YELLOWSTONE COUNTY BOARD OF PLANNING

City of Billings and
Yellowstone County, Montana

AGENDA

DECEMBER 9, 2025 MEETING TIME: 4:30 p.m.
City Council Chambers, 5th Floor
316 N 26th St, Billings MT

NOTICE TO THE PUBLIC

Citizens are invited to:

- Review the Agenda Packet on the City's website at: https://ci.billings.mt.us/117/Agendas-Minutes
- Public comment will be taken only during the Public Comment periods as indicated on the agenda and during the Public Hearings, if any are scheduled, under the Regular agenda. Comments may be sent to the Board via email before 12:00 pm on the meeting date. All emails received prior to this time will be entered into the record for the public hearing. Comments may be submitted by:
- Mail: City/County Planning Division PO Box 1178, Billings MT 59103
- Email: plnonline@billingsmt.gov
- NOTICE: All meetings and official activities of the MPO are held in buildings and locations that comply with accessibility standards according to the Americans with Disabilities Act (ADA). A TTY number for the hearing impaired, 406-657-3079, is available upon request. Special arrangements for participation in the public hearings by individuals with hearing, speech, or vision impairment may be made upon request at least three days prior to the hearing. Please notify Brenda Berns, Planning Clerk at bernsb@billingsmt.gov or call 406-247-8610.

1. **CALL TO ORDER - Planning Board President:** Welcome and Introduction of Board Members and Staff.

2. **APPROVAL OF AGENDA* -** including any additions or deletions to agenda. The agenda for a regular meeting will be closed at 5:00 p.m. three (3) working days prior to the date of the meeting.

3. APPROVAL OF MEETING MINUTES: October 14, 2025

   Attachments
   Meeting Minutes of October 14, 2025

4. **PUBLIC COMMENT PERIOD** -- As required (3 minute maximum per person). *Any member of the public may be heard on any subject that is not on the agenda. The Planning Board will not take any action on these items at this time, but could choose to add an item to the next meeting's agenda for discussion.*
   4a) Comments on items not on agenda and requests to add items to future agendas
   4b) Comments on items on the non-public hearing agenda items

5. **DISCLOSURE OF CONFLICT OF INTEREST**

6. **DISCLOSURE OF EX PARTE COMMUNICATION**

7. **OLD BUSINESS** (Agenda items that were not discussed or not completed in a previous meeting or items requiring action).

8. **NEW BUSINESS:** (Agenda items new to this meeting).

   a. **Motion. Appointment of the Planning Board Nominating Committee for the 2025 Planning Board Officers.** Nominating Committee: The President shall at the first regular meeting in November appoint three (3) members who will present their recommendations for new officers at the first meeting in December, as the first order of business following the approval of the minutes. Nominations from the floor may be made at this time. Election of officers will follow the nominations at the first meeting in December (See Article VII, Section 2). The President shall not be a member of the Nominating Committee.

b. **Board Action: Reappointment of Dave Coppock** to his seat on The Bicycle-Pedestrian Advisory Committee - 3 Year Beginning January 1, 2026

Attachments
Coppock Application

c. **Preliminary Plat Review; Copper Square City Subdivision** - Hunter Kelly, Planner I

Attachments
Findings of Fact
Proposed Plat
Draft SIA
Traffic Study

d. **Preliminary Plat Review; Lone Eagle North County Subdivision** - Dave Green, Planner II

Attachments
Findings of Fact
Proposed Plat
Draft SIA
Variance Request A
Variance Request A Staff Input
Variance Request B
Variance Request B Staff Input

9. **OTHER BUSINESS**

a. (Standing Item) Long Range Strategic Issues and an overview of future City and County issues and projects.

10. **ADJOURNMENT**

FUTURE AGENDA ITEMS
Vote for Board President and Vice President

Date:	12/09/2025
Title:	
Presented by:	
Department:	Planning & Community Services
Presentation:	

Information

RECOMMENDATION
APPROVAL OF MEETING MINUTES:

BACKGROUND (Consistency with Adopted Plans and Policies, if applicable)

ALTERNATIVES
City Council may:

- Approve; or,
- Not Approve

FISCAL EFFECTS

Attachments

Meeting Minutes of October 14, 2025

CITY/COUNTY PLANNING BOARD

TUESDAY, OCTOBER 14, 2025 at 4:30pm

	Position	01/14/2025	01/28/2025	02/11/2025	02/25/2025	03/11/2025	03/26520025	04/082025	04/22/2025	05/13/2025	05/28/2025	06/10/2025	06/24/2027	07/08/2025	07/22/2025	08/12/2025	08/26/2025	09/09/2025	09/23/2025	10/14/2025	10/28/2025	11/12/2025	11/26520025	12/09/2025	12/23/2025
Jim Ronquillo	Billings Ward I	1	A	1	1	A	1	1	1	A	1	A	A	A	-	1	1	1	1	A					
Roger Gravgaard **President**	Billings Ward II	1	1	1	1	1	1	1	1	1	1	1	1	V	-	1	1	1	1	1					
Dennie Stephenson	Billings Ward III	1	1	1	1	1	1	1	1	1	1	1	1	1	-	1	1	1	1	1					
John Staley **Vice President**	Billings Ward IV	V	1	1	1	1	1	1	1	1	1	A	1	1	-	1	1	1	A	1					
David Nordel	Billings Ward V	A	V	V	A	V	A	1	V	1	1	1	1	A	-	1	1	A	1	A					
Troy Boucher	YC District 1	A	A	A	A	A	A	A	A	A	A	A	A	A	-	A	A	A	A	A					
Dennis Cook	YC District 2	A	1	1	1	1	1	1	1	1	1	1	1	1	-	1	1	1	1	A					
Vacant	YC District 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Vacant	YC District 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Woody Woods	YC District 5	1	1	1	1	1	1	1	A	1	1	1	A	1	-	1	1	1	1	1					
Alexis Bonogofsky	YC District 6	1	1	V	1	V	1	1	1	A	1	1	V	1	-	1	1	A	1	1					
Morgan Tuss	YC District 7	A	A	A	A	A	A	A	A	A	A	A	A	A	-	A	A	A	A	A					
Scott Reiter	Ex-Officio SD2	A	A	A	A	A	A	A	A	A	A	1	1	A	-	1	A	A	1						

Please note: “A” stands for excused absence, “1” stands for present, “V” stands for Zoom participation, “C” stands for Canceled

Call the Meeting to Order: President Gravgaard called the meeting to order at 4:30 PM

Introduction of Planning Board Members and Planning Department Staff
President Gravgaard called for introductions of the members of the Planning Board and staff.

Attending Staff: Wyeth Friday, Planning & Community Services Director; Anna Vickers, Planning Division Manager; Brenda Berns, Planning Clerk

1. Others in Attendance: Gordon Klasna, Executive Director of Secondary Education Billings Public Schools; Brad Archibald, Pioneer Technical

2. Approval of Agenda

Motion
Motion made by Board member Staley, seconded by Board member Stephenson to approve the agenda as submitted. Motion passed unanimously.

3. Approval of Minutes: September 23, 2025

Motion
Motion made by Board member Stephenson, seconded by Board Member Bonogofsky to approve the September 23, 2025 meeting minutes as written. Motion passed unanimously.

4. Public Comment: As required (3 minutes maximum per person). Any member of the public might be heard on any subject that is not on the agenda. The Planning Board will not take any action on these items at this time but could choose to add an item to the next meeting agenda for discussion.

a. **Kevin Nelson, Billings MT** – Mr. Nelson public spoke in opposition to the proposed expansion of the Southside Billings Urban Renewal District. Concerns were raised that the expansion could divert city, county, and state funds from other projects, including parks, trails, water and sewer improvements, and local recreational initiatives. Mr. Nelson expressed the view that funding for the Southside pool project, which had previously been voted down, was being pursued through the TIF expansion, potentially using tax revenue from multiple sources. He characterized this approach as abuse of authority and suggested that the Board consider recommending denial of the expansion.

.**5. Disclosure of Outside (Ex-Parte) Communication –** There were no outside communications.

6. Disclosure of Conflicts of Interest – There were no conflicts of interests.

7. **Old Business –** There was no old business**.**

8. **New Business**

   a. **South Billings Blvd Urban Renewal District Expansion: Growth Policy Conformance. Board Discussion and Action**

Wyeth Friday, PCSD Director presented an overview of the SSBURD expansion project for the Board's discussion and recommended action.

Board members asked for clarification regarding the use of TIF funds, specifically whether tax increment revenue must be spent within the district. It was confirmed that any additional tax increment generated within the district boundary must be used for projects within the district.
Staff explained that the proposed expansion of the Southside Billings Urban Area TIF District is a multi-step process required by state law. The district boundaries follow city property lines and cannot include county property, resulting in some irregular shapes. A significant portion of the proposed expansion includes the Amend Park area near South Billings Boulevard.
The mechanics of a TIF were reviewed. Staff explained that the district incentivizes development by capturing the increase in property value above a base year, which is then used for improvements such as infrastructure and redevelopment of underutilized or "blighted" properties. Tax increments remain in the district for its duration and are available for development projects. At the sunset of the district, any remaining tax increment benefits the broader community. Changes in legislation over time, including exclusions for University mills, were noted.

Expansion Report Findings

- The report findings clearly demonstrate the proposed Expansion Area of the SBBURD meets the statutory criteria for designation as a URD.
- Found the presence of:
  - Deteriorating infrastructure
  - unsafe structures
  - excessive vacancies
- These elements collectively contribute to conditions of blight that hinder the area's economic vitality and public welfare.

- SBBURD expansion will provide the City with tools to address these challenges through strategic reinvestment, infrastructure improvements, and community revitalization efforts.

Planning Board Conformance with 2016 Growth Policy

- Montana's Urban Renewal Law (Title 7, Chapter 15, Parts 42 and 43) requires the urban renewal district conforms to the community's growth policy.
- The Planning Board must review the proposed expansion of the SBBURD and affirm the expansion conforms to the 2016 City of Billings Growth Policy.
- Several Growth Policy Guidelines are addressed by potential development and redevelopment that may occur in the existing District and the District expansion.
- Some examples are called out here for the Board's reference:

- Essential Investments
  - *Developed parks that provide recreation, special amenities (community gardens, dog parks, viewing areas), and active living opportunities are desirable for an attractive and healthy community*
  - *The safety of all users and the connectivity of the transportation system are important criteria to consider in roadway designs and transportation plans*
  - *Public health and safety and emergency service response are critical to the well-being of Billings' residents, businesses, and visitors*

Mr. Friday explained that the proposed expansion will follow a lengthy timeline, estimated at about 21 years from initiation to completion if begun in 2025. Reports prepared by Pioneer Technical identified a range of unsafe and deteriorating structures within the area, though not all were found to be deficient. It was noted that the Elysian School District building lies within the expansion boundary, but the school itself is not included. A public meeting and several discussions were held with community members, where concerns were expressed regarding new construction projects and confusion about funding sources and tax impacts.

Additional potential projects include the Southside Pool repairs and funding for the 21st Street railroad underpass. Mr. Friday concluded that tax increment revenue will take time to develop, requiring the City to prioritize improvements since funding will not be immediately available for all identified needs.

Recommendation
Staff recommends the Yellowstone County Planning Board review the proposed District Expansion and Draft Urban Renewal Plan amendments and make a recommendation to City Council that the expansion and plan amendments are in conformance with the 2016 City of Billings Growth Policy.

Discussion
The Board discussed whether the proposed district would affect property taxes for individuals who do not live within the area. It was clarified that taxes will not increase specifically to fund the Tax Increment Financing (TIF) district, as existing property tax assessments already include this component.
Questions were raised regarding the bond timeline, specifically whether a new bond could extend beyond the established 2046 deadline. It was explained that the 2046 date is a firm expiration point, and any new bond would need to be structured within that timeframe. Discussion also covered how schools benefit from the TIF once it sunsets, as they will receive revenue from the increased property values.
The conversation included examples of completed projects that have supported public improvements, such as school safety enhancements, property acquisition for recreation, and infrastructure upgrades.
Board members also discussed whether TIF districts have historically been allowed to expire or have been reestablished following completion. It was noted that while one district has sunsetted, most remain active since their creation in the late 2000s.
Concerns were expressed about the City's use of TIF funds for bonding rather than direct improvements, and whether tax revenues are being fully utilized for intended projects. The Board acknowledged that bonding has enabled the City to leverage grant funds and secure favorable rates for infrastructure investments.
It was confirmed that the Board's role in this matter is to determine whether the proposal aligns with the City's 2016 Growth Policy.

Motion
Motion made by Board member Stephenson, seconded by Board member Woods to approve the South Billings Blvd Urban Renewal District Expansion, Growth Policy Conformance. The motion carries unanimously.

b. **School District #2 Enrollment Projections & Building Capacities**. Presentation and Board Discussion. Presented by Gordon Klasna, Executive Director of Secondary Education – Billings Public Schools.

Mr. Klasna addressed the Board regarding how data obtained from subdivisions informs projections for new student enrollments. He reported that current enrollment stands at 16,652 students, slightly below the projected 17,041, and noted that enrollment has remained relatively steady.
He explained that when evaluating new subdivisions, assumptions are made based on the number of homes. As a result, anticipated student numbers are distributed across multiple elementary and middle schools. He noted that school boundaries are occasionally adjusted to accommodate changes in enrollment patterns.

The presentation included a discussion about **Functional Capacity versus Target Capacity**. Functional Capacity represents the maximum number of students a facility can accommodate, while Target Capacity is set lower to maintain optimal learning conditions.
The presenter also highlighted a recent demographics study that compares statistics across all schools in the district, providing a broader understanding of population trends and student distribution. He noted that college students who occasionally share high school facilities are not included in the enrollment count.

Questions
Board members raised concerns about approving new subdivisions in areas where schools are approaching or exceeding capacity. Issues discussed included the potential need to bus students, public safety with understaffed police and fire services, and road width and infrastructure challenges. Members emphasized that meeting the technical criteria for plat approval does not necessarily address these broader community impacts.
The discussion also addressed how the school district plans for growth. Representatives explained that enrollment projections are based on subdivision data, but the exact number of students per grade or school is difficult to predict. Redistricting is sometimes used to balance enrollment, and Functional Capacity versus Target Capacity is considered when planning for optimal classroom sizes. The Board discussed challenges with larger and smaller classrooms, potential impacts of demographic fluctuations and strategies such as combining classes in elementary grades to manage enrollment.
Questions were raised about potential incentives from developers, such as donating land or contributing funds for school facilities or traffic improvements. Representatives noted that while land or cash contributions may be possible under state law, logistical and regulatory challenges limit the district's ability to hold large sums or easily integrate parcels. The possibility of implementing impact fees to support schools and public safety was discussed as a potential tool for managing growth-related costs.
Board members also inquired about historical subdivision approvals, the number of lots added annually, and the projected impacts of major infrastructure projects, such as new bridges, on school districts.

9. Other Business
Anna Vickers informed the Board members of the upcoming Education Interim Budget Committee meeting on December 16, 2025, which can be attended remotely. Additional information, including participation instructions, will be provided via email.
Board members were also reminded of the City of Billings Boards and Commissions Volunteer Appreciation Dinner, scheduled for October 29th at 6:00 p.m. at the Senior Center.

10. Future Agenda Items

ADJOURNMENT: 5:54PM

Brenda J Berns, Planning Clerk

Date: 12/09/2025
Title:
Presented by:
Department: Planning & Community Services
Presentation:

Information

RECOMMENDATION
Board Action; Reappointment of Dave Coppock to his seat on The Bicycle-Pedestrian Advisory Committee - 3 Year Term Beginning January 1, 2026

BACKGROUND (Consistency with Adopted Plans and Policies, if applicable)

ALTERNATIVES
City Council may:

- Approve; or,
- Not Approve

FISCAL EFFECTS

Attachments

Coppock Application

BICYCLE AND PEDESTRIAN ADVISORY COMMITTEE (BPAC)

City of Billings & Yellowstone County
APPLICATION FORM

This 3-year position is appointed by the Yellowstone County Board of Planning. Applicants can live in either the City of Billings or Yellowstone County. Term will begin January 1, 2025 pending appointment by the Yellowstone County Board of Planning.

NAME: Dave Coppock **HOME PHONE:** 406-591-9598

ADDRESS: 641 Beverly Hill Blvd. **WORK PHONE:** 406-591-9598

CITY: Billings **STATE:** MT **ZIP:** 59102

BUSINESS OR JOB: Retired

EMAIL ADDRESS:
dgcoppock@gmail.com

Please describe your experience or background that you believe qualifies you for service on this Committee (see attached information regarding BPAC) (attach additional sheets if needed):
Served on BPAC for the past 2 ½ years and as Chairman for the past year. Retired from the Bureau of Land Management as a geologist. Worked on numerous planning and environmental impact statements. Specialized in Economic Geology and industrial minerals. Managed the Mineral Material program in the State office dealing primarily with construction materials. Coached cross country and track at Montana State University Billings for 28 years.

Why do you wish to serve on this Committee?
Serving on BPAC is a way for me to serve the Billings community in an area which I have a great interest in as an avid user of our bicycle and pedestrian trails. I've seen our trail system evolve and improve over the past 44 years I've lived in Billings and I'd like to see continued improvement and safety on our trails as well as city streets. I feel the Committee is vital for a citizens group to have input on City/County Planning, Streets and Parks issues and decisions. To help keep BPAC relevant and serve as a resource for input to government leaders decision-making process.

Will your schedule allow you to attend BPAC meetings? Meetings are generally the 4th Tuesday of the month at 11:30 am. Yes X No (if no, please explain)

Please list any additional information that you feel is pertinent (attach additional sheets if needed):

I've thoroughly enjoyed serving on BPAC over the past few years and am grateful for the opportunity to be of service to the City of Billings and Yellowstone County.

Dave Coppock November 4, 2025

Signature **Date**

APPLICATION DEADLINE: December 1, 2025 @ 5 pm MT

Return application to: City/County Planning Board
316 N 26th St 5th Floor
Billings, MT 59101

OR

Email application to hayesm@billingsmt.gov

OFFICE USE ONLY:

APPOINTED: YES____ NO ____ DATE _____

TERM EXPIRATION DATE: _____

Circle one: ORIGINAL APPOINTMENT REAPPOINTMENT TERM NO: _____

Planning Board

Date:	12/09/2025
Title:	Copper Square Subdivision - Preliminary Major Subdivision
Presented by:	Hunter Kelly, Planner 1
Department:	Planning & Community Services
Presentation:	Yes

Information

RECOMMENDATION

Staff proposes the Planning Board recommend to City Council that the preliminary plat of Copper Square Subdivision be conditionally approved and the Findings of Fact adopted as presented in the staff report.

BACKGROUND (Consistency with Adopted Plans and Policies, if applicable)

On November 3, 2025 , Performance Engineering , on behalf of Paddy Shack, LLC , applied for preliminary major plat approval for Copper Square Subdivision . The proposed subdivision creates 11 lots for development. The subject property is generally located south of Rimrock Road and east of 62nd Street West . The property is zoned CMU 1 (Corridor Mixed Use 1) & CMU 2 (Corridor Mixed Use 2). The land is currently used as agricultural land .

VARIANCES

No variances are requested.

PROPOSED CONDITIONS OF APPROVAL

1.To minimize the effects on local service prior to final plat approval, the applicant shall show on the face of the plat and provide for construction within the Subdivision Improvements Agreement (SIA) of an approved turnaround at the southern end of proposed Road B.
2.To minimize the effects on local service prior to final plat approval, the applicant will coordinate with the USPS to determine what type of deliver system is preferred and to locate and provide the correct amount of space for safely delivering the mail to the residents and businesses in the future development.
3. To provide correct documentation and timelines for the proposed phasing of the subdivision, prior to final plat, the applicant will include proposed opening dates for the phases and the correct documentation for future phases, restrictions on conveyances, and a release form.
4. Minor changes may be made in the SIA and final documents, as requested by the Planning, Legal or Public Works Departments to clarify the documents and bring them into the standard acceptable format.
5. The final plat shall comply with all requirements of the City of Billings Subdivision Regulations, rules, regulations, policies, and resolutions of the City of Billings, and the laws and Administrative Rules of the State of Montana.

PROCEDURAL HISTORY

Pre-Application Meeting: September 18, 2025
Preliminary Plat application submitted to Planning Division: November 3, 2025
Departmental Review Meeting: November 13, 2025
Preliminary Plat Resubmittal: November 20, 2025
Planning Board Plat Review: December 9, 2025
Planning Board Public Hearing: December 23, 2025
Preliminary Plat to City Council: January 26, 2026
60 Working-Day Preliminary Plat Review period ends: February 4, 2026

PLAT INFORMATION

General Location: south of Rimrock Road and east of 62nd Street West
Legal Description: Lot 7, Sunny Cove Fruit Farms
Owner/Subdivider: Paddy Shack, LLC
Engineer/Surveyor: Performance Engineering
Existing Zoning: CMU 1 (Corridor Mixed Use 1) & CMU 2 (Corridor Mixed Use 2).
Existing Land Use: Agricultural land
Proposed Zoning: CMU 1 (Corridor Mixed Use 1) & CMU 2 (Corridor Mixed Use 2)
Proposed Land Use: Commercial Development
Gross Area: 8.95 Acres
Lot Size Minimum: 0.45 Acres
Lot Size Maximum: 3.00 Acres
Parkland Requirements: N/A, as this is a commercial subdivision.

TIS Conclusions & Recommendations

Analysis of trip generation estimates, traffic operations, and considerations for alternative modes of transportation reveal that the proposed Copper Square Subdivision project will have minimal impact on area traffic operations. Based on the analyses included herein, the following are recommended as appropriate:

Site Roadways & Accesses

The proposed new Road A along the western boundary and 60th Street West along the eastern boundary of the proposed Copper Square Subdivision along with the proposed Road B and Road C should incorporate the following recommendations:

- Roadways should be designed to accommodate the appropriate design vehicles, including at intersections and any proposed lot driveways.
- Street design should include considerations of the needs for non-motorized users.
- Design must also provide adequate intersection sight distance in accordance with City of Billings, Yellowstone County, MDT, and AASHTO standards.

Rimrock Road and Its Intersections with Road A and 60th Street West:

- Stop control is recommended for the northbound approaches.
- For ease of design and construction coordination, installation of a dedicated westbound left-turn lane at each intersection is recommended to be incorporated with the City of Billings Rimrock Road project between 54th Street West and 62nd Street West.
- Consideration may be given to including separate left- and right-turn lanes on the northbound approaches to reduce delay for right-turning vehicles on those approaches.
- Because of the proposed development character of Copper Square Subdivision, it is recommended to utilize a WB-40 as the design vehicle at each intersection, at a minimum, and a WB-62 as a control vehicle for accommodating turning movements at each intersection. Additionally, accommodation for emergency and solid waste vehicles must be considered.
- Stop control is recommended for the eastbound, Road C approach at its intersection with 60th Street West plus the northbound and southbound, Road B approaches at its intersection with Road C.

STAKEHOLDERS

There are no stakeholder responses at this time. Stakeholder input will be received at the Planning Board public hearing scheduled for this subdivision on December 23, 2025.

ALTERNATIVES

In accordance with state law, the City Council has 60 working days to act upon this major preliminary plat. The 60 working day review period for the proposed plat ends February 4, 2026. State and City subdivision regulations also require that preliminary plat be reviewed using specific criteria, as stated within this report. The City may not unreasonably restrict an owner's ability to develop land if the subdivider provides evidence that any identified adverse effects can be mitigated. Within the 60 working day review period, the City Council is required to:

1. Approve;
2. Conditionally Approve; or
3. Deny the Preliminary Plat

FISCAL EFFECTS

The preliminary plat of this subdivision will have no financial impact on the Planning Division.

SUMMARY

One of the purposes of the City's subdivision review process is to identify potential negative effects of property being subdivided. Negative effects that are identified become the subdivider's responsibility to mitigate. Various City departments, private service/utility providers and the affected school district/s, have reviewed this application and provided input on effects and mitigation. The Findings of Fact, which are presented as an attachment, discuss potential negative impacts of the subdivision and conditions of approval are recommended as measures to further mitigate any impacts. In this case, there were found to be minimal impacts from this proposed subdivision.

Attachments

Findings of Fact
Proposed Plat
Draft SIA
Traffic Study

FINDINGS OF FACT

The Planning staff has prepared the Findings of Fact for the preliminary plat of Copper Square Subdivision. These findings are based on the preliminary plat application and supplemental documents and address the review criteria required by the Montana Subdivision and Platting Act (76-3-608, MCA) and the Billings Subdivision Regulations (Section 23-303(H), BMCC).

A. What are the effects on agriculture, local services, the natural environment, wildlife, wildlife habitat, and public health, safety and welfare? [MCA 76-3-608 (3) (a) and BMCC 23-302.H.2.]

1. Effect on agriculture and agricultural water user facilities

The subject property is agricultural land. Perimeter ditches and drains shall remain in place and not be altered by the subdivider or subsequent owners. The subdivision should not affect agricultural water users' facilities.

2. Effect on local services

a. **Utilities** – Water service will be provided by the City of Billings. New individual services will be provided to all the lots, and new fire hydrants will be installed as required by the City Fire Department. The water service for this subdivision comes from Rimrock Road with phase 1 development. During phase 2 development, a water line will be installed in 60th Street West. Connection to that water line will be made and provide water to the east side of the subdivision. Connection to loop the water lines in the subdivision will be done to provide equalized water pressure. Any needed extension of those water lines will be installed by the subdivider to meet the requirements of the City of Billings Engineering Department regulations. The subdivider will install all new water lines in the local streets and individual services for each lot in accordance with design standards, specifications, rules and regulations of the City of Billings Engineering/Public Works Department and MDEQ. This is outlined in the SIA under the heading VI Utilities, A, Water.

   Sanitary sewer service will be provided by connecting to the existing City of Billings' sewer mains from Rimrock Road and to a future sanitary sewer to be built in 60th Street West. There is an existing sewer main in Rimrock Road. All new services shall be installed in accordance with design standards, specifications, rules and regulations of the City of Billings Public Works Department and MDEQ. This is outlined in the SIA under the heading VI Utilities, B, Sanitary Sewer.

   Private Utilities will be provided from existing facilities to the subdivision. No additional easements on the lot frontage have been requested.

   Stormwater – Stormwater drainage for the public streets is proposed to be provided by curb and gutters that discharge into a temporary retention pond located on the south side of the constructed roadway within the existing 60th

Street West Right of way. Until such time in the future the roadway is extended to the south. These and all other drainage improvements shall satisfy the criteria set forth by the *City of Billings Stormwater Management Manual* and will be subject to review and approval by the City Engineering Department.

b. **Solid Waste** – The City of Billings will provide solid waste collection and disposal. The City's landfill has adequate capacity for this waste.

c. **Streets** – The subdivision is adjacent to Rimrock Road. Rimrock Road is a developed right of way and no street improvements are anticipated at this time. The applicant will be dedicating additional right of way so there is the correct amount for future use. Street improvements are included in the Waiver of Right to Protest Future Special Improvement Districts. In the future when phase 2 is begun the applicant will be required to build a half road width for 60th Street West. A half width of road is 30 feet of hard surface road. Phase 2 shall also include the construction of an approved turnaround at the southern end of Road B. **(Condition #1)**

   The sidewalks will be installed by the respective lot owner on a lot-by-lot basis, as lots develop. Sidewalks along the street frontage shall be minimum 5-foot-wide and separated with a boulevard width not less than five feet. The developer will also install all ADA required ramps at the intersections within the proposed subdivision. This information is all in the SIA under the heading Transportation.

d. **Emergency Services** – The Billings Police and Fire Departments will respond to emergencies within the proposed subdivision. The nearest fire station is Station #7, approximately 1.73 road miles or 3 minutes driving time to the subject property. The subdivision is located within the ambulance service area of American Medical Response (AMR).

e. **Schools** –School District #2 provides educational services to elementary through high school students. At the time of the writing of this staff report, School District 2 did not respond to requests to review this proposal.

f. **Parks and Recreation** – This subdivision is for commercial development. No parkland is required for commercial developments.

g. **Mail Delivery -** The USPS will provide postal service to the subdivision and has indicated that centralized mailbox units will be required. The developer will need to coordinate mailbox locations with the postal service. **(Condition #2)**

h. **Phasing** - The subdivision is proposed to be constructed in phases as defined below. Public improvements associated with these phases shall be constructed or monetarily guaranteed prior to opening the phase. **(Condition #3)**

   - Phase 1: Lots 1-6

- Phase 2 Lots 7-11

3. Effect on the natural environment

The subject property is currently agricultural land with the proposed use of commercial development. The property is not located in a floodplain. During development, storm water pollution prevention best management practices are required to be used and monitored to prevent erosion on exposed ground. Overall, the effect on the natural environment should be minimal.

4. Effect on wildlife and wildlife habitat

There are no known endangered or threatened species on the property. There is a paragraph in the SIA that warns future lot owners of the presence of deer in the area, which may cause damage to their landscaping. This subdivision should have a minimal effect on wildlife and wildlife habitat.

5. Effect on the public health, safety and welfare

There will be no significant impacts to public health, safety and welfare because of this subdivision.

B. Was an Environmental Assessment required? [(MCA 76-3-616 and BMCC 23-302.H.1.]

The proposed subdivision is exempt from the requirement for an Environmental Assessment pursuant to Section 76-3-616, MCA.

C. Does the subdivision conform to the City of Billings 2016 Growth Policy, the 2014 Transportation Plan, and the Billings Area Bikeway and Trail Master Plan? [BMCC 23-302.H.4.]

1. City of Billings 2016 Growth Policy

The proposed subdivision is consistent with the following goals of the Growth Policy:

A. **Essential Investments:**

1. Infill development and development near existing City infrastructure may be the most cost-effective.
2. Neighborhoods that are safe and attractive and provide essential services are much desired.

B. **Prosperity:**

1. Community investments that attract and retain a strong, skilled, and diverse workforce also attract businesses.

2. 2001 West Billings Plan

The proposed subdivision is consistent with the following goals of the West End Area Plan.

A. **Planned Growth**

1. Conserving land and natural resources by limiting sprawl (unplanned and unmanaged growth) through achieving more compact development.
2. Reserving key land parcels for parks and open space.
3. Having mixed land use to allow shorter automobile trips, more walking, and less automobile reliance.

3. 2023 Billings Urban Area Long Range Transportation Plan

The proposed subdivision adheres to the goals and objectives of the 2023 Transportation Plan and preserves the street network and street hierarchy specified in the plan.

4. Billings Area Bikeway and Trail Master Plan (BABTMP)

The proposed subdivision is within the jurisdiction of the Billings Area Bikeways and Trail Master Plan. The Billings Area Bikeway and Trail Master Plan identifies a future bike lane on Rimrock Road, to be constructed when road is built or widened, adjacent to the subdivision. No additional improvements of this nature are anticipated.

D. Does the subdivision conform to the Montana Subdivision and Platting Act and to local subdivision regulations? [MCA 76-3-608 (3) (b) and BMCC 23-302.H.3.a.]

The proposed subdivision satisfies the requirements of the Montana Subdivision and Platting Act and to the design standards specified in the local subdivision regulations. The subdivider and the local government have complied with the subdivision review and approval procedures set forth in the local and state subdivision regulations.

E. Does the proposed subdivision conform to all requirements of the zoning in effect? [BMCC 23-302.H.3.e.]

The subject property is located within CMU 1 and CMU 2 zoning. The lot frontages conform to the requirements of this zone. Other building setbacks and structure specific requirements will be reviewed for compliance at the time of building permit review.

F. Does the proposed plat provide easements for the location and installation of any utilities? [MCA 76-3-608 (3) (c) and BMCC 23-302.H.3.b.]

The subdivider will provide utility easements as requested by private utility companies on the face of the plat.

G. Does the proposed plat provide legal and physical access to each parcel within the subdivision and notation of that access on the plat? [MCA 76-3-608 (3) (d) and BMCC 23-302.H.3.c.]

Legal and physical access is provided to the proposed will be from Rimrock Road. New internal accesses will provide circulation to individual lots.

CONCLUSIONS OF FINDINGS OF FACT

- The preliminary plat of Copper Square Subdivision does not create any adverse impacts that warrant denial of the subdivision.

- The proposed subdivision conforms to several of the goals and policies of the 2016 Growth Policy and West End Area Plan, and does not conflict with the Transportation or Bikeway/Trail Plans.

- The proposed subdivision complies with state and local subdivision regulations, local zoning, and sanitary requirements and provides legal and physical access to each lot.

- Any potential negative or adverse impacts will be mitigated with the proposed conditions of approval.

RECOMMENDATION

The Planning Board recommends to City Council that the preliminary plat of Copper Square Subdivision be conditionally approved and adopt the Findings of Fact as presented in the staff report.

PRELIMINARY PLAT OF

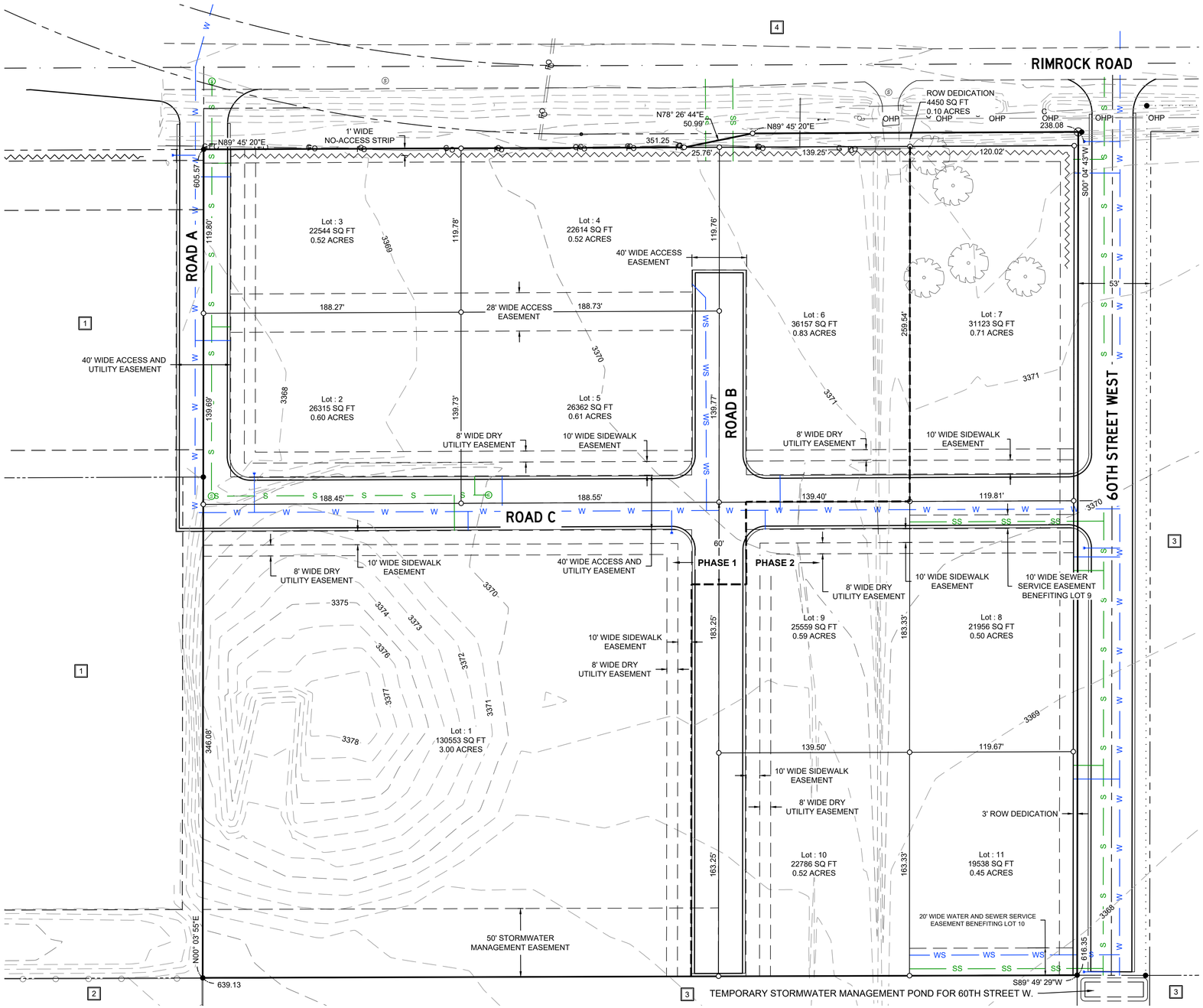
COPPER SQUARE SUBDIVISION

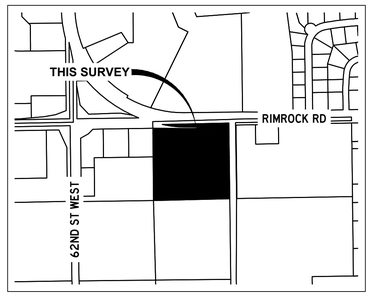
BEING LOT 7 OF SUNNY COVE FRUIT FARMS
LOCATED IN THE NW1/4 OF THE NW1/4 OF SECTION 31, TOWNSHIP 01 NORTH, RANGE 25 EAST, P.M.M.,
YELLOWSTONE COUNTY, MONTANA

PREPARED FOR : PADDY SHACK, LLC

PREPARED BY : PERFORMANCE ENGINEERING, LLC

TOTAL AREA OF SUBDIVISION : ± 8.95 ACRES
OCTOBER 2025





VICINITY MAP
NOT TO SCALE

SITE DATA

GROSS AREA	8.95 AC
NET AREA	8.85 AC
LOT COUNT	11
MAX. LOT AREA	3.00 AC
MIN. LOT AREA	0.45 AC
EXISTING ZONING	RR3
PROPOSED ZONING	CMU2, CMU1
REQ'D. PARKLAND DEDICATION	N/A

ADJOINING LANDOWNER INFORMATION

1 DANIEL PROPERTY, LLC
2047 BROADWATER AVE, STE 1
BILLINGS, MT 59102

2 JACOB & KAYCIE LAGRONE
2605 62ND ST WEST
BILLINGS, MT 59106

3 THOMAS E ROMINE
1128 N 32ND ST
BILLINGS, MT 59101

4 NEMER-TOPP REVOCABLE TRUST, ET. AL.
PO BOX 939
PAONIA, CO 81428

MUNICIPAL FACILITIES EXCLUSION

This survey is not subject to review by the Department of Environmental Quality under the Sanitation Act pursuant to Section 76-4-125(1)(d)(i), MCA. "New divisions of land subject to review under the Platting Act."

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SUBDIVISION IMPROVEMENTS AGREEMENT
& WAIVER OF RIGHT TO PROTEST FUTURE SPECIAL IMPROVEMENT DISTRICTS

Copper Square Subdivision

Table of Contents

(City of Billings)

I.	Variances	2
II.	Property Conditions and Information for Lot Purchasers	3
III.	Transportation	4
IV.	Emergency Service	6
V.	Storm Drainage	7
VI.	Utilities	7
VII.	Parks/Open Space	9
VIII.	Irrigation	10
IX.	Soils/Geotechnical Study	10
X.	Phasing of Improvements	10
XI.	Financial Guarantees	10
XII.	Legal Provisions Applying to Subdivider	10

SUBDIVISION IMPROVEMENTS AGREEMENT & WAIVER OF RIGHT TO PROTEST FUTURE SPECIAL IMPROVEMENT DISTRICTS

Copper Square Subdivision

This agreement is made and entered into this ____ day of _____, 20__, by and between *Rimrock and 60th, LLC*, whose address for the purpose of this agreement is **1248 Ponderosa Drive, Billings, MT 59102,** hereinafter referred to collectively as "Subdivider," and the **CITY OF BILLINGS**, Billings, Montana, hereinafter referred to as "City."

WITNESSETH:

WHEREAS, the plat of *Copper Square Subdivision*, located in Yellowstone County, Montana, was submitted to the Yellowstone County Board of Planning; and

WHEREAS, at a regular meeting conducted on _____ day of _____, 20__, the Board of Planning recommended conditional approval of a preliminary plat of *Copper Square Subdivision*; and

WHEREAS, at a regular meeting conducted on _____ day of _____, 20__, the City Council conditionally approved a preliminary plat of *Copper Square Subdivision*; and

WHEREAS, a Subdivision Improvements Agreement is required by the City prior to the approval of the final plat.

WHEREAS, the provisions of this agreement shall be effective and applicable to *Copper Square Subdivision* upon the filing of the final plat thereof in the office of the Clerk and Recorder of Yellowstone County, Montana. The Subdivision shall comply with all requirements of the City of Billings Subdivision Regulations, the rules, regulations, policies, and resolutions of the City of Billings, and the laws and administrative rules of the State of Montana.

THEREFORE, THE PARTIES TO THIS AGREEMENT, for and in consideration of the mutual promises herein contained and for other good and valuable consideration, do hereby agree as follows:

I. VARIANCES

Subdivider has requested, and the City hereby grants, the following variances by the City Council from the strict interpretation of the City's Subdivision Regulations (Section 23.1101, BMCC):

1. No variances are requested.

II. PROPERTY CONDITIONS AND INFORMATION FOR LOT PURCHASERS

A. Lot owners will be required to construct sidewalk along the segment of the existing access road(s) that fronts their property at the time of lot development. If sidewalk is not constructed within 5 years, the City has the right to construct the sidewalk and assess the property owners.

B. Lot owners should be aware that this subdivision is being built in close proximity to prime deer and antelope habitat and it is likely that homeowners will experience problems with damage to landscaped shrubs, flowers, and gardens. The Montana Fish, Wildlife, and Parks Department does not provide damage assistance unless there is damage to commercial crops and/or a threat to public health and safety.

C. Lot owners should be aware that soil characteristics within the area of this subdivision, as described in the 1972 Yellowstone County Soil Survey, indicate that there could be potential limitations for proposed construction on the lots, which may require a geotechnical survey prior to construction.

D. No water rights have been transferred to the lot owners. Irrigation ditches that exist on the perimeter of this development are for the benefit of other properties. Perimeter ditches and drains shall remain in place and shall not be altered by the Subdivider or subsequent owners without written approval from upstream and downstream users.

E. There is attached hereto a Waiver waiving the right to protest the creation of the special improvement district or districts which by this reference is expressly incorporated herein and made as much a part hereof as though fully and completely set forth herein at this point. The Waiver will be filed with the plat, shall run with the land, and shall constitute the guarantee by the Subdivider and property owner or owners of the developments described herein. Said Waiver is effective upon filing and is not conditioned on the completion of the conditions set forth in this Agreement. The Subdivider and owner specifically agree that they are waiving valuable rights and do so voluntarily.

F. The subdivider and subsequent contractors/builders acknowledge that there is a Stormwater Pollution and Prevention Plan (SWPPP) filed with the city and the Montana Department of Environmental Quality (MDEQ). This SWPPP shall be adhered to during all phases of construction and shall be updated as required by MDEQ under the General Permit for Stormwater Discharges Associated with Construction Activity, Chapter 28, BMCC and the Billings Stormwater Management Manual.

G. Individual lot owners should be aware that Best Management Practices for stormwater control shall be required for new construction on lots. Best Management Practices are defined within Section 28-201, BMCC and detailed in the Billings Stormwater Management Manual.

III. TRANSPORTATION

A. Streets

- Rimrock Road is designated as an arterial street. The City of Billings is requiring a 120-foot right-of-way for Rimrock Road. The existing half right-of-way is between 50 and 60 feet along the property frontage. This subdivision will dedicate right-of-way to establish a full 60-foot half right-of-way adjacent to the subdivision. The Subdivider will be required to participate/contribute to either a Special Improvement District or Work Order for any future improvements along Rimrock Road including widening, curb and gutter, and sidewalk or trail.

- 60th Street West is designated as a residential local access road. The City of Billings is requiring a 56-foot right-of-way for 60th Street West. The existing right-of-way is 53-feet along the property frontage. This subdivision will dedicate an additional 3-feet to establish a full 56-foot right-of-way along the entire property frontage.

- Road A, Road B and Road C are private roads constructed within a 40-foot wide access easement.

- Road A, Road B and Road C are constructed to a width of 39-feet back-of-curb to back-of-curb, in accordance with City of Billings Subdivision requirements for commercial roads.

- 60th Street West will be constructed as part of Phase 2 of the Subdivision. Should 60th Street West not be constructed prior to such time, the Subdivider will be responsible to construct the west curb line and 30' of asphalt pavement. Should 60th Street West be constructed prior to Phase 2 of the Subdivision, the Subdivider will be responsible to construct the remaining asphalt width and west curb and gutter.

- A Traffic Impact Study has been completed for the *Copper Square Subdivision*. All required intersection improvement contributions identified therein shall be completed by the Subdivider at the Subdivider's expense based on the additional lots created with the *Copper Square Subdivision.* The percentage of traffic contributions to the following intersections shall be in accordance with the approved traffic impact study:

A. Rimrock Road & 58th Street West / Glynn Abbey Way – 4.00%
B. Rimrock Road & 54th Street West – 3.83%

The cash contributions shall be based on the precent of traffic contributions to the intersections based on the total cost of an intersection as determined by City Engineering for the year in which the contribution is made. These cash contributions for the intersection improvements will be made prior to final plat approval. The percentage of contributions are as outlined within the Traffic Impact Study for *Copper Square Subdivision* as submitted with the preliminary plat.

B. Sidewalks

- Individual lot owners will be responsible for the construction of the sidewalks adjacent to the public right-of-way, unless constructed as part of a City Work Order or SID, as well as the private roads fronting their lot at the time of lot construction and shall be included in each building permit.

- ADA ramps shall be installed by the Subdivider at the time of construction of public improvements.

C. Street Lighting

- Street lighting will be required along 60th Street West at the time it is constructed. A Street Light Maintenance District will be created in the future and is included in the waiver of right to protest.

D. Traffic Control Devices

- Street name signs for streets within the subdivision, or located immediately adjacent thereto, shall be furnished and installed in accordance with the specifications of the City of Billings Public Works and Fire Departments.

- No traffic signals are required within this subdivision. Stop signs shall be installed on the northbound lane of Road A at the intersection of Rimrock Road, on the eastbound lane of Road C at the intersection of 60th Street West, as well as on the north and south legs of Road B's intersection with Road C. 60th Street West will be stop controlled in the north bound direction at its intersection with Rimrock Road.

- The Subdivider shall furnish and install all necessary traffic control devices in accordance with the Manual of Uniform Traffic Control Devices and approved by the City of Billings Public Works Department.

E. Access

- In Phase 1, the Subdivision will be accessed from Rimrock Road with a 40-foot wide access easement along the common property line of Tule Ridge Subdivision and *Copper Square Subdivision* (20' on each side of the common property line). A right turn lane is required to be installed for the eastbound lane of Rimrock Road for the approach as identified in the Traffic Accessibility Study and SIA for the Tule Ridge Subdivision as well as the TIS for *Copper Square Subdivision*.

- A second 40-foot wide access will be located off 60th Street West, both of which will be constructed as part of Phase 2 of the Subdivision. The centerline of the access being approximately 260-feet from the northeast corner of the subdivision.

- Private streets within the Subdivision shall allow public access through 40-foot wide access easement.

F. Billings Area Bikeway and Trail Master Plan

- The Billings Area Bikeway and Trail Master Plan identifies a future bike lane on Rimrock Road, to be constructed when the road is built or widened, adjacent to the subdivision.
- The Billings Area Bikeway and Trail Master Plan also identifies a shared-use path north of Rimrock Road, adjacent to the subdivision.

G. Public Transit

- No improvements to public transit service are proposed for this subdivision.

IV. EMERGENCY SERVICE

Construction of buildings made of combustible materials shall have adequate fire apparatus access roads and water supply (fire hydrants) in place to allow for fire suppression requirements. Prior to the issuance of a building permit for construction using combustible materials (i.e. lumber, plywood, wood trusses, etc.), fire apparatus access roads and water supply requirements shall be provided in accordance with the International Fire Code as adopted by the City of Billings.

At a minimum, the following is required:

- An unobstructed gravel road or gravel road base must be within 150 feet of the furthest portion of a building under construction as measured along the approved route.
- The access roads are required to support fire apparatus vehicle loading (40 tons) during all weather conditions and shall be a minimum of twenty (20) feet wide.
- An operational fire hydrant shall be located within 600 feet of the furthest portion of a residence under construction or within 400 feet of the furthest

portion of a commercial building under construction as measured along the access roads to the site.

- The above requirements do not alter or effect the current minimum subdivision requirements for fire apparatus access and water supply.

V. STORM DRAINAGE

All drainage improvements shall comply with the provisions set forth in Chapter 28, BMCC, and the Stormwater Management Manual in place at the time of development. A complete stormwater management plan shall be submitted to the Engineering Division for review and approval at the time of private contract permitting for public facilities and as part of individual lot development.

Stormwater management of improvements within the 60th Street West rights-of-way will be collected via curb inlets and storm drain piping in accordance with the City's Stormwater Management Manual. Collected stormwater will be discharged to a temporary retention pond located on the south side of the constructed roadway within the existing 60th Street West rights-of-way, until such time in the future the roadway is extending to the south and storm drain is available to received the flows.

VI. UTILITIES

The Subdivision Improvements Agreement does not constitute an approval for extension of or connection to water mains and sanitary sewers. The property owner shall make application for extension/connection of water mains and sanitary sewers to the Public Works Department – Engineering Division. The extension/connection of/to water mains and sanitary sewers is subject to the approval of the applications and the conditions of approval. Applications shall be submitted for processing prior to the start of any construction and prior to review and approval of any project plans and specifications.

The Developer/Owner acknowledges that the Subdivision shall be subject to the applicable System Development Fees in effect at the time new water and/or sanitary sewer service connections are made.

The design/installation of sanitary sewers and appurtenances, and water mains and appurtenances (fire hydrants, etc) shall be in accordance with design standards, specifications, rules, regulations of and as approved by the City of Billings Public Works Department, Fire Department and the Montana Department of Environmental Quality.

A. Water

- The Subdivision will extend a water main from Rimrock Road, south to the subdivision within Road A and Road C. Said waterline will

connect to the water main installed within 60th Street West at the time Phase 2 improvements are constructed. Said water main will be constructed in a public utility easement beneath Road A and Road C to the Road C intersection with 60th Street West.

- Lots 1-6 and 9 of the subdivision will be serviced from the public water main extended through the subdivision.

- Lots 7-8 and 10-11 will be serviced from the water main extended through 60th Street West right-of-way.

- The internal water main in Road A and Road C will be a 12" water main in compliance with City of Billings standards for commercial developments.

- The water main within 60th Street West will be an 8" water main as its primary use will be residential to the east and south.

- Subdivider will be responsible to reimburse the City of Billings for ½ of the water main costs within Rimrock Road, as calculated based on an average cost tabulated from the past two years.

- Should Subdivider install water line within 60th Street West as part of Phase 2 improvements, they will be reimbursed by the developer of the property to the east of 60th Street W. at the time it is connected onto. Should the development to the east construct the water line within 60th Street West prior to Phase 2, the Subdivider shall reimburse that developer for ½ the cost of the waterline as calculated based on an average cost tabulated from the past two years.

- Design/installation of fire hydrants shall be in accordance with the design standards, specifications, rules, regulations of and as approved by the City of Billings Public Works Department and Fire Department. Location of fire hydrants shall be as follows:

    - At the southwest corner of the Road A and Rimrock Road intersection.
    - At the northeast corner of the Road A and Road C intersection.
    - At the southeast corner of the Road B and Road C intersection.
    - At the southeast corner of the Rimrock Road and 60th Street West intersection.
    - At the southeast corner of the Road C and 60th Street West intersection.
    - Along 60th Street West near the southern subdivision boundary.

B. Sanitary Sewer

- The Subdivision will be extending sanitary sewer main from Rimrock Road south into the subdivision. At the northern boundary of the subdivision, sanitary sewer main will be extended in a public utility easement under Road A to the intersection with Road C. From this intersection, water main will extend east, in a public utility easement beneath Road C to approximately the western property line of Lot 5.

- Sanitary sewer will also be extended from Rimrock Road through 60th Street West right-of-way along the eastern boundary of the subdivision.

- Lots 1-3 and 5 of the subdivision will be serviced from the public sanitary sewer main extended through the subdivision.

- Lots 4 and 6 will be serviced from the existing sanitary sewer main located in the Rimrock Road right-of-way.

- Lots 7-11 will be serviced from the sanitary sewer main extended through 60th Street West right-of-way.

- Subdivider will be responsible to reimburse the City of Billings for ½ of the sewer main costs within Rimrock Road, as calculated based on an average cost tabulated from the past two years.

- Should Subdivider install sewer line within 60th Street West as part of Phase 2 improvements, they will be reimbursed by the developer of the property to the east of 60th Street W. at the time it is connected onto. Should the development to the east construct the sewer line within 60th Street West prior to Phase 2, the Subdivider shall reimburse that developer for ½ the cost of the sewer line as calculated based on an average cost tabulated from the past two years.

C. Power, Telephone, Gas, and Cable Television

All telephone, gas, electrical power, and cable television lines will be located within the easements shown on the plat. Any telephone, gas, electrical power, and cable television lines located within the private roads will be installed prior to surfacing.

VII. PARKS/OPEN SPACE

There is no parkland requirement for Copper Square Subdivision per 76-3-621(3)(b), MCA, when a land is subdivided into parcels that are all nonresidential.

VIII. IRRIGATION

No water rights have been transferred to the lot owners. Irrigation ditches that exist on the perimeter of this development are for the benefit of other properties. Perimeter ditches and drains shall remain in place and shall not be altered by the Subdivider or subsequent owners without written approval from upstream and downstream users.

IX. SOILS/GEOTECHNICAL STUDY

A geotechnical investigation was performed for the area and can be obtained from the City Engineering Department office.

X. PHASING OF IMPROVEMENTS

The Subdivision will be constructed phases as defined below. Public improvements associated with these phases shall be constructed or monetarily guaranteed prior to opening the phase.

- Phase I: Lots 1-6
  - Water main will be constructed from Rimrock Road through the subdivision to the intersection of Road C and Road B.
  - Sanitary sewer will be constructed from Rimrock Road through the subdivision to approximately the western property line of Lot 5.
- Phase II: Lots 7-11
  - West curb and gutter and 30-feet of asphalt will be constructed for 60th Street West from Rimrock Road along the eastern boundary of the subdivision.
  - Water main will be constructed from Rimrock Road through 60th Street West right-of-way along the eastern boundary of the subdivision.
  - Sanitary sewer main will be constructed from Rimrock Road through 60th Street West right-of-way along the eastern boundary of the subdivision.

XI. FINANCIAL GUARANTEES

Except as otherwise provided, Subdivider shall install and construct said required improvements with cash or by utilizing the mechanics of a private contract secured by letters of credit or a letter of commitment to lend funds from a commercial lender, or by SID. All engineering and legal work in connection with such improvements shall be paid by the contracting parties pursuant to said private contract, and the improvements shall be installed as approved by the City Engineer and Utility Department Manager.

XII. LEGAL PROVISIONS APPLYING TO SUBDIVIDER

A. Subdivider agrees to guarantee all public improvements for a period of two year from the date of final acceptance by the City of Billings.

B. The owners of the properties involved in this proposed Subdivision by signature subscribed herein below agree, consent, and shall be bound by the provisions of this Agreement.

C. The covenants, agreements, and all statements in this Agreement run with the land and apply to and shall be binding on the heirs, personal representatives, successors, assigns and transferees of the respective parties.

D. In the event it becomes necessary for either party to this Agreement to retain an attorney to enforce any of the terms or conditions of this Agreement or to give any notice required herein, then the prevailing party or the party giving notice shall be entitled to reasonable attorney fees and costs.

E. Any amendments or modifications of this Agreement or any provisions herein shall be made in writing and executed in the same manner as this original document and shall after execution become a part of this Agreement.

F. Subdivider shall comply with all applicable federal, state, and local statutes, ordinances, and administrative regulations during the performance and discharge of its obligations. Subdivider acknowledges and agrees that nothing contained herein shall relieve or exempt it from such compliance.

IN WITNESS WHEREOF, the parties hereto have set their hands and official seals on the date first above written.

"SUBDIVIDER" *Rimrock and 60th, LLC.*

By: _____

Title: _____

STATE OF MONTANA)
: ss
County of)

On this _____ day of _____, 20__, before me, a Notary Public in and for the State of _____, personally appeared _____ _____, known to me to be the _____ of *Rimrock and 60th, LLC,* who executed the foregoing instrument and acknowledged to me that he/she executed the same.

_____
Notary Public in and for the State of _____
Printed Name: _____
Residing at: _____
My commission expires: _____

This agreement is hereby approved and accepted by the City of Billings, this ____ day of _____, 20__.

"CITY"
CITY OF BILLINGS
MONTANA

By: _____
Mayor

Attest: _____
City Clerk

STATE OF MONTANA)
: ss
County of Yellowstone)

On this ____ day of _____, 20__, before me, a Notary Public in and for the State of Montana, personally appeared _____ and _____, known to me to be the Mayor and City Clerk, respectively, of the City of Billings, Montana, whose names are subscribed to the foregoing instrument in such capacity and acknowledged to me that they executed the same on behalf of the City of Billings, Montana.

_____
Notary Public in and for the State of Montana
Printed Name: _____
Residing at: _____
My commission expires: _____

Waiver of Right to Protest
FUTURE SPECIAL IMPROVEMENT DISTRICTS

FOR VALUABLE CONSIDERATION, the undersigned, being the Subdivider and all of the owners of the hereinafter described real property, do hereby waive the right to protest the formation of one or more special improvement district(s) for a period of no more than twenty years from the recording of this waiver, for street light maintenance and energy, and for the construction of streets, street widening, sidewalks, survey monuments, street name signs, curb and gutter, street lights, driveways, traffic signals, and traffic control devices, parks and park maintenance, trails, sanitary sewer lines, water lines, storm drains (either within or outside the area), and other improvements which the City of Billings may require.

This Waiver and Agreement is independent from all other agreements and is supported by sufficient independent consideration to which the undersigned are parties and shall run with the land and shall be binding upon the undersigned, their successors and assigns, and the same shall be recorded in the office of the County Clerk and Recorder of Yellowstone County, Montana.

This Waiver is in addition to any other recorded waiver related to the property described herein and is not intended to replace, supersede, or invalidate any such waiver.

The real property hereinabove mentioned is more particularly described as follows:

Copper Square Subdivision

Signed and dated this _____ day of _____, 20___.

Rimrock and 60th, LLC.

By: _____

Title: _____

STATE OF)
: ss
County of)

On this _____ day of _____, 20__, before me, a Notary Public in and for the State of _____, personally appeared _____ _____, known to me to be the _____ of *Rimrock and 60th, LLC,* who executed the foregoing instrument and acknowledged to me that he/she executed the same.

_____
Notary Public in and for the State of _____
Printed Name: _____
Residing at: _____
My commission expires: _____

OCTOBER
2025

TRAFFIC IMPACT STUDY

COPPER SQUARE SUBDIVISION

Billings, Yellowstone County, Montana

E5 ENGINEERING, PLLC

Prepared For
Performance Engineering

Traffic Impact Study

COPPER SQUARE SUBDIVISION

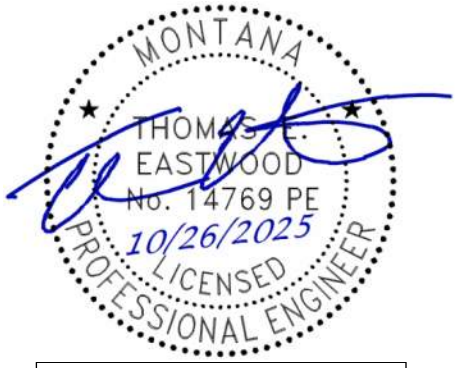
Billings, Yellowstone County, Montana

Prepared For

Performance Engineering

October 2025

Project No. 25-0109



PTOE Certification – 2020

619 Milestone Drive ● Belgrade, Montana 59714 ● (406) 209-3960 ● E5EngineeringPLLC@gmail.com

Table of Contents

Executive Summary 1

Purpose of Report & Study Objectives 1
Study Area Location & Land Use 1
Transportation Network 1
Rimrock Road 1
Study Intersections & Traffic Volumes 2
Pedestrians & Bicyclists 2
Transit Service 2
Safety 2
Proposed Development 3
Projected Traffic Volumes 4
Through Traffic Projections 4
Background Development 4
Growth Rate Projections 4
Total Traffic Projections 4
Transportation Analyses 4
Analysis Scenarios 4
Assessment of Impacts 5
Traffic Operations 5
Mitigation Analyses 5
Safety 6
Conclusions & Recommendations 6
Site Roadways & Accesses 6
Study Area Intersections 7
Grand Avenue & 62nd Street West 7
Rimrock Road & 62nd Street West / Molt Road 8
Rimrock Road & 58th Street West / Glynn Abbey Way 8
Rimrock Road & 54th Street West 8
Alternative Modes of Transportation 9
Pedestrians & Bicyclists 9
Transit Service 9
Improvements & Traffic Control Guidance 9
Financial Contributions 9

Proposed Study Area Development 10

Proposed Development Plan 10
Traffic Impact Analysis Horizon 10
Transportation Elements of the Proposed Development 10
Trip Generation 10
Trip Distribution 10
Traffic Assignment 18
Pedestrians & Bicyclists 18
Transit Service 18

Existing Conditions 25

Study Area Land Use 25
Transportation Network 25
Rimrock Road 25
Study Intersections 25
Alternative Modes of Transportation 27
Pedestrians & Bicyclists 27
Transit Service 27
Traffic Volumes 27
Safety 27

Projected Traffic 29

Through Traffic Projections 29
Background Development 30
Growth Rate Projections 30
Projected Growth Rate Traffic Volumes 33
Projected Through Traffic Volumes 33
Total Traffic Projections 33

Transportation Analyses 42

Analysis Scenarios 42

Analysis Methodologies 42

Unsignalized Intersections 42

Signalized Intersections 43

Study Scenario Analyses 43

Existing Conditions (2025) Study Scenario Operations Analyses 43

No Build Scenario – Estimated 2030 Background Traffic Volumes 43

Phase 1 Utilization Scenario – Estimated 2030 Total Traffic Volumes 43

Phase 2 Pre-Development Scenario – Estimated 2034 Background Traffic Volumes 51

Full Utilization Scenario – Estimated 2034 Total Traffic Volumes 51

Auxiliary Turn Lane Analyses 51

Assessment of Impacts 58

Traffic Operations 58

Mitigation Analyses 58

Grand Avenue & 62nd Street West ..58

Rimrock Road & 62nd Street West / Molt Road 62

Rimrock Road & 58th Street West / Glynn Abbey Way 62

Rimrock Road & 54th Street West ... 62

Rimrock Road & Road A 64

Rimrock Road & 60th Street West ... 64

Safety 65

Alternative Modes of Transportation 65

Existing Conditions 65

Proposed Development 65

Pedestrians & Bicyclists 65

Transit Service 65

Compliance with Applicable Local Codes 65

Conclusions & Recommendations 65

Site Roadways & Accesses 65

Study Area Intersections 66

Grand Avenue & 62nd Street West 66

Rimrock Road & 62nd Street West / Molt Road 68

Rimrock Road & 58th Street West / Glynn Abbey Way 68

Rimrock Road & 54th Street West 68

Alternative Modes of Transportation 69

Pedestrians & Bicyclists 69

Transit Service 69

Improvements & Traffic Control Guidance 69

Financial Contributions 69

References 71

Appendices

Appendix A

Level of Service Concepts, Analysis Methodologies, & Standards of Significance

Appendix B

Traffic Count Data

Appendix C

Trip Generation Analyses

Appendix D

Average Annual Growth Rate Analyses for Vehicular Traffic

Appendix E

Capacity & Level of Service Analyses

E-1: Intersection Operations Summaries

E-2: 2025 Existing Conditions

E-3: 2030 Estimated Background Traffic

E-4: 2030 Estimated Total Traffic

E-5: 2034 Estimated Background Traffic

E-6: 2034 Estimated Total Traffic

Appendix F

Auxiliary Turn Lane Analyses

Appendix G

Signal Warrant Analyses

Appendix H

Mitigation Analyses

H-1: Grand Avenue & 62nd Street West Turn Lanes Addition

H-2: Grand Avenue & 62nd Street West Signalization

H-3: Rimrock Road & 58th Street West Turn Lanes Addition

H-4: Rimrock Road & 54th Street West Turn Lanes Addition & Signal Timing Modifications

H-5: Rimrock Road & Road A Turn Lanes Addition

H-6: Rimrock Road & 60th Street West Turn Lanes Addition

Appendix I

Cost Participation Analyses

List of Tables

Table 1: Estimated Project Trip Generation | Lots 1 – 4 14
Table 2: Estimated Project Trip Generation | Lots 5 – 8 15
Table 3: Estimated Project Trip Generation | Lots 9 – 11 16
Table 4: Estimated Project Trip Generation Summary 17
Table 5: Study Area Intersections Existing Characteristics 26
Table 6: 2020 – 2024 Study Area Intersections Reported Crash Experience Summary 29
Table 7: Study Area Intersections Reported Crash Experience Rate Summary 29
Table 8: Estimated Average Annual Growth Rates 30
Table 9: Auxiliary Turn Lane Analyses Summary 51
Table 10: Warrant 1 | Eight-Hour Vehicular Volume Summary 59
Table 11: Warrant 2 | Four-Hour Vehicular Volume Summary 60
Table 12: Grand Avenue & 62nd Street West Weekday, AM Peak Hour Signalization Traffic Operations Summary 60
Table 13: Grand Avenue & 62nd Street West Weekday, Midday Peak Hour Signalization Traffic Operations Summary 61
Table 14: Grand Avenue & 62nd Street West Weekday, PM Peak Hour Signalization Traffic Operations Summary 61
Table 15: Rimrock Road & 54th Street West Weekday, AM Peak Hour Mitigation Traffic Operations Summary 63
Table 16: Rimrock Road & 54th Street West Weekday, Midday Peak Hour Mitigation Traffic Operations Summary 63
Table 17: Rimrock Road & 54th Street West Weekday, PM Peak Hour Mitigation Traffic Operations Summary 64
Table 18: Study Area Intersections Calculated Financial Contribution Percentages 69
Table A-1: Level of Service Criteria for Stop-Controlled Intersections A-1
Table A-2: Level of Service Criteria for Signalized Intersections A-2

List of Figures

Figure 1: Subdivision Location 11
Figure 2: Subdivision Layout 12
Figure 3: Estimated Primary Trip Distribution 13
Figure 4: Estimated Subdivision Phase 1 Traffic Assignment | Nodes 1, 2, 3, & 4 Plus Estimated Average Weekday Traffic Volumes 19
Figure 5: Estimated Subdivision Phase 1 Traffic Assignment | Nodes A, D, & E Plus Estimated Average Weekday Traffic Volumes 20
Figure 6: Estimated Subdivision Phase 2 Traffic Assignment | Nodes 1, 2, 3, & 4 Plus Estimated Average Weekday Traffic Volumes 21
Figure 7: Estimated Subdivision Phase 2 Traffic Assignment | Nodes A, B, & C Plus Estimated Average Weekday Traffic Volumes 22
Figure 8: Estimated Phases 1 & 2 Traffic Assignment | Nodes 1, 2, 3, & 4 Plus Estimated Average Weekday Traffic Volumes 23
Figure 9: Estimated Phases 1 & 2 Traffic Assignment | Nodes A, B, C, D, & E Plus Estimated Average Weekday Traffic Volumes 24
Figure 10: 2025 Existing Traffic Volumes | Nodes 1, 2, 3, 4 Plus Estimated Average Weekday Traffic Volumes 28
Figure 11: Estimated 2030 Background Development Build-Up Traffic Volumes 31
Figure 12: Estimated 2034 Background Development Build-Up Traffic Volumes 32
Figure 13: Estimated 2025 – 2030 AAGR Generated Traffic Volumes 34
Figure 14: Estimated 2030 – 2034 AAGR Generated Traffic Volumes 35
Figure 15: Estimated 2030 Background Traffic Volumes 36
Figure 16: Estimated 2034 Background Traffic Volumes 37
Figure 17: Estimated 2030 Total Traffic | Nodes 1, 2, 3, & 4 Plus Estimated Average Weekday Traffic Volumes 38
Figure 18: Estimated 2030 Total Traffic | Nodes A, D, & E Plus Estimated Average Weekday Traffic Volumes 39
Figure 19: Estimated 2034 Total Traffic | Nodes 1, 2, 3, & 4 Plus Estimated Average Weekday Traffic Volumes 40
Figure 20: Estimated 2034 Total Traffic | Nodes A, B, C, D, & E Plus Estimated Average Weekday Traffic Volumes 41

List of Figures (continued)

Figure 21: Traffic Operations Summary for 2025 Existing Conditions | Grand Avenue & 62nd Street West 44

Figure 22: Traffic Operations Summary for 2025 Existing Conditions | Rimrock Road Intersections..... 45

Figure 23: Traffic Operations Summary for
Estimated 2030 Background Traffic | Grand Avenue & 62nd Street West..... 46

Figure 24: Traffic Operations Summary for
Estimated 2030 Background Traffic | Rimrock Road Intersections 47

Figure 25: Traffic Operations Summary for
Estimated 2030 Total Traffic | Grand Avenue & 62nd Street West 48

Figure 26: Traffic Operations Summary for
Estimated 2030 Total Traffic | Rimrock Road Intersections 49

Figure 27: Traffic Operations Summary for
Estimated 2030 Total Traffic | Copper Square Subdivision Intersections 50

Figure 28: Traffic Operations Summary for
Estimated 2034 Background Traffic | Grand Avenue & 62nd Street West..... 52

Figure 29: Traffic Operations Summary for
Estimated 2034 Background Traffic | Rimrock Road Intersections 53

Figure 30: Traffic Operations Summary for
Estimated 2034 Background Traffic | Copper Square Subdivision Intersections 54

Figure 31: Traffic Operations Summary for
Estimated 2034 Total Traffic | Grand Avenue & 62nd Street West 55

Figure 32: Traffic Operations Summary for
Estimated 2034 Total Traffic | Rimrock Road Intersections 56

Figure 33: Traffic Operations Summary for
Estimated 2034 Total Traffic | Copper Square Subdivision Intersections 57

Figure 34: Grand Avenue & 62nd Street West Conceptual Intersection Geometry with
Turn Lanes & Signalized Traffic Control 67

Figure 35: Rimrock Road & 54th Street West Conceptual Intersection Geometry with
Turn Lanes & Signalized Traffic Control 70

Figure A-1: Control Delay and Flow Rate A-1

Executive Summary

Purpose of Report & Study Objectives

This report summarizes the results of a traffic impact study conducted by E5 Engineering, PLLC for the proposed Copper Square Subdivision in Billings, Yellowstone County, Montana. The objectives of the traffic study are as follows:

- Determine the existing vehicular, pedestrian, bicycle, and transit conditions in the study area to establish a base condition.
- Assess the impact that the proposed development will have on transportation conditions in the area.
- Evaluate proposed site access operations.
- Determine any street, access, bicycle, and pedestrian modifications and/or improvements that will be necessary to effectively accommodate and mitigate future conditions.

Study Area Location & Land Use

The proposed Copper Square Subdivision is to be located on Lot 7 of Sunny Cove Fruit Farms (less right-of-way) in Billings, Yellowstone County, Montana. The project is bounded by Rimrock Road to the north, the future 60th Street West to the east, and currently vacant agricultural properties to the west and south. Other properties in the immediate area are primarily residential with some agricultural properties.

Transportation Network

Study Roadway

Rimrock Road

Existing Study Area Roadway Corridor

Rimrock Road (U-1034A, C000302A) is functionally classified as a principal arterial as noted in the *2023 Billings Urban Area Long Range Transportation Plan* (LRTP). The roadway is also designated as an urban route by the Montana Department of Transportation (MDT). The posted speed limit adjacent to the proposed Copper Square Subdivision is 55 miles per hour (55 mph). Per MDT data, the paved surface width adjacent to the proposed development is approximately 24 feet, inclusive of single travel lanes in each direction.

Future Study Area Roadway Corridor

The City of Billings has a committed project to widen Rimrock Road from 54th Street West to 62nd Street West to a full arterial standard while also following its adopted complete streets policy with the goals of replacing deteriorating pavement, increasing safety on the existing narrow two-lane facility, and installing multimodal facilities. The currently committed project is included in the Fiscal Year 2026 budget with an estimated cost of $10,350,000. It is anticipated that this project will be completed within the analysis horizon years evaluated as a part of this study.

Study Intersections & Traffic Volumes

The existing intersections that were the primary focus and evaluated as a part of this study include the following:

▪ 1 | Grand Avenue & 62nd Street West ▪ 2 | Rimrock Road & 62nd Street West / Molt Road	▪ 3 | Rimrock Road & 58th Street West / Glynn Abbey Way ▪ 4 | Rimrock Road & 54th Street West

Current vehicle, pedestrian, and bicycle counts were utilized for the study area intersections based on averages taken for three weekdays at each location on September 30 plus October 1 and 2, 2025 (Tuesday, Wednesday, and Thursday). The intersection of Grand Avenue and 62nd Street West were conducted for a 14-hour period between 6:00 a.m. and 8:00 p.m. The remaining intersection counts were completed for three 2-hour periods – between 7:00 and 9:00 a.m. (AM peak period), 11:00 a.m. and 1:00 p.m. (midday peak period), and 4:00 and 6:00 p.m. (PM peak period). The count data were adjusted to account for seasonal or daily variations that may occur throughout the year from when the counts were taken. Seasonal and daily adjustment factors available through the City of Billings were utilized with the average count data.

Alternative Modes of Transportation

Pedestrians & Bicyclists

Sidewalks are not available for pedestrians along Rimrock Road between 62nd Street West and 54th Street West within the study area. Bike lanes are not presently available within this roadway segment either. The recently completed roundabout at the intersection of Rimrock Road and 62nd Street West included concrete sidewalk / pathway improvements at the intersection for connection to future sidewalk / pathway installations in the future. At the intersection of Rimrock Road and 54th Street West, sidewalks are currently available on the west side of 54th Street West north of the intersection and on the east side of 54th Street West south of the intersection. There are also asphalt shared-use pathways on the north side of Rimrock Road east of the intersection and the west side of 54th Street West on the west side of the roadway.

Transit Service

The City of Billings Metropolitan Transit System (MET Transit) currently provides service in Billings that includes 13 fixed bus routes and Americans with Disabilities Act (ADA) complementary paratransit service (MET Plus). There are not currently any existing routes along Rimrock Road adjacent to the proposed Copper Square Subdivision.

Safety

Traffic safety conditions were documented by reviewing the crash history of the study area intersections using data provided from the MDT crash database. Public crash information for the period 2020 through 2024, the most recent five years available, was reviewed. MDT reported 36 crashes at or within the vicinity of the study area intersections over the five-year period. Limited data is available through the public crash information provided by MDT. Additional crash information such as type; weather, roadway, and lighting conditions; number of vehicles, pedestrian, or bicyclist involvement; age and gender of drivers; and other potentially contributing conditions can be obtained through a review of the specific crash reports.

Proposed Development

The proposed Copper Square Subdivision project has been evaluated based on the following:

- The proposed subdivision includes eleven (11) total commercial lots to be developed in two phases with anticipated land uses comprised of pickleball, office, medical / dental office, restaurant, retail, and coffee shop with drive-through.
- Estimated trip generation for the proposed development was derived utilizing rates published by the Institute of Transportation Engineers (ITE) in the Trip Generation Manual, 12th Edition published in August 2025. The rates used in the analyses were based on the pickleball courts, (ITE Land Use Code 489), small office building (ITE Land Use Code 712), medical-dental office building (ITE Land Use Code 720), apparel store (ITE Land Use Code 876), high-turnover (sit-down) restaurant (ITE Land Use Code 932), and coffee / donut shop with drive through window (ITE Land Use Code 937) land uses with each utilizing a general urban/suburban setting. The forecast trip generation is as follows:
    - 3,282 average weekday vehicle trips for Phases 1 & 2 combined.
        - Phase 1 – 1,322 estimated average weekday trips and
        - Phase 2 – 1,960 estimated average weekday trips.
    - 337 vehicle trips during the weekday, AM peak hour of adjacent street traffic between 7:00 and 9:00 a.m. for Phases 1 & 2 combined.
        - Phase 1 – 110 estimated average weekday, AM peak hour trips and
        - Phase 2 – 227 estimated average weekday, AM peak hour trips.
    - 257 vehicle trips during the weekday, midday peak hour of adjacent street traffic between 11:00 a.m. and 1:00 p.m. for Phases 1 & 2 combined.
        - Phase 1 – 139 estimated average weekday, midday peak hour trips and
        - Phase 2 – 118 estimated average weekday, midday peak hour trips.
    - 273 vehicle trips during the weekday, PM peak of adjacent street traffic between 4:00 and 6:00 p.m. for Phases 1 & 2 combined.
        - Phase 1 – 132 estimated average weekday, PM peak hour trips and
        - Phase 2 – 141 estimated average weekday, PM peak hour trips.
- Access to the development is proposed via a new shared access with the adjacent Tule Ridge Subdivision to Rimrock Road at the northwest corner of the proposed subdivision plus an access to the future 60th Street West.
- Potential traffic impacts associated with the proposed Copper Square Subdivision have been evaluated through the year 2034 as a part of this study, anticipating full buildout, occupancy, and utilization of the development that also includes evaluation of separate stages of development in the years 2030 and 2034.
- It is anticipated that sidewalk improvements will be included as development progresses to provide non-motorized user connectivity within Copper Square Subdivision. No specific transit-oriented improvements are presently included with the project.

Projected Traffic Volumes

Through Traffic Projections

Estimated through traffic (background traffic) projections for the 2030 and 2034 analysis years utilized a combination of the build-up method, considering background traffic growth due to approved or anticipated to be approved developments in the study area, plus the trends or growth rate method.

Background Development

Other known developments in the study area that are in various stages of development or review processes within the evaluated 2034 analysis period of this study include the following:

- Buffalo Crossing Development
- Fifty-Four West Subdivision
- Sweetgrass Development
- The Trestles Subdivision
- Glynn Abbey Subdivision

Buffalo Crossing, Sweetgrass, Glynn Abbey, and portions of Fifty-Four West and The Trestles developments are anticipated to be completed by 2030. The remaining portions of Fifty-Four West and The Trestles are anticipated to be completed by the 2034 analysis horizon.

Growth Rate Projections

Estimated growth rate generated traffic volumes were projected for the 2030 and 2034 analysis years by applying an average annual growth rate (AAGR) to the 2025 traffic volumes for Grand Avenue, 62nd Street West, Rimrock Road, 58th Street West, and 54th Street West. It is important to note that the AAGR generated traffic volumes are intended to represent traffic growth from outside the study area, excluding the known background developments as well as the proposed Copper Square Subdivision.

Total Traffic Projections

Estimated 2030 and 2034 total traffic volumes include the combination of background traffic volumes with those projected for the proposed Copper Square Subdivision, Phases 1 and 2, respectively.

Transportation Analyses

Analysis Scenarios

To identify significant project impacts, the following scenarios for study area intersections were evaluated:

- Existing Conditions (2025)
  Consists of an operational analysis of seasonally and daily adjusted 2025 counts collected as part of this study.
- No Build Scenario – Estimated 2030 Background Traffic Volumes
  Consists of projected, non-site background traffic volumes resulting from applied AAGR and known development build-up values.

- Phase 1 Utilization Scenario – Estimated 2030 Total Traffic Volumes
  Consists of estimated 2030 background traffic volumes in combination with forecast traffic from Phase 1 of the proposed Copper Square Subdivision.
- Phase 2 Pre-Development Scenario – Estimated 2034 Background Traffic Volumes
  Consists of estimated 2030 total traffic volumes in combination with projected, non-site background traffic volumes resulting from applied AAGR and known development build-up values between 2030 and 2034.
- Full Utilization Scenario – Estimated 2034 Total Traffic Volumes
  Consists of estimated 2034 background traffic in combination with forecast volumes from Phase 2 of the proposed Copper Square Subdivision along with redistribution of traffic from Phase 1 with installation of 60th Street West access.

Assessment of Impacts

Traffic Operations

Each of the study area intersections are currently operating within acceptable levels of service. With continued traffic growth in the area, study area intersections may experience declines in levels of service on specific approaches or the whole intersection. Impacts and potential mitigation measures are discussed below.

Mitigation Analyses

Grand Avenue & 62nd Street West

- **Impact:** The intersection currently operates within acceptable levels of service but is projected to decline with continued traffic growth outside as well as from known developments within the study area. The intersection was found to satisfy minimum criteria for consideration of installation of an eastbound left-turn lane as well as a westbound right-turn lane.
- **Mitigation:** The intersection was evaluated under two alternatives: 1) installation of auxiliary lanes on the eastbound and westbound approaches plus providing separate turn lanes on the southbound approach, and 2) installation of signalized traffic control.
- A preliminary signal warrant evaluation was conducted for meeting minimum traffic signal warrant criteria for Warrant #1: Eight-Hour Vehicular Volume and Warrant #2: Four-Hour Vehicle Volume as delineated in the MUTCD. Based on the projected 2030 background traffic volumes, installation of a traffic signal may be warranted at the intersection of Grand Avenue and 62nd Street West. Estimated average daily traffic volumes are projected to satisfy minimum criteria for Warrant #2: Four-Hour Vehicular Volume.

Rimrock Road & 62nd Street West / Molt Road

- **Impact:** The intersection of Rimrock Road and 62nd Street West / Molt Road as a whole is forecast to operate within acceptable levels of service (LOS C or better) through the 2034 analysis period; however, the eastbound approach is projected to experience increased average vehicle delays during the AM peak period.
- **Mitigation:** Anticipated traffic growth from development west of the intersection is the primary driver for the longer delays along with circulating volumes within the roundabout. Mitigation for the eastbound approach may be necessary with continued development west of the intersection in the future. The addition of a non-yielding right-turn lane on the eastbound approach may improve operations.

Rimrock Road & 58th Street West / Glynn Abbey Way

- **Impact:** Vehicles on the northbound and southbound approaches may experience longer delays during the weekday, AM and PM peak periods with continued traffic growth on Rimrock Road. Projected traffic volumes at the intersection are not expected to meet minimum criteria for installation of a traffic signal under the analyzed conditions.
- **Mitigation:** It is anticipated that the City of Billings Rimrock Road widening project will provide a dedicated turn lane for westbound left-turns at 58th Street West. This mitigation is not anticipated to significantly improve traffic operations for the northbound, 58th Street West or southbound, Glynn Abbey Way approaches; however, it is anticipated to improve traffic flow for through vehicles on Rimrock Road and may also provide some safety benefits.

Rimrock Road & 54th Street West

- **Impact:** Vehicles on the northbound and southbound approaches experience longer delays during weekday peak periods, which is projected to continue with increased delays as traffic volumes grow on Rimrock Road. Likewise, the eastbound approach also experiences longer delays during the weekday, AM peak hour that will be exacerbated with continual traffic growth on Rimrock Road.
- **Mitigation:** Installation of dedicated eastbound and northbound right-turn lanes at the intersection to accommodate current and projected vehicular demand for those movements along with signal timing optimization updates for time-of-day plans may assist with improved overall intersection performance. This would also need to be evaluated with other coordinated signals to determine the appropriate cycle length, splits, and offsets.
- For ease of design and construction coordination, installation of turn lanes is recommended to be incorporated with the City of Billings Rimrock Road project between 54th Street West and 62nd Street West.

Safety

A significant crash experience trend was not identified at any of the study area intersections.

Conclusions & Recommendations

Analysis of trip generation estimates, traffic operations, and considerations for alternative modes of transportation reveal that the proposed Copper Square Subdivision project will have minimal impact on area traffic operations. Based on the analyses included herein, the following are recommended as appropriate:

Site Roadways & Accesses

The proposed new Road A along the western boundary and 60th Street West along the eastern boundary of the proposed Copper Square Subdivision along with the proposed Road B and Road C should incorporate the following recommendations:

- Roadways should be designed to accommodate the appropriate design vehicles, including at intersections and any proposed lot driveways.
- Street design should include considerations of the needs for non-motorized users.
- Design must also provide adequate intersection sight distance in accordance with City of Billings, Yellowstone County, MDT, and AASHTO standards.

- Rimrock Road and Its Intersections with Road A and 60th Street West:
    - Stop control is recommended for the northbound approaches.
    - For ease of design and construction coordination, installation of a dedicated westbound left-turn lane at each intersection is recommended to be incorporated with the City of Billings Rimrock Road project between 54th Street West and 62nd Street West.
    - Consideration may be given to including separate left- and right-turn lanes on the northbound approaches to reduce delay for right-turning vehicles on those approaches.
    - Because of the proposed development character of Copper Square Subdivision, it is recommended to utilize a WB-40 as the design vehicle at each intersection, at a minimum, and a WB-62 as a control vehicle for accommodating turning movements at each intersection. Additionally, accommodation for emergency and solid waste vehicles must be considered.
- Stop control is recommended for the eastbound, Road C approach at its intersection with 60th Street West plus the northbound and southbound, Road B approaches at its intersection with Road C.

Study Area Intersections

Grand Avenue & 62nd Street West

The intersection currently operates within acceptable levels of service but is projected to decline with continued traffic growth outside as well as from known developments within the study area. Mitigation for projected substandard traffic operations at this intersection includes the following:

- Consideration should be given to installation of an eastbound left-turn lane and a westbound right-turn lane at the intersection.
    - The intersection did satisfy minimum criteria for consideration of installation of an eastbound left-turn lane as well as a westbound right-turn lane based on existing, 2025 traffic conditions.
- A preliminary evaluation of forecast traffic conditions utilizing a procedure developed by the Oregon Department of Transportation identified that installation of a traffic signal may be warranted at the intersection based on the projected 2030 background traffic volumes. Estimated average daily traffic volumes are projected to satisfy minimum criteria for Warrant #2: Four-Hour Vehicular Volume.
- Consideration of installation of traffic signal infrastructure, at a minimum, should be given with installation of the auxiliary turn lanes noted above. Overhead flashing beacons may be substituted for signal indications until such time that minimum MUTCD warrant criteria are satisfied for installation of signalized control based on the results of a full signal warrant study.

The need for mitigation at the intersection of Grand Avenue and 62nd Street West is based on **existing** conditions as well as with **continued growth of non-site generated traffic** through the year 2030. It is not directly related to traffic impacts resulting from the proposed Copper Square Subdivision, which only represents an estimated 0.7% and 1.0% of forecast 2030 and 2034 total traffic volumes, respectively, at the intersection.

Rimrock Road & 62nd Street West / Molt Road

The intersection of Rimrock Road and 62nd Street West / Molt Road as a whole is forecast to operate within acceptable levels of service (LOS C or better) through the 2034 analysis period; however, the eastbound approach is projected to experience increased average vehicle delays during the AM peak period. The following is presented for consideration:

- Anticipated traffic growth from development west of the intersection is the primary driver for the longer delays along with circulating volumes within the roundabout.
- Traffic contributions from the proposed Copper Square Subdivision are not anticipated to result in the need for mitigation at the intersection of Rimrock Road and 62nd Street West / Molt Road as evidenced by estimated 2030 and 2034 traffic operational analyses, noting favorable LOS results for the westbound and northbound approaches.
- Mitigation for the eastbound approach may be necessary with continued development west of the intersection in the future. The addition of a non-yielding right-turn lane on the eastbound approach may improve operations.

Rimrock Road & 58th Street West / Glynn Abbey Way

Vehicles on the northbound and southbound approaches may experience longer delays during the weekday, AM and PM peak periods with continued traffic growth on Rimrock Road. Projected traffic volumes at the intersection are not expected to meet minimum criteria for installation of a traffic signal under the analyzed conditions.

- It is anticipated that the City of Billings Rimrock Road widening project will provide a dedicated turn lane for westbound left-turns at 58th Street West.
- This mitigation is not anticipated to significantly improve traffic operations for the northbound, 58th Street West or southbound, Glynn Abbey Way approaches; however, it is anticipated to improve traffic flow for through vehicles on Rimrock Road and may also provide some safety benefits.

Rimrock Road & 54th Street West

Vehicles on the northbound and southbound approaches experience longer delays during weekday, peak periods, which is projected to continue with increased delays as traffic volumes grow on Rimrock Road. Likewise, the eastbound approach also experiences longer delays during the weekday, AM peak hour that will be exacerbated with continual traffic growth on Rimrock Road. The following is presented for consideration:

- Installation of dedicated eastbound and northbound right-turn lanes at the intersection to accommodate current and projected vehicular demand for those movements.
- Signal timing optimization updates for time-of-day plans may assist with improved overall intersection performance. This would also need to be evaluated with other coordinated signals to determine the appropriate cycle length, splits, and offsets.
- For ease of design and construction coordination, installation of turn lanes is recommended to be incorporated with the City of Billings Rimrock Road project between 54th Street West and 62nd Street West.

Alternative Modes of Transportation

Pedestrians & Bicyclists

It is anticipated that sidewalk improvements will be included as development progresses to provide non-motorized user connectivity within Copper Square Subdivision.

Transit Service

No specific transit-oriented improvements are presently included with the project.

Improvements & Traffic Control Guidance

Included recommendations for mitigation and the proposed Copper Square Subdivision improvements should be installed according to City of Billings and/or Yellowstone County requirements (as applicable), the most current editions of the *Montana Public Works Standard Specifications*, Montana Department of Transportation requirements, and the *Manual on Uniform Traffic Control Devices*.

Financial Contributions

Financial contribution proportionate shares for the study area intersections have been determined and are presented below. Final contribution amounts will be determined by the City of Billings and will be based on the identified percentage applied to the City's most current cost participation monetary value.

- Grand Avenue & 62nd Street West 0.44%
- Rimrock Road & 62nd Street West / Molt Road 1.33%
- Rimrock Road & 58th Street West 4.00%
- Rimrock Road & 54th Street West 3.83%

Proposed Study Area Development

Proposed Development Plan

The proposed Copper Square Subdivision is to be located in Billings, Yellowstone County, Montana on Lot 7 of Sunny Cove Fruit Farms (less right-of-way) situated in the northeast quarter of the northwest quarter of the northwest quarter of Section 31, Township 1 North, Range 25 East of the Principal Meridian of Montana (NE ¼ NW ¼ NW ¼, Sec. 31, T1N, R25E, P.M.M.). The project is bounded by Rimrock Road to the north, the future 60th Street West to the east, and currently vacant agricultural properties to the west and south. Access to the development is proposed via a new shared access with the adjacent Tule Ridge Subdivision to Rimrock Road at the northwest corner of the proposed subdivision plus an access to the future 60th Street West. The subdivision location and study area are shown in Figure 1 on the following page. The proposed layout is shown in Figure 2 on page 12.

Traffic Impact Analysis Horizon

Potential traffic impacts associated with the proposed Copper Square Subdivision have been evaluated through the year 2034 as a part of this study, anticipating full buildout, occupancy, and utilization of the development that also includes evaluation of separate stages of development in the years 2030 and 2034.

Transportation Elements of the Proposed Development

Trip Generation

Estimated trip generation for the proposed development was derived utilizing rates published by the Institute of Transportation Engineers (ITE) in the *Trip Generation Manual, 12th Edition* published in August 2025. The rates used in the analyses were based on the pickleball courts, (ITE Land Use Code 489), small office building (ITE Land Use Code 712), medical-dental office building (ITE Land Use Code 720), apparel store (ITE Land Use Code 876), high-turnover (sit-down) restaurant (ITE Land Use Code 932), and coffee / donut shop with drive-through window (ITE Land Use Code 937) land uses with each utilizing a general urban/suburban setting. The estimated trip generation for the proposed project based on the ITE trip generation rates is presented in Tables 1 through 4 on pages 14 through 17 and is provided in Appendix C.

Trip Distribution

Trip distribution is the process of identifying the probable traffic routes that development related traffic will utilize based on likely trip origins and destinations given the characteristics of the proposed development and the surrounding area. Various methods are available for estimating trip distribution, including the analogy, trip distribution model, area of influence, origin-destination (O-D), and surrogate data methods. This study utilizes a combination of the analogy method that bases the trip distribution on existing travel patterns in the area, and the O-D method that considers likely trip origins and destinations. Figure 3 on page 13 shows the estimated primary trip distribution for the proposed Copper Square Subdivision.

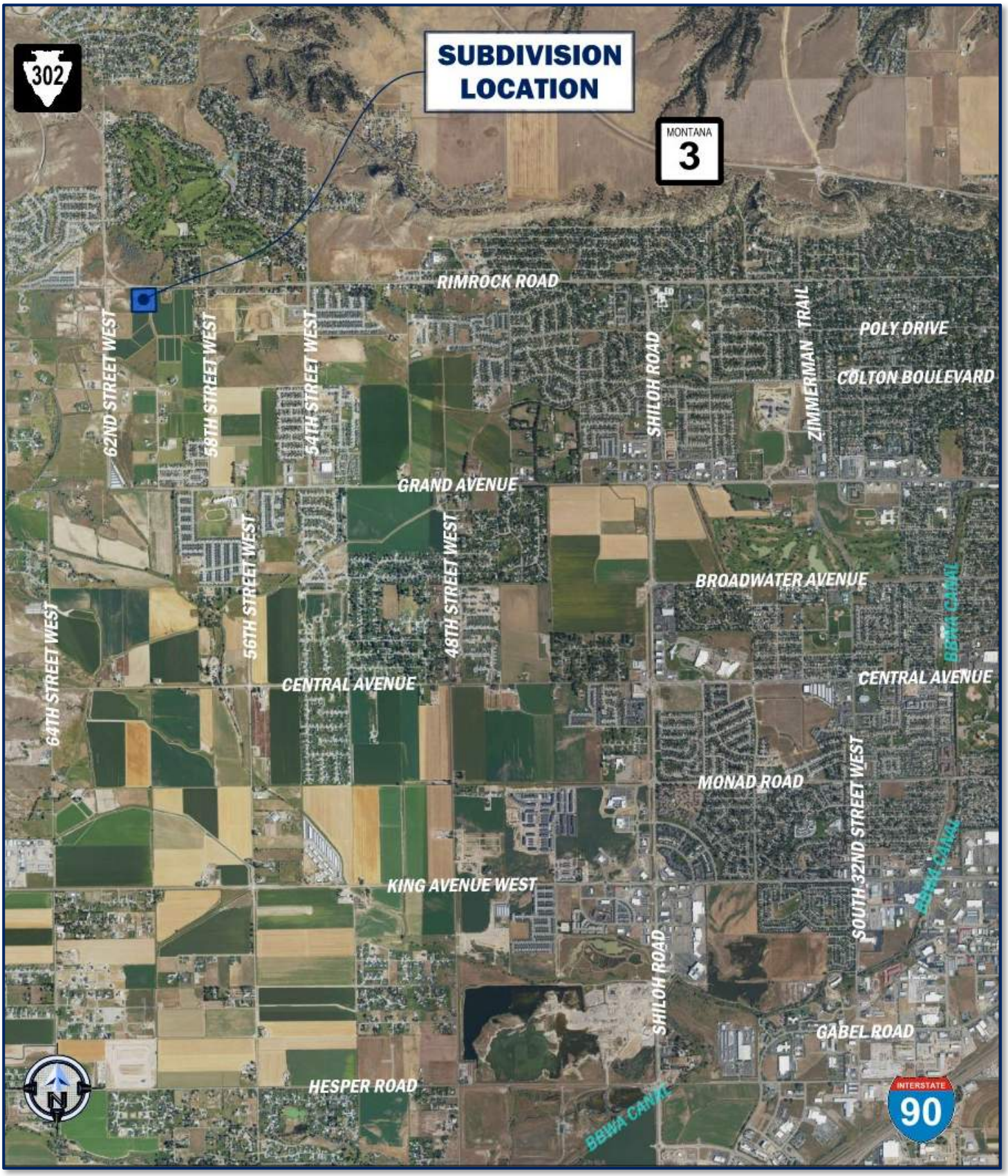


Figure 1: Subdivision Location

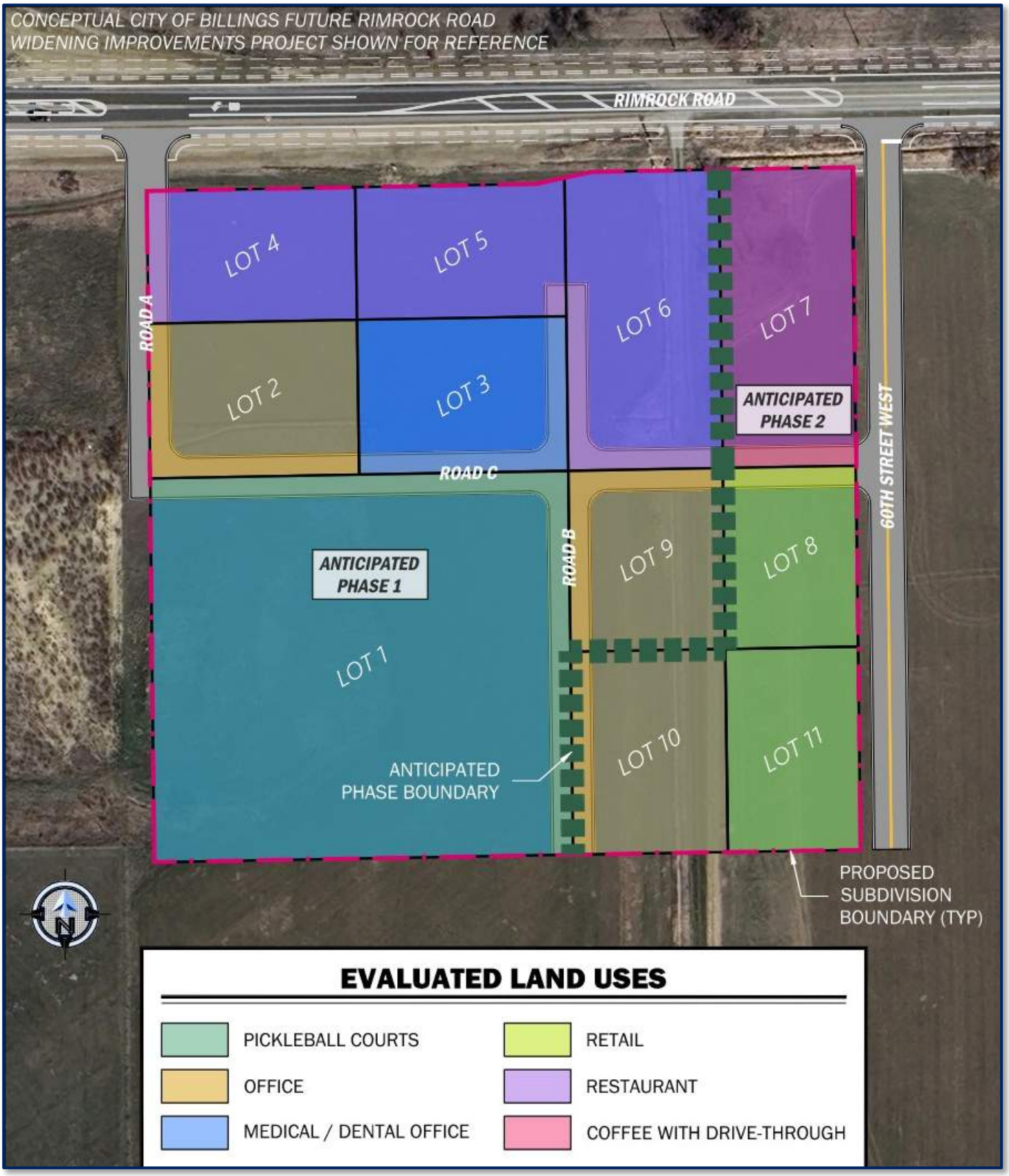


Figure 2: Subdivision Layout

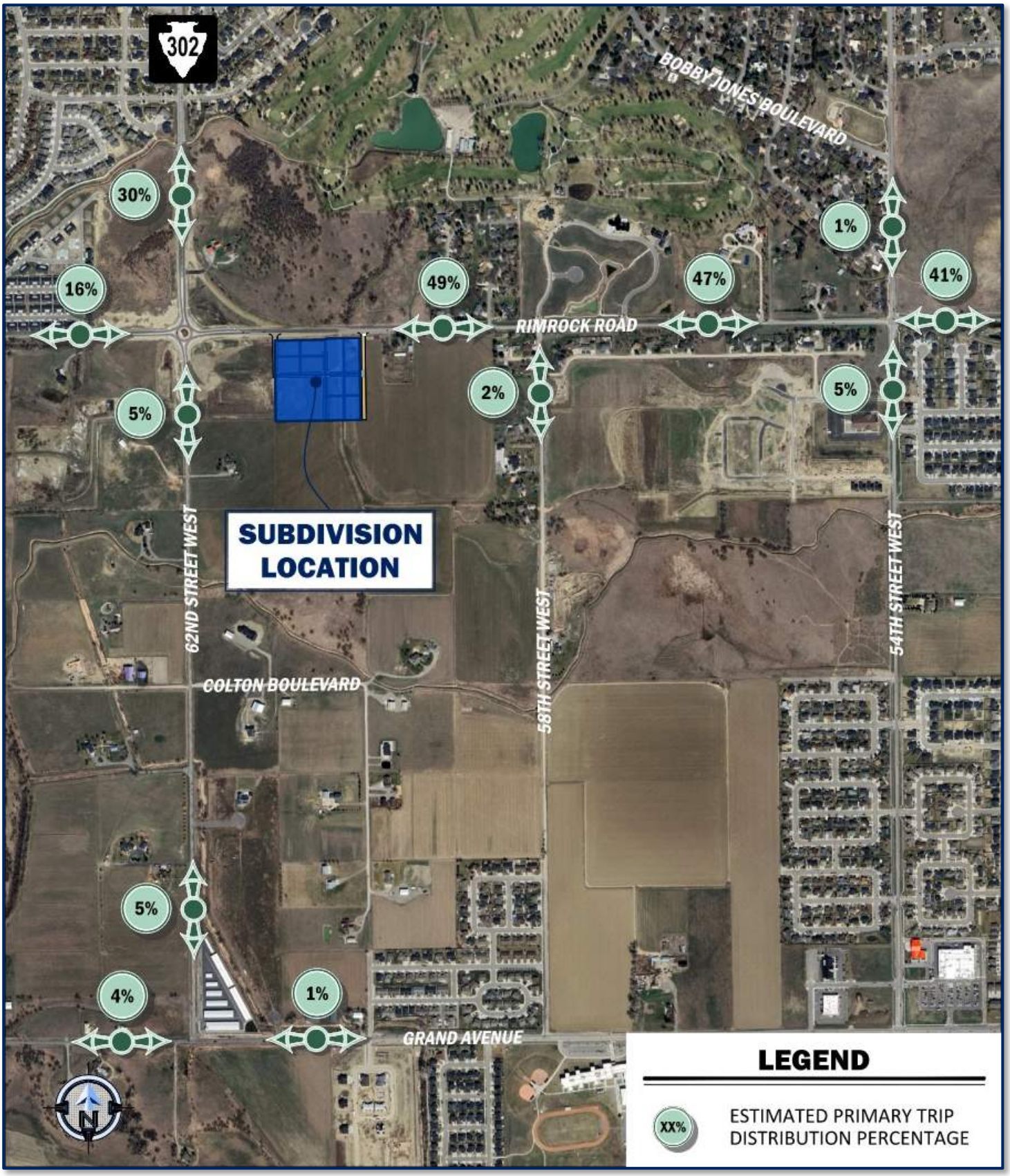


Figure 3: Estimated Primary Trip Distribution

Table 1: Estimated Project Trip Generation | Lots 1 – 4

Land Use	ITE Code	Quantity	Units	Estimated Vehicle Trip Ends Enter	Exit	Total
Lot 1 Paddy Shack						
Pickleball Courts	489	6	Courts			
Estimated Average Weekday Trip Ends				118	118	236
Estimated Weekday, AM Peak Hour of Adjacent Street Traffic One Hour Between 7:00 – 9:00 a.m. Trip Ends				6	6	12
Estimated Weekday, Midday Peak Hour of Adjacent Street Traffic One Hour Between 11:00 a.m. – 1:00 p.m. Trip Ends				7	6	13
Estimated Weekday, PM Peak Hour of Adjacent Street Traffic One Hour Between 4:00 – 6:00 p.m. Trip Ends				16	10	26
Lot 2 Office						
Small Office Building	712	4.0	1,000 Square Feet of Gross Floor Area			
Estimated Average Weekday Trip Ends				29	29	58
Estimated Weekday, AM Peak Hour of Adjacent Street Traffic One Hour Between 7:00 – 9:00 a.m. Trip Ends				6	1	7
Estimated Weekday, Midday Peak Hour of Adjacent Street Traffic One Hour Between 11:00 a.m. – 1:00 p.m. Trip Ends				3	4	7
Estimated Weekday, PM Peak Hour of Adjacent Street Traffic One Hour Between 4:00 – 6:00 p.m. Trip Ends				3	6	9
Lot 3 Medical / Dental Office						
Medical-Dental Office Building	720	4.0	1,000 Square Feet of Gross Floor Area			
Estimated Average Weekday Trip Ends				69	69	138
Estimated Weekday, AM Peak Hour of Adjacent Street Traffic One Hour Between 7:00 – 9:00 a.m. Trip Ends				10	3	13
Estimated Weekday, Midday Peak Hour of Adjacent Street Traffic One Hour Between 11:00 a.m. – 1:00 p.m. Trip Ends				5	5	10
Estimated Weekday, PM Peak Hour of Adjacent Street Traffic One Hour Between 4:00 – 6:00 p.m. Trip Ends				4	10	14
Lot 4 Restaurant						
High-Turnover (Sit-Down) Restaurant	932	2.5	1,000 Square Feet of Gross Floor Area			
Estimated Average Weekday Trip Ends				130	130	260
Estimated Weekday, AM Peak Hour of Adjacent Street Traffic One Hour Between 7:00 – 9:00 a.m. Trip Ends				12	10	22
Estimated Weekday, Midday Peak Hour of Adjacent Street Traffic One Hour Between 11:00 a.m. – 1:00 p.m. Trip Ends				16	16	32
Estimated Weekday, PM Peak Hour of Adjacent Street Traffic One Hour Between 4:00 – 6:00 p.m. Trip Ends				14	9	23

Table 2: Estimated Project Trip Generation | Lots 5 – 8

	Land Use	ITE Code	Quantity	Units	Estimated Vehicle Trip Ends Enter	Exit	Total
Lot 5	Restaurant						
	High Turnover (Sit Down) Restaurant	932	2.5	1,000 Square Feet of Gross Floor Area			
	Estimated Average Weekday Trip Ends				130	130	260
	Estimated Weekday, AM Peak Hour of Adjacent Street Traffic One Hour Between 7:00 – 9:00 a.m. Trip Ends				12	10	22
	Estimated Weekday, Midday Peak Hour of Adjacent Street Traffic One Hour Between 11:00 a.m. – 1:00 p.m. Trip Ends				16	16	32
	Estimated Weekday, PM Peak Hour of Adjacent Street Traffic One Hour Between 4:00 – 6:00 p.m. Trip Ends				14	9	23
Lot 6	Restaurant						
	High Turnover (Sit-Down) Restaurant	932	3.0	1,000 Square Feet of Gross Floor Area			
	Estimated Average Weekday Trip Ends				156	156	312
	Estimated Weekday, AM Peak Hour of Adjacent Street Traffic One Hour Between 7:00 – 9:00 a.m. Trip Ends				15	12	27
	Estimated Weekday, Midday Peak Hour of Adjacent Street Traffic One Hour Between 11:00 a.m. – 1:00 p.m. Trip Ends				19	19	38
	Estimated Weekday, PM Peak Hour of Adjacent Street Traffic One Hour Between 4:00 – 6:00 p.m. Trip Ends				17	11	28
Lot 7	Coffee with Drive-Through						
	Coffee / Donut Shop with Drive-Through Window	937	2.5	1,000 Square Feet of Gross Floor Area			
	Estimated Average Weekday Trip Ends				751 *616 – Pass-By* *135 – Net New*	751 *616 – Pass-By* *135 – Net New*	1,502 *1,232 – Pass-By* *270 – Net New*
	Estimated Weekday, AM Peak Hour of Adjacent Street Traffic One Hour Between 7:00 – 9:00 a.m. Trip Ends				109 *91 – Pass-By* *18 – Net New*	105 *87 – Pass-By* *18 – Net New*	214 *178 – Pass-By* *36 – Net New*
	Estimated Weekday, Midday Peak Hour of Adjacent Street Traffic One Hour Between 11:00 a.m. – 1:00 p.m. Trip Ends				41 *27 – Pass-By* *14 – Net New*	46 *30 – Pass-By* *16 – Net New*	87 *57 – Pass-By* *30 – Net New*
	Estimated Weekday, PM Peak Hour of Adjacent Street Traffic One Hour Between 4:00 – 6:00 p.m. Trip Ends				49 *40 – Pass-By* *9 – Net New*	49 *39 – Pass-By* *10 – Net New*	98 *79 – Pass-By* *19 – Net New*
Lot 8	Retail						
	Apparel Store	876	3.0	1,000 Square Feet of Gross Floor Area			
	Estimated Average Weekday Trip Ends				100	100	200
	Estimated Weekday, AM Peak Hour of Adjacent Street Traffic One Hour Between 7:00 – 9:00 a.m. Trip Ends				2	1	3
	Estimated Weekday, Midday Peak Hour of Adjacent Street Traffic One Hour Between 11:00 a.m. – 1:00 p.m. Trip Ends				6	6	12
	Estimated Weekday, PM Peak Hour of Adjacent Street Traffic One Hour Between 4:00 – 6:00 p.m. Trip Ends				9	8	17

Table 3: Estimated Project Trip Generation | Lots 9 – 11

	Land Use	ITE Code	Quantity	Units	Estimated Vehicle Trip Ends Enter	Exit	Total
Lot 9	Office						
	Small Office Building	712	4.0	1,000 Square Feet of Gross Floor Area			
	Estimated Average Weekday Trip Ends				29	29	58
	Estimated Weekday, AM Peak Hour of Adjacent Street Traffic One Hour Between 7:00 – 9:00 a.m. Trip Ends				6	1	7
	Estimated Weekday, Midday Peak Hour of Adjacent Street Traffic One Hour Between 11:00 a.m. – 1:00 p.m. Trip Ends				3	4	7
	Estimated Weekday, PM Peak Hour of Adjacent Street Traffic One Hour Between 4:00 – 6:00 p.m. Trip Ends				3	6	9
Lot 10	Office						
	Small Office Building	712	4.0	1,000 Square Feet of Gross Floor Area			
	Estimated Average Weekday Trip Ends				29	29	58
	Estimated Weekday, AM Peak Hour of Adjacent Street Traffic One Hour Between 7:00 – 9:00 a.m. Trip Ends				6	1	7
	Estimated Weekday, Midday Peak Hour of Adjacent Street Traffic One Hour Between 11:00 a.m. – 1:00 p.m. Trip Ends				3	4	7
	Estimated Weekday, PM Peak Hour of Adjacent Street Traffic One Hour Between 4:00 – 6:00 p.m. Trip Ends				3	6	9
Lot 11	Retail						
	Apparel Store	876	3.0	1,000 Square Feet of Gross Floor Area			
	Estimated Average Weekday Trip Ends				100	100	200
	Estimated Weekday, AM Peak Hour of Adjacent Street Traffic One Hour Between 7:00 – 9:00 a.m. Trip Ends				2	1	3
	Estimated Weekday, Midday Peak Hour of Adjacent Street Traffic One Hour Between 11:00 a.m. – 1:00 p.m. Trip Ends				6	6	12
	Estimated Weekday, PM Peak Hour of Adjacent Street Traffic One Hour Between 4:00 – 6:00 p.m. Trip Ends				9	8	17

Table 4: Estimated Project Trip Generation Summary

Included Lots		ITE Code	Quantity	Units	Estimated Vehicle Trip Ends Enter	Exit	Total
Phase 1 Development – Analysis Year 2030							
Lot 1	Paddy Shack	489	6	Courts			
Lot 2	Office	712	4.0	1,000 Square Feet of Gross Floor Area			
Lot 3	Medical / Dental Office	720	4.0				
Lot 4	Restaurant	932	2.5				
Lot 5	Restaurant		2.5				
Lot 6	Restaurant		3.0				
Lot 9	Office	712	4.0				
Estimated Average Weekday Trip Ends					661	661	1,322
Estimated Weekday, AM Peak Hour of Adjacent Street Traffic One Hour Between 7:00 – 9:00 a.m. Trip Ends					67	43	110
Estimated Weekday, Midday Peak Hour of Adjacent Street Traffic One Hour Between 11:00 a.m. – 1:00 p.m. Trip Ends					69	70	139
Estimated Weekday, PM Peak Hour of Adjacent Street Traffic One Hour Between 4:00 – 6:00 p.m. Trip Ends					71	61	132
Phase 2 Development – Analysis Year 2034							
Lot 7	Coffee with Drive-Through	937	2.5	1,000 Square Feet of Gross Floor Area			
Lot 8	Retail	876	3.0				
Lot 10	Office	712	4.0				
Lot 11	Retail	876	3.0				
Estimated Average Weekday Trip Ends					980 *616 – Pass-By* *364 – Net New*	980 *616 – Pass-By* *364 – Net New*	1,960 *1,232 – Pass-By* *728 – Net New*
Estimated Weekday, AM Peak Hour of Adjacent Street Traffic One Hour Between 7:00 – 9:00 a.m. Trip Ends					119 *91 – Pass-By* *28 – Net New*	108 *87 – Pass-By* *21 – Net New*	227 *178 – Pass-By* *49 – Net New*
Estimated Weekday, Midday Peak Hour of Adjacent Street Traffic One Hour Between 11:00 a.m. – 1:00 p.m. Trip Ends					56 *27 – Pass-By* *29 – Net New*	62 *30 – Pass-By* *32 – Net New*	118 *57 – Pass-By* *61 – Net New*
Estimated Weekday, PM Peak Hour of Adjacent Street Traffic One Hour Between 4:00 – 6:00 p.m. Trip Ends					70 *40 – Pass-By* *30 – Net New*	71 *39 – Pass-By* *32 – Net New*	141 *79 – Pass-By* *62 – Net New*
Phase 1 & 2 Development Totals							
Estimated Average Weekday Trip Ends					1,641 *616 – Pass-By* *1,025 – Net New*	1,641 *616 – Pass-By* *1,025 – Net New*	3,282 *1,232 – Pass-By* *2,050 – Net New*
Estimated Weekday, AM Peak Hour of Adjacent Street Traffic One Hour Between 7:00 – 9:00 a.m. Trip Ends					186 *91 – Pass-By* *95 – Net New*	151 *87 – Pass-By* *64 – Net New*	337 *178 – Pass-By* *159 – Net New*
Estimated Weekday, Midday Peak Hour of Adjacent Street Traffic One Hour Between 11:00 a.m. – 1:00 p.m. Trip Ends					125 *27 – Pass-By* *98 – Net New*	132 *30 – Pass-By* *102 – Net New*	257 *57 – Pass-By* *200 – Net New*
Estimated Weekday, PM Peak Hour of Adjacent Street Traffic One Hour Between 4:00 – 6:00 p.m. Trip Ends					141 *40 – Pass-By* *101 – Net New*	132 *39 – Pass-By* *93 – Net New*	273 *79 – Pass-By* *194 – Net New*

Traffic Assignment

The assignment of development traffic provides the necessary information to determine the level of site related impacts to the area roadway system and intersections. It involves determining the volume of traffic and its movements within the transportation system. At a minimum, trip assignment must also consider route choice, how the existing transportation system functions, and travel times to and from the development. The resulting traffic assignment within the study area for the Copper Square Subdivision is shown in the following figures and on the noted pages:

- Figure 4: Estimated Subdivision Phase 1 Traffic Assignment | Nodes 1, 2, 3, & 4 Plus Estimated Average Weekday Traffic Volumes – *Page 19*
- Figure 5: Estimated Subdivision Phase 1 Traffic Assignment | Nodes A, D, & E Plus Estimated Average Weekday Traffic Volumes – *Page 20*
- Figure 6: Estimated Subdivision Phase 2 Traffic Assignment | Nodes 1, 2, 3, & 4 Plus Estimated Average Weekday Traffic Volumes – *Page 21*
- Figure 7: Estimated Subdivision Phase 2 Traffic Assignment | Nodes A, B, & C Plus Estimated Average Weekday Traffic Volumes – *Page 22*
- Figure 8: Estimated Phases 1 & 2 Traffic Assignment | Nodes 1, 2, 3, & 4 Plus Estimated Average Weekday Traffic Volumes – *Page 23*
- Figure 9: Estimated Phases 1 & 2 Traffic Assignment | Nodes A, B, C, D, & E Plus Estimated Average Weekday Traffic Volumes – *Page 24*

Pedestrians & Bicyclists

It is anticipated that sidewalk improvements will be included as development progresses to provide non-motorized user connectivity within Copper Square Subdivision.

Transit Service

No specific transit-oriented improvements are presently included with the project.

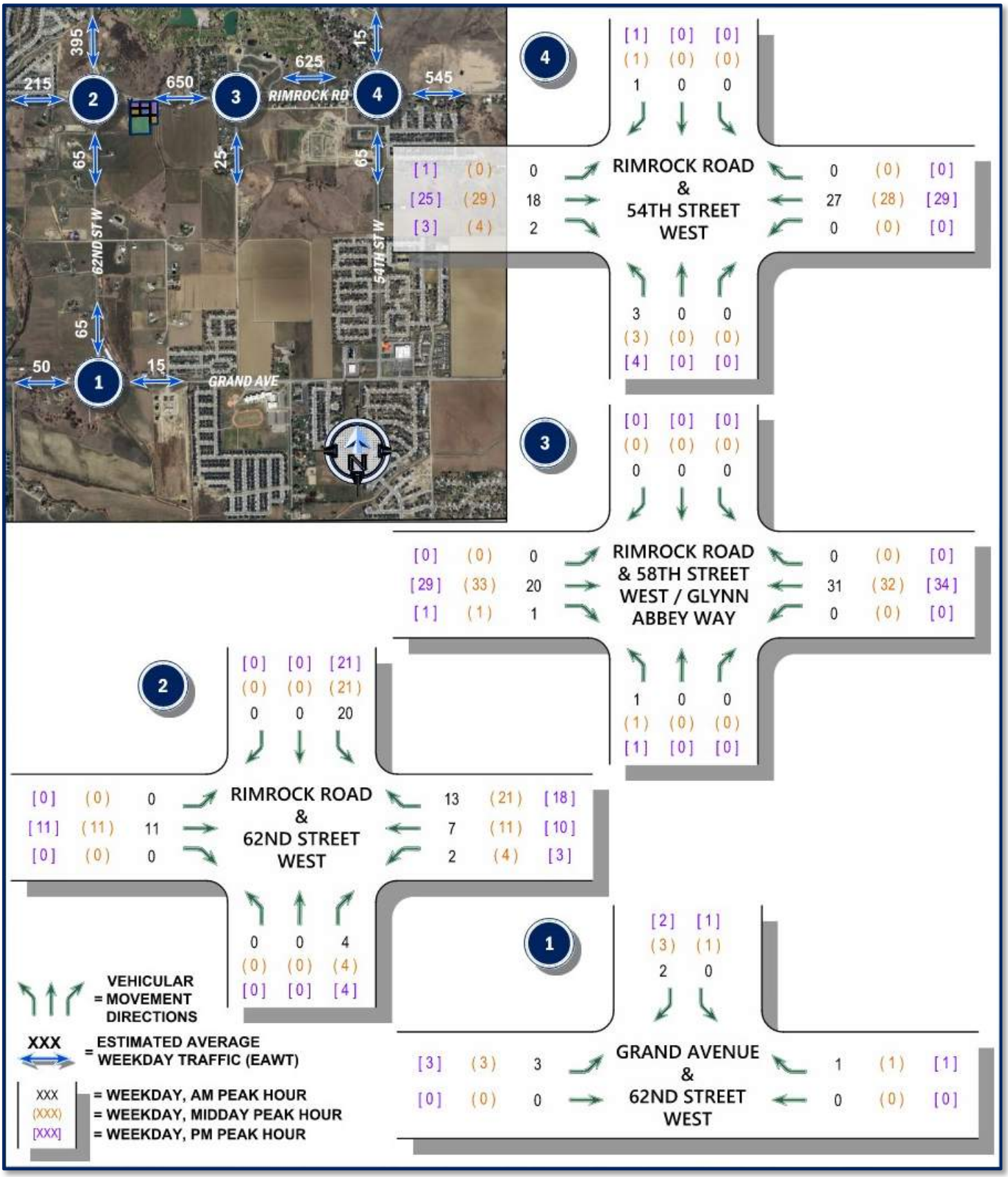


Figure 4: Estimated Subdivision Phase 1 Traffic Assignment | Nodes 1, 2, 3, & 4 Plus Estimated Average Weekday Traffic Volumes

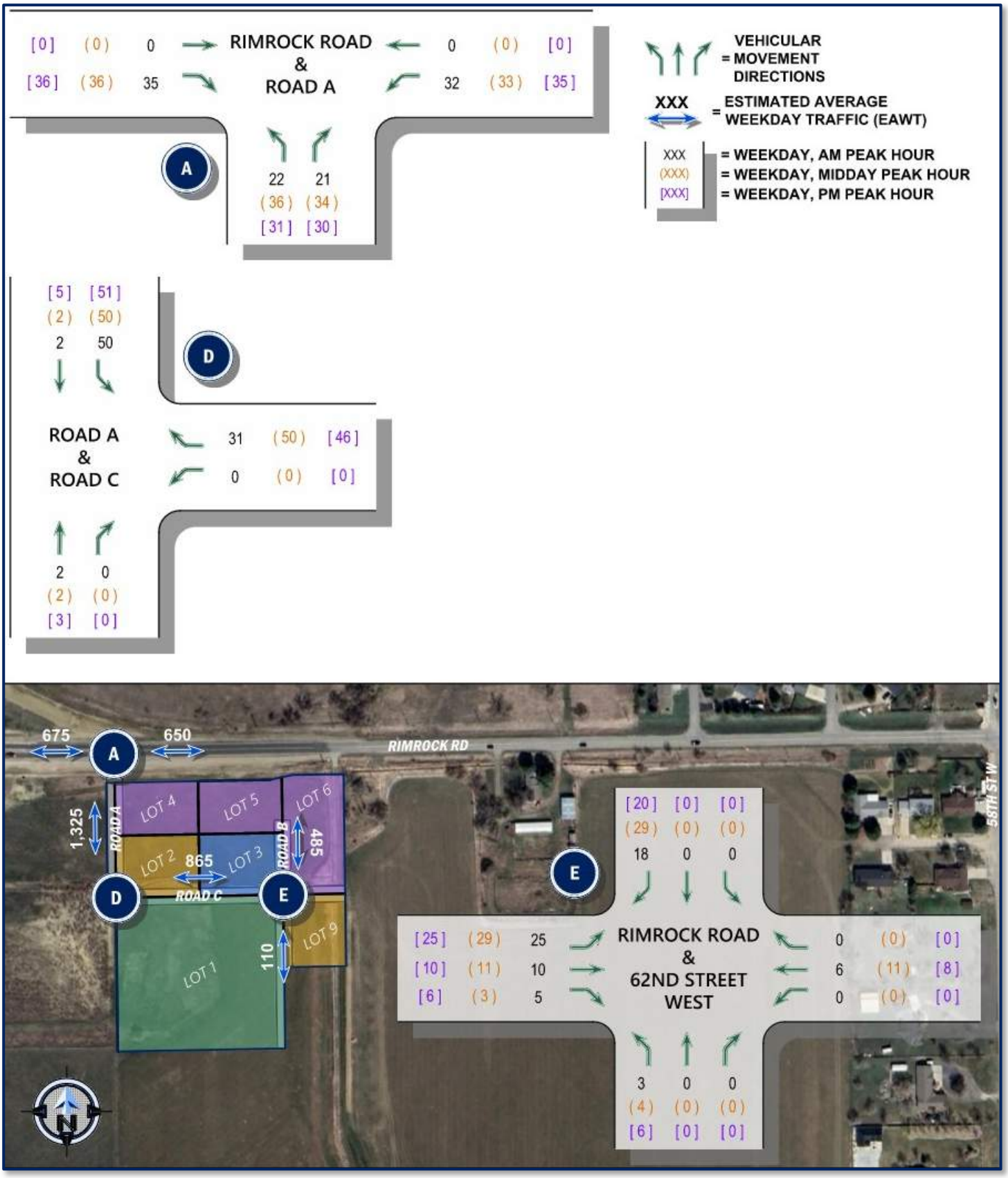


Figure 5: Estimated Subdivision Phase 1 Traffic Assignment | Nodes A, D, & E Plus Estimated Average Weekday Traffic Volumes

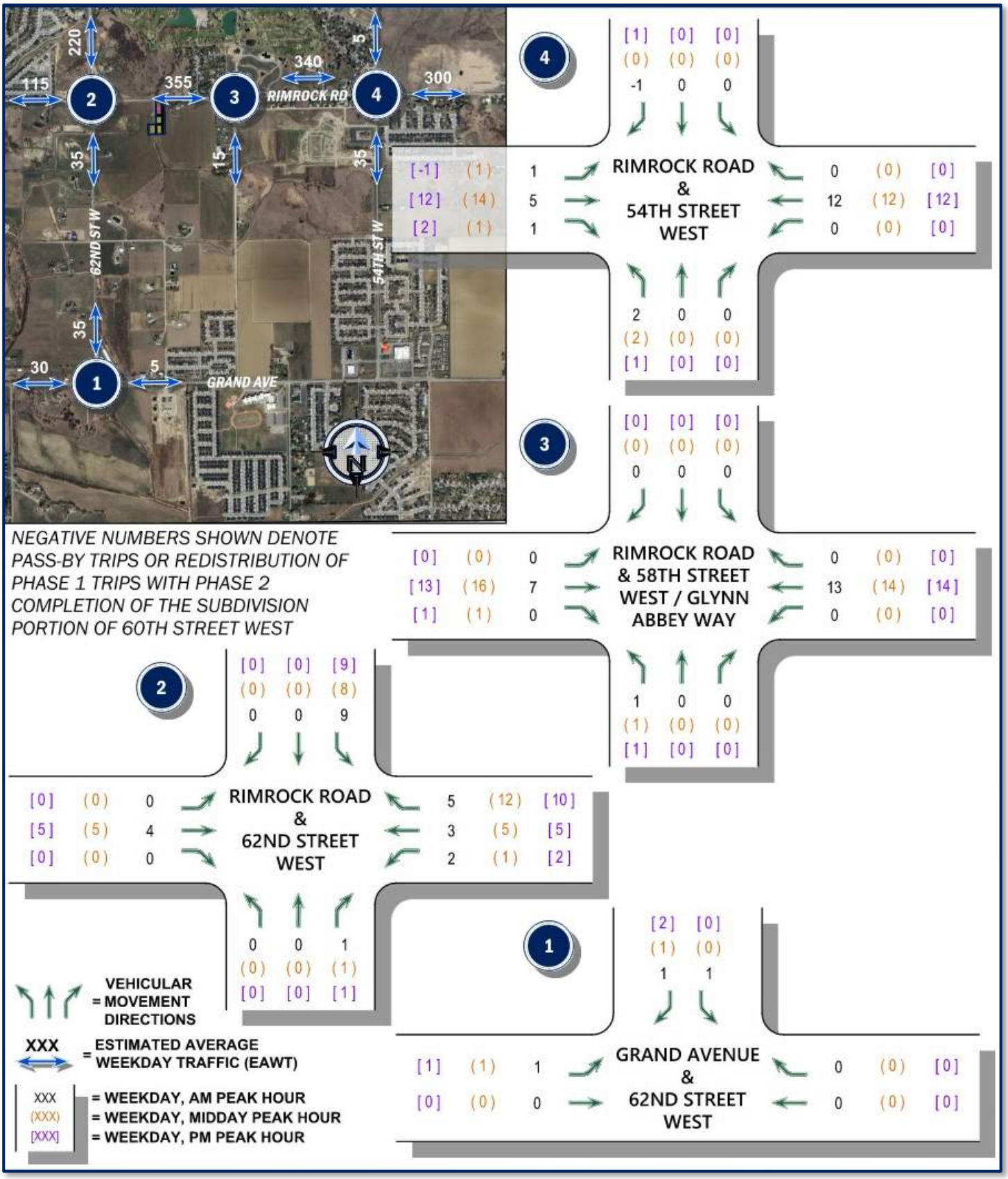


Figure 6: Estimated Subdivision Phase 2 Traffic Assignment | Nodes 1, 2, 3, & 4 Plus Estimated Average Weekday Traffic Volumes

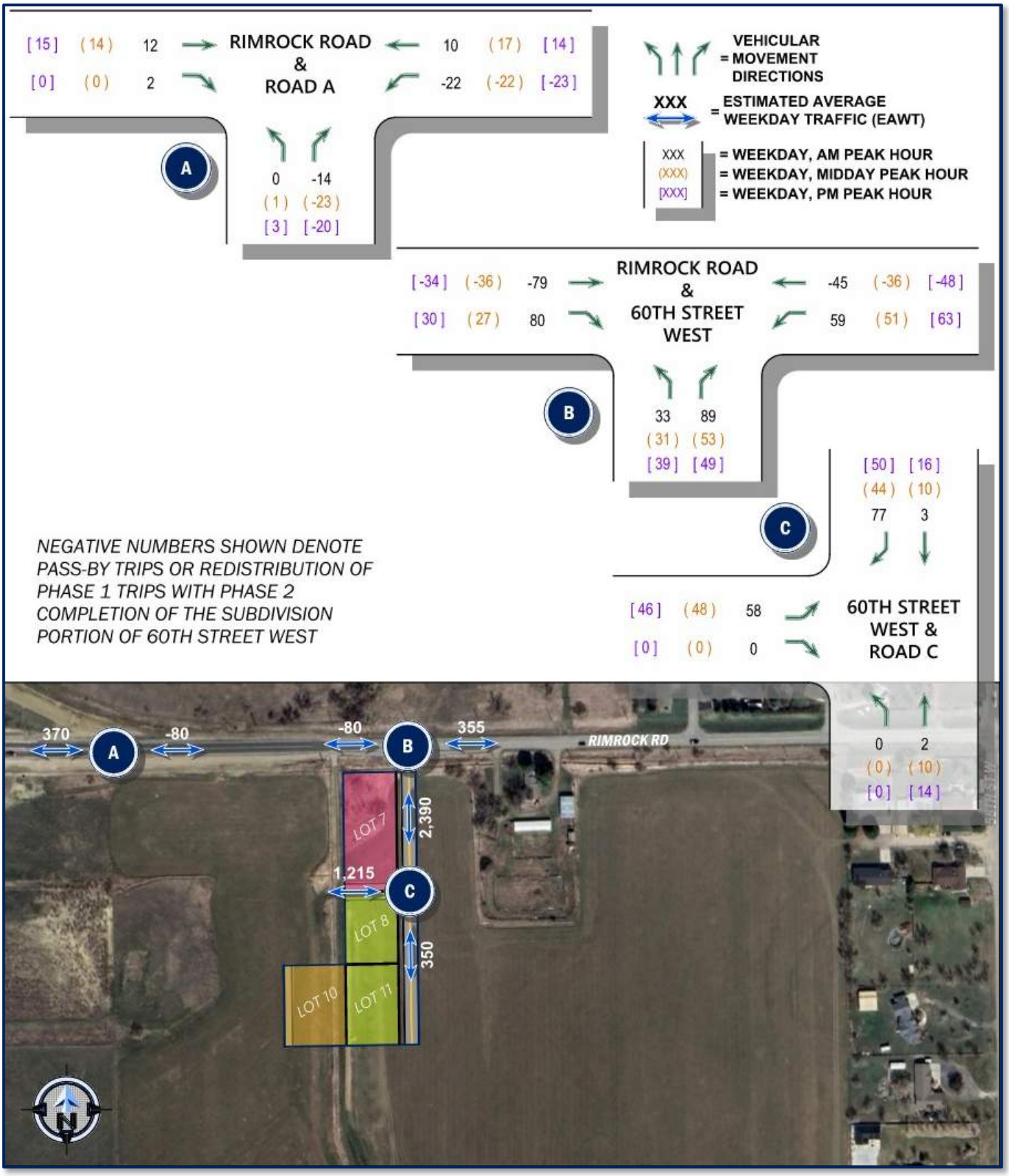


Figure 7: Estimated Subdivision Phase 2 Traffic Assignment | Nodes A, B, & C Plus Estimated Average Weekday Traffic Volumes

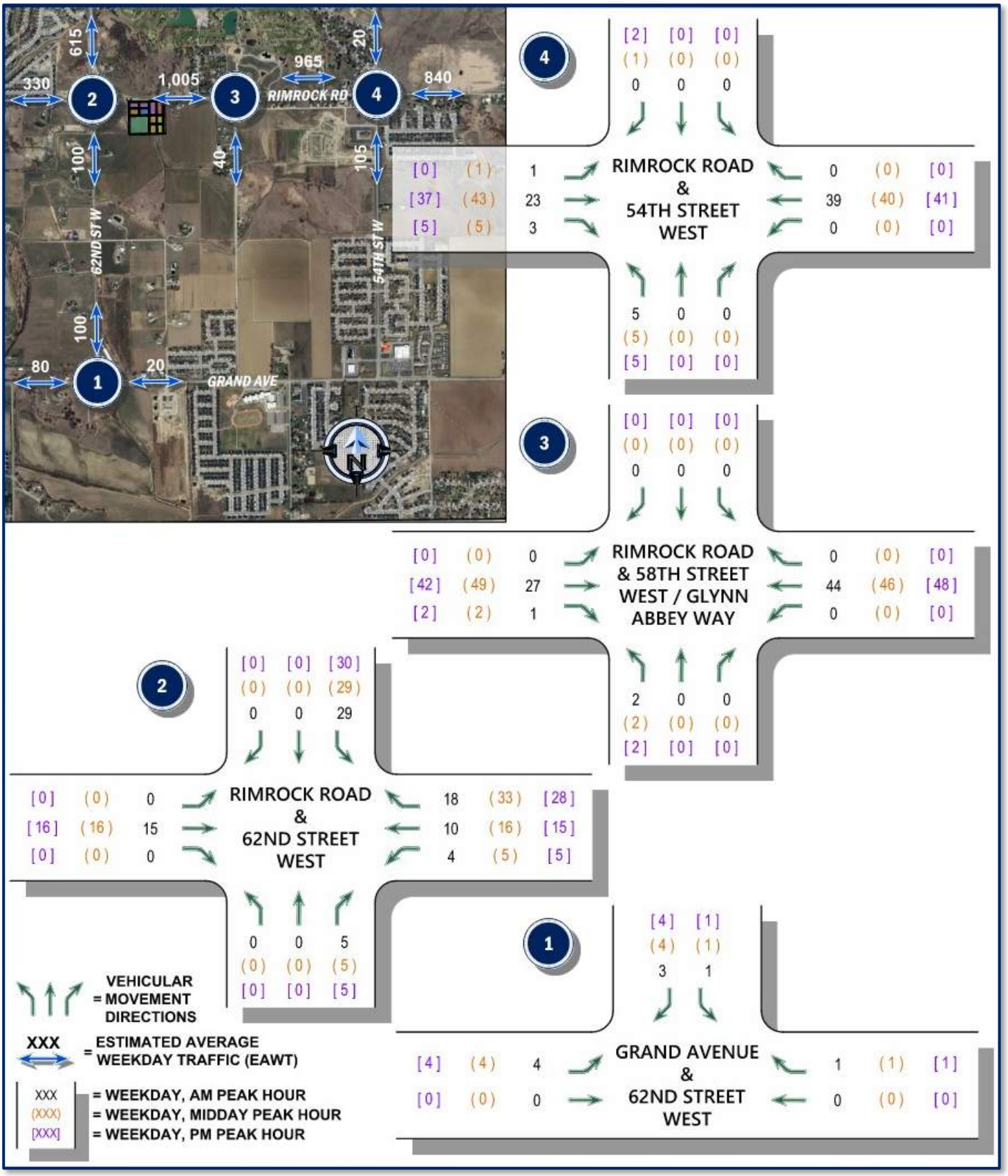


Figure 8: Estimated Phases 1 & 2 Traffic Assignment | Nodes 1, 2, 3, & 4 Plus Estimated Average Weekday Traffic Volumes

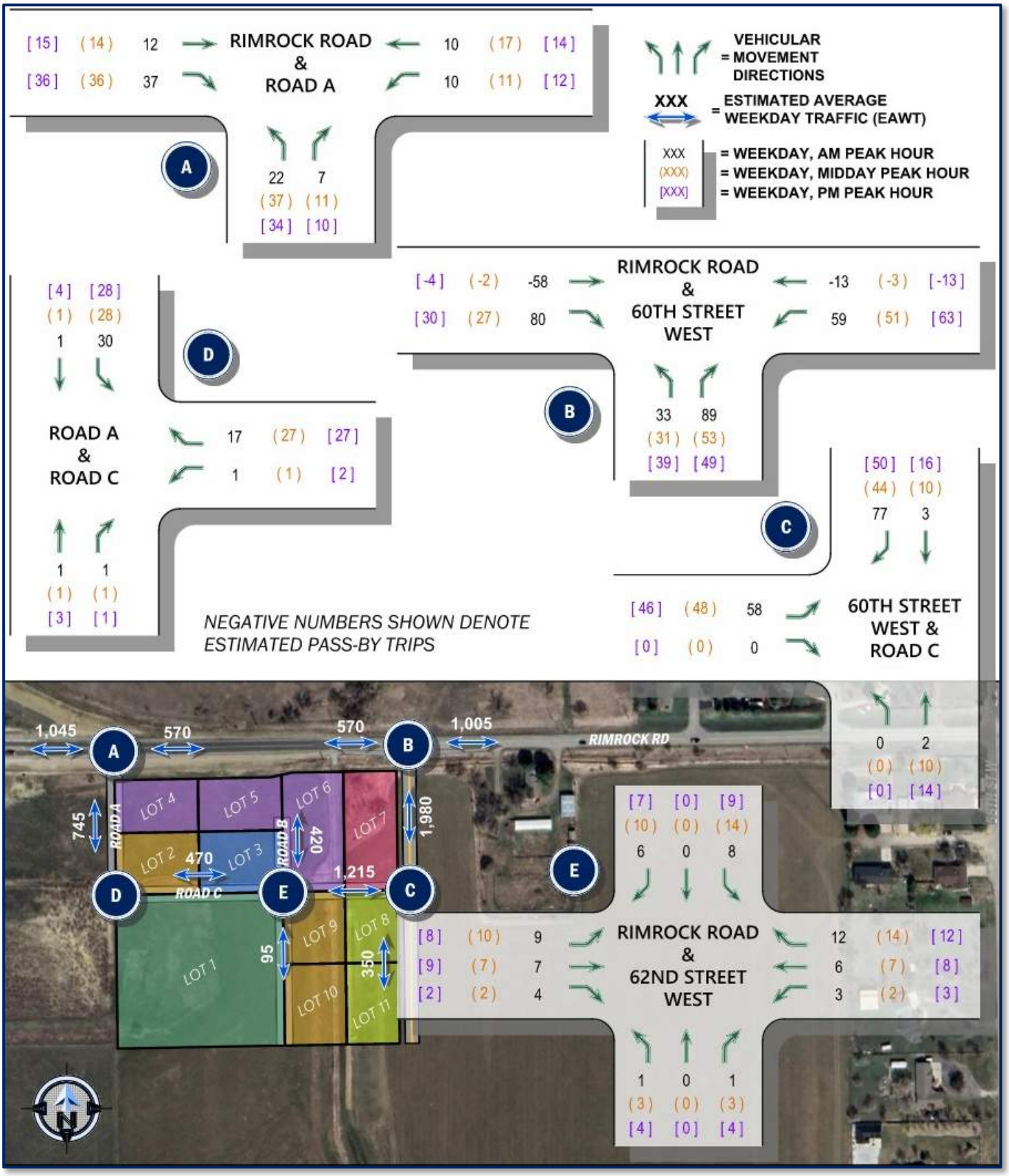


Figure 9: Estimated Phases 1 & 2 Traffic Assignment | Nodes A, B, C, D, & E Plus Estimated Average Weekday Traffic Volumes

Existing Conditions

Study Area Land Use

As noted previously, the proposed Copper Square Subdivision is to be located on Lot 7 of Sunny Cove Fruit Farms (less right-of-way) in Billings, Yellowstone County, Montana. The project is bounded by Rimrock Road to the north, the future 60th Street West to the east, and currently vacant agricultural properties to the west and south. Other properties in the immediate area are primarily residential with some agricultural properties as can be seen in the aerial imagery shown in Figure 2 on page 12.

Transportation Network

Some of the key characteristics of the existing roadways and intersections within the study area are listed in the sections that follow and are provided in Table 2 on the following page. All study area roadways are under the jurisdiction of the City of Billings except the intersection of Grand Avenue and 62nd Street West, which is under Yellowstone County jurisdiction.

Study Roadway

Rimrock Road

Existing Study Area Roadway Corridor

Rimrock Road (U-1034A, C000302A) is functionally classified as a principal arterial as noted in the *2023 Billings Urban Area Long Range Transportation Plan* (LRTP) prepared by Kittelson & Associates, Inc. and DOWL for the Billings – Yellowstone County Metropolitan Planning Organization (MPO) dated July 2023. The roadway is also designated as an urban route by the Montana Department of Transportation (MDT). Presently, the roadway runs east-west between 70th Street West and North 27th Street. Land uses along Rimrock Road are primarily residential with some limited assisted / senior living, church, commercial, school, college, and university uses along the corridor. The posted speed limit adjacent to the proposed Copper Square Subdivision is 55 miles per hour (55 mph). Per MDT data, the paved surface width adjacent to the proposed development is approximately 24 feet, inclusive of single travel lanes in each direction.

Future Study Area Roadway Corridor

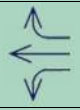
The City of Billings has a committed project to widen Rimrock Road from 54th Street West to 62nd Street West to a full arterial standard while also following its adopted complete streets policy with the goals of replacing deteriorating pavement, increasing safety on the existing narrow two-lane facility, and installing multimodal facilities. The currently committed project is included in the Fiscal Year 2026 budget with an estimated cost of $10,350,000. It is anticipated that this project will be completed within the analysis horizon years evaluated as a part of this study.

Study Intersections

The existing intersections that were the primary focus and evaluated as a part of this study include the following:

- 1 | Grand Avenue & 62nd Street West
- 2 | Rimrock Road & 62nd Street West / Molt Road
- 3 | Rimrock Road & 58th Street West / Glynn Abbey Way
- 4 | Rimrock Road & 54th Street West

Table 5: Study Area Intersections Existing Characteristics

Intersection						Pedestrian Accommodations	
ID	Roadways	Traffic Control	Approach	Lane Configuration	Bike Lane	Crossing	Marked Crosswalk
1	Grand Avenue & 62nd Street West	STOP 1-Way *(SB)*	EB				
			WB				
			SB				
2	Rimrock Road & 62nd Street West / Molt Road		EB				
			WB				
			NB				
			SB				
3	Rimrock Road & 58th Street West / Glynn Abbey Way	STOP 2-Way *(NB & SB)*	EB				
			WB				
			NB				
			SB *Gated Access*				
4	Rimrock Road & 54th Street West		EB				✓
			WB				✓
			NB				✓
			SB				✓

EB = Eastbound; WB = Westbound; NB = Northbound; and SB = Southbound; WB = Westbound.

Alternative Modes of Transportation

Pedestrians & Bicyclists

Sidewalks are not available for pedestrians along Rimrock Road between 62nd Street West and 54th Street West within the study area. Bike lanes are not presently available within this roadway segment either. The recently completed roundabout at the intersection of Rimrock Road and 62nd Street West included concrete sidewalk / pathway improvements at the intersection for connection to future sidewalk / pathway installations in the future. At the intersection of Rimrock Road and 54th Street West, sidewalks are currently available on the west side of 54th Street West north of the intersection and on the east side of 54th Street West south of the intersection. There are also asphalt shared-use pathways on the north side of Rimrock Road east of the intersection and the west side of 54th Street West on the west side of the roadway.

Transit Service

The City of Billings Metropolitan Transit System (MET Transit) currently provides service in Billings that includes 13 fixed bus routes and Americans with Disabilities Act (ADA) complementary paratransit service (MET Plus), as stated on MET Transit's website that additionally notes, "MET Transit has a current fleet of 40 vehicles – 25 vehicles are used on the MET fixed-route service, and 15 vehicles are used on the MET Plus paratransit service." There are not currently any existing routes along Rimrock Road adjacent to the proposed Copper Square Subdivision.

Traffic Volumes

Current vehicle, pedestrian, and bicycle counts were utilized for the study area intersections based on averages taken for three weekdays at each location on September 30 plus October 1 and 2, 2025 (Tuesday, Wednesday, and Thursday). The intersection of Grand Avenue and 62nd Street West were conducted for a 14-hour period between 6:00 a.m. and 8:00 p.m. The remaining intersection counts were completed for three 2-hour periods – between 7:00 and 9:00 a.m. (AM peak period), 11:00 a.m. and 1:00 p.m. (midday peak period), and 4:00 and 6:00 p.m. (PM peak period). The count data were adjusted to account for seasonal or daily variations that may occur throughout the year from when the counts were taken. Seasonal and daily adjustment factors available through the City of Billings were utilized with the average count data. Summaries of the count data are shown in Figure 10 on page 28. The count data are also provided in Appendix B.

Safety

Traffic safety conditions were documented by reviewing the crash history of the study area intersections using data provided from the MDT crash database. Public crash information for the period 2020 through 2024, the most recent five years available, was reviewed. MDT reported 36 crashes at or within the vicinity of the study area intersections over the five-year period. The reported crashes and the crash experience rates are summarized in Table 6 and Table 7 on page 29. Limited data is available through the public crash information provided by MDT. Additional crash information such as type; weather, roadway, and lighting conditions; number of vehicles, pedestrian, or bicyclist involvement; age and gender of drivers; and other potentially contributing conditions can be obtained through a review of the specific crash reports.

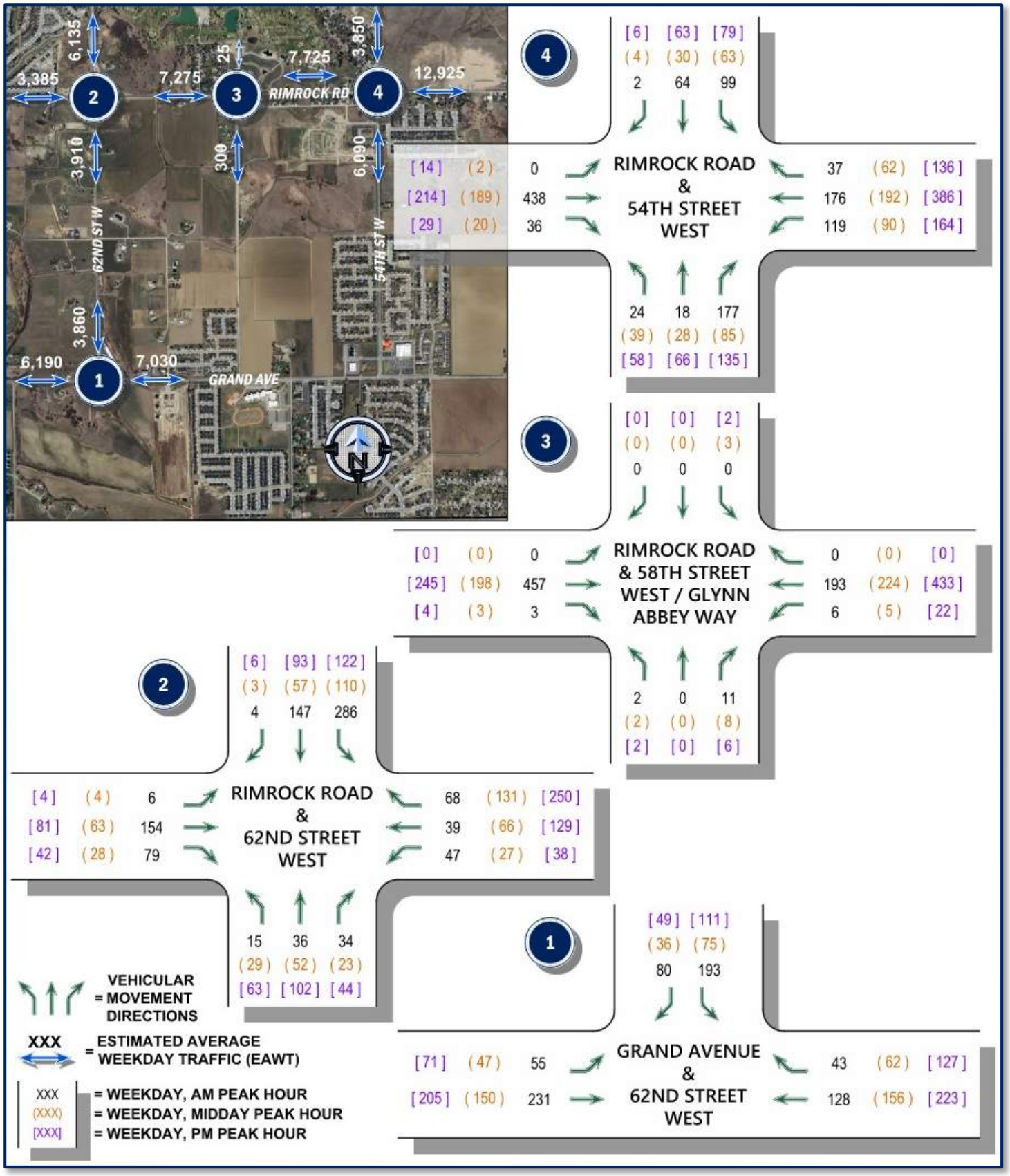


Figure 10: 2025 Existing Traffic Volumes | Nodes 1, 2, 3, 4 Plus Estimated Average Weekday Traffic Volumes

Table 6: 2020 – 2024 Study Area Intersections Reported Crash Experience Summary

Intersection		Reported Crashes						
		2020	2021	2022	2023	2024	5-Year Total	5-Year Average
1	Grand Avenue & 62nd Street West	3	0	1	5	1	10	2.00
2	Rimrock Road & 62nd Street West	1	1	1	6	4	13	2.60
3	Rimrock Road & 58th Street West / Glynn Abbey Way	1	0	1	1	0	3	0.60
4	Rimrock Road & 54th Street West	1	3	2	2	2	10	2.00
Study Area Totals		6	4	5	14	7	36	7.20

Table 7: Study Area Intersections Reported Crash Experience Rate Summary

Intersection		Seasonally Adjusted 2025 Estimated Average Weekday Traffic Entering Intersection	Reported 5-Year Average Crash Involvement Rate for Intersection *Per Million Entering Vehicles (MEV)*
1	Grand Avenue & 62nd Street West	8,540	0.64
2	Rimrock Road & 62nd Street West *Prior to Roundabout Installation*	10,295	0.69
3	Rimrock Road & 58th Street West	7,655	0.21
4	Rimrock Road & 54th Street West	15,365	0.36

Projected Traffic

Through Traffic Projections

An estimate of non-site related traffic growth is necessary to reflect potential impacts more accurately from the proposed Copper Square Subdivision in the study area through the year 2034. Three primary means are typically used to estimate growth of non-site generated traffic (background traffic growth) – the use of transportation plans or models and the build-up or growth rate methods. This study utilized a combination of the build-up and the growth rate methods. The build-up method considers background traffic growth due to approved or anticipated to be approved developments in the study area. The growth rate method involves evaluating the historic traffic growth rates within a study area, assuming that those trends will remain approximately the same and continue in the future.

Background Development

Other known developments in the study area that are in various stages of development or review processes within the evaluated 2034 analysis period of this study include the following:

- Buffalo Crossing Development
  Data Source: *Buffalo Crossing Development Traffic Impact Study* prepared by Sanderson Stewart (March 2022).
- Fifty-Four West Subdivision
  Data Source: *Traffic Impact Study – Fifty-Four West Subdivision* prepared by KLJ (March 2023).
- Sweetgrass Development
  Data Source: *Sweetgrass Development Traffic Impact Study* prepared by Sanderson Stewart (February 2022).
- The Trestles Subdivision
  Data Source: *The Trestles Subdivision Traffic Impact Study* prepared by Sanbell (June 2025).
- Glynn Abbey Subdivision
  Data Source: Trip generation, distribution, and assignment estimate prepared by E5 Engineering, PLLC with this study.

Buffalo Crossing, Sweetgrass, Glynn Abbey, and portions of Fifty-Four West and The Trestles developments are anticipated to be completed by 2030. The remaining portions of Fifty-Four West and The Trestles are anticipated to be completed by the 2034 analysis horizon. Traffic growth within the study area from these developments is represented through available data from the above noted traffic impact studies plus time-of-day traffic distributions for the appropriate land uses included with the ITE *Trip Generation Manual*. The resulting build-up traffic within the study area for these known developments is shown in the following figures and on the noted pages:

- Figure 11: Estimated 2030 Background Development Build-Up Traffic Volumes – *Page 31*
- Figure 12: Estimated 2034 Background Development Build-Up Traffic Volumes – *Page 32*

Growth Rate Projections

Estimated growth rate generated traffic volumes were projected for the 2030 and 2034 analysis years by applying an average annual growth rate (AAGR) to the 2025 traffic volumes. It is important to note that the AAGR generated traffic volumes are intended to represent traffic growth from outside the study area, excluding the known background developments as well as the proposed Copper Square Subdivision. Historical traffic growth trends in the area were evaluated to develop estimates for AAGR values based on available average annual daily traffic (AADT) from MDT. Assumed values were utilized for forecast traffic growth on 58th Street West. The AAGRs utilized as a part of this study are summarized Table 8 below and the analyses are provided in Appendix D.

Table 8: Estimated Average Annual Growth Rates

Roadway	Segment	Roadway Segment AAGR
Grand Avenue	East and West of 62nd Street West	0.60%
62nd Street West	Grand Avenue to Colton Boulevard	1.10%
62nd Street West	Colton Boulevard to North of Rimrock Road	0.60%
Rimrock Road	West of 62nd Street West to East of 54th Street West	0.60%
58th Street West	South of Rimrock Road	3.70%
54th Street West	North of Rimrock Road	1.50%
54th Street West	South of Rimrock Road	3.70%

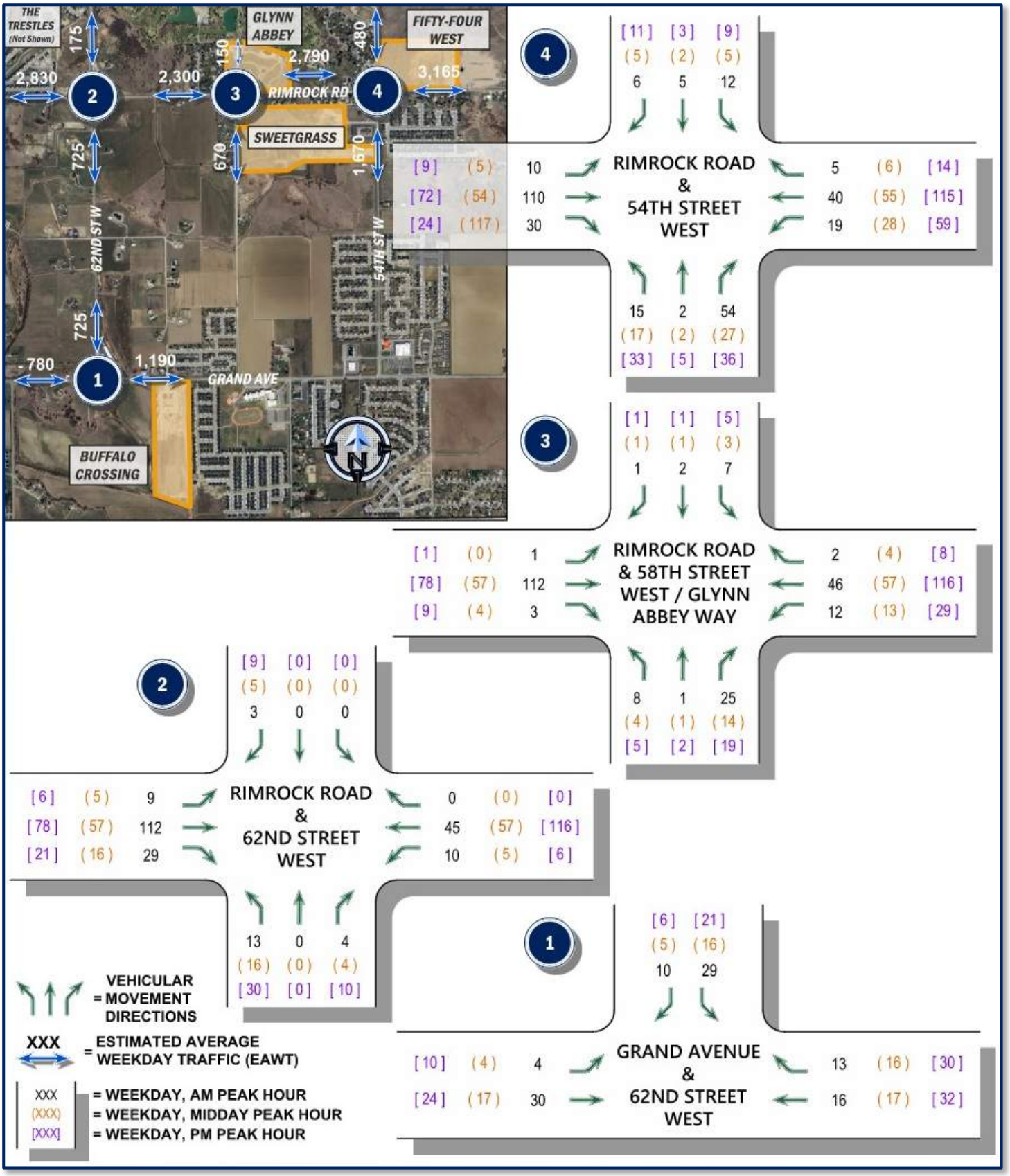


Figure 11: Estimated 2030 Background Development Build-Up Traffic Volumes

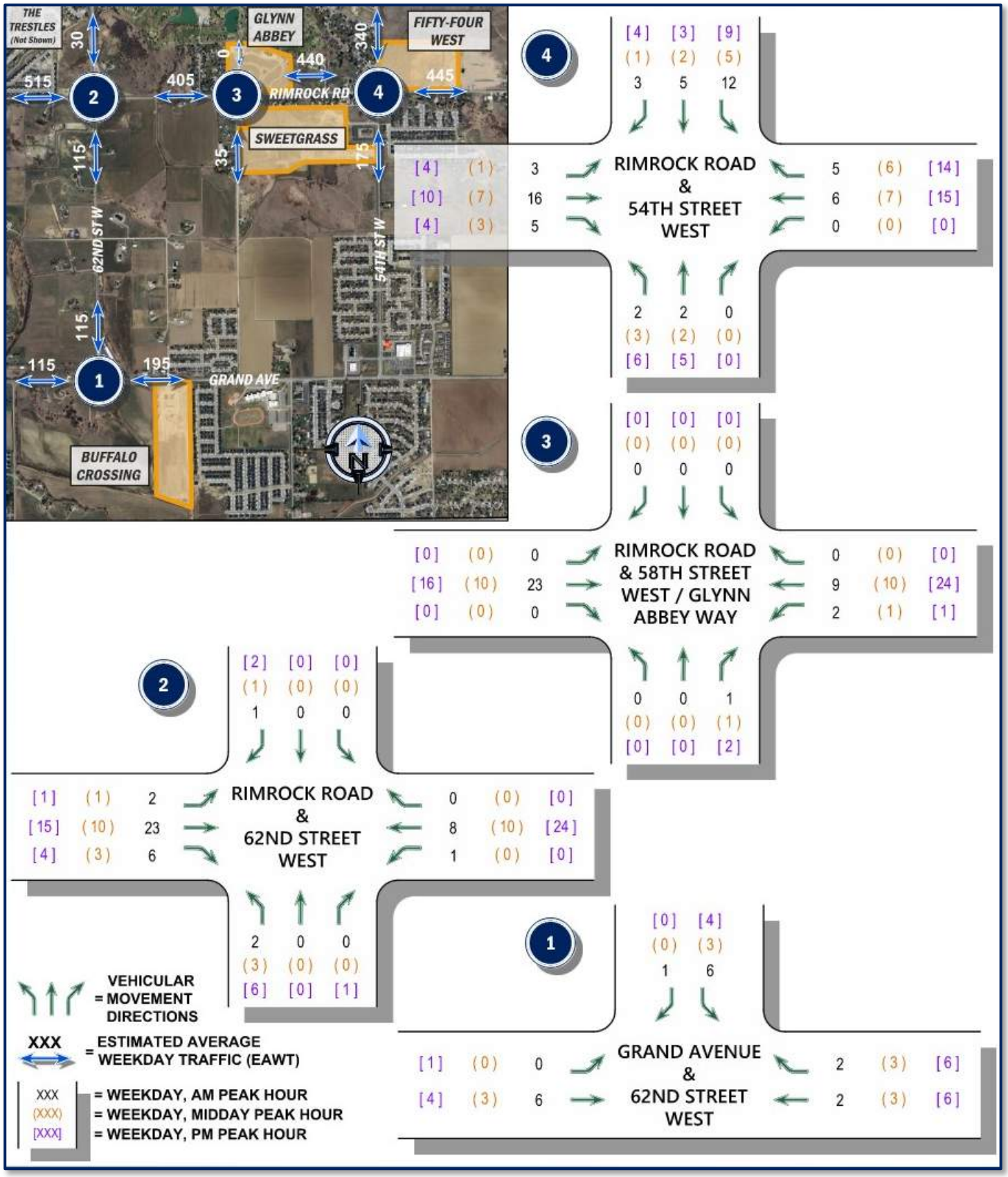


Figure 12: Estimated 2034 Background Development Build-Up Traffic Volumes

Projected Growth Rate Traffic Volumes

The estimated 2030 and 2034 growth rate generated volumes within the study area that have been used in the analyses are shown in the following figures and on the noted pages:

- Figure 13: Estimated 2025 – 2030 AAGR Generated Traffic Volumes – *Page 34*
- Figure 14: Estimated 2030 – 2034 AAGR Generated Traffic Volumes – *Page 35*

Projected Through Traffic Volumes

The estimated background traffic derived from build-up and AAGR volumes within the study area that have been used in the analyses are shown in the following figures and on the noted pages:

- Figure 15: Estimated 2030 Background Traffic Volumes – *Page 36*

  Consists of 2025 current daily traffic combined with estimated 2030 build-up and AAGR volumes.

- Figure 16: Estimated 2034 Background Traffic Volumes – *Page 37*

  Consists of 2030 total traffic, including Phase 1 of the proposed Copper Square Subdivision, combined with estimated 2034 build-up and AAGR volumes.

Total Traffic Projections

Estimated 2030 and 2034 total traffic volumes include the combination of background traffic volumes with those projected for the proposed Copper Square Subdivision, Phases 1 and 2, respectively that are shown in the following figures and on the noted pages:

- Figure 17: Estimated 2030 Total Traffic | Nodes 1, 2, 3, & 4 Plus Estimated Average Weekday Traffic Volumes – *Page 38*
- Figure 18: Estimated 2030 Total Traffic | Nodes A, D, & E Plus Estimated Average Weekday Traffic Volumes – *Page 39*
- Figure 19: Estimated 2034 Total Traffic | Nodes 1, 2, 3, & 4 Plus Estimated Average Weekday Traffic Volumes – *Page 40*
- Figure 20: Estimated 2034 Total Traffic | Nodes A, B, C, D, & E Plus Estimated Average Weekday Traffic Volumes – *Page 41*

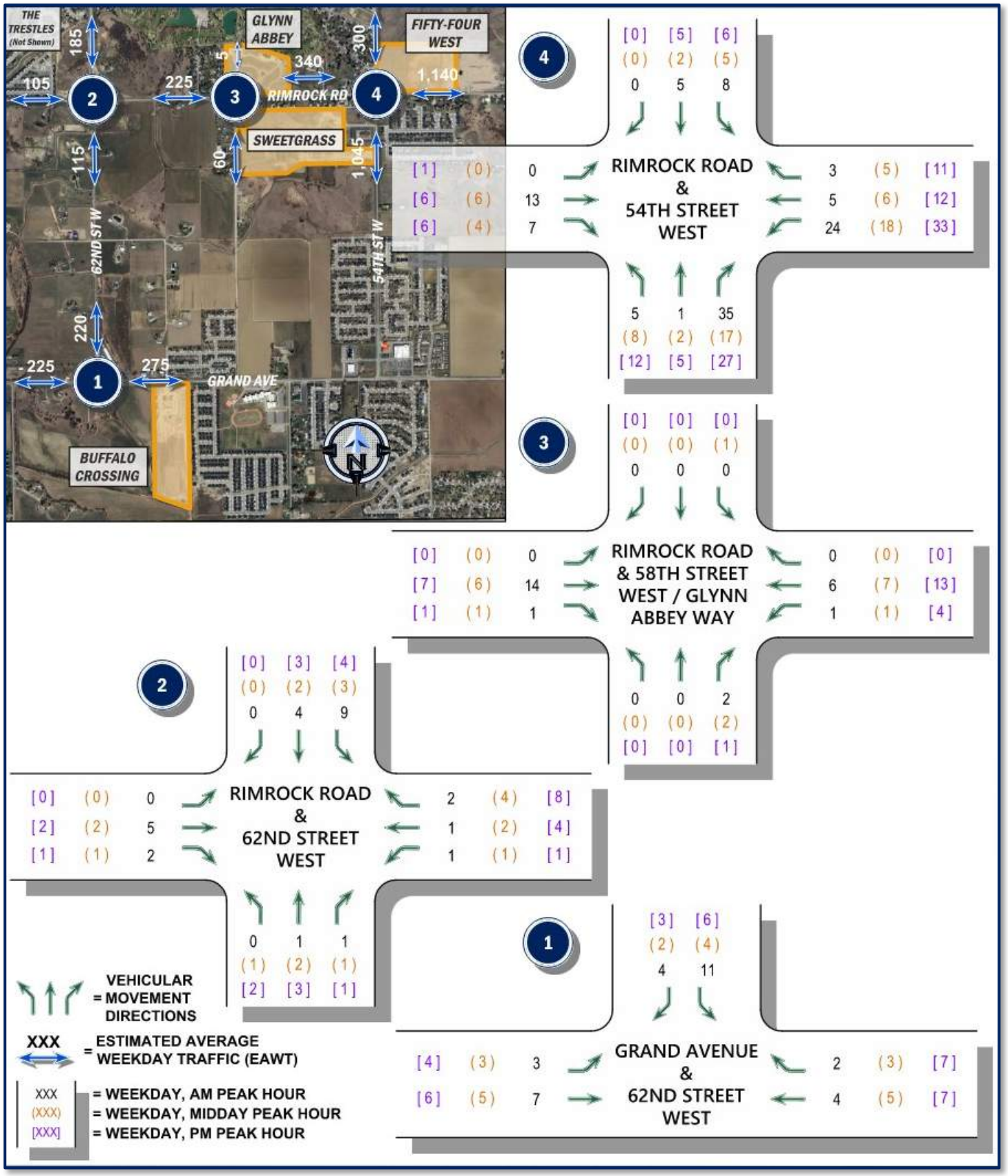


Figure 13: Estimated 2025 – 2030 AAGR Generated Traffic Volumes

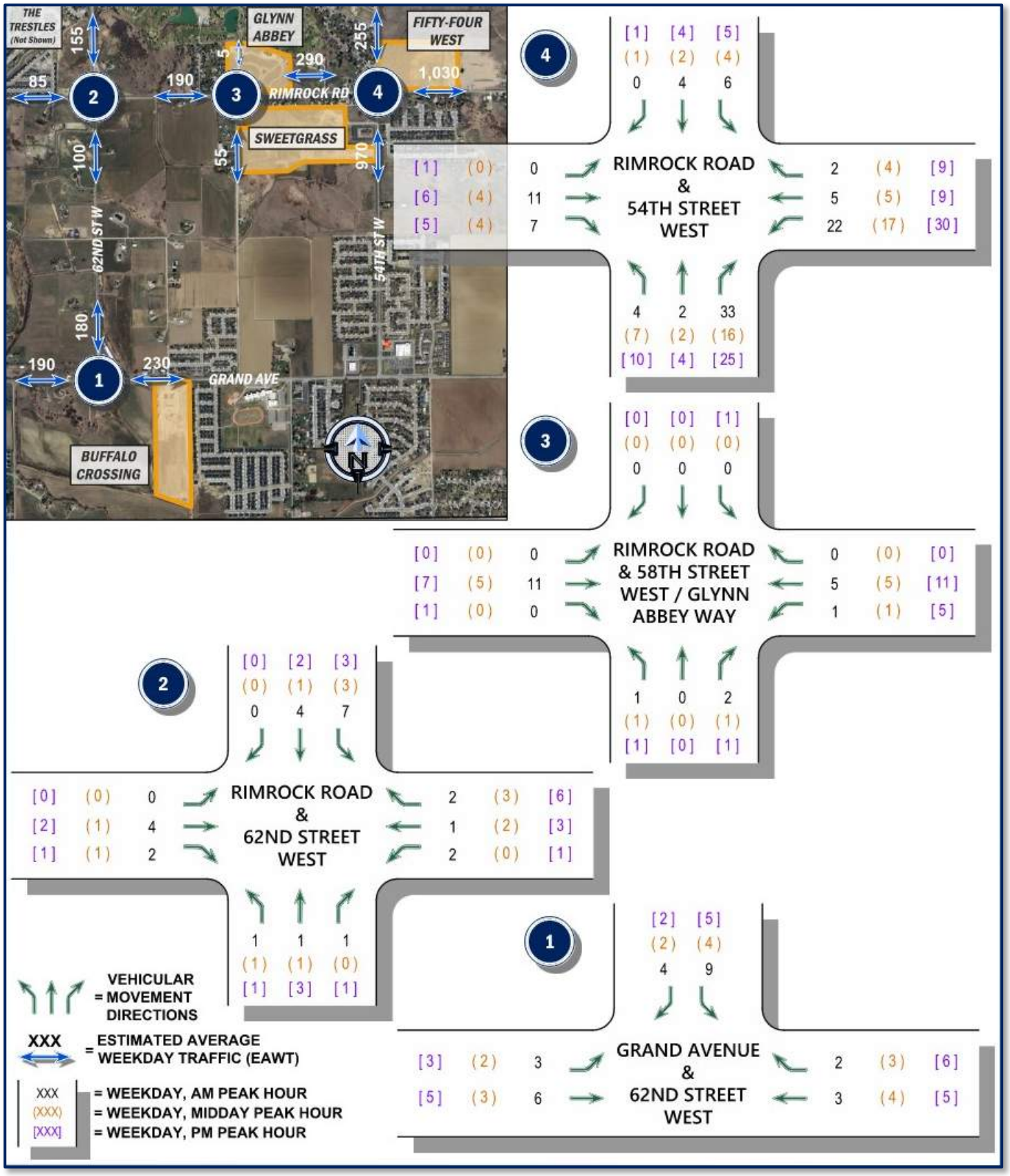


Figure 14: Estimated 2030 – 2034 AAGR Generated Traffic Volumes

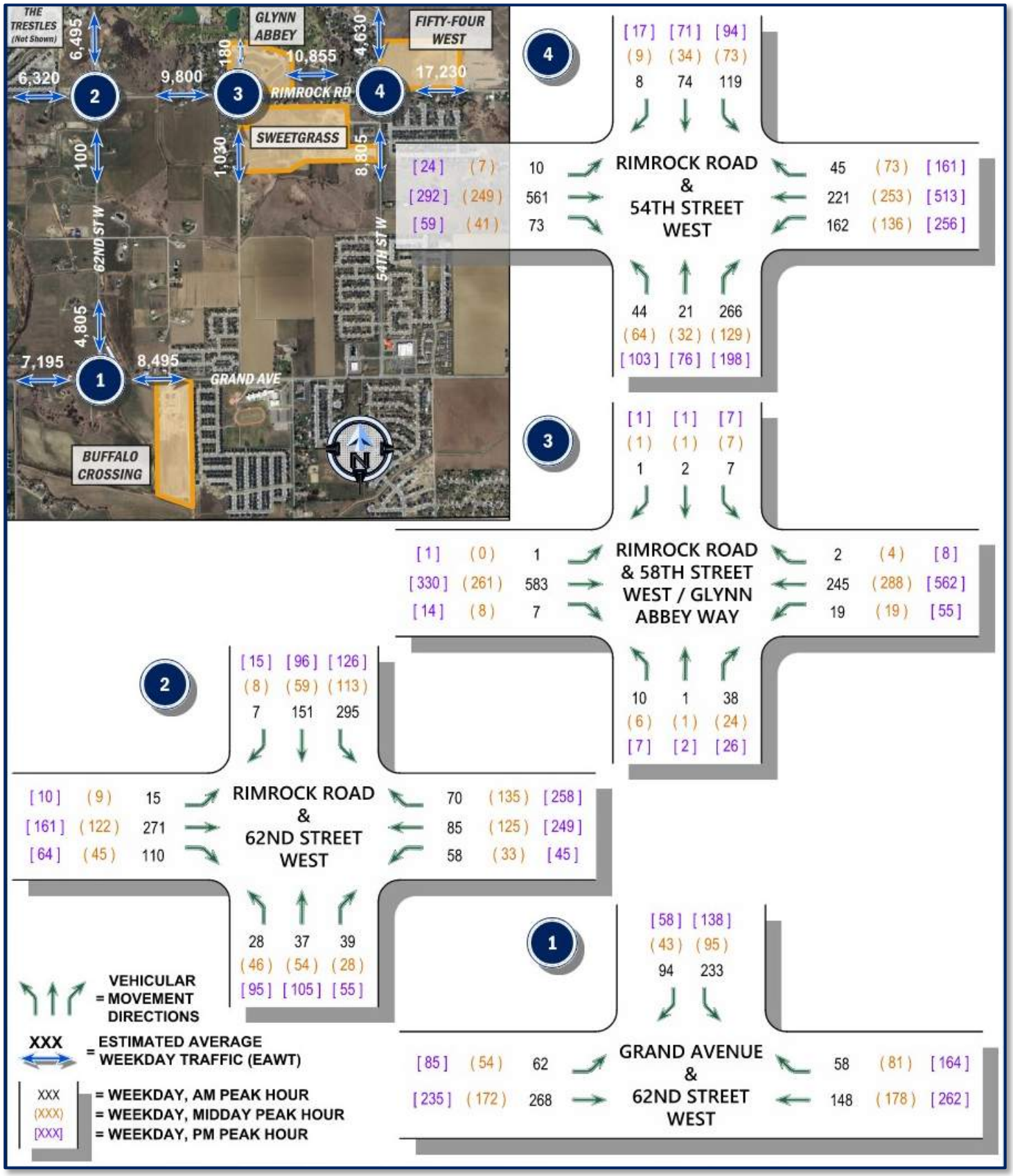


Figure 15: Estimated 2030 Background Traffic Volumes

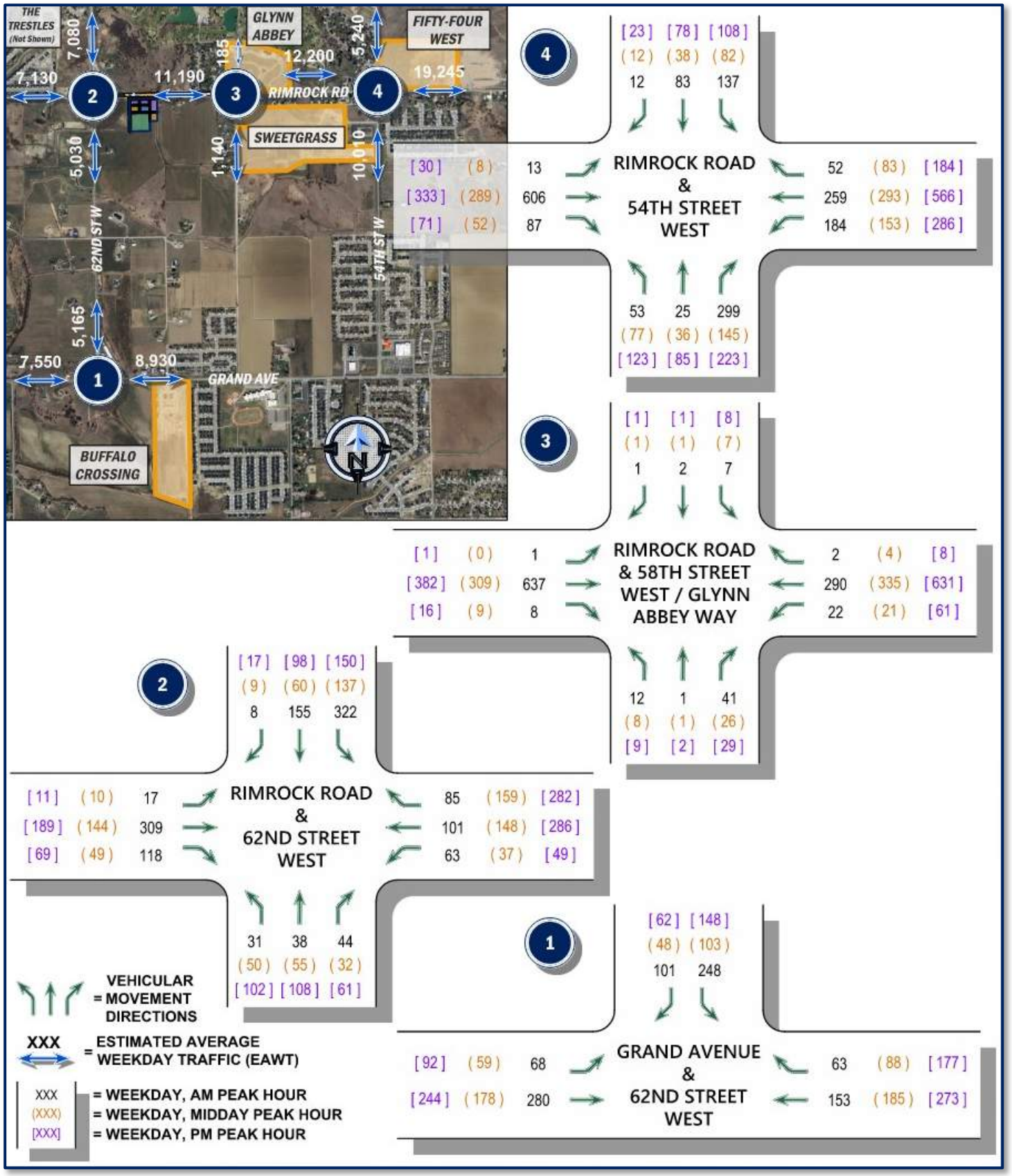


Figure 16: Estimated 2034 Background Traffic Volumes

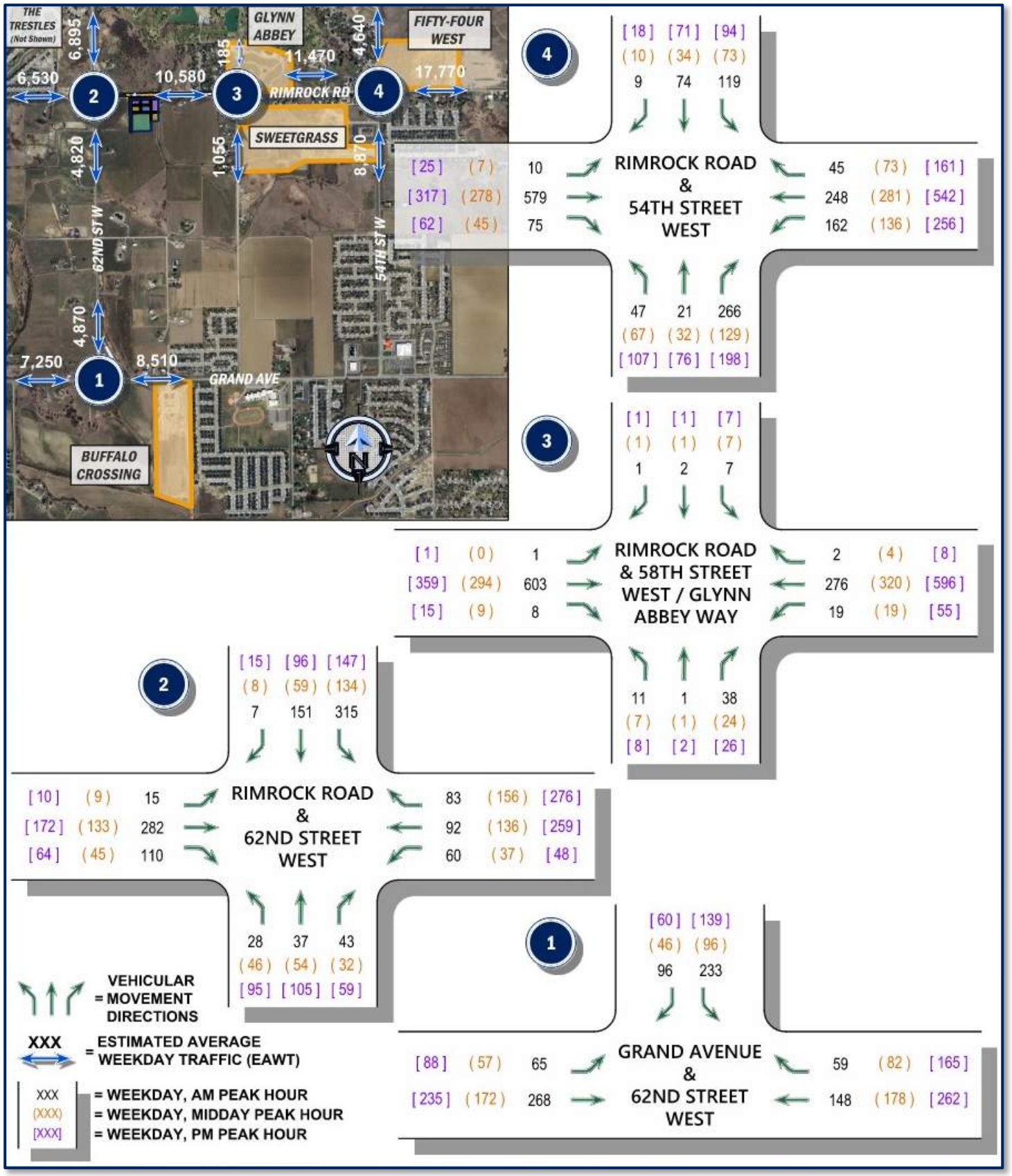


Figure 17: Estimated 2030 Total Traffic | Nodes 1, 2, 3, & 4 Plus Estimated Average Weekday Traffic Volumes

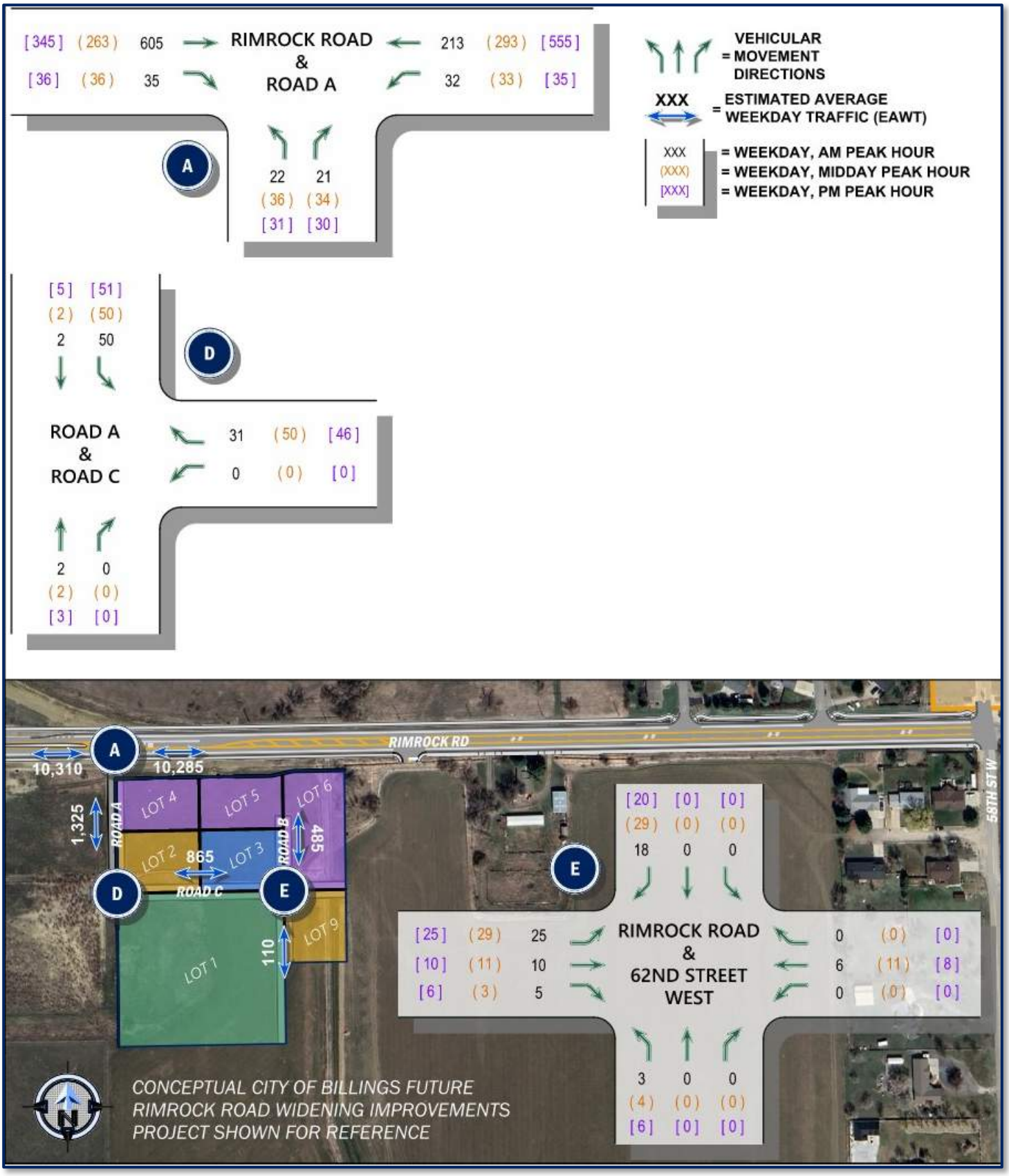


Figure 18: Estimated 2030 Total Traffic | Nodes A, D, & E Plus Estimated Average Weekday Traffic Volumes

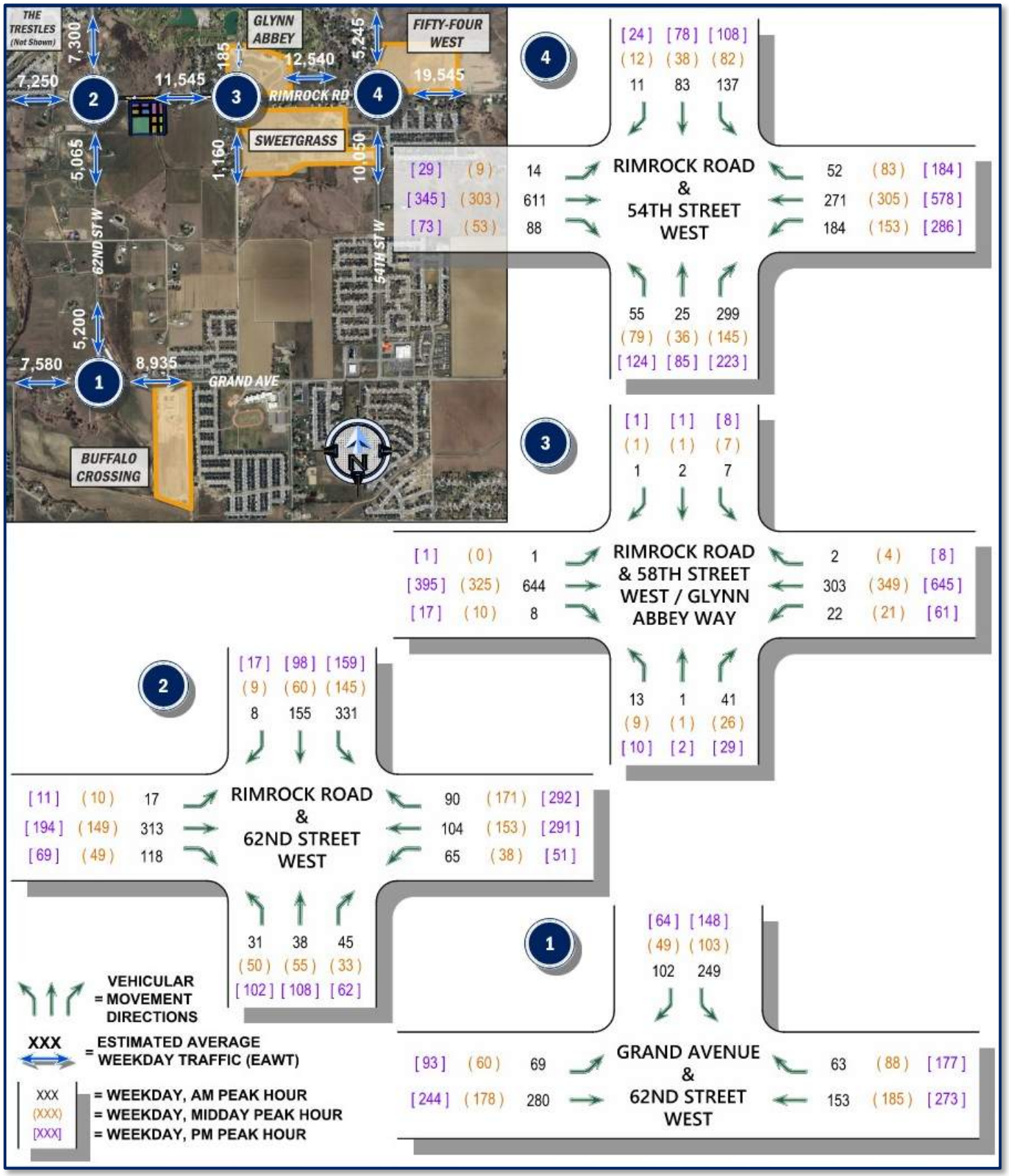


Figure 19: Estimated 2034 Total Traffic | Nodes 1, 2, 3, & 4 Plus Estimated Average Weekday Traffic Volumes

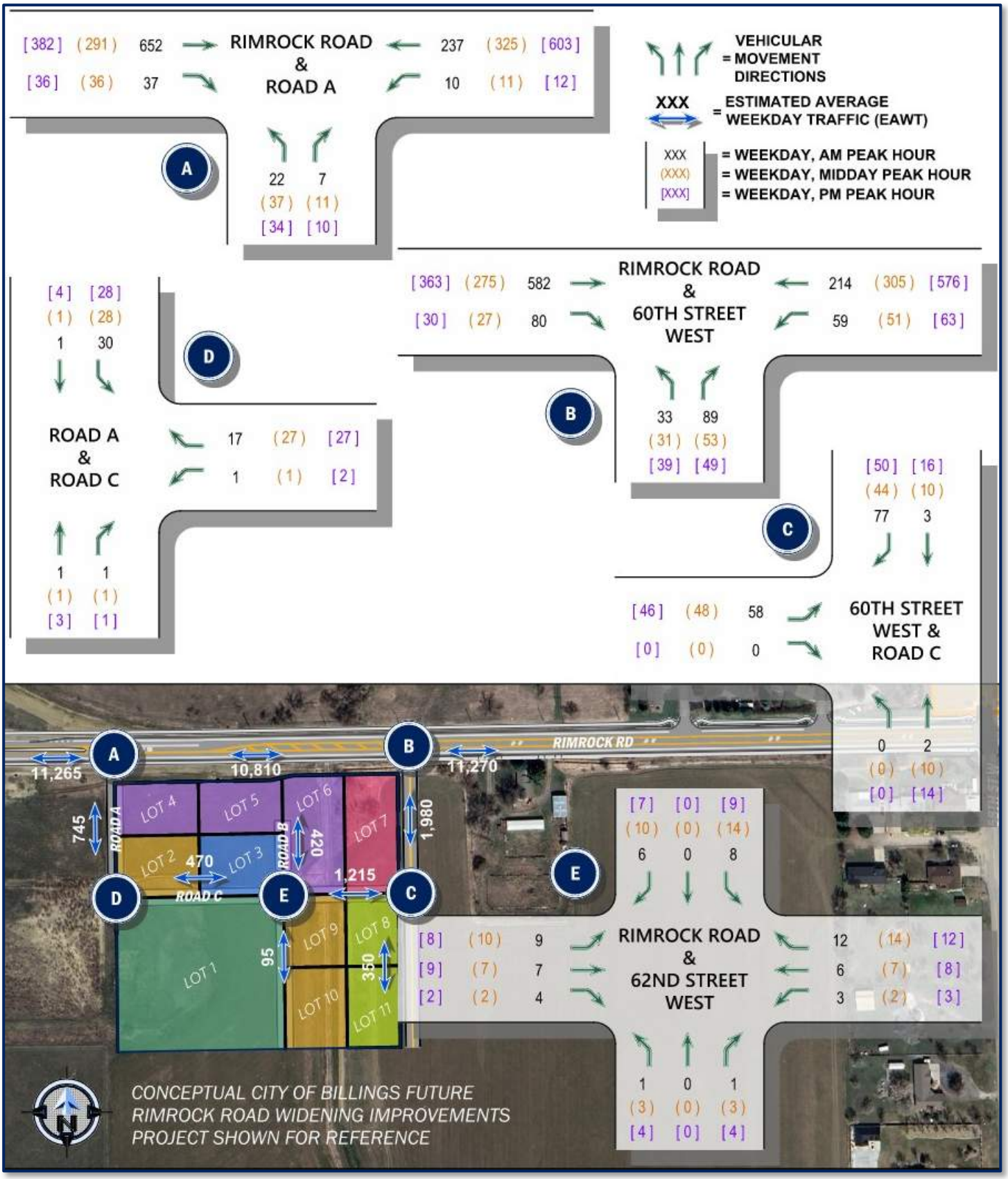


Figure 20: Estimated 2034 Total Traffic | Nodes A, B, C, D, & E Plus Estimated Average Weekday Traffic Volumes

Transportation Analyses

Analysis Scenarios

To identify significant project impacts, the following scenarios for study area intersections were evaluated:

- Existing Conditions (2025)
  Consists of an operational analysis of seasonally and daily adjusted 2025 counts collected as part of this study.
- No Build Scenario – Estimated 2030 Background Traffic Volumes
  Consists of projected, non-site background traffic volumes resulting from applied AAGR and known development build-up values.
- Phase 1 Utilization Scenario – Estimated 2030 Total Traffic Volumes
  Consists of estimated 2030 background traffic volumes in combination with forecast traffic from Phase 1 of the proposed Copper Square Subdivision.
- Phase 2 Pre-Development Scenario – Estimated 2034 Background Traffic Volumes
  Consists of estimated 2030 total traffic volumes in combination with projected, non-site background traffic volumes resulting from applied AAGR and known development build-up values between 2030 and 2034.
- Full Utilization Scenario – Estimated 2034 Total Traffic Volumes
  Consists of estimated 2034 background traffic in combination with forecast volumes from Phase 2 of the proposed Copper Square Subdivision along with redistribution of traffic from Phase 1 with installation of 60th Street West access.

Analysis Methodologies

The intersection analyses employ methodologies based on empirical research conducted by the Transportation Research Board (TRB) and other authorities, utilizing level of service (LOS) as the performance measure to evaluate the cumulative effects of such things as travel speed, traffic volumes, roadway and intersection capacity, travel delay, and traffic interruptions. Operating conditions are designated as LOS A through LOS F, representing the most to least favorable.

LOS for intersections is determined by control delay, which is defined as the total elapsed time from when a vehicle stops at the end of a queue to the time the vehicle departs from the stop line. The total elapsed time includes the time required for the vehicle to travel from the last-in-queue position to the first-in-queue position, including deceleration of vehicles from the free flow speed to the speed of vehicles in the queue. LOS characteristics based on varying durations of average vehicle delay as listed in the *Highway Capacity Manual, 7th Edition | A Guide for Multimodal Mobility Analysis* (HCM) published by the TRB are summarized in Appendix A.

Unsignalized Intersections

The methodology used to determine the level of service for unsignalized intersections is based on Chapter 20 of the HCM for two-way stop controlled (TWSC) intersections. The TWSC analyses were performed using *HCS TWSC Version 8.4* developed and maintained by the McTrans Center at the University of Florida. The HCM methodology for evaluating TWSC intersections is based on gap acceptance and conflicting traffic for vehicles stopped on minor street approaches. The critical gap (or minimum acceptable gap) is defined as the minimum time interval in the major street traffic stream that allows entry for one minor street vehicle. Average control delay and LOS for the minor street approach(es) is/are reported. LOS is not defined by the HCM for the intersection because major street traffic volumes and operations may skew the results of the LOS analyses.

Signalized Intersections

Signalized intersection operations were evaluated using both *Synchro plus SimTraffic (Version 12.2, Build 4, Revision 32 – 12.2.4.32)* developed and maintained by Cubic ITS, Inc. as well as *TEAPAC Complete (Version 9.50 – 26JAN19 Build 02)* developed and maintained by Strong Concepts that utilizes methodologies provided in Chapter 19 of the HCM. The HCM methodology for evaluating signalized intersections assigns a corresponding letter grade based on average control delays for each lane group at the intersection as well as overall intersection traffic operations. The overall condition of the intersection is determined by taking a volume-weighted average of all the delays for all vehicles entering the intersection.

Study Scenario Analyses

Intersection capacity and LOS analyses for the study scenarios were performed using the existing geometry and traffic control at each of the study area intersections. Existing signal timing for the intersection of Rimrock Road and 54th Street West, as provided by the City of Billings, was also utilized in the analyses of each of the study scenarios. The analyses are summarized in the following figures and detailed results are included in Appendix E.

Existing Conditions (2025) Study Scenario Operations Analyses

- Figure 21: Traffic Operations Summary for 2025 Existing Conditions | Grand Avenue & 62nd Street West – *Page 44*
- Figure 22: Traffic Operations Summary for 2025 Existing Conditions | Rimrock Road Intersections – *Page 45*

No Build Scenario – Estimated 2030 Background Traffic Volumes

- Figure 23: Traffic Operations Summary for Estimated 2030 Background Traffic | Grand Avenue & 62nd Street West – *Page 46*
- Figure 24: Traffic Operations Summary for Estimated 2030 Background Traffic | Rimrock Road Intersections – *Page 47*

Phase 1 Utilization Scenario – Estimated 2030 Total Traffic Volumes

- Figure 25: Traffic Operations Summary for Estimated 2030 Total Traffic | Grand Avenue & 62nd Street West – *Page 48*
- Figure 26: Traffic Operations Summary for Estimated 2030 Total Traffic | Rimrock Road Intersections – *Page 49*
- Figure 27: Traffic Operations Summary for Estimated 2030 Total Traffic | Copper Square Subdivision Intersections – *Page 50*

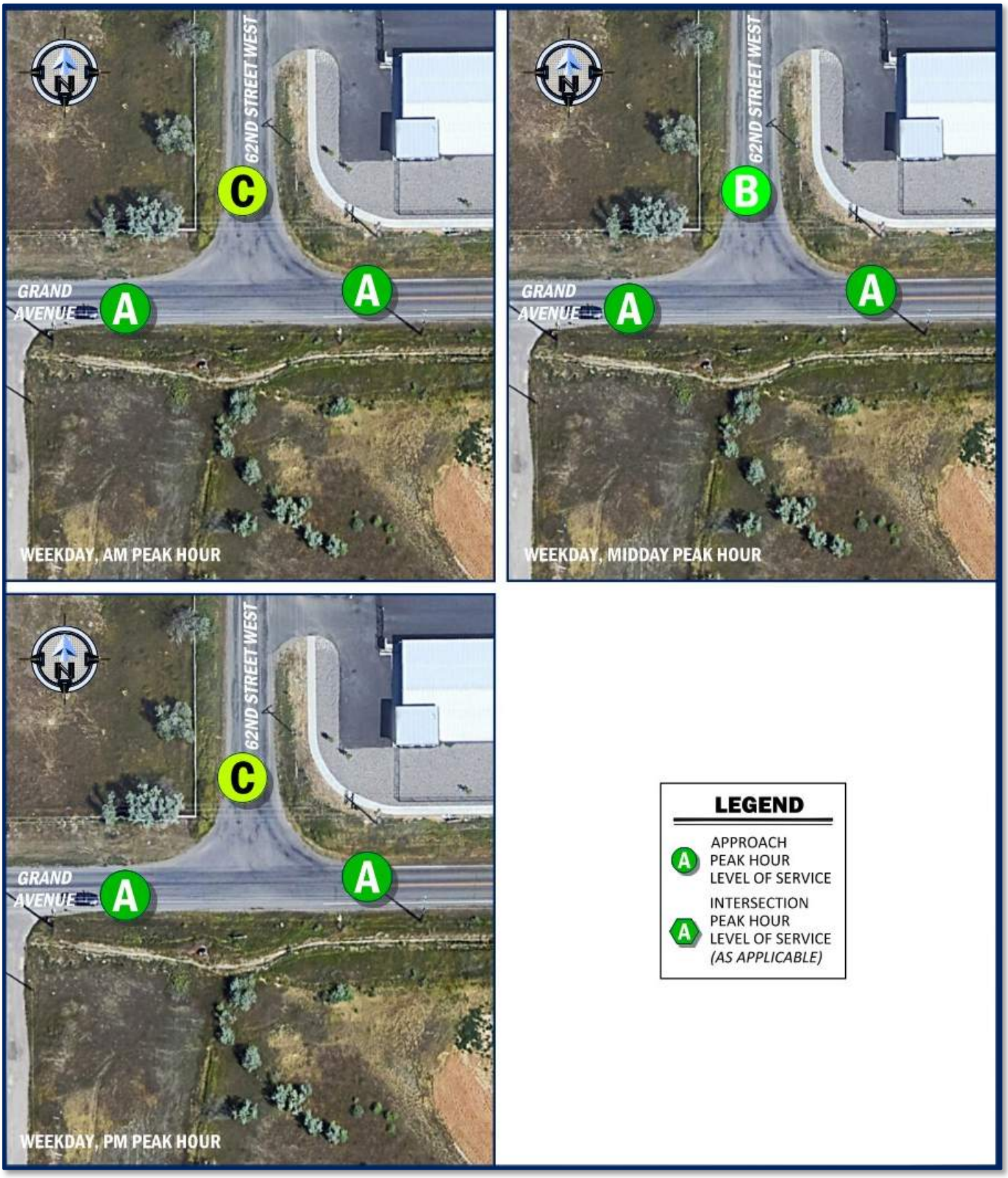


Figure 21: Traffic Operations Summary for 2025 Existing Conditions | Grand Avenue & 62nd Street West

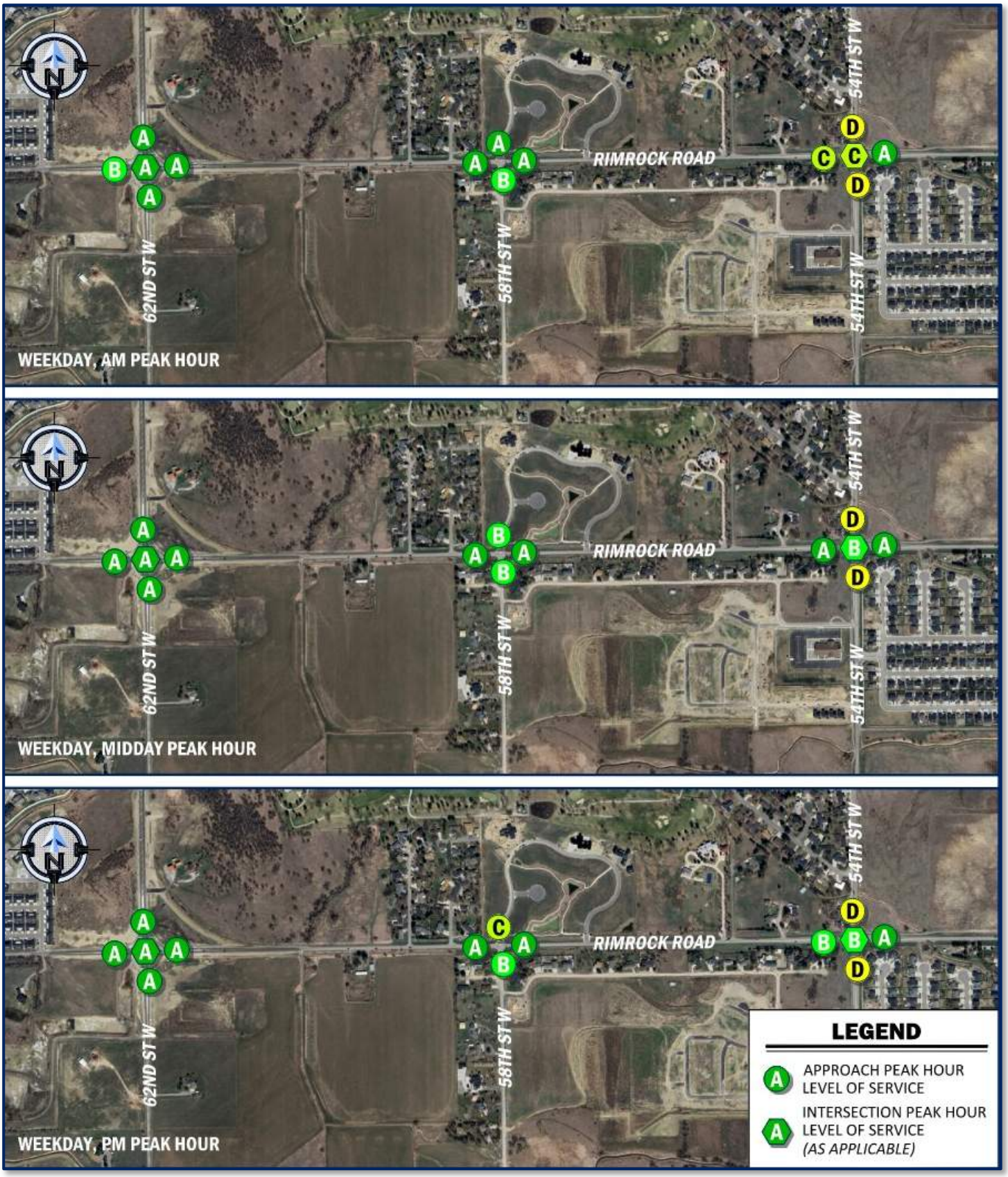


Figure 22: Traffic Operations Summary for 2025 Existing Conditions | Rimrock Road Intersections

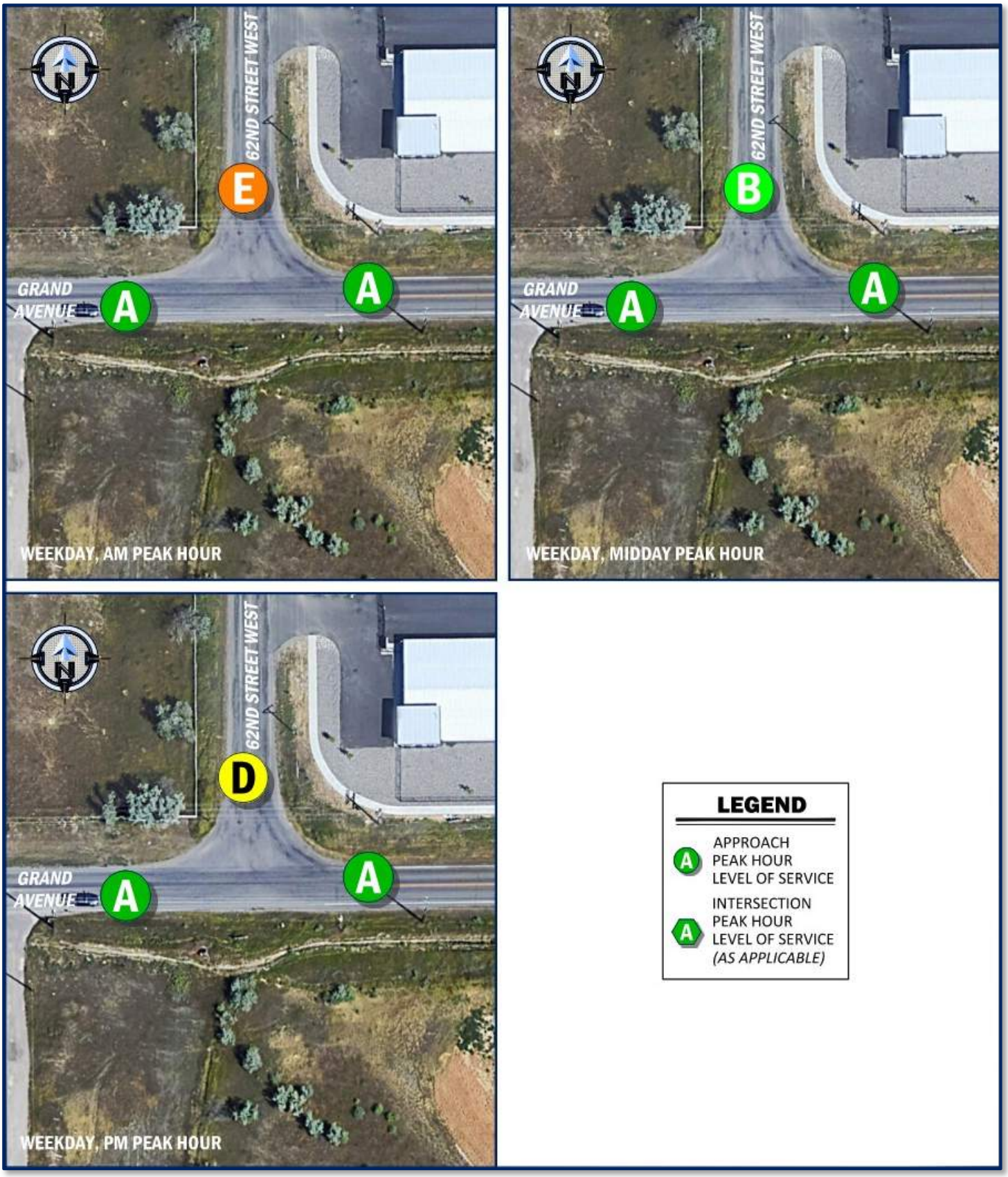


Figure 23: Traffic Operations Summary for Estimated 2030 Background Traffic | Grand Avenue & 62nd Street West

Figure 24: Traffic Operations Summary for Estimated 2030 Background Traffic | Rimrock Road Intersections

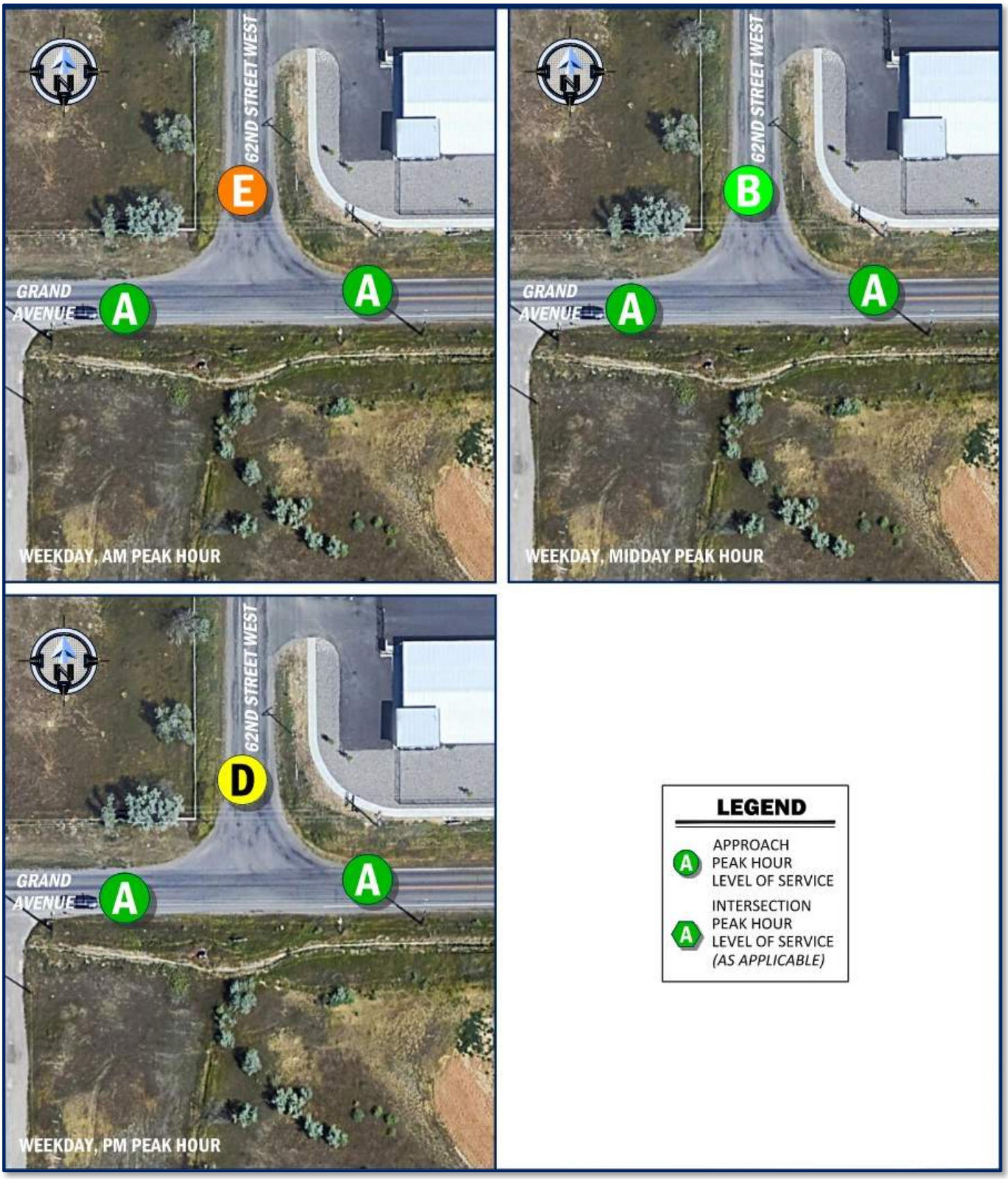


Figure 25: Traffic Operations Summary for Estimated 2030 Total Traffic | Grand Avenue & 62nd Street West

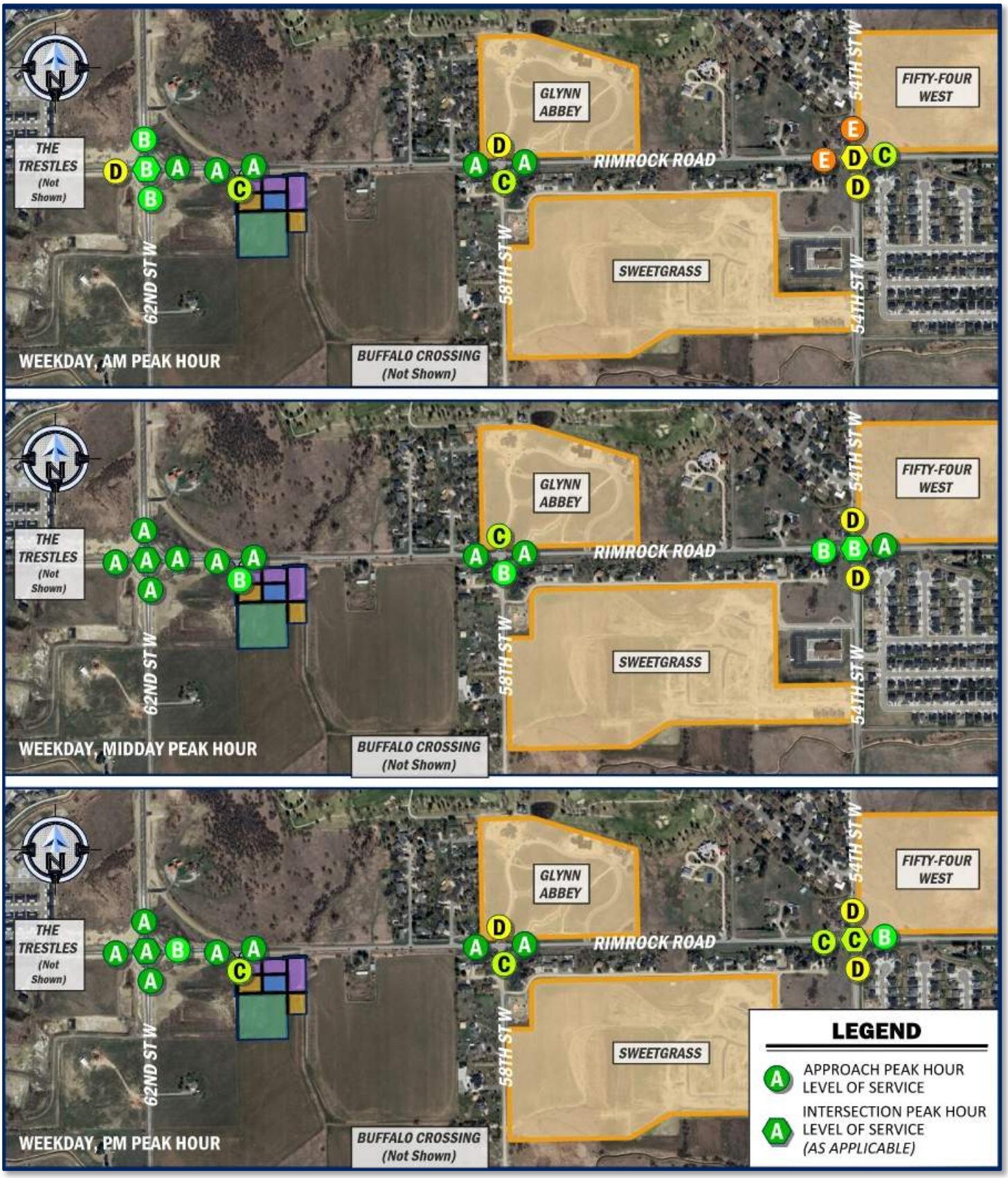


Figure 26: Traffic Operations Summary for Estimated 2030 Total Traffic | Rimrock Road Intersections

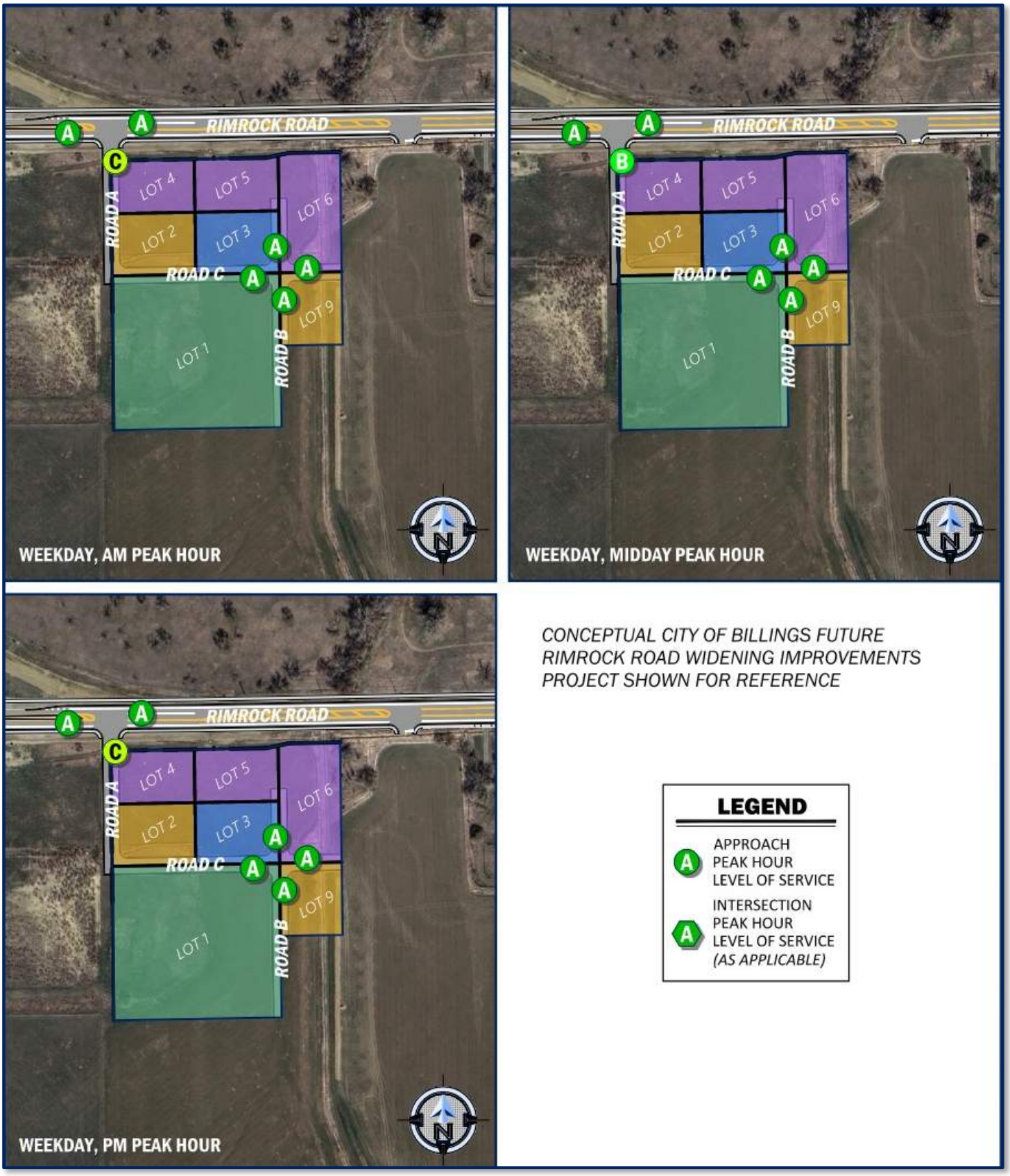


Figure 27: Traffic Operations Summary for Estimated 2030 Total Traffic | Copper Square Subdivision Intersections

Phase 2 Pre-Development Scenario – Estimated 2034 Background Traffic Volumes

- Figure 28: Traffic Operations Summary for Estimated 2034 Background Traffic | Grand Avenue & 62nd Street West – *Page 52*
- Figure 29: Traffic Operations Summary for Estimated 2034 Background Traffic | Rimrock Road Intersections – *Page 53*
- Figure 30: Traffic Operations Summary for Estimated 2034 Background Traffic | Copper Square Subdivision Intersections – *Page 54*

Full Utilization Scenario – Estimated 2034 Total Traffic Volumes

- Figure 31: Traffic Operations Summary for Estimated 2034 Total Traffic | Grand Avenue & 62nd Street West – *Page 55*
- Figure 32: Traffic Operations Summary for Estimated 2034 Total Traffic | Rimrock Road Intersections – *Page 56*
- Figure 33: Traffic Operations Summary for Estimated 2034 Total Traffic | Copper Square Subdivision Intersections – *Page 57*

Auxiliary Turn Lane Analyses

The intersection of Grand Avenue and 62nd Street West as well as Rimrock Road and its intersections with 58th Street West and the proposed 60th Street West and Road A to be included with Copper Square Subdivision were evaluated for consideration for auxiliary turn lanes utilizing criteria from the MDT *Traffic Engineering Manual* (August 2009). The results of the analyses are summarized in Table 9 below and are provided in Appendix F.

Table 9: Auxiliary Turn Lane Analyses Summary

Intersection	Evaluated Approach & Auxiliary Lane	Minimum Criteria Satisfied for Consideration of Installation of Auxiliary Turn Lane
Grand Avenue & 62nd Street West	EB Left-Turn Lane	☑ Weekday, AM Peak Hour *2030 Total Traffic* ❑ Weekday, Midday Peak Hour ☑ Weekday, PM Peak Hour *2025 Existing Conditions*
	WB Right-Turn Lane	❑ Weekday, AM Peak Hour ❑ Weekday, Midday Peak Hour ☑ Weekday, PM Peak Hour *2025 Existing Conditions*
Rimrock Road & 58th Street West / Glynn Abbey Way	EB Left-Turn Lane	*May Meet Minimum Criteria for Consideration of Turn Lane; However, Estimated Volumes are Very Low*
	EB Right-Turn Lane	❑ Weekday, AM Peak Hour ❑ Weekday, Midday Peak Hour ❑ Weekday, PM Peak Hour
	WB Left-Turn Lane	☑ Weekday, AM Peak Hour *2034 Background Traffic* ❑ Weekday, Midday Peak Hour ☑ Weekday, PM Peak Hour *2030 Background Traffic*
	WB Right-Turn Lane	❑ Weekday, AM Peak Hour ❑ Weekday, Midday Peak Hour ❑ Weekday, PM Peak Hour
Rimrock Road & Road A	EB Right-Turn Lane	❑ Weekday, AM Peak Hour ❑ Weekday, Midday Peak Hour ❑ Weekday, PM Peak Hour
	WB Left-Turn Lane	☑ Weekday, AM Peak Hour *2030 Total Traffic* ☑ Weekday, Midday Peak Hour *2034 Background Traffic* ☑ Weekday, PM Peak Hour *2030 Total Traffic*
Rimrock Road & 60th Street West	EB Right-Turn Lane	☑ Weekday, AM Peak Hour *2034 Total Traffic* ❑ Weekday, Midday Peak Hour ❑ Weekday, PM Peak Hour
	WB Left-Turn Lane	☑ Weekday, AM Peak Hour *2034 Total Traffic* ☑ Weekday, Midday Peak Hour *2034 Total Traffic* ☑ Weekday, PM Peak Hour *2034 Total Traffic*

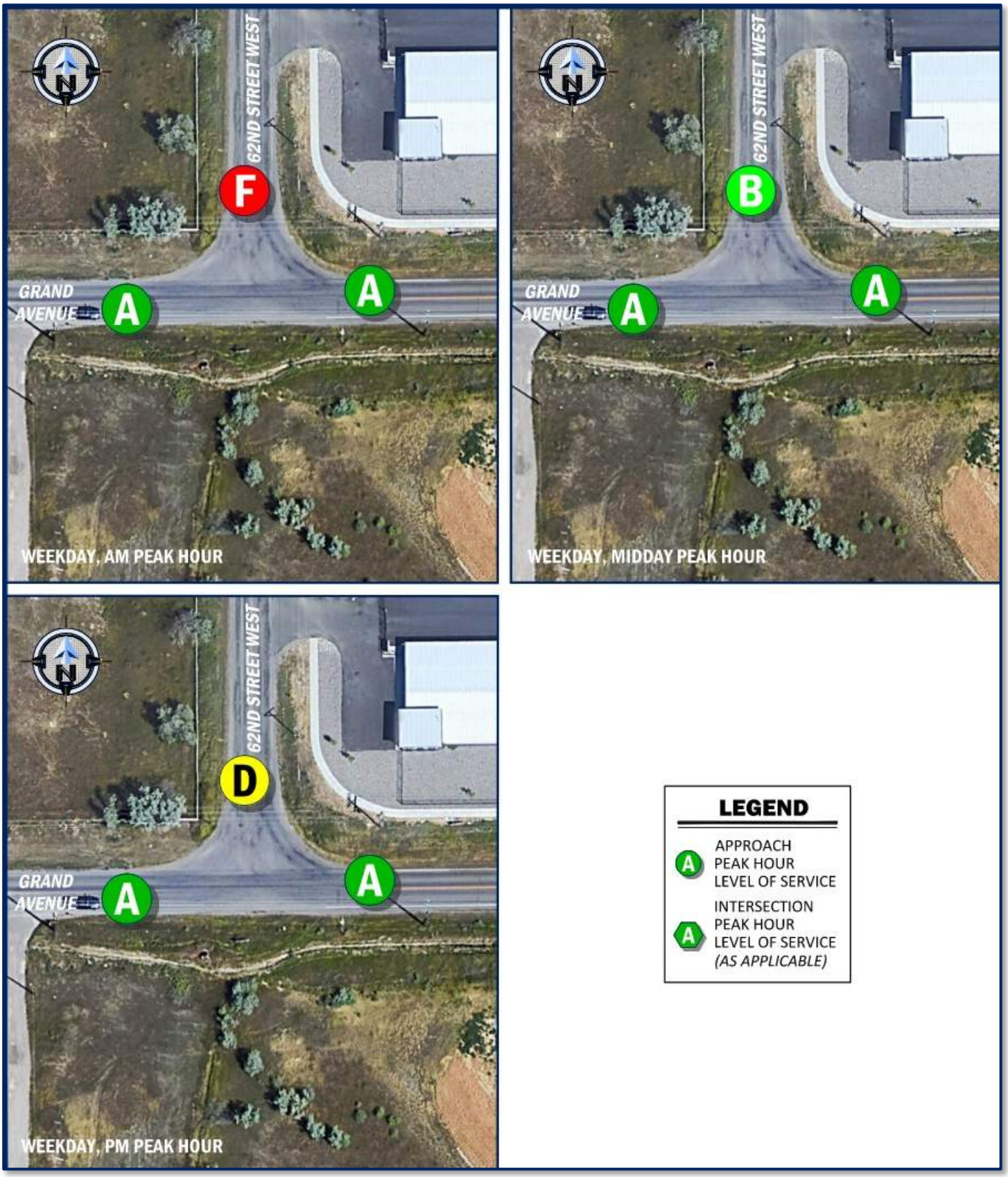


Figure 28: Traffic Operations Summary for Estimated 2034 Background Traffic | Grand Avenue & 62nd Street West

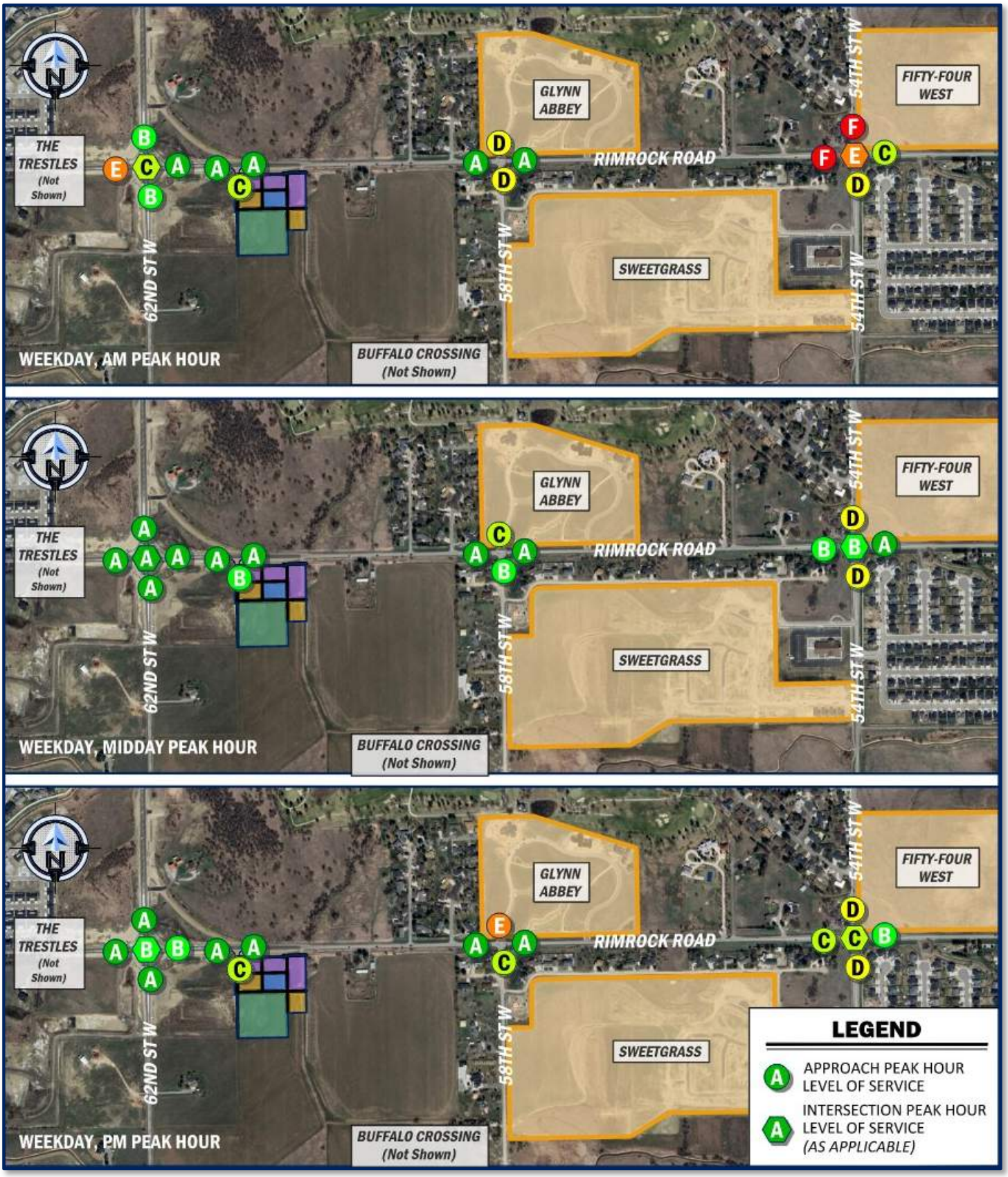


Figure 29: Traffic Operations Summary for Estimated 2034 Background Traffic | Rimrock Road Intersections

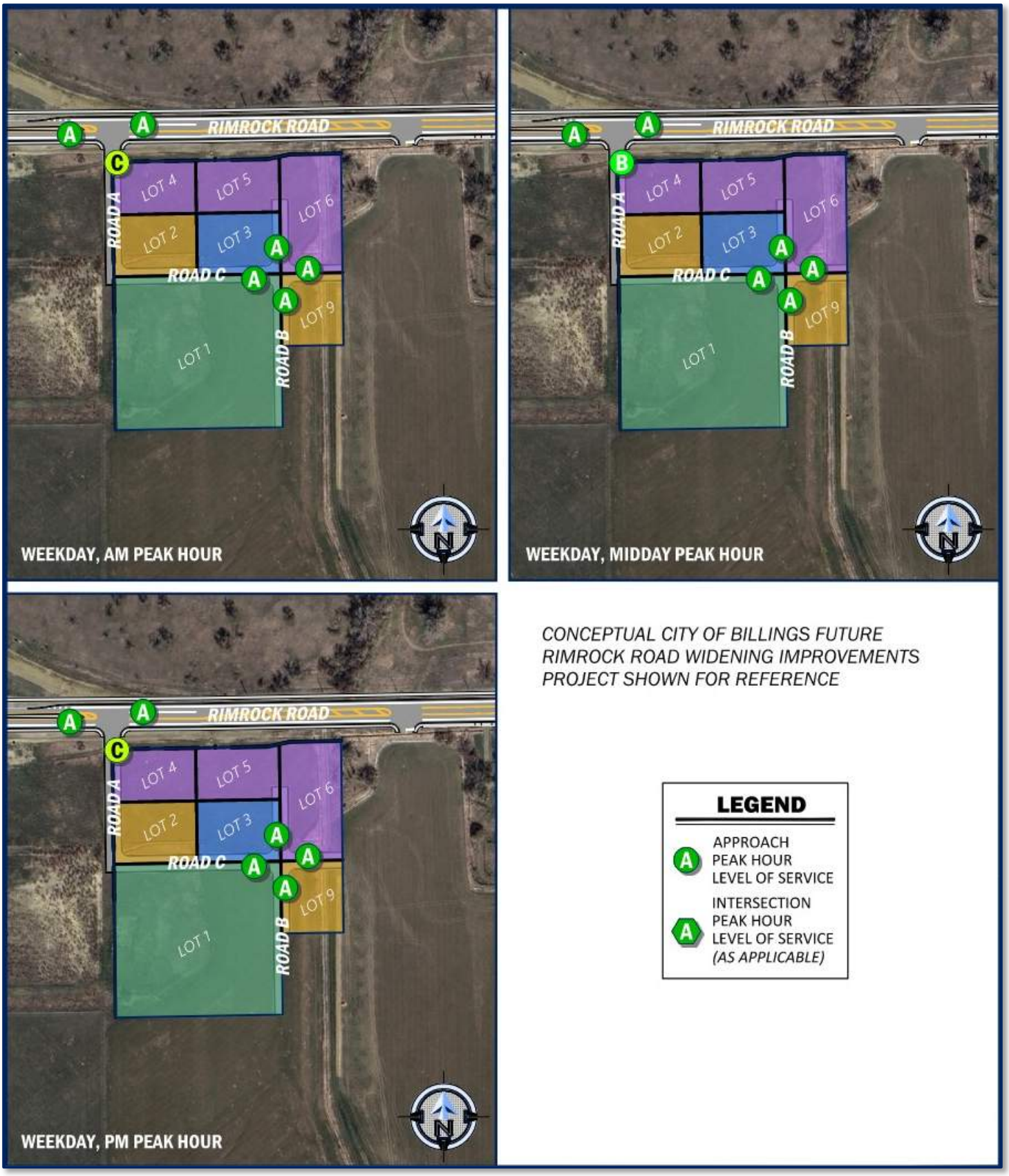


Figure 30: Traffic Operations Summary for Estimated 2034 Background Traffic | Copper Square Subdivision Intersections

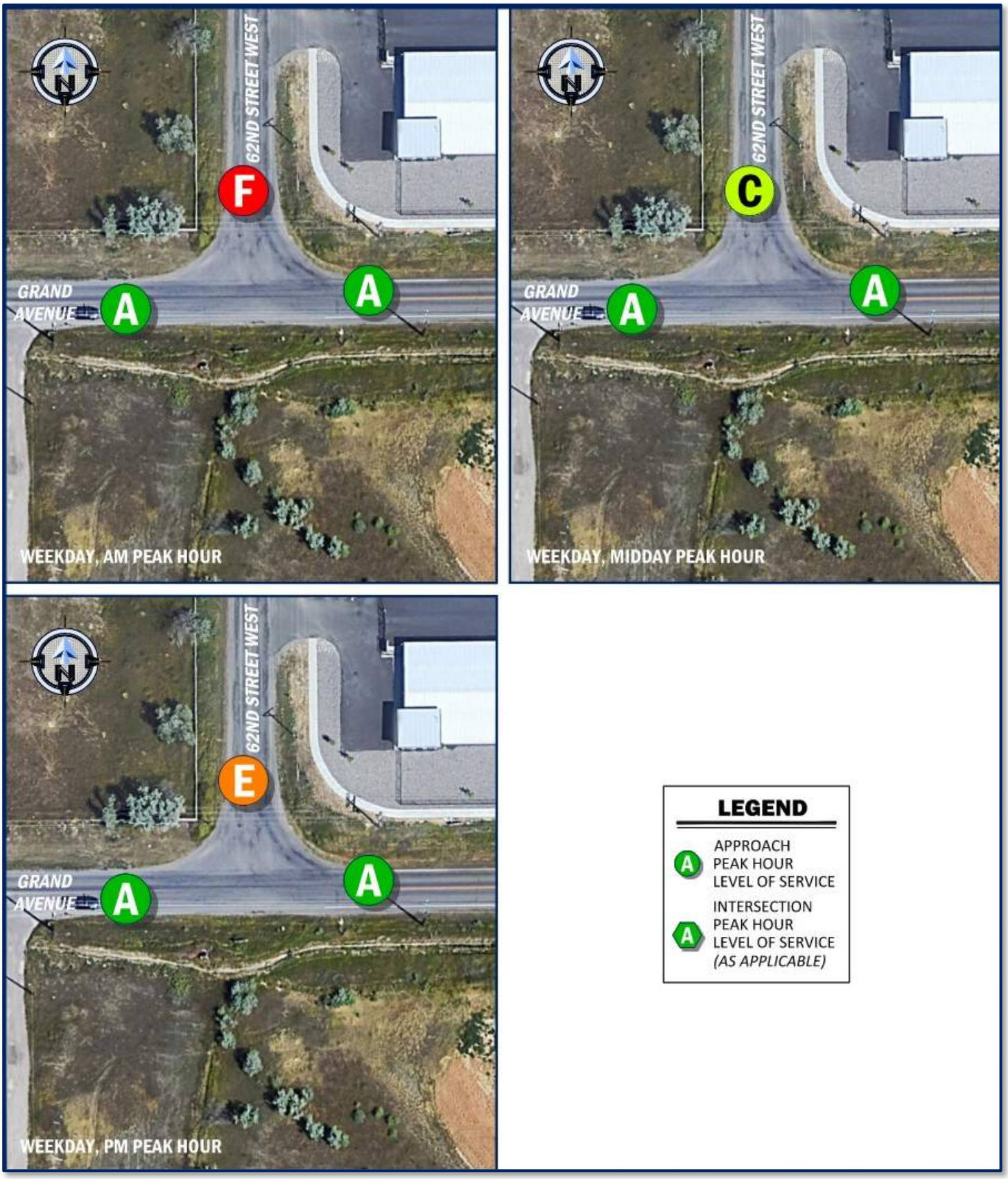


Figure 31: Traffic Operations Summary for Estimated 2034 Total Traffic | Grand Avenue & 62nd Street West

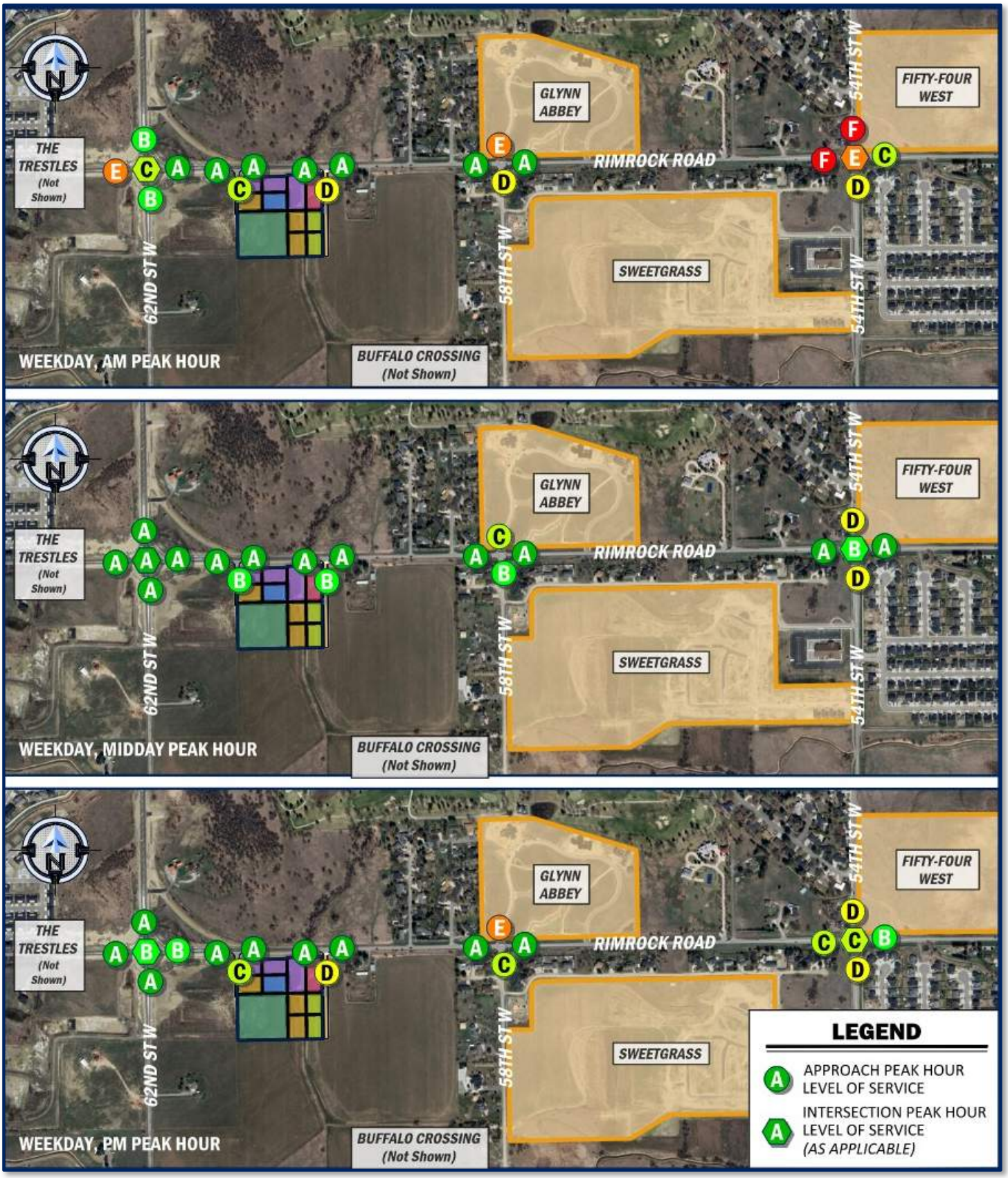


Figure 32: Traffic Operations Summary for Estimated 2034 Total Traffic | Rimrock Road Intersections

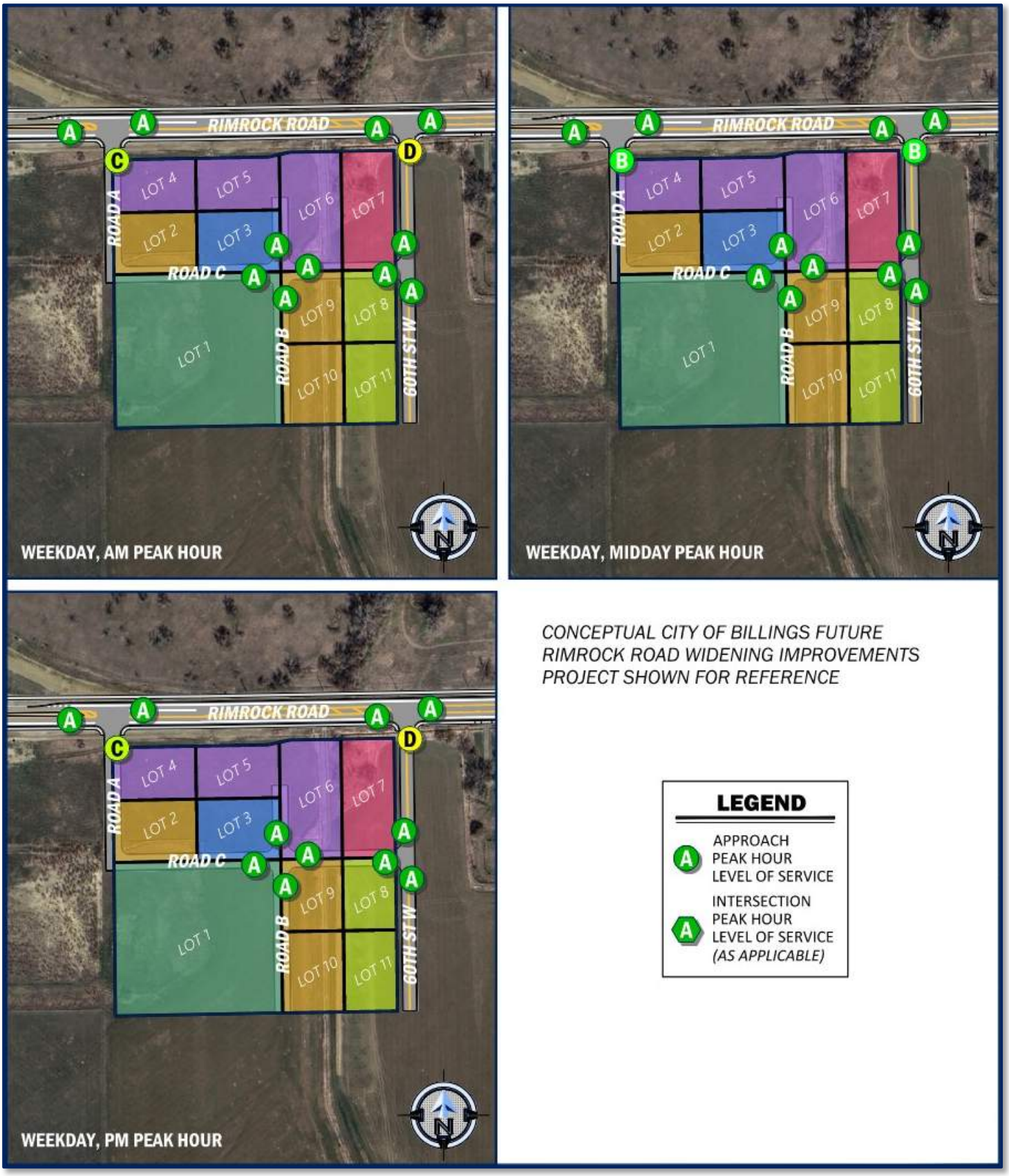


Figure 33: Traffic Operations Summary for Estimated 2034 Total Traffic | Copper Square Subdivision Intersections

Assessment of Impacts

Traffic Operations

Each of the study area intersections are currently operating within acceptable levels of service. With continued traffic growth in the area, study area intersections may experience declines in levels of service on specific approaches or the whole intersection. Impacts and potential mitigation measures are discussed below.

Mitigation Analyses

Grand Avenue & 62nd Street West

Impact: The intersection currently operates within acceptable levels of service but is projected to decline with continued traffic growth outside as well as from known developments within the study area. The intersection was found to satisfy minimum criteria for consideration of installation of an eastbound left-turn lane as well as a westbound right-turn lane.

Mitigation: The intersection was evaluated under two alternatives: 1) installation of auxiliary lanes on the eastbound and westbound approaches plus providing separate turn lanes on the southbound approach, and 2) installation of signalized traffic control.

Alternative 1: Installation of Turn Lanes

With the installation of turn lanes, the southbound approach may still experience substandard levels of service (lower than LOS C) during the weekday, AM peak hour. Southbound left-turn movements are projected to experience longer average vehicle delays during the weekday, AM and PM peak hours. The analyses are summarized in Appendix H-1.

Alternative 2: Installation of Signalized Traffic Control

The intersection of Grand Avenue and 62nd Street West was evaluated for satisfying specific *Manual on Uniform Traffic Control Devices, 11th Edition* (MUTCD) published by the United States Department of Transportation – Federal Highway Administration dated December 2023.

Preliminary Signal Warrant Analysis

A preliminary evaluation was conducted for meeting minimum traffic signal warrant criteria for Warrant #1: Eight-Hour Vehicular Volume and Warrant #2: Four-Hour Vehicle Volume as delineated in the MUTCD. This evaluation utilized a procedure developed by the Oregon Department of Transportation for performing a preliminary signal warrant analysis based on estimated average daily traffic volumes. Based on the projected 2030 background traffic volumes, installation of a traffic signal may be warranted at the intersection of Grand Avenue and 62nd Street West. Estimated average daily traffic volumes are projected to satisfy minimum criteria for Warrant #2: Four-Hour Vehicular Volume. The preliminary signal warrant analyses are included in Appendix G for reference and are summarized in Table 10 on the following page and Table 11 on page 60. It is worth noting that the MUTCD does state, “The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.”

Table 10: Warrant 1 | Eight-Hour Vehicular Volume Summary

Condition A – Minimum Vehicular Volume				
Data Source Description	**Vehicles Per Day on Major Street (Total of Both Approaches)**		**Vehicles Per Day on Minor Street (Southbound Left Turns Only)**	
	Vehicular Volume (Vehicles Per Day)	**Minimum Warrant Criteria Met? Yes or No – [% of Warrant]**	**Vehicular Volume (Vehicles Per Day)**	**Minimum Warrant Criteria Met? Yes or No – [% of Warrant]**
Warrant Minimum Volumes	**6,200**		**1,850**	
2025 Existing Conditions	5,435	No – [87.7%]	1,345	No – [72.7%]
Estimated 2030 Background Traffic	6,321	Yes – [102.0%]	1,704	No – [92.1%]
Estimated 2030 Total Traffic	6,347	Yes – [102.4%]	1,711	No – [92.5%]
Estimated 2034 Background Traffic	6,605	Yes – [106.5%]	1,823	No – [98.5%]
Estimated 2034 Total Traffic	6,620	Yes – [106.8%]	1,826	No – [98.7%]
Condition A – Warrant Criteria Met?	**6,620**	**Yes – [106.8%]**	**1,826**	**No – [98.7%]**
Condition B – Interruption of Continuous Traffic				
Data Source Description	**Vehicles Per Day on Major Street (Total of Both Approaches)**		**Vehicles Per Day on Minor Street (Southbound Left Turns Only)**	
	Vehicular Volume (Vehicles Per Day)	**Minimum Warrant Criteria Met? Yes or No – [% of Warrant]**	**Vehicular Volume (Vehicles Per Day)**	**Minimum Warrant Criteria Met? Yes or No – [% of Warrant]**
Warrant Minimum Volumes	**9,300**		**950**	
2025 Existing Conditions	5,435	No – [58.4%]	1,345	Yes – [141.6%]
Estimated 2030 Background Traffic	6,321	No – [68.0%]	1,704	Yes – [179.4%]
Estimated 2030 Total Traffic	6,347	No – [68.2%]	1,711	Yes – [180.1%]
Estimated 2034 Background Traffic	6,605	No – [71.0%]	1,823	Yes – [191.9%]
Estimated 2034 Total Traffic	6,620	No – [71.2%]	1,826	Yes – [192.2%]
Condition B – Warrant Criteria Met?	**21,595**	**Yes – [135.6%]**	**1,367**	**Yes – [102.8%]**

Warrant minimum volumes assume that the 8th highest vehicular volume is approximately 5.65% of average daily traffic.

Table 11: Warrant 2 | Four-Hour Vehicular Volume Summary

Data Source Description	Cumulative Vehicles on Major Street	Vehicles Per Hour on Minor Street (62nd Street West – Southbound Left Turns Only)		Minimum Warrant Criteria Met? Yes or No – [% of Warrant]
	Total of Both Approaches (Vehicles Per Hour)	Cumulative Contributing Portion (Vehicles Per Hour)	Warrant Minimum Volume (Vehicles Per Hour)	
2025 Existing Conditions	448	111	**149**	No – [74.4%]
Estimated 2030 Background Traffic	521	141	**122**	Yes – [115.3%]
Estimated 2030 Total Traffic	523	142	**122**	Yes – [116.8%]
Estimated 2034 Background Traffic	544	151	**114**	Yes – [132.2%]
Estimated 2034 Total Traffic	545	151	**114**	Yes – [132.6%]
Warrant Criteria Met?	**545**	**151**	**114**	**Yes – [132.6%]**

Warrant minimum volumes assume that the 4th highest vehicular volume is approximately 8.25% of average daily traffic.

Signal Operational Analyses

Estimated traffic operations for the intersection of Grand Avenue and 62nd Street West with the installation of a traffic signal are summarized in Table 12 below for the weekday, AM peak hour and on the following page for Table 13 (weekday, midday peak hour) and Table 14 (weekday, PM peak hour). The analyses are also included in Appendix H-2.

Table 12: Grand Avenue & 62nd Street West Weekday, AM Peak Hour Signalization Traffic Operations Summary

Analysis Scenario	Performance Measure	Intersection	Minor Approaches	Grand Avenue EB		Grand Avenue WB		62nd Street West SB	
				L	T	T	R	L	R
Estimated 2034 Total Traffic *Signalization With 75 Second Cycle Length*	Level of Service (LOS)	**B**	**C**	A	A	B	A	C	B
	Delay (sec/veh)	**15.3**	**23.6**	8.8	7.9	15.0	9.3	25.1	19.9
	Adjusted Entry Volume (veh/hr)	**1,078**	**413**	81	329	180	74	293	120
	Ped + Bike Volume (ped+bike/hr)	**0**	**0**	0		0		0	
	Volume-to-Capacity Ratio (v/c)	**0.14**	**0.33**	0.07	0.18	0.10	0.05	0.75	0.14
	HCM 95% Max Queue Length (veh)			1.2	4.2	0.0	0.7	5.9	0.6
	HCM 95% Max Queue Length (ft)			33	110	94	5	149	15
	Available Queue Storage (ft)			200	880	540	200	680	200

EB = Eastbound; WB = Westbound; and SB = Southbound | L = Left; T = Through; and R = Right

Table 13: Grand Avenue & 62nd Street West Weekday, Midday Peak Hour Signalization Traffic Operations Summary

Analysis Scenario	Performance Measure	Intersection	Minor Approaches	Grand Avenue EB L	Grand Avenue EB T	Grand Avenue WB T	Grand Avenue WB R	62nd Street West SB L	62nd Street West SB R
Estimated 2034 Total Traffic *Signalization With 75 Second Cycle Length*	Level of Service (LOS)	**B**	**C**	A	A	B	A	C	C
	Delay (sec/veh)	**11.7**	**24.4**	6.4	4.7	11.4	8.2	24.9	23.2
	Adjusted Entry Volume (veh/hr)	**713**	**500**	65	191	199	95	111	53
	Ped + Bike Volume (ped+bike/hr)	**0**	**0**	0		0		0	
	Volume-to-Capacity Ratio (v/c)	**0.33**	**0.19**	0.10	0.18	0.28	0.13	0.41	0.23
	HCM 95% Max Queue Length (veh)			0.6	1.1	0.0	1.0	1.1	0.3
	HCM 95% Max Queue Length (ft)			19	46	88	6	69	15
	Available Queue Storage (ft)			200	880	540	200	680	200

EB = Eastbound; WB = Westbound; and SB = Southbound | L = Left; T = Through; and R = Right

Table 14: Grand Avenue & 62nd Street West Weekday, PM Peak Hour Signalization Traffic Operations Summary

Analysis Scenario	Performance Measure	Intersection	Minor Approaches	Grand Avenue EB L	Grand Avenue EB T	Grand Avenue WB T	Grand Avenue WB R	62nd Street West SB L	62nd Street West SB R
Estimated 2034 Total Traffic *Signalization With 75 Second Cycle Length*	Level of Service (LOS)	**B**	**C**	A	A	B	A	C	C
	Delay (sec/veh)	**12.8**	**24.7**	7.5	5.6	14.1	9.5	25.6	22.7
	Adjusted Entry Volume (veh/hr)	**1,098**	**413**	102	268	300	195	163	70
	Ped + Bike Volume (ped+bike/hr)	**0**	**0**	0		0		0	
	Volume-to-Capacity Ratio (v/c)	**0.28**	**0.28**	0.18	0.24	0.44	0.28	0.37	0.18
	HCM 95% Max Queue Length (veh)			1.5	2.5	0.0	2.2	2.2	0.4
	HCM 95% Max Queue Length (ft)			32	74	149	8	94	15
	Available Queue Storage (ft)			200	880	540	200	680	200

EB = Eastbound; WB = Westbound; and SB = Southbound | L = Left; T = Through; and R = Right

Rimrock Road & 62nd Street West / Molt Road

Impact: The intersection as a whole is forecast to operate within acceptable levels of service (LOS C or better) through the 2034 analysis period; however, the eastbound approach is projected to experience increased average vehicle delays during the AM peak period. Anticipated traffic growth from development west of the intersection is the primary driver for the longer delays along with circulating volumes within the roundabout.

Mitigation: Traffic contributions from the proposed Copper Square Subdivision are not anticipated to result in the need for mitigation at the intersection of Rimrock Road and 62nd Street West / Molt Road as evidenced by estimated 2030 and 2034 traffic operational analyses, noting favorable LOS results for the westbound and northbound approaches. Mitigation may be necessary with development west of the intersection. The addition of a non-yielding right-turn lane on the eastbound approach may improve operations but has not been evaluated as a part of this study.

Rimrock Road & 58th Street West / Glynn Abbey Way

Impact: Vehicles on the northbound and southbound approaches may experience longer delays during the weekday, AM and PM peak periods with continued traffic growth on Rimrock Road. The southbound, Glynn Abbey Way approach has limited traffic volumes and includes gated access for the Glynn Abbey Subdivision. Projected traffic volumes at the intersection are not expected to meet minimum criteria for installation of a traffic signal under the analyzed conditions.

Mitigation: It is anticipated that the City of Billings Rimrock Road widening project will provide a dedicated turn lane for westbound left-turns at 58th Street West. This mitigation has been evaluated, and the addition of dedicated left-turn lanes is not anticipated to significantly improve traffic operations for the northbound or southbound approaches; however, it is anticipated to improve traffic flow for through vehicles on Rimrock Road and may also provide some safety benefits. Summaries of intersection operations and detailed analyses are provided in Appendix H-3.

Rimrock Road & 54th Street West

Impact: Vehicles on the northbound and southbound approaches experience longer delays during weekday, peak periods, which are projected to continue and increase with traffic growth on Rimrock Road. Likewise, the eastbound approach also experiences longer delays during the weekday, AM peak hour that will be exacerbated with continual traffic growth on Rimrock Road.

Mitigation: To address substandard levels of service, the intersection of Rimrock Road and 54th Street West was evaluated with the addition of right-turn lanes on the eastbound and northbound approaches. Additionally, signal timing was optimized for the forecast traffic conditions. Signal timing optimization would also need to be evaluated with other coordinated signals to determine the appropriate cycle length, splits, and offsets. Estimated traffic operations for the intersection of Rimrock Road and 54th Street West with the installation of eastbound and northbound right-turn lanes plus optimization of signal timing for time of day are summarized in Table 15 on page 63 for the weekday, AM peak hour and in Table 16 for the weekday, midday peak hour. Weekday, PM peak hour analyses are summarized in Table 17 on page 64. Detailed analyses are also included in Appendix H-4.

Table 15: Rimrock Road & 54th Street West Weekday, AM Peak Hour Mitigation Traffic Operations Summary

Analysis Scenario	Performance Measure	Intersection	Minor Approaches	Rimrock Road EB			Rimrock Road WB			54th Street West NB			54th St W SB	
				L	T	R	L	T	R	L	T	R	L	TR
Estimated 2034 Total Traffic *Signal Optimization With 90 Second Cycle Length & Addition of Eastbound and Northbound Right-Turn Lanes*	Level of Service (LOS)	**C**	**C**	B	C	B	C	B	A	C	C	C	D	C
	Delay (sec/veh)	**28.7**	**33.6**	10.9	34.3	13.0	33.3	11.5	9.1	35.0	29.1	33.0	37.1	30.9
	Adjusted Entry Volume (veh/hr)	**2,205**	**735**	17	736	106	222	327	63	66	30	360	165	113
	Ped + Bike Volume (ped+bike/hr)	**18**	**7**	11			0			0			7	
	Volume-to-Capacity Ratio (v/c)	**0.39**	**0.45**	0.03	0.88	0.15	0.78	0.35	0.08	0.27	0.09	0.89	0.58	0.31
	HCM 95% Max Queue Length (veh)			0.4	20.0	1.2	5.1	2.7	0.0	2.4	0.0	3.6	5.7	3.6
	HCM 95% Max Queue Length (ft)			9	513	32	133	155	0	66	31	92	145	91
	Available Queue Storage (ft)			300	480	200	240	1,030	200	290	500	200	230	400

EB = Eastbound; WB = Westbound; and SB = Southbound | L = Left; T = Through; R = Right; and TR = Through-Right

Table 16: Rimrock Road & 54th Street West Weekday, Midday Peak Hour Mitigation Traffic Operations Summary

Analysis Scenario	Performance Measure	Intersection	Minor Approaches	Rimrock Road EB			Rimrock Road WB			54th Street West NB			54th St W SB	
				L	T	R	L	T	R	L	T	R	L	TR
Estimated 2034 Total Traffic *Signal Optimization With 70 Second Cycle Length & Addition of Eastbound and Northbound Right-Turn Lanes*	Level of Service (LOS)	**B**	**C**	A	B	B	A	B	A	C	C	C	C	C
	Delay (sec/veh)	**15.3**	**24.7**	9.9	14.5	10.8	8.9	10.3	7.9	27.8	24.6	21.4	27.7	24.9
	Adjusted Entry Volume (veh/hr)	**1,411**	**426**	10	329	58	166	332	90	86	39	158	89	54
	Ped + Bike Volume (ped+bike/hr)	**6**	**4**	1			1			0			4	
	Volume-to-Capacity Ratio (v/c)	**0.25**	**0.28**	0.02	0.42	0.09	0.31	0.37	0.12	0.30	0.13	0.46	0.31	0.19
	HCM 95% Max Queue Length (veh)			0.2	7.0	0.4	2.1	6.1	0.2	2.4	0.1	0.6	2.6	1.4
	HCM 95% Max Queue Length (ft)			6	180	10	56	155	4	64	30	15	67	35
	Available Queue Storage (ft)			300	480	200	240	1,030	200	290	500	200	230	400

EB = Eastbound; WB = Westbound; and SB = Southbound | L = Left; T = Through; R = Right; and TR = Through-Right

Table 17: Rimrock Road & 54th Street West Weekday, PM Peak Hour Mitigation Traffic Operations Summary

Analysis Scenario	Performance Measure	Intersection	Minor Approaches	Rimrock Road EB			Rimrock Road WB			54th Street West NB			54th St W SB	
				L	T	R	L	T	R	L	T	R	L	TR
Estimated 2034 Total Traffic *Signal Optimization With 70 Second Cycle Length & Addition of Eastbound and Northbound Right-Turn Lanes*	Level of Service (LOS)	**B**	**C**	B	B	B	B	B	B	C	C	B	C	C
	Delay (sec/veh)	**19.1**	**23.5**	13.6	20.0	14.1	14.0	19.9	10.5	28.6	23.2	18.7	28.0	23.4
	Adjusted Entry Volume (veh/hr)	**2,298**	**690**	31	371	78	308	622	198	133	91	240	116	110
	Ped + Bike Volume (ped+bike/hr)	**16**	**3**	13			0			0			3	
	Volume-to-Capacity Ratio (v/c)	**0.43**	**0.39**	0.11	0.56	0.14	0.61	0.75	0.28	0.45	0.24	0.52	0.41	0.30
	HCM 95% Max Queue Length (veh)			0.6	8.4	0.7	4.2	25.6	0.8	3.5	0.6	1.6	3.3	2.4
	HCM 95% Max Queue Length (ft)			15	215	17	111	391	20	95	60	40	84	62
	Available Queue Storage (ft)			300	480	200	240	1,030	200	290	500	200	230	400

EB = Eastbound; WB = Westbound; and SB = Southbound | L = Left; T = Through; R = Right; and TR = Through-Right

Rimrock Road & Road A

The intersection is projected to operate within acceptable levels of service through the year 2034 analysis. The intersection was found to satisfy minimum criteria for consideration of installation of a westbound left-turn lane. It is anticipated that the City of Billings Rimrock Road widening project may incorporate a dedicated turn lane for westbound left-turns at Road A. Similar to the intersection of Rimrock Road and 58th Street West, the intersection at Road A has been evaluated with the addition of a westbound left-turn lane, which is not anticipated to significantly improve traffic operations for the northbound approach; however, it is anticipated to improve traffic flow for through vehicles on Rimrock Road and may also provide some safety benefits. Summaries of intersection operations and detailed analyses are provided in Appendix H-5.

Rimrock Road & 60th Street West

The northbound, 60th Street West approach is projected to at LOS D during the weekday, AM and PM peak hours as shown through traffic operations analyses. The intersection is estimated to satisfy minimum criteria for consideration of installing an eastbound right-turn lane as well as a westbound left-turn lane. If an eastbound right-turn lane were to be installed, it would need to include a lateral offset to preserve intersection sight distance for drivers on the northbound approach of eastbound through vehicles. The eastbound approach is projected to operate acceptable without the inclusion of an auxiliary right-turn lane. Similar to the Road A and 58th Street West intersections with Rimrock Road, it is anticipated that the City of Billings Rimrock Road widening project could incorporate a dedicated turn lane for westbound left-turns at 60th Street West. To alleviate vehicle delays on the northbound approach, separate left- and right-turn lanes may be beneficial. The intersection was evaluated with the dedicated turn lanes and summaries of forecast traffic operations with those improvements are provided in Appendix H-6 along with detailed analyses.

Safety

A significant crash experience trend was not identified at any of the study area intersections.

Alternative Modes of Transportation

Existing Conditions

As noted in previous sections, sidewalks are not available for pedestrians along Rimrock Road between 62nd Street West and 54th Street West within the study area. Bike lanes are not presently available within this roadway segment either. The recently completed roundabout at the intersection of Rimrock Road and 62nd Street West included concrete sidewalk / pathway improvements at the intersection for connection to future sidewalk / pathway installations in the future. At the intersection of Rimrock Road and 54th Street West, sidewalks are currently available on the west side of 54th Street West north of the intersection and on the east side of 54th Street West south of the intersection. There are also asphalt shared-use pathways on the north side of Rimrock Road east of the intersection and the west side of 54th Street West on the west side of the roadway. MET Transit currently provides service in Billings that includes 13 fixed bus routes and Americans with Disabilities Act (ADA) complementary paratransit service (MET Plus); however, there are not currently any existing routes along Rimrock Road adjacent to the proposed Copper Square Subdivision.

Proposed Development

Pedestrians & Bicyclists

It is anticipated that sidewalk improvements will be included as development progresses to provide non-motorized user connectivity within Copper Square Subdivision.

Transit Service

No specific transit-oriented improvements are presently included with the project.

Compliance with Applicable Local Codes

The proposed Copper Square Subdivision development improvements should be installed in accordance with City of Billings, Yellowstone County, and MDT requirements, as applicable.

Conclusions & Recommendations

Analysis of trip generation estimates, traffic operations, and considerations for alternative modes of transportation reveal that the proposed Copper Square Subdivision project will have minimal impact on area traffic operations. Based on the analyses included herein, the following are recommended as appropriate:

Site Roadways & Accesses

The proposed new Road A along the western boundary and 60th Street West along the eastern boundary of the proposed Copper Square Subdivision along with the proposed Road B and Road C should incorporate the following recommendations:

- Roadways should be designed to accommodate the appropriate design vehicles, including at intersections and any proposed lot driveways.

- Street design should include considerations of the needs for non-motorized users.
- Design must also provide adequate intersection sight distance in accordance with City of Billings, Yellowstone County, MDT, and AASHTO standards.
- Rimrock Road and Its Intersections with Road A and 60th Street West:
    - Stop control is recommended for the northbound approaches.
    - For ease of design and construction coordination, installation of a dedicated westbound left-turn lane at each intersection is recommended to be incorporated with the City of Billings Rimrock Road project between 54th Street West and 62nd Street West.
    - Consideration may be given to including separate left- and right-turn lanes on the northbound approaches to reduce delay for right-turning vehicles on those approaches.
    - Because of the proposed development character of Copper Square Subdivision, it is recommended to utilize a WB-40 as the design vehicle at each intersection, at a minimum, and a WB-62 as a control vehicle for accommodating turning movements at each intersection. Additionally, accommodation for emergency and solid waste vehicles must be considered.
- Stop control is recommended for the eastbound, Road C approach at its intersection with 60th Street West plus the northbound and southbound, Road B approaches at its intersection with Road C.

Study Area Intersections

Grand Avenue & 62nd Street West

The intersection currently operates within acceptable levels of service but is projected to decline with continued traffic growth outside as well as from known developments within the study area. Mitigation for projected substandard traffic operations at this intersection includes the following:

- Consideration should be given to installation of an eastbound left-turn lane and a westbound right-turn lane at the intersection.
    - The intersection did satisfy minimum criteria for consideration of installation of an eastbound left-turn lane as well as a westbound right-turn lane based on existing, 2025 traffic conditions.
- A preliminary evaluation of forecast traffic conditions utilizing a procedure developed by the Oregon Department of Transportation identified that installation of a traffic signal may be warranted at the intersection based on the projected 2030 background traffic volumes. Estimated average daily traffic volumes are projected to satisfy minimum criteria for Warrant #2: Four-Hour Vehicular Volume.
- Consideration of installation of traffic signal infrastructure, at a minimum, should be given with installation of the auxiliary turn lanes noted above. Overhead flashing beacons may be substituted for signal indications until such time that minimum MUTCD warrant criteria are satisfied for installation of signalized control based on the results of a full signal warrant study.
- A conceptual layout of the intersection with turn lanes and signal installation is shown in Figure 34 on the following page.

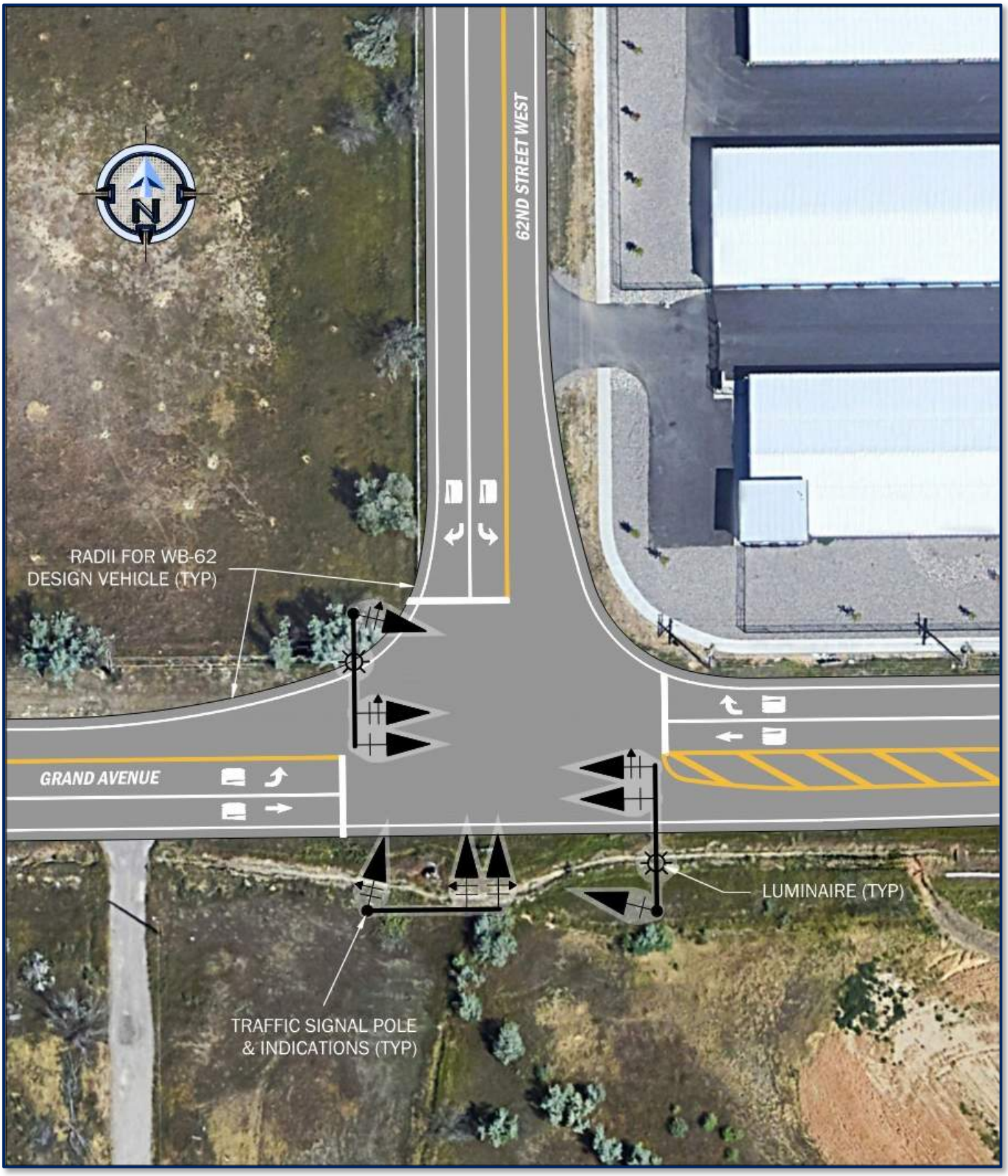


Figure 34: Grand Avenue & 62nd Street West Conceptual Intersection Geometry with Turn Lanes & Signalized Traffic Control

The need for mitigation at the intersection of Grand Avenue and 62nd Street West is based on **existing** conditions as well as with **continued growth of non-site generated traffic** through the year 2030. It is not directly related to traffic impacts resulting from the proposed Copper Square Subdivision, which only represents an estimated 0.7% and 1.0% of forecast 2030 and 2034 total traffic volumes, respectively, at the intersection.

Rimrock Road & 62nd Street West / Molt Road

The intersection of Rimrock Road and 62nd Street West / Molt Road as a whole is forecast to operate within acceptable levels of service (LOS C or better) through the 2034 analysis period; however, the eastbound approach is projected to experience increased average vehicle delays during the AM peak period. The following is presented for consideration:

- Anticipated traffic growth from development west of the intersection is the primary driver for the longer delays along with circulating volumes within the roundabout.
- Traffic contributions from the proposed Copper Square Subdivision are not anticipated to result in the need for mitigation at the intersection of Rimrock Road and 62nd Street West / Molt Road as evidenced by estimated 2030 and 2034 traffic operational analyses, noting favorable LOS results for the westbound and northbound approaches.
- Mitigation for the eastbound approach may be necessary with continued development west of the intersection in the future. The addition of a non-yielding right-turn lane on the eastbound approach may improve operations.

Rimrock Road & 58th Street West / Glynn Abbey Way

Vehicles on the northbound and southbound approaches may experience longer delays during the weekday, AM and PM peak periods with continued traffic growth on Rimrock Road. Projected traffic volumes at the intersection are not expected to meet minimum criteria for installation of a traffic signal under the analyzed conditions.

- It is anticipated that the City of Billings Rimrock Road widening project will provide a dedicated turn lane for westbound left-turns at 58th Street West.
- This mitigation is not anticipated to significantly improve traffic operations for the northbound, 58th Street West or southbound, Glynn Abbey Way approaches; however, it is anticipated to improve traffic flow for through vehicles on Rimrock Road and may also provide some safety benefits.

Rimrock Road & 54th Street West

Vehicles on the northbound and southbound approaches experience longer delays during weekday, peak periods, which is projected to continue with increased delays as traffic volumes grow on Rimrock Road. Likewise, the eastbound approach also experiences longer delays during the weekday, AM peak hour that will be exacerbated with continual traffic growth on Rimrock Road. The following is presented for consideration:

- Installation of dedicated eastbound and northbound right-turn lanes at the intersection to accommodate current and projected vehicular demand for those movements.

- Signal timing optimization updates for time-of-day plans may assist with improved overall intersection performance. This would also need to be evaluated with other coordinated signals to determine the appropriate cycle length, splits, and offsets.
- For ease of design and construction coordination, installation of turn lanes is recommended to be incorporated with the City of Billings Rimrock Road project between 54th Street West and 62nd Street West.
- A conceptual layout of the intersection with turn lanes and signal modifications is shown in Figure 35 on the following page.

Alternative Modes of Transportation

Pedestrians & Bicyclists

It is anticipated that sidewalk improvements will be included as development progresses to provide non-motorized user connectivity within Copper Square Subdivision.

Transit Service

No specific transit-oriented improvements are presently included with the project.

Improvements & Traffic Control Guidance

Included recommendations for mitigation and the proposed Copper Square Subdivision improvements should be installed according to City of Billings and/or Yellowstone County requirements (as applicable), the most current editions of the *Montana Public Works Standard Specifications*, Montana Department of Transportation requirements, and the *Manual on Uniform Traffic Control Devices*.

Financial Contributions

The City of Billings has established a policy where it may have a development mitigate its traffic impact to identified intersections by contributing monetarily towards the cost of the future improvements on a proportionate share basis. The proportionate share for a development is determined based on its traffic contributions to through and left-turn lane movements as compared to capacity thresholds for those movements specified by the City of Billings. Financial contribution proportionate shares for the study area intersections have been determined and are presented in Table 18 below and are included in Appendix I.

Table 18: Study Area Intersections Calculated Financial Contribution Percentages

Intersection	Calculated Intersection Financial Contribution Percentage
Grand Avenue & 62nd Street West	0.44%
Rimrock Road & 62nd Street West / Molt Road	1.33%
Rimrock Road & 58th Street West / Glynn Abbey Way	4.00%
Rimrock Road & 54th Street West	3.83%

Final contribution amounts will be determined by the City of Billings and will be based on the identified percentage applied to the City's most current cost participation monetary value.

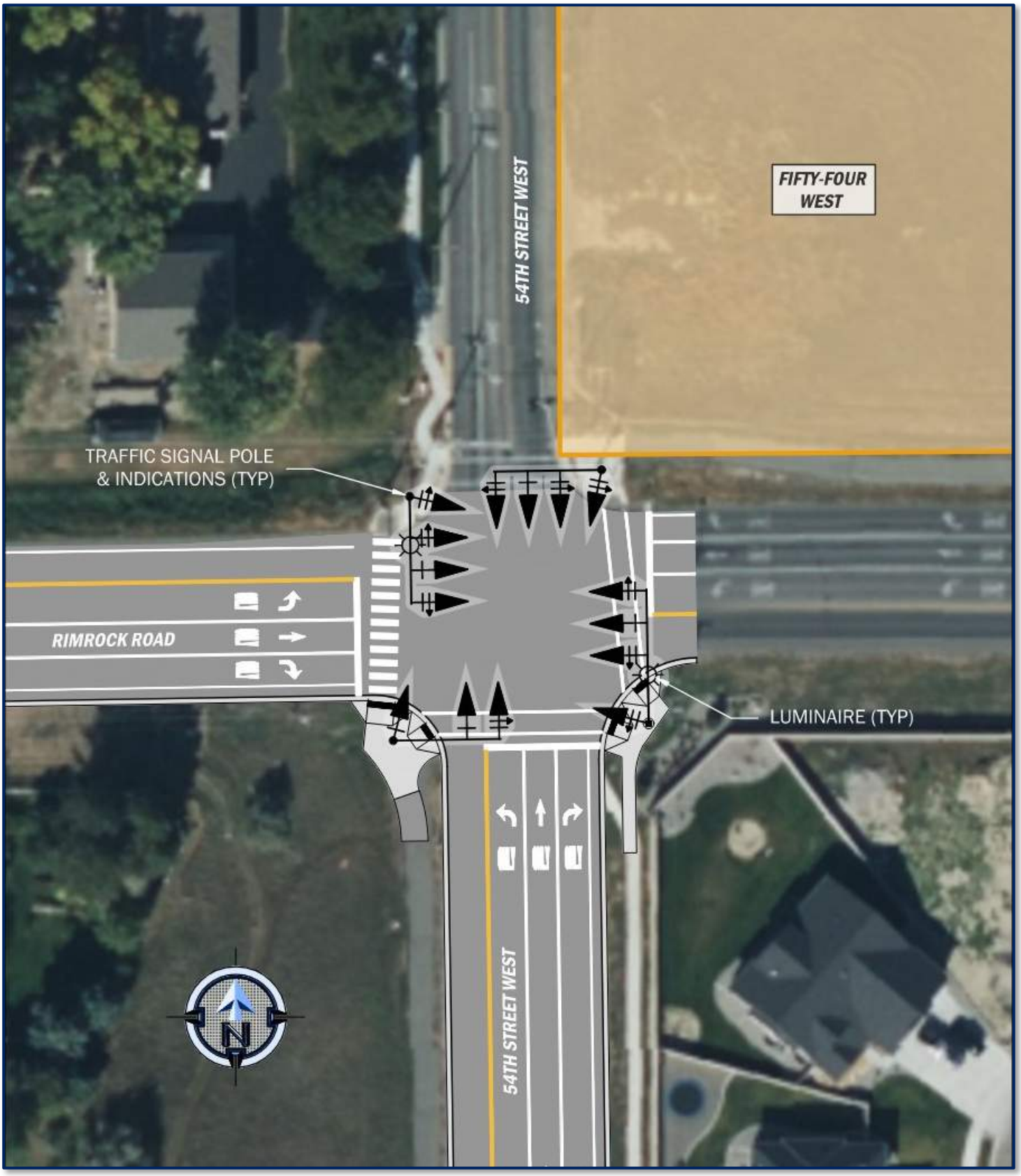


Figure 35: Rimrock Road & 54th Street West Conceptual Intersection Geometry with Turn Lanes & Signalized Traffic Control

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Appendix A

Level of Service Concepts, Analysis Methodologies, & Standards of Significance

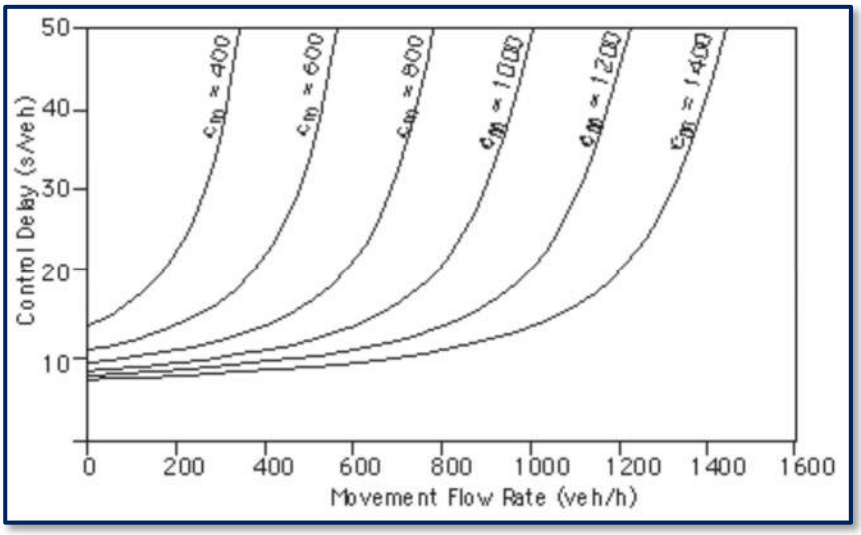
Unsignalized Intersection Level of Service

The method presented in the *Highway Capacity Manual, 7th Edition | A Guide for Multimodal Mobility Analysis* (HCM) published by the Transportation Research Board (TRB) for evaluating unsignalized, stop-controlled intersections is based on the average total delay for each impeded movement. As used here, total delay is defined as the total elapsed time from when a vehicle stops at the end of a queue until the vehicle departs from the stop line. This time includes the time required for the vehicle to travel from the last-in-queue to the first-in-queue position. The average total delay for any minor movement is a function of the service rate or capacity of the approach and the degree of saturation. The resulting delay is used to determine the level of service as shown in Table A-1 below.

Table A-1: Level of Service Criteria for Stop-Controlled Intersections

Average Control Delay	Level of Service (LOS)	Characteristics
≤ 10 seconds	A	Little or no delay
10.0 – 15.0 seconds	B	Short traffic delay
15.0 – 25.0 seconds	C	Average traffic delay
25.0 – 35.0 seconds	D	Long traffic delays
35.0 – 50.0 seconds	E	Very long traffic delays
> 50.0 seconds	F	When the demand exceeds the capacity of the lane, extreme delays will be encountered, and queuing may cause severe congestion to the intersection.

Source: *Highway Capacity Manual, 7th Edition | A Guide for Multimodal Mobility Analysis* (Transportation Research Board, 2022)



Source: *Highway Capacity Manual 2000,* Page 17-24 (Transportation Research Board, 2000)

Figure A-1: Control Delay and Flow Rate

Signalized Intersection Level of Service

The operational analysis method for signalized intersections presented in the HCM defines level of service in terms of delay, or more specifically, control stopped delay per vehicle. Delay is a measure of driver and/or passenger discomfort, frustration, fuel consumption, and lost travel time. The level of service criteria for signalized intersections is presented in Table A-2 below:

Table A-2: Level of Service Criteria for Signalized Intersections

Average Control Delay	Level of Service (LOS)	Characteristics
≤ 10 seconds	A	Operations with very low delay. This occurs when progression is extremely favorable, and most vehicles do not stop at all. Short cycle lengths may also contribute to low delay.
10.0 – 20.0 seconds	B	Operations with generally good progression and/or short cycle lengths. More vehicles stop than for LOS A, causing higher levels of average delay.
20.0 – 35.0 seconds	C	Operations with higher delays, which may result from fair progression and/or longer cycle lengths. Individual cycle failures may begin to appear at this level. The number of vehicles stopping is significant at this level, although many still pass through the intersection without stopping.
35.0 – 55.0 seconds	D	Operations with high delay, resulting from some combination of unfavorable progression, long cycle lengths, or high volumes. The influence of congestion becomes more noticeable, and individual cycle failures are noticeable.
55.0 – 80.0 seconds	E	Considered being the limit of acceptable delay. Individual cycle failures are frequent occurrences.
> 80.0 seconds	F	A condition of excessively high delay considered unacceptable to most drivers. This condition often occurs when arrival flow rates exceed the capacity of the intersection. Poor progression and long cycle lengths may also be major contributing causes to such delay.

Source: *Highway Capacity Manual, 7th Edition | A Guide for Multimodal Mobility Analysis* (Transportation Research Board, 2022)

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Appendix B

Traffic Count Data

Intersection Turning Movement Count Summary

Grand Avenue & 62nd Street West

Billings, Yellowstone County, Montana

Date Count Performed: September 30, October 1, October 2, 2025 (Average of Tuesday, Wednesday, & Thursday)

Count Time Periods: Weekday, 14-Hour Count (6:00 a.m. - 8:00 p.m.)

Data Collection Method: Video Traffic Recorder | Unit E5-07

Setup Location: Latitude: 45°47'03.52" N | Longitude: 108°40'24.17" W

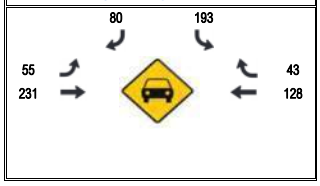
Weekday, AM Period

	GRAND AVENUE Eastbound (From the West)							GRAND AVENUE Westbound (From the East)							South Side of Grand Avenue							62ND STREET WEST Southbound (From the North)								
SEASONAL/ DAILY ADJ. FACTOR	0.970	0.970		0.960	1.000	1.000			0.970	0.970	0.960	1.000	1.000						1.000	1.000		0.970		0.970	0.970	1.000	1.000		INTERSECTION	HOURLY
START TIME	LEFT	THRU		U-TURN	PEDS	BIKES	VEHICLE TOTALS		THRU	RIGHT	U-TURN	PEDS	BIKES	VEHICLE TOTALS					PEDS	BIKES	VEHICLE TOTALS	LEFT		RIGHT	U-TURN	PEDS	BIKES	VEHICLE TOTALS	VEHICLE TOTALS	VOLUME
6:00 AM	5	15		0	0	0	20		11	5	0	0	0	16					0	0	0	10		7	0	0	0	17	53	
6:15 AM	5	27		0	0	0	32		13	3	0	0	0	16					0	0	0	13		9	0	0	0	22	70	
6:30 AM	10	30		0	0	0	40		20	6	0	0	0	26					0	0	0	24		15	0	0	0	39	105	
6:45 AM	9	40		0	0	0	49		28	8	0	0	0	36					0	0	0	25		16	0	0	0	41	126	354
7:00 AM	8	43		0	0	0	51		24	5	0	0	0	29					0	0	0	39		13	0	0	0	52	132	433
7:15 AM	11	60		0	0	0	71		29	8	0	0	0	37					0	0	0	41		14	0	0	0	55	163	526
7:30 AM	15	63		0	0	0	78		32	7	0	0	0	39					0	0	0	63		23	0	0	0	86	203	624
7:45 AM	13	58		0	0	0	71		36	20	0	0	0	56					0	0	0	64		23	0	0	0	87	214	712
8:00 AM	16	50		0	0	0	66		31	8	0	0	0	39					0	0	0	25		20	0	0	0	45	150	730
8:15 AM	10	37		0	0	0	47		32	11	0	0	0	43					0	0	0	28		17	0	0	0	45	135	702
8:30 AM	10	34		0	0	0	44		32	15	0	0	0	47					0	0	0	29		12	0	0	0	41	132	631
8:45 AM	14	37		0	0	0	51		24	7	0	0	0	31					0	0	0	23		15	0	0	0	38	120	537
9:00 AM	9	31		0	0	0	40		25	9	0	0	0	34					0	0	0	16		12	0	0	0	28	102	489
9:15 AM	9	36		0	0	0	45		27	7	0	0	0	34					0	0	0	14		9	0	0	0	23	102	456
9:30 AM	11	41		0	0	0	52		29	10	0	0	0	39					0	0	0	16		12	0	0	0	28	119	443
9:45 AM	16	37		0	0	0	53		28	7	0	0	0	35					0	0	0	16		10	0	0	0	26	114	437
10:00 AM	9	30		0	0	0	39		26	11	0	0	0	37					0	0	0	17		9	0	0	0	26	102	437
10:15 AM	12	27		0	0	0	39		32	10	0	0	0	42					0	0	0	20		7	0	0	0	27	108	443
10:30 AM	12	35		0	0	0	47		28	12	0	0	0	40					0	0	0	14		9	0	0	0	23	110	434
10:45 AM	8	33		0	0	0	41		29	9	0	0	0	38					0	0	0	22		11	0	0	0	33	112	432
11:00 AM	8	33		0	0	0	41		35	10	0	0	0	45					0	0	0	17		12	0	0	0	29	115	445
11:15 AM	10	35		0	0	0	45		35	10	0	0	0	45					0	0	0	16		8	0	0	0	24	114	451
11:30 AM	10	38		0	0	0	48		29	13	0	0	0	42					0	0	0	16		8	0	0	0	24	114	455
11:45 AM	11	41		0	0	0	52		34	17	0	0	0	51					0	0	0	19		9	0	0	0	28	131	474
TOTALS	**251**	**911**		**0**	**0**	**0**	**1,162**		**669**	**228**	**0**	**0**	**0**	**897**					**0**	**0**	**0**	**587**		**300**	**0**	**0**	**0**	**887**	**2,946**	

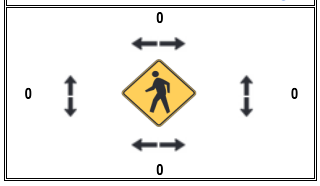
Weekday, AM Period - Peak Hour Summary

	GRAND AVENUE Eastbound (From the West)							GRAND AVENUE Westbound (From the East)							South Side of Grand Avenue							62ND STREET WEST Southbound (From the North)							
SEASONAL/ DAILY ADJ. FACTOR	0.970	0.970		0.960	1.000	1.000			0.970	0.970	0.960	1.000	1.000						1.000	1.000		0.970		0.970	0.970	1.000	1.000		INTERSECTION
START TIME	LEFT	THRU		U-TURN	PEDS	BIKES	VEHICLE TOTALS		THRU	RIGHT	U-TURN	PEDS	BIKES	VEHICLE TOTALS					PEDS	BIKES	VEHICLE TOTALS	LEFT		RIGHT	U-TURN	PEDS	BIKES	VEHICLE TOTALS	VEHICLE TOTALS
7:15 AM	11	60		0	0	0	71		29	8	0	0	0	37					0	0	0	41		14	0	0	0	55	163
7:30 AM	15	63		0	0	0	78		32	7	0	0	0	39					0	0	0	63		23	0	0	0	86	203
7:45 AM	13	58		0	0	0	71		36	20	0	0	0	56					0	0	0	64		23	0	0	0	87	214
8:00 AM	16	50		0	0	0	66		31	8	0	0	0	39					0	0	0	25		20	0	0	0	45	150
TOTALS	**55**	**231**		**0**	**0**	**0**	**286**		**128**	**43**	**0**	**0**	**0**	**171**					**0**	**0**	**0**	**193**		**80**	**0**	**0**	**0**	**273**	**730**
PEAK HOUR FACTOR	0.86	0.92		0.00	0.00	0.00	0.92		0.89	0.54	0.00	0.00	0.00	0.76					0.00	0.00	0.00	0.75		0.87	0.00	0.00	0.00	0.78	0.85
% HEAVY VEHICLES	18.18%	5.19%		0.00%			7.69%		3.13%	6.98%	0.00%			4.09%							0.00%	1.55%		6.25%	0.00%			2.93%	5.07%
% BUSES & RVs	0.00%	0.43%		0.00%			0.35%		0.00%	2.33%	0.00%			0.58%							0.00%	0.52%		0.00%	0.00%			0.37%	0.41%

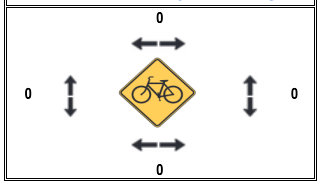
Total Vehicles | Weekday, AM Period Peak Hour



Peak Hour Total Pedestrians Crossing



Peak Hour Total Bicycles Crossing



Intersection Turning Movement Count Summary

Grand Avenue & 62nd Street West

Billings, Yellowstone County, Montana

Date Count Performed: September 30, October 1, October 2, 2025 (Average of Tuesday, Wednesday, & Thursday)

Count Time Periods: Weekday, 14-Hour Count (6:00 a.m. - 8:00 p.m.)

Data Collection Method: Video Traffic Recorder | Unit E5-07

Setup Location: Latitude: 45°47'03.52" N | Longitude: 108°40'24.17" W

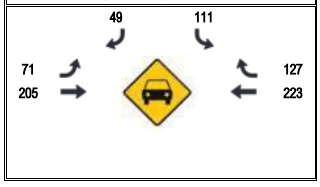
Weekday, PM Period

SEASONAL/ DAILY ADJ. FACTOR	GRAND AVENUE Eastbound (From the West)							GRAND AVENUE Westbound (From the East)							South Side of Grand Avenue							62ND STREET WEST Southbound (From the North)								
	0.970	0.970		0.960	1.000	1.000			0.970	0.970	0.960	1.000	1.000						1.000	1.000		0.970		0.970	0.970	1.000	1.000		INTERSECTION	HOURLY
START TIME	LEFT	THRU		U-TURN	PEDS	BIKES	VEHICLE TOTALS		THRU	RIGHT	U-TURN	PEDS	BIKES	VEHICLE TOTALS					PEDS	BIKES	VEHICLE TOTALS	LEFT		RIGHT	U-TURN	PEDS	BIKES	VEHICLE TOTALS	VEHICLE TOTALS	VOLUME
12:00 PM	11	38		0	0	0	49		36	16	0	0	0	52					0	0	0	21		7	0	0	0	28	129	488
12:15 PM	11	36		0	0	0	47		43	13	0	0	0	56					0	0	0	16		9	0	0	0	25	128	502
12:30 PM	14	35		0	0	0	49		43	16	0	0	0	59					0	0	0	19		11	0	0	0	30	138	526
12:45 PM	7	38		0	0	0	45		40	18	0	0	0	58					0	0	0	16		11	0	0	0	27	130	525
1:00 PM	7	36		0	0	0	43		36	19	0	0	0	55					0	0	0	16		11	0	0	0	27	125	521
1:15 PM	9	45		0	0	0	54		28	15	0	0	0	43					0	0	0	15		11	0	0	0	26	123	516
1:30 PM	6	32		0	0	0	38		47	11	0	0	0	58					0	0	0	16		9	0	0	0	25	121	499
1:45 PM	12	39		0	0	0	51		37	14	0	0	0	51					0	0	0	18		9	0	0	0	27	129	498
2:00 PM	13	26		0	0	0	39		38	12	0	0	0	50					0	0	0	16		12	0	0	0	28	117	490
2:15 PM	12	36		0	0	0	48		33	16	0	0	0	49					0	0	0	15		13	0	0	0	28	125	492
2:30 PM	15	41		0	0	0	56		50	18	0	0	0	68					0	0	0	17		11	0	0	0	28	152	523
2:45 PM	15	33		0	0	0	48		44	16	0	0	0	60					0	0	0	19		14	0	0	0	33	141	535
3:00 PM	15	42		0	0	0	57		45	16	0	0	0	61					0	0	0	23		16	0	0	0	39	157	575
3:15 PM	16	41		0	0	0	57		54	23	0	0	0	77					0	0	0	27		13	0	0	0	40	174	624
3:30 PM	21	43		0	0	0	64		53	22	0	0	0	75					0	0	0	22		16	0	0	0	38	177	649
3:45 PM	17	44		0	0	0	61		45	22	0	0	0	67					0	0	0	16		15	0	0	0	31	159	667
4:00 PM	16	59		0	0	0	75		49	23	0	0	0	72					0	0	0	20		13	0	0	0	33	180	690
4:15 PM	22	48		0	0	0	70		57	23	0	0	0	80					0	0	0	20		12	0	0	0	32	182	698
4:30 PM	20	51		0	0	0	71		49	22	0	0	0	71					0	0	0	19		14	0	0	0	33	175	696
4:45 PM	25	55		0	0	0	80		54	32	0	0	0	86					0	0	0	24		16	0	0	0	40	206	743
5:00 PM	17	62		0	0	0	79		55	27	0	0	0	82					0	0	0	35		15	0	0	0	50	211	774
5:15 PM	19	53		0	0	0	72		53	35	0	0	0	88					0	0	0	31		16	0	0	0	47	207	799
5:30 PM	16	47		0	0	0	63		54	39	0	0	0	93					0	0	0	23		10	0	0	0	33	189	813
5:45 PM	19	43		0	0	0	62		61	26	0	0	0	87					0	0	0	22		8	0	0	0	30	179	786
6:00 PM	12	38		0	0	0	50		46	23	0	0	0	69					0	0	0	20		10	0	0	0	30	149	724
6:15 PM	14	34		0	0	0	48		43	27	0	0	0	70					0	0	0	20		11	0	0	0	31	149	666
6:30 PM	10	39		0	0	0	49		41	23	0	0	0	64					0	0	0	19		8	0	0	0	27	140	617
6:45 PM	10	28		0	0	0	38		42	21	0	0	0	63					0	0	0	15		11	0	0	0	26	127	565
7:00 PM	9	29		0	0	0	38		37	26	0	0	0	63					0	0	0	15		9	0	0	0	24	125	541
7:15 PM	11	18		0	0	0	29		32	29	0	0	0	61					0	0	0	11		10	0	0	0	21	111	503
7:30 PM	10	23		0	0	0	33		43	27	0	0	0	70					0	0	0	8		9	0	0	0	17	120	483
7:45 PM	5	19		0	0	0	24		35	17	0	0	0	52					0	0	0	7		7	0	0	0	14	90	446
TOTALS	**436**	**1,251**		**0**	**0**	**0**	**1,687**		**1,423**	**687**	**0**	**0**	**0**	**2,110**					**0**	**0**	**0**	**601**		**367**	**0**	**0**	**0**	**968**	**4,765**	

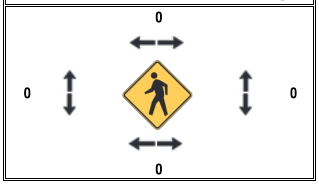
Weekday, PM Period - Peak Hour Summary

SEASONAL/ DAILY ADJ. FACTOR	GRAND AVENUE Eastbound (From the West)							GRAND AVENUE Westbound (From the East)							South Side of Grand Avenue							62ND STREET WEST Southbound (From the North)							
	0.970	0.970		0.960	1.000	1.000			0.970	0.970	0.960	1.000	1.000						1.000	1.000		0.970		0.970	0.970	1.000	1.000		INTERSECTION
START TIME	LEFT	THRU		U-TURN	PEDS	BIKES	VEHICLE TOTALS		THRU	RIGHT	U-TURN	PEDS	BIKES	VEHICLE TOTALS					PEDS	BIKES	VEHICLE TOTALS	LEFT		RIGHT	U-TURN	PEDS	BIKES	VEHICLE TOTALS	VEHICLE TOTALS
4:45 PM	17	62		0	0	0	79		55	27	0	0	0	82					0	0	0	35		15	0	0	0	50	211
5:00 PM	19	53		0	0	0	72		53	35	0	0	0	88					0	0	0	31		16	0	0	0	47	207
5:15 PM	16	47		0	0	0	63		54	39	0	0	0	93					0	0	0	23		10	0	0	0	33	189
5:30 PM	19	43		0	0	0	62		61	26	0	0	0	87					0	0	0	22		8	0	0	0	30	179
TOTALS	**71**	**205**		**0**	**0**	**0**	**276**		**223**	**127**	**0**	**0**	**0**	**350**					**0**	**0**	**0**	**111**		**49**	**0**	**0**	**0**	**160**	**786**
PEAK HOUR FACTOR	**0.93**	**0.83**		**0.00**	**0.00**	**0.00**	**0.87**		**0.91**	**0.81**	**0.00**	**0.00**	**0.00**	**0.94**					**0.00**	**0.00**	**0.00**	**0.79**		**0.77**	**0.00**	**0.00**	**0.00**	**0.80**	**0.93**
% HEAVY VEHICLES	**4.23%**	**1.95%**		**0.00%**			**2.54%**		**2.24%**	**0.00%**	**0.00%**			**1.43%**							**0.00%**	**2.70%**		**4.08%**	**0.00%**			**3.13%**	**2.16%**
% BUSES & RVs	**0.00%**	**0.00%**		**0.00%**			**0.00%**		**0.00%**	**0.00%**	**0.00%**			**0.00%**							**0.00%**	**0.00%**		**0.00%**	**0.00%**			**0.00%**	**0.00%**

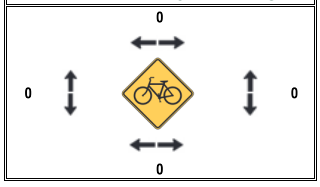
Total Vehicles | Weekday, PM Period Peak Hour



Peak Hour Total Pedestrians Crossing



Peak Hour Total Bicycles Crossing



Intersection Turning Movement Count Summary

Rimrock Road & 62nd Street West / Molt Road

Billings, Yellowstone County, Montana

Date Count Performed: September 30, October 1, October 2, 2025 (Average of Tuesday, Wednesday, & Thursday)

Count Time Periods: Weekday - AM, Midday, & PM Peaks (7:00 - 9:00 a.m. | 11:00 a.m. - 1:00 p.m. | 4:00 - 6:00 p.m.

Data Collection Method: Video Traffic Recorder | Unit E5-05

Setup Location: Latitude: 45°47'53.70" N | Longitude: 108°40'24.42" W

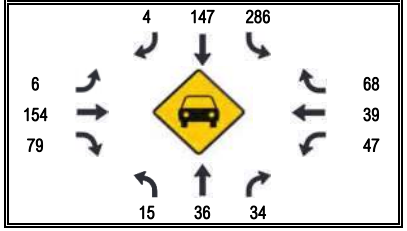
Weekday, AM Peak Period

	RIMROCK ROAD							RIMROCK ROAD							62ND STREET WEST							62ND STREET WEST / MOLT ROAD								
	Eastbound (From the West)							Westbound (From the East)							Northbound (From the South)							Southbound (From the North)								
SEASONAL/ DAILY ADJ. FACTOR	0.972	0.970	0.971	0.973	1.000	1.000		0.970	0.970	0.970	0.971	1.000	1.000		0.970	0.970	0.970	1.000	1.000	1.000		0.970	0.970	0.971	0.967	1.000	1.000		INTERSECTION	HOURLY
START TIME	LEFT	THRU	RIGHT	U-TURN	PEDS	BIKES	VEHICLE TOTALS	LEFT	THRU	RIGHT	U-TURN	PEDS	BIKES	VEHICLE TOTALS	LEFT	THRU	RIGHT	U-TURN	PEDS	BIKES	VEHICLE TOTALS	LEFT	THRU	RIGHT	U-TURN	PEDS	BIKES	VEHICLE TOTALS	VEHICLE TOTALS	VOLUME
7:00 AM	1	34	18	0	0	0	53	6	4	10	0	0	0	20	2	7	5	0	0	0	14	64	27	0	0	0	0	91	178	
7:15 AM	1	40	18	0	0	0	59	8	6	13	0	0	0	27	4	6	8	0	0	0	18	78	28	1	0	0	0	107	211	
7:30 AM	1	52	26	0	0	0	79	17	16	20	0	0	0	53	2	7	10	0	0	0	19	85	58	2	0	0	0	145	296	
7:45 AM	3	28	17	0	0	0	48	16	13	25	0	0	0	54	7	16	11	0	0	0	34	59	34	1	0	0	0	94	230	915
8:00 AM	0	20	6	0	0	0	26	17	13	27	0	0	0	57	3	11	11	0	0	0	25	38	23	1	0	0	0	62	170	907
8:15 AM	1	18	9	0	0	0	28	9	14	32	0	0	0	55	3	9	9	0	0	0	21	41	30	2	0	0	0	73	177	873
8:30 AM	0	18	8	0	0	0	26	9	12	29	0	0	0	50	6	10	8	0	0	0	24	46	22	1	0	0	0	69	169	746
8:45 AM	0	17	7	0	0	0	24	8	11	23	0	0	0	42	5	7	10	0	0	0	22	33	20	1	0	0	0	54	142	658
TOTALS	7	227	109	0	0	0	343	90	89	179	0	0	0	358	32	73	72	0	0	0	177	444	242	9	0	0	0	695	1,573	

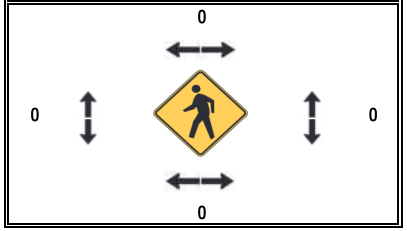
Weekday, AM Peak Period Summary

	RIMROCK ROAD							RIMROCK ROAD							62ND STREET WEST							62ND STREET WEST / MOLT ROAD							
	Eastbound (From the West)							Westbound (From the East)							Northbound (From the South)							Southbound (From the North)							
SEASONAL/ DAILY ADJ. FACTOR	0.972	0.970	0.971	0.973	1.000	1.000		0.970	0.970	0.970	0.971	1.000	1.000		0.970	0.970	0.970	1.000	1.000	1.000		0.970	0.970	0.971	0.967	1.000	1.000		INTERSECTION
START TIME	LEFT	THRU	RIGHT	U-TURN	PEDS	BIKES	VEHICLE TOTALS	LEFT	THRU	RIGHT	U-TURN	PEDS	BIKES	VEHICLE TOTALS	LEFT	THRU	RIGHT	U-TURN	PEDS	BIKES	VEHICLE TOTALS	LEFT	THRU	RIGHT	U-TURN	PEDS	BIKES	VEHICLE TOTALS	VEHICLE TOTALS
7:00 AM	1	34	18	0	0	0	53	6	4	10	0	0	0	20	2	7	5	0	0	0	14	64	27	0	0	0	0	91	178
7:15 AM	1	40	18	0	0	0	59	8	6	13	0	0	0	27	4	6	8	0	0	0	18	78	28	1	0	0	0	107	211
7:30 AM	1	52	26	0	0	0	79	17	16	20	0	0	0	53	2	7	10	0	0	0	19	85	58	2	0	0	0	145	296
7:45 AM	3	28	17	0	0	0	48	16	13	25	0	0	0	54	7	16	11	0	0	0	34	59	34	1	0	0	0	94	230
TOTALS	6	154	79	0	0	0	239	47	39	68	0	0	0	154	15	36	34	0	0	0	85	286	147	4	0	0	0	437	915
PEAK HOUR FACTOR	0.50	0.74	0.76	0.00	0.00	0.00	0.76	0.69	0.61	0.68	0.00	0.00	0.00	0.71	0.54	0.56	0.77	0.00	0.00	0.00	0.63	0.84	0.63	0.50	0.00	0.00	0.00	0.75	0.77
% HEAVY VEHICLES	14.29%	1.76%	0.92%	0.00%			1.75%	6.67%	10.11%	8.38%	0.00%			8.38%	15.63%	15.07%	8.33%	0.00%			12.43%	2.70%	3.31%	0.00%	0.00%			2.88%	4.96%
% BUSES & RVs	0.00%	1.32%	0.00%	0.00%			0.87%	0.00%	4.49%	2.23%	0.00%			2.23%	3.13%	0.00%	0.00%	0.00%			0.56%	1.35%	0.41%	0.00%	0.00%			1.01%	1.21%

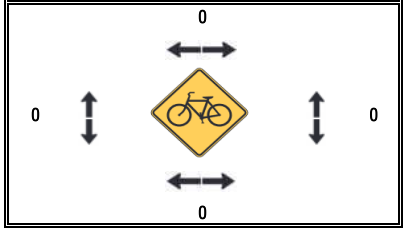
Total Vehicles | Weekday, AM Peak Period Peak Hour



Total Pedestrians | Weekday, AM Peak Period Peak Hour



Total Bicycles | Weekday, AM Peak Period Peak Hour



Intersection Turning Movement Count Summary

Rimrock Road & 62nd Street West / Molt Road

Billings, Yellowstone County, Montana

Date Count Performed: September 30, October 1, October 2, 2025 (Average of Tuesday, Wednesday, & Thursday)

Count Time Periods: Weekday - AM, Midday, & PM Peaks (7:00 - 9:00 a.m. | 11:00 a.m. - 1:00 p.m. | 4:00 - 6:00 p.m.

Data Collection Method: Video Traffic Recorder | Unit E5-05

Setup Location: Latitude: 45°47'53.70" N | Longitude: 108°40'24.42" W

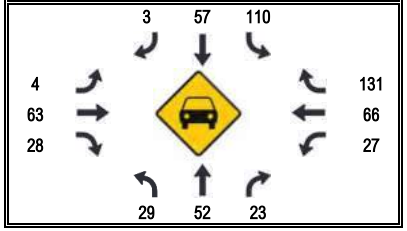
Weekday, Midday Peak Period

	RIMROCK ROAD							RIMROCK ROAD							62ND STREET WEST							62ND STREET WEST / MOLT ROAD								
	Eastbound (From the West)							Westbound (From the East)							Northbound (From the South)							Southbound (From the North)								
SEASONAL/ DAILY ADJ. FACTOR	0.972	0.970	0.971	0.973	1.000	1.000		0.970	0.970	0.970	0.971	1.000	1.000		0.970	0.970	0.970	1.000	1.000	1.000		0.970	0.970	0.971	0.967	1.000	1.000		INTERSECTION	HOURLY
START TIME	LEFT	THRU	RIGHT	U-TURN	PEDS	BIKES	VEHICLE TOTALS	LEFT	THRU	RIGHT	U-TURN	PEDS	BIKES	VEHICLE TOTALS	LEFT	THRU	RIGHT	U-TURN	PEDS	BIKES	VEHICLE TOTALS	LEFT	THRU	RIGHT	U-TURN	PEDS	BIKES	VEHICLE TOTALS	VEHICLE TOTALS	VOLUME
11:00 AM	1	14	9	0	0	0	24	8	15	24	0	0	0	47	3	10	4	0	0	0	17	29	13	2	0	0	0	44	132	
11:15 AM	0	16	7	0	0	0	23	5	13	28	0	0	0	46	3	11	6	0	0	0	20	20	11	1	0	0	0	32	121	
11:30 AM	0	16	4	0	0	0	20	6	16	27	0	0	0	49	5	13	5	0	0	0	23	27	15	1	0	0	0	43	135	
11:45 AM	0	13	6	0	0	0	19	4	16	36	0	0	0	56	7	14	6	0	0	0	27	23	16	0	0	0	0	39	141	529
12:00 PM	1	17	6	0	0	0	24	6	19	32	0	0	0	57	8	13	6	0	0	0	27	27	17	0	0	0	0	44	152	549
12:15 PM	0	12	9	0	0	0	21	7	16	33	0	0	0	56	9	10	5	0	0	0	24	26	10	0	0	0	0	36	137	565
12:30 PM	0	19	5	0	0	0	24	9	15	26	0	0	0	50	6	16	7	0	0	0	29	30	18	2	0	0	0	50	153	583
12:45 PM	3	15	8	0	0	0	26	5	16	40	0	0	0	61	6	13	5	0	0	0	24	27	12	1	0	0	0	40	151	593
TOTALS	**5**	**122**	**54**	**0**	**0**	**0**	**181**	**50**	**126**	**246**	**0**	**0**	**0**	**422**	**47**	**100**	**44**	**0**	**0**	**0**	**191**	**209**	**112**	**7**	**0**	**0**	**0**	**328**	**1,122**	

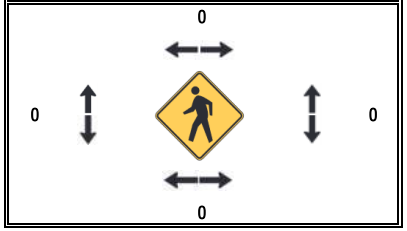
Weekday, Midday Peak Period Summary

	RIMROCK ROAD							RIMROCK ROAD							62ND STREET WEST							62ND STREET WEST / MOLT ROAD							
	Eastbound (From the West)							Westbound (From the East)							Northbound (From the South)							Southbound (From the North)							
SEASONAL/ DAILY ADJ. FACTOR	0.972	0.970	0.971	0.973	1.000	1.000		0.970	0.970	0.970	0.971	1.000	1.000		0.970	0.970	0.970	1.000	1.000	1.000		0.970	0.970	0.971	0.967	1.000	1.000		INTERSECTION
START TIME	LEFT	THRU	RIGHT	U-TURN	PEDS	BIKES	VEHICLE TOTALS	LEFT	THRU	RIGHT	U-TURN	PEDS	BIKES	VEHICLE TOTALS	LEFT	THRU	RIGHT	U-TURN	PEDS	BIKES	VEHICLE TOTALS	LEFT	THRU	RIGHT	U-TURN	PEDS	BIKES	VEHICLE TOTALS	VEHICLE TOTALS
12:00 PM	1	17	6	0	0	0	24	6	19	32	0	0	0	57	8	13	6	0	0	0	27	27	17	0	0	0	0	44	152
12:15 PM	0	12	9	0	0	0	21	7	16	33	0	0	0	56	9	10	5	0	0	0	24	26	10	0	0	0	0	36	137
12:30 PM	0	19	5	0	0	0	24	9	15	26	0	0	0	50	6	16	7	0	0	0	29	30	18	2	0	0	0	50	153
12:45 PM	3	15	8	0	0	0	26	5	16	40	0	0	0	61	6	13	5	0	0	0	24	27	12	1	0	0	0	40	151
TOTALS	**4**	**63**	**28**	**0**	**0**	**0**	**95**	**27**	**66**	**131**	**0**	**0**	**0**	**224**	**29**	**52**	**23**	**0**	**0**	**0**	**104**	**110**	**57**	**3**	**0**	**0**	**0**	**170**	**593**
PEAK HOUR FACTOR	0.33	0.83	0.78	0.00	0.00	0.00	0.91	0.75	0.87	0.82	0.00	0.00	0.00	0.92	0.81	0.81	0.82	0.00	0.00	0.00	0.90	0.92	0.79	0.38	0.00	0.00	0.00	0.85	0.97
% HEAVY VEHICLES	0.00%	4.10%	3.70%	0.00%			3.87%	8.00%	2.38%	4.47%	0.00%			4.27%	2.13%	6.00%	6.82%	0.00%			5.24%	7.18%	4.46%	14.29%	0.00%			6.40%	4.99%
% BUSES & RVs	0.00%	0.00%	1.85%	0.00%			0.55%	0.00%	0.00%	0.81%	0.00%			0.47%	0.00%	0.00%	0.00%	0.00%			0.00%	0.48%	0.00%	0.00%	0.00%			0.30%	0.36%

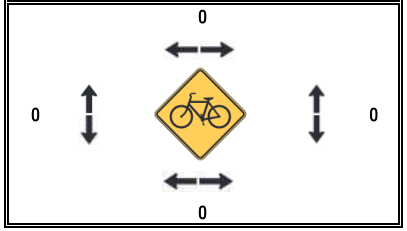
Total Vehicles | Weekday, Midday Peak Period Peak Hour



Total Pedestrians | Weekday, Midday Peak Period Peak Hour



Total Bicycles | Weekday, Midday Peak Period Peak Hour



Intersection Turning Movement Count Summary

Rimrock Road & 62nd Street West / Molt Road

Billings, Yellowstone County, Montana

Date Count Performed: September 30, October 1, October 2, 2025 (Average of Tuesday, Wednesday, & Thursday)

Count Time Periods: Weekday - AM, Midday, & PM Peaks (7:00 - 9:00 a.m. | 11:00 a.m. - 1:00 p.m. | 4:00 - 6:00 p.m.

Data Collection Method: Video Traffic Recorder | Unit E5-05

Setup Location: Latitude: 45°47'53.70" N | Longitude: 108°40'24.42" W

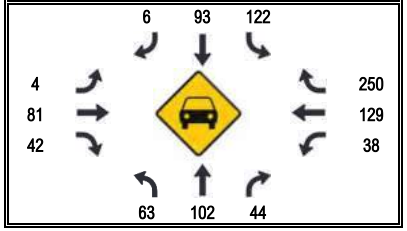
Weekday, PM Peak Period

	RIMROCK ROAD							RIMROCK ROAD							62ND STREET WEST							62ND STREET WEST / MOLT ROAD								
	Eastbound (From the West)							Westbound (From the East)							Northbound (From the South)							Southbound (From the North)								
SEASONAL/ DAILY ADJ. FACTOR	0.972	0.970	0.971	0.973	1.000	1.000		0.970	0.970	0.970	0.971	1.000	1.000		0.970	0.970	0.970	1.000	1.000	1.000		0.970	0.970	0.971	0.967	1.000	1.000		INTERSECTION	HOURLY
START TIME	LEFT	THRU	RIGHT	U-TURN	PEDS	BIKES	VEHICLE TOTALS	LEFT	THRU	RIGHT	U-TURN	PEDS	BIKES	VEHICLE TOTALS	LEFT	THRU	RIGHT	U-TURN	PEDS	BIKES	VEHICLE TOTALS	LEFT	THRU	RIGHT	U-TURN	PEDS	BIKES	VEHICLE TOTALS	VEHICLE TOTALS	VOLUME
4:00 PM	0	18	4	0	0	0	22	9	23	45	0	0	0	77	8	17	11	0	0	0	36	36	16	1	0	0	0	53	188	
4:15 PM	1	22	4	0	0	0	27	10	28	48	0	1	1	86	12	20	15	0	0	0	47	28	19	0	0	0	0	47	207	
4:30 PM	1	18	7	0	0	0	26	11	32	52	0	0	0	95	13	19	10	0	0	0	42	34	15	0	0	0	1	49	212	
4:45 PM	1	21	8	0	0	0	30	13	27	53	1	0	0	94	15	32	11	0	0	0	58	34	21	1	0	0	0	56	238	845
5:00 PM	0	25	15	0	0	0	40	7	28	55	1	0	0	91	12	21	11	0	0	0	44	31	26	2	0	0	0	59	234	891
5:15 PM	2	18	12	0	0	0	32	13	37	74	1	0	0	125	16	27	10	0	0	1	53	32	25	2	0	0	0	59	269	953
5:30 PM	1	17	7	0	0	0	25	5	37	68	0	0	0	110	20	22	12	0	0	0	54	25	21	1	0	0	0	47	236	977
5:45 PM	1	22	7	0	0	0	30	7	37	58	1	0	0	103	15	23	9	0	0	0	47	28	17	1	0	0	0	46	226	965
TOTALS	**7**	**161**	**64**	**0**	**0**	**0**	**232**	**75**	**249**	**453**	**4**	**1**	**1**	**781**	**111**	**181**	**89**	**0**	**0**	**1**	**381**	**248**	**160**	**8**	**0**	**0**	**1**	**416**	**1,810**	

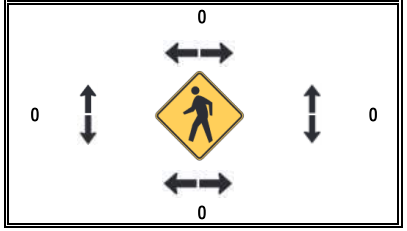
Weekday, PM Peak Period Summary

	RIMROCK ROAD							RIMROCK ROAD							62ND STREET WEST							62ND STREET WEST / MOLT ROAD							
	Eastbound (From the West)							Westbound (From the East)							Northbound (From the South)							Southbound (From the North)							
SEASONAL/ DAILY ADJ. FACTOR	0.972	0.970	0.971	0.973	1.000	1.000		0.970	0.970	0.970	0.971	1.000	1.000		0.970	0.970	0.970	1.000	1.000	1.000		0.970	0.970	0.971	0.967	1.000	1.000		INTERSECTION
START TIME	LEFT	THRU	RIGHT	U-TURN	PEDS	BIKES	VEHICLE TOTALS	LEFT	THRU	RIGHT	U-TURN	PEDS	BIKES	VEHICLE TOTALS	LEFT	THRU	RIGHT	U-TURN	PEDS	BIKES	VEHICLE TOTALS	LEFT	THRU	RIGHT	U-TURN	PEDS	BIKES	VEHICLE TOTALS	VEHICLE TOTALS
4:45 PM	1	21	8	0	0	0	30	13	27	53	1	0	0	94	15	32	11	0	0	0	58	34	21	1	0	0	0	56	238
5:00 PM	0	25	15	0	0	0	40	7	28	55	1	0	0	91	12	21	11	0	0	0	44	31	26	2	0	0	0	59	234
5:15 PM	2	18	12	0	0	0	32	13	37	74	1	0	0	125	16	27	10	0	0	1	53	32	25	2	0	0	0	59	269
5:30 PM	1	17	7	0	0	0	25	5	37	68	0	0	0	110	20	22	12	0	0	0	54	25	21	1	0	0	0	47	236
TOTALS	**4**	**81**	**42**	**0**	**0**	**0**	**127**	**38**	**129**	**250**	**3**	**0**	**0**	**420**	**63**	**102**	**44**	**0**	**0**	**1**	**209**	**122**	**93**	**6**	**0**	**0**	**0**	**221**	**977**
PEAK HOUR FACTOR	0.50	0.81	0.70	0.00	0.00	0.00	0.79	0.73	0.87	0.84	0.75	0.00	0.00	0.84	0.79	0.80	0.92	0.00	0.00	0.25	0.90	0.90	0.89	0.75	0.00	0.00	0.00	0.94	0.91
% HEAVY VEHICLES	0.00%	1.86%	0.00%	0.00%			1.29%	4.00%	0.40%	0.88%	0.00%			1.02%	0.00%	1.10%	1.12%	0.00%			0.79%	3.23%	2.50%	0.00%	0.00%			2.88%	1.44%
% BUSES & RVs	0.00%	1.24%	0.00%	0.00%			0.86%	0.00%	0.00%	0.44%	0.00%			0.26%	0.00%	0.00%	0.00%	0.00%			0.00%	1.21%	0.63%	0.00%	0.00%			0.96%	0.44%

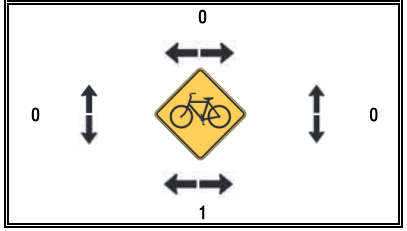
Total Vehicles | Weekday, PM Peak Period Peak Hour



Total Pedestrians | Weekday, PM Peak Period Peak Hour



Total Bicycles | Weekday, PM Peak Period Peak Hour



Intersection Turning Movement Count Summary

Rimrock Road & 58th Street West / Glynn Abbey Way

Billings, Yellowstone County, Montana

Date Count Performed: September 30, October 1, October 2, 2025 (Average of Tuesday, Wednesday, & Thursday)

Count Time Periods: Weekday - AM, Midday, & PM Peaks (7:00 - 9:00 a.m. | 11:00 a.m. - 1:00 p.m. | 4:00 - 6:00 p.m.

Data Collection Method: Video Traffic Recorder | Unit E5-09

Setup Location: Latitude: 45°47'53.70" N | Longitude: 108°40'24.42" W

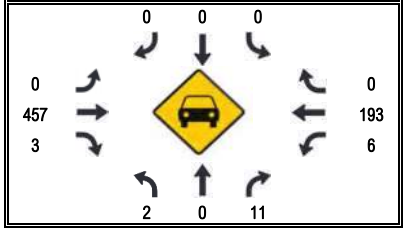
Weekday, AM Peak Period

	RIMROCK ROAD							RIMROCK ROAD							58TH STREET WEST							GLYNN ABBEY WAY								
	Eastbound (From the West)							Westbound (From the East)							Northbound (From the South)							Southbound (From the North)								
SEASONAL/ DAILY ADJ. FACTOR	0.970	0.970	0.968	1.000	1.000	1.000		0.967	0.970	0.967	1.000	1.000	1.000		0.969	0.967	0.971	1.000	1.000	1.000		0.973	0.970	0.971	1.000	1.000	1.000			
START TIME	LEFT	THRU	RIGHT	U-TURN	PEDS	BIKES	VEHICLE TOTALS	LEFT	THRU	RIGHT	U-TURN	PEDS	BIKES	VEHICLE TOTALS	LEFT	THRU	RIGHT	U-TURN	PEDS	BIKES	VEHICLE TOTALS	LEFT	THRU	RIGHT	U-TURN	PEDS	BIKES	VEHICLE TOTALS	INTERSECTION VEHICLE TOTALS	HOURLY VOLUME
7:00 AM	0	104	1	0	0	0	105	0	21	0	0	0	0	21	0	0	2	0	0	0	2	0	0	0	0	0	0	0	128	
7:15 AM	0	130	0	0	0	0	130	1	28	0	0	0	0	29	1	0	4	0	0	0	5	0	0	0	0	0	0	0	164	
7:30 AM	0	151	1	0	0	0	152	2	55	0	0	0	0	57	0	0	3	0	0	0	3	0	0	0	0	0	0	0	212	
7:45 AM	0	102	1	0	0	0	103	2	56	0	0	0	0	58	0	0	3	0	0	0	3	0	0	0	0	0	0	0	164	668
8:00 AM	0	74	1	0	0	0	75	1	54	0	0	0	0	55	1	0	1	0	0	0	2	0	0	0	0	0	0	0	132	672
8:15 AM	0	68	0	0	0	0	68	1	52	0	0	0	0	53	0	0	4	0	0	0	4	0	0	0	0	0	0	0	125	633
8:30 AM	0	73	0	0	0	0	73	1	45	0	0	0	0	46	0	0	2	0	0	0	2	0	0	0	0	1	0	0	121	542
8:45 AM	0	65	0	0	0	0	65	0	43	0	0	0	0	43	0	0	2	0	0	0	2	0	0	0	0	0	0	0	110	488
TOTALS	**0**	**767**	**4**	**0**	**0**	**0**	**771**	**8**	**354**	**0**	**0**	**0**	**0**	**362**	**2**	**0**	**21**	**0**	**0**	**0**	**23**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**1,156**	

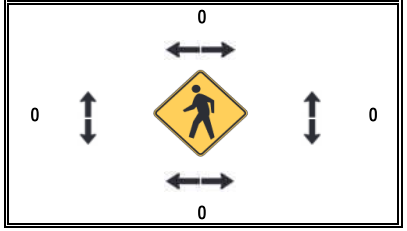
Weekday, AM Peak Period Summary

	RIMROCK ROAD							RIMROCK ROAD							58TH STREET WEST							GLYNN ABBEY WAY							
	Eastbound (From the West)							Westbound (From the East)							Northbound (From the South)							Southbound (From the North)							
SEASONAL/ DAILY ADJ. FACTOR	0.970	0.970	0.968	1.000	1.000	1.000		0.967	0.970	0.967	1.000	1.000	1.000		0.969	0.967	0.971	1.000	1.000	1.000		0.973	0.970	0.971	1.000	1.000	1.000		
START TIME	LEFT	THRU	RIGHT	U-TURN	PEDS	BIKES	VEHICLE TOTALS	LEFT	THRU	RIGHT	U-TURN	PEDS	BIKES	VEHICLE TOTALS	LEFT	THRU	RIGHT	U-TURN	PEDS	BIKES	VEHICLE TOTALS	LEFT	THRU	RIGHT	U-TURN	PEDS	BIKES	VEHICLE TOTALS	INTERSECTION VEHICLE TOTALS
7:15 AM	0	130	0	0	0	0	130	1	28	0	0	0	0	29	1	0	4	0	0	0	5	0	0	0	0	0	0	0	164
7:30 AM	0	151	1	0	0	0	152	2	55	0	0	0	0	57	0	0	3	0	0	0	3	0	0	0	0	0	0	0	212
7:45 AM	0	102	1	0	0	0	103	2	56	0	0	0	0	58	0	0	3	0	0	0	3	0	0	0	0	0	0	0	164
8:00 AM	0	74	1	0	0	0	75	1	54	0	0	0	0	55	1	0	1	0	0	0	2	0	0	0	0	0	0	0	132
TOTALS	**0**	**457**	**3**	**0**	**0**	**0**	**460**	**6**	**193**	**0**	**0**	**0**	**0**	**199**	**2**	**0**	**11**	**0**	**0**	**0**	**13**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**672**
PEAK HOUR FACTOR	0.00	0.76	0.75	0.00	0.00	0.00	0.76	0.75	0.86	0.00	0.00	0.00	0.00	0.86	0.50	0.00	0.69	0.00	0.00	0.00	0.65	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.79
% HEAVY VEHICLES	0.00%	3.26%	25.00%	0.00%			3.37%	0.00%	9.32%	0.00%	0.00%			9.12%	100.00%	0.00%	0.00%	0.00%			8.70%	0.00%	0.00%	0.00%	0.00%			0.00%	5.28%
% BUSES & RVs	0.00%	1.30%	25.00%	0.00%			1.43%	0.00%	2.54%	0.00%	0.00%			2.49%	50.00%	0.00%	0.00%	0.00%			4.35%	0.00%	0.00%	0.00%	0.00%			0.00%	1.82%

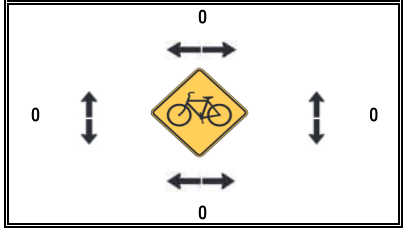
Total Vehicles | Weekday, AM Peak Period Peak Hour



Total Pedestrians | Weekday, AM Peak Period Peak Hour



Total Bicycles | Weekday, AM Peak Period Peak Hour



Intersection Turning Movement Count Summary

Rimrock Road & 58th Street West / Glynn Abbey Way

Billings, Yellowstone County, Montana

Date Count Performed: September 30, October 1, October 2, 2025 (Average of Tuesday, Wednesday, & Thursday)

Count Time Periods: Weekday - AM, Midday, & PM Peaks (7:00 - 9:00 a.m. | 11:00 a.m. - 1:00 p.m. | 4:00 - 6:00 p.m.

Data Collection Method: Video Traffic Recorder | Unit E5-09

Setup Location: Latitude: 45°47'53.70" N | Longitude: 108°40'24.42" W

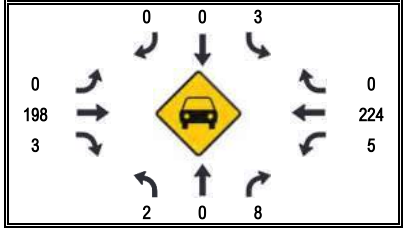
Weekday, Midday Peak Period

	RIMROCK ROAD							RIMROCK ROAD							58TH STREET WEST							GLYNN ABBEY WAY								
	Eastbound (From the West)							Westbound (From the East)							Northbound (From the South)							Southbound (From the North)								
SEASONAL/ DAILY ADJ. FACTOR	0.970	0.970	0.968	1.000	1.000	1.000		0.967	0.970	0.967	1.000	1.000	1.000		0.969	0.967	0.971	1.000	1.000	1.000		0.973	0.970	0.971	1.000	1.000	1.000		INTERSECTION	HOURLY
START TIME	LEFT	THRU	RIGHT	U-TURN	PEDS	BIKES	VEHICLE TOTALS	LEFT	THRU	RIGHT	U-TURN	PEDS	BIKES	VEHICLE TOTALS	LEFT	THRU	RIGHT	U-TURN	PEDS	BIKES	VEHICLE TOTALS	LEFT	THRU	RIGHT	U-TURN	PEDS	BIKES	VEHICLE TOTALS	VEHICLE TOTALS	VOLUME
11:00 AM	0	44	0	0	0	0	44	3	48	0	0	0	0	51	0	0	2	0	0	0	2	0	0	1	0	0	0	1	98	
11:15 AM	0	48	0	0	0	0	48	1	49	0	0	0	0	50	0	0	2	0	0	0	2	0	1	1	0	0	0	2	102	
11:30 AM	0	49	0	0	0	0	49	1	51	0	0	0	0	52	1	0	1	0	0	0	2	0	0	0	0	0	0	0	103	
11:45 AM	0	43	1	0	0	0	44	1	56	0	0	0	0	57	1	0	0	0	0	0	1	1	0	0	0	0	0	1	103	406
12:00 PM	0	49	0	0	0	0	49	3	59	0	0	0	0	62	1	0	2	0	0	0	3	1	0	0	0	0	0	1	115	423
12:15 PM	0	46	1	0	0	0	47	1	53	0	0	0	0	54	0	0	3	0	0	0	3	1	0	0	0	0	0	1	105	426
12:30 PM	0	54	1	0	0	0	55	0	51	0	0	0	0	51	0	0	1	0	0	0	1	1	0	0	0	0	0	1	108	431
12:45 PM	0	49	1	0	0	0	50	1	61	0	0	0	0	62	1	0	2	0	0	0	3	0	0	0	0	0	0	0	115	443
TOTALS	0	382	4	0	0	0	386	11	428	0	0	0	0	439	4	0	13	0	0	0	17	4	1	2	0	0	0	7	849	

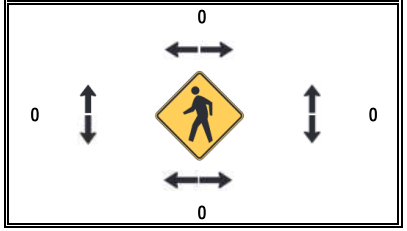
Weekday, Midday Peak Period Summary

	RIMROCK ROAD							RIMROCK ROAD							58TH STREET WEST							GLYNN ABBEY WAY							
	Eastbound (From the West)							Westbound (From the East)							Northbound (From the South)							Southbound (From the North)							
SEASONAL/ DAILY ADJ. FACTOR	0.970	0.970	0.968	1.000	1.000	1.000		0.967	0.970	0.967	1.000	1.000	1.000		0.969	0.967	0.971	1.000	1.000	1.000		0.973	0.970	0.971	1.000	1.000	1.000		INTERSECTION
START TIME	LEFT	THRU	RIGHT	U-TURN	PEDS	BIKES	VEHICLE TOTALS	LEFT	THRU	RIGHT	U-TURN	PEDS	BIKES	VEHICLE TOTALS	LEFT	THRU	RIGHT	U-TURN	PEDS	BIKES	VEHICLE TOTALS	LEFT	THRU	RIGHT	U-TURN	PEDS	BIKES	VEHICLE TOTALS	VEHICLE TOTALS
12:00 PM	0	49	0	0	0	0	49	3	59	0	0	0	0	62	1	0	2	0	0	0	3	1	0	0	0	0	0	1	115
12:15 PM	0	46	1	0	0	0	47	1	53	0	0	0	0	54	0	0	3	0	0	0	3	1	0	0	0	0	0	1	105
12:30 PM	0	54	1	0	0	0	55	0	51	0	0	0	0	51	0	0	1	0	0	0	1	1	0	0	0	0	0	1	108
12:45 PM	0	49	1	0	0	0	50	1	61	0	0	0	0	62	1	0	2	0	0	0	3	0	0	0	0	0	0	0	115
TOTALS	0	198	3	0	0	0	201	5	224	0	0	0	0	229	2	0	8	0	0	0	10	3	0	0	0	0	0	3	443
PEAK HOUR FACTOR	0.00	0.92	0.75	0.00	0.00	0.00	0.91	0.42	0.92	0.00	0.00	0.00	0.00	0.92	0.50	0.00	0.67	0.00	0.00	0.00	0.83	0.75	0.00	0.00	0.00	0.00	0.00	0.75	0.96
% HEAVY VEHICLES	0.00%	6.02%	0.00%	0.00%			5.96%	0.00%	5.37%	0.00%	0.00%			5.24%	0.00%	0.00%	0.00%	0.00%			0.00%	0.00%	0.00%	0.00%	0.00%			0.00%	5.42%
% BUSES & RVs	0.00%	0.26%	0.00%	0.00%			0.26%	0.00%	0.70%	0.00%	0.00%			0.68%	0.00%	0.00%	0.00%	0.00%			0.00%	0.00%	0.00%	0.00%	0.00%			0.00%	0.47%

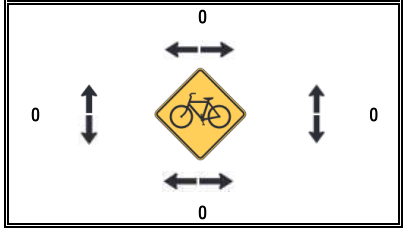
Total Vehicles | Weekday, Midday Peak Period Peak Hour



Total Pedestrians | Weekday, Midday Peak Period Peak Hour



Total Bicycles | Weekday, Midday Peak Period Peak Hour



Intersection Turning Movement Count Summary

Rimrock Road & 58th Street West / Glynn Abbey Way

Billings, Yellowstone County, Montana

Date Count Performed: September 30, October 1, October 2, 2025 (Average of Tuesday, Wednesday, & Thursday)

Count Time Periods: Weekday - AM, Midday, & PM Peaks (7:00 - 9:00 a.m. | 11:00 a.m. - 1:00 p.m. | 4:00 - 6:00 p.m.

Data Collection Method: Video Traffic Recorder | Unit E5-09

Setup Location: Latitude: 45°47'53.70" N | Longitude: 108°40'24.42" W

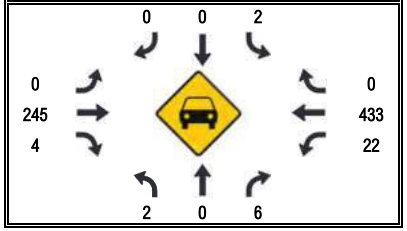
Weekday, PM Peak Period

	RIMROCK ROAD							RIMROCK ROAD							58TH STREET WEST							GLYNN ABBEY WAY								
	Eastbound (From the West)							Westbound (From the East)							Northbound (From the South)							Southbound (From the North)								
SEASONAL/ DAILY ADJ. FACTOR	0.970	0.970	0.968	1.000	1.000	1.000		0.967	0.970	0.967	1.000	1.000	1.000		0.969	0.967	0.971	1.000	1.000	1.000		0.973	0.970	0.971	1.000	1.000	1.000		INTERSECTION	HOURLY
START TIME	LEFT	THRU	RIGHT	U-TURN	PEDS	BIKES	VEHICLE TOTALS	LEFT	THRU	RIGHT	U-TURN	PEDS	BIKES	VEHICLE TOTALS	LEFT	THRU	RIGHT	U-TURN	PEDS	BIKES	VEHICLE TOTALS	LEFT	THRU	RIGHT	U-TURN	PEDS	BIKES	VEHICLE TOTALS	VEHICLE TOTALS	VOLUME
4:00 PM	0	63	0	0	0	0	63	2	79	0	0	0	0	81	1	0	1	0	0	0	2	0	0	0	0	0	0	0	146	
4:15 PM	1	66	1	0	0	0	68	1	88	0	0	0	0	89	1	0	2	0	0	0	3	0	0	0	0	0	0	0	160	
4:30 PM	0	62	0	0	0	0	62	2	92	0	0	0	0	94	1	0	1	0	0	0	2	2	0	0	0	0	1	2	160	
4:45 PM	0	65	1	0	0	0	66	2	94	1	0	0	0	97	0	0	1	0	0	0	1	0	1	0	0	0	0	1	165	631
5:00 PM	0	72	1	0	0	0	73	4	99	0	0	0	0	103	0	0	2	0	0	0	2	0	0	0	0	0	0	0	178	663
5:15 PM	0	60	0	0	0	0	60	5	120	0	0	0	0	125	1	0	1	0	0	0	2	1	0	0	0	0	0	1	188	691
5:30 PM	0	52	2	0	0	0	54	7	112	0	0	0	0	119	1	0	2	0	0	0	3	0	0	0	0	0	0	0	176	707
5:45 PM	0	61	1	0	0	0	62	6	102	0	0	0	0	108	0	0	1	0	0	0	1	1	0	0	0	0	0	1	172	714
TOTALS	1	501	6	0	0	0	508	29	786	1	0	0	0	816	5	0	11	0	0	0	16	4	1	0	0	0	1	5	1,345	

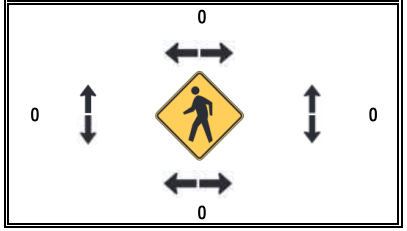
Weekday, PM Peak Period Summary

	RIMROCK ROAD							RIMROCK ROAD							58TH STREET WEST							GLYNN ABBEY WAY							
	Eastbound (From the West)							Westbound (From the East)							Northbound (From the South)							Southbound (From the North)							
SEASONAL/ DAILY ADJ. FACTOR	0.970	0.970	0.968	1.000	1.000	1.000		0.967	0.970	0.967	1.000	1.000	1.000		0.969	0.967	0.971	1.000	1.000	1.000		0.973	0.970	0.971	1.000	1.000	1.000		INTERSECTION
START TIME	LEFT	THRU	RIGHT	U-TURN	PEDS	BIKES	VEHICLE TOTALS	LEFT	THRU	RIGHT	U-TURN	PEDS	BIKES	VEHICLE TOTALS	LEFT	THRU	RIGHT	U-TURN	PEDS	BIKES	VEHICLE TOTALS	LEFT	THRU	RIGHT	U-TURN	PEDS	BIKES	VEHICLE TOTALS	VEHICLE TOTALS
5:00 PM	0	72	1	0	0	0	73	4	99	0	0	0	0	103	0	0	2	0	0	0	2	0	0	0	0	0	0	0	178
5:15 PM	0	60	0	0	0	0	60	5	120	0	0	0	0	125	1	0	1	0	0	0	2	1	0	0	0	0	0	1	188
5:30 PM	0	52	2	0	0	0	54	7	112	0	0	0	0	119	1	0	2	0	0	0	3	0	0	0	0	0	0	0	176
5:45 PM	0	61	1	0	0	0	62	6	102	0	0	0	0	108	0	0	1	0	0	0	1	1	0	0	0	0	0	1	172
TOTALS	0	245	4	0	0	0	249	22	433	0	0	0	0	455	2	0	6	0	0	0	8	2	0	0	0	0	0	2	714
PEAK HOUR FACTOR	0.00	0.85	0.50	0.00	0.00	0.00	0.85	0.79	0.90	0.00	0.00	0.00	0.00	0.91	0.50	0.00	0.75	0.00	0.00	0.00	0.67	0.50	0.00	0.00	0.00	0.00	0.00	0.50	0.95
% HEAVY VEHICLES	0.00%	2.40%	0.00%	0.00%			2.36%	0.00%	1.02%	0.00%	0.00%			0.98%	0.00%	0.00%	0.00%	0.00%			0.00%	25.00%	0.00%	0.00%	0.00%			20.00%	1.56%
% BUSES & RVs	0.00%	0.80%	0.00%	0.00%			0.79%	0.00%	0.25%	0.00%	0.00%			0.25%	0.00%	0.00%	0.00%	0.00%			0.00%	0.00%	0.00%	0.00%	0.00%			0.00%	0.45%

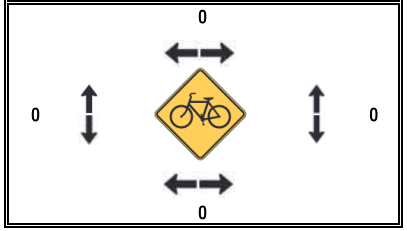
Total Vehicles | Weekday, PM Peak Period Peak Hour



Total Pedestrians | Weekday, PM Peak Period Peak Hour



Total Bicycles | Weekday, PM Peak Period Peak Hour



Intersection Turning Movement Count Summary

Rimrock Road & 54th Street West

Billings, Yellowstone County, Montana

Date Count Performed: September 30, October 1, October 2, 2025 (Average of Tuesday, Wednesday, & Thursday)

Count Time Periods: Weekday - AM, Midday, & PM Peaks (7:00 - 9:00 a.m. | 11:00 a.m. - 1:00 p.m. | 4:00 - 6:00 p.m.

Data Collection Method: Video Traffic Recorder | Unit E5-08

Setup Location: Latitude: 45°47'58.52" N | Longitude: 108°39'09.43" W

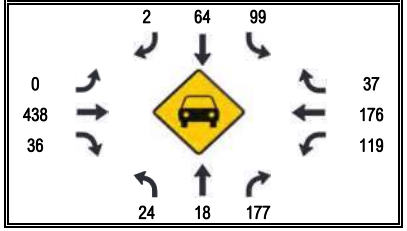
Weekday, AM Peak Period

SEASONAL/ DAILY ADJ. FACTOR	RIMROCK ROAD Eastbound (From the West)							RIMROCK ROAD Westbound (From the East)							54TH STREET WEST Northbound (From the South)							54TH STREET WEST Southbound (From the North)								
	0.971	0.970	0.971	1.000	1.000	1.000		0.970	0.970	0.970	0.960	1.000	1.000		0.970	0.971	0.970	1.000	1.000	1.000		0.970	0.971	0.972	0.970	1.000	1.000			
START TIME	LEFT	THRU	RIGHT	U-TURN	PEDS	BIKES	VEHICLE TOTALS	LEFT	THRU	RIGHT	U-TURN	PEDS	BIKES	VEHICLE TOTALS	LEFT	THRU	RIGHT	U-TURN	PEDS	BIKES	VEHICLE TOTALS	LEFT	THRU	RIGHT	U-TURN	PEDS	BIKES	VEHICLE TOTALS	INTERSECTION VEHICLE TOTALS	HOURLY VOLUME
7:00 AM	0	95	7	0	0	0	102	14	19	3	0	0	0	36	3	2	31	0	0	0	36	23	7	0	0	0	1	30	204	
7:15 AM	0	128	5	0	2	1	133	28	27	4	0	0	0	59	3	4	30	0	0	0	37	26	16	0	0	2	1	42	271	
7:30 AM	0	130	12	0	3	1	142	44	49	5	0	0	0	98	7	4	50	0	0	0	61	33	24	0	0	1	1	57	358	
7:45 AM	0	114	9	0	1	0	123	25	49	12	0	0	0	86	10	5	64	0	0	0	79	21	17	1	0	1	0	39	327	1,160
8:00 AM	0	66	10	0	1	0	76	22	51	16	0	0	0	89	4	5	33	0	0	0	42	19	7	1	0	1	0	27	234	1,190
8:15 AM	1	65	8	0	0	0	74	23	49	17	0	0	0	89	6	7	29	0	0	0	42	16	10	2	0	1	0	28	233	1,152
8:30 AM	1	66	8	0	1	0	75	16	38	13	0	0	0	67	8	4	26	0	0	0	38	18	11	0	0	1	0	29	209	1,003
8:45 AM	1	64	4	0	1	0	69	13	38	21	0	0	0	72	4	6	19	0	0	0	29	16	10	0	0	0	1	26	196	872
TOTALS	**3**	**728**	**63**	**0**	**9**	**2**	**794**	**185**	**320**	**91**	**0**	**0**	**0**	**596**	**45**	**37**	**282**	**0**	**0**	**0**	**364**	**172**	**102**	**4**	**0**	**7**	**4**	**278**	**2,032**	

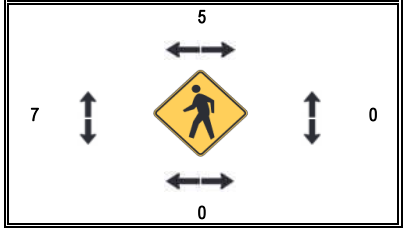
Weekday, AM Peak Period Summary

SEASONAL/ DAILY ADJ. FACTOR	RIMROCK ROAD Eastbound (From the West)							RIMROCK ROAD Westbound (From the East)							54TH STREET WEST Northbound (From the South)							54TH STREET WEST Southbound (From the North)							
	0.971	0.970	0.971	1.000	1.000	1.000		0.970	0.970	0.970	0.960	1.000	1.000		0.970	0.971	0.970	1.000	1.000	1.000		0.970	0.971	0.972	0.970	1.000	1.000		
START TIME	LEFT	THRU	RIGHT	U-TURN	PEDS	BIKES	VEHICLE TOTALS	LEFT	THRU	RIGHT	U-TURN	PEDS	BIKES	VEHICLE TOTALS	LEFT	THRU	RIGHT	U-TURN	PEDS	BIKES	VEHICLE TOTALS	LEFT	THRU	RIGHT	U-TURN	PEDS	BIKES	VEHICLE TOTALS	INTERSECTION VEHICLE TOTALS
7:15 AM	0	128	5	0	2	1	133	28	27	4	0	0	0	59	3	4	30	0	0	0	37	26	16	0	0	2	1	42	271
7:30 AM	0	130	12	0	3	1	142	44	49	5	0	0	0	98	7	4	50	0	0	0	61	33	24	0	0	1	1	57	358
7:45 AM	0	114	9	0	1	0	123	25	49	12	0	0	0	86	10	5	64	0	0	0	79	21	17	1	0	1	0	39	327
8:00 AM	0	66	10	0	1	0	76	22	51	16	0	0	0	89	4	5	33	0	0	0	42	19	7	1	0	1	0	27	234
TOTALS	**0**	**438**	**36**	**0**	**7**	**2**	**474**	**119**	**176**	**37**	**0**	**0**	**0**	**332**	**24**	**18**	**177**	**0**	**0**	**0**	**219**	**99**	**64**	**2**	**0**	**5**	**2**	**165**	**1,190**
PEAK HOUR FACTOR	0.00	0.84	0.75	0.00	0.58	0.50	0.83	0.68	0.86	0.58	0.00	0.00	0.00	0.85	0.60	0.90	0.69	0.00	0.00	0.00	0.69	0.75	0.67	0.50	0.00	0.63	0.50	0.72	0.83
% HEAVY VEHICLES	0.00%	2.88%	6.35%	0.00%			3.15%	7.03%	7.81%	7.69%	0.00%			7.55%	15.56%	8.11%	3.90%	0.00%			5.77%	2.91%	1.96%	0.00%	0.00%			2.52%	4.82%
% BUSES & RVs	0.00%	1.37%	1.59%	0.00%			1.39%	0.54%	1.25%	0.00%	0.00%			0.84%	6.67%	2.70%	1.06%	0.00%			1.92%	1.74%	0.98%	0.00%	0.00%			1.44%	1.33%

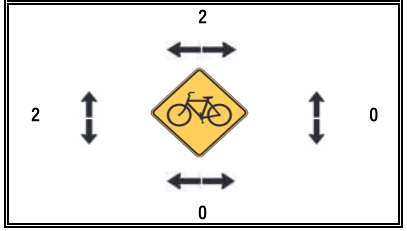
Total Vehicles | Weekday, AM Peak Period Peak Hour



Total Pedestrians | Weekday, AM Peak Period Peak Hour



Total Bicycles | Weekday, AM Peak Period Peak Hour



Intersection Turning Movement Count Summary

Rimrock Road & 54th Street West

Billings, Yellowstone County, Montana

Date Count Performed: September 30, October 1, October 2, 2025 (Average of Tuesday, Wednesday, & Thursday)

Count Time Periods: Weekday - AM, Midday, & PM Peaks (7:00 - 9:00 a.m. | 11:00 a.m. - 1:00 p.m. | 4:00 - 6:00 p.m.

Data Collection Method: Video Traffic Recorder | Unit E5-08

Setup Location: Latitude: 45°47'58.52" N | Longitude: 108°39'09.43" W

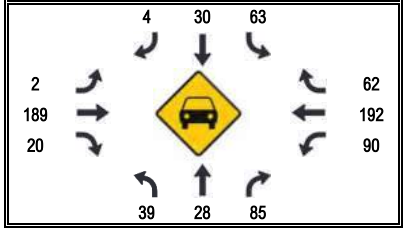
Weekday, Midday Peak Period

	RIMROCK ROAD							RIMROCK ROAD							54TH STREET WEST							54TH STREET WEST								
	Eastbound (From the West)							Westbound (From the East)							Northbound (From the South)							Southbound (From the North)								
SEASONAL/ DAILY ADJ. FACTOR	0.971	0.970	0.971	1.000	1.000	1.000		0.970	0.970	0.970	0.960	1.000	1.000		0.970	0.971	0.970	1.000	1.000	1.000		0.970	0.971	0.972	0.970	1.000	1.000		INTERSECTION	HOURLY
START TIME	LEFT	THRU	RIGHT	U-TURN	PEDS	BIKES	VEHICLE TOTALS	LEFT	THRU	RIGHT	U-TURN	PEDS	BIKES	VEHICLE TOTALS	LEFT	THRU	RIGHT	U-TURN	PEDS	BIKES	VEHICLE TOTALS	LEFT	THRU	RIGHT	U-TURN	PEDS	BIKES	VEHICLE TOTALS	VEHICLE TOTALS	VOLUME
11:00 AM	0	42	5	0	0	0	47	19	42	16	0	0	0	77	5	7	19	0	0	0	31	11	6	1	0	0	1	18	173	
11:15 AM	1	46	4	0	0	0	51	17	47	18	0	0	0	82	7	6	15	0	0	0	28	15	9	0	0	0	1	24	185	
11:30 AM	1	45	4	0	0	0	50	19	44	16	0	0	0	79	8	5	16	0	0	0	29	16	10	0	0	0	0	26	184	
11:45 AM	1	43	4	0	1	0	48	18	44	19	0	0	0	81	14	7	17	0	0	0	38	14	9	1	0	0	1	24	191	733
12:00 PM	1	43	5	0	1	0	49	21	52	17	0	0	0	90	9	4	16	0	0	0	29	12	8	0	0	0	1	20	188	748
12:15 PM	0	46	5	0	0	0	51	23	49	15	0	0	1	87	6	6	23	0	0	0	35	17	9	1	0	0	1	27	200	763
12:30 PM	1	51	5	0	0	0	57	27	45	16	0	0	0	88	9	8	25	0	0	0	42	17	4	2	0	0	1	23	210	789
12:45 PM	0	49	5	0	0	0	54	19	46	14	0	0	0	79	15	10	21	0	0	0	46	17	9	1	0	0	1	27	206	804
TOTALS	**5**	**365**	**37**	**0**	**2**	**0**	**407**	**163**	**369**	**131**	**0**	**0**	**1**	**663**	**73**	**53**	**152**	**0**	**0**	**0**	**278**	**119**	**64**	**6**	**0**	**0**	**7**	**189**	**1,537**	

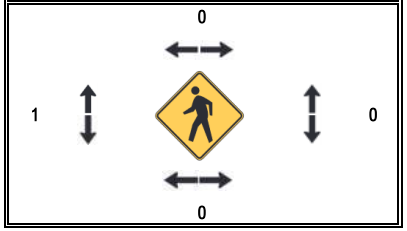
Weekday, Midday Peak Period Summary

	RIMROCK ROAD							RIMROCK ROAD							54TH STREET WEST							54TH STREET WEST							
	Eastbound (From the West)							Westbound (From the East)							Northbound (From the South)							Southbound (From the North)							
SEASONAL/ DAILY ADJ. FACTOR	0.971	0.970	0.971	1.000	1.000	1.000		0.970	0.970	0.970	0.960	1.000	1.000		0.970	0.971	0.970	1.000	1.000	1.000		0.970	0.971	0.972	0.970	1.000	1.000		INTERSECTION
START TIME	LEFT	THRU	RIGHT	U-TURN	PEDS	BIKES	VEHICLE TOTALS	LEFT	THRU	RIGHT	U-TURN	PEDS	BIKES	VEHICLE TOTALS	LEFT	THRU	RIGHT	U-TURN	PEDS	BIKES	VEHICLE TOTALS	LEFT	THRU	RIGHT	U-TURN	PEDS	BIKES	VEHICLE TOTALS	VEHICLE TOTALS
12:00 PM	1	43	5	0	1	0	49	21	52	17	0	0	0	90	9	4	16	0	0	0	29	12	8	0	0	0	1	20	188
12:15 PM	0	46	5	0	0	0	51	23	49	15	0	0	1	87	6	6	23	0	0	0	35	17	9	1	0	0	1	27	200
12:30 PM	1	51	5	0	0	0	57	27	45	16	0	0	0	88	9	8	25	0	0	0	42	17	4	2	0	0	1	23	210
12:45 PM	0	49	5	0	0	0	54	19	46	14	0	0	0	79	15	10	21	0	0	0	46	17	9	1	0	0	1	27	206
TOTALS	**2**	**189**	**20**	**0**	**1**	**0**	**211**	**90**	**192**	**62**	**0**	**0**	**1**	**344**	**39**	**28**	**85**	**0**	**0**	**0**	**152**	**63**	**30**	**4**	**0**	**0**	**4**	**97**	**804**
PEAK HOUR FACTOR	0.50	0.93	1.00	0.00	0.25	0.00	0.93	0.83	0.92	0.91	0.00	0.00	0.25	0.96	0.65	0.70	0.85	0.00	0.00	0.00	0.83	0.93	0.83	0.50	0.00	0.00	1.00	0.90	0.96
% HEAVY VEHICLES	20.00%	4.66%	8.11%	0.00%			5.16%	10.43%	5.15%	3.82%	0.00%			6.18%	4.11%	1.89%	9.87%	0.00%			6.83%	4.20%	9.38%	0.00%	0.00%			5.82%	5.99%
% BUSES & RVs	0.00%	0.27%	0.00%	0.00%			0.25%	0.00%	0.81%	0.00%	0.00%			0.45%	0.00%	0.00%	0.00%	0.00%			0.00%	0.00%	0.00%	0.00%	0.00%			0.00%	0.26%

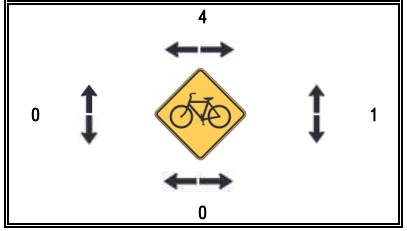
Total Vehicles | Weekday, Midday Peak Period Peak Hour



Total Pedestrians | Weekday, Midday Peak Period Peak Hour



Total Bicycles | Weekday, Midday Peak Period Peak Hour



Intersection Turning Movement Count Summary

Rimrock Road & 54th Street West

Billings, Yellowstone County, Montana

Date Count Performed: September 30, October 1, October 2, 2025 (Average of Tuesday, Wednesday, & Thursday)

Count Time Periods: Weekday - AM, Midday, & PM Peaks (7:00 - 9:00 a.m. | 11:00 a.m. - 1:00 p.m. | 4:00 - 6:00 p.m.

Data Collection Method: Video Traffic Recorder | Unit E5-08

Setup Location: Latitude: 45°47'58.52" N | Longitude: 108°39'09.43" W

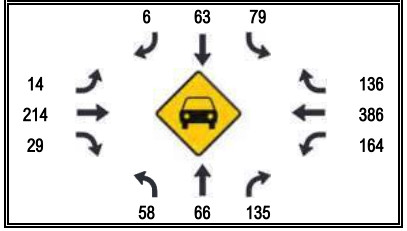
Weekday, PM Peak Period

	RIMROCK ROAD							RIMROCK ROAD							54TH STREET WEST							54TH STREET WEST								
	Eastbound (From the West)							Westbound (From the East)							Northbound (From the South)							Southbound (From the North)								
SEASONAL/ DAILY ADJ. FACTOR	0.971	0.970	0.971	1.000	1.000	1.000		0.970	0.970	0.970	0.960	1.000	1.000		0.970	0.971	0.970	1.000	1.000	1.000		0.970	0.971	0.972	0.970	1.000	1.000		INTERSECTION	HOURLY
START TIME	LEFT	THRU	RIGHT	U-TURN	PEDS	BIKES	VEHICLE TOTALS	LEFT	THRU	RIGHT	U-TURN	PEDS	BIKES	VEHICLE TOTALS	LEFT	THRU	RIGHT	U-TURN	PEDS	BIKES	VEHICLE TOTALS	LEFT	THRU	RIGHT	U-TURN	PEDS	BIKES	VEHICLE TOTALS	VEHICLE TOTALS	VOLUME
4:00 PM	1	60	8	0	3	0	69	34	69	24	0	0	0	127	12	10	29	0	0	0	51	16	11	1	0	0	0	28	275	
4:15 PM	2	55	5	0	1	1	62	44	77	22	0	1	1	143	10	12	27	0	0	0	49	16	10	1	0	0	0	27	281	
4:30 PM	2	56	8	0	1	0	66	39	83	24	0	0	0	146	11	11	27	0	0	0	49	16	10	1	0	0	1	27	288	
4:45 PM	1	54	10	0	2	2	65	42	84	33	0	0	0	159	12	14	37	0	0	0	63	22	17	1	0	0	1	40	327	1,171
5:00 PM	4	63	8	0	2	1	75	43	90	35	0	0	0	168	14	19	32	0	0	0	65	20	18	1	0	0	1	39	347	1,243
5:15 PM	6	49	6	0	1	0	61	42	108	33	0	0	0	183	16	17	33	0	0	0	66	22	16	3	0	0	0	41	351	1,313
5:30 PM	3	48	5	0	3	0	56	37	104	35	0	0	0	176	16	16	33	0	0	0	65	15	12	1	0	0	1	28	325	1,350
5:45 PM	1	50	8	0	2	1	59	49	87	28	0	0	0	164	17	17	26	0	0	0	60	19	8	1	0	0	0	28	311	1,334
TOTALS	**20**	**435**	**58**	**0**	**15**	**5**	**513**	**330**	**702**	**234**	**0**	**1**	**1**	**1,266**	**108**	**116**	**244**	**0**	**0**	**0**	**468**	**146**	**102**	**10**	**0**	**0**	**4**	**258**	**2,505**	

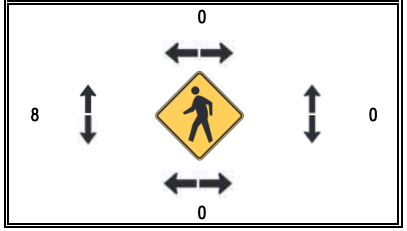
Weekday, PM Peak Period Summary

	RIMROCK ROAD							RIMROCK ROAD							54TH STREET WEST							54TH STREET WEST							
	Eastbound (From the West)							Westbound (From the East)							Northbound (From the South)							Southbound (From the North)							
SEASONAL/ DAILY ADJ. FACTOR	0.971	0.970	0.971	1.000	1.000	1.000		0.970	0.970	0.970	0.960	1.000	1.000		0.970	0.971	0.970	1.000	1.000	1.000		0.970	0.971	0.972	0.970	1.000	1.000		INTERSECTION
START TIME	LEFT	THRU	RIGHT	U-TURN	PEDS	BIKES	VEHICLE TOTALS	LEFT	THRU	RIGHT	U-TURN	PEDS	BIKES	VEHICLE TOTALS	LEFT	THRU	RIGHT	U-TURN	PEDS	BIKES	VEHICLE TOTALS	LEFT	THRU	RIGHT	U-TURN	PEDS	BIKES	VEHICLE TOTALS	VEHICLE TOTALS
4:45 PM	1	54	10	0	2	2	65	42	84	33	0	0	0	159	12	14	37	0	0	0	63	22	17	1	0	0	1	40	327
5:00 PM	4	63	8	0	2	1	75	43	90	35	0	0	0	168	14	19	32	0	0	0	65	20	18	1	0	0	1	39	347
5:15 PM	6	49	6	0	1	0	61	42	108	33	0	0	0	183	16	17	33	0	0	0	66	22	16	3	0	0	0	41	351
5:30 PM	3	48	5	0	3	0	56	37	104	35	0	0	0	176	16	16	33	0	0	0	65	15	12	1	0	0	1	28	325
TOTALS	**14**	**214**	**29**	**0**	**8**	**3**	**257**	**164**	**386**	**136**	**0**	**0**	**0**	**686**	**58**	**66**	**135**	**0**	**0**	**0**	**259**	**79**	**63**	**6**	**0**	**0**	**3**	**148**	**1,350**
PEAK HOUR FACTOR	0.58	0.85	0.73	0.00	0.67	0.38	0.86	0.95	0.89	0.97	0.00	0.00	0.00	0.94	0.91	0.87	0.91	0.00	0.00	0.00	0.98	0.90	0.88	0.50	0.00	0.00	0.75	0.90	0.96
% HEAVY VEHICLES	0.00%	2.76%	1.72%	0.00%			2.53%	2.42%	1.00%	0.43%	0.00%			1.26%	0.93%	0.00%	2.46%	0.00%			1.50%	2.05%	0.98%	0.00%	0.00%			1.55%	1.60%
% BUSES & RVs	0.00%	0.92%	1.72%	0.00%			0.97%	0.30%	0.28%	0.00%	0.00%			0.24%	0.00%	0.00%	0.41%	0.00%			0.21%	0.00%	0.00%	0.00%	0.00%			0.00%	0.36%

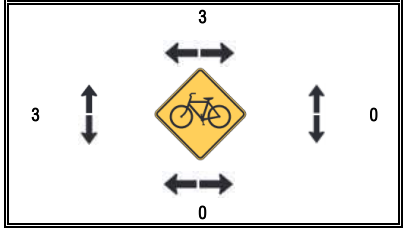
Total Vehicles | Weekday, PM Peak Period Peak Hour



Total Pedestrians | Weekday, PM Peak Period Peak Hour



Total Bicycles | Weekday, PM Peak Period Peak Hour



ENGINEERING, PLLC

Appendix C

Trip Generation Analyses

Estimated Trip Generation Summary

Copper Square Subdivision

Lot	Land Use	ITE Code	Quantity	[1]Units	Estimated Weekday Trip Ends			Estimated Weekday, AM Peak Hour of Adjacent Street Traffic Between 7:00 - 9:00 a.m. Trip Ends			Estimated Weekday, Midday Peak Hour of Adjacent Street Traffic Between 11:00 a.m. - 1:00 p.m. Trip Ends			Estimated Weekday, PM Peak Hour of Adjacent Street Traffic Between 4:00 - 6:00 p.m. Trip Ends		
					Enter	Exit	Total	Enter	Exit	Total	Enter	Exit	Total	Enter	Exit	Total
Phase 1 Development - Analysis Year 2030																
1	**Paddy Shack**															
	Pickleball Courts	489	6	CTS												
	Estimated Vehicle Trip Ends				118	118	236	6	6	12	7	6	13	16	10	26
2	**Office**															
	Small Office Building	712	4.0	GFA												
	Estimated Vehicle Trip Ends				29	29	58	6	1	7	3	4	7	3	6	9
3	**Medical / Dental Office**															
	Medical-Dental Office Building	720	4.0	GFA												
	Estimated Vehicle Trip Ends				69	69	138	10	3	13	5	5	10	4	10	14
4	**Restaurant**															
	High-Turnover (Sit-Down) Restaurant	932	2.5	GFA												
	Estimated Vehicle Trip Ends				130	130	260	12	10	22	16	16	32	14	9	23
5	**Restaurant**															
	High-Turnover (Sit-Down) Restaurant	932	2.5	GFA												
	Estimated Vehicle Trip Ends				130	130	260	12	10	22	16	16	32	14	9	23
6	**Restaurant**															
	High-Turnover (Sit-Down) Restaurant	932	3.0	GFA												
	Estimated Vehicle Trip Ends				156	156	312	15	12	27	19	19	38	17	11	28
9	**Office**															
	Small Office Building	712	4.0	GFA												
	Estimated Vehicle Trip Ends				29	29	58	6	1	7	3	4	7	3	6	9
	Phase 1 Development - Analysis Year 2030 Totals =				**661**	**661**	**1,322**	**67**	**43**	**110**	**69**	**70**	**139**	**71**	**61**	**132**
Phase 2 Development - Analysis Year 2034																
7	**Coffee with Drive-Through**															
	Coffee / Donut Shop with Drive-Through Window	937	2.5	GFA												
	Estimated Total Vehicle Trip Ends				751	751	1,502	109	105	214	41	46	87	49	49	98
	Estimated Pass-By Vehicle Trip Ends				616	616	1,232	91	87	178	27	30	57	40	39	79
	Estimated Net New Vehicle Trip Ends				**135**	**135**	**270**	**18**	**18**	**36**	**14**	**16**	**30**	**9**	**10**	**19**
8	**Retail**															
	Apparel Store	876	3.0	GFA												
	Estimated Vehicle Trip Ends				100	100	200	2	1	3	6	6	12	9	8	17
10	**Office**															
	Small Office Building	712	4.0	GFA												
	Estimated Vehicle Trip Ends				29	29	58	6	1	7	3	4	7	3	6	9
11	**Retail**															
	Apparel Store	876	3.0	GFA												
	Estimated Vehicle Trip Ends				100	100	200	2	1	3	6	6	12	9	8	17
	Phase 2 Development - Analysis Year 2034 Totals =				**980**	**980**	**1,960**	**119**	**108**	**227**	**56**	**62**	**118**	**70**	**71**	**141**
	Phase 1 & 2 Development Totals =				**1,641**	**1,641**	**3,282**	**186**	**151**	**337**	**125**	**132**	**257**	**141**	**132**	**273**

[1]Units: CTS = Courts; GFA = 1,000 Square Feet of Gross Floor Area

Estimated Trip Generation Summary

Copper Square Subdivision

ITE Land Use Code 489: Pickleball Courts | Setting/Location = General Urban/Suburban				
Trip Ends Analysis Case	**Estimated Trip Ends Analysis Equation**	**Directional Distribution**		**R² Value**
Estimated Vehicle Trip Ends On a Weekday	T = 39.22(X) *T = Estimated Vehicle Trip Ends* *X = Courts*	50% Entering	50% Exiting	N/A *Average Rate Utilized*
Estimated Vehicle Trip Ends On a Weekday, Peak Hour of Adjacent Street Traffic, One Hour Between 7:00 and 9:00 a.m.	T = 1.93(X) *T = Estimated Vehicle Trip Ends* *X = Courts*	52% Entering	48% Exiting	N/A *Average Rate Utilized*
[2]Estimated Vehicle Trip Ends On a Weekday, Midday Peak Hour of Adjacent Street Traffic One Hour Between 11:00 a.m. and 1:00 p.m.	T = 5.5% [39.22(X)] *T = Estimated Vehicle Trip Ends* *X = Courts*	53% Entering	47% Exiting	N/A *Average Rate Utilized*
Estimated Vehicle Trip Ends On a Weekday, Peak Hour of Adjacent Street Traffic, One Hour Between 4:00 and 6:00 p.m.	T = 4.39(X) *T = Estimated Vehicle Trip Ends* *X = Courts*	61% Entering	39% Exiting	N/A *Average Rate Utilized*

ITE Land Use Code 712: Small Office Building | Setting/Location = General Urban/Suburban				
Trip Ends Analysis Case	**Estimated Trip Ends Analysis Equation**	**Directional Distribution**		**R² Value**
Estimated Vehicle Trip Ends On a Weekday	T = 14.39(X) *T = Estimated Vehicle Trip Ends* *X = 1,000 Square Feet of Gross Floor Area*	50% Entering	50% Exiting	N/A *Average Rate Utilized*
Estimated Vehicle Trip Ends On a Weekday, Peak Hour of Adjacent Street Traffic, One Hour Between 7:00 and 9:00 a.m.	T = 1.64(X) *T = Estimated Vehicle Trip Ends* *X = 1,000 Square Feet of Gross Floor Area*	83% Entering	17% Exiting	N/A *Average Rate Utilized*
[2]Estimated Vehicle Trip Ends On a Weekday, Midday Peak Hour of Adjacent Street Traffic One Hour Between 11:00 a.m. and 1:00 p.m.	T = 12.6% [14.39(X)] *T = Estimated Vehicle Trip Ends* *X = 1,000 Square Feet of Gross Floor Area*	43% Entering	57% Exiting	N/A *Average Rate Utilized*
Estimated Vehicle Trip Ends On a Weekday, Peak Hour of Adjacent Street Traffic, One Hour Between 4:00 and 6:00 p.m.	T = 2.16(X) *T = Estimated Vehicle Trip Ends* *X = 1,000 Square Feet of Gross Floor Area*	34% Entering	66% Exiting	N/A *Average Rate Utilized*

ITE Land Use Code 720: Medical-Dental Office Building | Setting/Location = General Urban/Suburban - Stand-Alone				
Trip Ends Analysis Case	**Estimated Trip Ends Analysis Equation**	**Directional Distribution**		**R² Value**
Estimated Vehicle Trip Ends On a Weekday	T = 34.03(X) *T = Estimated Vehicle Trip Ends* *X = 1,000 Square Feet of Gross Floor Area*	50% Entering	50% Exiting	N/A *Average Rate Utilized*
Estimated Vehicle Trip Ends On a Weekday, Peak Hour of Adjacent Street Traffic, One Hour Between 7:00 and 9:00 a.m.	T = 3.21(X) *T = Estimated Vehicle Trip Ends* *X = 1,000 Square Feet of Gross Floor Area*	78% Entering	22% Exiting	N/A *Average Rate Utilized*
[2]Estimated Vehicle Trip Ends On a Weekday, Midday Peak Hour of Adjacent Street Traffic One Hour Between 11:00 a.m. and 1:00 p.m.	T = 7.5% [34.03(X)] *T = Estimated Vehicle Trip Ends* *X = 1,000 Square Feet of Gross Floor Area*	45% Entering	55% Exiting	N/A *Average Rate Utilized*
Estimated Vehicle Trip Ends On a Weekday, Peak Hour of Adjacent Street Traffic, One Hour Between 4:00 and 6:00 p.m.	T = 3.42(X) *T = Estimated Vehicle Trip Ends* *X = 1,000 Square Feet of Gross Floor Area*	30% Entering	70% Exiting	N/A *Average Rate Utilized*

ITE Land Use Code 876: Apparel Store | Setting/Location = General Urban/Suburban				
Trip Ends Analysis Case	**Estimated Trip Ends Analysis Equation**	**Directional Distribution**		**R² Value**
Estimated Vehicle Trip Ends On a Weekday	T = 66.40(X) *T = Estimated Vehicle Trip Ends* *X = 1,000 Square Feet of Gross Floor Area*	50% Entering	50% Exiting	N/A *Average Rate Utilized*
Estimated Vehicle Trip Ends On a Weekday, Peak Hour of Adjacent Street Traffic, One Hour Between 7:00 and 9:00 a.m.	T = 1.00(X) *T = Estimated Vehicle Trip Ends* *X = 1,000 Square Feet of Gross Floor Area*	80% Entering	20% Exiting	N/A *Average Rate Utilized*
[2]Estimated Vehicle Trip Ends On a Weekday, Midday Peak Hour of Adjacent Street Traffic One Hour Between 11:00 a.m. and 1:00 p.m.	T = 6.1% [66.40X)] *T = Estimated Vehicle Trip Ends* *X = 1,000 Square Feet of Gross Floor Area*	49% Entering	51% Exiting	N/A *Average Rate Utilized*
Estimated Vehicle Trip Ends On a Weekday, Peak Hour of Adjacent Street Traffic, One Hour Between 4:00 and 6:00 p.m.	T = 5.77(X) *T = Estimated Vehicle Trip Ends* *X = 1,000 Square Feet of Gross Floor Area*	53% Entering	47% Exiting	N/A *Average Rate Utilized*

Estimated Trip Generation Summary

Copper Square Subdivision

ITE Land Use Code 932: High-Turnover (Sit-Down) Restaurant | Setting/Location = General Urban/Suburban				
Trip Ends Analysis Case	**Estimated Trip Ends Analysis Equation**	**Directional Distribution**		**R^2 Value**
Estimated Vehicle Trip Ends On a Weekday	T = 103.75(X) *T = Estimated Vehicle Trip Ends* *X = 1,000 Square Feet of Gross Floor Area*	50% Entering	50% Exiting	N/A *Average Rate Utilized*
Estimated Vehicle Trip Ends On a Weekday, Peak Hour of Adjacent Street Traffic, One Hour Between 7:00 and 9:00 a.m.	T = 8.97(X) *T = Estimated Vehicle Trip Ends* *X = 1,000 Square Feet of Gross Floor Area*	55% Entering	45% Exiting	N/A *Average Rate Utilized*
[2]Estimated Vehicle Trip Ends On a Weekday, Midday Peak Hour of Adjacent Street Traffic One Hour Between 11:00 a.m. and 1:00 p.m.	T = 12.3% [103.75(X)] *T = Estimated Vehicle Trip Ends* *X = 1,000 Square Feet of Gross Floor Area*	50% Entering	50% Exiting	N/A *Average Rate Utilized*
Estimated Vehicle Trip Ends On a Weekday, Peak Hour of Adjacent Street Traffic, One Hour Between 4:00 and 6:00 p.m.	T = 9.18(X) *T = Estimated Vehicle Trip Ends* *X = 1,000 Square Feet of Gross Floor Area*	61% Entering	39% Exiting	N/A *Average Rate Utilized*

ITE Land Use Code 937: Coffee / Donut Shop with Drive-Through Window | Setting/Location = General Urban/Suburban				
Trip Ends Analysis Case	**Estimated Trip Ends Analysis Equation**	**Directional Distribution**		**R^2 Value**
Estimated Vehicle Trip Ends On a Weekday	T = 600.50(X) *T = Estimated Vehicle Trip Ends* *X = 1,000 Square Feet of Gross Floor Area*	50% Entering	50% Exiting	N/A *Average Rate Utilized*
Estimated Vehicle Trip Ends On a Weekday, Peak Hour of Adjacent Street Traffic, One Hour Between 7:00 and 9:00 a.m.	T = 85.41(X) *T = Estimated Vehicle Trip Ends* *X = 1,000 Square Feet of Gross Floor Area*	51% Entering	49% Exiting	N/A *Average Rate Utilized*
[2]Estimated Vehicle Trip Ends On a Weekday, Midday Peak Hour of Adjacent Street Traffic One Hour Between 11:00 a.m. and 1:00 p.m.	T = 5.8% [600.50(X)] *T = Estimated Vehicle Trip Ends* *X = 1,000 Square Feet of Gross Floor Area*	47% Entering	53% Exiting	N/A *Average Rate Utilized*
Estimated Vehicle Trip Ends On a Weekday, Peak Hour of Adjacent Street Traffic, One Hour Between 4:00 and 6:00 p.m.	T =39.00(X) *T = Estimated Vehicle Trip Ends* *X = 1,000 Square Feet of Gross Floor Area*	50% Entering	50% Exiting	N/A *Average Rate Utilized*
Estimated Pass-By Vehicle Trip Ends On a Weekday	T = 82% [600.50(X)] *T = Estimated Pass-By Vehicle Trip Ends* *X = 1,000 Square Feet of Gross Floor Area*	50% Entering	50% Exiting	N/A *Average Rate Utilized*
Estimated Pass-By Vehicle Trip Ends On a Weekday, Peak Hour of Adjacent Street Traffic, One Hour Between 7:00 and 9:00 a.m.	T = 83% [85.41(X)] *T = Estimated Pass-By Vehicle Trip Ends* *X = 1,000 Square Feet of Gross Floor Area*	51% Entering	49% Exiting	N/A *Average Rate Utilized*
[2]Estimated Pass-By Vehicle Trip Ends On a Weekday, Midday Peak Hour of Adjacent Street Traffic One Hour Between 11:00 a.m. and 1:00 p.m.	T = 66% { 5.8% [600.50(X)] } *T = Estimated Pass-By Vehicle Trip Ends* *X = 1,000 Square Feet of Gross Floor Area*	47% Entering	53% Exiting	N/A *Average Rate Utilized*
Estimated Pass-By Vehicle Trip Ends On a Weekday, Peak Hour of Adjacent Street Traffic, One Hour Between 4:00 and 6:00 p.m.	T =81% [39.00(X)] *T = Estimated Pass-By Vehicle Trip Ends* *X = 1,000 Square Feet of Gross Floor Area*	50% Entering	50% Exiting	N/A *Average Rate Utilized*

[2]The trip generation rate utilized for the estimated vehicle trip ends on a weekday for the midday peak hour of the adjacent street traffic for one hour between 11:00 a.m. and 1:00 p.m. was derived from the peak time of day distribution for the ITE land use.

Source: Institute of Transportation Engineers - *Trip Generation Manual, 12th Edition* (2025).

Estimated Trip Generation Summary

Fifty-Four West Subdivision

Lot	ITE Code	Quantity	[1]Units	Estimated Weekday Trip Ends			Estimated Weekday, AM Peak Hour of Adjacent Street Traffic Between 7:00 - 9:00 a.m. Trip Ends			Estimated Weekday, Midday Peak Hour of Adjacent Street Traffic Between 11:00 a.m. - 1:00 p.m. Trip Ends			Estimated Weekday, PM Peak Hour of Adjacent Street Traffic Between 4:00 - 6:00 p.m. Trip Ends		
				Enter	Exit	Total	Enter	Exit	Total	Enter	Exit	Total	Enter	Exit	Total
Analysis Year 2030															
Single-Family Detached Housing	210	34	DU												
Estimated Vehicle Trip Ends				155	155	310	8	20	28	9	8	17	22	14	36
Analysis Year 2030 Totals =				155	155	310	8	20	28	9	8	17	22	14	36
Analysis Year 2034															
Single-Family Detached Housing	210	34	DU												
Estimated Vehicle Trip Ends				155	155	310	8	20	28	9	8	17	22	14	36
Analysis Year 2034 Totals =				155	155	310	8	20	28	9	8	17	22	14	36
Development Totals =				310	310	620	16	40	56	18	16	34	44	28	72

[1]Units: DU = Dwelling Units

ITE Land Use Code 210: Single-Family Detached Housing | Setting/Location = General Urban/Suburban				
Trip Ends Analysis Case	**Estimated Trip Ends Analysis Equation**	**Directional Distribution**		**R^2 Value**
Estimated Vehicle Trip Ends On a Weekday	T = 9.09(X) *T = Estimated Vehicle Trip Ends* *X = Dwelling Units*	50% Entering	50% Exiting	N/A *Average Rate Utilized*
Estimated Vehicle Trip Ends On a Weekday, Peak Hour of Adjacent Street Traffic, One Hour Between 7:00 and 9:00 a.m.	T = 0.67(X) + 5.59 *T = Estimated Vehicle Trip Ends* *X = Dwelling Units*	27% Entering	73% Exiting	R^2 = 0.89
[2]Estimated Vehicle Trip Ends On a Weekday, Midday Peak Hour of Adjacent Street Traffic One Hour Between 11:00 a.m. and 1:00 p.m.	T = 5.6% [9.09(X)] *T = Estimated Vehicle Trip Ends* *X = Dwelling Units*	50% Entering	50% Exiting	N/A *Average Rate Utilized*
Estimated Vehicle Trip Ends On a Weekday, Peak Hour of Adjacent Street Traffic, One Hour Between 4:00 and 6:00 p.m.	Ln(T) = 0.92 Ln(X) + 0.33 *T = Estimated Vehicle Trip Ends* *X = Dwelling Units*	62% Entering	38% Exiting	R^2 = 0.90

[2]The trip generation rate utilized for the estimated vehicle trip ends on a weekday for the midday peak hour of the adjacent street traffic for one hour between 11:00 a.m. and 1:00 p.m. was derived from the peak time of day distribution for the ITE land use.

Source: Institute of Transportation Engineers - *Trip Generation Manual, 12th Edition* (2025).

Estimated Trip Generation Summary

Buffalo Crossing Subdivision

Lot	Land Use	ITE Code	Quantity	[1]Units	Estimated Weekday Trip Ends			Estimated Weekday, AM Peak Hour of Adjacent Street Traffic Between 7:00 - 9:00 a.m. Trip Ends			Estimated Weekday, Midday Peak Hour of Adjacent Street Traffic Between 11:00 a.m. - 1:00 p.m. Trip Ends			Estimated Weekday, PM Peak Hour of Adjacent Street Traffic Between 4:00 - 6:00 p.m. Trip Ends		
					Enter	Exit	Total	Enter	Exit	Total	Enter	Exit	Total	Enter	Exit	Total
Analysis Year 2030																
	Single-Family Detached Housing	210	67	DU												
	Estimated Vehicle Trip Ends				305	305	610	13	34	47	17	17	34	38	24	62
	Single-Family Attached Housing	215	26	DU												
	Estimated Vehicle Trip Ends				86	86	172	3	9	12	5	4	9	7	6	13
	Multifamily Housing (Low-Rise)	220	58	DU												
	Estimated Vehicle Trip Ends				181	181	362	6	18	24	9	9	18	19	11	30
	Analysis Year 2030 Totals =				**572**	**572**	**1,144**	**22**	**61**	**83**	**31**	**30**	**61**	**64**	**41**	**105**

[1]Units: DU = Dwelling Units

ITE Land Use Code 210: Single-Family Detached Housing | Setting/Location = General Urban/Suburban

Trip Ends Analysis Case	Estimated Trip Ends Analysis Equation	Directional Distribution		R^2 Value
Estimated Vehicle Trip Ends On a Weekday	T = 9.09(X) *T = Estimated Vehicle Trip Ends* *X = Dwelling Units*	50% Entering	50% Exiting	N/A *Average Rate Utilized*
Estimated Vehicle Trip Ends On a Weekday, Peak Hour of Adjacent Street Traffic, One Hour Between 7:00 and 9:00 a.m.	T = 0.70(X) *T = Estimated Vehicle Trip Ends* *X = Dwelling Units*	27% Entering	73% Exiting	N/A *Average Rate Utilized*
[2]Estimated Vehicle Trip Ends On a Weekday, Midday Peak Hour of Adjacent Street Traffic One Hour Between 11:00 a.m. and 1:00 p.m.	T = 5.6% [9.09(X)] *T = Estimated Vehicle Trip Ends* *X = Dwelling Units*	50% Entering	50% Exiting	N/A *Average Rate Utilized*
Estimated Vehicle Trip Ends On a Weekday, Peak Hour of Adjacent Street Traffic, One Hour Between 4:00 and 6:00 p.m.	T = 0.93(X) *T = Estimated Vehicle Trip Ends* *X = Dwelling Units*	62% Entering	38% Exiting	N/A *Average Rate Utilized*

ITE Land Use Code 215: Single-Family Attached Housing | Setting/Location = General Urban/Suburban

Trip Ends Analysis Case	Estimated Trip Ends Analysis Equation	Directional Distribution		R^2 Value
Estimated Vehicle Trip Ends On a Weekday	T = 6.57(X) *T = Estimated Vehicle Trip Ends* *X = Dwelling Units*	50% Entering	50% Exiting	N/A *Average Rate Utilized*
Estimated Vehicle Trip Ends On a Weekday, Peak Hour of Adjacent Street Traffic, One Hour Between 7:00 and 9:00 a.m.	T = 0.47(X) *T = Estimated Vehicle Trip Ends* *X = Dwelling Units*	25% Entering	75% Exiting	N/A *Average Rate Utilized*
[2]Estimated Vehicle Trip Ends On a Weekday, Midday Peak Hour of Adjacent Street Traffic One Hour Between 11:00 a.m. and 1:00 p.m.	T = 5.2% [6.57(X)] *T = Estimated Vehicle Trip Ends* *X = Dwelling Units*	51% Entering	49% Exiting	N/A *Average Rate Utilized*
Estimated Vehicle Trip Ends On a Weekday, Peak Hour of Adjacent Street Traffic, One Hour Between 4:00 and 6:00 p.m.	T = 0.51(X) *T = Estimated Vehicle Trip Ends* *X = Dwelling Units*	57% Entering	43% Exiting	N/A *Average Rate Utilized*

ITE Land Use Code 220: Multifamily Housing (Low-Rise) | Setting/Location = General Urban/Suburban

Trip Ends Analysis Case	Estimated Trip Ends Analysis Equation	Directional Distribution		R^2 Value
Estimated Vehicle Trip Ends On a Weekday	T = 6.21(X) *T = Estimated Vehicle Trip Ends* *X = Dwelling Units*	50% Entering	50% Exiting	N/A *Average Rate Utilized*
Estimated Vehicle Trip Ends On a Weekday, Peak Hour of Adjacent Street Traffic, One Hour Between 7:00 and 9:00 a.m.	T = 0.41(X) *T = Estimated Vehicle Trip Ends* *X = Dwelling Units*	24% Entering	76% Exiting	N/A *Average Rate Utilized*
[2]Estimated Vehicle Trip Ends On a Weekday, Midday Peak Hour of Adjacent Street Traffic One Hour Between 11:00 a.m. and 1:00 p.m.	T = 5.0% [6.21(X)] *T = Estimated Vehicle Trip Ends* *X = Dwelling Units*	51% Entering	49% Exiting	N/A *Average Rate Utilized*
Estimated Vehicle Trip Ends On a Weekday, Peak Hour of Adjacent Street Traffic, One Hour Between 4:00 and 6:00 p.m.	T = 0.52(X) *T = Estimated Vehicle Trip Ends* *X = Dwelling Units*	62% Entering	38% Exiting	N/A *Average Rate Utilized*

[2]The trip generation rate utilized for the estimated vehicle trip ends on a weekday for the midday peak hour of the adjacent street traffic for one hour between 11:00 a.m. and 1:00 p.m. was derived from the peak time of day distribution for the ITE land use.

Source: Institute of Transportation Engineers - *Trip Generation Manual, 12th Edition* (2025).

Estimated Trip Generation Summary

Sweetgrass Development

Lot	Land Use	ITE Code	Quantity	[1]Units	Estimated Weekday Trip Ends			Estimated Weekday, AM Peak Hour of Adjacent Street Traffic Between 7:00 - 9:00 a.m. Trip Ends			Estimated Weekday, Midday Peak Hour of Adjacent Street Traffic Between 11:00 a.m. - 1:00 p.m. Trip Ends			Estimated Weekday, PM Peak Hour of Adjacent Street Traffic Between 4:00 - 6:00 p.m. Trip Ends		
					Enter	Exit	Total	Enter	Exit	Total	Enter	Exit	Total	Enter	Exit	Total
Analysis Year 2030																
	Single-Family Detached Housing	210	194	DU												
	Estimated Vehicle Trip Ends				882	882	1,764	37	99	136	50	49	99	112	68	180
	Multifamily Housing (Low-Rise)	220	82	DU												
	Estimated Vehicle Trip Ends				255	255	510	8	26	34	13	12	25	27	16	43
	Analysis Year 2030 Totals =				**1,137**	**1,137**	**2,274**	**45**	**125**	**170**	**63**	**61**	**124**	**139**	**84**	**223**

[1]Units: DU = Dwelling Units

ITE Land Use Code 210: Single-Family Detached Housing | Setting/Location = General Urban/Suburban

Trip Ends Analysis Case	Estimated Trip Ends Analysis Equation	Directional Distribution		R^2 Value
Estimated Vehicle Trip Ends On a Weekday	T = 9.09(X) *T = Estimated Vehicle Trip Ends* *X = Dwelling Units*	50% Entering	50% Exiting	N/A *Average Rate Utilized*
Estimated Vehicle Trip Ends On a Weekday, Peak Hour of Adjacent Street Traffic, One Hour Between 7:00 and 9:00 a.m.	T = 0.70(X) *T = Estimated Vehicle Trip Ends* *X = Dwelling Units*	27% Entering	73% Exiting	N/A *Average Rate Utilized*
[2]Estimated Vehicle Trip Ends On a Weekday, Midday Peak Hour of Adjacent Street Traffic One Hour Between 11:00 a.m. and 1:00 p.m.	T = 5.6% [9.09(X)] *T = Estimated Vehicle Trip Ends* *X = Dwelling Units*	50% Entering	50% Exiting	N/A *Average Rate Utilized*
Estimated Vehicle Trip Ends On a Weekday, Peak Hour of Adjacent Street Traffic, One Hour Between 4:00 and 6:00 p.m.	T = 0.93(X) *T = Estimated Vehicle Trip Ends* *X = Dwelling Units*	62% Entering	38% Exiting	N/A *Average Rate Utilized*

ITE Land Use Code 220: Multifamily Housing (Low-Rise) | Setting/Location = General Urban/Suburban

Trip Ends Analysis Case	Estimated Trip Ends Analysis Equation	Directional Distribution		R^2 Value
Estimated Vehicle Trip Ends On a Weekday	T = 6.21(X) *T = Estimated Vehicle Trip Ends* *X = Dwelling Units*	50% Entering	50% Exiting	N/A *Average Rate Utilized*
Estimated Vehicle Trip Ends On a Weekday, Peak Hour of Adjacent Street Traffic, One Hour Between 7:00 and 9:00 a.m.	T = 0.41(X) *T = Estimated Vehicle Trip Ends* *X = Dwelling Units*	24% Entering	76% Exiting	N/A *Average Rate Utilized*
[2]Estimated Vehicle Trip Ends On a Weekday, Midday Peak Hour of Adjacent Street Traffic One Hour Between 11:00 a.m. and 1:00 p.m.	T = 5.0% [6.21(X)] *T = Estimated Vehicle Trip Ends* *X = Dwelling Units*	51% Entering	49% Exiting	N/A *Average Rate Utilized*
Estimated Vehicle Trip Ends On a Weekday, Peak Hour of Adjacent Street Traffic, One Hour Between 4:00 and 6:00 p.m.	T = 0.52(X) *T = Estimated Vehicle Trip Ends* *X = Dwelling Units*	62% Entering	38% Exiting	N/A *Average Rate Utilized*

[2]The trip generation rate utilized for the estimated vehicle trip ends on a weekday for the midday peak hour of the adjacent street traffic for one hour between 11:00 a.m. and 1:00 p.m. was derived from the peak time of day distribution for the ITE land use.

Source: Institute of Transportation Engineers - *Trip Generation Manual, 12th Edition* (2025).

Estimated Trip Generation Summary

Trestles Subdivision

Lot	ITE Code	Quantity	[1]Units	Estimated Weekday Trip Ends			Estimated Weekday, AM Peak Hour of Adjacent Street Traffic Between 7:00 - 9:00 a.m. Trip Ends			Estimated Weekday, Midday Peak Hour of Adjacent Street Traffic Between 11:00 a.m. - 1:00 p.m. Trip Ends			Estimated Weekday, PM Peak Hour of Adjacent Street Traffic Between 4:00 - 6:00 p.m. Trip Ends		
				Enter	Exit	Total	Enter	Exit	Total	Enter	Exit	Total	Enter	Exit	Total
Analysis Year 2030															
Single-Family Detached Housing	210	269	DU												
Estimated Vehicle Trip Ends				1,223	1,223	2,446	50	136	186	69	68	137	148	91	239
Single-Family Attached Housing	215	142	DU												
Estimated Vehicle Trip Ends				467	467	934	17	50	67	25	24	49	41	31	72
Analysis Year 2030 Totals =				1,690	1,690	3,380	67	186	253	94	92	186	189	122	311
Analysis Year 2034															
Single-Family Detached Housing	210	45	DU												
Estimated Vehicle Trip Ends				205	205	410	10	26	36	12	11	23	29	17	46
Single-Family Attached Housing	215	36	DU												
Estimated Vehicle Trip Ends				119	119	238	4	13	17	6	6	12	10	8	18
Analysis Year 2034 Totals =				324	324	648	14	39	53	18	17	35	39	25	64
Development Totals =				2,014	2,014	4,028	81	225	306	112	109	221	228	147	375

[1]Units: DU = Dwelling Units

ITE Land Use Code 210: Single-Family Detached Housing | Setting/Location = General Urban/Suburban				
Trip Ends Analysis Case	**Estimated Trip Ends Analysis Equation**	**Directional Distribution**		**R² Value**
Estimated Vehicle Trip Ends On a Weekday	T = 9.09(X) *T = Estimated Vehicle Trip Ends* *X = Dwelling Units*	50% Entering	50% Exiting	N/A *Average Rate Utilized*
Estimated Vehicle Trip Ends On a Weekday, Peak Hour of Adjacent Street Traffic, One Hour Between 7:00 and 9:00 a.m.	T = 0.67(X) + 5.59 *T = Estimated Vehicle Trip Ends* *X = Dwelling Units*	27% Entering	73% Exiting	R^2 = 0.89
[2]Estimated Vehicle Trip Ends On a Weekday, Midday Peak Hour of Adjacent Street Traffic One Hour Between 11:00 a.m. and 1:00 p.m.	T = 5.6% [9.09(X)] *T = Estimated Vehicle Trip Ends* *X = Dwelling Units*	50% Entering	50% Exiting	N/A *Average Rate Utilized*
Estimated Vehicle Trip Ends On a Weekday, Peak Hour of Adjacent Street Traffic, One Hour Between 4:00 and 6:00 p.m.	Ln(T) = 0.92 Ln(X) + 0.33 *T = Estimated Vehicle Trip Ends* *X = Dwelling Units*	62% Entering	38% Exiting	R^2 = 0.90

ITE Land Use Code 215: Single-Family Attached Housing | Setting/Location = General Urban/Suburban				
Trip Ends Analysis Case	**Estimated Trip Ends Analysis Equation**	**Directional Distribution**		**R² Value**
Estimated Vehicle Trip Ends On a Weekday	T = 6.57(X) *T = Estimated Vehicle Trip Ends* *X = Dwelling Units*	50% Entering	50% Exiting	N/A *Average Rate Utilized*
Estimated Vehicle Trip Ends On a Weekday, Peak Hour of Adjacent Street Traffic, One Hour Between 7:00 and 9:00 a.m.	T = 0.47(X) *T = Estimated Vehicle Trip Ends* *X = Dwelling Units*	25% Entering	75% Exiting	N/A *Average Rate Utilized*
[2]Estimated Vehicle Trip Ends On a Weekday, Midday Peak Hour of Adjacent Street Traffic One Hour Between 11:00 a.m. and 1:00 p.m.	T = 5.2% [6.57(X)] *T = Estimated Vehicle Trip Ends* *X = Dwelling Units*	51% Entering	49% Exiting	N/A *Average Rate Utilized*
Estimated Vehicle Trip Ends On a Weekday, Peak Hour of Adjacent Street Traffic, One Hour Between 4:00 and 6:00 p.m.	T = 0.51(X) *T = Estimated Vehicle Trip Ends* *X = Dwelling Units*	57% Entering	43% Exiting	N/A *Average Rate Utilized*

[2]The trip generation rate utilized for the estimated vehicle trip ends on a weekday for the midday peak hour of the adjacent street traffic for one hour between 11:00 a.m. and 1:00 p.m. was derived from the peak time of day distribution for the ITE land use.

Source: Institute of Transportation Engineers - *Trip Generation Manual, 12th Edition* (2025).

Estimated Trip Generation Summary

Glynn Abbey Subdivision

Lot	Land Use	ITE Code	Quantity	[1]Units	Estimated Weekday Trip Ends			Estimated Weekday, AM Peak Hour of Adjacent Street Traffic Between 7:00 - 9:00 a.m. Trip Ends			Estimated Weekday, Midday Peak Hour of Adjacent Street Traffic Between 11:00 a.m. - 1:00 p.m. Trip Ends			Estimated Weekday, PM Peak Hour of Adjacent Street Traffic Between 4:00 - 6:00 p.m. Trip Ends		
					Enter	Exit	Total	Enter	Exit	Total	Enter	Exit	Total	Enter	Exit	Total
Analysis Year 2030																
	Single-Family Detached Housing	210	33	DU												
	Estimated Vehicle Trip Ends				150	150	300	6	17	23	9	8	17	19	12	31
	Analysis Year 2030 Totals =				**150**	**150**	**300**	**6**	**17**	**23**	**9**	**8**	**17**	**19**	**12**	**31**

[1]Units: DU = Dwelling Units

ITE Land Use Code 210: Single-Family Detached Housing | Setting/Location = General Urban/Suburban

Trip Ends Analysis Case	Estimated Trip Ends Analysis Equation	Directional Distribution		R^2 Value
Estimated Vehicle Trip Ends On a Weekday	T = 9.09(X) *T = Estimated Vehicle Trip Ends* *X = Dwelling Units*	50% Entering	50% Exiting	N/A *Average Rate Utilized*
Estimated Vehicle Trip Ends On a Weekday, Peak Hour of Adjacent Street Traffic, One Hour Between 7:00 and 9:00 a.m.	T = 0.70(X) *T = Estimated Vehicle Trip Ends* *X = Dwelling Units*	27% Entering	73% Exiting	N/A *Average Rate Utilized*
[2]Estimated Vehicle Trip Ends On a Weekday, Midday Peak Hour of Adjacent Street Traffic One Hour Between 11:00 a.m. and 1:00 p.m.	T = 5.6% [9.09(X)] *T = Estimated Vehicle Trip Ends* *X = Dwelling Units*	50% Entering	50% Exiting	N/A *Average Rate Utilized*
Estimated Vehicle Trip Ends On a Weekday, Peak Hour of Adjacent Street Traffic, One Hour Between 4:00 and 6:00 p.m.	T = 0.93(X) *T = Estimated Vehicle Trip Ends* *X = Dwelling Units*	62% Entering	38% Exiting	N/A *Average Rate Utilized*

[2]The trip generation rate utilized for the estimated vehicle trip ends on a weekday for the midday peak hour of the adjacent street traffic for one hour between 11:00 a.m. and 1:00 p.m. was derived from the peak time of day distribution for the ITE land use.

Source: Institute of Transportation Engineers - *Trip Generation Manual, 12th Edition* (2025).

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Appendix D

Average Annual Growth Rate Analyses for Vehicular Traffic

Traffic Growth Rate Analyses

Study Area

Average Annual Daily Traffic (AADT) & Traffic Growth Projections

MDT Count Location 56-4A-112 Rimrock Road (East of 54th Street West)				
	Reported	1-Year	3-Year	5-Year
Year	AADT	AAGR	AAGR	AAGR
2015	7,540	-	-	-
2016	7,573	0.44%	-	-
2017	8,642	14.12%	-	-
2018	8,651	0.10%	4.69%	-
2019	8,621	-0.35%	4.42%	-
2020	8,018	-6.99%	-2.47%	1.24%
2021	11,341	41.44%	9.44%	8.41%
2022	11,420	0.70%	9.83%	5.73%
2023	11,489	0.60%	12.74%	5.84%
2024	9,603	-16.42%	-5.39%	2.18%
AVERAGES =	9,290	4.15%	6.65%	5.54%

AADT = Average Annual Daily Traffic AAGR = Average Annual Growth Rate

AADT data obtained from the Montana Department of Transportation (MDT)

Traffic Growth Rate Analyses

Study Area

Average Annual Daily Traffic (AADT) & Traffic Growth Projections

MDT Count Location 56-4A-342 Rimrock Road (West of 62nd Street West)				
	Reported	1-Year	3-Year	5-Year
Year	AADT	AAGR	AAGR	AAGR
2018	736	-	-	-
2019	2,014	173.64%	-	-
2020	1,873	-7.00%	-	-
2021	2,396	27.92%	48.21%	-
2022	2,413	0.71%	6.21%	-
2023	2,427	0.58%	9.02%	26.95%
2024	2,437	0.41%	0.57%	3.89%
AVERAGES =	2,042	32.71%	4.79%	15.42%

AADT = Average Annual Daily Traffic AAGR = Average Annual Growth Rate

AADT data obtained from the Montana Department of Transportation (MDT)

Traffic Growth Rate Analyses

Study Area

Average Annual Daily Traffic (AADT) & Traffic Growth Projections

MDT Count Location 56-4A-355 62nd Street West (North of Grand Avenue)				
	Reported	1-Year	3-Year	5-Year
Year	AADT	AAGR	AAGR	AAGR
2016	2,766	-	-	-
2017	2,744	-0.80%	-	-
2018	2,785	1.49%	-	-
2019	2,007	-27.94%	-10.14%	-
2020	1,867	-6.98%	-12.05%	-
2021	2,828	51.47%	0.51%	0.44%
2022	2,848	0.71%	12.37%	0.75%
2023	2,546	-10.60%	10.89%	-1.78%
2024	2,556	0.39%	-3.31%	4.95%
AVERAGES =	2,550	0.97%	5.12%	1.09%

AADT = Average Annual Daily Traffic AAGR = Average Annual Growth Rate

AADT data obtained from the Montana Department of Transportation (MDT)

Traffic Growth Rate Analyses

Study Area

Average Annual Daily Traffic (AADT) & Traffic Growth Projections

MDT Count Location 56-4A-356 Rimrock Road (East of 62nd Street West)				
	Reported	1-Year	3-Year	5-Year
Year	AADT	AAGR	AAGR	AAGR
2018	2,464	-	-	-
2019	1,985	-19.44%	-	-
2020	1,846	-7.00%	-	-
2021	2,119	14.79%	-4.90%	-
2022	2,134	0.71%	2.44%	-
2023	2,147	0.61%	5.16%	-2.72%
2024	2,155	0.37%	0.56%	1.66%
AVERAGES =	2,121	-1.66%	2.86%	-0.53%

AADT = Average Annual Daily Traffic AAGR = Average Annual Growth Rate

AADT data obtained from the Montana Department of Transportation (MDT)

Traffic Growth Rate Analyses

Study Area

Average Annual Daily Traffic (AADT) & Traffic Growth Projections

MDT Count Location 56-4A-357 Grand Avenue (East of 62nd Street West)				
	Reported	1-Year	3-Year	5-Year
Year	AADT	AAGR	AAGR	AAGR
2018	5,218	-	-	-
2019	5,249	0.59%	-	-
2020	4,469	-14.86%	-	-
2021	4,827	8.01%	-2.56%	-
2022	5,312	10.05%	0.40%	-
2023	5,344	0.60%	6.14%	0.48%
2024	5,289	-1.03%	3.09%	0.15%
AVERAGES =	5,101	0.56%	4.62%	0.32%

AADT = Average Annual Daily Traffic AAGR = Average Annual Growth Rate

AADT data obtained from the Montana Department of Transportation (MDT)

Traffic Growth Rate Analyses

Study Area

Average Annual Daily Traffic (AADT) & Traffic Growth Projections

MDT Count Location 56-4A-358 54th Street West (South of Rimrock Road)				
	Reported	1-Year	3-Year	5-Year
Year	AADT	AAGR	AAGR	AAGR
2018	2,798	-	-	-
2019	2,815	0.61%	-	-
2020	3,330	18.29%	-	-
2021	3,596	7.99%	8.72%	-
2022	3,344	-7.01%	5.91%	-
2023	3,364	0.60%	0.34%	3.75%
2024	3,377	0.39%	-2.07%	3.71%
AVERAGES =	3,232	3.48%	-0.87%	3.73%

AADT = Average Annual Daily Traffic AAGR = Average Annual Growth Rate

AADT data obtained from the Montana Department of Transportation (MDT)

Traffic Growth Rate Analyses

Study Area

Average Annual Daily Traffic (AADT) & Traffic Growth Projections

MDT Count Location 56-4A-375 54th Street West (North of Rimrock Road)				
	Reported	1-Year	3-Year	5-Year
Year	AADT	AAGR	AAGR	AAGR
2018	2,962	-	-	-
2019	2,980	0.61%	-	-
2020	2,838	-4.77%	-	-
2021	3,065	8.00%	1.15%	-
2022	3,173	3.52%	2.11%	-
2023	3,192	0.60%	4.00%	1.51%
2024	3,205	0.41%	1.50%	1.47%
AVERAGES =	3,059	1.40%	2.75%	1.49%

AADT = Average Annual Daily Traffic AAGR = Average Annual Growth Rate

AADT data obtained from the Montana Department of Transportation (MDT)

E5 ENGINEERING, PLLC

Appendix E

Capacity & Level-of-Service (LOS) Analyses

Appendix E

IN THIS SECTION:

Intersection Operations Summaries

Traffic Operations Summary

Copper Square Subdivision

Intersection: Grand Avenue & 62nd Street West

WEEKDAY, AM PEAK HOUR

Analysis Scenario	Analysis Data	GRAND AVENUE From the West (Eastbound) U	L	T	R	GRAND AVENUE From the East (Westbound) U	L	T	R	South Side of Grand Avenue U	L	T	R	62ND STREET WEST From the North (Southbound) U	L	T	R	Minor Approach Totals	Intersection Totals
2025 EXISTING CONDITIONS	Traffic Control	Uncontrolled				Uncontrolled								Stop Controlled					
	Minor or Major Approach?	Major				Major								Minor					
	Entry Volume, V (veh/hr)	0	55	231		0		128	43					0	193		80		
	Peak Hour Factor (PHF)	0.85				0.85								0.85					
	Adjusted Volume, V_A (veh/hr)	0	64	271		0		150	50					0	226		94		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	LT				TR								LR					
	Lane Group Volume, V_{LG} (veh/hr)	335				201								320				320	856
	Capacity, c (veh/hr)	1,281				1,471								523				523	3,275
	Volume-to-Capacity Ratio, V_A/c	0.26				0.14								0.61				0.61	0.26
	HCM 95% Queue Length, Q_{95} (veh)	0.2				0.0								4.1					
	HCM 95% Queue Length, Q_{95} (ft)	5.7				0.0								105.1					
	Available Queue Storage, S_Q (ft)	880				540								680					
	Average Control Delay (sec/veh)	1.9				1.3								22.2				22.2	9.4
	Level of Service, LOS	A				A								C					
	Approach Delay (sec/veh)	1.9				1.3								22.2				C	A
	Approach Level of Service, LOS	A				A								C					
ESTIMATED 2030 BACKGROUND TRAFFIC	Traffic Control	Uncontrolled				Uncontrolled								Stop Controlled					
	Minor or Major Approach?	Major				Major								Minor					
	Entry Volume, V (veh/hr)	0	62	268		0		148	58					0	233		94		
	Peak Hour Factor (PHF)	0.85				0.85								0.85					
	Adjusted Volume, V_A (veh/hr)	0	73	315		0		174	68					0	274		111		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	LT				TR								LR					
	Lane Group Volume, V_{LG} (veh/hr)	388				242								385				385	1,015
	Capacity, c (veh/hr)	1,241				1,458								462				462	3,161
	Volume-to-Capacity Ratio, V_A/c	0.31				0.17								0.83				0.83	0.32
	HCM 95% Queue Length, Q_{95} (veh)	0.2				0.0								8.1					
	HCM 95% Queue Length, Q_{95} (ft)	5.7				0.0								207.6					
	Available Queue Storage, S_Q (ft)	880				540								680					
	Average Control Delay (sec/veh)	2.0				1.4								41.1				41.1	16.7
	Level of Service, LOS	A				A								E					
	Approach Delay (sec/veh)	2.0				1.4								41.1				E	C
	Approach Level of Service, LOS	A				A								E					
ESTIMATED 2030 TOTAL TRAFFIC	Traffic Control	Uncontrolled				Uncontrolled								Stop Controlled					
	Minor or Major Approach?	Major				Major								Minor					
	Entry Volume, V (veh/hr)	0	65	268		0		148	59					0	233		96		
	Peak Hour Factor (PHF)	0.85				0.85								0.85					
	Adjusted Volume, V_A (veh/hr)	0	76	315		0		174	69					0	274		113		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	LT				TR								LR					
	Lane Group Volume, V_{LG} (veh/hr)	392				244								387				387	1,022
	Capacity, c (veh/hr)	1,240				1,457								458				458	3,155
	Volume-to-Capacity Ratio, V_A/c	0.32				0.17								0.85				0.85	0.32
	HCM 95% Queue Length, Q_{95} (veh)	0.2				0.0								8.4					
	HCM 95% Queue Length, Q_{95} (ft)	5.7				0.0								215.3					
	Available Queue Storage, S_Q (ft)	880				540								680					
	Average Control Delay (sec/veh)	2.1				1.4								43.0				43.0	17.4
	Level of Service, LOS	A				A								E					
	Approach Delay (sec/veh)	2.1				1.4								43.0				E	C
	Approach Level of Service, LOS	A				A								E					

U = U-Turns; L = Left Turns; T = Through; R = Right Turns | Lane Groups: LT = Left-Through; TR = Through-Righ; LR = Left-Right

Average intersection delay and volume-to-capacity ratio for minor approach(es) is a weighted average provided for reference purposes. The *Highway Capacity Manual, 7th Edition: A Guide for Multimodal Mobility Analysis* does not define overall average delay for the intersection as a whole for two-way or single approach stop-controlled intersections.

Traffic Operations Summary

Copper Square Subdivision

Intersection: **Grand Avenue & 62nd Street West**

WEEKDAY, AM PEAK HOUR

Analysis Scenario	Analysis Data	GRAND AVENUE From the West (Eastbound) U	L	T	R	GRAND AVENUE From the East (Westbound) U	L	T	R	South Side of Grand Avenue U	L	T	R	62ND STREET WEST From the North (Southbound) U	L	T	R	Minor Approach Totals	Intersection Totals
ESTIMATED 2034 BACKGROUND TRAFFIC	Traffic Control	Uncontrolled				Uncontrolled								Stop Controlled					
	Minor or Major Approach?	Major				Major								Minor					
	Entry Volume, V (veh/hr)	0	68	280		0		153	63					0	248		101		
	Peak Hour Factor (PHF)	0.85				0.85								0.85					
	Adjusted Volume, V_A (veh/hr)	0	80	329		0		180	74					0	292		119		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	LT				TR								LR					
	Lane Group Volume, V_{LG} (veh/hr)	409				254								411				411	1,074
	Capacity, c (veh/hr)	1,228				1,456								439				439	3,123
	Volume-to-Capacity Ratio, V_A/c	0.33				0.17								0.94				0.94	0.34
	HCM 95% Queue Length, Q_{95} (veh)	0.2				0.0								10.8					
	HCM 95% Queue Length, Q_{95} (ft)	5.7				0.0								276.8					
	Available Queue Storage, S_Q (ft)	880				540								680					
	Average Control Delay (sec/veh)	2.1				1.5								59.1				59.1	23.7
	Level of Service, LOS	A				A								F					
	Approach Delay (sec/veh)	2.1				1.5								59.1				F	C
	Approach Level of Service, LOS	A				A								F					
ESTIMATED 2034 TOTAL TRAFFIC	Traffic Control	Uncontrolled				Uncontrolled								Stop Controlled					
	Minor or Major Approach?	Major				Major								Minor					
	Entry Volume, V (veh/hr)	0	69	280		0		153	63					0	249		102		
	Peak Hour Factor (PHF)	0.85				0.85								0.85					
	Adjusted Volume, V_A (veh/hr)	0	81	329		0		180	74					0	293		120		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	LT				TR								LR					
	Lane Group Volume, V_{LG} (veh/hr)	411				254								413				413	1,078
	Capacity, c (veh/hr)	1,228				1,456								438				438	3,122
	Volume-to-Capacity Ratio, V_A/c	0.33				0.17								0.94				0.94	0.35
	HCM 95% Queue Length, Q_{95} (veh)	0.2				0.0								11.0					
	HCM 95% Queue Length, Q_{95} (ft)	5.7				0.0								282.0					
	Available Queue Storage, S_Q (ft)	880				540								680					
	Average Control Delay (sec/veh)	2.1				1.5								60.9				60.9	24.5
	Level of Service, LOS	A				A								F					
	Approach Delay (sec/veh)	2.1				1.5								60.9				F	C
	Approach Level of Service, LOS	A				A								F					

U = U-Turns; L = Left Turns; T = Through; R = Right Turns | Lane Groups: LT = Left-Through; TR = Through-Righ; LR = Left-Right

Average intersection delay and volume-to-capacity ratio for minor approach(es) is a weighted average provided for reference purposes. The *Highway Capacity Manual, 7th Edition: A Guide for Multimodal Mobility Analysis* does not define overall average delay for the intersection as a whole for two-way or single approach stop-controlled intersections.

Traffic Operations Summary

Copper Square Subdivision

Intersection: **Grand Avenue & 62nd Street West**

WEEKDAY, MIDDAY PEAK HOUR

Analysis Scenario	Analysis Data	GRAND AVENUE From the West (Eastbound) U	L	T	R	GRAND AVENUE From the East (Westbound) U	L	T	R	South Side of Grand Avenue U	L	T	R	62ND STREET WEST From the North (Southbound) U	L	T	R	Minor Approach Totals	Intersection Totals
2025 EXISTING CONDITIONS	Traffic Control	Uncontrolled				Uncontrolled								Stop Controlled					
	Minor or Major Approach?	Major				Major								Minor					
	Entry Volume, V (veh/hr)	0	47	150		0		156	62					0	75		36		
	Peak Hour Factor (PHF)	0.95				0.95								0.95					
	Adjusted Volume, V_A (veh/hr)	0	49	158		0		164	65					0	79		38		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	LT				TR								LR					
	Lane Group Volume, V_{LG} (veh/hr)	207				229								117				117	554
	Capacity, c (veh/hr)	1,298				1,629								604				604	3,531
	Volume-to-Capacity Ratio, V_A/c	0.16				0.14								0.19				0.19	0.16
	HCM 95% Queue Length, Q_{95} (veh)	0.1				0.0								0.7					
	HCM 95% Queue Length, Q_{95} (ft)	2.7				0.0								18.5					
	Available Queue Storage, S_Q (ft)	880				540								680					
	Average Control Delay (sec/veh)	2.1				1.4								12.4				12.4	4.0
	Level of Service, LOS	A				A								B					
	Approach Delay (sec/veh)	2.1				1.4								12.4				B	A
	Approach Level of Service, LOS	A				A								B					
ESTIMATED 2030 BACKGROUND TRAFFIC	Traffic Control	Uncontrolled				Uncontrolled								Stop Controlled					
	Minor or Major Approach?	Major				Major								Minor					
	Entry Volume, V (veh/hr)	0	54	172		0		178	81					0	95		43		
	Peak Hour Factor (PHF)	0.93				0.93								0.93					
	Adjusted Volume, V_A (veh/hr)	0	58	185		0		191	87					0	102		46		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	LT				TR								LR					
	Lane Group Volume, V_{LG} (veh/hr)	243				278								148				148	670
	Capacity, c (veh/hr)	1,250				1,587								541				541	3,378
	Volume-to-Capacity Ratio, V_A/c	0.19				0.18								0.27				0.27	0.20
	HCM 95% Queue Length, Q_{95} (veh)	0.1				0.0								1.1					
	HCM 95% Queue Length, Q_{95} (ft)	2.7				0.0								28.9					
	Available Queue Storage, S_Q (ft)	880				540								680					
	Average Control Delay (sec/veh)	2.2				1.6								14.1				14.1	4.6
	Level of Service, LOS	A				A								B					
	Approach Delay (sec/veh)	2.2				1.6								14.1				B	A
	Approach Level of Service, LOS	A				A								B					
ESTIMATED 2030 TOTAL TRAFFIC	Traffic Control	Uncontrolled				Uncontrolled								Stop Controlled					
	Minor or Major Approach?	Major				Major								Minor					
	Entry Volume, V (veh/hr)	0	57	172		0		178	82					0	96		46		
	Peak Hour Factor (PHF)	0.93				0.93								0.93					
	Adjusted Volume, V_A (veh/hr)	0	61	185		0		191	88					0	103		49		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	LT				TR								LR					
	Lane Group Volume, V_{LG} (veh/hr)	246				280								153				153	678
	Capacity, c (veh/hr)	1,249				1,586								539				539	3,374
	Volume-to-Capacity Ratio, V_A/c	0.20				0.18								0.28				0.28	0.20
	HCM 95% Queue Length, Q_{95} (veh)	0.2				0.0								1.2					
	HCM 95% Queue Length, Q_{95} (ft)	5.3				0.0								31.6					
	Available Queue Storage, S_Q (ft)	880				540								680					
	Average Control Delay (sec/veh)	2.3				1.6								14.3				14.3	4.7
	Level of Service, LOS	A				A								B					
	Approach Delay (sec/veh)	2.3				1.6								14.3				B	A
	Approach Level of Service, LOS	A				A								B					

U = U-Turns; L = Left Turns; T = Through; R = Right Turns | Lane Groups: LT = Left-Through; TR = Through-Righ; LR = Left-Right

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Traffic Operations Summary

Copper Square Subdivision

Intersection: **Grand Avenue & 62nd Street West**

WEEKDAY, MIDDAY PEAK HOUR

Analysis Scenario	Analysis Data	GRAND AVENUE From the West (Eastbound) U	L	T	R	GRAND AVENUE From the East (Westbound) U	L	T	R	South Side of Grand Avenue U	L	T	R	62ND STREET WEST From the North (Southbound) U	L	T	R	Minor Approach Totals	Intersection Totals
ESTIMATED 2034 BACKGROUND TRAFFIC	Traffic Control	Uncontrolled				Uncontrolled								Stop Controlled					
	Minor or Major Approach?	Major				Major								Minor					
	Entry Volume, V (veh/hr)	0	59	178		0		185	88					0	103		48		
	Peak Hour Factor (PHF)	0.93				0.93								0.93					
	Adjusted Volume, V_A (veh/hr)	0	63	191		0		199	95					0	111		52		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	LT				TR								LR					
	Lane Group Volume, V_{LG} (veh/hr)	255				294								162				162	711
	Capacity, c (veh/hr)	1,234				1,584								522				522	3,340
	Volume-to-Capacity Ratio, V_A/c	0.21				0.19								0.31				0.31	0.21
	HCM 95% Queue Length, Q_{95} (veh)	0.2				0.0								1.3					
	HCM 95% Queue Length, Q_{95} (ft)	5.3				0.0								34.2					
	Available Queue Storage, S_Q (ft)	880				540								680					
	Average Control Delay (sec/veh)	2.4				1.6								15.0				15.0	4.9
	Level of Service, LOS	A				A								B					
	Approach Delay (sec/veh)	2.4				1.6								15.0				B	A
	Approach Level of Service, LOS	A				A								B					
ESTIMATED 2034 TOTAL TRAFFIC	Traffic Control	Uncontrolled				Uncontrolled								Stop Controlled					
	Minor or Major Approach?	Major				Major								Minor					
	Entry Volume, V (veh/hr)	0	60	178		0		185	88					0	103		49		
	Peak Hour Factor (PHF)	0.93				0.93								0.93					
	Adjusted Volume, V_A (veh/hr)	0	65	191		0		199	95					0	111		53		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	LT				TR								LR					
	Lane Group Volume, V_{LG} (veh/hr)	256				294								163				163	713
	Capacity, c (veh/hr)	1,234				1,584								522				522	3,340
	Volume-to-Capacity Ratio, V_A/c	0.21				0.19								0.31				0.31	0.21
	HCM 95% Queue Length, Q_{95} (veh)	0.2				0.0								1.3					
	HCM 95% Queue Length, Q_{95} (ft)	5.3				0.0								34.2					
	Available Queue Storage, S_Q (ft)	880				540								680					
	Average Control Delay (sec/veh)	2.4				1.6								15.0				15.0	5.0
	Level of Service, LOS	A				A								C					
	Approach Delay (sec/veh)	2.4				1.6								15.0				C	A
	Approach Level of Service, LOS	A				A								C					

U = U-Turns; L = Left Turns; T = Through; R = Right Turns | Lane Groups: LT = Left-Through; TR = Through-Righ; LR = Left-Right

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Traffic Operations Summary

Copper Square Subdivision

Intersection: Grand Avenue & 62nd Street West

WEEKDAY, PM PEAK HOUR

Analysis Scenario	Analysis Data	GRAND AVENUE From the West (Eastbound) U	L	T	R	GRAND AVENUE From the East (Westbound) U	L	T	R	South Side of Grand Avenue U	L	T	R	62ND STREET WEST From the North (Southbound) U	L	T	R	Minor Approach Totals	Intersection Totals
2025 EXISTING CONDITIONS	Traffic Control	Uncontrolled				Uncontrolled								Stop Controlled					
	Minor or Major Approach?	Major				Major								Minor					
	Entry Volume, V (veh/hr)	0	71	205		0		223	127					0	111		49		
	Peak Hour Factor (PHF)	0.93				0.93								0.93					
	Adjusted Volume, V_A (veh/hr)	0	76	220		0		239	136					0	119		53		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	LT				TR								LR					
	Lane Group Volume, V_{LG} (veh/hr)	296				376								172				172	844
	Capacity, c (veh/hr)	1,171				1,575								449				449	3,195
	Volume-to-Capacity Ratio, V_A/c	0.25				0.24								0.38				0.38	0.26
	HCM 95% Queue Length, Q_{95} (veh)	0.2				0.0								1.8					
	HCM 95% Queue Length, Q_{95} (ft)	5.2				0.0								46.2					
	Available Queue Storage, S_Q (ft)	880				540								680					
	Average Control Delay (sec/veh)	2.6				1.8								17.9				17.9	5.4
	Level of Service, LOS	A				A								C					
	Approach Delay (sec/veh)	2.6				1.8								17.9				C	A
	Approach Level of Service, LOS	A				A								C					
ESTIMATED 2030 BACKGROUND TRAFFIC	Traffic Control	Uncontrolled				Uncontrolled								Stop Controlled					
	Minor or Major Approach?	Major				Major								Minor					
	Entry Volume, V (veh/hr)	0	85	235		0		262	164					0	138		58		
	Peak Hour Factor (PHF)	0.91				0.91								0.91					
	Adjusted Volume, V_A (veh/hr)	0	93	258		0		288	180					0	152		64		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	LT				TR								LR					
	Lane Group Volume, V_{LG} (veh/hr)	352				468								215				215	1,035
	Capacity, c (veh/hr)	1,083				1,533								366				366	2,982
	Volume-to-Capacity Ratio, V_A/c	0.32				0.31								0.59				0.59	0.35
	HCM 95% Queue Length, Q_{95} (veh)	0.3				0.0								3.6					
	HCM 95% Queue Length, Q_{95} (ft)	7.7				0.0								92.4					
	Available Queue Storage, S_Q (ft)	880				540								680					
	Average Control Delay (sec/veh)	2.9				1.9								28.0				28.0	7.7
	Level of Service, LOS	A				A								D					
	Approach Delay (sec/veh)	2.9				1.9								28.0				D	A
	Approach Level of Service, LOS	A				A								D					
ESTIMATED 2030 TOTAL TRAFFIC	Traffic Control	Uncontrolled				Uncontrolled								Stop Controlled					
	Minor or Major Approach?	Major				Major								Minor					
	Entry Volume, V (veh/hr)	0	88	235		0		262	165					0	139		60		
	Peak Hour Factor (PHF)	0.91				0.91								0.91					
	Adjusted Volume, V_A (veh/hr)	0	97	258		0		288	181					0	153		66		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	LT				TR								LR					
	Lane Group Volume, V_{LG} (veh/hr)	355				469								219				219	1,043
	Capacity, c (veh/hr)	1,082				1,533								363				363	2,978
	Volume-to-Capacity Ratio, V_A/c	0.33				0.31								0.60				0.60	0.35
	HCM 95% Queue Length, Q_{95} (veh)	0.3				0.0								3.8					
	HCM 95% Queue Length, Q_{95} (ft)	7.7				0.0								97.5					
	Available Queue Storage, S_Q (ft)	880				540								680					
	Average Control Delay (sec/veh)	3.0				1.9								28.9				28.9	7.9
	Level of Service, LOS	A				A								D					
	Approach Delay (sec/veh)	3.0				1.9								28.9				D	A
	Approach Level of Service, LOS	A				A								D					

U = U-Turns; L = Left Turns; T = Through; R = Right Turns | Lane Groups: LT = Left-Through; TR = Through-Righ; LR = Left-Right

Average intersection delay and volume-to-capacity ratio for minor approach(es) is a weighted average provided for reference purposes. The Highway Capacity Manual, 7th Edition: A Guide for Multimodal Mobility Analysis does not define overall average delay for the intersection as a whole for two-way or single approach stop-controlled intersections.

Traffic Operations Summary

Copper Square Subdivision

Intersection: **Grand Avenue & 62nd Street West**

WEEKDAY, PM PEAK HOUR

Analysis Scenario	Analysis Data	GRAND AVENUE From the West (Eastbound) U	L	T	R	GRAND AVENUE From the East (Westbound) U	L	T	R	South Side of Grand Avenue U	L	T	R	62ND STREET WEST From the North (Southbound) U	L	T	R	Minor Approach Totals	Intersection Totals
ESTIMATED 2034 BACKGROUND TRAFFIC	Traffic Control	Uncontrolled				Uncontrolled								Stop Controlled					
	Minor or Major Approach?	Major				Major								Minor					
	Entry Volume, V (veh/hr)	0	92	244		0		273	177					0	148		62		
	Peak Hour Factor (PHF)	0.91				0.91								0.91					
	Adjusted Volume, V_A (veh/hr)	0	101	268		0		300	195					0	163		68		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	LT				TR								LR					
	Lane Group Volume, V_{LG} (veh/hr)	369				495								231				231	1,095
	Capacity, c (veh/hr)	1,059				1,531								342				342	2,932
	Volume-to-Capacity Ratio, V_A/c	0.35				0.32								0.67				0.67	0.37
	HCM 95% Queue Length, Q_{95} (veh)	0.3				0.0								4.7					
	HCM 95% Queue Length, Q_{95} (ft)	7.7				0.0								120.6					
	Available Queue Storage, S_Q (ft)	880				540								680					
	Average Control Delay (sec/veh)	3.1				2.0								34.8				34.8	9.3
	Level of Service, LOS	A				A								D					
	Approach Delay (sec/veh)	3.1				2.0								34.8				D	A
	Approach Level of Service, LOS	A				A								D					
ESTIMATED 2034 TOTAL TRAFFIC	Traffic Control	Uncontrolled				Uncontrolled								Stop Controlled					
	Minor or Major Approach?	Major				Major								Minor					
	Entry Volume, V (veh/hr)	0	93	244		0		273	177					0	148		64		
	Peak Hour Factor (PHF)	0.91				0.91								0.91					
	Adjusted Volume, V_A (veh/hr)	0	102	268		0		300	195					0	163		70		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	LT				TR								LR					
	Lane Group Volume, V_{LG} (veh/hr)	370				495								233				233	1,098
	Capacity, c (veh/hr)	1,059				1,531								342				342	2,932
	Volume-to-Capacity Ratio, V_A/c	0.35				0.32								0.68				0.68	0.37
	HCM 95% Queue Length, Q_{95} (veh)	0.3				0.0								4.7					
	HCM 95% Queue Length, Q_{95} (ft)	7.7				0.0								120.6					
	Available Queue Storage, S_Q (ft)	880				540								680					
	Average Control Delay (sec/veh)	3.1				2.0								35.2				35.2	9.4
	Level of Service, LOS	A				A								E					
	Approach Delay (sec/veh)	3.1				2.0								35.2				E	A
	Approach Level of Service, LOS	A				A								E					

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Average intersection delay and volume-to-capacity ratio for minor approach(es) is a weighted average provided for reference purposes. The Highway Capacity Manual, 7th Edition: A Guide for Multimodal Mobility Analysis does not define overall average delay for the intersection as a whole for two-way or single approach stop-controlled intersections.

Traffic Operations Summary

Copper Square Subdivision

Intersection: Rimrock Road & 62nd Street West / Molt Road

WEEKDAY, AM PEAK HOUR

Analysis Scenario	Analysis Data	RIMROCK ROAD From the West (Eastbound)				RIMROCK ROAD From the East (Westbound)				62ND STREET WEST From the South (Northbound)				62ND ST W / MOLT RD From the North (Southbound)				Minor Approach Totals	Intersection Totals
		U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R		
2025 EXISTING CONDITIONS	Traffic Control	Roundabout				Roundabout				Roundabout				Roundabout					
	Minor or Major Approach?	Minor				Major				Minor				Major					
	Entry Volume, V (veh/hr)	0	6	154	79	0	47	39	68	0	15	36	34	0	286	147	4		
	Peak Hour Factor (PHF)	0.77				0.77				0.77				0.77					
	Adjusted Volume, V_A (veh/hr)	0	8	199	102	0	61	50	88	0	19	47	44	0	370	190	5		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	LTR				LTR				LTR				LTR					
	Lane Group Volume, V_{LG} (veh/hr)	309				199				110				565				118	1,184
	Capacity, c (veh/hr)	701				1,168				669				1,157				1,370	3,695
	Volume-to-Capacity Ratio, V_A/c	0.44				0.17				0.16				0.49				0.09	0.32
	HCM 95% Queue Length, Q_{95} (veh)	2.3				0.6				0.6				2.8					
	HCM 95% Queue Length, Q_{95} (ft)	58.4				16.0				16.5				71.7					
	Available Queue Storage, S_Q (ft)	640				1,050				500				900					
	Average Control Delay (sec/veh)	11.4				4.6				7.3				8.5				7.6	8.5
	Level of Service, LOS	B				A				A				A					
	Approach Delay (sec/veh)	11.4				4.6				7.3				8.5				A	A
	Approach Level of Service, LOS	B				A				A				A					
ESTIMATED 2030 BACKGROUND TRAFFIC	Traffic Control	Roundabout				Roundabout				Roundabout				Roundabout					
	Minor or Major Approach?	Minor				Major				Minor				Major					
	Entry Volume, V (veh/hr)	0	15	271	110	0	58	85	70	0	28	37	39	0	295	151	7		
	Peak Hour Factor (PHF)	0.78				0.78				0.78				0.78					
	Adjusted Volume, V_A (veh/hr)	0	19	347	141	0	74	109	90	0	36	47	50	0	378	194	9		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	LTR				LTR				LTR				LTR					
	Lane Group Volume, V_{LG} (veh/hr)	508				273				133				581				641	1,495
	Capacity, c (veh/hr)	685				1,151				570				1,056				1,255	3,462
	Volume-to-Capacity Ratio, V_A/c	0.74				0.24				0.23				0.55				0.51	0.43
	HCM 95% Queue Length, Q_{95} (veh)	6.6				0.9				0.9				3.5					
	HCM 95% Queue Length, Q_{95} (ft)	167.6				23.7				24.5				89.6					
	Available Queue Storage, S_Q (ft)	640				1,050				500				900					
	Average Control Delay (sec/veh)	22.4				5.3				9.4				10.2				2.6	13.4
	Level of Service, LOS	C				A				A				B					
	Approach Delay (sec/veh)	22.4				5.3				9.4				10.2				A	B
	Approach Level of Service, LOS	C				A				A				B					
ESTIMATED 2030 TOTAL TRAFFIC	Traffic Control	Roundabout				Roundabout				Roundabout				Roundabout					
	Minor or Major Approach?	Minor				Major				Minor				Major					
	Entry Volume, V (veh/hr)	0	15	282	110	0	60	92	83	0	28	37	43	0	315	151	7		
	Peak Hour Factor (PHF)	0.78				0.78				0.78				0.78					
	Adjusted Volume, V_A (veh/hr)	0	19	362	141	0	77	118	106	0	36	47	55	0	404	194	9		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	LTR				LTR				LTR				LTR					
	Lane Group Volume, V_{LG} (veh/hr)	522				301				138				606				660	1,568
	Capacity, c (veh/hr)	665				1,150				547				1,043				1,212	3,405
	Volume-to-Capacity Ratio, V_A/c	0.78				0.26				0.25				0.58				0.54	0.46
	HCM 95% Queue Length, Q_{95} (veh)	7.7				1.1				1.0				3.9					
	HCM 95% Queue Length, Q_{95} (ft)	195.5				29.0				27.2				99.8					
	Available Queue Storage, S_Q (ft)	640				1,050				500				900					
	Average Control Delay (sec/veh)	26.2				5.6				10.1				11.0				2.9	14.9
	Level of Service, LOS	D				A				B				B					
	Approach Delay (sec/veh)	26.2				5.6				10.1				11.0				A	B
	Approach Level of Service, LOS	D				A				B				B					

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Average intersection delay and volume-to-capacity ratio for minor approach(es) is a weighted average provided for reference purposes. The *Highway Capacity Manual, 7th Edition: A Guide for Multimodal Mobility Analysis* does not define overall average delay for the intersection as a whole for two-way or single approach stop-controlled intersections.

Traffic Operations Summary

Copper Square Subdivision

Intersection: Rimrock Road & 62nd Street West / Molt Road

WEEKDAY, AM PEAK HOUR

Analysis Scenario	Analysis Data	RIMROCK ROAD From the West (Eastbound)				RIMROCK ROAD From the East (Westbound)				62ND STREET WEST From the South (Northbound)				62ND ST W / MOLT RD From the North (Southbound)				Minor Approach Totals	Intersection Totals
		U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R		
ESTIMATED 2034 BACKGROUND TRAFFIC	Traffic Control	Roundabout				Roundabout				Roundabout				Roundabout					
	Minor or Major Approach?	Minor				Major				Minor				Major					
	Entry Volume, V (veh/hr)	0	17	309	118	0	63	101	85	0	31	38	44	0	322	155	8		
	Peak Hour Factor (PHF)	0.78				0.78				0.78				0.78					
	Adjusted Volume, V_A (veh/hr)	0	22	396	151	0	81	129	109	0	40	49	56	0	413	199	10		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	LTR				LTR				LTR				LTR					
	Lane Group Volume, V_{LG} (veh/hr)	569				319				145				622				714	1,655
	Capacity, c (veh/hr)	651				1,141				522				1,021				1,173	3,335
	Volume-to-Capacity Ratio, V_A/c	0.87				0.28				0.28				0.61				0.61	0.50
	HCM 95% Queue Length, Q_{95} (veh)	10.3				1.2				1.1				4.3					
	HCM 95% Queue Length, Q_{95} (ft)	262.0				31.6				29.9				110.1					
	Available Queue Storage, S_Q (ft)	640				1,050				500				900					
	Average Control Delay (sec/veh)	36.1				5.8				10.9				11.9				3.3	19.0
	Level of Service, LOS	E				A				B				B					
	Approach Delay (sec/veh)	36.1				5.8				10.9				11.9				A	C
	Approach Level of Service, LOS	E				A				B				B					
ESTIMATED 2034 TOTAL TRAFFIC	Traffic Control	Roundabout				Roundabout				Roundabout				Roundabout					
	Minor or Major Approach?	Minor				Major				Minor				Major					
	Entry Volume, V (veh/hr)	0	17	313	118	0	65	104	90	0	31	38	45	0	331	155	8		
	Peak Hour Factor (PHF)	0.78				0.78				0.78				0.78					
	Adjusted Volume, V_A (veh/hr)	0	22	401	151	0	83	133	115	0	40	49	58	0	424	199	10		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	LTR				LTR				LTR				LTR					
	Lane Group Volume, V_{LG} (veh/hr)	574				332				146				633				721	1,686
	Capacity, c (veh/hr)	641				1,141				515				1,014				1,156	3,311
	Volume-to-Capacity Ratio, V_A/c	0.90				0.29				0.28				0.62				0.62	0.51
	HCM 95% Queue Length, Q_{95} (veh)	11.0				1.2				1.2				4.5					
	HCM 95% Queue Length, Q_{95} (ft)	279.8				31.6				32.5				115.2					
	Available Queue Storage, S_Q (ft)	640				1,050				500				900					
	Average Control Delay (sec/veh)	39.4				5.9				11.2				12.4				3.5	20.2
	Level of Service, LOS	E				A				B				B					
	Approach Delay (sec/veh)	39.4				5.9				11.2				12.4				A	C
	Approach Level of Service, LOS	E				A				B				B					

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Traffic Operations Summary

Copper Square Subdivision

Intersection: Rimrock Road & 62nd Street West / Molt Road

WEEKDAY, MIDDAY PEAK HOUR

Analysis Scenario	Analysis Data	RIMROCK ROAD From the West (Eastbound)				RIMROCK ROAD From the East (Westbound)				62ND STREET WEST From the South (Northbound)				62ND ST W / MOLT RD From the North (Southbound)				Minor Approach Totals	Intersection Totals
		U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R		
2025 EXISTING CONDITIONS	Traffic Control	Roundabout				Roundabout				Roundabout				Roundabout					
	Minor or Major Approach?	Minor				Major				Minor				Major					
	Entry Volume, V (veh/hr)	0	4	63	28	0	27	66	131	0	29	52	23	0	110	57	3		
	Peak Hour Factor (PHF)	0.97				0.97				0.97				0.97					
	Adjusted Volume, V_A (veh/hr)	0	4	65	29	0	28	68	135	0	30	54	24	0	114	59	3		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	LTR				LTR				LTR				LTR					
	Lane Group Volume, V_{LG} (veh/hr)	98				231				107				175				205	612
	Capacity, c (veh/hr)	1,071				1,211				1,078				1,140				2,149	4,500
	Volume-to-Capacity Ratio, V_A/c	0.09				0.19				0.10				0.15				0.10	0.14
	HCM 95% Queue Length, Q_{95} (veh)	0.3				0.7				0.3				0.5					
	HCM 95% Queue Length, Q_{95} (ft)	7.7				18.0				7.8				13.1					
	Available Queue Storage, S_Q (ft)	640				1,050				500				900					
	Average Control Delay (sec/veh)	4.2				4.6				4.2				4.5				4.2	4.4
	Level of Service, LOS	A				A				A				A					
	Approach Delay (sec/veh)	4.2				4.6				4.2				4.5				A	A
	Approach Level of Service, LOS	A				A				A				A					
ESTIMATED 2030 BACKGROUND TRAFFIC	Traffic Control	Roundabout				Roundabout				Roundabout				Roundabout					
	Minor or Major Approach?	Minor				Major				Minor				Major					
	Entry Volume, V (veh/hr)	0	9	122	45	0	33	125	135	0	46	54	28	0	113	59	8		
	Peak Hour Factor (PHF)	0.93				0.93				0.93				0.93					
	Adjusted Volume, V_A (veh/hr)	0	10	131	48	0	35	134	145	0	49	58	30	0	122	63	9		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	LTR				LTR				LTR				LTR					
	Lane Group Volume, V_{LG} (veh/hr)	189				315				138				194				327	835
	Capacity, c (veh/hr)	1,049				1,173				996				1,034				2,045	4,252
	Volume-to-Capacity Ratio, V_A/c	0.18				0.27				0.14				0.19				0.16	0.20
	HCM 95% Queue Length, Q_{95} (veh)	0.7				1.1				0.5				0.7					
	HCM 95% Queue Length, Q_{95} (ft)	18.0				28.4				13.0				18.3					
	Available Queue Storage, S_Q (ft)	640				1,050				500				900					
	Average Control Delay (sec/veh)	5.1				5.5				4.9				5.2				5.0	5.2
	Level of Service, LOS	A				A				A				A					
	Approach Delay (sec/veh)	5.1				5.5				4.9				5.2				A	A
	Approach Level of Service, LOS	A				A				A				A					
ESTIMATED 2030 TOTAL TRAFFIC	Traffic Control	Roundabout				Roundabout				Roundabout				Roundabout					
	Minor or Major Approach?	Minor				Major				Minor				Major					
	Entry Volume, V (veh/hr)	0	9	133	45	0	37	136	156	0	46	54	32	0	134	59	8		
	Peak Hour Factor (PHF)	0.92				0.92				0.92				0.92					
	Adjusted Volume, V_A (veh/hr)	0	10	145	49	0	40	148	170	0	50	59	35	0	146	64	9		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	LTR				LTR				LTR				LTR					
	Lane Group Volume, V_{LG} (veh/hr)	203				358				143				218				347	923
	Capacity, c (veh/hr)	1,015				1,166				956				1,012				1,971	4,149
	Volume-to-Capacity Ratio, V_A/c	0.20				0.31				0.15				0.22				0.18	0.22
	HCM 95% Queue Length, Q_{95} (veh)	0.7				1.3				0.5				0.8					
	HCM 95% Queue Length, Q_{95} (ft)	18.0				33.6				13.0				21.0					
	Available Queue Storage, S_Q (ft)	640				1,050				500				900					
	Average Control Delay (sec/veh)	5.4				6.0				5.2				5.6				5.3	5.6
	Level of Service, LOS	A				A				A				A					
	Approach Delay (sec/veh)	5.4				6.0				5.2				5.6				A	A
	Approach Level of Service, LOS	A				A				A				A					

U = U-Turns; L = Left Turns; T = Through; R = Right Turns | Lane Groups: LTR = Left-Through-Right

Average intersection delay and volume-to-capacity ratio for minor approach(es) is a weighted average provided for reference purposes. The Highway Capacity Manual, 7th Edition: A Guide for Multimodal Mobility Analysis does not define overall average delay for the intersection as a whole for two-way or single approach stop-controlled intersections.

Traffic Operations Summary

Copper Square Subdivision

Intersection: Rimrock Road & 62nd Street West / Molt Road

WEEKDAY, MIDDAY PEAK HOUR

Analysis Scenario	Analysis Data	RIMROCK ROAD From the West (Eastbound)				RIMROCK ROAD From the East (Westbound)				62ND STREET WEST From the South (Northbound)				62ND ST W / MOLT RD From the North (Southbound)				Minor Approach Totals	Intersection Totals
		U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R		
ESTIMATED 2034 BACKGROUND TRAFFIC	Traffic Control	Roundabout				Roundabout				Roundabout				Roundabout					
	Minor or Major Approach?	Minor				Major				Minor				Major					
	Entry Volume, V (veh/hr)	0	10	144	49	0	37	148	159	0	50	55	32	0	137	60	9		
	Peak Hour Factor (PHF)	0.92				0.92				0.92				0.92					
	Adjusted Volume, V_A (veh/hr)	0	11	157	53	0	40	161	173	0	54	60	35	0	149	65	10		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	LTR				LTR				LTR				LTR					
	Lane Group Volume, V_{LG} (veh/hr)	221				374				149				224				370	967
	Capacity, c (veh/hr)	1,011				1,159				940				993				1,951	4,103
	Volume-to-Capacity Ratio, V_A/c	0.22				0.32				0.16				0.23				0.19	0.24
	HCM 95% Queue Length, Q_{95} (veh)	0.8				1.4				0.6				0.9					
	HCM 95% Queue Length, Q_{95} (ft)	20.6				36.2				15.5				23.6					
	Available Queue Storage, S_Q (ft)	640				1,050				500				900					
	Average Control Delay (sec/veh)	5.6				6.2				5.3				5.8				5.5	5.8
	Level of Service, LOS	A				A				A				A					
	Approach Delay (sec/veh)	5.6				6.2				5.3				5.8				A	A
	Approach Level of Service, LOS	A				A				A				A					
ESTIMATED 2034 TOTAL TRAFFIC	Traffic Control	Roundabout				Roundabout				Roundabout				Roundabout					
	Minor or Major Approach?	Minor				Major				Minor				Major					
	Entry Volume, V (veh/hr)	0	10	149	49	0	38	153	171	0	50	55	33	0	145	60	9		
	Peak Hour Factor (PHF)	0.92				0.92				0.92				0.92					
	Adjusted Volume, V_A (veh/hr)	0	11	162	53	0	41	166	186	0	54	60	36	0	158	65	10		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	LTR				LTR				LTR				LTR					
	Lane Group Volume, V_{LG} (veh/hr)	226				393				150				233				376	1,002
	Capacity, c (veh/hr)	999				1,159				926				987				1,925	4,071
	Volume-to-Capacity Ratio, V_A/c	0.23				0.34				0.16				0.24				0.20	0.25
	HCM 95% Queue Length, Q_{95} (veh)	0.9				1.5				0.6				0.9					
	HCM 95% Queue Length, Q_{95} (ft)	23.2				38.8				15.5				23.6					
	Available Queue Storage, S_Q (ft)	640				1,050				500				900					
	Average Control Delay (sec/veh)	5.8				6.4				5.4				5.9				5.6	6.0
	Level of Service, LOS	A				A				A				A					
	Approach Delay (sec/veh)	5.8				6.4				5.4				5.9				A	A
	Approach Level of Service, LOS	A				A				A				A					

U = U-Turns; L = Left Turns; T = Through; R = Right Turns | Lane Groups: LTR = Left-Through-Right

Average intersection delay and volume-to-capacity ratio for minor approach(es) is a weighted average provided for reference purposes. The Highway Capacity Manual, 7th Edition: A Guide for Multimodal Mobility Analysis does not define overall average delay for the intersection as a whole for two-way or single approach stop-controlled intersections.

Traffic Operations Summary

Copper Square Subdivision

Intersection: Rimrock Road & 62nd Street West / Molt Road

WEEKDAY, PM PEAK HOUR

Analysis Scenario	Analysis Data	RIMROCK ROAD From the West (Eastbound)				RIMROCK ROAD From the East (Westbound)				62ND STREET WEST From the South (Northbound)				62ND ST W / MOLT RD From the North (Southbound)				Minor Approach Totals	Intersection Totals
		U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R		
2025 EXISTING CONDITIONS	Traffic Control	Roundabout				Roundabout				Roundabout				Roundabout					
	Minor or Major Approach?	Minor				Major				Minor				Major					
	Entry Volume, V (veh/hr)	0	4	81	42	3	38	129	250	0	63	102	44	0	122	93	6		
	Peak Hour Factor (PHF)	0.91				0.91				0.91				0.91					
	Adjusted Volume, V_A (veh/hr)	0	4	89	46	3	42	142	275	0	69	112	48	0	134	102	7		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				1				0				1	1
	Lane Group	LTR				LTR				LTR				LTR					
	Lane Group Volume, V_{LG} (veh/hr)	140				463				230				243				370	1,076
	Capacity, c (veh/hr)	1,015				1,127				1,077				1,031				2,092	4,250
	Volume-to-Capacity Ratio, V_A/c	0.14				0.41				0.21				0.24				0.18	0.25
	HCM 95% Queue Length, Q_{95} (veh)	0.5				2.0				0.8				0.9					
	HCM 95% Queue Length, Q_{95} (ft)	12.6				50.5				20.1				23.0					
	Available Queue Storage, S_Q (ft)	640				1,050				500				900					
	Average Control Delay (sec/veh)	4.8				7.4				5.3				5.7				5.1	6.2
	Level of Service, LOS	A				A				A				A					
	Approach Delay (sec/veh)	4.8				7.4				5.3				5.7				A	A
	Approach Level of Service, LOS	A				A				A				A					
ESTIMATED 2030 BACKGROUND TRAFFIC	Traffic Control	Roundabout				Roundabout				Roundabout				Roundabout					
	Minor or Major Approach?	Minor				Major				Minor				Major					
	Entry Volume, V (veh/hr)	0	10	161	64	3	45	249	258	0	95	105	55	0	126	96	15		
	Peak Hour Factor (PHF)	0.88				0.88				0.88				0.88					
	Adjusted Volume, V_A (veh/hr)	0	11	183	73	3	51	283	293	0	108	119	63	0	143	109	17		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				1				0				1	1
	Lane Group	LTR				LTR				LTR				LTR					
	Lane Group Volume, V_{LG} (veh/hr)	267				631				290				269				557	1,457
	Capacity, c (veh/hr)	984				1,060				957				844				1,941	3,845
	Volume-to-Capacity Ratio, V_A/c	0.27				0.59				0.30				0.32				0.29	0.38
	HCM 95% Queue Length, Q_{95} (veh)	1.1				4.1				1.3				1.4					
	HCM 95% Queue Length, Q_{95} (ft)	27.9				103.9				32.8				35.8					
	Available Queue Storage, S_Q (ft)	640				1,050				500				900					
	Average Control Delay (sec/veh)	6.4				11.2				6.9				7.8				6.7	8.8
	Level of Service, LOS	A				B				A				A					
	Approach Delay (sec/veh)	6.4				11.2				6.9				7.8				A	A
	Approach Level of Service, LOS	A				B				A				A					
ESTIMATED 2030 TOTAL TRAFFIC	Traffic Control	Roundabout				Roundabout				Roundabout				Roundabout					
	Minor or Major Approach?	Minor				Major				Minor				Major					
	Entry Volume, V (veh/hr)	0	10	172	64	3	48	259	276	0	95	105	59	0	147	96	15		
	Peak Hour Factor (PHF)	0.88				0.88				0.88				0.88					
	Adjusted Volume, V_A (veh/hr)	0	11	195	73	3	55	294	314	0	108	119	67	0	167	109	17		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				1				0				1	1
	Lane Group	LTR				LTR				LTR				LTR					
	Lane Group Volume, V_{LG} (veh/hr)	280				666				294				293				574	1,533
	Capacity, c (veh/hr)	948				1,060				918				831				1,866	3,757
	Volume-to-Capacity Ratio, V_A/c	0.29				0.63				0.32				0.35				0.31	0.41
	HCM 95% Queue Length, Q_{95} (veh)	1.2				4.6				1.4				1.6					
	HCM 95% Queue Length, Q_{95} (ft)	30.6				116.6				35.3				40.9					
	Available Queue Storage, S_Q (ft)	640				1,050				500				900					
	Average Control Delay (sec/veh)	6.8				12.1				7.4				8.4				7.1	9.5
	Level of Service, LOS	A				B				A				A					
	Approach Delay (sec/veh)	6.8				12.1				7.4				8.4				A	A
	Approach Level of Service, LOS	A				B				A				A					

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Traffic Operations Summary

Copper Square Subdivision

Intersection: Rimrock Road & 62nd Street West / Molt Road

WEEKDAY, PM PEAK HOUR

Analysis Scenario	Analysis Data	RIMROCK ROAD From the West (Eastbound)				RIMROCK ROAD From the East (Westbound)				62ND STREET WEST From the South (Northbound)				62ND ST W / MOLT RD From the North (Southbound)				Minor Approach Totals	Intersection Totals
		U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R		
ESTIMATED 2034 BACKGROUND TRAFFIC	Traffic Control	Roundabout				Roundabout				Roundabout				Roundabout					
	Minor or Major Approach?	Minor				Major				Minor				Major					
	Entry Volume, V (veh/hr)	0	11	189	69	3	49	286	282	0	102	108	61	0	150	98	17		
	Peak Hour Factor (PHF)	0.88				0.88				0.88				0.88					
	Adjusted Volume, V_A (veh/hr)	0	13	215	78	3	56	325	320	0	116	123	69	0	170	111	19		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				1				0				1	1
	Lane Group	LTR				LTR				LTR				LTR					
	Lane Group Volume, V_{LG} (veh/hr)	306				705				308				301				614	1,619
	Capacity, c (veh/hr)	941				1,047				894				797				1,835	3,679
	Volume-to-Capacity Ratio, V_A/c	0.32				0.67				0.34				0.38				0.33	0.44
	HCM 95% Queue Length, Q_{95} (veh)	1.4				5.5				1.5				1.8					
	HCM 95% Queue Length, Q_{95} (ft)	35.7				139.4				37.9				46.1					
	Available Queue Storage, S_Q (ft)	640				1,050				500				900					
	Average Control Delay (sec/veh)	7.3				13.6				7.8				9.1				7.6	10.5
	Level of Service, LOS	A				B				A				A					
	Approach Delay (sec/veh)	7.3				13.6				7.8				9.1				A	B
	Approach Level of Service, LOS	A				B				A				A					
ESTIMATED 2034 TOTAL TRAFFIC	Traffic Control	Roundabout				Roundabout				Roundabout				Roundabout					
	Minor or Major Approach?	Minor				Major				Minor				Major					
	Entry Volume, V (veh/hr)	0	11	194	69	3	51	291	292	0	102	108	62	0	159	98	17		
	Peak Hour Factor (PHF)	0.88				0.88				0.88				0.88					
	Adjusted Volume, V_A (veh/hr)	0	13	220	78	3	58	331	332	0	116	123	70	0	181	111	19		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				1				0				1	1
	Lane Group	LTR				LTR				LTR				LTR					
	Lane Group Volume, V_{LG} (veh/hr)	311				724				309				311				620	1,656
	Capacity, c (veh/hr)	927				1,047				878				787				1,805	3,639
	Volume-to-Capacity Ratio, V_A/c	0.34				0.69				0.35				0.40				0.34	0.45
	HCM 95% Queue Length, Q_{95} (veh)	1.5				5.8				1.6				1.9					
	HCM 95% Queue Length, Q_{95} (ft)	38.2				147.0				40.4				48.8					
	Available Queue Storage, S_Q (ft)	640				1,050				500				900					
	Average Control Delay (sec/veh)	7.5				14.2				8.1				9.5				7.8	10.9
	Level of Service, LOS	A				B				A				A					
	Approach Delay (sec/veh)	7.5				14.2				8.1				9.5				A	B
	Approach Level of Service, LOS	A				B				A				A					

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Traffic Operations Summary

Copper Square Subdivision

Intersection: **Rimrock Road & 58th Street West / Glynn Abbey Way**

WEEKDAY, AM PEAK HOUR

Analysis Scenario	Analysis Data	RIMROCK ROAD From the West (Eastbound)				RIMROCK ROAD From the East (Westbound)				58TH STREET WEST From the South (Northbound)				GLYNN ABBEY WAY From the North (Southbound)				Minor Approach Totals	Intersection Totals
		U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R		
2025 EXISTING CONDITIONS	Traffic Control	Uncontrolled				Uncontrolled				Stop Controlled				Stop Controlled					
	Minor or Major Approach?	Major				Major				Minor				Minor					
	Entry Volume, V (veh/hr)	0	0	457	3	0	6	193	0	0	2	0	11	0	0	0	0		
	Peak Hour Factor (PHF)	0.79				0.79				0.79				0.79					
	Adjusted Volume, V_A (veh/hr)	0	0	577	4	0	8	244	0	0	3	0	14	0	0	0	0		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	LTR				LTR				LTR				LTR					
	Lane Group Volume, V_{LG} (veh/hr)	580				251				16				0				16	848
	Capacity, c (veh/hr)	1,334				1,002				382				0				382	2,718
	Volume-to-Capacity Ratio, V_A/c	0.44				0.25				0.04				0.00				0.04	0.31
	HCM 95% Queue Length, Q_{95} (veh)	0.0				0.0				0.1				0.0					
	HCM 95% Queue Length, Q_{95} (ft)	0.0				0.0				2.8				0.0					
	Available Queue Storage, S_Q (ft)	300				580				195				350					
	Average Control Delay (sec/veh)	0.0				0.3				14.8				0.0				14.8	0.4
	Level of Service, LOS	A				A				B				A					
	Approach Delay (sec/veh)	0.0				0.3				14.8				0.0				B	A
	Approach Level of Service, LOS	A				A				B				A					
ESTIMATED 2030 BACKGROUND TRAFFIC	Traffic Control	Uncontrolled				Uncontrolled				Stop Controlled				Stop Controlled					
	Minor or Major Approach?	Major				Major				Minor				Minor					
	Entry Volume, V (veh/hr)	0	1	583	7	0	19	245	2	0	10	1	38	0	7	2	1		
	Peak Hour Factor (PHF)	0.79				0.79				0.79				0.79					
	Adjusted Volume, V_A (veh/hr)	0	1	738	9	0	24	310	3	0	13	1	48	0	9	3	1		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	LTR				LTR				LTR				LTR					
	Lane Group Volume, V_{LG} (veh/hr)	748				337				62				13				75	1,159
	Capacity, c (veh/hr)	1,242				861				277				174				451	2,554
	Volume-to-Capacity Ratio, V_A/c	0.60				0.39				0.22				0.07				0.17	0.45
	HCM 95% Queue Length, Q_{95} (veh)	0.0				0.1				0.8				0.2					
	HCM 95% Queue Length, Q_{95} (ft)	0.0				2.5				21.0				5.1					
	Available Queue Storage, S_Q (ft)	300				580				195				350					
	Average Control Delay (sec/veh)	0.0				1.0				21.7				27.3				22.6	1.7
	Level of Service, LOS	A				A				C				D					
	Approach Delay (sec/veh)	0.0				1.0				21.7				27.3				C	A
	Approach Level of Service, LOS	A				A				C				D					
ESTIMATED 2030 TOTAL TRAFFIC	Traffic Control	Uncontrolled				Uncontrolled				Stop Controlled				Stop Controlled					
	Minor or Major Approach?	Major				Major				Minor				Minor					
	Entry Volume, V (veh/hr)	0	1	603	8	0	19	276	2	0	11	1	38	0	7	2	1		
	Peak Hour Factor (PHF)	0.79				0.79				0.79				0.79					
	Adjusted Volume, V_A (veh/hr)	0	1	763	10	0	24	349	3	0	14	1	48	0	9	3	1		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	LTR				LTR				LTR				LTR					
	Lane Group Volume, V_{LG} (veh/hr)	775				376				63				13				76	1,227
	Capacity, c (veh/hr)	1,201				842				252				156				408	2,451
	Volume-to-Capacity Ratio, V_A/c	0.65				0.45				0.25				0.08				0.19	0.50
	HCM 95% Queue Length, Q_{95} (veh)	0.0				0.1				1.0				0.3					
	HCM 95% Queue Length, Q_{95} (ft)	0.0				2.5				26.2				7.7					
	Available Queue Storage, S_Q (ft)	300				580				195				350					
	Average Control Delay (sec/veh)	0.0				0.9				24.0				30.1				25.0	1.8
	Level of Service, LOS	A				A				C				D					
	Approach Delay (sec/veh)	0.0				0.9				24.0				30.1				D	A
	Approach Level of Service, LOS	A				A				C				D					

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Traffic Operations Summary

Copper Square Subdivision

Intersection: Rimrock Road & 58th Street West / Glynn Abbey Way

WEEKDAY, AM PEAK HOUR

Analysis Scenario	Analysis Data	RIMROCK ROAD From the West (Eastbound)				RIMROCK ROAD From the East (Westbound)				58TH STREET WEST From the South (Northbound)				GLYNN ABBEY WAY From the North (Southbound)				Minor Approach Totals	Intersection Totals
		U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R		
ESTIMATED 2034 BACKGROUND TRAFFIC	Traffic Control	Uncontrolled				Uncontrolled				Stop Controlled				Stop Controlled					
	Minor or Major Approach?	Major				Major				Minor				Minor					
	Entry Volume, V (veh/hr)	0	1	637	8	0	22	290	2	0	12	1	41	0	7	2	1		
	Peak Hour Factor (PHF)	0.79				0.79				0.79				0.79					
	Adjusted Volume, V_A (veh/hr)	0	1	806	10	0	28	367	3	0	15	1	52	0	9	3	1		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	LTR				LTR				LTR				LTR					
	Lane Group Volume, V_{LG} (veh/hr)	818				397				68				13				81	1,296
	Capacity, c (veh/hr)	1,183				811				226				137				363	2,357
	Volume-to-Capacity Ratio, V_A/c	0.69				0.49				0.30				0.09				0.22	0.55
	HCM 95% Queue Length, Q_{95} (veh)	0.0				0.1				1.2				0.3					
	HCM 95% Queue Length, Q_{95} (ft)	0.0				2.5				31.8				7.7					
	Available Queue Storage, S_Q (ft)	300				580				195				350					
	Average Control Delay (sec/veh)	0.0				1.1				27.7				34.0				28.7	2.1
	Level of Service, LOS	A				A				D				D					
	Approach Delay (sec/veh)	0.0				1.1				27.7				34.0				D	A
	Approach Level of Service, LOS	A				A				D				D					
ESTIMATED 2034 TOTAL TRAFFIC	Traffic Control	Uncontrolled				Uncontrolled				Stop Controlled				Stop Controlled					
	Minor or Major Approach?	Major				Major				Minor				Minor					
	Entry Volume, V (veh/hr)	0	1	644	8	0	22	303	2	0	13	1	41	0	7	2	1		
	Peak Hour Factor (PHF)	0.79				0.79				0.79				0.79					
	Adjusted Volume, V_A (veh/hr)	0	1	815	10	0	28	384	3	0	16	1	52	0	9	3	1		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	LTR				LTR				LTR				LTR					
	Lane Group Volume, V_{LG} (veh/hr)	827				414				70				13				82	1,323
	Capacity, c (veh/hr)	1,167				805				215				131				346	2,318
	Volume-to-Capacity Ratio, V_A/c	0.71				0.51				0.32				0.10				0.24	0.57
	HCM 95% Queue Length, Q_{95} (veh)	0.0				0.1				1.3				0.3					
	HCM 95% Queue Length, Q_{95} (ft)	0.0				2.5				34.5				7.7					
	Available Queue Storage, S_Q (ft)	300				580				195				350					
	Average Control Delay (sec/veh)	0.0				1.0				29.6				35.4				30.5	2.2
	Level of Service, LOS	A				A				D				E					
	Approach Delay (sec/veh)	0.0				1.0				29.6				35.4				D	A
	Approach Level of Service, LOS	A				A				D				E					

U = U-Turns; L = Left Turns; T = Through; R = Right Turns | Lane Groups: LTR = Left-Through-Right

Average intersection delay and volume-to-capacity ratio for minor approach(es) is a weighted average provided for reference purposes. The *Highway Capacity Manual, 7th Edition: A Guide for Multimodal Mobility Analysis* does not define overall average delay for the intersection as a whole for two-way or single approach stop-controlled intersections.

Traffic Operations Summary

Copper Square Subdivision

Intersection: Rimrock Road & 58th Street West / Glynn Abbey Way

WEEKDAY, MIDDAY PEAK HOUR

Analysis Scenario	Analysis Data	RIMROCK ROAD From the West (Eastbound)				RIMROCK ROAD From the East (Westbound)				58TH STREET WEST From the South (Northbound)				GLYNN ABBEY WAY From the North (Southbound)				Minor Approach Totals	Intersection Totals
		U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R		
2025 EXISTING CONDITIONS	Traffic Control	Uncontrolled				Uncontrolled				Stop Controlled				Stop Controlled					
	Minor or Major Approach?	Major				Major				Minor				Minor					
	Entry Volume, V (veh/hr)	0	0	198	3	0	5	224	0	0	2	0	8	0	3	0	0		
	Peak Hour Factor (PHF)	0.96				0.96				0.96				0.96					
	Adjusted Volume, V_A (veh/hr)	0	0	206	3	0	5	233	0	0	2	0	8	0	3	0	0		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	LTR				LTR				LTR				LTR					
	Lane Group Volume, V_{LG} (veh/hr)	209				238				10				3				13	460
	Capacity, c (veh/hr)	1,346				1,373				721				511				1,232	3,951
	Volume-to-Capacity Ratio, V_A/c	0.16				0.17				0.01				0.01				0.01	0.12
	HCM 95% Queue Length, Q_{95} (veh)	0.0				0.0				0.0				0.0					
	HCM 95% Queue Length, Q_{95} (ft)	0.0				0.0				0.0				0.0					
	Available Queue Storage, S_Q (ft)	300				580				195				350					
	Average Control Delay (sec/veh)	0.0				0.2				10.1				12.1				10.6	0.4
	Level of Service, LOS	A				A				B				B					
	Approach Delay (sec/veh)	0.0				0.2				10.1				12.1				B	A
	Approach Level of Service, LOS	A				A				B				B					
ESTIMATED 2030 BACKGROUND TRAFFIC	Traffic Control	Uncontrolled				Uncontrolled				Stop Controlled				Stop Controlled					
	Minor or Major Approach?	Major				Major				Minor				Minor					
	Entry Volume, V (veh/hr)	0	0	261	8	0	19	288	4	0	6	1	24	0	7	1	1		
	Peak Hour Factor (PHF)	0.92				0.92				0.92				0.92					
	Adjusted Volume, V_A (veh/hr)	0	0	284	9	0	21	313	4	0	7	1	26	0	8	1	1		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	LTR				LTR				LTR				LTR					
	Lane Group Volume, V_{LG} (veh/hr)	292				338				34				10				43	674
	Capacity, c (veh/hr)	1,254				1,269				580				381				961	3,484
	Volume-to-Capacity Ratio, V_A/c	0.23				0.27				0.06				0.03				0.05	0.19
	HCM 95% Queue Length, Q_{95} (veh)	0.0				0.0				0.2				0.1					
	HCM 95% Queue Length, Q_{95} (ft)	0.0				0.0				5.1				2.5					
	Available Queue Storage, S_Q (ft)	300				580				195				350					
	Average Control Delay (sec/veh)	0.0				0.6				11.6				14.7				12.3	1.1
	Level of Service, LOS	A				A				B				B					
	Approach Delay (sec/veh)	0.0				0.6				11.6				14.7				B	A
	Approach Level of Service, LOS	A				A				B				B					
ESTIMATED 2030 TOTAL TRAFFIC	Traffic Control	Uncontrolled				Uncontrolled				Stop Controlled				Stop Controlled					
	Minor or Major Approach?	Major				Major				Minor				Minor					
	Entry Volume, V (veh/hr)	0	0	294	9	0	19	320	4	0	7	1	24	0	7	1	1		
	Peak Hour Factor (PHF)	0.91				0.91				0.91				0.91					
	Adjusted Volume, V_A (veh/hr)	0	0	323	10	0	21	352	4	0	8	1	26	0	8	1	1		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	LTR				LTR				LTR				LTR					
	Lane Group Volume, V_{LG} (veh/hr)	333				377				35				10				45	755
	Capacity, c (veh/hr)	1,214				1,226				519				338				857	3,297
	Volume-to-Capacity Ratio, V_A/c	0.27				0.31				0.07				0.03				0.05	0.23
	HCM 95% Queue Length, Q_{95} (veh)	0.0				0.1				0.2				0.1					
	HCM 95% Queue Length, Q_{95} (ft)	0.0				2.5				5.1				2.5					
	Available Queue Storage, S_Q (ft)	300				580				195				350					
	Average Control Delay (sec/veh)	0.0				0.6				12.4				16.0				13.2	1.1
	Level of Service, LOS	A				A				B				C					
	Approach Delay (sec/veh)	0.0				0.6				12.4				16.0				B	A
	Approach Level of Service, LOS	A				A				B				C					

U = U-Turns; L = Left Turns; T = Through; R = Right Turns | Lane Groups: LTR = Left-Through-Right

Average intersection delay and volume-to-capacity ratio for minor approach(es) is a weighted average provided for reference purposes. The Highway Capacity Manual, 7th Edition: A Guide for Multimodal Mobility Analysis does not define overall average delay for the intersection as a whole for two-way or single approach stop-controlled intersections.

Traffic Operations Summary

Copper Square Subdivision

Intersection: **Rimrock Road & 58th Street West / Glynn Abbey Way**

WEEKDAY, MIDDAY PEAK HOUR

Analysis Scenario	Analysis Data	RIMROCK ROAD From the West (Eastbound)				RIMROCK ROAD From the East (Westbound)				58TH STREET WEST From the South (Northbound)				GLYNN ABBEY WAY From the North (Southbound)				Minor Approach Totals	Intersection Totals
		U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R		
ESTIMATED 2034 BACKGROUND TRAFFIC	Traffic Control	Uncontrolled				Uncontrolled				Stop Controlled				Stop Controlled					
	Minor or Major Approach?	Major				Major				Minor				Minor					
	Entry Volume, V (veh/hr)	0	0	309	9	0	21	335	4	0	8	1	26	0	7	1	1		
	Peak Hour Factor (PHF)	0.91				0.91				0.91				0.91					
	Adjusted Volume, V_A (veh/hr)	0	0	340	10	0	23	368	4	0	9	1	29	0	8	1	1		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	LTR				LTR				LTR				LTR					
	Lane Group Volume, V_{LG} (veh/hr)	349				396				38				10				48	793
	Capacity, c (veh/hr)	1,197				1,209				494				317				811	3,217
	Volume-to-Capacity Ratio, V_A/c	0.29				0.33				0.08				0.03				0.06	0.25
	HCM 95% Queue Length, Q_{95} (veh)	0.0				0.1				0.3				0.1					
	HCM 95% Queue Length, Q_{95} (ft)	0.0				2.5				7.6				2.5					
	Available Queue Storage, S_Q (ft)	300				580				195				350					
	Average Control Delay (sec/veh)	0.0				0.7				12.9				16.7				13.7	1.2
	Level of Service, LOS	A				A				B				C					
	Approach Delay (sec/veh)	0.0				0.7				12.9				16.7				B	A
	Approach Level of Service, LOS	A				A				B				C					
ESTIMATED 2034 TOTAL TRAFFIC	Traffic Control	Uncontrolled				Uncontrolled				Stop Controlled				Stop Controlled					
	Minor or Major Approach?	Major				Major				Minor				Minor					
	Entry Volume, V (veh/hr)	0	0	325	10	0	21	349	4	0	9	1	26	0	7	1	1		
	Peak Hour Factor (PHF)	0.91				0.91				0.91				0.91					
	Adjusted Volume, V_A (veh/hr)	0	0	357	11	0	23	384	4	0	10	1	29	0	8	1	1		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	LTR				LTR				LTR				LTR					
	Lane Group Volume, V_{LG} (veh/hr)	368				411				40				10				49	829
	Capacity, c (veh/hr)	1,182				1,190				464				301				765	3,137
	Volume-to-Capacity Ratio, V_A/c	0.31				0.35				0.09				0.03				0.06	0.26
	HCM 95% Queue Length, Q_{95} (veh)	0.0				0.1				0.3				0.1					
	HCM 95% Queue Length, Q_{95} (ft)	0.0				2.5				7.6				2.5					
	Available Queue Storage, S_Q (ft)	300				580				195				350					
	Average Control Delay (sec/veh)	0.0				0.6				13.5				17.3				14.3	1.1
	Level of Service, LOS	A				A				B				C					
	Approach Delay (sec/veh)	0.0				0.6				13.5				17.3				B	A
	Approach Level of Service, LOS	A				A				B				C					

U = U-Turns; L = Left Turns; T = Through; R = Right Turns | Lane Groups: LTR = Left-Through-Right

Average intersection delay and volume-to-capacity ratio for minor approach(es) is a weighted average provided for reference purposes. The Highway Capacity Manual, 7th Edition: A Guide for Multimodal Mobility Analysis does not define overall average delay for the intersection as a whole for two-way or single approach stop-controlled intersections.

Traffic Operations Summary

Copper Square Subdivision

Intersection: Rimrock Road & 58th Street West / Glynn Abbey Way

WEEKDAY, PM PEAK HOUR

Analysis Scenario	Analysis Data	RIMROCK ROAD From the West (Eastbound)				RIMROCK ROAD From the East (Westbound)				58TH STREET WEST From the South (Northbound)				GLYNN ABBEY WAY From the North (Southbound)				Minor Approach Totals	Intersection Totals
		U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R		
2025 EXISTING CONDITIONS	Traffic Control	Uncontrolled				Uncontrolled				Stop Controlled				Stop Controlled					
	Minor or Major Approach?	Major				Major				Minor				Minor					
	Entry Volume, V (veh/hr)	0	0	245	4	0	22	433	0	0	2	0	6	0	2	0	0		
	Peak Hour Factor (PHF)	0.95				0.95				0.95				0.95					
	Adjusted Volume, V_A (veh/hr)	0	0	258	4	0	23	456	0	0	2	0	6	0	2	0	0		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	LTR				LTR				LTR				LTR					
	Lane Group Volume, V_{LG} (veh/hr)	262				479				8				2				11	752
	Capacity, c (veh/hr)	1,116				1,314				533				284				817	3,247
	Volume-to-Capacity Ratio, V_A/c	0.23				0.36				0.02				0.01				0.01	0.23
	HCM 95% Queue Length, Q_{95} (veh)	0.0				0.1				0.0				0.0					
	HCM 95% Queue Length, Q_{95} (ft)	0.0				2.5				0.0				0.0					
	Available Queue Storage, S_Q (ft)	300				580				195				350					
	Average Control Delay (sec/veh)	0.0				0.6				11.9				17.8				13.1	0.6
	Level of Service, LOS	A				A				B				C					
	Approach Delay (sec/veh)	0.0				0.6				11.9				17.8				B	A
	Approach Level of Service, LOS	A				A				B				C					
ESTIMATED 2030 BACKGROUND TRAFFIC	Traffic Control	Uncontrolled				Uncontrolled				Stop Controlled				Stop Controlled					
	Minor or Major Approach?	Major				Major				Minor				Minor					
	Entry Volume, V (veh/hr)	0	1	330	14	0	55	562	8	0	7	2	26	0	7	1	1		
	Peak Hour Factor (PHF)	0.91				0.91				0.91				0.91					
	Adjusted Volume, V_A (veh/hr)	0	1	363	15	0	60	618	9	0	8	2	29	0	8	1	1		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	LTR				LTR				LTR				LTR					
	Lane Group Volume, V_{LG} (veh/hr)	379				687				38				10				48	1,114
	Capacity, c (veh/hr)	950				1,180				342				168				510	2,640
	Volume-to-Capacity Ratio, V_A/c	0.40				0.58				0.11				0.06				0.09	0.42
	HCM 95% Queue Length, Q_{95} (veh)	0.0				0.2				0.4				0.2					
	HCM 95% Queue Length, Q_{95} (ft)	0.0				5.0				10.2				5.3					
	Available Queue Storage, S_Q (ft)	300				580				195				350					
	Average Control Delay (sec/veh)	0.0				1.3				16.9				27.7				19.1	1.6
	Level of Service, LOS	A				A				C				D					
	Approach Delay (sec/veh)	0.0				1.3				16.9				27.7				C	A
	Approach Level of Service, LOS	A				A				C				D					
ESTIMATED 2030 TOTAL TRAFFIC	Traffic Control	Uncontrolled				Uncontrolled				Stop Controlled				Stop Controlled					
	Minor or Major Approach?	Major				Major				Minor				Minor					
	Entry Volume, V (veh/hr)	0	1	359	15	0	55	596	8	0	8	2	26	0	7	1	1		
	Peak Hour Factor (PHF)	0.90				0.90				0.90				0.90					
	Adjusted Volume, V_A (veh/hr)	0	1	399	17	0	61	662	9	0	9	2	29	0	8	1	1		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	LTR				LTR				LTR				LTR					
	Lane Group Volume, V_{LG} (veh/hr)	417				732				40				10				50	1,199
	Capacity, c (veh/hr)	915				1,143				292				147				439	2,497
	Volume-to-Capacity Ratio, V_A/c	0.46				0.64				0.14				0.07				0.11	0.48
	HCM 95% Queue Length, Q_{95} (veh)	0.0				0.2				0.5				0.2					
	HCM 95% Queue Length, Q_{95} (ft)	0.0				5.0				12.7				5.3					
	Available Queue Storage, S_Q (ft)	300				580				195				350					
	Average Control Delay (sec/veh)	0.0				1.3				19.3				31.4				21.7	1.7
	Level of Service, LOS	A				A				C				D					
	Approach Delay (sec/veh)	0.0				1.3				19.3				31.4				C	A
	Approach Level of Service, LOS	A				A				C				D					

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Traffic Operations Summary

Copper Square Subdivision

Intersection: **Rimrock Road & 58th Street West / Glynn Abbey Way**

WEEKDAY, PM PEAK HOUR

Analysis Scenario	Analysis Data	RIMROCK ROAD From the West (Eastbound)				RIMROCK ROAD From the East (Westbound)				58TH STREET WEST From the South (Northbound)				GLYNN ABBEY WAY From the North (Southbound)				Minor Approach Totals	Intersection Totals
		U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R		
ESTIMATED 2034 BACKGROUND TRAFFIC	Traffic Control	Uncontrolled				Uncontrolled				Stop Controlled				Stop Controlled					
	Minor or Major Approach?	Major				Major				Minor				Minor					
	Entry Volume, V (veh/hr)	0	1	382	16	0	61	631	8	0	9	2	29	0	8	1	1		
	Peak Hour Factor (PHF)	0.90				0.90				0.90				0.90					
	Adjusted Volume, V_A (veh/hr)	0	1	424	18	0	68	701	9	0	10	2	32	0	9	1	1		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	LTR				LTR				LTR				LTR					
	Lane Group Volume, V_{LG} (veh/hr)	443				778				44				11				56	1,277
	Capacity, c (veh/hr)	885				1,118				262				124				386	2,389
	Volume-to-Capacity Ratio, V_A/c	0.50				0.70				0.17				0.09				0.14	0.53
	HCM 95% Queue Length, Q_{95} (veh)	0.0				0.2				0.6				0.3					
	HCM 95% Queue Length, Q_{95} (ft)	0.0				5.0				15.2				8.1					
	Available Queue Storage, S_Q (ft)	300				580				195				350					
	Average Control Delay (sec/veh)	0.0				1.5				21.5				36.9				24.6	2.0
	Level of Service, LOS	A				A				C				E					
	Approach Delay (sec/veh)	0.0				1.5				21.5				36.9				C	A
	Approach Level of Service, LOS	A				A				C				E					
ESTIMATED 2034 TOTAL TRAFFIC	Traffic Control	Uncontrolled				Uncontrolled				Stop Controlled				Stop Controlled					
	Minor or Major Approach?	Major				Major				Minor				Minor					
	Entry Volume, V (veh/hr)	0	1	395	17	0	61	645	8	0	10	2	29	0	8	1	1		
	Peak Hour Factor (PHF)	0.90				0.90				0.90				0.90					
	Adjusted Volume, V_A (veh/hr)	0	1	439	19	0	68	717	9	0	11	2	32	0	9	1	1		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	LTR				LTR				LTR				LTR					
	Lane Group Volume, V_{LG} (veh/hr)	459				793				46				11				57	1,309
	Capacity, c (veh/hr)	873				1,108				241				118				359	2,340
	Volume-to-Capacity Ratio, V_A/c	0.53				0.72				0.19				0.09				0.16	0.56
	HCM 95% Queue Length, Q_{95} (veh)	0.0				0.2				0.7				0.3					
	HCM 95% Queue Length, Q_{95} (ft)	0.0				5.0				17.8				8.1					
	Available Queue Storage, S_Q (ft)	300				580				195				350					
	Average Control Delay (sec/veh)	0.0				1.5				23.4				38.8				26.4	2.1
	Level of Service, LOS	A				A				C				E					
	Approach Delay (sec/veh)	0.0				1.5				23.4				38.8				D	A
	Approach Level of Service, LOS	A				A				C				E					

U = U-Turns; L = Left Turns; T = Through; R = Right Turns | Lane Groups: LTR = Left-Through-Right

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Traffic Operations Summary

Copper Square Subdivision

Intersection: Rimrock Road & 54th Street West

WEEKDAY, AM PEAK HOUR

Analysis Scenario	Analysis Data	RIMROCK ROAD From the West (Eastbound)				RIMROCK ROAD From the East (Westbound)				54TH STREET WEST From the South (Northbound)				54TH STREET WEST From the North (Southbound)				Minor Approach Totals	Intersection Totals
		U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R		
2025 EXISTING CONDITIONS	Traffic Control	Signalized				Signalized				Signalized				Signalized					
	Minor or Major Approach?	Major				Major				Minor				Minor					
	Entry Volume, V (veh/hr)	0	0	438	36	0	119	176	37	0	24	18	177	0	99	64	2		
	Peak Hour Factor (PHF)	0.83				0.83				0.83				0.83					
	Adjusted Volume, V_A (veh/hr)	0	0	527	38	0	143	212	8	0	29	22	36	0	119	77	1		
	Ped + Bike Volume, PBV (ped+bike/hr)	9				0				0				7				7	16
	Lane Group	L		TR		L	T	R		L		TR		L		TR			
	Lane Group Volume, V_{LG} (veh/hr)	0		565		143	212	8		29		58		119		78		284	1,212
	Capacity, c (veh/hr)	658		882		412	1,096	908		255		307		224		370		1,156	5,112
	Volume-to-Capacity Ratio, V_A/c	0.00		0.64		0.35	0.19	0.01		0.11		0.19		0.53		0.21		0.25	0.24
	HCM 95% Queue Length, Q_{95} (veh)	0.0		13.5		2.0	0.1	0.0		1.2		1.5		4.8		3.0			
	HCM 95% Queue Length, Q_{95} (ft)	0		347		54	75	0		35		40		124		75			
	Available Queue Storage, S_Q (ft)	300		480		240	1,030	200		290		500		230		400			
	Average Control Delay (sec/veh)	0.0		21.3		13.1	7.0	6.0		36.0		36.1		44.6		33.7		39.0	21.9
	Level of Service, LOS	A		C		B	A	A		D		D		D		C			
	Approach Delay (sec/veh)	21.3				9.4				36.1				40.3				D	C
	Approach Level of Service, LOS	C				A				D				D					
ESTIMATED 2030 BACKGROUND TRAFFIC	Traffic Control	Signalized				Signalized				Signalized				Signalized					
	Minor or Major Approach?	Major				Major				Minor				Minor					
	Entry Volume, V (veh/hr)	0	10	561	73	0	162	221	45	0	44	21	266	0	119	74	8		
	Peak Hour Factor (PHF)	0.83				0.83				0.83				0.83					
	Adjusted Volume, V_A (veh/hr)	0	12	676	88	0	195	266	54	0	53	25	320	0	143	89	10		
	Ped + Bike Volume, PBV (ped+bike/hr)	10				0				0				7				7	17
	Lane Group	L		TR		L	T	R		L		TR		L		TR			
	Lane Group Volume, V_{LG} (veh/hr)	12		764		195	266	54		53		346		143		99		641	1,933
	Capacity, c (veh/hr)	586		832		279	1,016	839		266		328		188		389		1,171	4,723
	Volume-to-Capacity Ratio, V_A/c	0.02		0.92		0.70	0.26	0.06		0.20		1.05		0.76		0.25		0.55	0.41
	HCM 95% Queue Length, Q_{95} (veh)	0.3		22.8		5.8	0.1	0.0		2.1		2.0		6.6		3.4			
	HCM 95% Queue Length, Q_{95} (ft)	8		584		152	119	0		59		52		170		87			
	Available Queue Storage, S_Q (ft)	300		480		240	1,030	200		290		500		230		400			
	Average Control Delay (sec/veh)	12.5		50.6		41.4	10.0	8.4		36.5		44.0		111.0		32.9		56.7	44.7
	Level of Service, LOS	B		D		D	A	A		D		F		F		C			
	Approach Delay (sec/veh)	50.0				21.7				43.0				79.1				E	D
	Approach Level of Service, LOS	D				C				D				E					
ESTIMATED 2030 TOTAL TRAFFIC	Traffic Control	Signalized				Signalized				Signalized				Signalized					
	Minor or Major Approach?	Major				Major				Minor				Minor					
	Entry Volume, V (veh/hr)	0	10	579	75	0	162	248	45	0	47	21	266	0	119	74	9		
	Peak Hour Factor (PHF)	0.83				0.83				0.83				0.83					
	Adjusted Volume, V_A (veh/hr)	0	12	698	90	0	195	299	54	0	57	25	320	0	143	89	11		
	Ped + Bike Volume, PBV (ped+bike/hr)	10				0				0				7				7	17
	Lane Group	L		TR		L	T	R		L		TR		L		TR			
	Lane Group Volume, V_{LG} (veh/hr)	12		788		195	299	54		57		346		143		100		646	1,994
	Capacity, c (veh/hr)	564		832		270	1,017	839		266		328		189		388		1,171	4,693
	Volume-to-Capacity Ratio, V_A/c	0.02		0.95		0.72	0.29	0.06		0.21		1.05		0.76		0.26		0.55	0.42
	HCM 95% Queue Length, Q_{95} (veh)	0.3		24.0		6.0	0.1	0.0		2.2		2.1		6.6		3.5			
	HCM 95% Queue Length, Q_{95} (ft)	8		617		158	136	0		63		55		170		88			
	Available Queue Storage, S_Q (ft)	300		480		240	1,030	200		290		500		230		400			
	Average Control Delay (sec/veh)	12.5		56.9		42.2	10.3	8.4		36.7		44.0		111.0		32.9		56.5	46.8
	Level of Service, LOS	B		E		D	B	A		D		F		F		C			
	Approach Delay (sec/veh)	56.2				21.5				43.0				78.9				E	D
	Approach Level of Service, LOS	E				C				D				E					

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Traffic Operations Summary

Copper Square Subdivision

Intersection: Rimrock Road & 54th Street West

WEEKDAY, AM PEAK HOUR

Analysis Scenario	Analysis Data	RIMROCK ROAD From the West (Eastbound)				RIMROCK ROAD From the East (Westbound)				54TH STREET WEST From the South (Northbound)				54TH STREET WEST From the North (Southbound)				Minor Approach Totals	Intersection Totals
		U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R		
ESTIMATED 2034 BACKGROUND TRAFFIC	Traffic Control	Signalized				Signalized				Signalized				Signalized					
	Minor or Major Approach?	Major				Major				Minor				Minor					
	Entry Volume, V (veh/hr)	0	13	606	87	0	184	259	52	0	53	25	299	0	137	83	12		
	Peak Hour Factor (PHF)	0.83				0.83				0.83				0.83					
	Adjusted Volume, V_A (veh/hr)	0	16	730	105	0	222	312	63	0	64	30	360	0	165	100	14		
	Ped + Bike Volume, PBV (ped+bike/hr)	11				0				0				7				7	18
	Lane Group	L		TR		L	T	R		L		TR		L		TR			
	Lane Group Volume, V_{LG} (veh/hr)	16		835		222	312	63		64		390		165		114		734	2,181
	Capacity, c (veh/hr)	524		779		236	983	813		278		352		179		419		1,228	4,563
	Volume-to-Capacity Ratio, V_A/c	0.03		1.07		0.94	0.32	0.08		0.23		1.11		0.92		0.27		0.60	0.48
	HCM 95% Queue Length, Q_{95} (veh)	0.4		30.3		9.2	0.1	0.0		2.4		3.5		7.9		3.8			
	HCM 95% Queue Length, Q_{95} (ft)	11		778		243	153	2		68		91		203		96			
	Available Queue Storage, S_Q (ft)	300		480		240	1,030	200		290		500		230		400			
	Average Control Delay (sec/veh)	13.9		82.9		71.3	11.3	9.1		35.7		53.2		286.3		31.4		100.7	74.9
	Level of Service, LOS	B		F		E	B	A		D		F		F		C			
	Approach Delay (sec/veh)	81.6				33.4				50.7				181.9				F	E
	Approach Level of Service, LOS	F				C				D				F					
ESTIMATED 2034 TOTAL TRAFFIC	Traffic Control	Signalized				Signalized				Signalized				Signalized					
	Minor or Major Approach?	Major				Major				Minor				Minor					
	Entry Volume, V (veh/hr)	0	14	611	88	0	184	271	52	0	55	25	299	0	137	83	11		
	Peak Hour Factor (PHF)	0.83				0.83				0.83				0.83					
	Adjusted Volume, V_A (veh/hr)	0	17	736	106	0	222	327	63	0	66	30	360	0	165	100	13		
	Ped + Bike Volume, PBV (ped+bike/hr)	11				0				0				7				7	18
	Lane Group	L		TR		L	T	R		L		TR		L		TR			
	Lane Group Volume, V_{LG} (veh/hr)	17		842		222	327	63		66		390		165		113		735	2,205
	Capacity, c (veh/hr)	512		774		236	981	811		280		353		179		422		1,234	4,548
	Volume-to-Capacity Ratio, V_A/c	0.03		1.09		0.94	0.33	0.08		0.24		1.11		0.92		0.27		0.60	0.48
	HCM 95% Queue Length, Q_{95} (veh)	0.4		31.3		9.2	0.2	0.0		2.5		3.6		7.9		3.7			
	HCM 95% Queue Length, Q_{95} (ft)	11		804		244	162	2		70		93		203		95			
	Available Queue Storage, S_Q (ft)	300		480		240	1,030	200		290		500		230		400			
	Average Control Delay (sec/veh)	14.1		87.7		72.1	11.5	9.2		35.6		53.1		286.3		31.3		100.5	76.3
	Level of Service, LOS	B		F		E	B	A		D		F		F		C			
	Approach Delay (sec/veh)	86.3				33.3				50.6				182.5				F	E
	Approach Level of Service, LOS	F				C				D				F					

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Traffic Operations Summary

Copper Square Subdivision

Intersection: Rimrock Road & 54th Street West

WEEKDAY, MIDDAY PEAK HOUR

Analysis Scenario	Analysis Data	RIMROCK ROAD From the West (Eastbound)				RIMROCK ROAD From the East (Westbound)				54TH STREET WEST From the South (Northbound)				54TH STREET WEST From the North (Southbound)				Minor Approach Totals	Intersection Totals
		U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R		
2025 EXISTING CONDITIONS	Traffic Control	Signalized				Signalized				Signalized				Signalized					
	Minor or Major Approach?	Major				Major				Minor				Minor					
	Entry Volume, V (veh/hr)	0	2	189	20	0	90	192	62	0	39	28	85	0	63	30	4		
	Peak Hour Factor (PHF)	0.96				0.96				0.96				0.96					
	Adjusted Volume, V_A (veh/hr)	0	2	197	14	0	94	201	3	0	41	29	4	0	66	31	0		
	Ped + Bike Volume, PBV (ped+bike/hr)	1				1				0				4				4	6
	Lane Group	L		TR		L	T	R		L		TR		L		TR			
	Lane Group Volume, V_{LG} (veh/hr)	2		211		94	201	3		41		33		66		32		171	682
	Capacity, c (veh/hr)	631		984		738	1,172	984		231		233		197		240		901	5,410
	Volume-to-Capacity Ratio, V_A/c	0.00		0.21		0.13	0.17	0.00		0.18		0.14		0.33		0.13		0.19	0.13
	HCM 95% Queue Length, Q_{95} (veh)	0.1		4.1		1.1	0.1	0.0		1.9		1.8		2.9		1.5			
	HCM 95% Queue Length, Q_{95} (ft)	2		107		31	74	3		50		49		76		41			
	Available Queue Storage, S_Q (ft)	300		480		240	1,030	200		290		500		230		400			
	Average Control Delay (sec/veh)	8.0		9.8		6.2	5.7	5.0		39.8		39.6		43.9		37.7		41.0	15.9
	Level of Service, LOS	A		A		A	A	A		D		D		D		D			
	Approach Delay (sec/veh)	9.8				5.9				39.7				41.9				D	B
	Approach Level of Service, LOS	A				A				D				D					
ESTIMATED 2030 BACKGROUND TRAFFIC	Traffic Control	Signalized				Signalized				Signalized				Signalized					
	Minor or Major Approach?	Major				Major				Minor				Minor					
	Entry Volume, V (veh/hr)	0	7	249	41	0	136	253	73	0	64	32	129	0	73	34	9		
	Peak Hour Factor (PHF)	0.93				0.93				0.93				0.93					
	Adjusted Volume, V_A (veh/hr)	0	8	268	44	0	146	272	78	0	69	34	139	0	78	37	10		
	Ped + Bike Volume, PBV (ped+bike/hr)	1				1				0				4				4	6
	Lane Group	L		TR		L	T	R		L		TR		L		TR			
	Lane Group Volume, V_{LG} (veh/hr)	8		312		146	272	78		69		173		78		46		367	1,183
	Capacity, c (veh/hr)	615		931		644	1,129	945		254		256		191		276		977	5,241
	Volume-to-Capacity Ratio, V_A/c	0.01		0.33		0.23	0.24	0.08		0.27		0.68		0.41		0.17		0.38	0.23
	HCM 95% Queue Length, Q_{95} (veh)	0.2		6.3		1.8	0.1	0.0		3.0		2.6		3.6		1.8			
	HCM 95% Queue Length, Q_{95} (ft)	5		165		50	109	6		78		68		92		47			
	Available Queue Storage, S_Q (ft)	300		480		240	1,030	200		290		500		230		400			
	Average Control Delay (sec/veh)	9.3		12.5		7.8	7.2	6.1		39.3		38.8		44.9		35.9		39.8	18.7
	Level of Service, LOS	A		B		A	A	A		D		D		D		D			
	Approach Delay (sec/veh)	12.4				7.2				38.9				41.6				D	B
	Approach Level of Service, LOS	B				A				D				D					
ESTIMATED 2030 TOTAL TRAFFIC	Traffic Control	Signalized				Signalized				Signalized				Signalized					
	Minor or Major Approach?	Major				Major				Minor				Minor					
	Entry Volume, V (veh/hr)	0	7	278	45	0	136	281	73	0	67	32	129	0	73	34	10		
	Peak Hour Factor (PHF)	0.92				0.92				0.92				0.92					
	Adjusted Volume, V_A (veh/hr)	0	8	302	49	0	148	305	79	0	73	35	140	0	79	37	11		
	Ped + Bike Volume, PBV (ped+bike/hr)	1				1				0				4				4	6
	Lane Group	L		TR		L	T	R		L		TR		L		TR			
	Lane Group Volume, V_{LG} (veh/hr)	8		351		148	305	79		73		175		79		48		375	1,266
	Capacity, c (veh/hr)	593		928		611	1,127	943		254		258		191		277		980	5,182
	Volume-to-Capacity Ratio, V_A/c	0.01		0.38		0.24	0.27	0.08		0.29		0.68		0.42		0.17		0.38	0.24
	HCM 95% Queue Length, Q_{95} (veh)	0.2		7.3		1.9	0.1	0.0		3.2		2.6		3.6		1.8			
	HCM 95% Queue Length, Q_{95} (ft)	5		189		51	123	6		82		69		93		47			
	Available Queue Storage, S_Q (ft)	300		480		240	1,030	200		290		500		230		400			
	Average Control Delay (sec/veh)	9.4		13.1		8.0	7.5	6.1		39.4		38.8		45.0		35.8		39.8	18.6
	Level of Service, LOS	A		B		A	A	A		D		D		D		D			
	Approach Delay (sec/veh)	13.0				7.4				39.0				41.5				D	B
	Approach Level of Service, LOS	B				A				D				D					

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Traffic Operations Summary

Copper Square Subdivision

Intersection: Rimrock Road & 54th Street West

WEEKDAY, MIDDAY PEAK HOUR

Analysis Scenario	Analysis Data	RIMROCK ROAD From the West (Eastbound)				RIMROCK ROAD From the East (Westbound)				54TH STREET WEST From the South (Northbound)				54TH STREET WEST From the North (Southbound)				Minor Approach Totals	Intersection Totals
		U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R		
ESTIMATED 2034 BACKGROUND TRAFFIC	Traffic Control	Signalized				Signalized				Signalized				Signalized					
	Minor or Major Approach?	Major				Major				Minor				Minor					
	Entry Volume, V (veh/hr)	0	8	289	52	0	153	293	83	0	77	36	145	0	82	38	12		
	Peak Hour Factor (PHF)	0.92				0.92				0.92				0.92					
	Adjusted Volume, V_A (veh/hr)	0	9	314	57	0	166	318	90	0	84	39	158	0	89	41	13		
	Ped + Bike Volume, PBV (ped+bike/hr)	1				1				0				4				4	6
	Lane Group	L		TR		L	T	R		L		TR		L		TR			
	Lane Group Volume, V_{LG} (veh/hr)	9		371		166	318	90		84		197		89		54		424	1,378
	Capacity, c (veh/hr)	574		902		584	1,107	927		264		285		204		296		1,049	5,143
	Volume-to-Capacity Ratio, V_A/c	0.02		0.41		0.28	0.29	0.10		0.32		0.69		0.44		0.18		0.40	0.27
	HCM 95% Queue Length, Q_{95} (veh)	0.2		8.1		2.2	0.1	0.0		3.6		2.3		4.0		1.9			
	HCM 95% Queue Length, Q_{95} (ft)	6		210		60	135	9		92		62		103		51			
	Available Queue Storage, S_Q (ft)	300		480		240	1,030	200		290		500		230		400			
	Average Control Delay (sec/veh)	10.0		14.4		8.9	8.2	6.7		39.2		37.6		44.4		35.1		39.0	19.3
	Level of Service, LOS	A		B		A	A	A		D		D		D		D			
	Approach Delay (sec/veh)	14.3				8.2				38.1				40.9				D	B
	Approach Level of Service, LOS	B				A				D				D					
ESTIMATED 2034 TOTAL TRAFFIC	Traffic Control	Signalized				Signalized				Signalized				Signalized					
	Minor or Major Approach?	Major				Major				Minor				Minor					
	Entry Volume, V (veh/hr)	0	9	303	53	0	153	305	83	0	79	36	145	0	82	38	12		
	Peak Hour Factor (PHF)	0.92				0.92				0.92				0.92					
	Adjusted Volume, V_A (veh/hr)	0	10	329	58	0	166	332	90	0	86	39	158	0	89	41	13		
	Ped + Bike Volume, PBV (ped+bike/hr)	1				1				0				4				4	6
	Lane Group	L		TR		L	T	R		L		TR		L		TR			
	Lane Group Volume, V_{LG} (veh/hr)	10		387		166	332	90		86		197		89		54		426	1,411
	Capacity, c (veh/hr)	566		903		571	1,106	926		264		285		204		296		1,049	5,121
	Volume-to-Capacity Ratio, V_A/c	0.02		0.43		0.29	0.30	0.10		0.33		0.69		0.44		0.18		0.41	0.28
	HCM 95% Queue Length, Q_{95} (veh)	0.2		8.5		2.2	0.1	0.0		3.6		2.3		4.0		1.9			
	HCM 95% Queue Length, Q_{95} (ft)	6		222		60	142	9		94		62		103		51			
	Available Queue Storage, S_Q (ft)	300		480		240	1,030	200		290		500		230		400			
	Average Control Delay (sec/veh)	10.0		9.2		9.0	8.3	6.7		39.3		37.6		44.4		35.1		39.0	17.8
	Level of Service, LOS	A		A		A	A	A		D		D		D		D			
	Approach Delay (sec/veh)	9.2				8.3				38.1				40.9				D	B
	Approach Level of Service, LOS	A				A				D				D					

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Traffic Operations Summary

Copper Square Subdivision

Intersection: Rimrock Road & 54th Street West

WEEKDAY, PM PEAK HOUR

Analysis Scenario	Analysis Data	RIMROCK ROAD From the West (Eastbound)				RIMROCK ROAD From the East (Westbound)				54TH STREET WEST From the South (Northbound)				54TH STREET WEST From the North (Southbound)				Minor Approach Totals	Intersection Totals
		U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R		
2025 EXISTING CONDITIONS	Traffic Control	Signalized				Signalized				Signalized				Signalized					
	Minor or Major Approach?	Major				Major				Minor				Minor					
	Entry Volume, V (veh/hr)	0	14	214	29	0	164	386	136	0	58	66	135	0	79	63	6		
	Peak Hour Factor (PHF)	0.96				0.96				0.96				0.96					
	Adjusted Volume, V_A (veh/hr)	0	15	223	21	0	171	401	5	0	60	69	37	0	82	66	1		
	Ped + Bike Volume, PBV (ped+bike/hr)	11				0				0				3				3	14
	Lane Group	L		TR		L	T	R		L		TR		L		TR			
	Lane Group Volume, V_{LG} (veh/hr)	15		244		171	401	5		60		106		82		67		315	1,151
	Capacity, c (veh/hr)	543		911		710	1,131	942		260		298		185		331		1,074	5,311
	Volume-to-Capacity Ratio, V_A/c	0.03		0.27		0.24	0.35	0.01		0.23		0.36		0.44		0.20		0.29	0.22
	HCM 95% Queue Length, Q_{95} (veh)	0.4		5.4		2.2	0.2	0.0		2.3		4.5		3.9		2.8			
	HCM 95% Queue Length, Q_{95} (ft)	9		138		59	174	14		66		117		101		71			
	Available Queue Storage, S_Q (ft)	300		480		240	1,030	200		290		500		230		400			
	Average Control Delay (sec/veh)	10.3		12.9		8.3	9.0	7.2		38.4		38.3		45.6		35.0		39.5	18.1
	Level of Service, LOS	B		B		A	A	A		D		D		D		C			
	Approach Delay (sec/veh)	12.8				8.8				38.3				40.8				D	B
	Approach Level of Service, LOS	B				A				D				D					
ESTIMATED 2030 BACKGROUND TRAFFIC	Traffic Control	Signalized				Signalized				Signalized				Signalized					
	Minor or Major Approach?	Major				Major				Minor				Minor					
	Entry Volume, V (veh/hr)	0	24	292	59	0	256	513	161	0	103	76	198	0	94	71	17		
	Peak Hour Factor (PHF)	0.93				0.93				0.93				0.93					
	Adjusted Volume, V_A (veh/hr)	0	26	314	63	0	275	552	173	0	111	82	213	0	101	76	18		
	Ped + Bike Volume, PBV (ped+bike/hr)	12				0				0				3				3	15
	Lane Group	L		TR		L	T	R		L		TR		L		TR			
	Lane Group Volume, V_{LG} (veh/hr)	26		377		275	552	173		111		295		101		95		601	2,004
	Capacity, c (veh/hr)	393		776		537	1,016	848		319		385		202		428		1,334	4,904
	Volume-to-Capacity Ratio, V_A/c	0.07		0.49		0.51	0.54	0.20		0.35		0.77		0.50		0.22		0.45	0.41
	HCM 95% Queue Length, Q_{95} (veh)	0.6		9.2		4.6	0.3	0.0		3.9		6.1		5.1		3.1			
	HCM 95% Queue Length, Q_{95} (ft)	16		236		122	311	19		111		158		130		78			
	Available Queue Storage, S_Q (ft)	300		480		240	1,030	200		290		500		230		400			
	Average Control Delay (sec/veh)	14.7		20.5		14.0	14.8	10.1		35.7		35.9		45.0		30.5		36.5	21.9
	Level of Service, LOS	B		C		B	B	B		D		D		D		C			
	Approach Delay (sec/veh)	20.1				13.8				35.8				38.0				D	C
	Approach Level of Service, LOS	C				B				D				D					
ESTIMATED 2030 TOTAL TRAFFIC	Traffic Control	Signalized				Signalized				Signalized				Signalized					
	Minor or Major Approach?	Major				Major				Minor				Minor					
	Entry Volume, V (veh/hr)	0	25	317	62	0	256	542	161	0	107	76	198	0	94	71	18		
	Peak Hour Factor (PHF)	0.93				0.93				0.93				0.93					
	Adjusted Volume, V_A (veh/hr)	0	27	341	67	0	275	583	173	0	115	82	213	0	101	76	19		
	Ped + Bike Volume, PBV (ped+bike/hr)	12				0				0				3				3	15
	Lane Group	L		TR		L	T	R		L		TR		L		TR			
	Lane Group Volume, V_{LG} (veh/hr)	27		408		275	583	173		115		295		101		96		606	2,072
	Capacity, c (veh/hr)	375		775		513	1,012	847		319		385		202		427		1,333	4,855
	Volume-to-Capacity Ratio, V_A/c	0.07		0.53		0.54	0.58	0.20		0.36		0.77		0.50		0.22		0.45	0.43
	HCM 95% Queue Length, Q_{95} (veh)	0.7		10.1		4.6	0.3	0.0		4.1		6.0		5.1		3.1			
	HCM 95% Queue Length, Q_{95} (ft)	17		259		122	339	19		115		157		130		78			
	Available Queue Storage, S_Q (ft)	300		480		240	1,030	200		290		500		230		400			
	Average Control Delay (sec/veh)	15.1		21.4		14.9	15.6	10.1		35.9		35.9		45.0		30.5		36.6	22.3
	Level of Service, LOS	B		C		B	B	B		D		D		D		C			
	Approach Delay (sec/veh)	21.0				14.5				35.9				37.9				D	C
	Approach Level of Service, LOS	C				B				D				D					

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Average intersection delay and volume-to-capacity ratio for minor approach(es) is a weighted average provided for reference purposes. The Highway Capacity Manual, 7th Edition: A Guide for Multimodal Mobility Analysis does not define overall average delay for the intersection as a whole for two-way or single approach stop-controlled intersections.

Traffic Operations Summary

Copper Square Subdivision

Intersection: Rimrock Road & 54th Street West

WEEKDAY, PM PEAK HOUR

Analysis Scenario	Analysis Data	RIMROCK ROAD From the West (Eastbound)				RIMROCK ROAD From the East (Westbound)				54TH STREET WEST From the South (Northbound)				54TH STREET WEST From the North (Southbound)				Minor Approach Totals	Intersection Totals
		U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R		
ESTIMATED 2034 BACKGROUND TRAFFIC	Traffic Control	Signalized				Signalized				Signalized				Signalized					
	Minor or Major Approach?	Major				Major				Minor				Minor					
	Entry Volume, V (veh/hr)	0	30	333	71	0	286	566	184	0	123	85	223	0	108	78	23		
	Peak Hour Factor (PHF)	0.93				0.93				0.93				0.93					
	Adjusted Volume, V_A (veh/hr)	0	32	358	76	0	308	609	198	0	132	91	240	0	116	84	25		
	Ped + Bike Volume, PBV (ped+bike/hr)	13				0				0				3				3	16
	Lane Group	L		TR		L	T	R		L		TR		L		TR			
	Lane Group Volume, V_{LG} (veh/hr)	32		434		308	609	198		132		331		116		109		688	2,269
	Capacity, c (veh/hr)	337		734		475	980	820		330		410		193		453		1,386	4,732
	Volume-to-Capacity Ratio, V_A/c	0.10		0.59		0.65	0.62	0.24		0.40		0.81		0.60		0.24		0.50	0.48
	HCM 95% Queue Length, Q_{95} (veh)	0.8		11.4		5.5	0.4	0.0		4.6		7.1		5.9		3.4			
	HCM 95% Queue Length, Q_{95} (ft)	21		293		145	377	22		128		184		152		86			
	Available Queue Storage, S_Q (ft)	300		480		240	1,030	200		290		500		230		400			
	Average Control Delay (sec/veh)	17.2		24.2		19.8	17.5	11.0		35.5		37.1		52.1		29.3		38.1	24.8
	Level of Service, LOS	B		C		B	B	B		D		D		D		C			
	Approach Delay (sec/veh)	23.7				17.0				36.6				41.1				D	C
	Approach Level of Service, LOS	C				B				D				D					
ESTIMATED 2034 TOTAL TRAFFIC	Traffic Control	Signalized				Signalized				Signalized				Signalized					
	Minor or Major Approach?	Major				Major				Minor				Minor					
	Entry Volume, V (veh/hr)	0	29	345	73	0	286	578	184	0	124	85	223	0	108	78	24		
	Peak Hour Factor (PHF)	0.93				0.93				0.93				0.93					
	Adjusted Volume, V_A (veh/hr)	0	31	371	78	0	308	622	198	0	133	91	240	0	116	84	26		
	Ped + Bike Volume, PBV (ped+bike/hr)	13				0				0				3				3	16
	Lane Group	L		TR		L	T	R		L		TR		L		TR			
	Lane Group Volume, V_{LG} (veh/hr)	31		449		308	622	198		133		331		116		110		690	2,298
	Capacity, c (veh/hr)	329		734		463	980	820		329		410		193		453		1,385	4,711
	Volume-to-Capacity Ratio, V_A/c	0.09		0.61		0.66	0.63	0.24		0.41		0.81		0.60		0.24		0.50	0.49
	HCM 95% Queue Length, Q_{95} (veh)	0.8		11.9		5.6	0.4	0.0		4.6		7.1		5.9		3.4			
	HCM 95% Queue Length, Q_{95} (ft)	21		307		148	394	23		129		184		152		87			
	Available Queue Storage, S_Q (ft)	300		480		240	1,030	200		290		500		230		400			
	Average Control Delay (sec/veh)	17.4		24.8		20.9	17.8	11.0		35.6		37.1		52.0		29.3		38.1	25.1
	Level of Service, LOS	B		C		C	B	B		D		D		D		C			
	Approach Delay (sec/veh)	24.3				17.5				36.7				41.0				D	C
	Approach Level of Service, LOS	C				B				D				D					

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Traffic Operations Summary

Copper Square Subdivision

Intersection: Rimrock Road & Road A

WEEKDAY, AM PEAK HOUR

Analysis Scenario	Analysis Data	RIMROCK ROAD From the West (Eastbound) U	L	T	R	RIMROCK ROAD From the East (Westbound) U	L	T	R	ROAD A From the South (Northbound) U	L	T	R	North Side of Rimrock Road U	L	T	R	Minor Approach Totals	Intersection Totals
ESTIMATED 2030 TOTAL TRAFFIC	Traffic Control	Uncontrolled				Uncontrolled				Stop Controlled									
	Minor or Major Approach?	Major				Major				Minor									
	Entry Volume, V (veh/hr)	0		605	35	0	32	213		0	22		21						
	Peak Hour Factor (PHF)	0.78				0.78				0.78									
	Adjusted Volume, V_A (veh/hr)	0		776	45	0	41	273		0	28		27						
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	TR				LT				LR									
	Lane Group Volume, V_{LG} (veh/hr)	821				314				55								55	1,190
	Capacity, c (veh/hr)	1,784				796				262								262	2,842
	Volume-to-Capacity Ratio, V_A/c	0.46				0.39				0.21								0.21	0.42
	HCM 95% Queue Length, Q_{95} (veh)	0.0				0.2				0.8									
	HCM 95% Queue Length, Q_{95} (ft)	0.0				5.2				20.8									
	Available Queue Storage, S_Q (ft)	350				450				125									
	Average Control Delay (sec/veh)	0.3				1.8				22.3								22.3	1.7
	Level of Service, LOS	A				A				C									
	Approach Delay (sec/veh)	0.3				1.8				22.3								C	A
	Approach Level of Service, LOS	A				A				C									
ESTIMATED 2034 BACKGROUND TRAFFIC	Traffic Control	Uncontrolled				Uncontrolled				Stop Controlled									
	Minor or Major Approach?	Major				Major				Minor									
	Entry Volume, V (veh/hr)	0		640	35	0	32	227		0	22		21						
	Peak Hour Factor (PHF)	0.78				0.78				0.78									
	Adjusted Volume, V_A (veh/hr)	0		821	45	0	41	291		0	28		27						
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	TR				LT				LR									
	Lane Group Volume, V_{LG} (veh/hr)	865				332				55								55	1,253
	Capacity, c (veh/hr)	1,784				765				242								242	2,791
	Volume-to-Capacity Ratio, V_A/c	0.49				0.43				0.23								0.23	0.45
	HCM 95% Queue Length, Q_{95} (veh)	0.0				0.2				9.0									
	HCM 95% Queue Length, Q_{95} (ft)	0.0				5.2				23.4									
	Available Queue Storage, S_Q (ft)	350				450				125									
	Average Control Delay (sec/veh)	0.3				1.8				24.2								24.2	1.7
	Level of Service, LOS	A				A				C									
	Approach Delay (sec/veh)	0.3				1.8				24.2								C	A
	Approach Level of Service, LOS	A				A				C									
ESTIMATED 2034 TOTAL TRAFFIC	Traffic Control	Uncontrolled				Uncontrolled				Stop Controlled									
	Minor or Major Approach?	Major				Major				Minor									
	Entry Volume, V (veh/hr)	0		652	37	0	10	237		0	22		7						
	Peak Hour Factor (PHF)	0.78				0.78				0.78									
	Adjusted Volume, V_A (veh/hr)	0		836	47	0	13	304		0	28		9						
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	TR				LT				LR									
	Lane Group Volume, V_{LG} (veh/hr)	883				317				37								37	1,237
	Capacity, c (veh/hr)	1,784				753				224								224	2,761
	Volume-to-Capacity Ratio, V_A/c	0.50				0.42				0.17								0.17	0.45
	HCM 95% Queue Length, Q_{95} (veh)	0.0				0.1				0.6									
	HCM 95% Queue Length, Q_{95} (ft)	0.0				2.6				15.6									
	Available Queue Storage, S_Q (ft)	350				450				125									
	Average Control Delay (sec/veh)	0.3				0.6				24.3								24.3	1.1
	Level of Service, LOS	A				A				C									
	Approach Delay (sec/veh)	0.3				0.6				24.3								C	A
	Approach Level of Service, LOS	A				A				C									

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Traffic Operations Summary

Copper Square Subdivision

Intersection: Rimrock Road & Road A

WEEKDAY, MIDDAY PEAK HOUR

Analysis Scenario	Analysis Data	RIMROCK ROAD From the West (Eastbound) U	L	T	R	RIMROCK ROAD From the East (Westbound) U	L	T	R	ROAD A From the South (Northbound) U	L	T	R	North Side of Rimrock Road U	L	T	R	Minor Approach Totals	Intersection Totals
ESTIMATED 2030 TOTAL TRAFFIC	Traffic Control	Uncontrolled				Uncontrolled				Stop Controlled									
	Minor or Major Approach?	Major				Major				Minor									
	Entry Volume, V (veh/hr)	0		263	36	0	33	293		0	36		34						
	Peak Hour Factor (PHF)	0.90				0.90				0.90									
	Adjusted Volume, V_A (veh/hr)	0		292	40	0	37	326		0	40		38						
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	TR				LT				LR									
	Lane Group Volume, V_{LG} (veh/hr)	332				362				78								78	772
	Capacity, c (veh/hr)	1,764				796				262								262	2,822
	Volume-to-Capacity Ratio, V_A/c	0.19				0.46				0.30								0.30	0.27
	HCM 95% Queue Length, Q_{95} (veh)	0.0				0.2				0.8									
	HCM 95% Queue Length, Q_{95} (ft)	0.0				5.2				20.8									
	Available Queue Storage, S_Q (ft)	350				450				125									
	Average Control Delay (sec/veh)	0.6				1.8				22.3								22.3	3.3
	Level of Service, LOS	A				A				C									
	Approach Delay (sec/veh)	0.6				1.8				22.3								C	A
	Approach Level of Service, LOS	A				A				C									
ESTIMATED 2034 BACKGROUND TRAFFIC	Traffic Control	Uncontrolled				Uncontrolled				Stop Controlled									
	Minor or Major Approach?	Major				Major				Minor									
	Entry Volume, V (veh/hr)	0		277	36	0	33	308		0	36		34						
	Peak Hour Factor (PHF)	0.90				0.90				0.90									
	Adjusted Volume, V_A (veh/hr)	0		308	40	0	37	342		0	40		38						
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	TR				LT				LR									
	Lane Group Volume, V_{LG} (veh/hr)	348				379				78								78	804
	Capacity, c (veh/hr)	1,765				1,195				476								476	3,436
	Volume-to-Capacity Ratio, V_A/c	0.20				0.32				0.16								0.16	0.23
	HCM 95% Queue Length, Q_{95} (veh)	0.0				0.1				0.6									
	HCM 95% Queue Length, Q_{95} (ft)	0.0				2.6				15.6									
	Available Queue Storage, S_Q (ft)	350				450				125									
	Average Control Delay (sec/veh)	0.6				1.1				14.0								14.0	2.1
	Level of Service, LOS	A				A				B									
	Approach Delay (sec/veh)	0.6				1.1				14.0								B	A
	Approach Level of Service, LOS	A				A				B									
ESTIMATED 2034 TOTAL TRAFFIC	Traffic Control	Uncontrolled				Uncontrolled				Stop Controlled									
	Minor or Major Approach?	Major				Major				Minor									
	Entry Volume, V (veh/hr)	0		291	36	0	11	325		0	37		11						
	Peak Hour Factor (PHF)	0.90				0.90				0.90									
	Adjusted Volume, V_A (veh/hr)	0		323	40	0	12	361		0	41		12						
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	TR				LT				LR									
	Lane Group Volume, V_{LG} (veh/hr)	363				373				53								53	790
	Capacity, c (veh/hr)	1,767				1,179				424								424	3,370
	Volume-to-Capacity Ratio, V_A/c	0.21				0.32				0.13								0.13	0.23
	HCM 95% Queue Length, Q_{95} (veh)	0.0				0.0				0.4									
	HCM 95% Queue Length, Q_{95} (ft)	0.0				0.0				10.4									
	Available Queue Storage, S_Q (ft)	350				450				125									
	Average Control Delay (sec/veh)	0.6				0.4				14.7								14.7	1.5
	Level of Service, LOS	A				A				B									
	Approach Delay (sec/veh)	0.6				0.4				14.7								B	A
	Approach Level of Service, LOS	A				A				B									

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Traffic Operations Summary

Copper Square Subdivision

Intersection: Rimrock Road & Road A

WEEKDAY, PM PEAK HOUR

Analysis Scenario	Analysis Data	RIMROCK ROAD From the West (Eastbound) U	L	T	R	RIMROCK ROAD From the East (Westbound) U	L	T	R	ROAD A From the South (Northbound) U	L	T	R	North Side of Rimrock Road U	L	T	R	Minor Approach Totals	Intersection Totals
ESTIMATED 2030 TOTAL TRAFFIC	Traffic Control	Uncontrolled				Uncontrolled				Stop Controlled									
	Minor or Major Approach?	Major				Major				Minor									
	Entry Volume, V (veh/hr)	0		345	36	0	35	555		0	31		30						
	Peak Hour Factor (PHF)	0.87				0.87				0.87									
	Adjusted Volume, V_A (veh/hr)	0		397	41	0	40	638		0	36		34						
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	TR				LT				LR									
	Lane Group Volume, V_{LG} (veh/hr)	438				678				70								70	1,186
	Capacity, c (veh/hr)	1,772				1,314				533								533	3,619
	Volume-to-Capacity Ratio, V_A/c	0.25				0.52				0.13								0.13	0.33
	HCM 95% Queue Length, Q_{95} (veh)	0.0				0.1				0.9									
	HCM 95% Queue Length, Q_{95} (ft)	0.0				2.6				23.4									
	Available Queue Storage, S_Q (ft)	350				450				125									
	Average Control Delay (sec/veh)	0.5				0.9				20.0								20.0	1.9
	Level of Service, LOS	A				A				C									
	Approach Delay (sec/veh)	0.5				0.9				20.0								C	A
	Approach Level of Service, LOS	A				A				C									
ESTIMATED 2034 BACKGROUND TRAFFIC	Traffic Control	Uncontrolled				Uncontrolled				Stop Controlled									
	Minor or Major Approach?	Major				Major				Minor									
	Entry Volume, V (veh/hr)	0		367	36	0	35	589		0	31		30						
	Peak Hour Factor (PHF)	0.87				0.87				0.87									
	Adjusted Volume, V_A (veh/hr)	0		422	41	0	40	677		0	36		34						
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	TR				LT				LR									
	Lane Group Volume, V_{LG} (veh/hr)	463				717				70								70	1,251
	Capacity, c (veh/hr)	1,773				1,082				287								287	3,142
	Volume-to-Capacity Ratio, V_A/c	0.26				0.66				0.24								0.24	0.40
	HCM 95% Queue Length, Q_{95} (veh)	0.0				0.1				0.9									
	HCM 95% Queue Length, Q_{95} (ft)	0.0				2.6				23.4									
	Available Queue Storage, S_Q (ft)	350				450				125									
	Average Control Delay (sec/veh)	0.4				0.9				21.6								21.6	1.9
	Level of Service, LOS	A				A				C									
	Approach Delay (sec/veh)	0.4				0.9				21.6								C	A
	Approach Level of Service, LOS	A				A				C									
ESTIMATED 2034 TOTAL TRAFFIC	Traffic Control	Uncontrolled				Uncontrolled				Stop Controlled									
	Minor or Major Approach?	Major				Major				Minor									
	Entry Volume, V (veh/hr)	0		382	36	0	12	603		0	34		10						
	Peak Hour Factor (PHF)	0.87				0.87				0.87									
	Adjusted Volume, V_A (veh/hr)	0		439	41	0	14	693		0	39		11						
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	TR				LT				LR									
	Lane Group Volume, V_{LG} (veh/hr)	480				707				51								51	1,238
	Capacity, c (veh/hr)	1,774				1,067				239								239	3,080
	Volume-to-Capacity Ratio, V_A/c	0.27				0.66				0.21								0.21	0.40
	HCM 95% Queue Length, Q_{95} (veh)	0.0				0.0				0.8									
	HCM 95% Queue Length, Q_{95} (ft)	0.0				0.0				20.8									
	Available Queue Storage, S_Q (ft)	350				450				125									
	Average Control Delay (sec/veh)	0.4				0.3				24.1								24.1	1.3
	Level of Service, LOS	A				A				C									
	Approach Delay (sec/veh)	0.4				0.3				24.1								C	A
	Approach Level of Service, LOS	A				A				C									

U = U-Turns; L = Left Turns; T = Through; R = Right Turns | Lane Groups: LTR = Left-Through-Right

Average intersection delay and volume-to-capacity ratio for minor approach(es) is a weighted average provided for reference purposes. The Highway Capacity Manual, 7th Edition: A Guide for Multimodal Mobility Analysis does not define overall average delay for the intersection as a whole for two-way or single approach stop-controlled intersections.

Traffic Operations Summary

Copper Square Subdivision

Intersection: Rimrock Road & 60th Street West

WEEKDAY, AM PEAK HOUR

Analysis Scenario	Analysis Data	RIMROCK ROAD From the West (Eastbound) U	L	T	R	RIMROCK ROAD From the East (Westbound) U	L	T	R	ROAD A From the South (Northbound) U	L	T	R	North Side of Rimrock Road U	L	T	R	Minor Approach Totals	Intersection Totals
ESTIMATED 2034 TOTAL TRAFFIC	Traffic Control	Uncontrolled				Uncontrolled				Stop Controlled									
	Minor or Major Approach?	Major				Major				Minor									
	Entry Volume, V (veh/hr)	0		582	80	0	59	214		0	33		89						
	Peak Hour Factor (PHF)	0.78				0.78				0.78									
	Adjusted Volume, V_A (veh/hr)	0		746	103	0	76	274		0	42		114						
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	TR				LT				LR									
	Lane Group Volume, V_{LG} (veh/hr)	849				350				156								156	1,355
	Capacity, c (veh/hr)	1,764				776				288								288	2,828
	Volume-to-Capacity Ratio, V_A/c	0.48				0.45				0.54								0.54	0.48
	HCM 95% Queue Length, Q_{95} (veh)	0.0				0.3				3.0									
	HCM 95% Queue Length, Q_{95} (ft)	0.0				7.8				78.0									
	Available Queue Storage, S_Q (ft)	450				350				125									
	Average Control Delay (sec/veh)	0.6				3.1				31.5								31.5	4.8
	Level of Service, LOS	A				A				D									
	Approach Delay (sec/veh)	0.6				3.1				31.5								D	A
	Approach Level of Service, LOS	A				A				D									

WEEKDAY, MIDDAY PEAK HOUR

Analysis Scenario	Analysis Data	RIMROCK ROAD From the West (Eastbound) U	L	T	R	RIMROCK ROAD From the East (Westbound) U	L	T	R	ROAD A From the South (Northbound) U	L	T	R	North Side of Rimrock Road U	L	T	R	Minor Approach Totals	Intersection Totals
ESTIMATED 2034 TOTAL TRAFFIC	Traffic Control	Uncontrolled				Uncontrolled				Stop Controlled									
	Minor or Major Approach?	Major				Major				Minor									
	Entry Volume, V (veh/hr)	0		275	27	0	51	305		0	31		53						
	Peak Hour Factor (PHF)	0.91				0.91				0.91									
	Adjusted Volume, V_A (veh/hr)	0		302	30	0	56	335		0	34		58						
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	TR				LT				LR									
	Lane Group Volume, V_{LG} (veh/hr)	332				391				92								78	815
	Capacity, c (veh/hr)	1,773				1,211				514								262	3,498
	Volume-to-Capacity Ratio, V_A/c	0.19				0.32				0.18								0.30	0.23
	HCM 95% Queue Length, Q_{95} (veh)	0.0				0.1				0.6									
	HCM 95% Queue Length, Q_{95} (ft)	0.0				2.6				15.6									
	Available Queue Storage, S_Q (ft)	450				350				125									
	Average Control Delay (sec/veh)	0.4				1.6				13.5								22.3	2.5
	Level of Service, LOS	A				A				B									
	Approach Delay (sec/veh)	0.4				1.6				13.5								D	A
	Approach Level of Service, LOS	A				A				B									

WEEKDAY, PM PEAK HOUR

Analysis Scenario	Analysis Data	RIMROCK ROAD From the West (Eastbound) U	L	T	R	RIMROCK ROAD From the East (Westbound) U	L	T	R	ROAD A From the South (Northbound) U	L	T	R	North Side of Rimrock Road U	L	T	R	Minor Approach Totals	Intersection Totals
ESTIMATED 2034 TOTAL TRAFFIC	Traffic Control	Uncontrolled				Uncontrolled				Stop Controlled									
	Minor or Major Approach?	Major				Major				Minor									
	Entry Volume, V (veh/hr)	0		363	30	0	63	576		0	39		49						
	Peak Hour Factor (PHF)	0.86				0.86				0.86									
	Adjusted Volume, V_A (veh/hr)	0		422	35	0	73	670		0	45		57						
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	TR				LT				LR									
	Lane Group Volume, V_{LG} (veh/hr)	457				743				102								70	1,302
	Capacity, c (veh/hr)	1,777				1,088				280								533	3,145
	Volume-to-Capacity Ratio, V_A/c	0.26				0.68				0.37								0.13	0.41
	HCM 95% Queue Length, Q_{95} (veh)	0.0				0.2				1.6									
	HCM 95% Queue Length, Q_{95} (ft)	0.0				5.2				41.6									
	Available Queue Storage, S_Q (ft)	350				450				125									
	Average Control Delay (sec/veh)	0.4				1.7				25.1								20.0	3.1
	Level of Service, LOS	A				A				D									
	Approach Delay (sec/veh)	0.4				1.7				25.1								D	A
	Approach Level of Service, LOS	A				A				D									

U = U-Turns; L = Left Turns; T = Through; R = Right Turns | Lane Groups: LTR = Left-Through-Right

Average intersection delay and volume-to-capacity ratio for minor approach(es) is a weighted average provided for reference purposes. The *Highway Capacity Manual, 7th Edition: A Guide for Multimodal Mobility Analysis* does not define overall average delay for the intersection as a whole for two-way or single approach stop-controlled intersections.

Traffic Operations Summary

Copper Square Subdivision

Intersection: 60th Street West & Road C

WEEKDAY, AM PEAK HOUR

Analysis Scenario	Analysis Data	ROAD C From the West (Eastbound) U	L	T	R	East Side of 60th Street West U	L	T	R	60TH STREET WEST From the South (Northbound) U	L	T	R	60TH STREET WEST From the North (Southbound) U	L	T	R	Minor Approach Totals	Intersection Totals
ESTIMATED 2034 TOTAL TRAFFIC	Traffic Control	Stop Controlled								Uncontrolled				Uncontrolled					
	Minor or Major Approach?	Minor								Major				Major					
	Entry Volume, V (veh/hr)	0	58		0					0	0	2		0		3	77		
	Peak Hour Factor (PHF)	0.80								0.80				0.80					
	Adjusted Volume, V_A (veh/hr)	0	73		0					0	0	3		0		4	96		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	LR								LT				TR					
	Lane Group Volume, V_{LG} (veh/hr)	73								3				100				73	175
	Capacity, c (veh/hr)	946								1,505				1,511				946	3,962
	Volume-to-Capacity Ratio, V_A/c	0.08								0.00				0.07				0.08	0.04
	HCM 95% Queue Length, Q_{95} (veh)	0.2								0.0				0.0					
	HCM 95% Queue Length, Q_{95} (ft)	5.2								0.0				0.0					
	Available Queue Storage, S_Q (ft)	100								100				100					
	Average Control Delay (sec/veh)	9.1								0.0				4.8				9.1	6.5
	Level of Service, LOS	A								A				A					
	Approach Delay (sec/veh)	9.1								0.0				4.8				A	A
	Approach Level of Service, LOS	A								A				A					

WEEKDAY, MIDDAY PEAK HOUR

Analysis Scenario	Analysis Data	ROAD C From the West (Eastbound) U	L	T	R	East Side of 60th Street West U	L	T	R	60TH STREET WEST From the South (Northbound) U	L	T	R	60TH STREET WEST From the North (Southbound) U	L	T	R	Minor Approach Totals	Intersection Totals
ESTIMATED 2034 TOTAL TRAFFIC	Traffic Control	Stop Controlled								Uncontrolled				Uncontrolled					
	Minor or Major Approach?	Minor								Major				Major					
	Entry Volume, V (veh/hr)	0	48		0					0	0	10		0		10	44		
	Peak Hour Factor (PHF)	0.80								0.80				0.80					
	Adjusted Volume, V_A (veh/hr)	0	60		0					0	0	13		0		13	55		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	LTR								LTR				LTR					
	Lane Group Volume, V_{LG} (veh/hr)	60								13				68				54	140
	Capacity, c (veh/hr)	948								1,547				1,556				1,585	4,051
	Volume-to-Capacity Ratio, V_A/c	0.06								0.01				0.04				0.03	0.03
	HCM 95% Queue Length, Q_{95} (veh)	0.2								0.0				0.0					
	HCM 95% Queue Length, Q_{95} (ft)	5.2								0.0				0.0					
	Available Queue Storage, S_Q (ft)	100								100				100					
	Average Control Delay (sec/veh)	9.1								0.0				4.1				5.0	5.9
	Level of Service, LOS	A								A				A					
	Approach Delay (sec/veh)	9.1								0.0				4.1				A	A
	Approach Level of Service, LOS	A								A				A					

WEEKDAY, PM PEAK HOUR

Analysis Scenario	Analysis Data	ROAD C From the West (Eastbound) U	L	T	R	East Side of 60th Street West U	L	T	R	60TH STREET WEST From the South (Northbound) U	L	T	R	60TH STREET WEST From the North (Southbound) U	L	T	R	Minor Approach Totals	Intersection Totals
ESTIMATED 2034 TOTAL TRAFFIC	Traffic Control	Stop Controlled								Uncontrolled				Uncontrolled					
	Minor or Major Approach?	Minor								Major				Major					
	Entry Volume, V (veh/hr)	0	46		0					0	0	14		0	16	50	20		
	Peak Hour Factor (PHF)	0.80								0.80				0.80					
	Adjusted Volume, V_A (veh/hr)	0	58		0					0	0	18		0		63	25		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	LTR								LTR				LTR					
	Lane Group Volume, V_{LG} (veh/hr)	58								18				88				51	163
	Capacity, c (veh/hr)	929								1,527				1,714				1,590	4,170
	Volume-to-Capacity Ratio, V_A/c	0.06								0.01				0.05				0.03	0.04
	HCM 95% Queue Length, Q_{95} (veh)	0.2								0.0				0.0					
	HCM 95% Queue Length, Q_{95} (ft)	5.2								0.0				0.0					
	Available Queue Storage, S_Q (ft)	100								100				100					
	Average Control Delay (sec/veh)	9.1								0.0				1.4				4.5	4.0
	Level of Service, LOS	A								A				A					
	Approach Delay (sec/veh)	9.1								0.0				1.4				A	A
	Approach Level of Service, LOS	A								A				A					

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Average intersection delay and volume-to-capacity ratio for minor approach(es) is a weighted average provided for reference purposes. The *Highway Capacity Manual, 7th Edition: A Guide for Multimodal Mobility Analysis* does not define overall average delay for the intersection as a whole for two-way or single approach stop-controlled intersections.

Traffic Operations Summary

Copper Square Subdivision

Intersection: Road B & Road C

WEEKDAY, AM PEAK HOUR

Analysis Scenario	Analysis Data	ROAD C From the West (Eastbound)				ROAD C From the East (Westbound)				ROAD B From the South (Northbound)				ROAD B From the North (Southbound)				Minor Approach Totals	Intersection Totals
		U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R		
ESTIMATED 2030 TOTAL TRAFFIC	Traffic Control	Uncontrolled				Uncontrolled				Stop Controlled				Stop Controlled					
	Minor or Major Approach?	Major				Major				Minor				Minor					
	Entry Volume, V (veh/hr)	0	25	10	5	0	0	6	0	0	3	0	0	0	0	0	18		
	Peak Hour Factor (PHF)	0.80				0.80				0.80				0.80					
	Adjusted Volume, V_A (veh/hr)	0	31	13	6	0	0	8	0	0	4	0	0	0	0	0	23		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	LTR				LTR				LTR				LTR					
	Lane Group Volume, V_{LG} (veh/hr)	50				8				4				23				26	84
	Capacity, c (veh/hr)	1,593				1,578				843				1,066				1,909	5,080
	Volume-to-Capacity Ratio, V_A/c	0.03				0.00				0.00				0.02				0.01	0.02
	HCM 95% Queue Length, Q_{95} (veh)	0.1				0.0				0.0				0.1					
	HCM 95% Queue Length, Q_{95} (ft)	2.5				0.0				0.0				2.6					
	Available Queue Storage, S_Q (ft)	100				100				100				100					
	Average Control Delay (sec/veh)	4.6				0.0				9.3				8.4				8.5	5.4
	Level of Service, LOS	A				A				A				A					
	Approach Delay (sec/veh)	4.6				0.0				9.3				8.4				A	A
	Approach Level of Service, LOS	A				A				A				A					
ESTIMATED 2034 BACKGROUND TRAFFIC	Traffic Control	Uncontrolled				Uncontrolled				Stop Controlled				Stop Controlled					
	Minor or Major Approach?	Major				Major				Minor				Minor					
	Entry Volume, V (veh/hr)	0	25	10	5	0	0	6	0	0	3	0	0	0	0	0	18		
	Peak Hour Factor (PHF)	0.80				0.80				0.80				0.80					
	Adjusted Volume, V_A (veh/hr)	0	31	13	6	0	0	8	0	0	4	0	0	0	0	0	23		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	LTR				LTR				LTR				LTR					
	Lane Group Volume, V_{LG} (veh/hr)	50				8				4				23				26	84
	Capacity, c (veh/hr)	1,593				1,578				843				1,066				1,909	5,080
	Volume-to-Capacity Ratio, V_A/c	0.03				0.00				0.00				0.02				0.01	0.02
	HCM 95% Queue Length, Q_{95} (veh)	0.1				0.0				0.0				0.1					
	HCM 95% Queue Length, Q_{95} (ft)	2.5				0.0				0.0				2.6					
	Available Queue Storage, S_Q (ft)	100				100				100				100					
	Average Control Delay (sec/veh)	4.6				0.0				9.3				8.4				8.5	5.4
	Level of Service, LOS	A				A				A				A					
	Approach Delay (sec/veh)	4.6				0.0				9.3				8.4				A	A
	Approach Level of Service, LOS	A				A				A				A					
ESTIMATED 2034 TOTAL TRAFFIC	Traffic Control	Uncontrolled				Uncontrolled				Stop Controlled				Stop Controlled					
	Minor or Major Approach?	Major				Major				Minor				Minor					
	Entry Volume, V (veh/hr)	0	9	7	4	0	3	6	12	0	1	0	1	0	8	0	6		
	Peak Hour Factor (PHF)	0.80				0.80				0.80				0.80					
	Adjusted Volume, V_A (veh/hr)	0	11	9	5	0	4	8	15	0	1	0	1	0	10	0	8		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	LTR				LTR				LTR				LTR					
	Lane Group Volume, V_{LG} (veh/hr)	25				26				3				18				20	71
	Capacity, c (veh/hr)	1,573				1,585				981				975				1,956	5,114
	Volume-to-Capacity Ratio, V_A/c	0.02				0.02				0.00				0.02				0.01	0.01
	HCM 95% Queue Length, Q_{95} (veh)	0.0				0.0				0.0				0.1					
	HCM 95% Queue Length, Q_{95} (ft)	0.0				0.0				0.0				2.6					
	Available Queue Storage, S_Q (ft)	100				100				100				100					
	Average Control Delay (sec/veh)	3.3				1.1				8.7				8.8				8.8	4.0
	Level of Service, LOS	A				A				A				A					
	Approach Delay (sec/veh)	3.3				1.1				8.7				8.8				A	A
	Approach Level of Service, LOS	A				A				A				A					

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Average intersection delay and volume-to-capacity ratio for minor approach(es) is a weighted average provided for reference purposes. The *Highway Capacity Manual, 7th Edition: A Guide for Multimodal Mobility Analysis* does not define overall average delay for the intersection as a whole for two-way or single approach stop-controlled intersections.

Traffic Operations Summary

Copper Square Subdivision

Intersection: **Road B & Road C**

WEEKDAY, MIDDAY PEAK HOUR

Analysis Scenario	Analysis Data	ROAD C From the West (Eastbound)				ROAD C From the East (Westbound)				ROAD B From the South (Northbound)				ROAD B From the North (Southbound)				Minor Approach Totals	Intersection Totals
		U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R		
ESTIMATED 2030 TOTAL TRAFFIC	Traffic Control	Uncontrolled				Uncontrolled				Stop Controlled				Stop Controlled					
	Minor or Major Approach?	Major				Major				Minor				Minor					
	Entry Volume, V (veh/hr)	0	29	11	3	0	0	11	0	0	4	0	0	0	0	0	29		
	Peak Hour Factor (PHF)	0.80				0.80				0.80				0.80					
	Adjusted Volume, V_A (veh/hr)	0	36	14	4	0	0	14	0	0	5	0	0	0	0	0	36		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	LTR				LTR				LTR				LTR					
	Lane Group Volume, V_{LG} (veh/hr)	54				14				5				36				41	109
	Capacity, c (veh/hr)	1,585				1,580				800				1,058				1,858	5,023
	Volume-to-Capacity Ratio, V_A/c	0.03				0.01				0.01				0.03				0.02	0.02
	HCM 95% Queue Length, Q_{95} (veh)	0.1				0.0				0.0				0.1					
	HCM 95% Queue Length, Q_{95} (ft)	2.5				0.0				0.0				2.6					
	Available Queue Storage, S_Q (ft)	100				100				100				100					
	Average Control Delay (sec/veh)	5.0				0.0				9.5				8.5				8.6	5.7
	Level of Service, LOS	A				A				A				A					
	Approach Delay (sec/veh)	5.0				0.0				9.5				8.5				A	A
	Approach Level of Service, LOS	A				A				A				A					
ESTIMATED 2034 BACKGROUND TRAFFIC	Traffic Control	Uncontrolled				Uncontrolled				Stop Controlled				Stop Controlled					
	Minor or Major Approach?	Major				Major				Minor				Minor					
	Entry Volume, V (veh/hr)	0	29	11	3	0	0	11	0	0	4	0	0	0	0	0	29		
	Peak Hour Factor (PHF)	0.80				0.80				0.80				0.80					
	Adjusted Volume, V_A (veh/hr)	0	36	14	4	0	0	14	0	0	5	0	0	0	0	0	36		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	LTR				LTR				LTR				LTR					
	Lane Group Volume, V_{LG} (veh/hr)	54				14				5				36				41	109
	Capacity, c (veh/hr)	1,585				1,580				800				1,058				1,858	5,023
	Volume-to-Capacity Ratio, V_A/c	0.03				0.01				0.01				0.03				0.02	0.02
	HCM 95% Queue Length, Q_{95} (veh)	0.1				0.0				0.0				0.1					
	HCM 95% Queue Length, Q_{95} (ft)	2.5				0.0				0.0				2.6					
	Available Queue Storage, S_Q (ft)	100				100				100				100					
	Average Control Delay (sec/veh)	5.0				0.0				9.5				8.5				8.6	5.7
	Level of Service, LOS	A				A				A				A					
	Approach Delay (sec/veh)	5.0				0.0				9.5				8.5				A	A
	Approach Level of Service, LOS	A				A				A				A					
ESTIMATED 2034 TOTAL TRAFFIC	Traffic Control	Uncontrolled				Uncontrolled				Stop Controlled				Stop Controlled					
	Minor or Major Approach?	Major				Major				Minor				Minor					
	Entry Volume, V (veh/hr)	0	10	7	2	0	2	7	14	0	3	0	3	0	14	0	10		
	Peak Hour Factor (PHF)	0.80				0.80				0.80				0.80					
	Adjusted Volume, V_A (veh/hr)	0	13	9	3	0	3	9	18	0	4	0	4	0	18	0	13		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	LTR				LTR				LTR				LTR					
	Lane Group Volume, V_{LG} (veh/hr)	24				29				8				30				38	90
	Capacity, c (veh/hr)	1,569				1,588				977				969				1,946	5,103
	Volume-to-Capacity Ratio, V_A/c	0.02				0.02				0.01				0.03				0.02	0.02
	HCM 95% Queue Length, Q_{95} (veh)	0.0				0.0				0.0				0.1					
	HCM 95% Queue Length, Q_{95} (ft)	0.0				0.0				0.0				2.6					
	Available Queue Storage, S_Q (ft)	100				100				100				100					
	Average Control Delay (sec/veh)	3.9				0.6				8.7				8.8				8.8	4.9
	Level of Service, LOS	A				A				A				A					
	Approach Delay (sec/veh)	3.9				0.6				8.7				8.8				A	A
	Approach Level of Service, LOS	A				A				A				A					

U = U-Turns; L = Left Turns; T = Through; R = Right Turns | Lane Groups: LTR = Left-Through-Right

Average intersection delay and volume-to-capacity ratio for minor approach(es) is a weighted average provided for reference purposes. The Highway Capacity Manual, 7th Edition: A Guide for Multimodal Mobility Analysis does not define overall average delay for the intersection as a whole for two-way or single approach stop-controlled intersections.

Traffic Operations Summary

Copper Square Subdivision

Intersection: Road B & Road C

WEEKDAY, PM PEAK HOUR

Analysis Scenario	Analysis Data	ROAD C From the West (Eastbound) U	L	T	R	ROAD C From the East (Westbound) U	L	T	R	ROAD B From the South (Northbound) U	L	T	R	ROAD B From the North (Southbound) U	L	T	R	Minor Approach Totals	Intersection Totals
ESTIMATED 2030 TOTAL TRAFFIC	Traffic Control	Uncontrolled				Uncontrolled				Stop Controlled				Stop Controlled					
	Minor or Major Approach?	Major				Major				Minor				Minor					
	Entry Volume, V (veh/hr)	0	25	10	6	0	0	8	0	0	6	0	0	0	0	0	20		
	Peak Hour Factor (PHF)	0.80				0.80				0.80				0.80					
	Adjusted Volume, V_A (veh/hr)	0	31	13	8	0	0	10	0	0	8	0	0	0	0	0	25		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	LTR				LTR				LTR				LTR					
	Lane Group Volume, V_{LG} (veh/hr)	51				10				8				25				33	94
	Capacity, c (veh/hr)	1,590				1,577				835				1,063				1,898	5,065
	Volume-to-Capacity Ratio, V_A/c	0.03				0.01				0.01				0.02				0.02	0.02
	HCM 95% Queue Length, Q_{95} (veh)	0.1				0.0				0.0				0.1					
	HCM 95% Queue Length, Q_{95} (ft)	2.5				0.0				0.0				2.6					
	Available Queue Storage, S_Q (ft)	100				100				100				100					
	Average Control Delay (sec/veh)	4.5				0.0				9.3				8.5				8.7	5.5
	Level of Service, LOS	A				A				A				A					
	Approach Delay (sec/veh)	4.5				0.0				9.3				8.5				A	A
	Approach Level of Service, LOS	A				A				A				A					
ESTIMATED 2034 BACKGROUND TRAFFIC	Traffic Control	Uncontrolled				Uncontrolled				Stop Controlled				Stop Controlled					
	Minor or Major Approach?	Major				Major				Minor				Minor					
	Entry Volume, V (veh/hr)	0	25	10	6	0	0	8	0	0	6	0	0	0	0	0	20		
	Peak Hour Factor (PHF)	0.80				0.80				0.80				0.80					
	Adjusted Volume, V_A (veh/hr)	0	31	13	8	0	0	10	0	0	8	0	0	0	0	0	25		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	LTR				LTR				LTR				LTR					
	Lane Group Volume, V_{LG} (veh/hr)	51				10				8				25				33	94
	Capacity, c (veh/hr)	1,590				1,577				835				1,063				1,898	5,065
	Volume-to-Capacity Ratio, V_A/c	0.03				0.01				0.01				0.02				0.02	0.02
	HCM 95% Queue Length, Q_{95} (veh)	0.1				0.0				0.0				0.1					
	HCM 95% Queue Length, Q_{95} (ft)	2.5				0.0				0.0				2.6					
	Available Queue Storage, S_Q (ft)	100				100				100				100					
	Average Control Delay (sec/veh)	4.5				0.0				9.3				8.5				8.7	5.5
	Level of Service, LOS	A				A				A				A					
	Approach Delay (sec/veh)	4.5				0.0				9.3				8.5				A	A
	Approach Level of Service, LOS	A				A				A				A					
ESTIMATED 2034 TOTAL TRAFFIC	Traffic Control	Uncontrolled				Uncontrolled				Stop Controlled				Stop Controlled					
	Minor or Major Approach?	Major				Major				Minor				Minor					
	Entry Volume, V (veh/hr)	0	8	9	2	0	3	8	12	0	4	0	4	0	9	0	7		
	Peak Hour Factor (PHF)	0.80				0.80				0.80				0.80					
	Adjusted Volume, V_A (veh/hr)	0	10	11	3	0	4	10	15	0	5	0	5	0	11	0	9		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	LTR				LTR				LTR				LTR					
	Lane Group Volume, V_{LG} (veh/hr)	24				29				10				20				30	83
	Capacity, c (veh/hr)	1,570				1,585				979				971				1,950	5,105
	Volume-to-Capacity Ratio, V_A/c	0.02				0.02				0.01				0.02				0.02	0.02
	HCM 95% Queue Length, Q_{95} (veh)	0.0				0.0				0.0				0.1					
	HCM 95% Queue Length, Q_{95} (ft)	0.0				0.0				0.0				2.6					
	Available Queue Storage, S_Q (ft)	100				100				100				100					
	Average Control Delay (sec/veh)	3.1				1.0				8.7				8.8				8.8	4.4
	Level of Service, LOS	A				A				A				A					
	Approach Delay (sec/veh)	3.1				1.0				8.7				8.8				A	A
	Approach Level of Service, LOS	A				A				A				A					

U = U-Turns; L = Left Turns; T = Through; R = Right Turns | Lane Groups: LTR = Left-Through-Right

Average intersection delay and volume-to-capacity ratio for minor approach(es) is a weighted average provided for reference purposes. The Highway Capacity Manual, 7th Edition: A Guide for Multimodal Mobility Analysis does not define overall average delay for the intersection as a whole for two-way or single approach stop-controlled intersections.

Appendix E

IN THIS SECTION:

2025 Existing Conditions

HCS Two-Way Stop-Control Report

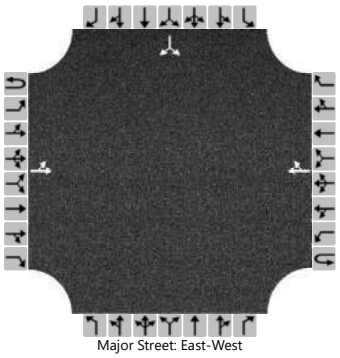
General Information

Analyst	T. Eastwood
Agency/Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2025
Time Analyzed	Weekday, AM Peak Hour
Intersection Orientation	East-West
Project Description	Copper Square TIS | Existing Conditions

Site Information

Intersection	Grand & 62nd
Jurisdiction	City of Billings
East/West Street	Grand Avenue
North/South Street	62nd Street West
Peak Hour Factor	0.85
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	0	0		0	1	0
Configuration		LT						TR							LR	
Volume (veh/h)		55	231				128	43						193		80
Percent Heavy Vehicles (%)		18												2		6
Proportion Time Blocked																
Percent Grade (%)														0		
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.1		6.2
Critical Headway (sec)		4.28												6.42		6.26
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.36												3.52		3.35

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		65													321	
Capacity, c (veh/h)		1281													523	
v/c Ratio		0.05													0.61	
95% Queue Length, Q_{95} (veh)		0.2													4.1	
95% Queue Length, Q_{95} (ft)		5.7													105.1	
Control Delay (s/veh)		8.0	0.5												22.2	
Level of Service (LOS)		A	A												C	
Approach Delay (s/veh)	1.9												22.2			
Approach LOS	A												C			

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HCS Two-Way Stop-Control Report

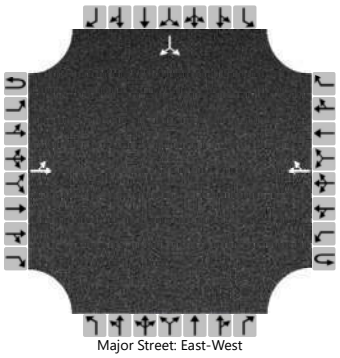
General Information

Analyst	T. Eastwood
Agency/Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2025
Time Analyzed	Weekday, Midday Peak Hour
Intersection Orientation	East-West
Project Description	Copper Square TIS | Existing Conditions

Site Information

Intersection	Grand & 62nd
Jurisdiction	City of Billings
East/West Street	Grand Avenue
North/South Street	62nd Street West
Peak Hour Factor	0.95
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	0	0		0	1	0
Configuration		LT						TR							LR	
Volume (veh/h)		47	150				156	62						75		36
Percent Heavy Vehicles (%)		9												5		11
Proportion Time Blocked																
Percent Grade (%)														0		
Right Turn Channelized																
Median Type | Storage					Undivided											

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.1		6.2
Critical Headway (sec)		4.19												6.45		6.31
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.28												3.55		3.40

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		49													117	
Capacity, c (veh/h)		1298													604	
v/c Ratio		0.04													0.19	
95% Queue Length, Q_{95} (veh)		0.1													0.7	
95% Queue Length, Q_{95} (ft)		2.7													18.5	
Control Delay (s/veh)		7.9	0.3												12.4	
Level of Service (LOS)		A	A												B	
Approach Delay (s/veh)		2.1												12.4		
Approach LOS		A												B		

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HCS Two-Way Stop-Control Report

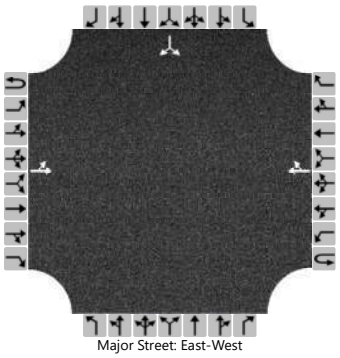
General Information

Analyst	T. Eastwood
Agency/Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2025
Time Analyzed	Weekday, PM Peak Hour
Intersection Orientation	East-West
Project Description	Copper Square TIS | Existing Conditions

Site Information

Intersection	Grand & 62nd
Jurisdiction	City of Billings
East/West Street	Grand Avenue
North/South Street	62nd Street West
Peak Hour Factor	0.93
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	0	0		0	1	0
Configuration		LT						TR							LR	
Volume (veh/h)		71	205				223	127						111		49
Percent Heavy Vehicles (%)		4												3		4
Proportion Time Blocked																
Percent Grade (%)														0		
Right Turn Channelized																
Median Type | Storage					Undivided											

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.1		6.2
Critical Headway (sec)		4.14												6.43		6.24
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.24												3.53		3.34

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		76													172	
Capacity, c (veh/h)		1171													449	
v/c Ratio		0.07													0.38	
95% Queue Length, Q_{95} (veh)		0.2													1.8	
95% Queue Length, Q_{95} (ft)		5.2													46.2	
Control Delay (s/veh)		8.3	0.6												17.9	
Level of Service (LOS)		A	A												C	
Approach Delay (s/veh)		2.6												17.9		
Approach LOS		A												C		

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HCS Roundabouts Report

General Information

Analyst	T. Eastwood
Agency or Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2025
Time Analyzed	Weekday, AM Peak Hour
Project Description	Copper Square TIS | Existing Conditions

Site Information

Intersection	Rimrock & 62nd St W
E/W Street Name	Rimrock Road
N/S Street Name	62nd Street West / Molt Road
Analysis Time Period, hrs	0.25
Peak Hour Factor	0.77
Jurisdiction	City of Billings

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0
Lane Assignment			LTR				LTR				LTR				LTR	
Volume (V), veh/h	0	6	154	79	0	47	39	68	0	15	36	34	0	286	147	4
Percent Heavy Vehicles, %	0	14	2	1	0	7	10	8	0	16	15	8	0	3	3	0
Flow Rate (v_{PCE}), pc/h	0	9	204	104	0	65	56	95	0	23	54	48	0	383	197	5
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				1				1			
Pedestrians Crossing, p/h	0				0				0				0			
Proportion of CAVs, %	0															

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway, s		4.9763			4.9763			4.9763			4.9763	
Follow-Up Headway, s		2.6087			2.6087			2.6087			2.6087	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h		317			216			125			585	
Entry Volume, veh/h		311			200			111			568	
Circulating Flow (v_c), pc/h	645			86			596			144		
Exiting Flow (v_{ex}), pc/h	635			84			158			366		
Capacity (c_{pce}), pc/h		715			1264			751			1191	
Capacity (c), veh/h		701			1168			669			1157	
v/c Ratio (x)		0.44			0.17			0.17			0.49	

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		11.4			4.6			7.3			8.5	
Lane LOS		B			A			A			A	
95% Queue Length, Q_{95} (veh)		2.3			0.6			0.6			2.8	
95% Queue Length, Q_{95} (ft)		58.4			16.0			16.5			71.7	
Approach Delay, s/veh | LOS	11.4	B		4.6	A		7.3	A		8.5	A	
Intersection Delay, s/veh | LOS	8.5						A					

HCS Roundabouts Report

General Information

Analyst	T. Eastwood
Agency or Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2025
Time Analyzed	Weekday, Midday Peak Hour
Project Description	Copper Square TIS | Existing Conditions

Site Information

Intersection	Rimrock & 62nd St W
E/W Street Name	Rimrock Road
N/S Street Name	62nd Street West / Molt Road
Analysis Time Period, hrs	0.25
Peak Hour Factor	0.97
Jurisdiction	City of Billings

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0
Lane Assignment			LTR				LTR				LTR				LTR	
Volume (V), veh/h	0	4	63	28	0	27	66	131	0	29	52	23	0	110	57	3
Percent Heavy Vehicles, %	0	0	4	4	0	8	2	4	0	2	6	7	0	7	4	14
Flow Rate (v_{PCE}), pc/h	0	4	68	30	0	30	69	140	0	30	57	25	0	121	61	4
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				1				1			
Pedestrians Crossing, p/h	0				0				0				0			
Proportion of CAVs, %	0															

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway, s		4.9763			4.9763			4.9763			4.9763	
Follow-Up Headway, s		2.6087			2.6087			2.6087			2.6087	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h		102			239			112			186	
Entry Volume, veh/h		98			230			107			175	
Circulating Flow (v_c), pc/h	212			91			193			129		
Exiting Flow (v_{ex}), pc/h	214			103			201			121		
Capacity (c_{pce}), pc/h		1112			1258			1133			1210	
Capacity (c), veh/h		1071			1211			1078			1140	
v/c Ratio (x)		0.09			0.19			0.10			0.15	

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		4.2			4.6			4.2			4.5	
Lane LOS		A			A			A			A	
95% Queue Length, Q_{95} (veh)		0.3			0.7			0.3			0.5	
95% Queue Length, Q_{95} (ft)		7.7			18.0			7.8			13.1	
Approach Delay, s/veh | LOS	4.2	A		4.6	A		4.2	A		4.5	A	
Intersection Delay, s/veh | LOS	4.4						A					

HCS Roundabouts Report

General Information

Analyst	T. Eastwood
Agency or Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2025
Time Analyzed	Weekday, PM Peak Hour
Project Description	Copper Square TIS | Existing Conditions

Site Information

Intersection	Rimrock & 62nd St W
E/W Street Name	Rimrock Road
N/S Street Name	62nd Street West / Molt Road
Analysis Time Period, hrs	0.25
Peak Hour Factor	0.91
Jurisdiction	City of Billings

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0
Lane Assignment			LTR				LTR				LTR				LTR	
Volume (V), veh/h	0	4	81	42	3	38	129	250	0	63	102	44	0	122	93	6
Percent Heavy Vehicles, %	0	0	2	0	0	4	1	1	0	0	1	1	0	3	3	0
Flow Rate (v_{PCE}), pc/h	0	4	91	46	3	43	143	277	0	69	113	49	0	138	105	7
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				1				1			
Pedestrians Crossing, p/h	0				0				0				0			
Proportion of CAVs, %	0															

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway, s		4.9763			4.9763			4.9763			4.9763	
Follow-Up Headway, s		2.6087			2.6087			2.6087			2.6087	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h		141			466			231			250	
Entry Volume, veh/h		139			460			229			243	
Circulating Flow (v_c), pc/h	289			186			236			258		
Exiting Flow (v_{ex}), pc/h	281			219			394			194		
Capacity (c_{pce}), pc/h		1028			1142			1085			1061	
Capacity (c), veh/h		1015			1127			1077			1031	
v/c Ratio (x)		0.14			0.41			0.21			0.24	

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		4.8			7.4			5.3			5.7	
Lane LOS		A			A			A			A	
95% Queue Length, Q_{95} (veh)		0.5			2.0			0.8			0.9	
95% Queue Length, Q_{95} (ft)		12.6			50.5			20.1			23.0	
Approach Delay, s/veh | LOS	4.8	A		7.4	A		5.3	A		5.7	A	
Intersection Delay, s/veh | LOS	6.2						A					

HCS Two-Way Stop-Control Report

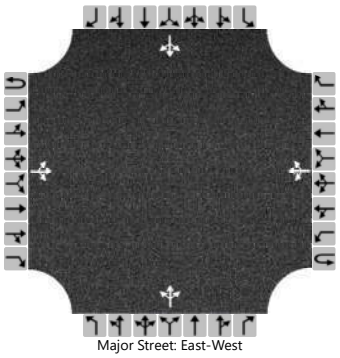
General Information

Analyst	T. Eastwood
Agency/Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2025
Time Analyzed	Weekday, AM Peak Hour
Intersection Orientation	East-West
Project Description	Copper Square TIS | Existing Conditions

Site Information

Intersection	Rimrock Rd & 58th St W
Jurisdiction	City of Billings
East/West Street	Rimrock Road
North/South Street	58th Street West
Peak Hour Factor	0.79
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		0	457	3		6	193	0		2	0	11		0	0	0
Percent Heavy Vehicles (%)		0				0				100	0	0		0	0	0
Proportion Time Blocked																
Percent Grade (%)										3				0		
Right Turn Channelized																
Median Type | Storage			Undivided													

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.10				4.10				8.70	7.10	6.50		7.10	6.50	6.20
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.20				2.20				4.40	4.00	3.30		3.50	4.00	3.30

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		0				8					16				0	
Capacity, c (veh/h)		1334				1002					382				0	
v/c Ratio		0.00				0.01					0.04					
95% Queue Length, Q_{95} (veh)		0.0				0.0					0.1					
95% Queue Length, Q_{95} (ft)		0.0				0.0					2.8					
Control Delay (s/veh)		7.7	0.0	0.0		8.6	0.1	0.1			14.8					
Level of Service (LOS)		A	A	A		A	A	A			B					
Approach Delay (s/veh)	0.0				0.3				14.8							
Approach LOS	A				A				B							

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HCS Two-Way Stop-Control Report

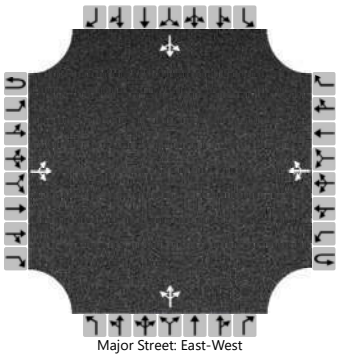
General Information

Analyst	T. Eastwood
Agency/Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2025
Time Analyzed	Weekday, Midday Peak Hour
Intersection Orientation	East-West
Project Description	Copper Square TIS | Existing Conditions

Site Information

Intersection	Rimrock Rd & 58th St W
Jurisdiction	City of Billings
East/West Street	Rimrock Road
North/South Street	58th Street West
Peak Hour Factor	0.96
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		0	198	3		5	224	0		2	0	8		3	0	0
Percent Heavy Vehicles (%)		0				0				0	0	0		0	0	0
Proportion Time Blocked																
Percent Grade (%)									3				0			
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.10				4.10				7.70	7.10	6.50		7.10	6.50	6.20
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.20				2.20				3.50	4.00	3.30		3.50	4.00	3.30

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		0				5					10				3	
Capacity, c (veh/h)		1346				1373					721				511	
v/c Ratio		0.00				0.00					0.01				0.01	
95% Queue Length, Q_{95} (veh)		0.0				0.0					0.0				0.0	
95% Queue Length, Q_{95} (ft)		0.0				0.0					0.0				0.0	
Control Delay (s/veh)		7.7	0.0	0.0		7.6	0.0	0.0			10.1				12.1	
Level of Service (LOS)		A	A	A		A	A	A			B				B	
Approach Delay (s/veh)	0.0				0.2				10.1				12.1			
Approach LOS	A				A				B				B			

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HCS Two-Way Stop-Control Report

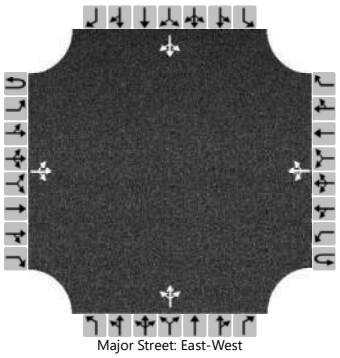
General Information

Analyst	T. Eastwood
Agency/Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2025
Time Analyzed	Weekday, PM Peak Hour
Intersection Orientation	East-West
Project Description	Copper Square TIS | Existing Conditions

Site Information

Intersection	Rimrock Rd & 58th St W
Jurisdiction	City of Billings
East/West Street	Rimrock Road
North/South Street	58th Street West
Peak Hour Factor	0.95
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		0	245	4		22	433	0		2	0	6		2	0	0
Percent Heavy Vehicles (%)		0				0				0	0	0		25	0	0
Proportion Time Blocked																
Percent Grade (%)									3				0			
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.10				4.10				7.70	7.10	6.50		7.35	6.50	6.20
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.20				2.20				3.50	4.00	3.30		3.73	4.00	3.30

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		0				23					8				2	
Capacity, c (veh/h)		1116				1314					533				284	
v/c Ratio		0.00				0.02					0.02				0.01	
95% Queue Length, Q_{95} (veh)		0.0				0.1					0.0				0.0	
95% Queue Length, Q_{95} (ft)		0.0				2.5					0.0				0.0	
Control Delay (s/veh)		8.2	0.0	0.0		7.8	0.2	0.2			11.9				17.8	
Level of Service (LOS)		A	A	A		A	A	A			B				C	
Approach Delay (s/veh)	0.0				0.6				11.9				17.8			
Approach LOS	A				A				B				C			

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	438	36	119	176	37	24	18	177	99	64	2
Future Volume (veh/h)	0	438	36	119	176	37	24	18	177	99	64	2
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width Adj.	1.04	1.00	1.00	1.04	1.00	1.00	1.04	1.04	1.00	1.00	1.00	1.00
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		0.97	0.99		0.99	1.00		0.96
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	1814	1704	1663	1757	1676	1676	1542	1656	1647	1817	1831	1859
Adj Flow Rate, veh/h	0	528	43	143	212	45	29	22	213	119	77	2
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Percent Heavy Veh, %	0	3	6	7	8	8	16	8	4	3	2	0
Cap, veh/h	587	732	60	332	1001	827	330	36	347	212	483	13
Arrive On Green	0.00	0.47	0.47	0.06	0.60	0.60	0.27	0.27	0.27	0.27	0.27	0.27
Sat Flow, veh/h	1728	1554	127	1673	1676	1384	1078	132	1275	1109	1775	46
Grp Volume(v), veh/h	0	0	571	143	212	45	29	0	235	119	0	79
Grp Sat Flow(s),veh/h/ln	1728	0	1680	1673	1676	1384	1078	0	1407	1109	0	1821
Q Serve(g_s), s	0.0	0.0	27.2	4.2	5.8	1.4	2.1	0.0	14.6	10.5	0.0	3.3
Cycle Q Clear(g_c), s	0.0	0.0	27.2	4.2	5.8	1.4	5.4	0.0	14.6	25.1	0.0	3.3
Prop In Lane	1.00		0.08	1.00		1.00	1.00		0.91	1.00		0.03
Lane Grp Cap(c), veh/h	587	0	791	332	1001	827	330	0	383	212	0	496
V/C Ratio(X)	0.00	0.00	0.72	0.43	0.21	0.05	0.09	0.00	0.61	0.56	0.00	0.16
Avail Cap(c_a), veh/h	732	0	791	371	1001	827	344	0	401	226	0	519
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)	0.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	0.0	21.2	16.2	9.3	8.4	29.7	0.0	31.8	42.7	0.0	27.7
Incr Delay (d2), s/veh	0.0	0.0	5.6	0.9	0.1	0.0	0.1	0.0	2.6	2.7	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	0.0	0.0	10.9	1.5	1.9	0.4	0.5	0.0	5.0	3.0	0.0	1.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	0.0	0.0	26.8	17.0	9.4	8.4	29.8	0.0	34.4	45.5	0.0	27.8
LnGrp LOS			C	B	A	A	C		C	D		C
Approach Vol, veh/h		571			400			264			198	
Approach Delay, s/veh		26.8			12.0			33.9			38.4	
Approach LOS		C			B			C			D	

Timer - Assigned Phs		2	3	4		6	7	8				
Phs Duration (G+Y+Rc), s		33.7	12.7	53.6		33.7	0.0	66.3				
Change Period (Y+Rc), s		6.5	6.5	6.5		6.5	6.5	6.5				
Max Green Setting (Gmax), s		28.5	8.5	43.5		28.5	8.5	43.5				
Max Q Clear Time (g_c+I1), s		16.6	6.2	29.2		27.1	0.0	7.8				
Green Ext Time (p_c), s		1.0	0.1	2.5		0.1	0.0	1.2				

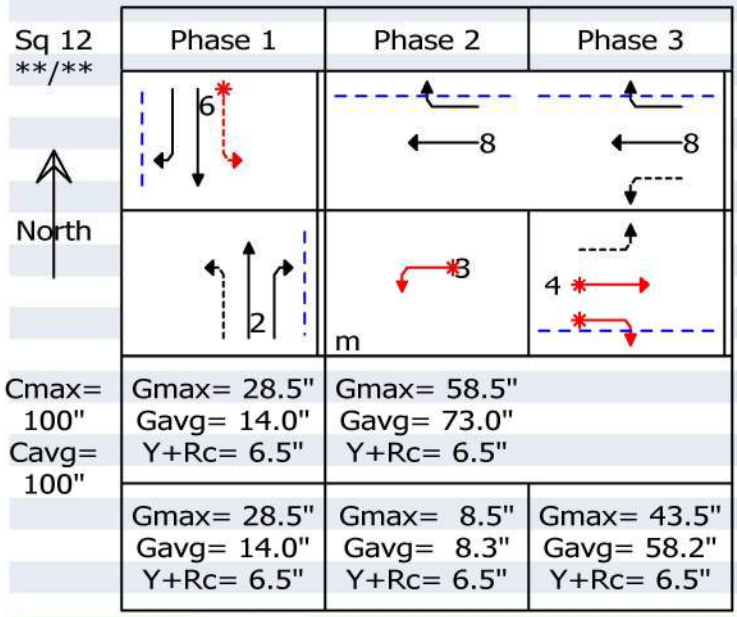
Intersection Summary												
HCM 7th Control Delay, s/veh			25.6									
HCM 7th LOS			C									

Lane Group	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	571	143	212	45	29	235	119	79
v/c Ratio	0.64	0.33	0.19	0.05	0.14	0.51	0.89	0.24
Control Delay (s/veh)	22.7	9.0	7.6	0.1	31.8	9.9	90.0	33.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	22.7	9.0	7.6	0.1	31.8	9.9	90.0	33.2
Queue Length 50th (ft)	251	30	47	0	18	12	76	43
Queue Length 95th (ft)	399	64	94	0	37	56	120	70
Internal Link Dist (ft)	2588		2504			2604		1914
Turn Bay Length (ft)		240		200	290		230	
Base Capacity (vph)	894	446	1108	943	313	586	203	494
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	0.64	0.32	0.19	0.05	0.09	0.40	0.59	0.16

Intersection Summary

TEAPAC[Ver 9.50.02] - Capacity Analysis Summary (HCM 2016)

Intersection Averages for Int # 4 - Rimrock Rd & 54th St W
V/C 0.427 (Critical V/C 0.641) Control Delay 18.4 Level of Service B



Lane Group	Width/ Lanes	g/C Max	g/C Avg	SatFlo	Capcty	Adj Volume	v/c	HCM Delay	L S	Queue Model 1
SB Approach								42.0	D+	
R+ T	12/1	0.285	0.140	1737	243	78	0.321	39.5	D+	80 ft
L	11/1	0.285	0.140	1281	236	119	0.505	43.6	*D+	128 ft
NB Approach								40.2	D+	
R+ T	14/1	0.285	0.140	1649	231	23	0.100	37.7	D+	23 ft
L	14/1	0.285	0.140	1077	179	29	0.162	42.1	D+	33 ft
WB Approach								6.4	A	
R	12/1			1354	989	1	0.001	3.6	A	0 ft
T	12/1	0.585	0.730	1631	1191	212	0.178	4.5	A	55 ft
L	14/1	0.085	0.083	1628	492	143	0.291	9.1	*A	43 ft
EB Approach								15.8	B	
R+ T	12/1	0.435	0.582	1669	971	565	0.582	15.8	*B	295 ft
L	14/1	0.435	0.582	1128	728	1	0.001	8.8	A	0 ft

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	2	189	20	90	192	62	39	28	85	63	30	4
Future Volume (veh/h)	2	189	20	90	192	62	39	28	85	63	30	4
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width Adj.	1.04	1.00	1.00	1.04	1.00	1.00	1.04	1.04	1.00	1.00	1.00	1.00
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.98	1.00		0.97	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	1530	1676	1635	1714	1717	1731	1712	1741	1565	1803	1734	1859
Adj Flow Rate, veh/h	2	197	21	94	200	65	41	29	89	66	31	4
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	20	5	8	10	5	4	4	2	10	4	9	0
Cap, veh/h	630	907	97	734	1121	937	237	55	169	166	225	29
Arrive On Green	0.00	0.61	0.61	0.05	0.65	0.65	0.15	0.15	0.15	0.15	0.15	0.15
Sat Flow, veh/h	1458	1489	159	1632	1717	1434	1254	369	1133	1226	1504	194
Grp Volume(v), veh/h	2	0	218	94	200	65	41	0	118	66	0	35
Grp Sat Flow(s),veh/h/ln	1458	0	1648	1632	1717	1434	1254	0	1502	1226	0	1699
Q Serve(g_s), s	0.1	0.0	6.0	2.1	4.6	1.6	2.9	0.0	7.3	5.3	0.0	1.8
Cycle Q Clear(g_c), s	0.1	0.0	6.0	2.1	4.6	1.6	4.7	0.0	7.3	12.5	0.0	1.8
Prop In Lane	1.00		0.10	1.00		1.00	1.00		0.75	1.00		0.11
Lane Grp Cap(c), veh/h	630	0	1004	734	1121	937	237	0	224	166	0	254
V/C Ratio(X)	0.00	0.00	0.22	0.13	0.18	0.07	0.17	0.00	0.53	0.40	0.00	0.14
Avail Cap(c_a), veh/h	750	0	1004	797	1121	937	407	0	428	332	0	484
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	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	7.5	0.0	8.8	6.5	6.8	6.3	39.0	0.0	39.3	45.0	0.0	36.9
Incr Delay (d2), s/veh	0.0	0.0	0.5	0.1	0.1	0.0	0.3	0.0	1.9	1.5	0.0	0.2
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.0	2.0	0.6	1.4	0.4	0.9	0.0	2.7	1.7	0.0	0.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	7.5	0.0	9.3	6.6	6.9	6.3	39.3	0.0	41.2	46.6	0.0	37.2
LnGrp LOS	A		A	A	A	A	D		D	D		D
Approach Vol, veh/h		220			359			159			101	
Approach Delay, s/veh		9.3			6.7			40.7			43.3	
Approach LOS		A			A			D			D	

Timer - Assigned Phs		2	3	4		6	7	8				
Phs Duration (G+Y+Rc), s		21.4	11.1	67.4		21.4	6.8	71.8				
Change Period (Y+Rc), s		6.5	6.5	6.5		6.5	6.5	6.5				
Max Green Setting (Gmax), s		28.5	8.5	43.5		28.5	8.5	43.5				
Max Q Clear Time (g_c+I1), s		9.3	4.1	8.0		14.5	2.1	6.6				
Green Ext Time (p_c), s		0.6	0.1	1.0		0.3	0.0	1.2				

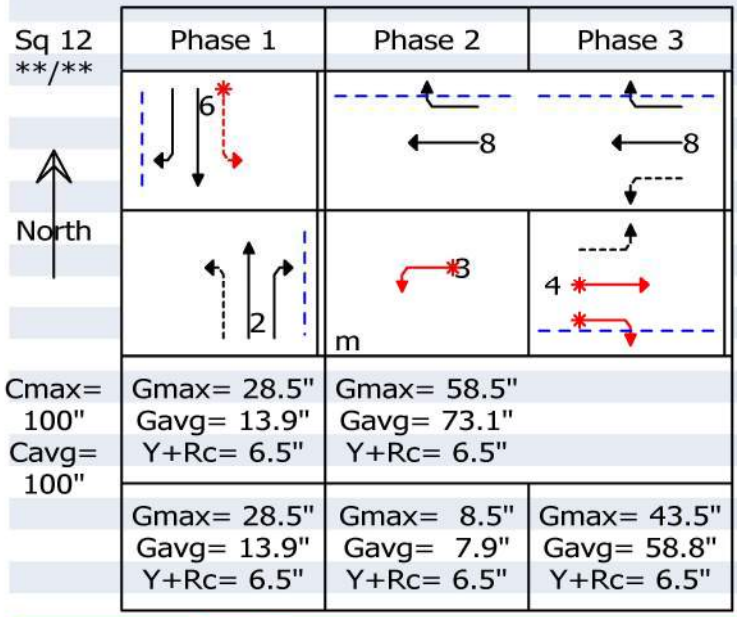
Intersection Summary	
HCM 7th Control Delay, s/veh	18.2
HCM 7th LOS	B

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	2	218	94	200	65	41	118	66	35
v/c Ratio	0.00	0.21	0.12	0.16	0.06	0.28	0.48	0.52	0.19
Control Delay (s/veh)	4.5	9.3	4.1	5.9	0.6	43.8	20.0	55.5	37.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	4.5	9.3	4.1	5.9	0.6	43.8	20.0	55.5	37.1
Queue Length 50th (ft)	0	55	14	30	0	25	17	42	20
Queue Length 95th (ft)	3	113	34	97	6	56	68	82	49
Internal Link Dist (ft)		2588		2504			2604		1914
Turn Bay Length (ft)	310		240		200	290		230	
Base Capacity (vph)	740	1056	793	1228	1058	368	486	320	462
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.00	0.21	0.12	0.16	0.06	0.11	0.24	0.21	0.08

Intersection Summary

TEAPAC[Ver 9.50.02] - Capacity Analysis Summary (HCM 2016)

Intersection Averages for Int # 4 - Rimrock Rd & 54th St W
V/C 0.186 (Critical V/C 0.299) Control Delay 15.3 Level of Service B



Lane Group	Width/ Lanes	g/C Max	g/C Avg	SatFlo	Capcty	Adj Volume	v/c	HCM Delay	L S	Queue Model 1
SB Approach								40.2	D+	
R+ T	12/1	0.285	0.139	1619	225	32	0.142	38.1	D+	33 ft
L	11/1	0.285	0.139	1257	227	66	0.290	41.2	*D+	70 ft
NB Approach								39.3	D+	
R+ T	14/1	0.285	0.139	1743	242	30	0.124	38.0	D+	30 ft
L	14/1	0.285	0.139	1264	225	41	0.182	40.3	D+	43 ft
WB Approach								4.8	A	
R	12/1			1408	1030	1	0.001	3.6	A	0 ft
T	12/1	0.585	0.731	1672	1223	200	0.164	4.4	A	50 ft
L	14/1	0.085	0.079	1578	742	94	0.127	5.7	*A	27 ft
EB Approach								10.3	B+	
R+ T	12/1	0.435	0.588	1640	964	211	0.219	10.3	*B+	100 ft
L	14/1	0.435	0.588	953	632	2	0.003	8.5	A	1 ft

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	14	214	29	164	386	136	58	66	135	79	63	6
Future Volume (veh/h)	14	214	29	164	386	136	58	66	135	79	63	6
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width Adj.	1.04	1.00	1.00	1.04	1.00	1.00	1.04	1.04	1.00	1.00	1.00	1.00
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.98	0.99		0.98	0.99		0.96
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	1814	1704	1717	1829	1772	1772	1755	1769	1674	1831	1845	1859
Adj Flow Rate, veh/h	15	223	30	171	402	142	60	69	141	82	66	6
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	0	3	2	2	1	1	1	0	2	2	1	0
Cap, veh/h	474	770	104	668	1013	840	298	111	226	179	359	33
Arrive On Green	0.02	0.52	0.52	0.07	0.57	0.57	0.22	0.22	0.22	0.22	0.22	0.22
Sat Flow, veh/h	1728	1470	198	1742	1772	1469	1228	512	1046	1137	1659	151
Grp Volume(v), veh/h	15	0	253	171	402	142	60	0	210	82	0	72
Grp Sat Flow(s),veh/h/ln	1728	0	1668	1742	1772	1469	1228	0	1558	1137	0	1810
Q Serve(g_s), s	0.4	0.0	8.5	4.4	12.6	4.6	4.2	0.0	12.2	7.0	0.0	3.2
Cycle Q Clear(g_c), s	0.4	0.0	8.5	4.4	12.6	4.6	7.4	0.0	12.2	19.2	0.0	3.2
Prop In Lane	1.00		0.12	1.00		1.00	1.00		0.67	1.00		0.08
Lane Grp Cap(c), veh/h	474	0	873	668	1013	840	298	0	337	179	0	392
V/C Ratio(X)	0.03	0.00	0.29	0.26	0.40	0.17	0.20	0.00	0.62	0.46	0.00	0.18
Avail Cap(c_a), veh/h	592	0	873	703	1013	840	382	0	444	257	0	516
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	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	11.0	0.0	13.4	9.7	11.9	10.2	35.0	0.0	35.5	44.2	0.0	32.0
Incr Delay (d2), s/veh	0.0	0.0	0.8	0.2	0.3	0.1	0.3	0.0	1.9	1.8	0.0	0.2
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	0.0	3.1	1.5	4.4	1.3	1.2	0.0	4.6	2.1	0.0	1.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	11.0	0.0	14.2	9.9	12.1	10.3	35.3	0.0	37.4	46.0	0.0	32.2
LnGrp LOS	B		B	A	B	B	D		D	D		C
Approach Vol, veh/h		268			715			270			154	
Approach Delay, s/veh		14.0			11.2			36.9			39.6	
Approach LOS		B			B			D			D	

Timer - Assigned Phs	2	3	4		6	7	8					
Phs Duration (G+Y+Rc), s	28.1	13.0	58.9		28.1	8.2	63.7					
Change Period (Y+Rc), s	6.5	6.5	6.5		6.5	6.5	6.5					
Max Green Setting (Gmax), s	28.5	8.5	43.5		28.5	8.5	43.5					
Max Q Clear Time (g_c+I1), s	14.2	6.4	10.5		21.2	2.4	14.6					
Green Ext Time (p_c), s	1.0	0.1	1.1		0.4	0.0	2.7					

Intersection Summary	
HCM 7th Control Delay, s/veh	19.8
HCM 7th LOS	B

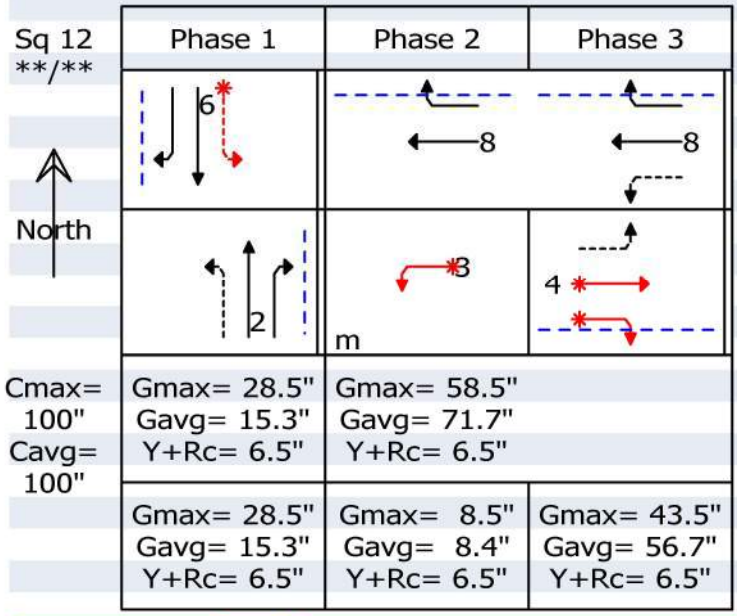
Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	15	253	171	402	142	60	210	82	72
v/c Ratio	0.02	0.26	0.22	0.34	0.14	0.34	0.66	0.85	0.29
Control Delay (s/veh)	5.8	12.6	5.6	9.9	2.3	41.8	30.0	99.4	36.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	5.8	12.6	5.6	9.9	2.3	41.8	30.0	99.4	36.7
Queue Length 50th (ft)	2	73	28	77	0	35	64	53	39
Queue Length 95th (ft)	10	153	64	225	28	69	130	#109	75
Internal Link Dist (ft)		2588		2504			2604		1914
Turn Bay Length (ft)	310		240		200	290		230	
Base Capacity (vph)	714	964	786	1183	1028	361	538	196	496
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.02	0.26	0.22	0.34	0.14	0.17	0.39	0.42	0.15

Intersection Summary

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

TEAPAC[Ver 9.50.02] - Capacity Analysis Summary (HCM 2016)

Intersection Averages for Int # 4 - Rimrock Rd & 54th St W
V/C 0.297 (Critical V/C 0.372) Control Delay 16.8 Level of Service B



Lane Group	Width/ Lanes	g/C Max	g/C Avg	SatFlo	Capcty	Adj Volume	v/c	HCM Delay	L S	Queue Model 1
SB Approach								41.8	D+	
R+ T	12/1	0.285	0.153	1753	269	67	0.249	37.8	D+	66 ft
L	11/1	0.285	0.153	1202	191	82	0.430	45.1	*D	92 ft
NB Approach								40.0	D+	
R+ T	14/1	0.285	0.153	1682	258	102	0.396	39.1	D+	103 ft
L	14/1	0.285	0.153	1243	221	60	0.272	41.4	D+	63 ft
WB Approach								6.1	A	
R	12/1			1457	1044	1	0.001	4.0	A	0 ft
T	12/1	0.585	0.717	1741	1248	402	0.322	5.9	A	122 ft
L	14/1	0.085	0.084	1701	751	171	0.228	6.7	*A	53 ft
EB Approach								11.5	B+	
R+ T	12/1	0.435	0.567	1670	948	244	0.257	11.6	*B+	123 ft
L	14/1	0.435	0.567	951	612	15	0.025	9.6	A	7 ft

Appendix E

IN THIS SECTION:

Estimated 2030 Background Traffic

HCS Two-Way Stop-Control Report

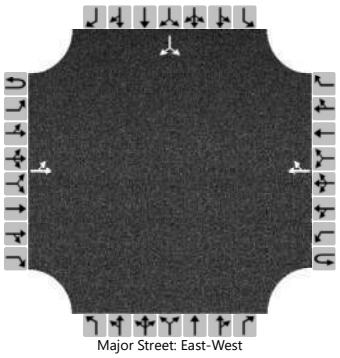
General Information

Analyst	T. Eastwood
Agency/Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2030
Time Analyzed	Weekday, AM Peak Hour
Intersection Orientation	East-West
Project Description	Copper Square TIS | Estimated Background Traffic

Site Information

Intersection	Grand & 62nd
Jurisdiction	City of Billings
East/West Street	Grand Avenue
North/South Street	62nd Street West
Peak Hour Factor	0.85
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	0	0		0	1	0
Configuration		LT						TR							LR	
Volume (veh/h)		62	268				148	58						233		94
Percent Heavy Vehicles (%)		17												2		6
Proportion Time Blocked																
Percent Grade (%)														0		
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.1		6.2
Critical Headway (sec)		4.27												6.42		6.26
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.35												3.52		3.35

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		73													385	
Capacity, c (veh/h)		1241													462	
v/c Ratio		0.06													0.83	
95% Queue Length, Q_{95} (veh)		0.2													8.1	
95% Queue Length, Q_{95} (ft)		5.7													207.6	
Control Delay (s/veh)		8.1	0.6												41.1	
Level of Service (LOS)		A	A												E	
Approach Delay (s/veh)	2.0												41.1			
Approach LOS	A												E			

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HCS Two-Way Stop-Control Report

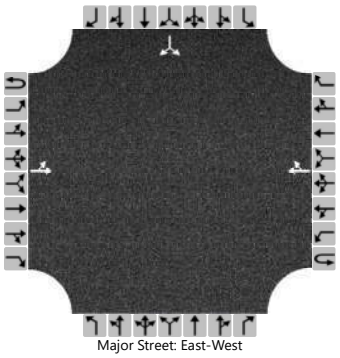
General Information

Analyst	T. Eastwood
Agency/Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2030
Time Analyzed	Weekday, Midday Peak Hour
Intersection Orientation	East-West
Project Description	Copper Square TIS | Estimated Background Traffic

Site Information

Intersection	Grand & 62nd
Jurisdiction	City of Billings
East/West Street	Grand Avenue
North/South Street	62nd Street West
Peak Hour Factor	0.93
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	0	0		0	1	0
Configuration		LT						TR							LR	
Volume (veh/h)		54	172				178	81						95		43
Percent Heavy Vehicles (%)		8												5		10
Proportion Time Blocked																
Percent Grade (%)														0		
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.1		6.2
Critical Headway (sec)		4.18												6.45		6.30
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.27												3.55		3.39

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		58													148	
Capacity, c (veh/h)		1250													541	
v/c Ratio		0.05													0.27	
95% Queue Length, Q_{95} (veh)		0.1													1.1	
95% Queue Length, Q_{95} (ft)		2.7													28.9	
Control Delay (s/veh)		8.0	0.4												14.1	
Level of Service (LOS)		A	A												B	
Approach Delay (s/veh)	2.2												14.1			
Approach LOS	A												B			

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HCS Two-Way Stop-Control Report

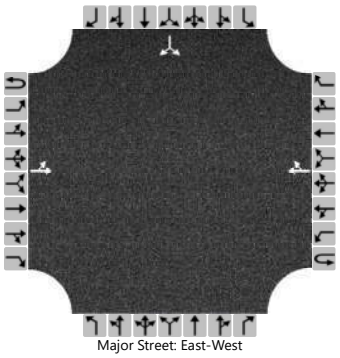
General Information

Analyst	T. Eastwood
Agency/Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2030
Time Analyzed	Weekday, PM Peak Hour
Intersection Orientation	East-West
Project Description	Copper Square TIS | Estimated Background Traffic

Site Information

Intersection	Grand & 62nd
Jurisdiction	City of Billings
East/West Street	Grand Avenue
North/South Street	62nd Street West
Peak Hour Factor	0.91
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	0	0		0	1	0
Configuration		LT						TR							LR	
Volume (veh/h)		85	235				262	164						138		58
Percent Heavy Vehicles (%)		4												3		4
Proportion Time Blocked																
Percent Grade (%)														0		
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.1		6.2
Critical Headway (sec)		4.14												6.43		6.24
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.24												3.53		3.34

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		93													215	
Capacity, c (veh/h)		1083													366	
v/c Ratio		0.09													0.59	
95% Queue Length, Q_{95} (veh)		0.3													3.6	
95% Queue Length, Q_{95} (ft)		7.7													92.4	
Control Delay (s/veh)		8.6	0.9												28.0	
Level of Service (LOS)		A	A												D	
Approach Delay (s/veh)	2.9												28.0			
Approach LOS	A												D			

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HCS Roundabouts Report

General Information

Analyst	T. Eastwood
Agency or Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2030
Time Analyzed	Weekday, AM Peak Hour
Project Description	Copper Square TIS | Estimated Background Traffic

Site Information

Intersection	Rimrock & 62nd St W
E/W Street Name	Rimrock Road
N/S Street Name	62nd Street West / Molt Road
Analysis Time Period, hrs	0.25
Peak Hour Factor	0.78
Jurisdiction	City of Billings

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0
Lane Assignment			LTR				LTR				LTR				LTR	
Volume (V), veh/h	0	15	271	110	0	58	85	70	0	28	37	39	0	295	151	7
Percent Heavy Vehicles, %	0	8	2	1	0	6	6	8	0	10	15	8	0	3	3	1
Flow Rate (v_{PCE}), pc/h	0	21	354	142	0	79	116	97	0	39	55	54	0	390	199	9
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				1				1			
Pedestrians Crossing, p/h	0				0				0				0			
Proportion of CAVs, %	0															

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway, s		4.9763			4.9763			4.9763			4.9763	
Follow-Up Headway, s		2.6087			2.6087			2.6087			2.6087	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h		517			292			148			598	
Entry Volume, veh/h		507			274			133			581	
Circulating Flow (v_c), pc/h	668			115			765			234		
Exiting Flow (v_{ex}), pc/h	798			164			173			420		
Capacity (c_{pce}), pc/h		698			1227			632			1087	
Capacity (c), veh/h		685			1151			570			1056	
v/c Ratio (x)		0.74			0.24			0.23			0.55	

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		22.4			5.3			9.4			10.2	
Lane LOS		C			A			A			B	
95% Queue Length, Q_{95} (veh)		6.6			0.9			0.9			3.5	
95% Queue Length, Q_{95} (ft)		167.6			23.7			24.5			89.6	
Approach Delay, s/veh | LOS	22.4	C		5.3	A		9.4	A		10.2	B	
Intersection Delay, s/veh | LOS	13.4						B					

HCS Roundabouts Report

General Information

Analyst	T. Eastwood
Agency or Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2030
Time Analyzed	Weekday, Midday Peak Hour
Project Description	Copper Square TIS | Estimated Background Traffic

Site Information

Intersection	Rimrock & 62nd St W
E/W Street Name	Rimrock Road
N/S Street Name	62nd Street West / Molt Road
Analysis Time Period, hrs	0.25
Peak Hour Factor	0.93
Jurisdiction	City of Billings

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0
Lane Assignment			LTR				LTR				LTR				LTR	
Volume (V), veh/h	0	9	122	45	0	33	125	135	0	46	54	28	0	113	59	8
Percent Heavy Vehicles, %	0	2	4	3	0	7	3	4	0	2	6	6	0	7	4	7
Flow Rate (v_{PCE}), pc/h	0	10	136	50	0	38	138	151	0	50	62	32	0	130	66	9
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				1				1			
Pedestrians Crossing, p/h	0				0				0				0			
Proportion of CAVs, %	0															

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway, s		4.9763			4.9763			4.9763			4.9763	
Follow-Up Headway, s		2.6087			2.6087			2.6087			2.6087	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h		196			327			144			205	
Entry Volume, veh/h		189			315			138			193	
Circulating Flow (v_c), pc/h	234			122			276			226		
Exiting Flow (v_{ex}), pc/h	298			197			223			154		
Capacity (c_{pce}), pc/h		1087			1219			1041			1096	
Capacity (c), veh/h		1049			1173			996			1034	
v/c Ratio (x)		0.18			0.27			0.14			0.19	

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		5.1			5.5			4.9			5.2	
Lane LOS		A			A			A			A	
95% Queue Length, Q_{95} (veh)		0.7			1.1			0.5			0.7	
95% Queue Length, Q_{95} (ft)		18.0			28.4			13.0			18.3	
Approach Delay, s/veh | LOS	5.1	A		5.5	A		4.9	A		5.2	A	
Intersection Delay, s/veh | LOS	5.3						A					

HCS Roundabouts Report

General Information

Analyst	T. Eastwood
Agency or Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2030
Time Analyzed	Weekday, PM Peak Hour
Project Description	Copper Square TIS | Estimated Background Traffic

Site Information

Intersection	Rimrock & 62nd St W
E/W Street Name	Rimrock Road
N/S Street Name	62nd Street West / Molt Road
Analysis Time Period, hrs	0.25
Peak Hour Factor	0.88
Jurisdiction	City of Billings

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0
Lane Assignment			LTR				LTR				LTR				LTR	
Volume (V), veh/h	0	10	161	64	3	45	249	258	0	95	105	55	0	126	96	15
Percent Heavy Vehicles, %	0	2	2	1	0	4	2	1	0	1	1	1	0	3	3	2
Flow Rate (v_{PCE}), pc/h	0	12	187	73	3	53	289	296	0	109	121	63	0	147	112	17
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				1				1			
Pedestrians Crossing, p/h	0				0				1				0			
Proportion of CAVs, %	0															

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway, s		4.9763			4.9763			4.9763			4.9763	
Follow-Up Headway, s		2.6087			2.6087			2.6087			2.6087	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h		272			641			293			276	
Entry Volume, veh/h		267			630			290			268	
Circulating Flow (v_c), pc/h	315			242			349			454		
Exiting Flow (v_{ex}), pc/h	400			415			429			238		
Capacity (c_{pce}), pc/h		1001			1078			967			868	
Capacity (c), veh/h		984			1060			957			844	
v/c Ratio (x)		0.27			0.59			0.30			0.32	

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		6.4			11.2			6.9			7.8	
Lane LOS		A			B			A			A	
95% Queue Length, Q_{95} (veh)		1.1			4.1			1.3			1.4	
95% Queue Length, Q_{95} (ft)		27.9			103.9			32.8			35.8	
Approach Delay, s/veh | LOS	6.4	A		11.2	B		6.9	A		7.8	A	
Intersection Delay, s/veh | LOS	8.8						A					

HCS Two-Way Stop-Control Report

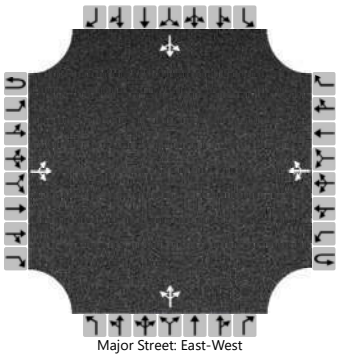
General Information

Analyst	T. Eastwood
Agency/Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2030
Time Analyzed	Weekday, AM Peak Hour
Intersection Orientation	East-West
Project Description	Copper Square TIS | Estimated Background Traffic

Site Information

Intersection	Rimrock Rd & 58th St W
Jurisdiction	City of Billings
East/West Street	Rimrock Road
North/South Street	58th Street West
Peak Hour Factor	0.79
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		1	583	7		19	245	2		10	1	38		7	2	1
Percent Heavy Vehicles (%)		3				2				22	3	2		3	3	3
Proportion Time Blocked																
Percent Grade (%)									3				0			
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.13				4.12				7.92	7.13	6.52		7.13	6.53	6.23
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.23				2.22				3.70	4.03	3.32		3.53	4.03	3.33

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		1				24					62				13	
Capacity, c (veh/h)		1242				861					277				174	
v/c Ratio		0.00				0.03					0.22				0.07	
95% Queue Length, Q_{95} (veh)		0.0				0.1					0.8				0.2	
95% Queue Length, Q_{95} (ft)		0.0				2.5					21.0				5.1	
Control Delay (s/veh)		7.9	0.0	0.0		9.3	0.3	0.3			21.7				27.3	
Level of Service (LOS)		A	A	A		A	A	A			C				D	
Approach Delay (s/veh)	0.0				1.0				21.7				27.3			
Approach LOS	A				A				C				D			

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HCS Two-Way Stop-Control Report

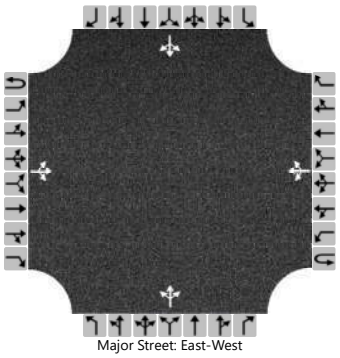
General Information

Analyst	T. Eastwood
Agency/Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2030
Time Analyzed	Weekday, Midday Peak Hour
Intersection Orientation	East-West
Project Description	Copper Square TIS | Estimated Background Traffic

Site Information

Intersection	Rimrock Rd & 58th St W
Jurisdiction	City of Billings
East/West Street	Rimrock Road
North/South Street	58th Street West
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		0	261	8		19	288	4		6	1	24		7	1	1
Percent Heavy Vehicles (%)		0				2				2	3	2		1	3	3
Proportion Time Blocked																
Percent Grade (%)									3				0			
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.10				4.12				7.72	7.13	6.52		7.11	6.53	6.23
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.20				2.22				3.52	4.03	3.32		3.51	4.03	3.33

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		0				21					34				10	
Capacity, c (veh/h)		1254				1269					580				381	
v/c Ratio		0.00				0.02					0.06				0.03	
95% Queue Length, Q_{95} (veh)		0.0				0.0					0.2				0.1	
95% Queue Length, Q_{95} (ft)		0.0				0.0					5.1				2.5	
Control Delay (s/veh)		7.9	0.0	0.0		7.9	0.2	0.2			11.6				14.7	
Level of Service (LOS)		A	A	A		A	A	A			B				B	
Approach Delay (s/veh)	0.0				0.6				11.6				14.7			
Approach LOS	A				A				B				B			

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HCS Two-Way Stop-Control Report

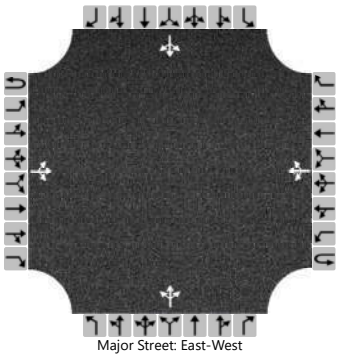
General Information

Analyst	T. Eastwood
Agency/Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2030
Time Analyzed	Weekday, PM Peak Hour
Intersection Orientation	East-West
Project Description	Copper Square TIS | Estimated Background Traffic

Site Information

Intersection	Rimrock Rd & 58th St W
Jurisdiction	City of Billings
East/West Street	Rimrock Road
North/South Street	58th Street West
Peak Hour Factor	0.91
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		1	330	14		55	562	8		7	2	26		7	1	1
Percent Heavy Vehicles (%)		3				2				2	3	2		9	3	3
Proportion Time Blocked																
Percent Grade (%)									3				0			
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.13				4.12				7.72	7.13	6.52		7.19	6.53	6.23
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.23				2.22				3.52	4.03	3.32		3.58	4.03	3.33

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		1				60					38				10	
Capacity, c (veh/h)		950				1180					342				168	
v/c Ratio		0.00				0.05					0.11				0.06	
95% Queue Length, Q_{95} (veh)		0.0				0.2					0.4				0.2	
95% Queue Length, Q_{95} (ft)		0.0				5.0					10.2				5.3	
Control Delay (s/veh)		8.8	0.0	0.0		8.2	0.6	0.6			16.9				27.7	
Level of Service (LOS)		A	A	A		A	A	A			C				D	
Approach Delay (s/veh)	0.0				1.3				16.9				27.7			
Approach LOS	A				A				C				D			

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	10	561	73	162	221	45	44	21	266	119	74	8
Future Volume (veh/h)	10	561	73	162	221	45	44	21	266	119	74	8
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width Adj.	1.04	1.00	1.00	1.04	1.00	1.00	1.04	1.04	1.00	1.00	1.00	1.00
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		0.97	0.99		0.99	1.00		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1772	1704	1676	1757	1689	1689	1613	1656	1647	1817	1831	1831
Adj Flow Rate, veh/h	12	676	88	195	266	54	53	25	320	143	89	10
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Percent Heavy Veh, %	3	3	5	7	7	7	11	8	4	3	2	2
Cap, veh/h	510	642	84	214	855	705	341	29	370	124	459	52
Arrive On Green	0.01	0.44	0.44	0.09	0.51	0.51	0.28	0.28	0.28	0.28	0.28	0.28
Sat Flow, veh/h	1687	1476	192	1673	1689	1394	1108	101	1299	1006	1610	181
Grp Volume(v), veh/h	12	0	764	195	266	54	53	0	345	143	0	99
Grp Sat Flow(s),veh/h/ln	1687	0	1668	1673	1689	1394	1108	0	1400	1006	0	1791
Q Serve(g_s), s	0.4	0.0	43.5	7.2	9.2	2.0	3.8	0.0	23.4	5.1	0.0	4.2
Cycle Q Clear(g_c), s	0.4	0.0	43.5	7.2	9.2	2.0	8.0	0.0	23.4	28.5	0.0	4.2
Prop In Lane	1.00		0.12	1.00		1.00	1.00		0.93	1.00		0.10
Lane Grp Cap(c), veh/h	510	0	725	214	855	705	341	0	399	124	0	510
V/C Ratio(X)	0.02	0.00	1.05	0.91	0.31	0.08	0.16	0.00	0.86	1.16	0.00	0.19
Avail Cap(c_a), veh/h	629	0	725	214	855	705	341	0	399	124	0	510
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	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	15.3	0.0	28.3	26.8	14.5	12.7	30.1	0.0	33.9	48.9	0.0	27.1
Incr Delay (d2), s/veh	0.0	0.0	48.3	37.8	0.2	0.0	0.2	0.0	17.6	129.6	0.0	0.2
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	0.0	25.3	4.3	3.3	0.6	1.0	0.0	9.4	7.5	0.0	1.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	15.3	0.0	76.5	64.6	14.7	12.7	30.3	0.0	51.5	178.5	0.0	27.2
LnGrp LOS	B		F	E	B	B	C		D	F		C
Approach Vol, veh/h		776			515			398			242	
Approach Delay, s/veh		75.6			33.4			48.7			116.6	
Approach LOS		E			C			D			F	

Timer - Assigned Phs		2	3	4		6	7	8				
Phs Duration (G+Y+Rc), s		35.0	15.0	50.0		35.0	7.9	57.1				
Change Period (Y+Rc), s		6.5	6.5	6.5		6.5	6.5	6.5				
Max Green Setting (Gmax), s		28.5	8.5	43.5		28.5	8.5	43.5				
Max Q Clear Time (g_c+I1), s		25.4	9.2	45.5		30.5	2.4	11.2				
Green Ext Time (p_c), s		0.6	0.0	0.0		0.0	0.0	1.5				

Intersection Summary	
HCM 7th Control Delay, s/veh	63.9
HCM 7th LOS	E

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	12	764	195	266	54	53	345	143	99
v/c Ratio	0.02	1.02	0.89	0.28	0.07	0.18	0.56	0.99	0.22
Control Delay (s/veh)	9.2	67.1	61.6	13.2	0.3	28.8	9.5	111.0	27.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	9.2	67.1	61.6	13.2	0.3	28.8	9.5	111.0	27.2
Queue Length 50th (ft)	3	~546	81	83	0	28	25	90	45
Queue Length 95th (ft)	10	#681	#200	160	0	57	78	#190	81
Internal Link Dist (ft)		2588		2504			2604		1914
Turn Bay Length (ft)	310		240		200	290		230	
Base Capacity (vph)	624	749	219	951	825	320	644	155	491
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.02	1.02	0.89	0.28	0.07	0.17	0.54	0.92	0.20

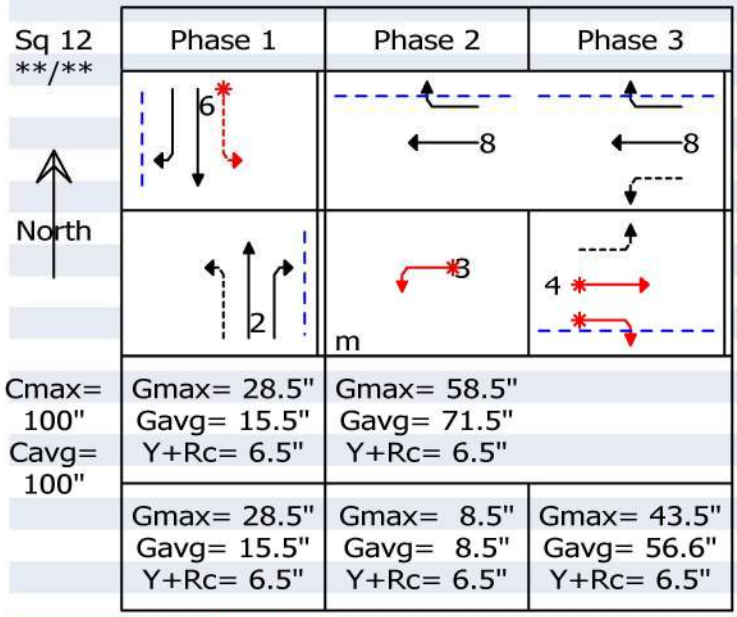
Intersection Summary

~ 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.

TEAPAC[Ver 9.50.02] - Capacity Analysis Summary (HCM 2016)

Intersection Averages for Int # 4 - Rimrock Rd & 54th St W
V/C 0.588 (Critical V/C 0.809) Control Delay 23.7 Level of Service C+



Lane Group	Width/ Lanes	g/C Max	g/C Avg	SatFlo	Capcty	Adj Volume	v/c	HCM Delay	L S	Queue Model 1
SB Approach								41.5	D+	
R+ T	12/1	0.285	0.155	1732	268	91	0.340	38.5	D+	92 ft
L	11/1	0.285	0.155	1278	252	143	0.567	43.5	*D+	149 ft
NB Approach								40.6	D+	
R+ T	14/1	0.285	0.155	1657	256	26	0.101	36.5	D+	26 ft
L	14/1	0.285	0.155	1108	191	53	0.277	42.6	D+	60 ft
WB Approach								10.7	B+	
R	12/1			1360	973	1	0.001	4.1	A	0 ft
T	12/1	0.585	0.715	1645	1177	266	0.226	5.3	A	78 ft
L	14/1	0.085	0.085	1634	343	195	0.569	18.1	*B	104 ft
EB Approach								24.3	C+	
R+ T	12/1	0.435	0.566	1658	938	754	0.804	24.6	*C+	487 ft
L	14/1	0.435	0.566	1042	662	12	0.018	9.6	A	5 ft

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	7	249	41	136	253	73	64	32	129	73	34	9
Future Volume (veh/h)	7	249	41	136	253	73	64	32	129	73	34	9
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width Adj.	1.04	1.00	1.00	1.04	1.00	1.00	1.04	1.04	1.00	1.00	1.00	1.00
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.98	1.00		0.98	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	1701	1690	1663	1728	1717	1731	1712	1741	1592	1803	1734	1831
Adj Flow Rate, veh/h	8	268	44	146	272	78	69	34	139	78	37	10
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	8	4	6	9	5	4	4	2	8	4	9	2
Cap, veh/h	580	782	128	609	1031	861	285	57	233	176	256	69
Arrive On Green	0.01	0.55	0.55	0.06	0.60	0.60	0.19	0.19	0.19	0.19	0.19	0.19
Sat Flow, veh/h	1620	1416	232	1646	1717	1434	1241	293	1197	1167	1314	355
Grp Volume(v), veh/h	8	0	312	146	272	78	69	0	173	78	0	47
Grp Sat Flow(s),veh/h/ln	1620	0	1648	1646	1717	1434	1241	0	1490	1167	0	1669
Q Serve(g_s), s	0.2	0.0	10.5	3.8	7.5	2.3	4.9	0.0	10.6	6.5	0.0	2.3
Cycle Q Clear(g_c), s	0.2	0.0	10.5	3.8	7.5	2.3	7.2	0.0	10.6	17.1	0.0	2.3
Prop In Lane	1.00		0.14	1.00		1.00	1.00		0.80	1.00		0.21
Lane Grp Cap(c), veh/h	580	0	911	609	1031	861	285	0	290	176	0	325
V/C Ratio(X)	0.01	0.00	0.34	0.24	0.26	0.09	0.24	0.00	0.60	0.44	0.00	0.14
Avail Cap(c_a), veh/h	702	0	911	654	1031	861	397	0	425	281	0	476
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	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	9.7	0.0	12.4	8.9	9.5	8.4	36.4	0.0	36.7	44.5	0.0	33.4
Incr Delay (d2), s/veh	0.0	0.0	1.0	0.2	0.1	0.0	0.4	0.0	2.0	1.8	0.0	0.2
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	0.0	3.7	1.2	2.5	0.6	1.5	0.0	3.8	2.0	0.0	1.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	9.7	0.0	13.4	9.1	9.6	8.5	36.8	0.0	38.7	46.2	0.0	33.6
LnGrp LOS	A		B	A	A	A	D		D	D		C
Approach Vol, veh/h		320			496			242			125	
Approach Delay, s/veh		13.3			9.3			38.1			41.5	
Approach LOS		B			A			D			D	

Timer - Assigned Phs	2	3	4		6	7	8					
Phs Duration (G+Y+Rc), s	26.0	12.3	61.7		26.0	7.5	66.5					
Change Period (Y+Rc), s	6.5	6.5	6.5		6.5	6.5	6.5					
Max Green Setting (Gmax), s	28.5	8.5	43.5		28.5	8.5	43.5					
Max Q Clear Time (g_c+I1), s	12.6	5.8	12.5		19.1	2.2	9.5					
Green Ext Time (p_c), s	1.0	0.1	1.4		0.4	0.0	1.6					

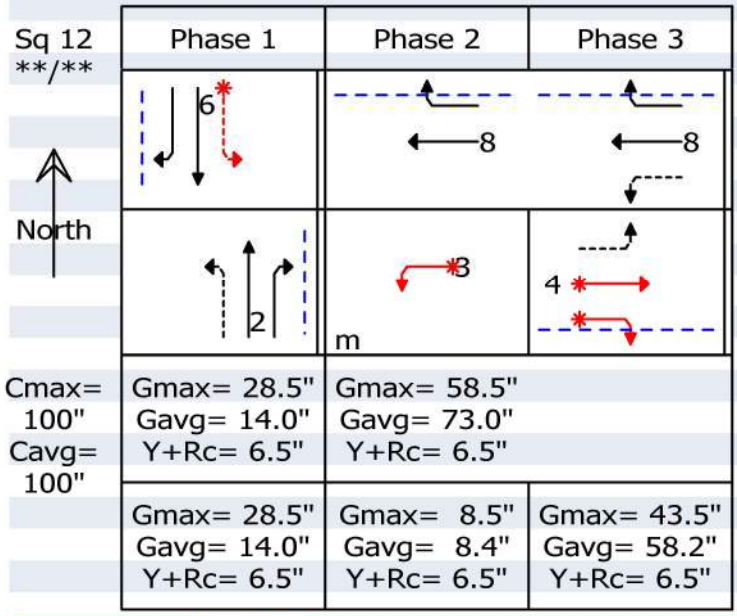
Intersection Summary	
HCM 7th Control Delay, s/veh	19.7
HCM 7th LOS	B

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	8	312	146	272	78	69	173	78	47
v/c Ratio	0.01	0.32	0.21	0.23	0.08	0.42	0.55	0.72	0.22
Control Delay (s/veh)	5.3	12.3	5.2	7.1	1.1	46.0	17.3	74.8	32.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	5.3	12.3	5.2	7.1	1.1	46.0	17.3	74.8	32.7
Queue Length 50th (ft)	1	92	24	47	0	42	20	50	23
Queue Length 95th (ft)	6	183	55	145	12	81	79	97	55
Internal Link Dist (ft)		2588		2504			2604		1914
Turn Bay Length (ft)	310		240		200	290		230	
Base Capacity (vph)	742	974	701	1198	1035	364	523	239	460
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.01	0.32	0.21	0.23	0.08	0.19	0.33	0.33	0.10

Intersection Summary

TEAPAC[Ver 9.50.02] - Capacity Analysis Summary (HCM 2016)

Intersection Averages for Int # 4 - Rimrock Rd & 54th St W
V/C 0.266 (Critical V/C 0.412) Control Delay 16.2 Level of Service B



Lane Group	Width/ Lanes	g/C Max	g/C Avg	SatFlo	Capcty	Adj Volume	v/c	HCM Delay	L S	Queue Model 1
SB Approach								41.8	D+	
R+ T	12/1	0.285	0.140	1625	227	38	0.167	38.2	D+	39 ft
L	11/1	0.285	0.140	1229	205	78	0.380	43.6	*D+	86 ft
NB Approach								40.5	D+	
R+ T	14/1	0.285	0.140	1588	222	56	0.252	38.9	D+	57 ft
L	14/1	0.285	0.140	1261	222	69	0.310	41.8	D+	74 ft
WB Approach								5.3	A	
R	12/1			1408	1028	1	0.001	3.6	A	0 ft
T	12/1	0.585	0.730	1680	1227	272	0.222	4.8	A	72 ft
L	14/1	0.085	0.084	1600	678	146	0.215	6.4	*A	44 ft
EB Approach								11.5	B+	
R+ T	12/1	0.435	0.582	1636	951	300	0.315	11.6	*B+	146 ft
L	14/1	0.435	0.582	993	649	8	0.012	8.9	A	4 ft

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	24	292	59	256	513	161	103	76	198	94	71	17
Future Volume (veh/h)	24	292	59	256	513	161	103	76	198	94	71	17
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width Adj.	1.04	1.00	1.00	1.04	1.00	1.00	1.04	1.04	1.00	1.00	1.00	1.00
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.98	0.99		0.99	1.00		0.96
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1800	1704	1717	1815	1772	1772	1741	1755	1660	1831	1845	1831
Adj Flow Rate, veh/h	26	314	63	275	552	173	111	82	213	101	76	18
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	1	3	2	3	1	1	2	1	3	2	1	2
Cap, veh/h	304	601	121	482	878	728	364	121	315	192	406	96
Arrive On Green	0.03	0.44	0.44	0.09	0.50	0.50	0.28	0.28	0.28	0.28	0.28	0.28
Sat Flow, veh/h	1714	1378	276	1728	1772	1469	1200	427	1109	1059	1430	339
Grp Volume(v), veh/h	26	0	377	275	552	173	111	0	295	101	0	94
Grp Sat Flow(s),veh/h/ln	1714	0	1654	1728	1772	1469	1200	0	1537	1059	0	1768
Q Serve(g_s), s	0.8	0.0	16.6	8.5	22.8	6.7	7.7	0.0	17.0	9.3	0.0	4.0
Cycle Q Clear(g_c), s	0.8	0.0	16.6	8.5	22.8	6.7	11.7	0.0	17.0	26.4	0.0	4.0
Prop In Lane	1.00		0.17	1.00		1.00	1.00		0.72	1.00		0.19
Lane Grp Cap(c), veh/h	304	0	722	482	878	728	364	0	436	192	0	502
V/C Ratio(X)	0.09	0.00	0.52	0.57	0.63	0.24	0.30	0.00	0.68	0.53	0.00	0.19
Avail Cap(c_a), veh/h	405	0	722	482	878	728	366	0	438	194	0	504
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	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	16.2	0.0	20.6	15.5	18.5	14.4	31.5	0.0	31.7	43.4	0.0	27.1
Incr Delay (d2), s/veh	0.1	0.0	2.7	1.6	1.4	0.2	0.5	0.0	4.1	2.6	0.0	0.2
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.3	0.0	6.4	3.3	8.7	2.1	2.2	0.0	6.5	2.6	0.0	1.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	16.3	0.0	23.3	17.1	19.9	14.6	32.0	0.0	35.8	46.0	0.0	27.3
LnGrp LOS	B		C	B	B	B	C		D	D		C
Approach Vol, veh/h		403			1000			406			195	
Approach Delay, s/veh		22.8			18.2			34.8			37.0	
Approach LOS		C			B			C			D	

Timer - Assigned Phs		2	3	4		6	7	8				
Phs Duration (G+Y+Rc), s		34.9	15.0	50.1		34.9	9.1	56.1				
Change Period (Y+Rc), s		6.5	6.5	6.5		6.5	6.5	6.5				
Max Green Setting (Gmax), s		28.5	8.5	43.5		28.5	8.5	43.5				
Max Q Clear Time (g_c+I1), s		19.0	10.5	18.6		28.4	2.8	24.8				
Green Ext Time (p_c), s		1.4	0.0	1.8		0.0	0.0	3.5				

Intersection Summary	
HCM 7th Control Delay, s/veh	24.3
HCM 7th LOS	C

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	26	377	275	552	173	111	295	101	94
v/c Ratio	0.05	0.45	0.45	0.51	0.18	0.47	0.72	1.07	0.28
Control Delay (s/veh)	8.2	19.0	10.6	15.8	2.9	40.7	29.8	153.5	29.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	8.2	19.0	10.6	15.8	2.9	40.7	29.8	153.5	29.7
Queue Length 50th (ft)	5	148	61	149	0	64	99	~72	45
Queue Length 95th (ft)	18	259	129	408	37	106	172	#148	81
Internal Link Dist (ft)		2588		2504			2604		1914
Turn Bay Length (ft)	310		240		200	290		230	
Base Capacity (vph)	544	848	610	1091	971	350	549	141	490
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.05	0.44	0.45	0.51	0.18	0.32	0.54	0.72	0.19

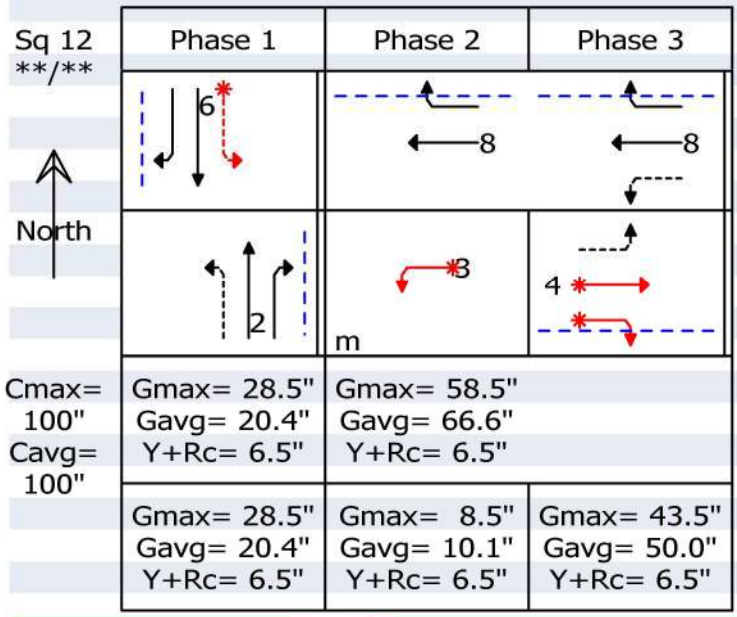
Intersection Summary

~ 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.

TEAPAC[Ver 9.50.02] - Capacity Analysis Summary (HCM 2016)

Intersection Averages for Int # 4 - Rimrock Rd & 54th St W
V/C 0.442 (Critical V/C 0.474) Control Delay 19.3 Level of Service B



Lane Group	Width/ Lanes	g/C Max	g/C Avg	SatFlo	Capcty	Adj Volume	v/c	HCM Delay	L S	Queue Model 1
SB Approach								39.4	D+	
R+ T	12/1	0.285	0.204	1731	353	81	0.229	33.6	C	75 ft
L	11/1	0.285	0.204	1146	211	101	0.479	44.0	*D+	112 ft
NB Approach								37.4	D+	
R+ T	14/1	0.285	0.204	1634	333	154	0.462	36.0	D+	143 ft
L	14/1	0.285	0.204	1227	274	111	0.405	39.3	D+	115 ft
WB Approach								10.0	B+	
R	12/1			1452	967	1	0.001	5.6	A	0 ft
T	12/1	0.585	0.666	1733	1154	552	0.478	9.6	A	213 ft
L	14/1	0.085	0.101	1698	592	275	0.464	10.9	*B+	115 ft
EB Approach								17.4	B	
R+ T	12/1	0.435	0.500	1656	829	363	0.438	17.7	*B	212 ft
L	14/1	0.435	0.500	819	482	26	0.054	13.1	B+	14 ft

Appendix E

IN THIS SECTION:

Estimated 2030 Total Traffic

HCS Two-Way Stop-Control Report

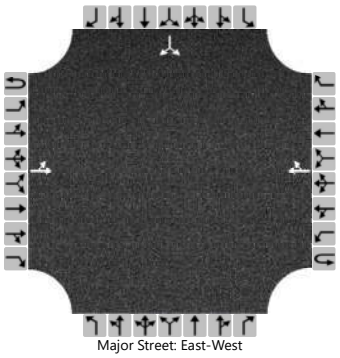
General Information

Analyst	T. Eastwood
Agency/Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2030
Time Analyzed	Weekday, AM Peak Hour
Intersection Orientation	East-West
Project Description	Copper Square TIS | Estimated Total Traffic

Site Information

Intersection	Grand & 62nd
Jurisdiction	City of Billings
East/West Street	Grand Avenue
North/South Street	62nd Street West
Peak Hour Factor	0.85
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	0	0		0	1	0
Configuration		LT						TR							LR	
Volume (veh/h)		65	268				148	59						233		96
Percent Heavy Vehicles (%)		17												2		6
Proportion Time Blocked																
Percent Grade (%)														0		
Right Turn Channelized																
Median Type | Storage																

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.1		6.2
Critical Headway (sec)		4.27												6.42		6.26
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.35												3.52		3.35

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		76													387	
Capacity, c (veh/h)		1240													458	
v/c Ratio		0.06													0.85	
95% Queue Length, Q_{95} (veh)		0.2													8.4	
95% Queue Length, Q_{95} (ft)		5.7													215.3	
Control Delay (s/veh)		8.1	0.6												43.0	
Level of Service (LOS)		A	A												E	
Approach Delay (s/veh)		2.1												43.0		
Approach LOS		A												E		

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HCS Two-Way Stop-Control Report

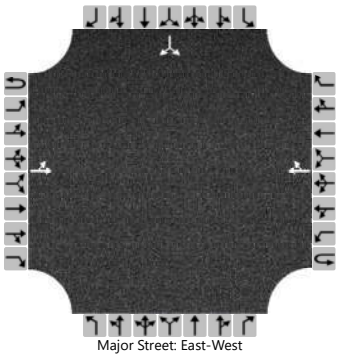
General Information

Analyst	T. Eastwood
Agency/Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2030
Time Analyzed	Weekday, Midday Peak Hour
Intersection Orientation	East-West
Project Description	Copper Square TIS | Estimated Total Traffic

Site Information

Intersection	Grand & 62nd
Jurisdiction	City of Billings
East/West Street	Grand Avenue
North/South Street	62nd Street West
Peak Hour Factor	0.93
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	0	0		0	1	0
Configuration		LT						TR							LR	
Volume (veh/h)		57	172				178	82						96		46
Percent Heavy Vehicles (%)		8												5		10
Proportion Time Blocked																
Percent Grade (%)														0		
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.1		6.2
Critical Headway (sec)		4.18												6.45		6.30
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.27												3.55		3.39

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		61													153	
Capacity, c (veh/h)		1249													539	
v/c Ratio		0.05													0.28	
95% Queue Length, Q_{95} (veh)		0.2													1.2	
95% Queue Length, Q_{95} (ft)		5.3													31.6	
Control Delay (s/veh)		8.0	0.4												14.3	
Level of Service (LOS)		A	A												B	
Approach Delay (s/veh)	2.3												14.3			
Approach LOS	A												B			

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HCS Two-Way Stop-Control Report

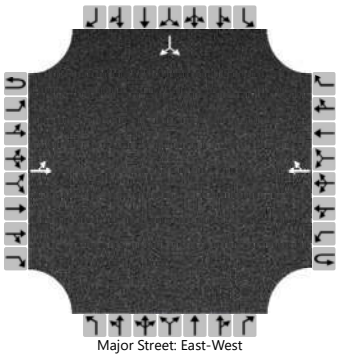
General Information

Analyst	T. Eastwood
Agency/Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2030
Time Analyzed	Weekday, PM Peak Hour
Intersection Orientation	East-West
Project Description	Copper Square TIS | Estimated Total Traffic

Site Information

Intersection	Grand & 62nd
Jurisdiction	City of Billings
East/West Street	Grand Avenue
North/South Street	62nd Street West
Peak Hour Factor	0.91
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	0	0		0	1	0
Configuration		LT						TR							LR	
Volume (veh/h)		88	235				262	165						139		60
Percent Heavy Vehicles (%)		4												3		4
Proportion Time Blocked																
Percent Grade (%)														0		
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.1		6.2
Critical Headway (sec)		4.14												6.43		6.24
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.24												3.53		3.34

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		97													219	
Capacity, c (veh/h)		1082													363	
v/c Ratio		0.09													0.60	
95% Queue Length, Q_{95} (veh)		0.3													3.8	
95% Queue Length, Q_{95} (ft)		7.7													97.5	
Control Delay (s/veh)		8.7	0.9												28.9	
Level of Service (LOS)		A	A												D	
Approach Delay (s/veh)	3.0												28.9			
Approach LOS	A												D			

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HCS Roundabouts Report

General Information

Analyst	T. Eastwood
Agency or Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2030
Time Analyzed	Weekday, AM Peak Hour
Project Description	Copper Square TIS | Estimated Total Traffic

Site Information

Intersection	Rimrock & 62nd St W
E/W Street Name	Rimrock Road
N/S Street Name	62nd Street West / Molt Road
Analysis Time Period, hrs	0.25
Peak Hour Factor	0.78
Jurisdiction	City of Billings

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0
Lane Assignment			LTR				LTR				LTR				LTR	
Volume (V), veh/h	0	15	282	110	0	60	92	83	0	28	37	43	0	315	151	7
Percent Heavy Vehicles, %	0	8	2	1	0	6	6	8	0	10	15	8	0	3	3	1
Flow Rate (v_{PCE}), pc/h	0	21	369	142	0	82	125	115	0	39	55	60	0	416	199	9
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				1				1			
Pedestrians Crossing, p/h	0				0				0				0			
Proportion of CAVs, %	0															

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway, s		4.9763			4.9763			4.9763			4.9763	
Follow-Up Headway, s		2.6087			2.6087			2.6087			2.6087	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h		532			322			154			624	
Entry Volume, veh/h		522			302			139			606	
Circulating Flow (v_c), pc/h	697			115			806			246		
Exiting Flow (v_{ex}), pc/h	845			173			191			423		
Capacity (c_{pce}), pc/h		678			1227			607			1074	
Capacity (c), veh/h		665			1150			547			1043	
v/c Ratio (x)		0.78			0.26			0.25			0.58	

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		26.2			5.6			10.1			11.0	
Lane LOS		D			A			B			B	
95% Queue Length, Q_{95} (veh)		7.7			1.1			1.0			3.9	
95% Queue Length, Q_{95} (ft)		195.5			29.0			27.2			99.8	
Approach Delay, s/veh | LOS	26.2	D		5.6	A		10.1	B		11.0	B	
Intersection Delay, s/veh | LOS	14.9						B					

HCS Roundabouts Report

General Information

Analyst	T. Eastwood
Agency or Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2030
Time Analyzed	Weekday, Midday Peak Hour
Project Description	Copper Square TIS | Estimated Total Traffic

Site Information

Intersection	Rimrock & 62nd St W
E/W Street Name	Rimrock Road
N/S Street Name	62nd Street West / Molt Road
Analysis Time Period, hrs	0.25
Peak Hour Factor	0.92
Jurisdiction	City of Billings

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0
Lane Assignment			LTR				LTR				LTR				LTR	
Volume (V), veh/h	0	9	133	45	0	37	136	156	0	46	54	32	0	134	59	8
Percent Heavy Vehicles, %	0	2	4	3	0	7	3	5	0	2	6	6	0	7	4	7
Flow Rate (v_{PCE}), pc/h	0	10	150	50	0	43	152	178	0	51	62	37	0	156	67	9
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				1				1			
Pedestrians Crossing, p/h	0				0				0				0			
Proportion of CAVs, %	0															

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway, s		4.9763			4.9763			4.9763			4.9763	
Follow-Up Headway, s		2.6087			2.6087			2.6087			2.6087	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h		210			373			150			232	
Entry Volume, veh/h		203			357			143			219	
Circulating Flow (v_c), pc/h	266			123			316			246		
Exiting Flow (v_{ex}), pc/h	343			212			250			160		
Capacity (c_{pce}), pc/h		1052			1217			1000			1074	
Capacity (c), veh/h		1015			1166			956			1012	
v/c Ratio (x)		0.20			0.31			0.15			0.22	

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		5.4			6.0			5.2			5.6	
Lane LOS		A			A			A			A	
95% Queue Length, Q_{95} (veh)		0.7			1.3			0.5			0.8	
95% Queue Length, Q_{95} (ft)		18.0			33.6			13.0			21.0	
Approach Delay, s/veh | LOS	5.4	A		6.0	A		5.2	A		5.6	A	
Intersection Delay, s/veh | LOS	5.6						A					

HCS Roundabouts Report

General Information

Analyst	T. Eastwood
Agency or Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2030
Time Analyzed	Weekday, PM Peak Hour
Project Description	Copper Square TIS | Estimated Total Traffic

Site Information

Intersection	Rimrock & 62nd St W
E/W Street Name	Rimrock Road
N/S Street Name	62nd Street West / Molt Road
Analysis Time Period, hrs	0.25
Peak Hour Factor	0.88
Jurisdiction	City of Billings

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0
Lane Assignment			LTR				LTR				LTR				LTR	
Volume (V), veh/h	0	10	172	64	3	48	259	276	0	95	105	59	0	147	96	15
Percent Heavy Vehicles, %	0	2	3	1	0	4	2	1	0	1	1	2	0	3	3	2
Flow Rate (v_{PCE}), pc/h	0	12	201	73	3	57	300	317	0	109	121	68	0	172	112	17
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				1				1			
Pedestrians Crossing, p/h	0				0				1				0			
Proportion of CAVs, %	0															

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway, s		4.9763			4.9763			4.9763			4.9763	
Follow-Up Headway, s		2.6087			2.6087			2.6087			2.6087	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h		286			677			298			301	
Entry Volume, veh/h		279			666			294			292	
Circulating Flow (v_c), pc/h	344			242			388			469		
Exiting Flow (v_{ex}), pc/h	444			426			450			242		
Capacity (c_{pce}), pc/h		972			1078			929			855	
Capacity (c), veh/h		948			1060			918			831	
v/c Ratio (x)		0.29			0.63			0.32			0.35	

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		6.8			12.1			7.4			8.4	
Lane LOS		A			B			A			A	
95% Queue Length, Q_{95} (veh)		1.2			4.6			1.4			1.6	
95% Queue Length, Q_{95} (ft)		30.6			116.6			35.3			40.9	
Approach Delay, s/veh | LOS	6.8	A		12.1	B		7.4	A		8.4	A	
Intersection Delay, s/veh | LOS	9.5						A					

HCS Two-Way Stop-Control Report

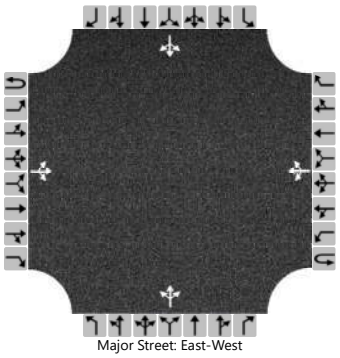
General Information

Analyst	T. Eastwood
Agency/Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2030
Time Analyzed	Weekday, AM Peak Hour
Intersection Orientation	East-West
Project Description	Copper Square TIS | Estimated Total Traffic

Site Information

Intersection	Rimrock Rd & 58th St W
Jurisdiction	City of Billings
East/West Street	Rimrock Road
North/South Street	58th Street West
Peak Hour Factor	0.79
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		1	603	8		19	276	2		11	1	38		7	2	1
Percent Heavy Vehicles (%)		3				2				21	3	2		3	3	3
Proportion Time Blocked																
Percent Grade (%)									3				0			
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.13				4.12				7.91	7.13	6.52		7.13	6.53	6.23
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.23				2.22				3.69	4.03	3.32		3.53	4.03	3.33

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		1				24					63				13	
Capacity, c (veh/h)		1201				842					252				156	
v/c Ratio		0.00				0.03					0.25				0.08	
95% Queue Length, Q_{95} (veh)		0.0				0.1					1.0				0.3	
95% Queue Length, Q_{95} (ft)		0.0				2.5					26.2				7.7	
Control Delay (s/veh)		8.0	0.0	0.0		9.4	0.3	0.3			24.0				30.1	
Level of Service (LOS)		A	A	A		A	A	A			C				D	
Approach Delay (s/veh)	0.0				0.9				24.0				30.1			
Approach LOS	A				A				C				D			

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HCS Two-Way Stop-Control Report

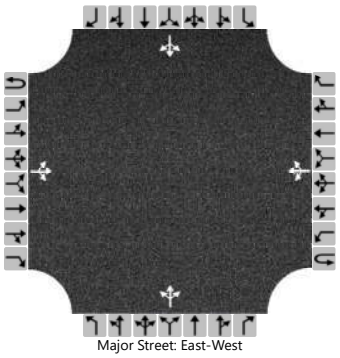
General Information

Analyst	T. Eastwood
Agency/Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2030
Time Analyzed	Weekday, Midday Peak Hour
Intersection Orientation	East-West
Project Description	Copper Square TIS | Estimated Total Traffic

Site Information

Intersection	Rimrock Rd & 58th St W
Jurisdiction	City of Billings
East/West Street	Rimrock Road
North/South Street	58th Street West
Peak Hour Factor	0.91
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		0	294	9		19	320	4		7	1	24		7	1	1
Percent Heavy Vehicles (%)		0				2				2	3	2		1	3	3
Proportion Time Blocked																
Percent Grade (%)									3				0			
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.10				4.12				7.72	7.13	6.52		7.11	6.53	6.23
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.20				2.22				3.52	4.03	3.32		3.51	4.03	3.33

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		0				21					35				10	
Capacity, c (veh/h)		1214				1226					519				338	
v/c Ratio		0.00				0.02					0.07				0.03	
95% Queue Length, Q_{95} (veh)		0.0				0.1					0.2				0.1	
95% Queue Length, Q_{95} (ft)		0.0				2.5					5.1				2.5	
Control Delay (s/veh)		8.0	0.0	0.0		8.0	0.2	0.2			12.4				16.0	
Level of Service (LOS)		A	A	A		A	A	A			B				C	
Approach Delay (s/veh)	0.0				0.6				12.4				16.0			
Approach LOS	A				A				B				C			

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HCS Two-Way Stop-Control Report

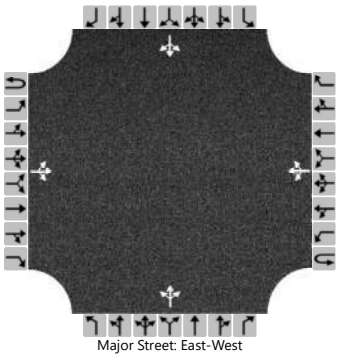
General Information

Analyst	T. Eastwood
Agency/Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2030
Time Analyzed	Weekday, PM Peak Hour
Intersection Orientation	East-West
Project Description	Copper Square TIS | Estimated Total Traffic

Site Information

Intersection	Rimrock Rd & 58th St W
Jurisdiction	City of Billings
East/West Street	Rimrock Road
North/South Street	58th Street West
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		1	359	15		55	596	8		8	2	26		7	1	1
Percent Heavy Vehicles (%)		3				2				3	3	2		9	3	3
Proportion Time Blocked																
Percent Grade (%)									3				0			
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.13				4.12				7.73	7.13	6.52		7.19	6.53	6.23
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.23				2.22				3.53	4.03	3.32		3.58	4.03	3.33

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		1				61					40				10	
Capacity, c (veh/h)		915				1143					292				147	
v/c Ratio		0.00				0.05					0.14				0.07	
95% Queue Length, Q_{95} (veh)		0.0				0.2					0.5				0.2	
95% Queue Length, Q_{95} (ft)		0.0				5.0					12.7				5.3	
Control Delay (s/veh)		8.9	0.0	0.0		8.3	0.7	0.7			19.3				31.4	
Level of Service (LOS)		A	A	A		A	A	A			C				D	
Approach Delay (s/veh)	0.0				1.3				19.3				31.4			
Approach LOS	A				A				C				D			

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	10	579	75	162	248	45	47	21	266	119	74	9
Future Volume (veh/h)	10	579	75	162	248	45	47	21	266	119	74	9
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width Adj.	1.04	1.00	1.00	1.04	1.00	1.00	1.04	1.04	1.00	1.00	1.00	1.00
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		0.97	0.99		0.99	1.00		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1772	1704	1676	1757	1689	1689	1613	1656	1647	1817	1831	1817
Adj Flow Rate, veh/h	12	698	90	195	299	54	57	25	320	143	89	11
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Percent Heavy Veh, %	3	3	5	7	7	7	11	8	4	3	2	3
Cap, veh/h	484	643	83	214	855	705	341	29	370	124	453	56
Arrive On Green	0.01	0.44	0.44	0.09	0.51	0.51	0.28	0.28	0.28	0.28	0.28	0.28
Sat Flow, veh/h	1687	1478	191	1673	1689	1394	1107	101	1299	1006	1591	197
Grp Volume(v), veh/h	12	0	788	195	299	54	57	0	345	143	0	100
Grp Sat Flow(s),veh/h/ln	1687	0	1668	1673	1689	1394	1107	0	1400	1006	0	1787
Q Serve(g_s), s	0.4	0.0	43.5	7.2	10.6	2.0	4.1	0.0	23.4	5.1	0.0	4.2
Cycle Q Clear(g_c), s	0.4	0.0	43.5	7.2	10.6	2.0	8.3	0.0	23.4	28.5	0.0	4.2
Prop In Lane	1.00		0.11	1.00		1.00	1.00		0.93	1.00		0.11
Lane Grp Cap(c), veh/h	484	0	726	214	855	705	341	0	399	124	0	509
V/C Ratio(X)	0.02	0.00	1.09	0.91	0.35	0.08	0.17	0.00	0.86	1.16	0.00	0.20
Avail Cap(c_a), veh/h	603	0	726	214	855	705	341	0	399	124	0	509
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	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	15.3	0.0	28.3	26.8	14.8	12.7	30.2	0.0	33.9	48.9	0.0	27.1
Incr Delay (d2), s/veh	0.0	0.0	59.2	37.8	0.2	0.0	0.2	0.0	17.6	129.6	0.0	0.2
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	0.0	27.5	4.3	3.7	0.6	1.1	0.0	9.4	7.5	0.0	1.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	15.4	0.0	87.4	64.6	15.1	12.7	30.5	0.0	51.5	178.5	0.0	27.3
LnGrp LOS	B		F	E	B	B	C		D	F		C
Approach Vol, veh/h		800			548			402			243	
Approach Delay, s/veh		86.4			32.5			48.5			116.3	
Approach LOS		F			C			D			F	

Timer - Assigned Phs	2	3	4		6	7	8					
Phs Duration (G+Y+Rc), s	35.0	15.0	50.0		35.0	7.9	57.1					
Change Period (Y+Rc), s	6.5	6.5	6.5		6.5	6.5	6.5					
Max Green Setting (Gmax), s	28.5	8.5	43.5		28.5	8.5	43.5					
Max Q Clear Time (g_c+I1), s	25.4	9.2	45.5		30.5	2.4	12.6					
Green Ext Time (p_c), s	0.6	0.0	0.0		0.0	0.0	1.6					

Intersection Summary	
HCM 7th Control Delay, s/veh	67.6
HCM 7th LOS	E

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	12	788	195	299	54	57	345	143	100
v/c Ratio	0.02	1.05	0.89	0.31	0.07	0.19	0.56	0.99	0.22
Control Delay (s/veh)	9.2	76.2	62.5	13.6	0.3	29.1	10.0	111.0	27.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	9.2	76.2	62.5	13.6	0.3	29.1	10.0	111.0	27.3
Queue Length 50th (ft)	3	~579	82	95	0	30	29	90	46
Queue Length 95th (ft)	10	#713	#201	181	0	60	84	#190	81
Internal Link Dist (ft)		2588		2504			2604		1914
Turn Bay Length (ft)	310		240		200	290		230	
Base Capacity (vph)	610	749	219	951	825	320	638	155	489
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.02	1.05	0.89	0.31	0.07	0.18	0.54	0.92	0.20

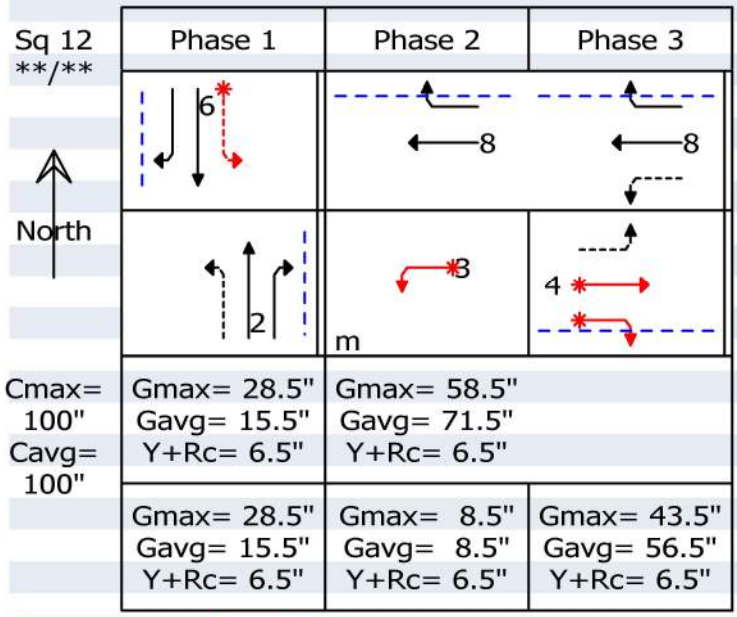
Intersection Summary

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

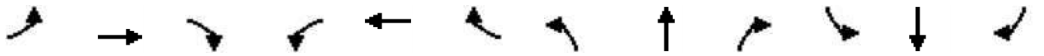
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

TEAPAC[Ver 9.50.02] - Capacity Analysis Summary (HCM 2016)

Intersection Averages for Int # 4 - Rimrock Rd & 54th St W
V/C 0.607 (Critical V/C 0.829) Control Delay 24.5 Level of Service C+



Lane Group	Width/ Lanes	g/C Max	g/C Avg	SatFlo	Capcty	Adj Volume	v/c	HCM Delay	L S	Queue Model 1
SB Approach								41.5	D+	
R+ T	12/1	0.285	0.155	1723	267	93	0.348	38.5	D+	94 ft
L	11/1	0.285	0.155	1278	253	143	0.566	43.5	*D+	149 ft
NB Approach								40.9	D+	
R+ T	14/1	0.285	0.155	1657	257	26	0.101	36.4	D+	26 ft
L	14/1	0.285	0.155	1110	190	57	0.299	42.9	D+	65 ft
WB Approach								11.1	B+	
R	12/1			1360	973	1	0.001	4.1	A	0 ft
T	12/1	0.585	0.715	1648	1179	299	0.254	5.5	A	90 ft
L	14/1	0.085	0.085	1634	325	195	0.601	19.8	*B	115 ft
EB Approach								26.1	C+	
R+ T	12/1	0.435	0.565	1657	937	779	0.832	26.4	*C+	520 ft
L	14/1	0.435	0.565	1012	644	12	0.019	9.6	A	5 ft



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	7	278	45	136	281	73	67	32	129	73	34	10
Future Volume (veh/h)	7	278	45	136	281	73	67	32	129	73	34	10
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width Adj.	1.04	1.00	1.00	1.04	1.00	1.00	1.04	1.04	1.00	1.00	1.00	1.00
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.98	1.00		0.98	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	1701	1690	1663	1728	1717	1731	1712	1741	1592	1803	1734	1831
Adj Flow Rate, veh/h	8	302	49	148	305	79	73	35	140	79	37	11
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	8	4	6	9	5	4	4	2	8	4	9	2
Cap, veh/h	553	780	127	576	1027	858	286	59	235	177	252	75
Arrive On Green	0.01	0.55	0.55	0.06	0.60	0.60	0.20	0.20	0.20	0.20	0.20	0.20
Sat Flow, veh/h	1620	1418	230	1646	1717	1434	1240	298	1193	1165	1283	381
Grp Volume(v), veh/h	8	0	351	148	305	79	73	0	175	79	0	48
Grp Sat Flow(s),veh/h/ln	1620	0	1649	1646	1717	1434	1240	0	1491	1165	0	1664
Q Serve(g_s), s	0.2	0.0	12.2	3.8	8.7	2.3	5.2	0.0	10.7	6.6	0.0	2.4
Cycle Q Clear(g_c), s	0.2	0.0	12.2	3.8	8.7	2.3	7.6	0.0	10.7	17.3	0.0	2.4
Prop In Lane	1.00		0.14	1.00		1.00	1.00		0.80	1.00		0.23
Lane Grp Cap(c), veh/h	553	0	906	576	1027	858	286	0	293	177	0	327
V/C Ratio(X)	0.01	0.00	0.39	0.26	0.30	0.09	0.25	0.00	0.60	0.45	0.00	0.15
Avail Cap(c_a), veh/h	675	0	906	619	1027	858	396	0	425	280	0	474
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	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	9.8	0.0	12.9	9.2	9.8	8.5	36.4	0.0	36.6	44.4	0.0	33.2
Incr Delay (d2), s/veh	0.0	0.0	1.3	0.2	0.2	0.0	0.5	0.0	1.9	1.8	0.0	0.2
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	0.0	4.3	1.2	2.9	0.6	1.5	0.0	3.9	2.0	0.0	1.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	9.8	0.0	14.1	9.4	10.0	8.6	36.8	0.0	38.5	46.2	0.0	33.4
LnGrp LOS	A		B	A	A	A	D		D	D		C
Approach Vol, veh/h		359			532			248			127	
Approach Delay, s/veh		14.0			9.6			38.0			41.4	
Approach LOS		B			A			D			D	

Timer - Assigned Phs	2	3	4		6	7	8					
Phs Duration (G+Y+Rc), s	26.2	12.4	61.5		26.2	7.5	66.3					
Change Period (Y+Rc), s	6.5	6.5	6.5		6.5	6.5	6.5					
Max Green Setting (Gmax), s	28.5	8.5	43.5		28.5	8.5	43.5					
Max Q Clear Time (g_c+I1), s	12.7	5.8	14.2		19.3	2.2	10.7					
Green Ext Time (p_c), s	1.0	0.1	1.6		0.4	0.0	1.8					

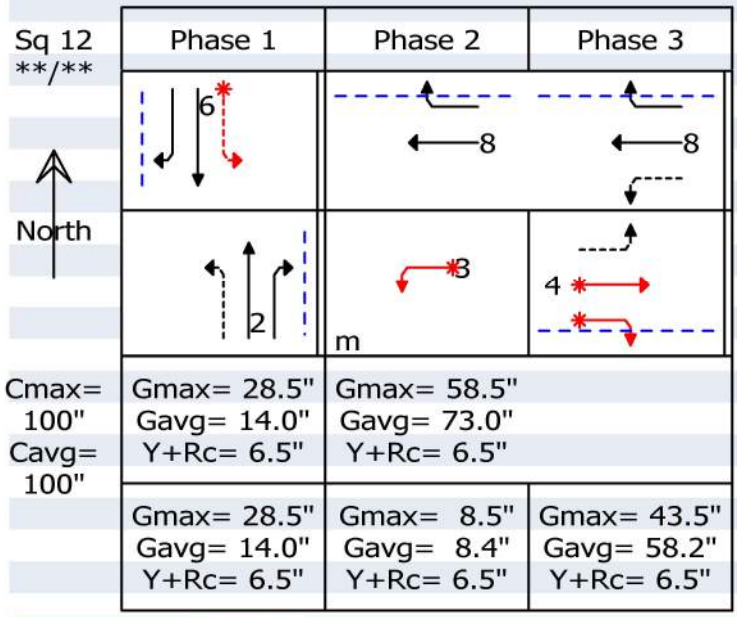
Intersection Summary	
HCM 7th Control Delay, s/veh	19.6
HCM 7th LOS	B

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	8	351	148	305	79	73	175	79	48
v/c Ratio	0.01	0.36	0.22	0.26	0.08	0.44	0.56	0.73	0.22
Control Delay (s/veh)	5.3	13.0	5.3	7.3	1.2	46.6	17.4	75.7	32.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	5.3	13.0	5.3	7.3	1.2	46.6	17.4	75.7	32.1
Queue Length 50th (ft)	1	107	24	54	0	45	21	51	23
Queue Length 95th (ft)	6	211	56	163	12	85	80	98	55
Internal Link Dist (ft)		2588		2504			2604		1914
Turn Bay Length (ft)	310		240		200	290		230	
Base Capacity (vph)	723	971	668	1196	1034	364	524	237	460
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.01	0.36	0.22	0.26	0.08	0.20	0.33	0.33	0.10

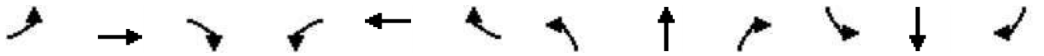
Intersection Summary

TEAPAC[Ver 9.50.02] - Capacity Analysis Summary (HCM 2016)

Intersection Averages for Int # 4 - Rimrock Rd & 54th St W
V/C 0.293 (Critical V/C 0.444) Control Delay 16.1 Level of Service B



Lane Group	Width/ Lanes	g/C Max	g/C Avg	SatFlo	Capcty	Adj Volume	v/c	HCM Delay	L S	Queue Model 1
SB Approach								41.9	D+	
R+ T	12/1	0.285	0.140	1625	227	38	0.167	38.2	D+	39 ft
L	11/1	0.285	0.140	1228	205	79	0.386	43.7	*D+	88 ft
NB Approach								40.7	D+	
R+ T	14/1	0.285	0.140	1591	222	57	0.256	39.0	D+	58 ft
L	14/1	0.285	0.140	1260	222	73	0.328	42.0	D+	79 ft
WB Approach								5.5	A	
R	12/1			1408	1028	1	0.001	3.6	A	0 ft
T	12/1	0.585	0.730	1680	1226	305	0.249	4.9	A	83 ft
L	14/1	0.085	0.084	1600	646	148	0.229	6.6	*A	45 ft
EB Approach								12.0	B+	
R+ T	12/1	0.435	0.582	1633	950	340	0.358	12.1	*B+	166 ft
L	14/1	0.435	0.582	963	632	8	0.013	8.9	A	4 ft



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	25	317	62	256	542	161	107	76	198	94	71	18
Future Volume (veh/h)	25	317	62	256	542	161	107	76	198	94	71	18
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width Adj.	1.04	1.00	1.00	1.04	1.00	1.00	1.04	1.04	1.00	1.00	1.00	1.00
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.98	0.99		0.99	1.00		0.96
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1800	1704	1717	1815	1759	1772	1741	1755	1660	1831	1845	1831
Adj Flow Rate, veh/h	27	341	67	275	583	173	115	82	213	101	76	19
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	1	3	2	3	2	1	2	1	3	2	1	2
Cap, veh/h	284	603	119	458	870	727	363	121	315	192	401	100
Arrive On Green	0.03	0.44	0.44	0.09	0.49	0.49	0.28	0.28	0.28	0.28	0.28	0.28
Sat Flow, veh/h	1714	1383	272	1728	1759	1469	1199	427	1109	1059	1412	353
Grp Volume(v), veh/h	27	0	408	275	583	173	115	0	295	101	0	95
Grp Sat Flow(s),veh/h/ln	1714	0	1655	1728	1759	1469	1199	0	1537	1059	0	1765
Q Serve(g_s), s	0.9	0.0	18.4	8.5	25.1	6.7	8.0	0.0	17.0	9.3	0.0	4.1
Cycle Q Clear(g_c), s	0.9	0.0	18.4	8.5	25.1	6.7	12.1	0.0	17.0	26.4	0.0	4.1
Prop In Lane	1.00		0.16	1.00		1.00	1.00		0.72	1.00		0.20
Lane Grp Cap(c), veh/h	284	0	722	458	870	727	363	0	436	192	0	501
V/C Ratio(X)	0.10	0.00	0.57	0.60	0.67	0.24	0.32	0.00	0.68	0.53	0.00	0.19
Avail Cap(c_a), veh/h	384	0	722	458	870	727	365	0	438	194	0	503
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	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	16.6	0.0	21.1	16.1	19.1	14.5	31.7	0.0	31.7	43.4	0.0	27.1
Incr Delay (d2), s/veh	0.1	0.0	3.2	2.2	2.0	0.2	0.5	0.0	4.1	2.6	0.0	0.2
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.3	0.0	7.2	3.3	9.6	2.1	2.3	0.0	6.5	2.6	0.0	1.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	16.7	0.0	24.3	18.3	21.1	14.6	32.2	0.0	35.8	46.0	0.0	27.3
LnGrp LOS	B		C	B	C	B	C		D	D		C
Approach Vol, veh/h		435			1031			410			196	
Approach Delay, s/veh		23.8			19.2			34.8			36.9	
Approach LOS		C			B			C			D	

Timer - Assigned Phs		2	3	4		6	7	8				
Phs Duration (G+Y+Rc), s		34.9	15.0	50.1		34.9	9.1	56.0				
Change Period (Y+Rc), s		6.5	6.5	6.5		6.5	6.5	6.5				
Max Green Setting (Gmax), s		28.5	8.5	43.5		28.5	8.5	43.5				
Max Q Clear Time (g_c+I1), s		19.0	10.5	20.4		28.4	2.9	27.1				
Green Ext Time (p_c), s		1.4	0.0	1.9		0.0	0.0	3.5				

Intersection Summary	
HCM 7th Control Delay, s/veh	25.0
HCM 7th LOS	C

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	27	408	275	583	173	115	295	101	95
v/c Ratio	0.06	0.48	0.47	0.56	0.18	0.49	0.72	1.07	0.29
Control Delay (s/veh)	8.2	19.7	11.0	18.3	3.1	41.4	29.8	153.5	29.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	8.2	19.7	11.0	18.3	3.1	41.4	29.8	153.5	29.4
Queue Length 50th (ft)	5	165	61	241	1	67	99	~72	45
Queue Length 95th (ft)	18	285	129	449	38	110	172	#148	81
Internal Link Dist (ft)		2588		2504			2604		1914
Turn Bay Length (ft)	310		240		200	290		230	
Base Capacity (vph)	506	848	584	1037	938	349	549	141	490
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.05	0.48	0.47	0.56	0.18	0.33	0.54	0.72	0.19

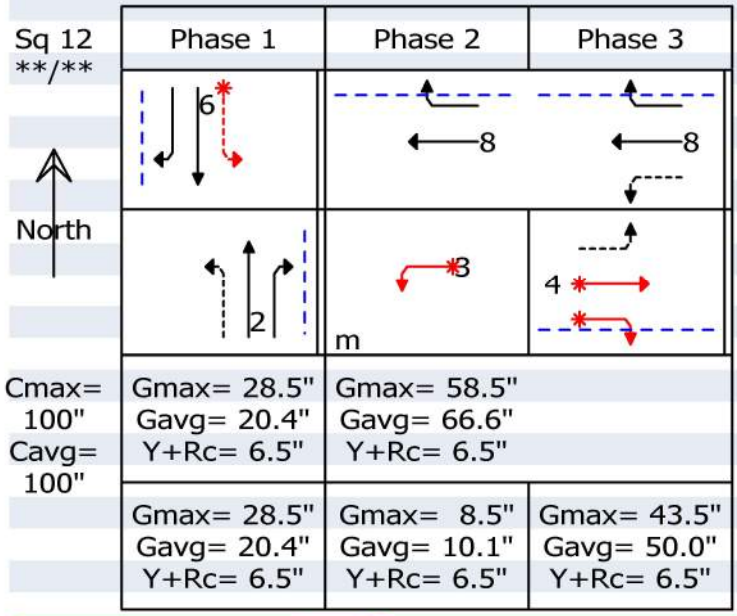
Intersection Summary

~ 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.

TEAPAC[Ver 9.50.02] - Capacity Analysis Summary (HCM 2016)

Intersection Averages for Int # 4 - Rimrock Rd & 54th St W
V/C 0.464 (Critical V/C 0.495) Control Delay 19.5 Level of Service B



Lane Group	Width/ Lanes	g/C Max	g/C Avg	SatFlo	Capcty	Adj Volume	v/c	HCM Delay	L S	Queue Model 1
SB Approach								39.4	D+	
R+ T	12/1	0.285	0.204	1731	353	81	0.229	33.6	C	75 ft
L	11/1	0.285	0.204	1146	211	101	0.479	44.0	*D+	112 ft
NB Approach								37.5	D+	
R+ T	14/1	0.285	0.204	1634	334	154	0.462	36.0	D+	142 ft
L	14/1	0.285	0.204	1226	274	115	0.419	39.5	D+	119 ft
WB Approach								10.5	B+	
R	12/1			1452	967	1	0.001	5.6	A	0 ft
T	12/1	0.585	0.666	1731	1153	583	0.506	10.0	B+	229 ft
L	14/1	0.085	0.101	1698	567	275	0.485	11.4	*B+	115 ft
EB Approach								18.0	B	
R+ T	12/1	0.435	0.500	1653	827	394	0.477	18.4	*B	233 ft
L	14/1	0.435	0.500	794	466	27	0.058	13.4	B+	15 ft

HCS Two-Way Stop-Control Report

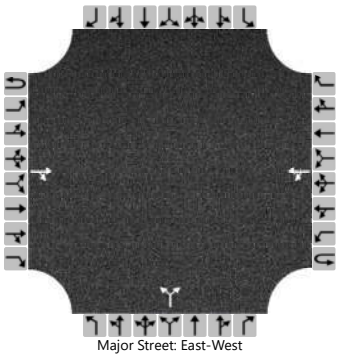
General Information

Analyst	T. Eastwood
Agency/Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2030
Time Analyzed	Weekday, AM Peak Hour
Intersection Orientation	East-West
Project Description	Copper Square TIS | Estimated Total Traffic

Site Information

Intersection	Rimrock Road & Road A
Jurisdiction	City of Billings
East/West Street	Rimrock Road
North/South Street	Road A
Peak Hour Factor	0.78
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	0	0
Configuration				TR		LT					LR					
Volume (veh/h)			605	35		32	213			22		21				
Percent Heavy Vehicles (%)						5				5		5				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.15				6.45		6.25				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.25				3.55		3.35				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						41					55					
Capacity, c (veh/h)						796					262					
v/c Ratio						0.05					0.21					
95% Queue Length, Q_{95} (veh)						0.2					0.8					
95% Queue Length, Q_{95} (ft)						5.2					20.8					
Control Delay (s/veh)						9.8	0.6				22.3					
Level of Service (LOS)						A	A				C					
Approach Delay (s/veh)					1.8				22.3							
Approach LOS					A				C							

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HCS Two-Way Stop-Control Report

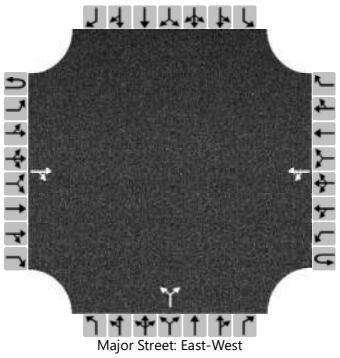
General Information

Analyst	T. Eastwood
Agency/Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2030
Time Analyzed	Weekday, Midday Peak Hour
Intersection Orientation	East-West
Project Description	Copper Square TIS | Estimated Total Traffic

Site Information

Intersection	Rimrock Road & Road A
Jurisdiction	City of Billings
East/West Street	Rimrock Road
North/South Street	Road A
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	0	0
Configuration				TR		LT					LR					
Volume (veh/h)			263	36		33	293			36		34				
Percent Heavy Vehicles (%)						5				5		5				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.15				6.45		6.25				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.25				3.55		3.35				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						37					78					
Capacity, c (veh/h)						1211					494					
v/c Ratio						0.03					0.16					
95% Queue Length, Q_{95} (veh)						0.1					0.6					
95% Queue Length, Q_{95} (ft)						2.6					15.6					
Control Delay (s/veh)						8.1	0.3				13.7					
Level of Service (LOS)						A	A				B					
Approach Delay (s/veh)					1.1				13.7							
Approach LOS					A				B							

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HCS Two-Way Stop-Control Report

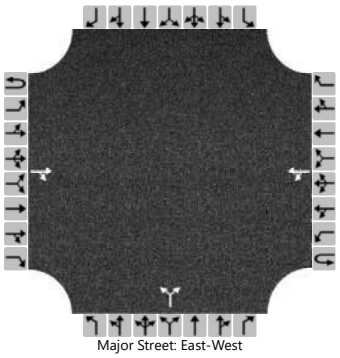
General Information

Analyst	T. Eastwood
Agency/Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2030
Time Analyzed	Weekday, PM Peak Hour
Intersection Orientation	East-West
Project Description	Copper Square TIS | Estimated Total Traffic

Site Information

Intersection	Rimrock Road & Road A
Jurisdiction	City of Billings
East/West Street	Rimrock Road
North/South Street	Road A
Peak Hour Factor	0.87
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	0	0
Configuration				TR		LT					LR					
Volume (veh/h)			345	36		35	555			31		30				
Percent Heavy Vehicles (%)						5				5		5				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.15				6.45		6.25				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.25				3.55		3.35				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						40					70					
Capacity, c (veh/h)						1106					310					
v/c Ratio						0.04					0.23					
95% Queue Length, Q_{95} (veh)						0.1					0.9					
95% Queue Length, Q_{95} (ft)						2.6					23.4					
Control Delay (s/veh)						8.4	0.5				20.0					
Level of Service (LOS)						A	A				C					
Approach Delay (s/veh)					0.9				20.0							
Approach LOS					A				C							

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HCS Two-Way Stop-Control Report

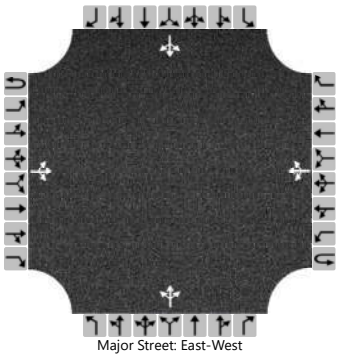
General Information

Analyst	T. Eastwood
Agency/Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2030
Time Analyzed	Weekday, AM Peak Hour
Intersection Orientation	East-West
Project Description	Copper Square TIS | Estimated Total Traffic

Site Information

Intersection	Road B & Road C
Jurisdiction	City of Billings
East/West Street	Road C
North/South Street	Road B
Peak Hour Factor	0.80
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		25	10	5		0	6	0		3	0	0		0	0	18
Percent Heavy Vehicles (%)		5				5				5	5	5		5	5	5
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.15				4.15				7.15	6.55	6.25		7.15	6.55	6.25
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.25				2.25				3.55	4.05	3.35		3.55	4.05	3.35

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		31				0					4				23	
Capacity, c (veh/h)		1593				1578					843				1066	
v/c Ratio		0.02				0.00					0.00				0.02	
95% Queue Length, Q_{95} (veh)		0.1				0.0					0.0				0.1	
95% Queue Length, Q_{95} (ft)		2.5				0.0					0.0				2.6	
Control Delay (s/veh)		7.3	0.1	0.1		7.3	0.0	0.0			9.3				8.4	
Level of Service (LOS)		A	A	A		A	A	A			A				A	
Approach Delay (s/veh)	4.6				0.0				9.3				8.4			
Approach LOS	A				A				A				A			

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HCS Two-Way Stop-Control Report

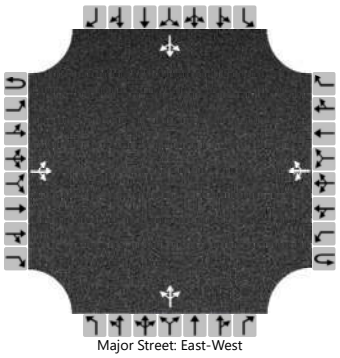
General Information

Analyst	T. Eastwood
Agency/Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2030
Time Analyzed	Weekday, Midday Peak Hour
Intersection Orientation	East-West
Project Description	Copper Square TIS | Estimated Total Traffic

Site Information

Intersection	Road B & Road C
Jurisdiction	City of Billings
East/West Street	Road C
North/South Street	Road B
Peak Hour Factor	0.80
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		29	11	3		0	11	0		4	0	0		0	0	29
Percent Heavy Vehicles (%)		5				5				5	5	5		5	5	5
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.15				4.15				7.15	6.55	6.25		7.15	6.55	6.25
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.25				2.25				3.55	4.05	3.35		3.55	4.05	3.35

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		36				0					5				36	
Capacity, c (veh/h)		1585				1580					800				1058	
v/c Ratio		0.02				0.00					0.01				0.03	
95% Queue Length, Q_{95} (veh)		0.1				0.0					0.0				0.1	
95% Queue Length, Q_{95} (ft)		2.5				0.0					0.0				2.6	
Control Delay (s/veh)		7.3	0.2	0.2		7.3	0.0	0.0			9.5				8.5	
Level of Service (LOS)		A	A	A		A	A	A			A				A	
Approach Delay (s/veh)	5.0				0.0				9.5				8.5			
Approach LOS	A				A				A				A			

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HCS Two-Way Stop-Control Report

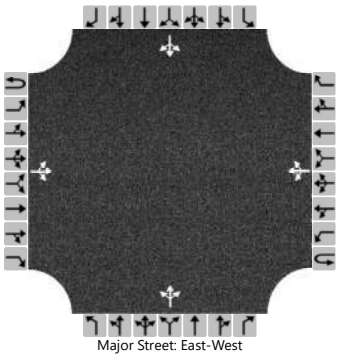
General Information

Analyst	T. Eastwood
Agency/Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2030
Time Analyzed	Weekday, PM Peak Hour
Intersection Orientation	East-West
Project Description	Copper Square TIS | Estimated Total Traffic

Site Information

Intersection	Road B & Road C
Jurisdiction	City of Billings
East/West Street	Road C
North/South Street	Road B
Peak Hour Factor	0.80
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		25	10	6		0	8	0		6	0	0		0	0	20
Percent Heavy Vehicles (%)		5				5				5	5	5		5	5	5
Proportion Time Blocked																
Percent Grade (%)										0				0		
Right Turn Channelized																
Median Type | Storage			Undivided													

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.15				4.15				7.15	6.55	6.25		7.15	6.55	6.25
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.25				2.25				3.55	4.05	3.35		3.55	4.05	3.35

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		31				0					8				25	
Capacity, c (veh/h)		1590				1577					835				1063	
v/c Ratio		0.02				0.00					0.01				0.02	
95% Queue Length, Q_{95} (veh)		0.1				0.0					0.0				0.1	
95% Queue Length, Q_{95} (ft)		2.5				0.0					0.0				2.6	
Control Delay (s/veh)		7.3	0.1	0.1		7.3	0.0	0.0			9.3				8.5	
Level of Service (LOS)		A	A	A		A	A	A			A				A	
Approach Delay (s/veh)	4.5				0.0				9.3				8.5			
Approach LOS	A				A				A				A			

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Appendix E

IN THIS SECTION:

Estimated 2034 Background Traffic

HCS Two-Way Stop-Control Report

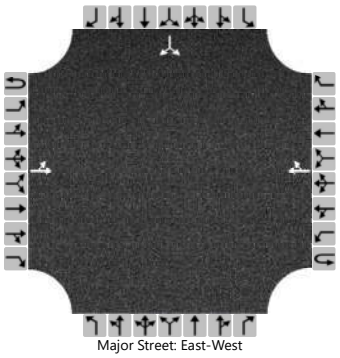
General Information

Analyst	T. Eastwood
Agency/Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2034
Time Analyzed	Weekday, AM Peak Hour
Intersection Orientation	East-West
Project Description	Copper Square TIS | Estimated Background Traffic

Site Information

Intersection	Grand & 62nd
Jurisdiction	City of Billings
East/West Street	Grand Avenue
North/South Street	62nd Street West
Peak Hour Factor	0.85
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	0	0		0	1	0
Configuration		LT						TR							LR	
Volume (veh/h)		68	280				153	63						248		101
Percent Heavy Vehicles (%)		17												2		6
Proportion Time Blocked																
Percent Grade (%)														0		
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.1		6.2
Critical Headway (sec)		4.27												6.42		6.26
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.35												3.52		3.35

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		80													411	
Capacity, c (veh/h)		1228													439	
v/c Ratio		0.07													0.93	
95% Queue Length, Q_{95} (veh)		0.2													10.8	
95% Queue Length, Q_{95} (ft)		5.7													276.8	
Control Delay (s/veh)		8.1	0.6												59.1	
Level of Service (LOS)		A	A												F	
Approach Delay (s/veh)	2.1												59.1			
Approach LOS	A												F			

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HCS Two-Way Stop-Control Report

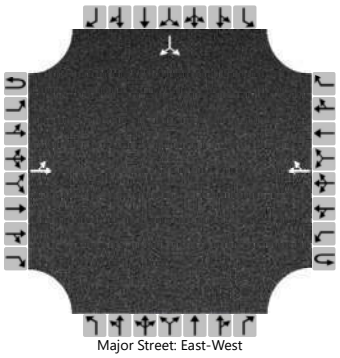
General Information

Analyst	T. Eastwood
Agency/Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2034
Time Analyzed	Weekday, Midday Peak Hour
Intersection Orientation	East-West
Project Description	Copper Square TIS | Estimated Background Traffic

Site Information

Intersection	Grand & 62nd
Jurisdiction	City of Billings
East/West Street	Grand Avenue
North/South Street	62nd Street West
Peak Hour Factor	0.93
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	0	0		0	1	0
Configuration		LT						TR							LR	
Volume (veh/h)		59	178				185	88						103		48
Percent Heavy Vehicles (%)		8												5		10
Proportion Time Blocked																
Percent Grade (%)														0		
Right Turn Channelized																
Median Type | Storage					Undivided											

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.1		6.2
Critical Headway (sec)		4.18												6.45		6.30
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.27												3.55		3.39

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		63													162	
Capacity, c (veh/h)		1234													522	
v/c Ratio		0.05													0.31	
95% Queue Length, Q_{95} (veh)		0.2													1.3	
95% Queue Length, Q_{95} (ft)		5.3													34.2	
Control Delay (s/veh)		8.1	0.5												15.0	
Level of Service (LOS)		A	A												B	
Approach Delay (s/veh)		2.4												15.0		
Approach LOS		A												B		

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HCS Two-Way Stop-Control Report

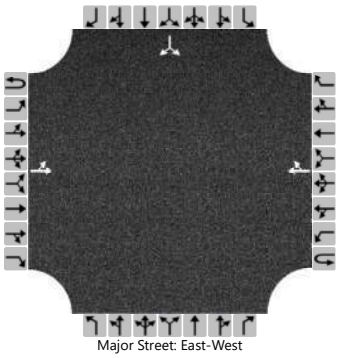
General Information

Analyst	T. Eastwood
Agency/Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2034
Time Analyzed	Weekday, PM Peak Hour
Intersection Orientation	East-West
Project Description	Copper Square TIS | Estimated Background Traffic

Site Information

Intersection	Grand & 62nd
Jurisdiction	City of Billings
East/West Street	Grand Avenue
North/South Street	62nd Street West
Peak Hour Factor	0.91
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	0	0		0	1	0
Configuration		LT						TR							LR	
Volume (veh/h)		92	244				273	177						148		62
Percent Heavy Vehicles (%)		4												3		4
Proportion Time Blocked																
Percent Grade (%)														0		
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.1		6.2
Critical Headway (sec)		4.14												6.43		6.24
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.24												3.53		3.34

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		101													231	
Capacity, c (veh/h)		1059													342	
v/c Ratio		0.10													0.67	
95% Queue Length, Q_{95} (veh)		0.3													4.7	
95% Queue Length, Q_{95} (ft)		7.7													120.6	
Control Delay (s/veh)		8.8	1.0												34.8	
Level of Service (LOS)		A	A												D	
Approach Delay (s/veh)	3.1												34.8			
Approach LOS	A												D			

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HCS Roundabouts Report

General Information

Analyst	T. Eastwood
Agency or Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2034
Time Analyzed	Weekday, AM Peak Hour
Project Description	Copper Square TIS | Estimated Background Traffic

Site Information

Intersection	Rimrock & 62nd St W
E/W Street Name	Rimrock Road
N/S Street Name	62nd Street West / Molt Road
Analysis Time Period, hrs	0.25
Peak Hour Factor	0.78
Jurisdiction	City of Billings

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0
Lane Assignment			LTR				LTR				LTR				LTR	
Volume (V), veh/h	0	17	309	118	0	63	101	85	0	31	38	44	0	322	155	8
Percent Heavy Vehicles, %	0	7	2	2	0	6	6	8	0	10	15	8	0	3	3	2
Flow Rate (v_{PCE}), pc/h	0	23	404	154	0	86	137	118	0	44	56	61	0	425	205	10
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				1				1			
Pedestrians Crossing, p/h	0				0				0				0			
Proportion of CAVs, %	0															

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway, s		4.9763			4.9763			4.9763			4.9763	
Follow-Up Headway, s		2.6087			2.6087			2.6087			2.6087	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h		581			341			161			640	
Entry Volume, veh/h		569			320			145			621	
Circulating Flow (v_c), pc/h	716			123			852			267		
Exiting Flow (v_{ex}), pc/h	890			191			197			445		
Capacity (c_{pce}), pc/h		665			1217			579			1051	
Capacity (c), veh/h		651			1141			522			1021	
v/c Ratio (x)		0.87			0.28			0.28			0.61	

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		36.1			5.8			10.9			11.9	
Lane LOS		E			A			B			B	
95% Queue Length, Q_{95} (veh)		10.3			1.2			1.1			4.3	
95% Queue Length, Q_{95} (ft)		262.0			31.6			29.9			110.1	
Approach Delay, s/veh | LOS	36.1	E		5.8	A		10.9	B		11.9	B	
Intersection Delay, s/veh | LOS	19.0						C					

HCS Roundabouts Report

General Information

Analyst	T. Eastwood
Agency or Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2034
Time Analyzed	Weekday, Midday Peak Hour
Project Description	Copper Square TIS | Estimated Background Traffic

Site Information

Intersection	Rimrock & 62nd St W
E/W Street Name	Rimrock Road
N/S Street Name	62nd Street West / Molt Road
Analysis Time Period, hrs	0.25
Peak Hour Factor	0.92
Jurisdiction	City of Billings

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0
Lane Assignment			LTR				LTR				LTR				LTR	
Volume (V), veh/h	0	10	144	49	0	37	148	159	0	50	55	32	0	137	60	9
Percent Heavy Vehicles, %	0	2	4	3	0	7	3	5	0	2	6	6	0	7	4	7
Flow Rate (v_{PCE}), pc/h	0	11	163	55	0	43	166	181	0	55	63	37	0	159	68	10
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				1				1			
Pedestrians Crossing, p/h	0				0				0				0			
Proportion of CAVs, %	0															

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway, s		4.9763			4.9763			4.9763			4.9763	
Follow-Up Headway, s		2.6087			2.6087			2.6087			2.6087	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h		229			390			155			237	
Entry Volume, veh/h		221			374			148			223	
Circulating Flow (v_c), pc/h	270			129			333			264		
Exiting Flow (v_{ex}), pc/h	359			231			255			166		
Capacity (c_{pce}), pc/h		1048			1210			983			1054	
Capacity (c), veh/h		1011			1159			940			993	
v/c Ratio (x)		0.22			0.32			0.16			0.22	

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		5.6			6.2			5.3			5.8	
Lane LOS		A			A			A			A	
95% Queue Length, Q_{95} (veh)		0.8			1.4			0.6			0.9	
95% Queue Length, Q_{95} (ft)		20.6			36.2			15.5			23.6	
Approach Delay, s/veh | LOS	5.6	A		6.2	A		5.3	A		5.8	A	
Intersection Delay, s/veh | LOS	5.8						A					

HCS Roundabouts Report

General Information

Analyst	T. Eastwood
Agency or Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2034
Time Analyzed	Weekday, PM Peak Hour
Project Description	Copper Square TIS | Estimated Background Traffic

Site Information

Intersection	Rimrock & 62nd St W
E/W Street Name	Rimrock Road
N/S Street Name	62nd Street West / Molt Road
Analysis Time Period, hrs	0.25
Peak Hour Factor	0.88
Jurisdiction	City of Billings

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0
Lane Assignment			LTR				LTR				LTR				LTR	
Volume (V), veh/h	0	11	189	69	3	49	286	282	0	102	108	61	0	150	98	17
Percent Heavy Vehicles, %	0	2	3	1	0	4	2	1	0	1	1	2	0	3	3	2
Flow Rate (v_{PCE}), pc/h	0	13	221	79	3	58	332	324	0	117	124	71	0	176	115	20
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				1				1			
Pedestrians Crossing, p/h	0				0				1				0			
Proportion of CAVs, %	0															

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway, s		4.9763			4.9763			4.9763			4.9763	
Follow-Up Headway, s		2.6087			2.6087			2.6087			2.6087	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h		313			717			312			311	
Entry Volume, veh/h		306			705			308			302	
Circulating Flow (v_c), pc/h	352			254			413			510		
Exiting Flow (v_{ex}), pc/h	471			469			461			252		
Capacity (c_{pce}), pc/h		964			1065			906			820	
Capacity (c), veh/h		941			1047			894			797	
v/c Ratio (x)		0.32			0.67			0.34			0.38	

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		7.3			13.6			7.8			9.1	
Lane LOS		A			B			A			A	
95% Queue Length, Q_{95} (veh)		1.4			5.5			1.5			1.8	
95% Queue Length, Q_{95} (ft)		35.7			139.4			37.9			46.1	
Approach Delay, s/veh | LOS	7.3	A		13.6	B		7.8	A		9.1	A	
Intersection Delay, s/veh | LOS	10.5						B					

HCS Two-Way Stop-Control Report

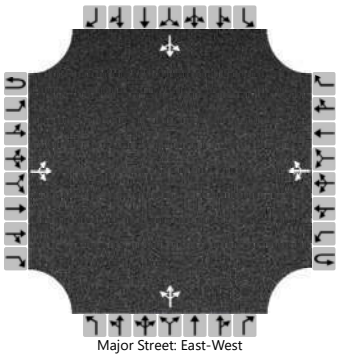
General Information

Analyst	T. Eastwood
Agency/Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2034
Time Analyzed	Weekday, AM Peak Hour
Intersection Orientation	East-West
Project Description	Copper Square TIS | Estimated Background Traffic

Site Information

Intersection	Rimrock Rd & 58th St W
Jurisdiction	City of Billings
East/West Street	Rimrock Road
North/South Street	58th Street West
Peak Hour Factor	0.79
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		1	637	8		22	290	2		12	1	41		7	2	1
Percent Heavy Vehicles (%)		3				2				27	3	2		3	3	3
Proportion Time Blocked																
Percent Grade (%)									3				0			
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.13				4.12				7.97	7.13	6.52		7.13	6.53	6.23
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.23				2.22				3.74	4.03	3.32		3.53	4.03	3.33

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		1				28					68				13	
Capacity, c (veh/h)		1183				811					226				137	
v/c Ratio		0.00				0.03					0.30				0.09	
95% Queue Length, Q_{95} (veh)		0.0				0.1					1.2				0.3	
95% Queue Length, Q_{95} (ft)		0.0				2.5					31.8				7.7	
Control Delay (s/veh)		8.0	0.0	0.0		9.6	0.4	0.4			27.7				34.0	
Level of Service (LOS)		A	A	A		A	A	A			D				D	
Approach Delay (s/veh)	0.0				1.1				27.7				34.0			
Approach LOS	A				A				D				D			

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HCS Two-Way Stop-Control Report

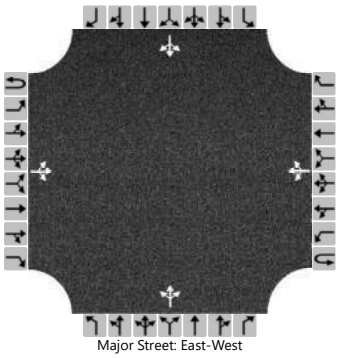
General Information

Analyst	T. Eastwood
Agency/Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2034
Time Analyzed	Weekday, Midday Peak Hour
Intersection Orientation	East-West
Project Description	Copper Square TIS | Estimated Background Traffic

Site Information

Intersection	Rimrock Rd & 58th St W
Jurisdiction	City of Billings
East/West Street	Rimrock Road
North/South Street	58th Street West
Peak Hour Factor	0.91
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		0	309	9		21	335	4		8	1	26		7	1	1
Percent Heavy Vehicles (%)		0				2				2	3	2		1	3	3
Proportion Time Blocked																
Percent Grade (%)									3				0			
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.10				4.12				7.72	7.13	6.52		7.11	6.53	6.23
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.20				2.22				3.52	4.03	3.32		3.51	4.03	3.33

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		0				23					38				10	
Capacity, c (veh/h)		1197				1209					494				317	
v/c Ratio		0.00				0.02					0.08				0.03	
95% Queue Length, Q_{95} (veh)		0.0				0.1					0.3				0.1	
95% Queue Length, Q_{95} (ft)		0.0				2.5					7.6				2.5	
Control Delay (s/veh)		8.0	0.0	0.0		8.0	0.2	0.2			12.9				16.7	
Level of Service (LOS)		A	A	A		A	A	A			B				C	
Approach Delay (s/veh)	0.0				0.7				12.9				16.7			
Approach LOS	A				A				B				C			

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HCS Two-Way Stop-Control Report

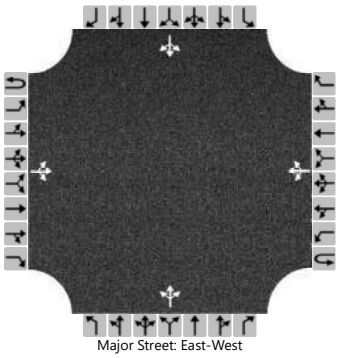
General Information

Analyst	T. Eastwood
Agency/Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2034
Time Analyzed	Weekday, PM Peak Hour
Intersection Orientation	East-West
Project Description	Copper Square TIS | Estimated Background Traffic

Site Information

Intersection	Rimrock Rd & 58th St W
Jurisdiction	City of Billings
East/West Street	Rimrock Road
North/South Street	58th Street West
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		1	382	16		61	631	8		9	2	29		8	1	1
Percent Heavy Vehicles (%)		3				2				2	3	2		11	3	3
Proportion Time Blocked																
Percent Grade (%)									3				0			
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.13				4.12				7.72	7.13	6.52		7.21	6.53	6.23
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.23				2.22				3.52	4.03	3.32		3.60	4.03	3.33

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		1				68					44				11	
Capacity, c (veh/h)		885				1118					262				124	
v/c Ratio		0.00				0.06					0.17				0.09	
95% Queue Length, Q_{95} (veh)		0.0				0.2					0.6				0.3	
95% Queue Length, Q_{95} (ft)		0.0				5.0					15.2				8.1	
Control Delay (s/veh)		9.1	0.0	0.0		8.4	0.8	0.8			21.5				36.9	
Level of Service (LOS)		A	A	A		A	A	A			C				E	
Approach Delay (s/veh)	0.0				1.5				21.5				36.9			
Approach LOS	A				A				C				E			

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	13	606	87	184	259	52	53	25	299	137	83	12
Future Volume (veh/h)	13	606	87	184	259	52	53	25	299	137	83	12
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width Adj.	1.04	1.00	1.00	1.04	1.00	1.00	1.04	1.04	1.00	1.00	1.00	1.00
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		0.97	0.99		0.98	1.00		0.96
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1772	1704	1676	1757	1689	1689	1613	1670	1647	1817	1831	1817
Adj Flow Rate, veh/h	16	730	105	222	312	63	64	30	360	165	100	14
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Percent Heavy Veh, %	3	3	5	7	7	7	11	7	4	3	2	3
Cap, veh/h	473	633	91	214	848	700	330	31	371	83	445	62
Arrive On Green	0.02	0.44	0.44	0.09	0.50	0.50	0.28	0.28	0.28	0.28	0.28	0.28
Sat Flow, veh/h	1687	1455	209	1673	1689	1394	1091	109	1302	966	1563	219
Grp Volume(v), veh/h	16	0	835	222	312	63	64	0	390	165	0	114
Grp Sat Flow(s),veh/h/ln	1687	0	1665	1673	1689	1394	1091	0	1411	966	0	1781
Q Serve(g_s), s	0.5	0.0	43.5	8.5	11.3	2.4	4.8	0.0	27.3	1.2	0.0	4.9
Cycle Q Clear(g_c), s	0.5	0.0	43.5	8.5	11.3	2.4	9.6	0.0	27.3	28.5	0.0	4.9
Prop In Lane	1.00		0.13	1.00		1.00	1.00		0.92	1.00		0.12
Lane Grp Cap(c), veh/h	473	0	724	214	848	700	330	0	402	83	0	508
V/C Ratio(X)	0.03	0.00	1.15	1.04	0.37	0.09	0.19	0.00	0.97	1.98	0.00	0.22
Avail Cap(c_a), veh/h	586	0	724	214	848	700	330	0	402	83	0	508
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	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	15.2	0.0	28.3	28.9	15.2	13.0	31.0	0.0	35.3	49.9	0.0	27.3
Incr Delay (d2), s/veh	0.0	0.0	84.3	71.3	0.3	0.1	0.3	0.0	36.9	480.1	0.0	0.2
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.2	0.0	32.5	6.5	4.0	0.7	1.2	0.0	12.9	13.2	0.0	2.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	15.2	0.0	112.5	100.1	15.5	13.0	31.3	0.0	72.2	530.0	0.0	27.5
LnGrp LOS	B		F	F	B	B	C		E	F		C
Approach Vol, veh/h		851			597			454			279	
Approach Delay, s/veh		110.7			46.7			66.5			324.7	
Approach LOS		F			D			E			F	

Timer - Assigned Phs		2	3	4		6	7	8				
Phs Duration (G+Y+Rc), s		35.0	15.0	50.0		35.0	8.3	56.7				
Change Period (Y+Rc), s		6.5	6.5	6.5		6.5	6.5	6.5				
Max Green Setting (Gmax), s		28.5	8.5	43.5		28.5	8.5	43.5				
Max Q Clear Time (g_c+I1), s		29.3	10.5	45.5		30.5	2.5	13.3				
Green Ext Time (p_c), s		0.0	0.0	0.0		0.0	0.0	1.8				

Intersection Summary	
HCM 7th Control Delay, s/veh	111.3
HCM 7th LOS	F

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	16	835	222	312	63	64	390	165	114
v/c Ratio	0.03	1.15	1.06	0.36	0.08	0.20	0.62	1.23	0.23
Control Delay (s/veh)	9.2	112.5	104.8	16.4	0.9	29.3	13.8	186.8	27.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	9.2	112.5	104.8	16.4	0.9	29.3	13.8	186.8	27.2
Queue Length 50th (ft)	4	~645	~111	100	0	34	58	~133	53
Queue Length 95th (ft)	12	#778	#242	190	3	66	129	#239	90
Internal Link Dist (ft)		2588		2504			2604		1914
Turn Bay Length (ft)	310		240		200	290		230	
Base Capacity (vph)	590	724	210	876	769	316	632	134	488
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.03	1.15	1.06	0.36	0.08	0.20	0.62	1.23	0.23

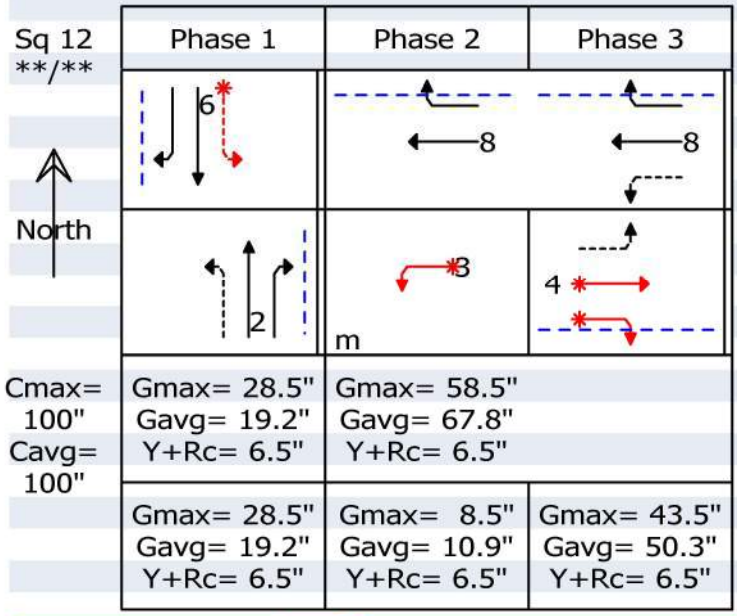
Intersection Summary

~ 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.

TEAPAC[Ver 9.50.02] - Capacity Analysis Summary (HCM 2016)

Intersection Averages for Int # 4 - Rimrock Rd & 54th St W
V/C 0.712 (Critical V/C 0.889) Control Delay 40.2 Level of Service D+



Lane Group	Width/ Lanes	g/C Max	g/C Avg	SatFlo	Capcty	Adj Volume	v/c	HCM Delay	L S	Queue Model 1
SB Approach								39.7	D+	
R+ T	12/1	0.285	0.192	1716	330	106	0.322	35.3	D+	102 ft
L	11/1	0.285	0.192	1245	275	165	0.601	42.5	*D+	167 ft
NB Approach								37.3	D+	
R+ T	14/1	0.285	0.192	1571	302	55	0.182	34.1	C	52 ft
L	14/1	0.285	0.192	1101	225	64	0.285	40.1	D+	70 ft
WB Approach								21.7	C+	
R	12/1			1365	925	1	0.001	5.2	A	0 ft
T	12/1	0.585	0.678	1648	1117	312	0.279	7.0	A	115 ft
L	14/1	0.085	0.109	1634	257	222	0.863	42.4	*D+	243 ft
EB Approach								52.5	D	
R+ T	12/1	0.435	0.503	1654	833	824	0.990	53.3	*D	777 ft
L	14/1	0.435	0.503	999	575	16	0.028	12.6	B+	9 ft

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	8	289	52	153	293	83	77	36	145	82	38	12
Future Volume (veh/h)	8	289	52	153	293	83	77	36	145	82	38	12
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width Adj.	1.04	1.00	1.00	1.04	1.00	1.00	1.04	1.04	1.00	1.00	1.00	1.00
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.98	1.00		0.98	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	1715	1690	1663	1728	1717	1731	1712	1741	1578	1803	1734	1831
Adj Flow Rate, veh/h	9	314	57	166	318	90	84	39	158	89	41	13
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	7	4	6	9	5	4	4	2	9	4	9	2
Cap, veh/h	519	725	132	536	988	825	309	65	261	186	276	87
Arrive On Green	0.01	0.52	0.52	0.07	0.58	0.58	0.22	0.22	0.22	0.22	0.22	0.22
Sat Flow, veh/h	1633	1392	253	1646	1717	1434	1234	295	1196	1142	1261	400
Grp Volume(v), veh/h	9	0	371	166	318	90	84	0	197	89	0	54
Grp Sat Flow(s),veh/h/ln	1633	0	1645	1646	1717	1434	1234	0	1491	1142	0	1661
Q Serve(g_s), s	0.3	0.0	14.0	4.5	9.7	2.8	5.9	0.0	11.9	7.6	0.0	2.6
Cycle Q Clear(g_c), s	0.3	0.0	14.0	4.5	9.7	2.8	8.5	0.0	11.9	19.5	0.0	2.6
Prop In Lane	1.00		0.15	1.00		1.00	1.00		0.80	1.00		0.24
Lane Grp Cap(c), veh/h	519	0	856	536	988	825	309	0	326	186	0	363
V/C Ratio(X)	0.02	0.00	0.43	0.31	0.32	0.11	0.27	0.00	0.60	0.48	0.00	0.15
Avail Cap(c_a), veh/h	640	0	856	568	988	825	391	0	425	262	0	473
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	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	11.1	0.0	14.8	10.4	11.1	9.6	35.0	0.0	35.2	44.0	0.0	31.6
Incr Delay (d2), s/veh	0.0	0.0	1.6	0.3	0.2	0.1	0.5	0.0	1.8	1.9	0.0	0.2
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	0.0	5.0	1.5	3.3	0.8	1.7	0.0	4.3	2.3	0.0	1.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	11.1	0.0	16.4	10.8	11.3	9.7	35.5	0.0	37.0	45.9	0.0	31.7
LnGrp LOS	B		B	B	B	A	D		D	D		C
Approach Vol, veh/h		380			574			281			143	
Approach Delay, s/veh		16.3			10.9			36.5			40.5	
Approach LOS		B			B			D			D	

Timer - Assigned Phs		2	3	4		6	7	8				
Phs Duration (G+Y+Rc), s		28.4	13.1	58.6		28.4	7.6	64.0				
Change Period (Y+Rc), s		6.5	6.5	6.5		6.5	6.5	6.5				
Max Green Setting (Gmax), s		28.5	8.5	43.5		28.5	8.5	43.5				
Max Q Clear Time (g_c+I1), s		13.9	6.5	16.0		21.5	2.3	11.7				
Green Ext Time (p_c), s		1.1	0.1	1.7		0.4	0.0	1.9				

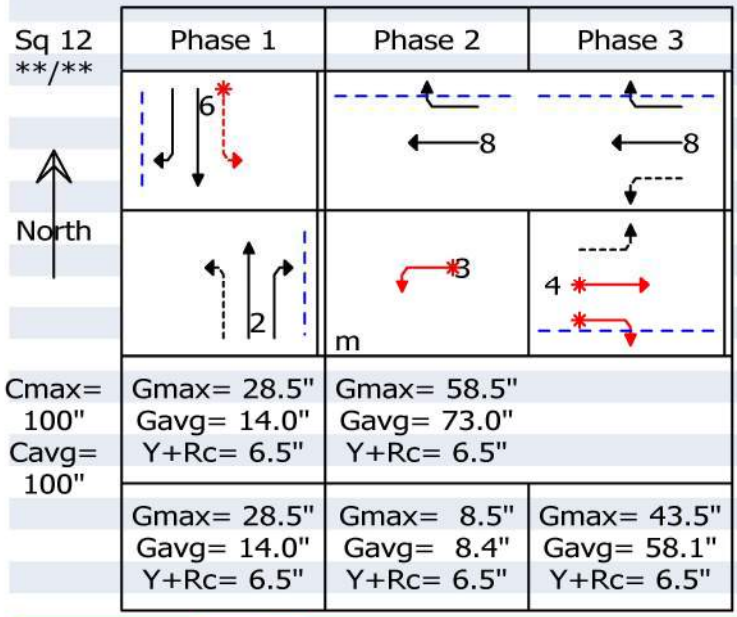
Intersection Summary	
HCM 7th Control Delay, s/veh	20.7
HCM 7th LOS	C

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	9	371	166	318	90	84	197	89	54
v/c Ratio	0.01	0.40	0.26	0.27	0.09	0.45	0.56	0.81	0.22
Control Delay (s/veh)	6.1	14.8	6.2	8.2	1.7	45.1	16.0	85.3	30.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	6.1	14.8	6.2	8.2	1.7	45.1	16.0	85.3	30.2
Queue Length 50th (ft)	1	122	30	61	0	51	22	57	25
Queue Length 95th (ft)	8	244	68	183	18	92	84	108	58
Internal Link Dist (ft)		2588		2504			2604		1914
Turn Bay Length (ft)	310		240		200	290		230	
Base Capacity (vph)	702	934	638	1170	1013	362	534	216	461
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.01	0.40	0.26	0.27	0.09	0.23	0.37	0.41	0.12

Intersection Summary

TEAPAC[Ver 9.50.02] - Capacity Analysis Summary (HCM 2016)

Intersection Averages for Int # 4 - Rimrock Rd & 54th St W
V/C 0.310 (Critical V/C 0.466) Control Delay 16.1 Level of Service B



Lane Group	Width/ Lanes	g/C Max	g/C Avg	SatFlo	Capcty	Adj Volume	v/c	HCM Delay	L S	Queue Model 1
SB Approach								41.4	D+	
R+ T	12/1	0.285	0.140	1630	228	42	0.184	38.4	D+	44 ft
L	11/1	0.285	0.140	1247	221	89	0.402	42.9	*D+	98 ft
NB Approach								41.4	D+	
R+ T	14/1	0.285	0.140	1746	244	40	0.164	38.2	D+	40 ft
L	14/1	0.285	0.140	1255	219	84	0.383	42.9	D+	92 ft
WB Approach								5.7	A	
R	12/1			1410	1029	1	0.001	3.6	A	0 ft
T	12/1	0.585	0.730	1680	1226	318	0.259	5.0	A	87 ft
L	14/1	0.085	0.084	1597	632	166	0.263	6.9	*A	51 ft
EB Approach								12.3	B+	
R+ T	12/1	0.435	0.581	1632	948	357	0.377	12.4	*B+	175 ft
L	14/1	0.435	0.581	957	628	9	0.014	8.9	A	4 ft

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	30	333	71	286	566	184	123	85	223	108	78	23
Future Volume (veh/h)	30	333	71	286	566	184	123	85	223	108	78	23
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width Adj.	1.04	1.00	1.00	1.04	1.00	1.00	1.04	1.04	1.00	1.00	1.00	1.00
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.98	0.99		0.98	1.00		0.96
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1800	1704	1717	1815	1759	1772	1741	1755	1660	1831	1845	1831
Adj Flow Rate, veh/h	32	358	76	308	609	198	132	91	240	116	84	25
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	1	3	2	3	2	1	2	1	3	2	1	2
Cap, veh/h	266	593	126	435	863	720	353	120	317	162	385	115
Arrive On Green	0.03	0.44	0.44	0.09	0.49	0.49	0.28	0.28	0.28	0.28	0.28	0.28
Sat Flow, veh/h	1714	1362	289	1728	1759	1469	1182	421	1111	1027	1350	402
Grp Volume(v), veh/h	32	0	434	308	609	198	132	0	331	116	0	109
Grp Sat Flow(s),veh/h/ln	1714	0	1652	1728	1759	1469	1182	0	1532	1027	0	1752
Q Serve(g_s), s	1.0	0.0	20.1	8.5	27.0	7.9	9.6	0.0	19.7	8.8	0.0	4.7
Cycle Q Clear(g_c), s	1.0	0.0	20.1	8.5	27.0	7.9	14.3	0.0	19.7	28.5	0.0	4.7
Prop In Lane	1.00		0.18	1.00		1.00	1.00		0.73	1.00		0.23
Lane Grp Cap(c), veh/h	266	0	718	435	863	720	353	0	437	162	0	499
V/C Ratio(X)	0.12	0.00	0.60	0.71	0.71	0.27	0.37	0.00	0.76	0.71	0.00	0.22
Avail Cap(c_a), veh/h	361	0	718	435	863	720	353	0	437	162	0	499
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	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	17.0	0.0	21.7	19.3	19.9	15.0	32.7	0.0	32.6	46.6	0.0	27.3
Incr Delay (d2), s/veh	0.2	0.0	3.7	5.2	2.6	0.2	0.7	0.0	7.5	13.9	0.0	0.2
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.4	0.0	7.9	4.2	10.5	2.5	2.7	0.0	7.8	3.5	0.0	2.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	17.2	0.0	25.4	24.5	22.5	15.2	33.4	0.0	40.1	60.5	0.0	27.5
LnGrp LOS	B		C	C	C	B	C		D	E		C
Approach Vol, veh/h		466			1115			463			225	
Approach Delay, s/veh		24.8			21.8			38.2			44.5	
Approach LOS		C			C			D			D	

Timer - Assigned Phs		2	3	4		6	7	8				
Phs Duration (G+Y+Rc), s		35.0	15.0	50.0		35.0	9.4	55.6				
Change Period (Y+Rc), s		6.5	6.5	6.5		6.5	6.5	6.5				
Max Green Setting (Gmax), s		28.5	8.5	43.5		28.5	8.5	43.5				
Max Q Clear Time (g_c+I1), s		21.7	10.5	22.1		30.5	3.0	29.0				
Green Ext Time (p_c), s		1.3	0.0	2.0		0.0	0.0	3.6				

Intersection Summary	
HCM 7th Control Delay, s/veh	28.0
HCM 7th LOS	C

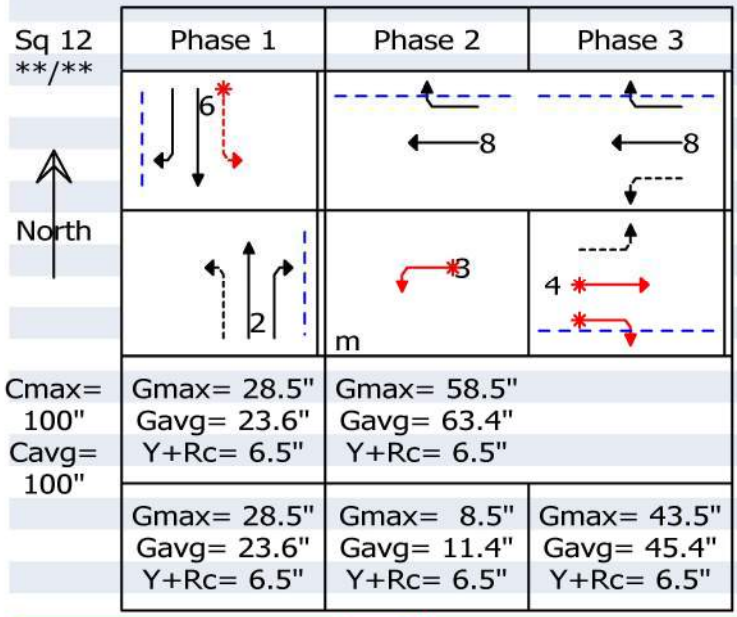
Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	32	434	308	609	198	132	331	116	109
v/c Ratio	0.08	0.55	0.60	0.62	0.22	0.49	0.72	1.07	0.28
Control Delay (s/veh)	9.2	22.5	16.1	21.9	3.6	38.4	29.2	146.5	27.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	9.2	22.5	16.1	21.9	3.6	38.4	29.2	146.5	27.4
Queue Length 50th (ft)	7	209	84	293	4	73	115	75	48
Queue Length 95th (ft)	21	309	146	482	44	125	203	#178	90
Internal Link Dist (ft)		2588		2504			2604		1914
Turn Bay Length (ft)	310		240		200	290		230	
Base Capacity (vph)	444	799	516	976	900	344	550	137	488
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.07	0.54	0.60	0.62	0.22	0.38	0.60	0.85	0.22

Intersection Summary

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

TEAPAC[Ver 9.50.02] - Capacity Analysis Summary (HCM 2016)

Intersection Averages for Int # 4 - Rimrock Rd & 54th St W
V/C 0.522 (Critical V/C 0.538) Control Delay 22.0 Level of Service C+



Lane Group	Width/ Lanes	g/C Max	g/C Avg	SatFlo	Capcty	Adj Volume	v/c	HCM Delay	L S	Queue Model 1
SB Approach								38.0	D+	
R+ T	12/1	0.285	0.236	1716	406	93	0.229	31.1	C	82 ft
L	11/1	0.285	0.236	1111	223	116	0.520	43.6	*D+	126 ft
NB Approach								35.4	D+	
R+ T	14/1	0.285	0.236	1618	382	188	0.492	34.0	C	164 ft
L	14/1	0.285	0.236	1215	306	132	0.431	37.5	D+	130 ft
WB Approach								13.3	B+	
R	12/1			1451	919	1	0.001	6.7	A	0 ft
T	12/1	0.585	0.634	1729	1096	609	0.556	12.4	B+	271 ft
L	14/1	0.085	0.114	1700	514	308	0.599	15.1	*B	144 ft
EB Approach								22.5	C+	
R+ T	12/1	0.435	0.454	1650	749	419	0.559	23.0	*C+	276 ft
L	14/1	0.435	0.454	774	408	32	0.078	17.1	B	21 ft

HCS Two-Way Stop-Control Report

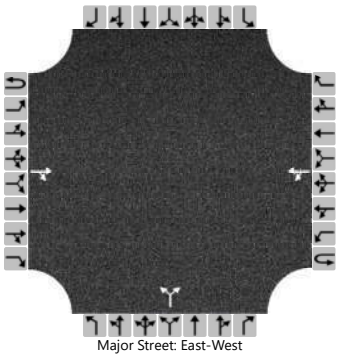
General Information

Analyst	T. Eastwood
Agency/Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2034
Time Analyzed	Weekday, AM Peak Hour
Intersection Orientation	East-West
Project Description	Copper Square TIS | Estimated Background Traffic

Site Information

Intersection	Rimrock Road & Road A
Jurisdiction	City of Billings
East/West Street	Rimrock Road
North/South Street	Road A
Peak Hour Factor	0.78
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	0	0
Configuration				TR		LT					LR					
Volume (veh/h)			640	35		32	227			22		21				
Percent Heavy Vehicles (%)						5				5		5				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.15				6.45		6.25				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.25				3.55		3.35				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						41					55					
Capacity, c (veh/h)						765					242					
v/c Ratio						0.05					0.23					
95% Queue Length, Q_{95} (veh)						0.2					0.9					
95% Queue Length, Q_{95} (ft)						5.2					23.4					
Control Delay (s/veh)						10.0	0.6				24.2					
Level of Service (LOS)						A	A				C					
Approach Delay (s/veh)					1.8				24.2							
Approach LOS					A				C							

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HCS Two-Way Stop-Control Report

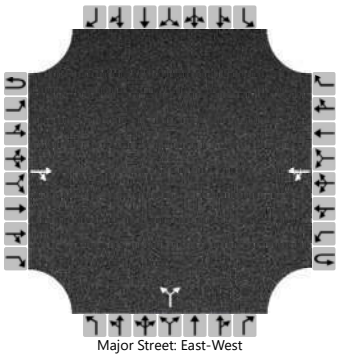
General Information

Analyst	T. Eastwood
Agency/Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2034
Time Analyzed	Weekday, Midday Peak Hour
Intersection Orientation	East-West
Project Description	Copper Square TIS | Estimated Background Traffic

Site Information

Intersection	Rimrock Road & Road A
Jurisdiction	City of Billings
East/West Street	Rimrock Road
North/South Street	Road A
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	0	0
Configuration				TR		LT					LR					
Volume (veh/h)			277	36		33	308			36		34				
Percent Heavy Vehicles (%)						5				5		5				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.15				6.45		6.25				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.25				3.55		3.35				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						37					78					
Capacity, c (veh/h)						1195					476					
v/c Ratio						0.03					0.16					
95% Queue Length, Q_{95} (veh)						0.1					0.6					
95% Queue Length, Q_{95} (ft)						2.6					15.6					
Control Delay (s/veh)						8.1	0.3				14.0					
Level of Service (LOS)						A	A				B					
Approach Delay (s/veh)					1.1				14.0							
Approach LOS					A				B							

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HCS Two-Way Stop-Control Report

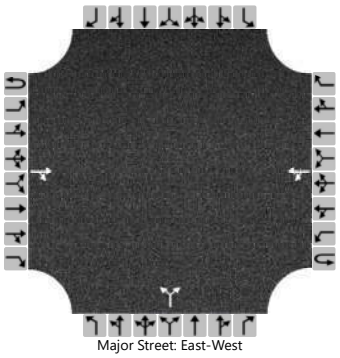
General Information

Analyst	T. Eastwood
Agency/Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2034
Time Analyzed	Weekday, PM Peak Hour
Intersection Orientation	East-West
Project Description	Copper Square TIS | Estimated Background Traffic

Site Information

Intersection	Rimrock Road & Road A
Jurisdiction	City of Billings
East/West Street	Rimrock Road
North/South Street	Road A
Peak Hour Factor	0.87
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	0	0
Configuration				TR		LT					LR					
Volume (veh/h)			367	36		35	589			31		30				
Percent Heavy Vehicles (%)						5				5		5				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.15				6.45		6.25				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.25				3.55		3.35				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						40					70					
Capacity, c (veh/h)						1082					287					
v/c Ratio						0.04					0.24					
95% Queue Length, Q_{95} (veh)						0.1					0.9					
95% Queue Length, Q_{95} (ft)						2.6					23.4					
Control Delay (s/veh)						8.5	0.5				21.6					
Level of Service (LOS)						A	A				C					
Approach Delay (s/veh)					0.9				21.6							
Approach LOS					A				C							

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HCS Two-Way Stop-Control Report

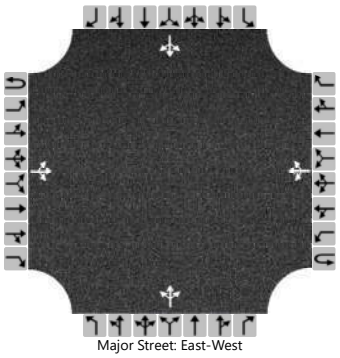
General Information

Analyst	T. Eastwood
Agency/Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2034
Time Analyzed	Weekday, AM Peak Hour
Intersection Orientation	East-West
Project Description	Copper Square TIS | Estimated Background Traffic

Site Information

Intersection	Road B & Road C
Jurisdiction	City of Billings
East/West Street	Road C
North/South Street	Road B
Peak Hour Factor	0.80
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		25	10	5		0	6	0		3	0	0		0	0	18
Percent Heavy Vehicles (%)		5				5				5	5	5		5	5	5
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.15				4.15				7.15	6.55	6.25		7.15	6.55	6.25
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.25				2.25				3.55	4.05	3.35		3.55	4.05	3.35

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		31				0					4				23	
Capacity, c (veh/h)		1593				1578					843				1066	
v/c Ratio		0.02				0.00					0.00				0.02	
95% Queue Length, Q_{95} (veh)		0.1				0.0					0.0				0.1	
95% Queue Length, Q_{95} (ft)		2.5				0.0					0.0				2.6	
Control Delay (s/veh)		7.3	0.1	0.1		7.3	0.0	0.0			9.3				8.4	
Level of Service (LOS)		A	A	A		A	A	A			A				A	
Approach Delay (s/veh)	4.6				0.0				9.3				8.4			
Approach LOS	A				A				A				A			

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HCS Two-Way Stop-Control Report

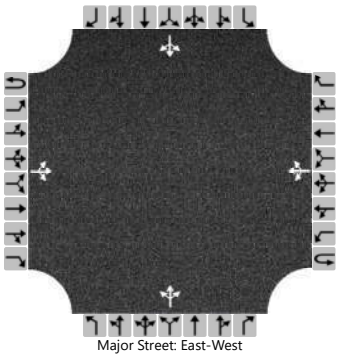
General Information

Analyst	T. Eastwood
Agency/Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2034
Time Analyzed	Weekday, Midday Peak Hour
Intersection Orientation	East-West
Project Description	Copper Square TIS | Estimated Background Traffic

Site Information

Intersection	Road B & Road C
Jurisdiction	City of Billings
East/West Street	Road C
North/South Street	Road B
Peak Hour Factor	0.80
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		29	11	3		0	11	0		4	0	0		0	0	29
Percent Heavy Vehicles (%)		5				5				5	5	5		5	5	5
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.15				4.15				7.15	6.55	6.25		7.15	6.55	6.25
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.25				2.25				3.55	4.05	3.35		3.55	4.05	3.35

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		36				0					5				36	
Capacity, c (veh/h)		1585				1580					800				1058	
v/c Ratio		0.02				0.00					0.01				0.03	
95% Queue Length, Q_{95} (veh)		0.1				0.0					0.0				0.1	
95% Queue Length, Q_{95} (ft)		2.5				0.0					0.0				2.6	
Control Delay (s/veh)		7.3	0.2	0.2		7.3	0.0	0.0			9.5				8.5	
Level of Service (LOS)		A	A	A		A	A	A			A				A	
Approach Delay (s/veh)	5.0				0.0				9.5				8.5			
Approach LOS	A				A				A				A			

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HCS Two-Way Stop-Control Report

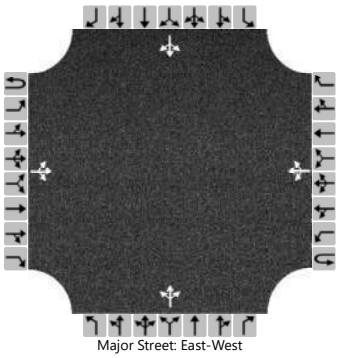
General Information

Analyst	T. Eastwood
Agency/Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2034
Time Analyzed	Weekday, PM Peak Hour
Intersection Orientation	East-West
Project Description	Copper Square TIS | Estimated Background Traffic

Site Information

Intersection	Road B & Road C
Jurisdiction	City of Billings
East/West Street	Road C
North/South Street	Road B
Peak Hour Factor	0.80
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		25	10	6		0	8	0		6	0	0		0	0	20
Percent Heavy Vehicles (%)		5				5				5	5	5		5	5	5
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.15				4.15				7.15	6.55	6.25		7.15	6.55	6.25
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.25				2.25				3.55	4.05	3.35		3.55	4.05	3.35

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		31				0					8				25	
Capacity, c (veh/h)		1590				1577					835				1063	
v/c Ratio		0.02				0.00					0.01				0.02	
95% Queue Length, Q_{95} (veh)		0.1				0.0					0.0				0.1	
95% Queue Length, Q_{95} (ft)		2.5				0.0					0.0				2.6	
Control Delay (s/veh)		7.3	0.1	0.1		7.3	0.0	0.0			9.3				8.5	
Level of Service (LOS)		A	A	A		A	A	A			A				A	
Approach Delay (s/veh)	4.5				0.0				9.3				8.5			
Approach LOS	A				A				A				A			

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Appendix E

IN THIS SECTION:

Estimated 2034 Total Traffic

HCS Two-Way Stop-Control Report

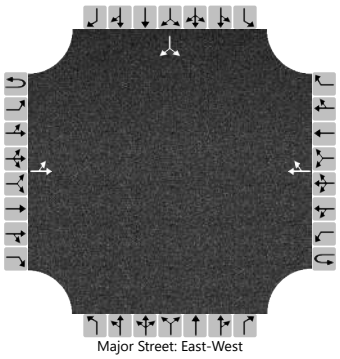
General Information

Analyst	T. Eastwood
Agency/Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2034
Time Analyzed	Weekday, AM Peak Hour
Intersection Orientation	East-West
Project Description	Copper Square TIS | Estimated Total Traffic

Site Information

Intersection	Grand & 62nd
Jurisdiction	City of Billings
East/West Street	Grand Avenue
North/South Street	62nd Street West
Peak Hour Factor	0.85
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	0	0		0	1	0
Configuration		LT						TR							LR	
Volume (veh/h)		69	280				153	63						249		102
Percent Heavy Vehicles (%)		17												2		6
Proportion Time Blocked																
Percent Grade (%)														0		
Right Turn Channelized																
Median Type | Storage																

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.1		6.2
Critical Headway (sec)		4.27												6.42		6.26
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.35												3.52		3.35

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		81													413	
Capacity, c (veh/h)		1228													438	
v/c Ratio		0.07													0.94	
95% Queue Length, Q_{95} (veh)		0.2													11.0	
95% Queue Length, Q_{95} (ft)		5.7													282.0	
Control Delay (s/veh)		8.1	0.7												60.9	
Level of Service (LOS)		A	A												F	
Approach Delay (s/veh)		2.1												60.9		
Approach LOS		A												F		

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HCS Two-Way Stop-Control Report

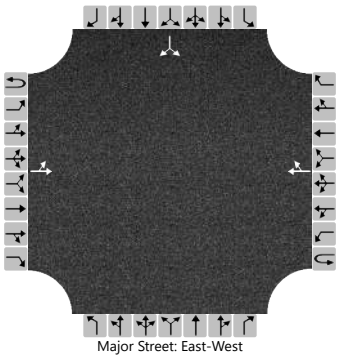
General Information

Analyst	T. Eastwood
Agency/Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2034
Time Analyzed	Weekday, Midday Peak Hour
Intersection Orientation	East-West
Project Description	Copper Square TIS | Estimated Total Traffic

Site Information

Intersection	Grand & 62nd
Jurisdiction	City of Billings
East/West Street	Grand Avenue
North/South Street	62nd Street West
Peak Hour Factor	0.93
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	0	0		0	1	0
Configuration		LT						TR							LR	
Volume (veh/h)		60	178				185	88						103		49
Percent Heavy Vehicles (%)		8												5		10
Proportion Time Blocked																
Percent Grade (%)														0		
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.1		6.2
Critical Headway (sec)		4.18												6.45		6.30
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.27												3.55		3.39

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		65													163	
Capacity, c (veh/h)		1234													522	
v/c Ratio		0.05													0.31	
95% Queue Length, Q_{95} (veh)		0.2													1.3	
95% Queue Length, Q_{95} (ft)		5.3													34.2	
Control Delay (s/veh)		8.1	0.5												15.0	
Level of Service (LOS)		A	A												C	
Approach Delay (s/veh)	2.4												15.0			
Approach LOS	A												C			

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HCS Two-Way Stop-Control Report

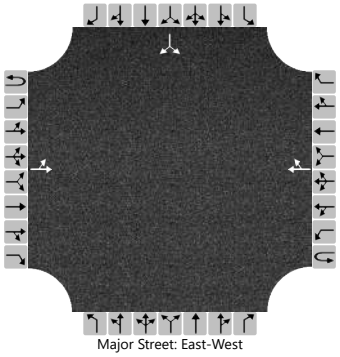
General Information

Analyst	T. Eastwood
Agency/Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2034
Time Analyzed	Weekday, PM Peak Hour
Intersection Orientation	East-West
Project Description	Copper Square TIS | Estimated Total Traffic

Site Information

Intersection	Grand & 62nd
Jurisdiction	City of Billings
East/West Street	Grand Avenue
North/South Street	62nd Street West
Peak Hour Factor	0.91
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	0	0		0	1	0
Configuration		LT						TR							LR	
Volume (veh/h)		93	244				273	177						148		64
Percent Heavy Vehicles (%)		4												3		4
Proportion Time Blocked																
Percent Grade (%)														0		
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.1		6.2
Critical Headway (sec)		4.14												6.43		6.24
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.24												3.53		3.34

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		102													233	
Capacity, c (veh/h)		1059													342	
v/c Ratio		0.10													0.68	
95% Queue Length, Q_{95} (veh)		0.3													4.7	
95% Queue Length, Q_{95} (ft)		7.7													120.6	
Control Delay (s/veh)		8.8	1.0												35.2	
Level of Service (LOS)		A	A												E	
Approach Delay (s/veh)	3.1												35.2			
Approach LOS	A												E			

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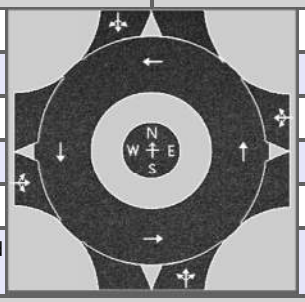
HCS Roundabouts Report

General Information

Analyst	T. Eastwood
Agency or Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2034
Time Analyzed	Weekday, AM Peak Hour
Project Description	Copper Square TIS | Estimated Total Traffic



Site Information

Intersection	Rimrock & 62nd St W
E/W Street Name	Rimrock Road
N/S Street Name	62nd Street West / Molt Road
Analysis Time Period, hrs	0.25
Peak Hour Factor	0.78
Jurisdiction	City of Billings

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0
Lane Assignment			LTR				LTR				LTR				LTR	
Volume (V), veh/h	0	17	313	118	0	65	104	90	0	31	38	45	0	331	155	8
Percent Heavy Vehicles, %	0	7	2	2	0	6	6	8	0	10	15	7	0	3	3	2
Flow Rate (v_{PCE}), pc/h	0	23	409	154	0	88	141	125	0	44	56	62	0	437	205	10
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				1				1			
Pedestrians Crossing, p/h	0				0				0				0			
Proportion of CAVs, %	0															

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway, s		4.9763			4.9763			4.9763			4.9763	
Follow-Up Headway, s		2.6087			2.6087			2.6087			2.6087	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h		586			354			162			652	
Entry Volume, veh/h		573			332			147			633	
Circulating Flow (v_c), pc/h	730			123			869			273		
Exiting Flow (v_{ex}), pc/h	908			195			204			447		
Capacity (c_{pce}), pc/h		655			1217			569			1045	
Capacity (c), veh/h		641			1141			515			1014	
v/c Ratio (x)		0.89			0.29			0.28			0.62	

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		39.4			5.9			11.2			12.4	
Lane LOS		E			A			B			B	
95% Queue Length, Q_{95} (veh)		11.0			1.2			1.2			4.5	
95% Queue Length, Q_{95} (ft)		279.8			31.6			32.5			115.2	
Approach Delay, s/veh | LOS	39.4	E		5.9	A		11.2	B		12.4	B	
Intersection Delay, s/veh | LOS	20.2						C					

HCS Roundabouts Report

General Information

Analyst	T. Eastwood
Agency or Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2034
Time Analyzed	Weekday, Midday Peak Hour
Project Description	Copper Square TIS | Estimated Total Traffic

Site Information

Intersection	Rimrock & 62nd St W
E/W Street Name	Rimrock Road
N/S Street Name	62nd Street West / Molt Road
Analysis Time Period, hrs	0.25
Peak Hour Factor	0.92
Jurisdiction	City of Billings

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0
Lane Assignment			LTR				LTR				LTR				LTR	
Volume (V), veh/h	0	10	149	49	0	38	153	171	0	50	55	33	0	145	60	9
Percent Heavy Vehicles, %	0	2	4	3	0	7	3	5	0	2	6	6	0	7	4	7
Flow Rate (v_{PCE}), pc/h	0	11	168	55	0	44	171	195	0	55	63	38	0	169	68	10
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				1				1			
Pedestrians Crossing, p/h	0				0				0				0			
Proportion of CAVs, %	0															

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway, s		4.9763			4.9763			4.9763			4.9763	
Follow-Up Headway, s		2.6087			2.6087			2.6087			2.6087	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h		234			410			156			247	
Entry Volume, veh/h		226			393			149			233	
Circulating Flow (v_c), pc/h	281			129			348			270		
Exiting Flow (v_{ex}), pc/h	375			236			269			167		
Capacity (c_{pce}), pc/h		1036			1210			968			1048	
Capacity (c), veh/h		999			1159			926			987	
v/c Ratio (x)		0.23			0.34			0.16			0.24	

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		5.8			6.4			5.4			5.9	
Lane LOS		A			A			A			A	
95% Queue Length, Q_{95} (veh)		0.9			1.5			0.6			0.9	
95% Queue Length, Q_{95} (ft)		23.2			38.8			15.5			23.6	
Approach Delay, s/veh | LOS	5.8	A		6.4	A		5.4	A		5.9	A	
Intersection Delay, s/veh | LOS	6.0						A					

HCS Roundabouts Report

General Information

Analyst	T. Eastwood
Agency or Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2034
Time Analyzed	Weekday, PM Peak Hour
Project Description	Copper Square TIS | Estimated Total Traffic

Site Information

Intersection	Rimrock & 62nd St W
E/W Street Name	Rimrock Road
N/S Street Name	62nd Street West / Molt Road
Analysis Time Period, hrs	0.25
Peak Hour Factor	0.88
Jurisdiction	City of Billings

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0
Lane Assignment			LTR				LTR				LTR				LTR	
Volume (V), veh/h	0	11	194	69	3	51	291	292	0	102	108	62	0	159	98	17
Percent Heavy Vehicles, %	0	2	3	1	0	4	2	1	0	1	1	2	0	4	3	2
Flow Rate (v_{PCE}), pc/h	0	13	227	79	3	60	337	335	0	117	124	72	0	188	115	20
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				1				1			
Pedestrians Crossing, p/h	0				0				1				0			
Proportion of CAVs, %	0															

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway, s		4.9763			4.9763			4.9763			4.9763	
Follow-Up Headway, s		2.6087			2.6087			2.6087			2.6087	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h		319			735			313			323	
Entry Volume, veh/h		311			723			309			312	
Circulating Flow (v_c), pc/h	366			254			431			517		
Exiting Flow (v_{ex}), pc/h	490			474			472			254		
Capacity (c_{pce}), pc/h		950			1065			889			814	
Capacity (c), veh/h		927			1047			878			787	
v/c Ratio (x)		0.34			0.69			0.35			0.40	

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		7.5			14.2			8.1			9.5	
Lane LOS		A			B			A			A	
95% Queue Length, Q_{95} (veh)		1.5			5.8			1.6			1.9	
95% Queue Length, Q_{95} (ft)		38.2			147.0			40.4			48.8	
Approach Delay, s/veh | LOS	7.5	A		14.2	B		8.1	A		9.5	A	
Intersection Delay, s/veh | LOS	10.9						B					

HCS Two-Way Stop-Control Report

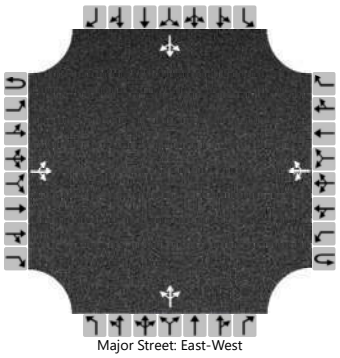
General Information

Analyst	T. Eastwood
Agency/Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2034
Time Analyzed	Weekday, AM Peak Hour
Intersection Orientation	East-West
Project Description	Copper Square TIS | Estimated Total Traffic

Site Information

Intersection	Rimrock Rd & 58th St W
Jurisdiction	City of Billings
East/West Street	Rimrock Road
North/South Street	58th Street West
Peak Hour Factor	0.79
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		1	644	8		22	303	2		13	1	41		7	2	1
Percent Heavy Vehicles (%)		3				2				26	3	2		3	3	3
Proportion Time Blocked																
Percent Grade (%)									3				0			
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.13				4.12				7.96	7.13	6.52		7.13	6.53	6.23
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.23				2.22				3.73	4.03	3.32		3.53	4.03	3.33

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		1				28					70				13	
Capacity, c (veh/h)		1167				805					215				131	
v/c Ratio		0.00				0.03					0.32				0.10	
95% Queue Length, Q_{95} (veh)		0.0				0.1					1.3				0.3	
95% Queue Length, Q_{95} (ft)		0.0				2.5					34.5				7.7	
Control Delay (s/veh)		8.1	0.0	0.0		9.6	0.4	0.4			29.6				35.4	
Level of Service (LOS)		A	A	A		A	A	A			D				E	
Approach Delay (s/veh)	0.0				1.0				29.6				35.4			
Approach LOS	A				A				D				E			

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HCS Two-Way Stop-Control Report

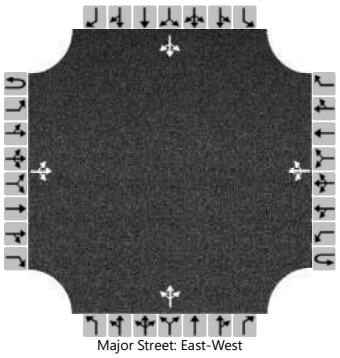
General Information

Analyst	T. Eastwood
Agency/Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2034
Time Analyzed	Weekday, Midday Peak Hour
Intersection Orientation	East-West
Project Description	Copper Square TIS | Estimated Total Traffic

Site Information

Intersection	Rimrock Rd & 58th St W
Jurisdiction	City of Billings
East/West Street	Rimrock Road
North/South Street	58th Street West
Peak Hour Factor	0.91
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		0	325	10		21	349	4		9	1	26		7	1	1
Percent Heavy Vehicles (%)		0				2				2	3	2		1	3	3
Proportion Time Blocked																
Percent Grade (%)									3				0			
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.10				4.12				7.72	7.13	6.52		7.11	6.53	6.23
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.20				2.22				3.52	4.03	3.32		3.51	4.03	3.33

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		0				23					40				10	
Capacity, c (veh/h)		1182				1190					464				301	
v/c Ratio		0.00				0.02					0.09				0.03	
95% Queue Length, Q_{95} (veh)		0.0				0.1					0.3				0.1	
95% Queue Length, Q_{95} (ft)		0.0				2.5					7.6				2.5	
Control Delay (s/veh)		8.0	0.0	0.0		8.1	0.2	0.2			13.5				17.3	
Level of Service (LOS)		A	A	A		A	A	A			B				C	
Approach Delay (s/veh)	0.0				0.6				13.5				17.3			
Approach LOS	A				A				B				C			

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HCS Two-Way Stop-Control Report

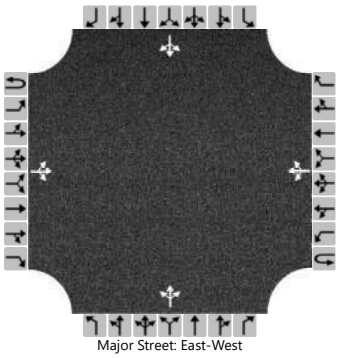
General Information

Analyst	T. Eastwood
Agency/Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2034
Time Analyzed	Weekday, PM Peak Hour
Intersection Orientation	East-West
Project Description	Copper Square TIS | Estimated Total Traffic

Site Information

Intersection	Rimrock Rd & 58th St W
Jurisdiction	City of Billings
East/West Street	Rimrock Road
North/South Street	58th Street West
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		1	395	17		61	645	8		10	2	29		8	1	1
Percent Heavy Vehicles (%)		3				1				3	3	2		11	3	3
Proportion Time Blocked																
Percent Grade (%)									3				0			
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.13				4.11				7.73	7.13	6.52		7.21	6.53	6.23
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.23				2.21				3.53	4.03	3.32		3.60	4.03	3.33

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		1				68					46				11	
Capacity, c (veh/h)		873				1108					241				118	
v/c Ratio		0.00				0.06					0.19				0.09	
95% Queue Length, Q_{95} (veh)		0.0				0.2					0.7				0.3	
95% Queue Length, Q_{95} (ft)		0.0				5.0					17.8				8.1	
Control Delay (s/veh)		9.1	0.0	0.0		8.5	0.9	0.9			23.4				38.8	
Level of Service (LOS)		A	A	A		A	A	A			C				E	
Approach Delay (s/veh)	0.0				1.5				23.4				38.8			
Approach LOS	A				A				C				E			

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	14	611	88	184	271	52	55	25	299	137	83	11
Future Volume (veh/h)	14	611	88	184	271	52	55	25	299	137	83	11
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width Adj.	1.04	1.00	1.00	1.04	1.00	1.00	1.04	1.04	1.00	1.00	1.00	1.00
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		0.97	0.99		0.98	1.00		0.96
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1772	1704	1676	1757	1689	1689	1613	1670	1647	1817	1831	1831
Adj Flow Rate, veh/h	17	736	106	222	327	63	66	30	360	165	100	13
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Percent Heavy Veh, %	3	3	5	7	7	7	11	7	4	3	2	2
Cap, veh/h	462	633	91	214	847	699	331	31	371	83	450	59
Arrive On Green	0.02	0.44	0.44	0.09	0.50	0.50	0.28	0.28	0.28	0.28	0.28	0.28
Sat Flow, veh/h	1687	1455	210	1673	1689	1394	1092	109	1302	966	1579	205
Grp Volume(v), veh/h	17	0	842	222	327	63	66	0	390	165	0	113
Grp Sat Flow(s),veh/h/ln	1687	0	1664	1673	1689	1394	1092	0	1411	966	0	1784
Q Serve(g_s), s	0.6	0.0	43.5	8.5	12.0	2.4	4.9	0.0	27.3	1.2	0.0	4.8
Cycle Q Clear(g_c), s	0.6	0.0	43.5	8.5	12.0	2.4	9.7	0.0	27.3	28.5	0.0	4.8
Prop In Lane	1.00		0.13	1.00		1.00	1.00		0.92	1.00		0.12
Lane Grp Cap(c), veh/h	462	0	724	214	847	699	331	0	402	83	0	509
V/C Ratio(X)	0.04	0.00	1.16	1.04	0.39	0.09	0.20	0.00	0.97	1.98	0.00	0.22
Avail Cap(c_a), veh/h	574	0	724	214	847	699	331	0	402	83	0	509
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	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	15.2	0.0	28.3	28.9	15.4	13.0	31.0	0.0	35.3	49.9	0.0	27.3
Incr Delay (d2), s/veh	0.0	0.0	88.1	71.3	0.3	0.1	0.3	0.0	36.9	480.1	0.0	0.2
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.2	0.0	33.3	6.5	4.2	0.7	1.3	0.0	12.9	13.2	0.0	2.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	15.2	0.0	116.3	100.1	15.7	13.1	31.3	0.0	72.2	530.0	0.0	27.5
LnGrp LOS	B		F	F	B	B	C		E	F		C
Approach Vol, veh/h		859			612			456			278	
Approach Delay, s/veh		114.3			46.1			66.3			325.7	
Approach LOS		F			D			E			F	

Timer - Assigned Phs		2	3	4		6	7	8				
Phs Duration (G+Y+Rc), s		35.0	15.0	50.0		35.0	8.4	56.6				
Change Period (Y+Rc), s		6.5	6.5	6.5		6.5	6.5	6.5				
Max Green Setting (Gmax), s		28.5	8.5	43.5		28.5	8.5	43.5				
Max Q Clear Time (g_c+I1), s		29.3	10.5	45.5		30.5	2.6	14.0				
Green Ext Time (p_c), s		0.0	0.0	0.0		0.0	0.0	1.8				

Intersection Summary												
HCM 7th Control Delay, s/veh			112.1									
HCM 7th LOS			F									

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	17	842	222	327	63	66	390	165	113
v/c Ratio	0.03	1.16	1.06	0.37	0.08	0.21	0.62	1.23	0.23
Control Delay (s/veh)	9.3	116.3	105.1	16.6	0.9	29.4	14.0	186.8	27.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	9.3	116.3	105.1	16.6	0.9	29.4	14.0	186.8	27.2
Queue Length 50th (ft)	4	~655	~111	106	0	35	59	~133	52
Queue Length 95th (ft)	12	#786	#242	201	3	67	131	#239	90
Internal Link Dist (ft)		2588		2504			2604		1914
Turn Bay Length (ft)	310		240		200	290		230	
Base Capacity (vph)	584	724	209	876	769	316	630	134	490
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.03	1.16	1.06	0.37	0.08	0.21	0.62	1.23	0.23

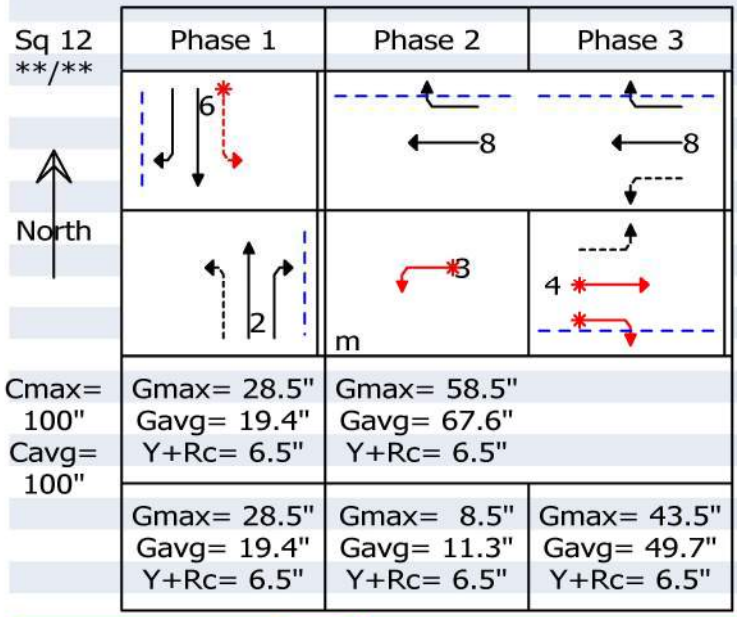
Intersection Summary

~ 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.

TEAPAC[Ver 9.50.02] - Capacity Analysis Summary (HCM 2016)

Intersection Averages for Int # 4 - Rimrock Rd & 54th St W
V/C 0.720 (Critical V/C 0.895) Control Delay 42.8 Level of Service D+



Lane Group	Width/ Lanes	g/C Max	g/C Avg	SatFlo	Capcty	Adj Volume	v/c	HCM Delay	L S	Queue Model 1
SB Approach								39.6	D+	
R+ T	12/1	0.285	0.194	1720	334	105	0.314	35.1	D+	100 ft
L	11/1	0.285	0.194	1241	275	165	0.601	42.5	*D+	167 ft
NB Approach								37.1	D+	
R+ T	14/1	0.285	0.194	1565	304	58	0.191	34.0	C	55 ft
L	14/1	0.285	0.194	1104	228	66	0.289	39.9	D+	72 ft
WB Approach								22.1	C+	
R	12/1			1365	923	1	0.001	5.3	A	0 ft
T	12/1	0.585	0.676	1650	1115	327	0.293	7.2	A	122 ft
L	14/1	0.085	0.113	1634	257	222	0.863	44.1	*D+	245 ft
EB Approach								58.2	E+	
R+ T	12/1	0.435	0.497	1653	823	831	1.010	59.1	*F	822 ft
L	14/1	0.435	0.497	985	562	17	0.030	12.9	B+	9 ft

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	9	303	53	153	305	83	79	36	145	82	38	12
Future Volume (veh/h)	9	303	53	153	305	83	79	36	145	82	38	12
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width Adj.	1.04	1.00	1.00	1.04	1.00	1.00	1.04	1.04	1.00	1.00	1.00	1.00
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.98	1.00		0.98	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	1715	1690	1663	1728	1717	1731	1712	1741	1578	1803	1734	1831
Adj Flow Rate, veh/h	10	329	58	166	332	90	86	39	158	89	41	13
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	7	4	6	9	5	4	4	2	9	4	9	2
Cap, veh/h	510	728	128	524	986	823	309	65	261	186	276	87
Arrive On Green	0.01	0.52	0.52	0.07	0.57	0.57	0.22	0.22	0.22	0.22	0.22	0.22
Sat Flow, veh/h	1633	1399	247	1646	1717	1434	1234	295	1196	1142	1261	400
Grp Volume(v), veh/h	10	0	387	166	332	90	86	0	197	89	0	54
Grp Sat Flow(s),veh/h/ln	1633	0	1646	1646	1717	1434	1234	0	1491	1142	0	1661
Q Serve(g_s), s	0.3	0.0	14.7	4.5	10.2	2.9	6.1	0.0	11.9	7.6	0.0	2.6
Cycle Q Clear(g_c), s	0.3	0.0	14.7	4.5	10.2	2.9	8.7	0.0	11.9	19.5	0.0	2.6
Prop In Lane	1.00		0.15	1.00		1.00	1.00		0.80	1.00		0.24
Lane Grp Cap(c), veh/h	510	0	857	524	986	823	309	0	326	186	0	363
V/C Ratio(X)	0.02	0.00	0.45	0.32	0.34	0.11	0.28	0.00	0.60	0.48	0.00	0.15
Avail Cap(c_a), veh/h	629	0	857	555	986	823	391	0	425	262	0	473
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	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	11.1	0.0	15.0	10.6	11.2	9.7	35.1	0.0	35.2	44.0	0.0	31.6
Incr Delay (d2), s/veh	0.0	0.0	1.7	0.3	0.2	0.1	0.5	0.0	1.8	1.9	0.0	0.2
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	0.0	5.3	1.5	3.4	0.8	1.8	0.0	4.3	2.3	0.0	1.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	11.1	0.0	16.7	10.9	11.4	9.7	35.5	0.0	37.0	45.9	0.0	31.7
LnGrp LOS	B		B	B	B	A	D		D	D		C
Approach Vol, veh/h		397			588			283			143	
Approach Delay, s/veh		16.6			11.0			36.5			40.5	
Approach LOS		B			B			D			D	

Timer - Assigned Phs	2	3	4		6	7	8					
Phs Duration (G+Y+Rc), s	28.4	13.1	58.6		28.4	7.7	63.9					
Change Period (Y+Rc), s	6.5	6.5	6.5		6.5	6.5	6.5					
Max Green Setting (Gmax), s	28.5	8.5	43.5		28.5	8.5	43.5					
Max Q Clear Time (g_c+I1), s	13.9	6.5	16.7		21.5	2.3	12.2					
Green Ext Time (p_c), s	1.1	0.1	1.8		0.4	0.0	2.0					

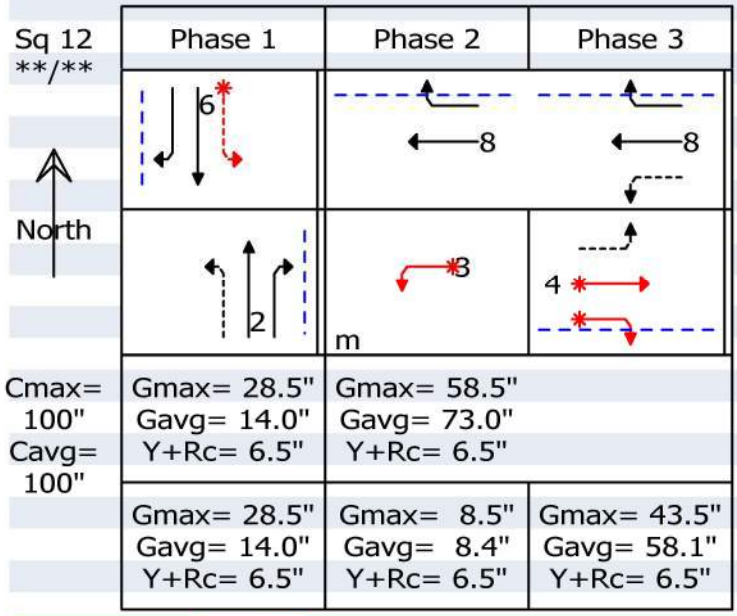
Intersection Summary	
HCM 7th Control Delay, s/veh	20.7
HCM 7th LOS	C

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	10	387	166	332	90	86	197	89	54
v/c Ratio	0.02	0.41	0.27	0.28	0.09	0.46	0.56	0.81	0.22
Control Delay (s/veh)	6.1	15.1	6.3	8.4	1.7	45.5	16.0	85.3	30.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	6.1	15.1	6.3	8.4	1.7	45.5	16.0	85.3	30.2
Queue Length 50th (ft)	2	129	30	65	0	53	22	57	25
Queue Length 95th (ft)	8	258	68	192	18	94	84	108	58
Internal Link Dist (ft)		2588		2504			2604		1914
Turn Bay Length (ft)	310		240		200	290		230	
Base Capacity (vph)	694	935	624	1170	1013	362	534	216	461
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.01	0.41	0.27	0.28	0.09	0.24	0.37	0.41	0.12

Intersection Summary

TEAPAC[Ver 9.50.02] - Capacity Analysis Summary (HCM 2016)

Intersection Averages for Int # 4 - Rimrock Rd & 54th St W
V/C 0.322 (Critical V/C 0.480) Control Delay 16.1 Level of Service B



Lane Group	Width/ Lanes	g/C Max	g/C Avg	SatFlo	Capcty	Adj Volume	v/c	HCM Delay	L S	Queue Model 1
SB Approach								41.4	D+	
R+ T	12/1	0.285	0.140	1630	228	42	0.184	38.4	D+	44 ft
L	11/1	0.285	0.140	1247	221	89	0.402	42.9	*D+	98 ft
NB Approach								41.5	D+	
R+ T	14/1	0.285	0.140	1746	244	40	0.164	38.2	D+	40 ft
L	14/1	0.285	0.140	1255	219	86	0.393	43.0	D+	94 ft
WB Approach								5.7	A	
R	12/1			1410	1029	1	0.001	3.6	A	0 ft
T	12/1	0.585	0.730	1680	1226	332	0.271	5.1	A	92 ft
L	14/1	0.085	0.084	1597	618	166	0.269	7.1	*A	51 ft
EB Approach								12.5	B+	
R+ T	12/1	0.435	0.581	1631	948	375	0.396	12.6	*B+	185 ft
L	14/1	0.435	0.581	948	622	10	0.016	8.9	A	4 ft

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	29	345	73	286	578	184	124	85	223	108	78	24
Future Volume (veh/h)	29	345	73	286	578	184	124	85	223	108	78	24
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width Adj.	1.04	1.00	1.00	1.04	1.00	1.00	1.04	1.04	1.00	1.00	1.00	1.00
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.98	0.99		0.98	1.00		0.96
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1800	1704	1717	1815	1759	1772	1741	1755	1660	1831	1845	1831
Adj Flow Rate, veh/h	31	371	78	308	622	198	133	91	240	116	84	26
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	1	3	2	3	2	1	2	1	3	2	1	2
Cap, veh/h	258	594	125	424	864	721	352	120	317	162	381	118
Arrive On Green	0.03	0.44	0.44	0.09	0.49	0.49	0.28	0.28	0.28	0.28	0.28	0.28
Sat Flow, veh/h	1714	1365	287	1728	1759	1469	1181	421	1111	1027	1336	414
Grp Volume(v), veh/h	31	0	449	308	622	198	133	0	331	116	0	110
Grp Sat Flow(s),veh/h/ln	1714	0	1652	1728	1759	1469	1181	0	1532	1027	0	1750
Q Serve(g_s), s	1.0	0.0	21.1	8.5	27.8	7.9	9.7	0.0	19.7	8.8	0.0	4.8
Cycle Q Clear(g_c), s	1.0	0.0	21.1	8.5	27.8	7.9	14.5	0.0	19.7	28.5	0.0	4.8
Prop In Lane	1.00		0.17	1.00		1.00	1.00		0.73	1.00		0.24
Lane Grp Cap(c), veh/h	258	0	719	424	864	721	352	0	437	162	0	499
V/C Ratio(X)	0.12	0.00	0.62	0.73	0.72	0.27	0.38	0.00	0.76	0.71	0.00	0.22
Avail Cap(c_a), veh/h	354	0	719	424	864	721	352	0	437	162	0	499
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	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	17.2	0.0	21.9	19.8	20.0	15.0	32.8	0.0	32.6	46.6	0.0	27.3
Incr Delay (d2), s/veh	0.2	0.0	4.1	6.2	2.9	0.2	0.7	0.0	7.5	13.9	0.0	0.2
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.4	0.0	8.3	4.3	10.9	2.5	2.7	0.0	7.8	3.5	0.0	2.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	17.4	0.0	26.0	25.9	23.0	15.2	33.5	0.0	40.1	60.5	0.0	27.5
LnGrp LOS	B		C	C	C	B	C		D	E		C
Approach Vol, veh/h		480			1128			464			226	
Approach Delay, s/veh		25.4			22.4			38.2			44.4	
Approach LOS		C			C			D			D	

Timer - Assigned Phs		2	3	4		6	7	8				
Phs Duration (G+Y+Rc), s		35.0	15.0	50.0		35.0	9.4	55.6				
Change Period (Y+Rc), s		6.5	6.5	6.5		6.5	6.5	6.5				
Max Green Setting (Gmax), s		28.5	8.5	43.5		28.5	8.5	43.5				
Max Q Clear Time (g_c+I1), s		21.7	10.5	23.1		30.5	3.0	29.8				
Green Ext Time (p_c), s		1.3	0.0	2.1		0.0	0.0	3.6				

Intersection Summary	
HCM 7th Control Delay, s/veh	28.4
HCM 7th LOS	C

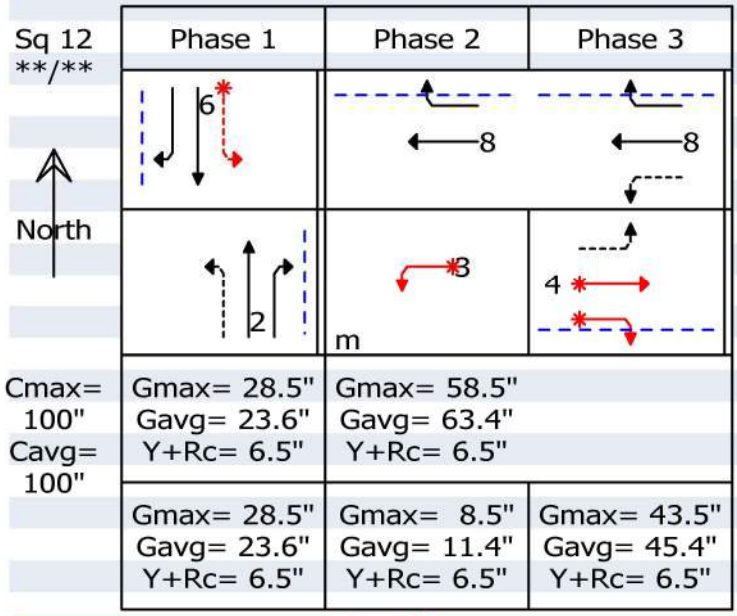
Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	31	449	308	622	198	133	331	116	110
v/c Ratio	0.08	0.57	0.61	0.64	0.22	0.49	0.72	1.07	0.28
Control Delay (s/veh)	9.2	23.1	16.7	22.3	3.8	38.6	29.2	146.5	27.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	9.2	23.1	16.7	22.3	3.8	38.6	29.2	146.5	27.2
Queue Length 50th (ft)	7	220	84	303	5	73	115	75	49
Queue Length 95th (ft)	20	324	#151	#509	45	126	203	#178	91
Internal Link Dist (ft)		2588		2504			2604		1914
Turn Bay Length (ft)	310		240		200	290		230	
Base Capacity (vph)	434	797	505	976	899	343	550	137	488
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.07	0.56	0.61	0.64	0.22	0.39	0.60	0.85	0.23

Intersection Summary

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

TEAPAC[Ver 9.50.02] - Capacity Analysis Summary (HCM 2016)

Intersection Averages for Int # 4 - Rimrock Rd & 54th St W
V/C 0.535 (Critical V/C 0.547) Control Delay 22.2 Level of Service C+



Lane Group	Width/ Lanes	g/C Max	g/C Avg	SatFlo	Capcty	Adj Volume	v/c	HCM Delay	L S	Queue Model 1
SB Approach								38.0	D+	
R+ T	12/1	0.285	0.236	1716	406	93	0.229	31.1	C	82 ft
L	11/1	0.285	0.236	1111	223	116	0.520	43.5	*D+	126 ft
NB Approach								35.5	D+	
R+ T	14/1	0.285	0.236	1618	383	188	0.491	34.0	C	164 ft
L	14/1	0.285	0.236	1215	306	133	0.435	37.6	D+	131 ft
WB Approach								13.7	B+	
R	12/1			1451	919	1	0.001	6.7	A	0 ft
T	12/1	0.585	0.634	1729	1096	622	0.568	12.6	B+	279 ft
L	14/1	0.085	0.114	1700	501	308	0.615	15.8	*B	145 ft
EB Approach								23.1	C+	
R+ T	12/1	0.435	0.454	1647	748	436	0.583	23.6	*C+	290 ft
L	14/1	0.435	0.454	766	400	31	0.078	17.4	B	21 ft

HCS Two-Way Stop-Control Report

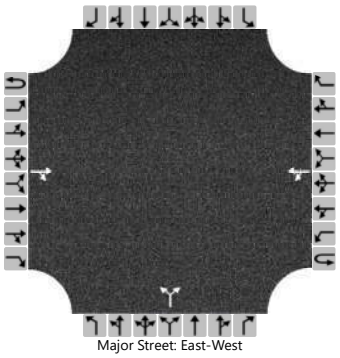
General Information

Analyst	T. Eastwood
Agency/Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2034
Time Analyzed	Weekday, AM Peak Hour
Intersection Orientation	East-West
Project Description	Copper Square TIS | Estimated Total Traffic

Site Information

Intersection	Rimrock Road & Road A
Jurisdiction	City of Billings
East/West Street	Rimrock Road
North/South Street	Road A
Peak Hour Factor	0.78
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	0	0
Configuration				TR		LT					LR					
Volume (veh/h)			652	37		10	237			22		7				
Percent Heavy Vehicles (%)						5				5		5				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.15				6.45		6.25				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.25				3.55		3.35				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						13					37					
Capacity, c (veh/h)						753					224					
v/c Ratio						0.02					0.17					
95% Queue Length, Q_{95} (veh)						0.1					0.6					
95% Queue Length, Q_{95} (ft)						2.6					15.6					
Control Delay (s/veh)						9.9	0.2				24.3					
Level of Service (LOS)						A	A				C					
Approach Delay (s/veh)					0.6				24.3							
Approach LOS					A				C							

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HCS Two-Way Stop-Control Report

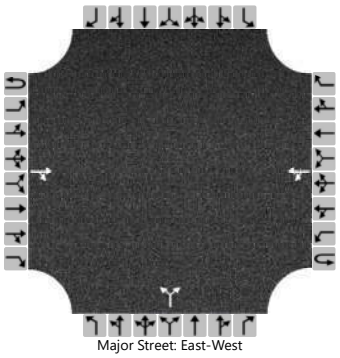
General Information

Analyst	T. Eastwood
Agency/Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2034
Time Analyzed	Weekday, Midday Peak Hour
Intersection Orientation	East-West
Project Description	Copper Square TIS | Estimated Total Traffic

Site Information

Intersection	Rimrock Road & Road A
Jurisdiction	City of Billings
East/West Street	Rimrock Road
North/South Street	Road A
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	0	0
Configuration				TR		LT					LR					
Volume (veh/h)			291	36		11	325			37		11				
Percent Heavy Vehicles (%)						5				5		5				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.15				6.45		6.25				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.25				3.55		3.35				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						12					53					
Capacity, c (veh/h)						1179					424					
v/c Ratio						0.01					0.13					
95% Queue Length, Q_{95} (veh)						0.0					0.4					
95% Queue Length, Q_{95} (ft)						0.0					10.4					
Control Delay (s/veh)						8.1	0.1				14.7					
Level of Service (LOS)						A	A				B					
Approach Delay (s/veh)					0.4				14.7							
Approach LOS					A				B							

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HCS Two-Way Stop-Control Report

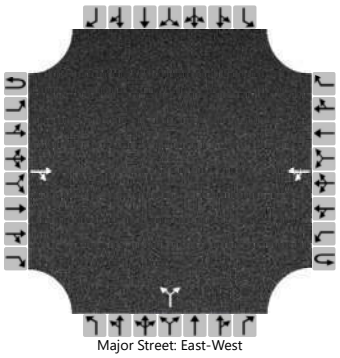
General Information

Analyst	T. Eastwood
Agency/Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2034
Time Analyzed	Weekday, PM Peak Hour
Intersection Orientation	East-West
Project Description	Copper Square TIS | Estimated Total Traffic

Site Information

Intersection	Rimrock Road & Road A
Jurisdiction	City of Billings
East/West Street	Rimrock Road
North/South Street	Road A
Peak Hour Factor	0.87
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	0	0
Configuration				TR		LT					LR					
Volume (veh/h)			382	36		12	603			34		10				
Percent Heavy Vehicles (%)						5				5		5				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.15				6.45		6.25				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.25				3.55		3.35				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						14					51					
Capacity, c (veh/h)						1067					239					
v/c Ratio						0.01					0.21					
95% Queue Length, Q_{95} (veh)						0.0					0.8					
95% Queue Length, Q_{95} (ft)						0.0					20.8					
Control Delay (s/veh)						8.4	0.2				24.1					
Level of Service (LOS)						A	A				C					
Approach Delay (s/veh)					0.3				24.1							
Approach LOS					A				C							

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HCS Two-Way Stop-Control Report

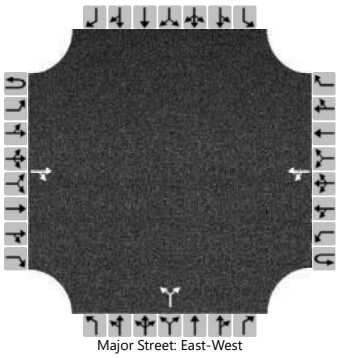
General Information

Analyst	T. Eastwood
Agency/Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2034
Time Analyzed	Weekday, AM Peak Hour
Intersection Orientation	East-West
Project Description	Copper Square TIS | Estimated Total Traffic

Site Information

Intersection	Rimrock Rd & 60th St W
Jurisdiction	City of Billings
East/West Street	Rimrock Road
North/South Street	60th Street West
Peak Hour Factor	0.78
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	0	0
Configuration				TR		LT					LR					
Volume (veh/h)			582	80		59	214			33		89				
Percent Heavy Vehicles (%)						5				5		5				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.15				6.45		6.25				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.25				3.55		3.35				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						76					156					
Capacity, c (veh/h)						776					288					
v/c Ratio						0.10					0.54					
95% Queue Length, Q_{95} (veh)						0.3					3.0					
95% Queue Length, Q_{95} (ft)						7.8					78.0					
Control Delay (s/veh)						10.1	1.2				31.5					
Level of Service (LOS)						B	A				D					
Approach Delay (s/veh)					3.1				31.5							
Approach LOS					A				D							

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HCS Two-Way Stop-Control Report

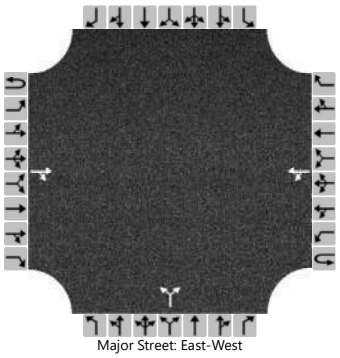
General Information

Analyst	T. Eastwood
Agency/Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2034
Time Analyzed	Weekday, Midday Peak Hour
Intersection Orientation	East-West
Project Description	Copper Square TIS | Estimated Total Traffic

Site Information

Intersection	Rimrock Rd & 60th St W
Jurisdiction	City of Billings
East/West Street	Rimrock Road
North/South Street	60th Street West
Peak Hour Factor	0.91
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	0	0
Configuration				TR		LT					LR					
Volume (veh/h)			275	27		51	305			31		53				
Percent Heavy Vehicles (%)						5				5		5				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized																
Median Type | Storage						Undivided										

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.15				6.45		6.25				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.25				3.55		3.35				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						56					92					
Capacity, c (veh/h)						1211					514					
v/c Ratio						0.05					0.18					
95% Queue Length, Q_{95} (veh)						0.1					0.6					
95% Queue Length, Q_{95} (ft)						2.6					15.6					
Control Delay (s/veh)						8.1	0.5				13.5					
Level of Service (LOS)						A	A				B					
Approach Delay (s/veh)						1.6				13.5						
Approach LOS						A				B						

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HCS Two-Way Stop-Control Report

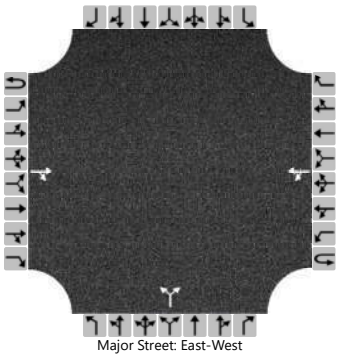
General Information

Analyst	T. Eastwood
Agency/Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2034
Time Analyzed	Weekday, PM Peak Hour
Intersection Orientation	East-West
Project Description	Copper Square TIS | Estimated Total Traffic

Site Information

Intersection	Rimrock Rd & 60th St W
Jurisdiction	City of Billings
East/West Street	Rimrock Road
North/South Street	60th Street West
Peak Hour Factor	0.86
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	0	0
Configuration				TR		LT					LR					
Volume (veh/h)			363	30		63	576			39		49				
Percent Heavy Vehicles (%)						5				5		5				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.15				6.45		6.25				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.25				3.55		3.35				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						73					102					
Capacity, c (veh/h)						1088					280					
v/c Ratio						0.07					0.37					
95% Queue Length, Q_{95} (veh)						0.2					1.6					
95% Queue Length, Q_{95} (ft)						5.2					41.6					
Control Delay (s/veh)						8.5	0.9				25.1					
Level of Service (LOS)						A	A				D					
Approach Delay (s/veh)					1.7				25.1							
Approach LOS					A				D							

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HCS Two-Way Stop-Control Report

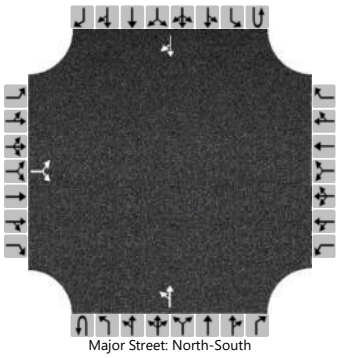
General Information

Analyst	T. Eastwood
Agency/Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2034
Time Analyzed	Weekday, AM Peak Hour
Intersection Orientation	North-South
Project Description	Copper Square TIS | Estimated Total Traffic

Site Information

Intersection	60th St W & Road C
Jurisdiction	City of Billings
East/West Street	Road C
North/South Street	60th Street West
Peak Hour Factor	0.80
Analysis Time Period (hrs)	0.25

Lanes


Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	0	0	0	0	1	0	0	0	1	0
Configuration			LR							LT						TR
Volume (veh/h)		58		0						0	2				3	77
Percent Heavy Vehicles (%)		5		0						0						
Proportion Time Blocked																
Percent Grade (%)		0														
Right Turn Channelized																
Median Type | Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1		6.2						4.1						
Critical Headway (sec)		6.45		6.20						4.10						
Base Follow-Up Headway (sec)		3.5		3.3						2.2						
Follow-Up Headway (sec)		3.55		3.30						2.20						

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			73							0						
Capacity, c (veh/h)			946							1505						
v/c Ratio			0.08							0.00						
95% Queue Length, Q_{95} (veh)			0.2							0.0						
95% Queue Length, Q_{95} (ft)			5.2							0.0						
Control Delay (s/veh)			9.1							7.4	0.0					
Level of Service (LOS)			A							A	A					
Approach Delay (s/veh)		9.1								0.0						
Approach LOS		A								A						

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HCS Two-Way Stop-Control Report

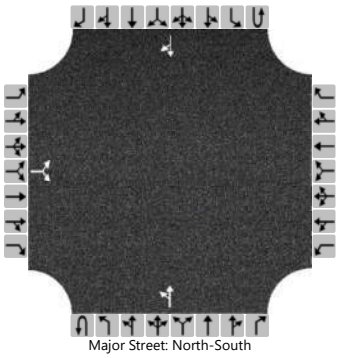
General Information

Analyst	T. Eastwood
Agency/Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2034
Time Analyzed	Weekday, Midday Peak Hour
Intersection Orientation	North-South
Project Description	Copper Square TIS | Estimated Total Traffic

Site Information

Intersection	60th St W & Road C
Jurisdiction	City of Billings
East/West Street	Road C
North/South Street	60th Street West
Peak Hour Factor	0.80
Analysis Time Period (hrs)	0.25

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	0	0	0	0	1	0	0	0	1	0
Configuration			LR							LT						TR
Volume (veh/h)		48		0						0	10				10	44
Percent Heavy Vehicles (%)		5		0						0						
Proportion Time Blocked																
Percent Grade (%)		0														
Right Turn Channelized																
Median Type | Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1		6.2						4.1						
Critical Headway (sec)		6.45		6.20						4.10						
Base Follow-Up Headway (sec)		3.5		3.3						2.2						
Follow-Up Headway (sec)		3.55		3.30						2.20						

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			60							0						
Capacity, c (veh/h)			948							1547						
v/c Ratio			0.06							0.00						
95% Queue Length, Q_{95} (veh)			0.2							0.0						
95% Queue Length, Q_{95} (ft)			5.2							0.0						
Control Delay (s/veh)			9.1							7.3	0.0					
Level of Service (LOS)			A							A	A					
Approach Delay (s/veh)		9.1								0.0						
Approach LOS		A								A						

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HCS Two-Way Stop-Control Report

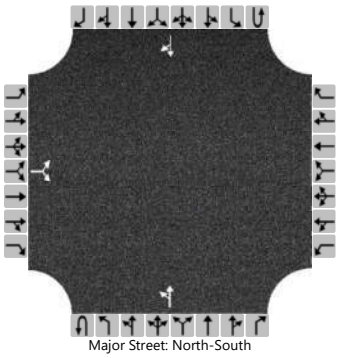
General Information

Analyst	T. Eastwood
Agency/Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2034
Time Analyzed	Weekday, PM Peak Hour
Intersection Orientation	North-South
Project Description	Copper Square TIS | Estimated Total Traffic

Site Information

Intersection	60th St W & Road C
Jurisdiction	City of Billings
East/West Street	Road C
North/South Street	60th Street West
Peak Hour Factor	0.80
Analysis Time Period (hrs)	0.25

Lanes


Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	0	0	0	0	1	0	0	0	1	0
Configuration			LR							LT						TR
Volume (veh/h)		46		0						0	14				16	50
Percent Heavy Vehicles (%)		5		0						0						
Proportion Time Blocked																
Percent Grade (%)		0														
Right Turn Channelized																
Median Type | Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1		6.2						4.1						
Critical Headway (sec)		6.45		6.20						4.10						
Base Follow-Up Headway (sec)		3.5		3.3						2.2						
Follow-Up Headway (sec)		3.55		3.30						2.20						

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			58							0						
Capacity, c (veh/h)			929							1527						
v/c Ratio			0.06							0.00						
95% Queue Length, Q_{95} (veh)			0.2							0.0						
95% Queue Length, Q_{95} (ft)			5.2							0.0						
Control Delay (s/veh)			9.1							7.4	0.0					
Level of Service (LOS)			A							A	A					
Approach Delay (s/veh)		9.1								0.0						
Approach LOS		A								A						

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HCS Two-Way Stop-Control Report

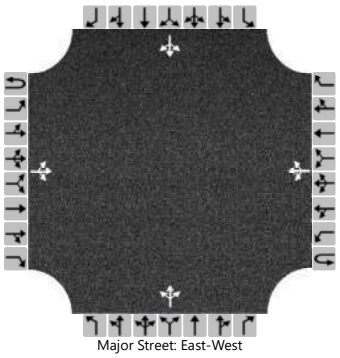
General Information

Analyst	T. Eastwood
Agency/Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2034
Time Analyzed	Weekday, AM Peak Hour
Intersection Orientation	East-West
Project Description	Copper Square TIS | Estimated Total Traffic

Site Information

Intersection	Road B & Road C
Jurisdiction	City of Billings
East/West Street	Road C
North/South Street	Road B
Peak Hour Factor	0.80
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		9	7	4		3	6	12		1	0	1		8	0	6
Percent Heavy Vehicles (%)		5				5				5	5	5		5	5	5
Proportion Time Blocked																
Percent Grade (%)										0				0		
Right Turn Channelized																
Median Type | Storage			Undivided													

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.15				4.15				7.15	6.55	6.25		7.15	6.55	6.25
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.25				2.25				3.55	4.05	3.35		3.55	4.05	3.35

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		11				4					3				18	
Capacity, c (veh/h)		1573				1585					981				975	
v/c Ratio		0.01				0.00					0.00				0.02	
95% Queue Length, Q_{95} (veh)		0.0				0.0					0.0				0.1	
95% Queue Length, Q_{95} (ft)		0.0				0.0					0.0				2.6	
Control Delay (s/veh)		7.3	0.1	0.1		7.3	0.0	0.0			8.7				8.8	
Level of Service (LOS)		A	A	A		A	A	A			A				A	
Approach Delay (s/veh)	3.3				1.1				8.7				8.8			
Approach LOS	A				A				A				A			

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HCS Two-Way Stop-Control Report

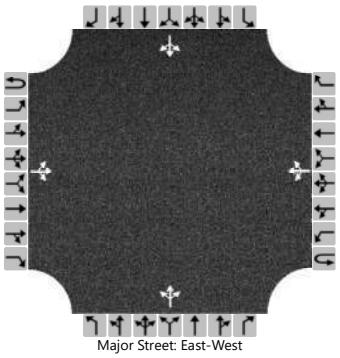
General Information

Analyst	T. Eastwood
Agency/Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2034
Time Analyzed	Weekday, Midday Peak Hour
Intersection Orientation	East-West
Project Description	Copper Square TIS | Estimated Total Traffic

Site Information

Intersection	Road B & Road C
Jurisdiction	City of Billings
East/West Street	Road C
North/South Street	Road B
Peak Hour Factor	0.80
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		10	7	2		2	7	14		3	0	3		14	0	10
Percent Heavy Vehicles (%)		5				5				5	5	5		5	5	5
Proportion Time Blocked																
Percent Grade (%)										0				0		
Right Turn Channelized																
Median Type | Storage			Undivided													

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.15				4.15				7.15	6.55	6.25		7.15	6.55	6.25
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.25				2.25				3.55	4.05	3.35		3.55	4.05	3.35

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		13				3					8				30	
Capacity, c (veh/h)		1569				1588					977				969	
v/c Ratio		0.01				0.00					0.01				0.03	
95% Queue Length, Q_{95} (veh)		0.0				0.0					0.0				0.1	
95% Queue Length, Q_{95} (ft)		0.0				0.0					0.0				2.6	
Control Delay (s/veh)		7.3	0.1	0.1		7.3	0.0	0.0			8.7				8.8	
Level of Service (LOS)		A	A	A		A	A	A			A				A	
Approach Delay (s/veh)	3.9				0.6				8.7				8.8			
Approach LOS	A				A				A				A			

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HCS Two-Way Stop-Control Report

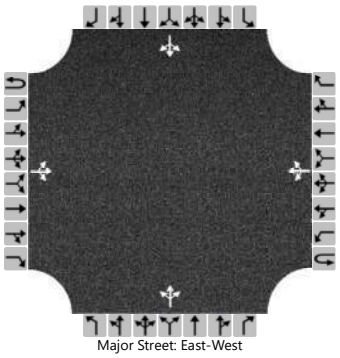
General Information

Analyst	T. Eastwood
Agency/Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2034
Time Analyzed	Weekday, PM Peak Hour
Intersection Orientation	East-West
Project Description	Copper Square TIS | Estimated Total Traffic

Site Information

Intersection	Road B & Road C
Jurisdiction	City of Billings
East/West Street	Road C
North/South Street	Road B
Peak Hour Factor	0.80
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		8	9	2		3	8	12		4	0	4		9	0	7
Percent Heavy Vehicles (%)		5				5				5	5	5		5	5	5
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.15				4.15				7.15	6.55	6.25		7.15	6.55	6.25
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.25				2.25				3.55	4.05	3.35		3.55	4.05	3.35

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		10				4					10				20	
Capacity, c (veh/h)		1570				1585					979				971	
v/c Ratio		0.01				0.00					0.01				0.02	
95% Queue Length, Q_{95} (veh)		0.0				0.0					0.0				0.1	
95% Queue Length, Q_{95} (ft)		0.0				0.0					0.0				2.6	
Control Delay (s/veh)		7.3	0.0	0.0		7.3	0.0	0.0			8.7				8.8	
Level of Service (LOS)		A	A	A		A	A	A			A				A	
Approach Delay (s/veh)	3.1				1.0				8.7				8.8			
Approach LOS	A				A				A				A			

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E5 ENGINEERING, PLLC

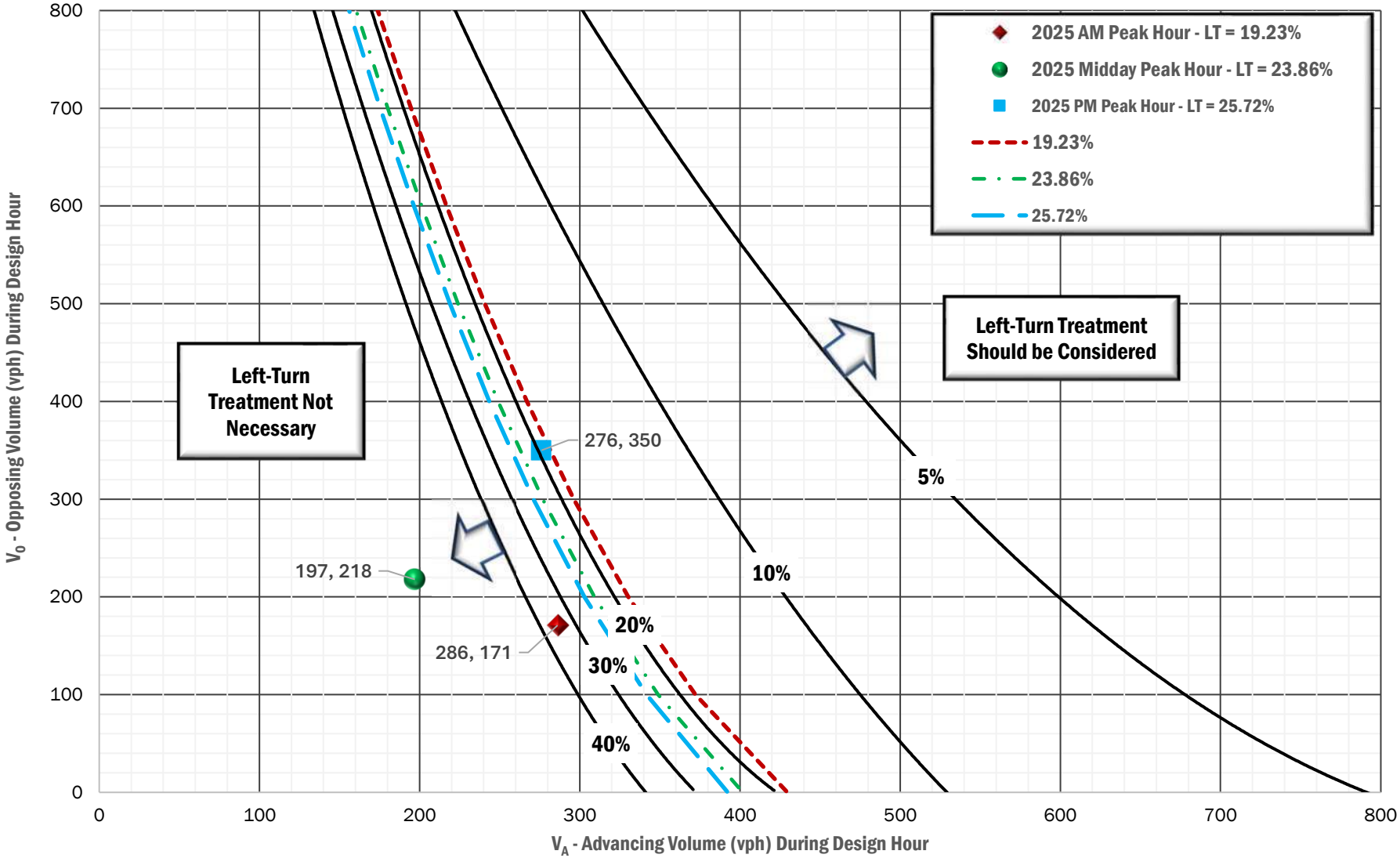
Appendix F

Auxiliary Turn Lane Analyses

Volume Guidelines for Left-Turn Lanes at Unsignalized Intersections on 2-Lane Highways (45 mph)

Grand Avenue & 62nd Street West | Eastbound Approach

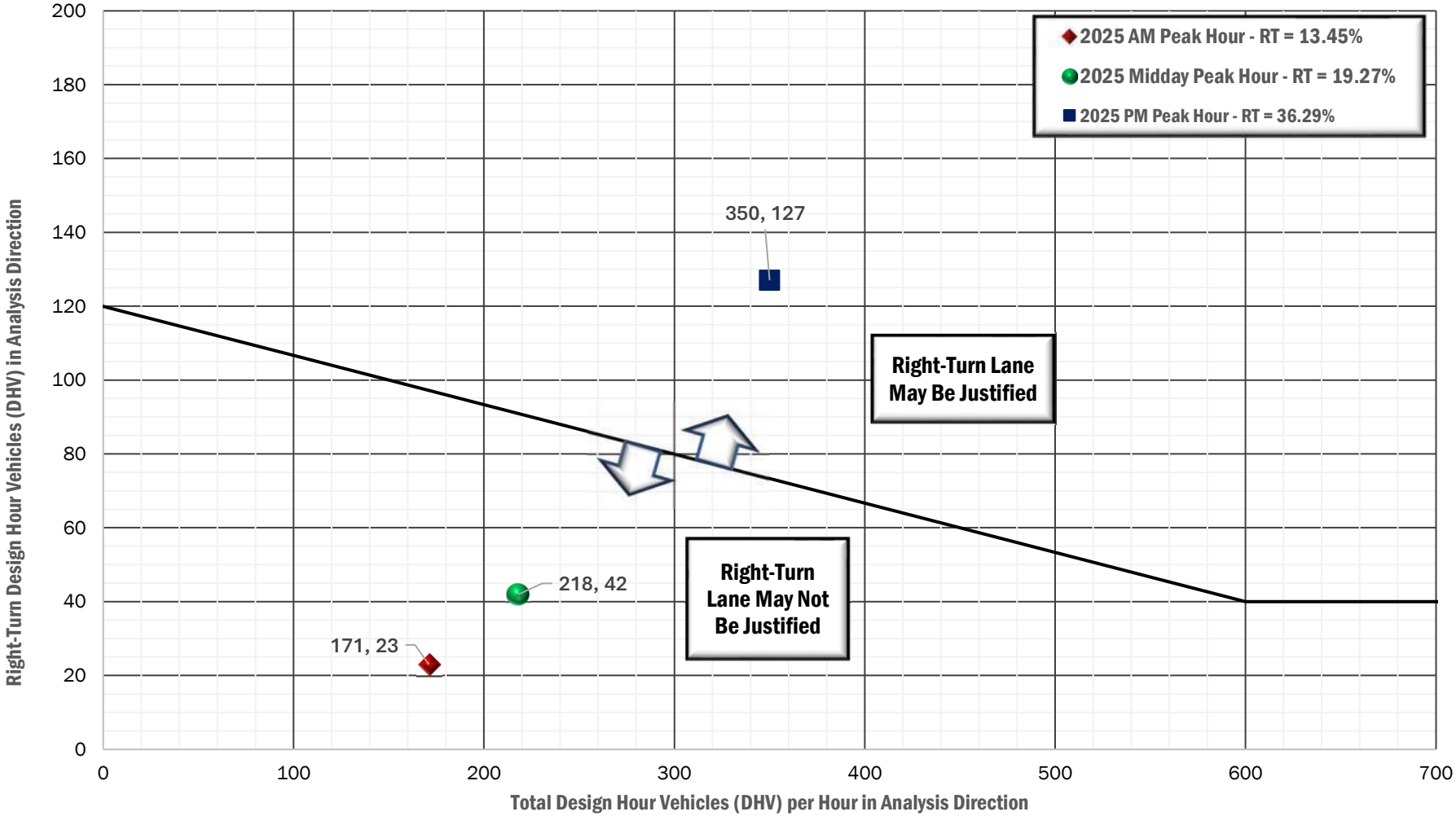
2025 Existing Conditions



Guidelines for Right-Turn Lanes at Unsignalized Intersections on 2-Lane Highways

Grand Avenue & 62nd Street West | Westbound Approach

2025 Existing Conditions

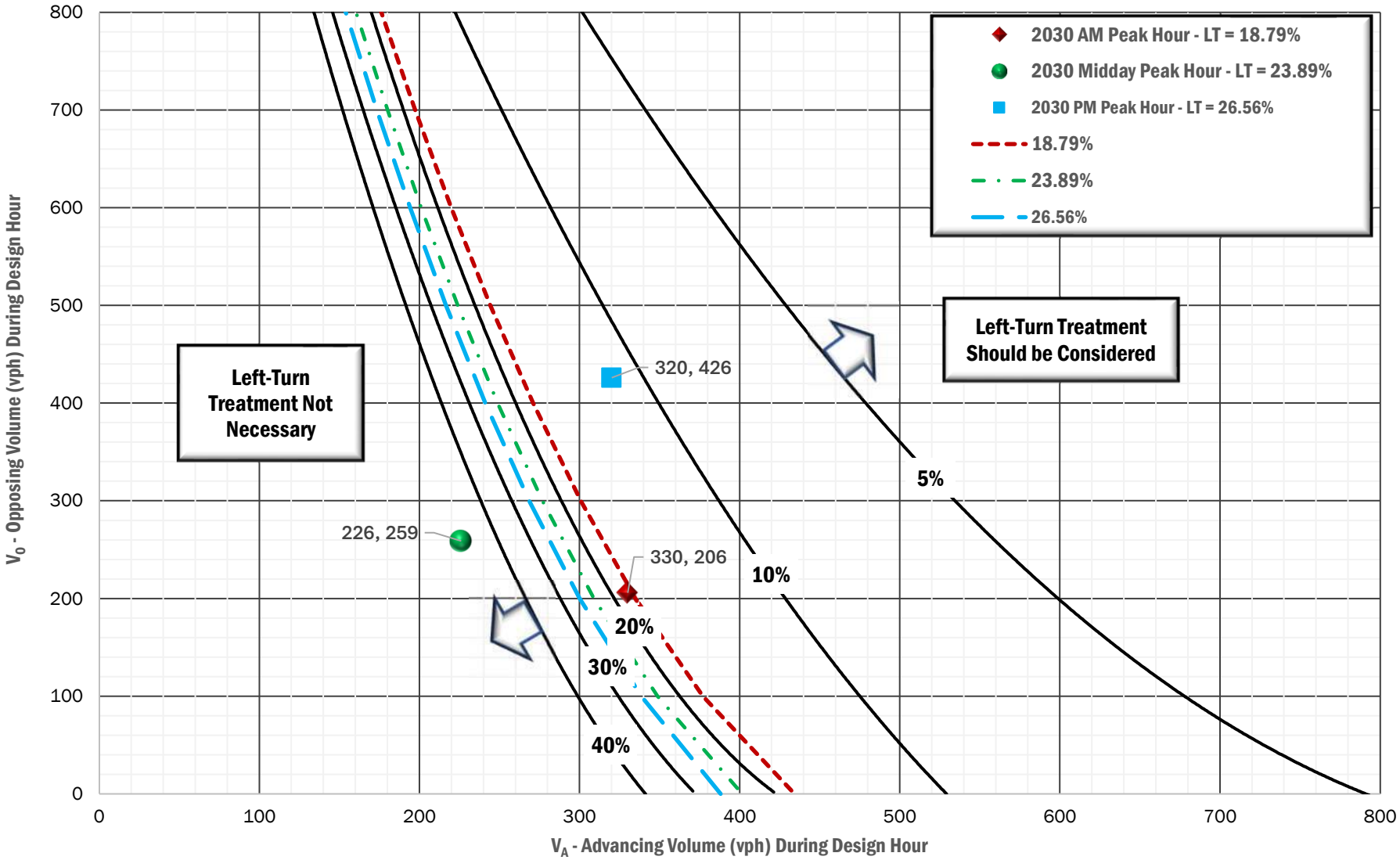


Note: For Highways with a design speed below 50 mph (80 km/h) with a DHV < 300 and where right turns are > 40, an adjustment should be used. To read the vertical axis of the chart, subtract 20 from the actual number of right turns.

Volume Guidelines for Left-Turn Lanes at Unsignalized Intersections on 2-Lane Highways (45 mph)

Grand Avenue & 62nd Street West | Eastbound Approach

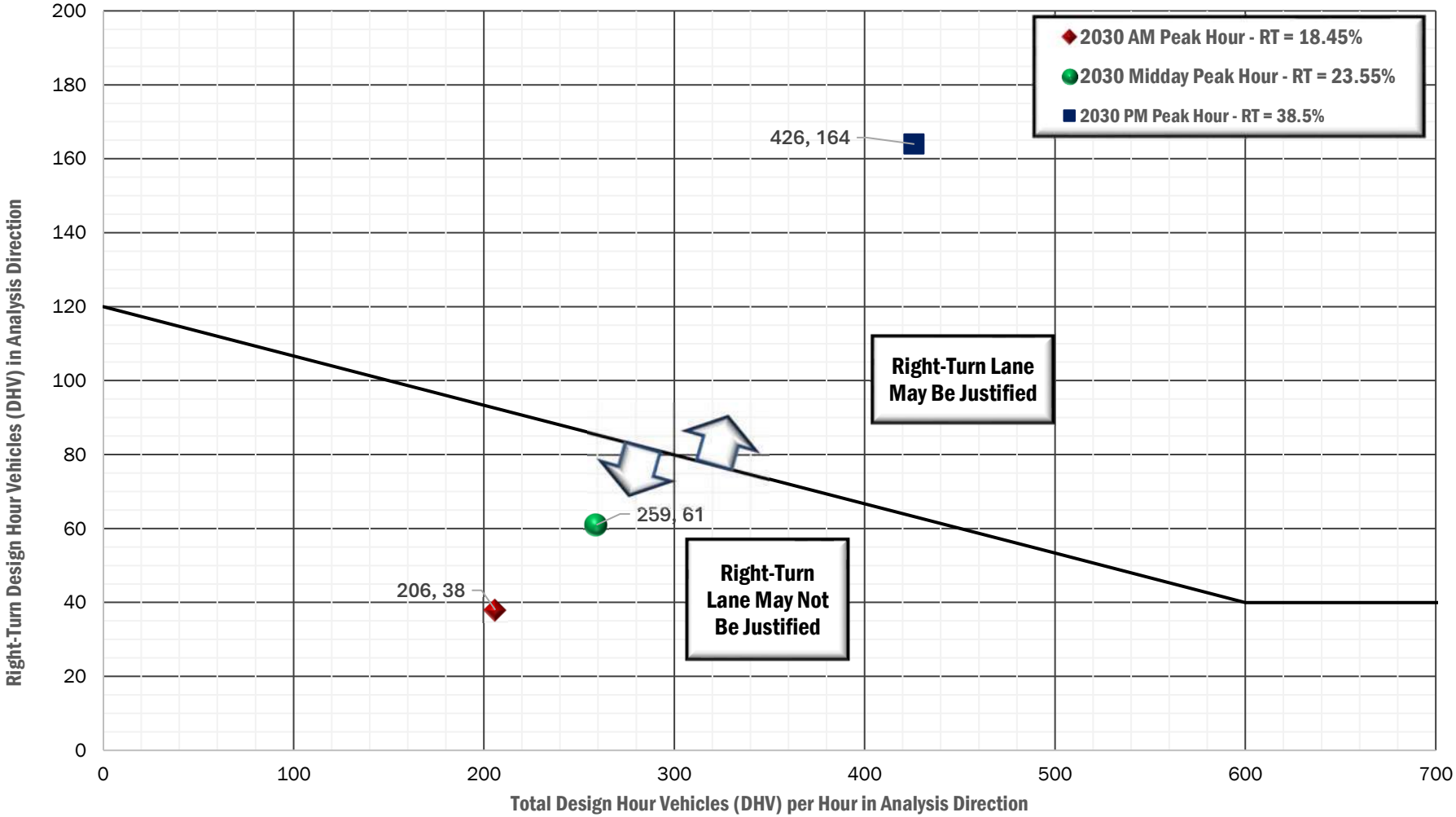
Estimated 2030 Background Traffic



Guidelines for Right-Turn Lanes at Unsignalized Intersections on 2-Lane Highways

Grand Avenue & 62nd Street West | Westbound Approach

Estimated 2030 Background Traffic



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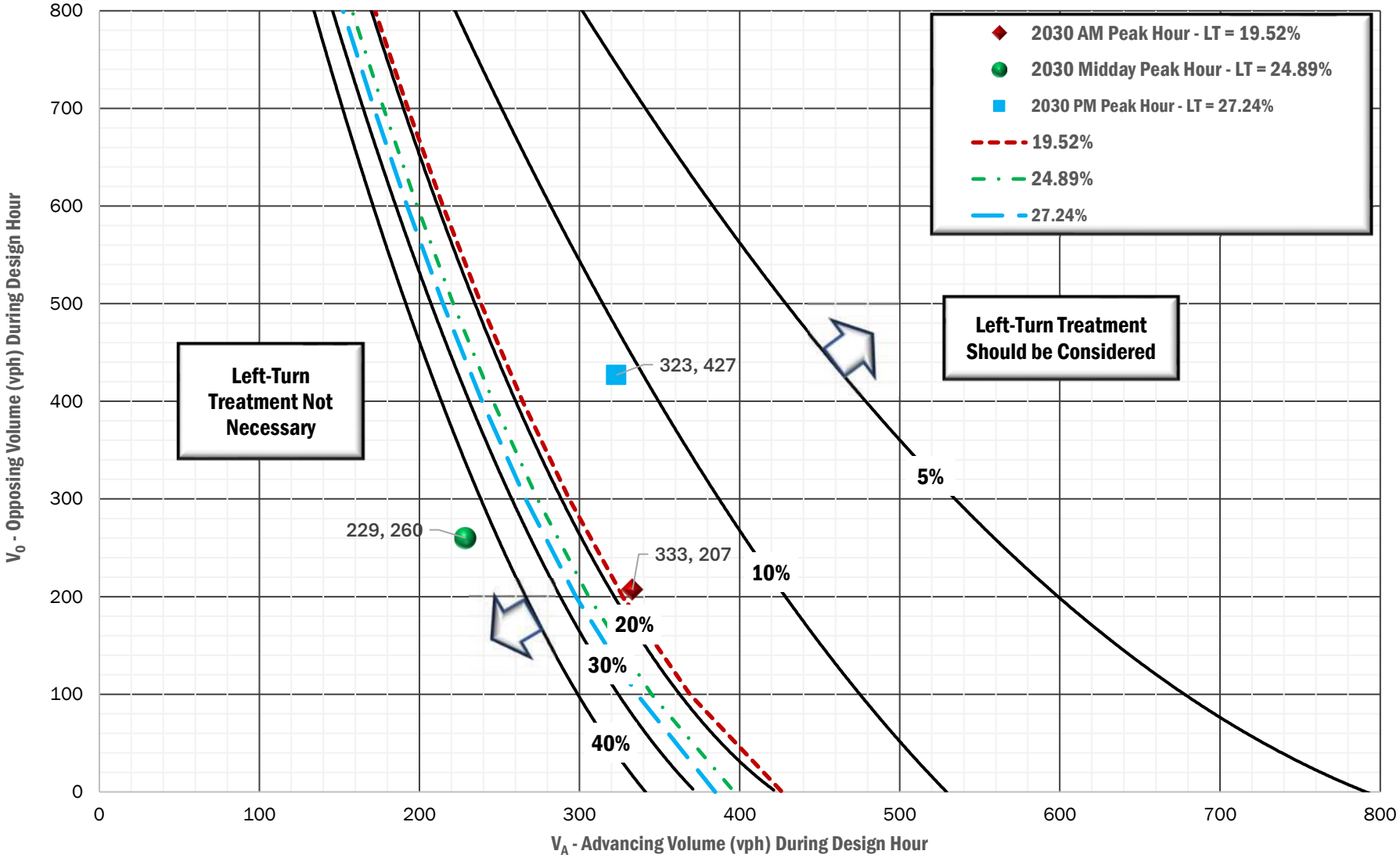
Grand Avenue & 62nd Street West | Eastbound Approach

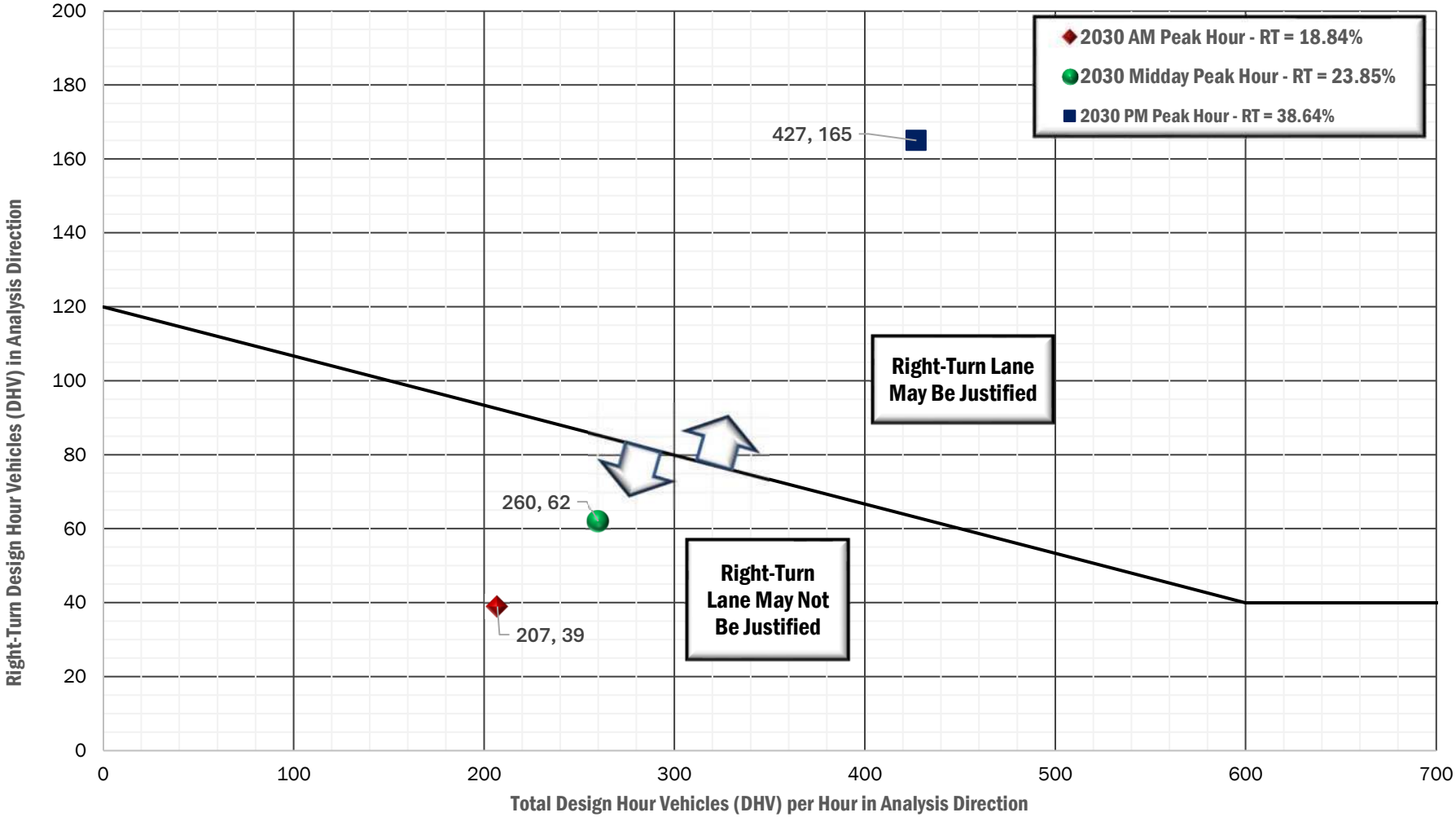
Estimated 2030 Total Traffic



Guidelines for Right-Turn Lanes at Unsignalized Intersections on 2-Lane Highways

Grand Avenue & 62nd Street West | Westbound Approach

Estimated 2030 Total Traffic



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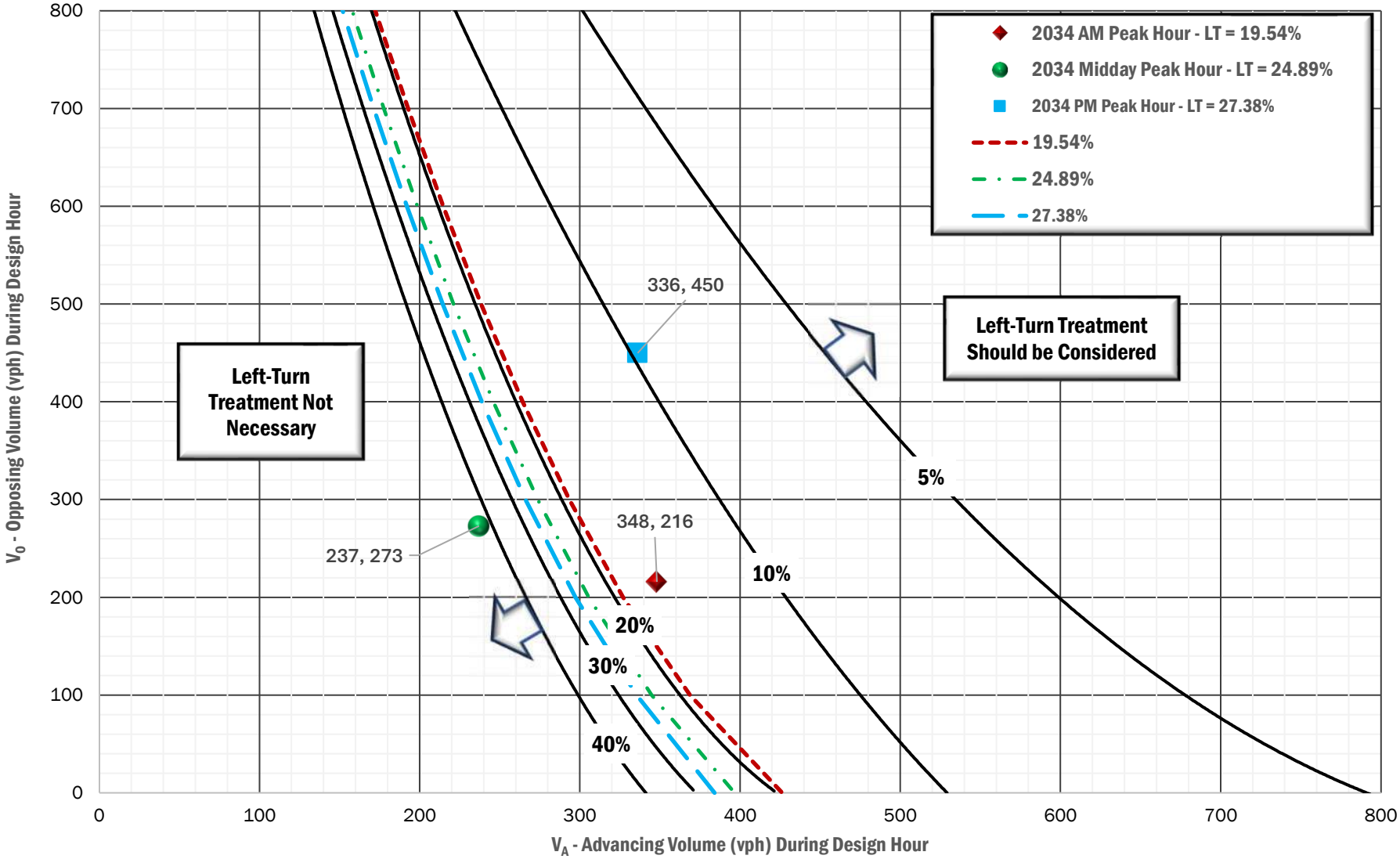
Volume Guidelines for Left-Turn Lanes at Unsignalized Intersections on 2-Lane Highways (45 mph)

Grand Avenue & 62nd Street West | Eastbound Approach

Estimated 2034 Background Traffic



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Grand Avenue & 62nd Street West | Westbound Approach

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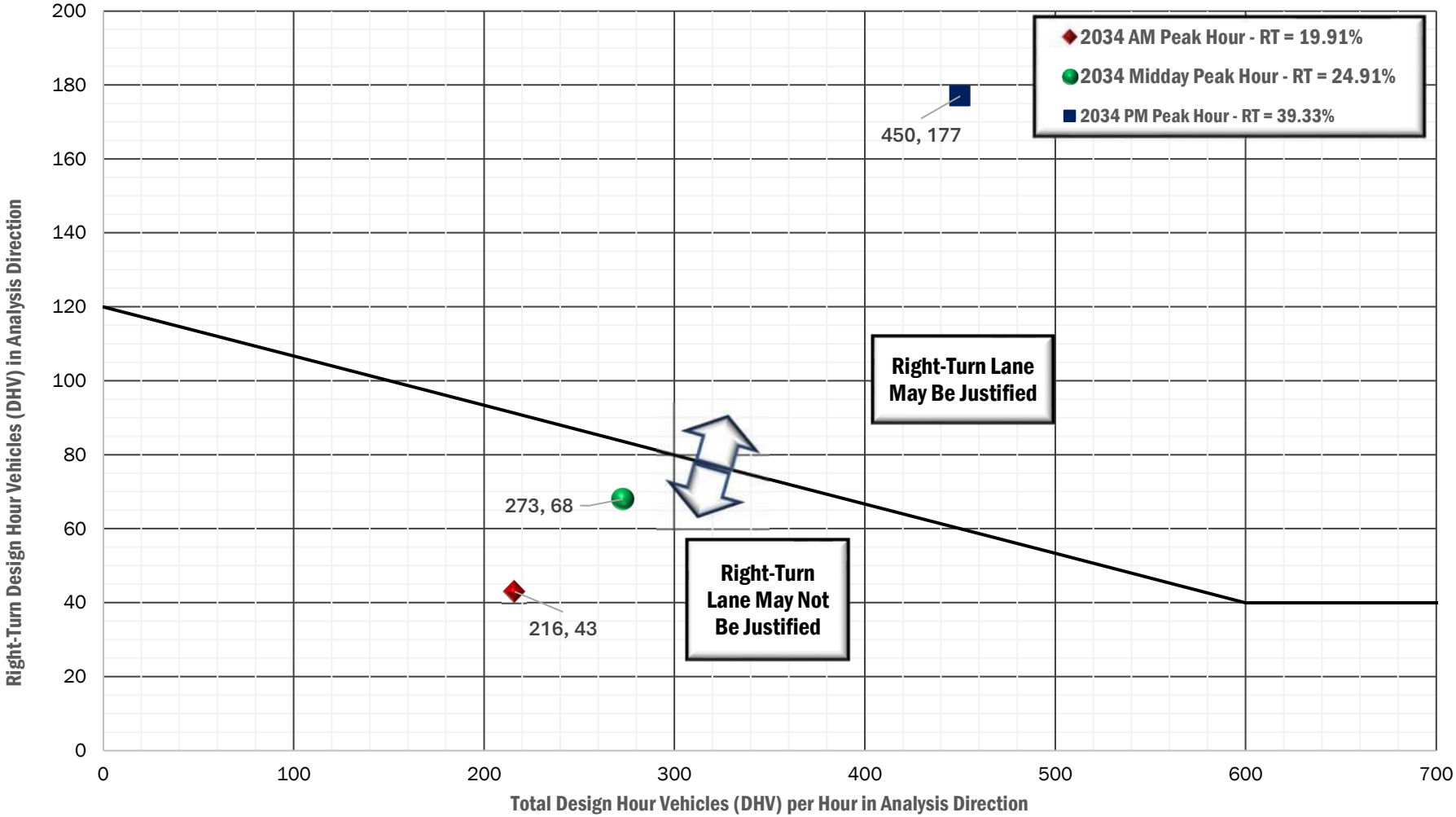

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Grand Avenue & 62nd Street West | Eastbound Approach

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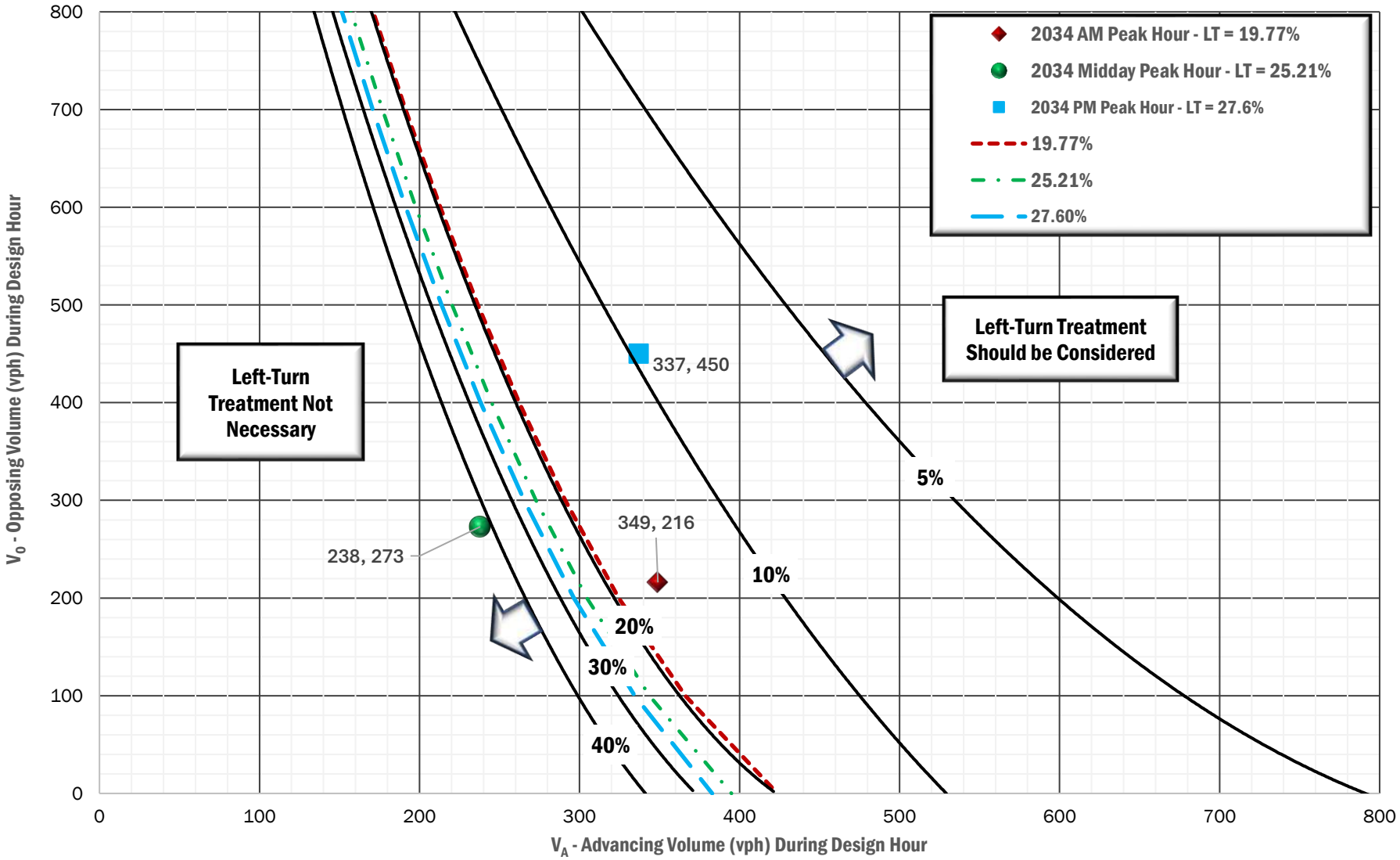

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Grand Avenue & 62nd Street West | Westbound Approach

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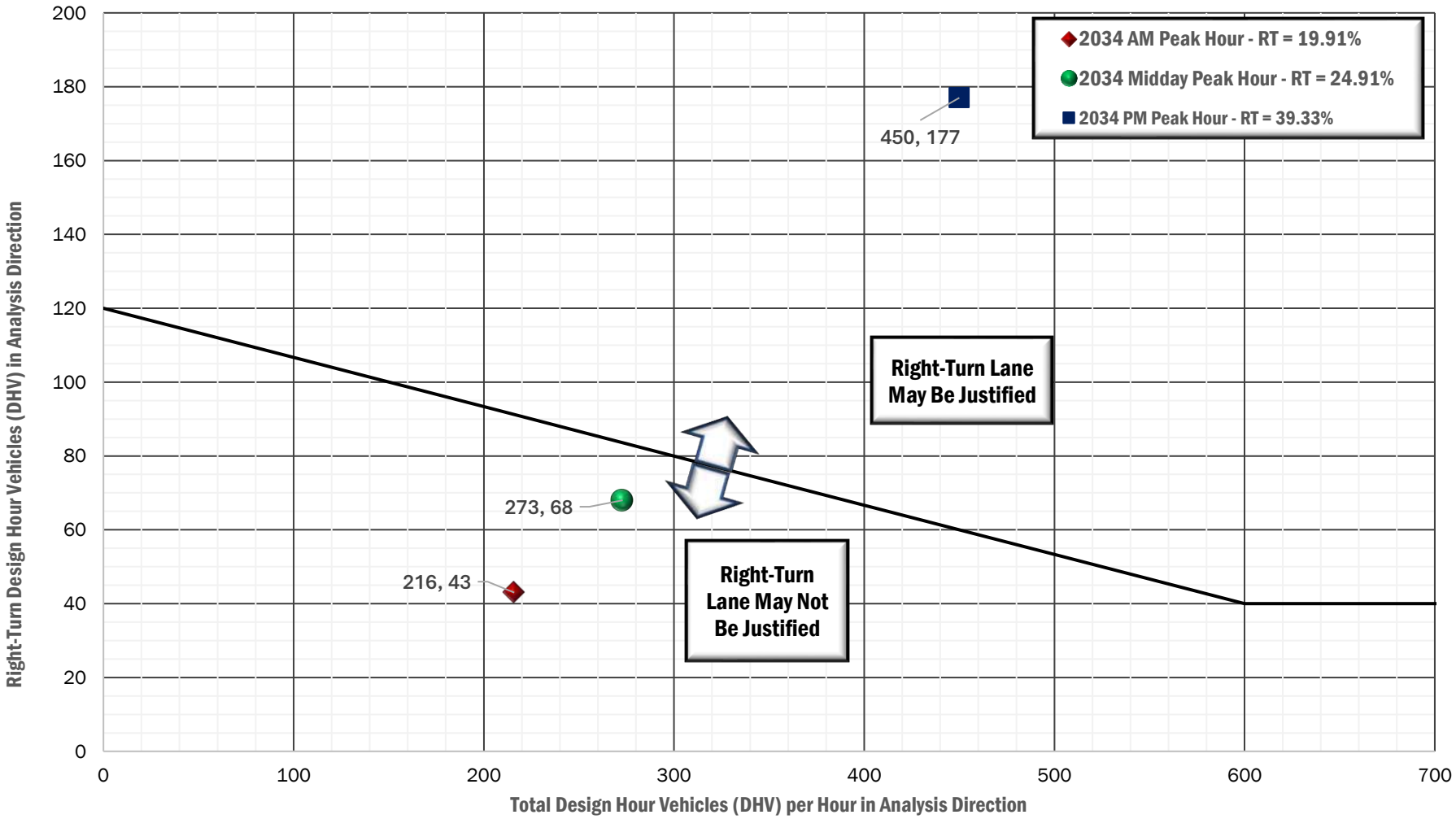

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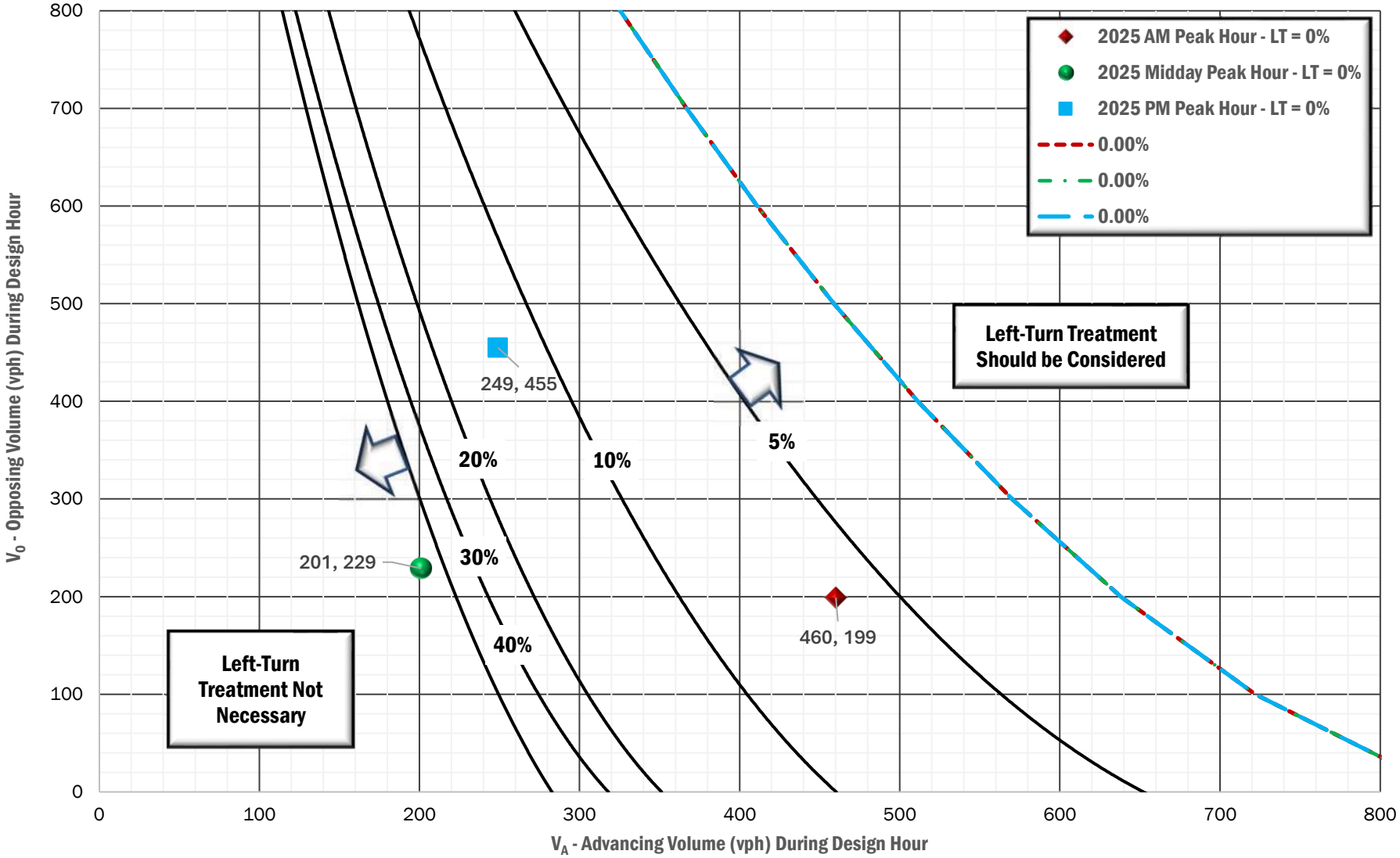
Volume Guidelines for Left-Turn Lanes at Unsignalized Intersections on 2-Lane Highways (55 mph)

Rimrock Road & 58th Street West / Glynn Abbey Way | Eastbound Approach

2025 Existing Conditions



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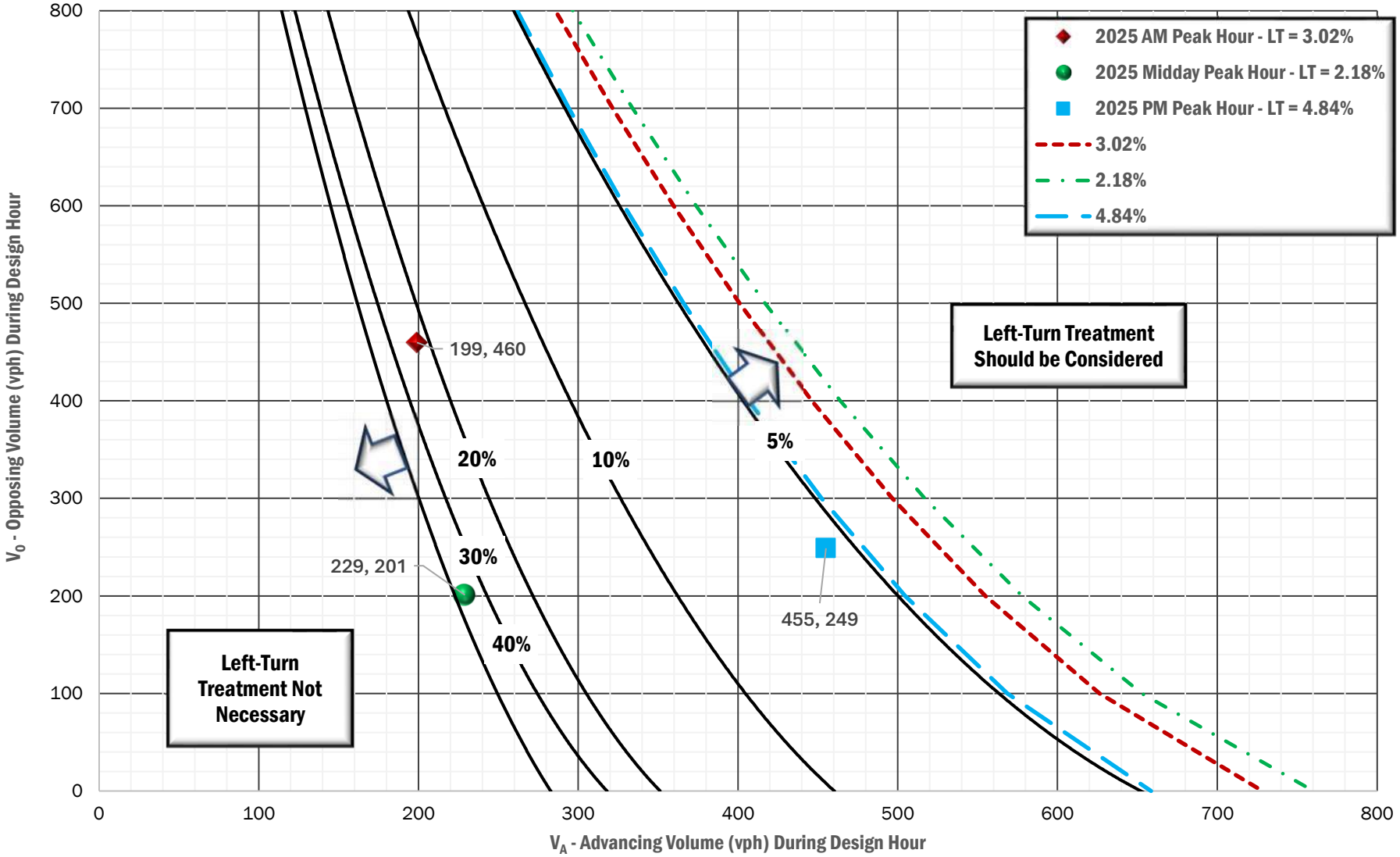
Rimrock Road & 58th Street West / Glynn Abbey Way | Westbound Approach

2025 Existing Conditions



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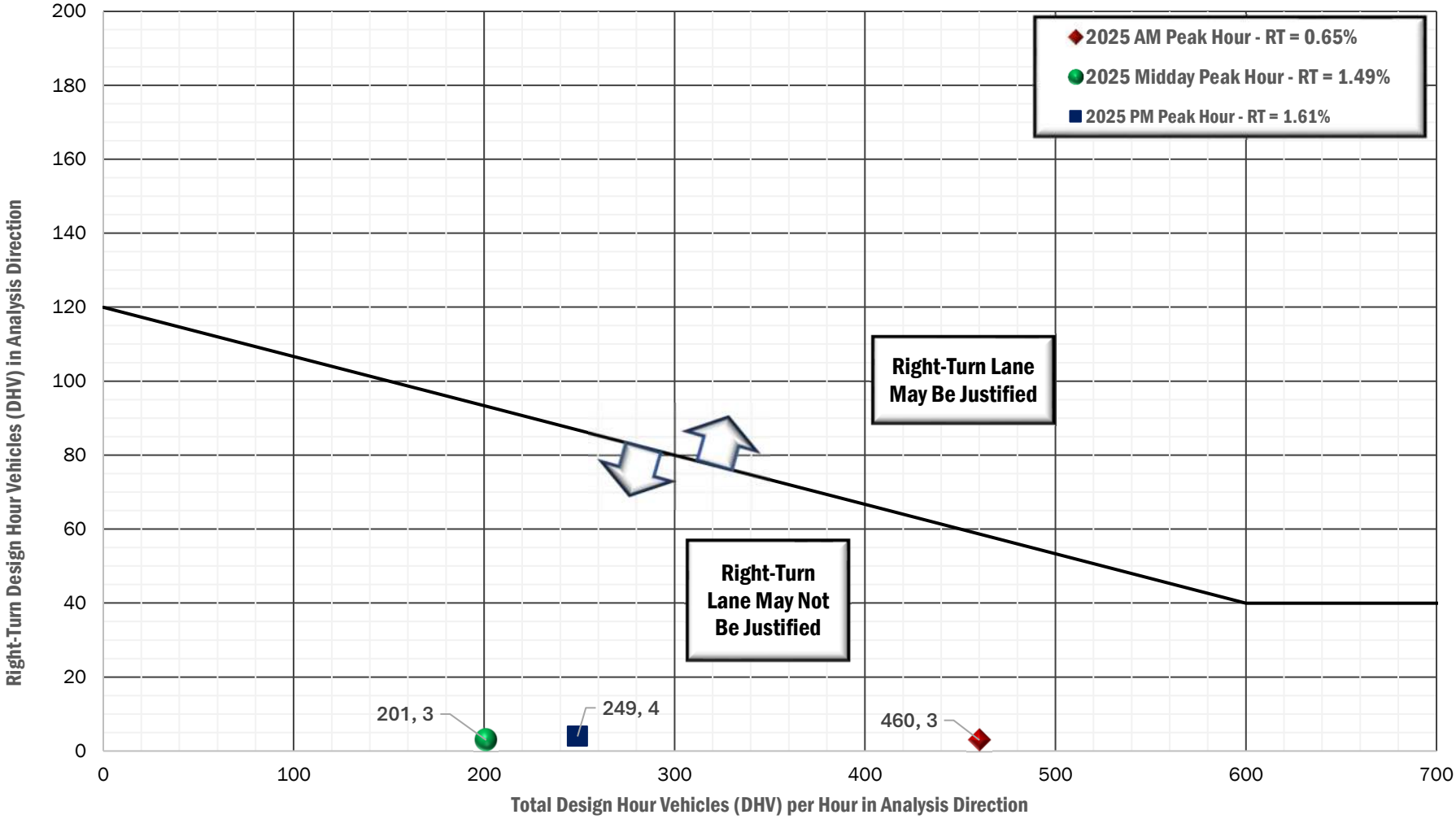
Rimrock Road & 58th Street West / Glynn Abbey Way | Eastbound Approach

2025 Existing Conditions



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Rimrock Road & 58th Street West / Glynn Abbey Way | Westbound Approach

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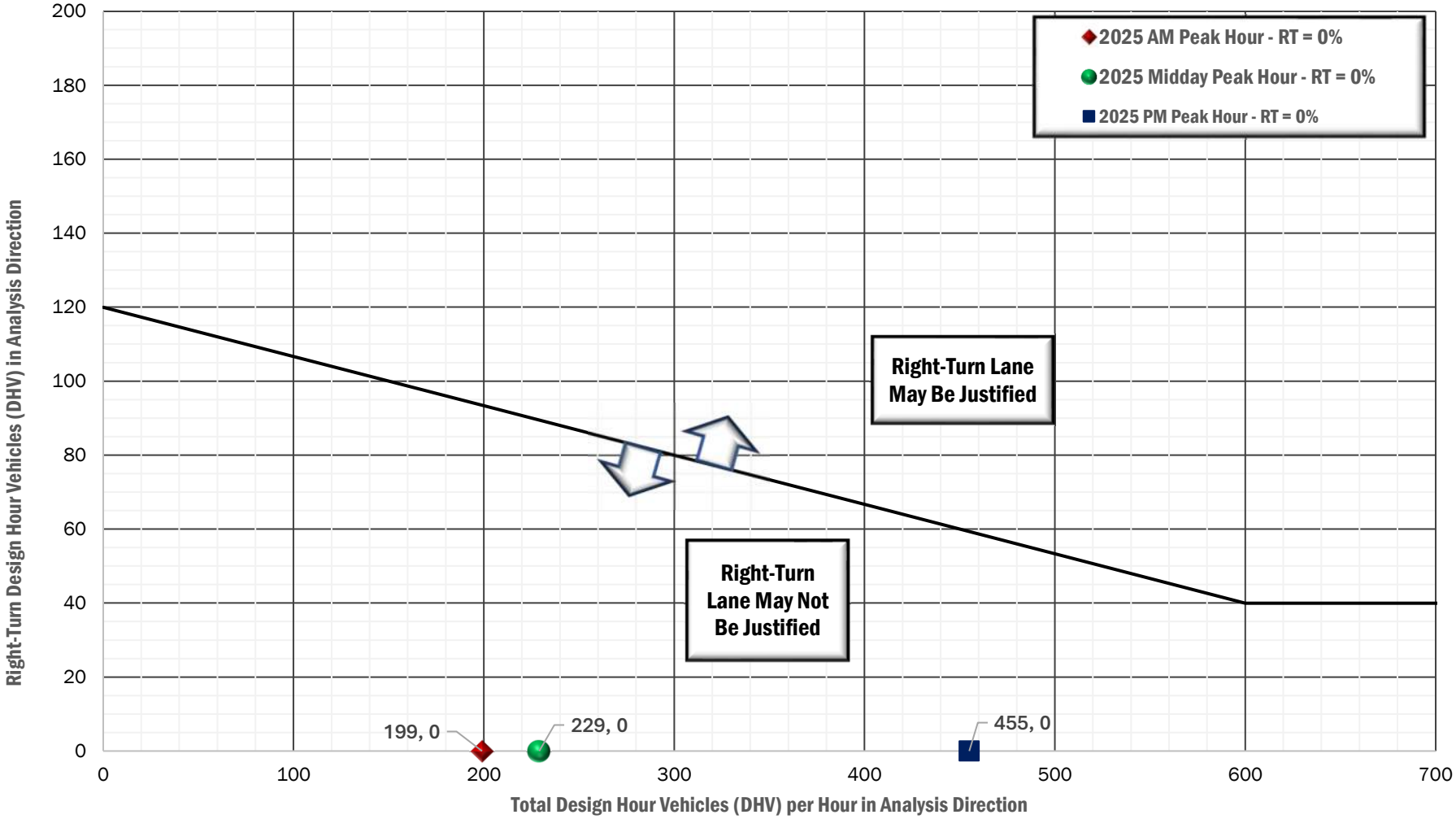

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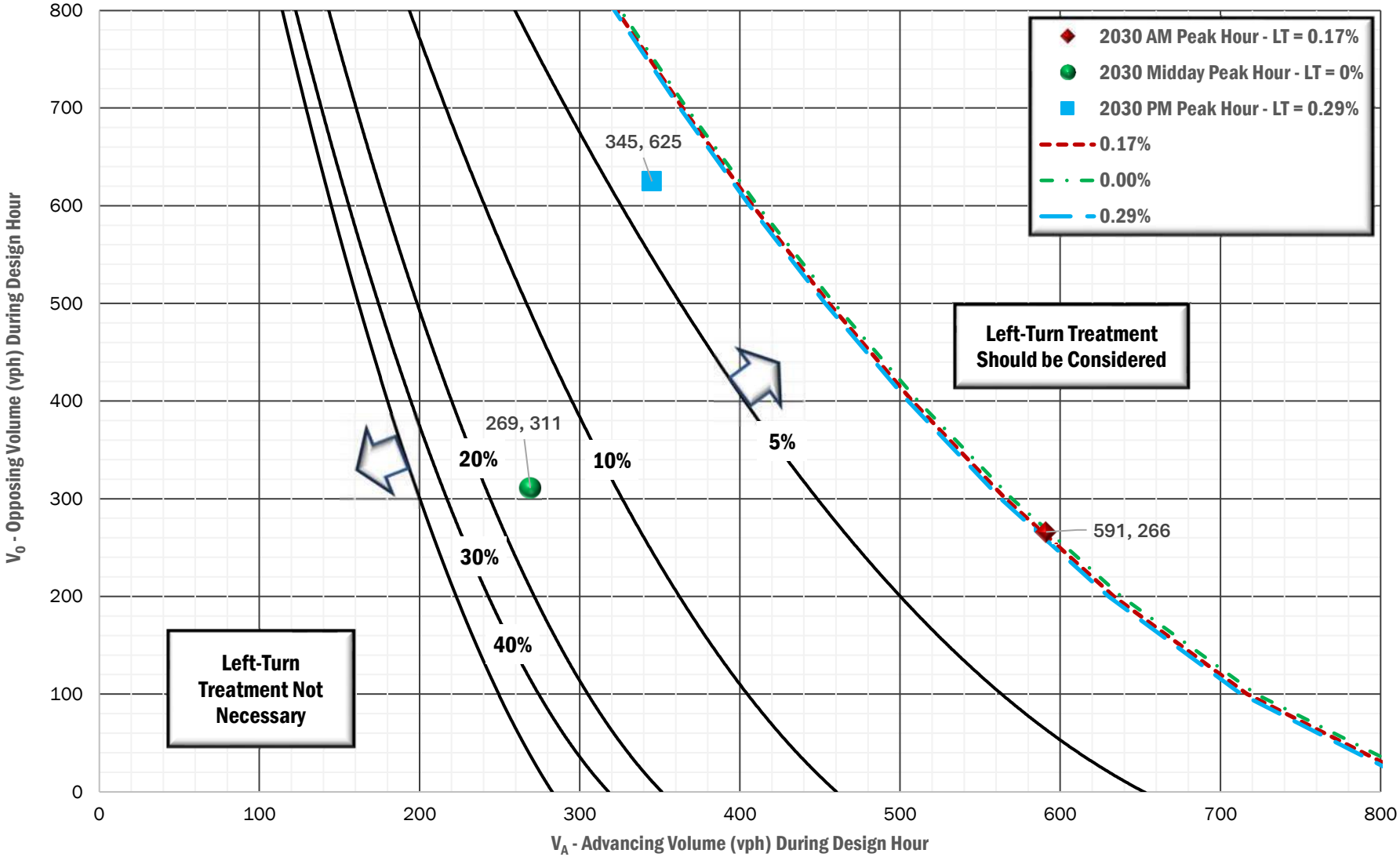
Rimrock Road & 58th Street West / Glynn Abbey Way | Eastbound Approach

Estimated 2030 Background Traffic



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Rimrock Road & 58th Street West / Glynn Abbey Way | Westbound Approach

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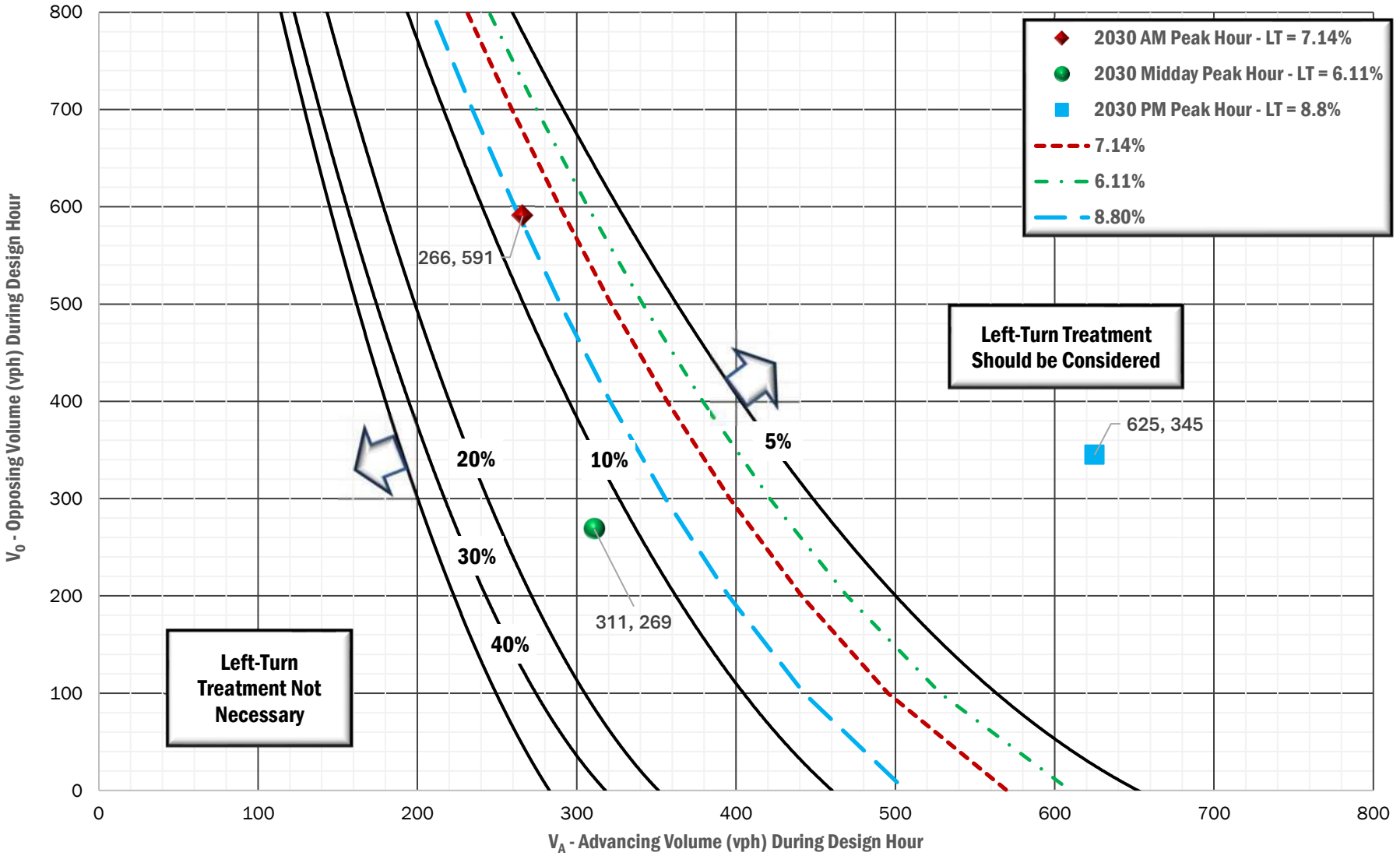

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Rimrock Road & 58th Street West / Glynn Abbey Way | Eastbound Approach

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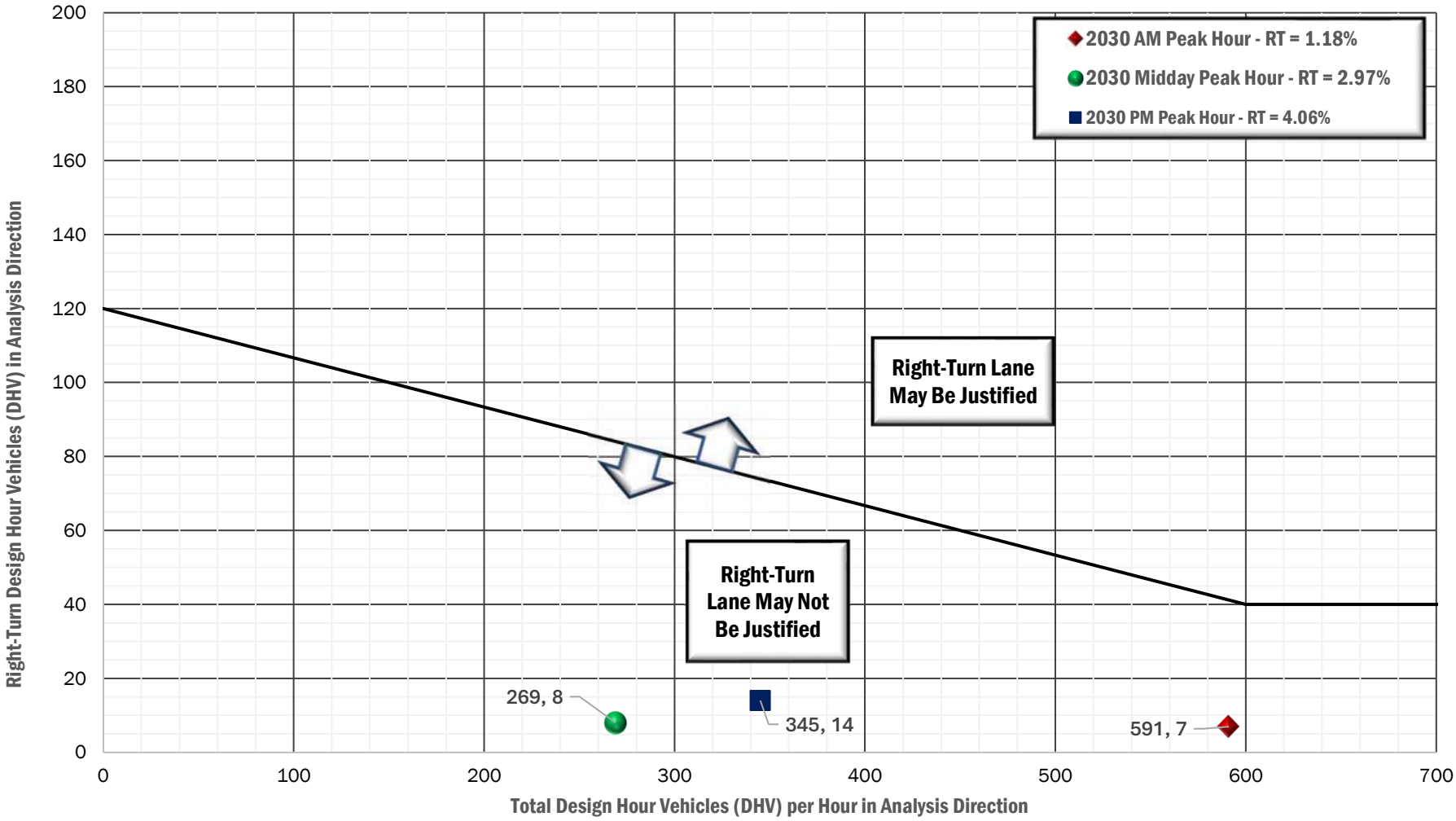

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Rimrock Road & 58th Street West / Glynn Abbey Way | Westbound Approach

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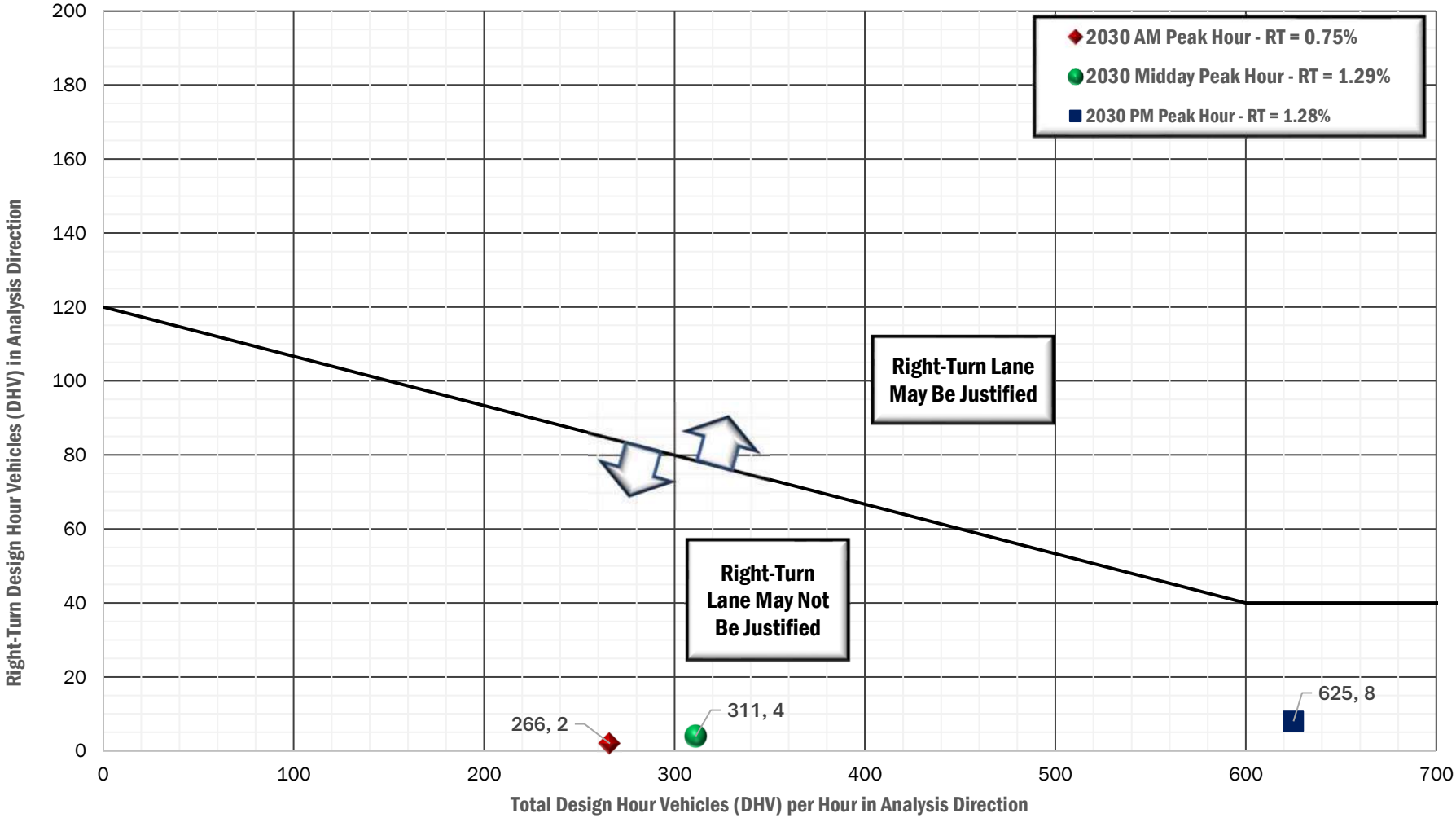

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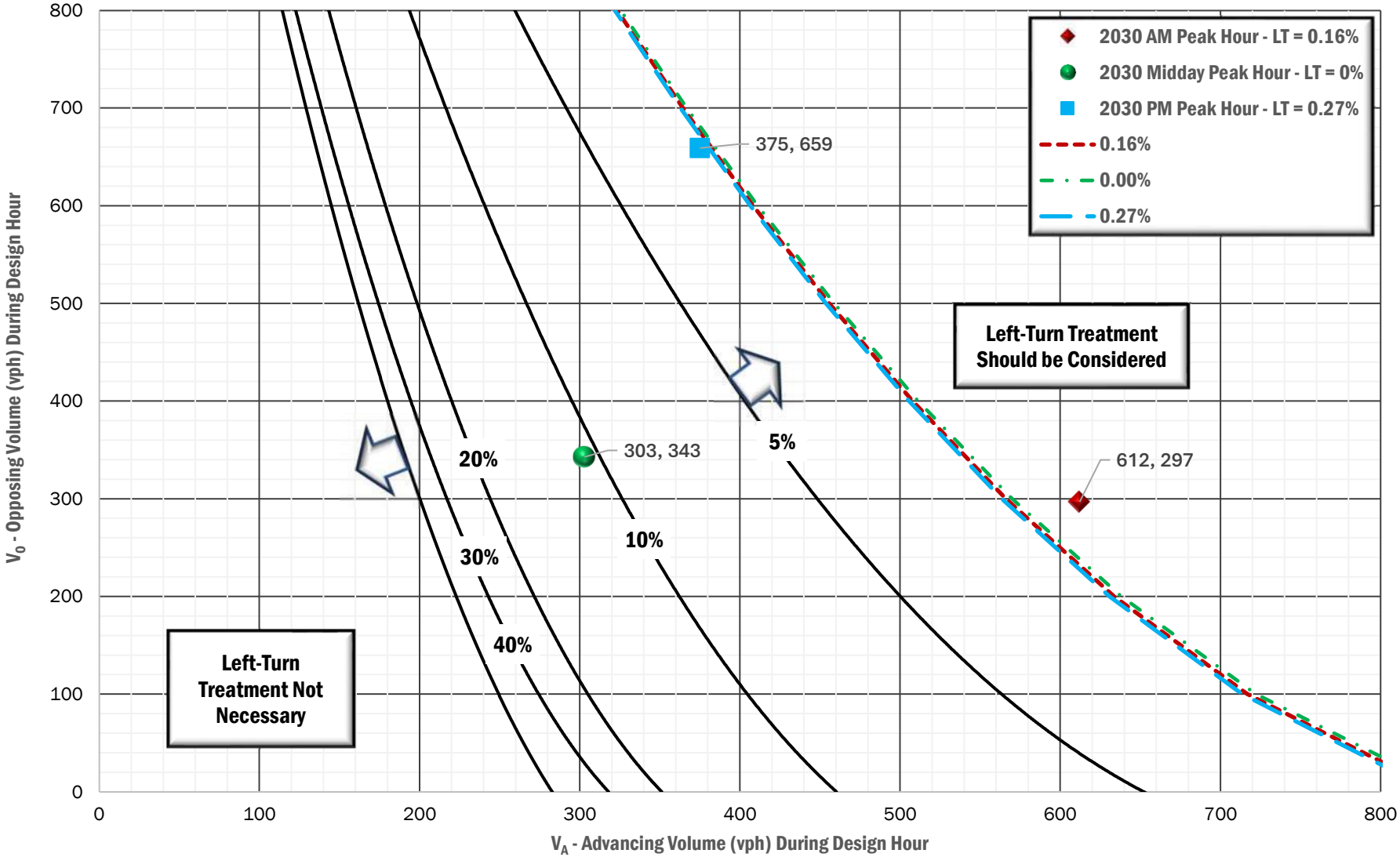
Rimrock Road & 58th Street West / Glynn Abbey Way | Eastbound Approach

Estimated 2030 Total Traffic



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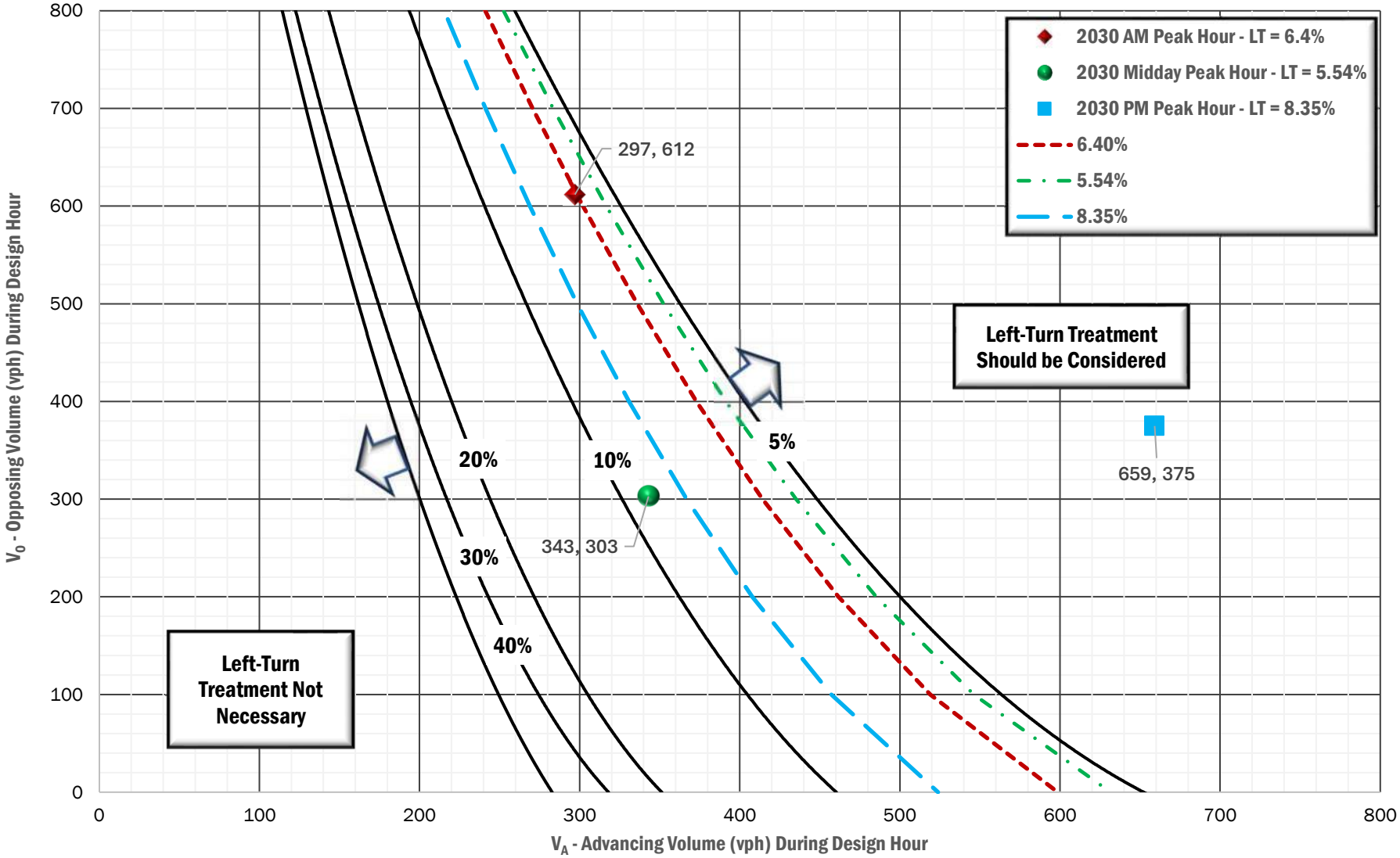
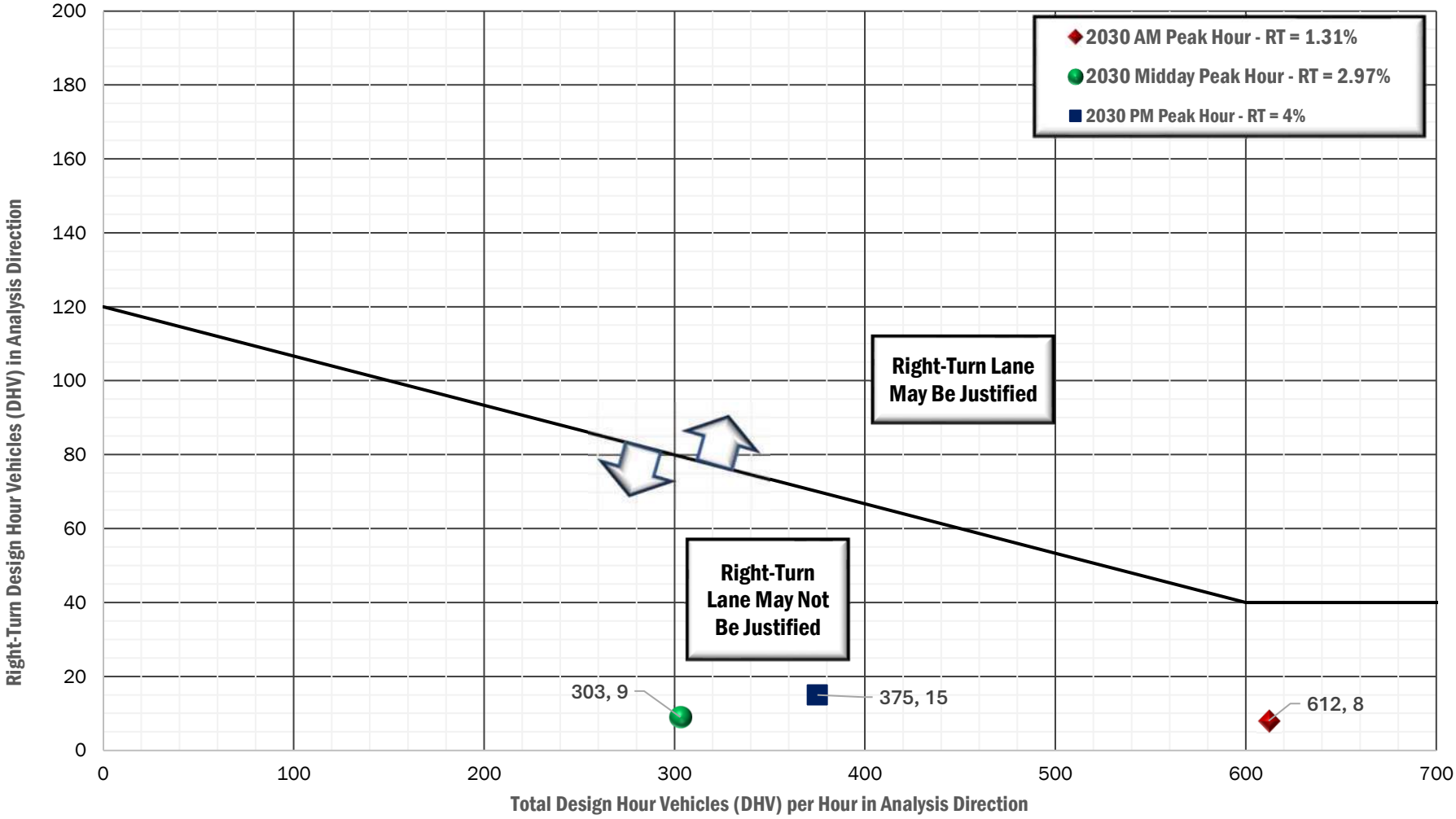


Guidelines for Right-Turn Lanes at Unsignalized Intersections on 2-Lane Highways

Rimrock Road & 58th Street West / Glynn Abbey Way | Eastbound Approach

Estimated 2030 Total Traffic



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Rimrock Road & 58th Street West / Glynn Abbey Way | Westbound Approach

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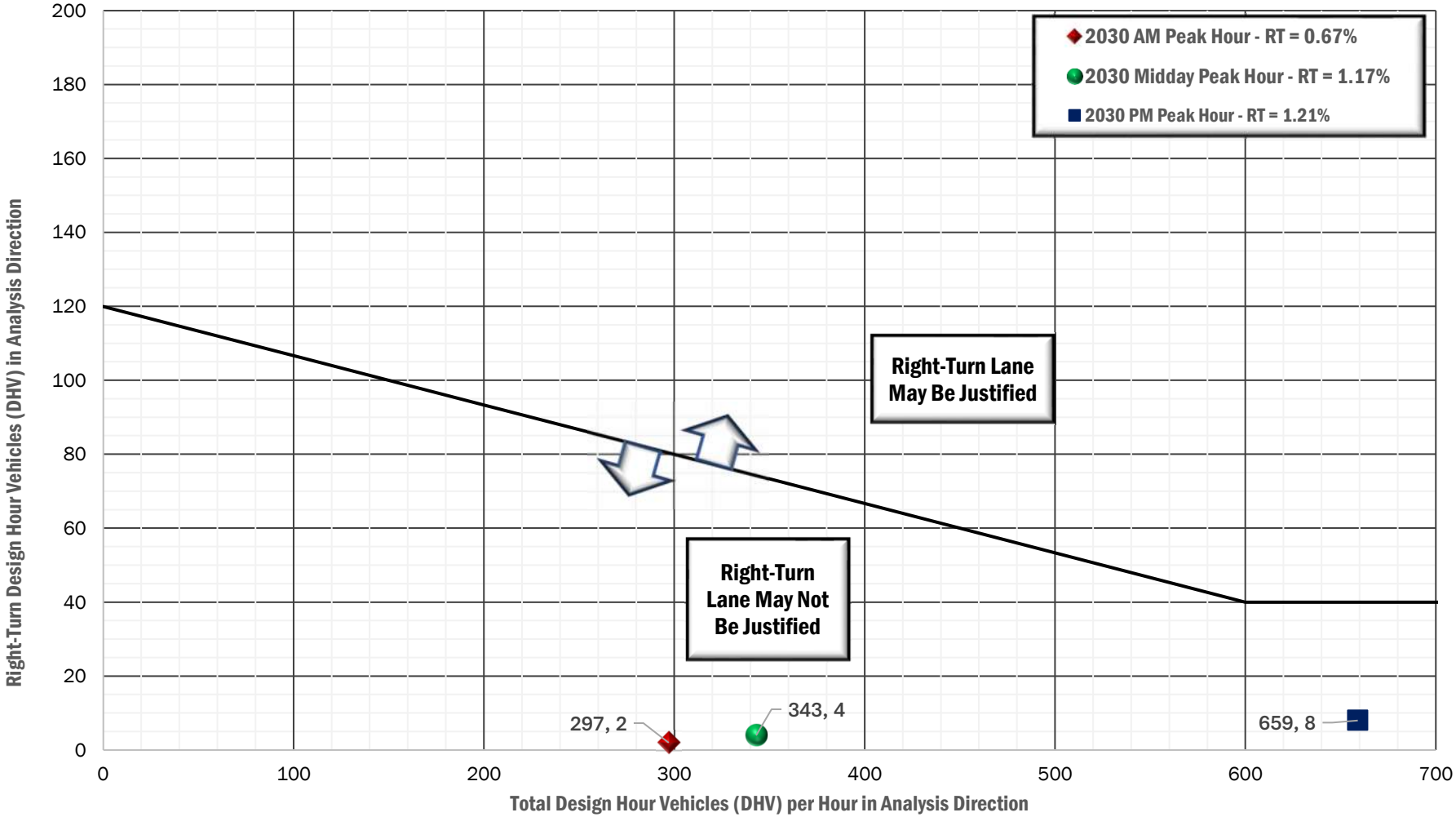

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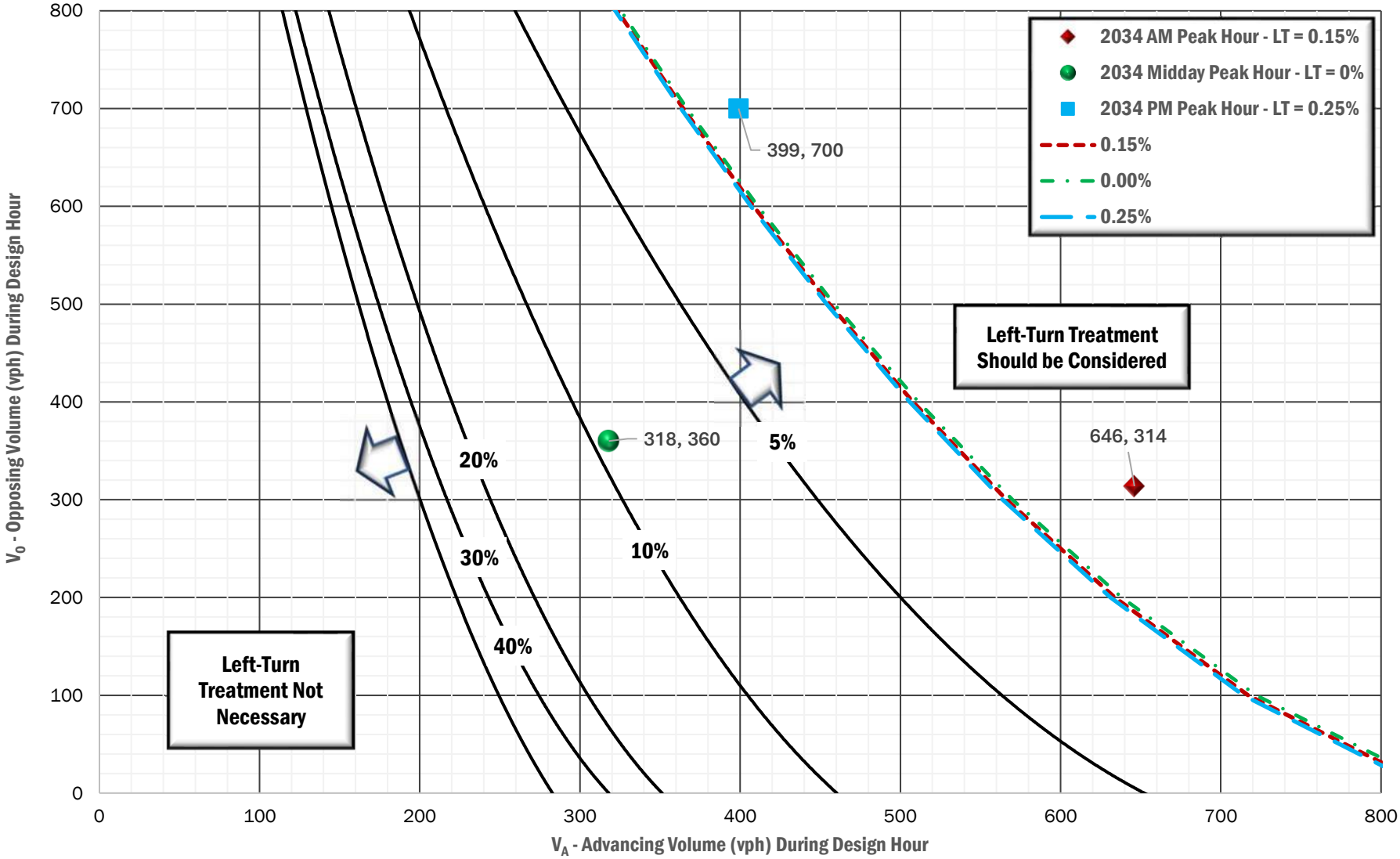
Volume Guidelines for Left-Turn Lanes at Unsignalized Intersections on 2-Lane Highways (55 mph)

Rimrock Road & 58th Street West / Glynn Abbey Way | Eastbound Approach

Estimated 2034 Background Traffic



Volume Guidelines for Left-Turn Lanes at Unsignalized Intersections on 2-Lane Highways (55 mph)

Rimrock Road & 58th Street West / Glynn Abbey Way | Westbound Approach

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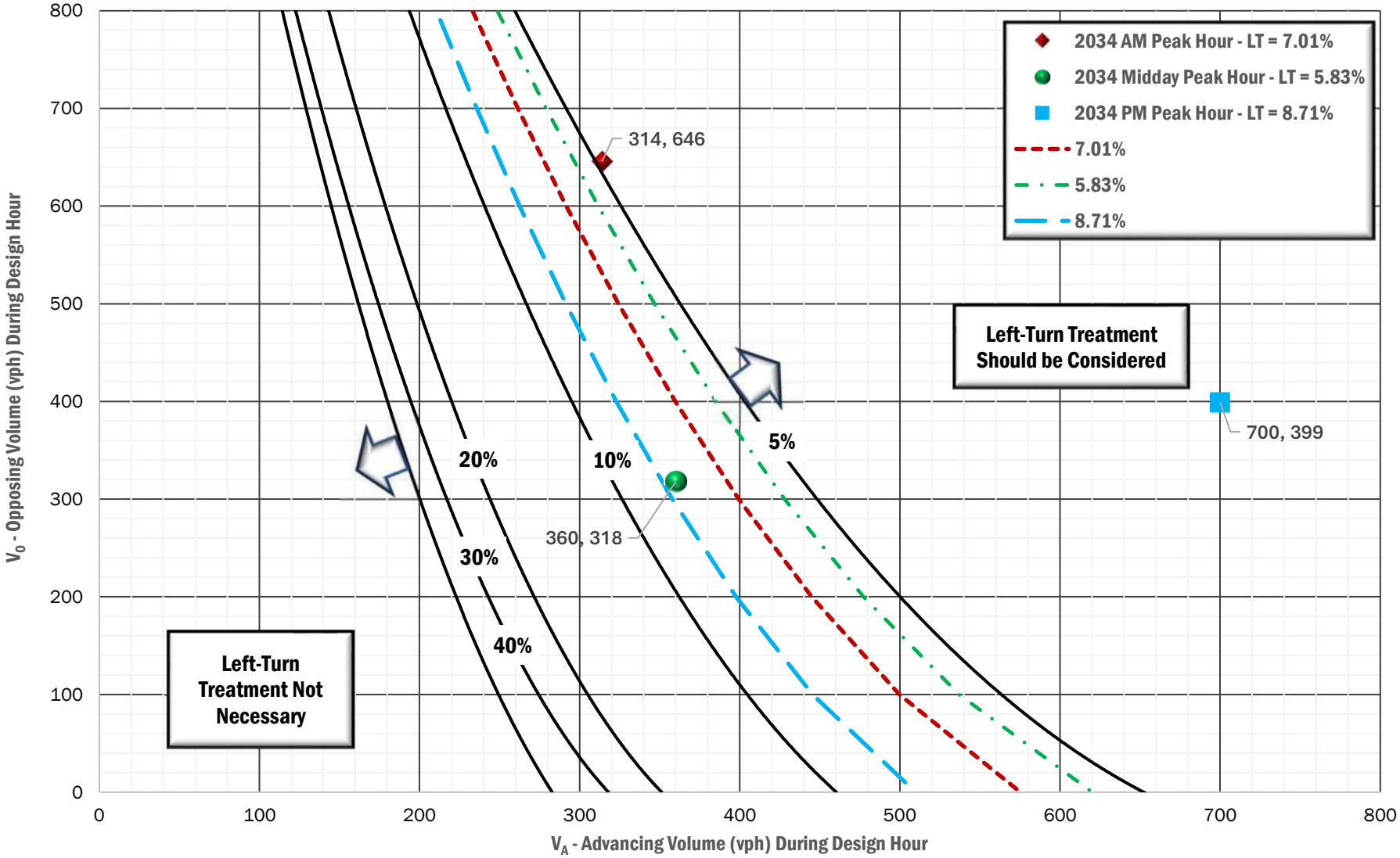
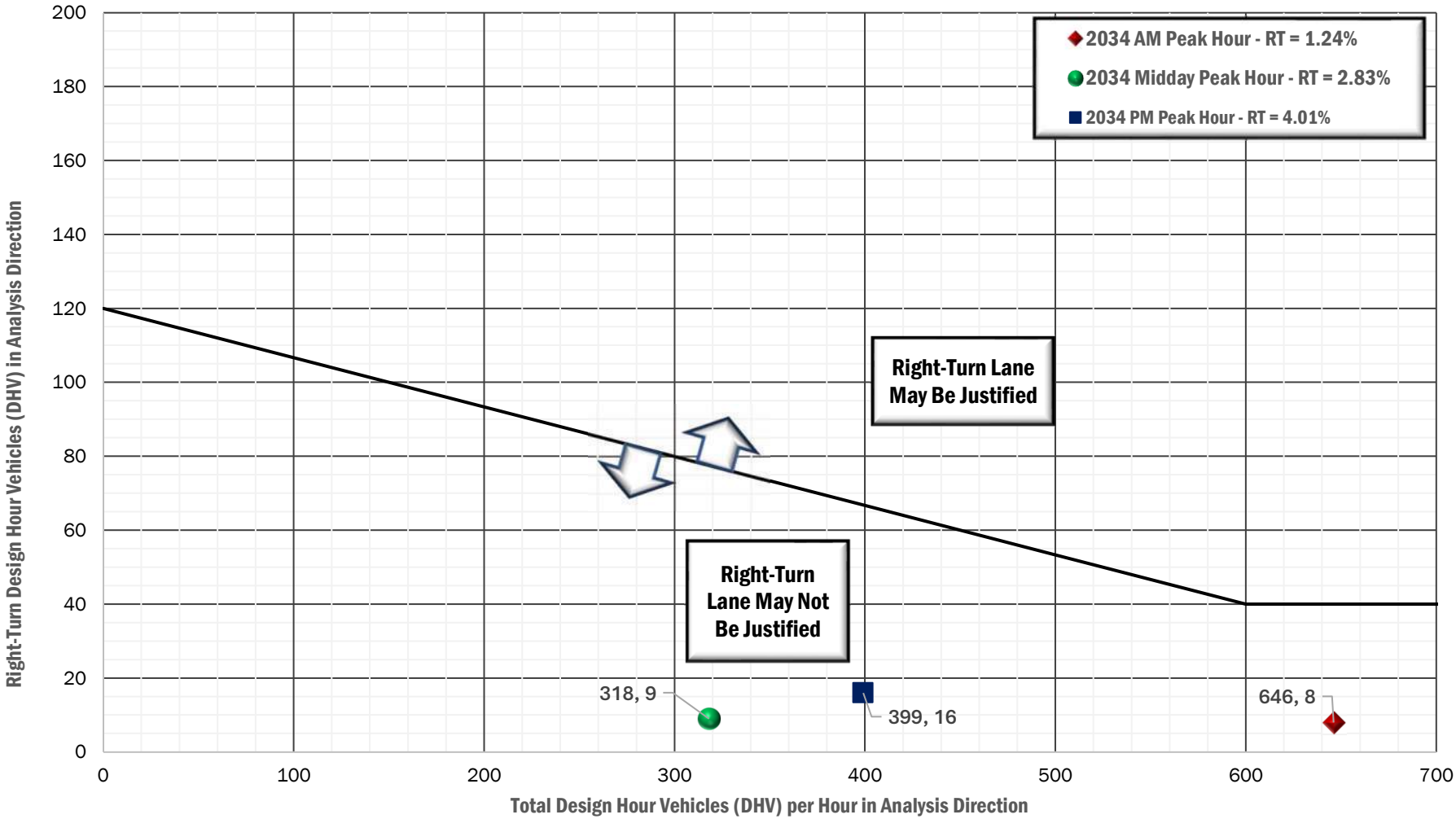


Int-03_Rimrock-Rd+58th-St-W_WB-LT-Eval_2034-Bkgnd

Guidelines for Right-Turn Lanes at Unsignalized Intersections on 2-Lane Highways

Rimrock Road & 58th Street West / Glynn Abbey Way | Eastbound Approach

Estimated 2034 Background Traffic



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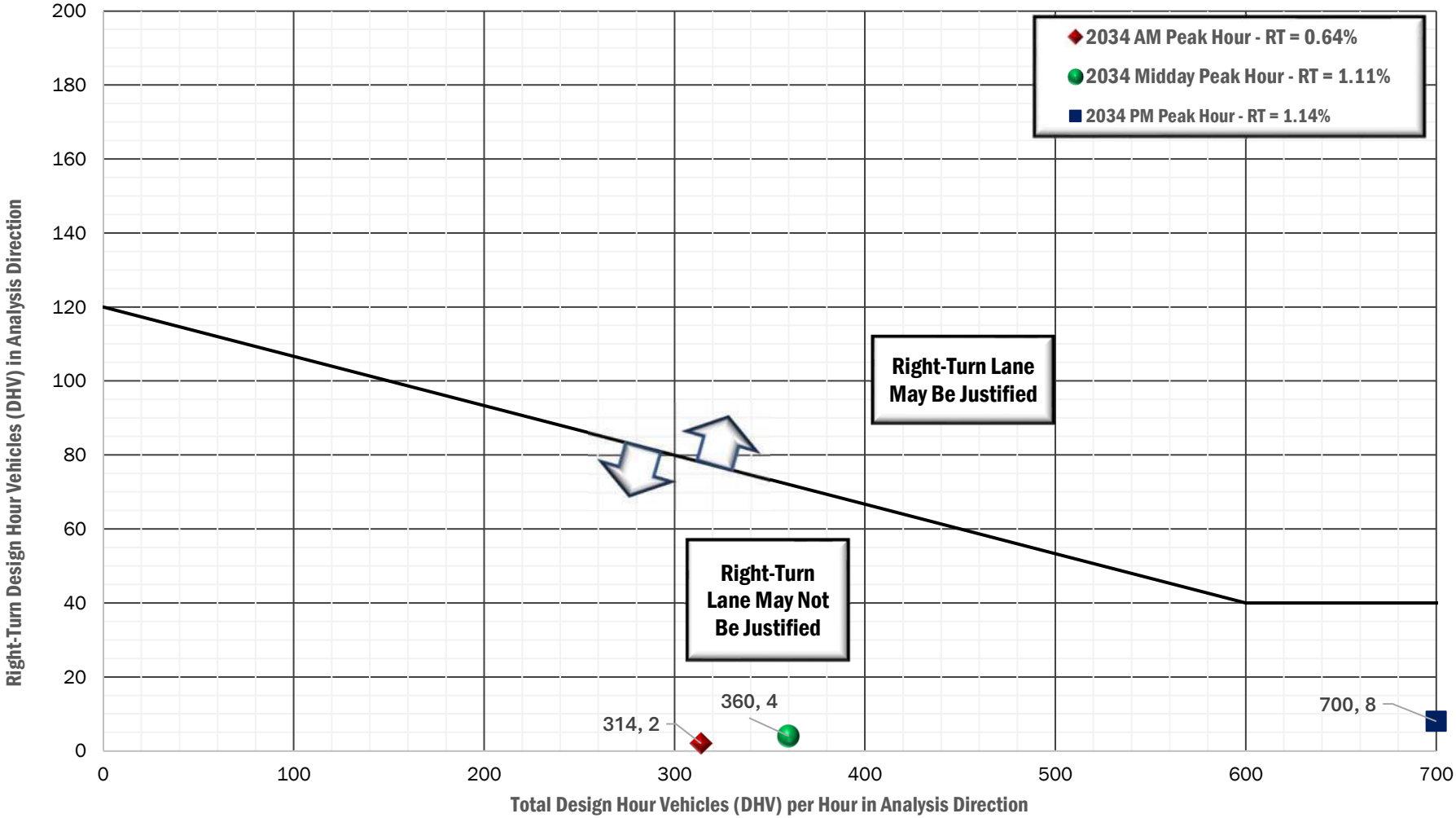
Guidelines for Right-Turn Lanes at Unsignalized Intersections on 2-Lane Highways

Rimrock Road & 58th Street West / Glynn Abbey Way | Westbound Approach

Estimated 2034 Background Traffic



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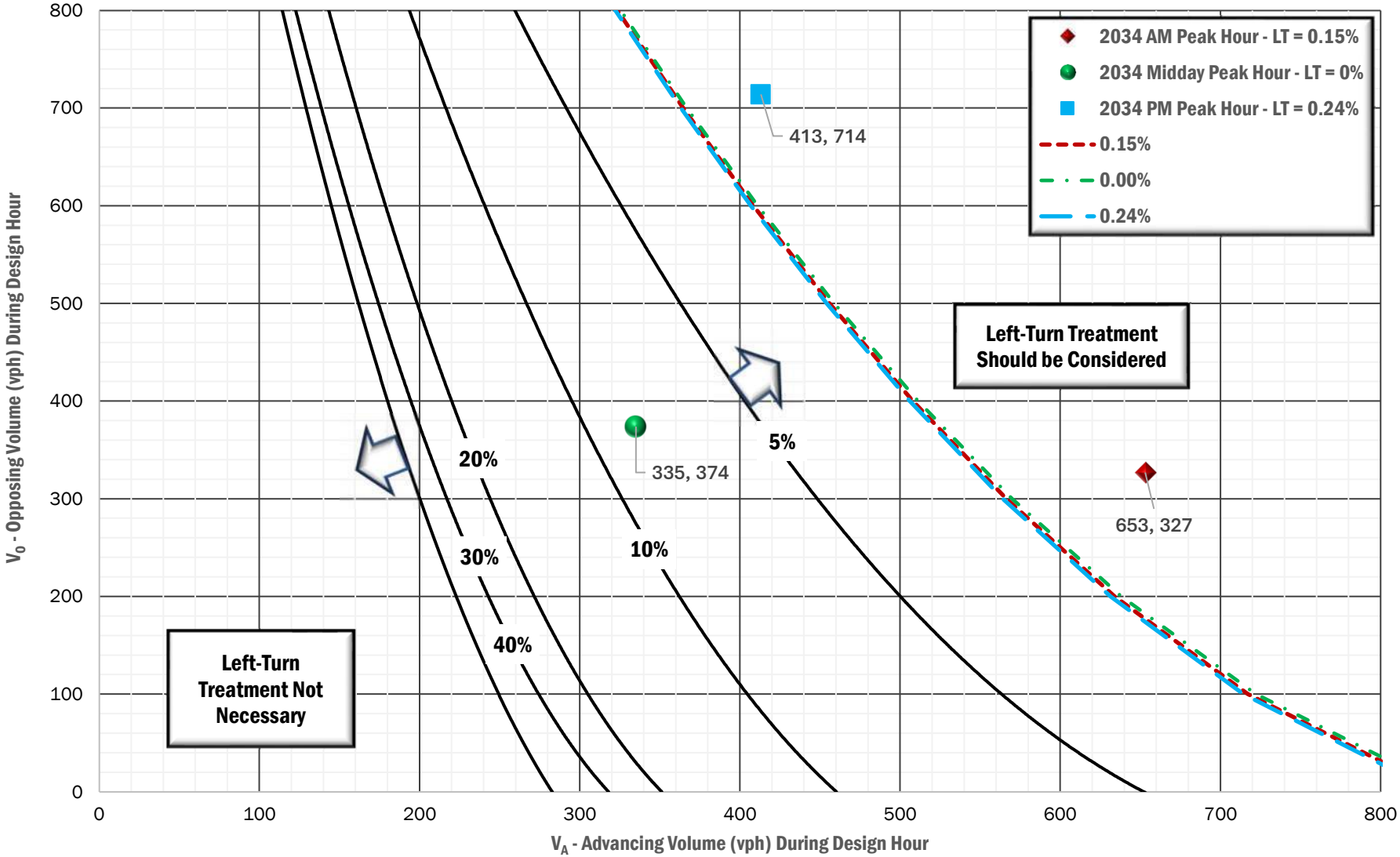
Rimrock Road & 58th Street West / Glynn Abbey Way | Eastbound Approach

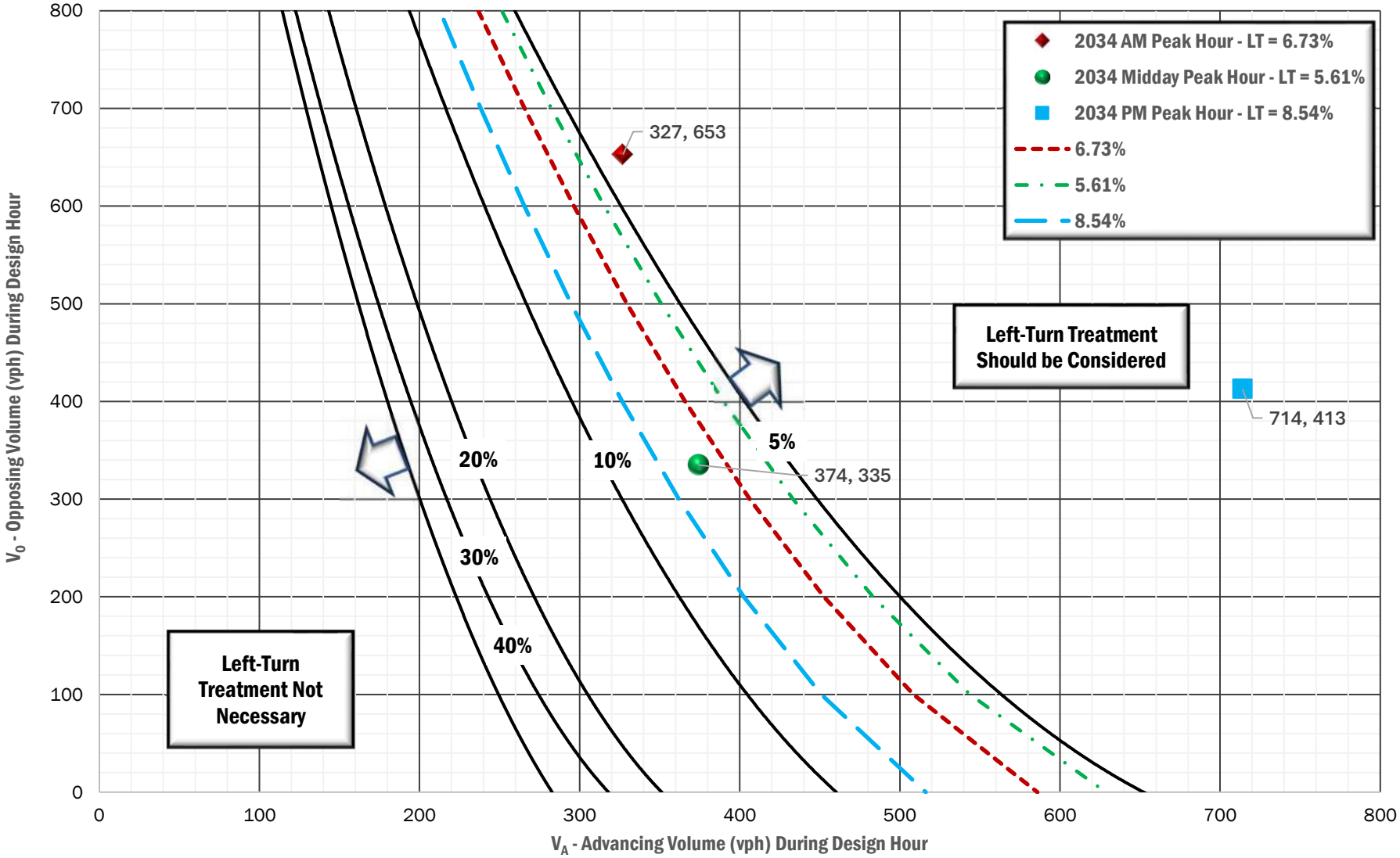
Estimated 2034 Total Traffic



Volume Guidelines for Left-Turn Lanes at Unsignalized Intersections on 2-Lane Highways (55 mph)

Rimrock Road & 58th Street West / Glynn Abbey Way | Westbound Approach

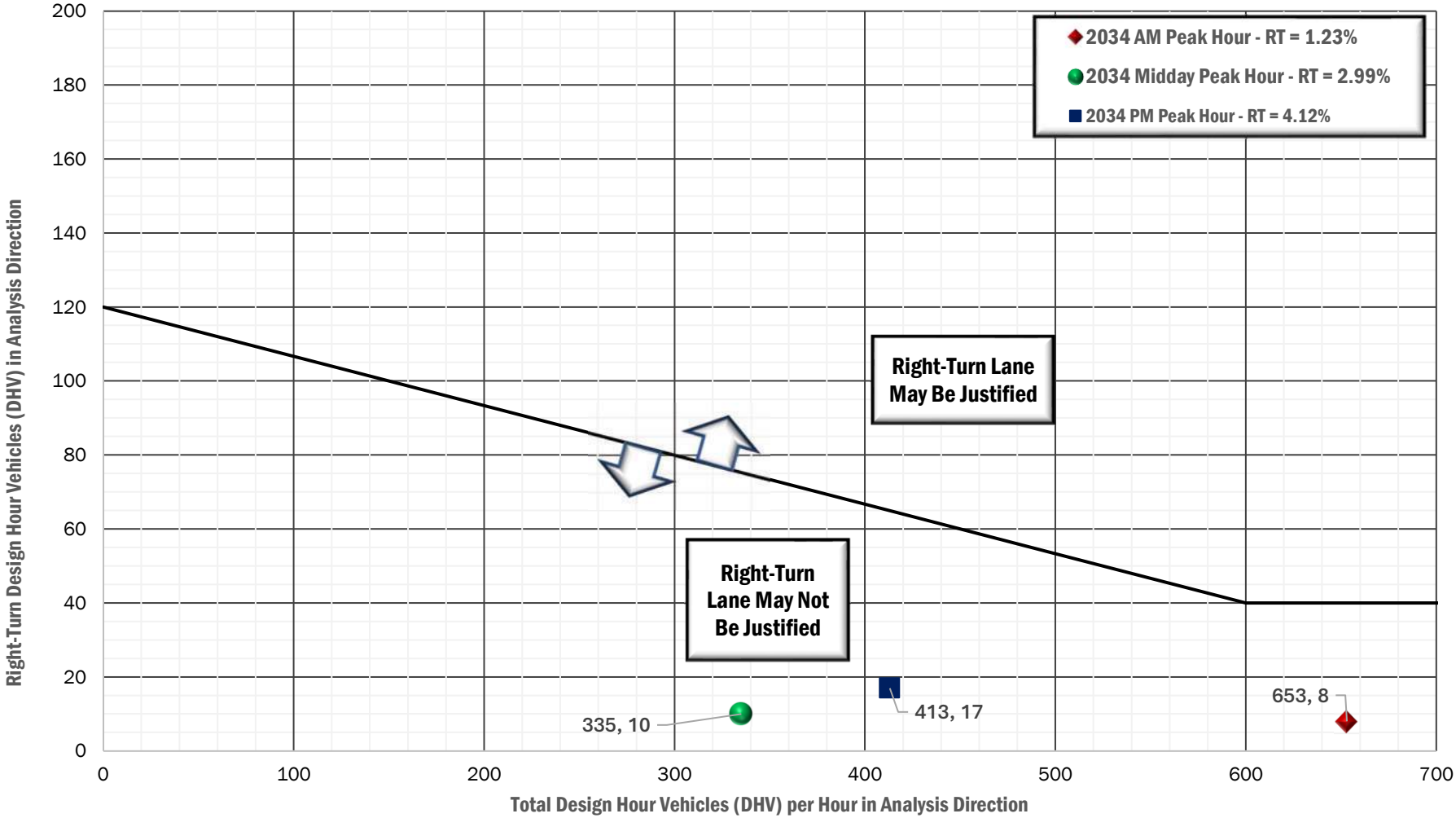
Estimated 2034 Total Traffic



Guidelines for Right-Turn Lanes at Unsignalized Intersections on 2-Lane Highways

Rimrock Road & 58th Street West / Glynn Abbey Way | Eastbound Approach

Estimated 2034 Total Traffic



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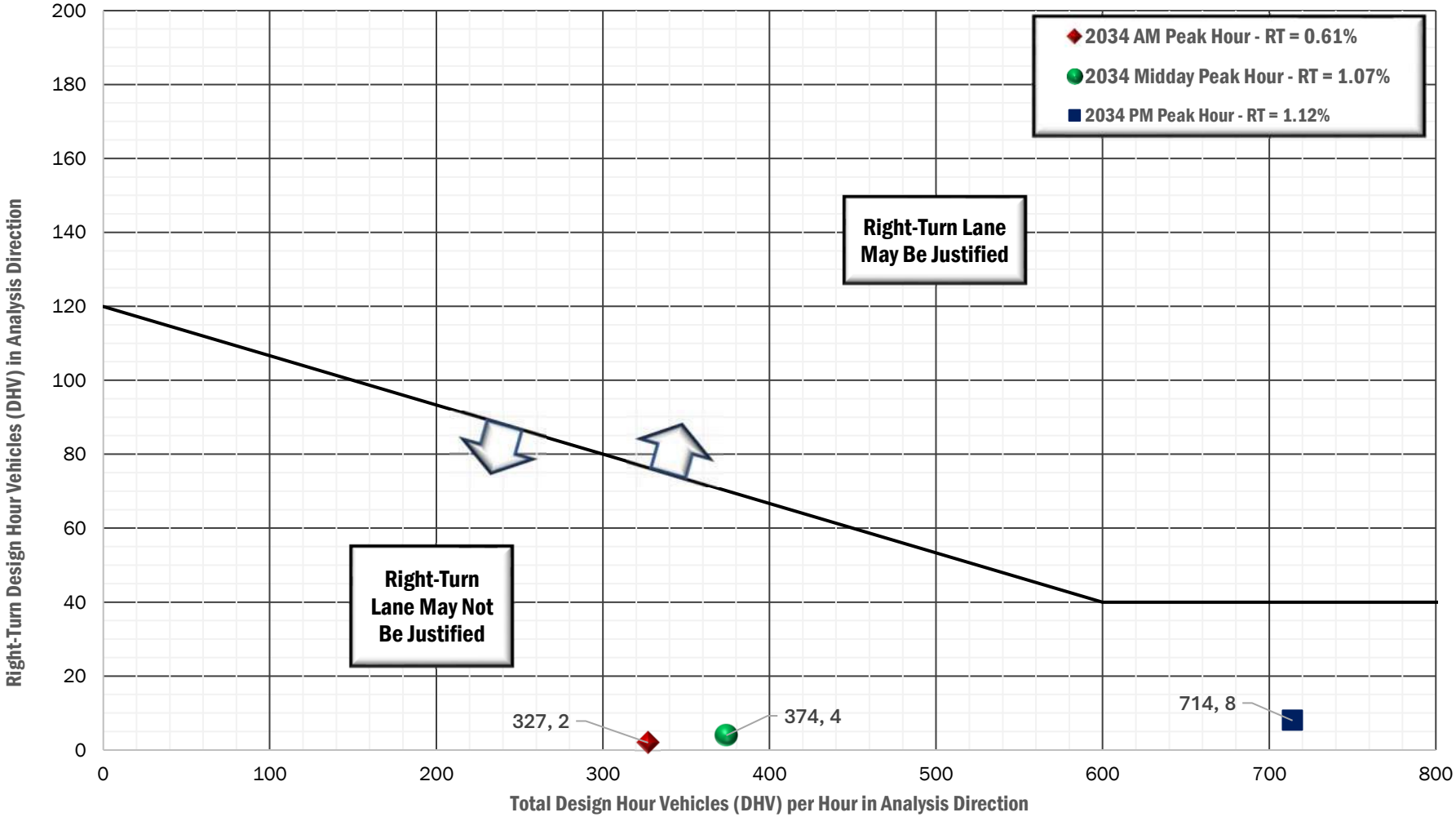
Guidelines for Right-Turn Lanes at Unsignalized Intersections on 2-Lane Highways

Rimrock Road & 58th Street West / Glynn Abbey Way | Westbound Approach

Estimated 2034 Total Traffic



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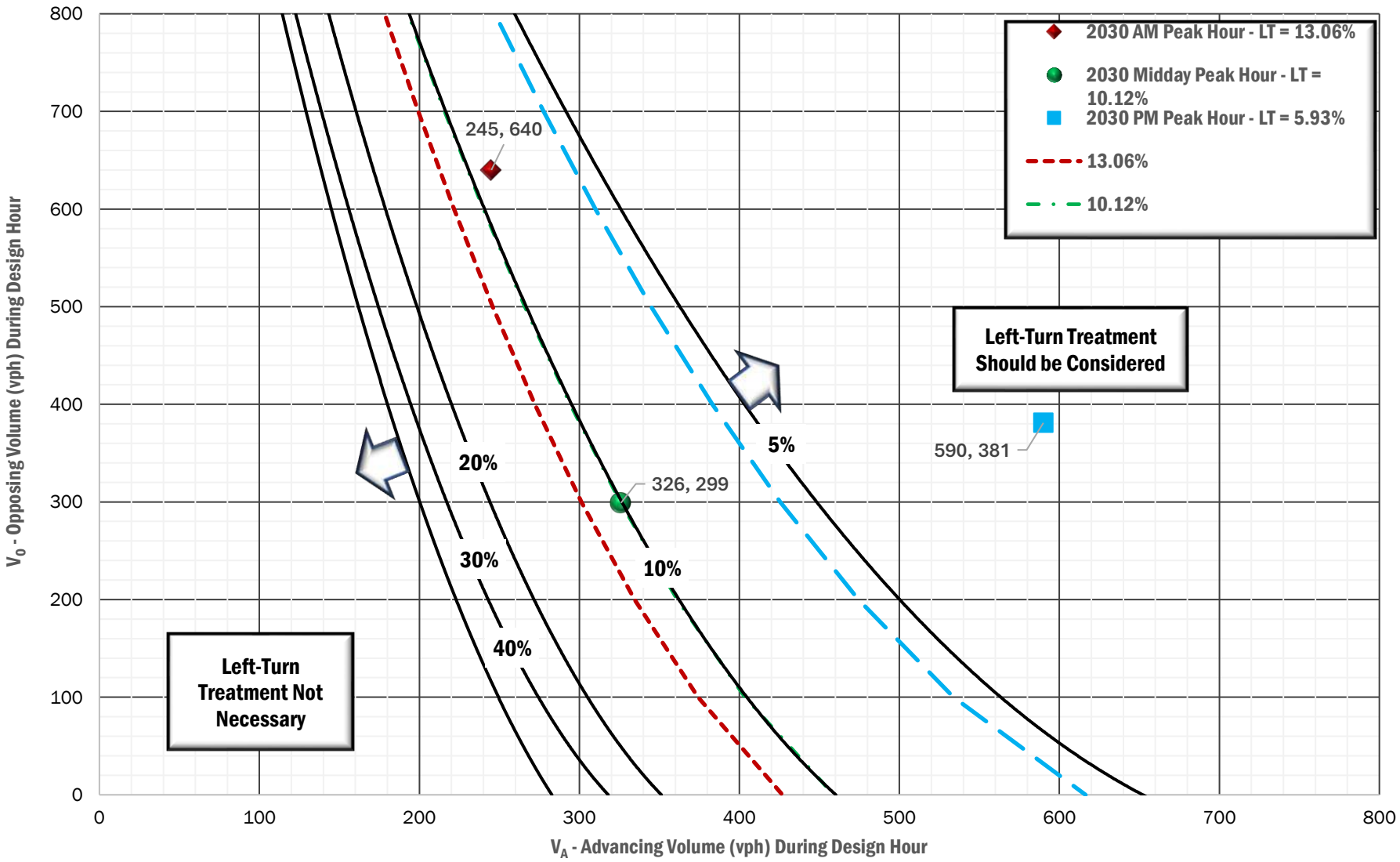
Volume Guidelines for Left-Turn Lanes at Unsignalized Intersections on 2-Lane Highways (55 mph)

Rimrock Road & Road A | Westbound Approach

Estimated 2030 Total Traffic

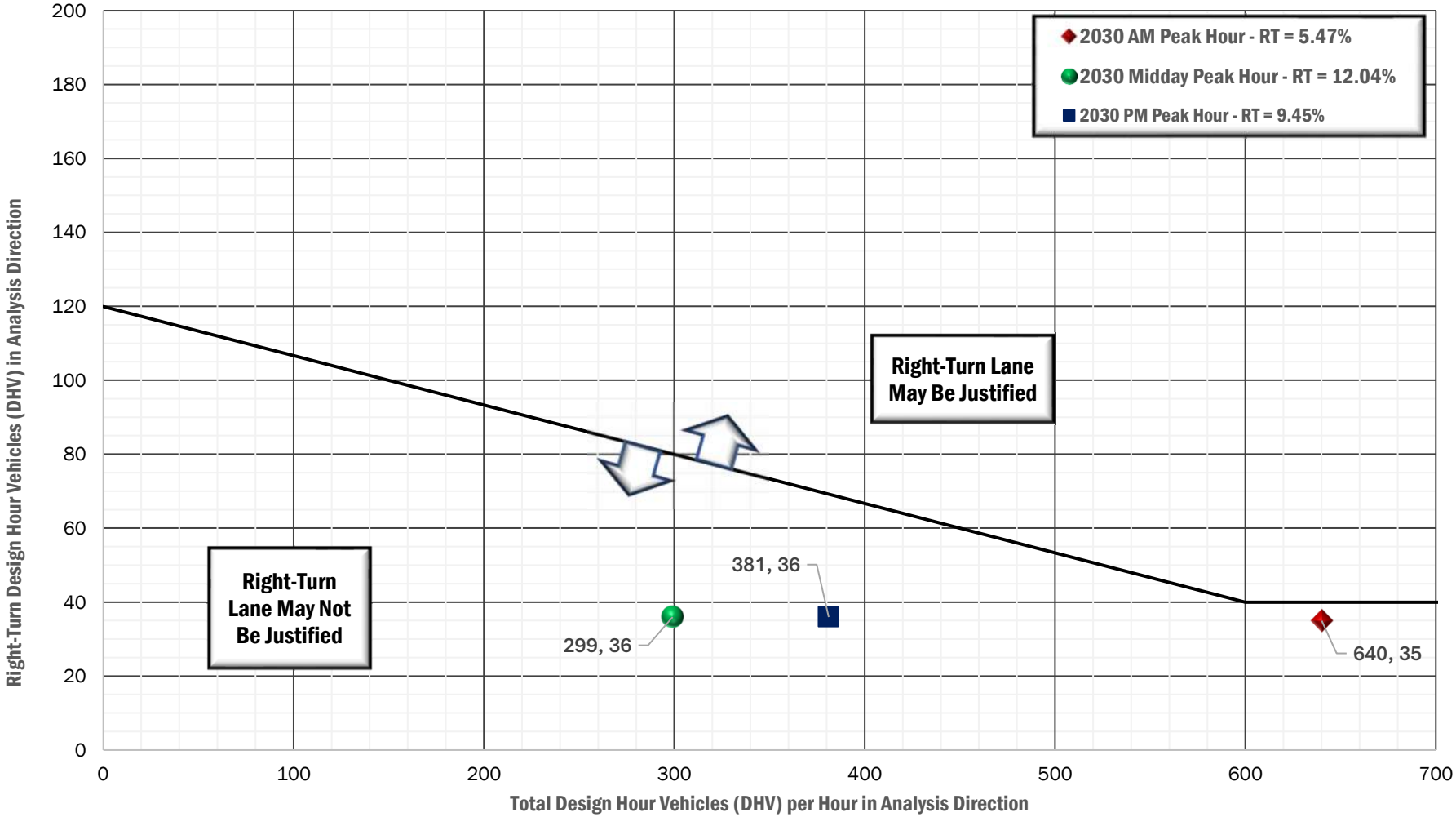


Int-A_Rimrock-Rd+Road-A_WB-LT-Eval_2030-Total

Guidelines for Right-Turn Lanes at Unsignalized Intersections on 2-Lane Highways

Rimrock Road & Road A | Eastbound Approach

Estimated 2030 Total Traffic



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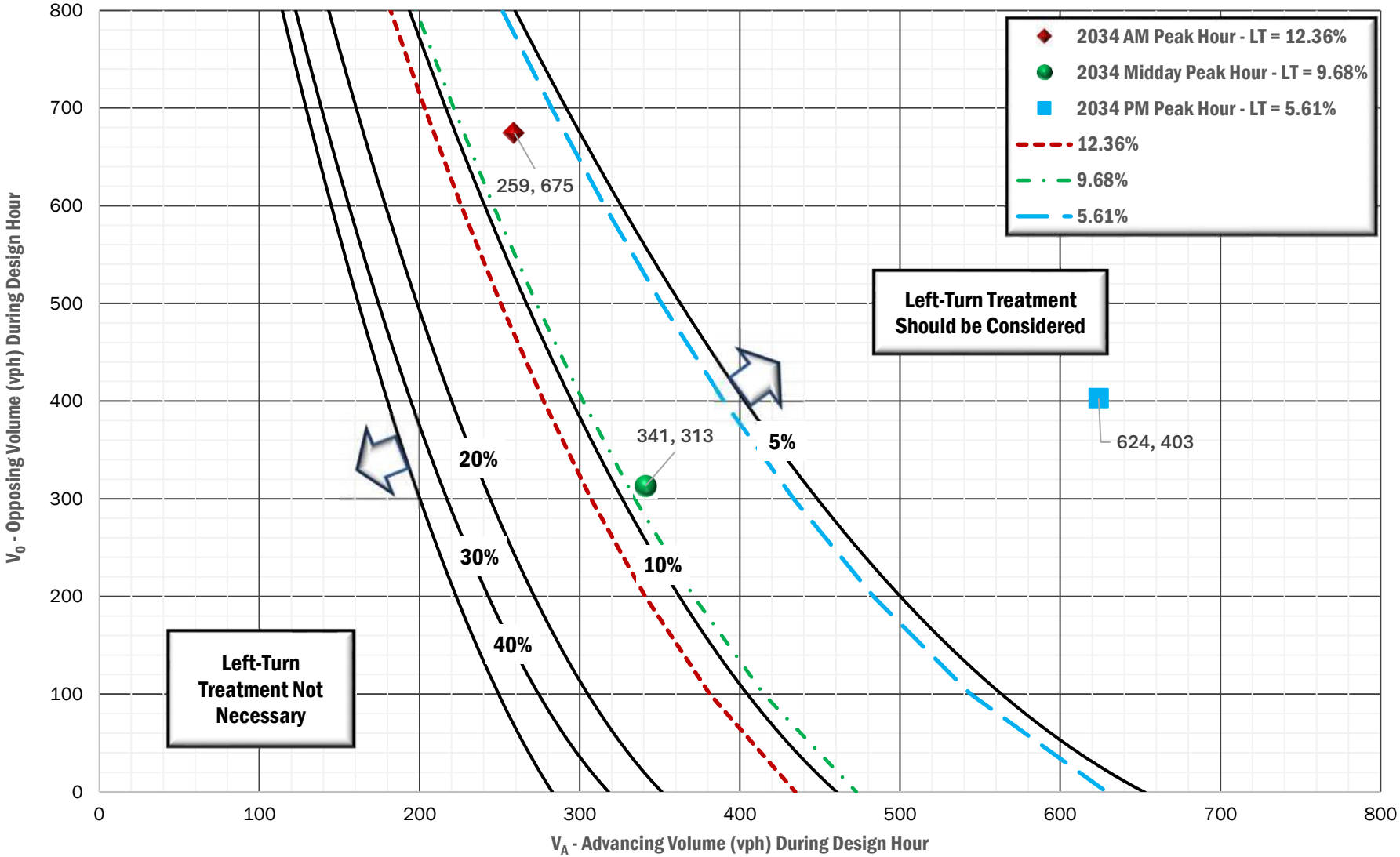
Volume Guidelines for Left-Turn Lanes at Unsignalized Intersections on 2-Lane Highways (55 mph)

Rimrock Road & Road A | Westbound Approach

Estimated 2034 Background Traffic

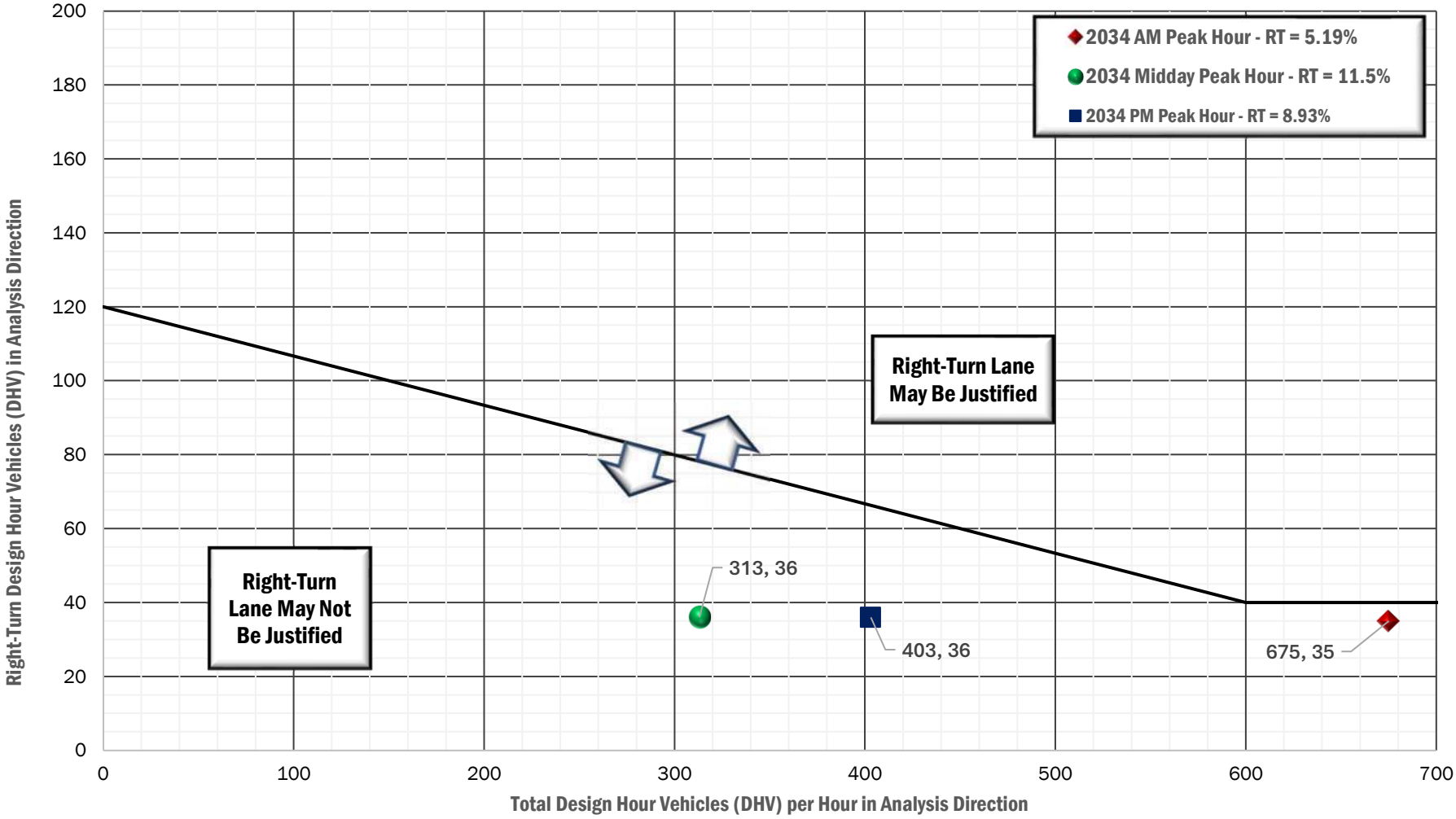


Int-A_Rimrock-Rd+Road-A_WB-LT-Eval_2034-Bkgnd

Guidelines for Right-Turn Lanes at Unsignalized Intersections on 2-Lane Highways

Rimrock Road & Road A | Eastbound Approach

Estimated 2034 Background Traffic

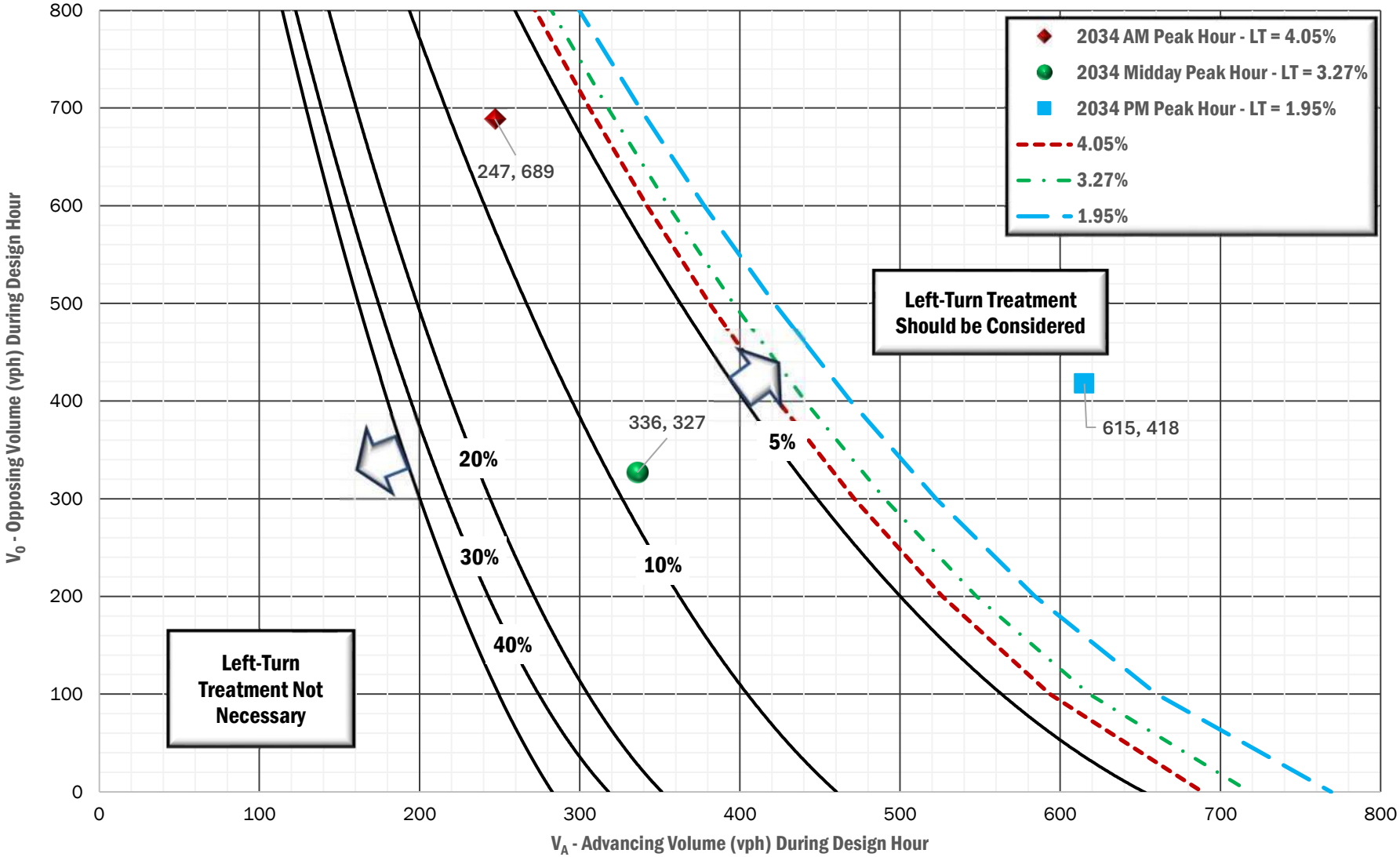


Note: For Highways with a design speed below 50 mph (80 km/h) with a DHV < 300 and where right turns are > 40, an adjustment should be used. To read the vertical axis of the chart, subtract 20 from the actual number of right turns.

Volume Guidelines for Left-Turn Lanes at Unsignalized Intersections on 2-Lane Highways (55 mph)

Rimrock Road & Road A | Westbound Approach

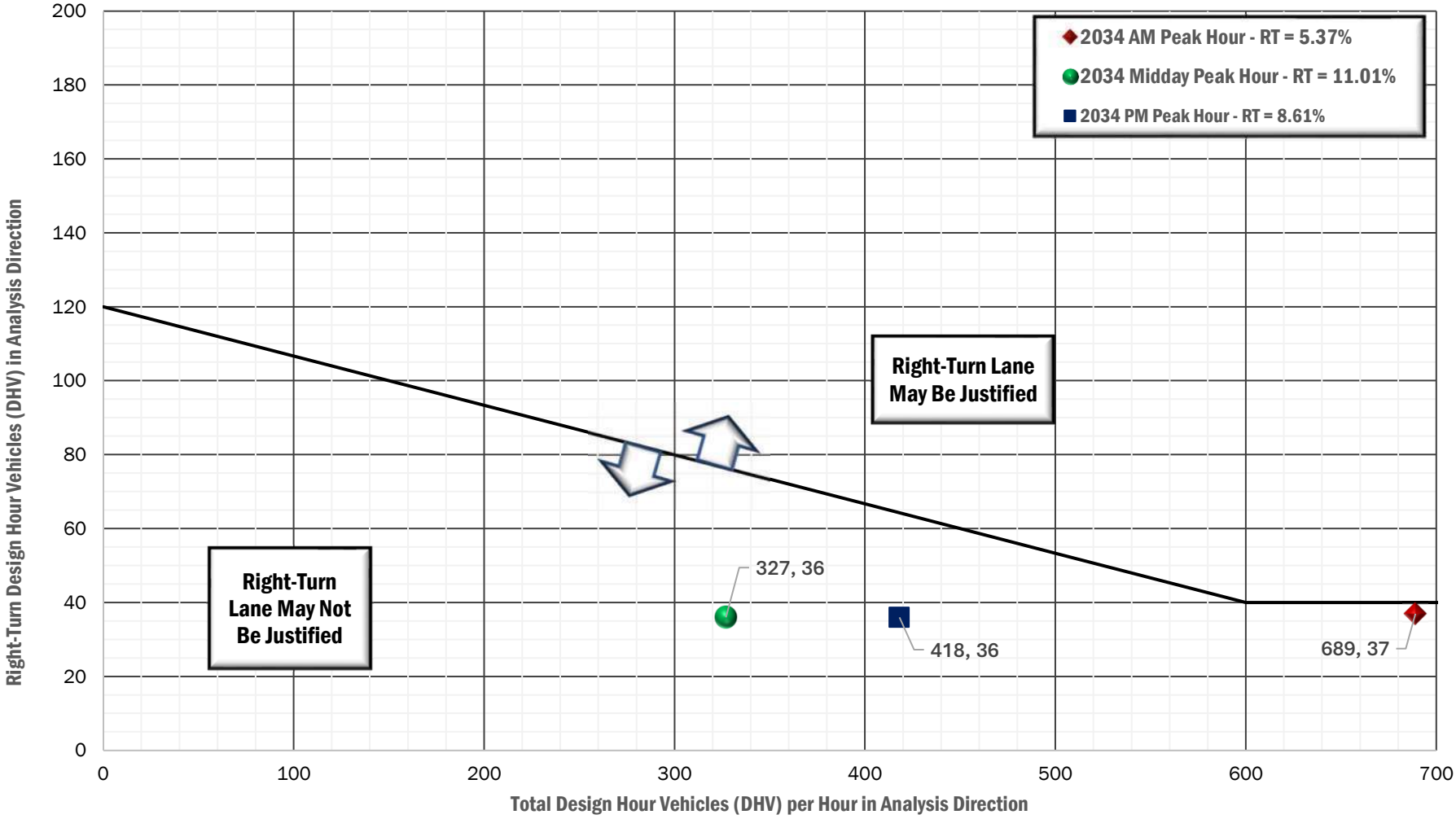
Estimated 2034 Total Traffic



Guidelines for Right-Turn Lanes at Unsignalized Intersections on 2-Lane Highways

Rimrock Road & Road A | Eastbound Approach

Estimated 2034 Total Traffic

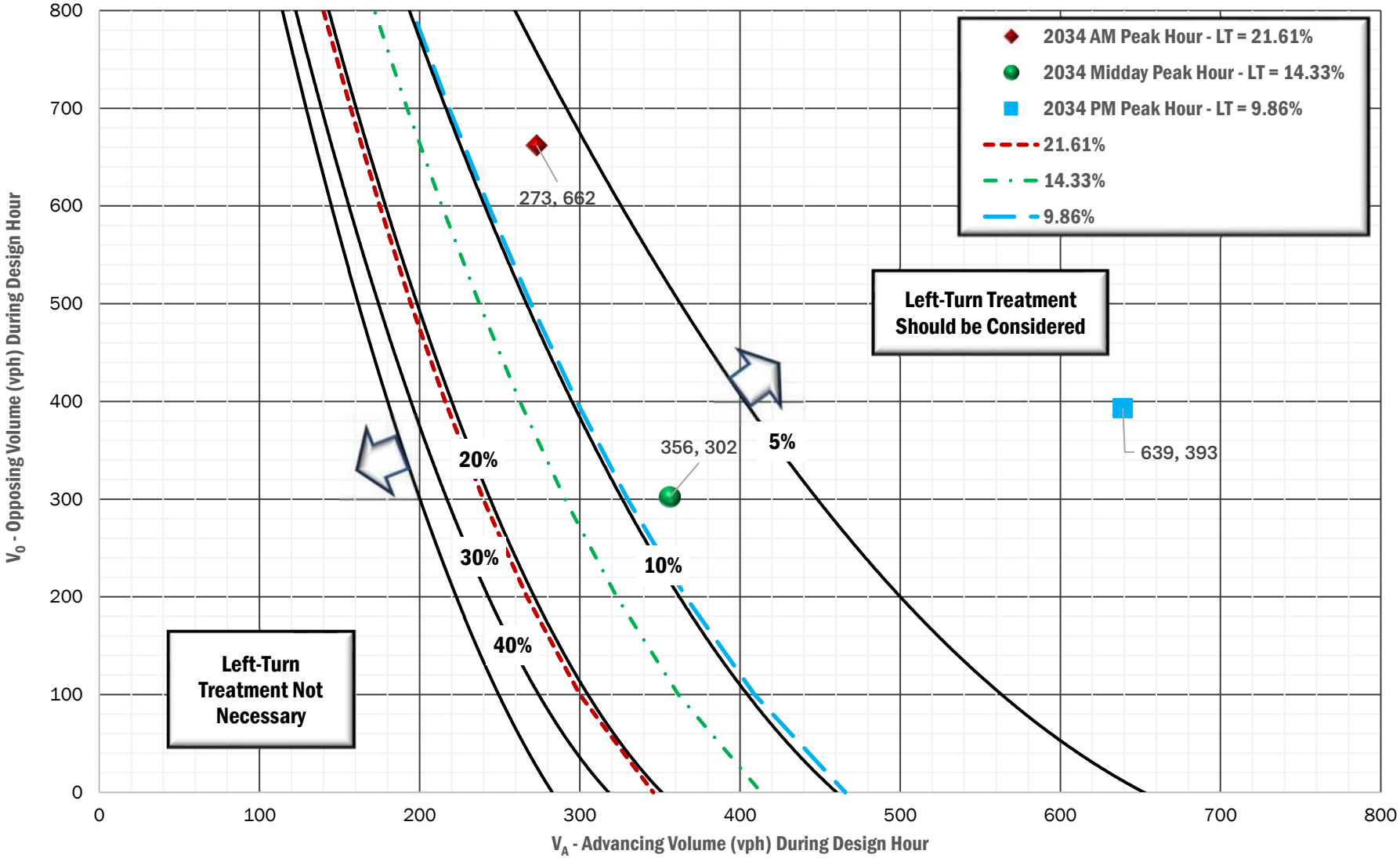


Note: For Highways with a design speed below 50 mph (80 km/h) with a DHV < 300 and where right turns are > 40, an adjustment should be used. To read the vertical axis of the chart, subtract 20 from the actual number of right turns.

Volume Guidelines for Left-Turn Lanes at Unsignalized Intersections on 2-Lane Highways (55 mph)

Rimrock Road & 60th Street West | Westbound Approach

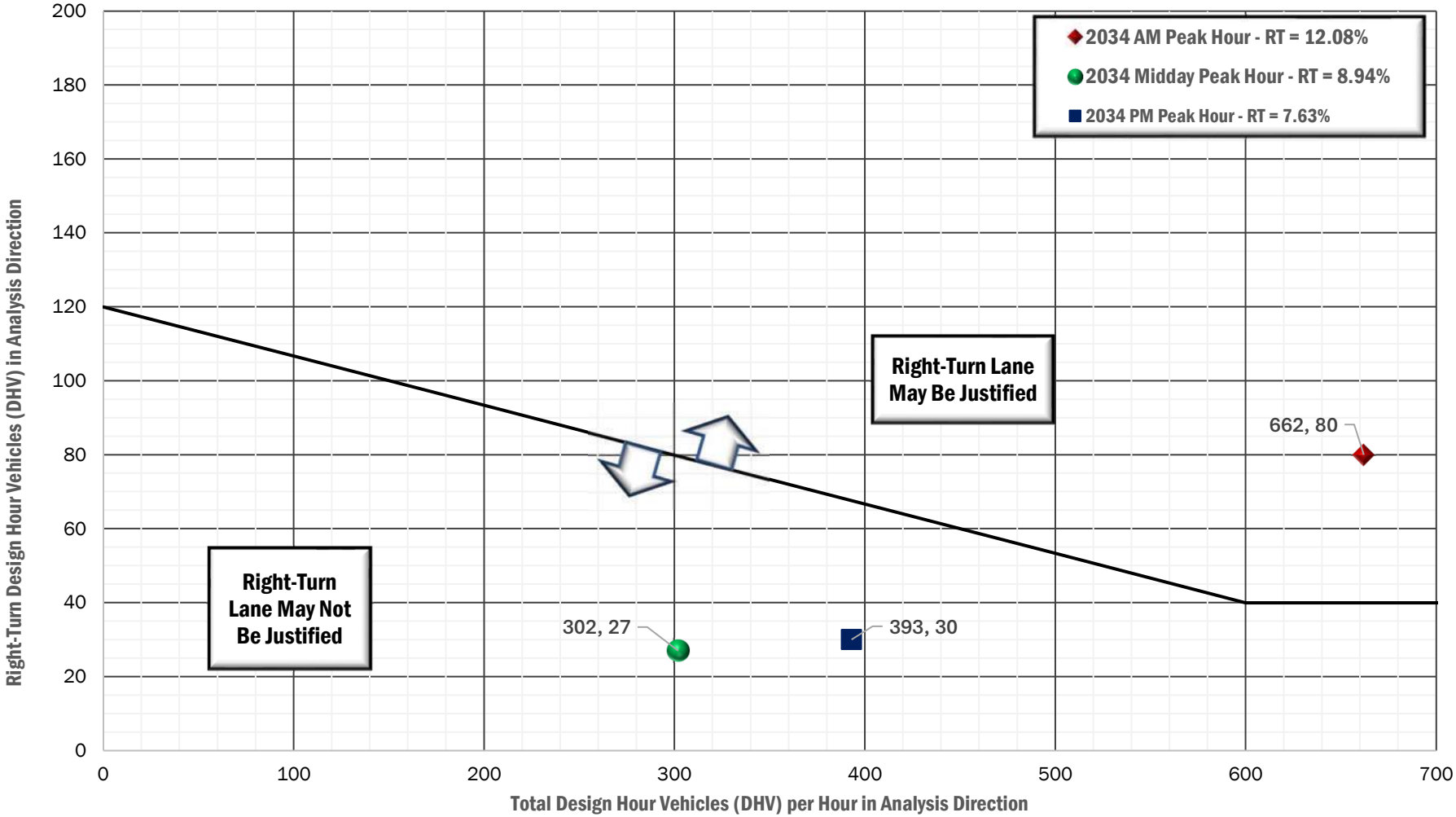
Estimated 2034 Total Traffic



Guidelines for Right-Turn Lanes at Unsignalized Intersections on 2-Lane Highways

Rimrock Road & 60th Street West | Eastbound Approach

Estimated 2034 Total Traffic



Note: For Highways with a design speed below 50 mph (80 km/h) with a DHV < 300 and where right turns are > 40, an adjustment should be used. To read the vertical axis of the chart, subtract 20 from the actual number of right turns.

Appendix G

Traffic Signal Warrant Evaluation

Intersection of Grand Avenue & 62nd Street West

E5 ENGINEERING, PLLC

Background Intersection Information

Major Roadway:	Grand Avenue		
Posted or 85% Speed:	45	mph	(Posted)
Approach Lanes:	1		
Distance to Nearest Traffic Signal:	5,310	ft	(54th Street West)
Minor Roadway:	62nd Street West		
Posted or 85% Speed:	45	mph	(Posted)
Approach Lanes:	1		
Total Number of Approaches:	3		
Community with a population less than 10,000 or speeds above 40 mph on the major street?			Yes
Analysis Case:	2025 Existing Conditions		

Warrant Analyses Summary

Traffic Signal Warrant	Warrant Satisfied?
Warrant 1 | Eight-Hour Vehicular Volume	No
Warrant 2 | Four-Hour Vehicular Volume	No
Warrant 3 | Peak Hour	Not Evaluated
Warrant 4 | Pedestrian Volume	Insufficient Ped Volumes
Warrant 5 | School Crossing	Not Evaluated
Warrant 6 | Coordinated Signal System	Not Evaluated
Warrant 7 | Crash Experience	Not Evaluated
Warrant 8 | Roadway Network	Not Evaluated
Warrant 9 | Intersection Near a Grade Crossing	Not Evaluated

Notes & Comments

The intersection of Grand Avenue and 62nd Street West was not determined to be at a location that would present an unusual case, such as office complexes, manufacturing plants, industrial complexes, or high-occupancy vehicle facilities that attract or discharge large numbers of vehicles over a short time; therefore, Warrant 3 | Peak Hour was not evaluated as a part of this study.

Warrants 5, 6, and 9 were not applicable to the intersection of Grand Avenue and 62nd Street West and were therefore not evaluated.

An adequate trial of alternatives to reduce crash frequency at the intersection of Grand Avenue and 62nd Street West have not been implemented; therefore, Warrant 7 has not been evaluated.

The existing traffic volumes at the intersection of Grand Avenue and 62nd Street West does not currently meet the hourly volume thresholds for Warrant 8 to be evaluated, at this time.

Traffic Signal Warrant Evaluation

Intersection of Grand Avenue & 62nd Street West

Intersection Traffic Volume Summary

		MAJOR ROADWAY Grand Avenue			MINOR ROADWAY 62nd Street West			MAJOR & MINOR ROADWAYS COMBINED TOTAL VOLUMES		
START TIME	END TIME	Total Volume (veh/hr)	Excluded Right-Turns (veh/hr)	Adjusted Volume (veh/hr)	Total Volume (veh/hr)	Excluded Right-Turns (veh/hr)	Adjusted Volume (veh/hr)	Unadjusted Volume (veh/hr)	Adjusted Volume (veh/hr)	Pedestrians Crossing Major Roadway (peds/hr)
6:00 AM	7:00 AM	235	22	213	119	47	72	354	285	0
7:00 AM	8:00 AM	432	40	392	280	73	207	712	599	0
8:00 AM	9:00 AM	368	41	327	169	64	105	537	432	0
9:00 AM	10:00 AM	332	33	299	105	43	62	437	361	0
10:00 AM	11:00 AM	323	42	281	109	36	73	432	354	0
11:00 AM	12:00 PM	369	50	319	105	37	68	474	387	0
12:00 PM	1:00 PM	415	63	352	110	38	72	525	424	0
1:00 PM	2:00 PM	393	59	334	105	40	65	498	399	0
2:00 PM	3:00 PM	418	62	356	117	50	67	535	423	0
3:00 PM	4:00 PM	519	83	436	148	60	88	667	524	0
4:00 PM	5:00 PM	605	100	505	138	55	83	743	588	0
5:00 PM	6:00 PM	626	127	499	160	49	111	786	610	0
6:00 PM	7:00 PM	451	94	357	114	40	74	565	431	0
7:00 PM	8:00 PM	370	99	271	76	35	41	446	312	0
TOTALS		5,856	915	4,941	1,855	667	1,188	7,711	6,129	0

Hourly Volume Warrant Summary

		Warrant Analyses Volume Data					
START TIME	END TIME	Major Volume (veh/hr)	Minor Volume (veh/hr)	Total Volume (veh/hr)	Pedestrian Volume (veh/hr)	Adequate Gaps (gaps/hr)	Rank
6:00 AM	7:00 AM	213	72	285	0	-	14
7:00 AM	8:00 AM	392	207	599	0	-	2
8:00 AM	9:00 AM	327	105	432	0	-	5
9:00 AM	10:00 AM	299	62	361	0	-	11
10:00 AM	11:00 AM	281	73	354	0	-	12
11:00 AM	12:00 PM	319	68	387	0	-	10
12:00 PM	1:00 PM	352	72	424	0	-	7
1:00 PM	2:00 PM	334	65	399	0	-	9
2:00 PM	3:00 PM	356	67	423	0	-	8
3:00 PM	4:00 PM	436	88	524	0	-	4
4:00 PM	5:00 PM	505	83	588	0	-	3
5:00 PM	6:00 PM	499	111	610	0	-	1
6:00 PM	7:00 PM	357	74	431	0	-	6
7:00 PM	8:00 PM	271	41	312	0	-	13
TOTALS		4,941	1,188	6,129	0	-	

Traffic Signal Warrant Evaluation

Intersection of Grand Avenue & 62nd Street West

Warrant 1 | Eight-Hour Vehicular Volume

Condition A - Minimum Vehicular Volume

Number of Lanes for Moving Traffic on each Approach		Vehicles Per Hour on Major Street (Total of Both Approaches)				Vehicles Per Hour on More Critical Minor Street Approach (One Direction Only)			
Major Street	Minor Street	100%[a]	80%[b]	70%[c]	56%[d]	100%[a]	80%[b]	70%[c]	56%[d]
1	1	500	400	350	280	150	120	105	84
2 or More	1	600	480	420	336	150	120	105	84
2 or More	2 or More	600	480	420	336	200	160	140	112
1	2 or More	500	400	350	280	200	160	140	112

Condition B - Interruption of Continuous Traffic

Number of Lanes for Moving Traffic on each Approach		Vehicles Per Hour on Major Street (Total of Both Approaches)				Vehicles Per Hour on More Critical Minor Street Approach (One Direction Only)			
Major Street	Minor Street	100%[a]	80%[b]	70%[c]	56%[d]	100%[a]	80%[b]	70%[c]	56%[d]
1	1	750	600	525	420	75	60	53	42
2 or More	1	900	720	630	504	75	60	53	42
2 or More	2 or More	900	720	630	504	100	80	70	56
1	2 or More	750	600	525	420	100	80	70	56

[a]Basic minimum hourly volume.

[b]Used for combination of Conditions A and B after adequate trial of other remedial measures.

[c]May be used when the major street speed exceeds 40 mph or in an isolated community with a population of less than 10,000.

[d]May be used for combination of Conditions A and B after adequate trial of other remedial measures when the major street speed exceeds 40 mph or in an isolated community with a population of less than 10,000.

Analyses of Warrant Conditions A & B

HOURLY VOLUME			Major Roadway (veh/hr)	Minor Roadway (veh/hr)	Condition A - Minimum Vehicular Volume				Condition B - Interruption of Continuous Traffic				Condition A Warrant Satisfied	Condition B Warrant Satisfied
					Major Roadway Warrant Minimum Volume (veh/hr)		Minor Roadway Warrant Minimum Volume (veh/hr)		Major Roadway Warrant Minimum Volume (veh/hr)		Minor Roadway Warrant Minimum Volume (veh/hr)			
START TIME	END TIME	RANK			100%	70%	100%	70%	100%	70%	100%	70%		
5:00 PM	6:00 PM	1	499	111										
7:00 AM	8:00 AM	2	392	207									☑	
4:00 PM	5:00 PM	3	505	83										
3:00 PM	4:00 PM	4	436	88										
8:00 AM	9:00 AM	5	327	105										
6:00 PM	7:00 PM	6	357	74										
12:00 PM	1:00 PM	7	352	72										
2:00 PM	3:00 PM	8	356	67	-	350	-	120	-	525	-	53		
1:00 PM	2:00 PM	9	334	65										
11:00 AM	12:00 PM	10	319	68										
9:00 AM	10:00 AM	11	299	62										
10:00 AM	11:00 AM	12	281	73										
7:00 PM	8:00 PM	13	271	41										
6:00 AM	7:00 AM	14	213	72										

Warrant Satisfied for Conditions A or B? ✘ ✘

Analyses of Combination of Warrant Conditions A & B

HOURLY VOLUME			Major Roadway (veh/hr)	Minor Roadway (veh/hr)	Condition A - Minimum Vehicular Volume				Condition B - Interruption of Continuous Traffic				Condition A Warrant Satisfied	Condition B Warrant Satisfied	Combination of Conditions A & B Satisfied for Warrant
					Major Roadway Warrant Minimum Volume (veh/hr)		Minor Roadway Warrant Minimum Volume (veh/hr)		Major Roadway Warrant Minimum Volume (veh/hr)		Minor Roadway Warrant Minimum Volume (veh/hr)				
START TIME	END TIME	RANK			80%	56%	80%	56%	80%	56%	80%	56%			
5:00 PM	6:00 PM	1	499	111									☑	☑	☑
7:00 AM	8:00 AM	2	392	207									☑		✘
4:00 PM	5:00 PM	3	505	83										☑	✘
3:00 PM	4:00 PM	4	436	88									☑	☑	☑
8:00 AM	9:00 AM	5	327	105									☑		✘
6:00 PM	7:00 PM	6	357	74											✘
12:00 PM	1:00 PM	7	352	72											✘
2:00 PM	3:00 PM	8	356	67	-	280	-	84	-	420	-	42			✘
1:00 PM	2:00 PM	9	334	65											✘
11:00 AM	12:00 PM	10	319	68											✘
9:00 AM	10:00 AM	11	299	62											✘
10:00 AM	11:00 AM	12	281	73											✘
7:00 PM	8:00 PM	13	271	41											✘
6:00 AM	7:00 AM	14	213	72											✘

Warrant Satisfied for Combination of Conditions A or B? ✘

Warrant 1 | Eight-Hour Vehicular Volume Satisfied? ✘

Traffic Signal Warrant Evaluation

Intersection of Grand Avenue & 62nd Street West

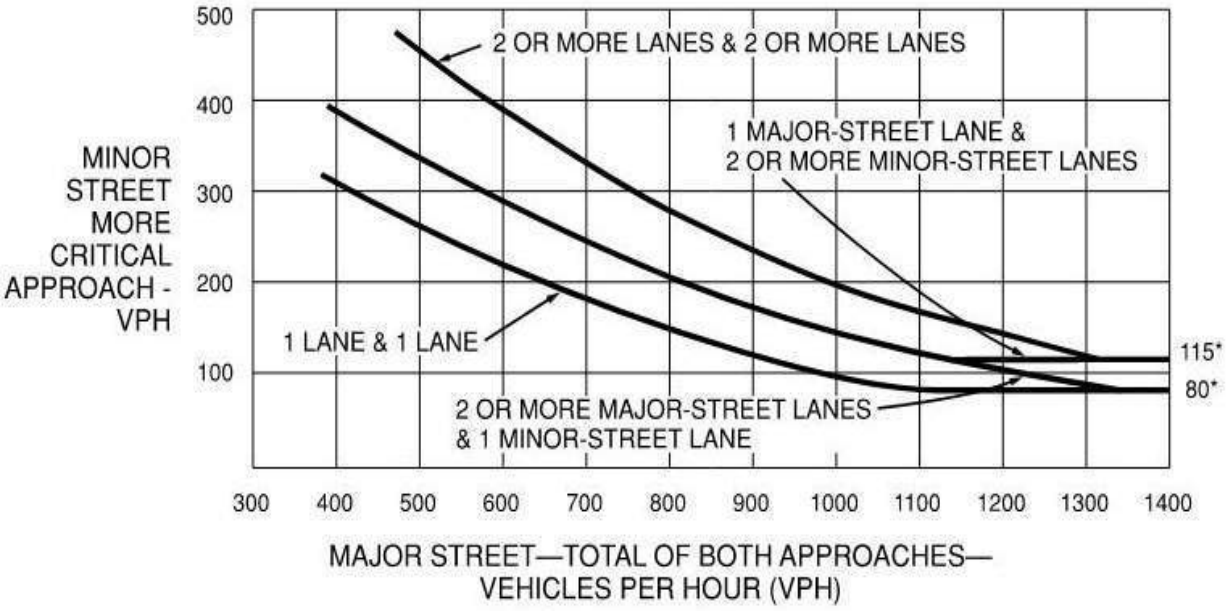
Warrant 2 | Four-Hour Vehicular Volume

HOURLY VOLUME			Major Roadway (veh/hr)	Minor Roadway (veh/hr)	Minor Roadway Warrant Minimum Volume (veh/hr)		Warrant Satisfied
START TIME	END TIME	RANK			100% Figure 4C-1	70% Figure 4C-2	
5:00 PM	6:00 PM	1	499	111	-	130	
7:00 AM	8:00 AM	2	392	207	-	171	☑
4:00 PM	5:00 PM	3	505	83	-	128	
3:00 PM	4:00 PM	4	436	88	-	154	
8:00 AM	9:00 AM	5	327	105	-	197	
6:00 PM	7:00 PM	6	357	74	-	185	
12:00 PM	1:00 PM	7	352	72	-	187	
2:00 PM	3:00 PM	8	356	67	-	185	
1:00 PM	2:00 PM	9	334	65	-	194	
11:00 AM	12:00 PM	10	319	68	-	199	
9:00 AM	10:00 AM	11	299	62	-	209	
10:00 AM	11:00 AM	12	281	73	-	217	
7:00 PM	8:00 PM	13	271	41	-	221	
6:00 AM	7:00 AM	14	213	72	-	247	

Warrant 2 | Four-Hour Vehicular Volume Satisfied? ✗

Warrant 2 | Four-Hour Vehicular Volume

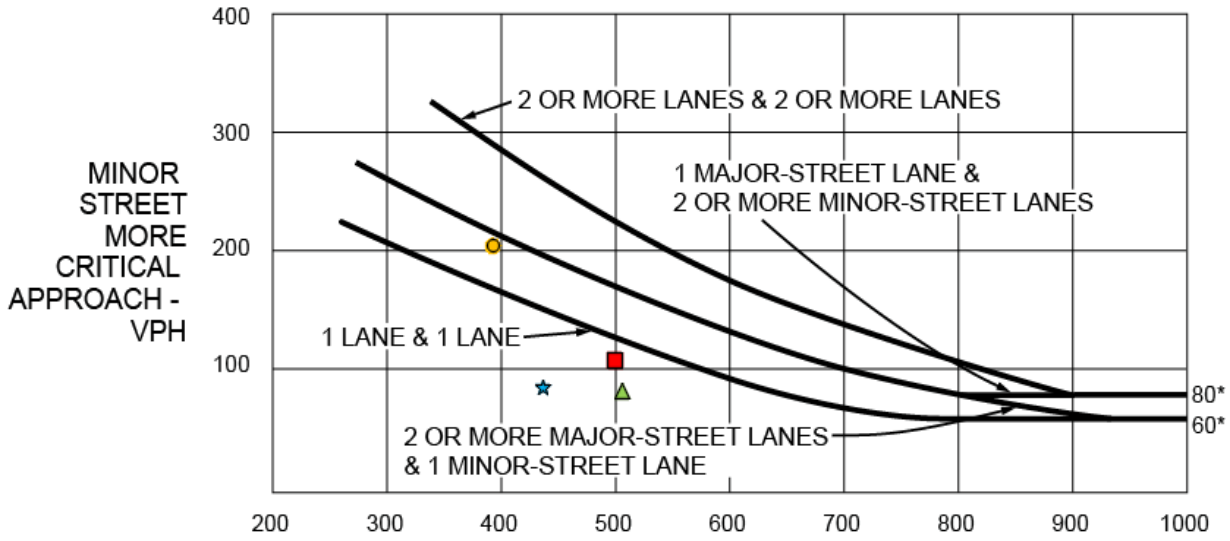
Figure 4C-1. Warrant 2, Four-Hour Vehicular Volume



*Note: 115 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 80 vph applies as the lower threshold volume for a minor-street approach with one lane

Figure 4C-2. Warrant 2, Four-Hour Vehicular Volume (70% Factor)

(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 MPH ON MAJOR STREET)



*Note: 80 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 60 vph applies as the lower threshold volume for a minor-street approach with one lane

Copper Square Subdivision

Grand Avenue & 62nd Street West

Traffic Signal Warrant Evaluation - Estimated 2030 Background Traffic

Based on procedures developed by the Oregon Department of Transportation utilizing estimated average daily traffic volumes as delineated in its *Analysis Procedures Manual, Version 2* (July 2025).

Estimated Average Daily Traffic Volumes

Description	ESTIMATED WEEKDAY, AM PEAK HOUR			
	GRAND AVENUE West of 62nd Street West (Vehicles Per Hour)	GRAND AVENUE East of 62nd Street West (Vehicles Per Hour) *Excluding Right-Turns*		62ND STREET WEST North of Grand Avenue (Vehicles Per Hour) *Excluding Right-Turns*
2025 Existing Conditions	286	128		193
2025 - 2030 Background Traffic Growth	44	20		40
Estimated 2030 Background Traffic	**330**	**148**		**233**

Description	ESTIMATED WEEKDAY, MIDDAY PEAK HOUR			
	GRAND AVENUE West of 62nd Street West (Vehicles Per Hour)	GRAND AVENUE East of 62nd Street West (Vehicles Per Hour) *Excluding Right-Turns*		62ND STREET WEST North of Grand Avenue (Vehicles Per Hour) *Excluding Right-Turns*
2025 Existing Conditions	197	156		75
2025 - 2030 Background Traffic Growth	29	22		20
Estimated 2030 Background Traffic	**226**	**178**		**95**

Description	ESTIMATED WEEKDAY, PM PEAK HOUR			
	GRAND AVENUE West of 62nd Street West (Vehicles Per Hour)	GRAND AVENUE East of 62nd Street West (Vehicles Per Hour) *Excluding Right-Turns*		62ND STREET WEST North of Grand Avenue (Vehicles Per Hour) *Excluding Right-Turns*
2025 Existing Conditions	276	223		111
2025 - 2030 Background Traffic Growth	44	39		27
Estimated 2030 Background Traffic	**320**	**262**		**138**

Description	ESTIMATED AVERAGE WEEKDAY TRAFFIC VOLUMES			
	GRAND AVENUE West of 62nd Street West (Vehicles Per Day)	GRAND AVENUE East of 62nd Street West (Vehicles Per Day) *Excluding Right-Turns*		62ND STREET WEST North of Grand Avenue (Vehicles Per Day) *Excluding Right-Turns*
2025 Existing Conditions	3,135	2,300		1,345
2025 - 2030 Background Traffic Growth	505	381		359
Estimated 2030 Background Traffic	**3,640**	**2,681**		**1,704**

Copper Square Subdivision
Grand Avenue & 62nd Street West
Traffic Signal Warrant Evaluation - Estimated 2030 Background Traffic

Based on procedures developed by the Oregon Department of Transportation utilizing estimated average daily traffic volumes as delineated in its *Analysis Procedures Manual, Version 2* (July 2025).

Warrant #1 - Eight-Hour Vehicular Volumes (Using Eighth-Highest Hour)

The eighth highest hourly volumes are based on the assumption that they are approximately 5.65% of the estimated average daily traffic (EADT).

Only MUTCD Warrant 1 Condition A and Condition B are utilized by the Oregon Department of Transportation to evaluate future needs for traffic signals beyond three years from the present year. This is presented in Section 12.4.1 of the Analysis Procedures Manual, Version 2. The warrant analyses utilize the above estimate for the eighth highest hourly volumes as a percentage of average daily traffic in comparison to the Manual on Uniform Traffic Control Devices, 11th Edition Table 4C-1.

Estimated Average Daily Traffic (EADT) Volumes for Warrant Analysis

Description	Vehicles Per Day on Major Street (Total of Both Approaches)		Vehicles Per Day on Minor Street (62nd Street West) (Southbound Left Movements Only)	
	Contributing Portion (Vehicles Per Day)	Cumulative (Vehicles Per Day)	Contributing Portion (Vehicles Per Day)	Cumulative (Vehicles Per Day)
2025 Existing Conditions	-	5,435	-	1,345
2025 - 2030 Background Traffic Growth	886	6,321	359	1,704
Combined Totals	**886**	**6,321**	**359**	**1,704**

Condition A - Minimum Vehicular Volume

	Warrant Minimum Volumes (Vehicles Per Day)		Warrant Minimum Volumes (Vehicles Per Day)	
	Major Street	6,200	Minor Street	1,850

Description	Vehicles Per Day on Major Street (Total of Both Approaches)		Vehicles Per Day on Minor Street (62nd Street West) (Eastbound Left and Through Movements Only)	
	Cumulative (Vehicles Per Day)	Minimum Warrant Criteria Met? Yes or No - [% of Warrant]	Contributing Portion (Vehicles Per Day)	Minimum Warrant Criteria Met? Yes or No - [% of Warrant]
2025 Existing Conditions	5,435	No - [87.7%]	1,345	No - [72.7%]
2025 - 2030 Background Traffic Growth	6,321	Yes - [102%]	1,704	No - [92.1%]
Warrant Criteria Met?	**6,321**	**Yes - [102%]**	**1,704**	**No - [92.1%]**
	No			

Condition B - Interruption of Continuous Traffic

	Warrant Minimum Volumes (Vehicles Per Day)		Warrant Minimum Volumes (Vehicles Per Day)	
	Major Street	9,300	Minor Street	950

Description	Vehicles Per Day on Major Street (Total of Both Approaches)		Vehicles Per Day on Minor Street (Southbound Left Turns Only)	
	Cumulative (Vehicles Per Day)	Minimum Warrant Criteria Met? Yes or No - [% of Warrant]	Contributing Portion (Vehicles Per Day)	Cumulative (Vehicles Per Day)
2025 Existing Conditions	5,435	No - [58.4%]	1,345	Yes - [141.6%]
2025 - 2030 Background Traffic Growth	6,321	No - [68%]	1,704	Yes - [179.4%]
Warrant Criteria Met?	**6,321**	**No - [68%]**	**1,704**	**Yes - [179.4%]**
	No			

Minimum criteria satisfied for Warrant #1 - Eight-Hour Vehicular Volume? No

Copper Square Subdivision
Grand Avenue & 62nd Street West
Traffic Signal Warrant Evaluation - Estimated 2030 Background Traffic

Based on procedures developed by the Oregon Department of Transportation utilizing estimated average daily traffic volumes as delineated in its *Analysis Procedures Manual, Version 2* (July 2025).

Warrant #2 - Four-Hour Vehicular Volumes (Using Fourth-Highest Hour)

The fourth highest hourly volumes are based on the assumption that they are approximately 8.25% of the estimated average daily traffic (EADT).

Analysis of Warrant 2 is not included in the Oregon Department of Transportation Analysis Procedures Manual, Version 2. It is included herein based on Version 1 of the manual and utilization of the above estimate for the fourth highest hourly volumes in comparison to the Manual on Uniform Traffic Control Devices, 11th Edition Figure 4C-1.

Description	Vehicles Per Hour on Major Street (Total of Both Approaches)		Vehicles Per Hour on Minor Street (62nd Street West) (Eastbound Left and Through Movements Only)	
	Contributing Portion (Vehicles Per Hour)	Cumulative (Vehicles Per Hour)	Contributing Portion (Vehicles Per Hour)	Cumulative (Vehicles Per Hour)
2025 Existing Conditions	-	448	-	111
2025 - 2030 Background Traffic Growth	73	521	30	141
Combined Totals	**73**	**521**	**30**	**141**

Description	Vehicles Per Hour on Major Street (Total of Both Approaches)	Vehicles Per Hour on Minor Street (62nd Street West) (Southbound Left Movements Only)		Minimum Warrant Criteria Met? Yes or No - [% of Warrant]
	Cumulative (Vehicles Per Hour)	Cumulative Contributing Portion (Vehicles Per Hour)	Warrant Minimum Volume (Vehicles Per Hour)	
2025 Existing Conditions	448	111	149	No - [74.4%]
Estimated 2030 Background Traffic	521	141	122	Yes - [115.3%]
Warrant Criteria Met?	**521**	**141**	**122**	**Yes - [115.3%]**
	Yes			

Minimum criteria satisfied for Warrant #2 - Four-Hour Vehicular Volume? Yes

Copper Square Subdivision
Grand Avenue & 62nd Street West
Traffic Signal Warrant Evaluation - Estimated 2030 Total Traffic

Based on procedures developed by the Oregon Department of Transportation utilizing estimated average daily traffic volumes as delineated in its *Analysis Procedures Manual, Version 2* (July 2025).

Estimated Average Daily Traffic Volumes

Description	ESTIMATED WEEKDAY, AM PEAK HOUR			
	GRAND AVENUE West of 62nd Street West (Vehicles Per Hour)	GRAND AVENUE East of 62nd Street West (Vehicles Per Hour) *Excluding Right-Turns*		62ND STREET WEST North of Grand Avenue (Vehicles Per Hour) *Excluding Right-Turns*
2025 Existing Conditions	286	128		193
2025 - 2030 Background Traffic Growth	44	20		40
2025 - 2030 Copper Square Traffic Growth	3	0		0
Estimated 2030 Total Traffic	**333**	**148**		**233**

Description	ESTIMATED WEEKDAY, MIDDAY PEAK HOUR			
	GRAND AVENUE West of 62nd Street West (Vehicles Per Hour)	GRAND AVENUE East of 62nd Street West (Vehicles Per Hour) *Excluding Right-Turns*		62ND STREET WEST North of Grand Avenue (Vehicles Per Hour) *Excluding Right-Turns*
2025 Existing Conditions	197	156		75
2025 - 2030 Background Traffic Growth	29	22		20
2025 - 2030 Copper Square Traffic Growth	3	0		1
Estimated 2030 Total Traffic	**229**	**178**		**96**

Description	ESTIMATED WEEKDAY, PM PEAK HOUR			
	GRAND AVENUE West of 62nd Street West (Vehicles Per Hour)	GRAND AVENUE East of 62nd Street West (Vehicles Per Hour) *Excluding Right-Turns*		62ND STREET WEST North of Grand Avenue (Vehicles Per Hour) *Excluding Right-Turns*
2025 Existing Conditions	276	223		111
2025 - 2030 Background Traffic Growth	44	39		27
2025 - 2030 Copper Square Traffic Growth	3	0		1
Estimated 2030 Total Traffic	**323**	**262**		**139**

Description	ESTIMATED AVERAGE WEEKDAY TRAFFIC VOLUMES			
	GRAND AVENUE West of 62nd Street West (Vehicles Per Day)	GRAND AVENUE East of 62nd Street West (Vehicles Per Day) *Excluding Right-Turns*		62ND STREET WEST North of Grand Avenue (Vehicles Per Day) *Excluding Right-Turns*
2025 Existing Conditions	3,135	2,300		1,345
2025 - 2030 Background Traffic Growth	505	381		359
2025 - 2030 Copper Square Traffic Growth	26	0		7
Estimated 2030 Total Traffic	**3,666**	**2,681**		**1,711**

Copper Square Subdivision
Grand Avenue & 62nd Street West
Traffic Signal Warrant Evaluation - Estimated 2030 Total Traffic

Based on procedures developed by the Oregon Department of Transportation utilizing estimated average daily traffic volumes as delineated in its *Analysis Procedures Manual, Version 2* (July 2025).

Warrant #1 - Eight-Hour Vehicular Volumes (Using Eighth-Highest Hour)

The eighth highest hourly volumes are based on the assumption that they are approximately 5.65% of the estimated average daily traffic (EADT).

Only MUTCD Warrant 1 Condition A and Condition B are utilized by the Oregon Department of Transportation to evaluate future needs for traffic signals beyond three years from the present year. This is presented in Section 12.4.1 of the Analysis Procedures Manual, Version 2. The warrant analyses utilize the above estimate for the eighth highest hourly volumes as a percentage of average daily traffic in comparison to the Manual on Uniform Traffic Control Devices, 11th Edition Table 4C-1.

Estimated Average Daily Traffic (EADT) Volumes for Warrant Analysis

Description	Vehicles Per Day on Major Street (Total of Both Approaches)		Vehicles Per Day on Minor Street (62nd Street West) (Southbound Left Movements Only)	
	Contributing Portion (Vehicles Per Day)	Cumulative (Vehicles Per Day)	Contributing Portion (Vehicles Per Day)	Cumulative (Vehicles Per Day)
2025 Existing Conditions	-	5,435	-	1,345
2025 - 2030 Background Traffic Growth	886	6,321	359	1,704
2025 - 2030 Copper Square Traffic Growth	26	6,347	7	1,711
Combined Totals	**912**	**6,347**	**366**	**1,711**

Condition A - Minimum Vehicular Volume

	Warrant Minimum Volumes (Vehicles Per Day)		Warrant Minimum Volumes (Vehicles Per Day)	
	Major Street	6,200	Minor Street	1,850

Description	Vehicles Per Day on Major Street (Total of Both Approaches)		Vehicles Per Day on Minor Street (62nd Street West) (Eastbound Left and Through Movements Only)	
	Cumulative (Vehicles Per Day)	Minimum Warrant Criteria Met? Yes or No - [% of Warrant]	Contributing Portion (Vehicles Per Day)	Minimum Warrant Criteria Met? Yes or No - [% of Warrant]
2025 Existing Conditions	5,435	No - [87.7%]	1,345	No - [72.7%]
2025 - 2030 Background Traffic Growth	6,321	Yes - [102%]	1,704	No - [92.1%]
2025 - 2030 Copper Square Traffic Growth	6,347	Yes - [102.4%]	1,711	No - [92.5%]
Warrant Criteria Met?	**6,347**	**Yes - [102.4%]**	**1,711**	**No - [92.5%]**
	No			

Condition B - Interruption of Continuous Traffic

	Warrant Minimum Volumes (Vehicles Per Day)		Warrant Minimum Volumes (Vehicles Per Day)	
	Major Street	9,300	Minor Street	950

Description	Vehicles Per Day on Major Street (Total of Both Approaches)		Vehicles Per Day on Minor Street (Southbound Left Turns Only)	
	Cumulative (Vehicles Per Day)	Minimum Warrant Criteria Met? Yes or No - [% of Warrant]	Contributing Portion (Vehicles Per Day)	Cumulative (Vehicles Per Day)
2025 Existing Conditions	5,435	No - [58.4%]	1,345	Yes - [141.6%]
2025 - 2030 Background Traffic Growth	6,321	No - [68%]	1,704	Yes - [179.4%]
2025 - 2030 Copper Square Traffic Growth	6,347	No - [68.2%]	1,711	Yes - [180.1%]
Warrant Criteria Met?	**6,347**	**No - [68.2%]**	**1,711**	**Yes - [180.1%]**
	No			

Minimum criteria satisfied for Warrant #1 - Eight-Hour Vehicular Volume? No

Copper Square Subdivision
Grand Avenue & 62nd Street West
Traffic Signal Warrant Evaluation - Estimated 2030 Total Traffic

Based on procedures developed by the Oregon Department of Transportation utilizing estimated average daily traffic volumes as delineated in its *Analysis Procedures Manual, Version 2* (July 2025).

Warrant #2 - Four-Hour Vehicular Volumes (Using Fourth-Highest Hour)

The fourth highest hourly volumes are based on the assumption that they are approximately 8.25% of the estimated average daily traffic (EADT).

Analysis of Warrant 2 is not included in the Oregon Department of Transportation Analysis Procedures Manual, Version 2. It is included herein based on Version 1 of the manual and utilization of the above estimate for the fourth highest hourly volumes in comparison to the Manual on Uniform Traffic Control Devices, 11th Edition Figure 4C-1.

Description	Vehicles Per Hour on Major Street (Total of Both Approaches)		Vehicles Per Hour on Minor Street (62nd Street West) (Eastbound Left and Through Movements Only)	
	Contributing Portion (Vehicles Per Hour)	Cumulative (Vehicles Per Hour)	Contributing Portion (Vehicles Per Hour)	Cumulative (Vehicles Per Hour)
2025 Existing Conditions	-	448	-	111
2025 - 2030 Background Traffic Growth	73	521	30	141
2025 - 2030 Copper Square Traffic Growth	2	523	1	142
Combined Totals	**75**	**523**	**31**	**142**

Description	Vehicles Per Hour on Major Street (Total of Both Approaches)	Vehicles Per Hour on Minor Street (62nd Street West) (Southbound Left Movements Only)		Minimum Warrant Criteria Met? Yes or No - [% of Warrant]
	Cumulative (Vehicles Per Hour)	Cumulative Contributing Portion (Vehicles Per Hour)	Warrant Minimum Volume (Vehicles Per Hour)	
2025 Existing Conditions	448	111	149	No - [74.4%]
Estimated 2030 Background Traffic	521	141	122	Yes - [115.3%]
Estimated 2030 Total Traffic	523	142	122	Yes - [116.1%]
Warrant Criteria Met?	**523**	**142**	**122**	**Yes - [116.1%]**
	Yes			

Minimum criteria satisfied for Warrant #2 - Four-Hour Vehicular Volume? Yes

Copper Square Subdivision

Grand Avenue & 62nd Street West

Traffic Signal Warrant Evaluation - Estimated 2034 Background Traffic

Based on procedures developed by the Oregon Department of Transportation utilizing estimated average daily traffic volumes as delineated in its *Analysis Procedures Manual, Version 2* (July 2025).

Estimated Average Daily Traffic Volumes

Description	ESTIMATED WEEKDAY, AM PEAK HOUR			
	GRAND AVENUE West of 62nd Street West (Vehicles Per Hour)	GRAND AVENUE East of 62nd Street West (Vehicles Per Hour) *Excluding Right-Turns*		62ND STREET WEST North of Grand Avenue (Vehicles Per Hour) *Excluding Right-Turns*
2025 Existing Conditions	286	128		193
2025 - 2030 Background Traffic Growth	44	20		40
2025 - 2030 Copper Square Traffic Growth	3	0		0
2030 - 2034 Background Traffic Growth	15	5		15
Estimated 2034 Background Traffic	**348**	**153**		**248**

Description	ESTIMATED WEEKDAY, MIDDAY PEAK HOUR			
	GRAND AVENUE West of 62nd Street West (Vehicles Per Hour)	GRAND AVENUE East of 62nd Street West (Vehicles Per Hour) *Excluding Right-Turns*		62ND STREET WEST North of Grand Avenue (Vehicles Per Hour) *Excluding Right-Turns*
2025 Existing Conditions	197	156		75
2025 - 2030 Background Traffic Growth	29	22		20
2025 - 2030 Copper Square Traffic Growth	3	0		1
2030 - 2034 Background Traffic Growth	8	7		7
Estimated 2034 Background Traffic	**237**	**185**		**103**

Description	ESTIMATED WEEKDAY, PM PEAK HOUR			
	GRAND AVENUE West of 62nd Street West (Vehicles Per Hour)	GRAND AVENUE East of 62nd Street West (Vehicles Per Hour) *Excluding Right-Turns*		62ND STREET WEST North of Grand Avenue (Vehicles Per Hour) *Excluding Right-Turns*
2025 Existing Conditions	276	223		111
2025 - 2030 Background Traffic Growth	44	39		27
2025 - 2030 Copper Square Traffic Growth	3	0		1
2030 - 2034 Background Traffic Growth	13	11		9
Estimated 2034 Background Traffic	**336**	**273**		**148**

Description	ESTIMATED AVERAGE WEEKDAY TRAFFIC VOLUMES			
	GRAND AVENUE West of 62nd Street West (Vehicles Per Day)	GRAND AVENUE East of 62nd Street West (Vehicles Per Day) *Excluding Right-Turns*		62ND STREET WEST North of Grand Avenue (Vehicles Per Day) *Excluding Right-Turns*
2025 Existing Conditions	3,135	2,300		1,345
2025 - 2030 Background Traffic Growth	505	381		359
2025 - 2030 Copper Square Traffic Growth	26	0		7
2030 - 2034 Background Traffic Growth	152	106		112
Estimated 2034 Background Traffic	**3,818**	**2,787**		**1,823**

Copper Square Subdivision
Grand Avenue & 62nd Street West
Traffic Signal Warrant Evaluation - Estimated 2034 Background Traffic

Based on procedures developed by the Oregon Department of Transportation utilizing estimated average daily traffic volumes as delineated in its *Analysis Procedures Manual, Version 2* (July 2025).

Warrant #1 - Eight-Hour Vehicular Volumes (Using Eighth-Highest Hour)

The eighth highest hourly volumes are based on the assumption that they are approximately 5.65% of the estimated average daily traffic (EADT).

Only MUTCD Warrant 1 Condition A and Condition B are utilized by the Oregon Department of Transportation to evaluate future needs for traffic signals beyond three years from the present year. This is presented in Section 12.4.1 of the Analysis Procedures Manual, Version 2. The warrant analyses utilize the above estimate for the eighth highest hourly volumes as a percentage of average daily traffic in comparison to the Manual on Uniform Traffic Control Devices, 11th Edition Table 4C-1.

Estimated Average Daily Traffic (EADT) Volumes for Warrant Analysis

Description	Vehicles Per Day on Major Street (Total of Both Approaches)		Vehicles Per Day on Minor Street (62nd Street West) (Southbound Left Movements Only)	
	Contributing Portion (Vehicles Per Day)	Cumulative (Vehicles Per Day)	Contributing Portion (Vehicles Per Day)	Cumulative (Vehicles Per Day)
2025 Existing Conditions	-	5,435	-	1,345
2025 - 2030 Background Traffic Growth	886	6,321	359	1,704
2025 - 2030 Copper Square Traffic Growth	26	6,347	7	1,711
2030 - 2034 Background Traffic Growth	258	6,605	112	1,823
Combined Totals	**1,170**	**6,605**	**478**	**1,823**

Condition A - Minimum Vehicular Volume

	Warrant Minimum Volumes (Vehicles Per Day)		Warrant Minimum Volumes (Vehicles Per Day)	
	Major Street	6,200	Minor Street	1,850

Description	Vehicles Per Day on Major Street (Total of Both Approaches)		Vehicles Per Day on Minor Street (62nd Street West) (Eastbound Left and Through Movements Only)	
	Cumulative (Vehicles Per Day)	Minimum Warrant Criteria Met? Yes or No - [% of Warrant]	Contributing Portion (Vehicles Per Day)	Minimum Warrant Criteria Met? Yes or No - [% of Warrant]
2025 Existing Conditions	5,435	No - [87.7%]	1,345	No - [72.7%]
2025 - 2030 Background Traffic Growth	6,321	Yes - [102%]	1,704	No - [92.1%]
2025 - 2030 Copper Square Traffic Growth	6,347	Yes - [102.4%]	1,711	No - [92.5%]
2030 - 2034 Background Traffic Growth	6,605	Yes - [106.5%]	1,823	No - [98.5%]
Warrant Criteria Met?	**6,605**	**Yes - [106.5%]**	**1,823**	**No - [98.5%]**
	No			

Condition B - Interruption of Continuous Traffic

	Warrant Minimum Volumes (Vehicles Per Day)		Warrant Minimum Volumes (Vehicles Per Day)	
	Major Street	9,300	Minor Street	950

Description	Vehicles Per Day on Major Street (Total of Both Approaches)		Vehicles Per Day on Minor Street (Southbound Left Turns Only)	
	Cumulative (Vehicles Per Day)	Minimum Warrant Criteria Met? Yes or No - [% of Warrant]	Contributing Portion (Vehicles Per Day)	Cumulative (Vehicles Per Day)
2025 Existing Conditions	5,435	No - [58.4%]	1,345	Yes - [141.6%]
2025 - 2030 Background Traffic Growth	6,321	No - [68%]	1,704	Yes - [179.4%]
2025 - 2030 Copper Square Traffic Growth	6,347	No - [68.2%]	1,711	Yes - [180.1%]
2030 - 2034 Background Traffic Growth	6,605	No - [71%]	1,823	Yes - [191.9%]
Warrant Criteria Met?	**6,605**	**No - [71%]**	**1,823**	**Yes - [191.9%]**
	No			

Minimum criteria satisfied for Warrant #1 - Eight-Hour Vehicular Volume? No

Copper Square Subdivision

Grand Avenue & 62nd Street West

Traffic Signal Warrant Evaluation - Estimated 2034 Background Traffic

Based on procedures developed by the Oregon Department of Transportation utilizing estimated average daily traffic volumes as delineated in its *Analysis Procedures Manual, Version 2* (July 2025).

Warrant #2 - Four-Hour Vehicular Volumes (Using Fourth-Highest Hour)

The fourth highest hourly volumes are based on the assumption that they are approximately 8.25% of the estimated average daily traffic (EADT).

Analysis of Warrant 2 is not included in the Oregon Department of Transportation Analysis Procedures Manual, Version 2. It is included herein based on Version 1 of the manual and utilization of the above estimate for the fourth highest hourly volumes in comparison to the Manual on Uniform Traffic Control Devices, 11th Edition Figure 4C-1.

Description	Vehicles Per Hour on Major Street (Total of Both Approaches)		Vehicles Per Hour on Minor Street (62nd Street West) (Eastbound Left and Through Movements Only)	
	Contributing Portion (Vehicles Per Hour)	Cumulative (Vehicles Per Hour)	Contributing Portion (Vehicles Per Hour)	Cumulative (Vehicles Per Hour)
2025 Existing Conditions	-	448	-	111
2025 - 2030 Background Traffic Growth	73	521	30	141
2025 - 2030 Copper Square Traffic Growth	2	523	1	142
2030 - 2034 Background Traffic Growth	21	544	9	151
Combined Totals	**96**	**544**	**40**	**151**

Description	Vehicles Per Hour on Major Street (Total of Both Approaches)	Vehicles Per Hour on Minor Street (62nd Street West) (Southbound Left Movements Only)		Minimum Warrant Criteria Met? Yes or No - [% of Warrant]
	Cumulative (Vehicles Per Hour)	Cumulative Contributing Portion (Vehicles Per Hour)	Warrant Minimum Volume (Vehicles Per Hour)	
2025 Existing Conditions	448	111	149	No - [74.4%]
Estimated 2030 Background Traffic	521	141	122	Yes - [115.3%]
Estimated 2030 Total Traffic	523	142	122	Yes - [116.8%]
Estimated 2034 Background Traffic	544	151	114	Yes - [132.2%]
Warrant Criteria Met?	**544**	**151**	**114**	**Yes - [132.2%]**
	Yes			

Minimum criteria satisfied for Warrant #2 - Four-Hour Vehicular Volume? Yes

Copper Square Subdivision
Grand Avenue & 62nd Street West
Traffic Signal Warrant Evaluation - Estimated 2034 Total Traffic

Based on procedures developed by the Oregon Department of Transportation utilizing estimated average daily traffic volumes as delineated in its *Analysis Procedures Manual, Version 2* (July 2025).

Estimated Average Daily Traffic Volumes

Description	ESTIMATED WEEKDAY, AM PEAK HOUR			
	GRAND AVENUE West of 62nd Street West (Vehicles Per Hour)	GRAND AVENUE East of 62nd Street West (Vehicles Per Hour) *Excluding Right-Turns*		62ND STREET WEST North of Grand Avenue (Vehicles Per Hour) *Excluding Right-Turns*
2025 Existing Conditions	286	128		193
2025 - 2030 Background Traffic Growth	44	20		40
2025 - 2030 Copper Square Traffic Growth	3	0		0
2030 - 2034 Background Traffic Growth	15	5		15
2030 - 2034 Copper Square Traffic Growth	1	0		1
Estimated 2034 Total Traffic	**349**	**153**		**249**

Description	ESTIMATED WEEKDAY, MIDDAY PEAK HOUR			
	GRAND AVENUE West of 62nd Street West (Vehicles Per Hour)	GRAND AVENUE East of 62nd Street West (Vehicles Per Hour) *Excluding Right-Turns*		62ND STREET WEST North of Grand Avenue (Vehicles Per Hour) *Excluding Right-Turns*
2025 Existing Conditions	197	156		75
2025 - 2030 Background Traffic Growth	29	22		20
2025 - 2030 Copper Square Traffic Growth	3	0		1
2030 - 2034 Background Traffic Growth	8	7		7
2030 - 2034 Copper Square Traffic Growth	1	0		0
Estimated 2034 Total Traffic	**238**	**185**		**103**

Description	ESTIMATED WEEKDAY, PM PEAK HOUR			
	GRAND AVENUE West of 62nd Street West (Vehicles Per Hour)	GRAND AVENUE East of 62nd Street West (Vehicles Per Hour) *Excluding Right-Turns*		62ND STREET WEST North of Grand Avenue (Vehicles Per Hour) *Excluding Right-Turns*
2025 Existing Conditions	276	223		111
2025 - 2030 Background Traffic Growth	44	39		27
2025 - 2030 Copper Square Traffic Growth	3	0		1
2030 - 2034 Background Traffic Growth	13	11		9
2030 - 2034 Copper Square Traffic Growth	1	0		0
Estimated 2034 Total Traffic	**337**	**273**		**148**

Description	ESTIMATED AVERAGE WEEKDAY TRAFFIC VOLUMES			
	GRAND AVENUE West of 62nd Street West (Vehicles Per Day)	GRAND AVENUE East of 62nd Street West (Vehicles Per Day) *Excluding Right-Turns*		62ND STREET WEST North of Grand Avenue (Vehicles Per Day) *Excluding Right-Turns*
2025 Existing Conditions	3,135	2,300		1,345
2025 - 2030 Background Traffic Growth	505	381		359
2025 - 2030 Copper Square Traffic Growth	26	0		7
2030 - 2034 Background Traffic Growth	152	106		112
2030 - 2034 Copper Square Traffic Growth	15	0		3
Estimated 2034 Total Traffic	**3,833**	**2,787**		**1,826**

Copper Square Subdivision
Grand Avenue & 62nd Street West
Traffic Signal Warrant Evaluation - Estimated 2034 Total Traffic

Based on procedures developed by the Oregon Department of Transportation utilizing estimated average daily traffic volumes as delineated in its *Analysis Procedures Manual, Version 2* (July 2025).

Warrant #1 - Eight-Hour Vehicular Volumes (Using Eighth-Highest Hour)

The eighth highest hourly volumes are based on the assumption that they are approximately 5.65% of the estimated average daily traffic (EADT).

Only MUTCD Warrant 1 Condition A and Condition B are utilized by the Oregon Department of Transportation to evaluate future needs for traffic signals beyond three years from the present year. This is presented in Section 12.4.1 of the Analysis Procedures Manual, Version 2. The warrant analyses utilize the above estimate for the eighth highest hourly volumes as a percentage of average daily traffic in comparison to the Manual on Uniform Traffic Control Devices, 11th Edition Table 4C-1.

Estimated Average Daily Traffic (EADT) Volumes for Warrant Analysis

Description	Vehicles Per Day on Major Street (Total of Both Approaches)		Vehicles Per Day on Minor Street (62nd Street West) (Southbound Left Movements Only)	
	Contributing Portion (Vehicles Per Day)	Cumulative (Vehicles Per Day)	Contributing Portion (Vehicles Per Day)	Cumulative (Vehicles Per Day)
2025 Existing Conditions	-	5,435	-	1,345
2025 - 2030 Background Traffic Growth	886	6,321	359	1,704
2025 - 2030 Copper Square Traffic Growth	26	6,347	7	1,711
2030 - 2034 Background Traffic Growth	258	6,605	112	1,823
2030 - 2034 Copper Square Traffic Growth	15	6,620	3	1,826
Combined Totals	**1,185**	**6,620**	**481**	**1,826**

Condition A - Minimum Vehicular Volume

Warrant Minimum Volumes (Vehicles Per Day)		Warrant Minimum Volumes (Vehicles Per Day)	
Major Street	6,200	Minor Street	1,850

Description	Vehicles Per Day on Major Street (Total of Both Approaches)		Vehicles Per Day on Minor Street (62nd Street West) (Eastbound Left and Through Movements Only)	
	Cumulative (Vehicles Per Day)	Minimum Warrant Criteria Met? Yes or No - [% of Warrant]	Contributing Portion (Vehicles Per Day)	Minimum Warrant Criteria Met? Yes or No - [% of Warrant]
2025 Existing Conditions	5,435	No - [87.7%]	1,345	No - [72.7%]
2025 - 2030 Background Traffic Growth	6,321	Yes - [102%]	1,704	No - [92.1%]
2025 - 2030 Copper Square Traffic Growth	6,347	Yes - [102.4%]	1,711	No - [92.5%]
2030 - 2034 Background Traffic Growth	6,605	Yes - [106.5%]	1,823	No - [98.5%]
2030 - 2034 Copper Square Traffic Growth	6,620	Yes - [106.8%]	1,826	No - [98.7%]
Warrant Criteria Met?	**6,620**	**Yes - [106.8%]**	**1,826**	**No - [98.7%]**
	No			

Condition B - Interruption of Continuous Traffic

Warrant Minimum Volumes (Vehicles Per Day)		Warrant Minimum Volumes (Vehicles Per Day)	
Major Street	9,300	Minor Street	950

Description	Vehicles Per Day on Major Street (Total of Both Approaches)		Vehicles Per Day on Minor Street (Southbound Left Turns Only)	
	Cumulative (Vehicles Per Day)	Minimum Warrant Criteria Met? Yes or No - [% of Warrant]	Contributing Portion (Vehicles Per Day)	Cumulative (Vehicles Per Day)
2025 Existing Conditions	5,435	No - [58.4%]	1,345	Yes - [141.6%]
2025 - 2030 Background Traffic Growth	6,321	No - [68%]	1,704	Yes - [179.4%]
2025 - 2030 Copper Square Traffic Growth	6,347	No - [68.2%]	1,711	Yes - [180.1%]
2030 - 2034 Background Traffic Growth	6,605	No - [71%]	1,823	Yes - [191.9%]
2030 - 2034 Copper Square Traffic Growth	6,620	No - [71.2%]	1,826	Yes - [192.2%]
Warrant Criteria Met?	**6,620**	**No - [71.2%]**	**1,826**	**Yes - [192.2%]**
	No			

Minimum criteria satisfied for Warrant #1 - Eight-Hour Vehicular Volume? No

Copper Square Subdivision
Grand Avenue & 62nd Street West
Traffic Signal Warrant Evaluation - Estimated 2034 Total Traffic

Based on procedures developed by the Oregon Department of Transportation utilizing estimated average daily traffic volumes as delineated in its *Analysis Procedures Manual, Version 2* (July 2025).

Warrant #2 - Four-Hour Vehicular Volumes (Using Fourth-Highest Hour)

The fourth highest hourly volumes are based on the assumption that they are approximately 8.25% of the estimated average daily traffic (EADT).

Analysis of Warrant 2 is not included in the Oregon Department of Transportation Analysis Procedures Manual, Version 2. It is included herein based on Version 1 of the manual and utilization of the above estimate for the fourth highest hourly volumes in comparison to the Manual on Uniform Traffic Control Devices, 11th Edition Figure 4C-1.

Description	Vehicles Per Hour on Major Street (Total of Both Approaches)		Vehicles Per Hour on Minor Street (62nd Street West) (Eastbound Left and Through Movements Only)	
	Contributing Portion (Vehicles Per Hour)	Cumulative (Vehicles Per Hour)	Contributing Portion (Vehicles Per Hour)	Cumulative (Vehicles Per Hour)
2025 Existing Conditions	-	448	-	111
2025 - 2030 Background Traffic Growth	73	521	30	141
2025 - 2030 Copper Square Traffic Growth	2	523	1	142
2030 - 2034 Background Traffic Growth	21	544	9	151
2030 - 2034 Copper Square Traffic Growth	1	545	0	151
Combined Totals	**97**	**545**	**40**	**151**

Description	Vehicles Per Hour on Major Street (Total of Both Approaches)	Vehicles Per Hour on Minor Street (62nd Street West) (Southbound Left Movements Only)		Minimum Warrant Criteria Met? Yes or No - [% of Warrant]
	Cumulative (Vehicles Per Hour)	Cumulative Contributing Portion (Vehicles Per Hour)	Warrant Minimum Volume (Vehicles Per Hour)	
2025 Existing Conditions	448	111	149	No - [74.4%]
Estimated 2030 Background Traffic	521	141	122	Yes - [115.3%]
Estimated 2030 Total Traffic	523	142	122	Yes - [116.8%]
Estimated 2034 Background Traffic	544	151	114	Yes - [132.2%]
Estimated 2034 Total Traffic	545	151	114	Yes - [132.6%]
Warrant Criteria Met?	**545**	**151**	**114**	**Yes - [132.6%]**
	Yes			

Minimum criteria satisfied for Warrant #2 - Four-Hour Vehicular Volume? Yes

Appendix H

Mitigation Analyses

Appendix H

IN THIS SECTION:

Grand Avenue &
62nd Street West

Turn Lanes Addition

Traffic Operations Mitigation Summary

Copper Square Subdivision

Intersection: Grand Avenue & 62nd Street West

WEEKDAY, AM PEAK HOUR

Analysis Scenario	Analysis Data	GRAND AVENUE From the West (Eastbound) U	L	T	R	GRAND AVENUE From the East (Westbound) U	L	T	R	From the South (Northbound) U	L	T	R	62ND STREET WEST From the North (Southbound) U	L	T	R	Minor Approach Totals	Intersection Totals
ESTIMATED 2030 BACKGROUND TRAFFIC Installation of Turn Lanes	Traffic Control	Uncontrolled				Uncontrolled								Stop Controlled					
	Minor or Major Approach?	Major				Major								Minor					
	Entry Volume, V (veh/hr)	0	62	268		0		148	58					0	233		94		
	Peak Hour Factor (PHF)	0.85				0.85								0.85					
	Adjusted Volume, V_A (veh/hr)	0	73	315		0		174	68					0	274		111		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	L		T		T		R						L		R			
	Lane Group Volume, V_{LG} (veh/hr)	73		315		174		68						274		111		385	1,015
	Capacity, c (veh/hr)	1,241		1,800		1,800		1,500						416		859		1,275	7,616
	Volume-to-Capacity Ratio, V_A/c	0.06		0.18		0.10		0.05						0.66		0.13		0.00	0.00
	HCM 95% Queue Length, Q_{95} (veh)	0.2		0.0		0.0		0.0						4.6		0.4			
	HCM 95% Queue Length, Q_{95} (ft)	5.7		0.0		0.0		0.0						116.8		10.5			
	Available Queue Storage, S_Q (ft)	200		880		540		200						680		200			
	Average Control Delay (sec/veh)	8.1		0.0		0.0		0.0						28.8		9.8		23.3	9.4
	Level of Service, LOS	A		A		A		A						D		A			
	Approach Delay (sec/veh)	1.5				0.0								23.3				C	A
	Approach Level of Service, LOS	A				A								C					
ESTIMATED 2030 TOTAL TRAFFIC Installation of Turn Lanes	Traffic Control	Uncontrolled				Uncontrolled								Stop Controlled					
	Minor or Major Approach?	Major				Major								Minor					
	Entry Volume, V (veh/hr)	0	65	268		0		148	59					0	233		96		
	Peak Hour Factor (PHF)	0.85				0.85								0.85					
	Adjusted Volume, V_A (veh/hr)	0	76	315		0		174	69					0	274		113		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	L		T		T		R						L		R			
	Lane Group Volume, V_{LG} (veh/hr)	76		315		174		69						274		113		387	1,022
	Capacity, c (veh/hr)	1,240		1,800		1,800		1,500						411		859		1,270	7,610
	Volume-to-Capacity Ratio, V_A/c	0.06		0.18		0.10		0.05						0.67		0.13		0.00	0.13
	HCM 95% Queue Length, Q_{95} (veh)	0.2		0.0		0.0		0.0						4.7		0.5			
	HCM 95% Queue Length, Q_{95} (ft)	5.7		0.0		0.0		0.0						119.4		13.1			
	Available Queue Storage, S_Q (ft)	200		880		540		200						680		200			
	Average Control Delay (sec/veh)	8.1		0.0		0.0		0.0						29.6		9.8		23.8	9.6
	Level of Service, LOS	A		A		A		A						D		A			
	Approach Delay (sec/veh)	1.6				0.0								23.8				C	A
	Approach Level of Service, LOS	A				A								C					
ESTIMATED 2034 BACKGROUND TRAFFIC Installation of Turn Lanes	Traffic Control	Uncontrolled				Uncontrolled								Stop Controlled					
	Minor or Major Approach?	Major				Major								Minor					
	Entry Volume, V (veh/hr)	0	68	280		0		153	63					0	248		101		
	Peak Hour Factor (PHF)	0.85				0.85								0.85					
	Adjusted Volume, V_A (veh/hr)	0	80	329		0		180	74					0	292		119		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	L		T		T		R						L		R			
	Lane Group Volume, V_{LG} (veh/hr)	80		329		180		74						292		119		411	1,074
	Capacity, c (veh/hr)	1,228		1,800		1,800		1,500						395		853		1,248	7,576
	Volume-to-Capacity Ratio, V_A/c	0.07		0.18		0.10		0.05						0.74		0.14		0.00	0.14
	HCM 95% Queue Length, Q_{95} (veh)	0.2		0.0		0.0		0.0						5.8		0.5			
	HCM 95% Queue Length, Q_{95} (ft)	5.7		0.0		0.0		0.0						147.3		13.1			
	Available Queue Storage, S_Q (ft)	200		880		540		200						680		200			
	Average Control Delay (sec/veh)	8.1		0.0		0.0		0.0						35.8		9.9		28.3	11.4
	Level of Service, LOS	A		A		A		A						E		A			
	Approach Delay (sec/veh)	1.6				0.0								28.3				D	B
	Approach Level of Service, LOS	A				A								D					
ESTIMATED 2034 TOTAL TRAFFIC Installation of Turn Lanes	Traffic Control	Uncontrolled				Uncontrolled								Stop Controlled					
	Minor or Major Approach?	Major				Major								Minor					
	Entry Volume, V (veh/hr)	0	69	280		0		153	63					0	249		102		
	Peak Hour Factor (PHF)	0.85				0.85								0.85					
	Adjusted Volume, V_A (veh/hr)	0	81	329		0		180	74					0	293		120		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	L		T		T		R						L		R			
	Lane Group Volume, V_{LG} (veh/hr)	81		329		180		74						293		120		413	1,078
	Capacity, c (veh/hr)	1,228		1,800		1,800		1,500						393		853		1,246	7,574
	Volume-to-Capacity Ratio, V_A/c	0.07		0.18		0.10		0.05						0.75		0.14		0.00	0.14
	HCM 95% Queue Length, Q_{95} (veh)	0.2		0.0		0.0		0.0						5.9		0.5			
	HCM 95% Queue Length, Q_{95} (ft)	5.7		0.0		0.0		0.0						149.9		13.1			
	Available Queue Storage, S_Q (ft)	200		880		540		200						680		200			
	Average Control Delay (sec/veh)	8.1		0.0		0.0		0.0						36.5		9.9		28.8	11.6
	Level of Service, LOS	A		A		A		A						E		A			
	Approach Delay (sec/veh)	1.6				0.0								28.8				D	B
	Approach Level of Service, LOS	A				A								D					

U = U-Turns; L = Left Turns; T = Through; R = Right Turns | Lane Groups: LR = Left-Right; TR = Through-Righ; L = Left; T = Through; and LTR = Left-Through-Right

Traffic Operations Mitigation Summary

Copper Square Subdivision

Intersection: Grand Avenue & 62nd Street West

WEEKDAY, MIDDAY PEAK HOUR

Analysis Scenario	Analysis Data	GRAND AVENUE From the West (Eastbound)				GRAND AVENUE From the East (Westbound)				From the South (Northbound)				62ND STREET WEST From the North (Southbound)				Minor Approach Totals	Intersection Totals
		U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R		
ESTIMATED 2030 BACKGROUND TRAFFIC Installation of Turn Lanes	Traffic Control	Uncontrolled				Uncontrolled								Stop Controlled					
	Minor or Major Approach?	Major				Major								Minor					
	Entry Volume, V (veh/hr)	0	54	172		0		178	81					0	95		43		
	Peak Hour Factor (PHF)	0.93				0.93								0.93					
	Adjusted Volume, V_A (veh/hr)	0	58	185		0		191	87					0	102		46		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	L		T		T		R						L		R			
	Lane Group Volume, V_{LG} (veh/hr)	58		185		191		87						102		46		148	670
	Capacity, c (veh/hr)	1,250		1,800		1,800		1,500						506		830		1,336	7,686
	Volume-to-Capacity Ratio, V_A/c	0.05		0.10		0.11		0.06						0.20		0.06		0.00	0.00
	HCM 95% Queue Length, Q_{95} (veh)	0.1		0.0		0.0		0.0						0.7		0.2			
	HCM 95% Queue Length, Q_{95} (ft)	2.7		0.0		0.0		0.0						18.2		5.4			
	Available Queue Storage, S_Q (ft)	200		880		540		200						680		200			
	Average Control Delay (sec/veh)	8.0		0.0		0.0		0.0						13.9		9.6		12.6	3.5
	Level of Service, LOS	A		A		A		A						B		A			
	Approach Delay (sec/veh)	1.9				0.0								12.6				B	A
	Approach Level of Service, LOS	A				A								B					
ESTIMATED 2030 TOTAL TRAFFIC Installation of Turn Lanes	Traffic Control	Uncontrolled				Uncontrolled								Stop Controlled					
	Minor or Major Approach?	Major				Major								Minor					
	Entry Volume, V (veh/hr)	0	57	172		0		178	82					0	96		46		
	Peak Hour Factor (PHF)	0.93				0.93								0.93					
	Adjusted Volume, V_A (veh/hr)	0	61	185		0		191	88					0	103		49		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	L		T		T		R						L		R			
	Lane Group Volume, V_{LG} (veh/hr)	61		185		191		88						103		49		153	678
	Capacity, c (veh/hr)	1,249		1,800		1,800		1,500						500		830		1,330	7,679
	Volume-to-Capacity Ratio, V_A/c	0.05		0.10		0.11		0.06						0.21		0.06		0.00	0.09
	HCM 95% Queue Length, Q_{95} (veh)	0.2		0.0		0.0		0.0						0.8		0.2			
	HCM 95% Queue Length, Q_{95} (ft)	5.3		0.0		0.0		0.0						20.8		5.4			
	Available Queue Storage, S_Q (ft)	200		880		540		200						680		200			
	Average Control Delay (sec/veh)	8.0		0.0		0.0		0.0						14.1		9.6		12.6	3.6
	Level of Service, LOS	A		A		A		A						B		A			
	Approach Delay (sec/veh)	2.0				0.0								12.6				B	A
	Approach Level of Service, LOS	A				A								B					
ESTIMATED 2034 BACKGROUND TRAFFIC Installation of Turn Lanes	Traffic Control	Uncontrolled				Uncontrolled								Stop Controlled					
	Minor or Major Approach?	Major				Major								Minor					
	Entry Volume, V (veh/hr)	0	59	178		0		185	88					0	103		48		
	Peak Hour Factor (PHF)	0.93				0.93								0.93					
	Adjusted Volume, V_A (veh/hr)	0	63	191		0		199	95					0	111		52		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	L		T		T		R						L		R			
	Lane Group Volume, V_{LG} (veh/hr)	63		191		199		95						111		52		162	711
	Capacity, c (veh/hr)	1,234		1,800		1,800		1,500						487		822		1,309	7,643
	Volume-to-Capacity Ratio, V_A/c	0.05		0.11		0.11		0.06						0.23		0.06		0.00	0.09
	HCM 95% Queue Length, Q_{95} (veh)	0.2		0.0		0.0		0.0						0.9		0.2			
	HCM 95% Queue Length, Q_{95} (ft)	5.3		0.0		0.0		0.0						23.4		5.4			
	Available Queue Storage, S_Q (ft)	200		880		540		200						680		200			
	Average Control Delay (sec/veh)	8.1		0.0		0.0		0.0						14.6		9.7		13.0	3.7
	Level of Service, LOS	A		A		A		A						B		A			
	Approach Delay (sec/veh)	2.0				0.0								13.0				B	A
	Approach Level of Service, LOS	A				A								B					
ESTIMATED 2034 TOTAL TRAFFIC Installation of Turn Lanes	Traffic Control	Uncontrolled				Uncontrolled								Stop Controlled					
	Minor or Major Approach?	Major				Major								Minor					
	Entry Volume, V (veh/hr)	0	60	178		0		185	88					0	103		49		
	Peak Hour Factor (PHF)	0.93				0.93								0.93					
	Adjusted Volume, V_A (veh/hr)	0	65	191		0		199	95					0	111		53		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	L		T		T		R						L		R			
	Lane Group Volume, V_{LG} (veh/hr)	65		191		199		95						111		53		163	713
	Capacity, c (veh/hr)	1,234		1,800		1,800		1,500						485		822		1,307	7,641
	Volume-to-Capacity Ratio, V_A/c	0.05		0.11		0.11		0.06						0.23		0.06		0.00	0.09
	HCM 95% Queue Length, Q_{95} (veh)	0.2		0.0		0.0		0.0						0.9		0.2			
	HCM 95% Queue Length, Q_{95} (ft)	5.3		0.0		0.0		0.0						23.4		5.4			
	Available Queue Storage, S_Q (ft)	200		880		540		200						680		200			
	Average Control Delay (sec/veh)	8.1		0.0		0.0		0.0						14.6		9.7		13.0	3.7
	Level of Service, LOS	A		A		A		A						B		A			
	Approach Delay (sec/veh)	2.0				0.0								13.0				B	A
	Approach Level of Service, LOS	A				A								B					

U = U-Turns; L = Left Turns; T = Through; R = Right Turns | Lane Groups: LR = Left-Right; TR = Through-Righ; L = Left; T = Through; and LTR = Left-Through-Right

Traffic Operations Mitigation Summary

Copper Square Subdivision

Intersection: Grand Avenue & 62nd Street West

WEEKDAY, PM PEAK HOUR

Analysis Scenario	Analysis Data	GRAND AVENUE From the West (Eastbound) U	L	T	R	GRAND AVENUE From the East (Westbound) U	L	T	R	From the South (Northbound) U	L	T	R	62ND STREET WEST From the North (Southbound) U	L	T	R	Minor Approach Totals	Intersection Totals
ESTIMATED 2030 BACKGROUND TRAFFIC Installation of Turn Lanes	Traffic Control	Uncontrolled				Uncontrolled								Stop Controlled					
	Minor or Major Approach?	Major				Major								Minor					
	Entry Volume, V (veh/hr)	0	85	235		0		262	164					0	138		58		
	Peak Hour Factor (PHF)	0.91				0.91								0.91					
	Adjusted Volume, V_A (veh/hr)	0	93	258		0		288	180					0	152		64		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	L		T		T		R						L		R			
	Lane Group Volume, V_{LG} (veh/hr)	93		258		288		180						152		64		215	1,035
	Capacity, c (veh/hr)	1,083		1,800		1,800		1,500						353		746		1,099	7,282
	Volume-to-Capacity Ratio, V_A/c	0.09		0.14		0.16		0.12						0.43		0.09		0.00	0.00
	HCM 95% Queue Length, Q_{95} (veh)	0.3		0.0		0.0		0.0						2.1		0.3			
	HCM 95% Queue Length, Q_{95} (ft)	7.7		0.0		0.0		0.0						53.8		7.7			
	Available Queue Storage, S_Q (ft)	200		880		540		200						680		200			
	Average Control Delay (sec/veh)	8.6		0.0		0.0		0.0						22.7		10.3		19.0	4.7
	Level of Service, LOS	A		A		A		A						C		B			
	Approach Delay (sec/veh)	2.3				0.0								19.0				C	A
	Approach Level of Service, LOS	A				A								C					
ESTIMATED 2030 TOTAL TRAFFIC Installation of Turn Lanes	Traffic Control	Uncontrolled				Uncontrolled								Stop Controlled					
	Minor or Major Approach?	Major				Major								Minor					
	Entry Volume, V (veh/hr)	0	88	235		0		262	165					0	139		60		
	Peak Hour Factor (PHF)	0.91				0.91								0.91					
	Adjusted Volume, V_A (veh/hr)	0	97	258		0		288	181					0	153		66		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	L		T		T		R						L		R			
	Lane Group Volume, V_{LG} (veh/hr)	97		258		288		181						153		66		219	1,043
	Capacity, c (veh/hr)	1,082		1,800		1,800		1,500						349		746		1,095	7,277
	Volume-to-Capacity Ratio, V_A/c	0.09		0.14		0.16		0.12						0.44		0.09		0.00	0.14
	HCM 95% Queue Length, Q_{95} (veh)	0.3		0.0		0.0		0.0						2.1		0.3			
	HCM 95% Queue Length, Q_{95} (ft)	7.7		0.0		0.0		0.0						53.8		7.7			
	Available Queue Storage, S_Q (ft)	200		880		540		200						680		200			
	Average Control Delay (sec/veh)	8.7		0.0		0.0		0.0						23.1		10.3		19.2	4.8
	Level of Service, LOS	A		A		A		A						C		B			
	Approach Delay (sec/veh)	2.4				0.0								19.2				C	A
	Approach Level of Service, LOS	A				A								C					
ESTIMATED 2034 BACKGROUND TRAFFIC Installation of Turn Lanes	Traffic Control	Uncontrolled				Uncontrolled								Stop Controlled					
	Minor or Major Approach?	Major				Major								Minor					
	Entry Volume, V (veh/hr)	0	92	244		0		273	177					0	148		62		
	Peak Hour Factor (PHF)	0.91				0.91								0.91					
	Adjusted Volume, V_A (veh/hr)	0	101	268		0		300	195					0	163		68		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	L		T		T		R						L		R			
	Lane Group Volume, V_{LG} (veh/hr)	101		268		300		195						163		68		231	1,095
	Capacity, c (veh/hr)	1,059		1,800		1,800		1,500						332		735		1,067	7,226
	Volume-to-Capacity Ratio, V_A/c	0.10		0.15		0.17		0.13						0.49		0.09		0.00	0.15
	HCM 95% Queue Length, Q_{95} (veh)	0.3		0.0		0.0		0.0						2.6		0.3			
	HCM 95% Queue Length, Q_{95} (ft)	7.7		0.0		0.0		0.0						66.6		7.7			
	Available Queue Storage, S_Q (ft)	200		880		540		200						680		200			
	Average Control Delay (sec/veh)	8.8		0.0		0.0		0.0						25.8		10.4		21.3	5.3
	Level of Service, LOS	A		A		A		A						D		B			
	Approach Delay (sec/veh)	2.4				0.0								21.3				C	A
	Approach Level of Service, LOS	A				A								C					
ESTIMATED 2034 TOTAL TRAFFIC Installation of Turn Lanes	Traffic Control	Uncontrolled				Uncontrolled								Stop Controlled					
	Minor or Major Approach?	Major				Major								Minor					
	Entry Volume, V (veh/hr)	0	93	244		0		273	177					0	148		64		
	Peak Hour Factor (PHF)	0.91				0.91								0.91					
	Adjusted Volume, V_A (veh/hr)	0	102	268		0		300	195					0	163		70		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	L		T		T		R						L		R			
	Lane Group Volume, V_{LG} (veh/hr)	102		268		300		195						163		70		233	1,098
	Capacity, c (veh/hr)	1,059		1,800		1,800		1,500						331		735		1,066	7,225
	Volume-to-Capacity Ratio, V_A/c	0.10		0.15		0.17		0.13						0.49		0.10		0.00	0.15
	HCM 95% Queue Length, Q_{95} (veh)	0.3		0.0		0.0		0.0						2.6		0.3			
	HCM 95% Queue Length, Q_{95} (ft)	7.7		0.0		0.0		0.0						66.6		7.7			
	Available Queue Storage, S_Q (ft)	200		880		540		200						680		200			
	Average Control Delay (sec/veh)	8.8		0.0		0.0		0.0						26.0		10.4		21.3	5.3
	Level of Service, LOS	A		A		A		A						D		B			
	Approach Delay (sec/veh)	2.4				0.0								21.3				C	A
	Approach Level of Service, LOS	A				A								C					

U = U-Turns; L = Left Turns; T = Through; R = Right Turns | Lane Groups: LR = Left-Right; TR = Through-Righ; L = Left; T = Through; and LTR = Left-Through-Right

HCS Two-Way Stop-Control Report

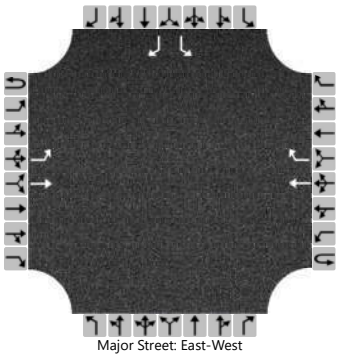
General Information

Analyst	T. Eastwood
Agency/Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2030
Time Analyzed	Weekday, AM Peak Hour
Intersection Orientation	East-West
Project Description	Copper Square TIS | Background Traffic Mitigation

Site Information

Intersection	Grand & 62nd
Jurisdiction	City of Billings
East/West Street	Grand Avenue
North/South Street	62nd Street West
Peak Hour Factor	0.85
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	1	1		0	0	0		1	0	1
Configuration		L	T				T	R						L		R
Volume (veh/h)		62	268				148	58						233		94
Percent Heavy Vehicles (%)		17												2		6
Proportion Time Blocked																
Percent Grade (%)														0		
Right Turn Channelized							No							No		
Median Type | Storage			Undivided													

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.1		6.2
Critical Headway (sec)		4.27												6.42		6.26
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.35												3.52		3.35

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		73												274		111
Capacity, c (veh/h)		1241												416		859
v/c Ratio		0.06												0.66		0.13
95% Queue Length, Q_{95} (veh)		0.2												4.6		0.4
95% Queue Length, Q_{95} (ft)		5.7												116.8		10.5
Control Delay (s/veh)		8.1												28.8		9.8
Level of Service (LOS)		A												D		A
Approach Delay (s/veh)		1.5												23.3		
Approach LOS		A												C		

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HCS Two-Way Stop-Control Report

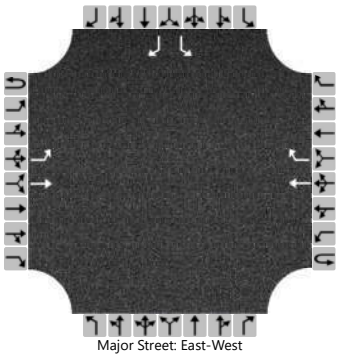
General Information

Analyst	T. Eastwood
Agency/Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2030
Time Analyzed	Weekday, Midday Peak Hour
Intersection Orientation	East-West
Project Description	Copper Square TIS | Background Traffic Mitigation

Site Information

Intersection	Grand & 62nd
Jurisdiction	City of Billings
East/West Street	Grand Avenue
North/South Street	62nd Street West
Peak Hour Factor	0.93
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	1	1		0	0	0		1	0	1
Configuration		L	T				T	R						L		R
Volume (veh/h)		54	172				178	81						95		43
Percent Heavy Vehicles (%)		8												5		10
Proportion Time Blocked																
Percent Grade (%)														0		
Right Turn Channelized							No							No		
Median Type | Storage							Undivided									

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.1		6.2
Critical Headway (sec)		4.18												6.45		6.30
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.27												3.55		3.39

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		58												102		46
Capacity, c (veh/h)		1250												506		830
v/c Ratio		0.05												0.20		0.06
95% Queue Length, Q_{95} (veh)		0.1												0.7		0.2
95% Queue Length, Q_{95} (ft)		2.7												18.2		5.4
Control Delay (s/veh)		8.0												13.9		9.6
Level of Service (LOS)		A												B		A
Approach Delay (s/veh)		1.9												12.6		
Approach LOS		A												B		

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HCS Two-Way Stop-Control Report

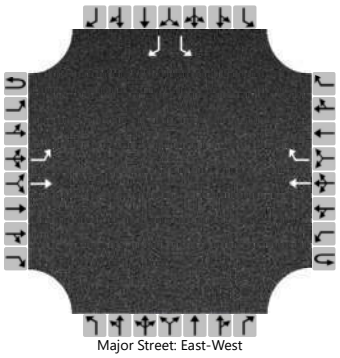
General Information

Analyst	T. Eastwood
Agency/Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2030
Time Analyzed	Weekday, PM Peak Hour
Intersection Orientation	East-West
Project Description	Copper Square TIS | Background Traffic Mitigation

Site Information

Intersection	Grand & 62nd
Jurisdiction	City of Billings
East/West Street	Grand Avenue
North/South Street	62nd Street West
Peak Hour Factor	0.91
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	1	1		0	0	0		1	0	1
Configuration		L	T				T	R						L		R
Volume (veh/h)		85	235				262	164						138		58
Percent Heavy Vehicles (%)		4												3		4
Proportion Time Blocked																
Percent Grade (%)														0		
Right Turn Channelized							No							No		
Median Type | Storage							Undivided									

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.1		6.2
Critical Headway (sec)		4.14												6.43		6.24
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.24												3.53		3.34

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		93												152		64
Capacity, c (veh/h)		1083												353		746
v/c Ratio		0.09												0.43		0.09
95% Queue Length, Q_{95} (veh)		0.3												2.1		0.3
95% Queue Length, Q_{95} (ft)		7.7												53.8		7.7
Control Delay (s/veh)		8.6												22.7		10.3
Level of Service (LOS)		A												C		B
Approach Delay (s/veh)		2.3												19.0		
Approach LOS		A												C		

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HCS Two-Way Stop-Control Report

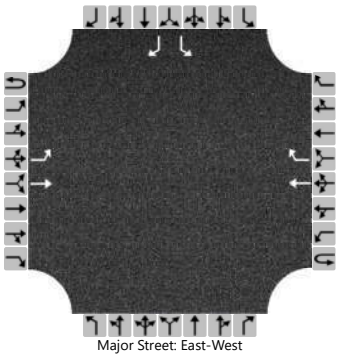
General Information

Analyst	T. Eastwood
Agency/Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2030
Time Analyzed	Weekday, AM Peak Hour
Intersection Orientation	East-West
Project Description	Copper Square TIS | Total Traffic Mitigation

Site Information

Intersection	Grand & 62nd
Jurisdiction	City of Billings
East/West Street	Grand Avenue
North/South Street	62nd Street West
Peak Hour Factor	0.85
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	1	1		0	0	0		1	0	1
Configuration		L	T				T	R						L		R
Volume (veh/h)		65	268				148	59						233		96
Percent Heavy Vehicles (%)		17												2		6
Proportion Time Blocked																
Percent Grade (%)														0		
Right Turn Channelized							No							No		
Median Type | Storage							Undivided									

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.1		6.2
Critical Headway (sec)		4.27												6.42		6.26
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.35												3.52		3.35

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		76												274		113
Capacity, c (veh/h)		1240												411		859
v/c Ratio		0.06												0.67		0.13
95% Queue Length, Q_{95} (veh)		0.2												4.7		0.5
95% Queue Length, Q_{95} (ft)		5.7												119.4		13.1
Control Delay (s/veh)		8.1												29.6		9.8
Level of Service (LOS)		A												D		A
Approach Delay (s/veh)		1.6												23.8		
Approach LOS		A												C		

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HCS Two-Way Stop-Control Report

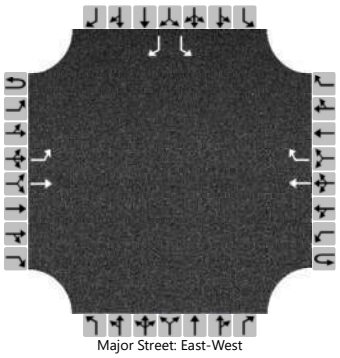
General Information

Analyst	T. Eastwood
Agency/Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2030
Time Analyzed	Weekday, Midday Peak Hour
Intersection Orientation	East-West
Project Description	Copper Square TIS | Total Traffic Mitigation

Site Information

Intersection	Grand & 62nd
Jurisdiction	City of Billings
East/West Street	Grand Avenue
North/South Street	62nd Street West
Peak Hour Factor	0.93
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	1	1		0	0	0		1	0	1
Configuration		L	T				T	R						L		R
Volume (veh/h)		57	172				178	82						96		46
Percent Heavy Vehicles (%)		8												5		10
Proportion Time Blocked																
Percent Grade (%)														0		
Right Turn Channelized							No							No		
Median Type | Storage			Undivided													

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.1		6.2
Critical Headway (sec)		4.18												6.45		6.30
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.27												3.55		3.39

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		61												103		49
Capacity, c (veh/h)		1249												500		830
v/c Ratio		0.05												0.21		0.06
95% Queue Length, Q_{95} (veh)		0.2												0.8		0.2
95% Queue Length, Q_{95} (ft)		5.3												20.8		5.4
Control Delay (s/veh)		8.0												14.1		9.6
Level of Service (LOS)		A												B		A
Approach Delay (s/veh)		2.0												12.6		
Approach LOS		A												B		

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HCS Two-Way Stop-Control Report

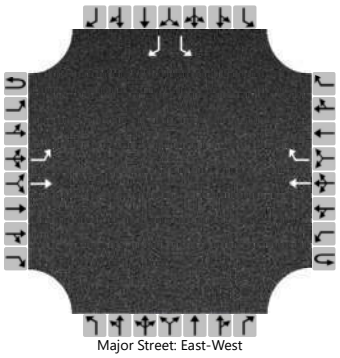
General Information

Analyst	T. Eastwood
Agency/Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2030
Time Analyzed	Weekday, PM Peak Hour
Intersection Orientation	East-West
Project Description	Copper Square TIS | Total Traffic Mitigation

Site Information

Intersection	Grand & 62nd
Jurisdiction	City of Billings
East/West Street	Grand Avenue
North/South Street	62nd Street West
Peak Hour Factor	0.91
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	1	1		0	0	0		1	0	1
Configuration		L	T				T	R						L		R
Volume (veh/h)		88	235				262	165						139		60
Percent Heavy Vehicles (%)		4												3		4
Proportion Time Blocked																
Percent Grade (%)														0		
Right Turn Channelized							No							No		
Median Type | Storage							Undivided									

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.1		6.2
Critical Headway (sec)		4.14												6.43		6.24
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.24												3.53		3.34

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		97												153		66
Capacity, c (veh/h)		1082												349		746
v/c Ratio		0.09												0.44		0.09
95% Queue Length, Q_{95} (veh)		0.3												2.1		0.3
95% Queue Length, Q_{95} (ft)		7.7												53.8		7.7
Control Delay (s/veh)		8.7												23.1		10.3
Level of Service (LOS)		A												C		B
Approach Delay (s/veh)		2.4												19.3		
Approach LOS		A												C		

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HCS Two-Way Stop-Control Report

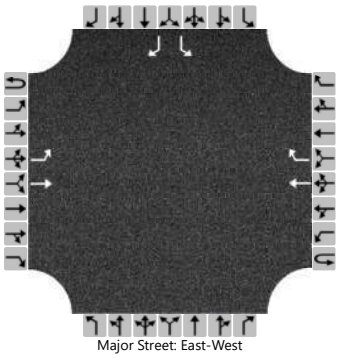
General Information

Analyst	T. Eastwood
Agency/Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2034
Time Analyzed	Weekday, AM Peak Hour
Intersection Orientation	East-West
Project Description	Copper Square TIS | Background Traffic Mitigation

Site Information

Intersection	Grand & 62nd
Jurisdiction	City of Billings
East/West Street	Grand Avenue
North/South Street	62nd Street West
Peak Hour Factor	0.85
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	1	1		0	0	0		1	0	1
Configuration		L	T				T	R						L		R
Volume (veh/h)		68	280				153	63						248		101
Percent Heavy Vehicles (%)		17												2		6
Proportion Time Blocked																
Percent Grade (%)														0		
Right Turn Channelized							No							No		
Median Type | Storage							Undivided									

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.1		6.2
Critical Headway (sec)		4.27												6.42		6.26
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.35												3.52		3.35

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		80												292		119
Capacity, c (veh/h)		1228												395		853
v/c Ratio		0.07												0.74		0.14
95% Queue Length, Q_{95} (veh)		0.2												5.8		0.5
95% Queue Length, Q_{95} (ft)		5.7												147.3		13.1
Control Delay (s/veh)		8.1												35.8		9.9
Level of Service (LOS)		A												E		A
Approach Delay (s/veh)		1.6												28.3		
Approach LOS		A												D		

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HCS Two-Way Stop-Control Report

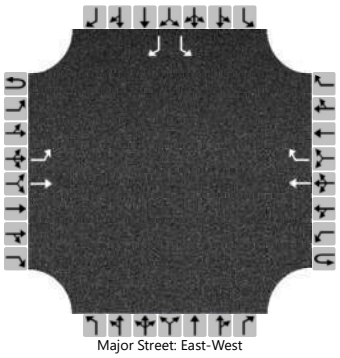
General Information

Analyst	T. Eastwood
Agency/Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2034
Time Analyzed	Weekday, Midday Peak Hour
Intersection Orientation	East-West
Project Description	Copper Square TIS | Background Traffic Mitigation

Site Information

Intersection	Grand & 62nd
Jurisdiction	City of Billings
East/West Street	Grand Avenue
North/South Street	62nd Street West
Peak Hour Factor	0.93
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	1	1		0	0	0		1	0	1
Configuration		L	T				T	R						L		R
Volume (veh/h)		59	178				185	88						103		48
Percent Heavy Vehicles (%)		8												5		10
Proportion Time Blocked																
Percent Grade (%)														0		
Right Turn Channelized							No							No		
Median Type | Storage			Undivided													

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.1		6.2
Critical Headway (sec)		4.18												6.45		6.30
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.27												3.55		3.39

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		63												111		52
Capacity, c (veh/h)		1234												487		822
v/c Ratio		0.05												0.23		0.06
95% Queue Length, Q_{95} (veh)		0.2												0.9		0.2
95% Queue Length, Q_{95} (ft)		5.3												23.4		5.4
Control Delay (s/veh)		8.1												14.6		9.7
Level of Service (LOS)		A												B		A
Approach Delay (s/veh)		2.0												13.0		
Approach LOS		A												B		

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HCS Two-Way Stop-Control Report

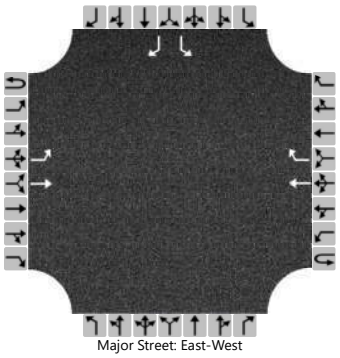
General Information

Analyst	T. Eastwood
Agency/Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2034
Time Analyzed	Weekday, PM Peak Hour
Intersection Orientation	East-West
Project Description	Copper Square TIS | Background Traffic Mitigation

Site Information

Intersection	Grand & 62nd
Jurisdiction	City of Billings
East/West Street	Grand Avenue
North/South Street	62nd Street West
Peak Hour Factor	0.91
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	1	1		0	0	0		1	0	1
Configuration		L	T				T	R						L		R
Volume (veh/h)		92	244				273	177						148		62
Percent Heavy Vehicles (%)		4												3		4
Proportion Time Blocked																
Percent Grade (%)														0		
Right Turn Channelized							No							No		
Median Type | Storage			Undivided													

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.1		6.2
Critical Headway (sec)		4.14												6.43		6.24
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.24												3.53		3.34

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		101												163		68
Capacity, c (veh/h)		1059												332		735
v/c Ratio		0.10												0.49		0.09
95% Queue Length, Q_{95} (veh)		0.3												2.6		0.3
95% Queue Length, Q_{95} (ft)		7.7												66.6		7.7
Control Delay (s/veh)		8.8												25.8		10.4
Level of Service (LOS)		A												D		B
Approach Delay (s/veh)		2.4												21.3		
Approach LOS		A												C		

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HCS Two-Way Stop-Control Report

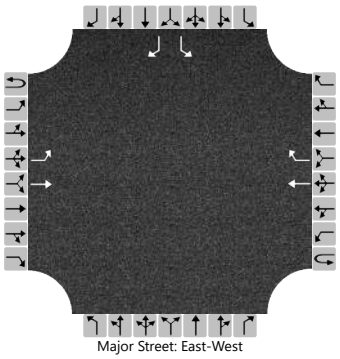
General Information

Analyst	T. Eastwood
Agency/Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2034
Time Analyzed	Weekday, AM Peak Hour
Intersection Orientation	East-West
Project Description	Copper Square TIS | Total Traffic Mitigation

Site Information

Intersection	Grand & 62nd
Jurisdiction	City of Billings
East/West Street	Grand Avenue
North/South Street	62nd Street West
Peak Hour Factor	0.85
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	1	1		0	0	0		1	0	1
Configuration		L	T				T	R						L		R
Volume (veh/h)		69	280				153	63						249		102
Percent Heavy Vehicles (%)		17												2		6
Proportion Time Blocked																
Percent Grade (%)														0		
Right Turn Channelized							No							No		
Median Type | Storage							Undivided									

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.1		6.2
Critical Headway (sec)		4.27												6.42		6.26
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.35												3.52		3.35

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		81												293		120
Capacity, c (veh/h)		1228												393		853
v/c Ratio		0.07												0.74		0.14
95% Queue Length, Q_{95} (veh)		0.2												5.9		0.5
95% Queue Length, Q_{95} (ft)		5.7												149.9		13.1
Control Delay (s/veh)		8.1												36.5		9.9
Level of Service (LOS)		A												E		A
Approach Delay (s/veh)		1.6												28.8		
Approach LOS		A												D		

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HCS Two-Way Stop-Control Report

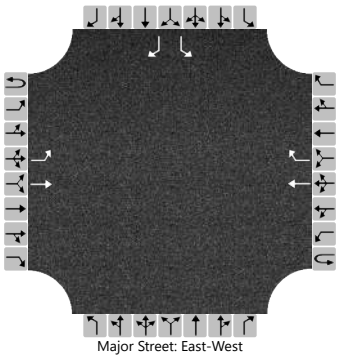
General Information

Analyst	T. Eastwood
Agency/Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2034
Time Analyzed	Weekday, Midday Peak Hour
Intersection Orientation	East-West
Project Description	Copper Square TIS | Total Traffic Mitigation

Site Information

Intersection	Grand & 62nd
Jurisdiction	City of Billings
East/West Street	Grand Avenue
North/South Street	62nd Street West
Peak Hour Factor	0.93
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	1	1		0	0	0		1	0	1
Configuration		L	T				T	R						L		R
Volume (veh/h)		60	178				185	88						103		49
Percent Heavy Vehicles (%)		8												5		10
Proportion Time Blocked																
Percent Grade (%)														0		
Right Turn Channelized							No							No		
Median Type | Storage			Undivided													

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.1		6.2
Critical Headway (sec)		4.18												6.45		6.30
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.27												3.55		3.39

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		65												111		53
Capacity, c (veh/h)		1234												485		822
v/c Ratio		0.05												0.23		0.06
95% Queue Length, Q_{95} (veh)		0.2												0.9		0.2
95% Queue Length, Q_{95} (ft)		5.3												23.4		5.4
Control Delay (s/veh)		8.1												14.6		9.7
Level of Service (LOS)		A												B		A
Approach Delay (s/veh)		2.0												13.0		
Approach LOS		A												B		

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HCS Two-Way Stop-Control Report

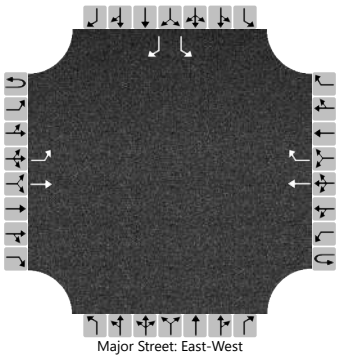
General Information

Analyst	T. Eastwood
Agency/Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2034
Time Analyzed	Weekday, PM Peak Hour
Intersection Orientation	East-West
Project Description	Copper Square TIS | Total Traffic Mitigation

Site Information

Intersection	Grand & 62nd
Jurisdiction	City of Billings
East/West Street	Grand Avenue
North/South Street	62nd Street West
Peak Hour Factor	0.91
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	1	1		0	0	0		1	0	1
Configuration		L	T				T	R						L		R
Volume (veh/h)		93	244				273	177						148		64
Percent Heavy Vehicles (%)		4												3		4
Proportion Time Blocked																
Percent Grade (%)														0		
Right Turn Channelized						No								No		
Median Type | Storage			Undivided													

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.1		6.2
Critical Headway (sec)		4.14												6.43		6.24
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.24												3.53		3.34

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		102												163		70
Capacity, c (veh/h)		1059												331		735
v/c Ratio		0.10												0.49		0.10
95% Queue Length, Q_{95} (veh)		0.3												2.6		0.3
95% Queue Length, Q_{95} (ft)		7.7												66.6		7.7
Control Delay (s/veh)		8.8												26.0		10.4
Level of Service (LOS)		A												D		B
Approach Delay (s/veh)		2.4												21.3		
Approach LOS		A												C		

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Appendix H

IN THIS SECTION:

Grand Avenue &
62nd Street West

Signalization

Traffic Operations Mitigation Summary

Copper Square Subdivision

Intersection: Grand Avenue & 62nd Street West

WEEKDAY, AM PEAK HOUR

Analysis Scenario	Analysis Data	GRAND AVENUE From the West (Eastbound)				GRAND AVENUE From the East (Westbound)				From the South (Northbound)				62ND STREET WEST From the North (Southbound)				Minor Approach Totals	Intersection Totals
		U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R		
ESTIMATED 2030 BACKGROUND TRAFFIC Signalization with Installation of Turn Lanes	Traffic Control	Signalized				Signalized								Signalized					
	Minor or Major Approach?	Major				Major								Minor					
	Entry Volume, V (veh/hr)	0	62	268		0		148	58					0	233		94		
	Peak Hour Factor (PHF)	0.85				0.85								0.85					
	Adjusted Volume, V_A (veh/hr)	0	73	315		0		174	68					0	274		111		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	L		T		T		R						L		R			
	Lane Group Volume, V_{LG} (veh/hr)	73		315		174		68						274		111		385	1,015
	Capacity, c (veh/hr)	571		996		633		682						388		334		722	3,604
	Volume-to-Capacity Ratio, V_A/c	0.13		0.32		0.28		0.10						0.71		0.33		0.53	0.28
	HCM 95% Queue Length, Q_{95} (veh)	1.1		3.9		0.0		1.6						5.5		0.6			
	HCM 95% Queue Length, Q_{95} (ft)	30		101		87		12						140		15			
	Available Queue Storage, S_Q (ft)	200		880		540		200						680		680			
	Average Control Delay (sec/veh)	8.4		7.4		14.2		8.9						24.7		20.3		23.4	14.8
	Level of Service, LOS	A		A		B		A						C		C			
	Approach Delay (sec/veh)	7.6				12.7								23.4				C	B
	Approach Level of Service, LOS	A				B								C					
ESTIMATED 2030 TOTAL TRAFFIC Signalization with Installation of Turn Lanes	Traffic Control	Signalized				Signalized								Signalized					
	Minor or Major Approach?	Major				Major								Minor					
	Entry Volume, V (veh/hr)	0	65	268		0		148	59					0	233		96		
	Peak Hour Factor (PHF)	0.85				0.85								0.85					
	Adjusted Volume, V_A (veh/hr)	0	76	315		0		174	69					0	274		113		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	L		T		T		R						L		R			
	Lane Group Volume, V_{LG} (veh/hr)	76		315		174		69						274		113		387	1,022
	Capacity, c (veh/hr)	1,240		1,800		1,800		1,500						411		859		1,270	7,610
	Volume-to-Capacity Ratio, V_A/c	0.06		0.18		0.10		0.05						0.67		0.13		0.30	0.13
	HCM 95% Queue Length, Q_{95} (veh)	1.1		3.9		0.0		0.7						5.5		0.6			
	HCM 95% Queue Length, Q_{95} (ft)	31		101		87		5						140		15			
	Available Queue Storage, S_Q (ft)	200		880		540		200						680		200			
	Average Control Delay (sec/veh)	8.4		7.4		14.3		9.0						24.8		20.3		23.5	14.8
	Level of Service, LOS	A		A		B		A						C		C			
	Approach Delay (sec/veh)	7.6				12.8								23.5				C	B
	Approach Level of Service, LOS	A				B								C					
ESTIMATED 2034 BACKGROUND TRAFFIC Signalization with Installation of Turn Lanes	Traffic Control	Signalized				Signalized								Signalized					
	Minor or Major Approach?	Major				Major								Minor					
	Entry Volume, V (veh/hr)	0	68	280		0		153	63					0	248		101		
	Peak Hour Factor (PHF)	0.85				0.85								0.85					
	Adjusted Volume, V_A (veh/hr)	0	80	329		0		180	74					0	292		119		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	L		T		T		R						L		R			
	Lane Group Volume, V_{LG} (veh/hr)	80		329		180		74						292		119		411	1,074
	Capacity, c (veh/hr)	1,228		1,800		1,800		1,500						395		853		1,248	7,576
	Volume-to-Capacity Ratio, V_A/c	0.07		0.18		0.10		0.05						0.74		0.14		0.33	0.14
	HCM 95% Queue Length, Q_{95} (veh)	1.2		4.3		0.0		0.7						5.9		0.8			
	HCM 95% Queue Length, Q_{95} (ft)	34		111		94		5						149		21			
	Available Queue Storage, S_Q (ft)	200		880		540		200						680		200			
	Average Control Delay (sec/veh)	8.9		7.9		15.0		9.3						24.9		20.1		23.5	15.2
	Level of Service, LOS	A		A		B		A						C		C			
	Approach Delay (sec/veh)	8.1				13.3								23.5				C	B
	Approach Level of Service, LOS	A				B								C					
ESTIMATED 2034 TOTAL TRAFFIC Signalization with Installation of Turn Lanes	Traffic Control	Signalized				Signalized								Signalized					
	Minor or Major Approach?	Major				Major								Minor					
	Entry Volume, V (veh/hr)	0	69	280		0		153	63					0	249		102		
	Peak Hour Factor (PHF)	0.85				0.85								0.85					
	Adjusted Volume, V_A (veh/hr)	0	81	329		0		180	74					0	293		120		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	L		T		T		R						L		R			
	Lane Group Volume, V_{LG} (veh/hr)	81		329		180		74						293		120		413	1,078
	Capacity, c (veh/hr)	1,228		1,800		1,800		1,500						393		853		1,246	7,574
	Volume-to-Capacity Ratio, V_A/c	0.07		0.18		0.10		0.05						0.75		0.14		0.33	0.14
	HCM 95% Queue Length, Q_{95} (veh)	1.2		4.2		0.0		0.7						5.9		0.6			
	HCM 95% Queue Length, Q_{95} (ft)	33		110		94		5						149		15			
	Available Queue Storage, S_Q (ft)	200		880		540		200						680		200			
	Average Control Delay (sec/veh)	8.8		7.9		15.0		9.3						25.1		19.9		23.6	15.3
	Level of Service, LOS	A		A		B		A						C		B			
	Approach Delay (sec/veh)	8.1				13.3								23.6				C	B
	Approach Level of Service, LOS	A				B								C					

U = U-Turns; L = Left Turns; T = Through; R = Right Turns | Lane Groups: LR = Left-Right; TR = Through-Righ; L = Left; T = Through; and LTR = Left-Through-Right

Traffic Operations Mitigation Summary

Copper Square Subdivision

Intersection: Grand Avenue & 62nd Street West

WEEKDAY, MIDDAY PEAK HOUR

Analysis Scenario	Analysis Data	GRAND AVENUE From the West (Eastbound) U	L	T	R	GRAND AVENUE From the East (Westbound) U	L	T	R	From the South (Northbound) U	L	T	R	62ND STREET WEST From the North (Southbound) U	L	T	R	Minor Approach Totals	Intersection Totals
ESTIMATED 2030 BACKGROUND TRAFFIC Signalization with Installation of Turn Lanes	Traffic Control	Signalized				Signalized								Signalized					
	Minor or Major Approach?	Major				Major								Minor					
	Entry Volume, V (veh/hr)	0	54	172		0		178	81					0	95		43		
	Peak Hour Factor (PHF)	0.93				0.93								0.93					
	Adjusted Volume, V_A (veh/hr)	0	58	185		0		191	87					0	102		46		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	L		T		T		R						L		R			
	Lane Group Volume, V_{LG} (veh/hr)	58		185		191		87						102		46		148	670
	Capacity, c (veh/hr)	651		1,079		724		734						264		225		489	3,677
	Volume-to-Capacity Ratio, V_A/c	0.09		0.17		0.26		0.12						0.39		0.21		0.30	0.18
	HCM 95% Queue Length, Q_{95} (veh)	0.5		1.0		0.0		1.0						1.0		0.2			
	HCM 95% Queue Length, Q_{95} (ft)	17		42		82		6						64		14			
	Available Queue Storage, S_Q (ft)	200		880		540		200						680		680			
	Average Control Delay (sec/veh)	6.2		4.7		11.0		7.9						24.7		23.1		24.2	11.4
	Level of Service, LOS	A		A		B		A						C		C			
	Approach Delay (sec/veh)	5.1				10.0								24.2				C	B
	Approach Level of Service, LOS	A				B								C					
ESTIMATED 2030 TOTAL TRAFFIC Signalization with Installation of Turn Lanes	Traffic Control	Signalized				Signalized								Signalized					
	Minor or Major Approach?	Major				Major								Minor					
	Entry Volume, V (veh/hr)	0	57	172		0		178	82					0	96		46		
	Peak Hour Factor (PHF)	0.93				0.93								0.93					
	Adjusted Volume, V_A (veh/hr)	0	61	185		0		191	88					0	103		49		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	L		T		T		R						L		R			
	Lane Group Volume, V_{LG} (veh/hr)	61		185		191		88						103		49		153	678
	Capacity, c (veh/hr)	653		1,080		720		731						265		226		491	3,675
	Volume-to-Capacity Ratio, V_A/c	0.09		0.17		0.27		0.12						0.39		0.22		0.31	0.18
	HCM 95% Queue Length, Q_{95} (veh)	0.5		1.0		0.0		1.0						1.1		0.3			
	HCM 95% Queue Length, Q_{95} (ft)	17		42		83		6						65		15			
	Available Queue Storage, S_Q (ft)	200		880		540		200						680		200			
	Average Control Delay (sec/veh)	6.2		4.7		11.1		8.0						24.7		23.2		24.2	11.5
	Level of Service, LOS	A		A		B		A						C		C			
	Approach Delay (sec/veh)	5.1				10.1								24.2				C	B
	Approach Level of Service, LOS	A				B								C					
ESTIMATED 2034 BACKGROUND TRAFFIC Signalization with Installation of Turn Lanes	Traffic Control	Signalized				Signalized								Signalized					
	Minor or Major Approach?	Major				Major								Minor					
	Entry Volume, V (veh/hr)	0	59	178		0		185	88					0	103		48		
	Peak Hour Factor (PHF)	0.93				0.93								0.93					
	Adjusted Volume, V_A (veh/hr)	0	63	191		0		199	95					0	111		52		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	L		T		T		R						L		R			
	Lane Group Volume, V_{LG} (veh/hr)	63		191		199		95						111		52		162	711
	Capacity, c (veh/hr)	643		1,076		715		726						270		230		500	3,660
	Volume-to-Capacity Ratio, V_A/c	0.10		0.18		0.28		0.13						0.41		0.22		0.32	0.19
	HCM 95% Queue Length, Q_{95} (veh)	0.6		1.1		0.0		1.0						1.1		0.3			
	HCM 95% Queue Length, Q_{95} (ft)	19		46		88		6						68		15			
	Available Queue Storage, S_Q (ft)	200		880		540		200						680		200			
	Average Control Delay (sec/veh)	6.4		4.7		11.4		8.1						24.9		23.2		24.4	11.7
	Level of Service, LOS	A		A		B		A						C		C			
	Approach Delay (sec/veh)	5.1				10.3								24.4				C	B
	Approach Level of Service, LOS	A				B								C					
ESTIMATED 2034 TOTAL TRAFFIC Signalization with Installation of Turn Lanes	Traffic Control	Signalized				Signalized								Signalized					
	Minor or Major Approach?	Major				Major								Minor					
	Entry Volume, V (veh/hr)	0	60	178		0		185	88					0	103		49		
	Peak Hour Factor (PHF)	0.93				0.93								0.93					
	Adjusted Volume, V_A (veh/hr)	0	65	191		0		199	95					0	111		53		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	L		T		T		R						L		R			
	Lane Group Volume, V_{LG} (veh/hr)	65		191		199		95						111		53		163	713
	Capacity, c (veh/hr)	645		1,077		713		725						270		230		500	3,660
	Volume-to-Capacity Ratio, V_A/c	0.10		0.18		0.28		0.13						0.41		0.23		0.33	0.19
	HCM 95% Queue Length, Q_{95} (veh)	0.6		1.1		0.0		1.0						1.1		0.3			
	HCM 95% Queue Length, Q_{95} (ft)	19		46		88		6						69		15			
	Available Queue Storage, S_Q (ft)	200		880		540		200						680		200			
	Average Control Delay (sec/veh)	6.4		4.7		11.4		8.2						24.9		23.2		24.4	11.7
	Level of Service, LOS	A		A		B		A						C		C			
	Approach Delay (sec/veh)	5.1				10.4								24.4				C	B
	Approach Level of Service, LOS	A				B								C					

U = U-Turns; L = Left Turns; T = Through; R = Right Turns | Lane Groups: LR = Left-Right; TR = Through-Righ; L = Left; T = Through; and LTR = Left-Through-Right

Traffic Operations Mitigation Summary

Copper Square Subdivision

Intersection: Grand Avenue & 62nd Street West

WEEKDAY, PM PEAK HOUR

Analysis Scenario	Analysis Data	GRAND AVENUE From the West (Eastbound) U	L	T	R	GRAND AVENUE From the East (Westbound) U	L	T	R	From the South (Northbound) U	L	T	R	62ND STREET WEST From the North (Southbound) U	L	T	R	Minor Approach Totals	Intersection Totals
ESTIMATED 2030 BACKGROUND TRAFFIC Signalization with Installation of Turn Lanes	Traffic Control	Signalized				Signalized								Signalized					
	Minor or Major Approach?	Major				Major								Minor					
	Entry Volume, V (veh/hr)	0	85	235		0		262	164					0	138		58		
	Peak Hour Factor (PHF)	0.91				0.91								0.91					
	Adjusted Volume, V_A (veh/hr)	0	93	258		0		288	180					0	152		64		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	L		T		T		R						L		R			
	Lane Group Volume, V_{LG} (veh/hr)	93		258		288		180						152		64		215	1,035
	Capacity, c (veh/hr)	588		1,111		701		708						299		264		563	3,671
	Volume-to-Capacity Ratio, V_A/c	0.16		0.23		0.41		0.25						0.51		0.24		0.38	0.28
	HCM 95% Queue Length, Q_{95} (veh)	1.4		2.3		0.0		2.2						2.1		0.4			
	HCM 95% Queue Length, Q_{95} (ft)	29		68		138		8						89		15			
	Available Queue Storage, S_Q (ft)	200		880		540		200						680		680			
	Average Control Delay (sec/veh)	7.2		5.4		13.5		9.2						25.7		22.9		24.9	12.5
	Level of Service, LOS	A		A		B		A						C		C			
	Approach Delay (sec/veh)	5.9				11.8								24.9				C	B
	Approach Level of Service, LOS	A				B								C					
ESTIMATED 2030 TOTAL TRAFFIC Signalization with Installation of Turn Lanes	Traffic Control	Signalized				Signalized								Signalized					
	Minor or Major Approach?	Major				Major								Minor					
	Entry Volume, V (veh/hr)	0	88	235		0		262	165					0	139		60		
	Peak Hour Factor (PHF)	0.91				0.91								0.91					
	Adjusted Volume, V_A (veh/hr)	0	97	258		0		288	181					0	153		66		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	L		T		T		R						L		R			
	Lane Group Volume, V_{LG} (veh/hr)	97		258		288		181						153		66		219	1,043
	Capacity, c (veh/hr)	590		1,111		698		705						440		388		828	3,932
	Volume-to-Capacity Ratio, V_A/c	0.16		0.23		0.41		0.26						0.35		0.17		0.26	0.27
	HCM 95% Queue Length, Q_{95} (veh)	1.4		2.3		0.0		2.2						2.1		0.4			
	HCM 95% Queue Length, Q_{95} (ft)	30		68		138		8						90		15			
	Available Queue Storage, S_Q (ft)	200		880		540		200						680		200			
	Average Control Delay (sec/veh)	7.2		5.4		13.7		9.3						25.7		23.0		24.9	12.6
	Level of Service, LOS	A		A		B		A						C		C			
	Approach Delay (sec/veh)	5.9				12.0								24.9				C	B
	Approach Level of Service, LOS	A				B								C					
ESTIMATED 2034 BACKGROUND TRAFFIC Signalization with Installation of Turn Lanes	Traffic Control	Signalized				Signalized								Signalized					
	Minor or Major Approach?	Major				Major								Minor					
	Entry Volume, V (veh/hr)	0	92	244		0		273	177					0	148		62		
	Peak Hour Factor (PHF)	0.91				0.91								0.91					
	Adjusted Volume, V_A (veh/hr)	0	101	268		0		300	195					0	163		68		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	L		T		T		R						L		R			
	Lane Group Volume, V_{LG} (veh/hr)	101		268		300		195						163		68		231	1,095
	Capacity, c (veh/hr)	576		1,104		689		703						308		272		580	3,652
	Volume-to-Capacity Ratio, V_A/c	0.18		0.24		0.44		0.28						0.53		0.25		0.40	0.30
	HCM 95% Queue Length, Q_{95} (veh)	1.5		2.5		0.0		2.2						2.2		0.4			
	HCM 95% Queue Length, Q_{95} (ft)	32		74		149		8						94		15			
	Available Queue Storage, S_Q (ft)	200		880		540		200						680		200			
	Average Control Delay (sec/veh)	7.5		5.6		14.1		9.4						25.6		22.7		24.7	12.8
	Level of Service, LOS	A		A		B		A						C		C			
	Approach Delay (sec/veh)	6.1				12.3								24.7				C	B
	Approach Level of Service, LOS	A				B								C					
ESTIMATED 2034 TOTAL TRAFFIC Signalization with Installation of Turn Lanes	Traffic Control	Signalized				Signalized								Signalized					
	Minor or Major Approach?	Major				Major								Minor					
	Entry Volume, V (veh/hr)	0	93	244		0		273	177					0	148		64		
	Peak Hour Factor (PHF)	0.91				0.91								0.91					
	Adjusted Volume, V_A (veh/hr)	0	102	268		0		300	195					0	163		70		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	L		T		T		R						L		R			
	Lane Group Volume, V_{LG} (veh/hr)	102		268		300		195						163		70		233	1,098
	Capacity, c (veh/hr)	576		1,105		688		702						442		390		832	3,903
	Volume-to-Capacity Ratio, V_A/c	0.18		0.24		0.44		0.28						0.37		0.18		0.28	0.28
	HCM 95% Queue Length, Q_{95} (veh)	1.5		2.5		0.0		2.2						2.2		0.4			
	HCM 95% Queue Length, Q_{95} (ft)	32		74		149		8						94		15			
	Available Queue Storage, S_Q (ft)	200		880		540		200						680		200			
	Average Control Delay (sec/veh)	7.5		5.6		14.1		9.5						25.6		22.7		24.7	12.8
	Level of Service, LOS	A		A		B		A						C		C			
	Approach Delay (sec/veh)	6.1				12.3								24.7				C	B
	Approach Level of Service, LOS	A				B								C					

U = U-Turns; L = Left Turns; T = Through; R = Right Turns | Lane Groups: LR = Left-Right; TR = Through-Righ; L = Left; T = Through; and LTR = Left-Through-Right

Traffic Signal Timing Evaluation

Analysis Case: Estimated 2030 Background Traffic

Major Roadway:	Grand Avenue	**Design or Posted Speed Limit:**	45 mph
Minor Roadway:	62nd Street West	**Design or Posted Speed Limit:**	45 mph

Minimum Green Interval Duration

Minimum Green to Satisfy Drive Expectancy			Pedestrian Walk Interval	
Signal Phase Type	Facility Type	Minimum Green Needed to Satisfy Driver Expectancy (G_e)	Conditions	Walk Interval Duration (PW)
Through Movements	Major Arterial (Speed Limit > 40 mph)	10 to 15 seconds	High pedestrian volume areas (e.g., schools, central business districts, sports venues, etc.)	10 to 15 seconds
	Major Arterial (Speed Limit ≤ 40 mph)	7 to 15 seconds	Typical pedestrian volume and longer cycle length	7 to 10 seconds
	Minor Arterial	4 to 10 seconds	Typical pedestrian volume and shorter cycle length	7 seconds
	Collector, Local, Driveway	2 to 10 seconds	Negligible pedestrian volume	4 seconds
Left Turns	Any	2 to 5 seconds	Conditions where older pedestrians are present	Distance to center of road divided by 3.0 feet per second

Source: United States Department of Transportation - Federal Highway Administration, *Signal Timing Manual* (June 2008)

Selected Minimum Green Interval Durations for Intersection Based on Driver Expectancy		*Selected Pedestrian Walk Interval*	
Grand Avenue:	15 sec	7 sec	
62nd Street West:	10 sec	7 sec	

Pedestrian Clearance Interval (Flashing Don't Walk) Duration

$PC = W_C / V_P$ where: PC = Pedestrian Clearance Time (sec); W_C = Width of Crossing - Curb to Curb (ft); V_P = Pedestrian Walking Speed (ft/sec)

Design Pedestrian Walking Speed, V_P = 4.0 ft/sec

Grand Avenue

Pedestrian Crossing of 62nd Street West

Width of Crossing - Curb to Curb, W_C = 48 ft

Calculated Pedestrian Clearance Interval, PC = 12.00 sec

62nd Street West

Pedestrian Crossing of Grand Avenue

Width of Crossing - Curb to Curb, W_C = 46 ft

Calculated Pedestrian Clearance Interval, PC = 11.50 sec

Maximum Green Interval Duration

$G_{MAX} = (DHV \cdot C) / (1200 \cdot n) + 1$ where: G_{MAX} = Maximum Green Interval Duration (sec); DHV = Design Hourly Volume Served by Subject Phase (veh / hr); C = Cycle Length (sec); n = Number of Lanes Served by Subject Phase

Grand Avenue Critical Movement

DHV = 430 veh/hr C = 75 sec n = 1

Calculated Maximum Green Interval Duration, G_{MAX} = 26.85 sec

Rounded to Nearest Tenth of a Second = 26.9 sec

62nd Street West Critical Movement

DHV = 240 veh/hr C = 75 sec n = 1

Calculated Maximum Green Interval Duration, G_{MAX} = 14.99 sec

Rounded to Nearest Tenth of a Second = 15.0 sec

Traffic Signal Timing Evaluation

Analysis Case: Estimated 2030 Background Traffic

Major Roadway:	Grand Avenue	**Design or Posted Speed Limit:**	45 mph
Minor Roadway:	62nd Street West	**Design or Posted Speed Limit:**	45 mph

Total Vehicular Clearance Interval

YAR = t + V/2d + (W + L) / V where: YAR = Yellow + All-Red Interval (sec); t = Perception-Reaction Time (sec) = 1.0 sec; V = Approach Speed (ft/sec); d = Deceleration Rate (ft/sec^2) = 10.0 ft/sec^2; W = Width of Intersection (ft); L = Length of Vehicle (ft) = 25 ft

Grand Avenue Approaches		62nd Street West Approaches	
V = 45 mph = 66.00 ft/sec	W = 84 ft	V = 45 mph = 66.00 ft/sec	W = 104 ft
Yellow + All-Red Clearance Interval, YAR =	*5.95 sec*	*Yellow + All-Red Clearance Interval, YAR =*	*6.25 sec*
Rounded to Nearest Tenth of a Second =	*6.0 sec*	*Rounded to Nearest Tenth of a Second =*	*6.3 sec*

All-Red Clearance Interval

AR = [(W + L) / V] - 1 where: AR = All-Red Clearance Interval (sec) - *Use maximum of 2.50 seconds*

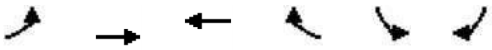
Equation accounts for perception-reaction time of drivers in next conflicting phase to be served.

Grand Avenue Approaches		62nd Street West Approaches	
All-Red Clearance Interval, AR =	*0.65 sec*	*All-Red Clearance Interval, AR =*	*0.95 sec*
Rounded to Nearest Tenth of a Second =	*0.7 sec*	*Rounded to Nearest Tenth of a Second =*	*1.0 sec*

Yellow Phase Change Interval

Y = YAR - AR where: Y = Yellow Phase Change Interval (sec)

Grand Avenue Approaches		62nd Street West Approaches	
Yellow Phase Change Interval, Y =	*5.30 sec*	*Yellow Phase Change Interval, Y =*	*5.30 sec*
Rounded to Nearest Tenth of a Second =	*5.3 sec*	*Rounded to Nearest Tenth of a Second =*	*5.3 sec*



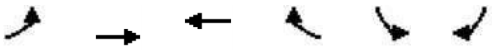
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	62	268	148	58	233	94
Future Volume (veh/h)	62	268	148	58	233	94
Initial Q (Qb), veh	0	0	0	0	0	0
Lane Width Adj.	1.00	1.00	1.00	1.00	1.00	1.00
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No	No		No	
Adj Sat Flow, veh/h/ln	1518	1682	1709	1668	1723	1668
Adj Flow Rate, veh/h	73	315	174	68	274	111
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Percent Heavy Veh, %	17	5	3	6	2	6
Cap, veh/h	580	1027	729	921	370	319
Arrive On Green	0.10	0.61	0.43	0.43	0.23	0.23
Sat Flow, veh/h	1446	1682	1709	1414	1641	1414
Grp Volume(v), veh/h	73	315	174	68	274	111
Grp Sat Flow(s),veh/h/ln	1446	1682	1709	1414	1641	1414
Q Serve(g_s), s	1.8	6.7	4.9	1.3	11.6	5.0
Cycle Q Clear(g_c), s	1.8	6.7	4.9	1.3	11.6	5.0
Prop In Lane	1.00			1.00	1.00	1.00
Lane Grp Cap(c), veh/h	580	1027	729	921	370	319
V/C Ratio(X)	0.13	0.31	0.24	0.07	0.74	0.35
Avail Cap(c_a), veh/h	642	1027	729	921	518	447
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	8.1	7.0	13.7	4.8	27.0	24.4
Incr Delay (d2), s/veh	0.1	0.8	0.2	0.0	3.5	0.7
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.4	2.0	1.7	1.9	4.5	4.2
Unsig. Movement Delay, s/veh						
LnGrp Delay(d), s/veh	8.2	7.8	13.9	4.8	30.5	25.1
LnGrp LOS	A	A	B	A	C	C
Approach Vol, veh/h		388	242		385	
Approach Delay, s/veh		7.8	11.4		29.0	
Approach LOS		A	B		C	

Timer - Assigned Phs	2	4	7	8
Phs Duration (G+Y+Rc), s	23.2	51.8	13.8	38.0
Change Period (Y+Rc), s	6.3	6.0	6.0	6.0
Max Green Setting (Gmax), s	23.7	39.0	11.0	22.0
Max Q Clear Time (g_c+I1), s	13.6	8.7	3.8	6.9
Green Ext Time (p_c), s	3.3	4.9	0.1	2.0

Intersection Summary	
HCM 7th Control Delay, s/veh	16.7
HCM 7th LOS	B

Notes

User approved changes to right turn type.

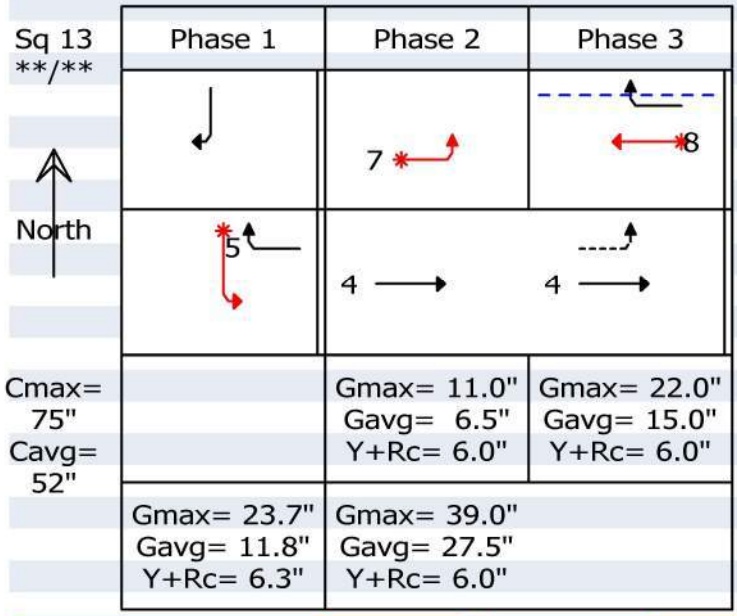


Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	73	315	174	68	274	111
v/c Ratio	0.13	0.32	0.24	0.17	0.70	0.26
Control Delay (s/veh)	8.9	10.0	18.7	6.4	34.8	5.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	8.9	10.0	18.7	6.4	34.8	5.9
Queue Length 50th (ft)	15	68	55	0	119	0
Queue Length 95th (ft)	40	136	111	24	160	29
Internal Link Dist (ft)		1489	1266		2591	
Turn Bay Length (ft)	200			200	200	200
Base Capacity (vph)	570	997	722	495	522	524
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	0.13	0.32	0.24	0.14	0.52	0.21

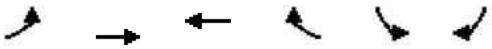
Intersection Summary

TEAPAC[Ver 9.50.02] - Capacity Analysis Summary (HCM 2016)

Intersection Averages for Int # 1 - Grand Ave & 62nd St W
V/C 0.422 (Critical V/C 0.430) Control Delay 12.6 Level of Service B+



Lane Group	Width/ Lanes	g/C Max	g/C Avg	SatFlo	Capcty	Adj Volume	v/c	HCM Delay	L S	Queue Model 1
SB Approach								18.9	B	
R	12/1	0.071	0.226	1525	348	1	0.003	15.4	B	0 ft
L	12/1	0.316	0.226	1779	406	274	0.675	18.9	*B	120 ft
WB Approach								14.4	B+	
R	12/1	0.071	0.288	1522	443	1	0.002	13.0	B+	0 ft
T	12/1	0.293	0.288	1843	536	174	0.324	14.4	*B+	63 ft
EB Approach								7.3	A	
T	12/1	0.520	0.529	1810	965	315	0.327	7.0	A	66 ft
L	12/1	0.147	0.125	1544	561	73	0.130	8.5	*A	19 ft



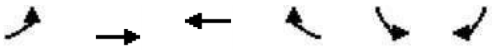
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	54	172	178	81	95	43
Future Volume (veh/h)	54	172	178	81	95	43
Initial Q (Qb), veh	0	0	0	0	0	0
Lane Width Adj.	1.00	1.00	1.00	1.00	1.00	1.00
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No	No		No	
Adj Sat Flow, veh/h/ln	1641	1654	1654	1723	1682	1614
Adj Flow Rate, veh/h	58	185	191	87	102	46
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	8	7	7	2	5	10
Cap, veh/h	701	1173	886	967	204	174
Arrive On Green	0.09	0.71	0.54	0.54	0.13	0.13
Sat Flow, veh/h	1563	1654	1654	1460	1602	1367
Grp Volume(v), veh/h	58	185	191	87	102	46
Grp Sat Flow(s),veh/h/ln	1563	1654	1654	1460	1602	1367
Q Serve(g_s), s	1.0	2.7	4.5	1.6	4.5	2.3
Cycle Q Clear(g_c), s	1.0	2.7	4.5	1.6	4.5	2.3
Prop In Lane	1.00			1.00	1.00	1.00
Lane Grp Cap(c), veh/h	701	1173	886	967	204	174
V/C Ratio(X)	0.08	0.16	0.22	0.09	0.50	0.26
Avail Cap(c_a), veh/h	784	1173	886	967	506	432
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	4.9	3.6	9.2	4.5	30.5	29.6
Incr Delay (d2), s/veh	0.1	0.3	0.1	0.0	1.9	0.8
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.2	0.6	1.3	2.4	1.7	1.8
Unsig. Movement Delay, s/veh						
LnGrp Delay(d), s/veh	5.0	3.9	9.3	4.6	32.4	30.4
LnGrp LOS	A	A	A	A	C	C
Approach Vol, veh/h		243	278		148	
Approach Delay, s/veh		4.1	7.8		31.8	
Approach LOS		A	A		C	

Timer - Assigned Phs	2	4	7	8
Phs Duration (G+Y+Rc), s	15.8	59.2	13.0	46.1
Change Period (Y+Rc), s	6.3	6.0	6.0	6.0
Max Green Setting (Gmax), s	23.7	39.0	11.0	22.0
Max Q Clear Time (g_c+I1), s	6.5	4.7	3.0	6.5
Green Ext Time (p_c), s	1.5	2.7	0.1	2.3

Intersection Summary	
HCM 7th Control Delay, s/veh	11.8
HCM 7th LOS	B

Notes

User approved changes to right turn type.

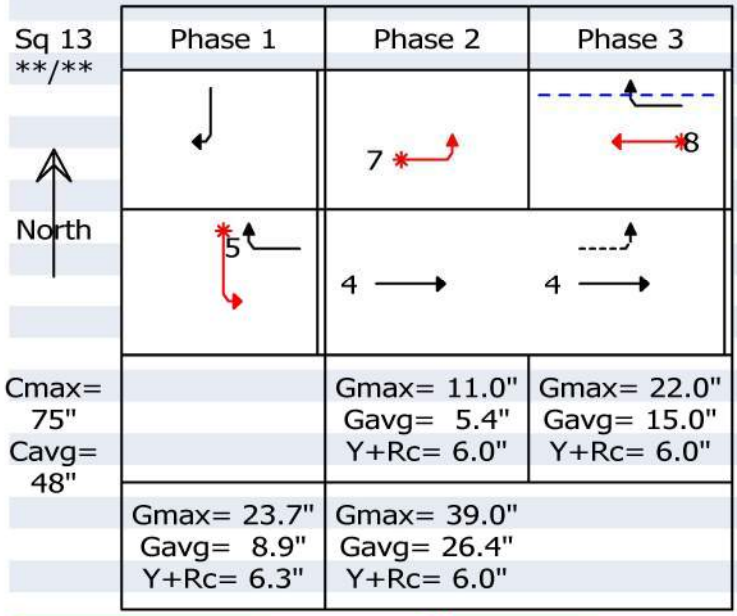


Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	58	185	191	87	102	46
v/c Ratio	0.08	0.15	0.19	0.07	0.43	0.19
Control Delay (s/veh)	4.5	4.6	11.2	1.0	34.6	10.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	4.5	4.6	11.2	1.0	34.6	10.9
Queue Length 50th (ft)	7	25	51	0	46	0
Queue Length 95th (ft)	22	56	104	11	88	28
Internal Link Dist (ft)		1489	1266		2591	
Turn Bay Length (ft)	200			200	200	200
Base Capacity (vph)	752	1220	1011	1341	500	458
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	0.08	0.15	0.19	0.06	0.20	0.10

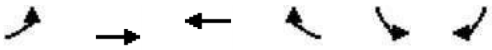
Intersection Summary

TEAPAC[Ver 9.50.02] - Capacity Analysis Summary (HCM 2016)

Intersection Averages for Int # 1 - Grand Ave & 62nd St W
V/C 0.256 (Critical V/C 0.325) Control Delay 10.4 Level of Service B+



Lane Group	Width/ Lanes	g/C Max	g/C Avg	SatFlo	Capcty	Adj Volume	v/c	HCM Delay	L S	Queue Model 1
SB Approach								16.9	B	
R	12/1	0.071	0.186	1466	275	1	0.004	15.7	B	0 ft
L	12/1	0.316	0.186	1725	324	102	0.315	16.9	*B	39 ft
WB Approach								12.6	B+	
R	12/1	0.071	0.313	1585	500	1	0.002	11.2	B+	0 ft
T	12/1	0.293	0.313	1781	561	191	0.340	12.6	*B+	60 ft
EB Approach								5.9	A	
T	12/1	0.520	0.549	1777	984	185	0.188	5.4	A	28 ft
L	12/1	0.147	0.112	1674	600	58	0.097	7.4	*A	11 ft

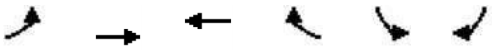


Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	85	235	262	164	138	58
Future Volume (veh/h)	85	235	262	164	138	58
Initial Q (Qb), veh	0	0	0	0	0	0
Lane Width Adj.	1.00	1.00	1.00	1.00	1.00	1.00
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No	No		No	
Adj Sat Flow, veh/h/ln	1695	1723	1723	1736	1709	1695
Adj Flow Rate, veh/h	93	258	288	180	152	64
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	4	2	2	1	3	4
Cap, veh/h	614	1194	859	945	233	205
Arrive On Green	0.11	0.69	0.50	0.50	0.14	0.14
Sat Flow, veh/h	1615	1723	1723	1471	1628	1437
Grp Volume(v), veh/h	93	258	288	180	152	64
Grp Sat Flow(s),veh/h/ln	1615	1723	1723	1471	1628	1437
Q Serve(g_s), s	1.7	4.1	7.5	3.7	6.6	3.0
Cycle Q Clear(g_c), s	1.7	4.1	7.5	3.7	6.6	3.0
Prop In Lane	1.00			1.00	1.00	1.00
Lane Grp Cap(c), veh/h	614	1194	859	945	233	205
V/C Ratio(X)	0.15	0.22	0.34	0.19	0.65	0.31
Avail Cap(c_a), veh/h	667	1194	859	945	514	454
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	5.8	4.2	11.3	5.5	30.4	28.8
Incr Delay (d2), s/veh	0.1	0.4	0.2	0.1	3.1	0.9
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.4	1.0	2.4	5.1	2.6	2.5
Unsig. Movement Delay, s/veh						
LnGrp Delay(d), s/veh	6.0	4.6	11.5	5.6	33.5	29.7
LnGrp LOS	A	A	B	A	C	C
Approach Vol, veh/h		351	468		216	
Approach Delay, s/veh		4.9	9.2		32.3	
Approach LOS		A	A		C	

Timer - Assigned Phs	2	4	7	8
Phs Duration (G+Y+Rc), s	17.0	58.0	14.6	43.4
Change Period (Y+Rc), s	6.3	6.0	6.0	6.0
Max Green Setting (Gmax), s	23.7	39.0	11.0	22.0
Max Q Clear Time (g_c+I1), s	8.6	6.1	3.7	9.5
Green Ext Time (p_c), s	2.2	3.9	0.2	3.5

Intersection Summary	
HCM 7th Control Delay, s/veh	12.6
HCM 7th LOS	B

Notes
User approved changes to right turn type.

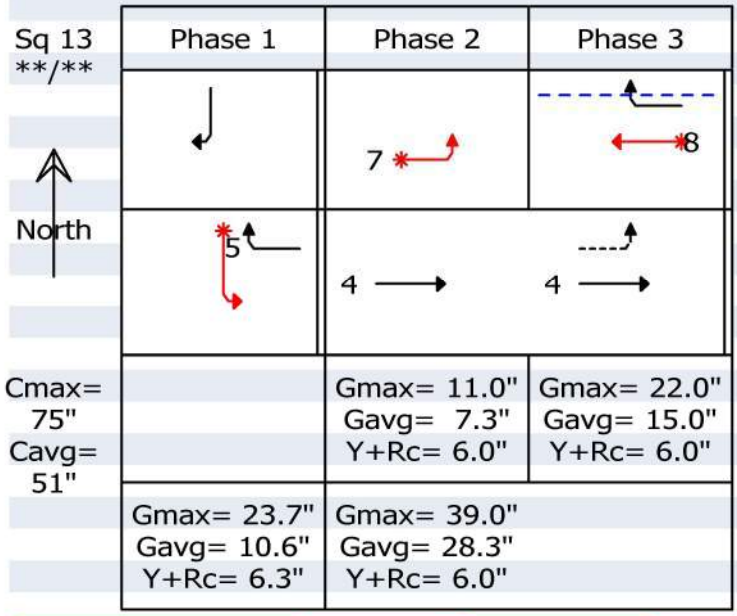


Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	93	258	288	180	152	64
v/c Ratio	0.15	0.23	0.34	0.15	0.54	0.21
Control Delay (s/veh)	6.0	6.3	15.6	1.0	34.7	8.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	6.0	6.3	15.6	1.0	34.7	8.7
Queue Length 50th (ft)	14	42	87	0	67	0
Queue Length 95th (ft)	36	89	165	15	114	29
Internal Link Dist (ft)		1489	1266		2591	
Turn Bay Length (ft)	200			200	200	200
Base Capacity (vph)	647	1133	840	1299	510	495
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	0.14	0.23	0.34	0.14	0.30	0.13

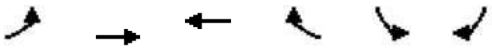
Intersection Summary

TEAPAC[Ver 9.50.02] - Capacity Analysis Summary (HCM 2016)

Intersection Averages for Int # 1 - Grand Ave & 62nd St W
V/C 0.373 (Critical V/C 0.460) Control Delay 12.1 Level of Service B+



Lane Group	Width/ Lanes	g/C Max	g/C Avg	SatFlo	Capcty	Adj Volume	v/c	HCM Delay	L S	Queue Model 1
SB Approach								17.9	B	
R	12/1	0.071	0.209	1553	322	1	0.003	16.1	B	0 ft
L	12/1	0.316	0.209	1760	365	152	0.416	17.9	*B	64 ft
WB Approach								15.5	B	
R	12/1	0.071	0.294	1605	470	1	0.002	12.8	B+	0 ft
T	12/1	0.293	0.294	1857	543	288	0.530	15.5	*B	110 ft
EB Approach								6.7	A	
T	12/1	0.520	0.556	1861	1028	258	0.251	6.1	A	46 ft
L	12/1	0.147	0.144	1738	562	93	0.165	8.4	*A	21 ft



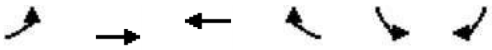
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	65	268	148	59	233	96
Future Volume (veh/h)	65	268	148	59	233	96
Initial Q (Qb), veh	0	0	0	0	0	0
Lane Width Adj.	1.00	1.00	1.00	1.00	1.00	1.00
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No	No		No	
Adj Sat Flow, veh/h/ln	1518	1682	1709	1668	1723	1668
Adj Flow Rate, veh/h	76	315	174	69	274	113
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Percent Heavy Veh, %	17	5	3	6	2	6
Cap, veh/h	581	1026	725	919	370	319
Arrive On Green	0.11	0.61	0.42	0.42	0.23	0.23
Sat Flow, veh/h	1446	1682	1709	1414	1641	1414
Grp Volume(v), veh/h	76	315	174	69	274	113
Grp Sat Flow(s),veh/h/ln	1446	1682	1709	1414	1641	1414
Q Serve(g_s), s	1.8	6.7	4.9	1.3	11.6	5.0
Cycle Q Clear(g_c), s	1.8	6.7	4.9	1.3	11.6	5.0
Prop In Lane	1.00			1.00	1.00	1.00
Lane Grp Cap(c), veh/h	581	1026	725	919	370	319
V/C Ratio(X)	0.13	0.31	0.24	0.08	0.74	0.35
Avail Cap(c_a), veh/h	639	1026	725	919	518	447
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	8.1	7.0	13.8	4.8	27.0	24.4
Incr Delay (d2), s/veh	0.1	0.8	0.2	0.0	3.5	0.7
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.5	2.0	1.7	1.9	4.5	4.2
Unsig. Movement Delay, s/veh						
LnGrp Delay(d), s/veh	8.2	7.8	14.0	4.9	30.5	25.1
LnGrp LOS	A	A	B	A	C	C
Approach Vol, veh/h		391	243		387	
Approach Delay, s/veh		7.9	11.4		28.9	
Approach LOS		A	B		C	

Timer - Assigned Phs	2	4	7	8
Phs Duration (G+Y+Rc), s	23.2	51.8	13.9	37.8
Change Period (Y+Rc), s	6.3	6.0	6.0	6.0
Max Green Setting (Gmax), s	23.7	39.0	11.0	22.0
Max Q Clear Time (g_c+I1), s	13.6	8.7	3.8	6.9
Green Ext Time (p_c), s	3.3	4.9	0.1	2.0

Intersection Summary	
HCM 7th Control Delay, s/veh	16.7
HCM 7th LOS	B

Notes

User approved changes to right turn type.

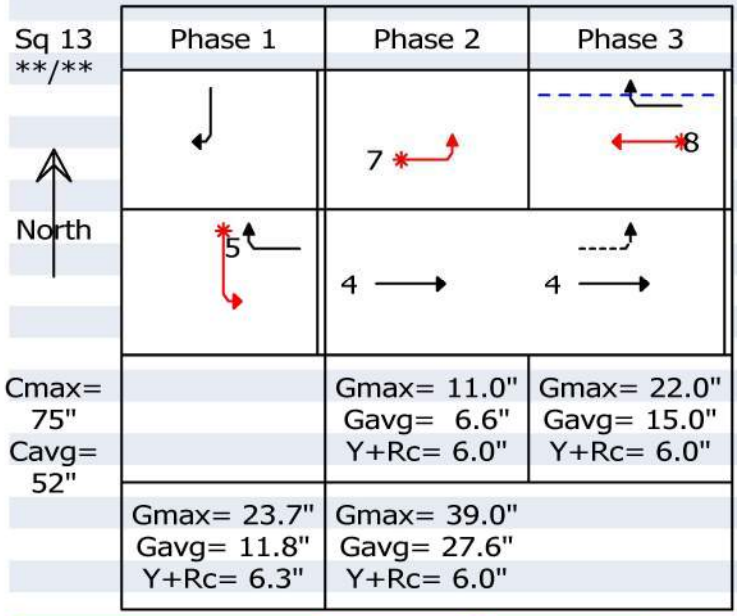


Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	76	315	174	69	274	113
v/c Ratio	0.14	0.32	0.24	0.06	0.70	0.27
Control Delay (s/veh)	8.9	10.0	18.7	1.2	34.8	5.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	8.9	10.0	18.7	1.2	34.8	5.9
Queue Length 50th (ft)	15	68	55	0	119	0
Queue Length 95th (ft)	42	136	111	9	160	29
Internal Link Dist (ft)		1489	1266		2591	
Turn Bay Length (ft)	200			200	200	200
Base Capacity (vph)	570	997	722	1146	522	526
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	0.13	0.32	0.24	0.06	0.52	0.21

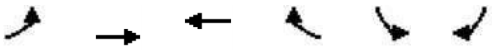
Intersection Summary

TEAPAC[Ver 9.50.02] - Capacity Analysis Summary (HCM 2016)

Intersection Averages for Int # 1 - Grand Ave & 62nd St W
V/C 0.422 (Critical V/C 0.430) Control Delay 12.6 Level of Service B+



Lane Group	Width/ Lanes	g/C Max	g/C Avg	SatFlo	Capcty	Adj Volume	v/c	HCM Delay	L S	Queue Model 1
SB Approach								19.0	B	
R	12/1	0.071	0.226	1525	347	1	0.003	15.4	B	0 ft
L	12/1	0.316	0.226	1779	405	274	0.677	19.0	*B	120 ft
WB Approach								14.5	B+	
R	12/1	0.071	0.288	1522	442	1	0.002	13.0	B+	0 ft
T	12/1	0.293	0.288	1843	535	174	0.326	14.5	*B+	63 ft
EB Approach								7.3	A	
T	12/1	0.520	0.532	1810	967	315	0.326	7.0	A	66 ft
L	12/1	0.147	0.128	1552	566	76	0.134	8.5	*A	19 ft



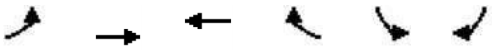
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	57	172	178	82	96	46
Future Volume (veh/h)	57	172	178	82	96	46
Initial Q (Qb), veh	0	0	0	0	0	0
Lane Width Adj.	1.00	1.00	1.00	1.00	1.00	1.00
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No	No		No	
Adj Sat Flow, veh/h/ln	1641	1654	1654	1723	1682	1614
Adj Flow Rate, veh/h	61	185	191	88	103	49
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	8	7	7	2	5	10
Cap, veh/h	701	1172	881	964	205	175
Arrive On Green	0.10	0.71	0.53	0.53	0.13	0.13
Sat Flow, veh/h	1563	1654	1654	1460	1602	1367
Grp Volume(v), veh/h	61	185	191	88	103	49
Grp Sat Flow(s),veh/h/ln	1563	1654	1654	1460	1602	1367
Q Serve(g_s), s	1.1	2.8	4.6	1.6	4.5	2.4
Cycle Q Clear(g_c), s	1.1	2.8	4.6	1.6	4.5	2.4
Prop In Lane	1.00			1.00	1.00	1.00
Lane Grp Cap(c), veh/h	701	1172	881	964	205	175
V/C Ratio(X)	0.09	0.16	0.22	0.09	0.50	0.28
Avail Cap(c_a), veh/h	780	1172	881	964	506	432
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	5.0	3.6	9.3	4.6	30.5	29.6
Incr Delay (d2), s/veh	0.1	0.3	0.1	0.0	1.9	0.9
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.2	0.6	1.4	2.5	1.7	2.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d), s/veh	5.0	3.9	9.4	4.7	32.4	30.5
LnGrp LOS	A	A	A	A	C	C
Approach Vol, veh/h		246	279		152	
Approach Delay, s/veh		4.2	7.9		31.8	
Approach LOS		A	A		C	

Timer - Assigned Phs	2	4	7	8
Phs Duration (G+Y+Rc), s	15.9	59.1	13.2	45.9
Change Period (Y+Rc), s	6.3	6.0	6.0	6.0
Max Green Setting (Gmax), s	23.7	39.0	11.0	22.0
Max Q Clear Time (g_c+I1), s	6.5	4.8	3.1	6.6
Green Ext Time (p_c), s	1.6	2.7	0.1	2.3

Intersection Summary	
HCM 7th Control Delay, s/veh	11.9
HCM 7th LOS	B

Notes

User approved changes to right turn type.

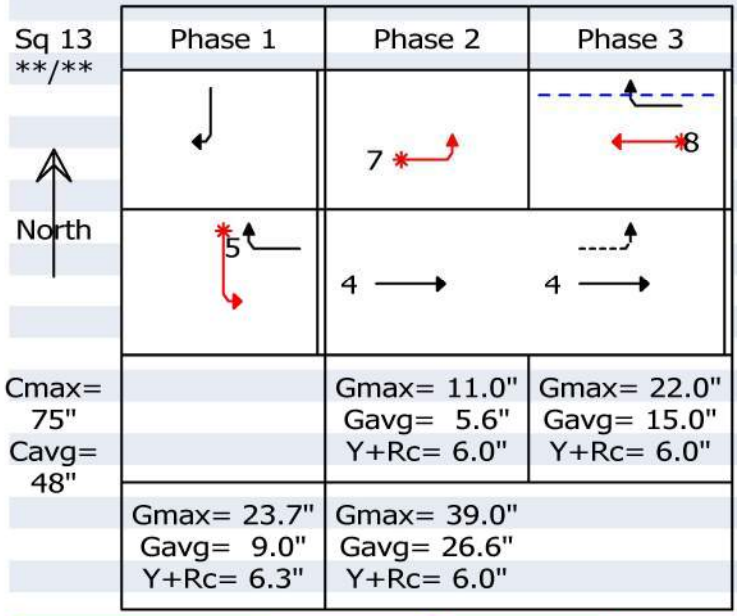


Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	61	185	191	88	103	49
v/c Ratio	0.08	0.15	0.19	0.07	0.43	0.20
Control Delay (s/veh)	4.6	4.7	11.4	1.0	34.2	10.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	4.6	4.7	11.4	1.0	34.2	10.6
Queue Length 50th (ft)	8	25	51	0	47	0
Queue Length 95th (ft)	22	56	104	11	89	29
Internal Link Dist (ft)		1489	1266		2591	
Turn Bay Length (ft)	200			200	200	200
Base Capacity (vph)	750	1216	1007	1338	500	460
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	0.08	0.15	0.19	0.07	0.21	0.11

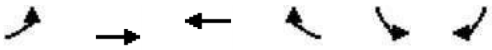
Intersection Summary

TEAPAC[Ver 9.50.02] - Capacity Analysis Summary (HCM 2016)

Intersection Averages for Int # 1 - Grand Ave & 62nd St W
V/C 0.256 (Critical V/C 0.329) Control Delay 10.4 Level of Service B+



Lane Group	Width/ Lanes	g/C Max	g/C Avg	SatFlo	Capcty	Adj Volume	v/c	HCM Delay	L S	Queue Model 1
SB Approach								17.0	B	
R	12/1	0.071	0.187	1471	276	1	0.004	15.8	B	0 ft
L	12/1	0.316	0.187	1725	324	103	0.318	17.0	*B	40 ft
WB Approach								12.8	B+	
R	12/1	0.071	0.313	1585	497	1	0.002	11.3	B+	0 ft
T	12/1	0.293	0.313	1781	558	191	0.342	12.8	*B+	61 ft
EB Approach								5.9	A	
T	12/1	0.520	0.553	1777	987	185	0.188	5.4	A	28 ft
L	12/1	0.147	0.116	1677	604	61	0.101	7.4	*A	12 ft

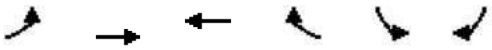


Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	88	235	262	165	139	60
Future Volume (veh/h)	88	235	262	165	139	60
Initial Q (Qb), veh	0	0	0	0	0	0
Lane Width Adj.	1.00	1.00	1.00	1.00	1.00	1.00
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No	No		No	
Adj Sat Flow, veh/h/ln	1695	1723	1723	1736	1709	1695
Adj Flow Rate, veh/h	97	258	288	181	153	66
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	4	2	2	1	3	4
Cap, veh/h	614	1192	855	942	234	207
Arrive On Green	0.12	0.69	0.50	0.50	0.14	0.14
Sat Flow, veh/h	1615	1723	1723	1471	1628	1437
Grp Volume(v), veh/h	97	258	288	181	153	66
Grp Sat Flow(s),veh/h/ln	1615	1723	1723	1471	1628	1437
Q Serve(g_s), s	1.7	4.1	7.6	3.8	6.7	3.1
Cycle Q Clear(g_c), s	1.7	4.1	7.6	3.8	6.7	3.1
Prop In Lane	1.00			1.00	1.00	1.00
Lane Grp Cap(c), veh/h	614	1192	855	942	234	207
V/C Ratio(X)	0.16	0.22	0.34	0.19	0.65	0.32
Avail Cap(c_a), veh/h	664	1192	855	942	514	454
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	5.9	4.2	11.4	5.5	30.3	28.8
Incr Delay (d2), s/veh	0.1	0.4	0.2	0.1	3.1	0.9
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.4	1.0	2.4	5.1	2.6	2.6
Unsig. Movement Delay, s/veh						
LnGrp Delay(d), s/veh	6.0	4.6	11.7	5.6	33.4	29.7
LnGrp LOS	A	A	B	A	C	C
Approach Vol, veh/h		355	469		219	
Approach Delay, s/veh		5.0	9.3		32.3	
Approach LOS		A	A		C	

Timer - Assigned Phs	2	4	7	8
Phs Duration (G+Y+Rc), s	17.1	57.9	14.7	43.2
Change Period (Y+Rc), s	6.3	6.0	6.0	6.0
Max Green Setting (Gmax), s	23.7	39.0	11.0	22.0
Max Q Clear Time (g_c+I1), s	8.7	6.1	3.7	9.6
Green Ext Time (p_c), s	2.3	3.9	0.2	3.5

Intersection Summary	
HCM 7th Control Delay, s/veh	12.7
HCM 7th LOS	B

Notes
User approved changes to right turn type.

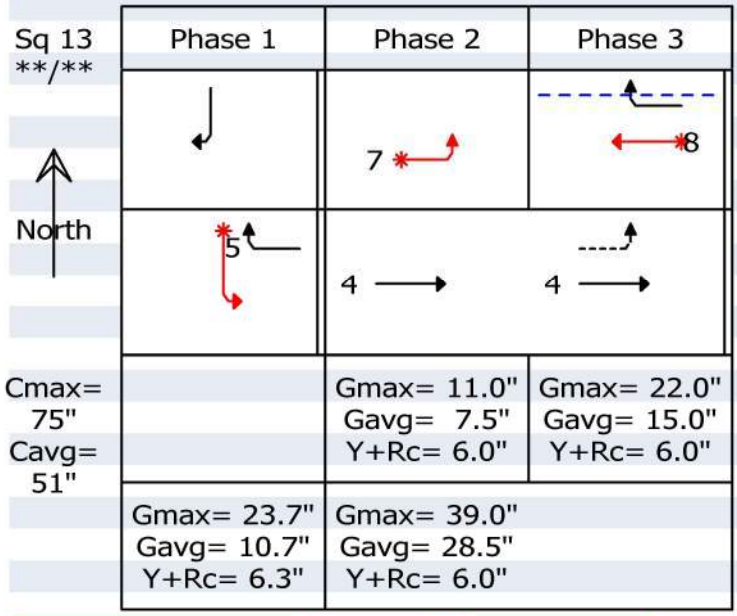


Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	97	258	288	181	153	66
v/c Ratio	0.15	0.23	0.34	0.16	0.54	0.22
Control Delay (s/veh)	6.0	6.4	15.6	0.9	34.5	8.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	6.0	6.4	15.6	0.9	34.5	8.7
Queue Length 50th (ft)	15	42	87	0	67	0
Queue Length 95th (ft)	37	89	165	15	115	30
Internal Link Dist (ft)		1489	1266		2591	
Turn Bay Length (ft)	200			200	200	200
Base Capacity (vph)	645	1131	838	1298	510	497
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	0.15	0.23	0.34	0.14	0.30	0.13

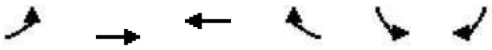
Intersection Summary

TEAPAC[Ver 9.50.02] - Capacity Analysis Summary (HCM 2016)

Intersection Averages for Int # 1 - Grand Ave & 62nd St W
V/C 0.374 (Critical V/C 0.464) Control Delay 12.1 Level of Service B+



Lane Group	Width/ Lanes	g/C Max	g/C Avg	SatFlo	Capcty	Adj Volume	v/c	HCM Delay	L S	Queue Model 1
SB Approach								18.0	B	
R	12/1	0.071	0.209	1553	322	1	0.003	16.2	B	0 ft
L	12/1	0.316	0.209	1760	365	153	0.419	18.0	*B	65 ft
WB Approach								15.6	B	
R	12/1	0.071	0.294	1605	468	1	0.002	12.9	B+	0 ft
T	12/1	0.293	0.294	1857	541	288	0.532	15.6	*B	111 ft
EB Approach								6.7	A	
T	12/1	0.520	0.559	1861	1030	258	0.250	6.1	A	46 ft
L	12/1	0.147	0.147	1738	565	97	0.172	8.4	*A	22 ft

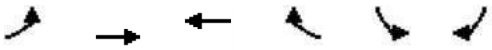


Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	68	280	153	63	248	101
Future Volume (veh/h)	68	280	153	63	248	101
Initial Q (Qb), veh	0	0	0	0	0	0
Lane Width Adj.	1.00	1.00	1.00	1.00	1.00	1.00
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No	No		No	
Adj Sat Flow, veh/h/ln	1518	1682	1709	1668	1723	1668
Adj Flow Rate, veh/h	80	329	180	74	292	119
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Percent Heavy Veh, %	17	5	3	6	2	6
Cap, veh/h	565	1009	704	916	387	334
Arrive On Green	0.11	0.60	0.41	0.41	0.24	0.24
Sat Flow, veh/h	1446	1682	1709	1414	1641	1414
Grp Volume(v), veh/h	80	329	180	74	292	119
Grp Sat Flow(s),veh/h/ln	1446	1682	1709	1414	1641	1414
Q Serve(g_s), s	2.0	7.3	5.2	1.5	12.4	5.3
Cycle Q Clear(g_c), s	2.0	7.3	5.2	1.5	12.4	5.3
Prop In Lane	1.00			1.00	1.00	1.00
Lane Grp Cap(c), veh/h	565	1009	704	916	387	334
V/C Ratio(X)	0.14	0.33	0.26	0.08	0.75	0.36
Avail Cap(c_a), veh/h	621	1009	704	916	518	447
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	8.5	7.5	14.5	4.9	26.6	23.9
Incr Delay (d2), s/veh	0.1	0.9	0.2	0.0	4.3	0.6
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.5	2.2	1.8	2.1	4.8	4.4
Unsig. Movement Delay, s/veh						
LnGrp Delay(d), s/veh	8.7	8.3	14.7	4.9	30.9	24.5
LnGrp LOS	A	A	B	A	C	C
Approach Vol, veh/h		409	254		411	
Approach Delay, s/veh		8.4	11.9		29.1	
Approach LOS		A	B		C	

Timer - Assigned Phs	2	4	7	8
Phs Duration (G+Y+Rc), s	24.0	51.0	14.1	36.9
Change Period (Y+Rc), s	6.3	6.0	6.0	6.0
Max Green Setting (Gmax), s	23.7	39.0	11.0	22.0
Max Q Clear Time (g_c+I1), s	14.4	9.3	4.0	7.2
Green Ext Time (p_c), s	3.3	5.1	0.1	2.1

Intersection Summary	
HCM 7th Control Delay, s/veh	17.1
HCM 7th LOS	B

Notes
User approved changes to right turn type.

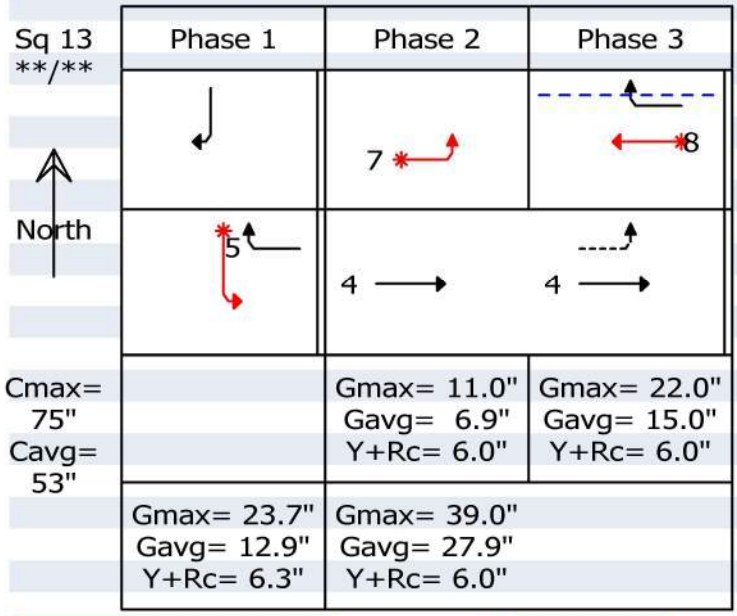


Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	80	329	180	74	292	119
v/c Ratio	0.14	0.34	0.26	0.07	0.71	0.27
Control Delay (s/veh)	9.3	10.6	19.5	1.1	34.9	5.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	9.3	10.6	19.5	1.1	34.9	5.6
Queue Length 50th (ft)	17	74	59	0	127	0
Queue Length 95th (ft)	45	147	118	9	168	29
Internal Link Dist (ft)		1489	1266		2591	
Turn Bay Length (ft)	200			200	200	200
Base Capacity (vph)	560	985	709	1137	525	532
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	0.14	0.33	0.25	0.07	0.56	0.22

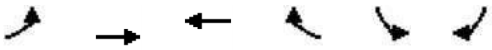
Intersection Summary

TEAPAC[Ver 9.50.02] - Capacity Analysis Summary (HCM 2016)

Intersection Averages for Int # 1 - Grand Ave & 62nd St W
V/C 0.424 (Critical V/C 0.450) Control Delay 13.1 Level of Service B+



Lane Group	Width/ Lanes	g/C Max	g/C Avg	SatFlo	Capcty	Adj Volume	v/c	HCM Delay	L S	Queue Model 1
SB Approach								18.6	B	
R	12/1	0.071	0.244	1525	371	32	0.086	15.6	B	12 ft
L	12/1	0.316	0.244	1778	432	292	0.676	18.9	*B	129 ft
WB Approach								15.3	B	
R	12/1	0.071	0.283	1524	430	1	0.002	13.7	B+	0 ft
T	12/1	0.293	0.283	1843	520	180	0.346	15.3	*B	69 ft
EB Approach								7.8	A	
T	12/1	0.520	0.527	1811	952	329	0.346	7.5	A	75 ft
L	12/1	0.147	0.131	1551	552	80	0.145	9.0	*A	22 ft

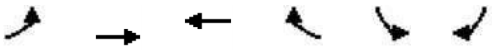


Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	59	178	185	88	103	48
Future Volume (veh/h)	59	178	185	88	103	48
Initial Q (Qb), veh	0	0	0	0	0	0
Lane Width Adj.	1.00	1.00	1.00	1.00	1.00	1.00
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No	No		No	
Adj Sat Flow, veh/h/ln	1641	1654	1654	1723	1682	1614
Adj Flow Rate, veh/h	63	191	199	95	111	52
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	8	7	7	2	5	10
Cap, veh/h	691	1170	876	961	206	176
Arrive On Green	0.10	0.71	0.53	0.53	0.13	0.13
Sat Flow, veh/h	1563	1654	1654	1460	1602	1367
Grp Volume(v), veh/h	63	191	199	95	111	52
Grp Sat Flow(s),veh/h/ln	1563	1654	1654	1460	1602	1367
Q Serve(g_s), s	1.1	2.9	4.8	1.8	4.9	2.6
Cycle Q Clear(g_c), s	1.1	2.9	4.8	1.8	4.9	2.6
Prop In Lane	1.00			1.00	1.00	1.00
Lane Grp Cap(c), veh/h	691	1170	876	961	206	176
V/C Ratio(X)	0.09	0.16	0.23	0.10	0.54	0.30
Avail Cap(c_a), veh/h	768	1170	876	961	506	432
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	5.0	3.6	9.4	4.7	30.6	29.6
Incr Delay (d2), s/veh	0.1	0.3	0.1	0.0	2.2	0.9
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.2	0.6	1.4	2.7	1.9	2.1
Unsig. Movement Delay, s/veh						
LnGrp Delay(d), s/veh	5.1	3.9	9.6	4.7	32.7	30.5
LnGrp LOS	A	A	A	A	C	C
Approach Vol, veh/h		254	294		163	
Approach Delay, s/veh		4.2	8.0		32.0	
Approach LOS		A	A		C	

Timer - Assigned Phs	2	4	7	8
Phs Duration (G+Y+Rc), s	16.0	59.0	13.3	45.7
Change Period (Y+Rc), s	6.3	6.0	6.0	6.0
Max Green Setting (Gmax), s	23.7	39.0	11.0	22.0
Max Q Clear Time (g_c+I1), s	6.9	4.9	3.1	6.8
Green Ext Time (p_c), s	1.7	2.8	0.1	2.5

Intersection Summary	
HCM 7th Control Delay, s/veh	12.2
HCM 7th LOS	B

Notes
User approved changes to right turn type.

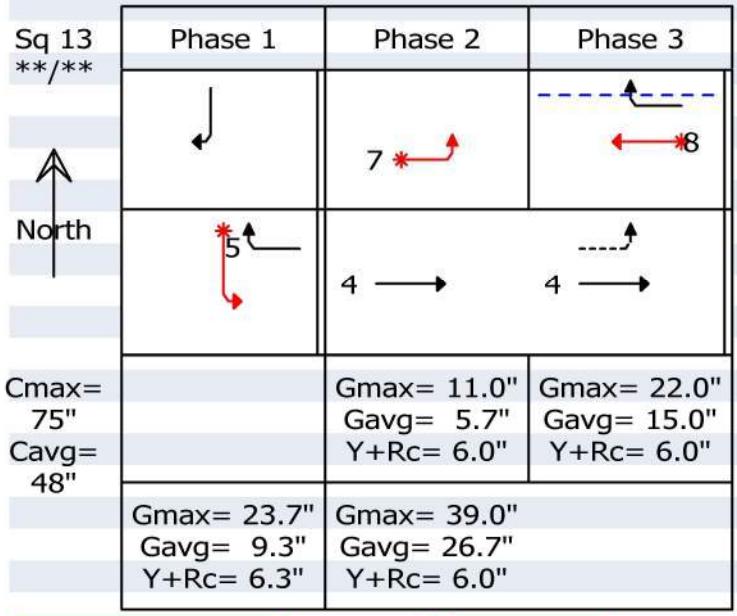


Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	63	191	199	95	111	52
v/c Ratio	0.09	0.16	0.20	0.08	0.45	0.20
Control Delay (s/veh)	4.9	4.9	11.8	1.0	34.2	10.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	4.9	4.9	11.8	1.0	34.2	10.2
Queue Length 50th (ft)	8	27	55	0	50	0
Queue Length 95th (ft)	24	61	110	11	93	30
Internal Link Dist (ft)		1489	1266		2591	
Turn Bay Length (ft)	200			200	200	200
Base Capacity (vph)	740	1208	999	1332	500	462
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	0.09	0.16	0.20	0.07	0.22	0.11

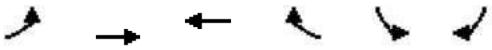
Intersection Summary

TEAPAC[Ver 9.50.02] - Capacity Analysis Summary (HCM 2016)

Intersection Averages for Int # 1 - Grand Ave & 62nd St W
V/C 0.269 (Critical V/C 0.345) Control Delay 10.7 Level of Service B+



Lane Group	Width/ Lanes	g/C Max	g/C Avg	SatFlo	Capcty	Adj Volume	v/c	HCM Delay	L S	Queue Model 1
SB Approach								17.0	B	
R	12/1	0.071	0.194	1470	284	1	0.004	15.8	B	0 ft
L	12/1	0.316	0.194	1725	333	111	0.333	17.0	*B	43 ft
WB Approach								13.1	B+	
R	12/1	0.071	0.313	1583	491	1	0.002	11.5	B+	0 ft
T	12/1	0.293	0.313	1782	553	199	0.360	13.1	*B+	65 ft
EB Approach								6.0	A	
T	12/1	0.520	0.556	1777	982	191	0.195	5.5	A	30 ft
L	12/1	0.147	0.119	1675	595	63	0.106	7.6	*A	13 ft

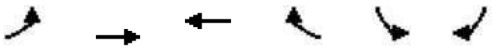


Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	92	244	273	177	148	62
Future Volume (veh/h)	92	244	273	177	148	62
Initial Q (Qb), veh	0	0	0	0	0	0
Lane Width Adj.	1.00	1.00	1.00	1.00	1.00	1.00
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No	No		No	
Adj Sat Flow, veh/h/ln	1695	1723	1723	1736	1709	1695
Adj Flow Rate, veh/h	101	268	300	195	163	68
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	4	2	2	1	3	4
Cap, veh/h	595	1179	840	940	246	217
Arrive On Green	0.12	0.68	0.49	0.49	0.15	0.15
Sat Flow, veh/h	1615	1723	1723	1471	1628	1437
Grp Volume(v), veh/h	101	268	300	195	163	68
Grp Sat Flow(s),veh/h/ln	1615	1723	1723	1471	1628	1437
Q Serve(g_s), s	1.8	4.4	8.1	4.1	7.1	3.2
Cycle Q Clear(g_c), s	1.8	4.4	8.1	4.1	7.1	3.2
Prop In Lane	1.00			1.00	1.00	1.00
Lane Grp Cap(c), veh/h	595	1179	840	940	246	217
V/C Ratio(X)	0.17	0.23	0.36	0.21	0.66	0.31
Avail Cap(c_a), veh/h	643	1179	840	940	514	454
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	6.2	4.4	11.9	5.6	30.0	28.4
Incr Delay (d2), s/veh	0.1	0.4	0.3	0.1	3.0	0.8
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.5	1.1	2.6	5.6	2.8	2.7
Unsig. Movement Delay, s/veh						
LnGrp Delay(d), s/veh	6.3	4.9	12.2	5.7	33.0	29.2
LnGrp LOS	A	A	B	A	C	C
Approach Vol, veh/h		369	495		231	
Approach Delay, s/veh		5.3	9.6		31.9	
Approach LOS		A	A		C	

Timer - Assigned Phs	2	4	7	8
Phs Duration (G+Y+Rc), s	17.7	57.3	14.8	42.6
Change Period (Y+Rc), s	6.3	6.0	6.0	6.0
Max Green Setting (Gmax), s	23.7	39.0	11.0	22.0
Max Q Clear Time (g_c+I1), s	9.1	6.4	3.8	10.1
Green Ext Time (p_c), s	2.4	4.1	0.2	3.6

Intersection Summary	
HCM 7th Control Delay, s/veh	12.9
HCM 7th LOS	B

Notes
User approved changes to right turn type.

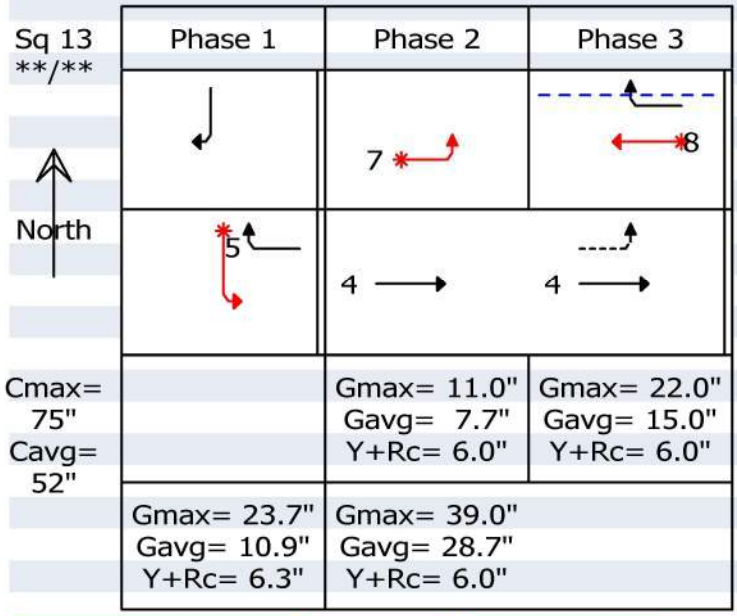


Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	101	268	300	195	163	68
v/c Ratio	0.16	0.24	0.37	0.17	0.54	0.21
Control Delay (s/veh)	6.6	6.9	16.6	1.0	33.7	8.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	6.6	6.9	16.6	1.0	33.7	8.1
Queue Length 50th (ft)	16	45	93	0	71	0
Queue Length 95th (ft)	41	99	179	16	118	29
Internal Link Dist (ft)		1489	1266		2591	
Turn Bay Length (ft)	200			200	200	200
Base Capacity (vph)	626	1114	821	1287	510	498
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	0.16	0.24	0.37	0.15	0.32	0.14

Intersection Summary

TEAPAC[Ver 9.50.02] - Capacity Analysis Summary (HCM 2016)

Intersection Averages for Int # 1 - Grand Ave & 62nd St W
V/C 0.393 (Critical V/C 0.482) Control Delay 12.3 Level of Service B+



Lane Group	Width/ Lanes	g/C Max	g/C Avg	SatFlo	Capcty	Adj Volume	v/c	HCM Delay	L S	Queue Model 1
SB Approach								18.1	B	
R	12/1	0.071	0.209	1553	326	1	0.003	16.2	B	0 ft
L	12/1	0.316	0.209	1760	369	163	0.442	18.1	*B	69 ft
WB Approach								15.9	B	
R	12/1	0.071	0.288	1605	465	1	0.002	13.1	B+	0 ft
T	12/1	0.293	0.288	1855	537	300	0.559	16.0	*B	118 ft
EB Approach								6.8	A	
T	12/1	0.520	0.551	1861	1029	268	0.260	6.2	A	49 ft
L	12/1	0.147	0.147	1738	556	101	0.182	8.6	*A	23 ft

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	69	280	153	63	249	102
Future Volume (veh/h)	69	280	153	63	249	102
Initial Q (Qb), veh	0	0	0	0	0	0
Lane Width Adj.	1.00	1.00	1.00	1.00	1.00	1.00
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	1518	1682	1709	1668	1723	1668
Adj Flow Rate, veh/h	81	329	180	74	293	120
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Percent Heavy Veh, %	17	5	3	6	2	6
Cap, veh/h	565	1008	702	915	388	335
Arrive On Green	0.11	0.60	0.41	0.41	0.24	0.24
Sat Flow, veh/h	1446	1682	1709	1414	1641	1414
Grp Volume(v), veh/h	81	329	180	74	293	120
Grp Sat Flow(s),veh/h/ln	1446	1682	1709	1414	1641	1414
Q Serve(g_s), s	2.0	7.3	5.2	1.5	12.4	5.3
Cycle Q Clear(g_c), s	2.0	7.3	5.2	1.5	12.4	5.3
Prop In Lane	1.00			1.00	1.00	1.00
Lane Grp Cap(c), veh/h	565	1008	702	915	388	335
V/C Ratio(X)	0.14	0.33	0.26	0.08	0.75	0.36
Avail Cap(c_a), veh/h	620	1008	702	915	518	447
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	8.6	7.5	14.6	4.9	26.6	23.9
Incr Delay (d2), s/veh	0.1	0.9	0.2	0.0	4.4	0.6
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.5	2.2	1.8	2.1	4.9	4.5
Unsig. Movement Delay, s/veh						
LnGrp Delay(d), s/veh	8.7	8.3	14.8	5.0	31.0	24.5
LnGrp LOS	A	A	B	A	C	C
Approach Vol, veh/h		410	254		413	
Approach Delay, s/veh		8.4	11.9		29.1	
Approach LOS		A	B		C	

Timer - Assigned Phs	2	4	7	8
Phs Duration (G+Y+Rc), s	24.1	50.9	14.2	36.8
Change Period (Y+Rc), s	6.3	6.0	6.0	6.0
Max Green Setting (Gmax), s	23.7	39.0	11.0	22.0
Max Q Clear Time (g_c+I1), s	14.4	9.3	4.0	7.2
Green Ext Time (p_c), s	3.3	5.1	0.1	2.1

Intersection Summary	
HCM 7th Control Delay, s/veh	17.2
HCM 7th LOS	B

Notes

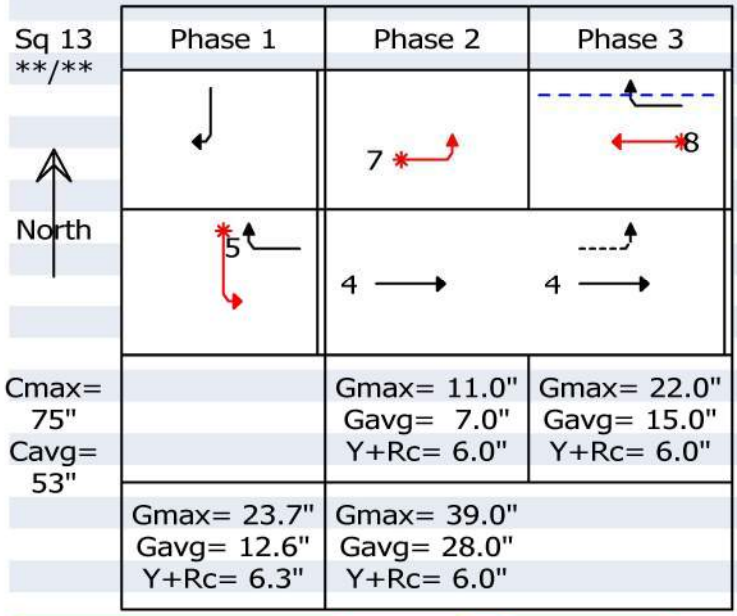
User approved changes to right turn type.

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	81	329	180	74	293	120
v/c Ratio	0.15	0.34	0.26	0.07	0.71	0.27
Control Delay (s/veh)	9.4	10.6	19.6	1.1	34.7	5.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	9.4	10.6	19.6	1.1	34.7	5.6
Queue Length 50th (ft)	17	74	59	0	127	0
Queue Length 95th (ft)	45	147	118	9	168	29
Internal Link Dist (ft)		1489	1266		2591	
Turn Bay Length (ft)	200			200	200	200
Base Capacity (vph)	558	983	708	1136	526	534
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	0.15	0.33	0.25	0.07	0.56	0.22

Intersection Summary

TEAPAC[Ver 9.50.02] - Capacity Analysis Summary (HCM 2016)

Intersection Averages for Int # 1 - Grand Ave & 62nd St W
V/C 0.440 (Critical V/C 0.451) Control Delay 13.0 Level of Service B+



Lane Group	Width/ Lanes	g/C Max	g/C Avg	SatFlo	Capcty	Adj Volume	v/c	HCM Delay	L S	Queue Model 1
SB Approach								19.1	B	
R	12/1	0.071	0.237	1525	363	1	0.003	15.3	B	0 ft
L	12/1	0.316	0.237	1778	423	293	0.692	19.1	*B	129 ft
WB Approach								15.2	B	
R	12/1	0.071	0.283	1524	433	1	0.002	13.6	B+	0 ft
T	12/1	0.293	0.283	1843	523	180	0.344	15.2	*B	69 ft
EB Approach								7.7	A	
T	12/1	0.520	0.527	1811	958	329	0.343	7.4	A	73 ft
L	12/1	0.147	0.131	1553	557	81	0.145	8.8	*A	21 ft

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	60	178	185	88	103	49
Future Volume (veh/h)	60	178	185	88	103	49
Initial Q (Qb), veh	0	0	0	0	0	0
Lane Width Adj.	1.00	1.00	1.00	1.00	1.00	1.00
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	1641	1654	1654	1723	1682	1614
Adj Flow Rate, veh/h	65	191	199	95	111	53
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	8	7	7	2	5	10
Cap, veh/h	692	1170	874	959	207	176
Arrive On Green	0.10	0.71	0.53	0.53	0.13	0.13
Sat Flow, veh/h	1563	1654	1654	1460	1602	1367
Grp Volume(v), veh/h	65	191	199	95	111	53
Grp Sat Flow(s),veh/h/ln	1563	1654	1654	1460	1602	1367
Q Serve(g_s), s	1.1	2.9	4.8	1.8	4.9	2.6
Cycle Q Clear(g_c), s	1.1	2.9	4.8	1.8	4.9	2.6
Prop In Lane	1.00			1.00	1.00	1.00
Lane Grp Cap(c), veh/h	692	1170	874	959	207	176
V/C Ratio(X)	0.09	0.16	0.23	0.10	0.54	0.30
Avail Cap(c_a), veh/h	767	1170	874	959	506	432
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	5.0	3.6	9.5	4.7	30.6	29.6
Incr Delay (d2), s/veh	0.1	0.3	0.1	0.0	2.2	0.9
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.3	0.6	1.4	2.7	1.9	2.1
Unsig. Movement Delay, s/veh						
LnGrp Delay(d), s/veh	5.1	3.9	9.6	4.8	32.7	30.5
LnGrp LOS	A	A	A	A	C	C
Approach Vol, veh/h		256	294		164	
Approach Delay, s/veh		4.2	8.1		32.0	
Approach LOS		A	A		C	

Timer - Assigned Phs	2	4	7	8
Phs Duration (G+Y+Rc), s	16.0	59.0	13.4	45.6
Change Period (Y+Rc), s	6.3	6.0	6.0	6.0
Max Green Setting (Gmax), s	23.7	39.0	11.0	22.0
Max Q Clear Time (g_c+I1), s	6.9	4.9	3.1	6.8
Green Ext Time (p_c), s	1.7	2.8	0.1	2.5

Intersection Summary	
HCM 7th Control Delay, s/veh	12.2
HCM 7th LOS	B

Notes

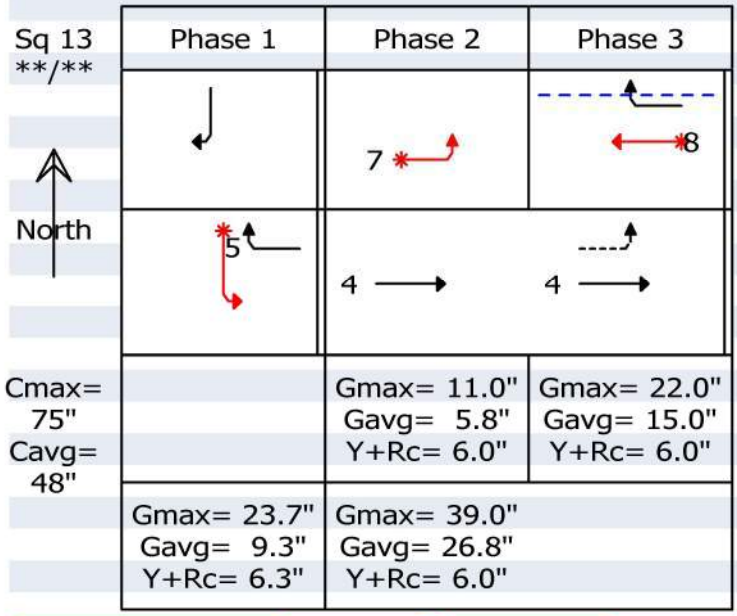
User approved changes to right turn type.

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	65	191	199	95	111	53
v/c Ratio	0.09	0.16	0.20	0.08	0.45	0.21
Control Delay (s/veh)	4.9	4.9	11.8	1.0	34.2	10.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	4.9	4.9	11.8	1.0	34.2	10.2
Queue Length 50th (ft)	8	27	55	0	50	0
Queue Length 95th (ft)	24	61	110	11	93	29
Internal Link Dist (ft)		1489	1266		2591	
Turn Bay Length (ft)	200			200	200	200
Base Capacity (vph)	740	1208	999	1332	500	463
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	0.09	0.16	0.20	0.07	0.22	0.11

Intersection Summary

TEAPAC[Ver 9.50.02] - Capacity Analysis Summary (HCM 2016)

Intersection Averages for Int # 1 - Grand Ave & 62nd St W
V/C 0.269 (Critical V/C 0.347) Control Delay 10.7 Level of Service B+



Lane Group	Width/ Lanes	g/C Max	g/C Avg	SatFlo	Capcty	Adj Volume	v/c	HCM Delay	L S	Queue Model 1
SB Approach								17.1	B	
R	12/1	0.071	0.195	1471	284	1	0.004	15.8	B	0 ft
L	12/1	0.316	0.195	1725	333	111	0.334	17.1	*B	44 ft
WB Approach								13.2	B+	
R	12/1	0.071	0.313	1583	490	1	0.002	11.6	B+	0 ft
T	12/1	0.293	0.313	1782	552	199	0.361	13.2	*B+	66 ft
EB Approach								6.0	A	
T	12/1	0.520	0.559	1777	984	191	0.194	5.5	A	30 ft
L	12/1	0.147	0.122	1677	598	65	0.109	7.6	*A	13 ft

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	93	244	273	177	148	64
Future Volume (veh/h)	93	244	273	177	148	64
Initial Q (Qb), veh	0	0	0	0	0	0
Lane Width Adj.	1.00	1.00	1.00	1.00	1.00	1.00
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	1695	1723	1723	1736	1709	1695
Adj Flow Rate, veh/h	102	268	300	195	163	70
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	4	2	2	1	3	4
Cap, veh/h	595	1179	839	940	247	218
Arrive On Green	0.12	0.68	0.49	0.49	0.15	0.15
Sat Flow, veh/h	1615	1723	1723	1471	1628	1437
Grp Volume(v), veh/h	102	268	300	195	163	70
Grp Sat Flow(s),veh/h/ln	1615	1723	1723	1471	1628	1437
Q Serve(g_s), s	1.9	4.4	8.1	4.1	7.1	3.3
Cycle Q Clear(g_c), s	1.9	4.4	8.1	4.1	7.1	3.3
Prop In Lane	1.00			1.00	1.00	1.00
Lane Grp Cap(c), veh/h	595	1179	839	940	247	218
V/C Ratio(X)	0.17	0.23	0.36	0.21	0.66	0.32
Avail Cap(c_a), veh/h	643	1179	839	940	514	454
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	6.2	4.4	12.0	5.6	30.0	28.4
Incr Delay (d2), s/veh	0.1	0.4	0.3	0.1	3.0	0.8
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.5	1.1	2.6	5.6	2.8	2.7
Unsig. Movement Delay, s/veh						
LnGrp Delay(d), s/veh	6.4	4.9	12.2	5.8	33.0	29.2
LnGrp LOS	A	A	B	A	C	C
Approach Vol, veh/h		370	495		233	
Approach Delay, s/veh		5.3	9.7		31.9	
Approach LOS		A	A		C	

Timer - Assigned Phs	2	4	7	8
Phs Duration (G+Y+Rc), s	17.7	57.3	14.8	42.5
Change Period (Y+Rc), s	6.3	6.0	6.0	6.0
Max Green Setting (Gmax), s	23.7	39.0	11.0	22.0
Max Q Clear Time (g_c+I1), s	9.1	6.4	3.9	10.1
Green Ext Time (p_c), s	2.4	4.1	0.2	3.6

Intersection Summary	
HCM 7th Control Delay, s/veh	12.9
HCM 7th LOS	B

Notes

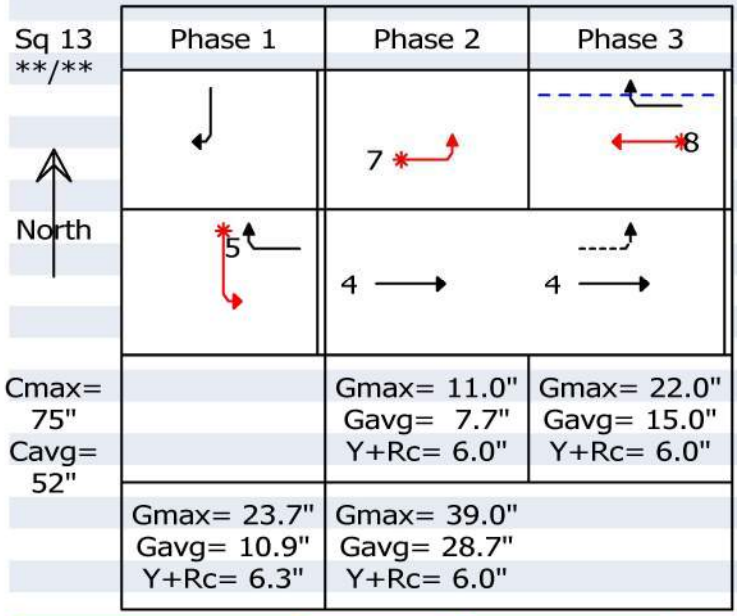
User approved changes to right turn type.

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Group Flow (vph)	102	268	300	195	163	70
v/c Ratio	0.17	0.24	0.37	0.17	0.54	0.22
Control Delay (s/veh)	6.6	6.9	16.6	1.0	33.7	8.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	6.6	6.9	16.6	1.0	33.7	8.1
Queue Length 50th (ft)	16	45	93	0	71	0
Queue Length 95th (ft)	41	99	179	16	118	30
Internal Link Dist (ft)		1489	1266		2591	
Turn Bay Length (ft)	200			200	200	200
Base Capacity (vph)	626	1114	821	1287	510	499
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	0.16	0.24	0.37	0.15	0.32	0.14

Intersection Summary

TEAPAC[Ver 9.50.02] - Capacity Analysis Summary (HCM 2016)

Intersection Averages for Int # 1 - Grand Ave & 62nd St W
V/C 0.393 (Critical V/C 0.483) Control Delay 12.4 Level of Service B+



Lane Group	Width/ Lanes	g/C Max	g/C Avg	SatFlo	Capcty	Adj Volume	v/c	HCM Delay	L S	Queue Model 1
SB Approach								18.2	B	
R	12/1	0.071	0.209	1553	325	1	0.003	16.2	B	0 ft
L	12/1	0.316	0.209	1760	369	163	0.442	18.2	*B	69 ft
WB Approach								16.0	B	
R	12/1	0.071	0.288	1605	464	1	0.002	13.1	B+	0 ft
T	12/1	0.293	0.288	1855	537	300	0.559	16.0	*B	118 ft
EB Approach								6.8	A	
T	12/1	0.520	0.552	1861	1030	268	0.260	6.2	A	49 ft
L	12/1	0.147	0.148	1738	557	102	0.183	8.6	*A	23 ft

Appendix H

IN THIS SECTION:

Rimrock Road &
58th Street West

Turn Lanes Addition

Traffic Operations Mitigation Summary

Copper Square Subdivision

Intersection: **Rimrock Road & 58th Street West / Glynn Abbey Way**

WEEKDAY, AM PEAK HOUR

Analysis Scenario	Analysis Data	RIMROCK ROAD From the West (Eastbound)				RIMROCK ROAD From the East (Westbound)				58TH STREET WEST From the South (Northbound)				GLYNN ABBEY WAY From the North (Southbound)				Minor Approach Totals	Intersection Totals
		U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R		
ESTIMATED 2030 BACKGROUND TRAFFIC Installation of Turn Lanes	Traffic Control	Uncontrolled				Uncontrolled				Stop Controlled				Stop Controlled					
	Minor or Major Approach?	Major				Major				Minor				Minor					
	Entry Volume, V (veh/hr)	0	1	583	7	0	19	245	2	0	10	1	38	0	7	2	1		
	Peak Hour Factor (PHF)	0.79				0.79				0.79				0.79					
	Adjusted Volume, V_A (veh/hr)	0	1	738	9	0	24	310	3	0	13	1	48	0	9	3	1		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	L		TR		L		TR		LTR				LTR					
	Lane Group Volume, V_{LG} (veh/hr)	1		747		24		313		62				13				75	1,159
	Capacity, c (veh/hr)	1,242		1,796		861		1,798		278				175				453	6,150
	Volume-to-Capacity Ratio, V_A/c	0.00		0.42		0.03		0.17		0.22				0.07				0.16	0.19
	HCM 95% Queue Length, Q_{95} (veh)	0.0		0.0		0.1		0.0		0.8				0.2					
	HCM 95% Queue Length, Q_{95} (ft)	0.0		0.0		2.5		0.0		21.0				5.1					
	Available Queue Storage, S_Q (ft)	150		300		150		580		195				350					
	Average Control Delay (sec/veh)	7.9		0.1		9.3		0.0		21.6				27.2				22.5	1.7
	Level of Service, LOS	A		A		A		A		C				D					
	Approach Delay (sec/veh)	0.1				0.7				21.6				27.2				C	A
	Approach Level of Service, LOS	A				A				C				D					
ESTIMATED 2030 TOTAL TRAFFIC Installation of Turn Lanes	Traffic Control	Uncontrolled				Uncontrolled				Stop Controlled				Stop Controlled					
	Minor or Major Approach?	Major				Major				Minor				Minor					
	Entry Volume, V (veh/hr)	0	1	603	8	0	19	276	2	0	11	1	38	0	7	2	1		
	Peak Hour Factor (PHF)	0.79				0.79				0.79				0.79					
	Adjusted Volume, V_A (veh/hr)	0	1	763	10	0	24	349	3	0	14	1	48	0	9	3	1		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	L		TR		L		TR		LTR				LTR					
	Lane Group Volume, V_{LG} (veh/hr)	1		773		24		352		63				13				76	1,227
	Capacity, c (veh/hr)	1,201		1,796		842		1,798		253				157				410	6,047
	Volume-to-Capacity Ratio, V_A/c	0.00		0.43		0.03		0.20		0.25				0.08				0.19	0.20
	HCM 95% Queue Length, Q_{95} (veh)	0.0		0.0		0.1		0.0		1.0				0.3					
	HCM 95% Queue Length, Q_{95} (ft)	0.0		0.0		2.5		0.0		26.2				7.7					
	Available Queue Storage, S_Q (ft)	150		300		150		580		195				350					
	Average Control Delay (sec/veh)	8.0		0.1		9.4		0.0		23.9				29.9				24.9	1.8
	Level of Service, LOS	A		A		A		A		C				D					
	Approach Delay (sec/veh)	0.1				0.6				23.9				29.9				C	A
	Approach Level of Service, LOS	A				A				C				D					
ESTIMATED 2034 BACKGROUND TRAFFIC Installation of Turn Lanes	Traffic Control	Uncontrolled				Uncontrolled				Stop Controlled				Stop Controlled					
	Minor or Major Approach?	Major				Major				Minor				Minor					
	Entry Volume, V (veh/hr)	0	1	637	8	0	22	290	2	0	12	1	41	0	7	2	1		
	Peak Hour Factor (PHF)	0.79				0.79				0.79				0.79					
	Adjusted Volume, V_A (veh/hr)	0	1	806	10	0	28	367	3	0	15	1	52	0	9	3	1		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	L		TR		L		TR		LTR				LTR					
	Lane Group Volume, V_{LG} (veh/hr)	1		816		28		370		68				13				81	1,296
	Capacity, c (veh/hr)	1,183		1,796		811		1,798		227				138				365	5,953
	Volume-to-Capacity Ratio, V_A/c	0.00		0.45		0.03		0.21		0.30				0.09				0.22	0.22
	HCM 95% Queue Length, Q_{95} (veh)	0.0		0.0		0.1		0.0		1.2				0.3					
	HCM 95% Queue Length, Q_{95} (ft)	0.0		0.0		2.5		0.0		31.8				7.7					
	Available Queue Storage, S_Q (ft)	150		300		150		580		195				350					
	Average Control Delay (sec/veh)	8.0		0.1		9.6		0.0		27.6				33.7				28.6	2.0
	Level of Service, LOS	A		A		A		A		D				D					
	Approach Delay (sec/veh)	0.1				0.7				27.6				33.7				D	A
	Approach Level of Service, LOS	A				A				D				D					
ESTIMATED 2034 TOTAL TRAFFIC Installation of Turn Lanes	Traffic Control	Uncontrolled				Uncontrolled				Stop Controlled				Stop Controlled					
	Minor or Major Approach?	Major				Major				Minor				Minor					
	Entry Volume, V (veh/hr)	0	1	644	8	0	22	303	2	0	13	1	41	0	7	2	1		
	Peak Hour Factor (PHF)	0.79				0.79				0.79				0.79					
	Adjusted Volume, V_A (veh/hr)	0	1	815	10	0	28	384	3	0	16	1	52	0	9	3	1		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	L		TR		L		TR		LTR				LTR					
	Lane Group Volume, V_{LG} (veh/hr)	1		825		28		386		70				13				82	1,323
	Capacity, c (veh/hr)	1,167		1,796		805		1,798		216				133				349	5,915
	Volume-to-Capacity Ratio, V_A/c	0.00		0.46		0.03		0.21		0.32				0.10				0.24	0.22
	HCM 95% Queue Length, Q_{95} (veh)	0.0		0.0		0.1		0.0		1.3				0.3					
	HCM 95% Queue Length, Q_{95} (ft)	0.0		0.0		2.5		0.0		34.5				7.7					
	Available Queue Storage, S_Q (ft)	150		300		150		580		195				350					
	Average Control Delay (sec/veh)	8.1		0.1		9.6		0.0		29.4				35.0				30.3	2.1
	Level of Service, LOS	A		A		A		A		D				E					
	Approach Delay (sec/veh)	0.1				0.7				29.4				35.0				D	A
	Approach Level of Service, LOS	A				A				D				E					

U = U-Turns; L = Left Turns; T = Through; R = Right Turns | Lane Groups: L = Left; TR = Through-Right; and LTR = Left-Through-Right

Average intersection delay and volume-to-capacity ratio for minor approach(es) is a weighted average provided for reference purposes. The *Highway Capacity Manual, 7th Edition: A Guide for Multimodal Mobility Analysis* does not define overall average delay for the intersection as a whole for two-way or single approach stop-controlled intersections.

Traffic Operations Mitigation Summary

Copper Square Subdivision

Intersection: **Rimrock Road & 58th Street West / Glynn Abbey Way**

WEEKDAY, MIDDAY PEAK HOUR

Analysis Scenario	Analysis Data	RIMROCK ROAD From the West (Eastbound)				RIMROCK ROAD From the East (Westbound)				58TH STREET WEST From the South (Northbound)				GLYNN ABBEY WAY From the North (Southbound)				Minor Approach Totals	Intersection Totals
		U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R		
ESTIMATED 2030 BACKGROUND TRAFFIC Installation of Turn Lanes	Traffic Control	Uncontrolled				Uncontrolled				Stop Controlled				Stop Controlled					
	Minor or Major Approach?	Major				Major				Minor				Minor					
	Entry Volume, V (veh/hr)	0	0	261	8	0	19	288	4	0	6	1	24	0	7	1	1		
	Peak Hour Factor (PHF)	0.92				0.92				0.92				0.92					
	Adjusted Volume, V_A (veh/hr)	0	0	284	9	0	21	313	4	0	7	1	26	0	8	1	1		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	L		TR		L		TR		LTR				LTR					
	Lane Group Volume, V_{LG} (veh/hr)	0		292		21		317		34				10				43	674
	Capacity, c (veh/hr)	1,254		1,791		1,269		1,796		581				382				963	7,073
	Volume-to-Capacity Ratio, V_A/c	0.00		0.16		0.02		0.18		0.06				0.03				0.05	0.10
	HCM 95% Queue Length, Q_{95} (veh)	0.0		0.0		0.0		0.0		0.2				0.1					
	HCM 95% Queue Length, Q_{95} (ft)	0.0		0.0		0.0		0.0		5.1				2.5					
	Available Queue Storage, S_Q (ft)	150		300		150		580		195				350					
	Average Control Delay (sec/veh)	7.9		0.1		7.9		0.1		11.6				14.7				12.3	1.1
	Level of Service, LOS	A		A		A		A		B				B					
	Approach Delay (sec/veh)	0.1				0.5				11.6				14.7				B	A
	Approach Level of Service, LOS	A				A				B				B					
ESTIMATED 2030 TOTAL TRAFFIC Installation of Turn Lanes	Traffic Control	Uncontrolled				Uncontrolled				Stop Controlled				Stop Controlled					
	Minor or Major Approach?	Major				Major				Minor				Minor					
	Entry Volume, V (veh/hr)	0	0	294	9	0	19	320	4	0	7	1	24	0	7	1	1		
	Peak Hour Factor (PHF)	0.91				0.91				0.91				0.91					
	Adjusted Volume, V_A (veh/hr)	0	0	323	10	0	21	352	4	0	8	1	26	0	8	1	1		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	L		TR		L		TR		LTR				LTR					
	Lane Group Volume, V_{LG} (veh/hr)	0		333		21		356		35				10				45	755
	Capacity, c (veh/hr)	1,214		1,791		1,226		1,796		520				339				859	6,886
	Volume-to-Capacity Ratio, V_A/c	0.00		0.19		0.02		0.20		0.07				0.03				0.05	0.11
	HCM 95% Queue Length, Q_{95} (veh)	0.0		0.0		0.1		0.0		0.2				0.1					
	HCM 95% Queue Length, Q_{95} (ft)	0.0		0.0		2.5		0.0		5.1				2.5					
	Available Queue Storage, S_Q (ft)	150		300		150		580		195				350					
	Average Control Delay (sec/veh)	8.0		0.1		8.0		0.1		12.4				15.9				13.2	1.1
	Level of Service, LOS	A		A		A		A		B				C					
	Approach Delay (sec/veh)	0.1				0.5				12.4				15.9				B	A
	Approach Level of Service, LOS	A				A				B				C					
ESTIMATED 2034 BACKGROUND TRAFFIC Installation of Turn Lanes	Traffic Control	Uncontrolled				Uncontrolled				Stop Controlled				Stop Controlled					
	Minor or Major Approach?	Major				Major				Minor				Minor					
	Entry Volume, V (veh/hr)	0	0	309	9	0	21	335	4	0	8	1	26	0	7	1	1		
	Peak Hour Factor (PHF)	0.91				0.91				0.91				0.91					
	Adjusted Volume, V_A (veh/hr)	0	0	340	10	0	23	368	4	0	9	1	29	0	8	1	1		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	L		TR		L		TR		LTR				LTR					
	Lane Group Volume, V_{LG} (veh/hr)	0		349		23		373		38				10				48	793
	Capacity, c (veh/hr)	1,197		1,792		1,209		1,796		495				319				814	6,808
	Volume-to-Capacity Ratio, V_A/c	0.00		0.20		0.02		0.21		0.08				0.03				0.06	0.12
	HCM 95% Queue Length, Q_{95} (veh)	0.0		0.0		0.1		0.0		0.3				0.1					
	HCM 95% Queue Length, Q_{95} (ft)	0.0		0.0		2.5		0.0		7.6				2.5					
	Available Queue Storage, S_Q (ft)	150		300		150		580		195				350					
	Average Control Delay (sec/veh)	8.0		0.1		8.0		0.1		12.9				16.7				13.7	1.2
	Level of Service, LOS	A		A		A		A		B				C					
	Approach Delay (sec/veh)	0.1				0.5				12.9				16.7				B	A
	Approach Level of Service, LOS	A				A				B				C					
ESTIMATED 2034 TOTAL TRAFFIC Installation of Turn Lanes	Traffic Control	Uncontrolled				Uncontrolled				Stop Controlled				Stop Controlled					
	Minor or Major Approach?	Major				Major				Minor				Minor					
	Entry Volume, V (veh/hr)	0	0	325	10	0	21	349	4	0	9	1	26	0	7	1	1		
	Peak Hour Factor (PHF)	0.91				0.91				0.91				0.91					
	Adjusted Volume, V_A (veh/hr)	0	0	357	11	0	23	384	4	0	10	1	29	0	8	1	1		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	L		TR		L		TR		LTR				LTR					
	Lane Group Volume, V_{LG} (veh/hr)	0		368		23		388		40				10				49	829
	Capacity, c (veh/hr)	1,182		1,791		1,190		1,797		465				303				768	6,728
	Volume-to-Capacity Ratio, V_A/c	0.00		0.21		0.02		0.22		0.09				0.03				0.06	0.12
	HCM 95% Queue Length, Q_{95} (veh)	0.0		0.0		0.1		0.0		0.3				0.1					
	HCM 95% Queue Length, Q_{95} (ft)	0.0		0.0		2.5		0.0		7.6				2.5					
	Available Queue Storage, S_Q (ft)	150		300		150		580		195				350					
	Average Control Delay (sec/veh)	8.0		0.1		8.1		0.1		13.5				17.3				14.3	1.2
	Level of Service, LOS	A		A		A		A		B				C					
	Approach Delay (sec/veh)	0.1				0.5				13.5				17.3				B	A
	Approach Level of Service, LOS	A				A				B				C					

U = U-Turns; L = Left Turns; T = Through; R = Right Turns | Lane Groups: L = Left; TR = Through-Right; and LTR = Left-Through-Right

Average intersection delay and volume-to-capacity ratio for minor approach(es) is a weighted average provided for reference purposes. The Highway Capacity Manual, 7th Edition: A Guide for Multimodal Mobility Analysis does not define overall average delay for the intersection as a whole for two-way or single approach stop-controlled intersections.

Traffic Operations Mitigation Summary

Copper Square Subdivision

Intersection: **Rimrock Road & 58th Street West / Glynn Abbey Way**

WEEKDAY, PM PEAK HOUR

Analysis Scenario	Analysis Data	RIMROCK ROAD From the West (Eastbound)				RIMROCK ROAD From the East (Westbound)				58TH STREET WEST From the South (Northbound)				GLYNN ABBEY WAY From the North (Southbound)				Minor Approach Totals	Intersection Totals
		U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R		
ESTIMATED 2030 BACKGROUND TRAFFIC Installation of Turn Lanes	Traffic Control	Uncontrolled				Uncontrolled				Stop Controlled				Stop Controlled					
	Minor or Major Approach?	Major				Major				Minor				Minor					
	Entry Volume, V (veh/hr)	0	1	330	14	0	55	562	8	0	7	2	26	0	7	1	1		
	Peak Hour Factor (PHF)	0.91				0.91				0.91				0.91					
	Adjusted Volume, V_A (veh/hr)	0	1	363	15	0	60	618	9	0	8	2	29	0	8	1	1		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	L		TR		L		TR		LTR				LTR					
	Lane Group Volume, V_{LG} (veh/hr)	1		378		60		626		38				10				48	1,114
	Capacity, c (veh/hr)	950		1,788		1,180		1,796		348				173				521	6,235
	Volume-to-Capacity Ratio, V_A/c	0.00		0.21		0.05		0.35		0.11				0.06				0.09	0.18
	HCM 95% Queue Length, Q_{95} (veh)	0.0		0.0		0.2		0.0		0.4				0.2					
	HCM 95% Queue Length, Q_{95} (ft)	0.0		0.0		5.1		0.0		10.2				5.3					
	Available Queue Storage, S_Q (ft)	150		300		150		580		195				350					
	Average Control Delay (sec/veh)	8.8		0.2		8.2		0.1		16.6				27.0				18.7	1.4
	Level of Service, LOS	A		A		A		A		C				D					
	Approach Delay (sec/veh)	0.2				0.8				16.6				27.0				C	A
	Approach Level of Service, LOS	A				A				C				D					
ESTIMATED 2030 TOTAL TRAFFIC Installation of Turn Lanes	Traffic Control	Uncontrolled				Uncontrolled				Stop Controlled				Stop Controlled					
	Minor or Major Approach?	Major				Major				Minor				Minor					
	Entry Volume, V (veh/hr)	0	1	359	15	0	55	596	8	0	8	2	26	0	7	1	1		
	Peak Hour Factor (PHF)	0.90				0.90				0.90				0.90					
	Adjusted Volume, V_A (veh/hr)	0	1	399	17	0	61	662	9	0	9	2	29	0	8	1	1		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	L		TR		L		TR		LTR				LTR					
	Lane Group Volume, V_{LG} (veh/hr)	1		416		61		671		40				10				50	1,199
	Capacity, c (veh/hr)	915		1,788		1,143		1,796		299				152				451	6,093
	Volume-to-Capacity Ratio, V_A/c	0.00		0.23		0.05		0.37		0.13				0.07				0.11	0.20
	HCM 95% Queue Length, Q_{95} (veh)	0.0		0.0		0.2		0.0		0.5				0.2					
	HCM 95% Queue Length, Q_{95} (ft)	0.0		0.0		5.1		0.0		12.7				5.3					
	Available Queue Storage, S_Q (ft)	150		300		150		580		195				350					
	Average Control Delay (sec/veh)	8.9		0.2		8.3		0.1		18.9				30.4				21.2	1.4
	Level of Service, LOS	A		A		A		A		C				D					
	Approach Delay (sec/veh)	0.2				0.8				18.9				30.4				C	A
	Approach Level of Service, LOS	A				A				C				D					
ESTIMATED 2034 BACKGROUND TRAFFIC Installation of Turn Lanes	Traffic Control	Uncontrolled				Uncontrolled				Stop Controlled				Stop Controlled					
	Minor or Major Approach?	Major				Major				Minor				Minor					
	Entry Volume, V (veh/hr)	0	1	382	16	0	61	631	8	0	9	2	29	0	8	1	1		
	Peak Hour Factor (PHF)	0.90				0.90				0.90				0.90					
	Adjusted Volume, V_A (veh/hr)	0	1	424	18	0	68	701	9	0	10	2	32	0	9	1	1		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	L		TR		L		TR		LTR				LTR					
	Lane Group Volume, V_{LG} (veh/hr)	1		442		68		710		44				11				56	1,277
	Capacity, c (veh/hr)	885		1,788		1,118		1,796		270				129				399	5,986
	Volume-to-Capacity Ratio, V_A/c	0.00		0.25		0.06		0.40		0.16				0.09				0.14	0.21
	HCM 95% Queue Length, Q_{95} (veh)	0.0		0.0		0.2		0.0		0.6				0.3					
	HCM 95% Queue Length, Q_{95} (ft)	0.0		0.0		5.1		0.0		15.2				8.1					
	Available Queue Storage, S_Q (ft)	150		300		150		580		195				350					
	Average Control Delay (sec/veh)	9.1		0.2		8.4		0.1		20.9				35.5				23.8	1.6
	Level of Service, LOS	A		A		A		A		C				E					
	Approach Delay (sec/veh)	0.2				0.8				20.9				35.5				C	A
	Approach Level of Service, LOS	A				A				C				E					
ESTIMATED 2034 TOTAL TRAFFIC Installation of Turn Lanes	Traffic Control	Uncontrolled				Uncontrolled				Stop Controlled				Stop Controlled					
	Minor or Major Approach?	Major				Major				Minor				Minor					
	Entry Volume, V (veh/hr)	0	1	395	17	0	61	645	8	0	10	2	29	0	8	1	1		
	Peak Hour Factor (PHF)	0.90				0.90				0.90				0.90					
	Adjusted Volume, V_A (veh/hr)	0	1	439	19	0	68	717	9	0	11	2	32	0	9	1	1		
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	L		TR		L		TR		LTR				LTR					
	Lane Group Volume, V_{LG} (veh/hr)	1		458		68		726		46				11				57	1,309
	Capacity, c (veh/hr)	873		1,788		1,108		1,796		249				123				372	5,937
	Volume-to-Capacity Ratio, V_A/c	0.00		0.26		0.06		0.40		0.18				0.09				0.15	0.22
	HCM 95% Queue Length, Q_{95} (veh)	0.0		0.0		0.2		0.0		0.7				0.3					
	HCM 95% Queue Length, Q_{95} (ft)	0.0		0.0		5.0		0.0		17.8				8.1					
	Available Queue Storage, S_Q (ft)	150		300		150		580		195				350					
	Average Control Delay (sec/veh)	9.1		0.2		8.5		0.1		22.7				37.2				25.5	1.7
	Level of Service, LOS	A		A		A		A		C				E					
	Approach Delay (sec/veh)	0.2				0.8				22.7				37.2				D	A
	Approach Level of Service, LOS	A				A				C				E					

U = U-Turns; L = Left Turns; T = Through; R = Right Turns | Lane Groups: L = Left; TR = Through-Right; and LTR = Left-Through-Right

Average intersection delay and volume-to-capacity ratio for minor approach(es) is a weighted average provided for reference purposes. The Highway Capacity Manual, 7th Edition: A Guide for Multimodal Mobility Analysis does not define overall average delay for the intersection as a whole for two-way or single approach stop-controlled intersections.

HCS Two-Way Stop-Control Report

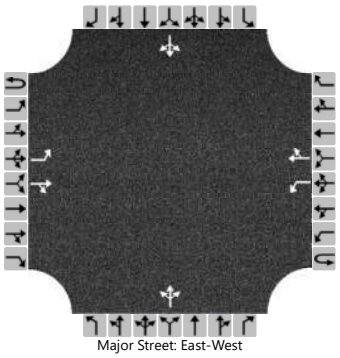
General Information

Analyst	T. Eastwood
Agency/Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2030
Time Analyzed	Weekday, AM Peak Hour
Intersection Orientation	East-West
Project Description	Copper Square TIS | Background Traffic Mitigation

Site Information

Intersection	Rimrock Rd & 58th St W
Jurisdiction	City of Billings
East/West Street	Rimrock Road
North/South Street	58th Street West
Peak Hour Factor	0.79
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	1	1	0		0	1	0		0	1	0
Configuration		L		TR		L		TR			LTR				LTR	
Volume (veh/h)		1	583	7		19	245	2		10	1	38		7	2	1
Percent Heavy Vehicles (%)		3				2				22	3	2		3	3	3
Proportion Time Blocked																
Percent Grade (%)										3				0		
Right Turn Channelized																
Median Type | Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.13				4.12				7.92	7.13	6.52		7.13	6.53	6.23
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.23				2.22				3.70	4.03	3.32		3.53	4.03	3.33

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		1				24					62				13	
Capacity, c (veh/h)		1242				861					278				175	
v/c Ratio		0.00				0.03					0.22				0.07	
95% Queue Length, Q_{95} (veh)		0.0				0.1					0.8				0.2	
95% Queue Length, Q_{95} (ft)		0.0				2.5					21.0				5.1	
Control Delay (s/veh)		7.9				9.3					21.6				27.2	
Level of Service (LOS)		A				A					C				D	
Approach Delay (s/veh)	0.0				0.7				21.6				27.2			
Approach LOS	A				A				C				D			

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HCS Two-Way Stop-Control Report

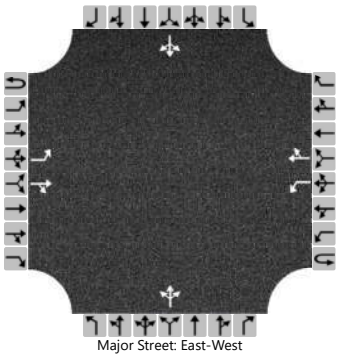
General Information

Analyst	T. Eastwood
Agency/Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2030
Time Analyzed	Weekday, Midday Peak Hour
Intersection Orientation	East-West
Project Description	Copper Square TIS | Background Traffic Mitigation

Site Information

Intersection	Rimrock Rd & 58th St W
Jurisdiction	City of Billings
East/West Street	Rimrock Road
North/South Street	58th Street West
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	1	1	0		0	1	0		0	1	0
Configuration		L		TR		L		TR			LTR				LTR	
Volume (veh/h)		0	261	8		19	288	4		6	1	24		7	1	1
Percent Heavy Vehicles (%)		0				2				2	3	2		1	3	3
Proportion Time Blocked																
Percent Grade (%)									3				0			
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.10				4.12				7.72	7.13	6.52		7.11	6.53	6.23
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.20				2.22				3.52	4.03	3.32		3.51	4.03	3.33

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		0				21					34				10	
Capacity, c (veh/h)		1254				1269					581				382	
v/c Ratio		0.00				0.02					0.06				0.03	
95% Queue Length, Q_{95} (veh)		0.0				0.0					0.2				0.1	
95% Queue Length, Q_{95} (ft)		0.0				0.0					5.1				2.5	
Control Delay (s/veh)		7.9				7.9					11.6				14.7	
Level of Service (LOS)		A				A					B				B	
Approach Delay (s/veh)	0.0				0.5				11.6				14.7			
Approach LOS	A				A				B				B			

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HCS Two-Way Stop-Control Report

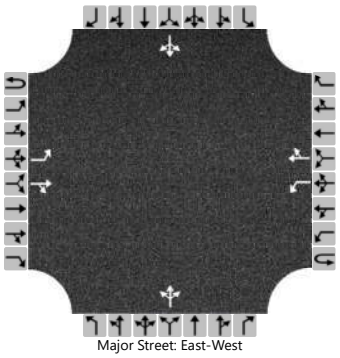
General Information

Analyst	T. Eastwood
Agency/Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2030
Time Analyzed	Weekday, PM Peak Hour
Intersection Orientation	East-West
Project Description	Copper Square TIS | Background Traffic Mitigation

Site Information

Intersection	Rimrock Rd & 58th St W
Jurisdiction	City of Billings
East/West Street	Rimrock Road
North/South Street	58th Street West
Peak Hour Factor	0.91
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	1	1	0		0	1	0		0	1	0
Configuration		L		TR		L		TR			LTR				LTR	
Volume (veh/h)		1	330	14		55	562	8		7	2	26		7	1	1
Percent Heavy Vehicles (%)		3				2				2	3	2		9	3	3
Proportion Time Blocked																
Percent Grade (%)									3				0			
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.13				4.12				7.72	7.13	6.52		7.19	6.53	6.23
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.23				2.22				3.52	4.03	3.32		3.58	4.03	3.33

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		1				60					38				10	
Capacity, c (veh/h)		950				1180					348				173	
v/c Ratio		0.00				0.05					0.11				0.06	
95% Queue Length, Q_{95} (veh)		0.0				0.2					0.4				0.2	
95% Queue Length, Q_{95} (ft)		0.0				5.1					10.2				5.3	
Control Delay (s/veh)		8.8				8.2					16.6				27.0	
Level of Service (LOS)		A				A					C				D	
Approach Delay (s/veh)	0.0				0.7				16.6				27.0			
Approach LOS	A				A				C				D			

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HCS Two-Way Stop-Control Report

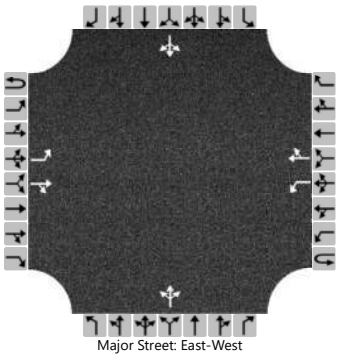
General Information

Analyst	T. Eastwood
Agency/Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2030
Time Analyzed	Weekday, AM Peak Hour
Intersection Orientation	East-West
Project Description	Copper Square TIS | Total Traffic Mitigation

Site Information

Intersection	Rimrock Rd & 58th St W
Jurisdiction	City of Billings
East/West Street	Rimrock Road
North/South Street	58th Street West
Peak Hour Factor	0.79
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	1	1	0		0	1	0		0	1	0
Configuration		L		TR		L		TR			LTR				LTR	
Volume (veh/h)		1	603	8		19	276	2		11	1	38		7	2	1
Percent Heavy Vehicles (%)		3				2				21	3	2		3	3	3
Proportion Time Blocked																
Percent Grade (%)										3				0		
Right Turn Channelized																
Median Type | Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.13				4.12				7.91	7.13	6.52		7.13	6.53	6.23
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.23				2.22				3.69	4.03	3.32		3.53	4.03	3.33

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		1				24					63				13	
Capacity, c (veh/h)		1201				842					253				157	
v/c Ratio		0.00				0.03					0.25				0.08	
95% Queue Length, Q_{95} (veh)		0.0				0.1					1.0				0.3	
95% Queue Length, Q_{95} (ft)		0.0				2.5					26.2				7.7	
Control Delay (s/veh)		8.0				9.4					23.9				29.9	
Level of Service (LOS)		A				A					C				D	
Approach Delay (s/veh)	0.0				0.6				23.9				29.9			
Approach LOS	A				A				C				D			

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HCS Two-Way Stop-Control Report

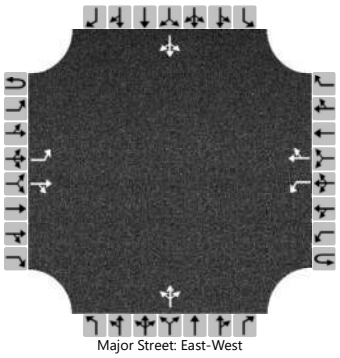
General Information

Analyst	T. Eastwood
Agency/Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2030
Time Analyzed	Weekday, Midday Peak Hour
Intersection Orientation	East-West
Project Description	Copper Square TIS | Total Traffic Mitigation

Site Information

Intersection	Rimrock Rd & 58th St W
Jurisdiction	City of Billings
East/West Street	Rimrock Road
North/South Street	58th Street West
Peak Hour Factor	0.91
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	1	1	0		0	1	0		0	1	0
Configuration		L		TR		L		TR			LTR				LTR	
Volume (veh/h)		0	294	9		19	320	4		7	1	24		7	1	1
Percent Heavy Vehicles (%)		0				2				2	3	2		1	3	3
Proportion Time Blocked																
Percent Grade (%)										3				0		
Right Turn Channelized																
Median Type | Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.10				4.12				7.72	7.13	6.52		7.11	6.53	6.23
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.20				2.22				3.52	4.03	3.32		3.51	4.03	3.33

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		0				21					35				10	
Capacity, c (veh/h)		1214				1226					520				339	
v/c Ratio		0.00				0.02					0.07				0.03	
95% Queue Length, Q_{95} (veh)		0.0				0.1					0.2				0.1	
95% Queue Length, Q_{95} (ft)		0.0				2.5					5.1				2.5	
Control Delay (s/veh)		8.0				8.0					12.4				15.9	
Level of Service (LOS)		A				A					B				C	
Approach Delay (s/veh)	0.0				0.4				12.4				15.9			
Approach LOS	A				A				B				C			

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HCS Two-Way Stop-Control Report

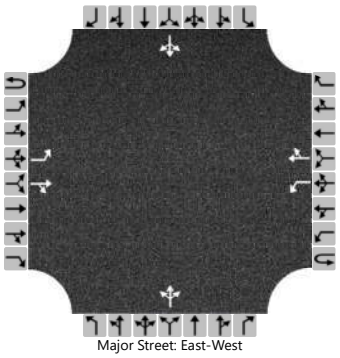
General Information

Analyst	T. Eastwood
Agency/Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2030
Time Analyzed	Weekday, PM Peak Hour
Intersection Orientation	East-West
Project Description	Copper Square TIS | Total Traffic Mitigation

Site Information

Intersection	Rimrock Rd & 58th St W
Jurisdiction	City of Billings
East/West Street	Rimrock Road
North/South Street	58th Street West
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	1	1	0		0	1	0		0	1	0
Configuration		L		TR		L		TR			LTR				LTR	
Volume (veh/h)		1	359	15		55	596	8		8	2	26		7	1	1
Percent Heavy Vehicles (%)		3				2				3	3	2		9	3	3
Proportion Time Blocked																
Percent Grade (%)									3				0			
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.13				4.12				7.73	7.13	6.52		7.19	6.53	6.23
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.23				2.22				3.53	4.03	3.32		3.58	4.03	3.33

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		1				61					40				10	
Capacity, c (veh/h)		915				1143					299				152	
v/c Ratio		0.00				0.05					0.13				0.07	
95% Queue Length, Q_{95} (veh)		0.0				0.2					0.5				0.2	
95% Queue Length, Q_{95} (ft)		0.0				5.1					12.7				5.3	
Control Delay (s/veh)		8.9				8.3					18.9				30.4	
Level of Service (LOS)		A				A					C				D	
Approach Delay (s/veh)	0.0				0.7				18.9				30.4			
Approach LOS	A				A				C				D			

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HCS Two-Way Stop-Control Report

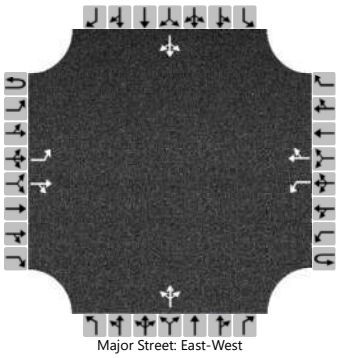
General Information

Analyst	T. Eastwood
Agency/Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2034
Time Analyzed	Weekday, AM Peak Hour
Intersection Orientation	East-West
Project Description	Copper Square TIS | Background Traffic Mitigation

Site Information

Intersection	Rimrock Rd & 58th St W
Jurisdiction	City of Billings
East/West Street	Rimrock Road
North/South Street	58th Street West
Peak Hour Factor	0.79
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	1	1	0		0	1	0		0	1	0
Configuration		L		TR		L		TR			LTR				LTR	
Volume (veh/h)		1	637	8		22	290	2		12	1	41		7	2	1
Percent Heavy Vehicles (%)		3				2				27	3	2		3	3	3
Proportion Time Blocked																
Percent Grade (%)										3				0		
Right Turn Channelized																
Median Type | Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.13				4.12				7.97	7.13	6.52		7.13	6.53	6.23
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.23				2.22				3.74	4.03	3.32		3.53	4.03	3.33

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		1				28					68				13	
Capacity, c (veh/h)		1183				811					227				138	
v/c Ratio		0.00				0.03					0.30				0.09	
95% Queue Length, Q_{95} (veh)		0.0				0.1					1.2				0.3	
95% Queue Length, Q_{95} (ft)		0.0				2.5					31.8				7.7	
Control Delay (s/veh)		8.0				9.6					27.6				33.7	
Level of Service (LOS)		A				A					D				D	
Approach Delay (s/veh)	0.0				0.7				27.6				33.7			
Approach LOS	A				A				D				D			

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HCS Two-Way Stop-Control Report

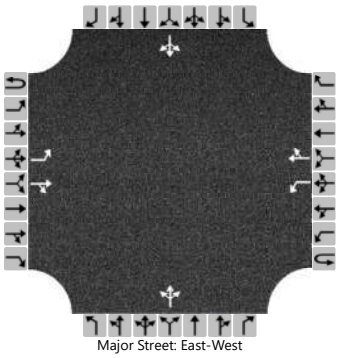
General Information

Analyst	T. Eastwood
Agency/Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2034
Time Analyzed	Weekday, Midday Peak Hour
Intersection Orientation	East-West
Project Description	Copper Square TIS | Background Traffic Mitigation

Site Information

Intersection	Rimrock Rd & 58th St W
Jurisdiction	City of Billings
East/West Street	Rimrock Road
North/South Street	58th Street West
Peak Hour Factor	0.91
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	1	1	0		0	1	0		0	1	0
Configuration		L		TR		L		TR			LTR				LTR	
Volume (veh/h)		0	309	9		21	335	4		8	1	26		7	1	1
Percent Heavy Vehicles (%)		0				2				2	3	2		1	3	3
Proportion Time Blocked																
Percent Grade (%)									3				0			
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.10				4.12				7.72	7.13	6.52		7.11	6.53	6.23
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.20				2.22				3.52	4.03	3.32		3.51	4.03	3.33

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		0				23					38				10	
Capacity, c (veh/h)		1197				1209					495				319	
v/c Ratio		0.00				0.02					0.08				0.03	
95% Queue Length, Q_{95} (veh)		0.0				0.1					0.3				0.1	
95% Queue Length, Q_{95} (ft)		0.0				2.5					7.6				2.5	
Control Delay (s/veh)		8.0				8.0					12.9				16.7	
Level of Service (LOS)		A				A					B				C	
Approach Delay (s/veh)	0.0				0.5				12.9				16.7			
Approach LOS	A				A				B				C			

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HCS Two-Way Stop-Control Report

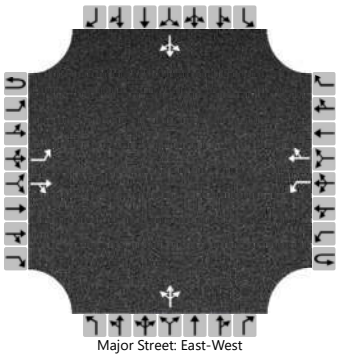
General Information

Analyst	T. Eastwood
Agency/Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2034
Time Analyzed	Weekday, PM Peak Hour
Intersection Orientation	East-West
Project Description	Copper Square TIS | Background Traffic Mitigation

Site Information

Intersection	Rimrock Rd & 58th St W
Jurisdiction	City of Billings
East/West Street	Rimrock Road
North/South Street	58th Street West
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	1	1	0		0	1	0		0	1	0
Configuration		L		TR		L		TR			LTR				LTR	
Volume (veh/h)		1	382	16		61	631	8		9	2	29		8	1	1
Percent Heavy Vehicles (%)		3				2				2	3	2		11	3	3
Proportion Time Blocked																
Percent Grade (%)									3				0			
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.13				4.12				7.72	7.13	6.52		7.21	6.53	6.23
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.23				2.22				3.52	4.03	3.32		3.60	4.03	3.33

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		1				68					44				11	
Capacity, c (veh/h)		885				1118					270				129	
v/c Ratio		0.00				0.06					0.16				0.09	
95% Queue Length, Q_{95} (veh)		0.0				0.2					0.6				0.3	
95% Queue Length, Q_{95} (ft)		0.0				5.1					15.2				8.1	
Control Delay (s/veh)		9.1				8.4					20.9				35.5	
Level of Service (LOS)		A				A					C				E	
Approach Delay (s/veh)	0.0				0.7				20.9				35.5			
Approach LOS	A				A				C				E			

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HCS Two-Way Stop-Control Report

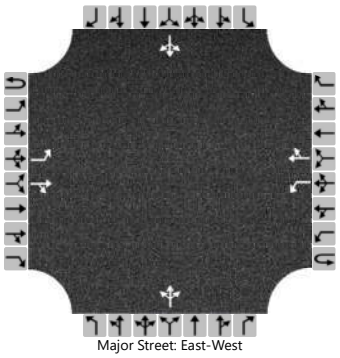
General Information

Analyst	T. Eastwood
Agency/Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2034
Time Analyzed	Weekday, AM Peak Hour
Intersection Orientation	East-West
Project Description	Copper Square TIS | Total Traffic Mitigation

Site Information

Intersection	Rimrock Rd & 58th St W
Jurisdiction	City of Billings
East/West Street	Rimrock Road
North/South Street	58th Street West
Peak Hour Factor	0.79
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	1	1	0		0	1	0		0	1	0
Configuration		L		TR		L		TR			LTR				LTR	
Volume (veh/h)		1	644	8		22	303	2		13	1	41		7	2	1
Percent Heavy Vehicles (%)		3				2				26	3	2		3	3	3
Proportion Time Blocked																
Percent Grade (%)										3				0		
Right Turn Channelized																
Median Type | Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.13				4.12				7.96	7.13	6.52		7.13	6.53	6.23
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.23				2.22				3.73	4.03	3.32		3.53	4.03	3.33

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		1				28					70				13	
Capacity, c (veh/h)		1167				805					216				133	
v/c Ratio		0.00				0.03					0.32				0.10	
95% Queue Length, Q_{95} (veh)		0.0				0.1					1.3				0.3	
95% Queue Length, Q_{95} (ft)		0.0				2.5					34.5				7.7	
Control Delay (s/veh)		8.1				9.6					29.4				35.0	
Level of Service (LOS)		A				A					D				E	
Approach Delay (s/veh)	0.0				0.6				29.4				35.0			
Approach LOS	A				A				D				E			

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HCS Two-Way Stop-Control Report

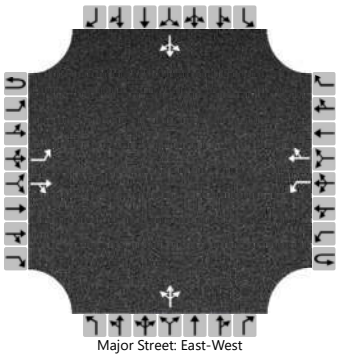
General Information

Analyst	T. Eastwood
Agency/Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2034
Time Analyzed	Weekday, Midday Peak Hour
Intersection Orientation	East-West
Project Description	Copper Square TIS | Total Traffic Mitigation

Site Information

Intersection	Rimrock Rd & 58th St W
Jurisdiction	City of Billings
East/West Street	Rimrock Road
North/South Street	58th Street West
Peak Hour Factor	0.91
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	1	1	0		0	1	0		0	1	0
Configuration		L		TR		L		TR			LTR				LTR	
Volume (veh/h)		0	325	10		21	349	4		9	1	26		7	1	1
Percent Heavy Vehicles (%)		0				2				2	3	2		1	3	3
Proportion Time Blocked																
Percent Grade (%)										3				0		
Right Turn Channelized																
Median Type | Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.10				4.12				7.72	7.13	6.52		7.11	6.53	6.23
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.20				2.22				3.52	4.03	3.32		3.51	4.03	3.33

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		0				23					40				10	
Capacity, c (veh/h)		1182				1190					465				303	
v/c Ratio		0.00				0.02					0.09				0.03	
95% Queue Length, Q_{95} (veh)		0.0				0.1					0.3				0.1	
95% Queue Length, Q_{95} (ft)		0.0				2.5					7.6				2.5	
Control Delay (s/veh)		8.0				8.1					13.5				17.3	
Level of Service (LOS)		A				A					B				C	
Approach Delay (s/veh)	0.0				0.5				13.5				17.3			
Approach LOS	A				A				B				C			

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HCS Two-Way Stop-Control Report

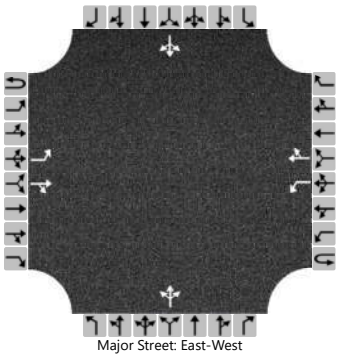
General Information

Analyst	T. Eastwood
Agency/Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2034
Time Analyzed	Weekday, PM Peak Hour
Intersection Orientation	East-West
Project Description	Copper Square TIS | Total Traffic Mitigation

Site Information

Intersection	Rimrock Rd & 58th St W
Jurisdiction	City of Billings
East/West Street	Rimrock Road
North/South Street	58th Street West
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	1	1	0		0	1	0		0	1	0
Configuration		L		TR		L		TR			LTR				LTR	
Volume (veh/h)		1	395	17		61	645	8		10	2	29		8	1	1
Percent Heavy Vehicles (%)		3				1				3	3	2		11	3	3
Proportion Time Blocked																
Percent Grade (%)									3				0			
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.13				4.11				7.73	7.13	6.52		7.21	6.53	6.23
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.23				2.21				3.53	4.03	3.32		3.60	4.03	3.33

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		1				68					46				11	
Capacity, c (veh/h)		873				1108					249				123	
v/c Ratio		0.00				0.06					0.18				0.09	
95% Queue Length, Q_{95} (veh)		0.0				0.2					0.7				0.3	
95% Queue Length, Q_{95} (ft)		0.0				5.0					17.8				8.1	
Control Delay (s/veh)		9.1				8.5					22.7				37.2	
Level of Service (LOS)		A				A					C				E	
Approach Delay (s/veh)	0.0				0.7				22.7				37.2			
Approach LOS	A				A				C				E			

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Appendix H

IN THIS SECTION:

Rimrock Road &
54th Street West

Turn Lanes Addition &
Signal Timing Modifications

Traffic Operations Mitigation Summary

Copper Square Subdivision

Intersection: **Rimrock Road & 54th Street West**

WEEKDAY, AM PEAK HOUR

Analysis Scenario	Analysis Data	RIMROCK ROAD From the West (Eastbound)				RIMROCK ROAD From the East (Westbound)				54TH STREET WEST From the South (Northbound)				54TH STREET WEST From the North (Southbound)				Minor Approach Totals	Intersection Totals
		U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R		
ESTIMATED 2030 BACKGROUND TRAFFIC Installation of Eastbound & Northbound Right-Turn Lanes + Signal Timing Modifications	Traffic Control	Signalized				Signalized				Signalized				Signalized					
	Minor or Major Approach?	Major				Major				Minor				Minor					
	Entry Volume, V (veh/hr)	0	10	561	73	0	162	221	45	0	44	21	266	0	119	74	8		
	Peak Hour Factor (PHF)	0.83				0.83				0.83				0.83					
	Adjusted Volume, V_A (veh/hr)	0	12	676	88	0	195	266	54	0	53	25	320	0	143	89	10		
	Ped + Bike Volume, PBV (ped+bike/hr)	10				0				0				7				7	17
	Lane Group	L		T	R	L		T	R	L		T	R	L		TR			
	Lane Group Volume, V_{LG} (veh/hr)	12		676	88	195		266	54	53		25	320	143		99		641	1,933
	Capacity, c (veh/hr)	611		863	718	334		958	791	244		322	383	281		343		1,573	5,848
	Volume-to-Capacity Ratio, V_A/c	0.02		0.78	0.12	0.58		0.28	0.07	0.22		0.08	0.84	0.51		0.29		0.41	0.33
	HCM 95% Queue Length, Q_{95} (veh)	0.2		15.9	0.8	2.7		1.9	0.0	2.0		0.0	2.3	5.0		3.2			
	HCM 95% Queue Length, Q_{95} (ft)	6		408	22	70		121	0	55		27	60	128		81			
	Available Queue Storage, S_Q (ft)	300		480	200	240		1,030	200	290		500	200	230		400			
	Average Control Delay (sec/veh)	10.4		25.9	12.0	18.7		10.2	8.4	34.9		29.9	30.5	36.1		31.5		32.2	23.9
	Level of Service, LOS	B		C	B	B		B	A	C		C	C	D		C			
	Approach Delay (sec/veh)	24.1				13.2				31.0				34.2				C	C
	Approach Level of Service, LOS	C				B				C				C					
ESTIMATED 2030 TOTAL TRAFFIC Installation of Eastbound & Northbound Right-Turn Lanes + Signal Timing Modifications	Traffic Control	Signalized				Signalized				Signalized				Signalized					
	Minor or Major Approach?	Major				Major				Minor				Minor					
	Entry Volume, V (veh/hr)	0	10	579	75	0	162	248	45	0	47	21	266	0	119	74	9		
	Peak Hour Factor (PHF)	0.83				0.83				0.83				0.83					
	Adjusted Volume, V_A (veh/hr)	0	12	698	90	0	195	299	54	0	57	25	320	0	143	89	11		
	Ped + Bike Volume, PBV (ped+bike/hr)	10				0				0				7				7	17
	Lane Group	L		T	R	L		T	R	L		T	R	L		TR			
	Lane Group Volume, V_{LG} (veh/hr)	12		698	90	195		299	54	57		25	320	143		100		646	1,994
	Capacity, c (veh/hr)	584		863	718	319		959	791	243		322	383	281		342		1,571	5,805
	Volume-to-Capacity Ratio, V_A/c	0.02		0.81	0.13	0.61		0.31	0.07	0.23		0.08	0.84	0.51		0.29		0.41	0.34
	HCM 95% Queue Length, Q_{95} (veh)	0.2		17.2	0.9	2.8		2.3	0.0	2.2		0.0	2.4	5.0		3.2			
	HCM 95% Queue Length, Q_{95} (ft)	6		441	24	73		137	0	59		27	63	128		82			
	Available Queue Storage, S_Q (ft)	300		480	200	240		1,030	200	290		500	200	230		400			
	Average Control Delay (sec/veh)	10.4		27.6	12.0	20.3		10.5	8.4	35.2		29.9	30.5	36.1		31.6		32.3	24.5
	Level of Service, LOS	B		C	B	C		B	A	D		C	C	D		C			
	Approach Delay (sec/veh)	25.6				13.8				31.1				34.3				C	C
	Approach Level of Service, LOS	C				B				C				C					
ESTIMATED 2034 BACKGROUND TRAFFIC Installation of Eastbound & Northbound Right-Turn Lanes + Signal Timing Modifications	Traffic Control	Signalized				Signalized				Signalized				Signalized					
	Minor or Major Approach?	Major				Major				Minor				Minor					
	Entry Volume, V (veh/hr)	0	13	606	87	0	184	259	52	0	53	25	299	0	137	83	12		
	Peak Hour Factor (PHF)	0.83				0.83				0.83				0.83					
	Adjusted Volume, V_A (veh/hr)	0	16	730	105	0	222	312	63	0	64	30	360	0	165	100	14		
	Ped + Bike Volume, PBV (ped+bike/hr)	11				0				0				7				7	18
	Lane Group	L		T	R	L		T	R	L		T	R	L		TR			
	Lane Group Volume, V_{LG} (veh/hr)	16		730	105	222		312	63	64		30	360	165		114		734	2,181
	Capacity, c (veh/hr)	560		838	697	289		934	772	246		343	404	285		359		1,637	5,727
	Volume-to-Capacity Ratio, V_A/c	0.03		0.87	0.15	0.77		0.33	0.08	0.26		0.09	0.89	0.58		0.32		0.45	0.38
	HCM 95% Queue Length, Q_{95} (veh)	0.3		19.7	1.2	4.9		2.5	0.0	2.4		0.0	3.5	5.7		3.6			
	HCM 95% Queue Length, Q_{95} (ft)	8		505	31	129		148	0	64		31	89	146		92			
	Available Queue Storage, S_Q (ft)	300		480	200	240		1,030	200	290		500	200	230		400			
	Average Control Delay (sec/veh)	11.0		33.4	12.9	31.8		11.3	9.0	35.1		29.1	33.0	37.1		30.9		33.6	28.3
	Level of Service, LOS	B		C	B	C		B	A	D		C	C	D		C			
	Approach Delay (sec/veh)	30.5				18.7				33.0				34.6				C	C
	Approach Level of Service, LOS	C				B				C				C					
ESTIMATED 2034 TOTAL TRAFFIC Installation of Eastbound & Northbound Right-Turn Lanes + Signal Timing Modifications	Traffic Control	Signalized				Signalized				Signalized				Signalized					
	Minor or Major Approach?	Major				Major				Minor				Minor					
	Entry Volume, V (veh/hr)	0	14	611	88	0	184	271	52	0	55	25	299	0	137	83	11		
	Peak Hour Factor (PHF)	0.83				0.83				0.83				0.83					
	Adjusted Volume, V_A (veh/hr)	0	17	736	106	0	222	327	63	0	66	30	360	0	165	100	13		
	Ped + Bike Volume, PBV (ped+bike/hr)	11				0				0				7				7	18
	Lane Group	L		T	R	L		T	R	L		T	R	L		TR			
	Lane Group Volume, V_{LG} (veh/hr)	17		736	106	222		327	63	66		30	360	165		113		735	2,205
	Capacity, c (veh/hr)	548		837	696	284		933	771	247		343	404	285		361		1,640	5,709
	Volume-to-Capacity Ratio, V_A/c	0.03		0.88	0.15	0.78		0.35	0.08	0.27		0.09	0.89	0.58		0.31		0.45	0.39
	HCM 95% Queue Length, Q_{95} (veh)	0.4		20.0	1.2	5.1		2.7	0.0	2.4		0.0	3.6	5.7		3.6			
	HCM 95% Queue Length, Q_{95} (ft)	9		513	32	133		155	0	66		31	92	145		91			
	Available Queue Storage, S_Q (ft)	300		480	200	240		1,030	200	290		500	200	230		400			
	Average Control Delay (sec/veh)	10.9		34.3	13.0	33.3		11.5	9.1	35.0		29.1	33.0	37.1		30.9		33.6	28.7
	Level of Service, LOS	B		C	B	C		B	A	C		C	C	D		C			
	Approach Delay (sec/veh)	31.2				19.2				33.0				34.6				C	C
	Approach Level of Service, LOS	C				B				C				C					

U = U-Turns; L = Left Turns; T = Through; R = Right Turns | Lane Groups: LR = Left-Right; TR = Through-Righ; L = Left; T = Through; and LTR = Left-Through-Right

Traffic Operations Mitigation Summary

Copper Square Subdivision

Intersection: **Rimrock Road & 54th Street West**

WEEKDAY, PM PEAK HOUR

Analysis Scenario	Analysis Data	RIMROCK ROAD From the West (Eastbound)				RIMROCK ROAD From the East (Westbound)				54TH STREET WEST From the South (Northbound)				54TH STREET WEST From the North (Southbound)				Minor Approach Totals	Intersection Totals
		U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R		
ESTIMATED 2030 BACKGROUND TRAFFIC Installation of Eastbound & Northbound Right-Turn Lanes + Signal Timing Modifications	Traffic Control	Signalized				Signalized				Signalized				Signalized					
	Minor or Major Approach?	Major				Major				Minor				Minor					
	Entry Volume, V (veh/hr)	0	7	249	41	0	136	253	73	0	64	32	129	0	73	34	9		
	Peak Hour Factor (PHF)	0.93				0.93				0.93				0.93					
	Adjusted Volume, V_A (veh/hr)	0	8	268	44	0	146	272	78	0	69	34	139	0	78	37	10		
	Ped + Bike Volume, PBV (ped+bike/hr)	1				1				0				4				4	6
	Lane Group	L		T	R	L		T	R	L		T		L		TR			
	Lane Group Volume, V_{LG} (veh/hr)	8		268	44	146		272	78	69		34	139	78		46		367	1,183
	Capacity, c (veh/hr)	554		788	658	594		917	766	291		301	336	290		283		1,501	5,778
	Volume-to-Capacity Ratio, V_A/c	0.01		0.34	0.07	0.25		0.30	0.10	0.24		0.11	0.41	0.27		0.16		0.24	0.20
	HCM 95% Queue Length, Q_{95} (veh)	0.2		5.5	0.3	1.8		4.8	0.0	1.9		0.1	0.8	2.3		1.3			
	HCM 95% Queue Length, Q_{95} (ft)	5		141	7	47		122	1	52		27	21	59		33			
	Available Queue Storage, S_Q (ft)	300		480	200	240		1,030	200	290		500	200	230		400			
	Average Control Delay (sec/veh)	9.7		13.1	10.4	8.3		9.5	7.7	27.3		24.7	21.8	27.3		25.0		24.7	14.8
	Level of Service, LOS	A		B	B	A		A	A	C		C	C	C		C			
	Approach Delay (sec/veh)	12.6				8.9				23.8				26.4				C	B
	Approach Level of Service, LOS	B				A				C				C					
ESTIMATED 2030 TOTAL TRAFFIC Installation of Eastbound & Northbound Right-Turn Lanes + Signal Timing Modifications	Traffic Control	Signalized				Signalized				Signalized				Signalized					
	Minor or Major Approach?	Major				Major				Minor				Minor					
	Entry Volume, V (veh/hr)	0	7	278	45	0	136	281	73	0	67	32	129	0	73	34	10		
	Peak Hour Factor (PHF)	0.92				0.92				0.92				0.92					
	Adjusted Volume, V_A (veh/hr)	0	8	302	49	0	148	305	79	0	73	35	140	0	79	37	11		
	Ped + Bike Volume, PBV (ped+bike/hr)	1				1				0				4				4	6
	Lane Group	L		T	R	L		T	R	L		T	0	L		TR			
	Lane Group Volume, V_{LG} (veh/hr)	8		302	49	148		305	79	73		35	140	79		48		375	1,266
	Capacity, c (veh/hr)	529		787	657	567		916	766	291		302	337	290		283		1,503	5,725
	Volume-to-Capacity Ratio, V_A/c	0.01		0.38	0.07	0.26		0.33	0.10	0.25		0.12	0.42	0.27		0.17		0.25	0.22
	HCM 95% Queue Length, Q_{95} (veh)	0.2		6.3	0.3	1.8		5.5	0.1	2.1		0.1	0.8	2.3		1.3			
	HCM 95% Queue Length, Q_{95} (ft)	5		160	8	48		139	2	56		28	21	60		33			
	Available Queue Storage, S_Q (ft)	300		480	200	240		1,030	200	290		500	200	230		400			
	Average Control Delay (sec/veh)	9.7		13.7	10.5	8.4		9.8	7.7	27.4		24.7	21.7	27.3		25.0		24.7	14.9
	Level of Service, LOS	A		B	B	A		A	A	C		C	C	C		C			
	Approach Delay (sec/veh)	13.2				9.1				23.8				26.4				C	B
	Approach Level of Service, LOS	B				A				C				C					
ESTIMATED 2034 BACKGROUND TRAFFIC Installation of Eastbound & Northbound Right-Turn Lanes + Signal Timing Modifications	Traffic Control	Signalized				Signalized				Signalized				Signalized					
	Minor or Major Approach?	Major				Major				Minor				Minor					
	Entry Volume, V (veh/hr)	0	8	289	52	0	153	293	83	0	77	36	145	0	82	38	12		
	Peak Hour Factor (PHF)	0.92				0.92				0.92				0.92					
	Adjusted Volume, V_A (veh/hr)	0	9	314	57	0	166	318	90	0	84	39	158	0	89	41	13		
	Ped + Bike Volume, PBV (ped+bike/hr)	1				1				0				4				4	6
	Lane Group	L		T	R	L		T	R	L		T	0	L		TR			
	Lane Group Volume, V_{LG} (veh/hr)	9		314	57	166		318	90	84		39	158	89		54		424	1,378
	Capacity, c (veh/hr)	518		776	648	555		910	762	290		305	344	290		287		1,516	5,685
	Volume-to-Capacity Ratio, V_A/c	0.02		0.40	0.09	0.30		0.35	0.12	0.29		0.13	0.46	0.31		0.19		0.28	0.24
	HCM 95% Queue Length, Q_{95} (veh)	0.3		19.7	1.2	4.9		5.9	0.0	2.4		0.2	3.5	5.7		3.6			
	HCM 95% Queue Length, Q_{95} (ft)	8		505	31	129		148	0	64		31	89	146		92			
	Available Queue Storage, S_Q (ft)	300		480	200	240		1,030	200	290		500	200	230		400			
	Average Control Delay (sec/veh)	9.9		14.2	10.8	8.8		10.0	7.9	27.8		24.6	21.4	27.7		25.0		24.7	15.2
	Level of Service, LOS	A		B	B	A		A	A	C		C	C	C		C			
	Approach Delay (sec/veh)	13.6				9.3				23.8				26.7				C	B
	Approach Level of Service, LOS	B				A				C				C					
ESTIMATED 2034 TOTAL TRAFFIC Installation of Eastbound & Northbound Right-Turn Lanes + Signal Timing Modifications	Traffic Control	Signalized				Signalized				Signalized				Signalized					
	Minor or Major Approach?	Major				Major				Minor				Minor					
	Entry Volume, V (veh/hr)	0	9	303	53	0	153	305	83	0	79	36	145	0	82	38	12		
	Peak Hour Factor (PHF)	0.92				0.92				0.92				0.92					
	Adjusted Volume, V_A (veh/hr)	0	10	329	58	0	166	332	90	0	86	39	158	0	89	41	13		
	Ped + Bike Volume, PBV (ped+bike/hr)	1				1				0				4				4	6
	Lane Group	L		T	R	L		T	R	L		T	0	L		TR			
	Lane Group Volume, V_{LG} (veh/hr)	10		329	58	166		332	90	86		39	158	89		54		426	1,411
	Capacity, c (veh/hr)	508		776	648	543		908	760	290		305	344	290		287		1,516	5,659
	Volume-to-Capacity Ratio, V_A/c	0.02		0.42	0.09	0.31		0.37	0.12	0.30		0.13	0.46	0.31		0.19		0.28	0.25
	HCM 95% Queue Length, Q_{95} (veh)	0.2		7.0	0.4	2.1		6.1	0.2	2.4		0.1	0.6	2.6		1.4			
	HCM 95% Queue Length, Q_{95} (ft)	6		180	10	56		155	4	64		30	15	67		35			
	Available Queue Storage, S_Q (ft)	300		480	200	240		1,030	200	290		500	200	230		400			
	Average Control Delay (sec/veh)	9.9		14.5	10.8	8.9		10.3	7.9	27.8		24.6	21.4	27.7		24.9		24.7	15.3
	Level of Service, LOS	A		B	B	A		B	A	C		C	C	C		C			
	Approach Delay (sec/veh)	13.8				9.5				23.8				26.6				C	B
	Approach Level of Service, LOS	B				A				C				C					

U = U-Turns; L = Left Turns; T = Through; R = Right Turns | Lane Groups: LR = Left-Right; TR = Through-Righ; L = Left; T = Through; and LTR = Left-Through-Right

Traffic Operations Mitigation Summary

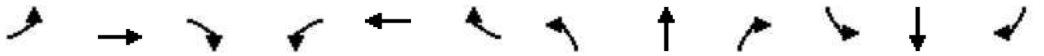
Copper Square Subdivision

Intersection: **Rimrock Road & 54th Street West**

WEEKDAY, PM PEAK HOUR

Analysis Scenario	Analysis Data	RIMROCK ROAD From the West (Eastbound)				RIMROCK ROAD From the East (Westbound)				54TH STREET WEST From the South (Northbound)				54TH STREET WEST From the North (Southbound)				Minor Approach Totals	Intersection Totals
		U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R		
ESTIMATED 2030 BACKGROUND TRAFFIC Installation of Eastbound & Northbound Right-Turn Lanes + Signal Timing Modifications	Traffic Control	Signalized				Signalized				Signalized				Signalized					
	Minor or Major Approach?	Major				Major				Minor				Minor					
	Entry Volume, V (veh/hr)	0	24	292	59	0	256	513	161	0	103	76	198	0	94	71	17		
	Peak Hour Factor (PHF)	0.93				0.93				0.93				0.93					
	Adjusted Volume, V_A (veh/hr)	0	26	314	63	0	275	552	173	0	111	82	213	0	101	76	18		
	Ped + Bike Volume, PBV (ped+bike/hr)	12				0				0				3				3	15
	Lane Group	L		T	R	L		T	R	L		T		L		TR			
	Lane Group Volume, V_{LG} (veh/hr)	26		314	63	275		552	173	111		82	213	101		95		601	2,004
	Capacity, c (veh/hr)	351		704	601	564		868	724	353		443	505	332		438		2,071	5,883
	Volume-to-Capacity Ratio, V_A/c	0.07		0.45	0.11	0.49		0.64	0.24	0.31		0.18	0.42	0.30		0.22		0.29	0.34
	HCM 95% Queue Length, Q_{95} (veh)	0.5		6.8	0.4	3.5		21.4	0.7	3.0		0.6	1.3	2.9		2.2			
	HCM 95% Queue Length, Q_{95} (ft)	12		175	11	93		312	18	81		56	34	74		56			
	Available Queue Storage, S_Q (ft)	300		480	200	240		1,030	200	290		500	200	230		400			
	Average Control Delay (sec/veh)	12.0		16.9	12.8	10.6		15.6	9.6	28.4		24.0	19.5	28.1		24.1		23.9	17.0
	Level of Service, LOS	B		B	B	B		B	A	C		C	B	C		C			
	Approach Delay (sec/veh)	15.9				13.2				22.8				26.2				C	B
	Approach Level of Service, LOS	B				B				C				C					
ESTIMATED 2030 TOTAL TRAFFIC Installation of Eastbound & Northbound Right-Turn Lanes + Signal Timing Modifications	Traffic Control	Signalized				Signalized				Signalized				Signalized					
	Minor or Major Approach?	Major				Major				Minor				Minor					
	Entry Volume, V (veh/hr)	0	25	317	62	0	256	542	161	0	107	76	198	0	94	71	18		
	Peak Hour Factor (PHF)	0.93				0.93				0.93				0.93					
	Adjusted Volume, V_A (veh/hr)	0	27	341	67	0	275	583	173	0	115	82	213	0	101	76	19		
	Ped + Bike Volume, PBV (ped+bike/hr)	12				0				0				3				3	15
	Lane Group	L		T	R	L		T	R	L		T	0	L		TR			
	Lane Group Volume, V_{LG} (veh/hr)	27		341	67	275		583	173	115		82	213	101		96		606	2,072
	Capacity, c (veh/hr)	329		700	598	541		860	720	292		354	436	279		348		1,709	5,457
	Volume-to-Capacity Ratio, V_A/c	0.08		0.49	0.11	0.51		0.68	0.24	0.39		0.23	0.49	0.36		0.27		0.35	0.38
	HCM 95% Queue Length, Q_{95} (veh)	0.5		7.5	0.5	3.5		22.9	0.7	3.1		0.5	1.3	2.9		2.2			
	HCM 95% Queue Length, Q_{95} (ft)	12		192	12	93		343	18	83		56	34	74		56			
	Available Queue Storage, S_Q (ft)	300		480	200	240		1,030	200	290		500	200	230		400			
	Average Control Delay (sec/veh)	12.3		17.6	13.0	11.1		16.8	9.7	28.4		23.9	19.3	28.0		24.1		23.9	17.5
	Level of Service, LOS	B		B	B	B		B	A	C		C	B	C		C			
	Approach Delay (sec/veh)	16.6				14.1				22.8				26.1				C	B
	Approach Level of Service, LOS	B				B				C				C					
ESTIMATED 2034 BACKGROUND TRAFFIC Installation of Eastbound & Northbound Right-Turn Lanes + Signal Timing Modifications	Traffic Control	Signalized				Signalized				Signalized				Signalized					
	Minor or Major Approach?	Major				Major				Minor				Minor					
	Entry Volume, V (veh/hr)	0	30	333	71	0	286	566	184	0	123	85	223	0	108	78	23		
	Peak Hour Factor (PHF)	0.93				0.93				0.93				0.93					
	Adjusted Volume, V_A (veh/hr)	0	32	358	76	0	308	609	198	0	132	91	240	0	116	84	25		
	Ped + Bike Volume, PBV (ped+bike/hr)	13				0				0				3				3	16
	Lane Group	L		T	R	L		T	R	L		T	0	L		TR			
	Lane Group Volume, V_{LG} (veh/hr)	32		358	76	308		609	198	132		91	240	116		109		688	2,269
	Capacity, c (veh/hr)	299		667	570	516		831	695	298		376	463	283		368		1,788	5,366
	Volume-to-Capacity Ratio, V_A/c	0.11		0.54	0.13	0.60		0.73	0.28	0.44		0.24	0.52	0.41		0.30		0.38	0.42
	HCM 95% Queue Length, Q_{95} (veh)	0.4		6.1	0.6	3.0		13.9	0.0	2.7		0.4	0.9	2.5		1.8			
	HCM 95% Queue Length, Q_{95} (ft)	9		156	15	79		209	0	74		45	24	64		45			
	Available Queue Storage, S_Q (ft)	300		480	200	240		1,030	200	290		500	200	230		400			
	Average Control Delay (sec/veh)	13.4		19.5	14.0	13.6		19.3	10.5	28.6		23.2	18.7	28.1		23.5		23.5	18.8
	Level of Service, LOS	B		B	B	B		B	B	C		C	B	C		C			
	Approach Delay (sec/veh)	18.2				16.2				22.4				25.9				C	B
	Approach Level of Service, LOS	B				B				C				C					
ESTIMATED 2034 TOTAL TRAFFIC Installation of Eastbound & Northbound Right-Turn Lanes + Signal Timing Modifications	Traffic Control	Signalized				Signalized				Signalized				Signalized					
	Minor or Major Approach?	Major				Major				Minor				Minor					
	Entry Volume, V (veh/hr)	0	29	345	73	0	286	578	184	0	124	85	223	0	108	78	24		
	Peak Hour Factor (PHF)	0.93				0.93				0.93				0.93					
	Adjusted Volume, V_A (veh/hr)	0	31	371	78	0	308	622	198	0	133	91	240	0	116	84	26		
	Ped + Bike Volume, PBV (ped+bike/hr)	13				0				0				3				3	16
	Lane Group	L		T	R	L		T	R	L		T	0	L		TR			
	Lane Group Volume, V_{LG} (veh/hr)	31		371	78	308		622	198	133		91	240	116		110		690	2,298
	Capacity, c (veh/hr)	289		665	569	504		830	695	299		377	464	284		369		1,793	5,345
	Volume-to-Capacity Ratio, V_A/c	0.11		0.56	0.14	0.61		0.75	0.28	0.45		0.24	0.52	0.41		0.30		0.39	0.43
	HCM 95% Queue Length, Q_{95} (veh)	0.6		8.4	0.7	4.2		25.6	0.8	3.5		0.6	1.6	3.3		2.4			
	HCM 95% Queue Length, Q_{95} (ft)	15		215	17	111		391	20	95		60	40	84		62			
	Available Queue Storage, S_Q (ft)	300		480	200	240		1,030	200	290		500	200	230		400			
	Average Control Delay (sec/veh)	13.6		20.0	14.1	14.0		19.9	10.5	28.6		23.2	18.7	28.0		23.4		23.5	19.1
	Level of Service, LOS	B		B	B	B		B	B	C		C	B	C		C			
	Approach Delay (sec/veh)	18.6				16.6				22.4				25.8				C	B
	Approach Level of Service, LOS	B				B				C				C					

U = U-Turns; L = Left Turns; T = Through; R = Right Turns | Lane Groups: LR = Left-Right; TR = Through-Righ; L = Left; T = Through; and LTR = Left-Through-Right



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	10	561	73	162	221	45	44	21	266	119	74	8
Future Volume (veh/h)	10	561	73	162	221	45	44	21	266	119	74	8
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width Adj.	1.04	1.00	1.00	1.04	1.00	1.00	1.04	1.04	1.00	1.00	1.00	1.00
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		0.97	0.99		0.98	0.99		0.96
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1772	1704	1676	1757	1689	1689	1613	1656	1647	1817	1831	1831
Adj Flow Rate, veh/h	12	676	88	195	266	54	53	25	320	143	89	10
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Percent Heavy Veh, %	3	3	5	7	7	7	11	8	4	3	2	2
Cap, veh/h	555	804	667	295	907	748	287	385	429	300	374	42
Arrive On Green	0.01	0.47	0.47	0.08	0.54	0.54	0.23	0.23	0.23	0.23	0.23	0.23
Sat Flow, veh/h	1687	1704	1413	1673	1689	1395	1103	1656	1371	996	1609	181
Grp Volume(v), veh/h	12	676	88	195	266	54	53	25	320	143	0	99
Grp Sat Flow(s),veh/h/ln	1687	1704	1413	1673	1689	1395	1103	1656	1371	996	0	1790
Q Serve(g_s), s	0.3	31.3	3.2	5.2	7.8	1.7	3.7	1.1	18.9	11.8	0.0	4.0
Cycle Q Clear(g_c), s	0.3	31.3	3.2	5.2	7.8	1.7	7.7	1.1	18.9	12.8	0.0	4.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.10
Lane Grp Cap(c), veh/h	555	804	667	295	907	748	287	385	429	300	0	416
V/C Ratio(X)	0.02	0.84	0.13	0.66	0.29	0.07	0.18	0.07	0.75	0.48	0.00	0.24
Avail Cap(c_a), veh/h	624	804	667	302	907	748	288	386	430	301	0	418
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	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	12.0	20.8	13.4	17.9	11.5	10.1	31.2	26.9	27.8	31.9	0.0	28.1
Incr Delay (d2), s/veh	0.0	10.3	0.4	5.2	0.2	0.0	0.3	0.1	6.9	1.2	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	0.1	13.1	1.0	2.0	2.6	0.5	1.0	0.4	6.5	2.9	0.0	1.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	12.0	31.2	13.8	23.1	11.6	10.1	31.5	27.0	34.8	33.1	0.0	28.4
LnGrp LOS	B	C	B	C	B	B	C	C	C	C		C
Approach Vol, veh/h		776			515			398			242	
Approach Delay, s/veh		28.9			15.8			33.8			31.2	
Approach LOS		C			B			C			C	

Timer - Assigned Phs		2	3	4		6	7	8				
Phs Duration (G+Y+Rc), s		27.4	13.6	49.0		27.4	7.8	54.8				
Change Period (Y+Rc), s		6.5	6.5	6.5		6.5	6.5	6.5				
Max Green Setting (Gmax), s		21.0	7.5	42.0		21.0	5.0	44.5				
Max Q Clear Time (g_c+I1), s		20.9	7.2	33.3		14.8	2.3	9.8				
Green Ext Time (p_c), s		0.0	0.0	2.6		0.7	0.0	1.5				

Intersection Summary	
HCM 7th Control Delay, s/veh	26.7
HCM 7th LOS	C

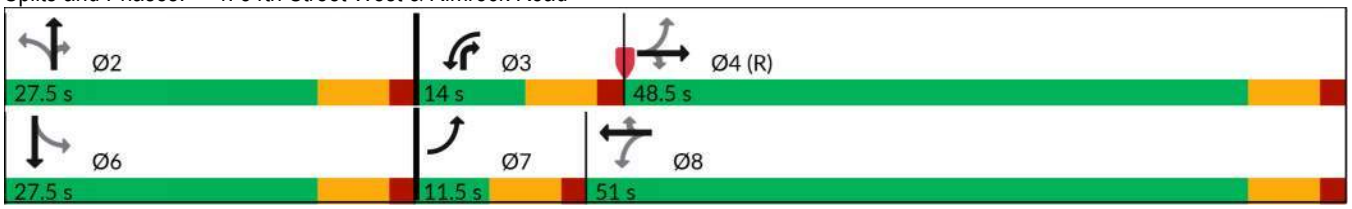
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	12	676	88	195	266	54	53	25	320	143	99
v/c Ratio	0.02	0.77	0.11	0.53	0.25	0.06	0.27	0.09	0.55	0.67	0.33
Control Delay (s/veh)	6.5	26.7	1.6	11.7	8.8	0.1	34.2	29.5	14.4	49.7	32.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	6.5	26.7	1.6	11.7	8.8	0.1	34.2	29.5	14.4	49.7	32.2
Queue Length 50th (ft)	2	308	0	37	53	0	29	13	68	79	48
Queue Length 95th (ft)	8	439	10	70	135	0	56	31	119	121	80
Internal Link Dist (ft)		2588			2504			2604			1914
Turn Bay Length (ft)	310		310	240		200	290		290	230	
Base Capacity (vph)	655	874	787	368	1080	928	263	397	586	288	403
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.02	0.77	0.11	0.53	0.25	0.06	0.20	0.06	0.55	0.50	0.25

Intersection Summary

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations											
Traffic Volume (vph)	10	561	73	162	221	45	44	21	266	119	74
Future Volume (vph)	10	561	73	162	221	45	44	21	266	119	74
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	pm+ov	Perm	NA
Protected Phases	7	4		3	8			2	3		6
Permitted Phases	4		4	8		8	2		2	6	
Detector Phase	7	4	4	3	8	8	2	2	3	6	6
Switch Phase											
Minimum Initial (s)	5.0	15.0	15.0	5.0	15.0	15.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	11.5	27.5	27.5	11.5	24.5	24.5	27.5	27.5	11.5	24.5	24.5
Total Split (s)	11.5	48.5	48.5	14.0	51.0	51.0	27.5	27.5	14.0	27.5	27.5
Total Split (%)	12.8%	53.9%	53.9%	15.6%	56.7%	56.7%	30.6%	30.6%	15.6%	30.6%	30.6%
Yellow Time (s)	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8
All-Red Time (s)	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag			Lead		
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes			Yes		
Recall Mode	None	C-Min	C-Min	None	Min	Min	None	None	None	None	None
Act Effct Green (s)	52.1	46.5	46.5	60.6	59.1	59.1	15.6	15.6	30.5	15.6	15.6
Actuated g/C Ratio	0.58	0.52	0.52	0.67	0.66	0.66	0.17	0.17	0.34	0.17	0.17
v/c Ratio	0.02	0.77	0.11	0.53	0.25	0.06	0.27	0.09	0.55	0.67	0.33
Control Delay (s/veh)	6.5	26.7	1.6	11.7	8.8	0.1	34.2	29.5	14.4	49.7	32.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	6.5	26.7	1.6	11.7	8.8	0.1	34.2	29.5	14.4	49.7	32.2
LOS	A	C	A	B	A	A	C	C	B	D	C
Approach Delay (s/veh)		23.5			9.0			17.9			42.5
Approach LOS		C			A			B			D

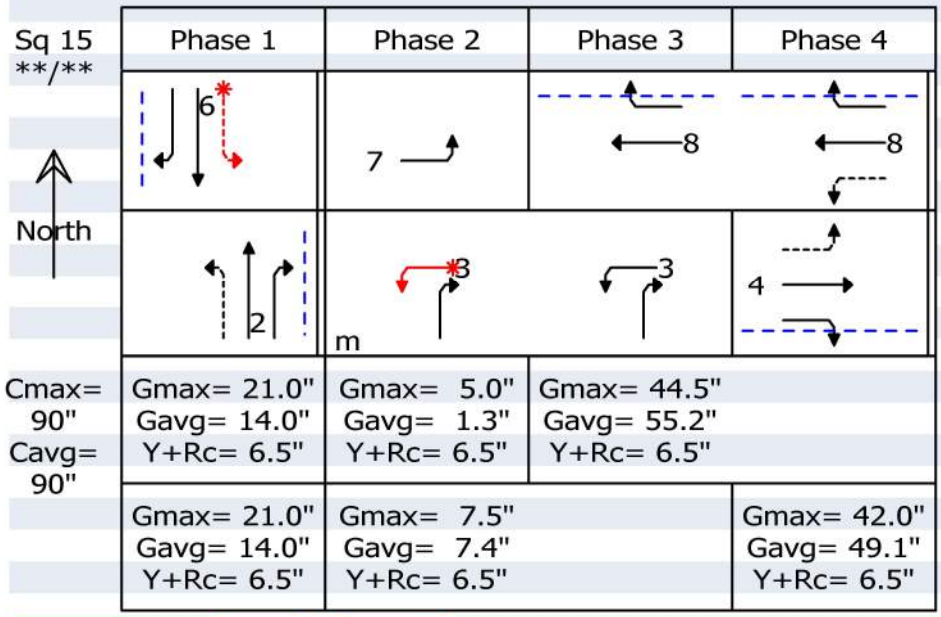
Intersection Summary	
Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 4:EBTL, Start of Green	
Natural Cycle: 90	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.77	
Intersection Signal Delay (s/veh): 20.9	Intersection LOS: C
Intersection Capacity Utilization 74.5%	ICU Level of Service D
Analysis Period (min) 15	

Splits and Phases: 4: 54th Street West & Rimrock Road

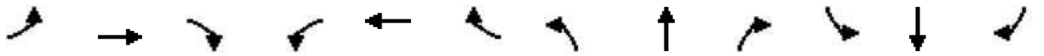


TEAPAC[Ver 9.50.02] - Capacity Analysis Summary (HCM 2016)

Intersection Averages for Int # 4 - Rimrock Rd & 54th St W
V/C 0.520 (Critical V/C 0.759) Control Delay 20.5 Level of Service C+



Lane Group	Width/ Lanes	g/C Max	g/C Avg	SatFlo	Capcty	Adj Volume	v/c	HCM Delay	L S	Queue Model 1
SB Approach								37.3	D+	
R+ T	12/1	0.233	0.155	1732	269	91	0.338	34.6	C	81 ft
L	11/1	0.233	0.155	1278	262	143	0.545	39.0	*D+	135 ft
NB Approach								36.4	D+	
R	12/1			1413	337	1	0.003	26.1	C+	1 ft
T	14/1	0.233	0.155	1666	259	25	0.096	32.7	C	22 ft
L	14/1	0.233	0.155	1106	200	53	0.265	38.2	D+	53 ft
WB Approach								11.0	B+	
R	12/1			1359	834	1	0.001	6.7	A	0 ft
T	12/1	0.494	0.613	1645	1009	266	0.264	8.7	A	106 ft
L	14/1	0.083	0.083	1634	373	195	0.523	14.2	*B+	69 ft
EB Approach								19.4	B	
R	12/1			1410	768	78	0.102	10.1	B+	34 ft
T	12/1	0.467	0.545	1692	922	676	0.733	20.6	*C+	376 ft
L	14/1	0.056	0.014	1674	666	12	0.018	8.8	A	4 ft



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	7	249	41	136	253	73	64	32	129	73	34	9
Future Volume (veh/h)	7	249	41	136	253	73	64	32	129	73	34	9
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width Adj.	1.04	1.00	1.00	1.04	1.00	1.00	1.04	1.04	1.00	1.00	1.00	1.00
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.98	1.00		0.97	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	1701	1690	1663	1728	1717	1731	1712	1741	1592	1803	1734	1831
Adj Flow Rate, veh/h	8	268	44	146	272	78	69	34	139	78	37	10
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	8	4	6	9	5	4	4	2	8	4	9	2
Cap, veh/h	573	859	716	624	971	810	253	254	282	253	192	52
Arrive On Green	0.01	0.51	0.51	0.07	0.57	0.57	0.15	0.15	0.15	0.15	0.15	0.15
Sat Flow, veh/h	1620	1690	1409	1646	1717	1434	1240	1741	1314	1165	1314	355
Grp Volume(v), veh/h	8	268	44	146	272	78	69	34	139	78	0	47
Grp Sat Flow(s),veh/h/ln	1620	1690	1409	1646	1717	1434	1240	1741	1314	1165	0	1669
Q Serve(g_s), s	0.2	6.5	1.1	2.9	5.7	1.8	3.6	1.2	6.5	4.4	0.0	1.7
Cycle Q Clear(g_c), s	0.2	6.5	1.1	2.9	5.7	1.8	5.4	1.2	6.5	5.6	0.0	1.7
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.21
Lane Grp Cap(c), veh/h	573	859	716	624	971	810	253	254	282	253	0	243
V/C Ratio(X)	0.01	0.31	0.06	0.23	0.28	0.10	0.27	0.13	0.49	0.31	0.00	0.19
Avail Cap(c_a), veh/h	672	859	716	677	971	810	444	522	485	433	0	501
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	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	8.2	10.1	8.7	7.3	7.9	7.0	28.6	26.0	24.2	28.5	0.0	26.3
Incr Delay (d2), s/veh	0.0	0.9	0.2	0.2	0.2	0.1	0.6	0.2	1.3	0.7	0.0	0.4
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	2.1	0.3	0.8	1.6	0.4	1.0	0.5	1.9	1.2	0.0	0.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	8.2	11.0	8.9	7.5	8.0	7.0	29.2	26.3	25.6	29.2	0.0	26.7
LnGrp LOS	A	B	A	A	A	A	C	C	C	C		C
Approach Vol, veh/h		320			496			242			125	
Approach Delay, s/veh		10.6			7.7			26.7			28.2	
Approach LOS		B			A			C			C	

Timer - Assigned Phs		2	3	4		6	7	8				
Phs Duration (G+Y+Rc), s		16.7	11.2	42.1		16.7	7.2	46.1				
Change Period (Y+Rc), s		6.5	6.5	6.5		6.5	6.5	6.5				
Max Green Setting (Gmax), s		21.0	7.0	22.5		21.0	5.0	24.5				
Max Q Clear Time (g_c+I1), s		8.5	4.9	8.5		7.6	2.2	7.7				
Green Ext Time (p_c), s		0.7	0.1	1.1		0.5	0.0	1.4				

Intersection Summary												
HCM 7th Control Delay, s/veh			14.6									
HCM 7th LOS			B									

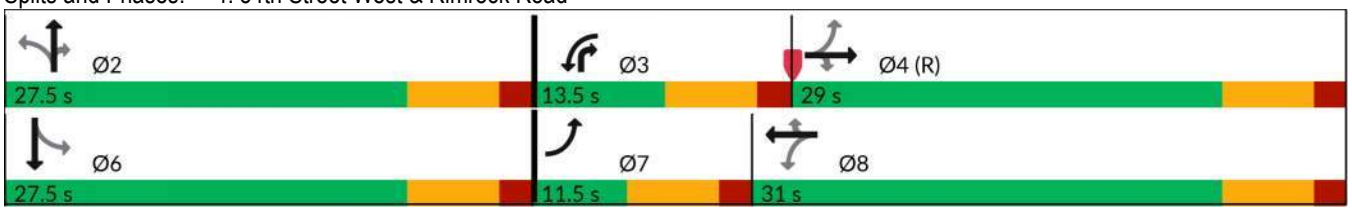
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	8	268	44	146	272	78	69	34	139	78	47
v/c Ratio	0.01	0.32	0.06	0.21	0.24	0.08	0.34	0.12	0.32	0.40	0.18
Control Delay (s/veh)	5.7	14.7	0.1	5.7	8.1	0.2	30.3	25.3	4.7	32.4	22.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	5.7	14.7	0.1	5.7	8.1	0.2	30.3	25.3	4.7	32.4	22.2
Queue Length 50th (ft)	1	71	0	20	40	0	28	13	0	32	15
Queue Length 95th (ft)	6	152	0	49	137	2	60	34	29	67	42
Internal Link Dist (ft)		2588			2504			2604			1914
Turn Bay Length (ft)	310		310	240		200	290		290	230	
Base Capacity (vph)	635	828	770	686	1145	1009	384	540	438	363	484
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.01	0.32	0.06	0.21	0.24	0.08	0.18	0.06	0.32	0.21	0.10

Intersection Summary

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations											
Traffic Volume (vph)	7	249	41	136	253	73	64	32	129	73	34
Future Volume (vph)	7	249	41	136	253	73	64	32	129	73	34
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	pm+ov	Perm	NA
Protected Phases	7	4		3	8			2	3		6
Permitted Phases	4		4	8		8	2		2	6	
Detector Phase	7	4	4	3	8	8	2	2	3	6	6
Switch Phase											
Minimum Initial (s)	5.0	15.0	15.0	5.0	15.0	15.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	11.5	27.5	27.5	11.5	24.5	24.5	27.5	27.5	11.5	24.5	24.5
Total Split (s)	11.5	29.0	29.0	13.5	31.0	31.0	27.5	27.5	13.5	27.5	27.5
Total Split (%)	16.4%	41.4%	41.4%	19.3%	44.3%	44.3%	39.3%	39.3%	19.3%	39.3%	39.3%
Yellow Time (s)	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8
All-Red Time (s)	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag			Lead		
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes			Yes		
Recall Mode	None	C-Min	C-Min	None	Min	Min	None	None	None	None	None
Act Effct Green (s)	40.3	34.7	34.7	48.7	47.9	47.9	11.2	11.2	17.1	11.2	11.2
Actuated g/C Ratio	0.58	0.50	0.50	0.70	0.68	0.68	0.16	0.16	0.24	0.16	0.16
v/c Ratio	0.01	0.32	0.06	0.21	0.24	0.08	0.34	0.12	0.32	0.40	0.18
Control Delay (s/veh)	5.7	14.7	0.1	5.7	8.1	0.2	30.3	25.3	4.7	32.4	22.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	5.7	14.7	0.1	5.7	8.1	0.2	30.3	25.3	4.7	32.4	22.2
LOS	A	B	A	A	A	A	C	C	A	C	C
Approach Delay (s/veh)		12.4			6.2			14.9			28.6
Approach LOS		B			A			B			C

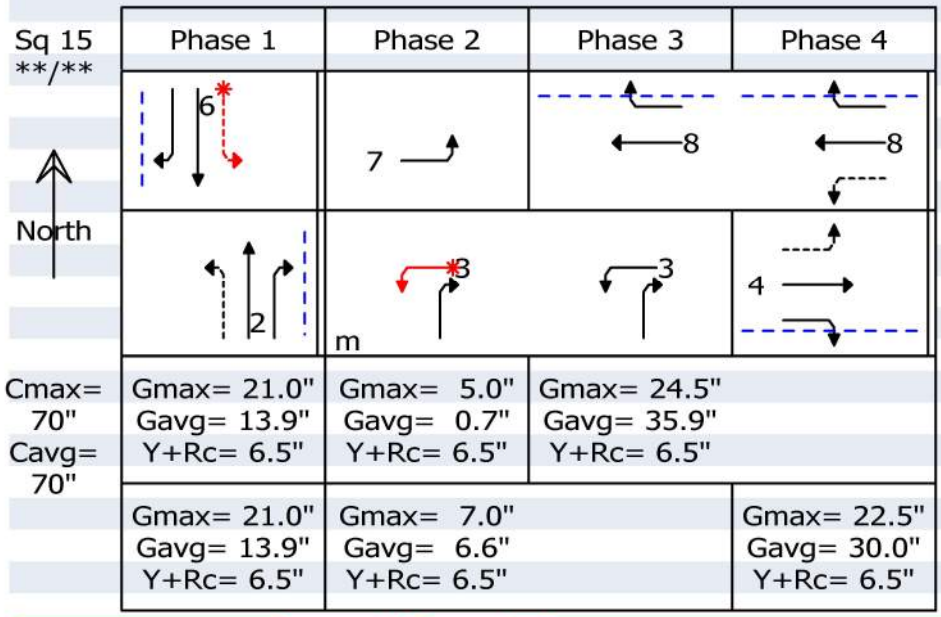
Intersection Summary	
Cycle Length: 70	
Actuated Cycle Length: 70	
Offset: 0 (0%), Referenced to phase 4:EBTL, Start of Green	
Natural Cycle: 70	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.40	
Intersection Signal Delay (s/veh): 12.0	Intersection LOS: B
Intersection Capacity Utilization 49.8%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 4: 54th Street West & Rimrock Road

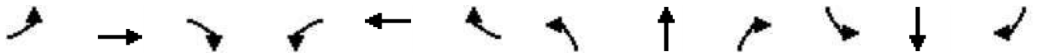


TEAPAC[Ver 9.50.02] - Capacity Analysis Summary (HCM 2016)

Intersection Averages for Int # 4 - Rimrock Rd & 54th St W
V/C 0.277 (Critical V/C 0.437) Control Delay 15.0 Level of Service B



Lane Group	Width/ Lanes	g/C Max	g/C Avg	SatFlo	Capcty	Adj Volume	v/c	HCM Delay	L S	Queue Model 1
SB Approach								24.7	C+	
R+ T	12/1	0.300	0.198	1625	322	38	0.118	23.2	C+	24 ft
L	11/1	0.300	0.198	1229	327	78	0.239	25.4	*C+	51 ft
NB Approach								23.4	C+	
R	12/1			1322	389	22	0.057	17.9	B	12 ft
T	14/1	0.300	0.198	1758	348	34	0.098	23.1	C+	20 ft
L	14/1	0.300	0.198	1262	329	69	0.210	25.3	C+	44 ft
WB Approach								10.2	B+	
R	12/1			1407	722	1	0.001	8.3	A	0 ft
T	12/1	0.350	0.513	1680	862	272	0.316	10.9	B+	106 ft
L	14/1	0.100	0.094	1600	564	146	0.259	9.0	*A	45 ft
EB Approach								14.6	B+	
R	12/1			1396	599	32	0.053	11.8	B+	13 ft
T	12/1	0.321	0.429	1669	716	268	0.374	15.1	*B	129 ft
L	14/1	0.071	0.010	1598	535	8	0.015	11.1	B+	3 ft



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	24	292	59	256	513	161	103	76	198	94	71	17
Future Volume (veh/h)	24	292	59	256	513	161	103	76	198	94	71	17
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width Adj.	1.04	1.00	1.00	1.04	1.00	1.00	1.04	1.04	1.00	1.00	1.00	1.00
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.98	0.98		0.98	0.99		0.95
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1800	1704	1717	1815	1772	1772	1741	1755	1660	1831	1845	1831
Adj Flow Rate, veh/h	26	314	63	275	552	173	111	82	213	101	76	18
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	1	3	2	3	1	1	2	1	3	2	1	2
Cap, veh/h	341	733	626	562	882	731	282	343	404	267	279	66
Arrive On Green	0.03	0.43	0.43	0.10	0.50	0.50	0.20	0.20	0.20	0.20	0.20	0.20
Sat Flow, veh/h	1714	1704	1455	1728	1772	1469	1193	1755	1378	1048	1427	338
Grp Volume(v), veh/h	26	314	63	275	552	173	111	82	213	101	0	94
Grp Sat Flow(s),veh/h/ln	1714	1704	1455	1728	1772	1469	1193	1755	1378	1048	0	1765
Q Serve(g_s), s	0.6	9.0	1.8	6.2	15.9	4.7	6.1	2.8	9.1	6.3	0.0	3.2
Cycle Q Clear(g_c), s	0.6	9.0	1.8	6.2	15.9	4.7	9.3	2.8	9.1	9.1	0.0	3.2
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.19
Lane Grp Cap(c), veh/h	341	733	626	562	882	731	282	343	404	267	0	345
V/C Ratio(X)	0.08	0.43	0.10	0.49	0.63	0.24	0.39	0.24	0.53	0.38	0.00	0.27
Avail Cap(c_a), veh/h	415	733	626	562	882	731	407	527	548	376	0	529
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	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	11.4	13.9	11.9	10.1	12.8	10.0	27.9	23.8	20.8	27.6	0.0	23.9
Incr Delay (d2), s/veh	0.1	1.8	0.3	0.7	1.4	0.2	0.9	0.4	1.1	0.9	0.0	0.4
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.2	3.3	0.5	1.9	5.3	1.2	1.7	1.1	2.7	1.6	0.0	1.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	11.4	15.8	12.2	10.7	14.2	10.2	28.8	24.1	21.9	28.5	0.0	24.3
LnGrp LOS	B	B	B	B	B	B	C	C	C	C		C
Approach Vol, veh/h		403			1000			406			195	
Approach Delay, s/veh		14.9			12.6			24.2			26.5	
Approach LOS		B			B			C			C	

Timer - Assigned Phs		2	3	4		6	7	8				
Phs Duration (G+Y+Rc), s		20.2	13.2	36.6		20.2	8.5	41.3				
Change Period (Y+Rc), s		6.5	6.5	6.5		6.5	6.5	6.5				
Max Green Setting (Gmax), s		21.0	6.7	22.8		21.0	5.0	24.5				
Max Q Clear Time (g_c+I1), s		11.3	8.2	11.0		11.1	2.6	17.9				
Green Ext Time (p_c), s		1.2	0.0	1.2		0.7	0.0	2.1				

Intersection Summary	
HCM 7th Control Delay, s/veh	16.8
HCM 7th LOS	B

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	26	314	63	275	552	173	111	82	213	101	94
v/c Ratio	0.05	0.41	0.08	0.41	0.51	0.18	0.51	0.25	0.33	0.48	0.30
Control Delay (s/veh)	6.8	18.1	0.2	7.8	15.3	3.1	33.7	25.7	3.2	33.0	22.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	6.8	18.1	0.2	7.8	15.3	3.1	33.7	25.7	3.2	33.0	22.6
Queue Length 50th (ft)	3	97	0	43	105	0	45	31	0	41	30
Queue Length 95th (ft)	13	191	0	96	#382	35	85	62	31	79	62
Internal Link Dist (ft)		2588			2504			2604			1914
Turn Bay Length (ft)	310		310	240		200	290		290	230	
Base Capacity (vph)	518	769	745	668	1092	972	371	546	650	355	519
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.05	0.41	0.08	0.41	0.51	0.18	0.30	0.15	0.33	0.28	0.18

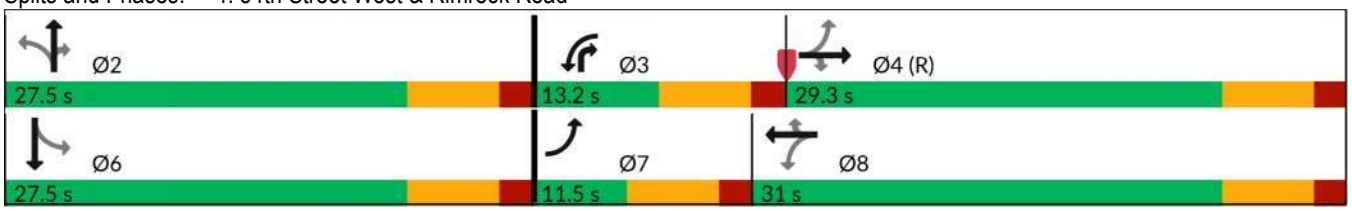
Intersection Summary

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

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations											
Traffic Volume (vph)	24	292	59	256	513	161	103	76	198	94	71
Future Volume (vph)	24	292	59	256	513	161	103	76	198	94	71
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	pm+ov	Perm	NA
Protected Phases	7	4		3	8			2	3		6
Permitted Phases	4		4	8		8	2		2	6	
Detector Phase	7	4	4	3	8	8	2	2	3	6	6
Switch Phase											
Minimum Initial (s)	5.0	15.0	15.0	5.0	15.0	15.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	11.5	27.5	27.5	11.5	24.5	24.5	27.5	27.5	11.5	24.5	24.5
Total Split (s)	11.5	29.3	29.3	13.2	31.0	31.0	27.5	27.5	13.2	27.5	27.5
Total Split (%)	16.4%	41.9%	41.9%	18.9%	44.3%	44.3%	39.3%	39.3%	18.9%	39.3%	39.3%
Yellow Time (s)	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8
All-Red Time (s)	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag			Lead		
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes			Yes		
Recall Mode	None	C-Min	C-Min	None	Min	Min	None	None	None	None	None
Act Effct Green (s)	37.8	31.9	31.9	47.2	43.9	43.9	12.5	12.5	25.1	12.5	12.5
Actuated g/C Ratio	0.54	0.46	0.46	0.67	0.63	0.63	0.18	0.18	0.36	0.18	0.18
v/c Ratio	0.05	0.41	0.08	0.41	0.51	0.18	0.51	0.25	0.33	0.48	0.30
Control Delay (s/veh)	6.8	18.1	0.2	7.8	15.3	3.1	33.7	25.7	3.2	33.0	22.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	6.8	18.1	0.2	7.8	15.3	3.1	33.7	25.7	3.2	33.0	22.6
LOS	A	B	A	A	B	A	C	C	A	C	C
Approach Delay (s/veh)		14.5			11.1			16.1			28.0
Approach LOS		B			B			B			C

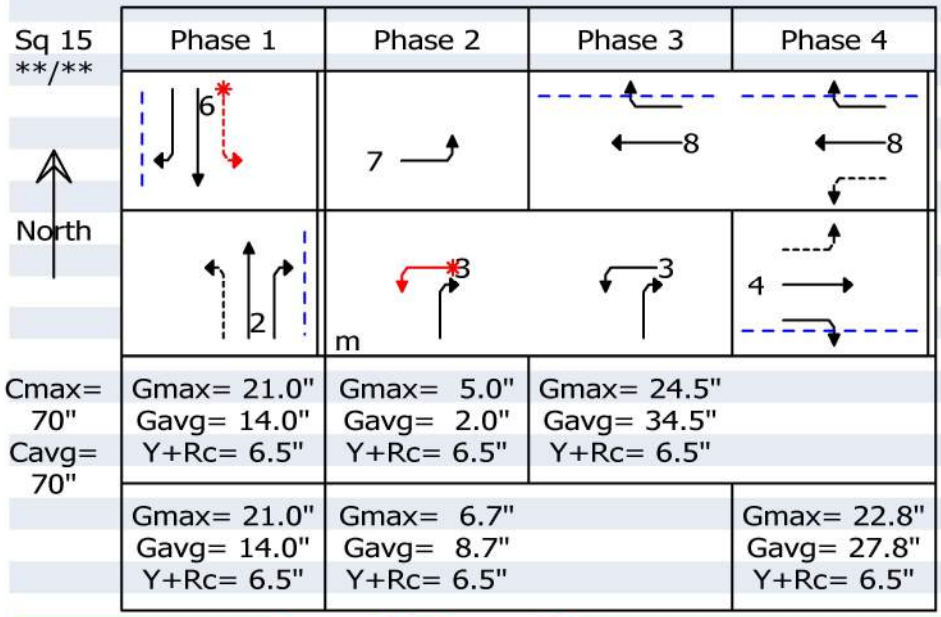
Intersection Summary	
Cycle Length: 70	
Actuated Cycle Length: 70	
Offset: 0 (0%), Referenced to phase 4:EBTL, Start of Green	
Natural Cycle: 70	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.51	
Intersection Signal Delay (s/veh): 14.5	Intersection LOS: B
Intersection Capacity Utilization 62.7%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 4: 54th Street West & Rimrock Road

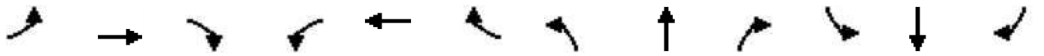


TEAPAC[Ver 9.50.02] - Capacity Analysis Summary (HCM 2016)

Intersection Averages for Int # 4 - Rimrock Rd & 54th St W
V/C 0.462 (Critical V/C 0.589) Control Delay 17.9 Level of Service B



Lane Group	Width/ Lanes	g/C Max	g/C Avg	SatFlo	Capcty	Adj Volume	v/c	HCM Delay	L S	Queue Model 1
SB Approach								26.0	C+	
R+ T	12/1	0.300	0.200	1731	346	81	0.234	23.8	C+	50 ft
L	11/1	0.300	0.200	1146	288	101	0.351	27.7	*C	69 ft
NB Approach								23.7	C+	
R	12/1			1428	462	72	0.156	17.0	B	36 ft
T	14/1	0.300	0.200	1789	358	82	0.229	23.8	C+	50 ft
L	14/1	0.300	0.200	1222	299	111	0.371	27.9	C	76 ft
WB Approach								14.8	B+	
R	12/1			1452	716	1	0.001	9.0	A	0 ft
T	12/1	0.350	0.493	1733	854	552	0.646	17.0	B	242 ft
L	14/1	0.096	0.124	1698	566	275	0.486	10.4	*B+	89 ft
EB Approach								17.0	B	
R	12/1			1448	576	49	0.085	13.4	B+	22 ft
T	12/1	0.326	0.398	1694	674	314	0.466	17.9	*B	158 ft
L	14/1	0.071	0.028	1706	361	26	0.072	12.5	B+	10 ft



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	10	579	75	162	248	45	47	21	266	119	74	9
Future Volume (veh/h)	10	579	75	162	248	45	47	21	266	119	74	9
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width Adj.	1.04	1.00	1.00	1.04	1.00	1.00	1.04	1.04	1.00	1.00	1.00	1.00
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		0.97	0.99		0.98	0.99		0.96
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1772	1704	1676	1757	1689	1689	1613	1656	1647	1817	1831	1817
Adj Flow Rate, veh/h	12	698	90	195	299	54	57	25	320	143	89	11
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Percent Heavy Veh, %	3	3	5	7	7	7	11	8	4	3	2	3
Cap, veh/h	529	804	667	280	907	748	286	385	429	300	369	46
Arrive On Green	0.01	0.47	0.47	0.08	0.54	0.54	0.23	0.23	0.23	0.23	0.23	0.23
Sat Flow, veh/h	1687	1704	1413	1673	1689	1395	1103	1656	1371	996	1590	196
Grp Volume(v), veh/h	12	698	90	195	299	54	57	25	320	143	0	100
Grp Sat Flow(s),veh/h/ln	1687	1704	1413	1673	1689	1395	1103	1656	1371	996	0	1786
Q Serve(g_s), s	0.3	33.0	3.2	5.2	9.0	1.7	4.0	1.1	18.9	11.8	0.0	4.1
Cycle Q Clear(g_c), s	0.3	33.0	3.2	5.2	9.0	1.7	8.1	1.1	18.9	12.8	0.0	4.1
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.11
Lane Grp Cap(c), veh/h	529	804	667	280	907	748	286	385	429	300	0	415
V/C Ratio(X)	0.02	0.87	0.13	0.70	0.33	0.07	0.20	0.07	0.75	0.48	0.00	0.24
Avail Cap(c_a), veh/h	598	804	667	287	907	748	287	386	430	301	0	417
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	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	12.0	21.3	13.4	18.6	11.7	10.1	31.4	26.9	27.8	31.9	0.0	28.1
Incr Delay (d2), s/veh	0.0	12.2	0.4	6.9	0.2	0.0	0.3	0.1	6.9	1.2	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	0.1	14.2	1.0	2.2	3.0	0.5	1.0	0.4	6.5	2.9	0.0	1.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	12.0	33.5	13.8	25.5	12.0	10.1	31.7	27.0	34.8	33.1	0.0	28.4
LnGrp LOS	B	C	B	C	B	B	C	C	C	C		C
Approach Vol, veh/h		800			548			402			243	
Approach Delay, s/veh		31.0			16.6			33.8			31.2	
Approach LOS		C			B			C			C	

Timer - Assigned Phs		2	3	4		6	7	8				
Phs Duration (G+Y+Rc), s		27.4	13.6	49.0		27.4	7.8	54.8				
Change Period (Y+Rc), s		6.5	6.5	6.5		6.5	6.5	6.5				
Max Green Setting (Gmax), s		21.0	7.5	42.0		21.0	5.0	44.5				
Max Q Clear Time (g_c+I1), s		20.9	7.2	35.0		14.8	2.3	11.0				
Green Ext Time (p_c), s		0.0	0.0	2.3		0.7	0.0	1.7				

Intersection Summary	
HCM 7th Control Delay, s/veh	27.6
HCM 7th LOS	C

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	12	698	90	195	299	54	57	25	320	143	100
v/c Ratio	0.02	0.80	0.11	0.56	0.28	0.06	0.29	0.09	0.55	0.67	0.33
Control Delay (s/veh)	6.5	28.3	1.7	12.7	9.1	0.1	34.7	29.5	15.3	49.7	32.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	6.5	28.3	1.7	12.7	9.1	0.1	34.7	29.5	15.3	49.7	32.4
Queue Length 50th (ft)	2	328	0	37	61	0	31	13	73	79	48
Queue Length 95th (ft)	8	#484	11	70	152	0	60	31	125	121	80
Internal Link Dist (ft)		2588			2504			2604			1914
Turn Bay Length (ft)	310		310	240		200	290		290	230	
Base Capacity (vph)	638	872	785	353	1080	928	262	397	580	288	401
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.02	0.80	0.11	0.55	0.28	0.06	0.22	0.06	0.55	0.50	0.25

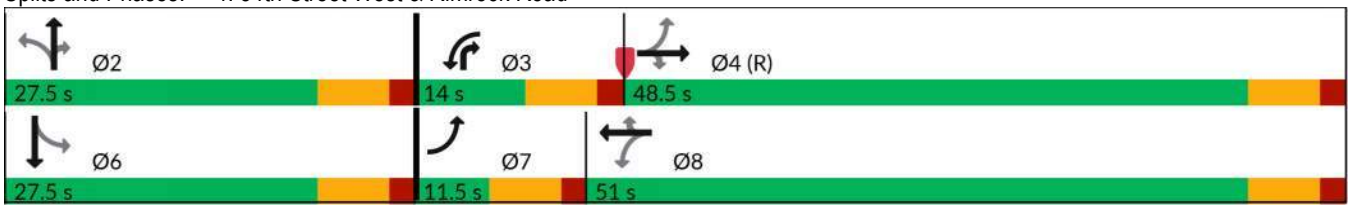
Intersection Summary

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

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations											
Traffic Volume (vph)	10	579	75	162	248	45	47	21	266	119	74
Future Volume (vph)	10	579	75	162	248	45	47	21	266	119	74
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	pm+ov	Perm	NA
Protected Phases	7	4		3	8			2	3		6
Permitted Phases	4		4	8		8	2		2	6	
Detector Phase	7	4	4	3	8	8	2	2	3	6	6
Switch Phase											
Minimum Initial (s)	5.0	15.0	15.0	5.0	15.0	15.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	11.5	27.5	27.5	11.5	24.5	24.5	27.5	27.5	11.5	24.5	24.5
Total Split (s)	11.5	48.5	48.5	14.0	51.0	51.0	27.5	27.5	14.0	27.5	27.5
Total Split (%)	12.8%	53.9%	53.9%	15.6%	56.7%	56.7%	30.6%	30.6%	15.6%	30.6%	30.6%
Yellow Time (s)	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8
All-Red Time (s)	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag			Lead		
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes			Yes		
Recall Mode	None	C-Min	C-Min	None	Min	Min	None	None	None	None	None
Act Effct Green (s)	51.9	46.4	46.4	60.6	59.1	59.1	15.6	15.6	30.6	15.6	15.6
Actuated g/C Ratio	0.58	0.52	0.52	0.67	0.66	0.66	0.17	0.17	0.34	0.17	0.17
v/c Ratio	0.02	0.80	0.11	0.56	0.28	0.06	0.29	0.09	0.55	0.67	0.33
Control Delay (s/veh)	6.5	28.3	1.7	12.7	9.1	0.1	34.7	29.5	15.3	49.7	32.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	6.5	28.3	1.7	12.7	9.1	0.1	34.7	29.5	15.3	49.7	32.4
LOS	A	C	A	B	A	A	C	C	B	D	C
Approach Delay (s/veh)		25.0			9.5			18.9			42.5
Approach LOS		C			A			B			D

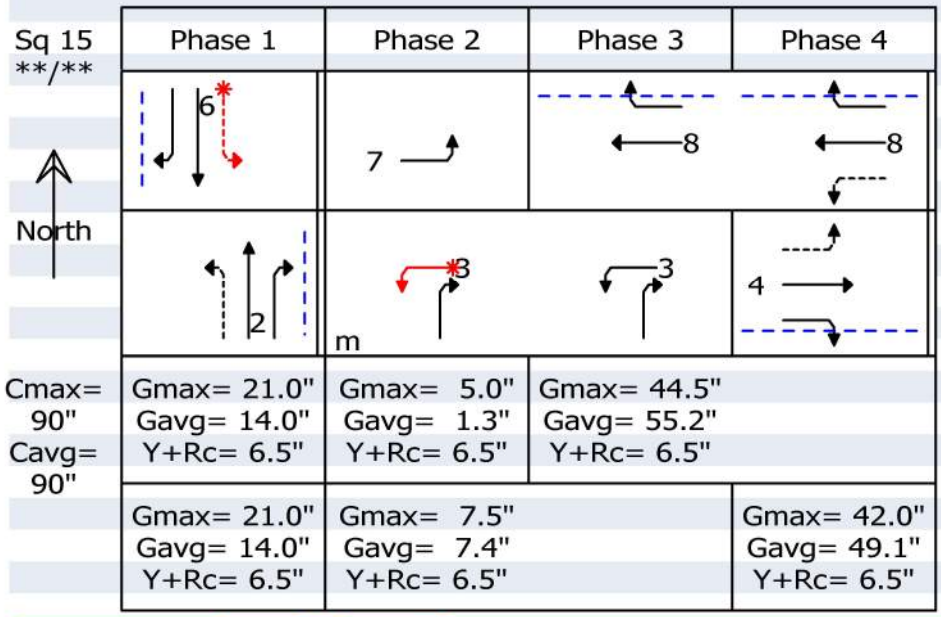
Intersection Summary	
Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 4:EBTL, Start of Green	
Natural Cycle: 90	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.80	
Intersection Signal Delay (s/veh): 21.6	Intersection LOS: C
Intersection Capacity Utilization 75.6%	ICU Level of Service D
Analysis Period (min) 15	

Splits and Phases: 4: 54th Street West & Rimrock Road

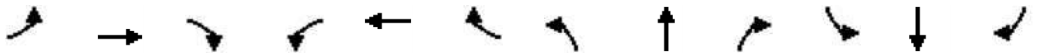


TEAPAC[Ver 9.50.02] - Capacity Analysis Summary (HCM 2016)

Intersection Averages for Int # 4 - Rimrock Rd & 54th St W
V/C 0.536 (Critical V/C 0.776) Control Delay 20.9 Level of Service C+



Lane Group	Width/ Lanes	g/C Max	g/C Avg	SatFlo	Capcty	Adj Volume	v/c	HCM Delay	L S	Queue Model 1
SB Approach								37.3	D+	
R+ T	12/1	0.233	0.156	1723	268	93	0.347	34.7	C	83 ft
L	11/1	0.233	0.156	1278	262	143	0.545	39.0	*D+	135 ft
NB Approach								36.7	D+	
R	12/1			1413	337	1	0.003	26.1	C+	1 ft
T	14/1	0.233	0.156	1666	259	25	0.096	32.7	C	22 ft
L	14/1	0.233	0.156	1108	199	57	0.286	38.6	D+	57 ft
WB Approach								11.4	B+	
R	12/1			1359	834	1	0.001	6.7	A	0 ft
T	12/1	0.494	0.613	1648	1011	299	0.296	9.0	A	121 ft
L	14/1	0.083	0.083	1634	358	195	0.544	15.1	*B	76 ft
EB Approach								20.3	C+	
R	12/1			1410	768	81	0.105	10.2	B+	36 ft
T	12/1	0.467	0.545	1691	922	698	0.757	21.6	*C+	397 ft
L	14/1	0.056	0.014	1674	638	12	0.019	8.8	A	4 ft



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	7	278	45	136	281	73	67	32	129	73	34	10
Future Volume (veh/h)	7	278	45	136	281	73	67	32	129	73	34	10
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width Adj.	1.04	1.00	1.00	1.04	1.00	1.00	1.04	1.04	1.00	1.00	1.00	1.00
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.98	1.00		0.97	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	1701	1690	1663	1728	1717	1731	1712	1741	1592	1803	1734	1831
Adj Flow Rate, veh/h	8	302	49	148	305	79	73	35	140	79	37	11
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	8	4	6	9	5	4	4	2	8	4	9	2
Cap, veh/h	548	858	715	596	971	810	252	254	283	252	187	56
Arrive On Green	0.01	0.51	0.51	0.07	0.57	0.57	0.15	0.15	0.15	0.15	0.15	0.15
Sat Flow, veh/h	1620	1690	1409	1646	1717	1434	1239	1741	1314	1163	1283	381
Grp Volume(v), veh/h	8	302	49	148	305	79	73	35	140	79	0	48
Grp Sat Flow(s),veh/h/ln	1620	1690	1409	1646	1717	1434	1239	1741	1314	1163	0	1664
Q Serve(g_s), s	0.2	7.5	1.2	2.9	6.6	1.8	3.9	1.2	6.6	4.4	0.0	1.8
Cycle Q Clear(g_c), s	0.2	7.5	1.2	2.9	6.6	1.8	5.6	1.2	6.6	5.7	0.0	1.8
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.23
Lane Grp Cap(c), veh/h	548	858	715	596	971	810	252	254	283	252	0	243
V/C Ratio(X)	0.01	0.35	0.07	0.25	0.31	0.10	0.29	0.14	0.49	0.31	0.00	0.20
Avail Cap(c_a), veh/h	647	858	715	649	971	810	443	522	486	431	0	499
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	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	8.2	10.3	8.8	7.4	8.0	7.0	28.8	26.1	24.2	28.5	0.0	26.3
Incr Delay (d2), s/veh	0.0	1.1	0.2	0.2	0.2	0.1	0.6	0.2	1.3	0.7	0.0	0.4
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	2.5	0.3	0.8	1.9	0.4	1.1	0.5	1.9	1.3	0.0	0.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	8.2	11.5	9.0	7.6	8.2	7.1	29.4	26.3	25.5	29.2	0.0	26.7
LnGrp LOS	A	B	A	A	A	A	C	C	C	C		C
Approach Vol, veh/h		359			532			248			127	
Approach Delay, s/veh		11.1			7.9			26.8			28.3	
Approach LOS		B			A			C			C	

Timer - Assigned Phs		2	3	4		6	7	8				
Phs Duration (G+Y+Rc), s		16.7	11.3	42.0		16.7	7.2	46.1				
Change Period (Y+Rc), s		6.5	6.5	6.5		6.5	6.5	6.5				
Max Green Setting (Gmax), s		21.0	7.0	22.5		21.0	5.0	24.5				
Max Q Clear Time (g_c+I1), s		8.6	4.9	9.5		7.7	2.2	8.6				
Green Ext Time (p_c), s		0.7	0.1	1.2		0.5	0.0	1.5				

Intersection Summary		
HCM 7th Control Delay, s/veh		14.5
HCM 7th LOS		B

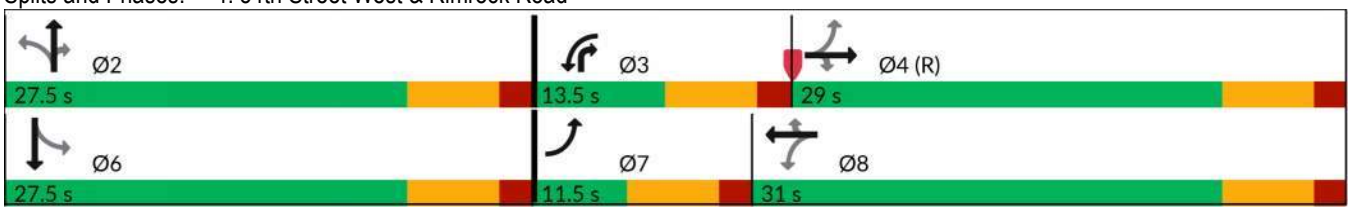
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	8	302	49	148	305	79	73	35	140	79	48
v/c Ratio	0.01	0.37	0.06	0.23	0.27	0.08	0.35	0.12	0.32	0.41	0.18
Control Delay (s/veh)	5.7	15.2	0.2	5.8	8.4	0.3	30.7	25.3	4.7	32.5	21.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	5.7	15.2	0.2	5.8	8.4	0.3	30.7	25.3	4.7	32.5	21.9
Queue Length 50th (ft)	1	82	0	21	46	0	30	14	0	33	15
Queue Length 95th (ft)	6	174	0	50	156	3	64	35	29	68	42
Internal Link Dist (ft)		2588			2504			2604			1914
Turn Bay Length (ft)	310		310	240		200	290		290	230	
Base Capacity (vph)	620	827	769	658	1145	1008	384	540	440	363	484
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.01	0.37	0.06	0.22	0.27	0.08	0.19	0.06	0.32	0.22	0.10

Intersection Summary

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations											
Traffic Volume (vph)	7	278	45	136	281	73	67	32	129	73	34
Future Volume (vph)	7	278	45	136	281	73	67	32	129	73	34
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	pm+ov	Perm	NA
Protected Phases	7	4		3	8			2	3		6
Permitted Phases	4		4	8		8	2		2	6	
Detector Phase	7	4	4	3	8	8	2	2	3	6	6
Switch Phase											
Minimum Initial (s)	5.0	15.0	15.0	5.0	15.0	15.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	11.5	27.5	27.5	11.5	24.5	24.5	27.5	27.5	11.5	24.5	24.5
Total Split (s)	11.5	29.0	29.0	13.5	31.0	31.0	27.5	27.5	13.5	27.5	27.5
Total Split (%)	16.4%	41.4%	41.4%	19.3%	44.3%	44.3%	39.3%	39.3%	19.3%	39.3%	39.3%
Yellow Time (s)	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8
All-Red Time (s)	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag			Lead		
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes			Yes		
Recall Mode	None	C-Min	C-Min	None	Min	Min	None	None	None	None	None
Act Effct Green (s)	40.3	34.6	34.6	48.7	47.9	47.9	11.2	11.2	17.2	11.2	11.2
Actuated g/C Ratio	0.58	0.49	0.49	0.70	0.68	0.68	0.16	0.16	0.25	0.16	0.16
v/c Ratio	0.01	0.37	0.06	0.23	0.27	0.08	0.35	0.12	0.32	0.41	0.18
Control Delay (s/veh)	5.7	15.2	0.2	5.8	8.4	0.3	30.7	25.3	4.7	32.5	21.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	5.7	15.2	0.2	5.8	8.4	0.3	30.7	25.3	4.7	32.5	21.9
LOS	A	B	A	A	A	A	C	C	A	C	C
Approach Delay (s/veh)		13.0			6.5			15.3			28.5
Approach LOS		B			A			B			C

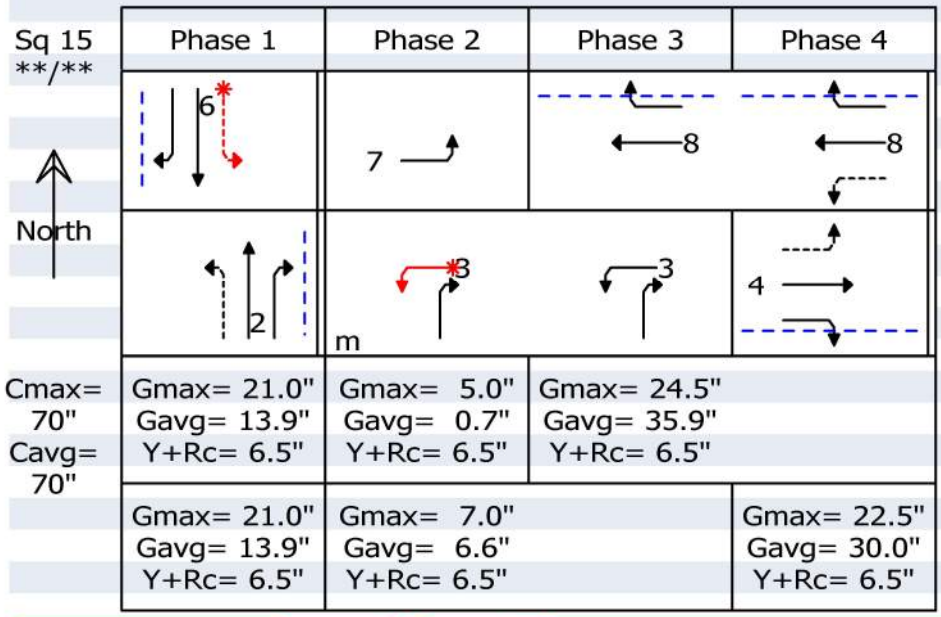
Intersection Summary	
Cycle Length: 70	
Actuated Cycle Length: 70	
Offset: 0 (0%), Referenced to phase 4:EBTL, Start of Green	
Natural Cycle: 70	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.41	
Intersection Signal Delay (s/veh): 12.2	Intersection LOS: B
Intersection Capacity Utilization 51.5%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 4: 54th Street West & Rimrock Road

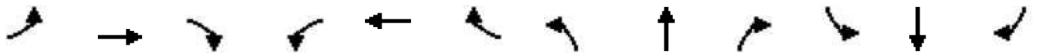


TEAPAC[Ver 9.50.02] - Capacity Analysis Summary (HCM 2016)

Intersection Averages for Int # 4 - Rimrock Rd & 54th St W
V/C 0.309 (Critical V/C 0.468) Control Delay 15.3 Level of Service B



Lane Group	Width/ Lanes	g/C Max	g/C Avg	SatFlo	Capcty	Adj Volume	v/c	HCM Delay	L S	Queue Model 1
SB Approach								24.7	C+	
R+ T	12/1	0.300	0.198	1625	322	38	0.118	23.2	C+	24 ft
L	11/1	0.300	0.198	1228	327	79	0.242	25.4	*C+	51 ft
NB Approach								23.5	C+	
R	12/1			1322	390	22	0.056	17.9	B	12 ft
T	14/1	0.300	0.198	1758	349	35	0.100	23.1	C+	21 ft
L	14/1	0.300	0.198	1262	329	73	0.222	25.4	C+	47 ft
WB Approach								10.6	B+	
R	12/1			1407	722	1	0.001	8.3	A	0 ft
T	12/1	0.350	0.513	1680	861	305	0.354	11.3	B+	122 ft
L	14/1	0.100	0.094	1600	537	148	0.276	9.2	*A	46 ft
EB Approach								15.3	B	
R	12/1			1398	599	37	0.062	11.9	B+	16 ft
T	12/1	0.321	0.429	1668	715	302	0.422	15.8	*B	145 ft
L	14/1	0.071	0.010	1598	509	8	0.016	11.1	B+	3 ft



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	25	317	62	256	542	161	107	76	198	94	71	18
Future Volume (veh/h)	25	317	62	256	542	161	107	76	198	94	71	18
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width Adj.	1.04	1.00	1.00	1.04	1.00	1.00	1.04	1.04	1.00	1.00	1.00	1.00
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.98	0.98		0.98	0.99		0.95
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1800	1704	1717	1815	1759	1772	1741	1755	1660	1831	1845	1831
Adj Flow Rate, veh/h	27	341	67	275	583	173	115	82	213	101	76	19
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	1	3	2	3	2	1	2	1	3	2	1	2
Cap, veh/h	318	727	621	537	868	725	285	349	409	270	280	70
Arrive On Green	0.03	0.43	0.43	0.10	0.49	0.49	0.20	0.20	0.20	0.20	0.20	0.20
Sat Flow, veh/h	1714	1704	1455	1728	1759	1469	1192	1755	1379	1049	1409	352
Grp Volume(v), veh/h	27	341	67	275	583	173	115	82	213	101	0	95
Grp Sat Flow(s),veh/h/ln	1714	1704	1455	1728	1759	1469	1192	1755	1379	1049	0	1762
Q Serve(g_s), s	0.6	10.0	1.9	6.3	17.6	4.7	6.3	2.7	9.0	6.3	0.0	3.2
Cycle Q Clear(g_c), s	0.6	10.0	1.9	6.3	17.6	4.7	9.5	2.7	9.0	9.0	0.0	3.2
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.20
Lane Grp Cap(c), veh/h	318	727	621	537	868	725	285	349	409	270	0	350
V/C Ratio(X)	0.08	0.47	0.11	0.51	0.67	0.24	0.40	0.24	0.52	0.37	0.00	0.27
Avail Cap(c_a), veh/h	391	727	621	537	868	725	406	527	548	376	0	529
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	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	11.8	14.4	12.0	10.4	13.4	10.2	27.8	23.6	20.6	27.4	0.0	23.8
Incr Delay (d2), s/veh	0.1	2.2	0.3	0.8	2.0	0.2	0.9	0.3	1.0	0.9	0.0	0.4
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.2	3.7	0.6	2.0	6.0	1.3	1.7	1.1	2.7	1.6	0.0	1.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	11.9	16.5	12.4	11.3	15.5	10.3	28.7	23.9	21.6	28.2	0.0	24.2
LnGrp LOS	B	B	B	B	B	B	C	C	C	C		C
Approach Vol, veh/h		435			1031			410			196	
Approach Delay, s/veh		15.6			13.5			24.1			26.3	
Approach LOS		B			B			C			C	

Timer - Assigned Phs		2	3	4		6	7	8				
Phs Duration (G+Y+Rc), s		20.4	13.2	36.4		20.4	8.5	41.0				
Change Period (Y+Rc), s		6.5	6.5	6.5		6.5	6.5	6.5				
Max Green Setting (Gmax), s		21.0	6.7	22.8		21.0	5.0	24.5				
Max Q Clear Time (g_c+I1), s		11.5	8.3	12.0		11.0	2.6	19.6				
Green Ext Time (p_c), s		1.2	0.0	1.3		0.7	0.0	1.7				

Intersection Summary	
HCM 7th Control Delay, s/veh	17.2
HCM 7th LOS	B

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	27	341	67	275	583	173	115	82	213	101	95
v/c Ratio	0.06	0.44	0.09	0.43	0.54	0.18	0.52	0.25	0.33	0.47	0.30
Control Delay (s/veh)	7.0	18.7	0.2	8.1	16.4	3.2	33.9	25.5	3.2	32.6	22.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	7.0	18.7	0.2	8.1	16.4	3.2	33.9	25.5	3.2	32.6	22.3
Queue Length 50th (ft)	4	108	0	44	117	0	47	31	0	41	30
Queue Length 95th (ft)	14	210	0	97	#424	35	87	61	31	78	62
Internal Link Dist (ft)		2588			2504			2604			1914
Turn Bay Length (ft)	310		310	240		200	290		290	230	
Base Capacity (vph)	490	767	743	643	1078	969	370	546	651	355	519
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.06	0.44	0.09	0.43	0.54	0.18	0.31	0.15	0.33	0.28	0.18

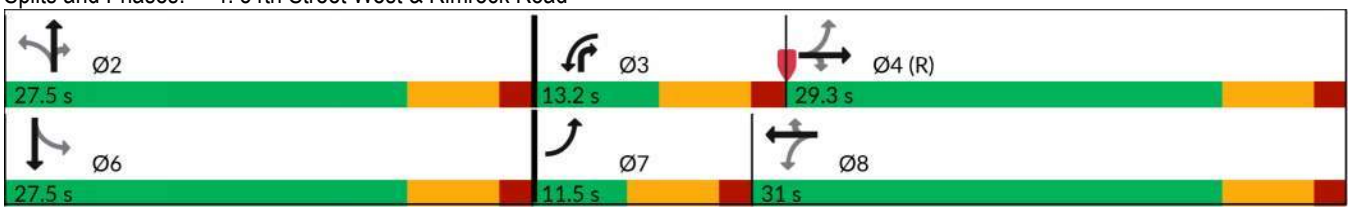
Intersection Summary

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

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations											
Traffic Volume (vph)	25	317	62	256	542	161	107	76	198	94	71
Future Volume (vph)	25	317	62	256	542	161	107	76	198	94	71
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	pm+ov	Perm	NA
Protected Phases	7	4		3	8			2	3		6
Permitted Phases	4		4	8		8	2		2	6	
Detector Phase	7	4	4	3	8	8	2	2	3	6	6
Switch Phase											
Minimum Initial (s)	5.0	15.0	15.0	5.0	15.0	15.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	11.5	27.5	27.5	11.5	24.5	24.5	27.5	27.5	11.5	24.5	24.5
Total Split (s)	11.5	29.3	29.3	13.2	31.0	31.0	27.5	27.5	13.2	27.5	27.5
Total Split (%)	16.4%	41.9%	41.9%	18.9%	44.3%	44.3%	39.3%	39.3%	18.9%	39.3%	39.3%
Yellow Time (s)	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8
All-Red Time (s)	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag			Lead		
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes			Yes		
Recall Mode	None	C-Min	C-Min	None	Min	Min	None	None	None	None	None
Act Effct Green (s)	37.7	31.8	31.8	47.0	43.8	43.8	12.6	12.6	25.2	12.6	12.6
Actuated g/C Ratio	0.54	0.45	0.45	0.67	0.63	0.63	0.18	0.18	0.36	0.18	0.18
v/c Ratio	0.06	0.44	0.09	0.43	0.54	0.18	0.52	0.25	0.33	0.47	0.30
Control Delay (s/veh)	7.0	18.7	0.2	8.1	16.4	3.2	33.9	25.5	3.2	32.6	22.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	7.0	18.7	0.2	8.1	16.4	3.2	33.9	25.5	3.2	32.6	22.3
LOS	A	B	A	A	B	A	C	C	A	C	C
Approach Delay (s/veh)		15.1			12.0			16.3			27.6
Approach LOS		B			B			B			C

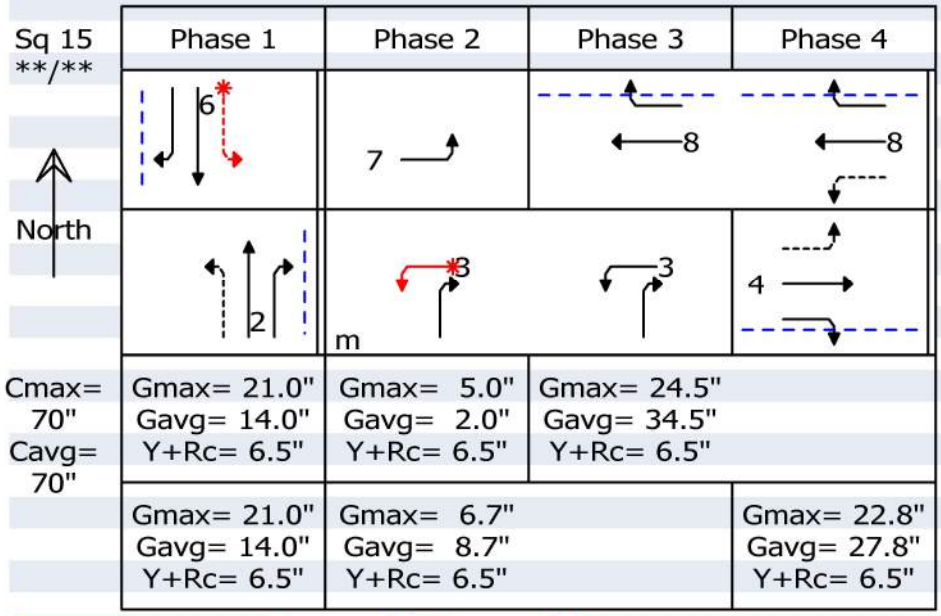
Intersection Summary	
Cycle Length: 70	
Actuated Cycle Length: 70	
Offset: 0 (0%), Referenced to phase 4:EBTL, Start of Green	
Natural Cycle: 75	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.54	
Intersection Signal Delay (s/veh): 15.0	Intersection LOS: B
Intersection Capacity Utilization 64.5%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 4: 54th Street West & Rimrock Road

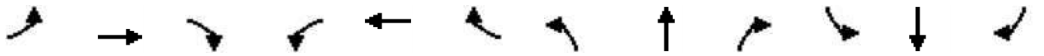


TEAPAC[Ver 9.50.02] - Capacity Analysis Summary (HCM 2016)

Intersection Averages for Int # 4 - Rimrock Rd & 54th St W
V/C 0.489 (Critical V/C 0.619) Control Delay 18.5 Level of Service B



Lane Group	Width/ Lanes	g/C Max	g/C Avg	SatFlo	Capcty	Adj Volume	v/c	HCM Delay	L S	Queue Model 1
SB Approach								26.0	C+	
R+ T	12/1	0.300	0.200	1726	345	82	0.238	23.9	C+	50 ft
L	11/1	0.300	0.200	1146	288	101	0.351	27.7	*C	69 ft
NB Approach								23.8	C+	
R	12/1			1428	462	72	0.156	17.0	B	36 ft
T	14/1	0.300	0.200	1789	358	82	0.229	23.8	C+	50 ft
L	14/1	0.300	0.200	1220	298	115	0.386	28.1	C	79 ft
WB Approach								15.7	B	
R	12/1			1452	715	1	0.001	9.0	A	0 ft
T	12/1	0.350	0.492	1731	852	583	0.684	18.0	B	262 ft
L	14/1	0.096	0.124	1698	545	275	0.505	10.8	*B+	89 ft
EB Approach								17.6	B	
R	12/1			1445	575	53	0.092	13.5	B+	24 ft
T	12/1	0.326	0.398	1691	673	341	0.507	18.6	*B	173 ft
L	14/1	0.071	0.029	1703	339	27	0.080	12.7	B+	10 ft



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	13	606	87	184	259	52	53	25	299	137	83	12
Future Volume (veh/h)	13	606	87	184	259	52	53	25	299	137	83	12
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width Adj.	1.04	1.00	1.00	1.04	1.00	1.00	1.04	1.04	1.00	1.00	1.00	1.00
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		0.97	0.99		0.98	0.99		0.96
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1772	1704	1676	1757	1689	1689	1613	1670	1647	1817	1831	1817
Adj Flow Rate, veh/h	16	730	105	222	312	63	64	30	360	165	100	14
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Percent Heavy Veh, %	3	3	5	7	7	7	11	7	4	3	2	3
Cap, veh/h	516	795	659	261	898	741	277	390	436	289	364	51
Arrive On Green	0.02	0.47	0.47	0.08	0.53	0.53	0.23	0.23	0.23	0.23	0.23	0.23
Sat Flow, veh/h	1687	1704	1413	1673	1689	1395	1088	1670	1368	955	1562	219
Grp Volume(v), veh/h	16	730	105	222	312	63	64	30	360	165	0	114
Grp Sat Flow(s),veh/h/ln	1687	1704	1413	1673	1689	1395	1088	1670	1368	955	0	1780
Q Serve(g_s), s	0.4	36.0	3.9	6.0	9.5	2.0	4.6	1.3	21.0	14.7	0.0	4.7
Cycle Q Clear(g_c), s	0.4	36.0	3.9	6.0	9.5	2.0	9.3	1.3	21.0	15.9	0.0	4.7
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.12
Lane Grp Cap(c), veh/h	516	795	659	261	898	741	277	390	436	289	0	415
V/C Ratio(X)	0.03	0.92	0.16	0.85	0.35	0.08	0.23	0.08	0.83	0.57	0.00	0.27
Avail Cap(c_a), veh/h	579	795	659	261	898	741	277	390	436	289	0	415
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	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	12.1	22.4	13.8	19.7	12.1	10.3	32.1	26.9	28.5	33.2	0.0	28.3
Incr Delay (d2), s/veh	0.0	17.3	0.5	22.7	0.2	0.0	0.4	0.1	12.4	2.7	0.0	0.4
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.2	16.3	1.2	3.5	3.2	0.5	1.2	0.5	8.1	3.6	0.0	2.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	12.2	39.7	14.3	42.4	12.3	10.4	32.5	27.0	40.9	35.8	0.0	28.6
LnGrp LOS	B	D	B	D	B	B	C	C	D	D		C
Approach Vol, veh/h		851			597			454			279	
Approach Delay, s/veh		36.0			23.3			38.8			32.9	
Approach LOS		D			C			D			C	

Timer - Assigned Phs		2	3	4		6	7	8				
Phs Duration (G+Y+Rc), s		27.5	14.0	48.5		27.5	8.1	54.4				
Change Period (Y+Rc), s		6.5	6.5	6.5		6.5	6.5	6.5				
Max Green Setting (Gmax), s		21.0	7.5	42.0		21.0	5.0	44.5				
Max Q Clear Time (g_c+I1), s		23.0	8.0	38.0		17.9	2.4	11.5				
Green Ext Time (p_c), s		0.0	0.0	1.6		0.5	0.0	1.8				

Intersection Summary	
HCM 7th Control Delay, s/veh	32.7
HCM 7th LOS	C

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	16	730	105	222	312	63	64	30	360	165	114
v/c Ratio	0.03	0.87	0.14	0.69	0.29	0.07	0.31	0.10	0.61	0.73	0.36
Control Delay (s/veh)	6.8	34.7	2.5	22.0	9.6	0.4	34.4	29.0	18.2	52.8	32.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	6.8	34.7	2.5	22.0	9.6	0.4	34.4	29.0	18.2	52.8	32.0
Queue Length 50th (ft)	3	384	0	46	68	0	34	15	96	91	54
Queue Length 95th (ft)	10	#544	17	#136	159	0	65	35	160	139	90
Internal Link Dist (ft)		2588			2504			2604			1914
Turn Bay Length (ft)	310		310	240		200	290		290	230	
Base Capacity (vph)	611	839	760	323	1062	915	259	400	595	287	401
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.03	0.87	0.14	0.69	0.29	0.07	0.25	0.08	0.61	0.57	0.28

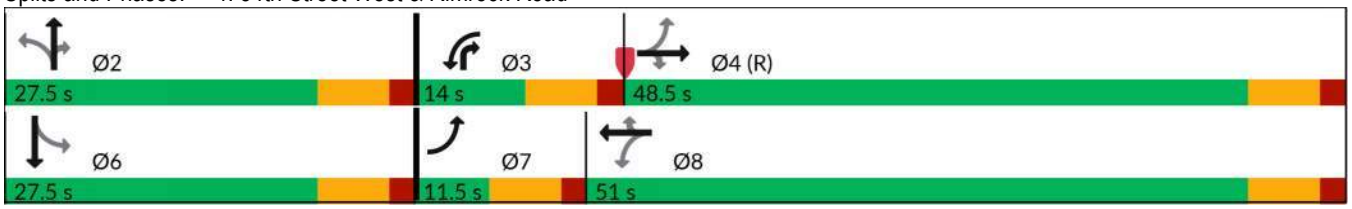
Intersection Summary

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

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations											
Traffic Volume (vph)	13	606	87	184	259	52	53	25	299	137	83
Future Volume (vph)	13	606	87	184	259	52	53	25	299	137	83
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	pm+ov	Perm	NA
Protected Phases	7	4		3	8			2	3		6
Permitted Phases	4		4	8		8	2		2	6	
Detector Phase	7	4	4	3	8	8	2	2	3	6	6
Switch Phase											
Minimum Initial (s)	5.0	15.0	15.0	5.0	15.0	15.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	11.5	27.5	27.5	11.5	24.5	24.5	27.5	27.5	11.5	24.5	24.5
Total Split (s)	11.5	48.5	48.5	14.0	51.0	51.0	27.5	27.5	14.0	27.5	27.5
Total Split (%)	12.8%	53.9%	53.9%	15.6%	56.7%	56.7%	30.6%	30.6%	15.6%	30.6%	30.6%
Yellow Time (s)	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8
All-Red Time (s)	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag			Lead		
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes			Yes		
Recall Mode	None	C-Min	C-Min	None	Min	Min	None	None	None	None	None
Act Effct Green (s)	50.2	44.7	44.7	59.7	58.2	58.2	16.5	16.5	32.3	16.5	16.5
Actuated g/C Ratio	0.56	0.50	0.50	0.66	0.65	0.65	0.18	0.18	0.36	0.18	0.18
v/c Ratio	0.03	0.87	0.14	0.69	0.29	0.07	0.31	0.10	0.61	0.73	0.36
Control Delay (s/veh)	6.8	34.7	2.5	22.0	9.6	0.4	34.4	29.0	18.2	52.8	32.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	6.8	34.7	2.5	22.0	9.6	0.4	34.4	29.0	18.2	52.8	32.0
LOS	A	C	A	C	A	A	C	C	B	D	C
Approach Delay (s/veh)		30.2			13.2			21.2			44.3
Approach LOS		C			B			C			D

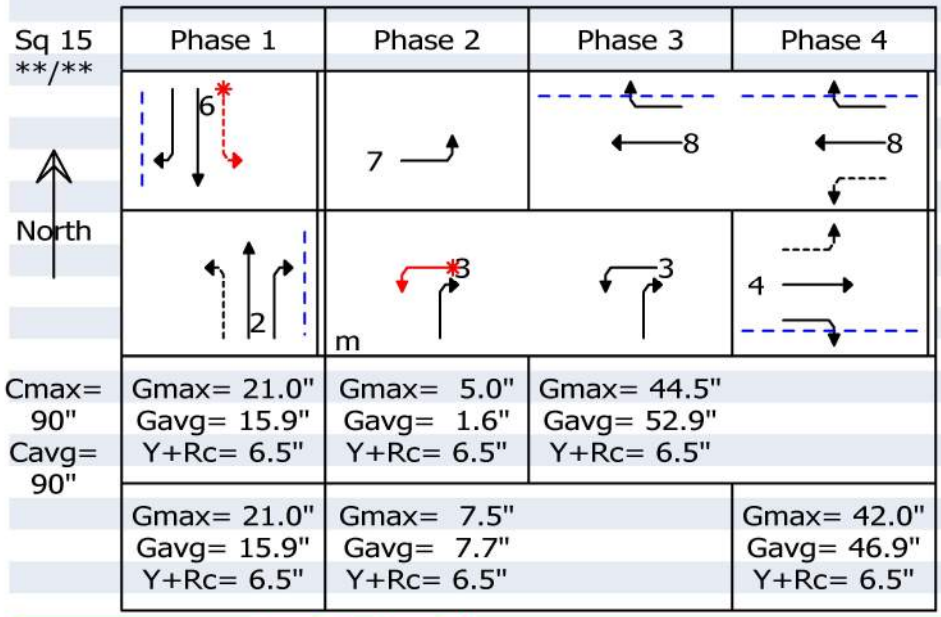
Intersection Summary	
Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 4:EBTL, Start of Green	
Natural Cycle: 90	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.87	
Intersection Signal Delay (s/veh): 25.5	Intersection LOS: C
Intersection Capacity Utilization 79.3%	ICU Level of Service D
Analysis Period (min) 15	

Splits and Phases: 4: 54th Street West & Rimrock Road

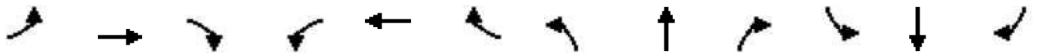


TEAPAC[Ver 9.50.02] - Capacity Analysis Summary (HCM 2016)

Intersection Averages for Int # 4 - Rimrock Rd & 54th St W
V/C 0.585 (Critical V/C 0.827) Control Delay 24.2 Level of Service C+



Lane Group	Width/ Lanes	g/C Max	g/C Avg	SatFlo	Capcty	Adj Volume	v/c	HCM Delay	L S	Queue Model 1
SB Approach								36.4	D+	
R+ T	12/1	0.233	0.177	1716	303	106	0.349	33.2	C	93 ft
L	11/1	0.233	0.177	1245	281	165	0.586	38.4	*D+	152 ft
NB Approach								33.3	C	
R	12/1			1413	371	25	0.067	25.0	C+	18 ft
T	14/1	0.233	0.177	1671	295	30	0.102	31.2	C	26 ft
L	14/1	0.233	0.177	1098	215	64	0.298	37.6	D+	63 ft
WB Approach								14.8	B+	
R	12/1			1364	802	1	0.001	7.6	A	0 ft
T	12/1	0.494	0.588	1648	969	312	0.322	10.3	B+	136 ft
L	14/1	0.083	0.086	1634	316	222	0.703	21.2	*C+	121 ft
EB Approach								25.0	C+	
R	12/1			1410	734	94	0.128	11.4	B+	45 ft
T	12/1	0.467	0.521	1691	880	730	0.829	27.1	*C+	466 ft
L	14/1	0.056	0.018	1674	603	16	0.027	9.7	A	6 ft



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	8	289	52	153	293	83	77	36	145	82	38	12
Future Volume (veh/h)	8	289	52	153	293	83	77	36	145	82	38	12
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width Adj.	1.04	1.00	1.00	1.04	1.00	1.00	1.04	1.04	1.00	1.00	1.00	1.00
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.98	1.00		0.97	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	1715	1690	1663	1728	1717	1731	1712	1741	1578	1803	1734	1831
Adj Flow Rate, veh/h	9	314	57	166	318	90	84	39	158	89	41	13
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	7	4	6	9	5	4	4	2	9	4	9	2
Cap, veh/h	534	839	700	583	961	803	253	261	296	252	189	60
Arrive On Green	0.01	0.50	0.50	0.07	0.56	0.56	0.15	0.15	0.15	0.15	0.15	0.15
Sat Flow, veh/h	1633	1690	1409	1646	1717	1434	1233	1741	1303	1140	1261	400
Grp Volume(v), veh/h	9	314	57	166	318	90	84	39	158	89	0	54
Grp Sat Flow(s),veh/h/ln	1633	1690	1409	1646	1717	1434	1233	1741	1303	1140	0	1661
Q Serve(g_s), s	0.2	8.0	1.5	3.4	7.0	2.1	4.5	1.4	7.5	5.2	0.0	2.0
Cycle Q Clear(g_c), s	0.2	8.0	1.5	3.4	7.0	2.1	6.5	1.4	7.5	6.5	0.0	2.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.24
Lane Grp Cap(c), veh/h	534	839	700	583	961	803	253	261	296	252	0	249
V/C Ratio(X)	0.02	0.37	0.08	0.28	0.33	0.11	0.33	0.15	0.53	0.35	0.00	0.22
Avail Cap(c_a), veh/h	632	839	700	624	961	803	437	522	491	423	0	498
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	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	8.6	10.9	9.2	7.7	8.3	7.2	29.0	25.9	23.9	28.7	0.0	26.1
Incr Delay (d2), s/veh	0.0	1.3	0.2	0.3	0.2	0.1	0.8	0.3	1.5	0.8	0.0	0.4
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	2.7	0.4	0.9	2.0	0.5	1.3	0.5	2.2	1.4	0.0	0.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	8.6	12.2	9.5	8.0	8.5	7.3	29.8	26.1	25.4	29.5	0.0	26.6
LnGrp LOS	A	B	A	A	A	A	C	C	C	C		C
Approach Vol, veh/h		380			574			281			143	
Approach Delay, s/veh		11.7			8.2			26.8			28.4	
Approach LOS		B			A			C			C	

Timer - Assigned Phs		2	3	4		6	7	8				
Phs Duration (G+Y+Rc), s		17.0	11.7	41.3		17.0	7.3	45.7				
Change Period (Y+Rc), s		6.5	6.5	6.5		6.5	6.5	6.5				
Max Green Setting (Gmax), s		21.0	7.0	22.5		21.0	5.0	24.5				
Max Q Clear Time (g_c+I1), s		9.5	5.4	10.0		8.5	2.2	9.0				
Green Ext Time (p_c), s		0.8	0.1	1.2		0.5	0.0	1.6				

Intersection Summary												
HCM 7th Control Delay, s/veh			15.0									
HCM 7th LOS			B									

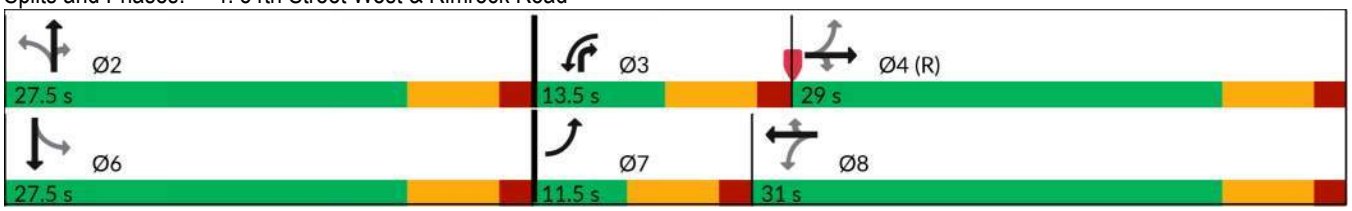
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	9	314	57	166	318	90	84	39	158	89	54
v/c Ratio	0.01	0.39	0.08	0.26	0.28	0.09	0.40	0.13	0.34	0.44	0.20
Control Delay (s/veh)	6.3	16.3	0.2	6.2	8.8	0.7	31.2	24.8	4.5	33.0	21.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	6.3	16.3	0.2	6.2	8.8	0.7	31.2	24.8	4.5	33.0	21.3
Queue Length 50th (ft)	1	89	0	24	49	0	35	15	0	37	17
Queue Length 95th (ft)	7	190	0	58	168	7	70	37	29	74	44
Internal Link Dist (ft)		2588			2504			2604			1914
Turn Bay Length (ft)	310		310	240		200	290		290	230	
Base Capacity (vph)	610	808	754	644	1134	1000	382	540	463	362	485
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.01	0.39	0.08	0.26	0.28	0.09	0.22	0.07	0.34	0.25	0.11

Intersection Summary

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations											
Traffic Volume (vph)	8	289	52	153	293	83	77	36	145	82	38
Future Volume (vph)	8	289	52	153	293	83	77	36	145	82	38
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	pm+ov	Perm	NA
Protected Phases	7	4		3	8			2	3		6
Permitted Phases	4		4	8		8	2		2	6	
Detector Phase	7	4	4	3	8	8	2	2	3	6	6
Switch Phase											
Minimum Initial (s)	5.0	15.0	15.0	5.0	15.0	15.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	11.5	27.5	27.5	11.5	24.5	24.5	27.5	27.5	11.5	24.5	24.5
Total Split (s)	11.5	29.0	29.0	13.5	31.0	31.0	27.5	27.5	13.5	27.5	27.5
Total Split (%)	16.4%	41.4%	41.4%	19.3%	44.3%	44.3%	39.3%	39.3%	19.3%	39.3%	39.3%
Yellow Time (s)	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8
All-Red Time (s)	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag			Lead		
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes			Yes		
Recall Mode	None	C-Min	C-Min	None	Min	Min	None	None	None	None	None
Act Effct Green (s)	39.5	33.8	33.8	48.4	47.4	47.4	11.7	11.7	18.0	11.7	11.7
Actuated g/C Ratio	0.56	0.48	0.48	0.69	0.68	0.68	0.17	0.17	0.26	0.17	0.17
v/c Ratio	0.01	0.39	0.08	0.26	0.28	0.09	0.40	0.13	0.34	0.44	0.20
Control Delay (s/veh)	6.3	16.3	0.2	6.2	8.8	0.7	31.2	24.8	4.5	33.0	21.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	6.3	16.3	0.2	6.2	8.8	0.7	31.2	24.8	4.5	33.0	21.3
LOS	A	B	A	A	A	A	C	C	A	C	C
Approach Delay (s/veh)		13.6			6.8			15.3			28.6
Approach LOS		B			A			B			C

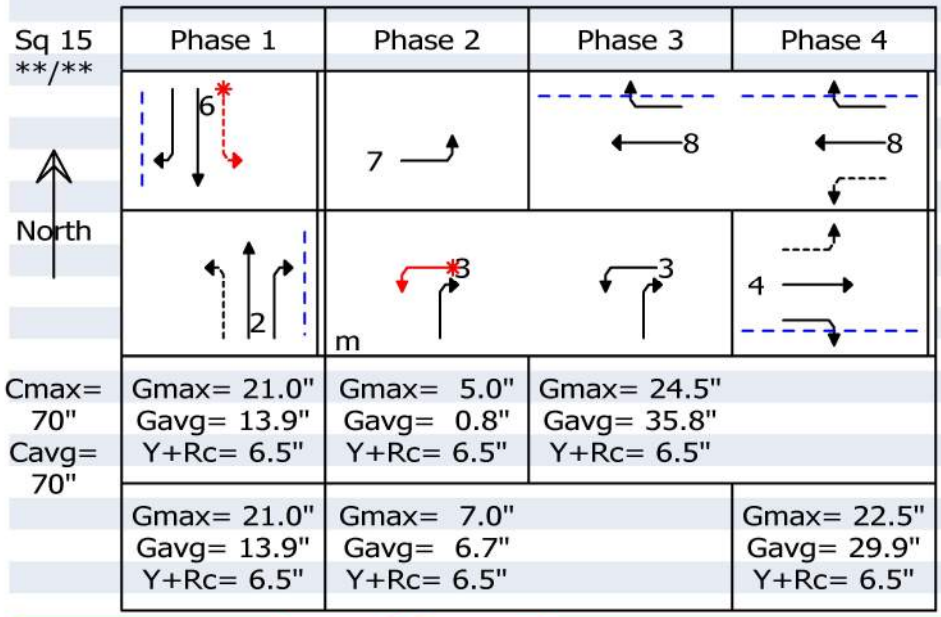
Intersection Summary	
Cycle Length: 70	
Actuated Cycle Length: 70	
Offset: 0 (0%), Referenced to phase 4:EBTL, Start of Green	
Natural Cycle: 70	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.44	
Intersection Signal Delay (s/veh): 12.7	Intersection LOS: B
Intersection Capacity Utilization 53.7%	ICU Level of Service A
Analysis Period (min) 15	

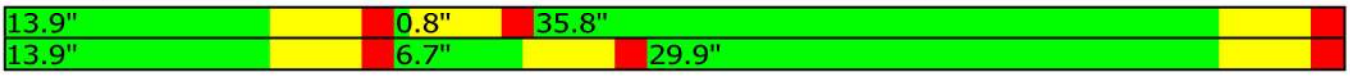
Splits and Phases: 4: 54th Street West & Rimrock Road



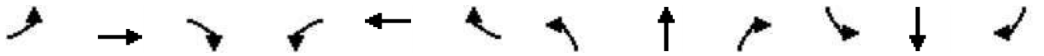
TEAPAC[Ver 9.50.02] - Capacity Analysis Summary (HCM 2016)

Intersection Averages for Int # 4 - Rimrock Rd & 54th St W
V/C 0.332 (Critical V/C 0.499) Control Delay 15.6 Level of Service B





Lane Group	Width/ Lanes	g/C Max	g/C Avg	SatFlo	Capcty	Adj Volume	v/c	HCM Delay	L S	Queue Model 1
SB Approach								25.0	C+	
R+ T	12/1	0.300	0.199	1630	324	42	0.130	23.3	C+	26 ft
L	11/1	0.300	0.199	1247	328	89	0.271	25.8	*C+	59 ft
NB Approach								24.9	C+	
R	12/1			1320	392	1	0.003	17.4	B	1 ft
T	14/1	0.300	0.199	1758	349	39	0.112	23.1	C+	23 ft
L	14/1	0.300	0.199	1256	326	84	0.258	25.8	C+	55 ft
WB Approach								10.8	B+	
R	12/1			1409	720	1	0.001	8.4	A	0 ft
T	12/1	0.350	0.511	1680	859	318	0.370	11.5	B+	127 ft
L	14/1	0.100	0.096	1597	526	166	0.316	9.5	*A	53 ft
EB Approach								15.5	B	
R	12/1			1398	596	43	0.072	12.1	B+	18 ft
T	12/1	0.321	0.427	1669	713	314	0.441	16.1	*B	151 ft
L	14/1	0.071	0.011	1607	501	9	0.018	11.2	B+	3 ft



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	30	333	71	286	566	184	123	85	223	108	78	23
Future Volume (veh/h)	30	333	71	286	566	184	123	85	223	108	78	23
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width Adj.	1.04	1.00	1.00	1.04	1.00	1.00	1.04	1.04	1.00	1.00	1.00	1.00
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.98	0.98		0.98	0.99		0.95
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1800	1704	1717	1815	1759	1772	1741	1755	1660	1831	1845	1831
Adj Flow Rate, veh/h	32	358	76	308	609	198	132	91	240	116	84	25
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	1	3	2	3	2	1	2	1	3	2	1	2
Cap, veh/h	280	690	590	497	823	687	301	387	438	283	297	88
Arrive On Green	0.03	0.41	0.41	0.10	0.47	0.47	0.22	0.22	0.22	0.22	0.22	0.22
Sat Flow, veh/h	1714	1704	1455	1728	1759	1468	1175	1755	1375	1014	1348	401
Grp Volume(v), veh/h	32	358	76	308	609	198	132	91	240	116	0	109
Grp Sat Flow(s),veh/h/ln	1714	1704	1455	1728	1759	1468	1175	1755	1375	1014	0	1749
Q Serve(g_s), s	0.7	11.1	2.3	6.7	19.7	5.8	7.4	3.0	10.1	7.4	0.0	3.6
Cycle Q Clear(g_c), s	0.7	11.1	2.3	6.7	19.7	5.8	11.0	3.0	10.1	10.4	0.0	3.6
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.23
Lane Grp Cap(c), veh/h	280	690	590	497	823	687	301	387	438	283	0	386
V/C Ratio(X)	0.11	0.52	0.13	0.62	0.74	0.29	0.44	0.24	0.55	0.41	0.00	0.28
Avail Cap(c_a), veh/h	346	690	590	497	823	687	394	527	547	364	0	525
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	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	13.0	15.7	13.1	12.9	15.2	11.5	27.2	22.4	19.8	26.7	0.0	22.7
Incr Delay (d2), s/veh	0.2	2.8	0.5	2.4	3.6	0.2	1.0	0.3	1.1	0.9	0.0	0.4
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.3	4.2	0.7	2.6	7.1	1.6	2.0	1.1	3.0	1.8	0.0	1.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	13.2	18.5	13.5	15.3	18.8	11.7	28.2	22.7	20.9	27.7	0.0	23.1
LnGrp LOS	B	B	B	B	B	B	C	C	C	C		C
Approach Vol, veh/h		466			1115			463			225	
Approach Delay, s/veh		17.3			16.5			23.4			25.4	
Approach LOS		B			B			C			C	

Timer - Assigned Phs		2	3	4		6	7	8				
Phs Duration (G+Y+Rc), s		21.9	13.2	34.9		21.9	8.8	39.2				
Change Period (Y+Rc), s		6.5	6.5	6.5		6.5	6.5	6.5				
Max Green Setting (Gmax), s		21.0	6.7	22.8		21.0	5.0	24.5				
Max Q Clear Time (g_c+I1), s		13.0	8.7	13.1		12.4	2.7	21.7				
Green Ext Time (p_c), s		1.2	0.0	1.3		0.8	0.0	1.2				

Intersection Summary	
HCM 7th Control Delay, s/veh	19.0
HCM 7th LOS	B

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	32	358	76	308	609	198	132	91	240	116	109
v/c Ratio	0.07	0.49	0.11	0.50	0.58	0.21	0.57	0.26	0.35	0.52	0.32
Control Delay (s/veh)	7.5	20.3	0.3	10.4	18.4	3.3	34.6	24.7	3.1	32.9	21.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	7.5	20.3	0.3	10.4	18.4	3.3	34.6	24.7	3.1	32.9	21.2
Queue Length 50th (ft)	5	123	0	53	132	0	54	34	0	47	33
Queue Length 95th (ft)	17	222	1	116	#472	39	96	65	33	86	67
Internal Link Dist (ft)		2588			2504			2604			1914
Turn Bay Length (ft)	310		310	240		200	290		290	230	
Base Capacity (vph)	456	735	719	612	1056	963	365	546	688	352	518
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.07	0.49	0.11	0.50	0.58	0.21	0.36	0.17	0.35	0.33	0.21

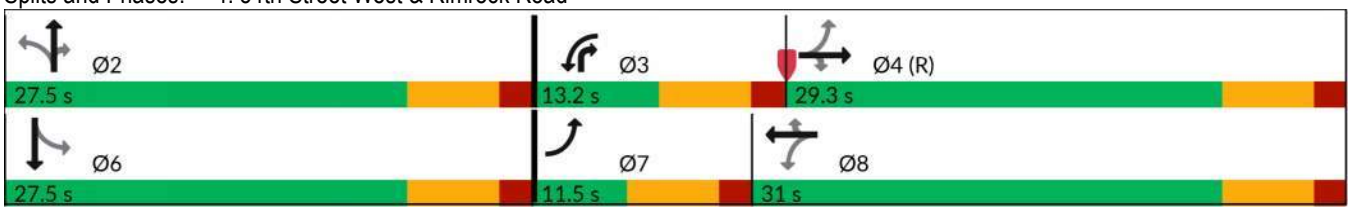
Intersection Summary

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

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations											
Traffic Volume (vph)	30	333	71	286	566	184	123	85	223	108	78
Future Volume (vph)	30	333	71	286	566	184	123	85	223	108	78
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	pm+ov	Perm	NA
Protected Phases	7	4		3	8			2	3		6
Permitted Phases	4		4	8		8	2		2	6	
Detector Phase	7	4	4	3	8	8	2	2	3	6	6
Switch Phase											
Minimum Initial (s)	5.0	15.0	15.0	5.0	15.0	15.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	11.5	27.5	27.5	11.5	24.5	24.5	27.5	27.5	11.5	24.5	24.5
Total Split (s)	11.5	29.3	29.3	13.2	31.0	31.0	27.5	27.5	13.2	27.5	27.5
Total Split (%)	16.4%	41.9%	41.9%	18.9%	44.3%	44.3%	39.3%	39.3%	18.9%	39.3%	39.3%
Yellow Time (s)	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8
All-Red Time (s)	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag			Lead		
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes			Yes		
Recall Mode	None	C-Min	C-Min	None	Min	Min	None	None	None	None	None
Act Effct Green (s)	36.5	30.4	30.4	45.9	42.9	42.9	13.4	13.4	26.6	13.4	13.4
Actuated g/C Ratio	0.52	0.43	0.43	0.66	0.61	0.61	0.19	0.19	0.38	0.19	0.19
v/c Ratio	0.07	0.49	0.11	0.50	0.58	0.21	0.57	0.26	0.35	0.52	0.32
Control Delay (s/veh)	7.5	20.3	0.3	10.4	18.4	3.3	34.6	24.7	3.1	32.9	21.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	7.5	20.3	0.3	10.4	18.4	3.3	34.6	24.7	3.1	32.9	21.2
LOS	A	C	A	B	B	A	C	C	A	C	C
Approach Delay (s/veh)		16.2			13.5			16.3			27.2
Approach LOS		B			B			B			C

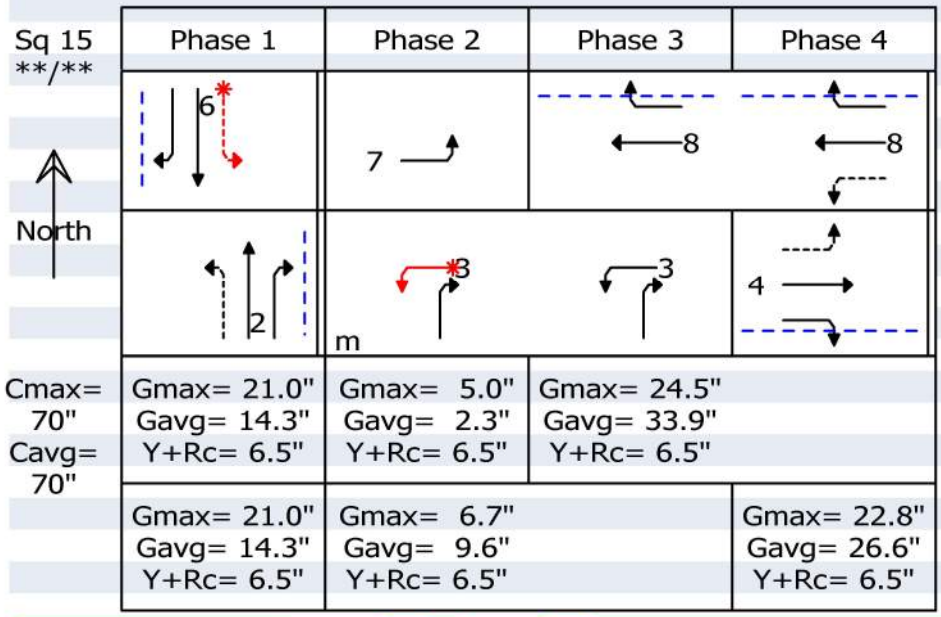
Intersection Summary	
Cycle Length: 70	
Actuated Cycle Length: 70	
Offset: 0 (0%), Referenced to phase 4:EBTL, Start of Green	
Natural Cycle: 75	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.58	
Intersection Signal Delay (s/veh): 16.0	Intersection LOS: B
Intersection Capacity Utilization 66.8%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 4: 54th Street West & Rimrock Road

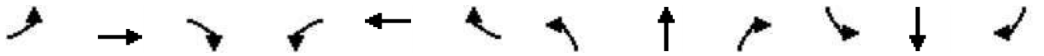


TEAPAC[Ver 9.50.02] - Capacity Analysis Summary (HCM 2016)

Intersection Averages for Int # 4 - Rimrock Rd & 54th St W
V/C 0.529 (Critical V/C 0.666) Control Delay 19.7 Level of Service B



Lane Group	Width/ Lanes	g/C Max	g/C Avg	SatFlo	Capcty	Adj Volume	v/c	HCM Delay	L S	Queue Model 1
SB Approach								26.4	C+	
R+ T	12/1	0.300	0.204	1716	350	93	0.266	23.9	C+	57 ft
L	11/1	0.300	0.204	1111	282	116	0.412	28.5	*C	81 ft
NB Approach								23.7	C+	
R	12/1			1428	487	97	0.199	16.5	B	47 ft
T	14/1	0.300	0.204	1786	364	91	0.250	23.7	C+	55 ft
L	14/1	0.300	0.204	1207	294	132	0.449	28.9	C	93 ft
WB Approach								17.1	B	
R	12/1			1450	703	1	0.001	9.3	A	0 ft
T	12/1	0.350	0.485	1729	838	609	0.727	19.8	B	286 ft
L	14/1	0.096	0.137	1700	534	308	0.577	11.8	*B+	104 ft
EB Approach								19.2	B	
R	12/1			1445	550	61	0.111	14.4	B+	29 ft
T	12/1	0.326	0.381	1691	643	358	0.556	20.5	*C+	189 ft
L	14/1	0.071	0.033	1699	317	32	0.101	13.5	B+	13 ft



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	14	611	88	184	271	52	55	25	299	137	83	11
Future Volume (veh/h)	14	611	88	184	271	52	55	25	299	137	83	11
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width Adj.	1.04	1.00	1.00	1.04	1.00	1.00	1.04	1.04	1.00	1.00	1.00	1.00
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		0.97	0.99		0.98	0.99		0.96
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1772	1704	1676	1757	1689	1689	1613	1670	1647	1817	1831	1831
Adj Flow Rate, veh/h	17	736	106	222	327	63	66	30	360	165	100	13
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Percent Heavy Veh, %	3	3	5	7	7	7	11	7	4	3	2	2
Cap, veh/h	505	795	659	257	897	740	278	390	436	289	368	48
Arrive On Green	0.02	0.47	0.47	0.08	0.53	0.53	0.23	0.23	0.23	0.23	0.23	0.23
Sat Flow, veh/h	1687	1704	1413	1673	1689	1395	1089	1670	1368	955	1578	205
Grp Volume(v), veh/h	17	736	106	222	327	63	66	30	360	165	0	113
Grp Sat Flow(s),veh/h/ln	1687	1704	1413	1673	1689	1395	1089	1670	1368	955	0	1783
Q Serve(g_s), s	0.5	36.5	3.9	6.0	10.1	2.0	4.8	1.3	21.0	14.7	0.0	4.7
Cycle Q Clear(g_c), s	0.5	36.5	3.9	6.0	10.1	2.0	9.4	1.3	21.0	15.9	0.0	4.7
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.12
Lane Grp Cap(c), veh/h	505	795	659	257	897	740	278	390	436	289	0	416
V/C Ratio(X)	0.03	0.93	0.16	0.86	0.36	0.09	0.24	0.08	0.83	0.57	0.00	0.27
Avail Cap(c_a), veh/h	566	795	659	257	897	740	278	390	436	289	0	416
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	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	12.1	22.5	13.8	19.8	12.3	10.4	32.1	26.9	28.5	33.2	0.0	28.2
Incr Delay (d2), s/veh	0.0	18.3	0.5	24.9	0.2	0.0	0.4	0.1	12.4	2.7	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	0.2	16.7	1.2	3.7	3.4	0.5	1.2	0.5	8.1	3.6	0.0	2.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	12.1	40.8	14.4	44.7	12.5	10.4	32.5	27.0	40.9	35.8	0.0	28.6
LnGrp LOS	B	D	B	D	B	B	C	C	D	D		C
Approach Vol, veh/h		859			612			456			278	
Approach Delay, s/veh		37.0			24.0			38.8			32.9	
Approach LOS		D			C			D			C	

Timer - Assigned Phs		2	3	4		6	7	8				
Phs Duration (G+Y+Rc), s		27.5	14.0	48.5		27.5	8.2	54.3				
Change Period (Y+Rc), s		6.5	6.5	6.5		6.5	6.5	6.5				
Max Green Setting (Gmax), s		21.0	7.5	42.0		21.0	5.0	44.5				
Max Q Clear Time (g_c+I1), s		23.0	8.0	38.5		17.9	2.5	12.1				
Green Ext Time (p_c), s		0.0	0.0	1.5		0.5	0.0	1.8				

Intersection Summary	
HCM 7th Control Delay, s/veh	33.2
HCM 7th LOS	C

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	17	736	106	222	327	63	66	30	360	165	113
v/c Ratio	0.03	0.88	0.14	0.70	0.32	0.07	0.32	0.10	0.61	0.73	0.36
Control Delay (s/veh)	6.8	35.6	2.6	24.4	11.5	0.4	34.7	29.0	18.4	52.8	31.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	6.8	35.6	2.6	24.4	11.5	0.4	34.7	29.0	18.4	52.8	31.9
Queue Length 50th (ft)	3	390	0	46	72	0	35	15	98	91	53
Queue Length 95th (ft)	10	#551	18	#142	167	0	67	35	162	139	89
Internal Link Dist (ft)		2588			2504			2604			1914
Turn Bay Length (ft)	310		310	240		200	290		290	230	
Base Capacity (vph)	603	837	759	317	1017	881	259	400	594	287	402
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.03	0.88	0.14	0.70	0.32	0.07	0.25	0.08	0.61	0.57	0.28

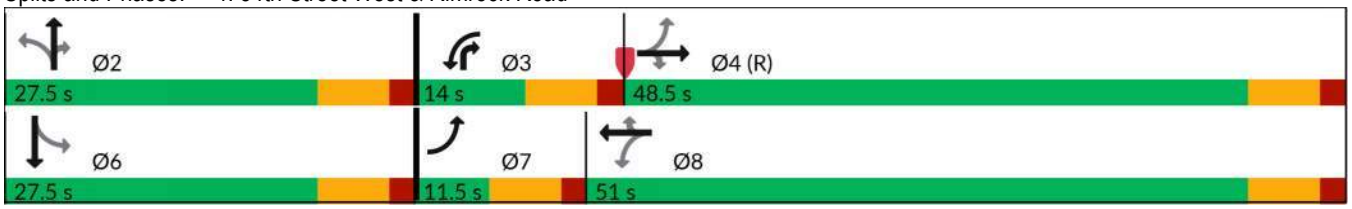
Intersection Summary

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

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations											
Traffic Volume (vph)	14	611	88	184	271	52	55	25	299	137	83
Future Volume (vph)	14	611	88	184	271	52	55	25	299	137	83
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	pm+ov	Perm	NA
Protected Phases	7	4		3	8			2	3		6
Permitted Phases	4		4	8		8	2		2	6	
Detector Phase	7	4	4	3	8	8	2	2	3	6	6
Switch Phase											
Minimum Initial (s)	5.0	15.0	15.0	5.0	15.0	15.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	11.5	27.5	27.5	11.5	24.5	24.5	27.5	27.5	11.5	24.5	24.5
Total Split (s)	11.5	48.5	48.5	14.0	51.0	51.0	27.5	27.5	14.0	27.5	27.5
Total Split (%)	12.8%	53.9%	53.9%	15.6%	56.7%	56.7%	30.6%	30.6%	15.6%	30.6%	30.6%
Yellow Time (s)	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8
All-Red Time (s)	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag			Lead		
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes			Yes		
Recall Mode	None	C-Min	C-Min	None	Min	Min	None	None	None	None	None
Act Effct Green (s)	50.1	44.6	44.6	58.9	55.7	55.7	16.5	16.5	32.4	16.5	16.5
Actuated g/C Ratio	0.56	0.50	0.50	0.65	0.62	0.62	0.18	0.18	0.36	0.18	0.18
v/c Ratio	0.03	0.88	0.14	0.70	0.32	0.07	0.32	0.10	0.61	0.73	0.36
Control Delay (s/veh)	6.8	35.6	2.6	24.4	11.5	0.4	34.7	29.0	18.4	52.8	31.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	6.8	35.6	2.6	24.4	11.5	0.4	34.7	29.0	18.4	52.8	31.9
LOS	A	D	A	C	B	A	C	C	B	D	C
Approach Delay (s/veh)		31.0			15.0			21.5			44.3
Approach LOS		C			B			C			D

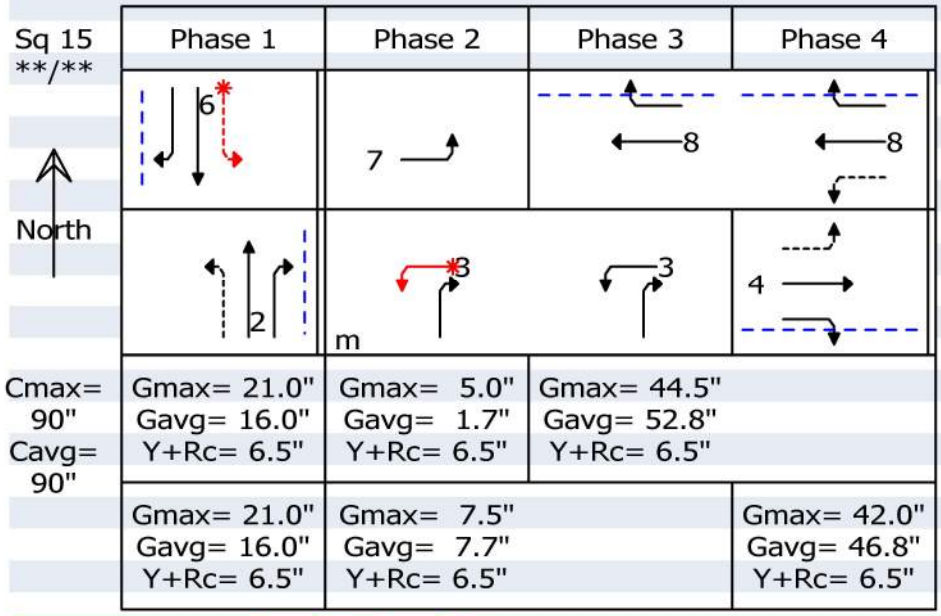
Intersection Summary	
Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 0 (0%), Referenced to phase 4:EBTL, Start of Green	
Natural Cycle: 90	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.88	
Intersection Signal Delay (s/veh): 26.3	Intersection LOS: C
Intersection Capacity Utilization 79.6%	ICU Level of Service D
Analysis Period (min) 15	

Splits and Phases: 4: 54th Street West & Rimrock Road

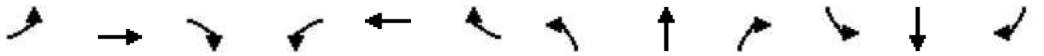


TEAPAC[Ver 9.50.02] - Capacity Analysis Summary (HCM 2016)

Intersection Averages for Int # 4 - Rimrock Rd & 54th St W
V/C 0.589 (Critical V/C 0.832) Control Delay 24.5 Level of Service C+



Lane Group	Width/ Lanes	g/C Max	g/C Avg	SatFlo	Capcty	Adj Volume	v/c	HCM Delay	L S	Queue Model 1
SB Approach								36.3	D+	
R+ T	12/1	0.233	0.177	1720	305	105	0.344	33.1	C	92 ft
L	11/1	0.233	0.177	1241	281	165	0.586	38.4	*D+	151 ft
NB Approach								33.2	C	
R	12/1			1413	372	28	0.075	25.0	C+	21 ft
T	14/1	0.233	0.177	1671	296	30	0.101	31.2	C	26 ft
L	14/1	0.233	0.177	1101	216	66	0.305	37.5	D+	65 ft
WB Approach								15.1	B	
R	12/1			1364	801	1	0.001	7.7	A	0 ft
T	12/1	0.494	0.587	1650	968	327	0.338	10.5	B+	143 ft
L	14/1	0.083	0.086	1634	311	222	0.713	21.9	*C+	123 ft
EB Approach								25.5	C+	
R	12/1			1410	733	95	0.130	11.5	B+	45 ft
T	12/1	0.467	0.520	1691	879	736	0.837	27.7	*C	474 ft
L	14/1	0.056	0.019	1673	590	17	0.029	9.7	A	7 ft



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	9	303	53	153	305	83	79	36	145	82	38	12
Future Volume (veh/h)	9	303	53	153	305	83	79	36	145	82	38	12
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width Adj.	1.04	1.00	1.00	1.04	1.00	1.00	1.04	1.04	1.00	1.00	1.00	1.00
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.98	1.00		0.97	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	1715	1690	1663	1728	1717	1731	1712	1741	1578	1803	1734	1831
Adj Flow Rate, veh/h	10	329	58	166	332	90	86	39	158	89	41	13
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	7	4	6	9	5	4	4	2	9	4	9	2
Cap, veh/h	524	839	699	571	959	801	253	261	296	252	189	60
Arrive On Green	0.01	0.50	0.50	0.07	0.56	0.56	0.15	0.15	0.15	0.15	0.15	0.15
Sat Flow, veh/h	1633	1690	1409	1646	1717	1434	1233	1741	1303	1140	1261	400
Grp Volume(v), veh/h	10	329	58	166	332	90	86	39	158	89	0	54
Grp Sat Flow(s),veh/h/ln	1633	1690	1409	1646	1717	1434	1233	1741	1303	1140	0	1661
Q Serve(g_s), s	0.2	8.5	1.5	3.4	7.4	2.1	4.6	1.4	7.5	5.2	0.0	2.0
Cycle Q Clear(g_c), s	0.2	8.5	1.5	3.4	7.4	2.1	6.6	1.4	7.5	6.5	0.0	2.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.24
Lane Grp Cap(c), veh/h	524	839	699	571	959	801	253	261	296	252	0	249
V/C Ratio(X)	0.02	0.39	0.08	0.29	0.35	0.11	0.34	0.15	0.53	0.35	0.00	0.22
Avail Cap(c_a), veh/h	620	839	699	612	959	801	437	522	491	423	0	498
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	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	8.6	11.0	9.3	7.8	8.5	7.3	29.0	25.9	23.9	28.7	0.0	26.1
Incr Delay (d2), s/veh	0.0	1.4	0.2	0.3	0.2	0.1	0.8	0.3	1.5	0.8	0.0	0.4
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	2.9	0.4	0.9	2.1	0.5	1.3	0.5	2.2	1.4	0.0	0.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	8.6	12.4	9.5	8.1	8.7	7.3	29.8	26.1	25.4	29.5	0.0	26.6
LnGrp LOS	A	B	A	A	A	A	C	C	C	C		C
Approach Vol, veh/h		397			588			283			143	
Approach Delay, s/veh		11.9			8.3			26.9			28.4	
Approach LOS		B			A			C			C	

Timer - Assigned Phs		2	3	4		6	7	8				
Phs Duration (G+Y+Rc), s		17.0	11.7	41.2		17.0	7.4	45.6				
Change Period (Y+Rc), s		6.5	6.5	6.5		6.5	6.5	6.5				
Max Green Setting (Gmax), s		21.0	7.0	22.5		21.0	5.0	24.5				
Max Q Clear Time (g_c+I1), s		9.5	5.4	10.5		8.5	2.2	9.4				
Green Ext Time (p_c), s		0.8	0.1	1.3		0.5	0.0	1.7				

Intersection Summary	
HCM 7th Control Delay, s/veh	15.1
HCM 7th LOS	B

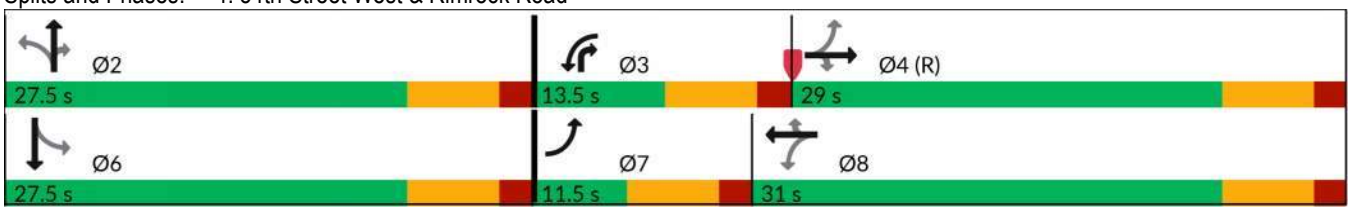
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	10	329	58	166	332	90	86	39	158	89	54
v/c Ratio	0.02	0.41	0.08	0.26	0.29	0.09	0.41	0.13	0.34	0.44	0.20
Control Delay (s/veh)	6.1	16.6	0.2	6.3	9.0	0.7	31.5	24.8	4.5	33.0	21.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	6.1	16.6	0.2	6.3	9.0	0.7	31.5	24.8	4.5	33.0	21.3
Queue Length 50th (ft)	1	94	0	24	52	0	36	15	0	37	17
Queue Length 95th (ft)	7	200	0	58	176	7	71	37	29	74	44
Internal Link Dist (ft)		2588			2504			2604			1914
Turn Bay Length (ft)	310		310	240		200	290		290	230	
Base Capacity (vph)	603	808	754	632	1134	1000	382	540	463	362	485
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.02	0.41	0.08	0.26	0.29	0.09	0.23	0.07	0.34	0.25	0.11

Intersection Summary

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations											
Traffic Volume (vph)	9	303	53	153	305	83	79	36	145	82	38
Future Volume (vph)	9	303	53	153	305	83	79	36	145	82	38
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	pm+ov	Perm	NA
Protected Phases	7	4		3	8			2	3		6
Permitted Phases	4		4	8		8	2		2	6	
Detector Phase	7	4	4	3	8	8	2	2	3	6	6
Switch Phase											
Minimum Initial (s)	5.0	15.0	15.0	5.0	15.0	15.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	11.5	27.5	27.5	11.5	24.5	24.5	27.5	27.5	11.5	24.5	24.5
Total Split (s)	11.5	29.0	29.0	13.5	31.0	31.0	27.5	27.5	13.5	27.5	27.5
Total Split (%)	16.4%	41.4%	41.4%	19.3%	44.3%	44.3%	39.3%	39.3%	19.3%	39.3%	39.3%
Yellow Time (s)	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8
All-Red Time (s)	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag			Lead		
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes			Yes		
Recall Mode	None	C-Min	C-Min	None	Min	Min	None	None	None	None	None
Act Effct Green (s)	39.5	33.8	33.8	48.4	47.4	47.4	11.7	11.7	18.0	11.7	11.7
Actuated g/C Ratio	0.56	0.48	0.48	0.69	0.68	0.68	0.17	0.17	0.26	0.17	0.17
v/c Ratio	0.02	0.41	0.08	0.26	0.29	0.09	0.41	0.13	0.34	0.44	0.20
Control Delay (s/veh)	6.1	16.6	0.2	6.3	9.0	0.7	31.5	24.8	4.5	33.0	21.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	6.1	16.6	0.2	6.3	9.0	0.7	31.5	24.8	4.5	33.0	21.3
LOS	A	B	A	A	A	A	C	C	A	C	C
Approach Delay (s/veh)		13.9			6.9			15.5			28.6
Approach LOS		B			A			B			C

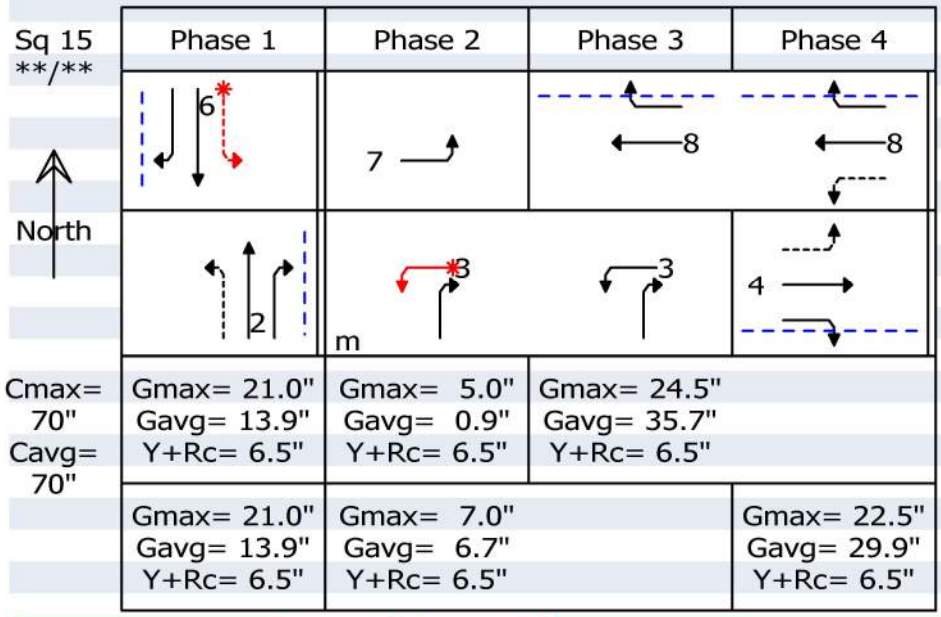
Intersection Summary	
Cycle Length: 70	
Actuated Cycle Length: 70	
Offset: 0 (0%), Referenced to phase 4:EBTL, Start of Green	
Natural Cycle: 70	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.44	
Intersection Signal Delay (s/veh): 12.8	Intersection LOS: B
Intersection Capacity Utilization 54.5%	ICU Level of Service A
Analysis Period (min) 15	

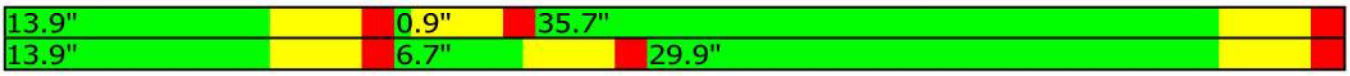
Splits and Phases: 4: 54th Street West & Rimrock Road



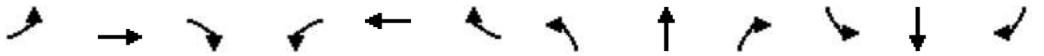
TEAPAC[Ver 9.50.02] - Capacity Analysis Summary (HCM 2016)

Intersection Averages for Int # 4 - Rimrock Rd & 54th St W
V/C 0.346 (Critical V/C 0.511) Control Delay 15.8 Level of Service B





Lane Group	Width/ Lanes	g/C Max	g/C Avg	SatFlo	Capcty	Adj Volume	v/c	HCM Delay	L S	Queue Model 1
SB Approach								25.0	C+	
R+ T	12/1	0.300	0.199	1630	324	42	0.130	23.2	C+	26 ft
L	11/1	0.300	0.199	1247	328	89	0.271	25.8	*C+	59 ft
NB Approach								24.9	C+	
R	12/1			1320	392	1	0.003	17.4	B	1 ft
T	14/1	0.300	0.199	1758	349	39	0.112	23.1	C+	23 ft
L	14/1	0.300	0.199	1256	326	86	0.264	25.8	C+	57 ft
WB Approach								11.1	B+	
R	12/1			1409	719	1	0.001	8.4	A	0 ft
T	12/1	0.350	0.510	1680	857	332	0.387	11.8	B+	133 ft
L	14/1	0.100	0.096	1597	514	166	0.323	9.7	*A	53 ft
EB Approach								15.8	B	
R	12/1			1398	596	46	0.077	12.1	B+	20 ft
T	12/1	0.321	0.427	1668	712	329	0.462	16.5	*B	159 ft
L	14/1	0.071	0.013	1612	492	10	0.020	11.1	B+	4 ft



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	29	345	73	286	578	184	124	85	223	108	78	24
Future Volume (veh/h)	29	345	73	286	578	184	124	85	223	108	78	24
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width Adj.	1.04	1.00	1.00	1.04	1.00	1.00	1.04	1.04	1.00	1.00	1.00	1.00
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.98	0.98		0.98	0.99		0.95
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1800	1704	1717	1815	1759	1772	1741	1755	1660	1831	1845	1831
Adj Flow Rate, veh/h	31	371	78	308	622	198	133	91	240	116	84	26
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	1	3	2	3	2	1	2	1	3	2	1	2
Cap, veh/h	271	688	588	486	822	686	302	389	440	284	296	92
Arrive On Green	0.03	0.40	0.40	0.10	0.47	0.47	0.22	0.22	0.22	0.22	0.22	0.22
Sat Flow, veh/h	1714	1704	1455	1728	1759	1468	1174	1755	1375	1014	1334	413
Grp Volume(v), veh/h	31	371	78	308	622	198	133	91	240	116	0	110
Grp Sat Flow(s),veh/h/ln	1714	1704	1455	1728	1759	1468	1174	1755	1375	1014	0	1747
Q Serve(g_s), s	0.7	11.6	2.4	6.7	20.4	5.8	7.4	3.0	10.1	7.4	0.0	3.7
Cycle Q Clear(g_c), s	0.7	11.6	2.4	6.7	20.4	5.8	11.1	3.0	10.1	10.4	0.0	3.7
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.24
Lane Grp Cap(c), veh/h	271	688	588	486	822	686	302	389	440	284	0	387
V/C Ratio(X)	0.11	0.54	0.13	0.63	0.76	0.29	0.44	0.23	0.55	0.41	0.00	0.28
Avail Cap(c_a), veh/h	338	688	588	486	822	686	394	527	547	364	0	524
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	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	13.2	15.9	13.1	13.2	15.4	11.5	27.2	22.4	19.8	26.6	0.0	22.6
Incr Delay (d2), s/veh	0.2	3.0	0.5	2.7	4.1	0.2	1.0	0.3	1.1	0.9	0.0	0.4
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.2	4.4	0.7	2.7	7.5	1.6	2.0	1.1	2.9	1.8	0.0	1.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	13.4	18.9	13.6	15.9	19.4	11.7	28.2	22.7	20.8	27.6	0.0	23.0
LnGrp LOS	B	B	B	B	B	B	C	C	C	C		C
Approach Vol, veh/h		480			1128			464			226	
Approach Delay, s/veh		17.7			17.1			23.3			25.4	
Approach LOS		B			B			C			C	

Timer - Assigned Phs		2	3	4		6	7	8				
Phs Duration (G+Y+Rc), s		22.0	13.2	34.8		22.0	8.8	39.2				
Change Period (Y+Rc), s		6.5	6.5	6.5		6.5	6.5	6.5				
Max Green Setting (Gmax), s		21.0	6.7	22.8		21.0	5.0	24.5				
Max Q Clear Time (g_c+I1), s		13.1	8.7	13.6		12.4	2.7	22.4				
Green Ext Time (p_c), s		1.2	0.0	1.3		0.8	0.0	0.9				

Intersection Summary	
HCM 7th Control Delay, s/veh	19.3
HCM 7th LOS	B

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	31	371	78	308	622	198	133	91	240	116	110
v/c Ratio	0.07	0.51	0.11	0.51	0.59	0.21	0.57	0.26	0.35	0.51	0.32
Control Delay (s/veh)	7.6	20.7	0.4	10.8	18.8	3.3	34.7	24.6	3.1	32.7	21.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	7.6	20.7	0.4	10.8	18.8	3.3	34.7	24.6	3.1	32.7	21.0
Queue Length 50th (ft)	4	129	0	53	137	0	54	34	0	47	33
Queue Length 95th (ft)	17	231	2	#117	#485	39	96	65	33	86	67
Internal Link Dist (ft)		2588			2504			2604			1914
Turn Bay Length (ft)	310		310	240		200	290		290	230	
Base Capacity (vph)	445	732	717	599	1055	962	364	546	690	352	518
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.07	0.51	0.11	0.51	0.59	0.21	0.37	0.17	0.35	0.33	0.21

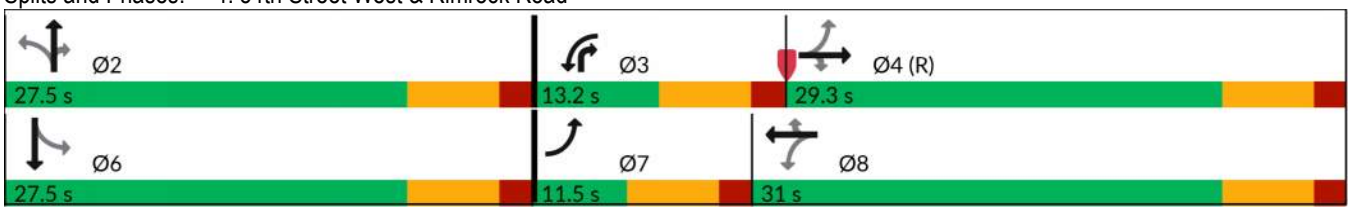
Intersection Summary

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

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations											
Traffic Volume (vph)	29	345	73	286	578	184	124	85	223	108	78
Future Volume (vph)	29	345	73	286	578	184	124	85	223	108	78
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	pm+ov	Perm	NA
Protected Phases	7	4		3	8			2	3		6
Permitted Phases	4		4	8		8	2		2	6	
Detector Phase	7	4	4	3	8	8	2	2	3	6	6
Switch Phase											
Minimum Initial (s)	5.0	15.0	15.0	5.0	15.0	15.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	11.5	27.5	27.5	11.5	24.5	24.5	27.5	27.5	11.5	24.5	24.5
Total Split (s)	11.5	29.3	29.3	13.2	31.0	31.0	27.5	27.5	13.2	27.5	27.5
Total Split (%)	16.4%	41.9%	41.9%	18.9%	44.3%	44.3%	39.3%	39.3%	18.9%	39.3%	39.3%
Yellow Time (s)	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8
All-Red Time (s)	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag			Lead		
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes			Yes		
Recall Mode	None	C-Min	C-Min	None	Min	Min	None	None	None	None	None
Act Effct Green (s)	36.4	30.3	30.3	45.8	42.9	42.9	13.5	13.5	26.7	13.5	13.5
Actuated g/C Ratio	0.52	0.43	0.43	0.65	0.61	0.61	0.19	0.19	0.38	0.19	0.19
v/c Ratio	0.07	0.51	0.11	0.51	0.59	0.21	0.57	0.26	0.35	0.51	0.32
Control Delay (s/veh)	7.6	20.7	0.4	10.8	18.8	3.3	34.7	24.6	3.1	32.7	21.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	7.6	20.7	0.4	10.8	18.8	3.3	34.7	24.6	3.1	32.7	21.0
LOS	A	C	A	B	B	A	C	C	A	C	C
Approach Delay (s/veh)		16.6			13.9			16.4			27.0
Approach LOS		B			B			B			C

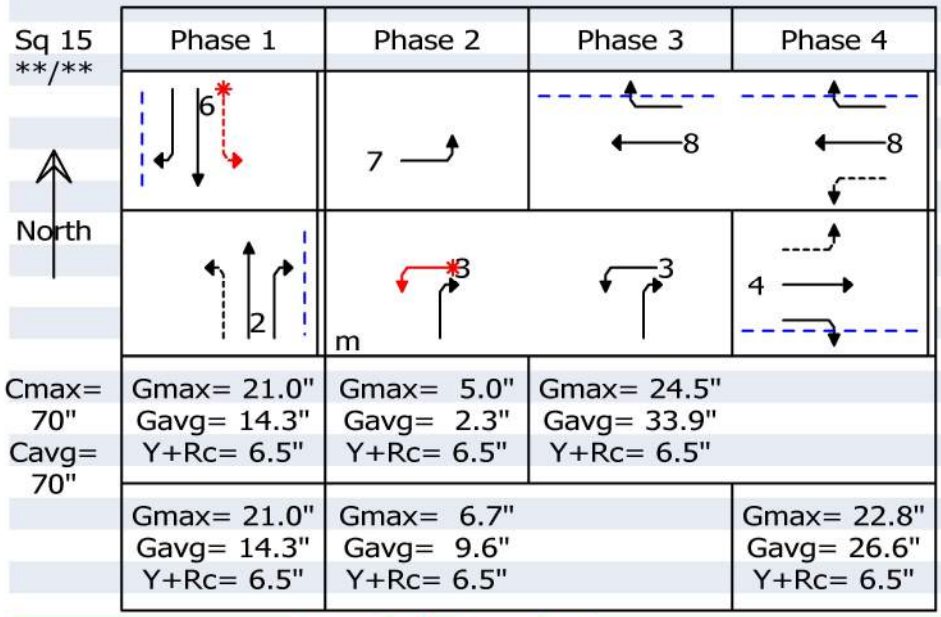
Intersection Summary	
Cycle Length: 70	
Actuated Cycle Length: 70	
Offset: 0 (0%), Referenced to phase 4:EBTL, Start of Green	
Natural Cycle: 75	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.59	
Intersection Signal Delay (s/veh): 16.2	Intersection LOS: B
Intersection Capacity Utilization 67.6%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 4: 54th Street West & Rimrock Road



TEAPAC[Ver 9.50.02] - Capacity Analysis Summary (HCM 2016)

Intersection Averages for Int # 4 - Rimrock Rd & 54th St W
V/C 0.541 (Critical V/C 0.676) Control Delay 20.1 Level of Service C+



Lane Group	Width/ Lanes	g/C Max	g/C Avg	SatFlo	Capcty	Adj Volume	v/c	HCM Delay	L S	Queue Model 1
SB Approach								26.4	C+	
R+ T	12/1	0.300	0.204	1715	351	93	0.265	23.8	C+	57 ft
L	11/1	0.300	0.204	1111	283	116	0.411	28.4	*C	81 ft
NB Approach								23.7	C+	
R	12/1			1428	488	97	0.199	16.5	B	47 ft
T	14/1	0.300	0.204	1786	365	91	0.249	23.7	C+	55 ft
L	14/1	0.300	0.204	1208	295	133	0.451	28.9	C	94 ft
WB Approach								17.6	B	
R	12/1			1450	703	1	0.001	9.3	A	0 ft
T	12/1	0.350	0.485	1729	838	622	0.742	20.4	C+	296 ft
L	14/1	0.096	0.137	1700	522	308	0.590	12.1	*B+	105 ft
EB Approach								19.6	B	
R	12/1			1445	549	65	0.118	14.5	B+	31 ft
T	12/1	0.326	0.380	1689	642	371	0.578	21.0	*C+	198 ft
L	14/1	0.071	0.032	1703	307	31	0.101	13.7	B+	12 ft

Appendix H

IN THIS SECTION:

Rimrock Road & Road A

Turn Lanes Addition

Traffic Operations Summary

Copper Square Subdivision

Intersection: Rimrock Road & Road A

WEEKDAY, AM PEAK HOUR

Analysis Scenario	Analysis Data	RIMROCK ROAD From the West (Eastbound) U	L	T	R	RIMROCK ROAD From the East (Westbound) U	L	T	R	ROAD A From the South (Northbound) U	L	T	R	North Side of Rimrock Road U	L	T	R	Minor Approach Totals	Intersection Totals
ESTIMATED 2030 TOTAL TRAFFIC Installation of Turn Lanes	Traffic Control	Uncontrolled				Uncontrolled				Stop Controlled									
	Minor or Major Approach?	Major				Major				Minor									
	Entry Volume, V (veh/hr)	0		605	35	0	32	213		0	22		21						
	Peak Hour Factor (PHF)	0.78				0.78				0.78									
	Adjusted Volume, V_A (veh/hr)	0		776	40	0	41	273		0	28		6						
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	TR				L		T		L		R							
	Lane Group Volume, V_{LG} (veh/hr)	816				41		273		28		6						34	1,164
	Capacity, c (veh/hr)	1,785				796		1,800		204		381						585	4,966
	Volume-to-Capacity Ratio, V_A/c	0.46				0.05		0.15		0.14		0.02						0.06	0.23
	HCM 95% Queue Length, Q_{95} (veh)	0.0				0.2		0.0		0.5		0.2							
	HCM 95% Queue Length, Q_{95} (ft)	0.0				5.2		0.0		13.0		5.2							
	Available Queue Storage, S_Q (ft)	350				200		450		125		125							
	Average Control Delay (sec/veh)	0.2				9.8		0.0		25.4		15.2						23.6	1.2
	Level of Service, LOS	A				A		A		D		C							
	Approach Delay (sec/veh)	0.2				1.3				23.6								C	A
	Approach Level of Service, LOS	A				A				C									
ESTIMATED 2034 BACKGROUND TRAFFIC Installation of Turn Lanes	Traffic Control	Uncontrolled				Uncontrolled				Stop Controlled									
	Minor or Major Approach?	Major				Major				Minor									
	Entry Volume, V (veh/hr)	0		640	35	0	32	227		0	22		21						
	Peak Hour Factor (PHF)	0.78				0.78				0.78									
	Adjusted Volume, V_A (veh/hr)	0		821	45	0	41	291		0	28		27						
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	TR				L		T		L		R							
	Lane Group Volume, V_{LG} (veh/hr)	865				41		291		28		27						55	1,253
	Capacity, c (veh/hr)	1,784				765		1,800		187		359						546	4,895
	Volume-to-Capacity Ratio, V_A/c	0.49				0.05		0.16		0.15		0.07						0.10	0.26
	HCM 95% Queue Length, Q_{95} (veh)	0.0				0.2		0.0		0.5		0.2							
	HCM 95% Queue Length, Q_{95} (ft)	0.0				5.2		0.0		13.0		5.2							
	Available Queue Storage, S_Q (ft)	350				200		450		125		125							
	Average Control Delay (sec/veh)	0.3				10.0		0.0		27.7		15.8						21.9	1.5
	Level of Service, LOS	A				A		A		D		C							
	Approach Delay (sec/veh)	0.3				1.2				21.9								C	A
	Approach Level of Service, LOS	A				A				C									
ESTIMATED 2034 TOTAL TRAFFIC Installation of Turn Lanes	Traffic Control	Uncontrolled				Uncontrolled				Stop Controlled									
	Minor or Major Approach?	Major				Major				Minor									
	Entry Volume, V (veh/hr)	0		652	37	0	10	237		0	22		7						
	Peak Hour Factor (PHF)	0.78				0.78				0.78									
	Adjusted Volume, V_A (veh/hr)	0		836	47	0	13	304		0	28		9						
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	TR				L		T		L		R							
	Lane Group Volume, V_{LG} (veh/hr)	883				13		304		28		9						37	1,237
	Capacity, c (veh/hr)	1,784				753		1,800		201		351						552	4,889
	Volume-to-Capacity Ratio, V_A/c	0.50				0.02		0.17		0.14		0.03						0.07	0.25
	HCM 95% Queue Length, Q_{95} (veh)	0.0				0.1		0.0		0.5		0.1							
	HCM 95% Queue Length, Q_{95} (ft)	0.0				2.6		0.0		13.0		2.6							
	Available Queue Storage, S_Q (ft)	350				200		450		125		125							
	Average Control Delay (sec/veh)	0.3				9.9		0.0		25.8		15.5						23.3	1.0
	Level of Service, LOS	A				A		A		D		C							
	Approach Delay (sec/veh)	0.3				0.4				23.3								C	A
	Approach Level of Service, LOS	A				A				C									

U = U-Turns; L = Left Turns; T = Through; R = Right Turns | Lane Groups: TR = Through-Righ; L = Left; T = Through; and LR = Left-Right

Average intersection delay and volume-to-capacity ratio for minor approach(es) is a weighted average provided for reference purposes. The *Highway Capacity Manual, 7th Edition: A Guide for Multimodal Mobility Analysis* does not define overall average delay for the intersection as a whole for two-way or single approach stop-controlled intersections.

Traffic Operations Summary

Copper Square Subdivision

Intersection: Rimrock Road & Road A

WEEKDAY, MIDDAY PEAK HOUR

Analysis Scenario	Analysis Data	RIMROCK ROAD From the West (Eastbound) U	L	T	R	RIMROCK ROAD From the East (Westbound) U	L	T	R	ROAD A From the South (Northbound) U	L	T	R	North Side of Rimrock Road U	L	T	R	Minor Approach Totals	Intersection Totals
ESTIMATED 2030 TOTAL TRAFFIC Installation of Turn Lanes	Traffic Control	Uncontrolled				Uncontrolled				Stop Controlled									
	Minor or Major Approach?	Major				Major				Minor									
	Entry Volume, V (veh/hr)	0		263	36	0	33	293		0	36		34						
	Peak Hour Factor (PHF)	0.90				0.90				0.90									
	Adjusted Volume, V_A (veh/hr)	0		292	33	0	37	326		0	40		4						
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	TR				L		T		L		R							
	Lane Group Volume, V_{LG} (veh/hr)	325				37		326		40		4						44	731
	Capacity, c (veh/hr)	1,770				1,211		1,800		383		721						1,104	5,885
	Volume-to-Capacity Ratio, V_A/c	0.18				0.03		0.18		0.10		0.01						0.04	0.12
	HCM 95% Queue Length, Q_{95} (veh)	0.0				0.1		0.0		0.3		0.2							
	HCM 95% Queue Length, Q_{95} (ft)	0.0				2.6		0.0		7.8		5.2							
	Available Queue Storage, S_Q (ft)	350				200		450		125		125							
	Average Control Delay (sec/veh)	0.5				8.1		0.0		15.5		10.3						15.1	1.5
	Level of Service, LOS	A				A		A		C		B							
	Approach Delay (sec/veh)	0.5				0.8				15.1								C	A
	Approach Level of Service, LOS	A				A				C									
ESTIMATED 2034 BACKGROUND TRAFFIC Installation of Turn Lanes	Traffic Control	Uncontrolled				Uncontrolled				Stop Controlled									
	Minor or Major Approach?	Major				Major				Minor									
	Entry Volume, V (veh/hr)	0		277	36	0	33	308		0	36		34						
	Peak Hour Factor (PHF)	0.90				0.90				0.90									
	Adjusted Volume, V_A (veh/hr)	0		308	40	0	37	342		0	40		38						
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	TR				L		T		L		R							
	Lane Group Volume, V_{LG} (veh/hr)	348				37		342		40		38						78	804
	Capacity, c (veh/hr)	1,765				1,195		1,800		366		707						1,073	5,833
	Volume-to-Capacity Ratio, V_A/c	0.20				0.03		0.19		0.11		0.05						0.07	0.14
	HCM 95% Queue Length, Q_{95} (veh)	0.0				0.1		0.0		0.4		0.2							
	HCM 95% Queue Length, Q_{95} (ft)	0.0				3		0		10		5							
	Available Queue Storage, S_Q (ft)	350				200		450		125		125							
	Average Control Delay (sec/veh)	0.6				8.1		0.0		16.0		10.4						13.3	1.9
	Level of Service, LOS	A				A		A		C		B							
	Approach Delay (sec/veh)	0.6				0.8				13.3								B	A
	Approach Level of Service, LOS	A				A				B									
ESTIMATED 2034 TOTAL TRAFFIC Installation of Turn Lanes	Traffic Control	Uncontrolled				Uncontrolled				Stop Controlled									
	Minor or Major Approach?	Major				Major				Minor									
	Entry Volume, V (veh/hr)	0		291	36	0	11	325		0	37		11						
	Peak Hour Factor (PHF)	0.90				0.90				0.90									
	Adjusted Volume, V_A (veh/hr)	0		323	40	0	12	361		0	41		12						
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	TR				L		T		L		R							
	Lane Group Volume, V_{LG} (veh/hr)	363				12		361		41		12						53	790
	Capacity, c (veh/hr)	1,767				1,179		1,800		382		693						1,075	5,821
	Volume-to-Capacity Ratio, V_A/c	0.21				0.01		0.20		0.11		0.02						0.05	0.14
	HCM 95% Queue Length, Q_{95} (veh)	0.0				0.0		0.0		0.4		0.1							
	HCM 95% Queue Length, Q_{95} (ft)	0.0				0.0		0.0		10.4		2.6							
	Available Queue Storage, S_Q (ft)	350				200		450		125		125							
	Average Control Delay (sec/veh)	0.6				8.1		0.0		15.6		10.3						14.4	1.4
	Level of Service, LOS	A				A		A		C		B							
	Approach Delay (sec/veh)	0.6				0.3				14.4								B	A
	Approach Level of Service, LOS	A				A				B									

U = U-Turns; L = Left Turns; T = Through; R = Right Turns | Lane Groups: TR = Through-Righ; L = Left; T = Through; and LR = Left-Right

Average intersection delay and volume-to-capacity ratio for minor approach(es) is a weighted average provided for reference purposes. The Highway Capacity Manual, 7th Edition: A Guide for Multimodal Mobility Analysis does not define overall average delay for the intersection as a whole for two-way or single approach stop-controlled intersections.

Traffic Operations Summary

Copper Square Subdivision

Intersection: Rimrock Road & Road A

WEEKDAY, PM PEAK HOUR

Analysis Scenario	Analysis Data	RIMROCK ROAD From the West (Eastbound) U	L	T	R	RIMROCK ROAD From the East (Westbound) U	L	T	R	ROAD A From the South (Northbound) U	L	T	R	North Side of Rimrock Road U	L	T	R	Minor Approach Totals	Intersection Totals
ESTIMATED 2030 TOTAL TRAFFIC Installation of Turn Lanes	Traffic Control	Uncontrolled				Uncontrolled				Stop Controlled									
	Minor or Major Approach?	Major				Major				Minor									
	Entry Volume, V (veh/hr)	0		345	36	0	35	555		0	31		30						
	Peak Hour Factor (PHF)	0.87				0.87				0.87									
	Adjusted Volume, V_A (veh/hr)	0		397	32	0	40	638		0	36		4						
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	TR				L		T		L		R							
	Lane Group Volume, V_{LG} (veh/hr)	429				40		638		36		4						40	1,147
	Capacity, c (veh/hr)	1,777				1,106		1,800		213		629						842	5,525
	Volume-to-Capacity Ratio, V_A/c	0.24				0.04		0.35		0.17		0.01						0.05	0.21
	HCM 95% Queue Length, Q_{95} (veh)	0.0				0.1		0.0		0.6		0.2							
	HCM 95% Queue Length, Q_{95} (ft)	0.0				2.6		0.0		15.6		5.2							
	Available Queue Storage, S_Q (ft)	350				200		450		125		125							
	Average Control Delay (sec/veh)	0.4				8.4		0.0		25.3		11.1						23.7	1.3
	Level of Service, LOS	A				A		A		D		B							
	Approach Delay (sec/veh)	0.4				0.5				23.7								C	A
	Approach Level of Service, LOS	A				A				C									
ESTIMATED 2034 BACKGROUND TRAFFIC Installation of Turn Lanes	Traffic Control	Uncontrolled				Uncontrolled				Stop Controlled									
	Minor or Major Approach?	Major				Major				Minor									
	Entry Volume, V (veh/hr)	0		367	36	0	35	589		0	31		30						
	Peak Hour Factor (PHF)	0.87				0.87				0.87									
	Adjusted Volume, V_A (veh/hr)	0		422	41	0	40	677		0	36		34						
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	TR				L		T		L		R							
	Lane Group Volume, V_{LG} (veh/hr)	463				40		677		36		34						70	1,251
	Capacity, c (veh/hr)	1,773				1,082		1,800		194		609						803	5,458
	Volume-to-Capacity Ratio, V_A/c	0.26				0.04		0.38		0.18		0.06						0.09	0.23
	HCM 95% Queue Length, Q_{95} (veh)	0.0				0.1		0.0		0.7		0.2							
	HCM 95% Queue Length, Q_{95} (ft)	0.0				2.6		0.0		18.2		5.2							
	Available Queue Storage, S_Q (ft)	350				200		450		125		125							
	Average Control Delay (sec/veh)	0.4				8.5		0.0		27.7		11.3						19.6	1.5
	Level of Service, LOS	A				A		A		D		B							
	Approach Delay (sec/veh)	0.4				0.5				19.6								C	A
	Approach Level of Service, LOS	A				A				C									
ESTIMATED 2034 TOTAL TRAFFIC Installation of Turn Lanes	Traffic Control	Uncontrolled				Uncontrolled				Stop Controlled									
	Minor or Major Approach?	Major				Major				Minor									
	Entry Volume, V (veh/hr)	0		382	36	0	12	603		0	34		10						
	Peak Hour Factor (PHF)	0.87				0.87				0.87									
	Adjusted Volume, V_A (veh/hr)	0		439	41	0	14	693		0	39		11						
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	TR				L		T		L		R							
	Lane Group Volume, V_{LG} (veh/hr)	480				14		693		39		11						51	1,238
	Capacity, c (veh/hr)	1,774				1,067		1,800		205		595						800	5,441
	Volume-to-Capacity Ratio, V_A/c	0.27				0.01		0.39		0.19		0.02						0.06	0.23
	HCM 95% Queue Length, Q_{95} (veh)	0.0				0.0		0.0		0.7		0.1							
	HCM 95% Queue Length, Q_{95} (ft)	0.0				0		0		18		3							
	Available Queue Storage, S_Q (ft)	350				200		450		125		125							
	Average Control Delay (sec/veh)	0.4				8.4		0.0		26.7		11.2						23.2	1.2
	Level of Service, LOS	A				A		A		D		B							
	Approach Delay (sec/veh)	0.4				0.2				23.2								C	A
	Approach Level of Service, LOS	A				A				C									

U = U-Turns; L = Left Turns; T = Through; R = Right Turns | Lane Groups: TR = Through-Righ; L = Left; T = Through; and LR = Left-Right

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HCS Two-Way Stop-Control Report

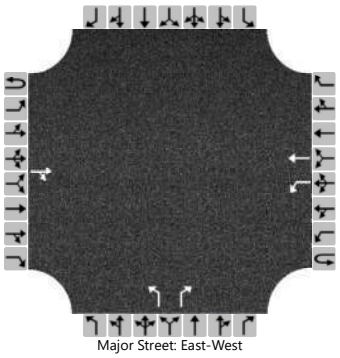
General Information

Analyst	T. Eastwood
Agency/Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2030
Time Analyzed	Weekday, AM Peak Hour
Intersection Orientation	East-West
Project Description	Copper Square TIS | Total Traffic Mitigation

Site Information

Intersection	Rimrock Road & Road A
Jurisdiction	City of Billings
East/West Street	Rimrock Road
North/South Street	Road A
Peak Hour Factor	0.78
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	1	1	0		1	0	1		0	0	0
Configuration				TR		L	T			L		R				
Volume (veh/h)			605	35		32	213			22		21				
Percent Heavy Vehicles (%)						5				5		5				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized										No						
Median Type | Storage						Undivided										

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.15				6.45		6.25				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.25				3.55		3.35				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						41				28		27				
Capacity, c (veh/h)						796				204		381				
v/c Ratio						0.05				0.14		0.07				
95% Queue Length, Q_{95} (veh)						0.2				0.5		0.2				
95% Queue Length, Q_{95} (ft)						5.2				13.0		5.2				
Control Delay (s/veh)						9.8				25.4		15.2				
Level of Service (LOS)						A				D		C				
Approach Delay (s/veh)						1.3				20.4						
Approach LOS						A				C						

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HCS Two-Way Stop-Control Report

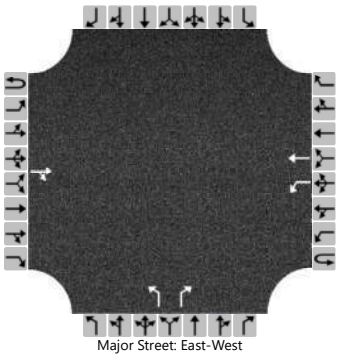
General Information

Analyst	T. Eastwood
Agency/Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2030
Time Analyzed	Weekday, Midday Peak Hour
Intersection Orientation	East-West
Project Description	Copper Square TIS | Total Traffic Mitigation

Site Information

Intersection	Rimrock Road & Road A
Jurisdiction	City of Billings
East/West Street	Rimrock Road
North/South Street	Road A
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	1	1	0		1	0	1		0	0	0
Configuration				TR		L	T			L		R				
Volume (veh/h)			263	36		33	293			36		34				
Percent Heavy Vehicles (%)						5				5		5				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized										No						
Median Type | Storage					Undivided											

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.15				6.45		6.25				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.25				3.55		3.35				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						37				40		38				
Capacity, c (veh/h)						1211				383		721				
v/c Ratio						0.03				0.10		0.05				
95% Queue Length, Q_{95} (veh)						0.1				0.3		0.2				
95% Queue Length, Q_{95} (ft)						2.6				7.8		5.2				
Control Delay (s/veh)						8.1				15.5		10.3				
Level of Service (LOS)						A				C		B				
Approach Delay (s/veh)					0.8				13.0							
Approach LOS					A				B							

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HCS Two-Way Stop-Control Report

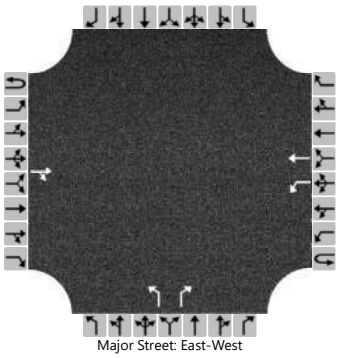
General Information

Analyst	T. Eastwood
Agency/Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2030
Time Analyzed	Weekday, PM Peak Hour
Intersection Orientation	East-West
Project Description	Copper Square TIS | Total Traffic Mitigation

Site Information

Intersection	Rimrock Road & Road A
Jurisdiction	City of Billings
East/West Street	Rimrock Road
North/South Street	Road A
Peak Hour Factor	0.87
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	1	1	0		1	0	1		0	0	0
Configuration				TR		L	T			L		R				
Volume (veh/h)			345	36		35	555			31		30				
Percent Heavy Vehicles (%)						5				5		5				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized										No						
Median Type | Storage						Undivided										

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.15				6.45		6.25				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.25				3.55		3.35				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						40				36		34				
Capacity, c (veh/h)						1106				213		629				
v/c Ratio						0.04				0.17		0.05				
95% Queue Length, Q_{95} (veh)						0.1				0.6		0.2				
95% Queue Length, Q_{95} (ft)						2.6				15.6		5.2				
Control Delay (s/veh)						8.4				25.3		11.1				
Level of Service (LOS)						A				D		B				
Approach Delay (s/veh)						0.5				18.3						
Approach LOS						A				C						

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HCS Two-Way Stop-Control Report

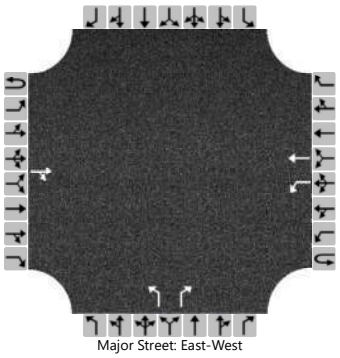
General Information

Analyst	T. Eastwood
Agency/Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2034
Time Analyzed	Weekday, AM Peak Hour
Intersection Orientation	East-West
Project Description	Copper Square TIS | Background Traffic Mitigation

Site Information

Intersection	Rimrock Road & Road A
Jurisdiction	City of Billings
East/West Street	Rimrock Road
North/South Street	Road A
Peak Hour Factor	0.78
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	1	1	0		1	0	1		0	0	0
Configuration				TR		L	T			L		R				
Volume (veh/h)			640	35		32	227			22		21				
Percent Heavy Vehicles (%)						5				5		5				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized										No						
Median Type | Storage					Undivided											

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.15				6.45		6.25				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.25				3.55		3.35				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						41				28		27				
Capacity, c (veh/h)						765				187		359				
v/c Ratio						0.05				0.15		0.07				
95% Queue Length, Q_{95} (veh)						0.2				0.5		0.2				
95% Queue Length, Q_{95} (ft)						5.2				13.0		5.2				
Control Delay (s/veh)						10.0				27.7		15.8				
Level of Service (LOS)						A				D		C				
Approach Delay (s/veh)					1.2				21.9							
Approach LOS					A				C							

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HCS Two-Way Stop-Control Report

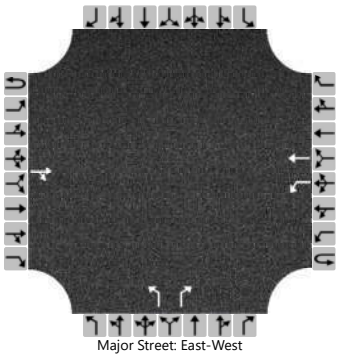
General Information

Analyst	T. Eastwood
Agency/Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2030
Time Analyzed	Weekday, Midday Peak Hour
Intersection Orientation	East-West
Project Description	Copper Square TIS | Background Traffic Mitigation

Site Information

Intersection	Rimrock Road & Road A
Jurisdiction	City of Billings
East/West Street	Rimrock Road
North/South Street	Road A
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	1	1	0		1	0	1		0	0	0
Configuration				TR		L	T			L		R				
Volume (veh/h)			277	36		33	308			36		34				
Percent Heavy Vehicles (%)						5				5		5				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized										No						
Median Type | Storage					Undivided											

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.15				6.45		6.25				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.25				3.55		3.35				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						37				40		38				
Capacity, c (veh/h)						1195				366		707				
v/c Ratio						0.03				0.11		0.05				
95% Queue Length, Q_{95} (veh)						0.1				0.4		0.2				
95% Queue Length, Q_{95} (ft)						2.6				10.4		5.2				
Control Delay (s/veh)						8.1				16.0		10.4				
Level of Service (LOS)						A				C		B				
Approach Delay (s/veh)					0.8				13.3							
Approach LOS					A				B							

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HCS Two-Way Stop-Control Report

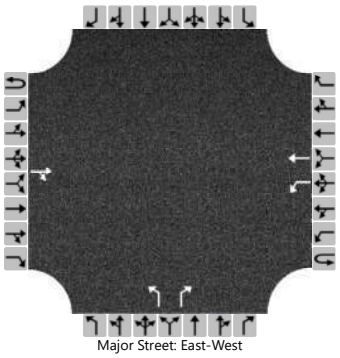
General Information

Analyst	T. Eastwood
Agency/Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2030
Time Analyzed	Weekday, PM Peak Hour
Intersection Orientation	East-West
Project Description	Copper Square TIS | Background Traffic Mitigation

Site Information

Intersection	Rimrock Road & Road A
Jurisdiction	City of Billings
East/West Street	Rimrock Road
North/South Street	Road A
Peak Hour Factor	0.87
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	1	1	0		1	0	1		0	0	0
Configuration				TR		L	T			L		R				
Volume (veh/h)			367	36		35	589			31		30				
Percent Heavy Vehicles (%)						5				5		5				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized										No						
Median Type | Storage						Undivided										

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.15				6.45		6.25				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.25				3.55		3.35				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						40				36		34				
Capacity, c (veh/h)						1082				194		609				
v/c Ratio						0.04				0.18		0.06				
95% Queue Length, Q_{95} (veh)						0.1				0.7		0.2				
95% Queue Length, Q_{95} (ft)						2.6				18.2		5.2				
Control Delay (s/veh)						8.5				27.7		11.3				
Level of Service (LOS)						A				D		B				
Approach Delay (s/veh)						0.5				19.6						
Approach LOS						A				C						

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HCS Two-Way Stop-Control Report

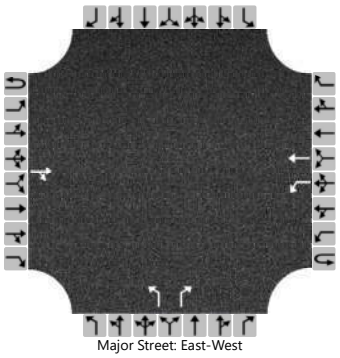
General Information

Analyst	T. Eastwood
Agency/Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2034
Time Analyzed	Weekday, AM Peak Hour
Intersection Orientation	East-West
Project Description	Copper Square TIS | Total Traffic Mitigation

Site Information

Intersection	Rimrock Road & Road A
Jurisdiction	City of Billings
East/West Street	Rimrock Road
North/South Street	Road A
Peak Hour Factor	0.78
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	1	1	0		1	0	1		0	0	0
Configuration				TR		L	T			L		R				
Volume (veh/h)			652	37		10	237			22		7				
Percent Heavy Vehicles (%)						5				5		5				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized										No						
Median Type | Storage						Undivided										

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.15				6.45		6.25				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.25				3.55		3.35				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						13				28		9				
Capacity, c (veh/h)						753				201		351				
v/c Ratio						0.02				0.14		0.03				
95% Queue Length, Q_{95} (veh)						0.1				0.5		0.1				
95% Queue Length, Q_{95} (ft)						2.6				13.0		2.6				
Control Delay (s/veh)						9.9				25.8		15.5				
Level of Service (LOS)						A				D		C				
Approach Delay (s/veh)						0.4				23.3						
Approach LOS						A				C						

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HCS Two-Way Stop-Control Report

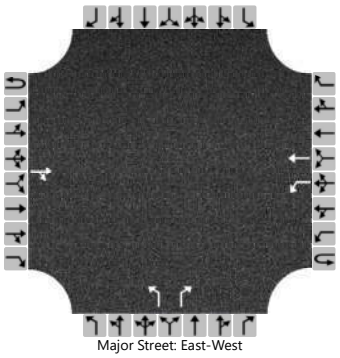
General Information

Analyst	T. Eastwood
Agency/Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2030
Time Analyzed	Weekday, Midday Peak Hour
Intersection Orientation	East-West
Project Description	Copper Square TIS | Total Traffic Mitigation

Site Information

Intersection	Rimrock Road & Road A
Jurisdiction	City of Billings
East/West Street	Rimrock Road
North/South Street	Road A
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	1	1	0		1	0	1		0	0	0
Configuration				TR		L	T			L		R				
Volume (veh/h)			291	36		11	325			37		11				
Percent Heavy Vehicles (%)						5				5		5				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized										No						
Median Type | Storage					Undivided											

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.15				6.45		6.25				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.25				3.55		3.35				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						12				41		12				
Capacity, c (veh/h)						1179				382		693				
v/c Ratio						0.01				0.11		0.02				
95% Queue Length, Q_{95} (veh)						0.0				0.4		0.1				
95% Queue Length, Q_{95} (ft)						0.0				10.4		2.6				
Control Delay (s/veh)						8.1				15.6		10.3				
Level of Service (LOS)						A				C		B				
Approach Delay (s/veh)					0.3				14.4							
Approach LOS					A				B							

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HCS Two-Way Stop-Control Report

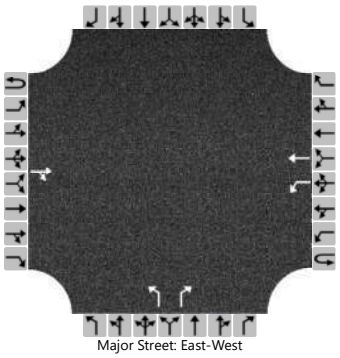
General Information

Analyst	T. Eastwood
Agency/Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2030
Time Analyzed	Weekday, PM Peak Hour
Intersection Orientation	East-West
Project Description	Copper Square TIS | Total Traffic Mitigation

Site Information

Intersection	Rimrock Road & Road A
Jurisdiction	City of Billings
East/West Street	Rimrock Road
North/South Street	Road A
Peak Hour Factor	0.87
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	1	1	0		1	0	1		0	0	0
Configuration				TR		L	T			L		R				
Volume (veh/h)			382	36		12	603			34		10				
Percent Heavy Vehicles (%)						5				5		5				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized										No						
Median Type | Storage					Undivided											

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.15				6.45		6.25				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.25				3.55		3.35				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						14				39		11				
Capacity, c (veh/h)						1067				205		595				
v/c Ratio						0.01				0.19		0.02				
95% Queue Length, Q_{95} (veh)						0.0				0.7		0.1				
95% Queue Length, Q_{95} (ft)						0.0				18.2		2.6				
Control Delay (s/veh)						8.4				26.7		11.2				
Level of Service (LOS)						A				D		B				
Approach Delay (s/veh)					0.2				23.2							
Approach LOS					A				C							

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Appendix H

IN THIS SECTION:

Rimrock Road &
60th Street West

Turn Lanes Addition

Traffic Operations Mitigation Summary

Copper Square Subdivision

Intersection: Rimrock Road & 60th Street West

WEEKDAY, AM PEAK HOUR

Analysis Scenario	Analysis Data	RIMROCK ROAD From the West (Eastbound) U	L	T	R	RIMROCK ROAD From the East (Westbound) U	L	T	R	60TH STREET WEST From the South (Northbound) U	L	T	R	North Side of Rimrock Road U	L	T	R	Minor Approach Totals	Intersection Totals
ESTIMATED 2034 TOTAL TRAFFIC Installation of Turn Lanes	Traffic Control	Uncontrolled				Uncontrolled				Stop Controlled									
	Minor or Major Approach?	Major				Major				Minor									
	Entry Volume, V (veh/hr)	0		582	80	0	59	214		0	33		89						
	Peak Hour Factor (PHF)	0.78				0.78				0.78									
	Adjusted Volume, V_A (veh/hr)	0		746	103	0	76	274		0	42		114						
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	T		R		L		T		L		R							
	Lane Group Volume, V_{LG} (veh/hr)	746		103		76		274		42		114						156	1,355
	Capacity, c (veh/hr)	1,800		1,500		776		1,800		189		409						598	6,474
	Volume-to-Capacity Ratio, V_A/c	0.41		0.07		0.10		0.15		0.22		0.28						0.26	0.21
	HCM 95% Queue Length, Q_{95} (veh)	0.0		0.0		0.3		0.0		0.8		1.1							
	HCM 95% Queue Length, Q_{95} (ft)	0.0		0.0		7.8		0.0		20.8		28.6							
	Available Queue Storage, S_Q (ft)	450		200		200		450		125		125							
	Average Control Delay (sec/veh)	0.0		5.0		10.1		0.0		29.4		17.2						20.5	2.9
	Level of Service, LOS	A		A		B		A		D		C							
	Approach Delay (sec/veh)	0.6				2.2				20.5								C	A
	Approach Level of Service, LOS	A				A				C									

WEEKDAY, MIDDAY PEAK HOUR

Analysis Scenario	Analysis Data	RIMROCK ROAD From the West (Eastbound) U	L	T	R	RIMROCK ROAD From the East (Westbound) U	L	T	R	60TH STREET WEST From the South (Northbound) U	L	T	R	North Side of Rimrock Road U	L	T	R	Minor Approach Totals	Intersection Totals
ESTIMATED 2034 TOTAL TRAFFIC Installation of Turn Lanes	Traffic Control	Uncontrolled				Uncontrolled				Stop Controlled									
	Minor or Major Approach?	Major				Major				Minor									
	Entry Volume, V (veh/hr)	0		275	27	0	51	305		0	31		53						
	Peak Hour Factor (PHF)	0.91				0.91				0.91									
	Adjusted Volume, V_A (veh/hr)	0		302	30	0	56	335		0	34		58						
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	T		R		L		T		L		R							
	Lane Group Volume, V_{LG} (veh/hr)	302		30		56		335		34		58						156	815
	Capacity, c (veh/hr)	1,800		1,500		1,211		1,800		358		730						598	7,399
	Volume-to-Capacity Ratio, V_A/c	0.17		0.02		0.05		0.19		0.10		0.08						0.04	0.11
	HCM 95% Queue Length, Q_{95} (veh)	0.0		0.0		0.1		0.0		0.3		0.3							
	HCM 95% Queue Length, Q_{95} (ft)	0.0		0.0		2.6		0.0		7.8		7.8							
	Available Queue Storage, S_Q (ft)	450		200		200		450		125		125							
	Average Control Delay (sec/veh)	0.0		5.0		8.1		0.0		16.1		10.4						12.5	2.0
	Level of Service, LOS	A		A		A		A		C		B							
	Approach Delay (sec/veh)	0.4				1.2				12.5								B	A
	Approach Level of Service, LOS	A				A				B									

WEEKDAY, PM PEAK HOUR

Analysis Scenario	Analysis Data	RIMROCK ROAD From the West (Eastbound) U	L	T	R	RIMROCK ROAD From the East (Westbound) U	L	T	R	60TH STREET WEST From the South (Northbound) U	L	T	R	North Side of Rimrock Road U	L	T	R	Minor Approach Totals	Intersection Totals
ESTIMATED 2034 TOTAL TRAFFIC Installation of Turn Lanes	Traffic Control	Uncontrolled				Uncontrolled				Stop Controlled									
	Minor or Major Approach?	Major				Major				Minor									
	Entry Volume, V (veh/hr)	0		363	30	0	63	576		0	39		49						
	Peak Hour Factor (PHF)	0.86				0.86				0.86									
	Adjusted Volume, V_A (veh/hr)	0		422	35	0	73	670		0	45		57						
	Ped + Bike Volume, PBV (ped+bike/hr)	0				0				0				0				0	0
	Lane Group	T		R		L		T		L		R							
	Lane Group Volume, V_{LG} (veh/hr)	422		35		73		670		45		57						156	1,302
	Capacity, c (veh/hr)	1,800		1,500		1,088		1,800		178		625						598	6,991
	Volume-to-Capacity Ratio, V_A/c	0.23		0.02		0.07		0.37		0.25		0.09						0.05	0.19
	HCM 95% Queue Length, Q_{95} (veh)	0.0		0.0		0.2		0.0		1.0		0.3							
	HCM 95% Queue Length, Q_{95} (ft)	0.0		0.0		5.2		0.0		26.0		7.8							
	Available Queue Storage, S_Q (ft)	450		200		200		450		125		125							
	Average Control Delay (sec/veh)	0.0		5.0		8.5		0.0		32.0		11.3						20.5	2.1
	Level of Service, LOS	A		A		A		A		D		B							
	Approach Delay (sec/veh)	0.4				0.8				20.5								C	A
	Approach Level of Service, LOS	A				A				C									

U = U-Turns; L = Left Turns; T = Through; R = Right Turns | Lane Groups: TR = Through-Righ; L = Left; T = Through; and LR = Left-Right

Average intersection delay and volume-to-capacity ratio for minor approach(es) is a weighted average provided for reference purposes. The *Highway Capacity Manual, 7th Edition: A Guide for Multimodal Mobility Analysis* does not define overall average delay for the intersection as a whole for two-way or single approach stop-controlled intersections.

HCS Two-Way Stop-Control Report

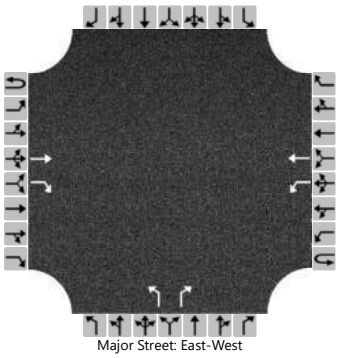
General Information

Analyst	T. Eastwood
Agency/Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2034
Time Analyzed	Weekday, AM Peak Hour
Intersection Orientation	East-West
Project Description	Copper Square TIS | Total Traffic Mitigation

Site Information

Intersection	Rimrock Rd & 60th St W
Jurisdiction	City of Billings
East/West Street	Rimrock Road
North/South Street	60th Street West
Peak Hour Factor	0.78
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	1	0	1	1	0		1	0	1		0	0	0
Configuration			T	R		L	T			L		R				
Volume (veh/h)			582	80		59	214			33		89				
Percent Heavy Vehicles (%)						5				5		5				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized			No							No						
Median Type | Storage			Undivided													

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.15				6.45		6.25				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.25				3.55		3.35				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						76				42		114				
Capacity, c (veh/h)						776				189		409				
v/c Ratio						0.10				0.22		0.28				
95% Queue Length, Q_{95} (veh)						0.3				0.8		1.1				
95% Queue Length, Q_{95} (ft)						7.8				20.8		28.6				
Control Delay (s/veh)						10.1				29.4		17.2				
Level of Service (LOS)						B				D		C				
Approach Delay (s/veh)						2.2				20.5						
Approach LOS						A				C						

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HCS Two-Way Stop-Control Report

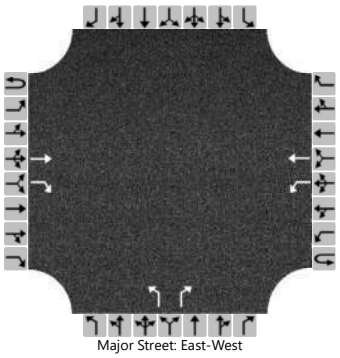
General Information

Analyst	T. Eastwood
Agency/Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2034
Time Analyzed	Weekday, Midday Peak Hour
Intersection Orientation	East-West
Project Description	Copper Square TIS | Total Traffic Mitigation

Site Information

Intersection	Rimrock Rd & 60th St W
Jurisdiction	City of Billings
East/West Street	Rimrock Road
North/South Street	60th Street West
Peak Hour Factor	0.91
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	1	0	1	1	0		1	0	1		0	0	0
Configuration			T	R		L	T			L		R				
Volume (veh/h)			275	27		51	305			31		53				
Percent Heavy Vehicles (%)						5				5		5				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized			No							No						
Median Type | Storage			Undivided													

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.15				6.45		6.25				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.25				3.55		3.35				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						56				34		58				
Capacity, c (veh/h)						1211				358		730				
v/c Ratio						0.05				0.10		0.08				
95% Queue Length, Q_{95} (veh)						0.1				0.3		0.3				
95% Queue Length, Q_{95} (ft)						2.6				7.8		7.8				
Control Delay (s/veh)						8.1				16.1		10.4				
Level of Service (LOS)						A				C		B				
Approach Delay (s/veh)						1.2				12.5						
Approach LOS						A				B						

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HCS Two-Way Stop-Control Report

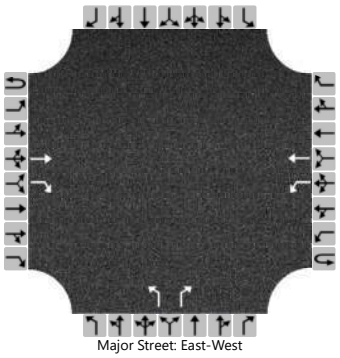
General Information

Analyst	T. Eastwood
Agency/Co.	E5 Engineering, PLLC
Date Performed	10/12/2025
Analysis Year	2034
Time Analyzed	Weekday, PM Peak Hour
Intersection Orientation	East-West
Project Description	Copper Square TIS | Total Traffic Mitigation

Site Information

Intersection	Rimrock Rd & 60th St W
Jurisdiction	City of Billings
East/West Street	Rimrock Road
North/South Street	60th Street West
Peak Hour Factor	0.86
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	1	0	1	1	0		1	0	1		0	0	0
Configuration			T	R		L	T			L		R				
Volume (veh/h)			363	30		63	576			39		49				
Percent Heavy Vehicles (%)						5				5		5				
Proportion Time Blocked																
Percent Grade (%)										0						
Right Turn Channelized			No							No						
Median Type | Storage			Undivided													

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.15				6.45		6.25				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.25				3.55		3.35				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						73				45		57				
Capacity, c (veh/h)						1088				178		625				
v/c Ratio						0.07				0.25		0.09				
95% Queue Length, Q_{95} (veh)						0.2				1.0		0.3				
95% Queue Length, Q_{95} (ft)						5.2				26.0		7.8				
Control Delay (s/veh)						8.5				32.0		11.3				
Level of Service (LOS)						A				D		B				
Approach Delay (s/veh)						0.8				20.5						
Approach LOS						A				C						

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ENGINEERING, PLLC

Appendix I

Cost Participation Analyses

Intersection: Grand Avenue & 62nd Street West

Conditions: Copper Square Subdivision
Estimated 2034 Total Traffic Volumes

Approach		AM Peak		PM Peak		Number of Lanes
		Mvmt Vol.	Lane Vol.	Mvmt Vol.	Lane Vol.	
NB	T	0	0	0	0	0
	L	0	0	0	0	0
SB	T	0	0	0	0	0
	L	1	1	1	1	1
EB	T	0	0	0	0	1
	L	4	4	4	4	1
WB	T	0	0	0	0	1
	L	0	0	0	0	0
Critical Lane Sum Increase:			5	5		
Critical Lane Sum:			1200	1140		<--- 1200 for 4-leg intersection,
Peak Hour %:			0.4%	0.4%		1140 for 3-leg intersection
Highest %:			0.44%			

Intersection: Rimrock Road & 62nd Street West / Molt Road

Conditions: Copper Square Subdivision
Estimated 2034 Total Traffic Volumes

Approach		AM Peak		PM Peak		Number of Lanes
		Mvmt Vol.	Lane Vol.	Mvmt Vol.	Lane Vol.	
NB	T	0	0	0	0	1
	L	0	0	0	0	0
SB	T	0	0	0	0	1
	L	29	0	30	0	0
EB	T	15	15	16	16	1
	L	0	0	0	0	0
WB	T	10	10	15	15	1
	L	4	0	5	0	0
Critical Lane Sum Increase:			15	16		
Critical Lane Sum:			1200	1200		<--- 1200 for 4-leg intersection,
Peak Hour %:			1.3%	1.3%		1140 for 3-leg intersection
Highest %:			1.33%			

Intersection: Rimrock Road & 58th Street West

Conditions: Copper Square Subdivision
Estimated 2034 Total Traffic Volumes

Approach		AM Peak		PM Peak		Number of Lanes
		Mvmt Vol.	Lane Vol.	Mvmt Vol.	Lane Vol.	
NB	T	0	0	0	0	1
	L	2	0	2	0	0
SB	T	0	0	0	0	1
	L	0	0	0	0	0
EB	T	27	27	42	42	1
	L	0	0	0	0	1
WB	T	44	44	48	48	1
	L	0	0	0	0	1
Critical Lane Sum Increase:			**44**	**48**		
Critical Lane Sum:			**1200**	**1200**		<--- 1200 for 4-leg intersection,
Peak Hour %:			**3.7%**	**4.0%**		1140 for 3-leg intersection
Highest %:			**4.00%**			

Intersection: Rimrock Road & 54th Street West

Conditions: Copper Square Subdivision
Estimated 2034 Total Traffic Volumes

Approach		AM Peak		PM Peak		Number of Lanes
		Mvmt Vol.	Lane Vol.	Mvmt Vol.	Lane Vol.	
NB	T	0	0	0	0	1
	L	5	5	5	5	1
SB	T	0	0	0	0	1
	L	0	0	0	0	1
EB	T	23	23	37	37	1
	L	1	1	0	0	1
WB	T	39	39	41	41	1
	L	0	0	0	0	1
Critical Lane Sum Increase:			45	46		
Critical Lane Sum:			1200	1200		<--- 1200 for 4-leg intersection, 1140 for 3-leg intersection
Peak Hour %:			3.8%	3.8%		
Highest %:			3.83%			

Intersection: Rimrock Road & Road A

Conditions: Copper Square Subdivision
Estimated 2034 Total Traffic Volumes

Approach		AM Peak		PM Peak		Number of Lanes
		Mvmt Vol.	Lane Vol.	Mvmt Vol.	Lane Vol.	
NB	T	0	0	0	0	0
	L	22	22	34	34	1
SB	T	0	0	0	0	0
	L	0	0	0	0	0
EB	T	12	12	15	15	1
	L	0	0	0	0	0
WB	T	10	10	14	14	1
	L	10	10	12	12	1
Critical Lane Sum Increase:			**44**	**61**		
Critical Lane Sum:			**1200**	**1140**		<--- 1200 for 4-leg intersection,
Peak Hour %:			**3.7%**	**5.4%**		1140 for 3-leg intersection
Highest %:			**5.35%**			

Intersection: Rimrock Road & 60th Street West

Conditions: Copper Square Subdivision
Estimated 2034 Total Traffic Volumes

Approach		AM Peak		PM Peak		Number of Lanes
		Mvmt Vol.	Lane Vol.	Mvmt Vol.	Lane Vol.	
NB	T	0	0	0	0	0
	L	33	33	39	39	1
SB	T	0	0	0	0	0
	L	0	0	0	0	0
EB	T	-58	-58	-4	-4	1
	L	0	0	0	0	0
WB	T	-13	-13	-13	-13	1
	L	59	59	63	63	1
Critical Lane Sum Increase:			34	98		
Critical Lane Sum:			1200	1140		<--- 1200 for 4-leg intersection, 1140 for 3-leg intersection
Peak Hour %:			2.8%	8.6%		
Highest %:			8.60%			

619 Milestone Drive ● Belgrade, Montana 59714 ● (406) 209-3960 ● E5EngineeringPLLC@gmail.com

Planning Board

Date:	12/09/2025
Title:	Lone Eagle North Subdivision - Preliminary Major Subdivision, County
Presented by:	David Green
Department:	Planning & Community Services
Presentation:	Yes

Information

RECOMMENDATION

Staff recommends to the Planning Board that they forward a recommendation of conditional approval to the Board of County Commissioners for the preliminary plat of Lone Eagle North Subdivision, denial of the variance requests, and adoption of the Findings of Fact as presented in the staff report.

BACKGROUND (Consistency with Adopted Plans and Policies, if applicable)

On November 3, 2025, WWC Engineering, applied for preliminary major plat approval of Lone Eagle North Subdivision. The subdivision will create 37 lots for residential development. The subject property is generally located south of Alkali Creek Road and east of Highway 3. This parcel of land is currently zoned Agriculture. The applicant has a request submitted for a zone change to Rural Residential 3 zoning. Some of the land has been used for farming. Other areas are native grassland and scrub. There are trees around the Alkali Creek stream.

VARIANCES REQUESTED

The applicant has requested two variances from the Yellowstone County Subdivision Regulations. One variance from Section 4.6.A.7. Streets and Roads, Road Network Performance Standards associated with a dead end road exceeding 1,000 feet in length. The other from Section 4.6.A.3 associated with providing connection to existing roads.

"*Section 4.6.A.7. Dead end roads shall not be more than 1000 feet in length*."

"Section 4.6.A.3. There shall be right-of-way and road connections made when existing roads or platted roads outside the subdivision connect to the subject parcel."

Staff is recommending denial of the variance requests. County Public Works stated in reviewing the variance requests that, "Public Works has reviewed the variances, and we will not support them." Further explanation and staff analysis can be found in the attachments, "Variance A Staff Input" and "Variance B Staff Input."

PROPOSED CONDITIONS OF APPROVAL

Pursuant to Section 76-3-608(4), MCA, the following conditions are recommended to reasonably minimize potential adverse impacts identified within the Findings of Fact.

1. To protect public health and safety, prior to final plat approval, the applicant will receive approval from the MDEQ for the proposed water systems, septic systems and the proposed stormwater management.
2. To provide a maintenance mechanism for the new public roads within the subdivision and to protect public health and safety, prior to final plat approval, the applicant will petition to create an RSID for the future maintenance of the public roads.
3. To protect public health and safety and to follow the requirements of Yellowstone County Subdivision Regulations, prior to final plat, should both variances requested by the applicant be denied, the applicant shall ensure all dead end roads within the subdivision do not exceed a maximum of 1000 feet and provide for an approved road turnaround and the applicant shall provide connection to the existing Lone Eagle Rd.
4. To protect public health and safety with proper fire suppression, prior to final plat approval, the applicant will submit construction drawings of the dry hydrant system to Fuego Volunteer Fire Department for review and approval. Once installed, the applicant will request Fuego Volunteer Fire Department test the system to ensure it works correctly and get a sign off from Fuego Volunteer Fire Department. The applicant will also create an RSID for the dry hydrant system.
5. To minimize the effects on local service, prior to final plat approval, the applicant will coordinate with the USPS for locating and providing the correct amount of space for safely delivering the mail to the residents.
6. To complete the requirements of a Phased Subdivision, prior to final plat, the applicant will provide the correct paperwork to be recorded with the final plat, restrictions on conveyances.
7. To minimize effects on the natural environment, prior to final plat approval a weed management plan and property inspection shall be completed by the County Weed Department.
8. Minor changes may be made in the SIA and final documents, as requested by the Planning, Legal or Public Works Departments to clarify the documents and bring them into the standard acceptable format.

9. The final plat shall comply with all requirements of the Yellowstone County Subdivision Regulations, rules, policies, and resolutions of Yellowstone County, and the laws and Administrative Rules of the State of Montana.

PROCEDURAL HISTORY

- Pre-application meeting September 4, 2025
- Preliminary plat application submitted to Planning Division on November 3, 2025
- Departmental Review Meeting November 13, 2025
- Re-submittal of proposed plat November 20, 2025
- Planning Board plat review meeting December 9, 2025
- Planning Board public hearing meeting December 23, 2025
- Preliminary plat to Board of County Commissioners, January 20, 2026
- 60 working-day preliminary plat review period ends February 4, 2026

PLAT INFORMATION

General location:	South of Alkali Creek Road and east of Highway 3
Legal Description:	SECTION 9, TOWNSHIP 1 NORTH, RANGE 25 EAST, COS 3420
Owner/Subdivider:	Yellowstone Farm LLC
Engineer and Surveyor:	WWC Engineering
Existing Zoning:	Agriculture requesting RR3
Existing land use:	Some Active Farmland
Proposed land use:	Residential
Gross and Net area:	327.28 acres
Proposed number of lots:	37
Lot size:	Max: 9.97 acres Min.: 5.61 acres
Parkland requirements:	Parkland dedication is not required as all lots are over 5 acres in size.

TRAFFIC IMPACT STUDY - INTERSECTION COST PARTICIPATION:
The Lone Eagle North Subdivision has been studied in accordance with Yellowstone County Traffic Impact Study (TIS) guidelines and the latest traffic engineering industry standards and references for traffic impact analysis. Because no traffic impacts are indicated with respect to the County's Level of Service (LOS) C standard for peak hour intersection operations, no mitigations for traffic operations are recommended as a result of this project. No auxiliary turn lanes would be warranted with or without this project based on design hour volume, per MDT guidelines and procedures. All study intersections would have critical traffic shares well below the 2% threshold for cost participation, so no such contribution is required.

Intersection	AM	PM	Higher Peak, if 2% or Greater
1. MT 3 at Alkali Creek Road	0.7%	0.6%	n/a
2. MT 3 at Lone Eagle Drive	0.7%	0.8%	n/a
3. Skyway Drive at Alkali Creek Road	0.7%	0.9%	n/a
Total Participation %:			0%

None of the intersections studied would experience a high enough critical-movement volume increase due to the project to require participation in the cost of future improvements.

PARKLAND:
There is no parkland requirement for this subdivision as all the lots in the proposed subdivision are over 5 acres in size.

STAKEHOLDERS
There are no stakeholder responses at this time. Stakeholder input will be received at a public hearing scheduled for this subdivision on December 23, 2025.

ALTERNATIVES

In accordance with state law, the Board of County Commissioners has 60 working days to act upon this major preliminary plat. The 60 working day review period for the proposed plat ends on February 4, 2026. State and County subdivision regulations also require that preliminary plats be reviewed using specific criteria, as stated within this report. The County may not unreasonably restrict an owner's ability to develop land if the subdivider provides evidence that any identified adverse effects can be mitigated. Within the 60 working day review period, the Board of County Commissioners is required to:

1. Approve;
2. Conditionally Approve; or
3. Deny the Preliminary Plat

FISCAL EFFECTS

This plat will have no fiscal impact on the City/County Planning Division.

SUMMARY

The purpose of the County's subdivision review process is to identify potential negative effects of property being subdivided. When negative effects are identified, it is the subdivider's responsibility to mitigate those effects. Various County departments, private service/utility providers and the affected school district(s), have reviewed this application and provided input on effects and mitigation. The Findings of Fact, which are presented as an attachment, discuss potential negative impacts of the subdivision and conditions of approval are recommended as measures to further mitigate any impacts. In this case, there were found to be some impacts from this proposed subdivision.

Attachments

Findings of Fact
Proposed Plat
Draft SIA
Variance Request A
Variance Request A Staff Input
Variance Request B
Variance Request B Staff Input

FINDINGS OF FACT

The City-County Planning Division Staff has prepared the Findings of Fact for Lone Eagle North Subdivision. These findings are based on the preliminary plat application and supplemental documents addressing the review criteria required by the Montana Subdivision and Platting Act (76-3-608, MCA) and the Yellowstone County Subdivision Regulations (YCSR).

A. What are the effects on agriculture, local services, the natural environment, wildlife and wildlife habitat and public health and safety (76-3-608 (3) (a) MCA) (Section 3.2 (H) (2) YCSR)

1. Effect on agriculture and agricultural water users' facilities

The subject property open grass and scrub with some trees along Alkali Creek. No water rights or shares are available to this subdivision so there will be none transferred to individual lot owners. There are no irrigation ditches that exist on the perimeter of this development. Perimeter drains shall remain in place and shall not be altered by the subdivider or subsequent owners. There will be no effect on the water users downstream from this property.

2. Effect on local services

a. **Water** – The proposed subdivision is not located within any public water district. In accordance with Section 4.4.E. Yellowstone County Subdivision Regulations, all proposed water systems must obtain approval by MDEQ, or its designee.

Individual wells or cisterns will be permitted. An approval letter from MDEQ will be submitted with the final plat. The maintenance and operation of the individual systems will be facilitated by the individual lot owner.

Water systems will be installed meeting the requirements outlined in Section 4.9 of the Yellowstone County Subdivision Regulations and the MDEQ. **(Condition #1)**

b. **Septic -** The proposed subdivision is not located within any public sewer district. In accordance with Section 4.4.E. Yellowstone County Subdivision Regulations, all proposed sanitary sewer systems must obtain approval by MDEQ, or its designee.

Individual septic systems will be permitted. An approval letter from MDEQ will be submitted with the final plat. The maintenance and operation of the individual systems will be facilitated by the individual lot owner.

Septic systems will be installed meeting the requirements outlined in Section 4.8 of the Yellowstone County Subdivision Regulations and the MDEQ. **(Condition #1)**

All private utilities, power, telephone, gas and cable television will be installed in the public right of way or easements identified on the plat.

c. **Streets and roads** – Access to the subdivision shall be from proposed approaches on Alkali Creek Road. The roads will be built to the County standard paved surface roads. They will be in a 60-foot-wide rights of way and be built with a 24-foot paved surface. An RSID will be created to maintain the public roads within the subdivision. **(Condition #2)**

A TIS has been submitted for this proposed subdivision. The traffic study showed the impacts would be minimal to the studied intersections and do not meet the threshold for contributions to the County for intersection improvements. In the future should there be more development, then this subdivision can be assessed proportional cost through the Waiver of Right to Protest.

INTERSECTION COST PARTICIPATION from TIS

The net new trips identified in this report are subject to examination under Yellowstone County's cost participation program to the extent that they would travel through studied intersections. Cost participation has been estimated for the three public-street intersections in this study under the assumptions that (a) the peak with the highest percentage of trips added to the intersection's critical volume pairs governs cost contribution and (b) site traffic must result in an increase of 2% in total critical-movement volume, after project trips are considered, to be subject to cost participation. The project trips used in this calculation are those shown previously in Exhibit 10. Once it is demonstrated that an intersection is eligible, the applicant pays the entire percentage, not just the marginal part above 2%, unless another arrangement is made with the County. Exhibit 14 shows the intersection cost participation summary for project trips.

Exhibit 14. Intersection Cost Participation

Intersection	AM	PM	Higher Peak, if 2% or Greater
1. MT 3 at Alkali Creek Road	0.7%	0.6%	n/a
2. MT 3 at Lone Eagle Drive	0.7%	0.8%	n/a
3. Skyway Drive at Alkali Creek Road	0.7%	0.9%	n/a
	Total Participation %: 0%		
	x $500,000		$0

None of the intersections studied would experience a high enough critical-movement volume increase to require participation in the cost of future intersection improvements.

d. **Fire and Police services** – The property is within the Fuego Volunteer Fire boundary. The subdivision will have a dry hydrant tank installed alongside the road Stagecoach Trail within Lot 6, Block 1. Their will be a second dry hydrant tank along Swift Hawk Road within Lot 2, block 4 of the proposed subdivision. The applicant will submit drawings for the tank to the Fuego Volunteer Fire for review and approval. When the tank is installed the applicant will have the system tested and signed off by the Fuego Volunteer Fire. **(Condition #3)**

The Yellowstone County Sheriff's Department will provide law enforcement services to this subdivision.

e. **Solid Waste disposal** – The Billings Landfill has capacity for solid waste disposal.

Solid waste will be collected and disposed of by a private garbage collection company. Each lot owner will be responsible for arranging for collection.

f. **Storm water drainage** – Stormwater will be collected onsite using a combination of swales, culverts, and the natural slope of the land and delivered to onsite storm detention facilities. Proposed storm water drainage shall be submitted to the MDEQ for review and approval prior to final plat. All proposed stormwater systems shall meet the requirements of Section 4.7 of Yellowstone County Subdivision Regulation's and the requirements of MDEQ. **(Condition #1)**

g. **School facilities** – The proposed subdivision schools are located in the Heights. Eagle Cliff Elementary, currently under maximum capacity. Castle Rock Middle School, currently under maximum capacity. Skyview High School currently under maximum capacity.

h. **Parks and recreation** – There is no Parkland dedication required for this subdivision as all lots are over 5 acres. The applicant is proposing to provide a private park area with this filing. They are proposing to have 20.57 acres of private parkland around Alkali Creek.

i. **Postal Service –** The applicant will be required to coordinate with the USPS to ensure they are providing a safe location for the postal worker to deliver the mail and the residents to retrieve their mail. **(Condition #4)**

j. **Historic features** – No known historic or cultural assets exist on the site.

k. **Phasing of Development** - The applicant is proposing to develop this subdivision in phases. Phase 1 and Phase 2. The applicant will provide the correct paperwork to be recorded with the final plat, restriction on conveyances. The subdivision improvement agreement shall be updated to reflect the date associated with the opening of each phase of the subdivision. **(Condition #6)**

- Phase I
  Swift Hawk Road will be constructed in its entirety along and a temporary cul-de-sac at the terminus of the roadway will be constructed. A dry hydrant will be constructed on Lot 2 of Block 4 in this phase. A private gate will be installed at the end of the public dedicated portion of Swift Hawk Road.
- Phase 2
  Stagecoach Trail will be constructed to the intersection with Painted Horse Road and Painted Horse Road will be constructed in its entirety. A dry hydrant will be installed on Lot 5 of Block 1.
- Phase 3
  All of Whiskey Jack Road will be constructed between Swift Hawk Road and Stagecoach Trail. Stagecoach Trail will be constructed from the end of Phase II to its terminus at the intersection with Consuela Creek Road. A temporary cul-de-sac will be constructed at the end of Stagecoach Trail.
- Phase 4

Consuela Creek Road will be extended to the east edge of Lot 5 of Block 5 with construction of a temporary cul-de-sac.

3. Effects on the natural environment

The development will use noxious weed control measures to prevent the spread of noxious weeds to adjacent developed or agricultural land. As required by County Subdivision Regulations Section 4.15 all county subdivisions are required to apply for and obtain a weed management plan with the County Weed Department. Any subdivision that has an existing Weed Management Plan is required to get an updated Weed Management Plan. A weed management plan will be completed and a copy will be submitted with final plat. **(Condition #6)**

There are no apparent or known natural hazards on the property.

4. Effects on wildlife and wildlife habitat

Impacts on Significant, Important, and Critical Habitat: Because part of this land has been cultivated for farming the native habitat has been disturbed and limited to smaller animals. The property has been historically used for livestock rangeland. There are no known protected species or special status habitats within the proposed subdivision. This site is not in sage grouse habitat. There are no threatened or endangered species known to inhabit the area.

A paragraph in the 'Conditions that Run with the Land' section of the SIA warns future lot owners of the likely presence of wildlife in the area and their potential to damage residential landscaping.

5. Effects on public health and safety

Plans and designs for the water and septic system will be reviewed and approved by MDEQ prior building construction on each lot to ensure public health and safety.

Fire and emergency services are provided for this proposed subdivision from Fuego Volunteer Fire and the Yellowstone County Sheriff's department.

B. Was an environmental assessment required? If yes, what, if any, significant adverse impacts were identified? (76-3-603 MCA) (Chapter 9, YCSR)

A summary of impacts was required for this subdivision pursuant Section 9.2 of the County Subdivision Regulations. There were no significant impacts identified in the environmental assessment submitted with the proposed subdivision.

C. Does the subdivision conform to the Yellowstone County 2008 Growth Policy, the 2018 Urban Area Transportation Plan and the Billings Area Bikeway and Trail Master Plan Update? [BMCC 23-302.H.4.]

1. **Yellowstone County - 2008 Growth Policy**

The subdivision is consistent with the following goals of the Growth Policy:

- Goal: Predictable land use decisions that are consistent with neighborhood character and land use patterns. (p. 6)

The subdivision is consistent with the type of residential development in the surrounding area. There is residential development to the south. Large acreage lots.

- Goal: Controlled weed populations. (p. 9)

The developer shall complete a weed management plan and shall provide a re-vegetation plan for any ground disturbed by development.

2. 2023 Billings Urban Area Long Range Transportation Plan

The subject property maintains the road study area of the Transportation Plan. As proposed, the internal streets are neighborhood streets associated with this subdivision.

3. Billings Area Bikeway and Trail Master Plan (BABTMP)

This subdivision is outside the BABTMP boundaries for trails. This subdivision will not be required to install any trails at this time.

D. Does the subdivision conform to the Montana Subdivision and Platting Act (MSPA) and to local subdivision regulations? [MCA 76-3-608 (3) (b) and Section 3.2 (3) (a) YCSR]

The proposed subdivision meets the requirements of the MSPA and the YCSR. The subdivider and the local government have complied with the subdivision review and approval procedures that are set forth by local and state subdivision regulations.

E. Does the subdivision conform to sanitary requirements? [Section 4.8 (C) and 4.9 (C), YCSR]

The subdivision must receive approval from the MDEQ prior to any building construction on each lot. Each lot will have its own septic and well system. These new systems will be approved by MDEQ before final plat.

F. Does the proposed subdivision meet any applicable Zoning Requirements? [Section 3.2 (H) (3) (e), YCSR]

The proposed subdivision is within the County Zoning Jurisdiction. The lots are currently zoned Agriculture, they are requesting a zone change to Rural Residential 3.

G. Does the subdivision provide for necessary planned utilities? [MCA 76-3-608 (3) (c) and Section 3.2 (H) (3) (b), YCSR]

The applicant will coordinate with private utility companies to provide the required easements.

H. Does the proposed subdivision provide for Legal and Physical Access to all lots? [MCA 76-3-608 (3) (d) and Section 3.2 (H) (3) (c) (d), YCSR]

Legal and physical access will be provided from Alkali Creek Road. Access to each lot will be from the internal roads of the subdivision.

CONCLUSIONS OF FINDINGS OF FACT

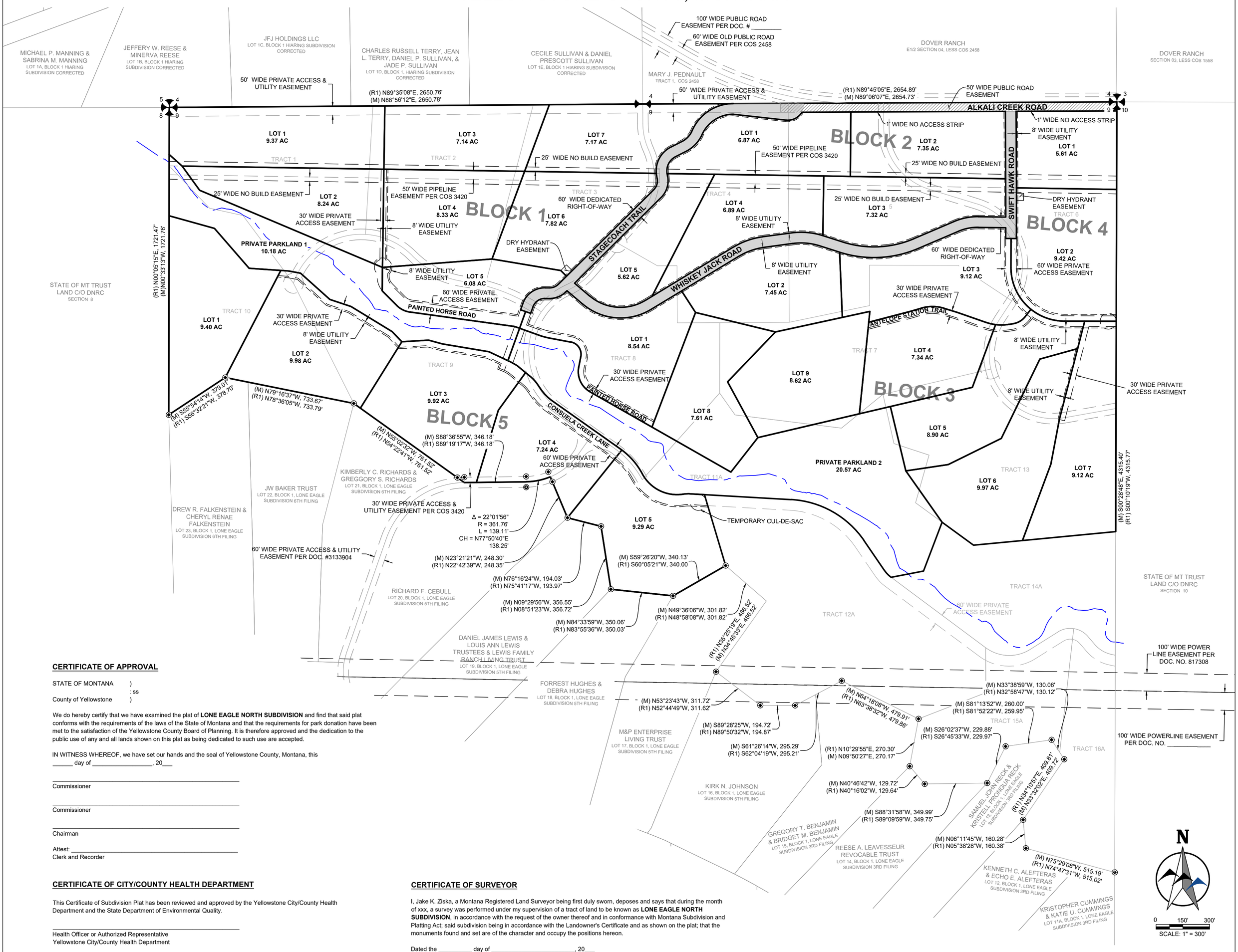
- This subdivision does not create adverse impacts that warrant denial of the subdivision.
- Impacts to agriculture, agriculture water user facilities, local services, public health and safety, the natural environment, and wildlife should be minimal, and can be mitigated by reasonable conditions of final plat approval.
- The subdivision conforms to some of the goals of the Growth Policy.
- The applicant has complied with the MSPA and YCSR processes and the subdivision conforms to the law requirements.

RECOMMENDATION

Staff recommends to the Planning Board that they forward a recommendation of conditional approval to the Board of County Commissioners for the preliminary plat of Lone Eagle North Subdivision, deny the variance requests and adopt the Findings of Fact as presented in the staff report.

LONE EAGLE NORTH SUBDIVISION

TRACT LOCATED IN SECTION 9, TOWNSHIP 1 NORTH, RANGE 25 EAST, P.M.M., YELLOWSTONE COUNTY, MONTANA



CERTIFICATE OF APPROVAL

STATE OF MONTANA)
: ss
County of Yellowstone)

We do hereby certify that we have examined the plat of **LONE EAGLE NORTH SUBDIVISION** and find that said plat conforms with the requirements of the laws of the State of Montana and that the requirements for park donation have been met to the satisfaction of the Yellowstone County Board of Planning. It is therefore approved and the dedication to the public use of any and all lands shown on this plat as being dedicated to such use are accepted.

IN WITNESS WHEREOF, we have set our hands and the seal of Yellowstone County, Montana, this _____ day of _____, 20___

_____
Commissioner

_____
Commissioner

_____
Chairman

Attest: _____
Clerk and Recorder

CERTIFICATE OF CITY/COUNTY HEALTH DEPARTMENT

This Certificate of Subdivision Plat has been reviewed and approved by the Yellowstone City/County Health Department and the State Department of Environmental Quality.

_____
Health Officer or Authorized Representative
Yellowstone City/County Health Department

CERTIFICATE OF COUNTY ATTORNEY

This document has been reviewed by the Yellowstone County Attorney's Office and is acceptable as to form.

_____
County Attorney or Authorized Representative
Yellowstone County Attorney's Office

_____
Date

CERTIFICATE OF COUNTY TREASURER

I hereby certify that all real property taxes and special assessments have been paid per 76-3-611(1)(b)/76-3-207(3), M.C.A.

_____
County Treasurer or Authorized Representative
Yellowstone County Treasurer's Office

_____
Date

LEGAL DESCRIPTION AND PROPERTY OWNER CERTIFICATE OF DEDICATION

STATE OF MONTANA)
: ss
County of YELLOWSTONE)

KNOW ALL MEN BY THESE PRESENTS: That, **YELLOWSTONE FARMS LLC,** the owner of the following described tract of land, does hereby certify that it has caused to be surveyed, subdivided and platted into lots, blocks and streets as shown on the plat, said tract being situated in Section 9, T.01N., R.25E., P.M.M. Yellowstone County, Montana, said tract being more particularly described as follows:

Jake to Enter Legal description. 325.22 ACRES MORE OR LESS

The park requirement for this subdivision has been met by land donation pursuant to Section 76-3-621(3)(a), M.C.A.

The undersigned hereby grants unto all utility companies, as such are defined and established by Montana Law, and cable television companies an easement for the location, maintenance, repair and removal of their lines and other facilities, in, over, under and across the areas designated on this plat as "UTILITY EASEMENT" to have and to hold forever. Said tract shall be known and designated as "**LOAN EAGLE NORTH SUBDIVISION**", and the lands designated as public right-of-way are hereby granted and dedicated to the use of the public forever.

_____
Robert Arensberg, Member
Yellowstone Farms LLC

STATE OF MONTANA)
: ss
County of YELLOWSTONE)

On this _____ day of _____ , 202___, before me, the undersigned a notary public for the State of _____, personally appeared Robert Arensberg, as Member of the Yellowstone Farms LLC, known to me to be the person whose name is subscribed to the within instrument and acknowledged to me that he executed the same.

_____
Notary Public for the State of _____

CERTIFICATE OF SURVEYOR

I, Jake K. Ziska, a Montana Registered Land Surveyor being first duly sworn, deposes and says that during the month of xxx, a survey was performed under my supervision of a tract of land to be known as **LONE EAGLE NORTH SUBDIVISION**, in accordance with the request of the owner thereof and in conformance with Montana Subdivision and Platting Act; said subdivision being in accordance with the Landowner's Certificate and as shown on the plat; that the monuments found and set are of the character and occupy the positions hereon.

Dated the _____ day of _____, 20___

_____
Jake K. Ziska
Registration Number 18636 LS

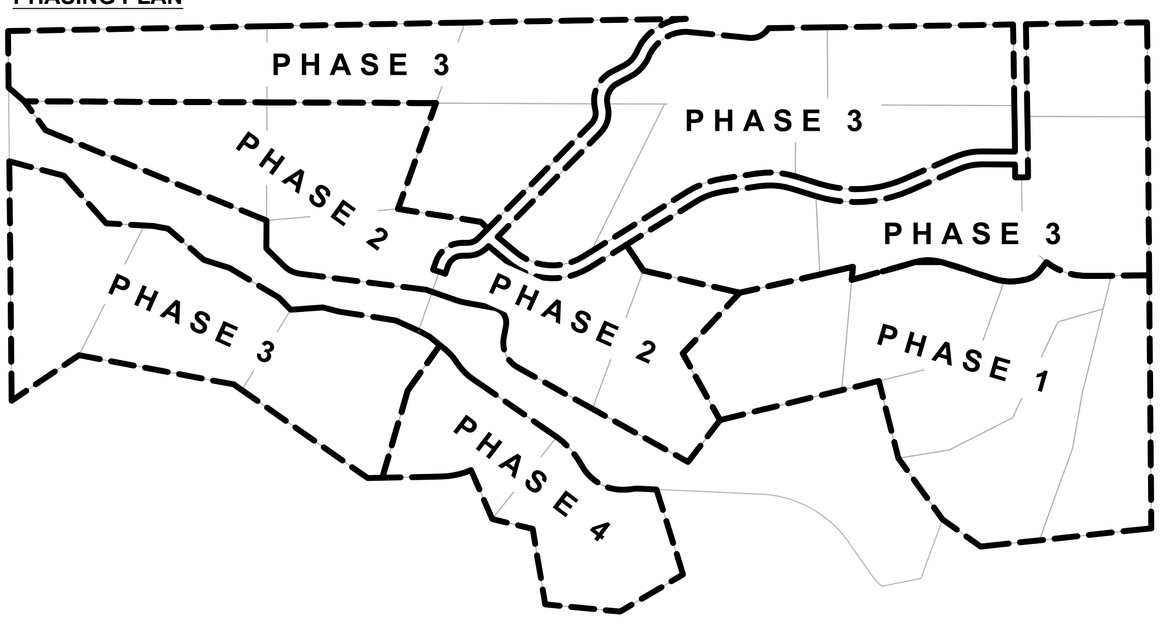
MONTANA
JAKE K. ZISKA
No. 18636LS
LICENSED
PROFESSIONAL LAND SURVEYOR
PRELIMINARY

SURVEYOR'S NOTES

1. Interior monuments and lot line dimensions for Certificate of Survey No. 3420 are not shown on all sheets for purposes of clarity.

2. All private access easements created this survey.

PHASING PLAN



SURVEY IS NOT VALID UNLESS SEAL CONTAINS THE SIGNATURE OF THE PROFESSIONAL LAND SURVEYOR

LEGEND

(M)	MEASURED DISTANCE
(R1)	RECORD DISTANCE PER COS 3420
	FOUND SECTION CORNER AS NOTED
	FOUND QUARTER SECTION CORNER AS NOTED
	SET 5/8" REBAR WITH YELLOW PLASTIC CAP (ZISKA18636LS)
	FOUND 5/8" REBAR WITH A YELLOW PLASTIC CAP (EI) OR AS NOTED
	FOUND 2" O.D. PIPE
	CALCULATED POSITION, NOTHING FOUND OR SET
	SUBDIVISION BOUNDARY
	ADJACENT BOUNDARY
	EASEMENT LINE AS NOTED
	EASEMENT AREA AS NOTED

1/4	SEC.	TWP.	RGE.
	9	1N.	25E.

LONE EAGLE NORTH SUBDIVISION
YELLOWSTONE COUNTY, MT

PREPARED FOR:
YELLOWSTONE FARMS LLC.
3680 VICKERY DR
BILLINGS, MONTANA 59102-8006

PREPARED BY:
WWC ENGINEERING
550 S. 24TH ST. W., SUITE 201
BILLINGS, MT 59102
(406) 894-2210
www.wwcengineering.com

PROJECT NO. 2023-401

NO.	REVISION	BY	DATE

DESIGNED BY: GTR
DRAWN BY: JRT
CHECKED BY: JKZ
DATE: 11/20/25

SHEET
1 OF 2

LONE EAGLE NORTH SUBDIVISION

Table of Contents

I. VARIANCES 2

II. CONDITIONS THAT RUN WITH THE LAND 2

III. TRANSPORTATION 3

A. Streets 4

B. Traffic Control Devices 4

C. Access 4

D. Billings Area Bikeways and Trail Master Plan (BABTMP) 4

IV. EMERGENCY SERVICE 4

V. STORM DRAINAGE 5

VI. UTILITIES 5

A. Water 5

B. Septic System 5

C. Power, Telephone, Gas, and Cable Television 5

VII. PARKS/OPEN SPACE 5

VIII. IRRIGATION 6

IX. WEED MANAGEMENT 6

X. SOILS/GEOTECHNICAL STUDY 6

LONE EAGLE NORTH SUBDIVISION

This agreement is made and entered into this ____day of _____, 20 __, by and between Robert Arensberg, Yellowstone Farms LLC, whose address for the purpose of this agreement is **3680 Vickery Drive, Billings, Montana 59102**, hereinafter referred to as "Subdivider," and YELLOWSTONE COUNTY, Montana, hereinafter referred to as "County."

WITNESSETH:

WHEREAS, at a regular meeting conducted on __day of _____, 20__, the Yellowstone County Board of Planning recommended conditional approval of a preliminary plat of *LONE EAGLE NORTH SUBDIVISION*; and

WHEREAS, at a regular meeting conducted on _____ day of _____, 20____, the Yellowstone County Board of County Commissioners conditionally approved a preliminary plat of *LONE EAGLE NORTH SUBDIVISION*; and

WHEREAS, a Subdivision Improvements Agreement is required by the County prior to the approval of the final plat.

WHEREAS, the provisions of this agreement shall be effective and applicable to *LONE EAGLE NORTH SUBDIVISION* upon the filing of the final plat thereof in the office of the Clerk and Recorder of Yellowstone County, Montana. The Subdivision shall comply with all requirements of the Yellowstone County Subdivision Regulations, the rules, regulations, policies, and resolutions of Yellowstone County, and the laws and administrative rules of the State of Montana.

THEREFORE, THE PARTIES TO THIS AGREEMENT, for and in consideration of the mutual promises herein contained and for other good and valuable consideration, do hereby agree as follows:

I. VARIANCES

Subdivider has requested, and the County hereby grants, the following variances by the County Commissioners from the strict interpretation of the County's Subdivision Regulations (Section 11.1 Yellowstone County Subdivision Regulations):

1. Dead End Length Variance for Section 4.6 part 7 of the Yellowstone County Subdivision Regulations.

2. Connectivity to adjacent Lone Eagle Subdivision, 5th Filing development variance for Section 4.6 part 3 of the Yellowstone County Subdivision Regulations.

II. CONDITIONS THAT RUN WITH THE LAND

A. Lot owners should be aware that this subdivision is being built in close proximity to prime deer and antelope habitat, and it is likely that homeowners will experience problems with damage to landscaped shrubs, flowers, and gardens. The Montana Fish, Wildlife, and Parks Department does not provide damage assistance unless there is damage to commercial crops

and/or a threat to public health and safety.

B. Lot owners should be aware that soil characteristics within the area of this subdivision, as described in the 1972 Yellowstone County Soil Survey, indicate that there could be potential limitations for proposed construction on the lots, which may require a geotechnical survey prior to construction.

C. No water rights have been transferred to the lot owners. Irrigation ditches that exist on the perimeter of this development are for the benefit of other properties. Perimeter ditches and drains shall remain in place and shall not be altered by the Subdivider or subsequent owners.

D. There is attached hereto a Waiver waiving the right to protest the creation of the special improvement district or districts which by this reference is expressly incorporated herein and made as much a part hereof as though fully and completely set forth herein at this point. The Waiver will be filed with the plat, shall run with the land, and shall constitute the guarantee by the Subdivider and property owner, or owners of the developments described herein. Said Waiver is effective upon filing and is not conditioned on the completion of the conditions set forth in this Agreement. The Subdivider and owner specifically agree that they are waiving valuable rights and do so voluntarily.

E. Culverts and associated drainage swales shall not be filled in or altered by the subdivider or subsequent lot owners.

F. When required by road improvements, all fences and irrigation ditches in the public right-of- way adjacent to this subdivision shall be removed or relocated outside of the public right-of- way and any relocation outside of the public right-of-way shall be subject to securing and recording easements.

G. Future maintenance of all public (or common) improvements shall be done through one (1) or more RSID(s) created as part of the SIA for this subdivision.

H. Lot owners or their agent will obtain an Access Permit from County Public Works prior to any construction on any lot within the subdivision. The application will include a site plan showing the desired location of the access and show that it meets the requirements outlined by the DEQ storm water requirements for the subdivision. Failure to do so will result in the lot owner or their agent removing what has been installed and locating the access in an approved location at the lot owners' expense.

I. Lot owners will comply with Yellowstone County Subdivision Regulations for driveways. Driveways greater than 150 feet in length must have an approved turn-around at their terminus per Yellowstone County Subdivision Regulations.

III. TRANSPORTATION

The subdivider agrees to guarantee all improvements for a period of one (1) year from the date of final acceptance by Yellowstone County.

A. Streets

Swift Hawk Road, Stagecoach Trail, Whiskey Jack Road, Consuela Creek Lane, and Painted Horse Road within areas of 60 foot dedicated right-of-way or private access easements shall be built to county paved road standards with a satisfactory subbase, base course, and asphalt surface. Swift Hawk Road, Stagecoach Trail, Whiskey Jack Road, Consuela Creek Lane, and Painted Horse Road shall have either a dedicated 60' right-of-way or 60’ private road easement as shown on the Plat. Swift Hawk Road will be public dedicated right-of-way to 90 feet south of the intersection with Whiskey Jack Road, at which point it will transition to private roadway. Stagecoach Trail will be public dedicated right-of-way to 70 feet north of the intersection with Painted Horse Road, at which point it will transition to private roadway.

Roads will be paved to the end of the lots being developed as identified in the phasing section herein. The design cross-section shall be a 24-foot asphalt width street with 2-foot-wide gravel shoulders and shoulder drainage swales. The dedicated portions of Stagecoach Trail, Whiskey Jack Road, and Swift Hawk Road, will be maintained by creation of a new county road RSID. Private access easement sections of the roadways will be maintained by creation of an HOA made up of the lots within the Lone Eagle North Subdivision. A gate will be installed at the end of the public dedicated portion of the roadways for Stagecoach Trail and Swift Hawk Road and the gate will be operated and maintained by an HOA created by the Subdivider. Gates must automatically open when a vehicle is leaving the property, to allow future traffic from adjacent connected subdivisions to exit through Lone Eagle North Subdivision roadways.

B. Traffic Control Devices

Street name and stop signs for streets within the subdivision, or located immediately adjacent thereto, shall be furnished and installed in accordance with the specifications of the Yellowstone County Public Works Departments.

C. Access

Primary and secondary access to the subdivision will be from Alkali Creek Road.

D. Billings Area Bikeways and Trail Master Plan (BABTMP)

There is no proposed trail identified near this subdivision. The applicant is not responsible for any additional road development for bike lanes.

IV. EMERGENCY SERVICE

Two 30,000-gallon water storage tank/dry hydrants will be installed on the western side of Stagecoach Trail within Lot 6, Block 1 and on the eastern side of Swift Hawk Road within Lot 2, Block 4 of Lone Eagle North Subdivision. The dry hydrants will be located within dry hydrant easements and will be maintained and serviced by a new dry hydrant RSID made up of the lots within the Lone Eagle North Subdivision. The dry hydrant system will be installed by the Subdivider and inspected and approved by the Fuego Volunteer Fire Company.

V. STORM DRAINAGE

All drainage improvements shall comply with the provisions of the Section 4.7, Yellowstone County Subdivision Regulations, and a stormwater management plan shall be submitted to and approved by the Montana Department of Environmental Quality (MDEQ), or its designee.

Stormwater will be collected onsite using a combination of swales, culverts, and the natural slope of the land and delivered to onsite storm detention facilities.

VI. UTILITIES

A. Water

Public water service is not available in the subdivision at this time. In accordance with Section 4.4.E. Yellowstone County Subdivision Regulations, all proposed water systems must obtain approval by MDEQ, or its designee.

Individual wells or cisterns will be permitted. An approval letter from MDEQ will be submitted with the final plat. The maintenance and operation of the individual systems will be facilitated by the individual lot owner.

B. Septic System

Municipal public sewer service is not available in the subdivision at this time. In accordance with Section 4.4.E. Yellowstone County Subdivision Regulations, all proposed sanitary sewer systems must obtain approval by MDEQ, or its designee.

Individual septic systems will be permitted. An approval letter from MDEQ will be submitted with the final plat. The maintenance and operation of the individual systems will be facilitated by the individual lot owner.

C. Power, Telephone, Gas, and Cable Television

The private utilities shall be installed within the provided easements. 8-foot-wide utility easements have been shown on the plat adjacent to all streets within the subdivision per the request of the utility companies.

VII. PARKS/OPEN SPACE

No public parkland dedication is required for this Subdivision. Private parkland will be dedicated for the Subdivision and maintained privately by creation of an HOA made up of the lots within the Subdivision.

VIII. IRRIGATION

No internal irrigation facilities border the subdivision. There are no water shares to be transferred to the lot owners.

IX. WEED MANAGEMENT

All noxious weeds on the latest Yellowstone County Noxious Weed List shall be controlled on all properties in the subdivision.

A. A Weed Management Plan must be filed and updated as needed for approval by the Yellowstone County Weed Department. Said weed management plan shall contain the noxious weeds being addressed and the plan for the control of those weeds. All associated cost for noxious weed control is the responsibility of the owner of record.

B. A revegetation plan shall be submitted as part of the management plan. A seeding recommendation can be obtained from the Yellowstone County Weed Department pursuant to Section 7-22-2152, MCA. The Yellowstone County Weed Department reserves the right to revise these recommendations based on the required site inspection.

X. SOILS/GEOTECHNICAL STUDY

A geotechnical investigation Phase I of the Subdivision was completed by Rimrock Engineering in July of 2025. The following is the executive summary of this report:

- Based on materials encountered in our recent borings, underlying about a foot of gravel surfacing, the subsurface profile generally consists of about 3 feet of loose to medium dense clayey sand soils overlying weathered sandstone bedrock. Groundwater was not encountered while drilling or for the short duration the borings were allowed to remain open.
- Clayey sand soils were encountered throughout the new road alignment. Sand soils are typically fair materials for supporting road sections for vehicle use. Subgrade remediation in the form of scarification, moisture conditioning, and recompaction should create a stable base for road construction. Good positive drainage will be important for longevity of pavement sections.
- Weathered sandstone bedrock was encountered within the borings drilled throughout the site. The bedrock is weathered, moderately hard near the surface and generally becomes more competent with depth. During drilling operations, we were able to advance solid stem, carbide tipped-augers through the native bedrock. Typically, this is indicative that contractors will be able to excavate the weathered bedrock using heavy-duty excavation equipment potentially combined with ripping or rock-hammering.

XI. PHASING OF IMPROVEMENTS

Included herein is a description of lots included within each phase and associated improvements

to be completed with each phase. Phases are listed on the face of the plat.

A. Phase I
   - Phase I includes Lots 4, 5, 6, 7, and 9 of Block 3.
   - Swift Hawk Road will be constructed in its entirety along and a temporary cul-de-sac at the terminus of the roadway will be constructed. A dry hydrant will be constructed on Lot 2 of Block 4 in this phase. A private gate will be installed at the end of the public dedicated portion of Swift Hawk Road. Phase I will be opened at the time of final plat.

B. Phase II
   - Phase II includes Lots 2, 4, and 5 of Block 1 and Lots 1 and 8 of Block 3.
   - Stagecoach Trail will be constructed to the intersection with Painted Horse Road and Painted Horse Road will be constructed in its entirety. A dry hydrant will be installed on Lot 5 of Block 1. Phase II is anticipated to be opened in 2029.

C. Phase III
   - Phase III includes Lots 1, 3, 6, and 7 of Block 1; Lots 2 and 3 of Block 3; all Lots of Blocks 2 and 4; and Lots 1, 2, and 3 of Block 5.
   - All of Whiskey Jack Road will be constructed between Swift Hawk Road and Stagecoach Trail. Stagecoach Trail will be constructed from the end of Phase II to its terminus at the intersection with Consuela Creek Road. A temporary cul-de-sac will be constructed at the end of Stagecoach Trail. Phase III is anticipated to be opened in 2032.

D. Phase IV
   - Phase IV includes Lots 4 and 5 of Block 5.
   - Consuela Creek Road will be extended to the east edge of Lot 5 of Block 5 with construction of a temporary cul-de-sac. Phase IV is anticipated to be opened in 2036.

XII. FINANCIAL GUARANTEES

Except as otherwise provided, Subdivider shall install and construct said required improvements by private contracts secured by bonds, irrevocable letters of credit, sequential development, or any other method that may be acceptable to the Planning Board and Board of County Commissioners. All engineering and legal work in connection with such improvements shall be paid by the contracting parties pursuant to said special improvement district or private contract, and the improvements shall be designed by and constructed under the supervision of a professional engineer competent in civil engineering, licensed in the state of Montana. Upon completion of the improvements, the consulting Engineer shall file with the Public Works Department, a statement certifying that the improvements have been completed in accordance with approved, seal stamped, record drawings, along with all required post-construction certification per Section 4.6.C. of the Yellowstone County Subdivision Regulations.

XIII. LEGAL PROVISIONS

A. Subdivider agrees to guarantee all public improvements for a period of one year from the date of final acceptance by Yellowstone County.

B. The owners of the properties involved in this proposed Subdivision by signature subscribed herein below agree, consent, and shall be bound by the provisions of this Agreement.

C. The covenants, agreements, and all statements in this Agreement apply to and shall be binding on the heirs, personal representatives, successors and assigns of the respective parties.

D. In the event it becomes necessary for either party to this Agreement to retain an attorney to enforce any of the terms or conditions of this Agreement or to give any notice required herein, then the prevailing party or the party giving notice shall be entitled to reasonable attorney fees and costs.

E. Any amendments or modifications of this Agreement or any provisions herein shall be made in writing and executed in the same manner as this original document and shall after execution become a part of this Agreement.

F. Subdivider shall comply with all applicable federal, state, and local statutes, ordinances, and administrative regulations during the performance and discharge of its obligations. Subdivider acknowledges and agrees that nothing contained herein shall relieve or exempt it from such compliance.

G. Subdivider agrees to create any required (or expansion of existing) RSID(s) for future maintenance of all public (or common) constructed improvements prior to final plat approval.

IN WITNESS WHEREOF, the parties hereto have set their hands and official seals on the date first above written.

"SUBDIVIDER" *Yellowstone Farms LLC*

By: _____

Its: _____

STATE OF MONTANA)
: ss
County of Yellowstone)

On this ___day of_____, 20___, before me, a Notary Public in and for the State of Montana, personally appeared Robert Arensberg, known to me to be member of *Yellowstone Farms LLC*, who executed the foregoing instrument and acknowledged to me that he/she executed the same.

_____
Notary Public in and for the State of Montana
Printed Name: _____
Residing at: _____
My commission expires: _____

This agreement is hereby approved and accepted by Yellowstone County, this ____ day of _____, 20 ____.

"COUNTY"
COUNTY OF YELLOWSTONE MONTANA

County of Yellowstone
Board of County Commissioners

By: _____
Chairman

_____
Commissioner

_____
Commissioner

Attest: _____
County Clerk and Recorder

STATE OF MONTANA)
: ss
County of Yellowstone)

On this _____day of _____, 20____, before me, a Notary Public in and for the State of Montana, personally appeared _____, and _____ , known to me to be the Board of County Commissioners and the County Clerk and Recorder, respectively, of Yellowstone County, Montana, whose names are subscribed to the foregoing instrument in such capacity and acknowledged to me that they executed the same on behalf of Yellowstone County, Montana.

_____
Notary Public in and for the State of Montana
Printed Name: _____
Residing at: _____
My commission expires: _____

Waiver of Right to Protest

FOR VALUABLE CONSIDERATION, the undersigned, being the Subdivider and all of the owners of the hereinafter described real property, do hereby waive the right to protest the formation of one or more Rural Special Improvement Districts (RSID's), for a period of no more than twenty years from the recording of this waiver, which Yellowstone County may require.

This Waiver and Agreement is independent from all other agreements and is supported by sufficient independent consideration to which the undersigned are parties, and shall run with the land and shall be binding upon the undersigned, their successors and assigns, and the same shall be recorded in the office of the County Clerk and Recorder of Yellowstone County, Montana.

The real property hereinabove mentioned is more particularly described as follows:

LONE EAGLE NORTH SUBDIVISION

Signed and dated this ____day of _____, 20____ .

Yellowstone Farms LLC

By: _____

Its: _____

STATE OF MONTANA)
: ss
County of Yellowstone)

On this _____day of _____, 20____, before me, a Notary Public in and for the State of Montana, personally appeared Robert Arensberg, known to me to be a member of *Yellowstone Farms LLC*, the person who executed the forgoing instrument and acknowledged to me that he/she executed the same.

IN WITNESS WHEROF, I have hereunto set my hand and affixed my Notarial Seal the day and year hereinabove written.

_____
Notary Public in and for the State of Montana
Printed name: _____
Residing in: _____
My commission expires: _____

WWC ENGINEERING

550 S 24th St W, BILLINGS, MT 59102 | 406.894.2210

October 31, 2025

Anna Vickers
Planning Division Manager
Yellowstone County Planning Department
2825 3rd Ave N
Billings, MT 59101

Subject: LONE EAGLE SUBDIVISION – VARIANCE REQUEST FROM SECTION 4.6 (DEAD-END ROAD LENGTH)

Dear Ms. Vickers,

On behalf of Yellowstone Farms LLC, WWC Engineering respectfully submits this request for a variance from Section 4.6 of the Yellowstone County Subdivision Regulations, which limits the maximum allowable length of a dead-end road to 1,000 linear feet. As part of the design for the Lone Eagle North Subdivision, Consuela Creek Lane is proposed to extend beyond 1,000 linear feet. The extended length is required to provide access to all lots within the subdivision while also preserving future connectivity to a parcel located east of this development that is not within the major subdivision. Strict compliance with the 1,000-foot limitation would create significant physical and engineering challenges, as explained below. The proposed dead-end length would by 1,970 linear feet.

Part 1 – Impact on Public Health, Safety, and Welfare

The proposed variance does not compromise public health or safety. The road will be constructed to County standards in terms of width, surfacing, and turnaround dimensions. Emergency access has been addressed by including a compliant turnaround at the terminus of the road, ensuring access for fire and emergency services.

Part 2 – Site-Specific Conditions

The extended dead-end road is the result of unique site constraints:

- Alkali Creek Crossing: To eliminate the dead end, a second crossing of the North Fork of Alkali Creek would be required. This would entail substantial environmental and permitting challenges, as well as a costly infrastructure addition.
- Topographic Limitations to the North: Routing the road north to form a loop would require ascending a steep slope that cannot be constructed to County road gradient standards.
- Geological Barriers: An alternative loop along the north bank of the creek would involve traversing a steep drop and sidehill containing a rock outcropping, which is not suitable for cost-effective or standard-compliant road construction.

Given these conditions, the proposed alignment is the only feasible layout that maintains logical future connectivity and avoids excessive environmental disturbance or non-compliant road grades.

Part 3 – Avoidance of Public Burden

This variance does not shift any burden onto the County or local taxpayers. All improvements, including the extended roadway and associated infrastructure, will be privately funded and constructed in compliance with County improvement standards.

Part 4 – Zoning Compliance

This request pertains solely to the subdivision design standard in Section 4.6 and does not conflict with applicable zoning ordinances or land use regulations.

Part 5 – Reasonableness and Adequacy of Design

The subdivision has been planned to balance access, constructability, and long-term development goals. The extended road will support low-density residential use and will include provisions for future extension to the adjacent parcel. The road's termination will feature a County-compliant turnaround, ensuring continued accessibility for service and emergency vehicles.

In conclusion, we respectfully request approval of this variance due to the significant physical constraints on the site and the logical need to maintain access for future development. Supporting documents, including site plans and roadway layout, are attached for your review.

Should you have any questions or require further information, please do not hesitate to contact me at (406) 894-2210 or via email at greid@wwcengineering.com.

Regards,
Greg Reid, P.E.
Billings Branch Manager
WWC Engineering

Variance Request A
Lone Eagle North Subdivision

Lone Eagle North Subdivision is a proposed major subdivision in Yellowstone County. The applicant has requested a variance from Section 4.6.A.7 of the Yellowstone County Subdivision Regulations.

Section 4.6.A.7. Dead end roads shall not be more than 1000 feet in length.

The proposed subdivision contains large lots, 5 to nearly 10 acres in size. With lots of that size the roads tend to be longer to reach each lot. The reason for not allowing roads over 1000 feet has to do with fire safety. The fire departments that provide services to the subdivision are concerned with safety. Fire departments have previously expressed concerns about going down a long dead-end road and becoming trapped by hazardous conditions due to fire. Connectivity through the provision of an additional ingress/egress is preferred as it can help address public safety concerns and alleviate emergency response circulation throughout both the proposed and existing subdivisions.

County Public Works stated in reviewing the variance requests that, "Public Works has reviewed the variances, and we will not support them".

1. *The granting of the variance will not be detrimental to the public health, safety, or general welfare or injurious to other adjoining properties.*
   Staff believes a long dead-end road could present a dangerous situation for fire fighters and other emergency vehicles not being able to maneuver safely in an emergency situation. Granting the variance could be detrimental to the public health, safety, or general welfare of the public.

2. *Because of the particular physical surroundings, shape, or topographical conditions of the specific property involved, an undue hardship to the owner would result if the strict letter of the regulation was enforced.*
   Dead end roads can create some logistical issues that would make it difficult for emergency vehicles to move around when trying to get past each other. The slopes in the area are steep in some areas, especially going down to the creek area.

3. *The variance will not result in an increase in taxpayer burden.*
   The variance will not increase a tax burden on taxpayers.

4. *The variance will not in any manner place the subdivision in nonconformance with any adopted zoning regulations or Growth Policy.*
   Granting the variance would not place the subdivision in nonconformance with any adopted zoning regulations or the growth policy.

5. *The subdivider must prove that the alternative design is equally effective, and the objectives of the improvements are satisfied.*
   An alternative to the variance was not provided by the applicant.

WWC ENGINEERING

550 S 24th St W, BILLINGS, MT 59102 | 406.894.2210

October 31, 2025

Anna Vickers
Planning Division Manager
Yellowstone County Planning Department
2825 3rd Ave N
Billings, MT 59101

RE: Variance to Section 4.6(B)(1) Yellowstone County Subdivision Regulations - Connectivity

Dear Ms. Vickers,

On behalf of Yellowstone Farms LLC, WWC Engineering respectfully requests a variance from Section 4.6 of the Yellowstone County Subdivision Regulations regarding the requirement for connection to existing platted roads outside the subdivision, specifically to an access easement located in the previous Lone Eagle development immediately south of the proposed subdivision.

The existing access easement is unconstructed and terminates at the south boundary of the proposed development. While this easement represents a theoretical connection, the topographic conditions in that location—specifically a steep uphill section—would require a roadway to be constructed at a grade exceeding County standard. In addition, this connection would direct new subdivision traffic into the previously developed Lone Eagle neighborhood, which is not preferred by the residents of that community and would alter its internal traffic patterns.

Part 1 – Impact on Public Health, Safety, and Welfare

Eliminating this connection does not negatively impact public health or safety. The proposed Lone Eagle Subdivision maintains access independent of the unconstructed access easement. Emergency response services will not be impeded, and a County-standard turnaround is included in the design to ensure accessibility.

Part 2 – Site-Specific Conditions

Construction of a connection road along the existing easement would require ascending a hill with grades that exceed allowable limits under County road standards. This topographic limitation makes it impractical and noncompliant to implement the connection in the current location. Alternative routes are either physically infeasible or would result in significant environmental and financial impacts.

Part 3 – Avoidance of Public Burden

Constructing the required connection would necessitate extensive grading, potential retaining structures, and drainage improvements—all of which would add considerable cost without a proportional public benefit. These improvements would not be justified for the limited value of the connection, particularly when the subdivision already includes compliant road access from the north and east.

Part 4 – Zoning Compliance

This variance does not create a conflict with applicable zoning designations. The proposed layout complies with zoning regulations and land use objectives while meeting the intent of the subdivision regulations through connectivity where practical.

Part 5 – Reasonableness and Adequacy of Design

The design of the Lone Eagle North Subdivision maintains a logical and functional road network. While the physical connection to the southern access easement is omitted, the overall layout ensures adequate access, internal circulation, and emergency service provisions. The existing easement will remain in place, preserving the potential for future use if adjacent conditions change or standards are revised.

Considering the topographic constraints, resident concerns, and lack of necessity for the connection from a traffic and safety perspective, we respectfully request that Yellowstone County grant a variance to Section 4.6 as it relates to the road connection to the unconstructed access easement in the Lone Eagle development to the south.

Should you have any questions or require further information, please do not hesitate to contact me at (406) 894-2210 or via email at greid@wwcengineering.com.

Sincerely,

Greg Reid, P.E.
Billings Branch Manager

Variance Request B
Lone Eagle North Subdivision

Lone Eagle North Subdivision is a proposed major subdivision in Yellowstone County. The applicant has requested a variance from Section 4.6.A.3. of the Yellowstone County Subdivision Regulations.

3. There shall be right-of-way and road connections made when existing roads or platted roads outside of the subdivision connect to the subject parcel.

Part of the proposed subdivision is north of the existing Lone Eagle Subdivision, 5th Filing. On the existing 5th Filing of Lone Eagle Subdivision, Lone Eagle Drive is depicted on the plat as a 60-foot-wide Private Access Easement. This easement for Lone Eagle Drive runs the entire western length of Lot 20, Lone Eagle Subdivision 5th Filing and the southern boundary of proposed Lot 3 and Lot 4, Block 5 of the proposed subdivision, Lone Eagle North Subdivision. It appears that the developer of the 5th Filing intended to continue connection to the north as the subdivision became larger with future filings.

The proposed Lone Eagle North Subdivision shows a private road on the northern side of Lots 3 and 4, Block 5 to be called Consuela Creek Lane. Lone Eagle Road is the only way in or out of the existing Lone Eagle Subdivision. A connection with Lone Eagle North Subdivision would provide a second way in and out of the existing Lone Eagle Subdivision, as well as an emergency access route to the proposed subdivision.

County Public Works stated in reviewing the variance requests that, "Public Works has reviewed the variances, and we will not support them".

1. *The granting of the variance will not be detrimental to the public health, safety, or general welfare or injurious to other adjoining properties.*
   Staff believes a connection to the south would provide another way out of the proposed subdivision increasing the safety of those living in the subdivision. It will also provide a second way in and out of the existing Lone Eagle Subdivision to the south. Granting the variance could be detrimental to the public health, safety, or general welfare of the public.

2. *Because of the particular physical surroundings, shape, or topographical conditions of the specific property involved, an undue hardship to the owner would result if the strict letter of the regulation was enforced.*
   There are some logistical issues, topography, that would make it difficult to build the road. But it would benefit all residents already out there and the new ones proposed with the new subdivision.

3. *The variance will not result in an increase in taxpayer burden.*
   The variance will not increase a tax burden on taxpayers.

4. *The variance will not in any manner place the subdivision in nonconformance with any adopted zoning regulations or Growth Policy.*
   Granting the variance would not place the subdivision in nonconformance with any adopted zoning regulations or the growth policy.

5. *The subdivider must prove that the alternative design is equally effective, and the objectives of the improvements are satisfied.*
   An alternative is to build the subdivision with the proposed layout. This filing does provide two ways in and out with both going to Alkali Creek Road.