Green Ext Time (p_c), s		2.1		0.4		2.8						

Intersection Summary												
HCM 6th Ctrl Delay			8.3									
HCM 6th LOS			A									

HCM 6th Signalized Intersection Summary
12: SD37 (Ohlman Street) & I-90 EB (Exit 330) Off-Ramp/I-90 EB (Exit 330) On-Ramp 06/13/2022



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	115	0	45	0	0	0	0	475	35	190	405	0
Future Volume (veh/h)	115	0	45	0	0	0	0	475	35	190	405	0
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No						No			No	
Adj Sat Flow, veh/h/ln	1688	1800	1716				0	1772	1744	1744	1786	0
Adj Flow Rate, veh/h	128	0	50				0	528	39	211	450	0
Peak Hour Factor	0.90	0.90	0.90				0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	8	0	6				0	2	4	4	1	0
Cap, veh/h	171	0	162				0	1261	93	648	1381	0
Arrive On Green	0.11	0.00	0.11				0.00	0.77	0.77	0.77	0.77	0.00
Sat Flow, veh/h	1607	0	1525				0	1630	120	831	1786	0
Grp Volume(v), veh/h	128	0	50				0	0	567	211	450	0
Grp Sat Flow(s),veh/h/ln	1607	0	1525				0	0	1750	831	1786	0
Q Serve(g_s), s	5.8	0.0	2.3				0.0	0.0	8.1	8.6	5.7	0.0
Cycle Q Clear(g_c), s	5.8	0.0	2.3				0.0	0.0	8.1	16.7	5.7	0.0
Prop In Lane	1.00		1.00				0.00		0.07	1.00		0.00
Lane Grp Cap(c), veh/h	171	0	162				0	0	1354	648	1381	0
V/C Ratio(X)	0.75	0.00	0.31				0.00	0.00	0.42	0.33	0.33	0.00
Avail Cap(c_a), veh/h	396	0	376				0	0	1354	648	1381	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00				0.00	0.00	1.00	0.85	0.85	0.00
Uniform Delay (d), s/veh	32.5	0.0	31.0				0.0	0.0	2.8	5.6	2.6	0.0
Incr Delay (d2), s/veh	6.4	0.0	1.1				0.0	0.0	1.0	1.1	0.5	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.4	0.0	0.8				0.0	0.0	1.3	1.2	0.9	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	38.9	0.0	32.0				0.0	0.0	3.8	6.8	3.1	0.0
LnGrp LOS	D	A	C				A	A	A	A	A	A
Approach Vol, veh/h		178						567			661	
Approach Delay, s/veh		37.0						3.8			4.3	
Approach LOS		D						A			A	

Timer - Assigned Phs		2		4		6						
Phs Duration (G+Y+Rc), s		62.5		12.5		62.5						
Change Period (Y+Rc), s		4.5		4.5		4.5						
Max Green Setting (Gmax), s		47.5		18.5		47.5						
Max Q Clear Time (g_c+I1), s		10.1		7.8		18.7						
Green Ext Time (p_c), s		3.7		0.4		4.2						

Intersection Summary		
HCM 6th Ctrl Delay		8.2
HCM 6th LOS		A

Intersection	
Int Delay, s/veh	8.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	135	0	45	0	0	0	0	400	15	210	360	0
Future Vol, veh/h	135	0	45	0	0	0	0	400	15	210	360	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	150	-	-	-	-	-	-	-	-	80	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	3	0	0	0	0	0	0	5	14	16	3	0
Mvmt Flow	150	0	50	0	0	0	0	444	17	233	400	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1319	1327	400	-	1319	-	-	0	0	461	0	0
Stage 1	866	866	-	-	453	-	-	-	-	-	-	-
Stage 2	453	461	-	-	866	-	-	-	-	-	-	-
Critical Hdwy	7.13	6.5	6.2	-	6.5	-	-	-	-	4.26	-	-
Critical Hdwy Stg 1	6.13	5.5	-	-	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.13	5.5	-	-	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.527	4	3.3	-	4	-	-	-	-	2.344	-	-
Pot Cap-1 Maneuver	~ 133	157	654	0	158	0	0	-	-	1030	-	0
Stage 1	347	373	-	0	573	0	0	-	-	-	-	0
Stage 2	584	569	-	0	373	0	0	-	-	-	-	0
Platoon blocked, %								-	-		-	
Mov Cap-1 Maneuver	~ 110	122	654	-	122	-	-	-	-	1030	-	-
Mov Cap-2 Maneuver	209	197	-	-	223	-	-	-	-	-	-	-
Stage 1	347	289	-	-	573	-	-	-	-	-	-	-
Stage 2	584	569	-	-	289	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	45.3	0	0	3.5
HCM LOS	E	A		

Minor Lane/Major Mvmt	NBT	NBR	EBLn1	EBLn2	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	209	654	-	1030	-
HCM Lane V/C Ratio	-	-	0.718	0.076	-	0.227	-
HCM Control Delay (s)	-	-	56.7	11	0	9.5	-
HCM Lane LOS	-	-	F	B	A	A	-
HCM 95th %tile Q(veh)	-	-	4.7	0.2	-	0.9	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Intersection	
Int Delay, s/veh	36.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	145	0	60	0	0	0	0	615	45	245	530	0
Future Vol, veh/h	145	0	60	0	0	0	0	615	45	245	530	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	150	-	-	-	-	-	-	-	-	80	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	8	0	6	0	0	0	0	2	4	4	1	0
Mvmt Flow	161	0	67	0	0	0	0	683	50	272	589	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1841	1866	589	-	1841	-	-	0	0	733	0	0
Stage 1	1133	1133	-	-	708	-	-	-	-	-	-	-
Stage 2	708	733	-	-	1133	-	-	-	-	-	-	-
Critical Hdwy	7.18	6.5	6.26	-	6.5	-	-	-	-	4.14	-	-
Critical Hdwy Stg 1	6.18	5.5	-	-	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.18	5.5	-	-	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.572	4	3.354	-	4	-	-	-	-	2.236	-	-
Pot Cap-1 Maneuver	~ 56	73	501	0	76	0	0	-	-	863	-	0
Stage 1	240	280	-	0	441	0	0	-	-	-	-	0
Stage 2	416	429	-	0	280	0	0	-	-	-	-	0
Platoon blocked, %								-	-		-	
Mov Cap-1 Maneuver	~ 42	50	501	-	52	-	-	-	-	863	-	-
Mov Cap-2 Maneuver	~ 100	101	-	-	141	-	-	-	-	-	-	-
Stage 1	240	192	-	-	441	-	-	-	-	-	-	-
Stage 2	416	429	-	-	192	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	280.2	0	0	3.5
HCM LOS	F	A		

Minor Lane/Major Mvmt	NBT	NBR	EBLn1	EBLn2	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	100	501	-	863	-
HCM Lane V/C Ratio	-	-	1.611	0.133	-	0.315	-
HCM Control Delay (s)	-	-	$ 390.6	13.3	0	11.1	-
HCM Lane LOS	-	-	F	B	A	B	-
HCM 95th %tile Q(veh)	-	-	12.5	0.5	-	1.4	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	135	0	45	0	0	0	0	400	15	210	360	0
Future Volume (veh/h)	135	0	45	0	0	0	0	400	15	210	360	0
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No						No			No	
Adj Sat Flow, veh/h/ln	1758	1800	1800				0	1730	1603	1575	1758	0
Adj Flow Rate, veh/h	150	0	50				0	444	17	233	400	0
Peak Hour Factor	0.90	0.90	0.90				0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	3	0	0				0	5	14	16	3	0
Cap, veh/h	188	0	171				0	745	29	615	1326	0
Arrive On Green	0.11	0.00	0.11				0.00	0.45	0.45	0.46	1.00	0.00
Sat Flow, veh/h	1674	0	1525				0	1655	63	1500	1758	0
Grp Volume(v), veh/h	150	0	50				0	0	461	233	400	0
Grp Sat Flow(s),veh/h/ln	1674	0	1525				0	0	1718	1500	1758	0
Q Serve(g_s), s	7.9	0.0	2.7				0.0	0.0	18.1	0.0	0.0	0.0
Cycle Q Clear(g_c), s	7.9	0.0	2.7				0.0	0.0	18.1	0.0	0.0	0.0
Prop In Lane	1.00		1.00				0.00		0.04	1.00		0.00
Lane Grp Cap(c), veh/h	188	0	171				0	0	773	615	1326	0
V/C Ratio(X)	0.80	0.00	0.29				0.00	0.00	0.60	0.38	0.30	0.00
Avail Cap(c_a), veh/h	307	0	280				0	0	773	615	1326	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	2.00	2.00	1.00
Upstream Filter(I)	1.00	0.00	1.00				0.00	0.00	1.00	0.85	0.85	0.00
Uniform Delay (d), s/veh	38.9	0.0	36.7				0.0	0.0	18.6	11.5	0.0	0.0
Incr Delay (d2), s/veh	7.5	0.0	0.9				0.0	0.0	3.4	0.3	0.5	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.4	0.0	1.0				0.0	0.0	7.1	2.1	0.2	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	46.4	0.0	37.6				0.0	0.0	22.0	11.8	0.5	0.0
LnGrp LOS	D	A	D				A	A	C	B	A	A
Approach Vol, veh/h		200						461			633	
Approach Delay, s/veh		44.2						22.0			4.7	
Approach LOS		D						C			A	

Timer - Assigned Phs	1	2		4		6
Phs Duration (G+Y+Rc), s	27.4	47.0		15.6		74.4
Change Period (Y+Rc), s	6.5	* 6.5		5.5		6.5
Max Green Setting (Gmax), s	15.5	* 41		16.5		61.5
Max Q Clear Time (g_c+I1), s	2.0	20.1		9.9		2.0
Green Ext Time (p_c), s	0.5	2.5		0.3		2.4

Intersection Summary	
HCM 6th Ctrl Delay	16.9
HCM 6th LOS	B

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	145	0	60	0	0	0	0	615	45	245	530	0
Future Volume (veh/h)	145	0	60	0	0	0	0	615	45	245	530	0
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No						No			No	
Adj Sat Flow, veh/h/ln	1688	1800	1716				0	1772	1744	1744	1786	0
Adj Flow Rate, veh/h	161	0	67				0	683	50	272	589	0
Peak Hour Factor	0.90	0.90	0.90				0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	8	0	6				0	2	4	4	1	0
Cap, veh/h	189	0	179				0	1077	79	483	1398	0
Arrive On Green	0.12	0.00	0.12				0.00	0.66	0.66	0.15	1.00	0.00
Sat Flow, veh/h	1607	0	1525				0	1631	119	1661	1786	0
Grp Volume(v), veh/h	161	0	67				0	0	733	272	589	0
Grp Sat Flow(s),veh/h/ln	1607	0	1525				0	0	1750	1661	1786	0
Q Serve(g_s), s	11.8	0.0	4.9				0.0	0.0	29.4	6.6	0.0	0.0
Cycle Q Clear(g_c), s	11.8	0.0	4.9				0.0	0.0	29.4	6.6	0.0	0.0
Prop In Lane	1.00		1.00				0.00		0.07	1.00		0.00
Lane Grp Cap(c), veh/h	189	0	179				0	0	1155	483	1398	0
V/C Ratio(X)	0.85	0.00	0.37				0.00	0.00	0.63	0.56	0.42	0.00
Avail Cap(c_a), veh/h	248	0	235				0	0	1155	639	1398	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	2.00	2.00	1.00
Upstream Filter(I)	1.00	0.00	1.00				0.00	0.00	1.00	0.74	0.74	0.00
Uniform Delay (d), s/veh	51.9	0.0	48.9				0.0	0.0	11.9	9.9	0.0	0.0
Incr Delay (d2), s/veh	19.3	0.0	1.3				0.0	0.0	2.7	0.8	0.7	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.6	0.0	1.9				0.0	0.0	10.6	2.1	0.3	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	71.2	0.0	50.2				0.0	0.0	14.6	10.7	0.7	0.0
LnGrp LOS	E	A	D				A	A	B	B	A	A
Approach Vol, veh/h		228						733			861	
Approach Delay, s/veh		65.1						14.6			3.8	
Approach LOS		E						B			A	

Timer - Assigned Phs	1	2		4		6
Phs Duration (G+Y+Rc), s	14.7	85.7		19.6		100.4
Change Period (Y+Rc), s	5.5	6.5		5.5		6.5
Max Green Setting (Gmax), s	20.5	63.5		18.5		89.5
Max Q Clear Time (g_c+I1), s	8.6	31.4		13.8		2.0
Green Ext Time (p_c), s	0.6	5.3		0.3		3.9

Intersection Summary	
HCM 6th Ctrl Delay	15.8
HCM 6th LOS	B

HCS7: MUTCD Signal Warrants Release 7.2

Analyst: HDR
Agency: HDR
Date: 5/16/2022
Project ID: Mitchell MTP
EW Street: I-90 Exit 330 EB RTI

Intersection: Exit 330 EB RTI & SD37
Jurisdiction: SDDOT
Units: U.S. Customary
Analysis Year: 2032 Build
NS Street: SD37 (Ohlman Street)

General Information

Major St. Speed (mph): 45
Nearest Signal (ft): 1050
Crashes per Yr: 0

Population: Not less than 10000
Coordinated Signal System: Y

School Crossing

Students in Highest Hour: 0
Adequate Gaps in Period: 0
Minutes in Period: 0

Roadway Network

Two Major Routes: 1
Weekend Count: 0
5-yr Growth Factor: 0

Geometry and Traffic

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	1	0	0	0	0	0	1	0	1	1	0
LaneUsage	L	TR						TR		L	T	

Results

Warrant 1: Eight-Hour Vehicular Volume	[ ]
1 A. Minimum Vehicular Volumes	[ ]
1 B. Interruption of Continuous Traffic	[ ]
1 56% Vehicular --and-- Interruption Volumes	[ ]
Warrant 2: Four-Hour Vehicular Volume	
2 A. Four-Hour Vehicular Volumes	[ ]
Warrant 3: Peak Hour	[X]
3 A. Peak-Hour Conditions	[ ]
3 B. Peak-Hour Vehicular Volume Hours Met	[X]
Warrant 4: Pedestrian Volume	[ ]
4 A. Four Hour Volumes	[ ]
4 B. One-Hour Volumes	[ ]
Warrant 5: School Crossing	[ ]
5 A. Student Volumes	[ ]
5 B. Gaps Same Period	[ ]
Warrant 6: Coordinated Signal System	
6 Degree of Platooning	[X]
Warrant 7: Crash Experience	[ ]
7 A. Adequate trials of alternatives	[ ]

7 B. Reported crashes [ ]
7 56% Volumes for Warrants 1A, 1B --or-- 4 [ ]

Warrant 8: Roadway Network [X]
8 A. Weekday Volume [X]
8 B. Weekend Volume [ ]

Warrant 9: Grade Crossing [ ]
9 A. Grade Crossing within 140 ft --and-- [ ]
9 B. Peak-Hour Vehicular Volumes [ ]

Summary

Hours	Major Volume	Minor Volume	Total Volume	Delay (Veh-hr)	1A 70%	1A 56%	1B 70%	1B 56%	2 70%	3A 70%	3B 70%
07-08	760	140	900	0.0	Yes	Yes	Yes	Yes	Yes	No	No
08-09	0	0	0	0.0	No	No	No	No	No	No	No
09-10	0	0	0	0.0	No	No	No	No	No	No	No
10-11	0	0	0	0.0	No	No	No	No	No	No	No
11-12	0	0	0	0.0	No	No	No	No	No	No	No
12-13	0	0	0	0.0	No	No	No	No	No	No	No
13-14	0	0	0	0.0	No	No	No	No	No	No	No
14-15	0	0	0	0.0	No	No	No	No	No	No	No
15-16	0	0	0	0.0	No	No	No	No	No	No	No
16-17	0	0	0	0.0	No	No	No	No	No	No	No
17-18	1105	160	1265	0.0	Yes	Yes	Yes	Yes	Yes	No	Yes
18-19	0	0	0	0.0	No	No	No	No	No	No	No
Total	1865	300	2165		2	2	2	2	2	0	1

Traffic Volumes (vph)

Eastbound			Westbound			Northbound			Southbound		
L	T	R	L	T	R	L	T	R	L	T	R
105	0	35	0	0	0	0	310	10	160	280	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
115	0	45	0	0	0	0	475	35	190	405	0
0	0	0	0	0	0	0	0	0	0	0	0

Pedestrian Volumes and Gaps (Per Hour)

Volume	Gap	Volume	Gap	Volume	Gap	Volume	Gap
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0

!

Delay	sec/veh	veh-hrs	sec/veh	veh-hrs	sec/veh	veh-hrs	sec/veh	veh-hrs
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

HCS7: MUTCD Signal Warrants Release 7.2

Analyst: HDR
Agency: HDR
Date: 5/16/2022
Project ID: Mitchell MTP
EW Street: I-90 Exit 330 EB RTI

Intersection: Exit 330 EB RTI & SD37
Jurisdiction: SDDOT
Units: U.S. Customary
Analysis Year: 2045 Build
NS Street: SD37 (Ohlman Street)

General Information

Major St. Speed (mph): 45
Nearest Signal (ft): 1050
Crashes per Yr: 0

Population: Not less than 10000
Coordinated Signal System: Y

School Crossing

Students in Highest Hour: 0
Adequate Gaps in Period: 0
Minutes in Period: 0

Roadway Network

Two Major Routes: 1
Weekend Count: 0
5-yr Growth Factor: 0

Geometry and Traffic

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	1	0	0	0	0	0	1	0	1	1	0
LaneUsage	L	TR						TR		L	T	

Results

Warrant 1: Eight-Hour Vehicular Volume	[ ]
1 A. Minimum Vehicular Volumes	[ ]
1 B. Interruption of Continuous Traffic	[ ]
1 56% Vehicular --and-- Interruption Volumes	[ ]
Warrant 2: Four-Hour Vehicular Volume	
2 A. Four-Hour Vehicular Volumes	[ ]
Warrant 3: Peak Hour	[X]
3 A. Peak-Hour Conditions	[ ]
3 B. Peak-Hour Vehicular Volume Hours Met	[X]
Warrant 4: Pedestrian Volume	[ ]
4 A. Four Hour Volumes	[ ]
4 B. One-Hour Volumes	[ ]
Warrant 5: School Crossing	[ ]
5 A. Student Volumes	[ ]
5 B. Gaps Same Period	[ ]
Warrant 6: Coordinated Signal System	
6 Degree of Platooning	[X]
Warrant 7: Crash Experience	[ ]
7 A. Adequate trials of alternatives	[ ]

7 B. Reported crashes [ ]
7 56% Volumes for Warrants 1A, 1B --or-- 4 [ ]

Warrant 8: Roadway Network [X]
8 A. Weekday Volume [X]
8 B. Weekend Volume [ ]

Warrant 9: Grade Crossing [ ]
9 A. Grade Crossing within 140 ft --and-- [ ]
9 B. Peak-Hour Vehicular Volumes [ ]

Summary

Hours	Major Volume	Minor Volume	Total Volume	Delay (Veh-hr)	1A 70%	1A 56%	1B 70%	1B 56%	2 70%	3A 70%	3B 70%
07-08	985	180	1165	0.0	Yes	Yes	Yes	Yes	Yes	No	Yes
08-09	0	0	0	0.0	No	No	No	No	No	No	No
09-10	0	0	0	0.0	No	No	No	No	No	No	No
10-11	0	0	0	0.0	No	No	No	No	No	No	No
11-12	0	0	0	0.0	No	No	No	No	No	No	No
12-13	0	0	0	0.0	No	No	No	No	No	No	No
13-14	0	0	0	0.0	No	No	No	No	No	No	No
14-15	0	0	0	0.0	No	No	No	No	No	No	No
15-16	0	0	0	0.0	No	No	No	No	No	No	No
16-17	0	0	0	0.0	No	No	No	No	No	No	No
17-18	1435	205	1640	0.0	Yes	Yes	Yes	Yes	Yes	No	Yes
18-19	0	0	0	0.0	No	No	No	No	No	No	No
Total	2420	385	2805		2	2	2	2	2	0	2

Traffic Volumes (vph)

Eastbound			Westbound			Northbound			Southbound		
L	T	R	L	T	R	L	T	R	L	T	R
135	0	45	0	0	0	0	400	15	210	360	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
145	0	60	0	0	0	0	615	45	245	530	0
0	0	0	0	0	0	0	0	0	0	0	0

Pedestrian Volumes and Gaps (Per Hour)

Volume	Gap	Volume	Gap	Volume	Gap	Volume	Gap
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0

!

Delay	sec/veh	veh-hrs	sec/veh	veh-hrs	sec/veh	veh-hrs	sec/veh	veh-hrs
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Foster Street Corridor

Foster Street & 1st Avenue Intersection:

2032 Build Condition AM/PM (TWSC on NB/SB Approaches)
2032 Build Condition AM/PM (TWSC on EB/WB Approaches)
2032 Build Condition AM/PM (AWSC)
2045 Build Condition AM/PM (TWSC on NB/SB Approaches)
2045 Build Condition AM/PM (TWSC on EB/WB Approaches)
2045 Build Condition AM/PM (AWSC)

Intersection	
Int Delay, s/veh	8.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	20	30	30	50	70	130	25	105	15	25	150	25
Future Vol, veh/h	20	30	30	50	70	130	25	105	15	25	150	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
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	100	-	-	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	7	0	0	3	4	0	0	3	17	0	1	9
Mvmt Flow	22	33	33	56	78	144	28	117	17	28	167	28

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	222	0	0	66	0	0	454	428	50	423	372	150
Stage 1	-	-	-	-	-	-	94	94	-	262	262	-
Stage 2	-	-	-	-	-	-	360	334	-	161	110	-
Critical Hdwy	4.17	-	-	4.13	-	-	7.1	6.53	6.37	7.1	6.51	6.29
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.53	-	6.1	5.51	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.53	-	6.1	5.51	-
Follow-up Hdwy	2.263	-	-	2.227	-	-	3.5	4.027	3.453	3.5	4.009	3.381
Pot Cap-1 Maneuver	1318	-	-	1529	-	-	520	518	977	545	560	878
Stage 1	-	-	-	-	-	-	918	815	-	747	693	-
Stage 2	-	-	-	-	-	-	662	641	-	846	806	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1318	-	-	1529	-	-	364	487	977	418	527	878
Mov Cap-2 Maneuver	-	-	-	-	-	-	364	487	-	418	527	-
Stage 1	-	-	-	-	-	-	902	801	-	734	663	-
Stage 2	-	-	-	-	-	-	459	613	-	698	792	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.9	1.5	14.5	14.7
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	364	520	1318	-	-	1529	-	-	418	559
HCM Lane V/C Ratio	0.076	0.256	0.017	-	-	0.036	-	-	0.066	0.348
HCM Control Delay (s)	15.7	14.3	7.8	0	-	7.4	0	-	14.2	14.8
HCM Lane LOS	C	B	A	A	-	A	A	-	B	B
HCM 95th %tile Q(veh)	0.2	1	0.1	-	-	0.1	-	-	0.2	1.5

Intersection	
Int Delay, s/veh	9.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	35	65	35	25	65	30	20	145	40	60	150	25
Future Vol, veh/h	35	65	35	25	65	30	20	145	40	60	150	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
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	100	-	-	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	7	0	0	0	2	0	0	2	0
Mvmt Flow	39	72	39	28	72	33	22	161	44	67	167	28

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	105	0	0	111	0	0	412	331	92	417	334	89
Stage 1	-	-	-	-	-	-	170	170	-	145	145	-
Stage 2	-	-	-	-	-	-	242	161	-	272	189	-
Critical Hdwy	4.1	-	-	4.17	-	-	7.1	6.52	6.2	7.1	6.52	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.52	-	6.1	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.52	-	6.1	5.52	-
Follow-up Hdwy	2.2	-	-	2.263	-	-	3.5	4.018	3.3	3.5	4.018	3.3
Pot Cap-1 Maneuver	1499	-	-	1448	-	-	554	588	971	550	586	975
Stage 1	-	-	-	-	-	-	837	758	-	863	777	-
Stage 2	-	-	-	-	-	-	766	765	-	738	744	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1499	-	-	1448	-	-	399	560	971	394	558	975
Mov Cap-2 Maneuver	-	-	-	-	-	-	399	560	-	394	558	-
Stage 1	-	-	-	-	-	-	814	737	-	839	761	-
Stage 2	-	-	-	-	-	-	569	749	-	535	723	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.9	1.6	13.8	14.5
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	399	616	1499	-	-	1448	-	-	394	594
HCM Lane V/C Ratio	0.056	0.334	0.026	-	-	0.019	-	-	0.169	0.327
HCM Control Delay (s)	14.6	13.7	7.5	0	-	7.5	0	-	16	14
HCM Lane LOS	B	B	A	A	-	A	A	-	C	B
HCM 95th %tile Q(veh)	0.2	1.5	0.1	-	-	0.1	-	-	0.6	1.4

Intersection	
Int Delay, s/veh	7.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	20	30	30	50	70	130	25	105	15	25	150	25
Future Vol, veh/h	20	30	30	50	70	130	25	105	15	25	150	25
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	100	-	-	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	7	0	0	3	4	0	0	3	17	0	1	9
Mvmt Flow	22	33	33	56	78	144	28	117	17	28	167	28

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	530	427	181	452	433	126	195	0	0	134	0	0
Stage 1	237	237	-	182	182	-	-	-	-	-	-	-
Stage 2	293	190	-	270	251	-	-	-	-	-	-	-
Critical Hdwy	7.17	6.5	6.2	7.13	6.54	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.17	5.5	-	6.13	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.17	5.5	-	6.13	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.563	4	3.3	3.527	4.036	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	452	523	867	516	513	930	1390	-	-	1463	-	-
Stage 1	755	713	-	817	745	-	-	-	-	-	-	-
Stage 2	704	747	-	734	695	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	326	503	867	457	493	930	1390	-	-	1463	-	-
Mov Cap-2 Maneuver	326	503	-	457	493	-	-	-	-	-	-	-
Stage 1	740	699	-	801	730	-	-	-	-	-	-	-
Stage 2	521	732	-	659	682	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	13.5	14.9	1.3	0.9
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1390	-	-	514	639	1463	-	-
HCM Lane V/C Ratio	0.02	-	-	0.173	0.435	0.019	-	-
HCM Control Delay (s)	7.6	-	-	13.5	14.9	7.5	-	-
HCM Lane LOS	A	-	-	B	B	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	0.6	2.2	0.1	-	-

Intersection	
Int Delay, s/veh	7.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	35	65	35	25	65	30	20	145	40	60	150	25
Future Vol, veh/h	35	65	35	25	65	30	20	145	40	60	150	25
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	100	-	-	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	7	0	0	0	2	0	0	2	0
Mvmt Flow	39	72	39	28	72	33	22	161	44	67	167	28

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	595	564	181	598	556	183	195	0	0	205	0	0
Stage 1	315	315	-	227	227	-	-	-	-	-	-	-
Stage 2	280	249	-	371	329	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.17	6.5	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.17	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.17	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.563	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	419	438	867	407	442	865	1390	-	-	1378	-	-
Stage 1	700	659	-	765	720	-	-	-	-	-	-	-
Stage 2	731	704	-	639	650	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	332	410	867	320	414	865	1390	-	-	1378	-	-
Mov Cap-2 Maneuver	332	410	-	320	414	-	-	-	-	-	-	-
Stage 1	689	627	-	753	708	-	-	-	-	-	-	-
Stage 2	621	693	-	514	618	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	17.2	16.5	0.7	2
HCM LOS	C	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1390	-	-	444	445	1378	-	-
HCM Lane V/C Ratio	0.016	-	-	0.338	0.3	0.048	-	-
HCM Control Delay (s)	7.6	-	-	17.2	16.5	7.7	-	-
HCM Lane LOS	A	-	-	C	C	A	-	-
HCM 95th %tile Q(veh)	0	-	-	1.5	1.2	0.2	-	-

Intersection	
Intersection Delay, s/veh	10.4
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	20	30	30	50	70	130	25	105	15	25	150	25
Future Vol, veh/h	20	30	30	50	70	130	25	105	15	25	150	25
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles, %	7	0	0	3	4	0	0	3	17	0	1	9
Mvmt Flow	22	33	33	56	78	144	28	117	17	28	167	28
Number of Lanes	0	1	0	0	1	0	1	1	0	1	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	2	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	2	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	2	1	1
HCM Control Delay	9.2	10.8	9.9	10.6
HCM LOS	A	B	A	B

Lane	NBLn1	NBLn2	EBLn1	WBLn1	SBLn1	SBLn2
Vol Left, %	100%	0%	25%	20%	100%	0%
Vol Thru, %	0%	88%	38%	28%	0%	86%
Vol Right, %	0%	12%	38%	52%	0%	14%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	25	120	80	250	25	175
LT Vol	25	0	20	50	25	0
Through Vol	0	105	30	70	0	150
RT Vol	0	15	30	130	0	25
Lane Flow Rate	28	133	89	278	28	194
Geometry Grp	7	7	2	2	7	7
Degree of Util (X)	0.048	0.212	0.132	0.378	0.048	0.303
Departure Headway (Hd)	6.274	5.731	5.33	4.902	6.195	5.604
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	571	627	673	739	579	642
Service Time	4.004	3.46	3.36	2.902	3.921	3.33
HCM Lane V/C Ratio	0.049	0.212	0.132	0.376	0.048	0.302
HCM Control Delay	9.3	10	9.2	10.8	9.2	10.8
HCM Lane LOS	A	A	A	B	A	B
HCM 95th-tile Q	0.2	0.8	0.5	1.8	0.2	1.3

Intersection	
Intersection Delay, s/veh	10.2
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	35	65	35	25	65	30	20	145	40	60	150	25
Future Vol, veh/h	35	65	35	25	65	30	20	145	40	60	150	25
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles, %	0	0	0	7	0	0	0	2	0	0	2	0
Mvmt Flow	39	72	39	28	72	33	22	161	44	67	167	28
Number of Lanes	0	1	0	0	1	0	1	1	0	1	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	2	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	2	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	2	1	1
HCM Control Delay	9.9	9.9	10.6	10.3
HCM LOS	A	A	B	B

Lane	NBLn1	NBLn2	EBLn1	WBLn1	SBLn1	SBLn2
Vol Left, %	100%	0%	26%	21%	100%	0%
Vol Thru, %	0%	78%	48%	54%	0%	86%
Vol Right, %	0%	22%	26%	25%	0%	14%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	20	185	135	120	60	175
LT Vol	20	0	35	25	60	0
Through Vol	0	145	65	65	0	150
RT Vol	0	40	35	30	0	25
Lane Flow Rate	22	206	150	133	67	194
Geometry Grp	7	7	2	2	7	7
Degree of Util (X)	0.038	0.315	0.222	0.202	0.113	0.298
Departure Headway (Hd)	6.14	5.515	5.321	5.461	6.091	5.519
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	584	654	675	657	589	651
Service Time	3.865	3.24	3.349	3.491	3.816	3.244
HCM Lane V/C Ratio	0.038	0.315	0.222	0.202	0.114	0.298
HCM Control Delay	9.1	10.8	9.9	9.9	9.6	10.6
HCM Lane LOS	A	B	A	A	A	B
HCM 95th-tile Q	0.1	1.3	0.8	0.8	0.4	1.2

Intersection	
Int Delay, s/veh	9.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	25	40	35	65	95	155	30	120	20	35	165	30
Future Vol, veh/h	25	40	35	65	95	155	30	120	20	35	165	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
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	100	-	-	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	7	0	0	3	4	0	0	3	17	0	1	9
Mvmt Flow	28	44	39	72	106	172	33	133	22	39	183	33

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	278	0	0	83	0	0	564	542	64	533	475	192
Stage 1	-	-	-	-	-	-	120	120	-	336	336	-
Stage 2	-	-	-	-	-	-	444	422	-	197	139	-
Critical Hdwy	4.17	-	-	4.13	-	-	7.1	6.53	6.37	7.1	6.51	6.29
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.53	-	6.1	5.51	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.53	-	6.1	5.51	-
Follow-up Hdwy	2.263	-	-	2.227	-	-	3.5	4.027	3.453	3.5	4.009	3.381
Pot Cap-1 Maneuver	1257	-	-	1508	-	-	439	446	960	461	490	832
Stage 1	-	-	-	-	-	-	889	794	-	682	644	-
Stage 2	-	-	-	-	-	-	597	587	-	809	784	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1257	-	-	1508	-	-	272	410	960	318	451	832
Mov Cap-2 Maneuver	-	-	-	-	-	-	272	410	-	318	451	-
Stage 1	-	-	-	-	-	-	869	776	-	666	607	-
Stage 2	-	-	-	-	-	-	377	553	-	639	766	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	2	1.5	17.8	18.2
HCM LOS			C	C

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	272	447	1257	-	-	1508	-	-	318	485
HCM Lane V/C Ratio	0.123	0.348	0.022	-	-	0.048	-	-	0.122	0.447
HCM Control Delay (s)	20.1	17.3	7.9	0	-	7.5	0	-	17.9	18.3
HCM Lane LOS	C	C	A	A	-	A	A	-	C	C
HCM 95th %tile Q(veh)	0.4	1.5	0.1	-	-	0.2	-	-	0.4	2.3

Intersection	
Int Delay, s/veh	11.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	40	85	40	40	80	40	25	165	55	75	165	30
Future Vol, veh/h	40	85	40	40	80	40	25	165	55	75	165	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
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	100	-	-	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	7	0	0	0	2	0	0	2	0
Mvmt Flow	44	94	44	44	89	44	28	183	61	83	183	33

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	133	0	0	138	0	0	511	425	116	525	425	111
Stage 1	-	-	-	-	-	-	204	204	-	199	199	-
Stage 2	-	-	-	-	-	-	307	221	-	326	226	-
Critical Hdwy	4.1	-	-	4.17	-	-	7.1	6.52	6.2	7.1	6.52	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.52	-	6.1	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.52	-	6.1	5.52	-
Follow-up Hdwy	2.2	-	-	2.263	-	-	3.5	4.018	3.3	3.5	4.018	3.3
Pot Cap-1 Maneuver	1464	-	-	1415	-	-	476	521	942	466	521	948
Stage 1	-	-	-	-	-	-	803	733	-	807	736	-
Stage 2	-	-	-	-	-	-	707	720	-	691	717	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1464	-	-	1415	-	-	309	487	942	294	487	948
Mov Cap-2 Maneuver	-	-	-	-	-	-	309	487	-	294	487	-
Stage 1	-	-	-	-	-	-	777	709	-	780	711	-
Stage 2	-	-	-	-	-	-	489	696	-	463	693	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.8	1.9	16.6	18.1
HCM LOS			C	C

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	309	554	1464	-	-	1415	-	-	294	526
HCM Lane V/C Ratio	0.09	0.441	0.03	-	-	0.031	-	-	0.283	0.412
HCM Control Delay (s)	17.8	16.5	7.5	0	-	7.6	0	-	22	16.6
HCM Lane LOS	C	C	A	A	-	A	A	-	C	C
HCM 95th %tile Q(veh)	0.3	2.2	0.1	-	-	0.1	-	-	1.1	2

Intersection	
Int Delay, s/veh	10.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	25	40	35	65	95	155	30	120	20	35	165	30
Future Vol, veh/h	25	40	35	65	95	155	30	120	20	35	165	30
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	100	-	-	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	7	0	0	3	4	0	0	3	17	0	1	9
Mvmt Flow	28	44	39	72	106	172	33	133	22	39	183	33

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	627	499	200	529	504	144	216	0	0	155	0	0
Stage 1	278	278	-	210	210	-	-	-	-	-	-	-
Stage 2	349	221	-	319	294	-	-	-	-	-	-	-
Critical Hdwy	7.17	6.5	6.2	7.13	6.54	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.17	5.5	-	6.13	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.17	5.5	-	6.13	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.563	4	3.3	3.527	4.036	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	389	476	846	459	467	909	1366	-	-	1438	-	-
Stage 1	718	684	-	790	725	-	-	-	-	-	-	-
Stage 2	657	724	-	690	666	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	248	452	846	390	444	909	1366	-	-	1438	-	-
Mov Cap-2 Maneuver	248	452	-	390	444	-	-	-	-	-	-	-
Stage 1	701	666	-	771	708	-	-	-	-	-	-	-
Stage 2	442	707	-	598	648	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	16.1	20.7	1.4	1.2
HCM LOS	C	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1366	-	-	434	572	1438	-	-
HCM Lane V/C Ratio	0.024	-	-	0.256	0.612	0.027	-	-
HCM Control Delay (s)	7.7	-	-	16.1	20.7	7.6	-	-
HCM Lane LOS	A	-	-	C	C	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	1	4.1	0.1	-	-

Intersection	
Int Delay, s/veh	10.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	40	85	40	40	80	40	25	165	55	75	165	30
Future Vol, veh/h	40	85	40	40	80	40	25	165	55	75	165	30
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	100	-	-	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	7	0	0	0	2	0	0	2	0
Mvmt Flow	44	94	44	44	89	44	28	183	61	83	183	33

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	702	666	200	705	652	214	216	0	0	244	0	0
Stage 1	366	366	-	270	270	-	-	-	-	-	-	-
Stage 2	336	300	-	435	382	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.17	6.5	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.17	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.17	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.563	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	355	383	846	345	390	831	1366	-	-	1334	-	-
Stage 1	657	626	-	725	690	-	-	-	-	-	-	-
Stage 2	682	669	-	590	616	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	256	352	846	244	358	831	1366	-	-	1334	-	-
Mov Cap-2 Maneuver	256	352	-	244	358	-	-	-	-	-	-	-
Stage 1	644	587	-	711	676	-	-	-	-	-	-	-
Stage 2	549	656	-	440	578	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	23.8	23.7	0.8	2.2
HCM LOS	C	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1366	-	-	371	367	1334	-	-
HCM Lane V/C Ratio	0.02	-	-	0.494	0.484	0.062	-	-
HCM Control Delay (s)	7.7	-	-	23.8	23.7	7.9	-	-
HCM Lane LOS	A	-	-	C	C	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	2.6	2.5	0.2	-	-

Intersection	
Intersection Delay, s/veh	12
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	25	40	35	65	95	155	30	120	20	35	165	30
Future Vol, veh/h	25	40	35	65	95	155	30	120	20	35	165	30
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles, %	7	0	0	3	4	0	0	3	17	0	1	9
Mvmt Flow	28	44	39	72	106	172	33	133	22	39	183	33
Number of Lanes	0	1	0	0	1	0	1	1	0	1	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	2	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	2	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	2	1	1
HCM Control Delay	10	13.4	10.9	11.8
HCM LOS	A	B	B	B

Lane	NBLn1	NBLn2	EBLn1	WBLn1	SBLn1	SBLn2
Vol Left, %	100%	0%	25%	21%	100%	0%
Vol Thru, %	0%	86%	40%	30%	0%	85%
Vol Right, %	0%	14%	35%	49%	0%	15%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	30	140	100	315	35	195
LT Vol	30	0	25	65	35	0
Through Vol	0	120	40	95	0	165
RT Vol	0	20	35	155	0	30
Lane Flow Rate	33	156	111	350	39	217
Geometry Grp	7	7	2	2	7	7
Degree of Util (X)	0.062	0.265	0.177	0.503	0.071	0.36
Departure Headway (Hd)	6.691	6.132	5.74	5.171	6.588	5.988
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	535	585	623	697	543	600
Service Time	4.439	3.88	3.796	3.213	4.333	3.732
HCM Lane V/C Ratio	0.062	0.267	0.178	0.502	0.072	0.362
HCM Control Delay	9.9	11.1	10	13.4	9.8	12.1
HCM Lane LOS	A	B	A	B	A	B
HCM 95th-tile Q	0.2	1.1	0.6	2.8	0.2	1.6

Intersection	
Intersection Delay, s/veh	11.6
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	40	85	40	40	80	40	25	165	55	75	165	30
Future Vol, veh/h	40	85	40	40	80	40	25	165	55	75	165	30
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles, %	0	0	0	7	0	0	0	2	0	0	2	0
Mvmt Flow	44	94	44	44	89	44	28	183	61	83	183	33
Number of Lanes	0	1	0	0	1	0	1	1	0	1	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	2	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	2	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	2	1	1
HCM Control Delay	11.1	11.3	12.2	11.5
HCM LOS	B	B	B	B

Lane	NBLn1	NBLn2	EBLn1	WBLn1	SBLn1	SBLn2
Vol Left, %	100%	0%	24%	25%	100%	0%
Vol Thru, %	0%	75%	52%	50%	0%	85%
Vol Right, %	0%	25%	24%	25%	0%	15%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	25	220	165	160	75	195
LT Vol	25	0	40	40	75	0
Through Vol	0	165	85	80	0	165
RT Vol	0	55	40	40	0	30
Lane Flow Rate	28	244	183	178	83	217
Geometry Grp	7	7	2	2	7	7
Degree of Util (X)	0.05	0.399	0.291	0.288	0.15	0.355
Departure Headway (Hd)	6.526	5.875	5.72	5.84	6.483	5.9
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	548	611	625	613	552	609
Service Time	4.276	3.625	3.777	3.899	4.231	3.648
HCM Lane V/C Ratio	0.051	0.399	0.293	0.29	0.15	0.356
HCM Control Delay	9.6	12.5	11.1	11.3	10.4	11.9
HCM Lane LOS	A	B	B	B	B	B
HCM 95th-tile Q	0.2	1.9	1.2	1.2	0.5	1.6

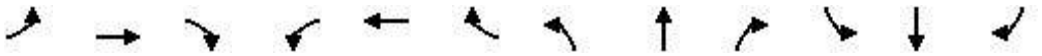
Burr Street Corridor

Burr Street & 1st Avenue Intersection:

2032 Build Condition AM/PM (Signal - Reconstruction)
2032 Build Condition AM/PM (Signal - Road Diet)
2032 Build Condition AM/PM (Roundabout)
2045 Build Condition AM/PM (Signal - Reconstruction)
2045 Build Condition AM/PM (Signal - Road Diet)
2045 Build Condition AM/PM (Roundabout)

HCM 6th Signalized Intersection Summary
5: Burr Street & 1st Avenue

06/13/2022



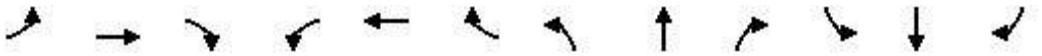
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	30	75	120	55	95	10	110	275	35	15	275	20
Future Volume (veh/h)	30	75	120	55	95	10	110	275	35	15	275	20
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1800	1800	1800	1744	1786	1800	1786	1772	1716	1800	1772	1800
Adj Flow Rate, veh/h	33	83	133	61	106	11	122	306	39	17	306	22
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	0	0	0	4	1	0	1	2	6	0	2	0
Cap, veh/h	346	132	212	248	338	35	575	741	94	543	706	51
Arrive On Green	0.21	0.21	0.21	0.21	0.21	0.21	0.07	0.48	0.48	0.02	0.43	0.43
Sat Flow, veh/h	1295	623	998	1147	1591	165	1701	1540	196	1714	1633	117
Grp Volume(v), veh/h	33	0	216	61	0	117	122	0	345	17	0	328
Grp Sat Flow(s),veh/h/ln	1295	0	1620	1147	0	1756	1701	0	1737	1714	0	1751
Q Serve(g_s), s	1.1	0.0	6.1	2.6	0.0	2.8	1.9	0.0	6.4	0.3	0.0	6.5
Cycle Q Clear(g_c), s	3.9	0.0	6.1	8.6	0.0	2.8	1.9	0.0	6.4	0.3	0.0	6.5
Prop In Lane	1.00		0.62	1.00		0.09	1.00		0.11	1.00		0.07
Lane Grp Cap(c), veh/h	346	0	344	248	0	373	575	0	835	543	0	757
V/C Ratio(X)	0.10	0.00	0.63	0.25	0.00	0.31	0.21	0.00	0.41	0.03	0.00	0.43
Avail Cap(c_a), veh/h	356	0	356	257	0	386	671	0	835	689	0	757
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	18.3	0.0	17.9	21.8	0.0	16.6	7.3	0.0	8.4	7.8	0.0	9.9
Incr Delay (d2), s/veh	0.1	0.0	3.3	0.5	0.0	0.5	0.2	0.0	1.5	0.0	0.0	1.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.3	0.0	2.4	0.7	0.0	1.1	0.6	0.0	2.2	0.1	0.0	2.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	18.4	0.0	21.2	22.3	0.0	17.1	7.5	0.0	9.9	7.8	0.0	11.7
LnGrp LOS	B	A	C	C	A	B	A	A	A	A	A	B
Approach Vol, veh/h		249			178			467			345	
Approach Delay, s/veh		20.8			18.9			9.3			11.5	
Approach LOS		C			B			A			B	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	5.3	29.0		15.6	7.8	26.6		15.6				
Change Period (Y+Rc), s	4.5	5.0		5.0	4.5	5.0		5.0				
Max Green Setting (Gmax), s	5.1	19.4		11.0	6.1	18.4		11.0				
Max Q Clear Time (g_c+I1), s	2.3	8.4		8.1	3.9	8.5		10.6				
Green Ext Time (p_c), s	0.0	1.5		0.4	0.1	1.4		0.0				

Intersection Summary												
HCM 6th Ctrl Delay			13.6									
HCM 6th LOS			B									

HCM 6th Signalized Intersection Summary
5: Burr Street & 1st Avenue

06/13/2022



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	15	125	195	40	95	10	180	310	55	15	285	20
Future Volume (veh/h)	15	125	195	40	95	10	180	310	55	15	285	20
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1800	1800	1772	1800	1800	1800	1786	1786	1800	1800	1786	1800
Adj Flow Rate, veh/h	17	139	217	44	106	11	200	344	61	17	317	22
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	0	0	2	0	0	0	1	1	0	0	1	0
Cap, veh/h	417	173	270	202	437	45	524	660	117	437	602	42
Arrive On Green	0.27	0.27	0.27	0.27	0.27	0.27	0.10	0.45	0.45	0.02	0.36	0.36
Sat Flow, veh/h	1295	633	989	1042	1604	166	1701	1477	262	1714	1651	115
Grp Volume(v), veh/h	17	0	356	44	0	117	200	0	405	17	0	339
Grp Sat Flow(s),veh/h/ln	1295	0	1622	1042	0	1770	1701	0	1739	1714	0	1765
Q Serve(g_s), s	0.6	0.0	11.2	2.3	0.0	2.8	3.7	0.0	9.2	0.3	0.0	8.3
Cycle Q Clear(g_c), s	3.4	0.0	11.2	13.5	0.0	2.8	3.7	0.0	9.2	0.3	0.0	8.3
Prop In Lane	1.00		0.61	1.00		0.09	1.00		0.15	1.00		0.06
Lane Grp Cap(c), veh/h	417	0	442	202	0	483	524	0	777	437	0	644
V/C Ratio(X)	0.04	0.00	0.80	0.22	0.00	0.24	0.38	0.00	0.52	0.04	0.00	0.53
Avail Cap(c_a), veh/h	417	0	442	202	0	483	556	0	777	568	0	644
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	16.9	0.0	18.6	24.9	0.0	15.6	9.0	0.0	11.0	10.8	0.0	13.7
Incr Delay (d2), s/veh	0.0	0.0	10.4	0.5	0.0	0.3	0.5	0.0	2.5	0.0	0.0	3.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.2	0.0	5.1	0.6	0.0	1.1	1.1	0.0	3.5	0.1	0.0	3.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	16.9	0.0	29.0	25.5	0.0	15.8	9.4	0.0	13.5	10.9	0.0	16.8
LnGrp LOS	B	A	C	C	A	B	A	A	B	B	A	B
Approach Vol, veh/h		373			161			605			356	
Approach Delay, s/veh		28.5			18.5			12.1			16.5	
Approach LOS		C			B			B			B	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	5.4	29.6		20.0	9.9	25.1		20.0				
Change Period (Y+Rc), s	4.5	5.0		5.0	4.5	5.0		5.0				
Max Green Setting (Gmax), s	5.1	20.4		15.0	6.5	19.0		15.0				
Max Q Clear Time (g_c+I1), s	2.3	11.2		13.2	5.7	10.3		15.5				
Green Ext Time (p_c), s	0.0	1.7		0.4	0.0	1.4		0.0				

Intersection Summary												
HCM 6th Ctrl Delay			17.9									
HCM 6th LOS			B									

HCM 6th Signalized Intersection Summary
5: Burr Street & 1st Avenue

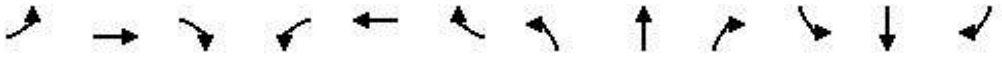
06/13/2022



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	30	75	120	55	95	10	110	275	35	15	275	20
Future Volume (veh/h)	30	75	120	55	95	10	110	275	35	15	275	20
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1800	1800	1800	1744	1786	1800	1786	1772	1716	1800	1772	1800
Adj Flow Rate, veh/h	33	83	133	61	106	11	122	306	39	17	306	22
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	0	0	0	4	1	0	1	2	6	0	2	0
Cap, veh/h	346	132	212	248	338	35	575	741	94	543	706	51
Arrive On Green	0.21	0.21	0.21	0.21	0.21	0.21	0.07	0.48	0.48	0.02	0.43	0.43
Sat Flow, veh/h	1295	623	998	1147	1591	165	1701	1540	196	1714	1633	117
Grp Volume(v), veh/h	33	0	216	61	0	117	122	0	345	17	0	328
Grp Sat Flow(s),veh/h/ln	1295	0	1620	1147	0	1756	1701	0	1737	1714	0	1751
Q Serve(g_s), s	1.1	0.0	6.1	2.6	0.0	2.8	1.9	0.0	6.4	0.3	0.0	6.5
Cycle Q Clear(g_c), s	3.9	0.0	6.1	8.6	0.0	2.8	1.9	0.0	6.4	0.3	0.0	6.5
Prop In Lane	1.00		0.62	1.00		0.09	1.00		0.11	1.00		0.07
Lane Grp Cap(c), veh/h	346	0	344	248	0	373	575	0	835	543	0	757
V/C Ratio(X)	0.10	0.00	0.63	0.25	0.00	0.31	0.21	0.00	0.41	0.03	0.00	0.43
Avail Cap(c_a), veh/h	356	0	356	257	0	386	671	0	835	689	0	757
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	18.3	0.0	17.9	21.8	0.0	16.6	7.3	0.0	8.4	7.8	0.0	9.9
Incr Delay (d2), s/veh	0.1	0.0	3.3	0.5	0.0	0.5	0.2	0.0	1.5	0.0	0.0	1.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.3	0.0	2.4	0.7	0.0	1.1	0.6	0.0	2.2	0.1	0.0	2.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	18.4	0.0	21.2	22.3	0.0	17.1	7.5	0.0	9.9	7.8	0.0	11.7
LnGrp LOS	B	A	C	C	A	B	A	A	A	A	A	B
Approach Vol, veh/h		249			178			467			345	
Approach Delay, s/veh		20.8			18.9			9.3			11.5	
Approach LOS		C			B			A			B	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	5.3	29.0		15.6	7.8	26.6		15.6				
Change Period (Y+Rc), s	4.5	5.0		5.0	4.5	5.0		5.0				
Max Green Setting (Gmax), s	5.1	19.4		11.0	6.1	18.4		11.0				
Max Q Clear Time (g_c+I1), s	2.3	8.4		8.1	3.9	8.5		10.6				
Green Ext Time (p_c), s	0.0	1.5		0.4	0.1	1.4		0.0				

Intersection Summary			
HCM 6th Ctrl Delay		13.6	
HCM 6th LOS		B	



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	15	125	195	40	95	10	180	310	55	15	285	20
Future Volume (veh/h)	15	125	195	40	95	10	180	310	55	15	285	20
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1800	1800	1772	1800	1800	1800	1786	1786	1800	1800	1786	1800
Adj Flow Rate, veh/h	17	139	217	44	106	11	200	344	61	17	317	22
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	0	0	2	0	0	0	1	1	0	0	1	0
Cap, veh/h	417	173	270	202	437	45	524	660	117	437	602	42
Arrive On Green	0.27	0.27	0.27	0.27	0.27	0.27	0.10	0.45	0.45	0.02	0.36	0.36
Sat Flow, veh/h	1295	633	989	1042	1604	166	1701	1477	262	1714	1651	115
Grp Volume(v), veh/h	17	0	356	44	0	117	200	0	405	17	0	339
Grp Sat Flow(s),veh/h/ln	1295	0	1622	1042	0	1770	1701	0	1739	1714	0	1765
Q Serve(g_s), s	0.6	0.0	11.2	2.3	0.0	2.8	3.7	0.0	9.2	0.3	0.0	8.3
Cycle Q Clear(g_c), s	3.4	0.0	11.2	13.5	0.0	2.8	3.7	0.0	9.2	0.3	0.0	8.3
Prop In Lane	1.00		0.61	1.00		0.09	1.00		0.15	1.00		0.06
Lane Grp Cap(c), veh/h	417	0	442	202	0	483	524	0	777	437	0	644
V/C Ratio(X)	0.04	0.00	0.80	0.22	0.00	0.24	0.38	0.00	0.52	0.04	0.00	0.53
Avail Cap(c_a), veh/h	417	0	442	202	0	483	556	0	777	568	0	644
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	16.9	0.0	18.6	24.9	0.0	15.6	9.0	0.0	11.0	10.8	0.0	13.7
Incr Delay (d2), s/veh	0.0	0.0	10.4	0.5	0.0	0.3	0.5	0.0	2.5	0.0	0.0	3.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.2	0.0	5.1	0.6	0.0	1.1	1.1	0.0	3.5	0.1	0.0	3.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	16.9	0.0	29.0	25.5	0.0	15.8	9.4	0.0	13.5	10.9	0.0	16.8
LnGrp LOS	B	A	C	C	A	B	A	A	B	B	A	B
Approach Vol, veh/h		373			161			605			356	
Approach Delay, s/veh		28.5			18.5			12.1			16.5	
Approach LOS		C			B			B			B	

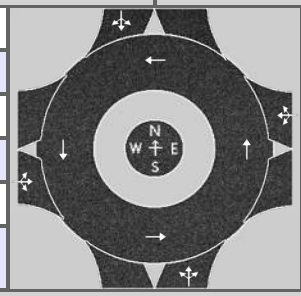
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	5.4	29.6		20.0	9.9	25.1		20.0				
Change Period (Y+Rc), s	4.5	5.0		5.0	4.5	5.0		5.0				
Max Green Setting (Gmax), s	5.1	20.4		15.0	6.5	19.0		15.0				
Max Q Clear Time (g_c+I1), s	2.3	11.2		13.2	5.7	10.3		15.5				
Green Ext Time (p_c), s	0.0	1.7		0.4	0.0	1.4		0.0				

Intersection Summary												
HCM 6th Ctrl Delay			17.9									
HCM 6th LOS			B									

HCS Roundabouts Report

General Information

Analyst	HDR
Agency or Co.	HDR
Date Performed	7/13/2022
Analysis Year	2032
Time Analyzed	AM Peak
Project Description	Mitchell MTP: 2032 Future C...



Site Information

Intersection	1st Street & Burr Street
E/W Street Name	1st Avenue
N/S Street Name	Burr Street
Analysis Time Period, hrs	0.25
Peak Hour Factor	0.90
Jurisdiction	City of Mitchell

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0
Lane Assignment			LTR				LTR				LTR				LTR	
Volume (V), veh/h	0	30	75	120	0	55	95	10	0	110	275	35	0	15	275	20
Percent Heavy Vehicles, %	0	0	5	0	0	14	4	5	0	0	4	9	0	0	14	0
Flow Rate (v_{PCE}), pc/h	0	33	88	133	0	70	110	12	0	122	318	42	0	17	348	22
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				1				1			
Pedestrians Crossing, p/h	0				0				0				0			
Proportion of CAVs	0															

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway, s		4.9763			4.9763			4.9763			4.9763	
Follow-Up Headway, s		2.6087			2.6087			2.6087			2.6087	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h		254			192			482			387	
Entry Volume, veh/h		250			179			466			344	
Circulating Flow (v_c), pc/h	435			473			138			302		
Exiting Flow (v_{ex}), pc/h	147			254			363			551		
Capacity (c_{pce}), pc/h		885			852			1199			1014	
Capacity (c), veh/h		871			792			1160			902	
v/c Ratio (x)		0.29			0.23			0.40			0.38	

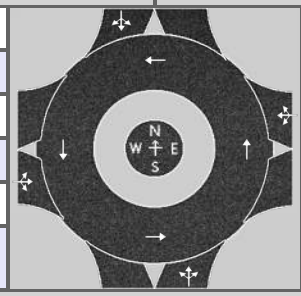
Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		7.2			7.0			7.2			8.3	
Lane LOS		A			A			A			A	
95% Queue, veh		1.2			0.9			2.0			1.8	
Approach Delay, s/veh	7.2			7.0			7.2			8.3		
Approach LOS	A			A			A			A		
Intersection Delay, s/veh | LOS	7.5						A					

HCS Roundabouts Report

General Information

Analyst	HDR
Agency or Co.	HDR
Date Performed	7/13/2022
Analysis Year	2032
Time Analyzed	PM Peak
Project Description	Mitchell MTP: 2032 Future C...



Site Information

Intersection	1st Street & Burr Street
E/W Street Name	1st Avenue
N/S Street Name	Burr Street
Analysis Time Period, hrs	0.25
Peak Hour Factor	0.90
Jurisdiction	City of Mitchell

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0
Lane Assignment			LTR				LTR				LTR				LTR	
Volume (V), veh/h	0	15	125	195	0	40	95	10	0	180	310	55	0	15	285	20
Percent Heavy Vehicles, %	0	0	5	0	0	14	4	5	0	0	4	9	0	0	14	0
Flow Rate (v_{PCE}), pc/h	0	17	146	217	0	51	110	12	0	200	358	67	0	17	361	22
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				1				1			
Pedestrians Crossing, p/h	0				0				0				0			
Proportion of CAVs	0															

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway, s		4.9763			4.9763			4.9763			4.9763	
Follow-Up Headway, s		2.6087			2.6087			2.6087			2.6087	

Flow Computations, Capacity and v/c Ratios

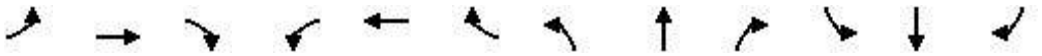
Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h		380			173			625			400	
Entry Volume, veh/h		373			162			606			356	
Circulating Flow (v_c), pc/h	429			575			180			361		
Exiting Flow (v_{ex}), pc/h	230			332			387			629		
Capacity (c_{pce}), pc/h		891			768			1149			955	
Capacity (c), veh/h		875			719			1113			849	
v/c Ratio (x)		0.43			0.23			0.54			0.42	

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		9.3			7.6			9.7			9.4	
Lane LOS		A			A			A			A	
95% Queue, veh		2.2			0.9			3.4			2.1	
Approach Delay, s/veh	9.3			7.6			9.7			9.4		
Approach LOS	A			A			A			A		
Intersection Delay, s/veh | LOS	9.3						A					

HCM 6th Signalized Intersection Summary
5: Burr Street & 1st Avenue

06/13/2022



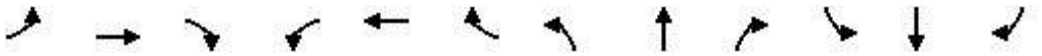
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	35	85	135	60	110	15	125	315	40	20	310	25
Future Volume (veh/h)	35	85	135	60	110	15	125	315	40	20	310	25
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1800	1800	1800	1744	1786	1800	1786	1772	1716	1800	1772	1800
Adj Flow Rate, veh/h	39	94	150	67	122	17	139	350	44	22	344	28
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	0	0	0	4	1	0	1	2	6	0	2	0
Cap, veh/h	340	144	230	237	354	49	539	748	94	502	702	57
Arrive On Green	0.23	0.23	0.23	0.23	0.23	0.23	0.07	0.48	0.48	0.02	0.43	0.43
Sat Flow, veh/h	1270	624	996	1118	1534	214	1701	1543	194	1714	1617	132
Grp Volume(v), veh/h	39	0	244	67	0	139	139	0	394	22	0	372
Grp Sat Flow(s),veh/h/ln	1270	0	1621	1118	0	1747	1701	0	1737	1714	0	1748
Q Serve(g_s), s	1.5	0.0	7.5	3.2	0.0	3.7	2.4	0.0	8.3	0.4	0.0	8.4
Cycle Q Clear(g_c), s	5.1	0.0	7.5	10.7	0.0	3.7	2.4	0.0	8.3	0.4	0.0	8.4
Prop In Lane	1.00		0.61	1.00		0.12	1.00		0.11	1.00		0.08
Lane Grp Cap(c), veh/h	340	0	374	237	0	403	539	0	842	502	0	759
V/C Ratio(X)	0.11	0.00	0.65	0.28	0.00	0.34	0.26	0.00	0.47	0.04	0.00	0.49
Avail Cap(c_a), veh/h	347	0	383	243	0	413	624	0	842	625	0	759
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	19.8	0.0	19.2	24.0	0.0	17.7	8.0	0.0	9.4	8.6	0.0	11.2
Incr Delay (d2), s/veh	0.1	0.0	3.8	0.6	0.0	0.5	0.3	0.0	1.9	0.0	0.0	2.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.4	0.0	3.0	0.8	0.0	1.4	0.7	0.0	3.0	0.1	0.0	3.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	20.0	0.0	22.9	24.6	0.0	18.2	8.2	0.0	11.3	8.6	0.0	13.5
LnGrp LOS	B	A	C	C	A	B	A	A	B	A	A	B
Approach Vol, veh/h		283			206			533			394	
Approach Delay, s/veh		22.5			20.3			10.5			13.2	
Approach LOS		C			C			B			B	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	5.6	31.7		17.7	8.4	28.9		17.7				
Change Period (Y+Rc), s	4.5	5.0		5.0	4.5	5.0		5.0				
Max Green Setting (Gmax), s	5.1	22.4		13.0	6.7	20.8		13.0				
Max Q Clear Time (g_c+I1), s	2.4	10.3		9.5	4.4	10.4		12.7				
Green Ext Time (p_c), s	0.0	1.9		0.5	0.1	1.7		0.0				

Intersection Summary			
HCM 6th Ctrl Delay		15.1	
HCM 6th LOS		B	

HCM 6th Signalized Intersection Summary
5: Burr Street & 1st Avenue

06/13/2022



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	20	140	220	40	110	15	205	350	65	20	320	25
Future Volume (veh/h)	20	140	220	40	110	15	205	350	65	20	320	25
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1800	1800	1772	1800	1800	1800	1786	1786	1800	1800	1786	1800
Adj Flow Rate, veh/h	22	156	244	44	122	17	228	389	72	22	356	28
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	0	0	2	0	0	0	1	1	0	0	1	0
Cap, veh/h	402	179	280	169	438	61	496	666	123	399	598	47
Arrive On Green	0.28	0.28	0.28	0.28	0.28	0.28	0.11	0.45	0.45	0.02	0.37	0.37
Sat Flow, veh/h	1270	633	989	1000	1546	215	1701	1466	271	1714	1634	129
Grp Volume(v), veh/h	22	0	400	44	0	139	228	0	461	22	0	384
Grp Sat Flow(s),veh/h/ln	1270	0	1622	1000	0	1761	1701	0	1737	1714	0	1763
Q Serve(g_s), s	0.8	0.0	14.1	2.6	0.0	3.7	4.6	0.0	11.8	0.5	0.0	10.6
Cycle Q Clear(g_c), s	4.5	0.0	14.1	16.7	0.0	3.7	4.6	0.0	11.8	0.5	0.0	10.6
Prop In Lane	1.00		0.61	1.00		0.12	1.00		0.16	1.00		0.07
Lane Grp Cap(c), veh/h	402	0	460	169	0	499	496	0	790	399	0	645
V/C Ratio(X)	0.05	0.00	0.87	0.26	0.00	0.28	0.46	0.00	0.58	0.06	0.00	0.60
Avail Cap(c_a), veh/h	402	0	460	169	0	499	552	0	790	509	0	645
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	18.5	0.0	20.5	28.4	0.0	16.7	10.1	0.0	12.2	11.8	0.0	15.4
Incr Delay (d2), s/veh	0.1	0.0	16.4	0.8	0.0	0.3	0.7	0.0	3.1	0.1	0.0	4.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.2	0.0	7.0	0.6	0.0	1.4	1.5	0.0	4.6	0.2	0.0	4.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	18.5	0.0	36.8	29.2	0.0	17.0	10.7	0.0	15.3	11.9	0.0	19.4
LnGrp LOS	B	A	D	C	A	B	B	A	B	B	A	B
Approach Vol, veh/h		422			183			689			406	
Approach Delay, s/veh		35.9			20.0			13.8			19.0	
Approach LOS		D			B			B			B	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	5.7	32.3		22.0	11.0	27.0		22.0				
Change Period (Y+Rc), s	4.5	5.0		5.0	4.5	5.0		5.0				
Max Green Setting (Gmax), s	5.1	23.4		17.0	8.5	20.0		17.0				
Max Q Clear Time (g_c+I1), s	2.5	13.8		16.1	6.6	12.6		18.7				
Green Ext Time (p_c), s	0.0	2.0		0.3	0.1	1.4		0.0				

Intersection Summary												
HCM 6th Ctrl Delay			21.2									
HCM 6th LOS			C									

HCM 6th Signalized Intersection Summary
5: Burr Street & 1st Avenue

06/13/2022



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	35	85	135	60	110	15	125	315	40	20	310	25
Future Volume (veh/h)	35	85	135	60	110	15	125	315	40	20	310	25
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1800	1800	1800	1744	1786	1800	1786	1772	1716	1800	1772	1800
Adj Flow Rate, veh/h	39	94	150	67	122	17	139	350	44	22	344	28
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	0	0	0	4	1	0	1	2	6	0	2	0
Cap, veh/h	340	144	230	237	354	49	539	748	94	502	702	57
Arrive On Green	0.23	0.23	0.23	0.23	0.23	0.23	0.07	0.48	0.48	0.02	0.43	0.43
Sat Flow, veh/h	1270	624	996	1118	1534	214	1701	1543	194	1714	1617	132
Grp Volume(v), veh/h	39	0	244	67	0	139	139	0	394	22	0	372
Grp Sat Flow(s),veh/h/ln	1270	0	1621	1118	0	1747	1701	0	1737	1714	0	1748
Q Serve(g_s), s	1.5	0.0	7.5	3.2	0.0	3.7	2.4	0.0	8.3	0.4	0.0	8.4
Cycle Q Clear(g_c), s	5.1	0.0	7.5	10.7	0.0	3.7	2.4	0.0	8.3	0.4	0.0	8.4
Prop In Lane	1.00		0.61	1.00		0.12	1.00		0.11	1.00		0.08
Lane Grp Cap(c), veh/h	340	0	374	237	0	403	539	0	842	502	0	759
V/C Ratio(X)	0.11	0.00	0.65	0.28	0.00	0.34	0.26	0.00	0.47	0.04	0.00	0.49
Avail Cap(c_a), veh/h	347	0	383	243	0	413	624	0	842	625	0	759
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	19.8	0.0	19.2	24.0	0.0	17.7	8.0	0.0	9.4	8.6	0.0	11.2
Incr Delay (d2), s/veh	0.1	0.0	3.8	0.6	0.0	0.5	0.3	0.0	1.9	0.0	0.0	2.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.4	0.0	3.0	0.8	0.0	1.4	0.7	0.0	3.0	0.1	0.0	3.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	20.0	0.0	22.9	24.6	0.0	18.2	8.2	0.0	11.3	8.6	0.0	13.5
LnGrp LOS	B	A	C	C	A	B	A	A	B	A	A	B
Approach Vol, veh/h		283			206			533			394	
Approach Delay, s/veh		22.5			20.3			10.5			13.2	
Approach LOS		C			C			B			B	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	5.6	31.7		17.7	8.4	28.9		17.7				
Change Period (Y+Rc), s	4.5	5.0		5.0	4.5	5.0		5.0				
Max Green Setting (Gmax), s	5.1	22.4		13.0	6.7	20.8		13.0				
Max Q Clear Time (g_c+I1), s	2.4	10.3		9.5	4.4	10.4		12.7				
Green Ext Time (p_c), s	0.0	1.9		0.5	0.1	1.7		0.0				

Intersection Summary												
HCM 6th Ctrl Delay			15.1									
HCM 6th LOS			B									

HCM 6th Signalized Intersection Summary
5: Burr Street & 1st Avenue

06/13/2022

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	20	140	220	40	110	15	205	350	65	20	320	25
Future Volume (veh/h)	20	140	220	40	110	15	205	350	65	20	320	25
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1800	1800	1772	1800	1800	1800	1786	1786	1800	1800	1786	1800
Adj Flow Rate, veh/h	22	156	244	44	122	17	228	389	72	22	356	28
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	0	0	2	0	0	0	1	1	0	0	1	0
Cap, veh/h	398	173	270	166	422	59	493	649	120	395	576	45
Arrive On Green	0.27	0.27	0.27	0.27	0.27	0.27	0.11	0.44	0.44	0.02	0.35	0.35
Sat Flow, veh/h	1270	633	989	1000	1546	215	1701	1466	271	1714	1634	129
Grp Volume(v), veh/h	22	0	400	44	0	139	228	0	461	22	0	384
Grp Sat Flow(s),veh/h/ln	1270	0	1622	1000	0	1761	1701	0	1737	1714	0	1763
Q Serve(g_s), s	0.8	0.0	13.1	1.9	0.0	3.4	4.3	0.0	11.1	0.4	0.0	9.9
Cycle Q Clear(g_c), s	4.2	0.0	13.1	15.0	0.0	3.4	4.3	0.0	11.1	0.4	0.0	9.9
Prop In Lane	1.00		0.61	1.00		0.12	1.00		0.16	1.00		0.07
Lane Grp Cap(c), veh/h	398	0	442	166	0	480	493	0	769	395	0	621
V/C Ratio(X)	0.06	0.00	0.90	0.27	0.00	0.29	0.46	0.00	0.60	0.06	0.00	0.62
Avail Cap(c_a), veh/h	398	0	442	166	0	480	521	0	769	518	0	621
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	17.4	0.0	19.3	26.7	0.0	15.8	9.6	0.0	11.6	11.3	0.0	14.7
Incr Delay (d2), s/veh	0.1	0.0	21.7	0.8	0.0	0.3	0.7	0.0	3.4	0.1	0.0	4.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.2	0.0	7.1	0.6	0.0	1.3	1.3	0.0	4.3	0.2	0.0	4.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	17.5	0.0	41.0	27.6	0.0	16.1	10.3	0.0	15.1	11.3	0.0	19.3
LnGrp LOS	B	A	D	C	A	B	B	A	B	B	A	B
Approach Vol, veh/h		422			183			689			406	
Approach Delay, s/veh		39.8			18.9			13.5			18.9	
Approach LOS		D			B			B			B	

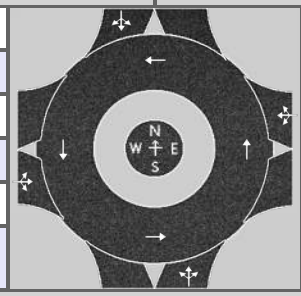
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	5.6	29.4		20.0	10.6	24.4		20.0				
Change Period (Y+Rc), s	4.5	5.0		5.0	4.5	5.0		5.0				
Max Green Setting (Gmax), s	5.1	20.4		15.0	7.0	18.5		15.0				
Max Q Clear Time (g_c+I1), s	2.4	13.1		15.1	6.3	11.9		17.0				
Green Ext Time (p_c), s	0.0	1.7		0.0	0.1	1.3		0.0				

Intersection Summary		
HCM 6th Ctrl Delay		21.9
HCM 6th LOS		C

HCS Roundabouts Report

General Information

Analyst	HDR
Agency or Co.	HDR
Date Performed	7/13/2022
Analysis Year	2045
Time Analyzed	AM Peak
Project Description	Mitchell MTP: 2045 Future C...



Site Information

Intersection	1st Street & Burr Street
E/W Street Name	1st Avenue
N/S Street Name	Burr Street
Analysis Time Period, hrs	0.25
Peak Hour Factor	0.90
Jurisdiction	City of Mitchell

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0
Lane Assignment			LTR				LTR				LTR				LTR	
Volume (V), veh/h	0	30	85	135	0	60	110	15	0	125	315	40	0	20	310	25
Percent Heavy Vehicles, %	0	0	5	0	0	14	4	5	0	0	4	9	0	0	14	0
Flow Rate (v_{PCE}), pc/h	0	33	99	150	0	76	127	18	0	139	364	48	0	22	393	28
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				1				1			
Pedestrians Crossing, p/h	0				0				0				0			
Proportion of CAVs	0															

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway, s		4.9763			4.9763			4.9763			4.9763	
Follow-Up Headway, s		2.6087			2.6087			2.6087			2.6087	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h		282			221			551			443	
Entry Volume, veh/h		277			206			533			395	
Circulating Flow (v_c), pc/h	491			536			154			342		
Exiting Flow (v_{ex}), pc/h	169			294			415			619		
Capacity (c_{pce}), pc/h		836			799			1179			974	
Capacity (c), veh/h		822			744			1141			868	
v/c Ratio (x)		0.34			0.28			0.47			0.46	

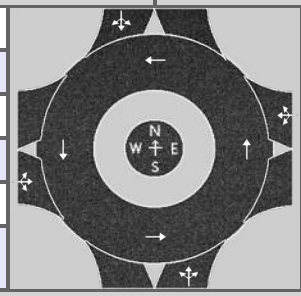
Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		8.3			8.1			8.2			9.8	
Lane LOS		A			A			A			A	
95% Queue, veh		1.5			1.1			2.5			2.4	
Approach Delay, s/veh	8.3			8.1			8.2			9.8		
Approach LOS	A			A			A			A		
Intersection Delay, s/veh | LOS	8.7						A					

HCS Roundabouts Report

General Information

Analyst	HDR
Agency or Co.	HDR
Date Performed	7/13/2022
Analysis Year	2032
Time Analyzed	PM Peak
Project Description	Mitchell MTP: 2032 Future C...



Site Information

Intersection	1st Street & Burr Street
E/W Street Name	1st Avenue
N/S Street Name	Burr Street
Analysis Time Period, hrs	0.25
Peak Hour Factor	0.90
Jurisdiction	City of Mitchell

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0
Lane Assignment			LTR				LTR				LTR				LTR	
Volume (V), veh/h	0	20	140	220	0	40	110	15	0	205	350	65	0	20	320	25
Percent Heavy Vehicles, %	0	0	5	0	0	14	4	5	0	0	4	9	0	0	14	0
Flow Rate (v_{PCE}), pc/h	0	22	163	244	0	51	127	18	0	228	404	79	0	22	405	28
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				1				1			
Pedestrians Crossing, p/h	0				0				0				0			
Proportion of CAVs	0															

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway, s		4.9763			4.9763			4.9763			4.9763	
Follow-Up Headway, s		2.6087			2.6087			2.6087			2.6087	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h		429			196			711			455	
Entry Volume, veh/h		421			184			689			405	
Circulating Flow (v_c), pc/h	478			654			207			406		
Exiting Flow (v_{ex}), pc/h	264			383			444			700		
Capacity (c_{pce}), pc/h		847			708			1117			912	
Capacity (c), veh/h		832			665			1083			812	
v/c Ratio (x)		0.51			0.28			0.64			0.50	

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		11.2			8.9			12.1			11.3	
Lane LOS		B			A			B			B	
95% Queue, veh		2.9			1.1			4.8			2.8	
Approach Delay, s/veh	11.2			8.9			12.1			11.3		
Approach LOS	B			A			B			B		
Intersection Delay, s/veh | LOS	11.3						B					

Appendix D: Synchro 11/HCS7 Output (Supplemental Scenarios)

Foster Street Extension Scenario

SD38 & Foster Street Intersection:

2045 Build Condition AM/PM (TWSC)
2045 Build Condition AM/PM (Signal)
2045 Build Condition Signal Warrants

Foster Street & Spruce Street Intersection:

2045 Build Condition AM/PM (TWSC)

SD37 & Spruce Street Intersection:

2045 Build Condition AM/PM (Signal)

Intersection	
Int Delay, s/veh	12.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	195	100	60	45	190	25	25	20	15	35	60	305
Future Vol, veh/h	195	100	60	45	190	25	25	20	15	35	60	305
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
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	100	-	-	100	-	-	100	-	-	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	4	12	0	0	7	12	0	0	0	0	0	3
Mvmt Flow	217	111	67	50	211	28	28	22	17	39	67	339

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	239	0	0	178	0	0	818	918	89	826	937	120
Stage 1	-	-	-	-	-	-	579	579	-	325	325	-
Stage 2	-	-	-	-	-	-	239	339	-	501	612	-
Critical Hdwy	4.18	-	-	4.1	-	-	7.5	6.5	6.9	7.5	6.5	6.96
Critical Hdwy Stg 1	-	-	-	-	-	-	6.5	5.5	-	6.5	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.5	5.5	-	6.5	5.5	-
Follow-up Hdwy	2.24	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.33
Pot Cap-1 Maneuver	1310	-	-	1410	-	-	271	274	958	268	267	906
Stage 1	-	-	-	-	-	-	473	504	-	667	653	-
Stage 2	-	-	-	-	-	-	749	643	-	526	487	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1310	-	-	1410	-	-	111	221	958	207	215	906
Mov Cap-2 Maneuver	-	-	-	-	-	-	111	221	-	207	215	-
Stage 1	-	-	-	-	-	-	394	420	-	556	630	-
Stage 2	-	-	-	-	-	-	404	620	-	408	406	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	4.6	1.3	30.1	23.5
HCM LOS			D	C

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	111	330	1310	-	-	1410	-	-	207	593
HCM Lane V/C Ratio	0.25	0.118	0.165	-	-	0.035	-	-	0.188	0.684
HCM Control Delay (s)	47.9	17.4	8.3	-	-	7.6	-	-	26.4	23.2
HCM Lane LOS	E	C	A	-	-	A	-	-	D	C
HCM 95th %tile Q(veh)	0.9	0.4	0.6	-	-	0.1	-	-	0.7	5.3

Intersection	
Int Delay, s/veh	11.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	305	200	30	20	140	40	45	35	25	30	20	225
Future Vol, veh/h	305	200	30	20	140	40	45	35	25	30	20	225
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
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	100	-	-	100	-	-	100	-	-	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	1	14	0	0	13	0	0	0	0	0	0	2
Mvmt Flow	339	222	33	22	156	44	50	39	28	33	22	250

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	200	0	0	255	0	0	1050	1161	128	1031	1155	100
Stage 1	-	-	-	-	-	-	917	917	-	222	222	-
Stage 2	-	-	-	-	-	-	133	244	-	809	933	-
Critical Hdwy	4.12	-	-	4.1	-	-	7.5	6.5	6.9	7.5	6.5	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.5	5.5	-	6.5	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.5	5.5	-	6.5	5.5	-
Follow-up Hdwy	2.21	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.32
Pot Cap-1 Maneuver	1377	-	-	1322	-	-	184	197	905	190	199	936
Stage 1	-	-	-	-	-	-	297	354	-	766	723	-
Stage 2	-	-	-	-	-	-	862	708	-	345	348	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1377	-	-	1322	-	-	96	146	905	118	147	936
Mov Cap-2 Maneuver	-	-	-	-	-	-	96	146	-	118	147	-
Stage 1	-	-	-	-	-	-	224	267	-	578	711	-
Stage 2	-	-	-	-	-	-	602	696	-	215	262	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	4.8	0.8	49.1	18
HCM LOS			E	C

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	96	224	1377	-	-	1322	-	-	118	651
HCM Lane V/C Ratio	0.521	0.298	0.246	-	-	0.017	-	-	0.282	0.418
HCM Control Delay (s)	77.6	27.7	8.5	-	-	7.8	-	-	47.1	14.4
HCM Lane LOS	F	D	A	-	-	A	-	-	E	B
HCM 95th %tile Q(veh)	2.3	1.2	1	-	-	0.1	-	-	1.1	2.1

HCM 6th Signalized Intersection Summary
4: Foster Street & SD38

06/13/2022

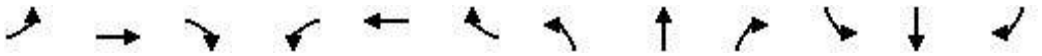
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	195	100	60	45	190	25	25	20	15	35	60	305
Future Volume (veh/h)	195	100	60	45	190	25	25	20	15	35	60	305
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1744	1632	1800	1800	1702	1632	1800	1800	1800	1800	1800	1758
Adj Flow Rate, veh/h	217	111	67	50	211	28	28	22	17	39	67	339
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	4	12	0	0	7	12	0	0	0	0	0	3
Cap, veh/h	587	677	382	546	808	106	199	290	224	539	80	402
Arrive On Green	0.12	0.35	0.35	0.04	0.28	0.28	0.31	0.31	0.31	0.31	0.31	0.31
Sat Flow, veh/h	1661	1909	1078	1714	2874	377	995	942	728	1390	258	1307
Grp Volume(v), veh/h	217	89	89	50	117	122	28	0	39	39	0	406
Grp Sat Flow(s),veh/h/ln	1661	1550	1437	1714	1617	1634	995	0	1669	1390	0	1565
Q Serve(g_s), s	4.6	2.1	2.3	1.1	3.0	3.1	1.5	0.0	0.9	1.1	0.0	13.0
Cycle Q Clear(g_c), s	4.6	2.1	2.3	1.1	3.0	3.1	14.4	0.0	0.9	2.0	0.0	13.0
Prop In Lane	1.00		0.75	1.00		0.23	1.00		0.44	1.00		0.83
Lane Grp Cap(c), veh/h	587	549	509	546	454	459	199	0	514	539	0	482
V/C Ratio(X)	0.37	0.16	0.18	0.09	0.26	0.26	0.14	0.00	0.08	0.07	0.00	0.84
Avail Cap(c_a), veh/h	710	549	509	639	454	459	274	0	638	630	0	584
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	10.3	11.9	11.9	12.8	14.9	15.0	24.1	0.0	13.1	13.8	0.0	17.3
Incr Delay (d2), s/veh	0.4	0.6	0.7	0.1	1.4	1.4	0.3	0.0	0.1	0.1	0.0	9.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.3	0.7	0.7	0.3	1.1	1.1	0.3	0.0	0.3	0.3	0.0	5.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	10.7	12.5	12.7	12.8	16.3	16.4	24.4	0.0	13.2	13.9	0.0	26.6
LnGrp LOS	B	B	B	B	B	B	C	A	B	B	A	C
Approach Vol, veh/h		395			289			67			445	
Approach Delay, s/veh		11.5			15.7			17.9			25.5	
Approach LOS		B			B			B			C	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	7.1	25.0		21.5	11.0	21.1		21.5				
Change Period (Y+Rc), s	5.0	6.0		5.0	4.5	6.0		* 5				
Max Green Setting (Gmax), s	5.0	19.0		20.0	10.5	14.0		* 21				
Max Q Clear Time (g_c+I1), s	3.1	4.3		15.0	6.6	5.1		16.4				
Green Ext Time (p_c), s	0.0	0.7		1.3	0.2	0.7		0.1				

Intersection Summary		
HCM 6th Ctrl Delay		18.1
HCM 6th LOS		B

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	305	200	30	20	140	40	45	35	25	30	20	225
Future Volume (veh/h)	305	200	30	20	140	40	45	35	25	30	20	225
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1786	1603	1800	1800	1617	1800	1800	1800	1800	1800	1800	1772
Adj Flow Rate, veh/h	339	222	33	22	156	44	50	39	28	33	22	250
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	1	14	0	0	13	0	0	0	0	0	0	2
Cap, veh/h	721	1178	173	514	723	198	224	237	170	419	30	345
Arrive On Green	0.17	0.44	0.44	0.02	0.30	0.30	0.24	0.24	0.24	0.24	0.24	0.24
Sat Flow, veh/h	1701	2666	391	1714	2384	653	1125	974	700	1355	125	1420
Grp Volume(v), veh/h	339	126	129	22	99	101	50	0	67	33	0	272
Grp Sat Flow(s),veh/h/ln	1701	1523	1533	1714	1537	1500	1125	0	1674	1355	0	1544
Q Serve(g_s), s	6.6	2.7	2.8	0.5	2.6	2.7	2.3	0.0	1.7	1.1	0.0	8.8
Cycle Q Clear(g_c), s	6.6	2.7	2.8	0.5	2.6	2.7	11.1	0.0	1.7	2.8	0.0	8.8
Prop In Lane	1.00		0.25	1.00		0.44	1.00		0.42	1.00		0.92
Lane Grp Cap(c), veh/h	721	673	677	514	466	455	224	0	406	419	0	375
V/C Ratio(X)	0.47	0.19	0.19	0.04	0.21	0.22	0.22	0.00	0.16	0.08	0.00	0.73
Avail Cap(c_a), veh/h	919	673	677	637	466	455	271	0	478	464	0	427
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	8.5	9.2	9.2	12.6	14.1	14.1	24.0	0.0	16.2	17.3	0.0	18.9
Incr Delay (d2), s/veh	0.5	0.6	0.6	0.0	1.0	1.1	0.5	0.0	0.2	0.1	0.0	5.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.7	0.8	0.8	0.2	0.9	0.9	0.6	0.0	0.6	0.3	0.0	3.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	9.0	9.8	9.9	12.6	15.1	15.3	24.5	0.0	16.4	17.4	0.0	24.2
LnGrp LOS	A	A	A	B	B	B	C	A	B	B	A	C
Approach Vol, veh/h		594			222			117			305	
Approach Delay, s/veh		9.3			14.9			19.9			23.4	
Approach LOS		A			B			B			C	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	6.1	30.0		18.2	13.7	22.5		18.2				
Change Period (Y+Rc), s	5.0	6.0		5.0	4.5	6.0		* 5				
Max Green Setting (Gmax), s	5.0	24.0		15.0	15.5	14.0		* 16				
Max Q Clear Time (g_c+I1), s	2.5	4.8		10.8	8.6	4.7		13.1				
Green Ext Time (p_c), s	0.0	1.2		0.7	0.6	0.6		0.1				

Intersection Summary		
HCM 6th Ctrl Delay		14.8
HCM 6th LOS		B

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

HCS7: MUTCD Signal Warrants Release 7.2

Analyst: HDR
Agency: HDR
Date: 5/16/2022
Project ID: Mitchell MTP - Foster St Extalysis Year: 2045 Build
EW Street: Foster Street
Intersection: SD37 & 23rd Ave
Jurisdiction: SDDOT
Units: U.S. Customary
NS Street: SD38 (Havens Avenue)

General Information

Major St. Speed (mph): 30
Nearest Signal (ft): 850
Crashes per Yr: 0
Population: Not less than 10000
Coordinated Signal System: Y

School Crossing

Students in Highest Hour: 0
Adequate Gaps in Period: 0
Minutes in Period: 0

Roadway Network

Two Major Routes: 1
Weekend Count: 0
5-yr Growth Factor: 0

Geometry and Traffic

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	2	0	1	2	0	1	1	0	1	1	0
LaneUsage	L	TR		L	TR		L	TR		L	TR	

Results

Warrant 1: Eight-Hour Vehicular Volume	[ ]
1 A. Minimum Vehicular Volumes	[ ]
1 B. Interruption of Continuous Traffic	[ ]
1 80% Vehicular --and-- Interruption Volumes	[ ]
Warrant 2: Four-Hour Vehicular Volume	
2 A. Four-Hour Vehicular Volumes	[ ]
Warrant 3: Peak Hour	[ ]
3 A. Peak-Hour Conditions	[ ]
3 B. Peak-Hour Vehicular Volume Hours Met	[ ]
Warrant 4: Pedestrian Volume	[ ]
4 A. Four Hour Volumes	[ ]
4 B. One-Hour Volumes	[ ]
Warrant 5: School Crossing	[ ]
5 A. Student Volumes	[ ]
5 B. Gaps Same Period	[ ]
Warrant 6: Coordinated Signal System	
6 Degree of Platooning	[X]
Warrant 7: Crash Experience	[ ]
7 A. Adequate trials of alternatives	[ ]

7 B. Reported crashes [ ]
7 80% Volumes for Warrants 1A, 1B --or-- 4 [ ]

Warrant 8: Roadway Network [ ]
8 A. Weekday Volume [ ]
8 B. Weekend Volume [ ]

Warrant 9: Grade Crossing [ ]
9 A. Grade Crossing within 140 ft --and-- [ ]
9 B. Peak-Hour Vehicular Volumes [ ]

Summary

Hours	Major Volume	Minor Volume	Total Volume	Delay (Veh-hr)	1A 100%	1A 80%	1B 100%	1B 80%	2 100%	3A 100%	3B 100%
07-08	460	355	1075	0.0	No	No	No	No	No	No	No
08-09	0	0	0	0.0	No	No	No	No	No	No	No
09-10	0	0	0	0.0	No	No	No	No	No	No	No
10-11	0	0	0	0.0	No	No	No	No	No	No	No
11-12	0	0	0	0.0	No	No	No	No	No	No	No
12-13	0	0	0	0.0	No	No	No	No	No	No	No
13-14	0	0	0	0.0	No	No	No	No	No	No	No
14-15	0	0	0	0.0	No	No	No	No	No	No	No
15-16	0	0	0	0.0	No	No	No	No	No	No	No
16-17	380	535	1115	0.0	No	No	No	No	No	No	No
17-18	0	0	0	0.0	No	No	No	No	No	No	No
18-19	0	0	0	0.0	No	No	No	No	No	No	No
Total	840	890	2190		0	0	0	0	0	0	0

Traffic Volumes (vph)

Eastbound			Westbound			Northbound			Southbound		
L	T	R	L	T	R	L	T	R	L	T	R
195	100	60	45	190	25	25	20	15	35	60	305
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
305	200	30	20	140	40	45	35	25	30	20	225
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0

Pedestrian Volumes and Gaps (Per Hour)

Volume	Gap	Volume	Gap	Volume	Gap	Volume	Gap
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0

!

Delay	sec/veh	veh-hrs	sec/veh	veh-hrs	sec/veh	veh-hrs	sec/veh	veh-hrs
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Intersection	
Int Delay, s/veh	4.2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	30	285	30	30	135	30
Future Vol, veh/h	30	285	30	30	135	30
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	100	-	-	100	150	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	33	317	33	33	150	33

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	66	0	-	0	416	33
Stage 1	-	-	-	-	33	-
Stage 2	-	-	-	-	383	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1536	-	-	-	593	1041
Stage 1	-	-	-	-	989	-
Stage 2	-	-	-	-	689	-
Platoon blocked, %			-	-	-	
Mov Cap-1 Maneuver	1536	-	-	-	581	1041
Mov Cap-2 Maneuver	-	-	-	-	581	-
Stage 1	-	-	-	-	968	-
Stage 2	-	-	-	-	689	-

Approach	EB	WB	SB
HCM Control Delay, s	0.7	0	12.4
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1536	-	-	-	581	1041
HCM Lane V/C Ratio	0.022	-	-	-	0.258	0.032
HCM Control Delay (s)	7.4	-	-	-	13.3	8.6
HCM Lane LOS	A	-	-	-	B	A
HCM 95th %tile Q(veh)	0.1	-	-	-	1	0.1

Intersection	
Int Delay, s/veh	2.6

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	30	50	125	75	35	35
Future Vol, veh/h	30	50	125	75	35	35
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	100	-	-	100	150	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	33	56	139	83	39	39

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	222	0	-	0	261	139
Stage 1	-	-	-	-	139	-
Stage 2	-	-	-	-	122	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1347	-	-	-	728	909
Stage 1	-	-	-	-	888	-
Stage 2	-	-	-	-	903	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1347	-	-	-	711	909
Mov Cap-2 Maneuver	-	-	-	-	711	-
Stage 1	-	-	-	-	867	-
Stage 2	-	-	-	-	903	-

Approach	EB	WB	SB
HCM Control Delay, s	2.9	0	9.8
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1347	-	-	-	711	909
HCM Lane V/C Ratio	0.025	-	-	-	0.055	0.043
HCM Control Delay (s)	7.7	-	-	-	10.4	9.1
HCM Lane LOS	A	-	-	-	B	A
HCM 95th %tile Q(veh)	0.1	-	-	-	0.2	0.1

HCM 6th Signalized Intersection Summary
2: SD37 (Burr Street) & Spruce Street

06/13/2022

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	155	135	25	10	20	30	50	335	45	135	175	205
Future Volume (veh/h)	155	135	25	10	20	30	50	335	45	135	175	205
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1716	1772	1800	1800	1800	1688	1800	1702	1716	1772	1575	1772
Adj Flow Rate, veh/h	172	150	28	11	22	33	56	372	0	150	194	0
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	6	2	0	0	0	8	0	7	6	2	16	2
Cap, veh/h	634	214	40	204	265	421	74	1354		193	1466	
Arrive On Green	0.15	0.15	0.15	0.15	0.15	0.15	0.04	0.42	0.00	0.11	0.49	0.00
Sat Flow, veh/h	2534	1452	271	1225	1800	2860	1714	3233	1454	1688	2993	1502
Grp Volume(v), veh/h	172	0	178	11	22	33	56	372	0	150	194	0
Grp Sat Flow(s),veh/h/ln	1267	0	1723	1225	1800	1430	1714	1617	1454	1688	1497	1502
Q Serve(g_s), s	3.1	0.0	4.9	0.4	0.5	0.5	1.6	3.8	0.0	4.3	1.8	0.0
Cycle Q Clear(g_c), s	3.7	0.0	4.9	5.3	0.5	0.5	1.6	3.8	0.0	4.3	1.8	0.0
Prop In Lane	1.00		0.16	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	634	0	253	204	265	421	74	1354		193	1466	
V/C Ratio(X)	0.27	0.00	0.70	0.05	0.08	0.08	0.76	0.27		0.78	0.13	
Avail Cap(c_a), veh/h	667	0	276	220	288	458	206	1354		456	1466	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.91	0.91	0.00
Uniform Delay (d), s/veh	20.0	0.0	20.3	22.8	18.4	18.4	23.7	9.5	0.0	21.5	7.0	0.0
Incr Delay (d2), s/veh	0.2	0.0	7.1	0.1	0.1	0.1	14.3	0.5	0.0	6.1	0.2	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.8	0.0	2.2	0.1	0.2	0.1	0.9	1.1	0.0	1.8	0.4	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	20.2	0.0	27.4	22.9	18.5	18.5	38.0	10.0	0.0	27.6	7.1	0.0
LnGrp LOS	C	A	C	C	B	B	D	B		C	A	
Approach Vol, veh/h		350			66			428	A		344	A
Approach Delay, s/veh		23.9			19.2			13.7			16.1	
Approach LOS		C			B			B			B	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	11.2	26.4		12.4	7.7	30.0		12.4				
Change Period (Y+Rc), s	5.5	5.5		5.0	5.5	5.5		5.0				
Max Green Setting (Gmax), s	13.5	12.5		8.0	6.0	20.0		8.0				
Max Q Clear Time (g_c+I1), s	6.3	5.8		6.9	3.6	3.8		7.3				
Green Ext Time (p_c), s	0.2	1.2		0.2	0.0	1.0		0.0				

Intersection Summary		
HCM 6th Ctrl Delay		17.7
HCM 6th LOS		B

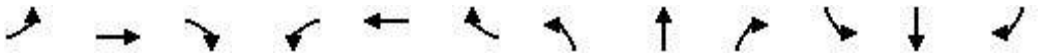
Notes

User approved volume balancing among the lanes for turning movement.

Unsignalized Delay for [NBR, SBR] is excluded from calculations of the approach delay and intersection delay.

HCM 6th Signalized Intersection Summary
2: SD37 (Burr Street) & Spruce Street

06/13/2022



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	495	35	60	25	60	75	30	255	10	35	325	450
Future Volume (veh/h)	495	35	60	25	60	75	30	255	10	35	325	450
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1786	1688	1800	1800	1800	1646	1800	1646	1519	1561	1702	1786
Adj Flow Rate, veh/h	550	39	67	28	66	83	33	283	0	39	361	0
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	1	8	0	0	0	11	0	11	20	17	7	1
Cap, veh/h	912	165	283	448	532	824	49	1192		49	1245	
Arrive On Green	0.30	0.30	0.30	0.30	0.30	0.30	0.03	0.38	0.00	0.01	0.13	0.00
Sat Flow, veh/h	2422	558	958	1308	1800	2789	1714	3127	1287	1487	3233	1514
Grp Volume(v), veh/h	550	0	106	28	66	83	33	283	0	39	361	0
Grp Sat Flow(s),veh/h/ln	1211	0	1515	1308	1800	1395	1714	1563	1287	1487	1617	1514
Q Serve(g_s), s	11.8	0.0	2.9	0.9	1.5	1.2	1.0	3.4	0.0	1.4	5.6	0.0
Cycle Q Clear(g_c), s	13.3	0.0	2.9	3.8	1.5	1.2	1.0	3.4	0.0	1.4	5.6	0.0
Prop In Lane	1.00		0.63	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	912	0	447	448	532	824	49	1192		49	1245	
V/C Ratio(X)	0.60	0.00	0.24	0.06	0.12	0.10	0.67	0.24		0.80	0.29	
Avail Cap(c_a), veh/h	998	0	501	494	596	923	128	1192		149	1245	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.33	0.33	0.33
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.87	0.87	0.00
Uniform Delay (d), s/veh	19.0	0.0	14.7	16.1	14.2	14.1	26.4	11.6	0.0	27.0	17.2	0.0
Incr Delay (d2), s/veh	0.9	0.0	0.3	0.1	0.1	0.1	14.5	0.5	0.0	22.7	0.5	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.0	0.0	0.9	0.2	0.5	0.3	0.6	1.1	0.0	0.8	2.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	19.9	0.0	15.0	16.2	14.3	14.1	40.9	12.0	0.0	49.7	17.7	0.0
LnGrp LOS	B	A	B	B	B	B	D	B		D	B	
Approach Vol, veh/h		656			177			316	A		400	A
Approach Delay, s/veh		19.1			14.5			15.1			20.8	
Approach LOS		B			B			B			C	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	7.3	26.5		21.2	7.1	26.7		21.2				
Change Period (Y+Rc), s	5.5	5.5		5.0	5.5	5.5		5.0				
Max Green Setting (Gmax), s	5.5	15.3		18.2	4.1	16.7		18.2				
Max Q Clear Time (g_c+I1), s	3.4	5.4		15.3	3.0	7.6		5.8				
Green Ext Time (p_c), s	0.0	1.2		0.9	0.0	1.5		0.5				

Intersection Summary		
HCM 6th Ctrl Delay		18.2
HCM 6th LOS		B

Notes

User approved volume balancing among the lanes for turning movement.

Unsignalized Delay for [NBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Mattie Street Connection Scenario

Mattie Street & 1st Avenue Intersection:

2032 Build Condition AM/PM (TWSC)

2045 Build Condition AM/PM (TWSC)

SD38 & Mattie Street Intersection:

2032 Build Condition AM/PM (TWSC)

2045 Build Condition AM/PM (TWSC)

Intersection	
Int Delay, s/veh	5.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	15	15	20	25	40	5	15	5	5	5	20	20
Future Vol, veh/h	15	15	20	25	40	5	15	5	5	5	20	20
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
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	17	17	22	28	44	6	17	6	6	6	22	22

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	50	0	0	39	0	0	187	168	28	171	176	47
Stage 1	-	-	-	-	-	-	62	62	-	103	103	-
Stage 2	-	-	-	-	-	-	125	106	-	68	73	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1570	-	-	1584	-	-	778	728	1053	797	721	1028
Stage 1	-	-	-	-	-	-	954	847	-	908	814	-
Stage 2	-	-	-	-	-	-	884	811	-	947	838	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1570	-	-	1584	-	-	727	707	1053	771	700	1028
Mov Cap-2 Maneuver	-	-	-	-	-	-	727	707	-	771	700	-
Stage 1	-	-	-	-	-	-	944	838	-	898	799	-
Stage 2	-	-	-	-	-	-	826	796	-	925	829	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	2.2	2.6	9.9	9.6
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	770	1570	-	-	1584	-	-	826
HCM Lane V/C Ratio	0.036	0.011	-	-	0.018	-	-	0.061
HCM Control Delay (s)	9.9	7.3	0	-	7.3	0	-	9.6
HCM Lane LOS	A	A	A	-	A	A	-	A
HCM 95th %tile Q(veh)	0.1	0	-	-	0.1	-	-	0.2

Intersection	
Int Delay, s/veh	4.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	40	30	50	15	10	5	15	5	5	5	15	10
Future Vol, veh/h	40	30	50	15	10	5	15	5	5	5	15	10
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
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	44	33	56	17	11	6	17	6	6	6	17	11

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	17	0	0	89	0	0	211	200	61	203	225	14
Stage 1	-	-	-	-	-	-	149	149	-	48	48	-
Stage 2	-	-	-	-	-	-	62	51	-	155	177	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1613	-	-	1519	-	-	750	699	1010	759	678	1072
Stage 1	-	-	-	-	-	-	858	778	-	971	859	-
Stage 2	-	-	-	-	-	-	954	856	-	852	756	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1613	-	-	1519	-	-	706	671	1010	727	651	1072
Mov Cap-2 Maneuver	-	-	-	-	-	-	706	671	-	727	651	-
Stage 1	-	-	-	-	-	-	833	755	-	943	850	-
Stage 2	-	-	-	-	-	-	915	847	-	817	734	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	2.4	3.7	10	9.9
HCM LOS			B	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	743	1613	-	-	1519	-	-	764
HCM Lane V/C Ratio	0.037	0.028	-	-	0.011	-	-	0.044
HCM Control Delay (s)	10	7.3	0	-	7.4	0	-	9.9
HCM Lane LOS	B	A	A	-	A	A	-	A
HCM 95th %tile Q(veh)	0.1	0.1	-	-	0	-	-	0.1

Intersection	
Int Delay, s/veh	5.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	25	25	20	20	55	10	20	10	10	15	35	40
Future Vol, veh/h	25	25	20	20	55	10	20	10	10	15	35	40
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
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	28	28	22	22	61	11	22	11	11	17	39	44

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	72	0	0	50	0	0	247	211	39	217	217	67
Stage 1	-	-	-	-	-	-	95	95	-	111	111	-
Stage 2	-	-	-	-	-	-	152	116	-	106	106	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1541	-	-	1570	-	-	711	690	1038	744	685	1002
Stage 1	-	-	-	-	-	-	917	820	-	899	807	-
Stage 2	-	-	-	-	-	-	855	803	-	905	811	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1541	-	-	1570	-	-	632	667	1038	708	662	1002
Mov Cap-2 Maneuver	-	-	-	-	-	-	632	667	-	708	662	-
Stage 1	-	-	-	-	-	-	900	804	-	882	795	-
Stage 2	-	-	-	-	-	-	765	791	-	866	796	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	2.6	1.7	10.4	10.2
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	711	1541	-	-	1570	-	-	790
HCM Lane V/C Ratio	0.063	0.018	-	-	0.014	-	-	0.127
HCM Control Delay (s)	10.4	7.4	0	-	7.3	0	-	10.2
HCM Lane LOS	B	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	0.2	0.1	-	-	0	-	-	0.4

Intersection	
Int Delay, s/veh	5.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		⇕			⇕			⇕			⇕	
Traffic Vol, veh/h	75	40	55	20	15	15	20	10	10	15	30	20
Future Vol, veh/h	75	40	55	20	15	15	20	10	10	15	30	20
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
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	83	44	61	22	17	17	22	11	11	17	33	22

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	34	0	0	105	0	0	338	319	75	322	341	26
Stage 1	-	-	-	-	-	-	241	241	-	70	70	-
Stage 2	-	-	-	-	-	-	97	78	-	252	271	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1591	-	-	1499	-	-	620	601	992	635	584	1056
Stage 1	-	-	-	-	-	-	767	710	-	945	841	-
Stage 2	-	-	-	-	-	-	914	834	-	757	689	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1591	-	-	1499	-	-	547	559	992	585	543	1056
Mov Cap-2 Maneuver	-	-	-	-	-	-	547	559	-	585	543	-
Stage 1	-	-	-	-	-	-	724	670	-	892	828	-
Stage 2	-	-	-	-	-	-	846	821	-	695	650	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	3.3	3	11.3	11.2
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	620	1591	-	-	1499	-	-	651
HCM Lane V/C Ratio	0.072	0.052	-	-	0.015	-	-	0.111
HCM Control Delay (s)	11.3	7.4	0	-	7.4	0	-	11.2
HCM Lane LOS	B	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	0.2	0.2	-	-	0	-	-	0.4

Intersection	
Int Delay, s/veh	2.2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	15	90	125	5	15	40
Future Vol, veh/h	15	90	125	5	15	40
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	17	100	139	6	17	44

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	145	0	-	0	276	142
Stage 1	-	-	-	-	142	-
Stage 2	-	-	-	-	134	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1437	-	-	-	714	906
Stage 1	-	-	-	-	885	-
Stage 2	-	-	-	-	892	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1437	-	-	-	705	906
Mov Cap-2 Maneuver	-	-	-	-	705	-
Stage 1	-	-	-	-	873	-
Stage 2	-	-	-	-	892	-

Approach	EB	WB	SB
HCM Control Delay, s	1.1	0	9.6
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1437	-	-	-	841
HCM Lane V/C Ratio	0.012	-	-	-	0.073
HCM Control Delay (s)	7.5	0	-	-	9.6
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.2

Intersection	
Int Delay, s/veh	1.7

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	45	135	120	15	5	20
Future Vol, veh/h	45	135	120	15	5	20
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	50	150	133	17	6	22

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	150	0	-	0	392	142
Stage 1	-	-	-	-	142	-
Stage 2	-	-	-	-	250	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1431	-	-	-	612	906
Stage 1	-	-	-	-	885	-
Stage 2	-	-	-	-	792	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1431	-	-	-	589	906
Mov Cap-2 Maneuver	-	-	-	-	589	-
Stage 1	-	-	-	-	851	-
Stage 2	-	-	-	-	792	-

Approach	EB	WB	SB
HCM Control Delay, s	1.9	0	9.6
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1431	-	-	-	818
HCM Lane V/C Ratio	0.035	-	-	-	0.034
HCM Control Delay (s)	7.6	0	-	-	9.6
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0.1	-	-	-	0.1

Intersection	
Int Delay, s/veh	1.9

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	15	120	175	10	20	40
Future Vol, veh/h	15	120	175	10	20	40
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	17	133	194	11	22	44

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	205	0	-	0	367	200
Stage 1	-	-	-	-	200	-
Stage 2	-	-	-	-	167	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1366	-	-	-	633	841
Stage 1	-	-	-	-	834	-
Stage 2	-	-	-	-	863	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1366	-	-	-	625	841
Mov Cap-2 Maneuver	-	-	-	-	625	-
Stage 1	-	-	-	-	823	-
Stage 2	-	-	-	-	863	-

Approach	EB	WB	SB
HCM Control Delay, s	0.9	0	10.2
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1366	-	-	-	754
HCM Lane V/C Ratio	0.012	-	-	-	0.088
HCM Control Delay (s)	7.7	0	-	-	10.2
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.3

Intersection	
Int Delay, s/veh	2.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	65	165	150	25	10	30
Future Vol, veh/h	65	165	150	25	10	30
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	72	183	167	28	11	33

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	195	0	-	0	508	181
Stage 1	-	-	-	-	181	-
Stage 2	-	-	-	-	327	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1378	-	-	-	525	862
Stage 1	-	-	-	-	850	-
Stage 2	-	-	-	-	731	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1378	-	-	-	495	862
Mov Cap-2 Maneuver	-	-	-	-	495	-
Stage 1	-	-	-	-	801	-
Stage 2	-	-	-	-	731	-

Approach	EB	WB	SB
HCM Control Delay, s	2.2	0	10.3
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1378	-	-	-	727
HCM Lane V/C Ratio	0.052	-	-	-	0.061
HCM Control Delay (s)	7.8	0	-	-	10.3
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0.2	-	-	-	0.2

Hospital Relocation Scenario

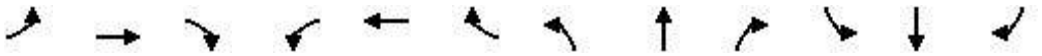
Rowley Street & Norway Avenue Intersection:

2045 Build Condition AM/PM (Signal)

2045 Build Condition Signal Warrants

Rowley *Street & Spruce Street Intersection:*

2045 Build Condition AM/PM (AWSC)



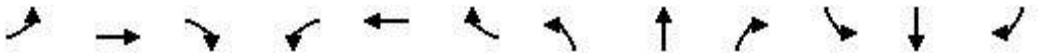
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	20	105	120	60	110	35	105	170	70	55	245	40
Future Volume (veh/h)	20	105	120	60	110	35	105	170	70	55	245	40
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1800	1800	1772	1730	1772	1800	1772	1744	1800	1617	1786	1674
Adj Flow Rate, veh/h	22	117	133	67	122	39	117	189	78	61	272	44
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	0	0	2	5	2	0	2	4	0	13	1	9
Cap, veh/h	100	163	170	176	210	58	524	443	183	512	528	85
Arrive On Green	0.21	0.21	0.21	0.21	0.21	0.21	0.08	0.38	0.38	0.06	0.35	0.35
Sat Flow, veh/h	70	772	806	349	994	277	1688	1173	484	1540	1500	243
Grp Volume(v), veh/h	272	0	0	228	0	0	117	0	267	61	0	316
Grp Sat Flow(s),veh/h/ln	1649	0	0	1620	0	0	1688	0	1657	1540	0	1742
Q Serve(g_s), s	1.4	0.0	0.0	0.0	0.0	0.0	1.9	0.0	5.4	1.1	0.0	6.5
Cycle Q Clear(g_c), s	7.0	0.0	0.0	5.6	0.0	0.0	1.9	0.0	5.4	1.1	0.0	6.5
Prop In Lane	0.08		0.49	0.29		0.17	1.00		0.29	1.00		0.14
Lane Grp Cap(c), veh/h	433	0	0	444	0	0	524	0	626	512	0	614
V/C Ratio(X)	0.63	0.00	0.00	0.51	0.00	0.00	0.22	0.00	0.43	0.12	0.00	0.52
Avail Cap(c_a), veh/h	554	0	0	555	0	0	566	0	626	590	0	614
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	16.9	0.0	0.0	16.3	0.0	0.0	8.3	0.0	10.5	8.4	0.0	11.6
Incr Delay (d2), s/veh	1.5	0.0	0.0	0.9	0.0	0.0	0.2	0.0	2.1	0.1	0.0	3.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.6	0.0	0.0	2.0	0.0	0.0	0.6	0.0	1.9	0.3	0.0	2.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	18.4	0.0	0.0	17.3	0.0	0.0	8.5	0.0	12.6	8.5	0.0	14.7
LnGrp LOS	B	A	A	B	A	A	A	A	B	A	A	B
Approach Vol, veh/h		272			228			384			377	
Approach Delay, s/veh		18.4			17.3			11.3			13.7	
Approach LOS		B			B			B			B	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	8.7	22.2		14.6	9.9	21.0		14.6				
Change Period (Y+Rc), s	6.0	5.0		5.0	6.0	5.0		5.0				
Max Green Setting (Gmax), s	5.0	16.0		13.0	5.0	16.0		13.0				
Max Q Clear Time (g_c+I1), s	3.1	7.4		9.0	3.9	8.5		7.6				
Green Ext Time (p_c), s	0.0	1.0		0.6	0.0	1.1		0.6				

Intersection Summary			
HCM 6th Ctrl Delay		14.6	
HCM 6th LOS		B	

HCM 6th Signalized Intersection Summary
3: Rowley Street & Norway Avenue

06/13/2022



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	20	120	120	55	100	50	125	370	70	40	245	15
Future Volume (veh/h)	20	120	120	55	100	50	125	370	70	40	245	15
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1800	1716	1800	1800	1800	1800	1800	1786	1744	1688	1786	1800
Adj Flow Rate, veh/h	22	133	133	61	111	56	139	411	78	44	272	17
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	0	6	0	0	0	0	0	1	4	8	1	0
Cap, veh/h	83	172	159	146	195	84	597	655	124	402	688	43
Arrive On Green	0.22	0.22	0.22	0.22	0.22	0.22	0.08	0.45	0.45	0.04	0.41	0.41
Sat Flow, veh/h	62	787	728	294	889	385	1714	1459	277	1607	1663	104
Grp Volume(v), veh/h	288	0	0	228	0	0	139	0	489	44	0	289
Grp Sat Flow(s),veh/h/ln	1577	0	0	1569	0	0	1714	0	1736	1607	0	1767
Q Serve(g_s), s	2.5	0.0	0.0	0.0	0.0	0.0	2.5	0.0	12.0	0.8	0.0	6.4
Cycle Q Clear(g_c), s	9.6	0.0	0.0	7.1	0.0	0.0	2.5	0.0	12.0	0.8	0.0	6.4
Prop In Lane	0.08		0.46	0.27		0.25	1.00		0.16	1.00		0.06
Lane Grp Cap(c), veh/h	415	0	0	426	0	0	597	0	779	402	0	731
V/C Ratio(X)	0.69	0.00	0.00	0.54	0.00	0.00	0.23	0.00	0.63	0.11	0.00	0.40
Avail Cap(c_a), veh/h	493	0	0	502	0	0	646	0	779	475	0	731
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	20.7	0.0	0.0	19.6	0.0	0.0	8.2	0.0	11.8	9.4	0.0	11.4
Incr Delay (d2), s/veh	3.3	0.0	0.0	1.0	0.0	0.0	0.2	0.0	3.8	0.1	0.0	1.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.7	0.0	0.0	2.6	0.0	0.0	0.8	0.0	4.8	0.3	0.0	2.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	24.0	0.0	0.0	20.7	0.0	0.0	8.4	0.0	15.6	9.5	0.0	13.0
LnGrp LOS	C	A	A	C	A	A	A	A	B	A	A	B
Approach Vol, veh/h		288			228			628			333	
Approach Delay, s/veh		24.0			20.7			14.0			12.6	
Approach LOS		C			C			B			B	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	8.5	30.0		17.2	10.4	28.0		17.2				
Change Period (Y+Rc), s	6.0	5.0		5.0	6.0	5.0		5.0				
Max Green Setting (Gmax), s	5.0	24.0		15.0	6.0	23.0		15.0				
Max Q Clear Time (g_c+I1), s	2.8	14.0		11.6	4.5	8.4		9.1				
Green Ext Time (p_c), s	0.0	2.4		0.6	0.0	1.5		0.7				

Intersection Summary			
HCM 6th Ctrl Delay		16.7	
HCM 6th LOS		B	

HCS7: MUTCD Signal Warrants Release 7.2

Analyst: HDR
Agency: HDR
Date: 5/16/2022
Project ID: Mitchell MTP
EW Street: Norway Avenue

Intersection: Rowley St & Norway Ave
Jurisdiction: SDDOT
Units: U.S. Customary
Analysis Year: 2045 Build (Hospital)
NS Street: Rowley Street

General Information

Major St. Speed (mph): 30
Nearest Signal (ft): 0
Crashes per Yr: 0

Population: Not less than 10000
Coordinated Signal System: N

School Crossing

Students in Highest Hour: 0
Adequate Gaps in Period: 0
Minutes in Period: 0

Roadway Network

Two Major Routes: 1
Weekend Count: 0
5-yr Growth Factor: 0

Geometry and Traffic

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	1	0	0	1	0	1	1	0	1	1	0
LaneUsage		LTR			LTR		L	TR		L	TR	

Results

Warrant 1: Eight-Hour Vehicular Volume	[ ]
1 A. Minimum Vehicular Volumes	[ ]
1 B. Interruption of Continuous Traffic	[ ]
1 80% Vehicular --and-- Interruption Volumes	[ ]
Warrant 2: Four-Hour Vehicular Volume	
2 A. Four-Hour Vehicular Volumes	[ ]
Warrant 3: Peak Hour	[X]
3 A. Peak-Hour Conditions	[ ]
3 B. Peak-Hour Vehicular Volume Hours Met	[X]
Warrant 4: Pedestrian Volume	[ ]
4 A. Four Hour Volumes	[ ]
4 B. One-Hour Volumes	[ ]
Warrant 5: School Crossing	[ ]
5 A. Student Volumes	[ ]
5 B. Gaps Same Period	[ ]
Warrant 6: Coordinated Signal System	
6 Degree of Platooning	[ ]
Warrant 7: Crash Experience	[ ]
7 A. Adequate trials of alternatives	[ ]

7 B. Reported crashes [ ]
7 80% Volumes for Warrants 1A, 1B --or-- 4 [ ]

Warrant 8: Roadway Network [X]
8 A. Weekday Volume [X]
8 B. Weekend Volume [ ]

Warrant 9: Grade Crossing [ ]
9 A. Grade Crossing within 140 ft --and-- [ ]
9 B. Peak-Hour Vehicular Volumes [ ]

Summary

Hours	Major Volume	Minor Volume	Total Volume	Delay (Veh-hr)	1A 100%	1A 80%	1B 100%	1B 80%	2 100%	3A 100%	3B 100%
07-08	450	345	1135	0.0	No	Yes	No	No	No	No	No
08-09	0	0	0	0.0	No	No	No	No	No	No	No
09-10	0	0	0	0.0	No	No	No	No	No	No	No
10-11	0	0	0	0.0	No	No	No	No	No	No	No
11-12	0	0	0	0.0	No	No	No	No	No	No	No
12-13	0	0	0	0.0	No	No	No	No	No	No	No
13-14	0	0	0	0.0	No	No	No	No	No	No	No
14-15	0	0	0	0.0	No	No	No	No	No	No	No
15-16	0	0	0	0.0	No	No	No	No	No	No	No
16-17	465	565	1330	0.0	No	Yes	No	No	Yes	No	Yes
17-18	0	0	0	0.0	No	No	No	No	No	No	No
18-19	0	0	0	0.0	No	No	No	No	No	No	No
Total	915	910	2465		0	2	0	0	1	0	1

Traffic Volumes (vph)

Eastbound			Westbound			Northbound			Southbound		
L	T	R	L	T	R	L	T	R	L	T	R
20	105	120	60	110	35	105	170	70	55	245	40
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
20	120	120	55	100	50	125	370	70	40	245	15
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0

Pedestrian Volumes and Gaps (Per Hour)

Volume	Gap	Volume	Gap	Volume	Gap	Volume	Gap
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	!
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0

Delay	sec/veh	veh-hrs	sec/veh	veh-hrs	sec/veh	veh-hrs	sec/veh	veh-hrs
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Intersection	
Intersection Delay, s/veh	11.6
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	110	170	15	15	80	105	20	95	20	130	35	30
Future Vol, veh/h	110	170	15	15	80	105	20	95	20	130	35	30
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles, %	0	5	0	14	4	5	0	4	9	0	14	0
Mvmt Flow	122	189	17	17	89	117	22	106	22	144	39	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	11.7	11.4	11.8	11.4
HCM LOS	B	B	B	B

Lane	NBLn1	EBLn1	EBLn2	WBLn1	WBLn2	SBLn1	SBLn2
Vol Left, %	15%	100%	0%	100%	0%	100%	0%
Vol Thru, %	70%	0%	92%	0%	43%	0%	54%
Vol Right, %	15%	0%	8%	0%	57%	0%	46%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	135	110	185	15	185	130	65
LT Vol	20	110	0	15	0	130	0
Through Vol	95	0	170	0	80	0	35
RT Vol	20	0	15	0	105	0	30
Lane Flow Rate	150	122	206	17	206	144	72
Geometry Grp	6	7	7	7	7	7	7
Degree of Util (X)	0.267	0.221	0.345	0.032	0.334	0.274	0.125
Departure Headway (Hd)	6.412	6.52	6.041	6.94	5.855	6.835	6.241
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	560	550	594	515	613	524	573
Service Time	4.466	4.267	3.788	4.689	3.604	4.585	3.991
HCM Lane V/C Ratio	0.268	0.222	0.347	0.033	0.336	0.275	0.126
HCM Control Delay	11.8	11.1	12	9.9	11.5	12.2	9.9
HCM Lane LOS	B	B	B	A	B	B	A
HCM 95th-tile Q	1.1	0.8	1.5	0.1	1.5	1.1	0.4

Intersection	
Intersection Delay, s/veh	20
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	80	255	20	20	220	155	15	45	25	210	65	40
Future Vol, veh/h	80	255	20	20	220	155	15	45	25	210	65	40
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles, %	0	0	0	0	2	0	0	8	8	0	0	0
Mvmt Flow	89	283	22	22	244	172	17	50	28	233	72	44
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	17.4	26.9	13.1	16.2
HCM LOS	C	D	B	C

Lane	NBLn1	EBLn1	EBLn2	WBLn1	WBLn2	SBLn1	SBLn2
Vol Left, %	18%	100%	0%	100%	0%	100%	0%
Vol Thru, %	53%	0%	93%	0%	59%	0%	62%
Vol Right, %	29%	0%	7%	0%	41%	0%	38%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	85	80	275	20	375	210	105
LT Vol	15	80	0	20	0	210	0
Through Vol	45	0	255	0	220	0	65
RT Vol	25	0	20	0	155	0	40
Lane Flow Rate	94	89	306	22	417	233	117
Geometry Grp	6	7	7	7	7	7	7
Degree of Util (X)	0.209	0.184	0.586	0.046	0.765	0.506	0.228
Departure Headway (Hd)	7.963	7.466	6.901	7.383	6.61	7.81	7.026
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	450	480	522	485	546	462	511
Service Time	6.032	5.215	4.65	5.129	4.355	5.56	4.775
HCM Lane V/C Ratio	0.209	0.185	0.586	0.045	0.764	0.504	0.229
HCM Control Delay	13.1	11.9	19	10.5	27.8	18.3	11.9
HCM Lane LOS	B	B	C	B	D	C	B
HCM 95th-tile Q	0.8	0.7	3.7	0.1	6.8	2.8	0.9

Appendix D: Origin-Destination Summary Memo

Memo

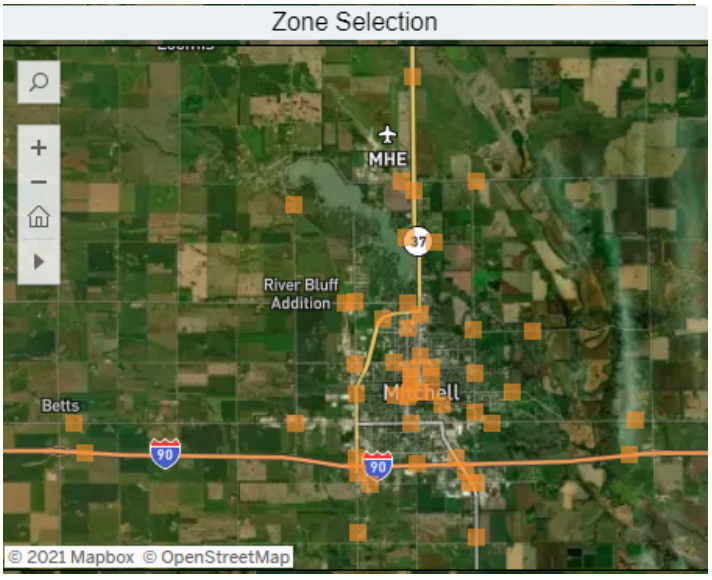
Date:	Monday, January 31, 2022
Project:	Mitchell Area Master Transportation Plan
To:	Study Advisory Team
From:	HDR
Subject:	Mitchell Area Origin-Destination Summary

Introduction

The purpose of this memo is to preset findings from an origin-destination review of vehicle patterns throughout Mitchell, South Dakota, and the surrounding area for a variety of scenarios. This review is based on origin-destination data collected between the years of 2016 and 2021 and provided by StreetLight Data.

Methodology

The primary input for StreetLight analysis is vehicle pass-through zones known as gates. Gates can be assigned to track trip origins, destinations, and/or middle filters. External gates are locations on the edges of the regional network where traffic enters and exits the analysis area. The middle filter gates are located throughout Mitchell on arterial and collector roadways to capture traffic movements throughout the area. A high-level map of gate locations for this analysis is shown in **Figure 1**.



Orange squares reflect study area gates

Figure 1: Study Area Gates

Location-based services were used as the data source for the StreetLight index, which represents trip activity but does not indicate the actual number of trips. Each origin-destination pair was assigned an index through StreetLight, which were then converted to percentages based on the total index of trips entering (or exiting) the study area.

Data ranges used in the analysis scenarios include (years data was pulled):

- ***Daily traffic scenarios:*** *average day when school is in session during the months of March, April, September, and October (2019)*
- ***Daily/weekend summer traffic scenarios:*** *average day or weekend day between mid-May and mid-August (2017-2019)*
- ***Corn Palace Days traffic scenarios:*** *average day during Corn Palace festival event days (2017-2021)*
- ***Sturgis Motorcycle Rally traffic scenarios:*** *average day during the peak travel period, including up to one week before and one week after the official Rally dates (2017-2020)*
- ***Dakotafest traffic scenarios:*** *average day during Dakotafest event days (2016-2019)*

Due to the COVID pandemic, year 2020 and 2021 traffic information was generally omitted from this analysis unless for a specific event scenario such as Sturgis Motorcycle Rally, Dakotafest, and Corn Palace Days (if the event was held).

External gate average daily traffic (ADT) and average daily truck traffic (ADTT) volumes presented for the static map 'Daily Traffic' and 'Daily Truck Traffic' are based on daily volume counts obtained from the South Dakota Department of Transportation (SDDOT).

Website App

A website app was developed specific for this study to summarize a variety of scenarios, volume index, travel direction, day part, and day type. This allows a user to easily toggle through various scenario combinations of interest. The website app link is provided below:

https://public.tableau.com/app/profile/andrew.eckerson1579/viz/MitchellSouthDakota-TopRoutesforZones/Dashboard1

Static Map Scenarios

Static maps were developed for five scenarios as part of this analysis. Each map figure shows the distribution of inbound (or outbound) trips entering the study area via the external gate. Traffic is shown by direction, so the relative proportion of inbound or outbound traffic can be traced through the study area network. The five scenarios are described below with the maps attached at the end of the memo.

Scenario 1: External Stations – Daily Traffic

Scenario Summary: For traffic entering/exiting the Mitchell area, where are motorists going daily and what routes are they using?

- Daily Traffic from I-90 West
- Daily Traffic from I-90 East
- Daily Traffic from SD37 North
- Daily Traffic from SD37 South

Scenario 2: External Stations – Sturgis Motorcycle Rally Traffic

Scenario Summary: During the Sturgis Motorcycle Rally, do the daily trip patterns change from a typical day and to what extent?

- Daily Traffic from I-90 West during Sturgis Motorcycle Rally
- Daily Traffic from I-90 East during Sturgis Motorcycle Rally

Scenario 3: External Stations – Daily Truck Traffic

Scenario Summary: For truck traffic entering/exiting the Mitchell area, where are trucks going daily and what routes are they using?

- Daily Traffic from I-90 West
- Daily Traffic from I-90 East
- Daily Traffic from SD37 North
- Daily Traffic from SD37 South

Scenario 4: Downtown Traffic

Scenario Summary: For traffic entering/exiting downtown, what routes are motorists using to travel to/from downtown?

- Daily Traffic from Downtown
- Weekend Summer Traffic from Downtown
- Corn Palace Days from Downtown

Scenario 5: Lake Mitchell – Summer Weekend Traffic

Scenario Summary: What routes are motorists using to travel to/from Lake Mitchell?

- Summer Weekend Traffic from N Harmon Drive (west of SD37)
- Summer Weekend Traffic from National Guard Road (west of SD37)
- Summer Weekend Traffic from 23rd Avenue (east of Ohlman street)
- Summer Weekend Traffic from Ohlman Street (north of 23rd Avenue)

Conclusions

The following summarizes findings form the Origin-Destination review. Supplemental notes for each scenario, plus a review of east/west cut-through routes, is provided in the **Appendix**.

Scenario 1: External Stations – Daily Traffic

- *Mitchell is a regional destination for 'External' travel entering the Mitchell area*
- *Collectively (I-90 east/west and SD37 north/south), approximately 60% traffic entering the area is stopping in Mitchell*

Scenario 2: External Stations – Sturgis Motorcycle Rally Traffic

- *Similar patterns to those shown in the 'External Stations – Daily Traffic' scenarios, with slightly higher percentage of vehicles passing through the Mitchell Area*
    - *Total I-90 volumes are higher during this period, so a consistent percentage of traffic exiting the area reflects a higher overall volume with a Mitchell destination*
    - *Exiting traffic destinations tend to be more localized to areas along I-90 (Havens Avenue to Spruce Street)*

Scenario 3: External Stations – Daily Truck Traffic

- *I-90 truck traffic generally passes through the Mitchell area*
- *SD37 truck traffic has greater likelihood of stopping in Mitchell*
    - *Generally, SD37 bypass is most used for pass-through truck traffic*
    - *From the north, trucks still appear to use Main Street (could include stops in the Mitchell core area)*
    - *From the south, Spruce Street used as east/west connection between Ohlman Avenue and SD37*

Scenario 4: Downtown Traffic

- *Burr Street is the highest volume route between I-90 interchange area and downtown*
    - *Sanborn Blvd and Main Street also common, but 50% less than Burr Street*
- *I-90 traffic accessing downtown is directional, with the WB I-90 direction of travel being the higher movement (both heading to and departing from downtown)*

Scenario 5: Lake Mitchell – Summer Weekend Traffic

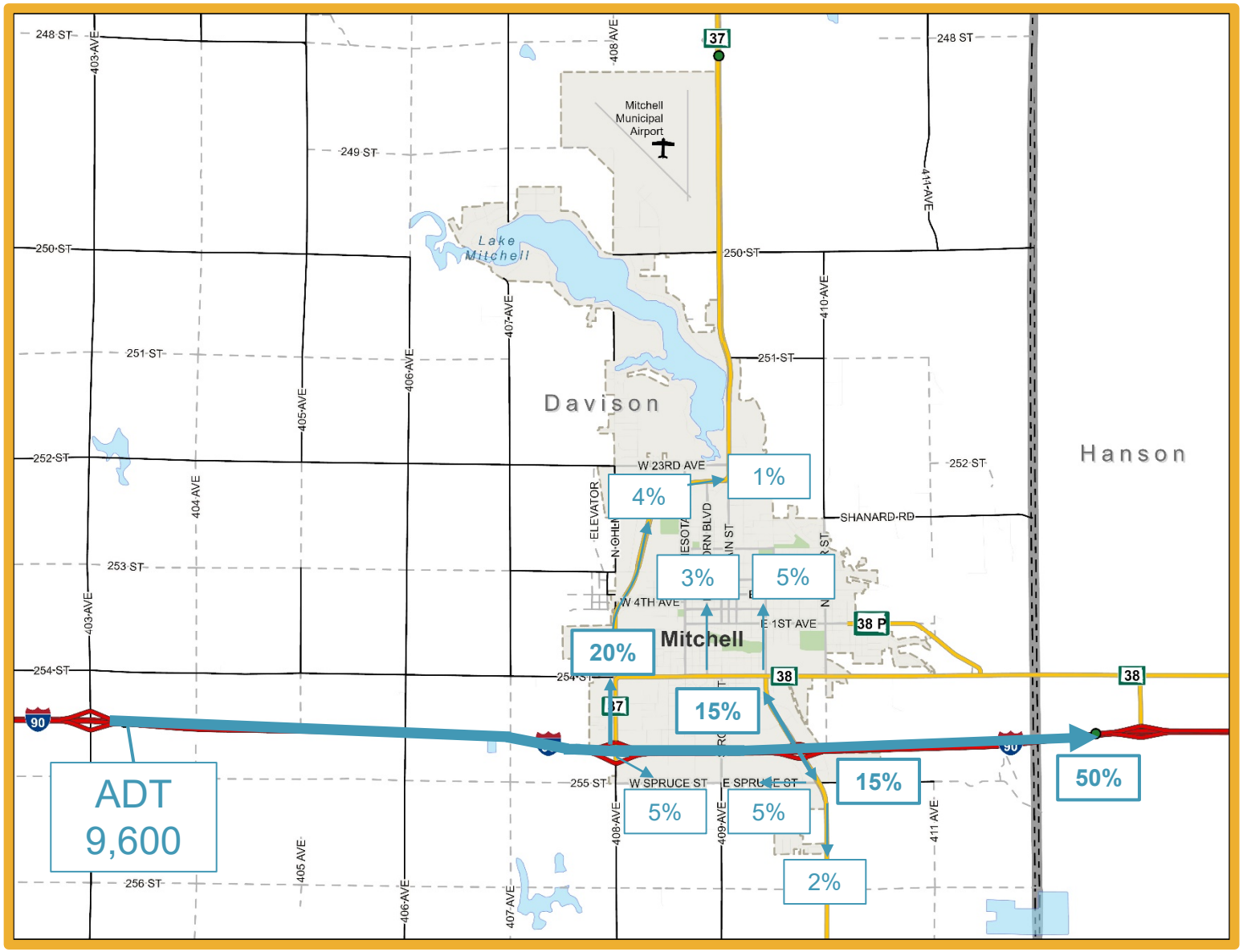
- *SD37, Main Street, Burr Street, and Foster Street are common north/south corridors for travel between I-90 interchange area and Lake Mitchell*
    - *Traffic to/from National Guard Road and Harmon Drive often travels through the urban core in lieu of SD37*
- *252nd Street corridor is the predominant east/west route to/from Betts Road*

Other Scenario: Dakotafest

- *Dakotafest traffic is very localized to the I-90 corridor (Havens Avenue to Spruce Street)*

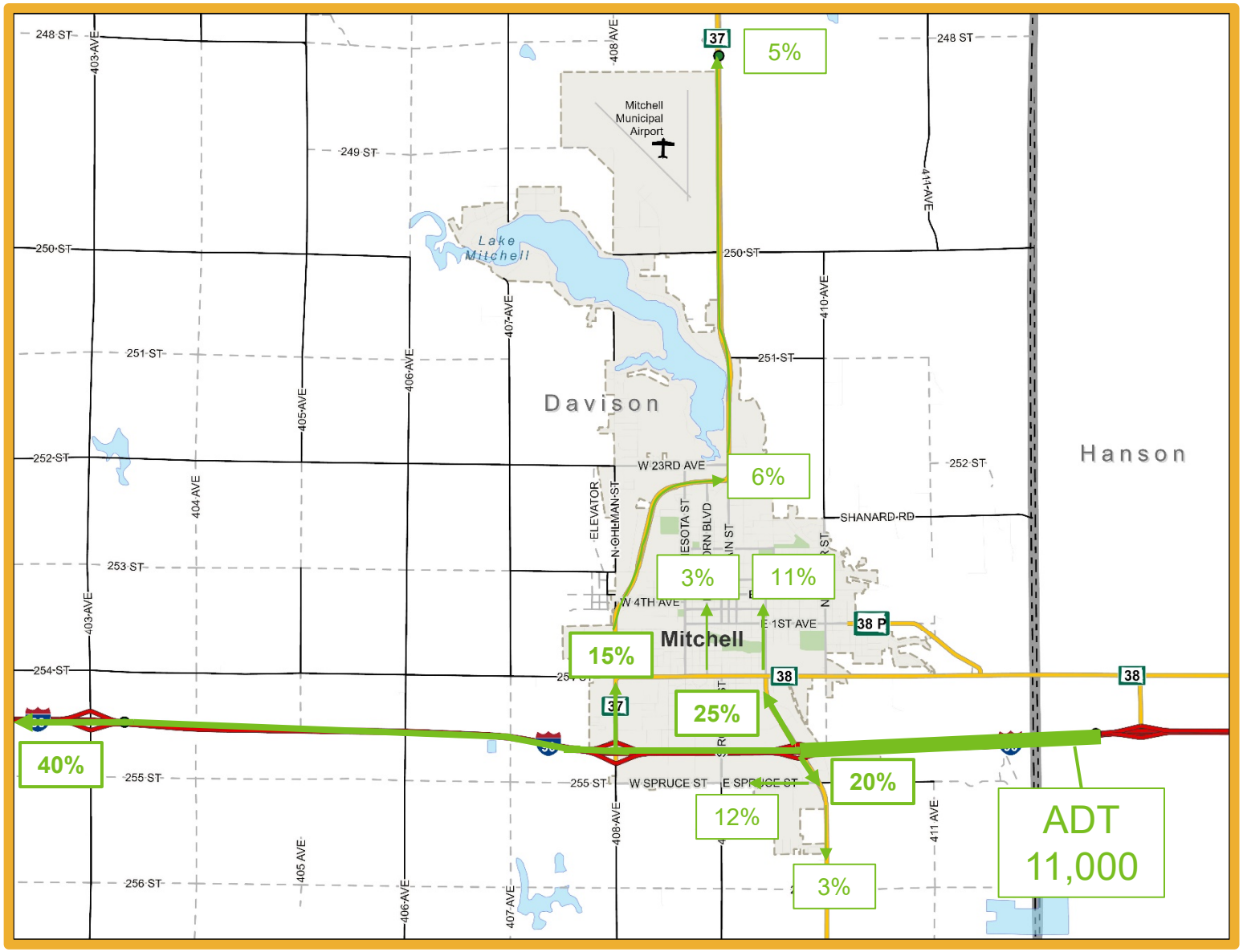
1. External Stations

Daily Traffic from I-90 West



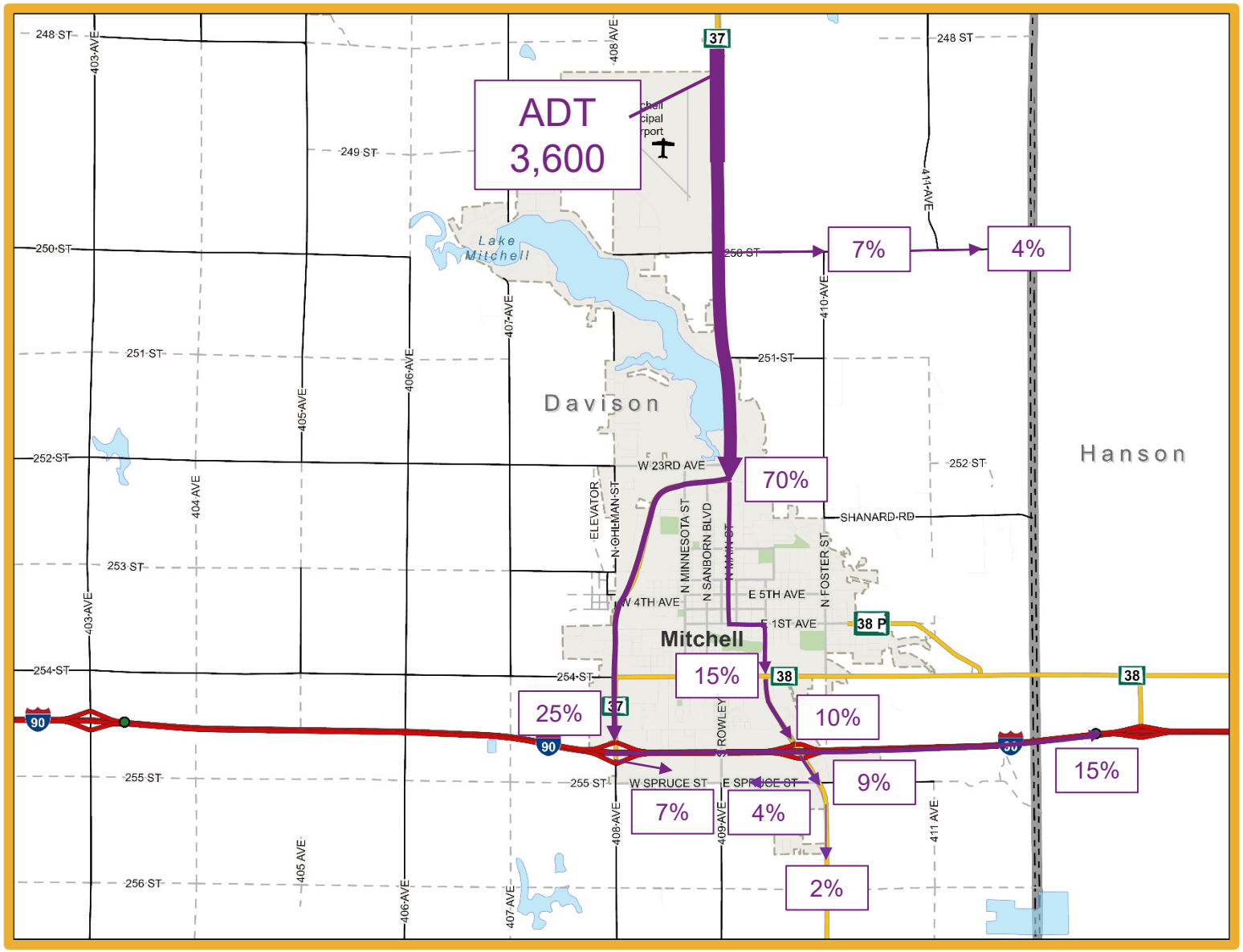
1. External Stations

Daily Traffic from I-90 East



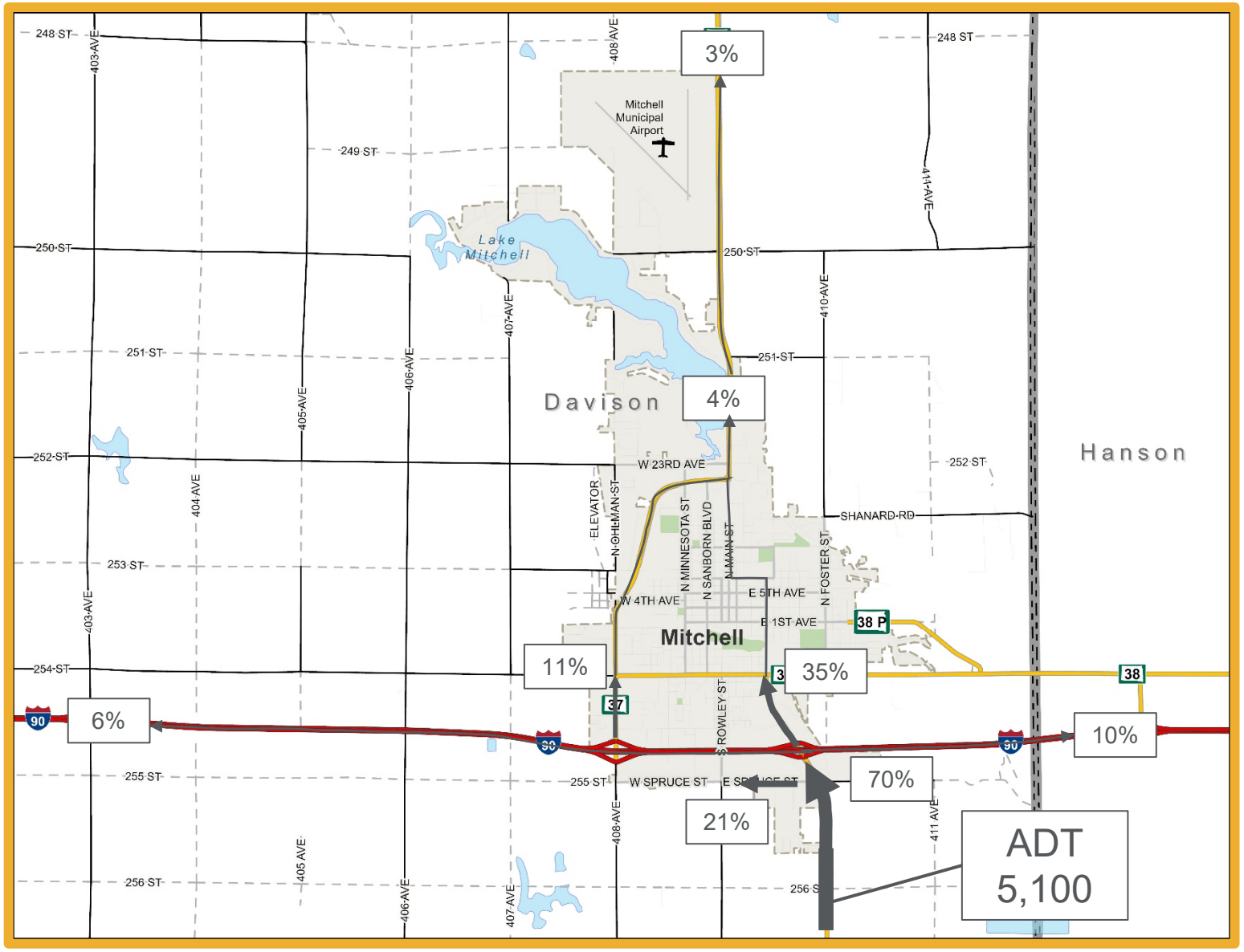
1. External Stations

Daily Traffic from SD37 North



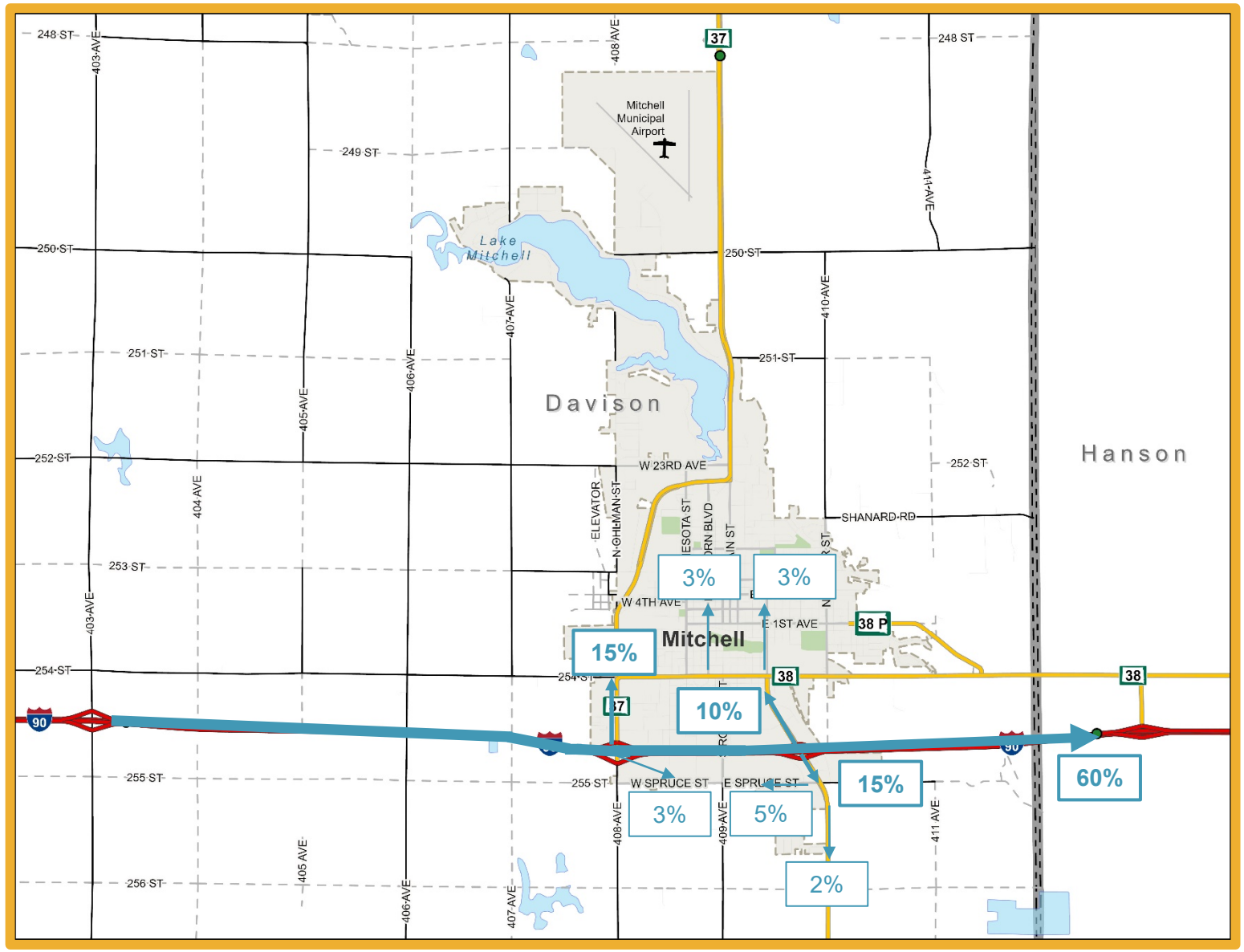
1. External Stations

Daily Traffic from SD37 South



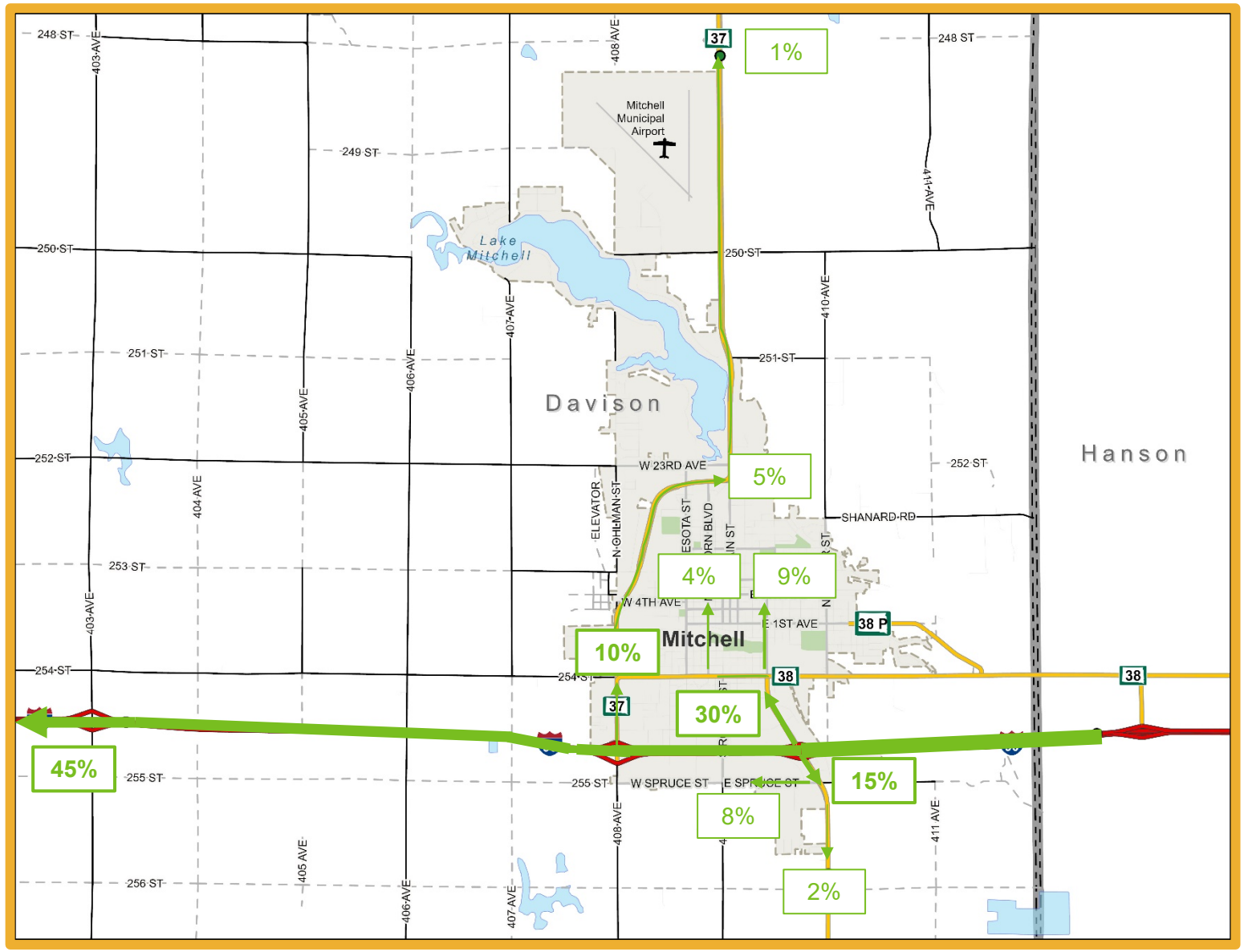
2. External Stations

Daily Sturgis Motorcycle Rally Traffic from I-90 West



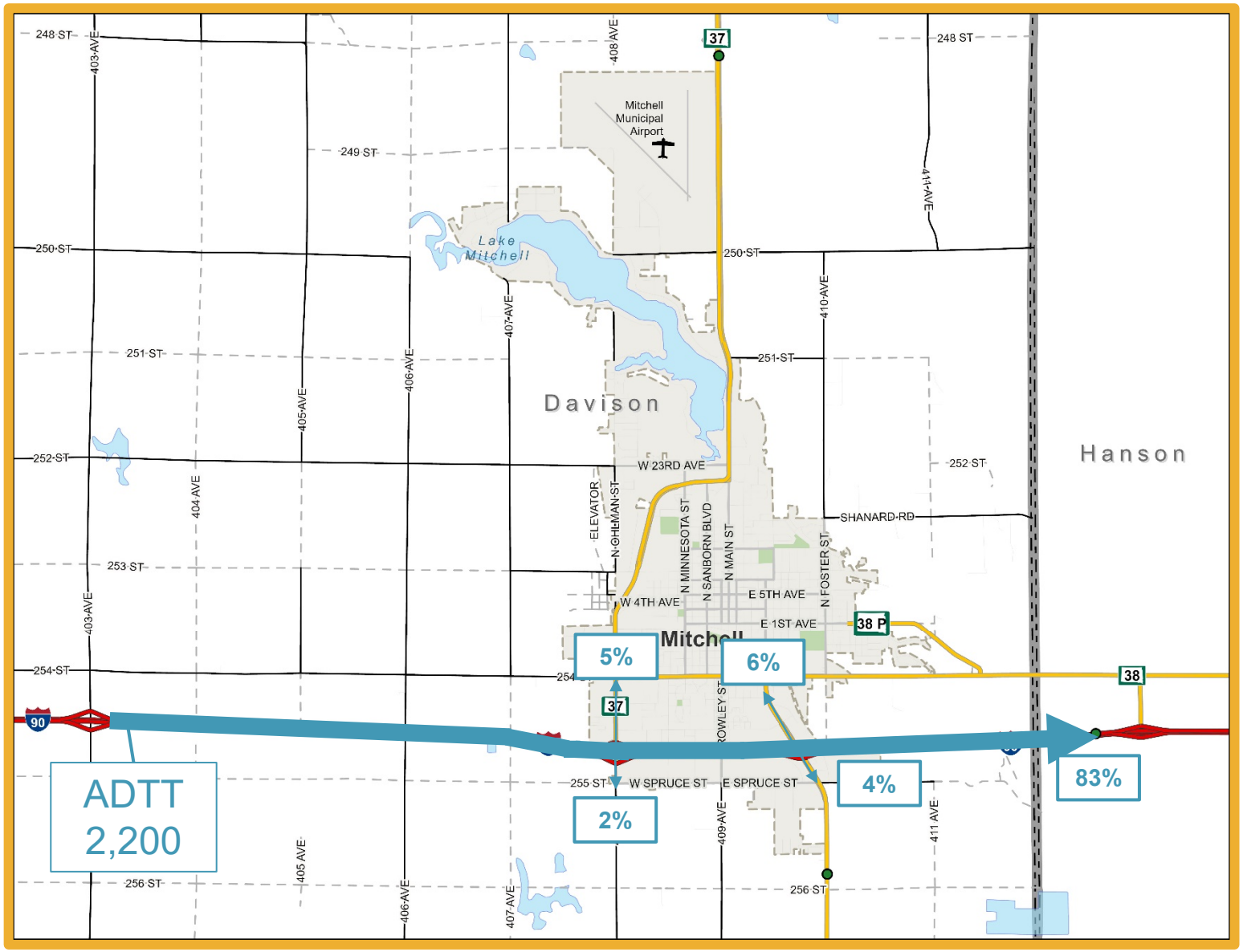
2. External Stations

Daily Sturgis Motorcycle Rally Traffic from I-90 East



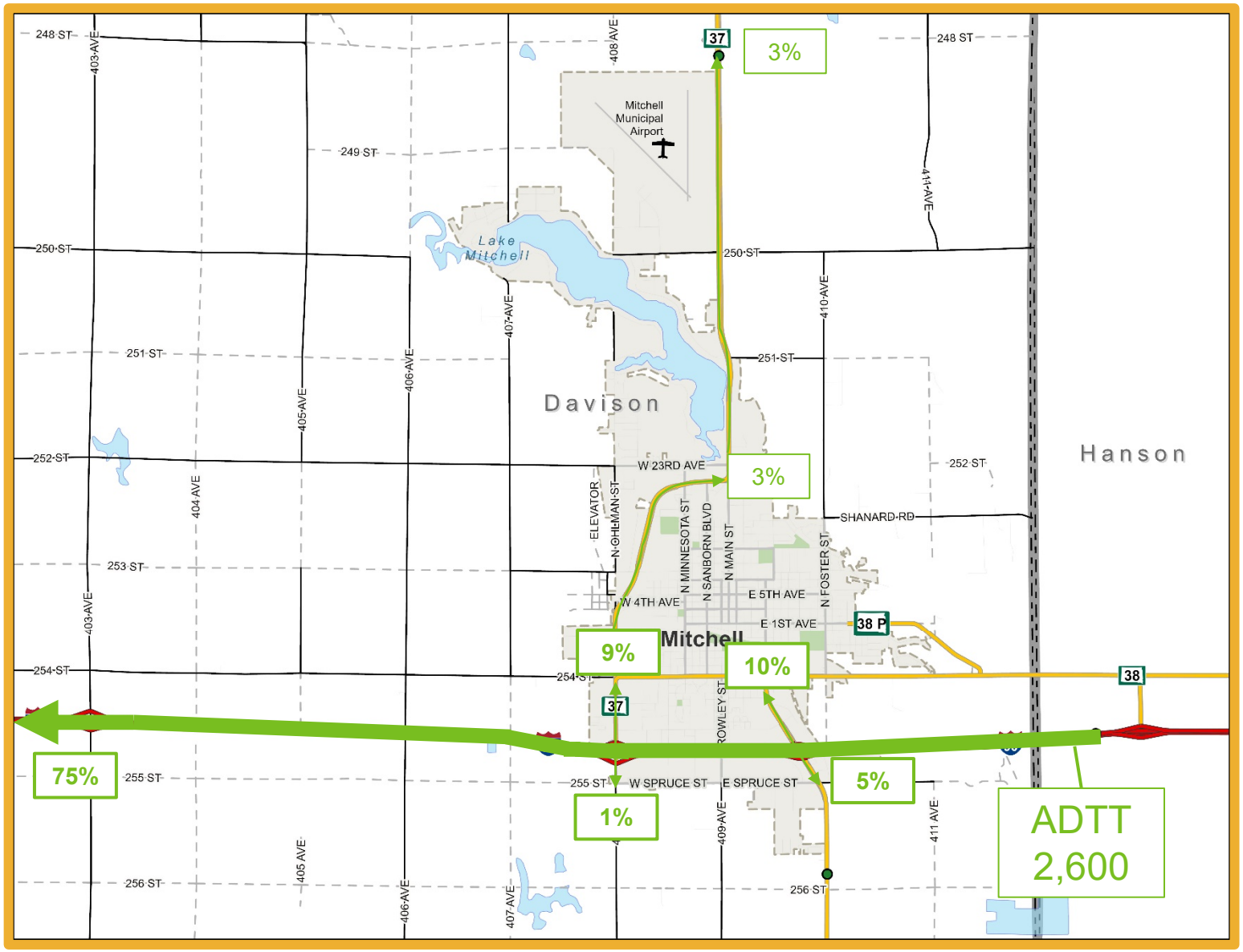
3. External Stations – Truck Traffic

Daily Truck Traffic from I-90 West



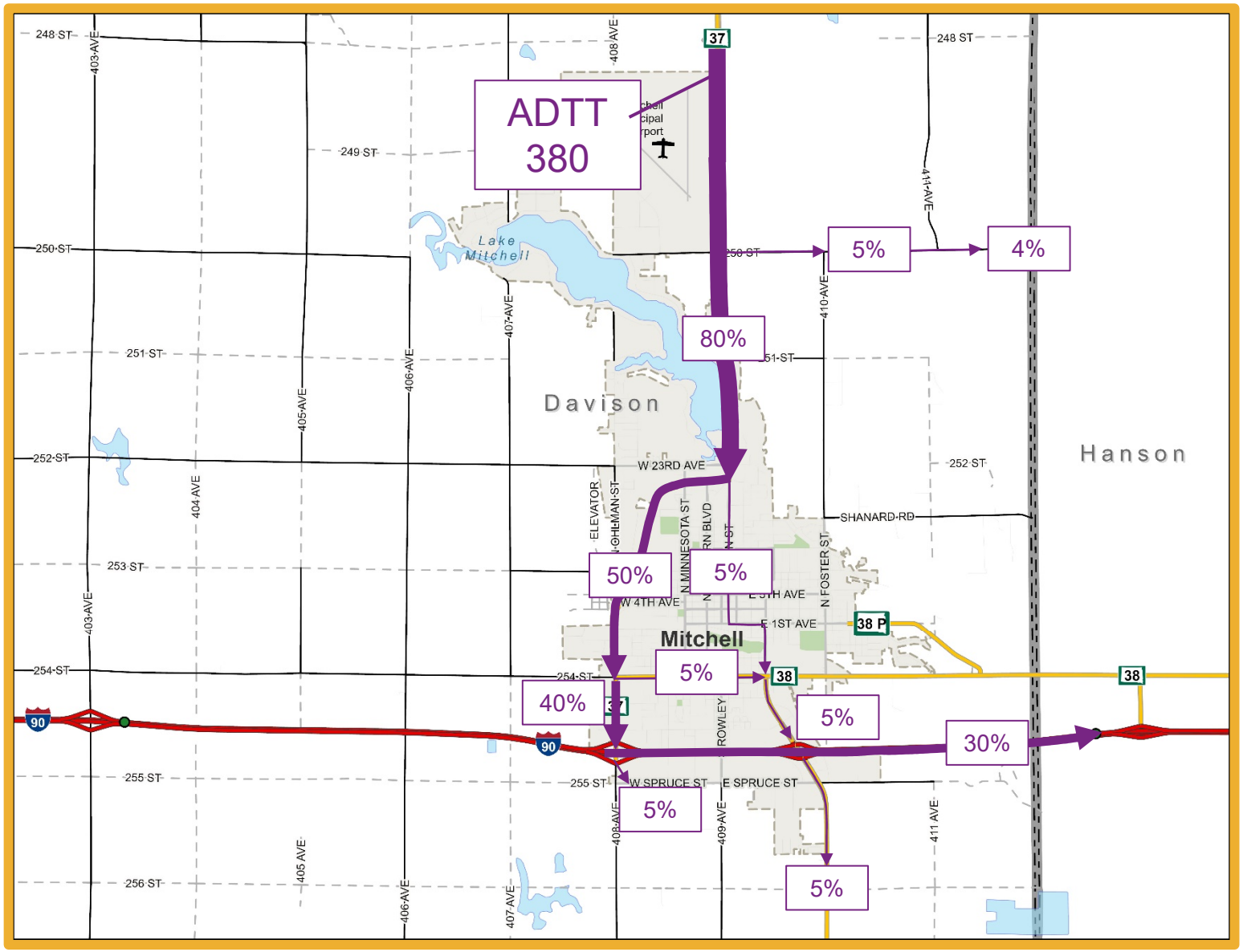
3. External Stations – Truck Traffic

Daily Truck Traffic from I-90 East



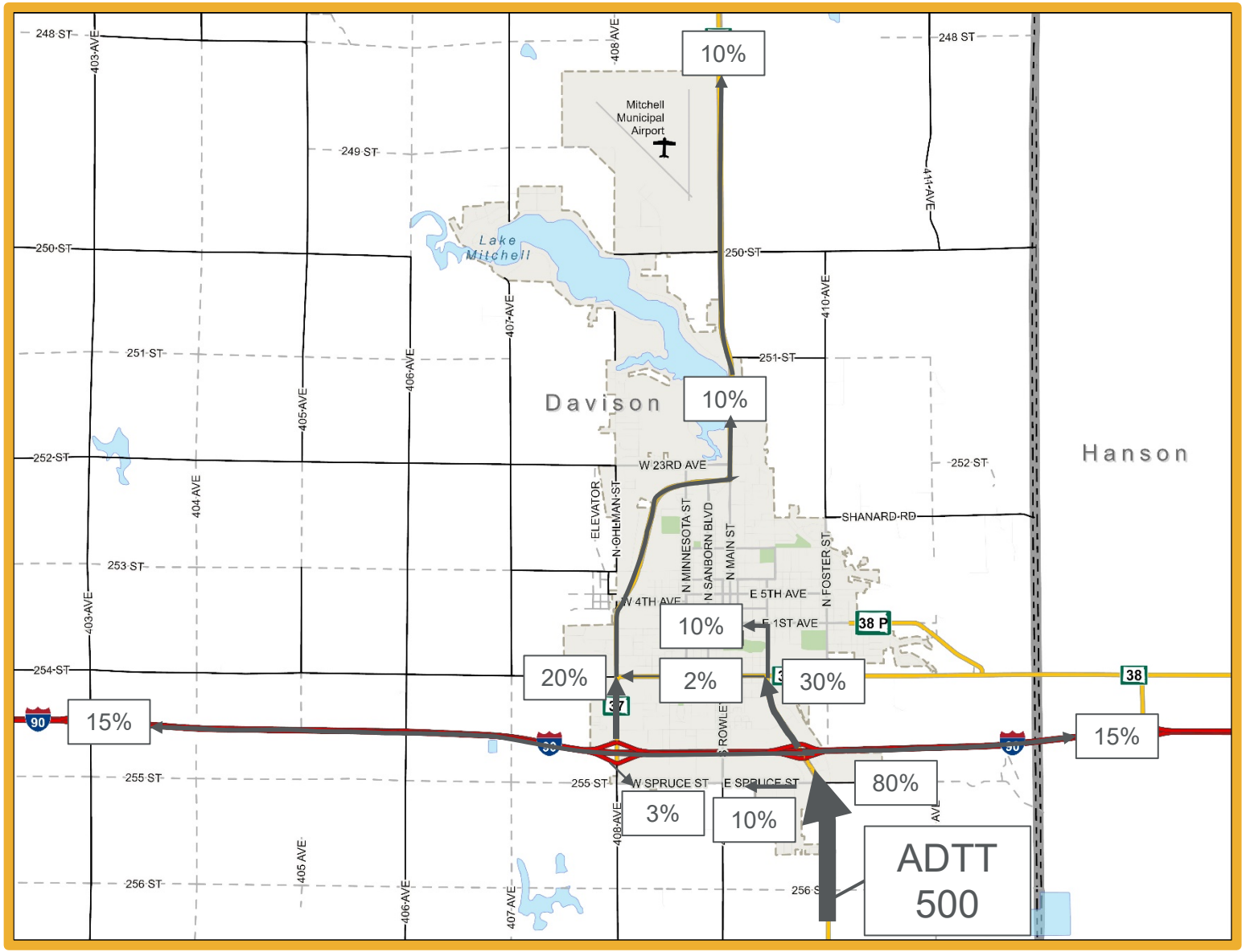
3. External Stations – Truck Traffic

Daily Truck Traffic from SD37 North



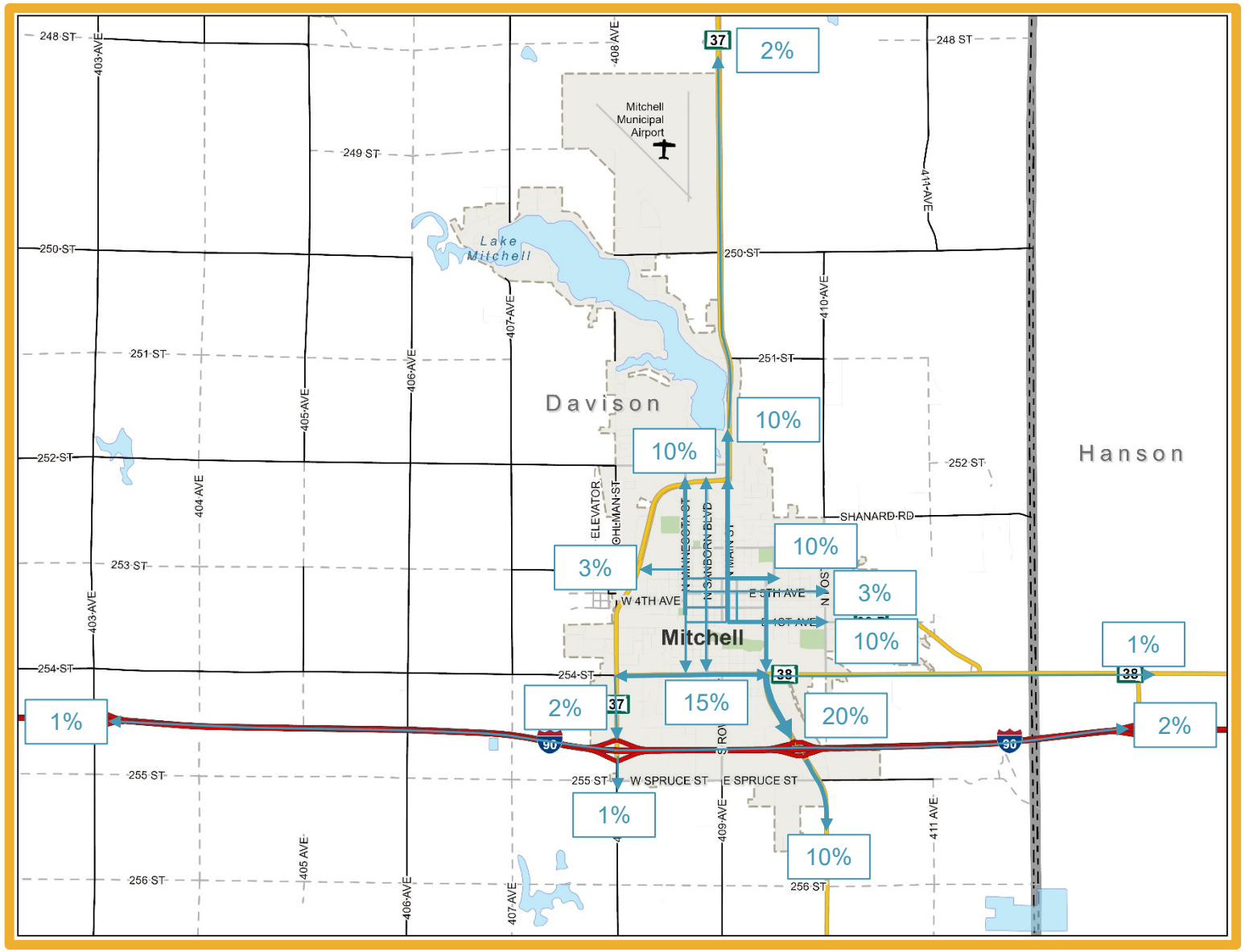
3. External Stations – Truck Traffic

Daily Truck Traffic from SD37 South



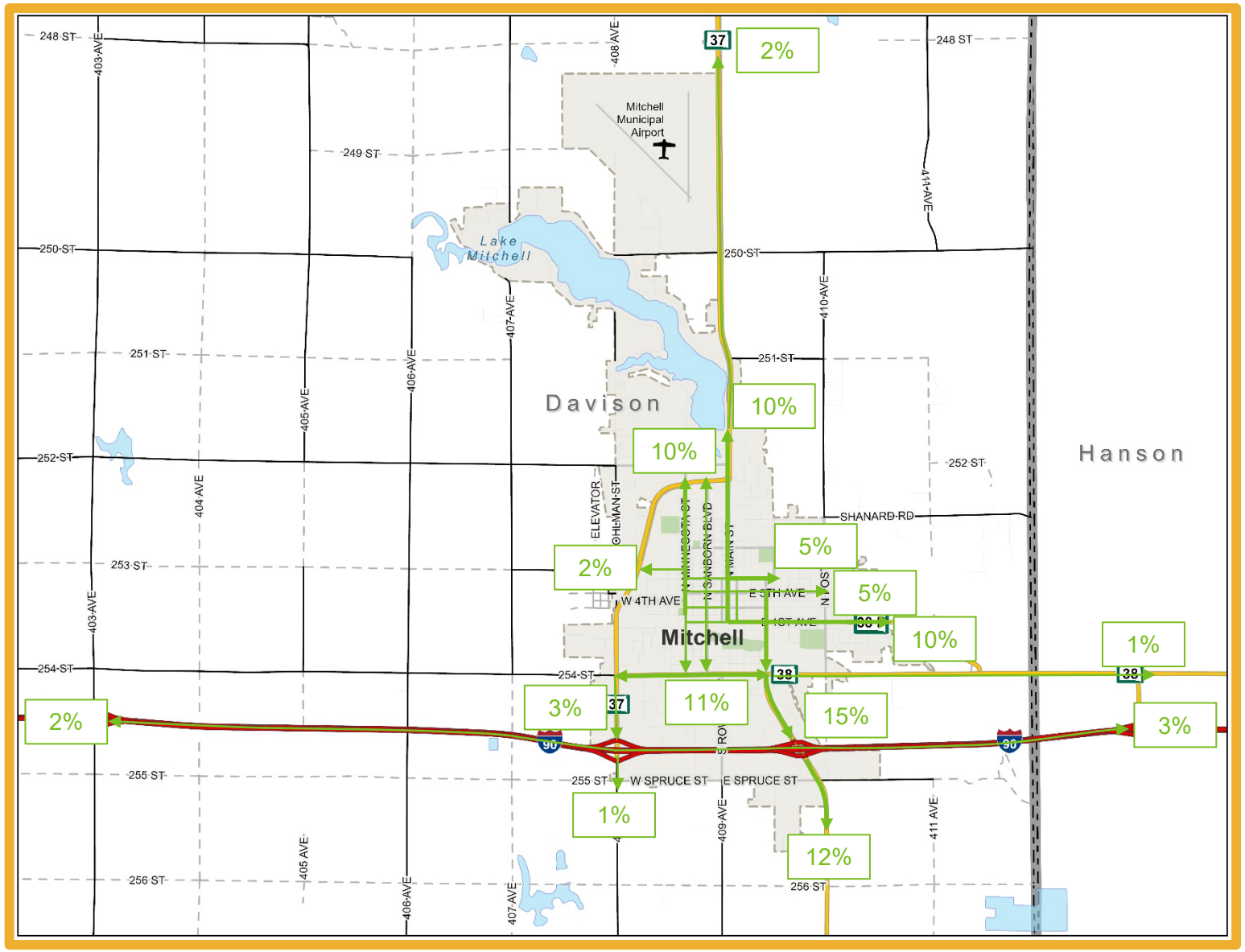
4. Downtown

Daily Traffic from Downtown



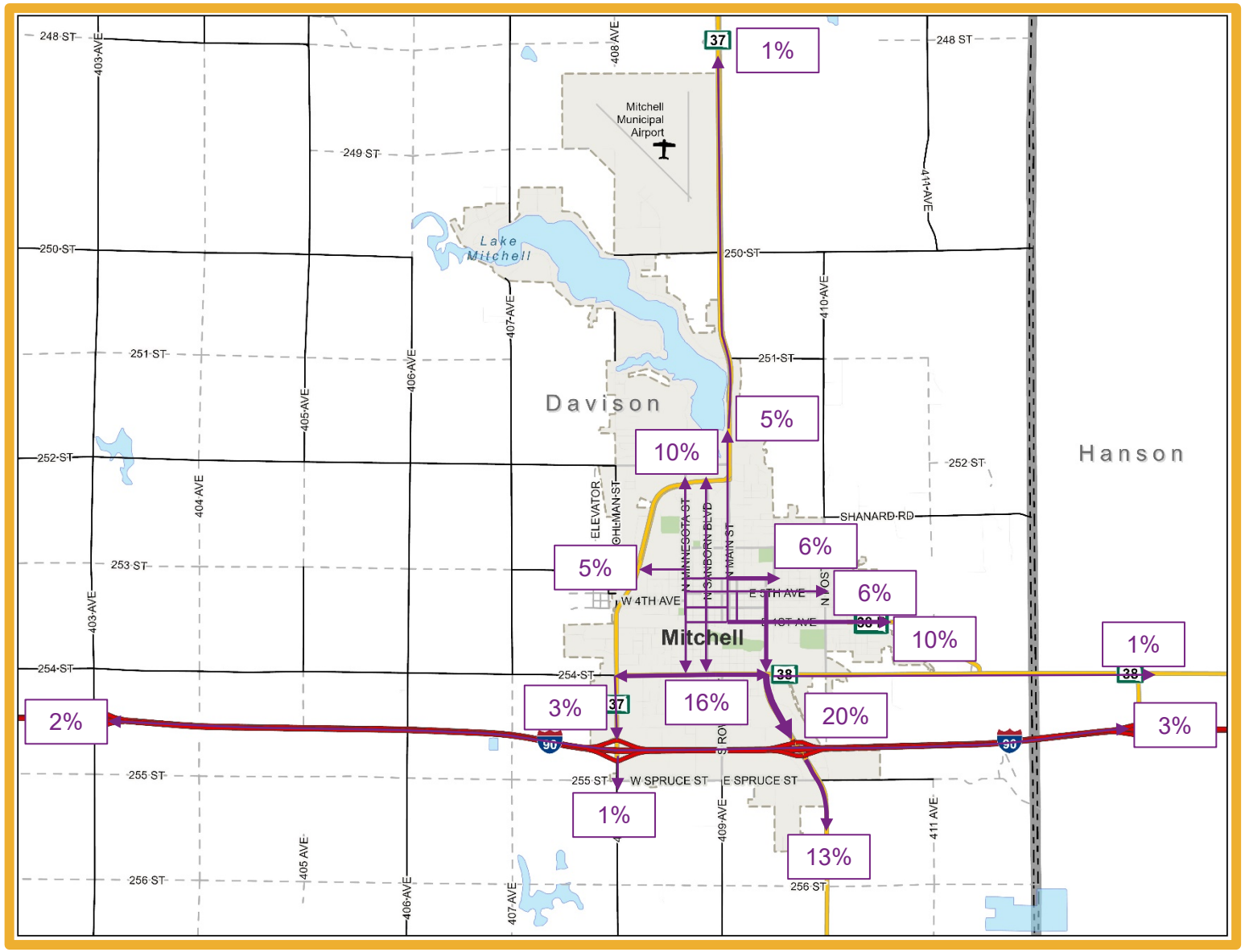
4. Downtown

Weekend Summer Traffic from Downtown



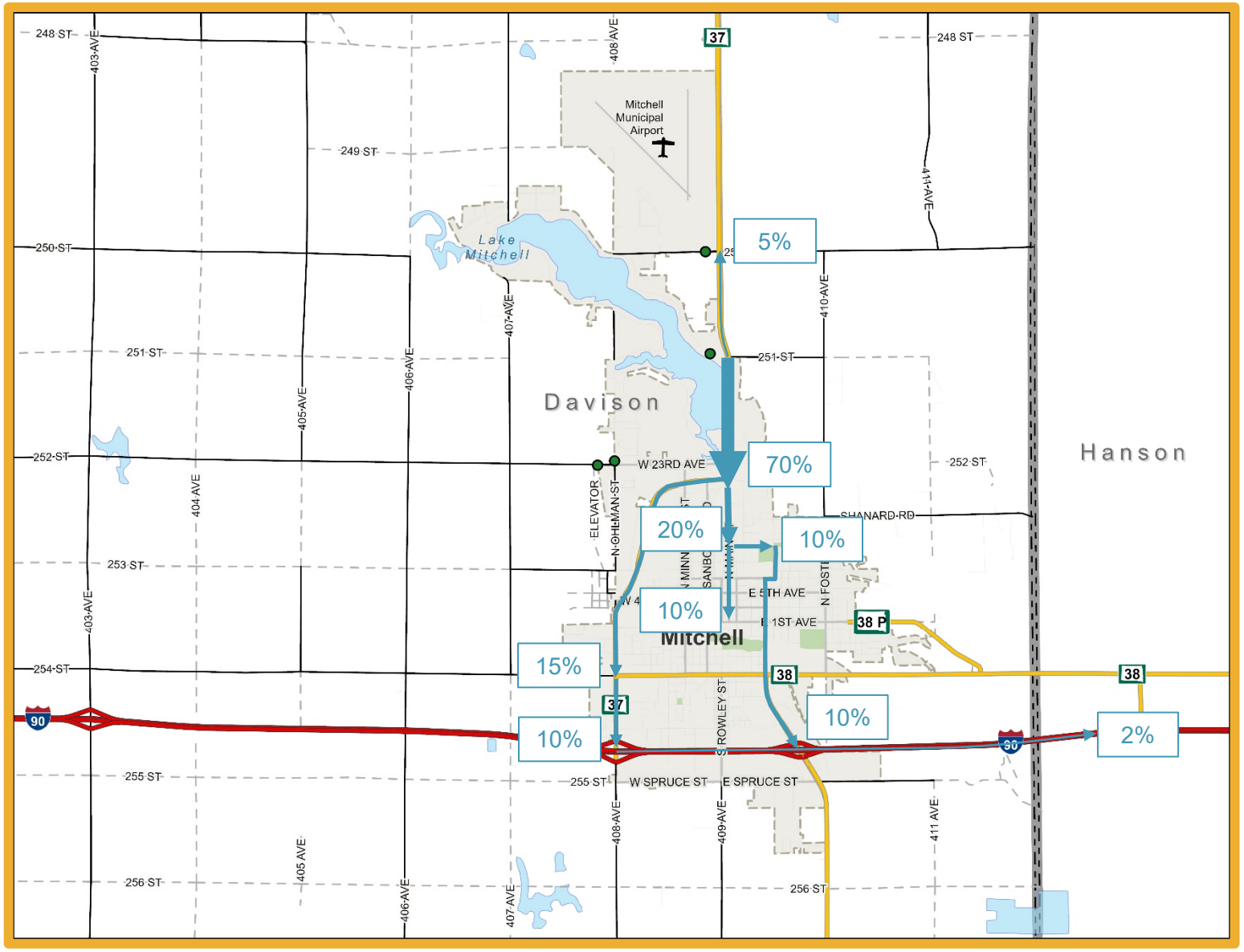
4. Downtown

Corn Palace Days Traffic from Downtown



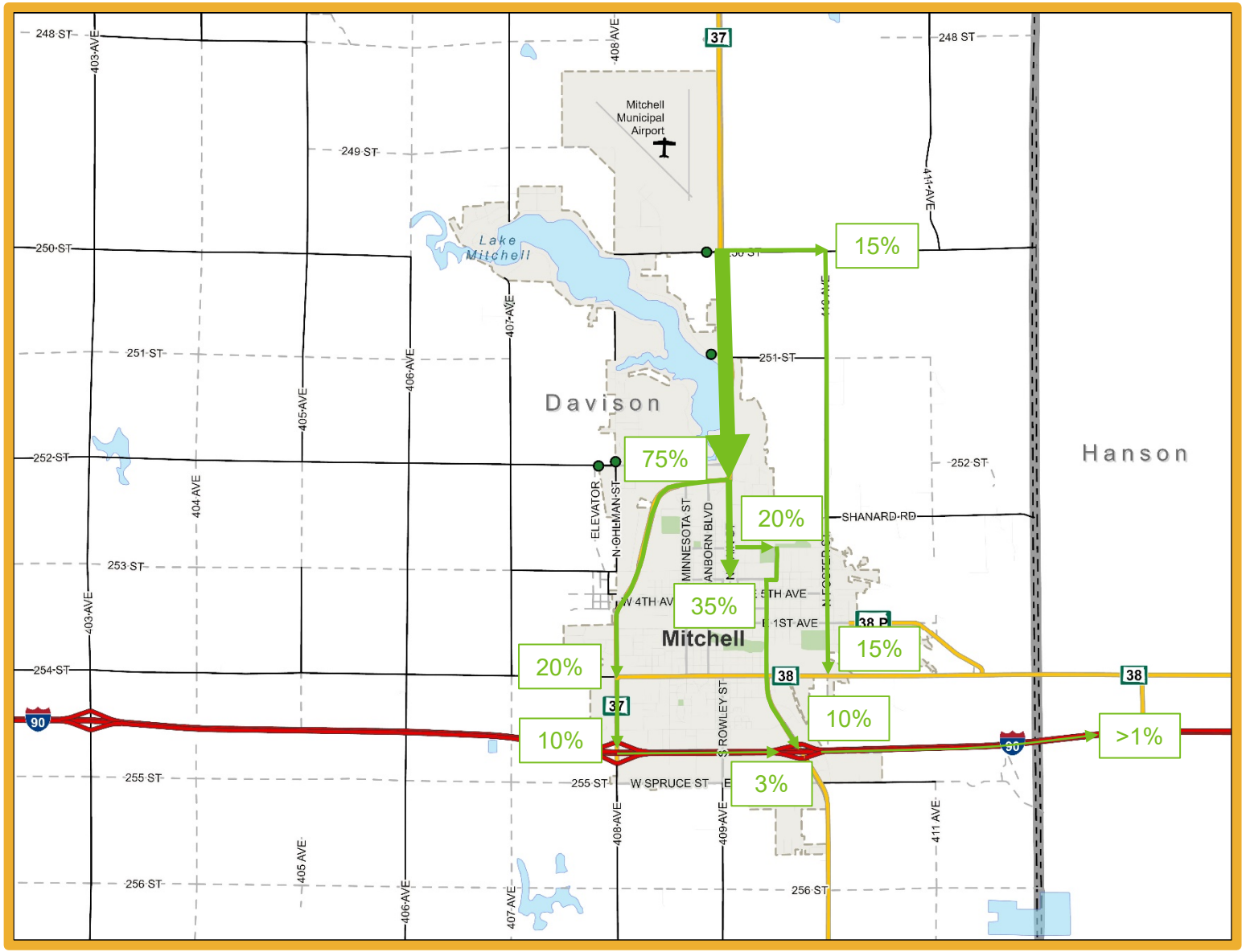
5. Lake Mitchell

Summer Weekend Traffic from N Harmon Drive



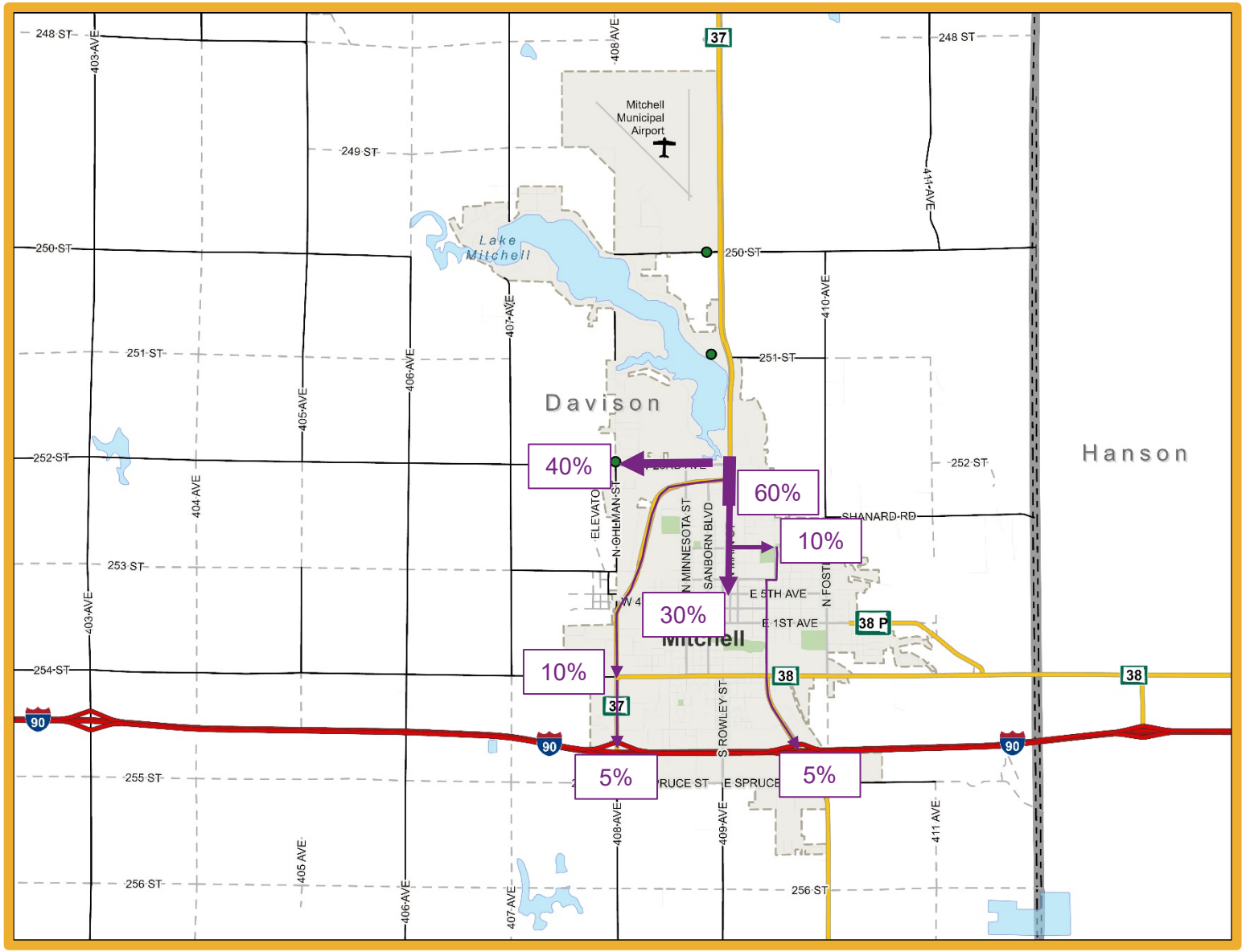
5. Lake Mitchell

Summer Weekend Traffic from National Guard Road



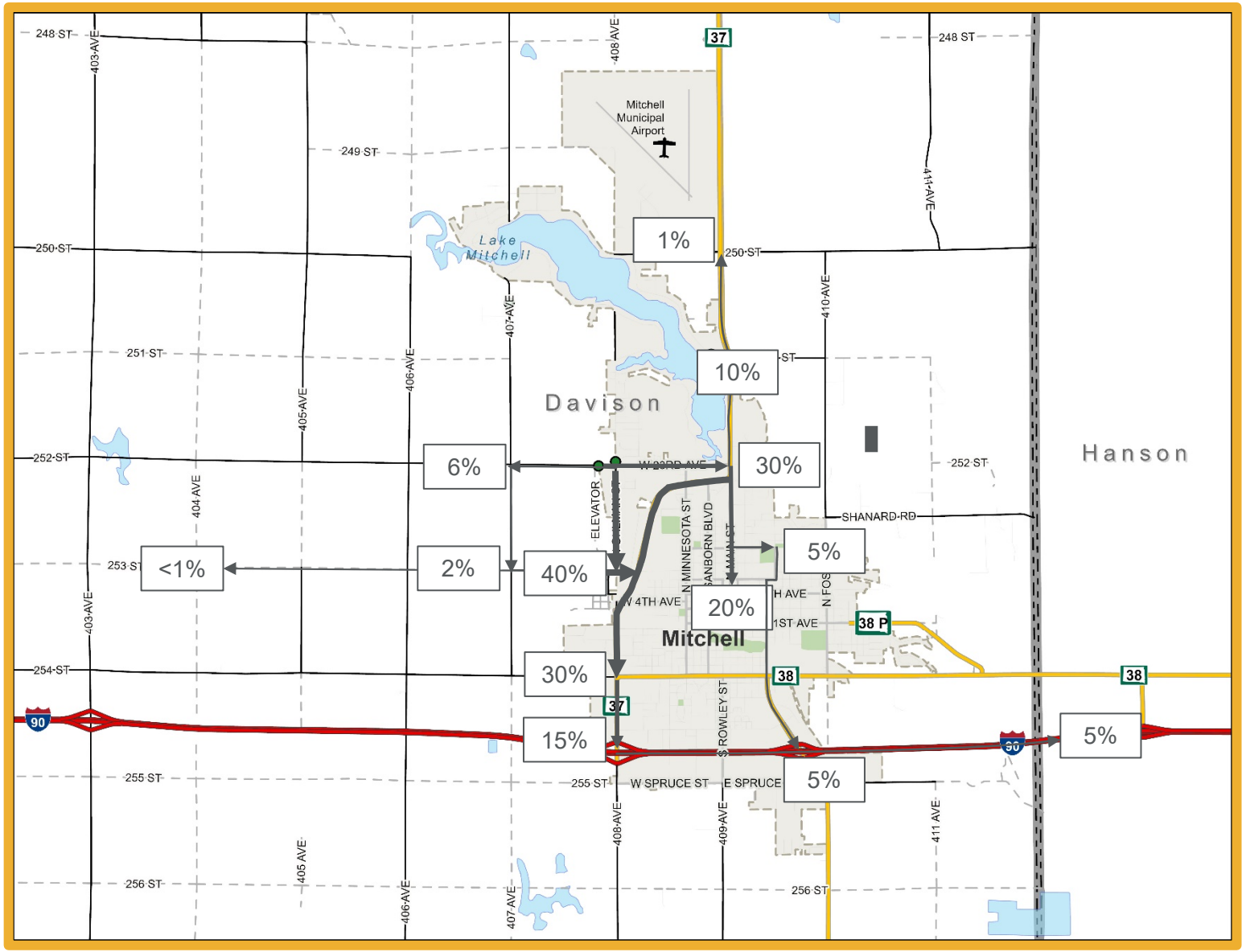
5. Lake Mitchell

Summer Weekend Traffic from 23rd Avenue



5. Lake Mitchell

Summer Weekend Traffic from Ohlman Street



Appendix

Scenario Notes

1. External Stations – Daily Traffic (Average Day)

From I-90 West

- 50% exits at the two Mitchell interchanges, with most reaching a destination in Mitchell

From I-90 East

- 60% exits at the two Mitchell interchanges, with most reaching a destination in Mitchell
- 45% uses Exit 332
- Higher percentage of traffic heading north or south on SD37 outside of Mitchell (compared to 'From I-90 West')
- Burr Street, north of Havens Avenue, around 11%

From SD37 North

- ~75% have a destination in Mitchell, with most E-E trips heading east
- 4% using the 250th Street to 413th Avenue 'east bypass' route
- 10% are using Main Street to travel north/south through Mitchell

From SD37 South

- ~80% have a destination in Mitchell, with most E-E trips heading east
- Spruce Street commonly used for westerly travel to Ohlman Street/SD37
- Main Street less common for north/south travel through Mitchell (compared to 'From SD37 North')

Overarching conclusions:

- *Mitchell is a regional destination for 'External' travel entering the Mitchell area*
- *Collectively (I-90 east/west and SD37 north/south), approximately 60% traffic entering the area is stopping in Mitchell*

2. External Stations – Sturgis Rally

From I-90 West

- Higher percentage of traffic passing through Mitchell instead of stopping (compared to 'External Stations – Average Day' scenarios)

From I-90 East

- Higher percentage of traffic passing through Mitchell instead of stopping (compared to 'External Stations – Average Day' scenarios)
    - Higher percentage of traffic existing at Exit 332 with a destination somewhere between I-90 and Havens

Overarching conclusions:

- *Similar patterns to those shown in the 'External Stations – Daily Traffic' scenarios, with slightly higher percentage of vehicles passing through the Mitchell Area*
    - *Total I-90 volumes are higher during this period, so a consistent percentage of traffic exiting the area reflects a higher overall volume with a Mitchell destination*
    - *Exiting traffic destinations tend to be more localized to areas along I-90 (Havens Avenue to Spruce Street)*

3. External Stations – Truck Traffic

From I-90 West

- 83% of entering truck traffic is pass-through traffic, with those exiting typically having a destination in Mitchell
    - Fairly even split across Exit 330 or Exit 332

From I-90 East

- 75% of entering truck traffic is pass-through traffic
    - Fairly even split across Exit 330 or Exit 332
    - Trucks typically use the SD37 truck route to travel through Mitchell

From SD37 North

- ~60% of entering truck traffic have a destination in Mitchell
- ~35% is pass-through traffic that exits to the east
    - 30%: SD37 to I-90 east
    - 4%: 250th Street to 413th Avenue 'east bypass' to I-90 east
- 5% are using Main Street to travel north/south in Mitchell

From SD37 South

- ~60% of entering truck traffic have a destination in Mitchell
    - More diverse mix of travel east/west/north outside of the Mitchell area (compared to 'From SD37 North')
- Trucks heading north of Mitchell are typically using SD37

Overarching conclusions:

- *I-90 truck traffic generally passes through the Mitchell area*
- *SD37 truck traffic has greater likelihood of stopping in Mitchell*
    - *Generally, SD37 bypass is most used for pass-through truck traffic*
    - *From the north, trucks still appear to use Main Street (could include stops in the Mitchell core area)*
    - *From the south, Spruce Street used as east/west connection between Ohlman Avenue and SD37*

4. Downtown

Downtown Static Map Scenarios

- Similar patterns across the three scenarios
- Burr Street is the highest volume route to/from downtown

Weekend Summer Traffic (Tourist Season) (App Scenario)

- I-90 traffic patterns to and from downtown do not exhibit reverse flow
    - To downtown: higher volume on WB I-90 entering at eastern gate
    - From downtown: higher volume on WB I-90 to western gate
- Burr Street is the most popular route ~2:1 over Sanborn Blvd

Overarching conclusions:

- *Burr Street is the highest volume route between I-90 interchange area and downtown*
    - *Sanborn Blvd and Main Street also common, but 50% less than Burr Street*
- *I-90 traffic accessing downtown is directional, with the WB I-90 direction of travel being the higher movement (both heading to and departing from downtown)*

5. Lake Mitchell – Summer Weekend

From N Harmon Drive

- To I-90 interchanges: 10% uses SD37 and 10% uses Burr Street
- 10% traverses Main Street to 11th Avenue to Capital Street to Burr Street

National Guard Road

- To I-90 interchanges: 10% uses SD37 and 10% uses Burr Street
- 20% traverses Main Street to 11th Avenue to Capital Street to Burr Street
- 15% uses Foster Street as eastern north/south route to access SD38

23rd Avenue

- Nearly all 23rd Avenue traffic heads west on 23rd Avenue or south on Main Street

Ohlman Street

- 252nd Street has become a more popular east/west route to Betts Road than 254th Street

Lake Mitchell Area Gates (App Scenario)

App input: Average Summer Day (2021) – All Directions – All Day – All Days; select all Lake Mitchell gates (4)

- Arriving/departing traffic is well-dispersed throughout the Mitchell area
- Approximately 1.5x more traffic using Ohlman Street than Burr Street, but volumes were much closer than the study team anticipated
- Approximately 7x more traffic using 252nd Street than 254th Street, but volumes low for both
- Spruce Street is highly utilized
- SD37 traffic from the south is often using 8th Avenue to Ohlman Street in lieu of continuing north on SD37 to a northern lake gate

Overarching conclusions:

- *SD37, Main Street, Burr Street, and Foster Street are common north/south corridors for travel between I-90 interchange area and Lake Mitchell*
    - *Traffic to/from National Guard Road and Harmon Drive often travels through the urban core in lieu of SD37*
- *252nd Street corridor is the predominant east/west route to/from Betts Road*

Others

254th Street Bypass (east of Betts Road) (App Scenario)

App input: Average Day (2021) – All Directions – All Day – All Days

- 86% continues on 254th Street into Mitchell
- 3% to/from 8th Avenue
- 3% to/from 23rd Avenue
- No significant change for 'Average Summer Day', though get more traffic heading north to lake

Dakotafest (App Scenario)

App input: Dakotafest – All Directions – All Day – All Days; Spruce Street gate

- At the north SD37 gate, nearly a 50/50 split with SD37 and Main Street to/from Dakotafest
- Dakotafest traffic is very localized to the I-90 corridor, between Havens Avenue and Spruce Street

Overarching conclusions:

- *Dakotafest traffic is very localized to the I-90 corridor (Havens Avenue to Spruce Street)*

Cut-Through Review

App input: Average Day (2021) – All Vehicles – All Directions – All Day – Weekday

Scenario reviews most frequently traveled east/west corridors depending on location within Mitchell

Foster Street (7th Ave – 5th Ave)

1. 7th Avenue
2. 15th Ave – Park Drive – 11th Avenue
3. Havens Avenue

Foster Street (north of SD38)

1. Havens Avenue
2. 15th Ave – Park Drive – 11th Avenue (tie)
3. 7th Ave (tie)
4. 1st Ave (tie)

Minnesota Street (at RR grade separation)

1. Havens Avenue
2. 1st Avenue
3. 7th Ave
4. Others (tie): 15th Ave, 12th Ave, 5th Ave, Norway Ave

8th Avenue (west of Ohlman Street)

1. 7th Avenue
2. SD37 to Main Street
3. Havens Avenue
4. 7th Ave
5. Others (tie): 15th Ave, 5th Ave, 1st Ave, Norway Ave

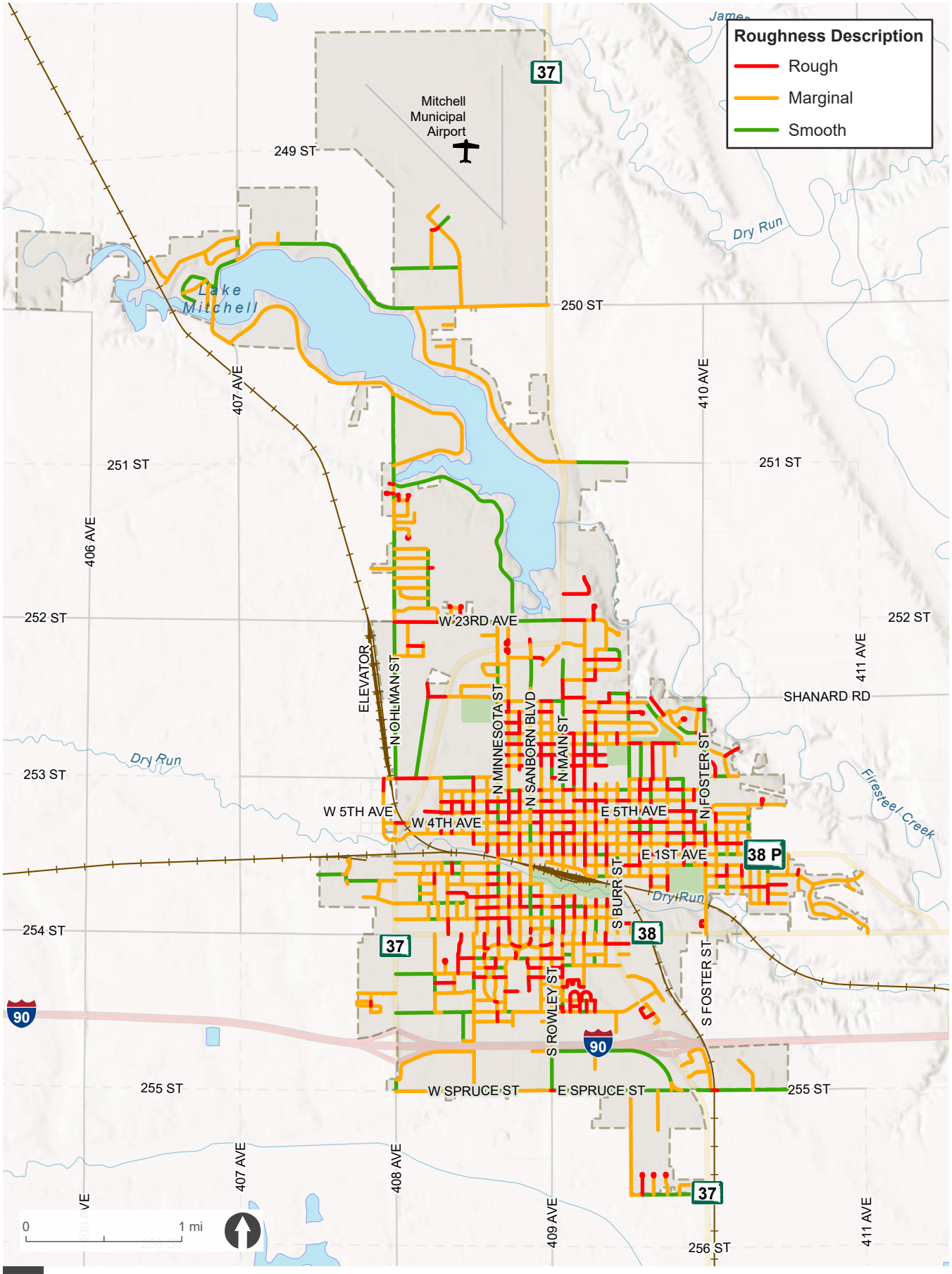
254th Street (west of 407th Avenue)

1. Havens Avenue
2. SD37 to Main Street (tie)
3. Spruce Street (tie)
4. 1st Avenue (tie)

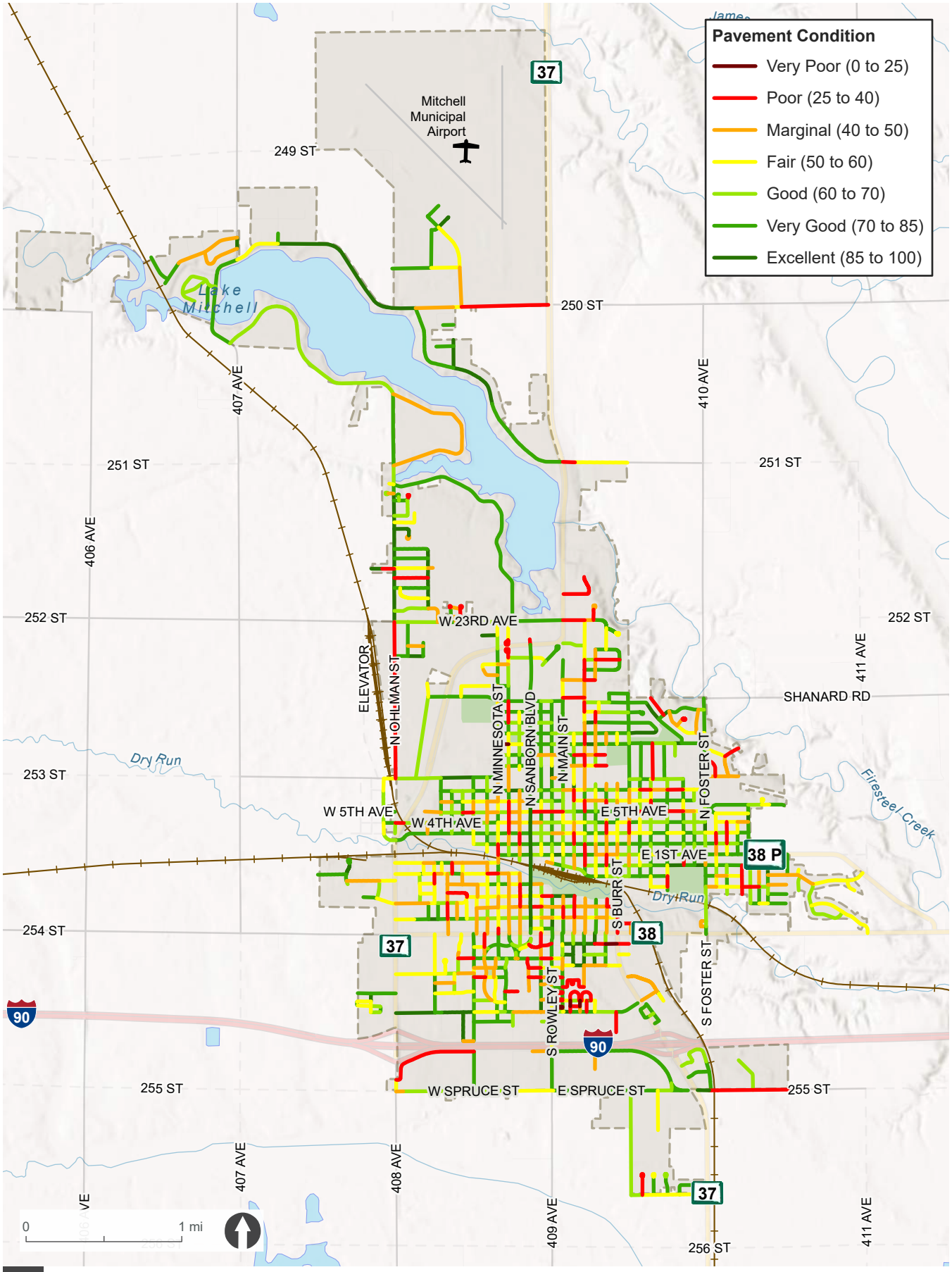
Trucks – all zones

- Nothing unexpected to the study team other than the level of truck volumes on Minnesota Street

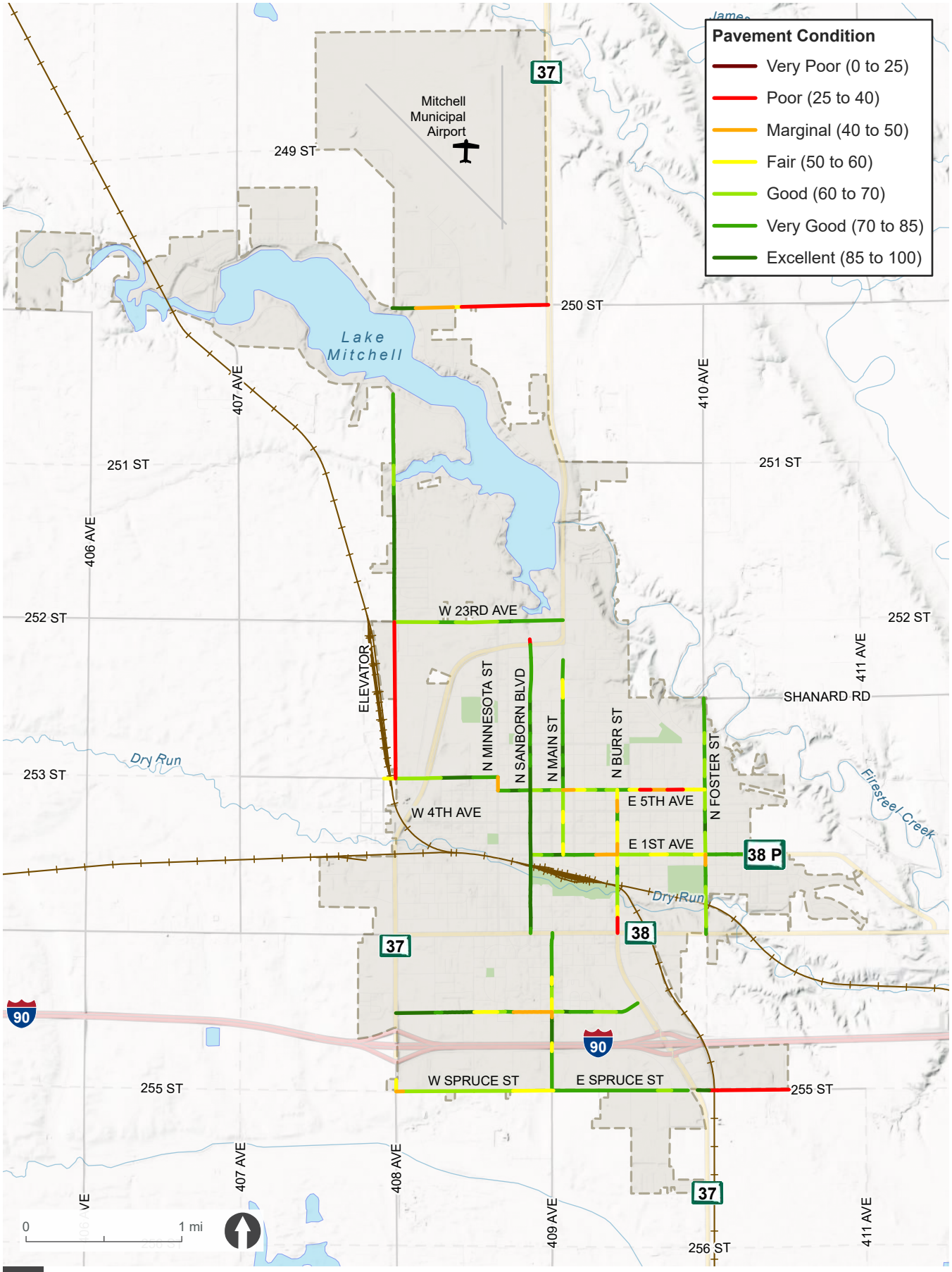
Appendix E: Pavement Data Collection Information



INTERNATIONAL ROUGHNESS INDEX



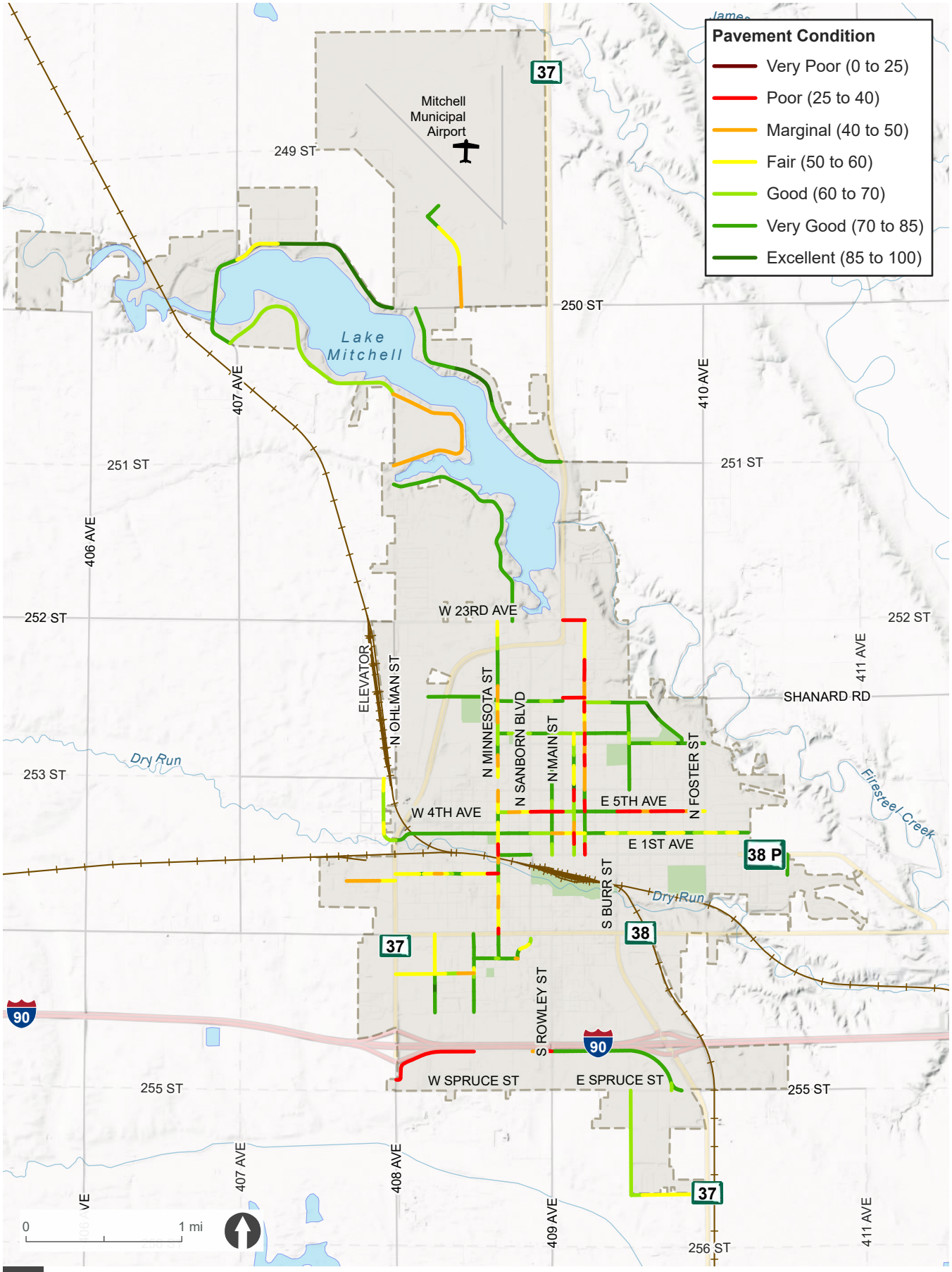
PAVEMENT CONDITION INDEX



MITCHELL Master Transportation Plan

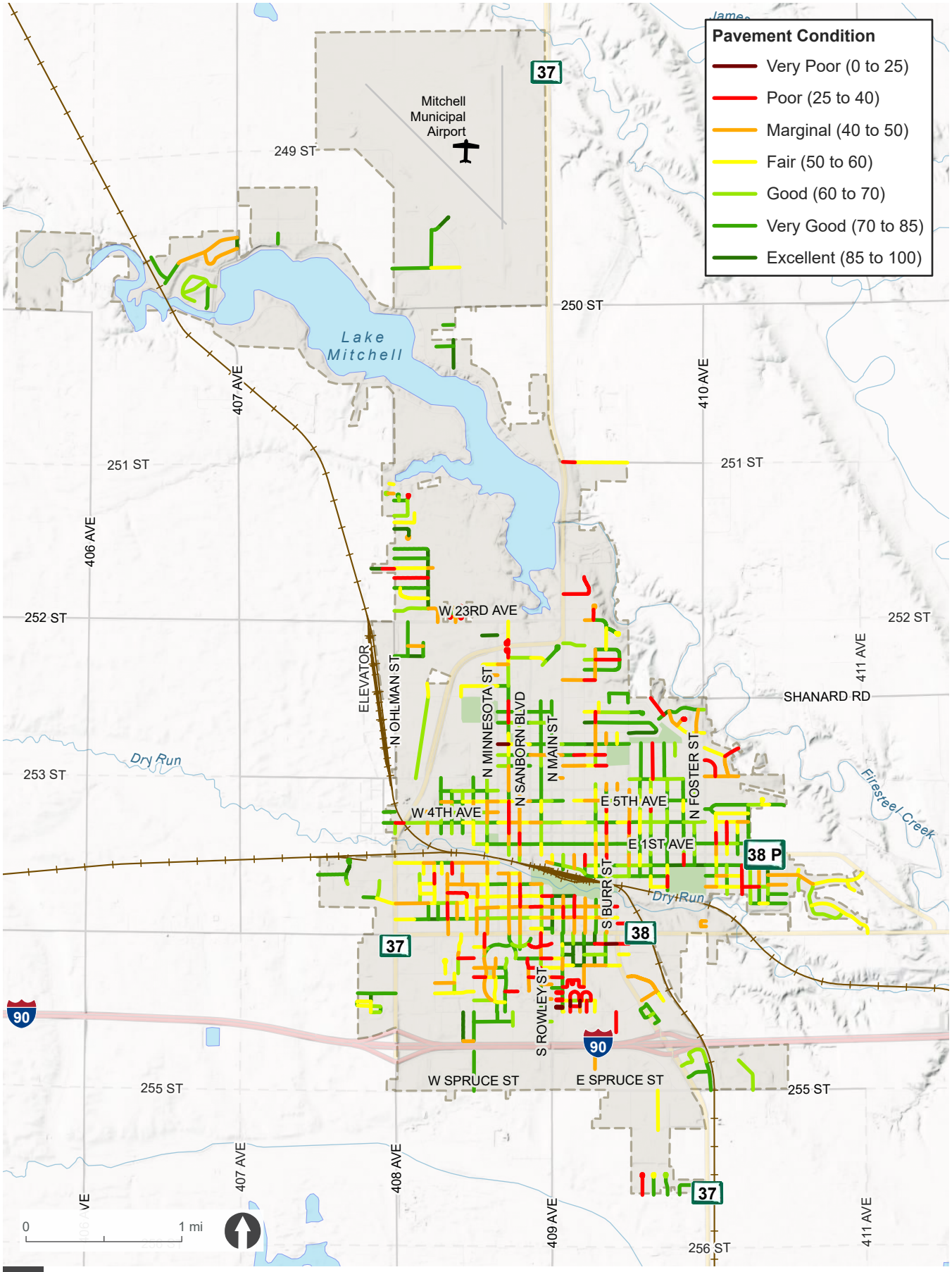
PAVEMENT CONDITION INDEX

MAJOR ROADS PLAN ARTERIAL STREETS



PAVEMENT CONDITION INDEX

MAJOR ROADS PLAN COLLECTOR STREETS



MITCHELL Master Transportation Plan

PAVEMENT CONDITION INDEX

MAJOR ROADS PLAN LOCAL STREETS

Recommended Surfacing Maintenance Projects Identified through the Pavement Condition Analysis

Street	From Street	To Street	Rehabilitation Activity	Length (ft)	Length (mi)	Cost ($)
10TH AVE	N MAIN ST	N LAWLER ST	Slurry Seal / Prvntve Mntnce	387	0.1	2,100
10TH AVE	N MINNESOTA ST	N WISCONSIN ST	EM + Thin Overlay (1.5 - 2.0)	359	0.1	12,400
10TH AVE	N EDMUNDS ST	N SANBORN BLVD	Surface Trtmnt / Chip Seal	355	0.1	1,600
11TH AVE	W 11TH AVE	N LAWLER ST	Surface Trtmnt / Chip Seal	389	0.1	1,900
11TH AVE	N LAWLER ST	N KIMBALL ST	Surface Trtmnt / Chip Seal	381	0.1	2,500
11TH AVE	N LANGDON ST	N DAVISON ST	Surface Trtmnt / Chip Seal	368	0.1	1,900
11TH AVE	N BURR ST	N CAPITAL ST	Surface Trtmnt / Chip Seal	420	0.1	2,100
11TH AVE	N WINSOR ST	N MENTZER ST	Surface Trtmnt / Chip Seal	376	0.1	4,500
11TH AVE	N MENTZER ST	N GAMBLE ST	EM + Thin Overlay (1.5 - 2.0)	407	0.1	16,000
11TH AVE	N GAMBLE ST	N KITTRIDGE ST	EM + Thin Overlay (1.5 - 2.0)	361	0.1	23,500
11TH AVE	N DUFF ST	N ROWLEY ST	Surface Trtmnt / Chip Seal	361	0.1	2,600
11TH AVE	N ROWLEY ST	E 11TH AVE	EM + Thin Overlay (1.5 - 2.0)	364	0.1	12,500
12TH AVE	W 12TH AVE	N LAWLER ST	EM + Thin Overlay (1.5 - 2.0)	390	0.1	13,400
12TH AVE	N LAWLER ST	N KIMBALL ST	EM + Thin Overlay (1.5 - 2.0)	381	0.1	15,900
12TH AVE	N KIMBALL ST	N LANGDON ST	Surface Trtmnt / Chip Seal	345	0.1	2,800
12TH AVE	N LANGDON ST	N DAVISON ST	Surface Trtmnt / Chip Seal	374	0.1	2,900
12TH AVE	N WISCONSIN ST	N EDMUNDS ST	EM + Thin Overlay (1.5 - 2.0)	368	0.1	12,700
12TH AVE	N EDMUNDS ST	N SANBORN BLVD	EM + Thin Overlay (1.5 - 2.0)	352	0.1	12,500
12TH AVE	N DUFF ST	N ROWLEY ST	Surface Trtmnt / Chip Seal	363	0.1	2,700
12TH AVE	N ROWLEY ST	E 12TH AVE	EM + Thin Overlay (1.5 - 2.0)	361	0.1	12,800
13TH AVE	N WISCONSIN ST	N EDMUNDS ST	EM + Thin Overlay (1.5 - 2.0)	370	0.1	12,600
13TH AVE	N EDMUNDS ST	N SANBORN BLVD	Surface Trtmnt / Chip Seal	363	0.1	2,900
13TH AVE	N SANBORN BLVD	N DUFF ST	EM + Thin Overlay (1.5 - 2.0)	379	0.1	11,000
13TH AVE	N DUFF ST	N ROWLEY ST	EM + Thin Overlay (1.5 - 2.0)	355	0.1	10,300
14TH AVE	N LANGDON ST	N CAPITAL ST	EM + Thin Overlay (1.5 - 2.0)	997	0.2	32,100
14TH AVE	N CAPITAL ST	DS@385FT	Surface Trtmnt / Chip Seal	392	0.1	2,500
14TH AVE	DS@385FT	E 14TH AVE	Surface Trtmnt / Chip Seal	323	0.1	4,700
14TH AVE	N SANBORN BLVD	N DUFF ST	Surface Trtmnt / Chip Seal	371	0.1	2,600
14TH AVE	N DUFF ST	N ROWLEY ST	Surface Trtmnt / Chip Seal	353	0.1	2,700
15TH AVE	N KIMBALL ST	N LANGDON ST	EM + Thin Overlay (1.5 - 2.0)	494	0.1	15,900
15TH AVE	N LANGDON ST	N DAVISON ST	EM + Thin Overlay (1.5 - 2.0)	340	0.1	13,600
15TH AVE	N DAVISON ST	N CAPITAL ST	Surface Trtmnt / Chip Seal	638	0.1	4,300
15TH AVE	COMMERCE ST	SD HWY 37 S	Surface Trtmnt / Chip Seal	387	0.1	1,800
15TH AVE	N WISCONSIN ST	N SANBORN BLVD	Surface Trtmnt / Chip Seal	720	0.1	5,600
15TH AVE	N DUFF ST	N ROWLEY ST	EM + Thin Overlay (1.5 - 2.0)	373	0.1	12,900
19TH AVE	N WISCONSIN ST	N SANBORN BLVD	EM + Thin Overlay (1.5 - 2.0)	745	0.1	16,600
1ST AVE	N BURR ST	S CAPITAL ST	EM + Thin Overlay (1.5 - 2.0)	382	0.1	11,500
1ST AVE	S CAPITAL ST	S WINSOR ST	EM + Thin Overlay (1.5 - 2.0)	386	0.1	19,400
1ST AVE	S WINSOR ST	N MENTZER ST	EM + Thin Overlay (1.5 - 2.0)	358	0.1	17,800
1ST AVE	N GAMBLE ST	S KITTRIDGE ST	EM + Thin Overlay (1.5 - 2.0)	561	0.1	15,600
1ST AVE	S KITTRIDGE ST	S HUNTER ST	EM + Thin Overlay (1.5 - 2.0)	365	0.1	10,100
1ST AVE	S FOSTER ST	N MARSHALL ST	Surface Trtmnt / Chip Seal	351	0.1	3,500
1ST AVE	N TAYLOR ST	DS@175FT	Surface Trtmnt / Chip Seal	182	0.0	1,100
1ST AVE	S SANBORN BLVD	N DUFF ST	EM + Thin Overlay (1.5 - 2.0)	273	0.1	7,000
23RD AVE	N OHLMAN ST	PEBBLE BEACH RD	EM + Thin Overlay (1.5 - 2.0)	1479	0.3	39,400
23RD AVE	KIPPES COVE	N MINNESOTA ST	EM + Thin Overlay (1.5 - 2.0)	1429	0.3	38,100
23RD AVE	INDIAN VILLAGE RD	SD HWY 37	Surface Trtmnt / Chip Seal	1666	0.3	11,100
2ND AVE	N BURR ST	N CAPITAL ST	Surface Trtmnt / Chip Seal	401	0.1	3,200
2ND AVE	N FOSTER ST	N MARSHALL ST	Surface Trtmnt / Chip Seal	358	0.1	2,300
2ND AVE	N MARSHALL ST	N TAYLOR ST	EM + Thin Overlay (1.5 - 2.0)	365	0.1	14,100
2ND AVE	N TAYLOR ST	N WALLACE ST	EM + Thin Overlay (1.5 - 2.0)	373	0.1	14,700
2ND AVE	N WALLACE ST	N CALHOUN ST	Surface Trtmnt / Chip Seal	371	0.1	2,300
2ND AVE	N IOWA ST	N MONTANA ST	EM + Thin Overlay (1.5 - 2.0)	486	0.1	17,300
3RD AVE	N KIMBALL ST	N LANGDON ST	Surface Trtmnt / Chip Seal	351	0.1	2,200
3RD AVE	N LANGDON ST	N DAVISON ST	Surface Trtmnt / Chip Seal	375	0.1	3,100
3RD AVE	N BURR ST	N CAPITAL ST	EM + Thin Overlay (1.5 - 2.0)	408	0.1	10,900
3RD AVE	N HUNTER ST	N FOSTER ST	EM + Thin Overlay (1.5 - 2.0)	364	0.1	10,500
3RD AVE	N MARSHALL ST	N TAYLOR ST	EM + Thin Overlay (1.5 - 2.0)	378	0.1	10,500
3RD AVE	N EDGERTON ST	N JUANITA ST	Surface Trtmnt / Chip Seal	361	0.1	2,400
3RD AVE	N JUANITA ST	N ISADORE ST	Surface Trtmnt / Chip Seal	360	0.1	2,500
3RD AVE	N ISADORE ST	N IOWA ST	Surface Trtmnt / Chip Seal	347	0.1	2,500
3RD AVE	N MONTANA ST	N MINNESOTA ST	Surface Trtmnt / Chip Seal	376	0.1	2,700
3RD AVE	N MINNESOTA ST	N WISCONSIN ST	Surface Trtmnt / Chip Seal	378	0.1	2,800
3RD AVE	N WISCONSIN ST	N EDMUNDS ST	Surface Trtmnt / Chip Seal	355	0.1	3,100
3RD AVE	N EDMUNDS ST	N SANBORN BLVD	Surface Trtmnt / Chip Seal	356	0.1	2,500
3RD AVE	N SANBORN BLVD	N DUFF ST	EM + Thin Overlay (1.5 - 2.0)	370	0.1	8,200
3RD AVE	N DUFF ST	N ROWLEY ST	EM + Thin Overlay (1.5 - 2.0)	360	0.1	8,000
4TH AVE	N KIMBALL ST	N LANGDON ST	EM + Thin Overlay (1.5 - 2.0)	354	0.1	11,100
4TH AVE	N CAPITAL ST	N WINSOR ST	Surface Trtmnt / Chip Seal	366	0.1	2,800
4TH AVE	N WINSOR ST	N MENTZER ST	EM + Thin Overlay (1.5 - 2.0)	354	0.1	13,400
4TH AVE	N MENTZER ST	N GAMBLE ST	EM + Thin Overlay (1.5 - 2.0)	574	0.1	21,700
4TH AVE	N GAMBLE ST	N KITTRIDGE ST	Surface Trtmnt / Chip Seal	541	0.1	3,000
4TH AVE	N KITTRIDGE ST	N HUNTER ST	EM + Thin Overlay (1.5 - 2.0)	370	0.1	13,800
4TH AVE	N HUNTER ST	N FOSTER ST	EM + Thin Overlay (1.5 - 2.0)	368	0.1	14,000
4TH AVE	SD HWY 37	N JOHNSON ST	EM + Thin Overlay (1.5 - 2.0)	628	0.1	24,400
4TH AVE	N JOHNSON ST	N EDGERTON ST	EM + Thin Overlay (1.5 - 2.0)	458	0.1	16,300
4TH AVE	N JUANITA ST	N ISADORE ST	Surface Trtmnt / Chip Seal	359	0.1	2,900
4TH AVE	N IOWA ST	N MONTANA ST	EM + Thin Overlay (1.5 - 2.0)	453	0.1	15,100
4TH AVE	N MONTANA ST	N MINNESOTA ST	Surface Trtmnt / Chip Seal	404	0.1	2,300
4TH AVE	N DUFF ST	N ROWLEY ST	EM + Thin Overlay (1.5 - 2.0)	367	0.1	11,800
4TH AVE	N ROWLEY ST	E 4TH AVE	EM + Thin Overlay (1.5 - 2.0)	365	0.1	12,600
5TH AVE	W 5TH AVE	N LAWLER ST	EM + Thin Overlay (1.5 - 2.0)	392	0.1	13,100
5TH AVE	N FOSTER ST	BRIDLE DR	Surface Trtmnt / Chip Seal	140	0.0	1,100
5TH AVE	BRIDLE DR	N MARSHALL ST	Surface Trtmnt / Chip Seal	281	0.1	2,200
5TH AVE	N EDGERTON ST	N JUANITA ST	EM + Thin Overlay (1.5 - 2.0)	373	0.1	14,900
5TH AVE	N JUANITA ST	N ISADORE ST	EM + Thin Overlay (1.5 - 2.0)	353	0.1	14,200
5TH AVE	N IOWA ST	N MONTANA ST	EM + Thin Overlay (1.5 - 2.0)	468	0.1	13,000
5TH AVE	N MINNESOTA ST	N WISCONSIN ST	EM + Thin Overlay (1.5 - 2.0)	353	0.1	12,600
6TH AVE	N DAVISON ST	N BURR ST	EM + Thin Overlay (1.5 - 2.0)	363	0.1	10,900
6TH AVE	N MENTZER ST	N GAMBLE ST	Surface Trtmnt / Chip Seal	564	0.1	3,500
6TH AVE	N JUANITA ST	N ISADORE ST	Surface Trtmnt / Chip Seal	343	0.1	1,800

Recommended Surfacing Maintenance Projects Identified through the Pavement Condition Analysis

Street	From Street	To Street	Rehabilitation Activity	Length (ft)	Length (mi)	Cost ($)
6TH AVE	N DUFF ST	N ROWLEY ST	EM + Thin Overlay (1.5 - 2.0)	351	0.1	13,600
6TH AVE	N ROWLEY ST	N MAIN ST	Surface Trtmnt / Chip Seal	373	0.1	3,000
7TH AVE	N KIMBALL ST	N LANGDON ST	EM + Thin Overlay (1.5 - 2.0)	355	0.1	15,800
7TH AVE	N LANGDON ST	N DAVISON ST	Surface Trtmnt / Chip Seal	376	0.1	3,200
7TH AVE	N DAVISON ST	N BURR ST	EM + Thin Overlay (1.5 - 2.0)	361	0.1	13,400
7TH AVE	N JUANITA ST	N ISADORE ST	EM + Thin Overlay (1.5 - 2.0)	326	0.1	13,000
7TH AVE	N ISADORE ST	N IOWA ST	EM + Thin Overlay (1.5 - 2.0)	348	0.1	10,100
7TH AVE	N IOWA ST	N MONTANA ST	Surface Trtmnt / Chip Seal	492	0.1	2,400
7TH AVE	N MONTANA ST	N MINNESOTA ST	EM + Thin Overlay (1.5 - 2.0)	363	0.1	15,700
7TH AVE	N SANBORN BLVD	N DUFF ST	EM + Thin Overlay (1.5 - 2.0)	386	0.1	13,700
7TH AVE	N DUFF ST	N ROWLEY ST	Surface Trtmnt / Chip Seal	352	0.1	2,100
7TH AVE	N ROWLEY ST	E 7TH AVE	EM + Thin Overlay (1.5 - 2.0)	356	0.1	10,300
8TH AVE	N CAPITAL ST	N WINSOR ST	EM + Thin Overlay (1.5 - 2.0)	388	0.1	19,900
8TH AVE	N MENTZER ST	N GAMBLE ST	EM + Thin Overlay (1.5 - 2.0)	439	0.1	14,100
8TH AVE	N GAMBLE ST	N GAMBLE ST	EM + Thin Overlay (1.5 - 2.0)	108	0.0	3,700
8TH AVE	N GAMBLE ST	N KITTRIDGE ST	EM + Thin Overlay (1.5 - 2.0)	523	0.1	19,200
8TH AVE	253 ST	SD HWY 37	EM + Thin Overlay (1.5 - 2.0)	1005	0.2	34,800
8TH AVE	SD HWY 37	N EDGERTON ST	EM + Thin Overlay (1.5 - 2.0)	438	0.1	12,200
9TH AVE	N MINNESOTA ST	N WISCONSIN ST	EM + Thin Overlay (1.5 - 2.0)	358	0.1	10,400
9TH AVE	N EDMUNDS ST	N SANBORN BLVD	Surface Trtmnt / Chip Seal	351	0.1	2,500
ANDERSON ST	W MCCABE AVE	W WILLIAMS AVE	EM + Thin Overlay (1.5 - 2.0)	533	0.1	19,000
ANDERSON ST	W STATE AVE	W HURST AVE	EM + Thin Overlay (1.5 - 2.0)	355	0.1	10,300
ARROWHEAD PASS	BAY HILL	N OHLMAN ST	EM + Thin Overlay (1.5 - 2.0)	978	0.2	21,700
ASH AVE	S DAVISON ST	S BURR ST	EM + Thin Overlay (1.5 - 2.0)	356	0.1	13,500
ASH AVE	S BURR ST	S CAPITAL ST	EM + Thin Overlay (1.5 - 2.0)	402	0.1	14,800
ASH AVE	S WINSOR ST	S MENTZER ST	Surface Trtmnt / Chip Seal	372	0.1	2,400
ASH AVE	S ANDERSON ST	S JUANITA ST	EM + Thin Overlay (1.5 - 2.0)	172	0.0	6,300
BILLS BEACH DR	CANAL CIR	CANAL CIR	EM + Thin Overlay (1.5 - 2.0)	916	0.2	22,400
BIRCH AVE	CHRISTINE ST	TIGER ST	EM + Thin Overlay (1.5 - 2.0)	297	0.1	11,200
BRIDLE DR	E 5TH AVE	N CALHOUN ST	Surface Trtmnt / Chip Seal	1379	0.3	7,000
BRIDLE DR	N CALHOUN ST	ROSELANDER ST	EM + Thin Overlay (1.5 - 2.0)	474	0.1	11,600
BURNS ST	W CEDAR AVE	W ELM AVE	Surface Trtmnt / Chip Seal	540	0.1	3,400
BURR ST	E 5TH AVE	E 4TH AVE	Surface Trtmnt / Chip Seal	375	0.1	2,500
BURR ST	E HANSON AVE	DS@119FT	Surface Trtmnt / Chip Seal	98	0.0	800
BURR ST	E ASH AVE	E DOUGLAS AVE	EM + Thin Overlay (1.5 - 2.0)	1031	0.2	36,700
CABELA DR	DS@4563FT	E SPRUCE ST	EM + Thin Overlay (1.5 - 2.0)	251	0.0	5,900
CANAL CIR	EOP	N HARMON DR	EM + Thin Overlay (1.5 - 2.0)	2099	0.4	95,600
CAPITAL ST	E 16TH AVE	E 15TH AVE	Surface Trtmnt / Chip Seal	300	0.1	2,500
CAPITAL ST	E 12TH AVE	E 11TH AVE	EM + Thin Overlay (1.5 - 2.0)	357	0.1	9,500
CAPITAL ST	E 11TH AVE	E 8TH AVE	Surface Trtmnt / Chip Seal	1196	0.2	7,700
CAPITAL ST	E 8TH AVE	E 7TH AVE	Surface Trtmnt / Chip Seal	362	0.1	2,300
CAPITAL ST	E 2ND AVE	E 1ST AVE	EM + Thin Overlay (1.5 - 2.0)	358	0.1	12,300
CAPITAL ST	E HANSON AVE	E ASH AVE	EM + Thin Overlay (1.5 - 2.0)	350	0.1	7,800
CAPITAL ST	E SPRUCE ST	CARL ST	EM + Thin Overlay (1.5 - 2.0)	3527	0.7	105,800
CARL ST	S CAPITAL ST	WINSOR COURT	EM + Thin Overlay (1.5 - 2.0)	187	0.0	5,600
CEDAR AVE	EOP	JONES ST	Surface Trtmnt / Chip Seal	462	0.1	2,600
CEDAR AVE	S EDGERTON ST	S BURNS ST	EM + Thin Overlay (1.5 - 2.0)	114	0.0	3,900
CEDAR AVE	S BURNS ST	S ANDERSON ST	EM + Thin Overlay (1.5 - 2.0)	327	0.1	11,300
CEDAR AVE	S ANDERSON ST	S JUANITA ST	EM + Thin Overlay (1.5 - 2.0)	280	0.1	9,600
CHALKSTONE DR	PARK DR	RIDGE RD	Surface Trtmnt / Chip Seal	210	0.0	1,000
CHALKSTONE DR	SUMMIT DR	N FOSTER ST	EM + Thin Overlay (1.5 - 2.0)	179	0.0	5,600
CHARLES AVE	TIGER ST	EOP	Surface Trtmnt / Chip Seal	599	0.1	5,200
CHARLES ST	E HANSON AVE	E BIRCH AVE	EM + Thin Overlay (1.5 - 2.0)	725	0.1	26,600
CHARLES ST	E BIRCH AVE	CHARLES AVE	EM + Thin Overlay (1.5 - 2.0)	561	0.1	21,200
CHRISTINE ST	DS@585FT	E BIRCH AVE	EM + Thin Overlay (1.5 - 2.0)	156	0.0	5,900
CHRISTINE ST	E BIRCH AVE	CHARLES AVE	Surface Trtmnt / Chip Seal	560	0.1	3,900
COMMERCE ST	W 15TH AVE	W 8TH AVE	EM + Thin Overlay (1.5 - 2.0)	2797	0.5	108,800
COURT MERRILL	DS@178FT	W MILAN AVE	Surface Trtmnt / Chip Seal	272	0.1	2,300
COURT MERRILL	W MILAN AVE	W MITCHELL BLVD	EM + Thin Overlay (1.5 - 2.0)	310	0.1	13,400
COURT MERRILL	W MILAN AVE	S COURT MERRILL	EM + Thin Overlay (1.5 - 2.0)	317	0.1	12,000
CYPRESS POINT	CYPRESS POINT	DS@209FT	Surface Trtmnt / Chip Seal	209	0.0	2,100
CYPRESS POINT	DS@209FT	ARROWHEAD PASS	EM + Thin Overlay (1.5 - 2.0)	118	0.0	6,200
DAVISON ST	E 16TH AVE	E 15TH AVE	Surface Trtmnt / Chip Seal	330	0.1	1,800
DAVISON ST	SD HWY 90 L	E HACKBERRY AVE	EM + Thin Overlay (1.5 - 2.0)	376	0.1	19,500
DOBSON ST	W ASH AVE	W BIRCH AVE	EM + Thin Overlay (1.5 - 2.0)	322	0.1	8,900
DOBSON ST	PALMER PL	W CEDAR AVE	EM + Thin Overlay (1.5 - 2.0)	310	0.1	7,900
DORIS DR	QUIETT ST	DEAN DR	EM + Thin Overlay (1.5 - 2.0)	2130	0.4	49,700
DOUGLAS AVE	S MAIN ST	S LAWLER ST	EM + Thin Overlay (1.5 - 2.0)	379	0.1	14,300
DUFF ST	W 11TH AVE	W 10TH AVE	Surface Trtmnt / Chip Seal	349	0.1	2,700
DUFF ST	W 10TH AVE	W 9TH AVE	EM + Thin Overlay (1.5 - 2.0)	368	0.1	12,700
DUFF ST	W 9TH AVE	W 7TH AVE	Surface Trtmnt / Chip Seal	834	0.2	5,200
DUFF ST	W 7TH AVE	W 6TH AVE	Surface Trtmnt / Chip Seal	358	0.1	2,500
DUFF ST	W 5TH AVE	W 4TH AVE	Surface Trtmnt / Chip Seal	364	0.1	3,000
DUFF ST	W 4TH AVE	W 3RD AVE	EM + Thin Overlay (1.5 - 2.0)	370	0.1	12,700
DUFF ST	W 3RD AVE	W 2ND AVE	EM + Thin Overlay (1.5 - 2.0)	372	0.1	12,400
DUFF ST	W BIRCH AVE	W CEDAR AVE	EM + Thin Overlay (1.5 - 2.0)	411	0.1	12,300
DUFF ST	W DOUGLAS AVE	W ELM AVE	EM + Thin Overlay (1.5 - 2.0)	371	0.1	11,100
DUFF ST	W ELM AVE	W FIR AVE	EM + Thin Overlay (1.5 - 2.0)	379	0.1	10,900
DUFF ST	W MCCABE AVE	W REID AVE	EM + Thin Overlay (1.5 - 2.0)	314	0.1	17,200
EDGERTON ST	W 6TH AVE	W 5TH AVE	Surface Trtmnt / Chip Seal	360	0.1	2,400
EDGERTON ST	W 5TH AVE	W 4TH AVE	EM + Thin Overlay (1.5 - 2.0)	354	0.1	12,200
EDGERTON ST	W 4TH AVE	W 3RD AVE	Surface Trtmnt / Chip Seal	369	0.1	2,500
EDGERTON ST	W CEDAR AVE	W ELM AVE	Surface Trtmnt / Chip Seal	531	0.1	3,200
EDMUNDS ST	W 13TH AVE	W 12TH AVE	EM + Thin Overlay (1.5 - 2.0)	373	0.1	12,400
EDMUNDS ST	W 12TH AVE	W 11TH AVE	EM + Thin Overlay (1.5 - 2.0)	368	0.1	12,700
EDMUNDS ST	W 11TH AVE	W 10TH AVE	EM + Thin Overlay (1.5 - 2.0)	373	0.1	12,400
EDMUNDS ST	W 10TH AVE	W 9TH AVE	Surface Trtmnt / Chip Seal	360	0.1	2,400
EDMUNDS ST	W 1ST AVE	EOP	EM + Thin Overlay (1.5 - 2.0)	194	0.0	5,600
EDMUNDS ST	SD HWY 90 L	W MITCHELL BLVD	EM + Thin Overlay (1.5 - 2.0)	447	0.1	12,900
ELM AVE	S BURNS ST	ANDERSON ST	Surface Trtmnt / Chip Seal	320	0.1	1,800
ELM AVE	ANDERSON ST	S JUANITA ST	Surface Trtmnt / Chip Seal	328	0.1	1,800

Recommended Surfacing Maintenance Projects Identified through the Pavement Condition Analysis

Street	From Street	To Street	Rehabilitation Activity	Length (ft)	Length (mi)	Cost ($)
ELM AVE	S ISADORE ST	S IOWA ST	EM + Thin Overlay (1.5 - 2.0)	335	0.1	12,700
ELM AVE	S IOWA ST	S MONTANA ST	EM + Thin Overlay (1.5 - 2.0)	363	0.1	13,700
ELM AVE	S MONTANA ST	S MINNESOTA ST	EM + Thin Overlay (1.5 - 2.0)	370	0.1	13,600
ELM AVE	S MINNESOTA ST	S WISCONSIN ST	EM + Thin Overlay (1.5 - 2.0)	346	0.1	11,900
ELM AVE	S WISCONSIN ST	S EDMUNDS ST	EM + Thin Overlay (1.5 - 2.0)	402	0.1	14,300
ELM AVE	S EDMUNDS ST	S SANBORN BLVD	EM + Thin Overlay (1.5 - 2.0)	347	0.1	11,600
FAIROAKS AVE	SD HWY 37	N KIMBALL ST	EM + Thin Overlay (1.5 - 2.0)	779	0.1	28,600
FOSS PL	S FOSS PL	W MITCHELL BLVD	EM + Thin Overlay (1.5 - 2.0)	118	0.0	4,500
FOSTER ST	RIDGE RD	E 11TH AVE	EM + Thin Overlay (1.5 - 2.0)	341	0.1	13,200
FOSTER ST	ROLAND LN	E 8TH AVE	EM + Thin Overlay (1.5 - 2.0)	550	0.1	21,400
FOSTER ST	E 7TH AVE	E 5TH AVE	EM + Thin Overlay (1.5 - 2.0)	666	0.1	33,900
FOSTER ST	E 3RD AVE	E 2ND AVE	EM + Thin Overlay (1.5 - 2.0)	376	0.1	14,200
FOSTER ST	E 2ND AVE	E 1ST AVE	EM + Thin Overlay (1.5 - 2.0)	359	0.1	12,800
GAMBLE COURT	GAMBLE CT	GAMBLE CT	EM + Thin Overlay (1.5 - 2.0)	105	0.0	3,000
GAMBLE ST	DS@800F	E 8TH AVE	Surface Trtmnt / Chip Seal	423	0.1	2,000
GAMBLE ST	E 8TH AVE	E 7TH AVE	EM + Thin Overlay (1.5 - 2.0)	362	0.1	8,900
GAMBLE ST	E 5TH AVE	E 4TH AVE	EM + Thin Overlay (1.5 - 2.0)	387	0.1	14,200
GAMBLE ST	E 4TH AVE	E 3RD AVE	Surface Trtmnt / Chip Seal	361	0.1	3,300
GAMBLE ST	E 3RD AVE	E 2ND AVE	Surface Trtmnt / Chip Seal	380	0.1	3,400
GAMBLE ST	E 2ND AVE	E 1ST AVE	Surface Trtmnt / Chip Seal	342	0.1	3,200
HANGAR RD	AIRPORT RD	TOWER RD	Surface Trtmnt / Chip Seal	267	0.1	2,100
HANSON AVE	S KIMBALL ST	S LANGDON ST	EM + Thin Overlay (1.5 - 2.0)	364	0.1	11,300
HANSON AVE	S LANGDON ST	S DAVISON ST	Surface Trtmnt / Chip Seal	361	0.1	2,300
HANSON AVE	S DAVISON ST	S BURR ST	Surface Trtmnt / Chip Seal	357	0.1	2,300
HANSON AVE	S BURR ST	S CAPITAL ST	EM + Thin Overlay (1.5 - 2.0)	402	0.1	23,700
HANSON AVE	S CAPITAL ST	S WINSOR ST	EM + Thin Overlay (1.5 - 2.0)	372	0.1	11,600
HANSON AVE	S WINSOR ST	S MENTZER ST	EM + Thin Overlay (1.5 - 2.0)	369	0.1	11,500
HANSON AVE	TIGER ST	EOP	EM + Thin Overlay (1.5 - 2.0)	136	0.0	3,600
HANSON AVE	S EDGERTON ST	S ANDERSON ST	Surface Trtmnt / Chip Seal	253	0.0	2,200
HANSON AVE	S ANDERSON ST	S JUANITA ST	Surface Trtmnt / Chip Seal	346	0.1	3,400
HARMON DR	DS@1046FT	SD HWY 37 S	Surface Trtmnt / Chip Seal	2199	0.4	16,600
HARMON DR	407 AVE	S HARMON DR	EM + Thin Overlay (1.5 - 2.0)	7739	1.5	275,200
HIGHLAND WAY	SD HWY 37 N	MALL DR	EM + Thin Overlay (1.5 - 2.0)	1554	0.3	69,100
HOMER CT	QUIETT ST	EOP	EM + Thin Overlay (1.5 - 2.0)	488	0.1	11,900
HUNTER ST	E 7TH AVE	E 6TH AVE	EM + Thin Overlay (1.5 - 2.0)	369	0.1	14,000
HUNTER ST	E 5TH AVE	E 4TH AVE	EM + Thin Overlay (1.5 - 2.0)	403	0.1	14,300
HUNTER ST	E 4TH AVE	E 3RD AVE	EM + Thin Overlay (1.5 - 2.0)	337	0.1	12,700
HUNTER ST	E 2ND AVE	E 1ST AVE	EM + Thin Overlay (1.5 - 2.0)	354	0.1	13,400
HUNTER ST	E 1ST AVE	E HANSON AVE	Surface Trtmnt / Chip Seal	389	0.1	2,300
INDIAN VILLAGE RD	N OHLMAN ST	W 23RD AVE	Slurry Seal / Prvntve Mntnce	8050	1.5	42,300
IOWA ST	W 7TH AVE	W 6TH AVE	Surface Trtmnt / Chip Seal	349	0.1	2,200
IOWA ST	W 5TH AVE	W 4TH AVE	EM + Thin Overlay (1.5 - 2.0)	341	0.1	12,500
ISADORE ST	W 7TH AVE	W 6TH AVE	EM + Thin Overlay (1.5 - 2.0)	330	0.1	11,000
ISADORE ST	W 6TH AVE	W 5TH AVE	Surface Trtmnt / Chip Seal	397	0.1	3,000
ISLAND CT	CANAL CIR	EOP	Surface Trtmnt / Chip Seal	813	0.2	6,000
IVY AVE	S KIMBALL ST	S DAVISON ST	EM + Thin Overlay (1.5 - 2.0)	730	0.1	27,600
JO GENE CT	EOP	FIALA RD	Surface Trtmnt / Chip Seal	585	0.1	4,400
JONES ST	W ASH AVE	W CEDAR AVE	EM + Thin Overlay (1.5 - 2.0)	605	0.1	23,500
JUANITA ST	W 6TH AVE	W 5TH AVE	EM + Thin Overlay (1.5 - 2.0)	343	0.1	12,900
JUANITA ST	W 4TH AVE	W 3RD AVE	EM + Thin Overlay (1.5 - 2.0)	379	0.1	15,200
JUNIPER AVE	S DAVISON ST	DS@96FT	EM + Thin Overlay (1.5 - 2.0)	90	0.0	3,300
KAY AVE	E NORWAY AVE	DS@59FT	EM + Thin Overlay (1.5 - 2.0)	59	0.0	2,200
KAY AVE	DS@59FT	DS@97FT	Surface Trtmnt / Chip Seal	38	0.0	300
KIMBALL ST	E 5TH AVE	E 4TH AVE	Surface Trtmnt / Chip Seal	370	0.1	3,000
KIMBALL ST	E 3RD AVE	E 2ND AVE	EM + Thin Overlay (1.5 - 2.0)	369	0.1	13,900
KIMBALL ST	SD HWY 90 L	E HACKBERRY AVE	Surface Trtmnt / Chip Seal	360	0.1	2,300
KIPPES COVE (W)	KIPPES COVE (N)	KIPPES COVE (S)	Surface Trtmnt / Chip Seal	314	0.1	2,900
KITTRIDGE ST	E 11TH AVE	EOP	EM + Thin Overlay (1.5 - 2.0)	435	0.1	16,000
KITTRIDGE ST	E 8TH AVE	E 7TH AVE	Surface Trtmnt / Chip Seal	362	0.1	2,900
KITTRIDGE ST	E 5TH AVE	E 4TH AVE	Surface Trtmnt / Chip Seal	392	0.1	3,000
KITTRIDGE ST	E 2ND AVE	E 1ST AVE	EM + Thin Overlay (1.5 - 2.0)	353	0.1	18,500
KYNETTE PL	S MILLER AVE	W MITCHELL BLVD	EM + Thin Overlay (1.5 - 2.0)	594	0.1	22,400
LANGDON ST	E 10TH AVE	E 9TH AVE	EM + Thin Overlay (1.5 - 2.0)	374	0.1	14,100
LANGDON ST	EOP	E 7TH AVE	EM + Thin Overlay (1.5 - 2.0)	199	0.0	7,800
LANGDON ST	E 6TH AVE	E 5TH AVE	EM + Thin Overlay (1.5 - 2.0)	360	0.1	9,600
LANGDON ST	E 5TH AVE	E 4TH AVE	Surface Trtmnt / Chip Seal	382	0.1	2,900
LANGDON ST	E 4TH AVE	E 3RD AVE	EM + Thin Overlay (1.5 - 2.0)	357	0.1	10,700
LANGDON ST	E DOUGLAS AVE	E ELM AVE	EM + Thin Overlay (1.5 - 2.0)	364	0.1	11,700
LAWLER ST	E 11TH AVE	E 10TH AVE	EM + Thin Overlay (1.5 - 2.0)	358	0.1	10,300
LAWLER ST	E 10TH AVE	E 9TH AVE	Surface Trtmnt / Chip Seal	366	0.1	2,000
LAWLER ST	E 6TH AVE	E 5TH AVE	EM + Thin Overlay (1.5 - 2.0)	359	0.1	17,600
LAWLER ST	E 5TH AVE	E 4TH AVE	EM + Thin Overlay (1.5 - 2.0)	364	0.1	14,000
LAWLER ST	E 2ND AVE	E 1ST AVE	EM + Thin Overlay (1.5 - 2.0)	341	0.1	9,500
LAWLER ST	SD HWY 90 L	E HACKBERRY AVE	EM + Thin Overlay (1.5 - 2.0)	357	0.1	10,700
LYLE ST	W 7TH AVE	W 5TH AVE	EM + Thin Overlay (1.5 - 2.0)	721	0.1	36,800
LYLE ST	W 5TH AVE	W 4TH AVE	EM + Thin Overlay (1.5 - 2.0)	375	0.1	14,600
LYLE ST	W 3RD AVE	SD HWY 37	EM + Thin Overlay (1.5 - 2.0)	490	0.1	21,800
MAIN ST	E 15TH AVE	W 15TH AVE	Surface Trtmnt / Chip Seal	134	0.0	800
MAIN ST	W 7TH AVE	W 6TH AVE	EM + Thin Overlay (1.5 - 2.0)	385	0.1	13,400
MAIN ST	W 6TH AVE	W 5TH AVE	EM + Thin Overlay (1.5 - 2.0)	353	0.1	10,600
MAIN ST	E 4TH AVE	W 3RD AVE	EM + Thin Overlay (1.5 - 2.0)	374	0.1	11,200
MAIN ST	W 3RD AVE	E 2ND AVE	EM + Thin Overlay (1.5 - 2.0)	373	0.1	11,200
MAIN ST	E 1ST AVE	W RAILROAD ST	EM + Thin Overlay (1.5 - 2.0)	377	0.1	20,100
MAIN ST	W RAILROAD ST	EOP	Surface Trtmnt / Chip Seal	116	0.0	700
MAIN ST	W MILAN AVE	E IVY AVE	EM + Thin Overlay (1.5 - 2.0)	304	0.1	11,800
MAIN ST	E IVY AVE	W MCCABE AVE	Surface Trtmnt / Chip Seal	133	0.0	700
MAIN ST	W REID AVE	W ANDREWS ST	Surface Trtmnt / Chip Seal	289	0.1	800
MAIN ST	W ANDREWS ST	W HURST AVE	Surface Trtmnt / Chip Seal	329	0.1	2,400
MAIN ST	UNKNOWN	UNKNOWN	Surface Trtmnt / Chip Seal	49	0.0	500
MAIN ST	UNKNOWN	W NORWAY AVE	EM + Thin Overlay (1.5 - 2.0)	127	0.0	4,400
MALL DR	HIGHLAND WAY	HIGHLAND WAY	Surface Trtmnt / Chip Seal	353	0.1	2,700

Recommended Surfacing Maintenance Projects Identified through the Pavement Condition Analysis

Street	From Street	To Street	Rehabilitation Activity	Length (ft)	Length (mi)	Cost ($)
MALL DR	HIGHLAND WAY	DS@335FT	Surface Trtmnt / Chip Seal	332	0.1	3,200
MARSHALL ST	E HANSON AVE	E ASH AVE	EM + Thin Overlay (1.5 - 2.0)	326	0.1	11,600
MCCABE AVE	S MINNESOTA ST	S MINNESOTA ST	EM + Thin Overlay (1.5 - 2.0)	123	0.0	4,700
MCCABE AVE	S MINNESOTA ST	W UNIVERSITY BLVD	Surface Trtmnt / Chip Seal	253	0.0	1,900
MCCABE AVE	MCGOVERN AVE	S DUFF ST	Surface Trtmnt / Chip Seal	441	0.1	2,400
MENTZER CT	MENTZER COURT	CARL ST	Surface Trtmnt / Chip Seal	716	0.1	5,400
MENTZER ST	E 8TH AVE	E 7TH AVE	EM + Thin Overlay (1.5 - 2.0)	358	0.1	9,900
MENTZER ST	E 5TH AVE	E 4TH AVE	EM + Thin Overlay (1.5 - 2.0)	377	0.1	11,700
MENTZER ST	E 4TH AVE	E 3RD AVE	EM + Thin Overlay (1.5 - 2.0)	363	0.1	14,500
MENTZER ST	E 3RD AVE	E 2ND AVE	Surface Trtmnt / Chip Seal	368	0.1	2,900
MENTZER ST	E 2ND AVE	E 1ST AVE	EM + Thin Overlay (1.5 - 2.0)	361	0.1	13,200
MIDDLE BORDER	UNKNOWN	UNKNOWN	EM + Thin Overlay (1.5 - 2.0)	311	0.1	11,800
MILLER AVE	W WILLIAMS AVE	W WILLIAMS AVE	EM + Thin Overlay (1.5 - 2.0)	141	0.0	5,300
MINNESOTA ST	INNOVATIVE DR	SD HWY 37	EM + Thin Overlay (1.5 - 2.0)	434	0.1	18,500
MINNESOTA ST	W 13TH AVE	W 12TH AVE	EM + Thin Overlay (1.5 - 2.0)	394	0.1	15,900
MINNESOTA ST	W 12TH AVE	W 11TH AVE	EM + Thin Overlay (1.5 - 2.0)	376	0.1	13,800
MINNESOTA ST	W 11TH AVE	W 10TH AVE	Surface Trtmnt / Chip Seal	352	0.1	2,000
MINNESOTA ST	W HANSON AVE	W ASH AVE	Surface Trtmnt / Chip Seal	380	0.1	2,700
MINNESOTA ST	W ASH AVE	W BIRCH AVE	EM + Thin Overlay (1.5 - 2.0)	344	0.1	12,600
MINNESOTA ST	SD HWY 90 L	W MITCHELL BLVD	Surface Trtmnt / Chip Seal	347	0.1	1,800
MINNESOTA ST	W MITCHELL BLVD	W NORWAY AVE	Surface Trtmnt / Chip Seal	331	0.1	2,300
MINNESOTA ST	W NORWAY AVE	W PINE AVE	Surface Trtmnt / Chip Seal	327	0.1	1,700
MITCHELL BLVD	S COURT MERRILL	UNIVERSITY BLVD	EM + Thin Overlay (1.5 - 2.0)	286	0.1	10,500
MITCHELL BLVD	W FOSS PL	S FOSS PL	Surface Trtmnt / Chip Seal	191	0.0	1,500
MITCHELL BLVD	S FOSS PL	W MCCABE AVE	EM + Thin Overlay (1.5 - 2.0)	164	0.0	5,800
MITCHELL BLVD	S MINNESOTA ST	S MINNESOTA ST	EM + Thin Overlay (1.5 - 2.0)	90	0.0	3,300
MONTANA ST	W 8TH AVE	W 7TH AVE	EM + Thin Overlay (1.5 - 2.0)	472	0.1	14,700
MONTANA ST	W 4TH AVE	W 3RD AVE	EM + Thin Overlay (1.5 - 2.0)	364	0.1	16,200
MONTANA ST	W DOUGLAS AVE	W ELM AVE	EM + Thin Overlay (1.5 - 2.0)	347	0.1	9,300
MTI DR	EOP	E SPRUCE ST	EM + Thin Overlay (1.5 - 2.0)	1205	0.2	26,800
NORWAY AVE	S LANGDON ST	VAN DYKE DR	EM + Thin Overlay (1.5 - 2.0)	757	0.1	28,600
NORWAY AVE	S MINNESOTA ST	W UNIVERSITY BLVD	EM + Thin Overlay (1.5 - 2.0)	261	0.0	7,200
NORWAY AVE	S ROWLEY ST	E NORWAY AVE	EM + Thin Overlay (1.5 - 2.0)	365	0.1	14,700
OAKMOND ST	N LANGDON ST	WILDWOOD AVE	Surface Trtmnt / Chip Seal	1079	0.2	7,900
OHLMAN ST	S HARMON DR	S HARMON DR	Surface Trtmnt / Chip Seal	2453	0.5	14,200
OHLMAN ST	S HARMON DR	INDIAN VILLAGE RD	EM + Thin Overlay (1.5 - 2.0)	616	0.1	15,700
OHLMAN ST	W 4TH AVE	W 3RD AVE	EM + Thin Overlay (1.5 - 2.0)	346	0.1	11,200
PEBBLE BEACH RD	N OHLMAN ST	THUNDERBIRD DR	EM + Thin Overlay (1.5 - 2.0)	1176	0.2	48,300
PEPSI ST	W ASH AVE	EOP	EM + Thin Overlay (1.5 - 2.0)	120	0.0	3,300
PEPSI ST	S PEPSI ST	DS@316FT	Surface Trtmnt / Chip Seal	125	0.0	700
PHEASANT ST	W 23RD AVE	W 20TH AVE	Surface Trtmnt / Chip Seal	1155	0.2	9,000
PINE AVE	S MINNESOTA ST	S WISCONSIN ST	Surface Trtmnt / Chip Seal	522	0.1	3,700
PINE AVE	EOP	S ROWLEY ST	EM + Thin Overlay (1.5 - 2.0)	176	0.0	6,100
PINE HURST AVE	N OHLMAN ST	AUGUSTA AVE	Surface Trtmnt / Chip Seal	207	0.0	1,700
PRAIRIE LN	PRAIRIE LN	DS@243FT	EM + Thin Overlay (1.5 - 2.0)	244	0.0	7,300
RAILROAD ST	W RAILROAD ST	S LAWLER ST	EM + Thin Overlay (1.5 - 2.0)	394	0.1	13,100
RAILROAD ST	S LAWLER ST	S KIMBALL ST	EM + Thin Overlay (1.5 - 2.0)	394	0.1	14,900
REID AVE	S DUFF ST	S ROWLEY ST	EM/FWM + Mod Olay (2.0 - 3.0)	371	0.1	13,800
RIDGE RD	SUMMIT DR	N FOSTER ST	EM/FWM + Mod Olay (2.0 - 3.0)	266	0.1	10,700
ROSELANDER ST	DS@234FT	BRIDLE DR	EM + Thin Overlay (1.5 - 2.0)	110	0.0	2,800
ROSELANDER ST	ROSELANDER ST	DS@234FT	EM/FWM + Mod Olay (2.0 - 3.0)	234	0.0	8,700
ROWLEY ST	W 7TH AVE	W 6TH AVE	Surface Trtmnt / Chip Seal	346	0.1	2,000
ROWLEY ST	W 6TH AVE	W 5TH AVE	EM + Thin Overlay (1.5 - 2.0)	367	0.1	14,100
ROWLEY ST	W 2ND AVE	W 1ST AVE	EM + Thin Overlay (1.5 - 2.0)	340	0.1	12,500
ROWLEY ST	SD HWY 90 L	W MILAN AVE	Surface Trtmnt / Chip Seal	355	0.1	5,400
ROWLEY ST	W HURST AVE	W MITCHELL BLVD	EM + Thin Overlay (1.5 - 2.0)	381	0.1	14,400
SERVICE ROAD	SD HWY 90 EL	SERVICE ROAD	EM + Thin Overlay (1.5 - 2.0)	145	0.0	5,300
SNEAD AVE	TIGER ST	EOP	Surface Trtmnt / Chip Seal	611	0.1	3,500
SPRUCE ST	S MENTZER ST	CABELA DR	EM + Thin Overlay (1.5 - 2.0)	473	0.1	16,200
SPRUCE ST	49' E of S ROWLEY ST	URBANA DR	Surface Trtmnt / Chip Seal	1535	0.3	6,800
SPRUCE ST	DS@242FT	S MILLER AVE	EM + Thin Overlay (1.5 - 2.0)	2404	0.5	82,800
SPRUCE ST	S MILLER AVE	S WISCONSIN ST	EM + Thin Overlay (1.5 - 2.0)	1309	0.2	43,600
TAYLOR ST	E HANSON AVE	E ASH AVE	EM + Thin Overlay (1.5 - 2.0)	337	0.1	11,700
TAYLOR ST	E ASH AVE	E BIRCH AVE	Surface Trtmnt / Chip Seal	375	0.1	2,800
TAYLOR ST	E BIRCH AVE	EOP	EM + Thin Overlay (1.5 - 2.0)	325	0.1	11,200
TIGER ST	SD HWY 38 P	E HANSON AVE	Surface Trtmnt / Chip Seal	362	0.1	2,000
TIGER ST	E BIRCH AVE	SNEAD AVE	EM + Thin Overlay (1.5 - 2.0)	244	0.0	8,700
UNIVERSITY BLVD	DS@322FT	W MCCABE AVE	EM + Thin Overlay (1.5 - 2.0)	196	0.0	7,800
UNIVERSITY BLVD	W MCCABE AVE	W NINDE AVE	EM + Thin Overlay (1.5 - 2.0)	317	0.1	10,200
UNIVERSITY BLVD	W WILLIAMS AVE	W HURST AVE	Surface Trtmnt / Chip Seal	472	0.1	3,300
UNKNOWN	UNKNOWN	UNKNOWN	EM + Thin Overlay (1.5 - 2.0)	324	0.1	7,900
UNKNOWN	UNKNOWN	UNKNOWN	EM + Thin Overlay (1.5 - 2.0)	315	0.1	8,700
UNKNOWN	UNKNOWN	UNKNOWN	Surface Trtmnt / Chip Seal	187	0.0	1,000
WILDWOOD AVE	N KIMBALL ST	N LANGDON ST	EM + Thin Overlay (1.5 - 2.0)	388	0.1	12,900
WILLIAMS AVE	SUNNYSIDE CT	S ANDERSON ST	EM + Thin Overlay (1.5 - 2.0)	313	0.1	8,300
WILLIAMS AVE	S ANDERSON ST	ANDERSON ST	EM + Thin Overlay (1.5 - 2.0)	124	0.0	3,300
WINSOR ST	E 8TH AVE	E 7TH AVE	Surface Trtmnt / Chip Seal	358	0.1	3,300
WINSOR ST	E 7TH AVE	E 6TH AVE	EM + Thin Overlay (1.5 - 2.0)	378	0.1	16,400
WINSOR ST	E 6TH AVE	E 5TH AVE	EM + Thin Overlay (1.5 - 2.0)	359	0.1	13,100
WINSOR ST	E 3RD AVE	E 2ND AVE	Surface Trtmnt / Chip Seal	373	0.1	2,200
WISCONSIN ST	W 7TH AVE	W 6TH AVE	Surface Trtmnt / Chip Seal	359	0.1	2,200
WISCONSIN ST	W 2ND AVE	W 1ST AVE	EM + Thin Overlay (1.5 - 2.0)	360	0.1	10,800
WISCONSIN ST	W 10TH AVE	W 9TH AVE	EM + Thin Overlay (1.5 - 2.0)	357	0.1	14,900
WISCONSIN ST	W 18TH AVE	W 16TH AVE	EM + Thin Overlay (1.5 - 2.0)	741	0.1	22,200
WISCONSIN ST	W 16TH AVE	W 15TH AVE	Surface Trtmnt / Chip Seal	511	0.1	3,100
WISCONSIN ST	W NORWAY AVE	DS@469FT	EM + Thin Overlay (1.5 - 2.0)	254	0.0	5,900

Table X.X Major Rehabilitation Identified through the Pavement Condition Analysis

Street	From Street	To Street	Rehabilitation Activity	Length (ft)	Length (mi)	Cost ($)
10TH AVE	N LAWLER ST	N KIMBALL ST	Surf Rmvl + Base Rehab + Olay	381	0.1	41,200
10TH AVE	N KIMBALL ST	N LANGDON ST	FWM + Thick Olay (> 2.0 - 3.0)	352	0.1	22,800
10TH AVE	N LANGDON ST	EOP	Surf Rmvl + Base Rehab + Olay	306	0.1	33,800
10TH AVE	N SANBORN BLVD	N DUFF ST	FWM + Thick Olay (> 2.0 - 3.0)	382	0.1	23,800
10TH AVE	N DUFF ST	N ROWLEY ST	FWM + Thick Olay (> 2.0 - 3.0)	355	0.1	21,400
10TH AVE	N ROWLEY ST	E 10TH AVE	FWM + Thick Olay (> 2.0 - 3.0)	360	0.1	16,300
11TH AVE	N MINNESOTA ST	N WISCONSIN ST	ACP Full Depth Reconstruction	362	0.1	70,500
11TH AVE	N WISCONSIN ST	N EDMUNDS ST	EM/FWM + Mod Olay (2.0 - 3.0)	364	0.1	11,300
11TH AVE	N EDMUNDS ST	N SANBORN BLVD	EM/FWM + Mod Olay (2.0 - 3.0)	353	0.1	17,600
14TH AVE	N KIMBALL ST	N LANGDON ST	EM/FWM + Mod Olay (2.0 - 3.0)	351	0.1	19,100
14TH AVE	N LANGDON ST	N LANGDON ST	FWM + Thick Olay (> 2.0 - 3.0)	119	0.0	5,600
15TH AVE	N MAIN ST	N KIMBALL ST	Surf Rmvl + Base Rehab + Olay	779	0.1	99,100
16TH AVE	W 15TH AVE	N MINNESOTA ST	EM/FWM + Mod Olay (2.0 - 3.0)	1575	0.3	80,800
17TH AVE	W 18TH AVE	N MINNESOTA ST	FWM + Thick Olay (> 2.0 - 3.0)	577	0.1	35,900
18TH AVE	W 17TH AVE	N MINNESOTA ST	EM/FWM + Mod Olay (2.0 - 3.0)	685	0.1	35,200
18TH AVE	N MINNESOTA ST	N WISCONSIN ST	FWM + Thick Olay (> 2.0 - 3.0)	356	0.1	9,400
19TH AVE	N SANBORN BLVD	N SANBORN BLVD	EM/FWM + Mod Olay (2.0 - 3.0)	561	0.1	19,200
1ST AVE	S LANGDON ST	S DAVISON ST	FWM + Thick Olay (> 2.0 - 3.0)	363	0.1	23,300
1ST AVE	S DAVISON ST	N BURR ST	FWM + Thick Olay (> 2.0 - 3.0)	362	0.1	31,000
1ST AVE	N MENTZER ST	N GAMBLE ST	EM/FWM + Mod Olay (2.0 - 3.0)	564	0.1	26,300
1ST AVE	S HUNTER ST	S FOSTER ST	EM/FWM + Mod Olay (2.0 - 3.0)	371	0.1	17,300
21ST AVE	PHEASANT ST	QUAIL ST	FWM + Thick Olay (> 2.0 - 3.0)	518	0.1	35,200
23RD AVE	SD HWY 37	N KIMBALL ST	Surf Rmvl + Base Rehab + Olay	721	0.1	89,400
23RD AVE	N KIMBALL ST	N LANGDON ST	FWM + Thick Olay (> 2.0 - 3.0)	283	0.1	22,700
251 ST	SD HWY 37 N	DS@411FT	Surf Rmvl + Base Rehab + Olay	387	0.1	32,400
251 ST	DS@411FT	DS@2192FT	EM/FWM + Mod Olay (2.0 - 3.0)	1781	0.3	80,300
253 ST	N LYLE ST	N OHLMAN	EM/FWM + Mod Olay (2.0 - 3.0)	396	0.1	12,300
3RD AVE	W 3RD AVE	N LAWLER ST	EM/FWM + Mod Olay (2.0 - 3.0)	404	0.1	18,200
3RD AVE	N LAWLER ST	N KIMBALL ST	EM/FWM + Mod Olay (2.0 - 3.0)	366	0.1	16,500
3RD AVE	N DAVISON ST	N BURR ST	EM/FWM + Mod Olay (2.0 - 3.0)	357	0.1	17,700
3RD AVE	N CAPITAL ST	N WINSOR ST	EM/FWM + Mod Olay (2.0 - 3.0)	380	0.1	14,200
3RD AVE	N WINSOR ST	N MENTZER ST	EM/FWM + Mod Olay (2.0 - 3.0)	336	0.1	14,600
3RD AVE	N GAMBLE ST	N KITTRIDGE ST	EM/FWM + Mod Olay (2.0 - 3.0)	540	0.1	31,700
3RD AVE	N FOSTER ST	N MARSHALL ST	EM/FWM + Mod Olay (2.0 - 3.0)	358	0.1	13,400
3RD AVE	N TAYLOR ST	N WALLACE ST	EM/FWM + Mod Olay (2.0 - 3.0)	361	0.1	15,700
3RD AVE	N ROWLEY ST	E 3RD AVE	FWM + Thick Olay (> 2.0 - 3.0)	370	0.1	23,800
4TH AVE	W 4TH AVE	N LAWLER ST	EM/FWM + Mod Olay (2.0 - 3.0)	394	0.1	17,800
4TH AVE	N LAWLER ST	N KIMBALL ST	EM/FWM + Mod Olay (2.0 - 3.0)	375	0.1	14,600
4TH AVE	N BURR ST	N CAPITAL ST	EM/FWM + Mod Olay (2.0 - 3.0)	413	0.1	22,500
4TH AVE	N MARSHALL ST	N TAYLOR ST	EM/FWM + Mod Olay (2.0 - 3.0)	383	0.1	20,100
4TH AVE	N TAYLOR ST	N WALLACE ST	EM/FWM + Mod Olay (2.0 - 3.0)	357	0.1	15,500
4TH AVE	N WALLACE ST	N CALHOUN ST	FWM + Thick Olay (> 2.0 - 3.0)	364	0.1	26,100
4TH AVE	N OHLMAN ST	SD HWY 37	Surf Rmvl + Base Rehab + Olay	378	0.1	27,300
4TH AVE	N ISADORE ST	N IOWA ST	EM/FWM + Mod Olay (2.0 - 3.0)	349	0.1	17,400
4TH AVE	N MINNESOTA ST	N WISCONSIN ST	EM/FWM + Mod Olay (2.0 - 3.0)	346	0.1	16,700
4TH AVE	N WISCONSIN ST	N EDMUNDS ST	FWM + Thick Olay (> 2.0 - 3.0)	383	0.1	15,200
4TH AVE	N EDMUNDS ST	N SANBORN BLVD	EM/FWM + Mod Olay (2.0 - 3.0)	342	0.1	10,600
4TH AVE	N SANBORN BLVD	N DUFF ST	FWM + Thick Olay (> 2.0 - 3.0)	386	0.1	21,100
5TH AVE	N BURR ST	N CAPITAL ST	Surf Rmvl + Base Rehab + Olay	418	0.1	38,900
5TH AVE	N CAPITAL ST	N WINSOR ST	Surf Rmvl + Base Rehab + Olay	368	0.1	30,800
5TH AVE	N WINSOR ST	N MENTZER ST	FWM + Thick Olay (> 2.0 - 3.0)	352	0.1	24,600
5TH AVE	N MENTZER ST	N GAMBLE ST	Surf Rmvl + Base Rehab + Olay	566	0.1	60,500
5TH AVE	N GAMBLE ST	N KITTRIDGE ST	Surf Rmvl + Base Rehab + Olay	539	0.1	42,000
5TH AVE	N KITTRIDGE ST	N HUNTER ST	FWM + Thick Olay (> 2.0 - 3.0)	367	0.1	20,100
5TH AVE	N HUNTER ST	N FOSTER ST	EM/FWM + Mod Olay (2.0 - 3.0)	368	0.1	16,600
5TH AVE	N MARSHALL ST	N CALHOUN ST	EM/FWM + Mod Olay (2.0 - 3.0)	1097	0.2	46,100
5TH AVE	EOP	N EDGERTON ST	FWM + Thick Olay (> 2.0 - 3.0)	601	0.1	39,800
5TH AVE	N ISADORE ST	N IOWA ST	Surf Rmvl + Base Rehab + Olay	354	0.1	27,600
5TH AVE	N MONTANA ST	N MINNESOTA ST	FWM + Thick Olay (> 2.0 - 3.0)	393	0.1	26,700
5TH AVE	N WISCONSIN ST	N EDMUNDS ST	FWM + Thick Olay (> 2.0 - 3.0)	374	0.1	22,600
5TH AVE	N EDMUNDS ST	N SANBORN BLVD	EM/FWM + Mod Olay (2.0 - 3.0)	344	0.1	11,800
5TH AVE	N SANBORN BLVD	N DUFF ST	Surf Rmvl + Base Rehab + Olay	383	0.1	34,300
5TH AVE	N DUFF ST	N ROWLEY ST	Surf Rmvl + Base Rehab + Olay	354	0.1	30,700
5TH AVE	N ROWLEY ST	E 5TH AVE	Surf Rmvl + Base Rehab + Olay	378	0.1	26,200
6TH AVE	N LAWLER ST	N KIMBALL ST	EM/FWM + Mod Olay (2.0 - 3.0)	369	0.1	15,500
6TH AVE	N KIMBALL ST	N LANGDON ST	FWM + Thick Olay (> 2.0 - 3.0)	331	0.1	13,800
6TH AVE	N LANGDON ST	N DAVISON ST	FWM + Thick Olay (> 2.0 - 3.0)	374	0.1	19,100
6TH AVE	N BURR ST	N CAPITAL ST	EM/FWM + Mod Olay (2.0 - 3.0)	408	0.1	18,400
6TH AVE	N CAPITAL ST	N WINSOR ST	EM/FWM + Mod Olay (2.0 - 3.0)	373	0.1	16,800
6TH AVE	N WINSOR ST	N MENTZER ST	EM/FWM + Mod Olay (2.0 - 3.0)	361	0.1	18,800
6TH AVE	N EDGERTON ST	N JUANITA ST	FWM + Thick Olay (> 2.0 - 3.0)	391	0.1	17,700
6TH AVE	N ISADORE ST	N IOWA ST	EM/FWM + Mod Olay (2.0 - 3.0)	354	0.1	13,200
6TH AVE	N IOWA ST	N MONTANA ST	EM/FWM + Mod Olay (2.0 - 3.0)	485	0.1	28,200
6TH AVE	N MONTANA ST	N MINNESOTA ST	FWM + Thick Olay (> 2.0 - 3.0)	365	0.1	13,800
6TH AVE	N MINNESOTA ST	N WISCONSIN ST	EM/FWM + Mod Olay (2.0 - 3.0)	368	0.1	13,700
6TH AVE	N WISCONSIN ST	N EDMUNDS ST	EM/FWM + Mod Olay (2.0 - 3.0)	365	0.1	11,900
6TH AVE	N EDMUNDS ST	N SANBORN BLVD	FWM + Thick Olay (> 2.0 - 3.0)	348	0.1	23,700
7TH AVE	W 7TH AVE	N LAWLER ST	FWM + Thick Olay (> 2.0 - 3.0)	406	0.1	19,900
7TH AVE	N LAWLER ST	N KIMBALL ST	EM/FWM + Mod Olay (2.0 - 3.0)	362	0.1	19,900
7TH AVE	N CAPITAL ST	N WINSOR ST	EM/FWM + Mod Olay (2.0 - 3.0)	372	0.1	16,200
7TH AVE	N WINSOR ST	N MENTZER ST	Surf Rmvl + Base Rehab + Olay	358	0.1	37,200
7TH AVE	N MENTZER ST	N GAMBLE ST	FWM + Thick Olay (> 2.0 - 3.0)	568	0.1	38,600
7TH AVE	N GAMBLE ST	N KITTRIDGE ST	Surf Rmvl + Base Rehab + Olay	531	0.1	73,700
7TH AVE	N KITTRIDGE ST	N HUNTER ST	EM/FWM + Mod Olay (2.0 - 3.0)	376	0.1	16,400
7TH AVE	N HUNTER ST	N FOSTER ST	EM/FWM + Mod Olay (2.0 - 3.0)	366	0.1	15,900
8TH AVE	N MENTZER ST	N MENTZER ST	EM/FWM + Mod Olay (2.0 - 3.0)	82	0.0	3,700
8TH AVE	N FOSTER ST	ROLAND LN	FWM + Thick Olay (> 2.0 - 3.0)	371	0.1	21,000
8TH AVE	ROLAND LN	FIRESTEEL DR	FWM + Thick Olay (> 2.0 - 3.0)	439	0.1	23,200
8TH AVE	FIRESTEEL DR	DS@336FT	FWM + Thick Olay (> 2.0 - 3.0)	336	0.1	19,100
8TH AVE	N ROWLEY ST	N MAIN ST	FWM + Thick Olay (> 2.0 - 3.0)	362	0.1	24,600
9TH AVE	W 9TH AVE	N LAWLER ST	FWM + Thick Olay (> 2.0 - 3.0)	391	0.1	46,900

Table X.X Major Rehabilitation Identified through the Pavement Condition Analysis

Street	From Street	To Street	Rehabilitation Activity	Length (ft)	Length (mi)	Cost ($)
9TH AVE	N LAWLER ST	N KIMBALL ST	FWM + Thick Olay (> 2.0 - 3.0)	379	0.1	20,000
9TH AVE	N KIMBALL ST	N LANGDON ST	EM/FWM + Mod Olay (2.0 - 3.0)	347	0.1	15,600
9TH AVE	N LANGDON ST	EOP	Surf Rmvl + Base Rehab + Olay	1099	0.2	88,900
AIRPORT RD	HANGAR RD	INDUSTRIAL RD	EM/FWM + Mod Olay (2.0 - 3.0)	1613	0.3	70,200
AIRPORT RD	INDUSTRIAL RD	NATIONAL GUARD RD	FWM + Thick Olay (> 2.0 - 3.0)	1345	0.3	63,500
ANDERSON ST	W ELM AVE	SD HWY 90 L	FWM + Thick Olay (> 2.0 - 3.0)	560	0.1	30,700
ANDERSON ST	SD HWY 90 L	DS@637FT	EM/FWM + Mod Olay (2.0 - 3.0)	607	0.1	26,400
ANDERSON ST	DS@637FT	W MCCABE AVE	FWM + Thick Olay (> 2.0 - 3.0)	168	0.0	9,800
ANDERSON ST	W HANSON AVE	W ASH AVE	EM/FWM + Mod Olay (2.0 - 3.0)	366	0.1	13,600
ANDERSON ST	W ASH AVE	W BIRCH AVE	FWM + Thick Olay (> 2.0 - 3.0)	334	0.1	35,500
ANDERSON ST	W BIRCH AVE	PALMER PL	FWM + Thick Olay (> 2.0 - 3.0)	316	0.1	21,300
ANDERSON ST	PALMER PL	W CEDAR AVE	FWM + Thick Olay (> 2.0 - 3.0)	350	0.1	22,300
ANDERSON ST	W CEDAR AVE	W ELM AVE	Surf Rmvl + Base Rehab + Olay	525	0.1	37,900
ANDERSON ST	W WILLIAMS AVE	W STATE AVE	EM/FWM + Mod Olay (2.0 - 3.0)	320	0.1	13,400
ANDREWS ST	MCGOVERN AVE	S DUFF ST	Surf Rmvl + Base Rehab + Olay	421	0.1	28,000
ANDREWS ST	S DUFF ST	S ROWLEY ST	FWM + Thick Olay (> 2.0 - 3.0)	378	0.1	25,700
ANDREWS ST	S ROWLEY ST	S MAIN ST	Surf Rmvl + Base Rehab + Olay	358	0.1	24,800
ASH AVE	S MARSHALL ST	S TAYLOR ST	FWM + Thick Olay (> 2.0 - 3.0)	376	0.1	21,300
ASH AVE	S TAYLOR ST	S WALLACE ST	EM/FWM + Mod Olay (2.0 - 3.0)	511	0.1	23,100
ASH AVE	S PEPSI ST	JONES ST	FWM + Thick Olay (> 2.0 - 3.0)	1119	0.2	42,300
ASH AVE	JONES ST	SD HWY 37	EM/FWM + Mod Olay (2.0 - 3.0)	537	0.1	16,700
ASH AVE	SD HWY 37	S DOBSON ST	EM/FWM + Mod Olay (2.0 - 3.0)	806	0.2	25,100
ASH AVE	S DOBSON ST	S EDGERTON ST	EM/FWM + Mod Olay (2.0 - 3.0)	395	0.1	21,500
ASH AVE	S EDGERTON ST	S ANDERSON ST	FWM + Thick Olay (> 2.0 - 3.0)	267	0.1	36,300
ASH AVE	S ANDERSON ST	S ANDERSON ST	EM/FWM + Mod Olay (2.0 - 3.0)	167	0.0	8,800
ASH AVE	S ISADORE ST	S MONTANA ST	EM/FWM + Mod Olay (2.0 - 3.0)	844	0.2	55,100
ASH AVE	S MONTANA ST	S MINNESOTA ST	Surf Rmvl + Base Rehab + Olay	373	0.1	44,500
ASH AVE	S MINNESOTA ST	S WISCONSIN ST	FWM + Thick Olay (> 2.0 - 3.0)	347	0.1	24,900
ASH AVE	S WISCONSIN ST	S EDMUNDS ST	EM/FWM + Mod Olay (2.0 - 3.0)	380	0.1	13,600
AUGUSTA AVE	PINE HURST AVE	THUNDERBIRD DR	EM/FWM + Mod Olay (2.0 - 3.0)	1187	0.2	48,000
AUSTEN ST	IVERSON AVE	SD HWY 38	FWM + Thick Olay (> 2.0 - 3.0)	340	0.1	12,200
BAY HILL	BAY HILL	DS@226FT	Surf Rmvl + Base Rehab + Olay	226	0.0	13,100
BIRCH AVE	S MENTZER ST	S GAMBLE ST	EM/FWM + Mod Olay (2.0 - 3.0)	567	0.1	29,100
BIRCH AVE	S FOSTER ST	S MARSHALL ST	FWM + Thick Olay (> 2.0 - 3.0)	336	0.1	20,300
BIRCH AVE	S MARSHALL ST	S TAYLOR ST	EM/FWM + Mod Olay (2.0 - 3.0)	214	0.0	9,700
BIRCH AVE	S TAYLOR ST	S WALLACE ST	EM/FWM + Mod Olay (2.0 - 3.0)	521	0.1	30,300
BIRCH AVE	S WALLACE ST	CHARLES ST	Surf Rmvl + Base Rehab + Olay	278	0.1	31,800
BIRCH AVE	CHARLES ST	CHRISTINE ST	Surf Rmvl + Base Rehab + Olay	300	0.1	29,500
BIRCH AVE	TIGER ST	EOP	FWM + Thick Olay (> 2.0 - 3.0)	640	0.1	39,900
BIRCH AVE	S DOBSON ST	S EDGERTON ST	EM/FWM + Mod Olay (2.0 - 3.0)	503	0.1	15,700
BIRCH AVE	S ANDERSON ST	S ISADORE ST	FWM + Thick Olay (> 2.0 - 3.0)	504	0.1	19,000
BIRCH AVE	S ISADORE ST	S IOWA ST	FWM + Thick Olay (> 2.0 - 3.0)	551	0.1	26,000
BIRCH AVE	S IOWA ST	S MONTANA ST	EM/FWM + Mod Olay (2.0 - 3.0)	306	0.1	12,400
BIRCH AVE	S WISCONSIN ST	S EDMUNDS ST	EM/FWM + Mod Olay (2.0 - 3.0)	373	0.1	23,200
BIRCH AVE	S SANBORN BLVD	S DUFF ST	FWM + Thick Olay (> 2.0 - 3.0)	380	0.1	17,900
BRIDLE DR	ROSELANDER ST	DS@255FT	EM/FWM + Mod Olay (2.0 - 3.0)	255	0.0	13,500
BUDS CT	EOP	QUIETT ST	EM/FWM + Mod Olay (2.0 - 3.0)	174	0.0	5,900
BURR ST	E 12TH AVE	E 11TH AVE	EM/FWM + Mod Olay (2.0 - 3.0)	375	0.1	8,200
BURR ST	EOP	E 7TH AVE	FWM + Thick Olay (> 2.0 - 3.0)	194	0.0	11,000
BURR ST	E 7TH AVE	E 6TH AVE	EM/FWM + Mod Olay (2.0 - 3.0)	409	0.1	19,700
BURR ST	E 6TH AVE	E 5TH AVE	FWM + Thick Olay (> 2.0 - 3.0)	344	0.1	19,500
BURR ST	E 4TH AVE	E 3RD AVE	EM/FWM + Mod Olay (2.0 - 3.0)	372	0.1	17,900
BURR ST	E 3RD AVE	E 2ND AVE	EM/FWM + Mod Olay (2.0 - 3.0)	356	0.1	16,600
BURR ST	E 2ND AVE	E 1ST AVE	FWM + Thick Olay (> 2.0 - 3.0)	357	0.1	19,600
BURR ST	E 1ST AVE	E HANSON AVE	EM/FWM + Mod Olay (2.0 - 3.0)	391	0.1	23,700
BURR ST	E DOUGLAS AVE	E ELM AVE	EM/FWM + Mod Olay (2.0 - 3.0)	355	0.1	18,800
BURR ST	E ELM AVE	SD HWY 90 L	Surf Rmvl + Base Rehab + Olay	544	0.1	51,800
CAPITAL ST	E 7TH AVE	E 6TH AVE	FWM + Thick Olay (> 2.0 - 3.0)	409	0.1	23,200
CAPITAL ST	E 6TH AVE	E 5TH AVE	FWM + Thick Olay (> 2.0 - 3.0)	337	0.1	18,400
CAPITAL ST	E 5TH AVE	E 4TH AVE	FWM + Thick Olay (> 2.0 - 3.0)	375	0.1	22,600
CAPITAL ST	E 4TH AVE	E 3RD AVE	Surf Rmvl + Base Rehab + Olay	360	0.1	40,800
CAPITAL ST	E 3RD AVE	E 2ND AVE	FWM + Thick Olay (> 2.0 - 3.0)	367	0.1	28,500
CAPITAL ST	E 1ST AVE	E HANSON AVE	FWM + Thick Olay (> 2.0 - 3.0)	389	0.1	26,400
CARL ST	WINSOR COURT	SD HWY 37	EM/FWM + Mod Olay (2.0 - 3.0)	2215	0.4	68,900
CEDAR AVE	JONES ST	SD HWY 37	EM/FWM + Mod Olay (2.0 - 3.0)	665	0.1	25,900
CEDAR AVE	SD HWY 37	S DOBSON ST	FWM + Thick Olay (> 2.0 - 3.0)	635	0.1	38,400
CEDAR AVE	S DOBSON ST	S EDGERTON ST	FWM + Thick Olay (> 2.0 - 3.0)	312	0.1	18,800
CEDAR AVE	S EDGERTON ST	S EDGERTON ST	EM/FWM + Mod Olay (2.0 - 3.0)	187	0.0	10,100
CEDAR AVE	S JUANITA ST	S ISADORE ST	EM/FWM + Mod Olay (2.0 - 3.0)	359	0.1	20,100
CEDAR AVE	S ISADORE ST	PALMER PL	EM/FWM + Mod Olay (2.0 - 3.0)	83	0.0	5,300
CEDAR AVE	PALMER PL	S IOWA ST	EM/FWM + Mod Olay (2.0 - 3.0)	364	0.1	16,400
CEDAR AVE	S IOWA ST	S MONTANA ST	EM/FWM + Mod Olay (2.0 - 3.0)	355	0.1	17,700
CEDAR AVE	S MONTANA ST	S MINNESOTA ST	EM/FWM + Mod Olay (2.0 - 3.0)	371	0.1	19,600
CEDAR AVE	S MINNESOTA ST	S WISCONSIN ST	EM/FWM + Mod Olay (2.0 - 3.0)	343	0.1	17,100
CEDAR AVE	S WISCONSIN ST	S EDMUNDS ST	EM/FWM + Mod Olay (2.0 - 3.0)	395	0.1	12,300
CEDAR AVE	S EDMUNDS ST	S SANBORN BLVD	EM/FWM + Mod Olay (2.0 - 3.0)	346	0.1	17,800
CEDAR AVE	S SANBORN BLVD	S DUFF ST	EM/FWM + Mod Olay (2.0 - 3.0)	387	0.1	19,900
CEDAR AVE	S DUFF ST	S ROWLEY ST	Surf Rmvl + Base Rehab + Olay	344	0.1	23,900
CHARLES AVE	CHRISTINE ST	TIGER ST	EM/FWM + Mod Olay (2.0 - 3.0)	303	0.1	10,400
CHRISTINE ST	E HANSON AVE	DS@585FT	FWM + Thick Olay (> 2.0 - 3.0)	575	0.1	38,000
CIRCLE DR	RIDGE RD	DS@296FT	FWM + Thick Olay (> 2.0 - 3.0)	281	0.1	17,000
CIRCLE DR	DS@296FT	CIRCLE DR	Surf Rmvl + Base Rehab + Olay	249	0.0	25,200
COMMERCE ST	EOP	W 15TH AVE	EM/FWM + Mod Olay (2.0 - 3.0)	452	0.1	24,600
COUNTRY DR	DS@367FT	N OHLMAN ST	Surf Rmvl + Base Rehab + Olay	353	0.1	19,400
COUNTRY DR	N OHLMAN ST	THUNDERBIRD DR	EM/FWM + Mod Olay (2.0 - 3.0)	1147	0.2	33,900
COUNTRY DR	THUNDERBIRD DR	EOP	FWM + Thick Olay (> 2.0 - 3.0)	164	0.0	6,200
COURT MERRILL	S EDMUNDS ST	W MILAN AVE	EM/FWM + Mod Olay (2.0 - 3.0)	344	0.1	18,700
DAILY DR	DAILEY ST	407 AVE	FWM + Thick Olay (> 2.0 - 3.0)	1555	0.3	91,000
DAVISON ST	GREENRIDGE LN	FAIROAKS AVE	EM/FWM + Mod Olay (2.0 - 3.0)	721	0.1	41,500
DAVISON ST	E 12TH AVE	E 11TH AVE	FWM + Thick Olay (> 2.0 - 3.0)	377	0.1	12,800
DAVISON ST	EOP	E 7TH AVE	FWM + Thick Olay (> 2.0 - 3.0)	199	0.0	11,700

Table X.X Major Rehabilitation Identified through the Pavement Condition Analysis

Street	From Street	To Street	Rehabilitation Activity	Length (ft)	Length (mi)	Cost ($)
DAVISON ST	E 6TH AVE	E 5TH AVE	Surf Rmvl + Base Rehab + Olay	357	0.1	33,000
DAVISON ST	E 5TH AVE	E 4TH AVE	EM/FWM + Mod Olay (2.0 - 3.0)	378	0.1	23,600
DAVISON ST	E 4TH AVE	E 3RD AVE	Surf Rmvl + Base Rehab + Olay	363	0.1	28,300
DAVISON ST	E 3RD AVE	E 2ND AVE	FWM + Thick Olay (> 2.0 - 3.0)	373	0.1	21,800
DAVISON ST	E 2ND AVE	S DAVISON ST	FWM + Thick Olay (> 2.0 - 3.0)	337	0.1	19,700
DAVISON ST	N DAVISON ST	E HANSON AVE	Surf Rmvl + Base Rehab + Olay	394	0.1	39,800
DAVISON ST	E HANSON AVE	E ASH AVE	EM/FWM + Mod Olay (2.0 - 3.0)	346	0.1	17,800
DAVISON ST	EOP	E DOUGLAS AVE	Surf Rmvl + Base Rehab + Olay	192	0.0	14,400
DAVISON ST	E DOUGLAS AVE	E ELM AVE	FWM + Thick Olay (> 2.0 - 3.0)	372	0.1	19,000
DAVISON ST	E ELM AVE	SD HWY 90 L	FWM + Thick Olay (> 2.0 - 3.0)	521	0.1	26,600
DEAN DR	DORIS DR	SD HWY 38	EM/FWM + Mod Olay (2.0 - 3.0)	2331	0.4	76,100
DOBSON ST	W HANSON AVE	W ASH AVE	EM/FWM + Mod Olay (2.0 - 3.0)	376	0.1	24,200
DOBSON ST	W BIRCH AVE	PALMER PL	EM/FWM + Mod Olay (2.0 - 3.0)	363	0.1	14,700
DOUGLAS AVE	S LAWLER ST	S KIMBALL ST	FWM + Thick Olay (> 2.0 - 3.0)	373	0.1	21,800
DOUGLAS AVE	S KIMBALL ST	S LANGDON ST	FWM + Thick Olay (> 2.0 - 3.0)	363	0.1	31,200
DOUGLAS AVE	S LANGDON ST	S DAVISON ST	FWM + Thick Olay (> 2.0 - 3.0)	375	0.1	24,800
DOUGLAS AVE	S DAVISON ST	S BURR ST	Surf Rmvl + Base Rehab + Olay	339	0.1	35,200
DOUGLAS AVE	S IOWA ST	S MONTANA ST	FWM + Thick Olay (> 2.0 - 3.0)	368	0.1	18,100
DOUGLAS AVE	S MONTANA ST	S MINNESOTA ST	FWM + Thick Olay (> 2.0 - 3.0)	364	0.1	22,000
DOUGLAS AVE	S MINNESOTA ST	S WISCONSIN ST	EM/FWM + Mod Olay (2.0 - 3.0)	354	0.1	11,000
DOUGLAS AVE	S WISCONSIN ST	S EDMUNDS ST	FWM + Thick Olay (> 2.0 - 3.0)	391	0.1	22,900
DOUGLAS AVE	S EDMUNDS ST	S SANBORN BLVD	FWM + Thick Olay (> 2.0 - 3.0)	346	0.1	17,000
DOUGLAS AVE	S SANBORN BLVD	S DUFF ST	Surf Rmvl + Base Rehab + Olay	383	0.1	29,900
DOUGLAS AVE	S DUFF ST	S ROWLEY ST	FWM + Thick Olay (> 2.0 - 3.0)	349	0.1	18,500
DOUGLAS AVE	S ROWLEY ST	S MAIN ST	FWM + Thick Olay (> 2.0 - 3.0)	379	0.1	19,300
DUFF ST	W 6TH AVE	W 5TH AVE	EM/FWM + Mod Olay (2.0 - 3.0)	372	0.1	17,900
DUFF ST	W 2ND AVE	W 1ST AVE	EM/FWM + Mod Olay (2.0 - 3.0)	339	0.1	16,900
DUFF ST	W CEDAR AVE	W DOUGLAS AVE	EM/FWM + Mod Olay (2.0 - 3.0)	358	0.1	14,500
DUFF ST	W FIR AVE	SD HWY 90 L	EM/FWM + Mod Olay (2.0 - 3.0)	177	0.0	7,700
DUFF ST	SD HWY 90 L	W MILAN AVE	Surf Rmvl + Base Rehab + Olay	397	0.1	41,900
DUFF ST	W MILAN AVE	W MCCABE AVE	FWM + Thick Olay (> 2.0 - 3.0)	430	0.1	22,600
EDGERTON ST	W HANSON AVE	W ASH AVE	EM/FWM + Mod Olay (2.0 - 3.0)	369	0.1	15,500
EDGERTON ST	W ASH AVE	W BIRCH AVE	Surf Rmvl + Base Rehab + Olay	337	0.1	25,300
EDGERTON ST	W BIRCH AVE	PALMER PL	EM/FWM + Mod Olay (2.0 - 3.0)	365	0.1	14,800
EDGERTON ST	PALMER PL	W CEDAR AVE	EM/FWM + Mod Olay (2.0 - 3.0)	297	0.1	12,500
EDGERTON ST	SD HWY 90 L	W WILLIAMS AVE	EM/FWM + Mod Olay (2.0 - 3.0)	1298	0.2	99,500
EDMUNDS ST	W 14TH AVE	W 13TH AVE	EM/FWM + Mod Olay (2.0 - 3.0)	333	0.1	16,900
EDMUNDS ST	W 9TH AVE	EOP	EM/FWM + Mod Olay (2.0 - 3.0)	140	0.0	3,300
EDMUNDS ST	W 7TH AVE	W 6TH AVE	FWM + Thick Olay (> 2.0 - 3.0)	371	0.1	11,900
EDMUNDS ST	W 6TH AVE	W 5TH AVE	FWM + Thick Olay (> 2.0 - 3.0)	367	0.1	21,500
EDMUNDS ST	W 5TH AVE	W 4TH AVE	FWM + Thick Olay (> 2.0 - 3.0)	350	0.1	19,800
EDMUNDS ST	W 4TH AVE	W 3RD AVE	FWM + Thick Olay (> 2.0 - 3.0)	368	0.1	20,200
EDMUNDS ST	W 3RD AVE	W 2ND AVE	Surf Rmvl + Base Rehab + Olay	373	0.1	35,600
EDMUNDS ST	W 2ND AVE	W 1ST AVE	FWM + Thick Olay (> 2.0 - 3.0)	361	0.1	22,500
EDMUNDS ST	W ASH AVE	W BIRCH AVE	FWM + Thick Olay (> 2.0 - 3.0)	369	0.1	25,100
EDMUNDS ST	W BIRCH AVE	W CEDAR AVE	Surf Rmvl + Base Rehab + Olay	410	0.1	30,800
EDMUNDS ST	W CEDAR AVE	W DOUGLAS AVE	Surf Rmvl + Base Rehab + Olay	357	0.1	26,800
EDMUNDS ST	W DOUGLAS AVE	W ELM AVE	FWM + Thick Olay (> 2.0 - 3.0)	358	0.1	19,000
EDMUNDS ST	W ELM AVE	SD HWY 90 L	FWM + Thick Olay (> 2.0 - 3.0)	564	0.1	26,700
ELM AVE	S MAIN ST	S LAWLER ST	FWM + Thick Olay (> 2.0 - 3.0)	375	0.1	25,500
ELM AVE	S LAWLER ST	S KIMBALL ST	FWM + Thick Olay (> 2.0 - 3.0)	369	0.1	26,500
ELM AVE	S KIMBALL ST	S LANGDON ST	EM/FWM + Mod Olay (2.0 - 3.0)	376	0.1	20,500
ELM AVE	S LANGDON ST	S DAVISON ST	FWM + Thick Olay (> 2.0 - 3.0)	367	0.1	22,900
ELM AVE	S DAVISON ST	S BURR ST	EM/FWM + Mod Olay (2.0 - 3.0)	336	0.1	19,300
ELM AVE	SD HWY 37	DS@640FT	EM/FWM + Mod Olay (2.0 - 3.0)	608	0.1	23,700
ELM AVE	S SANBORN BLVD	S DUFF ST	EM/FWM + Mod Olay (2.0 - 3.0)	384	0.1	19,100
ELM AVE	S DUFF ST	S ROWLEY ST	FWM + Thick Olay (> 2.0 - 3.0)	354	0.1	17,400
ELM AVE	S ROWLEY ST	S MAIN ST	EM/FWM + Mod Olay (2.0 - 3.0)	369	0.1	18,400
FIR AVE	S SANBORN BLVD	S DUFF ST	EM/FWM + Mod Olay (2.0 - 3.0)	373	0.1	19,800
FIRESTEEL DR	N FOSTER ST	RIDGE LN	EM/FWM + Mod Olay (2.0 - 3.0)	754	0.1	39,900
FIRESTEEL DR	RIDGE LN	E 8TH AVE	FWM + Thick Olay (> 2.0 - 3.0)	696	0.1	43,400
FOSS PL	SD HWY 90 L	VINCENT PL	Surf Rmvl + Base Rehab + Olay	416	0.1	31,200
FOSS PL	VINCENT PL	W FOSS PL	FWM + Thick Olay (> 2.0 - 3.0)	47	0.0	2,300
FOSS PL	W FOSS PL	W MITCHELL BLVD	FWM + Thick Olay (> 2.0 - 3.0)	175	0.0	8,900
FOSTER ST	E 1ST AVE	E HANSON AVE	FWM + Thick Olay (> 2.0 - 3.0)	382	0.1	18,800
GAMBLE ST	E HANSON AVE	E ASH AVE	EM/FWM + Mod Olay (2.0 - 3.0)	341	0.1	14,800
GAMBLE ST	E ASH AVE	E BIRCH AVE	Surf Rmvl + Base Rehab + Olay	396	0.1	36,500
GOLF COURSE RD	N OHLMAN ST	EOP	EM/FWM + Mod Olay (2.0 - 3.0)	1003	0.2	54,600
GRASSLAND	CABELA DR	EOP	FWM + Thick Olay (> 2.0 - 3.0)	615	0.1	62,800
GREEN DR	N MAIN ST	N KIMBALL ST	FWM + Thick Olay (> 2.0 - 3.0)	775	0.1	49,800
GREEN DR	N KIMBALL ST	N LANGDON ST	Surf Rmvl + Base Rehab + Olay	365	0.1	34,800
GREENRIDGE LN	DS@369FT	GREENRIDGE LN	EM/FWM + Mod Olay (2.0 - 3.0)	290	0.1	20,300
HACKBERRY AVE	S LANGDON ST	S DAVISON ST	Surf Rmvl + Base Rehab + Olay	370	0.1	23,500
HACKBERRY AVE	S DAVISON ST	SD HWY 90 L	ACP Full Depth Reconstruction	380	0.1	73,900
HACKBERRY AVE	SD HWY 90 L	S CAPITAL ST	Surf Rmvl + Base Rehab + Olay	375	0.1	50,000
HANSON AVE	SD HWY 37	S DOBSON ST	EM/FWM + Mod Olay (2.0 - 3.0)	961	0.2	46,100
HANSON AVE	S DOBSON ST	S EDGERTON ST	FWM + Thick Olay (> 2.0 - 3.0)	174	0.0	10,200
HANSON AVE	S JUANITA ST	S ISADORE ST	FWM + Thick Olay (> 2.0 - 3.0)	333	0.1	15,700
HANSON AVE	S ISADORE ST	S MONTANA ST	FWM + Thick Olay (> 2.0 - 3.0)	839	0.2	41,200
HANSON AVE	S MONTANA ST	S MINNESOTA ST	EM/FWM + Mod Olay (2.0 - 3.0)	370	0.1	11,500
HARMON DR	407 AVE	LIVESAY LN	EM/FWM + Mod Olay (2.0 - 3.0)	1582	0.3	54,100
HARMON DR	W HARMON DR	N OHLMAN ST	FWM + Thick Olay (> 2.0 - 3.0)	5957	1.1	315,100
HURST AVE	S EDGERTON ST	S ANDERSON ST	EM/FWM + Mod Olay (2.0 - 3.0)	648	0.1	32,300
HURST AVE	S ANDERSON ST	S MILLER AVE	EM/FWM + Mod Olay (2.0 - 3.0)	678	0.1	31,600
HURST AVE	W UNIVERSITY BLVD	EOP	Surf Rmvl + Base Rehab + Olay	426	0.1	36,900
HURST AVE	S DUFF ST	S ROWLEY ST	FWM + Thick Olay (> 2.0 - 3.0)	362	0.1	21,200
INDUSTRIAL RD	TOWER RD	AIRPORT RD	EM/FWM + Mod Olay (2.0 - 3.0)	975	0.2	54,600
IOWA ST	W 6TH AVE	W 5TH AVE	FWM + Thick Olay (> 2.0 - 3.0)	388	0.1	22,100
IOWA ST	W 4TH AVE	W 3RD AVE	EM/FWM + Mod Olay (2.0 - 3.0)	363	0.1	14,700
IOWA ST	W 3RD AVE	W 2ND AVE	EM/FWM + Mod Olay (2.0 - 3.0)	364	0.1	14,700
IOWA ST	W BIRCH AVE	W CEDAR AVE	FWM + Thick Olay (> 2.0 - 3.0)	457	0.1	24,200

Table X.X Major Rehabilitation Identified through the Pavement Condition Analysis

Street	From Street	To Street	Rehabilitation Activity	Length (ft)	Length (mi)	Cost ($)
IOWA ST	W CEDAR AVE	W DOUGLAS AVE	EM/FWM + Mod Olay (2.0 - 3.0)	324	0.1	14,600
IOWA ST	W DOUGLAS AVE	W ELM AVE	FWM + Thick Olay (> 2.0 - 3.0)	357	0.1	19,600
IOWA ST	W ELM AVE	SD HWY 90 L	FWM + Thick Olay (> 2.0 - 3.0)	564	0.1	28,800
ISADORE ST	W HANSON AVE	W ASH AVE	EM/FWM + Mod Olay (2.0 - 3.0)	375	0.1	16,300
ISADORE ST	W ASH AVE	W BIRCH AVE	FWM + Thick Olay (> 2.0 - 3.0)	344	0.1	16,900
ISADORE ST	W CEDAR AVE	W ELM AVE	EM/FWM + Mod Olay (2.0 - 3.0)	608	0.1	26,500
IVERSON AVE	S BURR ST	AUSTEN ST	Surf Rmvl + Base Rehab + Olay	467	0.1	27,000
IVY AVE	SD HWY 90 L	S CAPITAL ST	EM/FWM + Mod Olay (2.0 - 3.0)	379	0.1	20,600
JOHNSON ST	W 4TH AVE	W 3RD AVE	FWM + Thick Olay (> 2.0 - 3.0)	372	0.1	15,400
JUANITA ST	W HANSON AVE	W ASH AVE	Surf Rmvl + Base Rehab + Olay	369	0.1	27,700
JUANITA ST	W CEDAR AVE	W ELM AVE	FWM + Thick Olay (> 2.0 - 3.0)	519	0.1	27,500
JUNIPER AVE	S MAIN ST	S LAWLER ST	EM/FWM + Mod Olay (2.0 - 3.0)	349	0.1	17,900
JUNIPER AVE	S KIMBALL ST	S DAVISON ST	FWM + Thick Olay (> 2.0 - 3.0)	728	0.1	45,400
JUNIPER AVE	DS@96FT	SD HWY 90 L	EM/FWM + Mod Olay (2.0 - 3.0)	393	0.1	16,500
KAY AVE	EOP	E NORWAY AVE	FWM + Thick Olay (> 2.0 - 3.0)	1177	0.2	75,600
KAY AVE	DS@97FT	EOP	EM/FWM + Mod Olay (2.0 - 3.0)	643	0.1	25,000
KIMBALL ST	E 23RD AVE	FAIROAKS AVE	EM/FWM + Mod Olay (2.0 - 3.0)	884	0.2	45,400
KIMBALL ST	FAIROAKS AVE	WILDWOOD AVE	EM/FWM + Mod Olay (2.0 - 3.0)	452	0.1	24,600
KIMBALL ST	WILDWOOD AVE	OAKMOND ST	Surf Rmvl + Base Rehab + Olay	342	0.1	34,500
KIMBALL ST	OAKMOND ST	GREEN DR	Surf Rmvl + Base Rehab + Olay	375	0.1	23,800
KIMBALL ST	GREEN DR	E 15TH AVE	FWM + Thick Olay (> 2.0 - 3.0)	576	0.1	35,900
KIMBALL ST	E 15TH AVE	E 15TH AVE	FWM + Thick Olay (> 2.0 - 3.0)	173	0.0	16,100
KIMBALL ST	E 15TH AVE	E 14TH AVE	Surf Rmvl + Base Rehab + Olay	310	0.1	18,800
KIMBALL ST	E 14TH AVE	E 13TH AVE	EM/FWM + Mod Olay (2.0 - 3.0)	355	0.1	23,300
KIMBALL ST	E 13TH AVE	E 12TH AVE	FWM + Thick Olay (> 2.0 - 3.0)	367	0.1	22,900
KIMBALL ST	E 12TH AVE	E 11TH AVE	Surf Rmvl + Base Rehab + Olay	373	0.1	32,400
KIMBALL ST	E 11TH AVE	E 10TH AVE	FWM + Thick Olay (> 2.0 - 3.0)	360	0.1	22,400
KIMBALL ST	E 10TH AVE	E 9TH AVE	Surf Rmvl + Base Rehab + Olay	365	0.1	34,800
KIMBALL ST	E 9TH AVE	E 7TH AVE	FWM + Thick Olay (> 2.0 - 3.0)	827	0.2	50,000
KIMBALL ST	E 6TH AVE	E 5TH AVE	Surf Rmvl + Base Rehab + Olay	361	0.1	35,500
KIMBALL ST	E 2ND AVE	E 1ST AVE	Surf Rmvl + Base Rehab + Olay	347	0.1	34,100
KIMBALL ST	E 1ST AVE	E HANSON AVE	Surf Rmvl + Base Rehab + Olay	400	0.1	33,500
KIMBALL ST	EOP	E DOUGLAS AVE	FWM + Thick Olay (> 2.0 - 3.0)	278	0.1	14,200
KIMBALL ST	E DOUGLAS AVE	E ELM AVE	FWM + Thick Olay (> 2.0 - 3.0)	370	0.1	25,100
KIMBALL ST	E ELM AVE	SD HWY 90 L	FWM + Thick Olay (> 2.0 - 3.0)	529	0.1	34,000
KIMBALL ST	E JUNIPER AVE	UNKNOWN	FWM + Thick Olay (> 2.0 - 3.0)	726	0.1	34,300
KIPPES COVE	KIPPES COVE (S)	W 23RD AVE	FWM + Thick Olay (> 2.0 - 3.0)	178	0.0	14,800
KIPPES COVE (E)	KIPPES COVE (NE)	KIPPES COVE (S)	Surf Rmvl + Base Rehab + Olay	286	0.1	36,300
KIPPES COVE (N)	KIPPES COVE (W)	KIPPES COVE (NE)	FWM + Thick Olay (> 2.0 - 3.0)	324	0.1	20,800
KIPPES COVE (NE)	EOP	KIPPES COVE (N)	Surf Rmvl + Base Rehab + Olay	224	0.0	20,700
KIPPES COVE (NW)	KIPPES COVE (N)	KIPPES COVE (N)	Surf Rmvl + Base Rehab + Olay	161	0.0	18,400
KIPPES COVE (S)	KIPPES COVE (W)	KIPPES COVE	FWM + Thick Olay (> 2.0 - 3.0)	169	0.0	9,200
KIPPES COVE (S)	KIPPES COVE	KIPPES COVE (E)	FWM + Thick Olay (> 2.0 - 3.0)	154	0.0	9,900
KIPPES COVE (SE)	KIPPES COVE (E)	KIPPES COVE (E)	Surf Rmvl + Base Rehab + Olay	193	0.0	18,400
KIPPES COVE (SW)	KIPPES COVE (W)	KIPPES COVE (W)	Surf Rmvl + Base Rehab + Olay	141	0.0	13,400
KITTRIDGE ST	E 6TH AVE	E 5TH AVE	EM/FWM + Mod Olay (2.0 - 3.0)	349	0.1	17,900
KITTRIDGE ST	E 1ST AVE	E HANSON AVE	Surf Rmvl + Base Rehab + Olay	401	0.1	41,700
LAKEVIEW LN	EOP	EOP	Surf Rmvl + Base Rehab + Olay	1448	0.3	151,100
LANGDON ST	N LANGDON ST	DS@354FT	FWM + Thick Olay (> 2.0 - 3.0)	354	0.1	23,400
LANGDON ST	DS@354FT	E 23RD AVE	Surf Rmvl + Base Rehab + Olay	357	0.1	25,800
LANGDON ST	FAIROAKS AVE	WILDWOOD AVE	FWM + Thick Olay (> 2.0 - 3.0)	352	0.1	21,300
LANGDON ST	WILDWOOD AVE	OAKMOND ST	FWM + Thick Olay (> 2.0 - 3.0)	345	0.1	15,600
LANGDON ST	OAKMOND ST	GREEN DR	FWM + Thick Olay (> 2.0 - 3.0)	378	0.1	20,000
LANGDON ST	E 15TH AVE	E 14TH AVE	EM/FWM + Mod Olay (2.0 - 3.0)	338	0.1	14,700
LANGDON ST	E 14TH AVE	E 13TH AVE	Surf Rmvl + Base Rehab + Olay	343	0.1	34,700
LANGDON ST	E 13TH AVE	E 12TH AVE	FWM + Thick Olay (> 2.0 - 3.0)	368	0.1	23,600
LANGDON ST	E 12TH AVE	E 11TH AVE	FWM + Thick Olay (> 2.0 - 3.0)	378	0.1	24,200
LANGDON ST	E 11TH AVE	E 10TH AVE	FWM + Thick Olay (> 2.0 - 3.0)	343	0.1	23,100
LANGDON ST	E 7TH AVE	E 6TH AVE	EM/FWM + Mod Olay (2.0 - 3.0)	374	0.1	14,000
LANGDON ST	E 3RD AVE	E 2ND AVE	EM/FWM + Mod Olay (2.0 - 3.0)	365	0.1	14,800
LANGDON ST	E 2ND AVE	E 1ST AVE	FWM + Thick Olay (> 2.0 - 3.0)	358	0.1	18,300
LANGDON ST	E 1ST AVE	E HANSON AVE	EM/FWM + Mod Olay (2.0 - 3.0)	408	0.1	25,000
LANGDON ST	E HANSON AVE	E ASH AVE	EM/FWM + Mod Olay (2.0 - 3.0)	334	0.1	19,700
LANGDON ST	E MIDDLE BORDER	E NORWAY AVE	EM/FWM + Mod Olay (2.0 - 3.0)	365	0.1	20,500
LAWLER ST	E 12TH AVE	E 11TH AVE	EM/FWM + Mod Olay (2.0 - 3.0)	367	0.1	14,900
LAWLER ST	E 9TH AVE	DS@618FT	EM/FWM + Mod Olay (2.0 - 3.0)	630	0.1	33,300
LAWLER ST	E 7TH AVE	E 6TH AVE	Surf Rmvl + Base Rehab + Olay	378	0.1	48,100
LAWLER ST	E 4TH AVE	E 3RD AVE	FWM + Thick Olay (> 2.0 - 3.0)	378	0.1	27,600
LAWLER ST	E 3RD AVE	E 2ND AVE	Surf Rmvl + Base Rehab + Olay	376	0.1	46,700
LAWLER ST	E 1ST AVE	E RAILROAD ST	FWM + Thick Olay (> 2.0 - 3.0)	467	0.1	33,500
LAWLER ST	E CEDAR AVE	E DOUGLAS AVE	Surf Rmvl + Base Rehab + Olay	358	0.1	38,200
LAWLER ST	E DOUGLAS AVE	E ELM AVE	Surf Rmvl + Base Rehab + Olay	356	0.1	38,000
LAWLER ST	E ELM AVE	SD HWY 90 L	FWM + Thick Olay (> 2.0 - 3.0)	545	0.1	39,100
LYLE ST	253 ST	W 7TH AVE	EM/FWM + Mod Olay (2.0 - 3.0)	414	0.1	16,700
LYLE ST	W 4TH AVE	W 3RD AVE	EM/FWM + Mod Olay (2.0 - 3.0)	367	0.1	19,300
MAIN ST	GREEN DR	E 15TH AVE	EM/FWM + Mod Olay (2.0 - 3.0)	563	0.1	23,700
MAIN ST	W 5TH AVE	E 4TH AVE	EM/FWM + Mod Olay (2.0 - 3.0)	369	0.1	14,300
MAIN ST	E 2ND AVE	E 1ST AVE	EM/FWM + Mod Olay (2.0 - 3.0)	348	0.1	18,400
MAIN ST	W CEDAR AVE	W DOUGLAS AVE	FWM + Thick Olay (> 2.0 - 3.0)	364	0.1	23,400
MAIN ST	W DOUGLAS AVE	E ELM AVE	Surf Rmvl + Base Rehab + Olay	361	0.1	35,500
MAIN ST	E HACKBERRY AVE	W MILAN AVE	EM/FWM + Mod Olay (2.0 - 3.0)	63	0.0	3,300
MAIN ST	W MCCABE AVE	E JUNIPER AVE	FWM + Thick Olay (> 2.0 - 3.0)	231	0.0	16,100
MAIN ST	E JUNIPER AVE	W REID AVE	FWM + Thick Olay (> 2.0 - 3.0)	133	0.0	9,300
MAIN ST	UNKNOWN	UNKNOWN	EM/FWM + Mod Olay (2.0 - 3.0)	39	0.0	1,300
MARSHALL ST	E 5TH AVE	E 4TH AVE	EM/FWM + Mod Olay (2.0 - 3.0)	281	0.1	14,000
MARSHALL ST	E 4TH AVE	E 3RD AVE	EM/FWM + Mod Olay (2.0 - 3.0)	363	0.1	11,800
MARSHALL ST	E 3RD AVE	E 2ND AVE	Surf Rmvl + Base Rehab + Olay	375	0.1	49,800
MARSHALL ST	E 2ND AVE	E 1ST AVE	FWM + Thick Olay (> 2.0 - 3.0)	369	0.1	17,400
MARSHALL ST	E 1ST AVE	E HANSON AVE	EM/FWM + Mod Olay (2.0 - 3.0)	385	0.1	20,400
MARSHALL ST	E ASH AVE	E BIRCH AVE	EM/FWM + Mod Olay (2.0 - 3.0)	379	0.1	19,500
MAUI DR	DS@822FT	DAILY DR	FWM + Thick Olay (> 2.0 - 3.0)	976	0.2	60,800

Table X.X Major Rehabilitation Identified through the Pavement Condition Analysis

Street	From Street	To Street	Rehabilitation Activity	Length (ft)	Length (mi)	Cost ($)
MAUI DR	DAILY DR	407 AVE	FWM + Thick Olay (> 2.0 - 3.0)	1229	0.2	78,900
MCCABE AVE	UNIVERSITY BLVD	S COURT MERRILL	FWM + Thick Olay (> 2.0 - 3.0)	79	0.0	4,500
MCCABE AVE	S DUFF ST	S ROWLEY ST	Surf Rmvl + Base Rehab + Olay	374	0.1	28,100
MCCABE AVE	S ROWLEY ST	S MAIN ST	EM/FWM + Mod Olay (2.0 - 3.0)	359	0.1	14,500
MCGOVERN AVE	W MCCABE AVE	W REID AVE	Surf Rmvl + Base Rehab + Olay	306	0.1	29,200
MCGOVERN AVE	W REID AVE	W ANDREWS ST	FWM + Thick Olay (> 2.0 - 3.0)	328	0.1	20,500
MCGOVERN AVE	W ANDREWS ST	EOP	FWM + Thick Olay (> 2.0 - 3.0)	467	0.1	30,900
MENTZER COURT	MENTZER CT	MENTZER CT	EM/FWM + Mod Olay (2.0 - 3.0)	279	0.1	14,700
MENTZER ST	E 11TH AVE	E 8TH AVE	Surf Rmvl + Base Rehab + Olay	1238	0.2	82,300
MENTZER ST	E 7TH AVE	E 6TH AVE	EM/FWM + Mod Olay (2.0 - 3.0)	368	0.1	20,600
MENTZER ST	E 6TH AVE	E 5TH AVE	Surf Rmvl + Base Rehab + Olay	362	0.1	25,100
MENTZER ST	E ASH AVE	E BIRCH AVE	EM/FWM + Mod Olay (2.0 - 3.0)	370	0.1	23,000
MENTZER ST	E SPRUCE ST	DS@1347FT	EM/FWM + Mod Olay (2.0 - 3.0)	1027	0.2	60,700
MIDDLE BORDER	UNKNOWN	UNKNOWN	EM/FWM + Mod Olay (2.0 - 3.0)	262	0.0	14,600
MIDDLE BORDER	UNKNOWN	UNKNOWN	FWM + Thick Olay (> 2.0 - 3.0)	71	0.0	4,600
MIDDLE BORDER	UNKNOWN	UNKNOWN	EM/FWM + Mod Olay (2.0 - 3.0)	176	0.0	9,300
MIDDLE BORDER	UNKNOWN	S LANGDON ST	EM/FWM + Mod Olay (2.0 - 3.0)	138	0.0	7,900
MIDRED CT	QUIETT ST	EOP	EM/FWM + Mod Olay (2.0 - 3.0)	444	0.1	37,300
MILAN AVE	S COURT MERRILL	S DUFF ST	Surf Rmvl + Base Rehab + Olay	462	0.1	33,400
MILAN AVE	S DUFF ST	S ROWLEY ST	Surf Rmvl + Base Rehab + Olay	357	0.1	33,000
MILLER AVE	W NINDE AVE	W WILLIAMS AVE	EM/FWM + Mod Olay (2.0 - 3.0)	194	0.0	8,200
MINNESOTA ST	W 23RD AVE	INNOVATIVE DR	EM/FWM + Mod Olay (2.0 - 3.0)	471	0.1	24,200
MINNESOTA ST	W 16TH AVE	W 15TH AVE	FWM + Thick Olay (> 2.0 - 3.0)	508	0.1	26,900
MINNESOTA ST	W 15TH AVE	W 14TH AVE	EM/FWM + Mod Olay (2.0 - 3.0)	355	0.1	15,500
MINNESOTA ST	W 14TH AVE	W 13TH AVE	FWM + Thick Olay (> 2.0 - 3.0)	346	0.1	18,300
MINNESOTA ST	W 10TH AVE	W 9TH AVE	FWM + Thick Olay (> 2.0 - 3.0)	377	0.1	26,400
MINNESOTA ST	W 9TH AVE	W 8TH AVE	EM/FWM + Mod Olay (2.0 - 3.0)	386	0.1	27,000
MINNESOTA ST	W 8TH AVE	W 7TH AVE	FWM + Thick Olay (> 2.0 - 3.0)	464	0.1	16,700
MINNESOTA ST	W 7TH AVE	W 6TH AVE	FWM + Thick Olay (> 2.0 - 3.0)	346	0.1	15,700
MINNESOTA ST	W 6TH AVE	W 5TH AVE	EM/FWM + Mod Olay (2.0 - 3.0)	386	0.1	10,200
MINNESOTA ST	W 4TH AVE	W 3RD AVE	EM/FWM + Mod Olay (2.0 - 3.0)	362	0.1	22,400
MINNESOTA ST	W 3RD AVE	W 2ND AVE	EM/FWM + Mod Olay (2.0 - 3.0)	384	0.1	23,900
MINNESOTA ST	W 2ND AVE	W 1ST AVE	Surf Rmvl + Base Rehab + Olay	347	0.1	36,100
MINNESOTA ST	W 1ST AVE	W HANSON AVE	FWM + Thick Olay (> 2.0 - 3.0)	265	0.1	16,500
MINNESOTA ST	W BIRCH AVE	W CEDAR AVE	EM/FWM + Mod Olay (2.0 - 3.0)	456	0.1	22,700
MINNESOTA ST	W CEDAR AVE	W DOUGLAS AVE	FWM + Thick Olay (> 2.0 - 3.0)	341	0.1	21,300
MINNESOTA ST	W DOUGLAS AVE	W ELM AVE	EM/FWM + Mod Olay (2.0 - 3.0)	342	0.1	14,900
MINNESOTA ST	W ELM AVE	DS@344FT	EM/FWM + Mod Olay (2.0 - 3.0)	359	0.1	20,600
MINNESOTA ST	DS@344FT	SD HWY 90 L	Surf Rmvl + Base Rehab + Olay	201	0.0	26,100
MINNESOTA ST	W MCCABE AVE	W NINDE AVE	FWM + Thick Olay (> 2.0 - 3.0)	313	0.1	24,200
MINNESOTA ST	W NINDE AVE	W WILLIAMS AVE	FWM + Thick Olay (> 2.0 - 3.0)	311	0.1	18,800
MINNESOTA ST	W WILLIAMS AVE	W MITCHELL BLVD	EM/FWM + Mod Olay (2.0 - 3.0)	832	0.2	44,000
MITCHELL BLVD	W MCCABE AVE	W NINDE AVE	FWM + Thick Olay (> 2.0 - 3.0)	315	0.1	19,600
MITCHELL BLVD	W NINDE AVE	W WILLIAMS AVE	FWM + Thick Olay (> 2.0 - 3.0)	327	0.1	19,200
MITCHELL BLVD	W WILLIAMS AVE	KYNETTE PL	FWM + Thick Olay (> 2.0 - 3.0)	888	0.2	53,700
MITCHELL BLVD	S MINNESOTA ST	W UNIVERSITY BLVD	EM/FWM + Mod Olay (2.0 - 3.0)	270	0.1	11,400
MITCHELL BLVD	S DUFF ST	S ROWLEY ST	FWM + Thick Olay (> 2.0 - 3.0)	365	0.1	18,600
MONTANA ST	W 6TH AVE	W 5TH AVE	FWM + Thick Olay (> 2.0 - 3.0)	321	0.1	16,400
MONTANA ST	W 5TH AVE	W 4TH AVE	FWM + Thick Olay (> 2.0 - 3.0)	342	0.1	16,800
MONTANA ST	W 2ND AVE	EOP	EM/FWM + Mod Olay (2.0 - 3.0)	259	0.0	15,300
MONTANA ST	W HANSON AVE	W ASH AVE	FWM + Thick Olay (> 2.0 - 3.0)	376	0.1	20,600
MONTANA ST	W ASH AVE	W BIRCH AVE	EM/FWM + Mod Olay (2.0 - 3.0)	345	0.1	15,600
MONTANA ST	W BIRCH AVE	W CEDAR AVE	EM/FWM + Mod Olay (2.0 - 3.0)	471	0.1	23,500
MONTANA ST	W CEDAR AVE	W DOUGLAS AVE	EM/FWM + Mod Olay (2.0 - 3.0)	333	0.1	12,400
MONTANA ST	W ELM AVE	SD HWY 90 L	FWM + Thick Olay (> 2.0 - 3.0)	572	0.1	28,100
NATIONAL GAURD RD	N HARMON DR	FIALA RD	FWM + Thick Olay (> 2.0 - 3.0)	1068	0.2	46,400
NATIONAL GAURD RD	FIALA RD	AIRPORT RD	EM/FWM + Mod Olay (2.0 - 3.0)	276	0.1	15,000
NATIONAL GUARD RD	AIRPORT RD	SD HWY 37 S	Surf Rmvl + Base Rehab + Olay	2942	0.6	280,400
NINDE AVE	S MILLER AVE	W MITCHELL BLVD	FWM + Thick Olay (> 2.0 - 3.0)	382	0.1	18,700
NINDE AVE	W MITCHELL BLVD	S MINNESOTA ST	FWM + Thick Olay (> 2.0 - 3.0)	280	0.1	13,200
NINDE AVE	S MINNESOTA ST	S MINNESOTA ST	EM/FWM + Mod Olay (2.0 - 3.0)	62	0.0	3,000
NORWAY AVE	W NORWAY AVE	S MAIN ST	EM/FWM + Mod Olay (2.0 - 3.0)	29	0.0	1,500
NORWAY AVE	DS@78FT	E KAY AVE	FWM + Thick Olay (> 2.0 - 3.0)	557	0.1	36,800
NORWAY AVE	S MILLER AVE	S MINNESOTA ST	EM/FWM + Mod Olay (2.0 - 3.0)	785	0.1	30,500
NORWAY AVE	S WISCONSIN ST	S DUFF ST	FWM + Thick Olay (> 2.0 - 3.0)	926	0.2	43,700
NORWAY AVE	S DUFF ST	S ROWLEY ST	FWM + Thick Olay (> 2.0 - 3.0)	382	0.1	22,300
OHLMAN	W 23RD AVE	253 ST	Surf Rmvl + Base Rehab + Olay	5307	1.0	622,700
OHLMAN ST	W QUINCE ST	408 AVE	EM/FWM + Mod Olay (2.0 - 3.0)	341	0.1	12,200
PALMER PL	S DOBSON ST	S EDGERTON ST	EM/FWM + Mod Olay (2.0 - 3.0)	502	0.1	21,100
PALMER PL	S ANDERSON ST	W CEDAR AVE	Surf Rmvl + Base Rehab + Olay	815	0.2	94,200
PEBBLE BEACH RD	THUNDERBIRD DR	W 23RD AVE	FWM + Thick Olay (> 2.0 - 3.0)	722	0.1	49,100
PRAIRIE LN	DS@243FT	N OHLMAN ST	FWM + Thick Olay (> 2.0 - 3.0)	176	0.0	8,600
QUIETT ST	TIGER ST	DORIS DR	FWM + Thick Olay (> 2.0 - 3.0)	1622	0.3	82,700
QUIETT ST	DORIS DR	SD HWY 38 P	EM/FWM + Mod Olay (2.0 - 3.0)	1780	0.3	96,900
QUINCE ST	S OHLMAN ST	S MILLER AVE	Surf Rmvl + Base Rehab + Olay	3169	0.6	302,100
QUINCE ST	DS@665FT	DS@1182FT	FWM + Thick Olay (> 2.0 - 3.0)	517	0.1	31,300
QUINCE ST	DS@1182FT	CABELA DR	Surf Rmvl + Base Rehab + Olay	150	0.0	13,800
RAILROAD ST	DS@181FT	S ROWLEY ST	FWM + Thick Olay (> 2.0 - 3.0)	193	0.0	11,300
REID AVE	MCGOVERN AVE	S DUFF ST	Surf Rmvl + Base Rehab + Olay	431	0.1	37,400
REID AVE	S ROWLEY ST	S MAIN ST	EM/FWM + Mod Olay (2.0 - 3.0)	360	0.1	13,400
RIDGE LN	FIRESTEEL DR	DS@530FT	Surf Rmvl + Base Rehab + Olay	530	0.1	39,800
RIDGE RD	EOP	CHALKSTONE DR	Surf Rmvl + Base Rehab + Olay	723	0.1	79,500
RIDGE RD	CHALKSTONE DR	CIRCLE DR	FWM + Thick Olay (> 2.0 - 3.0)	582	0.1	44,300
RIDGE RD	CIRCLE DR	SUMMIT DR	EM/FWM + Mod Olay (2.0 - 3.0)	719	0.1	45,500
ROLAND LN	N FOSTER ST	E 8TH AVE	Surf Rmvl + Base Rehab + Olay	786	0.1	56,800
ROWLEY ST	W 10TH AVE	W 9TH AVE	EM/FWM + Mod Olay (2.0 - 3.0)	358	0.1	19,800
ROWLEY ST	W 1ST AVE	W RAILROAD ST	EM/FWM + Mod Olay (2.0 - 3.0)	298	0.1	12,000
ROWLEY ST	W ANDREWS ST	W HURST AVE	EM/FWM + Mod Olay (2.0 - 3.0)	234	0.0	7,600
ROWLEY ST	W MITCHELL BLVD	W NORWAY AVE	EM/FWM + Mod Olay (2.0 - 3.0)	404	0.1	20,100
ROWLEY ST	W NORWAY AVE	DS@188FT	FWM + Thick Olay (> 2.0 - 3.0)	194	0.0	13,200
ROWLEY ST	DS@732FT	CABELA DR	EM/FWM + Mod Olay (2.0 - 3.0)	276	0.1	11,100

Table X.X Major Rehabilitation Identified through the Pavement Condition Analysis

Street	From Street	To Street	Rehabilitation Activity	Length (ft)	Length (mi)	Cost ($)
SANBORN BLVD	EOP	SD HWY 37	Surf Rmvl + Base Rehab + Olay	45	0.0	4,300
SAWGRASS AVE	N OHLMAN ST	THUNDERBIRD DR	Surf Rmvl + Base Rehab + Olay	1147	0.2	49,700
SHARPSTONE DR	DS@692FT	SHARPSTONE DR	FWM + Thick Olay (> 2.0 - 3.0)	310	0.1	21,100
SPRUCE ST	MALL DR	DS@234FT	Surf Rmvl + Base Rehab + Olay	240	0.0	24,300
SPRUCE ST	DS@234FT	DS@2646FT	Surf Rmvl + Base Rehab + Olay	2411	0.5	236,800
SPRUCE ST	W SPRUCE ST	49' E of S ROWLEY ST	EM/FWM + Mod Olay (2.0 - 3.0)	85	0.0	2,800
SPRUCE ST	408 AVE	DS@242FT	FWM + Thick Olay (> 2.0 - 3.0)	151	0.0	6,900
SPRUCE ST	S WISCONSIN ST	SPRUCE ST	EM/FWM + Mod Olay (2.0 - 3.0)	1303	0.2	62,800
STATE AVE	S EDGERTON ST	S ANDERSON ST	FWM + Thick Olay (> 2.0 - 3.0)	657	0.1	60,800
SUMMIT DR	CHALKSTONE DR	RIDGE RD	FWM + Thick Olay (> 2.0 - 3.0)	817	0.2	49,400
SUNNYSIDE CT	DS@321FT	W WILLIAMS AVE	EM/FWM + Mod Olay (2.0 - 3.0)	343	0.1	13,300
SUNNYSIDE CT	SUNNYSIDE CT	DS@321FT	EM/FWM + Mod Olay (2.0 - 3.0)	321	0.1	12,500
TAYLOR ST	E 4TH AVE	E 3RD AVE	Surf Rmvl + Base Rehab + Olay	358	0.1	50,200
TAYLOR ST	E 3RD AVE	E 2ND AVE	Surf Rmvl + Base Rehab + Olay	376	0.1	30,400
TAYLOR ST	E 2ND AVE	E 1ST AVE	EM/FWM + Mod Olay (2.0 - 3.0)	366	0.1	17,600
THOMSEN PLACE	DS@974FT	S MILLER AVE	FWM + Thick Olay (> 2.0 - 3.0)	356	0.1	13,500
UNKNOWN	DS@252FT	INDIAN VILLAGE RD	EM/FWM + Mod Olay (2.0 - 3.0)	154	0.0	8,100
UNKNOWN	UNKNOWN	UNKNOWN	EM/FWM + Mod Olay (2.0 - 3.0)	155	0.0	7,700
UNKNOWN	UNKNOWN	UNKNOWN	EM/FWM + Mod Olay (2.0 - 3.0)	476	0.1	22,900
UNKNOWN	UNKNOWN	UNKNOWN	EM/FWM + Mod Olay (2.0 - 3.0)	447	0.1	15,300
UNKNOWN	UNKNOWN	UNKNOWN	EM/FWM + Mod Olay (2.0 - 3.0)	207	0.0	6,400
UNKNOWN	UNKNOWN (LP)	S KIMBALL ST	Surf Rmvl + Base Rehab + Olay	547	0.1	50,900
UNKNOWN	UNKNOWN (LP)	UNKNOWN (LP)	FWM + Thick Olay (> 2.0 - 3.0)	84	0.0	4,300
UNKNOWN	S MAIN ST	UNKNOWN (LP)	Surf Rmvl + Base Rehab + Olay	494	0.1	44,300
UNKNOWN	S MAIN ST	S MAIN ST	Surf Rmvl + Base Rehab + Olay	453	0.1	40,600
UNKNOWN	S MAIN ST	S MAIN ST	Surf Rmvl + Base Rehab + Olay	451	0.1	40,400
UNKNOWN	S MAIN ST	S MAIN ST	ACP Full Depth Reconstruction	483	0.1	116,400
UNKNOWN	E MIDDLE BORDER	UNKNOWN	ACP Full Depth Reconstruction	171	0.0	41,200
UNKNOWN	UNKNOWN	E NORWAY AVE	Surf Rmvl + Base Rehab + Olay	197	0.0	17,600
UNKNOWN	UNKNOWN	UNKNOWN	Surf Rmvl + Base Rehab + Olay	330	0.1	31,400
UNKNOWN	E MIDDLE BORDER	UNKNOWN	ACP Full Depth Reconstruction	185	0.0	50,300
UNKNOWN	UNKNOWN	E NORWAY AVE	FWM + Thick Olay (> 2.0 - 3.0)	182	0.0	11,700
UNKNOWN	E MIDDLE BORDER	E MIDDLE BORDER	Surf Rmvl + Base Rehab + Olay	789	0.1	73,000
UNKNOWN	E MIDDLE BORDER	E MIDDLE BORDER	Surf Rmvl + Base Rehab + Olay	782	0.1	72,300
UNKNOWN	E MIDDLE BORDER	E NORWAY AVE	Surf Rmvl + Base Rehab + Olay	361	0.1	33,400
UNKNOWN	S FOSTER ST	S FOSTER ST	FWM + Thick Olay (> 2.0 - 3.0)	445	0.1	26,000
UNKNOWN (LP)	UNKNOWN	UNKNOWN	Surf Rmvl + Base Rehab + Olay	377	0.1	33,800
VAN DYKE DR	E NORWAY AVE	EOP	Surf Rmvl + Base Rehab + Olay	693	0.1	64,100
VINCENT PL	S MILLER AVE	S FOSS PL	EM/FWM + Mod Olay (2.0 - 3.0)	353	0.1	19,200
WALLACE ST	E 4TH AVE	E 3RD AVE	EM/FWM + Mod Olay (2.0 - 3.0)	357	0.1	18,900
WALLACE ST	E HANSON AVE	E ASH AVE	Surf Rmvl + Base Rehab + Olay	344	0.1	30,800
WALLACE ST	E ASH AVE	E BIRCH AVE	Surf Rmvl + Base Rehab + Olay	374	0.1	34,600
WALLACE ST	E BIRCH AVE	EOP	Surf Rmvl + Base Rehab + Olay	250	0.0	25,200
WILDWOOD AVE	N LANGDON ST	OAKMOND ST	Surf Rmvl + Base Rehab + Olay	790	0.1	58,100
WILLIAMS AVE	SD HWY 37	S EDGERTON ST	EM/FWM + Mod Olay (2.0 - 3.0)	1306	0.2	60,900
WILLIAMS AVE	S EDGERTON ST	SUNNYSIDE CT	EM/FWM + Mod Olay (2.0 - 3.0)	354	0.1	17,100
WILLIAMS AVE	ANDERSON ST	S MILLER AVE	FWM + Thick Olay (> 2.0 - 3.0)	544	0.1	24,700
WILLIAMS AVE	S MILLER AVE	W MITCHELL BLVD	Surf Rmvl + Base Rehab + Olay	389	0.1	28,100
WILLIAMS AVE	W MITCHELL BLVD	S MINNESOTA ST	EM/FWM + Mod Olay (2.0 - 3.0)	278	0.1	10,800
WILLIAMS AVE	S MINNESOTA ST	S MINNESOTA ST	EM/FWM + Mod Olay (2.0 - 3.0)	61	0.0	2,900
WINSOR COURT	DS@279FT	CARL ST	Surf Rmvl + Base Rehab + Olay	601	0.1	55,600
WINSOR COURT	WINSOR COURT	DS@279FT	Surf Rmvl + Base Rehab + Olay	279	0.1	25,000
WINSOR ST	E 5TH AVE	E 4TH AVE	EM/FWM + Mod Olay (2.0 - 3.0)	364	0.1	20,400
WINSOR ST	E 4TH AVE	E 3RD AVE	EM/FWM + Mod Olay (2.0 - 3.0)	374	0.1	21,000
WINSOR ST	E 1ST AVE	E HANSON AVE	EM/FWM + Mod Olay (2.0 - 3.0)	385	0.1	24,000
WISCONSIN ST	W 23RD AVE	DS@641FT	EM/FWM + Mod Olay (2.0 - 3.0)	643	0.1	35,000
WISCONSIN ST	DS@641FT	N WISCONSIN ST	Surf Rmvl + Base Rehab + Olay	395	0.1	37,700
WISCONSIN ST	W 6TH AVE	W 5TH AVE	Surf Rmvl + Base Rehab + Olay	382	0.1	30,900
WISCONSIN ST	W 5TH AVE	W 4TH AVE	Surf Rmvl + Base Rehab + Olay	346	0.1	28,000
WISCONSIN ST	W 4TH AVE	W 3RD AVE	Surf Rmvl + Base Rehab + Olay	359	0.1	29,000
WISCONSIN ST	W 3RD AVE	W 2ND AVE	FWM + Thick Olay (> 2.0 - 3.0)	381	0.1	20,100
WISCONSIN ST	W 15TH AVE	W 14TH AVE	Surf Rmvl + Base Rehab + Olay	363	0.1	37,700
WISCONSIN ST	W 14TH AVE	W 13TH AVE	Surf Rmvl + Base Rehab + Olay	336	0.1	22,300
WISCONSIN ST	W 12TH AVE	W 11TH AVE	EM/FWM + Mod Olay (2.0 - 3.0)	181	0.0	12,300
WISCONSIN ST	W 11TH AVE	W 10TH AVE	EM/FWM + Mod Olay (2.0 - 3.0)	361	0.1	31,500
WISCONSIN ST	W 9TH AVE	W 7TH AVE	FWM + Thick Olay (> 2.0 - 3.0)	854	0.2	42,000
WISCONSIN ST	DS@382FT	W 19TH AVE	Surf Rmvl + Base Rehab + Olay	144	0.0	13,700
WISCONSIN ST	W 19TH AVE	W 18TH AVE	EM/FWM + Mod Olay (2.0 - 3.0)	239	0.0	10,000
WISCONSIN ST	N WISCONSIN ST	DS@382FT	Surf Rmvl + Base Rehab + Olay	382	0.1	32,000
WISCONSIN ST	W ASH AVE	W BIRCH AVE	FWM + Thick Olay (> 2.0 - 3.0)	358	0.1	16,900
WISCONSIN ST	W BIRCH AVE	W CEDAR AVE	FWM + Thick Olay (> 2.0 - 3.0)	432	0.1	29,400
WISCONSIN ST	W CEDAR AVE	W DOUGLAS AVE	FWM + Thick Olay (> 2.0 - 3.0)	350	0.1	22,500
WISCONSIN ST	W DOUGLAS AVE	W ELM AVE	FWM + Thick Olay (> 2.0 - 3.0)	354	0.1	20,700
WISCONSIN ST	W ELM AVE	SD HWY 90 L	FWM + Thick Olay (> 2.0 - 3.0)	557	0.1	25,300

Appendix F: Jurisdictional Transfer Guidance Memo

Jurisdictional Transfer Guidance

Date:	Friday, August 26, 2022
Project:	Mitchell Area Master Transportation Plan
To:	Study Advisory Team
From:	HDR
Subject:	Jurisdictional Transfer Guidance

Introduction

Roadway jurisdiction determines whether a road falls under the state, county, city, or township level of responsibility. This memo examines why jurisdictional road assignments are needed, how system continuity is achieved, and recommends criteria to evaluate whether a roadway jurisdictional transfer should be considered.

Jurisdiction Background

The jurisdiction of a roadway is important and addresses how a road is operated, maintained, and administered for the following areas.

Administration

The roadway's jurisdiction identifies the agency or entity having responsibility for planning, design, construction, maintenance, and operations. Each agency or entity has staff or responsible persons with expertise pertaining to a distinct philosophy which matches to the level of roadways they are responsible for maintaining.

Funding

Certain funding sources are available based upon a roadway's jurisdictional classification. For example, roadways under the jurisdiction of the state, county, or city which are on, or a part of, the National Highway System have access to funding from the Federal Government.

Functional and Roadway Classification

The hierarchy of roadway functional classification is supported by having the proper agency assigned to monitor a road's mobility and access priorities. Roadway functional classification is typically identified with the following:

Arterial Roads – roads which prioritize mobility over access. Arterial roads generally provide access from state to state and from population centers to population centers within a state.

Collector Roads – roads which have balanced mobility and access. Collector roads are typically associated with providing connectivity between Local and Arterial roads.

Local Roads – road which have access as the top priority. Local roads provide direct access to properties.

System Continuity/Roadway Characteristics

Appropriate jurisdictional classification is necessary to provide roadway system continuity, connectivity, and aid in defining roadway user expectations.

System continuity is important as each identified agency has jurisdiction over facilities that align with their goals and responsibilities. For instance, the state (South Dakota Department of Transportation – SDDOT) is interested in maintaining a system of highways serving inter/intra state travel, with a high focus on mobility. A county's roadway system is intended to serve regional/sub-regional travel. The city road hierarchy supports regional/sub-regional priorities while also providing direct local access to neighborhoods and individual properties.

For the Mitchell area, continuity is achieved through:

- System connections and differing levels of mobility
- Linkages between cities/towns and rural areas
- Integration between the state highways and local street networks

Consistency for each of the jurisdictional entities is maintained through:

- Design and safety standards
    - Roadway geometrics
    - Roadway surfacing
    - Operating and design speeds
    - Traffic operations
    - Access guidelines
    - Signage
- Funding
- Maintenance
    - Capital (physical roadway improvements)
    - Operational (plowing/striping/etc.)

Jurisdictional Transfer Criteria Considerations

Jurisdictional transfer is when ownership of a roadway is transferred from one roadway agency to another. For each agency having roadway jurisdiction/ownership, there may be a significant amount of cost associated with a transfer. It is typical for a roadway to be brought "up to standards" or 'acceptable condition' by one or both parties involved in the transfer.

The overall objective of jurisdictional transfer is to provide for roadway ownership, operations, and maintenance at the proper jurisdictional level. Properly aligned roads provide the correct level of service, and better align with user expectations for maintenance, operations, safety, and ride quality. It also provides efficiencies for transportation costs associated with constructing, operating, and maintaining the transportation network.

In the Mitchell area, the following criteria should be considered in determining whether a roadway jurisdictional transfer is warranted:

System Continuity

- Is the roadway currently located within the boundary of a municipality?
- Is the roadway located adjacent and parallel to the boundary of a municipality?
- Is the roadway currently located within a municipal growth area?
- Is land on both sides annexed or planned to be annexed by the municipality?

Roadway Characteristics

- Does adjacent development contain urban roadway characteristics?
- Is there a desire for additional roadway amenities (sidewalks/shared-use paths)?
- Is there a need for public utilities?
- Are traffic volumes greater than 250 ADT (for Township gravel roadway)?
- Are traffic volumes greater than 2,500 ADT (for 2-lane County asphalt roadway)?

Roadway Classification

- How is the roadway functioning?
    - What types of trips is it serving?
    - What types of vehicles are using the roadway?
- What jurisdiction is best equipped to maintain the roadway?

Streamlined Maintenance and Funding Opportunities

- Is the segment an island or peninsula surrounded by a different jurisdiction?
- Would efficiency in maintenance and operation be improved with a transfer?
- What is the timeline for the next major investment (reconstruction or major rehabilitation)?

Future Planning Documents

- Is the roadway in future growth areas identified in comprehensive plans?
- What is the timeline of growth in the area and potential annexation?
    - Does this align with the roadway segments next major investment?

Political Desire

- Are there special political considerations for a jurisdictional transfer?

While not an exhaustive set of criteria to identify road jurisdiction transfers, this list provides guidance for agencies considering whether a road may be better suited to be operated and maintained by a different agency. Ultimately, each agency must be agreeable to the transfer of jurisdiction to provide a level of service that is equitable from a resource and economic perspective.

Jurisdictional Transfer Process

Methods

The transfer of jurisdiction can be formalized in multiple ways including by Memorandum of Understanding, assignment of easement or Right-of-Way, or by other agreement as deemed necessary by the legal counsel of the state/city/county/township and should be considered on a case-by-case basis. In all cases, the agency/jurisdiction must be agreeable for a transfer of jurisdiction of a particular road facility.

A Life-Cycle Cost Analysis spreadsheet used by the SDDOT for determining the value of a roadway segment considered for jurisdictional transfer is included in **Appendix A**. The worksheet is used to determine the present worth of the roadway, accounting for future maintenance and upkeep costs over the specified analysis period. Additional information can also be found in the SDDOT Report SD96-08 *Guidelines for Using Economic Factors and Maintenance Costs in Life-Cycle Cost Analysis*.

Administrative Transfer

Once an agreement has been reached between the parties considering a transfer, the City of Mitchell should follow procedures outlined in SDCL §31-33-9 and SDDOT policy to add or delete segments from their system. Additional information is provided in SDDOT's *A Guide for Reporting Local Road Information to South Dakota's Non-State Trunk Road Inventory* brochure[1].

Appendix A: Life Cycle Cost Analysis Examples

Background

The SDDOT's life-cycle cost estimating worksheet, **Figure 1**, was provided to illustrate a process of determining present worth of a roadway and accounting for future reconstruction and maintenance costs over a specific analysis period. The spreadsheet was developed to compare and evaluate different surfacing treatment alternatives, such as gravel and paved surfacing, and contains basic components for determining present worth of a specific roadway segment.

The concept behind a life cycle cost analysis for assessing a jurisdictional transfer is to determine the present value of anticipated funds the agency with current jurisdiction will invest into a road segment over a 25-year period. The 25-year timeframe is typical for the SDDOT but can vary depending on the type of surfacing and traffic volumes. The present value of the current owner's expected investments into the roadway provides an estimate of what they could contribute toward improvements when transferring the roadway to another jurisdiction. This methodology is applicable for all transfer possibilities in the Mitchell area (county to city, SDDOT to city, township to city, etc.).

[1] https://dot.sd.gov/media/documents/Revised_Brochure_Nov_2021.pdf

LIFE-CYCLE COST ESTIMATING WORKSHEET							
Initial Analysis Year	2019	Project Id:					
Analysis Period	25	County:					
Annual Discount Rate, %	2.32	PCN					
				Alternative 1		Alternative 2	
				Project Description:		Project Description:	
Initial Costs							
Item	Item Description	Year	Year	Cost	Worth	Cost	Worth
1	Alternate 1	0	2019				
2	Alternate 2	0	2019				
3							
	Total Present Worth of Initial Costs			$0	$0	$0	$0
Periodic Costs							
Item	Item Description	Year	Year	Cost	Worth	Cost	Worth
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
	Total Present Worth of Periodic Costs				$0		$0
Annual Maintenance Costs		First Yr. of Ann. Costs		Last Yr. of Ann. Costs		Estimated	Present	Estimated	Present
Item	Item Description	Analysis Yr.	Cal Yr	Analysis Yr	Cal Yr	Annual Cost	Worth	Annual Cost	Worth
1	Alternate 1	1	2020	25	2044				
2	Alternate 2	1	2020	25	2044				
	Total Present Worth of Annual Costs						$0		$0
Replacement/Salvage Value									
Item	Item Description	Year	Year			Value	Worth	Value	Worth
1	Alternate 1	25	2044			$0	$0		
2	Alternate 2	25	2044					$0	$0
	Total Present Worth of Replacement/Salvage Value						$0		$0
TOTAL LCC						Alternative 1		Alternative 2	
	Present Worth LCC						$0		$0
	Equivalent Uniform Annual LCC						$0		$0

Figure 1: SDDOT Life-Cycle Cost Analysis Worksheet

Example 1: Reconstruction and Maintenance Costs

The County is planning to transfer a 1-mile segment of bituminous/asphalt road to an adjacent municipality. Due to high traffic volumes, the existing 2-lane bituminous road needs to be improved to a 4-lane urban section. As part of the agreement, the County will pay the equivalent value for reconstructing the roadway as a 2-lane bituminous road along with future maintenance costs.

Assumptions:

- Base Analysis Year: 2019
- Analysis Period: 25 Years
- Discount Rate: 2.32%
- Initial Cost: Full-depth reconstruction as 2-lane asphalt section at a unit cost of $45 per square yard; 40-foot pavement width is assumed.
- Annual Maintenance Costs: Expected average annual cost of maintenance operations (crack seal, chip seal, repairs, etc.) is $10,000 per year over the 25-year cycle.

The present worth of the segment would be $1,244,095 and this value represents the amount the County could contribute for transfer of the segment to the municipality. **Figure 2** shows the completed spreadsheet for Example 1.

Example 2: Maintenance Costs

Similar to Example 1, the County is planning to transfer a 1-mile segment of bituminous/asphalt road to an adjacent municipality. The existing 2-lane bituminous road is in good condition and will be maintained as a 2-lane roadway by the municipality. Due to the location of the segment, it was advantageous to transfer jurisdiction for maintenance purposes since it is currently within City limits. As part of the transfer agreement, the County will pay the equivalent value for future maintenance costs.

Assumptions:

- Base Analysis Year: 2019
- Analysis Period: 25 Years
- Discount Rate: 2.32%
- Initial Cost: $0.00
- Periodic Costs: Contracted maintenance services with a specific application (crack seal, chip seal, etc.) are detailed in the spreadsheet for the 25-year cycle.
- Annual Maintenance Costs: County performed maintenance operations (pothole repair, mowing, etc.) are detailed in the spreadsheet for the 25-year cycle.

The present worth of the segment would be $285,143 and this value represents the amount the County could contribute for transfer of the segment to the municipality. **Figure 3** shows the completed spreadsheet for Example 2.

LIFE-CYCLE COST ESTIMATING WORKSHEET							
Initial Analysis Year	2019	Project Id:	Present worth of 1-mile segment reconstruct & maintenance				
Analysis Period	25	County:					
Annual Discount Rate, %	2.32	PCN					
				Alternative 1		**Alternative 2**	
				Project Description:		Project Description:	
Initial Costs							
Item	Item Description	Year	Year	Cost	Worth	Cost	Worth
1	Alternate 1	0	2019	$1,056,000	$1,056,000		
2							
3							
	Total Present Worth of Initial Costs			$1,056,000	$1,056,000	$0	$0
Periodic Costs							
Item	Item Description	Year	Year	Cost	Worth	Cost	Worth
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
	Total Present Worth of Periodic Costs				$0		$0
Annual Maintenance Costs		First Yr. of Ann. Costs		Last Yr. of Ann. Costs		Estimated	Present	Estimated	Present
Item	Item Description	Analysis Yr.	Cal Yr	Analysis Yr	Cal Yr	Annual Cost	Worth	Annual Cost	Worth
1	Alternate 1	1	2020	25	2044	$10,000	$188,095		
2									
	Total Present Worth of Annual Costs						$188,095		$0
Replacement/Salvage Value									
Item	Item Description	Year	Year			Value	Worth	Value	Worth
1	Alternate 1	25	2044			$0	$0		
2								$0	#VALUE!
	Total Present Worth of Replacement/Salvage Value						$0		#VALUE!
TOTAL LCC						Alternative 1		Alternative 2	
	Present Worth LCC						$1,244,095		#VALUE!
	Equivalent Uniform Annual LCC						$66,142		#VALUE!

Figure 2: Example 1 Life Cycle Cost Analysis

LIFE-CYCLE COST ESTIMATING WORKSHEET							
Initial Analysis Year	2019	Project Id:	Present worth of 1-mile segment maintenance				
Analysis Period	25	County:					
Annual Discount Rate, %	2.32	PCN					
				Alternative 1		**Alternative 2**	
				Project Description:		Project Description:	
Initial Costs							
Item	Item Description	Year	Year	Cost	Worth	Cost	Worth
1	Alternate 1	0	2019	$0	$0		
2							
3							
	Total Present Worth of Initial Costs			$0	$0	$0	$0
Periodic Costs							
Item	Item Description	Year	Year	Cost	Worth	Cost	Worth
1	Rout & Seal	2	2021	$4,000	$3,821		
2	Chip Seal	3	2022	$32,000	$29,872		
3	Rout & Seal	8	2027	$4,000	$3,329		
4	Chip Seal	10	2029	$32,000	$25,442		
5	Rout & Seal	14	2033	$4,000	$2,901		
6	Mill & Overlay	17	2036	$260,000	$176,053		
7	Rout & Seal	19	2038	$4,000	$2,587		
8	Chip Seal	22	2041	$32,000	$19,320		
9							
10							
11							
12							
13							
14							
15							
16							
	Total Present Worth of Periodic Costs				$263,326		$0
Annual Maintenance Costs		First Yr. of Ann. Costs		Last Yr. of Ann. Costs		Estimated	Present	Estimated	Present
Item	Item Description	Analysis Yr.	Cal Yr	Analysis Yr	Cal Yr	Annual Cost	Worth	Annual Cost	Worth
1	Maintenance Activity 1	1	2020	5	2024	$500	$2,335		
2	Maintenance Activity 2	6	2025	7	2026	$1,000	$1,723		
3	Maintenance Activity 3	8	2027	9	2028	$1,500	$2,469		
4	Maintenance Activity 4	10	2029	11	2030	$1,000	$1,572		
5	Maintenance Activity 5	12	2031	13	2032	$1,500	$2,252		
6	Maintenance Activity 6	14	2033	15	2034	$2,000	$2,869		
7	Maintenance Activity 7	16	2035	21	2040	$1,000	$3,928		
8	Maintenance Activity 8	22	2041	25	2044	$2,000	$4,668		
9									
10									
	Total Present Worth of Annual Costs						$21,817		$0
Replacement/Salvage Value									
Item	Item Description			Year	Year	Value	Worth	Value	Worth
1	Alternate 1			25	2044				
2								$0	#VALUE!
	Total Present Worth of Replacement/Salvage Value						$0		#VALUE!
TOTAL LCC						Alternative 1		Alternative 2	
	Present Worth LCC						$285,143		#VALUE!
	Equivalent Uniform Annual LCC						$15,160		#VALUE!

Figure 3: Example 2 Life Cycle Cost Analysis

Appendix G: Traffic Signal Review Memo

Memo

Date:	Tuesday, November 15, 2022
Project:	Mitchell Area Master Transportation Plan
To:	Study Advisory Team
From:	HDR
Subject:	Traffic Signals

Introduction

Traffic signals are a critical element of transportation systems, enabling safe and efficient movement of the traveling public. A comprehensive review of the City of Mitchell's (the City's) traffic signal system has been conducted, including an assessment of the system's management, operations, methods, and equipment. The City's practices were compared to national best practices and South Dakota Department of Transportation (SDDOT) traffic signal policies, operations, and standards to determine areas where the City exceeds, meets, or falls short of common practices. This document summarizes the data collected from the city, the general assessment of the City's signal system, and recommendations for improvement.

The signal system assessment was based on multiple categories, such as:

- Management – planning, oversight, funding, outreach
- Traffic Monitoring – data collection, data archiving
- Traffic Signal Design – geometry, detectors, wiring
- Signal Timing Practices – tools, timing plans, implementation
- Infrastructure – controller type, software, firmware, communications
- Preventative Maintenance – reliability, frequency, training



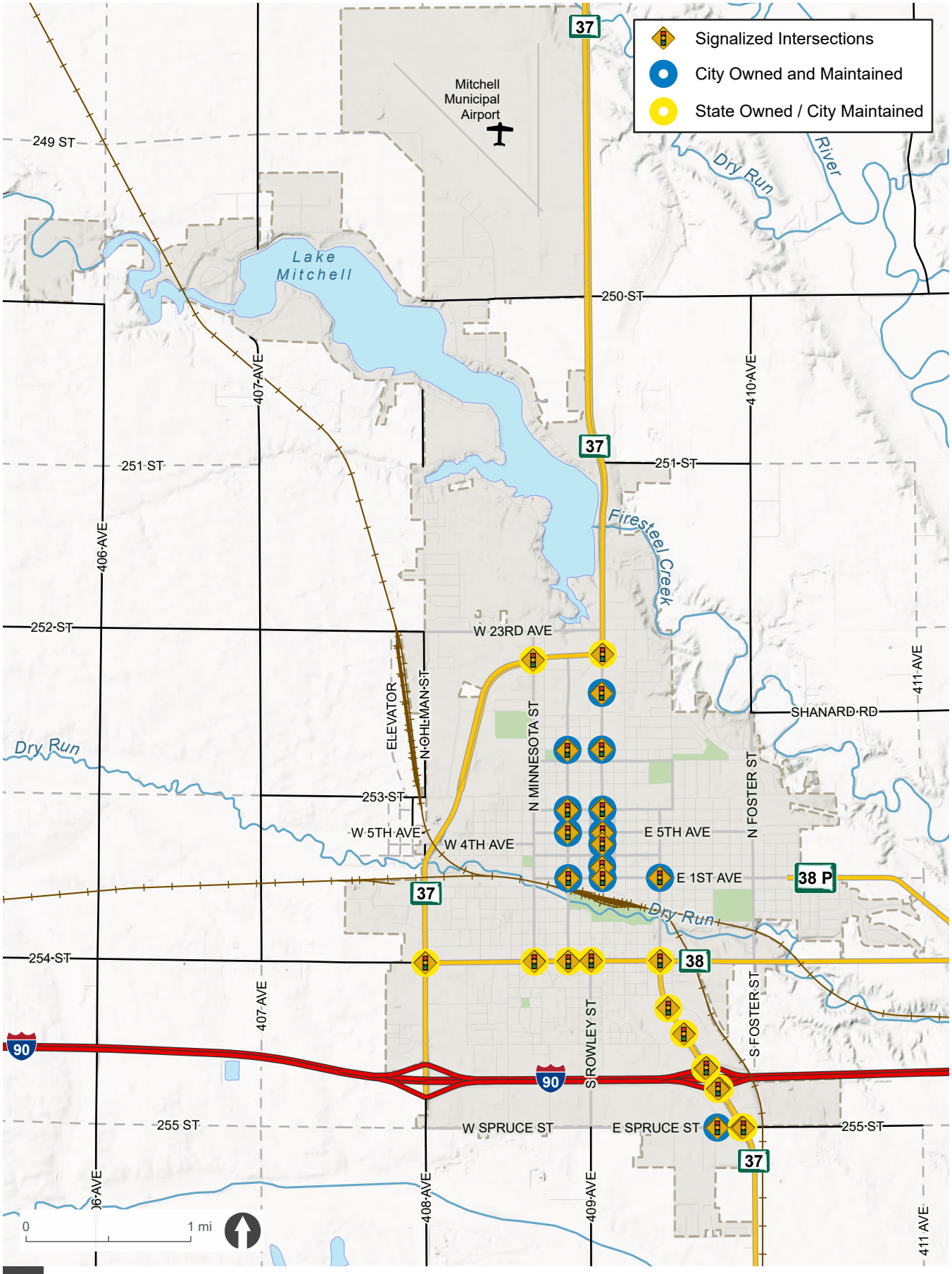
Existing Conditions

At the onset of the existing conditions assessment, City staff completed the Institute of Transportation Engineers (ITE) Traffic Signal Benchmarking Self-Assessment and the Federal Highway Administration (FHWA) Traffic Signal Systems Capability Maturity Framework survey. Results from the ITE Traffic Signal Benchmarking Self-Assessment are shown in **Appendix A**.

The locations of Mitchell area traffic signals are shown in Figure 1. The city currently owns thirteen (13) traffic signals and maintains a total of twenty-five (25), as the City maintains traffic signals for the SDDOT on state routes within the city limits. All signals are NEMA-standard.

- Signal controller types vary based on the year of installation and whether the City or SDDOT installed them. Some signal controllers are surplus provided to the city by the SDDOT. Controllers identified in the assessment include Econolite Cobalt and ASC/3-1000, Siemens M50, Eagle EPAC 300, and potentially others. Cabinet types and componentry also vary and often match the controller manufacturer (example: Econolite controller was observed in an Econolite cabinet).
- Ten (10) of these traffic signals are on a closed-looped communications system; the other fifteen (15) traffic signals are isolated.
- Seventeen (17) traffic signals have some form of stop bar vehicular detection, with sixteen (16) having detector loops and one (1) having video detection.
- No intersections are equipped with closed circuit television (CCTV) cameras for traffic monitoring.
- All traffic signal heads have been equipped with industry standard LED modules. Flashing yellow arrows have been implemented at thirteen (13) locations.
- Emergency vehicle preemption is utilized with emergency response timing plans at sixteen (16) locations.
- Pedestrian indications are provided at all twenty-five (25) signalized locations. Only sixteen (16) are equipped with pedestrian pushbuttons and only eleven (11) meet ADA compliance (as self-reported).

The city's traffic signal system is operated/maintained by two (2) signal technicians, both of whom also have other responsibilities, such as traffic signs, utility locates, and pavement markings. Traffic signal design and construction is contracted out to consultants and contractors. The city annually budgets $47,500 from the city's General Fund for traffic signal operations/maintenance. No recurring capital improvement funds are currently designated/allocated for traffic signals. New traffic signals are rarely implemented and, when installed, are usually part of a much larger capital improvement or private development project.



MITCHELL AREA TRAFFIC SIGNALS

FIGURE 1

MITCHELL, SD | MASTER TRANSPORTATION PLAN

Recommendations

In general, it is recommended that traffic signal industry standard best practices be followed. Several guiding documents that provide recommended or best practices are identified below. The *SDDOT Traffic Operations Manual*, which includes traffic signal policy, standard specifications, and approved products list, should be followed, when practical, to provide operational continuity city-wide. The *SDDOT Road Design Manual* should be followed, when practical, to design a public roadway improvement that includes a traffic signal(s), with particular attention to Chapter 15, which includes turn-lane warrants, detector placements, and signal phasing and timings.

Management (Traffic Signal Management Plan)

The *USDOT/FHWA Traffic Signal Management Plans* document identifies a process for a community to determine if they need a Traffic Signal Management Plan (TSMP). This document states:

> *"It is clear from the results of the national traffic signal report card survey (NTOC, 2012) and other research that very few agencies have a comprehensive plan covering the full lifecycle of design, operations, management, maintenance and ultimate replacement of traffic signals. Moreover, those agencies that do have operating and management plans very often have not clearly linked their objectives to the livability and mobility goals and objectives of their agency or regional planning authority. A strategic approach is needed in order to effectively garner support for and resources to improve the state of traffic signal systems.*
>
> *Based on FHWA's broad experience with agencies across the country, it has also become clear that agencies that have some form of strategic plan that covers their traffic signal system also have a high level of performance in the management of their traffic signal system. Moreover, this seems to apply regardless of the level of resources available for traffic signal management. Many resource-rich agencies do not provide great service, while other relatively under-resourced agencies provide very good service within their constraints.*
>
> *The TSMP connects the goals that appear in agency and regional plans with objectives and strategies that support day to day traffic signal design, operations maintenance, and administrative activities. The TSMP supports an agency's general plan or strategic plan, in a manner similar to an ITS plan, pedestrian master plan or a bicycle master plan, and lays the foundation for development of traffic signal capital improvement plans. Many agencies have existing procedures and policies that feed into the information in the TSMP."*

The USDOT/FHWA document continues with step-by-step directions to complete a TSMP. It is recommended that the City evaluate this document and consider development of a TSMP. A TSMP will document and connect, at a high level, the goals, objectives, strategies, and performance measures that the City will use to achieve outcomes consistent with doing what's

most important given a limited set of resources. This guidance will help the City strategically connect its activities related to traffic signal design, operations, maintenance, and management with its overall agency goals and objectives.

The planning and installation of new traffic signals should follow guidance and traffic signal warrants provided in the *Manual on Uniform Traffic Control Devices (MUTCD), 2009 Edition*.

Traffic Monitoring

Since signal timing should be based on actual traffic volumes, intersection turning movement counts should be periodically gathered in a programmatic fashion. Collected traffic volumes can also be used as data for City and SDDOT planning and development initiatives. The City should consider funding and implementing a traffic count program to collect turning movement counts as follows:

- High priority intersections
    - Major or high-volume signalized intersections: every 3-5 years
    - Coordinated corridor signalized intersections: every 3-5 years
- Low priority intersections
    - Isolated, low-volume signalized intersections: every 5-7 years

Counts may be collected more frequently in developing areas or locations subject to notable changes in traffic patterns.

Counts should be collected in 15-minute intervals to identify peak and off-peak periods throughout the day. For traffic signals on state routes, the City should coordinate a count program with the SDDOT.

Traffic Signal Design

Traffic signal design should be performed only by experienced traffic engineers registered as a Professional Engineer in the State of South Dakota. Without a traffic engineer on staff at the City of Mitchell, it is recommended that newly anticipated traffic signal installations be designed by a qualified consulting engineer specializing in both roadway and traffic signal design.

Designers should refer to local/state practices, guidelines, or policies when selecting detection technology. The designer should consider future conditions while maintaining consistency with agency objectives and system needs. When designing a traffic signal layout and determining equipment needs:

- Setback detectors should be placed so that the signal avoids displaying a yellow indication for a vehicle in the dilemma zone.
- Wiring and cabinet equipment should support independent operation of each crosswalk, if possible.
- Controllers should be configured to account for time-related operational needs, such as time-of-day signal timing plans.
- ADA compliant Accessible Pedestrian Signals (APS) and pedestrian ramps should be provided.

Signal Timing Practices

Traffic signal operations should follow the National Cooperative Highway Research Program (NCHRP) *Report 812: Signal Timing Manual* as best practice.

Efficient traffic signal operations are a byproduct of good signal timing practices and quality detection. Traffic volumes and patterns change throughout a day and over long time periods requiring differing traffic signal timings. A well-timed free operation timing plan with reliable detection can typically handle traffic volumes below saturated conditions. However, as intersections and/or corridors approach congested/saturated conditions, semi-actuated or pretimed timing plans typically operate more efficiently. Actuated (free operation) and semi-actuated signal operations are most responsive to real-time traffic volumes and arrivals based on detector actuations. Detection is a critical component of traffic signal operation. Detectors provide the traffic signal controller with the information necessary to determine the servicing of roadway users. Use of detection allows timings to only serve side streets when traffic is present, thus maximizing green time on the main street and minimizing overall delay.

Coordinating a traffic signal system is generally beneficial when considering signals within short distances (i.e., one-half mile) of each other, but may also be beneficial for signals at longer distances when deemed appropriate. When implementing or considering a coordinated signal system:

- All intersections should have the same cycle length, or a cycle length of one-half that of the critical intersection and have reliable detection on all approaches.
- Phase splits may be allocated to maintain a design level of capacity or to maintain equal volume-to-capacity ratios for the critical movements.
- Phase sequence and green bandwidth (progression) should be evaluated.
- Time-space diagrams and post-implementation field review should be used to optimize the system.

Clearance interval timings shall follow the National Cooperative Highway Research Program (NCHRP) Report 731: Guidelines for Timing Yellow and All-Red Intervals at Signalized Intersections.

Preparation of traffic signal timings should be performed only by experienced traffic engineers registered as a Professional Engineer in the State of South Dakota. Without a traffic engineer on staff at the City of Mitchell, it is recommended that new traffic signal timings be prepared an implemented by a qualified consulting engineer specializing traffic signal operations.

Infrastructure

Signal infrastructure includes power supplies, cabinets, controllers, cabinet equipment, battery backups, poles, pushbuttons, signal heads, pedestrian heads, detection systems, etc.. Currently, the City's traffic signal equipment varies considerably by type and age from intersection to intersection. Newly installed traffic signals commonly have material/equipment that is on the SDDOT's Approved Products list. Many older signal installations throughout the city have outdated equipment that varies by manufacturer. This complicates maintenance

activities because it requires signal technicians to have the knowledge required to operate and maintain these differing technologies and equipment. It is recommended that, over time, traffic signal controllers be replaced with the preferred controller/technology for ease of operation and maintenance. This same recommendation is made for installation of new or replacement of signal cabinets and components, battery backup systems, pushbutton systems, and vehicular detection systems. Replacement stock should be purchased and stored for replacement of cabinets, controllers, load switches, flash transfer relays, detector cards, MMU's with conflict monitor cards, pushbuttons, pedestrian heads, signal heads, LED inserts, tunnel visors, backplates, mounting hardware, battery backup components, detection system components, and others as deemed necessary. Quantities should be evaluated based on history of need.

Preventative Maintenance

Preventative maintenance (PM) is the regular and routine maintenance of equipment and assets to keep them running and prevent costly unplanned downtime as a result of unexpected equipment failure. A successful maintenance strategy requires planning and scheduling maintenance of equipment before a problem occurs.

The benefits of preventive maintenance include:

1. Lengthen asset lifespan
2. Lower risk of malfunctions or breakdowns
3. Increase operational efficiency
4. Decrease unplanned downtime
5. Boost citizen satisfaction
6. Save money

Standard Operating Procedures (SOPs) are a good way to document maintenance (and operational) procedures and ensure consistency over time and throughout an organization. Recommended SOPs are attached hereto and should be reviewed and edited as needed, adopted, and distributed to affected staff for consistent implementation. SOPs provided include:

1. Installation and Maintenance of Traffic Control Devices
2. Placement of Portable STOP or YIELD signs
3. After hours call-out procedures for Traffic Signals

Recommended minimum maintenance standards and frequency are defined in the SOP for Installation and Maintenance of Traffic Control Devices.

The existing asset inventory already created by City staff should be entered into an asset-tracking or spreadsheet-style software and updated to track age of existing infrastructure. This asset inventory should be used to plan for the capital replacement of aging traffic signal infrastructure.

Development of minimum qualifications and certifications for maintenance staff should be strongly considered to ensure proper knowledge and ability of staff assigned to work in the field and on traffic signal infrastructure. The International Municipal Signal Association (IMSA) is the

most regarded name in public safety related to traffic signals, delivering quality certification programs and connecting the traffic signal industry through membership. It is recommended that City staff involved in signal maintenance and operations be members of IMSA, attend either the online or in-person IMSA Certification Program, and obtain, at a minimum, the Traffic Signal Field Technician Level II certification. Other certifications recommended include Traffic Signal Bench Technician, Work Zone Temporary Traffic Control Technician, and Signs and Pavement Markings Technician Level 1. Certification should be kept active by meeting all renewal requirements, including earning Continuing Education Credits. Some industry vendors offer continuing education credits by coming to the city and demonstrating or teaching products in their product suite. City staff involved in signal operations and maintenance should communicate training needs to the industry vendors and host in-person visits from the vendors to obtain the needing training and continuing education credits.

Summary

Traffic signals are a critical element of transportation systems that enable the safe and efficient movement of the traveling public. A review of the City of Mitchell's traffic signal system was conducted, including an assessment of the system's management, maintenance, and operations practices as well as a comparison of these to national norms and industry best practices.

Standard signal management, maintenance, and operations practices were reviewed at the national levels by completing the Institute of Transportation Engineers (ITE) Traffic Signal Benchmarking Self-Assessment and the Federal Highway Administration (FHWA) Traffic Signal Systems Capability Maturity Framework survey. Resulting documentation from those exercises shows areas of improvement and provides guiding recommendations.

The City's traffic signal system was assessed based on six aspects: management, traffic monitoring, traffic signal design, signal timing practices, infrastructure, and preventative maintenance. Generally, the city has very limited funding and resources dedicated to the traffic signal system. Signal equipment in the field and in the traffic shop varies by manufacturer and age. Signal timing improvements are rarely made. City staff indicated that they minimally adjust signal timing parameters based on citizen complaints; however, the City lacks the staff and knowledge to implement more sophisticated strategies such as time-based coordinated timing plans. Also, city staff is limited to making very small timing adjustments to SDDOT owned traffic signals that are maintained by the city.

City staff indicated that it has been difficult to dedicate time beyond reactive maintenance activities, due to other responsibilities that include maintenance of signs and pavement markings, and completion of utility locates. In general, system maintenance is reactive – although an asset inventory has been created, and some equipment stock exists – any improvement is again largely limited by staffing and funding levels. City signal infrastructure generally operates consistently; however, some aspects of the system infrastructure are noticeably aging with no formal program in place to replace them.

Overall, the City has a traffic signal system that functions minimally and is fairly reliable; however, several operational improvements should be prioritized and implemented. Enhancing the City's signal system beyond its current state will require additional investment, dedication of additional staff time, and possibly completion of a capital funded signal system improvement project. Recommendations resulting from this evaluation include:

- Complete a comprehensive Traffic Signal Management Plan that defines a vision, mission, goals, and objectives.
- Implement a traffic count program that counts signalized intersection every 3-5 years for high priority intersections and 5-7 years for low priority intersections.
- Install vehicular detection systems at more major signalized intersections. Detection installation should be prioritized with major signaled intersections on arterial roadways being equipped first. Detection should then be installed at more minor signalized intersections along collectors and other minor roadways.
- Utilize collected traffic counts and develop new signal timings that include off-peak free operations and peak hour time-of-day timing plans for increased operational efficiency.
- Continue to install battery backups at all signalized intersections.
- Replace aging infrastructure with products from the same manufacturer for consistency from intersection to intersection.
- Obtain training and certifications for staff involved in signal operations and maintenance.

Appendix A – ITE Traffic Signal Benchmarking Self-Assessment

Traffic Signal Benchmarking

ASSESSMENT COMPLETE

Traffic Signal Benchmarking | State-of-the-Practice

Thank you for taking the time to complete our assessment. You can find your answers below. You may print your results now or return to the Self Assessment page and login to print them at a later date.

Print Assessment Responses

Benchmarking

All information and responses to this self assessment will remain confidential.

The information below is requested so that we may contact you with questions regarding the information you have submitted. It also will be used as a mailing address for the certificate of completion and self assessment score summary we will send you in response to your completion of the survey and will enable us to correlate survey responses with demographics (organization type, size, etc.).

1. How many full-time, in-house employees perform traffic signal management, operations, and maintenance under the following categories?

APPENDIX A

0	Non-technical Manager	0	Engineering Manager	0	Engineers
0	Other Professionals	2	Signal Technicians	0	Other Technicians
0	Administrative	0	IT/IS Engineers		Other (please specify)

If you have information available, please consider answering Question 1a

1a. What is the salary range of full-time employees performing management, operations, and maintenance under the following categories?

	Design		Operations		Maintenance	
	Low	High	Low	High	Low	High
Non-technical Manager	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
Engineering Manager	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
Engineers	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0

APPENDIX A

	Design		Operations		Maintenance	
	Low	High	Low	High	Low	High
Other Professionals	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
Signal Technicians	$ 0	$ 0	$ 0	$ 0	$ 40000	$ 55000
Other Technicians	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
Administrative	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
IT/IS Engineers	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
Other (please specify)	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0

2. Does your agency track utilization of staff resources to deliver services?

Design	○ Yes ◉ No	Operations	○ Yes ◉ No	Maintenance	○ Yes ◉ No

3. How is the traffic signal function performed by your agency?

APPENDIX A

Function	Program Management	Design	Construction	Operations	Maintenance
By agency staff	☐	☐	☐	☑	☑
Delegated to outside agency	☐	☐	☐	☐	☐
Contracted out	☑	☑	☑	☐	☐

If you checked boxes as "Delegated to outside agency" in Question 3, please answer the following questions

3a. If yes, to what type of agency?

☐ Local ☐ County ☐ MPO ☐ State ☐ Utility ☐ Private

3b. If yes, do you provide any support to those agencies?

☐ Non-financial assistance (such as technical assistance, design guidance, training, etc.)

☐ Operations and Maintenance Funding

☐ Capital Funding

3c. If yes, how many traffic signals?

3d. If yes, how many agencies?

4. What are the source(s) and amount(s) of your agency's annual operating/maintenance funding for traffic signals?

Local	Regional	State
$ 47500	$ 0	$ 0
Federal	**Other**	**If other, please specify**
$ 0	$	

5. What are the source(s) and amount(s) of your agency's annual capital funding for traffic signals?

Local	Regional	State
$ 0	$ 0	$ 0

APPENDIX A

Federal	Other	If other, please specify
$ 0	$	

6. How does your agency typically acquire funding for traffic signals?

- [x] Periodic requests
- [x] Project-based
- [x] Annual programming

Infrastructure

7. How many signalized intersections does your agency own?	13

8. How many signalized intersections does your agency operate and maintain?	25

9. What number/percentage of signalized intersections have the following types of controllers?

APPENDIX A

Model 2070	0	#	Model 170	0	#	NEMA	25	#
ATC	0	#	Electro-Mechanical	0	#	Other		#
							(Please specify)	

If you have information available, please consider answering Question 9a:

9a. What is the average age of controllers (in years)?	20	Unknown

10. Do any signalized intersections have communication installed (i.e. interconnect)?

Yes No

If answer YES to Question 10, please consider answering Question 10a, 10b and 10c

10a. What number/percentage of signalized intersections communicate with a central system?	0	#

10b. What number/percentage of signalized intersections operate as part of a closed-loop system?	10	#

10c. What number/percentage of signalized intersections use the following types of interconnect?

Fiber	10	#	Copper		#	Wireless		#
Other		#	(Please specify)					

11. Do any signalized intersections have detection installed?

(•) Yes ( ) No

If answer YES to Question 11, please consider answering Question 11a and 11b

11a. What number/percentage of signalized intersections have detection?	17	#

APPENDIX A

11b. What number/percentage of signalized intersections use the following types of detection?

Loops	16	#	Video	1	#	Radar		#
Magnetometers		#	Microwave		#	Infrared		#
Other		#	(Please specify)					

12. What number/percentage of signalized intersections are equipped with closed circuit television (CCTV) cameras (for the purpose of monitoring traffic)?	0	#	☐ Unknown

13. Do you have cybersecurity measures that are taken by your agency?

○ Yes ◉ No

14. How many intersections have been converted to LED modules?	100	%

Maintenance

15. How does your agency typically identify maintenance issues? (Select all that apply)

- [x] Public service requests (complaints)
- [x] Field observations
- [x] Preventative maintenance (i.e. based on regular schedule)
- [ ] Automated monitoring
- [ ] Other (please specify)

(Please specify)

16. What is the typical response time for emergency maintenance activities?

During regular working hours (in hours)?	0
During non-working hours (in hours)?	0

17. Does your agency perform preventive maintenance activities? Select all that apply

- [ ] Never
- [ ] Rarely / as-needed
- [ ] Project-based
- [x] Routinely

18. How are maintenance activities recorded? Select any that apply

- [ ] Paper record at the intersection
- [ ] Electronic spreadsheet
- [ ] Work orders
- [ ] Asset management system
- [x] Other (please specify)

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Operations

19. How does your agency typically identify operations issues?

- [x] Public service requests (complaints)

APPENDIX A

- [x] Field observations
- [x] Preventative maintenance (i.e. based on regular schedule)
- [ ] Automated monitoring
- [ ] Other (please specify)

(Please specify)

---

20. Which tools does your agency typically use to adjust signal timing?

- [x] Field observations
- [ ] Signal timing optimization software
- [ ] Simulation software
- [ ] Automated traffic signal performance measures
- [ ] Other (please specify)

(Please specify)

---

21. What number/percentage of signalized intersections operate in the following modes?

Coordinated?	10	#

Isolated?	15	#

22. Are any of the following non-motorized applications used at signalized intersections?

Optional: can you provide the number or percentage of intersections in operation?

	Number	Percent
☐ Bicycle Signals		%
☐ Bicycle Detection		%
☑ Pedestrian Indications	25	%
☑ Pedestrian Actuation	16	%
☑ Accessible to meet ADA requirements	11	%

23. What number/percentage of signalized intersections use the following applications? (Select any that apply)

Optional: can you provide the number or percentage of intersections in operation?

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	Number	Percent
☐ Traffic Responsive Control		%
☐ Adaptive Control		%
☑ Flashing Yellow Arrows	13	%
☑ Emergency response plans (i.e. different signal timing for an unplanned event)	16	%
☐ Special event plans (i.e. different signal timing for a planned event)		%
☐ Preemption for rail crossings		%
☑ Preemption for emergency vehicles	16	%
☐ Preemption for transit vehicles		%
☐ Ramp metering		%
☐ Special functions for extending clearance intervals (i.e. for red-light running)		%

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	Number	Percent
☐ Other (please specify) (Please specify)		%

Management

Business Processes encompass the practices that an organization undertakes to carry out the strategies and methods that lead to the attainment of objectives and goals.

24. Does your agency have a document or set of documents that guide the traffic signal program in your department?

○ Yes ◉ No

24a. Does it include policy and guidance on any of the following topics?

☐ Operations (incl. Signal Timing) ☐ Design ☐ Maintenance ☐ Monitoring ☐ Workforce

24b. Does it include specific goals and objectives for the traffic signal program on any of the following topics?

☐ Operations (incl. Signal Timing) ☐ Design ☐ Maintenance ☐ Monitoring ☐ Workforce

24c. How often are these document(s) updated?

☐ Never ☐ Rarely / as-needed ☐ Project-based ☐ Routinely

24d. Does your agency link performance measures to documented goals and objectives?

○ Yes ○ No

24e. Are performance measures used for budget and resource allocation?

○ Yes ○ No

25. Does your agency use a systems engineering approach to guide procurement of traffic signal systems specifications and/or requirements?

○ Yes ◉ No

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26. How is the replacement of traffic signal equipment planned?

	Cabinets	Controllers	Infrastructure (Poles, mast arms, heads, conduits, etc.)	Communications	Detection
Unplanned (failure, damage, etc.)	☑	☑	☑	☑	☑
Planned roadway construction projects	☑	☑	☑	☑	☑
Planned periodic traffic signal capital projects	☑	☑	☑	☑	☑
Regular upgrades scheduled through life cycle planning (asset management)	☐	☐	☐	☐	☐
Other (please specify)	☐	☐	☐	☐	☐

27. Does your agency track a valuation on traffic signal system infrastructure (controllers, communication, central system, detection, etc.)?

○ Yes ◉ No

If answer YES to Question 27, please consider answering Question 27a

27a. If yes, what is the valuation of your entire traffic signal system infrastructure?	$

Systems & Technology

The Systems & Technology dimension focuses on how an organization strategically utilizes traffic signal infrastructure to provide the capability necessary to carry out tactical level activities and actions.

28. Does your agency have a traffic signal central system?

○ Yes ◉ No

28a. If yes, is it used to store historic signal timing documentation?

○ Yes ○ No

28b. If yes, is it used to upload/download signal timing information to/from the field?

- ○ Yes
- ○ No

28c. If yes, how often is it used to monitor traffic signals?

- ☐ Never
- ☐ Rarely / as-needed
- ☐ Project-based
- ☐ Routinely

28d. If yes, does your agency maintain an inventory of signal timing for each intersection?

- ○ Yes
- ○ No

29. Does your agency have a traffic management center (TMC)?

- ○ Yes
- ◉ No

30. Does your agency use an asset management system that includes traffic signal equipment?

Yes No

If answer is YES to Question 30, please consider answering Question 30a, 30b and 30c

30a. Is the information geo-coded data?

Yes No

30b. What equipment is included in the asset management inventory? (Select Any That Apply)

- Cabinets
- Controllers
- Infrastructure
- Communications
- Detection

30c. What information is recorded about the equipment? (Select Any That Apply)

- Location of Documentation (drawings, timing charts, etc)

- [ ] Maintenance activities
- [ ] Cost
- [ ] Condition Assessment
- [ ] Life cycle
- [ ] Other (please specify)

Performance Measurement

The Performance Measurement dimension determines the effectiveness of strategies and tactics within all areas of the traffic signal program. Effective program performance measurement requires the use of output and outcome measures that are directly linked to objectives and frequently strategies.

31. Has your agency developed performance measures to evaluate the effectiveness of traffic signal operations?

- ○ Yes
- ◉ No

31a. If yes, does your agency use any of the following performance measures regularly? (Select Any That Apply)

- [ ] Travel time
- [ ] Travel time reliability
- [ ] Volumes
- [ ] Queues
- [ ] Delay
- [ ] Signal state data (e.g. gap out, max out, etc.)
- [ ] High resolution data (such arrivals on green, split failures, etc.)
- [ ] Crash Data
- [ ] Response time to public service requests
- [ ] Other (please specify)

32. Has your agency developed performance measures to evaluate the effectiveness of traffic signal maintenance activities?

- ○ Yes
- ◉ No

32a. If yes, does your agency use any of the following performance measures regularly? (Select Any That Apply)

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- [ ] Number of maintenance activities completed
- [ ] Number of traffic signals retimed
- [ ] Maintenance response times
- [ ] Emergency Maintenance Response times
- [ ] Communication Reliability
- [ ] Detection Reliability
- [ ] Crash Data
- [ ] Response time to public service requests
- [ ] Other (please specify)

33. Is your agency aware of the FHWA Every Day Counts Automated Traffic Signal Performance Measures technology initiative?

- ○ Yes
- ◉ No

33a. If yes, does your agency plan to implement technologies from the program?

- ○ Yes
- ○ No

Organization & Staffing

This dimension focuses on workforce capability of core competencies to carry out the strategies and tactics of the program, including training, recruitment, and staff development. The program structure is also a function of program organization, and facilitates the development of relationships and execution of work and business in a manner that is consistent with program objectives.

34. When staff enter the traffic signal program (i.e. design, operations and/or maintenance) what level of knowledge, skills, and abilities are expected?

	Design	Operations	Maintenance
Have basic knowledge "generally" in engineering and technical topics?	☑	☑	☑
Have specific knowledge of traffic signal technical and engineering concepts?	☑	☑	☑
Have specific advanced knowledge of traffic signal technical and engineering concepts?	☐	☐	☑
Have specific expert knowledge of traffic signal technical and engineering concept?	☐	☐	☑
Have the capability to implement innovative traffic signal technologies that have not been deployed before?	☐	☐	☑

35. When staff enter the traffic signal program (i.e. design, operations and/or maintenance) what level of education is expected?

	Design	Operations	Maintenance
Apprenticeship	☑	☑	☑
Technical/Vocational Program	☐	☐	☐
Associates Degree	☐	☐	☐
B.S. in engineering or related field	☐	☐	☐
M.S. in engineering or related field	☐	☐	☐
Other (Please specify)	☐	☐	☐

36. What activities does your agency fund support for professional development? (Select all that apply)

	Design	Operations	Maintenance
In-house training	☑	☑	☑
Self-Study	☐	☑	☑
Webinars	☐	☑	☑

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	Design	Operations	Maintenance
Instructor-led Training	☐	☐	☐
Local Meetings	☐	☐	☐
Regional Meetings	☐	☐	☐
Technical Committees	☐	☐	☐
National / International Meetings	☐	☐	☐

37. When does staff training generally occur?

	Design	Operations	Maintenance
Rarely	☑	☑	☑
As-needed (i.e. when requested)	☐	☐	☐
Project-based	☐	☐	☐
Routinely (at least annually)	☐	☐	☐

38. Does your agency have certification requirements associated with position descriptions (Select all that apply)

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	Design	Operations	Maintenance
None	☑	☑	☑
IMSA Level 1	☐	☐	☐
IMSA Level 2	☐	☐	☐
IMSA Level 3	☐	☐	☐
P.E.	☐	☐	☐
PTOE	☐	☐	☐
PMP	☐	☐	☐
Other (please specify)	☐	☐	☐

39. Does your agency fund support membership in professional associations?

○ Yes ◉ No

If answer is YES to Question 39, please consider answering Question 39a

39a. Which professional associations?

- [ ] AASHTO
- [ ] ACSE
- [ ] APWA
- [ ] IMSA
- [ ] ITE
- [ ] ITS America
- [ ] NACE
- [ ] NACTO
- [ ] TRB
- [ ] Other (please specify)

If other, please specify

Collaboration

The maturity of the Collaboration dimension is driven by improving vertical and horizontal coordinated performance of internal and external partners for both transactional day-to-day events as well as programmatic and relational activities.

40. Does your traffic signal program staff collaborate on design, operation and maintenance activities?

- (●) Yes
- ( ) No

If answer is YES to Question 40, please consider answering Question 40a and 40b

40a. How often does the traffic signal program staff collaborate on design, operation and maintenance activities?

- [ ] Never
- [x] Rarely / as-needed
- [x] Project-based
- [ ] Routinely

40b. What drives the level of traffic signal program staff collaboration on design, operation and maintenance activities?

- [x] None
- [ ] Informal staff level relationships
- [ ] Hierarchical organizational structure
- [ ] Matrix organizational structure

41. Does your agency collaborate with internal stakeholders (i.e. other departments such as planning, construction, information technology, etc.)?

- (•) Yes
- ( ) No

41a. How often does the traffic signal program collaborate with internal stakeholders (i.e. other departments such as planning, construction, information technology, etc.)?

- [ ] Never
- [x] Rarely / as-needed
- [ ] Project-based
- [ ] Routinely

41b. What drives the level of internal collaboration?

- [ ] Informal relationships
- [x] Documented organizational structure
- [ ] Static formal partnerships
- [ ] Routinely-adjusted formal partnerships

42. Does your agency collaborate with external stakeholders (i.e. the public, media, private entities, etc.)?

- (●) Yes
- ( ) No

42a. How often does the traffic signal program collaborate with external stakeholders (i.e. the public, media, private entities, etc.)?

- [ ] Never
- [x] Rarely / as-needed
- [ ] Project-based
- [ ] Routinely

42b. What drives the level of external collaboration?

- [ ] Informal relationships
- [x] Documented organizational structure
- [ ] Static formal partnerships
- [ ] Routinely-adjusted formal partnerships

42c. How often do you share data/information with external stakeholders (i.e. the public, media, private entities, etc.)?

- [x] Never
- [ ] Rarely / as-needed

- [ ] Project-based
- [ ] Routinely

42d. What type of platform is generally used to share data/information with external stakeholders (i.e. the public, media, private entities, etc.)? (Select All That Apply)

- [ ] Reports
- [ ] Fact Sheets
- [ ] Access to an electronic database
- [ ] Websites
- [ ] Dashboards
- [ ] Social media
- [x] Other (please specify)

n/a

43. Does your agency collaborate in regional activities with other agencies?

- ( ) Yes
- (•) No

If answer is YES to Question 43, please consider answering Question 43a, 43b and 43c

43a. How often does the traffic signal program participate in regional activities with other agencies?

- [ ] Never
- [ ] Rarely / as-needed
- [ ] Project-based
- [ ] Routinely

43b. How often do you share data/information with other public agencies?

- [ ] Never
- [ ] Rarely / as-needed
- [ ] Project-based
- [ ] Routinely

43c. What type of platform is generally used to share data/information with other public agencies?

- [ ] Reports

- [ ] Fact Sheets
- [ ] Access to an electronic database
- [ ] Websites
- [ ] Dashboards
- [ ] Social media
- [ ] Other (please specify)

Traffic Signal Program Organizational Assessment

This section will evaluate the maturity of your organization in deliver traffic signal program services. There are four levels of program delivery as generally summarized below, and specifically on the following pages for particular topic areas

Level 1: Ad-Hoc

Objectives are not well defined, policies are informal and may be influenced by factors external to the program.

Activities are ad hoc and driven by individuals with adequate or developing skills and expertise to implement strategies.

Success is difficult to measure and is generally dependent on the expertise and heroics of individuals.

The potential loss of champions and expertise to perform program functions presents significant risk to program effectiveness

Level 2: Established

Objectives are established to guide the application of strategies activities and processes to manage results.

Business process, workforce capability and systems and technology functions are established and supported by documentation to allow early success to be repeatable.

Measures are being developed to evaluate program effectiveness, efforts to make improvements are limited, tend to be reactive with limited accountability.

Process discipline, often in the form of documentation, is in place or under development to capture experience mitigating some risk due to the potential loss of champions.

Level 3: Measured

In addition to Level 2:

Objectives and strategies are well defined.

Output and outcome measures are established to evaluate the effectiveness of strategies and progress towards the attainment of objectives.

The capability to verify and validate the effectiveness of activities, processes and systems is established. Reporting of program output and outcomes is a core business practice.

Level 4: Managed

In addition to Level 3:

Objectives, strategies and performance measures are fully integrated across the program.

The relationship between activities, processes, systems and performance is acknowledged by efforts to predict, detect and proactively make improvements that add value to the organization, optimize the planning and use of resources and increase customer satisfaction.

Infrastructure

Traffic control devices, and infrastructure (displays, structures, lane configuration) placement, visibility, recognition, necessity and function supports objectives.

Level 1: Ad-Hoc

Infrastructure specifications and requirements for functionality are not well defined, ad hoc selection of components is made based on preferences of key individuals.

The capability to confirm that the current condition and function of signalized intersection infrastructure components (e.g. poles, mast arms, span wire, wiring, signal heads) is consistent with operations and maintenance requirements is not well defined.

Infrastructure location and placement must be identified each time design, operations and maintenance activities are initiated due to the lack of adequate recorded keeping.

Level 2: Established

Infrastructure specifications and requirements for functionality are based on established operations and maintenance needs which support component selection.

The capability to confirm that the current condition and function of signalized infrastructure components (e.g. poles, mast arms, span wire, wiring, signal heads) is consistent with well-established operations and maintenance requirements.

Infrastructure location and placement is recorded on As-Built plans that are readily accessible to support ongoing design, maintenance and operations activities.

Level 3: Measured

In addition to Level 2:

Processes and measures are established to track the condition of infrastructure components to ensure the consistency of functionality with specifications and objectives.

Measures are established to ensure that infrastructure provides the required functionality (visibility, recognition, understanding) to meet objectives and compliance with national standards is maintained.

Level 4: Managed

In addition to Level 3:

Infrastructure measures are regularly evaluated to ensure consistency with required condition and functionality to attain objectives. Gaps in functionality and opportunities for enhancement are monitored to identify needed investments.

Business Processes

Design

Formal scoping, planning, programming and budgeting

Level 1: Ad-Hoc

Design activities are not well developed practices are ad hoc. Designs may largely be based on tradition rather than established design objectives.

Processes that guide the selection, location and placement of traffic signal control devices are not well defined and could be based outdated guidance.

Requirements to support procurement of systems (e.g. local control central control, detection, communication) are not well defined, ad hoc selection of systems and technology is typically based on the preferences of key individuals.

Level 2: Established

Design activities and processes are well established, and responsive to operations and maintenance objectives to ensure that what gets built can be operated and maintained.

Design standards are established and based on nationally accepted guidelines, or state and local standards that are routinely updated and conform to national guidelines.

Requirements to support procurement of system (e.g. local control central control, detection, communication) are established via systematic processes (systems engineering, architecture standards) that link operations and maintenance objectives and needs to requirements.

Level 3: Measured

In addition to Level 2:

Objectives and strategies are well defined and performance measures (output and or outcome) are defined to support evaluation of design activities.

Reporting of program output and outcomes is a core business practice.

Processes are established to verify that systems provide the required functionality.

Level 4: Managed

In addition to Level 3:

Traffic signal design activities are evaluated to identify deficiencies and proactively identify opportunities to make improvements that add value to design activities and processes.

Processes are managed to verify that systems provide the required functionality.

Business Processes

Operations

Formal scoping, planning, programming and budgeting

Level 1: Ad-Hoc

Operations activities are not well defined. The day to day approach to operations might be described as “fire-fighting.”

Priorities and processes are ad hoc, driven by individuals with adequate or developing skills and expertise to implement operations strategies.

Little or no documentation exists to guide operations, processes. Updates to existing guidelines are rare and are not tracked.

Level 2: Established

Established operations strategies and tools are used to develop and implement signal timing, based on appropriate objectives (e.g. smooth flow, equitable distribution of green time, manage queues) and context (e.g. traffic demand, user mix, network configuration).

Guidelines and strategies are well established to support the design and evaluation of signal timing to provide consistency, manage results and capture experience.

Efforts to make improvements to operations processes are limited, tend to be reactive and have limited accountability.

Level 3: Measured

In addition to Level 2:

Measures and process to collect data and evaluate performance are established.

Measures (output and or outcome) are established to validate the attainment of objectives and effectiveness of strategies.

Reporting of program output and outcomes is a core business practice.

Level 4: Managed

In addition to Level 3:

Operations objectives, strategies and performance measures are fully integrated across the program. The relationship between activities, processes, systems and performance is acknowledged by efforts to predict, detect and proactively

make improvements that add value to operations activities and processes.

Business Processes

Maintenance

Formal scoping, planning, programming and budgeting

Level 1: Ad-Hoc

Maintenance activities are not well defined, ad hoc.

Little or no documentation exists to guide maintenance processes. Updates to existing guidelines are rare and are not tracked.

Processes to evaluate infrastructure condition are ad hoc and not well defined. The systems, technology and infrastructure components may be dated (potentially obsolete), with gaps in functionality and typically replaced upon failure.

System components are typically replaced when there is equipment failure.

Level 2: Established

Established maintenance strategies, activities, processes are practiced to guide preventative, routine/scheduled and emergency maintenance.

Guidelines, checklist or other documentation is available or under development to support traffic signal maintenance to ensure the reliability of infrastructure, systems and technology.

Efforts to make improvements to maintenance processes are limited, tend to be reactive and have limited accountability.

System components are replaced based on life cycle and or when needed improvements in functionality are identified.

Level 3: Measured

In addition to Level 2:

Measures (output and or outcome) are defined for maintenance-related activities.

Measures (output and or outcome) are established to validate the attainment of maintenance objectives and the effectiveness of strategies.

Reporting of maintenance output and outcomes is a core business practice.

Traffic signal equipment is replaced/updated through regular upgrades that are considerate of life cycle and functionality gaps.

Level 4: Managed

In addition to Level 3:

Maintenance objectives, strategies and performance measures are fully integrated across the program.

The relationship between activities, processes, systems and performance is acknowledged by efforts to predict, detect and proactively make improvements

Processes are continuously improved by validating the effectiveness of day to day activities, systems and technology and workforce capabilities with performance measures.

Business Processes

Management

Formal scoping, planning, programming and budgeting

Level 1: Ad-Hoc

The clear articulation of the goals and objectives of the traffic signal program relies on one or more program champions as documentation to support day to day activities in the area of design, operations and maintenance have not been fully developed.

The loss of key staff due to attrition or retirement presents a risk to continuity of administration activities.

Little or no documentation exists to provide direction, vision, and goals to guide traffic signal program processes.

The relationship between workforce, systems and technology, asset management and agency goals is reliant on key individuals. Updates to existing guidelines are rare and are not tracked.

Level 2: Established

The potential loss of continuity resulting from the attrition of key staff is mitigated by documenting program goals and objectives in the form of a Traffic Signal Management Plan (TSMP).

The TSMP references national standards and guidelines to support agency practices. The TSMP considers and documents the need for collaboration among traffic signal related activities.

Workforce competencies, asset inventories, procurement processes (e.g. systems engineering) are documented. An asset management system is available to track the life cycle of equipment.

Level 3: Measured

In addition to Level 2:

A set of measures (output and or outcome) are defined for management-related activities as well as the overall program.

The capability and processes to validate and routinely report on the attainment of program objectives and strategies is developed or under development.

Asset management inventory is available.

Level 4: Managed

In addition to Level 3:

- Program business processes, are continuously improved by validating the effectiveness of day to day activities, systems and technology and workforce capabilities with measures.
- Asset management, funding processes, training, implementation of technology and innovation and investments in innovation and technology are informed by evaluation of measures.
- Priorities and investments are referenced in the Agency strategic plan.

Workforce

Competency, development, training

Level 1: Ad-Hoc

- The workforce maintains minimum levels of capability to complete required tasks. Workforce competencies/position descriptions are not well defined.
- Training is ad hoc and lacks formal structure. Funding to support training, development of core skills and certification is limited.

Level 2: Established

Workforce competencies are established, job descriptions are documented to support alignment of staff capability with design, operations and maintenance strategies.

Workforce development is supported fiscally with structured internal and or external training and certification as appropriate to maintain the competency of the workforce.

Level 3: Measured

In addition to Level 2:

Workforce competencies are linked to current and planned program needs in each area of the traffic signal program and monitored for consistency.

Training and certifications are tracked to ensure that staff capability is consistent with program needs.

Level 4: Managed

In addition to Level 3:

Workforce competencies are evaluated to ensure consistency with industry standards and program needs and routinely updated to improve competencies.

Appropriate program performance measures are evaluated to identify and address potential gaps between staff capability and program needs. Training and certifications are prescribed to address gaps.

Management & Administration / Leadership

Culture

Overall direction, leadership, outreach, and program resources

Level 1: Ad-Hoc

Overall the program lacks direction, goals and objectives are not well defined.

Customer needs are difficult to evaluate.

The traffic signal program is a low priority within the overall transportation program.

The need programmatic for investments is not well defined. Budgetary and resource needs are not well defined.

Level 2: Established

The direction of the program is established and documented in a plan

Customer needs are established and processes exist to address issues.

A consistent message is established to articulate the value of the program, its activities and needs.

Budgetary and resource needs are established, planned and constrained based on objectives, workforce, strategic needs and limitations.

Infrastructure and systems life-cycle planning is under development or established.

Level 3: Measured

In addition to Level 2:

Measures of effectiveness are established to validate attainment of the programs objectives.

Customer satisfaction is evaluated, and reported.

The value of the program is demonstrated by reporting progress on program measures of effectiveness.

Budgetary and resource needs and priorities are established and monitored.

An asset management plan is established and includes measures to evaluate infrastructure and systems.

Level 4: Managed

In addition to Level 3:

Measures are continuously evaluated to identify opportunities to improve the program.

Opportunities to improve customer satisfaction are identified and planned.

The traffic signal program is included in the overall strategic plan of the organization.

The program budget and resource needs are managed. Opportunities to improve fiscal support is continuously evaluated and reflected in investments.

Infrastructure and systems are managed, based on life-cycle monitoring and opportunities to enhance functionality is continuously evaluated.

Management & Administration / Leadership

Organization and Staffing

Organizational structure, roles and responsibilities, and staffing levels

Level 1: Ad-Hoc

Coordination between the units responsible for design, operations and maintenance is ad-hoc and not well developed.

The roles of organizational units may lack clear definition, resulting in redundancy or voids in needed activities. (e.g. asset management, procurement, monitoring, reporting)

Staffing levels are not consistent with needs.

Staff retirements, promotions, and rotation within the organization or attrition is ad hoc.

Level 2: Established

Coordination between planning, design, operations and maintenance, is established and supported by organizational structure

Roles of organizational units are established, and coordination is planned strategically to facilitate attainment of objectives.

Staffing levels are established to address attainment of objectives.

A staff succession plan is established to ensure staffing levels are consistent with needs and attainment of objectives.

Level 3: Measured

In addition to Level 2:

Measures are established to validate the effectiveness of coordination among business units.

Measures are established to verify that the activities and processes of each business unit, support attainment of objectives.

The output of organizational units is measured and reported.

Staff succession, retention and rotation within the organization is monitored.

Level 4: Managed

In addition to Level 3:

- The Organizational structure is managed to facilitate appropriate levels of coordination between business units.
- The roles and activity of business units are evaluated to identify and take advantage of opportunities for improvements.
- Staffing levels are routinely evaluated and modified as needed to maximize the output and outcomes of the program
- Staff succession, retention and rotation within the organization is managed.

Management & Administration / Leadership

Collaboration

Public safety agencies, local governments, metropolitan planning organizations (MPOs) and the private sector

Level 1: Ad-Hoc

Internal

- Coordination between the traffic signal program and other units (e.g. Planning, Safety, Construction, Active Transportation) is ad hoc, not well defined and dependent informal relationships.

External

The program does not routinely coordinate with other public or private organizations (e.g. MPOs, police, emergency services, schools, colleges, special event facilities) to plan, coordinate or respond to activity or share information to support, day to day operations (e.g. cross jurisdictional coordination), management of special events, incidents, unplanned events or unusual occurrences.

The traffic signal program is not routinely considered in local, regional or state transportation planning activities.

Level 2: Established

Internal

Coordination between the program and other units (e.g. Planning, Safety, Construction, Active Transportation) is established and consistent with objectives.

External

Relationships with external public and private partners is established. Memorandums of Understanding or formal agreements are developed as needed to facilitate collaboration. Special events, incidents and emergencies are appropriately planned for and coordinated.

The program is appropriately established within regional and State transportation planning activities.

Level 3: Measured

In addition to Level 2:

Internal

The capability to monitor projects and activities that may benefit from coordination with the traffic signal program is established.

External

The capability to evaluate the need for and effectiveness of coordination with external partners and Integration of systems is established.

The program monitors the outcome of regional planning activities to ensure appropriate consideration of needs.

Level 4: Managed

In addition to Level 3:

Internal

The program evaluates projects to identify opportunities to improve the quality of projects by enhancing coordination with other units (e.g. Planning, Safety, Construction, Active Transportation).

External

The traffic signal program strategically coordinates with partners to achieve shared goals and objectives.

Appropriate local, state and federal resources are leveraged to integrate activities, processes and systems in support of regionally shared goals and objectives.

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Appendix B – Standard Operating Procedure (SOP) Templates

City of Mitchell, SD

Standard Operating Procedure (SOP) for
Emergency Call-Out for Traffic Signals

The following procedure shall be used for call-out of Signal Technicians when traffic signal malfunctions are reported.

1. When a complaint is taken by the Mitchell Police Department (MPD), a patrol officer shall be dispatched to that intersection location to verify the issue and/or safety hazard. If the caller also reports that an accident has occurred due to a signal related issue, please notify the responding technician immediately.

   To help the officer in determining if a signal technician should be called in, the following is a list of typical signal related issues that are called in by citizens or others that will require a signal technician:

   a.) Signal Power Outage (or All Signal Indications Out);
   b.) Signal Pole or Cabinet Hit and/or Knocked Down;
   c.) Red Indication Out (in either a Left Turn Head or both Through Heads);
   d.) Amber or Green Indication Out (in either a Left Turn Head or two or more ambers or greens are out in one direction);
   e.) Signal Head Turned;
   f.) Signal Stuck;
   g.) Erratic Timing;
   h.) Signal Flashing (refer to flashing schedule to verify that it is not operating as programmed; or,
   i.) Other

   Any reports made that do not require the call out of a signal technician should reported via email to jharvey@cityofmitchell.org.

2. Following verification of a signal-related issue listed above, the MPD should request traffic signal technicians to dispatch to the site by calling the technicians in following order (if there are answers, leave a message):

		Cell
a.)	Josh Harvey	605-630-1148
b.)	John Horton	605-999-7636

3. If a technician cannot be reached, call Muth Electric at 605-996-7300.

4. The responding signal technician shall radio in to MPD to notify that they are en route to the subject intersection.

5. After the signal technician has fixed the signal issue (if fixable during the call-out), they shall radio into the MTP and notify them that the issue is resolved. The signal technician shall document the complaint/issue and repair work completed in the intersection book.

6. After documenting in the intersection book, the signal technician shall now radio in to the MPD and notify them that the technician is leaving the site.

Effective: _____
(Date)

By: _____
(Public Works Director)

City of Mitchell, SD

Standard Operating Procedure (SOP) for the
Maintenance and Removal of Traffic Control Devices

This memo is to serve as a statement of the City of Mitchell's policy regarding the procedure for installing and maintaining traffic control devices. This SOP ensures that minimum criteria are defined and met for installing traffic control devices. It also ensures that traffic control devices are periodically checked to ensure that they still provide for motorist safety and that traffic control devices that are no longer suitable for current traffic conditions are removed or changed.

The Manual on Uniform Traffic Control Devices (MUTCD) and industry standards shall be always met to ensure safety, need, and uniformity for all traffic control devices.

General – Each time that a new MUTCD is published, an on-staff or consulting Professional Engineer shall review all changes within the document and compare to our policies/procedures and report any changes that are needed to stay in compliance with the new MUTCD.

Removal – Annually, staff shall meet and review a list of signalized intersections and discuss the needs of older signalized intersections including whether a particular traffic signal is warranted any longer. If any are determined to be close to not meeting warrant, a staff Professional Engineer shall perform a warrant analysis as identified in the MUTCD and review the findings with the Public Works Director. If it is determined that it would be in the best interest of the public to remove a traffic signal, then a press release shall be issued for 30 days to seek public input, while concurrently the signal is put into a safe flash operation. If after 30 days, insignificant comments or no comments are received; a decision is made by the Public Works Director to continue with the removal by issuing another press release, again seeking any additional comments, while concurrently turning the signal off and bagging all heads for a period of 30-60 days. If after the 30-60 days, insignificant comments or no comments are received, then the Public Works Director will make a final decision to remove all equipment and work with the Traffic Shop to ensure all proper signage and striping are complete during the removal process. If at any time during the removal/public comment period it is determined that the comments from the public warrant keeping the signal, then that decision will be made by the Public Works Director and the signal will be placed back into normal operation and the issue closed.

Annually, staff shall meet to review a list of intersections and street segments where high crash rates exist. Remediation efforts, including but not limited to minor geometric improvements, the addition of signs and markings, or changes to traffic signal operations, shall be considered to address any deficiencies that are discovered. Larger geometric or other infrastructure issues are noted and reported to the Public Works Director.

The Public Works Department shall continually review the use of signs and pavement markings throughout the year and determine if any removals are warranted. When removal warrants met, crews shall remove the either the signs, poles, and hardware of the existing signs that are no longer

warranted and/or use a pavement marking grinder to remove any existing pavement markings that are no longer warranted.

Maintenance – The Traffic Shop, or qualified traffic signal company, shall perform annual conflict monitor checks, controller checks, and general cabinet cleaning with full documentation for every traffic signal. Documentation of such checks shall be kept on file.

The Traffic Shop shall perform scheduled maintenance on all signs and pavement markings. Signs shall be replaced when minimum retro-reflectivity standards are no longer met, or the sign has been damaged beyond repair. Pavement markings shall be routinely replaced on a schedule which is based on the useful life of the thermoplastic material or paint.

Effective: _____
(Date)

By: _____
(Public Works Director)

City of Mitchell, SD

Standard Operating Procedure (SOP) for Placement of
Portable STOP or YIELD Signs at Signalized Intersections

This memo is to serve as a statement of the City of Mitchell's policy regarding the procedure for placement of portable STOP or YIELD signs at signalized locations.

Federal regulations from the Manual on Uniform Traffic Control Devices (MUTCD) 2009 edition states:

> **Because the potential for conflicting commands could create driver confusion, YIELD or STOP signs shall not be used in conjunction with any traffic control signal operation, except in the following cases:**
>
> **A. If the signal indication for an approach is a flashing red at all times;**
>
> **B. If a minor street or driveway is located within or adjacent to the area controlled by the traffic control signal, but does not require separate traffic signal control because an extremely low potential for conflict exists; or**
>
> **C. If a channelized turn lane is separated from the adjacent travel lanes by an island and the channelized turn lane is not controlled by a traffic control signal.**
>
> **STOP signs and YIELD signs shall not be installed on different approaches to the same unsignalized intersection if those approaches conflict with or oppose each other.**
>
> **Portable or part-time STOP or YIELD signs shall not be used except for emergency and temporary traffic control zone purposes.**
>
> **A portable or part-time (folding) STOP sign that is manually placed into view and manually removed from view shall not be used during a power outage to control a signalized approach unless the maintaining agency establishes that the signal indication that will first be displayed to that approach upon restoration of power is a flashing red signal indication and that the portable STOP sign will be manually removed from view prior to stop-and-go operation of the traffic control signal.**

These regulations **SHALL** be followed in all situations.

Should a power outage occur at an intersection, portable STOP signs shall not be utilized unless a signal technician is on site and authorizes their placement. This will only occur if the signal technician shuts off the power to the signal cabinet at the breaker. This will allow the signal technician to ensure that the signal will resume in flashing red operation upon restoration of the power. The signal technician will then have the portable STOP signs removed and then place the signal into regular operation.

Should a power outage occur during normal business hours (M-F 7:00 am to 4:00 pm):

1. Call 995-8408 (Traffic Shop) and they will provide immediate assistance including placement of STOP or YIELD signs if they are deemed appropriate for use.

Should a power outage occur outside normal business hours:

1. Use the Standard Operating Procedures (SOP) for Emergency Call-Out for Traffic Signals. The responding signal technician provide immediate assistance including placement of STOP or YIELD signs if they are deemed appropriate for use.

Effective: _____
(Date)

By: _____
(Public Works Director)

Appendix H: Project Summary Sheets

SD37 & Sanborn Boulevard Intersection

Corridor Description	Intersection Traffic and Safety Improvements
Limits: Intersection Major Roads Plan: SD37: Regional Arterial Sanborn Boulevard: Local Arterial	

Summary of Needs

- Intersection Operations: LOS F (2045)
- Crash history
  - Elevated crash intersection
  - Most frequent crash type: angle and single vehicle
- Public comment indicated left turn lanes are too short and should be extended
- Multimodal:
  - Shared-use path connectivity between 15th Avenue and Main Street

Major Intersection Improvements Summary

Intersection	Option	Short-Term Improvements			Planning Horizon Improvements		
		Traffic Control	Summary	New Lane Configuration	Traffic Control	Summary	New Lane Configuration
SD37 & 23rd Avenue	Stop Control → Traffic Signal	TWSC	-	-	**Traffic Signal**	Signalize (when warranted)	-

*Changes noted in **Bold Orange***

Recommendations

- Monitor intersection traffic volumes and crash history for signalization and turn lane storage needs
  - Signalize when warranted
  - Extend SD37 turn lane striping based on observed queues

Long-Range (2040+)

Traffic Signal

- Monitor intersection traffic volumes and signalize when warranted

Sanborn Boulevard & Havens Avenue Intersection

Corridor Description	Intersection Safety Improvements
Limits: Intersection Major Roads Plan: Sanborn Boulevard: Local Arterial Havens Avenue: Regional Arterial	

Summary of Needs

- Crash history (years 2019-2020 only)
  - Elevated crash intersection (0.88 critical ratio)
  - 6 of 7 angle crashes involved a westbound movement

Recommendations

- Add signal heads over each lane
- Review traffic signal yellow and all-red phases
- Review protected-only phasing for eastbound left turn
- Increase left turn offset for eastbound and westbound left turn lanes (long-range due to ROW impacts)

Short-Term (<2030)

Traffic Signal Modifications

- Add signal heads over each lane, review traffic signal yellow and all-red phases, and review applicability for protected-only left turn phasing

5th Avenue & Duff Street Intersection

Corridor Description	Intersection Safety Improvements
Limits: Intersection Major Roads Plan: Duff Street: Local 5th Avenue: Collector	

Summary of Needs

- Crash history
  - Elevated crash intersection (0.97 critical ratio)
  - 4 of 5 angle crashes involved a northbound movement
  - 1 crash involved a pedalcycle (incapacitating injury)

Recommendations

- Review intersection sight distance
- Construct intersection bump-outs or other traffic calming measures along 5th Avenue

Short-Term (<2030)

Intersection Modifications

- Review intersection sight distance and construct intersection bump outs or other traffic calming measures along 5th Avenue

Spruce Street & Wal-Mart Right-in Right-out Intersection

Corridor Description	Intersection Safety Improvements
Limits: Intersection Major Roads Plan: Local Arterial (Spruce Street)	

Summary of Needs

Intersection noted during the study as a candidate location for future modification due to:

- Wrong-way travel or motorists turning left into or out of the right-in right-out access
- Motorists hitting signs and driving over the splitter island

It should be noted that 100 percent right-in right-out compliance is difficult without a median, particularly during off-peak hours where there are adequate gaps for traffic to maneuver around right-in right-out islands.

Recommendations

The primary recommendation is to construct a raised median on Spruce Street for at least 50 feet on either side of the right-in right-out access. A raised median is the best method to restrict left turns into and out of an access.

If this option is not feasible, increasing the median size to facilitate a more sweeping right turn into the access and/or extending a portion of the raised island further to the west to separate the eastbound right turn and through movements is recommended. Both options make it more difficult for a westbound left turning vehicle to enter the access. The right turn out is challenging to modify as skewing the approach too much creates a sight issue for the motorist trying to look over their shoulder and gauge gaps in traffic.

Mid-Term (2030-2039)

Spruce Street Raised Median

- Construct raised median on Spruce Street

Main Street & 15th Avenue 'Offset T' Intersections

Corridor Description	Intersection Safety Improvements
Limits: Intersection Major Roads Plan: • Main Street: Local Arterial • 15th Avenue: Collector	

Summary of Needs

- Crash history
  - Main Street and West 15th Avenue intersection
    - Elevated crash intersection (0.98 critical ratio) and angle crash frequency
  - Main Street and East 15th Avenue intersection
    - Elevated angle crash frequency
- Connectivity
  - 15th Avenue identified as an east/west Collector in the Major Roads Plan, but is offset between Main Street and Kimball Street and creates 'T' intersections
- Access
  - High volume, full access points located within the Main Street intersection functional area

Recommendations

Both intersections exhibit a propensity for angle crashes, particularly those involving a vehicle turning from the side street. There are several potential modifications for further consideration and study, with varying degrees of benefit, impact, and cost:

- Extend median through 15th Avenue intersections and adjacent access points, and convert all access to right-in right-out with downstream U-turns
- Extend median through 15th Avenue intersections and adjacent access points, and convert both 15th Avenue intersections to ¾ intersections (restricts left turns from 15th Avenue approaches) with downstream U-turns
- Construct 'peanut' or oval type roundabout to bring both legs of 15th Avenue into a single intersection
- Realign either (or both) 15th Avenue approaches
- Reconstruct 15th Avenue to the south between Main Street and Kimball Street to line up with existing 15th Avenue intersections

A detailed study of this intersection is recommended as the next step. A study would facilitate a process to develop and evaluate options in greater detail, discuss options with adjacent property and business owners, and gather public feedback.

Mid-Term (2030-2039)

Intersection Study

- Determine long-range Main Street & 15th Avenue intersection configuration
  - Develop and evaluate intersection concepts
  - Public involvement
- Identify future project(s)

23rd Avenue Corridor

Corridor Description	Planning Horizon Corridor Vision
Limits: Ohlman Street to SD37 Major Roads Plan: Local Arterial	3-lane urban section with center left turn lane

Summary of Needs

- Segment capacity: 3-lane section (2032)
- Intersection operations:
  - Ohlman Street & 23rd Avenue: LOS F (2045)
  - SD37 & 23rd Avenue: LOS F (2032)
- Crash history:
  - Ohlman Street & 23rd Avenue:
    - Elevated crash intersection
    - Most frequent crash type: angle crashes
- Multimodal:
  - Shared-use path connectivity between Minnesota Street and SD37
  - Intersection crossing improvements

Major Intersection Improvements Summary

Intersection	Option	Short-Term Improvements			Planning Horizon Improvements		
		Traffic Control	Summary	New Lane Configuration	Traffic Control	Summary	New Lane Configuration
Ohlman Street & 23rd Avenue	Stop Control → Traffic Signal	**TWSC / Signalize if warranted**	3-lane corridor improvements on all legs	EB: **LT**, **T/RT** WB: **LT**, **T/RT** NB: **LT**, **T/RT** SB: **LT**, **T/RT**	**Traffic Signal**	Signalize reconstructed intersection (when warranted)	-
	Roundabout	**Roundabout**	Single-lane roundabout	EB: **LT/T/RT** WB: **LT/T/RT** NB: **LT/T/RT** SB: **LT/T/RT**	-	-	-
SD37 & 23rd Avenue	Stop Control → Traffic Signal	**TWSC / Signalize if warranted**	3-lane corridor improvements on 23rd Ave	EB: **LT**, T, **RT** WB: **LT**, **T/RT** NB: LT, T, T/RT SB: LT, T, T/RT	**Traffic Signal**	Signalize reconstructed intersection (when warranted)	-

*Changes noted in **Bold Orange***

Recommendations

Reconstruct 23rd Avenue corridor as a 3-lane urban section to address emerging capacity needs. This segment is a key east/west arterial corridor south of Lake Mitchell and provides connectivity to developing areas. Monitor the 23rd Avenue intersections with Ohlman Street and SD37 for traffic signal needs. A roundabout is recommended for further consideration at the 23rd Avenue & Ohlman Street intersection.

Coordinate with future Ohlman Street corridor projects.

Mid-Term (2030-2039)

23rd Avenue 3-Lane Urban Section Reconstruction

Ohlman Street to SD37

- Ohlman Street & 23rd Avenue intersection options:
  - Traditional intersection (signalize if warranted) or
  - Roundabout
- Signalize SD37 & 23rd Avenue intersection (if warranted)
- Extend shared-use path on south side to tie into SD37 path
- 23rd Avenue pedestrian crossing improvements

Long-Range (2040+)

Signalize Intersection (if not yet signalized, when warranted)

- Ohlman Street & 23rd Avenue (if traditional intersection)
- SD37 & 23rd Avenue

Ohlman Street Corridor

Corridor Description	**Planning Horizon Corridor Vision**
Limits: S Harmon Drive to 8th Street Major Roads Plan: Local Arterial	3-lane urban section with center left turn lane

Summary of Needs

- Segment capacity:
  - 23rd Avenue to 8th Avenue: 3-lanes (2045)
  - S Harmon Drive to 23rd Avenue: dependent on future development
- Intersection operations
  - Ohlman Street & 23rd Avenue: LOS F (2045)
- Crash history:
  - Ohlman Street & 23rd Avenue:
    - Elevated crash intersection
    - Most frequent crash types: angle crashes
- Multimodal:
  - Shared-use path connectivity between Kemper Avenue and 23rd Avenue
  - Paved shoulder between 23rd Avenue and 8th Avenue
  - Intersection crossing improvements

Major Intersection Improvements Summary

Intersection	Option	Short-Term Improvements			Planning Horizon Improvements		
		Traffic Control	Summary	New Lane Configuration	Traffic Control	Summary	New Lane Configuration
Ohlman Street & 23rd Avenue	Stop Control → Traffic Signal	**TWSC / Signalize if warranted**	3-lane corridor improvements on all legs	EB: **LT**, **T/RT** WB: **LT**, **T/RT** NB: **LT**, **T/RT** SB: **LT**, **T/RT**	**Traffic Signal**	Signalize reconstructed intersection (when warranted)	-
	Roundabout	**Roundabout**	Single-lane roundabout	EB: **LT/T/RT** WB: **LT/T/RT** NB: **LT/T/RT** SB: **LT/T/RT**	-	-	-
Ohlman Street & 8th Avenue	Stop Control	TWSC	-	-	TWSC	3-lane corridor improvements on all legs	EB: **LT**, **T/RT** WB: **LT**, **T/RT** SB: **LT**, **T/RT**

Recommendations

Reconstruct Ohlman Street corridor as a 3-lane urban section to address capacity needs along Mitchell's western growth area. This segment is a key north/south arterial corridor west of SD37 and provides connectivity to SD37 Bypass, Lake Mitchell, and developing areas. Timing of needs likely dependent on development type, density, and timeline. South of 23rd Avenue, high truck volumes due to industrial development may accelerate the need for corridor improvements.

Construct shared-use path between Kemper Avenue and 23rd Avenue to provide greater connectivity on the bike trail / sidewalk system.

Monitor traffic volumes and crash history at the 23rd Avenue intersection for traffic signal needs. A roundabout is recommended at the intersection for further consideration.

Coordinate with future 23rd Avenue and 8th Avenue corridor projects.

Short-Term (<2030)

Ohlman Street 3-Lane Urban Section Reconstruction

S. Harmon Drive to 23rd Avenue

- Maintain existing shared-use path; construct shared-use path between Kemper Avenue and 23rd Avenue

Long-Range (2040+)

Ohlman Street 3-Lane Urban Section Reconstruction

23rd Avenue to 8th Avenue

- Paved shoulders, additional width for bicyclists, or shared-use path

Signalize Intersection (when warranted)

- Ohlman Street & 23rd Avenue (if traditional intersection)

Rowley Street Corridor

Corridor Description

Limits: Havens Avenue to Spruce Street
Major Roads Plan: Local Arterial

Planning Horizon Corridor Vision

Havens Avenue to Norway Avenue
3-lane / 2-lane corridor
- 3-lane urban section with center left turn lane, or

Norway Avenue to Spruce Street
3-lane urban section with center left turn lane

Summary of Needs

- Segment capacity: 3 lanes (2032)
- Intersection operations:
  - Rowley Street & Norway Avenue: LOS E (2045)
- Crash history:
  - Rowley Street & Norway Avenue intersection:
    - Elevated crash intersection
    - Most frequent crash types: angle and rear-end crashes
- Multimodal
  - Shared-use path connectivity:
    - Spruce Street to Norway Avenue to Burr Street
  - Intersection crossing improvements

Major Intersection Improvements Summary

Intersection	Option	Short-Term Improvements			Planning Horizon Improvements		
		Traffic Control	Summary	New Lane Configuration	Traffic Control	Summary	New Lane Configuration
Rowley Street & Norway Avenue	Stop Control → Traffic Signal	AWSC	3-lane corridor improvements	EB: LT/T/RT WB: LT/T/RT NB: **LT**, **T/RT** SB: **LT**, **T/RT**	AWSC	3-lane corridor improvements	EB: LT/T/RT WB: LT/T/RT NB: **LT**, **T/RT** SB: **LT**, **T/RT**
		-	-	-	**Traffic Signal**	3-lane corridor improvements Signalize (when warranted)	EB: **LT**, **T/RT** WB: **LT**, **T/RT** NB: **LT**, **T/RT** SB: **LT**, **T/RT**
Rowley Street & Spruce Street	Stop Control	AWSC	3-lane corridor improvements	EB: LT, T/RT WB: LT, T/RT NB: LT/T/RT SB: **LT, T/RT**	AWSC	3-lane corridor improvements	EB: LT, T/RT WB: LT, T/RT NB: LT/T/RT SB: **LT, T/RT**
	Roundabout	**Roundabout**	Single-lane roundabout	EB: **LT/T/RT** WB: **LT/T/RT** NB: LT/T/RT SB: LT/T/RT	-	-	-

Recommendations

The segment south of Norway Avenue is a key north/south arterial corridor in southern Mitchell with access under I-90. The corridor provides important connectivity between Havens Avenue and Spruce Street and for developing areas south of I-90. Development type, density, and timeline will influence timing of a 3-lane urban section south of Norway Avenue.

The proposed project between Norway Avenue and the I-90 bridge completes a 3-lane urban section on the east side, restripes the roadway with three lanes, and incorporates Norway Avenue intersection capacity improvements. The proposed project between I-90 and Spruce Street reconstructs the existing 2-lane rural section to an urban 3-lane section and incorporates Spruce Street intersection capacity improvements. A roundabout is recommended for further consideration at the Spruce Street intersection.

North of Norway Avenue, maintain existing 2-lane corridor with left turn lanes, as needed to meet operational and safety goals, at major intersections and access points through established areas.

Monitor traffic volumes and crash history at the Norway Avenue and Spruce Street intersections for future traffic signal needs.

Mid-Term (2030-2039)

Rowley Street Urban 3-Lane Section Construction (East Side)

Norway Avenue to I-90

- Construct urban section on east side and stripe for 3 lanes
- Rowley Street & Norway Avenue intersection improvements
- Shared-use path

Rowley Street Urban 3-Lane Section Reconstruction

I-90 to Spruce Street

- Rowley Street & Spruce Street intersection options
  - Traditional intersection with westbound right turn lane or roundabout
- Shared-use path

Long-Range (2040+)

Signalize Intersection (when warranted)

- Rowley Street & Norway Avenue
- Rowley Street & Spruce Street (if traditional intersection)

I-90 Exit 330 / Ohlman Street Interchange

Corridor Description	Planning Horizon Corridor Summary
Limits: Norway Avenue to Spruce Street	5-lane section with center left turn lane (north of WB RTI)
Major Roads Plan: Local Arterial	3-lane section with center left turn lane (south of WB RTI)

Summary of Needs

- Intersection operations
  - I-90 WB RTI & SD37: off-ramp approach LOS E (2032) and LOS F (2045)
  - I-90 EB RTI & SD37: off-ramp approach and intersection LOS F (2032 & 2045)
- Tower lighting
- Multimodal
  - No sidewalk across I-90 interchange bridge or south of interchange to Spruce Street
    - Shoulders are available
  - Shared-use path connectivity between Norway Avenue and Spruce Street

Major Intersection Improvements Summary

Intersection	Option	Short-Term Improvements			Planning Horizon Improvements		
		Traffic Control	Summary	New Lane Configuration	Traffic Control	Summary	New Lane Configuration
I-90 WB RTI & SD37 (Ohlman Street)	Stop Control → Traffic Signal	TWSC	Construct WB RT Lane	WB: **LT/T**, **RT** NB: LT, T SB: T, RT	**Traffic Signal**	Signalize (when warranted)	-
I-90 EB RTI & SD37 (Ohlman Street)	Stop Control → Traffic Signal	**TWSC / Signalize if warranted**	Construct EB LT lane Signalize (when warranted)	EB: **LT**, **T/RT** NB: T/RT SB: LT, T	**Traffic Signal**	-	-

Recommendations

Long-range needs are focused to the two ramp terminal intersections. Existing SD37/Ohlman Street cross-section provides long-range segment capacity. Recommended RTI improvements align with the *SDDOT 2020 Decennial Interstate Corridor Study*.

Following construction of recommended turn lanes, monitor major intersections for traffic signal warrants.

Consider interchange lighting upgrades such as removing tower lighting and/or replacing luminaire type. Coordinate with SDDOT statewide lighting review.

Mid-Term (2030-2039)

I-90 Exit 330 Westbound Off-Ramp Intersection: Right Turn Lane Extension

- Extend right turn lane beyond left/through lane queue

I-90 Exit 330 Eastbound Off-Ramp Intersection: Right Turn Lane Construction

- Split left and right turn movements
- Review traffic signal warrants for eastbound left turn traffic

Long-Range (2040+)

Signalize Intersection (when warranted)

- I-90 Exit 330 westbound ramp terminal intersection
- I-90 Exit 330 eastbound ramp terminal intersection

Extend shared-use path from Norway Avenue south to Spruce Street

Foster Street Corridor
(Focus Intersection: Foster Street & 1st Avenue)

Corridor Description

Limits: 7th Avenue to SD38 (Havens Avenue)
Major Roads Plan: Local Arterial

Planning Horizon Corridor Vision

3-lane / 2-lane corridor

- 3-lane urban section with center left turn lane, or
- 2-lane urban section with turn lanes at major intersections

Summary of Needs

- Segment capacity: 3 Lanes (2045)
- Crash history
  - Foster Street & 1st Avenue:
    - Elevated crash intersection (0.83 critical ratio) and angle crash frequency
    - All angle crashes involved a southbound left or though movement with an eastbound or westbound through movement
- Multimodal
  - Foster Street is a key, long-range north/south corridor for bicycles and pedestrians.
  - Intersection crossing improvements

Major Intersection Improvements Summary

Intersection	Option	Short-Term Improvements			Planning Horizon Improvements		
		Traffic Control	Summary	New Lane Configuration	Traffic Control	Summary	New Lane Configuration
Foster Street & 1st Avenue	Stop Control	TWSC	NB and SB left turn lanes NB and SB approach stop signs Access management and speed reduction measures	EB: LT/T/RT WB: LT/T/RT NB: **LT, T/RT** SB: **LT, T/RT**	TWSC	-	-
			NB and SB left turn lanes EB and WB approach stop signs Access management and speed reduction measures			-	
		AWSC	NB and SB left turn lanes All-way stop-control Access management and speed reduction measures		AWSC	-	

Recommendations

Corridor development and redevelopment will play a significant role in timeline of intersection turn lane or traffic control modifications. As the notable north/south arterial along the eastern Mitchell growth area, volumes are anticipated to grow with future development, particularly with higher-density multifamily or apartment residential. The hospital between 5th Avenue and 7th Avenue is a key generator of corridor traffic. If the hospital relocates to a different location in Mitchell at some point in the future, traffic volumes and pattens will likely change to some extent throughout the area. However, volumes may not necessarily decrease, and could increase, depending on how the area redevelops.

Foster Street & 1st Avenue intersection modifications include changes to intersection traffic control, 1st Avenue speed management/traffic calming, access management, and multimodal travel improvements. Implementing multiple elements as part of one project will change the look and feel of the intersection, which benefits short-term safety due to changes in traffic control.

The current intersection exhibits an elevated overall and angle crash frequency, with most angle crashes involving a southbound vehicle and an eastbound or westbound vehicle. Traffic control options include:

- TWSC for NB/SB (Foster Street): maintain existing condition
- TWSC for EB/WB (1st Avenue): provides free movement for higher volume northbound/southbound (Foster Street) through and left turn traffic
- AWSC: aligns with relative balance of entering volumes and provides for stop-controlled crossings for bicyclists and pedestrians

Consideration to speed management for 1st Avenue traffic, particularly westbound heading to Foster Street, includes:

- Intersection bump-outs: narrows roadway to encourage slower speeds entering the intersection; shortens pedestrian crossing distances
- Mid-segment bump-out: narrows roadway to encourage slower speeds ahead of the intersection; establishes a gateway feature

Access management should limit one access per street face per parcel within the intersection functional area, with the access as far away from the intersection physical area as feasible.

See the Foster Street extension to Spruce Street option for additional needs associated with the potential future connection.

Short-Term (<2030)

Foster Street & 1st Avenue Intersection Improvements

- Traffic Control Modifications
  - TWSC for NB/SB (Foster Street) (existing)
  - TWSC for EB/WB (1st Avenue)
  - Multiway stop (AWSC)
- Access Management
  - Access management in northwest quadrant (limit access to one access per street face)
- Traffic Calming
  - 1st Avenue & Foster Street intersection bump-outs (east and west intersection legs)
  - 1st Avenue mid-block bump-out (east of Foster Street)

Construct bike lane along Foster Street from 11th Avenue to Birch Avenue

Burr Street Corridor

Corridor Description

Limits: SD38 (Havens Avenue) to 7th Avenue
Major Roads Plan: Local Arterial

Planning Horizon Corridor Vision

7th Avenue to 1st Avenue
3-lane / 2-lane corridor

- 3-lane urban section with center left turn lane, or
- 2-lane urban section with turn lanes at major intersections

1st Avenue to Havens Avenue
4-lane corridor (Existing), or
3-lane urban section with center left turn lane (Option)

Summary of Needs

- Segment capacity:
  - Havens Avenue to 1st Avenue: feasibility to reduce from 4-lane section to 3-lane section through Year 2045
  - 1st Avenue to 3rd Avenue: 3 lanes (2032)
  - 3rd Avenue to 5th Avenue: 3 lanes (2045)
- Crash history
  - Burr Street & 1st Avenue:
    - Most frequent crash types: angle and rear-end
    - Angle crashes involve a westbound through movement
  - Burr Street & Ash Avenue
    - Elevated rear-end crash frequency on Burr Street approaches
- 1st Avenue intersection: truck turning movements, free right turn in neighborhood urban setting, and atypical configuration
- Multimodal
  - Segment links several shared-use paths and other multimodal facilities throughout the area
  - Sidewalk width (available space) constraints due to railroad underpass and limited ROW
  - Intersection crossing improvements

Major Intersection Improvements Summary

Intersection	Option	Short-Term Improvements			Planning Horizon Improvements		
		Traffic Control	Summary	New Lane Configuration	Traffic Control	Summary	New Lane Configuration
Burr Street & 1st Avenue	Reconstruction or Road Diet (A)	Traffic Signal	Reconstruct intersection to pull all lanes into main intersection	EB: **LT, T/RT** WB: **LT, T/RT** NB: LT, T/RT SB: LT, T/RT	Traffic Signal	-	-
	Roundabout (B)	**Roundabout**	Single-lane roundabout	EB: **LT/T/RT** WB: **LT/T/RT** NB: LT/T/RT SB: LT/T/RT	-	-	-
Burr Street & Havens Avenue	Road Diet	Traffic Signal	3-lane section on Burr Street	EB: LT, T, T/RT WB: LT, T, T/RT NB: **LT, T, RT** SB: **LT, T, RT**	Traffic Signal	-	-

Recommendations

North of 1st Avenue, monitor need for left turn lanes at major intersections or access points or a 3-lane urban section to address traffic growth.

Between 1st Avenue and Havens Avenue, a detailed study is recommended determine the long-range vision for the corridor. The study would focus on the Burr Street & 1st Avenue intersection, the Burr Street corridor cross-section and allocating space for all modes of travel, providing multimodal connectivity for area bicycle and pedestrian facilities, and determining pedestrian and bicycle crossing locations. The study would also provide an opportunity for public feedback.

Long-range traffic volumes show feasibility to reduce the Burr Street cross-section from 4 lanes to 3 lanes and implementing a 'Road Diet'. This modification adds a center left turn lane and provides additional space for multimodal elements throughout the segment. The Road Diet could be implemented within the existing cross-section through striping modifications.

Two Burr Street & 1st Avenue intersection reconstruction options include reconstructing the existing intersection as an A) traditional intersection (with turn lane and traffic signal modifications) or B) roundabout.

Short-Term (<2030)

Burr Street & 1st Avenue Intersection Safety Improvements

- Optimize traffic signal phase change and clearance intervals
- Update vehicle detection
- Add signal head on mast arms for northbound/southbound through movements and install retroreflective backplates

Mid-Term (2030-2039)

Burr Street Corridor Study

1st Avenue to Havens Avenue

- Determine long-range Burr Street corridor cross-section, from 1st Avenue & Havens Avenue
  - Identify number of lanes: maintain existing 4-lane section or convert to 3-lane section with center left turn lane ('Road Diet')
  - Allocate corridor space within existing ROW to vehicle, bicycle, and pedestrian modes of travel
  - Identify bicycle and pedestrian crossing locations, crossing treatments, and connectivity to area multimodal facilities
- Determine long-range Burr Street & 1st Avenue intersection configuration (identify future projects)
  - Improve truck turning paths and bring turn lanes into main intersection (no free movements)
  - Traditional intersection (with turn lane and traffic signal modifications) or roundabout

8th / 7th Avenue Corridor

Corridor Description

8th Avenue Limits: Ohlman Street to Minnesota Street
7th Avenue Limits: Minnesota Street to Foster Street
Major Roads Plan: Local Arterial

Planning Horizon Corridor Vision

3-lane / 2-lane corridor

- 3-lane section with center left turn lane, or
- 2-lane section with turn lanes at major intersections and access points

Summary of Needs

- Segment capacity:
  - 8th Avenue
    - Ohlman Street to SD37 Bypass: 3-lane section (2045)
  - 7th Avenue
    - Kimball Street to Burr Street: 3-lane section (2032)
    - Sanborn Boulevard to Kimball Street: 3-lane section (2045)
- Route continuity: 1-block north/south offset at Minnesota Street
- Crash history:
  - 7th Avenue & Kimball Street intersection
    - Elevated crash intersection (1.67 critical ratio, 2nd highest of all City intersections)
    - 11 angle crashes (7 involving southbound and eastbound vehicles)
    - 5 rear-end crashes (four in southbound direction)
- Multimodal: bike lane connectivity and intersection crossings

Major Intersection Improvements Summary

Intersection	Option	Short-Term Improvements			Planning Horizon Improvements		
		Traffic Control	Summary	New Lane Configuration	Traffic Control	Summary	New Lane Configuration
Ohlman Street & 8th Avenue	Maintain Existing	TWSC	-	-	TWSC		EB: **LT**, **T/RT** WB: **LT**, **T/RT** SB: **LT, T/RT**
SD37 & 8th Avenue	Stop Control	TWSC	-	-	TWSC	8th Avenue left turn lanes	EB: **LT, T/RT** WB: **LT, T/RT** NB: LT, T, T/RT SB: LT, T, T, RT
7th Avenue & Kimball Street	Stop Control	TWSC	3-lane section on EB and WB legs Install EB LT and WB LT lanes	EB: **LT, T/RT** WB: **LT, T/RT** NB: LT/T/RT SB: LT/T/RT	TWSC	3-lane section on EB and WB legs Install EB LT and WB LT lanes	EB: **LT, T/RT** WB: **LT, T/RT** NB: LT/T/RT SB: LT/T/RT
7th Avenue & Burr Street	Stop Control	AWSC	3-lane section on EB leg Install EB LT lane	EB: **LT, T/RT** WB: LT/T/RT NB: LT/T/RT SB: LT/T/RT	AWSC	3-lane section on EB leg Install EB LT lane	EB: **LT, T/RT** WB: LT/T/RT NB: LT/T/RT SB: LT/T/RT

Recommendations

Corridor was identified as a Local Arterial in the Major Roads Plan to provide east/west connectivity through Mitchell. With the built-out nature of the adjacent land, opportunities for expansion beyond the existing cross-section will be limited.

Left turn lanes at major intersections or 3-lane section segments will provide operational benefits where needed to meet future traffic growth. Corridor volumes should be monitored for timing of those needs. Consider traffic calming measures to manage speeds through residential and downtown areas. Modify traffic control at 7th Avenue intersections with Lawler Street and Kimball Street. Coordinate with other intersecting corridor projects.

Short-Term (<2030)

7th Avenue & Kimball Street and 7th Avenue & Lawler Street Intersections Traffic Control Modifications

- Modify traffic control:
  - Kimball Street: TWSC to AWSC
  - Lawler Street: AWSC to TWSC
- Review intersection sight distance in relation to stop bar location and roadway speed
- Restrict parking further back from stop sign to increase visibility of stop signs
- Review truck turning movements for conflicts and adjustment needs

Mid-Term (2030-2039)

Corridor Traffic Calming

SD37 to Foster Street

- Speed feedback signs, mid-segment narrowing, and bulb-outs curb extensions through residential and downtown areas
- Opportunistic implementation in conjunction with other corridor resurfacing or reconstruction projects

Install bike lanes/buffered bike lanes between Ohlman Street and Foster Street

Long-Range (2040+)

7th Avenue to 8th Avenue Diagonal Connector Construction

Minnesota Street to Wisconsin Street

- 3-lane section with center left turn lane through both intersections

8th Avenue 3-Lane Urban Reconstruction

Ohlman Street to SD37

- Review traffic signal warrants for signalization

1st Avenue Corridor

Corridor Description

Limits: Sanborn Boulevard to Burr Street
Major Roads Plan: Local Arterial

Planning Horizon Corridor Vision

3-lane / 2-lane corridor

- 3-lane section with center left turn lane, or
- 2-lane section with turn lanes at major intersections and access points

Summary of Needs

- Segment capacity:
  - Sanborn Boulevard to Kimball Street: 3 Lanes (2032)
- Crash history
  - Burr Street & 1st Avenue:
    - Rear end and angle crash frequency
  - Foster Street & 1st Avenue:
    - Elevated crash intersection (0.83 critical ratio) and angle crash frequency
    - All angle crashes involved a southbound left or though movement
    - 83% of crashes involved a failure to stop for stop sign
- Multimodal
  - Shared-use path connectivity between Foster Street and SD38/Havens Avenue
  - Intersection crossing improvements

Major Intersection Improvements Summary

Intersection	Option	Short-Term Improvements			Planning Horizon Improvements		
		Traffic Control	Summary	New Lane Configuration	Traffic Control	Summary	New Lane Configuration
1st Avenue & Burr Street	Burr Street Corridor Project - Reconstruction	Traffic Signal	Reconstruct intersection to pull all lanes into main intersection	EB: **LT, T/RT** WB: **LT, T/RT** NB: LT, T/RT SB: LT, T/RT	Traffic Signal	-	-
	Burr Street Corridor Project - Road Diet	Traffic Signal	3-lane section on Burr Street Reconstruct intersection to pull all lanes into main intersection	EB: **LT, T/RT** WB: **LT, T/RT** NB: LT, T/RT SB: LT, T/RT	Traffic Signal	-	-

Recommendations

Existing 1st Avenue corridor is a 3-lane / 2-lane corridor with left turn lanes already striped at major intersections. Monitor other downtown area intersections along 1st Street, such as Duff Street, Rowley Street, Lawler Street, Kimball Street for operational and safety needs associated with left turning vehicles. Parking will be impacted at modified intersections.

See Burr Street corridor for further discussion and projects associated with the 1st Avenue & Burr Street intersection.

Havens Avenue Corridor

Corridor Description	**Planning Horizon Corridor Vision**
Limits: 406th Avenue to SD37 (Ohlman Street)	3-lane urban section with center left turn lane
Major Roads Plan: Regional Arterial	Turn lanes and intersection traffic control modifications

Summary of Needs

- Segment capacity
  - 407th Avenue to SD37 (Ohlman Street): 3 Lanes (2032)
- Intersection operations: no analysis intersections along corridor
- Crash history
  - SD37 (Ohlman Street) & Havens Avenue:
    - Elevated crash intersection (3rd highest critical ratio and highest frequency of all City intersections)
    - Most frequent crash types: rear-end and angle
- Multimodal
  - No shoulder, sidewalk, or shared-use path along corridor

Major Intersection Improvements Summary

Intersection	Option	Short/Mid-Term Improvements			Planning Horizon Improvements		
		Traffic Control	Summary	New Lane Configuration	Traffic Control	Summary	New Lane Configuration
Havens Avenue & 406th Avenue	Stop control	TWSC	-	-	TWSC	3-lane corridor improvements Widen north and south legs to include LT lane	EB: **LT, T/RT** WB: **LT, T/RT** NB: **LT, T/RT** SB: **LT, T/RT**
Havens Avenue & 407th Avenue	Stop control	TWSC	3-lane corridor improvements Widen north and south legs to include LT lane	EB: **LT, T/RT** WB: **LT, T/RT** NB: **LT, T/RT** SB: **LT, T/RT**	TWSC	-	-
SD37 (Ohlman Street) & Havens Avenue	Traffic signal	Signal	Reconstruct west leg with 3-lane corridor improvements	EB: **LT, T, RT** WB: LT, T, RT NB: LT, T, T/RT (channelized) SB: LT, T, T/RT	Signal	-	-

Recommendations

Havens Avenue is currently a 2-lane rural section roadway west of SD37 (Ohlman Street) with numerous access points and growing traffic volumes with a high proportion of trucks/large vehicles. Development is most prevalent between 407th Avenue and SD37 (Ohlman Street), though continued westward growth is anticipated.

The future corridor reflects a 3-lane urban section with continuous left turn lane to remove left-turning vehicles from the through lane. Access management is recommended in conjunction with a future project to remove and consolidate access points where feasible.

Corridor reconstruction could be phased, with a first phase reconstructing Havens Avenue between 407th Avenue and SD37 (Ohlman Street) and the second phase between 406th Avenue and 407th Avenue. It is recommended each phase builds out the western-most section line intersection (i.e., the first phase reconstructs the 407th Avenue intersection), so lane transitions occur to the west of the 1-mile segment. If is also recommended that SD37 (Ohlman Street) intersection improvements be considered as part of the first phase.

Mid-Term (2030-2039)

Havens Avenue & SD37 (Ohlman Street) Intersection Improvements

- Additional intersection approach signing, such as flashing advance warning beacons for northbound and eastbound directions
- Create positive offset for left turn lanes with permitted left turn movements
- Close, relocate, or restrict (median) access within intersection turn lanes
- Change protected/permitted left turn phasing to protected only
- Review SB to EB truck turning paths and potential conflict with NB to EB right turn lane add and WB left turn lane

Havens Avenue 3-Lane Urban Reconstruction

407th Avenue to SD37 (Ohlman Street)

- Includes Havens Avenue & 407th Avenue intersection
- Shared-use path

Long-Range (2040+)

Havens Avenue 3-Lane Urban Reconstruction

406th Avenue to 407th Avenue

- Includes Havens Avenue & 406th Avenue intersection
- Shared-use path

2nd / 3rd / 4th Avenue One-Way to Two-Way Conversion

Corridor Description

Limits: varies
Major Roads Plan:

- 2nd Avenue: Local
- 3rd Avenue: Collector
- 4th Avenue: Local

Planning Horizon Corridor Vision

2-lane urban section with on-street parking

Summary of Needs

Historically, one-way streets were often implemented through downtown areas to provide greater roadway capacity. These one-way streets then extend out into the residential areas in connected grid networks. Currently, 2nd Avenue, 3rd Avenue, and 4th Avenue, are one-way streets from Edgerton Street to Sanborn Boulevard and Kimball Street to Foster Street. There is a gap in the downtown area that provides for 2-way travel between Sanborn Boulevard and Kimball Street.

Conversion from one-way to two-way roadways would be expected to improve driver expectancy, facilitate route continuity, and reduce out-of-the-way travel. Two-way roadways also support multimodal safety by slowing vehicle travel speeds and improve bicyclist and pedestrian expectancy at crossings. Existing roadway widths support conversion to two-way travel as Major Roads Plan local (2nd Avenue and 4th Avenue) and collector (3rd Avenue) streets.

Recommendations

Convert 2nd Avenue, 3ed Avenue, and 4th Avenue to two-way streets.

On-street parking should be reviewed for each segment. Existing street widths are approximately 36 feet between the back of curbs. City of Mitchell on-street parking width is nine feet. If wider street lane widths are desired, priority should be given to the 3rd Avenue corridor as a Collector and parking should be limited to one side.

A conversion project includes installing stop signs, traffic signal heads, and pavement markings to accommodate the new direction of traffic on each roadway where applicable. Intersection sight distance should also be reviewed.

Short-Term (<2030)

Convert 2nd Avenue, 3rd Avenue, and 4th Avenue to Two-Way Streets
Edgerton Street to Sanborn Boulevard and Kimball Street to Foster Street

- Install stop signs, traffic signal heads, and pavement markings as needed to facilitate the conversion

Spruce Street Extension

Corridor Description

Limits: SD37 to 411th Avenue
Major Roads Plan: Local Arterial

Planning Horizon Corridor Vision

5-lane urban section (SD37 to ½-mile west of 411th Avenue)
3-lane urban section (½-mile west of 411th Avenue to 411th Avenue)

Summary of Needs

City of Mitchell is planning to construct an urban 5-lane section between Burr Street and the western Mitchell Technical College access. With additional access points and potential redevelopment to the east, a need has been identified to continue this urban section to the ½-mile point or a future Foster Street extension intersection (whichever is further east). To the east, a 3-lane section supports long-range build-out of the area. Combined, the future urban section between SD37 and 411th Avenue supports existing and future development, high truck volumes, and multimodal uses.

Recommendations

Reconstruct existing 2-lane rural section with an urban 5-lane section from a planned 5-lane section just east of the railroad tracks eastward to the ½-mile point or a Foster Street extension intersection (whichever is further east). Sidewalks and/or shared-use paths should be constructed with the urban section to support multimodal travel, particularly on the north side with Mitchell Technical College.

Short-Term (<2030)

Spruce Street 5-Lane Urban Section Reconstruction
SD37 to west Mitchell Technical College access

- Railroad crossing improvements
- Sidewalks and/or shared-use paths

Mid-Term (2030-2039)

Spruce Street 5-Lane Urban Section Reconstruction
West Mitchell Technical College access to ½-mile west of 411th Avenue (or future Foster Street intersection)

- Sidewalks and/or shared-use paths

Long-Range (2040+)

Spruce Street 5-Lane Urban Section Reconstruction
½-mile west of 411th Avenue (or future Foster Street intersection) to 411th Avenue

- Sidewalks and/or shared-use paths

Sanborn Boulevard Extension

Corridor Description	Planning Horizon Corridor Vision
Limits: SD37 to 23rd Avenue Major Roads Plan: Local Arterial	3-lane urban section

Summary of Needs

Sanborn Boulevard is an important north/south Local Arterial in Mitchell. Currently, the northern terminus of the corridor is a 'T' intersection at SD37. An extension northward to 23rd Avenue would improve Local Arterial network connectivity to development and recreational opportunities along Lake Mitchell. Challenges with this extension include development along the north side of SD37, between SD37 and 23rd Avenue, and topography.

Recommendations

Construct a 3-lane urban section between SD37 and 23rd Avenue with sidewalks and/or shared-use paths. A 5-lane section may be considered if lane continuity north of SD37 is desired but should be reviewed for operational need. Consider a roundabout at the 23rd Avenue intersection. Review signalization needs at both the SD37 and 23rd Avenue intersections.

Long-Range (2040+)

Sanborn Boulevard 3-Lane Urban Section Construction

SD37 to 23rd Avenue

- Sidewalks and/or shared-use paths
- Consider roundabout at 23rd Avenue intersection
- Review need for signalization at SD37 and 23rd Avenue intersections

Main Street Corridor Downtown Improvements

Corridor Description	Planning Horizon Corridor Vision
Limits: Railroad Street to 7th Avenue Major Roads Plan: Local Arterial	3-lane urban section

Summary of Needs

Several years ago, Mitchell Main Street & Beyond identified a need for improvements to the downtown Main Street corridor. A Business Improvement District was created to generate additional funds to be spent on buildings and infrastructure in downtown area to enhance quality of life. Mitchell Main Street & Beyond identified improvements at the Main Street intersections that include intersection bump-outs to shorten crossing distances and landscape/streetscape elements.

Recommendations

Recommendation is in support of the Mitchell Main Street & Beyond plan to construct intersection bump-outs at downtown Main Street intersections and review intersection traffic control.

Short-Term (<2030)

Main Street Intersection Improvements

Railroad Street to 7th Avenue

- Maintain existing 3-lane section with on-street parking between intersections
- Construct bump-outs
- Review traffic control (stop signs vs. traffic signals)

National Guard Road

Corridor Description	Planning Horizon Corridor Vision
Limits: Ohlman Street to SD37 Major Roads Plan: Local Arterial	3-lane urban section

Summary of Needs

National Guard Road is an important east/west Local Arterial in the northern Mitchell Area. The roadway provides connectivity to the airport, surrounding industrial area, Lake Mitchell area residential development, and recreational areas. This is the preferred east/west corridor to access the Lake Mitchell recreational opportunities from the north side of the lake (in lieu of North Harmon Drive via SD37). The existing corridor is a 2-lane rural section with steep ditches and narrow right-of-way, which pose challenges to reconstruction as an urban section.

Recommendations

Reconstruct as a 3-lane urban section with shared-use path on one side and sidewalk on the other side. The shared-use path supports recommendations in the Bicycle and Pedestrian Plan.

A short-range option would be to construct a half urban section where only the north or south side includes curb and gutter and a shared-use path.

Mid-Term (2030-2039)

Reconstruct National Guard Road as Partial 3-Lane Urban Section
Ohlman Street to SD37

- Constructs urban section (curb and gutter) on one side only
  - Other side is maintained as rural section with ditch
- Shared-use path constructed on urban section side, behind curb and gutter
- Review intersection traffic control at SD37 & National Guard Road intersection

Long-Range (2040+)

Reconstruct National Guard Road as 3-Lane Urban Section
Ohlman Street to SD37

- Project depends on whether the partial 3-lane urban section was construction
  - Complete remaining 3-lane urban section elements from partial reconstruction project, or
  - Full reconstruction
- Shared-use path on one side and sidewalk on the other
- Review intersection traffic control at SD37 & National Guard Road intersection

SD38P

Corridor Description	Planning Horizon Corridor Vision
Limits: Wallace Street to SD37 Major Roads Plan: Local Arterial	3-lane / 2-lane corridor • 3-lane urban section with center left turn lane, or • 2-lane urban section with turn lanes at major intersections

Summary of Needs

SD38P is currently a 2-lane rural section with no shoulders, sidewalk, or roadway lighting. SDDOT has a project identified in the 2027-2030 developmental STIP (PCN 06RX).

Recommendations

Reconstruct as a 3-lane urban section or 2-lane urban section with turn lanes at higher volume access points, with:

- Shared-use path on one side, sidewalk on the other side
- Roadway lighting

Short-Term (<2030)

SD38P 2/3-Lane Urban Reconstruction
Wallace Street to SD37

- Shared-use path on one side and sidewalk on the other

Other Local Roadway Connections

Local roadway construction to support transportation connectivity in the Mitchell area.

Short-Term (<2030)

Mattie Street Construction
Charles Avenue to SD38 (Havens Avenue)

Mid-Term (2030-2039)

West Harmon Drive Connection Construction
Navin Road to West Harmon Drive