



YELLOWSTONE COUNTY BOARD OF PLANNING

CITY OF BILLINGS AND
YELLOWSTONE COUNTY, MONTANA



AGENDA

SEPTEMBER 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>
- . View the meeting live online at Facebook
- . 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 of August 26, 2025**

Attachments
Minutes of August 26, 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. **Trestles City Major Subdivision. Presentation and Board Discussion.**
Lots 15 and 16, block 3: of Copper Ridge Subdivision, 7th Filing and Lot 15A, Block 3: of Copper Ridge Subdivision 8th Filing

Attachments
Findings of Fact
Proposed Plat
Draft SIA
Traffic Study

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

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

Information

RECOMMENDATION

APPROVAL OF MEETING MINUTES: August 26, 2025

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

ALTERNATIVES

City Council may:

- Approve; or,
- Not Approve

FISCAL EFFECTS

Attachments

Minutes of August 26, 2025

CITY/COUNTY PLANNING BOARD

TUESDAY, AUGUST 26, 2025 at 6:00pm

	Position	01/14/2025	01/28/2025	02/11/2025	02/25/2025	03/11/2025	03/26/2025	04/08/2025	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	11/26/2025	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								
Roger Gravgaard President	Billings Ward II	1	1	1	1	1	1	1	1	1	1	1	1	V	-	1	1								
Dennie Stephenson	Billings Ward III	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								
David Nordel	Billings Ward V	A	V	V	A	V	A	1	V	1	1	1	1	A	-	1	1								
Troy Boucher	YC District 1	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								
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								
Alexis Bonogofsky	YC District 6	1	1	V	1	V	1	1	1	A	1	1	V	1	-	1	1								
Morgan Tuss	YC District 7	A	A	A	A	A	A	A	A	A	A	A	A	A	-	A	A								
Vacant	YC Cons. District	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Scott Reiter Megan Trevino	Ex-Officio SD2	A	A	A	A	A	A	A	A	A	A	1	1	A	-	1	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 6:00 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: Anna Vickers, Planning Division Manager; Hunter Kelly, Planner; Brenda Berns, Planning Clerk

1. Others in Attendance: Landy Leep and Gary Oakland of the Oakland Company; Gary Owen, Sanbell

2. Approval of Agenda

Motion

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

3. Approval of Minutes: August 12, 2025

Motion

Motion made by Board member Stephenson, seconded by Board Member Nordel to approve the August 12, 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. There were no comments from the public.

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

8. New Business

- a. High Sierra 23rd Filing Preliminary Plat – City Major Subdivision. Presentation and Discussion.

Legal description: Lot 6A-1, Block 19 of the Amended Plat of Lot 1A1-A1, Block 33 of High Sierra Subdivision, 14th Filing & Lot 6A, Block 19 of High Siera Subdivision, 21st Filing.

Hunter Kelly gave a brief overview of the High Sierra subdivision.

Property Information:

- General Location: north of Annadale Road and west of West Bonito Loop
- Legal Description: Lot 6A-1, Block 19 of the Amended Plat of Lot 1A1-A1, Block 33 of High Sierra Subdivision, 14th Filing & Lot 6A, Block 19 of High Sierra Subdivision, 21st Filing
- Owner/Subdivider: High Sierra II, Inc.
- Engineer/Surveyor: Sanbell
- Existing Zoning: N3 - Suburban Neighborhood Residential
- Existing Land Use: vacant
- Proposed Zoning: N3 - Suburban Neighborhood Residential
- Proposed Land Use: Residential
- Gross & Net Area: 12.41 Acres gross / 9.34 Acres net
- Lot Size:
 - Minimum: 7,023 square feet
 - Maximum: 86,496 square feet
- Parkland Requirements: 0.809 Acres, provided by cash-in-lieu contribution

Cash-in-lieu option selected for 0.809 acres:

A Traffic Impact Study (TIS) was completed for High Sierra Subdivision, 23rd Filing. All required intersection improvement contributions identified therein shall be completed by the Subdivider at the Subdivider's expense. The percent of traffic contributions to the following intersections shall be in accordance with the traffic study:

Intersection	% Contribution
Annandale Road/ Riveroaks Drive	0.79 %
Annandale Road/ St. Andrews Drive	0.88 %
Sierra Granda Boulevard/ High Sierra Boulevard	0.17 %
Sierra Granda Boulevard/ Gleneagle Boulevard	0.61 %
Alkali Creek/ Skyway Drive	0.25 %
Wicks Lane/ Skyway Drive	0.26 %
Wicks Lane/ High Sierra Boulevard	0.17 %
Wicks Lane/ Fantan Street	0.09 %
Wicks Lane/ Governors Boulevard	0.58 %
Wicks Lane/ Lake Hills Drive	0.17 %
Wicks Lane/ St. Andrews Drive	0.70 %

Recommendation

Staff recommends conditional approval subject to the three (3) conditions of approval as provided in the staff report.

City Council is scheduled to review and act on the preliminary plat on September 22, 2025.

Discussion

Concerns were raised regarding whether the roads within the subdivision would be paved. Staff confirmed that the roads will be paved and maintained by City Public Works as part of the municipal street system once constructed.

It was further clarified that some of the paved sections may transition into gravel in the early phases of development. However, with the next filing, additional paving will be completed, and speed limits on residential streets will be reduced to align with neighborhood standards. Engineering plans, which extend beyond the current phase, will provide more detailed guidance on roadway design and improvements at that stage.

Board members also asked where jurisdiction between the City and County begins and ends. Staff noted that this will depend on final engineering determinations and roadway classifications. Regardless, new roads are expected to be built as part of the subdivision and will ultimately be incorporated into the City's maintenance responsibilities.

Applicant's Agent: Gary Owen, Sanbell; Mr. Owen stated that the previous phases of the subdivision were constructed and paved with utilities installed to City standards. He noted that future streets will also comply with City and DEQ requirements. The right-of-way has been dedicated, and the developer will complete all required improvements. Following completion and the warranty period, the City will assume maintenance responsibilities.

Questions

Questions were raised regarding the street layout, including whether there is a cul-de-sac on a particular property. It was explained that the current turnaround is temporary and surfaced with gravel, and that it will be removed when the next phase extends the street to the west. It was confirmed that a fire truck can safely turn around, and that streetlights and sidewalks will be installed.

Developer: Gary Oakland, Oakland Company; Mr. Oakland stated that this is a phase of a 20-year project. Previous phases have donated substantial parkland, totaling hundreds of acres, which has been annexed by the City. He noted that this phase is part of a preapproved master plan.

Motion

Motion made by Board member Stephenson, seconded by Board member Woods to forward a recommendation of approval, with the conditions of approval and the findings of fact. Motion passed unanimously.

9. Other Business

- a. Proposed Adjustment to Planning Board Meeting Start Time. Discussion and Action.

Anna Vickers requested that the Board consider moving the Planning Board meeting start time to 4:00 p.m. to better accommodate staff schedules and reduce after-hours costs.

Discussion

The Board discussed scheduling concerns with staff and board members and concluded that a 4:30 p.m. meeting start time would accommodate the Board's needs and promote better in-person participation.

Motion

Motion made by Board member Bonogofsky, seconded by Board member Woods to adjust the starting time of the City County Planning Board meetings to 4:30pm. Motion passed unanimously.

Other Business – General Discussion

Questions were raised regarding the possibility of a large data center development. Limited information was available at this time, but outreach has been made to Big Sky EDA for additional details.

The Board then discussed activity related to BNSF. It was explained that a parcel near 72nd Street, located outside of the zoning boundary, is being developed as a rail storage yard. Because the property is outside zoning, and the state administers building permits and inspections in the county, and the land is not being subdivided, planning regulations cannot be applied. The only potential area of local oversight would be an approach permit, though it is uncertain whether one is needed.

The discussion acknowledged that this situation highlights the challenges of limited county zoning. Development can occur outside of zoning without restrictions and permitting processes at the State level are often minimal. Concerns were expressed that construction of facilities can have significant impacts on surrounding properties, yet local jurisdiction is limited. Commissioners often rely on the State's review and defer to their authority, which can result in frustration for residents and board members.

It was emphasized that long-range land use planning is intended to address such issues by providing a framework for managing growth over the next 20 years and avoiding fragmented development. Although attempts have been made in the past to establish countywide zoning, they have not been successful. Developers often prefer building in the county because the process is less restrictive. The discussion concluded with acknowledgment that planning staff continue to manage a heavy workload but see value in engaging commissioners in broader conversations about zoning, growth management, and community impacts.

10. Future Agenda Items

ADJOURNMENT: 6:37PM

Brenda J Berns, Planning Clerk

Planning Board

Date: 09/09/2025
Title: Trestles Subdivision, 1st Filing - City Major Subdivision Preliminary Plat
Presented by: David Green
Department: Planning & Community Services
Presentation: Yes

Information

RECOMMENDATION

Staff recommends the Planning Board recommend to City Council the preliminary plat of Trestles Subdivision, 1st Filing, 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 August 1, 2025, Sanbell, the agent for the applicant, applied for preliminary major plat approval for Trestles Subdivision, 1st Filing. The proposed subdivision creates 337 lots, with 330 of the lots for residential development, 6 are private parks or storm water facilities, and 1 is a remaining lot for future development. The subject property is generally located west of 70th Street West and north of Rimrock Road. The property is zoned N3 -- Suburban Neighborhood Residential, N1 -- First Neighborhood Residential, and P1 - Parks and Open Space.

VARIANCES REQUESTED

No variances from the City Subdivision Regulations have been requested.

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 provide needed private utilities to the residents of this subdivision, prior to final plat approval, the applicant will provide easements as requested by private utility companies and show them on the final plat.
2. To provide locations and safe delivery and retrieval of individuals mail, prior to final plat approval, the applicant will coordinate with the USPS to determine location of Central Box Units and provide the correct amount of space for safely delivering the mail to the residents.
3. 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.
4. The final plat shall comply with all requirements of the City of Billings Subdivision regulations, rules, policies, and resolutions of the City of Billings, and the laws and Administrative Rules of the State of Montana.

PROCEDURAL HISTORY

- Pre-application meeting May 29, 2025
- Preliminary plat application submitted to Planning Division on August 1, 2025
- Departmental review meeting August 14, 2025
- Subdivision resubmittal August 21, 2025
- Planning Board plat review September 9, 2025
- Planning Board public hearing September 23, 2025
- Preliminary plat to City Council October 27, 2025
- 60 working-day preliminary plat review period ends October 27, 2025

PLAT INFORMATION

General location: West of 70th Street West and north of Rimrock Road

Legal Description: Lots 15 and 16, Block 3: of Copper Ridge Subdivision, 7th Filing and Lot 15A, Block 3: of Copper Ridge Subdivision 8th Filing located in Section 26, Township 1 North, Range 24 East, Principal Meridian Montana

Owner/Subdivider: WH Copper Ridge 54 LLC

Engineer and Surveyor: Sanbell

Existing Zoning: N3, N1, and P1

Existing land use:	Vacant, formerly Agricultural
Proposed land use:	Residential
Gross and Net area:	69.443 acres / 46.784 acres
Proposed number of lots:	337
Lot size:	Max: 1,095,772 square feet / 25.16 acres Min: 1,969 square feet
Parkland requirements:	Parkland dedication requirement is 2.698 acres. The applicant is providing 10.554 acres.

TRAFFIC IMPACT STUDY - SUMMARY

The subdivider shall furnish and install all necessary traffic control devices within and adjacent to the subdivision. Traffic control devices shall include all necessary signing, striping, and channelization devices to properly complete the implementation of the proposed street construction.

A traffic impact study has been completed for Trestles. All required intersection improvement contributions identified therein shall be completed by the subdivider at the subdivider's expense. The percent of traffic contributions to the following intersections shall be in accordance with the traffic accessibility study:

The studied intersections are anticipated to operate similarly to existing conditions at the time this filing is fully built out.

Rimrock Road and 70th Street West -- 10.67 percent
Rimrock Road & 62nd Street West -- 10.83 percent
Rimrock Road & 54th Street West -- 8.08 percent
70th Street West & Colton Blvd -- 2.98 percent
70th Street West & Grand Avenue -- 2.28 percent
Grand Avenue & 62nd Street West -- 4.12 percent
Grand Avenue & 56th Street West -- 4.47 percent
Grand Avenue & 54th Street West -- 4.12 percent

The percentages are based on 330 total buildable lots in the First Filing.

The contributions for Trestles Subdivision, 1st Filing, (330- residential lots) shall be made prior to final plat approval. Contribution amounts are tied to the cost of improving an intersection. For 2025, this amount is set at \$450,000 and will be reevaluated annually. Each contribution is calculated as a percentage of the intersection improvement cost. No building permits or private contract permits will be issued until subdivider has made the cash contribution to the City.

STAKEHOLDERS

There are no stakeholder responses as of writing this report. Stakeholder input will be received at a public hearing scheduled for this subdivision on September 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 on October 27, 2025. State and City subdivision regulations also require that preliminary plats 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

This plat will have no fiscal impact on the City/County 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 districts, 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 Trestles Subdivision, 1st Filing. 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 has been used for agricultural purposes in the past. There are no ditches that run through this project. Little Cove Creek runs under the train tracks where Rimrock Road would go under the tracks. The Birely Drain is to the east near 62nd Street West on the south side of Rimrock Road. Cove Ditch runs through Falcon Ridge Subdivision and Reflections at Copper Ridge Subdivision to the east of this property. Cove Ditch is to the south of this proposed subdivision and is not part of the proposed area to be subdivided. 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. With farming activity wildlife habitat has not been maintained. There is a paragraph in the SIA under the heading Property Conditions and Information for Lot Purchasers alerting property owners of the potential for wildlife in the area.

2. Effect on local services

Utilities – Water service will be provided by the City of Billings. Service to the subdivision will be provided from a 12-inch water main stub located at Shiny Penny Way and an 8-inch stub in Bronze Boulevard. The subdivider will be extending the existing 12-inch water main from the existing terminus at 70th Street West/Rimrock Road. They will install a new line going west along Rimrock to the intersection with Street 5 (temporary name). The 12-inch water main will continue in Shiny Penny Way to the intersection of Street 1 (temp name). An 8-inch water main will be located in the remainder of Shiny Penny to Bronze Blvd. A 12-inch water main will be located in Street 1 (temp name) and stubbed out for future Filings. An 8-inch water main will be installed in the remaining streets, these lines will be looped to ensure consistent water pressure. New individual services will be provided to all the lots, and new fire hydrants will be installed as required by the City Fire Department.

Sanitary sewer service to the subdivision will be from the existing 8-inch sanitary sewer stub located in Shiny Penny Way. A 12-inch sanitary sewer main will be installed in Rimrock Road to street 5 (temp name). An 8-inch sewer main will be installed in all other proposed streets. Sewer lines within the subdivision shall be no smaller than 8-inches in diameter.

The subdivider will install all new water lines and sewer lines in the 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.

Private Utilities will be provided from existing facilities to the subdivision. The private utilities will be installed in easements included on the plat, as requested by the utility companies. Montana Dakota Utilities (MDU) has requested a 10-foot-wide easement along the front property lines of the lots. **(Condition #1)**

Stormwater – The storm drainage system for Trestles Subdivision, 1st Filing, will consist of a curb and gutter surface collection and curb inlets that drain into storm drainage piping, as well as surface conveyance.

The developer will construct two detention facilities with this filing located on Lot 15, Block 3 and Lot 70, Block 8. The remaining detention facility will be constructed with a future filing. The detention facilities will be located on Home Owner's Association (HOA) owned lots and shall be operated and maintained by the HOA. The stormwater detention facilities will have an outlet to Rimrock Road and be piped to a City of Billings owned stormwater management facility located near the intersection of 62nd Street West and Rimrock Road via the Birely Drain.

The subdivider may direct runoff from this filing and any future filings to the City of Billings stormwater management facility located near the intersection of Rimrock Road and 62nd Street West. The City of Billings will review the stormwater storage provided on-site to ensure compliance with the City of Billings Stormwater Management Manual (SWMM). The Subdivision will be required to retain, or provide treatment, of the water quality volume/flow on-site in accordance with the SWMM.

All required stormwater storage for the subdivision will be provided on-site. Therefore, no off-site stormwater contributions to the City of Billings stormwater management facility will be required.

A complete stormwater management plan shall be submitted to the Engineering Division for review and approval at the time of development. This is outlined in the SIA under the heading V. Storm Drainage.

All 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.

- a. **Solid Waste** – The City of Billings will provide solid waste collection and disposal. The City's landfill has adequate capacity for this subdivision.
- b. **Streets** – All internal streets within the subdivision shall be built to grade with a satisfactory subbase, base course, curb and gutter, and asphalt surface. All streets in the subdivision will be public roads. They will be built to provide a 34-foot back-to-back curb street width. Street 5 (temporary name) will be in a 74-foot wide right of way dedication.

The drive lanes will be 18-feet wide, one on each side of a 16-foot wide median. There will be curb and gutter on both sides of the street.

Rimrock Road is classified as a Collector Street on the functional classification map of the City of Billings. The applicant will be providing a 74-foot-wide right of way for Rimrock Road. They are required to build a 30-foot-wide asphalt surface road on the northern side of right of way. This will include a 5-foot-wide sidewalk with a minimum of a 5-foot boulevard.

All streets and carriage lanes will be built according to the standards of the City of Billings Public Works Department. Street improvements are included in the Waiver of Right to Protest Future Special Improvement Districts.

The sidewalks will be installed by the respective lot owners 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. The developer shall construct the 5-foot-wide boulevard sidewalk adjacent to parks and open spaces where no construction will be taking place on the lot. This information is all in the SIA under the heading Transportation.

Traffic Impact Study overview:

The subdivider shall furnish and install all necessary traffic control devices within and adjacent to the subdivision. Traffic control devices shall include all necessary signing, striping, and channelization devices to properly complete the implementation of the proposed street construction.

A traffic impact study has been completed for Trestles. All required intersection improvement contributions identified therein shall be completed by the subdivider at the subdivider's expense. The percent of traffic contributions to the following intersections shall be in accordance with the traffic accessibility study:

- Rimrock Road and 70th Street West – 10.67 percent
- Rimrock Road & 62nd Street West – 10.83 percent
- Rimrock Road & 54th Street West – 8.08 percent
- 70th Street West & Colton Blvd – 2.98 percent
- 70th Street West & Grand Avenue – 2.28 percent
- Grand Avenue & 62nd Street West – 4.12 percent
- Grand Avenue & 56th Street West – 4.47 percent
- Grand Avenue & 54th Street West – 4.12 percent

The percentages are based on 330 total buildable lots in the First Filing.

The contributions for Trestles Subdivision, First Filing (330- residential lots) shall be made prior to final plat approval. No building permits or private contract permits will be issued until subdivider has made the cash contribution to the City.

Street lighting is required for this subdivision. In the SIA the applicant has indicated that street lighting will be installed by private contract or SID. A Street Light Maintenance District will be created for operation and maintenance of the lighting at a future date and is included in the waiver of right to protest.

- c. **Emergency Services** – The Billings Police and Fire Departments will respond to emergencies within the proposed subdivision. The police department comments that continued annexation and development without commensurate resources has adversely affected our ability to deliver service. The fire station that provides service for this area is Fire Station #7, it is located at 1501 54th Street West. The subdivision is located within the ambulance service area of American Medical Response (AMR).
- d. **Schools** – School District #2 provides service to students within this subdivision for elementary through high school. Boulder for elementary school, Ben Steele for middle school and West for high school. School District #2 stated they are over capacity at Boulder Elementary. Ben Steele is just under capacity and West is over capacity.
- e. **Parks and Recreation** – This subdivision is required to provide 2.7 acres of parkland. The applicant will be providing 10.55 acres of private parkland for this subdivision. The parkland will be maintained by the Homeowner Association. The Parks Department responded that they approve of the proposed parkland for the subdivision.
- f. **Mail Delivery** - The developer shall coordinate with the United States Postal Service to determine the location of the Central Box Units for mail delivery within this subdivision. **(Condition #2)**
- g. **Phasing of Development** – This subdivision will not be developed in phases.

3. Effect on the natural environment

The subject property is currently vacant with the proposed use of residential development. The land was historically farm land so the natural environment would have been altered by the farming activity. The property is not located within 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 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 2023 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:

Strong Neighborhoods (livable, safe, sociable and resilient neighborhoods): Neighborhoods that are safe and attractive and provide essential services are much desired.

Home Base (healthy, safe and diverse housing options): Planning and construction of interconnected sidewalks and trails are important to the economy and livability of Billings.

Essential Investments (relating public and private expenditures to public values): Planning and construction of safe and affordable interconnected sidewalks and trails are important to the economy and livability of Billings.

Developed parks that provide recreation and active living opportunities are desirable for an attractive and healthy community.

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 just outside the Billings Area Bikeways and Trail Master Plan. The master plan show proposed trails ending at 70th Street West. There are no trails identified within the subdivision. The applicant will be installing a sidewalk along the north side of Rimrock Road that provides continuity from the sidewalk to the east. No additional trails are required with this subdivision.

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 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 N3 – Suburban Neighborhood, N1 – First Neighborhood and P1 Parks and Open Space. 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. MDU has requested a 10-foot-wide easement on the front of the lots.

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 to the subdivision will be provided by Rimrock Road, and 70th Street West out to either Grand or Rimrock Road. All internal streets will provide access to residential lots within the subdivision.

CONCLUSIONS OF FINDINGS OF FACT

- The preliminary plat of Trestles Subdivision, 1st Filing, 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 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

Staff proposes the Planning Board recommends to City Council that the preliminary plat of Trestles Subdivision, 1st Filing, be conditionally approved and the Findings of Fact adopted as presented in the staff report.

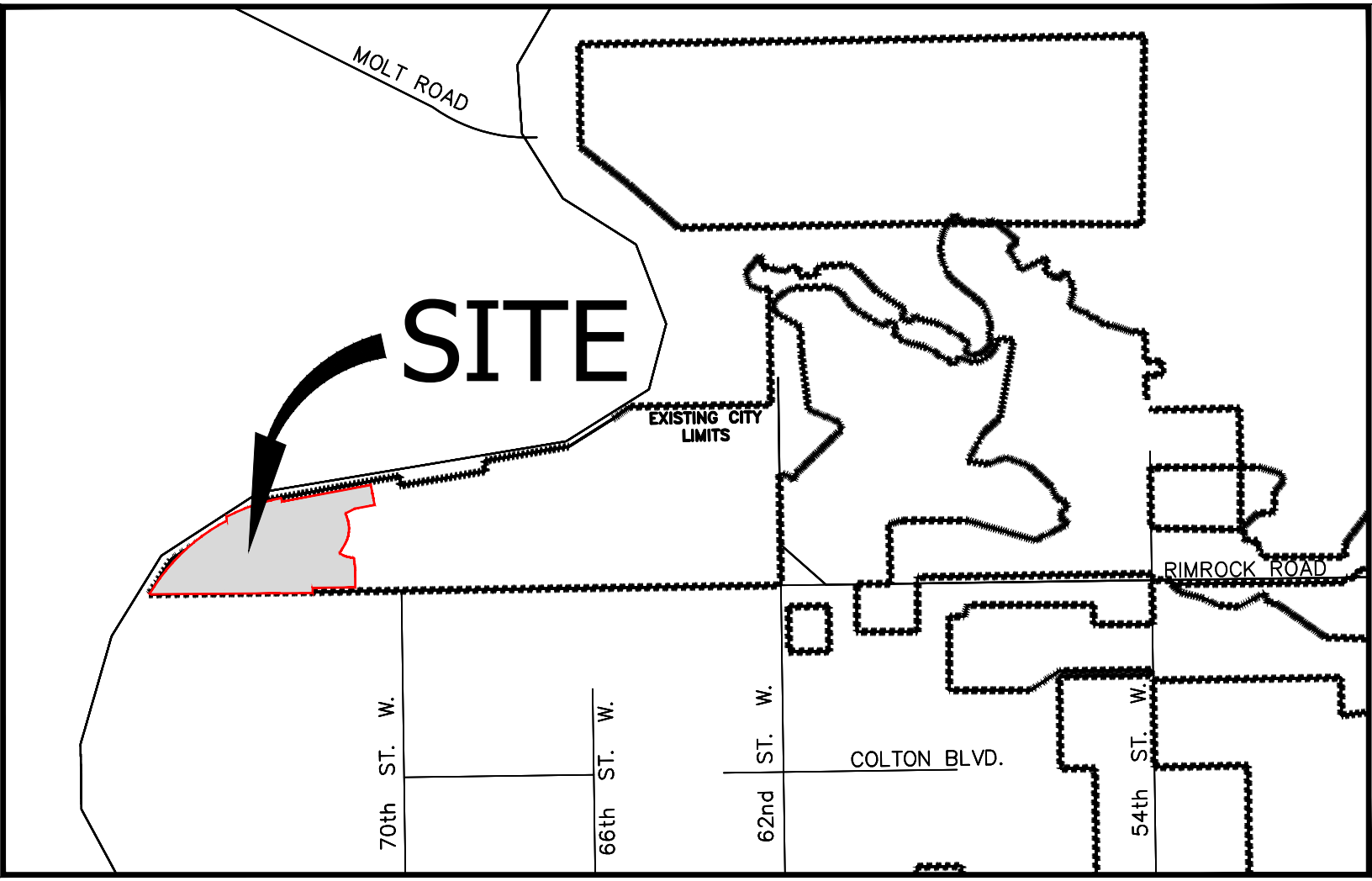
PRELIMINARY PLAT OF
TRESTLES SUBDIVISION

OF LOTS 15 AND 16, BLOCK 3; OF COPPER RIDGE SUBDIVISION, 7TH FILING AND LOT 15A, BLOCK 3; OF COPPER
RIDGE SUBDIVISION 8TH FILING SITUATED IN THE SE1/4 OF SECTION 26, T. 1 N., R. 24 E., P.M.M.,
IN THE CITY OF BILLINGS, YELLOWSTONE COUNTY, MONTANA

PREPARED FOR : WH COPPER RIDGE 54 LLC.

PREPARED BY : **sanbell**

JULY, 2025
BILLINGS, MONTANA

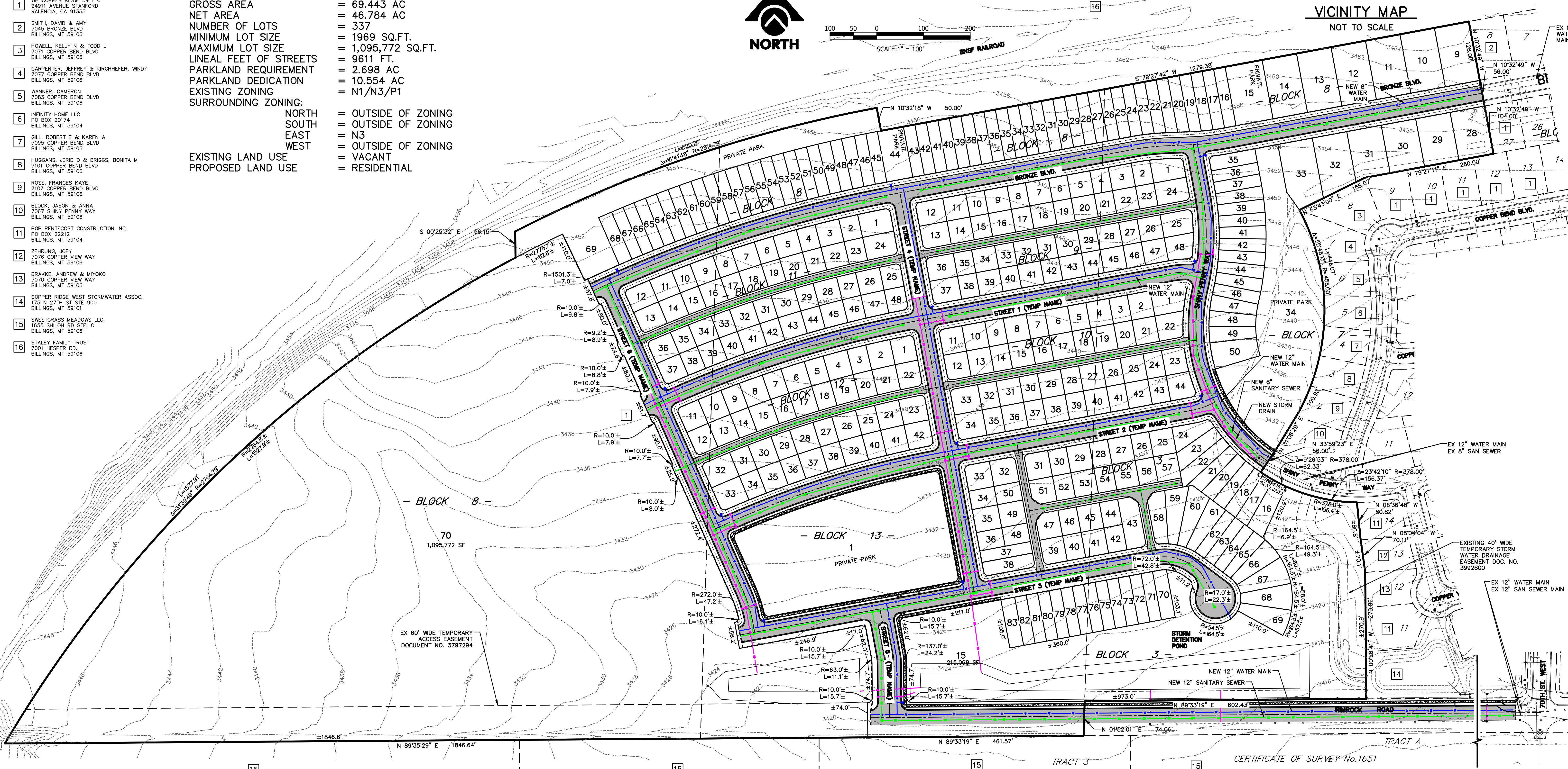
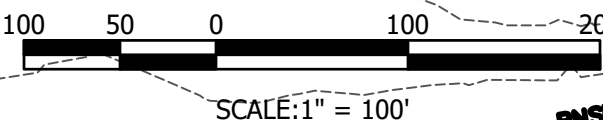


OWNERSHIPS

- 1 WH COPPER RIDGE 54 LLC
24911 AVENUE STANFORD
VALENCIA, CA 91355
- 2 SMITH, DAVID & AMY
7045 BRONZE BLVD
BILLINGS, MT 59106
- 3 HOWELL, KELLY N & TODD L
7071 COPPER BEND BLVD
BILLINGS, MT 59106
- 4 CARPENTER, JEFFREY & KIRCHHEFER, WINDY
7077 COPPER BEND BLVD
BILLINGS, MT 59106
- 5 WANNER, CAMERON
7083 COPPER BEND BLVD
BILLINGS, MT 59106
- 6 INFINITY HOME LLC
PO BOX 20174
BILLINGS, MT 59104
- 7 GILL, ROBERT E. & KAREN A
7095 COPPER BEND BLVD
BILLINGS, MT 59106
- 8 HUGGANS, JERID D & BRIGGS, BONITA M
7101 COPPER BEND BLVD
BILLINGS, MT 59106
- 9 ROSE, FRANCES KAYE
7107 COPPER BEND BLVD
BILLINGS, MT 59106
- 10 BLOCK, JASON & ANNA
7067 SHINY PENNY WAY
BILLINGS, MT 59106
- 11 BOB PENTECOST CONSTRUCTION INC.
PO BOX 22212
BILLINGS, MT 59104
- 12 ZEHRUNG, JOEY
7076 COPPER VIEW WAY
BILLINGS, MT 59106
- 13 BRAKKE, ANDREW & MIYOKO
7070 COPPER VIEW WAY
BILLINGS, MT 59106
- 14 COPPER RIDGE WEST STORMWATER ASSOC.
175 N 27TH ST STE 900
BILLINGS, MT 59101
- 15 SWEETGRASS MEADOWS LLC.
1655 SHILOH RD STE. C
BILLINGS, MT 59106
- 16 STALEY FAMILY TRUST
7001 HESPER RD.
BILLINGS, MT 59106

PLAT DATA

GROSS AREA = 69.443 AC
NET AREA = 46.784 AC
NUMBER OF LOTS = 337
MINIMUM LOT SIZE = 1969 SQ.FT.
MAXIMUM LOT SIZE = 1,095,772 SQ.FT.
LINEAL FEET OF STREETS = 9611 FT.
PARKLAND REQUIREMENT = 2.698 AC
PARKLAND DEDICATION = 10.554 AC
EXISTING ZONING = N1/N3/P1
SURROUNDING ZONING:
NORTH = OUTSIDE OF ZONING
SOUTH = OUTSIDE OF ZONING
EAST = N3
WEST = OUTSIDE OF ZONING
EXISTING LAND USE = VACANT
PROPOSED LAND USE = RESIDENTIAL



PRELIMINARY PLAT OF
TRESTLES SUBDIVISION

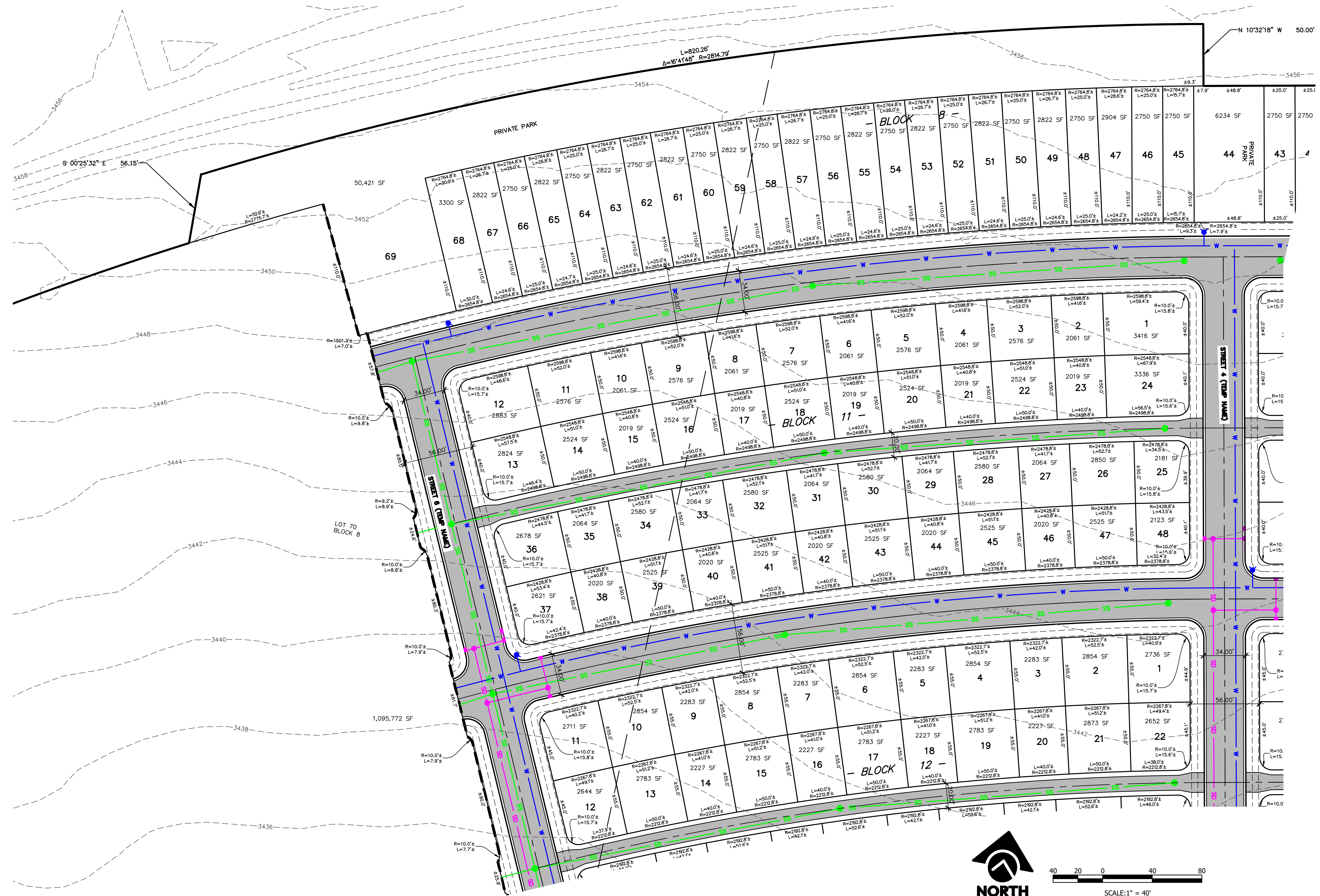
OF LOTS 15 AND 16, BLOCK 3; OF COPPER RIDGE SUBDIVISION, 7TH FILING AND LOT 15A, BLOCK 3; OF COPPER
RIDGE SUBDIVISION 8TH FILING SITUATED IN THE SE1/4 OF SECTION 26, T. 1 N., R. 24 E., P.M.M.,
IN THE CITY OF BILLINGS, YELLOWSTONE COUNTY, MONTANA

PREPARED FOR : WH COPPER RIDGE 54 LLC.

PREPARED BY : **sanbell**

JULY, 2025

BILLINGS, MONTANA



40 20 0 40 80
SCALE: 1" = 40'

PRELIMINARY PLAT OF
TRESTLES SUBDIVISION

OF LOTS 15 AND 16, BLOCK 3; OF COPPER RIDGE SUBDIVISION, 7TH FILING AND LOT 15A, BLOCK 3; OF COPPER
RIDGE SUBDIVISION 8TH FILING SITUATED IN THE SE1/4 OF SECTION 26, T. 1 N., R. 24 E., P.M.M.,
IN THE CITY OF BILLINGS, YELLOWSTONE COUNTY, MONTANA

PREPARED FOR : WH COPPER RIDGE 54 LLC.

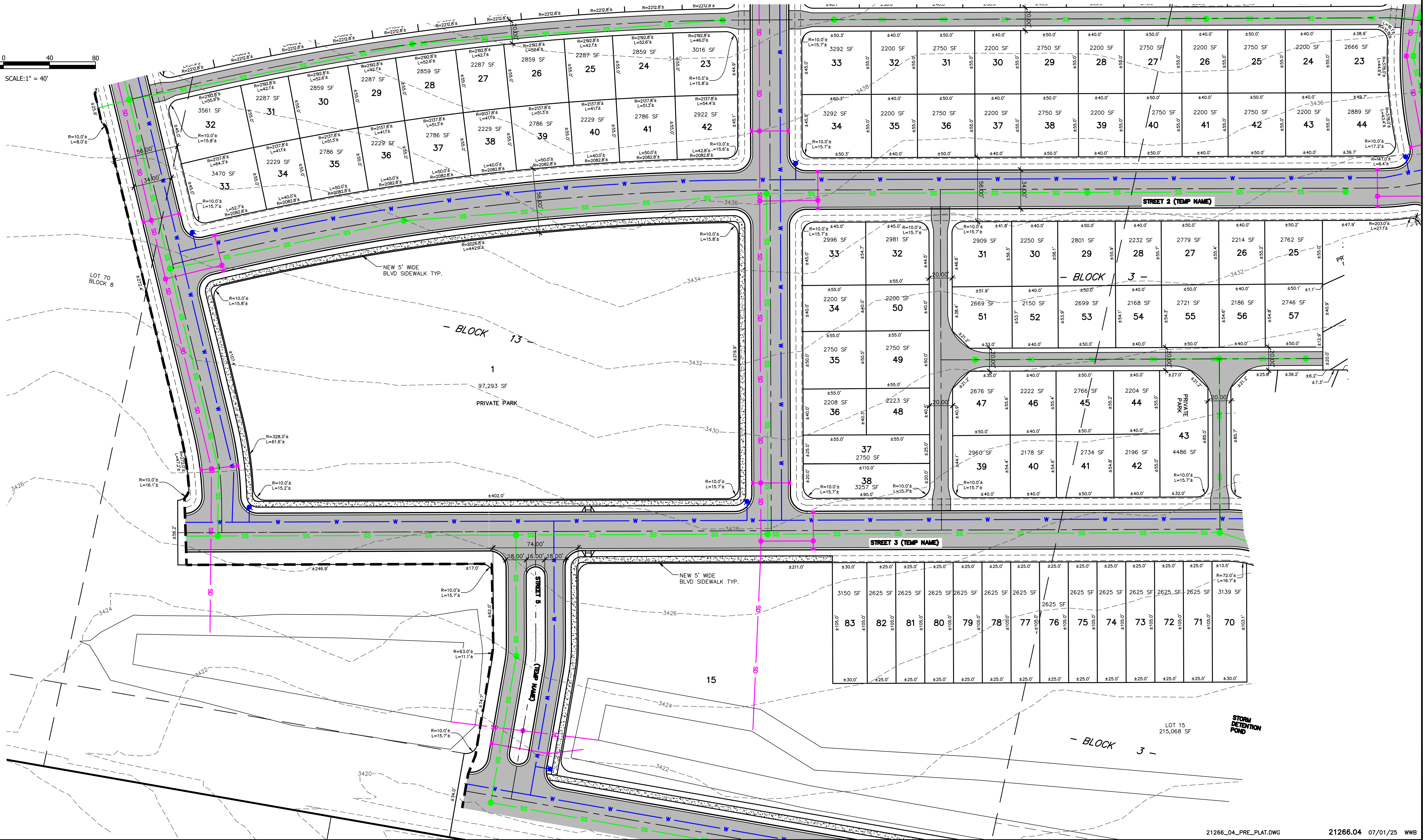
PREPARED BY : **sanbell**

JULY, 2025

BILLINGS, MONTANA



40 20 0 40 80
SCALE: 1" = 40'



PRELIMINARY PLAT OF
TRESTLES SUBDIVISION

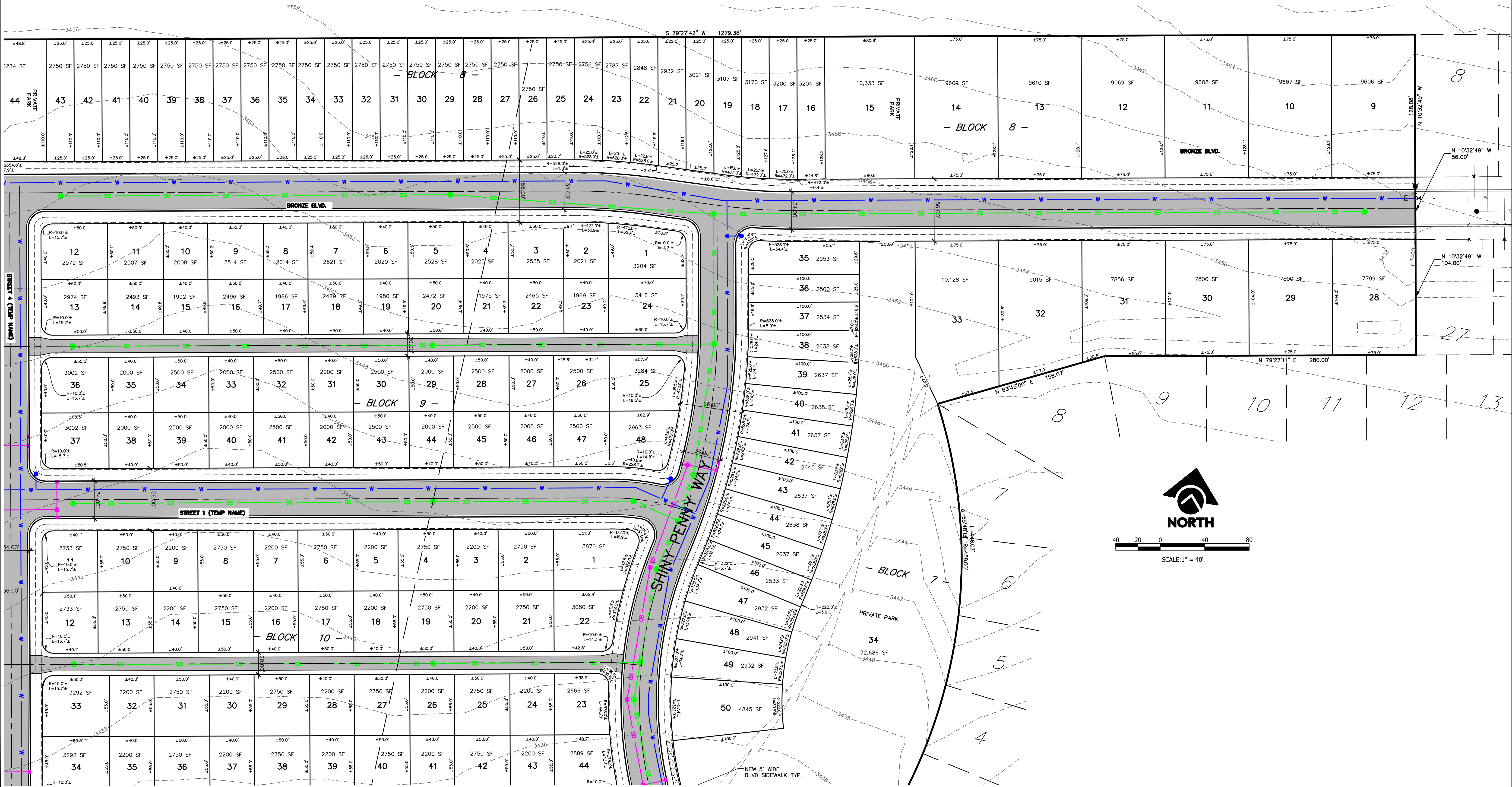
OF LOTS 15 AND 16, BLOCK 3; OF COPPER RIDGE SUBDIVISION, 7TH FILING AND LOT 15A, BLOCK 3; OF COPPER
RIDGE SUBDIVISION 8TH FILING SITUATED IN THE SE1/4 OF SECTION 26, T. 1 N., R. 24 E., P.M.M.,
IN THE CITY OF BILLINGS, YELLOWSTONE COUNTY, MONTANA

PREPARED FOR : WH COPPER RIDGE 54 LLC.

PREPARED BY : **sanbell**

JULY, 2025

BILLINGS, MONTANA



PRELIMINARY PLAT OF
TRESTLES SUBDIVISION

OF LOTS 15 AND 16, BLOCK 3; OF COPPER RIDGE SUBDIVISION, 7TH FILING AND LOT 15A, BLOCK 3; OF COPPER
RIDGE SUBDIVISION 8TH FILING SITUATED IN THE SE1/4 OF SECTION 26, T. 1 N., R. 24 E., P.M.M.,
IN THE CITY OF BILLINGS, YELLOWSTONE COUNTY, MONTANA

PREPARED FOR : WH COPPER RIDGE 54 LLC.

PREPARED BY : **sanbell**

JULY, 2025

BILLINGS, MONTANA

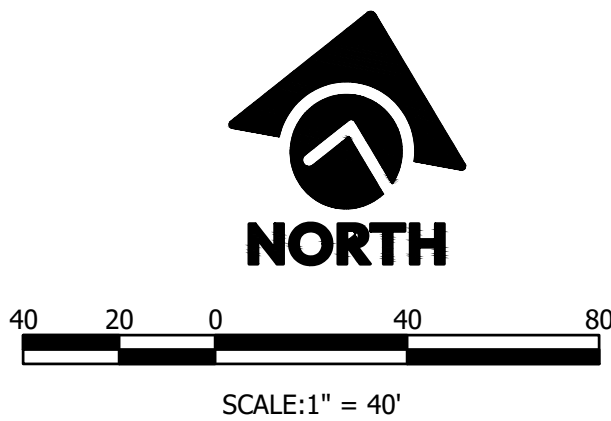
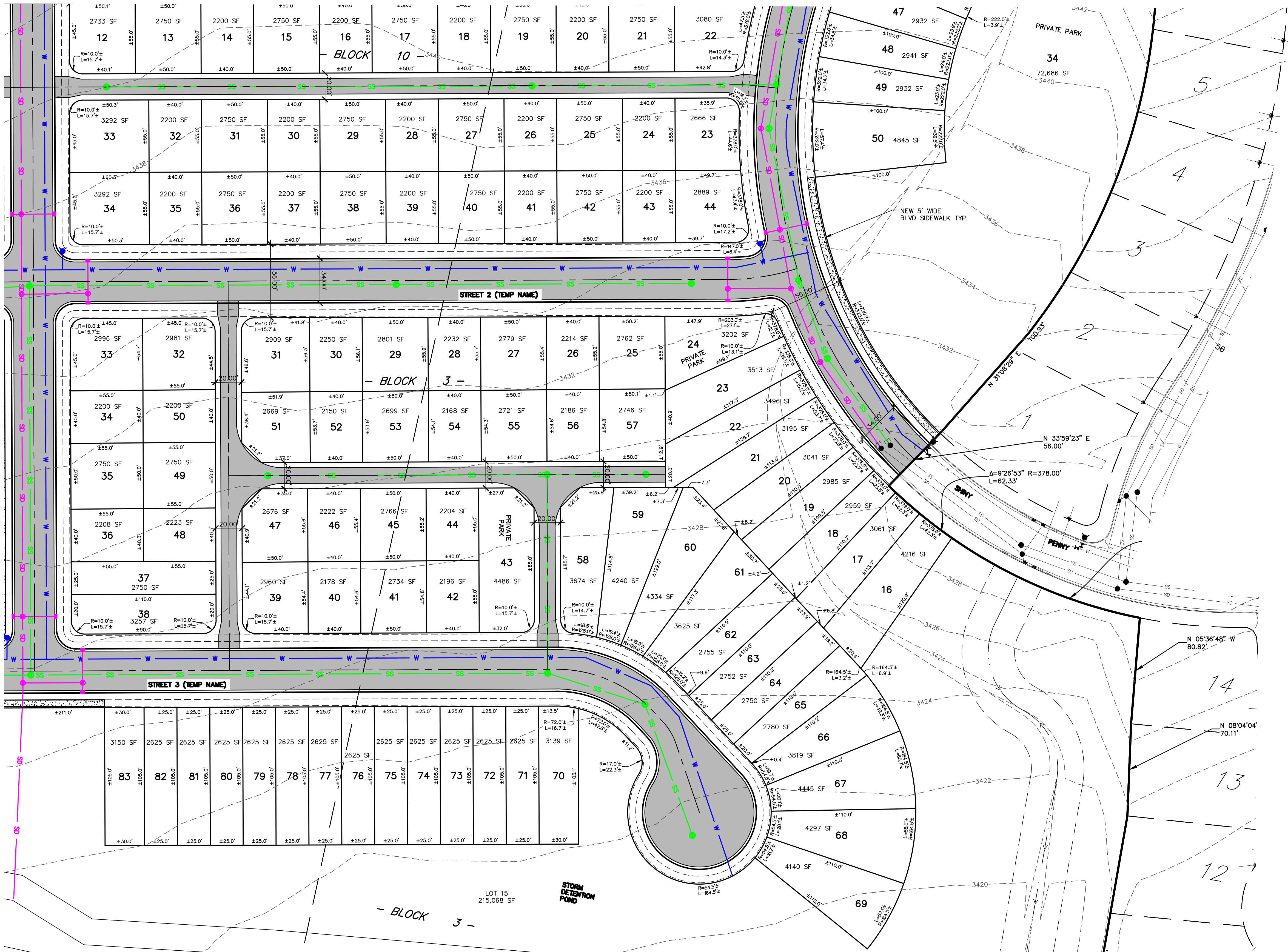


Table of Contents

I.	VARIANCES	SIA-2
II.	PROPERTY CONDITIONS AND INFORMATION FOR LOT PURCHASERS	SIA-2
III.	TRANSPORTATION	SIA-4
	A. Streets.....	SIA-4
	B. Carriage Lanes.....	SIA-5
	C. Sidewalks	SIA-5
	D. Street Lighting	SIA-6
	E. Traffic Control Devices.....	SIA-6
	F. Access	SIA-7
	G. Billings Area Bikeway and Trail Master Plan	SIA-7
	H. Public Transit.....	SIA-7
IV.	EMERGENCY SERVICE	SIA-7
V.	STORM DRAINAGE.....	SIA-8
VI.	UTILITIES	SIA-9
	A. Water.....	SIA-10
	B. Sanitary Sewer.....	SIA-10
	C. Power, Telephone, Gas, and Cable Television.....	SIA-11
VII.	PARKS/OPEN SPACE	SIA-11
VIII.	HOMEOWNER’S ASSOCIATIONS.....	SIA-11
IX.	SOILS/GEOTECHNICAL STUDY.....	SIA-11
X.	FINANCIAL GUARANTEES.....	SIA-12
XI.	LEGAL PROVISIONS APPLYING TO SUBDIVIDER.....	SIA-12
	WAIVER OF RIGHT TO PROTEST FUTURE SPECIAL IMPROVEMENT DISTRICTS	WAIVER-1

Return to:
Sanbell
1300 North Transtech Way
Billings, MT 59102

**Subdivision Improvements Agreement
& Waiver of Right to Protest Future Special
Improvement Districts
TRESTLES, FIRST FILING**

THIS AGREEMENT is made and entered into this ____ day of _____, 20____, by and between **WH Trestles 50, LLC (II)**, whose address for the purpose of this agreement is 24911 Avenue Stanford, Santa Clarita, California 91355, hereinafter referred to as “Subdivider,” and the **CITY OF BILLINGS**, Montana, hereinafter referred to as “City.”

WITNESSETH:

WHEREAS, the preliminary plat of Trestles, First Filing located in the City of Billings, Yellowstone County, Montana, was submitted to the Planning and Community Services Department, which recommended its approval to the Yellowstone County Board of Planning; and

WHEREAS, at a meeting held on the ____ day of _____, 2025, by the Yellowstone County Board of Planning, the Board recommended for approval, subject to certain conditions, an area known as Trestles Subdivision, Eighth Filing, and

WHEREAS, at a regular meeting held on the ____ day of _____, 2025, the City Council approved, subject to certain conditions, a preliminary plat of Trestles Subdivision, First Filing, and

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

WHEREAS, the provisions of this agreement shall be effective and applicable to the plat of Trestles Subdivision, First Filing, upon 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 requests no variances.

II. PROPERTY CONDITIONS AND INFORMATION FOR LOT PURCHASERS

- A.** Lot owners will be required to construct that segment of the required sidewalk 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 could contain wildlife migratory routes. Consequently, owners are advised that wildlife indigenous to this area could be found on the property and may impact the developed property and interface with domestic animals, residents, and visitors. Owners may also experience problems with damage to landscaped shrubs, flowers, and gardens. Any impacts associated with wildlife and any damage arising therefrom is the responsibility of the lot owners.
- C.** Lot owners should be aware that there is a Declaration of Restrictions and Protective Covenants recorded in conjunction with this subdivision, which outlines additional requirements specific to this subdivision design.
- D.** Lot owners should be aware that the United States Postal Service mail delivery will be made only to centralized delivery locations. Such locations shall consist of from 8 to 16 mailboxes per location. The location of each centralized mailbox setting is shown on the overall development plan and the private contract construction plans. Subdivider shall install the mailboxes within the private contract for the First Filing.

- E. Lot owners shall be advised that land in proximity to the northern boundary of Trestles Subdivision is a right-of-way owned by the Burlington Northern Santa Fe Railroad, upon which they actively operate a transportation business. The noise from moving trains is clearly audible in the subdivision. This activity is protected by state law and can be expected to continue indefinitely. Subdivider, for itself and all successor owners of property within Trestles Subdivision, hereby waives any right to object and/or protest the noise created by normal operation of trains running along the railway, acknowledges that the railroad right-of-way is private property, and further acknowledges that Trestles Subdivision and successor owners of lots within the subdivision have an affirmative duty to stay off the Burlington Northern Santa Fe Railroad property and to keep children, guests, and invitees off the property.
- F. 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.
- G. Individual lot owners should be aware that Best Management Practices for stormwater control shall be required for any construction on lots. Best Management Practices are defined within Section 28-201, BMCC and detailed in the Billings Stormwater Management Manual.
- H. Certain lots as shown on the final plat of Trestles Subdivision, First Filing contain storm water drainage easements with a drainage swale along property lines. This storm water drainage easement and drainage swale is for conveying storm water and shall not be altered in any way to inhibit the conveyance of storm water. It shall be the lot owners' responsibility to maintain and perpetuate this storm water swale, as a fully functional swale.
- I. The lowest finished floor elevation (which includes the garage) shall be a minimum of 18-inches higher than the top of curb

measured from the highest location along the lot frontage. Higher finished floor elevations shall be required on a lot by lot basis, as noted on the final plat.

- J. The lowest openings on each home (window well, walk-out basement doors, and equivalent openings) shall be located outside drainage paths. If this is not possible, the homebuilder and lot owners must take necessary measures to protect these openings from being inundated from surface water flows. Allow enough space between window wells and property lines to provide sufficient swales and drainage away from window wells, and meet applicable building codes for drainage requirements.
- K. The developer and subsequent contractors/builders acknowledge that there is a Stormwater Pollution Prevention Plan (SWPPP) filed with the City and State Department of Environmental Quality (DEQ). This SWPPP shall be adhered to during all phases of construction and shall be updated as required by DEQ under the General Permit for Stormwater Discharges Associated with Construction Activity, Chapter 28, BMCC and the Billings Stormwater Management Manual.

III. TRANSPORTATION

A. Streets

Subdivider will enter into a private contract for the construction of all required improvements for those streets within the subdivision, as follows:

Shiny Penny Way, Street 1 (Temporary Name), Street 2 (Temporary Name), Street 3 (Temporary Name), Street 4 (Temporary Name), Street 6 (Temporary Name), and Bronze Boulevard, shall be 56-foot rights-of-way using curb and gutter and full-width pavement (34-feet back of curb to back of curb). Curb and gutter will be installed per the City of Billings Standards in place at time of construction.

Street 5 (Temporary Name) will have a 74-foot wide right of way dedicated. The lanes will be 18-foot-wide back of curb with a 16-foot wide median.

Rimrock Road is classified as a collector street west of 70th Street West. A 74-foot wide right of way will be dedicated for Rimrock

Road. Rimrock Road will be built with 30 feet of asphalt and the curb and gutter on the north side.

All roads shall be built to grade with a satisfactory subbase, base course, curb and gutter, and asphalt surface. All streets shall be built in accordance with the City of Billings Standards in place at time of construction.

B. Carriage Lanes

All Carriage Lanes within the subdivision shall be built to grade with a satisfactory subbase, base course, and asphalt surface or concrete surface. All Carriage Lane approaches constructed with asphalt shall be replaced with concrete by the Subdivider at the time when home construction is complete. In the event asphalt approaches within the subdivision are not replaced with concrete within three years of the date of recording of the final plat, the City may construct the concrete approaches and assess the Subdivider for the costs associated with the approach construction. Carriage Lane pavement widths shall be 12-feet. The design cross-sections of said Carriage Lanes shall be submitted to, and approved by, the City of Billings Public Works Department. No trees are allowed to be planted in the Carriage Lane. In addition, no shrubs taller than two feet are allowed to be planted in Carriage Lanes.

C. Sidewalks

City and Subdivider agree that developer will install handicap accessibility ramps at time of private contract construction. The developer will construct 5' boulevard and 5' sidewalk along Rimrock Road. No additional boulevard sidewalks will be installed by the developer as part of construction improvements.

Individual lot owners will be responsible for the construction of the sidewalks adjacent to their lot at the time of lot construction. Sidewalks shall be 5-foot-wide boulevard sidewalks.

Subdivider shall install a 5-foot wide boulevard sidewalk along the private park and storm detention areas.

D. Street Lighting

Street lighting is required for this subdivision. It is anticipated that street lighting will be installed for First Filing by private contract or SID. A Street Light Maintenance District will be created for operation and maintenance of the lighting at a future date and is included in the waiver of right to protest.

E. Traffic Control Devices

The Subdivider shall furnish and install all necessary traffic control devices within and adjacent to the subdivision. Traffic control devices shall include all necessary signing, striping, and channelization devices to properly complete the implementation of the proposed street construction.

A traffic impact study has been completed for Trestles. All required intersection improvement contributions identified therein shall be completed by the Subdivider at the Subdivider's expense. The percent of traffic contributions to the following intersections shall be in accordance with the traffic accessibility study:

Rimrock Road and 70th Street West - 10.67 percent
Rimrock Road & 62nd Street West - 10.83 percent
Rimrock Road & 54th Street West - 8.08 percent
70th Street West & Colton Blvd - 2.98 percent
70th Street West & Grand Avenue - 2.28 percent
Grand Avenue & 62nd Street West - 4.12 percent
Grand Avenue & 56th Street West - 4.47 percent
Grand Avenue & 54th Street West - 4.12 percent

The percentages are based on 330 total lots in the First Filing.

These contributions represent a fair and equitable amount based on subdivision traffic using these intersections and may be used by the City for design and construction of geometric improvements, auxiliary turn lanes, or intersection controls such as traffic signals or roundabouts, at these intersections. Improvements will not be constructed until the City determines they are needed

and the timing and extent of the improvements shall be at the City's sole discretion.

The contributions for Trestles Subdivision, First Filing (330-residential lots) shall be made prior to final plat approval. No building permits or private contract permits will be issued until Subdivider has made the cash contribution to the City.

F. Access

Access will be provided in three locations for the subdivision. Extension of Shiny Penny Way, Bronze Blvd, and Street 5 (temporary name) access from Rimrock Road will provide access.

G. Billings Area Bikeway and Trail Master Plan

The Billings Area Bikeway and Trail Master Plan identifies the BNSF Railroad right of way adjacent to the subdivision as a potential future trail alignment. As such, a potential future trail alignment is nearby to this subdivision; therefore, City and the Subdivider agree that no additional trails will be required with this subdivision.

H. Public Transit

There are no MET Transit routes that service this subdivision at this time. No improvements with regard to MET Transit vehicles are anticipated at this time.

IV. EMERGENCY SERVICES

Access is provided to this subdivision from two existing locations. The Trestles Subdivision, First Filing, will complete street connections from Shiny Penny, Bronze Blvd, and Rimrock Road. In addition, fire hydrants will be installed at the required locations as reviewed and approved by the City of Billings Fire Department.

Construction of buildings made of combustible materials shall have adequate fire apparatus access roads and fire hydrant(s) 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 an 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 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

- A. All storm drainage improvements shall comply with the provisions of Chapter 28, BMCC, and shall be in accordance with the recommendations of an approved storm drain report to be submitted to the City of Billings Engineering Department by the Subdivider. The stormwater in the subdivision will be managed on-site through surface flow on the streets, inlets, piping, and stormwater detention facilities. The stormwater design for Trestles Subdivision, First Filing, will conform to the current City of Billings Stormwater Management Manual and be reviewed by the City of Billings Public Works Department.
- B. The developer will construct one detention basin along the southern boundary of the subdivision. The developer will construct two detention facilities with this filing located on Lot 15, Block 3 and lot 70, Block 8. The remaining detention facility will be constructed with a future filing. The detention facilities will be located on Home Owner's Association (HOA) owned lots and shall be operated and maintained by the HOA. The stormwater detention facilities will have an outlet to Rimrock Road and be piped to a City of Billings owned stormwater management facility located near

the intersection of 62nd Street West and Rimrock Road via the Birely Drain.

- i. The Subdivider may direct runoff from this filing and future filings to the City of Billings stormwater management facility located near the intersection of Rimrock Road and 62nd Street West. The City of Billings will review the stormwater storage provided on-site to ensure compliance with the City of Billings Stormwater Management Manual (SWMM). The Subdivision will be required to retain, or provide treatment, of the water quality volume/flow on-site in accordance with the SWMM.
- ii. All required stormwater storage for the subdivision will be provided on-site. Therefore, no off-site stormwater contributions to the City of Billings stormwater management facility will be required.

VI. UTILITIES

Water and sanitary sewer lines shall be sized and installed in conformance with the City design standards and specifications, and the rules and regulations of the City of Billings.

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/to water mains and sanitary sewers to the Public Works Department, Engineering Division. The extension/connection of/to water mains and sanitary sewers are 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 and regulations of, and as approved by, the City of Billings Public Works Department, Fire Department, and the Montana Department of Environmental Quality.

A. Water

Service to the subdivision will be provided from a 12-inch water main stub located at Shiny Penny Way and 8-inch stub in Bronze Boulevard. The Subdivider will extend the existing 12-inch water main from the existing terminus at 70th Street West/Rimrock Road west along Rimrock to the intersection with Street 5 (temporary name). 12-inch water will continue in Shiny Penny Way to the intersection of Street 1 (temp name). 8-inch water will be located in the remainder of Shiny Penny to Bronze Blvd. 12-inch water will be located in Street 1 (temp name) and stubbed out for future Filings. The remaining streets will be looped with 8-inch water.

Appropriately sized mains and services in the internal streets will provide service to the individual lots within the subdivision. It is anticipated that each lot shall be provided with its own separate water service. All water construction improvements shall be installed in conformance with the design standards, specifications, and rules and regulations of the City of Billings and Montana Department of Environmental Quality, and will be approved by the Public Works Department.

B. Sanitary Sewer

Service to the subdivision will be from the existing 8-inch sanitary sewer stub located in Shiny Penny Way. 12-inch sanitary sewer main will be installed in Rimrock Road to street 5 (temp name). 8-inch sewer main will be installed in all other proposed streets.

Appropriately sized mains and services in the internal streets will provide service to the individual lots within the subdivision. Each lot shall be provided with its own service. All sanitary sewer construction improvements shall be installed in conformance with the design standards, specifications, and rules and regulations of the City of Billings and Montana Department of Environmental Quality, and will be approved by the Public Works Department.

Improvements noted herein shall include, but not be limited to, any and all interim improvements that may be deemed necessary due to phased or partial construction.

C. Power, Telephone, Gas, and Cable Television

All telephone, gas, electrical power, and cable television lines shall be placed in designated easements outside of the right-of-way and shall be installed underground prior to surface improvements. The location of all such facilities shall be subject to approval of the City Engineer.

VII. PARKS/OPEN SPACE

Section 76-3-621 of the Montana Subdivision and Platting Act covers the park dedication requirement. Additionally, Section 23-1002.B.1 of the City of Billings municipal code cover Eighths parkland dedication of major subdivisions. The First Filing has a total of 330 residential lots, requiring a parkland dedication of 2.70 acres. 10.55 acres of parkland has been dedicated with the Trestles First Filing

VIII. HOMEOWNER'S ASSOCIATIONS

A homeowner's association (HOA) will be established for this subdivision. The HOA will have the following responsibilities:

A. Contact Information

HOA shall provide contact information of the senior board official to the City Engineering Department upon the establishment of the HOA and/or changing of board members.

B. Stormwater Drainage Facilities

The HOA shall be responsible for the maintenance of the on-site stormwater drainage facilities located on Lot 15, Block 3 and Lot 70, Block 8. The HOA shall share the cost of maintenance of the community stormwater facilities.

IX. SOILS/GEOTECHNICAL STUDY

The Subdivider has retained an engineering firm to prepare a geotechnical analysis for this property. A copy of the entire geotechnical report prepared by LGC Valley Inc., dated February 26, 2024, is available for review at the City Building and/or Planning Division offices.

It is recommended that owners, purchasers, realtors, builders, and developers fully familiarize themselves with the information contained in this report prior to design or construction. There are variable soils conditions throughout the Subdivision, and the potential exists for collapsible soils within the Subdivision.

X. 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. 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 Engineering Department and Public Works Department, Distribution and Collection Division.

XI. LEGAL PROVISIONS APPLYING TO SUBDIVIDER

- A.** Subdivider agrees to guarantee all public improvements for a period of two years 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 provision of the 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 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”

WH COPPER RIDGE 54, 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 _____, known to me to be the person who signed the foregoing instrument as the _____ of **WH Copper Ridge 54, LLC**, and who acknowledged to me that said company executed the same.

IN WITNESS WHEREOF, 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 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:

Trestles Subdivision, 1st Filing

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

“SUBDIVIDER”

WH COPPER RIDGE 54, LLC

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 _____, known to me to be the _____ of **WH Copper Ridge 54, LLC**, the person who executed the forgoing instrument and acknowledged to me that he/she executed the same.

IN WITNESS WHEREOF, 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 at: _____
My commission expires: _____

THE TRESTLES SUBDIVISION TRAFFIC IMPACT STUDY

21266.04

Mark Smith
WH Copper Ridge 54, LLC
24911 Avenue Stanford
Santa Clarita CA 91355



**Intelligent Infrastructure.
Enduring Communities.**

AUGUST/2025



TABLE OF CONTENTS

INTRODUCTION	1
SITE LOCATION AND DESCRIPTION	1
SITE DEVELOPMENT PLAN.....	1
EXISTING CONDITIONS.....	1
Streets	1
Intersections	5
Bicycle/Pedestrian Facilities	5
Traffic Volumes.....	5
Intersection Capacity.....	6
Crash History	6
TRIP GENERATION	11
TRIP DISTRIBUTION.....	12
TRAFFIC IMPACTS.....	12
Traffic Volumes.....	12
Intersection Capacity.....	17
Mitigation Alternatives	17
CONCLUSIONS AND RECOMMENDATIONS.....	20
Conclusions	20
Recommendations.....	21
FINANCIAL CONTRIBUTION CALCULATIONS	22

APPENDICES

APPENDIX A – TRAFFIC VOLUME DATA
APPENDIX B – CAPACITY CALCULATIONS – EXISTING CONDITIONS (2025)
APPENDIX C – CAPACITY CALCULATIONS – 1ST FILING (2029) AND FULL BUILDOUT (2031)
APPENDIX D – AUXILIARY TURN LANE WARRANT WORKSHEETS
APPENDIX E – ALL-WAY STOP CONTROL WARRANT WORKSHEETS
APPENDIX F – TRAFFIC SIGNAL WARRANT WORKSHEETS
APPENDIX G – CAPACITY CALCULATIONS – IMPROVEMENTS
APPENDIX H – FINANCIAL CONTRIBUTION CALCULATIONS

LIST OF TABLES

TABLE 1: CRASH HISTORY – FREQUENCY AND SEVERITY STATISTICS	8
TABLE 2: CRASH HISTORY – COLLISION TYPE.....	9
TABLE 3: TRIP GENERATION SUMMARY	11

LIST OF FIGURES

FIGURE 1: STUDY AREA	2
FIGURE 2: SITE LAYOUT	3
FIGURE 3: STREET AND INTERSECTION CHARACTERISTICS.....	4
FIGURE 4: EXISTING CONDITIONS (2025) PEAK HOUR TRAFFIC VOLUMES	7
FIGURE 5: 1ST FILING TRIP DISTRIBUTION & TRAFFIC ASSIGNMENT SUMMARY.....	13
FIGURE 6: FULL BUILDOUT TRIP DISTRIBUTION & TRAFFIC ASSIGNMENT SUMMARY	14
FIGURE 7: 1ST FILING (2029) TRAFFIC PROJECTIONS	15
FIGURE 8: FULL BUILDOUT (2031) TRAFFIC PROJECTIONS	16

INTRODUCTION

This traffic impact study (TIS) assesses the traffic-related impacts associated with the proposed development of the Trestles Subdivision in Billings, Montana on the surrounding transportation system. This report also provides recommendations to mitigate any such impacts. The methodology and analysis procedures used in this study employ the latest technology and nationally accepted standards in the areas of site development and transportation impact assessment. Recommendations made in this report are based on professional judgment and these principles.

SITE LOCATION AND DESCRIPTION

The Trestles Subdivision is located in west Billings, Montana. The site is bordered by undeveloped land and the future Rimrock Road to the south, 70th Street West and the Copper Ridge Subdivision to the east, undeveloped land to the west, and a railroad to the north. Figure 1 on the following page depicts the designated study area.

SITE DEVELOPMENT PLAN

The site development plan for Trestles Subdivision 1st Filing proposes construction of 330 single-family residential units, of which 106 units will be configured as duplexes. Completion of the 1st Filing is anticipated by the year 2029. 2nd Filing proposes an additional 162 single-family residential units, including 72 duplex units. Full buildout of the Trestles Subdivision is expected to occur over the next six years, with 492 homes in total. Some of the houses in the subdivision will be alley loaded.

Primary access to Trestles Subdivision is proposed via two new full-movement approaches on Rimrock Road and connections to 70th Street West via Bronze Boulevard and Shiny Penny Way. Sidewalks are proposed to be installed throughout the development. Figure 2 on page three shows the current proposed site plan for Trestles Subdivision.

Bronze Boulevard is proposed to be a lengthier straight segment of roadway within the subdivision. With this layout, installation of traffic calming such as curb bulb-outs, other lane narrowing measures, chicanes, or speed humps may be necessary to control vehicle speeds.

EXISTING CONDITIONS

Streets

Figure 3 on page four shows the City of Billings roadway functional classifications and speed limits on study area streets. Additional conditions of existing streets within the study area are described as follows.

All study area streets generally have two-lane sections, with one travel lane in each direction. Grand Avenue has a three-lane section with a center two-way left-turn lane (TWLTL) east of Wilderness Drive. There is curb and gutter on the south side of Grand Avenue from Wilderness Drive to 56th Street West. Rimrock Road will be constructed as a two-lane Collector section west of 70th Street West to reach the proposed site.

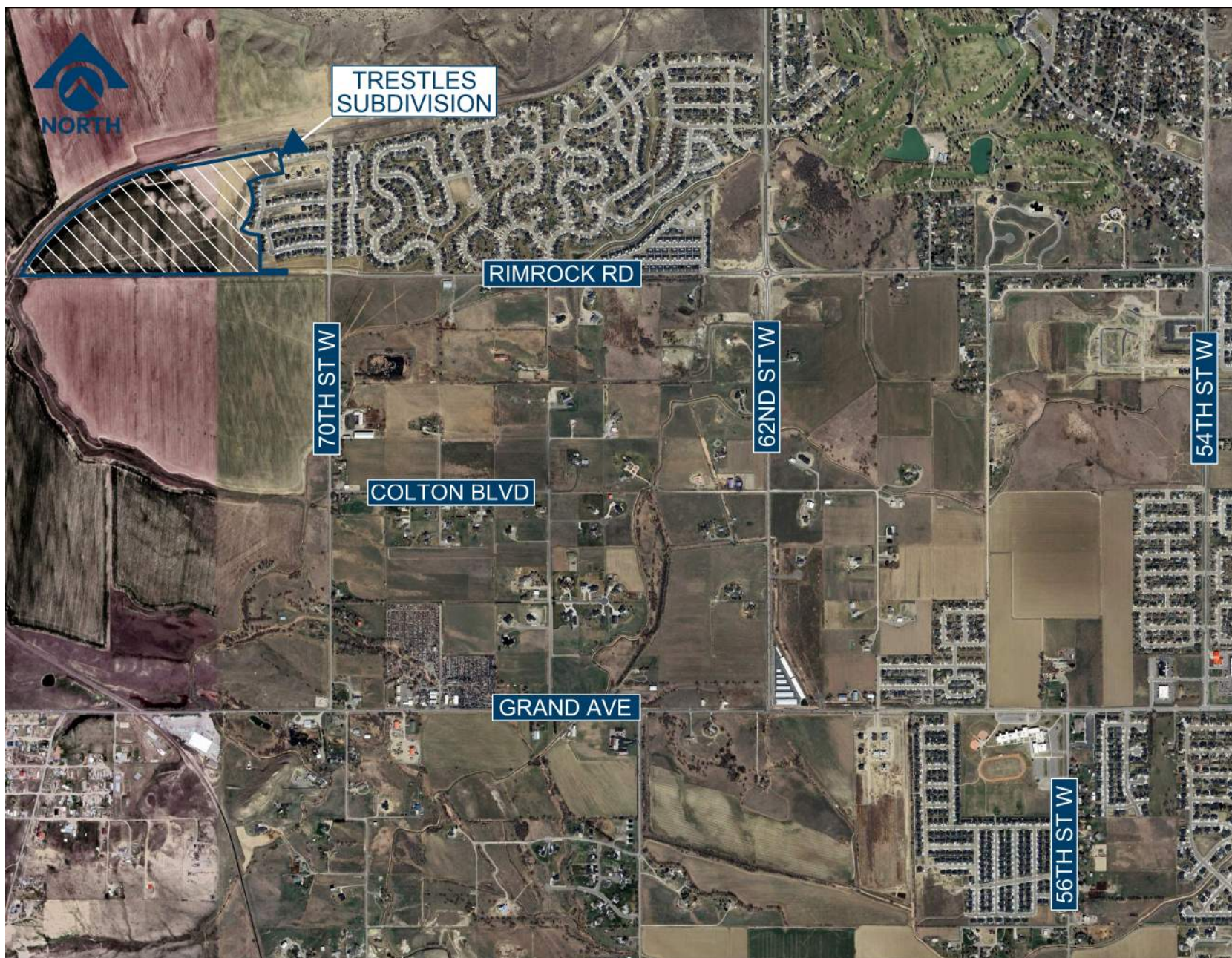


Figure 1: Study Area

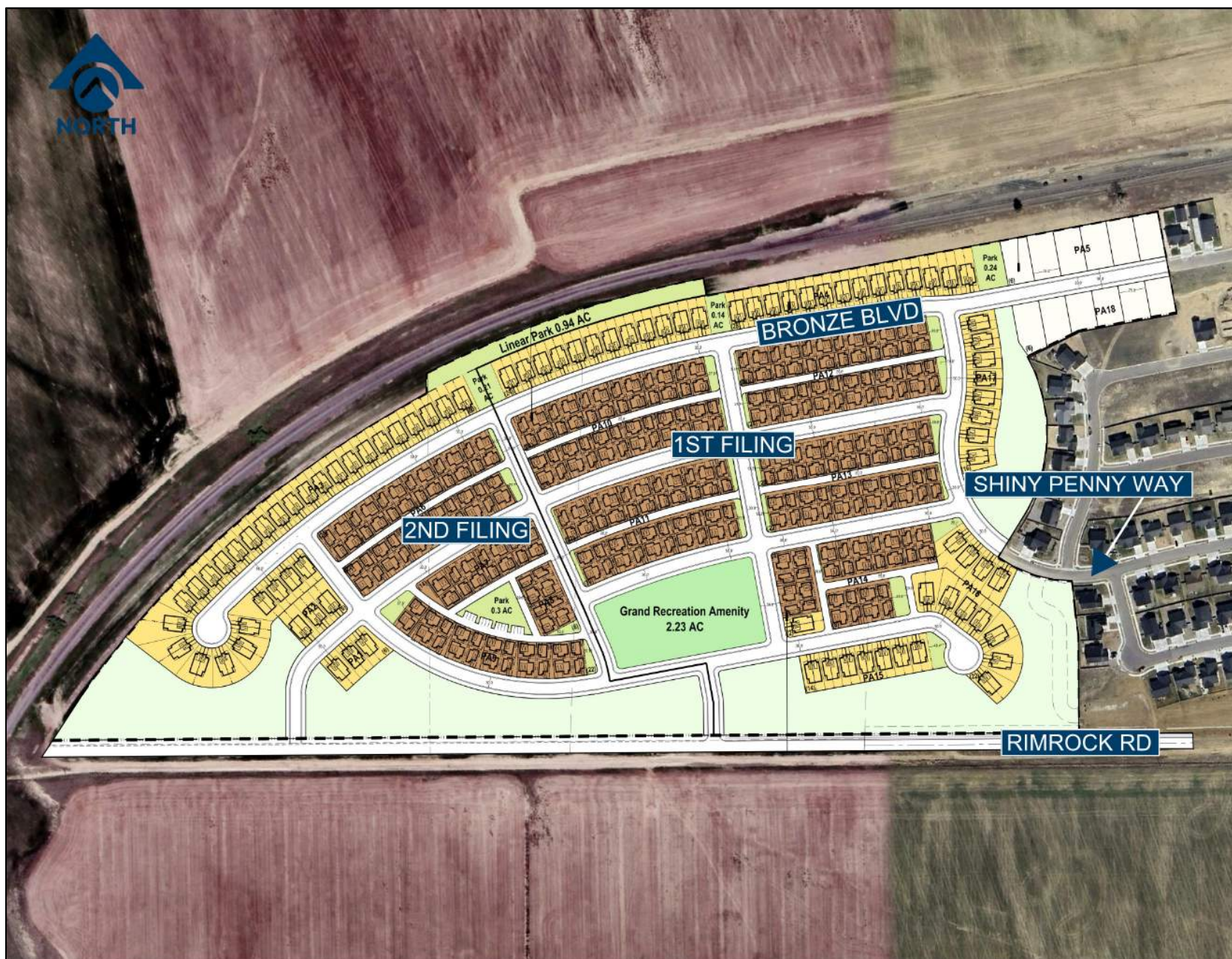


Figure 2: Site Layout

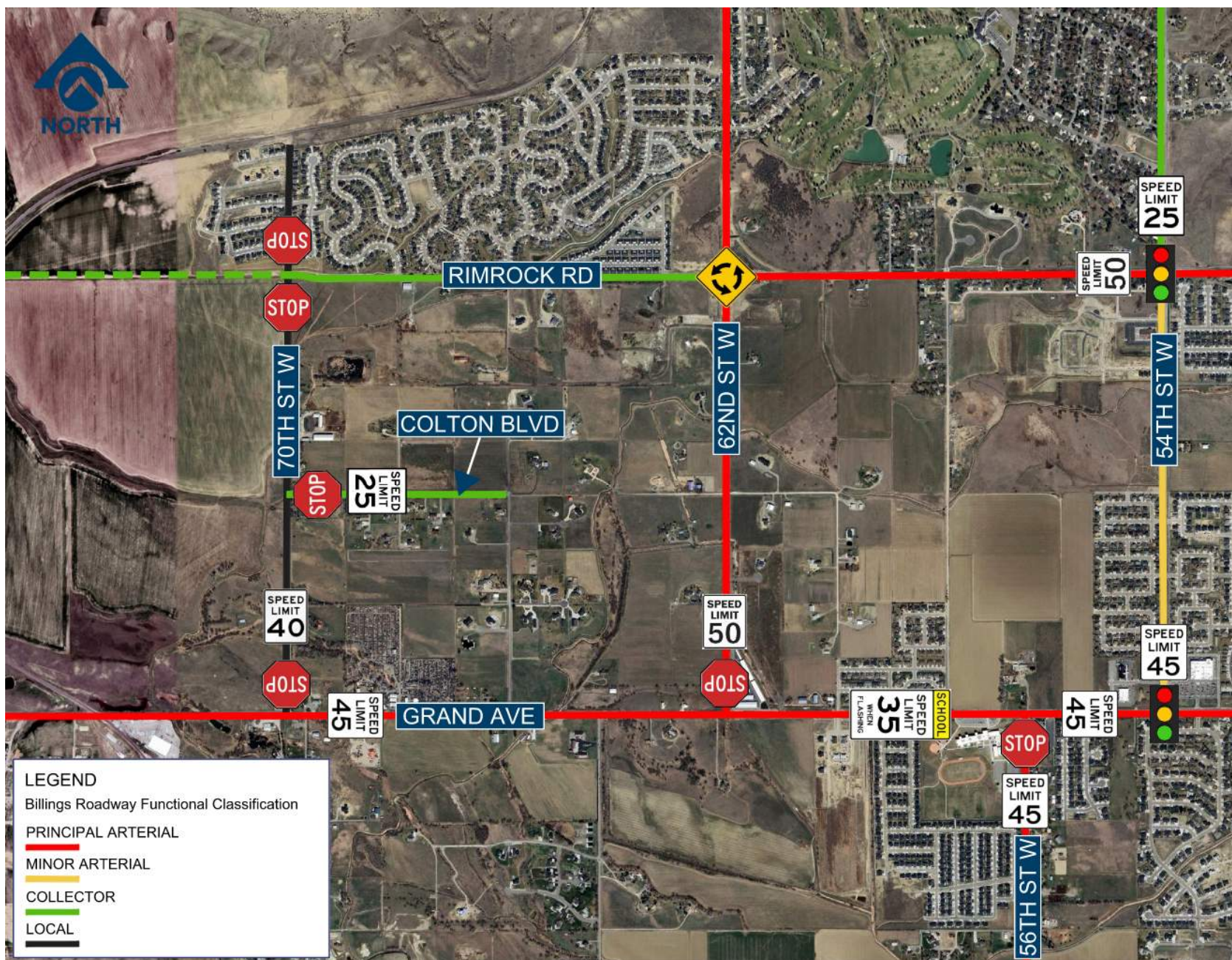


Figure 3: Street and Intersection Characteristics

Intersections

Figure 3 also shows the traffic control utilized at each study area intersection. Additional intersection characteristics are described below.

The 54th Street West/Rimrock Road intersection is signalized and operates with protected/permissive phasing for eastbound and westbound left turns. There are left-turn lanes on all approaches as well as a westbound right-turn lane.

The 54th Street West/Grand Avenue intersection is signalized and operates with a protected/permissive phase for eastbound left turns and a protected-only phase for southbound left turns. The southbound approach has separate left- and right-turn lanes, the eastbound approach has a left-turn lane, and the westbound approach has a right-turn lane.

The 62nd Street West/Rimrock Road intersection was recently upgraded to a single-lane roundabout, and the Molt Road curve between the east and north legs was removed. All turning movements now utilize the roundabout.

The remaining study area intersections are stop-controlled on the minor approaches. At the 56th Street West/Grand Avenue intersection there are left-turn lanes on the eastbound, westbound, and northbound approaches. The remaining study area intersections have one shared lane on each approach.

Bicycle/Pedestrian Facilities

There is a shared use path on the south side of Grand Avenue beginning at Wilderness Drive and extending east to 52nd Street West. On 54th Street West, the west side features a shared use path between Grand Avenue and Rimrock Road, while the east side has a sidewalk with a missing section between Colton Boulevard and Poly Drive. North of Rimrock Road, sidewalk is present only on the west side of 54th Street West. A shared use path also follows the north side of Rimrock Road east of 54th Street West. Sidewalk extends along the north side of Rimrock Road between Golden Acres Drive and 70th Street West, and continues on both sides of 70th Street West north of Rimrock Road.

The signalized intersections of 54th Street West/Rimrock Road and 54th Street West/Grand Avenue each have striped crosswalks, and there is a striped crosswalk across the south leg of the 56th Street West/Grand Avenue intersection. The new roundabout at the 62nd Street West/Rimrock Road intersection also has pedestrian crosswalks. There are no dedicated bicycle facilities in the study area.

The 2023 Billings Urban Area Long Range Transportation Plan (LRTP) and the 2017 Billings Area Bikeway + Trails Master Plan update recommends construction of shared use paths and/or bike lanes along nearly every street in the study area.

Traffic Volumes

Weekday AM and PM peak hour turning movement counts were collected for study area intersections on Tuesday, January 7, 2025. The traffic data was collected using Miovision Scout video-based systems. In

general, the weekday AM and PM peak hour periods were found to occur from 7:15 to 8:15 AM and 4:30 to 5:30 PM. Raw count data was adjusted for seasonal variation using City of Billings seasonal adjustment factors. Figure 4 on the following page summarizes the calculated Existing Conditions (2025) peak hour turning movement volumes for the AM and PM peak hours. Detailed traffic count data worksheets are included in Appendix A.

Intersection Capacity

Existing Conditions (2025) intersection capacity calculations were performed for the study area intersections using PTV Vistro 2023 software, which is based on the Highway Capacity Manual, 7th Edition (Transportation Research Board, 2022). Level of service (LOS) is defined as a quality measure describing operational conditions within a traffic stream, generally in terms of such service measures as speed and travel time, freedom to maneuver, traffic interruptions, comfort, and convenience. LOS is a qualitative measure of the performance of an intersection with values ranging from LOS A, which indicates good operation and low vehicle delays, to LOS F, which indicates congestion and longer vehicle delays. LOS C is typically considered a minimum acceptable threshold for operations in Montana-based communities, though exceptions are made in certain cases.

The results of the Existing Conditions (2025) intersection capacity calculations showed that all intersections currently operate at LOS C or better on all approaches during both peak hours. Queues are generally minimal at all study area intersection approaches, with generally minimal 95th percentile queues with some longer queues at the signalized intersections in comparison to the stop-controlled intersections. Figure 4 also shows the Existing Conditions (2025) LOS results at each intersection. A detailed capacity summary table and capacity calculation worksheets for each of the study area intersections can be found in Appendix B.

Crash History

Historical crash data was obtained from the Montana Department of Transportation (MDT) for the five-year period from January 1, 2019, through December 31, 2023 for all study area intersections. Note that no crashes were reported at the 70th Street West/Colton Boulevard intersection. It should also be noted that a roundabout was recently installed at the intersection of 62nd Street West/Rimrock Road, but the crash analysis was performed based on the stop-controlled configuration that was present during the crash history period. The crash data was analyzed for the purpose of calculating intersection crash and severity rates and evaluating collision type trends. Tables 1 and 2 on pages eight and nine, respectively, illustrate the results of that analysis.

Intersection crash frequency rates were calculated on the basis of crashes per million vehicles entering (MVE). The MVE metric was estimated based on published historical ADT volumes from the MDT website and 2025 peak hour counts. The highest crash rate was 1.28 crashes/MVE at the 62nd Street West/Grand Avenue intersection, which had the highest number of reported crashes in the study area at 13.

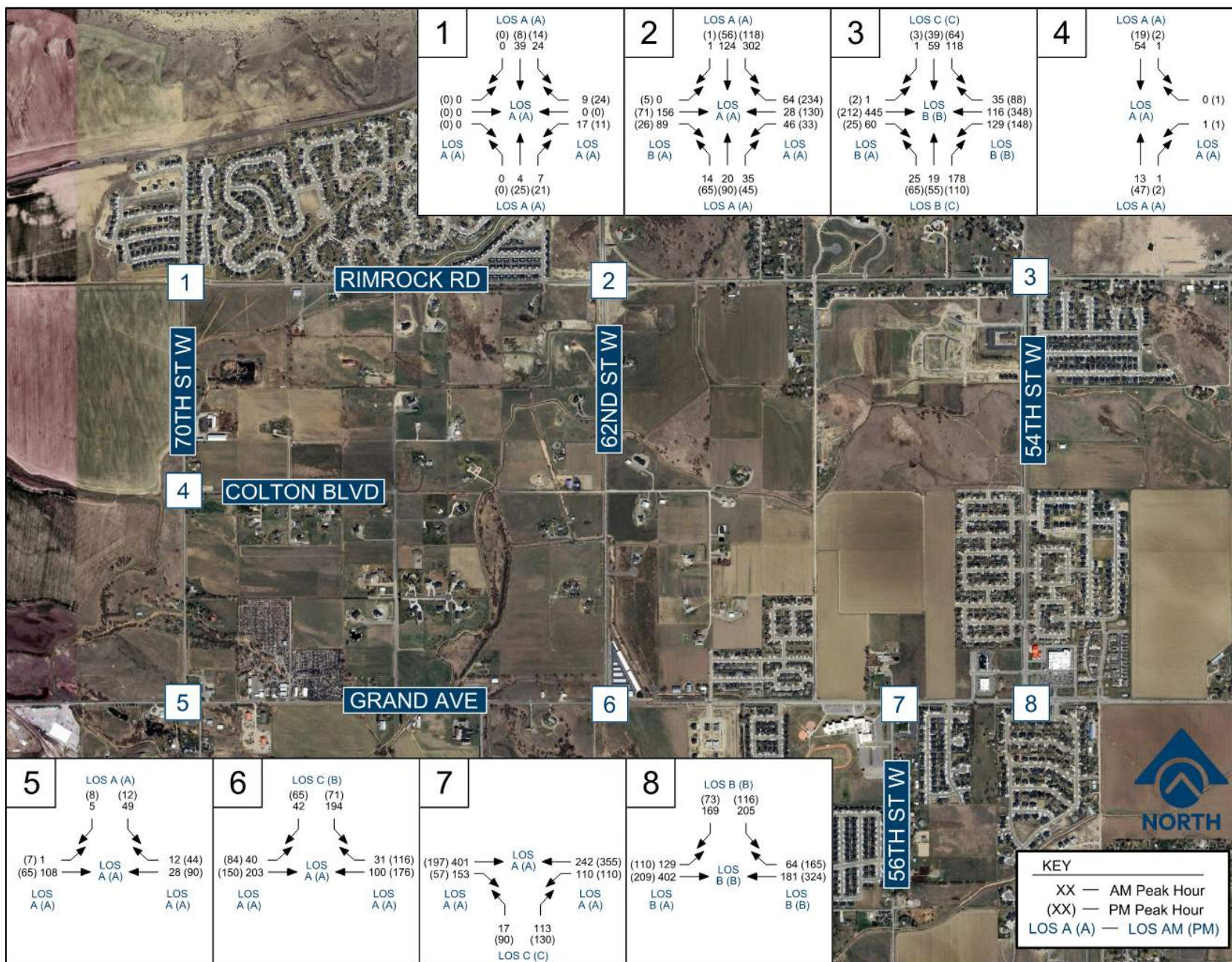


Figure 4: Existing Conditions (2025) Peak Hour Traffic Volumes

Table 1: Crash History – Frequency and Severity Statistics

Intersection	2019-2023 DEV ¹	Reported Crashes ²	Crash Type			Crash Data ³			HSM Predictions ⁴	
			PDO	Injury	Fatality	Average Crash Frequency (Crash/Yr)	Crash Rate (Crash/MVE)	Severity Index	Predicted Average Crash Frequency (Crash/Yr)	Predicted Crash Rate (Crash/MVE)
70th St W & Rimrock Rd	890	1	1	0	0	0.20	0.62	1.00	0.11	0.34
62nd St W & Rimrock Rd	6451	11	8	3	0	2.20	0.93	1.55	1.34	0.57
54th St W & Rimrock Rd	11353	11	6	4	1	2.20	0.53	2.36	1.33	0.32
70th St W & Colton Blvd	622	0	0	0	0	0.00	0.00	0.00	0.03	0.13
70th St W & Grand Ave	2260	5	4	1	0	1.00	1.21	1.40	0.25	0.30
62nd St W & Grand Ave	5550	13	9	4	0	2.60	1.28	1.62	0.75	0.37
56th St W & Grand Ave	8241	6	4	2	0	1.20	0.40	1.67	0.53	0.18
54th St W & Grand Ave	9501	4	2	1	1	0.80	0.23	3.25	0.80	0.23

¹ Daily Entering Volume (DEV) estimated from 2025 peak hour counts and 2019-2023 MDT published ADTs

² Crashes reported from January 1, 2019 to December 31, 2023

³ Crash rates expressed as crashes per million vehicles entering (MVE)

⁴ Rates calculated using Highway Safety Manual (HSM) 1st Edition predictive methodology

As a means of evaluating the relative significance of the calculated historical crash rates, an expected rate was also calculated using the predictive crash rate formulas in the American Association of State Highway and Transportation Officials (AASHTO) Highway Safety Manual (HSM). The process involves calculating the number of crashes predicted in a year based on traffic demand (AADTs) and various physical and traffic environment-based conditions, such as lane configurations and traffic control. The calculation results in a crashes-per-year prediction. A frequency rate was then back calculated on the basis of MVE for the sake of comparison with the actual historical crash rates. The results of the calculations for this study showed that the historical crash rates were higher than predicted at every study intersection with reported crashes, except for the 54th Street West/Grand Avenue intersection, where the historical and predicted crash rates were equal. The historical crash rate was higher than the predicted rate by as much as a factor of 4.0 at the 70th Street West/Grand Avenue intersection, which had five total reported crashes. At the 62nd Street West/Grand Avenue intersection, the historical crash rate was approximately 3.5 times higher than would be predicted using HSM methodology. The 56th Street West/Grand Avenue intersection had a historical crash rate over two times higher than predicted, while the intersections along Rimrock Road had historical rates that were between 1.6 and 1.8 times higher than predicted. Installation of a roundabout at the 62nd Street West/Rimrock Road intersection is expected to reduce crashes by approximately 80 percent. The HSM rate predictions and five-year crash totals for each intersection are summarized in Table 1 above.

Severity indices were also calculated for all study area intersections. A severity index gives an indication of relative crash severity for a location based on the number of fatal, injury, and property damage only (PDO) crashes. The severity index was high at both the 54th Street West/Rimrock Road and 54th Street West/Grand Avenue intersections due to each intersection having one fatal crash reported. Severity index calculations are also shown in Table 1.

Collision type was evaluated for the purpose of identifying any significant trends in the crash data. Table 2 below presents the results of that analysis. Fixed object crashes were the most commonly reported collision type in the study area, with rear end and right-angle crashes also prevalent.

Table 2: Crash History – Collision Type

	Collision Type										
	Rear End	Right Angle	LT, OD	SS, SD	SS, OD	Head On	Roll Over	Fixed Object	Wild Animal	Other	Total
70th St W & Rimrock Rd										1	1
62nd St W & Rimrock Rd	1	3	2					4		1	11
54th St W & Rimrock Rd	4	2	1		1				3		11
70th St W & Colton Blvd											0
70th St W & Grand Ave								5			5
62nd St W & Grand Ave	2	2	2	1		1		5			13
56th St W & Grand Ave	1	1			1		1	2			6
54th St W & Grand Ave	2							2			4

Fixed object collisions were the most commonly reported collision type at five study intersections and were the only crash type reported at the 70th Street West/Grand Avenue intersection. Fixed object collisions often occur due to alcohol, excessive speeds, inattention, or poor visibility where objects are too close to the roadway. Snowy, icy, or wet roads were reported for 61 percent of the total fixed object crashes and dark conditions were reported for 72 percent of fixed object crashes. Impaired drivers were reported to be involved in 17 percent of fixed object crashes and 11 percent were reported as hit-and-runs. It is possible that high speeds may have been a contributing factor in some of these crashes. At the 62nd Street West/Rimrock Road intersection, there were power poles on each corner of the intersection during the crash history period, which have been removed or relocated with construction of the roundabout. At the 70th Street West/Grand Avenue intersection, there is a power pole on the northeast corner very close to the traveled way and a ditch to the northwest. There is a ditch on both corners of the 62nd Street West/Grand Avenue intersection. The fatal crash reported at the 54th Street West/Grand Avenue intersection involved a westbound vehicle striking a traffic signal support. The crash occurred at night and involved an impaired driver.

Rear end collisions occurred at five intersections and were the most common collision type at two intersections, both of which are signalized. Rear end crashes commonly occur at signalized intersections because the signal control is dynamic and thereby requires drivers to recognize and react to changing conditions in real time. High speeds approaching signalized intersections allow drivers less response time, which creates an opportunity for an increased chance of rear end collisions. Factors that typically contribute to the high occurrence of rear end crashes at signalized intersections include inadequate yellow change intervals or a lack of dedicated turn lanes where high turning movement demands are prevalent. Yellow change intervals at the signalized intersections of 54th Street West with Rimrock Road and Grand Avenue were calculated to be adequate. Rear end crashes are also common at stop-controlled intersections due to slowing turning vehicles on the major road where no turn lanes are present, or where vehicles

attempt to enter the intersection from the minor road but stop due to conflicting vehicles, pedestrians, or bicycles, with the following vehicles then hitting the lead vehicle.

Right-angle crashes were reported at four study intersections, one of which was signalized. Right-angle collisions typically occur at signalized intersections when there is an increased presence of red-light-running. The remaining intersections with reported right-angle crashes were stop-controlled. Right-angle crashes typically occur at unsignalized intersections when drivers stop at a stop sign but then proceed when it is unsafe to do so. Often these crashes are caused by sight distance issues, drivers incorrectly detecting speeds of approaching vehicles, and/or high speeds on the main roadway. All the intersections with reported right-angle crashes have adequate sight distance but involve high-speed roadways.

Left-turn/opposite-direction (LT/OD) crashes were reported at one signalized and two unsignalized intersections. LT/OD crashes typically occur at unsignalized and signalized intersections when a driver performs a left turn while misjudging an appropriate gap in oncoming traffic. At traffic signals, implementation of protected or protected/permissive phasing may reduce LT/OD crashes. At the 54th Street West/Rimrock Road intersection, the LT/OD crash resulted in a fatality when a westbound left-turning vehicle collided with an eastbound thru vehicle. Both vehicles were reported to have entered the intersection with a yellow light.

Three wild animal collisions were reported at or near the 54th Street West/Rimrock Road intersection. Wild animal collisions are more likely to occur in areas adjacent to wild habitat with high speeds and no or limited roadway lighting. Lower speed limits, increased lighting, and more driver awareness of potential animal crossings could reduce wild animal/vehicle conflicts by providing increased sight distance and reducing stopping distance.

Lower vehicle speeds lessen the energy transfer when crashes do occur, resulting in crashes with potentially less severe outcomes. With two fatal crashes in the study area, it is possible that the high posted speed limits were a factor. The speed limit on Rimrock Road between 54th Street West and 62nd Street West and on Molt Road was previously reduced from 55 mph to 50 mph in 2023. However, further reductions should be considered, specifically on Rimrock Road west of 62nd Street West, due to the high density of development and approaches to Copper Ridge and other subdivisions. A lower speed limit and appropriate design would support the lesser roadway classification of Rimrock Road as a Collector street west of 62nd Street West.

In total, 37 percent of crashes in the study area occurred with wet, snowy, or icy roadway conditions and 47 percent occurred at night. Ten percent were reported as hit-and-run crashes, eight percent involved an impaired driver, and two percent involved heavy vehicles.

It is important to note that all of the above evaluations of crash causes are speculative, and more detailed information about individual crashes would be needed to determine exact causes for each collision and identify whether any specific trends are present.

TRIP GENERATION

This study utilized Trip Generation, 11th Edition, published by the Institute of Transportation Engineers (ITE), which is the most widely accepted source in the United States for determining trip generation projections. These projections are used to analyze the impacts of a new development on the surrounding area. For the purposes of this study, Land Use Code 210 – Single-Family Detached Housing and Land Use Code 215 – Single Family Attached Housing were utilized to project trip generation for the Trestles Subdivision. Table 3 below illustrates the results of the trip generation calculations for the site.

Table 3: Trip Generation Summary

Land Use	Independent Variable		Average Weekday			AM Peak Hour			PM Peak Hour		
	Intensity	Units	total	enter	exit	total	enter	exit	total	enter	exit
<i>1st Filing</i>											
Single-Family Detached Housing ¹	224	Dwelling Units	2112	1056	1056	157	39	118	211	133	78
Single-Family Attached Housing ²	106	Dwelling Units	763	382	381	51	13	38	60	35	25
<i>2nd Filing</i>											
Single-Family Detached Housing ¹	90	Dwelling Units	849	425	424	63	16	47	85	54	31
Single-Family Attached Housing ²	72	Dwelling Units	518	259	259	35	9	26	41	24	17
Total 1st Filing External Trips			2875	1438	1437	208	52	156	271	168	103
Total 2nd Filing External Trips			1367	684	683	98	25	73	126	78	48
Total Full Buildout External Trips			4242	2122	2120	306	77	229	397	246	151

(1) Single-Family Detached Housing - Land Use 210*

Average Weekday:

Peak Hour of the Adjacent Street, One Hour between 7 and 9 AM:

Peak Hour of the Adjacent Street, One Hour between 4 and 6 PM:

Units = Dwelling Units

Average Rate = 9.43 (50% entering/50% exiting)

Average Rate = 0.70 (25% entering/75% exiting)

Average Rate = 0.94 (63% entering/37% exiting)

(2) Single-Family Attached Housing - Land Use 215*

Average Weekday:

Peak Hour of the Adjacent Street, One Hour between 7 and 9 AM:

Peak Hour of the Adjacent Street, One Hour between 4 and 6 PM:

Units = Dwelling Units

Average Rate = 7.20 (50% entering/50% exiting)

Average Rate = 0.48 (25% entering/75% exiting)

Average Rate = 0.57 (59% entering/41% exiting)

*Trip Generation, 11th Edition, Institute of Transportation Engineers, 2021

The 1st Filing of Trestles Subdivision is projected to generate a total of 2,875 gross average weekday trips with 208 trips (52 entering/156 exiting) generated during the AM peak hour and 271 trips (168 entering/103 exiting) generated during the PM peak hour. 2nd Filing is projected to generate 1,367 gross average weekday trips with 98 trips (25 entering/73 exiting) generated during the AM peak hour and 126 trips (78 entering/48 exiting) generated during the PM peak hour. Full buildout of the Trestles Subdivision is projected to generate a total of 4,242 gross average weekday trips.

Trip generation projections provide an estimate of the total number of trips that would be generated by a proposed development. However, to estimate the net number of new trips made by personal vehicles external to the site, adjustments must often be made to account for internal capture trips, pass-by trips, and trips made by alternate modes.

Internal capture (IC) trips are trips that do not have origins or destinations external to a project site. Since IC trips occur internally, they do not have an impact on external traffic operations. IC trips most often occur in mixed-use developments where residential, commercial, and office-related land uses exhibit a high rate of internal trip exchange and were therefore not calculated for this study.

Pass-by trips are trips that are made as intermediate stops on the way from a point of origin to a primary trip destination. Pass-by trips are attracted from traffic “passing by” on an adjacent street that offers direct access to that site. Pass-by trips are primarily attracted by commercial type land uses such as restaurants, convenience markets, and gas stations, and were also not calculated for this study.

Trips made by alternate modes (walking, biking, transit) are not anticipated to be prevalent for this site due to the lack of bicycle and pedestrian facility connectivity from the subdivision, as well as the distance to downtown Billings and other services. Alternate mode trips were thus considered as negligible for the analysis.

TRIP DISTRIBUTION

Trip distribution is an estimate of site-generated trip routing, which can be determined by methods such as computerized travel demand models, calculation of travel time for various available routes, and/or inspection of existing traffic patterns in the project area. For this study, distribution percentages were reviewed from traffic studies performed for similar area developments, as well as percentages calculated from existing traffic volumes, with consideration given to the location of the development in relation to the greater Billings areas. Figures 5 and 6 on pages 13 and 14 present the trip distribution schemes for the 1st Filing (2029) and Full Buildout (2031) analysis scenarios, respectively.

TRAFFIC ASSIGNMENT

Traffic assignment is the procedure whereby site-generated vehicle trips are assigned to study area streets, intersections, and site access driveways based on the calculated trip distribution and the physical attributes of the development site. Using this approach, site-generated trips for the Trestles Subdivision were assigned to the study area intersections for the purpose of projecting future traffic volumes for analysis. The results of the traffic assignment exercise are also illustrated in Figure 5.

TRAFFIC IMPACTS

Traffic Volumes

Based on information from the Client, construction of Trestles Subdivision 1st Filing is anticipated to occur within approximately four years. Therefore, a future year of 2029 was utilized for calculating traffic projections for 1st Filing of this analysis. Full buildout of Trestles Subdivision is anticipated to occur within six years, so a future year of 2031 was utilized for the full buildout projections. In addition to site-generated trips, background traffic volumes will also likely increase for study area streets and intersections due to general growth and surrounding area developments. To account for that growth, historical MDT traffic data and previous traffic studies in the area were reviewed and it was determined that an annual background growth rate of four percent would be appropriate for modeling ambient growth of this region of Billings.

The 1st Filing (2029) and Full Buildout (2031) traffic projections for the Trestles Subdivision were then calculated by combining existing traffic volumes with anticipated background growth and site-generated traffic assignments. Figures 7 and 8 on pages 15 and 16, respectively, illustrate the resulting AM and PM peak hour 1st Filing (2029) and Full Buildout (2031) traffic volume projections.

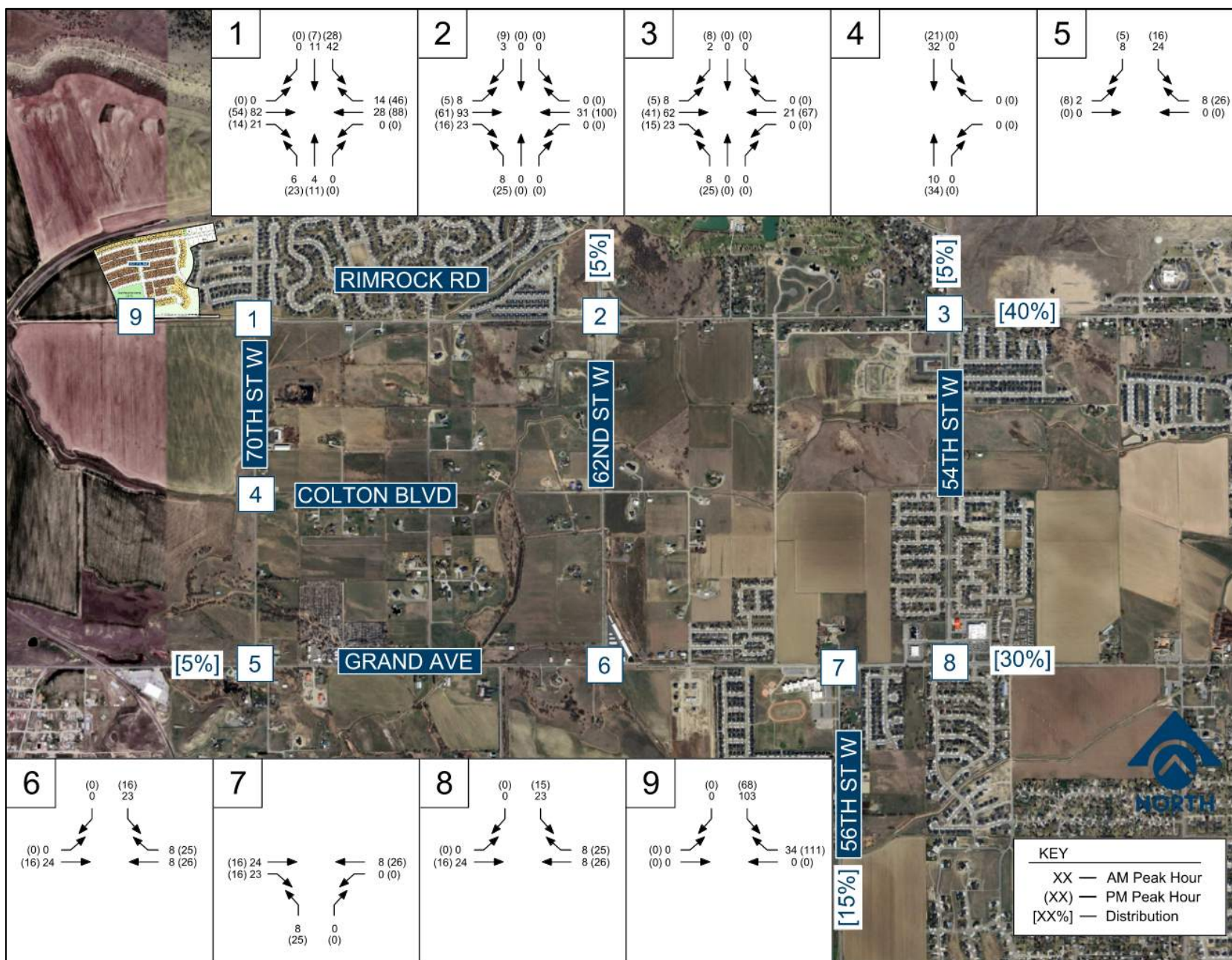


Figure 5: 1st Filing Trip Distribution & Traffic Assignment Summary

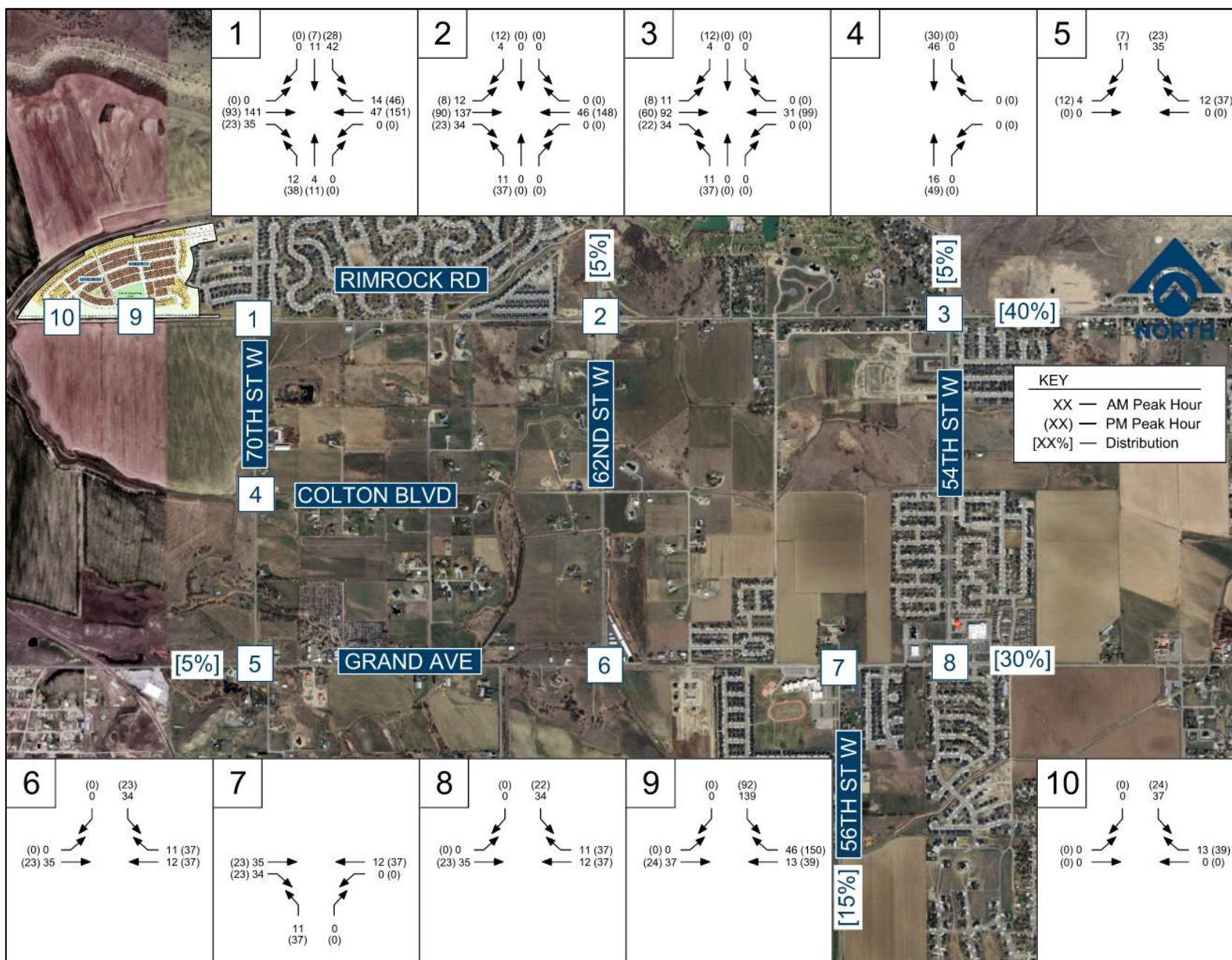


Figure 6: Full Buildout Trip Distribution & Traffic Assignment Summary

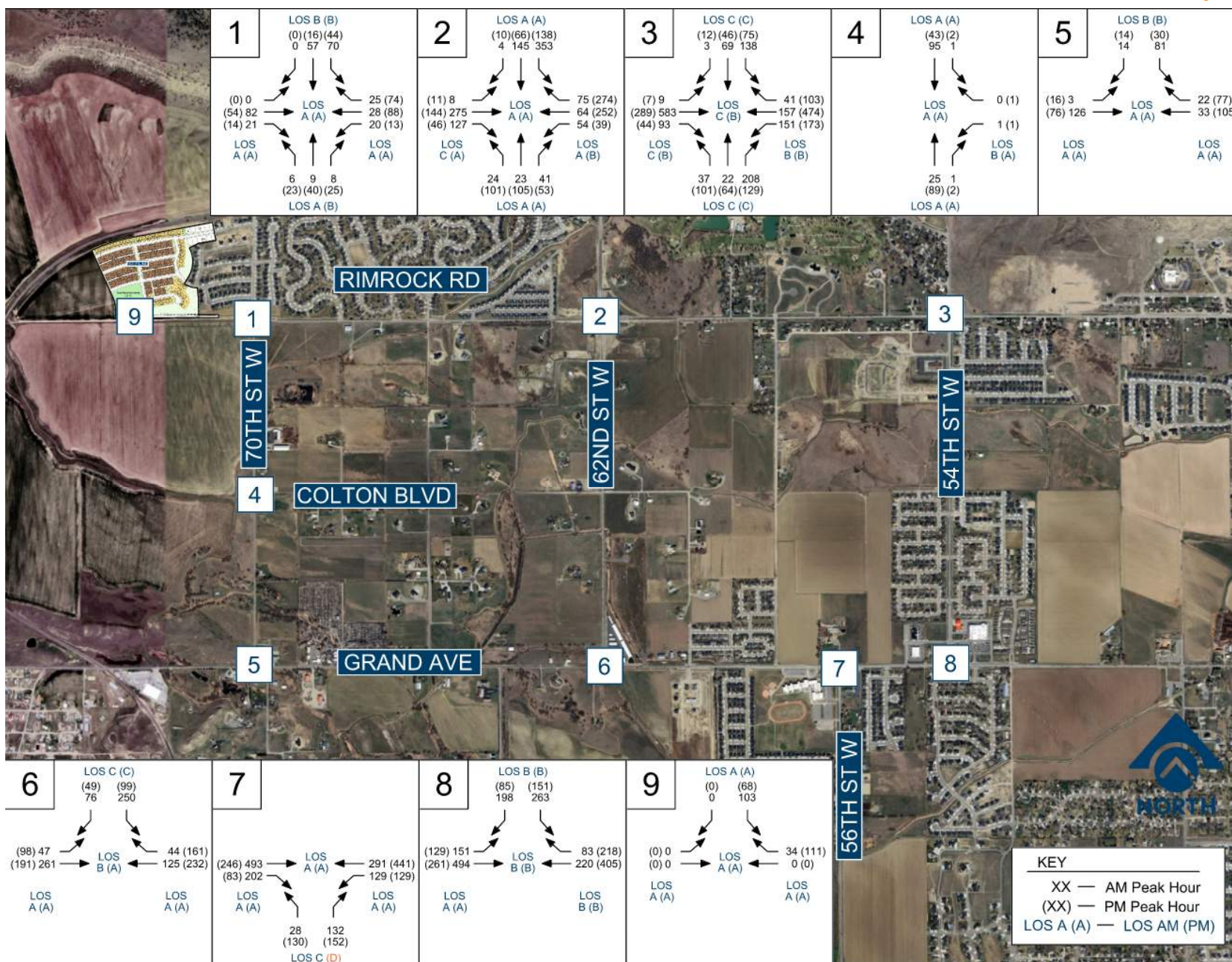


Figure 7: 1st Filing (2029) Traffic Projections

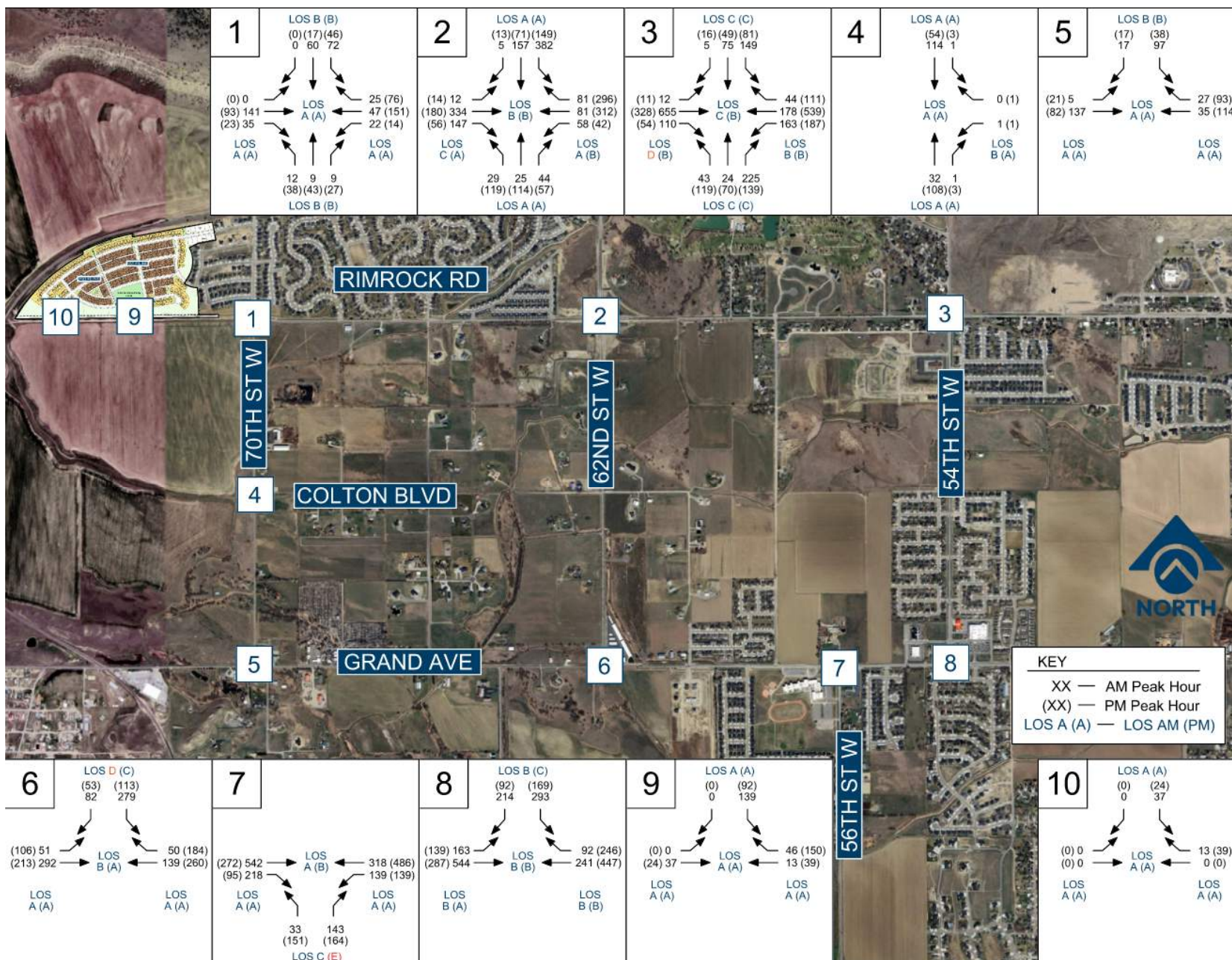


Figure 8: Full Buildout (2031) Traffic Projections

Intersection Capacity

Capacity calculations were performed for the 1st Filing (2029) and Full Buildout (2031) scenarios based on the AM and PM peak hour traffic volume projections presented in Figures 7 and 8. Peak hour factors (PHFs) for the design year were assumed to be 0.92 for all intersections, per HCM guidelines and common industry practice for future scenarios. The assumed values were utilized to not overestimate future congestion in the study area. Figures 7 and 8 show the 1st Filing (2029) and Full Buildout (2031) LOS results at each intersection.

First (1st) Filing (2029) capacity results were similar to Existing Conditions (2025), with all intersections and approaches projected to continue to operate at LOS C or better during both peak hours, except during the PM peak hour in which the northbound approach at the 56th Street West/Grand Avenue intersection is projected to worsen to LOS D. The 95th percentile queueing is projected to remain minimal with some moderate queues at the signalized intersections.

Full Buildout (2031) capacity results show worsening operations from the 1st Filing (2029) scenario at all study area intersections. In addition to the northbound approach at the 56th Street West/Grand Avenue intersection, which is projected to degrade to LOS E during the PM peak hour, one approach at both the 54th Street West/Rimrock Road and 62nd Street West/Grand Avenue intersections is projected to operate at LOS D during the AM peak hour. There is minimal to moderate projected 95th percentile queueing at most study area intersections, with high projected queues up to 22 vehicles on the eastbound approach at the 54th Street West/Rimrock Road intersection during the AM peak hour. Detailed intersection capacity summary tables and capacity calculation worksheets for the 1st Filing (2029) and Full Buildout (2031) traffic projection scenarios can be found in Appendix C.

Mitigation Alternatives

A variety of potential mitigation improvement options were evaluated to address existing concerns and/or projected impacts for study area streets and intersections. The following sections provide details on that analysis.

Auxiliary Turn Lanes

Auxiliary right- and left-turn lane warrants were evaluated based on the methodology outlined in the MDT Traffic Engineering Manual (November 2007) for the Existing Conditions (2025), 1st Filing (2029), and Full Buildout (2031) analysis scenarios at the following intersections:

62nd Street West/Grand Avenue: A westbound right-turn lane and eastbound left-turn lane are warranted based on the Existing Conditions (2025) scenario. These improvements would reduce delay by four seconds on the southbound approach, but the intersection is still projected to operate at LOS D during the AM peak hour for the Full Buildout (2031) scenario. This intersection experienced the highest number of crashes in the study area with a historical rate that is much higher than would be predicted. However, installation of the warranted turn lanes would address only some of the crash types reported. The Billings LRTP recommends installation of a traffic signal or roundabout at this intersection in the future.

56th Street West/Grand Avenue: An eastbound right-turn lane is warranted based on the Existing Conditions (2025) scenario. This lane is projected to have a minimal impact on delay and queuing in the Full Buildout (2031) scenario, with the northbound approach remaining at LOS E in the PM peak hour. The warranted turn lane could address any rear end collisions due to slowing eastbound right-turning vehicles, but no crashes of this type were reported in the five years of reviewed data.

The final decision to install any turn lanes should be made by the City of Billings after evaluation of what impacts they may have to other aspects of the intersections or adjacent intersections. Auxiliary turn lane warrant worksheets for the Existing Conditions (2025), 1st Filing (2029), and Full Buildout (2031) scenarios can be found in Appendix D.

Multi-Way Stop Control

Installation of multi-way stop signs at the 56th Street West/Grand Avenue intersection was considered based on guidance presented in Section 2B.12 of the *Manual on Uniform Traffic Control Devices* (MUTCD) 11th Edition (2023). The MUTCD provides criteria for considering multi-way stop-control based on crash trends, sight distance, minimum entering volumes, and other factors. Multi-way stop-control is also often implemented as an interim measure to control traffic at locations where a traffic signal or roundabout is warranted but has not yet been installed.

No warrants were met or projected to be met for the Existing Conditions (2025), 1st Filing (2029), or Full Buildout (2031) scenarios. The crash history does not meet Warrant A and sight distance appears adequate, so Warrant B is not met. Volumes for both scenarios are insufficient to meet Warrant D, although Warrant D is one hour from being met with Full Buildout (2031) volumes. Warrant E addresses other factors influencing the need for multi-way stop-control such as the need to control left-turn conflicts, improve operations at an intersection of two similar streets, or to support pedestrian/bicycle movements. This warrant is not considered to be met. If pedestrian facilities are installed across Grand Avenue in the future this warrant, as well as other pedestrian-based crossing improvements, should be reevaluated due to the proximity to the Ben Steele Middle School. If multi-way stop-control was installed, capacity is projected to improve to LOS C or better for all approaches in both scenarios. Multi-way stop warrant worksheets for the Existing Conditions (2025), 1st Filing (2029), and Full Buildout (2031) scenarios can be found in Appendix E.

Traffic Signals

Traffic signal warrants were evaluated at the 56th Street West/Grand Avenue intersection using criteria outlined in the MUTCD for the Existing Conditions (2025), 1st Filing (2029), and Full Buildout (2031) analysis scenarios. The MUTCD presents several warrants that can be considered based on traffic volumes, school crossings, crash history, and others.

For the purposes of this analysis, Warrant 9 (Intersection Near a Grade Crossing) was not evaluated because this intersection is not near a railroad crossing. Additionally, satisfaction of the Peak Hour Warrant alone should not be considered as warranting a signal, as it is primarily meant for application at office complexes, manufacturing plants, or other high-occupancy vehicle facilities that attract or discharge large numbers of vehicles over a short time.

It was found that the Four-Hour Vehicular Volume Warrant is met with Existing Conditions (2025), the Peak Hour Warrant is projected to be met in the 1st Filing (2029) scenario, and the Eight-Hour Vehicular Volume Warrant is projected to be met in the Full Buildout (2031) scenario. Warrants 4 and 5 (Pedestrian Volume and School Crossing) are not met for this intersection because there are no pedestrians crossing the major street. The intersection is adjacent to Ben Steele Middle School and there is a high volume of students crossing 56th Street West after school. If crosswalks were installed across Grand Avenue along with a multi-use path or sidewalk along the north side of Grand Avenue, it is possible that a moderate volume of pedestrians would desire to cross Grand Avenue at this intersection. The installation of a traffic signal at this intersection is projected to improve operations to LOS C or better on all approaches for each scenario. Traffic signal warrant worksheets for the Existing Conditions (2025), 1st Filing (2029), and Full Buildout (2031) scenarios can be found in Appendix F. Continued development of the Trails West and Buffalo Crossing Subdivisions south and west of the 56th Street West/Grand Avenue intersection is likely to influence the need for a traffic signal at this intersection and warrants should be evaluated as construction progresses. The Billings LRTP recommends installation of a traffic signal or roundabout at this intersection at some time in the future.

Improved Intersection Capacity

54th Street West/Rimrock Road: Adjusting the signal timing to allocate more green time for the eastbound and westbound thru movements is projected to improve intersection operations to LOS C or better during both peak hours for the Full Buildout (2031) scenario.

62nd Street West/Grand Avenue: Installation of the warranted westbound right-turn lane and eastbound left-turn lane is expected to reduce delay on the southbound approach by approximately four seconds during both peak periods of the Full Buildout (2031) scenario. However, the intersection is still projected to operate at LOS D during the AM peak hour. Installation of separate southbound left- and right-turn lanes was found to improve Full Buildout (2031) operations to LOS C or better for both peak hours.

56th Street West/Grand Avenue: It was found that the installation of the warranted eastbound right-turn lane is projected to reduce delay on the northbound approach by three and eight seconds during the PM peak hour of the 1st Filing (2029) and Full Buildout (2031) scenarios, respectively. Despite this improvement, the intersection is expected to continue operating at substandard operations during the PM peak hour for both scenarios. The implementation of all-way stop-control at this intersection was evaluated but found to degrade operations during both peak periods and volume scenarios. The installation of a single-lane roundabout or the signalization of the intersection is projected to significantly improve performance, achieving LOS B or better during both AM and PM peak hours for both 1st Filing (2029) and Full Buildout (2031).

Detailed intersection capacity summary tables and capacity calculation worksheets for the 1st Filing (2029) and Full Buildout (2031) traffic projection scenarios with improvements can be found in Appendix G.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

The preceding analysis has shown that construction of the Trestles Subdivision will generate a substantial volume of new traffic demand for area streets and intersections. Through the planned development, it is estimated that approximately 2,875 gross new vehicle trips could be generated daily after the construction of 1st Filing and 1,367 additional new daily trips could be generated after the construction of 2nd Filing. In total, 4,242 daily trips are projected upon full buildout. Due to its longer and straight design that provides external access, traffic calming measures should be considered along Bronze Boulevard to reduce vehicle speeds.

An evaluation of Existing Conditions (2025) intersection capacity showed that all intersections and approaches currently operate at LOS C or better during both peak hours. Queues are generally minimal at all study area intersection approaches.

A crash history analysis showed that fixed object, rear end, and right-angle crashes were the most common collision types in the study area. Historical crash rates were higher than predicted at nearly every study intersection, but a factor of up to four times at the 70th Street West/Grand Avenue intersection. Two fatal crashes were reported in the study area: one at the 54th Street West/Grand Avenue intersection which was a fixed object collision, and one at the 54th Street West/Rimrock Road intersection which was a left-turn/opposite-direction collision. It is recommended that lower speed limits be considered in the study area to improve safety and reduce required stopping distances. Although the Rimrock Road speed limit was reduced in 2023, a further reduction may be considered, particularly west of 62nd Street West due to development and access density and the desired classification of the roadway. Installation of intersection and corridor lighting may also improve safety in the study area.

First (1st) Filing (2029) intersection capacity results showed that all intersections are projected to continue to operate at LOS C or better with the exception of the 56th Street West/Grand Avenue intersection which is expected to degrade to LOS D on the northbound approach during the PM peak hour. Full Buildout (2031) intersection capacity results were similar to 1st Filing (2029) capacity results, with a few exceptions. At the 54th Street West/Rimrock Road and 62nd Street West/Grand Avenue intersections, one approach at each location is projected to operate at LOS D during the AM peak hour, and the northbound approach of the 56th Street West/Grand Avenue intersection is projected to worsen to LOS E during the PM peak hour.

Auxiliary turn lane warrants were evaluated based on the application of MDT Traffic Engineering Manual criteria. An eastbound right-turn lane was found to be warranted at the 56th Street West/Grand Avenue intersection and a westbound right-turn lane and eastbound left-turn lane were found to be warranted at the 62nd Street West/Grand Avenue intersection with Existing Conditions (2025) volumes.

Multi-way stop and traffic signal warrants were evaluated at the 56th Street West/Grand Avenue intersection for the Existing Conditions (2025), 1st Filing (2029), and Full Buildout (2031) scenarios. The multi-way stop warrant is not considered warranted for any scenarios. A traffic signal is considered warranted based on the Existing Conditions (2025) scenario.

Recommendations

The following list of recommendations is based on the analysis results from this study and the professional judgment of the author:

- A stop (R1-1) sign should be installed on the southbound approach at the new site access intersection with Rimrock Road.
- Installation of traffic calming measures such as curb bulb-outs, lane narrowing, chicanes, and/or speed humps should be considered along Bronze Boulevard to keep vehicle speeds low through the neighborhood.
- Installation of an eastbound right-turn lane at the 56th Street West/Grand Avenue intersection could be considered at this intersection based on Existing Conditions (2025) traffic volume data. However, this turn lane alone is not projected to improve capacity above LOS E in the Full Buildout (2031) scenario and existing crash trends may not support the need for this lane. A traffic signal is warranted based on the Existing Conditions (2025) scenario and should be considered for installation.
- Installation of a westbound right-turn lane and an eastbound left-turn lane should be considered at the 62nd Street West/Grand Avenue intersection based on MDT warrants and Existing Conditions (2025) volumes. Installation of separate southbound left-turn and right-turn lanes could also be considered to improve capacity operations above LOS D in the Full Buildout (2031) scenario if desired by the City of Billings.
- Signal timing plans at the 54th Street West/Rimrock Road intersection should be updated as the development of the Trestles Subdivision and general growth in west Billings continues.
- The implementation of reduced speed limits and other measures to reduce vehicle speeds should be considered in the study area as development density continues to increase. Specifically, consideration should be given to reducing the speed limit on Rimrock Road west of 62nd Street West, where the development density is much higher than the area east of 62nd Street West. Additionally, Rimrock Road is classified as a collector west of 62nd Street West, in contrast to the principal arterial classification east of 62nd Street West. Reduced speeds improve safety by allowing for smaller stopping distances and lessened crash severities. Installation of intersection and corridor lighting should also be considered to improve safety and visibility at night. Fixed objects or other hazards near intersections should be relocated where possible. These recommendations are based on a general review of crash trends as well as other study area characteristics.

Any proposed improvements should be coordinated with LRTP and MDT area projects and all transportation-related improvements shall be designed in accordance with City of Billings and/or MDT standards (where applicable) and the *Manual on Uniform Traffic Control Devices (MUTCD)*.

FINANCIAL CONTRIBUTION CALCULATIONS

The City of Billings calculates financial contributions toward improvement costs at impacted intersections based on the developer's contribution of entering traffic to the total entering volume at failing capacity for the intersection. The proposed contributions for this study were calculated based on the sum of critical lane volumes generated by both 1st Filing and 2nd Filing for this development compared to the capacity thresholds specified by the City. This development's portion of the critical volumes for impacted intersections are as follows for 1st Filing / 2nd Filing, respectively:

- 70th Street West & Rimrock Road – 10.67 percent / 6.50 percent
- 62nd Street West & Rimrock Road – 10.83 percent / 5.25 percent
- 54th Street West & Rimrock Road – 8.08 percent / 3.92 percent
- 70th Street West & Colton Boulevard – 2.98 percent / 1.32 percent
- 70th Street West & Grand Avenue – 2.28 percent / 1.14 percent
- 62nd Street West & Grand Avenue – 4.12 percent / 1.93 percent
- 56th Street West & Grand Avenue – 4.47 percent / 2.02 percent
- 54th Street West & Grand Avenue – 4.12 percent / 1.93 percent

The conversion of these percentages into dollar figures should be calculated based on the current City of Billings intersection cost participation value, which is \$450,000.00 as of July 1, 2024. The final contribution amount will be determined by the City. Detailed financial contribution calculation worksheets are included in Appendix G.

TRAFFIC VOLUME DATA

APPENDIX A

Intelligent Infrastructure.
Enduring Communities.



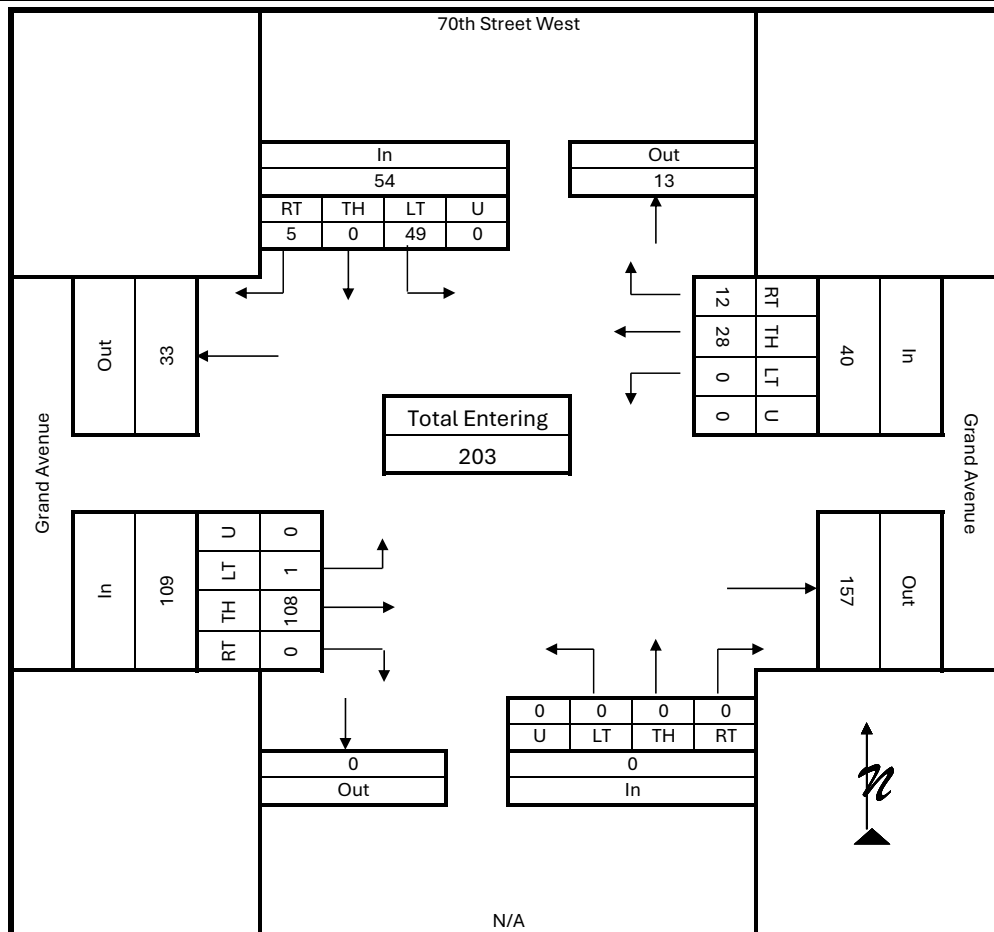
INTERSECTION TURNING MOVEMENT COUNT SUMMARY

General Information

Counted By:	Connor Scoles	Intersection:	70th Street West and Grand Avenue
Agency/Company:	Sanbell	Jurisdiction:	Billings, MT /MDT
Date Performed:	Tuesday, January 7, 2025	Project Description:	The Trestles Subdivision
Count Time Period:	AM Peak Hour (7:15 - 8:15 AM)	East/West Street:	Grand Avenue
Project Number:	21266.04		
North/South Street:	70th Street West		

Vehicle Volumes and Adjustments

	70th Street West Southbound					N/A Northbound					Grand Avenue Eastbound					Grand Avenue Westbound					Int. Total
Start Time	Right	Thru	Left	U-turn	Total	Right	Thru	Left	U-turn	Total	Right	Thru	Left	U-turn	Total	Right	Thru	Left	U-turn	Total	
Factor	1.07	1.07	1.07	1.07		1.07	1.07	1.07	1.07		1.07	1.07	1.07	1.07		1.07	1.07	1.07	1.07		
7:15 AM	2	0	13	0	15	0	0	0	0	0	0	32	0	0	32	0	4	0	0	4	51
7:30 AM	3	0	17	0	20	0	0	0	0	0	0	26	1	0	27	2	5	0	0	7	54
7:45 AM	0	0	16	0	16	0	0	0	0	0	0	35	0	0	35	3	5	0	0	8	59
8:00 AM	0	0	3	0	3	0	0	0	0	0	0	15	0	0	15	7	14	0	0	21	39
Grand Total	5	0	49	0	54	0	0	0	0	0	0	108	1	0	109	12	28	0	0	40	203
Medium Truck %	0.0	0.0	4.1	0.0	3.7	0.0	0.0	0.0	0.0	0.0	0.0	0.9	0.0	0.0	0.9	8.3	3.6	0.0	0.0	5.0	
Heavy Truck %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Truck %	0.0	0.0	4.1	0.0	3.7	0.0	0.0	0.0	0.0	0.0	0.0	0.9	0.0	0.0	0.9	8.3	3.6	0.0	0.0	5.0	
Total %	2.5	0.0	24.1	0.0	26.6	0.0	0.0	0.0	0.0	0.0	0.0	53.2	0.5	0.0	53.7	5.9	13.8	0.0	0.0	19.7	100.0
PHF	0.85	0.85	0.85			1.00	1.00	1.00			0.77	0.77	0.77			1.00	1.00	1.00			0.86



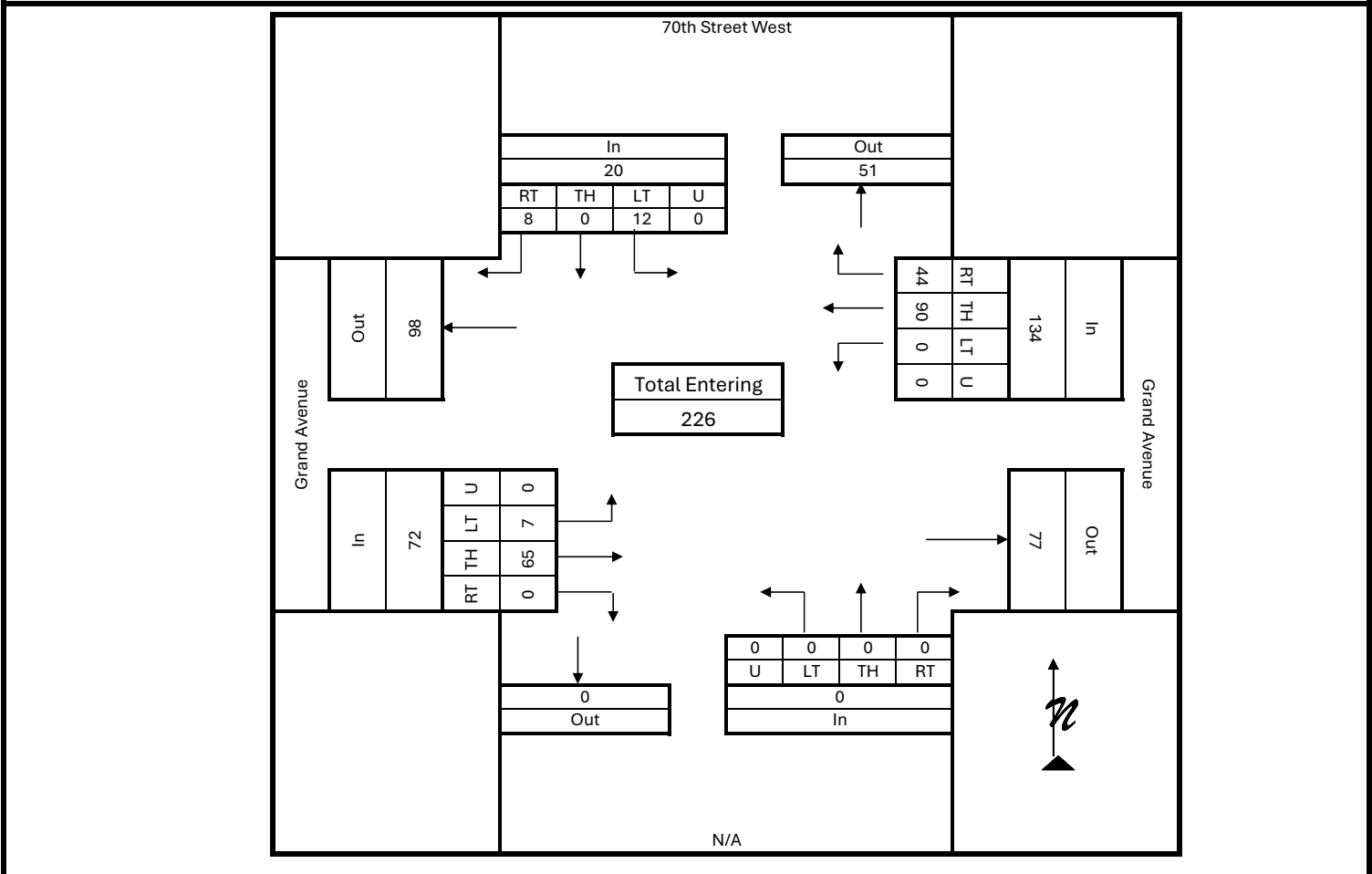
INTERSECTION TURNING MOVEMENT COUNT SUMMARY

General Information

Counted By:	Connor Scales	Intersection:	70th Street West and Grand Avenue
Agency/Company:	Sanbell	Jurisdiction:	Billings, MT /MDT
Date Performed:	Tuesday, January 7, 2025		
Count Time Period:	PM Peak Hour (4:30 - 5:30 PM)		
Project Number:	21266.04	Project Description:	The Trestles Subdivision
North/South Street:	70th Street West	East/West Street:	Grand Avenue

Vehicle Volumes and Adjustments

	70th Street West Southbound					N/A Northbound					Grand Avenue Eastbound					Grand Avenue Westbound					Int. Total
Start Time	Right	Thru	Left	U-turn	Total	Right	Thru	Left	U-turn	Total	Right	Thru	Left	U-turn	Total	Right	Thru	Left	U-turn	Total	
Factor	1.07	1.07	1.07	1.07		1.07	1.07	1.07	1.07		1.07	1.07	1.07	1.07		1.07	1.07	1.07	1.07		
4:30 PM	4	0	1	0	5	0	0	0	0	0	0	16	3	0	19	12	27	0	0	39	63
4:45 PM	1	0	4	0	5	0	0	0	0	0	0	20	3	0	23	9	19	0	0	28	56
5:00 PM	0	0	5	0	5	0	0	0	0	0	0	15	0	0	15	12	19	0	0	31	51
5:15 PM	3	0	2	0	5	0	0	0	0	0	0	14	1	0	15	11	25	0	0	36	56
Grand Total	8	0	12	0	20	0	0	0	0	0	0	65	7	0	72	44	90	0	0	134	226
Medium Truck %	12.5	0.0	0.0	0.0	5.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5	0.0	0.0	1.4	0.0	1.1	0.0	0.0	0.7	
Heavy Truck %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5	0.0	0.0	1.4	0.0	0.0	0.0	0.0	0.0	
Total Truck %	12.5	0.0	0.0	0.0	5.0	0.0	0.0	0.0	0.0	0.0	0.0	3.1	0.0	0.0	2.8	0.0	1.1	0.0	0.0	0.7	
Total %	3.5	0.0	5.3	0.0	8.8	0.0	0.0	0.0	0.0	0.0	0.0	28.8	3.1	0.0	31.9	19.5	39.8	0.0	0.0	59.3	100.0
PHF	1.00	1.00	1.00			1.00	1.00	1.00			0.94	0.94	0.94			0.86	0.86	0.86			0.90



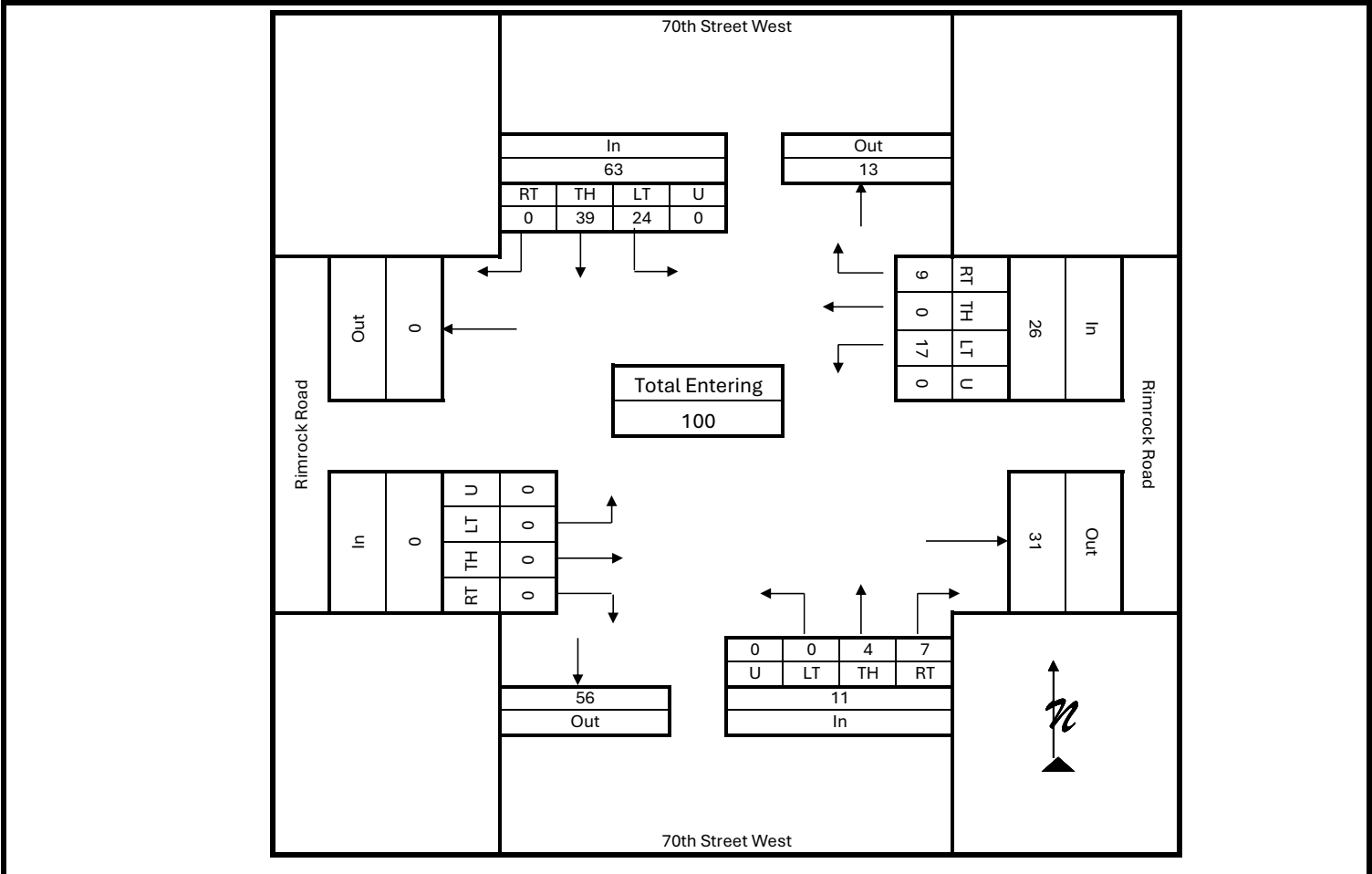
INTERSECTION TURNING MOVEMENT COUNT SUMMARY

General Information

Counted By:	Connor Scoles	Intersection:	70th Street West and Rimrock Road
Agency/Company:	Sanbell	Jurisdiction:	Billings, MT /MDT
Date Performed:	Tuesday, January 7, 2025	Project Description:	The Trestles Subdivision
Count Time Period:	AM Peak Hour (7:15 - 8:15 AM)	East/West Street:	Rimrock Road
Project Number:	21266.04		
North/South Street:	70th Street West		

Vehicle Volumes and Adjustments

	70th Street West Southbound					70th Street West Northbound					Rimrock Road Eastbound					Rimrock Road Westbound					Int. Total
Start Time	Right	Thru	Left	U-turn	Total	Right	Thru	Left	U-turn	Total	Right	Thru	Left	U-turn	Total	Right	Thru	Left	U-turn	Total	
Factor	1.07	1.07	1.07	1.07		1.07	1.07	1.07	1.07		1.07	1.07	1.07	1.07		1.07	1.07	1.07	1.07		
7:15 AM	0	14	10	0	24	0	0	0	0	0	0	0	0	0	0	2	0	7	0	9	33
7:30 AM	0	9	3	0	12	2	0	0	0	2	0	0	0	0	0	3	0	6	0	9	23
7:45 AM	0	12	7	0	19	1	1	0	0	2	0	0	0	0	0	1	0	1	0	2	23
8:00 AM	0	4	4	0	8	4	3	0	0	7	0	0	0	0	0	3	0	3	0	6	21
Grand Total	0	39	24	0	63	7	4	0	0	11	0	0	0	0	0	9	0	17	0	26	100
Medium Truck %	0.0	2.6	0.0	0.0	1.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	22.2	0.0	5.9	0.0	11.5	
Heavy Truck %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Truck %	0.0	2.6	0.0	0.0	1.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	22.2	0.0	5.9	0.0	11.5	
Total %	0.0	39.0	24.0	0.0	63.0	7.0	4.0	0.0	0.0	11.0	0.0	0.0	0.0	0.0	0.0	9.0	0.0	17.0	0.0	26.0	100.0
PHF	0.67	0.67	0.67			1.00	1.00	1.00			1.00	1.00	1.00			0.72	0.72	0.72			0.77



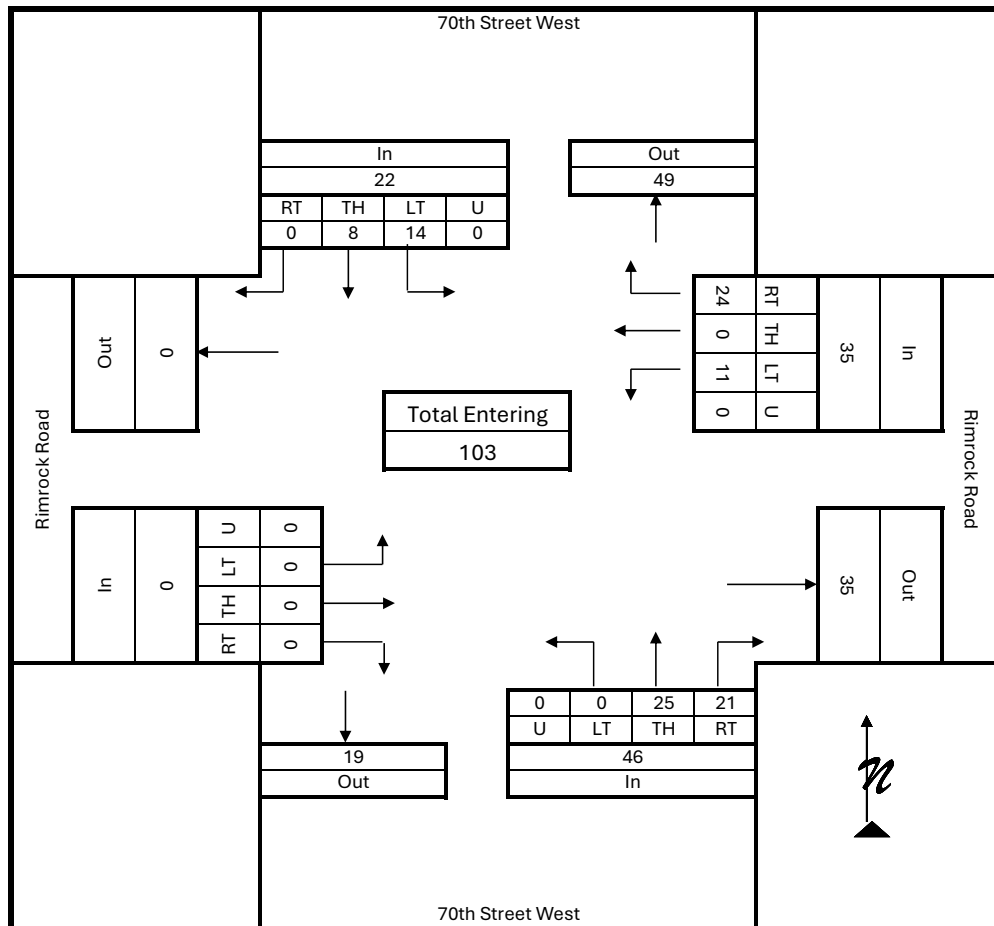
INTERSECTION TURNING MOVEMENT COUNT SUMMARY

General Information

Counted By:	Connor Scales	Intersection:	70th Street West and Rimrock Road
Agency/Company:	Sanbell	Jurisdiction:	Billings, MT /MDT
Date Performed:	Tuesday, January 7, 2025		
Count Time Period:	PM Peak Hour (4:30 - 5:30 PM)		
Project Number:	21266.04	Project Description:	The Trestles Subdivision
North/South Street:	70th Street West	East/West Street:	Rimrock Road

Vehicle Volumes and Adjustments

	70th Street West Southbound					70th Street West Northbound					Rimrock Road Eastbound					Rimrock Road Westbound					Int. Total
Start Time	Right	Thru	Left	U-turn	Total	Right	Thru	Left	U-turn	Total	Right	Thru	Left	U-turn	Total	Right	Thru	Left	U-turn	Total	
Factor	1.07	1.07	1.07	1.07		1.07	1.07	1.07	1.07		1.07	1.07	1.07	1.07		1.07	1.07	1.07	1.07		
4:30 PM	0	0	5	0	5	6	10	0	0	16	0	0	0	0	0	7	0	4	0	11	32
4:45 PM	0	3	1	0	4	4	7	0	0	11	0	0	0	0	0	3	0	3	0	6	21
5:00 PM	0	5	3	0	8	5	5	0	0	10	0	0	0	0	0	5	0	1	0	6	24
5:15 PM	0	0	5	0	5	6	3	0	0	9	0	0	0	0	0	9	0	3	0	12	26
Grand Total	0	8	14	0	22	21	25	0	0	46	0	0	0	0	0	24	0	11	0	35	103
Medium Truck %	0.0	12.5	0.0	0.0	4.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Heavy Truck %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Truck %	0.0	12.5	0.0	0.0	4.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total %	0.0	7.8	13.6	0.0	21.4	20.4	24.3	0.0	0.0	44.7	0.0	0.0	0.0	0.0	0.0	23.3	0.0	10.7	0.0	34.0	100.0
PHF	1.00	1.00	1.00			0.75	0.75	0.75			1.00	1.00	1.00			0.77	0.77	0.77			0.81



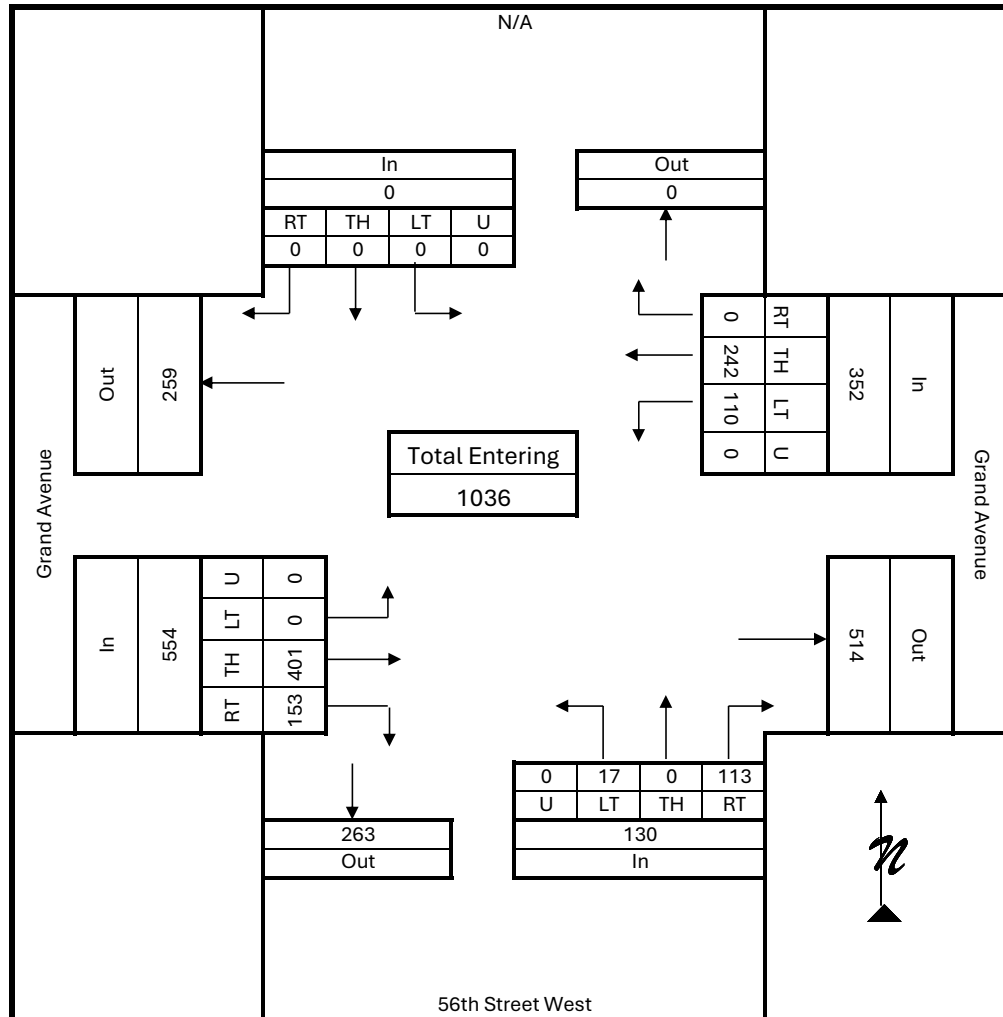
INTERSECTION TURNING MOVEMENT COUNT SUMMARY

General Information

Counted By:	Connor Scales	Intersection:	Grand Avenue and 56th Street West
Agency/Company:	Sanbell	Jurisdiction:	Billings, MT /MDT
Date Performed:	Tuesday, January 7, 2025		
Count Time Period:	AM Peak Hour (7:15 - 8:15 AM)		
Project Number:	21266.04	Project Description:	The Trestles Subdivision
North/South Street:	56th Street West	East/West Street:	Grand Avenue

Vehicle Volumes and Adjustments

	N/A Southbound					56th Street West Northbound					Grand Avenue Eastbound					Grand Avenue Westbound					Int. Total
Start Time	Right	Thru	Left	U-turn	Total	Right	Thru	Left	U-turn	Total	Right	Thru	Left	U-turn	Total	Right	Thru	Left	U-turn	Total	
Factor	1.07	1.07	1.07	1.07		1.07	1.07	1.07	1.07		1.07	1.07	1.07	1.07		1.07	1.07	1.07	1.07		
7:15 AM	0	0	0	0	0	15	0	3	0	18	22	61	0	0	83	0	30	17	0	47	148
7:30 AM	0	0	0	0	0	27	0	2	0	29	35	95	0	0	130	0	43	30	0	73	232
7:45 AM	0	0	0	0	0	45	0	9	0	54	48	124	0	0	172	0	113	37	0	150	376
8:00 AM	0	0	0	0	0	26	0	3	0	29	48	121	0	0	169	0	56	26	0	82	280
Grand Total	0	0	0	0	0	113	0	17	0	130	153	401	0	0	554	0	242	110	0	352	1036
Medium Truck %	0.0	0.0	0.0	0.0	0.0	6.2	0.0	5.9	0.0	6.2	2.6	0.7	0.0	0.0	1.3	0.0	2.1	3.6	0.0	2.6	
Heavy Truck %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Truck %	0.0	0.0	0.0	0.0	0.0	6.2	0.0	5.9	0.0	6.2	2.6	0.7	0.0	0.0	1.3	0.0	2.1	3.6	0.0	2.6	
Total %	0.0	0.0	0.0	0.0	0.0	10.9	0.0	1.6	0.0	12.5	14.8	38.7	0.0	0.0	53.5	0.0	23.4	10.6	0.0	34.0	100.0
PHF	1.00	1.00	1.00			0.61	0.61	0.61			0.81	0.81	0.81			0.58	0.58	0.58			0.69



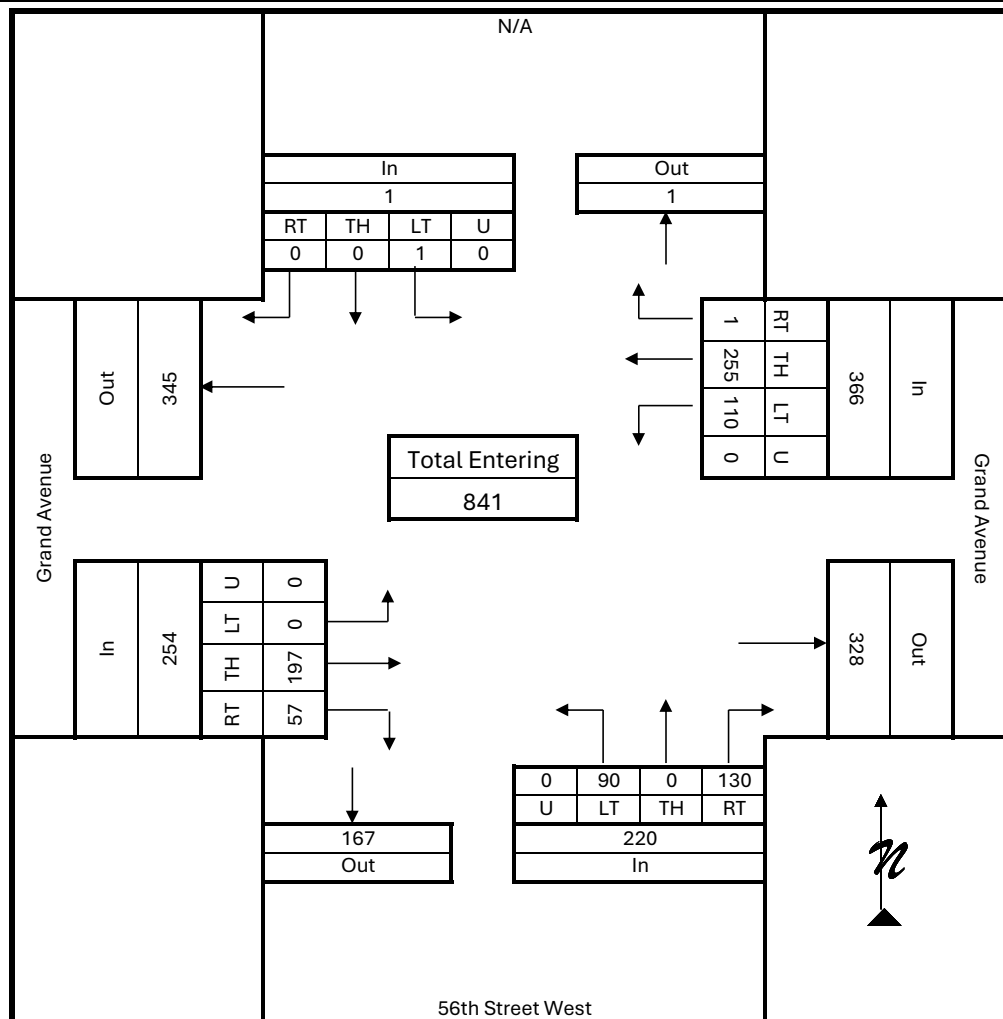
INTERSECTION TURNING MOVEMENT COUNT SUMMARY

General Information

Counted By:	Connor Scoles	Intersection:	Grand Avenue and 56th Street West
Agency/Company:	Sanbell		
Date Performed:	Tuesday, January 7, 2025	Jurisdiction:	Billings, MT /MDT
Count Time Period:	PM Peak Hour (4:30 - 5:30 PM)		
Project Number:	21266.04	Project Description:	The Trestles Subdivision
North/South Street:	56th Street West	East/West Street:	Grand Avenue

Vehicle Volumes and Adjustments

	N/A Southbound					56th Street West Northbound					Grand Avenue Eastbound					Grand Avenue Westbound					Int.
Start Time	Right	Thru	Left	U-turn	Total	Right	Thru	Left	U-turn	Total	Right	Thru	Left	U-turn	Total	Right	Thru	Left	U-turn	Total	Total
Factor	1.07	1.07	1.07	1.07		1.07	1.07	1.07	1.07		1.07	1.07	1.07	1.07		1.07	1.07	1.07	1.07		
4:30 PM	0	0	0	0	0	29	0	19	0	48	17	66	0	0	83	0	55	26	0	81	212
4:45 PM	0	0	0	0	0	43	0	24	0	67	15	52	0	0	67	0	68	25	0	93	227
5:00 PM	0	0	0	0	0	25	0	19	0	44	13	46	0	0	59	1	62	33	0	96	199
5:15 PM	0	0	1	0	1	33	0	28	0	61	12	33	0	0	45	0	70	26	0	96	203
Grand Total	0	0	1	0	1	130	0	90	0	220	57	197	0	0	254	1	255	110	0	366	841
Medium Truck %	0.0	0.0	0.0	0.0	0.0	0.8	0.0	0.0	0.0	0.5	1.8	0.5	0.0	0.0	0.8	0.0	1.6	0.0	0.0	1.1	
Heavy Truck %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Truck %	0.0	0.0	0.0	0.0	0.0	0.8	0.0	0.0	0.0	0.5	1.8	0.5	0.0	0.0	0.8	0.0	1.6	0.0	0.0	1.1	
Total %	0.0	0.0	0.1	0.0	0.1	15.5	0.0	10.7	0.0	26.2	6.8	23.4	0.0	0.0	30.2	0.1	30.3	13.1	0.0	43.5	100.0
PHF	1.00	1.00	1.00			0.83	0.83	0.83			0.94	0.94	0.94			0.98	0.98	0.98			0.93



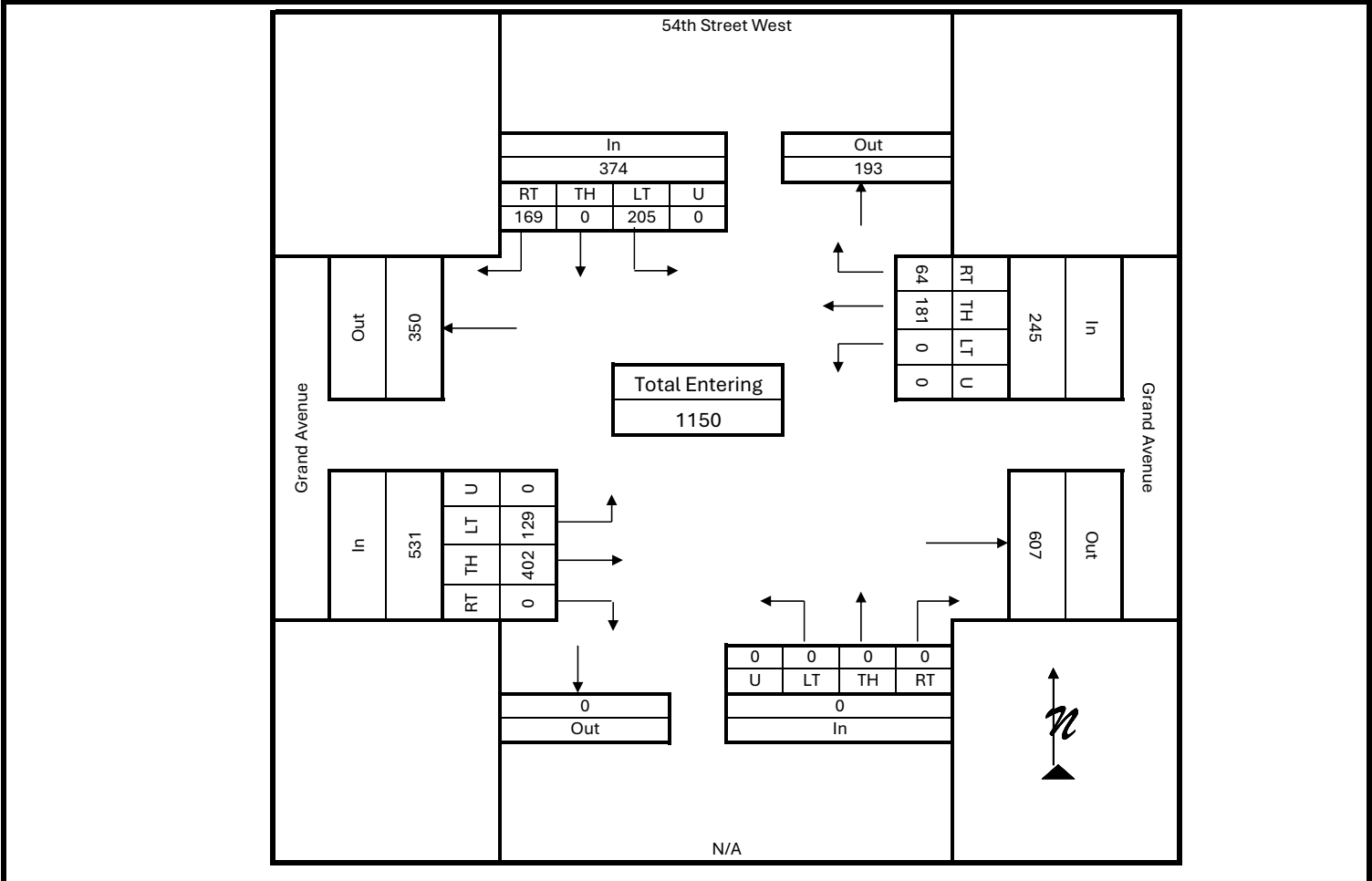
INTERSECTION TURNING MOVEMENT COUNT SUMMARY

General Information

Counted By:	Connor Scoles	Intersection:	54th Street West and Grand Avenue
Agency/Company:	Sanbell	Jurisdiction:	Billings, MT /MDT
Date Performed:	Tuesday, January 7, 2025	Project Description:	The Trestles Subdivision
Count Time Period:	AM Peak Hour (7:15 - 8:15 AM)	East/West Street:	Grand Avenue
Project Number:	21266.04		
North/South Street:	54th Street West		

Vehicle Volumes and Adjustments

	54th Street West Southbound					N/A Northbound					Grand Avenue Eastbound					Grand Avenue Westbound					Int. Total
Start Time	Right	Thru	Left	U-turn	Total	Right	Thru	Left	U-turn	Total	Right	Thru	Left	U-turn	Total	Right	Thru	Left	U-turn	Total	Total
Factor	1.07	1.07	1.07	1.07		1.07	1.07	1.07	1.07		1.07	1.07	1.07	1.07		1.07	1.07	1.07	1.07		
7:15 AM	19	0	32	0	51	0	0	0	0	0	0	62	14	0	76	7	27	0	0	34	161
7:30 AM	42	0	63	0	105	0	0	0	0	0	0	106	14	0	120	10	42	0	0	52	277
7:45 AM	81	0	63	0	144	0	0	0	0	0	0	129	50	0	179	25	66	0	0	91	414
8:00 AM	27	0	47	0	74	0	0	0	0	0	0	105	51	0	156	22	46	0	0	68	298
Grand Total	169	0	205	0	374	0	0	0	0	0	0	402	129	0	531	64	181	0	0	245	1150
Medium Truck %	0.6	0.0	1.0	0.0	0.8	0.0	0.0	0.0	0.0	0.0	0.0	1.7	2.3	0.0	1.9	3.1	4.4	0.0	0.0	4.1	
Heavy Truck %	0.0	0.0	0.5	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.0	0.2	0.0	0.0	0.0	0.0	0.0	
Total Truck %	0.6	0.0	1.5	0.0	1.1	0.0	0.0	0.0	0.0	0.0	0.0	1.7	3.1	0.0	2.1	3.1	4.4	0.0	0.0	4.1	
Total %	14.7	0.0	17.8	0.0	32.5	0.0	0.0	0.0	0.0	0.0	0.0	35.0	11.2	0.0	46.2	5.6	15.7	0.0	0.0	21.3	100.0
PHF	0.65	0.65	0.65			1.00	1.00	1.00			0.74	0.74	0.74			0.67	0.67	0.67			0.69



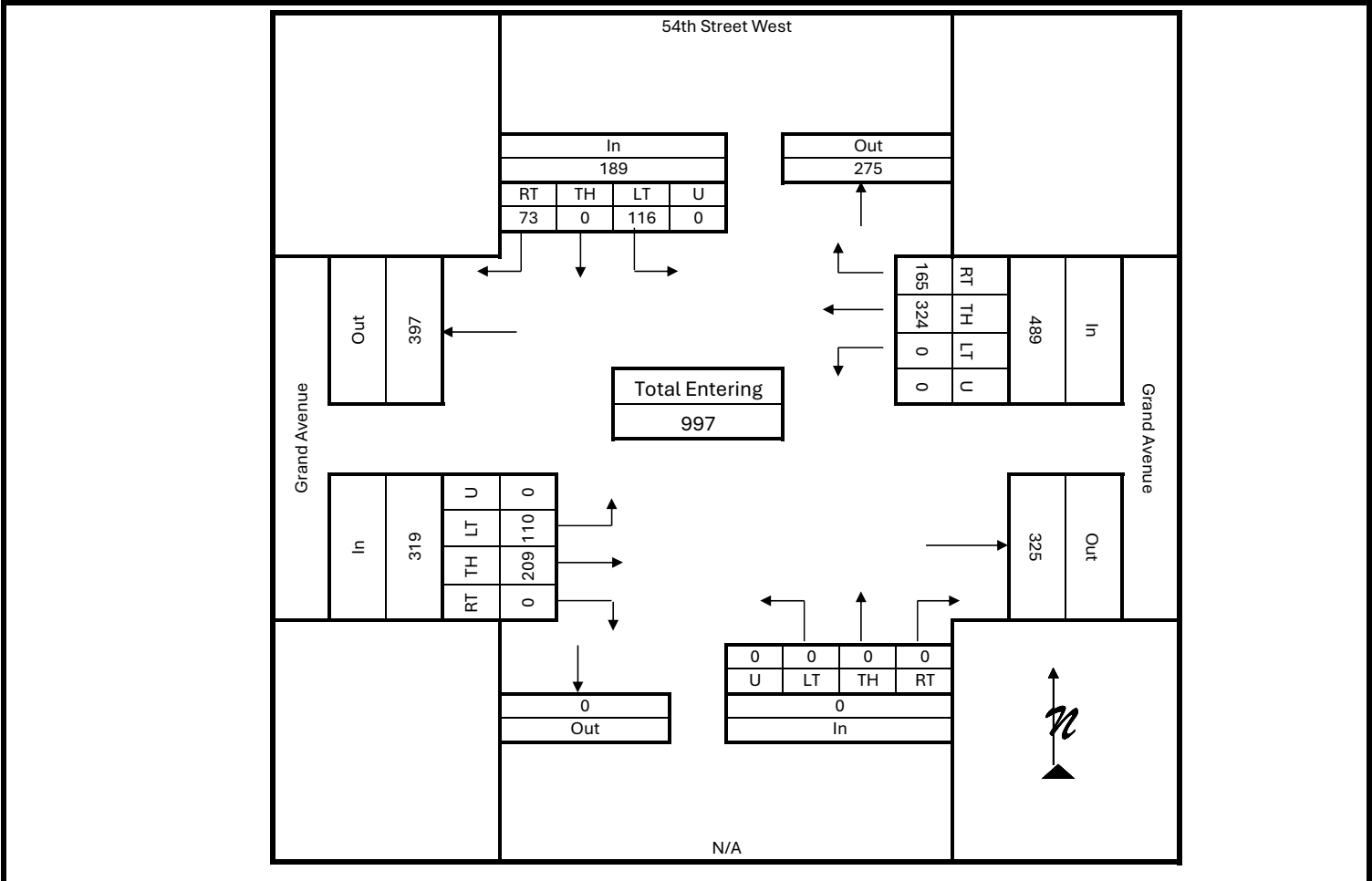
INTERSECTION TURNING MOVEMENT COUNT SUMMARY

General Information

Counted By:	Connor Scoles	Intersection:	54th Street West and Grand Avenue
Agency/Company:	Sanbell	Jurisdiction:	Billings, MT /MDT
Date Performed:	Tuesday, January 7, 2025	Project Description:	The Trestles Subdivision
Count Time Period:	PM Peak Hour (4:30 - 5:30 PM)	East/West Street:	Grand Avenue
Project Number:	21266.04		
North/South Street:	54th Street West		

Vehicle Volumes and Adjustments

	54th Street West Southbound					N/A Northbound					Grand Avenue Eastbound					Grand Avenue Westbound					Int. Total
Start Time	Right	Thru	Left	U-turn	Total	Right	Thru	Left	U-turn	Total	Right	Thru	Left	U-turn	Total	Right	Thru	Left	U-turn	Total	Total
Factor	1.07	1.07	1.07	1.07		1.07	1.07	1.07	1.07		1.07	1.07	1.07	1.07		1.07	1.07	1.07	1.07		
4:30 PM	19	0	24	0	43	0	0	0	0	0	0	55	39	0	94	32	71	0	0	103	240
4:45 PM	19	0	34	0	53	0	0	0	0	0	0	57	32	0	89	39	83	0	0	122	264
5:00 PM	16	0	27	0	43	0	0	0	0	0	0	56	15	0	71	49	87	0	0	136	250
5:15 PM	19	0	31	0	50	0	0	0	0	0	0	41	24	0	65	45	83	0	0	128	243
Grand Total	73	0	116	0	189	0	0	0	0	0	0	209	110	0	319	165	324	0	0	489	997
Medium Truck %	1.4	0.0	0.9	0.0	1.1	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.6	0.0	0.9	0.0	0.0	0.6	
Heavy Truck %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Truck %	1.4	0.0	0.9	0.0	1.1	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.6	0.0	0.9	0.0	0.0	0.6	
Total %	7.3	0.0	11.6	0.0	19.0	0.0	0.0	0.0	0.0	0.0	0.0	21.0	11.0	0.0	32.0	16.5	32.5	0.0	0.0	49.0	100.0
PHF	0.89	0.89	0.89			1.00	1.00	1.00			0.89	0.89	0.89			1.00	1.00	1.00			0.94



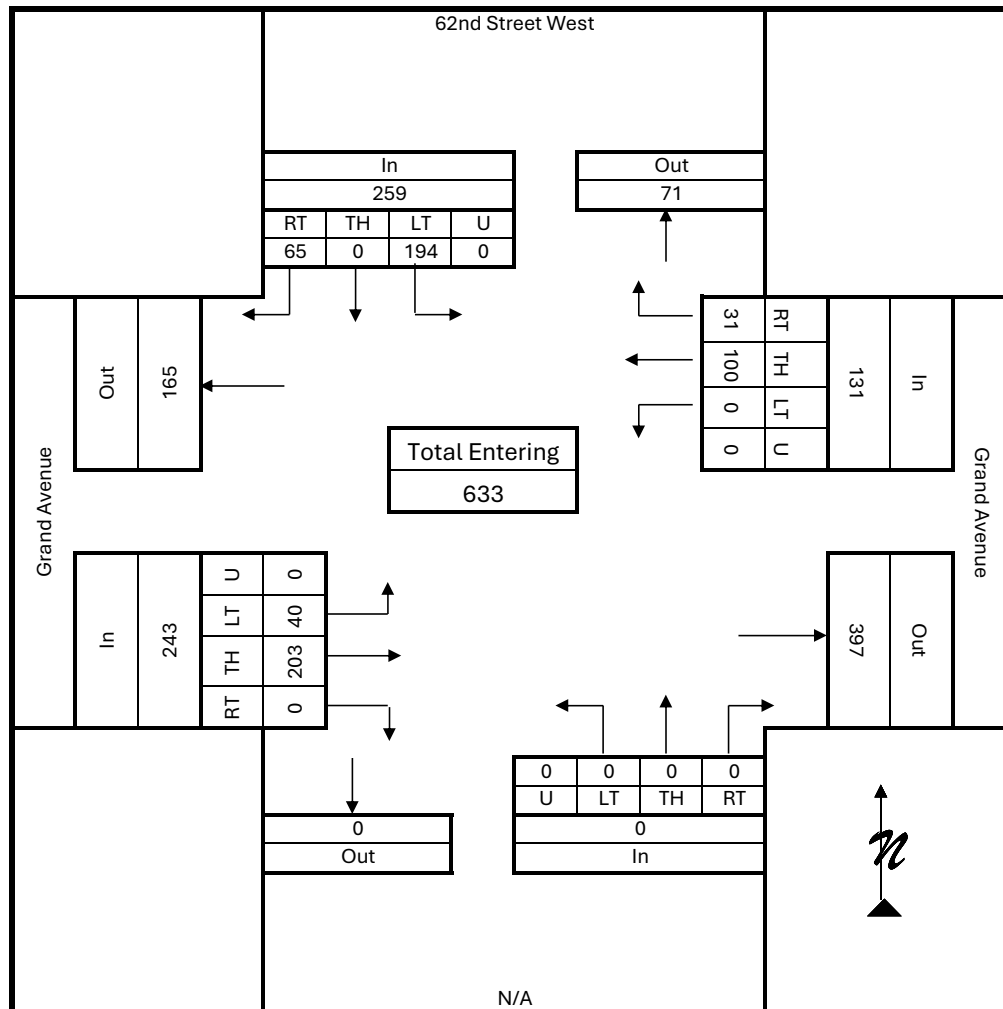
INTERSECTION TURNING MOVEMENT COUNT SUMMARY

General Information

Counted By:	Connor Scales	Intersection:	62nd Street West and Grand Avenue
Agency/Company:	Sanbell	Jurisdiction:	Billings, MT /MDT
Date Performed:	Tuesday, January 7, 2025	Project Description:	The Trestles Subdivision
Count Time Period:	AM Peak Hour (7:15 - 8:15 AM)	East/West Street:	Grand Avenue
Project Number:	21266.04		
North/South Street:	62nd Street West		

Vehicle Volumes and Adjustments

	62nd Street West Southbound					N/A Northbound					Grand Avenue Eastbound					Grand Avenue Westbound					Int. Total
Start Time	Right	Thru	Left	U-turn	Total	Right	Thru	Left	U-turn	Total	Right	Thru	Left	U-turn	Total	Right	Thru	Left	U-turn	Total	
Factor	1.07	1.07	1.07	1.07		1.07	1.07	1.07	1.07		1.07	1.07	1.07	1.07		1.07	1.07	1.07	1.07		
7:15 AM	16	0	28	0	44	0	0	0	0	0	0	49	9	0	58	4	19	0	0	23	125
7:30 AM	19	0	55	0	74	0	0	0	0	0	0	60	15	0	75	4	19	0	0	23	172
7:45 AM	15	0	76	0	91	0	0	0	0	0	0	61	5	0	66	14	32	0	0	46	203
8:00 AM	15	0	35	0	50	0	0	0	0	0	0	33	11	0	44	9	30	0	0	39	133
Grand Total	65	0	194	0	259	0	0	0	0	0	0	203	40	0	243	31	100	0	0	131	633
Medium Truck %	1.5	0.0	0.5	0.0	0.8	0.0	0.0	0.0	0.0	0.0	0.0	2.5	2.5	0.0	2.5	6.5	2.0	0.0	0.0	3.1	
Heavy Truck %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Truck %	1.5	0.0	0.5	0.0	0.8	0.0	0.0	0.0	0.0	0.0	0.0	2.5	2.5	0.0	2.5	6.5	2.0	0.0	0.0	3.1	
Total %	10.3	0.0	30.6	0.0	40.9	0.0	0.0	0.0	0.0	0.0	0.0	32.1	6.3	0.0	38.4	4.9	15.8	0.0	0.0	20.7	100.0
PHF	0.71	0.71	0.71			1.00	1.00	1.00			0.92	0.92	0.92			0.72	0.72	0.72			0.78



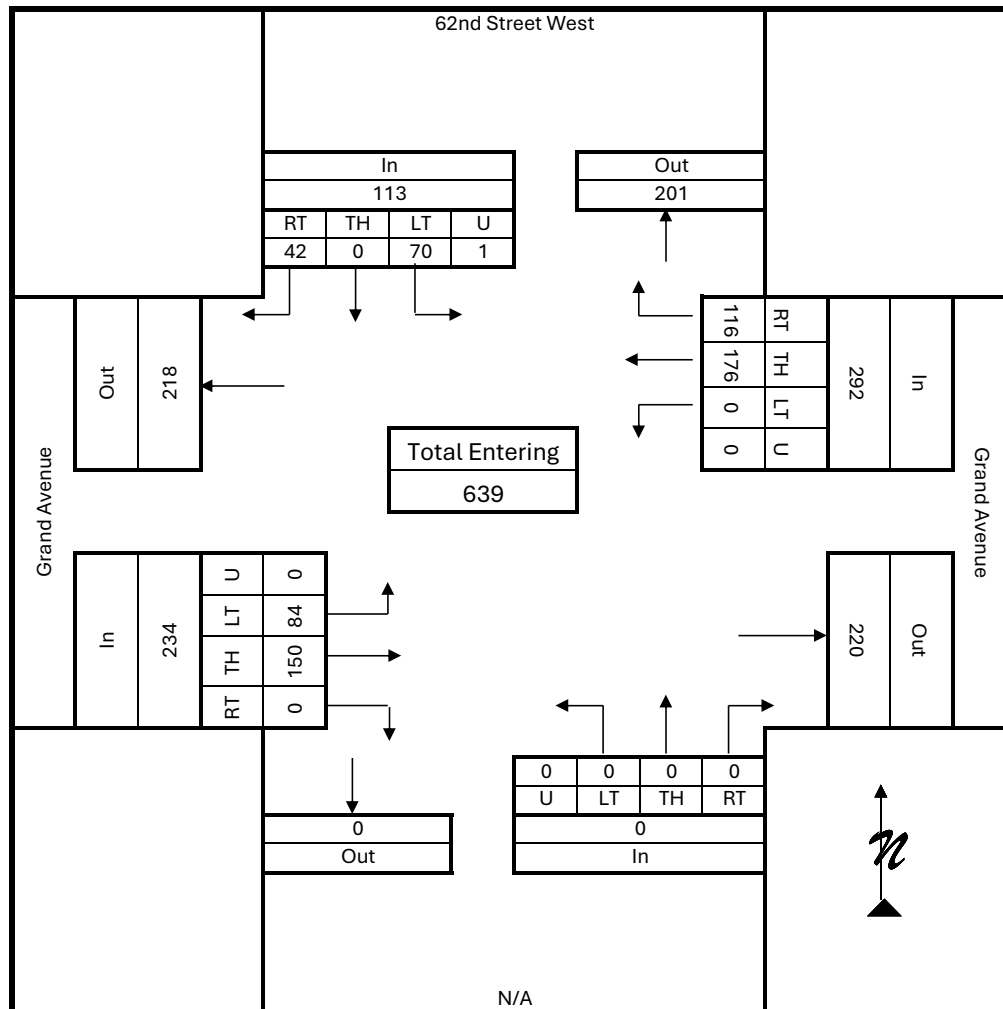
INTERSECTION TURNING MOVEMENT COUNT SUMMARY

General Information

Counted By:	Connor Scales	Intersection:	62nd Street West and Grand Avenue
Agency/Company:	Sanbell	Jurisdiction:	Billings, MT /MDT
Date Performed:	Tuesday, January 7, 2025	Project Description:	The Trestles Subdivision
Count Time Period:	PM Peak Hour (4:30 - 5:30 PM)	East/West Street:	Grand Avenue
Project Number:	21266.04		
North/South Street:	62nd Street West		

Vehicle Volumes and Adjustments

	62nd Street West Southbound					N/A Northbound					Grand Avenue Eastbound					Grand Avenue Westbound					Int. Total
Start Time	Right	Thru	Left	U-turn	Total	Right	Thru	Left	U-turn	Total	Right	Thru	Left	U-turn	Total	Right	Thru	Left	U-turn	Total	
Factor	1.07	1.07	1.07	1.07		1.07	1.07	1.07	1.07		1.07	1.07	1.07	1.07		1.07	1.07	1.07	1.07		
4:30 PM	10	0	22	1	33	0	0	0	0	0	0	48	18	0	66	21	44	0	0	65	164
4:45 PM	13	0	13	0	26	0	0	0	0	0	0	41	26	0	67	34	44	0	0	78	171
5:00 PM	6	0	24	0	30	0	0	0	0	0	0	37	20	0	57	27	46	0	0	73	160
5:15 PM	13	0	11	0	24	0	0	0	0	0	0	24	20	0	44	34	42	0	0	76	144
Grand Total	42	0	70	1	113	0	0	0	0	0	0	150	84	0	234	116	176	0	0	292	639
Medium Truck %	2.4	0.0	0.0	0.0	0.9	0.0	0.0	0.0	0.0	0.0	0.0	1.3	1.2	0.0	1.3	0.0	1.1	0.0	0.0	0.7	
Heavy Truck %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Truck %	2.4	0.0	0.0	0.0	0.9	0.0	0.0	0.0	0.0	0.0	0.0	1.3	1.2	0.0	1.3	0.0	1.1	0.0	0.0	0.7	
Total %	6.6	0.0	11.0	0.2	17.7	0.0	0.0	0.0	0.0	0.0	0.0	23.5	13.1	0.0	36.6	18.2	27.5	0.0	0.0	45.7	100.0
PHF	1.00	1.00	1.00			1.00	1.00	1.00			0.88	0.88	0.88			0.93	0.93	0.93			0.94



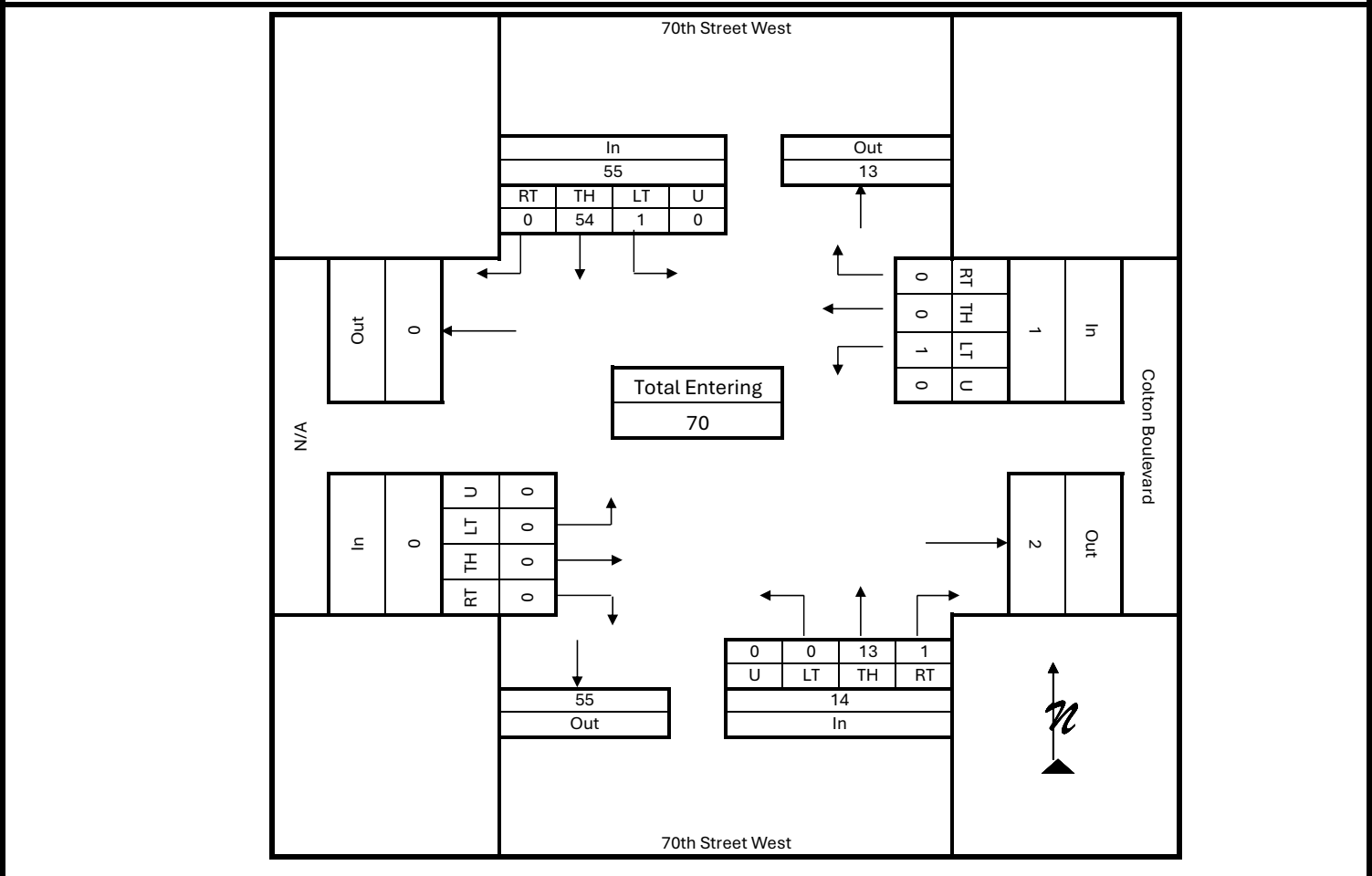
INTERSECTION TURNING MOVEMENT COUNT SUMMARY

General Information

Counted By:	Connor Scoles	Intersection:	70th Street West and Colton Boulevard
Agency/Company:	Sanbell	Jurisdiction:	Billings, MT /MDT
Date Performed:	Tuesday, January 7, 2025	Project Description:	The Trestles Subdivision
Count Time Period:	AM Peak Hour (7:15 - 8:15 AM)	East/West Street:	Colton Boulevard
Project Number:	21266.04		
North/South Street:	70th Street West		

Vehicle Volumes and Adjustments

	70th Street West Southbound					70th Street West Northbound					N/A Eastbound					Colton Boulevard Westbound					Int. Total
Start Time	Right	Thru	Left	U-turn	Total	Right	Thru	Left	U-turn	Total	Right	Thru	Left	U-turn	Total	Right	Thru	Left	U-turn	Total	
Factor	1.07	1.07	1.07	1.07		1.07	1.07	1.07	1.07		1.07	1.07	1.07	1.07		1.07	1.07	1.07	1.07		
7:15 AM	0	17	0	0	17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	17
7:30 AM	0	18	0	0	18	1	2	0	0	3	0	0	0	0	0	0	0	1	0	1	22
7:45 AM	0	13	0	0	13	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0	15
8:00 AM	0	6	1	0	7	0	9	0	0	9	0	0	0	0	0	0	0	0	0	0	16
Grand Total	0	54	1	0	55	1	13	0	0	14	0	0	0	0	0	0	0	1	0	1	70
Medium Truck %	0.0	3.7	0.0	0.0	3.6	100.0	0.0	0.0	0.0	7.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Heavy Truck %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Truck %	0.0	3.7	0.0	0.0	3.6	100.0	0.0	0.0	0.0	7.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total %	0.0	77.1	1.4	0.0	78.6	1.4	18.6	0.0	0.0	20.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.4	0.0	1.4	100.0
PHF	0.76	0.76	0.76			1.00	1.00	1.00			1.00	1.00	1.00			0.25	0.25	0.25			0.79



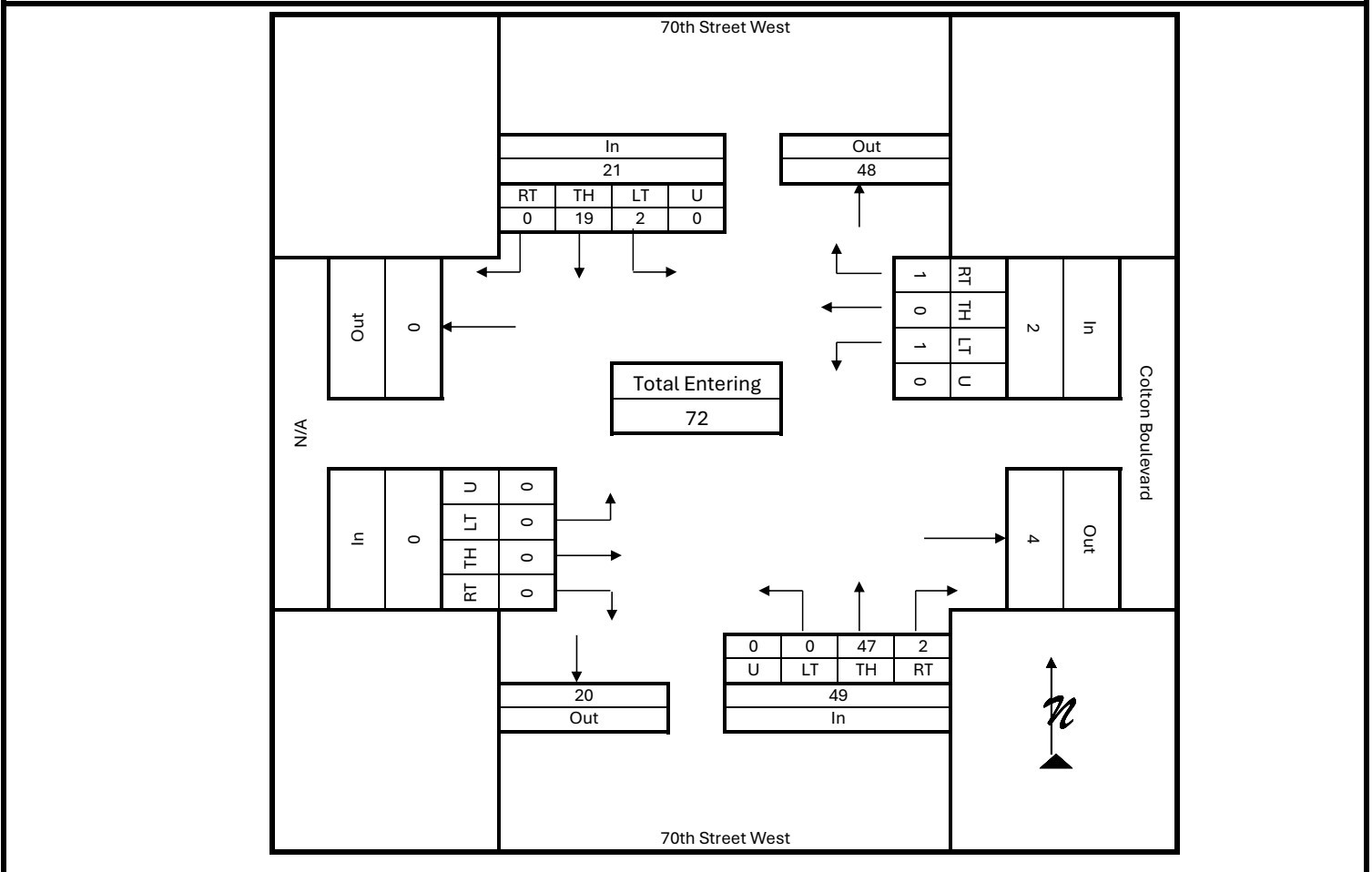
INTERSECTION TURNING MOVEMENT COUNT SUMMARY

General Information

Counted By:	Connor Scales	Intersection:	70th Street West and Colton Boulevard
Agency/Company:	Sanbell	Jurisdiction:	Billings, MT /MDT
Date Performed:	Tuesday, January 7, 2025		
Count Time Period:	PM Peak Hour (4:30 - 5:30 PM)		
Project Number:	21266.04	Project Description:	The Trestles Subdivision
North/South Street:	70th Street West	East/West Street:	Colton Boulevard

Vehicle Volumes and Adjustments

	70th Street West Southbound					70th Street West Northbound					N/A Eastbound					Colton Boulevard Westbound					Int. Total
Start Time	Right	Thru	Left	U-turn	Total	Right	Thru	Left	U-turn	Total	Right	Thru	Left	U-turn	Total	Right	Thru	Left	U-turn	Total	
Factor	1.07	1.07	1.07	1.07		1.07	1.07	1.07	1.07		1.07	1.07	1.07	1.07		1.07	1.07	1.07	1.07		
4:30 PM	0	3	1	0	4	0	13	0	0	13	0	0	0	0	0	0	0	1	0	1	18
4:45 PM	0	7	0	0	7	1	12	0	0	13	0	0	0	0	0	0	0	0	0	0	20
5:00 PM	0	6	1	0	7	0	10	0	0	10	0	0	0	0	0	1	0	0	0	1	18
5:15 PM	0	3	0	0	3	1	12	0	0	13	0	0	0	0	0	0	0	0	0	0	16
Grand Total	0	19	2	0	21	2	47	0	0	49	0	0	0	0	0	1	0	1	0	2	72
Medium Truck %	0.0	5.3	0.0	0.0	4.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Heavy Truck %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Truck %	0.0	5.3	0.0	0.0	4.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total %	0.0	26.4	2.8	0.0	29.2	2.8	65.3	0.0	0.0	68.1	0.0	0.0	0.0	0.0	0.0	1.4	0.0	1.4	0.0	2.8	100.0
PHF	0.75	0.75	0.75			0.94	0.94	0.94			1.00	1.00	1.00			1.00	1.00	1.00			0.89



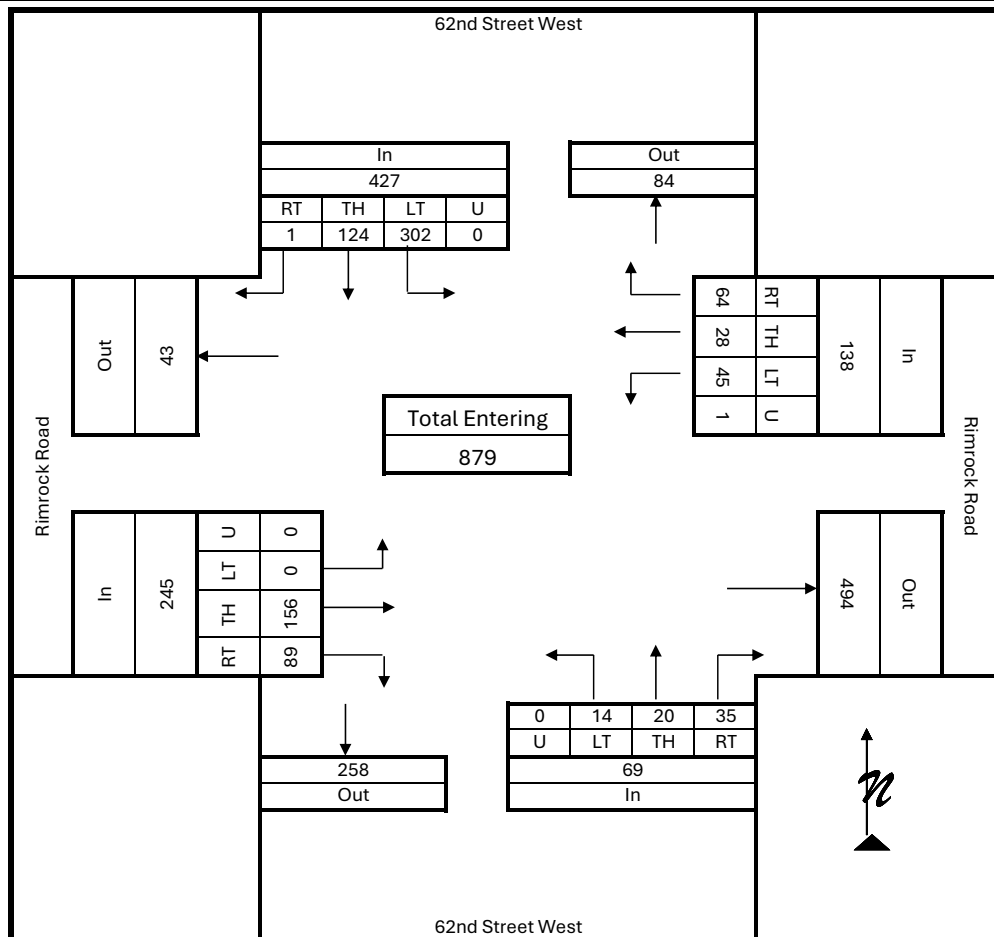
INTERSECTION TURNING MOVEMENT COUNT SUMMARY

General Information

Counted By:	Connor Scoles	Intersection:	62nd Street West and Rimrock Road
Agency/Company:	Sanbell	Jurisdiction:	Billings, MT /MDT
Date Performed:	Tuesday, January 7, 2025	Project Description:	The Trestles Subdivision
Count Time Period:	AM Peak Hour (7:15 - 8:15 AM)	East/West Street:	Rimrock Road
Project Number:	21266.04		
North/South Street:	62nd Street West		

Vehicle Volumes and Adjustments

	62nd Street West Southbound					62nd Street West Northbound					Rimrock Road Eastbound					Rimrock Road Westbound					Int. Total
Start Time	Right	Thru	Left	U-turn	Total	Right	Thru	Left	U-turn	Total	Right	Thru	Left	U-turn	Total	Right	Thru	Left	U-turn	Total	Total
Factor	1.07	1.07	1.07	1.07		1.07	1.07	1.07	1.07		1.07	1.07	1.07	1.07		1.07	1.07	1.07	1.07		
7:15 AM	1	21	81	0	103	9	3	0	0	12	15	57	0	0	72	16	5	12	0	33	220
7:30 AM	0	41	96	0	137	14	5	2	0	21	26	54	0	0	80	10	4	18	1	33	271
7:45 AM	0	34	77	0	111	3	6	6	0	15	35	30	0	0	65	13	6	10	0	29	220
8:00 AM	0	28	48	0	76	9	6	6	0	21	13	15	0	0	28	25	13	5	0	43	168
Grand Total	1	124	302	0	427	35	20	14	0	69	89	156	0	0	245	64	28	45	1	138	879
Medium Truck %	0.0	0.8	1.3	0.0	1.2	0.0	5.0	14.3	0.0	4.3	0.0	1.3	0.0	0.0	0.8	12.5	10.7	0.0	100.0	8.7	
Heavy Truck %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Truck %	0.0	0.8	1.3	0.0	1.2	0.0	5.0	14.3	0.0	4.3	0.0	1.3	0.0	0.0	0.8	12.5	10.7	0.0	100.0	8.7	
Total %	0.1	14.1	34.4	0.0	48.6	4.0	2.3	1.6	0.0	7.8	10.1	17.7	0.0	0.0	27.9	7.3	3.2	5.1	0.1	15.7	100.0
PHF	0.78	0.78	0.78			0.83	0.83	0.83			0.77	0.77	0.77			1.00	1.00	1.00			0.81



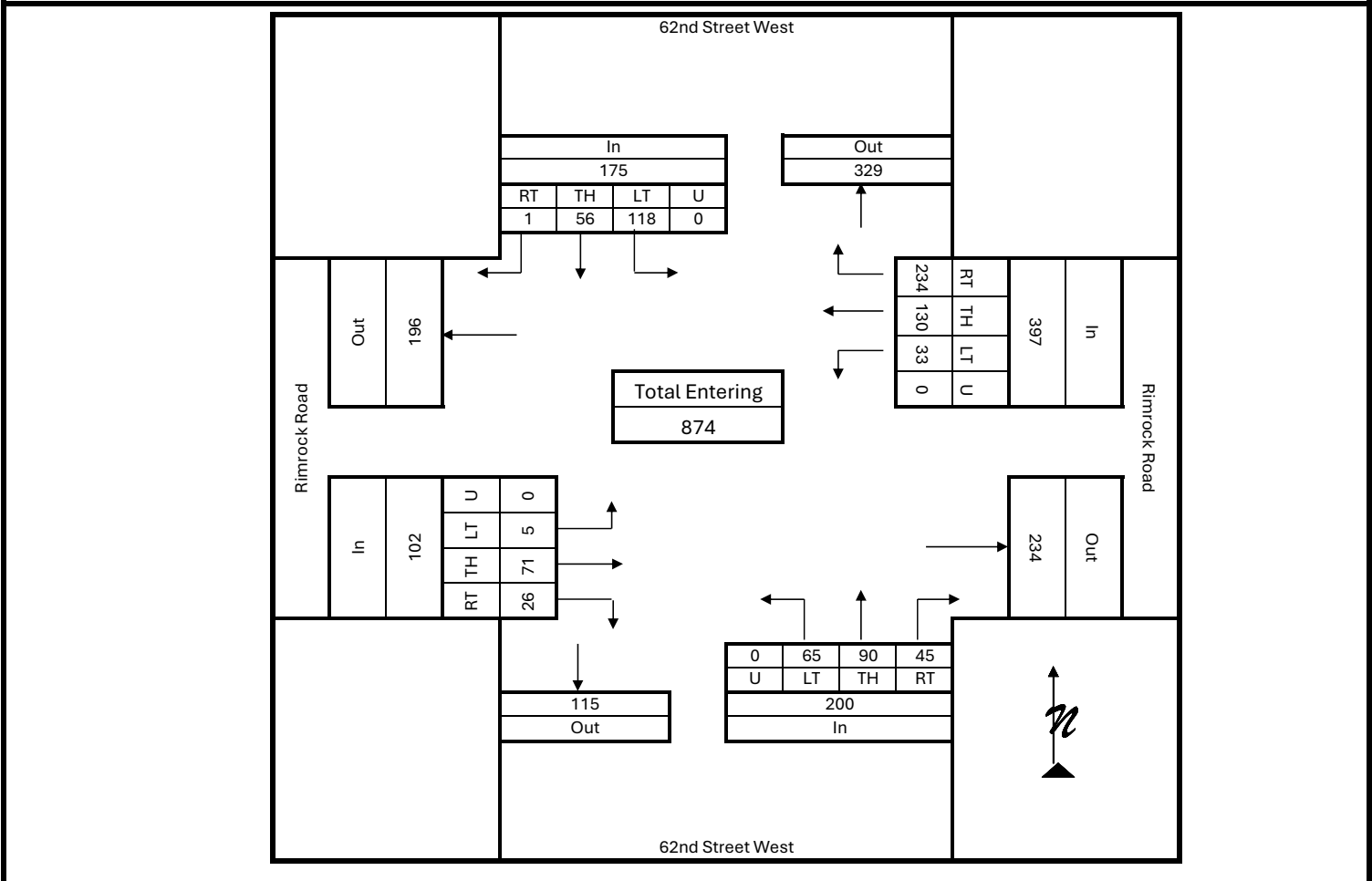
INTERSECTION TURNING MOVEMENT COUNT SUMMARY

General Information

Counted By:	Connor Scoles	Intersection:	62nd Street West and Rimrock Road
Agency/Company:	Sanbell	Jurisdiction:	Billings, MT /MDT
Date Performed:	Tuesday, January 7, 2025	Project Description:	The Trestles Subdivision
Count Time Period:	PM Peak Hour (4:30 - 5:30 PM)	East/West Street:	Rimrock Road
Project Number:	21266.04		
North/South Street:	62nd Street West		

Vehicle Volumes and Adjustments

	62nd Street West Southbound					62nd Street West Northbound					Rimrock Road Eastbound					Rimrock Road Westbound					Int. Total
Start Time	Right	Thru	Left	U-turn	Total	Right	Thru	Left	U-turn	Total	Right	Thru	Left	U-turn	Total	Right	Thru	Left	U-turn	Total	
Factor	1.07	1.07	1.07	1.07		1.07	1.07	1.07	1.07		1.07	1.07	1.07	1.07		1.07	1.07	1.07	1.07		
4:30 PM	0	17	30	0	47	12	15	14	0	41	9	19	3	0	31	47	26	10	0	83	202
4:45 PM	0	14	35	0	49	12	25	18	0	55	3	14	0	0	17	36	33	5	0	74	195
5:00 PM	1	15	34	0	50	11	22	15	0	48	10	22	1	0	33	72	25	6	0	103	234
5:15 PM	0	10	19	0	29	10	28	18	0	56	4	16	1	0	21	79	46	12	0	137	243
Grand Total	1	56	118	0	175	45	90	65	0	200	26	71	5	0	102	234	130	33	0	397	874
Medium Truck %	0.0	0.0	1.7	0.0	1.1	2.2	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.3	
Heavy Truck %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Truck %	0.0	0.0	1.7	0.0	1.1	2.2	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.3	
Total %	0.1	6.4	13.5	0.0	20.0	5.1	10.3	7.4	0.0	22.9	3.0	8.1	0.6	0.0	11.7	26.8	14.9	3.8	0.0	45.4	100.0
PHF	1.00	1.00	1.00			0.89	0.89	0.89			1.00	1.00	1.00			0.72	0.72	0.72			0.90



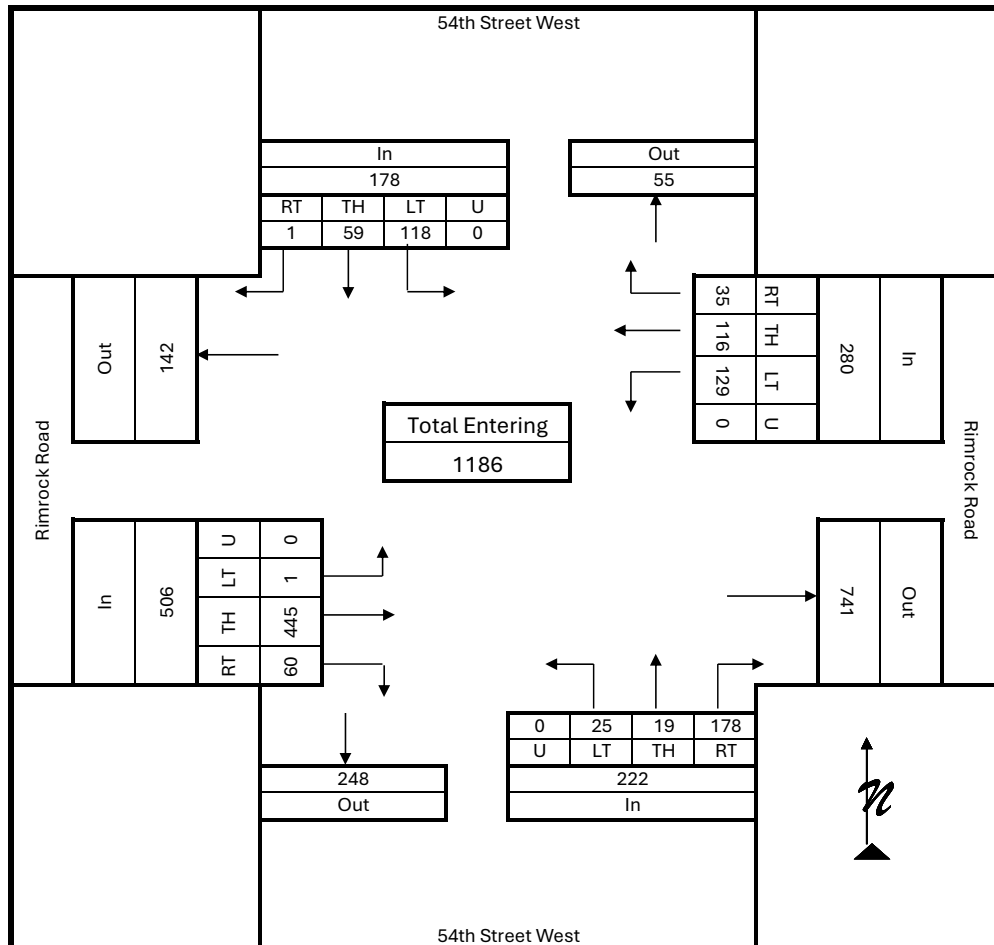
INTERSECTION TURNING MOVEMENT COUNT SUMMARY

General Information

Counted By:	Connor Scoles	Intersection:	54th Street West and Rimrock Road
Agency/Company:	Sanbell	Jurisdiction:	Billings, MT /MDT
Date Performed:	Tuesday, January 7, 2025		
Count Time Period:	AM Peak Hour (7:15 - 8:15 AM)		
Project Number:	21266.04	Project Description:	The Trestles Subdivision
North/South Street:	54th Street West	East/West Street:	Rimrock Road

Vehicle Volumes and Adjustments

	54th Street West Southbound					54th Street West Northbound					Rimrock Road Eastbound					Rimrock Road Westbound					Int. Total
Start Time	Right	Thru	Left	U-turn	Total	Right	Thru	Left	U-turn	Total	Right	Thru	Left	U-turn	Total	Right	Thru	Left	U-turn	Total	
Factor	1.07	1.07	1.07	1.07		1.07	1.07	1.07	1.07		1.07	1.07	1.07	1.07		1.07	1.07	1.07	1.07		
7:15 AM	0	11	33	0	44	35	1	5	0	41	10	110	0	0	120	5	28	25	0	58	263
7:30 AM	0	12	36	0	48	39	1	4	0	44	19	149	0	0	168	10	26	28	0	64	324
7:45 AM	1	22	25	0	48	49	7	9	0	65	21	110	0	0	131	5	27	60	0	92	336
8:00 AM	0	14	24	0	38	55	10	7	0	72	10	76	1	0	87	15	35	16	0	66	263
Grand Total	1	59	118	0	178	178	19	25	0	222	60	445	1	0	506	35	116	129	0	280	1186
Medium Truck %	100.0	0.0	1.7	0.0	1.7	0.6	5.3	16.0	0.0	2.7	3.3	1.3	0.0	0.0	1.6	2.9	6.0	0.8	0.0	3.2	
Heavy Truck %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Truck %	100.0	0.0	1.7	0.0	1.7	0.6	5.3	16.0	0.0	2.7	3.3	1.3	0.0	0.0	1.6	2.9	6.0	0.8	0.0	3.2	
Total %	0.1	5.0	9.9	0.0	15.0	15.0	1.6	2.1	0.0	18.7	5.1	37.5	0.1	0.0	42.7	3.0	9.8	10.9	0.0	23.6	100.0
PHF	0.92	0.92	0.92			0.85	0.85	0.85			0.96	0.96	0.96			0.76	0.76	0.76			0.88



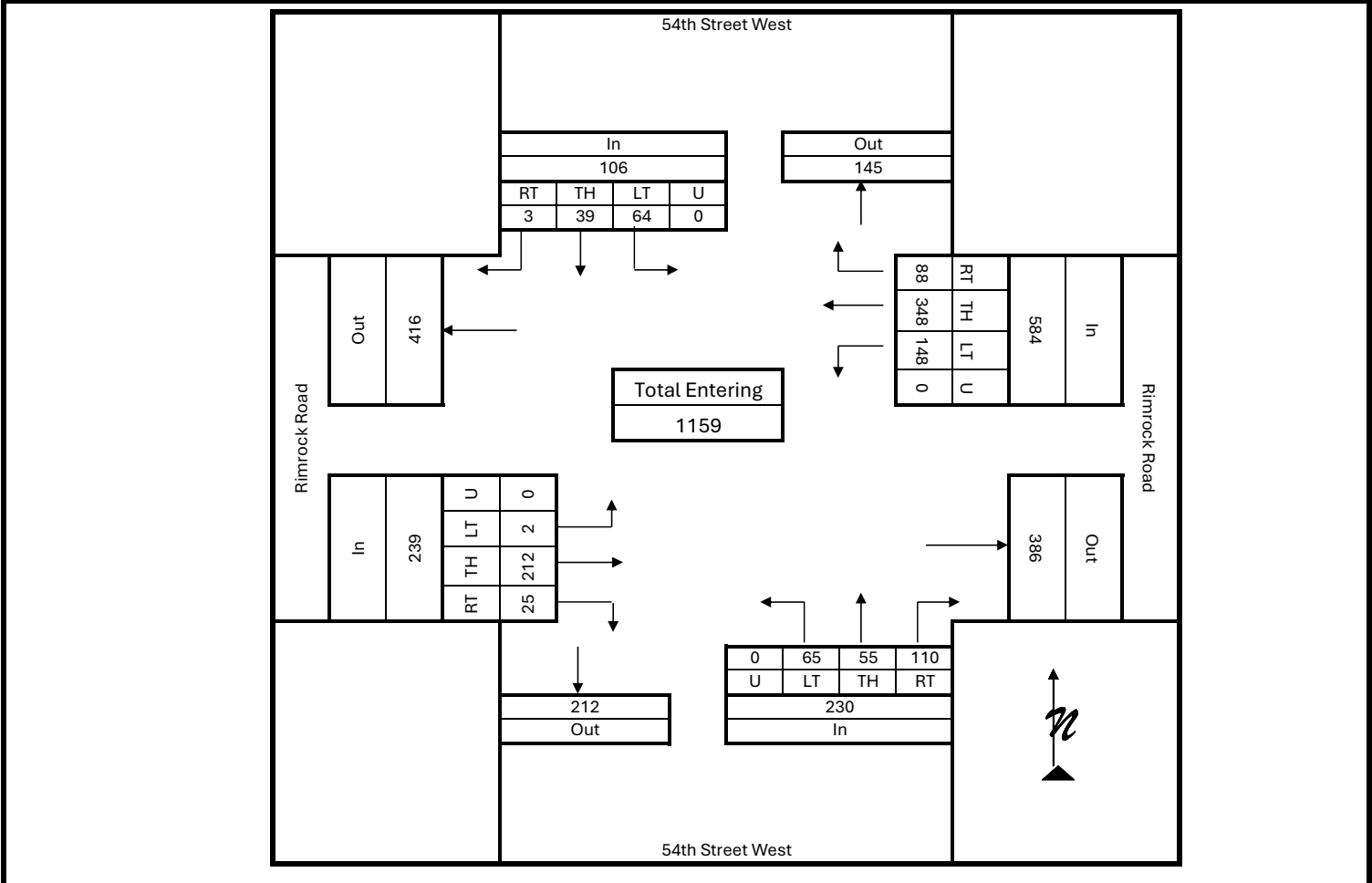
INTERSECTION TURNING MOVEMENT COUNT SUMMARY

General Information

Counted By:	Connor Scoles	Intersection:	54th Street West and Rimrock Road
Agency/Company:	Sanbell	Jurisdiction:	Billings, MT /MDT
Date Performed:	Tuesday, January 7, 2025		
Count Time Period:	PM Peak Hour (4:30 - 5:30 PM)		
Project Number:	21266.04	Project Description:	The Trestles Subdivision
North/South Street:	54th Street West	East/West Street:	Rimrock Road

Vehicle Volumes and Adjustments

	54th Street West Southbound					54th Street West Northbound					Rimrock Road Eastbound					Rimrock Road Westbound					Int. Total
Start Time	Right	Thru	Left	U-turn	Total	Right	Thru	Left	U-turn	Total	Right	Thru	Left	U-turn	Total	Right	Thru	Left	U-turn	Total	
Factor	1.07	1.07	1.07	1.07		1.07	1.07	1.07	1.07		1.07	1.07	1.07	1.07		1.07	1.07	1.07	1.07		
4:30 PM	2	9	20	0	31	25	10	10	0	45	1	61	1	0	63	22	76	27	0	125	264
4:45 PM	1	11	14	0	26	36	18	11	0	65	7	54	0	0	61	21	60	46	0	127	279
5:00 PM	0	14	14	0	28	24	13	30	0	67	5	58	0	0	63	19	94	32	0	145	303
5:15 PM	0	5	16	0	21	25	14	14	0	53	12	39	1	0	52	26	118	43	0	187	313
Grand Total	3	39	64	0	106	110	55	65	0	230	25	212	2	0	239	88	348	148	0	584	1159
Medium Truck %	0.0	0.0	3.1	0.0	1.9	0.0	1.8	0.0	0.0	0.4	0.0	1.4	0.0	0.0	1.3	0.0	0.3	0.0	0.0	0.2	
Heavy Truck %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Truck %	0.0	0.0	3.1	0.0	1.9	0.0	1.8	0.0	0.0	0.4	0.0	1.4	0.0	0.0	1.3	0.0	0.3	0.0	0.0	0.2	
Total %	0.3	3.4	5.5	0.0	9.1	9.5	4.7	5.6	0.0	19.8	2.2	18.3	0.2	0.0	20.6	7.6	30.0	12.8	0.0	50.4	100.0
PHF	1.00	1.00	1.00			1.00	1.00	1.00			1.00	1.00	1.00			0.78	0.78	0.78			0.93



**CAPACITY CALCULATIONS –
EXISTING CONDITIONS (2025)**

APPENDIX B

**Intelligent Infrastructure.
Enduring Communities.**



Intersection	Approach	Existing (2025)					
		AM Peak			PM Peak		
		Avg Delay (s/veh)	LOS	95th % Queue (veh)	Avg Delay (s/veh)	LOS	95th % Queue (veh)
Intersection Control		Two-Way Stop-Control (NB/SB)					
70th St W & Rimrock Rd	NB	8.7	A	1	9.1	A	1
	SB	9.7	A	1	9.4	A	1
	WB	4.7	A	1	2.3	A	1
	Intersection	8.4	A	--	6.8	A	--
Intersection Control		Roundabout					
Rimrock Rd & 62nd St W	NB	6.1	A	1	5.0	A	1
	SB	7.4	A	3	5.2	A	1
	EB	10.6	B	3	4.1	A	1
	WB	3.8	A	1	8.4	A	3
	Intersection	7.8	A	--	6.7	A	--
Intersection Control		Signalized					
54th St W & Rimrock Rd	NB	18.6	B	3	21.8	C	2
	SB	22.1	C	3	22.6	C	2
	EB	14.8	B	8	8.5	A	2
	WB	11.6	B	3	11.5	B	6
	Intersection	15.6	B	--	13.3	B	--
Intersection Control		One-Way Stop-Control (WB)					
70th St W & Colton Blvd	NB	0.0	A	0	0.0	A	0
	SB	7.2	A	1	6.5	A	1
	WB	9.5	A	1	8.8	A	1
	Intersection	6.2	A	--	2.5	A	--
Intersection Control		One-Way Stop-Control (SB)					
70th St W & Grand Ave	SB	9.7	A	1	9.5	A	1
	EB	0.1	A	0	0.7	A	1
	WB	0.0	A	0	0.0	A	0
	Intersection	2.6	A	--	1.0	A	--
Intersection Control		One-Way Stop-Control (SB)					
62nd St W & Grand Ave	SB	20.1	C	5	14.1	B	1
	EB	1.2	A	1	2.9	A	1
	WB	0.0	A	0	0.0	A	0
	Intersection	9.5	A	--	3.4	A	--
Intersection Control		One-Way Stop-Control (NB)					
56th St W & Grand Ave	NB	19.9	C	2	15.4	C	2
	EB	0.0	A	0	0.0	A	0
	WB	3.2	A	1	1.9	A	1
	Intersection	4.1	A	--	4.9	A	--
Intersection Control		Signalized					
54th St W & Grand Ave	SB	15.1	B	5	18.2	B	2
	EB	10.2	B	5	5.6	A	1
	WB	18.2	B	4	13.6	B	4
	Intersection	13.4	B	--	11.4	B	--

Intersection Level Of Service Report

Intersection 1: 70th St W & Rimrock Rd

Control Type: Two-way stop
 Analysis Method: HCM 7th Edition
 Analysis Period: 15 minutes

Delay (sec / veh): 9.9
 Level Of Service: A
 Volume to Capacity (v/c): 0.070

Intersection Setup

Name	70th St W			70th St W			Rimrock Rd			Rimrock Rd		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	40.00			25.00			25.00			50.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name	70th St W			70th St W			Rimrock Rd			Rimrock Rd		
Base Volume Input [veh/h]	0	4	7	24	39	0	0	0	0	17	0	9
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	0.00	0.00	2.60	0.00	0.00	0.00	0.00	5.90	0.00	5.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	4	7	24	39	0	0	0	0	17	0	9
Peak Hour Factor	1.0000	1.0000	1.0000	0.6700	0.6700	0.6700	1.0000	1.0000	1.0000	0.7200	0.7200	0.7200
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	1	2	9	15	0	0	0	0	6	0	3
Total Analysis Volume [veh/h]	0	4	7	36	58	0	0	0	0	24	0	13
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	No	No		
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance	No	No		
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.00	0.01	0.04	0.07	0.00	0.00	0.00	0.00	0.02	0.00	0.00
d_M, Delay for Movement [s/veh]	9.37	9.43	8.34	9.45	9.89	8.85	7.22	0.00	0.00	7.29	0.00	0.00
Movement LOS	A	A	A	A	A	A	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0.03	0.03	0.03	0.37	0.37	0.37	0.00	0.00	0.00	0.05	0.05	0.05
95th-Percentile Queue Length [ft/ln]	0.86	0.86	0.86	9.21	9.21	9.21	0.00	0.00	0.00	1.22	1.22	1.22
d_A, Approach Delay [s/veh]	8.74			9.72			2.41			4.73		
Approach LOS	A			A			A			A		
d_I, Intersection Delay [s/veh]	8.35											
Intersection LOS	A											

Intersection Level Of Service Report

Intersection 2: Rimrock Rd & 62nd St W

Control Type: Roundabout
 Analysis Method: HCM 7th Edition
 Analysis Period: 15 minutes

Delay (sec / veh): 7.8
 Level Of Service: A

Intersection Setup

Name	62nd St W			62nd St W			Rimrock Rd			Rimrock Rd		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	50.00			50.00			50.00			50.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	62nd St W			62nd St W			Rimrock Rd			Rimrock Rd		
Base Volume Input [veh/h]	14	20	35	302	124	1	0	156	89	46	28	64
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	5.00	5.00	0.00	1.30	0.80	0.00	0.00	1.30	0.00	0.00	5.00	12.50
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	14	20	35	302	124	1	0	156	89	46	28	64
Peak Hour Factor	0.8300	0.8300	0.8300	0.7800	0.7800	0.7800	0.7700	0.7700	0.7700	1.0000	1.0000	1.0000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	4	6	11	97	40	0	0	51	29	12	7	16
Total Analysis Volume [veh/h]	17	24	42	387	159	1	0	203	116	46	28	64
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Number of Conflicting Circulating Lanes	1			1			1			1		
Circulating Flow Rate [veh/h]	598			93			598			43		
Exiting Flow Rate [veh/h]	322			97			48			640		
Demand Flow Rate [veh/h]	14	20	35	302	124	1	0	156	89	46	28	64
Adjusted Demand Flow Rate [veh/h]	17	24	42	387	159	1	0	203	116	46	28	64

Lanes

Override Calculated Critical Headway	No			No			No			No		
User-Defined Critical Headway [s]	4.00			4.00			4.00			4.00		
Override Calculated Follow-Up Time	No			No			No			No		
User-Defined Follow-Up Time [s]	3.00			3.00			3.00			3.00		
A (intercept)	1380.00			1380.00			1380.00			1380.00		
B (coefficient)	0.00102			0.00102			0.00102			0.00102		
HV Adjustment Factor	0.98			0.99			0.99			0.94		
Entry Flow Rate [veh/h]	85			554			322			147		
Capacity of Entry and Bypass Lanes [veh/h]	751			1255			750			1321		
Pedestrian Impedance	1.00			1.00			1.00			1.00		
Capacity per Entry Lane [veh/h]	733			1241			744			1240		
X, volume / capacity	0.11			0.44			0.43			0.11		

Movement, Approach, & Intersection Results

Lane LOS	A	A	B	A
95th-Percentile Queue Length [veh]	0.38	2.30	2.17	0.37
95th-Percentile Queue Length [ft]	9.54	57.62	54.15	9.37
Approach Delay [s/veh]	6.11	7.38	10.58	3.82
Approach LOS	A	A	B	A
Intersection Delay [s/veh]	7.77			
Intersection LOS	A			

Intersection Level Of Service Report
Intersection 3: 54th St W & Rimrock Rd

Control Type:	Signalized	Delay (sec / veh):	15.6
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.390

Intersection Setup

Name	54th St W			54th St W			Rimrock Rd			Rimrock Rd		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	1	0	0	1	0	0	1	0	1
Entry Pocket Length [ft]	200.00	100.00	100.00	150.00	100.00	100.00	200.00	100.00	100.00	150.00	100.00	150.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	45.00			45.00			50.00			45.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	54th St W			54th St W			Rimrock Rd			Rimrock Rd		
Base Volume Input [veh/h]	25	19	178	118	59	1	1	445	60	129	116	35
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	5.00	5.30	0.60	1.70	0.00	2.00	0.00	1.30	3.30	0.80	6.00	2.90
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	89	0	0	1	0	0	30	0	0	18
Total Hourly Volume [veh/h]	25	19	89	118	59	0	1	445	30	129	116	17
Peak Hour Factor	0.8500	0.8500	0.8500	0.9200	0.9200	0.9200	0.9600	0.9600	0.9600	0.7600	0.7600	0.7600
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	7	6	26	32	16	0	0	116	8	42	38	6
Total Analysis Volume [veh/h]	29	22	105	128	64	0	1	464	31	170	153	22
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing m	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	100
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	70.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing

Control Type	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	ProtPer	Permiss	Permiss	ProtPer	Permiss	Permiss
Signal Group	0	6	0	5	2	0	3	4	0	7	8	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	Lead	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	0	5	0	5	5	0	5	5	0	5	5	0
Maximum Green [s]	0	30	0	30	30	0	15	40	0	15	40	0
Amber [s]	0.0	4.8	0.0	4.8	4.8	0.0	4.8	4.8	0.0	4.8	4.8	0.0
All red [s]	0.0	1.7	0.0	1.7	1.7	0.0	1.7	1.7	0.0	1.7	1.7	0.0
Split [s]	0	35	0	0	35	0	15	50	0	15	50	0
Vehicle Extension [s]	0.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
Walk [s]	0	7	0	0	7	0	0	7	0	0	7	0
Pedestrian Clearance [s]	0	11	0	0	11	0	0	11	0	0	11	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			Yes			Yes	
I1, Start-Up Lost Time [s]	0.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	4.5	0.0	4.5	4.5	0.0	4.5	4.5	0.0	4.5	4.5	0.0
Minimum Recall		No			No		No	Yes		No	Yes	
Maximum Recall		No			No		No	No		No	No	
Pedestrian Recall		No			No		No	Yes		No	Yes	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	L	C	L	C	L	C	R
C, Cycle Length [s]	56	56	56	56	56	56	56	56	56
L, Total Lost Time per Cycle [s]	6.50	6.50	6.50	6.50	6.50	6.50	6.50	6.50	6.50
l1_p, Permitted Start-Up Lost Time [s]	2.00	0.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	4.50	4.50	4.50	4.50	0.00	4.50	0.00	4.50	4.50
g_i, Effective Green Time [s]	13	13	13	13	29	23	29	18	18
g / C, Green / Cycle	0.24	0.24	0.24	0.24	0.53	0.41	0.53	0.32	0.32
(v / s)_i Volume / Saturation Flow Rate	0.02	0.09	0.10	0.04	0.00	0.29	0.17	0.09	0.02
s, saturation flow rate [veh/h]	1305	1463	1266	1750	1368	1713	1027	1667	1453
c, Capacity [veh/h]	350	346	288	414	832	703	517	542	472
d1, Uniform Delay [s]	19.59	17.70	23.61	16.77	6.28	13.56	8.76	13.91	12.83
k, delay calibration	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
l, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.10	0.65	1.07	0.17	0.00	1.30	0.37	0.28	0.04
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.08	0.37	0.44	0.15	0.00	0.70	0.33	0.28	0.05
d, Delay for Lane Group [s/veh]	19.69	18.35	24.68	16.95	6.28	14.86	9.13	14.19	12.87
Lane Group LOS	B	B	C	B	A	B	A	B	B
Critical Lane Group	No	No	Yes	No	Yes	Yes	No	No	No
50th-Percentile Queue Length [veh/ln]	0.28	1.20	1.50	0.56	0.00	3.95	0.76	1.20	0.16
50th-Percentile Queue Length [ft/ln]	7.09	30.05	37.43	14.10	0.09	98.81	18.90	29.95	3.96
95th-Percentile Queue Length [veh/ln]	0.51	2.16	2.70	1.02	0.01	7.11	1.36	2.16	0.29
95th-Percentile Queue Length [ft/ln]	12.77	54.10	67.38	25.39	0.16	177.85	34.02	53.91	7.13

Movement, Approach, & Intersection Results

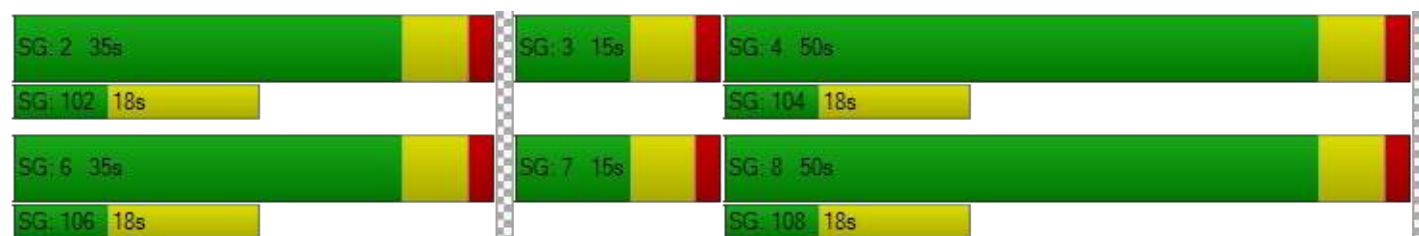
d_M, Delay for Movement [s/veh]	19.69	18.35	18.35	24.68	16.95	16.95	6.28	14.86	14.86	9.13	14.19	12.87
Movement LOS	B	B	B	C	B	B	A	B	B	A	B	B
d_A, Approach Delay [s/veh]	18.60			22.10			14.84			11.61		
Approach LOS	B			C			B			B		
d_I, Intersection Delay [s/veh]	15.57											
Intersection LOS	B											
Intersection V/C	0.390											

Other Modes

g_Walk,mi, Effective Walk Time [s]	23.0			23.0			11.0			11.0		
M_corner, Corner Circulation Area [ft ² /ped]	0.00			0.00			0.00			0.00		
M_CW, Crosswalk Circulation Area [ft ² /ped]	0.00			0.00			0.00			0.00		
d_p, Pedestrian Delay [s]	9.53			9.53			17.85			17.85		
I_p,int, Pedestrian LOS Score for Intersection	2.386			2.015			2.381			2.732		
Crosswalk LOS	B			B			B			B		
s_b, Saturation Flow Rate of the bicycle lane	2000			2000			2000			2000		
c_b, Capacity of the bicycle lane [bicycles/h]	1026			1026			1567			1567		
d_b, Bicycle Delay [s]	6.58			6.58			1.30			1.30		
I_b,int, Bicycle LOS Score for Intersection	1.964			1.878			2.428			2.159		
Bicycle LOS	A			A			B			B		

Sequence

Ring 1	-	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	6	7	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 4: 70th St W & Colton Blvd

Control Type:	Two-way stop	Delay (sec / veh):	9.5
Analysis Method:	HCM 7th Edition	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.005

Intersection Setup

Name	70th St W		70th St W		Colton Blvd	
Approach	Northbound		Southbound		Westbound	
Lane Configuration						
Turning Movement	Thru	Right	Left	Thru	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	40.00		40.00		25.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	70th St W		70th St W		Colton Blvd	
Base Volume Input [veh/h]	13	1	54	1	1	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	2.00	0.00	3.70	0.00	0.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	13	1	54	1	1	0
Peak Hour Factor	1.0000	1.0000	0.7600	0.7600	0.2500	0.2500
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	3	0	18	0	1	0
Total Analysis Volume [veh/h]	13	1	71	1	4	0
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Free	Free	Stop
Flared Lane			No
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance			No
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.00	0.04	0.00	0.00	0.00
d_M, Delay for Movement [s/veh]	0.00	0.00	7.33	0.00	9.51	8.38
Movement LOS	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0.00	0.00	0.14	0.14	0.02	0.02
95th-Percentile Queue Length [ft/ln]	0.00	0.00	3.39	3.39	0.38	0.38
d_A, Approach Delay [s/veh]	0.00		7.22		9.51	
Approach LOS	A		A		A	
d_I, Intersection Delay [s/veh]	6.20					
Intersection LOS	A					

Intersection Level Of Service Report
Intersection 5: 70th St W & Grand Ave

Control Type:	Two-way stop	Delay (sec / veh):	9.8
Analysis Method:	HCM 7th Edition	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.072

Intersection Setup

Name	70th St W		Grand Ave		Grand Ave	
Approach	Southbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Left	Thru	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	40.00		50.00		50.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	70th St W		Grand Ave		Grand Ave	
Base Volume Input [veh/h]	49	5	1	108	28	12
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	4.10	0.00	0.00	0.90	3.60	8.30
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	49	5	1	108	28	12
Peak Hour Factor	0.8500	0.8500	0.7700	0.7700	1.0000	1.0000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	14	1	0	35	7	3
Total Analysis Volume [veh/h]	58	6	1	140	28	12
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Stop	Free	Free
Flared Lane	No		
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance	No		
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.07	0.01	0.00	0.00	0.00	0.00
d_M, Delay for Movement [s/veh]	9.82	8.81	7.28	0.00	0.00	0.00
Movement LOS	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0.25	0.25	0.00	0.00	0.00	0.00
95th-Percentile Queue Length [ft/ln]	6.28	6.28	0.04	0.04	0.00	0.00
d_A, Approach Delay [s/veh]	9.72		0.05		0.00	
Approach LOS	A		A		A	
d_I, Intersection Delay [s/veh]	2.57					
Intersection LOS	A					

Intersection Level Of Service Report

Intersection 6: 62nd St W & Grand Ave

Control Type:	Two-way stop	Delay (sec / veh):	20.8
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.508

Intersection Setup

Name	62nd St W		Grand Ave		Grand Ave	
Approach	Southbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Left	Thru	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	50.00		45.00		35.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	62nd St W		Grand Ave		Grand Ave	
Base Volume Input [veh/h]	194	65	40	203	100	31
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.50	1.50	2.50	2.50	2.00	6.50
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	194	65	40	203	100	31
Peak Hour Factor	0.7100	0.7100	0.9200	0.9200	0.7200	0.7200
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	68	23	11	55	35	11
Total Analysis Volume [veh/h]	273	92	43	221	139	43
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Stop	Free	Free
Flared Lane	No		
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance	No		
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.51	0.10	0.03	0.00	0.00	0.00
d_M, Delay for Movement [s/veh]	20.77	18.13	7.64	0.00	0.00	0.00
Movement LOS	C	C	A	A	A	A
95th-Percentile Queue Length [veh/ln]	4.14	4.14	0.07	0.07	0.00	0.00
95th-Percentile Queue Length [ft/ln]	103.58	103.58	1.83	1.83	0.00	0.00
d_A, Approach Delay [s/veh]	20.10		1.24		0.00	
Approach LOS	C		A		A	
d_I, Intersection Delay [s/veh]	9.45					
Intersection LOS	C					

Intersection Level Of Service Report

Intersection 7: 56th St W & Grand Ave

Control Type:	Two-way stop	Delay (sec / veh):	43.1
Analysis Method:	HCM 7th Edition	Level Of Service:	E
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.230

Intersection Setup

Name	56th St W		Grand Ave		Grand Ave	
Approach	Northbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Thru	Right	Left	Thru
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	1	0	1	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	45.00		35.00		45.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		No		No	

Volumes

Name	56th St W		Grand Ave		Grand Ave	
Base Volume Input [veh/h]	17	113	401	153	110	242
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	5.90	6.20	0.70	2.60	3.60	2.10
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	17	113	401	153	110	242
Peak Hour Factor	0.6100	0.6100	0.8100	0.8100	0.5800	0.5800
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	7	46	124	47	47	104
Total Analysis Volume [veh/h]	28	185	495	189	190	417
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Stop	Free	Free
Flared Lane			
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance	No		
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.23	0.37	0.00	0.00	0.21	0.00
d_M, Delay for Movement [s/veh]	43.09	16.36	0.00	0.00	10.05	0.00
Movement LOS	E	C	A	A	B	A
95th-Percentile Queue Length [veh/ln]	0.83	1.69	0.00	0.00	0.79	0.00
95th-Percentile Queue Length [ft/ln]	20.86	42.22	0.00	0.00	19.84	0.00
d_A, Approach Delay [s/veh]	19.88		0.00		3.15	
Approach LOS	C		A		A	
d_I, Intersection Delay [s/veh]	4.09					
Intersection LOS	E					

Intersection Level Of Service Report

Intersection 8: 54th St W & Grand Ave

Control Type:	Signalized	Delay (sec / veh):	13.4
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.506

Intersection Setup

Name	54th St W		Grand Ave		Grand Ave	
Approach	Southbound		Eastbound		Westbound	
Lane Configuration	↵↵		↵↑		↑↵	
Turning Movement	Left	Right	Left	Thru	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	1	1	0	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	300.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	45.00		45.00		45.00	
Grade [%]	0.00		0.00		0.00	
Curb Present	No		No		No	
Crosswalk	Yes		Yes		No	

Volumes

Name	54th St W		Grand Ave		Grand Ave	
Base Volume Input [veh/h]	205	169	129	402	181	64
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	1.50	0.60	3.10	1.70	4.40	3.10
Proportion of CAVs [%]	0.00					
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	85	0	0	0	32
Total Hourly Volume [veh/h]	205	84	129	402	181	32
Peak Hour Factor	0.6500	0.6500	0.7400	0.7400	0.6700	0.6700
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	79	32	44	136	68	12
Total Analysis Volume [veh/h]	315	129	174	543	270	48
Presence of On-Street Parking	No	No	No	No	No	No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0		0		0	
v_di, Inbound Pedestrian Volume crossing m	0		0		0	
v_co, Outbound Pedestrian Volume crossing	0		0		0	
v_ci, Inbound Pedestrian Volume crossing mi	0		0		0	
v_ab, Corner Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	0		0		0	

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Active Pattern	Free Running
Coordination Type	<i>Free Running</i>
Actuation Type	<i>Fully actuated</i>
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing

Control Type	Permissive	Overlap	ProtPerm	Permissive	Permissive	Permissive
Signal Group	5	2	3	8	4	0
Auxiliary Signal Groups		2,3				
Lead / Lag	Lead	-	Lag	-	-	-
Minimum Green [s]	5	5	5	5	5	0
Maximum Green [s]	50	50	50	50	50	0
Amber [s]	4.8	4.8	4.8	4.8	4.8	0.0
All red [s]	1.5	1.5	1.5	1.5	1.5	0.0
Split [s]	9	9	9	57	14	0
Vehicle Extension [s]	3.0	3.0	3.0	3.0	3.0	0.0
Walk [s]	7	0	0	7	7	0
Pedestrian Clearance [s]	14	0	0	14	14	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk	No			No	No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	4.3	4.3	4.3	4.3	4.3	0.0
Minimum Recall	No	No	No	No	No	
Maximum Recall	No	No	No	No	No	
Pedestrian Recall	No	No	No	No	No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	R	L	C	C	R
C, Cycle Length [s]	42	42	42	42	42	42
L, Total Lost Time per Cycle [s]	6.30	6.30	6.30	6.30	6.30	6.30
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	2.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	4.30	0.00	0.00	4.30	4.30	4.30
g_i, Effective Green Time [s]	10	21	20	20	9	9
g / C, Green / Cycle	0.24	0.49	0.46	0.46	0.21	0.21
(v / s)_i Volume / Saturation Flow Rate	0.19	0.09	0.12	0.31	0.16	0.03
s, saturation flow rate [veh/h]	1647	1480	1421	1726	1689	1451
c, Capacity [veh/h]	398	729	577	799	358	308
d1, Uniform Delay [s]	15.17	6.02	10.52	8.98	15.76	13.70
k, delay calibration	0.11	0.11	0.11	0.11	0.11	0.11
l, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	3.57	0.11	0.29	1.02	3.23	0.23
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.79	0.18	0.30	0.68	0.75	0.16
d, Delay for Lane Group [s/veh]	18.73	6.13	10.81	10.00	19.00	13.93
Lane Group LOS	B	A	B	A	B	B
Critical Lane Group	Yes	No	No	Yes	No	No
50th-Percentile Queue Length [veh/ln]	2.50	0.37	0.59	2.43	2.17	0.31
50th-Percentile Queue Length [ft/ln]	62.39	9.15	14.68	60.65	54.18	7.63
95th-Percentile Queue Length [veh/ln]	4.49	0.66	1.06	4.37	3.90	0.55
95th-Percentile Queue Length [ft/ln]	112.30	16.47	26.43	109.16	97.53	13.73

Movement, Approach, & Intersection Results

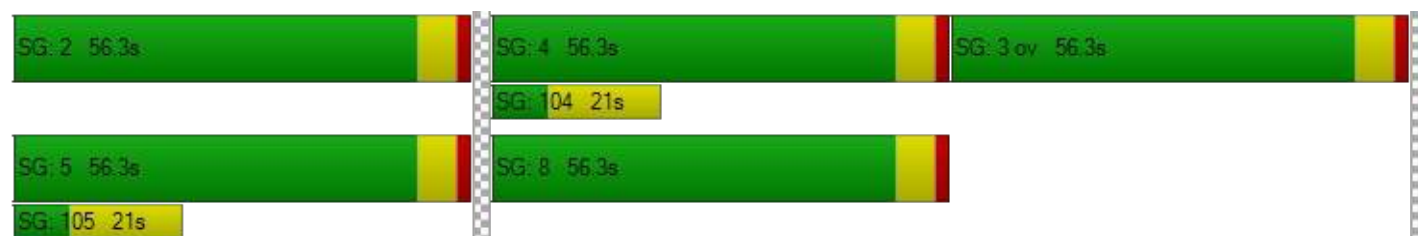
d_M, Delay for Movement [s/veh]	18.73	6.13	10.81	10.00	19.00	13.93
Movement LOS	B	A	B	A	B	B
d_A, Approach Delay [s/veh]	15.07		10.20		18.23	
Approach LOS	B		B		B	
d_I, Intersection Delay [s/veh]	13.39					
Intersection LOS	B					
Intersection V/C	0.506					

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	0.0
M_corner, Corner Circulation Area [ft ² /ped]	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft ² /ped]	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	11.66	11.66	0.00
I_p,int, Pedestrian LOS Score for Intersection	2.572	2.482	0.000
Crosswalk LOS	B	B	F
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	2354	2354	2354
d_b, Bicycle Delay [s]	0.67	0.67	0.67
I_b,int, Bicycle LOS Score for Intersection	1.560	2.743	2.137
Bicycle LOS	A	B	B

Sequence

Ring 1	-	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	-	-	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 1: 70th St W & Rimrock Rd

Control Type:	Two-way stop	Delay (sec / veh):	9.6
Analysis Method:	HCM 7th Edition	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.040

Intersection Setup

Name	70th St W			70th St W			Rimrock Rd			Rimrock Rd		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration	⬆			⬆			⬆			⬆		
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	40.00			25.00			25.00			50.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name	70th St W			70th St W			Rimrock Rd			Rimrock Rd		
Base Volume Input [veh/h]	0	25	21	14	8	0	0	0	0	11	0	24
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	25	21	14	8	0	0	0	0	11	0	24
Peak Hour Factor	0.7500	0.7500	0.7500	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.7700	0.7700	0.7700
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	8	7	4	2	0	0	0	0	4	0	8
Total Analysis Volume [veh/h]	0	33	28	14	8	0	0	0	0	14	0	31
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	No	No		
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance	No	No		
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.04	0.03	0.02	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00
d_M, Delay for Movement [s/veh]	9.10	9.62	8.57	9.33	9.42	8.48	7.26	0.00	0.00	7.22	0.00	0.00
Movement LOS	A	A	A	A	A	A	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0.21	0.21	0.21	0.08	0.08	0.08	0.00	0.00	0.00	0.03	0.03	0.03
95th-Percentile Queue Length [ft/ln]	5.25	5.25	5.25	2.00	2.00	2.00	0.00	0.00	0.00	0.71	0.71	0.71
d_A, Approach Delay [s/veh]	9.14			9.36			2.42			2.25		
Approach LOS	A			A			A			A		
d_I, Intersection Delay [s/veh]	6.75											
Intersection LOS	A											

Intersection Level Of Service Report

Intersection 2: Rimrock Rd & 62nd St W

Control Type: Roundabout
 Analysis Method: HCM 7th Edition
 Analysis Period: 15 minutes

Delay (sec / veh): 6.7
 Level Of Service: A

Intersection Setup

Name	62nd St W			62nd St W			Rimrock Rd			Rimrock Rd		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	50.00			50.00			50.00			50.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	62nd St W			62nd St W			Rimrock Rd			Rimrock Rd		
Base Volume Input [veh/h]	65	90	45	118	56	1	5	71	26	33	130	234
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	2.20	1.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.40
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	65	90	45	118	56	1	5	71	26	33	130	234
Peak Hour Factor	0.8900	0.8900	0.8900	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.7200	0.7200	0.7200
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	18	25	13	30	14	0	1	18	7	11	45	81
Total Analysis Volume [veh/h]	73	101	51	118	56	1	5	71	26	46	181	325
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Number of Conflicting Circulating Lanes	1			1			1			1		
Circulating Flow Rate [veh/h]	196			300			222			179		
Exiting Flow Rate [veh/h]	128			432			255			243		
Demand Flow Rate [veh/h]	65	90	45	118	56	1	5	71	26	33	130	234
Adjusted Demand Flow Rate [veh/h]	73	101	51	118	56	1	5	71	26	46	181	325

Lanes

Override Calculated Critical Headway	No			No			No			No		
User-Defined Critical Headway [s]	4.00			4.00			4.00			4.00		
Override Calculated Follow-Up Time	No			No			No			No		
User-Defined Follow-Up Time [s]	3.00			3.00			3.00			3.00		
A (intercept)	1380.00			1380.00			1380.00			1380.00		
B (coefficient)	0.00102			0.00102			0.00102			0.00102		
HV Adjustment Factor	1.00			0.99			1.00			1.00		
Entry Flow Rate [veh/h]	227			177			102			554		
Capacity of Entry and Bypass Lanes [veh/h]	1130			1017			1101			1150		
Pedestrian Impedance	1.00			1.00			1.00			1.00		
Capacity per Entry Lane [veh/h]	1125			1005			1101			1148		
X, volume / capacity	0.20			0.17			0.09			0.48		

Movement, Approach, & Intersection Results

Lane LOS	A	A	A	A
95th-Percentile Queue Length [veh]	0.75	0.63	0.31	2.69
95th-Percentile Queue Length [ft]	18.64	15.72	7.64	67.15
Approach Delay [s/veh]	5.00	5.21	4.07	8.42
Approach LOS	A	A	A	A
Intersection Delay [s/veh]	6.74			
Intersection LOS	A			

Intersection Level Of Service Report
Intersection 3: 54th St W & Rimrock Rd

Control Type:	Signalized	Delay (sec / veh):	13.3
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.382

Intersection Setup

Name	54th St W			54th St W			Rimrock Rd			Rimrock Rd		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	1	0	0	1	0	0	1	0	1
Entry Pocket Length [ft]	200.00	100.00	100.00	150.00	100.00	100.00	200.00	100.00	100.00	150.00	100.00	150.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	45.00			45.00			50.00			45.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	54th St W			54th St W			Rimrock Rd			Rimrock Rd		
Base Volume Input [veh/h]	65	55	110	64	39	3	2	212	25	148	348	88
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	1.80	0.00	3.10	0.00	0.00	0.00	1.40	0.00	0.00	0.30	0.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	55	0	0	0	0	0	0	0	0	44
Total Hourly Volume [veh/h]	65	55	55	64	39	3	2	212	25	148	348	44
Peak Hour Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.7800	0.7800	0.7800
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	16	14	14	16	10	1	1	53	6	47	112	14
Total Analysis Volume [veh/h]	65	55	55	64	39	3	2	212	25	190	446	56
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing m	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	100
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	50.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing

Control Type	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	ProtPer	Permiss	Permiss	ProtPer	Permiss	Permiss
Signal Group	0	6	0	0	2	0	3	4	0	7	8	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	-	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	0	5	0	0	5	0	5	5	0	5	5	0
Maximum Green [s]	0	30	0	0	30	0	15	40	0	15	40	0
Amber [s]	0.0	4.8	0.0	0.0	4.8	0.0	4.8	4.8	0.0	4.8	4.8	0.0
All red [s]	0.0	1.7	0.0	0.0	1.7	0.0	1.7	1.7	0.0	1.7	1.7	0.0
Split [s]	0	35	0	0	35	0	15	50	0	15	50	0
Vehicle Extension [s]	0.0	3.0	0.0	0.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
Walk [s]	0	7	0	0	7	0	0	7	0	0	7	0
Pedestrian Clearance [s]	0	11	0	0	11	0	0	11	0	0	11	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			Yes			Yes	
I1, Start-Up Lost Time [s]	0.0	2.0	0.0	0.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	4.5	0.0	0.0	4.5	0.0	4.5	4.5	0.0	4.5	4.5	0.0
Minimum Recall		No			No		No	Yes		No	Yes	
Maximum Recall		No			No		No	No		No	No	
Pedestrian Recall		No			No		No	Yes		No	Yes	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	L	C	L	C	L	C	R
C, Cycle Length [s]	49	49	49	49	49	49	49	49	49
L, Total Lost Time per Cycle [s]	6.50	6.50	6.50	6.50	6.50	6.50	6.50	6.50	6.50
l1_p, Permitted Start-Up Lost Time [s]	2.00	0.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	4.50	4.50	4.50	4.50	0.00	4.50	0.00	4.50	4.50
g_i, Effective Green Time [s]	7	7	7	7	29	23	29	18	18
g / C, Green / Cycle	0.14	0.14	0.14	0.14	0.60	0.46	0.60	0.37	0.37
(v / s)_i Volume / Saturation Flow Rate	0.05	0.07	0.05	0.02	0.00	0.14	0.15	0.26	0.04
s, saturation flow rate [veh/h]	1386	1585	1272	1728	1148	1699	1242	1746	1488
c, Capacity [veh/h]	256	218	192	238	706	784	865	644	549
d1, Uniform Delay [s]	21.85	19.63	23.94	18.73	5.10	8.28	4.67	13.13	10.16
k, delay calibration	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
l, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.51	1.80	1.01	0.35	0.00	0.21	0.13	1.34	0.08
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.25	0.50	0.33	0.18	0.00	0.30	0.22	0.69	0.10
d, Delay for Lane Group [s/veh]	22.36	21.44	24.95	19.08	5.11	8.49	4.80	14.47	10.24
Lane Group LOS	C	C	C	B	A	A	A	B	B
Critical Lane Group	No	Yes	No	No	No	No	Yes	Yes	No
50th-Percentile Queue Length [veh/ln]	0.65	1.07	0.70	0.37	0.00	1.03	0.45	3.26	0.31
50th-Percentile Queue Length [ft/ln]	16.20	26.87	17.45	9.37	0.09	25.67	11.13	81.49	7.64
95th-Percentile Queue Length [veh/ln]	1.17	1.93	1.26	0.67	0.01	1.85	0.80	5.87	0.55
95th-Percentile Queue Length [ft/ln]	29.16	48.37	31.41	16.87	0.17	46.21	20.04	146.68	13.75

Movement, Approach, & Intersection Results

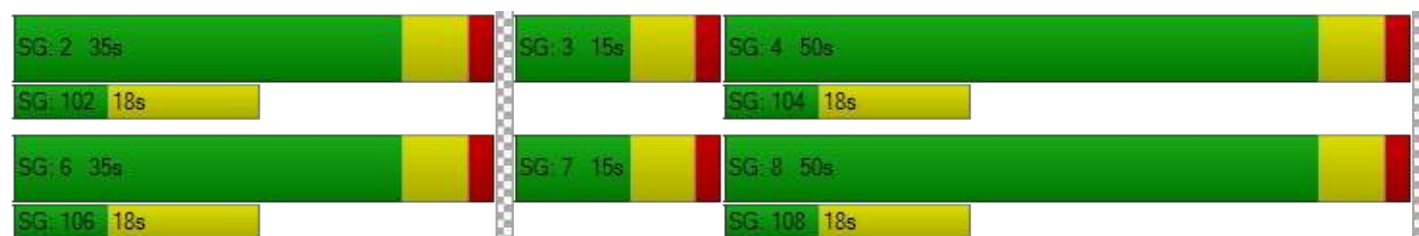
d_M, Delay for Movement [s/veh]	22.36	21.44	21.44	24.95	19.08	19.08	5.11	8.49	8.49	4.80	14.47	10.24
Movement LOS	C	C	C	C	B	B	A	A	A	A	B	B
d_A, Approach Delay [s/veh]	21.78			22.62			8.46			11.47		
Approach LOS	C			C			A			B		
d_I, Intersection Delay [s/veh]	13.34											
Intersection LOS	B											
Intersection V/C	0.382											

Other Modes

g_Walk,mi, Effective Walk Time [s]	23.0		23.0		11.0		11.0	
M_corner, Corner Circulation Area [ft ² /ped]	0.00		0.00		0.00		0.00	
M_CW, Crosswalk Circulation Area [ft ² /ped]	0.00		0.00		0.00		0.00	
d_p, Pedestrian Delay [s]	6.92		6.92		14.76		14.76	
I_p,int, Pedestrian LOS Score for Intersection	2.325		2.004		2.406		2.660	
Crosswalk LOS	B		B		B		B	
s_b, Saturation Flow Rate of the bicycle lane	2000		2000		2000		2000	
c_b, Capacity of the bicycle lane [bicycles/h]	1162		1162		1774		1774	
d_b, Bicycle Delay [s]	4.30		4.30		0.31		0.31	
I_b,int, Bicycle LOS Score for Intersection	1.939		1.735		1.954		2.774	
Bicycle LOS	A		A		A		C	

Sequence

Ring 1	-	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	6	7	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report

Intersection 4: 70th St W & Colton Blvd

Control Type:	Two-way stop	Delay (sec / veh):	9.1
Analysis Method:	HCM 7th Edition	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.001

Intersection Setup

Name	70th St W		70th St W		Colton Blvd	
Approach	Northbound		Southbound		Westbound	
Lane Configuration						
Turning Movement	Thru	Right	Left	Thru	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	40.00		40.00		25.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	70th St W		70th St W		Colton Blvd	
Base Volume Input [veh/h]	47	2	19	2	1	1
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	0.00	5.30	0.00	0.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	47	2	19	2	1	1
Peak Hour Factor	0.9400	0.9400	0.7500	0.7500	1.0000	1.0000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	13	1	6	1	0	0
Total Analysis Volume [veh/h]	50	2	25	3	1	1
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Free	Free	Stop
Flared Lane			No
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance			No
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.00	0.02	0.00	0.00	0.00
d_M, Delay for Movement [s/veh]	0.00	0.00	7.33	0.00	9.08	8.53
Movement LOS	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0.00	0.00	0.04	0.04	0.01	0.01
95th-Percentile Queue Length [ft/ln]	0.00	0.00	1.09	1.09	0.16	0.16
d_A, Approach Delay [s/veh]	0.00		6.54		8.80	
Approach LOS	A		A		A	
d_I, Intersection Delay [s/veh]	2.45					
Intersection LOS	A					

Intersection Level Of Service Report

Intersection 5: 70th St W & Grand Ave

Control Type:	Two-way stop	Delay (sec / veh):	9.8
Analysis Method:	HCM 7th Edition	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.015

Intersection Setup

Name	70th St W		Grand Ave		Grand Ave	
Approach	Southbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Left	Thru	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	40.00		50.00		50.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	70th St W		Grand Ave		Grand Ave	
Base Volume Input [veh/h]	12	8	7	65	90	44
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	5.00	0.00	3.10	1.10	0.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	12	8	7	65	90	44
Peak Hour Factor	1.0000	1.0000	0.9400	0.9400	0.8600	0.8600
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	3	2	2	17	26	13
Total Analysis Volume [veh/h]	12	8	7	69	105	51
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Stop	Free	Free
Flared Lane	No		
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance	No		
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.02	0.01	0.00	0.00	0.00	0.00
d_M, Delay for Movement [s/veh]	9.75	9.06	7.51	0.00	0.00	0.00
Movement LOS	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0.07	0.07	0.01	0.01	0.00	0.00
95th-Percentile Queue Length [ft/ln]	1.86	1.86	0.29	0.29	0.00	0.00
d_A, Approach Delay [s/veh]	9.47		0.69		0.00	
Approach LOS	A		A		A	
d_I, Intersection Delay [s/veh]	0.96					
Intersection LOS	A					

Intersection Level Of Service Report

Intersection 6: 62nd St W & Grand Ave

Control Type:	Two-way stop	Delay (sec / veh):	15.5
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.168

Intersection Setup

Name	62nd St W		Grand Ave		Grand Ave	
Approach	Southbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Left	Thru	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	50.00		45.00		35.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	62nd St W		Grand Ave		Grand Ave	
Base Volume Input [veh/h]	71	42	84	150	176	116
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	2.40	1.20	1.30	1.10	0.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	71	42	84	150	176	116
Peak Hour Factor	1.0000	1.0000	0.8800	0.8800	0.9300	0.9300
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	18	11	24	43	47	31
Total Analysis Volume [veh/h]	71	42	95	170	189	125
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Stop	Free	Free
Flared Lane	No		
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance	No		
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.17	0.05	0.08	0.00	0.00	0.00
d_M, Delay for Movement [s/veh]	15.55	11.58	7.99	0.00	0.00	0.00
Movement LOS	C	B	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0.84	0.84	0.17	0.17	0.00	0.00
95th-Percentile Queue Length [ft/ln]	21.03	21.03	4.18	4.18	0.00	0.00
d_A, Approach Delay [s/veh]	14.07		2.86		0.00	
Approach LOS	B		A		A	
d_I, Intersection Delay [s/veh]	3.39					
Intersection LOS	C					

Intersection Level Of Service Report

Intersection 7: 56th St W & Grand Ave

Control Type:	Two-way stop	Delay (sec / veh):	22.3
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.343

Intersection Setup

Name	56th St W		Grand Ave		Grand Ave	
Approach	Northbound		Eastbound		Westbound	
Lane Configuration	↔↔		↑		↔↑	
Turning Movement	Left	Right	Thru	Right	Left	Thru
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	1	0	1	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	45.00		35.00		45.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		No		No	

Volumes

Name	56th St W		Grand Ave		Grand Ave	
Base Volume Input [veh/h]	90	130	197	57	110	355
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.80	0.50	1.80	0.00	1.60
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	90	130	197	57	110	355
Peak Hour Factor	0.8300	0.8300	0.9400	0.9400	0.9800	0.9800
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	27	39	52	15	28	91
Total Analysis Volume [veh/h]	108	157	210	61	112	362
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Stop	Free	Free
Flared Lane			
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance	No		
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.34	0.20	0.00	0.00	0.09	0.00
d_M, Delay for Movement [s/veh]	22.30	10.58	0.00	0.00	8.02	0.00
Movement LOS	C	B	A	A	A	A
95th-Percentile Queue Length [veh/ln]	1.48	0.72	0.00	0.00	0.28	0.00
95th-Percentile Queue Length [ft/ln]	37.05	18.11	0.00	0.00	7.03	0.00
d_A, Approach Delay [s/veh]	15.36		0.00		1.89	
Approach LOS	C		A		A	
d_I, Intersection Delay [s/veh]	4.92					
Intersection LOS	C					

Intersection Level Of Service Report

Intersection 8: 54th St W & Grand Ave

Control Type:	Signalized	Delay (sec / veh):	11.4
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.290

Intersection Setup

Name	54th St W		Grand Ave		Grand Ave	
Approach	Southbound		Eastbound		Westbound	
Lane Configuration	↵↵		↵↑		↑↵	
Turning Movement	Left	Right	Left	Thru	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	1	1	0	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	300.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	45.00		45.00		45.00	
Grade [%]	0.00		0.00		0.00	
Curb Present	No		No		No	
Crosswalk	Yes		Yes		No	

Volumes

Name	54th St W		Grand Ave		Grand Ave	
Base Volume Input [veh/h]	116	73	110	209	324	165
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.90	1.40	0.00	1.00	0.90	0.00
Proportion of CAVs [%]	0.00					
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	37	0	0	0	83
Total Hourly Volume [veh/h]	116	36	110	209	324	82
Peak Hour Factor	0.8900	0.8900	0.8900	0.8900	1.0000	1.0000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	33	10	31	59	81	21
Total Analysis Volume [veh/h]	130	40	124	235	324	82
Presence of On-Street Parking	No	No	No	No	No	No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0		0		0	
v_di, Inbound Pedestrian Volume crossing m	0		0		0	
v_co, Outbound Pedestrian Volume crossing	0		0		0	
v_ci, Inbound Pedestrian Volume crossing mi	0		0		0	
v_ab, Corner Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	0		0		0	

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Active Pattern	Free Running
Coordination Type	<i>Free Running</i>
Actuation Type	<i>Fully actuated</i>
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing

Control Type	Permissive	Overlap	ProtPerm	Permissive	Permissive	Permissive
Signal Group	5	2	3	8	4	0
Auxiliary Signal Groups		2,3				
Lead / Lag	Lead	-	Lag	-	-	-
Minimum Green [s]	5	5	5	5	5	0
Maximum Green [s]	50	50	50	50	50	0
Amber [s]	4.8	4.8	4.8	4.8	4.8	0.0
All red [s]	1.5	1.5	1.5	1.5	1.5	0.0
Split [s]	9	9	9	57	14	0
Vehicle Extension [s]	3.0	3.0	3.0	3.0	3.0	0.0
Walk [s]	7	0	0	7	7	0
Pedestrian Clearance [s]	14	0	0	14	14	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk	No			No	No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	4.3	4.3	4.3	4.3	4.3	0.0
Minimum Recall	No	No	No	No	No	
Maximum Recall	No	No	No	No	No	
Pedestrian Recall	No	No	No	No	No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	R	L	C	C	R
C, Cycle Length [s]	35	35	35	35	35	35
L, Total Lost Time per Cycle [s]	6.30	6.30	6.30	6.30	6.30	6.30
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	2.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	4.30	0.00	0.00	4.30	4.30	4.30
g_i, Effective Green Time [s]	4	13	19	19	9	9
g / C, Green / Cycle	0.10	0.39	0.53	0.53	0.25	0.25
(v / s)_i Volume / Saturation Flow Rate	0.08	0.03	0.09	0.14	0.19	0.06
s, saturation flow rate [veh/h]	1655	1471	1420	1736	1738	1488
c, Capacity [veh/h]	173	568	676	929	440	377
d1, Uniform Delay [s]	15.21	6.77	7.64	4.37	11.98	10.31
k, delay calibration	0.11	0.11	0.11	0.11	0.11	0.11
l, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	6.45	0.05	0.13	0.14	2.42	0.29
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.75	0.07	0.18	0.25	0.74	0.22
d, Delay for Lane Group [s/veh]	21.66	6.82	7.77	4.51	14.39	10.60
Lane Group LOS	C	A	A	A	B	B
Critical Lane Group	Yes	No	Yes	No	Yes	No
50th-Percentile Queue Length [veh/ln]	1.03	0.11	0.15	0.29	1.76	0.35
50th-Percentile Queue Length [ft/ln]	25.76	2.65	3.75	7.30	43.91	8.71
95th-Percentile Queue Length [veh/ln]	1.85	0.19	0.27	0.53	3.16	0.63
95th-Percentile Queue Length [ft/ln]	46.36	4.77	6.76	13.14	79.04	15.68

Movement, Approach, & Intersection Results

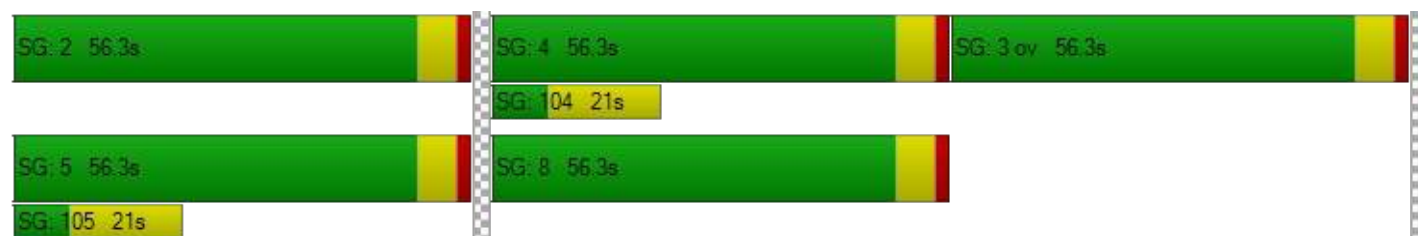
d_M, Delay for Movement [s/veh]	21.66	6.82	7.77	4.51	14.39	10.60
Movement LOS	C	A	A	A	B	B
d_A, Approach Delay [s/veh]	18.17		5.64		13.63	
Approach LOS	B		A		B	
d_I, Intersection Delay [s/veh]	11.38					
Intersection LOS	B					
Intersection V/C	0.290					

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	0.0
M_corner, Corner Circulation Area [ft ² /ped]	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft ² /ped]	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	8.15	8.15	0.00
I_p,int, Pedestrian LOS Score for Intersection	2.293	2.252	0.000
Crosswalk LOS	B	B	F
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	2871	2871	2871
d_b, Bicycle Delay [s]	3.30	3.30	3.30
I_b,int, Bicycle LOS Score for Intersection	1.560	2.152	2.366
Bicycle LOS	A	B	B

Sequence

Ring 1	-	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	-	-	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



**CAPACITY CALCULATIONS –
1ST FILING (2029) AND FULL BUILDOUT (2031)**

APPENDIX C

Intelligent Infrastructure.
Enduring Communities.



Intersection	Approach	1st Filing (2029)					
		AM Peak			PM Peak		
		Avg Delay (s/veh)	LOS	95th % Queue (veh)	Avg Delay (s/veh)	LOS	95th % Queue (veh)
Intersection Control		Two-Way Stop-Control (NB/SB)					
70th St W & Rimrock Rd	NB	9.9	A	1	10.7	B	1
	SB	11.3	B	1	11.4	B	1
	EB	0.0	A	0	0.0	A	0
	WB	2.1	A	1	0.5	A	1
	Intersection	5.6	A	--	4.4	A	--
Intersection Control		Roundabout					
Rimrock Rd & 62nd St W	NB	7.1	A	1	6.5	A	2
	SB	8.2	A	3	6.8	A	2
	EB	15.1	C	5	5.4	A	1
	WB	4.4	A	1	10.4	B	4
	Intersection	9.9	A	--	8.2	A	--
Intersection Control		Signalized					
54th St W & Rimrock Rd	NB	21.0	C	3	21.2	C	3
	SB	25.2	C	4	22.1	C	2
	EB	25.5	C	15	11.6	B	5
	WB	14.9	B	3	16.0	B	9
	Intersection	22.3	C	--	16.4	B	--
Intersection Control		One-Way Stop-Control (WB)					
70th St W & Colton Blvd	NB	0.0	A	0	0.0	A	0
	SB	7.3	A	1	7.2	A	1
	WB	10.1	B	0	9.2	A	1
	Intersection	5.8	A	--	2.5	A	--
Intersection Control		One-Way Stop-Control (SB)					
70th St W & Grand Ave	SB	10.0	B	1	10.1	B	1
	EB	0.2	A	1	1.3	A	1
	WB	0.0	A	0	0.0	A	0
	Intersection	3.5	A	--	1.8	A	--
Intersection Control		One-Way Stop-Control (SB)					
62nd St W & Grand Ave	SB	23.8	C	5	19.6	C	2
	EB	1.2	A	1	2.8	A	1
	WB	0.0	A	0	0.0	A	0
	Intersection	10.1	B	--	4.5	A	--
Intersection Control		One-Way Stop-Control (NB)					
56th St W & Grand Ave	NB	19.1	C	2	28.0	D	4
	EB	0.0	A	0	0.0	A	0
	WB	3.1	A	1	1.9	A	1
	Intersection	3.4	A	--	7.6	A	--
Intersection Control		Signalized					
54th St W & Grand Ave	SB	14.6	B	4	19.4	B	3
	EB	9.5	A	4	6.7	A	1
	WB	17.5	B	4	14.8	B	6
	Intersection	12.6	B	--	12.7	B	--
Intersection Control		One-Way Stop-Control (SB)					
East Site Access & Rimrock Rd	SB	9.1	A	1	9.1	A	1
	EB	0.0	A	0	0.0	A	0
	WB	0.0	A	0	0.0	A	0
	Intersection	6.8	A	--	3.5	A	--

Intersection Level Of Service Report

Intersection 1: 70th St W & Rimrock Rd

Control Type: Two-way stop
 Analysis Method: HCM 7th Edition
 Analysis Period: 15 minutes

Delay (sec / veh): 11.5
 Level Of Service: B
 Volume to Capacity (v/c): 0.091

Intersection Setup

Name	70th St W			70th St W			Rimrock Rd			Rimrock Rd		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	40.00			25.00			30.00			50.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name	70th St W			70th St W			Rimrock Rd			Rimrock Rd		
Base Volume Input [veh/h]	6	9	8	70	57	0	0	82	21	20	28	25
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	0.00	0.00	2.60	0.00	0.00	0.00	0.00	5.90	0.00	5.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	6	9	8	70	57	0	0	82	21	20	28	25
Peak Hour Factor	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	2	2	2	19	15	0	0	22	6	5	8	7
Total Analysis Volume [veh/h]	7	10	9	76	62	0	0	89	23	22	30	27
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	No	No		
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance	No	No		
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.01	0.01	0.01	0.10	0.09	0.00	0.00	0.00	0.00	0.02	0.00	0.00
d_M, Delay for Movement [s/veh]	10.59	10.41	8.92	11.10	11.47	9.70	7.31	0.00	0.00	7.51	0.00	0.00
Movement LOS	B	B	A	B	B	A	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0.11	0.11	0.11	0.71	0.71	0.71	0.00	0.00	0.00	0.04	0.04	0.04
95th-Percentile Queue Length [ft/ln]	2.67	2.67	2.67	17.86	17.86	17.86	0.00	0.00	0.00	1.02	1.02	1.02
d_A, Approach Delay [s/veh]	9.94			11.27			0.00			2.09		
Approach LOS	A			B			A			A		
d_I, Intersection Delay [s/veh]	5.57											
Intersection LOS	B											

Intersection Level Of Service Report
Intersection 2: Rimrock Rd & 62nd St W

Control Type: Roundabout
Analysis Method: HCM 7th Edition
Analysis Period: 15 minutes

Delay (sec / veh): 9.9
Level Of Service: A

Intersection Setup

Name	62nd St W			62nd St W			Rimrock Rd			Rimrock Rd		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration	⬆			⬆			⬆			⬆		
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	50.00			50.00			50.00			50.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	62nd St W			62nd St W			Rimrock Rd			Rimrock Rd		
Base Volume Input [veh/h]	24	23	41	353	145	4	8	275	127	54	64	75
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	5.00	5.00	0.00	1.30	0.80	0.00	0.00	1.30	0.00	0.00	5.00	12.50
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	24	23	41	353	145	4	8	275	127	54	64	75
Peak Hour Factor	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	7	6	11	96	39	1	2	75	35	15	17	20
Total Analysis Volume [veh/h]	26	25	45	384	158	4	9	299	138	59	70	82
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Number of Conflicting Circulating Lanes	1			1			1			1		
Circulating Flow Rate [veh/h]	701			160			607			63		
Exiting Flow Rate [veh/h]	356			128			105			737		
Demand Flow Rate [veh/h]	24	23	41	353	145	4	8	275	127	54	64	75
Adjusted Demand Flow Rate [veh/h]	26	25	45	384	158	4	9	299	138	59	70	82

Lanes

Override Calculated Critical Headway	No			No			No			No		
User-Defined Critical Headway [s]	4.00			4.00			4.00			4.00		
Override Calculated Follow-Up Time	No			No			No			No		
User-Defined Follow-Up Time [s]	3.00			3.00			3.00			3.00		
A (intercept)	1380.00			1380.00			1380.00			1380.00		
B (coefficient)	0.00102			0.00102			0.00102			0.00102		
HV Adjustment Factor	0.97			0.99			0.99			0.94		
Entry Flow Rate [veh/h]	99			553			450			225		
Capacity of Entry and Bypass Lanes [veh/h]	676			1173			743			1295		
Pedestrian Impedance	1.00			1.00			1.00			1.00		
Capacity per Entry Lane [veh/h]	658			1160			737			1219		
X, volume / capacity	0.15			0.47			0.61			0.17		

Movement, Approach, & Intersection Results

Lane LOS	A	A	C	A
95th-Percentile Queue Length [veh]	0.51	2.58	4.14	0.63
95th-Percentile Queue Length [ft]	12.72	64.61	103.40	15.63
Approach Delay [s/veh]	7.13	8.19	15.13	4.44
Approach LOS	A	A	C	A
Intersection Delay [s/veh]	9.89			
Intersection LOS	A			

Intersection Level Of Service Report
Intersection 3: 54th St W & Rimrock Rd

Control Type:	Signalized	Delay (sec / veh):	22.3
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.523

Intersection Setup

Name	54th St W			54th St W			Rimrock Rd			Rimrock Rd		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	1	0	0	1	0	0	1	0	1
Entry Pocket Length [ft]	200.00	100.00	100.00	150.00	100.00	100.00	200.00	100.00	100.00	150.00	100.00	150.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	45.00			45.00			50.00			45.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	54th St W			54th St W			Rimrock Rd			Rimrock Rd		
Base Volume Input [veh/h]	37	22	208	138	69	3	9	583	93	151	157	41
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	5.00	5.30	0.60	1.70	0.00	2.00	0.00	1.30	3.30	0.80	6.00	2.90
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	104	0	0	2	0	0	47	0	0	21
Total Hourly Volume [veh/h]	37	22	104	138	69	1	9	583	46	151	157	20
Peak Hour Factor	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	10	6	28	38	19	0	2	158	13	41	43	5
Total Analysis Volume [veh/h]	40	24	113	150	75	1	10	634	50	164	171	22
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing m	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	100
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	70.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing

Control Type	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	ProtPer	Permiss	Permiss	ProtPer	Permiss	Permiss
Signal Group	0	6	0	5	2	0	3	4	0	7	8	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	Lead	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	0	5	0	5	5	0	5	5	0	5	5	0
Maximum Green [s]	0	30	0	30	30	0	15	40	0	15	40	0
Amber [s]	0.0	4.8	0.0	4.8	4.8	0.0	4.8	4.8	0.0	4.8	4.8	0.0
All red [s]	0.0	1.7	0.0	1.7	1.7	0.0	1.7	1.7	0.0	1.7	1.7	0.0
Split [s]	0	35	0	0	35	0	15	50	0	15	50	0
Vehicle Extension [s]	0.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
Walk [s]	0	7	0	0	7	0	0	7	0	0	7	0
Pedestrian Clearance [s]	0	11	0	0	11	0	0	11	0	0	11	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			Yes			Yes	
I1, Start-Up Lost Time [s]	0.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	4.5	0.0	4.5	4.5	0.0	4.5	4.5	0.0	4.5	4.5	0.0
Minimum Recall		No			No		No	Yes		No	Yes	
Maximum Recall		No			No		No	No		No	No	
Pedestrian Recall		No			No		No	Yes		No	Yes	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	L	C	L	C	L	C	R
C, Cycle Length [s]	66	66	66	66	66	66	66	66	66
L, Total Lost Time per Cycle [s]	6.50	6.50	6.50	6.50	6.50	6.50	6.50	6.50	6.50
l1_p, Permitted Start-Up Lost Time [s]	2.00	0.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	4.50	4.50	4.50	4.50	0.00	4.50	0.00	4.50	4.50
g_i, Effective Green Time [s]	17	17	17	17	36	28	36	24	24
g / C, Green / Cycle	0.26	0.26	0.26	0.26	0.55	0.43	0.55	0.37	0.37
(v / s)_i Volume / Saturation Flow Rate	0.03	0.09	0.12	0.04	0.01	0.40	0.18	0.10	0.02
s, saturation flow rate [veh/h]	1291	1464	1255	1746	1333	1710	897	1667	1453
c, Capacity [veh/h]	358	375	297	447	804	742	362	612	533
d1, Uniform Delay [s]	22.07	20.04	26.98	18.99	6.97	17.52	13.40	14.66	13.36
k, delay calibration	0.11	0.11	0.11	0.11	0.11	0.18	0.20	0.11	0.11
l, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.14	0.60	1.33	0.18	0.01	8.26	1.62	0.25	0.03
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.11	0.37	0.51	0.17	0.01	0.92	0.45	0.28	0.04
d, Delay for Lane Group [s/veh]	22.21	20.63	28.31	19.17	6.97	25.78	15.01	14.90	13.39
Lane Group LOS	C	C	C	B	A	C	B	B	B
Critical Lane Group	No	No	Yes	No	Yes	Yes	No	No	No
50th-Percentile Queue Length [veh/ln]	0.47	1.57	2.14	0.81	0.05	9.13	1.02	1.56	0.18
50th-Percentile Queue Length [ft/ln]	11.83	39.25	53.52	20.37	1.16	228.27	25.48	38.99	4.56
95th-Percentile Queue Length [veh/ln]	0.85	2.83	3.85	1.47	0.08	14.09	1.83	2.81	0.33
95th-Percentile Queue Length [ft/ln]	21.29	70.65	96.34	36.67	2.09	352.16	45.86	70.18	8.22

Movement, Approach, & Intersection Results

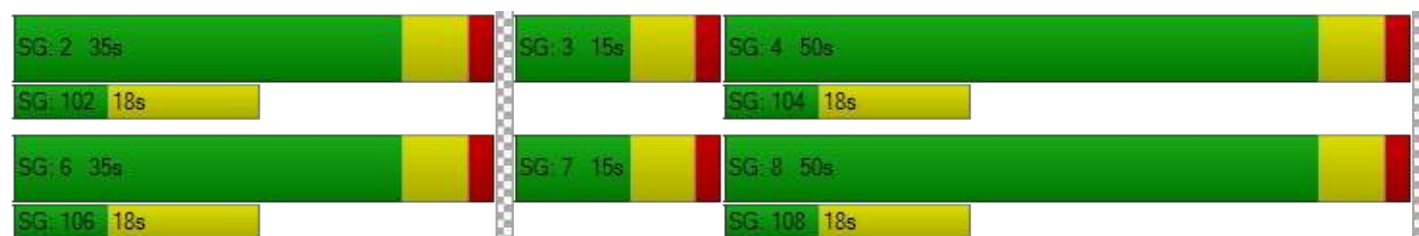
d_M, Delay for Movement [s/veh]	22.21	20.63	20.63	28.31	19.17	19.17	6.97	25.78	25.78	15.01	14.90	13.39
Movement LOS	C	C	C	C	B	B	A	C	C	B	B	B
d_A, Approach Delay [s/veh]	20.99			25.23			25.51			14.86		
Approach LOS	C			C			C			B		
d_I, Intersection Delay [s/veh]	22.30											
Intersection LOS	C											
Intersection V/C	0.523											

Other Modes

g_Walk,mi, Effective Walk Time [s]	23.0			23.0			11.0			11.0		
M_corner, Corner Circulation Area [ft ² /ped]	0.00			0.00			0.00			0.00		
M_CW, Crosswalk Circulation Area [ft ² /ped]	0.00			0.00			0.00			0.00		
d_p, Pedestrian Delay [s]	13.80			13.80			22.68			22.68		
I_p,int, Pedestrian LOS Score for Intersection	2.460			2.060			2.564			2.861		
Crosswalk LOS	B			B			B			C		
s_b, Saturation Flow Rate of the bicycle lane	2000			2000			2000			2000		
c_b, Capacity of the bicycle lane [bicycles/h]	870			870			1328			1328		
d_b, Bicycle Delay [s]	10.46			10.46			3.70			3.70		
I_b,int, Bicycle LOS Score for Intersection	2.023			1.936			2.782			2.183		
Bicycle LOS	B			A			C			B		

Sequence

Ring 1	-	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	6	7	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 4: 70th St W & Colton Blvd

Control Type:	Two-way stop	Delay (sec / veh):	10.1
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.001

Intersection Setup

Name	70th St W		70th St W		Colton Blvd	
Approach	Northbound		Southbound		Westbound	
Lane Configuration						
Turning Movement	Thru	Right	Left	Thru	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	40.00		40.00		25.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	70th St W		70th St W		Colton Blvd	
Base Volume Input [veh/h]	25	1	95	1	1	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	2.00	0.00	3.70	0.00	0.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	25	1	95	1	1	0
Peak Hour Factor	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	7	0	26	0	0	0
Total Analysis Volume [veh/h]	27	1	103	1	1	0
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Free	Free	Stop
Flared Lane			No
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance			No
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.00	0.06	0.00	0.00	0.00
d_M, Delay for Movement [s/veh]	0.00	0.00	7.40	0.00	10.08	8.42
Movement LOS	A	A	A	A	B	A
95th-Percentile Queue Length [veh/ln]	0.00	0.00	0.20	0.20	0.00	0.00
95th-Percentile Queue Length [ft/ln]	0.00	0.00	5.11	5.11	0.11	0.11
d_A, Approach Delay [s/veh]	0.00		7.33		10.08	
Approach LOS	A		A		B	
d_I, Intersection Delay [s/veh]	5.81					
Intersection LOS	B					

Intersection Level Of Service Report

Intersection 5: 70th St W & Grand Ave

Control Type:	Two-way stop	Delay (sec / veh):	10.2
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.111

Intersection Setup

Name	70th St W		Grand Ave		Grand Ave	
Approach	Southbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Left	Thru	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	40.00		50.00		50.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	70th St W		Grand Ave		Grand Ave	
Base Volume Input [veh/h]	81	14	3	126	33	22
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	4.10	0.00	0.00	0.90	3.60	8.30
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	81	14	3	126	33	22
Peak Hour Factor	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	22	4	1	34	9	6
Total Analysis Volume [veh/h]	88	15	3	137	36	24
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Stop	Free	Free
Flared Lane	No		
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance	No		
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.11	0.01	0.00	0.00	0.00	0.00
d_M, Delay for Movement [s/veh]	10.18	9.14	7.32	0.00	0.00	0.00
Movement LOS	B	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0.43	0.43	0.01	0.01	0.00	0.00
95th-Percentile Queue Length [ft/ln]	10.74	10.74	0.13	0.13	0.00	0.00
d_A, Approach Delay [s/veh]	10.03		0.16		0.00	
Approach LOS	B		A		A	
d_I, Intersection Delay [s/veh]	3.48					
Intersection LOS	B					

Intersection Level Of Service Report
Intersection 6: 62nd St W & Grand Ave

Control Type: Two-way stop
 Analysis Method: HCM 7th Edition
 Analysis Period: 15 minutes

Delay (sec / veh): 24.6
 Level Of Service: C
 Volume to Capacity (v/c): 0.567

Intersection Setup

Name	62nd St W		Grand Ave		Grand Ave	
Approach	Southbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Left	Thru	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	50.00		45.00		35.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	62nd St W		Grand Ave		Grand Ave	
Base Volume Input [veh/h]	250	76	47	261	125	44
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.50	1.50	2.50	2.50	2.00	6.50
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	250	76	47	261	125	44
Peak Hour Factor	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	68	21	13	71	34	12
Total Analysis Volume [veh/h]	272	83	51	284	136	48
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Stop	Free	Free
Flared Lane	No		
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance	No		
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.57	0.09	0.04	0.00	0.00	0.00
d_M, Delay for Movement [s/veh]	24.62	21.17	7.65	0.00	0.00	0.00
Movement LOS	C	C	A	A	A	A
95th-Percentile Queue Length [veh/ln]	4.83	4.83	0.09	0.09	0.00	0.00
95th-Percentile Queue Length [ft/ln]	120.64	120.64	2.19	2.19	0.00	0.00
d_A, Approach Delay [s/veh]	23.81		1.16		0.00	
Approach LOS	C		A		A	
d_I, Intersection Delay [s/veh]	10.12					
Intersection LOS	C					

Intersection Level Of Service Report
Intersection 7: 56th St W & Grand Ave

Control Type:	Two-way stop	Delay (sec / veh):	33.0
Analysis Method:	HCM 7th Edition	Level Of Service:	D
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.190

Intersection Setup

Name	56th St W		Grand Ave		Grand Ave	
Approach	Northbound		Eastbound		Westbound	
Lane Configuration	↔↔		↑		↔↑	
Turning Movement	Left	Right	Thru	Right	Left	Thru
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	1	0	1	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	45.00		35.00		45.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		No		No	

Volumes

Name	56th St W		Grand Ave		Grand Ave	
Base Volume Input [veh/h]	28	132	493	202	129	291
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	5.90	6.20	0.70	2.60	3.60	2.10
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	28	132	493	202	129	291
Peak Hour Factor	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	8	36	134	55	35	79
Total Analysis Volume [veh/h]	30	143	536	220	140	316
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Stop	Free	Free
Flared Lane			
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance	No		
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.19	0.31	0.01	0.00	0.17	0.00
d_M, Delay for Movement [s/veh]	33.03	16.17	0.00	0.00	10.09	0.00
Movement LOS	D	C	A	A	B	A
95th-Percentile Queue Length [veh/ln]	0.67	1.29	0.00	0.00	0.59	0.00
95th-Percentile Queue Length [ft/ln]	16.86	32.35	0.00	0.00	14.74	0.00
d_A, Approach Delay [s/veh]	19.09		0.00		3.10	
Approach LOS	C		A		A	
d_I, Intersection Delay [s/veh]	3.40					
Intersection LOS	D					

Intersection Level Of Service Report

Intersection 8: 54th St W & Grand Ave

Control Type:	Signalized	Delay (sec / veh):	12.6
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.485

Intersection Setup

Name	54th St W		Grand Ave		Grand Ave	
Approach	Southbound		Eastbound		Westbound	
Lane Configuration	↵↵		↵↑		↑↵	
Turning Movement	Left	Right	Left	Thru	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	1	1	0	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	300.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	45.00		45.00		45.00	
Grade [%]	0.00		0.00		0.00	
Curb Present	No		No		No	
Crosswalk	Yes		Yes		No	

Volumes

Name	54th St W		Grand Ave		Grand Ave	
Base Volume Input [veh/h]	263	198	151	494	220	83
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	1.50	0.60	3.10	1.70	4.40	3.10
Proportion of CAVs [%]	0.00					
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	99	0	0	0	42
Total Hourly Volume [veh/h]	263	99	151	494	220	41
Peak Hour Factor	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	71	27	41	134	60	11
Total Analysis Volume [veh/h]	286	108	164	537	239	45
Presence of On-Street Parking	No	No	No	No	No	No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0		0		0	
v_di, Inbound Pedestrian Volume crossing m	0		0		0	
v_co, Outbound Pedestrian Volume crossing	0		0		0	
v_ci, Inbound Pedestrian Volume crossing mi	0		0		0	
v_ab, Corner Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	0		0		0	

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Active Pattern	Free Running
Coordination Type	<i>Free Running</i>
Actuation Type	<i>Fully actuated</i>
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing

Control Type	Permissive	Overlap	ProtPerm	Permissive	Permissive	Permissive
Signal Group	5	2	3	8	4	0
Auxiliary Signal Groups		2,3				
Lead / Lag	Lead	-	Lag	-	-	-
Minimum Green [s]	5	5	5	5	5	0
Maximum Green [s]	50	50	50	50	50	0
Amber [s]	4.8	4.8	4.8	4.8	4.8	0.0
All red [s]	1.5	1.5	1.5	1.5	1.5	0.0
Split [s]	9	9	9	57	14	0
Vehicle Extension [s]	3.0	3.0	3.0	3.0	3.0	0.0
Walk [s]	7	0	0	7	7	0
Pedestrian Clearance [s]	14	0	0	14	14	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk	No			No	No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	4.3	4.3	4.3	4.3	4.3	0.0
Minimum Recall	No	No	No	No	No	
Maximum Recall	No	No	No	No	No	
Pedestrian Recall	No	No	No	No	No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	R	L	C	C	R
C, Cycle Length [s]	40	40	40	40	40	40
L, Total Lost Time per Cycle [s]	6.30	6.30	6.30	6.30	6.30	6.30
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	2.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	4.30	0.00	0.00	4.30	4.30	4.30
g_i, Effective Green Time [s]	9	19	18	18	8	8
g / C, Green / Cycle	0.22	0.49	0.46	0.46	0.19	0.19
(v / s)_i Volume / Saturation Flow Rate	0.17	0.07	0.11	0.31	0.14	0.03
s, saturation flow rate [veh/h]	1647	1480	1457	1726	1689	1451
c, Capacity [veh/h]	369	724	613	792	327	281
d1, Uniform Delay [s]	14.46	5.59	9.30	8.44	15.04	13.32
k, delay calibration	0.11	0.11	0.11	0.11	0.11	0.11
l, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	3.52	0.09	0.23	1.03	3.15	0.26
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.78	0.15	0.27	0.68	0.73	0.16
d, Delay for Lane Group [s/veh]	17.98	5.68	9.53	9.47	18.18	13.58
Lane Group LOS	B	A	A	A	B	B
Critical Lane Group	Yes	No	No	Yes	No	No
50th-Percentile Queue Length [veh/ln]	2.08	0.26	0.47	2.08	1.76	0.27
50th-Percentile Queue Length [ft/ln]	52.00	6.45	11.86	52.12	44.05	6.67
95th-Percentile Queue Length [veh/ln]	3.74	0.46	0.85	3.75	3.17	0.48
95th-Percentile Queue Length [ft/ln]	93.60	11.61	21.35	93.81	79.29	12.01

Movement, Approach, & Intersection Results

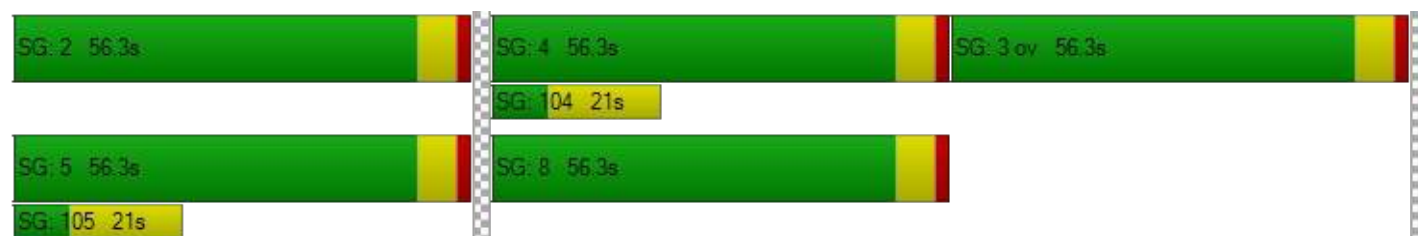
d_M, Delay for Movement [s/veh]	17.98	5.68	9.53	9.47	18.18	13.58
Movement LOS	B	A	A	A	B	B
d_A, Approach Delay [s/veh]	14.61		9.49		17.46	
Approach LOS	B		A		B	
d_I, Intersection Delay [s/veh]	12.59					
Intersection LOS	B					
Intersection V/C	0.485					

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	0.0
M_corner, Corner Circulation Area [ft ² /ped]	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft ² /ped]	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	10.30	10.30	0.00
I_p,int, Pedestrian LOS Score for Intersection	2.554	2.450	0.000
Crosswalk LOS	B	B	F
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	2529	2529	2529
d_b, Bicycle Delay [s]	1.38	1.38	1.38
I_b,int, Bicycle LOS Score for Intersection	1.560	2.716	2.098
Bicycle LOS	A	B	B

Sequence

Ring 1	-	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	-	-	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 13: Rimrock Rd & East Site Access

Control Type:	Two-way stop	Delay (sec / veh):	9.1
Analysis Method:	HCM 7th Edition	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.112

Intersection Setup

Name	East Site Access		Rimrock Rd		Rimrock Rd	
Approach	Southbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Left	Thru	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	East Site Access		Rimrock Rd		Rimrock Rd	
Base Volume Input [veh/h]	103	0	0	0	0	34
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	103	0	0	0	0	34
Peak Hour Factor	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	28	0	0	0	0	9
Total Analysis Volume [veh/h]	112	0	0	0	0	37
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Stop	Free	Free
Flared Lane	No		
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance	No		
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.11	0.00	0.00	0.00	0.00	0.00
d_M, Delay for Movement [s/veh]	9.06	8.85	7.29	0.00	0.00	0.00
Movement LOS	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0.38	0.38	0.00	0.00	0.00	0.00
95th-Percentile Queue Length [ft/ln]	9.44	9.44	0.00	0.00	0.00	0.00
d_A, Approach Delay [s/veh]	9.06		3.64		0.00	
Approach LOS	A		A		A	
d_I, Intersection Delay [s/veh]	6.81					
Intersection LOS	A					

Intersection Level Of Service Report

Intersection 1: 70th St W & Rimrock Rd

Control Type: Two-way stop
 Analysis Method: HCM 7th Edition
 Analysis Period: 15 minutes

Delay (sec / veh): 11.5
 Level Of Service: B
 Volume to Capacity (v/c): 0.077

Intersection Setup

Name	70th St W			70th St W			Rimrock Rd			Rimrock Rd		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	40.00			25.00			30.00			50.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name	70th St W			70th St W			Rimrock Rd			Rimrock Rd		
Base Volume Input [veh/h]	23	40	25	44	16	0	0	54	14	13	88	74
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	23	40	25	44	16	0	0	54	14	13	88	74
Peak Hour Factor	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	6	11	7	12	4	0	0	15	4	4	24	20
Total Analysis Volume [veh/h]	25	43	27	48	17	0	0	59	15	14	96	80
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	No	No		
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance	No	No		
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.04	0.07	0.03	0.08	0.03	0.00	0.00	0.00	0.00	0.01	0.00	0.00
d_M, Delay for Movement [s/veh]	10.94	11.43	9.34	11.46	11.19	9.58	7.55	0.00	0.00	7.36	0.00	0.00
Movement LOS	B	B	A	B	B	A	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0.45	0.45	0.45	0.34	0.34	0.34	0.00	0.00	0.00	0.03	0.03	0.03
95th-Percentile Queue Length [ft/ln]	11.23	11.23	11.23	8.61	8.61	8.61	0.00	0.00	0.00	0.64	0.64	0.64
d_A, Approach Delay [s/veh]	10.71			11.39			0.00			0.54		
Approach LOS	B			B			A			A		
d_I, Intersection Delay [s/veh]	4.39											
Intersection LOS	B											

Intersection Level Of Service Report

Intersection 2: Rimrock Rd & 62nd St W

Control Type: Roundabout
 Analysis Method: HCM 7th Edition
 Analysis Period: 15 minutes

Delay (sec / veh): 8.2
 Level Of Service: A

Intersection Setup

Name	62nd St W			62nd St W			Rimrock Rd			Rimrock Rd		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	50.00			50.00			50.00			50.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	62nd St W			62nd St W			Rimrock Rd			Rimrock Rd		
Base Volume Input [veh/h]	101	105	53	138	66	10	11	144	46	39	252	274
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	2.20	1.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.40
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	101	105	53	138	66	10	11	144	46	39	252	274
Peak Hour Factor	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	27	29	14	38	18	3	3	39	13	11	68	74
Total Analysis Volume [veh/h]	110	114	58	150	72	11	12	157	50	42	274	298
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Number of Conflicting Circulating Lanes	1			1			1			1		
Circulating Flow Rate [veh/h]	322			426			267			236		
Exiting Flow Rate [veh/h]	164			425			395			369		
Demand Flow Rate [veh/h]	101	105	53	138	66	10	11	144	46	39	252	274
Adjusted Demand Flow Rate [veh/h]	110	114	58	150	72	11	12	157	50	42	274	298

Lanes

Override Calculated Critical Headway	No			No			No			No		
User-Defined Critical Headway [s]	4.00			4.00			4.00			4.00		
Override Calculated Follow-Up Time	No			No			No			No		
User-Defined Follow-Up Time [s]	3.00			3.00			3.00			3.00		
A (intercept)	1380.00			1380.00			1380.00			1380.00		
B (coefficient)	0.00102			0.00102			0.00102			0.00102		
HV Adjustment Factor	1.00			0.99			1.00			1.00		
Entry Flow Rate [veh/h]	284			236			219			616		
Capacity of Entry and Bypass Lanes [veh/h]	995			894			1052			1085		
Pedestrian Impedance	1.00			1.00			1.00			1.00		
Capacity per Entry Lane [veh/h]	990			885			1052			1083		
X, volume / capacity	0.28			0.26			0.21			0.57		

Movement, Approach, & Intersection Results

Lane LOS	A	A	A	B
95th-Percentile Queue Length [veh]	1.18	1.06	0.78	3.70
95th-Percentile Queue Length [ft]	29.49	26.50	19.58	92.42
Approach Delay [s/veh]	6.50	6.84	5.36	10.42
Approach LOS	A	A	A	B
Intersection Delay [s/veh]	8.16			
Intersection LOS	A			

Intersection Level Of Service Report
Intersection 3: 54th St W & Rimrock Rd

Control Type:	Signalized	Delay (sec / veh):	16.4
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.444

Intersection Setup

Name	54th St W			54th St W			Rimrock Rd			Rimrock Rd		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	1	0	0	1	0	0	1	0	1
Entry Pocket Length [ft]	200.00	100.00	100.00	150.00	100.00	100.00	200.00	100.00	100.00	150.00	100.00	150.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	45.00			45.00			50.00			45.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	54th St W			54th St W			Rimrock Rd			Rimrock Rd		
Base Volume Input [veh/h]	101	64	129	75	46	12	7	289	44	173	474	103
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	1.80	0.00	3.10	0.00	0.00	0.00	1.40	0.00	0.00	0.30	0.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	65	0	0	0	0	0	0	0	0	52
Total Hourly Volume [veh/h]	101	64	64	75	46	12	7	289	44	173	474	51
Peak Hour Factor	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	27	17	17	20	13	3	2	79	12	47	129	14
Total Analysis Volume [veh/h]	110	70	70	82	50	13	8	314	48	188	515	55
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing m	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	100
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	50.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing

Control Type	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	ProtPer	Permiss	Permiss	ProtPer	Permiss	Permiss
Signal Group	0	6	0	0	2	0	3	4	0	7	8	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	-	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	0	5	0	0	5	0	5	5	0	5	5	0
Maximum Green [s]	0	30	0	0	30	0	15	40	0	15	40	0
Amber [s]	0.0	4.8	0.0	0.0	4.8	0.0	4.8	4.8	0.0	4.8	4.8	0.0
All red [s]	0.0	1.7	0.0	0.0	1.7	0.0	1.7	1.7	0.0	1.7	1.7	0.0
Split [s]	0	35	0	0	35	0	15	50	0	15	50	0
Vehicle Extension [s]	0.0	3.0	0.0	0.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
Walk [s]	0	7	0	0	7	0	0	7	0	0	7	0
Pedestrian Clearance [s]	0	11	0	0	11	0	0	11	0	0	11	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			Yes			Yes	
I1, Start-Up Lost Time [s]	0.0	2.0	0.0	0.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	4.5	0.0	0.0	4.5	0.0	4.5	4.5	0.0	4.5	4.5	0.0
Minimum Recall		No			No		No	Yes		No	Yes	
Maximum Recall		No			No		No	No		No	No	
Pedestrian Recall		No			No		No	Yes		No	Yes	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	L	C	L	C	L	C	R
C, Cycle Length [s]	54	54	54	54	54	54	54	54	54
L, Total Lost Time per Cycle [s]	6.50	6.50	6.50	6.50	6.50	6.50	6.50	6.50	6.50
l1_p, Permitted Start-Up Lost Time [s]	2.00	0.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	4.50	4.50	4.50	4.50	0.00	4.50	0.00	4.50	4.50
g_i, Effective Green Time [s]	11	11	11	11	30	23	30	19	19
g / C, Green / Cycle	0.20	0.20	0.20	0.20	0.56	0.43	0.56	0.35	0.35
(v / s)_i Volume / Saturation Flow Rate	0.08	0.09	0.07	0.04	0.01	0.21	0.16	0.29	0.04
s, saturation flow rate [veh/h]	1360	1585	1237	1689	1111	1691	1143	1746	1488
c, Capacity [veh/h]	310	314	235	334	588	724	681	604	515
d1, Uniform Delay [s]	22.14	18.94	24.24	17.94	7.18	11.17	6.59	16.28	11.92
k, delay calibration	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
l, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.69	1.00	0.88	0.27	0.01	0.54	0.22	3.53	0.09
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.36	0.45	0.35	0.19	0.01	0.50	0.28	0.85	0.11
d, Delay for Lane Group [s/veh]	22.83	19.94	25.12	18.21	7.19	11.71	6.81	19.81	12.01
Lane Group LOS	C	B	C	B	A	B	A	B	B
Critical Lane Group	No	Yes	No	No	No	No	Yes	Yes	No
50th-Percentile Queue Length [veh/ln]	1.18	1.37	0.95	0.57	0.02	2.29	0.68	5.11	0.37
50th-Percentile Queue Length [ft/ln]	29.60	34.32	23.63	14.33	0.59	57.21	16.90	127.72	9.15
95th-Percentile Queue Length [veh/ln]	2.13	2.47	1.70	1.03	0.04	4.12	1.22	8.82	0.66
95th-Percentile Queue Length [ft/ln]	53.28	61.77	42.53	25.79	1.07	102.97	30.43	220.39	16.47

Movement, Approach, & Intersection Results

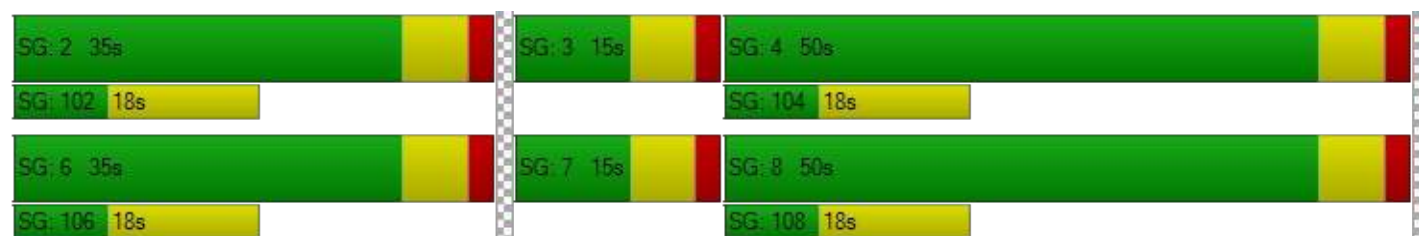
d_M, Delay for Movement [s/veh]	22.83	19.94	19.94	25.12	18.21	18.21	7.19	11.71	11.71	6.81	19.81	12.01
Movement LOS	C	B	B	C	B	B	A	B	B	A	B	B
d_A, Approach Delay [s/veh]	21.21			22.12			11.61			16.02		
Approach LOS	C			C			B			B		
d_I, Intersection Delay [s/veh]	16.38											
Intersection LOS	B											
Intersection V/C	0.444											

Other Modes

g_Walk,mi, Effective Walk Time [s]	23.0			23.0			11.0			11.0		
M_corner, Corner Circulation Area [ft ² /ped]	0.00			0.00			0.00			0.00		
M_CW, Crosswalk Circulation Area [ft ² /ped]	0.00			0.00			0.00			0.00		
d_p, Pedestrian Delay [s]	8.74			8.74			16.93			16.93		
I_p,int, Pedestrian LOS Score for Intersectio	2.394			2.050			2.613			2.783		
Crosswalk LOS	B			B			B			C		
s_b, Saturation Flow Rate of the bicycle lane	2000			2000			2000			2000		
c_b, Capacity of the bicycle lane [bicycles/h]	1063			1063			1623			1623		
d_b, Bicycle Delay [s]	5.88			5.88			0.95			0.95		
I_b,int, Bicycle LOS Score for Intersection	2.079			1.799			2.170			2.896		
Bicycle LOS	B			A			B			C		

Sequence

Ring 1	-	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	6	7	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 4: 70th St W & Colton Blvd

Control Type:	Two-way stop	Delay (sec / veh):	9.7
Analysis Method:	HCM 7th Edition	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.001

Intersection Setup

Name	70th St W		70th St W		Colton Blvd	
Approach	Northbound		Southbound		Westbound	
Lane Configuration						
Turning Movement	Thru	Right	Left	Thru	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	40.00		40.00		25.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	70th St W		70th St W		Colton Blvd	
Base Volume Input [veh/h]	89	2	43	2	1	1
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	0.00	5.30	0.00	0.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	89	2	43	2	1	1
Peak Hour Factor	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	24	1	12	1	0	0
Total Analysis Volume [veh/h]	97	2	47	2	1	1
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Free	Free	Stop
Flared Lane			No
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance			No
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.00	0.03	0.00	0.00	0.00
d_M, Delay for Movement [s/veh]	0.00	0.00	7.46	0.00	9.66	8.75
Movement LOS	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0.00	0.00	0.09	0.09	0.01	0.01
95th-Percentile Queue Length [ft/ln]	0.00	0.00	2.32	2.32	0.18	0.18
d_A, Approach Delay [s/veh]	0.00		7.16		9.20	
Approach LOS	A		A		A	
d_I, Intersection Delay [s/veh]	2.46					
Intersection LOS	A					

Intersection Level Of Service Report
Intersection 5: 70th St W & Grand Ave

Control Type:	Two-way stop	Delay (sec / veh):	10.4
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.046

Intersection Setup

Name	70th St W		Grand Ave		Grand Ave	
Approach	Southbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Left	Thru	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	40.00		50.00		50.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	70th St W		Grand Ave		Grand Ave	
Base Volume Input [veh/h]	30	14	16	76	105	77
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	5.00	0.00	3.10	1.10	0.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	30	14	16	76	105	77
Peak Hour Factor	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	8	4	4	21	29	21
Total Analysis Volume [veh/h]	33	15	17	83	114	84
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Stop	Free	Free
Flared Lane	No		
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance	No		
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.05	0.02	0.01	0.00	0.00	0.00
d_M, Delay for Movement [s/veh]	10.38	9.40	7.62	0.00	0.00	0.00
Movement LOS	B	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0.20	0.20	0.03	0.03	0.00	0.00
95th-Percentile Queue Length [ft/ln]	5.06	5.06	0.71	0.71	0.00	0.00
d_A, Approach Delay [s/veh]	10.08		1.29		0.00	
Approach LOS	B		A		A	
d_I, Intersection Delay [s/veh]	1.77					
Intersection LOS	B					

Intersection Level Of Service Report
Intersection 6: 62nd St W & Grand Ave

Control Type:	Two-way stop	Delay (sec / veh):	21.4
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.321

Intersection Setup

Name	62nd St W		Grand Ave		Grand Ave	
Approach	Southbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Left	Thru	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	50.00		45.00		35.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	62nd St W		Grand Ave		Grand Ave	
Base Volume Input [veh/h]	99	49	98	191	232	161
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	2.40	1.20	1.30	1.10	0.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	99	49	98	191	232	161
Peak Hour Factor	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	27	13	27	52	63	44
Total Analysis Volume [veh/h]	108	53	107	208	252	175
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Stop	Free	Free
Flared Lane	No		
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance	No		
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.32	0.08	0.09	0.00	0.00	0.00
d_M, Delay for Movement [s/veh]	21.44	15.85	8.29	0.00	0.00	0.00
Movement LOS	C	C	A	A	A	A
95th-Percentile Queue Length [veh/ln]	1.86	1.86	0.19	0.19	0.00	0.00
95th-Percentile Queue Length [ft/ln]	46.54	46.54	4.74	4.74	0.00	0.00
d_A, Approach Delay [s/veh]	19.60		2.82		0.00	
Approach LOS	C		A		A	
d_I, Intersection Delay [s/veh]	4.48					
Intersection LOS	C					

Intersection Level Of Service Report

Intersection 7: 56th St W & Grand Ave

Control Type:	Two-way stop	Delay (sec / veh):	47.4
Analysis Method:	HCM 7th Edition	Level Of Service:	E
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.646

Intersection Setup

Name	56th St W		Grand Ave		Grand Ave	
Approach	Northbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Thru	Right	Left	Thru
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	1	0	1	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	45.00		35.00		45.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		No		No	

Volumes

Name	56th St W		Grand Ave		Grand Ave	
Base Volume Input [veh/h]	130	152	246	83	129	441
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.80	0.50	1.80	0.00	1.60
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	130	152	246	83	129	441
Peak Hour Factor	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	35	41	67	23	35	120
Total Analysis Volume [veh/h]	141	165	267	90	140	479
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Stop	Free	Free
Flared Lane			
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance	No		
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.65	0.23	0.00	0.00	0.12	0.00
d_M, Delay for Movement [s/veh]	47.44	11.35	0.00	0.00	8.36	0.00
Movement LOS	E	B	A	A	A	A
95th-Percentile Queue Length [veh/ln]	3.90	0.86	0.00	0.00	0.39	0.00
95th-Percentile Queue Length [ft/ln]	97.59	21.60	0.00	0.00	9.76	0.00
d_A, Approach Delay [s/veh]	27.98		0.00		1.89	
Approach LOS	D		A		A	
d_I, Intersection Delay [s/veh]	7.59					
Intersection LOS	E					

Intersection Level Of Service Report

Intersection 8: 54th St W & Grand Ave

Control Type:	Signalized	Delay (sec / veh):	12.7
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.378

Intersection Setup

Name	54th St W		Grand Ave		Grand Ave	
Approach	Southbound		Eastbound		Westbound	
Lane Configuration	↵↵		↵↑		↑↵	
Turning Movement	Left	Right	Left	Thru	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	1	1	0	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	300.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	45.00		45.00		45.00	
Grade [%]	0.00		0.00		0.00	
Curb Present	No		No		No	
Crosswalk	Yes		Yes		No	

Volumes

Name	54th St W		Grand Ave		Grand Ave	
Base Volume Input [veh/h]	151	85	129	261	405	218
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.90	1.40	0.00	1.00	0.90	0.00
Proportion of CAVs [%]	0.00					
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	43	0	0	0	109
Total Hourly Volume [veh/h]	151	42	129	261	405	109
Peak Hour Factor	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	41	11	35	71	110	30
Total Analysis Volume [veh/h]	164	46	140	284	440	118
Presence of On-Street Parking	No	No	No	No	No	No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0		0		0	
v_di, Inbound Pedestrian Volume crossing m	0		0		0	
v_co, Outbound Pedestrian Volume crossing	0		0		0	
v_ci, Inbound Pedestrian Volume crossing mi	0		0		0	
v_ab, Corner Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	0		0		0	

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Active Pattern	Free Running
Coordination Type	<i>Free Running</i>
Actuation Type	<i>Fully actuated</i>
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing

Control Type	Permissive	Overlap	ProtPerm	Permissive	Permissive	Permissive
Signal Group	5	2	3	8	4	0
Auxiliary Signal Groups		2,3				
Lead / Lag	Lead	-	Lag	-	-	-
Minimum Green [s]	5	5	5	5	5	0
Maximum Green [s]	50	50	50	50	50	0
Amber [s]	4.8	4.8	4.8	4.8	4.8	0.0
All red [s]	1.5	1.5	1.5	1.5	1.5	0.0
Split [s]	9	9	9	57	14	0
Vehicle Extension [s]	3.0	3.0	3.0	3.0	3.0	0.0
Walk [s]	7	0	0	7	7	0
Pedestrian Clearance [s]	14	0	0	14	14	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk	No			No	No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	4.3	4.3	4.3	4.3	4.3	0.0
Minimum Recall	No	No	No	No	No	
Maximum Recall	No	No	No	No	No	
Pedestrian Recall	No	No	No	No	No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	R	L	C	C	R
C, Cycle Length [s]	41	41	41	41	41	41
L, Total Lost Time per Cycle [s]	6.30	6.30	6.30	6.30	6.30	6.30
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	2.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	4.30	0.00	0.00	4.30	4.30	4.30
g_i, Effective Green Time [s]	5	16	23	23	13	13
g / C, Green / Cycle	0.13	0.38	0.56	0.56	0.31	0.31
(v / s)_i Volume / Saturation Flow Rate	0.10	0.03	0.11	0.16	0.25	0.08
s, saturation flow rate [veh/h]	1655	1471	1288	1736	1738	1488
c, Capacity [veh/h]	218	560	590	980	548	469
d1, Uniform Delay [s]	17.35	8.20	10.22	4.70	13.02	10.56
k, delay calibration	0.11	0.11	0.11	0.11	0.11	0.11
l, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	5.23	0.06	0.21	0.16	2.82	0.28
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.75	0.08	0.24	0.29	0.80	0.25
d, Delay for Lane Group [s/veh]	22.58	8.26	10.43	4.86	15.83	10.84
Lane Group LOS	C	A	B	A	B	B
Critical Lane Group	Yes	Yes	No	No	Yes	No
50th-Percentile Queue Length [veh/ln]	1.48	0.18	0.25	0.53	2.96	0.59
50th-Percentile Queue Length [ft/ln]	37.07	4.45	6.33	13.30	74.09	14.70
95th-Percentile Queue Length [veh/ln]	2.67	0.32	0.46	0.96	5.33	1.06
95th-Percentile Queue Length [ft/ln]	66.72	8.01	11.39	23.94	133.37	26.45

Movement, Approach, & Intersection Results

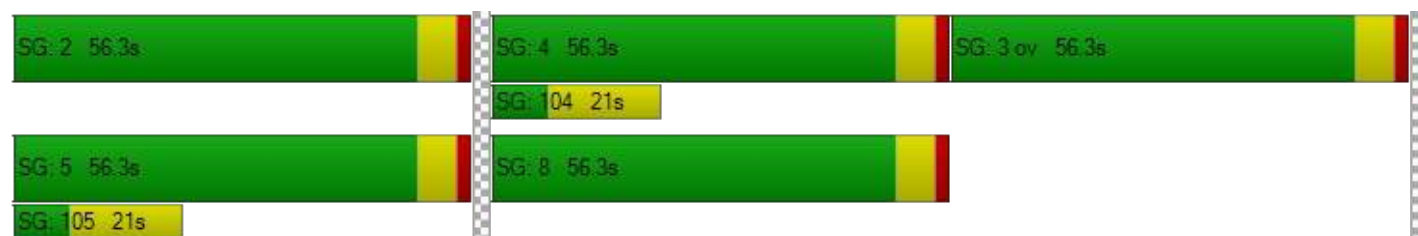
d_M, Delay for Movement [s/veh]	22.58	8.26	10.43	4.86	15.83	10.84
Movement LOS	C	A	B	A	B	B
d_A, Approach Delay [s/veh]	19.44		6.70		14.78	
Approach LOS	B		A		B	
d_I, Intersection Delay [s/veh]	12.72					
Intersection LOS	B					
Intersection V/C	0.378					

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	0.0
M_corner, Corner Circulation Area [ft ² /ped]	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft ² /ped]	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	11.12	11.12	0.00
I_p,int, Pedestrian LOS Score for Intersection	2.397	2.359	0.000
Crosswalk LOS	B	B	F
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	2420	2420	2420
d_b, Bicycle Delay [s]	0.91	0.91	0.91
I_b,int, Bicycle LOS Score for Intersection	1.560	2.259	2.660
Bicycle LOS	A	B	B

Sequence

Ring 1	-	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	-	-	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 14: Rimrock Rd & East Site Access

Control Type:	Two-way stop	Delay (sec / veh):	9.1
Analysis Method:	HCM 7th Edition	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.078

Intersection Setup

Name	East Site Access		Rimrock Rd		Rimrock Rd	
Approach	Southbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Left	Thru	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	East Site Access		Rimrock Rd		Rimrock Rd	
Base Volume Input [veh/h]	68	0	0	0	0	111
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	68	0	0	0	0	111
Peak Hour Factor	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	18	0	0	0	0	30
Total Analysis Volume [veh/h]	74	0	0	0	0	121
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Stop	Free	Free
Flared Lane	No		
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance	No		
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.08	0.00	0.00	0.00	0.00	0.00
d_M, Delay for Movement [s/veh]	9.13	8.91	7.45	0.00	0.00	0.00
Movement LOS	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0.25	0.25	0.00	0.00	0.00	0.00
95th-Percentile Queue Length [ft/ln]	6.35	6.35	0.00	0.00	0.00	0.00
d_A, Approach Delay [s/veh]	9.13		3.73		0.00	
Approach LOS	A		A		A	
d_I, Intersection Delay [s/veh]	3.46					
Intersection LOS	A					

Intersection	Approach	Full Buildout (2031)					
		AM Peak			PM Peak		
		Avg Delay (s/veh)	LOS	95th % Queue (veh)	Avg Delay (s/veh)	LOS	95th % Queue (veh)
Intersection Control		Two-Way Stop-Control (NB/SB)					
70th St W & Rimrock Rd	NB	10.9	B	1	12.2	B	1
	SB	12.6	B	1	13.0	B	1
	EB	0.0	A	1	0.0	A	0
	WB	1.8	A	1	0.4	A	1
	Intersection	5.0	A	--	4.2	A	--
Intersection Control		Roundabout					
Rimrock Rd & 62nd St W	NB	8.3	A	1	7.5	A	2
	SB	9.3	A	4	8.0	A	2
	EB	23.6	C	8	6.1	A	2
	WB	4.7	A	1	13.6	B	6
	Intersection	13.7	B	--	10.1	B	--
Intersection Control		Signalized					
54th St W & Rimrock Rd	NB	24.9	C	4	23.9	C	4
	SB	30.3	C	6	24.7	C	3
	EB	37.0	D	22	12.5	B	6
	WB	19.4	B	4	17.9	B	12
	Intersection	30.2	C	--	18.1	B	--
Intersection Control		One-Way Stop-Control (WB)					
70th St W & Colton Blvd	NB	0.0	A	0	0.0	A	0
	SB	7.4	A	1	7.2	A	1
	WB	10.5	B	0	9.4	A	1
	Intersection	5.8	A	--	2.5	A	--
Intersection Control		One-Way Stop-Control (SB)					
70th St W & Grand Ave	SB	10.3	B	1	10.4	B	1
	EB	0.2	A	1	1.6	A	1
	WB	0.0	A	0	0.0	A	0
	Intersection	3.8	A	--	2.0	A	--
Intersection Control		One-Way Stop-Control (SB)					
62nd St W & Grand Ave	SB	34.4	D	8	24.8	C	3
	EB	1.1	A	1	2.8	A	1
	WB	0.0	A	0	0.0	A	0
	Intersection	14.4	B	--	5.4	A	--
Intersection Control		One-Way Stop-Control (NB)					
56th St W & Grand Ave	NB	22.7	C	2	49.4	E	7
	EB	0.0	A	0	0.0	A	0
	WB	3.2	A	1	1.9	A	1
	Intersection	3.9	A	--	12.8	B	--
Intersection Control		Signalized					
54th St W & Grand Ave	SB	15.2	B	5	20.2	C	4
	EB	10.8	B	6	7.4	A	2
	WB	18.2	B	4	15.5	B	7
	Intersection	13.6	B	--	13.5	B	--
Intersection Control		One-Way Stop-Control (SB)					
East Site Access & Rimrock Rd	SB	9.7	A	1	9.9	A	1
	EB	0.0	A	0	0.0	A	0
	WB	0.0	A	0	0.0	A	0
	Intersection	5.7	A	--	3.0	A	--
Intersection Control		One-Way Stop-Control (SB)					
West Site Access & Rimrock Rd	SB	8.7	A	1	8.7	A	1
	EB	0.0	A	0	0.0	A	0
	WB	0.0	A	0	0.0	A	0
	Intersection	6.4	A	--	3.3	A	--

Intersection Level Of Service Report

Intersection 1: 70th St W & Rimrock Rd

Control Type:	Two-way stop	Delay (sec / veh):	12.8
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.109

Intersection Setup

Name	70th St W			70th St W			Rimrock Rd			Rimrock Rd		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	40.00			25.00			30.00			50.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name	70th St W			70th St W			Rimrock Rd			Rimrock Rd		
Base Volume Input [veh/h]	12	9	9	72	60	0	0	141	35	22	47	25
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	0.00	0.00	2.60	0.00	0.00	0.00	0.00	5.90	0.00	5.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	12	9	9	72	60	0	0	141	35	22	47	25
Peak Hour Factor	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	3	2	2	20	16	0	0	38	10	6	13	7
Total Analysis Volume [veh/h]	13	10	10	78	65	0	0	153	38	24	51	27
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	No	No		
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance	No	No		
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.02	0.02	0.01	0.12	0.11	0.00	0.00	0.00	0.00	0.02	0.00	0.00
d_M, Delay for Movement [s/veh]	11.72	11.24	9.41	12.46	12.79	10.34	7.35	0.00	0.00	7.68	0.00	0.00
Movement LOS	B	B	A	B	B	B	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0.16	0.16	0.16	0.89	0.89	0.89	0.00	0.00	0.00	0.04	0.04	0.04
95th-Percentile Queue Length [ft/ln]	4.03	4.03	4.03	22.36	22.36	22.36	0.00	0.00	0.00	1.08	1.08	1.08
d_A, Approach Delay [s/veh]	10.87			12.61			0.00			1.81		
Approach LOS	B			B			A			A		
d_I, Intersection Delay [s/veh]	5.00											
Intersection LOS	B											

Intersection Level Of Service Report

Intersection 2: Rimrock Rd & 62nd St W

Control Type: Roundabout
 Analysis Method: HCM 7th Edition
 Analysis Period: 15 minutes

Delay (sec / veh): 13.7
 Level Of Service: B

Intersection Setup

Name	62nd St W			62nd St W			Rimrock Rd			Rimrock Rd		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	50.00			50.00			50.00			50.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	62nd St W			62nd St W			Rimrock Rd			Rimrock Rd		
Base Volume Input [veh/h]	29	25	44	382	157	5	12	334	147	58	81	81
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	5.00	5.00	0.00	1.30	0.80	0.00	0.00	1.30	0.00	0.00	5.00	12.50
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	29	25	44	382	157	5	12	334	147	58	81	81
Peak Hour Factor	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	8	7	12	104	43	1	3	91	40	16	22	22
Total Analysis Volume [veh/h]	32	27	48	415	171	5	13	363	160	63	88	88
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Number of Conflicting Circulating Lanes	1			1			1			1		
Circulating Flow Rate [veh/h]	801			189			656			75		
Exiting Flow Rate [veh/h]	395			140			131			836		
Demand Flow Rate [veh/h]	29	25	44	382	157	5	12	334	147	58	81	81
Adjusted Demand Flow Rate [veh/h]	32	27	48	415	171	5	13	363	160	63	88	88

Lanes

Override Calculated Critical Headway	No			No			No			No		
User-Defined Critical Headway [s]	4.00			4.00			4.00			4.00		
Override Calculated Follow-Up Time	No			No			No			No		
User-Defined Follow-Up Time [s]	3.00			3.00			3.00			3.00		
A (intercept)	1380.00			1380.00			1380.00			1380.00		
B (coefficient)	0.00102			0.00102			0.00102			0.00102		
HV Adjustment Factor	0.97			0.99			0.99			0.94		
Entry Flow Rate [veh/h]	110			598			541			254		
Capacity of Entry and Bypass Lanes [veh/h]	610			1139			707			1279		
Pedestrian Impedance	1.00			1.00			1.00			1.00		
Capacity per Entry Lane [veh/h]	594			1126			701			1204		
X, volume / capacity	0.18			0.53			0.76			0.20		

Movement, Approach, & Intersection Results

Lane LOS	A	A	C	A
95th-Percentile Queue Length [veh]	0.65	3.17	7.22	0.74
95th-Percentile Queue Length [ft]	16.32	79.22	180.60	18.47
Approach Delay [s/veh]	8.30	9.31	23.63	4.72
Approach LOS	A	A	C	A
Intersection Delay [s/veh]	13.70			
Intersection LOS	B			

Intersection Level Of Service Report
Intersection 3: 54th St W & Rimrock Rd

Control Type:	Signalized	Delay (sec / veh):	30.2
Analysis Method:	HCM 7th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.587

Intersection Setup

Name	54th St W			54th St W			Rimrock Rd			Rimrock Rd		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	1	0	0	1	0	0	1	0	1
Entry Pocket Length [ft]	200.00	100.00	100.00	150.00	100.00	100.00	200.00	100.00	100.00	150.00	100.00	150.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	45.00			45.00			50.00			45.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	54th St W			54th St W			Rimrock Rd			Rimrock Rd		
Base Volume Input [veh/h]	43	24	225	149	75	5	12	655	110	163	178	44
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	5.00	5.30	0.60	1.70	0.00	2.00	0.00	1.30	3.30	0.80	6.00	2.90
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	113	0	0	3	0	0	55	0	0	22
Total Hourly Volume [veh/h]	43	24	112	149	75	2	12	655	55	163	178	22
Peak Hour Factor	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	12	7	30	40	20	1	3	178	15	44	48	6
Total Analysis Volume [veh/h]	47	26	122	162	82	2	13	712	60	177	193	24
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing m	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	100
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	70.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing

Control Type	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	ProtPer	Permiss	Permiss	ProtPer	Permiss	Permiss
Signal Group	0	6	0	5	2	0	3	4	0	7	8	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	Lead	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	0	5	0	5	5	0	5	5	0	5	5	0
Maximum Green [s]	0	30	0	30	30	0	15	40	0	15	40	0
Amber [s]	0.0	4.8	0.0	4.8	4.8	0.0	4.8	4.8	0.0	4.8	4.8	0.0
All red [s]	0.0	1.7	0.0	1.7	1.7	0.0	1.7	1.7	0.0	1.7	1.7	0.0
Split [s]	0	35	0	0	35	0	15	50	0	15	50	0
Vehicle Extension [s]	0.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
Walk [s]	0	7	0	0	7	0	0	7	0	0	7	0
Pedestrian Clearance [s]	0	11	0	0	11	0	0	11	0	0	11	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			Yes			Yes	
I1, Start-Up Lost Time [s]	0.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	4.5	0.0	4.5	4.5	0.0	4.5	4.5	0.0	4.5	4.5	0.0
Minimum Recall		No			No		No	Yes		No	Yes	
Maximum Recall		No			No		No	No		No	No	
Pedestrian Recall		No			No		No	Yes		No	Yes	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	L	C	L	C	L	C	R
C, Cycle Length [s]	79	79	79	79	79	79	79	79	79
L, Total Lost Time per Cycle [s]	6.50	6.50	6.50	6.50	6.50	6.50	6.50	6.50	6.50
l1_p, Permitted Start-Up Lost Time [s]	2.00	0.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	4.50	4.50	4.50	4.50	0.00	4.50	0.00	4.50	4.50
g_i, Effective Green Time [s]	21	21	21	21	45	37	45	32	32
g / C, Green / Cycle	0.26	0.26	0.26	0.26	0.57	0.47	0.57	0.41	0.41
(v / s)_i Volume / Saturation Flow Rate	0.04	0.10	0.13	0.05	0.01	0.45	0.21	0.12	0.02
s, saturation flow rate [veh/h]	1282	1464	1242	1743	1297	1709	826	1667	1453
c, Capacity [veh/h]	350	387	285	460	787	809	299	686	598
d1, Uniform Delay [s]	26.17	23.85	32.44	22.52	7.54	20.03	17.32	15.52	13.95
k, delay calibration	0.11	0.11	0.11	0.11	0.11	0.35	0.40	0.11	0.11
l, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.17	0.62	1.79	0.19	0.01	17.45	6.69	0.22	0.03
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.13	0.38	0.57	0.18	0.02	0.95	0.59	0.28	0.04
d, Delay for Lane Group [s/veh]	26.35	24.47	34.23	22.71	7.55	37.48	24.01	15.74	13.98
Lane Group LOS	C	C	C	C	A	D	C	B	B
Critical Lane Group	No	No	Yes	No	Yes	Yes	No	No	No
50th-Percentile Queue Length [veh/ln]	0.70	2.14	2.93	1.14	0.08	14.88	1.72	2.09	0.23
50th-Percentile Queue Length [ft/ln]	17.44	53.49	73.26	28.38	1.89	372.06	42.92	52.23	5.83
95th-Percentile Queue Length [veh/ln]	1.26	3.85	5.27	2.04	0.14	21.21	3.09	3.76	0.42
95th-Percentile Queue Length [ft/ln]	31.40	96.28	131.87	51.08	3.40	530.23	77.25	94.02	10.50

Movement, Approach, & Intersection Results

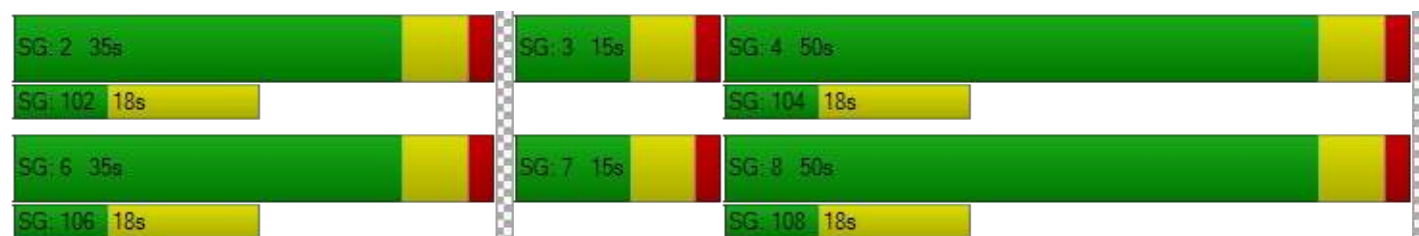
d_M, Delay for Movement [s/veh]	26.35	24.47	24.47	34.23	22.71	22.71	7.55	37.48	37.48	24.01	15.74	13.98
Movement LOS	C	C	C	C	C	C	A	D	D	C	B	B
d_A, Approach Delay [s/veh]	24.92			30.30			36.98			19.35		
Approach LOS	C			C			D			B		
d_I, Intersection Delay [s/veh]	30.23											
Intersection LOS	C											
Intersection V/C	0.587											

Other Modes

g_Walk,mi, Effective Walk Time [s]	23.0			23.0			11.0			11.0		
M_corner, Corner Circulation Area [ft ² /ped]	0.00			0.00			0.00			0.00		
M_CW, Crosswalk Circulation Area [ft ² /ped]	0.00			0.00			0.00			0.00		
d_p, Pedestrian Delay [s]	19.88			19.88			29.30			29.30		
I_p,int, Pedestrian LOS Score for Intersection	2.536			2.093			2.666			2.943		
Crosswalk LOS	B			B			B			C		
s_b, Saturation Flow Rate of the bicycle lane	2000			2000			2000			2000		
c_b, Capacity of the bicycle lane [bicycles/h]	721			721			1100			1100		
d_b, Bicycle Delay [s]	16.17			16.17			8.00			8.00		
I_b,int, Bicycle LOS Score for Intersection	2.068			1.970			2.946			2.246		
Bicycle LOS	B			A			C			B		

Sequence

Ring 1	-	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	6	7	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report

Intersection 4: 70th St W & Colton Blvd

Control Type: Two-way stop
 Analysis Method: HCM 7th Edition
 Analysis Period: 15 minutes

Delay (sec / veh): 10.5
 Level Of Service: B
 Volume to Capacity (v/c): 0.002

Intersection Setup

Name	70th St W		70th St W		Colton Blvd	
Approach	Northbound		Southbound		Westbound	
Lane Configuration						
Turning Movement	Thru	Right	Left	Thru	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	40.00		40.00		25.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	70th St W		70th St W		Colton Blvd	
Base Volume Input [veh/h]	32	1	114	1	1	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	2.00	0.00	3.70	0.00	0.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	32	1	114	1	1	0
Peak Hour Factor	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	9	0	31	0	0	0
Total Analysis Volume [veh/h]	35	1	124	1	1	0
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Free	Free	Stop
Flared Lane			No
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance			No
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.00	0.08	0.00	0.00	0.00
d_M, Delay for Movement [s/veh]	0.00	0.00	7.46	0.00	10.51	8.46
Movement LOS	A	A	A	A	B	A
95th-Percentile Queue Length [veh/ln]	0.00	0.00	0.25	0.25	0.00	0.00
95th-Percentile Queue Length [ft/ln]	0.00	0.00	6.29	6.29	0.11	0.11
d_A, Approach Delay [s/veh]	0.00		7.40		10.51	
Approach LOS	A		A		B	
d_I, Intersection Delay [s/veh]	5.77					
Intersection LOS	B					

Intersection Level Of Service Report

Intersection 5: 70th St W & Grand Ave

Control Type:	Two-way stop	Delay (sec / veh):	10.5
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.136

Intersection Setup

Name	70th St W		Grand Ave		Grand Ave	
Approach	Southbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Left	Thru	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	40.00		50.00		50.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	70th St W		Grand Ave		Grand Ave	
Base Volume Input [veh/h]	97	17	5	137	35	27
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	4.10	0.00	0.00	0.90	3.60	8.30
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	97	17	5	137	35	27
Peak Hour Factor	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	26	5	1	37	10	7
Total Analysis Volume [veh/h]	105	18	5	149	38	29
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Stop	Free	Free
Flared Lane	No		
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance	No		
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.14	0.02	0.00	0.00	0.00	0.00
d_M, Delay for Movement [s/veh]	10.50	9.35	7.33	0.00	0.00	0.00
Movement LOS	B	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0.54	0.54	0.01	0.01	0.00	0.00
95th-Percentile Queue Length [ft/ln]	13.58	13.58	0.21	0.21	0.00	0.00
d_A, Approach Delay [s/veh]	10.33		0.24		0.00	
Approach LOS	B		A		A	
d_I, Intersection Delay [s/veh]	3.80					
Intersection LOS	B					

Intersection Level Of Service Report

Intersection 6: 62nd St W & Grand Ave

Control Type:	Two-way stop	Delay (sec / veh):	35.3
Analysis Method:	HCM 7th Edition	Level Of Service:	E
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.688

Intersection Setup

Name	62nd St W		Grand Ave		Grand Ave	
Approach	Southbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Left	Thru	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	50.00		45.00		35.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	62nd St W		Grand Ave		Grand Ave	
Base Volume Input [veh/h]	279	82	51	292	139	50
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.50	1.50	2.50	2.50	2.00	6.50
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	279	82	51	292	139	50
Peak Hour Factor	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	76	22	14	79	38	14
Total Analysis Volume [veh/h]	303	89	55	317	151	54
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Stop	Free	Free
Flared Lane	No		
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance	No		
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.69	0.10	0.04	0.00	0.00	0.00
d_M, Delay for Movement [s/veh]	35.34	31.33	7.70	0.00	0.00	0.00
Movement LOS	E	D	A	A	A	A
95th-Percentile Queue Length [veh/ln]	7.26	7.26	0.09	0.09	0.00	0.00
95th-Percentile Queue Length [ft/ln]	181.49	181.49	2.36	2.36	0.00	0.00
d_A, Approach Delay [s/veh]	34.43		1.14		0.00	
Approach LOS	D		A		A	
d_I, Intersection Delay [s/veh]	14.37					
Intersection LOS	E					

Intersection Level Of Service Report

Intersection 7: 56th St W & Grand Ave

Control Type: Two-way stop
 Analysis Method: HCM 7th Edition
 Analysis Period: 15 minutes

Delay (sec / veh): 42.6
 Level Of Service: E
 Volume to Capacity (v/c): 0.275

Intersection Setup

Name	56th St W		Grand Ave		Grand Ave	
Approach	Northbound		Eastbound		Westbound	
Lane Configuration	↔↔		↑		↔↑	
Turning Movement	Left	Right	Thru	Right	Left	Thru
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	1	0	1	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	45.00		35.00		45.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		No		No	

Volumes

Name	56th St W		Grand Ave		Grand Ave	
Base Volume Input [veh/h]	33	143	542	218	139	318
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	5.90	6.20	0.70	2.60	3.60	2.10
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	33	143	542	218	139	318
Peak Hour Factor	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	9	39	147	59	38	86
Total Analysis Volume [veh/h]	36	155	589	237	151	346
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Stop	Free	Free
Flared Lane			
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance	No		
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.28	0.36	0.01	0.00	0.19	0.00
d_M, Delay for Movement [s/veh]	42.62	18.11	0.00	0.00	10.56	0.00
Movement LOS	E	C	A	A	B	A
95th-Percentile Queue Length [veh/ln]	1.05	1.63	0.00	0.00	0.69	0.00
95th-Percentile Queue Length [ft/ln]	26.14	40.65	0.00	0.00	17.36	0.00
d_A, Approach Delay [s/veh]	22.73		0.00		3.21	
Approach LOS	C		A		A	
d_I, Intersection Delay [s/veh]	3.92					
Intersection LOS	E					

Intersection Level Of Service Report

Intersection 8: 54th St W & Grand Ave

Control Type:	Signalized	Delay (sec / veh):	13.6
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.535

Intersection Setup

Name	54th St W		Grand Ave		Grand Ave	
Approach	Southbound		Eastbound		Westbound	
Lane Configuration	↵↵		↵↑		↑↵	
Turning Movement	Left	Right	Left	Thru	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	1	1	0	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	300.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	45.00		45.00		45.00	
Grade [%]	0.00		0.00		0.00	
Curb Present	No		No		No	
Crosswalk	Yes		Yes		No	

Volumes

Name	54th St W		Grand Ave		Grand Ave	
Base Volume Input [veh/h]	293	214	163	544	241	92
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	1.50	0.60	3.10	1.70	4.40	3.10
Proportion of CAVs [%]	0.00					
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	107	0	0	0	46
Total Hourly Volume [veh/h]	293	107	163	544	241	46
Peak Hour Factor	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	80	29	44	148	65	13
Total Analysis Volume [veh/h]	318	116	177	591	262	50
Presence of On-Street Parking	No	No	No	No	No	No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0		0		0	
v_di, Inbound Pedestrian Volume crossing m	0		0		0	
v_co, Outbound Pedestrian Volume crossing	0		0		0	
v_ci, Inbound Pedestrian Volume crossing mi	0		0		0	
v_ab, Corner Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	0		0		0	

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Active Pattern	Free Running
Coordination Type	<i>Free Running</i>
Actuation Type	<i>Fully actuated</i>
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing

Control Type	Permissive	Overlap	ProtPerm	Permissive	Permissive	Permissive
Signal Group	5	2	3	8	4	0
Auxiliary Signal Groups		2,3				
Lead / Lag	Lead	-	Lag	-	-	-
Minimum Green [s]	5	5	5	5	5	0
Maximum Green [s]	50	50	50	50	50	0
Amber [s]	4.8	4.8	4.8	4.8	4.8	0.0
All red [s]	1.5	1.5	1.5	1.5	1.5	0.0
Split [s]	9	9	9	57	14	0
Vehicle Extension [s]	3.0	3.0	3.0	3.0	3.0	0.0
Walk [s]	7	0	0	7	7	0
Pedestrian Clearance [s]	14	0	0	14	14	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk	No			No	No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	4.3	4.3	4.3	4.3	4.3	0.0
Minimum Recall	No	No	No	No	No	
Maximum Recall	No	No	No	No	No	
Pedestrian Recall	No	No	No	No	No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	R	L	C	C	R
C, Cycle Length [s]	42	42	42	42	42	42
L, Total Lost Time per Cycle [s]	6.30	6.30	6.30	6.30	6.30	6.30
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	2.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	4.30	0.00	0.00	4.30	4.30	4.30
g_i, Effective Green Time [s]	10	21	19	19	9	9
g / C, Green / Cycle	0.24	0.50	0.46	0.46	0.21	0.21
(v / s)_i Volume / Saturation Flow Rate	0.19	0.08	0.12	0.34	0.16	0.03
s, saturation flow rate [veh/h]	1647	1480	1428	1726	1689	1451
c, Capacity [veh/h]	402	735	580	793	350	301
d1, Uniform Delay [s]	15.05	5.85	10.42	9.43	15.80	13.83
k, delay calibration	0.11	0.11	0.11	0.11	0.11	0.11
l, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	3.55	0.10	0.29	1.41	3.22	0.26
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.79	0.16	0.31	0.74	0.75	0.17
d, Delay for Lane Group [s/veh]	18.60	5.95	10.72	10.85	19.02	14.08
Lane Group LOS	B	A	B	B	B	B
Critical Lane Group	Yes	No	No	Yes	No	No
50th-Percentile Queue Length [veh/ln]	2.50	0.32	0.60	2.82	2.10	0.32
50th-Percentile Queue Length [ft/ln]	62.43	7.93	15.03	70.43	52.48	8.00
95th-Percentile Queue Length [veh/ln]	4.49	0.57	1.08	5.07	3.78	0.58
95th-Percentile Queue Length [ft/ln]	112.37	14.27	27.05	126.78	94.47	14.39

Movement, Approach, & Intersection Results

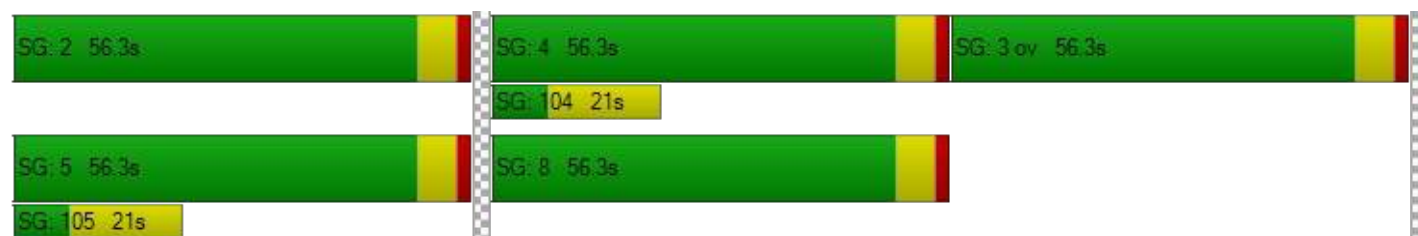
d_M, Delay for Movement [s/veh]	18.60	5.95	10.72	10.85	19.02	14.08
Movement LOS	B	A	B	B	B	B
d_A, Approach Delay [s/veh]	15.22		10.82		18.23	
Approach LOS	B		B		B	
d_I, Intersection Delay [s/veh]	13.61					
Intersection LOS	B					
Intersection V/C	0.535					

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	0.0
M_corner, Corner Circulation Area [ft ² /ped]	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft ² /ped]	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	11.58	11.58	0.00
I_p,int, Pedestrian LOS Score for Intersection	2.621	2.507	0.000
Crosswalk LOS	B	B	F
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	2364	2364	2364
d_b, Bicycle Delay [s]	0.70	0.70	0.70
I_b,int, Bicycle LOS Score for Intersection	1.560	2.827	2.150
Bicycle LOS	A	C	B

Sequence

Ring 1	-	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	-	-	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 13: Rimrock Rd & East Site Access

Control Type:	Two-way stop	Delay (sec / veh):	9.7
Analysis Method:	HCM 7th Edition	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.163

Intersection Setup

Name	East Site Access		Rimrock Rd		Rimrock Rd	
Approach	Southbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Left	Thru	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	East Site Access		Rimrock Rd		Rimrock Rd	
Base Volume Input [veh/h]	139	0	0	37	13	46
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	139	0	0	37	13	46
Peak Hour Factor	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	38	0	0	10	4	13
Total Analysis Volume [veh/h]	151	0	0	40	14	50
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Stop	Free	Free
Flared Lane	No		
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance	No		
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.16	0.00	0.00	0.00	0.00	0.00
d_M, Delay for Movement [s/veh]	9.66	9.25	7.34	0.00	0.00	0.00
Movement LOS	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0.58	0.58	0.00	0.00	0.00	0.00
95th-Percentile Queue Length [ft/ln]	14.57	14.57	0.00	0.00	0.00	0.00
d_A, Approach Delay [s/veh]	9.66		0.00		0.00	
Approach LOS	A		A		A	
d_I, Intersection Delay [s/veh]	5.72					
Intersection LOS	A					

Intersection Level Of Service Report
Intersection 15: Rimrock Rd & West Site Access

Control Type:	Two-way stop	Delay (sec / veh):	8.7
Analysis Method:	HCM 7th Edition	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.039

Intersection Setup

Name	West Site Access		Rimrock Rd		Rimrock Rd	
Approach	Southbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Left	Thru	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		Yes		Yes	

Volumes

Name	West Site Access		Rimrock Rd		Rimrock Rd	
Base Volume Input [veh/h]	37	0	0	0	0	13
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	37	0	0	0	0	13
Peak Hour Factor	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	10	0	0	0	0	4
Total Analysis Volume [veh/h]	40	0	0	0	0	14
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Stop	Free	Free
Flared Lane	No		
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance	No		
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.04	0.00	0.00	0.00	0.00	0.00
d_M, Delay for Movement [s/veh]	8.70	8.49	7.24	0.00	0.00	0.00
Movement LOS	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0.12	0.12	0.00	0.00	0.00	0.00
95th-Percentile Queue Length [ft/ln]	3.08	3.08	0.00	0.00	0.00	0.00
d_A, Approach Delay [s/veh]	8.70		3.62		0.00	
Approach LOS	A		A		A	
d_I, Intersection Delay [s/veh]	6.44					
Intersection LOS	A					

Intersection Level Of Service Report

Intersection 1: 70th St W & Rimrock Rd

Control Type: Two-way stop
 Analysis Method: HCM 7th Edition
 Analysis Period: 15 minutes

Delay (sec / veh): 13.2
 Level Of Service: B
 Volume to Capacity (v/c): 0.099

Intersection Setup

Name	70th St W			70th St W			Rimrock Rd			Rimrock Rd		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	40.00			25.00			30.00			50.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name	70th St W			70th St W			Rimrock Rd			Rimrock Rd		
Base Volume Input [veh/h]	38	43	27	46	17	0	0	93	23	14	151	76
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	38	43	27	46	17	0	0	93	23	14	151	76
Peak Hour Factor	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	10	12	7	13	5	0	0	25	6	4	41	21
Total Analysis Volume [veh/h]	41	47	29	50	18	0	0	101	25	15	164	83
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	No	No		
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance	No	No		
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.07	0.09	0.03	0.10	0.03	0.00	0.00	0.00	0.00	0.01	0.00	0.00
d_M, Delay for Movement [s/veh]	12.61	12.99	10.16	13.20	12.55	10.34	7.71	0.00	0.00	7.46	0.00	0.00
Movement LOS	B	B	B	B	B	B	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0.69	0.69	0.69	0.45	0.45	0.45	0.00	0.00	0.00	0.03	0.03	0.03
95th-Percentile Queue Length [ft/ln]	17.27	17.27	17.27	11.29	11.29	11.29	0.00	0.00	0.00	0.67	0.67	0.67
d_A, Approach Delay [s/veh]	12.16			13.03			0.00			0.43		
Approach LOS	B			B			A			A		
d_I, Intersection Delay [s/veh]	4.22											
Intersection LOS	B											

Intersection Level Of Service Report

Intersection 2: Rimrock Rd & 62nd St W

Control Type: Roundabout
 Analysis Method: HCM 7th Edition
 Analysis Period: 15 minutes

Delay (sec / veh): 10.1
 Level Of Service: B

Intersection Setup

Name	62nd St W			62nd St W			Rimrock Rd			Rimrock Rd		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	50.00			50.00			50.00			50.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	62nd St W			62nd St W			Rimrock Rd			Rimrock Rd		
Base Volume Input [veh/h]	119	114	57	149	71	13	14	180	56	42	312	296
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	2.20	1.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.40
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	119	114	57	149	71	13	14	180	56	42	312	296
Peak Hour Factor	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	32	31	15	40	19	4	4	49	15	11	85	80
Total Analysis Volume [veh/h]	129	124	62	162	77	14	15	196	61	46	339	322
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Number of Conflicting Circulating Lanes	1			1			1			1		
Circulating Flow Rate [veh/h]	376			514			288			268		
Exiting Flow Rate [veh/h]	184			462			482			424		
Demand Flow Rate [veh/h]	119	114	57	149	71	13	14	180	56	42	312	296
Adjusted Demand Flow Rate [veh/h]	129	124	62	162	77	14	15	196	61	46	339	322

Lanes

Override Calculated Critical Headway	No			No			No			No		
User-Defined Critical Headway [s]	4.00			4.00			4.00			4.00		
Override Calculated Follow-Up Time	No			No			No			No		
User-Defined Follow-Up Time [s]	3.00			3.00			3.00			3.00		
A (intercept)	1380.00			1380.00			1380.00			1380.00		
B (coefficient)	0.00102			0.00102			0.00102			0.00102		
HV Adjustment Factor	1.00			0.99			1.00			1.00		
Entry Flow Rate [veh/h]	317			256			272			709		
Capacity of Entry and Bypass Lanes [veh/h]	941			817			1029			1050		
Pedestrian Impedance	1.00			1.00			1.00			1.00		
Capacity per Entry Lane [veh/h]	937			809			1029			1049		
X, volume / capacity	0.34			0.31			0.26			0.67		

Movement, Approach, & Intersection Results

Lane LOS	A	A	A	B
95th-Percentile Queue Length [veh]	1.49	1.34	1.07	5.51
95th-Percentile Queue Length [ft]	37.29	33.53	26.65	137.70
Approach Delay [s/veh]	7.46	8.04	6.07	13.61
Approach LOS	A	A	A	B
Intersection Delay [s/veh]	10.12			
Intersection LOS	B			

Intersection Level Of Service Report
Intersection 3: 54th St W & Rimrock Rd

Control Type:	Signalized	Delay (sec / veh):	18.1
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.493

Intersection Setup

Name	54th St W			54th St W			Rimrock Rd			Rimrock Rd		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	0	1	0	0	1	0	0	1	0	1
Entry Pocket Length [ft]	200.00	100.00	100.00	150.00	100.00	100.00	200.00	100.00	100.00	150.00	100.00	150.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	45.00			45.00			50.00			45.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	54th St W			54th St W			Rimrock Rd			Rimrock Rd		
Base Volume Input [veh/h]	119	70	139	81	49	16	11	328	54	187	539	111
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	1.80	0.00	3.10	0.00	0.00	0.00	1.40	0.00	0.00	0.30	0.00
Proportion of CAVs [%]	0.00											
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	0	70	0	0	0	0	0	0	0	0	56
Total Hourly Volume [veh/h]	119	70	69	81	49	16	11	328	54	187	539	55
Peak Hour Factor	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	32	19	19	22	13	4	3	89	15	51	146	15
Total Analysis Volume [veh/h]	129	76	75	88	53	17	12	357	59	203	586	60
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing m	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	100
Active Pattern	Pattern 1
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Fully actuated
Offset [s]	50.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing

Control Type	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	ProtPer	Permiss	Permiss	ProtPer	Permiss	Permiss
Signal Group	0	6	0	0	2	0	3	4	0	7	8	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	-	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	0	5	0	0	5	0	5	5	0	5	5	0
Maximum Green [s]	0	30	0	0	30	0	15	40	0	15	40	0
Amber [s]	0.0	4.8	0.0	0.0	4.8	0.0	4.8	4.8	0.0	4.8	4.8	0.0
All red [s]	0.0	1.7	0.0	0.0	1.7	0.0	1.7	1.7	0.0	1.7	1.7	0.0
Split [s]	0	35	0	0	35	0	15	50	0	15	50	0
Vehicle Extension [s]	0.0	3.0	0.0	0.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	0.0
Walk [s]	0	7	0	0	7	0	0	7	0	0	7	0
Pedestrian Clearance [s]	0	11	0	0	11	0	0	11	0	0	11	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk		No			No			Yes			Yes	
I1, Start-Up Lost Time [s]	0.0	2.0	0.0	0.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	4.5	0.0	0.0	4.5	0.0	4.5	4.5	0.0	4.5	4.5	0.0
Minimum Recall		No			No		No	Yes		No	Yes	
Maximum Recall		No			No		No	No		No	No	
Pedestrian Recall		No			No		No	Yes		No	Yes	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	L	C	L	C	L	C	R
C, Cycle Length [s]	61	61	61	61	61	61	61	61	61
L, Total Lost Time per Cycle [s]	6.50	6.50	6.50	6.50	6.50	6.50	6.50	6.50	6.50
l1_p, Permitted Start-Up Lost Time [s]	2.00	0.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	4.50	4.50	4.50	4.50	0.00	4.50	0.00	4.50	4.50
g_i, Effective Green Time [s]	13	13	13	13	36	28	36	23	23
g / C, Green / Cycle	0.21	0.21	0.21	0.21	0.58	0.46	0.58	0.38	0.38
(v / s)_i Volume / Saturation Flow Rate	0.10	0.10	0.07	0.04	0.01	0.25	0.19	0.34	0.04
s, saturation flow rate [veh/h]	1352	1586	1225	1678	1047	1688	1090	1746	1488
c, Capacity [veh/h]	310	333	231	352	530	773	631	663	565
d1, Uniform Delay [s]	24.98	21.22	27.24	20.03	8.49	12.00	7.37	17.79	12.31
k, delay calibration	0.11	0.11	0.11	0.11	0.11	0.11	0.18	0.11	0.11
l, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.89	0.97	1.03	0.27	0.02	0.59	0.48	4.11	0.08
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.42	0.45	0.38	0.20	0.02	0.54	0.32	0.88	0.11
d, Delay for Lane Group [s/veh]	25.87	22.18	28.27	20.31	8.51	12.59	7.85	21.90	12.40
Lane Group LOS	C	C	C	C	A	B	A	C	B
Critical Lane Group	Yes	No	No	No	No	No	Yes	Yes	No
50th-Percentile Queue Length [veh/ln]	1.65	1.74	1.19	0.75	0.04	3.14	0.92	6.95	0.45
50th-Percentile Queue Length [ft/ln]	41.35	43.60	29.87	18.77	1.09	78.53	23.03	173.66	11.29
95th-Percentile Queue Length [veh/ln]	2.98	3.14	2.15	1.35	0.08	5.65	1.66	11.27	0.81
95th-Percentile Queue Length [ft/ln]	74.42	78.47	53.77	33.79	1.96	141.35	41.45	281.72	20.32

Movement, Approach, & Intersection Results

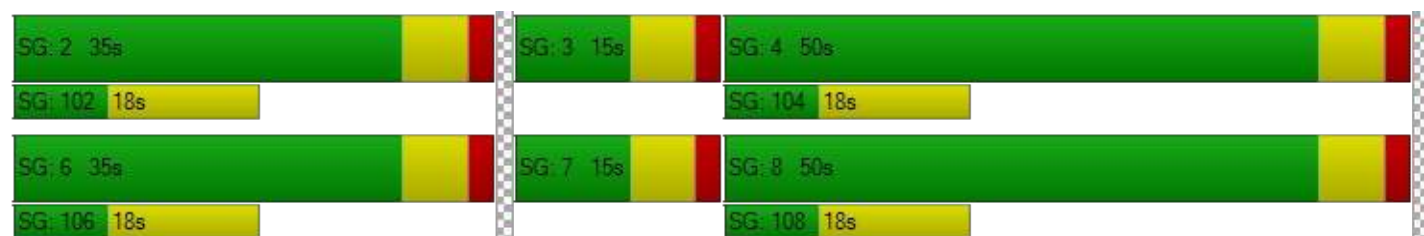
d_M, Delay for Movement [s/veh]	25.87	22.18	22.18	28.27	20.31	20.31	8.51	12.59	12.59	7.85	21.90	12.40
Movement LOS	C	C	C	C	C	C	A	B	B	A	C	B
d_A, Approach Delay [s/veh]	23.88			24.74			12.47			17.87		
Approach LOS	C			C			B			B		
d_I, Intersection Delay [s/veh]	18.14											
Intersection LOS	B											
Intersection V/C	0.493											

Other Modes

g_Walk,mi, Effective Walk Time [s]	23.0			23.0			11.0			11.0		
M_corner, Corner Circulation Area [ft ² /ped]	0.00			0.00			0.00			0.00		
M_CW, Crosswalk Circulation Area [ft ² /ped]	0.00			0.00			0.00			0.00		
d_p, Pedestrian Delay [s]	12.01			12.01			20.69			20.69		
I_p,int, Pedestrian LOS Score for Intersection	2.462			2.081			2.731			2.861		
Crosswalk LOS	B			B			B			C		
s_b, Saturation Flow Rate of the bicycle lane	2000			2000			2000			2000		
c_b, Capacity of the bicycle lane [bicycles/h]	928			928			1417			1417		
d_b, Bicycle Delay [s]	8.82			8.82			2.61			2.61		
I_b,int, Bicycle LOS Score for Intersection	2.137			1.820			2.266			3.053		
Bicycle LOS	B			A			B			C		

Sequence

Ring 1	-	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	6	7	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report

Intersection 4: 70th St W & Colton Blvd

Control Type:	Two-way stop	Delay (sec / veh):	10.0
Analysis Method:	HCM 7th Edition	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.001

Intersection Setup

Name	70th St W		70th St W		Colton Blvd	
Approach	Northbound		Southbound		Westbound	
Lane Configuration						
Turning Movement	Thru	Right	Left	Thru	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	40.00		40.00		25.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	70th St W		70th St W		Colton Blvd	
Base Volume Input [veh/h]	108	3	54	3	1	1
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	0.00	5.30	0.00	0.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	108	3	54	3	1	1
Peak Hour Factor	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	29	1	15	1	0	0
Total Analysis Volume [veh/h]	117	3	59	3	1	1
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Free	Free	Stop
Flared Lane			No
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance			No
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.00	0.04	0.00	0.00	0.00
d_M, Delay for Movement [s/veh]	0.00	0.00	7.52	0.00	9.99	8.85
Movement LOS	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0.00	0.00	0.12	0.12	0.01	0.01
95th-Percentile Queue Length [ft/ln]	0.00	0.00	2.96	2.96	0.18	0.18
d_A, Approach Delay [s/veh]	0.00		7.16		9.42	
Approach LOS	A		A		A	
d_I, Intersection Delay [s/veh]	2.51					
Intersection LOS	A					

Intersection Level Of Service Report

Intersection 5: 70th St W & Grand Ave

Control Type:	Two-way stop	Delay (sec / veh):	10.8
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.061

Intersection Setup

Name	70th St W		Grand Ave		Grand Ave	
Approach	Southbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Left	Thru	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	40.00		50.00		50.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	70th St W		Grand Ave		Grand Ave	
Base Volume Input [veh/h]	38	17	21	82	114	93
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	5.00	0.00	3.10	1.10	0.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	38	17	21	82	114	93
Peak Hour Factor	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	10	5	6	22	31	25
Total Analysis Volume [veh/h]	41	18	23	89	124	101
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Stop	Free	Free
Flared Lane	No		
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance	No		
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.06	0.02	0.02	0.00	0.00	0.00
d_M, Delay for Movement [s/veh]	10.78	9.62	7.68	0.00	0.00	0.00
Movement LOS	B	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0.27	0.27	0.04	0.04	0.00	0.00
95th-Percentile Queue Length [ft/ln]	6.65	6.65	0.97	0.97	0.00	0.00
d_A, Approach Delay [s/veh]	10.43		1.58		0.00	
Approach LOS	B		A		A	
d_I, Intersection Delay [s/veh]	2.00					
Intersection LOS	B					

Intersection Level Of Service Report

Intersection 6: 62nd St W & Grand Ave

Control Type: Two-way stop
 Analysis Method: HCM 7th Edition
 Analysis Period: 15 minutes

Delay (sec / veh): 27.0
 Level Of Service: D
 Volume to Capacity (v/c): 0.417

Intersection Setup

Name	62nd St W		Grand Ave		Grand Ave	
Approach	Southbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Left	Thru	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	50.00		45.00		35.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	62nd St W		Grand Ave		Grand Ave	
Base Volume Input [veh/h]	113	53	106	213	260	184
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	2.40	1.20	1.30	1.10	0.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	113	53	106	213	260	184
Peak Hour Factor	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	31	14	29	58	71	50
Total Analysis Volume [veh/h]	123	58	115	232	283	200
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Stop	Free	Free
Flared Lane	No		
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance	No		
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.42	0.09	0.11	0.00	0.00	0.00
d_M, Delay for Movement [s/veh]	27.00	20.21	8.46	0.00	0.00	0.00
Movement LOS	D	C	A	A	A	A
95th-Percentile Queue Length [veh/ln]	2.72	2.72	0.20	0.20	0.00	0.00
95th-Percentile Queue Length [ft/ln]	68.03	68.03	5.11	5.11	0.00	0.00
d_A, Approach Delay [s/veh]	24.82		2.80		0.00	
Approach LOS	C		A		A	
d_I, Intersection Delay [s/veh]	5.41					
Intersection LOS	D					

Intersection Level Of Service Report

Intersection 7: 56th St W & Grand Ave

Control Type:	Two-way stop	Delay (sec / veh):	90.0
Analysis Method:	HCM 7th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.884

Intersection Setup

Name	56th St W		Grand Ave		Grand Ave	
Approach	Northbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Thru	Right	Left	Thru
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	1	0	1	0	1	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	45.00		35.00		45.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		No		No	

Volumes

Name	56th St W		Grand Ave		Grand Ave	
Base Volume Input [veh/h]	151	164	272	95	139	486
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.80	0.50	1.80	0.00	1.60
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	151	164	272	95	139	486
Peak Hour Factor	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	41	45	74	26	38	132
Total Analysis Volume [veh/h]	164	178	296	103	151	528
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Stop	Free	Free
Flared Lane			
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance	No		
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.88	0.25	0.00	0.00	0.13	0.01
d_M, Delay for Movement [s/veh]	90.04	11.91	0.00	0.00	8.53	0.00
Movement LOS	F	B	A	A	A	A
95th-Percentile Queue Length [veh/ln]	6.61	1.01	0.00	0.00	0.44	0.00
95th-Percentile Queue Length [ft/ln]	165.37	25.26	0.00	0.00	11.07	0.00
d_A, Approach Delay [s/veh]	49.38		0.00		1.90	
Approach LOS	E		A		A	
d_I, Intersection Delay [s/veh]	12.80					
Intersection LOS	F					

Intersection Level Of Service Report

Intersection 8: 54th St W & Grand Ave

Control Type:	Signalized	Delay (sec / veh):	13.5
Analysis Method:	HCM 7th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.418

Intersection Setup

Name	54th St W		Grand Ave		Grand Ave	
Approach	Southbound		Eastbound		Westbound	
Lane Configuration	↰↱		↰↑		↑↱	
Turning Movement	Left	Right	Left	Thru	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	1	1	0	0	1
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	300.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	45.00		45.00		45.00	
Grade [%]	0.00		0.00		0.00	
Curb Present	No		No		No	
Crosswalk	Yes		Yes		No	

Volumes

Name	54th St W		Grand Ave		Grand Ave	
Base Volume Input [veh/h]	169	92	139	287	447	246
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.90	1.40	0.00	1.00	0.90	0.00
Proportion of CAVs [%]	0.00					
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Right Turn on Red Volume [veh/h]	0	46	0	0	0	123
Total Hourly Volume [veh/h]	169	46	139	287	447	123
Peak Hour Factor	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	46	13	38	78	121	33
Total Analysis Volume [veh/h]	184	50	151	312	486	134
Presence of On-Street Parking	No	No	No	No	No	No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0		0		0	
v_di, Inbound Pedestrian Volume crossing m	0		0		0	
v_co, Outbound Pedestrian Volume crossing	0		0		0	
v_ci, Inbound Pedestrian Volume crossing mi	0		0		0	
v_ab, Corner Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	0		0		0	

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Active Pattern	Free Running
Coordination Type	<i>Free Running</i>
Actuation Type	<i>Fully actuated</i>
Offset [s]	0.0
Offset Reference	Lead Green - Beginning of First Green
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing

Control Type	Permissive	Overlap	ProtPerm	Permissive	Permissive	Permissive
Signal Group	5	2	3	8	4	0
Auxiliary Signal Groups		2,3				
Lead / Lag	Lead	-	Lag	-	-	-
Minimum Green [s]	5	5	5	5	5	0
Maximum Green [s]	50	50	50	50	50	0
Amber [s]	4.8	4.8	4.8	4.8	4.8	0.0
All red [s]	1.5	1.5	1.5	1.5	1.5	0.0
Split [s]	9	9	9	57	14	0
Vehicle Extension [s]	3.0	3.0	3.0	3.0	3.0	0.0
Walk [s]	7	0	0	7	7	0
Pedestrian Clearance [s]	14	0	0	14	14	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0
Rest In Walk	No			No	No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	4.3	4.3	4.3	4.3	4.3	0.0
Minimum Recall	No	No	No	No	No	
Maximum Recall	No	No	No	No	No	
Pedestrian Recall	No	No	No	No	No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	R	L	C	C	R
C, Cycle Length [s]	45	45	45	45	45	45
L, Total Lost Time per Cycle [s]	6.30	6.30	6.30	6.30	6.30	6.30
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	2.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	4.30	0.00	0.00	4.30	4.30	4.30
g_i, Effective Green Time [s]	7	17	26	26	15	15
g / C, Green / Cycle	0.15	0.38	0.57	0.57	0.34	0.34
(v / s)_i Volume / Saturation Flow Rate	0.11	0.03	0.12	0.18	0.28	0.09
s, saturation flow rate [veh/h]	1655	1471	1231	1736	1738	1488
c, Capacity [veh/h]	242	561	553	995	588	503
d1, Uniform Delay [s]	18.43	8.90	11.67	4.99	13.67	10.82
k, delay calibration	0.11	0.11	0.11	0.11	0.11	0.11
l, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	4.84	0.07	0.26	0.18	3.05	0.28
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.76	0.09	0.27	0.31	0.83	0.27
d, Delay for Lane Group [s/veh]	23.27	8.97	11.93	5.17	16.72	11.10
Lane Group LOS	C	A	B	A	B	B
Critical Lane Group	Yes	Yes	No	No	Yes	No
50th-Percentile Queue Length [veh/ln]	1.79	0.22	0.33	0.72	3.66	0.73
50th-Percentile Queue Length [ft/ln]	44.73	5.62	8.28	17.88	91.42	18.22
95th-Percentile Queue Length [veh/ln]	3.22	0.40	0.60	1.29	6.58	1.31
95th-Percentile Queue Length [ft/ln]	80.52	10.11	14.91	32.18	164.56	32.80

Movement, Approach, & Intersection Results

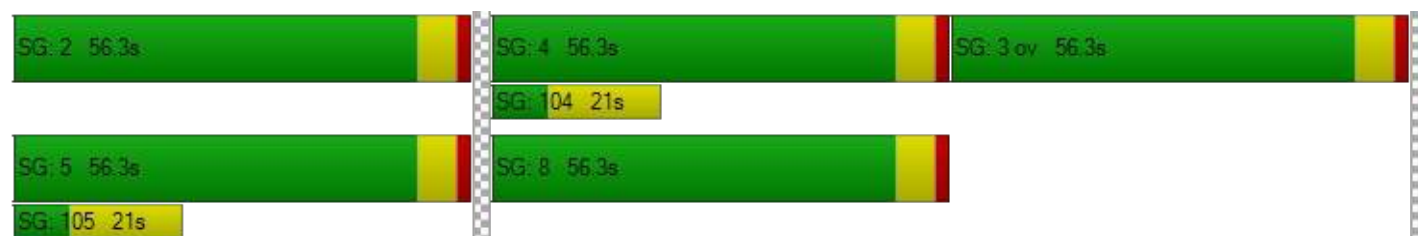
d_M, Delay for Movement [s/veh]	23.27	8.97	11.93	5.17	16.72	11.10
Movement LOS	C	A	B	A	B	B
d_A, Approach Delay [s/veh]	20.21		7.37		15.50	
Approach LOS	C		A		B	
d_I, Intersection Delay [s/veh]	13.48					
Intersection LOS	B					
Intersection V/C	0.418					

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	0.0
M_corner, Corner Circulation Area [ft ² /ped]	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft ² /ped]	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	12.76	12.76	0.00
I_p,int, Pedestrian LOS Score for Intersection	2.455	2.409	0.000
Crosswalk LOS	B	B	F
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	2231	2231	2231
d_b, Bicycle Delay [s]	0.30	0.30	0.30
I_b,int, Bicycle LOS Score for Intersection	1.560	2.324	2.786
Bicycle LOS	A	B	C

Sequence

Ring 1	-	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	-	-	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 14: Rimrock Rd & East Site Access

Control Type:	Two-way stop	Delay (sec / veh):	9.8
Analysis Method:	HCM 7th Edition	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.119

Intersection Setup

Name	East Site Access		Rimrock Rd		Rimrock Rd	
Approach	Southbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Left	Thru	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	East Site Access		Rimrock Rd		Rimrock Rd	
Base Volume Input [veh/h]	92	0	0	24	39	150
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	92	0	0	24	39	150
Peak Hour Factor	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	25	0	0	7	11	41
Total Analysis Volume [veh/h]	100	0	0	26	42	163
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Stop	Free	Free
Flared Lane	No		
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance	No		
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.12	0.00	0.00	0.00	0.00	0.00
d_M, Delay for Movement [s/veh]	9.85	9.46	7.63	0.00	0.00	0.00
Movement LOS	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0.40	0.40	0.00	0.00	0.00	0.00
95th-Percentile Queue Length [ft/ln]	10.06	10.06	0.00	0.00	0.00	0.00
d_A, Approach Delay [s/veh]	9.85		0.00		0.00	
Approach LOS	A		A		A	
d_I, Intersection Delay [s/veh]	2.98					
Intersection LOS	A					

Intersection Level Of Service Report

Intersection 16: Rimrock Rd & West Site Access

Control Type:	Two-way stop	Delay (sec / veh):	8.7
Analysis Method:	HCM 7th Edition	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.026

Intersection Setup

Name	West Site Access		Rimrock Rd		Rimrock Rd	
Approach	Southbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Left	Thru	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Entry Pocket	0	0	0	0	0	0
Entry Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	Yes		Yes		Yes	

Volumes

Name	West Site Access		Rimrock Rd		Rimrock Rd	
Base Volume Input [veh/h]	24	0	0	0	0	39
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	2.00	2.00	2.00	2.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	24	0	0	0	0	39
Peak Hour Factor	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	7	0	0	0	0	11
Total Analysis Volume [veh/h]	26	0	0	0	0	42
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Stop	Free	Free
Flared Lane	No		
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance	No		
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.03	0.00	0.00	0.00	0.00	0.00
d_M, Delay for Movement [s/veh]	8.71	8.50	7.30	0.00	0.00	0.00
Movement LOS	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0.08	0.08	0.00	0.00	0.00	0.00
95th-Percentile Queue Length [ft/ln]	2.01	2.01	0.00	0.00	0.00	0.00
d_A, Approach Delay [s/veh]	8.71		3.65		0.00	
Approach LOS	A		A		A	
d_I, Intersection Delay [s/veh]	3.33					
Intersection LOS	A					

AUXILIARY TURN LANE WARRANT WORKSHEETS

APPENDIX D

TURN LANE WARRANTS		56th Street West & Grand		62nd Street West & Grand	
		Avenue		Avenue	
		AM	PM	AM	PM
2025	NB Right-Turn Lane				
	NB Left-Turn Lane				
	SB Right-Turn Lane				
	SB Left-Turn Lane				
	EB Right-Turn Lane	YES	NO		
	EB Left-Turn Lane			NO	YES
	WB Right-Turn Lane			NO	YES
	WB Left-Turn Lane				
2029	NB Right-Turn Lane				
	NB Left-Turn Lane				
	SB Right-Turn Lane				
	SB Left-Turn Lane				
	EB Right-Turn Lane	YES	YES		
	EB Left-Turn Lane			NO	YES
	WB Right-Turn Lane			NO	YES
	WB Left-Turn Lane				
2031	NB Right-Turn Lane				
	NB Left-Turn Lane				
	SB Right-Turn Lane				
	SB Left-Turn Lane				
	EB Right-Turn Lane	YES	YES		
	EB Left-Turn Lane			YES	YES
	WB Right-Turn Lane			NO	YES
	WB Left-Turn Lane				

Existing Traffic Volumes (2025) - Right-Turn Lanes at Unsignalized Intersections on 2-Lane Highways

Approach	Time	Total DHV (veh/hr)	Right-Turn Volume During DHV (veh/hr, one direction)	Required Right-Turn Volume for Warranted Lane	Warranted Right- Turn Lane? (Y/N)
56th Street West & Grand Avenue EB	AM weekday	554	153	46	Y
	PM weekday	254	57	106	N
62nd Street West & Grand Avenue WB	AM weekday	131	31	103	N
	PM weekday	292	116	101	Y

Speed Limit at Approach	Adjustment
45	0
45	20
45	0
45	20

Future Traffic Volumes (2029) - Right-Turn Lanes at Unsignalized Intersections on 2-Lane Highways

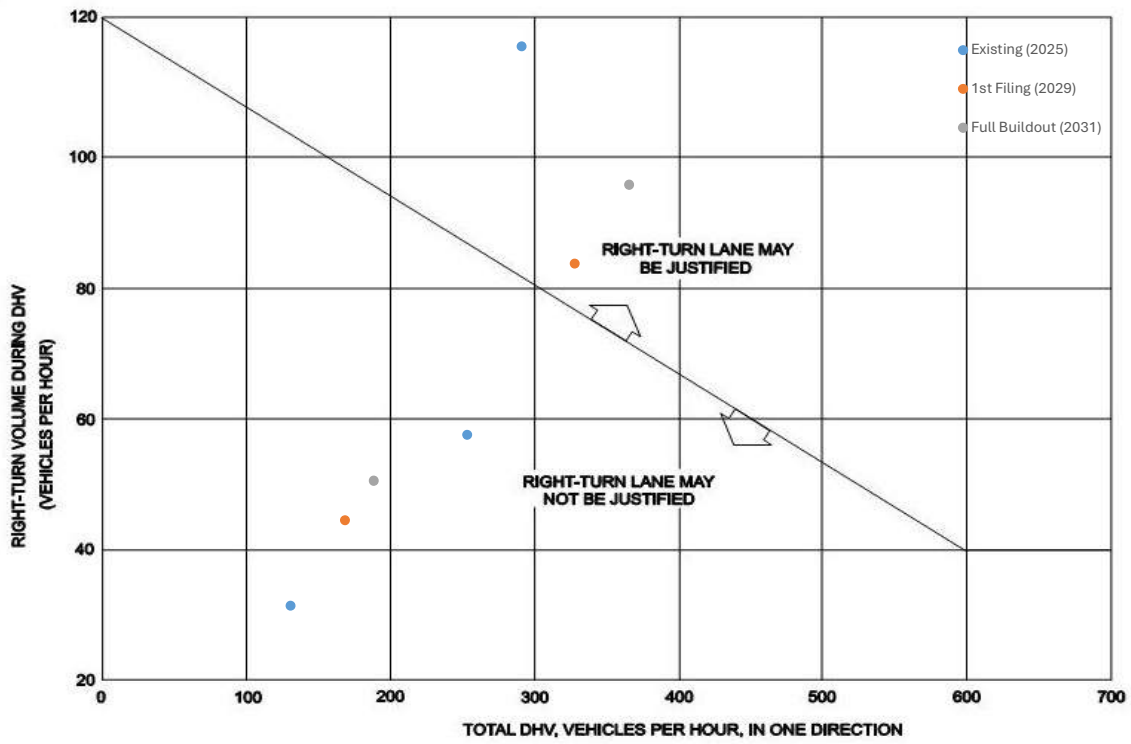
Approach	Time	Total DHV (veh/hr)	Right-Turn Volume During DHV (veh/hr, one direction)	Required Right-Turn Volume for Warranted Lane	Warranted Right- Turn Lane? (Y/N)	Speed Limit at Approach	Adjustment
56th Street West & Grand Avenue EB	AM weekday	695	202	27	Y	45	0
	PM weekday	329	83	76	Y	45	0
62nd Street West & Grand Avenue WB	AM weekday	169	44	117	N	45	20
	PM weekday	393	161	68	Y	45	0

Future Traffic Volumes (2031) - Right-Turn Lanes at Unsignalized Intersections on 2-Lane Highways

Approach	Time	Total DHV (veh/hr)	Right-Turn Volume During DHV (veh/hr, one direction)	Required Right-Turn Volume for Warranted Lane	Warranted Right- Turn Lane? (Y/N)
56th Street West & Grand Avenue EB	AM weekday	760	218	19	Y
	PM weekday	367	95	71	Y
62nd Street West & Grand Avenue WB	AM weekday	189	50	115	N
	PM weekday	444	184	61	Y

Speed Limit at Approach	Adjustment
45	0
45	0
45	20
45	0

Guidelines for Right-Turn Lanes at Unsignalized Intersections
on 2-Lane Highways (Figure 28.4A)



Existing Traffic Volumes (2025) - Left-Turn Lanes at Unsignalized Intersections on 2-Lane Highways

Approach	Time	Va = Total advancing traffic volume	Val = Total left-turn volume in advancing traffic	Percent left-turns in Va	Vo = Total opposing traffic volume	Warranted Left-Turn Lane? (Y/N)
62nd Street West & Grand Avenue EB	AM weekday	243	40	16.5%	131	N
	PM weekday	234	84	35.9%	292	Y

Speed Limit
at Approach
45
45

Future Traffic Volumes (2029) - Left-Turn Lanes at Unsignalized Intersections on 2-Lane Highways

Approach	Time	Va = Total advancing traffic volume	Val = Total left-turn volume in advancing traffic	Percent left-turns in Va	Vo = Total opposing traffic volume	Warranted Left-Turn Lane? (Y/N)
62nd Street West & Grand Avenue EB	AM weekday	308	47	15.3%	169	N
	PM weekday	289	98	33.9%	393	Y

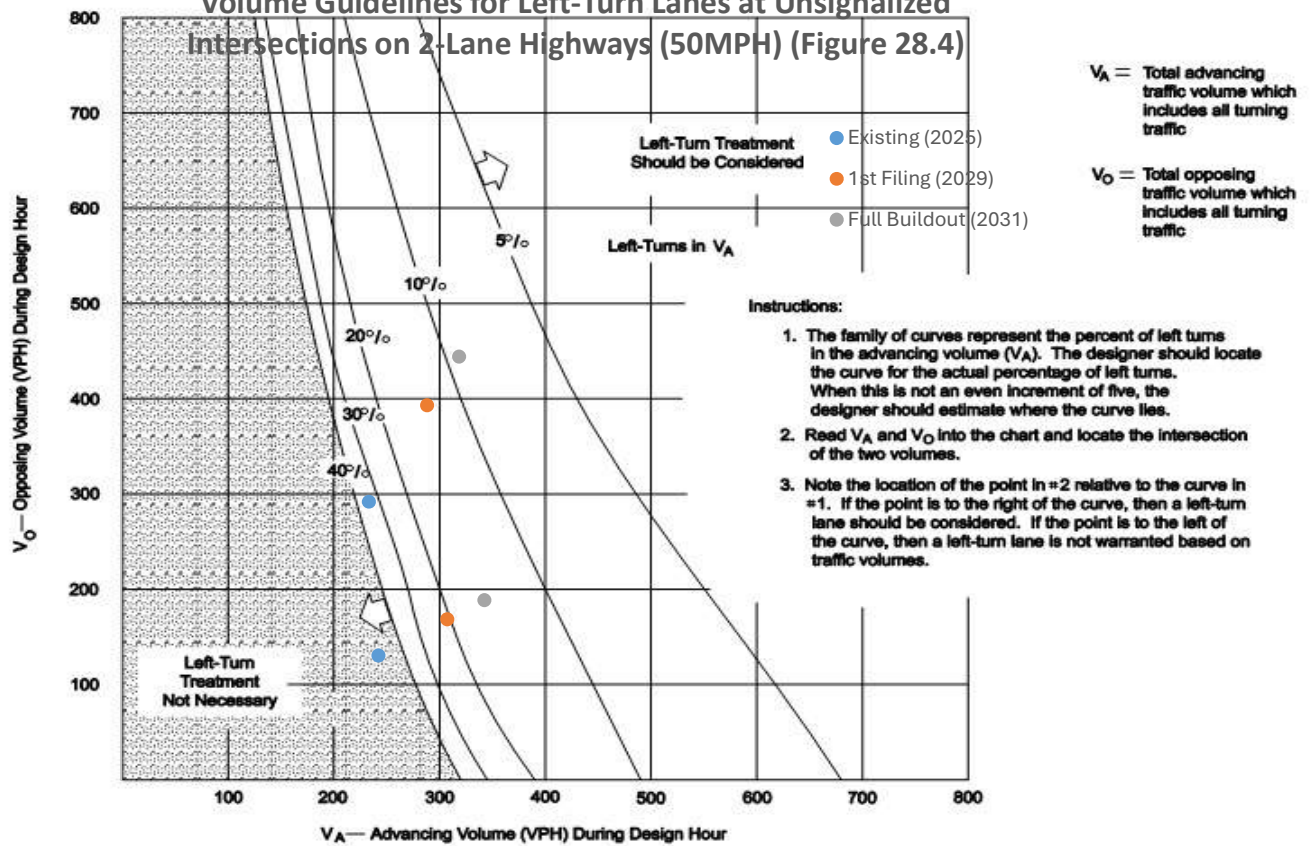
Speed Limit
at Approach
45
45

Future Traffic Volumes (2031) - Left-Turn Lanes at Unsignalized Intersections on 2-Lane Highways

Approach	Time	Va = Total advancing traffic volume	Val = Total left-turn volume in advancing traffic	Percent left-turns in Va	Vo = Total opposing traffic volume	Warranted Left-Turn Lane? (Y/N)
62nd Street West & Grand Avenue EB	AM weekday	343	51	14.9%	189	Y
	PM weekday	319	106	33.2%	444	Y

Speed Limit
at Approach
45
45

Volume Guidelines for Left-Turn Lanes at Unsignalized Intersections on 2-Lane Highways (50MPH) (Figure 28.4)



ALL-WAY STOP WARRANT WORKSHEETS

APPENDIX E

Intelligent Infrastructure.
Enduring Communities.



All-Way Stop Application

Warrant D: 8-Hour Volume (Vehicles, Pedestrians, Bicycles)

General Information

Agency/Company: Sanbell
 Date: 7/1/2025
 Project Number: 21266.04
 Project Description: The Trestles Subdivision
 Jurisdiction: City of Billings
 Major Street Speed Limit: 45 mph
 Major Street (Approach Lanes): Grand Avenue (2 lanes)
 Minor Street (Approach Lanes): 56th Street West (2 lanes)
 Analysis Year/Case: Existing (2025)

Hour Begin	Major Street Total (Both Approaches)	Minor Street Total (Both Approaches)	Major Street Pedestrian/ Bicycle Total	Minor Street Pedestrian/ Bicycle Total	Combined Entering Major Street	Combined Entering Minor Street
0:00	23	7	0	0	23	7
1:00	17	3	0	0	17	3
2:00	26	4	0	0	26	4
3:00	17	6	0	0	17	6
4:00	38	7	0	0	38	7
5:00	93	17	0	1	93	18
6:00	327	39	0	0	327	39
7:00	878	122	6	6	884	128
8:00	673	89	2	2	675	91
9:00	416	81	0	1	416	82
10:00	415	86	0	0	415	86
11:00	448	88	0	0	448	88
12:00	455	90	2	3	457	93
13:00	447	100	1	2	448	102
14:00	523	110	0	0	523	110
15:00	789	155	0	52	789	207
16:00	753	182	0	0	753	182
17:00	690	192	0	0	690	192
18:00	448	103	0	0	448	103
19:00	301	83	0	0	301	83
20:00	219	57	0	1	219	58
21:00	131	35	0	0	131	35
22:00	74	14	0	0	74	14
23:00	39	3	0	0	39	3
TOTAL	8240	1673	11	68	8251	1741

D Major Street Total > 300 and Minor Street Total > 200 for 8 hours? **No (1 hr)**

If 85th-percentile approach speed of major street traffic exceeds 40 mph:
 Major Street Total > 210 and Minor Street Total > 140 for 8 hours? **No (3 hrs)**

All-Way Stop Control Warrant D Satisfied? **No**

All-Way Stop Application

Warrant D: 8-Hour Volume (Vehicles, Pedestrians, Bicycles)

General Information

Agency/Company: Sanbell
 Date: 7/1/2025
 Project Number: 21266.04
 Project Description: The Trestles Subdivision
 Jurisdiction: City of Billings
 Major Street Speed Limit: 45 mph
 Major Street (Approach Lanes): Grand Avenue (2 lanes)
 Minor Street (Approach Lanes): 56th Street West (2 lanes)
 Analysis Year/Case: 1st Filing (2029)

Hour Begin	Major Street Total (Both Approaches)	Minor Street Total (Both Approaches)	Major Street Pedestrian/ Bicycle Total	Minor Street Pedestrian/ Bicycle Total	Combined Entering Major Street	Combined Entering Minor Street
0:00	28	9	0	0	28	9
1:00	21	4	0	0	21	4
2:00	32	5	0	0	32	5
3:00	21	8	0	0	21	8
4:00	47	9	0	0	47	9
5:00	116	21	0	1	116	22
6:00	407	49	0	0	407	49
7:00	1090	154	7	8	1097	162
8:00	835	112	2	3	837	115
9:00	515	102	0	1	515	103
10:00	514	109	0	0	514	109
11:00	555	111	0	0	555	111
12:00	562	114	2	4	564	118
13:00	551	126	1	3	552	129
14:00	645	139	0	0	645	139
15:00	974	196	0	66	974	262
16:00	928	230	0	0	928	230
17:00	848	242	0	0	848	242
18:00	551	130	0	0	551	130
19:00	369	105	0	0	369	105
20:00	269	72	0	1	269	73
21:00	161	44	0	0	161	44
22:00	91	18	0	0	91	18
23:00	48	4	0	0	48	4
TOTAL	10178	2113	12	87	10190	2200

D Major Street Total > 300 and Minor Street Total > 200 for 8 hours? **No (3 hrs)**

If 85th-percentile approach speed of major street traffic exceeds 40 mph:
 Major Street Total > 210 and Minor Street Total > 140 for 8 hours? **No (4 hrs)**

All-Way Stop Control Warrant D Satisfied? **No**

All-Way Stop Application

Warrant D: 8-Hour Volume (Vehicles, Pedestrians, Bicycles)

General Information

Agency/Company: Sanbell
 Date: 7/1/2025
 Project Number: 21266.04
 Project Description: The Trestles Subdivision
 Jurisdiction: City of Billings
 Major Street Speed Limit: 45 mph
 Major Street (Approach Lanes): Grand Avenue (2 lanes)
 Minor Street (Approach Lanes): 56th Street West (2 lanes)
 Analysis Year/Case: Full Buildout (2031)

Hour Begin	Major Street Total (Both Approaches)	Minor Street Total (Both Approaches)	Major Street Pedestrian/ Bicycle Total	Minor Street Pedestrian/ Bicycle Total	Combined Entering Major Street	Combined Entering Minor Street
0:00	32	10	0	0	32	10
1:00	23	4	0	0	23	4
2:00	35	6	0	0	35	6
3:00	23	8	0	0	23	8
4:00	53	10	0	0	53	10
5:00	127	24	0	1	127	25
6:00	446	55	0	0	446	55
7:00	1196	171	8	8	1204	179
8:00	916	125	3	3	919	128
9:00	566	114	0	1	566	115
10:00	564	121	0	0	564	121
11:00	609	123	0	0	609	123
12:00	616	126	3	4	619	130
13:00	604	140	1	3	605	143
14:00	706	154	0	0	706	154
15:00	1068	217	0	73	1068	290
16:00	1018	255	0	0	1018	255
17:00	929	269	0	0	929	269
18:00	604	144	0	0	604	144
19:00	404	116	0	0	404	116
20:00	294	80	0	1	294	81
21:00	177	49	0	0	177	49
22:00	100	20	0	0	100	20
23:00	52	4	0	0	52	4
TOTAL	11162	2345	15	94	11177	2439

D Major Street Total > 300 and Minor Street Total > 200 for 8 hours? **No (3 hrs)**

If 85th-percentile approach speed of major street traffic exceeds 40 mph:
 Major Street Total > 210 and Minor Street Total > 140 for 8 hours? **No (7 hrs)**

All-Way Stop Control Warrant D Satisfied? **No**

All-Way Stop Application	
Warrants A-C, E	
General Information	
Agency/Company:	Sanbell
Date:	7/1/2025
Project Number:	21266.04
Project Description:	The Trestles Subdivision
Jurisdiction:	City of Billings
Major Street Speed Limit:	45 mph
Major Street (Approach Lanes):	Grand Avenue (2 lanes)
Minor Street (Approach Lanes):	56th Street West (2 lanes)
Analysis Year/Case:	Existing (2025)
Warrant A: Crash Experience	
Four-Leg Intersection: Have there been five or more reported crashes in a 12-month period or six or more reported crashes in a 36-month period that were of a type susceptible to correction by the installation of all-way stop control? N/A Three-Leg Intersection: Have there been four or more reported crashes in a 12-month period or five or more reported crashes in a 36-month period that were of a type susceptible to correction by the installation of all-way stop control? No Warrant A Satisfied? No	
Warrant B: Sight Distance	
Is the sight distance on the minor-road approaches controlled by a STOP sign not adequate for a vehicle to turn onto or cross the major (uncontrolled) road? No Warrant B Satisfied? No	
Warrant C: Transition to Signal Control or Transition to Yield Control at a Circular Intersection	
Is an interim measure needed to control traffic while arrangements are being made for the installation of a traffic control signal at the intersection or for the installation of yield control at a circular intersection? No Warrant C Satisfied? No	
Warrant E: Other Factors	
Is all-way stop control needed due to other factors not addressed in the other all-way stop control warrants? Such other factors may include, but are not limited to, the following: A. The need to control left-turn conflicts. B. An intersection of two residential neighborhood collector (through) streets of similar design and operating characteristics where all-way stop control would improve traffic operational characteristics of the intersection. C. Where pedestrian and/or bicyclist movements support the installation of all-way stop control. No Warrant E Satisfied? No	

All-Way Stop Application	
Warrants A-C, E	
General Information	
Agency/Company:	Sanbell
Date:	7/1/2025
Project Number:	21266.04
Project Description:	The Trestles Subdivision
Jurisdiction:	City of Billings
Major Street Speed Limit:	45 mph
Major Street (Approach Lanes):	Grand Avenue (2 lanes)
Minor Street (Approach Lanes):	56th Street West (2 lanes)
Analysis Year/Case:	1st Filing (2029)
Warrant A: Crash Experience	
Four-Leg Intersection: Have there been five or more reported crashes in a 12-month period or six or more reported crashes in a 36-month period that were of a type susceptible to correction by the installation of all-way stop control? N/A Three-Leg Intersection: Have there been four or more reported crashes in a 12-month period or five or more reported crashes in a 36-month period that were of a type susceptible to correction by the installation of all-way stop control? No Warrant A Satisfied? No	
Warrant B: Sight Distance	
Is the sight distance on the minor-road approaches controlled by a STOP sign not adequate for a vehicle to turn onto or cross the major (uncontrolled) road? No Warrant B Satisfied? No	
Warrant C: Transition to Signal Control or Transition to Yield Control at a Circular Intersection	
Is an interim measure needed to control traffic while arrangements are being made for the installation of a traffic control signal at the intersection or for the installation of yield control at a circular intersection? No Warrant C Satisfied? No	
Warrant E: Other Factors	
Is all-way stop control needed due to other factors not addressed in the other all-way stop control warrants? Such other factors may include, but are not limited to, the following: A. The need to control left-turn conflicts. B. An intersection of two residential neighborhood collector (through) streets of similar design and operating characteristics where all-way stop control would improve traffic operational characteristics of the intersection. C. Where pedestrian and/or bicyclist movements support the installation of all-way stop control. No Warrant E Satisfied? No	

All-Way Stop Application	
Warrants A-C, E	
General Information	
Agency/Company:	Sanbell
Date:	7/1/2025
Project Number:	21266.04
Project Description:	The Trestles Subdivision
Jurisdiction:	City of Billings
Major Street Speed Limit:	45 mph
Major Street (Approach Lanes):	Grand Avenue (2 lanes)
Minor Street (Approach Lanes):	56th Street West (2 lanes)
Analysis Year/Case:	Full Buildout (2031)
Warrant A: Crash Experience	
Four-Leg Intersection: Have there been five or more reported crashes in a 12-month period or six or more reported crashes in a 36-month period that were of a type susceptible to correction by the installation of all-way stop control? N/A Three-Leg Intersection: Have there been four or more reported crashes in a 12-month period or five or more reported crashes in a 36-month period that were of a type susceptible to correction by the installation of all-way stop control? No Warrant A Satisfied? No	
Warrant B: Sight Distance	
Is the sight distance on the minor-road approaches controlled by a STOP sign not adequate for a vehicle to turn onto or cross the major (uncontrolled) road? No Warrant B Satisfied? No	
Warrant C: Transition to Signal Control or Transition to Yield Control at a Circular Intersection	
Is an interim measure needed to control traffic while arrangements are being made for the installation of a traffic control signal at the intersection or for the installation of yield control at a circular intersection? No Warrant C Satisfied? No	
Warrant E: Other Factors	
Is all-way stop control needed due to other factors not addressed in the other all-way stop control warrants? Such other factors may include, but are not limited to, the following: A. The need to control left-turn conflicts. B. An intersection of two residential neighborhood collector (through) streets of similar design and operating characteristics where all-way stop control would improve traffic operational characteristics of the intersection. C. Where pedestrian and/or bicyclist movements support the installation of all-way stop control. No Warrant E Satisfied? No	

TRAFFIC SIGNAL WARRANT WORKSHEETS

APPENDIX F

TRAFFIC SIGNAL WARRANTS		Existing Volumes (2025)	1st Filing Volumes (2029)	Full Buildout Volumes (2031)
		56th Street West & Grand Avenue	56th Street West & Grand Avenue	56th Street West & Grand Avenue
1. Eight-Hour Vehicular Volume		x	x	✓
2. Four-Hour Vehicular Volume		✓	✓	✓
3. Peak Hour		x	✓	✓
4. Pedestrian Volume		x	x	x
5. School Crossing		x	x	x
6. Coordinated Signal System		x	x	x
7. Crash History		x	x	x
8. Roadway Network		✓	✓	✓
9. Intersection Near a Grade Crossing		--	--	--
Signals Warranted	Yes		✓	✓
	No	x		

Warrant 1: Eight-Hour Vehicular Volume

General Information

Agency/Company: Sanbell
 Date: 7/1/2025
 Project Number: 21266.04
 Project Description: The Trestles Subdivision
 Jurisdiction: City of Billings
 Major Street Speed Limit: 45 mph
 Major Street (Approach Lanes): Grand Avenue (2 lanes)
 Minor Street (Approach Lanes): 56th Street West (2 lanes)
 Analysis Year/Case: Existing (2025)

Hour Begin	Avg. Entering Volume				Major Street Total (Both Approaches)	Higher Volume Minor Approach
	EB	WB	NB	SB		
0:00	9	14	7	0	23	7
1:00	7	10	3	0	17	3
2:00	11	15	4	0	26	4
3:00	10	7	6	0	17	6
4:00	27	11	7	0	38	7
5:00	64	29	17	0	93	17
6:00	186	141	39	0	327	39
7:00	460	418	122	0	878	122
8:00	352	321	89	0	673	89
9:00	207	209	81	0	416	81
10:00	199	216	86	0	415	86
11:00	209	239	88	0	448	88
12:00	196	259	90	0	455	90
13:00	173	274	100	0	447	100
14:00	198	325	110	0	523	110
15:00	326	463	155	0	789	155
16:00	288	465	182	0	753	182
17:00	204	486	192	0	690	192
18:00	151	297	103	0	448	103
19:00	76	225	83	0	301	83
20:00	67	152	57	0	219	57
21:00	42	89	35	0	131	35
22:00	19	55	14	0	74	14
23:00	13	26	3	0	39	3
TOTAL	3494	4746	1673	0	8240	1673

Condition A - Minimum Vehicular Volume (70% Columns):

Major Street Total > 420 and Higher Minor Street Total > 140 for 8 hours?

No

Hrs

3

Condition B - Interruption of Continuous Traffic (70% Columns):

Major Street Total > 630 and Higher Minor Street Total > 70 for 8 hours?

No

5

Combination of Conditions A & B (56% Columns):

Major Street Total > 336 and Higher Minor Street Total > 112 for 8 hours?

No

4

Major Street Total > 504 and Higher Minor Street Total > 56 for 8 hours?

No

6

Warrant 1 Satisfied?

No

Warrant 1: Eight-Hour Vehicular Volume

General Information

Agency/Company: Sanbell
 Date: 7/1/2025
 Project Number: 21266.04
 Project Description: The Trestles Subdivision
 Jurisdiction: City of Billings
 Major Street Speed Limit: 45 mph
 Major Street (Approach Lanes): Grand Avenue (2 lanes)
 Minor Street (Approach Lanes): 56th Street West (2 lanes)
 Analysis Year/Case: 1st Filing (2029)

Hour Begin	Avg. Entering Volume				Major Street Total (Both Approaches)	Higher Volume Minor Approach
	EB	WB	NB	SB		
0:00	10	16	9	0	26	9
1:00	9	11	4	0	20	4
2:00	13	17	5	0	30	5
3:00	11	8	8	0	19	8
4:00	32	12	9	0	44	9
5:00	76	33	20	0	109	20
6:00	221	160	45	0	381	45
7:00	545	474	144	0	1019	144
8:00	417	364	105	0	781	105
9:00	245	236	96	0	481	96
10:00	236	245	101	0	481	101
11:00	247	270	104	0	517	104
12:00	232	293	106	0	525	106
13:00	205	310	117	0	515	117
14:00	234	368	130	0	602	130
15:00	387	525	183	0	912	183
16:00	341	527	215	0	868	215
17:00	242	550	226	0	792	226
18:00	179	337	121	0	516	121
19:00	90	254	99	0	344	99
20:00	80	172	67	0	252	67
21:00	49	101	42	0	150	42
22:00	23	62	16	0	85	16
23:00	15	29	4	0	44	4
TOTAL	4139	5374	1976	0	9513	1976

Condition A - Minimum Vehicular Volume (70% Columns):

Major Street Total > 420 and Higher Minor Street Total > 140 for 8 hours?

No

Hrs

4

Condition B - Interruption of Continuous Traffic (70% Columns):

Major Street Total > 630 and Higher Minor Street Total > 70 for 8 hours?

No

5

Combination of Conditions A & B (56% Columns):

Major Street Total > 336 and Higher Minor Street Total > 112 for 8 hours?

No

7

Major Street Total > 504 and Higher Minor Street Total > 56 for 8 hours?

Yes

10

Warrant 1 Satisfied?

No

Warrant 1: Eight-Hour Vehicular Volume

General Information

Agency/Company: Sanbell
 Date: 7/1/2025
 Project Number: 21266.04
 Project Description: The Trestles Subdivision
 Jurisdiction: City of Billings
 Major Street Speed Limit: 45 mph
 Major Street (Approach Lanes): Grand Avenue (2 lanes)
 Minor Street (Approach Lanes): 56th Street West (2 lanes)
 Analysis Year/Case: Full Buildout (2031)

Hour Begin	Avg. Entering Volume				Major Street Total (Both Approaches)	Higher Volume Minor Approach
	EB	WB	NB	SB		
0:00	11	17	10	0	28	10
1:00	10	12	4	0	22	4
2:00	14	19	6	0	33	6
3:00	13	9	8	0	22	8
4:00	35	13	10	0	48	10
5:00	84	36	22	0	120	22
6:00	243	175	51	0	418	51
7:00	600	518	160	0	1118	160
8:00	459	397	116	0	856	116
9:00	269	258	107	0	527	107
10:00	259	268	112	0	527	112
11:00	272	295	115	0	567	115
12:00	255	320	118	0	575	118
13:00	226	339	130	0	565	130
14:00	258	403	144	0	661	144
15:00	425	573	203	0	998	203
16:00	375	576	238	0	951	238
17:00	266	601	251	0	867	251
18:00	197	368	135	0	565	135
19:00	99	278	109	0	377	109
20:00	88	188	74	0	276	74
21:00	54	110	46	0	164	46
22:00	25	68	18	0	93	18
23:00	17	32	4	0	49	4
TOTAL	4554	5873	2191	0	10427	2191

Condition A - Minimum Vehicular Volume (70% Columns):

Major Street Total > 420 and Higher Minor Street Total > 140 for 8 hours?

No

Hrs
5

Condition B - Interruption of Continuous Traffic (70% Columns):

Major Street Total > 630 and Higher Minor Street Total > 70 for 8 hours?

No

6

Combination of Conditions A & B (56% Columns):

Major Street Total > 336 and Higher Minor Street Total > 112 for 8 hours?

Yes

11

Major Street Total > 504 and Higher Minor Street Total > 56 for 8 hours?

Yes

12

Warrant 1 Satisfied?

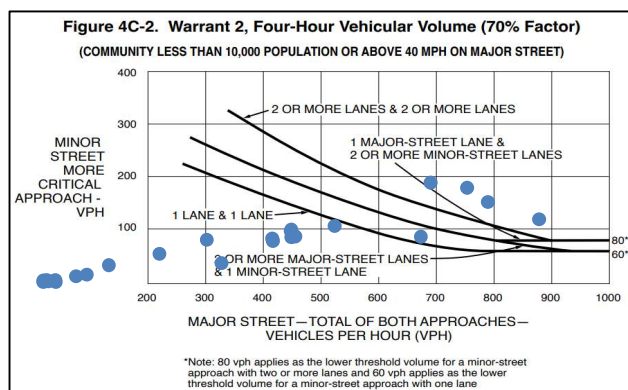
Yes

Warrant 2: Four-Hour Vehicular Volume

General Information

Agency/Company: Sanbell
 Date: 7/1/2025
 Project Number: 21266.04
 Project Description: The Trestles Subdivision
 Jurisdiction: City of Billings
 Major Street Speed Limit: 45 mph
 Major Street (Approach Lanes): Grand Avenue (2 lanes)
 Minor Street (Approach Lanes): 56th Street West (2 lanes)
 Analysis Year/Case: Existing (2025)

Hour Begin	Avg. Entering Volume				Major Street Total (Both Approaches)	Higher Volume Minor Approach
	EB	WB	NB	SB		
0:00	9	14	7	0	23	7
1:00	7	10	3	0	17	3
2:00	11	15	4	0	26	4
3:00	10	7	6	0	17	6
4:00	27	11	7	0	38	7
5:00	64	29	17	0	93	17
6:00	186	141	39	0	327	39
7:00	460	418	122	0	878	122
8:00	352	321	89	0	673	89
9:00	207	209	81	0	416	81
10:00	199	216	86	0	415	86
11:00	209	239	88	0	448	88
12:00	196	259	90	0	455	90
13:00	173	274	100	0	447	100
14:00	198	325	110	0	523	110
15:00	326	463	155	0	789	155
16:00	288	465	182	0	753	182
17:00	204	486	192	0	690	192
18:00	151	297	103	0	448	103
19:00	76	225	83	0	301	83
20:00	67	152	57	0	219	57
21:00	42	89	35	0	131	35
22:00	19	55	14	0	74	14
23:00	13	26	3	0	39	3
TOTAL	3494	4746	1673	0	8240	1673



Meets warrant criteria on graph for minimum of 4 hours (70% thresholds)?

Warrant 2 Satisfied?

Yes (4 hrs)

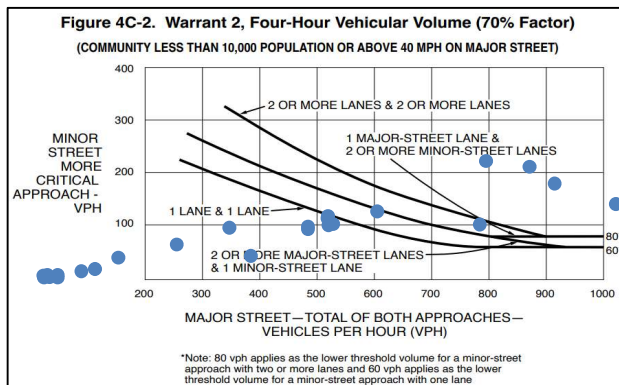
Yes

Warrant 2: Four-Hour Vehicular Volume

General Information

Agency/Company: Sanbell
 Date: 7/1/2025
 Project Number: 21266.04
 Project Description: The Trestles Subdivision
 Jurisdiction: City of Billings
 Major Street Speed Limit: 45 mph
 Major Street (Approach Lanes): Grand Avenue (2 lanes)
 Minor Street (Approach Lanes): 56th Street West (2 lanes)
 Analysis Year/Case: 1st Filing (2029)

Hour Begin	Avg. Entering Volume				Major Street Total (Both Approaches)	Higher Volume Minor Approach
	EB	WB	NB	SB		
0:00	10	16	9	0	26	9
1:00	9	11	4	0	20	4
2:00	13	17	5	0	30	5
3:00	11	8	8	0	19	8
4:00	32	12	9	0	44	9
5:00	76	33	20	0	109	20
6:00	221	160	45	0	381	45
7:00	545	474	144	0	1019	144
8:00	417	364	105	0	781	105
9:00	245	236	96	0	481	96
10:00	236	245	101	0	481	101
11:00	247	270	104	0	517	104
12:00	232	293	106	0	525	106
13:00	205	310	117	0	515	117
14:00	234	368	130	0	602	130
15:00	387	525	183	0	912	183
16:00	341	527	215	0	868	215
17:00	242	550	226	0	792	226
18:00	179	337	121	0	516	121
19:00	90	254	99	0	344	99
20:00	80	172	67	0	252	67
21:00	49	101	42	0	150	42
22:00	23	62	16	0	85	16
23:00	15	29	4	0	44	4
TOTAL	4139	5374	1976	0	9513	1976



Meets warrant criteria on graph for minimum of 4 hours (70% thresholds)?

Warrant 2 Satisfied?

Yes (4 hrs)

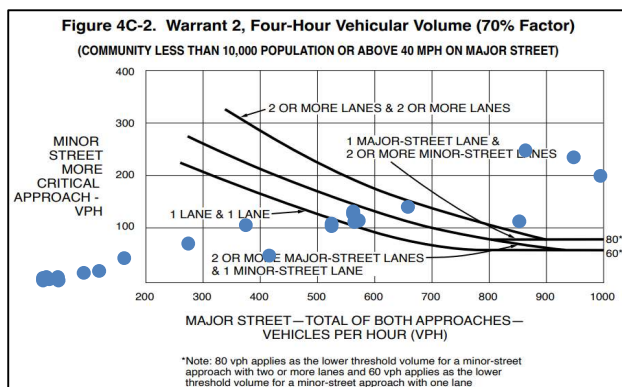
Yes

Warrant 2: Four-Hour Vehicular Volume

General Information

Agency/Company: Sanbell
 Date: 7/1/2025
 Project Number: 21266.04
 Project Description: The Trestles Subdivision
 Jurisdiction: City of Billings
 Major Street Speed Limit: 45 mph
 Major Street (Approach Lanes): Grand Avenue (2 lanes)
 Minor Street (Approach Lanes): 56th Street West (2 lanes)
 Analysis Year/Case: Full Buildout (2031)

Hour Begin	Avg. Entering Volume				Major Street Total (Both Approaches)	Higher Volume Minor Approach
	EB	WB	NB	SB		
0:00	11	17	10	0	28	10
1:00	10	12	4	0	22	4
2:00	14	19	6	0	33	6
3:00	13	9	8	0	22	8
4:00	35	13	10	0	48	10
5:00	84	36	22	0	120	22
6:00	243	175	51	0	418	51
7:00	600	518	160	0	1118	160
8:00	459	397	116	0	856	116
9:00	269	258	107	0	527	107
10:00	259	268	112	0	527	112
11:00	272	295	115	0	567	115
12:00	255	320	118	0	575	118
13:00	226	339	130	0	565	130
14:00	258	403	144	0	661	144
15:00	425	573	203	0	998	203
16:00	375	576	238	0	951	238
17:00	266	601	251	0	867	251
18:00	197	368	135	0	565	135
19:00	99	278	109	0	377	109
20:00	88	188	74	0	276	74
21:00	54	110	46	0	164	46
22:00	25	68	18	0	93	18
23:00	17	32	4	0	49	4
TOTAL	4554	5873	2191	0	10427	2191



Meets warrant criteria on graph for minimum of 4 hours (70% thresholds)?

Warrant 2 Satisfied?

Yes (5 hrs)

Yes

Warrant 3: Peak Hour

General Information

Agency/Company: Sanbell
Date: 7/1/2025
Project Number: 21266.04
Project Description: The Trestles Subdivision
Jurisdiction: City of Billings
Major Street Speed Limit: 45 mph
Major Street (Approach Lanes): Grand Avenue (2 lanes)
Minor Street (Approach Lanes): 56th Street West (2 lanes)
Analysis Year/Case: Existing (2025)

AM Peak Hour 7:15 - 8:15 AM

High Minor Total Stopped Time Delay (hrs)	0.72
Total Volume of Major Approaches (vehs)	906
High Minor Approach Volume (vehs)	130
Total Entering Volume (vehs)	1036

PM Peak Hour 4:30 - 5:30 PM

High Minor Total Stopped Time Delay (hrs)	0.94
Total Volume of Major Approaches (vehs)	719
High Minor Approach Volume (vehs)	220
Total Entering Volume (vehs)	939

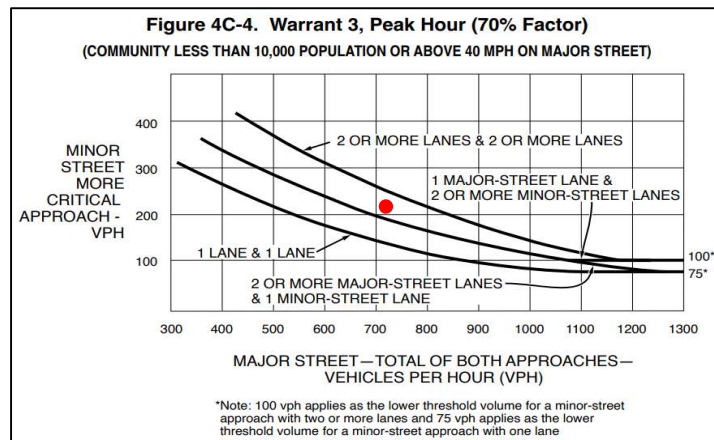
Category A: Peak Period: PM
Total stopped time delay for minor approach > 5 veh-hrs?
High minor approach volume > 150 for peak hour?
Total entering volume > 650 for peak hour?

No (0.94)
Yes (220)
Yes (939)

Category A warrant satisfied?

No

Category B:



Meets warrant criteria on graph for minimum of one hour (70% thresholds)?

No

Warrant 3 Satisfied?

No

Warrant 3: Peak Hour

General Information

Agency/Company: Sanbell
Date: 7/1/2025
Project Number: 21266.04
Project Description: The Trestles Subdivision
Jurisdiction: City of Billings
Major Street Speed Limit: 45 mph
Major Street (Approach Lanes): Grand Avenue (2 lanes)
Minor Street (Approach Lanes): 56th Street West (2 lanes)
Analysis Year/Case: 1st Filing (2029)

AM Peak Hour 7:15 - 8:15 AM

High Minor Total Stopped Time Delay (hrs)	0.85
Total Volume of Major Approaches (vehs)	1115
High Minor Approach Volume (vehs)	160
Total Entering Volume (vehs)	1275

PM Peak Hour 4:30 - 5:30 PM

High Minor Total Stopped Time Delay (hrs)	2.19
Total Volume of Major Approaches (vehs)	899
High Minor Approach Volume (vehs)	282
Total Entering Volume (vehs)	1181

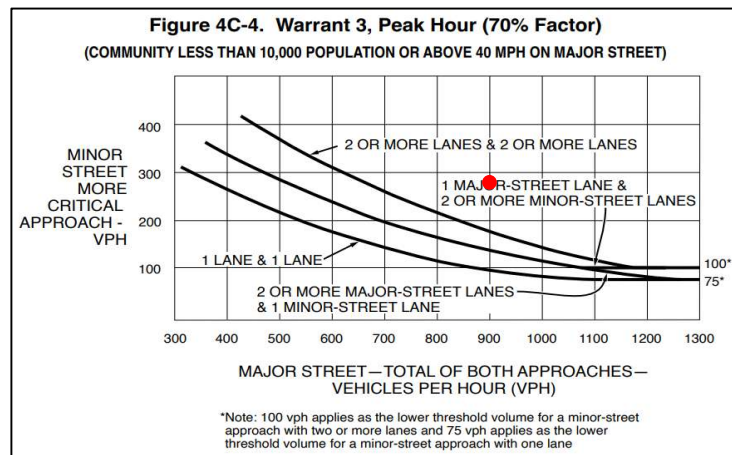
Category A: Peak Period: PM
Total stopped time delay for minor approach > 5 veh-hrs?
High minor approach volume > 150 for peak hour?
Total entering volume > 650 for peak hour?

No (2.19)
Yes (282)
Yes (1181)

Category A warrant satisfied?

No

Category B:



Meets warrant criteria on graph for minimum of one hour (70% thresholds)?

Yes

Warrant 3 Satisfied?

Yes

Warrant 3: Peak Hour

General Information

Agency/Company: Sanbell
 Date: 7/1/2025
 Project Number: 21266.04
 Project Description: The Trestles Subdivision
 Jurisdiction: City of Billings
 Major Street Speed Limit: 45 mph
 Major Street (Approach Lanes): Grand Avenue (2 lanes)
 Minor Street (Approach Lanes): 56th Street West (2 lanes)
 Analysis Year/Case: Full Buildout (2031)

AM Peak Hour 7:15 - 8:15 AM

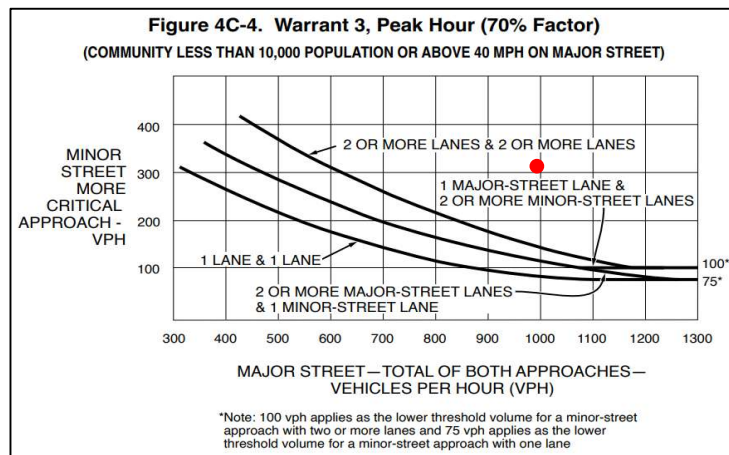
High Minor Total Stopped Time Delay (hrs)	1.11
Total Volume of Major Approaches (vehs)	1217
High Minor Approach Volume (vehs)	176
Total Entering Volume (vehs)	1393

PM Peak Hour 4:30 - 5:30 PM

High Minor Total Stopped Time Delay (hrs)	4.32
Total Volume of Major Approaches (vehs)	992
High Minor Approach Volume (vehs)	315
Total Entering Volume (vehs)	1307

Category A: Peak Period: PM
 Total stopped time delay for minor approach > 5 veh-hrs? **No (4.32)**
 High minor approach volume > 150 for peak hour? **Yes (315)**
 Total entering volume > 650 for peak hour? **Yes (1307)**
 Category A warrant satisfied? **No**

Category B:



Meets warrant criteria on graph for minimum of one hour (70% thresholds)? **Yes**

Warrant 3 Satisfied? **Yes**

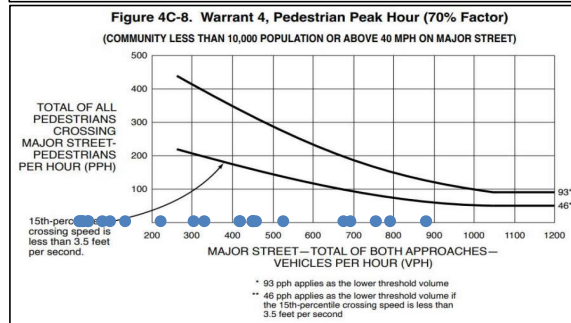
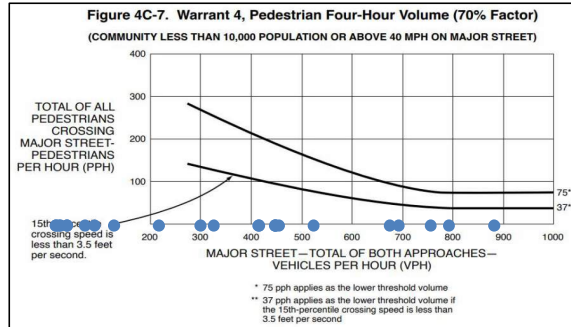
Warrant 4: Pedestrian Volume

General Information

Agency/Company: Sanbell
 Date: 7/1/2025
 Project Number: 21266.04
 Project Description: The Trestles Subdivision
 Jurisdiction: City of Billings
 Major Street Speed Limit: 45 mph
 Major Street (Approach Lanes): Grand Avenue (2 lanes)
 Minor Street (Approach Lanes): 56th Street West (2 lanes)
 Analysis Year/Case: Existing (2025)

This warrant is intended for application where the traffic volume on a major street is so heavy that pedestrians experience excessive delay in crossing the major street.

Hour Begin	Major Street Total Traffic	Pedestrian Volume Crossing Major Street
0:00	23	0
1:00	17	0
2:00	26	0
3:00	17	0
4:00	38	0
5:00	93	0
6:00	327	0
7:00	878	0
8:00	673	0
9:00	416	0
10:00	415	0
11:00	448	0
12:00	455	0
13:00	447	0
14:00	523	0
15:00	789	0
16:00	753	0
17:00	690	0
18:00	448	0
19:00	301	0
20:00	219	0
21:00	131	0
22:00	74	0
23:00	39	0
TOTAL	8,240	0



For each of any 4 hours of an average day, do the plotted points representing the vehicles per hour on the major street and the corresponding pedestrians per hour crossing the major street fall above the curve in Figure 4C-7?
No

For 1 hour of an average day, does the plotted point representing vehicles per hour on the major street and the corresponding pedestrians per hour crossing the major street fall above the curve in Figure 4C-8?
No

Warrant 4 Satisfied?

No

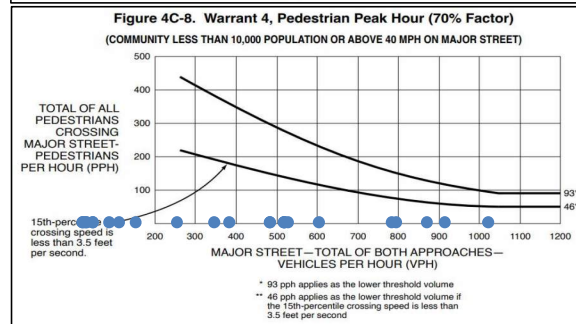
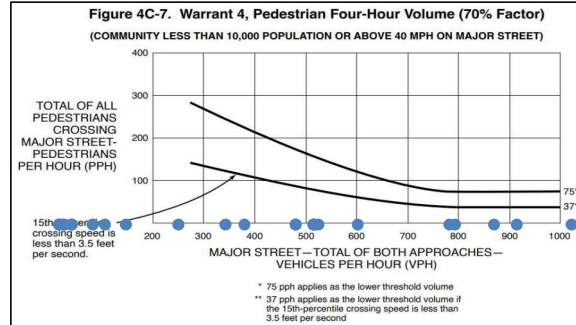
Warrant 4: Pedestrian Volume

General Information

Agency/Company: Sanbell
 Date: 7/1/2025
 Project Number: 21266.04
 Project Description: The Trestles Subdivision
 Jurisdiction: City of Billings
 Major Street Speed Limit: 45 mph
 Major Street (Approach Lanes): Grand Avenue (2 lanes)
 Minor Street (Approach Lanes): 56th Street West (2 lanes)
 Analysis Year/Case: 1st Filing (2029)

This warrant is intended for application where the traffic volume on a major street is so heavy that pedestrians experience excessive delay in crossing the major street.

Hour Begin	Major Street Total Traffic	Pedestrian Volume Crossing Major Street
0:00	26	0
1:00	20	0
2:00	30	0
3:00	19	0
4:00	44	0
5:00	109	0
6:00	381	0
7:00	1019	0
8:00	781	0
9:00	481	0
10:00	481	0
11:00	517	0
12:00	525	0
13:00	515	0
14:00	602	0
15:00	912	0
16:00	868	0
17:00	792	0
18:00	516	0
19:00	344	0
20:00	252	0
21:00	150	0
22:00	85	0
23:00	44	0
TOTAL	9,513	0



For each of any 4 hours of an average day, do the plotted points representing the vehicles per hour on the major street and the corresponding pedestrians per hour crossing the major street fall above the curve in Figure 4C-7?
No

For 1 hour of an average day, does the plotted point representing vehicles per hour on the major street and the corresponding pedestrians per hour crossing the major street fall above the curve in Figure 4C-8?
No

Warrant 4 Satisfied?

No

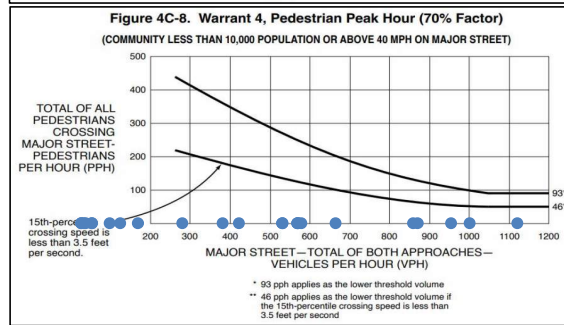
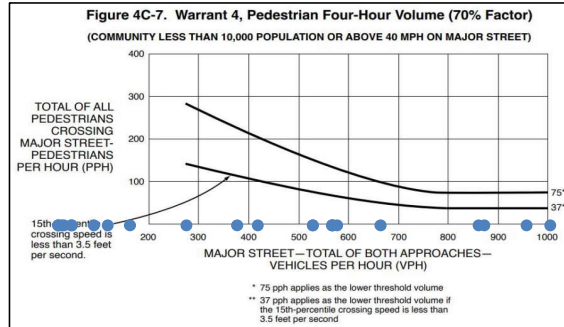
Warrant 4: Pedestrian Volume

General Information

Agency/Company: Sanbell
 Date: 7/1/2025
 Project Number: 21266.04
 Project Description: The Trestles Subdivision
 Jurisdiction: City of Billings
 Major Street Speed Limit: 45 mph
 Major Street (Approach Lanes): Grand Avenue (2 lanes)
 Minor Street (Approach Lanes): 56th Street West (2 lanes)
 Analysis Year/Case: Full Buildout (2031)

This warrant is intended for application where the traffic volume on a major street is so heavy that pedestrians experience excessive delay in crossing the major street.

Hour Begin	Major Street Total Traffic	Pedestrian Volume Crossing Major Street
0:00	28	0
1:00	22	0
2:00	33	0
3:00	22	0
4:00	48	0
5:00	120	0
6:00	418	0
7:00	1118	0
8:00	856	0
9:00	527	0
10:00	527	0
11:00	567	0
12:00	575	0
13:00	565	0
14:00	661	0
15:00	998	0
16:00	951	0
17:00	867	0
18:00	565	0
19:00	377	0
20:00	276	0
21:00	164	0
22:00	93	0
23:00	49	0
TOTAL	10,427	0



For each of any 4 hours of an average day, do the plotted points representing the vehicles per hour on the major street and the corresponding pedestrians per hour crossing the major street fall above the curve in Figure 4C-7?
No

For 1 hour of an average day, does the plotted point representing vehicles per hour on the major street and the corresponding pedestrians per hour crossing the major street fall above the curve in Figure 4C-8?
No

Warrant 4 Satisfied?

No

General Information	
Agency/Company:	Sanbell
Date:	7/1/2025
Project Number:	21266.04
Project Description:	The Trestles Subdivision
Jurisdiction:	City of Billings
Major Street Speed Limit:	45 mph
Major Street (Approach Lanes):	Grand Avenue (2 lanes)
Minor Street (Approach Lanes):	56th Street West (2 lanes)
Analysis Year/Case:	Existing (2025)
Warrant 5: School Crossing	
This warrant is intended for application where the fact that school children (elementary through high school students) cross the major street is the principle reason to consider installing a traffic signal. This warrant shall not be applied at locations where the distance to the nearest traffic control signal along the major street is less than 300 feet, unless it can be shown that the proposed traffic signal would not restrict the progressive movement of traffic.	
Is the number of adequate gaps in the major crossing traffic stream during the primary crossing period less than the number of minutes in that crossing period?	N/A
Do 20 or more students cross at this location during the highest crossing hour?	No
Warrant 5 Satisfied?	No
Warrant 6: Coordinated Signal System	
This warrant is intended for application where installation of a traffic signal would help to provide proper platooning of vehicles and therefore provide progressive movement in a coordinated signal system.	
Are any adjacent traffic signals located so far away that they do not provide a necessary degree of platooning and/or progressive operation?	No
Warrant 6 Satisfied?	No
Warrant 7: Crash Experience	
This warrant is intended for application where the severity and frequency of crashes are the principal reasons to consider installing a traffic control signal	
Have adequate trials of alternatives failed to reduce the crash frequency?	N/A
Have at least one of the following conditions apply to the reported crash history:	
1. Do the number of reported angle crashes and pedestrian crashes within a 1-year period equal or exceed the threshold number in Table 4C-4 for total angle crashes and pedestrian crashes?	
2. Do the number of reported fatal-and-injury angle crashes and pedestrian crashes within a 1-year period equal or exceed the threshold number in Table 4C-4 for total fatal-and-injury angle crashes and pedestrian crashes?	
3. Do the number of reported angle crashes and pedestrian crashes within a 3-year period equal or exceed the threshold number in Table 4C-5 for total angle crashes and pedestrian crashes?	
4. Do the number of reported fatal-and-injury angle crashes and pedestrian crashes within a 3-year period equal or exceed the threshold number in Table 4C-5 for total fatal-and-injury angle crashes and pedestrian crashes?	No
Is Condition A criterion met for 56% columns of Warrant 1 met?	No
Is Condition B criterion met for 56% columns of Warrant 1 met?	No
Are observed pedestrian volumes equal to or greater than 80% of what is required for Warrant 4?	No
Warrant 7 Satisfied?	No

General Information	
Agency/Company:	Sanbell
Date:	7/1/2025
Project Number:	21266.04
Project Description:	The Trestles Subdivision
Jurisdiction:	City of Billings
Major Street Speed Limit:	45 mph
Major Street (Approach Lanes):	Grand Avenue (2 lanes)
Minor Street (Approach Lanes):	56th Street West (2 lanes)
Analysis Year/Case:	1st Filing (2029)
Warrant 5: School Crossing	
This warrant is intended for application where the fact that school children (elementary through high school students) cross the major street is the principle reason to consider installing a traffic signal. This warrant shall not be applied at locations where the distance to the nearest traffic control signal along the major street is less than 300 feet, unless it can be shown that the proposed traffic signal would not restrict the progressive movement of traffic.	
Is the number of adequate gaps in the major crossing traffic stream during the primary crossing period less than the number of minutes in that crossing period?	N/A
Do 20 or more students cross at this location during the highest crossing hour?	No
Warrant 5 Satisfied?	No
Warrant 6: Coordinated Signal System	
This warrant is intended for application where installation of a traffic signal would help to provide proper platooning of vehicles and therefore provide progressive movement in a coordinated signal system.	
Are any adjacent traffic signals located so far away that they do not provide a necessary degree of platooning and/or progressive operation?	No
Warrant 6 Satisfied?	No
Warrant 7: Crash Experience	
This warrant is intended for application where the severity and frequency of crashes are the principal reasons to consider installing a traffic control signal	
Have adequate trials of alternatives failed to reduce the crash frequency?	N/A
Have at least one of the following conditions apply to the reported crash history:	
1. Do the number of reported angle crashes and pedestrian crashes within a 1-year period equal or exceed the threshold number in Table 4C-4 for total angle crashes and pedestrian crashes?	
2. Do the number of reported fatal-and-injury angle crashes and pedestrian crashes within a 1-year period equal or exceed the threshold number in Table 4C-4 for total fatal-and-injury angle crashes and pedestrian crashes?	
3. Do the number of reported angle crashes and pedestrian crashes within a 3-year period equal or exceed the threshold number in Table 4C-5 for total angle crashes and pedestrian crashes?	
4. Do the number of reported fatal-and-injury angle crashes and pedestrian crashes within a 3-year period equal or exceed the threshold number in Table 4C-5 for total fatal-and-injury angle crashes and pedestrian crashes?	No
Is Condition A criterion met for 56% columns of Warrant 1 met?	No
Is Condition B criterion met for 56% columns of Warrant 1 met?	Yes
Are observed pedestrian volumes equal to or greater than 80% of what is required for Warrant 4?	No
Warrant 7 Satisfied?	No

General Information	
Agency/Company:	Sanbell
Date:	7/1/2025
Project Number:	21266.04
Project Description:	The Trestles Subdivision
Jurisdiction:	City of Billings
Major Street Speed Limit:	45 mph
Major Street (Approach Lanes):	Grand Avenue (2 lanes)
Minor Street (Approach Lanes):	56th Street West (2 lanes)
Analysis Year/Case:	Full Buildout (2031)
Warrant 5: School Crossing	
This warrant is intended for application where the fact that school children (elementary through high school students) cross the major street is the principle reason to consider installing a traffic signal. This warrant shall not be applied at locations where the distance to the nearest traffic control signal along the major street is less than 300 feet, unless it can be shown that the proposed traffic signal would not restrict the progressive movement of traffic.	
Is the number of adequate gaps in the major crossing traffic stream during the primary crossing period less than the number of minutes in that crossing period?	N/A
Do 20 or more students cross at this location during the highest crossing hour?	No
Warrant 5 Satisfied?	No
Warrant 6: Coordinated Signal System	
This warrant is intended for application where installation of a traffic signal would help to provide proper platooning of vehicles and therefore provide progressive movement in a coordinated signal system.	
Are any adjacent traffic signals located so far away that they do not provide a necessary degree of platooning and/or progressive operation?	No
Warrant 6 Satisfied?	No
Warrant 7: Crash Experience	
This warrant is intended for application where the severity and frequency of crashes are the principal reasons to consider installing a traffic control signal	
Have adequate trials of alternatives failed to reduce the crash frequency?	N/A
Have at least one of the following conditions apply to the reported crash history:	
1. Do the number of reported angle crashes and pedestrian crashes within a 1-year period equal or exceed the threshold number in Table 4C-4 for total angle crashes and pedestrian crashes?	
2. Do the number of reported fatal-and-injury angle crashes and pedestrian crashes within a 1-year period equal or exceed the threshold number in Table 4C-4 for total fatal-and-injury angle crashes and pedestrian crashes?	
3. Do the number of reported angle crashes and pedestrian crashes within a 3-year period equal or exceed the threshold number in Table 4C-5 for total angle crashes and pedestrian crashes?	
4. Do the number of reported fatal-and-injury angle crashes and pedestrian crashes within a 3-year period equal or exceed the threshold number in Table 4C-5 for total fatal-and-injury angle crashes and pedestrian crashes?	No
Is Condition A criterion met for 56% columns of Warrant 1 met?	Yes
Is Condition B criterion met for 56% columns of Warrant 1 met?	Yes
Are observed pedestrian volumes equal to or greater than 80% of what is required for Warrant 4?	No
Warrant 7 Satisfied?	No

General Information

Agency/Company: Sanbell
Date: 7/1/2025
Project Number: 21266.04
Project Description: The Trestles Subdivision
Jurisdiction: City of Billings
Major Street Speed Limit: 45 mph
Major Street (Approach Lanes): Grand Avenue (2 lanes)
Minor Street (Approach Lanes): 56th Street West (2 lanes)
Analysis Year/Case: Existing (2025)

Warrant 8: Roadway Network

This warrant is intended for application where installation of a traffic signal could be justified in order to encourage concentration and organization of traffic flow on a roadway network

Do two or more of the intersecting routes at this location have at least one of the following characteristics:

- A. It is part of the street or highway system that serves as the principal roadway network for through traffic flow; or
- B. It includes rural or suburban highways outside, entering, or traversing a City; or
- C. It appears as a major route on an official plan.

Yes

Does this intersection have an existing or immediately projected total entering volume of a least 1000 vehicles during a weekday typical peak hour and have a 5-year projected traffic volume that meets one or more of Warrants 1, 2, and 3 during an average weekday?

Yes

Does this intersection have an existing or immediately projected total entering volume of at least 1000 vph for each of any 5 hours of a Saturday or Sunday?

N/A

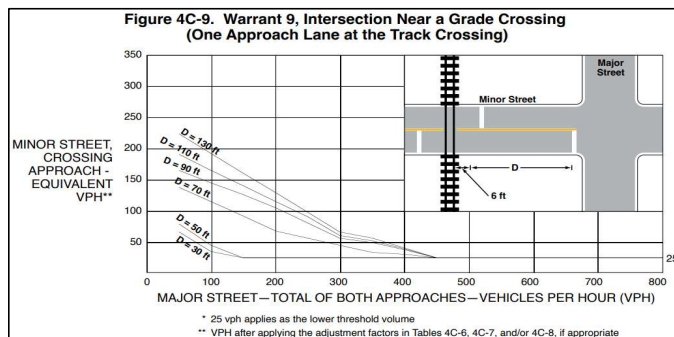
Warrant 8 Satisfied? Yes

Warrant 9: Intersection Near a Grade Crossing

This warrant is intended for application where none of the conditions described in the other eight traffic signal warrants are met, but the proximity to the intersection of a grade crossing on an intersection approach controlled by a STOP or YIELD sign is the principal reason to consider installing a traffic signal.

Does a grade crossing exist on an approach controlled by a STOP or YIELD sign whereby the center of the track nearest to the intersection is within 140 feet of the stop or yield line?

No



During the highest traffic volume hour during which the rail traffic uses the crossing, does the plotted point representing vehicles per hour on the major street and the corresponding vehicles per hour on the minor-street approach that crosses the track fall above the applicable curve in Figure 4C-9 or 4C-10 (whichever is applicable) for the existing combination of approach lanes over the track and the distance D, which is the clear storage distance?

N/A

Warrant 9 Satisfied? N/A

General Information

Agency/Company: Sanbell
Date: 7/1/2025
Project Number: 21266.04
Project Description: The Trestles Subdivision
Jurisdiction: City of Billings
Major Street Speed Limit: 45 mph
Major Street (Approach Lanes): Grand Avenue (2 lanes)
Minor Street (Approach Lanes): 56th Street West (2 lanes)
Analysis Year/Case: 1st Filing (2029)

Warrant 8: Roadway Network

This warrant is intended for application where installation of a traffic signal could be justified in order to encourage concentration and organization of traffic flow on a roadway network

Do two or more of the intersecting routes at this location have at least one of the following characteristics:

- A. It is part of the street or highway system that serves as the principal roadway network for through traffic flow; or
- B. It includes rural or suburban highways outside, entering, or traversing a City; or
- C. It appears as a major route on an official plan.

Yes

Does this intersection have an existing or immediately projected total entering volume of a least 1000 vehicles during a weekday typical peak hour and have a 5-year projected traffic volume that meets one or more of Warrants 1, 2, and 3 during an average weekday?

Yes

Does this intersection have an existing or immediately projected total entering volume of at least 1000 vph for each of any 5 hours of a Saturday or Sunday?

N/A

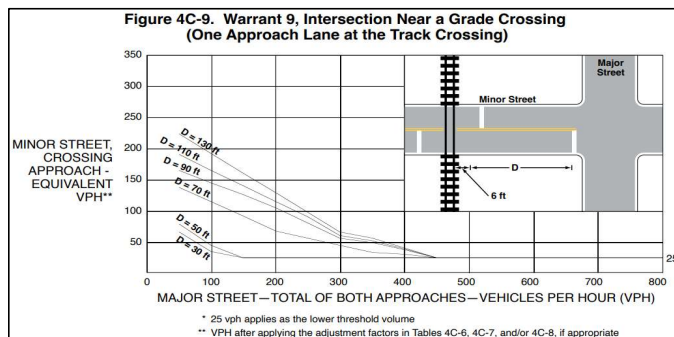
Warrant 8 Satisfied? Yes

Warrant 9: Intersection Near a Grade Crossing

This warrant is intended for application where none of the conditions described in the other eight traffic signal warrants are met, but the proximity to the intersection of a grade crossing on an intersection approach controlled by a STOP or YIELD sign is the principal reason to consider installing a traffic signal.

Does a grade crossing exist on an approach controlled by a STOP or YIELD sign whereby the center of the track nearest to the intersection is within 140 feet of the stop or yield line?

No



During the highest traffic volume hour during which the rail traffic uses the crossing, does the plotted point representing vehicles per hour on the major street and the corresponding vehicles per hour on the minor-street approach that crosses the track fall above the applicable curve in Figure 4C-9 or 4C-10 (whichever is applicable) for the existing combination of approach lanes over the track and the distance D, which is the clear storage distance?

N/A

Warrant 9 Satisfied? N/A

General Information

Agency/Company: Sanbell
Date: 7/1/2025
Project Number: 21266.04
Project Description: The Trestles Subdivision
Jurisdiction: City of Billings
Major Street Speed Limit: 45 mph
Major Street (Approach Lanes): Grand Avenue (2 lanes)
Minor Street (Approach Lanes): 56th Street West (2 lanes)
Analysis Year/Case: Full Buildout (2031)

Warrant 8: Roadway Network

This warrant is intended for application where installation of a traffic signal could be justified in order to encourage concentration and organization of traffic flow on a roadway network

Do two or more of the intersecting routes at this location have at least one of the following characteristics:

- A. It is part of the street or highway system that serves as the principal roadway network for through traffic flow; or
- B. It includes rural or suburban highways outside, entering, or traversing a City; or
- C. It appears as a major route on an official plan.

Yes

Does this intersection have an existing or immediately projected total entering volume of a least 1000 vehicles during a weekday typical peak hour and have a 5-year projected traffic volume that meets one or more of Warrants 1, 2, and 3 during an average weekday?

Yes

Does this intersection have an existing or immediately projected total entering volume of at least 1000 vph for each of any 5 hours of a Saturday or Sunday?

N/A

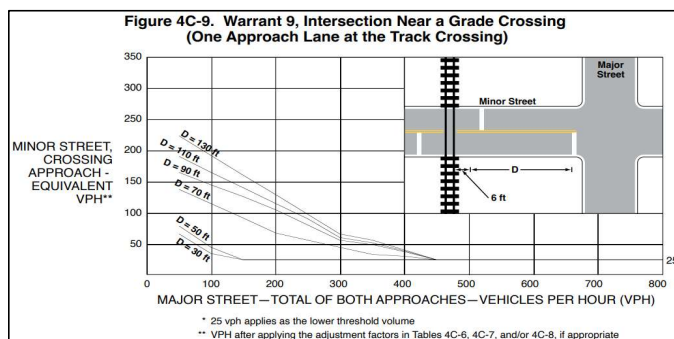
Warrant 8 Satisfied? Yes

Warrant 9: Intersection Near a Grade Crossing

This warrant is intended for application where none of the conditions described in the other eight traffic signal warrants are met, but the proximity to the intersection of a grade crossing on an intersection approach controlled by a STOP or YIELD sign is the principal reason to consider installing a traffic signal.

Does a grade crossing exist on an approach controlled by a STOP or YIELD sign whereby the center of the track nearest to the intersection is within 140 feet of the stop or yield line?

No



During the highest traffic volume hour during which the rail traffic uses the crossing, does the plotted point representing vehicles per hour on the major street and the corresponding vehicles per hour on the minor-street approach that crosses the track fall above the applicable curve in Figure 4C-9 or 4C-10 (whichever is applicable) for the existing combination of approach lanes over the track and the distance D, which is the clear storage distance?

N/A

Warrant 9 Satisfied? N/A

CAPACITY CALCULATIONS – IMPROVEMENTS

APPENDIX G

Intelligent Infrastructure.
Enduring Communities.



Intersection	Approach	1st Filing (2029) with Improvements					
		AM Peak			PM Peak		
		Avg Delay (s/veh)	LOS	95th % Queue (veh)	Avg Delay (s/veh)	LOS	95th % Queue (veh)
Intersection Control		One-Way Stop-Control (NB) - EB RT Lane					
56th St W & Grand Ave	NB	16.6	C	2	25.2	D	4
	EB	0.0	A	0	0.0	A	0
	WB	3.1	A	1	1.9	A	1
	Intersection	3.1	A	--	6.9	A	--
Intersection Control		All-Way Stop-Control					
56th St W & Grand Ave	NB	11.5	B	2	12.5	B	2
	EB	109.5	F	25	19.0	C	5
	WB	13.4	B	3	25.6	D	9
	Intersection	65.6	F	--	20.6	C	--
Intersection Control		All-Way Stop-Control - EB RT Lane					
56th St W & Grand Ave	NB	11.5	B	2	12.2	B	2
	EB	25.8	D	10	13.4	B	3
	WB	14.1	B	4	25.0	D	8
	Intersection	20.2	C	--	18.7	C	--
Intersection Control		Single-Lane Roundabout					
56th St W & Grand Ave	NB	7.4	A	1	6.3	A	2
	EB	11.6	B	5	5.8	A	2
	WB	6.0	A	2	9.0	A	4
	Intersection	9.2	A	--	7.5	A	--
Intersection Control		Signalized					
56th St W & Grand Ave	NB	18.6	B	2	14.6	B	3
	EB	9.9	A	8	9.7	A	4
	WB	9.8	A	3	12.6	B	7
	Intersection	10.6	B	--	12.2	B	--

Option 1: EB RT Lane

Number	7					
Intersection	56th St W & Grand Ave					
Control Type	Two-way stop					
Analysis Method	HCM 7th Edition					
Name	56th St W		Grand Ave		Grand Ave	
Approach	Northbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Thru	Right	Left	Thru
Base Volume Input [veh/h]	28	132	493	202	129	291
Total Analysis Volume [veh/h]	30	143	536	220	140	316

Intersection Settings

Priority Scheme	Stop	Free	Free
Flared Lane			
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance	No		
Number of Storage Spaces in Median	0	0	0

Capacity Analysis

Calculated Rank	3	2	1	1	2	1
v_c, Conflicting Flow Rate	1132	536	0	0	756	0
v_c, Stage 1	536	536	0	0	756	0
v_c, Stage 2	596	0	0	0	0	0
c_p,x, Potential Capacity [veh/h]	221	537	0	0	848	0
c_p,x, Stage 1 [veh/h]	579	1350	0	0	2005	0
c_p,x, Stage 2 [veh/h]	543	1073	0	0	1613	0
c_m,x, Movement Capacity [veh/h]	184	537	100000	100000	848	100000
c_m,x, Stage 1 [veh/h]	0	0	0	0	0	0
c_m,x, Stage 2 [veh/h]	0	0	0	0	0	0
c_T, Total Capacity [veh/h]	184	537	100000	100000	848	100000

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.16	0.27	0.01	0.00	0.17	0.00
d_M, Delay for Movement [s/veh]	28.30	14.13	0.00	0.00	10.09	0.00
Movement LOS	D	B	A	A	B	A
Critical Movement	Yes	No	No	No	No	No
95th-Percentile Queue Length [veh/ln]	0.57	1.07	0.00	0.00	0.59	0.00
95th-Percentile Queue Length [ft/ln]	14.17	26.68	0.00	0.00	14.74	0.00
d_A, Approach Delay [s/veh]	16.59		0.00		3.10	
Approach LOS	C		A		A	
V/C_I, Worst Movement V/C Ratio	0.16					
d_I, Worst Movement Control Delay [s/veh]	28.30					
d_I, Intersection Delay [s/veh]	3.09					
Intersection LOS	D					

Option 2: AWSC

Number	7					
Intersection	56th St W & Grand Ave					
Control Type	All-way stop					
Analysis Method	HCM 7th Edition					
Name	56th St W		Grand Ave		Grand Ave	
Approach	Northbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Thru	Right	Left	Thru
Base Volume Input [veh/h]	28	132	493	202	129	291
Total Analysis Volume [veh/h]	30	143	536	220	140	316

Intersection Settings

Lanes

Capacity per Entry Lane [veh/h]	465	549	756	567	618

Movement, Approach, & Intersection Results

Average Lane Delay [s/veh]	10.98	11.54	109.45	11.11	14.45
95th-Percentile Queue Length [veh]	0.21	1.03	24.61	0.97	2.91
95th-Percentile Queue Length [ft]	5.15	25.87	615.14	24.14	72.78
Approach Delay [s/veh]	11.45		109.45	13.42	
Approach LOS	B		F	B	
Intersection Delay [s/veh]	65.59				
Intersection LOS	F				

Option 3: AWSC w/ EB RT Lane

Number	7					
Intersection	56th St W & Grand Ave					
Control Type	All-way stop					
Analysis Method	HCM 7th Edition					
Name	56th St W		Grand Ave		Grand Ave	
Approach	Northbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Thru	Right	Left	Thru
Base Volume Input [veh/h]	28	132	493	202	129	291
Total Analysis Volume [veh/h]	30	143	536	220	140	316

Intersection Settings

Lanes

Capacity per Entry Lane [veh/h]	463	547	631	715	549	598

Movement, Approach, & Intersection Results

Average Lane Delay [s/veh]	11.02	11.59	32.31	9.96	11.49	15.29
95th-Percentile Queue Length [veh]	0.21	1.04	9.45	1.31	1.01	3.10
95th-Percentile Queue Length [ft]	5.18	26.00	236.28	32.65	25.17	77.40
Approach Delay [s/veh]	11.49		25.81		14.12	
Approach LOS	B		D		B	
Intersection Delay [s/veh]	20.17					
Intersection LOS	C					

Option 4: Roundabout

Number	7					
Intersection	56th St W & Grand Ave					
Control Type	Roundabout					
Analysis Method	HCM 7th Edition					
Name	56th St W		Grand Ave		Grand Ave	
Approach	Northbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Thru	Right	Left	Thru
Base Volume Input [veh/h]	28	132	493	202	129	291
Total Analysis Volume [veh/h]	30	143	536	220	140	316

Intersection Settings

Number of Conflicting Circulating Lanes	1		1		1	
Circulating Flow Rate [veh/h]	540		145		32	
Exiting Flow Rate [veh/h]	371		354		692	
Demand Flow Rate [veh/h]	28	132	493	202	129	291
Adjusted Demand Flow Rate [veh/h]	30	143	536	220	140	316

Lanes

Overwrite Calculated Critical Headway	No		No		No	
User-Defined Critical Headway [s]	4.00		4.00		4.00	
Overwrite Calculated Follow-Up Time	No		No		No	
User-Defined Follow-Up Time [s]	3.00		3.00		3.00	
A (intercept)	1380.00		1380.00		1380.00	
B (coefficient)	0.00102		0.00102		0.00102	
HV Adjustment Factor	0.94		0.99		0.98	
Entry Flow Rate [veh/h]	184		766		468	
Capacity of Entry and Bypass Lanes [veh/h]	796		1191		1336	
Pedestrian Impedance	1.00		1.00		1.00	
Capacity per Entry Lane [veh/h]	750		1176		1303	
X, volume / capacity	0.23		0.64		0.35	

Movement, Approach, & Intersection Results

Average Lane Delay [s/veh]	7.39	11.62	5.99
Lane LOS	A	B	A
95th-Percentile Queue Length [veh]	0.89	4.94	1.59
95th-Percentile Queue Length [ft]	22.23	123.50	39.79
Approach Delay [s/veh]	7.39	11.62	5.99
Approach LOS	A	B	A
Intersection Delay [s/veh]	9.24		
Intersection LOS	A		

Option 5: Signalized

Number	7					
Intersection	56th St W & Grand Ave					
Control Type	Signalized					
Analysis Method	HCM 7th Edition					
Name	56th St W		Grand Ave		Grand Ave	
Approach	Northbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Thru	Right	Left	Thru
Base Volume Input [veh/h]	28	132	493	202	129	291
Total Analysis Volume [veh/h]	30	72	536	110	140	316

Intersection Settings

Cycle Length [s]	60					
Active Pattern	Pattern 1					
Coordination Type	Time of Day Pattern Coordinated					
Actuation Type	Fixed time					
Lost time [s]	0.00					
Control Type	Permissive	Permissive	Permissive	Permissive	Permissive	Permissive
Signal Group	1	0	8	0	0	4
Auxiliary Signal Groups						
Lead / Lag	Lead	-	-	-	-	-
Minimum Green [s]	5	0	10	0	0	10
Maximum Green [s]	25	0	187	0	0	187
Amber [s]	3.0	0.0	3.0	0.0	0.0	3.0
All red [s]	1.0	0.0	1.0	0.0	0.0	1.0
Split [s]	19	0	41	0	0	41
Walk [s]	5	0	5	0	0	5
Pedestrian Clearance [s]	10	0	10	0	0	10
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0
l1, Start-Up Lost Time [s]	2.0	0.0	2.0	0.0	0.0	2.0
Minimum Recall	No		No			No
Maximum Recall	No		No			No
Pedestrian Recall	No		No			No
Pedestrian Signal Group	0					
Pedestrian Walk [s]	0					
Pedestrian Clearance [s]	0					

Lane Group Calculations

g / C, Green / Cycle	0.25	0.25	0.62	0.62	0.62
(v / s)_i Volume / Saturation Flow Rate	0.02	0.05	0.38	0.18	0.18
so, Base Saturation Flow per Lane [pc/h/ln]	1750	1750	1750	1750	1750
Arrival type	3		3	3	
s, saturation flow rate [veh/h]	1589	1415	1690	774	1721
c, Capacity [veh/h]	397	354	1042	388	1061
X, volume / capacity	0.08	0.20	0.62	0.36	0.30
d, Delay for Lane Group [s/veh]	17.57	19.08	9.91	18.26	6.12

Version 2023 (SP 0-9)

Lane Group LOS	B	B	A	B	A
Critical Lane Group	No	Yes	Yes	No	No
50th-Percentile Queue Length [veh/ln]	0.31	0.81	4.23	1.53	1.30
50th-Percentile Queue Length [ft/ln]	7.85	20.13	105.79	38.33	32.61
95th-Percentile Queue Length [veh/ln]	0.57	1.45	7.61	2.76	2.35
95th-Percentile Queue Length [ft/ln]	14.13	36.23	190.13	69.00	58.70

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	17.57	19.08	9.91	9.91	18.26	6.12
Movement LOS	B	B	A	A	B	A
Critical Movement	No	Yes	No	No	No	No
d_A, Approach Delay [s/veh]	18.63		9.91		9.84	
Approach LOS	B		A		A	
d_I, Intersection Delay [s/veh]	10.63					
Intersection LOS	B					
Intersection V/C	0.433					

Option 1: EB RT Lane

Number	7					
Intersection	56th St W & Grand Ave					
Control Type	Two-way stop					
Analysis Method	HCM 7th Edition					
Name	56th St W		Grand Ave		Grand Ave	
Approach	Northbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Thru	Right	Left	Thru
Base Volume Input [veh/h]	130	152	246	83	129	441
Total Analysis Volume [veh/h]	141	165	267	90	140	479

Intersection Settings

Priority Scheme	Stop	Free	Free
Flared Lane			
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance	No		
Number of Storage Spaces in Median	0	0	0

Capacity Analysis

Calculated Rank	3	2	1	1	2	1
v_c, Conflicting Flow Rate	1026	267	0	0	357	0
v_c, Stage 1	267	267	0	0	357	0
v_c, Stage 2	759	0	0	0	0	0
c_p,x, Potential Capacity [veh/h]	262	775	0	0	1213	0
c_p,x, Stage 1 [veh/h]	782	1227	0	0	1821	0
c_p,x, Stage 2 [veh/h]	466	1089	0	0	1636	0
c_m,x, Movement Capacity [veh/h]	232	775	100000	100000	1213	100000
c_m,x, Stage 1 [veh/h]	0	0	0	0	0	0
c_m,x, Stage 2 [veh/h]	0	0	0	0	0	0
c_T, Total Capacity [veh/h]	232	775	100000	100000	1213	100000

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.61	0.21	0.00	0.00	0.12	0.00
d_M, Delay for Movement [s/veh]	41.94	10.90	0.00	0.00	8.36	0.00
Movement LOS	E	B	A	A	A	A
Critical Movement	Yes	No	No	No	No	No
95th-Percentile Queue Length [veh/ln]	3.54	0.80	0.00	0.00	0.39	0.00
95th-Percentile Queue Length [ft/ln]	88.58	20.09	0.00	0.00	9.76	0.00
d_A, Approach Delay [s/veh]	25.21		0.00		1.89	
Approach LOS	D		A		A	
V/C_I, Worst Movement V/C Ratio	0.61					
d_I, Worst Movement Control Delay [s/veh]	41.94					
d_I, Intersection Delay [s/veh]	6.93					
Intersection LOS	E					

Option 2: AWSC

Number	7					
Intersection	56th St W & Grand Ave					
Control Type	All-way stop					
Analysis Method	HCM 7th Edition					
Name	56th St W		Grand Ave		Grand Ave	
Approach	Northbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Thru	Right	Left	Thru
Base Volume Input [veh/h]	130	152	246	83	129	441
Total Analysis Volume [veh/h]	141	165	267	90	140	479

Intersection Settings

Lanes

Capacity per Entry Lane [veh/h]	476	566	575	548	592

Movement, Approach, & Intersection Results

Average Lane Delay [s/veh]	13.42	11.66	18.98	11.50	29.65
95th-Percentile Queue Length [veh]	1.23	1.21	4.25	1.01	8.11
95th-Percentile Queue Length [ft]	30.69	30.15	106.37	25.23	202.70
Approach Delay [s/veh]	12.47		18.98	25.55	
Approach LOS	B		C	D	
Intersection Delay [s/veh]	20.60				
Intersection LOS	C				

Option 3: AWSC w/ EB RT Lane

Number	7					
Intersection	56th St W & Grand Ave					
Control Type	All-way stop					
Analysis Method	HCM 7th Edition					
Name	56th St W		Grand Ave		Grand Ave	
Approach	Northbound		Eastbound		Westbound	
Lane Configuration	↵↶		↑↶		↵↑	
Turning Movement	Left	Right	Thru	Right	Left	Thru
Base Volume Input [veh/h]	130	152	246	83	129	441
Total Analysis Volume [veh/h]	141	165	267	90	140	479

Intersection Settings

Lanes

Capacity per Entry Lane [veh/h]	485	577	564	632	551	596

Movement, Approach, & Intersection Results

Average Lane Delay [s/veh]	13.14	11.40	14.70	9.34	11.43	28.99
95th-Percentile Queue Length [veh]	1.20	1.17	2.53	0.49	1.00	7.98
95th-Percentile Queue Length [ft]	29.91	29.32	63.20	12.37	25.02	199.44
Approach Delay [s/veh]	12.20		13.35		25.02	
Approach LOS	B		B		D	
Intersection Delay [s/veh]	18.71					
Intersection LOS	C					

Option 4: Roundabout

Number	7					
Intersection	56th St W & Grand Ave					
Control Type	Roundabout					
Analysis Method	HCM 7th Edition					
Name	56th St W		Grand Ave		Grand Ave	
Approach	Northbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Thru	Right	Left	Thru
Base Volume Input [veh/h]	130	152	246	83	129	441
Total Analysis Volume [veh/h]	141	165	267	90	140	479

Intersection Settings

Number of Conflicting Circulating Lanes	1		1		1	
Circulating Flow Rate [veh/h]	268		140		141	
Exiting Flow Rate [veh/h]	232		628		435	
Demand Flow Rate [veh/h]	130	152	246	83	129	441
Adjusted Demand Flow Rate [veh/h]	141	165	267	90	140	479

Lanes

Overwrite Calculated Critical Headway	No		No		No	
User-Defined Critical Headway [s]	4.00		4.00		4.00	
Overwrite Calculated Follow-Up Time	No		No		No	
User-Defined Follow-Up Time [s]	3.00		3.00		3.00	
A (intercept)	1380.00		1380.00		1380.00	
B (coefficient)	0.00102		0.00102		0.00102	
HV Adjustment Factor	1.00		0.99		0.99	
Entry Flow Rate [veh/h]	308		360		627	
Capacity of Entry and Bypass Lanes [veh/h]	1050		1197		1196	
Pedestrian Impedance	1.00		1.00		1.00	
Capacity per Entry Lane [veh/h]	1046		1187		1181	
X, volume / capacity	0.29		0.30		0.52	

Movement, Approach, & Intersection Results

Average Lane Delay [s/veh]	6.33	5.84	8.98
Lane LOS	A	A	A
95th-Percentile Queue Length [veh]	1.23	1.28	3.16
95th-Percentile Queue Length [ft]	30.65	31.88	79.10
Approach Delay [s/veh]	6.33	5.84	8.98
Approach LOS	A	A	A
Intersection Delay [s/veh]	7.47		
Intersection LOS	A		

Option 5: Signalized

Number	7					
Intersection	56th St W & Grand Ave					
Control Type	Signalized					
Analysis Method	HCM 7th Edition					
Name	56th St W		Grand Ave		Grand Ave	
Approach	Northbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Thru	Right	Left	Thru
Base Volume Input [veh/h]	130	152	246	83	129	441
Total Analysis Volume [veh/h]	141	83	267	45	140	479

Intersection Settings

Cycle Length [s]	60					
Active Pattern	Pattern 1					
Coordination Type	Time of Day Pattern Coordinated					
Actuation Type	Fixed time					
Lost time [s]	0.00					
Control Type	Permissive	Permissive	Permissive	Permissive	Permissive	Permissive
Signal Group	1	0	8	0	0	4
Auxiliary Signal Groups						
Lead / Lag	Lead	-	-	-	-	-
Minimum Green [s]	5	0	10	0	0	10
Maximum Green [s]	21	0	31	0	0	31
Amber [s]	3.0	0.0	3.0	0.0	0.0	3.0
All red [s]	1.0	0.0	1.0	0.0	0.0	1.0
Split [s]	25	0	35	0	0	35
Walk [s]	5	0	5	0	0	5
Pedestrian Clearance [s]	10	0	10	0	0	10
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0
l1, Start-Up Lost Time [s]	2.0	0.0	2.0	0.0	0.0	2.0
Minimum Recall	No		No			No
Maximum Recall	No		No			No
Pedestrian Recall	No		No			No
Pedestrian Signal Group	0					
Pedestrian Walk [s]	0					
Pedestrian Clearance [s]	0					

Lane Group Calculations

g / C, Green / Cycle	0.35	0.35	0.52	0.52	0.52
(v / s)_i Volume / Saturation Flow Rate	0.08	0.06	0.18	0.13	0.28
so, Base Saturation Flow per Lane [pc/h/ln]	1750	1750	1750	1750	1750
Arrival type	3		3	3	
s, saturation flow rate [veh/h]	1667	1478	1700	1084	1728
c, Capacity [veh/h]	583	517	878	526	893
X, volume / capacity	0.24	0.16	0.36	0.27	0.54
d, Delay for Lane Group [s/veh]	14.83	14.09	9.71	14.70	12.01

Version 2023 (SP 0-9)

Lane Group LOS	B	B	A	B	B
Critical Lane Group	Yes	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	1.28	0.73	2.16	1.28	3.55
50th-Percentile Queue Length [ft/ln]	31.96	18.36	54.10	32.07	88.71
95th-Percentile Queue Length [veh/ln]	2.30	1.32	3.90	2.31	6.39
95th-Percentile Queue Length [ft/ln]	57.53	33.05	97.38	57.73	159.68

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	14.83	14.09	9.71	9.71	14.70	12.01
Movement LOS	B	B	A	A	B	B
Critical Movement	Yes	No	No	No	No	No
d_A, Approach Delay [s/veh]	14.56		9.71		12.62	
Approach LOS	B		A		B	
d_I, Intersection Delay [s/veh]	12.21					
Intersection LOS	B					
Intersection V/C	0.362					

Intersection	Approach	Full Buildout (2031) with Improvements					
		AM Peak			PM Peak		
		Avg Delay (s/veh)	LOS	95th % Queue (veh)	Avg Delay (s/veh)	LOS	95th % Queue (veh)
Intersection Control		Signalized - Longer Timing for EB/WB Thru					
54th St W & Rimrock Rd	NB	25.4	C	4	23.8	C	4
	SB	30.9	C	6	24.7	C	3
	EB	31.5	C	20	12.5	B	6
	WB	20.0	B	4	17.8	B	12
	Intersection	27.9	C	--	18.1	B	--
Intersection Control		One-Way Stop-Control (SB) - WB RT & EB LT Lanes					
62nd St W & Grand Ave	SB	30.4	D	7	20.1	C	3
	EB	1.2	A	1	2.9	A	1
	WB	0.0	A	0	0.0	A	0
	Intersection	12.8	B	--	4.6	A	--
Intersection Control		One-Way Stop-Control (SB) - SB RT & LT Lanes					
62nd St W & Grand Ave	SB	24.8	C	6	21.0	C	2
	EB	1.1	A	1	2.8	A	1
	WB	0.0	A	1	0.0	A	0
	Intersection	10.5	B	--	4.7	A	--
Intersection Control		One-Way Stop-Control (NB) - EB RT Lane					
56th St W & Grand Ave	NB	19.1	C	2	41.6	E	6
	EB	0.0	A	0	0.0	A	0
	WB	3.2	A	1	1.9	A	1
	Intersection	3.5	A	--	10.9	B	--
Intersection Control		All-Way Stop-Control					
56th St W & Grand Ave	NB	11.8	B	2	13.7	B	2
	EB	165.4	F	34	25.1	D	7
	WB	14.7	B	4	39.8	E	12
	Intersection	96.6	F	--	29.4	D	--
Intersection Control		All-Way Stop-Control - EB RT Lane					
56th St W & Grand Ave	NB	12.2	B	2	13.3	B	2
	EB	39.7	E	14	15.3	C	4
	WB	16.1	C	4	38.3	E	12
	Intersection	28.5	D	--	25.8	D	--
Intersection Control		Single-Lane Roundabout					
56th St W & Grand Ave	NB	8.3	A	2	7.0	A	2
	EB	13.9	B	7	6.3	A	2
	WB	6.4	A	2	10.4	B	5
	Intersection	10.7	B	--	8.5	A	--
Intersection Control		Signalized					
56th St W & Grand Ave	NB	19.8	B	2	14.9	B	3
	EB	10.1	B	9	10.1	B	5
	WB	10.1	B	4	13.6	B	8
	Intersection	11.0	B	--	12.9	B	--

Option 1: Adjusted Signal Timing

Number	3											
Intersection	54th St W & Rimrock Rd											
Control Type	Signalized											
Analysis Method	HCM 7th Edition											
Name	54th St W			54th St W			Rimrock Rd			Rimrock Rd		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Base Volume Input [veh/h]	43	24	225	149	75	5	12	655	110	163	178	44
Total Analysis Volume [veh/h]	47	26	122	162	82	2	13	712	60	177	193	24

Intersection Settings

Cycle Length [s]	110											
Active Pattern	Pattern 1											
Coordination Type	Time of Day Pattern Coordinated											
Actuation Type	Fully actuated											
Lost time [s]	0.00											
Control Type	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	ProtPer	Permiss	Permiss	ProtPer	Permiss	Permiss
Signal Group	0	6	0	5	2	0	3	4	0	7	8	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	Lead	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	0	5	0	5	5	0	5	5	0	5	5	0
Maximum Green [s]	0	30	0	30	30	0	10	50	0	10	50	0
Amber [s]	0.0	4.8	0.0	4.8	4.8	0.0	4.8	4.8	0.0	4.8	4.8	0.0
All red [s]	0.0	1.7	0.0	1.7	1.7	0.0	1.7	1.7	0.0	1.7	1.7	0.0
Split [s]	0	35	0	0	35	0	15	60	0	15	60	0
Walk [s]	0	7	0	0	7	0	0	7	0	0	7	0
Pedestrian Clearance [s]	0	11	0	0	11	0	0	11	0	0	11	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
l1, Start-Up Lost Time [s]	0.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
Minimum Recall		No			No		No	Yes		No	Yes	
Maximum Recall		No			No		No	No		No	No	
Pedestrian Recall		No			No		No	Yes		No	Yes	
Pedestrian Signal Group	0											
Pedestrian Walk [s]	0											
Pedestrian Clearance [s]	0											

Lane Group Calculations

g / C, Green / Cycle	0.26	0.26	0.26	0.26	0.58	0.48	0.58	0.42	0.42
(v / s)_i Volume / Saturation Flow Rate	0.04	0.10	0.13	0.05	0.01	0.45	0.22	0.12	0.02
so, Base Saturation Flow per Lane [pc/h/lane]	1750	1750	1750	1750	1750	1750	1750	1750	1750
Arrival type	3		3		3		3		
s, saturation flow rate [veh/h]	1282	1464	1242	1743	1294	1709	823	1667	1453
c, Capacity [veh/h]	348	385	283	459	787	819	302	698	609
X, volume / capacity	0.14	0.38	0.57	0.18	0.02	0.94	0.59	0.28	0.04
d, Delay for Lane Group [s/veh]	26.84	24.98	34.86	23.19	7.55	31.86	25.56	15.60	13.86

Version 2023 (SP 0-9)

Lane Group LOS	C	C	C	C	A	C	C	B	B
Critical Lane Group	No	No	Yes	No	Yes	Yes	No	No	No
50th-Percentile Queue Length [veh/ln]	0.71	2.19	3.00	1.16	0.08	13.78	1.85	2.10	0.23
50th-Percentile Queue Length [ft/ln]	17.85	54.85	74.93	29.10	1.91	344.59	46.37	52.53	5.87
95th-Percentile Queue Length [veh/ln]	1.29	3.95	5.39	2.10	0.14	19.87	3.34	3.78	0.42
95th-Percentile Queue Length [ft/ln]	32.14	98.72	134.87	52.39	3.45	496.81	83.47	94.56	10.56

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	26.84	24.98	24.98	34.86	23.19	23.19	7.55	31.86	31.86	25.56	15.60	13.86
Movement LOS	C	C	C	C	C	C	A	C	C	C	B	B
Critical Movement	No	No	No	Yes	No	No	No	No	No	No	No	No
d_A, Approach Delay [s/veh]	25.43			30.87			31.46			19.97		
Approach LOS	C			C			C			B		
d_I, Intersection Delay [s/veh]	27.85											
Intersection LOS	C											
Intersection V/C	0.587											

Option 1: Separate SB RT and LT Lanes

Number	6					
Intersection	62nd St W & Grand Ave					
Control Type	Two-way stop					
Analysis Method	HCM 7th Edition					
Name	62nd St W		Grand Ave		Grand Ave	
Approach	Southbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Left	Thru	Thru	Right
Base Volume Input [veh/h]	279	82	51	292	139	50
Total Analysis Volume [veh/h]	303	89	55	317	151	54

Intersection Settings

Priority Scheme	Stop	Free	Free
Flared Lane			
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance	No		
Number of Storage Spaces in Median	0	0	0

Capacity Analysis

Calculated Rank	3	2	2	1	1	1
v_c, Conflicting Flow Rate	605	178	205	0	0	0
v_c, Stage 1	178	178	205	0	0	0
v_c, Stage 2	427	0	0	0	0	0
c_p,x, Potential Capacity [veh/h]	463	866	1363	0	0	0
c_p,x, Stage 1 [veh/h]	856	1177	1722	0	0	0
c_p,x, Stage 2 [veh/h]	661	1086	1620	0	0	0
c_m,x, Movement Capacity [veh/h]	441	866	1363	100000	100000	100000
c_m,x, Stage 1 [veh/h]	0	0	0	0	0	0
c_m,x, Stage 2 [veh/h]	0	0	0	0	0	0
c_T, Total Capacity [veh/h]	441	866	1363	100000	100000	100000

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.69	0.10	0.04	0.00	0.00	0.00
d_M, Delay for Movement [s/veh]	29.31	9.63	7.70	0.00	0.00	0.00
Movement LOS	D	A	A	A	A	A
Critical Movement	Yes	No	No	No	No	No
95th-Percentile Queue Length [veh/ln]	5.10	0.34	0.09	0.09	0.00	0.00
95th-Percentile Queue Length [ft/ln]	127.41	8.56	2.36	2.36	0.00	0.00
d_A, Approach Delay [s/veh]	24.84		1.14		0.00	
Approach LOS	C		A		A	
V/C_I, Worst Movement V/C Ratio	0.69					
d_I, Worst Movement Control Delay [s/veh]	29.31					
d_I, Intersection Delay [s/veh]	10.49					
Intersection LOS	D					

Option 2: WB RT and EB LT Lanes

Number	6					
Intersection	62nd St W & Grand Ave					
Control Type	Two-way stop					
Analysis Method	HCM 7th Edition					
Name	62nd St W		Grand Ave		Grand Ave	
Approach	Southbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Left	Thru	Thru	Right
Base Volume Input [veh/h]	279	82	51	292	139	50
Total Analysis Volume [veh/h]	303	89	55	317	151	54

Intersection Settings

Priority Scheme	Stop	Free	Free
Flared Lane	No		
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance	No		
Number of Storage Spaces in Median	0	0	0

Capacity Analysis

Calculated Rank	3	2	2	1	1	1
v_c, Conflicting Flow Rate	578	151	205	0	0	0
v_c, Stage 1	151	151	205	0	0	0
v_c, Stage 2	427	0	0	0	0	0
c_p,x, Potential Capacity [veh/h]	480	897	1363	0	0	0
c_p,x, Stage 1 [veh/h]	881	1163	1722	0	0	0
c_p,x, Stage 2 [veh/h]	661	1086	1620	0	0	0
c_m,x, Movement Capacity [veh/h]	461	897	1363	100000	100000	100000
c_m,x, Stage 1 [veh/h]	0	0	0	0	0	0
c_m,x, Stage 2 [veh/h]	0	0	0	0	0	0
c_T, Total Capacity [veh/h]	461	897	1363	100000	100000	100000

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.66	0.10	0.04	0.00	0.00	0.00
d_M, Delay for Movement [s/veh]	31.29	27.50	7.75	0.00	0.00	0.00
Movement LOS	D	D	A	A	A	A
Critical Movement	Yes	No	No	No	No	No
95th-Percentile Queue Length [veh/ln]	6.58	6.58	0.13	0.00	0.00	0.00
95th-Percentile Queue Length [ft/ln]	164.48	164.48	3.15	0.00	0.00	0.00
d_A, Approach Delay [s/veh]	30.43		1.15		0.00	
Approach LOS	D		A		A	
V/C_I, Worst Movement V/C Ratio	0.66					
d_I, Worst Movement Control Delay [s/veh]	31.29					
d_I, Intersection Delay [s/veh]	12.75					
Intersection LOS	D					

Option 1: AWSC

Number	7					
Intersection	56th St W & Grand Ave					
Control Type	All-way stop					
Analysis Method	HCM 7th Edition					
Name	56th St W		Grand Ave		Grand Ave	
Approach	Northbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Thru	Right	Left	Thru
Base Volume Input [veh/h]	33	143	542	218	139	318
Total Analysis Volume [veh/h]	36	155	589	237	151	346

Intersection Settings

Lanes

Capacity per Entry Lane [veh/h]	460	543	826	559	609

Movement, Approach, & Intersection Results

Average Lane Delay [s/veh]	11.17	11.94	165.42	11.49	16.08
95th-Percentile Queue Length [veh]	0.25	1.17	33.23	1.09	3.56
95th-Percentile Queue Length [ft]	6.32	29.21	830.65	27.14	88.94
Approach Delay [s/veh]	11.80		165.42	14.69	
Approach LOS	B		F	B	
Intersection Delay [s/veh]	96.56				
Intersection LOS	F				

Option 2: EB RT Lane

Number	7					
Intersection	56th St W & Grand Ave					
Control Type	Two-way stop					
Analysis Method	HCM 7th Edition					
Name	56th St W		Grand Ave		Grand Ave	
Approach	Northbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Thru	Right	Left	Thru
Base Volume Input [veh/h]	33	143	542	218	139	318
Total Analysis Volume [veh/h]	36	155	589	237	151	346

Intersection Settings

Priority Scheme	Stop	Free	Free
Flared Lane			
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance	No		
Number of Storage Spaces in Median	0	0	0

Capacity Analysis

Calculated Rank	3	2	1	1	2	1
v_c, Conflicting Flow Rate	1237	589	0	0	826	0
v_c, Stage 1	589	589	0	0	826	0
v_c, Stage 2	648	0	0	0	0	0
c_p,x, Potential Capacity [veh/h]	191	500	0	0	798	0
c_p,x, Stage 1 [veh/h]	547	1380	0	0	2044	0
c_p,x, Stage 2 [veh/h]	513	1073	0	0	1613	0
c_m,x, Movement Capacity [veh/h]	155	500	100000	100000	798	100000
c_m,x, Stage 1 [veh/h]	0	0	0	0	0	0
c_m,x, Stage 2 [veh/h]	0	0	0	0	0	0
c_T, Total Capacity [veh/h]	155	500	100000	100000	798	100000

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.23	0.31	0.01	0.00	0.19	0.00
d_M, Delay for Movement [s/veh]	35.22	15.39	0.00	0.00	10.56	0.00
Movement LOS	E	C	A	A	B	A
Critical Movement	Yes	No	No	No	No	No
95th-Percentile Queue Length [veh/ln]	0.86	1.31	0.00	0.00	0.69	0.00
95th-Percentile Queue Length [ft/ln]	21.52	32.67	0.00	0.00	17.36	0.00
d_A, Approach Delay [s/veh]	19.13		0.00		3.21	
Approach LOS	C		A		A	
V/C_I, Worst Movement V/C Ratio	0.23					
d_I, Worst Movement Control Delay [s/veh]	35.22					
d_I, Intersection Delay [s/veh]	3.47					
Intersection LOS	E					

Option 3: AWSC EB RT Lane

Number	7					
Intersection	56th St W & Grand Ave					
Control Type	All-way stop					
Analysis Method	HCM 7th Edition					
Name	56th St W		Grand Ave		Grand Ave	
Approach	Northbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Thru	Right	Left	Thru
Base Volume Input [veh/h]	33	143	542	218	139	318
Total Analysis Volume [veh/h]	36	155	589	237	151	346

Intersection Settings

Lanes

Capacity per Entry Lane [veh/h]	449	528	612	691	531	577

Movement, Approach, & Intersection Results

Average Lane Delay [s/veh]	11.43	12.33	51.38	10.60	12.15	17.88
95th-Percentile Queue Length [veh]	0.26	1.22	13.50	1.53	1.16	3.96
95th-Percentile Queue Length [ft]	6.51	30.38	337.62	38.13	29.07	98.99
Approach Delay [s/veh]	12.16		39.68		16.14	
Approach LOS	B		E		C	
Intersection Delay [s/veh]	28.48					
Intersection LOS	D					

Option 4: Signalized

Number	7					
Intersection	56th St W & Grand Ave					
Control Type	Signalized					
Analysis Method	HCM 7th Edition					
Name	56th St W		Grand Ave		Grand Ave	
Approach	Northbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Thru	Right	Left	Thru
Base Volume Input [veh/h]	33	143	542	218	139	318
Total Analysis Volume [veh/h]	36	77	589	118	151	346

Intersection Settings

Cycle Length [s]	60					
Active Pattern	Pattern 1					
Coordination Type	Time of Day Pattern Coordinated					
Actuation Type	Fixed time					
Lost time [s]	0.00					
Control Type	Permissive	Permissive	Permissive	Permissive	Permissive	Permissive
Signal Group	1	0	8	0	0	4
Auxiliary Signal Groups						
Lead / Lag	Lead	-	-	-	-	-
Minimum Green [s]	5	0	10	0	0	10
Maximum Green [s]	27	0	205	0	0	205
Amber [s]	3.0	0.0	3.0	0.0	0.0	3.0
All red [s]	1.0	0.0	1.0	0.0	0.0	1.0
Split [s]	18	0	42	0	0	42
Walk [s]	5	0	5	0	0	5
Pedestrian Clearance [s]	10	0	10	0	0	10
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0
I1, Start-Up Lost Time [s]	2.0	0.0	2.0	0.0	0.0	2.0
Minimum Recall	No		No			No
Maximum Recall	No		No			No
Pedestrian Recall	No		No			No
Pedestrian Signal Group	0					
Pedestrian Walk [s]	0					
Pedestrian Clearance [s]	0					

Lane Group Calculations

g / C, Green / Cycle	0.23	0.23	0.63	0.63	0.63
(v / s)_i Volume / Saturation Flow Rate	0.02	0.05	0.42	0.21	0.20
so, Base Saturation Flow per Lane [pc/h/ln]	1750	1750	1750	1750	1750
Arrival type	3		3	3	
s, saturation flow rate [veh/h]	1589	1415	1691	732	1721
c, Capacity [veh/h]	371	330	1071	366	1090
X, volume / capacity	0.10	0.23	0.66	0.41	0.32
d, Delay for Lane Group [s/veh]	18.56	20.30	10.13	20.05	5.81

Version 2023 (SP 0-9)

Lane Group LOS	B	C	B	C	A
Critical Lane Group	No	Yes	Yes	No	No
50th-Percentile Queue Length [veh/ln]	0.39	0.90	4.60	1.77	1.33
50th-Percentile Queue Length [ft/ln]	9.83	22.54	114.96	44.31	33.36
95th-Percentile Queue Length [veh/ln]	0.71	1.62	8.11	3.19	2.40
95th-Percentile Queue Length [ft/ln]	17.69	40.57	202.87	79.76	60.06

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	18.56	20.30	10.13	10.13	20.05	5.81
Movement LOS	B	C	B	B	C	A
Critical Movement	No	Yes	No	No	No	No
d_A, Approach Delay [s/veh]	19.75		10.13		10.14	
Approach LOS	B		B		B	
d_I, Intersection Delay [s/veh]	10.96					
Intersection LOS	B					
Intersection V/C	0.473					

Option 5: Roundabout

Number	7					
Intersection	56th St W & Grand Ave					
Control Type	Roundabout					
Analysis Method	HCM 7th Edition					
Name	56th St W		Grand Ave		Grand Ave	
Approach	Northbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Thru	Right	Left	Thru
Base Volume Input [veh/h]	33	143	542	218	139	318
Total Analysis Volume [veh/h]	36	155	589	237	151	346

Intersection Settings

Number of Conflicting Circulating Lanes	1		1		1	
Circulating Flow Rate [veh/h]	593		156		38	
Exiting Flow Rate [veh/h]	400		391		758	
Demand Flow Rate [veh/h]	33	143	542	218	139	318
Adjusted Demand Flow Rate [veh/h]	36	155	589	237	151	346

Lanes

Overwrite Calculated Critical Headway	No		No		No	
User-Defined Critical Headway [s]	4.00		4.00		4.00	
Overwrite Calculated Follow-Up Time	No		No		No	
User-Defined Follow-Up Time [s]	3.00		3.00		3.00	
A (intercept)	1380.00		1380.00		1380.00	
B (coefficient)	0.00102		0.00102		0.00102	
HV Adjustment Factor	0.94		0.99		0.98	
Entry Flow Rate [veh/h]	203		837		510	

Version 2023 (SP 0-9)

Capacity of Entry and Bypass Lanes [veh/h]	754	1177	1328
Pedestrian Impedance	1.00	1.00	1.00
Capacity per Entry Lane [veh/h]	710	1163	1295
X, volume / capacity	0.27	0.71	0.38

Movement, Approach, & Intersection Results

Average Lane Delay [s/veh]	8.27	13.87	6.42
Lane LOS	A	B	A
95th-Percentile Queue Length [veh]	1.09	6.40	1.84
95th-Percentile Queue Length [ft]	27.15	159.96	45.90
Approach Delay [s/veh]	8.27	13.87	6.42
Approach LOS	A	B	A
Intersection Delay [s/veh]	10.72		
Intersection LOS	B		

Option 1: Adjusted Signal Timing

Number	3											
Intersection	54th St W & Rimrock Rd											
Control Type	Signalized											
Analysis Method	HCM 7th Edition											
Name	54th St W			54th St W			Rimrock Rd			Rimrock Rd		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Base Volume Input [veh/h]	119	70	139	81	49	16	11	328	54	187	539	111
Total Analysis Volume [veh/h]	129	76	75	88	53	17	12	357	59	203	586	60

Intersection Settings

Cycle Length [s]	100											
Active Pattern	Pattern 1											
Coordination Type	Time of Day Pattern Coordinated											
Actuation Type	Fully actuated											
Lost time [s]	0.00											
Control Type	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	ProtPer	Permiss	Permiss	ProtPer	Permiss	Permiss
Signal Group	0	6	0	0	2	0	3	4	0	7	8	0
Auxiliary Signal Groups												
Lead / Lag	-	-	-	-	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	0	5	0	0	5	0	5	5	0	5	5	0
Maximum Green [s]	0	30	0	0	30	0	10	50	0	10	50	0
Amber [s]	0.0	4.8	0.0	0.0	4.8	0.0	4.8	4.8	0.0	4.8	4.8	0.0
All red [s]	0.0	1.7	0.0	0.0	1.7	0.0	1.7	1.7	0.0	1.7	1.7	0.0
Split [s]	0	35	0	0	35	0	15	50	0	15	50	0
Walk [s]	0	7	0	0	7	0	0	7	0	0	7	0
Pedestrian Clearance [s]	0	11	0	0	11	0	0	11	0	0	11	0
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
l1, Start-Up Lost Time [s]	0.0	2.0	0.0	0.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	0.0
Minimum Recall		No			No		No	Yes		No	Yes	
Maximum Recall		No			No		No	No		No	No	
Pedestrian Recall		No			No		No	Yes		No	Yes	
Pedestrian Signal Group	0											
Pedestrian Walk [s]	0											
Pedestrian Clearance [s]	0											

Lane Group Calculations

g / C, Green / Cycle	0.21	0.21	0.21	0.21	0.58	0.46	0.58	0.38	0.38
(v / s)_i Volume / Saturation Flow Rate	0.10	0.10	0.07	0.04	0.01	0.25	0.19	0.34	0.04
so, Base Saturation Flow per Lane [pc/h/ln]	1750	1750	1750	1750	1750	1750	1750	1750	1750
Arrival type	3		3		3		3		
s, saturation flow rate [veh/h]	1352	1586	1225	1678	1045	1688	1090	1746	1488
c, Capacity [veh/h]	310	332	232	352	530	772	632	665	567
X, volume / capacity	0.42	0.45	0.38	0.20	0.02	0.54	0.32	0.88	0.11
d, Delay for Lane Group [s/veh]	25.80	22.14	28.20	20.27	8.48	12.58	8.26	21.69	12.32

Lane Group LOS	C	C	C	C	A	B	A	C	B
Critical Lane Group	Yes	No	No	No	No	No	Yes	Yes	No
50th-Percentile Queue Length [veh/ln]	1.65	1.74	1.19	0.75	0.04	3.13	0.99	6.89	0.45
50th-Percentile Queue Length [ft/ln]	41.20	43.46	29.77	18.71	1.09	78.36	24.81	172.24	11.21
95th-Percentile Queue Length [veh/ln]	2.97	3.13	2.14	1.35	0.08	5.64	1.79	11.19	0.81
95th-Percentile Queue Length [ft/ln]	74.16	78.23	53.58	33.68	1.95	141.04	44.65	279.86	20.19

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	25.80	22.14	22.14	28.20	20.27	20.27	8.48	12.58	12.58	8.26	21.69	12.32
Movement LOS	C	C	C	C	C	C	A	B	B	A	C	B
Critical Movement	No	No	No	Yes	No	No	No	No	No	No	No	No
d_A, Approach Delay [s/veh]	23.83			24.68			12.47			17.82		
Approach LOS	C			C			B			B		
d_I, Intersection Delay [s/veh]	18.10											
Intersection LOS	B											
Intersection V/C	0.493											

Option 1: SB RT and LT Lanes

Number	6					
Intersection	62nd St W & Grand Ave					
Control Type	Two-way stop					
Analysis Method	HCM 7th Edition					
Name	62nd St W		Grand Ave		Grand Ave	
Approach	Southbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Left	Thru	Thru	Right
Base Volume Input [veh/h]	113	53	106	213	260	184
Total Analysis Volume [veh/h]	123	58	115	232	283	200

Intersection Settings

Priority Scheme	Stop	Free	Free
Flared Lane			
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance	No		
Number of Storage Spaces in Median	0	0	0

Capacity Analysis

Calculated Rank	3	2	2	1	1	1
v_c, Conflicting Flow Rate	845	383	483	0	0	0
v_c, Stage 1	383	383	483	0	0	0
v_c, Stage 2	462	0	0	0	0	0
c_p,x, Potential Capacity [veh/h]	336	664	1084	0	0	0
c_p,x, Stage 1 [veh/h]	694	1283	1879	0	0	0
c_p,x, Stage 2 [veh/h]	638	1084	1628	0	0	0
c_m,x, Movement Capacity [veh/h]	295	664	1084	100000	100000	100000
c_m,x, Stage 1 [veh/h]	0	0	0	0	0	0
c_m,x, Stage 2 [veh/h]	0	0	0	0	0	0
c_T, Total Capacity [veh/h]	295	664	1084	100000	100000	100000

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.42	0.09	0.11	0.00	0.00	0.00
d_M, Delay for Movement [s/veh]	25.67	10.94	8.46	0.00	0.00	0.00
Movement LOS	D	B	A	A	A	A
Critical Movement	Yes	No	No	No	No	No
95th-Percentile Queue Length [veh/ln]	1.97	0.29	0.20	0.20	0.00	0.00
95th-Percentile Queue Length [ft/ln]	49.17	7.16	5.11	5.11	0.00	0.00
d_A, Approach Delay [s/veh]	20.95		2.80		0.00	
Approach LOS	C		A		A	
V/C_I, Worst Movement V/C Ratio	0.42					
d_I, Worst Movement Control Delay [s/veh]	25.67					
d_I, Intersection Delay [s/veh]	4.71					
Intersection LOS	D					

Option 2: WB RT and EB LT Lanes

Number	6					
Intersection	62nd St W & Grand Ave					
Control Type	Two-way stop					
Analysis Method	HCM 7th Edition					
Name	62nd St W		Grand Ave		Grand Ave	
Approach	Southbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Left	Thru	Thru	Right
Base Volume Input [veh/h]	113	53	106	213	260	184
Total Analysis Volume [veh/h]	123	58	115	232	283	200

Intersection Settings

Priority Scheme	Stop	Free	Free
Flared Lane	No		
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance	No		
Number of Storage Spaces in Median	0	0	0

Capacity Analysis

Calculated Rank	3	2	2	1	1	1
v_c, Conflicting Flow Rate	745	283	483	0	0	0
v_c, Stage 1	283	283	483	0	0	0
v_c, Stage 2	462	0	0	0	0	0
c_p,x, Potential Capacity [veh/h]	384	755	1084	0	0	0
c_p,x, Stage 1 [veh/h]	770	1229	1879	0	0	0
c_p,x, Stage 2 [veh/h]	638	1084	1628	0	0	0
c_m,x, Movement Capacity [veh/h]	344	755	1084	100000	100000	100000
c_m,x, Stage 1 [veh/h]	0	0	0	0	0	0
c_m,x, Stage 2 [veh/h]	0	0	0	0	0	0
c_T, Total Capacity [veh/h]	344	755	1084	100000	100000	100000

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.36	0.08	0.11	0.00	0.00	0.00
d_M, Delay for Movement [s/veh]	21.96	16.25	8.72	0.00	0.00	0.00
Movement LOS	C	C	A	A	A	A
Critical Movement	Yes	No	No	No	No	No
95th-Percentile Queue Length [veh/ln]	2.15	2.15	0.36	0.00	0.00	0.00
95th-Percentile Queue Length [ft/ln]	53.75	53.75	8.88	0.00	0.00	0.00
d_A, Approach Delay [s/veh]	20.13		2.89		0.00	
Approach LOS	C		A		A	
V/C_I, Worst Movement V/C Ratio	0.36					
d_I, Worst Movement Control Delay [s/veh]	21.96					
d_I, Intersection Delay [s/veh]	4.60					
Intersection LOS	C					

Option 1: AWSC

Number	7					
Intersection	56th St W & Grand Ave					
Control Type	All-way stop					
Analysis Method	HCM 7th Edition					
Name	56th St W		Grand Ave		Grand Ave	
Approach	Northbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Thru	Right	Left	Thru
Base Volume Input [veh/h]	151	164	272	95	139	486
Total Analysis Volume [veh/h]	164	178	296	103	151	528

Intersection Settings

Lanes

Capacity per Entry Lane [veh/h]	458	541	549	527	567

Movement, Approach, & Intersection Results

Average Lane Delay [s/veh]	14.89	12.58	25.05	12.26	47.62
95th-Percentile Queue Length [veh]	1.60	1.43	6.04	1.18	11.87
95th-Percentile Queue Length [ft]	40.11	35.64	150.93	29.41	296.78
Approach Delay [s/veh]	13.69		25.05	39.76	
Approach LOS	B		D	E	
Intersection Delay [s/veh]	29.35				
Intersection LOS	D				

Option 2: EB RT

Number	7					
Intersection	56th St W & Grand Ave					
Control Type	Two-way stop					
Analysis Method	HCM 7th Edition					
Name	56th St W		Grand Ave		Grand Ave	
Approach	Northbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Thru	Right	Left	Thru
Base Volume Input [veh/h]	151	164	272	95	139	486
Total Analysis Volume [veh/h]	164	178	296	103	151	528

Intersection Settings

Priority Scheme	Stop	Free	Free
Flared Lane			
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance	No		
Number of Storage Spaces in Median	0	0	0

Capacity Analysis

Calculated Rank	3	2	1	1	2	1
v_c, Conflicting Flow Rate	1126	296	0	0	399	0
v_c, Stage 1	296	296	0	0	399	0
v_c, Stage 2	830	0	0	0	0	0
c_p,x, Potential Capacity [veh/h]	229	746	0	0	1171	0
c_p,x, Stage 1 [veh/h]	759	1242	0	0	1844	0
c_p,x, Stage 2 [veh/h]	432	1089	0	0	1636	0
c_m,x, Movement Capacity [veh/h]	199	746	100000	100000	1171	100000
c_m,x, Stage 1 [veh/h]	0	0	0	0	0	0
c_m,x, Stage 2 [veh/h]	0	0	0	0	0	0
c_T, Total Capacity [veh/h]	199	746	100000	100000	1171	100000

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.82	0.24	0.00	0.00	0.13	0.01
d_M, Delay for Movement [s/veh]	74.36	11.33	0.00	0.00	8.53	0.00
Movement LOS	F	B	A	A	A	A
Critical Movement	Yes	No	No	No	No	No
95th-Percentile Queue Length [veh/ln]	5.95	0.93	0.00	0.00	0.44	0.00
95th-Percentile Queue Length [ft/ln]	148.71	23.19	0.00	0.00	11.07	0.00
d_A, Approach Delay [s/veh]	41.55		0.00		1.90	
Approach LOS	E		A		A	
V/C_I, Worst Movement V/C Ratio	0.82					
d_I, Worst Movement Control Delay [s/veh]	74.36					
d_I, Intersection Delay [s/veh]	10.92					
Intersection LOS	F					

Option 3: AWSC with EB RT Lane

Number	7					
Intersection	56th St W & Grand Ave					
Control Type	All-way stop					
Analysis Method	HCM 7th Edition					
Name	56th St W		Grand Ave		Grand Ave	
Approach	Northbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Thru	Right	Left	Thru
Base Volume Input [veh/h]	151	164	272	95	139	486
Total Analysis Volume [veh/h]	164	178	296	103	151	528

Intersection Settings

Lanes

Capacity per Entry Lane [veh/h]	468	554	539	601	531	572

Movement, Approach, & Intersection Results

Average Lane Delay [s/veh]	14.49	12.25	17.20	9.92	12.15	45.76
95th-Percentile Queue Length [veh]	1.56	1.38	3.29	0.61	1.16	11.60
95th-Percentile Queue Length [ft]	38.90	34.51	82.36	15.35	29.07	290.04
Approach Delay [s/veh]	13.32		15.32		38.29	
Approach LOS	B		C		E	
Intersection Delay [s/veh]	25.82					
Intersection LOS	D					

Option 4: Signalized

Number	7					
Intersection	56th St W & Grand Ave					
Control Type	Signalized					
Analysis Method	HCM 7th Edition					
Name	56th St W		Grand Ave		Grand Ave	
Approach	Northbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Thru	Right	Left	Thru
Base Volume Input [veh/h]	151	164	272	95	139	486
Total Analysis Volume [veh/h]	164	89	296	51	151	528

Intersection Settings

Cycle Length [s]	60					
Active Pattern	Pattern 1					
Coordination Type	Time of Day Pattern Coordinated					
Actuation Type	Fixed time					
Lost time [s]	0.00					
Control Type	Permissive	Permissive	Permissive	Permissive	Permissive	Permissive
Signal Group	1	0	8	0	0	4
Auxiliary Signal Groups						
Lead / Lag	Lead	-	-	-	-	-
Minimum Green [s]	5	0	10	0	0	10
Maximum Green [s]	21	0	31	0	0	31
Amber [s]	3.0	0.0	3.0	0.0	0.0	3.0
All red [s]	1.0	0.0	1.0	0.0	0.0	1.0
Split [s]	25	0	35	0	0	35
Walk [s]	7	0	7	0	0	7
Pedestrian Clearance [s]	10	0	10	0	0	10
Delayed Vehicle Green [s]	0.0	0.0	0.0	0.0	0.0	0.0
l1, Start-Up Lost Time [s]	2.0	0.0	2.0	0.0	0.0	2.0
Minimum Recall	No		No			No
Maximum Recall	No		No			No
Pedestrian Recall	No		No			No
Pedestrian Signal Group	0					
Pedestrian Walk [s]	0					
Pedestrian Clearance [s]	0					

Lane Group Calculations

g / C, Green / Cycle	0.35	0.35	0.52	0.52	0.52
(v / s)_i Volume / Saturation Flow Rate	0.10	0.06	0.20	0.14	0.31
so, Base Saturation Flow per Lane [pc/h/ln]	1750	1750	1750	1750	1750
Arrival type	3		3	3	
s, saturation flow rate [veh/h]	1667	1478	1699	1050	1728
c, Capacity [veh/h]	583	517	878	497	893
X, volume / capacity	0.28	0.17	0.40	0.30	0.59
d, Delay for Lane Group [s/veh]	15.26	14.21	10.14	15.95	12.97
-	-	-	-	-	-

Version 2023 (SP 0-9)

Lane Group LOS	B	B	B	B	B
Critical Lane Group	Yes	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	1.52	0.79	2.48	1.47	4.13
50th-Percentile Queue Length [ft/ln]	37.92	19.80	62.04	36.79	103.17
95th-Percentile Queue Length [veh/ln]	2.73	1.43	4.47	2.65	7.43
95th-Percentile Queue Length [ft/ln]	68.26	35.64	111.67	66.21	185.71

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	15.26	14.21	10.14	10.14	15.95	12.97
Movement LOS	B	B	B	B	B	B
Critical Movement	No	No	No	No	Yes	No
d_A, Approach Delay [s/veh]	14.89		10.14		13.63	
Approach LOS	B		B		B	
d_I, Intersection Delay [s/veh]	12.93					
Intersection LOS	B					
Intersection V/C	0.404					

Option 5: Roundabout

Number	7					
Intersection	56th St W & Grand Ave					
Control Type	Roundabout					
Analysis Method	HCM 7th Edition					
Name	56th St W		Grand Ave		Grand Ave	
Approach	Northbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Thru	Right	Left	Thru
Base Volume Input [veh/h]	151	164	272	95	139	486
Total Analysis Volume [veh/h]	164	178	296	103	151	528

Intersection Settings

Number of Conflicting Circulating Lanes	1		1		1	
Circulating Flow Rate [veh/h]	297		151		164	
Exiting Flow Rate [veh/h]	256		700		477	
Demand Flow Rate [veh/h]	151	164	272	95	139	486
Adjusted Demand Flow Rate [veh/h]	164	178	296	103	151	528

Lanes

Override Calculated Critical Headway	No		No		No	
User-Defined Critical Headway [s]	4.00		4.00		4.00	
Override Calculated Follow-Up Time	No		No		No	
User-Defined Follow-Up Time [s]	3.00		3.00		3.00	
A (intercept)	1380.00		1380.00		1380.00	
B (coefficient)	0.00102		0.00102		0.00102	
HV Adjustment Factor	1.00		0.99		0.99	
Entry Flow Rate [veh/h]	344		403		688	

Version 2023 (SP 0-9)

Capacity of Entry and Bypass Lanes [veh/h]	1019	1184	1168
Pedestrian Impedance	1.00	1.00	1.00
Capacity per Entry Lane [veh/h]	1015	1174	1154
X, volume / capacity	0.34	0.34	0.59

Movement, Approach, & Intersection Results

Average Lane Delay [s/veh]	7.03	6.34	10.43
Lane LOS	A	A	B
95th-Percentile Queue Length [veh]	1.50	1.52	4.02
95th-Percentile Queue Length [ft]	37.47	38.05	100.58
Approach Delay [s/veh]	7.03	6.34	10.43
Approach LOS	A	A	B
Intersection Delay [s/veh]	8.46		
Intersection LOS	A		

FINANCIAL CONTRIBUTION CALCULATIONS

APPENDIX H

Intelligent Infrastructure.
Enduring Communities.



1st Filing - Intersection: 70th Street West & Rimrock Road

Approach		AM Peak		PM Peak		Number of Lanes
		Mvmt Vol.	Lane Vol.	Mvmt Vol.	Lane Vol.	
NB	T	4	4	11	11	1
	L	6	6	23	23	1
SB	T	11	11	7	7	1
	L	42	42	28	28	1
EB	T	82	82	54	54	1
	L		0		0	1
WB	T	28	28	88	88	1
	L		0		0	1
Critical Lane Sum Increase:		128		127		
Critical Lane Sum:		1200		1200		
Peak Hour %:		10.67%		10.58%		
Highest %:		10.67%				

<--- 1200 for 4-leg intersection,
1140 for 3-leg intersection

1st Filing - Intersection: 62nd Street West & Rimrock Road

Approach		AM Peak		PM Peak		Number of Lanes
		Mvmt Vol.	Lane Vol.	Mvmt Vol.	Lane Vol.	
NB	T		0		0	1
	L	8	8	25	25	1
SB	T		0		0	1
	L		0		0	1
EB	T	93	93	61	61	1
	L	8	8	5	5	1
WB	T	31	31	100	100	1
	L		0		0	1
Critical Lane Sum Increase:			101	130		<--- 1200 for 4-leg 1140 for 3-leg
Critical Lane Sum:			1200	1200		
Peak Hour %:			8.42%	10.83%		
Highest %:			10.83%			

1st Filing - Intersection: 54th Street West & Rimrock Road

Approach		AM Peak		PM Peak		Number of Lanes
		Mvmnt Vol.	Lane Vol.	Mvmnt Vol.	Lane Vol.	
NB	T		0		0	1
	L	8	8	25	25	1
SB	T		0		0	1
	L		0		0	1
EB	T	62	62	41	41	1
	L	8	8	5	5	1
WB	T	21	21	67	67	1
	L		0		0	1
Critical Lane Sum Increase:			70	97		<--- 1200 for 4-leg 1140 for 3-leg
Critical Lane Sum:			1200	1200		
Peak Hour %:			5.83%	8.08%		
Highest %:			8.08%			

1st Filing - Intersection: 70th Street West & Colton Boulevard

Approach		AM Peak		PM Peak		Number of Lanes
		Mvmt Vol.	Lane Vol.	Mvmt Vol.	Lane Vol.	
NB	T	10	10	34	34	1
	L		0		0	0
SB	T	32	32	21	21	1
	L		0		0	1
EB	T		0		0	0
	L		0		0	0
WB	T		0		0	0
	L		0		0	1
Critical Lane Sum Increase:		32		34		
Critical Lane Sum:		1140		1140		
Peak Hour %:		2.81%		2.98%		
Highest %:				2.98%		

<--- 1200 for 4-leg intersection,
1140 for 3-leg intersection

1st Filing - Intersection: 70th Street West & Grand Avenue

Approach		AM Peak		PM Peak		Number of Lanes
		Mvmt Vol.	Lane Vol.	Mvmt Vol.	Lane Vol.	
NB	T		0		0	0
	L		0		0	0
SB	T		0		0	0
	L	24	24	16	16	1
EB	T		0		0	1
	L	2	2	8	8	1
WB	T		0		0	1
	L		0		0	0
Critical Lane Sum Increase:		26		24		<--- 1200 for 4-leg 1140 for 3-leg
Critical Lane Sum:		1140		1140		
Peak Hour %:		2.28%		2.11%		
Highest %:		2.28%				

1st Filing - Intersection: 62nd Street West & Grand Avenue

Approach		AM Peak		PM Peak		Number of Lanes
		Mvmt Vol.	Lane Vol.	Mvmt Vol.	Lane Vol.	
NB	T		0		0	0
	L		0		0	0
SB	T		0		0	0
	L	23	23	16	16	1
EB	T	24	24	16	16	1
	L		0		0	1
WB	T	8	8	26	26	1
	L		0		0	0
Critical Lane Sum Increase:			47	42		<--- 1200 for 4-leg 1140 for 3-leg
Critical Lane Sum:			1140	1140		
Peak Hour %:			4.12%	3.68%		
Highest %:			4.12%			

1st Filing - Intersection: 56th Street West & Grand Avenue

Approach		AM Peak		PM Peak		Number of Lanes
		Mvmt Vol.	Lane Vol.	Mvmt Vol.	Lane Vol.	
NB	T		0		0	1
	L	8	8	25	25	1
SB	T		0		0	1
	L		0		0	1
EB	T	24	24	16	16	1
	L		0		0	1
WB	T	8	8	26	26	1
	L		0		0	1
Critical Lane Sum Increase:			32	51		<--- 1200 for 4-leg 1140 for 3-leg
Critical Lane Sum:			1140	1140		
Peak Hour %:			2.81%	4.47%		
Highest %:			4.47%			

1st Filing - Intersection: 54th Street West & Grand Avenue

Approach		AM Peak		PM Peak		Number of Lanes
		Mvmt Vol.	Lane Vol.	Mvmt Vol.	Lane Vol.	
NB	T		0		0	0
	L		0		0	0
SB	T		0		0	0
	L	23	23	15	15	1
EB	T	24	24	16	16	1
	L		0		0	1
WB	T	8	8	26	26	1
	L		0		0	0
Critical Lane Sum Increase:			47	41		<--- 1200 for 4-leg 1140 for 3-leg
Critical Lane Sum:			1140	1140		
Peak Hour %:			4.12%	3.60%		
Highest %:			4.12%			

2nd Filing - Intersection: 70th Street West & Rimrock Road

Approach		AM Peak		PM Peak		Number of Lanes
		Mvmt Vol.	Lane Vol.	Mvmt Vol.	Lane Vol.	
NB	T	0	0	0	0	1
	L	6	6	15	15	1
SB	T	0	0	0	0	1
	L	0	0	0	0	1
EB	T	59	59	39	39	1
	L		0		0	1
WB	T	19	19	63	63	1
	L		0		0	1
Critical Lane Sum Increase:			65	78		<--- 1200 for 4-leg 1140 for 3-leg
Critical Lane Sum:			1200	1200		
Peak Hour %:			5.42%	6.50%		
Highest %:			6.50%			

2nd Filing - Intersection: 62nd Street West & Rimrock Road

Approach		AM Peak		PM Peak		Number of Lanes
		Mvmt Vol.	Lane Vol.	Mvmt Vol.	Lane Vol.	
NB	T		0		0	1
	L	3	3	12	12	1
SB	T		0		0	1
	L		0		0	1
EB	T	44	44	29	29	1
	L	4	4	3	3	1
WB	T	15	15	48	48	1
	L		0		0	1
Critical Lane Sum Increase:			47	63		<--- 1200 for 4-leg 1140 for 3-leg
Critical Lane Sum:			1200	1200		
Peak Hour %:			3.92%	5.25%		
Highest %:			5.25%			

2nd Filing - Intersection: 54th Street West & Rimrock Road

Approach		AM Peak		PM Peak		Number of Lanes
		Mvmt Vol.	Lane Vol.	Mvmt Vol.	Lane Vol.	
NB	T		0		0	1
	L	3	3	12	12	1
SB	T		0		0	1
	L		0		0	1
EB	T	30	30	19	19	1
	L	3	3	3	3	1
WB	T	10	10	32	32	1
	L		0		0	1
Critical Lane Sum Increase:			33	47		<--- 1200 for 4-leg 1140 for 3-leg
Critical Lane Sum:			1200	1200		
Peak Hour %:			2.75%	3.92%		
Highest %:			3.92%			

2nd Filing - Intersection: 70th Street West & Colton Boulevard

Approach		AM Peak		PM Peak		Number of Lanes
		Mvmt Vol.	Lane Vol.	Mvmt Vol.	Lane Vol.	
NB	T	6	6	15	15	1
	L		0		0	0
SB	T	14	14	9	9	1
	L		0		0	1
EB	T		0		0	0
	L		0		0	0
WB	T		0		0	0
	L		0		0	1
Critical Lane Sum Increase:		14		15		
Critical Lane Sum:		1140		1140		
Peak Hour %:		1.23%		1.32%		
Highest %:				1.32%		

<--- 1200 for 4-leg intersection,
1140 for 3-leg intersection

2nd Filing - Intersection: 70th Street West & Grand Avenue

Approach		AM Peak		PM Peak		Number of Lanes
		Mvmt Vol.	Lane Vol.	Mvmt Vol.	Lane Vol.	
NB	T		0		0	0
	L		0		0	0
SB	T		0		0	0
	L	11	11	7	7	1
EB	T		0		0	1
	L	2	2	4	4	1
WB	T		0		0	1
	L		0		0	0
Critical Lane Sum Increase:			13	11		<--- 1200 for 4-leg 1140 for 3-leg
Critical Lane Sum:			1140	1140		
Peak Hour %:			1.14%	0.96%		
Highest %:			1.14%			

2nd Filing - Intersection: 62nd Street West & Grand Avenue

Approach		AM Peak		PM Peak		Number of Lanes
		Mvmt Vol.	Lane Vol.	Mvmt Vol.	Lane Vol.	
NB	T		0		0	0
	L		0		0	0
SB	T		0		0	0
	L	11	11	7	7	1
EB	T	11	11	7	7	1
	L		0		0	1
WB	T	4	4	11	11	1
	L		0		0	0
Critical Lane Sum Increase:			22	18		<--- 1200 for 4-leg 1140 for 3-leg
Critical Lane Sum:			1140	1140		
Peak Hour %:			1.93%	1.58%		
Highest %:			1.93%			

2nd Filing - Intersection: 56th Street West & Grand Avenue

Approach		AM Peak		PM Peak		Number of Lanes
		Mvmt Vol.	Lane Vol.	Mvmt Vol.	Lane Vol.	
NB	T		0		0	1
	L	3	3	12	12	1
SB	T		0		0	1
	L		0		0	1
EB	T	11	11	7	7	1
	L		0		0	1
WB	T	4	4	11	11	1
	L		0		0	1
Critical Lane Sum Increase:			14	23		<--- 1200 for 4-leg 1140 for 3-leg
Critical Lane Sum:			1140	1140		
Peak Hour %:			1.23%	2.02%		
Highest %:			2.02%			

2nd Filing - Intersection: 54th Street West & Grand Avenue

Approach		AM Peak		PM Peak		Number of Lanes
		Mvmt Vol.	Lane Vol.	Mvmt Vol.	Lane Vol.	
NB	T		0		0	0
	L		0		0	0
SB	T		0		0	0
	L	11	11	7	7	1
EB	T	11	11	7	7	1
	L		0		0	1
WB	T	4	4	11	11	1
	L		0		0	0
Critical Lane Sum Increase:			22	18		<--- 1200 for 4-leg 1140 for 3-leg
Critical Lane Sum:			1140	1140		
Peak Hour %:			1.93%	1.58%		
Highest %:			1.93%			



Community Planning
Surveying + Mapping + GIS + Drone
Civil Infrastructure Engineering
Multimodal Transportation Engineering
*Water and Wastewater Utility Design and
Operations*
Landscape Architecture + Placemaking
Construction Management and Inspection
*Communications + Public Engagement +
Visualizations*

www.sanbell.com