# Converse Avenue Improvement Plan
# Final Report

City of Cheyenne

September 2021

AYRES

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# Disclaimer Notice

Ayres Associates and the Cheyenne Metropolitan Planning Organization (MPO) have developed these electronic report files for the use of the MPO and the City of Cheyenne to support planning level efforts for the Converse Avenue Improvement Plan. Some additional data collection and validation, and design refinement will be required during the final design phase.

# Works Cited

*Connect 2045 Long-Range Transportation Plan Update*, December 2020, by Kimley Horn and Cheyenne MPO
*Converse / Dell Range Intersection Traffic Safety Plan & Converse Avenue 35% Design Plan*, November 2017, by HDR

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# Acknowledgments

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# Section 1

# Introduction

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# Introduction

In 2017, a study of Converse Avenue and Dell Range Boulevard was completed for the Cheyenne Metropolitan Planning Organization (MPO). Since that study, development in the City of Cheyenne has occurred faster than originally expected, which has impacted and will continue to impact Converse Avenue traffic volumes. The 2017 study did not address some issues and potential opportunities along Converse Avenue that the MPO has now identified. Recently, the MPO's Travel Demand Forecast Model was updated for the *Connect 2045 – PlanCheyenne Master Transportation Plan*, providing new traffic forecasts for determining future right-of-way and street network cross section needs. Private access drives and traffic control considerations needed additional study to address the anticipated increase in traffic volumes on the Converse Avenue corridor. In addition, analysis of the drainage swale on the west side of Converse Avenue north of the US Post Office was needed to support the reconstruction of the larger corridor. Because the previous study made recommendations for improvements to the larger Dell Range Boulevard and Converse Avenue intersection, this study does not include a review of that intersection, but is intended to accommodate those anticipated improvements.

## OBJECTIVE

Develop a corridor improvement plan that enhances mobility and safety for all users to serve existing and future land use and traffic growth projections between Dell Range Boulevard and the new Carlson Street extension.

## GOALS

- Identify the community's vision for the corridor
- Identify the corridor roadway cross-section
- Enhance pedestrian and bicycle mobility and safety, including crossings of Converse Avenue and connections to other facilities
- Improve intersection design and evaluate the need for traffic signal controls
- Minimize traffic conflicts through corridor access management

This project evaluates roadway improvements for the 3,200-foot-long segment of Converse Avenue north of Dell Range Boulevard to a new intersection with the planned construction of Carlson Street.

The City of Cheyenne reconstructed Converse Avenue from Storey Boulevard to a point south of Ogden Street in 2000. Converse Avenue was never fully completed and is in deteriorating condition. This project includes continuation of the Greenway on the west side of Converse Avenue from the existing terminus south of Ogden Street to Mason Way. Additional appropriate sidewalk improvements will be addressed along both sides of Converse Avenue in addition to considerations for all modes of travel. There is a bank of concrete box culverts (CBCs) at Dry Creek under Converse Avenue south of Mason Way which needs to be replaced as well due to their deteriorating condition which was documented in a 2020 WYDOT Structure Inspection Report.

# 1.1 | Project Objective

The general objective of the Converse Avenue project is to design a corridor with improvements that optimize and prioritize future safety and mobility for all users of the corridor. The traffic study addresses the following corridor transportation topics:

- Current and year 2045 peak hour intersection operation
- Vehicle crash history
- Corridor cross-section improvement alternatives
- Potential future traffic signal warrants
- Potential residential street network connectivity options

# 1.2 | Project Goals

The following project goals were identified by the Project Steering Committee:

- Identify the community's vision for the corridor.
- Identify the corridor roadway cross-section.
- Enhance pedestrian and bicycle safety, including crossings of Converse Avenue and connections to other facilities.
- Improve intersection design and evaluate the need for traffic signal controls.
- Minimize traffic conflicts through corridor access management.

The corridor study evaluated the following intersections:

- Mason Way
- Point Bluff/United States Postal Service (USPS) Driveway
- Briarwood Lane
- Grandview Avenue
- Ogden Road
- Future Carlson Street

***Figure 1: Converse Avenue study corridor.***

# Section 2

# Project Coordination and Public Involvement

*In this section:*

The Converse Avenue Improvement Plan invited public and stakeholder participation, and developed a Public Involvement Plan (PIP) including small group (focus group) meetings with businesses and landowners, open house meetings with project area residents and stakeholders, project steering committee meetings, Cheyenne MPO committees, City of Cheyenne Planning Commissions, and City approvals.

# 2.1 | Project Steering Committee

Before any project activities were initiated, a small project team from Ayres and the MPO identified a larger group of local stakeholders to act as the Project Steering Committee. Participants included stakeholders from the MPO, the City, and the Laramie County School District 1. While initially envisioned as a large, formal group intended to guide and shape the project, it became evident that for such a short duration project, the intended purpose of stakeholder participation and acknowledgment could be fulfilled by the MPO and City Committees that the project was already scheduled and scoped to present to. Therefore, a smaller group from the same stakeholder groups was identified to act in a guidance role in more frequent progress-style Steering Committee meetings. The Steering Committee met bi-weekly and consisted of the following people:

- Tom Mason, MPO Director
- Jillian Harris, MPO Senior Transportation Planner
- Christopher Yaney, MPO Senior Planning Technician
- Tom Cobb, City of Cheyenne, City Engineer
- Anissa Gerard, City of Cheyenne, Traffic Engineer
- Charles Bloom, City of Cheyenne, Planning and Development Director
- Bryce Dorr, City of Cheyenne, Board of Public Utilities (BOPU)
- Jean Vetter, City of Cheyenne, Greenway and Parks Planner
- Vicki Nemecek, City of Cheyenne, Public Works Director
- Jeff Daugherty, Laramie County School District 1

The regular Project Steering Committee meetings provided a cooperative design effort which helped to identify opportunities and constraints in the corridor, as well as provided background and framework for key considerations that informed and shaped the plan recommendations.

The Steering Committee met 17 times during the project to guide the consultant team, review project progress and information, answer questions and provide insight, discuss public and stakeholder involvement, and collaborate to make decisions about the plan direction and recommendations. Agendas, meeting minutes, and presentations can be found in Appendix B.

# 2.2 | Public Involvement Strategy & Materials

The next component of the Public involvement effort involved developing a public involvement strategy for the project.

The project team developed a Public Involvement Plan and advertisement material including a Project Fact Sheet and general project information for posting to the MPO website. The project also developed summary informational language for use on mailers and handouts and identified a geographic area around the project (to include residents and businesses within 1/8th of a mile along Converse Avenue and inside the project boundaries of Storey Boulevard and Dell Range Boulevard) to use for generating mailing lists for Public Involvement activities.

# 2.3 | Public Involvement Activities

The next component of the Public Involvement effort involved actively seeking public feedback through focus groups and public meetings. The project hosted focus groups with the US Post Office, local businesses, and a one-on-one meeting with Section 20 landowner and developer Frank Cole.

**Converse Avenue Public Involvement Activities**

| Event | Date |
|---|---|
| ***Small Group Events*** | |
| Focus Group #1 (Post Office) | Wednesday, February 10, 2021 |
| Focus Group #2 (Local Businesses) | Thursday, February 11, 2021 |
| Focus Group #3 (Frank Cole 1-on-1) | Wednesday, February 17, 2021 |
| ***Public/Large Group Events*** | |
| Public Meeting #1 | Wednesday, March 3, 2021 |
| Public Meeting #2 | Wednesday, May 26, 2021 |
| ***Committee Presentations*** | |
| MPO Technical Committee Presentation | Wednesday, May 19, 2021 |
| MPO Citizen Advisory Committee | Wednesday, June 9, 2021 |
| *Special Technical Advisory Committee | Wednesday, September 15, 2021 |
| *City Planning Commission | Monday, September 20, 2021 |
| *City Governing Body (Final Plan Introduced) | Monday, October 11, 2021 |
| *Public Service Committee | Monday, October 18, 2021 |
| *City Governing Body (Final Plan Adoption) | Monday, October 25, 2021 |
| *MPO Policy Committee Vote | Wednesday, December 15, 2021 |

**Scheduled future activities*

**Focus Group #1** with the US Post Office was held on February 10 and was attended by 4 Postal Service staff, including:

- Cory Stibley (Plant Manager)
- Al Web (Network Specialist)
- Scott Boyd (Network Specialist)
- Kurt Kouba (Expediter)
- Jillian Harris (MPO) and Nathan Silberhorn and Darci Hendon (project team)

A summary of attendees and comments can be found in Appendix B, but primary concerns expressed included large freight truck accommodation and light vehicle safety during snowstorms and icy conditions.

**Focus Group #2** was held on February 11 and was attended by 8 business owners, managers, and representatives, including:

- Rande Pouppirt (Owner of Black Market / AAA / Cold Stone Creamery building)
- Charlie Moore (Building Supervisor of Aspen Ridge)
- Steve Wehmeyer (Owner of Aspen Ridge)
- Sue Davidson (tenant in Aspen Ridge building)
- Justin Beckner (Civil Engineer for Ridge View Apartments)
- Tom Mason & Jillian Harris (MPO) and Nathan Silberhorn, Ken Voigt, and Darci Hendon (project team)

A summary of the meeting can be found in Appendix B, but primary concerns expressed included access issues, construction disruptions, and the addition and/or correction of traffic controls (signals).

**Public Meeting #1** was held virtually on March 3. The Public Meeting was advertised on the MPO Facebook page, on the MPO website, through 198 physical mailers sent to residences in the immediate vicinity of the corridor, and through Variable Message Boards placed in each direction of Converse Avenue for 3 days prior to the meeting. A 35-minute presentation was given, including Introduction of Team, Project Overview and Limits, Purpose and Goals, Overall Study Process, Identifying Existing Issues, Existing and Future Traffic, Conceptual Alternatives for addressing future traffic, and general Project Schedule. Active feedback was encouraged during the presentation via live polling questions, chat window, and live Question and Answer session following the presentation. One of the most successful engagement elements of the meeting was the live Polling questions, with around 90% to 95% of participants (by observation) responding. The polling questions asked are shown below, with the highest response to each question in bold text.

### Polling questions

*1. How did you hear about this meeting?*

- Postcard mailer
- MPO Website
- Facebook
- **Message Board on Converse**
- Friend/Family/Neighbor

*2. From Converse, which street do you most frequently use?*

- Ogden Rd
- Grandview Ave
- Briarwood Ln
- **Point Bluff**
- Mason Way

*3. What elements of this street are most important to you?*

- **Capacity/vehicle throughput**
- Bike lane or shoulder
- Business access
- Speed
- Pedestrian access/safety
- Greenway
- Landscaping & aesthetics
- Intersection safety

*4. How comfortable are you walking on a sidewalk immediately adjacent to the street?*

- Completely uncomfortable
- **Uncomfortable**
- Mostly comfortable
- Completely comfortable

*5. How comfortable are you riding a bicycle on a street with a shoulder?*

- Completely uncomfortable
- **Uncomfortable**
- Mostly comfortable
- Completely comfortable

*6. How comfortable are you riding a bicycle on a Greenway?*

- Completely uncomfortable
- Uncomfortable
- Mostly comfortable
- **Completely comfortable**

*7. Do you like the idea of a raised center median? (**YES**/NO)*

*8. In general, how do you feel about traffic signals?*

- They make me feel safe
- **We need more to control speeds and cross-traffic**
- I could take them or leave them
- I don't like them, but they are necessary
- I hate them, and we have too many of them already

Unfortunately, due to technical issues with the features on the Zoom platform, the polling questions and responses were not captured in the meeting recording, and so the results are not available to print in this report. The project team was surprised to see that very few responses reflected a strong overall position on any question (i.e. results were, generally, fairly evenly distributed across the available options).

## Summary

The presentation can be found in Appendix B.

**Public Meeting #2** was held in person at Anderson Elementary School on May 26 and streamed live on the MPO Facebook page. The Public Meeting was advertised on the MPO Facebook page, on the MPO website, through 198 physical mailers sent to residences in the immediate vicinity of the corridor, and through Variable Message Boards placed in each direction of Converse Avenue for 3 days prior to the meeting. 35 individuals signed in at the meeting, with 5 attendees on Facebook Live. Before the presentation, attendees were able to spend approximately 15 minutes visiting two duplicate workshop station areas to review exhibits, ask specific questions of project and City staff, and complete comment cards.  Each station was comprised of the following exhibits:

- Explanation of intersection analysis elements (LOS, peak hour signal warrants, and graphs)
- Current and future traffic volumes
- Study recommendations (bullet list of nine recommendations presented in the presentation)
- Overall aerial strip map exhibit showing corridor recommendations
- Select recommendation images (blow-up aerials of Briarwood cul-de-sac and Carlson Street roundabout)
- Large format map for drawing/writing on (roll-out aerial image showing conceptual exhibit of overall corridor recommendations)
- Project schedules

A 40-minute presentation was given, including Introduction of Team, Project Overview and Limits, Purpose and Goals, Overall Study Process, Identifying Existing Issues, Existing and Future Traffic, Conceptual Alternatives Evaluated, Preliminary Plan Recommendations, and remaining Project Schedule. Active feedback was encouraged during the presentation via Facebook Live stream and live Question and Answer session following the presentation. The Q&A session occupied the entirety of the remaining time, though participants were invited to stay and ask additional questions while the meeting room was cleaned up.

## Summary

The presentation slides and summary of comments can be found in Appendix B.

**Committee Meetings**

The project was concluded with presentations to a variety of committees leading up to and following Governing Body approval of the planning document. Committee presentations began in May with the MPO Technical Advisory Committee on May 19 and the MPO's Citizen Advisory Committee on June 9.  Both presentations generated good discussion and insightful feedback which was incorporated into the final planning report and preliminary design submitted to the MPO.

Presentations of the final document were made in October and November 2021 and included the MPO Technical Advisory Committee, the City Planning Commission, the Public Service Committee, the City Governing Body, and the MPO Policy Committee.

# Section 3

# Improvement Alternatives Development and Analysis

*In this section:*

This report section summarizes the Converse Avenue Corridor Traffic Report, which was conducted as part of this study and is included as an Appendix to this report. The traffic report summary includes the following information:

- Existing Conditions
- Year 2045 Conditions
- Improvement Alternatives
- Access Management
- Dell Range Boulevard Eastbound Truck Turning Requirements
- Street Network Connectivity
- Evaluation
- Recommendations

# 3.1 | Existing Conditions

In order to design sound Converse Avenue corridor improvement alternatives, it is necessary to identify existing and future corridor conditions. The study segment of Converse Avenue extends from its intersection with Dell Range Boulevard to a proposed intersection with a new Carlson Street located approximately 1,500 feet north of Ogden Road. This segment of Converse Avenue is in need of reconstruction due to deteriorating pavement and Dry Creek bridge conditions. Since the Dell Range Boulevard intersection with Converse Avenue is planned to be reconstructed in a future project, it is not included in this traffic study.

At Dell Range Boulevard, Converse Avenue is signalized with a five-lane cross-section that provides separate southbound left- and right-turn lanes, two southbound through lanes, and a single 20-foot wide northbound traffic lane. The northbound traffic lane is separated from southbound traffic by double yellow paint lines. As Converse Avenue approaches Mason Way, the cross-section tapers to a three-lane continuous left-turn lane design with a separate southbound right-turn lane. The three-lane continuous left-turn lane design extends north through a future Carlson Street intersection to Storey Boulevard.

# 3.2 | Identification of Deficiencies

Existing traffic conditions can be defined by vehicle crash history, traffic volumes, and peak hour intersection operation.

## Corridor Crash History

A summary of the most recent 5-year motor vehicle crash history from 2015 through 2019 for the study segment of Converse Avenue, obtained from the City of Cheyenne, is summarized in Table 1. As shown in Table 1, there were a total of 23 crashes reported on the study segment of Converse Avenue, with the highest number of crashes (11) reported on the segment of Converse Avenue just north of the Dell Range Boulevard intersection which averaged 2.2 crashes per year (11 total) followed by the Mason Way intersection which averaged 0.8 crashes per year (4 total).

***Table 1: Converse Avenue Crash History (2015-2019)***

| Location | Crashes/Year | | | | | Crash Severity | | | Total | Annual Average |
|---|---|---|---|---|---|---|---|---|---|---|
| | 2015 | 2016 | 2017 | 2018 | 2019 | Property Damage Only | Injury | Fatal | | |
| Converse Avenue north of Dell Range | 0 | 2 | 2 | 5 | 2 | 9 | 2 | 0 | **11** | **2.2** |
| Business Access Road | 0 | 0 | 1 | 1 | 1 | 3 | 0 | 0 | **3** | **0.6** |
| Dry Creek Segment | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | **1** | **0.2** |
| Mason Way | 0 | 2 | 1 | 1 | 0 | 4 | 0 | 0 | **4** | **0.8** |
| USPS Truck Driveway | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | **1** | **0.2** |
| Point Bluff/USPS Driveway | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | **1** | **0.2** |
| Briarwood Lane | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **0** | **0.0** |
| Grandview Avenue | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **0** | **0.0** |
| Ogden Road | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | **1** | **0.2** |
| Carlson Street | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | **1** | **0.2** |
| **Total** | **0** | **4** | **6** | **9** | **4** | **21** | **2** | **0** | **23** | **4.6** |

Table 1 indicates only 2 of the total 23 crashes (9%) reported along the Converse Avenue Corridor involved injuries with both injury crashes occurring on the segment of Converse Avenue just north of Dell Range Boulevard.

Table 2 summarizes collision patterns reported at the Converse Avenue study intersections.

***Table 2: Converse Avenue Collision Patterns***

| Location | Crash Types | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|
| | Rear | Head | Same Direction | Front to Side | Right from Broadside | Sideswipe | Not a Collision with 2 Vehicles in Transport | |
| Converse Avenue north of Dell Range | 5 | 1 | 1 | 1 | 1 | 2 | 0 | **11** |
| Business Access Road | 1 | 0 | 0 | 0 | 1 | 0 | 1 | **3** |
| Dry Creek Segment | 0 | 0 | 0 | 0 | 0 | 0 | 1 | **1** |
| Mason Way | 1 | 0 | 1 | 0 | 1 | 1 | 0 | **4** |
| USPS Truck Driveway | 0 | 0 | 0 | 0 | 0 | 0 | 1 | **1** |
| Point Bluff/USPS Driveway | 0 | 0 | 0 | 0 | 0 | 0 | 1 | **1** |
| Briarwood Lane | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **0** |
| Grandview Avenue | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **0** |
| Ogden Road | 0 | 0 | 0 | 0 | 0 | 0 | 1 | **1** |
| Carlson Street | 0 | 0 | 0 | 0 | 0 | 1 | 0 | **1** |
| **Total** | **7** | **1** | **2** | **1** | **3** | **4** | **5** | **23** |

As shown in Table 2, the primary collision patterns involving more than one vehicle were rear-end and sideswipe crashes. As also shown in Table 2, 5 rear-end crashes occurred on the segment of Converse Avenue north of Dell Range Boulevard. Of the 4 sideswipe crashes, half occurred on the segment of Converse Avenue north of Dell Range Boulevard. It is noted the crash terms "Same Direction," "Front to Side," and "Right from Broadside" involve an angle-type collision. When summed together, the number of angle crashes along the corridor totals 6.

## Existing Traffic Volumes

Figure 2 illustrates the existing Year 2020 daily traffic volumes on Converse Avenue and the adjacent street network. As identified at right, daily traffic volumes steadily decrease along the study corridor north of Dell Range Boulevard.


***Figure 2***

24-hour intersection turning movement counts were collected at the following three study intersections by the City of Cheyenne from 12:00 p.m. Monday, June 1, 2020 to 12:00 p.m. on Tuesday, June 2, 2020 and from 12:00 p.m. on Monday, December 14, 2020 to 12:00 p.m. on Tuesday, December 15, 2020.

- Mason Way
- Point Bluff
- Ogden Road

Daily traffic volumes on Briarwood Lane and Grandview Avenue were estimated based on residential trip generation rates published in the Institute of Transportation Engineers Trip Generation Manual, 10th edition.

Figure 3 at right shows the hourly volume distribution of traffic on Converse Avenue between the Mason Way and Point Bluff intersections.

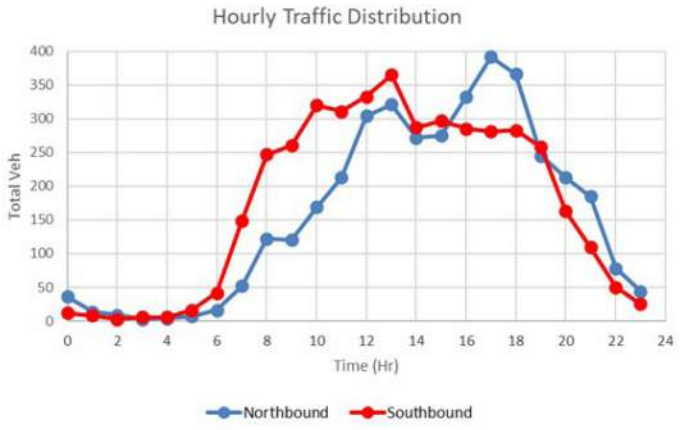



***Figure 3***

As an overall corridor, the mid-day peak hour occurs between 12:00 PM to 1:00 PM with the evening peak hour occurring between 3:30 PM to 4:30 PM. Heavy vehicles (trucks) comprise approximately 2% of the traffic stream along Converse Avenue during the peak hour time periods. This includes USPS trucks which use the corridor to access the USPS truck access driveway.

## Corridor Traffic Operation

Existing Year 2020 and future Year 2045 peak hour traffic volumes are identified and analyzed in this study to identify any traffic operation corridor improvement needs.

## Year 2020 Intersection Operation

For the purpose of this study, Level of Service (LOS) 'D' as defined in the Highway Capacity Manual (HCM), 6th Edition is used as the threshold for acceptable peak hour intersection operating conditions. Intersection operation is typically quantified based on its LOS during peak traffic volume periods. The LOS is determined based on the average amount of delay experienced by each vehicle entering an intersection during a 1-hour time period and is categorized by grades 'A' through 'F'. Table 3 provides a general LOS operation summary of the Converse Avenue study intersections highlighting only those traffic movements that are not operating at acceptable levels defined as LOS 'E' and 'F' during peak traffic volume time periods.

***Table 3: Converse Avenue Intersection Traffic Movement Operation Summary***
***Year 2020 Existing Roadway Conditions***

| Intersection | Midday Peak Hour | Evening Peak Hour |
|---|---|---|
| Mason Way | All at LOS 'D' or better | EBLT at LOS 'F' |
| Point Bluff | All at LOS 'C' or better | All at LOS 'C' or better |
| Briarwood Lane | All at LOS 'B' or better | All at LOS 'B' or better |
| Grandview Avenue | All at LOS 'B' or better | All at LOS 'B' or better |
| Ogden Road | All at LOS 'B' or better | All at LOS 'B' or better |

Based on the intersection capacity analysis summarized in Table 3, all existing study intersection traffic movements are operating at or better than LOS 'D' except for the eastbound left turn on Mason Way, which operates at LOS 'F' during the evening peak hour. The maximum queue length of the eastbound left turn on Mason Way is 125 feet.

## Year 2045 Intersection Operation

According to PlanCheyenne year 2045 land use projections, residential and associated urban development is expected within the Section 20 area generally bounded by Powderhouse Road to the west, Converse Avenue to the east, Storey Boulevard to the north and the new Carlson Street on the south, as well as future development adjacent to the east side of the Converse Avenue Corridor. Based on a review of historic traffic patterns and PlanCheyenne transportation forecasts, development is expected to result in an annual growth rate of 2.64 percent in traffic on the study segment of Converse Avenue.

Figure 4 at right illustrates the Section 20 Year 2045 land use development plan. As shown on this map, all of Section 20 is

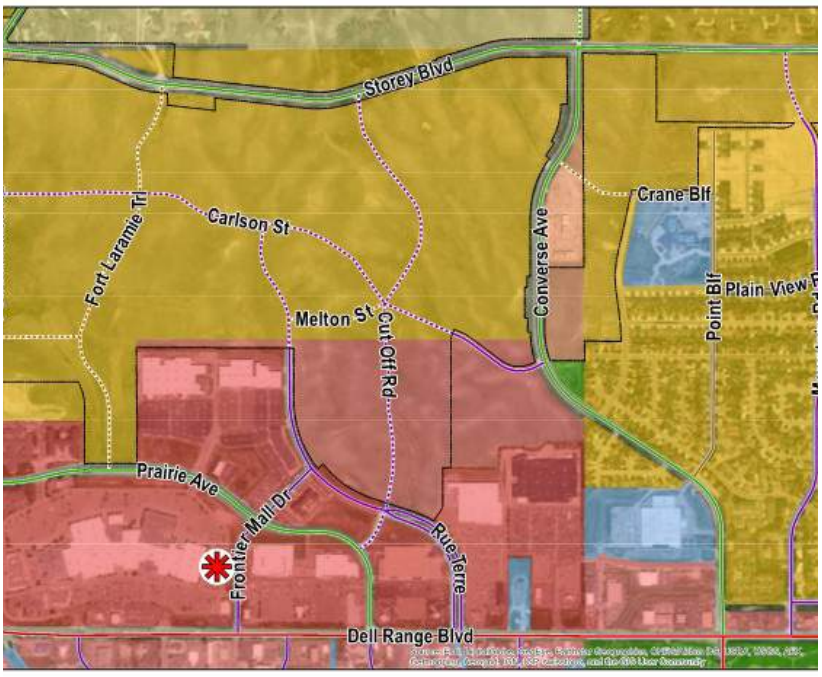



***Figure 4: Section 20 Year 2045 Land Use Map (source: PlanCheyenne Connect 2045 LRTP)***

forecasted to be fully developed by the year 2045. The land area in the northern half of Section 20 is projected to contain new residential development along with the land area adjacent to the east side of Converse Avenue north of Carlson Street to Storey Boulevard.

Figure 5 illustrates the Year 2045 daily traffic volumes on Converse Avenue and the adjacent street network.

The forecasted 2045 peak hour volumes shown in Figure 5 are based on the trips forecast from the PlanCheyenne long-range land use/transportation model. These traffic volumes were used to identify the Year 2045 peak hour intersection turning movement projections.

Table 4 below provides a general LOS operation summary of the Converse Avenue study intersections, highlighting only those traffic movements that are not operating at acceptable levels defined as LOS 'E' and 'F' during peak traffic volume time periods.


***Figure 5: Year 2045 Daily Traffic Volumes***

***Table 4: Converse Avenue Intersection Traffic Movement Operation Summary***
***Year 2045 Existing Roadway Conditions***

| Intersection | Midday Peak Hour | Evening Peak Hour |
|---|---|---|
| Mason Way | EBLT at LOS 'F' | EBLT at LOS 'F' |
| Point Bluff | EBLT at LOS 'F' | EBLT at LOS 'F' |
| | | WBLT at LOS 'F' |
| Briarwood Lane | All at LOS 'C' or better | All at LOS 'C' or better |
| Grandview Avenue | All at LOS 'C' or better | All at LOS 'C' or better |
| Ogden Road | All at LOS 'C' or better | All at LOS 'D' or better |
| Future Carlson Street | EBLT at LOS 'E' | EBLT at LOS 'F' |

The analysis of Year 2045 traffic indicates that all study intersection traffic movements in design year 2045 are expected to continue to operate at or better than LOS 'D' at the Briarwood Lane, Grandview Avenue, and Ogden Road intersections. At the Mason Way intersection, the eastbound left turn is expected to operate at LOS 'F' during both the mid-day and evening peak hours with maximum queue lengths increasing to 425 feet during both peak hours, as compared to current 125-foot queue. At the Point Bluff/USPS Driveway intersection, the westbound left turn is expected to operate at LOS 'F' during both the midday and evening peak hour with maximum queue lengths of 425 feet and 575 feet, respectively. The eastbound approach of the intersection is also expected to operate at LOS 'F' during the evening peak hour with a queue length of 25 feet. The analysis also indicates a future Carlson Street intersection would experience eastbound LOS 'E operation during the morning and LOS 'F' during the evening peak traffic period.

# 3.3 | Alternatives Development

An Enhanced 3-Lane Roadway and a 4-Lane Median Divided Roadway corridor improvement cross-section was developed to safely and efficiently accommodate projected Year 2045 traffic on Converse Avenue.

## Enhanced 3-Lane Roadway Alternative

The first improvement cross-section involves an enhanced 3-lane roadway design illustrated in Figure 6 below.

***Figure 6: Enhanced 3-Lane Roadway Alternative***
***Artist Rendering of Roadway Perspective***

***Roadway Cross-Section Dimensions***


Under this design, the roadway includes a raised 16-foot median with channelized left-turn lanes at cross-street intersections. The median would be designed with a 'lipped' colored pavement and raised curbing at pedestrian crosswalk locations. This cross-section includes an 8-foot curbed tree lawn and 6-foot sidewalk on the east side of Converse Avenue and an 8-foot curbed tree lawn and 10-foot extension of the City's Greenway path. The total cross-section from outside of the east sidewalk to outside of the west Greenway path is 86 feet.

## Year 2045 Intersection Operation Improvements

Due to poor Year 2045 intersection peak hour intersection operation at the Mason Way, Point Bluff, and a future Carlson Street intersection, each intersection was evaluated for the potential installation of traffic signals or roundabouts. Since the other study intersections were projected to operate at acceptable levels in 2045, they were not evaluated for traffic signal control.

### Traffic Signal Analysis

An engineering study is required to determine if traffic signals are a viable intersection traffic control improvement option. The primary element of an Engineering Study involves a traffic signal warrant analysis documented in the national Manual on Uniform Traffic Control Devices (MUTCD). There are nine warrants that may justify the safe installation of traffic signals.

The three primary traffic signal warrants include:

1. Eight-Hour Volume;
2. Four-Hour Volume; and
3. Peak Hour Volume

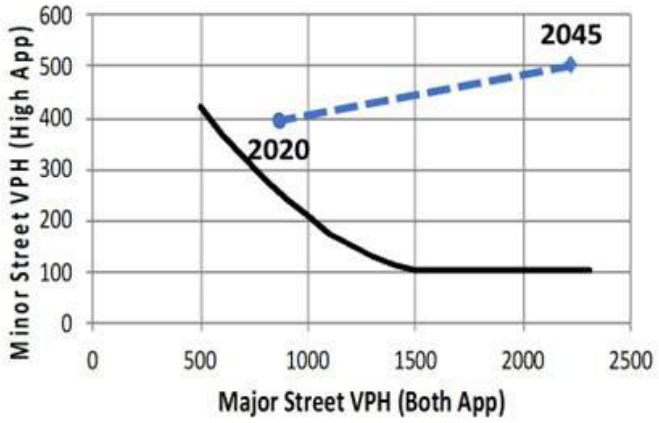
These are typically used to identify the potential criteria for future installation of traffic signals. Consistent with City of Cheyenne practice, Year 2045 peak hour traffic projections were evaluated to determine if the Mason Way, Point Bluff, and a future Carlson Street intersection satisfied Warrant Number 3 (Peak Hour Volume).

As shown in Figure 7, the Peak Hour Warrant graphs for the Mason Way, Point Bluff, and a future Carlson Street intersection indicate that each intersection can be expected to satisfy the warrants for future traffic signals by the year 2045. It is noted that the Mason Way intersection currently satisfies the peak hour warrant. Additional evaluation of existing hourly traffic count data at the Mason Way intersection indicates the 8-Hour Warrant is also satisfied.

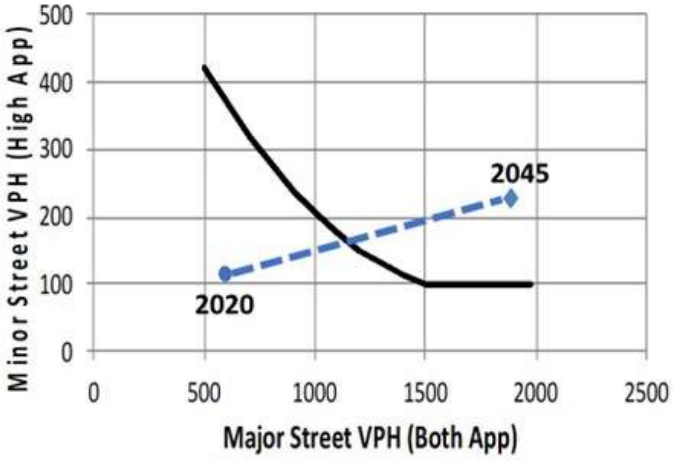
Table 5 on the following page provides a general LOS operation summary of the traffic signal operational improvements at the Mason Way, Point Bluff, and a future Carlson Street intersection with Converse Avenue.

***Figure 7: Year 2045 Peak Hour Traffic Signal Warrant***
***Enhanced 3-Lane Roadway Alternative***

***Mason Way***




***Point Bluff***




***Future Carlson Street Intersection***

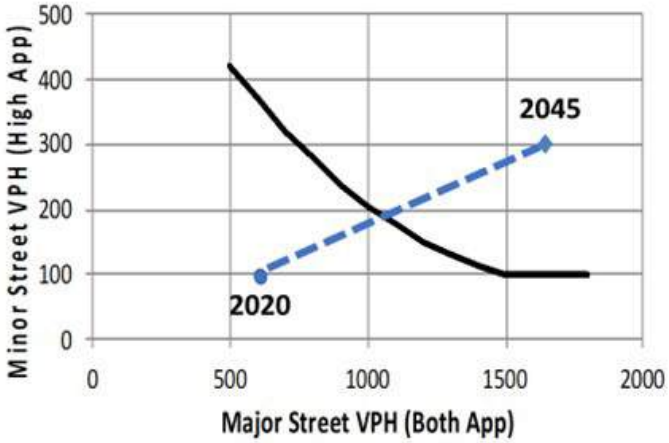


***Table 5: Converse Avenue Enhanced 3-Lane Roadway Alternative Intersection Traffic Movement Summary - Year 2045 Traffic Signal Improvement Operation***

| Intersection | Midday Peak Hour | Evening Peak Hour |
|---|---|---|
| Mason Way | All at LOS 'C' or better | All at LOS 'C' or better |
| Point Bluff | All at LOS 'C' or better | All at LOS 'D' or better |
| Future Carlson Street | All at LOS 'D' or better | All at LOS 'C' or better |

A peak hour intersection operation analysis indicates that the installation of future traffic signals will improve intersection operation to acceptable LOS 'D' or better at the Mason Way, Point Bluff, and the new Carlson Street intersection. With the installation of these 3 intersection traffic signal controls, all study intersection traffic movements are expected to operate at or better than LOS 'D' throughout the Converse Avenue Corridor through the design year 2045.

Additional detailed examination of the Point Bluff intersection operation indicates extensive northbound queuing of 875 feet during the evening peak. In order to reduce queuing, a separate northbound right-turn lane was analyzed.

Table 6 provides a general LOS operation summary of the traffic signal operational and construction of a separate northbound right-turn lane improvement at the Point Bluff intersection with Converse Avenue.

***Table 6: Converse Avenue Enhanced 3-Lane Roadway Alternative Intersection Traffic Movement Year 2045 Traffic Signal with Northbound Right Turn Lane Improvement Operation Summary***

| Intersection | Midday Peak Hour | Evening Peak Hour |
|---|---|---|
| Point Bluff | All at LOS 'C' or better | All at LOS 'C' or better |

With a separate northbound right-turn lane, evening peak hour operation is at LOS 'B' with queue reduction to 625 feet.

**Roundabout Analysis**

Based on comments received at the March 3, 2021, public information meeting, an analysis was conducted for a potential roundabout traffic control improvement in the Year 2045 at a future Carlson Street intersection with Converse Avenue.

Figure 8 illustrates a primary single-lane roundabout design for a future Carlson Street intersection with Converse Avenue.

Table 7 on the following page provides a general LOS operation summary of a single lane roundabout at a future Carlson Street intersection with Converse Avenue.

***Figure 8: 3-Leg Roundabout Design for a Future Carlson Street Intersection with Converse Avenue***

***Table 7: Converse Avenue Enhanced 3-Lane Roadway Alternative Intersection Traffic Movement Year 2045 Traffic Roundabout Improvement Operation Summary***

| Intersection | Midday Peak Hour | Evening Peak Hour |
|---|---|---|
| Future Carlson Street | All at LOS 'B' or better | All at LOS 'C' or better |

Under roundabout control, all intersection traffic movements are expected to operate at LOS 'B' during the midday peak hour and at LOS 'C' or better during the evening peak hour. Maximum queue lengths are expected to reach 125 feet during the midday and 250 feet during the evening peak hour for the northbound and southbound approaches, respectively. All other movements are expected to have a maximum queue length of 125 feet or less. Roundabout consideration at the Mason Way and Point Bluff intersections were not evaluated due to their close proximity and traffic platooning impacts generated by the signalized Converse Avenue intersection with Dell Range Boulevard and a future traffic signal at Mason Way.

## Year 2045 Intersection Operation Improvements

The second improvement cross-section involves a 4-lane median divided roadway, shown in Figure 9.

***Figure 9: 4-Lane Median Divided Roadway Alternative***
***Artist Rendering of Roadway Perspective***

***Roadway Cross-Section Dimensions***

Under this design, the roadway includes two travel lanes in the north and southbound directions with a 16-foot median with channelized left-turn lanes. The median would be designed with a 'lipped' colored pavement and raised curbing at pedestrian crosswalk locations. This cross-section includes an 8-foot curbed tree lawn and 6-foot sidewalk on the east side of Converse Avenue and an 8-foot curbed tree lawn and 10-foot extension of the City's Greenway path. The total cross-section width from outside of the east sidewalk to outside of the west Greenway path is 100 feet wide.

Table 8 provides as general LOS operation summary of the Converse Avenue study intersections highlighting only those traffic movements that are not operating at acceptable levels defined as LOS 'E' and 'F' during peak traffic volume time periods.

***Table 8: Converse Avenue 4-Lane Median Divided Roadway Alternative Intersection Traffic Movement Operation Summary - Year 2045 Existing Traffic Control Conditions***

| Intersection | Midday Peak Hour | Evening Peak Hour |
|---|---|---|
| Mason Way | EBLT at LOS 'F' | EBLT at LOS 'F' |
| Point Bluff | WBLT at LOS 'F' | WBLT at LOS 'F' |
| | | EBLT at LOS 'E' |
| Briarwood Lane | All at LOS 'B' or better | All at LOS 'B' or better |
| Grandview Avenue | All at LOS 'B' or better | All at LOS 'C' or better |
| Ogden Road | All at LOS 'C' or better | All at LOS 'D' or better |
| Future Carlson Street | EBLT at LOS 'F' | EBLT at LOS 'F' |

With the 4-lane Median Divided Roadway alternative and existing cross-street stop sign control, the left-turn movements on the eastbound approach of Mason Way and the westbound approach of Point Bluff are expected to operate at LOS 'F' during both the morning and evening peak hours with the eastbound approach at Point Bluff operating at LOS 'E' during the evening peak hour. The future Carlson Street intersection eastbound left turn is expected to operate at LOS 'E' during the morning and LOS 'F' during the evening peak hour.

Due to the poor intersection peak hour traffic operation at the Mason Way, Point Bluff, and future Carlson Street intersections, each intersection was evaluated for the potential installation of traffic signals or roundabouts.

**Traffic Signal Analysis**

A similar engineering study was conducted for the 4-Lane Median Divided Roadway alternative as was conducted for the Enhanced 3-Lane Roadway alternative. The peak hour warrant curves for a 4-lane roadway, shown on Figure 10, are slightly different than those used in 3-lane roadway analysis. As shown in Figure 10 at right and on the following page, the Mason Way, Point Bluff, and a future Carlson Street intersections will satisfy the 4-lane warrants to consider the installation of traffic signals.

***Figure 10: Year 2045 Peak Hour Traffic Signal Warrant 4-Lane Median Roadway Alternative Mason Way***

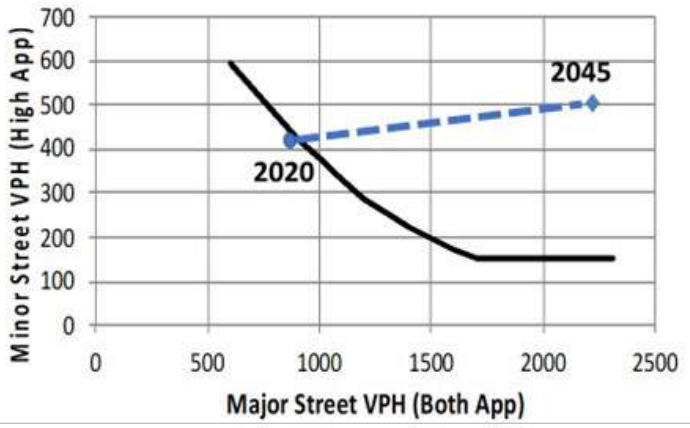


Table 9 below provides a general LOS operation summary of the traffic signal operational improvements at the Mason Way, Point Bluff and a future Carlson Street intersection with Converse Avenue.

With traffic signals, all traffic movements at the Mason Way, Point Bluff and at a future Carlson Street intersection are expected to operate at LOS 'C' or better during both the morning and evening peak hours except for the eastbound left turn at a future Carlson Street intersection which is expected to operate at LOS 'D' during the morning peak hour.

**Roundabout Analysis**

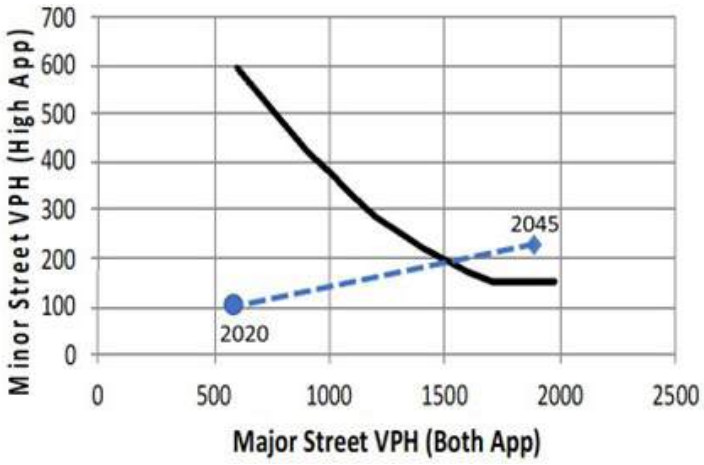
It is noted that the 4-lane cross-section alternative was not analyzed with a dual lane roundabout due to local traffic safety concerns experienced at a dual lane roundabout on Pershing Boulevard at its intersection with Converse Avenue.

## Access Management

Access management on arterial streets has been shown to improve safety by reducing traffic conflict points along a roadway. Two principle areas identified in this study for access management involved left turns that currently occur at the commercial developments located along Converse Avenue north of its intersection with Dell Range Boulevard and south of the Dry Creek bridge (Commercial Back Access Roads) with the second access management location involved traffic conflicts at the Briarwood Lane intersection with Converse Avenue.

***Figure 10: Year 2045 Peak Hour Traffic Signal Warrant 4-Lane Median Roadway Alternative (cont.)***

***Point Bluff***




***Future Carlson Street Intersection***

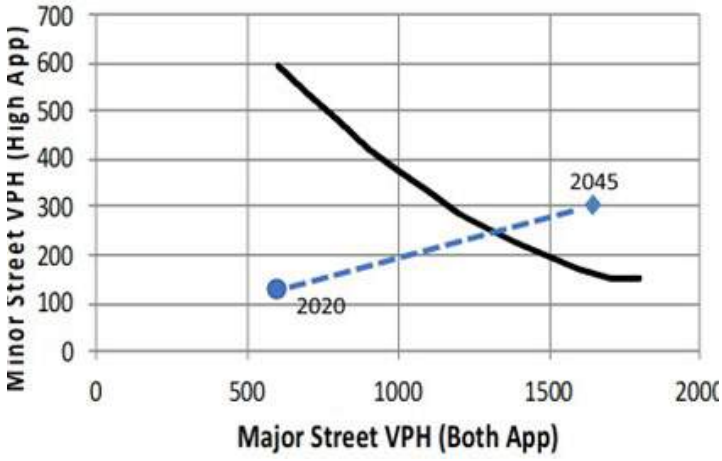



***Table 9: Converse Avenue 4-Lane Median Divided Roadway Alternative Intersection Traffic Movement Operation Summary - Year 2045 Traffic Signal Improvements***

| Intersection | Midday Peak Hour | Evening Peak Hour |
|---|---|---|
| Mason Way | All at LOS 'C' or better | All at LOS 'C' or better |
| Point Bluff | All at LOS 'C' or better | All at LOS 'C' or better |
| Future Carlson Street | All at LOS 'D' or better | All at LOS 'C' or better |

**Commercial Access Business Roads**

The commercial business access road on the east side of Converse Avenue provides secondary access to Cold Stone Creamery and adjacent businesses and accommodates entering and exiting traffic flow. The commercial business access

road on the west side of Converse Avenue operates as a one-way eastbound roadway exiting the Cheyenne State Bank property and adjacent development. In addition to the left-turn conflict concerns with traffic on Converse Avenue, it has also been reported that motorists will travel in the wrong direction on the western back access road to avoid southbound right-turn traffic delays at the Dell Range intersection. Both of these access roads are located approximately 175 feet north of Dell Range Boulevard.

Traffic conflict concerns at both these access road intersections involve left-turn conflicts in close proximity to the Dell Range Boulevard intersection; the fact that left turns attempting to across Converse Avenue are periodically blocked by traffic queues on Converse Avenue and traffic driving in the wrong direction creates a problem on the eastbound one-way road on the west side of Converse Avenue.

It is therefore recommended to construct a raised 4-foot-wide median separating northbound and southbound traffic on Converse Avenue between Dell Range Boulevard and Mason Way under both the 3-lane enhanced and 4-lane divided roadway alternatives. In the event that right-of-way constraints don't allow for a raised median, another option is to place glue-down plastic bollards along the yellow centerline to similarly prevent left-turn exits from these access roads.

**Briarwood Lane**

According to data published in the Institute of Transportation Engineers Trip Generation Manual, 10th edition, the 30 homes on Briarwood Lane and Grandview Avenue generate 26 morning and 30 evening peak hour trips. The Converse Avenue spacing between the Briarwood Lane and Point Bluff intersections is approximately 250 feet. Based on the 2045 signalized operation analysis for the Enhanced 3-Lane roadway alternative cross-section, the 95th percentile southbound through movement queue is expected to extend 450 feet during the morning peak and 525 feet during the evening peak hour north of the Point Bluff intersection. Under this condition, access management is needed for traffic flow and safety on Converse Avenue due to left turns entering and exiting Briarwood Lane that can be blocked by southbound queuing on Converse Avenue. Based on this concern, it is recommended cul-de-sacing Briarwood at its intersection with Converse Avenue with all neighborhood traffic using the Grandview intersection. Typically, neighborhood design would involve 2 points of access. It is, therefore, recommended to construct a 10-foot wide emergency vehicle access surface connecting Converse Avenue to the Briarwood Lane cul-de-sac.

Table 10 provides a general LOS operation summary of the Grandview Avenue intersection with Converse Avenue under the cul-de-saced Briarwood Lane recommendation for both the Enhanced 3-Lane Roadway and 4-Lane Median Divided Roadway cross-section alternatives.

***Table 10: Grand View Avenue Intersection Traffic Movement Summary***
***Year 2045 with a Cul-de-Saced Briarwood Lane***

| Alternative Section | Midday Peak Hour | Evening Peak Hour |
|---|---|---|
| Enhanced 3-Lane Roadway | All at LOS 'C' or better | All at LOS 'C' or better |
| 4-Lane Median Divided Roadway | All at LOS 'B' or better | All at LOS 'C' or better |

Under this access management improvement, all traffic movements on Converse Avenue at its intersection with Grandview Avenue, including the northbound left turn, are expected to operate at LOS 'A' under an Enhanced 3-Lane or a 4-Lane Median Divided Roadway design. The eastbound approach of Grandview Avenue operates at LOS 'C' or better during peak hour traffic periods.

## Dell Range Boulevard Truck Turning Issue

In addition to analyzing corridor improvement alternatives, this study also investigated an existing eastbound semi-truck turning problem at the northeast corner of the Dell Range Boulevard intersection with Converse Avenue. It has been reported that semi-trucks can not make the eastbound left turn without traveling over the intersection corner curbing and crossing into oncoming southbound left-turn traffic lane. Existing semi-truck traffic includes WB-53 foot long vehicles. The USPS has indicated they will start using WB-53 trucks with an attached "pup" at their facility on Converse Avenue at Point Bluff.

Figure 11 illustrates the additional right-of-way required to accommodate right-turn movements for both of these truck classifications. Design of the recommended Converse Avenue improvements should include the truck turning need which will require additional right-of-way on the northeast intersection quadrant.

## Street Network Continuity

Three street network continuity options were identified by the Project Steering Committee to improve accessibility to future residential development and Anderson Elementary School located east of Converse Avenue and north of a future Carlson Street intersection.

Figure 12 shows three street connection route options between Converse Avenue and Ogden Road. The southern option (green) connects to Apache Street, the center option (red) connects to Pattison Avenue, with the third option (blue) connecting to Ogden Road in the vicinity of Plainview Boulevard or Council Bluff.

The PlanCheyenne Long-Range Transportation Model was used to identify Year 2045 traffic projections for each street network connectivity option, which are summarized on Table 11 on the following page.

A new neighborhood street network connection is projected to carry approximately 1,100 vehicles per day except for the Plainview Boulevard/Council Bluff connection, which is projected to carry 400 vehicles per day.

***Figure 11: Eastbound Right Turn Truck Turning Requirements at the Dell Range Boulevard Intersection with Converse Avenue***

***WB-53 Semi Truck Turning Requirement***

***WB-53 Semi Truck with Pup Turning Requirement***

***Figure 12: Street Network Connectivity Options***

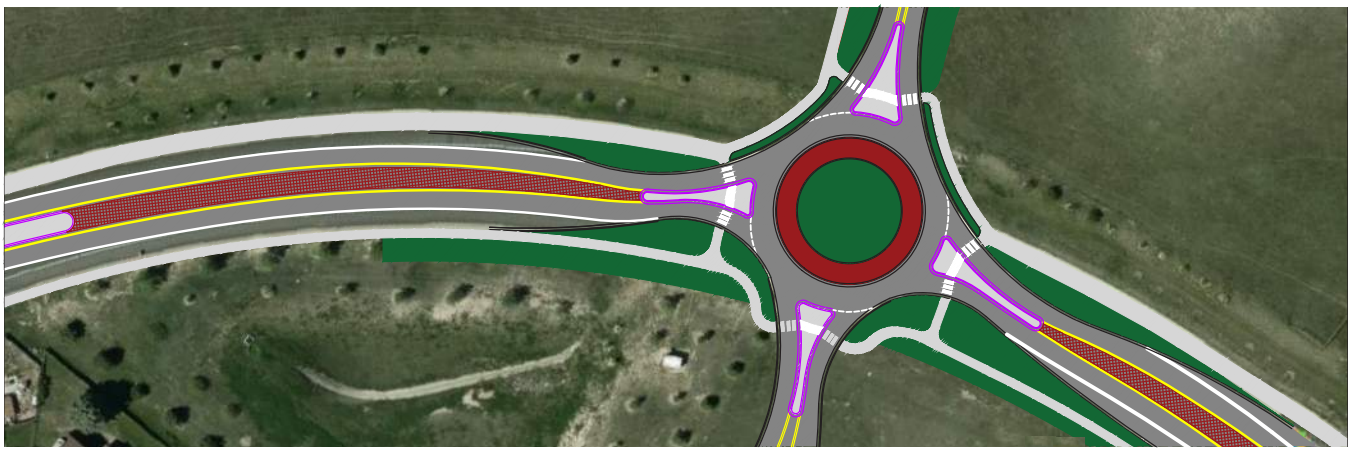
***Table 11: Year 2045 Traffic Volume Impact of Neighborhood Street Connectivity Options***

| New Street Network Connection | Percent Traffic Reduction: Ogden Road | Percent Traffic Reduction: Point Bluff |
|---|---|---|
| Plainview Boulevard/Council Bluff | 19% | 0% |
| Pattison Avenue | 40% | 0% |
| Apache Street | 40% | 0% |

As shown on Table 11, both the Apache Street and the Pattison Avenue connections between Converse Avenue and Ogden Road provide the most efficient routes to reduce traffic on Ogden Road. Based on street intersection spacing guidelines, the connection located between Plainview Boulevard and Crane Bluff Road (800 feet) provides the greatest separation spacing from the new Carlson Street intersection with Converse Avenue.

Should the Apache Street or Pattison Avenue Connections be selected, they would create a fourth leg to the future Carlson Street intersection with Converse Avenue. A 4-leg roundabout operation analysis was conducted for the 3-Lane Enhanced Roadway alternative. Figure 13 shows a 4-leg roundabout design at a future Carlson Street intersection.

***Figure 13: 4-Leg Roundabout Design for a Future Carlson Street Intersection***



All 4-leg roundabout Year 2045 peak hour traffic movements are expected to operate at LOS 'C' or better with the Enhanced 3-Lane roadway design alternative.

Table 12 provides a general LOS operation summary of a single lane roundabout at a future 4-leg Carlson Street intersection with Converse Avenue under the Enhanced 3-lane Roadway Alternative.

***Table 12: Future Carlson Street Intersection LOS Operation Summary – Year 2045 4-Leg Roundabout***

| Intersection | Midday Peak Hour | Evening Peak Hour |
|---|---|---|
| Future Carlson Street | All at LOS 'B' or better | All at LOS 'C' or better |

# 3.4 | Decision Matrix Evaluation Development

Each of the two cross-section design improvement alternatives were evaluated based on the criteria shown in Table 13. It is noted that the evaluation is subjective on each alternative's qualitative ability to satisfy each of the criteria.

***Table 13: Evaluation of Converse Avenue Design Alternatives***

| Criteria | Enhanced 3-Lane | 4-Lane Divided |
|---|---|---|
| Safety | ★ | ● |
| Traffic Operation | ★ | ★ |
| Pedestrian Friendly | ★ | ● |
| Speed Management | ★ | ● |
| Connectivity | ★ | ● |
| Drainage | ★ | ● |
| Right-of-Way | ★ | ● |

Note
★ = Very Good
● = Good
■ = Poor
— = Very Poor

The evaluation findings shown on Table 13 are based on the following general qualitative impacts:

- **Safety** | The enhanced 3-lane alternative reduces pedestrian crossing distances, tames traffic speeds, and reduces potential sideswipe crashes by providing only one traffic lane in each direction, as compared to the 4-lane alternative.
- **Traffic Operation** | Both alternatives provide acceptable LOS at the study intersections with traffic signal controls at Mason Way, Point Bluff, and a new Carlson Street intersection. The Year 2045 daily traffic on Converse Avenue between Mason Way to north of Carlson Street is projected to range between 18,000 vpd to 9,000 vpd. Based on FHWA criteria, a 3-lane continuous left-turn lane roadway can accommodate 17,000 to 21,000 vpd.
- **Pedestrian Friendly** | Both alternatives provide median refuge islands, a continuous sidewalk along the east side of Converse Avenue and greenway path along the west side of Converse Avenue. The enhanced 3-lane alternative provides reduced pedestrian crossing distances of Converse Avenue and exposure to oncoming traffic.
- **Speed Management** | Both alternatives provide a raised median, urban street crosswalk cadence, and tree lawn terrace landscaping. The enhanced 3-lane alternative provides narrower northbound and southbound pavement perspectives to drivers which impacts vehicle speeds.
- **Connectivity** | Both alternatives provide similar existing cross-street accessibility to adjacent residential and commercial land uses.
- **Drainage** | Both alternatives will require replacing the existing drainage swale with an underground drainage system and curb inlets. The enhanced 3-lane option provides less impervious surface and additional opportunities for vegetated swales compared to the 4-lane alternative.
- **Right-of-Way** | The 4-lane alternative may require additional right-of-way at selected locations to accommodate a buffered tree lawn and full-width sidewalk due to its total 100-foot width, compared to the 86-foot back of sidewalk to back of greenway path width requirement of the enhanced 3-lane alternative.

## Recommendations

Based on the evaluation of street design cross-sections, public comments, and according to the previously stated criteria, the following recommendations are made:

- It is recommended to construct the 4-Lane Median Divided Roadway design between Dell Range Boulevard and Mason Way, transitioning to the 3-Lane Enhanced Roadway design north of Mason Way as illustrated in Figure 14.
- It is recommended to install traffic signals at the Mason Way and Point Bluff intersections with Converse Avenue.
- It is recommended to construct a single-lane roundabout at a future Carlson Street intersection with Converse Avenue based on its ability to tame traffic speeds, enhance intersection safety, and serve as a gateway to the future fully developed urban area south of a future Carlson Street.
- It is recommended to install "Continental" design marked crosswalks at the Converse Avenue intersections with Mason Way, Point Bluff and a future Carlson Street. (See Figure 15.)
- It is recommended to construct a new street connection to Converse Avenue at a location between Apache Road and Crane Bluff Road.

Figure 14 illustrates the recommended corridor design improvement for Converse Avenue.

***Figure 14: Recommended Converse Avenue Design Improvements***

***Figure 15: Example of Continental crosswalk***

*Image courtesy of US Department of Transportation, Federal Highway Administration*

# Section 4

# Preliminary Engineering Design

*In this section:*

Ayres performed preliminary engineering on project elements sufficient to determine project limits and construction costs to a confidence level appropriate for 35% design for Converse Avenue (hereafter called Converse). Major elements were identified and quantified, and minor elements were estimated based on typical percentages for similar projects.

The design utilized recommendations from the Traffic Operations Report as a starting point, and adjustments were made based on conversations with the City. The design also took into account the logical limitations of the project site, such as limiting the number of private property parcels impacted by the project, aligning the project with the existing Dell Range intersection, and considering potential future projects (the Dell Range intersection and possible changes to Converse south of Dell Range).

Based on conversations with the City, Ayres has developed an ultimate design which illustrates the greatest benefit and most desirable configuration, which is included as Attachment A. Ayres also developed an interim design at the Dell Range intersection that incorporates most of the ultimate design improvements, but which limits cost and right-of-way (ROW) impact. The interim design also postpones improvements at Point Bluff that may not be warranted at the time of construction (current traffic volumes do not warrant the need for traffic signals at Point Bluff). It will be important for the City to determine the most appropriate design to construct based on available funding and traffic volumes at the time of anticipated construction.

Besides improved lane configuration north of Dell Range, the design includes a realignment of the lanes north of Dell Range. The project should align the new lanes with the existing lanes south of the intersection to eliminate the current angle break across the intersection, reduce driver confusion, and fix the unusual situation of having unbalanced left turn lanes. In addition, the recommended alignment was made parallel to the ROW lines so that acquisition legal descriptions are clearer and simpler.

It is important to note that while improved, the lane alignment is not ideal. Specifically, a better operational lane configuration would have the lanes south of the intersection balance with the lanes north of the intersection (two southbound lanes, two left turn lanes, and two northbound lanes). To create proper lane balance, widening of Converse an additional 12 feet both north and south of Dell Range would be required. South of Dell Range, this is only feasible by widening to the west where the pedestrian bridge would not be impacted. North of Dell Range, this is only feasible by widening to the east where the Aspen Ridge complex would not be impacted. In this scenario, a new angle point across the intersection would be introduced, “breaking” one of the major improvements this project has to offer.

# 4.1 | Typical Sections

As described in Section 3 and the Traffic Operations Report, the corridor sees a wide range of traffic volumes and movements, and as such, the project will require a variety of lane configurations, or Typical Sections, to best accommodate the anticipated needs. All segments or sections should include a variable-width raised* median, 24-inch curb and gutters, a tree lawn**, and 6-foot sidewalk or 10-foot greenway.

With traffic near the Dell Range and Mason Way intersections the heaviest and most varied, the segment from Dell Range to Mason Way will require a 5-lane typical section plus additional southbound right-turn lanes at Dell Range and Mason Way. Due to the extra lanes, no shoulder is recommended.

As traffic volumes lighten north of Mason Way, one through lane should be dropped in each direction. The southbound lane should drop between the southern USPS truck access and the Point Bluff intersection. This will allow southbound vehicles slowing and entering the USPS facility (primarily freight trucks) to exit the primary lane and thus reduce traffic conflicts due to speed differential. A 6-foot shoulder should be constructed along southbound Converse between the lane drop and Point Bluff. The northbound lane should terminate as a right-turn only lane at the Point Bluff intersection. This extra lane allows slowing, right-turning vehicles to maintain separation from through traffic and likewise reduces conflicts due to speed differential. Due to the extra lane, no northbound shoulder is recommended between Point Bluff and Mason Way.

North of Point Bluff, the corridor should maintain the enhanced 3-lane typical section; a single lane in each direction with 6-foot shoulders and a raised* median that acts as an alternating left-turn lane (or Two-Way Left Turn Lane).

In all cases through the project, the median should be either 16 feet when no left turn lane is present or 4 feet (face of curb to face of curb) wide when a left turn lane is present. The project should construct a 10-foot concrete greenway along the west side of the road between Carlson Street and Mason Way, and 6-foot concrete sidewalks in all other locations.

An 8-foot tree lawn has been included per City standards; however, the use of this buffer space should be carefully considered by the City and future designers, taking into account cost of irrigating and maintaining any vegetation that is installed. Specific elements that should be considered include:

** Median curb should be 6" raised where traffic is being channelized (i.e. lane tapers), and where pedestrian crosswalks are present. In other locations, a flat or 2" lipped curb could be utilized with colored and/or textured pavement to reduce snow drifting, damage from vehicle and snowplow strikes, etc.*
*** Tree lawn space should be provided wherever practical given adjacent constraints. Where additional right-turn lanes are provided, buffer space typically is not.*

- Buffer zone: the tree lawn buffer provides both a real and perceived safety benefit to cyclists and pedestrians; it is comforting to these users and the separation should be maintained if at all possible.
- Trees arguably provide the greatest aesthetic and environmental benefit for the lowest irrigation and maintenance cost, provided the species are carefully selected, they are properly irrigated, and they can fully establish prior to onset of harsh weather.
- Landscaping the buffer zone has a great deal of aesthetic value, but also comes with high installation, irrigation, and/or maintenance costs.
- The final design phase should include careful consideration of these elements and include a landscape architect review to make specific, targeted recommendations for low-water, drought-tolerant species that minimize the City's maintenance efforts.

# 4.2 | Right-of-Way and Access Management

## ROW Impacts

Generally speaking, the effort was made to design the proposed improvements to minimize ROW impacts to the most beneficial extent. For example, the roadway template was aligned to avoid ROW impacts to the numerous parcels along the east side of the project in favor of greater impacts to only two parcels along the west side of the project. The rationale for this was that minimal sliver impacts to several parcels would require a great deal of ROW acquisition effort for minimal benefit. On the other hand, once a parcel is impacted, a greater area of impact is only marginally more effort and cost than a small impact to that same parcel. The design was tailored to keep ROW impacts limited to the empty parcel south of Mason Way, the USPS parcel north of Mason Way, and the Blackmarket parcel northeast of the Dell Range intersection. The benefits of this approach are as follows:

- The USPS parcel will be impacted in any condition in order to bury the existing drainage which partially lies in the utility easement. While some of the impact is due to permanent roadway widening, a portion of the impact will likely be expansion of the utility easement which will be landscaped and available for USPS use or beautification.
- There is more buffer space between Converse and the USPS facility than any other parcel, making the project's impacts less evident at this location.
- The parcel southwest of Mason Way is vacant, so the City can work with the owner/developer to accommodate the project instead of the project causing or mitigating impacts to an existing facility or buffer zone.
- Impacts to the Black Market parcel are unavoidable due to necessary improvements to the northeast corner of the Dell Range intersection to accommodate truck turning movements. Given this unavoidable impact, it makes sense to maximize improvements in this area in order to avoid sliver impacts to the Aspen Ridge parcel west of Converse. The Black Market owner is believed to be a willing and cooperative property owner, and a total buyout of the parcel is believed to be feasible. This parcel impact allowed us to incorporate other very beneficial intersection improvements as well, such as lane alignment and continuity improvements.

### Access Management

As described in detail in Section 3 and the Traffic Operations Report, the project should incorporate a number of minor Access Management elements; primarily limiting left turn movements at Aspen Ridge and Black Market via construction of the center raised median, and at Briarwood Lane via closure of the open cul-de-sac. It is noted that in the ultimate configuration, we have shown the Black Market access remaining, though it could be eliminated should the parcel be a total acquisition. Additional improvements include sharpening the leading curb radius at the Aspen Ridge exit-only to dissuade right turns into the property from Converse.

Particular consideration should be given to thoughtful and effective directional messaging in the greater business plaza west of and including Aspen Ridge Plaza. The existing exit at this location serves the entire development west of Aspen Ridge, including Apple Ridge Plaza (5 businesses), Spruce Ridge Plaza (7 businesses), and Big 5 Sporting Goods in addition to the 13 businesses in Aspen Ridge Plaza. Customers have grown accustomed to the convenient access to northbound Converse Avenue through this exit; eliminating left turns here will require a relatively long alternative route via westbound Dell Range, northbound Grandview, and eastbound Mason Way (which will accommodate the increased traffic volume with the recommended traffic signal). Initially, this will be an unfamiliar and inconvenient movement, and the final design should accommodate and mitigate it to the greatest extent possible.

The closure of the Briarwood intersection is only recommended in conjunction with the installation of a future traffic signal at Point Bluff under the ultimate design. In this scenario, southbound queues at Point Bluff are expected to extend through the Briarwood intersection. This creates additional conflicts and delays for vehicles entering and exiting Briarwood. For this reason, we are showing the closure of the Briarwood cul-de-sac in the ultimate design configuration, but maintaining the intersection in the interim design condition is both feasible and likely. It is also noted that the project team received strong feedback from residents of Century West subdivision (Briarwood Lane and Grandview Avenue) against closing the Briarwood cul-de-sac. The objections were heard and documented. However, none of the reasons for objection have any engineering or safety merit to them. See the Section 2 Public Involvement references for these objections and the project team's responses.

## 4.3 | Posted Speed Limit and Design Speed

The project is currently posted at 30 mph, which is in line with the project's context and use (heavy retail access adjacent to dense residential). Common observation by local residents is that much of the traffic along the project corridor exceeds that speed and many residents expressed concern with current vehicle speeds and are hesitant to walk or bicycle along the project. It is believed that a major factor contributing to the excessive speeds is the open, rural feel of the corridor north of Ogden Ave, where speeds of 45 mph are comfortable. The addition of development at and north of Carlson in the coming years will help reduce that perception, and the construction of the recommended roundabout at Carlson will both force and emphasize the low-speed, urban context of the segment of Converse this project represents. The project recommendations are intended to calm traffic and bring the average speed down to the 30 mph posted limit. As such, we propose no changes to the posted speed limit.

The design speed for the project design is 30 mph, and the existing horizontal alignment is within acceptable ranges for this design speed, so no alignment changes are recommended.

# 4.4 | Pedestrian, Bicycle, and Transit Facilities

At the project onset, the City expressed a specific interest in accommodating multi-modal options, and feedback from the public involvement efforts verified the need for bicycle and pedestrian improvements in particular. Specifically, sidewalk gaps and lack of crosswalks were identified as major problems. The extension of the existing Greenway was well received by the public.

The project should improve pedestrian and bicycle access primarily by providing new sidewalk connectivity, extending the existing Greenway to Mason Way, providing three new marked crosswalks, and by widening the existing sidewalk along the east side of the project. In addition, the tree lawn will provide much needed comfort and safety benefits to sidewalk and Greenway users.

The 10-foot-wide concrete Greenway should be rebuilt along the west side of Converse from north of Carlson, through the recommended roundabout, and south to Mason Way, where it will connect to the existing Greenway running west. In doing so, the project will complete a 2.37-mile stretch of Greenway. The Greenway will need to include ADA-compliant ramps and crosswalks at all intersections along the west side of the project. South of Mason Way, the project should construct new 6-foot sidewalk all the way to the Dell Range intersection, including ADA-compliant ramps at the Aspen Ridge exit.

The project should replace the existing sidewalk along the east side of Converse with a new 6-foot sidewalk with ADA compliant ramps at each intersection, as well as ADA-compliant ramps and crosswalks crossing Converse at Mason Way, Point Bluff, and Ogden Road. The roundabout at Carlson should include ramps to connect the 6-foot shoulders with the adjacent sidewalks or Greenway so that cyclists riding on the shoulder can utilize the roundabout crosswalks if they so choose.

There is an existing Cheyenne Transit Progam (CTP) bus stop on southbound Converse just north of Mason Way, in front of the USPS facility. The existing stop is located in the right-turn lane for Mason Way, creating high risk for bus/car conflicts. In discussions with the City and CTP, it was determined that moving the stop out of the right-turn lane and on to Mason Way would be advantageous for vehicle and rider safety as well as rider and CTP convenience since the current route turns west on Mason Way. The project should reconstruct a new bus stop just west of the USPS entrance on Mason Way, including a concrete bus turn-out.

In addition, the new Ridge View apartment complex in the southwest corner of Carlson Street intersection presents a promising opportunity for transit use. A bus stop should be considered and evaluated south of the recommended roundabout. Since a route doesn't currently serve this location, consultation and coordination with CTP will be required.

# 4.5 | Dry Creek Structure

The Sheridan Reach of Dry Creek crosses Converse Avenue in a generally east/west direction approximately 250 feet north of the Dell Range intersection, crossing at a skew of approximately 20 degrees from perpendicular. The channel is heavy wetland and is approximately 66 feet wide with 3:1 side slopes. There is a history of flooding along Dry Creek in the vicinity of the project, and a flood control/diversion structure was constructed 3,700 feet upstream to mitigate this hazard and maintain a predictable flood stage water elevation.

## Existing Structure

The existing structure is a 5-cell, 8-by-10-foot concrete box culvert (CBC) structure with a 20-degree skew to match the channel alignment as it crosses under Converse Avenue. The inlet consists of 45-degree wingwalls 25 feet long. The outlet consists of parallel wingwalls following the channel to accommodate a sidewalk and a driveway adjacent to the creek; the north wingwall is approximately 70 feet long and the south wingwall is approximately 60 feet long. An existing 48-inch storm drain carries roadside drainage from Mason Way outlets into the north side of the channel just west of Converse Avenue. The storm drain outlet consists of headwall and wingwalls with grouted riprap outlet protection. The south channel bank has been stabilized with riprap gabions opposite the storm outlet. A second storm sewer line collecting roadside and surface drainage from the Converse Avenue corridor and Section 20 parcel northwest of the project crosses Converse Avenue north of the Dry Creek structure and outlets into a 6th partial bay in the northeast corner of the structure. The headwalls and wingwalls are outfitted with box beam pedestrian railings, and box beam guardrail bolted to a special 18-inch concrete curb separates vehicles and pedestrians. There are two curb inlets on the north end of the structure, draining to the storm sewer outlet in the northeast corner of the structure.

Originally the project team anticipated extending the existing CBC to the east and west to accommodate widening of Converse Avenue for traffic and improved pedestrian accessibility. However, during the traffic study and preliminary design, it was discovered that a recent WYDOT inspection report indicated the existing Dry Creek structure was in worse condition than was previously known. Based on that report's findings, the City anticipates the need to replace the structure soon, possibly before a Converse Avenue roadway project is funded. With this information, the decision was made to design Converse Avenue improvements without the constraints the existing structure might place on the design and instead include an entirely new structure in the project.

## Proposed Structure and Impacts

With this approach, improvements were directed entirely to the east. The new structure is expected to be 16 feet longer along the flow path than the existing structure to accommodate Converse Avenue widening to the downstream (east) side. Based on flow calculations explained in Section 5 Drainage, it is estimated that the entire structure will need to be approximately 5 feet wider than the existing structure to maintain the current top of box elevations. The proposed structure is expected to be a 5-cell, 8-by-11-foot CBC similar to the existing structure. Because the ditch along the west side of Converse Avenue outlets into a separate, adjacent structure in the northwest (downstream) corner of the CBC, only that portion of the structure will need to accommodate increased design flows from the piped ditch (also explained in Section 5). No significant grade changes on Converse Avenue are anticipated for the new structure.

The new structure will largely maintain the existing inlet wingwall and box footprint to limit impacts to the wetlands, riprap bank stabilization, and existing storm outlet in the Dry Creek channel. Analysis indicates that the existing inlet

wingwall and structure opening provide appropriate geometry to provide sufficient flow for the design storm event, including increased flows from the enlarged storm drain. Construction will require some temporary wetlands impacts at the structure inlet, conservatively estimated at 0.1 acres.

Due to the increased width of the structure, downstream impacts will include complete removal and reconstruction of the existing wingwalls and significant permanent and temporary wetlands impacts. Permanent impacts are estimated to be 0.05 acres and temporary impacts are estimated to be 0.1 acres, for a conservative total of approximately 0.25 acres of wetland impacts related to the structure replacement.

### Constructability and Phasing

With a proposed structure width of 99 feet curb-to-curb (increased from 85 feet), the east half of the new structure (52 feet) can be constructed while maintaining one northbound and two southbound lanes of traffic and a sidewalk (47 feet total, including temporary concrete barrier and shy distance) on the west half. Once completed, a traffic shift to the new eastern half of the structure would allow construction of the western half.

It is noted that an existing storm sewer manhole is in the north bank approximately 20 feet from the end of the northeast wingwall; during final design, an investigation of that storm line should be conducted, and special consideration made for how the proposed wingwall will impact it or can avoid it.

The final design project team should also consider additional design options to accommodate construction, including restricting Converse Avenue to a single southbound lane over the structure, the temporary use of 11-foot lanes during this configuration, and increasing the width of the proposed structure to ensure safe accommodation of both traffic and work site safety during construction. Final design should also consider packaging the structure work as a separate project from the Converse Avenue improvements to allow for winter construction of the CBC, in coordination with traditional low-flow season. In addition, the City may wish to consider solicitation of Alternative Technical Concepts (ATCs) from prospective bidders to encourage and better understand innovative ideas, and maximize construction efficiencies.

## 4.6 | Utilities

Like most urban corridors, a variety of underground utilities exist along Converse Avenue. There are no existing overhead utilities on the project aside from traffic signal mast arms at Dell Range Boulevard. Ayres performed utility locating and designating on the corridor from Dell Range Boulevard north to Carlson Street. The following is a list of utilities and owners identified within and adjacent to the ROW:

- Black Hills Electric
- Black Hills Gas
- CenturyLink/Lumen
- Cheyenne City Department of Public Works
- Cheyenne Water Department
- 360 Networks
- Charter Communications

For much of the corridor, Converse Avenue sits in a 100-foot ROW with 16-foot utility easements along both sides. Fiber-optic, electric, and gas utilities are present in the eastern utility easement and electric, fiber optic, and copper communications are present in the west easement. Water and sanitary sewer are present in the ROW, primarily under the existing pavement or curb and gutter, and storm sewer occasionally crosses under the pavement. The Converse Avenue template generally sits along the east edge of the ROW adjacent to residential development, with a drainage ditch running along the west side, occupying much of the utility easement. Due to this existing roadway alignment within the ROW and the constraints east of the ROW, improvements must primarily be constructed to the west, which will have a significant impact to the existing drainage and utility easement on that side, but which largely avoids utility impacts along the east side, where most of the dry utilities are located.

The team's general design approach is to limit utility and ROW impacts wherever practical while accommodating priority project elements. For example, the alignment near Dell Range Boulevard was shifted east to avoid ROW and utility impacts near Aspen Ridge Office Plaza that would have had minimal benefits, in favor of expanded ROW and utility impacts at the Blackmarket property, which was going to be impacted regardless of alignment due to necessary turning radius improvements. In particular, the project can avoid numerous existing surface utility boxes in the northwest corner of the Dell Range Boulevard intersection and all the underground utilities on the west side of Converse Avenue, south of Dry Creek. Similarly, the project can generally avoid impacts to utilities along the entire eastern edge of the project north of Mason Way. The intent is to direct impacts to locations the project is already going to disturb.

### Dell Range Boulevard to Mason Way

The greatest impact from roadway widening will occur in the northeast corner of the Dell Range Boulevard intersection on the Black Market property and extending 200 feet to the north across Dry Creek. In this area are known Xcel gas, Black Hills electric, CenturyLink fiber, and City of Cheyenne water lines. Primary utility impacts include relocation of the existing traffic signal pole/streetlight and all related electrical and communications utilities, relocation of an existing gas vent immediately adjacent to the signal pole, and relocation and reconnection of several existing streetlights. Although the new signal pole location is well outside any identified utilities in the area, it will require a deep foundation, so a careful review of the existing utilities and utility potholing should be performed during final design. Due to the grade differential between Converse Avenue and the Black Market parking lot, widening to the east will represent a fill condition of approximately 2 feet, so other utility impacts are expected to be negligible.

Four private utilities cross Dry Creek as well as a City water line, so final design will need to include potholing at the new Dry Creek structure to determine exact utility locations and depths to minimize conflicts. Because the new structure is not anticipated to be deeper than the existing structure, no direct impacts are anticipated to the utilities crossing Dry Creek, although construction loading is a very important design consideration. Many private utilities require 3 to 4 feet of vertical clearance for construction to occur over their facilities. The required clearance may be greater in the saturated subgrade conditions one would expect in the creek channel. In addition, there are 3 existing water valves in the immediate vicinity of the structures' northeast corner, which are likely to require relocation or resetting due to the roadway widening and/or structure work.

The only impact expected on the west side of this segment is the relocation of an existing streetlight just north of Dry Creek.

### Mason Way to Point Bluff

With the same utilities continuing north, direct utility impacts include several more streetlight relocations and an electrical transformer relocation in front of the USPS facility. Additional conflicts can be assumed along the ditch west of Converse Avenue; while utilities are deep enough to run under the existing ditch, construction activities to install the new culverts will be significant. It is noteworthy to point out that the existing storm sewer that drains the roadside ditch does share the utility easement with the three existing dry utilities from Mason Way to the USPS freight entrance. This suggests that a carefully designed storm sewer system can be installed to the north in the same utility easement without damage to the existing utilities.

It is possible these utilities will not agree to having storm sewer pipes in parallel above them. In this case, it will be important to design the storm system within existing (not proposed) ROW to avoid purchasing an additional easement and paying to relocate these utilities. Placement of the pipe culverts in the existing ROW will require crossings with the streetlight service feeds, which need to be carefully considered. In the case of this culvert alignment, an additional 300 feet of new storm sewer pipe will be installed below the proposed Converse Avenue pavement, compared to 400 feet of culvert that exists under Converse Avenue currently. For the remainder of the project to the north, the proposed storm sewer will be under the new Greenway.

Due to the density of existing utilities at the Point Bluff intersection, the future traffic signal is likely to require some minor utility relocation. Three of the required poles can be installed without any conflicts. Depending on mast arm reach, the pole in the southeast corner may require relocation of a portion of the existing electrical line. This is probably not a major item since a new service feed and pull box will have to be installed at each corner to power the signals.

### Point Bluff to Carlson Street

North of Point Bluff, no utility conflicts are anticipated; the existing streetlights will remain undisturbed, and the new storm sewer pipes can be installed between the existing dry utilities. Electrical services may still conflict with the storm sewer and should be potholed.

At Ogden Road, the existing triple storm sewer inlets will need to be reconstructed at the proposed curb line, and north of Ogden Road, a series of four new streetlights will need to be installed along Converse Avenue, with an additional four streetlights installed at the Carlson Street roundabout. The existing electrical line crosses Converse just north of Ogden Road, so a new west service line will likely need to be installed to feed the west lights.

### Coordination with new infrastructure

During preliminary design, it was noted that the Ridge View Apartments development was designing water line improvements at the Carlson Street intersection and the City is planning a number of water line improvements along the corridor. Because the water lines generally run under the pavement, and the project does not have significant impacts to most of the intersections, the primary design effort to avoid, mitigate, or accommodate these improvements will be to ensure the roadway pavement section is determined with water and storm sewer depths carefully considered, and to carefully coordinate the project schedule with the City's water improvements to allow these improvements to be constructed in conjunction with the roadway project. Special consideration is being made as part of this project to coordinate Converse Avenue improvements with the Ridge View development so that new water line improvements do not need to be relocated when the Carlson Street roundabout is constructed.

# Section 5

# Drainage

*In this section:*

Ayres performed a brief analysis of the Section 20 drainage basin and a floodplain review of the Sheridan Reach of Dry Creek, as well as preliminary drainage calculations for a storm sewer collection, conveyance, and detention system from Mason Way to Carlson Street. Drainage planning and conceptual design followed the Cheyenne Stormwater Management Manual and the Cheyenne Unified Development Code (UDC).

# 5.1 | Section 20 and Converse Avenue Storm Sewer

The Section 20 drainage basin is impacted by this roadway improvement project. In general, the basin slopes southeast across Section 20 to an existing roadside ditch along Converse Avenue, which collects runoff and conveys it south along the west side of Converse Avenue to Dry Creek. Per the UDC, all new development on Section 20 must detain flows from any new impervious areas.

Existing inlets at the Ogden Road and Point Bluff intersections drain curbside street runoff from Converse Avenue, Ogden Road, and Point Bluff to the ditch immediately west of the intersections. Rain and snowmelt on southbound Converse Avenue surface flows to the ditch on the west side of Converse Avenue from south of Ogden Road down to Mason Way, where no curb or inlets are present. Flows in this ditch are piped from the USPS freight truck entry south via a single-cell 6-by-8-foot RCBC, which outlets to Dry Creek in the northeast corner of the Dry Creek structure. Street runoff south of Point Bluff runs curbside south to inlets on the Dry Creek structure, which drain directly into Dry Creek.

The project requires widening into the area currently occupied by the roadside ditch. To avoid significant ROW impacts and utility relocations, the project should pipe the flows in this ditch from Ogden Road to the USPS facility. Because the project will add curb and gutter to this section, it will also require new curb inlets along the west edge of the roadway. Curb inlets are recommended upstream (north) of the Grandview Avenue, Briarwood Lane, and Point Bluff intersections as well as the USPS freight entrance north of Mason Way. The inlets will drain to the adjacent piped storm system.

Drain inlets will be sized and placed along the west curb line to adequately capture stormwater runoff while limiting street flooding in compliance with standards. Our recommendation is to install curb inlets upstream of each intersection. Dual 48-inch pipes and a 5-by-8-foot RCBC are recommended to replace the existing roadside ditch, with single 24-inch lateral pipes (minimum size) draining the inlets into the trunk line. See the Drainage Plan & Profile sheets (see Appendix A) for details.

North of the future Carlson Street intersection, runoff from the existing roadway is captured into inlets and piped to the existing detention pond on the east side of Converse Avenue just south of Carlson Street, which then discharges to the existing roadside ditch on the west side of Converse, just north of the Ogden Road intersection. The west roadside ditch, north of Ogden, receives and conveys offsite drainage flowing from the large undeveloped area of Section 20 to the northwest. Plans for the proposed Ridge View Apartments on the west side of Converse at Carlson Street show an intent to intercept some of this drainage and route it through proposed local detention facilities and into an existing drainage system to the south and not into the existing Converse roadside ditch. This reduces the amount of runoff reaching the west roadside ditch. The proposed Converse Avenue road improvements encroach upon the roadside ditch, but leave room to maintain open channel stormwater conveyance through this reach. We recommend maintaining the roadside ditch between the Carlson Street culverts and the Ogden Road culverts.

The area east of the post office between the Point Bluff intersection and the driveway entrance (north of Mason Way), should be considered as a potential location for detention and water quality improvements. Reconfiguration of this area to maintain the visual buffer from the post office and provide stormwater improvements should be analyzed further during final design.

A preliminary assessment has been completed to size the storm sewer pipes and inlets. Further analysis will be required to validate storm sewer flows, size inlets, refine conveyance infrastructure sizing, develop detention and water quality opportunities, and further analyze the upstream and downstream impacts to Dry Creek.

# Section 6

# Costs

*In this section:*

# 6.1 | Overview

The goal of the 35% cost estimate is to develop a reasonable funding target for budgeting purposes. For this reason, time is not spent at 35% to nail down precise item quantities or unit costs, because it is almost certain that by the time the design is complete, both quantities and units cost will have changed. By design, quantities and costs are estimated, and typically, conservatively so. In addition, since most of the details are not yet developed at the 35% phase, some items are estimated using a historical percentage basis. For example, it is typical for erosion control, signing and striping, and construction traffic control each to cost between 3% and 5% of the total project cost, so those are simple work items to bundle and use a ratio to estimate.

A 35% cost estimate also typically includes a contingency line item to account for all of the site conditions, proposed equipment, and contractor work items that won't be known until final design (for example detailed utility conflicts, impacts, and costs; exact traffic control communications and networking equipment; dimensions, layout, and impacts of sidewalk ramps at intersections, miscellaneous contractor equipment needs). Although a 20% contingency is common at the preliminary phase, Ayres has worked hard to quantify more individual pay items than a typical 35% plan, and have therefore reduced the contingency to 10%.

In addition, at 35% design, we typically don't have a firm handle on when the project will be constructed, especially when funding has not yet been obligated. For this reason, we have added an inflation line item to adjust 2020 dollars to a likely future construction year. We used 2023 as the target construction year for Converse Avenue.

Our intent is to give our client a cost that we are very confident the project will not exceed; it's far better to spend less than your budget on the project than to spend more than you budgeted.

# 6.2 | Methodology

To the extent possible, Ayres utilized actual quantities from the CAD design files to determine quantities (removals, pavement, sidewalks, curbs, pipes and inlets, revegetation, etc.). For items not represented by actual design lines in the CAD files, Ayres calculated quantities using dimensions based on mapping and project length, and known or estimated depths and thicknesses (earthwork, structural subexcavation, CBC and wingwalls, plantings, topsoil, miscellaneous concrete, etc.).

For all items - whether measured, calculated, or estimated - quantities from these sources were rounded up to the nearest logical unit (generally, the nearest 5 for items under 50, the nearest 10 for items 50 to 200, and the nearest 50 for items 200 to 1,000, and so on). The intent of rounding is to illustrate and reflect the nature of the 35% cost estimate; using the unit quantity of 14,356 feet for curb and gutter from the CAD files implies a significant degree of confidence that the actual quantity will be very near that estimate. It is a near certainty that almost every quantity will change during final design based on changes in the design during that phase, or because an item might be broken into more detailed items during that phase.

# 6.3 | Costs Basis

Individual pay item costs were estimated using WYDOT's 2020 Weighted Average Bid Prices when pay items matched well (typically for common construction items). Unusual or specific items, like a specific size of CBC, require adjustments or additional cost sources because it is rare to find past construction projects with a specific size structure. CDOT Historic Bid Prices were used to cost items that were not on WYDOT's published list of items (traffic signal poles, for example).

Again, for all items, calculated costs from these sources were rounded up to the nearest logical dollar (generally, the nearest $5 for items under $50, the nearest $10 for items $50 to $200, and the nearest $50 for items $200 to $1,000). And again, the intent of rounding is to illustrate and reflect the nature of the 35% cost estimate; using the unit cost of $5,070.49 for Clearing and Grubbing straight from the WYDOT document implies a significant degree of confidence that the actual price will be very near that estimate, and construction costs are known to fluctuate significantly over time.

# 6.4 | Cost Estimate

**Ayres estimates the overall cost for the Converse Avenue ultimate configuration to be just under $11M.** This is in line with our previous 10% design estimate of $10M, which did not include full reconstruction of the Dry Creek structure or utility relocation costs. The added utility relocation cost includes a planned City water line replacement, representing the largest share of the utility costs. As noted above, this is intended to be a conservative estimate, and during final design there may be opportunities to reduce this cost by refining both quantities and unit costs.

Ayres has developed cost adjustments for the pavement items, since there are three different pavement alternatives specified in the UDC. The pavement selection will need to be determined at the final design phase based on market costs and the City's goals for the project. For example, concrete is traditionally more expensive, but also more durable and requires less maintenance. With asphalt prices as volatile as they are in 2021, concrete may be an attractive and cost-feasible option.

# CONVERSE AVENUE 35% CONSTRUCTION COST ESTIMATE

| ITEM DESCRIPTION | PAY UNIT | PAY UNIT QUANTITY | PAY UNIT COST | BID COST |
|---|---|---|---|---|
| **CLEARING, REMOVALS, & EARTHWORK** | | | | **$974,774** |
| Clearing and Grubbing | ACRE | 2.8 | $5,000.00 | $13,774 |
| Clearing Small Trees & Shrubs | EA | 15 | $500.00 | $7,500 |
| Clearing Large Trees | EA | 15 | $1,000.00 | $15,000 |
| Removal of Pipe | LF | 1,000 | $46.00 | $46,000 |
| Removal of Curb Inlet | EA | 10 | $1,600.00 | $16,000 |
| Removal of Sidewalk | SY | 2,600 | $20.00 | $52,000 |
| Removal of Curb and Gutter | LF | 4,600 | $15.00 | $69,000 |
| Removal of Concrete Pavement | SY | 5,100 | $100.00 | $510,000 |
| Removal of Asphalt Material (Milling) | SY | 13,300 | $10.00 | $133,000 |
| Sawing Asphalt Material (8 Inch) | LF | 500 | $5.00 | $2,500 |
| Unclassified Excavation | CY | 11,000 | $10.00 | $110,000 |
| | | | | |
| **PAVEMENT, CURB, & SIDEWALK** | | | | **$2,856,351** |
| Aggregate Base Course (8" Depth) | CY | 5,539 | $45.00 | $249,240 |
| Hot Mix Asphalt (6" Depth) (includes binder agent) | TON | 5,100 | $160.00 | $816,000 |
| Concrete Sidewalk/Greenway (6" Depth) | SY | 7,000 | $70.00 | $490,000 |
| Curb Ramps & Detectable Warnings | SF | 800 | $100.00 | $80,000 |
| Curb and Gutter Type A | LF | 7,500 | $50.00 | $375,000 |
| Curb and Gutter Type C | LF | 7,100 | $50.00 | $355,000 |
| Decorative Concrete Median Cover (4" Colored, Stamped) | SY | 2,456 | $200.00 | $491,111 |
| | | | | |
| **TRAFFIC SIGNALS** | | | | **$280,000** |
| Traffic Signal Pole w/55' Mastarm, 4-12" x 36" Signal Heads | EA | 1 | $80,000.00 | $80,000 |
| Traffic Signal Pole w/45' Mastarm, 3-12" x 36" Signal Heads | EA | 1 | $70,000.00 | $70,000 |
| Traffic Signal Pole w/30' Mastarm, 2-12" x 36" Signal Heads | EA | 1 | $60,000.00 | $60,000 |
| Traffic Signal Pole w/6' Mastarm, 2-12" x 36" Signal Heads | EA | 1 | $50,000.00 | $50,000 |
| Pedestrian Push Button Assembly | EA | 2 | $10,000.00 | $20,000 |
| | | | | |
| **STORM SEWER** | | | | **$1,350,850** |
| Pipe Outlet (12 inch Riprap) | CY | 30 | $160.00 | $4,800 |
| 18 Inch Reinforced Concrete Pipe | LF | 180 | $100.00 | $18,000 |
| 24 Inch Reinforced Concrete Pipe | LF | 100 | $125.00 | $12,500 |
| 36 Inch Reinforced Concrete Pipe | LF | 300 | $150.00 | $45,000 |
| 48 Inch Reinforced Concrete Pipe | LF | 2,000 | $250.00 | $500,000 |
| 24x36 Inch Reinforced Concrete Pipe Arch | LF | 126 | $350.00 | $44,100 |
| 36 Inch Reinforced Concrete End Section | EA | 2 | $850.00 | $1,700 |
| 24x 36 Inch Reinforced Concrete Arch End Section | EA | 6 | $1,000.00 | $6,000 |
| Pipe Collars | CY | 8 | $900.00 | $6,750 |
| 8' x 5' Concrete Box Culvert (Precast) | LF | 500 | $1,000.00 | $500,000 |
| Curb Inlet Type A | EA | 25 | $8,000.00 | $200,000 |
| Manhole and Base (10 Foot) Type D | EA | 2 | $6,000.00 | $12,000 |
| | | | | |
| **STRUCTURES** | | | | **$1,610,300** |
| Removal of Structure | EA | 1 | $150,000.00 | $150,000 |
| Removal of Wingwalls | EA | 4 | $5,000.00 | $20,000 |
| Culvert Subexcavation | CY | 500 | $25.00 | $12,500 |
| Culvert Base (Geotextile & 18 inch Riprap) | CY | 500 | $150.00 | $75,000 |
| Remove & Reset Bridge & Pedestrian Rail | LF | 300 | $100.00 | $30,000 |
| 10' x 8' Concrete Box Culvert (Cast In Place) | LF | 530 | $2,000.00 | $1,060,000 |
| Culvert Toe Wall (Class B Concrete) | CY | 11 | $2,300.00 | $25,300 |

| | | | | |
|---|---|---|---|---|
| Culvert Apron (Class B Concrete) | CY | 21 | $2,000.00 | $42,000 |
| Culvert Headwalls (Class B Concrete) | CY | 10 | $2,300.00 | $23,000 |
| Culvert Wingwalls (Class B Concrete) | CY | 75 | $2,300.00 | $172,500 |
| | | | | |
| **REVEGETATION** | | | | **$31,767** |
| Topsoil Storing | CY | 1,200 | $5.00 | $6,000 |
| Topsoil Stripping and Placing (Onsite) | CY | 1,200 | $6.00 | $7,200 |
| Soil Conditioning | ACRE | 2.8 | $2,500.00 | $6,887 |
| Seeding (Bluegrass) | ACRE | 2.8 | $1,500.00 | $4,132 |
| Sod | SY | | $10.00 | $0 |
| Dry Mulching (Weed Free Hay) | ACRE | 2.1 | $1,500.00 | $3,099 |
| Hydraulic Mulching | ACRE | 0.7 | $5,000.00 | $3,444 |
| Mulch Tackifier | ACRE | 2.1 | $2.50 | $5 |
| Soil Retention Blanket (Straw-Coconut) (Biodegradable) | SY | 333 | $3.00 | $1,000 |
| | | | | |
| **PLANTINGS** | | | | **$199,200** |
| Deciduous Tree (2.5 Inch Caliper) | EA | 144 | $1,300.00 | $187,200 |
| Landscape Maintenance (Quarterly for 1 year) | EA | 4 | $3,000.00 | $12,000 |
| | | | | |
| **IRRIGATION** | | | | **$45,100** |
| | | | | |
| **UTILITIES** | | | | **$553,900** |
| Removal of Lighting Pole | EA | 14 | $1,000.00 | $14,000 |
| Reset Lighting Pole | EA | 14 | $1,000.00 | $14,000 |
| Lighting Pole Foundation | EA | 14 | $600.00 | $8,400 |
| Water Line Replacement/Relocation | LF | 3,500 | $105.00 | $367,500 |
| Fiber Relocation | LF | 500 | $100.00 | $50,000 |
| Phone/Communications Relocation | LF | 500 | $100.00 | $50,000 |
| Electrical Service Relocation | LF | 500 | $100.00 | $50,000 |
| | | | | |
| Erosion Control (3%) | | 2% | | $158,045 |
| Traffic Control (5%) | | 5% | | $395,112 |
| Signing & Striping (2%) | | 2% | | $158,045 |
| **Subtotal Construction Items** | | | | **$8,613,444** |
| Contractor Mobilization & General Conditions | | 10% | | $861,344 |
| Contingency | | 10% | | $861,344 |
| Inflation 2020 - 2023 | | 2% per year | | $620,168 |
| **TOTAL ESTIMATED CONSTRUCTION COST** | | | | **$10,956,301** |

**PAVEMENT OPTIONS (Principal Arterial):**

| | | | | |
|---|---|---|---|---|
| Hot Mix Asphalt Pavement (6" Depth on 8" Aggregage Base) | (included above) | | | $1,065,240 |
| Hot Mix Asphalt Pavement (8" Depth - no Aggregate Base) | TON | 8,500 | $160.00 | + $294,760 |
| Concrete Pavement (8" Depth - no Aggregate Base) | SY | 28,000 | $75.00 | + $1,034,760 |

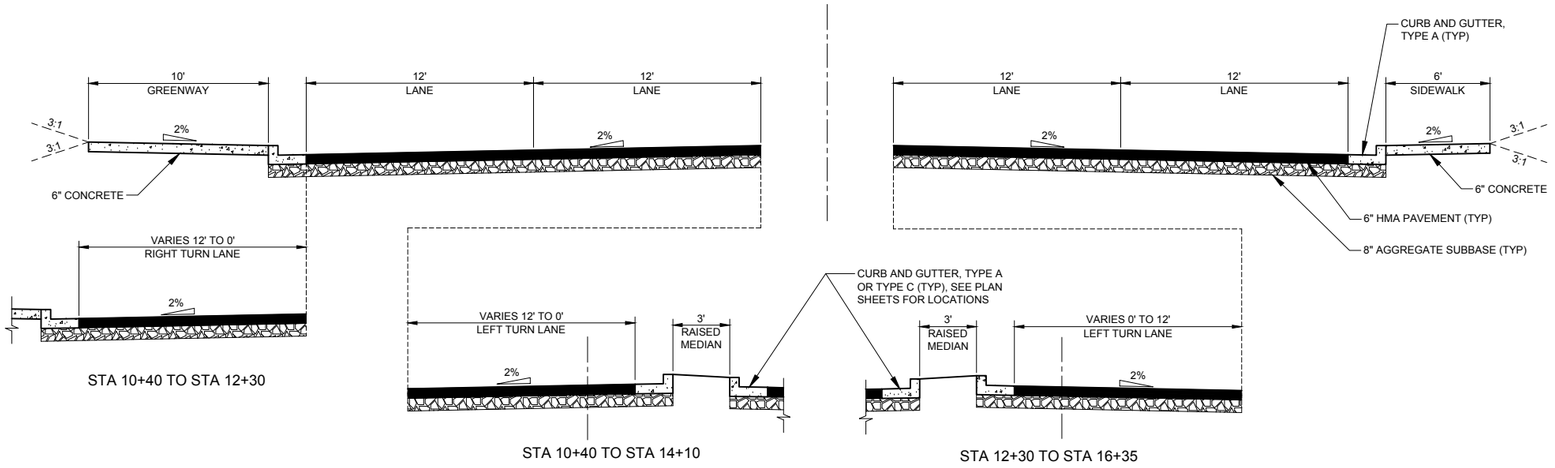
**OTHER OPTIONS (Future Years):**

| | | | | |
|---|---|---|---|---|
| Traffic Signals w/45' Mastarms (Point Bluff) (**future**) | EA | 4 | $80,000.00 | $320,000 |
| Road Connection to Apache/Pattison/Plainview | SY | 10,000 | $75.00 | $750,000 |

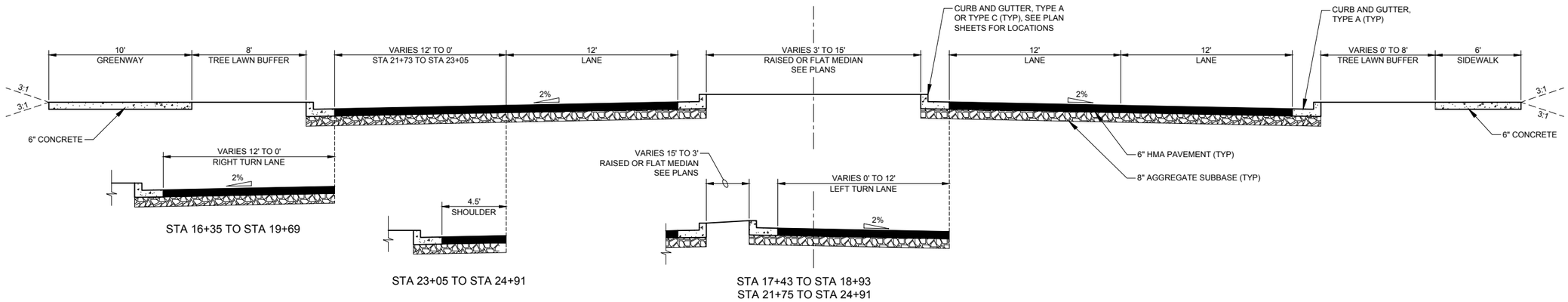
**Notes: Costs above reflect 2020 costruction cost data**


# Appendix A

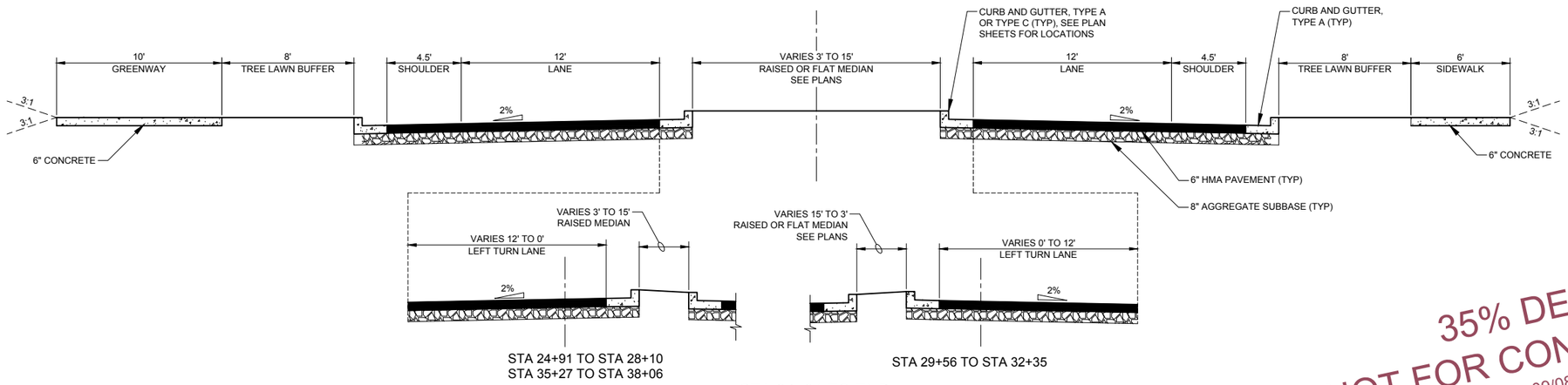
## Recommended Improvement Plan Sheets




STA 10+40 TO STA 16+35




STA 16+35 TO STA 24+91




STA 24+91 TO END

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TYPICAL SECTIONS

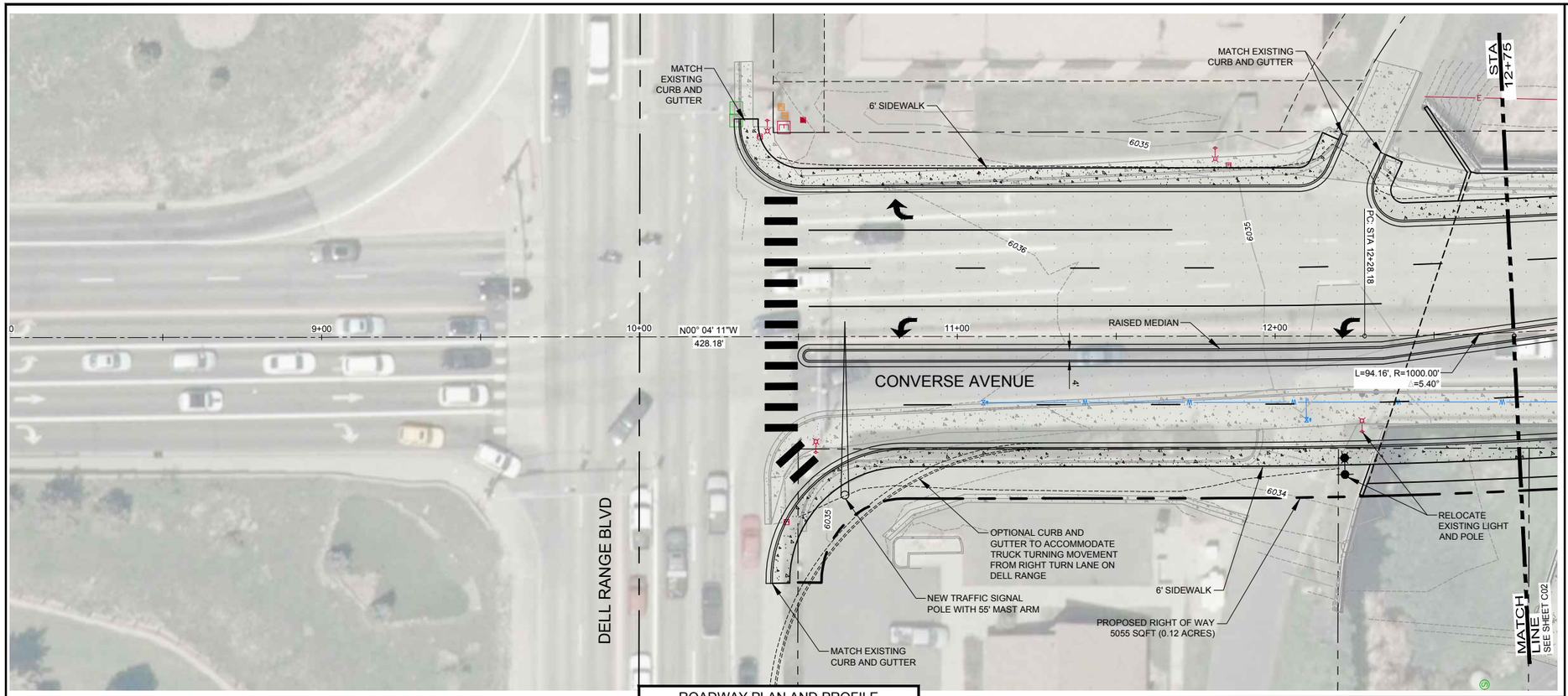
Project Mgr. NTS
Designed By: RBR
Drawn By: RBR
Approved By: XXX
Date: 09/08/21

PROJECT NO.
45-0508.00

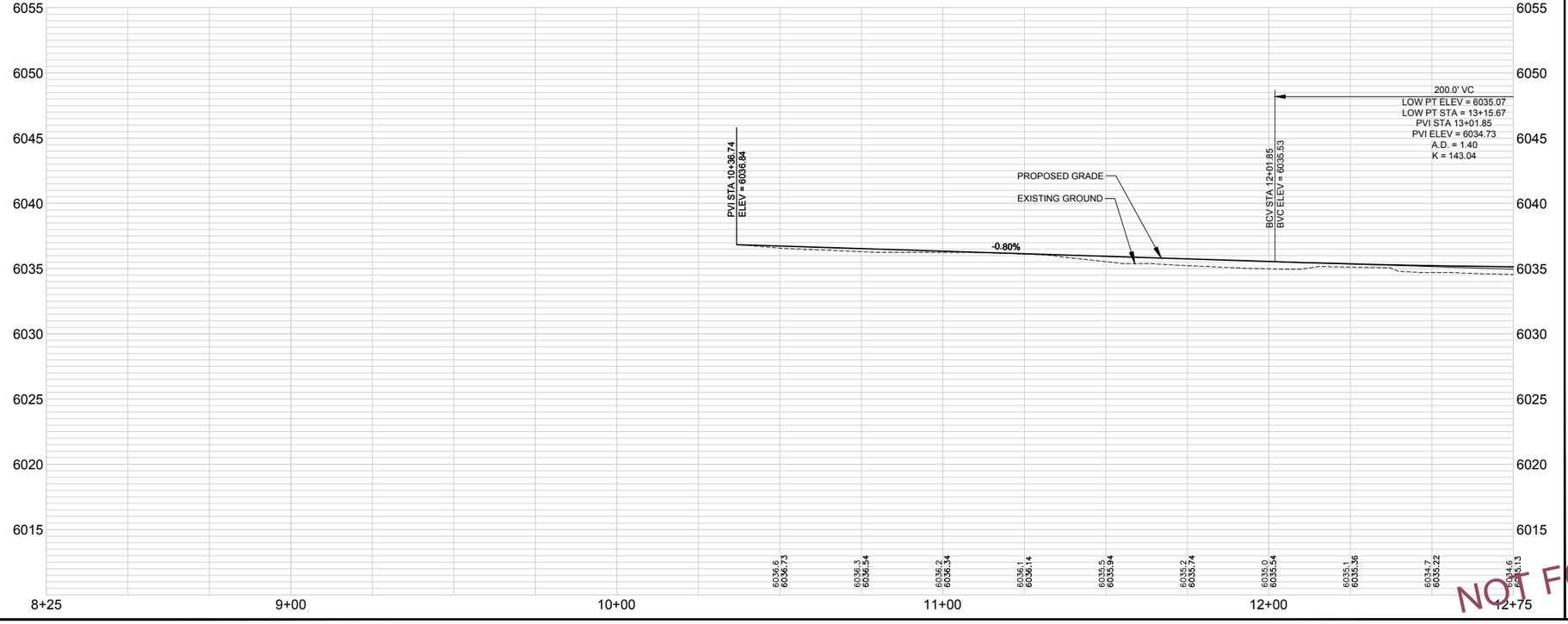
DRAWING NO.
T01

SHEET XX OF XX

Drawing Name: I:\36\45-050800 CHEYENNE CONVERSE AVE\MAINDWGS\SHEETS\45-0508.00 TYPICAL SECTIONS.DWG Monday, September 13, 2021 1:18 PM By: RICKS, RONALD




ROADWAY PLAN AND PROFILE




NOTES:

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ROADWAY PLAN AND PROFILE

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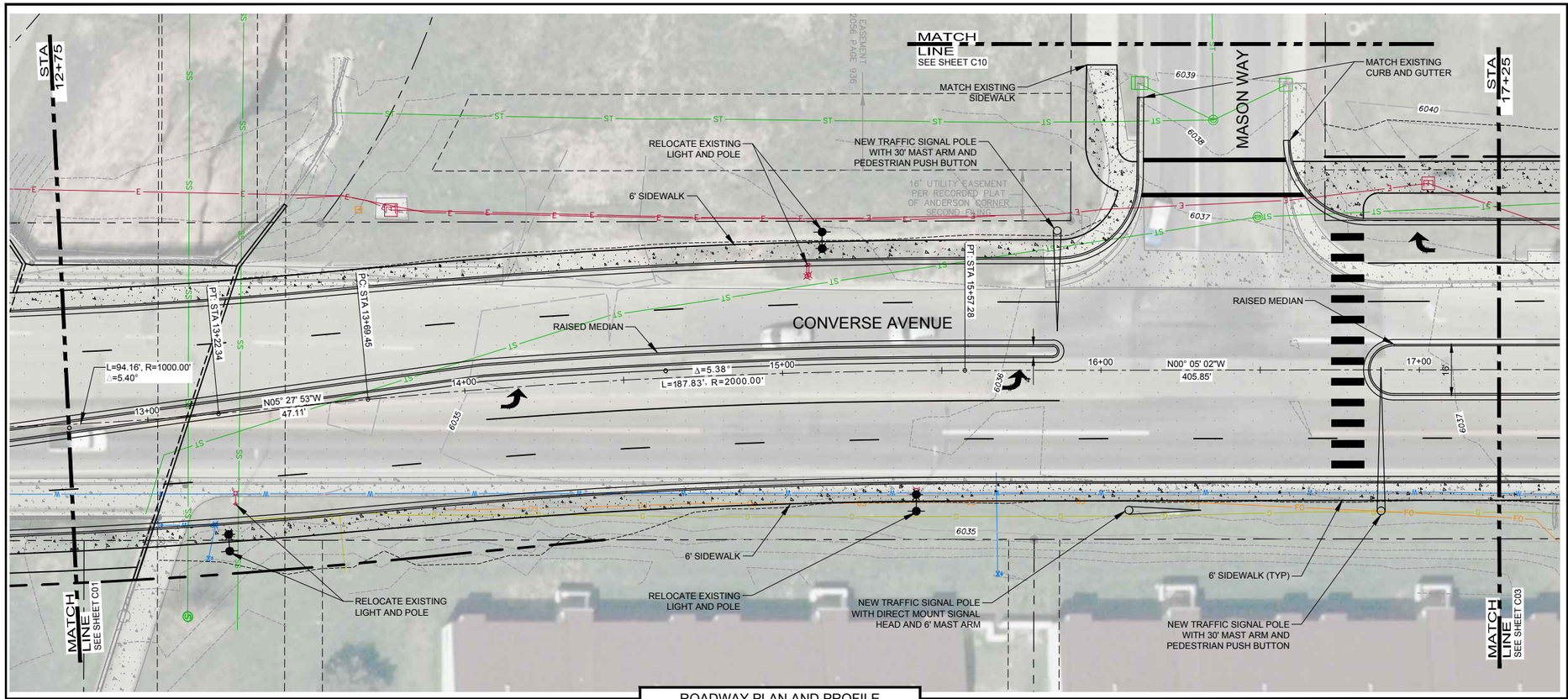
Designed By: RBR
Drawn By: RBR
Approved By: XXX
Date: 09/08/21

PROJECT NO.
45-0508.00

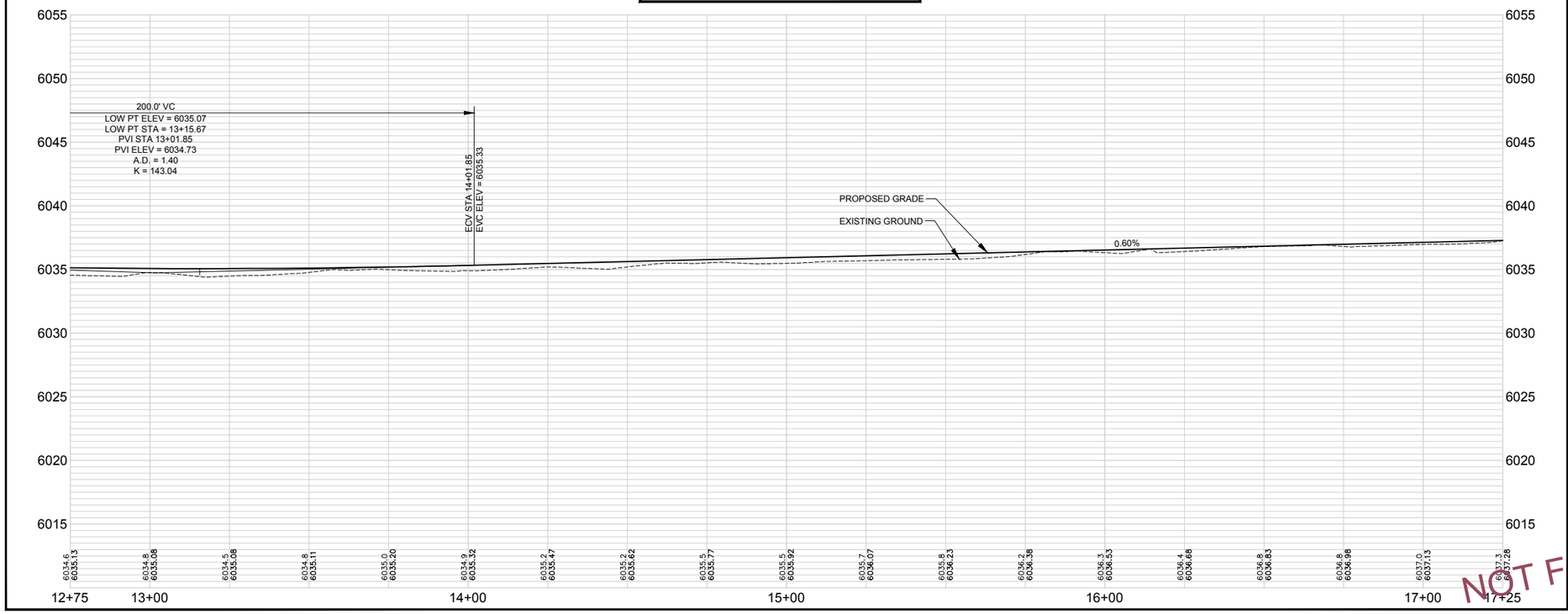
DRAWING NO.
C01

SHEET XX OF XX

Drawing Name: I:\36\45-050800 CHEYENNE CONVERSE AVE\MAINDWGS\SHEETS\45-0508.00 PLAN AND PROFILE ROADWAY.DWG Monday, September 13, 2021 2:11 PM By: RICKS, RONALD




ROADWAY PLAN AND PROFILE

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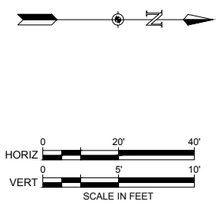


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Approved By: XXX
Date: 09/08/21

PROJECT NO. 45-0508.00
DRAWING NO. C02
SHEET XX OF XX

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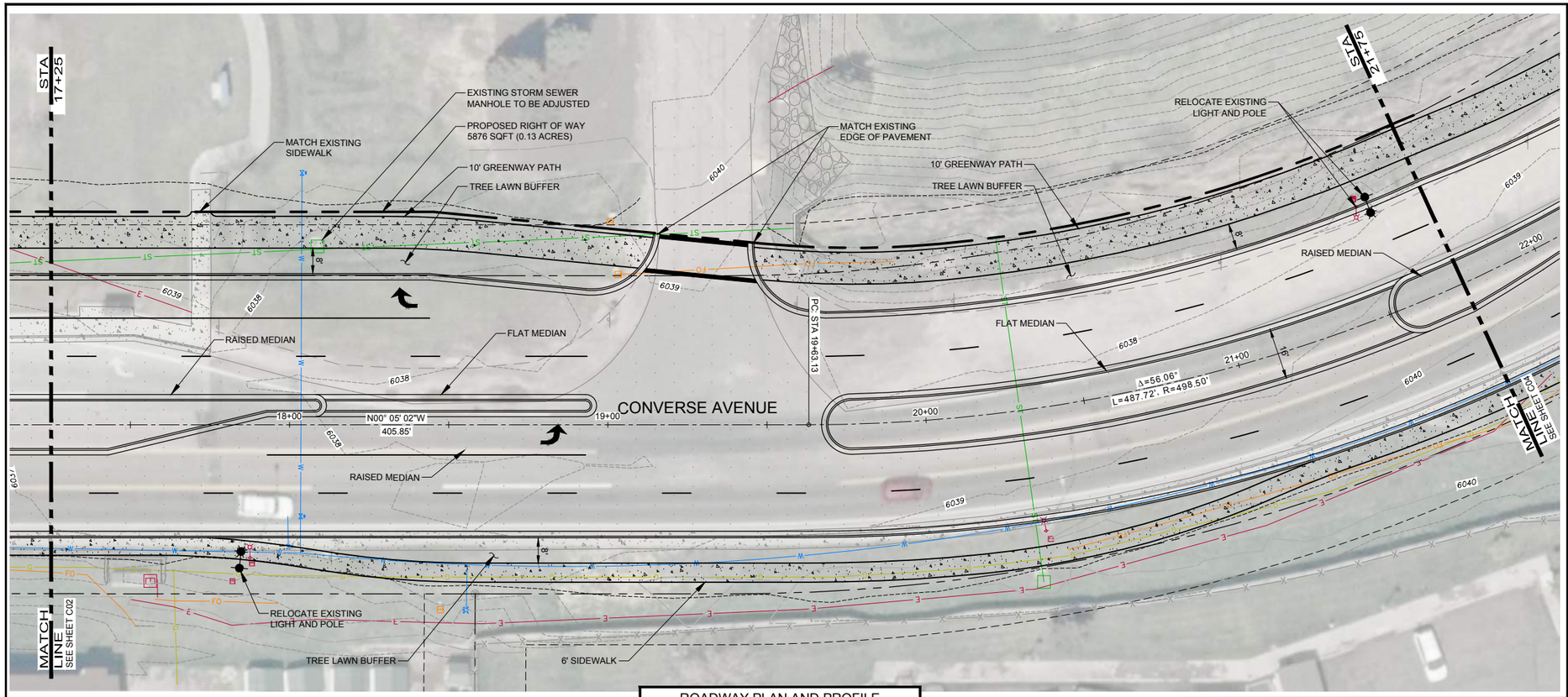


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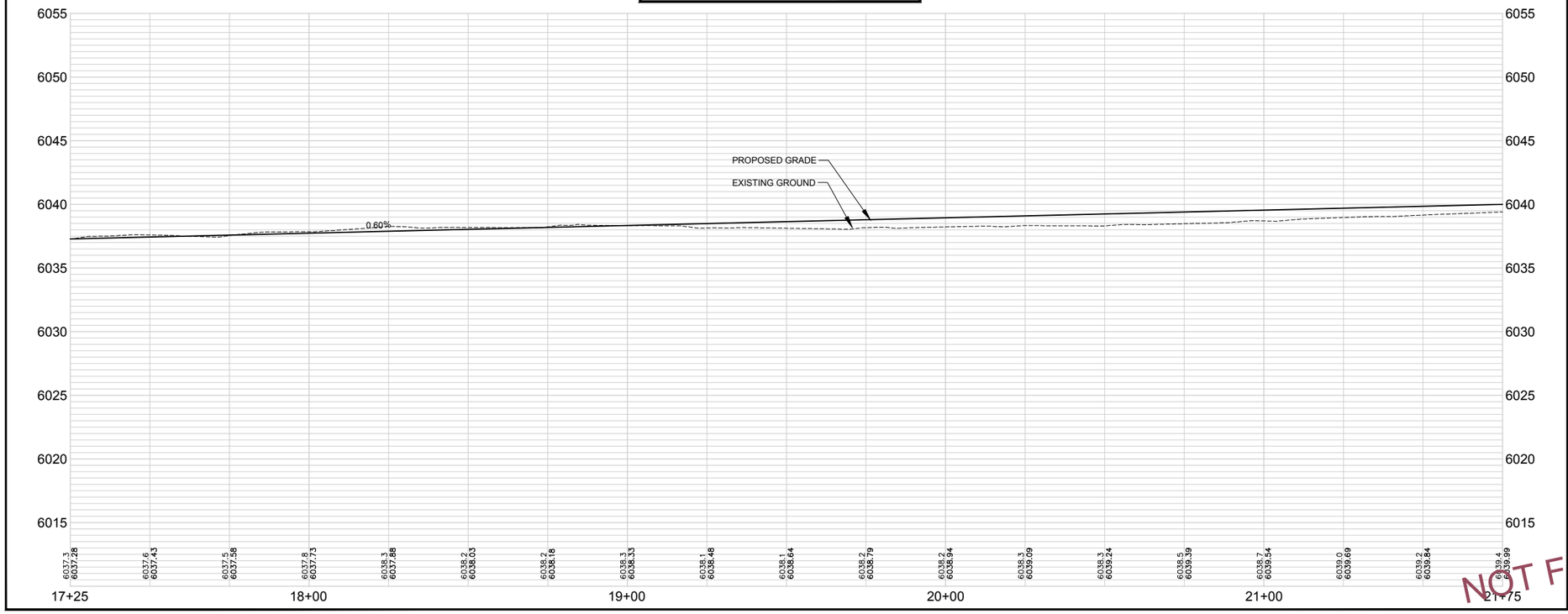


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DRAWING NO.
C03

SHEET XX OF XX

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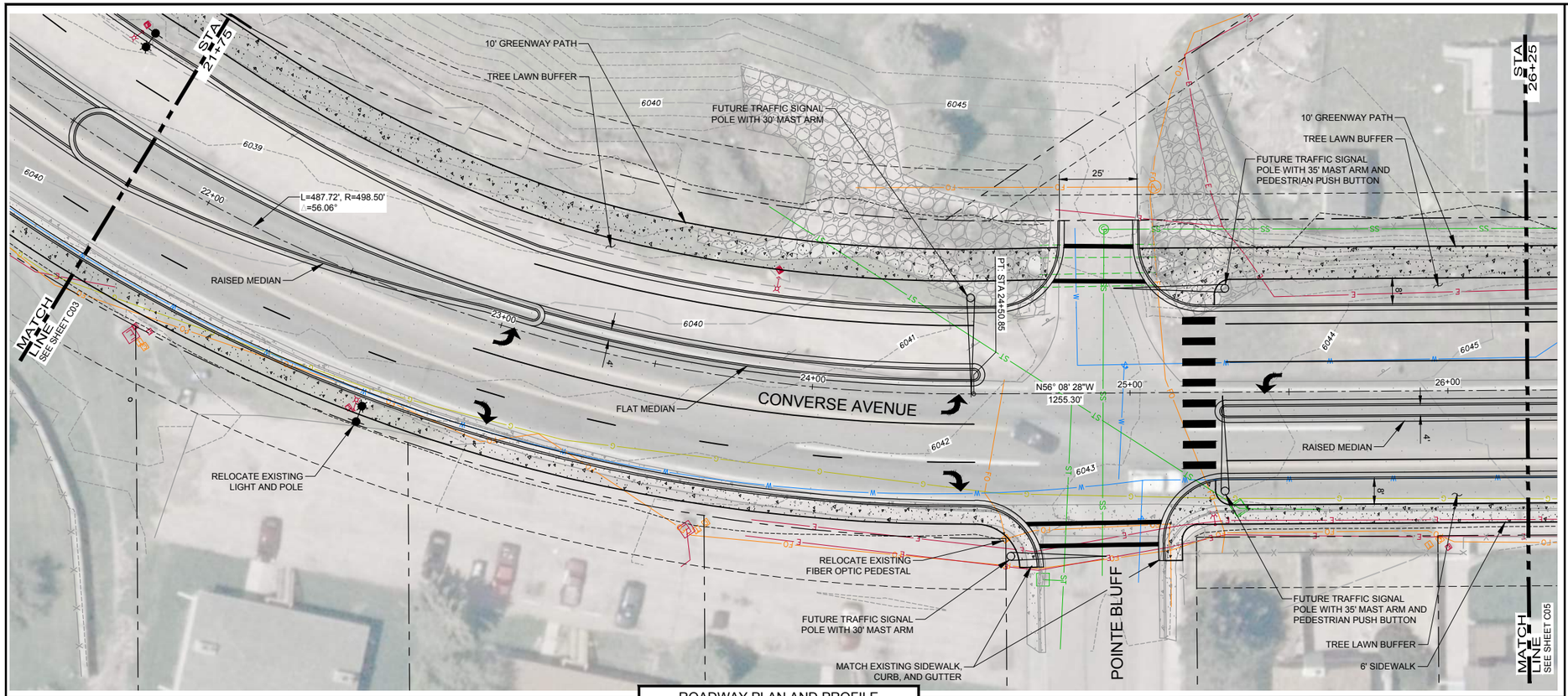


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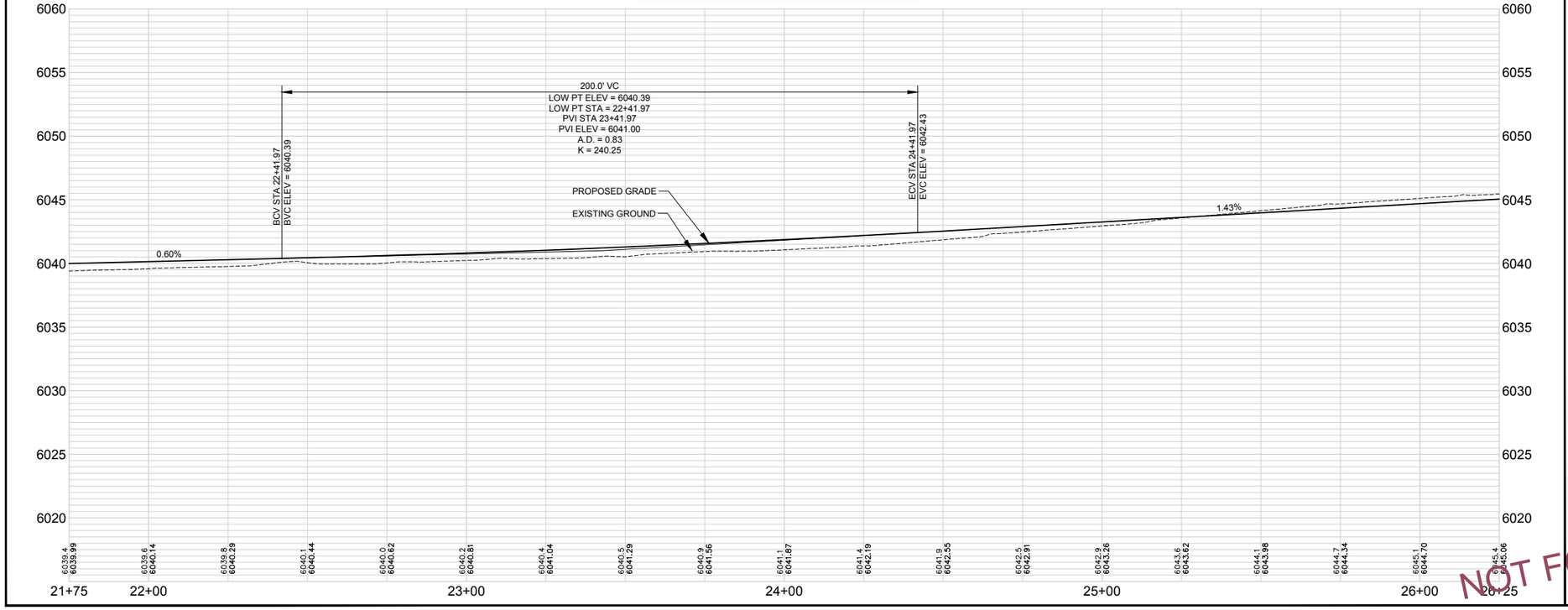


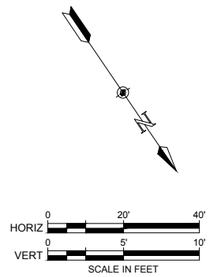


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PROJECT NO.
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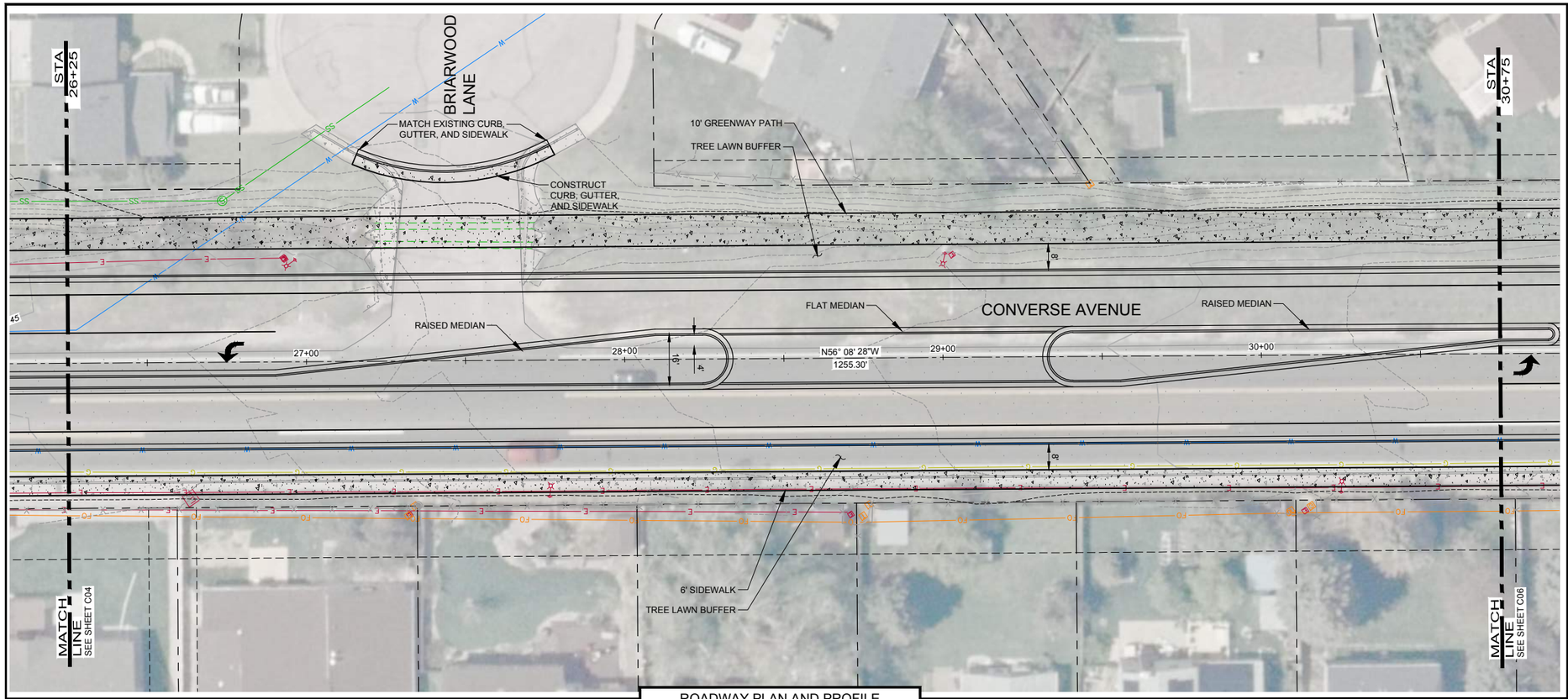
DRAWING NO.
C04

SHEET XX OF XX

Drawing Name: I:\36\45-050800 CHEYENNE CONVERSE AVE\MAINDWGS\SHEETS\45-0508.00 PLAN AND PROFILE ROADWAY.DWG Monday, September 13, 2021 2:11 PM By: RICKS, RONALD

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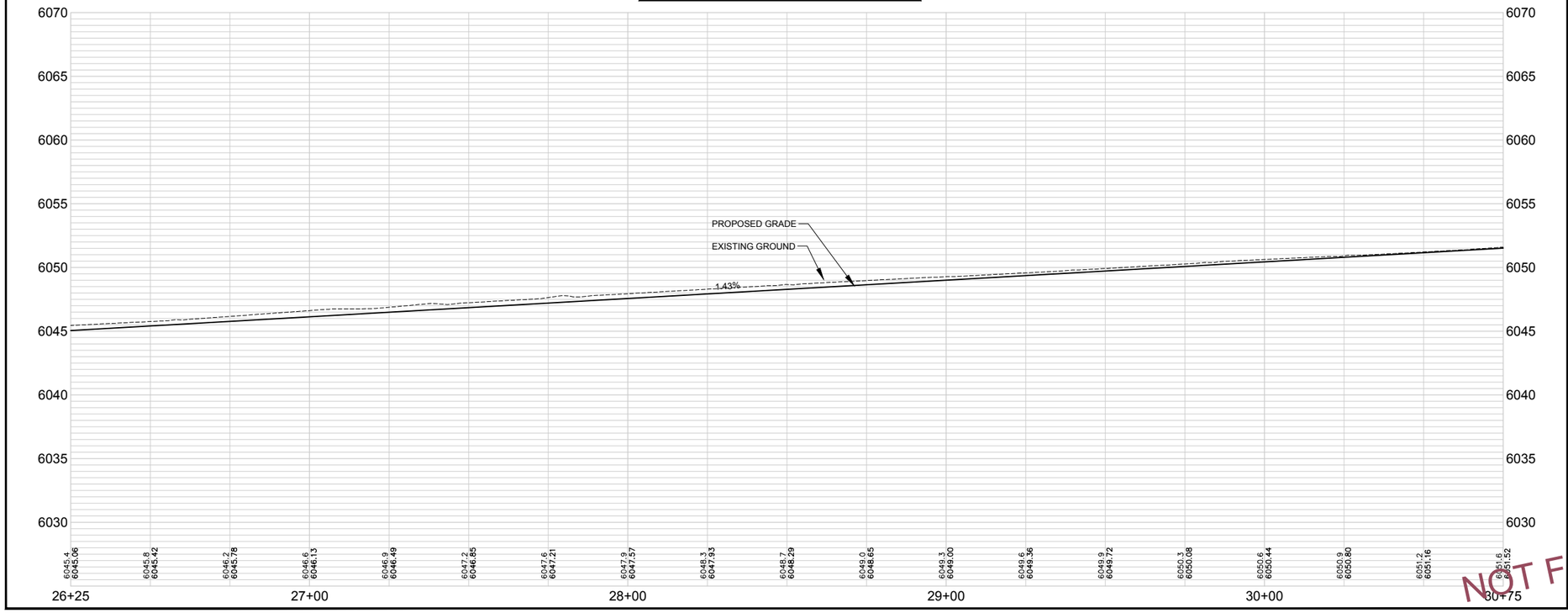


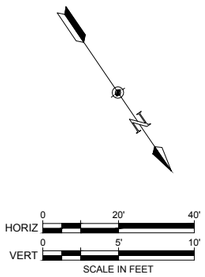


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C05

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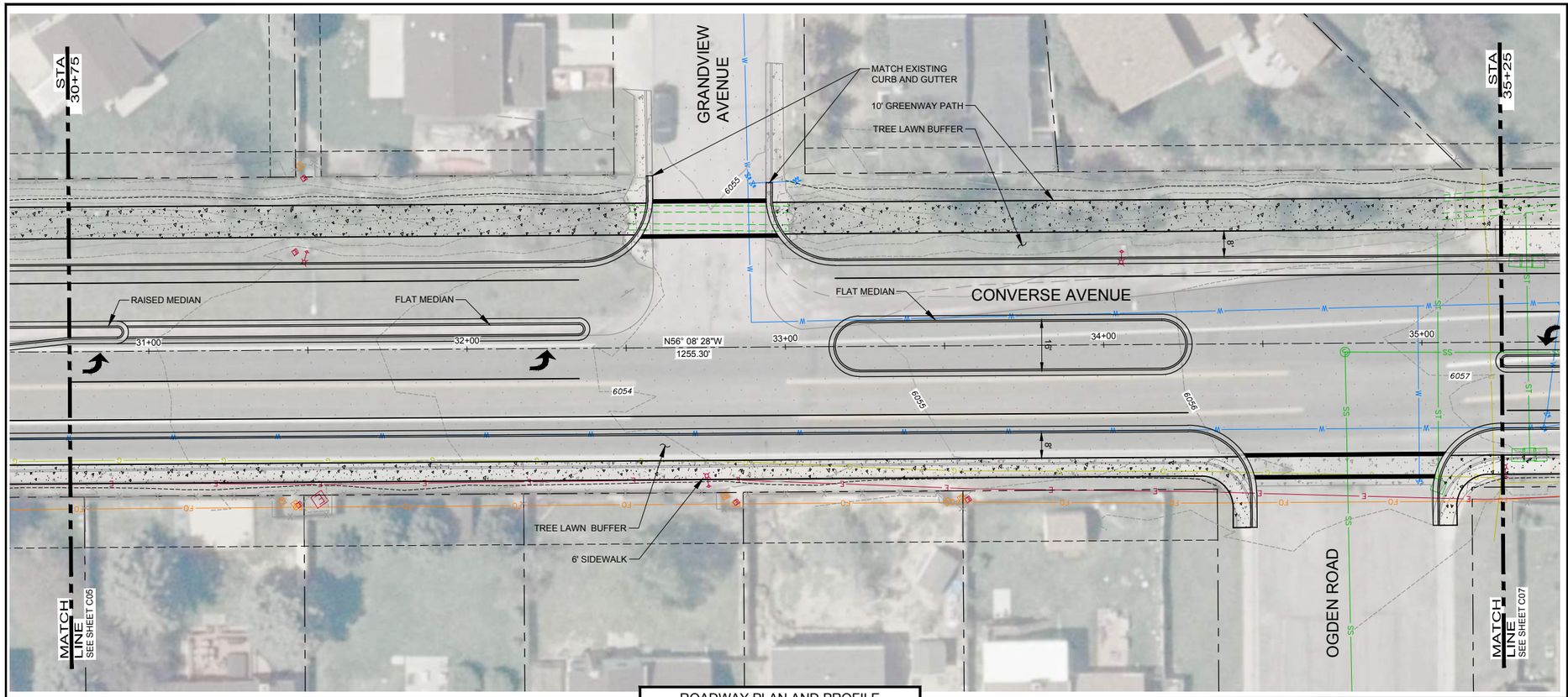


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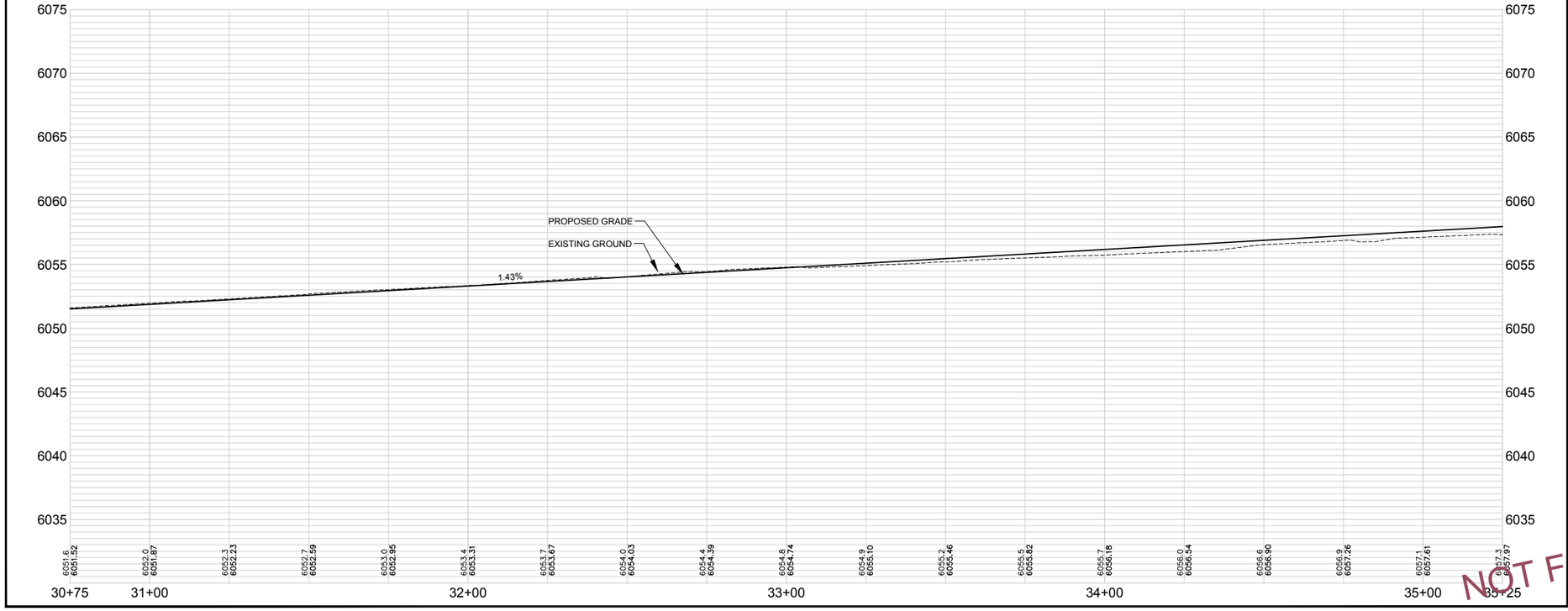


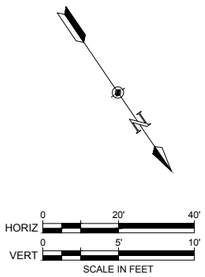


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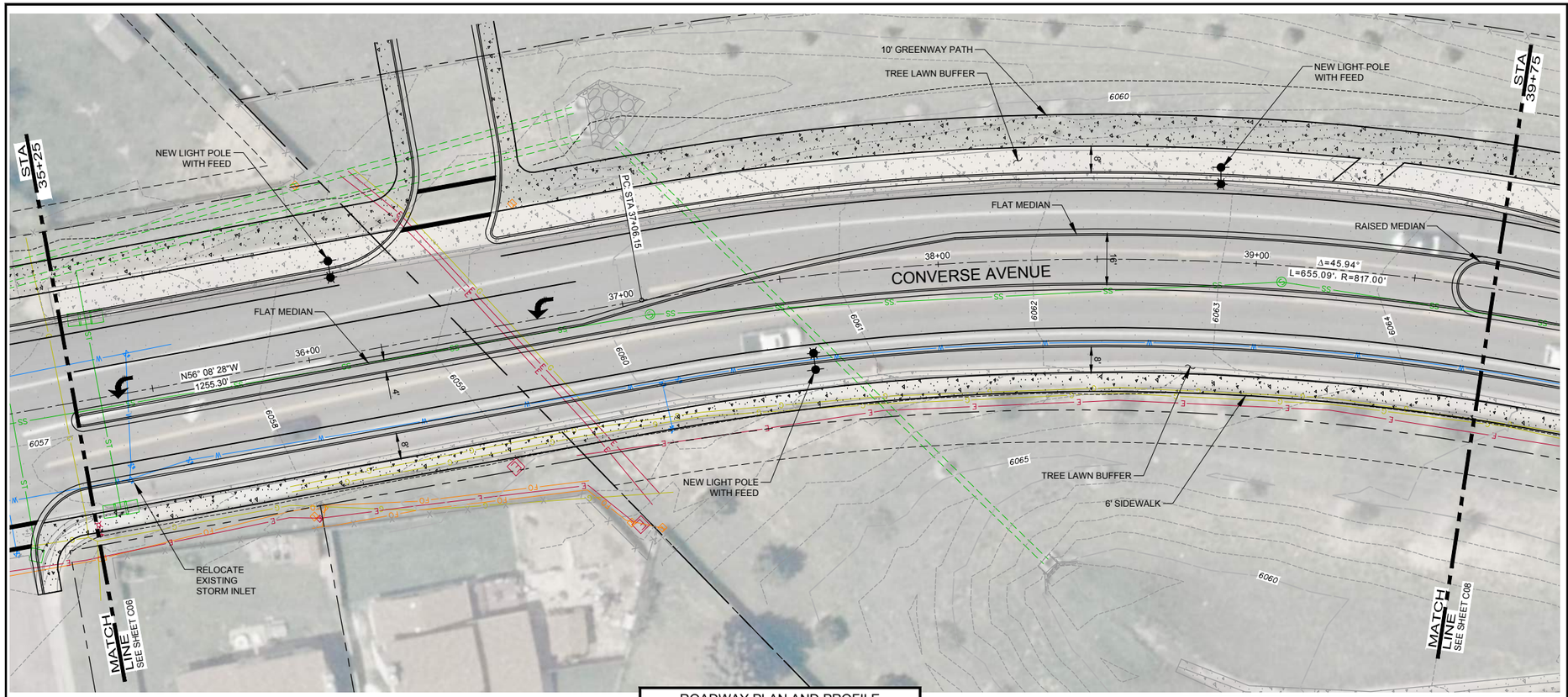
DRAWING NO.
C06

SHEET XX OF XX

Drawing Name: I:\36\45-050800 CHEYENNE CONVERSE AVE\MAINDWGS\SHEETS\45-0508.00 PLAN AND PROFILE ROADWAY.DWG Monday, September 13, 2021 2:11 PM By: RICKS, RONALD

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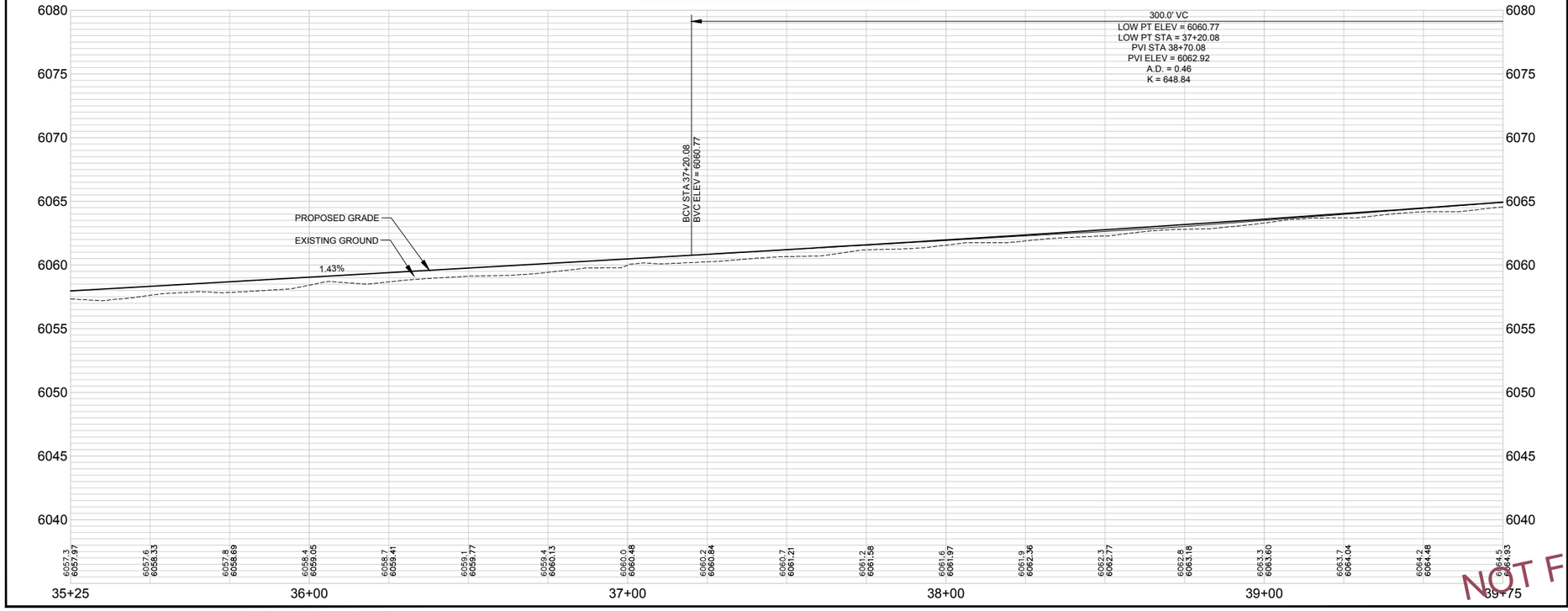


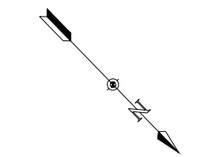


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Approved By: XXX
Date: 09/08/21

PROJECT NO.
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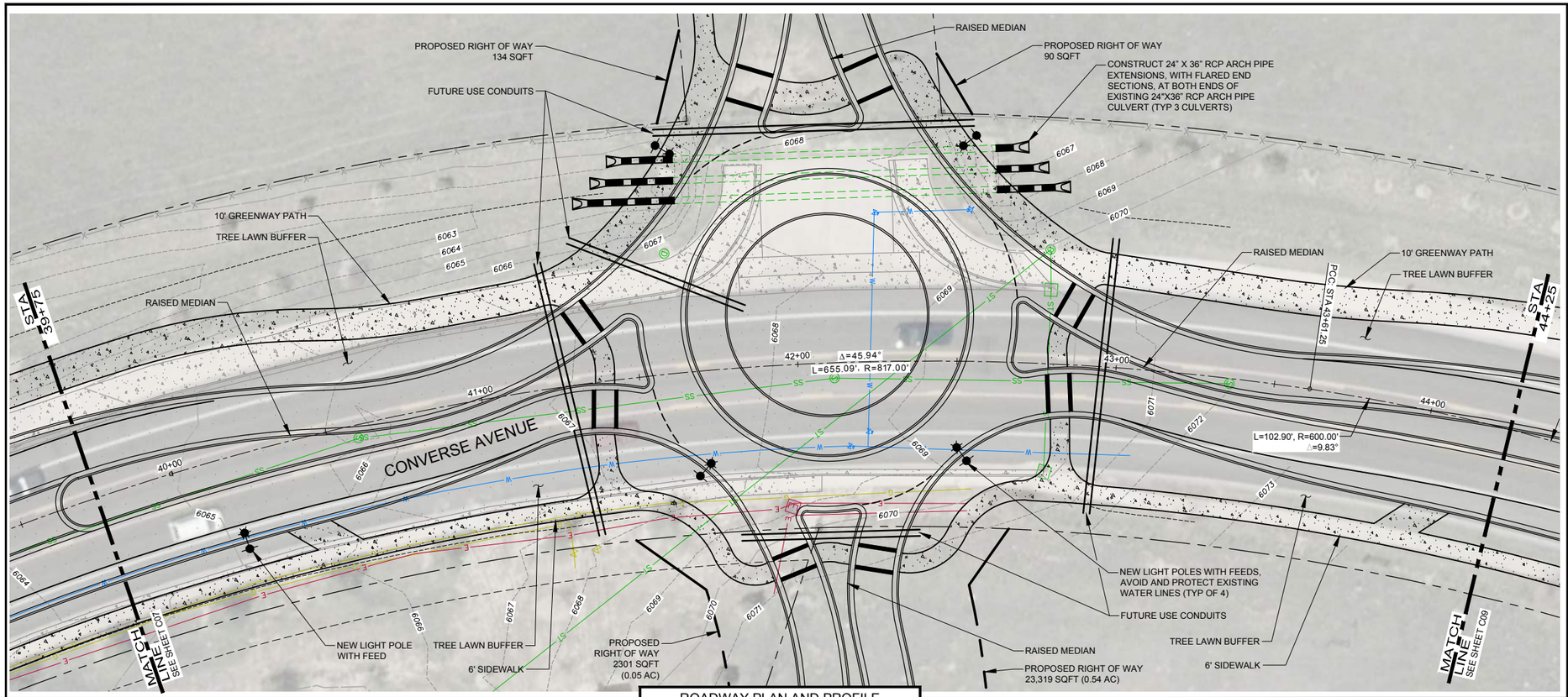
DRAWING NO.
C07

SHEET XX OF XX

Drawing Name: I:\36\45-050800 CHEYENNE CONVERSE AVE\MAINDWGS\SHEETS\45-0508.00 PLAN AND PROFILE ROADWAY.DWG Monday, September 13, 2021 2:11 PM By: RICKS, RONALD

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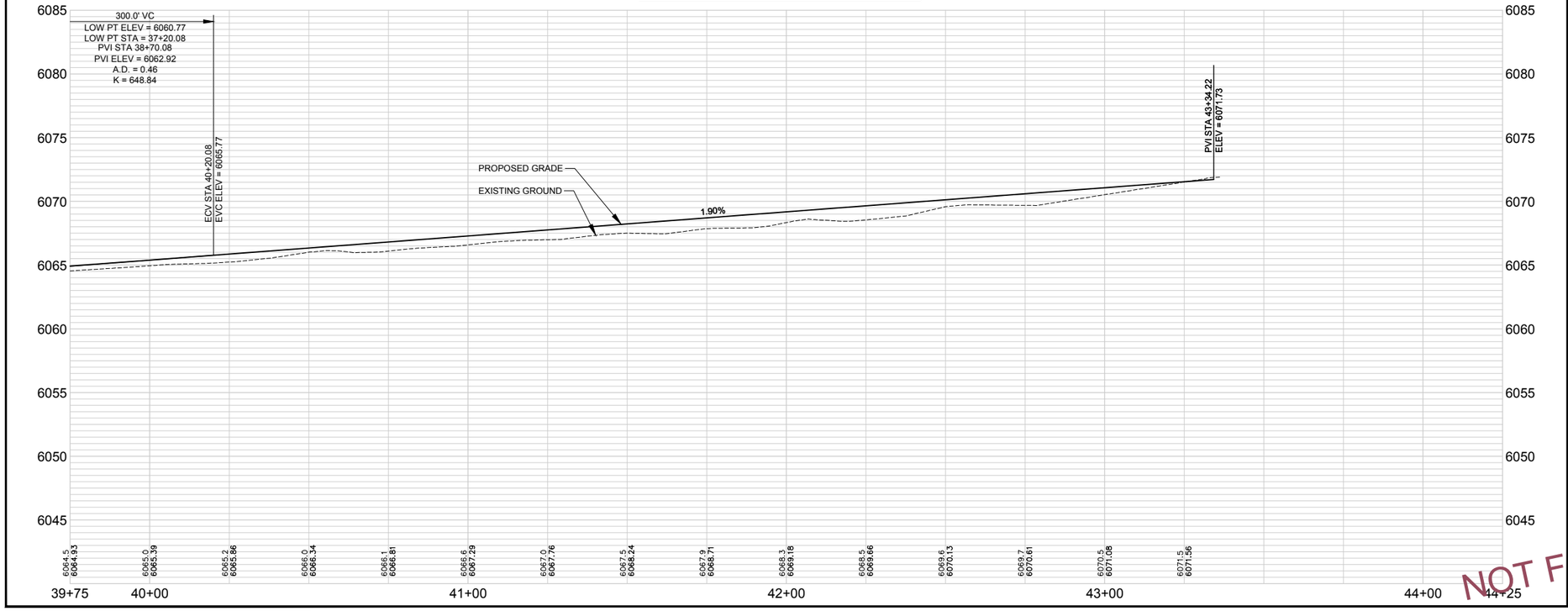


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Drawn By: RBR
Approved By: XXX
Date: 09/08/21

PROJECT NO.
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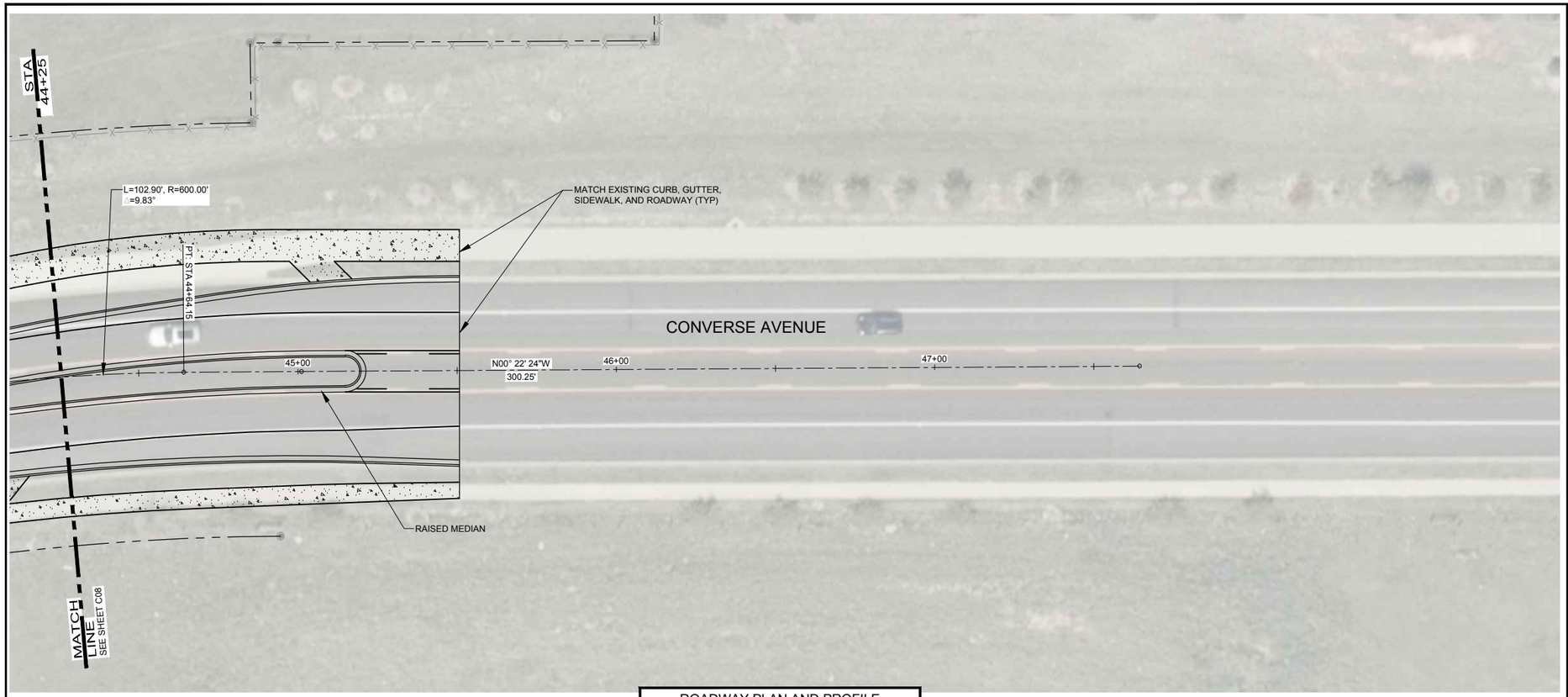
DRAWING NO.
C08

SHEET XX OF XX

Drawing Name: I:\36\45-050800 CHEYENNE CONVERSE AVE\MAINDWGS\SHEETS\45-0508.00 PLAN AND PROFILE ROADWAY.DWG Monday, September 13, 2021 2:11 PM By: RICKS, RONALD

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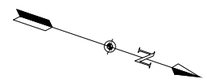


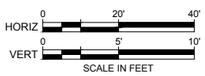


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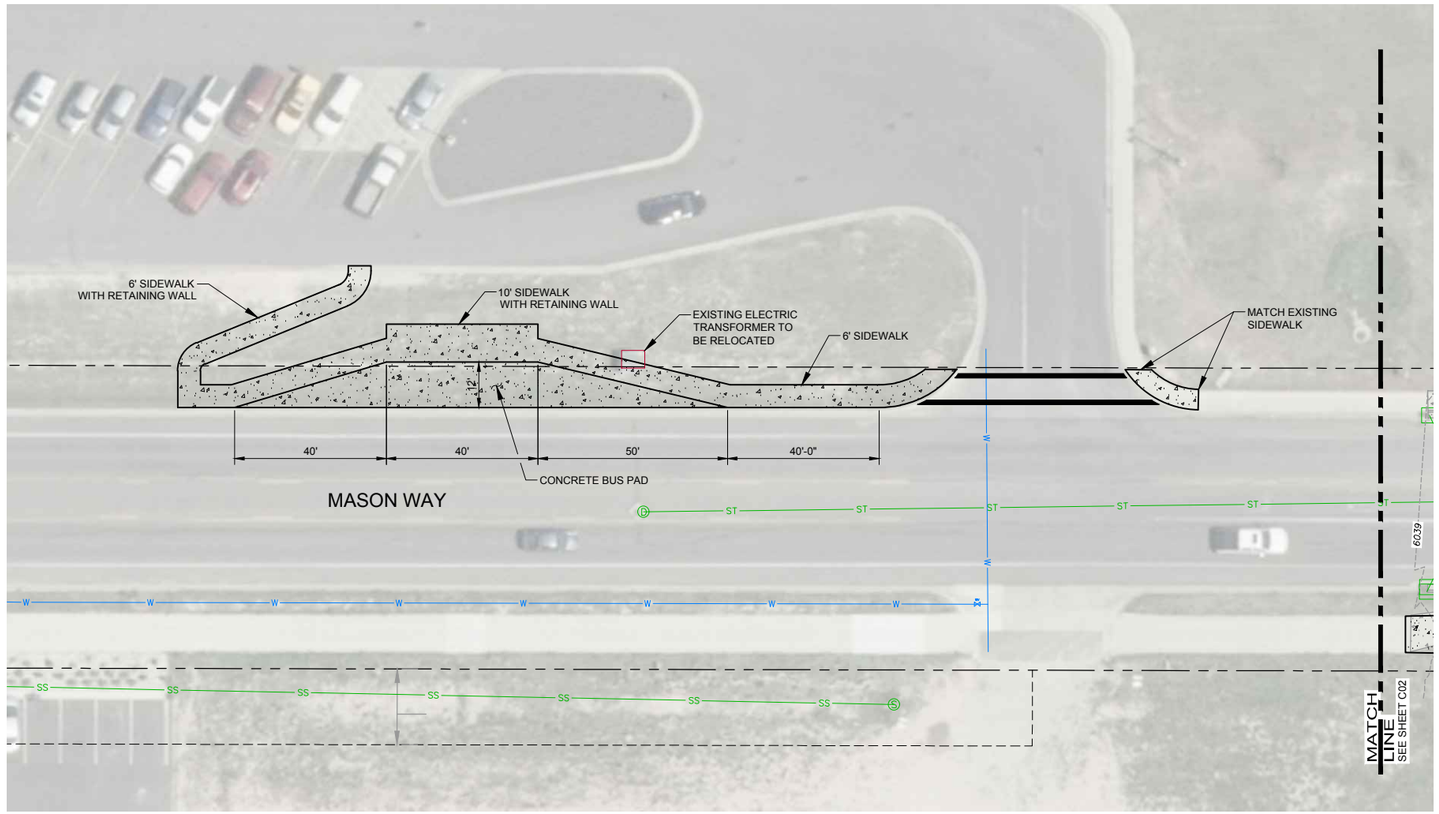
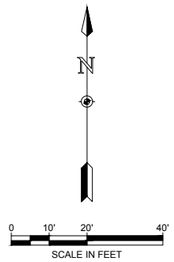
PROJECT NO.
45-0508.00

DRAWING NO.
C09

SHEET XX OF XX

Drawing Name: I:\36\45-050800 CHEYENNE CONVERSE AVE\MAINDWGS\SHEETS\45-0508.00 PLAN AND PROFILE ROADWAY.DWG Monday, September 13, 2021 2:11 PM By: RICKS, RONALD

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MASON WAY PLAN

Project Mgr: NTS
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Approved By: XXX
Date: 09/08/21

PROJECT NO.
45-0508.00

DRAWING NO.
C10

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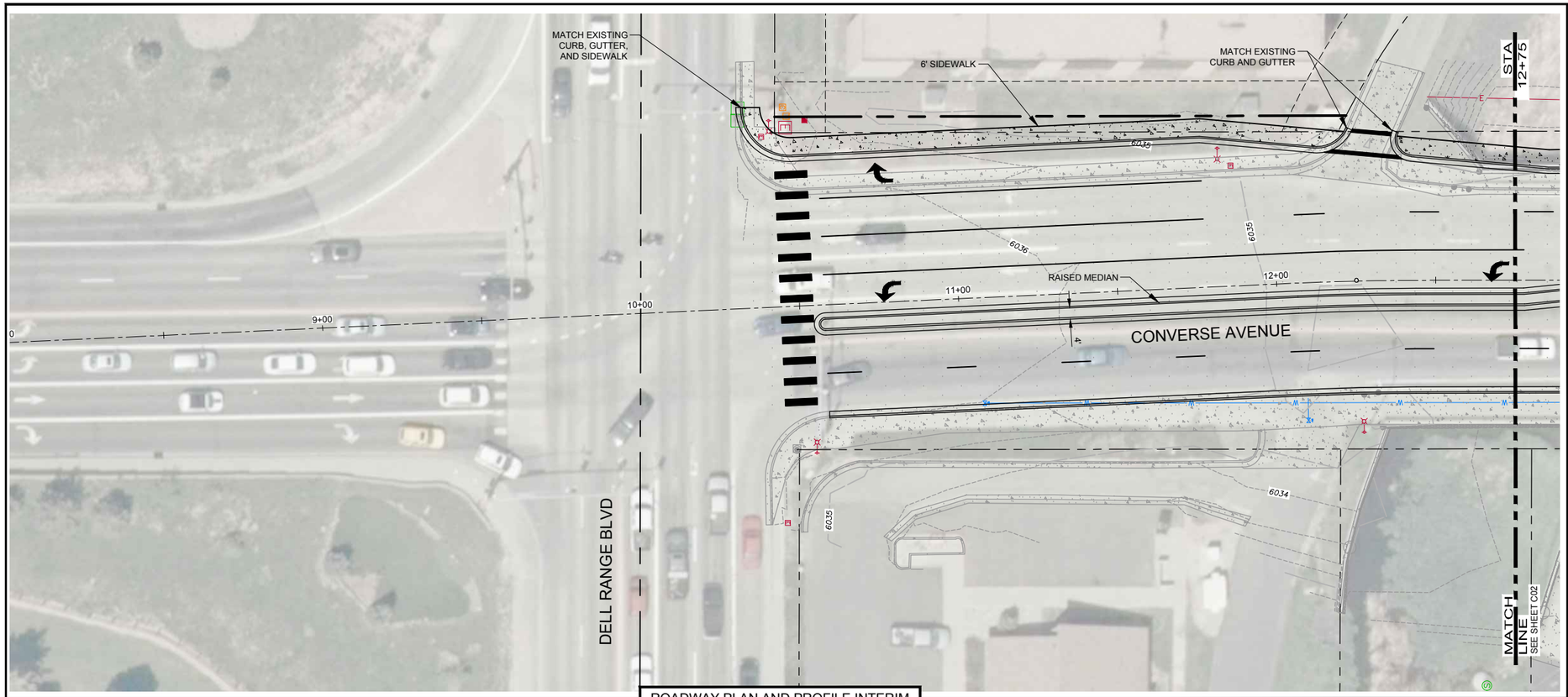
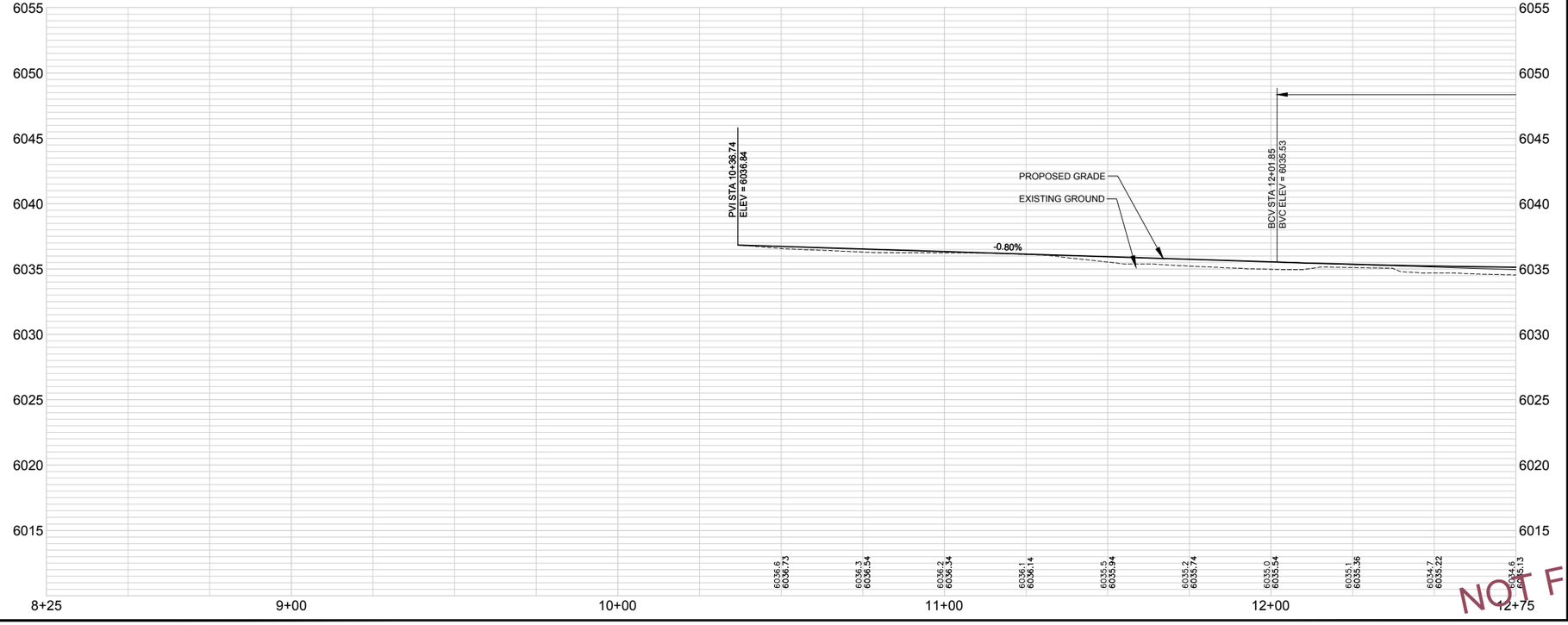
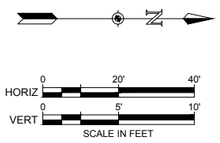
Drawing Name: I:\36\45-050800 CHEYENNE CONVERSE AVE\MAINDWGS\SHEETS\45-0508.00 PLAN AND PROFILE ROADWAY.DWG Monday, September 13, 2021 2:11 PM By: RICKS, RONALD




ROADWAY PLAN AND PROFILE INTERIM

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Date: 09/08/21

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DRAWING NO.
C11

SHEET XX OF XX

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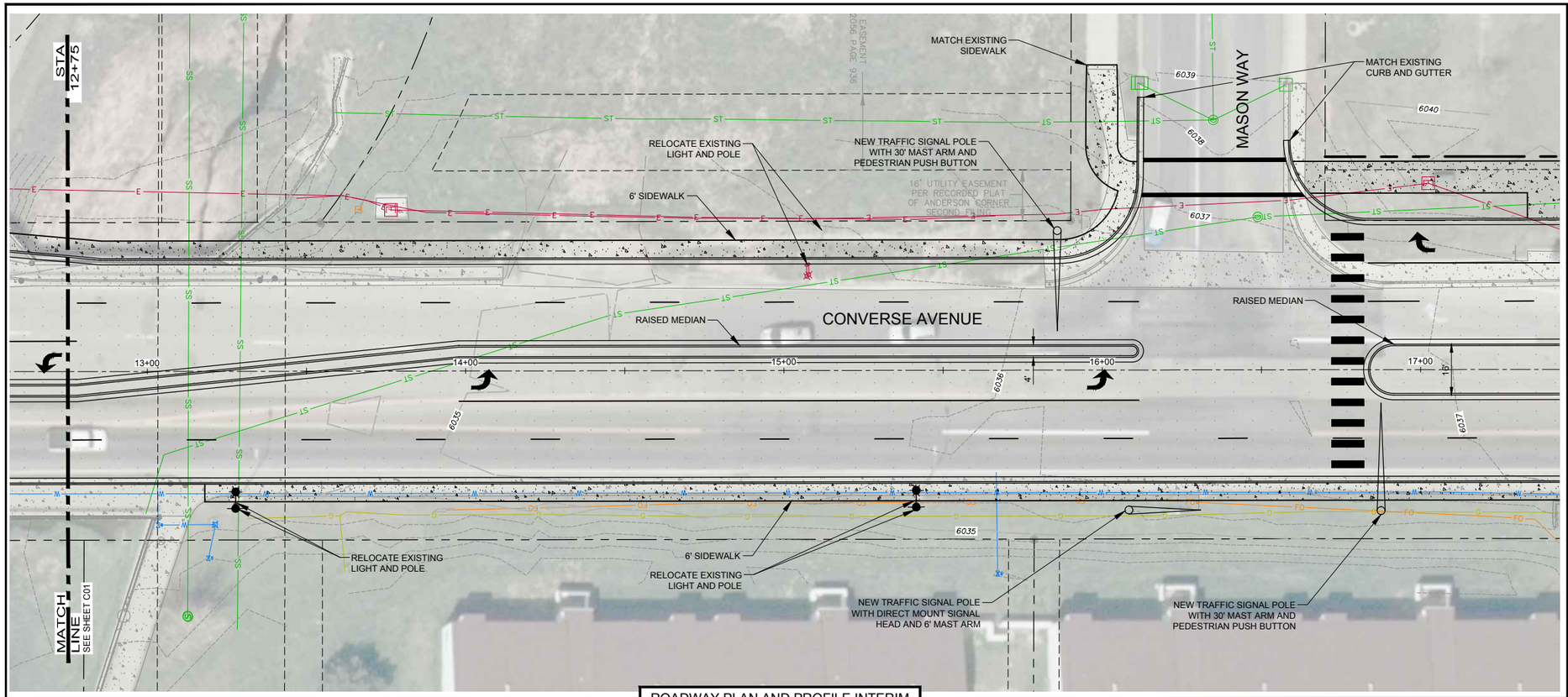


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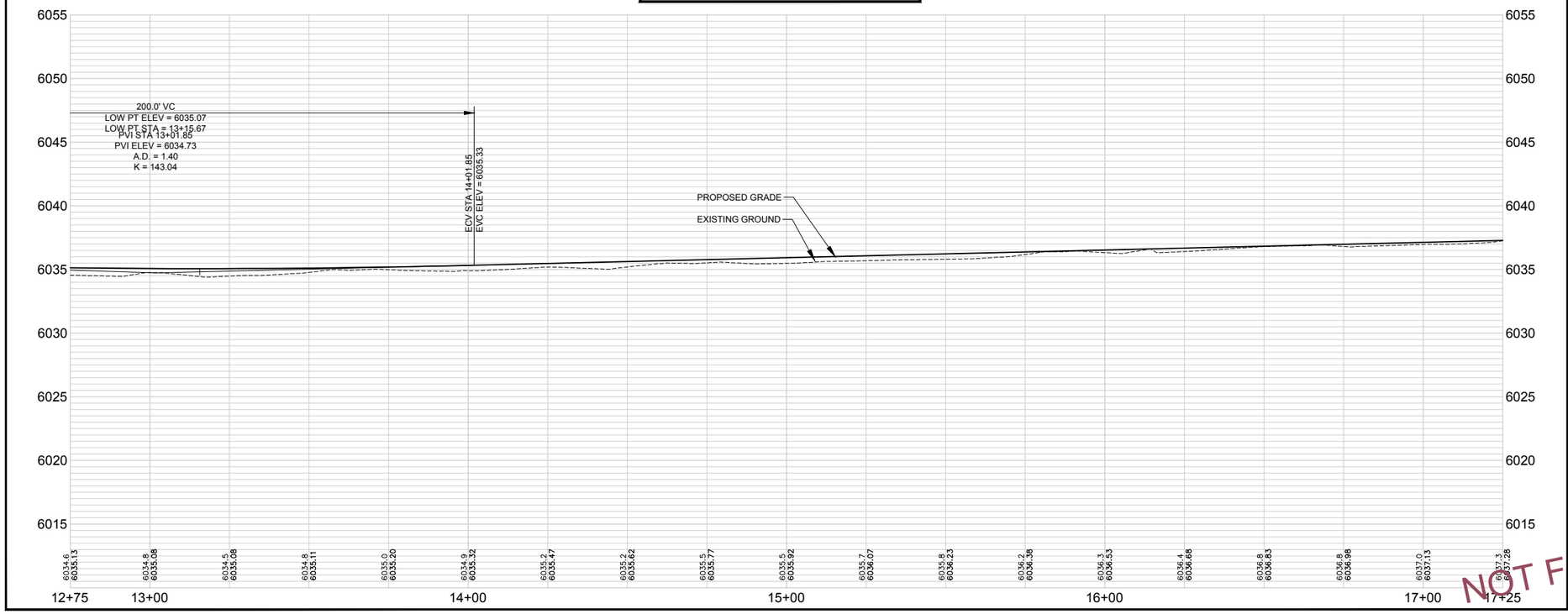


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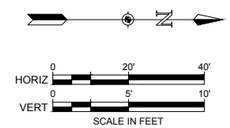


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CITY OF CHEYENNE, WYOMING

ROADWAY PLAN AND PROFILE INTERIM

Project Mgr. NTS
Designed By: RBR
Drawn By: RBR
Approved By: XXX
Date: 09/08/21

PROJECT NO.
45-0508.00

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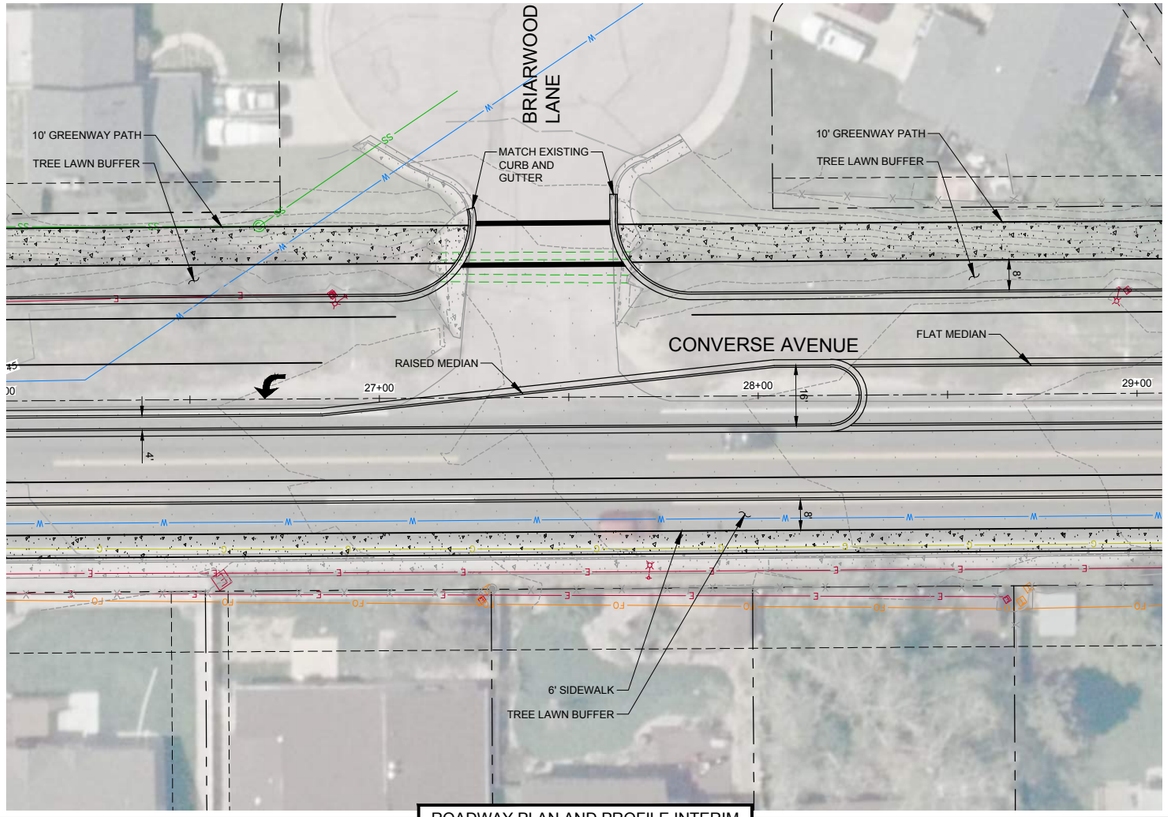
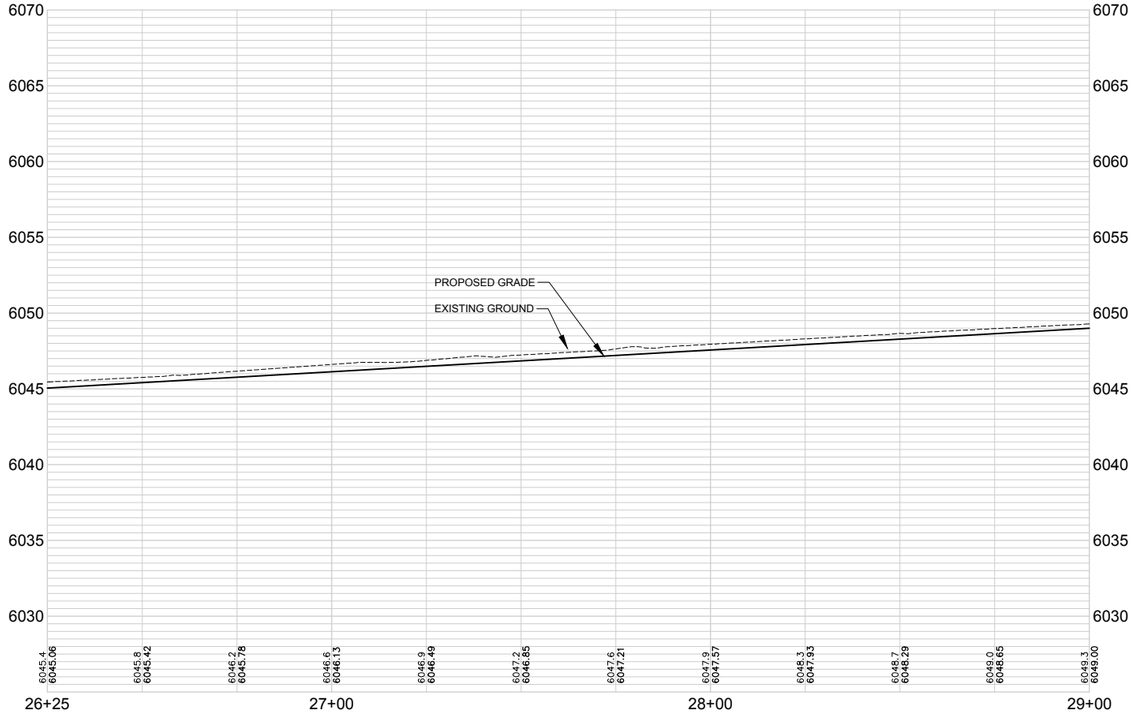
C12

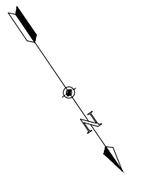
SHEET XX OF XX

Drawing Name: I:\36\45-050800 CHEYENNE CONVERSE AVE\MAINDWGS\SHEETS\45-0508.00 PLAN AND PROFILE ROADWAY INTERIM.DWG Wednesday, September 01, 2021 4:12 PM By: RICKS, RONALD




ROADWAY PLAN AND PROFILE INTERIM



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ROADWAY PLAN AND PROFILE
INTERIM

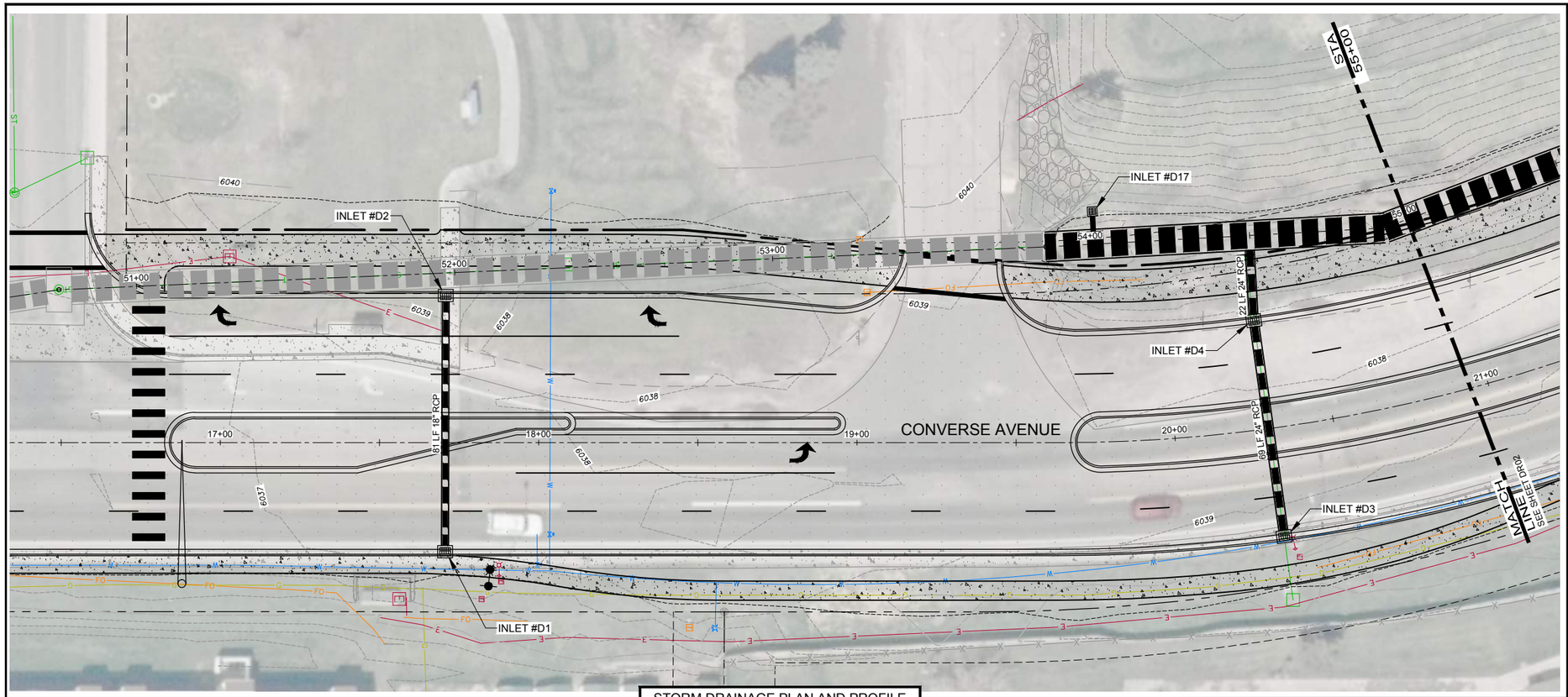
Project Mgr. NTS
Designed By: RBR
Drawn By: RBR
Approved By: XXX
Date: 09/08/21

PROJECT NO.
45-0508.00

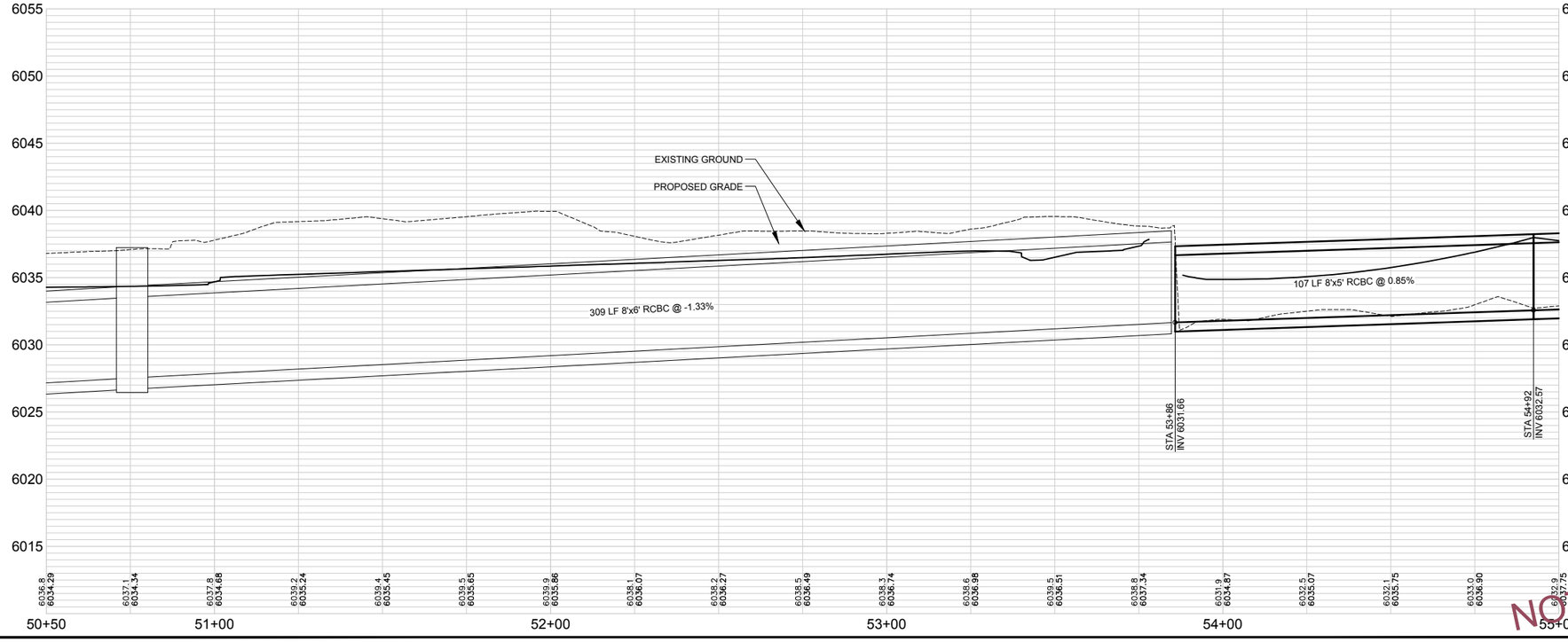
DRAWING NO.
C13

SHEET XX OF XX

Drawing Name: I:\36\45-050800 CHEYENNE CONVERSE AVE\MAINDWGS\SHEETS\45-0508.00 PLAN AND PROFILE ROADWAY INTERIM.DWG Wednesday, September 01, 2021 4:12 PM By: RICKS, RONALD




STORM DRAINAGE PLAN AND PROFILE

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CITY OF CHEYENNE, WYOMING

STORM DRAINAGE
PLAN AND PROFILE

Project Mgr. NTS
Designed By: RBR
Drawn By: RBR
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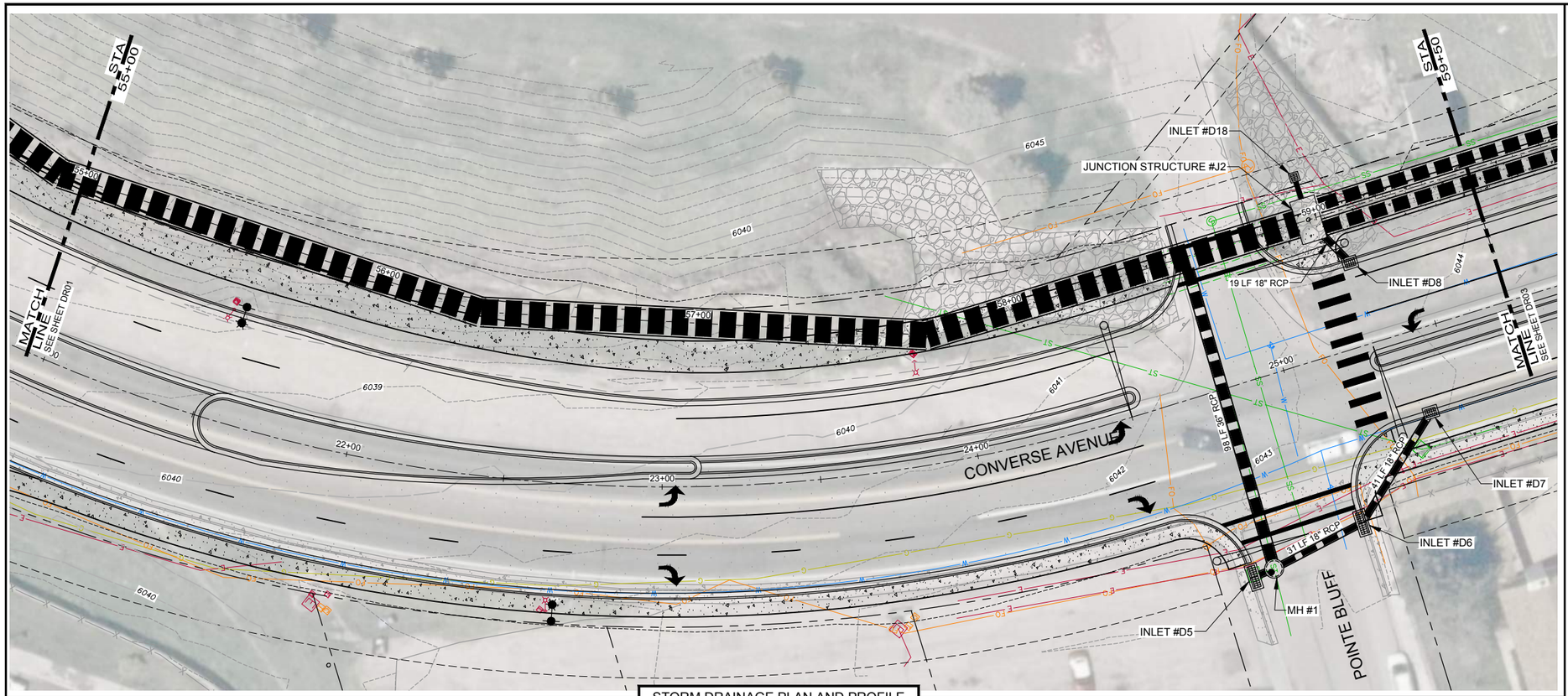
Date: 09/08/21

PROJECT NO.
45-0508.00

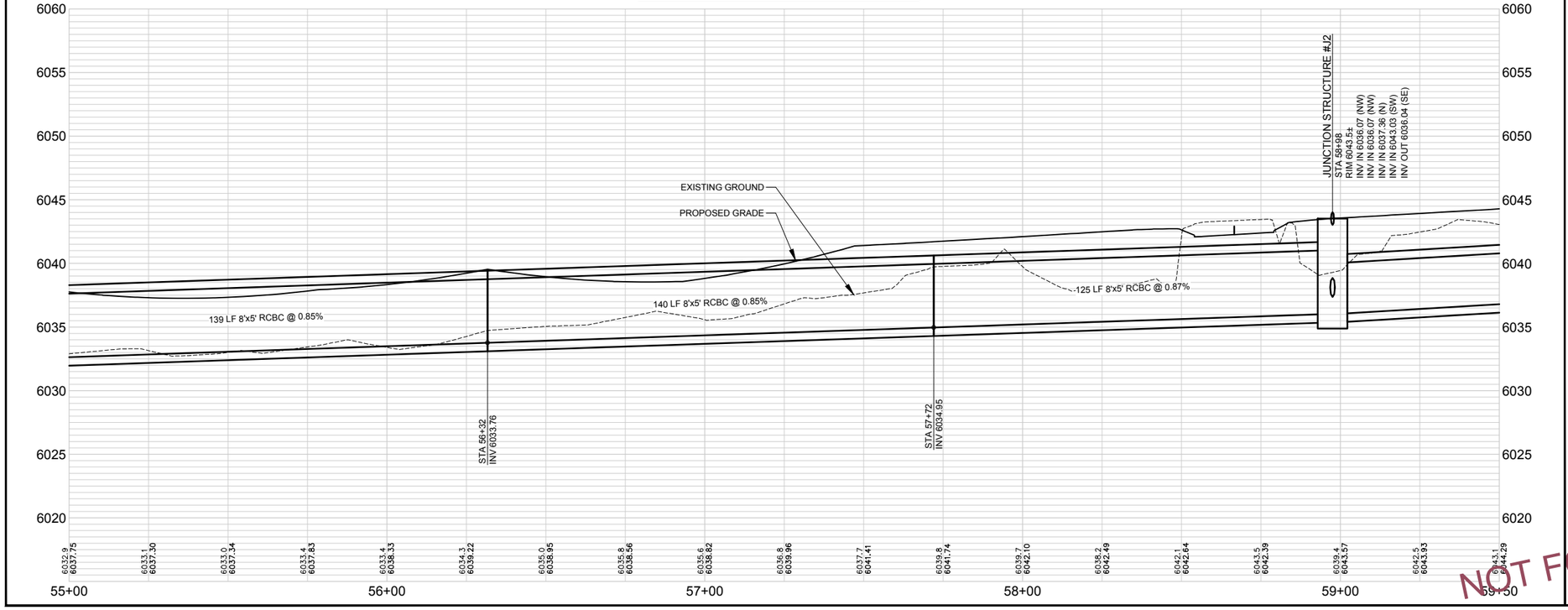
DRAWING NO.
DR01

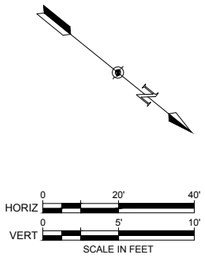
SHEET XX OF XX

Drawing Name: I:\36\45-050800 CHEYENNE CONVERSE AVE\MAINDWGS\SHEETS\45-0508.00 PLAN AND PROFILE DRAINAGE.DWG Tuesday, August 31, 2021 12:47 PM By: RICKS, RONALD




STORM DRAINAGE PLAN AND PROFILE

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STORM DRAINAGE
PLAN AND PROFILE

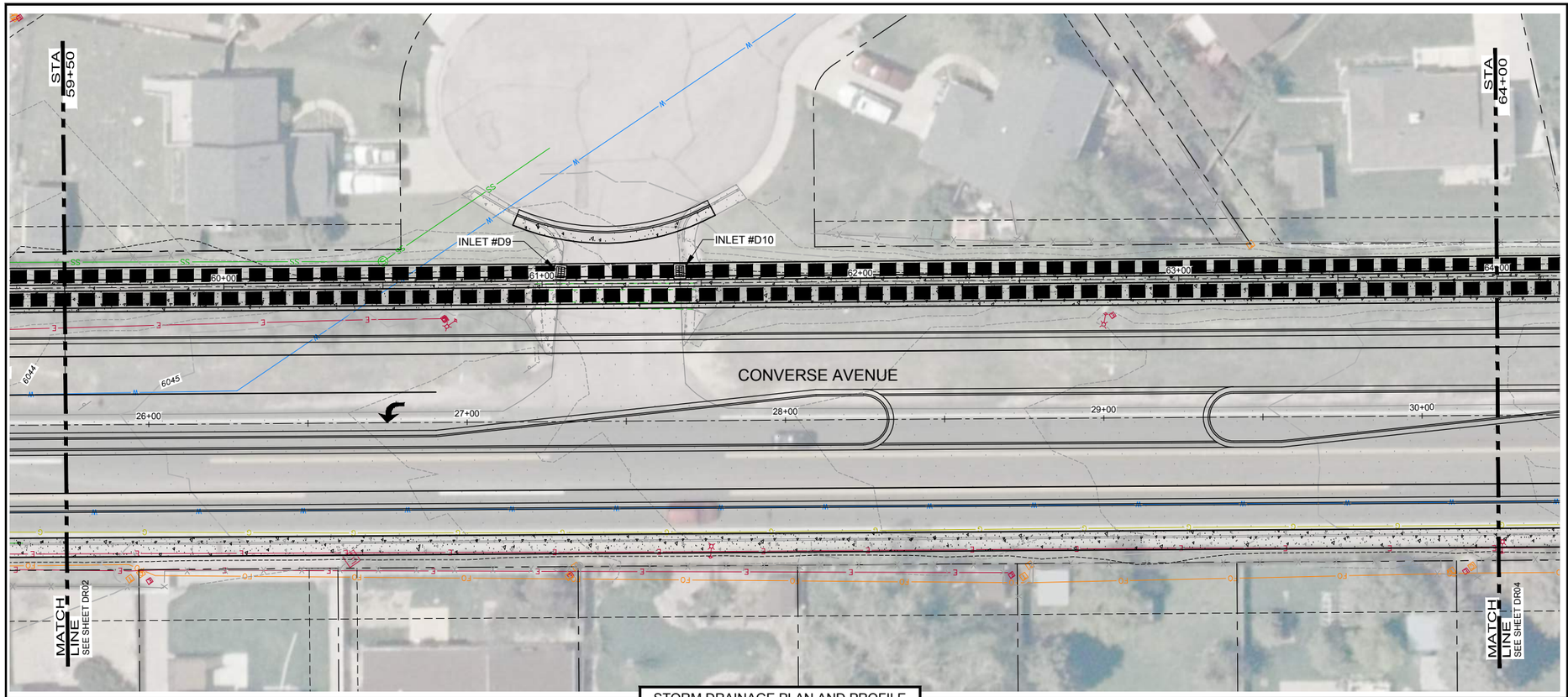
Project Mgr. NTS
Designed By: RBR
Drawn By: RBR
Approved By: XXX
Date: 09/08/21

PROJECT NO.
45-0508.00

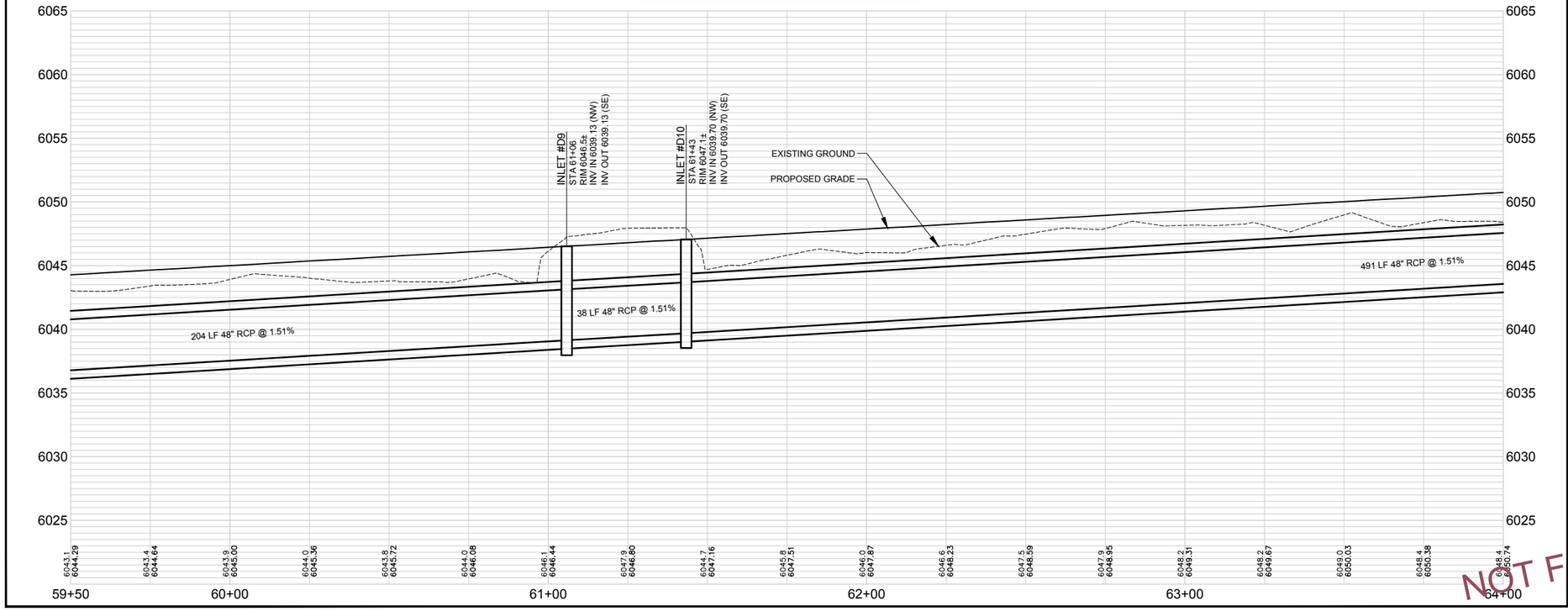
DRAWING NO.
DR02

SHEET XX OF XX

Drawing Name: I:\36\45-050800 CHEYENNE CONVERSE AVE\MAINDWGS\SHEETS\45-0508.00 PLAN AND PROFILE DRAINAGE.DWG Tuesday, August 31, 2021 12:47 PM By: RICKS, RONALD




STORM DRAINAGE PLAN AND PROFILE

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STORM DRAINAGE
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Drawn By: RBR
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PROJECT NO. 45-0508.00
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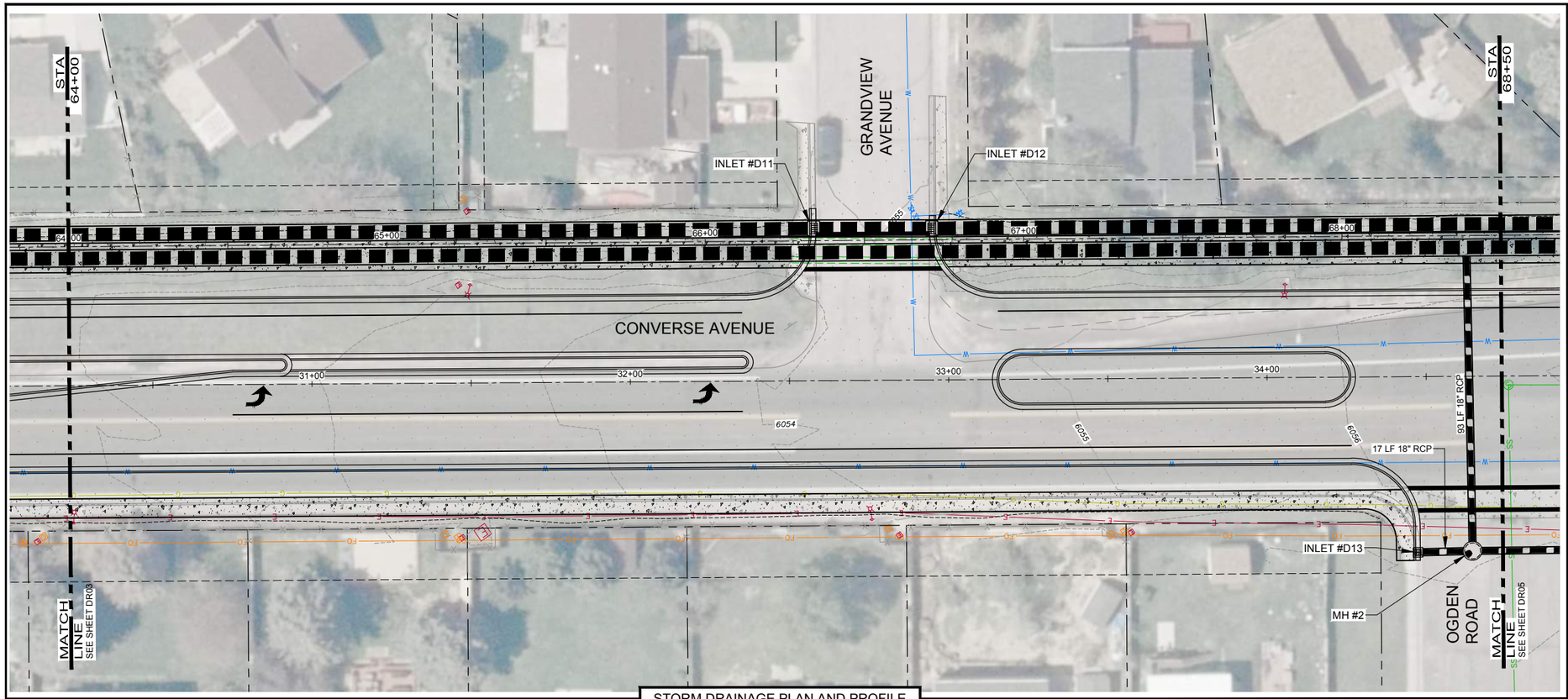
SHEET XX OF XX

Drawing Name: I:\36\45-050800 CHEYENNE CONVERSE AVE\MAINDWGS\SHEETS\45-0508.00 PLAN AND PROFILE DRAINAGE.DWG Tuesday, August 31, 2021 12:47 PM By: RICKS, RONALD

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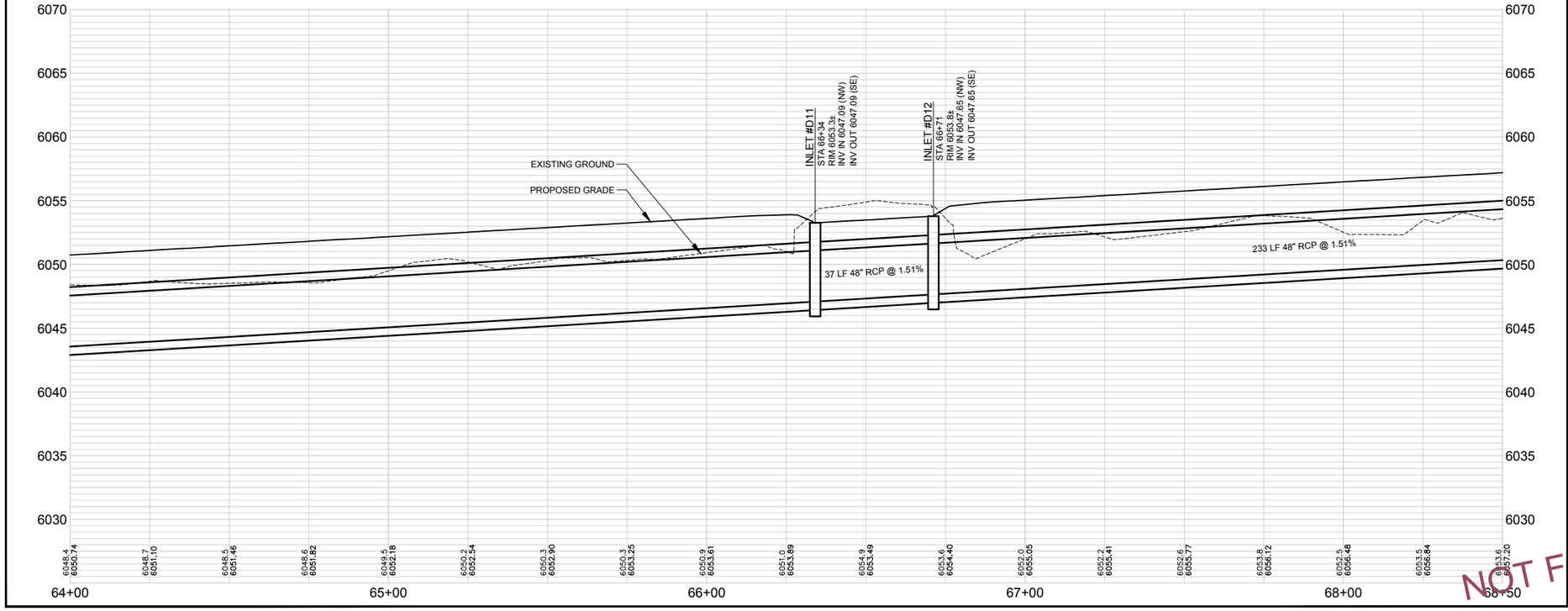


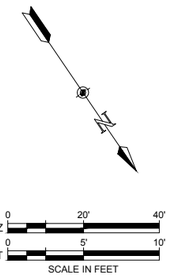


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CITY OF CHEYENNE, WYOMING

STORM DRAINAGE
PLAN AND PROFILE

Project Mgr. NTS
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Drawn By: RBR
Approved By: XXX
Date: 09/08/21

PROJECT NO.
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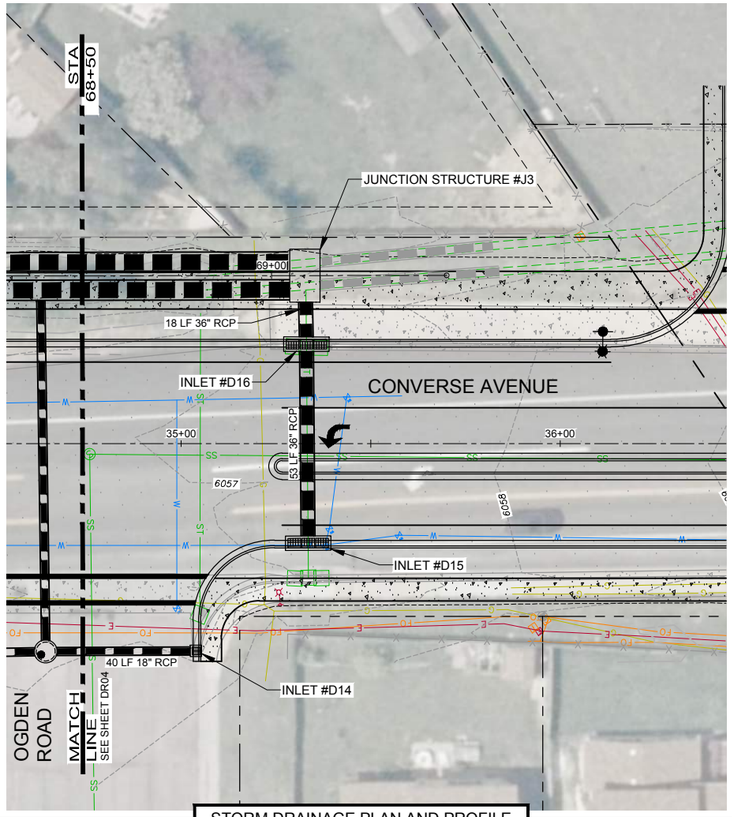
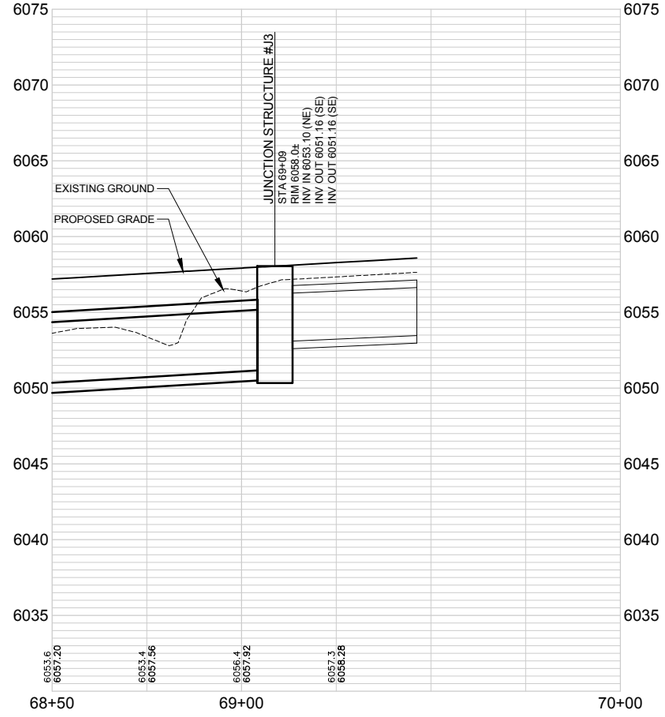
DR04

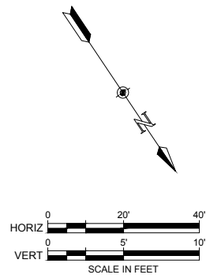
SHEET XX OF XX

Drawing Name: I:\36\45-050800 CHEYENNE CONVERSE AVE\MAINDWGS\SHEETS\45-0508.00 PLAN AND PROFILE DRAINAGE.DWG Tuesday, August 31, 2021 12:47 PM By: RICKS, RONALD




STORM DRAINAGE PLAN AND PROFILE

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CITY OF CHEYENNE, WYOMING

STORM DRAINAGE
PLAN AND PROFILE

Project Mgr. NTS
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Drawn By: RBR
Approved By: XXX
Date: 09/08/21

PROJECT NO.
45-0508.00

DRAWING NO.
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Drawing Name: I:\36\45-050800 CHEYENNE CONVERSE AVE\MAINDWGS\SHEETS\45-0508.00 PLAN AND PROFILE DRAINAGE.DWG Tuesday, August 31, 2021 12:47 PM By: RICKS, RONALD

# Appendix B

## Public Meeting Presentations

# Focus Group Meeting Summaries

# FOCUS GROUP #1 MEETING MINUTES

CONVERSE AVENUE Improvement Plan

| | |
|---|---|
| Meeting Location: USPS (Mason Way) | Project No.: 45-00508 |
| Date/Time: Thursday 2/10/21, 1:00pm MST | Re: Focus Group Meeting #1 |

Attendees: Jillian Harris, Cory Stibley (Plant Manager), Al Web (Network Specialist), Scott Boyd (Network Specialist), Kurt Kouba (Expediter), Nathan Silberhorn, Darci Hendon

**Discussion & Comments:**

- Truck traffic:
  - Trucks enter and exit thru the first approach north of Mason Way.
  - 50 trucks a day on average, with 70-80 trucks during the Christmas holiday.
  - The location of the approach is ideal. Moving it would be difficult because of the existing security fencing there. A larger approach is desired to accommodate the trucks.
  - Trucks are 53' long and may have pups added in the near future, also many 80 cy box trucks.
  - Trucks enter and exit in both directions on Converse Blvd. Incoming truck routes vary greatly: PO can only control trucks from Cheyenne – out of state and out of city trucks are being routed differently
  - With all of the truck traffic the USPS would see a benefit to having a center turn lane and a right turn lane (for south-bound truck traffic to enter the truck approach.)
- Postal Carriers:
  - Utilize the approach north of the truck approach.
  - Size and location is just fine.
  - Security gates/fencing at this approach also.
- Employee Parking:
  - Employees park on the west side of the building.
  - Entrance to employee parking is off of Mason Way.
  - During snow storms employees will use the exit to the north side of the employee parking because of a snow drifting issue at the approach off of Mason Way.
- Discussion:
  - Transit stop seems fine – not a concern.
  - Left turn from south bound Converse to east bound Dell Range is difficult. When there is a USPS truck in the turn lane that is the only vehicle that can make it thru on the left turn arrow.
  - Radius of the NE corner of the intersection of Dell Range/Converse is small.
  - No drainage concerns.
  - Frequently see pedestrians trying to cross Converse near Mason Way.

5-Minute Corridor Plans and an aerial map were given to Cory on 2-11-2021 for employees to leave comments. Both items were also emailed to Cory.



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# FOCUS GROUP #2 MEETING MINUTES

CONVERSE AVENUE Improvement Plan

| | |
|---|---|
| Meeting Location: City, Room 208 | Project No.: 45-00508 |
| Date/Time: Friday 02/11/21, 4:00pm MST | Re: Focus Group Meeting #2 |

Attendees: Tom Mason, Jillian Harris, Rande Pouppirt (Owner of Black Market / AAA / Cold Stone building), Charlie Moore (Building Supervisor of Aspen Ridge), Steve Wehmeyer (Owner of Aspen Ridge), Sue ____ (tenant in Aspen Ridge building), Justin Beckner (Civil Engineer for Ridge View Apartments), Nathan Silberhorn, Ken Voigt, Darci Hendon

**Discussion & Comments:**

- **Aspen Ridge**
  - The largest concern is people using the exit only driveway on the north side of the building to enter the Aspen Ridge parking lot. There have been a few accidents and several near misses. (Because this is private property, the accidents may not be reflected in the City provided crash data.)
  - This exit approach onto Converse is wide enough for Aspen Ridge (as a one-way exit.)
  - Charlie asked if there would be an opportunity to expand their parking lot to the north. It was discussed that we don't want to impact Dry Creek because of the existing wetlands and because Dry Creek conveys floodwaters.
  - Charlie and Sue are worried about the impacts during construction. Currently whenever the intersection of Dell Range/Converse is impacted due to an accident, that is when traffic increases thru their parking lot and particularly people entering thru the exit. *Asked specifically to address that in construction*.
  - Steve's biggest concern is getting new leases in the building during construction as well as the impact on the businesses currently in the building – especially those businesses that rely on clients coming into the building.
    - Maintaining easy access during construction is a top concern.
- **Pouppirt's Properties**
  - Randy would like to see a right turn lane into his property off of Converse Blvd. Due to the speeds vehicles are travelling on Converse north-bound, it makes turning into the property difficult (need a low speed to make the very tight right turn).
    - Discussion about the tight right-of-way in this location. It was suggested that perhaps there doesn't need to be 2 south-bound lanes to cross Dell Range from Converse.
  - Randy recently reconstructed the approach to the building(s) off of Converse Blvd.
- **Ridge View Apartments**
  - Justin is most interested in what will happen at the Carlson Intersection.
  - It was stated that there are no plans to relocate the Carlson Intersection at Converse Ave.
  - Ridge View apartments will have 232 units in Phase 1 and 250 units in Phase 2.
  - Phase 1 is expected to start construction Spring 2021. 2027 for full build-out, but that will be market driven.
  - Phase 1 will build Carlson Rd. thru the first entrance into the apartments.
  - Phase 2 will build Carlson Rd. between first and second entrances.
  - Justin believes that a signal at Carlson would be a good idea. His client is pro signal as well. They have no plans to install conduit for a future signal.
  - He does think that a left turn from Carlson to Converse could be an issue without a signal. He thinks that a lower speed limit on Converse would help.
- **General Corridor Comments**
  - The intersection of Dell Range and Converse doesn't function well for south-bound Converse to east-bound Dell Range (left turners).
    - Left turn arrow is WAY too short (time/duration)



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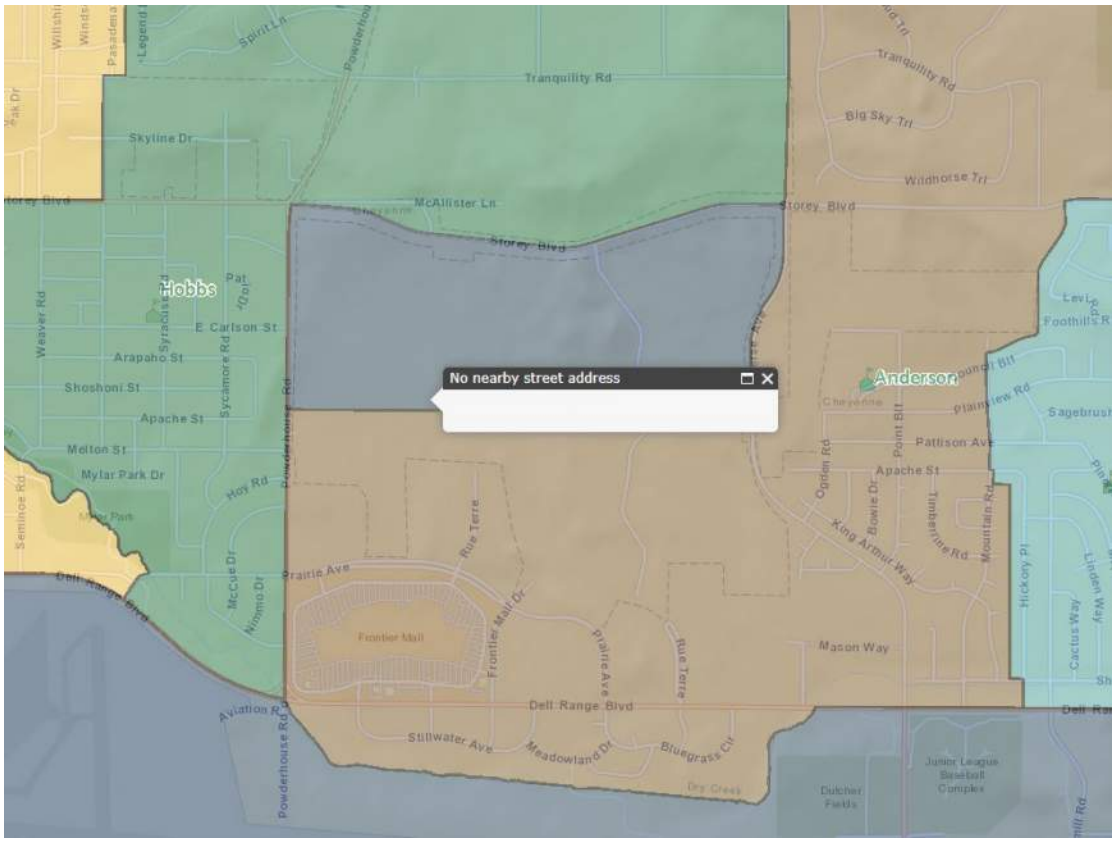
        - There doesn't seem to be a need for 2 south-bound lanes, maybe make a dual left
        - Frequently they see people getting tired of waiting for the left turn and will go south thru the intersection and turn into the ball fields in order to turn around to be able to go east on Dell Range.
        - There is a man that rides his bike along Dell Range. He gets off to walk his bike across Converse, but the light isn't long enough for him to make the crossing.
    - Definitely see the need for a pedestrian crossing from Sagebrush apartments, near Mason Way.
        - Charlie did not have a contact for the apartments. – Tom to call or visit? Phone 307-220-2950 https://sagebrush.apartments/
    - Transit Stop:
        - Aspen Ridge has a transit stop at the front door of their building.
        - No one had any concerns about the location of the transit stop along Converse Blvd.
    - Drainage:
        - No one had any concerns about drainage.
    - The group does not see a variation in traffic amounts based on time of year or weather.

5-Minute Corridor Plans were given to Charlie, Randy and Sue. Darci also emailed a PDF of the 5-Minute Plan to Charlie.

**Follow-up**: Darci will ask Frank Cole when he forsees the connection of Carlson between the 5-6 School and Ridge View Apartments happening.

**Additional Information**: Below is a snip of the LCSD1 boundaries. As you can see, the school district has not assigned the area where Ridge View Apartments will be to a specific school/triad because there are no current addresses associated with this area in Section 21 (blue area are unassigned.) The brown area has kids assigned to Anderson Elementary, the green area has kids assigned to Hobbs Elementary. The new 5-6 school will be in the Central Triad, which is the same triad as Hobbs Elementary.



# Public Meeting Presentations

CONVERSE AVENUE Improvement Plan

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# Converse Avenue Improvement Plan

## Public Meeting #1
## March 3, 2021

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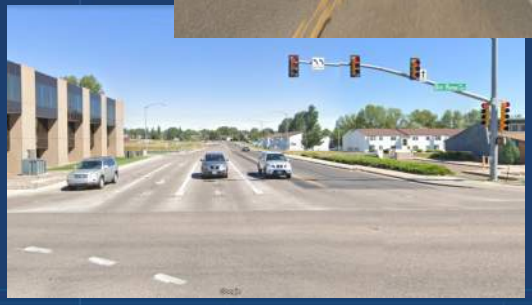
CHEYENNE METROPOLITAN PLANNING ORGANIZATION

## Welcome!

We appreciate this opportunity to meet with you and the time you're taking to learn about this project!

We would love to hear from you.



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# Housekeeping

- Rules
- Presentation Agenda:
  - Introductions & Study Background
  - Existing Conditions & Future Growth
  - Traffic Engineering Considerations
  - Improvement Options
  - Q&A

# Zoom Meeting Tools


- Chat – use the everyone option
  - Best place to log questions for later
  - When closing, DON'T close your browser
- Reactions – we will be using them later
- Raise Hand – save this for the Q&A session
- Polls – let's do one now

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# Poll Question #1

How did you hear about tonight's meeting?

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CONVERSE AVENUE
Improvement Plan

## The Project Team

- Tom Mason, Cheyenne MPO
- Jillian Harris, Cheyenne MPO
- Christopher Yaney, Cheyenne MPO
- Tom Cobb, City of Cheyenne
- Anissa Gerard, City of Cheyenne
- Nathan Silberhorn, Ayers Associates
- Ken Voigt, Ayres Associates
- Darci Hendon, Summit Engineering

CHEYENNE MPO
CHEYENNE METROPOLITAN PLANNING ORGANIZATION

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Improvement Plan

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CHEYENNE MPO
CHEYENNE METROPOLITAN PLANNING ORGANIZATION

## Previous planning projects in Cheyenne:

- Dell Range Corridor Study
- East Pershing Corridor Plan
- Archer Greenway Trail Connector Plan
- Missile Drive Corridor Plan
- Evers Blvd Plan
- Cheyenne Frontier Days Traffic Study
- Cheyenne Freight Mobility Study

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CONVERSE AVENUE Improvement Plan

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# The Project (The "Plan")

Objective:

Develop a corridor improvement plan that enhances mobility and safety for all users to serve existing and future land use and traffic growth projections between Dell Range Boulevard and the new Carlson Street extension.

Goals:

- Identify the community's vision for the corridor.
- Identify the corridor roadway cross-section.
- Enhance pedestrian and bicycle mobility and safety, including crossings of Converse Avenue and connections to other facilities.
- Improve intersection design and evaluate the need for traffic signals.
- Minimize traffic conflicts through corridor access management.

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# Study Considerations

1. Safety
2. Traffic Operation
3. Speed Management
4. Pedestrian Friendly
5. Connectivity
6. Right-of-way impacts
7. Drainage

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# Study Intersections

1. Business accesses
2. Mason Way
3. USPS truck access
4. Point Bluff & USPS
5. Briarwood Lane
6. Grandview Avenue
7. Ogden Road
8. Future Carlson Street


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# Why Public Involvement?

- To provide a project that serves the City
- You know the corridor best
- We want to understand your concerns
- We want to hear your ideas
- We want to incorporate as many of your ideas as possible and still meet the City's objectives and needs and industry standards and best practices

## Public Involvement Events

- Public Information Meeting #1
  - March 3
- Public Information Meeting #2
  - Mid-May
- Project Website
  - plancheyenne.org
    - > View Plans and Programs
    - > Converse Avenue Improvement Plan

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# Poll question #2

From Converse, which street do you most frequently use?

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# Existing Conditions

- Low crash frequency – mostly rear-enders at Dell Range and Mason Way
- SB left turns onto Dell Range are a problem
- EB left turns from Mason Way are a problem
- Crossing Converse Ave on foot is a problem


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# Existing Conditions - Access

- Business accesses near Dry Creek bridge complicate traffic conflicts
- Wrong-way traffic to Aspen Ridge
- Tight right turn into Blackmarket/AAA
- US Post Office Truck entrance near Mason Way

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# Existing Conditions - Other

- Lane marking issues, especially from Post Office to Dell Range
- Lane continuity issues
- Pedestrian access & safety issues
- Pavement conditions issues


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# Poll question #3

What elements of this street are most important to you?

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# Poll question #4

Do you think speeding is an issue on the corridor?

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# Opportunities for Improvement

## Connectivity

The corridor divides more than it connects

We can connect the community to amenities!

- Homes to Homes
- Homes to Schools
- Homes to Retail
- Retail to Retail

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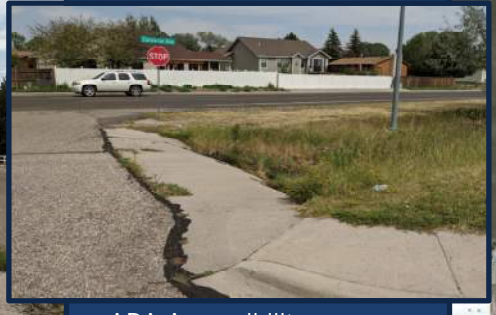
# Opportunities for Improvement

## Pedestrian Considerations



- ADA Accessibility
- Routes to School
- Routes to Retail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# Opportunities for Improvement

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## Greenway Considerations



- ADA ramps & accessibility
- Safe crossing
- Connections to retail

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# Opportunities for Improvement

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## Transit Considerations:

- Safe crossing
- Sidewalk connections to residential
- ADA accessibility to transit
- Separate transit stop from turn movements



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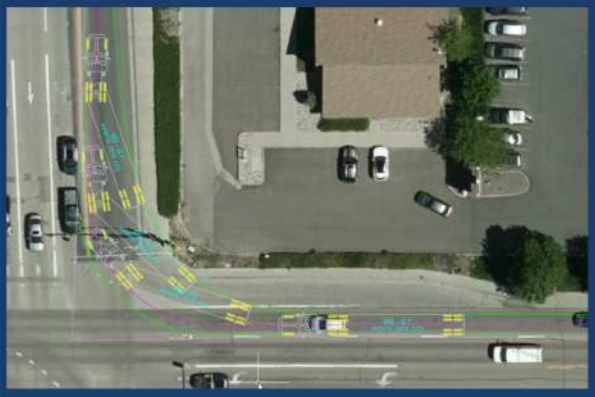
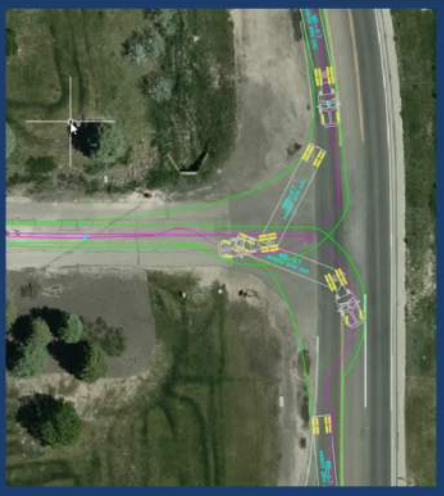
# Freight Truck Accommodation



Dell Range Intersection



Post Office Truck Entrance

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# Poll question #5

How comfortable are you walking on a sidewalk right next to the street?

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# Poll question #6

How comfortable are you riding a bicycle on a street with a shoulder?

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# Poll question #7

How comfortable are you riding a bicycle on a Greenway?

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# So what about traffic?

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# Traffic Analysis Steps

Existing Conditions
- ADT Trends
- Safety
- Capacity

Future Traffic
- Land Use/Transportation Model
- Section 20 Growth

Future Signals

Pedestrian Connectivity

Access Management


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# Year 2045 Street Network Plan

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# Year 2045 Land Development Plan


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# Existing Traffic


# 2045 Traffic


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# Existing Intersection Operation

**Mason Way Traffic Operations**

| Scenario | Control | MOE | Movement | | | | | | OVERALL |
|---|---|---|---|---|---|---|---|---|---|
| | | | EBL | EBR | NBL | NBT | SBT | SBR | |
| 2020 Midday Existing | Stop | LOS | D | B | A | A | A | A | A |
| | | Delay (sec) | 28.1 | 10.8 | 8.6 | 0.0 | 0.0 | 0.0 | 7.1 |
| | | Queue (ft) | 50' | 50' | 25' | 0' | 0' | 0' | -- |
| 2020 PM Existing | Stop | LOS | F | B | A | A | A | A | B |
| | | Delay (sec) | 62.9 | 12.2 | 9.0 | 0.0 | 0.0 | 0.0 | 11.0 |
| | | Queue (ft) | 125' | 50' | 25' | 0' | 0' | 0' | -- |

**USPS Driveway/Point Bluff Traffic Operations**

| Scenario | Control | MOE | Movement | | | | | | | | | | OVERALL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR | |
| 2020 Midday Existing | Stop | LOS | B | | | C | | | A | A | | A | A | | A |
| | | Delay (sec) | 12.0 | | | 16.9 | | | 8.0 | 0.0 | | 7.8 | 0.0 | | 3.1 |
| | | Queue (ft) | 25' | | | 50' | | | 25' | 0' | | 25' | 0' | | -- |
| 2020 PM Existing | Stop | LOS | B | | | C | | | A | A | | A | A | | A |
| | | Delay (sec) | 12.4 | | | 17.5 | | | 8.1 | 0.0 | | 7.8 | 0.0 | | 3.2 |
| | | Queue (ft) | 25' | | | 50' | | | 25' | 0' | | 25' | 0' | | -- |

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# Existing Intersection Operation

| Ogden Road Traffic Operations | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Scenario | Control | MOE | Movement | | | | | | OVERALL |
| | | | WBL | WBR | SBL | SBT | NBT | NBR | |
| 2020 Midday Existing | Stop | LOS | B | A | A | A | A | | A |
| | | Delay (sec) | 11.1 | 9.5 | 7.7 | 0.0 | 0.0 | | 1.0 |
| | | Queue (ft) | 25' | 25' | 25' | 0' | 0' | | -- |
| 2020 PM Existing | Stop | LOS | B | B | A | A | A | | A |
| | | Delay (sec) | 12.7 | 10.4 | 8.1 | 0.0 | 0.0 | | 1.9 |
| | | Queue (ft) | 25' | 25' | 25' | 0' | 0' | | -- |

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# Preliminary Improvement Options

## From 3-Lane Continuous Left Turn Lane (Existing)

1. Enhanced 3-Lane Continuous Left Turn Lane (Raised Median)
2. 4-Lane Divided Roadway with Median

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# Enhanced 3-Lane Continuous Left Turn Lane



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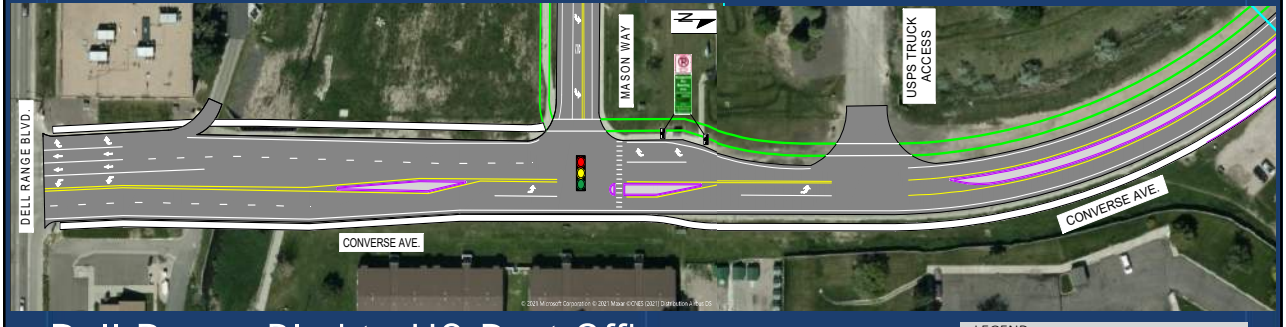
# Enhanced 3-Lane Continuous Left Turn Lane




## Dell Range Blvd to US Post Office

LEGEND
- CONCRETE PAVEMENT
- CONCRETE MEDIAN
- CONCRETE SIDEWALK
- CONCRETE CURB
- GREENWAY
- CENTERLINE PAVEMENT MARKING
- LANE LINE PAVEMENT MARKING
- CONTINUOUS LEFT-TURN LANE
- SIGN ON PERMANENT SUPPORT

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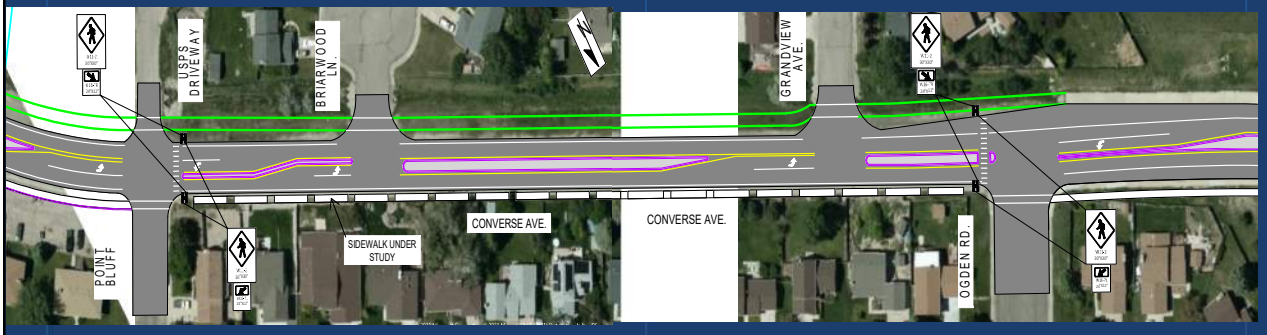
# Enhanced 3-Lane Continuous Left Turn Lane




## US Post Office to north of Ogden Road

LEGEND
- CONCRETE PAVEMENT
- CONCRETE MEDIAN
- CONCRETE SIDEWALK
- CONCRETE CURB
- GREENWAY
- CENTERLINE PAVEMENT MARKING
- LANE LINE PAVEMENT MARKING
- CONTINUOUS LEFT-TURN LANE
- SIGN ON PERMANENT SUPPORT

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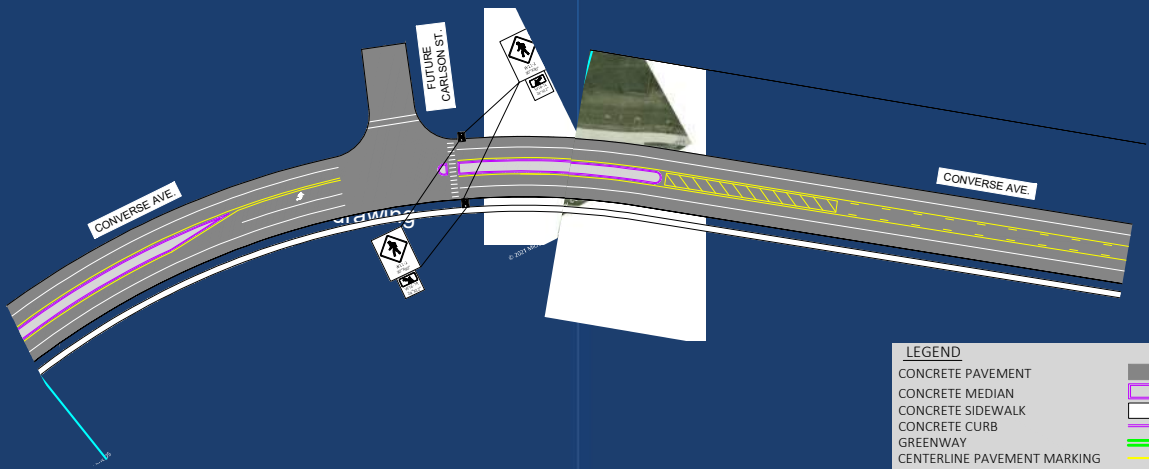
# Enhanced 3-Lane Continuous Left Turn Lane




## North of Ogden Road to north of Carlson St

LEGEND
- CONCRETE PAVEMENT
- CONCRETE MEDIAN
- CONCRETE SIDEWALK
- CONCRETE CURB
- GREENWAY
- CENTERLINE PAVEMENT MARKING
- LANE LINE PAVEMENT MARKING
- CONTINUOUS LEFT-TURN LANE
- SIGN ON PERMANENT SUPPORT

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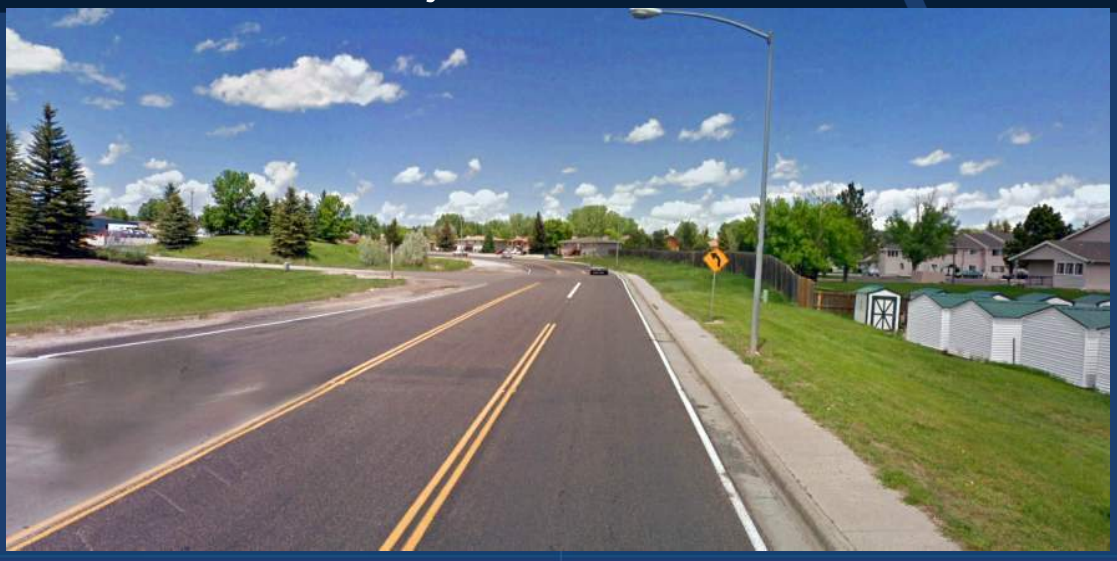
# Converse Avenue today



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# Enhanced 3-Lane Continuous Left Turn Lane

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# 4-Lane Divided Roadway with Median



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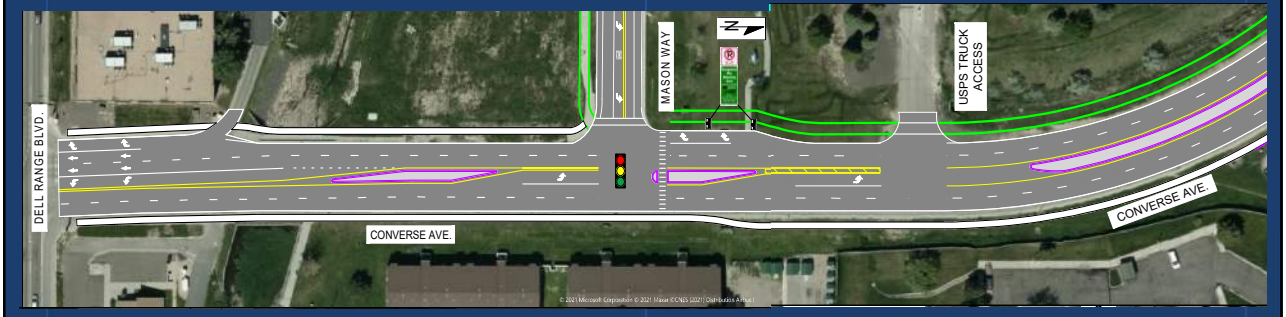
# 4-Lane Divided Roadway with Median




## Dell Range Blvd to US Post Office

LEGEND
- CONCRETE PAVEMENT
- CONCRETE MEDIAN
- CONCRETE SIDEWALK
- CONCRETE CURB
- GREENWAY
- CENTERLINE PAVEMENT MARKING
- LANE LINE PAVEMENT MARKING
- CONTINUOUS LEFT-TURN LANE
- SIGN ON PERMANENT SUPPORT

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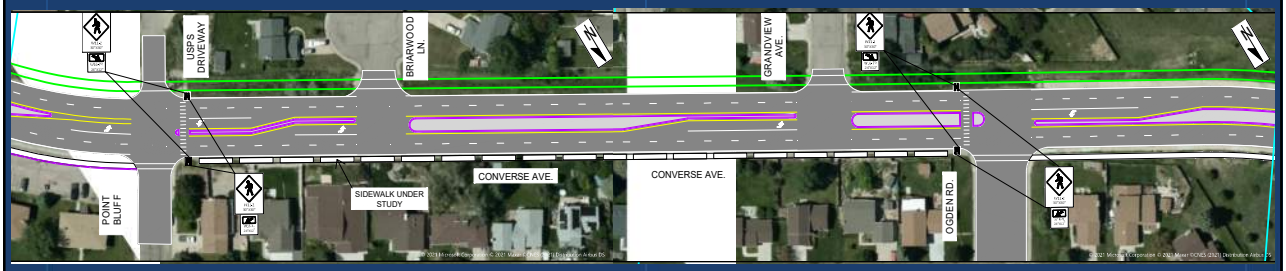
# 4-Lane Divided Roadway with Median




## US Post Office to north of Ogden Road

LEGEND
- CONCRETE PAVEMENT
- CONCRETE MEDIAN
- CONCRETE SIDEWALK
- CONCRETE CURB
- GREENWAY
- CENTERLINE PAVEMENT MARKING
- LANE LINE PAVEMENT MARKING
- CONTINUOUS LEFT-TURN LANE
- SIGN ON PERMANENT SUPPORT

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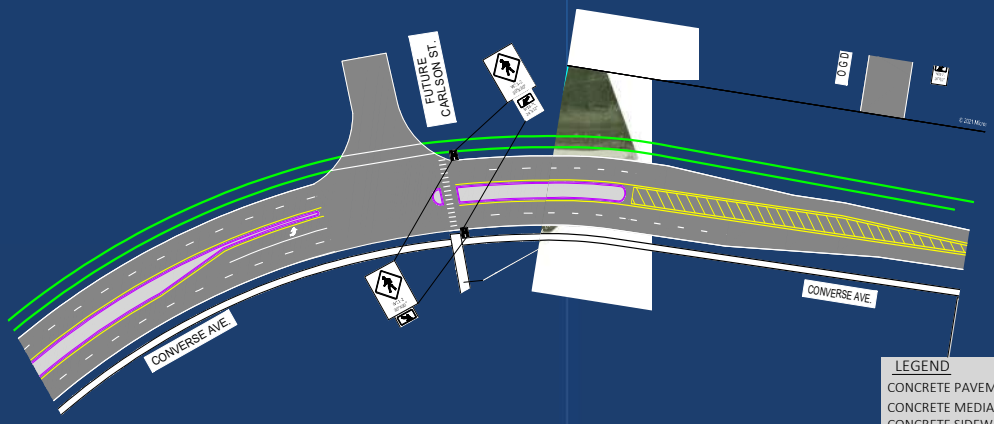
# 4-Lane Divided Roadway with Median




## North of Ogden Road to north of Carlson St

LEGEND
- CONCRETE PAVEMENT
- CONCRETE MEDIAN
- CONCRETE SIDEWALK
- CONCRETE CURB
- GREENWAY
- CENTERLINE PAVEMENT MARKING
- LANE LINE PAVEMENT MARKING
- CONTINUOUS LEFT-TURN LANE
- SIGN ON PERMANENT SUPPORT

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# 4-Lane Divided Roadway with Median

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# Poll question #8

Do you like the idea of a raised center median?

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# Engineering Improvements Under Study

1. Extension to Converse
   - Plainview Rd
   - Pattison Ave
   - Apache St
2. Extension to Storey; Ogden Rd or Mountain Rd
3. Traffic Signal Warrants
   - Point Bluff
   - Ogden Road
   - Carlson Street
4. Transit Stop Location

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# Poll question #9

How do you feel about traffic signals?

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# Other Chat question

What did we miss? What is the biggest need for Converse Avenue that we didn't touch on?

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# Other Chat questions

Where do you think a traffic signal would be beneficial?

Are there too many intersections on Converse?

Send your email address to jharris@cheyennempo.org

- Project Website
  - plancheyenne.org
    - > View Plans and Programs
    - > Converse Avenue Reconstruction Plan

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# Thank You!

We appreciate your time!

We appreciate this opportunity!

Send your email address to jharris@cheyennempo.org


- Public Information Meeting #2
  - Mid-May
- Project Website
  - plancheyenne.org
    - > View Plans and Programs
    - > Converse Avenue Reconstruction Plan

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# Converse Avenue Improvement Plan

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# Converse Avenue Improvement Plan

## Public Meeting #2
## May 26, 2021

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CONVERSE AVENUE Improvement Plan

## The Project Team

- Nathan Silberhorn, Ayers Associates
- Ken Voigt, Ayres Associates
- Darci Hendon, Summit Engineers
- Tom Mason, Cheyenne MPO
- Jillian Harris, Cheyenne MPO
- Christopher Yaney, Cheyenne MPO
- Tom Cobb, City of Cheyenne
- Anissa Gerard, City of Cheyenne

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# The Project

Scope:

Study and develop recommendations for the future Converse Avenue corridor

Limits:

Dell Range Blvd to north of Carlson Street

Goals:

- Identify the corridor roadway cross-section
- Improve intersection design and evaluate the need for traffic signals
- Minimize traffic conflicts through corridor access management
- Identify the community's vision for the corridor
- Enhance pedestrian and bicycle mobility and safety, including crossings of Converse Avenue and connections to other facilities

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# Step 1: Existing Conditions

- Lane marking & continuity issues, especially from Post Office to Dell Range
- Pedestrian access & safety issues
  - Pedestrian Crossing (at Dell Range crosswalk and mid-block)
- Pavement conditions; 25-30 years old
- Dry Creek culvert condition


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# Existing Conditions - Access

- Business accesses near Dry Creek bridge likely complicate traffic conflicts
- Tight right turn into Blackmarket/AAA
- Wrong-way traffic to Aspen Ridge
- US Post Office Truck entrance near Mason Way

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# Existing Conditions – Other Input

- SB left turns onto Dell Range
- EB left turns from Mason Way
- Crossing Converse Ave on foot


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## Step 2: Opportunities for Improvement

The corridor divides more than it connects

Connectivity

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## Opportunities for Improvement

### Pedestrian Considerations

- Sidewalks along
- Connections to
- Crossings of


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# Opportunities for Improvement

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## Greenway Considerations



- Continuing the Greenway corridor
- Ensure Greenway is accessible & ADA compliant

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# Opportunities for Improvement

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## Transit Considerations:

- Safe crossings & connections
- ADA accessibility to transit
- Separate transit stop from turn movements
- Consider additional bus stops and/or improvements



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# Freight Truck Accommodation

Dell Range Intersection

Post Office Truck Entrance

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# Study Intersections

1. Business accesses
2. Mason Way
3. USPS truck access
4. Point Bluff & USPS
5. Briarwood Lane
6. Grandview Avenue
7. Ogden Road
8. Future Carlson Street*


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## Study Evaluation Criteria

1. Safety
2. Traffic Operation
3. Speed Management
4. Pedestrian Friendliness
5. Connectivity
6. Right-of-way impacts
7. Drainage
8. Cost
9. Maintenance impacts

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## Step 3a: Public Involvement (direct)

### Initial Focus Groups

- Post Office
- Businesses

### Public Meeting #1 – March 3

- Project overview
- Asked polling questions
- Presented initial alternatives
- Invited live and online feedback

### Public Meeting #2 – May 26

- Project review
- Present study findings
- Present recommendations
- Invite live and online feedback

Document all feedback and post online

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# Step 3b: Public Involvement (via city presentations)

## MPO and City Committees

- MPO Technical Committee – May 19
- Citizens Advisory Committee – June 9
- Special Technical Committee – July 14
- City Planning Commission – July 19
- City Governing Body – August 9
- Public Service Committee – August 17
- City Governing Body – August 23
- MPO Policy Committee – September 22

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# Step 4: Traffic Analysis

Existing Conditions
- Traffic Volume Trends
- Safety
- Capacity

Future Conditions
- Land Use/Transportation Model
- Section 20 Growth

Corridor Templates and Cross Sections

Traffic Signals and Intersection Configurations

Access Management

Pedestrian Connectivity

These affect traffic!

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# Year 2045 Land Development Plan


**Future Land Use**

- Agricultural/Rural
- Rural Residential
- Urban Transition Residential
- Urban Residential
- Mixed-Use Residential
- Mixed-Use Commercial
- Mixed-Use Employment
- Industrial
- Central Business District
- Community Business
- Public and Quasi-Public
- Military/Federal
- Open Space and Parks

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## Existing Traffic


## 2045 Traffic


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# Existing Intersection Operation

| Mason Way Traffic Operations | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Scenario | Control | MOE | Movement | | | | | | OVERALL |
| | | | EBL | EBR | NBL | NBT | SBT | SBR | |
| 2020 Midday Existing | Stop | LOS | D | B | A | A | A | A | A |
| | | Delay (sec) | 28.1 | 10.8 | 8.6 | 0.0 | 0.0 | 0.0 | 7.1 |
| | | Queue (ft) | 50' | 50' | 25' | 0' | 0' | 0' | -- |
| 2020 PM Existing | Stop | LOS | F | B | A | A | A | A | B |
| | | Delay (sec) | 62.9 | 12.2 | 9.0 | 0.0 | 0.0 | 0.0 | 11.0 |
| | | Queue (ft) | 125' | 50' | 25' | 0' | 0' | 0' | -- |





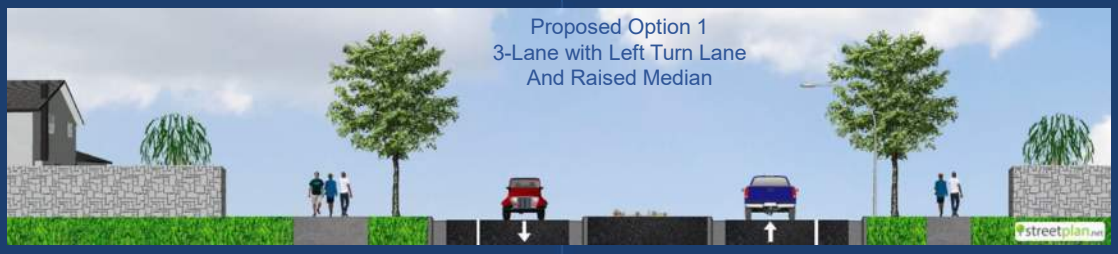


# Step 5(a): Evaluating Improvement Options

From existing 3-Lane with Continuous Left Turn Lane (CLTL)

1. Enhanced 3-Lane with CLTL (Shoulders, Raised Median, Tree Lawn)
2. 4-Lane Divided Roadway with CLTL (Raised Median & Tree Lawn)
3. Signalized Intersections (Mason Way, Point Bluff, & Carlson)
4. Roundabouts (Mason Way, Point Bluff, & Carlson)

# Enhanced 3-Lane Continuous Left Turn Lane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# Enhanced 3-Lane Continuous Left Turn Lane


## Dell Range Blvd to US Post Office

LEGEND
CONCRETE PAVEMENT
CONCRETE MEDIAN
CONCRETE SIDEWALK
CONCRETE CURB
GREENWAY
CENTERLINE PAVEMENT MARKING
LANE LINE PAVEMENT MARKING
CONTINUOUS LEFT-TURN LANE
SIGN ON PERMANENT SUPPORT

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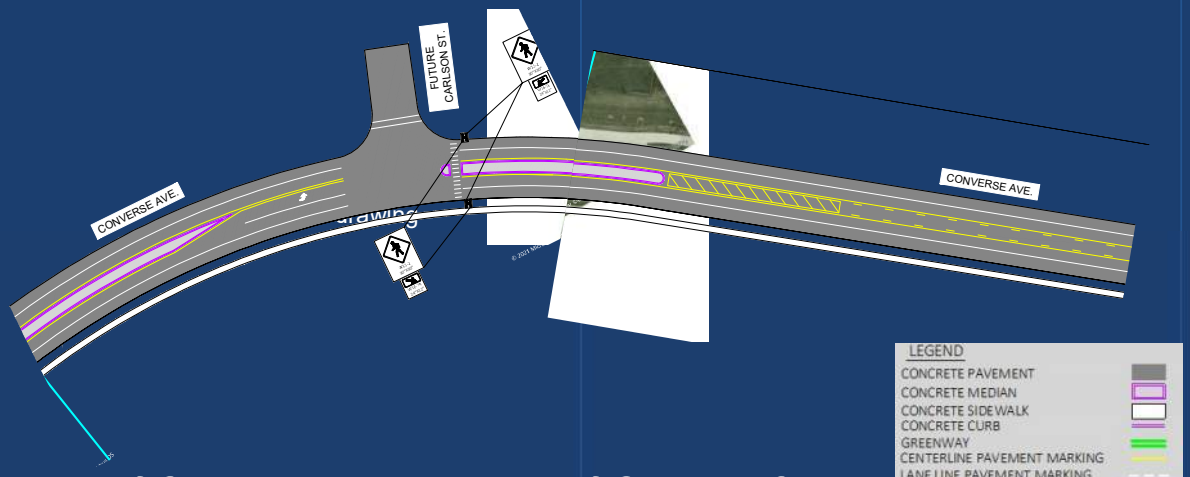
# Enhanced 3-Lane Continuous Left Turn Lane




North of Ogden Road to north of Carlson St

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# Converse Avenue today

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# Enhanced 3-Lane Continuous Left Turn Lane

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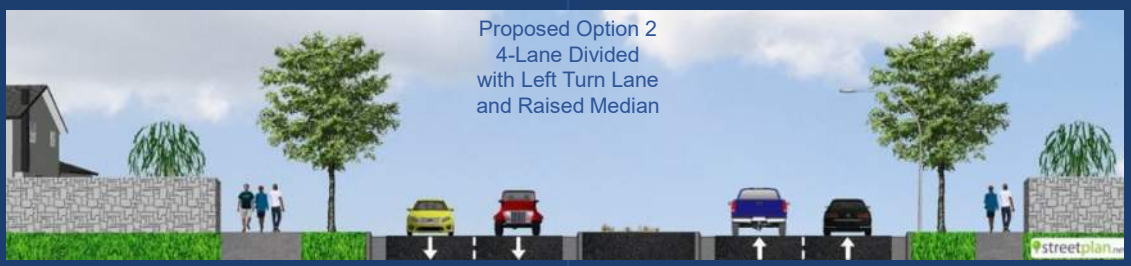
# 4-Lane Divided Roadway with Median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# 4-Lane Divided Roadway with Median


## Dell Range Blvd to US Post Office

LEGEND
- CONCRETE PAVEMENT
- CONCRETE MEDIAN
- CONCRETE SIDEWALK
- CONCRETE CURB
- GREENWAY
- CENTERLINE PAVEMENT MARKING
- LANE LINE PAVEMENT MARKING
- CONTINUOUS LEFT-TURN LANE
- SIGN ON PERMANENT SUPPORT

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# 4-Lane Divided Roadway with Median


## US Post Office to north of Ogden Road

LEGEND
- CONCRETE PAVEMENT
- CONCRETE MEDIAN
- CONCRETE SIDEWALK
- CONCRETE CURB
- GREENWAY
- CENTERLINE PAVEMENT MARKING
- LANE LINE PAVEMENT MARKING
- CONTINUOUS LEFT-TURN LANE
- SIGN ON PERMANENT SUPPORT

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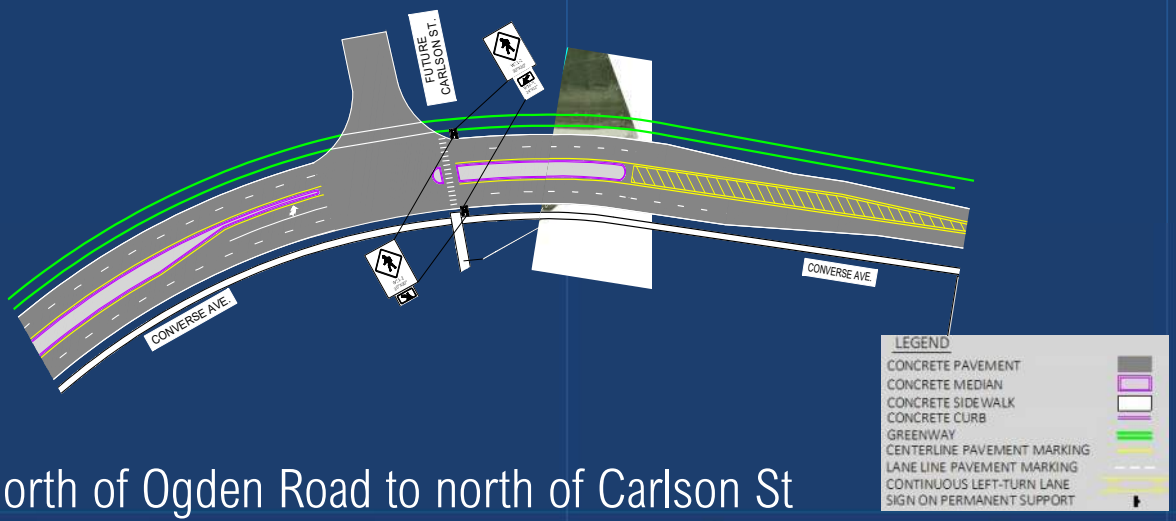
# 4-Lane Divided Roadway with Median




North of Ogden Road to north of Carlson St

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# 4-Lane Divided Roadway with Median

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# Step 5(b): Improvements Studied

1. Traffic Signal Warrants
   - Mason Way
   - Point Bluff
   - Ogden Road
   - Carlson Street
2. Roundabout Analysis
   - Point Bluff
   - Ogden Road
   - Carlson Street
3. Dell Range Modifications
   - SB lane configuration
   - Widening the NE turn Radius
4. Access Management
   - Business Accesses south of Dry Creek
   - Grandview Ave / Briarwood Lane
5. E-W Extension to Converse
   - Plainview Rd
   - Pattison Ave
   - Apache St

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# Improvements Studied

4. E-W Extension to Converse
   - Plainview Rd
   - Pattison Ave
   - Apache St


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# Step 6: Preliminary Recommendations

1. Modified 3-lane template (hybrid)
   - 5/6-lane section Dell Range to Post Office
   - Extend NB lane to Point Bluff (3+ Lane)
   - 3-lane north of Point Bluff
   - Low-profile median (raised in select locations)
   - Stamped concrete and/or xeriscape median
2. Traffic signal at Mason Way (soon)
3. Traffic signal at Point Bluff (future)
4. Roundabout at Carlson Street
5. Close the cul-de-sac at Briarwood Lane
6. Prohibit left turns at business accesses
7. Bury & pipe the ditch west of Converse
8. Extend Greenway south to Mason Way (connect existing Greenway going west)
9. Construct crosswalks at Carlson, Point Bluff, and Mason Way
10. E-W extension to Converse from:
    - Pattison or Apache to Carlson intersection*
    - Plainview to Converse*

*location not determined yet

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# Modified 5-Lane Divided Roadway with Variable Median


## Dell Range Blvd to US Post Office

- 6 lanes at Dell Range Intersection (maintain existing SB)
- Prohibited left turns from Aspen Ridge and Blackmarket
- Sliver ROW impacts at both corners
- Tree lawns on both Sides of Converse
- Complete sidewalk connections both sides of Converse
- Greenway connection and crosswalk at Mason Way

- 5 lanes at Mason Way
- 5 lanes at Post Office
- Widened Post Office Access
- Maintain existing bus stop
- Extend NB outside lane to Point Bluff

LEGEND
PAVEMENT
CONCRETE MEDIAN
STAMPED CONCRETE
CONCRETE SIDEWALK
CONCRETE CURB
GREENWAY
CENTERLINE PAVEMENT MARKING
LANE LINE PAVEMENT MARKING
CONTINUOUS LEFT-TURN LANE
SIGN ON PERMANENT SUPPORT

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# Modified 3-Lane Continuous Left Turn Lane


## US Post Office to Ogden Way

- NB outside lane extends to Point Bluff (becomes RT only)
- 3-lane section Point Bluff to Ogden Rd
- Crosswalk at Point Bluff
- Close off Briarwood Lane Cul-de-sac (fire access only)
- Variable median (raised at tapers to direct traffic/protect pedestrians)
- Extend existing Greenway to the south

- No anticipated ROW impacts
- Tree lawns on both sides

LEGEND
PAVEMENT
CONCRETE MEDIAN
STAMPED CONCRETE
CONCRETE SIDEWALK
CONCRETE CURB
GREENWAY
CENTERLINE PAVEMENT MARKING
LANE LINE PAVEMENT MARKING
CONTINUOUS LEFT-TURN LANE
SIGN ON PERMANENT SUPPORT

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# Modified 3-Lane Continuous Left Turn Lane


LEGEND
PAVEMENT
CONCRETE MEDIAN
STAMPED CONCRETE
CONCRETE SIDEWALK
CONCRETE CURB
GREENWAY
CENTERLINE PAVEMENT MARKING
LANE LINE PAVEMENT MARKING
CONTINUOUS LEFT-TURN LANE
SIGN ON PERMANENT SUPPORT

## Ogden Way to Carlson Street

- 3-lane section tapers to 2-lane for roundabout
- Variable median (raised at tapers to direct traffic)
- Connect existing Greenway to intersection sidewalks
- Tree lawns on both sides of Converse
- Minor ROW impacts at NW and SW corners
- Transition to existing 3-lane section

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## Questions and discussion

- Traffic Related
- Types of Function of Intersections
- Technical findings
- Levels of Service


## What's next?

### Walk the room & review the exhibits

- Use stickies to make notes on all boards
- Talk to us!!
- Fill out comment cards if you can't fit it on a sticky note

### Visit the MPO website

- plancheyenne.org > Plans & Programs
- Leave comments and feedback

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## Thank You!

We appreciate your time!

We appreciate this opportunity!

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# Converse Avenue Improvement Plan

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# Public Meeting Comment Log

# Converse Ave Public Meeting #2 Comment Log

| COMMENT | Comment/ Question | Answer |
|---|---|---|
| **COMMENT FORMS** | | |
| I'm concerned about the possibile use of Apache as a thru-way to Converse. It's a small residential street not suitable for traffic. Please urge the city to consider changes to long-established residential areas very carefully. | C | |
| Apache St. is too small & shouldn't go thru to Converse | C | |
| Apache is not good for a thru way - kids play in the road now. | C | |
| Apache is a narrow road that has always been a dead-end on the west side. I am very concerned about extending Apache to Converse. | | |
| What are the pros & cons of Apache going thru? | Q | Pros:<br>-Closest street to Carlson which minimizes construction impact and cost.<br>-Best alignment to intersect Converse Ave at 90° (the safest alignment)<br>-Apache would relieve much of the current NB neighborhood traffic at Odgen and Point Bluff intersections, but because it's not a through street to Dell Range, it would not attract use by through traffic.<br>-Apache/Pattison is the most logical connection between Anderson Elementary School and the proposed Ridge View Apartments for both cars and pedestrians.<br><br>Cons:<br>-As an existing dead-end street, an extension would have a greater negative effect on the west end residents than other options.<br>-If extended to Converse, Apache traffic would create an increased traffic conflict risk near a curve in Ogden, obstructing sight distance.<br>-Because Apache is not a through street to Dell Range or Ridge Road, it would not relieve as much traffic from Coverse Ave as the Plainview extension would.<br>-At +/-38' wide, Apache and Pattison are not likely wide enouvh to support incresed traffic compared to Ogden and Plainview (both 42' to 58' wide) |
| I live at the corner of Ogden & Apache. My concern is the school bus traffic and parents taking their children to Anderson Elementary School. Connecting Apache to Converse will greatly increase traffic at the corner of Ogden & Apache. Even now I have difficulty getting out of my driveway during school. | C | |
| School buses use Ogden as well as parents picking up and dropping off kids [at Anderson]. During these times it is very hard to get out of our driveway. | C | |
| I live on Briarwood. I'm not in favor of cutting off the access. Consider a right out. | C | |
| School bus stop on Briarwood (2 stops) - Emergency vehicles, snow plows make it a right turn/right out. This past winter snow was so high - if Briarwood had been closed they never would have gotten out. | C | |
| Briarwood Lane cul-de-sac should remain open, even if only a right hand turn. Shutting down would effect 1) Emergency vehicles in & out, it would be a safety issue. 2) School buses & bus stops on Briarwood - again, would create both an access & safety issue. 3) During snow storms the area drifts badly. This again, would create access problems for heavy equipment to clear snow. | C | |
| Please start on time! Don't want for late comers or people to take a seat. Go to the front and announce, "Folks, please take a seat so we can get started." It's been a long day, please don't waste my time. | C | |
| Need roads to go north to Storey, not west to Converse. | C | |
| Plan Ogden Rd and Mountain Rd to extend by getting either consent of ROW to help eliminate traffic congestion. Do it now! | C | The MPO has been working for many years with Mr. Cole to identify the appropriate street connections through the Section 20 parcel, and have already established and purchased easements to accommodate them. That is part of the planning process, and is done well in advance of road construction. Streets will not be built in those easements until development occurs, and there is very little way to know when that will happen. |
| Building Mountain & Ogden to North would help now; don't wait for development. | C | |
| City should consider impacts on long term residents (i.e. major changes to those who have lived in area for a long time). | C | |
| Has there been talk about Grandview to Mason Way? | Q | There was discussion during the Section 20 Study about extending Grandview to the south, but that discussion/negotiation did not result in any agreemetns. |
| Crosswalk (active ped crossing) crossing Converse [at] Ogden to take Grandkids to school at park. | C | The intersection does not meet traffic volume warrants for a signal, but we will review other warrants (including pedestrian volume/need) to see if a signal is warranted to provide safe crossing at this location. |
| More speed limit signs on Converse. Police Dept. needs to monitor traffic. | C | |
| Plainview detention pond w/ water & SAN line existing under/near it. | C | The Converse project is not yet at the design phase which is when we really start looking at project impacts and underground utilities (nor will this project impact that detention basin). We do know that there are utilities out there, and when a future project develops in the area of the detention pond, that project engineer will have to review, understand, and avaluate how any proposed changes to the ground will affect the utilities in the project area. |
| There is a very high water table; sump pumps run regularly now. Worried about how piping water will impact water table. Also want to know how any new development is going to affect the water table (i.e. runoff from development into detention ponds). | Q | Cheyenne requires new development to over-detain (developments now have to detain more water on-site than their property contributes to teh watershed). This will reduce the amount of water initially flowing into Dry Creek during a rain event and will reduce the chance of flooding, but will increase the amount of water temporarily stored in localized detention basins throughout the area. It is extremely difficult to determine how this might affect the water table in the area becasue there are so many variables. However, here are some things that would need to be studied to help understand it:<br>• Is the high ground water issue true for the whole neighborhood or only somes home or one particular area?<br>• Studying a detailed topographic map of the area may be helpful.<br>• Groundwater is controlled by terrain and soil types, so a soil map and geotechnical data will be needed<br>• Stormwater detention is temporary and may not impact groundwater levels very much<br>• If this is a repeated or continuing issue, a groundwater model may be needed to show that the added detention will not impact homeowners |

| | | |
|---|---|---|
| Who is going to address mosquito control on existing/proposed detension ponds? | Q | The detention ponds are specially design to collect water and then let it out slowly after the rain event is over to limit and control the amount of water entering the storm system. Because they are designed to drain out over a day or so, they do not generally invite mosquito breeding. *(we may note that during wet weeks standing water may occur for longer than a few days)* |
| Fire station off of Dell Range & move it to Converse to decrease response time. | C | |
| SW corner of Mason Way & Converse - What is it zoned? | Q | The parcel is zoned CB (Commercial Business) |
| Truck traffic; will a roundabout keep trucks off the road? | Q | This was a discussion toipic during the Post Office Focus Group. They are as frustrated with trucks using wrong routes as the public is. They do instruct their fleet to use certain roads (particularly Converse north to Storey/Powderhouse/Iron Mountain/I-25). Unfortunately they cannot control out of state and out of area trucks that use the wrong routes.<br>Roundabouts generally work better for large trucks than standard intersections at many locations. This of course is dependent on proper design of the roundabout and proper navigation of the roundabout by the truck driver. Properly designed roundabouts accomodate large truck traffic and encourage slow speeds. |
| Truck traffic; Left turning trucks from Dell Range to Converse is hard - Cars have to move back sometimes. | Q | There are a few ways to help with large truck left turn movement; we may evaluate pulling back the southbound left turn lanes to allow for large truck to maneuver through a left turn from Dell Range Blvd to Converse Ave. This would require changes to the Stop bar locations (none are currently painted at the Dell Range intersection). Another idea is to increase the radius at the corner to allow large trucks to make a wider turn to avoid encroaching into the left turn lane. |
| What bicycle accomodations will be provided? | Q | The project recommends the addition of a full 6' shoulder to each direction of traffic, as well as extending the 10' Greenway west of Converse from Odgen down to Mason Way. The intent is to encourage cyclists to use the off-street Greenway system. |
| You say that this project won't likely be built for 5 or more years; won't we just have to pay for another study then based on new traffic numbers. It's very frustrating to use tax pay $ now for a study without funds to build for 6 years. | C | The project has developed 2045 traffic volumes based on known, planned development in Section 20, and recommendations are designed to accommodate that future volume. In addition, we know there will be at least two connections to Storey Blvd east of Converse that will help distribute traffic. |
| Will construction shut down Converse completely? How come Mountain can't go thru to Storey? Rationale for Plainview, etc. to Converse? | Q | It's imposible to predict how a contractor may choose to stage construction, but the City will almost certainly limit or prohibit full closures of Converse during construction. In all liklihood, at least one lane in each direction will be maintained at all times, with specific, short duration closures of side streets (for example to pave an intersection). Becasue much of the widened road can be built to the west of the existing road, impacts north of Mason way will probably be limited. Impacts between Mason Way and Dell Range will probably be more significant and delays are likely, especially during rush hours. |
| Traffic Counts; How do you know if the counts are good compared to counts taken now? | Q | The previous three counts are reviewed to help determine the percentage of growth per year. The percentage of growth is added each year from the last count year to present count year and compare with current count taken. Housing is looked at and factors into the number of trips each house hold generate (to and from work, grocery stores, restaurants and entertainment sites) to determine the volumes of traffic generated in the area. All of this data is applied to an algorithm that will develop to and from trips and then calculate the volume of traffic on each road section as well as factoring a percentage of change from past counts and compared to present counts and a factored adjustment is made to help determine the volume of traffic during our off year (Covid) count growth. This calculation is also a factor when comparing winter/summer counts vs school season counts. |
| Dell Range Intersection; What is going to be done at the intersection of Dell Range Blvd & Converse Ave? | Q | Converse Ave at the intersection of Dell Range Blvd is being evaluated with the Converse Ave Corridor project. This project is looking at what is needed on Converse to help improve the function of the two access points nearest to the intersection. The study is looking at the number of lanes needed for northbound through, southbound through, and southbound left turns. The recommendation is to build two northbound through lanes instead of one. Changing the SB lane configuration will require major changes to the intersection traffic signal and signal timing mechanisms. However, the City is evaluating this as an option when the Converse project goes into final design and construction (date and funding not identified).<br><br>The intersection of Dell Range and Converse is itself a separate, complex project that has already been evaluated with a recommendation to convert it to a Continuous-Flow Intersection (CFI), which will have greater impacts to Converse, Dell Range, and the adjacent properties than the Converse Ave project will have. |
| | | |
| **NOTES** | | |
| Items investigated after PIM#2 based on comments made during PIM#2. Not to be posted publicly, but to be kept in the project files.<br>Bus Stops in Century West subdivision: | | |
| **Q1:** Why do buses go into [Century West] subdivision? (Is it because kids crossing Converse isn't safe? Are they special needs buses? Is the distance to Anderson and/or the Jr. or Sr. High too far?) | | **A1:** LCSD1 picks up students in this area for Meadowlark, Carey, and East. The distance is outside the statutory no transportation zone. However, we do pick up some Anderson students who may be siblings of Meadowlark students. The current route picks up in the area, proceeds to Anderson, then to Meadowlark. |
| **Q2:** If we add a cross walk at Ogden – does that eliminate the need for the elementary bus at least? | | A2: We would still pick up secondary students in this area. The city has expressed concerns about adding crosswalks mid-block in previous meetings. In theory, a crosswalk could eliminate an elementary bus stop in the neighborhood but would need to be discussed with our Transportation Advisory Committee. |
| **Q3:** What would the District's thoughts be to closing the Briarwood Lane access to Converse? | | A3: [LCSD1] Transportation doesn't have an issue with the plan if the cul-de-sac is large enough to accommodate a full-size school bus without a need to backup. |

# Appendix C

## Traffic Analysis Technical Documents

# Converse Avenue Corridor Traffic Study
# Technical Supplement

Image courtesy of Google Maps

CONVERSE AVENUE
Improvement Plan

**Prepared by: Ayres Associates**

AYRES

**April 7, 2021**

# Table of Contents

# 1. Enhanced Three-Lane Roadway with Continuous Left Turn Lane Concept Drawings

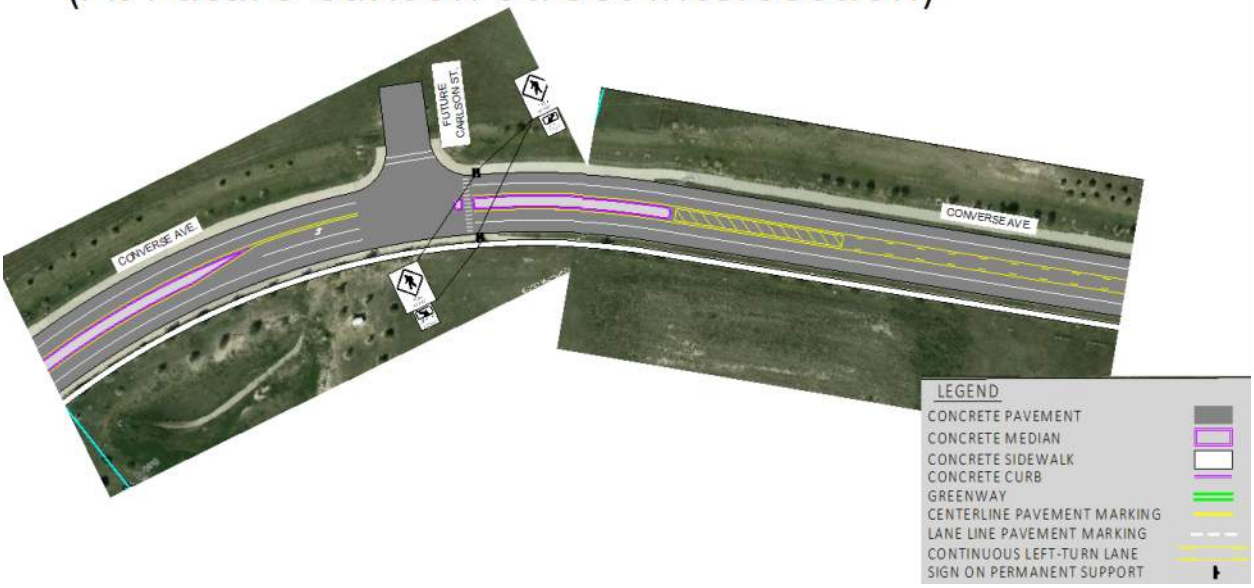
# Enhanced 3-Lane Continuous Turn Lane Concept (Dell Range Boulevard to USPS Truck Driveway)


LEGEND
- CONCRETE PAVEMENT
- CONCRETE MEDIAN
- CONCRETE SIDEWALK
- CONCRETE CURB
- GREENWAY
- CENTERLINE PAVEMENT MARKING
- LANE LINE PAVEMENT MARKING
- CONTINUOUS LEFT-TURN LANE
- SIGN ON PERMANENT SUPPORT

# Enhanced 3-Lane Continuous Turn Lane Concept (Point Bluff to Ogden Road)


LEGEND
- CONCRETE PAVEMENT
- CONCRETE MEDIAN
- CONCRETE SIDEWALK
- CONCRETE CURB
- GREENWAY
- CENTERLINE PAVEMENT MARKING
- LANE LINE PAVEMENT MARKING
- CONTINUOUS LEFT-TURN LANE
- SIGN ON PERMANENT SUPPORT

# Enhanced 3-Lane Continuous Turn Lane Concept (At Future Carlson Street Intersection)



## 2. Four-Lane Divided Roadway with Raised Median Concept Drawings

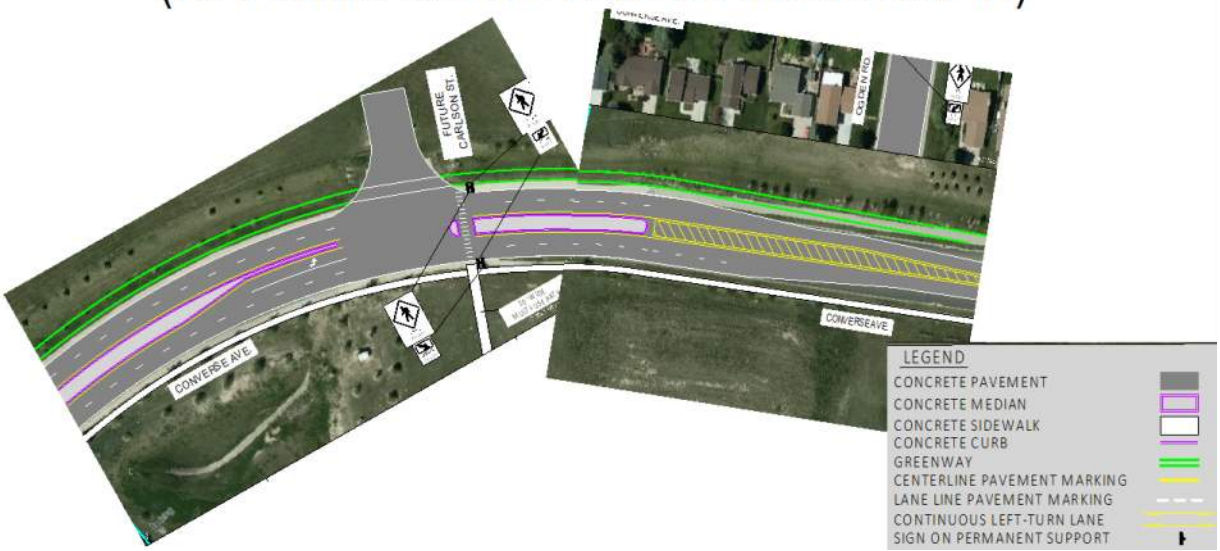
# 4-Lane Divided Roadway with Median
# (Dell Range Boulevard to USPS Truck Driveway)


LEGEND
- CONCRETE PAVEMENT
- CONCRETE MEDIAN
- CONCRETE SIDEWALK
- CONCRETE CURB
- GREENWAY
- CENTERLINE PAVEMENT MARKING
- LANE LINE PAVEMENT MARKING
- CONTINUOUS LEFT-TURN LANE
- SIGN ON PERMANENT SUPPORT

# 4-Lane Divided Roadway with Median
# (Point Bluff to Ogden Road)


LEGEND
- CONCRETE PAVEMENT
- CONCRETE MEDIAN
- CONCRETE SIDEWALK
- CONCRETE CURB
- GREENWAY
- CENTERLINE PAVEMENT MARKING
- LANE LINE PAVEMENT MARKING
- CONTINUOUS LEFT-TURN LANE
- SIGN ON PERMANENT SUPPORT

# 4-Lane Divided Roadway with Median
# (At Future Carlson Street Intersection)



# 3a.i) Existing 2020 Mid-Day Peak Hour Intersection Operation Computer Capacity Worksheets

| Intersection | |
|---|---|
| Int Delay, s/veh | 7.1 |

| Movement | EBL | EBR | NBL | NBT | SBT | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 100 | 245 | 235 | 190 | 170 | 130 |
| Future Vol, veh/h | 100 | 245 | 235 | 190 | 170 | 130 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Stop | Stop | Free | Free | Free | Free |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | 100 | 0 | 100 | - | - | 75 |
| Veh in Median Storage, # | 0 | - | - | 0 | 0 | - |
| Grade, % | 0 | - | - | 0 | 0 | - |
| Peak Hour Factor | 89 | 97 | 97 | 97 | 97 | 97 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 112 | 253 | 242 | 196 | 175 | 134 |

| Major/Minor | Minor2 | | Major1 | | Major2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 855 | 175 | 309 | 0 | - | 0 |
| Stage 1 | 175 | - | - | - | - | - |
| Stage 2 | 680 | - | - | - | - | - |
| Critical Hdwy | 6.42 | 6.22 | 4.12 | - | - | - |
| Critical Hdwy Stg 1 | 5.42 | - | - | - | - | - |
| Critical Hdwy Stg 2 | 5.42 | - | - | - | - | - |
| Follow-up Hdwy | 3.518 | 3.318 | 2.218 | - | - | - |
| Pot Cap-1 Maneuver | 329 | 868 | 1252 | - | - | - |
| Stage 1 | 855 | - | - | - | - | - |
| Stage 2 | 503 | - | - | - | - | - |
| Platoon blocked, % | | | | - | - | - |
| Mov Cap-1 Maneuver | 266 | 868 | 1252 | - | - | - |
| Mov Cap-2 Maneuver | 266 | - | - | - | - | - |
| Stage 1 | 690 | - | - | - | - | - |
| Stage 2 | 503 | - | - | - | - | - |

| Approach | EB | NB | SB |
|---|---|---|---|
| HCM Control Delay, s | 16.1 | 4.7 | 0 |
| HCM LOS | C | | |

| Minor Lane/Major Mvmt | NBL | NBT | EBLn1 | EBLn2 | SBT | SBR |
|---|---|---|---|---|---|---|
| Capacity (veh/h) | 1252 | - | 266 | 868 | - | - |
| HCM Lane V/C Ratio | 0.194 | - | 0.422 | 0.291 | - | - |
| HCM Control Delay (s) | 8.6 | - | 28.1 | 10.8 | - | - |
| HCM Lane LOS | A | - | D | B | - | - |
| HCM 95th %tile Q(veh) | 0.7 | - | 2 | 1.2 | - | - |

| Intersection | |
|---|---|
| Int Delay, s/veh | 3.1 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 20 | 255 | 5 | 5 | 225 | 90 | 5 | 0 | 5 | 105 | 0 | 10 |
| Future Vol, veh/h | 20 | 255 | 5 | 5 | 225 | 90 | 5 | 0 | 5 | 105 | 0 | 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 | 50 | - | - | 75 | - | - | - | - | - | - | - | - |
| Veh in Median Storage, # | - | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - |
| Grade, % | - | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - |
| Peak Hour Factor | 97 | 97 | 97 | 97 | 97 | 97 | 97 | 97 | 97 | 97 | 97 | 97 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 21 | 263 | 5 | 5 | 232 | 93 | 5 | 0 | 5 | 108 | 0 | 10 |

| Major/Minor | Major1 | | | Major2 | | | Minor1 | | | Minor2 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Conflicting Flow All | 325 | 0 | 0 | 268 | 0 | 0 | 602 | 643 | 266 | 599 | 599 | 279 |
| Stage 1 | - | - | - | - | - | - | 308 | 308 | - | 289 | 289 | - |
| Stage 2 | - | - | - | - | - | - | 294 | 335 | - | 310 | 310 | - |
| Critical Hdwy | 4.12 | - | - | 4.12 | - | - | 7.12 | 6.52 | 6.22 | 7.12 | 6.52 | 6.22 |
| Critical Hdwy Stg 1 | - | - | - | - | - | - | 6.12 | 5.52 | - | 6.12 | 5.52 | - |
| Critical Hdwy Stg 2 | - | - | - | - | - | - | 6.12 | 5.52 | - | 6.12 | 5.52 | - |
| Follow-up Hdwy | 2.218 | - | - | 2.218 | - | - | 3.518 | 4.018 | 3.318 | 3.518 | 4.018 | 3.318 |
| Pot Cap-1 Maneuver | 1235 | - | - | 1296 | - | - | 412 | 392 | 773 | 413 | 415 | 760 |
| Stage 1 | - | - | - | - | - | - | 702 | 660 | - | 719 | 673 | - |
| Stage 2 | - | - | - | - | - | - | 714 | 643 | - | 700 | 659 | - |
| Platoon blocked, % | | - | - | | - | - | | | | | | |
| Mov Cap-1 Maneuver | 1235 | - | - | 1296 | - | - | 400 | 384 | 773 | 404 | 406 | 760 |
| Mov Cap-2 Maneuver | - | - | - | - | - | - | 400 | 384 | - | 404 | 406 | - |
| Stage 1 | - | - | - | - | - | - | 690 | 649 | - | 707 | 670 | - |
| Stage 2 | - | - | - | - | - | - | 702 | 640 | - | 684 | 648 | - |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| HCM Control Delay, s | 0.6 | 0.1 | 12 | 16.9 |
| HCM LOS | | | B | C |

| Minor Lane/Major Mvmt | NBLn1 | EBL | EBT | EBR | WBL | WBT | WBR | SBLn1 |
|---|---|---|---|---|---|---|---|---|
| Capacity (veh/h) | 527 | 1235 | - | - | 1296 | - | - | 421 |
| HCM Lane V/C Ratio | 0.02 | 0.017 | - | - | 0.004 | - | - | 0.282 |
| HCM Control Delay (s) | 12 | 8 | - | - | 7.8 | - | - | 16.9 |
| HCM Lane LOS | B | A | - | - | A | - | - | C |
| HCM 95th %tile Q(veh) | 0.1 | 0.1 | - | - | 0 | - | - | 1.1 |

| Intersection | |
|---|---|
| Int Delay, s/veh | 1 |

| Movement | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 15 | 230 | 200 | 15 | 15 | 20 |
| Future Vol, veh/h | 15 | 230 | 200 | 15 | 15 | 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 | 100 | - | - | - | 0 | 0 |
| Veh in Median Storage, # | - | 0 | 0 | - | 0 | - |
| Grade, % | - | 0 | 0 | - | 0 | - |
| Peak Hour Factor | 97 | 97 | 97 | 97 | 97 | 97 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 15 | 237 | 206 | 15 | 15 | 21 |

| Major/Minor | Major1 | | Major2 | | Minor2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 221 | 0 | - | 0 | 481 | 214 |
| Stage 1 | - | - | - | - | 214 | - |
| Stage 2 | - | - | - | - | 267 | - |
| 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 | 1348 | - | - | - | 544 | 826 |
| Stage 1 | - | - | - | - | 822 | - |
| Stage 2 | - | - | - | - | 778 | - |
| Platoon blocked, % | | - | - | - | | |
| Mov Cap-1 Maneuver | 1348 | - | - | - | 538 | 826 |
| Mov Cap-2 Maneuver | - | - | - | - | 608 | - |
| Stage 1 | - | - | - | - | 813 | - |
| Stage 2 | - | - | - | - | 778 | - |

| Approach | EB | WB | SB |
|---|---|---|---|
| HCM Control Delay, s | 0.5 | 0 | 10.2 |
| HCM LOS | | | B |

| Minor Lane/Major Mvmt | EBL | EBT | WBT | WBR | SBLn1 | SBLn2 |
|---|---|---|---|---|---|---|
| Capacity (veh/h) | 1348 | - | - | - | 608 | 826 |
| HCM Lane V/C Ratio | 0.011 | - | - | - | 0.025 | 0.025 |
| HCM Control Delay (s) | 7.7 | - | - | - | 11.1 | 9.5 |
| HCM Lane LOS | A | - | - | - | B | A |
| HCM 95th %tile Q(veh) | 0 | - | - | - | 0.1 | 0.1 |

| Intersection | |
|---|---|
| Int Delay, s/veh | 0.3 |

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 275 | 0 | 5 | 235 | 5 | 5 |
| Future Vol, veh/h | 275 | 0 | 5 | 235 | 5 | 5 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Free | Free | Free | Free | Stop | Stop |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | - | - | 50 | - | 0 | - |
| Veh in Median Storage, # | 0 | - | - | 0 | 0 | - |
| Grade, % | 0 | - | - | 0 | 0 | - |
| Peak Hour Factor | 97 | 97 | 97 | 97 | 97 | 97 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 284 | 0 | 5 | 242 | 5 | 5 |

| Major/Minor | Major1 | | Major2 | | Minor1 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 0 | 0 | 284 | 0 | 536 | 284 |
| Stage 1 | - | - | - | - | 284 | - |
| Stage 2 | - | - | - | - | 252 | - |
| 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 | - | - | 1278 | - | 505 | 755 |
| Stage 1 | - | - | - | - | 764 | - |
| Stage 2 | - | - | - | - | 790 | - |
| Platoon blocked, % | - | - | | - | | |
| Mov Cap-1 Maneuver | - | - | 1278 | - | 503 | 755 |
| Mov Cap-2 Maneuver | - | - | - | - | 583 | - |
| Stage 1 | - | - | - | - | 764 | - |
| Stage 2 | - | - | - | - | 787 | - |

| Approach | EB | WB | NB |
|---|---|---|---|
| HCM Control Delay, s | 0 | 0.2 | 10.6 |
| HCM LOS | | | B |

| Minor Lane/Major Mvmt | NBLn1 | EBT | EBR | WBL | WBT |
|---|---|---|---|---|---|
| Capacity (veh/h) | 658 | - | - | 1278 | - |
| HCM Lane V/C Ratio | 0.016 | - | - | 0.004 | - |
| HCM Control Delay (s) | 10.6 | - | - | 7.8 | - |
| HCM Lane LOS | B | - | - | A | - |
| HCM 95th %tile Q(veh) | 0 | - | - | 0 | - |

| Intersection | |
|---|---|
| Int Delay, s/veh | 0.3 |

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 245 | 0 | 5 | 210 | 5 | 5 |
| Future Vol, veh/h | 245 | 0 | 5 | 210 | 5 | 5 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Free | Free | Free | Free | Stop | Stop |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | - | - | 200 | - | 0 | - |
| Veh in Median Storage, # | 0 | - | - | 0 | 0 | - |
| Grade, % | 0 | - | - | 0 | 0 | - |
| Peak Hour Factor | 97 | 97 | 97 | 97 | 97 | 97 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 253 | 0 | 5 | 216 | 5 | 5 |

| Major/Minor | Major1 | | Major2 | | Minor1 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 0 | 0 | 253 | 0 | 479 | 253 |
| Stage 1 | - | - | - | - | 253 | - |
| Stage 2 | - | - | - | - | 226 | - |
| 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 | - | - | 1312 | - | 545 | 786 |
| Stage 1 | - | - | - | - | 789 | - |
| Stage 2 | - | - | - | - | 812 | - |
| Platoon blocked, % | - | - | | - | | |
| Mov Cap-1 Maneuver | - | - | 1312 | - | 543 | 786 |
| Mov Cap-2 Maneuver | - | - | - | - | 612 | - |
| Stage 1 | - | - | - | - | 789 | - |
| Stage 2 | - | - | - | - | 809 | - |

| Approach | EB | WB | NB |
|---|---|---|---|
| HCM Control Delay, s | 0 | 0.2 | 10.3 |
| HCM LOS | | | B |

| Minor Lane/Major Mvmt | NBLn1 | EBT | EBR | WBL | WBT |
|---|---|---|---|---|---|
| Capacity (veh/h) | 688 | - | - | 1312 | - |
| HCM Lane V/C Ratio | 0.015 | - | - | 0.004 | - |
| HCM Control Delay (s) | 10.3 | - | - | 7.8 | - |
| HCM Lane LOS | B | - | - | A | - |
| HCM 95th %tile Q(veh) | 0 | - | - | 0 | - |

# 3a.ii) Existing 2020 PM Peak Hour Intersection Operation Computer Capacity Worksheets

| Intersection | |
|---|---|
| Int Delay, s/veh | 11 |

| Movement | EBL | EBR | NBL | NBT | SBT | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 115 | 295 | 255 | 275 | 210 | 150 |
| Future Vol, veh/h | 115 | 295 | 255 | 275 | 210 | 150 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Stop | Stop | Free | Free | Free | Free |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | 100 | 0 | 100 | - | - | 75 |
| Veh in Median Storage, # | 0 | - | - | 0 | 0 | - |
| Grade, % | 0 | - | - | 0 | 0 | - |
| Peak Hour Factor | 79 | 91 | 95 | 95 | 95 | 95 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 5 | 5 |
| Mvmt Flow | 146 | 324 | 268 | 289 | 221 | 158 |

| Major/Minor | Minor2 | | Major1 | | Major2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 1046 | 221 | 379 | 0 | - | 0 |
| Stage 1 | 221 | - | - | - | - | - |
| Stage 2 | 825 | - | - | - | - | - |
| Critical Hdwy | 6.42 | 6.22 | 4.12 | - | - | - |
| Critical Hdwy Stg 1 | 5.42 | - | - | - | - | - |
| Critical Hdwy Stg 2 | 5.42 | - | - | - | - | - |
| Follow-up Hdwy | 3.518 | 3.318 | 2.218 | - | - | - |
| Pot Cap-1 Maneuver | 253 | 819 | 1179 | - | - | - |
| Stage 1 | 816 | - | - | - | - | - |
| Stage 2 | 430 | - | - | - | - | - |
| Platoon blocked, % | | | | - | - | - |
| Mov Cap-1 Maneuver | 196 | 819 | 1179 | - | - | - |
| Mov Cap-2 Maneuver | 196 | - | - | - | - | - |
| Stage 1 | 631 | - | - | - | - | - |
| Stage 2 | 430 | - | - | - | - | - |

| Approach | EB | NB | SB |
|---|---|---|---|
| HCM Control Delay, s | 27.9 | 4.3 | 0 |
| HCM LOS | D | | |

| Minor Lane/Major Mvmt | NBL | NBT | EBLn1 | EBLn2 | SBT | SBR |
|---|---|---|---|---|---|---|
| Capacity (veh/h) | 1179 | - | 196 | 819 | - | - |
| HCM Lane V/C Ratio | 0.228 | - | 0.743 | 0.396 | - | - |
| HCM Control Delay (s) | 9 | - | 62.9 | 12.2 | - | - |
| HCM Lane LOS | A | - | F | B | - | - |
| HCM 95th %tile Q(veh) | 0.9 | - | 4.9 | 1.9 | - | - |

| 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 | 15 | 220 | 5 | 15 | 235 | 105 | 5 | 0 | 5 | 90 | 0 | 20 |
| Future Vol, veh/h | 15 | 220 | 5 | 15 | 235 | 105 | 5 | 0 | 5 | 90 | 0 | 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 | 50 | - | - | 75 | - | - | - | - | - | - | - | - |
| 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, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 17 | 247 | 6 | 17 | 264 | 118 | 6 | 0 | 6 | 101 | 0 | 22 |

| Major/Minor | Major1 | | | Major2 | | | Minor1 | | | Minor2 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Conflicting Flow All | 382 | 0 | 0 | 253 | 0 | 0 | 652 | 700 | 250 | 644 | 644 | 323 |
| Stage 1 | - | - | - | - | - | - | 284 | 284 | - | 357 | 357 | - |
| Stage 2 | - | - | - | - | - | - | 368 | 416 | - | 287 | 287 | - |
| Critical Hdwy | 4.12 | - | - | 4.12 | - | - | 7.12 | 6.52 | 6.22 | 7.12 | 6.52 | 6.22 |
| Critical Hdwy Stg 1 | - | - | - | - | - | - | 6.12 | 5.52 | - | 6.12 | 5.52 | - |
| Critical Hdwy Stg 2 | - | - | - | - | - | - | 6.12 | 5.52 | - | 6.12 | 5.52 | - |
| Follow-up Hdwy | 2.218 | - | - | 2.218 | - | - | 3.518 | 4.018 | 3.318 | 3.518 | 4.018 | 3.318 |
| Pot Cap-1 Maneuver | 1176 | - | - | 1312 | - | - | 381 | 363 | 789 | 386 | 391 | 718 |
| Stage 1 | - | - | - | - | - | - | 723 | 676 | - | 661 | 628 | - |
| Stage 2 | - | - | - | - | - | - | 652 | 592 | - | 720 | 674 | - |
| Platoon blocked, % | | - | - | | - | - | | | | | | |
| Mov Cap-1 Maneuver | 1176 | - | - | 1312 | - | - | 362 | 353 | 789 | 375 | 380 | 718 |
| Mov Cap-2 Maneuver | - | - | - | - | - | - | 362 | 353 | - | 375 | 380 | - |
| Stage 1 | - | - | - | - | - | - | 713 | 667 | - | 652 | 620 | - |
| Stage 2 | - | - | - | - | - | - | 623 | 584 | - | 705 | 665 | - |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| HCM Control Delay, s | 0.5 | 0.3 | 12.4 | 17.5 |
| HCM LOS | | | B | C |

| Minor Lane/Major Mvmt | NBLn1 | EBL | EBT | EBR | WBL | WBT | WBR | SBLn1 |
|---|---|---|---|---|---|---|---|---|
| Capacity (veh/h) | 496 | 1176 | - | - | 1312 | - | - | 411 |
| HCM Lane V/C Ratio | 0.023 | 0.014 | - | - | 0.013 | - | - | 0.301 |
| HCM Control Delay (s) | 12.4 | 8.1 | - | - | 7.8 | - | - | 17.5 |
| HCM Lane LOS | B | A | - | - | A | - | - | C |
| HCM 95th %tile Q(veh) | 0.1 | 0 | - | - | 0 | - | - | 1.2 |

| Intersection | |
|---|---|
| Int Delay, s/veh | 1.9 |

| Movement | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 40 | 235 | 275 | 20 | 35 | 45 |
| Future Vol, veh/h | 40 | 235 | 275 | 20 | 35 | 45 |
| 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 | - | - | - | 0 | 0 |
| Veh in Median Storage, # | - | 0 | 0 | - | 0 | - |
| Grade, % | - | 0 | 0 | - | 0 | - |
| Peak Hour Factor | 90 | 90 | 90 | 90 | 90 | 90 |
| Heavy Vehicles, % | 5 | 5 | 2 | 2 | 5 | 5 |
| Mvmt Flow | 44 | 261 | 306 | 22 | 39 | 50 |

| Major/Minor | Major1 | | Major2 | | Minor2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 328 | 0 | - | 0 | 666 | 317 |
| Stage 1 | - | - | - | - | 317 | - |
| Stage 2 | - | - | - | - | 349 | - |
| Critical Hdwy | 4.15 | - | - | - | 6.45 | 6.25 |
| Critical Hdwy Stg 1 | - | - | - | - | 5.45 | - |
| Critical Hdwy Stg 2 | - | - | - | - | 5.45 | - |
| Follow-up Hdwy | 2.245 | - | - | - | 3.545 | 3.345 |
| Pot Cap-1 Maneuver | 1215 | - | - | - | 420 | 717 |
| Stage 1 | - | - | - | - | 732 | - |
| Stage 2 | - | - | - | - | 707 | - |
| Platoon blocked, % | | - | - | - | | |
| Mov Cap-1 Maneuver | 1215 | - | - | - | 405 | 717 |
| Mov Cap-2 Maneuver | - | - | - | - | 507 | - |
| Stage 1 | - | - | - | - | 706 | - |
| Stage 2 | - | - | - | - | 707 | - |

| Approach | EB | WB | SB |
|---|---|---|---|
| HCM Control Delay, s | 1.2 | 0 | 11.4 |
| HCM LOS | | | B |

| Minor Lane/Major Mvmt | EBL | EBT | WBT | WBR | SBLn1 | SBLn2 |
|---|---|---|---|---|---|---|
| Capacity (veh/h) | 1215 | - | - | - | 507 | 717 |
| HCM Lane V/C Ratio | 0.037 | - | - | - | 0.077 | 0.07 |
| HCM Control Delay (s) | 8.1 | - | - | - | 12.7 | 10.4 |
| HCM Lane LOS | A | - | - | - | B | B |
| HCM 95th %tile Q(veh) | 0.1 | - | - | - | 0.2 | 0.2 |

| Intersection | |
|---|---|
| Int Delay, s/veh | 0.4 |

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 235 | 0 | 10 | 250 | 5 | 5 |
| Future Vol, veh/h | 235 | 0 | 10 | 250 | 5 | 5 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Free | Free | Free | Free | Stop | Stop |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | - | - | 50 | - | 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 | 261 | 0 | 11 | 278 | 6 | 6 |

| Major/Minor | Major1 | | Major2 | | Minor1 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 0 | 0 | 261 | 0 | 561 | 261 |
| Stage 1 | - | - | - | - | 261 | - |
| Stage 2 | - | - | - | - | 300 | - |
| 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 | - | - | 1303 | - | 489 | 778 |
| Stage 1 | - | - | - | - | 783 | - |
| Stage 2 | - | - | - | - | 752 | - |
| Platoon blocked, % | - | - | | - | | |
| Mov Cap-1 Maneuver | - | - | 1303 | - | 485 | 778 |
| Mov Cap-2 Maneuver | - | - | - | - | 570 | - |
| Stage 1 | - | - | - | - | 783 | - |
| Stage 2 | - | - | - | - | 746 | - |

| Approach | EB | WB | NB |
|---|---|---|---|
| HCM Control Delay, s | 0 | 0.3 | 10.6 |
| HCM LOS | | | B |

| Minor Lane/Major Mvmt | NBLn1 | EBT | EBR | WBL | WBT |
|---|---|---|---|---|---|
| Capacity (veh/h) | 658 | - | - | 1303 | - |
| HCM Lane V/C Ratio | 0.017 | - | - | 0.009 | - |
| HCM Control Delay (s) | 10.6 | - | - | 7.8 | - |
| HCM Lane LOS | B | - | - | A | - |
| HCM 95th %tile Q(veh) | 0.1 | - | - | 0 | - |

| Intersection | |
|---|---|
| Int Delay, s/veh | 0.2 |

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 270 | 0 | 5 | 290 | 5 | 5 |
| Future Vol, veh/h | 270 | 0 | 5 | 290 | 5 | 5 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Free | Free | Free | Free | Stop | Stop |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | - | - | 200 | - | 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 | 300 | 0 | 6 | 322 | 6 | 6 |

| Major/Minor | Major1 | | Major2 | | Minor1 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 0 | 0 | 300 | 0 | 634 | 300 |
| Stage 1 | - | - | - | - | 300 | - |
| Stage 2 | - | - | - | - | 334 | - |
| 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 | - | - | 1261 | - | 443 | 740 |
| Stage 1 | - | - | - | - | 752 | - |
| Stage 2 | - | - | - | - | 725 | - |
| Platoon blocked, % | - | - | | - | | |
| Mov Cap-1 Maneuver | - | - | 1261 | - | 441 | 740 |
| Mov Cap-2 Maneuver | - | - | - | - | 537 | - |
| Stage 1 | - | - | - | - | 752 | - |
| Stage 2 | - | - | - | - | 721 | - |

| Approach | EB | WB | NB |
|---|---|---|---|
| HCM Control Delay, s | 0 | 0.1 | 10.9 |
| HCM LOS | | | B |

| Minor Lane/Major Mvmt | NBLn1 | EBT | EBR | WBL | WBT |
|---|---|---|---|---|---|
| Capacity (veh/h) | 622 | - | - | 1261 | - |
| HCM Lane V/C Ratio | 0.018 | - | - | 0.004 | - |
| HCM Control Delay (s) | 10.9 | - | - | 7.9 | - |
| HCM Lane LOS | B | - | - | A | - |
| HCM 95th %tile Q(veh) | 0.1 | - | - | 0 | - |

# 3b.i) Year 2045 Mid-Day Peak Hour Intersection Operation Computer Capacity Worksheets

| Intersection | |
|---|---|
| Int Delay, s/veh | 110.2 |

| Movement | EBL | EBR | NBL | NBT | SBT | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 130 | 300 | 300 | 650 | 750 | 170 |
| Future Vol, veh/h | 130 | 300 | 300 | 650 | 750 | 170 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Stop | Stop | Free | Free | Free | Free |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | 300 | 0 | 150 | - | - | 100 |
| Veh in Median Storage, # | 0 | - | - | 0 | 0 | - |
| Grade, % | 0 | - | - | 0 | 0 | - |
| Peak Hour Factor | 89 | 97 | 97 | 97 | 97 | 97 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 146 | 192 | 309 | 670 | 773 | 109 |

| Major/Minor | Minor2 | | Major1 | | Major2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 2061 | 773 | 882 | 0 | - | 0 |
| Stage 1 | 773 | - | - | - | - | - |
| Stage 2 | 1288 | - | - | - | - | - |
| Critical Hdwy | 6.42 | 6.22 | 4.12 | - | - | - |
| Critical Hdwy Stg 1 | 5.42 | - | - | - | - | - |
| Critical Hdwy Stg 2 | 5.42 | - | - | - | - | - |
| Follow-up Hdwy | 3.518 | 3.318 | 2.218 | - | - | - |
| Pot Cap-1 Maneuver | ~ 60 | 399 | 767 | - | - | - |
| Stage 1 | 455 | - | - | - | - | - |
| Stage 2 | 259 | - | - | - | - | - |
| Platoon blocked, % | | | | - | - | - |
| Mov Cap-1 Maneuver | ~ 36 | 399 | 767 | - | - | - |
| Mov Cap-2 Maneuver | ~ 36 | - | - | - | - | - |
| Stage 1 | 272 | - | - | - | - | - |
| Stage 2 | 259 | - | - | - | - | - |

| Approach | EB | NB | SB |
|---|---|---|---|
| HCM Control Delay, s | $ 705.5 | 4.1 | 0 |
| HCM LOS | F | | |

| Minor Lane/Major Mvmt | NBL | NBT | EBLn1 | EBLn2 | SBT | SBR |
|---|---|---|---|---|---|---|
| Capacity (veh/h) | 767 | - | 36 | 399 | - | - |
| HCM Lane V/C Ratio | 0.403 | - | 4.057 | 0.481 | - | - |
| HCM Control Delay (s) | 12.8 | - | $ 1602.7 | 22.1 | - | - |
| HCM Lane LOS | B | - | F | C | - | - |
| HCM 95th %tile Q(veh) | 2 | - | 17 | 2.5 | - | - |

| Notes | | | |
|---|---|---|---|
| ~: Volume exceeds capacity | $: Delay exceeds 300s | +: Computation Not Defined | *: All major volume in platoon |

| Intersection | |
|---|---|
| Int Delay, s/veh | 60.3 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 40 | 720 | 5 | 10 | 600 | 170 | 5 | 0 | 10 | 190 | 0 | 20 |
| Future Vol, veh/h | 40 | 720 | 5 | 10 | 600 | 170 | 5 | 0 | 10 | 190 | 0 | 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 | 75 | - | - | 100 | - | 100 | - | - | - | 75 | - | - |
| Veh in Median Storage, # | - | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - |
| Grade, % | - | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - |
| Peak Hour Factor | 97 | 97 | 97 | 97 | 97 | 97 | 97 | 97 | 97 | 97 | 97 | 97 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 41 | 742 | 5 | 10 | 619 | 175 | 5 | 0 | 10 | 196 | 0 | 21 |

| Major/Minor | Major1 | | | Major2 | | | Minor1 | | | Minor2 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Conflicting Flow All | 794 | 0 | 0 | 747 | 0 | 0 | 1564 | 1641 | 745 | 1471 | 1468 | 619 |
| Stage 1 | - | - | - | - | - | - | 827 | 827 | - | 639 | 639 | - |
| Stage 2 | - | - | - | - | - | - | 737 | 814 | - | 832 | 829 | - |
| Critical Hdwy | 4.12 | - | - | 4.12 | - | - | 7.12 | 6.52 | 6.22 | 7.12 | 6.52 | 6.22 |
| Critical Hdwy Stg 1 | - | - | - | - | - | - | 6.12 | 5.52 | - | 6.12 | 5.52 | - |
| Critical Hdwy Stg 2 | - | - | - | - | - | - | 6.12 | 5.52 | - | 6.12 | 5.52 | - |
| Follow-up Hdwy | 2.218 | - | - | 2.218 | - | - | 3.518 | 4.018 | 3.318 | 3.518 | 4.018 | 3.318 |
| Pot Cap-1 Maneuver | 827 | - | - | 861 | - | - | 91 | 100 | 414 | ~ 105 | 128 | 489 |
| Stage 1 | - | - | - | - | - | - | 366 | 386 | - | 464 | 470 | - |
| Stage 2 | - | - | - | - | - | - | 410 | 391 | - | 363 | 385 | - |
| Platoon blocked, % | | - | - | | - | - | | | | | | |
| Mov Cap-1 Maneuver | 827 | - | - | 861 | - | - | 83 | 94 | 414 | ~ 98 | 120 | 489 |
| Mov Cap-2 Maneuver | - | - | - | - | - | - | 83 | 94 | - | ~ 98 | 120 | - |
| Stage 1 | - | - | - | - | - | - | 348 | 367 | - | 441 | 464 | - |
| Stage 2 | - | - | - | - | - | - | 388 | 386 | - | 336 | 366 | - |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| HCM Control Delay, s | 0.5 | 0.1 | 27.1 | $ 503.8 |
| HCM LOS | | | D | F |

| Minor Lane/Major Mvmt | NBLn1 | EBL | EBT | EBR | WBL | WBT | WBR | SBLn1 | SBLn2 |
|---|---|---|---|---|---|---|---|---|---|
| Capacity (veh/h) | 178 | 827 | - | - | 861 | - | - | 98 | 489 |
| HCM Lane V/C Ratio | 0.087 | 0.05 | - | - | 0.012 | - | - | 1.999 | 0.042 |
| HCM Control Delay (s) | 27.1 | 9.6 | - | - | 9.2 | - | - | $ 555.5 | 12.7 |
| HCM Lane LOS | D | A | - | - | A | - | - | F | B |
| HCM 95th %tile Q(veh) | 0.3 | 0.2 | - | - | 0 | - | - | 16.6 | 0.1 |

| Notes | | | |
|---|---|---|---|
| ~: Volume exceeds capacity | $: Delay exceeds 300s | +: Computation Not Defined | *: All major volume in platoon |

| Intersection | |
|---|---|
| Int Delay, s/veh | 0.9 |

| Movement | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 25 | 730 | 600 | 30 | 25 | 40 |
| Future Vol, veh/h | 25 | 730 | 600 | 30 | 25 | 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 | - | - | - | 0 | 0 |
| Veh in Median Storage, # | - | 0 | 0 | - | 0 | - |
| Grade, % | - | 0 | 0 | - | 0 | - |
| Peak Hour Factor | 97 | 97 | 97 | 97 | 97 | 97 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 26 | 753 | 619 | 31 | 26 | 41 |

| Major/Minor | Major1 | | Major2 | | Minor2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 650 | 0 | - | 0 | 1440 | 635 |
| Stage 1 | - | - | - | - | 635 | - |
| Stage 2 | - | - | - | - | 805 | - |
| 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 | 936 | - | - | - | 146 | 478 |
| Stage 1 | - | - | - | - | 528 | - |
| Stage 2 | - | - | - | - | 440 | - |
| Platoon blocked, % | | - | - | - | | |
| Mov Cap-1 Maneuver | 936 | - | - | - | 142 | 478 |
| Mov Cap-2 Maneuver | - | - | - | - | 280 | - |
| Stage 1 | - | - | - | - | 513 | - |
| Stage 2 | - | - | - | - | 440 | - |

| Approach | EB | WB | SB |
|---|---|---|---|
| HCM Control Delay, s | 0.3 | 0 | 15.5 |
| HCM LOS | | | C |

| Minor Lane/Major Mvmt | EBL | EBT | WBT | WBR | SBLn1 | SBLn2 |
|---|---|---|---|---|---|---|
| Capacity (veh/h) | 936 | - | - | - | 280 | 478 |
| HCM Lane V/C Ratio | 0.028 | - | - | - | 0.092 | 0.086 |
| HCM Control Delay (s) | 9 | - | - | - | 19.2 | 13.2 |
| HCM Lane LOS | A | - | - | - | C | B |
| HCM 95th %tile Q(veh) | 0.1 | - | - | - | 0.3 | 0.3 |

| Intersection | |
|---|---|
| Int Delay, s/veh | 6.8 |

| Movement | EBL | EBR | NBL | NBT | SBT | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 150 | 200 | 140 | 500 | 555 | 110 |
| Future Vol, veh/h | 150 | 200 | 140 | 500 | 555 | 110 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Stop | Stop | Free | Free | Free | Free |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | 75 | 0 | 150 | - | - | 100 |
| Veh in Median Storage, # | 0 | - | - | 0 | 0 | - |
| Grade, % | 0 | - | - | 0 | 0 | - |
| Peak Hour Factor | 92 | 92 | 92 | 92 | 92 | 92 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 163 | 217 | 152 | 543 | 603 | 120 |

| Major/Minor | Minor2 | | Major1 | | Major2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 1450 | 603 | 723 | 0 | - | 0 |
| Stage 1 | 603 | - | - | - | - | - |
| Stage 2 | 847 | - | - | - | - | - |
| Critical Hdwy | 6.42 | 6.22 | 4.12 | - | - | - |
| Critical Hdwy Stg 1 | 5.42 | - | - | - | - | - |
| Critical Hdwy Stg 2 | 5.42 | - | - | - | - | - |
| Follow-up Hdwy | 3.518 | 3.318 | 2.218 | - | - | - |
| Pot Cap-1 Maneuver | ~ 144 | 499 | 879 | - | - | - |
| Stage 1 | 546 | - | - | - | - | - |
| Stage 2 | 420 | - | - | - | - | - |
| Platoon blocked, % | | | | - | - | - |
| Mov Cap-1 Maneuver | ~ 119 | 499 | 879 | - | - | - |
| Mov Cap-2 Maneuver | 253 | - | - | - | - | - |
| Stage 1 | 452 | - | - | - | - | - |
| Stage 2 | 420 | - | - | - | - | - |

| Approach | EB | NB | SB |
|---|---|---|---|
| HCM Control Delay, s | 28 | 2.2 | 0 |
| HCM LOS | D | | |

| Minor Lane/Major Mvmt | NBL | NBT | EBLn1 | EBLn2 | SBT | SBR |
|---|---|---|---|---|---|---|
| Capacity (veh/h) | 879 | - | 253 | 499 | - | - |
| HCM Lane V/C Ratio | 0.173 | - | 0.644 | 0.436 | - | - |
| HCM Control Delay (s) | 10 | - | 41.8 | 17.7 | - | - |
| HCM Lane LOS | A | - | E | C | - | - |
| HCM 95th %tile Q(veh) | 0.6 | - | 4 | 2.2 | - | - |

| Notes | | | |
|---|---|---|---|
| ~: Volume exceeds capacity | $: Delay exceeds 300s | +: Computation Not Defined | *: All major volume in platoon |

| Intersection | |
|---|---|
| Int Delay, s/veh | 0.2 |

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 760 | 0 | 5 | 620 | 5 | 5 |
| Future Vol, veh/h | 760 | 0 | 5 | 620 | 5 | 5 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Free | Free | Free | Free | Stop | Stop |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | - | - | 75 | - | 0 | - |
| Veh in Median Storage, # | 0 | - | - | 0 | 0 | - |
| Grade, % | 0 | - | - | 0 | 0 | - |
| Peak Hour Factor | 97 | 97 | 97 | 97 | 97 | 97 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 784 | 0 | 5 | 639 | 5 | 5 |

| Major/Minor | Major1 | | Major2 | | Minor1 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 0 | 0 | 784 | 0 | 1433 | 784 |
| Stage 1 | - | - | - | - | 784 | - |
| Stage 2 | - | - | - | - | 649 | - |
| 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 | - | - | 834 | - | 148 | 393 |
| Stage 1 | - | - | - | - | 450 | - |
| Stage 2 | - | - | - | - | 520 | - |
| Platoon blocked, % | - | - | | - | | |
| Mov Cap-1 Maneuver | - | - | 834 | - | 147 | 393 |
| Mov Cap-2 Maneuver | - | - | - | - | 286 | - |
| Stage 1 | - | - | - | - | 450 | - |
| Stage 2 | - | - | - | - | 517 | - |

| Approach | EB | WB | NB |
|---|---|---|---|
| HCM Control Delay, s | 0 | 0.1 | 16.2 |
| HCM LOS | | | C |

| Minor Lane/Major Mvmt | NBLn1 | EBT | EBR | WBL | WBT |
|---|---|---|---|---|---|
| Capacity (veh/h) | 331 | - | - | 834 | - |
| HCM Lane V/C Ratio | 0.031 | - | - | 0.006 | - |
| HCM Control Delay (s) | 16.2 | - | - | 9.3 | - |
| HCM Lane LOS | C | - | - | A | - |
| HCM 95th %tile Q(veh) | 0.1 | - | - | 0 | - |

| Intersection | |
|---|---|
| Int Delay, s/veh | 0.2 |

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 755 | 0 | 5 | 625 | 5 | 5 |
| Future Vol, veh/h | 755 | 0 | 5 | 625 | 5 | 5 |
| 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 | - | 0 | - |
| Veh in Median Storage, # | 0 | - | - | 0 | 0 | - |
| Grade, % | 0 | - | - | 0 | 0 | - |
| Peak Hour Factor | 97 | 97 | 97 | 97 | 97 | 97 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 778 | 0 | 5 | 644 | 5 | 5 |

| Major/Minor | Major1 | | Major2 | | Minor1 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 0 | 0 | 778 | 0 | 1432 | 778 |
| Stage 1 | - | - | - | - | 778 | - |
| Stage 2 | - | - | - | - | 654 | - |
| 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 | - | - | 839 | - | 148 | 396 |
| Stage 1 | - | - | - | - | 453 | - |
| Stage 2 | - | - | - | - | 517 | - |
| Platoon blocked, % | - | - | | - | | |
| Mov Cap-1 Maneuver | - | - | 839 | - | 147 | 396 |
| Mov Cap-2 Maneuver | - | - | - | - | 286 | - |
| Stage 1 | - | - | - | - | 453 | - |
| Stage 2 | - | - | - | - | 514 | - |

| Approach | EB | WB | NB |
|---|---|---|---|
| HCM Control Delay, s | 0 | 0.1 | 16.2 |
| HCM LOS | | | C |

| Minor Lane/Major Mvmt | NBLn1 | EBT | EBR | WBL | WBT |
|---|---|---|---|---|---|
| Capacity (veh/h) | 332 | - | - | 839 | - |
| HCM Lane V/C Ratio | 0.031 | - | - | 0.006 | - |
| HCM Control Delay (s) | 16.2 | - | - | 9.3 | - |
| HCM Lane LOS | C | - | - | A | - |
| HCM 95th %tile Q(veh) | 0.1 | - | - | 0 | - |

# 3b.ii) Year 2045 PM Peak Hour Intersection Operation Computer Capacity Worksheets

| Intersection | |
|---|---|
| Int Delay, s/veh | 137.7 |

| Movement | EBL | EBR | NBL | NBT | SBT | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 100 | 400 | 300 | 990 | 720 | 200 |
| Future Vol, veh/h | 100 | 400 | 300 | 990 | 720 | 200 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Stop | Stop | Free | Free | Free | Free |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | 300 | 0 | 150 | - | - | 100 |
| Veh in Median Storage, # | 0 | - | - | 0 | 0 | - |
| Grade, % | 0 | - | - | 0 | 0 | - |
| Peak Hour Factor | 79 | 91 | 95 | 95 | 95 | 95 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 5 | 5 |
| Mvmt Flow | 127 | 273 | 316 | 1042 | 758 | 131 |

| Major/Minor | Minor2 | | Major1 | | Major2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 2432 | 758 | 889 | 0 | - | 0 |
| Stage 1 | 758 | - | - | - | - | - |
| Stage 2 | 1674 | - | - | - | - | - |
| Critical Hdwy | 6.42 | 6.22 | 4.12 | - | - | - |
| Critical Hdwy Stg 1 | 5.42 | - | - | - | - | - |
| Critical Hdwy Stg 2 | 5.42 | - | - | - | - | - |
| Follow-up Hdwy | 3.518 | 3.318 | 2.218 | - | - | - |
| Pot Cap-1 Maneuver | ~ 35 | 407 | 762 | - | - | - |
| Stage 1 | 463 | - | - | - | - | - |
| Stage 2 | 167 | - | - | - | - | - |
| Platoon blocked, % | | | | - | - | - |
| Mov Cap-1 Maneuver | ~ 20 | 407 | 762 | - | - | - |
| Mov Cap-2 Maneuver | ~ 20 | - | - | - | - | - |
| Stage 1 | 271 | - | - | - | - | - |
| Stage 2 | 167 | - | - | - | - | - |

| Approach | EB | NB | SB |
|---|---|---|---|
| HCM Control Delay, s | $ 902.4 | 3 | 0 |
| HCM LOS | F | | |

| Minor Lane/Major Mvmt | NBL | NBT | EBLn1 | EBLn2 | SBT | SBR |
|---|---|---|---|---|---|---|
| Capacity (veh/h) | 762 | - | 20 | 407 | - | - |
| HCM Lane V/C Ratio | 0.414 | - | 6.329 | 0.67 | - | - |
| HCM Control Delay (s) | 13 | - | $ 2780.6 | 30 | - | - |
| HCM Lane LOS | B | - | F | D | - | - |
| HCM 95th %tile Q(veh) | 2 | - | 16.2 | 4.7 | - | - |

| Notes | | | |
|---|---|---|---|
| ~: Volume exceeds capacity | $: Delay exceeds 300s | +: Computation Not Defined | *: All major volume in platoon |

| Intersection | |
|---|---|
| Int Delay, s/veh | 150.7 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 50 | 735 | 5 | 15 | 845 | 230 | 5 | 0 | 5 | 180 | 5 | 40 |
| Future Vol, veh/h | 50 | 735 | 5 | 15 | 845 | 230 | 5 | 0 | 5 | 180 | 5 | 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 | 75 | - | - | 100 | - | 100 | - | - | - | 75 | - | - |
| 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, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 56 | 826 | 6 | 17 | 949 | 258 | 6 | 0 | 6 | 202 | 6 | 45 |

| Major/Minor | Major1 | | | Major2 | | | Minor1 | | | Minor2 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Conflicting Flow All | 1207 | 0 | 0 | 832 | 0 | 0 | 2079 | 2182 | 829 | 1927 | 1927 | 949 |
| Stage 1 | - | - | - | - | - | - | 941 | 941 | - | 983 | 983 | - |
| Stage 2 | - | - | - | - | - | - | 1138 | 1241 | - | 944 | 944 | - |
| Critical Hdwy | 4.12 | - | - | 4.12 | - | - | 7.12 | 6.52 | 6.22 | 7.12 | 6.52 | 6.22 |
| Critical Hdwy Stg 1 | - | - | - | - | - | - | 6.12 | 5.52 | - | 6.12 | 5.52 | - |
| Critical Hdwy Stg 2 | - | - | - | - | - | - | 6.12 | 5.52 | - | 6.12 | 5.52 | - |
| Follow-up Hdwy | 2.218 | - | - | 2.218 | - | - | 3.518 | 4.018 | 3.318 | 3.518 | 4.018 | 3.318 |
| Pot Cap-1 Maneuver | 578 | - | - | 801 | - | - | 39 | 46 | 370 | ~ 50 | 67 | 316 |
| Stage 1 | - | - | - | - | - | - | 316 | 342 | - | 299 | 327 | - |
| Stage 2 | - | - | - | - | - | - | 245 | 247 | - | 315 | 341 | - |
| Platoon blocked, % | | - | - | | - | - | | | | | | |
| Mov Cap-1 Maneuver | 578 | - | - | 801 | - | - | 28 | 41 | 370 | ~ 45 | 59 | 316 |
| Mov Cap-2 Maneuver | - | - | - | - | - | - | 28 | 41 | - | ~ 45 | 59 | - |
| Stage 1 | - | - | - | - | - | - | 285 | 309 | - | 270 | 320 | - |
| Stage 2 | - | - | - | - | - | - | 202 | 242 | - | 280 | 308 | - |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| HCM Control Delay, s | 0.8 | 0.1 | 92.4 | $ 1408.9 |
| HCM LOS | | | F | F |

| Minor Lane/Major Mvmt | NBLn1 | EBL | EBT | EBR | WBL | WBT | WBR | SBLn1 | SBLn2 |
|---|---|---|---|---|---|---|---|---|---|
| Capacity (veh/h) | 52 | 578 | - | - | 801 | - | - | 45 | 213 |
| HCM Lane V/C Ratio | 0.216 | 0.097 | - | - | 0.021 | - | - | 4.494 | 0.237 |
| HCM Control Delay (s) | 92.4 | 11.9 | - | - | 9.6 | - | - | $ 1754.4 | 27.1 |
| HCM Lane LOS | F | B | - | - | A | - | - | F | D |
| HCM 95th %tile Q(veh) | 0.7 | 0.3 | - | - | 0.1 | - | - | 23 | 0.9 |

| Notes | | | |
|---|---|---|---|
| ~: Volume exceeds capacity | $: Delay exceeds 300s | +: Computation Not Defined | *: All major volume in platoon |

| Intersection | |
|---|---|
| Int Delay, s/veh | 1.5 |

| Movement | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 50 | 750 | 840 | 40 | 40 | 50 |
| Future Vol, veh/h | 50 | 750 | 840 | 40 | 40 | 50 |
| 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 | - | - | - | 0 | 0 |
| Veh in Median Storage, # | - | 0 | 0 | - | 0 | - |
| Grade, % | - | 0 | 0 | - | 0 | - |
| Peak Hour Factor | 90 | 90 | 90 | 90 | 90 | 90 |
| Heavy Vehicles, % | 5 | 5 | 2 | 2 | 5 | 5 |
| Mvmt Flow | 56 | 833 | 933 | 44 | 44 | 56 |

| Major/Minor | Major1 | | Major2 | | Minor2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 977 | 0 | - | 0 | 1900 | 955 |
| Stage 1 | - | - | - | - | 955 | - |
| Stage 2 | - | - | - | - | 945 | - |
| Critical Hdwy | 4.15 | - | - | - | 6.45 | 6.25 |
| Critical Hdwy Stg 1 | - | - | - | - | 5.45 | - |
| Critical Hdwy Stg 2 | - | - | - | - | 5.45 | - |
| Follow-up Hdwy | 2.245 | - | - | - | 3.545 | 3.345 |
| Pot Cap-1 Maneuver | 694 | - | - | - | 75 | 309 |
| Stage 1 | - | - | - | - | 369 | - |
| Stage 2 | - | - | - | - | 373 | - |
| Platoon blocked, % | | - | - | - | | |
| Mov Cap-1 Maneuver | 694 | - | - | - | 69 | 309 |
| Mov Cap-2 Maneuver | - | - | - | - | 194 | - |
| Stage 1 | - | - | - | - | 339 | - |
| Stage 2 | - | - | - | - | 373 | - |

| Approach | EB | WB | SB |
|---|---|---|---|
| HCM Control Delay, s | 0.7 | 0 | 23.6 |
| HCM LOS | | | C |

| Minor Lane/Major Mvmt | EBL | EBT | WBT | WBR | SBLn1 | SBLn2 |
|---|---|---|---|---|---|---|
| Capacity (veh/h) | 694 | - | - | - | 194 | 309 |
| HCM Lane V/C Ratio | 0.08 | - | - | - | 0.229 | 0.18 |
| HCM Control Delay (s) | 10.6 | - | - | - | 29 | 19.2 |
| HCM Lane LOS | B | - | - | - | D | C |
| HCM 95th %tile Q(veh) | 0.3 | - | - | - | 0.9 | 0.6 |

| Intersection | |
|---|---|
| Int Delay, s/veh | 6.6 |

| Movement | EBL | EBR | NBL | NBT | SBT | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 100 | 200 | 240 | 650 | 600 | 150 |
| Future Vol, veh/h | 100 | 200 | 240 | 650 | 600 | 150 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Stop | Stop | Free | Free | Free | Free |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | 75 | 0 | 150 | - | - | 100 |
| Veh in Median Storage, # | 0 | - | - | 0 | 0 | - |
| Grade, % | 0 | - | - | 0 | 0 | - |
| Peak Hour Factor | 92 | 92 | 92 | 92 | 92 | 92 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 5 | 5 |
| Mvmt Flow | 109 | 217 | 261 | 707 | 652 | 163 |

| Major/Minor | Minor2 | | Major1 | | Major2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 1881 | 652 | 815 | 0 | - | 0 |
| Stage 1 | 652 | - | - | - | - | - |
| Stage 2 | 1229 | - | - | - | - | - |
| Critical Hdwy | 6.42 | 6.22 | 4.12 | - | - | - |
| Critical Hdwy Stg 1 | 5.42 | - | - | - | - | - |
| Critical Hdwy Stg 2 | 5.42 | - | - | - | - | - |
| Follow-up Hdwy | 3.518 | 3.318 | 2.218 | - | - | - |
| Pot Cap-1 Maneuver | ~ 78 | 468 | 812 | - | - | - |
| Stage 1 | 518 | - | - | - | - | - |
| Stage 2 | 276 | - | - | - | - | - |
| Platoon blocked, % | | | | - | - | - |
| Mov Cap-1 Maneuver | ~ 53 | 468 | 812 | - | - | - |
| Mov Cap-2 Maneuver | 165 | - | - | - | - | - |
| Stage 1 | 352 | - | - | - | - | - |
| Stage 2 | 276 | - | - | - | - | - |

| Approach | EB | NB | SB |
|---|---|---|---|
| HCM Control Delay, s | 33.2 | 3.1 | 0 |
| HCM LOS | D | | |

| Minor Lane/Major Mvmt | NBL | NBT | EBLn1 | EBLn2 | SBT | SBR |
|---|---|---|---|---|---|---|
| Capacity (veh/h) | 812 | - | 165 | 468 | - | - |
| HCM Lane V/C Ratio | 0.321 | - | 0.659 | 0.465 | - | - |
| HCM Control Delay (s) | 11.5 | - | 61.2 | 19.2 | - | - |
| HCM Lane LOS | B | - | F | C | - | - |
| HCM 95th %tile Q(veh) | 1.4 | - | 3.8 | 2.4 | - | - |

| Notes | | | |
|---|---|---|---|
| ~: Volume exceeds capacity | $: Delay exceeds 300s | +: Computation Not Defined | *: All major volume in platoon |

| Intersection | |
|---|---|
| Int Delay, s/veh | 0.1 |

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 785 | 0 | 10 | 880 | 0 | 5 |
| Future Vol, veh/h | 785 | 0 | 10 | 880 | 0 | 5 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Free | Free | Free | Free | Stop | Stop |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | - | - | 75 | - | 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 | 872 | 0 | 11 | 978 | 0 | 6 |

| Major/Minor | Major1 | | Major2 | | Minor1 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 0 | 0 | 872 | 0 | 1872 | 872 |
| Stage 1 | - | - | - | - | 872 | - |
| Stage 2 | - | - | - | - | 1000 | - |
| 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 | - | - | 773 | - | 79 | 350 |
| Stage 1 | - | - | - | - | 409 | - |
| Stage 2 | - | - | - | - | 356 | - |
| Platoon blocked, % | - | - | | - | | |
| Mov Cap-1 Maneuver | - | - | 773 | - | 78 | 350 |
| Mov Cap-2 Maneuver | - | - | - | - | 208 | - |
| Stage 1 | - | - | - | - | 409 | - |
| Stage 2 | - | - | - | - | 351 | - |

| Approach | EB | WB | NB |
|---|---|---|---|
| HCM Control Delay, s | 0 | 0.1 | 15.5 |
| HCM LOS | | | C |

| Minor Lane/Major Mvmt | NBLn1 | EBT | EBR | WBL | WBT |
|---|---|---|---|---|---|
| Capacity (veh/h) | 350 | - | - | 773 | - |
| HCM Lane V/C Ratio | 0.016 | - | - | 0.014 | - |
| HCM Control Delay (s) | 15.5 | - | - | 9.7 | - |
| HCM Lane LOS | C | - | - | A | - |
| HCM 95th %tile Q(veh) | 0 | - | - | 0 | - |

| Intersection | |
|---|---|
| Int Delay, s/veh | 0.1 |

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 785 | 5 | 5 | 875 | 5 | 0 |
| Future Vol, veh/h | 785 | 5 | 5 | 875 | 5 | 0 |
| 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 | - | 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 | 872 | 6 | 6 | 972 | 6 | 0 |

| Major/Minor | Major1 | | Major2 | | Minor1 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 0 | 0 | 878 | 0 | 1859 | 875 |
| Stage 1 | - | - | - | - | 875 | - |
| Stage 2 | - | - | - | - | 984 | - |
| 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 | - | - | 769 | - | 81 | 349 |
| Stage 1 | - | - | - | - | 408 | - |
| Stage 2 | - | - | - | - | 362 | - |
| Platoon blocked, % | - | - | | - | | |
| Mov Cap-1 Maneuver | - | - | 769 | - | 80 | 349 |
| Mov Cap-2 Maneuver | - | - | - | - | 211 | - |
| Stage 1 | - | - | - | - | 408 | - |
| Stage 2 | - | - | - | - | 359 | - |

| Approach | EB | WB | NB |
|---|---|---|---|
| HCM Control Delay, s | 0 | 0.1 | 22.5 |
| HCM LOS | | | C |

| Minor Lane/Major Mvmt | NBLn1 | EBT | EBR | WBL | WBT |
|---|---|---|---|---|---|
| Capacity (veh/h) | 211 | - | - | 769 | - |
| HCM Lane V/C Ratio | 0.026 | - | - | 0.007 | - |
| HCM Control Delay (s) | 22.5 | - | - | 9.7 | - |
| HCM Lane LOS | C | - | - | A | - |
| HCM 95th %tile Q(veh) | 0.1 | - | - | 0 | - |

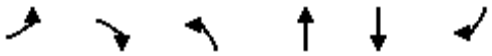
# 3c.i) Year 2045 Mid-Day Peak Hour Intersection Operation with Traffic Signal Control at Mason Way, Point Bluff and a New Carlson Street Intersection Computer Capacity Worksheets

| Lane Group | EBL | EBR | NBL | NBT | SBT | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Volume (vph) | 130 | 300 | 300 | 650 | 750 | 170 |
| Future Volume (vph) | 130 | 300 | 300 | 650 | 750 | 170 |
| Turn Type | Prot | pm+ov | pm+pt | NA | NA | Perm |
| Protected Phases | 4 | 5 | 5 | 2 | 6 | |
| Permitted Phases | | 4 | 2 | | | 6 |
| Detector Phase | 4 | 5 | 5 | 2 | 6 | 6 |
| Switch Phase | | | | | | |
| Minimum Initial (s) | 8.0 | 6.0 | 6.0 | 10.0 | 10.0 | 10.0 |
| Minimum Split (s) | 27.0 | 12.0 | 12.0 | 24.0 | 24.0 | 24.0 |
| Total Split (s) | 27.0 | 12.0 | 12.0 | 48.0 | 36.0 | 36.0 |
| Total Split (%) | 36.0% | 16.0% | 16.0% | 64.0% | 48.0% | 48.0% |
| Maximum Green (s) | 22.0 | 7.0 | 7.0 | 43.0 | 31.0 | 31.0 |
| Yellow Time (s) | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 |
| All-Red Time (s) | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 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 | 5.0 | 5.0 | 5.0 | 5.0 |
| Lead/Lag | | Lead | Lead | | Lag | Lag |
| Lead-Lag Optimize? | | Yes | Yes | | Yes | Yes |
| Vehicle Extension (s) | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |
| Minimum Gap (s) | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |
| Time Before Reduce (s) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Time To Reduce (s) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Recall Mode | None | None | None | C-Min | C-Min | C-Min |
| Walk Time (s) | 7.0 | | | | 7.0 | 7.0 |
| Flash Dont Walk (s) | 14.0 | | | | 11.0 | 11.0 |
| Pedestrian Calls (#/hr) | 0 | | | | 0 | 0 |

## Intersection Summary

Cycle Length: 75
Actuated Cycle Length: 75
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated

Splits and Phases: 4: Converse Ave. & Mason Way



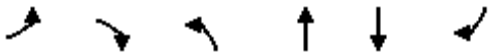
| Lane Group | EBL | EBR | NBL | NBT | SBT | SBR |
|---|---|---|---|---|---|---|
| Lane Group Flow (vph) | 146 | 192 | 309 | 670 | 773 | 109 |
| v/c Ratio | 0.53 | 0.27 | 0.61 | 0.51 | 1.00 | 0.17 |
| Control Delay | 35.7 | 14.1 | 19.9 | 7.1 | 51.1 | 13.6 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 35.7 | 14.1 | 19.9 | 7.1 | 51.1 | 13.6 |
| Queue Length 50th (ft) | 64 | 53 | 72 | 113 | ~360 | 14 |
| Queue Length 95th (ft) | 109 | 96 | #201 | 225 | #583 | m61 |
| Internal Link Dist (ft) | 528 | | | 242 | 321 | |
| Turn Bay Length (ft) | 300 | | 150 | | | 100 |
| Base Capacity (vph) | 519 | 713 | 503 | 1324 | 775 | 658 |
| 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 | 0.28 | 0.27 | 0.61 | 0.51 | 1.00 | 0.17 |

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

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

m Volume for 95th percentile queue is metered by upstream signal.



| Movement | EBL | EBR | NBL | NBT | SBT | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Volume (veh/h) | 130 | 300 | 300 | 650 | 750 | 170 |
| Future Volume (veh/h) | 130 | 300 | 300 | 650 | 750 | 170 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | 1.00 | 1.00 | | | 1.00 |
| Parking Bus, Adj | 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 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 |
| Adj Flow Rate, veh/h | 146 | 192 | 309 | 670 | 773 | 109 |
| Peak Hour Factor | 0.89 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 255 | 374 | 423 | 1353 | 1055 | 894 |
| Arrive On Green | 0.14 | 0.14 | 0.09 | 0.72 | 0.56 | 0.56 |
| Sat Flow, veh/h | 1781 | 1585 | 1781 | 1870 | 1870 | 1585 |
| Grp Volume(v), veh/h | 146 | 192 | 309 | 670 | 773 | 109 |
| Grp Sat Flow(s),veh/h/ln | 1781 | 1585 | 1781 | 1870 | 1870 | 1585 |
| Q Serve(g_s), s | 5.7 | 7.9 | 5.0 | 11.6 | 23.0 | 2.4 |
| Cycle Q Clear(g_c), s | 5.7 | 7.9 | 5.0 | 11.6 | 23.0 | 2.4 |
| Prop In Lane | 1.00 | 1.00 | 1.00 | | | 1.00 |
| Lane Grp Cap(c), veh/h | 255 | 374 | 423 | 1353 | 1055 | 894 |
| V/C Ratio(X) | 0.57 | 0.51 | 0.73 | 0.50 | 0.73 | 0.12 |
| Avail Cap(c_a), veh/h | 523 | 612 | 424 | 1353 | 1055 | 894 |
| HCM Platoon Ratio | 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 |
| Uniform Delay (d), s/veh | 30.0 | 24.9 | 12.6 | 4.5 | 12.2 | 7.7 |
| Incr Delay (d2), s/veh | 2.0 | 1.1 | 6.3 | 1.3 | 4.5 | 0.3 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 2.5 | 7.2 | 3.2 | 3.5 | 9.5 | 0.8 |
| Unsig. Movement Delay, s/veh | | | | | | |
| LnGrp Delay(d),s/veh | 32.0 | 26.0 | 18.9 | 5.8 | 16.7 | 7.9 |
| LnGrp LOS | C | C | B | A | B | A |
| Approach Vol, veh/h | 338 | | | 979 | 882 | |
| Approach Delay, s/veh | 28.6 | | | 9.9 | 15.6 | |
| Approach LOS | C | | | A | B | |

| Timer - Assigned Phs | | 2 | | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | | 59.3 | | 15.7 | 12.0 | 47.3 |
| Change Period (Y+Rc), s | | 5.0 | | 5.0 | 5.0 | 5.0 |
| Max Green Setting (Gmax), s | | 43.0 | | 22.0 | 7.0 | 31.0 |
| Max Q Clear Time (g_c+I1), s | | 13.6 | | 9.9 | 7.0 | 25.0 |
| Green Ext Time (p_c), s | | 5.2 | | 0.9 | 0.0 | 2.9 |

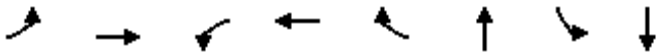
| Intersection Summary | |
|---|---|
| HCM 6th Ctrl Delay | 15.1 |
| HCM 6th LOS | B |

| Lane Group | EBL | EBT | WBL | WBT | WBR | NBL | NBT | SBL | SBT |
|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | |
| Traffic Volume (vph) | 40 | 720 | 10 | 600 | 170 | 5 | 0 | 190 | 0 |
| Future Volume (vph) | 40 | 720 | 10 | 600 | 170 | 5 | 0 | 190 | 0 |
| Turn Type | Perm | NA | Perm | NA | Perm | Perm | NA | Perm | NA |
| Protected Phases | | 2 | | 6 | | | 4 | | 8 |
| Permitted Phases | 2 | | 6 | | 6 | 4 | | 8 | |
| Detector Phase | 2 | 2 | 6 | 6 | 6 | 4 | 4 | 8 | 8 |
| Switch Phase | | | | | | | | | |
| Minimum Initial (s) | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 | 7.0 | 7.0 | 7.0 | 7.0 |
| Minimum Split (s) | 23.0 | 23.0 | 23.0 | 23.0 | 23.0 | 23.0 | 23.0 | 23.0 | 23.0 |
| Total Split (s) | 50.0 | 50.0 | 50.0 | 50.0 | 50.0 | 25.0 | 25.0 | 25.0 | 25.0 |
| Total Split (%) | 66.7% | 66.7% | 66.7% | 66.7% | 66.7% | 33.3% | 33.3% | 33.3% | 33.3% |
| Maximum Green (s) | 45.0 | 45.0 | 45.0 | 45.0 | 45.0 | 20.0 | 20.0 | 20.0 | 20.0 |
| Yellow Time (s) | 3.5 | 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 | 1.5 | 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 |
| Total Lost Time (s) | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | | 5.0 | 5.0 | 5.0 |
| Lead/Lag | | | | | | | | | |
| Lead-Lag Optimize? | | | | | | | | | |
| Vehicle Extension (s) | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |
| Minimum Gap (s) | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |
| Time Before Reduce (s) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Time To Reduce (s) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Recall Mode | C-Min | C-Min | C-Min | C-Min | C-Min | None | None | None | None |
| Walk Time (s) | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | | | 7.0 | 7.0 |
| Flash Dont Walk (s) | 11.0 | 11.0 | 11.0 | 11.0 | 11.0 | | | 11.0 | 11.0 |
| Pedestrian Calls (#/hr) | 0 | 0 | 0 | 0 | 0 | | | 0 | 0 |

## Intersection Summary

Cycle Length: 75
Actuated Cycle Length: 75
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated

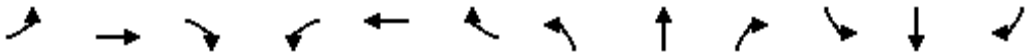
Splits and Phases: 5: USPS dwy/Point Bluff & Converse Ave.



| Lane Group | EBL | EBT | WBL | WBT | WBR | NBT | SBL | SBT |
|---|---|---|---|---|---|---|---|---|
| Lane Group Flow (vph) | 41 | 747 | 10 | 619 | 109 | 15 | 196 | 21 |
| v/c Ratio | 0.09 | 0.61 | 0.03 | 0.50 | 0.10 | 0.05 | 0.70 | 0.07 |
| Control Delay | 5.1 | 11.7 | 4.5 | 6.6 | 4.3 | 21.9 | 40.2 | 22.2 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 5.1 | 11.7 | 4.5 | 6.6 | 4.3 | 21.9 | 40.2 | 22.2 |
| Queue Length 50th (ft) | 0 | 314 | 1 | 85 | 13 | 6 | 84 | 8 |
| Queue Length 95th (ft) | m16 | 446 | m3 | 117 | 26 | 19 | 141 | 23 |
| Internal Link Dist (ft) | | 180 | | 386 | | 121 | | 254 |
| Turn Bay Length (ft) | 75 | | 100 | | 100 | | 75 | |
| Base Capacity (vph) | 443 | 1234 | 349 | 1236 | 1050 | 424 | 371 | 422 |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Storage Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Reduced v/c Ratio | 0.09 | 0.61 | 0.03 | 0.50 | 0.10 | 0.04 | 0.53 | 0.05 |

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.



| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 40 | 720 | 5 | 10 | 600 | 170 | 5 | 0 | 10 | 190 | 0 | 20 |
| Future Volume (veh/h) | 40 | 720 | 5 | 10 | 600 | 170 | 5 | 0 | 10 | 190 | 0 | 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 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 |
| Adj Flow Rate, veh/h | 41 | 742 | 5 | 10 | 619 | 109 | 5 | 0 | 10 | 196 | 0 | 21 |
| 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 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 500 | 1304 | 9 | 456 | 1314 | 1114 | 122 | 27 | 171 | 329 | 0 | 260 |
| Arrive On Green | 0.70 | 0.70 | 0.70 | 0.70 | 0.70 | 0.70 | 0.16 | 0.00 | 0.16 | 0.16 | 0.00 | 0.16 |
| Sat Flow, veh/h | 727 | 1856 | 13 | 714 | 1870 | 1585 | 354 | 166 | 1041 | 1405 | 0 | 1585 |
| Grp Volume(v), veh/h | 41 | 0 | 747 | 10 | 619 | 109 | 15 | 0 | 0 | 196 | 0 | 21 |
| Grp Sat Flow(s),veh/h/ln | 727 | 0 | 1868 | 714 | 1870 | 1585 | 1561 | 0 | 0 | 1405 | 0 | 1585 |
| Q Serve(g_s), s | 2.0 | 0.0 | 14.9 | 0.5 | 11.0 | 1.6 | 0.0 | 0.0 | 0.0 | 9.4 | 0.0 | 0.8 |
| Cycle Q Clear(g_c), s | 13.0 | 0.0 | 14.9 | 15.4 | 11.0 | 1.6 | 0.6 | 0.0 | 0.0 | 10.0 | 0.0 | 0.8 |
| Prop In Lane | 1.00 | | 0.01 | 1.00 | | 1.00 | 0.33 | | 0.67 | 1.00 | | 1.00 |
| Lane Grp Cap(c), veh/h | 500 | 0 | 1313 | 456 | 1314 | 1114 | 320 | 0 | 0 | 329 | 0 | 260 |
| V/C Ratio(X) | 0.08 | 0.00 | 0.57 | 0.02 | 0.47 | 0.10 | 0.05 | 0.00 | 0.00 | 0.60 | 0.00 | 0.08 |
| Avail Cap(c_a), veh/h | 500 | 0 | 1313 | 456 | 1314 | 1114 | 475 | 0 | 0 | 473 | 0 | 423 |
| 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 | 0.00 | 0.00 | 1.00 | 0.00 | 1.00 |
| Uniform Delay (d), s/veh | 7.8 | 0.0 | 5.5 | 9.3 | 5.0 | 3.6 | 26.4 | 0.0 | 0.0 | 30.3 | 0.0 | 26.6 |
| Incr Delay (d2), s/veh | 0.3 | 0.0 | 1.8 | 0.1 | 1.2 | 0.2 | 0.1 | 0.0 | 0.0 | 1.7 | 0.0 | 0.1 |
| 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 | 0.3 | 0.0 | 4.8 | 0.1 | 3.5 | 0.4 | 0.2 | 0.0 | 0.0 | 3.5 | 0.0 | 0.3 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 8.2 | 0.0 | 7.3 | 9.4 | 6.2 | 3.7 | 26.5 | 0.0 | 0.0 | 32.0 | 0.0 | 26.7 |
| LnGrp LOS | A | A | A | A | A | A | C | A | A | C | A | C |
| Approach Vol, veh/h | | 788 | | | 738 | | | 15 | | | 217 | |
| Approach Delay, s/veh | | 7.4 | | | 5.9 | | | 26.5 | | | 31.5 | |
| Approach LOS | | A | | | A | | | C | | | C | |

| Timer - Assigned Phs | | 2 | | 4 | | 6 | | 8 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | | 57.7 | | 17.3 | | 57.7 | | 17.3 | | | | |
| Change Period (Y+Rc), s | | 5.0 | | 5.0 | | 5.0 | | 5.0 | | | | |
| Max Green Setting (Gmax), s | | 45.0 | | 20.0 | | 45.0 | | 20.0 | | | | |
| Max Q Clear Time (g_c+I1), s | | 16.9 | | 2.6 | | 17.4 | | 12.0 | | | | |
| Green Ext Time (p_c), s | | 6.5 | | 0.0 | | 5.1 | | 0.4 | | | | |

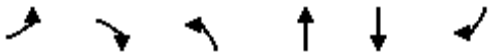
| Intersection Summary | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HCM 6th Ctrl Delay | | | 9.9 | | | | | | | | | |
| HCM 6th LOS | | | A | | | | | | | | | |

| Lane Group | EBL | EBR | NBL | NBT | SBT | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Volume (vph) | 150 | 200 | 140 | 500 | 555 | 110 |
| Future Volume (vph) | 150 | 200 | 140 | 500 | 555 | 110 |
| Turn Type | Prot | Perm | Prot | NA | NA | Perm |
| Protected Phases | 4 | | 5 | 2 | 6 | |
| Permitted Phases | | 4 | | | | 6 |
| Detector Phase | 4 | 4 | 5 | 2 | 6 | 6 |
| Switch Phase | | | | | | |
| Minimum Initial (s) | 5.0 | 5.0 | 5.0 | 10.0 | 10.0 | 10.0 |
| Minimum Split (s) | 26.0 | 26.0 | 9.5 | 23.0 | 23.0 | 23.0 |
| Total Split (s) | 26.0 | 26.0 | 20.0 | 49.0 | 29.0 | 29.0 |
| Total Split (%) | 34.7% | 34.7% | 26.7% | 65.3% | 38.7% | 38.7% |
| Maximum Green (s) | 21.0 | 21.0 | 15.5 | 44.0 | 24.0 | 24.0 |
| Yellow Time (s) | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 |
| All-Red Time (s) | 1.5 | 1.5 | 1.0 | 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 | 4.5 | 5.0 | 5.0 | 5.0 |
| Lead/Lag | | | Lead | | Lag | Lag |
| Lead-Lag Optimize? | | | Yes | | Yes | Yes |
| Vehicle Extension (s) | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |
| Minimum Gap (s) | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |
| Time Before Reduce (s) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Time To Reduce (s) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Recall Mode | None | None | None | C-Min | C-Min | C-Min |
| Walk Time (s) | 7.0 | 7.0 | | | 7.0 | 7.0 |
| Flash Dont Walk (s) | 14.0 | 14.0 | | | 11.0 | 11.0 |
| Pedestrian Calls (#/hr) | 0 | 0 | | | 0 | 0 |

**Intersection Summary**

Cycle Length: 75
Actuated Cycle Length: 75
Offset: 23 (31%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 70
Control Type: Actuated-Coordinated

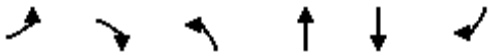
Splits and Phases: 9: Converse Ave. & Future Carlsen St



| Lane Group | EBL | EBR | NBL | NBT | SBT | SBR |
|---|---|---|---|---|---|---|
| Lane Group Flow (vph) | 163 | 135 | 152 | 543 | 603 | 74 |
| v/c Ratio | 0.58 | 0.53 | 0.55 | 0.42 | 0.67 | 0.10 |
| Control Delay | 36.4 | 35.7 | 38.1 | 8.2 | 22.2 | 13.7 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 36.4 | 35.7 | 38.1 | 8.2 | 22.2 | 13.7 |
| Queue Length 50th (ft) | 71 | 58 | 76 | 62 | 202 | 18 |
| Queue Length 95th (ft) | 120 | 102 | 127 | 261 | #451 | 50 |
| Internal Link Dist (ft) | 406 | | | 650 | 865 | |
| Turn Bay Length (ft) | 75 | | 150 | | | 100 |
| Base Capacity (vph) | 479 | 428 | 368 | 1306 | 905 | 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 | 0.34 | 0.32 | 0.41 | 0.42 | 0.67 | 0.10 |

Intersection Summary

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



| Movement | EBL | EBR | NBL | NBT | SBT | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Volume (veh/h) | 150 | 200 | 140 | 500 | 555 | 110 |
| Future Volume (veh/h) | 150 | 200 | 140 | 500 | 555 | 110 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | 1.00 | 1.00 | | | 1.00 |
| Parking Bus, Adj | 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 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 |
| Adj Flow Rate, veh/h | 163 | 135 | 152 | 543 | 603 | 74 |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 222 | 197 | 192 | 1388 | 1074 | 910 |
| Arrive On Green | 0.12 | 0.12 | 0.11 | 0.74 | 0.57 | 0.57 |
| Sat Flow, veh/h | 1781 | 1585 | 1781 | 1870 | 1870 | 1585 |
| Grp Volume(v), veh/h | 163 | 135 | 152 | 543 | 603 | 74 |
| Grp Sat Flow(s),veh/h/ln | 1781 | 1585 | 1781 | 1870 | 1870 | 1585 |
| Q Serve(g_s), s | 6.6 | 6.1 | 6.2 | 7.9 | 15.2 | 1.6 |
| Cycle Q Clear(g_c), s | 6.6 | 6.1 | 6.2 | 7.9 | 15.2 | 1.6 |
| Prop In Lane | 1.00 | 1.00 | 1.00 | | | 1.00 |
| Lane Grp Cap(c), veh/h | 222 | 197 | 192 | 1388 | 1074 | 910 |
| V/C Ratio(X) | 0.74 | 0.68 | 0.79 | 0.39 | 0.56 | 0.08 |
| Avail Cap(c_a), veh/h | 499 | 444 | 368 | 1388 | 1074 | 910 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 0.92 | 0.92 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 31.6 | 31.4 | 32.6 | 3.5 | 10.0 | 7.1 |
| Incr Delay (d2), s/veh | 4.7 | 4.2 | 6.6 | 0.8 | 2.1 | 0.2 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 3.0 | 5.5 | 3.0 | 2.2 | 5.6 | 0.5 |
| Unsig. Movement Delay, s/veh | | | | | | |
| LnGrp Delay(d),s/veh | 36.4 | 35.6 | 39.2 | 4.3 | 12.1 | 7.3 |
| LnGrp LOS | D | D | D | A | B | A |
| Approach Vol, veh/h | 298 | | | 695 | 677 | |
| Approach Delay, s/veh | 36.0 | | | 11.9 | 11.6 | |
| Approach LOS | D | | | B | B | |

| Timer - Assigned Phs | | 2 | | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | | 60.7 | | 14.3 | 12.6 | 48.1 |
| Change Period (Y+Rc), s | | 5.0 | | 5.0 | 4.5 | 5.0 |
| Max Green Setting (Gmax), s | | 44.0 | | 21.0 | 15.5 | 24.0 |
| Max Q Clear Time (g_c+I1), s | | 9.9 | | 8.6 | 8.2 | 17.2 |
| Green Ext Time (p_c), s | | 4.0 | | 0.7 | 0.2 | 2.2 |

| Intersection Summary | |
|---|---|
| HCM 6th Ctrl Delay | 16.1 |
| HCM 6th LOS | B |

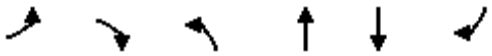
# 3c.ii) Year 2045 PM Peak Hour Intersection Operation with Traffic Signal Control at Mason Way, Point Bluff and a New Carlson Street Intersection Computer Capacity Worksheets

| Lane Group | EBL | EBR | NBL | NBT | SBT | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Volume (vph) | 100 | 400 | 300 | 990 | 720 | 200 |
| Future Volume (vph) | 100 | 400 | 300 | 990 | 720 | 200 |
| Turn Type | Prot | pm+ov | pm+pt | NA | NA | Perm |
| Protected Phases | 4 | 5 | 5 | 2 | 6 | |
| Permitted Phases | | 4 | 2 | | | 6 |
| Detector Phase | 4 | 5 | 5 | 2 | 6 | 6 |
| Switch Phase | | | | | | |
| Minimum Initial (s) | 8.0 | 6.0 | 6.0 | 10.0 | 10.0 | 10.0 |
| Minimum Split (s) | 26.0 | 12.0 | 12.0 | 24.0 | 24.0 | 24.0 |
| Total Split (s) | 26.0 | 13.0 | 13.0 | 49.0 | 36.0 | 36.0 |
| Total Split (%) | 34.7% | 17.3% | 17.3% | 65.3% | 48.0% | 48.0% |
| Maximum Green (s) | 21.0 | 8.0 | 8.0 | 44.0 | 31.0 | 31.0 |
| Yellow Time (s) | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 |
| All-Red Time (s) | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 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 | 5.0 | 5.0 | 5.0 | 5.0 |
| Lead/Lag | | Lead | Lead | | Lag | Lag |
| Lead-Lag Optimize? | | Yes | Yes | | Yes | Yes |
| Vehicle Extension (s) | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |
| Minimum Gap (s) | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |
| Time Before Reduce (s) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Time To Reduce (s) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Recall Mode | None | None | None | C-Min | C-Min | C-Min |
| Walk Time (s) | 7.0 | | | | 7.0 | 7.0 |
| Flash Dont Walk (s) | 14.0 | | | | 11.0 | 11.0 |
| Pedestrian Calls (#/hr) | 0 | | | | 0 | 0 |

## Intersection Summary

Cycle Length: 75
Actuated Cycle Length: 75
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated

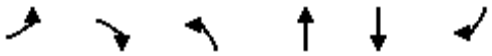
Splits and Phases: 4: Converse Ave. & Mason Way



| Lane Group | EBL | EBR | NBL | NBT | SBT | SBR |
|---|---|---|---|---|---|---|
| Lane Group Flow (vph) | 127 | 273 | 316 | 1042 | 758 | 131 |
| v/c Ratio | 0.49 | 0.43 | 0.64 | 0.73 | 0.90 | 0.18 |
| Control Delay | 35.4 | 17.5 | 20.7 | 11.3 | 34.2 | 13.2 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 35.4 | 17.5 | 20.7 | 11.3 | 34.2 | 13.2 |
| Queue Length 50th (ft) | 55 | 82 | 78 | 242 | 377 | 46 |
| Queue Length 95th (ft) | 85 | 137 | #203 | #550 | #596 | m68 |
| Internal Link Dist (ft) | 528 | | | 242 | 321 | |
| Turn Bay Length (ft) | 300 | | 150 | | | 100 |
| Base Capacity (vph) | 495 | 635 | 497 | 1431 | 842 | 715 |
| 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 | 0.26 | 0.43 | 0.64 | 0.73 | 0.90 | 0.18 |

Intersection Summary

# 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.



| Movement | EBL | EBR | NBL | NBT | SBT | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Volume (veh/h) | 100 | 400 | 300 | 990 | 720 | 200 |
| Future Volume (veh/h) | 100 | 400 | 300 | 990 | 720 | 200 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | 1.00 | 1.00 | | | 1.00 |
| Parking Bus, Adj | 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 | 1870 | 1870 | 1870 | 1870 | 1826 | 1826 |
| Adj Flow Rate, veh/h | 127 | 273 | 316 | 1042 | 758 | 131 |
| Peak Hour Factor | 0.79 | 0.91 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 5 | 5 |
| Cap, veh/h | 331 | 460 | 383 | 1273 | 931 | 789 |
| Arrive On Green | 0.19 | 0.19 | 0.10 | 0.68 | 0.51 | 0.51 |
| Sat Flow, veh/h | 1781 | 1585 | 1781 | 1870 | 1826 | 1547 |
| Grp Volume(v), veh/h | 127 | 273 | 316 | 1042 | 758 | 131 |
| Grp Sat Flow(s),veh/h/ln | 1781 | 1585 | 1781 | 1870 | 1826 | 1547 |
| Q Serve(g_s), s | 4.7 | 11.1 | 5.8 | 30.1 | 26.1 | 3.4 |
| Cycle Q Clear(g_c), s | 4.7 | 11.1 | 5.8 | 30.1 | 26.1 | 3.4 |
| Prop In Lane | 1.00 | 1.00 | 1.00 | | | 1.00 |
| Lane Grp Cap(c), veh/h | 331 | 460 | 383 | 1273 | 931 | 789 |
| V/C Ratio(X) | 0.38 | 0.59 | 0.82 | 0.82 | 0.81 | 0.17 |
| Avail Cap(c_a), veh/h | 499 | 609 | 387 | 1273 | 931 | 789 |
| HCM Platoon Ratio | 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 |
| Uniform Delay (d), s/veh | 26.8 | 22.8 | 14.7 | 8.6 | 15.4 | 9.8 |
| Incr Delay (d2), s/veh | 0.7 | 1.2 | 13.5 | 5.9 | 7.8 | 0.5 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 2.0 | 9.9 | 4.1 | 11.0 | 11.5 | 1.1 |
| Unsig. Movement Delay, s/veh | | | | | | |
| LnGrp Delay(d),s/veh | 27.5 | 24.1 | 28.2 | 14.6 | 23.2 | 10.3 |
| LnGrp LOS | C | C | C | B | C | B |
| Approach Vol, veh/h | 400 | | | 1358 | 889 | |
| Approach Delay, s/veh | 25.1 | | | 17.7 | 21.3 | |
| Approach LOS | C | | | B | C | |

| Timer - Assigned Phs | | 2 | | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | | 56.1 | | 18.9 | 12.8 | 43.2 |
| Change Period (Y+Rc), s | | 5.0 | | 5.0 | 5.0 | 5.0 |
| Max Green Setting (Gmax), s | | 44.0 | | 21.0 | 8.0 | 31.0 |
| Max Q Clear Time (g_c+I1), s | | 32.1 | | 13.1 | 7.8 | 28.1 |
| Green Ext Time (p_c), s | | 6.5 | | 0.9 | 0.0 | 1.6 |

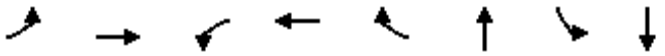
| Intersection Summary | |
|---|---|
| HCM 6th Ctrl Delay | 20.0 |
| HCM 6th LOS | C |

| Lane Group | EBL | EBT | WBL | WBT | WBR | NBL | NBT | SBL | SBT |
|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | |
| Traffic Volume (vph) | 50 | 735 | 15 | 845 | 230 | 5 | 0 | 180 | 5 |
| Future Volume (vph) | 50 | 735 | 15 | 845 | 230 | 5 | 0 | 180 | 5 |
| Turn Type | Perm | NA | Perm | NA | Perm | Perm | NA | Perm | NA |
| Protected Phases | | 2 | | 6 | | | 4 | | 8 |
| Permitted Phases | 2 | | 6 | | 6 | 4 | | 8 | |
| Detector Phase | 2 | 2 | 6 | 6 | 6 | 4 | 4 | 8 | 8 |
| Switch Phase | | | | | | | | | |
| Minimum Initial (s) | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 | 7.0 | 7.0 | 7.0 | 7.0 |
| Minimum Split (s) | 23.0 | 23.0 | 23.0 | 23.0 | 23.0 | 23.0 | 23.0 | 23.0 | 23.0 |
| Total Split (s) | 50.0 | 50.0 | 50.0 | 50.0 | 50.0 | 25.0 | 25.0 | 25.0 | 25.0 |
| Total Split (%) | 66.7% | 66.7% | 66.7% | 66.7% | 66.7% | 33.3% | 33.3% | 33.3% | 33.3% |
| Maximum Green (s) | 45.0 | 45.0 | 45.0 | 45.0 | 45.0 | 20.0 | 20.0 | 20.0 | 20.0 |
| Yellow Time (s) | 3.5 | 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 | 1.5 | 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 |
| Total Lost Time (s) | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | | 5.0 | 5.0 | 5.0 |
| Lead/Lag | | | | | | | | | |
| Lead-Lag Optimize? | | | | | | | | | |
| Vehicle Extension (s) | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |
| Minimum Gap (s) | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |
| Time Before Reduce (s) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Time To Reduce (s) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Recall Mode | C-Min | C-Min | C-Min | C-Min | C-Min | None | None | None | None |
| Walk Time (s) | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | | | 7.0 | 7.0 |
| Flash Dont Walk (s) | 11.0 | 11.0 | 11.0 | 11.0 | 11.0 | | | 11.0 | 11.0 |
| Pedestrian Calls (#/hr) | 0 | 0 | 0 | 0 | 0 | | | 0 | 0 |

## Intersection Summary

Cycle Length: 75
Actuated Cycle Length: 75
Offset: 23 (31%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 65
Control Type: Actuated-Coordinated

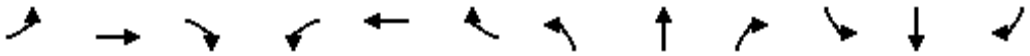
Splits and Phases: 5: USPS dwy/Point Bluff & Converse Ave.



| Lane Group | EBL | EBT | WBL | WBT | WBR | NBT | SBL | SBT |
|---|---|---|---|---|---|---|---|---|
| Lane Group Flow (vph) | 56 | 832 | 17 | 949 | 160 | 12 | 202 | 51 |
| v/c Ratio | 0.27 | 0.68 | 0.06 | 0.77 | 0.15 | 0.04 | 0.70 | 0.15 |
| Control Delay | 9.7 | 9.0 | 5.8 | 17.0 | 5.6 | 21.5 | 40.4 | 23.6 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 9.7 | 9.0 | 5.8 | 17.0 | 5.6 | 21.5 | 40.4 | 23.6 |
| Queue Length 50th (ft) | 5 | 96 | 3 | 375 | 30 | 4 | 87 | 19 |
| Queue Length 95th (ft) | m22 | 235 | m5 | #618 | m43 | 16 | 144 | 43 |
| Internal Link Dist (ft) | | 180 | | 386 | | 121 | | 254 |
| Turn Bay Length (ft) | 75 | | 100 | | 100 | | 75 | |
| Base Capacity (vph) | 204 | 1229 | 285 | 1230 | 1045 | 417 | 372 | 431 |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Storage Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Reduced v/c Ratio | 0.27 | 0.68 | 0.06 | 0.77 | 0.15 | 0.03 | 0.54 | 0.12 |

Intersection Summary

# 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.



| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 50 | 735 | 5 | 15 | 845 | 230 | 5 | 0 | 5 | 180 | 5 | 40 |
| Future Volume (veh/h) | 50 | 735 | 5 | 15 | 845 | 230 | 5 | 0 | 5 | 180 | 5 | 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 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 |
| Adj Flow Rate, veh/h | 56 | 826 | 6 | 17 | 949 | 160 | 6 | 0 | 6 | 202 | 6 | 45 |
| 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 | 297 | 1302 | 9 | 401 | 1313 | 1113 | 172 | 23 | 123 | 338 | 31 | 234 |
| Arrive On Green | 0.70 | 0.70 | 0.70 | 0.70 | 0.70 | 0.70 | 0.16 | 0.00 | 0.16 | 0.16 | 0.16 | 0.16 |
| Sat Flow, veh/h | 508 | 1854 | 13 | 660 | 1870 | 1585 | 609 | 137 | 746 | 1410 | 190 | 1424 |
| Grp Volume(v), veh/h | 56 | 0 | 832 | 17 | 949 | 160 | 12 | 0 | 0 | 202 | 0 | 51 |
| Grp Sat Flow(s),veh/h/ln | 508 | 0 | 1868 | 660 | 1870 | 1585 | 1493 | 0 | 0 | 1410 | 0 | 1614 |
| Q Serve(g_s), s | 5.6 | 0.0 | 17.9 | 1.1 | 23.0 | 2.5 | 0.0 | 0.0 | 0.0 | 7.8 | 0.0 | 2.0 |
| Cycle Q Clear(g_c), s | 28.6 | 0.0 | 17.9 | 19.0 | 23.0 | 2.5 | 2.0 | 0.0 | 0.0 | 9.8 | 0.0 | 2.0 |
| Prop In Lane | 1.00 | | 0.01 | 1.00 | | 1.00 | 0.50 | | 0.50 | 1.00 | | 0.88 |
| Lane Grp Cap(c), veh/h | 297 | 0 | 1311 | 401 | 1313 | 1113 | 318 | 0 | 0 | 338 | 0 | 266 |
| V/C Ratio(X) | 0.19 | 0.00 | 0.63 | 0.04 | 0.72 | 0.14 | 0.04 | 0.00 | 0.00 | 0.60 | 0.00 | 0.19 |
| Avail Cap(c_a), veh/h | 297 | 0 | 1311 | 401 | 1313 | 1113 | 467 | 0 | 0 | 482 | 0 | 430 |
| 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 | 0.00 | 0.00 | 1.00 | 0.00 | 1.00 |
| Uniform Delay (d), s/veh | 15.4 | 0.0 | 6.0 | 11.1 | 6.8 | 3.7 | 26.4 | 0.0 | 0.0 | 30.1 | 0.0 | 27.0 |
| Incr Delay (d2), s/veh | 1.4 | 0.0 | 2.3 | 0.2 | 3.5 | 0.3 | 0.0 | 0.0 | 0.0 | 1.7 | 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 | 0.7 | 0.0 | 5.8 | 0.2 | 7.7 | 0.7 | 0.2 | 0.0 | 0.0 | 3.6 | 0.0 | 0.8 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 16.8 | 0.0 | 8.3 | 11.3 | 10.2 | 4.0 | 26.4 | 0.0 | 0.0 | 31.8 | 0.0 | 27.4 |
| LnGrp LOS | B | A | A | B | B | A | C | A | A | C | A | C |
| Approach Vol, veh/h | | 888 | | | 1126 | | | 12 | | | 253 | |
| Approach Delay, s/veh | | 8.9 | | | 9.4 | | | 26.4 | | | 30.9 | |
| Approach LOS | | A | | | A | | | C | | | C | |

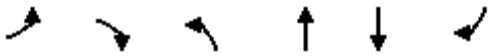
| Timer - Assigned Phs | | 2 | | 4 | | 6 | | 8 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | | 57.7 | | 17.3 | | 57.7 | | 17.3 | | | | |
| Change Period (Y+Rc), s | | 5.0 | | 5.0 | | 5.0 | | 5.0 | | | | |
| Max Green Setting (Gmax), s | | 45.0 | | 20.0 | | 45.0 | | 20.0 | | | | |
| Max Q Clear Time (g_c+I1), s | | 30.6 | | 4.0 | | 25.0 | | 11.8 | | | | |
| Green Ext Time (p_c), s | | 5.9 | | 0.0 | | 8.4 | | 0.5 | | | | |

| Intersection Summary | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HCM 6th Ctrl Delay | | | 11.7 | | | | | | | | | |
| HCM 6th LOS | | | B | | | | | | | | | |

| Lane Group | EBL | EBR | NBL | NBT | SBT | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Volume (vph) | 100 | 200 | 240 | 650 | 600 | 150 |
| Future Volume (vph) | 100 | 200 | 240 | 650 | 600 | 150 |
| Turn Type | Prot | Perm | Prot | NA | NA | Perm |
| Protected Phases | 4 | | 5 | | 6 | |
| Permitted Phases | | 4 | | 2 | | 6 |
| Detector Phase | 4 | 4 | 5 | 2 | 6 | 6 |
| Switch Phase | | | | | | |
| Minimum Initial (s) | 5.0 | 5.0 | 5.0 | 10.0 | 10.0 | 10.0 |
| Minimum Split (s) | 26.0 | 26.0 | 10.0 | 23.0 | 23.0 | 23.0 |
| Total Split (s) | 26.0 | 26.0 | 20.0 | 49.0 | 29.0 | 29.0 |
| Total Split (%) | 34.7% | 34.7% | 26.7% | 65.3% | 38.7% | 38.7% |
| Maximum Green (s) | 21.0 | 21.0 | 15.0 | 44.0 | 24.0 | 24.0 |
| Yellow Time (s) | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 |
| All-Red Time (s) | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 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 | 5.0 | 5.0 | 5.0 | 5.0 |
| Lead/Lag | | | Lead | | Lag | Lag |
| Lead-Lag Optimize? | | | Yes | | Yes | Yes |
| Vehicle Extension (s) | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |
| Minimum Gap (s) | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |
| Time Before Reduce (s) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Time To Reduce (s) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Recall Mode | None | None | None | C-Min | C-Min | C-Min |
| Walk Time (s) | 7.0 | 7.0 | | | 7.0 | 7.0 |
| Flash Dont Walk (s) | 14.0 | 14.0 | | | 11.0 | 11.0 |
| Pedestrian Calls (#/hr) | 0 | 0 | | | 0 | 0 |

| Intersection Summary |
|---|
| Cycle Length: 75 |
| Actuated Cycle Length: 75 |
| Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green |
| Natural Cycle: 80 |
| Control Type: Actuated-Coordinated |

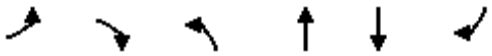
Splits and Phases: 9: Converse Ave. & Future Carlsen St



| Lane Group | EBL | EBR | NBL | NBT | SBT | SBR |
|---|---|---|---|---|---|---|
| Lane Group Flow (vph) | 109 | 135 | 261 | 707 | 652 | 101 |
| v/c Ratio | 0.40 | 0.56 | 0.70 | 0.54 | 0.84 | 0.15 |
| Control Delay | 31.6 | 37.2 | 36.5 | 6.6 | 34.7 | 16.7 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 31.6 | 37.2 | 36.5 | 6.6 | 34.7 | 16.7 |
| Queue Length 50th (ft) | 46 | 59 | 112 | 121 | 266 | 28 |
| Queue Length 95th (ft) | 85 | 103 | 177 | 202 | #552 | 70 |
| Internal Link Dist (ft) | 406 | | | 650 | 865 | |
| Turn Bay Length (ft) | 75 | | 150 | | | 100 |
| Base Capacity (vph) | 479 | 428 | 399 | 1319 | 776 | 659 |
| 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 | 0.23 | 0.32 | 0.65 | 0.54 | 0.84 | 0.15 |

Intersection Summary

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



| Movement | EBL | EBR | NBL | NBT | SBT | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Volume (veh/h) | 100 | 200 | 240 | 650 | 600 | 150 |
| Future Volume (veh/h) | 100 | 200 | 240 | 650 | 600 | 150 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | 1.00 | 1.00 | | | 1.00 |
| Parking Bus, Adj | 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 | 1870 | 1870 | 1870 | 1870 | 1826 | 1826 |
| Adj Flow Rate, veh/h | 109 | 135 | 261 | 707 | 652 | 101 |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 5 | 5 |
| Cap, veh/h | 207 | 184 | 304 | 1404 | 937 | 794 |
| Arrive On Green | 0.12 | 0.12 | 0.17 | 0.75 | 0.51 | 0.51 |
| Sat Flow, veh/h | 1781 | 1585 | 1781 | 1870 | 1826 | 1547 |
| Grp Volume(v), veh/h | 109 | 135 | 261 | 707 | 652 | 101 |
| Grp Sat Flow(s),veh/h/ln | 1781 | 1585 | 1781 | 1870 | 1826 | 1547 |
| Q Serve(g_s), s | 4.3 | 6.2 | 10.7 | 11.4 | 20.3 | 2.5 |
| Cycle Q Clear(g_c), s | 4.3 | 6.2 | 10.7 | 11.4 | 20.3 | 2.5 |
| Prop In Lane | 1.00 | 1.00 | 1.00 | | | 1.00 |
| Lane Grp Cap(c), veh/h | 207 | 184 | 304 | 1404 | 937 | 794 |
| V/C Ratio(X) | 0.53 | 0.73 | 0.86 | 0.50 | 0.70 | 0.13 |
| Avail Cap(c_a), veh/h | 499 | 444 | 356 | 1404 | 937 | 794 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 0.76 | 0.76 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 31.2 | 32.0 | 30.2 | 3.8 | 13.8 | 9.5 |
| Incr Delay (d2), s/veh | 2.1 | 5.6 | 13.1 | 1.0 | 4.3 | 0.3 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 1.9 | 5.6 | 5.5 | 3.0 | 8.0 | 0.8 |
| Unsig. Movement Delay, s/veh | | | | | | |
| LnGrp Delay(d),s/veh | 33.3 | 37.6 | 43.3 | 4.7 | 18.1 | 9.8 |
| LnGrp LOS | C | D | D | A | B | A |
| Approach Vol, veh/h | 244 | | | 968 | 753 | |
| Approach Delay, s/veh | 35.7 | | | 15.1 | 17.0 | |
| Approach LOS | D | | | B | B | |

| Timer - Assigned Phs | | 2 | | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | | 61.3 | | 13.7 | 17.8 | 43.5 |
| Change Period (Y+Rc), s | | 5.0 | | 5.0 | 5.0 | 5.0 |
| Max Green Setting (Gmax), s | | 44.0 | | 21.0 | 15.0 | 24.0 |
| Max Q Clear Time (g_c+I1), s | | 13.4 | | 8.2 | 12.7 | 22.3 |
| Green Ext Time (p_c), s | | 5.7 | | 0.6 | 0.2 | 0.8 |

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

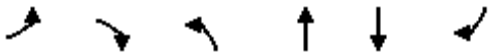
# 3d.i) Year 2045 Four-Lane Alternative Mid-Day Peak Hour Intersection Operation Computer Capacity Worksheets

| Lane Group | EBL | EBR | NBL | NBT | SBT | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Volume (vph) | 130 | 300 | 300 | 650 | 750 | 170 |
| Future Volume (vph) | 130 | 300 | 300 | 650 | 750 | 170 |
| Turn Type | Prot | pm+ov | pm+pt | NA | NA | Perm |
| Protected Phases | 4 | 5 | 5 | 2 | 6 | |
| Permitted Phases | | 4 | 2 | | | 6 |
| Detector Phase | 4 | 5 | 5 | 2 | 6 | 6 |
| Switch Phase | | | | | | |
| Minimum Initial (s) | 8.0 | 6.0 | 6.0 | 10.0 | 10.0 | 10.0 |
| Minimum Split (s) | 33.5 | 12.0 | 12.0 | 24.0 | 24.0 | 24.0 |
| Total Split (s) | 33.5 | 16.0 | 16.0 | 41.5 | 25.5 | 25.5 |
| Total Split (%) | 44.7% | 21.3% | 21.3% | 55.3% | 34.0% | 34.0% |
| Maximum Green (s) | 28.0 | 11.0 | 11.0 | 36.5 | 20.5 | 20.5 |
| Yellow Time (s) | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 |
| All-Red Time (s) | 2.0 | 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 |
| Total Lost Time (s) | 5.5 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 |
| Lead/Lag | | Lead | Lead | | Lag | Lag |
| Lead-Lag Optimize? | | Yes | Yes | | Yes | Yes |
| Vehicle Extension (s) | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |
| Minimum Gap (s) | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |
| Time Before Reduce (s) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Time To Reduce (s) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Recall Mode | None | None | None | C-Min | C-Min | C-Min |
| Walk Time (s) | 7.0 | | | | 7.0 | 7.0 |
| Flash Dont Walk (s) | 21.0 | | | | 11.0 | 11.0 |
| Pedestrian Calls (#/hr) | 0 | | | | 0 | 0 |

## Intersection Summary

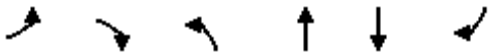
Cycle Length: 75
Actuated Cycle Length: 75
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green
Natural Cycle: 75
Control Type: Actuated-Coordinated

Splits and Phases: 4: Converse Ave. & Mason Way



| Lane Group | EBL | EBR | NBL | NBT | SBT | SBR |
|---|---|---|---|---|---|---|
| Lane Group Flow (vph) | 146 | 192 | 309 | 670 | 773 | 109 |
| v/c Ratio | 0.53 | 0.30 | 0.55 | 0.27 | 0.48 | 0.15 |
| Control Delay | 35.5 | 14.6 | 8.4 | 4.8 | 17.1 | 15.4 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 35.5 | 14.6 | 8.4 | 4.8 | 17.1 | 15.4 |
| Queue Length 50th (ft) | 64 | 60 | 42 | 48 | 122 | 27 |
| Queue Length 95th (ft) | 109 | 75 | 89 | 86 | 225 | 74 |
| Internal Link Dist (ft) | 528 | | | 242 | 321 | |
| Turn Bay Length (ft) | 300 | | 150 | | | 100 |
| Base Capacity (vph) | 660 | 658 | 570 | 2489 | 1614 | 722 |
| 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 | 0.22 | 0.29 | 0.54 | 0.27 | 0.48 | 0.15 |

Intersection Summary



| Movement | EBL | EBR | NBL | NBT | SBT | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Volume (veh/h) | 130 | 300 | 300 | 650 | 750 | 170 |
| Future Volume (veh/h) | 130 | 300 | 300 | 650 | 750 | 170 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | 1.00 | 1.00 | | | 1.00 |
| Parking Bus, Adj | 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 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 |
| Adj Flow Rate, veh/h | 146 | 192 | 309 | 670 | 773 | 109 |
| Peak Hour Factor | 0.89 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 257 | 386 | 540 | 2544 | 1955 | 872 |
| Arrive On Green | 0.14 | 0.14 | 0.10 | 0.72 | 0.55 | 0.55 |
| Sat Flow, veh/h | 1781 | 1585 | 1781 | 3647 | 3647 | 1585 |
| Grp Volume(v), veh/h | 146 | 192 | 309 | 670 | 773 | 109 |
| Grp Sat Flow(s),veh/h/ln | 1781 | 1585 | 1781 | 1777 | 1777 | 1585 |
| Q Serve(g_s), s | 5.7 | 7.8 | 5.1 | 4.9 | 9.4 | 2.5 |
| Cycle Q Clear(g_c), s | 5.7 | 7.8 | 5.1 | 4.9 | 9.4 | 2.5 |
| Prop In Lane | 1.00 | 1.00 | 1.00 | | | 1.00 |
| Lane Grp Cap(c), veh/h | 257 | 386 | 540 | 2544 | 1955 | 872 |
| V/C Ratio(X) | 0.57 | 0.50 | 0.57 | 0.26 | 0.40 | 0.13 |
| Avail Cap(c_a), veh/h | 665 | 749 | 625 | 2544 | 1955 | 872 |
| HCM Platoon Ratio | 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 |
| Uniform Delay (d), s/veh | 29.9 | 24.4 | 6.5 | 3.7 | 9.7 | 8.2 |
| Incr Delay (d2), s/veh | 2.0 | 1.0 | 1.0 | 0.3 | 0.6 | 0.3 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 2.5 | 7.1 | 1.6 | 1.3 | 3.4 | 0.8 |
| Unsig. Movement Delay, s/veh | | | | | | |
| LnGrp Delay(d),s/veh | 31.9 | 25.4 | 7.4 | 4.0 | 10.3 | 8.4 |
| LnGrp LOS | C | C | A | A | B | A |
| Approach Vol, veh/h | 338 | | | 979 | 882 | |
| Approach Delay, s/veh | 28.2 | | | 5.1 | 10.1 | |
| Approach LOS | C | | | A | B | |

| Timer - Assigned Phs | | 2 | | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | | 58.7 | | 16.3 | 12.4 | 46.2 |
| Change Period (Y+Rc), s | | 5.0 | | 5.5 | 5.0 | 5.0 |
| Max Green Setting (Gmax), s | | 36.5 | | 28.0 | 11.0 | 20.5 |
| Max Q Clear Time (g_c+I1), s | | 6.9 | | 9.8 | 7.1 | 11.4 |
| Green Ext Time (p_c), s | | 5.1 | | 1.0 | 0.4 | 3.8 |

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

| Intersection | |
|---|---|
| Int Delay, s/veh | 31.7 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 40 | 720 | 5 | 10 | 600 | 170 | 5 | 0 | 10 | 190 | 0 | 20 |
| Future Vol, veh/h | 40 | 720 | 5 | 10 | 600 | 170 | 5 | 0 | 10 | 190 | 0 | 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 | 75 | - | - | 100 | - | - | - | - | - | 75 | - | - |
| Veh in Median Storage, # | - | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - |
| Grade, % | - | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - |
| Peak Hour Factor | 97 | 97 | 97 | 97 | 97 | 97 | 97 | 97 | 97 | 97 | 97 | 97 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 41 | 742 | 5 | 10 | 619 | 175 | 5 | 0 | 10 | 196 | 0 | 21 |

| Major/Minor | Major1 | | | Major2 | | | Minor1 | | | Minor2 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Conflicting Flow All | 794 | 0 | 0 | 747 | 0 | 0 | 1157 | 1641 | 374 | 1180 | 1556 | 397 |
| Stage 1 | - | - | - | - | - | - | 827 | 827 | - | 727 | 727 | - |
| Stage 2 | - | - | - | - | - | - | 330 | 814 | - | 453 | 829 | - |
| 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 | 823 | - | - | 857 | - | - | 151 | 99 | 623 | ~ 146 | 112 | 602 |
| Stage 1 | - | - | - | - | - | - | 332 | 384 | - | 381 | 427 | - |
| Stage 2 | - | - | - | - | - | - | 657 | 390 | - | 556 | 383 | - |
| Platoon blocked, % | | - | - | | - | - | | | | | | |
| Mov Cap-1 Maneuver | 823 | - | - | 857 | - | - | 139 | 93 | 623 | ~ 137 | 105 | 602 |
| Mov Cap-2 Maneuver | - | - | - | - | - | - | 139 | 93 | - | ~ 137 | 105 | - |
| Stage 1 | - | - | - | - | - | - | 315 | 365 | - | 362 | 422 | - |
| Stage 2 | - | - | - | - | - | - | 627 | 385 | - | 520 | 364 | - |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| HCM Control Delay, s | 0.5 | 0.1 | 18.2 | 263.4 |
| HCM LOS | | | C | F |

| Minor Lane/Major Mvmt | NBLn1 | EBL | EBT | EBR | WBL | WBT | WBR | SBLn1 | SBLn2 |
|---|---|---|---|---|---|---|---|---|---|
| Capacity (veh/h) | 288 | 823 | - | - | 857 | - | - | 137 | 602 |
| HCM Lane V/C Ratio | 0.054 | 0.05 | - | - | 0.012 | - | - | 1.43 | 0.034 |
| HCM Control Delay (s) | 18.2 | 9.6 | - | - | 9.3 | - | - | 290 | 11.2 |
| HCM Lane LOS | C | A | - | - | A | - | - | F | B |
| HCM 95th %tile Q(veh) | 0.2 | 0.2 | - | - | 0 | - | - | 13 | 0.1 |

| Notes | | | |
|---|---|---|---|
| ~: Volume exceeds capacity | $: Delay exceeds 300s | +: Computation Not Defined | *: All major volume in platoon |

| Intersection | |
|---|---|
| Int Delay, s/veh | 0.7 |

| Movement | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 25 | 730 | 600 | 30 | 25 | 40 |
| Future Vol, veh/h | 25 | 730 | 600 | 30 | 25 | 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 | - | - | - | 0 | 0 |
| Veh in Median Storage, # | - | 0 | 0 | - | 0 | - |
| Grade, % | - | 0 | 0 | - | 0 | - |
| Peak Hour Factor | 97 | 97 | 97 | 97 | 97 | 97 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 26 | 753 | 619 | 31 | 26 | 41 |

| Major/Minor | Major1 | | Major2 | | Minor2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 650 | 0 | - | 0 | 1064 | 325 |
| Stage 1 | - | - | - | - | 635 | - |
| Stage 2 | - | - | - | - | 429 | - |
| Critical Hdwy | 4.14 | - | - | - | 6.84 | 6.94 |
| Critical Hdwy Stg 1 | - | - | - | - | 5.84 | - |
| Critical Hdwy Stg 2 | - | - | - | - | 5.84 | - |
| Follow-up Hdwy | 2.22 | - | - | - | 3.52 | 3.32 |
| Pot Cap-1 Maneuver | 932 | - | - | - | 218 | 671 |
| Stage 1 | - | - | - | - | 490 | - |
| Stage 2 | - | - | - | - | 624 | - |
| Platoon blocked, % | | - | - | - | | |
| Mov Cap-1 Maneuver | 932 | - | - | - | 212 | 671 |
| Mov Cap-2 Maneuver | - | - | - | - | 340 | - |
| Stage 1 | - | - | - | - | 476 | - |
| Stage 2 | - | - | - | - | 624 | - |

| Approach | EB | WB | SB |
|---|---|---|---|
| HCM Control Delay, s | 0.3 | 0 | 12.9 |
| HCM LOS | | | B |

| Minor Lane/Major Mvmt | EBL | EBT | WBT | WBR | SBLn1 | SBLn2 |
|---|---|---|---|---|---|---|
| Capacity (veh/h) | 932 | - | - | - | 340 | 671 |
| HCM Lane V/C Ratio | 0.028 | - | - | - | 0.076 | 0.061 |
| HCM Control Delay (s) | 9 | - | - | - | 16.5 | 10.7 |
| HCM Lane LOS | A | - | - | - | C | B |
| HCM 95th %tile Q(veh) | 0.1 | - | - | - | 0.2 | 0.2 |

| Intersection | |
|---|---|
| Int Delay, s/veh | 5.9 |

| Movement | EBL | EBR | NBL | NBT | SBT | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 150 | 200 | 140 | 500 | 555 | 110 |
| Future Vol, veh/h | 150 | 200 | 140 | 500 | 555 | 110 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Stop | Stop | Free | Free | Free | Free |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | 75 | 0 | 150 | - | - | - |
| Veh in Median Storage, # | 0 | - | - | 0 | 0 | - |
| Grade, % | 0 | - | - | 0 | 0 | - |
| Peak Hour Factor | 92 | 92 | 92 | 92 | 92 | 92 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 163 | 217 | 152 | 543 | 603 | 120 |

| Major/Minor | Minor2 | | Major1 | | Major2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 1239 | 362 | 723 | 0 | - | 0 |
| Stage 1 | 663 | - | - | - | - | - |
| Stage 2 | 576 | - | - | - | - | - |
| Critical Hdwy | 6.84 | 6.94 | 4.14 | - | - | - |
| Critical Hdwy Stg 1 | 5.84 | - | - | - | - | - |
| Critical Hdwy Stg 2 | 5.84 | - | - | - | - | - |
| Follow-up Hdwy | 3.52 | 3.32 | 2.22 | - | - | - |
| Pot Cap-1 Maneuver | 168 | 635 | 875 | - | - | - |
| Stage 1 | 474 | - | - | - | - | - |
| Stage 2 | 525 | - | - | - | - | - |
| Platoon blocked, % | | | | - | - | - |
| Mov Cap-1 Maneuver | ~ 139 | 635 | 875 | - | - | - |
| Mov Cap-2 Maneuver | 266 | - | - | - | - | - |
| Stage 1 | 392 | - | - | - | - | - |
| Stage 2 | 525 | - | - | - | - | - |

| Approach | EB | NB | SB |
|---|---|---|---|
| HCM Control Delay, s | 24 | 2.2 | 0 |
| HCM LOS | C | | |

| Minor Lane/Major Mvmt | NBL | NBT | EBLn1 | EBLn2 | SBT | SBR |
|---|---|---|---|---|---|---|
| Capacity (veh/h) | 875 | - | 266 | 635 | - | - |
| HCM Lane V/C Ratio | 0.174 | - | 0.613 | 0.342 | - | - |
| HCM Control Delay (s) | 10 | - | 37.8 | 13.6 | - | - |
| HCM Lane LOS | A | - | E | B | - | - |
| HCM 95th %tile Q(veh) | 0.6 | - | 3.7 | 1.5 | - | - |

| Notes | | | |
|---|---|---|---|
| ~: Volume exceeds capacity | $: Delay exceeds 300s | +: Computation Not Defined | *: All major volume in platoon |

| Intersection | |
|---|---|
| Int Delay, s/veh | 0.1 |

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 760 | 0 | 5 | 620 | 5 | 5 |
| Future Vol, veh/h | 760 | 0 | 5 | 620 | 5 | 5 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Free | Free | Free | Free | Stop | Stop |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | - | - | 75 | - | 0 | - |
| Veh in Median Storage, # | 0 | - | - | 0 | 0 | - |
| Grade, % | 0 | - | - | 0 | 0 | - |
| Peak Hour Factor | 97 | 97 | 97 | 97 | 97 | 97 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 784 | 0 | 5 | 639 | 5 | 5 |

| Major/Minor | Major1 | | Major2 | | Minor1 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 0 | 0 | 784 | 0 | 1114 | 392 |
| Stage 1 | - | - | - | - | 784 | - |
| Stage 2 | - | - | - | - | 330 | - |
| Critical Hdwy | - | - | 4.14 | - | 6.84 | 6.94 |
| Critical Hdwy Stg 1 | - | - | - | - | 5.84 | - |
| Critical Hdwy Stg 2 | - | - | - | - | 5.84 | - |
| Follow-up Hdwy | - | - | 2.22 | - | 3.52 | 3.32 |
| Pot Cap-1 Maneuver | - | - | 830 | - | 202 | 607 |
| Stage 1 | - | - | - | - | 410 | - |
| Stage 2 | - | - | - | - | 701 | - |
| Platoon blocked, % | - | - | | - | | |
| Mov Cap-1 Maneuver | - | - | 830 | - | 201 | 607 |
| Mov Cap-2 Maneuver | - | - | - | - | 318 | - |
| Stage 1 | - | - | - | - | 410 | - |
| Stage 2 | - | - | - | - | 697 | - |

| Approach | EB | WB | NB |
|---|---|---|---|
| HCM Control Delay, s | 0 | 0.1 | 13.9 |
| HCM LOS | | | B |

| Minor Lane/Major Mvmt | NBLn1 | EBT | EBR | WBL | WBT |
|---|---|---|---|---|---|
| Capacity (veh/h) | 417 | - | - | 830 | - |
| HCM Lane V/C Ratio | 0.025 | - | - | 0.006 | - |
| HCM Control Delay (s) | 13.9 | - | - | 9.4 | - |
| HCM Lane LOS | B | - | - | A | - |
| HCM 95th %tile Q(veh) | 0.1 | - | - | 0 | - |

| Intersection | |
|---|---|
| Int Delay, s/veh | 0.1 |

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 755 | 0 | 5 | 625 | 5 | 5 |
| Future Vol, veh/h | 755 | 0 | 5 | 625 | 5 | 5 |
| 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 | - | 0 | - |
| Veh in Median Storage, # | 0 | - | - | 0 | 0 | - |
| Grade, % | 0 | - | - | 0 | 0 | - |
| Peak Hour Factor | 97 | 97 | 97 | 97 | 97 | 97 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 778 | 0 | 5 | 644 | 5 | 5 |

| Major/Minor | Major1 | | Major2 | | Minor1 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 0 | 0 | 778 | 0 | 1110 | 389 |
| Stage 1 | - | - | - | - | 778 | - |
| Stage 2 | - | - | - | - | 332 | - |
| Critical Hdwy | - | - | 4.14 | - | 6.84 | 6.94 |
| Critical Hdwy Stg 1 | - | - | - | - | 5.84 | - |
| Critical Hdwy Stg 2 | - | - | - | - | 5.84 | - |
| Follow-up Hdwy | - | - | 2.22 | - | 3.52 | 3.32 |
| Pot Cap-1 Maneuver | - | - | 834 | - | 203 | 610 |
| Stage 1 | - | - | - | - | 413 | - |
| Stage 2 | - | - | - | - | 699 | - |
| Platoon blocked, % | - | - | | - | | |
| Mov Cap-1 Maneuver | - | - | 834 | - | 202 | 610 |
| Mov Cap-2 Maneuver | - | - | - | - | 319 | - |
| Stage 1 | - | - | - | - | 413 | - |
| Stage 2 | - | - | - | - | 695 | - |

| Approach | EB | WB | NB |
|---|---|---|---|
| HCM Control Delay, s | 0 | 0.1 | 13.8 |
| HCM LOS | | | B |

| Minor Lane/Major Mvmt | NBLn1 | EBT | EBR | WBL | WBT |
|---|---|---|---|---|---|
| Capacity (veh/h) | 419 | - | - | 834 | - |
| HCM Lane V/C Ratio | 0.025 | - | - | 0.006 | - |
| HCM Control Delay (s) | 13.8 | - | - | 9.3 | - |
| HCM Lane LOS | B | - | - | A | - |
| HCM 95th %tile Q(veh) | 0.1 | - | - | 0 | - |

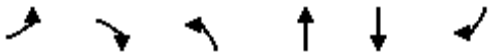
# 3d.ii) Year 2045 Four-Lane Alternative PM Peak Hour Intersection Operation Computer Capacity Worksheets

| Lane Group | EBL | EBR | NBL | NBT | SBT | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Volume (vph) | 100 | 400 | 300 | 990 | 720 | 200 |
| Future Volume (vph) | 100 | 400 | 300 | 990 | 720 | 200 |
| Turn Type | Prot | pm+ov | pm+pt | NA | NA | Perm |
| Protected Phases | 4 | 5 | 5 | 2 | 6 | |
| Permitted Phases | | 4 | 2 | | | 6 |
| Detector Phase | 4 | 5 | 5 | 2 | 6 | 6 |
| Switch Phase | | | | | | |
| Minimum Initial (s) | 8.0 | 6.0 | 6.0 | 10.0 | 10.0 | 10.0 |
| Minimum Split (s) | 33.5 | 12.0 | 12.0 | 24.0 | 24.0 | 24.0 |
| Total Split (s) | 33.5 | 16.0 | 16.0 | 41.5 | 25.5 | 25.5 |
| Total Split (%) | 44.7% | 21.3% | 21.3% | 55.3% | 34.0% | 34.0% |
| Maximum Green (s) | 28.0 | 11.0 | 11.0 | 36.5 | 20.5 | 20.5 |
| Yellow Time (s) | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 |
| All-Red Time (s) | 2.0 | 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 |
| Total Lost Time (s) | 5.5 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 |
| Lead/Lag | | Lead | Lead | | Lag | Lag |
| Lead-Lag Optimize? | | Yes | Yes | | Yes | Yes |
| Vehicle Extension (s) | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |
| Minimum Gap (s) | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |
| Time Before Reduce (s) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Time To Reduce (s) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Recall Mode | None | None | None | C-Min | C-Min | C-Min |
| Walk Time (s) | 7.0 | | | | 7.0 | 7.0 |
| Flash Dont Walk (s) | 21.0 | | | | 11.0 | 11.0 |
| Pedestrian Calls (#/hr) | 0 | | | | 0 | 0 |

## Intersection Summary

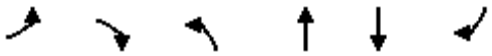
Cycle Length: 75
Actuated Cycle Length: 75
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green
Natural Cycle: 75
Control Type: Actuated-Coordinated

Splits and Phases: 4: Converse Ave. & Mason Way



| Lane Group | EBL | EBR | NBL | NBT | SBT | SBR |
|---|---|---|---|---|---|---|
| Lane Group Flow (vph) | 127 | 273 | 316 | 1042 | 758 | 131 |
| v/c Ratio | 0.49 | 0.46 | 0.51 | 0.39 | 0.45 | 0.17 |
| Control Delay | 35.2 | 18.2 | 7.1 | 4.8 | 16.1 | 15.1 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 35.2 | 18.2 | 7.1 | 4.8 | 16.1 | 15.1 |
| Queue Length 50th (ft) | 55 | 91 | 41 | 82 | 118 | 33 |
| Queue Length 95th (ft) | 85 | 112 | 86 | 141 | 217 | 85 |
| Internal Link Dist (ft) | 528 | | | 242 | 321 | |
| Turn Bay Length (ft) | 300 | | 150 | | | 100 |
| Base Capacity (vph) | 660 | 596 | 614 | 2697 | 1684 | 753 |
| 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 | 0.19 | 0.46 | 0.51 | 0.39 | 0.45 | 0.17 |

Intersection Summary



| Movement | EBL | EBR | NBL | NBT | SBT | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Volume (veh/h) | 100 | 400 | 300 | 990 | 720 | 200 |
| Future Volume (veh/h) | 100 | 400 | 300 | 990 | 720 | 200 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | 1.00 | 1.00 | | | 1.00 |
| Parking Bus, Adj | 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 | 1870 | 1870 | 1870 | 1870 | 1826 | 1826 |
| Adj Flow Rate, veh/h | 127 | 273 | 316 | 1042 | 758 | 131 |
| Peak Hour Factor | 0.79 | 0.91 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 5 | 5 |
| Cap, veh/h | 335 | 473 | 513 | 2387 | 1718 | 766 |
| Arrive On Green | 0.19 | 0.19 | 0.11 | 0.67 | 0.50 | 0.50 |
| Sat Flow, veh/h | 1781 | 1585 | 1781 | 3647 | 3561 | 1547 |
| Grp Volume(v), veh/h | 127 | 273 | 316 | 1042 | 758 | 131 |
| Grp Sat Flow(s),veh/h/ln | 1781 | 1585 | 1781 | 1777 | 1735 | 1547 |
| Q Serve(g_s), s | 4.7 | 11.0 | 6.0 | 10.2 | 10.6 | 3.5 |
| Cycle Q Clear(g_c), s | 4.7 | 11.0 | 6.0 | 10.2 | 10.6 | 3.5 |
| Prop In Lane | 1.00 | 1.00 | 1.00 | | | 1.00 |
| Lane Grp Cap(c), veh/h | 335 | 473 | 513 | 2387 | 1718 | 766 |
| V/C Ratio(X) | 0.38 | 0.58 | 0.62 | 0.44 | 0.44 | 0.17 |
| Avail Cap(c_a), veh/h | 665 | 766 | 579 | 2387 | 1718 | 766 |
| HCM Platoon Ratio | 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 |
| Uniform Delay (d), s/veh | 26.6 | 22.3 | 8.3 | 5.7 | 12.2 | 10.4 |
| Incr Delay (d2), s/veh | 0.7 | 1.1 | 1.6 | 0.6 | 0.8 | 0.5 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 2.0 | 9.8 | 2.0 | 3.1 | 3.9 | 1.2 |
| Unsig. Movement Delay, s/veh | | | | | | |
| LnGrp Delay(d),s/veh | 27.3 | 23.4 | 9.9 | 6.3 | 13.1 | 10.9 |
| LnGrp LOS | C | C | A | A | B | B |
| Approach Vol, veh/h | 400 | | | 1358 | 889 | |
| Approach Delay, s/veh | 24.7 | | | 7.1 | 12.7 | |
| Approach LOS | C | | | A | B | |

| Timer - Assigned Phs | | 2 | | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | | 55.4 | | 19.6 | 13.2 | 42.1 |
| Change Period (Y+Rc), s | | 5.0 | | 5.5 | 5.0 | 5.0 |
| Max Green Setting (Gmax), s | | 36.5 | | 28.0 | 11.0 | 20.5 |
| Max Q Clear Time (g_c+I1), s | | 12.2 | | 13.0 | 8.0 | 12.6 |
| Green Ext Time (p_c), s | | 8.3 | | 1.2 | 0.3 | 3.4 |

| Intersection Summary | |
|---|---|
| HCM 6th Ctrl Delay | 11.7 |
| HCM 6th LOS | B |

| Intersection | |
|---|---|
| Int Delay, s/veh | 104.1 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 50 | 735 | 5 | 15 | 845 | 230 | 5 | 0 | 5 | 180 | 5 | 40 |
| Future Vol, veh/h | 50 | 735 | 5 | 15 | 845 | 230 | 5 | 0 | 5 | 180 | 5 | 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 | 75 | - | - | 100 | - | - | - | - | - | 75 | - | - |
| 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, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 56 | 826 | 6 | 17 | 949 | 258 | 6 | 0 | 6 | 202 | 6 | 45 |

| Major/Minor | Major1 | | | Major2 | | | Minor1 | | | Minor2 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Conflicting Flow All | 1207 | 0 | 0 | 832 | 0 | 0 | 1453 | 2182 | 416 | 1637 | 2056 | 604 |
| Stage 1 | - | - | - | - | - | - | 941 | 941 | - | 1112 | 1112 | - |
| Stage 2 | - | - | - | - | - | - | 512 | 1241 | - | 525 | 944 | - |
| 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 | 574 | - | - | 796 | - | - | 91 | 45 | 585 | ~ 67 | 55 | 441 |
| Stage 1 | - | - | - | - | - | - | 283 | 340 | - | 223 | 282 | - |
| Stage 2 | - | - | - | - | - | - | 513 | 245 | - | 504 | 339 | - |
| Platoon blocked, % | | - | - | | - | - | | | | | | |
| Mov Cap-1 Maneuver | 574 | - | - | 796 | - | - | 68 | 40 | 585 | ~ 60 | 49 | 441 |
| Mov Cap-2 Maneuver | - | - | - | - | - | - | 68 | 40 | - | ~ 60 | 49 | - |
| Stage 1 | - | - | - | - | - | - | 255 | 307 | - | ~ 201 | 276 | - |
| Stage 2 | - | - | - | - | - | - | 442 | 240 | - | 450 | 306 | - |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| HCM Control Delay, s | 0.8 | 0.1 | 37.5 | $ 974 |
| HCM LOS | | | E | F |

| Minor Lane/Major Mvmt | NBLn1 | EBL | EBT | EBR | WBL | WBT | WBR | SBLn1 | SBLn2 |
|---|---|---|---|---|---|---|---|---|---|
| Capacity (veh/h) | 122 | 574 | - | - | 796 | - | - | 60 | 233 |
| HCM Lane V/C Ratio | 0.092 | 0.098 | - | - | 0.021 | - | - | 3.371 | 0.217 |
| HCM Control Delay (s) | 37.5 | 12 | - | - | 9.6 | - | - | $ 1211.3 | 24.7 |
| HCM Lane LOS | E | B | - | - | A | - | - | F | C |
| HCM 95th %tile Q(veh) | 0.3 | 0.3 | - | - | 0.1 | - | - | 21.3 | 0.8 |

| Notes | | | |
|---|---|---|---|
| ~: Volume exceeds capacity | $: Delay exceeds 300s | +: Computation Not Defined | *: All major volume in platoon |

| Intersection | |
|---|---|
| Int Delay, s/veh | 1.3 |

| Movement | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 50 | 750 | 840 | 40 | 40 | 50 |
| Future Vol, veh/h | 50 | 750 | 840 | 40 | 40 | 50 |
| 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 | - | - | - | 0 | 0 |
| Veh in Median Storage, # | - | 0 | 0 | - | 0 | - |
| Grade, % | - | 0 | 0 | - | 0 | - |
| Peak Hour Factor | 90 | 90 | 90 | 90 | 90 | 90 |
| Heavy Vehicles, % | 5 | 5 | 2 | 2 | 5 | 5 |
| Mvmt Flow | 56 | 833 | 933 | 44 | 44 | 56 |

| Major/Minor | Major1 | | Major2 | | Minor2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 977 | 0 | - | 0 | 1484 | 489 |
| Stage 1 | - | - | - | - | 955 | - |
| Stage 2 | - | - | - | - | 529 | - |
| Critical Hdwy | 4.2 | - | - | - | 6.9 | 7 |
| Critical Hdwy Stg 1 | - | - | - | - | 5.9 | - |
| Critical Hdwy Stg 2 | - | - | - | - | 5.9 | - |
| Follow-up Hdwy | 2.25 | - | - | - | 3.55 | 3.35 |
| Pot Cap-1 Maneuver | 684 | - | - | - | 112 | 517 |
| Stage 1 | - | - | - | - | 327 | - |
| Stage 2 | - | - | - | - | 547 | - |
| Platoon blocked, % | | - | - | - | | |
| Mov Cap-1 Maneuver | 684 | - | - | - | 103 | 517 |
| Mov Cap-2 Maneuver | - | - | - | - | 219 | - |
| Stage 1 | - | - | - | - | 300 | - |
| Stage 2 | - | - | - | - | 547 | - |

| Approach | EB | WB | SB |
|---|---|---|---|
| HCM Control Delay, s | 0.7 | 0 | 18.5 |
| HCM LOS | | | C |

| Minor Lane/Major Mvmt | EBL | EBT | WBT | WBR | SBLn1 | SBLn2 |
|---|---|---|---|---|---|---|
| Capacity (veh/h) | 684 | - | - | - | 219 | 517 |
| HCM Lane V/C Ratio | 0.081 | - | - | - | 0.203 | 0.107 |
| HCM Control Delay (s) | 10.7 | - | - | - | 25.6 | 12.8 |
| HCM Lane LOS | B | - | - | - | D | B |
| HCM 95th %tile Q(veh) | 0.3 | - | - | - | 0.7 | 0.4 |

| Intersection | |
|---|---|
| Int Delay, s/veh | 5.6 |

| Movement | EBL | EBR | NBL | NBT | SBT | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 100 | 200 | 240 | 650 | 600 | 150 |
| Future Vol, veh/h | 100 | 200 | 240 | 650 | 600 | 150 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Stop | Stop | Free | Free | Free | Free |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | 75 | 0 | 150 | - | - | - |
| Veh in Median Storage, # | 0 | - | - | 0 | 0 | - |
| Grade, % | 0 | - | - | 0 | 0 | - |
| Peak Hour Factor | 92 | 92 | 92 | 92 | 92 | 92 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 5 | 5 |
| Mvmt Flow | 109 | 217 | 261 | 707 | 652 | 163 |

| Major/Minor | Minor2 | | Major1 | | Major2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 1610 | 408 | 815 | 0 | - | 0 |
| Stage 1 | 734 | - | - | - | - | - |
| Stage 2 | 876 | - | - | - | - | - |
| Critical Hdwy | 6.84 | 6.94 | 4.14 | - | - | - |
| Critical Hdwy Stg 1 | 5.84 | - | - | - | - | - |
| Critical Hdwy Stg 2 | 5.84 | - | - | - | - | - |
| Follow-up Hdwy | 3.52 | 3.32 | 2.22 | - | - | - |
| Pot Cap-1 Maneuver | ~ 95 | 593 | 808 | - | - | - |
| Stage 1 | 436 | - | - | - | - | - |
| Stage 2 | 368 | - | - | - | - | - |
| Platoon blocked, % | | | | - | - | - |
| Mov Cap-1 Maneuver | ~ 64 | 593 | 808 | - | - | - |
| Mov Cap-2 Maneuver | 178 | - | - | - | - | - |
| Stage 1 | 295 | - | - | - | - | - |
| Stage 2 | 368 | - | - | - | - | - |

| Approach | EB | NB | SB |
|---|---|---|---|
| HCM Control Delay, s | 27.2 | 3.1 | 0 |
| HCM LOS | D | | |

| Minor Lane/Major Mvmt | NBL | NBT | EBLn1 | EBLn2 | SBT | SBR |
|---|---|---|---|---|---|---|
| Capacity (veh/h) | 808 | - | 178 | 593 | - | - |
| HCM Lane V/C Ratio | 0.323 | - | 0.611 | 0.367 | - | - |
| HCM Control Delay (s) | 11.6 | - | 52.7 | 14.5 | - | - |
| HCM Lane LOS | B | - | F | B | - | - |
| HCM 95th %tile Q(veh) | 1.4 | - | 3.4 | 1.7 | - | - |

| Notes | | | |
|---|---|---|---|
| ~: Volume exceeds capacity | $: Delay exceeds 300s | +: Computation Not Defined | *: All major volume in platoon |

| Intersection | |
|---|---|
| Int Delay, s/veh | 0.1 |

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 785 | 0 | 10 | 880 | 0 | 5 |
| Future Vol, veh/h | 785 | 0 | 10 | 880 | 0 | 5 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Free | Free | Free | Free | Stop | Stop |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | - | - | 75 | - | 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 | 872 | 0 | 11 | 978 | 0 | 6 |

| Major/Minor | Major1 | | Major2 | | Minor1 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 0 | 0 | 872 | 0 | 1383 | 436 |
| Stage 1 | - | - | - | - | 872 | - |
| Stage 2 | - | - | - | - | 511 | - |
| Critical Hdwy | - | - | 4.14 | - | 6.84 | 6.94 |
| Critical Hdwy Stg 1 | - | - | - | - | 5.84 | - |
| Critical Hdwy Stg 2 | - | - | - | - | 5.84 | - |
| Follow-up Hdwy | - | - | 2.22 | - | 3.52 | 3.32 |
| Pot Cap-1 Maneuver | - | - | 769 | - | 135 | 568 |
| Stage 1 | - | - | - | - | 369 | - |
| Stage 2 | - | - | - | - | 567 | - |
| Platoon blocked, % | - | - | | - | | |
| Mov Cap-1 Maneuver | - | - | 769 | - | 133 | 568 |
| Mov Cap-2 Maneuver | - | - | - | - | 260 | - |
| Stage 1 | - | - | - | - | 369 | - |
| Stage 2 | - | - | - | - | 559 | - |

| Approach | EB | WB | NB |
|---|---|---|---|
| HCM Control Delay, s | 0 | 0.1 | 11.4 |
| HCM LOS | | | B |

| Minor Lane/Major Mvmt | NBLn1 | EBT | EBR | WBL | WBT |
|---|---|---|---|---|---|
| Capacity (veh/h) | 568 | - | - | 769 | - |
| HCM Lane V/C Ratio | 0.01 | - | - | 0.014 | - |
| HCM Control Delay (s) | 11.4 | - | - | 9.8 | - |
| HCM Lane LOS | B | - | - | A | - |
| HCM 95th %tile Q(veh) | 0 | - | - | 0 | - |

| Intersection | |
|---|---|
| Int Delay, s/veh | 0.1 |

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 785 | 5 | 5 | 875 | 5 | 0 |
| Future Vol, veh/h | 785 | 5 | 5 | 875 | 5 | 0 |
| 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 | - | 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 | 872 | 6 | 6 | 972 | 6 | 0 |

| Major/Minor | Major1 | | Major2 | | Minor1 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 0 | 0 | 878 | 0 | 1373 | 439 |
| Stage 1 | - | - | - | - | 875 | - |
| Stage 2 | - | - | - | - | 498 | - |
| Critical Hdwy | - | - | 4.14 | - | 6.84 | 6.94 |
| Critical Hdwy Stg 1 | - | - | - | - | 5.84 | - |
| Critical Hdwy Stg 2 | - | - | - | - | 5.84 | - |
| Follow-up Hdwy | - | - | 2.22 | - | 3.52 | 3.32 |
| Pot Cap-1 Maneuver | - | - | 765 | - | 137 | 566 |
| Stage 1 | - | - | - | - | 368 | - |
| Stage 2 | - | - | - | - | 576 | - |
| Platoon blocked, % | - | - | | - | | |
| Mov Cap-1 Maneuver | - | - | 765 | - | 136 | 566 |
| Mov Cap-2 Maneuver | - | - | - | - | 262 | - |
| Stage 1 | - | - | - | - | 368 | - |
| Stage 2 | - | - | - | - | 571 | - |

| Approach | EB | WB | NB |
|---|---|---|---|
| HCM Control Delay, s | 0 | 0.1 | 19 |
| HCM LOS | | | C |

| Minor Lane/Major Mvmt | NBLn1 | EBT | EBR | WBL | WBT |
|---|---|---|---|---|---|
| Capacity (veh/h) | 262 | - | - | 765 | - |
| HCM Lane V/C Ratio | 0.021 | - | - | 0.007 | - |
| HCM Control Delay (s) | 19 | - | - | 9.7 | - |
| HCM Lane LOS | C | - | - | A | - |
| HCM 95th %tile Q(veh) | 0.1 | - | - | 0 | - |

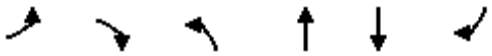
# 3e.i) Year 2045 Mid-Day Peak Hour Intersection Operation with Traffic Signal Control at Mason Way, Point Bluff and a New Carlson Street Intersection Computer Capacity Worksheets

| Lane Group | EBL | EBR | NBL | NBT | SBT | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Volume (vph) | 130 | 300 | 300 | 650 | 750 | 170 |
| Future Volume (vph) | 130 | 300 | 300 | 650 | 750 | 170 |
| Turn Type | Prot | pm+ov | pm+pt | NA | NA | Perm |
| Protected Phases | 4 | 5 | 5 | 2 | 6 | |
| Permitted Phases | | 4 | 2 | | | 6 |
| Detector Phase | 4 | 5 | 5 | 2 | 6 | 6 |
| Switch Phase | | | | | | |
| Minimum Initial (s) | 8.0 | 6.0 | 6.0 | 10.0 | 10.0 | 10.0 |
| Minimum Split (s) | 33.5 | 12.0 | 12.0 | 24.0 | 24.0 | 24.0 |
| Total Split (s) | 33.5 | 16.0 | 16.0 | 41.5 | 25.5 | 25.5 |
| Total Split (%) | 44.7% | 21.3% | 21.3% | 55.3% | 34.0% | 34.0% |
| Maximum Green (s) | 28.0 | 11.0 | 11.0 | 36.5 | 20.5 | 20.5 |
| Yellow Time (s) | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 |
| All-Red Time (s) | 2.0 | 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 |
| Total Lost Time (s) | 5.5 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 |
| Lead/Lag | | Lead | Lead | | Lag | Lag |
| Lead-Lag Optimize? | | Yes | Yes | | Yes | Yes |
| Vehicle Extension (s) | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |
| Minimum Gap (s) | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |
| Time Before Reduce (s) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Time To Reduce (s) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Recall Mode | None | None | None | C-Min | C-Min | C-Min |
| Walk Time (s) | 7.0 | | | | 7.0 | 7.0 |
| Flash Dont Walk (s) | 21.0 | | | | 11.0 | 11.0 |
| Pedestrian Calls (#/hr) | 0 | | | | 0 | 0 |

## Intersection Summary

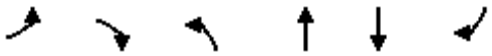
Cycle Length: 75
Actuated Cycle Length: 75
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green
Natural Cycle: 75
Control Type: Actuated-Coordinated

Splits and Phases: 4: Converse Ave. & Mason Way



| Lane Group | EBL | EBR | NBL | NBT | SBT | SBR |
|---|---|---|---|---|---|---|
| Lane Group Flow (vph) | 146 | 192 | 309 | 670 | 773 | 109 |
| v/c Ratio | 0.53 | 0.30 | 0.55 | 0.27 | 0.48 | 0.15 |
| Control Delay | 35.5 | 14.6 | 8.4 | 4.8 | 7.2 | 6.0 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 35.5 | 14.6 | 8.4 | 4.8 | 7.2 | 6.0 |
| Queue Length 50th (ft) | 64 | 60 | 42 | 48 | 50 | 13 |
| Queue Length 95th (ft) | 109 | 75 | 89 | 86 | 83 | 32 |
| Internal Link Dist (ft) | 528 | | | 242 | 321 | |
| Turn Bay Length (ft) | 300 | | 150 | | | 100 |
| Base Capacity (vph) | 660 | 658 | 570 | 2489 | 1614 | 722 |
| 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 | 0.22 | 0.29 | 0.54 | 0.27 | 0.48 | 0.15 |

Intersection Summary



| Movement | EBL | EBR | NBL | NBT | SBT | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Volume (veh/h) | 130 | 300 | 300 | 650 | 750 | 170 |
| Future Volume (veh/h) | 130 | 300 | 300 | 650 | 750 | 170 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | 1.00 | 1.00 | | | 1.00 |
| Parking Bus, Adj | 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 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 |
| Adj Flow Rate, veh/h | 146 | 192 | 309 | 670 | 773 | 109 |
| Peak Hour Factor | 0.89 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 257 | 386 | 540 | 2544 | 1955 | 872 |
| Arrive On Green | 0.14 | 0.14 | 0.10 | 0.72 | 0.55 | 0.55 |
| Sat Flow, veh/h | 1781 | 1585 | 1781 | 3647 | 3647 | 1585 |
| Grp Volume(v), veh/h | 146 | 192 | 309 | 670 | 773 | 109 |
| Grp Sat Flow(s),veh/h/ln | 1781 | 1585 | 1781 | 1777 | 1777 | 1585 |
| Q Serve(g_s), s | 5.7 | 7.8 | 5.1 | 4.9 | 9.4 | 2.5 |
| Cycle Q Clear(g_c), s | 5.7 | 7.8 | 5.1 | 4.9 | 9.4 | 2.5 |
| Prop In Lane | 1.00 | 1.00 | 1.00 | | | 1.00 |
| Lane Grp Cap(c), veh/h | 257 | 386 | 540 | 2544 | 1955 | 872 |
| V/C Ratio(X) | 0.57 | 0.50 | 0.57 | 0.26 | 0.40 | 0.13 |
| Avail Cap(c_a), veh/h | 665 | 749 | 625 | 2544 | 1955 | 872 |
| HCM Platoon Ratio | 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 |
| Uniform Delay (d), s/veh | 29.9 | 24.4 | 6.5 | 3.7 | 9.7 | 8.2 |
| Incr Delay (d2), s/veh | 2.0 | 1.0 | 1.0 | 0.3 | 0.6 | 0.3 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 2.5 | 7.1 | 1.6 | 1.3 | 3.4 | 0.8 |
| Unsig. Movement Delay, s/veh | | | | | | |
| LnGrp Delay(d),s/veh | 31.9 | 25.4 | 7.4 | 4.0 | 10.3 | 8.4 |
| LnGrp LOS | C | C | A | A | B | A |
| Approach Vol, veh/h | 338 | | | 979 | 882 | |
| Approach Delay, s/veh | 28.2 | | | 5.1 | 10.1 | |
| Approach LOS | C | | | A | B | |

| Timer - Assigned Phs | | 2 | | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | | 58.7 | | 16.3 | 12.4 | 46.2 |
| Change Period (Y+Rc), s | | 5.0 | | 5.5 | 5.0 | 5.0 |
| Max Green Setting (Gmax), s | | 36.5 | | 28.0 | 11.0 | 20.5 |
| Max Q Clear Time (g_c+I1), s | | 6.9 | | 9.8 | 7.1 | 11.4 |
| Green Ext Time (p_c), s | | 5.1 | | 1.0 | 0.4 | 3.8 |

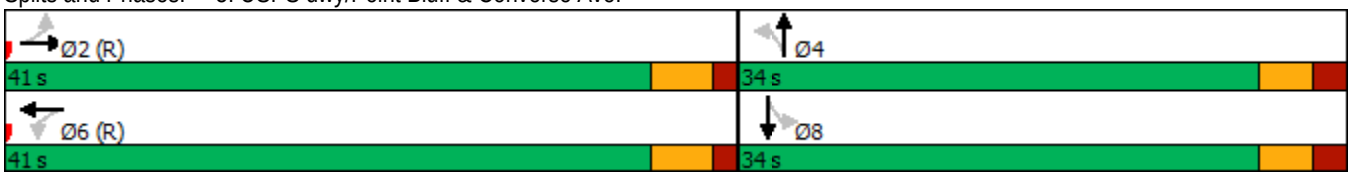
| Intersection Summary | |
|---|---|
| HCM 6th Ctrl Delay | 10.6 |
| HCM 6th LOS | B |

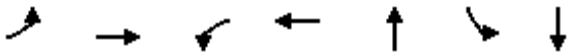
| Lane Group | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | |
| Traffic Volume (vph) | 40 | 720 | 10 | 600 | 5 | 0 | 190 | 0 |
| Future Volume (vph) | 40 | 720 | 10 | 600 | 5 | 0 | 190 | 0 |
| Turn Type | Perm | NA | Perm | NA | Perm | NA | Perm | NA |
| Protected Phases | | 2 | | 6 | | 4 | | 8 |
| Permitted Phases | 2 | | 6 | | 4 | | 8 | |
| Detector Phase | 2 | 2 | 6 | 6 | 4 | 4 | 8 | 8 |
| Switch Phase | | | | | | | | |
| Minimum Initial (s) | 10.0 | 10.0 | 10.0 | 10.0 | 7.0 | 7.0 | 7.0 | 7.0 |
| Minimum Split (s) | 23.5 | 23.5 | 23.5 | 23.5 | 23.0 | 23.0 | 29.0 | 29.0 |
| Total Split (s) | 41.0 | 41.0 | 41.0 | 41.0 | 34.0 | 34.0 | 34.0 | 34.0 |
| Total Split (%) | 54.7% | 54.7% | 54.7% | 54.7% | 45.3% | 45.3% | 45.3% | 45.3% |
| Maximum Green (s) | 36.0 | 36.0 | 36.0 | 36.0 | 29.0 | 29.0 | 29.0 | 29.0 |
| Yellow Time (s) | 3.5 | 3.5 | 3.5 | 3.5 | 3.0 | 3.0 | 3.0 | 3.0 |
| All-Red Time (s) | 1.5 | 1.5 | 1.5 | 1.5 | 2.0 | 2.0 | 2.0 | 2.0 |
| Lost Time Adjust (s) | 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 | | 5.0 | 5.0 | 5.0 |
| Lead/Lag | | | | | | | | |
| Lead-Lag Optimize? | | | | | | | | |
| Vehicle Extension (s) | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |
| Minimum Gap (s) | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |
| Time Before Reduce (s) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Time To Reduce (s) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Recall Mode | C-Min | C-Min | C-Min | C-Min | None | None | None | None |
| Walk Time (s) | 7.0 | 7.0 | 7.0 | 7.0 | | | 7.0 | 7.0 |
| Flash Dont Walk (s) | 11.0 | 11.0 | 11.0 | 11.0 | | | 17.0 | 17.0 |
| Pedestrian Calls (#/hr) | 0 | 0 | 0 | 0 | | | 0 | 0 |

## Intersection Summary

Cycle Length: 75
Actuated Cycle Length: 75
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 55
Control Type: Actuated-Coordinated

Splits and Phases: 5: USPS dwy/Point Bluff & Converse Ave.

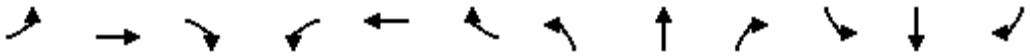




| Lane Group | EBL | EBT | WBL | WBT | NBT | SBL | SBT |
|---|---|---|---|---|---|---|---|
| Lane Group Flow (vph) | 41 | 747 | 10 | 794 | 15 | 196 | 21 |
| v/c Ratio | 0.10 | 0.32 | 0.02 | 0.35 | 0.04 | 0.66 | 0.06 |
| Control Delay | 11.5 | 12.2 | 5.3 | 5.3 | 20.7 | 37.3 | 21.1 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 11.5 | 12.2 | 5.3 | 5.3 | 20.7 | 37.3 | 21.1 |
| Queue Length 50th (ft) | 13 | 136 | 1 | 57 | 6 | 84 | 8 |
| Queue Length 95th (ft) | 40 | 202 | m6 | 94 | 18 | 134 | 22 |
| Internal Link Dist (ft) | | 175 | | 386 | 121 | | 254 |
| Turn Bay Length (ft) | 75 | | 100 | | | 75 | |
| Base Capacity (vph) | 403 | 2313 | 427 | 2239 | 615 | 538 | 612 |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Storage Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Reduced v/c Ratio | 0.10 | 0.32 | 0.02 | 0.35 | 0.02 | 0.36 | 0.03 |

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.



| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 40 | 720 | 5 | 10 | 600 | 170 | 5 | 0 | 10 | 190 | 0 | 20 |
| Future Volume (veh/h) | 40 | 720 | 5 | 10 | 600 | 170 | 5 | 0 | 10 | 190 | 0 | 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 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 |
| Adj Flow Rate, veh/h | 41 | 742 | 5 | 10 | 619 | 175 | 5 | 0 | 10 | 196 | 0 | 21 |
| 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 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 515 | 2535 | 17 | 541 | 1916 | 541 | 123 | 27 | 173 | 332 | 0 | 263 |
| Arrive On Green | 0.70 | 0.70 | 0.70 | 0.70 | 0.70 | 0.70 | 0.17 | 0.00 | 0.17 | 0.17 | 0.00 | 0.17 |
| Sat Flow, veh/h | 684 | 3618 | 24 | 714 | 2736 | 772 | 356 | 164 | 1040 | 1405 | 0 | 1585 |
| Grp Volume(v), veh/h | 41 | 364 | 383 | 10 | 402 | 392 | 15 | 0 | 0 | 196 | 0 | 21 |
| Grp Sat Flow(s),veh/h/ln | 684 | 1777 | 1866 | 714 | 1777 | 1731 | 1560 | 0 | 0 | 1405 | 0 | 1585 |
| Q Serve(g_s), s | 1.9 | 5.8 | 5.8 | 0.4 | 6.6 | 6.6 | 0.0 | 0.0 | 0.0 | 9.4 | 0.0 | 0.8 |
| Cycle Q Clear(g_c), s | 8.4 | 5.8 | 5.8 | 6.2 | 6.6 | 6.6 | 0.6 | 0.0 | 0.0 | 10.0 | 0.0 | 0.8 |
| Prop In Lane | 1.00 | | 0.01 | 1.00 | | 0.45 | 0.33 | | 0.67 | 1.00 | | 1.00 |
| Lane Grp Cap(c), veh/h | 515 | 1245 | 1307 | 541 | 1245 | 1213 | 323 | 0 | 0 | 332 | 0 | 263 |
| V/C Ratio(X) | 0.08 | 0.29 | 0.29 | 0.02 | 0.32 | 0.32 | 0.05 | 0.00 | 0.00 | 0.59 | 0.00 | 0.08 |
| Avail Cap(c_a), veh/h | 515 | 1245 | 1307 | 541 | 1245 | 1213 | 657 | 0 | 0 | 642 | 0 | 613 |
| 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 | 0.00 | 1.00 | 0.00 | 1.00 |
| Uniform Delay (d), s/veh | 6.0 | 4.2 | 4.2 | 5.4 | 4.3 | 4.4 | 26.3 | 0.0 | 0.0 | 30.2 | 0.0 | 26.4 |
| Incr Delay (d2), s/veh | 0.3 | 0.6 | 0.6 | 0.1 | 0.7 | 0.7 | 0.1 | 0.0 | 0.0 | 1.7 | 0.0 | 0.1 |
| 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 | 0.3 | 1.7 | 1.8 | 0.1 | 2.0 | 1.9 | 0.2 | 0.0 | 0.0 | 3.5 | 0.0 | 0.3 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 6.3 | 4.8 | 4.8 | 5.5 | 5.0 | 5.1 | 26.4 | 0.0 | 0.0 | 31.8 | 0.0 | 26.5 |
| LnGrp LOS | A | A | A | A | A | A | C | A | A | C | A | C |
| Approach Vol, veh/h | | 788 | | | 804 | | | 15 | | | 217 | |
| Approach Delay, s/veh | | 4.9 | | | 5.1 | | | 26.4 | | | 31.3 | |
| Approach LOS | | A | | | A | | | C | | | C | |

| Timer - Assigned Phs | | 2 | | 4 | | 6 | | 8 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | | 57.5 | | 17.5 | | 57.5 | | 17.5 | | | | |
| Change Period (Y+Rc), s | | 5.0 | | 5.0 | | 5.0 | | 5.0 | | | | |
| Max Green Setting (Gmax), s | | 36.0 | | 29.0 | | 36.0 | | 29.0 | | | | |
| Max Q Clear Time (g_c+I1), s | | 10.4 | | 2.6 | | 8.6 | | 12.0 | | | | |
| Green Ext Time (p_c), s | | 5.4 | | 0.0 | | 5.7 | | 0.6 | | | | |

| Intersection Summary | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HCM 6th Ctrl Delay | | | 8.3 | | | | | | | | | |
| HCM 6th LOS | | | A | | | | | | | | | |

| Lane Group | EBL | EBR | NBL | NBT | SBT |
|---|---|---|---|---|---|
| Lane Configurations | | | | | |
| Traffic Volume (vph) | 150 | 200 | 140 | 500 | 555 |
| Future Volume (vph) | 150 | 200 | 140 | 500 | 555 |
| Turn Type | Prot | Perm | Prot | NA | NA |
| Protected Phases | 4 | | 5 | | 6 |
| Permitted Phases | | 4 | | 2 | |
| Detector Phase | 4 | 4 | 5 | 2 | 6 |
| Switch Phase | | | | | |
| Minimum Initial (s) | 7.0 | 7.0 | 7.0 | 10.0 | 10.0 |
| Minimum Split (s) | 29.0 | 29.0 | 12.0 | 23.0 | 23.0 |
| Total Split (s) | 29.0 | 29.0 | 18.0 | 46.0 | 28.0 |
| Total Split (%) | 38.7% | 38.7% | 24.0% | 61.3% | 37.3% |
| Maximum Green (s) | 24.0 | 24.0 | 13.0 | 41.0 | 23.0 |
| Yellow Time (s) | 3.0 | 3.0 | 3.5 | 3.5 | 3.5 |
| All-Red Time (s) | 2.0 | 2.0 | 1.5 | 1.5 | 1.5 |
| Lost Time Adjust (s) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Lost Time (s) | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 |
| Lead/Lag | | | Lead | | Lag |
| Lead-Lag Optimize? | | | Yes | | Yes |
| Vehicle Extension (s) | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |
| Minimum Gap (s) | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |
| Time Before Reduce (s) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Time To Reduce (s) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Recall Mode | None | None | None | C-Min | C-Min |
| Walk Time (s) | 7.0 | 7.0 | | | 7.0 |
| Flash Dont Walk (s) | 17.0 | 17.0 | | | 11.0 |
| Pedestrian Calls (#/hr) | 0 | 0 | | | 0 |

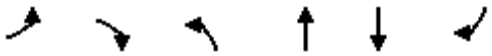
**Intersection Summary**

Cycle Length: 75
Actuated Cycle Length: 75
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 65
Control Type: Actuated-Coordinated

Splits and Phases: 9: Converse Ave. & Future Carlsen St

| Lane Group | EBL | EBR | NBL | NBT | SBT |
|---|---|---|---|---|---|
| Lane Group Flow (vph) | 163 | 135 | 152 | 543 | 723 |
| v/c Ratio | 0.58 | 0.53 | 0.55 | 0.22 | 0.44 |
| Control Delay | 36.4 | 35.6 | 31.8 | 8.2 | 15.5 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 36.4 | 35.6 | 31.8 | 8.2 | 15.5 |
| Queue Length 50th (ft) | 71 | 58 | 69 | 51 | 110 |
| Queue Length 95th (ft) | 119 | 102 | 124 | 148 | 195 |
| Internal Link Dist (ft) | 406 | | | 650 | 865 |
| Turn Bay Length (ft) | 75 | | 150 | | |
| Base Capacity (vph) | 547 | 489 | 323 | 2481 | 1653 |
| 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 | 0.30 | 0.28 | 0.47 | 0.22 | 0.44 |

Intersection Summary



| Movement | EBL | EBR | NBL | NBT | SBT | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Volume (veh/h) | 150 | 200 | 140 | 500 | 555 | 110 |
| Future Volume (veh/h) | 150 | 200 | 140 | 500 | 555 | 110 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | 1.00 | 1.00 | | | 1.00 |
| Parking Bus, Adj | 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 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 |
| Adj Flow Rate, veh/h | 163 | 135 | 152 | 543 | 603 | 120 |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 223 | 198 | 191 | 2635 | 1677 | 333 |
| Arrive On Green | 0.13 | 0.13 | 0.11 | 0.74 | 0.57 | 0.57 |
| Sat Flow, veh/h | 1781 | 1585 | 1781 | 3647 | 3048 | 587 |
| Grp Volume(v), veh/h | 163 | 135 | 152 | 543 | 362 | 361 |
| Grp Sat Flow(s),veh/h/ln | 1781 | 1585 | 1781 | 1777 | 1777 | 1765 |
| Q Serve(g_s), s | 6.6 | 6.1 | 6.2 | 3.5 | 8.3 | 8.3 |
| Cycle Q Clear(g_c), s | 6.6 | 6.1 | 6.2 | 3.5 | 8.3 | 8.3 |
| Prop In Lane | 1.00 | 1.00 | 1.00 | | | 0.33 |
| Lane Grp Cap(c), veh/h | 223 | 198 | 191 | 2635 | 1008 | 1002 |
| V/C Ratio(X) | 0.73 | 0.68 | 0.80 | 0.21 | 0.36 | 0.36 |
| Avail Cap(c_a), veh/h | 570 | 507 | 309 | 2635 | 1008 | 1002 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 0.99 | 0.99 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 31.6 | 31.4 | 32.7 | 3.0 | 8.8 | 8.8 |
| Incr Delay (d2), s/veh | 4.6 | 4.1 | 7.3 | 0.2 | 1.0 | 1.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 3.0 | 5.5 | 3.0 | 0.9 | 2.9 | 2.8 |
| Unsig. Movement Delay, s/veh | | | | | | |
| LnGrp Delay(d),s/veh | 36.2 | 35.4 | 39.9 | 3.1 | 9.8 | 9.8 |
| LnGrp LOS | D | D | D | A | A | A |
| Approach Vol, veh/h | 298 | | | 695 | 723 | |
| Approach Delay, s/veh | 35.8 | | | 11.2 | 9.8 | |
| Approach LOS | D | | | B | A | |

| Timer - Assigned Phs | | 2 | | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | | 60.6 | | 14.4 | 13.0 | 47.6 |
| Change Period (Y+Rc), s | | 5.0 | | 5.0 | 5.0 | 5.0 |
| Max Green Setting (Gmax), s | | 41.0 | | 24.0 | 13.0 | 23.0 |
| Max Q Clear Time (g_c+I1), s | | 5.5 | | 8.6 | 8.2 | 10.3 |
| Green Ext Time (p_c), s | | 4.1 | | 0.8 | 0.2 | 3.4 |

| Intersection Summary | |
|---|---|
| HCM 6th Ctrl Delay | 14.9 |
| HCM 6th LOS | B |

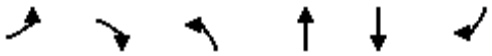
# 3e.ii) Year 2045 PM Peak Hour Intersection Operation with Traffic Signal Control at Mason Way, Point Bluff and a New Carlson Street Intersection Computer Capacity Worksheets

| Lane Group | EBL | EBR | NBL | NBT | SBT | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Volume (vph) | 100 | 400 | 300 | 990 | 720 | 200 |
| Future Volume (vph) | 100 | 400 | 300 | 990 | 720 | 200 |
| Turn Type | Prot | pm+ov | pm+pt | NA | NA | Perm |
| Protected Phases | 4 | 5 | 5 | 2 | 6 | |
| Permitted Phases | | 4 | 2 | | | 6 |
| Detector Phase | 4 | 5 | 5 | 2 | 6 | 6 |
| Switch Phase | | | | | | |
| Minimum Initial (s) | 8.0 | 6.0 | 6.0 | 10.0 | 10.0 | 10.0 |
| Minimum Split (s) | 33.5 | 12.0 | 12.0 | 24.0 | 24.0 | 24.0 |
| Total Split (s) | 33.5 | 16.0 | 16.0 | 41.5 | 25.5 | 25.5 |
| Total Split (%) | 44.7% | 21.3% | 21.3% | 55.3% | 34.0% | 34.0% |
| Maximum Green (s) | 28.0 | 11.0 | 11.0 | 36.5 | 20.5 | 20.5 |
| Yellow Time (s) | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 |
| All-Red Time (s) | 2.0 | 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 |
| Total Lost Time (s) | 5.5 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 |
| Lead/Lag | | Lead | Lead | | Lag | Lag |
| Lead-Lag Optimize? | | Yes | Yes | | Yes | Yes |
| Vehicle Extension (s) | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |
| Minimum Gap (s) | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |
| Time Before Reduce (s) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Time To Reduce (s) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Recall Mode | None | None | None | C-Min | C-Min | C-Min |
| Walk Time (s) | 7.0 | | | | 7.0 | 7.0 |
| Flash Dont Walk (s) | 21.0 | | | | 11.0 | 11.0 |
| Pedestrian Calls (#/hr) | 0 | | | | 0 | 0 |

## Intersection Summary

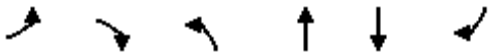
Cycle Length: 75
Actuated Cycle Length: 75
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green
Natural Cycle: 75
Control Type: Actuated-Coordinated

Splits and Phases: 4: Converse Ave. & Mason Way



| Lane Group | EBL | EBR | NBL | NBT | SBT | SBR |
|---|---|---|---|---|---|---|
| Lane Group Flow (vph) | 127 | 273 | 316 | 1042 | 758 | 131 |
| v/c Ratio | 0.49 | 0.46 | 0.51 | 0.39 | 0.45 | 0.17 |
| Control Delay | 35.2 | 18.2 | 7.1 | 4.8 | 14.2 | 15.6 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 35.2 | 18.2 | 7.1 | 4.8 | 14.2 | 15.6 |
| Queue Length 50th (ft) | 55 | 91 | 41 | 82 | 31 | 8 |
| Queue Length 95th (ft) | 85 | 112 | 86 | 141 | 238 | 101 |
| Internal Link Dist (ft) | 528 | | | 242 | 321 | |
| Turn Bay Length (ft) | 300 | | 150 | | | 100 |
| Base Capacity (vph) | 660 | 596 | 614 | 2697 | 1684 | 753 |
| 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 | 0.19 | 0.46 | 0.51 | 0.39 | 0.45 | 0.17 |

Intersection Summary



| Movement | EBL | EBR | NBL | NBT | SBT | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Volume (veh/h) | 100 | 400 | 300 | 990 | 720 | 200 |
| Future Volume (veh/h) | 100 | 400 | 300 | 990 | 720 | 200 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | 1.00 | 1.00 | | | 1.00 |
| Parking Bus, Adj | 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 | 1870 | 1870 | 1870 | 1870 | 1826 | 1826 |
| Adj Flow Rate, veh/h | 127 | 273 | 316 | 1042 | 758 | 131 |
| Peak Hour Factor | 0.79 | 0.91 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 5 | 5 |
| Cap, veh/h | 335 | 473 | 513 | 2387 | 1718 | 766 |
| Arrive On Green | 0.19 | 0.19 | 0.11 | 0.67 | 0.50 | 0.50 |
| Sat Flow, veh/h | 1781 | 1585 | 1781 | 3647 | 3561 | 1547 |
| Grp Volume(v), veh/h | 127 | 273 | 316 | 1042 | 758 | 131 |
| Grp Sat Flow(s),veh/h/ln | 1781 | 1585 | 1781 | 1777 | 1735 | 1547 |
| Q Serve(g_s), s | 4.7 | 11.0 | 6.0 | 10.2 | 10.6 | 3.5 |
| Cycle Q Clear(g_c), s | 4.7 | 11.0 | 6.0 | 10.2 | 10.6 | 3.5 |
| Prop In Lane | 1.00 | 1.00 | 1.00 | | | 1.00 |
| Lane Grp Cap(c), veh/h | 335 | 473 | 513 | 2387 | 1718 | 766 |
| V/C Ratio(X) | 0.38 | 0.58 | 0.62 | 0.44 | 0.44 | 0.17 |
| Avail Cap(c_a), veh/h | 665 | 766 | 579 | 2387 | 1718 | 766 |
| HCM Platoon Ratio | 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 |
| Uniform Delay (d), s/veh | 26.6 | 22.3 | 8.3 | 5.7 | 12.2 | 10.4 |
| Incr Delay (d2), s/veh | 0.7 | 1.1 | 1.6 | 0.6 | 0.8 | 0.5 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 2.0 | 9.8 | 2.0 | 3.1 | 3.9 | 1.2 |
| Unsig. Movement Delay, s/veh | | | | | | |
| LnGrp Delay(d),s/veh | 27.3 | 23.4 | 9.9 | 6.3 | 13.1 | 10.9 |
| LnGrp LOS | C | C | A | A | B | B |
| Approach Vol, veh/h | 400 | | | 1358 | 889 | |
| Approach Delay, s/veh | 24.7 | | | 7.1 | 12.7 | |
| Approach LOS | C | | | A | B | |

| Timer - Assigned Phs | | 2 | | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | | 55.4 | | 19.6 | 13.2 | 42.1 |
| Change Period (Y+Rc), s | | 5.0 | | 5.5 | 5.0 | 5.0 |
| Max Green Setting (Gmax), s | | 36.5 | | 28.0 | 11.0 | 20.5 |
| Max Q Clear Time (g_c+I1), s | | 12.2 | | 13.0 | 8.0 | 12.6 |
| Green Ext Time (p_c), s | | 8.3 | | 1.2 | 0.3 | 3.4 |

| Intersection Summary | |
|---|---|
| HCM 6th Ctrl Delay | 11.7 |
| HCM 6th LOS | B |

Notes

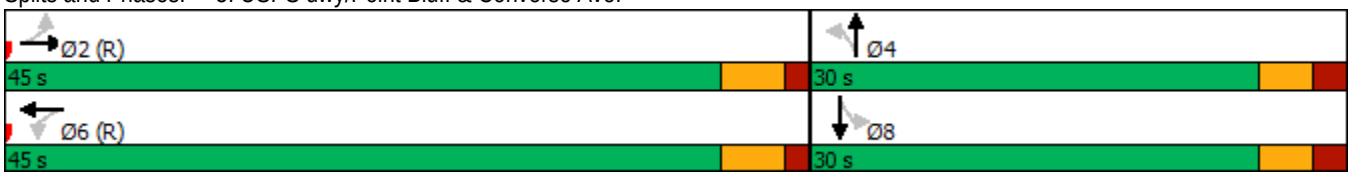
User approved pedestrian interval to be less than phase max green.

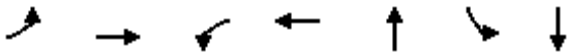
| Lane Group | EBL | EBT | WBL | WBT | NBL | NBT | SBL | SBT |
|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | |
| Traffic Volume (vph) | 50 | 735 | 15 | 845 | 5 | 0 | 180 | 5 |
| Future Volume (vph) | 50 | 735 | 15 | 845 | 5 | 0 | 180 | 5 |
| Turn Type | Perm | NA | Perm | NA | Perm | NA | Perm | NA |
| Protected Phases | | 2 | | 6 | | 4 | | 8 |
| Permitted Phases | 2 | | 6 | | 4 | | 8 | |
| Detector Phase | 2 | 2 | 6 | 6 | 4 | 4 | 8 | 8 |
| Switch Phase | | | | | | | | |
| Minimum Initial (s) | 10.0 | 10.0 | 10.0 | 10.0 | 7.0 | 7.0 | 7.0 | 7.0 |
| Minimum Split (s) | 23.5 | 23.5 | 23.5 | 23.5 | 23.0 | 23.0 | 29.0 | 29.0 |
| Total Split (s) | 45.0 | 45.0 | 45.0 | 45.0 | 30.0 | 30.0 | 30.0 | 30.0 |
| Total Split (%) | 60.0% | 60.0% | 60.0% | 60.0% | 40.0% | 40.0% | 40.0% | 40.0% |
| Maximum Green (s) | 40.0 | 40.0 | 40.0 | 40.0 | 25.0 | 25.0 | 25.0 | 25.0 |
| Yellow Time (s) | 3.5 | 3.5 | 3.5 | 3.5 | 3.0 | 3.0 | 3.0 | 3.0 |
| All-Red Time (s) | 1.5 | 1.5 | 1.5 | 1.5 | 2.0 | 2.0 | 2.0 | 2.0 |
| Lost Time Adjust (s) | 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 | | 5.0 | 5.0 | 5.0 |
| Lead/Lag | | | | | | | | |
| Lead-Lag Optimize? | | | | | | | | |
| Vehicle Extension (s) | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |
| Minimum Gap (s) | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |
| Time Before Reduce (s) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Time To Reduce (s) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Recall Mode | C-Min | C-Min | C-Min | C-Min | None | None | None | None |
| Walk Time (s) | 7.0 | 7.0 | 7.0 | 7.0 | | | 7.0 | 7.0 |
| Flash Dont Walk (s) | 11.0 | 11.0 | 11.0 | 11.0 | | | 17.0 | 17.0 |
| Pedestrian Calls (#/hr) | 0 | 0 | 0 | 0 | | | 0 | 0 |

## Intersection Summary

Cycle Length: 75
Actuated Cycle Length: 75
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated

Splits and Phases: 5: USPS dwy/Point Bluff & Converse Ave.





| Lane Group | EBL | EBT | WBL | WBT | NBT | SBL | SBT |
|---|---|---|---|---|---|---|---|
| Lane Group Flow (vph) | 56 | 832 | 17 | 1207 | 12 | 202 | 51 |
| v/c Ratio | 0.25 | 0.36 | 0.04 | 0.54 | 0.04 | 0.67 | 0.15 |
| Control Delay | 21.7 | 16.2 | 4.2 | 7.1 | 20.2 | 37.1 | 22.4 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 21.7 | 16.2 | 4.2 | 7.1 | 20.2 | 37.1 | 22.4 |
| Queue Length 50th (ft) | 20 | 171 | 2 | 88 | 4 | 87 | 19 |
| Queue Length 95th (ft) | 60 | 262 | m5 | 268 | 15 | 134 | 40 |
| Internal Link Dist (ft) | | 175 | | 386 | 121 | | 254 |
| Turn Bay Length (ft) | 75 | | 100 | | | 75 | |
| Base Capacity (vph) | 228 | 2299 | 381 | 2228 | 523 | 465 | 539 |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Storage Cap Reductn | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Reduced v/c Ratio | 0.25 | 0.36 | 0.04 | 0.54 | 0.02 | 0.43 | 0.09 |

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 50 | 735 | 5 | 15 | 845 | 230 | 5 | 0 | 5 | 180 | 5 | 40 |
| Future Volume (veh/h) | 50 | 735 | 5 | 15 | 845 | 230 | 5 | 0 | 5 | 180 | 5 | 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 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 |
| Adj Flow Rate, veh/h | 56 | 826 | 6 | 17 | 949 | 258 | 6 | 0 | 6 | 202 | 6 | 45 |
| 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 | 347 | 2532 | 18 | 499 | 1935 | 525 | 174 | 23 | 124 | 341 | 32 | 237 |
| Arrive On Green | 0.70 | 0.70 | 0.70 | 0.70 | 0.70 | 0.70 | 0.17 | 0.00 | 0.17 | 0.17 | 0.17 | 0.17 |
| Sat Flow, veh/h | 463 | 3616 | 26 | 660 | 2763 | 749 | 611 | 136 | 747 | 1410 | 190 | 1424 |
| Grp Volume(v), veh/h | 56 | 406 | 426 | 17 | 609 | 598 | 12 | 0 | 0 | 202 | 0 | 51 |
| Grp Sat Flow(s),veh/h/ln | 463 | 1777 | 1866 | 660 | 1777 | 1736 | 1493 | 0 | 0 | 1410 | 0 | 1614 |
| Q Serve(g_s), s | 4.7 | 6.7 | 6.7 | 0.8 | 11.7 | 11.8 | 0.0 | 0.0 | 0.0 | 7.8 | 0.0 | 2.0 |
| Cycle Q Clear(g_c), s | 16.5 | 6.7 | 6.7 | 7.4 | 11.7 | 11.8 | 2.0 | 0.0 | 0.0 | 9.8 | 0.0 | 2.0 |
| Prop In Lane | 1.00 | | 0.01 | 1.00 | | 0.43 | 0.50 | | 0.50 | 1.00 | | 0.88 |
| Lane Grp Cap(c), veh/h | 347 | 1244 | 1306 | 499 | 1244 | 1215 | 321 | 0 | 0 | 341 | 0 | 269 |
| V/C Ratio(X) | 0.16 | 0.33 | 0.33 | 0.03 | 0.49 | 0.49 | 0.04 | 0.00 | 0.00 | 0.59 | 0.00 | 0.19 |
| Avail Cap(c_a), veh/h | 347 | 1244 | 1306 | 499 | 1244 | 1215 | 564 | 0 | 0 | 576 | 0 | 538 |
| 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 | 0.00 | 1.00 | 0.00 | 1.00 |
| Uniform Delay (d), s/veh | 8.9 | 4.4 | 4.4 | 5.8 | 5.1 | 5.1 | 26.2 | 0.0 | 0.0 | 30.0 | 0.0 | 26.9 |
| Incr Delay (d2), s/veh | 1.0 | 0.7 | 0.7 | 0.1 | 1.4 | 1.4 | 0.0 | 0.0 | 0.0 | 1.6 | 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 | 0.5 | 2.0 | 2.1 | 0.1 | 3.6 | 3.5 | 0.2 | 0.0 | 0.0 | 3.6 | 0.0 | 0.8 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 9.9 | 5.1 | 5.0 | 5.9 | 6.5 | 6.6 | 26.3 | 0.0 | 0.0 | 31.6 | 0.0 | 27.2 |
| LnGrp LOS | A | A | A | A | A | A | C | A | A | C | A | C |
| Approach Vol, veh/h | | 888 | | | 1224 | | | 12 | | | 253 | |
| Approach Delay, s/veh | | 5.4 | | | 6.5 | | | 26.3 | | | 30.7 | |
| Approach LOS | | A | | | A | | | C | | | C | |

| Timer - Assigned Phs | | 2 | | 4 | | 6 | | 8 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | | 57.5 | | 17.5 | | 57.5 | | 17.5 | | | | |
| Change Period (Y+Rc), s | | 5.0 | | 5.0 | | 5.0 | | 5.0 | | | | |
| Max Green Setting (Gmax), s | | 40.0 | | 25.0 | | 40.0 | | 25.0 | | | | |
| Max Q Clear Time (g_c+I1), s | | 18.5 | | 4.0 | | 13.8 | | 11.8 | | | | |
| Green Ext Time (p_c), s | | 6.3 | | 0.0 | | 9.9 | | 0.7 | | | | |

| Intersection Summary | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HCM 6th Ctrl Delay | | | 8.8 | | | | | | | | | |
| HCM 6th LOS | | | A | | | | | | | | | |

| Lane Group | EBL | EBR | NBL | NBT | SBT |
|---|---|---|---|---|---|
| Lane Configurations | | | | | |
| Traffic Volume (vph) | 100 | 200 | 240 | 650 | 600 |
| Future Volume (vph) | 100 | 200 | 240 | 650 | 600 |
| Turn Type | Prot | Perm | Prot | NA | NA |
| Protected Phases | 4 | | 5 | 2 | 6 |
| Permitted Phases | | 4 | | | |
| Detector Phase | 4 | 4 | 5 | 2 | 6 |
| Switch Phase | | | | | |
| Minimum Initial (s) | 7.0 | 7.0 | 7.0 | 10.0 | 10.0 |
| Minimum Split (s) | 29.0 | 29.0 | 12.0 | 23.0 | 23.0 |
| Total Split (s) | 29.0 | 29.0 | 19.0 | 46.0 | 27.0 |
| Total Split (%) | 38.7% | 38.7% | 25.3% | 61.3% | 36.0% |
| Maximum Green (s) | 24.0 | 24.0 | 14.0 | 41.0 | 22.0 |
| Yellow Time (s) | 3.0 | 3.0 | 3.5 | 3.5 | 3.5 |
| All-Red Time (s) | 2.0 | 2.0 | 1.5 | 1.5 | 1.5 |
| Lost Time Adjust (s) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Lost Time (s) | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 |
| Lead/Lag | | | Lead | | Lag |
| Lead-Lag Optimize? | | | Yes | | Yes |
| Vehicle Extension (s) | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |
| Minimum Gap (s) | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |
| Time Before Reduce (s) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Time To Reduce (s) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Recall Mode | None | None | None | C-Min | C-Min |
| Walk Time (s) | 7.0 | 7.0 | | | 7.0 |
| Flash Dont Walk (s) | 17.0 | 17.0 | | | 11.0 |
| Pedestrian Calls (#/hr) | 0 | 0 | | | 0 |

**Intersection Summary**

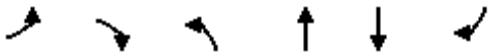
Cycle Length: 75
Actuated Cycle Length: 75
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 70
Control Type: Actuated-Coordinated

Splits and Phases: 9: Converse Ave. & Future Carlsen St

| Lane Group | EBL | EBR | NBL | NBT | SBT |
|---|---|---|---|---|---|
| Lane Group Flow (vph) | 109 | 135 | 261 | 707 | 815 |
| v/c Ratio | 0.40 | 0.56 | 0.67 | 0.28 | 0.58 |
| Control Delay | 31.5 | 37.1 | 25.5 | 6.9 | 21.1 |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total Delay | 31.5 | 37.1 | 25.5 | 6.9 | 21.1 |
| Queue Length 50th (ft) | 46 | 59 | 116 | 141 | 148 |
| Queue Length 95th (ft) | 84 | 103 | 133 | 107 | #278 |
| Internal Link Dist (ft) | 406 | | | 650 | 865 |
| Turn Bay Length (ft) | 75 | | 150 | | |
| Base Capacity (vph) | 547 | 489 | 403 | 2503 | 1400 |
| 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 | 0.20 | 0.28 | 0.65 | 0.28 | 0.58 |

Intersection Summary

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



| Movement | EBL | EBR | NBL | NBT | SBT | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Volume (veh/h) | 100 | 200 | 240 | 650 | 600 | 150 |
| Future Volume (veh/h) | 100 | 200 | 240 | 650 | 600 | 150 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | 1.00 | 1.00 | | | 1.00 |
| Parking Bus, Adj | 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 | 1870 | 1870 | 1870 | 1870 | 1826 | 1826 |
| Adj Flow Rate, veh/h | 109 | 135 | 261 | 707 | 652 | 163 |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 5 | 5 |
| Cap, veh/h | 208 | 185 | 303 | 2665 | 1412 | 353 |
| Arrive On Green | 0.12 | 0.12 | 0.17 | 0.75 | 0.51 | 0.51 |
| Sat Flow, veh/h | 1781 | 1585 | 1781 | 3647 | 2841 | 687 |
| Grp Volume(v), veh/h | 109 | 135 | 261 | 707 | 411 | 404 |
| Grp Sat Flow(s),veh/h/ln | 1781 | 1585 | 1781 | 1777 | 1735 | 1702 |
| Q Serve(g_s), s | 4.3 | 6.2 | 10.7 | 4.7 | 11.3 | 11.4 |
| Cycle Q Clear(g_c), s | 4.3 | 6.2 | 10.7 | 4.7 | 11.3 | 11.4 |
| Prop In Lane | 1.00 | 1.00 | 1.00 | | | 0.40 |
| Lane Grp Cap(c), veh/h | 208 | 185 | 303 | 2665 | 890 | 874 |
| V/C Ratio(X) | 0.52 | 0.73 | 0.86 | 0.27 | 0.46 | 0.46 |
| Avail Cap(c_a), veh/h | 570 | 507 | 333 | 2665 | 890 | 874 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 0.96 | 0.96 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 31.2 | 32.0 | 30.3 | 2.9 | 11.6 | 11.6 |
| Incr Delay (d2), s/veh | 2.0 | 5.4 | 18.3 | 0.2 | 1.7 | 1.8 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 1.9 | 5.6 | 5.9 | 1.1 | 4.1 | 4.0 |
| Unsig. Movement Delay, s/veh | | | | | | |
| LnGrp Delay(d),s/veh | 33.2 | 37.4 | 48.6 | 3.2 | 13.4 | 13.4 |
| LnGrp LOS | C | D | D | A | B | B |
| Approach Vol, veh/h | 244 | | | 968 | 815 | |
| Approach Delay, s/veh | 35.5 | | | 15.4 | 13.4 | |
| Approach LOS | D | | | B | B | |

| Timer - Assigned Phs | | 2 | | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| Phs Duration (G+Y+Rc), s | | 61.2 | | 13.8 | 17.7 | 43.5 |
| Change Period (Y+Rc), s | | 5.0 | | 5.0 | 5.0 | 5.0 |
| Max Green Setting (Gmax), s | | 41.0 | | 24.0 | 14.0 | 22.0 |
| Max Q Clear Time (g_c+I1), s | | 6.7 | | 8.2 | 12.7 | 13.4 |
| Green Ext Time (p_c), s | | 5.6 | | 0.6 | 0.1 | 3.2 |

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

# 3f.i) Year 2045 Mid-Day Future Carlson Street Operation – Roundabout Control Computer Capacity Worksheets

# HCS7 Roundabouts Report

## General Information

| | |
|---|---|
| Analyst | NY |
| Agency or Co. | Ayres Associates |
| Date Performed | 3/15/2021 |
| Analysis Year | 2045 |
| Time Analyzed | Mid-day |
| Project Description | Carlson Street Roundabout |

## Site Information

| | |
|---|---|
| Intersection | Converse Ave./Carlson St. |
| E/W Street Name | Future Carlson St. |
| N/S Street Name | Converse Ave. |
| Analysis Time Period (hrs) | 0.25 |
| Peak Hour Factor | 0.92 |
| Jurisdiction | City of Cheyenne |

## 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 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| Lane Assignment | | | LR | | | | | | | | LT | | | | TR | |
| Volume (V), veh/h | 0 | 150 | | 200 | | | | | 0 | 140 | 500 | | 0 | | 555 | 110 |
| Percent Heavy Vehicles, % | 2 | 2 | | 2 | | | | | 2 | 2 | 2 | | 2 | | 2 | 2 |
| Flow Rate ($v_{PCE}$), pc/h | 0 | 166 | | 222 | | | | | 0 | 155 | 554 | | 0 | | 615 | 122 |
| Right-Turn Bypass | None | | | | None | | | | None | | | | None | | | |
| Conflicting Lanes | 1 | | | | | | | | 1 | | | | 1 | | | |
| Pedestrians Crossing, p/h | 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 | |
| Follow-Up Headway (s) | | 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 | | | | | | 709 | | | 737 | |
| Entry Volume, veh/h | | 380 | | | | | | 695 | | | 723 | |
| Circulating Flow ($v_c$), pc/h | 615 | | | 875 | | | 166 | | | 155 | | |
| Exiting Flow ($v_{ex}$), pc/h | 0 | | | 277 | | | 720 | | | 837 | | |
| Capacity ($c_{pce}$), pc/h | | 737 | | | | | | 1165 | | | 1178 | |
| Capacity (c), veh/h | | 723 | | | | | | 1142 | | | 1155 | |
| v/c Ratio (x) | | 0.53 | | | | | | 0.61 | | | 0.63 | |

## 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 | | 13.0 | | | | | | 11.0 | | | 11.3 | |
| Lane LOS | | B | | | | | | B | | | B | |
| 95% Queue, veh | | 3.1 | | | | | | 4.3 | | | 4.6 | |
| Approach Delay, s/veh | 13.0 | | | | | | 11.0 | | | 11.3 | | |
| Approach LOS | B | | | | | | B | | | B | | |
| Intersection Delay, s/veh \| LOS | 11.5 | | | | | | B | | | | | |

## 3f.ii) Year 2045 PM Future Carlson Street Operation – Roundabout Control Computer Capacity Worksheets

# HCS7 Roundabouts Report

## General Information

| | |
|---|---|
| Analyst | NY |
| Agency or Co. | Ayres Associates |
| Date Performed | 3/15/2021 |
| Analysis Year | 2045 |
| Time Analyzed | PM |
| Project Description | Carlson Street Roundabout |

## Site Information

| | |
|---|---|
| Intersection | Converse Ave./Carlson St. |
| E/W Street Name | Future Carlson St. |
| N/S Street Name | Converse Ave. |
| Analysis Time Period (hrs) | 0.25 |
| Peak Hour Factor | 0.92 |
| Jurisdiction | City of Cheyenne |

## 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 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| Lane Assignment | | | LR | | | | | | | | LT | | | | TR | |
| Volume (V), veh/h | 0 | 100 | | 200 | | | | | 0 | 240 | 650 | | 0 | | 600 | 150 |
| Percent Heavy Vehicles, % | 2 | 2 | | 2 | | | | | 2 | 2 | 2 | | 2 | | 2 | 2 |
| Flow Rate ($v_{PCE}$), pc/h | 0 | 111 | | 222 | | | | | 0 | 266 | 721 | | 0 | | 665 | 166 |
| Right-Turn Bypass | None | | | | None | | | | None | | | | None | | | |
| Conflicting Lanes | 1 | | | | | | | | 1 | | | | 1 | | | |
| Pedestrians Crossing, p/h | 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 | |
| Follow-Up Headway (s) | | 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 | | 333 | | | | | | 987 | | | 831 | |
| Entry Volume, veh/h | | 326 | | | | | | 968 | | | 815 | |
| Circulating Flow ($v_c$), pc/h | 665 | | | 1098 | | | 111 | | | 266 | | |
| Exiting Flow ($v_{ex}$), pc/h | 0 | | | 432 | | | 832 | | | 887 | | |
| Capacity ($c_{pce}$), pc/h | | 700 | | | | | | 1232 | | | 1052 | |
| Capacity (c), veh/h | | 687 | | | | | | 1208 | | | 1031 | |
| v/c Ratio (x) | | 0.48 | | | | | | 0.80 | | | 0.79 | |

## 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 | | 12.3 | | | | | | 17.7 | | | 19.1 | |
| Lane LOS | | B | | | | | | C | | | C | |
| 95% Queue, veh | | 2.6 | | | | | | 9.2 | | | 8.6 | |
| Approach Delay, s/veh | 12.3 | | | | | | 17.7 | | | 19.1 | | |
| Approach LOS | B | | | | | | C | | | C | | |
| Intersection Delay, s/veh \| LOS | 17.4 | | | | | | C | | | | | |